Ultra low-loss SHF cable assemblies

AS 9100 CERTIFIED

General interconnect
Outdoor
Air frame
Light Weight
Test & Measurement

RADIALL
The next conneXion

COMPANY Profile

Founded in 1952 in France, RADIALL started as a family owned company making coaxial plugs. Today, RADIALL is an international and global manufacturer of interconnect components including ***RF coaxial connectors and cable assemblies****,* ***antennas****,* ***fiber optic components****,* ***microwave components,*** *and* ***multipin connectors*** *for the Automotive, Civil Aviation, Defense, Industrial, Medical, Space and Telecommunication markets.*

QSE (Quality Safety Environment) POLICY

RADIALL maintains a quality management system conforming to international standards, including for environmental protection. Our customers' recognition of our products quality and sustainability of our company, demonstrates the efficiency of our quality system.

CERTIFICATIONS

Certified ISO 9001 since 1994, RADIALL has a pro-active policy in terms of conforming to international standards. Today, all RADIALL sites are certified to **ISO 9001:2000** and some dedicated activities are AS9100 or TS 16949. Our process approach gives us the tool for continuous improvement in all our activities.

A major step in our environment policy was the **ISO 14001** certification of our Voreppe plant in 2001. RADIALL complies with European directives such as **RoHS** for hazardous substance restrictions and **EuP** for environmentally friendly designs of energy-using products.

Some RADIALL product lines are on **MIL, ESA/SCC** Qualified Product Lists.

RADIALL is therefore proud to be recognized by leading industrial customers for its quality of service and products.

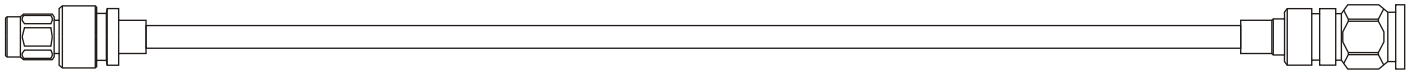
A WORLDWIDE ENGINEERING & MANUFACTURING CAPABILITY

RADIALL has expertise centers and manufacturing locations on 3 continents. Through 9 industrial sites, RADIALL offers customers the proximity they need to obtain the best quality service and delivery performance. Our facilities feature state of the art equipment for the many technologies involved in the design, manufacturing and assembly of interconnect products. This international organization allows RADIALL to offer its outstanding quality products at

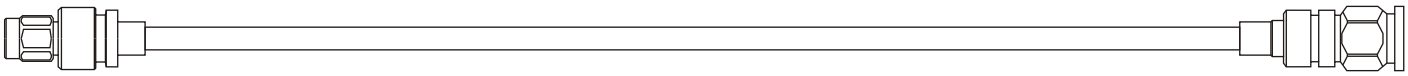
Technical information and sales contacts are available on: www.radiall.com

SHF cable-assemblies

CONTENTS



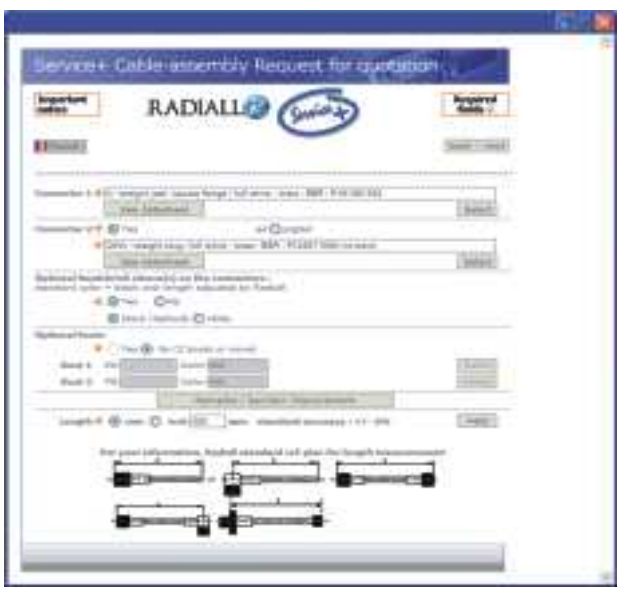
HOW TO ORDER



"To access our online tools and get the desired cable assembly, goto www.radiall.com, select Services and click our Cable assembly builder. Choose from 3 available tools to build your cable assembly: **Test & Measurement** for test cables, **SERVICE+** for immediate delivery, and **Cable assembly RFQ** for custom cable assemblies.
These tools enable you to choose the coaxial cables and connectors to meet your need as well as to define the performance of the desired cable assembly."

Test & Measurement: Define your **18 GHz test cable**, get price and lead time.
Choose your SHF cable, choose your connectors. Calculate the performances of the test cable.

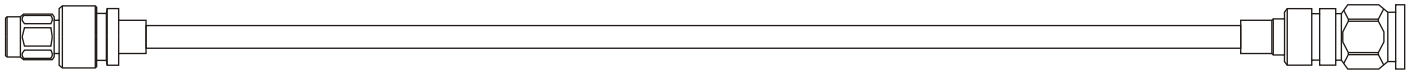
Cable assembly RFQ: For your **custom cable assemblies**, describe your specific need.
Choose from the available cable and connector matrix or describe them. Enter your requirements or send us your cable assembly specification. Tell us about your application. Let us analyse your specification and propose a compliance matrix with our price and lead time.



SERVICE+: Your immediate need for **standard cable assemblies**.
Applicable for a limited range of coaxial cables and connectors.
Choose your cable and connectors among the list of available products. Get pricing information within 24 hours. Place your order with us, and your cable assemblies will be delivered within 1 week.
S+ requirements: no technical specification, maximum quantity: 500, maximum length = 10 meters / 390 inch.

SHF cable-assemblies

INTRODUCTION



Radiall, one of the recognized key global manufacturers of coaxial connectors and cable assemblies, is also a leading manufacturer of high frequency, low loss, high performance cable and cable assemblies due to it's mastery of foam **PTFE wrapping technology**. Radiall is one of only a few companies in the world to fully master this capability and this enables Radiall to supply cable assemblies featuring the highest levels of performance, stability, and repeatability.

Radiall's SHF cable offering meets a wide range of applications for the military, aerospace, and test and instrumentation markets as well as copes with the rigorous demands of space and other harsh environments. Radiall produces five standard ranges of SHF cables to meet your needs: **General Interconnect Test & Measurement, Outdoor, Airframe**, and **Light Weight**. With the perfect control of material density, tape tension, and wrapping technologies, Radiall is able to manufacture the ideally tuned cable to fulfill your exacting specifications and the most demanding requirements. And, the Radiall connectors for SHF cables are engineered specifically for compatibility and performance for SHF applications.

But, because performance is not enough, Radiall is able to recommend a wide range of jackets and protective barriers adapted to your application environment. Whatever your environmental operating constraints steam or fluid aggressions, harsh mechanical conditions, extreme temperatures, or any other operational extremes Radiall is able to supply the most suitable SHF cable with high stability and repeatable performance.

Every SHF cable assembly is 100% fully tested and inspected prior to shipment.

In order to provide the best quality microwave SHF cable assemblies, Radiall's Quality Management System is ISO 9001 certified and our processes meet all of the requirements of EN/AS9100.

Calibration: All measurement devices used in production and testing are fully monitored and calibrated from DC to 65 GHz.

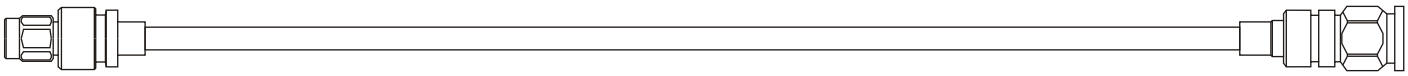
Traceability: Every SHF cable assembly is serialized.This number follows the product at every phase of Production and Testing. Every component is lot traceable and a full history is maintained for every assembly.

Workmanship: All SHF staff members receive continual training and monitoring to maintain the highest levels of expertise and capabilities in assembly and soldering control processes.

Production Equipment: Radiall maintains highly specialized production equipment including
precision stripping machines, internally-developed precision cutting, soldering, and cleaning equipment as well as performing live microwave measurements during the assembly and soldering phases. This internally developed equipment allows Radiall to reach consistent and repeatable quality which makes the SHF range one of the best performing high frequency, low loss
microwave cable assemblies on the market today.

Qualification: SHF cable assemblies benefit from Radiall's certified Test facility.

FINDER GUIDE



• ULTRA LOW-LOSS CABLES (solid inner conductor)

	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12.4 GHz (band X) *(dB/m dB/ft)*	12.4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26.5 GHz (band K) *(dB/m dB/ft)*	26.5 to 40 GHz (band ka) *(dB/m dB/ft)*
SHF2.4M	0.62 / 0.19	0.89 / 0.27	1.28 / 0.39	1.86 / 0.56	2.36 / 0.72	2.91 / 0.88	3.62 / 1.10	4.59 / 1.39
SHF3M	0.39 / 0.12	0.56 / 0.17	0.81 / 0.25	1.19 / 0.36	1.53 / 0.46	1.91 / 0.58	2.41 / 0.73	3.11 / 0.94
SHF4.2M	0.36 / 0.11	0.51 / 0.15	0.73 / 0.22	1.05 / 0.32	1.32 / 0.40	1.61 /0.49	-	-
SHF5M	0.23 / 0.07	0.32 / 0.10	0.46 / 0.14	0.66 / 0.20	0.84 / 0.25	1.02 / 0.31	1.27 / 0.38	-
SHF8M	0.15 / 0.05	0.21 / 0.06	0.30 / 0.09	0.44 / 0.13	0.55 / 0.17	0.68 / 0.21	-	-

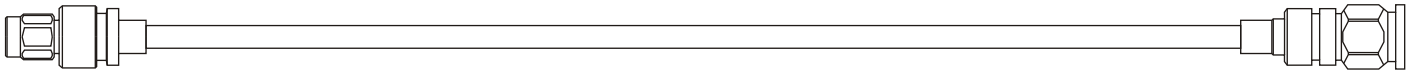
• HIGH FLEXIBILITY CABLES (stranded inner conductor)

	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12.4 GHz (band X) *(dB/m dB/ft)*	12.4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26.5 GHz (band K) *(dB/m dB/ft)*	26.5 to 40 GHz (band ka) *(dB/m dB/ft)*
SHF3	0.51 / 0.15	0.72 / 0.22	1.04 / 0.32	1.51 / 0.46	1.91 / 0.58	2.35 / 0.71	2.91 / 0.88	3.70 / 1.12
SHF5	0.26 / 0.08	0.37 / 0.11	0.54 / 0.16	0.79 / 0.24	1.00 / 0.30	1.24 / 0.38	1.55 / 0.47	-
SHF8	0.18 / 0.05	0.26 / 0.08	0.38 / 0.12	0.56 / 0.17	0.72 / 0.22	0.90 / 0.27	-	-
SHF13	0.09 / 0.03	0.14 / 0.04	0.20 / 0.06	0.30 / 0.09	0.33 / 0.10 (max 9.5 GHz)	-	-	-

• ARMOURED CABLES

	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12,4 GHz (band X) *(dB/m dB/ft)*	12,4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26,5 GHz (band K) *(dB/m dB/ft)*	26.5 to 40 GHz (band ka) *(dB/m dB/ft)*
SHF5MA/10	0.23 / 0.07	0.32 / 0.10	0.46 / 0.14	0.66 / 0.20	0.84 / 0.25	1.02 / 0.31	1.27 / 0.38	-
SHF5MR	0.23 / 0.07	0.32 / 0.10	0.46 / 0.14	0.66 / 0.20	0.84 / 0.25	1.02 / 0.31	1.27 / 0.38	-
SHF8MA/10	0.15 / 0.05	0.21 / 0.06	0.30 / 0.09	0.44 / 0.13	0.55 / 0.17	0.68 / 0.21	-	-
SHF8MR	0.15 / 0.05	0.21 / 0.06	0.30 / 0.09	0.44 / 0.13	0.55 / 0.17	0.68 / 0.21	-	-
SHF13	0.09 / 0.03	0.14 / 0.04	0.20 / 0.06	0.30 / 0.09	-	-	-	-

FINDER GUIDE



• ULTRA LOW-LOSS CABLES (solid inner conductor)

	SMP	SSMA	MCX / SMB	SMA	SMA 2.9	BMA	BNC	TNC	N	PC7	MQ	7/16	DSX	NSX	MPX	EPX	Mil C 38999 – BMA contact
SHF2.4M	-	√	√	√	-	√	-	-	√	-	-	-	√	√	√	√	√
SHF3M	-	-	-	√	√	√	-	√	√	-	-	-	-	-	-	-	√
SHF4.2M	-	-	-	√	-	√	-	√	√	-	-	-	√	√	-	√	√
SHF5M	-	-	-	√	-	√	√	√	√	√	√	√	-	√	√	√	√
SHF8M	-	-	-	√	-	-	√	√	√	√	-	√	-	-	-	-	-

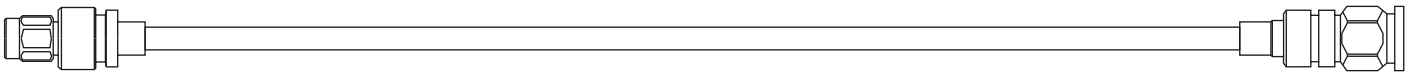
• HIGH FLEXIBILITY CABLES (stranded inner conductor)

	SMP	SSMA	MCX / SMB	SMA	SMA 2.9	BMA	BNC	TNC	N	PC7	MQ	7/16	DSX	NSX	MPX	EPX	Mil C 38999 – BMA contact
SHF3	-	-	-	√	√	√	-	√	√	-	-	-	-	-	-	-	√
SHF5	-	-	-	√	-	√	√	√	√	√	√	√	-	√	√	√	√
SHF8	-	-	-	√	-	-	√	√	√	√	-	√	-	-	-	-	-
SHF13	-	-	-	-	-	-	-	√	√	-	-	-	-	-	-	-	-

• ARMOURED CABLES

	SMP	SSMA	MCX / SMB	SMA	SMA 2.9	BMA	BNC	TNC	N	PC7	MQ	7/16	DSX	NSX	MPX	EPX	Mil C 38999 – BMA contact
SHF5MA/10	-	-	-	√	-	-	-	√	√	-	-	-	-	-	-	-	-
SHF5MR	-	-	-	√	-	√	√	√	√	√	√	√	-	√	√	√	√
SHF8MA/10	-	-	-	-	-	-	-	√	√	-	-	-	-	-	-	-	-
SHF8MR	-	-	-	√	-	-	√	√	√	√	-	√	-	-	-	-	-
SHF13	-	-	-	-	-	-	-	√	√	-	-	-	-	-	-	-	-

OPTIONS, SPECIFICATIONS & TESTING



OPTIONAL PROTECTIVE JACKETS

In the case of harsh environmental conditions, like for example **antenna feeders** in battlefields or quite simply for **test bench cable-assemblies** submitted to many manipulations, RADIALL advises the use of specific protective jackets.
For optimal and secured watertightness, RADIALL has developed new specific compound chambers allowing the cable protective jacket to be glued to the connector once the chamber is filled with glue. In addition, the new compound chamber technology brings high mechanical protection for a secured cable/connector link.
For compact sizes and reduced weights, each cable size has its own adapted compound chamber.
Manufactured by RADIALL, these jackets bring exceptional crush resistance and tensile strength while keeping a very good flexibility.

OPTIONAL CABLE-PULLER

This stainless steel cable-grip allows easy holding and routing of the assembly and avoids any damage between the connector interface and the cable attachment during the installation.

This support accessory can also feature a stainless steel snap-fastener for speedy anchoring and reliable attachment and detachment of any insulated cable.

note : some connectors in this range can also be sold separately, please consult us.

Remark : in this kind of construction, RADIALL advises the use of a "cable-puller" for easy and secured handling (see below)

CONNECTORS SPECIFICATION

Connector design : RADIALL connectors meet or exceed the requirements of MIL-C-39012. They are designed to provide optimal electrical, mechanical and environmental performances.

Connector materials : Stainless steel 303 & 316L and nickel-plated brass for body, coupling nut and compound chamber
Gold-plated nickel clad brass for center contact.
PTFE (PolyTetraFluoroEthylene) dielectric.

CABLE SPECIFICATION

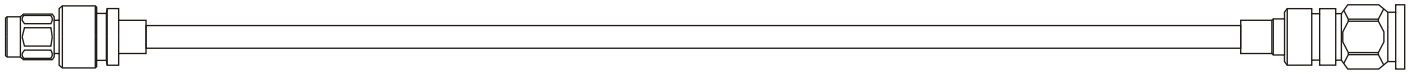
Cable-assembly insertion loss = cable loss * length + 0.0447* √F + 0.04

cable loss **connectors loss**

TESTING

Our cable-assemblies are 100% Insertion Loss and VSWR tested over the test frequency range according to the RADIALL detailed specification. Many other tests are possible upon request.

CHARACTERISTICS



ELECTRICAL

Impedance	50 ± 1 Ω
High amplitude stability under flexures	better than 0.005dB/GHz during and after repeated bending on dynamic bending radius
High phase stability under flexures	better than 0.4°/GHz during and after repeated bending on dynamic bending radius * ** Consult us for SHF13 phase stability with flexures*
High phase stability with temperature **	See detailed cable specification.
Insertion loss variation with temperature	< 0.2% /°C
Screening effectiveness	better than 90dB up to 18 GHz (for screwed connectors)
Phase matching	by set, with master or per absolute phase, available with a typical phase matching of ± 0.4°/GHz
VSWR and Power handling	depends on cable-assembly configuration *Please consult us*

*** Optimal phase stability with temperature is proposed for cables using a solid inner conductor.*

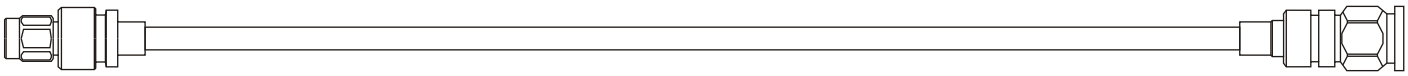
MECHANICAL

Reduced cable size and weight *(thanks to low density PTFE)*	see detailed cable specification
High flexibility	in accordance with MIL C 87104
Vibration resistance	in accordance with MIL T 81490
Shock	in accordance with MIL T 81490
High crush resistance *(for armoured cables)*	see detailed RADIALL specification

ENVIRONMENTAL

Large temperature range *(cable-assemblies)*	-55 / +150°C (except SHF5MA/10 & SHF8MA/10 = -50 / +105°C)
Fire resistant and self extinguishing	in accordance with MIL C 87104
Chemical resistance	in accordance with MIL C 87104 and MIL T 81490
Humidity resistance	in accordance with MIL C 87104 and MIL T 81490
Moisture resistance	in accordance with RTCADO 160 D
Salt fog	in accordance with MIL STD 810

FLEXIBLE ULTRA LOW-LOSS CABLE SHF2.4M



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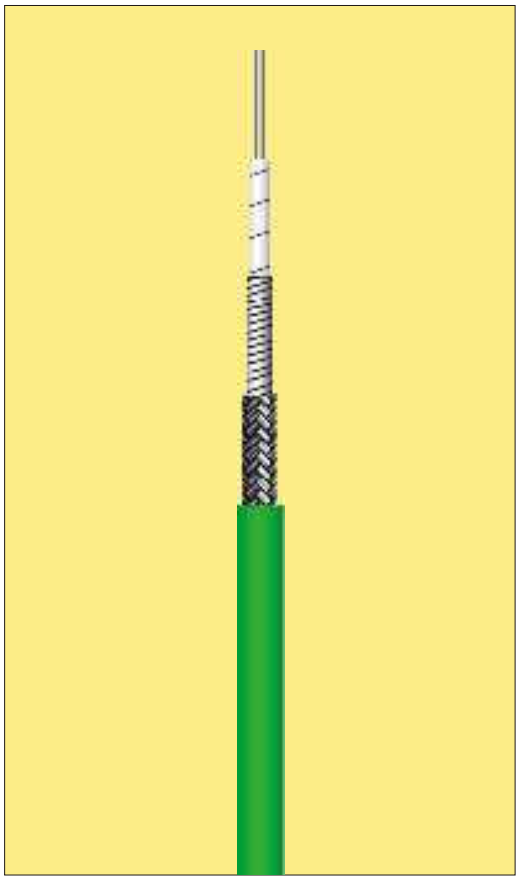


APPLICATION NOTE

This cable, featuring a solid center conductor, is a perfect alternative to semi-rigid cable RG402 (dia.141) when flexibility is required.

Main benefits :

- ultra-low loss
- high screening effectiveness
- standard connectors for semi-rigid cables can be used
- no 3D drawing required for design and manufacturing
- high chemical resistance (oil, lubricant, humidity,...)

[1] SPC = Silver Plated Copper
[2] PTFE = PolyTeraFluoroEthylene
[3] FEP = Fluorinated Ethylene Propylene

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC[1]	-	-
dielectric	PTFE[2] tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green PFA[3]	max. 2.45	max. 0.096

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 40 GHz	
cut-off frequency	70 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	77 %	
propagation time	4.3 ns / m	1.3 ns / ft
capacitance	87 pF / m (at 1 GHz)	26.4 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ/m	
corona extinction voltage	-	
nominal phase	1560° / m / GHz	
phase stability with temperature	< 3° / m / GHz (-55°C / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 40 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.03 dB / m (at 40 GHz)	
atten. variation with temperature	Att. (at X° C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	14 g / m	4.3 g / ft
recommend. min. bend radius	10 mm	0.394 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70°C / +200°C	-94°C / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	No	

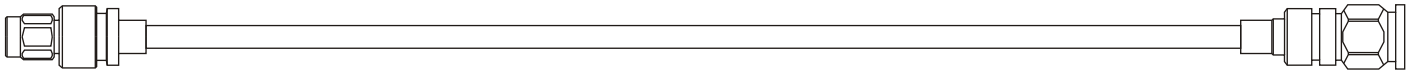
FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.62	0.19	260
2.0	0.89	0.27	180
4.0	1.28	0.39	130
6.0	1.59	0.48	105
8.0	1.86	0.56	90
12.4	2.36	0.72	75
18.0	2.91	0.88	60
26.5	3.62	1.10	50
40.0	4.59	1.39	35
attenuation calculation (dB / m)	(0.60 x √F GHz) + (0.02 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F(GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF2.4M



SMP series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R222 052 000	female plug	straight	40	500	5 000	CuBe2	gold	female c.c.
R222 152 000	female plug	right-angle	26	500	5 000	CuBe2	gold	female c.c.
R222 223 002	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	snap-in panel feedtrough full detent / male c.c.
R222 223 302	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	snap-in panel feedtrough limited detent / male c.c.
R222 223 702	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	snap-in panel feedtrough smooth bore / male c.c.
R222 252 001	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	2 hole narrow flange full detent / male c.c.
R222 252 301	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	2 hole narrow flange limited detent / male c.c.
R222 252 702	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	2 hole narrow flange smooth bore / male c.c.
R222 302 002	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	bulkhead feedtrough panel nut torque 60 Ncm full detent / male c.c.
R222 302 302	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	bulkhead feedtrough panel nut torque 60 Ncm limited detent / male c.c.
R222 302 702	male jack	straight	40	500	5 000	stainless steel 303	passivated + gold	bulkhead feedtrough panel nut torque 60 Ncm smooth bore / male c.c.

RF leakage = 80 dB up to 3 GHz / 65 dB from 3 to 26.5 GHz

SSMA series

(temperature range with SHF cables = -55 / +155°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R121 053 000	plug	straight	18	750	5 000	CuBe2	nickel	-
R121 153 000	plug	right-angle	12,4	750	5 000	CuBe2	nickel	-
R121 315 000	jack	straight	18	750	5 000	stainless steel 303	gold	bulkhead feedthrough panel nut torque = 70 Ncm

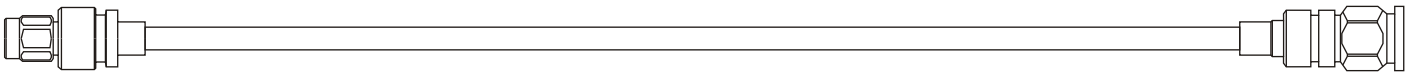
Advised torque wrench for plugs: R282 319 000 / 6.35 mm / 60-80 Ncm

MMCX series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R110 153 000	plug	right-angle	6	500	1 000	brass	gold	-

Note: the above information is only listing recommended part-number. For other connectors or more information, please consult our main coax connector catalog, your

CONNECTORS COMPATIBLE WITH CABLE SHF2.4M



MCX series

(temperature range with SHF cables = -55 / +155°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R113 053 000	plug	straight	6	750	1 000	brass	gold	-
R113 053 020	plug	straight	6	750	1 000	brass	BBR	-
R113 153 000	plug	right-angle	6	750	1 000	brass	gold	-
R113 153 020	plug	right-angle	6	750	1 000	brass	BBR	-
R113 161 000	plug	right-angle	6	750	1 000	brass	gold	reduced height
R113 161 020	plug	right-angle	6	750	1 000	brass	BBR	reduced height
R113 223 000	jack	straight	6	750	1 000	brass	gold	-
R113 223 020	jack	straight	6	750	1 000	brass	BBR	-
R113 303 000	jack	straight	6	750	1 000	brass	gold	bulkhead feedthrough removable front clip panel nut torque = 60 Ncm
R113 303 020	jack	straight	6	750	1 000	brass	BBR	bulkhead feedthrough removable front clip panel nut torque = 60 Ncm
R113 303 200	jack	straight	6	750	1 000	brass	gold	bulkhead feedthrough 6 flat nut panel nut torque = 60 Ncm

SMB series

(temperature range with SHF cables = -65 / +165°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R114 053 000	female plug	straight	4	750	1 000	brass	gold	-
R114 152 000	female plug	right-angle	4	750	1 000	brass	gold	reduced height
R114 169 000	female plug	right-angle	4	750	1 000	brass	gold	cable bending required
R114 222 000	male jack	straight	4	750	1 000	brass	gold	bulkhead feedthrough panel nut torque = 60 Ncm

SMC series

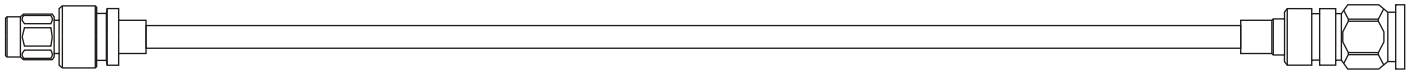
(temperature range with SHF cables = -65 / +165°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R112 053 000	female plug	straight	10	750	1 000	brass	gold	-
R112 169 000	female plug	right-angle	10	750	1 000	brass	gold	-
R112 323 020	male jack	straight	10	1 000	1 000	brass	gold	bulkhead feedthrough panel nut torque = 60 Ncm

Advised torque wrench for plugs: R282 318 000 / 6 mm / 25-35 Ncm

Note: the above information is only listing recommended part-number. For other connectors or more information, please consult our main coax connector catalog, your

CONNECTORS COMPATIBLE WITH CABLE SHF2.4M



SMA series

(temperature range with SHF cables = -65 / +165°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 062 L00★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
R125 052 000	plug	straight	18	750	5 000	stainless steel 303	gold	cost effective solution coupling nut torque 100 Ncm
R125 052 002	plug	straight	18	750	5 000	stainless steel 303	passivated	cost effective solution gold plated soldered part coupling nut torque 100 Ncm
R125 192 L00★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
R125 153 000	plug	right-angle	12,4	750	5 000	stainless steel 303	gold	cost effective solution coupling nut torque 100 Ncm
R125 153 002	plug	right-angle	12,4	750	5 000	stainless steel 303	passivated	cost effective solution gold plated soldered part coupling nut torque 100 Ncm
R125 222 000	jack	straight	18	750	5 000	stainless steel 303	gold	-
R125 332 L00★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 200 Ncm
R125 326 000	jack	straight	18	750	5 000	stainless steel 303	gold	cost effective solution bulkhead feedthrough panel sealed panel nut torque 150 Ncm
R125 252 000	jack	straight	18	750	5 000	stainless steel 303	gold	2 hole flange 2 holes dia. 2.6 mm
R125 256 000	jack	straight	18	750	5 000	stainless steel 303	gold	square flange 12.7 mm 4 holes dia. 2.6 mm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm)

