ROHDE&SCHWARZ

Test and Measurement
Division

Release Notes

Wireless LAN Test

Application Firmware

R&S FSQ-K90/K91/K91n

Release 4.70

for R&S FSQ, FSG, FMU Analyzer Firmware V4.7x

New Features:

- **Simultaneous analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices.**
- **Sequential analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices using the Rohde & Schwarz OSP switching box.**
- **Sequential analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices.**

Release Note Revision: 2

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Contents

History

Date	Rel Note Rev	Changes
16 May 2011	1	First revision for Wireless LAN Application Firmware 4.70.
24 August 2011	2	Known issues of version 4.70 added.

General Topics

Compatibility of the R&S FSQ-K90/K91/K91n Wireless LAN Application Firmware with other Firmware Releases

The following table shows the compatible versions of the basic analyzer firmware and the Wireless LAN Application Firmware:

Table of compatible versions:

R&S FSQ-K90 Application Firmware	R&S FSQ-K91 Application Firmware	R&S FSQ-K91n Application Firmware	R&S FSQ Basic Firmware	R&S FMU Basic Firmware	R&S FSG Basic Firmware
4.70	4.70	4.70	4.75		4.79
4.62 SP1	4.62 SP1	4.62 SP1	4.65 SP1		4.69 SP1
4.62	4.62	4.62	4.65 SP1		4.69 SP1
4.61	4.61	4.61	4.65 SP1		4.69 SP1

R&S FSQ-K90 Application Firmware	R&S FSQ-K91 Application Firmware	R&S FSQ-K91n Application Firmware	R&S FSQ Basic Firmware	R&S FMU Basic Firmware	R&S FSG Basic Firmware
4.60	4.60	4.60	4.65		4.69
4.51	4.51	4.51	4.55 SP2		4.59 SP1
4.50	4.50	4.50	4.55 SP1	-	4.59
4.40 SP1	4.40 SP1	4.40 SP1	4.45 SP1	-	4.49 SP1
4.40	4.40	4.40	4.45	-	4.49
4.30 SP1	4.30	4.30	4.35	4.38	4.39
4.30	4.30	4.30	4.35		4.39
4.21	4.21	-	4.25	-	4.29 SP2
4.20	4.20	-	-	-	4.29
4.10	4.10	-	4.15	-	-
4.00	4.00	-	4.05	-	-
3.90 SP1	3.90 SP1	-	3.95 SP1	-	-
3.90	3.90	-	3.95	-	-
3.80	3.80	-	3.85	-	-
3.70	3.70	-	3.75	-	-
3.60 SP1	3.60 SP1	-	3.65	-	-
3.60	3.60	-	3.65	-	-
3.52	3.52	-	3.55 SP1 3.55	-	-
3.50 SP1	3.50 SP1	-	3.55 SP1 3.55	-	-
3.50	3.50	-	3.55	-	-
3.42	3.42	-	3.45 SP4	-	-
3.40	3.40	-	3.45	-	-
3.31	3.31	-	3.35 SP1	-	-
3.30	3.30	-	3.35	-	-
3.28	-	-	3.25	-	-
3.24	-	-	3.15	-	-
3.20	-	-	3.05	-	-

Firmware Update of the R&S FSQ-K90/K91/K91n Wireless LAN Application Firmware

Since basic firmware version 4.2x a ZIP file with the update sets of the basic system firmware and all available applications is provided. This ZIP file is available in the instruments FIRMWARE section, e.g. R&S FSQ of the Service Board on GLORIS.

Please follow the steps described in the instrument's basic firmware release note to perform a complete firmware update.

Enabling the Application Firmware via License Key Code Entry

This section can be skipped if the option key was entered once.

After installing the application firmware package a license key for validation must be entered. The license key is printed either on a label on the rear panel of the instrument or delivered as a part of the R&S FSQ-K90/K91/K91n Wireless LAN application firmware package.

The key sequence for entering the license key is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

Use the numeric keypad to input the license key number and press ENTER.

- On a successful validation the message 'option key valid‘ will appear. The instrument will perform an automatic reboot.
- If the validation failed, the application firmware is not installed.

  The most probable reason will be that the instrument is not equipped with the correct basic firmware version. Therefore a messagebox will appear asking for installation of the correct basic firmware version.

  If the application firmware package was not installed prior to entering the license key code, a message will appear asking for installation of the application firmware package.

  In any case please make sure that the correct basic firmware version <u>and</u> the application firmware package is installed prior to entering the license key code.

If upgrading to FSQ-K91 from FSQ-K90 then an upgrade key is supplied. This key needs to be entered (as described above) in addition to the existing FSQ-K90 key-code. Similarly if upgrading FSQ-K91 to include IEEE 802.11n then an additional upgrade key is required

System Memory Requirements

For FSQ-K90 Wireless LAN Application Firmware, an installed system memory of 512MByte is recommended. For FSQ-K91 Wireless LAN Application Firmware, an installed system memory of 512MByte is essential. The FSQ-K90/K1 will generate an error message during activation, if available system memory does not meet the requirements. This may happen for FS-K90, if FS-K30 or FSQ-K70 was active before starting WLAN.

For instruments, shipped with 256MByte system memory, a memory extension FSQ-B512, order number 1157.1590.02, is available.

A reboot of the instrument after using NOISE (FS-K30) or VSA (FSQ-K70), will allow FSQ-K90 to be activated without memory extension.

