EPS2116

Outdoor Microphone & Preamplifier Protection Manual

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Larson Davis

EPS2116
Environment Protection System
Manual

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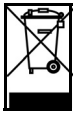

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CHAPTER

1 Introduction

Getting Started

The EPS2116 is an environmental protection system accessory that provides complete weather protection to your ½ inch microphone and microphone preamplifier.

Before you begin working with the EPS2116, read an overview of its capabilities and learn how to assemble, mount, and calibrate the device to optimally perform your tasks.

What is the EPS2116?

The EPS2116 protects your microphone if it is exposed to wind, rain, and humidity during the data collection period.

The EPS2116 can help accomplish your tasks:

- If you deploy the microphone in unpredictable weather, the water-repellent membrane in the EPS2116 will protect it from rain, sleet, and snow
- In high humidity environments, desiccant cartridges can be inserted to preserve performance
- Birds are unable to land on your device and are effectively deterred by the built-in bird-spike.

It works with back-vented microphones in particular, in which static air pressure reaches the back of the microphone from an opening inside the device. Moist air passes through the desiccant before reaching the preamplifier and the back of the microphone.

The EPS2116 is intended to be connected on a threaded ¾ inch conduit, 1½ inch (38mm) speaker stand, or similar mating connector when in use. The whole assembly can be fastened on a mounting screw for tripod use in the field. The EPS2116 is a necessary tool for environmental exposure sound monitoring.

Supported Devices

The EPS2116 protects your microphone and preamplifier from the environment and is only effective if the preamplifier has an O-ring installed.

The O-ring is the small rubber ring hugging the bottom of the thread of the preamplifier to make the threads between the preamplifier and microphone waterproof. If your device does not have one, see the O-ring replacement section of the manual.

Refer to this table of Larson Davis preamplifiers to ensure your device is ready for the EPS 2116:

Preamplifier	Manufacturer Installed O-ring?	Can Environment Certification be Purchased?
PRM2103	Yes	
PRM831	No	Yes
PRMLXT1/2B/1L/2L	No, the O-ring cannot be installed it is not fully environmentally secure	No
PRM828	No	Yes
PRM902	No	Yes

CHAPTER

2 Assembly & Mounting

Assembly

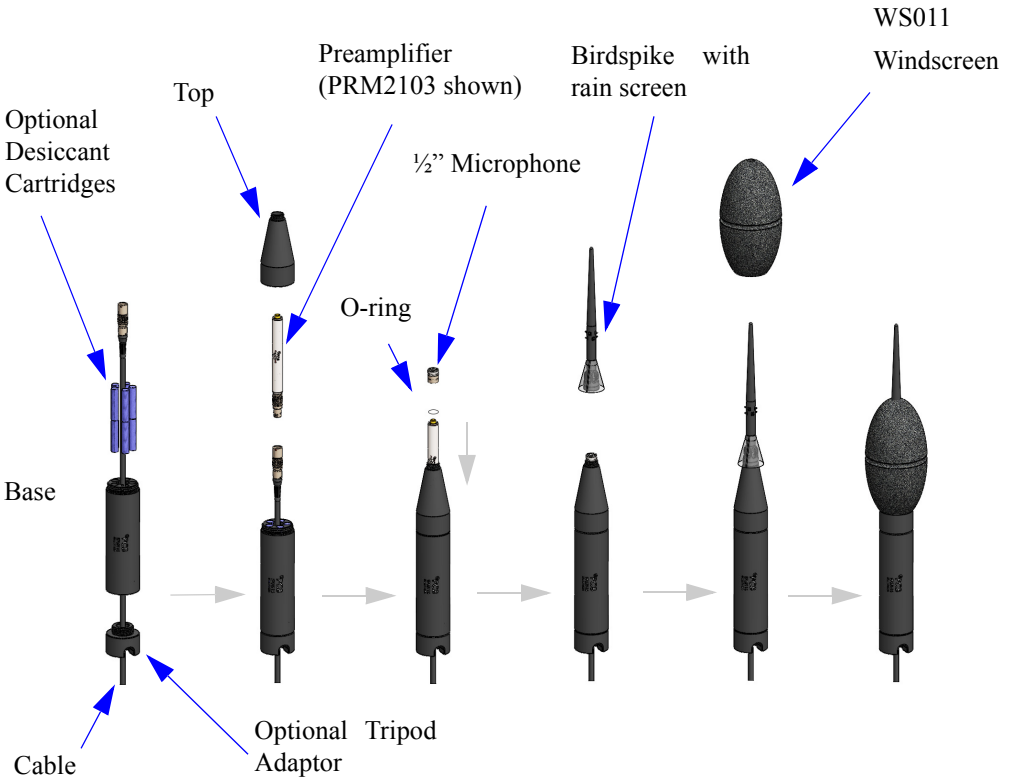


FIGURE 2-1 EPS2116 Assembly

To assemble and mount the EPS2116, follow these steps:

If the windscreen is already attached, unscrew the birdspike by twisting the tip.

Step 1 Disassemble the EPS2116 by unscrewing the base, tripod adaptor, the top, and the birdspike.

Step 2 Thread the cable through the mounting connection and mount the EPS2116 accordingly:

- For the TRP001 or another camera tripod, thread the cable through the tripod adaptor first and then screw the adaptor to the base, as shown in Figure 2-1. Then secure the tripod adaptor to 1/4-20 thread mounting screw on the tripod. Make sure the cable is positioned at the bottom through the arched cable opening on the tripod adaptor.

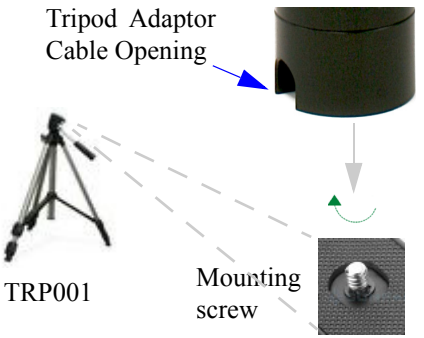


FIGURE 2-2 TRP001 or Camera Tripod Mounting

- For a 3/4”-14 NPSM (ISO 228-G 3/4) threaded pipe, slide the cable through the pipe and then screw the base directly to the pipe.
- For a 1 1/2” BSPF (or ISO 228-G 1.5) threaded pipe, slide the cable through the pipe and then through the ADP100 adaptor. Screw the base to the 3/4” opening on the adaptor and then screw the 1 1/2” opening on the adaptor to the 1 1/2” pipe.
- Figure 2-3 shows the 1 1/2” BSPF assembly.

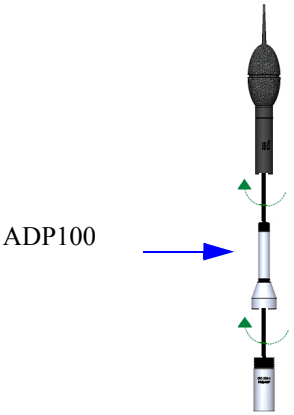


FIGURE 2-3 1 1/2" Pipe Mounting

- For a speaker tripod such as the TRP003, thread the cable through the tripod. Then secure the base directly to the tripod with the included ADP103 accessory.

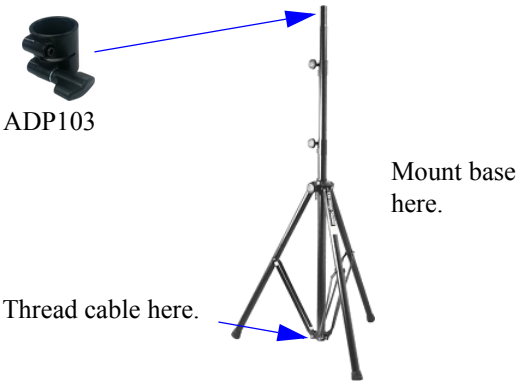


FIGURE 2-4 TRP003 or Speaker Tripod Mounting

If using the PRM2103, desiccant is not required as the preamplifier uses built-in heaters to control humidity within the microphone and preamplifier.

Step 3 If using desiccant cartridges, insert them into the desiccant chambers in the base.

Step 4 Connect the preamplifier (PRM2103 shown) to the cable.

You should expect some resistance pushing the preamplifier partially through the top. A built in O-ring helps to hold the preamplifier in place.

Step 5 Slide the preamplifier partially through the top and then screw the top to the base.

Step 6 Screw the 1/2” microphone on to the preamplifier and then carefully push the preamplifier back down into the top until it stops and the microphone is seated properly.

Step 7 Screw the birdspike (with attached rain-screen) on to the top.

If you need to remove the windscreen, do not pull it off the birdspike with an upward motion. First, unscrew the birdspike by twisting its top and then pull the windscreen down over the bottom of the unscrewed birdspike.

Step 8 If the windscreen is not already in place, slide it over the birdspike until the bottom of the windscreen is seated on the EPS2116 top.

Once assembled, the EPS2116 can be left in place during calibration or transport.

CHAPTER

3 Calibration & Maintenance

Calibration

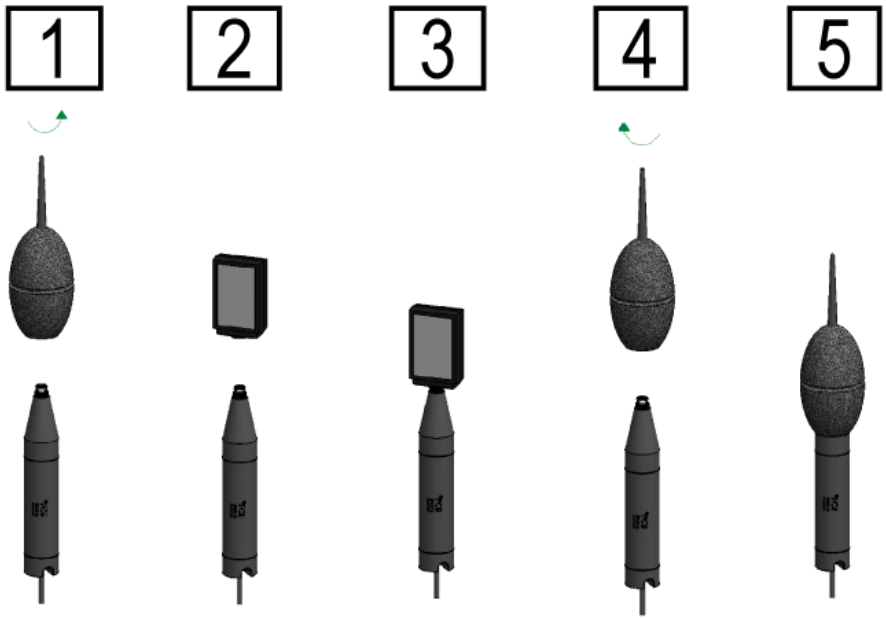


FIGURE 3-1 Calibrating Microphones in the EPS2116

To calibrate microphones in the EPS2116, follow these steps:

Step 1 Remove birdspike and windscreen by unscrewing the assembly.

The microphone and preamplifier can be pulled up if needed to allow the microphone to seat fully inside the calibrator, though this is not necessary when using the CAL 200.

Step 2 Place the calibrator (CAL 200 shown) on the microphone by pushing down gently while slightly twisting clockwise.

Step 3 Perform calibration as described in sound level meter manual.

Step 4 Remove calibrator by pulling it up while slightly twisting it counter-clockwise.

Step 5 Replace birdspike and windscreen.

