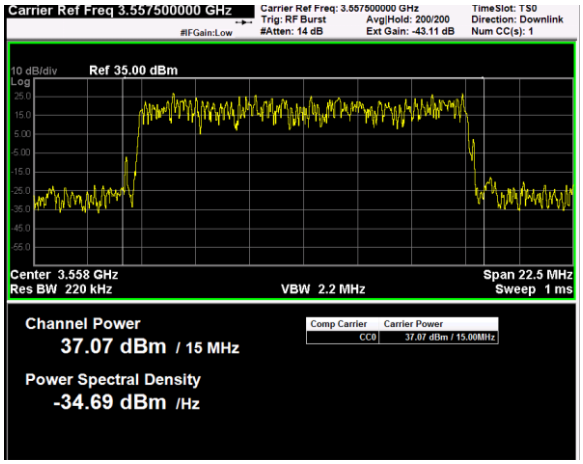
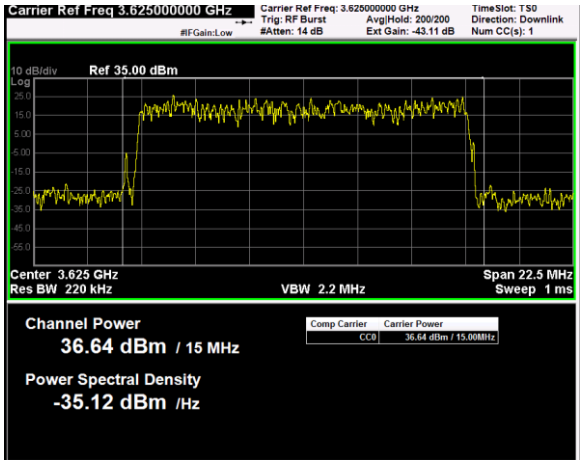
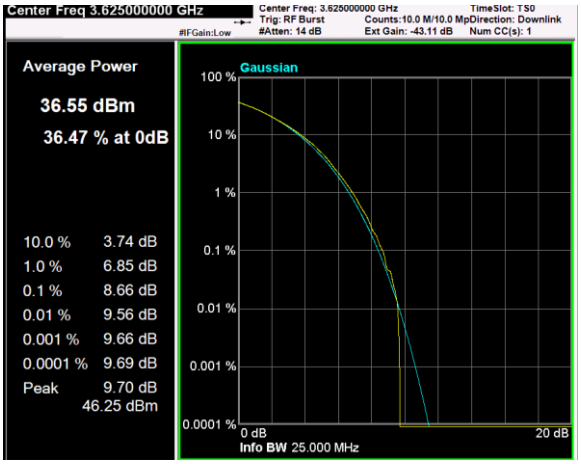


Channel: BOTTOM, Modulation: 64QAM, BW=15MHz, Channel Power

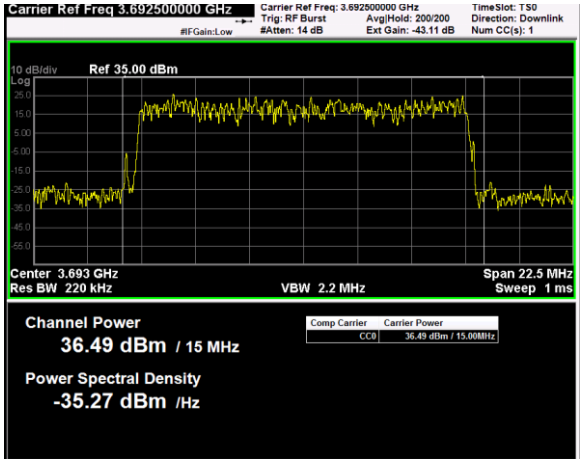
Channel: BOTTOM, Modulation: 64QAM, BW=15MHz, CCDF



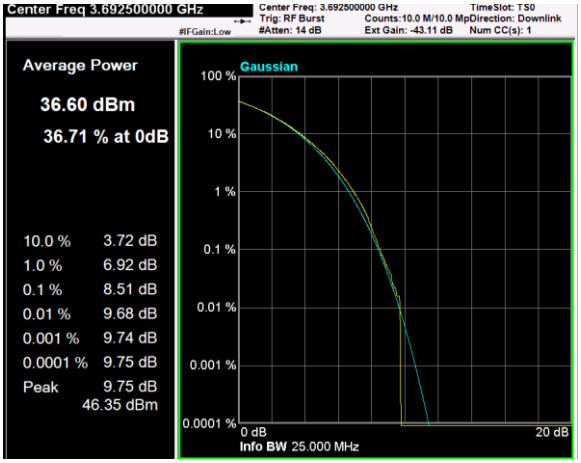
Channel: MIDDLE, Modulation: 64QAM, BW=15MHz, Channel Power



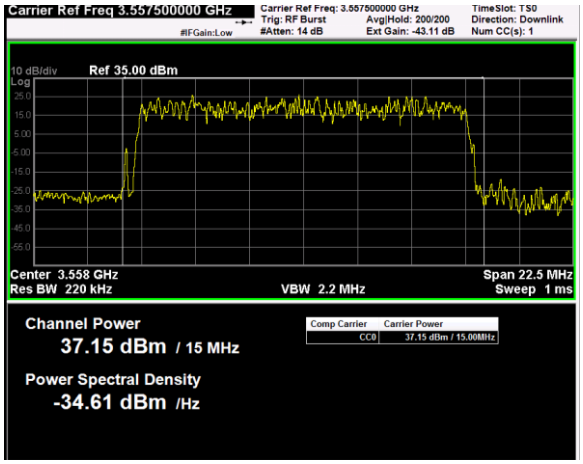
Channel: MIDDLE, Modulation: 64QAM, BW=15MHz, CCDF



Channel: TOP, Modulation: 64QAM, BW=15MHz, Channel Power

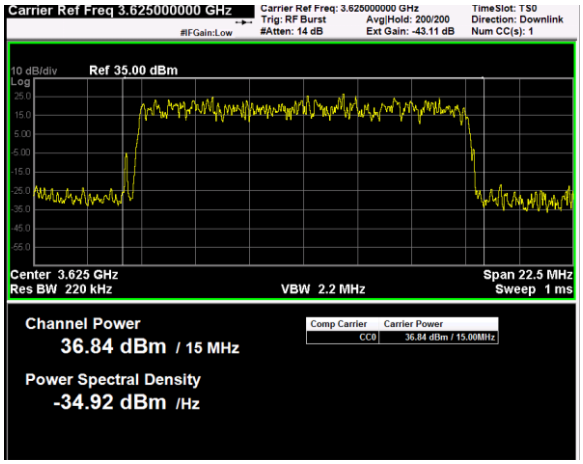


Channel: TOP, Modulation: 64QAM, BW=15MHz, CCDF



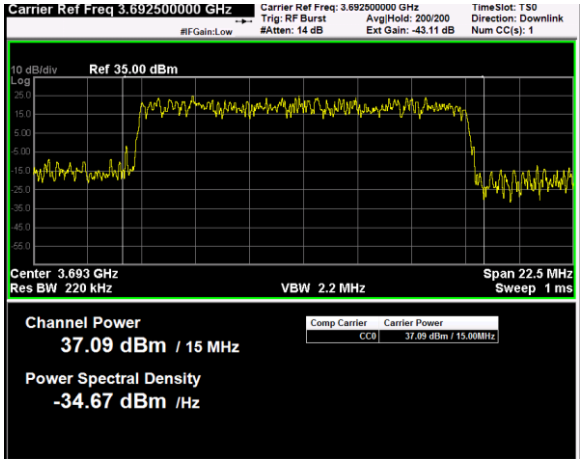
Channel: BOTTOM, Modulation: 256QAM, BW=15MHz, Channel Power

Channel: BOTTOM, Modulation: 256QAM, BW=15MHz, CCDF



Channel: MIDDLE, Modulation: 256QAM, BW=15MHz, Channel Power

Channel: MIDDLE, Modulation: 256QAM, BW=15MHz, CCDF



Channel: TOP, Modulation: 256QAM, BW=15MHz, Channel Power

Channel: TOP, Modulation: 256QAM, BW=15MHz, CCDF

RF PORT 1 (BW = 20 MHz)