The system memory size can be easily checked by pressing SETUP – SYSTEM INFO – STATISTICS, item "Memory size". This item is available since version 3.25 of the base system firmware.

New Functions in version 4.70

- **Simultaneous analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices.**
- **Sequential analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices using the Rohde & Schwarz OSP switching box.**
- **Sequential analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices.**

Improvements with option R&S FSQ-K90/K91/K91n Wireless LAN Application Firmware

The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. (V4.62) 802.11b signals failed to analyze:
In some situations 802.11b signals failed to analyze. This has now been corrected

Known Issues with option R&S FSQ-K90/K91/K91n Wireless LAN Application Firmware

The version numbers in brackets indicate the version in which the error was observed for the first time. Unless otherwise stated all errors apply to be FSQ-K90 and FSQ-K91

Manual Operation and IEC/IEEE Bus

1. (K90 V3.40) Memory usage on instrument with 256 Mbytes of memory
Performing combinations of calibration, activating and using the VSA (K70) option and activating and using FSQ-K90 on an instrument with 256 Mbytes of memory may lead to the FSQ-K90 option no longer being able to be activated due to insufficient memory.

Workaround: Ensure no other applications are running. Restarting the firmware after performing calibration also improves memory usage. Using Preset also releases memory.

2. (K90/K91 V3.50) Gating and negative trigger offset values
With the FSQ gating and negative trigger offset values can not be used together. Any negative trigger offset will internally be set to 0s.

3. (K90/K91 V3.60) Analysis times
In some cases with low powered signals measurement can take a long time to complete.

Workaround: Use auto-level or adjust the reference level to improve analysis speed. Reducing the amount of data to analyze by reducing the capture time can also help.

4. (K91 V4.70) For the 11b and 11g standards the maximal capture length is erroneously restricted to 22.72ms.

Workaround: none

5. (K91 V4.70) For the 11n standards, the input sample rate is not automatically set to the signal BW oversampled by the factor two.
Workaround: For a nominal signal BW of 20 MHz set *'Advanced Settings* | *Input Sample Rate = 40MHz'*.
For a nominal signal BW of 40 MHz set *'Advanced Settings* | *Input Sample Rate = 80MHz'*.

6. (K90/K91 V4.70) For the 11n standards *'Demod Settings* | *Level Tracking'* has no effect.
Workaround: Use the *Timing Tracking* to control the *Level Tracking* as well.
Timing Tracking jointly controls timing AND -erroneously for this version- *Level Tracking*.

IEC/IEEE Bus only

1. (K90 V3.28) Selecting screen A/B
For selecting screen A or B, DISPlay:<WINDow[1|2]>:SELect command does not work correctly.

Workaround: Instead of this command, an alias command is provided, which is:
DISPlay:<WINDow[1|2]>:**SSELect**.

2. (K90/K91 V4.70) The query commands FETCh:BURSt:PEAK? and FETCh:BURSt:ALL? do not return the peak power measurement result.

Workaround: none

Modified Functions

The behaviour of the following functions changed compared to earlier versions (the number in brackets indicates the firmware version that introduced the individual change):

1. (V3.30) Limit values in table of results can now be modified whilst a measurement is running.

2. (V3.30) Spectrum Mask according to ETSI.

3. (V3.30) EVM Trace results can now be displayed in % of dB (User selectable).

4. (V3.40) Baseband board version VAR03 with baseband impendence of 1 MOhm supported

5. (V3.42) Single auto-level sequence can now be activated via SCPI (CONFigure:POWer:AUTO ONCE)

6. (V3.42) The STATus:QUEStionable:SYNC and STATus:QUEStionable:ACPLimit registers are provided.

7. (V3.42) Marker to peak and to minimum functions are supported for the Spectrum Flatness measurement.

8. (V3.42) EVM Vs Symbol display: The boundaries of bursts are now highlighted with verticle lines.

9. (V3.42) Support for wideband extension (B72).

10. (V3.42) Support for preamplifier B23 & B25 options.

11. (V3.42) Error Vs Preamble measurements are provided for all standards. The results can be displayed in Phase or Frequency error Vs preamble.

12. (V3.42) Advanced settings for mechanical and electronic attenuators, YIG filter and baseband settings.

13. (V3.42) Support for IEEE 802.11g and 802.11 OFDM Turbo Mode standards added.

14. (V3.42) Gating support for Spectrum Mask and Spectrum ACP measurements).

15. (V3.42) The sample rate can be modified for IEEE 802.11a measurements.

16. (V3.42) IF Power trigger disabled for Spectrum Mask (ETSI) measurement

17. (V3.42) Minimum and Maximum payload length can now also be specified in time

18. (V3.42) The calculation for the rise and fall time results for IEEE 802.11b signals has been changed

19. (V3.42) List mode results accessible from frequency sweep measurements

20. (V3.60) IQ Data Export & Import available.

21. (V3.60) Sample rates between 20.4 MHz and 40.8 MHz now supported without the use of option B72.

22. (V3.70) Bursts analyzed with errors now marked in yellow.

23. (V3.70) Number of analyzed bursts available via IEC/IEEE Bus (FETCh:BURSt:COUNt?).

24. (V3.70) Number of symbols in each analyzed burst available via IEC/IEEE Bus (FETCh:SYMBol:COUNt?).

25. (V3.70) Sweep time for auto-level can be specified using the Auto Level Time setting in the Advanced Settings of the General Settings view.