SMA 2.9 series

(temperature range with SHF cables = -65 / +165°C)

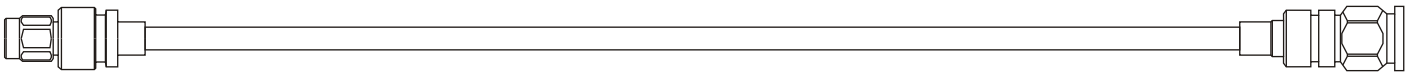
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R127 801 L01★	plug	straight	40	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
R127 821 L01★	jack	straight	40	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 200 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm)

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

Note: the above information is only listing recommended part-number. For other connectors or more information, please consult our main coax connector catalog, your

CONNECTORS COMPATIBLE WITH CABLE SHF2.4M



QMA series

(temperature range with SHF cables = -40 / +80°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R123 054 000	plug	straight	6	750	5 000	brass	BBR	-
R123 153 000	plug	right-angle	6	750	5 000	brass	BBR	-
R123 153 003	plug	right-angle	6	750	5 000	brass	gold	-
R123 326 003	jack	straight	6	750	5 000	brass	gold	bulkhead feedthrough panel sealed panel nut torque 160 Ncm

BMA series

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 052 000	female plug	straight	22	1 000	5 000	stainless steel 303	gold	bulkhead feedthrough panel nut torque = 150 Ncm
R128 292 000	male jack	straight	22	1 000	5 000	stainless steel 303	gold	2 hole flange panel floating 2 holes dia. 2.65 mm
R128 294 000	male jack	straight	22	1 000	5 000	stainless steel 303	gold	snap-in / panel floating advised removal tool : R282 918 000

RF leakage = 50 dB at 18 GHz

TNC 18 series

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R143 272 700	jack	straight	18	1 000	5 000	stainless steel 303	passivated	square flange 17.5 mm 4 holes M2.5 x 0.45
R143 272 720	jack	straight	18	1 000	5 000	stainless steel 303	passivated	square flange 17.5 mm 4 holes dia. 2.6 mm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

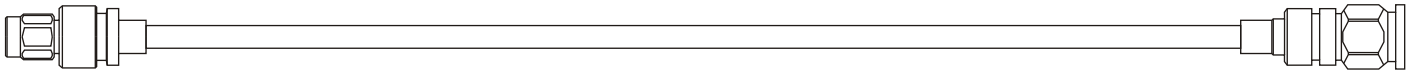
N series

(temperature range with SHF cables = -55 / +155°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R161 050 300	plug	straight	11	1 000	5 000	brass	BBR	gold plated soldered part
R161 276 300	jack	straight	11	1 000	5 000	brass	BBR	gold plated soldered part square flange 25.4 mm 4 holes dia.3.3 mm
R161 335 200	jack	straight	11	1 000	5 000	brass	BBR	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Note: the above information is only listing recommended part-number. For other connectors or more information, please consult our main coax connector catalog, your

CONNECTORS COMPATIBLE WITH CABLE SHF2.4M



MIL DTL 38999 series I, II, III, & BMA contacts

(temperature range with SHF cables = -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 053 000	pin coax	straight	22	1 000	5 000	stainless steel 303	gold	# 8 / snap-in male center contact
R128 294 300	socket coax	straight	22	1 000	5 000	stainless steel 303	gold	# 8 / snap-in spring loaded floating female center contact

DSX (ARINC 404) series contacts

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
616 125	pin coax	straight	1.7	750	5 000	brass	gold	-

NSX (ARINC600) and MPX series contacts

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
620 047 010	pin coax	straight	6	2 500	5 000	CuBe2	gold	# 1 / snap-in male center contact
R128 053 201	BMA pin coax	straight	18	1 000	5 000	stainless steel 303	passivated	# 8 / snap-in BMA male center contact

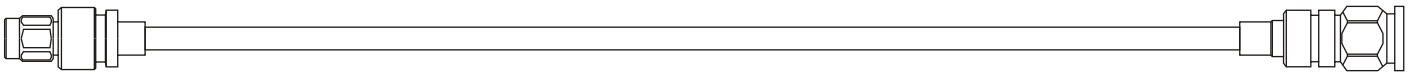
EPXB series contacts

(temperature range with SHF cables = -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
617 060	socket coax	straight	4	900	5 000	brass	gold	# 12 / snap-in male center contact
617 160	pin coax	straight	4	900	5 000	brass	gold	# 12 / snap-in female center contact

Note: the above information is only listing recommended part-number. For other connectors or more information, please consult our main coax connector catalog, your

FLEXIBLE ULTRA LOW LOSS CABLE SHF3



Radiall P/N : F1703107

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	stranded SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 3.50	max. 0.138

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 40 GHz	
cut-off frequency	48 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	78 %	
propagation time	4.3 ns / m	1.3 ns / ft
capacitance	85 pF / m (at 1 GHz)	25.8 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 1.6 Kv	
nominal phase	1520° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.4° /360°/ GHz	
attenuation stability with bending	< 0.1 dB (at 18 GHz) / < 0.2 dB (at 40 GHz)	
attenuation stability with shaking	< 0.01 dB/m (at 18 GHz) / < 0.03 dB/m (at 40 GHz)	
atten. variation with temperature	Att. (at X° C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	29 g / m	8.8 g / ft
recommend. min. bend radius	12.5 mm	0.492 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.51	0.15	360
2.0	0.72	0.22	250
4.0	1.04	0.32	180
6.0	1.29	0.39	150
8.0	1.51	0.46	125
12.4	1.91	0.58	100
18.0	2.35	0.71	80
26.5	2.92	0.88	70
40.0	3.70	1.12	50
attenuation calculation (dB / m)	(0.49 x √ F GHz) + (0.015 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, featuring a stranded center conductor is dedicated to application requiring high flexibility.

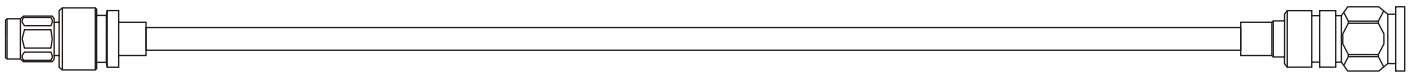
Main benefits :

- high flexbility for dynamic applications
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity ...)

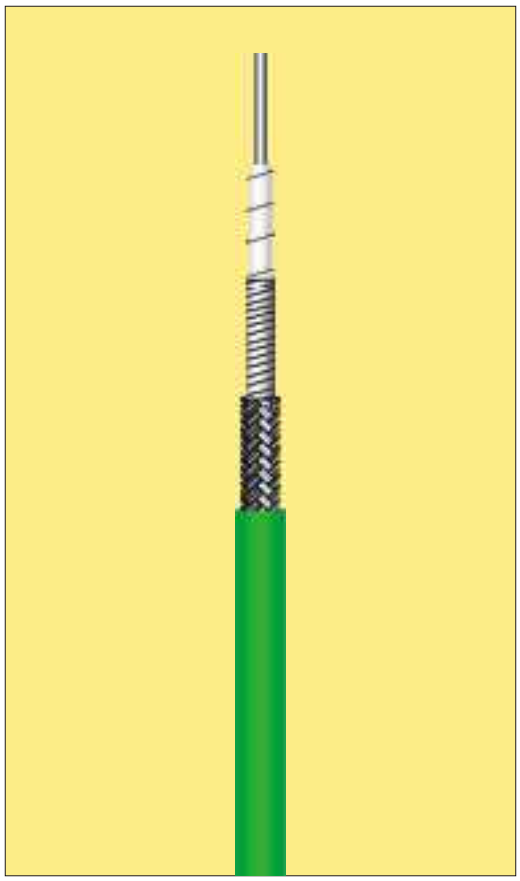
(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE SHF3M



Radiall P/N : F1703163



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green PFA(3)	max. 3.50	max. 0.138

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 40 GHz	
cut-off frequency	44 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	76 %	
propagation time	4.4 ns / m	1.3 ns / ft
capacitance	88 pF / m (at 1 GHz)	26.7 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	-	
nominal phase	1590° / m / GHz	
phase stability with temperature	< 3° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 40 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.03 dB / m (at 40 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	35 g / m	10.6 g / ft
recommend. min. bend radius	12.5 mm	0.492 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.39	0.12	400
2.0	0.56	0.17	280
4.0	0.81	0.25	200
6.0	1.01	0.31	160
8.0	1.19	0.36	140
12.4	1.53	0.46	120
18.0	1.91	0.58	90
26.5	2.41	0.73	80
40.0	3.11	0.94	60
attenuation calculation (dB / m)	(0.365 x √F GHz) + (0.02 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, is fitted out with a solid center conductor to reach a better loss level.

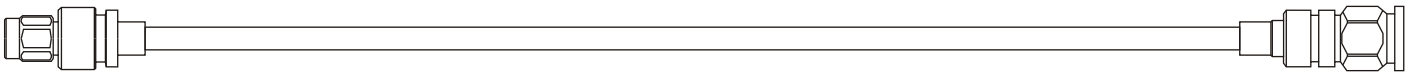
Main benefits :

- ultra-low loss
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PFA = PerfluoroAlkoxy

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF3 and SHF3M



SMP series

(temperature range with SHF cables = -65 / +165 ° C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R222 063 600	female plug	straight	40	500	5 000	CuBe2	gold	female c.c.

RF leakage = 80 dB up to 3 GHz / 65 dB from 3 to 26.5 GHz

SMA series

(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 063 L00★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 063 L00★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 063 001	plug	straight	18	750	5 000	stainless steel 303	passivated	cost effective solution coupling nut torque 100Ncm
R125 194 L00★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 194 L00★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	With compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 063 L01★	plug	swept	18	1 000	5 000	stainless steel 316L	passivated	Coupling nut torque 110 Ncm lock holes x 3
R125 263 001	jack	straight	18	750	5 000	stainless steel 303	passivated	square flange 12.7 mm 4 holes dia. 2.6 mm
R125 333 L01★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 200 Ncm
M125 330 L00★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm
R125 333 001	jack	straight	18	750	5 000	stainless steel 303	passivated	cost effective solution bulkhead feedthrough panel sealed panel nut torque 150Ncm

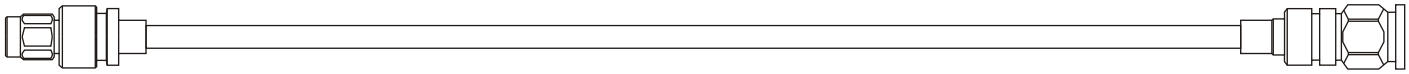
SMA 2.9 series

(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R127 801 L00★	plug	straight	40	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M127 801 L00★	plug	straight	40	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R127 213 001	jack	straight	40	750	5 000	stainless steel 303	passivated	-
R127 821 L00★	jack	straight	40	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 200 Ncm
M127 821 L00★	jack	straight	40	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

CONNECTORS COMPATIBLE WITH CABLE SHF3 and SHF3M



BMA series

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 363 121	male jack	right angle	18	1 000	5 000	brass	nickel	2 hole flange panel floating 2 holes dia. 2.65 mm

RF leakage = 50 dB at 18 GHz

TNC series

(temperature range with SHF cables = -65 / +165°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R143 063 000	plug	straight	18	750	5 000	stainless steel 303	passivated	coupling nut torque 170 Ncm

N series

(temperature range with SHF cables = -65 / +155°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R161 063 000	plug	straight	18	1 000	5 000	stainless steel 303	passivated	6 flat coupling nut 18.9 mm on flats coupling nut torque 170 Ncm
R161 193 000	plug	swept	18	1 000	5 000	stainless steel 303	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 170 Ncm

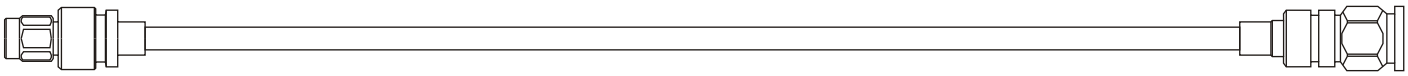
MIL DTL 38999 series I, II, III & IV / BMA contacts

(temperature range with SHF cables = -65 / +175°C)

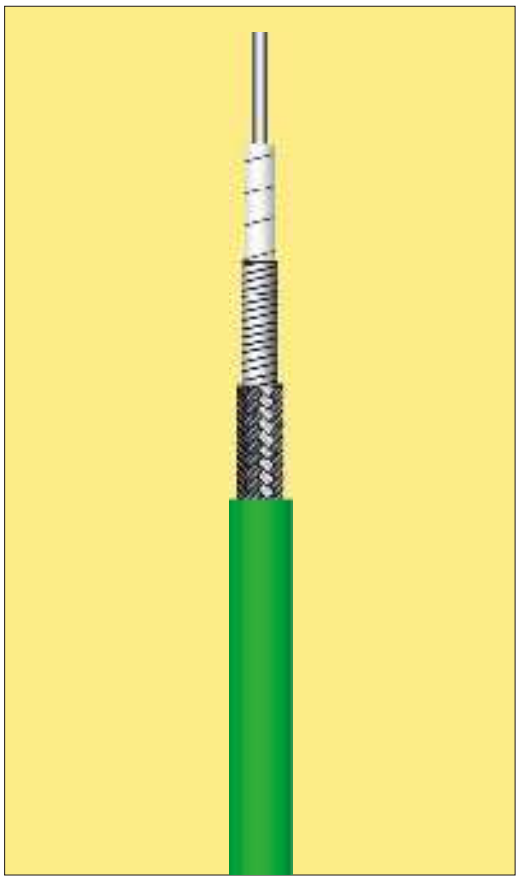
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 003 000	pin coax	straight	22	1 000	5 000	stainless steel 303	gold	# 8 / snap-in male center contact
R128 213 501	socket coax	straight	22	1 000	5 000	stainless steel 303	passivated	# 8 / snap-in spring loaded floating female center contact panel sealed

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE SHF4.2M



Radiall P/N : F1703194



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 4.20	max. 0.165

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 30 GHz	
cut-off frequency	36 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	74 %	
propagation time	4.5 ns / m	1.4 ns / ft
capacitance	91 pF / m (at 1 GHz)	27.6 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 1.5 kV	
nominal phase	1620° / m / GHz	
phase stability with temperature	< 3° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 30 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.02 dB / m (at 30 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	45 g / m	13.6 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 600 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.32	0.10	630
2.0	0.46	0.14	450
4.0	0.68	0.21	310
6.0	0.85	0.26	260
8.0	1.01	0.31	220
12.4	1.30	0.40	180
18.0	1.63	0.49	150
26.5	2.07	0.63	140
30.0	2.24	0.68	110
attenuation calculation (dB / m)	(0.30 x √F GHz) + (0.02 x F GHz)		

(*) CW max power calculated at sea level / 40 C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, featuring a solid center conductor, is a perfect alternative to semi-rigid cable RG402 (dia.141) when flexibility is required.

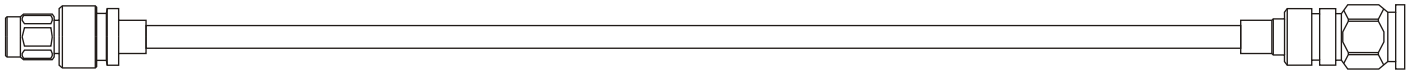
Main benefits :

- ultra-low loss
- high screening effectiveness
- standard connectors for semi-rigid cables can be used
- no 3D drawing required for design and manufacturing
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF4.2M



(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

SMA series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 064 L00★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 064 L01★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 055 000	plug	straight	18	1 000	5 000	stainless steel 303	gold	cost effective solution coupling nut torque 100 Ncm
R125 055 002	plug	straight	18	1 000	5 000	stainless steel 303	passivated	cost effective solution gold plated soldered part coupling nut torque 100 Ncm
R125 190 L00★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 190 L01★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 154 000	plug	right-angle	12,4	1 000	5 000	stainless steel 303	gold	cost effective solution coupling nut torque 100 Ncm
R125 154 002	plug	right-angle	12,4	1 000	5 000	stainless steel 303	passivated	cost effective solution gold plated soldered part coupling nut torque 100 Ncm
R125 064 L01★	plug	swept	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
R125 251 000	jack	straight	18	1 000	5 000	stainless steel 303	gold	2 hole flange 2 holes dia. 2.6 mm
R125 255 000	jack	straight	18	1 000	5 000	stainless steel 303	gold	square flange 12.7 mm 4 holes dia 2.6 mm
R125 334 L00★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	-
M125 334 L01★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm
R125 325 000	jack	straight	18	1 000	5 000	stainless steel 303	gold	cost effective solution bulkhead feedthrough panel sealed panel nut torque 150 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

QMA series

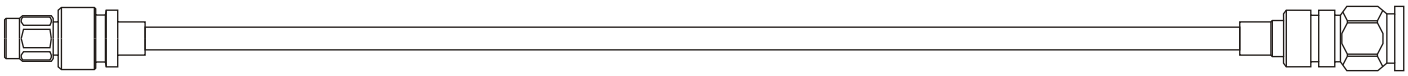
(temperature range with SHF cables = -40 / +80°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R123 055 000	plug	straight	6	1 000	5 000	brass	BBR	-
R123 055 017	plug	straight	6	1 000	5 000	brass	NPGR	-
R123 154 000	plug	right angle	6	1 000	5 000	brass	BBR	-
R123 154 003	plug	right angle	6	1 000	5 000	brass	gold	-
R123 225 023	jack	straight	6	1 000	5 000	brass	gold	-
R123 305 023	jack	straight	6	1 000	5 000	brass	gold	bulkhead feedthrough panel sealed panel nut torque 160 Ncm

RF leakage > 70 dB

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

CONNECTORS COMPATIBLE WITH CABLE SHF4.2M



BMA series

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 055 000	female plug	straight	22	1 500	5 000	stainless steel 303	gold	bulkhead feedthrough panel nut torque = 150 Ncm
R128 295 000	male jack	straight	22	1 500	5 000	stainless steel 303	gold	panel floating 2 hole flange 2 holes dia. 2.65 mm
R128 296 000	male jack	straight	22	1 500	5 000	stainless steel 303	gold	snap-in/ panel floating advised removal tool: R282 918 000
R128 305 000	male jack	straight	22	1 500	5 000	stainless steel 303	gold	bulkhead feedthrough panel nut torque = 250 Ncm

RF leakage = 50 dB at 18 GHz

TNC 18 series

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R143 051 700	plug	straight	18	1 500	5 000	stainless steel 303	passivated	6 flat coupling nut 14 mm on flats lock wire holes x 3 coupling nut torque 265 Ncm
R143 273 700	jack	straight	18	1 500	5 000	stainless steel 303	passivated	square flange = 17.5 mm 4 holes M2.5 x 0.45
R143 321 700	jack	straight	18	1 500	5 000	stainless steel 303	passivated	bulkhead feedthrough panel sealed panel nut torque = 370Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

N series

(temperature range with SHF cables = -55 / +155°C)

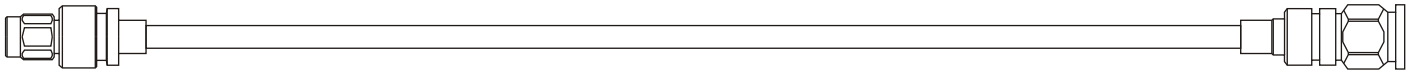
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R161 051 000	plug	straight	11	1 000	5 000	brass	BBR	gold plated soldered part
R161 226 020	jack	straight	11	1 000	5 000	brass	BBR	gold plated soldered part
R161 277 300	jack	straight	11	1 000	5 000	brass	BBR	gold plated soldered part square flange 25.4 mm 4 holes dia. 3.3 mm
R161 336 000	jack	straight	11	1 000	5 000	brass	BBR	gold plated soldered part bulkhead feedthrough Panel sealed panel nut torque = 500Ncm

QN series

(temperature range with SHF cables = -55 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R164 051 002	plug	straight	11	1 000	5 000	brass	BBR	-
R164 152 000	plug	right-angle	11	1 000	5 000	brass	BBR	-
R164 226 023	jack	straight	11	1 000	5 000	brass	gold	-
R164 336 000	jack	straight	11	1 000	5 000	brass	BBR	-
R164 635 002	jack	straight	11	1 000	5 000	brass	BBR	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

CONNECTORS COMPATIBLE WITH CABLE SHF4.2M



(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

N 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R163 064 L00★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 064 L01★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 194 L00★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 194 L01★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 324 L00★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 324 L01★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 303 000 / 19 / 160 Ncm

MIL DTL 38999 series I, II, III & IV / BMA contacts

(temperature range with SHF cables = -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 056 000	pin coax	straight	22	1 500	5 000	stainless steel 303	gold	# 8 / snap-in male center contact
R128 296 300	socket coax	straight	22	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in spring loaded floating female center contact

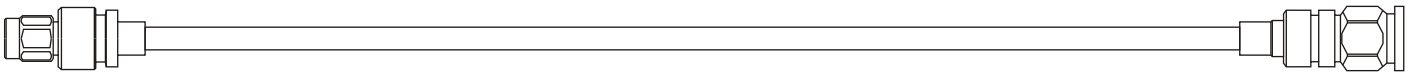
DSX (ARINC 404) series contacts

(temperature range with SHF cables = -65 / +125 °C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
616 005	pin coax	straight	6	2500	5000	CuBe2	gold	# 1 / snap-in male center contact
616 028	socket coax	straight	1	750	5 000	CuBe2	gold	# 5 / snap-in male center contact
616 128	pin coax	straight	1	750	5 000	CuBe2	gold	# 5 / snap-in female center contact

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

CONNECTORS COMPATIBLE WITH CABLE SHF4.2M



NSX (ARINC 600) series contacts

(temperature range with SHF cables = -65 / +125°C)

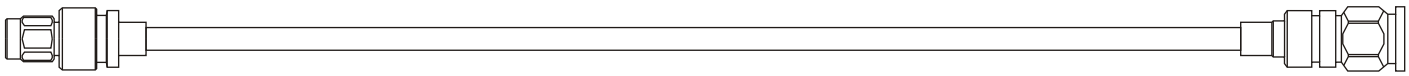
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
620 005	pin coax	straight	6	2500	5000	CuBe2	gold	# 1 / rectangular 4 hole assembly plate male center contact
620 047	pin coax	straight	6	2500	5000	CuBe2	gold	# 1 / snap-in male center contact

EPXB series/ BMA contacts

(temperature range with SHF cables = -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 296 020	socket coax	straight	22	1 500	5 000	stainless steel 303	gold	# 8 / snap-in spring loaded floating female center contact

FLEXIBLE ULTRA LOW LOSS CABLE SHF5



Radiall P/N : F1703183

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	stranded SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 5.25	max. 0.207

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	29 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	78 %	
propagation time	4.3 ns / m	1.3 ns / ft
capacitance	85 pF / m (at 1 GHz)	25.8 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.5 kV	
nominal phase	1520° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.1 dB (at 18 GHz) / < 0.15 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X° C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	72 g / m (62 s/ TDS)	21.8 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.26	0.08	800
2.0	0.37	0.11	570
4.0	0.54	0.16	400
6.0	0.67	0.20	330
8.0	0.79	0.24	280
10.0	0.89	0.27	250
12.4	1.00	0.30	230
18.0	1.24	0.38	190
26.5	1.55	0.47	180
attenuation calculation (dB / m)	(0.25 x √F GHz) + (0.01 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, featuring a stranded center conductor is dedicated to application requiring high flexibility.

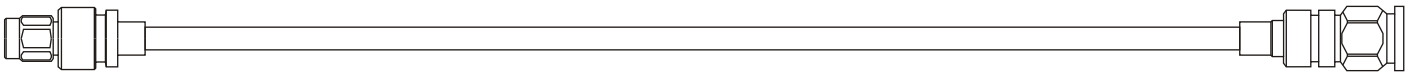
Main benefits :

- high flexbility for dynamic applications
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE SHF5M



Radiall P/N : F1703159

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 5.20	max. 0.205

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	60 g / m	18.2 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 200 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	850
2.0	0.32	0.10	600
4.0	0.46	0.14	420
6.0	0.57	0.17	340
8.0	0.66	0.20	300
10.0	0.75	0.23	270
12.4	0.84	0.25	240
18.0	1.02	0.31	200
26.5	1.27	0.38	190
attenuation calculation (dB / m)	(0.22 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable is fitted out with a solid center conductor to reach a better loss level.

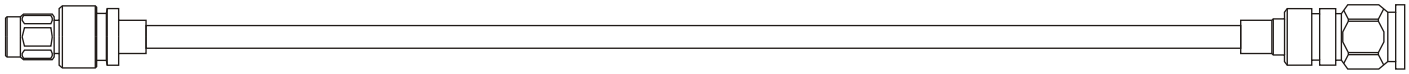
Main benefits :

- ultra-low loss
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity, ...)

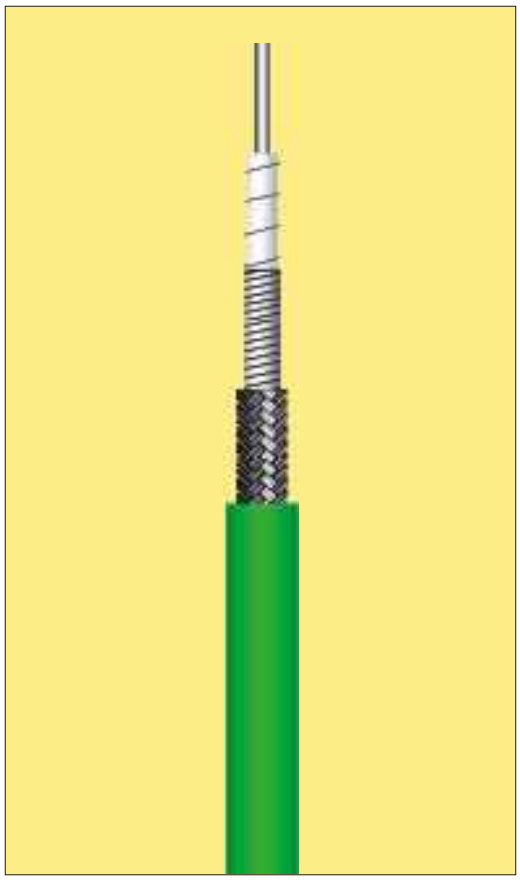
(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE SHF5MR



Radiall P/N : F1703159GR



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 5.85	max. 0.230

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	73 g / m	22.1 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 700 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	850
2.0	0.32	0.10	600
4.0	0.46	0.14	420
6.0	0.57	0.17	340
8.0	0.66	0.20	300
10.0	0.75	0.23	270
12.4	0.84	0.25	240
18.0	1.02	0.31	200
26.5	1.27	0.38	190
attenuation calculation (dB / m)	(0.22 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

The thick outer jacket of this over-molded reinforced cable provides a better crush resistance.