Test data							
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	PSD (dBm/Hz)	PSD (dBm/MHz)	PAR (dB)
Down-link	LTE 20MHz (QPSK)	3560.0	37.3	5.420	-35.7	24.3	9.5
Down-link	LTE 20MHz (QPSK)	3625.0	37.0	4.989	-36.0	24.0	9.8
Down-link	LTE 20MHz (QPSK)	3690.0	37.3	5.370	-35.7	24.3	9.7
Down-link	LTE 20MHz (16QAM)	3560.0	37.6	5.702	-35.5	24.6	9.4
Down-link	LTE 20MHz (16QAM)	3625.0	37.5	5.636	-35.5	24.5	9.8
Down-link	LTE 20MHz (16QAM)	3690.0	37.4	5.445	-35.7	24.4	9.4
Down-link	LTE 20MHz (64QAM)	3560.0	37.4	5.508	-35.6	24.4	9.7
Down-link	LTE 20MHz (64QAM)	3625.0	37.3	5.358	-35.7	24.3	9.0
Down-link	LTE 20MHz (64QAM)	3690.0	37.4	5.445	-35.7	24.4	9.8
Down-link	LTE 20MHz (256QAM)	3560.0	37.0	5.000	-36.0	24.0	9.5
Down-link	LTE 20MHz (256QAM)	3625.0	37.4	5.445	-35.7	24.4	9.1
Down-link	LTE 20MHz (256QAM)	3690.0	37.3	5.420	-35.7	24.3	9.6

RF PORT 2 (BW = 20 MHz)

Test data							
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	PSD (dBm/Hz)	PSD (dBm/MHz)	PAR (dB)
Down-link	LTE 20MHz (QPSK)	3560.0	37.1	5.140	-35.9	24.1	9.3
Down-link	LTE 20MHz (QPSK)	3625.0	37.2	5.212	-35.8	24.2	9.8
Down-link	LTE 20MHz (QPSK)	3690.0	36.7	4.677	-36.3	23.7	9.5
Down-link	LTE 20MHz (16QAM)	3560.0	37.1	5.093	-35.9	24.1	9.5
Down-link	LTE 20MHz (16QAM)	3625.0	37.1	5.093	-35.9	24.1	9.3
Down-link	LTE 20MHz (16QAM)	3690.0	36.9	4.864	-36.1	23.9	9.6
Down-link	LTE 20MHz (64QAM)	3560.0	37.0	5.023	-36.0	24.0	9.5
Down-link	LTE 20MHz (64QAM)	3625.0	37.1	5.117	-35.9	24.1	9.4
Down-link	LTE 20MHz (64QAM)	3690.0	37.0	5.047	-36.0	24.0	9.8
Down-link	LTE 20MHz (256QAM)	3560.0	37.2	5.224	-35.8	24.2	9.4
Down-link	LTE 20MHz (256QAM)	3625.0	37.1	5.152	-35.9	24.1	9.8
Down-link	LTE 20MHz (256QAM)	3690.0	37.2	5.297	-35.8	24.2	9.5

Special notes

Remark: MIMO application where only cross-polarized antennas are allowed (KDB “662911 D01 Multiple Transmitter Output v02r01”, chapter F, paragraph 2), letter c), item (i)).

Please note that the case with cross-polarized antennas (the only allowed, as stated in the User Manual), with a pair of antennas (N_{ANT} = 2) and two outputs ports driving the antennas, has been considered as worst case; therefore the directional gain is the gain of an individual antenna.

Compliance to Category A limits (BW = 20 MHz):

Maximum EIRP ≤ 30 dBm/10MHz
Maximum PSD eirp ≤ 20 dBm/1MHz

PSD eirp (in 1 MHz) = PSD_{max} – N + G_{max} = 24* – N + G_{max} ≤ 20

The allowed max antenna gain is calculated as: G_{max} ≤ (20-24+N) = N – 4 dBi

Compliance to Category B limits (BW = 20 MHz):

Maximum EIRP ≤ 47 dBm/10MHz
Maximum PSD eirp ≤ 37 dBm/1MHz

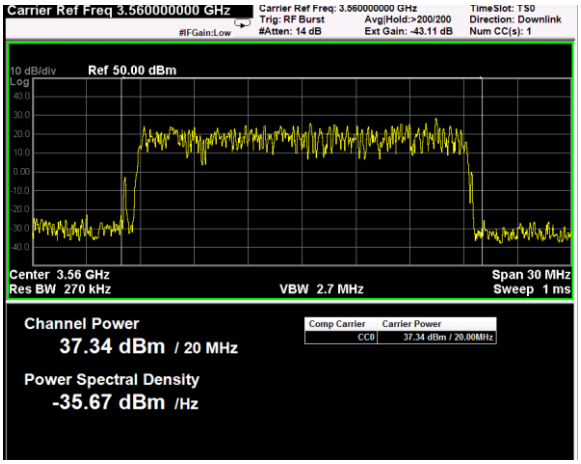
PSD eirp (in 1 MHz) = PSD_{max} – N + G_{max} = 24* – N + G_{max} ≤ 37

The allowed max antenna gain is calculated as: G_{max} ≤ (37-24+N) = N + 13 dBi
Where:

- PSD_{max} is the maximum PSD value measured on the antenna connector of the equipment and it depends on the LTE bandwidth signal (∗: 37 dBm, that is the measured value at antenna port, with a 20 MHz band matches up 37+10∗Log(1/20) = 24 dBm/1MHz)
- N is system path loss (in dB) due to cable insertion, splitter, etc….

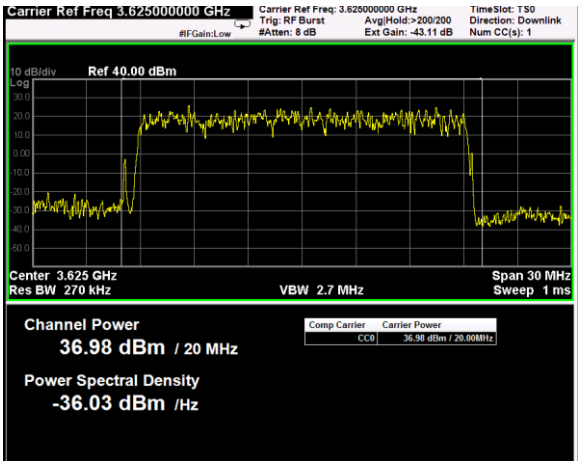
  G_{max} is the maximum antenna gain allowed (in dBi)

RF PORT 1 PLOT

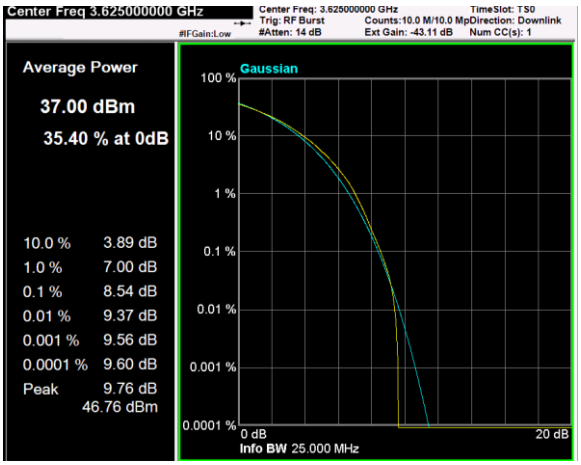


Channel: BOTTOM, Modulation: QPSK, BW=20MHz, Channel Power

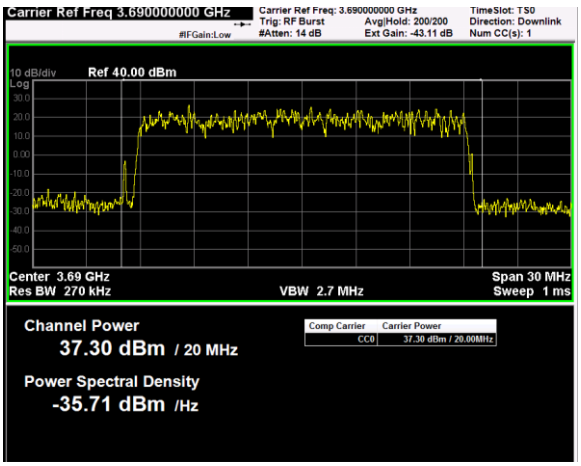
Channel: BOTTOM, Modulation: QPSK, BW=20MHz, CCDF



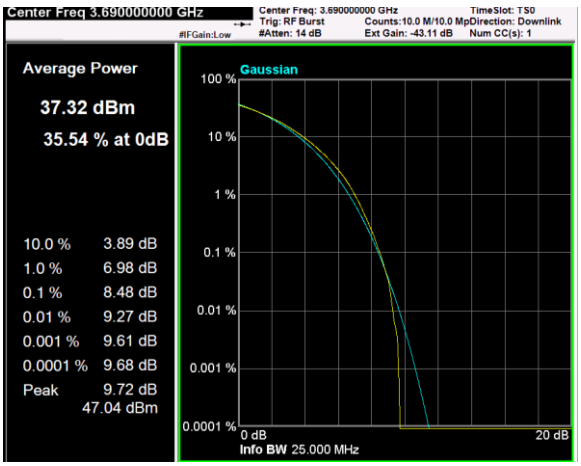
Channel: MIDDLE, Modulation: QPSK, BW=20MHz, Channel Power