Windscreen Replacement

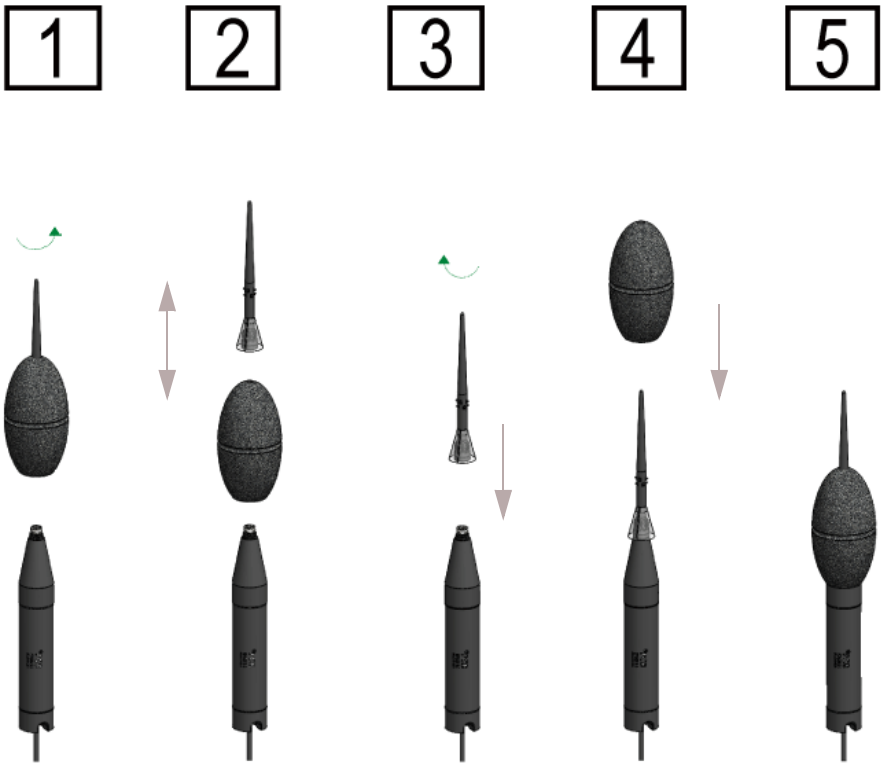


FIGURE 3-2 Replacing EPS2116 Windscreens

To replace the windscreen, follow these steps:

Step 1 Remove birdspike and windscreen by unscrewing the assembly.

WARNING! *Removing the windscreen by pulling it over the top of the birdspike can damage the rain-screen.*

Step 2 Remove windscreen from bottom of birdspike.

Step 3 Replace birdspike.

Step 4 Place new windscreen on birdspike.

Step 5 Push windscreen down until the bottom aligns with windscreen seating line.

Desiccant Replacement

FIGURE 3-3 Replacing EPS2116 Desiccant Cartridge

To replace the desiccants, follow these steps:

Step 1 Remove EPS2116 top from by unscrewing it from the base and disconnect preamplifier from cable.

Step 2 Remove base from tripod adaptor or pipe.

Step 3 Turn base upside-down to remove old desiccants.

Step 4 Insert new desiccant cartridges into base; then thread preamplifier cable through base and re-attach base.

Step 5 Reconnect preamplifier to cable and re-install top to base.

O-Ring Replacement

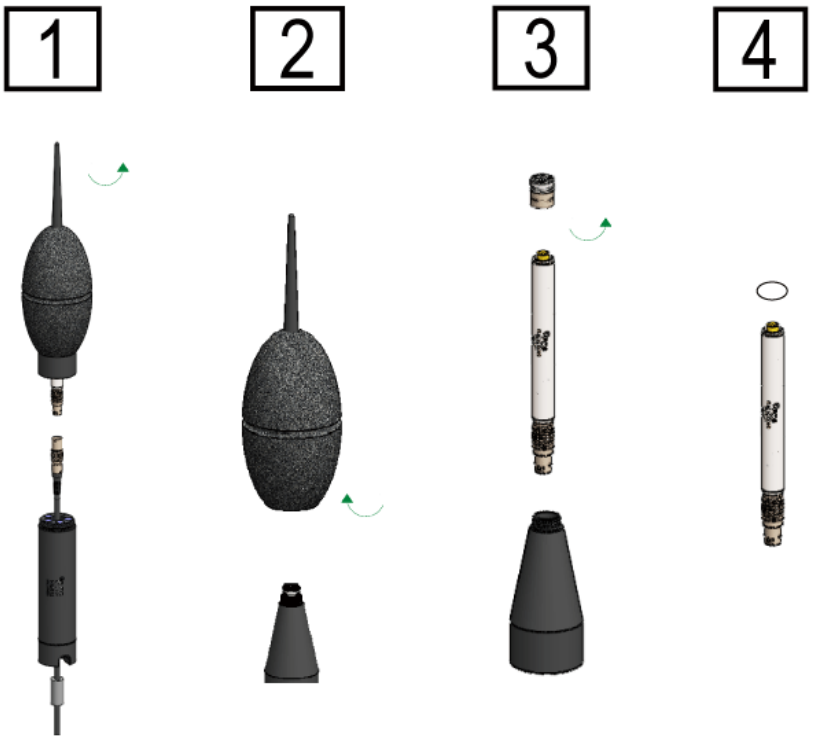


FIGURE 3-4 Replacing Preamplifier O-rings

To replace O-ring on a ½ inch microphone preamp, follow these steps:

The microphone top of the EPS2116 has a built-in O-ring located inside, this will not need to be installed or replaced.

Step 1 Remove the base first to unplug the preamp.

Step 2 Unscrew the top and birdspike.

Step 3 Separate the preamp from top, then, unscrew microphone from preamp.

Step 4 If needed, remove old O-ring from preamp using your fingernail or needle. Discard properly. Stretch replacement O-ring over the threads of the top of the preamp until it rests snuggly under the bottom thread.

Reassemble equipment using the assembly instructions or by reversing disassembly process in FIGURE 3-4.

APPENDIX

A Technical Specifications

Values specified are typical unless tolerances are provided.

Standards Met by EPS2116

Sound Level Meter Standards

When used with the Larson Davis Model 831 or LxT versions, the EPS2116 can be used as part of a Class 1 or 2 measurement system, according to IEC 61672-1:2013 and ANSI S1.4-2014, when the appropriate microphone correction is used.

Safety Requirements

Compliance	Standard
All	IEC 61010-1 (2010): Safety requirements for electrical equipment for measurement, control, and laboratory use
IP 55	IEC 60529 (2001): Degrees of Protection Provided by Enclosures
NEMA 4	NEMA 250 (2008): Enclosures for Electrical Equipment
2002/95/EC (RoHS 1)	RoHS: The Restriction of Hazardous Substances Directive

Included Accessories

Parts	Quantity	Accessories
WS011	2	Windscreen for EPS2116
M2116.01	1	Camera/instrument tripod adaptor
ADP103	1	EPS2116 to TRP003 adaptor
I2116.01	1	CD with instruction manual

Optional Accessories

Parts	Accessories
TRP001	Camera/instrument tripod
TRP003	Tripod, maximum height 8 feet, for use with portable noise monitoring systems and ADP034
TRP019	Permanent, tilt-down pole use with ADP100
TRP020	Semi-permanent tripod use with ADP100
DSC003	20 desiccant cartridges*
ADP100	Adaptor connecting EPS2116 to TRP019 or TRP020. Connects 3/4"-14 NPSM (ISO 228-G 3/4) to 1 1/2" BSPF (ISO 228-G 1.5).
CAL200	Class 1 acoustic calibrator for 1/2" microphones

**Desiccant cartridges contain 0.05% cobalt chloride and are suitable for use in Europe.*

Physical Specifications

Dimensions	
Windscreen/birdspikes	Height 24.0 cm (9.5”) ; O.D. 7 cm (3.0”)
Total Height	42.55 cm (16.75”)
Desiccant Chamber	Height 8.3 cm (3.3”); O.D. 4.2 cm (1.6"); I.D. 1.5 cm (0.6”)
Mounting	3/4” standard solid wall PVC conduit thread (female)
Weight	
Windscreen/birdspikes	32 g (1.1 oz.)
Body	176 g (6.2 oz.)
Desiccant cartridges (10)	20 g (0.70 oz.)
Total	340 g (12.0 oz.)

Caution: Although non-toxic, the desiccant cartridges are not edible. Keep away from children and pets.

EPS2116 Dimensions

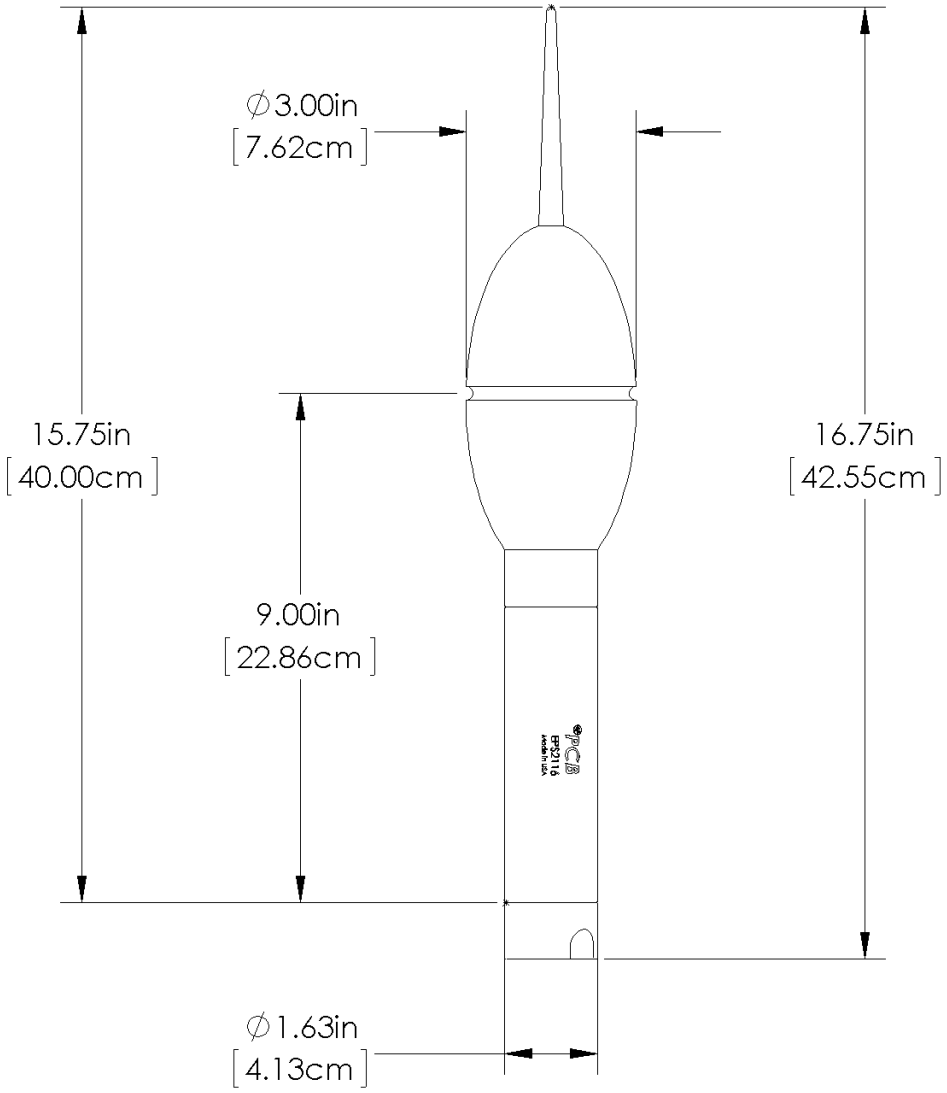
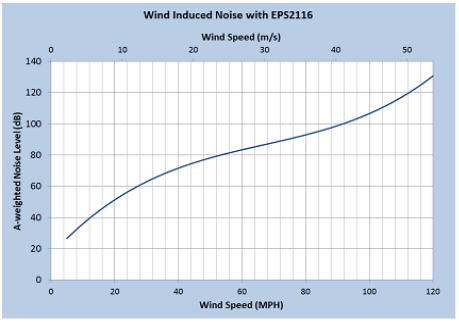


FIGURE A-1 EPS2116 Dimensions

Wind-induced Noise

The following tables show data for the self-generated noise created by the EPS2116 due to wind.