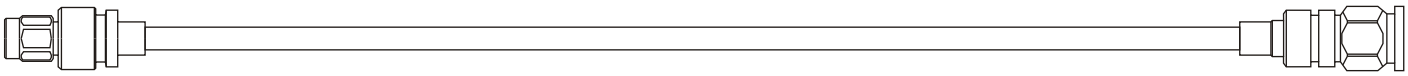
Main benefits :

- high flexibility for dynamic applications
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.045 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF5, SHF5M and SHF5MR



(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

SMA series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 065 L00★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
R125 065 001★	plug	straight	18	1 000	5 000	stainless steel 303	passivated	cost effective solution coupling nut torque 100 Ncm
M125 065 L02★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 065 L03★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 195 L00★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L02★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L03★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 065 L01★	plug	swept	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
R125 265 001★	jack	straight	26	1 000	5 000	stainless steel 303	passivated	square flange 12.7 mm 4 holes dia 2.6 mm
R125 330 L02★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 200 Ncm
M125 330 L02★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber Bulkhead feedthrough Panel sealed Panel nut torque 200 Ncm
M125 330 L03★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

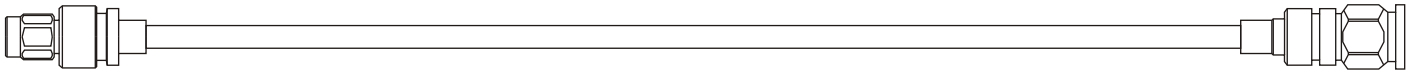
BMA series

(temperature range with SHF cables = -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 065 001	male plug	straight	22	1 000	5 000	stainless steel 303	passivated	-
R128 195 001	male plug	swept	18	1 000	5 000	stainless steel 303	passivated	-
R128 206 020	female jack	straight	22	1 000	5 000	stainless steel 303	gold	press-in panel feedthrough spring loaded floatting
R128 275 025	female jack	straight	18	1 000	5 000	stainless steel 303	passivated	2 hole flange 2 holes dia. 2.65 mm spring loaded floatting
R128 330 001	female jack	straight	18	1 000	5 000	stainless steel 303	passivated	bulkhead feedthrough
R128 331 001	female jack	straight	18	1 000	5 000	stainless steel 303	passivated	2 hole flange
R128 365 001	female jack	swept	18	1 000	5 000	stainless steel 303	passivated	spring loaded floatting

RF leakage = 50 dB at 18 GHz

CONNECTORS COMPATIBLE WITH CABLE SHF5, SHF5M and SHF5MR



(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

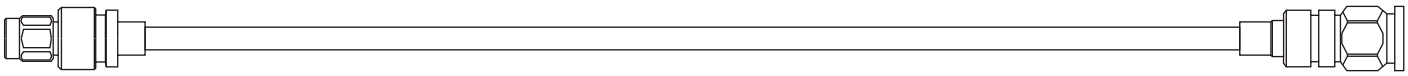
TNC 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini	Material	Finish	Miscellaneous
R143 065 L01 ★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 065 L02 ★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 065 L03 ★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 195 L01 ★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L02 ★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L03 ★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 065 L02 ★	plug	swept	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
R143 245 050	jack	straight	18	1 500	5 000	stainless steel 303	passivated	-
R143 265 000	jack	straight	18	1 500	5 000	stainless steel 303	passivated	square flange 17.5 mm 4 holes M2.5 x 0.45
R143 330 L00 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 330 L02 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 330 L03 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

CONNECTORS COMPATIBLE WITH CABLE SHF5, SHF5M and SHF5MR



(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

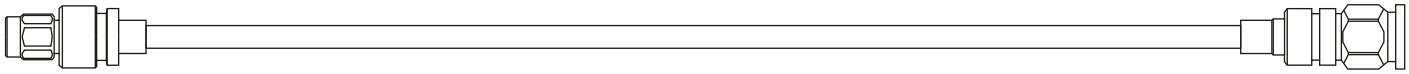
N 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R163 065 L00 ⋆	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut / 18.9 mm on flats / coupling nut torque 400 Ncm / lock wire holes x 3
M163 065 L02 ⋆	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 065 L03 ⋆	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 195 L00 ⋆	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L02 ⋆	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L03 ⋆	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 065 L01 ⋆	plug	swept	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R161 255 000	jack	straight	18	1 500	5 000	stainless steel 303	passivated	square flange 25.4 mm 4 holes dia. 3.2 mm
R163 325 L00 ⋆	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 325 L02 ⋆	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 325 L03 ⋆	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

⋆ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

CONNECTORS COMPATIBLE WITH CABLE SHF5, SHF5M and SHF5MR



MIL DTL 38999 series I, II, III & IV / BMA contacts

(temperature range with SHF cables = -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 005 201	pin coax	straight	22	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in male center contact panel sealed
R128 215 501	socket coax	straight	22	1 500	5 000	stainless steel 303	gold	# 8 / snap-in spring loaded floatting female center contact panel sealed

NSX (ARINC600) and MPX series / BMA contacts

(temperature range with SHF cables = -65 / +125°C)

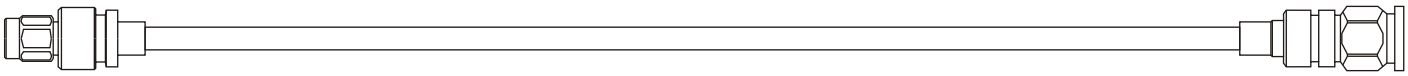
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 005 221	pin coax	straight	18	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in male center contact panel sealed
R128 215 521	socket coax	straight	18	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in spring loaded floatting female center contact panel sealed

EPXB series / BMA contacts

(temperature range with SHF cables = -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 005 341	pin coax	straight	18	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in male center contact
R128 215 561	socket coax	straight	18	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in female center contact

FLEXIBLE ULTRA LOW LOSS CABLE SHF5MA/10



Radiall P/N : F1709-69

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
inner jacket	green FEP(3)	-	-
1st protection layer	SS (5) braid	-	-
2nd protection layer	green FEP(3)	-	-
outer jacket	black PA(4)	max. 7.20	max. 0.283

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	120 g / m	36 g / ft
recommend. min. bend radius	60 mm	2.362 inch
crush resistance	> 1000 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-50 / +105°C	-58 / +221°F
fire resistance	no	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	850
2.0	0.32	0.10	600
4.0	0.46	0.14	420
6.0	0.57	0.17	340
8.0	0.66	0.20	300
10.0	0.75	0.23	270
12.4	0.84	0.25	240
18.0	1.02	0.31	200
26.5	1.27	0.38	190
attenuation calculation (dB / m)	(0.22 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This armored cable, featuring a solid center conductor, will be used operation in harsh environment.

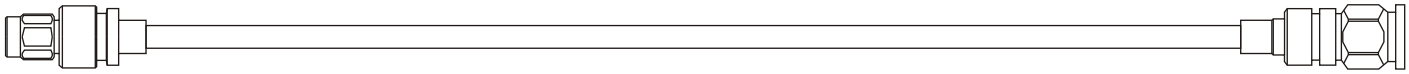
Main benefits :

- ultra-low loss
- high screening effectiveness
- high mechanical strength (resistance to crush, traction,...)
- high abrasion resistance

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene
(4) PA = PolyAmide

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF5MA/10



SMA series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 065 L02★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L02★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 330 L02★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

TNC 18 series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 065 L02★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L02★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 330 L02★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

N 18 series

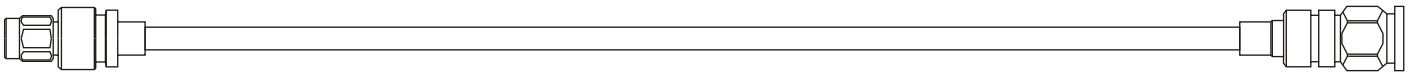
(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 065 L02★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L02★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 325 L02★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

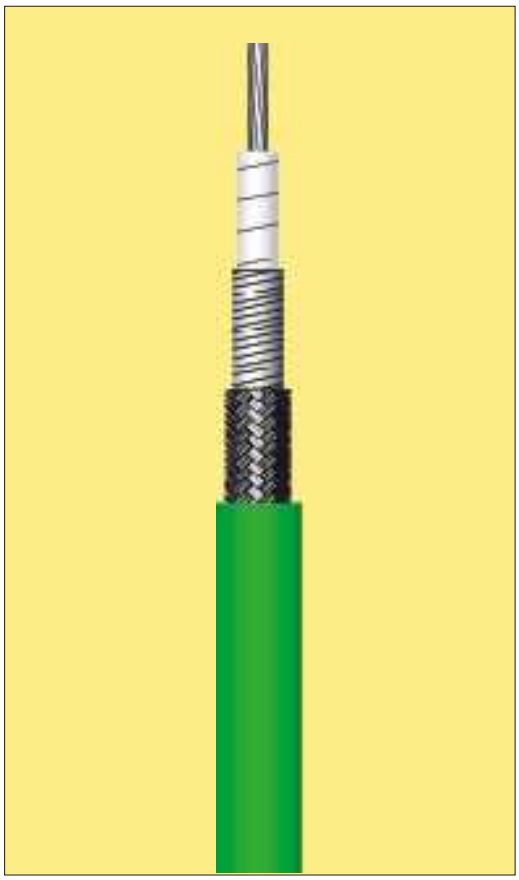
Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE SHF8



Radiall P/N : F1703197



APPLICATION NOTE

This cable, featuring a stranded center conductor is dedicated to application requiring flexibility.

Main benefits :

- high flexibility for dynamic applications
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	stranded SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 7.80	max. 0.307

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	18.5 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	78 %	
propagation time	4.3 ns / m	1.3 ns / ft
capacitance	85 pF / m (at 1 GHz)	25.8 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.5 kV	
nominal phase	1520° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.1 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	140 g / m	42.4 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

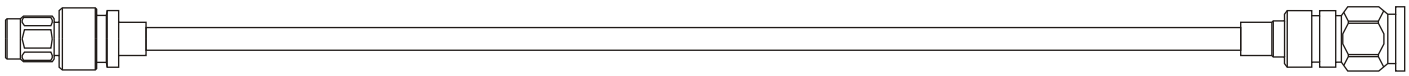
FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0,18	0.05	1400
2.0	0,26	0.08	1000
3.0	0,32	0.10	830
4.0	0,38	0.12	720
5.0	0,43	0.13	650
6.0	0,48	0.14	590
8.0	0,56	0.17	510
10.0	0,64	0.19	450
12.4	0,72	0.22	410
18.0	0,90	0.27	340
attenuation calculation (dB / m)	(0.17 x √F GHz) + (0.01 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE SHF8M



Radiall P/N : F1703160

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 7.60	max. 0.299

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	20 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	130 g / m	39.4 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 200 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	1600
2.0	0.21	0.06	1100
3.0	0.26	0.08	920
4.0	0.30	0.09	800
5.0	0.34	0.10	710
6.0	0.37	0.11	650
8.0	0.44	0.13	560
10.0	0.49	0.15	500
12.4	0.55	0.17	450
18.0	0.68	0.21	380
attenuation calculation (dB / m)	(0.14 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable is fitted out with a solid center conductor to reach a better loss level.

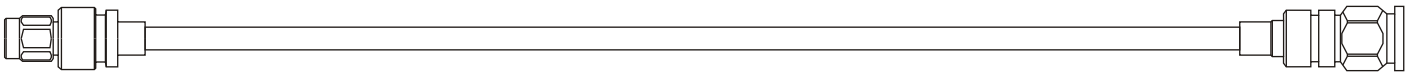
Main benefits :

- ultra-low loss
- high screening effectiveness
- high chemical resistance (oil, lubricant, humidity, ...)

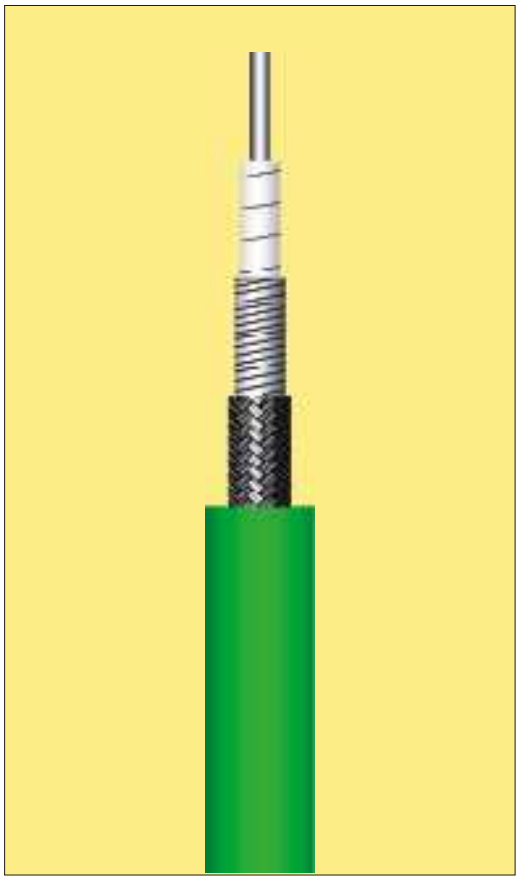
(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE SHF8MR



Radiall P/N : F1703160GR



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 8.50	max. 0.335

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	20 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	155 g / m	47.0 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 1000 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	1600
2.0	0.21	0.06	1100
3.0	0.26	0.08	920
4.0	0.30	0.09	800
5.0	0.34	0.10	710
6.0	0.37	0.11	650
8.0	0.44	0.13	560
10.0	0.49	0.15	500
12.4	0.55	0.17	450
18.0	0.68	0.21	380
attenuation calculation (dB / m)	(0.14 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40 C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

The thick outer jacket of this over-molded reinforced cable provides a better crush resistance.

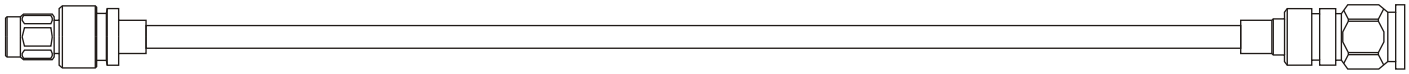
Main benefits :

- ultra-low loss
- high screening effectiveness
- high crush resistance
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF8, SHF8M and SHF8MR



(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

SMA series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 068 L00★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 068 L04★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm Lock wire holes x 3
M125 068 L05★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 199 L02★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 199 L04★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 199 L05★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 199 L00★	plug	swept	18	1 000	5 000	stainless steel 316L	passivated	Coupling nut torque 110 Ncm Lock wire holes x 3
R125 338 L01★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 250 Ncm
M125 338 L04★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 250 Ncm
M125 338 L05★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber bulkhead feedthrough panel sealed panel nut torque 250 Ncm

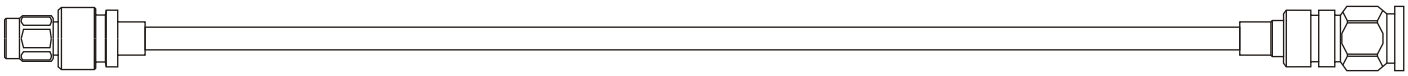
(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

TNC 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R143 068 L00★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 068 L04★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 068 L05★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 198 L01★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L04★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

CONNECTORS COMPATIBLE WITH CABLE SHF8, SHF8M and SHF8MR



TNC 18 series (continued)

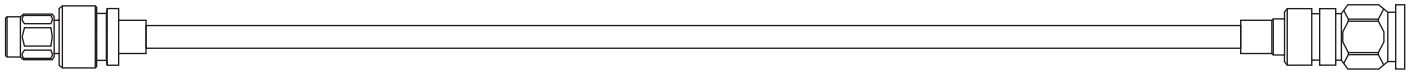
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 198 L05 ★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 068 L01 ★	plug	swept	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
R143 338 L01 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 338 L04 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 338 L05	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm
R143 358 000	jack	straight	18	1 000	5 000	stainless steel 303	passivated	bulkhead feedthrough panel sealed panel nut torque 370 Ncm

(temperature range with SHF cables = -65 / +165°C)
(-55 / +130°C with compound chamber)

N 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R163 068 L01	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 068 L04	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 068 L05	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 198 L01	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L04	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L05	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3

CONNECTORS COMPATIBLE WITH CABLE SHF8, SHF8M and SHF8MR



N 18 series (continued)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R163 068 L03 ★	plug	swept	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 328 L00 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 328 L04 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 328 L05 ★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
R161 298 000	jack	straight	18	1 000	5000	stainless steel 303	passivated	square flange 25.4 mm 4 holes dia. 3.2 mm

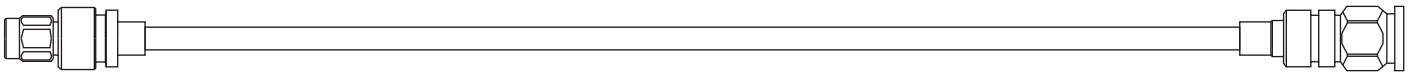
NSX (ARINC600) and MPX series contacts

(temperature range with SHF cables = -55 / +155°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
620 101 006	socket coax	straight	6	2500	5000	brass	gold	# 1 / spring loaded floating female center contact

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE SHF8MA/10



Radiall P/N : F170968

APPLICATION NOTE

This armored cable, featuring a solid center conductor, will be used for operation in harsh environment.

Main benefits :

- ultra-low loss
- high screening effectiveness
- high mechanical strength (resistance to crush, traction,...)
- high abrasion resistance

[1] SPC = Silver Plated Copper
[2] PTFE = PolyTeraFluoroEthylene
[3] FEP = Fluorinated Ethylene Propylene
[4] SS = Stainless Steel

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC[1]	-	-
dielectric	low density PTFE[2] tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
inner jacket	green FEP[3]	-	-
1st protection layer	SS[4] braid	-	-
2nd protection layer	green FEP	-	-
outer jacket	black PA[5]	max. 10.0	max. 0.394

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	20 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	78 pF / m (at 1 GHz)	23.6 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	205 g / m	62.1 g / ft
recommend. min. bend radius	100 mm	3.937 inch
crush resistance	> 1000 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-50 / +105°C	-58 / +221°F
fire resistance	no	
halogen free jacket	no	

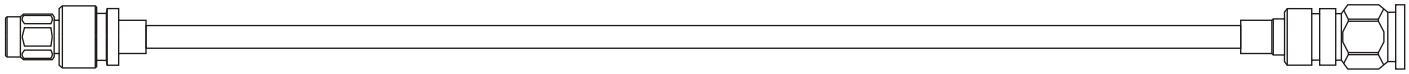
FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	1600
2.0	0.21	0.06	1100
3.0	0.26	0.08	920
4.0	0.30	0.09	800
5.0	0.34	0.10	710
6.0	0.37	0.11	650
8.0	0.44	0.13	560
10.0	0.49	0.15	500
12.4	0.55	0.17	450
18.0	0.68	0.21	380
attenuation calculation (dB / m)	(0.14 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F GHz) + 0.04

CONNECTORS COMPATIBLE WITH SHF8MA/10



SMA series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 068 L04★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm Lock wire holes x3
M125 199 L04★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 338 L04★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber Bulkhead feedthrough Panel sealed panel nut torque 250 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm)

TNC 18 series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 068 L04★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L04★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 338 L04★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 320 000 /14 mm / 265 Ncm)

N 18 series

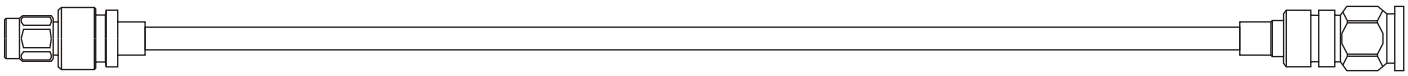
(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 068 L04★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L04★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 328 L04★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

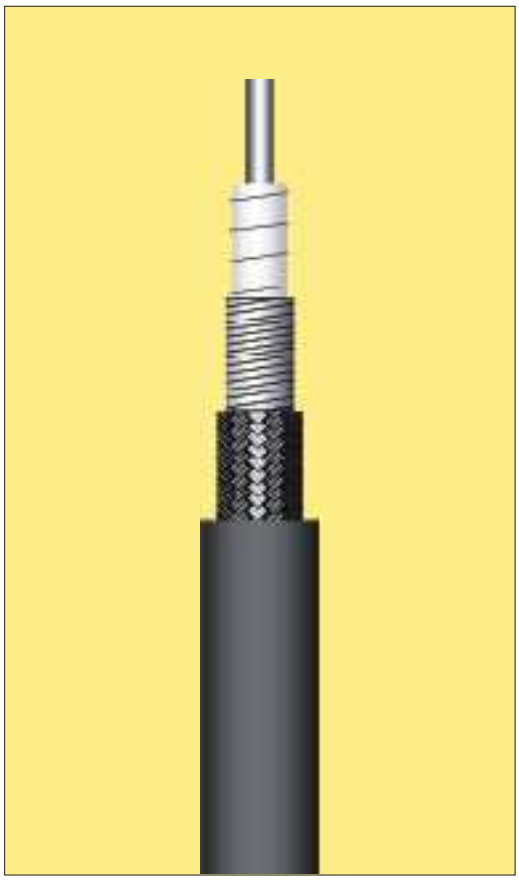
Advised torque wrench for plugs: R282 320 000 /19 mm / 160 Ncm)

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE SHF13



Radiall P/N : F1703186



APPLICATION NOTE

This cable, featuring a special center conductor, will be used when flexibility and weight saving are required.

Main benefits :

- high flexibility
- light weight
- high chemical resistance (oil, lubricant, humidity, ...)

(1) PTFE = PolyTeraFluoroEthylene
(2) SPC = Silver Plated Copper
(3) PFA = PerfluoroAlkoxy

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	PTFE(1) / SPC(2) tape	-	-
dielectric	PTFE tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	black PFA(3)	max. 13.80	max. 0.543

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	100 kHz - 9.5 GHz	
cut-off frequency	10 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	78 pF / m (at 1 GHz)	23.6 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 10 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.6° / 360° / GHz	
attenuation stability with bending	< 0.05 dB	
attenuation stability with shaking	< 0.01 dB / m at 9GHz	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	280 g / m	84.8 g / ft
recommend. min. bend radius	60 mm	2.362 inch
crush resistance	> 600 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

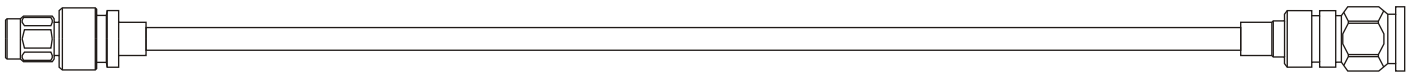
FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.09	0.03	2500
2.0	0.14	0.04	1800
3.0	0.17	0.05	1500
4.0	0.20	0.06	1300
5.0	0.23	0.07	1100
6.0	0.26	0.08	1000
7.0	0.28	0.08	970
8.0	0.30	0.09	900
9.5	0.33	0.10	830
attenuation calculation (dB / m)	(0.087 x √F GHz) + (0.007 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F(GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE SHF13A



Radiall P/N : F1709-70

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	PTFE(1) / SPC(2) tape	-	-
dielectric	PTFE tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
inner jacket	PFA	-	-
protection layer	steel braid	-	-
outer jacket	black PU(3)	max. 18	max. 0.709

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	100 kHz - 9.5 GHz	
cut-off frequency	10 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	78 pF / m (at 1 GHz)	23.6 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 10 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.6° / 360° / GHz	
attenuation stability with bending	< 0.05 dB	
attenuation stability with shaking	< 0.01 dB / m at 9GHz	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	410 g / m	124.2 g / ft
recommend. min. bend radius	90 mm	3.543 inch
crush resistance	> 800 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.09	0.03	2500
2.0	0.14	0.04	1800
3.0	0.17	0.05	1500
4.0	0.20	0.06	1300
5.0	0.23	0.07	1100
6.0	0.26	0.08	1000
7.0	0.28	0.08	970
8.0	0.30	0.09	900
9.5	0.33	0.10	830
attenuation calculation (dB / m)	(0.087 x √F GHz) + (0.007 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This armoured cable, featuring a special center conductor, will be used when flexibility and weight saving are required in severe environments.

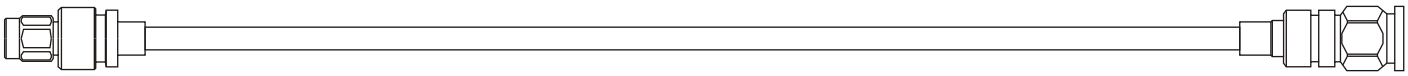
Main benefits :

- high flexibility
- light weight
- high chemical resistance (oil, lubricant, humidity, ...)
- high mechanical strength (resistance to crush, traction, abrasion,...)

(1) PTFE = PolyTeraFluoroEthylene
(2) SPC = Silver Plated Copper
(3) PFA = PerfluoroAlkoxy

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF13 and SHF13A



TNC series

(temperature range with SHF cables = -55 / +130°C)

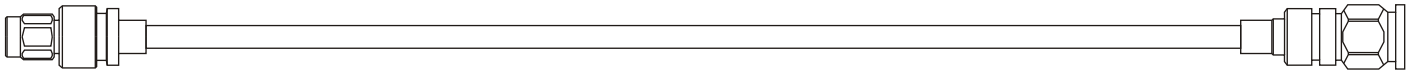
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 077 001	plug	straight	9.5	1 500	5 000	stainless steel 303	passivated	with compound chamber

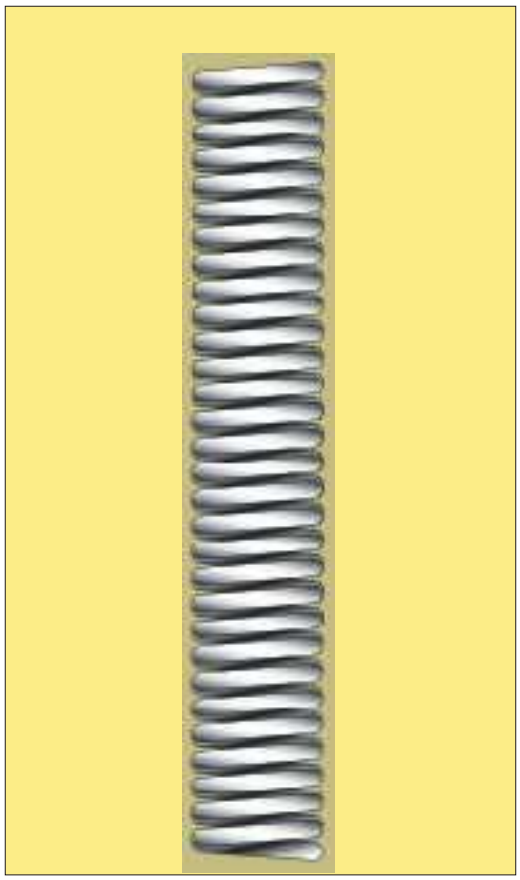
N series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M161 077 001	plug	straight	9.5	2 500	5 000	brass	nickel	with compound chamber lock wire holes x 3

FLEXJACK 5 and FLEXJACK 8





Radiall P/N : G930RV11 (for cables SHF5 and 5M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	galvanized steel	-	-
jacket	transparent PVC	6.3 (I.D)	0.248 (I.D)
		max. OD. 12	max OD. 0.472

MECHANICAL CHARACTERISTICS

maximum weight	110 g / m	34 g / ft
recommend. min. bend radius	25 mm	
crush resistance	2 000 N / 100 mm	
tensile strength	300 N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-40 / +85°C	-40 / +185°F
fire resistance	yes	
halogen free jacket	no (TBC)	

APPLICATION NOTE

Main benefits :

- high flexibility
- cost effective protection
- high mechanical protection (resistance to crush, abrasion,...)
- strain relief
- anti-kinking action
- secured watertightness when used with compound chamber

Radiall P/N : G931RV11 (for cables SHF8 and 8M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	galvanized steel	-	-
jacket	transparent PVC	9.5 (I.D)	0.374 (I.D)
		max. OD. 16.5	max. OD 0.650

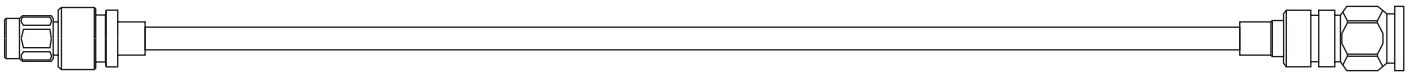
MECHANICAL CHARACTERISTICS

maximum weight	180 g / m	55 g / ft
recommend. min. bend radius	38 mm	
crush resistance	2 000 N / 100 mm	
tensile strength	300N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-40 / +85°C	-40 / +185°F
fire resistance	yes	
halogen free jacket	no (TBC)	

PROJACK 5 and PROJACK 8



Radiall P/N : G940RP10 (for cables SHF5 and 5M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	stainless steel	6.00 (inner)	0.240
braid	stainless steel	-	-
jacket	black PU	max. 11	max. 0.433

MECHANICAL CHARACTERISTICS

maximum weight	340 g / m	103 g / ft
recommend. min. bend radius	equal to cable bend radius	
crush resistance	2 500 N / 100 mm	
tensile strength	900 N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	no	

APPLICATION NOTE

Main benefits :

- high mechanical protection (resistance to crush, traction, abrasion,...)
- high flexibility
- strain relief
- anti-kinking action
- secured watertightness when used with compound chamber

Radiall P/N : G941RP10 (for cables SHF8 and 8M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	stainless steel	8.50 (inner)	0.330
braid	stainless steel	-	-
jacket	black PU	max. 15	max 0.590

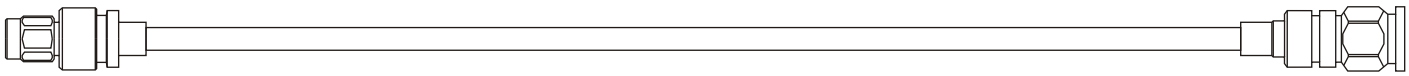
MECHANICAL CHARACTERISTICS

maximum weight	190 g / m	57,6 g / ft
recommend. min. bend radius	equal to cable bend radius	
crush resistance	2 500 N / 100 mm	
tensile strength	900 N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	no	

INTRODUCTION



HIGH PERFORMANCES

- Ultra Low loss
- Excellent return loss
- High Phase stability (Temperature & Bending)
- High mechanical and environmental resistance
- Long life connexion
- High flexibility
- Strain relief
- Rugged construction

This range is dedicated to **laboratory applications** requiring excellent electrical performance, high mechanical resistance and ability to repeated mating/unmating procedure.