26. (V3.80) Digital Down Converter available for low carrier frequency with Baseband input.

27. (V3.80) External trigger level can now be specified.

28. (V3.80) REFRESH hot-key for recalculation of results after data capture.

29. (V3.80) The new SUPPORT softkey has been provided to allow detailed information about the FS-K90/91 option to be saved to file.

30. (V3.90) New SCPI command CONFigure:BURSt:PREamble:SELect PHASe | FREQuency.

31. (V4.10) The SEM measurement and SPECTRUM MASK softkey replaces the Spectrum ETSI / IEEE measurements.

32. (V4.20) Support for new instrument model R&S FSG.

33. (V4.20) Trace data now available via remote control in binary format for all traces.

34. (V4.30) The IEEE 802.11n standard is now supported

35. (V4.30) Option B17 is now supported.

36. (V4.30) Option FSU-B24 supported

37. (V4.30) Support for Application Recovery

38. (V4.50) Setting FFT Start Offset provided to allow improved EVM results.

39. (V4.60) FETCh:BURSt:COUNt:ALL? Command added to obtain complete number of analyzed bursts for a measurement, including bursts from multiple seeps.

40. (V4.60) CONFigure:WLAN:PVERror:MRANge Command added. This command specifies whether the Peak Error Vector results are calculated over the complete burst or just over the PSDU.

41. (V4.61) Support files now stored in option specific folder.

42. (V4.62) New parameter PEAK was added to the command [SENSe:]DEMod:FFT:OFFSet.

43. (V4.62) Simultaneous analysis of up to 2 Tx antennas for IEEE 802.11n MIMO capable devices.

44. (V4.70) Simultaneous analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices.

45. (V4.70) Sequential analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices using the Rohde & Schwarz OSP switching box.

46. (V4.70) Sequential analysis of up to 4 Tx antennas for IEEE 802.11n MIMO capable devices.

Modifications to the Operating Manual

The R&S FSQ-K90/K91/K91n analyzer functions are included in a separate manual set. Please refer to the following order numbers:

- 1157.3135.42-07 (English)

Modified Chapters for manual operation

STC/MIMO Settings IEEE 802.11n MIMO only

The *STC/MIMO* settings panel is used provide the measurement application with the MIMO measurement setup.

The *STC/MIMO* panel is selected by placing the focus on the *General Settings* tab and navigating with the arrow keys below the roll key to the right respective left.

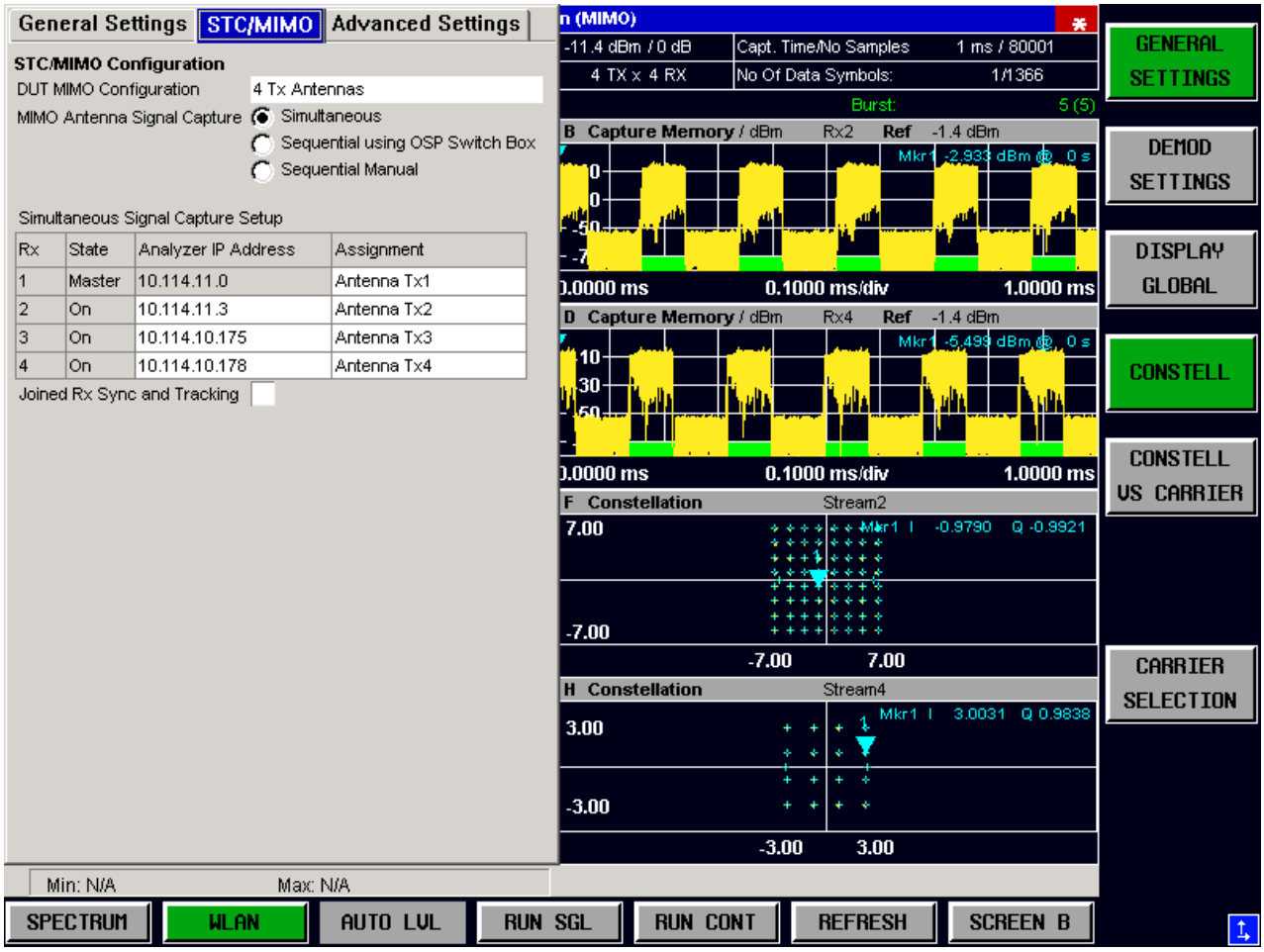
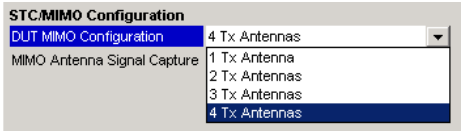