MPH	m/s	A-weighted Level (dB)
5	2.2352	26.721245
10	4.4704	36.030425
15	6.7056	44.211405
20	8.9408	51.363185
25	11.176	57.584765
30	13.4112	62.975145
35	15.6464	67.633325
40	17.8816	71.658305
45	20.1168	75.149085
50	22.352	78.204665
55	24.5872	80.924045
60	26.8224	83.406225
65	29.0576	85.750205
70	31.2928	88.054985
75	33.528	90.419565
80	35.7632	92.942945
85	37.9984	95.724125
90	40.2336	98.862105
95	42.4688	102.455885
100	44.704	106.604465
105	46.9392	111.406845
110	49.1744	116.962025
115	51.4096	123.369005
120	53.6448	130.726785

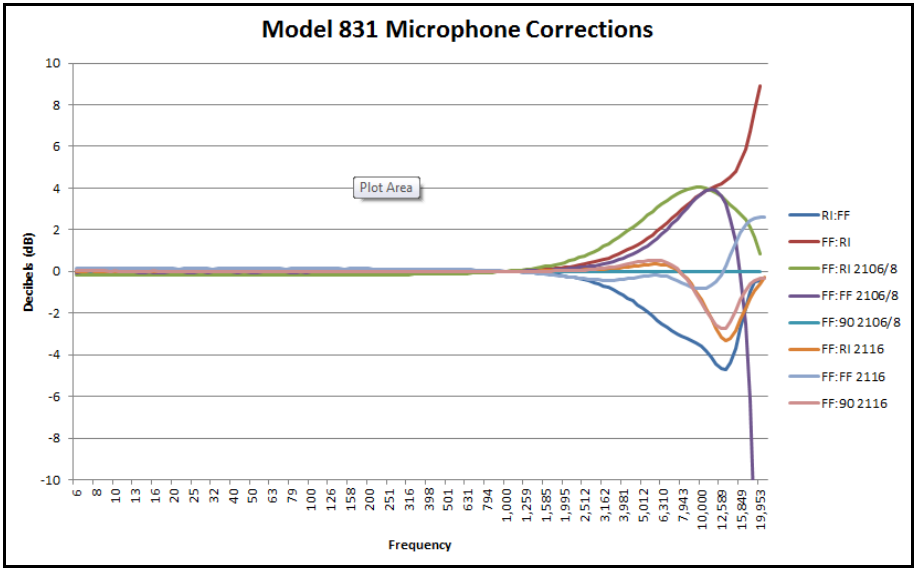


Wind Speed [m/s]	A-wt Noise [dB]
8.9	51.2
30	86.7
50	119.2

km/h	A-wt Noise
100	84.4

EPS2116 Corrections

The following graph and table display corrections for the effects of the microphone and EPS2116 that are available with the Larson Davis Model 831 and LxT sound level meters.



Model 831 Microphone Corrections (Sheet 1 of 2)

Frequency	FF:RI 2106/8	FF:FF 2106/8	FF:90 2106/8	RI:FF	FF:RI	FF:FF 2116	FF:RI 2116	FF:90 2116
63.10	-0.16	-0.03	-0.00	0.07	-0.06	0.13	-0.03	-0.01
79.43	-0.16	-0.04	-0.01	0.06	-0.07	0.12	-0.03	-0.00
100.00	-0.16	-0.04	-0.00	0.07	-0.07	0.13	-0.02	-0.00
125.89	-0.16	-0.03	-0.00	0.07	-0.06	0.13	-0.02	0.00
158.49	-0.16	-0.03	0.00	0.07	-0.07	0.12	-0.02	-0.01
199.53	-0.16	-0.04	-0.00	0.07	-0.07	0.12	-0.02	-0.00
251.19	-0.15	-0.03	-0.00	0.07	-0.06	0.12	-0.02	-0.00
316.23	-0.15	-0.03	-0.00	0.07	-0.06	0.12	-0.02	-0.00
398.11	-0.13	-0.03	0.00	0.07	-0.05	0.11	-0.01	-0.00
501.19	-0.12	-0.03	0.00	0.06	-0.05	0.10	-0.01	-0.00
630.96	-0.10	-0.02	-0.00	0.04	-0.04	0.07	-0.01	-0.00
794.33	-0.06	-0.01	0.00	0.03	-0.02	0.04	-0.01	-0.00
1000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1059.25	0.02	0.00	-0.00	-0.01	0.01	-0.01	0.00	0.00
1122.02	0.04	0.01	-0.00	-0.02	0.02	-0.03	0.00	0.00
1188.50	0.06	0.02	-0.00	-0.03	0.03	-0.05	0.01	0.00
1258.93	0.09	0.02	-0.00	-0.04	0.04	-0.07	0.01	0.00
1333.52	0.12	0.03	0.00	-0.06	0.05	-0.09	0.01	0.01
1412.54	0.15	0.04	-0.00	-0.07	0.07	-0.11	0.02	0.01
1496.24	0.19	0.05	-0.00	-0.09	0.08	-0.13	0.02	0.01
1584.89	0.23	0.06	-0.00	-0.11	0.10	-0.15	0.03	0.01
1678.80	0.28	0.07	0.00	-0.14	0.12	-0.18	0.03	0.02
1778.28	0.33	0.08	-0.00	-0.16	0.14	-0.21	0.04	0.02
1883.65	0.38	0.10	-0.00	-0.19	0.17	-0.24	0.04	0.03
1995.26	0.44	0.11	-0.00	-0.23	0.20	-0.26	0.05	0.03
2113.49	0.51	0.13	-0.00	-0.26	0.23	-0.29	0.06	0.04
2238.72	0.58	0.15	-0.00	-0.30	0.26	-0.32	0.06	0.06
2371.37	0.67	0.18	0.00	-0.35	0.30	-0.35	0.07	0.07
2511.89	0.75	0.21	-0.00	-0.40	0.34	-0.37	0.08	0.08
2660.73	0.85	0.24	-0.00	-0.46	0.39	-0.39	0.09	0.10
2818.38	0.96	0.28	0.00	-0.53	0.45	-0.41	0.11	0.13

(Continued)Model 831 Microphone Corrections (Sheet 2 of 2)

Frequency	FF:RI 2106/8	FF:FF 2106/8	FF:90 2106/8	RI:FF	FF:RI	FF:FF 2116	FF:RI 2116	FF:90 2116
2985.38	1.07	0.32	0.00	-0.60	0.51	-0.42	0.12	0.15
3162.28	1.19	0.37	-0.00	-0.69	0.58	-0.42	0.14	0.18
3349.65	1.33	0.42	0.00	-0.78	0.65	-0.42	0.16	0.22
3548.13	1.47	0.48	-0.00	-0.89	0.73	-0.40	0.18	0.26
3758.37	1.62	0.55	-0.00	-1.00	0.83	-0.38	0.20	0.31
3981.07	1.78	0.64	0.00	-1.13	0.93	-0.35	0.23	0.35
4216.97	1.95	0.73	-0.00	-1.27	1.04	-0.31	0.25	0.40
4466.84	2.13	0.83	0.00	-1.42	1.16	-0.27	0.28	0.45
4731.51	2.31	0.95	0.00	-1.59	1.29	-0.23	0.31	0.49
5011.87	2.50	1.09	0.00	-1.77	1.44	-0.20	0.33	0.53
5308.84	2.69	1.24	0.00	-1.95	1.60	-0.18	0.35	0.55
5623.41	2.88	1.41	0.00	-2.14	1.77	-0.18	0.35	0.54
5956.62	3.07	1.60	0.00	-2.34	1.95	-0.20	0.33	0.50
6309.57	3.25	1.80	0.00	-2.53	2.14	-0.25	0.28	0.43
6683.44	3.43	2.03	0.00	-2.70	2.34	-0.33	0.20	0.31
7079.46	3.59	2.27	0.00	-2.86	2.54	-0.44	0.07	0.13
7498.94	3.73	2.52	0.00	-3.00	2.76	-0.55	-0.11	-0.10
7943.28	3.86	2.78	0.00	-3.12	2.97	-0.67	-0.34	-0.39
8413.95	3.95	3.05	0.00	-3.22	3.18	-0.77	-0.62	-0.72
8912.51	4.02	3.30	0.00	-3.32	3.38	-0.82	-0.96	-1.09
9440.61	4.05	3.53	0.00	-3.44	3.56	-0.83	-1.35	-1.49
10000.00	4.04	3.73	0.00	-3.60	3.73	-0.79	-1.79	-1.89
10592.54	3.99	3.87	0.00	-3.82	3.88	-0.68	-2.27	-2.27
11220.18	3.90	3.92	0.00	-4.10	4.01	-0.49	-2.75	-2.58
11885.02	3.78	3.86	0.00	-4.42	4.13	-0.19	-3.14	-2.76
12589.25	3.61	3.65	0.00	-4.68	4.23	0.24	-3.34	-2.71
13335.21	3.43	3.22	0.00	-4.74	4.36	0.78	-3.23	-2.41
14125.38	3.22	2.52	0.00	-4.42	4.54	1.35	-2.83	-1.91
14962.36	2.99	1.44	0.00	-3.70	4.82	1.86	-2.28	-1.36
15848.93	2.76	-0.16	0.00	-2.73	5.25	2.22	-1.75	-0.91

Acoustical Response

The following graphs present directional responses for the EPS2116, including any effects of the windscreen. Data is presented both in graphs with corrections and in graphs without corrections. Graphs displaying corrections correspond to responses when the EPS2116 is used with the Model 831 and the LxT versions and a Larson Davis 377B02 microphone. Graphs displaying data without corrections correspond to responses when using other equipment with the EPS2116.

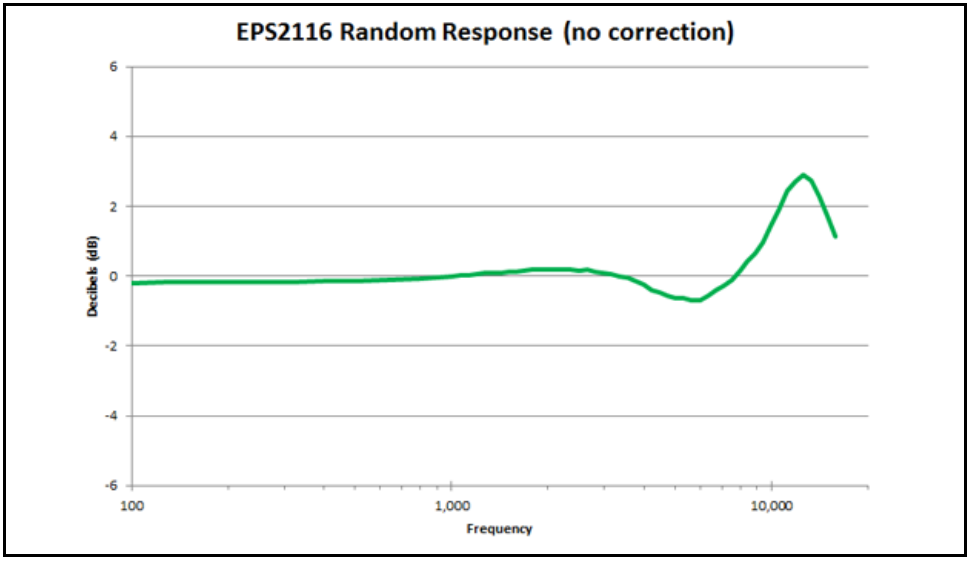
The correction filter applied through the Model 831 or LxT versions is indicated in parentheses, e.g. (FF:FF 2116).

Reference Direction

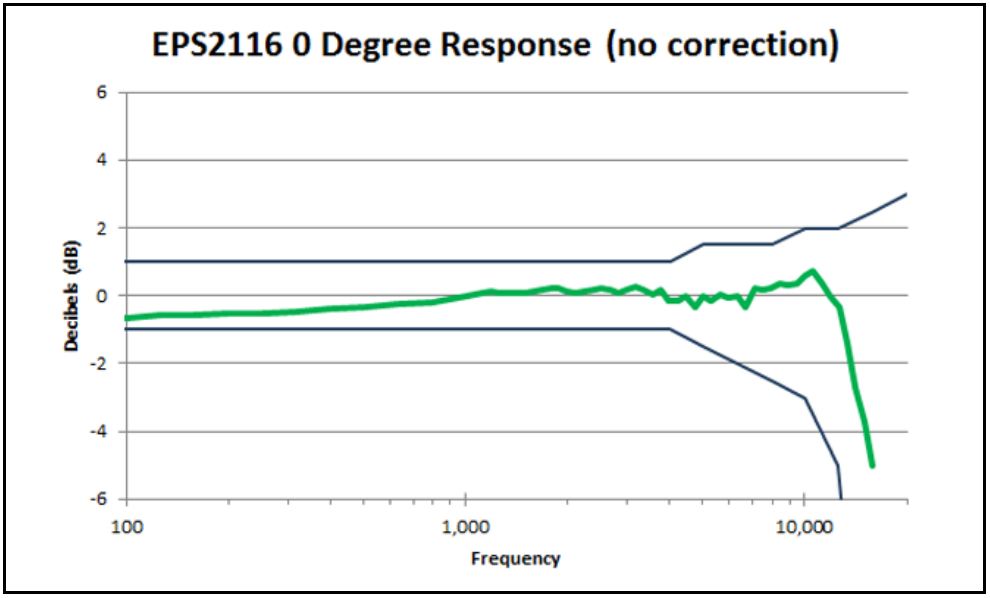
0° is perpendicular to plane of microphone diagram, as shown below:

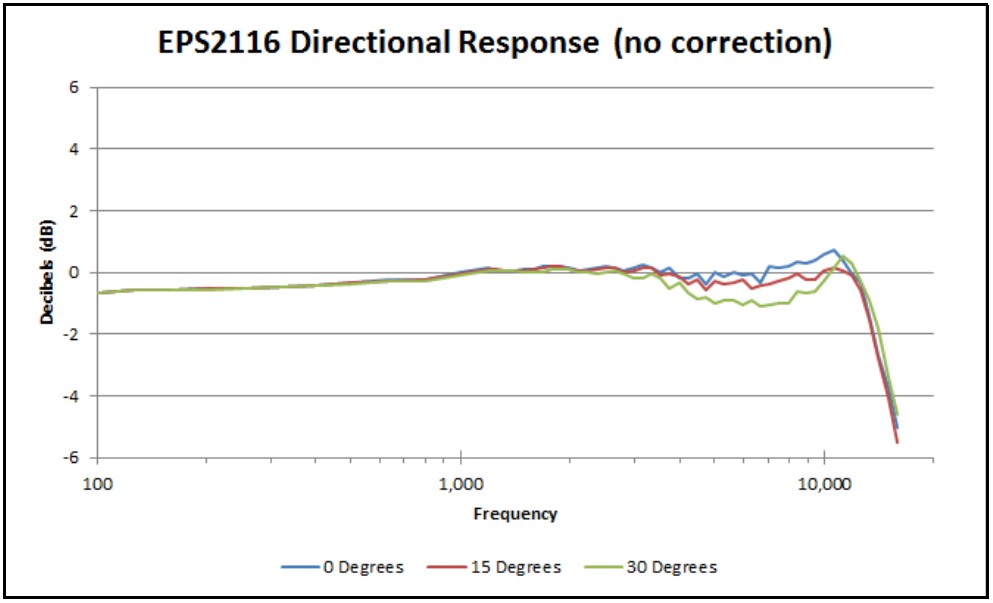
EPS2116 Effects without Correction

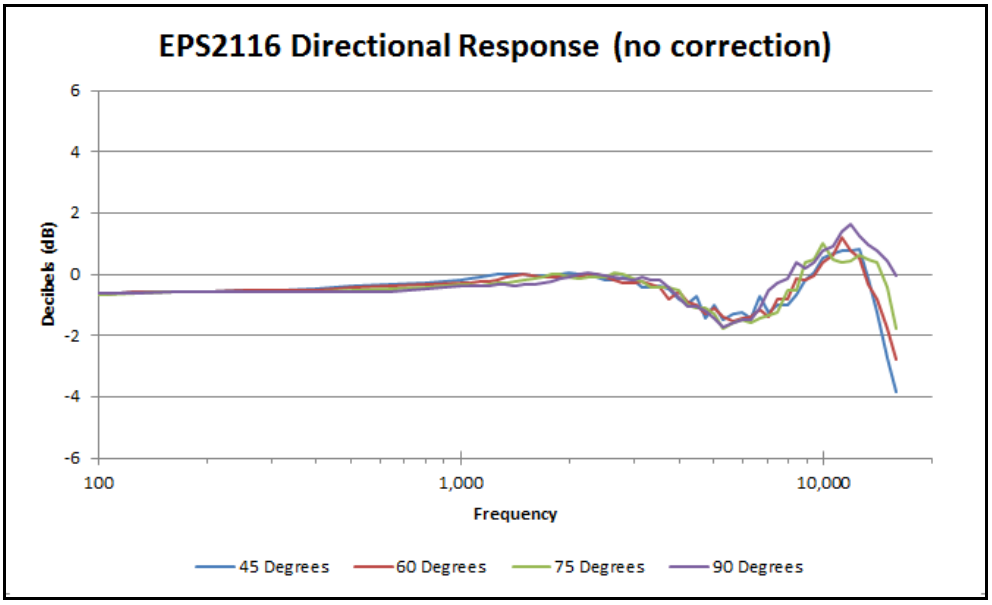
The data in the following graph was taken by computing the difference between the random response of the microphone by itself and the random response of the same microphone in an EPS2116.

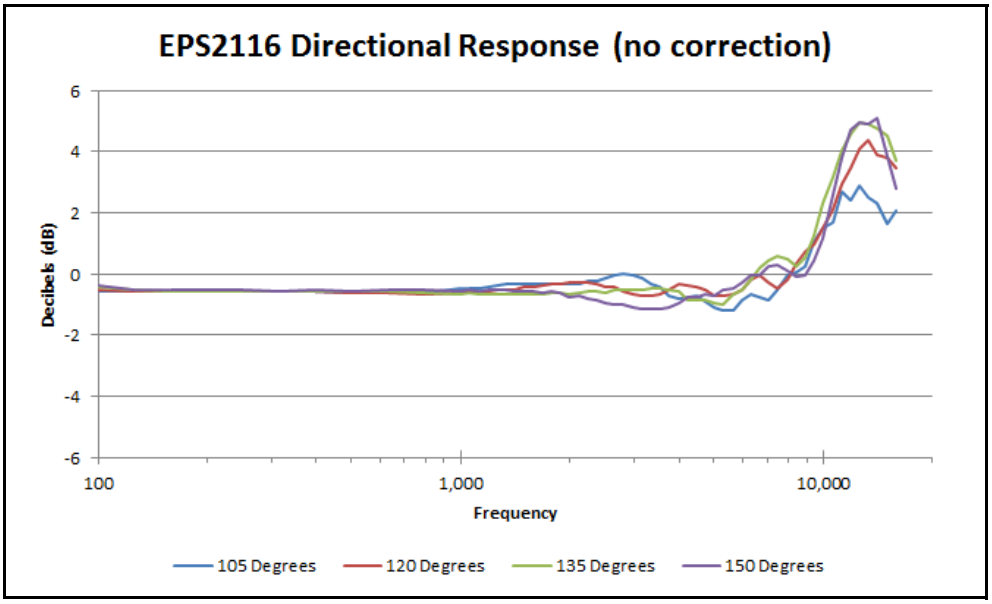


The data below shows the effects of the EPS2116 on a free-field measurement.



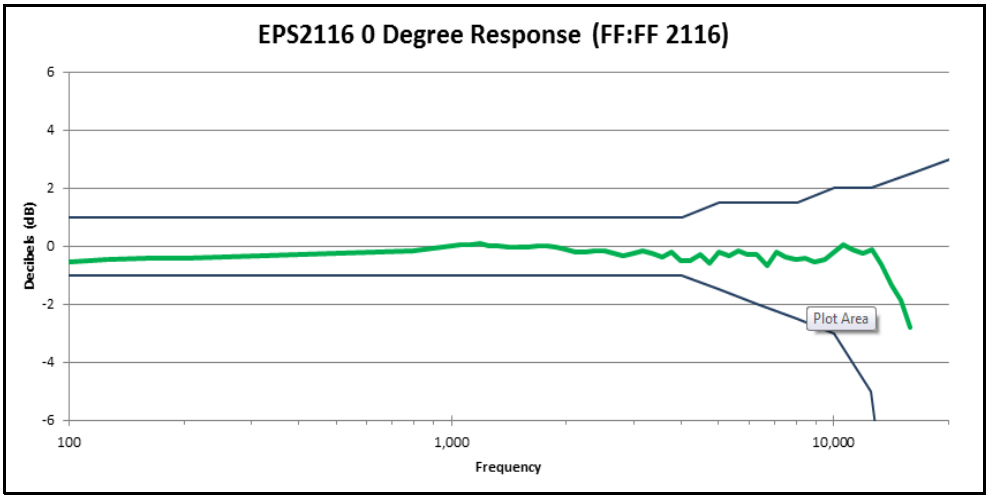


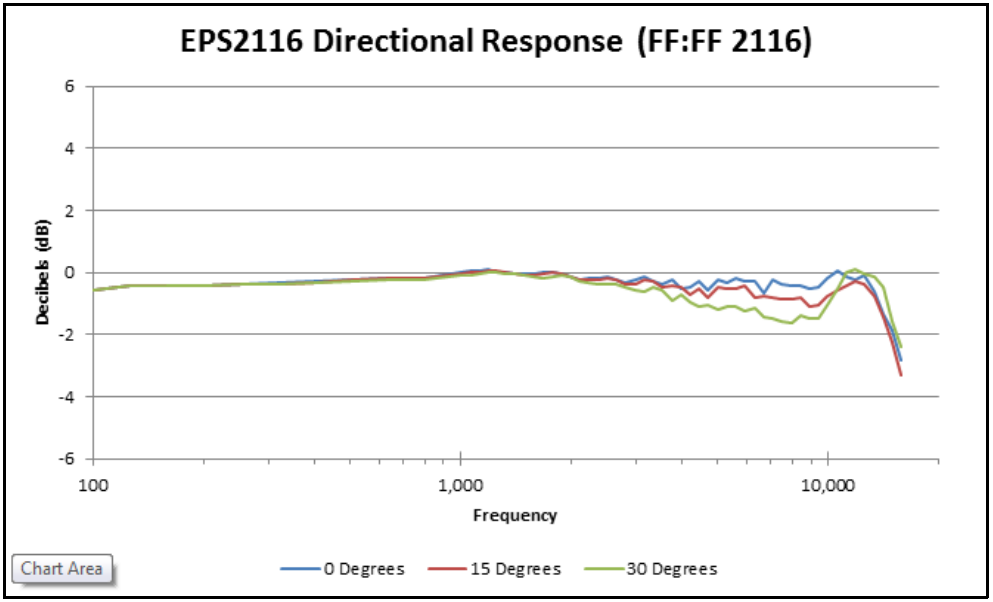

EPS2116 Directional Response (no correction)
6
4
2
0
-2
-4
-6
Decibels (dB)
100
1,000
10,000
Frequency
45 Degrees
60 Degrees
75 Degrees
90 Degrees

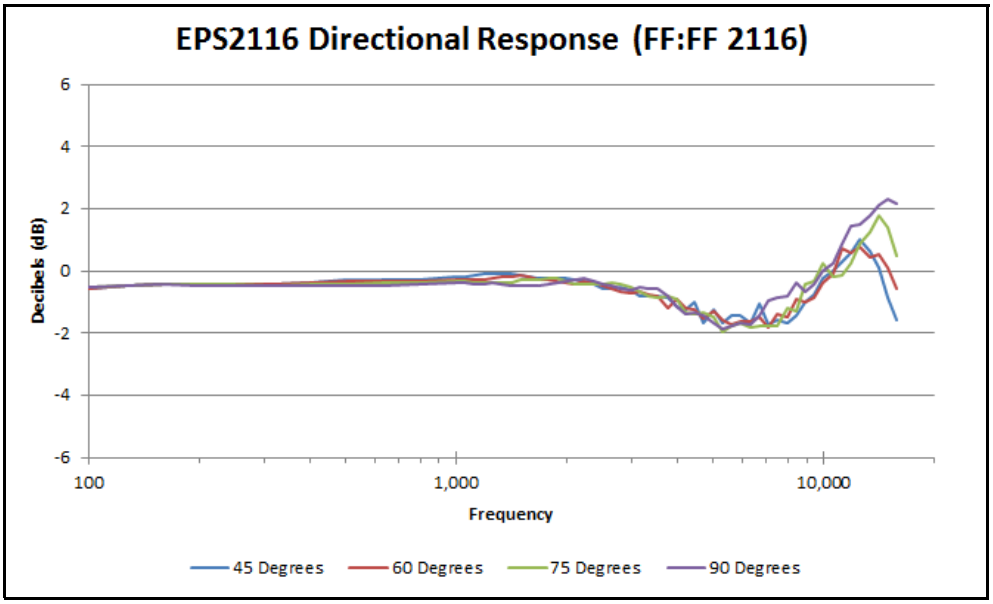

EPS2116 Directional Response (no correction)
6
4
2
0
-2
-4
-6
Decibels (dB)
100
1,000
10,000
Frequency
105 Degrees
120 Degrees
135 Degrees
150 Degrees