To fulfill these requirements, RADIALL offers 2 technologies within this range :

- SHF bare cables without protective jackets
- SHF cables with **Flexjack** or **ProJack** (details in page 5) protective jackets

All components are designed and manufactured by RADIALL in facilities operated under ISO9001-V2000 / ASN9100 quality standards.

QUICK SERVICE

For better service, RADIALL innovates with extra advantages :

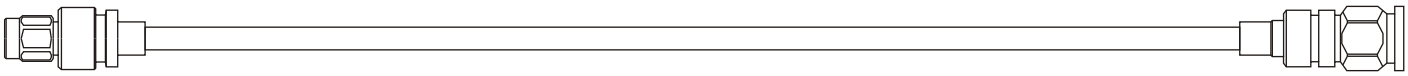
- build your assembly
- calculate performance
- get TDS with our online webtool on :**www.radiall.com/cableassembly**
- all components on stock for short lead time

ASSEMBLY LENGTH

Standard length* = 200 mm to 5000 mm.

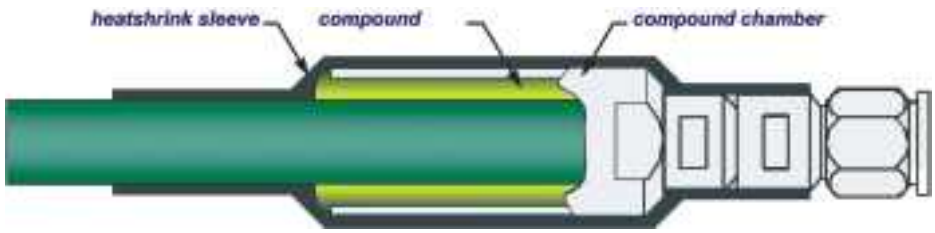
*For other length, please consult us or use our General RFQ webtool on **www.radiall.com**

CONSTRUCTION



CONNECTOR ATTACHMENT

For high mechanical protection and secured watertightness, all connectors in this range are equipped with new **compound chambers** (see drawing below) allowing the cable jacket to be hermetically sealed into the connector once the chamber is filled with compound.



CONNECTORS SPECIFICATION

Connector design : RADIALL connectors meet or exceed the requirements of MIL-C-39012 standard. They are designed to provide optimal electrical, mechanical and environmental performances.

Connector material : **Stainless steel 316L** for highest mechanical and environmental resistance and long term use.

OPTIONAL PROTECTIVE JACKETS

For higher mechanical protection, strain relief and secured watertightness, RADIALL advises the use of specific protective jackets for test-bench cable-assemblies submitted to many manipulations and harsh environment.

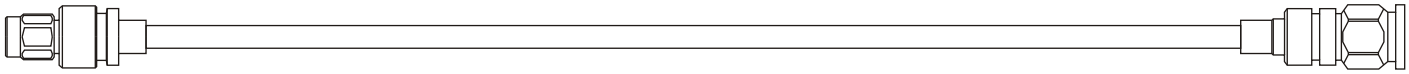
Manufactured by RADIALL, these outer jackets bring exceptional crush resistance and tensile strength while keeping a very good flexibility.

COMPLETE ASSEMBLIES

in order to get optimized service and price, you can select in a list of existing assemblies off the shelf.
(detailed TDS on **www.radiall.com/cableassembly**)

Part number	Assembly construction
R288 931 001	SMA straight plug (M125 065 L02) / SHF5 MR cable (F1703159GR) / SMA straight plug (M125 065 L02) / 1.00 m
R288 931 002	N straight plug (M163 065 L02) / SHF5 MR cable (F1703159GR) / N straight plug (M163 065 L02) / 1.00 m
R288 931 003	SMA straight plug (M125 065 L02) / SHF5 MR cable (F1703159GR) / N straight plug (M163 065 L02) / 1.00 m
R288 931 004	SMA straight plug (M125 068 L02) / SHF8 MR cable (F17031160GR) / SMA straight plug (M125 068 L04) / 1.00 m
R288 931 005	N straight plug (M163 068 L04) / SHF8 MR cable (F1703160GR) / N straight plug (M163 068 L04) / 1.00 m
R288 931 006	SMA straight plug (M125 068 L04) / SHF8 MR cable (F17031160Gr) / N straight plug (M163 068 L04) / 1.00 m

CHARACTERISTICS



VSWR FOR 200 TO 5000 mm CABLE ASSEMBLY

(This table gives value for length between 200 and 5000 mm. For other length please use our General RFQ webtool on www.radiall.com)

SHF5 MR	0-4 GHz		4-8 GHz		8-12.4 GHz		12.4-18 GHz	
	VSWR	dB	VSWR	dB	VSWR	dB	VSWR	dB
2 x SMA *	1.09	27	1.12	25	1.19	21	1.25	19
2 x TNC *	1.12	25	1.19	21	1.25	19	1.38	16
2 x N *	1.12	25	1.17	22	1.19	21	1.25	19

SHF8 MR	0-4 GHz		4-8 GHz		8-12.4 GHz		12.4-18 GHz	
	VSWR	dB	VSWR	dB	VSWR	dB	VSWR	dB
2 x SMA *	1.12	25	1.17	22	1.22	20	1.29	18
2 x TNC *	1.12	25	1.19	21	1.25	19	1.38	16
2 x N *	1.12	25	1.17	22	1.19	21	1.25	19

MAXIMUM POWER HANDLING, 20°C, SEA LEVEL (W)

Cable and connectors		1 GHz	2 GHz	4 GHz	8 GHz	12,4 GHz	18 GHz
		VHF/UHF	Band L	Band S	Band C	Band X	Band Ku
SHF5MR and	2x **SMA** *	450	330	240	180	145	130
	2x**TNC** *	495	360	270	200	160	140
	2x**N** *	750	520	360	250	200	160
SHF8 MR and	2x **SMA** *	520	390	280	210	170	145
	2x**TNC** *	585	430	315	235	195	160
	2x**N** *	870	610	420	300	235	200

MAXIMUM CABLE ASSEMBLY INSERTION LOSS (dB at 20°C)

Cable loss x Cable Length

Cable Loss:

For SHF5 MR : $0.240 \times \sqrt{F} + 0.005 \times F$
For SHF8 MR : $0.155 \times \sqrt{F} + 0.005 \times F$

+

Couple of connectors Loss

Couple of connectors Loss:

For SMA, N, TNC
$0.045 \times \sqrt{F} + 0.04$

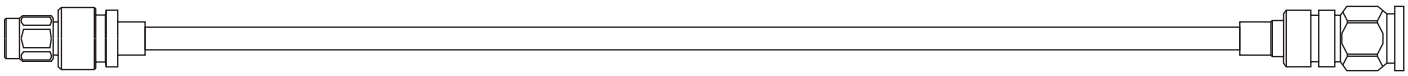
F in GHz - L in meter

TEMPERATURE DERATING

Attenuation at X°C = Attenuation (20°C) x (1 + (X - 20) x θ).
Temperature coefficient depends on the conductor materials.
Ex : θ = 0.002 for copper and silver.

*For a precise calculation according to your specific construction, please use our Test & Measurement webtool on www.radiall.com

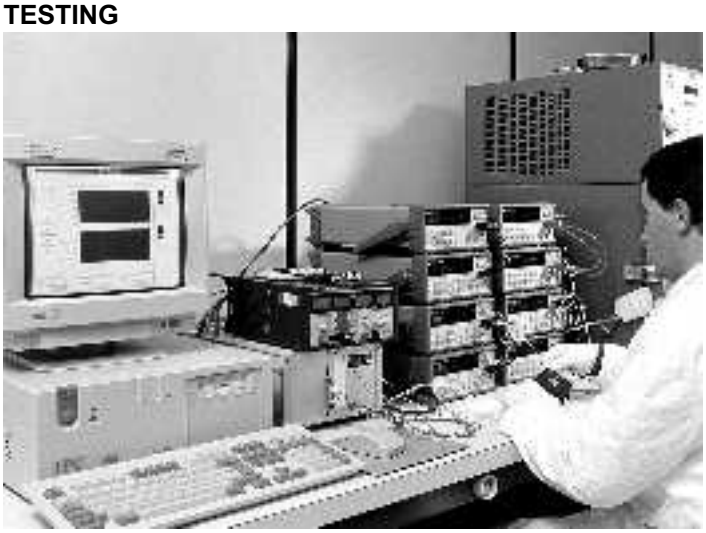
KEY FEATURE AND TESTING



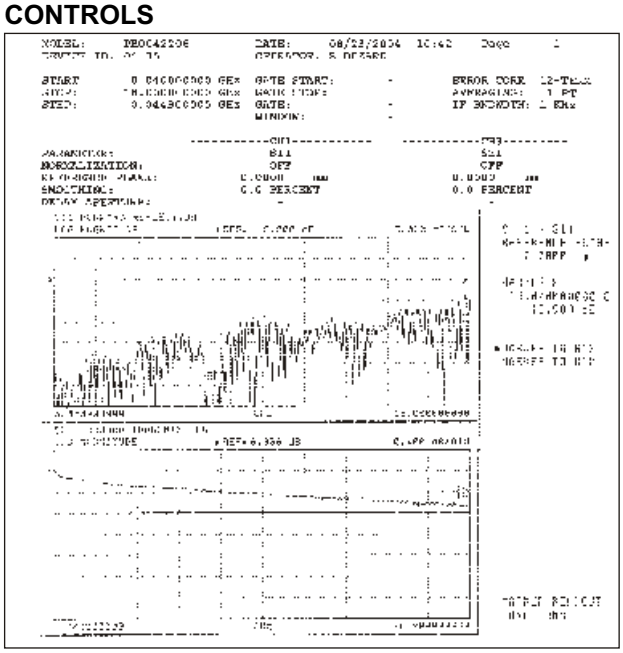
ELECTRICAL

Impedance	50 Ω ± 1 Ω
High amplitude stability under flexures	Better than 0.005dB / GHz during and after repeated bending on dynamic radius
High phase stability with flexures	Better than 0.4° / GHz during and after repeated bending on dynamic radius
High phase stability with temperature	See detailed cable specification
Insertion loss variation with temperature	< 0.2% / °C
Screening effectiveness	Better than 90 dB up to 18 GHz
Phase matching	By set, with master or per absolute phase, available with a typical phase matching of ± 0.4° / GHz
V.S.W.R	Depends on cable-assembly configuration (see page 8)
Large temperature range	-55°C / +125°C (except **ProJack** = -55°C / +100°C)

TESTING

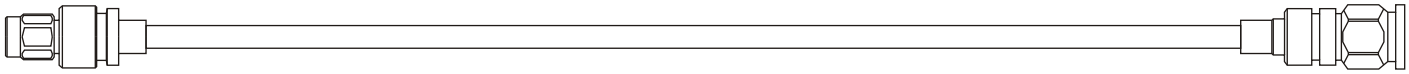


CONTROLS

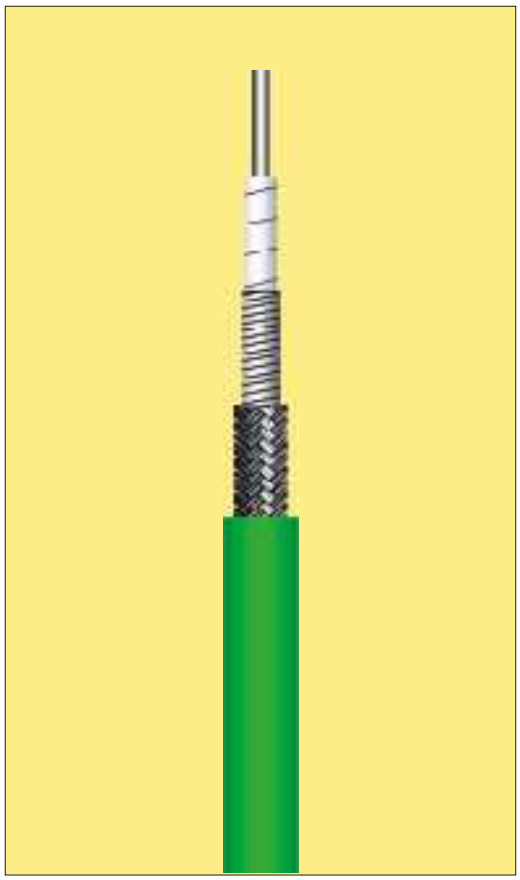


- Aspect / Marking
- Length
- Connectors orientation
- Dielectric withstanding voltage
- Insertion loss
- VSWR
- IL and VSWR curves are delivered with every assembly

FLEXIBLE ULTRA-LOW LOSS CABLE SHF5MR



Radiall P/N : F1703159GR



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 5.85	max. 0.230

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	73 g / m	22.1 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 700 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70°C / +200°C	-94°C / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	850
2.0	0.32	0.10	600
4.0	0.46	0.14	420
6.0	0.57	0.17	340
8.0	0.66	0.20	300
10.0	0.75	0.23	270
12.4	0.84	0.25	240
18.0	1.02	0.31	200
26.5	1.27	0.38	190
attenuation calculation (dB / m)	(0.22 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This Ultra-low loss cable is fully adapted to laboratory applications. It can be reinforced with "proJack" protective jackets for high mechanical stress applications.

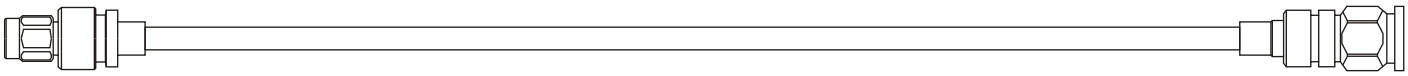
Main benefits :

- ultra-low loss
- high electrical stability with bending and temperature
- high phase stability with tempeature
- stain relief
- high mechanical strength and crush resistance
- complete range of connectors available

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF5MR



SMA series

(temperature range with SHF cables = -55 / +130°C)

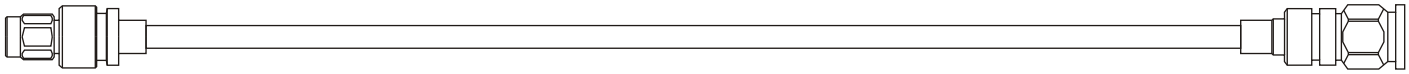
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 065 L02★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 065 L03★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L02★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L03★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 330 L02★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	With compound chamber Bulkhead feedthrough Panel sealed Panel nut torque 200 Ncm
M125 330 L03★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm

TNC 18 series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 065 L02★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 065 L03★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L02★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L03★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 330 L02★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 330 L03★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

CONNECTORS COMPATIBLE WITH CABLE SHF5MR



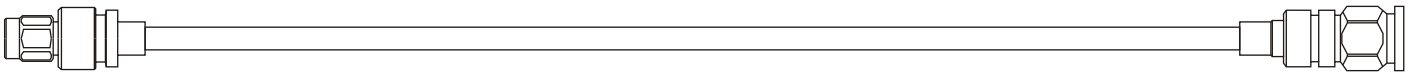
N 18 series

(temperature range with SHF cables = -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 065 L02★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 065 L03★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L02★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L03★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 325 L02★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 325 L03★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 5 with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA-LOW LOSS CABLE
SHF8MR



Radiall P/N : F1703160GR

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	green FEP(3)	max. 8.50	max. 0.335

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	20 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	155 g / m	47.0 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 1000 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70°C / +200°C	-94°C / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	1600
2.0	0.21	0.06	1100
3.0	0.26	0.08	920
4.0	0.30	0.09	800
5.0	0.34	0.10	710
6.0	0.37	0.11	650
8.0	0.44	0.13	560
10.0	0.49	0.15	500
12.4	0.55	0.17	450
18.0	0.68	0.21	380
attenuation calculation (dB / m)	(0.14 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This Ultra-low loss cable is fully adapted to laboratory applications. It can be reinforced with "projack" protective jackets for high mechanical stress applications.

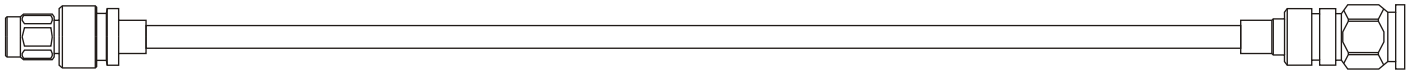
Main benefits :

- ultra-low loss
- high electrical stability with bending and temperature
- high phase stability with temperature
- stain relief
- high mechanical strength and crush resistance
- complete range of connectors available

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF8MR



SMA series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 068 L04★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 068 L05★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 199 L04★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 199 L05★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 338 L04★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber Bulkhead feedthrough Panel sealed Panel nut torque 250 Ncm
M125 338 L05★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber bulkhead feedthrough panel sealed panel nut torque 250 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

TNC 18 series

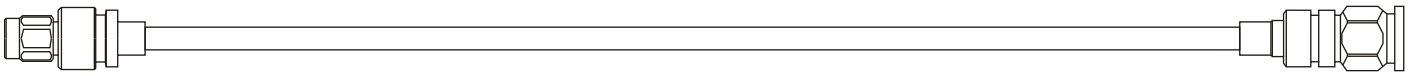
(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 068 L04★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 068 L05★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L04★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L05★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 338 L04★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 338 L05★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

CONNECTORS COMPATIBLE WITH CABLE SHF8MR



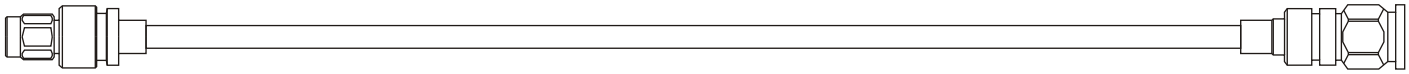
N 18 series **(temperature range with SHF cables= -55 / +130°C)**

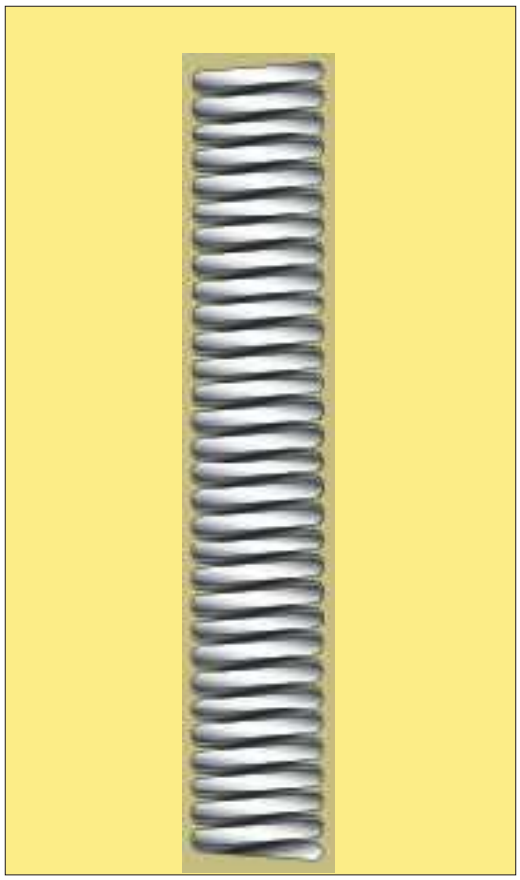
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 068 L04★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 068 L05★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L04★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L05★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 328 L04★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 328 L05★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	compatible with Projack 8 with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXJACK 5 and FLEXJACK 8





APPLICATION NOTE

Main benefits :

- high flexibility
- cost effective protection
- high mechanical protection (resistance to crush, abrasion,...)
- strain relief
- anti-kinking action
- secured watertightness when used with compound chamber

Radiall P/N : G930RV11 (for cables SHF5 and 5M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	galvanized steel	-	-
jacket	transparent PVC	6.3 (I.D)	0.248 (I.D)
		max. OD. 12	max OD. 0.472

MECHANICAL CHARACTERISTICS

maximum weight	110 g / m	34 g / ft
recommend. min. bend radius	25 mm	
crush resistance	2 000 N / 100 mm	
tensile strength	300 N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-40 / +85°C	-40 / +185°F
fire resistance	yes	
halogen free jacket	no (TBC)	

Radiall P/N : G931RV11 (for cables SHF8 and 8M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	galvanized steel	-	-
jacket	transparent PVC	9.5 (I.D)	0.374 (I.D)
		max. OD. 16.5	max. OD 0.650

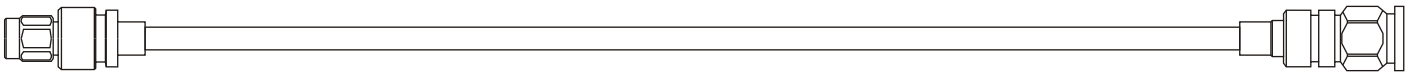
MECHANICAL CHARACTERISTICS

maximum weight	180 g / m	55 g / ft
recommend. min. bend radius	38 mm	
crush resistance	2 000 N / 100 mm	
tensile strength	300N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-40 / +85°C	-40 / +185°F
fire resistance	yes	
halogen free jacket	no (TBC)	

PROJACK 5 and PROJACK 8



Radiall P/N : G940RP10 (for cables SHF5 and 5M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	stainless steel	6.00 (inner)	0.240
braid	stainless steel	-	-
jacket	black PU	max. 11	max. 0.433

MECHANICAL CHARACTERISTICS

maximum weight	340 g / m	103 g / ft
recommend. min. bend radius	equal to cable bend radius	
crush resistance	2 500 N / 100 mm	
tensile strength	900 N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	no	

APPLICATION NOTE

Main benefits :

- high mechanical protection (resistance to crush, traction, abrasion,...)
- high flexibility
- strain relief
- anti-kinking action
- secured watertightness when used with compound chamber

Radiall P/N : G941RP10 (for cables SHF8 and 8M)

CONSTRUCTION / DIMENSIONS

	material	mm	inches
spring	stainless steel	8.50 (inner)	0.330
braid	stainless steel	-	-
jacket	black PU	max. 15	max 0.590

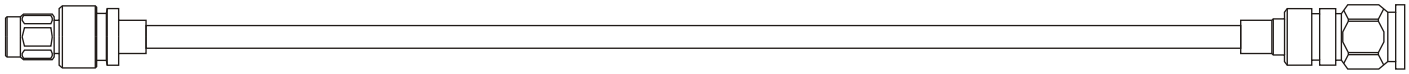
MECHANICAL CHARACTERISTICS

maximum weight	190 g / m	57,6 g / ft
recommend. min. bend radius	equal to cable bend radius	
crush resistance	2 500 N / 100 mm	
tensile strength	900 N	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	no	

ACCESSORIES



BETWEEN SERIES ADAPTORS (DC-18 GHz)

Interface	PC7	N18 male	N18 female	N18 female bulkhead panel sealed
SMA male SMA female	R191 009 000 R191 011 000			
SMA 3.5 male SMA 3.5 female	R191 010 000 R191 012 000	R191 324 000 R191 328 000	R191 326 000 R191 330 000	R191 333 000
TNC male TNC female	R191 017 000 R191 019 000			
TNC 18 male TNC 18 female	R191 017 700 R191 019 700			

IN-SERIES ADAPTORS (DC-18 GHz)

interface	male - male	male - female	female - female	f - f square flange	f - f bulkhead
gold plated stainless steel SMA	R125 703 000	R125 704 000	R125 705 000		
passivated stainless steel SMA	R125 703 001	R125 704 001	R125 705 001		
TNC18	R143 703 700	R143 705 700	R143 704 700	R143 710 700	R143 730 700
N18	R163 703 701	R163 708 701	R163 705 701		
N18 silicon gasket	R163 703 001	R163 708 001	R163 705 001		

LOADS (DC-18 GHz)

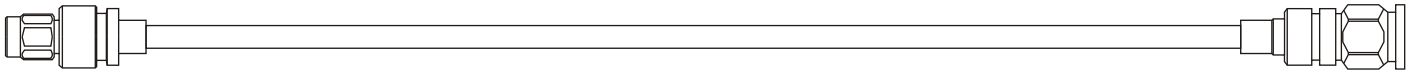
Interface	Part Number	Gender	Power (W)	Remark
SMA	R404 210 000	M	2	-
	R404 210 120	M		with cord
	R404 215 000	F		-
	R404 523 000	M	6	-
	R404 523 500	F		
	R404 573 000	M	12	-
	R404 573 500	F		
	R404 589 000	M	20	-
	R404 589 500	F		
TNC	R404 370 000	M	2	-
	R404 370 120	M		with chain
	R404 375 000	F		-
	R404 521 000	M	6	-
	R404 521 500	F		
	R404 571 000	M	12	-
	R404 571 500	F		
	R404 586 000	M	20	-
	R404 586 500	F		
N	R404 340 000	M	2	-
	R404 340 120	M		with chain
	R404 355 000	F		-
	R404 522 000	M	6	-
	R404 522 500	F		
	R404 572 000	M	12	-
	R404 572 500	F		
	R404 588 000	M	20	-
	R404 588 500	F		

Short-circuit cap : TNC18 male = R143 850 700

ATTENUATORS (DC-18 GHz) xx = attenuation value

Interface	Part number	Attenuation (dB)	Power (W)	Remark
SMA	R411 8xx 121	0 to 30	2	flat frequency response
	R413 8xx 000	0 to 60		
	R416 1xx 000	3 to 20	10 to 15	
TNC	R414 5xx 161	0 to 20	2	-
	R416 8xx 000	3 to 20	10 to 15	
N	R414 7xx 161	0 to 20	2	
	R416 0xx 000	3 to 20	10 to 15	

INTRODUCTION



OUTDOOR (OD) RANGE

Based on the RADIALL “General Interconnect Range”, this product family has been specially developed to suit most environmental conditions linked to outdoor applications.