Fig. 1 STC/MIMO Settings

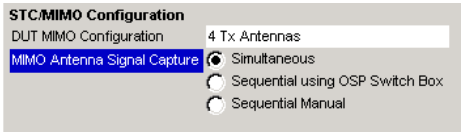
DUT MIMO Configuration



DUT MIMO Configuration defines the number of Tx antennas of the device under test (DUT). Currently up to *4 Tx Antennas* are supported.

Remote: `CONF:WLAN:DUTC`

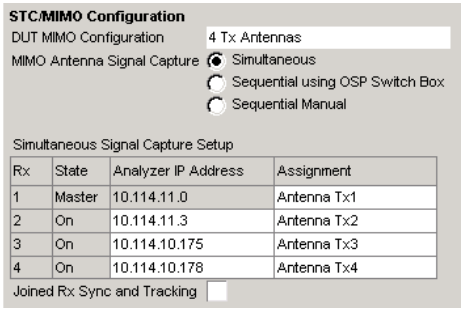
MIMO Antenna Signal Capture



MIMO Antenna Signal Capture defines the setup how the Tx antenna signals of the device under test (DUT) are captured by the analyzer/analyzers. The following scenarios are supported.

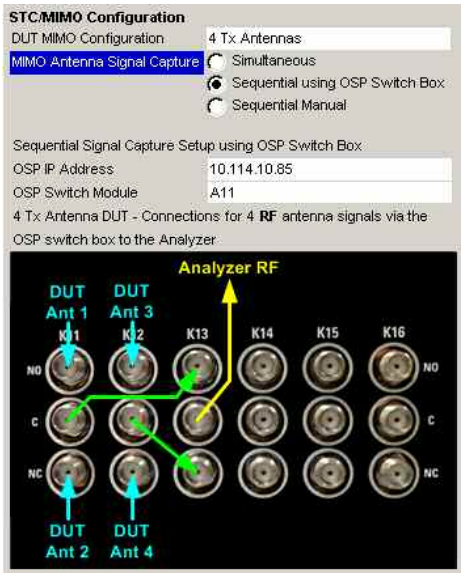
Note each mode supports RF and Analog Baseband signal input.

Remote: `CONF:WLAN:MIMO:CAPT:TYPE`



Simultaneous: The number of Tx antennas set in *DUT MIMO Cofigurations* defines the number of analyzers required for this measurement setup.

Remote:
`CONF:WLAN:MIMO:CAPT:TYPE SIM`
`CONF:WLAN:ANTM:STAT`
`CONF:WLAN:ANTM:ADDR`
`CONF:WLAN:ANTM:ANT`



4x4 MIMO measurement setup using RF Input

Sequential using OSP Switch platform: A single analyzer and the Rohde & Schwarz OSP Switch Platform[1] is required to measure the number of DUT Tx Antennas as defined in *DUT MIMO Cofiguration.*

Important Note: For sequential MIMO measurements the DUT has to transmit identical bursts over time! For example the signal field has to be identical for all bursts.

This setup requires the analyzer and the OSP switch platform being connected via LAN.

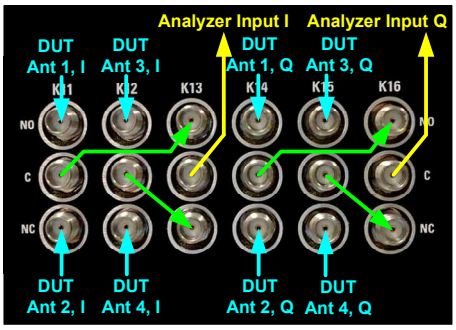
To assist the user connecting the DUT Tx antennas via the Rohde & Schwarz OSP switch platform with the analyzer a connection diagram is shown. The diagram shows a R&S®OSP-B101 option fitted in one of the three module slots at the rear of the OSP switch platform.

The DUT Tx antennas, the OSP switching box and the analyzer have to be connected according to the figures shown in the 'Sequential Signal Capture Setup using OSP switch platform' section of the STC/MIMO dialog.

Cyan colored arrows represent the connections between the Tx antennas of the DUT and the corresponding SMA plugs of the R&S®OSP-B101 option.

Green colored arrows represent auxiliary connections of SMA

[1] with at least one fitted R&S®OSP-B101 option.