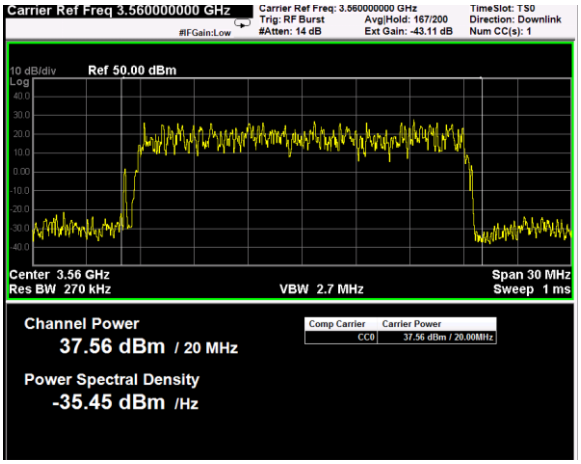
Channel: MIDDLE, Modulation: QPSK, BW=20MHz, CCDF



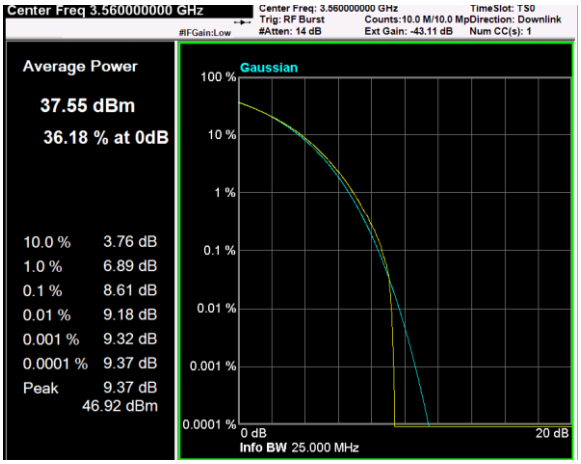
Channel: TOP, Modulation: QPSK, BW=20MHz, Channel Power



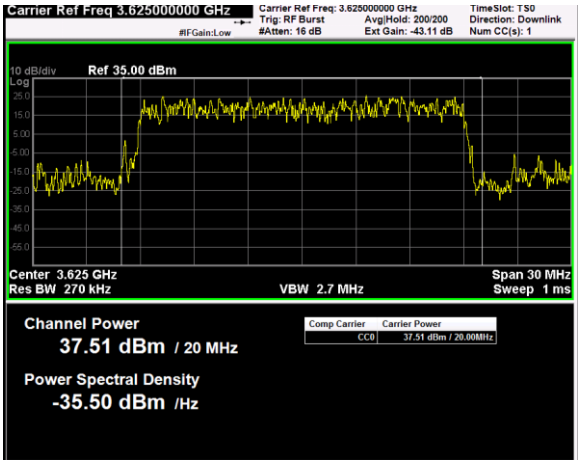
Channel: TOP, Modulation: QPSK, BW=20MHz, CCDF



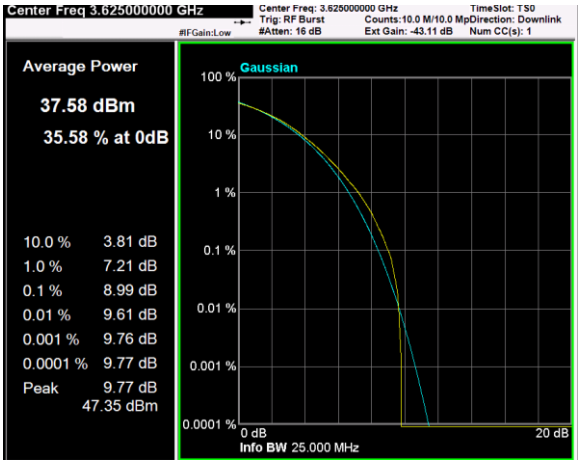
Channel: BOTTOM, Modulation: 16QAM, BW=20MHz, Channel Power



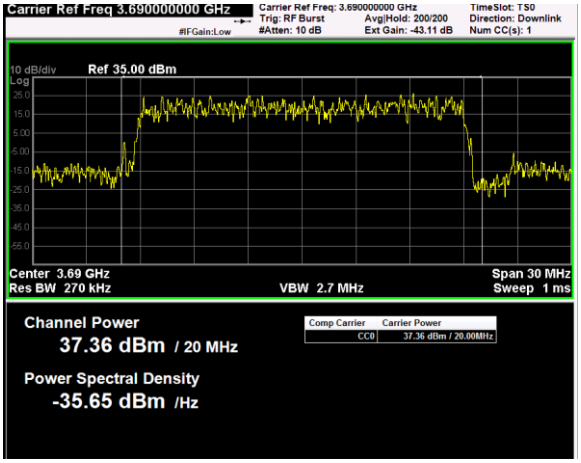
Channel: BOTTOM, Modulation: 16QAM, BW=20MHz, CCDF



Channel: MIDDLE, Modulation: 16QAM, BW=20MHz, Channel Power

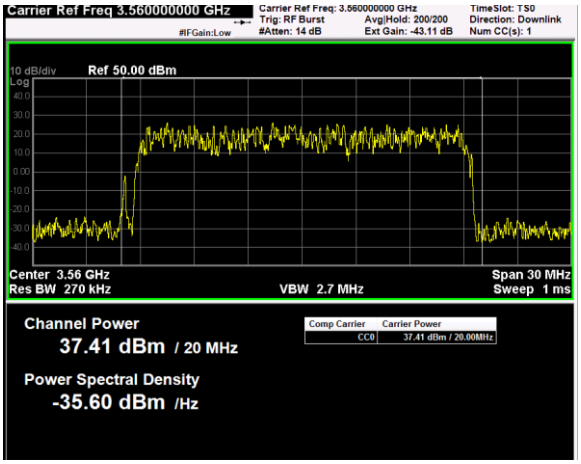


Channel: MIDDLE, Modulation: 16QAM, BW=20MHz, CCDF

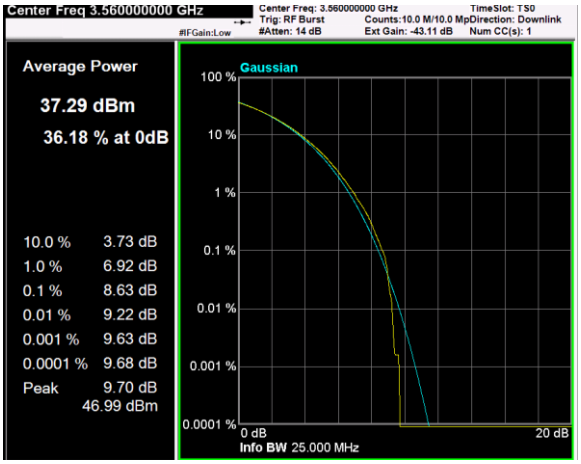


Channel: TOP, Modulation: 16QAM, BW=20MHz, Channel Power

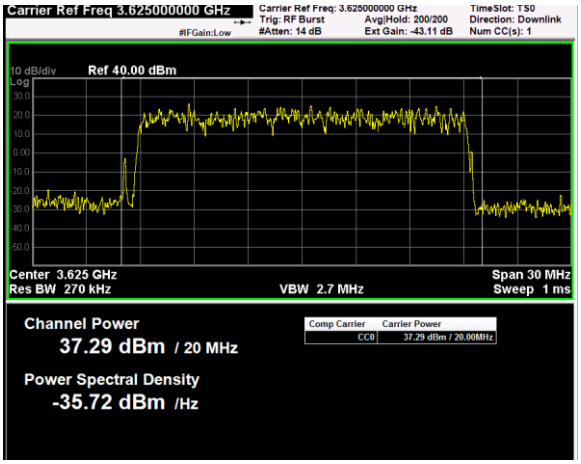
Channel: TOP, Modulation: 16QAM, BW=20MHz, CCDF