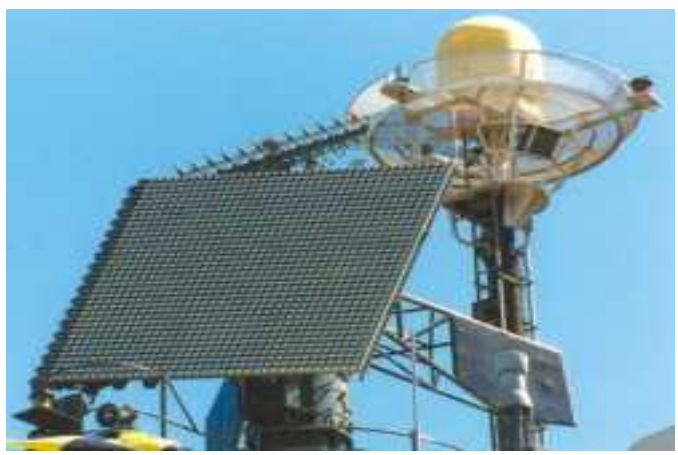
Based on high precision wrapping technology (like the General Interconnect Range), this special SHF construction unites optimal electrical performances and **high resistance to harsh environmental conditions**.

This cable range will be selected for all **outdoor applications** requiring, for example, permanent **exposure to UV**, repetitive and/or **long time water immersion** and **high abrasion resistance**.

APPLICATIONS

Ship-board
Antenna feeder
Cable assemblies for radar equipment

Ground surveillance system
Phase array radar
Active antenna radar



FINDER GUIDE

CABLE / FREQUENCY / LOSS
(indicative average values) (dB/m)

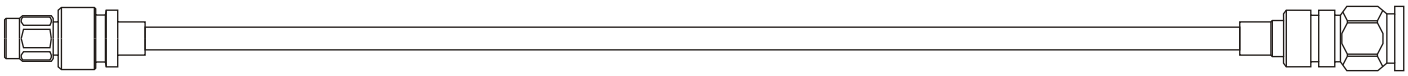
• ULTRA-LOW LOSS CABLES (solid inner conductor)

	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12.4 GHz (band X) *(dB/m dB/ft)*	12.4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26.5 GHz (band K) *(dB/m dB/ft)*
SHF5MOD	0.23 / 0.07	0.32 / 0.10	0.46 / 0.14	0.66 / 0.20	0.84 / 0.25	1.02 / 0.31	1.27 / 0.38
SHF8MOD	0.15 / 0.05	0.21 / 0.06	0.30 / 0.09	0.44 / 0.13	0.55 / 0.17	0.68 / 0.21	

• ULTRA-LOW LOSS AND HIGH FLEXIBILITY CABLES (stranded inner conductor)

	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12,4 GHz (band X) *(dB/m dB/ft)*	12,4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26,5 GHz (band K) *(dB/m dB/ft)*
SHF5OD	0.26 / 0.08	0.37 / 0.11	0.54 / 0.16	0.79 / 0.24	1.00 / 0.30	1.24 / 0.38	1.55 / 0.47
SHF8OD	0.18 / 0.05	0.26 / 0.08	0.38 / 0.12	0.56 / 0.17	0.72 / 0.22	0.90 / 0.27	

CONSTRUCTION

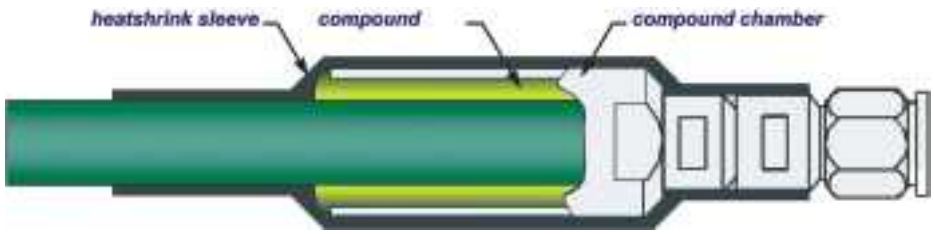


CONNECTOR ATTACHMENT

For optimal and secured watertightness, RADIALL has developed new specific compound chambers (see drawing) allowing the cable jacket to be glued to the connector once the chamber is filled with glue.

In addition, the new compound chamber technology brings high mechanical protection for a secured cable-connector link.

For compact sizes and reduced weights, each cable size has its own adapted compound chamber.



CONNECTORS SPECIFICATION

Connector design :

RADIALL connectors meet or exceed the requirements of MIL-C-39012.
They are designed to provide optimal electrical, mechanical and environmental performances.

Connector materials :

Stainless steel 316L, nickel plated (4µm) brass, black chromium plated brass for body, coupling nut and compound chamber.
Gold plated nickel clad brass for center contact.
PTFE (PolyTetraFluoroEthylene) dielectric.

Lock wire holes: all connector series present 3 lock wire holes to ensure right adressing and secure the link.

Note : connectors in this range cannot be sold separately.

CABLE SPECIFICATION

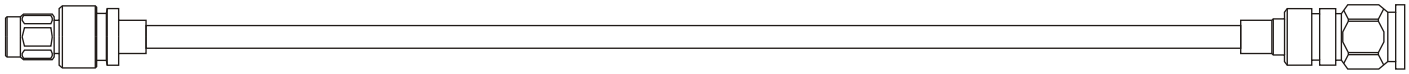
Cable-assembly insertion loss = cable loss * length + 0.0447* √F + 0.04

cable loss **connectors loss**

TESTING

Our cable-assemblies are 100% Insertion Loss and VSWR tested over the test frequency range according to the RADIALL detailed specification. Many other tests are possible upon request.

CHARACTERISTICS



ELECTRICAL

Impedance	50 ± 1 Ω
High amplitude stability under flexures	better than 0.005dB / GHz during and after repeated bending on dynamic bending radius
High phase stability under flexures	better than 0.4°/GHz during and after repeated bending on dynamic bending radius
High phase stability with temperature *	See detailed cable specification.
Insertion loss variation with temperature	<0.2% /°C
Screening effectiveness	better than 90dB up to 18 GHz
Phase matching	by set, with master or per absolute phase available with a typical phase matching of ± 0.4°/GHz
VSWR and Power handling	depends on cable-assembly configuration *Please consult us*

** Optimal phase stability with temperature is proposed for cables using a solid inner conductor.*

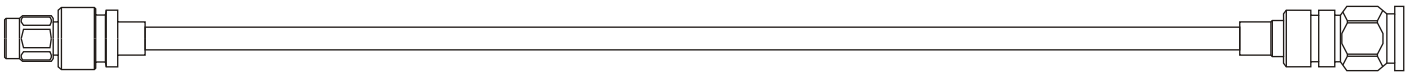
MECHANICAL

Reduced cable size and weight *(thanks to low density PTFE)*	See detailed cable specification
High flexibility	in accordance with MIL C 87104
Vibration resistance	in accordance with MIL T 81490
Shock	in accordance with MIL T 81490
Crush resistance	See detailed RADIALL specification

ENVIRONMENTAL

Temperature range	- 55 / + 100°C (cable-assemblies)
Hermeticity (helium)	in accordance with IEC 68-17
Watertightness	in accordance with EN 60529 - IP67
Radiation resistance	>100 Mrads (5 times better than FEP jacket)
Fire resistant and self extinguishing	in accordance with FAR 25
Fluid resistance	in accordance with MIL STD 1344 (except skydrol)
Humidity resistance	in accordance with MIL C 87104, MIL T 81490 and RTCADO 160 D
Moisture resistance	in accordance with RTCADO 160 D
Salt fog	in accordance with MIL C 87104 and MIL T 81490
Toxicity index (of the PUR jacket)	<1.4 in accordance with NES 713 (MIL C17 requires 5 max.)

FLEXIBLE ULTRA LOW LOSS CABLE
SHF5OD



Radiall P/N : F1703202

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	stranded SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
interlayer	Polyester tape	-	-
jacket	black PU(3)	max. 6.25	max. 0.246

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	29 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	78 %	
propagation time	4.3 ns / m	1.3 ns / ft
capacitance	85 pF / m (at 1 GHz)	25.8 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.5 kV	
nominal phase	1520° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.1 dB (at 18 GHz) / < 0.15 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	78 g / m	23.6 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 400 N/100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.26	0.08	160
2.0	0.37	0.11	115
4.0	0.54	0.16	80
6.0	0.67	0.20	65
8.0	0.79	0.24	55
10.0	0.89	0.27	50
12.4	1.00	0.30	45
18.0	1.24	0.38	40
26.5	1.55	0.47	35
attenuation calculation (dB / m)	(0.25 x √F GHz) + (0.01 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable is fitted out with a stranded center conductor to improve its flexibility. It will be used for outdoor applications.

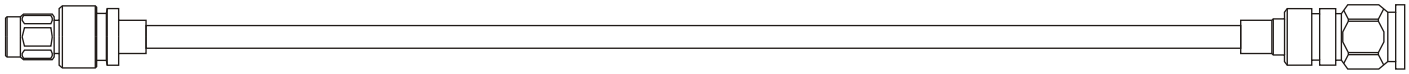
Main benefits :

- high resistance to UV
- high resistance to long time water immersion
- high abrasion resistance

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PU = PolyUrethane

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE
SHF5MOD



Radiall P/N : F1703205

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
interlayer	Polyester tape	-	-
jacket	black PU(3)	max. 5.90	max. 0.232

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	68 g / m	20.6 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	170
2.0	0.32	0.10	120
4.0	0.46	0.14	85
6.0	0.57	0.17	70
8.0	0.66	0.20	60
10.0	0.75	0.23	55
12.4	0.84	0.25	50
18.0	1.02	0.31	40
26.5	1.27	0.38	35
attenuation calculation (dB / m)	(0.22 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable is fitted out with a stranded center conductor to improve its flexibility. It will be used for outdoor applications.

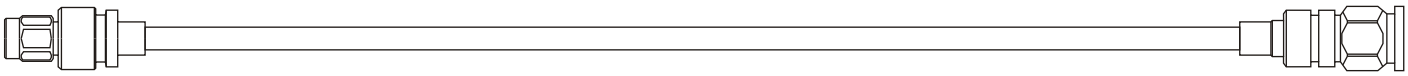
Main benefits :

- high resistance to UV
- high resistance to long time water immersion
- high abrasion resistance

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PU = PolyUrethane

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF5OD and SHF5MOD



SMA series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 065 L02⋆	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L02⋆	plug	right-angle	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 330 L02⋆	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed lock wire holes x 3 panel nut torque 150 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

TNC 18 series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 065 L02⋆	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L02⋆	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 330 L02⋆	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

N 18 series

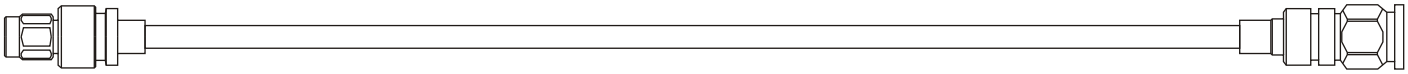
(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 065 L02⋆	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L02⋆	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 325 L02⋆	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

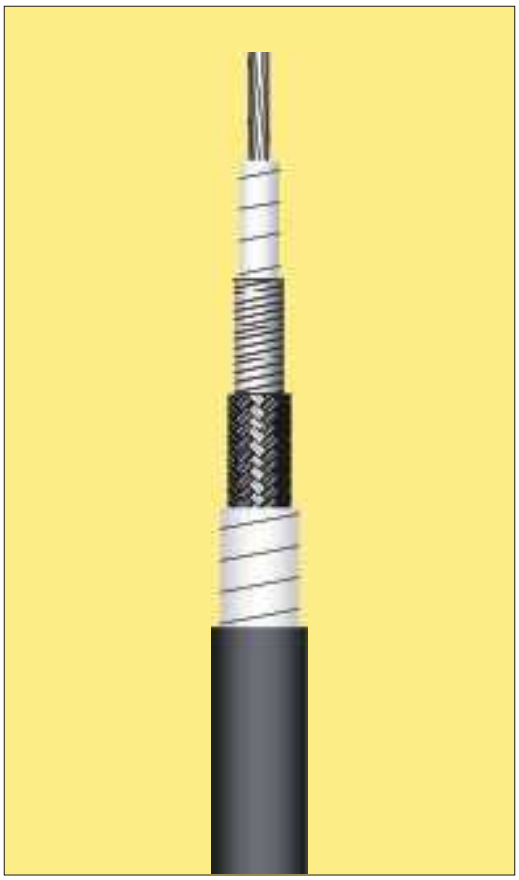
Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

⋆ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE
SHF8OD



Radiall P/N : F1703210



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	stranded SPC(1)	-	-
dielectric	PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
interlayer	Polyester tape	-	-
jacket	black PU(3)	max. 8.90	max. 0.350

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	18.5 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	78 %	
propagation time	4.3 ns / m	1.30 ns / ft
capacitance	85 pF / m (at 1 GHz)	25.8 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.5 kV	
nominal phase	1520° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.1 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	155 g / m	47.0 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.18	0.05	280
2.0	0.26	0.08	200
3.0	0.32	0.10	165
4.0	0.38	0.12	140
5.0	0.43	0.13	130
6.0	0.48	0.14	120
8.0	0.56	0.17	100
10.0	0.64	0.19	90
12.4	0.72	0.22	80
18.0	0.90	0.27	70
attenuation calculation (dB / m)	(0.17 x √F GHz) + (0.01 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable is fitted out with a stranded center conductor to improve its flexibility. It will be used for outdoor applications.

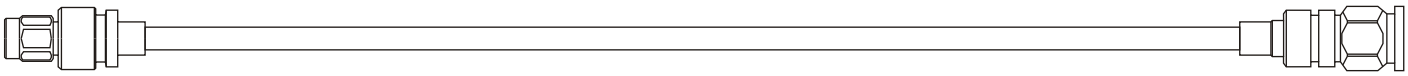
Main benefits :

- high resistance to UV
- high resistance to long time water immersion
- high abrasion resistance

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PU = PolyUrethane

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

FLEXIBLE ULTRA LOW LOSS CABLE
SHF8MOD



Radiall P/N : F1703206

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
interlayer	Polyester tape	-	-
jacket	black PU(3)	max. 8.60	max. 0.339

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	19.4 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.90 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	135 g / m	40.9 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 200 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	320
2.0	0.21	0.06	220
3.0	0.26	0.08	185
4.0	0.30	0.09	160
5.0	0.34	0.10	140
6.0	0.37	0.11	130
8.0	0.44	0.13	110
10.0	0.49	0.15	100
12.4	0.55	0.17	90
18.0	0.68	0.21	75
attenuation calculation (dB / m)	(0.14 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable is fitted out with a stranded center conductor to improve its flexibility. It will be used for outdoor applications.

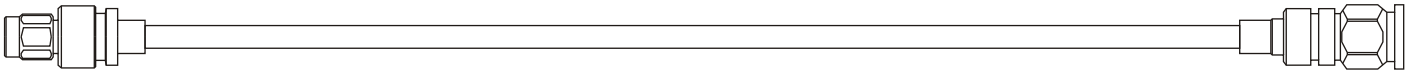
Main benefits :

- high resistance to UV
- high resistance to long time water immersion
- high abrasion resistance

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PU = PolyUrethane

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF8OD AND SHF8MOD



SMA series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 068 L04★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	With compound chamber coupling nut torque 110 Ncm Lock wire holes x 3
M125 199 L04★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 338 L04★	jack	straight	18	1000	5000	stainless steel 316L	passivated	with compound chamber Bulkhead feedthrough Panel sealed Panel nut torque 250 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

TNC 18 series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 068 L04★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L04★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 338 L04★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

N 18 series

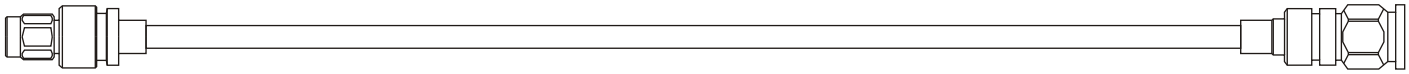
(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 068 L04★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L04★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 328 L04★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

INTRODUCTION



AIRFRAME (AF) RANGE

Based on the RADIALL “General Interconnect Range”, this product family has been specially developed to suit most **on-board applications** requiring **hermetically sealed cable-assemblies**

Based on high precision wrapping technology (like the General Interconnect Range), this special SHF construction unites optimal electrical performances, **light weight** (use of flat braid) and high resistance to harsh environmental conditions.
As a result, this product range exhibits extremely **long life in very severe environments**.

This cable range will be selected for all on-board applications for which cable-assemblies are located in non-pressurized and non-protected areas.

All connectors in this range are made of **stainless steel 316L** for highest mechanical and environmental resistance and long term use. They include a rear compound chamber for optimal and secured watertightness as well as strain relief.

SHF Airframe cables benefit from a **PEEK protective jacket**. It makes our cable the most abrasion resistant on the market.
Peek fiber is **more** abrasion resistant than any aramide fiber like NOMEX® type frequently used. The most demanding applications requiring extreme abrasion resistance need PEEK protection.

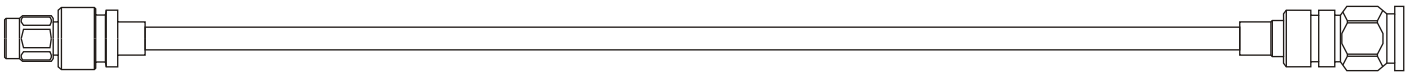
Applications

Electronic warfare
On-board systems for intelligence

Unmanned Aerial vehicle
Drones

Combat aircraft

NOMEX® is a registered trade mark from DuPont



FINDER GUIDE

CABLE / FREQUENCY / LOSS
(Indicative typical values) (dB/m)

• **ULTRA LOW-LOSS CABLES** (solid inner conductor)

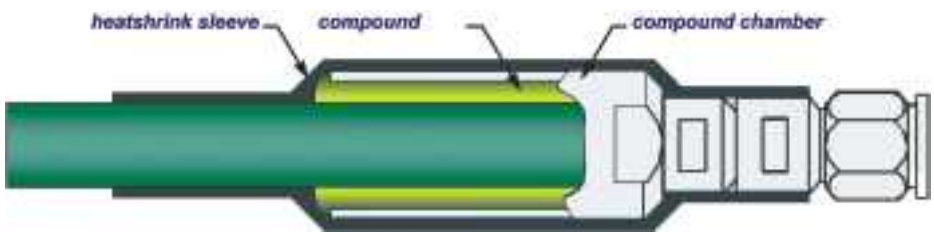
	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12.4 GHz (band X) *(dB/m dB/ft)*	12.4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26.5 GHz (band K) *(dB/m dB/ft)*
SHF5MAF	0.23 / 0.07	0.32 / 0.10	0.46 / 0.14	0.66 / 0.20	0.84 / 0.25	1.02 / 0.31	1.27 / 0.38
SHF8MAF	0.15 / 0.05	0.21 / 0.06	0.30 / 0.09	0.44 / 0.13	0.55 / 0.17	0.68 / 0.21	-

CONNECTOR ATTACHMENT

For optimal and secured hermetically-sealed solution, RADIALL has developed new specific compound chambers (see drawing) allowing the cable jacket and the PEEK braid to be glued to the connector once the chamber is filled with glue.

In addition, the new compound chamber technology brings high mechanical protection for a secured cable/connector link.

For compact sizes and reduced weights, each cable size has its own adapted compound chamber.



CONNECTORS SPECIFICATION

Connector design : RADIALL connectors meet or exceed the requirements of MIL-C-39012.They are designed to provide optimal electrical, mechanical and environmental performances.

Connector materials : Stainless steel 316L for body, coupling nut and compound chamber
Gold plated nickel clad brass for center contact.
PTFE (PolyTetraFluoroEthylene) dielectric.

Lock wire holes : All connector series present 3 lock wire holes to ensure right addressing and secure the link.

Note : connector in this range cannot be sold separately

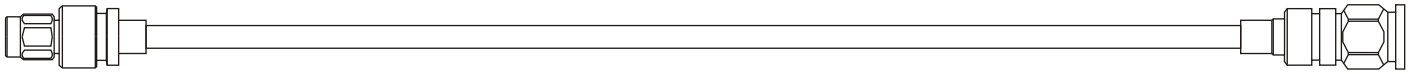
CABLE SPECIFICATION

$$\text{Cable-assembly insertion loss} = \underbrace{\text{cable loss} * \text{length}}_{\text{cable loss}} + \underbrace{0.0447 * \sqrt{F} + 0.04}_{\text{connectors loss}}$$

TESTING

Our cable-assemblies are 100% Insertion Loss and VSWR tested over the test frequency range according to the RADIALL detailed specification. Many other tests are possible upon request.

CHARACTERISTICS



ELECTRICAL

Impedance	50 ± 1Ω
High amplitude stability under flexures	better than 0.005dB / GHz during and after repeated bending on dynamic bending radius
High phase stability under flexures	better than 0.4°/GHz during and after repeated bending on dynamic bending radius
High phase stability with temperature *	See detailed cable specification.
Insertion loss variation with Temperature	<0.2% /°C
Screening effectiveness	better than 90dB up to 18 GHz
Phase matching	by set, with master or per absolute phase available with a typical phase matching of ± 0.4°/GHz
VSWR and Power handling	depends on cable-assembly configuration *Please consult us*

** Optimal phase stability with temperature is proposed for cables using a solid inner conductor.*

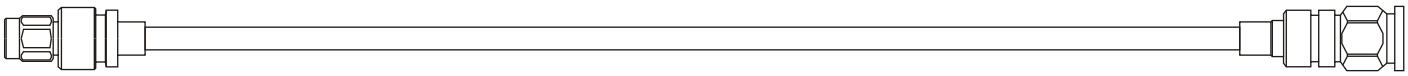
MECHANICAL

Reduced cable size and weight *(thanks to low density PTFE and flat braid technology)*	See detailed cable specification
Vibration resistance	in accordance with MIL T 81490
Shock	in accordance with MIL T 81490
Crush resistance	See detailed cable specification

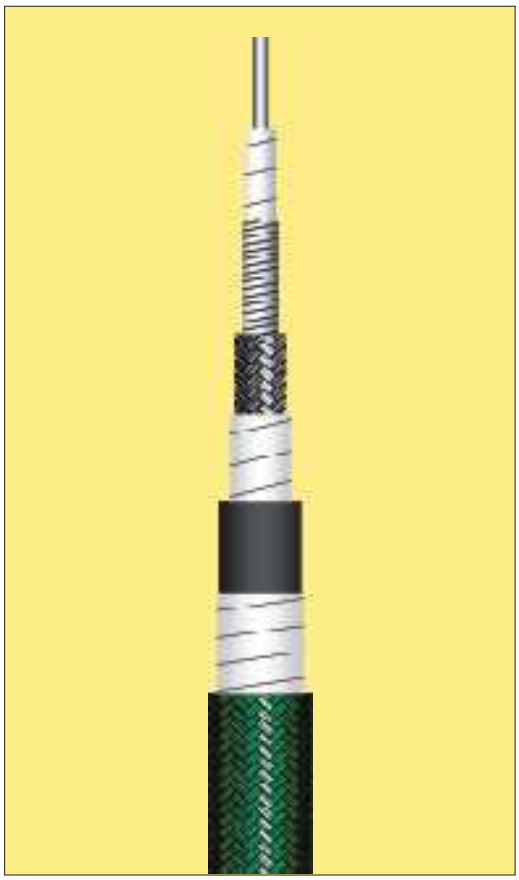
ENVIRONMENTAL

Temperature range	- 55 / + 100°C (cable-assemblies)
Hermeticity (helium)	in accordance with IEC 68-17
Watertightness	in accordance with EN 60529 - IP67
Radiation resistance	>100 Mrads (5 times better than FEP jacket)
Fire resistant and self extinguishing	in accordance with FAR 25
Fluid resistance	in accordance with MIL STD 1344 (except skydrol)
Humidity resistance	in accordance with MIL C 87104, MIL T 81490 and RTCADO 160 D
Fungus resistance	in accordance with RTCADO 160 D
Salt fog	in accordance with MIL C 87104 and MIL T 81490

FLEXIBLE ULTRA LOW LOSS CABLE
SHF5MAF



Radiall P/N : F1703211



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC flat braid	-	-
1st interlayer	Polyester tape	-	-
inner jacket	black PU(3)	-	-
2nd interlayer	KAPTON tape	-	-
outer jacket	PEEK(4) braid	max. 7.4	max. 0.291

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	74 g / m	22.4 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	170
2.0	0.32	0.10	120
4.0	0.46	0.14	85
6.0	0.57	0.17	70
8.0	0.66	0.20	60
10.0	0.75	0.23	55
12.4	0.84	0.25	50
18.0	1.02	0.31	40
26.5	1.27	0.38	35
Attenuation calculation (dB / m)	(0.22 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

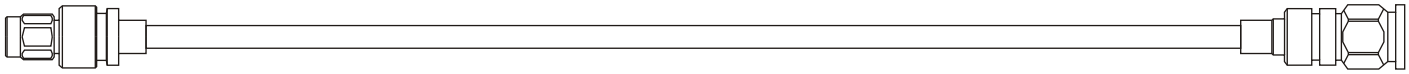
This cable will be selected when hermetically sealed solutions are required in onboard severe environments. It is dedicated to static applications.

Main benefits :
- light weight
- long life
- high abrasion resistance (PEEK braid)
- hermetically sealed solution

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PU = PolyUrethane
(4) PEEK = PolyEther-Etherketone

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF5MAF



SMA series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 065 L12★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L12★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 330 L12★	jack	straigh	26	1000	5000	stainless steel 316L	passivated	with compound chamber Bulkhead feedthrough Panel sealed Panel nut torque 200 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

TNC 18 series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 065 L12★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L12★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 330 L12★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

N 18 series

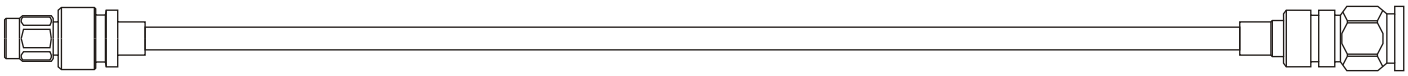
(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 065 L12★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L12★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 325 L12★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

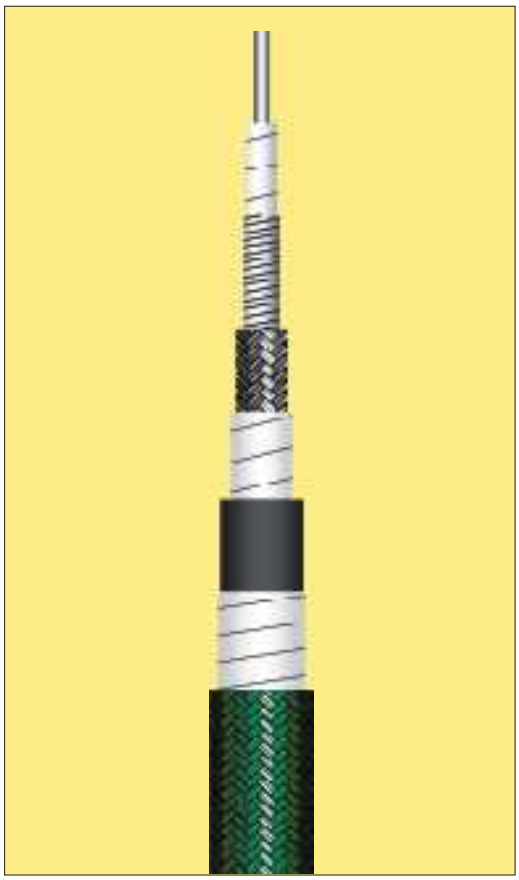
Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE
SHF8MAF



Radiall P/N : F1703212



CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC flat braid	-	-
1st interlayer	Polyester tape	-	-
inner jacket	black PU(3)	-	-
2nd interlayer	KAPTON tape	-	-
outer jacket	PEEK(4) braid	max. 9.90	max. 0.390

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	19.4 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	130 g / m	39.4 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 400 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-55 / +100°C	-67 / +212°F
fire resistance	yes (FAR 25 853)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	320
2.0	0.21	0.06	220
3.0	0.26	0.08	185
4.0	0.30	0.09	160
5.0	0.34	0.10	140
6.0	0.37	0.11	130
8.0	0.44	0.13	110
10.0	0.49	0.15	100
12.4	0.55	0.17	90
18.0	0.68	0.21	75

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable will be selected when hermetically sealed solutions are required in onboard severe environments. It is dedicated to static applications.