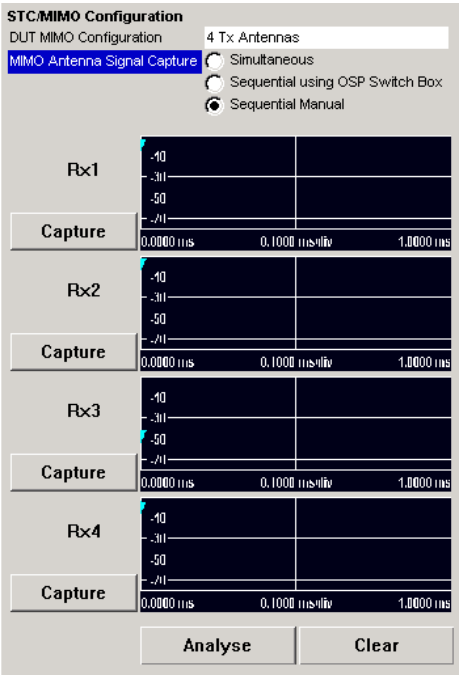


4x4 MIMO measurement setup using Analog Baseband Input

plugs of the R&S®OSP-B101 option.

Yellow colored arrows represent the connection between the SMA plug of the R&S®OSP-B101 option with the RF respective analog baseband input of the analyzer.

Remote: `CONF:WLAN:MIMO:CAPT:TYPE OSP`



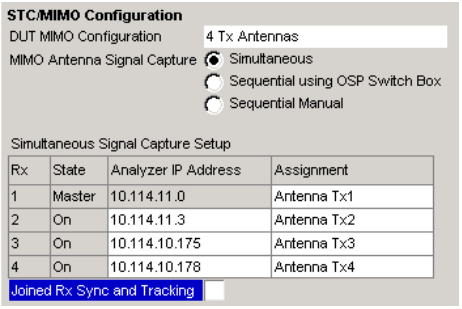
Sequential Manual: A single analyzer is required to measure the number of DUT Tx Antennas as defined in *DUT MIMO Cofiguration.* Each DUT Tx antenna has to be manually connected to the analyzer prior to the signal capture process.

Important Note: For sequential MIMO measurements the DUT has to transmit identical bursts over time! For example the signal field has to be identical for all bursts.

Remote: `:CONF:WLAN:MIMO:CAPT:TYPE MAN`

Simultaneous Signal Capture Setup settings

Joined Rx Sync and Tracking



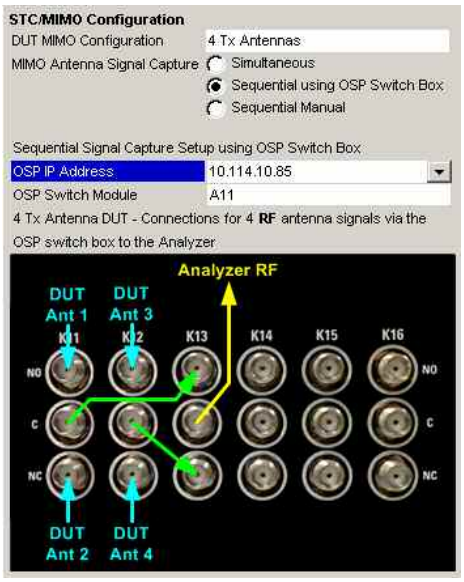
Joined Rx Sync and Tracking:

Checked: The burst synchronisation and tracking is performed **joined** for all the captured antenna signals.

Cleared: The burst synchronisation and tracking is performed **individually** for each captured antenna signal.

Sequential Signal Capture Setup using the OSP Switch platform settings

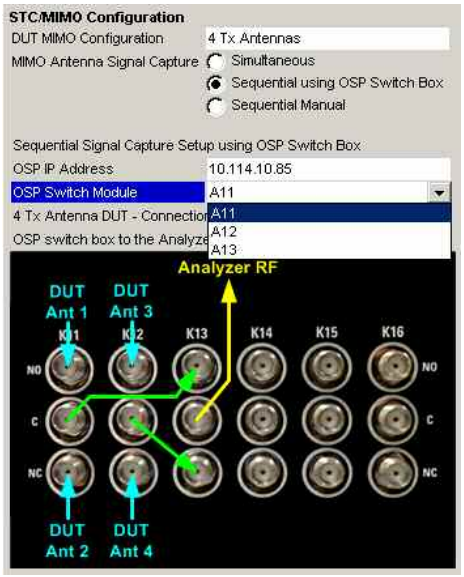
OSP IP Address



OSP IP Address: The analyzer and the Rohde & Schwarz OSP switch platform have to be connected via LAN. Enter the IP address of the OSP switch platform here using for example the numerical key pad of the analyzer.
In case of a R&S®OSP130 switch platform, the IP address is shown in the front display.
In case of a R&S®OSP120 switch platform connect an external monitor to get the IP address or use the default IP address of the OSP switch platform. For details read the OSP operation manual.