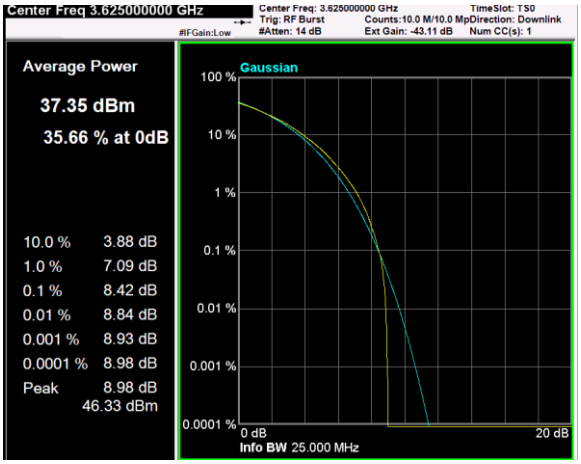
Channel: BOTTOM, Modulation: 64QAM, BW=20MHz, Channel Power



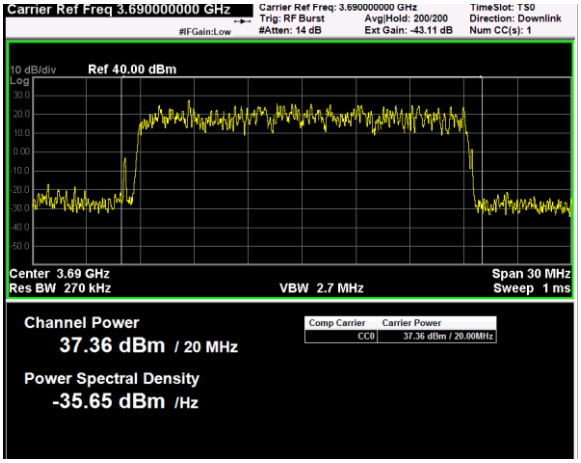
Channel: BOTTOM, Modulation: 64QAM, BW=20MHz, CCDF



Channel: MIDDLE, Modulation: 64QAM, BW=20MHz, Channel Power

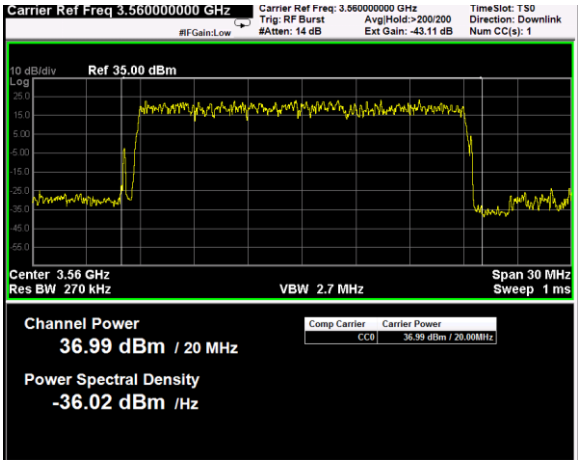


Channel: MIDDLE, Modulation: 64QAM, BW=20MHz, CCDF

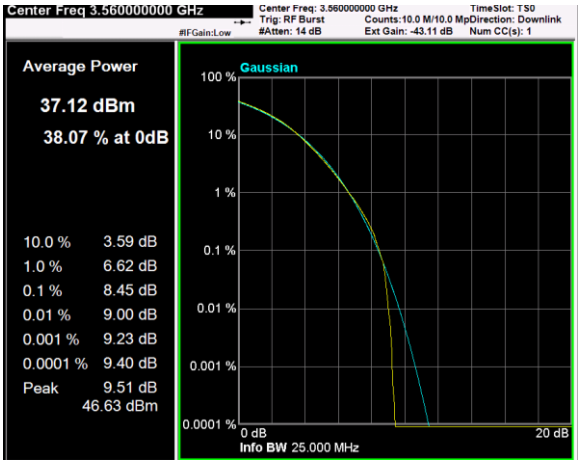


Channel: TOP, Modulation: 64QAM, BW=20MHz, Channel Power

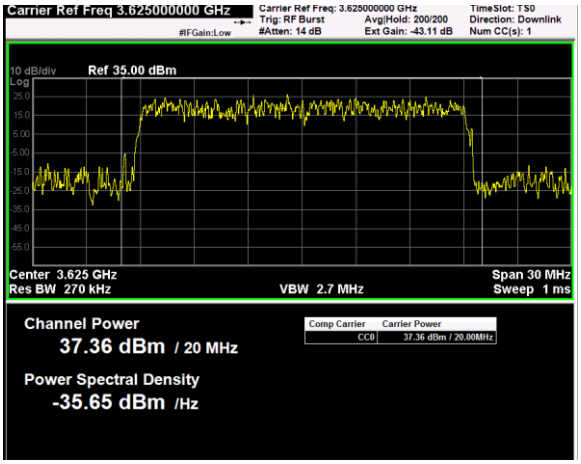
Channel: TOP, Modulation: 64QAM, BW=20MHz, CCDF



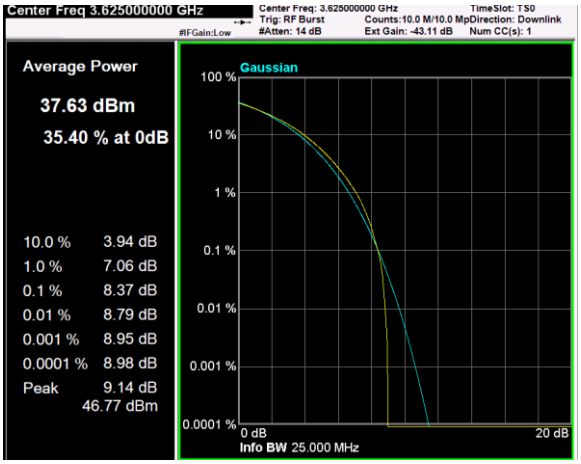
Channel: BOTTOM, Modulation: 256QAM, BW=20MHz, Channel Power



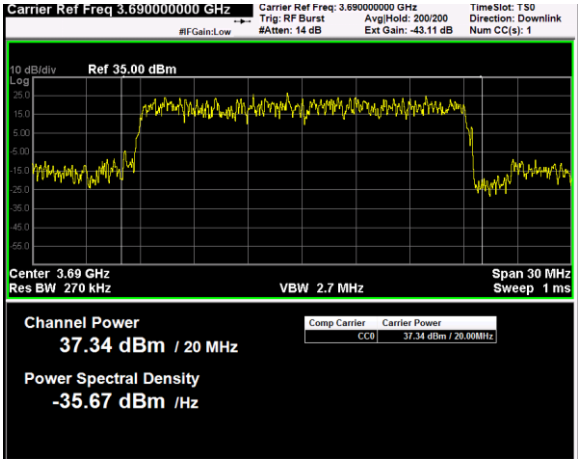
Channel: BOTTOM, Modulation: 256QAM, BW=20MHz, CCDF



Channel: MIDDLE, Modulation: 256QAM, BW=20MHz, Channel Power



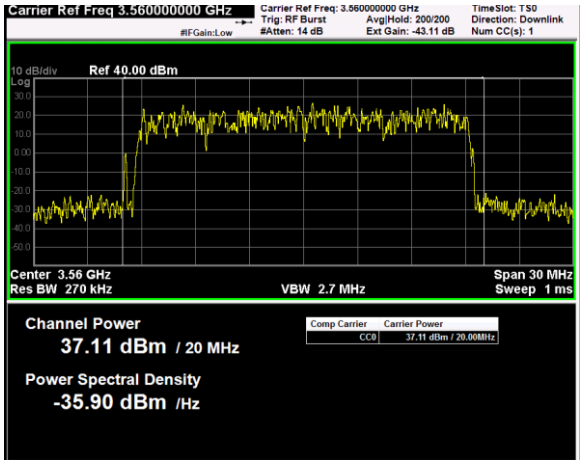
Channel: MIDDLE, Modulation: 256QAM, BW=20MHz, CCDF



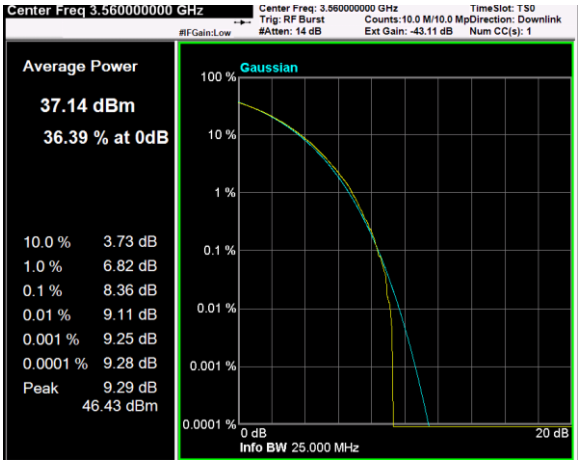
Channel: TOP, Modulation: 256QAM, BW=20MHz, Channel Power