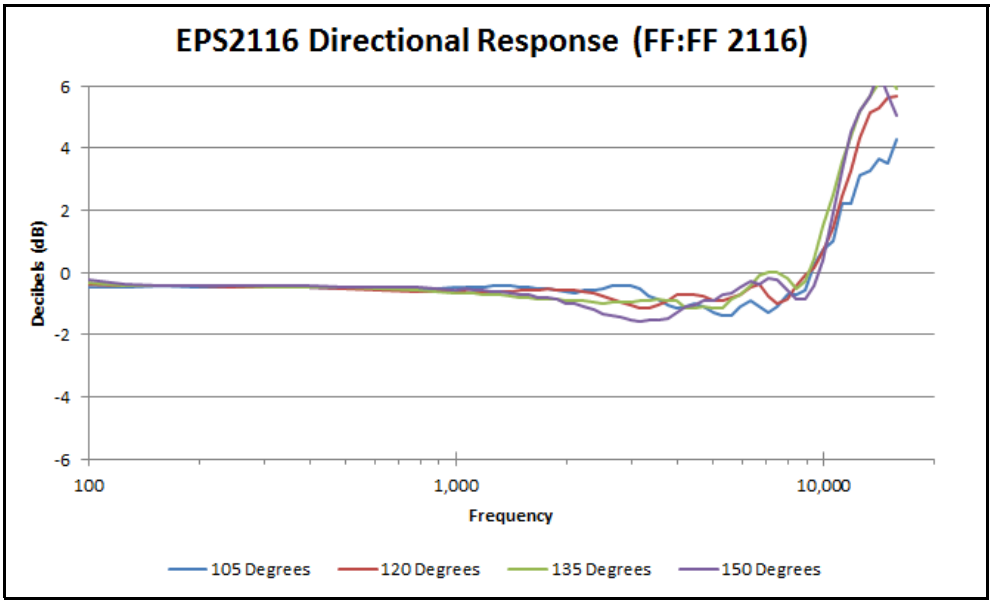
EPS2116 Responses with Free-Field (0°) Correction

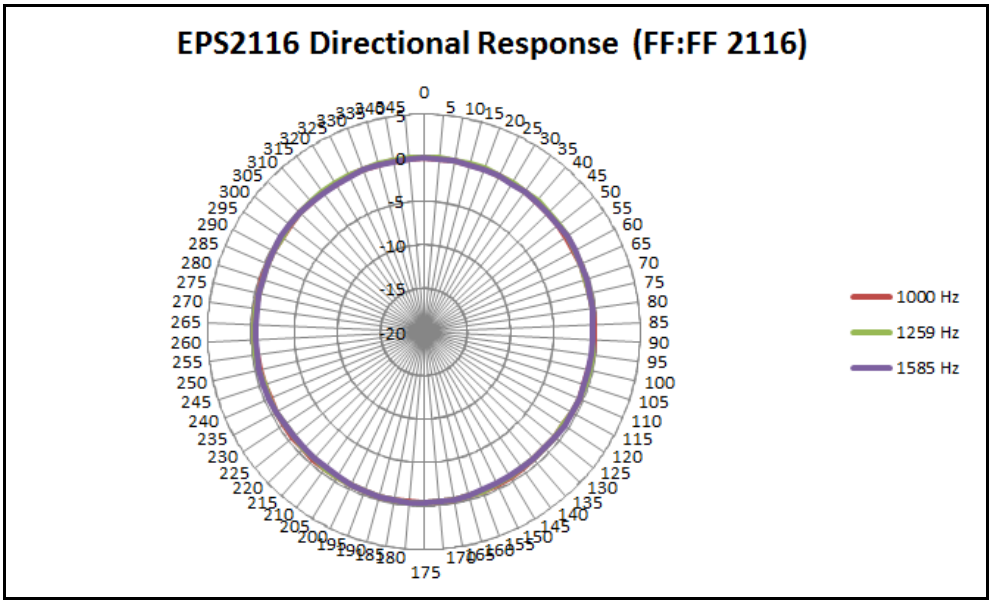
The following graphs show EPS2116 responses when using a Model 831 or LxT sound level meter with the 0° free field (FF:FF 2116) microphone correction.

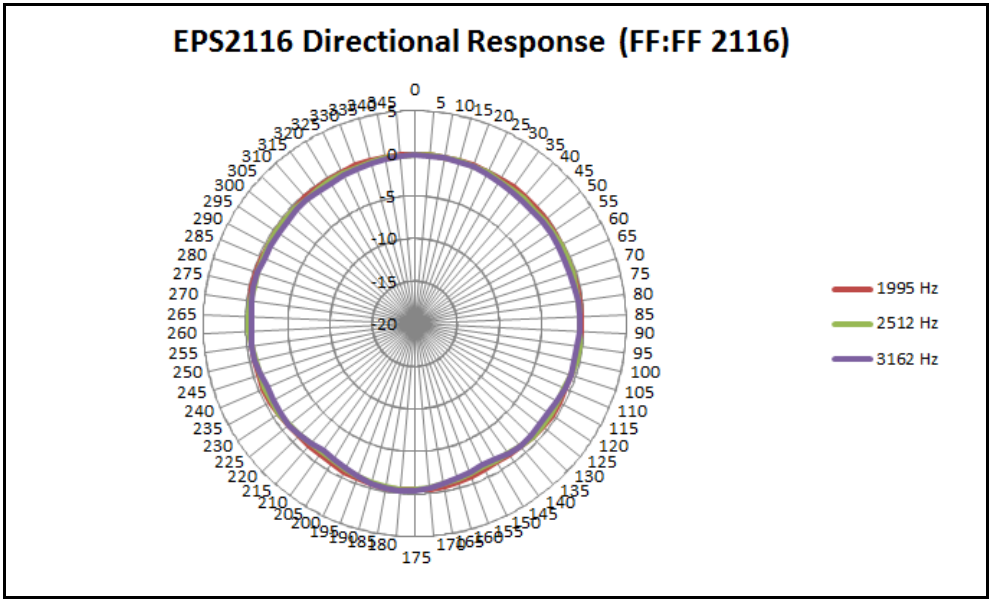


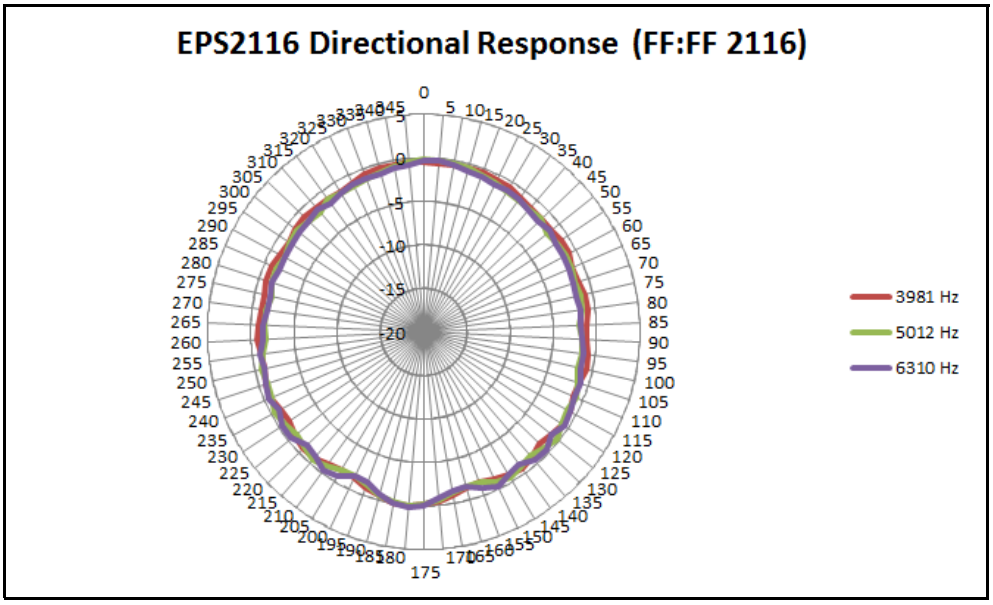


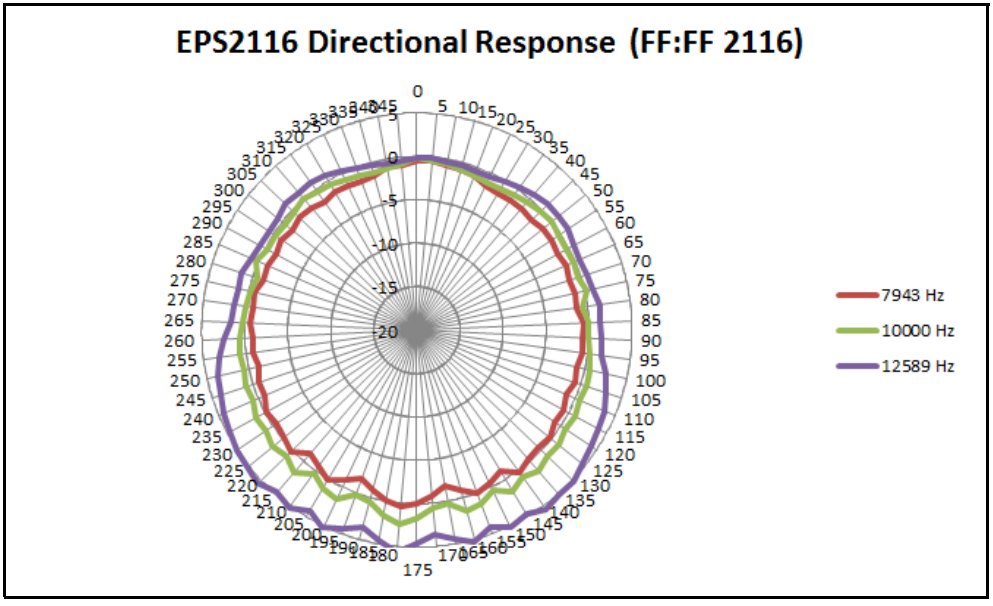

EPS2116 Directional Response (FF:FF 2116)
Decibels (dB)
6
4
2
0
-2
-4
-6
100
1,000
10,000
Frequency
45 Degrees
60 Degrees
75 Degrees
90 Degrees

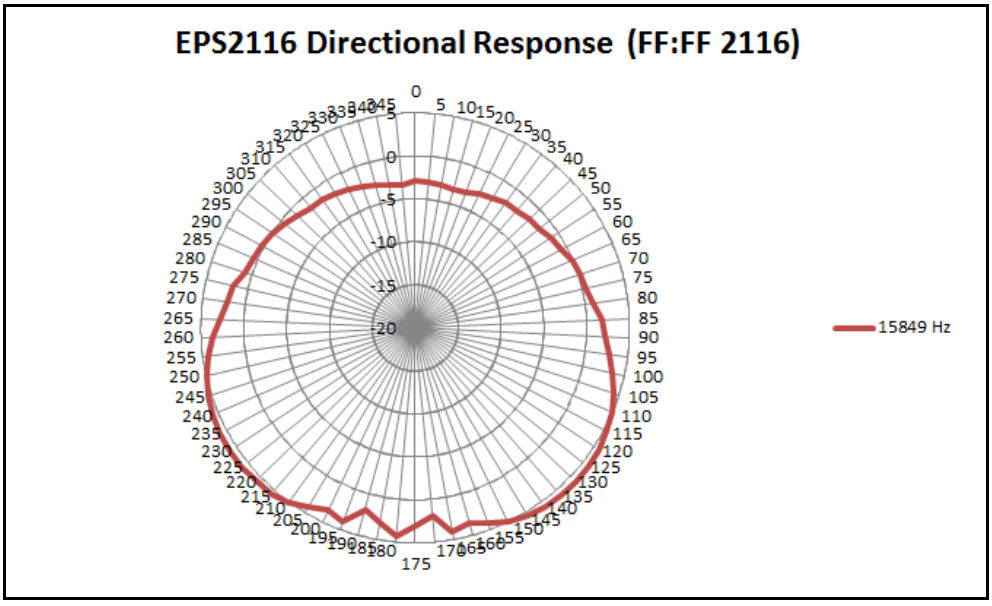

EPS2116 Directional Response (FF:FF 2116)
Decibels (dB)
6
4
2
0
-2
-4
-6
100
1,000
10,000
Frequency
105 Degrees
120 Degrees
135 Degrees
150 Degrees