Remote: `CONF:WLAN:MIMO:OSP:ADDR`

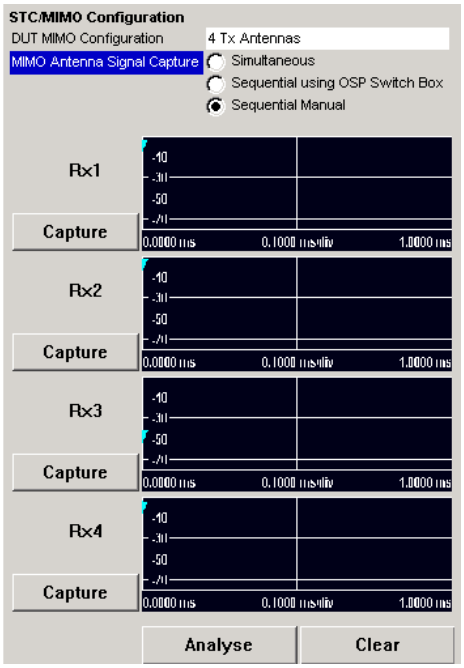
OSP Switch Module



OSP Switch Module: The R&S®OSP-B101 option is fitted in one of the three module slots at the rear of the OSP switch platform. The DUT Tx antennas are connected via the R&S®OSP-B101 module - fitted in the OSP switch platform - with the analyzer. Select with this GUI control the R&S®OSP-B101 module that is used for the connection.

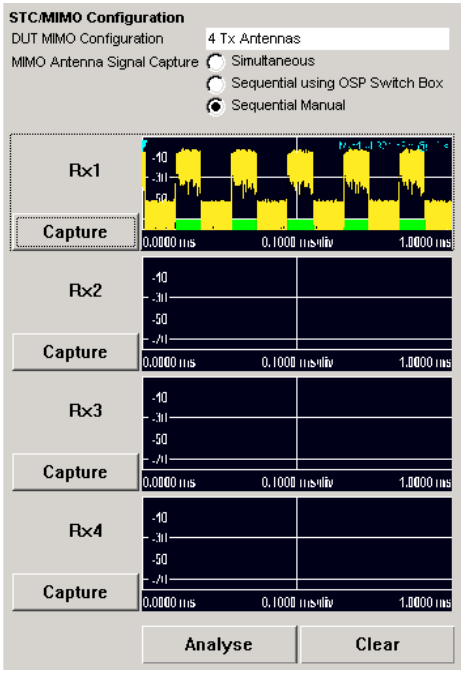
Remote: `CONF:WLAN:MIMO:OSP:MOD`

Sequential Manual Signal Capture Setup settings



The Clear button clears all the Capture Memory previews.

Use the roll key to get the focus on the desired GUI control.



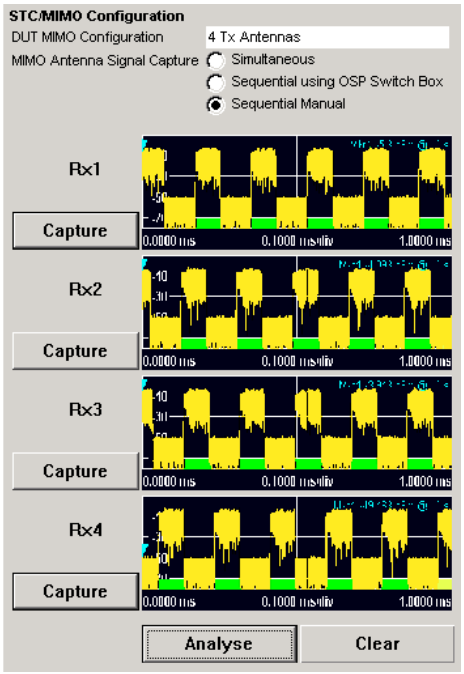
Important Note: For sequential MIMO measurements the DUT has to transmit identical bursts over time! For example the signal field has to be identical for all bursts. In case this condition is NOT hold, the subsequent procedure will NOT generate reasonable measurement results!

Manually connect the Tx antenna 1 of the WLAN DUT with the analyzer and press the *Capture* button for the Rx1 Capture Memory. The bursts detected by the application are highlighted by the green bars.

Manually connect the Tx antenna 2 of the WLAN DUT with the analyzer and press the *Capture* button for the Rx2 Capture Memory. The bursts detected by the application are highlighted by the green bars.