Channel: TOP, Modulation: 256QAM, BW=20MHz, CCDF

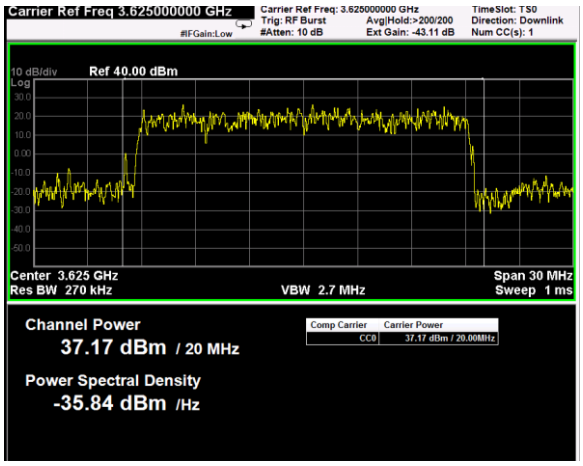
RF PORT 2 PLOT



Channel: BOTTOM, Modulation: QPSK, BW=20MHz, Channel Power

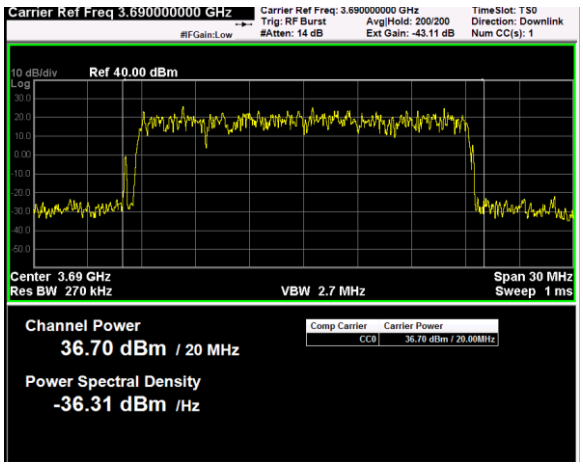


Channel: BOTTOM, Modulation: QPSK, BW=20MHz, CCDF

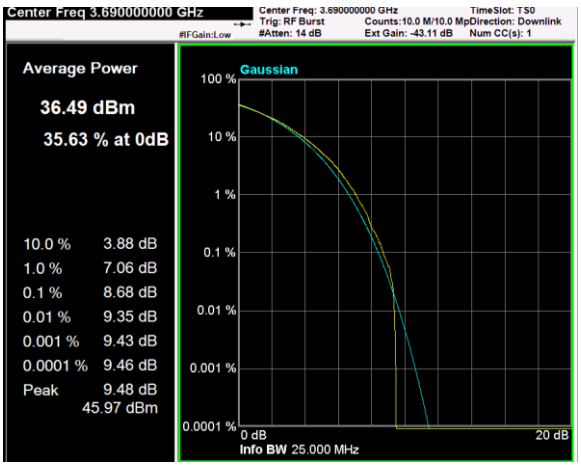


Channel: MIDDLE, Modulation: QPSK, BW=20MHz, Channel Power

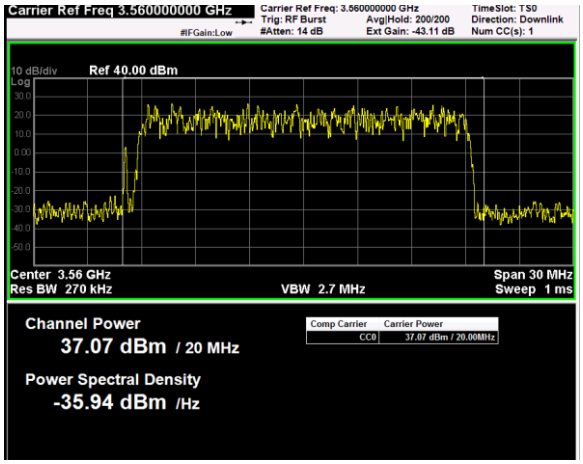
Channel: MIDDLE, Modulation: QPSK, BW=20MHz, CCDF



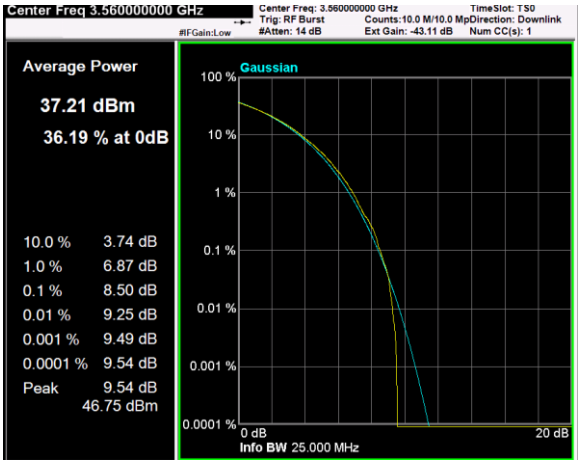
Channel: TOP, Modulation: QPSK, BW=20MHz, Channel Power



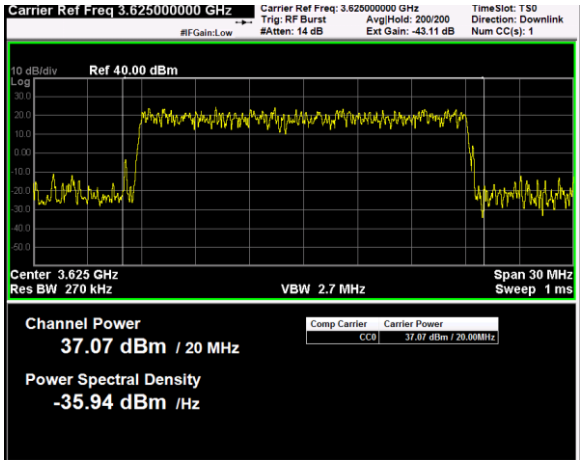
Channel: TOP, Modulation: QPSK, BW=20MHz, CCDF



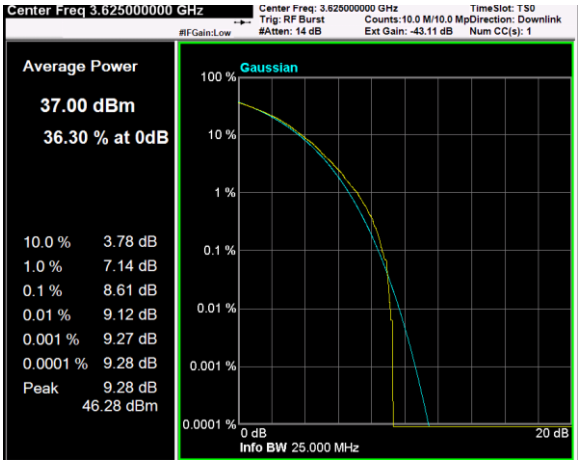
Channel: BOTTOM, Modulation: 16QAM, BW=20MHz, Channel Power



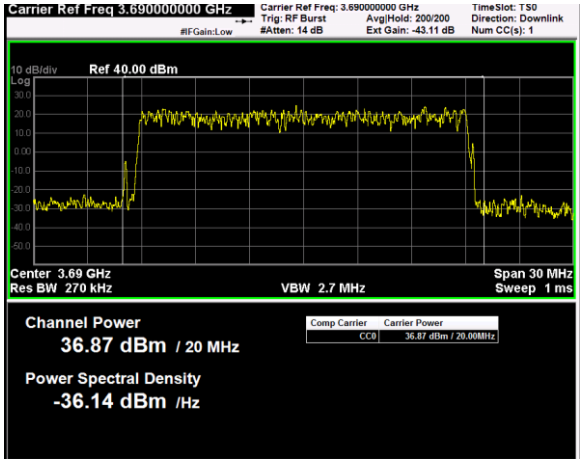
Channel: BOTTOM, Modulation: 16QAM, BW=20MHz, CCDF