EPS2116 Directional Response (FF:FF 2116)
1000 Hz
1259 Hz
1585 Hz


EPS2116 Directional Response (FF:FF 2116)
1995 Hz
2512 Hz
3162 Hz

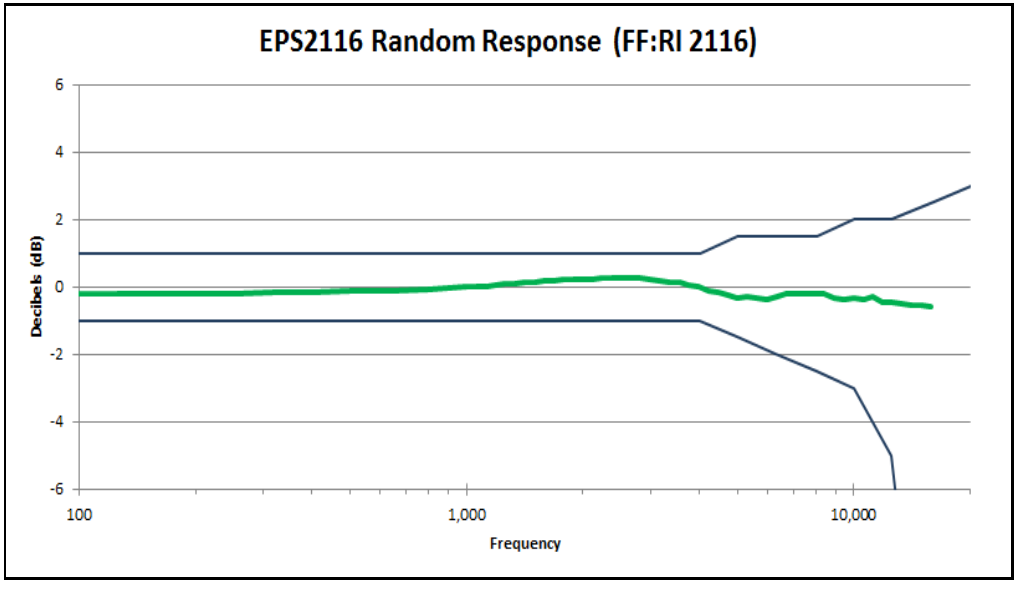

EPS2116 Directional Response (FF:FF 2116)
3981 Hz
5012 Hz
6310 Hz

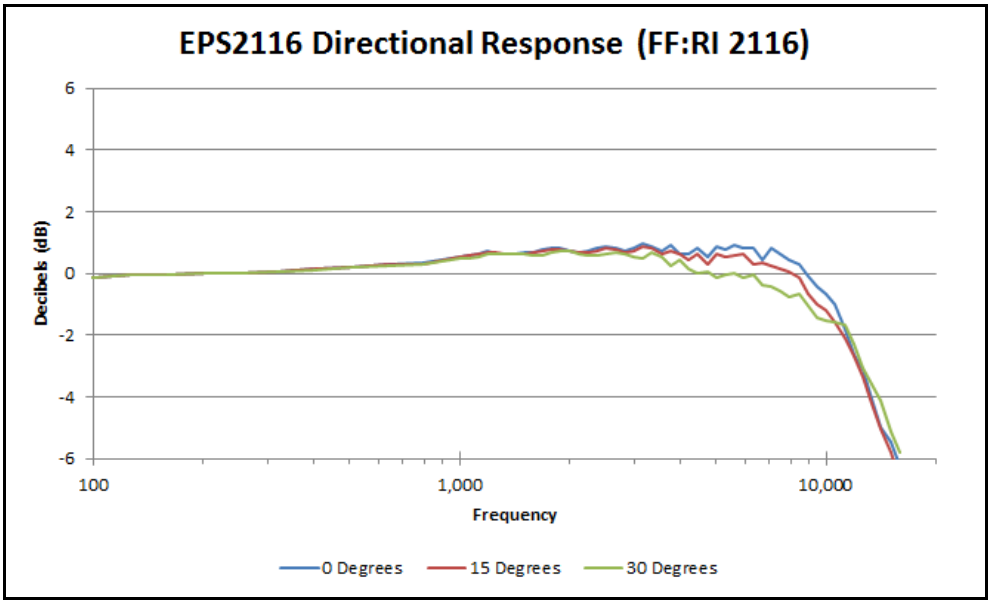

EPS2116 Directional Response (FF:FF 2116)
7943 Hz
10000 Hz
12589 Hz

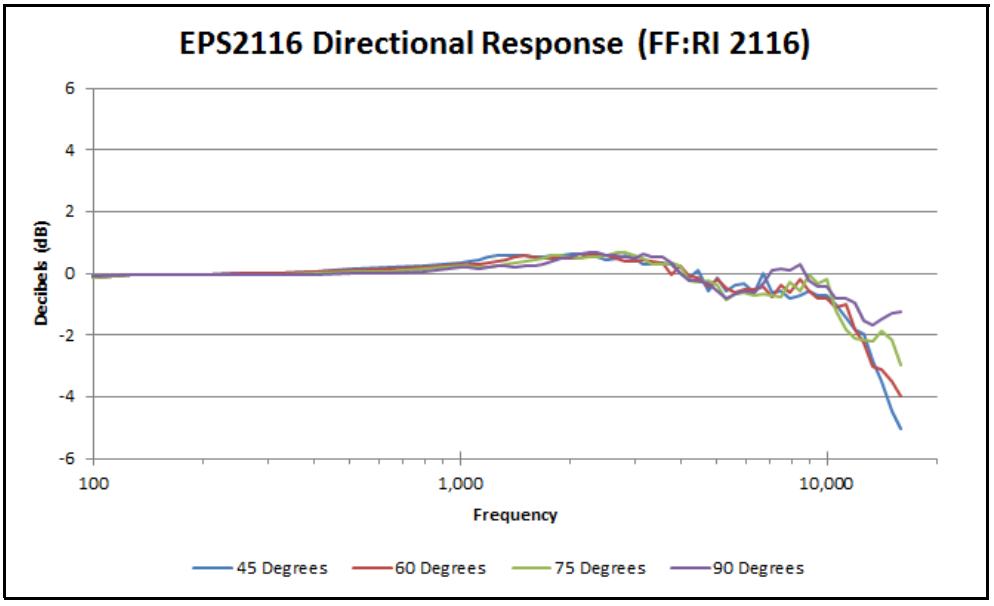


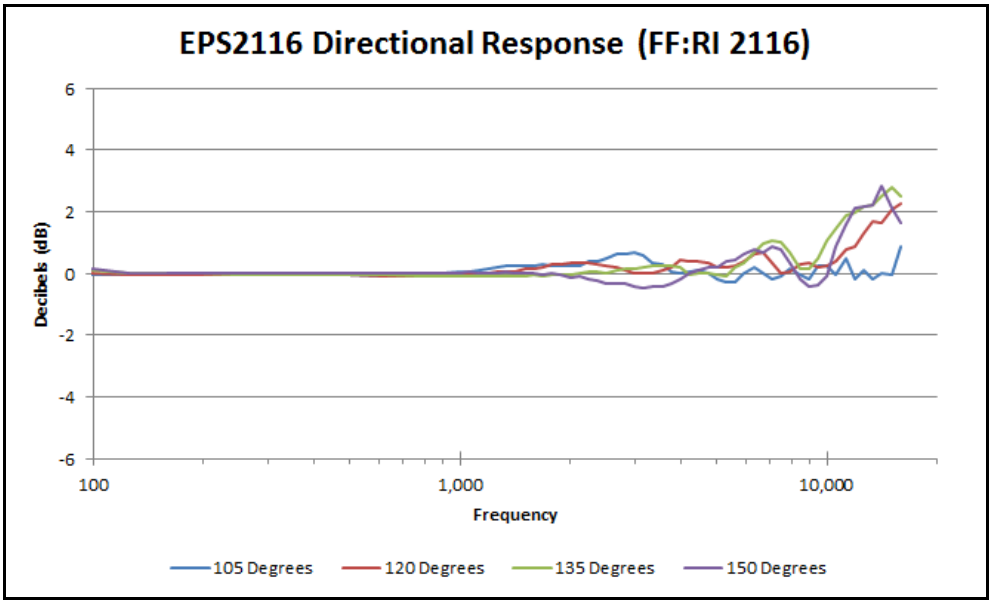
EPS2116 Responses with Random Response (diffuse) Correction

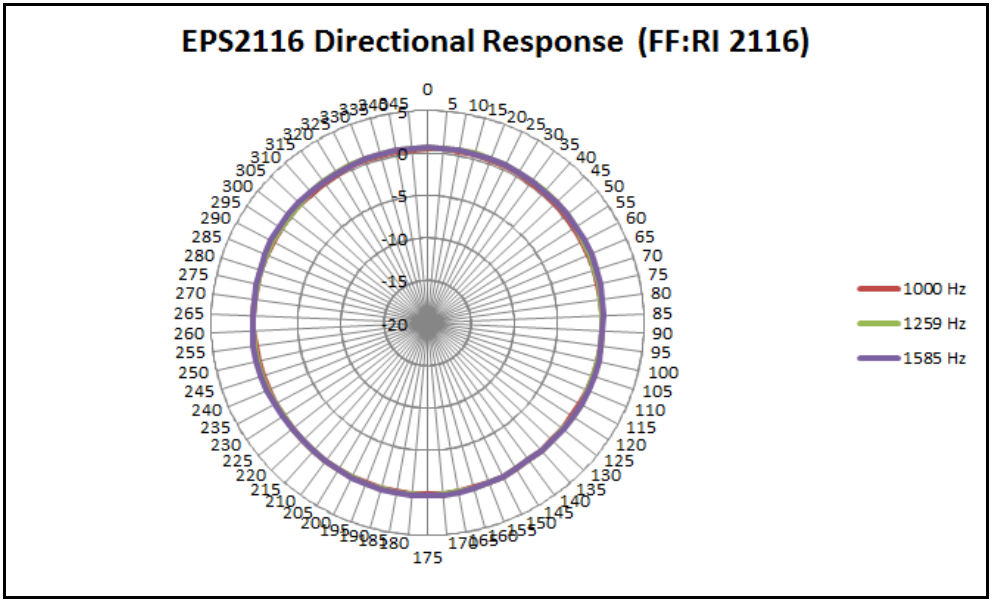
The following graphs show EPS2116 responses when using a Model 831 or LxT sound level meter with the random response, or diffuse, (FF:RI 2116) microphone correction.

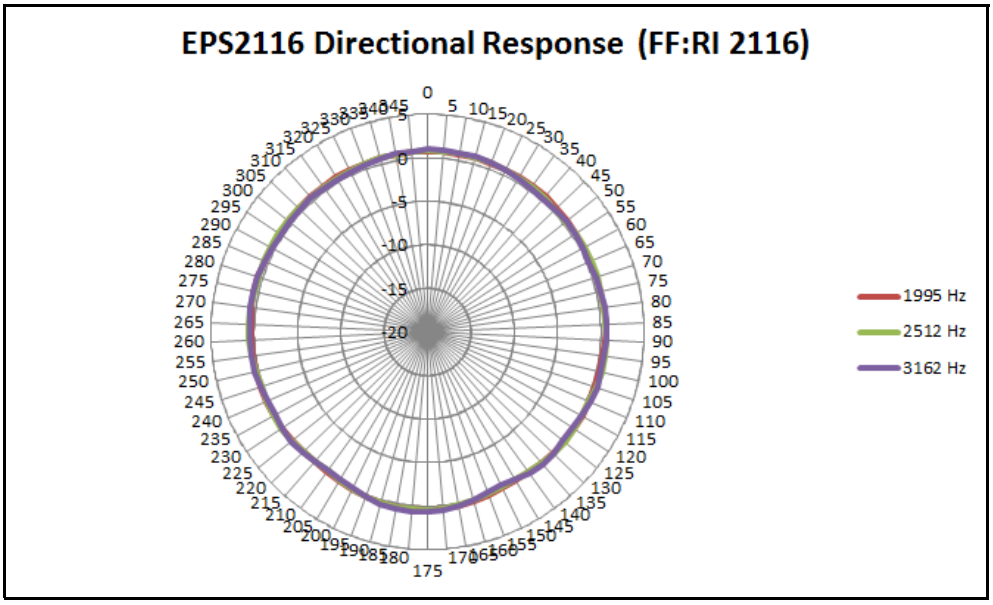


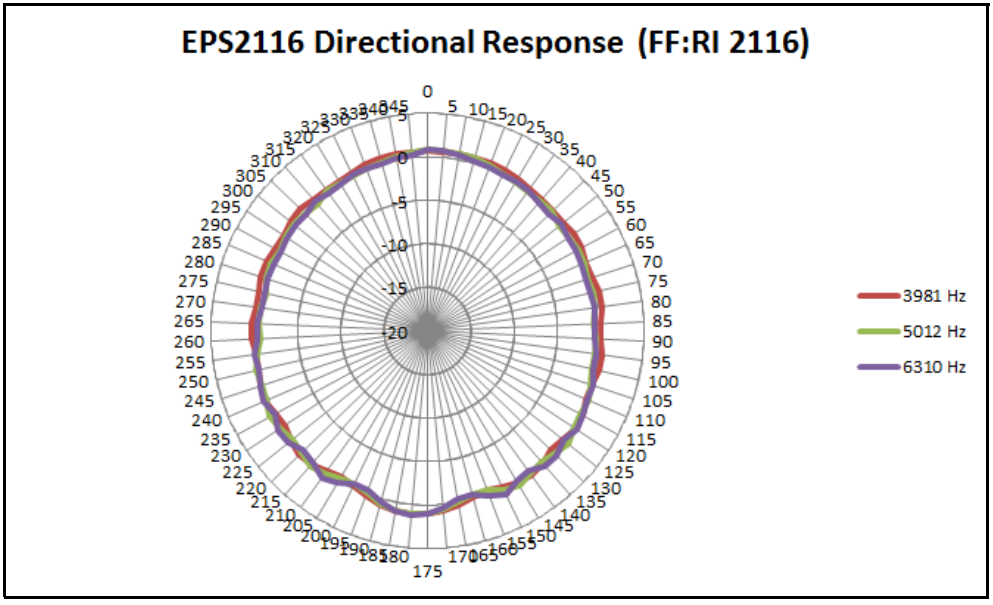

EPS2116 Directional Response (FF:RI 2116)
6
4
2
0
-2
-4
-6
Decibels (dB)
100
1,000
10,000
Frequency
0 Degrees
15 Degrees
30 Degrees