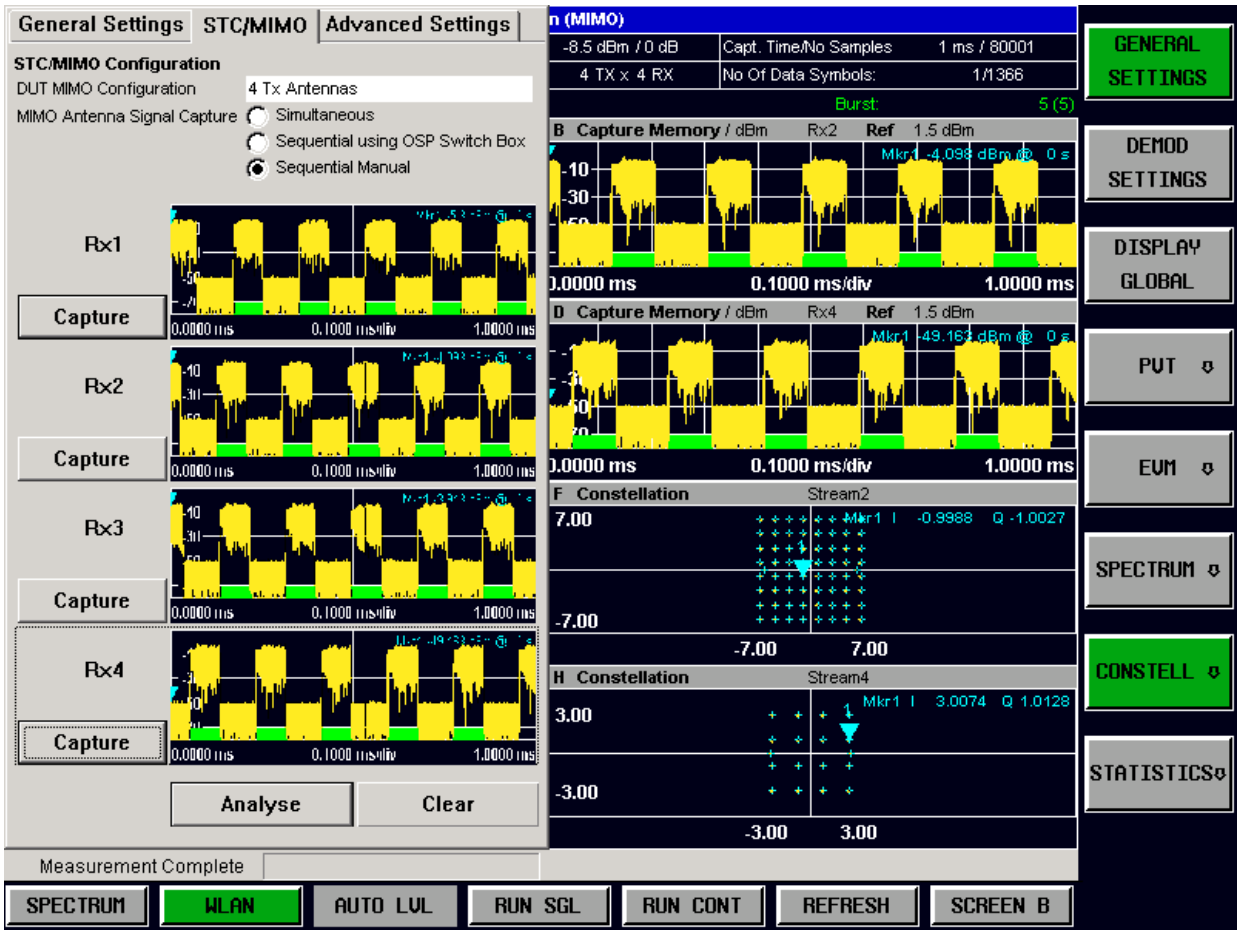
Carry on in this manner for all the Tx antennas of the DUT up to the number of Tx antennas defined in *DUT MIMO Configuration*.

Remote: `CONF:WLAN:MIMO:CAPT`
`INIT:IMM`



Finally press the *Analyse* button to compute the results for the captured antenna signals.

Remote: `CALC:BURS:IMM`



Modified Chapters for remote operation

CALCulate:BURSt Subsystem

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2> :BURSt [:IMMediate]	-	-	

CALCulate<1|2>:BURSt[:IMMediate]

This command forces the IQ measurement results to be recalculated according to the current settings

Example: "CALC:BURS" Forces an update of the IQ results

Characteristics: *RST value: -
SCPI: device-specific

Mode: MIMO

Configure Subsystem

The CONFigure subsystem contains commands for configuring complex measurement tasks. The CONFigure subsystem is closely linked to the functions of the FETCH subsystem, where the measurement results of the measurements are queried.

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:POWer			
:EXPected			
:RF	<numeric_value>	DBM	
:IQ	<numeric_value>	V	
:AUTO	<boolean> | ONCE		
:SWEep			
:TIME	<numeric_value>	S	
:CHANnel	<numeric_value>		
:STANdard	<numeric_value>		
:WLAN			
:MIMo			
:CAPTure	RX1 | RX2 | RX3 | RX4		
:TYPe	SIMultaneous | OSP | MANual		
:OSP			
:ADDRess	<String>		
:MODule	A11 | A12 | A13		
:DUTConfig	TX1 | TX2 | TX3 | TX4		
:ANTMatrix			
:STATe<1 to 4>	<boolean>		
:ADDRess<1 to 4>	<String>		
:ANTenna<1 to 4>	ANTenna1 | ANTenna2 | ANTenna3 | ANTenna4		
:GTIMe			
:SELect	SHORt | NORMal		
:AUTO	<boolean>		
:TYPE	FBURst|ALL|MN8|ML16|MN16|ML32|DN8|DL16|DN16|DL32		
:STBC			
:AUTO			
:TYPE	FBURst | ALL | M0 | M1 | M2 | D0 | D1 | D2		
:EXTension			
:AUTO			
:TYPE	FBURst | ALL | M0 | M1 | M2 | M3 | D0 | D1 | D2 | D3		

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:WLAN			
:SMAPping			
:MODE	DIRect | SEXPansion | USER		
:NORMalise	<boolean>		
:TX<1 to 4>	<numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>		
:STReam<1 to 4>	<numeric_value>, <numeric_value>		
:TIMeshift	<numeric_value>		
:PAYload			
:LENgth			
:SRC	ESTimate | HTSignal		
:PVERror			
:MRANge	ALL | PSDU		
:BURSt			
:PVT			
:SELect	EDGE | FULL | RISE | FALL		
[:IMMediate]			
:AVERage	<numeric_value>		802.11b only
:RPOWer	MEAN | MAXimum		802.11b only
:EVM			
:ECARrier			
[:IMMediate]			
:ESYMbol			
[:IMMediate]			
:SPECtrum			
:MASK			
:SELect	IEEE | ETSI		
[:IMMediate]			
:FLATness			
:SELect	FLATness | GRDelay		
:CSELect	EFFective | PHYsical		
[:IMMediate]			
:FFT			
[:IMMediate]			
:ACPR			
[:IMMediate]			