Channel: MIDDLE, Modulation: 16QAM, BW=20MHz, Channel Power

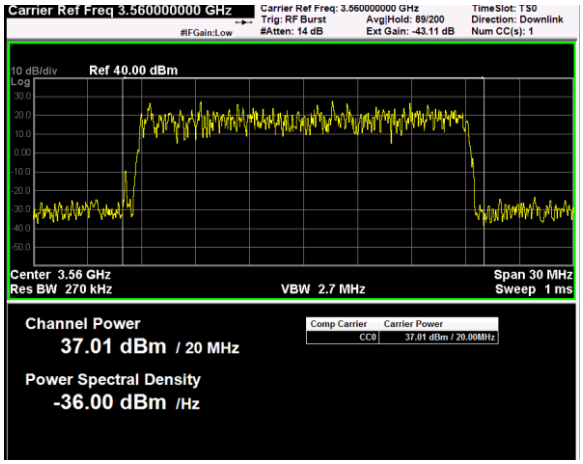


Channel: MIDDLE, Modulation: 16QAM, BW=20MHz, CCDF

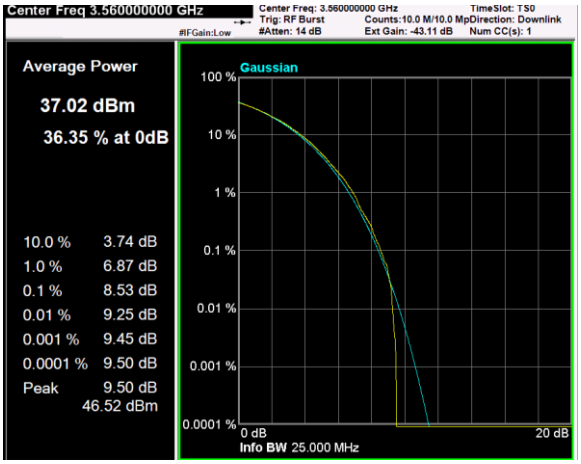


Channel: TOP, Modulation: 16QAM, BW=20MHz, Channel Power

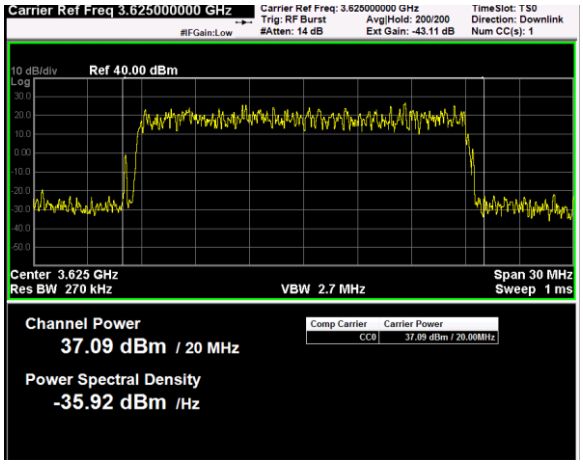
Channel: TOP, Modulation: 16QAM, BW=20MHz, CCDF



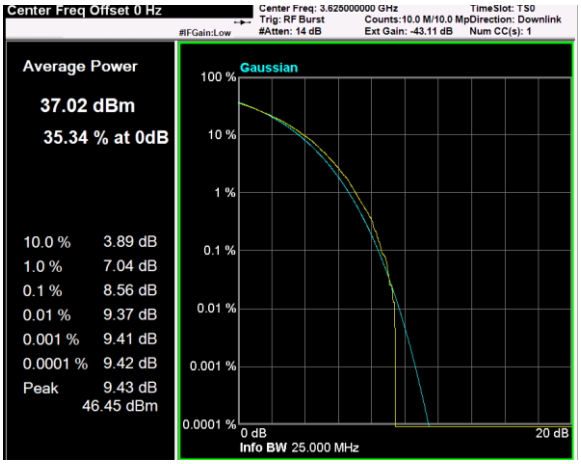
Channel: BOTTOM, Modulation: 64QAM, BW=20MHz, Channel Power



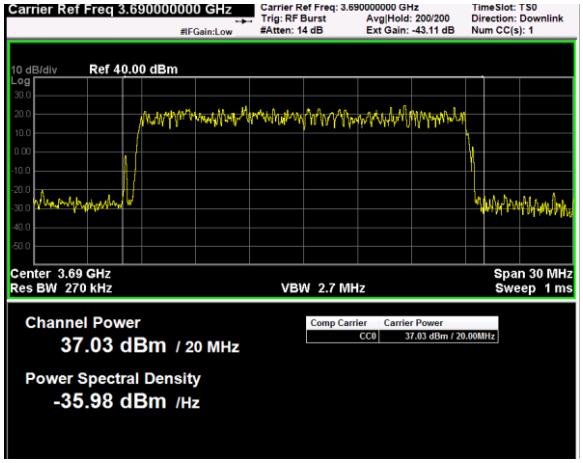
Channel: BOTTOM, Modulation: 64QAM, BW=20MHz, CCDF



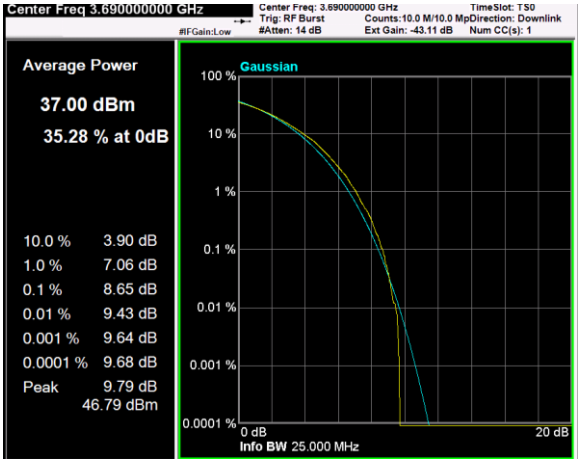
Channel: MIDDLE, Modulation: 64QAM, BW=20MHz, Channel Power



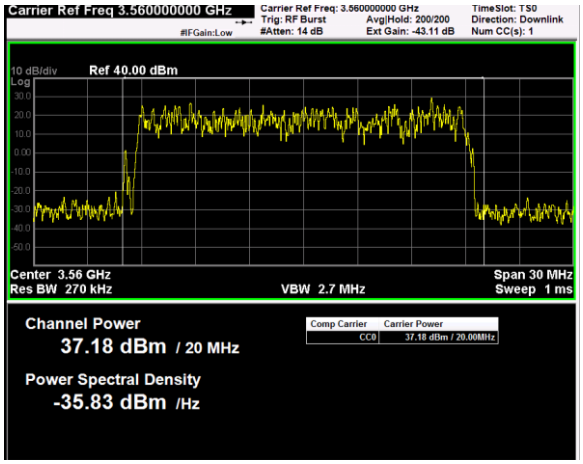
Channel: MIDDLE, Modulation: 64QAM, BW=20MHz, CCDF



Channel: TOP, Modulation: 64QAM, BW=20MHz, Channel Power

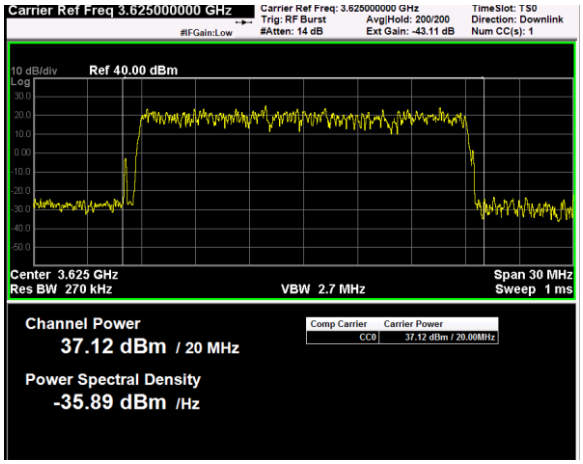


Channel: TOP, Modulation: 64QAM, BW=20MHz, CCDF



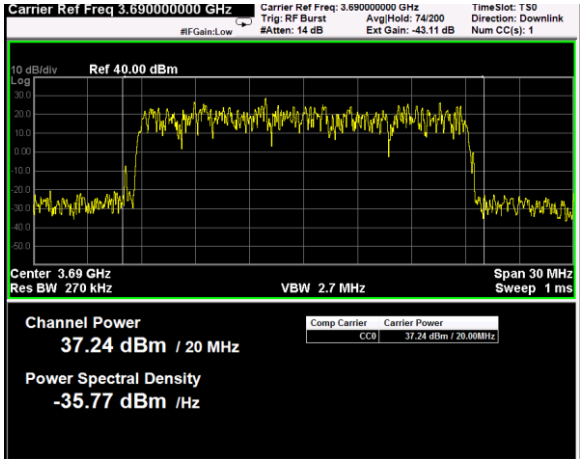
Channel: BOTTOM, Modulation: 256QAM, BW=20MHz, Channel Power

Channel: BOTTOM, Modulation: 256QAM, BW=20MHz, CCDF



Channel: MIDDLE, Modulation: 256QAM, BW=20MHz, Channel Power

Channel: MIDDLE, Modulation: 256QAM, BW=20MHz, CCDF



Channel: TOP, Modulation: 256QAM, BW=20MHz, Channel Power

Channel: TOP, Modulation: 256QAM, BW=20MHz, CCDF

Clause 96.41(e)(1)(2)(3) Spurious emissions at RF antenna connector

(e) *3.5 GHz Emissions and Interference Limits—*

(1) *General protection levels.* Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz
within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed −25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

(2) *Additional protection levels.* Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

(3) *Measurement procedure.* (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and
adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (*i.e.,* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test date: 09/28/2020 to 10/09/2020

Test results: Pass

Special notes

Limit of spurious emission at RF connector has been calculated following the indication in the “662911 D01 Multiple Transmitter Output v02r01” Clause 3) a) iii) with $N_{Ant} = 2$.