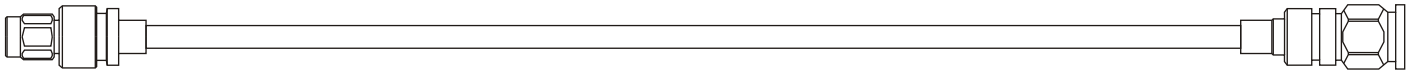
Main benefits :

- light weight
- long life
- high abrasion resistance (PEEK braid)
- hermetically sealed solution

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PU = PolyUrethane
(4) PEEK = PolyEther-Etherketone

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF8MAF



SMA series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M125 068 L14★	plug	straigh	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber Coupling nut torque 110 Ncm Lock wire holes x 3
M125 199 L14★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
M125 338 L14★	jack	straigh	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber Bulkhead feedthrough Panel sealed Panel nut torque 250 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

TNC 18 series

(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 068 L14★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L14★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
M143 338 L14★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

N 18 series

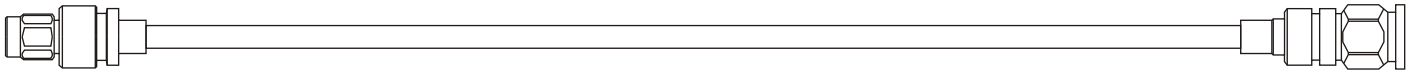
(temperature range with SHF cables= -55 / +130°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M163 068 L14★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L14★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 328 L14★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

INTRODUCTION



LIGHTWEIGHT (LW) RANGE

Based on the RADIALL “General Interconnect Range”, this product family has been specially developed to suit most **on-board applications** for which the weight is a major issue.

Based on high precision wrapping technology (like the General Interconnect Range) these special cables use a flat wire braid instead of the standard round wire technology. This allows the braid weight to be halved and the jacket weight to be significantly reduced. For example, the SHF(X)MLW range allows a **15 to 20% weight saving** compared to the equivalent General Interconnect solutions.

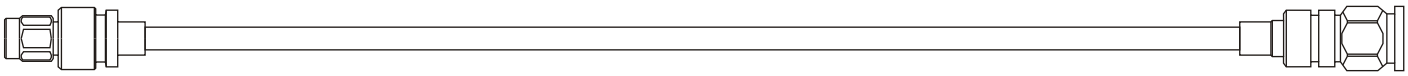
All the electrical characteristics of the General Interconnect are maintained. Thus, this special SHF construction unites optimal electrical performances, **low weight and reduced size.**

This range is advised for on-board high density applications requiring reduced size.
The used flat wire braid does not slide over the other inter-layers like the standard round wire does, consequently, these LW cables will preferably be used in static applications.
All connectors in this range are made of **stainless steel 316L** for highest mechanical and environmental resistance and long term use.
They are also compatible with rear compound chambers for optimal and secured waterightness
As well as strain relief.

APPLICATIONS

Electronic warfare
On-board systems for intelligence

Unmanned Aerial vehicle
Drones



FINDER GUIDE

CABLE / FREQUENCY / LOSS
(indicative typical values) (dB/m)

	0 to 1 GHz (VHF/UHF) *(dB/m dB/ft)*	1 to 2 GHz (band L) *(dB/m dB/ft)*	2 to 4 GHz (band S) *(dB/m dB/ft)*	4 to 8 GHz (band C) *(dB/m dB/ft)*	8 to 12.4 GHz (band X) *(dB/m dB/ft)*	12.4 to 18 GHz (band KU) *(dB/m dB/ft)*	18 to 26.5 GHz (band K) *(dB/m dB/ft)*
SHF5MLW	0.23 / 0.07	0.32 / 0.10	0.46 / 0.14	0.66 / 0.20	0.84 / 0.25	1.02 / 0.31	1.27 / 0.38
SHF8MLW	0.15 / 0.05	0.21 / 0.06	0.30 / 0.09	0.44 / 0.13	0.55 / 0.17	0.68 / 0.21	-
SHF13	0.09 / 0.03	0.14 / 0.04	0.20 / 0.06	0.30 / 0.09	0.33 / 0.10 (max 9.5 GHz)	-	-

CABLE / INTERFACE

	SMA	BMA	TNC	N
SHF5MLW	√	√	√	√
SHF8MLW	√	-	√	√
SHF13	-	-	√	√

CONNECTORS SPECIFICATION

Connector design : RADIALL connectors meet or exceed the requirements of MIL-C-39012.
They are designed to provide optimal electrical, mechanical and environmental performances.

Connector materials : Stainless steel 303 & 316L and nickel-plated brass for body and coupling nut
Gold plated nickel clad brass for center contact.
PTFE (PolyTetraFluoroEthylene) dielectric.

Note : connectors in this range cannot be sold separately

CABLE SPECIFICATION

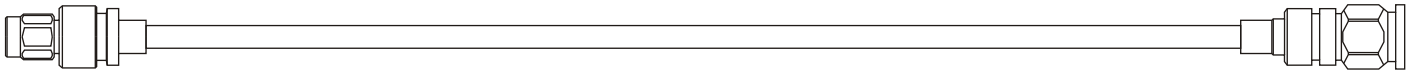
Cable-assembly insertion loss = cable loss * length + 0.0447* $\sqrt{F}$ + 0.04

cable loss **connectors loss**

TESTING

Our cable assemblies are 100% Insertion Loss and VSWR tested over the test frequency range according to the RADIALL detailed specification. Many other tests are possible upon request.

LIGHTWEIGHT



ELECTRICAL

Impedance	50 ± 1 Ω
High amplitude stability under flexures	better than 0.005dB/GHz during and after repeated bending on dynamic bending radius
High phase stability under flexures	better than 0.4°/GHz during and after repeated bending on dynamic bending radius
High phase stability with temperature *	See detailed cable specification.
Insertion loss variation with temperature	< 0.2% /°C
Screening effectiveness	better than 90dB up to 18 GHz (for screwed connectors)
Phase matching	by set, with master or per absolute phase available with a typical phase matching of +/- 0.4°/GHz
VSWR and Power handling	depends on cable-assembly configuration *Please consult us*

** Optimal phase stability with temperature is proposed for cables using a solid inner conductor.*

MECHANICAL

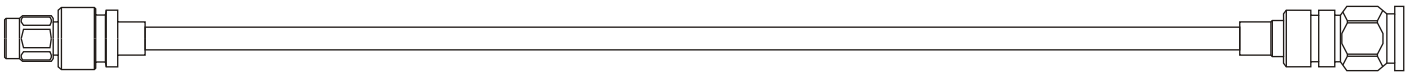
Reduced cable size and weight *(thanks to low density PTFE and flat braid)*	See detailed cable specification
Vibration resistance	in accordance with MIL T 81490
Shock	in accordance with MIL T 81490
Crush resistance	See detailed RADIALL specification

ENVIRONMENTAL

Large temperature range :	- 55 / + 150°C (cable-assemblies)
Fire resistant and self extinguishing	in accordance with MIL C 87104
Chemical resistance	in accordance with MIL C 87104 and MIL T 81490
Humidity resistance	in accordance with MIL C 87104 and MIL T 81490
Fungus resistance	in accordance with RTCADO 160 D
Salt fog	in accordance with MIL STD 810

LIGHTWEIGHT

FLEXIBLE ULTRA LOW LOSS CABLE
SHF5MLW



Radiall P/N : F1703226

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC flat braid	-	-
jacket	green FEP(3)	max. 4.90	max. 0.193

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 26.5 GHz	
cut-off frequency	31 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 2.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz) / < 0.1 dB (at 26.5 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz) / < 0.015 dB / m (at 26.5 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	49 g / m	14.8 g / ft
recommend. min. bend radius	25 mm	0.984 inch
crush resistance	> 200 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.23	0.07	850
2.0	0.32	0.10	600
4.0	0.46	0.14	420
6.0	0.57	0.17	340
8.0	0.66	0.20	300
10.0	0.75	0.23	270
12.4	0.84	0.25	240
18.0	1.02	0.31	200
26.5	1.27	0.38	190
attenuation calculation (dB / m)	(0.22 x √ FGHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, using a flat wire braid, allows a 15 to 20% saving. It is dedicated to static applications.

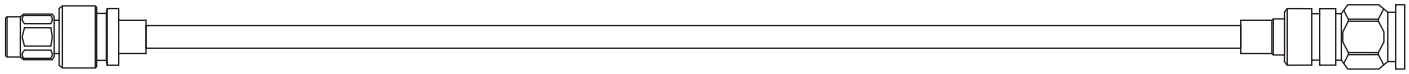
Main benefits :

- light weight
- reduced size for high density applications
- high chemical resistance (oil, lubricant, humidity, ...)

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF5MLW



SMA series

(temperature range with SHF cables= -65 / +165°C)
(-55 / 130°C with compound chamber)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 065 L10★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 065 L12★	plug	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 195 L10★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 195 L12★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 330 L12★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough Panel sealed panel nut torque 200 Ncm
M125 330 L12★	jack	straight	26	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 200 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

BMA series

(temperature range with SHF cables= -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 065 001	male plug	straight	22	1 500	5 000	stainless steel 303	passivated	
R128 206 020	female jack	straight	22	1 500	5 000	stainless steel 303	gold	press-in panel feedthrough spring loaded floatting
R128 275 025	female jack	straight	18	1 500	5 000	stainless steel 303	passivated	2 hole flange 2 holes dia. 2.65 mm spring loaded floatting
R128 330 001	female jack	straight	18	1 000	5 000	stainless steel 303	passivated	bulkhead feedthrough
R128 331 001	female jack	straight	18	1 000	5 000	stainless steel 303	passivated	2 hole flange

RF leakage = 50 dB at 18 GHz

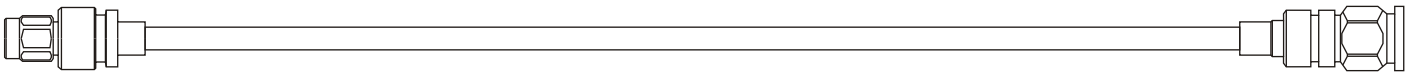
TNC 18 series

(temperature range with SHF cables= -65 / +165°C)
(-55 / 130°C with compound chamber)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R143 065 L11★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 065 L12★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 195 L11★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 195 L12★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 330 L10★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 330 L12★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

CONNECTORS COMPATIBLE WITH CABLE SHF5MLW



(temperature range with SHF cables= -65 / +165°C)
(-55 / 130°C with compound chamber)

N 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R163 065 L10 ⋆	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 065 L12 ⋆	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 195 L10 ⋆	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 195 L22 ⋆	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 325 L10 ⋆	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm
M163 325 L02 ⋆	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

MIL DTL 38999 series I, II, III, IV / BMA contacts

(temperature range with SHF cables= -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 005 201	pin coax	straight	22	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in male center contact panel sealed
R128 215 501	socket coax	straight	22	1 500	5 000	stainless steel 303	gold	# 8 / snap-in spring loaded floatting female center contact panel sealed

NSX (ARINC600) and MPX series / BMA contacts

(temperature range with SHF cables= -65 / +125°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 005 221	pin coax	straight	18	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in male center contact panel sealed

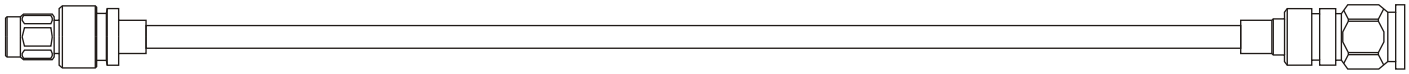
EPXB series / BMA contacts

(temperature range with SHF cables= -65 / +175°C)

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R128 005 341	pin coax	straight	18	1 500	5 000	stainless steel 303	passivated	# 8 / snap-in male center contact

⋆ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

FLEXIBLE ULTRA LOW LOSS CABLE
SHF8MLW



Radiall P/N : F1703218

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	solid SPC(1)	-	-
dielectric	low density PTFE(2) tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC flat braid	-	-
jacket	green FEP(3)	max. 7.30	max. 0.287

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	DC - 18 GHz	
cut-off frequency	20 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	79 pF / m (at 1 GHz)	23.9 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ/m	
corona extinction voltage	> 3.3 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	< 1° / m / GHz (-55 / +100°C)	
phase stability with bending	< 0.4° / 360° / GHz	
attenuation stability with bending	< 0.05 dB (at 18 GHz)	
attenuation stability with shaking	< 0.01 dB / m (at 18 GHz)	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	105 g / m	31.8 g / ft
recommend. min. bend radius	40 mm	1.575 inch
crush resistance	> 200 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	No	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.15	0.04	1600
2.0	0.21	0.06	1100
3.0	0.26	0.08	920
4.0	0.30	0.09	800
5.0	0.34	0.10	710
6.0	0.37	0.11	650
8.0	0.44	0.13	560
10.0	0.49	0.15	500
12.4	0.55	0.17	450
18.0	0.68	0.21	380
attenuation calculation (dB / m)	(0.14 x √F GHz) + (0.005 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, using a flat wire braid, allows a 15 to 20% weight saving. It is dedicated to static applications.

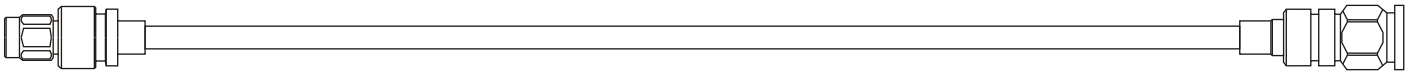
Main benefits :

- light weight
- high chemical resistance (oil, lubricant, humidity, ...)
- reduced size for high density applications

(1) SPC = Silver Plated Copper
(2) PTFE = PolyTeraFluoroEthylene
(3) PFA = PerfluoroAlkoxy
(4) FEP = Fluorinated Ethylene Propylene

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F (GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF8MLW



(temperature range with SHF cables= -65 / +165°C)
(-55 / 130°C with compound chamber)

SMA series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R125 068 L10★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	coupling nut troque 110 Ncm lock wire holes x 3
M125 068 L14★	plug	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 199 L12★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	coupling nut torque 110 Ncm lock wire holes x 3
M125 199 L14★	plug	right-angle	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 110 Ncm lock wire holes x 3
R125 338 L11★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 250 Ncm
M125 338 L14★	jack	straight	18	1 000	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 250 Ncm

Advised torque wrench for plugs: R282 320 000 / 8 mm / 80-120 Ncm

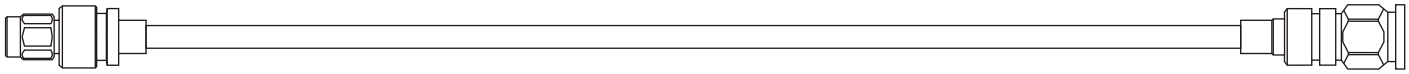
(Temperature range with SHF cables= -65 / +165°C)
(-55 / 130°C with compound chamber)

TNC 18 series

Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R143 068 L10★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 068 L14★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 198 L11★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	coupling nut torque 330 Ncm lock wire holes x 3
M143 198 L14★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber coupling nut torque 330 Ncm lock wire holes x 3
R143 338 L11★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque 370 Ncm
M143 338 L14★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber bulkhead feedthrough panel sealed panel nut torque 370 Ncm

Advised torque wrench for plugs: R282 300 000 / 14 mm / 265 Ncm

CONNECTORS COMPATIBLE WITH CABLE SHF8MLW



(temperature range with SHF cables= -65 / +165°C)
(-55 / 130°C with compound chamber)

N 18 series

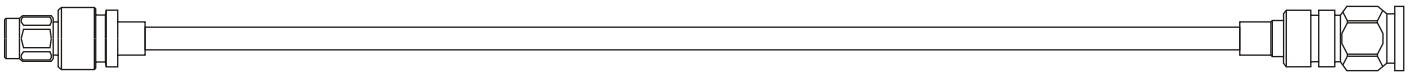
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
R163 068 L11★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 068 L14★	plug	straight	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 198 L11★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
M163 198 L14★	plug	right-angle	18	1 500	5 000	stainless steel 316L	passivated	with compound chamber mixed coupling nut 18.9 mm on flats coupling nut torque 400 Ncm lock wire holes x 3
R163 328 L10★	jack	straight	18	1 500	5 000	stainless steel 316L	passivated	bulkhead feedthrough panel sealed panel nut torque = 500 Ncm

Advised torque wrench for plugs: R282 303 000 / 19 mm / 160 Ncm

★ These connectors are made of STAINLESS STEEL 316L for highest mechanical and environmental resistance and long term use most of them are maintained on stock to bring optimized service and price

LIGHTWEIGHT

FLEXIBLE ULTRA LOW LOSS CABLE
SHF13



Radiall P/N : F1703186

CONSTRUCTION / DIMENSIONS

	material	mm	inches
center conductor	PTFE(1) / SPC(2) tape	-	-
dielectric	PTFE tape	-	-
inner shield	SPC tape	-	-
outer shield	SPC braid	-	-
jacket	black PFA(3)	max. 13.80	max. 0.543

ELECTRICAL CHARACTERISTICS

characteristic impedance	50 Ω ± 1 Ω	
operating frequency range	100 kHz - 9.5 GHz	
cut-off frequency	10 GHz	
screening effectiveness	> 90 dB (at 18 GHz)	
velocity of propagation	85 %	
propagation time	3.9 ns / m	1.2 ns / ft
capacitance	78 pF / m (at 1 GHz)	23.6 pF / ft (at 1 GHz)
insulation resistance	> 3 x 10^5 MΩ / m	
corona extinction voltage	> 10 kV	
nominal phase	1400° / m / GHz	
phase stability with temperature	-	
phase stability with bending	< 0.6° / 360° / GHz	
attenuation stability with bending	< 0.05 dB	
attenuation stability with shaking	< 0.01 dB / m at 9GHz	
atten. variation with temperature	Att. (at X°C) = att. (at 20°C) x 1 + (X - 20) x 0.002	

MECHANICAL CHARACTERISTICS

maximum weight	280 g / m	84.8 g / ft
recommend. min. bend radius	60 mm	2.362 inch
crush resistance	> 600 N / 100 mm	

ENVIRONMENTAL CHARACTERISTICS

operating temperature range	-70 / +200°C	-94 / +392°F
fire resistance	yes (MIL C 87104)	
halogen free jacket	no	

FREQUENCY / ATTENUATION (typ.) / CW MAX POWER (*)

GHz	dB / m	dB / ft	Watts
1.0	0.09	0.03	2500
2.0	0.14	0.04	1800
3.0	0.17	0.05	1500
4.0	0.20	0.06	1300
5.0	0.23	0.07	1100
6.0	0.26	0.08	1000
7.0	0.28	0.08	970
8.0	0.30	0.09	900
9.5	0.33	0.10	830
attenuation calculation (dB / m)	(0.087 x √F GHz) + (0.007 x F GHz)		

(*) CW max power calculated at sea level / 40°C and VSWR 1:1 (Cable-assembly power ratings may be limited by the connector type. Please contact us for specific needs)

APPLICATION NOTE

This cable, featuring a special center conductor, will be used when flexibility and weight saving are required.

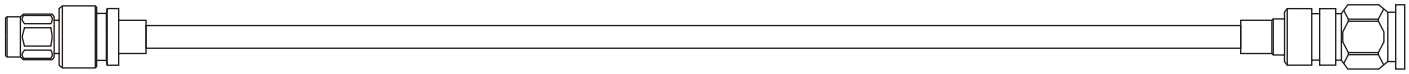
Main benefits :

- high flexibility
- light weight
- high chemical resistance (oil, lubricant, humidity, ...)

(1) PTFE = PolyTeraFluoroEthylene
(2) SPC = Silver Plated Copper
(3) PFA = PerfluoroAlkoxy

Note: typical attenuation for a couple of connectors (dB) = 0.0447 x √F GHz) + 0.04

CONNECTORS COMPATIBLE WITH CABLE SHF13



TNC series

(temperature range with SHF cables= -55 / +130°C)

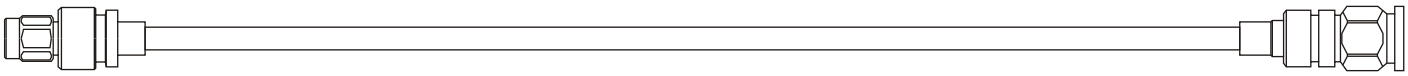
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M143 077 001	plug	straight	9.5	1 500	5 000	stainless steel 303	passivated	with compound chamber

N series

(temperature range with SHF cables= -55 / +130°C)

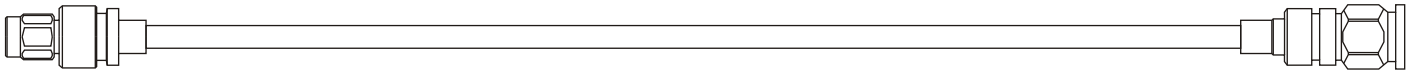
Part number	Interface	Geometry	Frequency (GHz)	Voltage Withstanding (Vrms)	Insulation Resistance (MΩ mini)	Material	Finish	Miscellaneous
M161 077 001	plug	straight	9.5	2 500	5 000	brass	nickel	with compound chamber lock wire holes x 3

RADIALL SHF HARNESS SOLUTIONS



The combination of design and manufacturing of RF and microwave cables as well as multipin connectors allows Radiall to also be a specialist of harnesses for multicontact connections.

Series	Relevant standard	Market & application	Equipment design	Key feature	Temperature range	Radiall catalog
DSX	ARINC 404 MIL C81659B	civil & military aeronautics	rack & panel connections	spray water resistant	-65 / +125°C	D7C00CE
NSX	ARINC 600	civil aeronautics	rack & panel connections	rain water resistant	-65 / +125°C	D7B00CE
MPX	MIL DTL83527 EN 3682	military aeronautics	rack & panel connections	altitude and immersion	-55 / +155°C	D7D00CE
EPX	Proprietary interface per BPSC179	civil & military aeronautics	rack & panel disconnect panel and cable-to-cable connections	altitude and immersion	-65 / +175°C	D72010CE
MIL 38999	MIL C38999 series I, II ,III, IV BMA contact	civil & military aeronautics	disconnect panel and cable-to-cable connections	see series detailed specification	see series detailed specification	-



Choosing the best cable for a new application is not an easy thing.
The cable selection is always a question of compromise between mechanical, electrical and environmental performances.
For example, choosing a stranded inner conductor will improve the flexibility but will increase the attenuation and so the power withstanding.

With 15 years of expertise in cable technology and 40 years in coaxial connectors RADIALL masters the expertise to help the customers to make the best choice adapted to their needs.

To choose the best technical solution, the characteristics listed below have to be considered.
The following sections provide information dealing with each characteristic.

1- Capacitance = C (pF/m)
2- Velocity of propagation
3- Characteristic impedance
4- Skin effect
5- Attenuation
6- VSWR (Voltage Standing Wave Ratio)
7- Shielding effectiveness
8- Dielectric Withstanding Voltage
9- Power handling (CW and peak power)
10- Phase stability with temperature.
11- Flexibility/Bending radius
12- Operating temperature range
13- Environmental considerations

1- CAPACITANCE = C (expressed in pF/m)

The capacitance is the ability of a dielectric material placed between conductors to store energy when a difference of potential is created between the conductors

It is linked to the dielectric constant (ε) of the insulator material and conductors sizes (Ø **d** = outer diameter of the inner conductor and Ø **D** = inner diameter of the outer conductor)

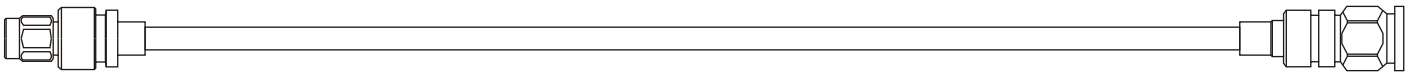
$$C = \frac{24.2 \times \varepsilon}{\log(D/d)}$$

Another relationship can also be used relating the capacitance to the characteristic impedance (**Zc**) and dielectric constant (ε).

$$C = \frac{3333 \times \sqrt{\varepsilon}}{Zc}$$

Typical capacitance values are given below.

Characteristic impedance	Insulation material	Capacitance (pF/m)	Capacitance (pF/foot)
50 ohms	Solid PE	99	30
	Foam PE	79	24
	Solid PTFE	95.7	29
	Foam PTFE	82.5	25
75 ohms	Solid PE	67.5	20.5
	Foam PE	53	16
	Solid PTFE	63	19
	Foam PTFE	56	17



2- VELOCITY OF PROPAGATION = Vp (%) and propagation time (ns/m)

The velocity of propagation characterizes the speed of electrical energy in the cable, compared to the speed of light in free space.

The velocity of propagation is a key point when, for example, the coaxial cable is to be used as a delay line

Vp is calculated as follow **:**

$$Vp\ (m/s) = \frac{C}{\sqrt{\varepsilon}}$$

Where :
C = Light velocity (= 3 x 10^8 m/s)

Ɛ = Dielectric constant.

Vp is also usually expressed in percentage of the velocity of light in free space.

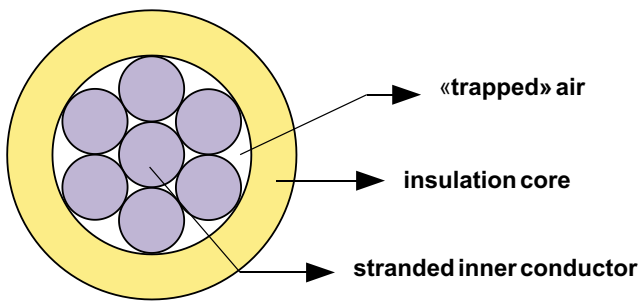
$$Vp\ (\%) = \frac{1}{\sqrt{\varepsilon}}$$

As Ɛ is independent of the frequency for considered insulation materials, **Vp** is also independent of the frequency.

Remarks :

Dielectric constant Ɛ not only depends on the dielectric material but also on cable construction.

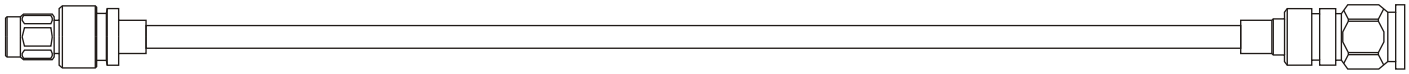
Thus, a stranded inner conductor will make the Ɛ decrease around 5 %, due to the presence of air between wires and insulation core (see fig. below).