COMMAND	PARAMETERS	UNIT	COMMENT
CONFigure			
:BURSt			
:CONSt			
:CCARrier			
[:IMMediate]			
:CSYMbol			
[:IMMediate]			
:CARRier			
:SELect	-26 to 26 | ALL | PILOTS		
:STATistics			
:CCDF			
[:IMMediate]			
:BSTReam			
[:IMMediate]			
:SFIeld			
[:IMMediate]			
:PREamble			
:SELect	FREQuency | PHASe		
[:IMMediate]			

CONFigure:WLAN:MIMo[:CAPTure]:TYPe

This remote control command specifies method for analyzing MIMO signals.

SIMultaneous	Simultaneous normal MIMO operation
OSP	Sequential using open switch platform
MANual	Sequential using manual operation

Example: "CONF:WLAN:MIM:TYP SIM"
Characteristics: *RST value: SIM
SCPI: Device Specific
Mode: MIMO

CONFigure:WLAN:MIMo:OSP:ADDRess

This remote control command specifies the TCP/IP address (dotted IPV4 format) of the switch unit that can be used for automated sequential MIMO measurements. The supported unit is Rohde & Schwarz OSP 1505.3009.03 with module option 1505.5101.02

Example: "CONF:WLAN:MIM:OSP:ADDR '192.168.114.157'"
Characteristics: *RST value: …
SCPI: Device-specific
Mode: MIMO

CONFigure:WLAN:MIMo:OSP:MODule

This remote control command specifies module of the switch unit that can be used for automated sequential MIMO measurements. The supported unit is Rohde & Schwarz OSP 1505.3009.03 with module option 1505.5101.02

Example: "CONF:WLAN:OSP:MOD A11"
Characteristics: *RST value: A11
SCPI: Device-specific
Mode: MIMO

CONFigure:WLAN:MIMo:CAPTure

This remote control command specifies the signal path to be captured in MIMO sequential manual measurements. Once the signal path has been selected with this command, INIT:IMMediate is used to capture data from the specified signal path.

RX1 Sequential capture of RX1 (Manual see MIMo:TYPe)
RX2 Sequential capture of RX2 (Manual see MIMo:TYPe)
RX3 Sequential capture of RX3 (Manual see MIMo:TYPe)
RX4 Sequential capture of RX4 (Manual see MIMo:TYPe)

Example:

```
"CONF:WLAN:DUTC TX4"
"CONF:WLAN:MIMO:CAPT:TYPE MAN"
                                  Pause the script
                                  Connect TX1 of the DUT to the analyzer
                                  Continue the script
"CONF:WLAN:MIM:CAPT RX1"          Select RX1 for the next capture
"INIT:IMM"                        Capture the selected channel
                                  Pause the script
                                  Connect TX2 of the DUT to the analyzer
                                  Continue the script
"CONF:WLAN:MIM:CAPT RX2"          Select RX2 for the next capture
"INIT:IMM"                        Capture the selected channel
                                  Pause the script
                                  Connect TX3 of the DUT to the analyzer
                                  Continue the script
"CONF:WLAN:MIM:CAPT RX3"          Select RX3 for the next capture
"INIT:IMM"                        Capture the selected channel
                                  Pause the script
                                  Connect TX4 of the DUT to the analyzer
                                  Continue the script
"CONF:WLAN:MIM:CAPT RX4"          Select RX4 for the next capture
"INIT:IMM"                        Capture the selected channel

"CALC:BURS:IMM"                   Analyze captured data
```

Characteristics: *RST value: RX1
SCPI: Device Specific
Mode: MIMO

CONFigure:WLAN:DUTConfig

This remote control command specifies the number of antennas used for MIMO measurement.

TX1	one antenna
TX2	two antennas
TX3	three antennas
TX4	four antennas

Example: "CONF:WLAN:DUTC TX1"
Characteristics: *RST value: TX1
SCPI: Device Specific
Mode: MIMO

CONFigure:WLAN:ANTMatrix:ADDRess<1..4>

This remote control command specifies the TCP/IP address in IPV4 format.
Note, it is not possible to set the IP address of ANTMatrix1 (Master).

Example: "CONF:WLAN:ANTM:ADDR2 '192.168.114.157'"
Characteristics: *RST value: …
SCPI: Device-specific
Mode: MIMO

CONFigure:WLAN:ANTMatrix:STATe<1..4>

This remote control command specifies the ON/OFF state of the receive path.
Note, it is not possible to set the state of ANTMatrix1 (Master).

Example: "CONF:WLAN:ANTM:STAT2 ON"
Characteristics: *RST value: 0
SCPI: device-specific
Mode: MIMO

CONFigure:WLAN:ANTMatrix:ANTenna<1..4>

This remote control command specifies the antenna assignment of the receive path.
Note, it is not possible to set the antenna of ANTMatrix1 (Master).

ANTENNA 1	assigns Antenna 1
ANTENNA 2	assigns Antenna 2
ANTENNA 3	assigns Antenna 3
ANTENNA 4	assigns Antenna 4

Example: "CONF:WLAN:ANTM:ANT2 ANTENNA1"
Characteristics: *RST value: ANTENNA 1
SCPI: device-specific
Mode: MIMO

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