$10\text{Log}(N_{Ant}) = 10\text{Log}(2) = 3$ dB
Limit= -40dBm - 3dBm=-43dBm

Note: Spurious emissions at antenna Terminals are performed with “notched carrier”.

Clause 96.41(e)(1)(2)(3) Spurious emissions at RF antenna connector

Test data

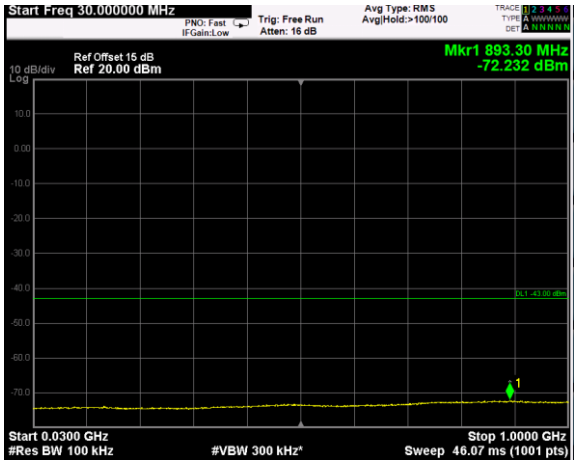
See Plots below

Spurious emissions measurement results:

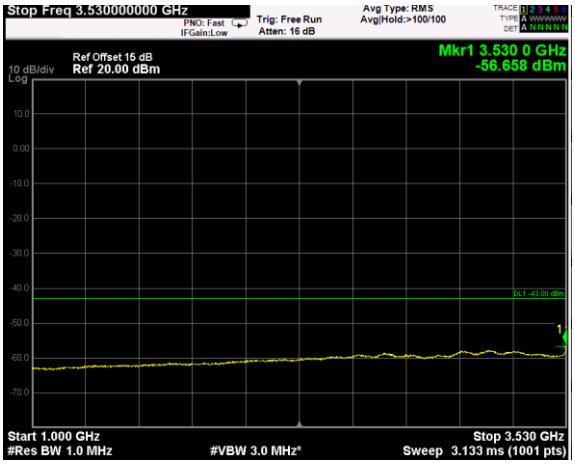
Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
Low channel			
First channel	Negligible	-43	
Mid channel			
3625 MHz	Negligible	-43	
High channel			
Last channel	Negligible	-43	

Test data: Spurious Emissions at antenna terminal

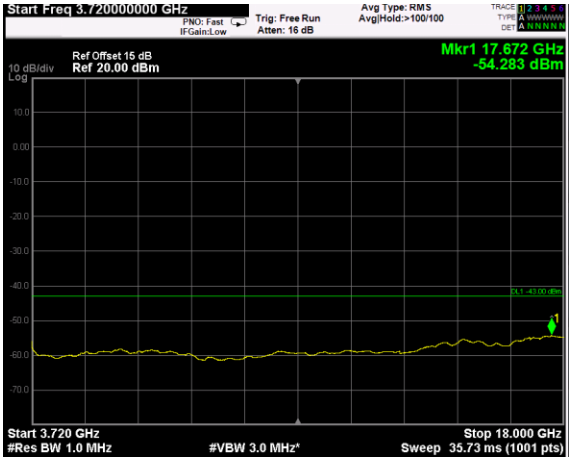
RF PORT 1



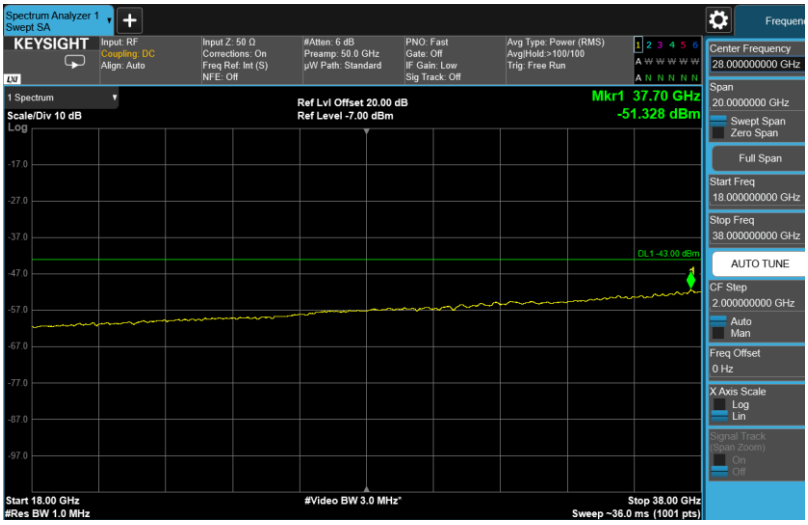
Channel: BOTTOM, Modulation: QPSK, BW=5MHz, Range: 30MHz - 1GHz



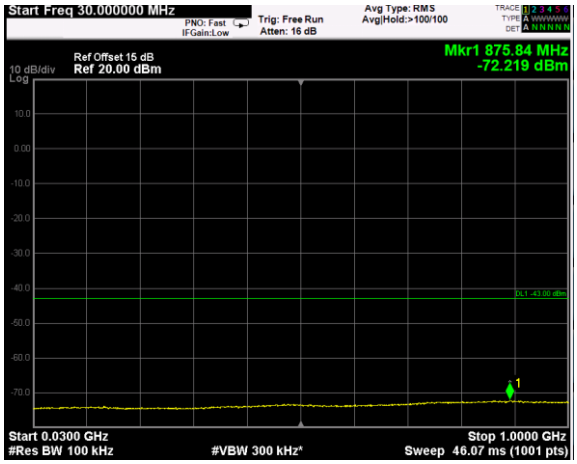
Channel: BOTTOM, Modulation: QPSK, BW=5MHz, Range: 1GHz - 3530MHz



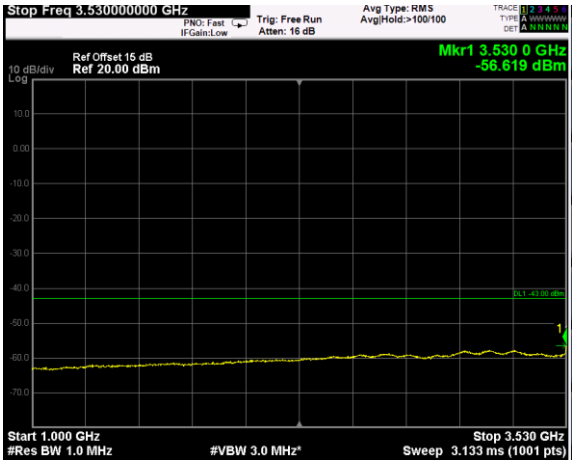
Channel: BOTTOM, Modulation: QPSK, BW=5MHz, Range: 3720MHz - 18GHz



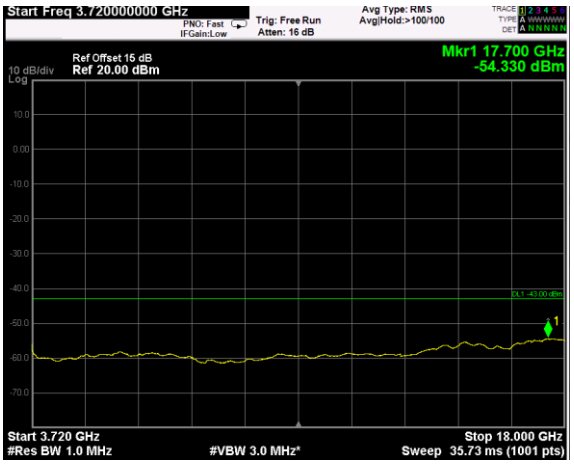
Channel: BOTTOM, Modulation: QPSK, BW=5MHz, Range: 18GHz - 38GHz