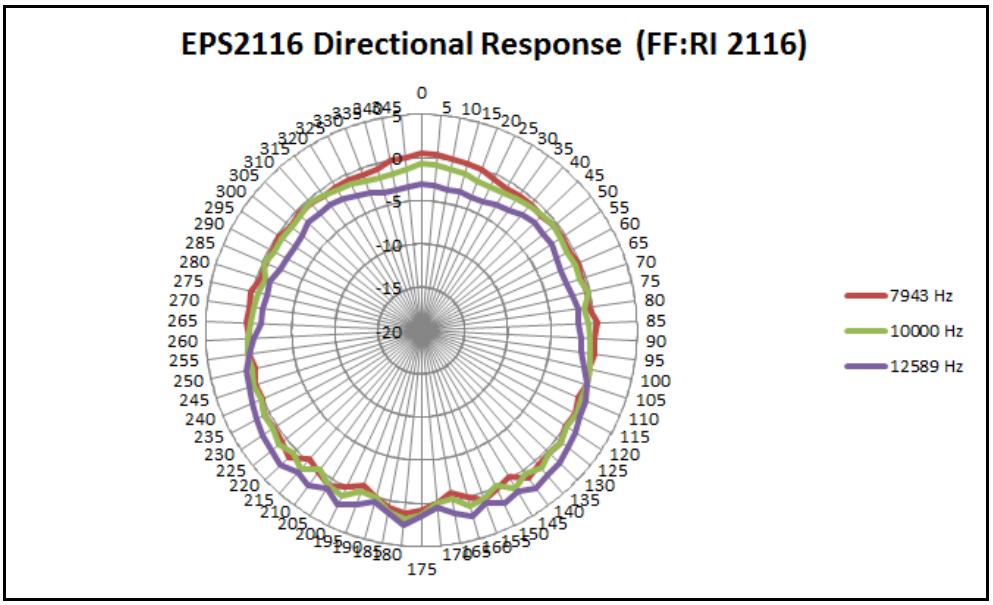

EPS2116 Directional Response (FF:RI 2116)
6
4
2
0
-2
-4
-6
Decibels (dB)
100
1,000
10,000
Frequency
45 Degrees
60 Degrees
75 Degrees
90 Degrees

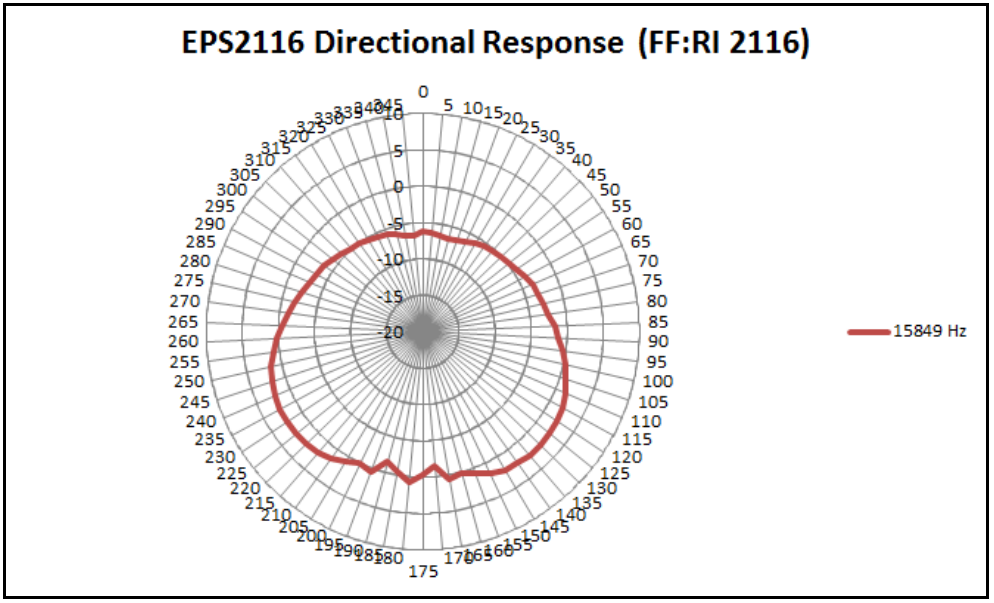

EPS2116 Directional Response (FF:RI 2116)
Decibels (dB)
6
4
2
0
-2
-4
-6
100
1,000
10,000
Frequency
105 Degrees
120 Degrees
135 Degrees
150 Degrees