For the same kind of reason, braided external conductor will have the same effect.
The propagation time (t) is the time taken by the wave to cover one meter of cable.
t is directly calculated from **Vp** :

$$t = \frac{1}{Vp(m/s)}$$

Material	Dielectric constant	Velocity (%)	Propagation time/m (ns)
Solid PTFE	2.07	69.5	4.8
PE	2.3	65.9	5
Foam PTFE	1.4 - 1.6	79 – 84.5	3.9 – 4.2
Foam PE	1.4 – 1.7	76.5 – 84.5	3.9 – 4.3
FEP	2.1	69	4.8
Foam FEP	1.4 – 1.7	76.5 – 84.5	3.9 – 4.2



3- CHARACTERISTIC IMPEDANCE = Zc (ohm = Ω)

The characteristic impedance is usually the prime parameter when selecting cable and connectors for a given system impedance.
For the best performance, the cable and connectors must be selected to match the impedance of the other components in the system.

The characteristic impedance is linked to the dielectric constant (ε) and conductors sizes (**Ø d** and **Ø D**) according to the following formula:

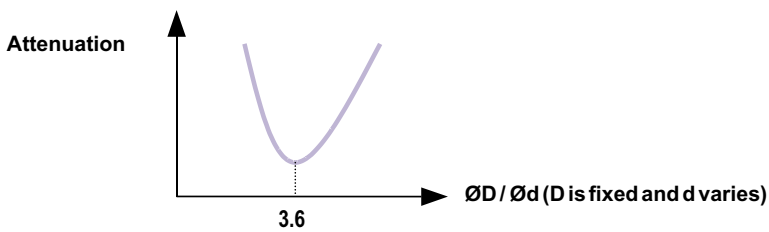
$$Zc = \frac{60}{\sqrt{\varepsilon}} \times \ln(D/d)$$

Where :
d = outer diameter of the inner conductor
D = inner diameter of the outer conductor

Zc can also be expressed in function of **C** and ε (see capacitance section).

$$Zc = \frac{3333 \times \sqrt{\varepsilon}}{C(Pf/m)}$$

Remark :
For a given insulation diameter D, and considering that the external shield construction and dielectric are fixed, the best attenuation is obtained for the ratio **ØD / Ød = 3.6**.



That means, with a typical dielectric constant **ε=2**, that the best compromise between attenuation, size and weight is obtained with a **50 ohms** cable.
Therefore, low loss cables required for microwave and RF applications very often utilize a 50 ohms technology.

4- SKIN EFFECT

The skin effect describes the behavior of high frequency currents to propagate only on the surface of the conductors when the frequency increases.

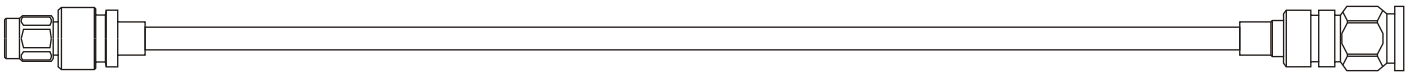
The sections of conduction decrease with the frequency and are located, due to magnetic inductance effect, in the external part of the inner conductor and the internal part of the external conductor. This state is called the **skin effect.**

For microwaves frequencies, around 100% of the current circulates in a depth of around **3xE**.

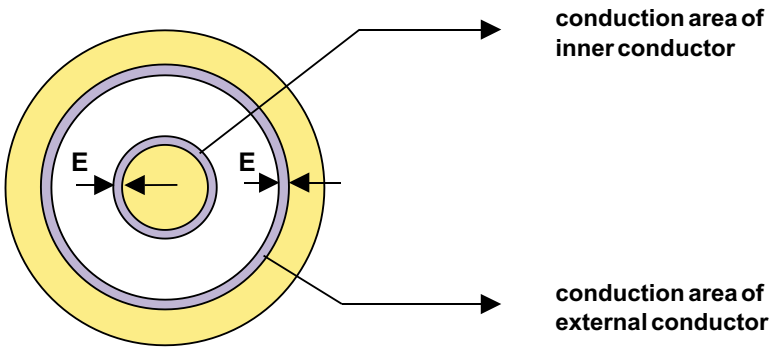
The skin depth (**E**) in which approximately 40% of the current flows is calculated as follow :

$$E = \sqrt{\frac{1}{\pi \times f \times \mu_0 \times \mu_r \times \sigma}}$$

Where :
E = Thickness of conduction.
f = Frequency (Hz)
μ_0 = Permeability of vacuum (H/m)
μ_r = Permeability of the metal (H/m)



Example with copper (valid for silver too) : **E** (µm) = $\sqrt{\frac{66}{f\ (MHz)}}$

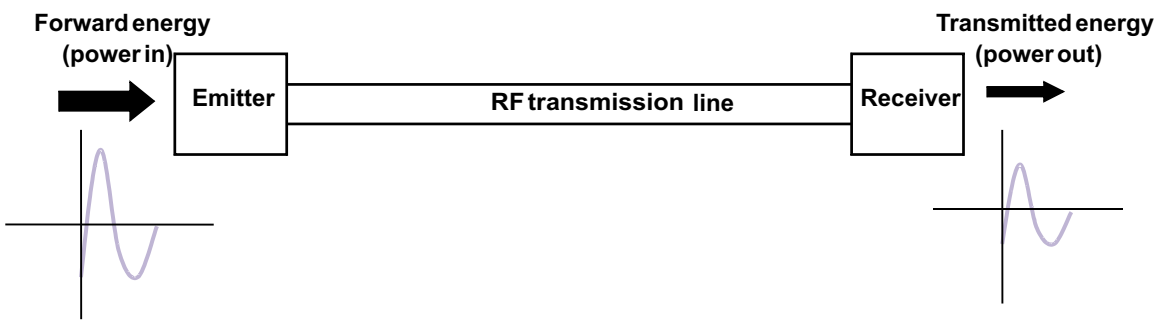


The table below gives some examples of the skin effect depth for copper (or silver)

Frequency	Skin depth
50 Hz	9.3 mm
1 MHz	66 µm
1 GHz	2 µm
18 GHz	0.5 µm

5- ATTENUATION / TRANSMISSION LOSS (dB/m or dB/100ft)

Attenuation (or transmission loss) is defined as the loss of energy along the RF line.

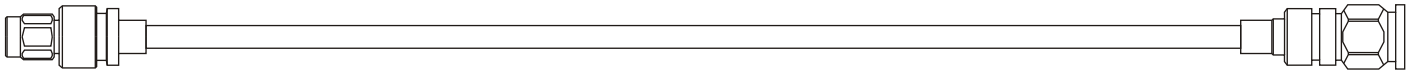


$$\text{Attenuation (dB)} = 10 \log \frac{\text{Power out}}{\text{Power in}}$$

The energy loss comes from four origins :
– Loss in the conductors (a portion of signal is converted to heat)
– Loss due to external shield leakage(radiation)
– Loss coming from dissipation in the dielectric
– Loss induced by reflected signal (VSWR)

Considering that the radiation loss is non significant in comparison with conductors and dielectric losses, the attenuation formula is given as follow:

$$\text{Attenuation (dB)} = (A \times \sqrt{f}) + (B \times f)$$



Where :
A = loss factor due to conductors
(A depends on conductors construction and conductivity)
B = loss factor due to dielectric.

(B only depends on the dielectric material : dielectric constant ε and dissipation factor **tg** δ)

f = frequency in GHz.

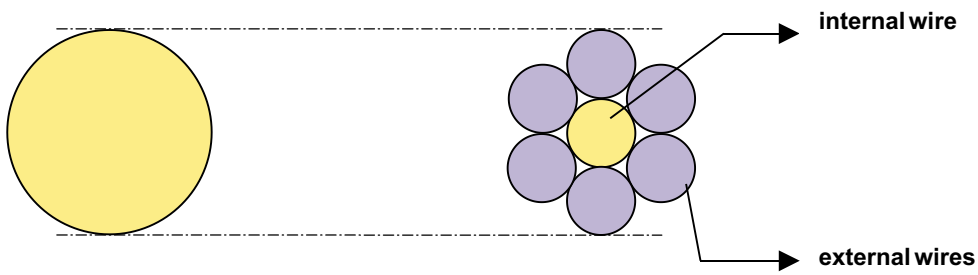
For cable assemblies, the insertion loss is the sum of cable attenuation x length + connectors losses.
Due to the connector length (non significant) the connectors losses are due to impedance mismatching. (see VSWR section).

For cables size < 10mm, **A** is much more greater than **B.**
As a consequence, the loss due to dielectric dissipation can be considered as non significant for low frequencies
(typically for **f** < 0.5 GHz)
Dielectric loss increases linearly with the frequency, while conductor loss increases with the square root of frequency.
Therefore, dielectric loss takes a bigger part of the total loss as frequency is increasing.
Thus, the choice of the dielectric material must be considered in detail for high frequencies (>1GHz) application.
The below paragraphs present in detail the origin of conductor loss and dielectric loss.

5-a RELATION BETWEEN CONDUCTORS CONSTRUCTION AND ATTENUATION

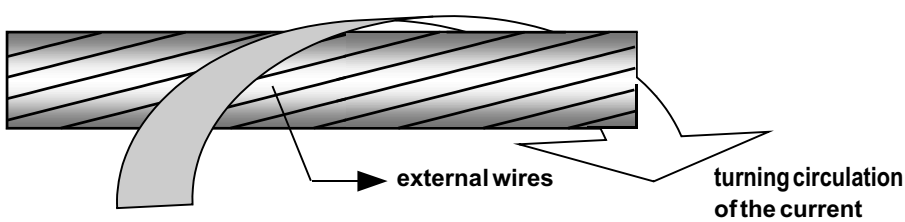
5-a-1 The inner conductor

Two main kinds of construction currently exist :

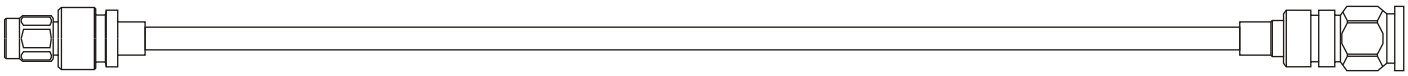


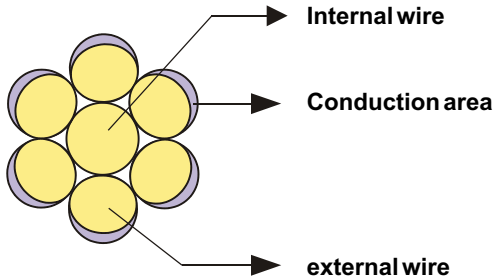
For the same inner conductor size, the best configuration for an optimized attenuation is the solid conductor.
Choosing a solid inner conductor allows to save between 5 to 20 % of the attenuation. (to the detriment of flexibility).

For solid inner conductors the current circulates straight along the wire bar. For stranded constructions it circulates along the external wires, which turn around the inner wires (see drawing below)
As a consequence, the current has to cover a longer distance in the case of stranded construction.



Another reason of higher attenuation of the stranded inner construction is the electromagnetic repulsion generated by currents circulating in the same way on the external wires.
The electromagnetic repulsion , in conjunction with the skin effect, generates a reduction of the conduction area which is reduced to the crescent shaped described below.





5-a-2 The outer conductor

As seen in the skin effect section, the current circulates in the internal part of the shield.
The direct consequence is that only the internal shield has an impact on the attenuation.
Adding a second braid does not have any significant impact on the attenuation.

In practical terms, five kinds of construction are used.

Braided wires (flexible RG types)
Braided wire tinned soaked (hand-formable technology)
Longitudinal tape (eco-friendly cables ECO142 and ECO393)
Tube (semi-rigid technology)
SHF technology

The table below gives a rough idea of attenuation performances attached to each type of shield.

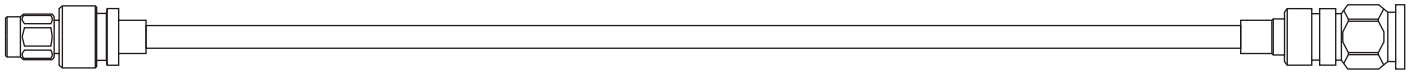
	Braided wires	Braided wires tin soaked	Longitudinal tape	Tube	SHF technology
Attenuation	⊕ Medium loss	⊕⊕ Low loss	⊕⊕⊕ Ultra low loss	⊕⊕⊕ Ultra low loss	⊕⊕⊕ Ultra low loss

5-b Relation between insulation materiel and attenuation

The dielectric losses are independent of the cable size.

The table below gives typical values of the dielectric constant (ε) and dissipation factor (**tg** δ) of the most common materials used as insulation core.

Material	Dielectric constant	Dissipation factor	Operating temperature (°C)
Solid PTFE	2.07	0.0003	-65/+250
PE	2.3	0.0003	-40/+85
Foam PTFE	1.4 – 1.6	0.00005	-65/+250
Foam PE	1.4 – 1.7	0.0001	-40/+85
FEP	2.1	0.0007	-65/+200
Foam FEP	1.4 – 1.7	0.0007	-65/+200



5-c Relation between attenuation and temperature

The temperature has an important impact on the cable attenuation.
This effect is due to the conductors electrical resistance which increases for T°C upper than 20°C and decrease for T°C below 20°C.
The relation between temperature and attenuation can be given in first approach as follow :

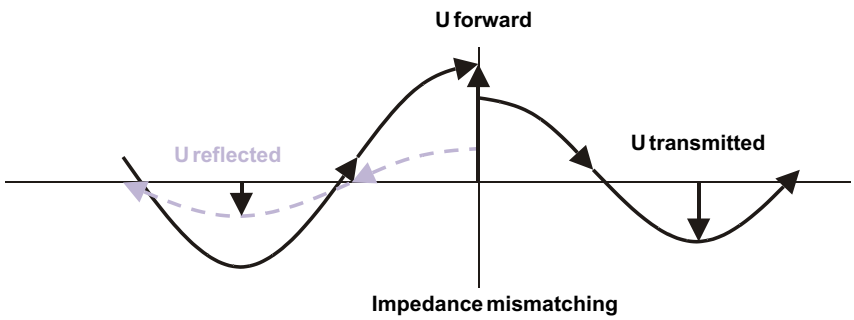
$$\text{Attenuation}(\text{at } X°C) = \text{att. (20°C)} \times \left[1 + (X-20) \times \theta\right]$$

Where :
θ : Temperature coefficient depending on the conductor materials
(θ = 0.002 for Copper and Aluminum)

6- VSWR (VOLTAGE STANDING WAVE RATIO) / RETURN LOSS

The VSWR / Return loss characterizes the level of energy reflected by impedance mismatching along a cable assembly.

Each time the forward wave meets a non adapted impedance area (modification in the dielectric constant (ε) or conductors size ratio (**Ø d** and **Ø D**) or concentricity, …) a part of the energy is reflected, the rest is transmitted.
To express these two parameters, it is necessary to define the **reflection coefficient factor :** Γ.



The reflection coefficient factor (expressed in %) is calculated as follow :

$$\Gamma = \frac{\text{U reflected}}{\text{U forward}} \times 100\%$$

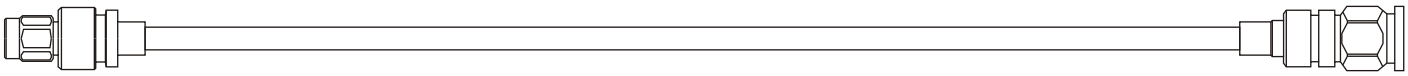
Where :
U forward : forwarded voltage.
U reflected : reflected voltage.

6-a The return loss (dB)

The return loss (expressed in dB) is a logarithmic measure of the reflection coefficient.
It represents the ratio of the transmitted power to the reflected power.

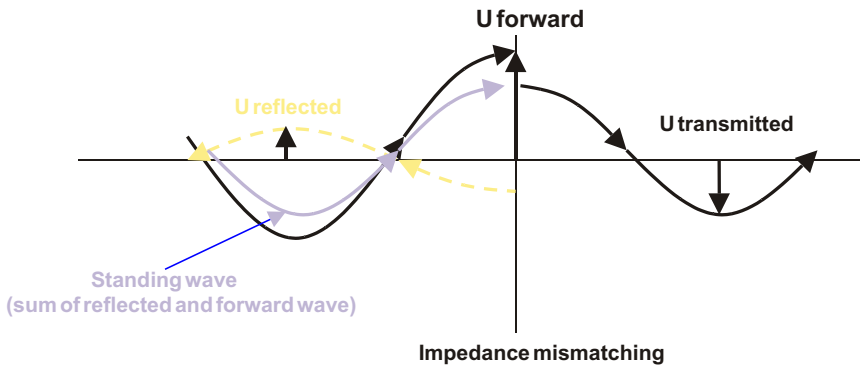
$$R_L\,(\text{dB}) = -20 \log \Gamma$$

Ideal line U reflected = 0 $R_L = \infty$ (dB)
Open or short circuit U reflected = U forward R_L = 0 (dB)



6-b The VSWR

Along a line containing an impedance default, two waves propagate : one travels forward and the other one is reflected. Both waves have the same frequency. At any point of the line the measured voltage will be the sum of the two waves. The summed wave does not travel along the line but stands still, and is known as the standing wave.



The standing wave ratio is the ratio of the maximum voltage (U forward + U reflected) to the minimum voltage (U forward - U reflected) along the RF ligne.

$$VSWR = \frac{U\ forward + U\ reflected}{U\ forward - U\ reflected}$$

Ideal line : VSWR =1.0 (U reflected = 0)

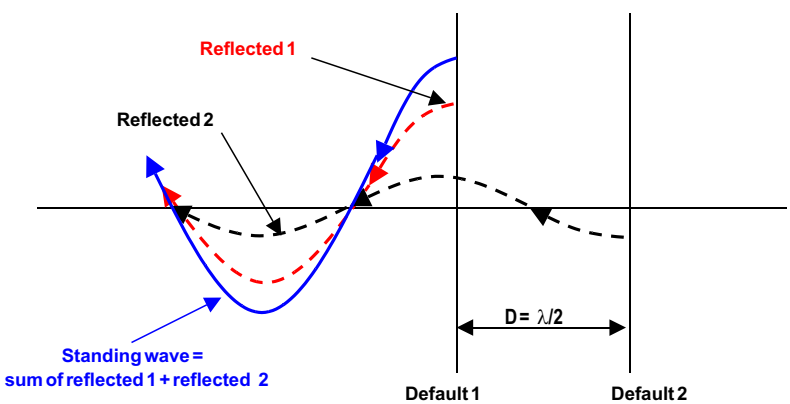
Short or open circuit : VSWR = ∞ (U reflected = U forward)

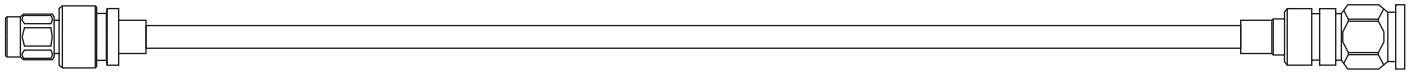
The table below summarizes the relationship between Γ, R_L, and **VSWR** :

Reflection coefficient (Γ)	Return loss R_L (dB)	VSWR
$\Gamma = \frac{U\ reflected}{U\ forward} \times 100\ \%$	$R_L = -20 \log \Gamma$	$VSWR = \frac{U\ forward + U\ reflected}{U\ forward - U\ reflected}$
$\Gamma = \frac{VSWR - 1}{VSWR + 1}$	$R_L = -20 \log \frac{U\ reflected}{U\ forward}$	$VSWR = \frac{1 + \Gamma}{1 - \Gamma}$

In practical terms, for cable assemblies, there is not only one impedance discontinuity but several.
Like the previous presentation with one impedance default, the standing wave is going to be the sum of all the reflected signals + the forward signal.
Depending on the distance between impedance discontinuities and on the frequency, the sum will be maximum or minimum.

For example, the sum will be maximum if the distance between defaults is $\lambda/2$ as described below.

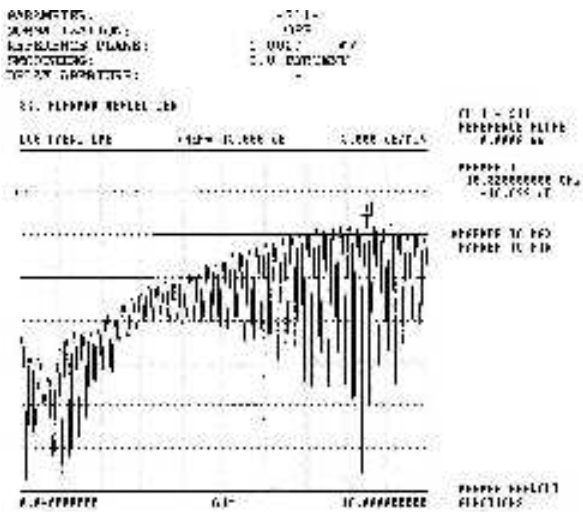




6-c Remarks : Typical Return loss signature and associated causes.

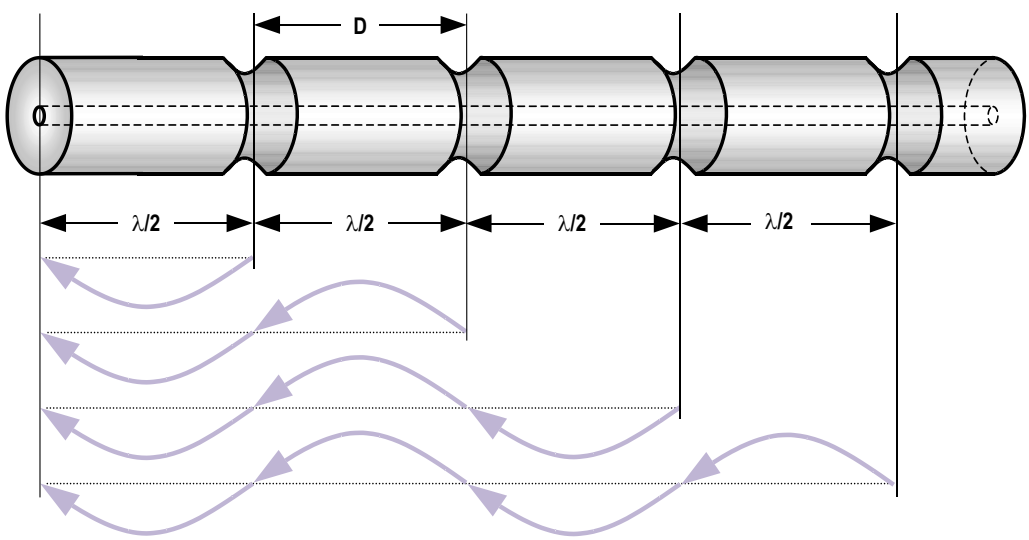
6-c-1 Signature due to a single discontinuity

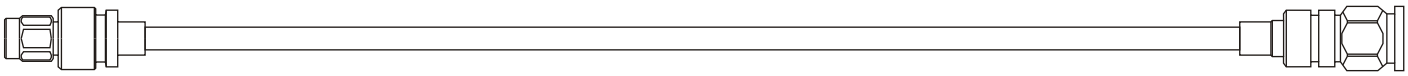
A typical VSWR signature is the result coming from a cable assembly having a single discontinuity often located at the cable-connector link. For all the frequencies such as λ is much bigger (at least 50 times bigger) than the discontinuity length, the discontinuity is not “seen” by the wave, and so the VSWR is very low.
Then, the default impact on $\mathbf{R_L}$ increases with frequency as shown in the graph below.



6-c-2 Signature due to discontinuities at regular intervals.

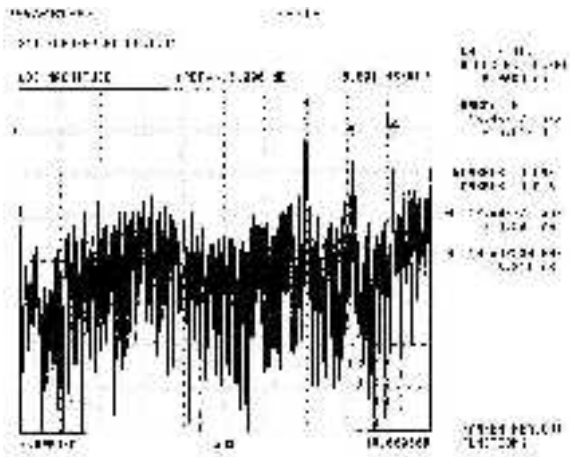
The principle of reflected waves sum, generating maximum or minimum reflected signal allows to understand the typical signature of a cable assembly presenting **discontinuities at regular intervals**.
This kind of regular defaults is quite always due to the cable manufacturing process. (see drawing below).





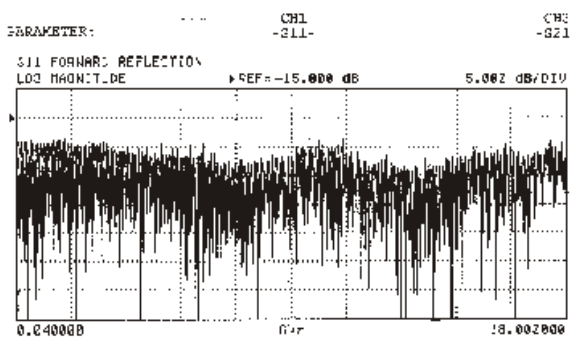
In this case, and considering that the distance between two defaults is **D**, the sum of the reflected signals will be maximum for frequency **F** such as $\lambda/2$ = **D** (or multiple).
At such a frequency, all the waves reflected by each individual default add in phase with another.