EPS2116 Directional Response (FF:RI 2116)
1000 Hz
1259 Hz
1585 Hz


EPS2116 Directional Response (FF:RI 2116)
1995 Hz
2512 Hz
3162 Hz

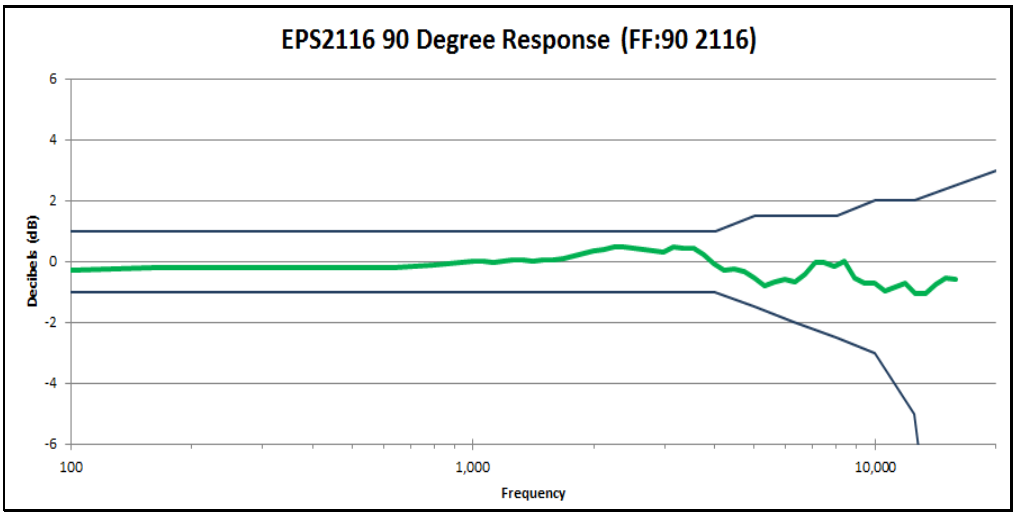

EPS2116 Directional Response (FF:RI 2116)
3981 Hz
5012 Hz
6310 Hz

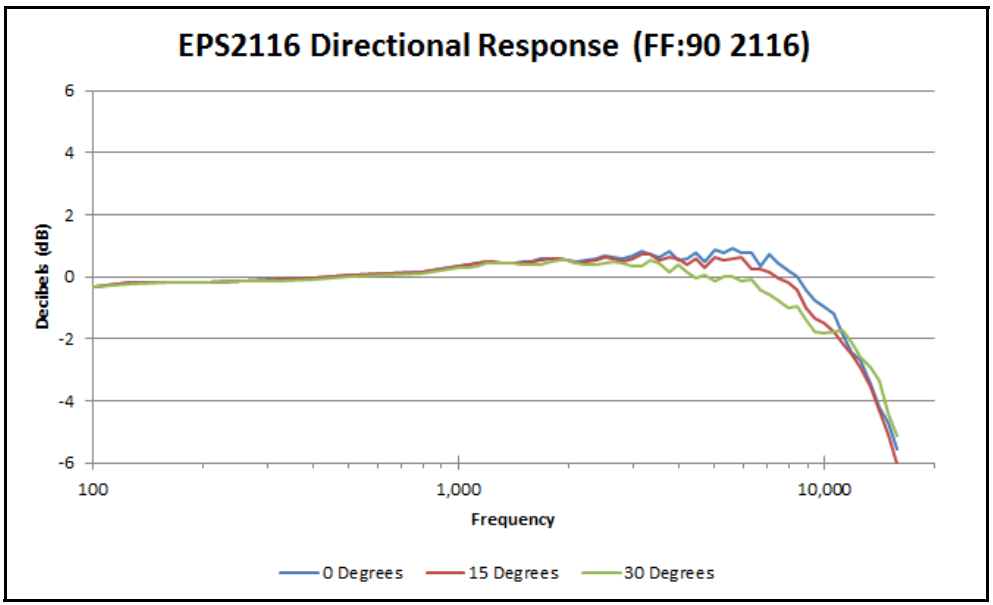

EPS2116 Directional Response (FF:RI 2116)
7943 Hz
10000 Hz
12589 Hz

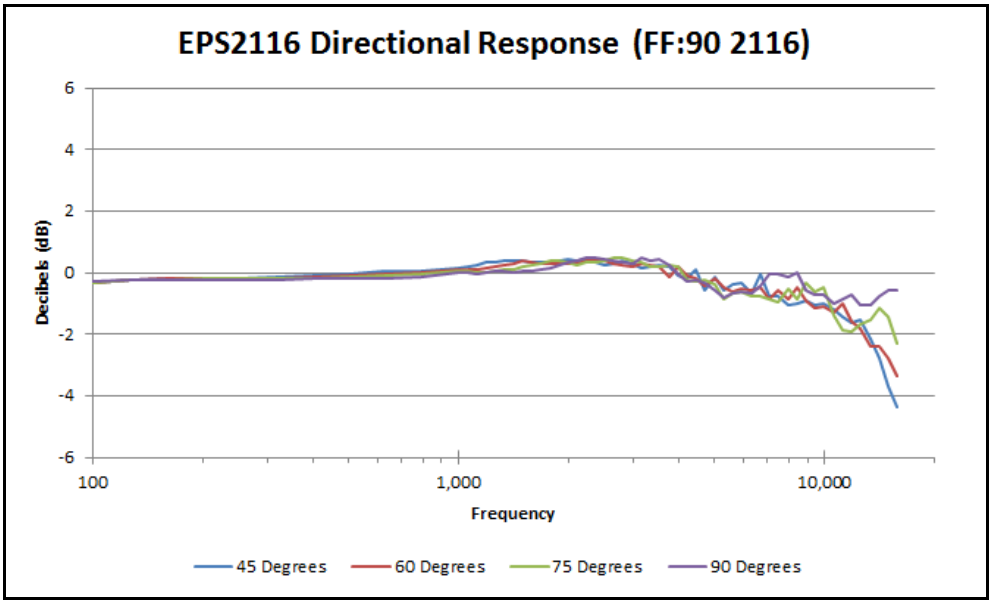

EPS2116 Directional Response (FF:RI 2116)
15849 Hz

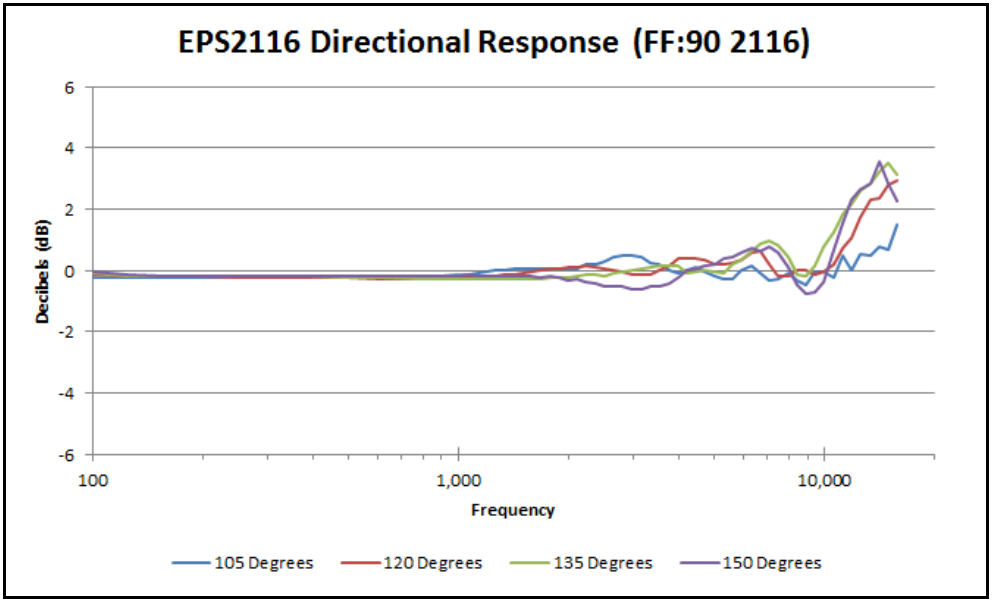
EPS2116 Responses with 90° Correction

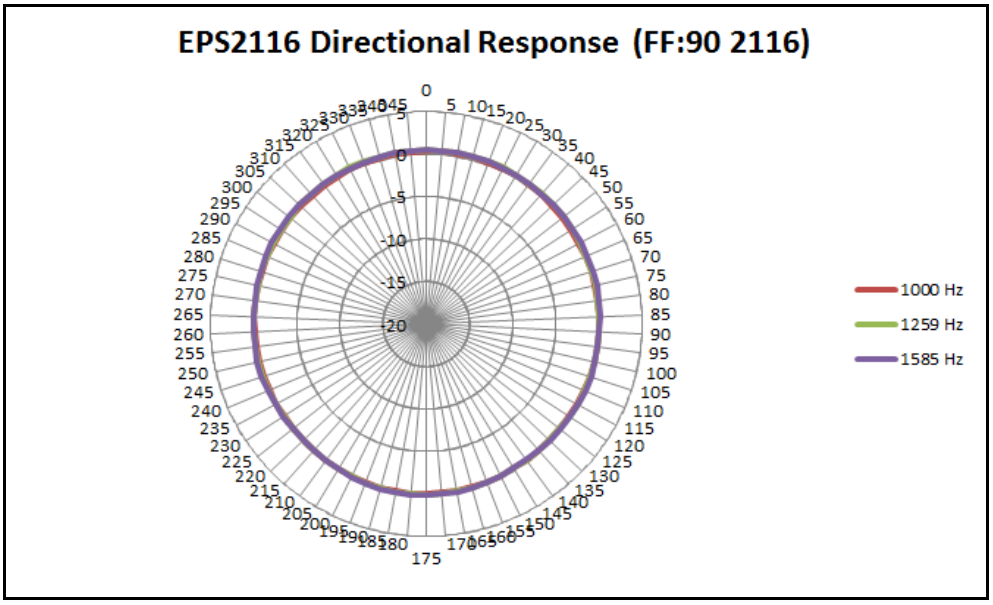
The following graphs show EPS2116 responses when using a Model 831 or LxT sound level meter with the 90° (FF:90 2116) microphone correction.

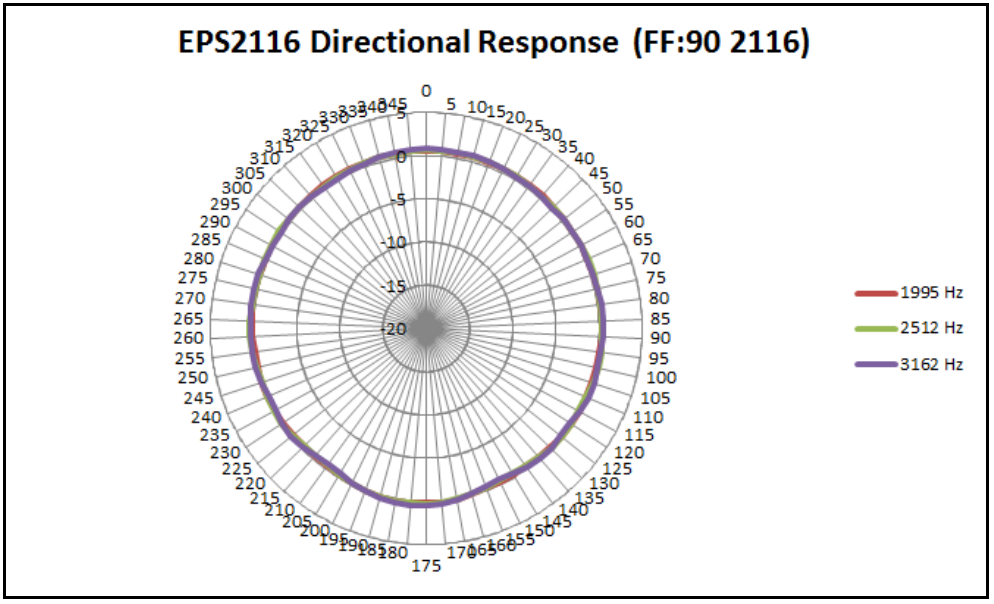


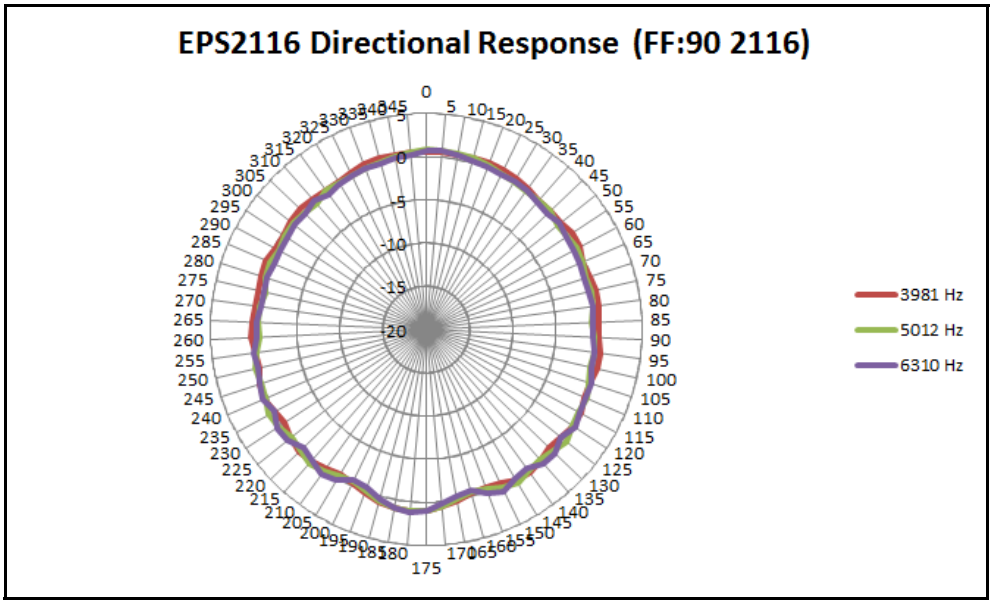


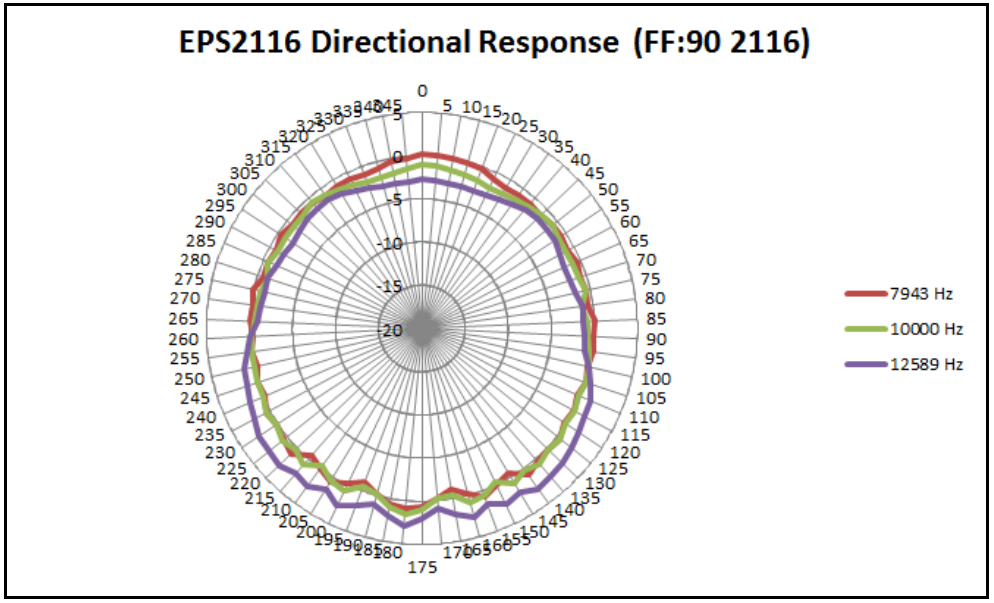

EPS2116 Directional Response (FF:90 2116)
Decibels (dB)
6
4
2
0
-2
-4
-6
100
1,000
10,000
Frequency
45 Degrees
60 Degrees
75 Degrees
90 Degrees

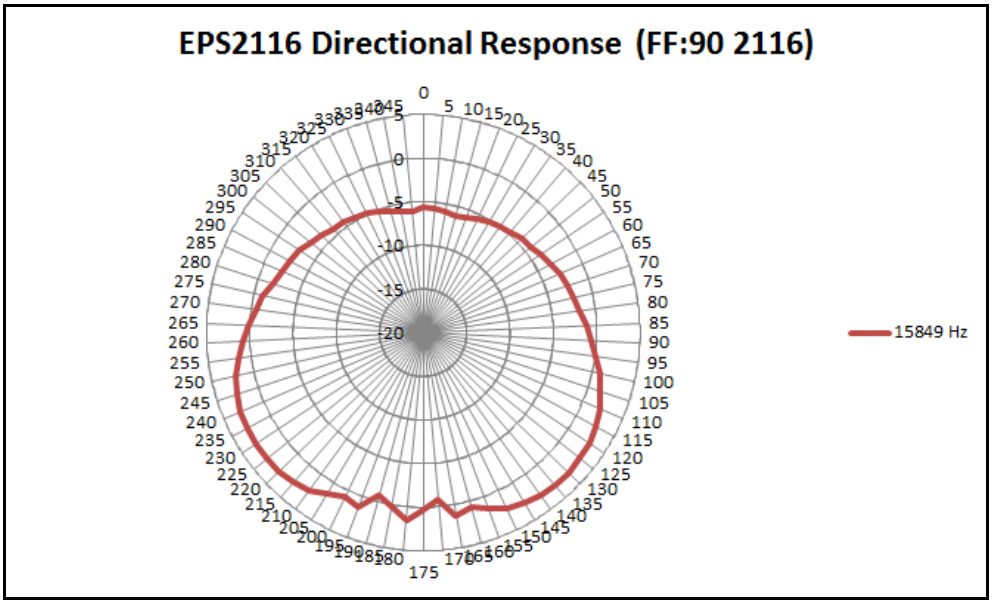

EPS2116 Directional Response (FF:90 2116)
Decibels (dB)
6
4
2
0
-2
-4
-6
100
1,000
10,000
Frequency
105 Degrees
120 Degrees
135 Degrees
150 Degrees


EPS2116 Directional Response (FF:90 2116)
1000 Hz
1259 Hz
1585 Hz


EPS2116 Directional Response (FF:90 2116)
1995 Hz
2512 Hz
3162 Hz


EPS2116 Directional Response (FF:90 2116)
3981 Hz
5012 Hz
6310 Hz


EPS2116 Directional Response (FF:90 2116)
7943 Hz
10000 Hz
12589 Hz


EPS2116 Directional Response (FF:90 2116)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
-5
-10
-15
-20
15849 Hz

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