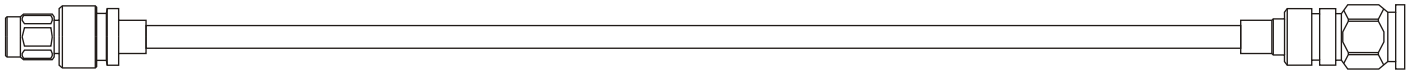
If the cable assembly is long enough to allow a significant number of defaults, the resulting $\mathbf{R_L}$ at specific frequencies (such as λ is multiple of **D**) will be very high, even in case of small discontinuities as shown in the graph below :



6-c-3 Signature due to wrong cable impedance

This happens when cable impedance (even if constant) is not well adapted (matched).
In that case, starting from very low frequencies, the discontinuity is seen by the wave and $\mathbf{R_L}$ is quite high . See the graph below :



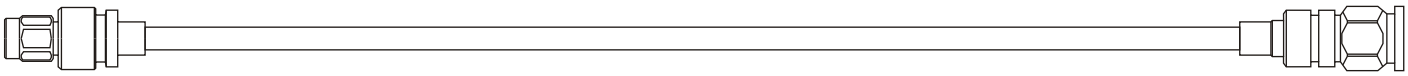


RELATION BETWEEN THE VOLTAGE STANDING WAVE RATIO (VSWR), THE RETURN LOSS (RL) AND THE REFLECTION COEFFICIENT FACTOR (Γ)

VSWR	RL(dB)	Γ
1.01	46.1	0.005
1.02	40.1	0.010
1.03	36.6	0.015
1.04	34.2	0.020
1.05	32.3	0.024
1.06	30.7	0.029
1.07	29.4	0.034
1.08	28.3	0.039
1.09	27.3	0.043
1.10	26.4	0.048
1.11	25.7	0.052
1.12	24.9	0.057
1.13	24.3	0.061
1.14	23.7	0.065
1.15	23.1	0.070
1.16	22.6	0.074
1.17	22.1	0.078
1.18	21.7	0.083
1.19	21.2	0.087
1.20	20.8	0.091
1.21	20.4	0.095
1.22	20.1	0.099
1.23	19.7	0.103
1.24	19.4	0.107
1.25	19.1	0.111
1.26	18.8	0.115
1.27	18.5	0.119
1.28	18.2	0.123
1.29	18.0	0.127
1.30	17.7	0.130
1.31	17.4	0.134
1.32	17.2	0.138
1.33	17.0	0.142
1.34	16.8	0.145

VSWR	RL(dB)	Γ
1.35	16.5	0.149
1.36	16.3	0.153
1.37	16.1	0.156
1.38	15.9	0.160
1.39	15.7	0.163
1.40	15.6	0.167
1.41	15.4	0.170
1.42	15.2	0.174
1.43	15.0	0.177
1.44	14.9	0.180
1.45	14.7	0.184
1.46	14.6	0.187
1.47	14.4	0.190
1.48	14.3	0.194
1.49	14.1	0.197
1.50	14.0	0.200
1.51	13.8	0.203
1.52	13.7	0.206
1.53	13.6	0.209
1.54	13.4	0.213
1.55	13.3	0.216
1.56	13.2	0.219
1.57	13.1	0.222
1.58	13.0	0.225
1.59	12.8	0.228
1.60	12.7	0.231
1.61	12.6	0.234
1.62	12.5	0.237
1.63	12.4	0.240
1.64	12.3	0.242
1.65	12.2	0.245
1.66	12.1	0.248
1.67	12.0	0.251

VSWR	RL(dB)	Γ
1.68	11.9	0.254
1.69	11.8	0.257
1.70	11.7	0.259
1.71	11.6	0.262
1.72	11.5	0.265
1.73	11.5	0.267
1.74	11.4	0.270
1.75	11.3	0.273
1.76	11.2	0.275
1.77	11.1	0.278
1.78	11.0	0.281
1.79	11.0	0.283
1.80	10.9	0.286
1.81	10.8	0.288
1.82	10.7	0.291
1.83	10.7	0.293
1.84	10.6	0.296
1.85	10.5	0.298
1.86	10.4	0.301
1.87	10.4	0.303
1.88	10.3	0.306
1.89	10.2	0.308
1.90	10.2	0.310
1.91	10.1	0.313
1.92	10.0	0.315
1.93	10.0	0.317
1.94	9.9	0.320
1.95	9.8	0.322
1.96	9.8	0.324
1.97	9.7	0.327
1.98	9.7	0.329
1.99	9.6	0.331
2.00	9.5	0.333

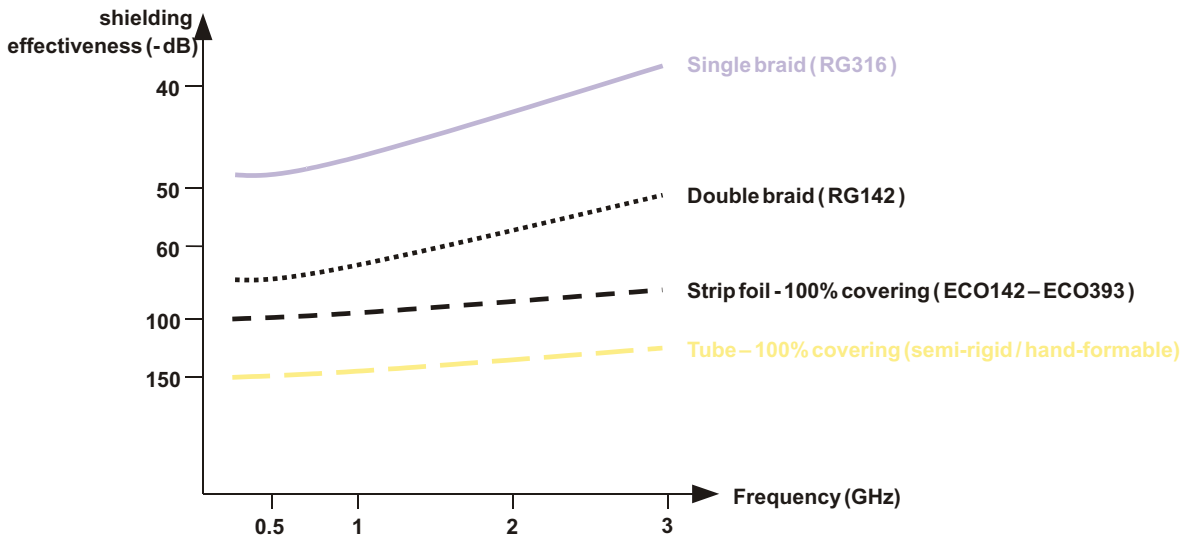


7- SHIELDING EFFECTIVENESS (dB)

The shielding effectiveness represents the ability of the used technology to screen out interference and to prevent RF leakage out of the transmission line. It can also be characterized as the RF leakage value

The shielding effectiveness depends solely on the outer conductor construction and on the frequency.
It features the level of protection of the cable against external electromagnetic fields such as power lines, electric motors, transformers…
In the same way, it characterizes the protection of the environment against electromagnetic pollution coming from the coaxial line.
These two effects are totally symmetrical .
Radiall has the facilities to perform shielding effectiveness measurement by several ways(tri-axial test set up and reverberation chamber according to MIL STD 1344 and IEC61726).
The most efficient and representative test for cable assemblies is the reverberation chamber that allows Radiall to measure the RF leakage of complete cable-assemblies (cable + connectors) from 0.5 to 20 GHz.
In addition, RADIALL has at his disposal an anechoïd chamber to perform default research test (see Radiall test capability section)

For low frequencies (< 10MHz) the shielding effectiveness mainly depends on the outer conductor thickness and material (outer conductor resistance)
For frequencies > 10MHz the shielding effectiveness mainly depends on the outer conductor self induction.
In addition of these two main effects, holes located in the cable outer conductor or poor electrical contact between cable shield and connector are important sources of RF leakage in cable assemblies applications.
Obviously, holes and self induction effect becomes more and more critical when frequency increases.
The graph below shows typical shielding effectiveness performances corresponding to major coax outer shield constructions.
It clearly shows that the best technology for an optimized shielding effectiveness is the 100% covering shield without any self induction effect (longitudinally applied tape or tube technology).



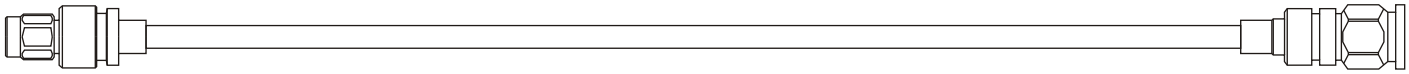
8- VOLTAGE WITHSTANDING (V rms)

To ensure the selected cable is the correct cable for the application, care must be taken regarding the continuous and peak voltage operating conditions.
Two different voltage ratings have to be considered for a coaxial cable, the corona voltage and the **D**ielectric **W**ithstanding **V**oltage **(D.W.V)**

8-a Corona effect

The Corona effect is a ionization phenomenon that appears in the dielectric when submitted to high potential.

The Corona effect causes electrical noise, long term dielectric damage and in some cases a breakdown of the cable.
As a consequence, it is not recommended to use a cable under corona conditions, and the maximum operating voltage must be lower than the corona extinction voltage of the cable.
The determination of the corona extinction voltage requires a very sensitive instrumentation able to detect voltage induced ionization noise.



8-b Dielectric withstanding Voltage (V rms)
The Dielectric Withstanding Voltage (named voltage withstanding in the cable TDS) is the voltage at which the dielectric abruptly breaks down.
The D.W.V does not depend on the frequency but only on the distance between inner and outer conductor and the nature of dielectric material.

This test requires a less sensitive instrumentation, and can be performed as a cable and cable-assembly serial control.
For this test, a voltage is applied (during a limited time) to the cable or cable assembly, and monitored for current flow.

To determine the right cable assembly configuration for a given application proceed as follow :

I1. dentify your effective input voltage by multiplying your input voltage by the square root of the VSWR :
→ **Effective voltage = Input voltage x $\sqrt{VSWR}$**

2. Identify the maximum dielectric withstanding voltage of the cable assembly which is limited by the lower D.W.V of the different components (Connector 1 - Cable - Connector 2). The maximum dielectric withstanding voltage (at sea level) is given in RMS (root mean square) in this catalogue for cable and connectors.
→ **Cable assembly D.W.V = Min (Connector 1 D.W.V / Cable D.W.V / Connector 2 D.W.V)**

3. Check that the cable assembly D.W.V (2.) is greater than the effective voltage (1.)

Remarks :
To determine peak voltage using D.W.V in RMS given in this catalogue, the following calculation shall be done :

$$\textbf{Peak voltage} = \textbf{D.W.V}\ (\text{V rms}) \times \sqrt{2}$$

When altitude increases, the air pressure in the cable assembly termination (cable-connector link and connector) decreases and reduces as a consequence the cable assembly D.W.V.
Relation between D.W.V and altitude is given below :

$$\textbf{Connector D.W.V.}\ (\text{at } 21000\text{ m} = 70\,000\text{ft}) = \frac{\textbf{Connector D.W.V.}(\text{at sea level})}{4}$$

9 - POWER HANDLING (W)

9-a Continuous Working (CW) Power handling

As seen in the insertion loss chapter, a part of the input energy is converted to heat by the resistive effect of the conductors.
Most of the heat is generated at the inner conductor which offers, due to its low section, the higher electrical resistance.
As a consequence, the power handling of a cable (or cable assembly) is limited by the maximum allowable operating temperature of the materials used in the cable (or cable assembly).

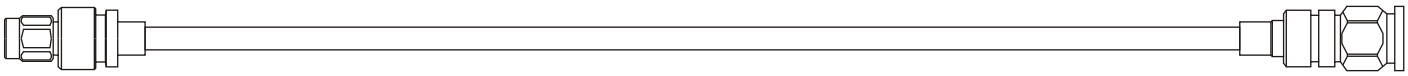
The most critical materials is the dielectric for raw cable and solder spots for cable assemblies.
The power handling increases when the attenuation decreases and also generally when the size increases.
Another factor to take in to account is the heat transfer in the cable (or cable assembly).

Power handling must be de-rated by correction factors taking into account the frequency, the ambient temperature, the altitude and the VSWR.
An increasing of each of these parameters will decrease the power handling.
RADIALL has at his disposal all the de-rating curves to quickly calculate the max. power handling in all kinds of environmental conditions.

9-b Peak power

Peak power is the maximum instantaneous value of a varying power.

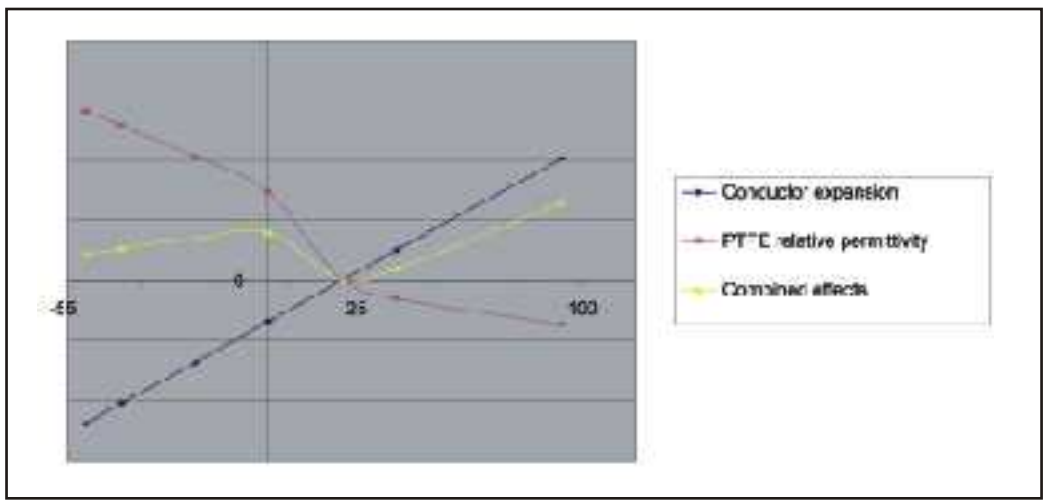
Peak power, like dielectric voltage withstanding, does not depend on the frequency but only on the distance between inner and outer conductor and dielectric material.



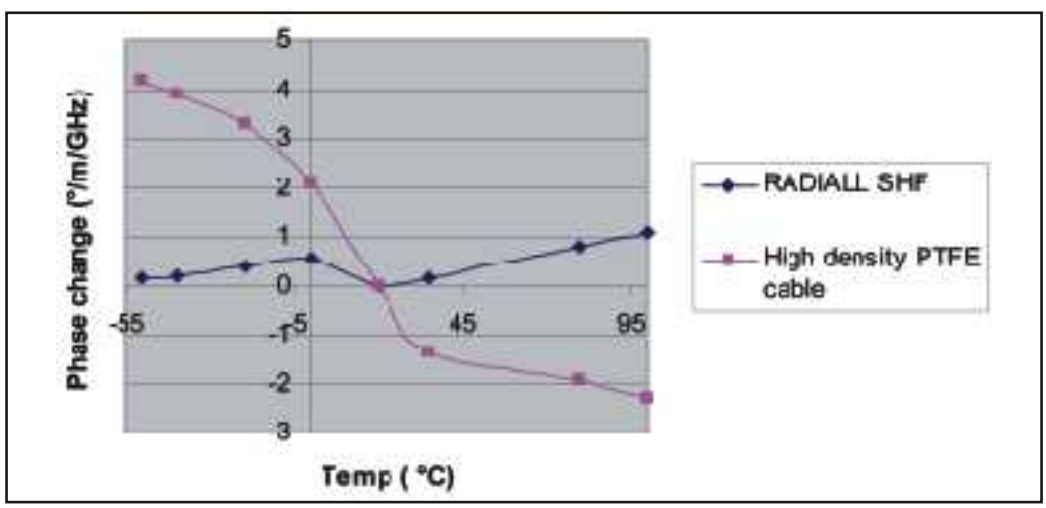
10- PHASE STABILITY WITH TEMPERATURE

Phase change with temperature is a key parameter in many applications like active antennas and labs.
Cable phase change results from the conductors which expand in the heat in a linear and predictable manner (coefficient of thermal expansion) and from the insulation density variations which makes cable relative permittivity changing.

For PTFE, from temperatures higher than 25°C, the molecular structure of PTFE expands that makes the permittivity and electrical length decreasing.
In the opposite way, for temperatures lower than 25°C the molecular structure of PTFE contracts that makes the cable permittivity and electrical length increasing.
An illustration of these effects is given below

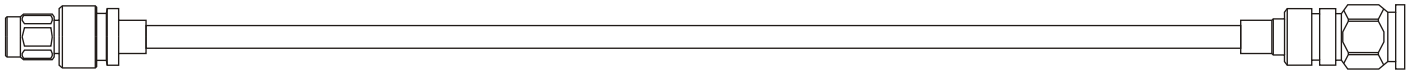


Phase change fingerprint is specific for each cable technology as represented below.



In addition of the phase change by itself, the phase hysteresis must be of big concern.
Even with the help of error correction systems it is very difficult to compensate any hysteresis.
Phase hysteresis : Phase gap between the phase at a particular t°C and the phase at the same t°C after cycling toward extreme t°C and return to the particular t°C

Radiall SHF cable assemblies are mastered from raw materials to cable and assembling process to get the flatest phase change curve with t°C as well as the lowest phase hysteresis.



11- FLEXIBLE / BENDING RADIUS (MM)

Cable flexibility is one of the most important parameters when specifying a cable-assembly.
Bends generated during integration and during operating have to be considered.

To help to make the right cable selection, the designer shall identify, among the following parameters list, those which are pertinent in regard of the application:

- Small bending radius ?
- Low bending moment ?
- Flexure endurance ? Bending angle ? How many cycles ?
- Spring back effect ?
- Cable assembly may be routed during integration (“on site” forming), or pre-formed before ?

The following table will help to link cable construction to expected performances .

11-a Flexibility and inner conductor

	Small bending radius	Low bending moment	Flexure endurance	Spring back effect	“On site” forming
Standed inner conductor	⊕ ⊕	⊕ ⊕	⊕ ⊕	⊕ ⊕	⊕ ⊕
Solid inner conductor	⊕	⊕	⊕	⊕	⊕

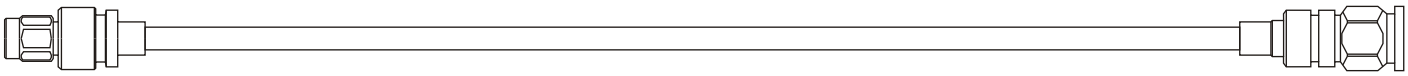
11-b Flexibility and outer conductor

	Small bending radius	Low bending moment	Flexure endurance	Spring back effect	“On site” forming
Braid (flexible RG cables)	⊕ ⊕	⊕ ⊕	⊕ ⊕	⊕ ⊕	⊕ ⊕
Longitudinal tape (ECO friendly cables)	⊕ ⊕	⊕	⊖	⊖	⊕ ⊕
Wrapped foil (SHF technology)	⊕ ⊕	⊕ ⊕	⊕ ⊕	⊕	⊕ ⊕
Tin soaked braid (Handformable)	⊕ ⊕	⊖	⊖	⊖	⊕ ⊕
Tube (semi-rigid)	⊕ ⊕	⊖	⊖	⊖	⊖

12- OPERATING TEMPERATURE RANGE

12-a For flexible cables :

Operating temperature of flexible cables is limited by the operating temperature range of the dielectric and jacket material.
Note that Silver Plated Copper (SPC) conductors are more suitable for long life applications at temperature over 80°C.
The table below gives operating temperature range for main materials used in cable technology.



Material	Operating temperature (°C)
Solid PTFE	-65/+250
PE	-40/+85
Foam PTFE	-65/+250
Foam PE	-40/+85
FEP	-65/+200
Foam FEP	-65/+200
PVC	-50/+105
(PUR) Polyurethane	-50/+125
PA (Polyamide)	-50/+105

12-b For semi-rigid cables

Exposure of cable with extruded PTFE insulation to elevated temperatures causes stressing of the outer conductor since the thermal expansion coefficient of the PTFE is about 10 times greater than that of the metal conductors.
Operating temperature of semi-rigid cables is limited by the expansive force applied by the core material on the outer conductor.
The maximum operating temperature is the temperature at which the expansive force exceeds the yield strength of the outer conductor and causes a permanent (but non significant) increase of the cable outer diameter.
Cable operating temperature are given in cable Technical Data Sheet;

13- ENVIRONMENTAL CONSIDERATIONS.

The life duration of a coaxial cable-assembly depends on many effects that can be combined or not.
The effects of radiation exposure, humidity, salt fog or salt water, corrosive vapors, chemical attacks and fire on material used are the main cause of cable failure.
As the coaxial jacket is used to protect the “active” electrical line against environmental attacks, it is critical to identify cable resistance through jacket material resistance.
The table below gives elements of comparison between main raw material jackets.
In any case, for specific environmental conditions, it is advised to contact RADIALL for an optimized solution.

	Radiation resistance	Chemical resistance	Moisture resistance	Flame non propagating	Abrasion resistance
FEP	±	⊕⊕	⊕⊕	⊕⊕	±
PFA	⊕	⊕⊕	⊕⊕	⊕⊕	±
PVC	±	⊕	⊕	⊕	⊕
Polyurethane	⊕⊕	⊕	±	±	⊕⊕
Polyethylène	⊕⊕	⊕	⊕	-	±
PA	⊕	⊕	⊕	-	⊕⊕

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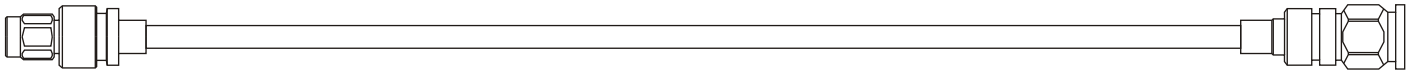

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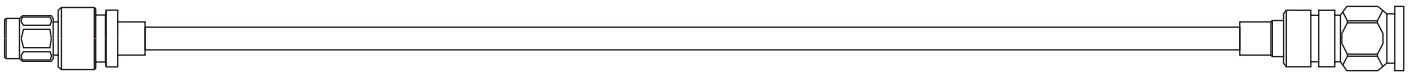

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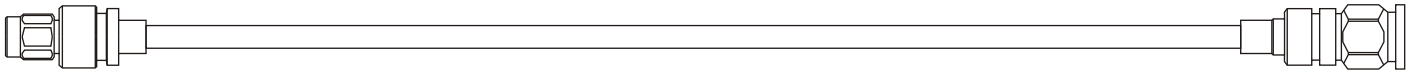

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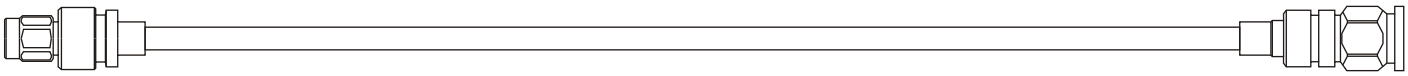


A global range
To meet your needs

ANTENNAS

RADIALL develops and produces antennas for frequencies from 27 MHz to 6 GHz.
- Technologies used: wire, patch, printed, wire- plate, PIFA
- Numerous types of antennas: single pole, dipole, network, passive or active (with LNA), adaptable and intelligent, outdoor or integrated.

AEP CONNECTORS

AEP, a Radiall US subsidiary, design RF connectors for the demanding requirements of military field radio and avionics systems:
- Coaxial waterproof connectors with a unique system of sealing.
- MIL-PRF-39012 QPL connectors
- SSMB and SSMC superior connectors
- SLB Self Aligning connector system.

FIBER OPTIC CONNECTORS

Wide range of interconnect solutions, including standard connector interfaces for multimode and singlemode fiber (LC, SC, FC, ST...) as well as connectors and termini contacts (MIL-T-29504, ARINC 801) for harsh environment applications (aeronautic, military, naval, medical, railway...). Great flexibility for custom design.

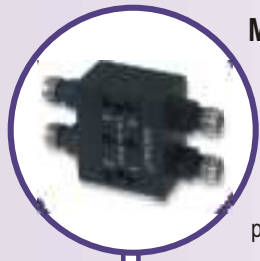
HARNESSES

The combination of design and manufacturing of RF and microwave cables as well as multipin connectors (EPX, ARINC 404 and 600) allows Radiall to be a specialist of harnesses for on-board (aeronautic, navy...) or land (railways, removed antenna...) equipment or communications systems. All types of contacts can be used and mixed such as signal, power, RF, quadrax, fiber optic...

RF & MICROWAVE SWITCHES

Wide range of coaxial switching products for commercial, military and instrumentation applications. Available with a large choice of interfaces (SMA, QMA, N, ...), from DC to 40 GHz.

Main products:
- Standard RAMSES series.
- PLATINUM series with high repeatability (0.03dB) on insertion loss during 10 million actuations.
- Subminiature SPnT up to 26.5 GHz.
- SMT high power micro-SPDT.



MICROWAVE COMPONENTS

Wide range of coaxial terminations and attenuators using standard interfaces (SMA, QMA, N, QN...) from low (1W) to high power (100W) and new cable load solution, chip terminations up to 18 GHz, hybrid or directional SMT couplers up to connectorized couplers, lightning protectors, detectors, rotary joints, phase shifters, DC Blocks...

MULTIPIN CONNECTORS

The range includes rack and panel connectors (Arinc 404 & MIL-C-81659B DSX, Arinc 600 NSX & SW280WS1 BPX, EN3682/MIL-C-83527 MPX JN1123 TCX), modular connector (EPX A & B), compatible with a large variety of contacts : signal, power, RF, data bus, fiber optic, quadrax and twinax.
A range of wire to wire and wire to board is also available: B & MCSR duty connectors, M, MM, MB, MBC rectangular miniature series, MMC.

MICROWAVE SUB-SYSTEMS

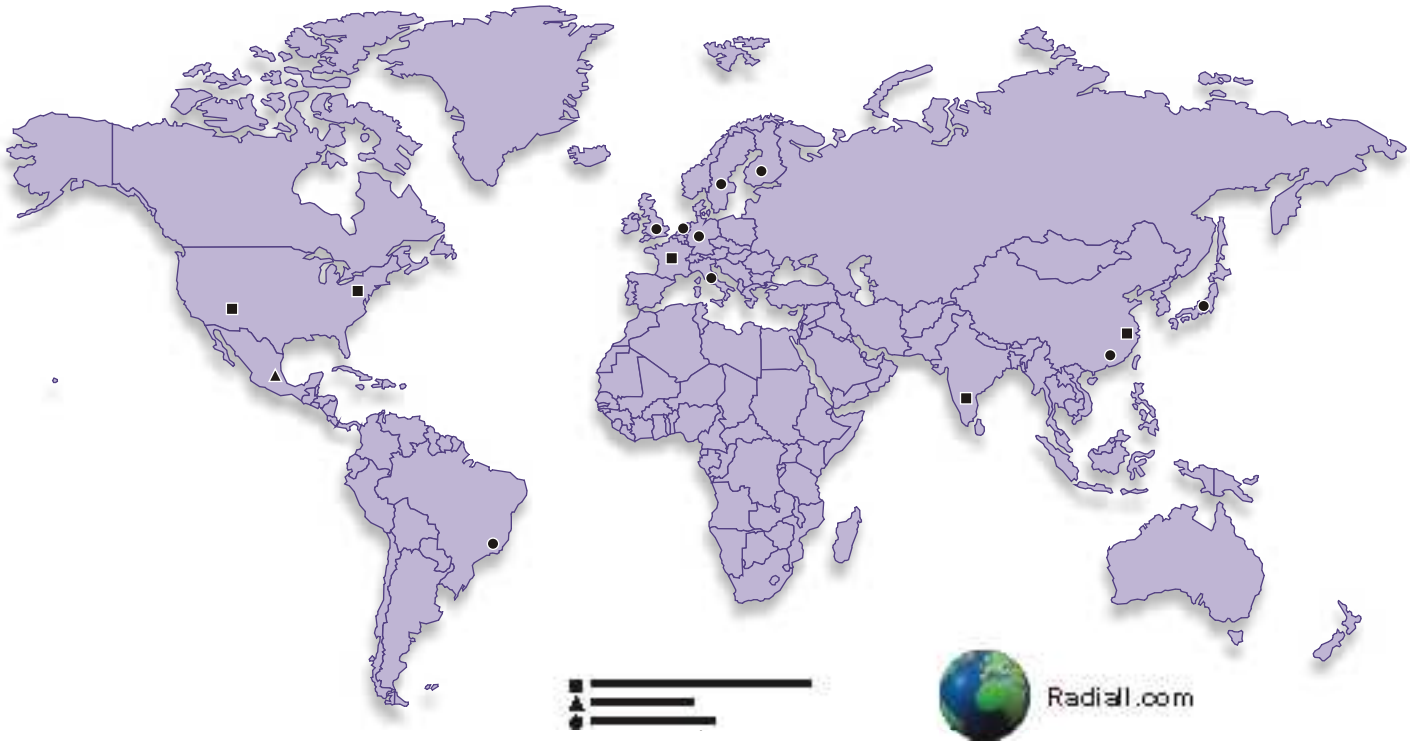
We design Filters, Duplexers, Splitters and Combiners, Switching matrix, interconnection racks and enclosures, Custom assemblies, ... Our expertise includes Microwave passive systems design, Mechanical integration to customer environment, Thermal management, Cabling, wiring, harnessing, …

RF & MICROWAVE CABLE ASSEMBLIES

RG, Eco-Friendly, Handformable, Semi-rigid, SHF Ultra-low loss (General Interconnect, Outdoor, Airframe phase matching large choice of interfaces, Lightweight), …

RF COAXIAL CONNECTORS

The widest range of coaxial connectors in the world from microminiature (UMP) to standard connectors (7/16) covering the frequency range of DC to 65 GHz mixing standardized and custom interfaces (UMP, IMP, MMS, MMT, QMA, QN, MMBX).



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