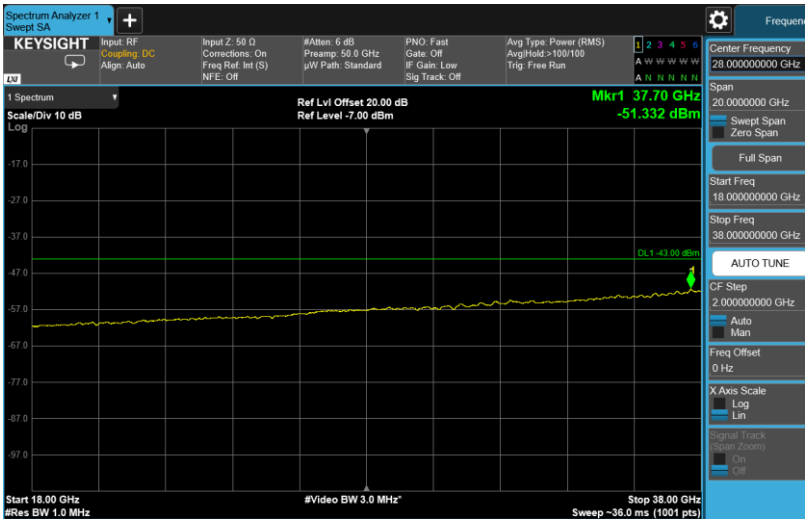
Channel: BOTTOM, Modulation: 16QAM, BW=5MHz, Range: 30MHz - 1GHz



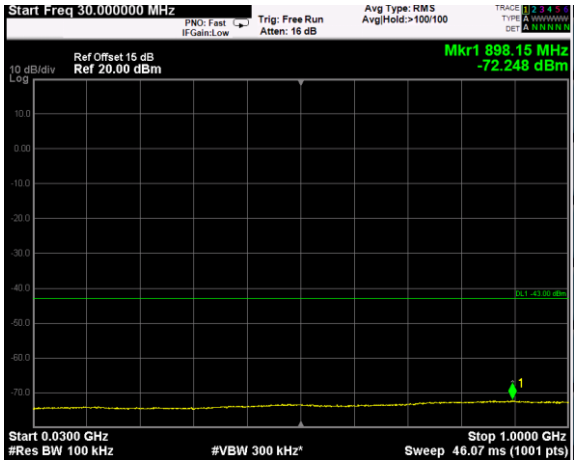
Channel: BOTTOM, Modulation: 16QAM, BW=5MHz, Range: 1GHz - 3530MHz



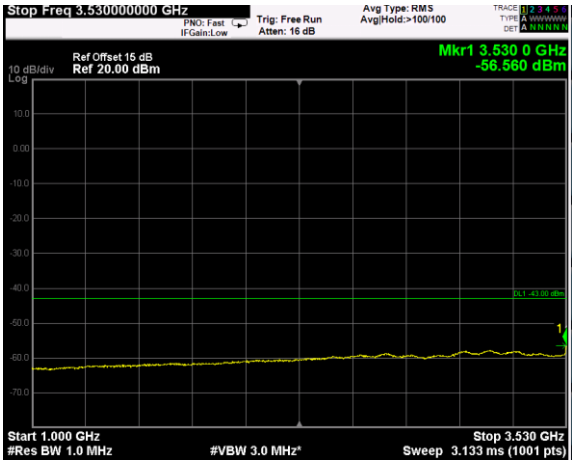
Channel: BOTTOM, Modulation: 16QAM, BW=5MHz, Range: 3720MHz - 18GHz.



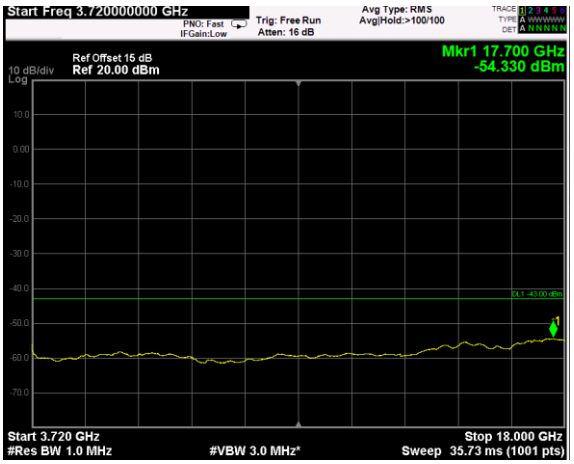
Channel: BOTTOM, Modulation: 16QAM, BW=5MHz, Range: 18GHz - 38GHz



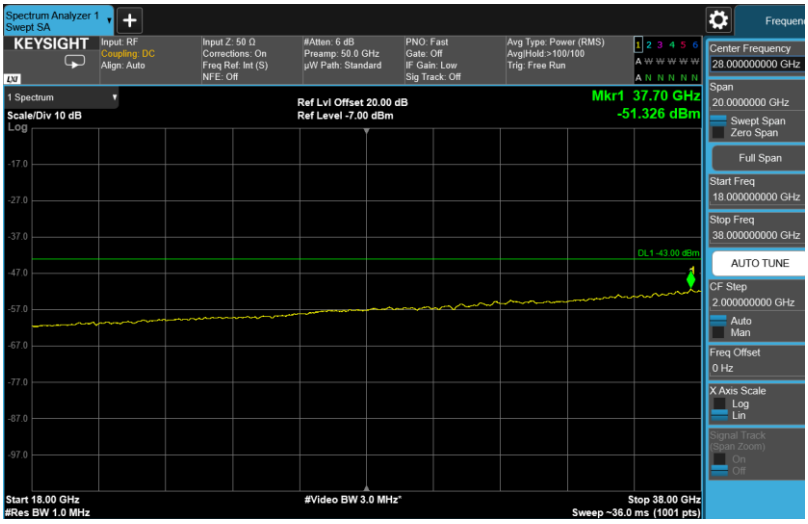
Channel: BOTTOM, Modulation: 64QAM, BW=5MHz, Range: 30MHz - 1GHz



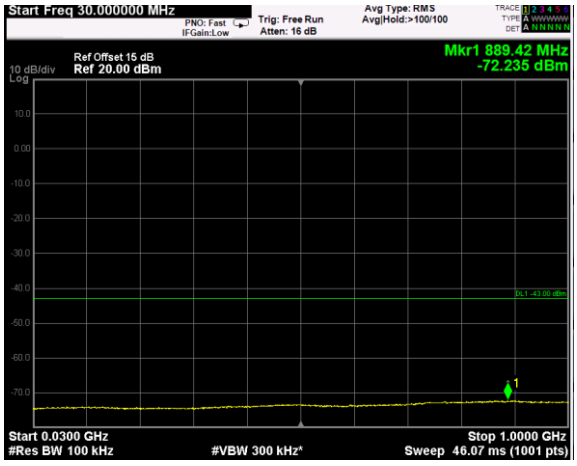
Channel: BOTTOM, Modulation: 64QAM, BW=5MHz, Range: 1GHz - 3530MHz



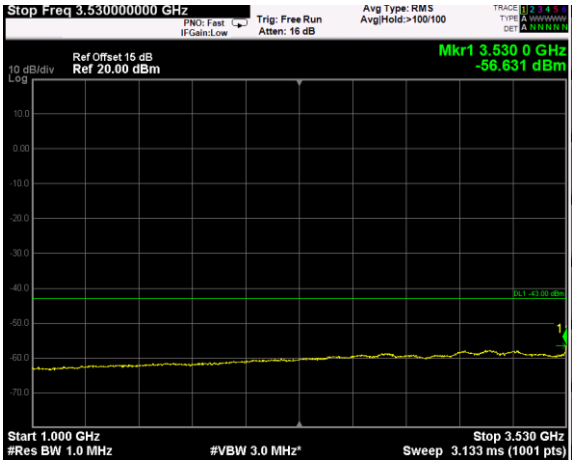
Channel: BOTTOM, Modulation: 64QAM, BW=5MHz, Range: 3720MHz - 18GHz



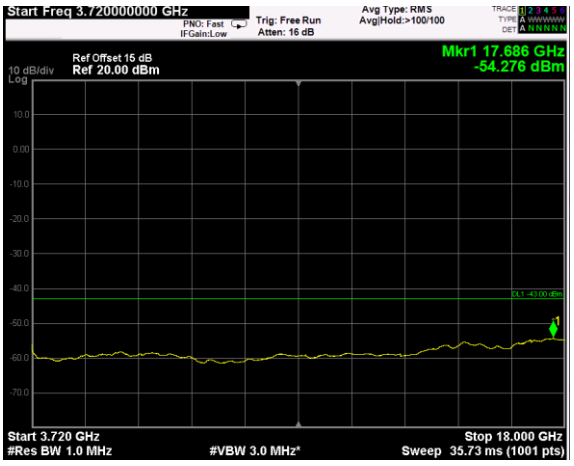
Channel: BOTTOM, Modulation: 64QAM, BW=5MHz, Range: 18GHz - 38GHz



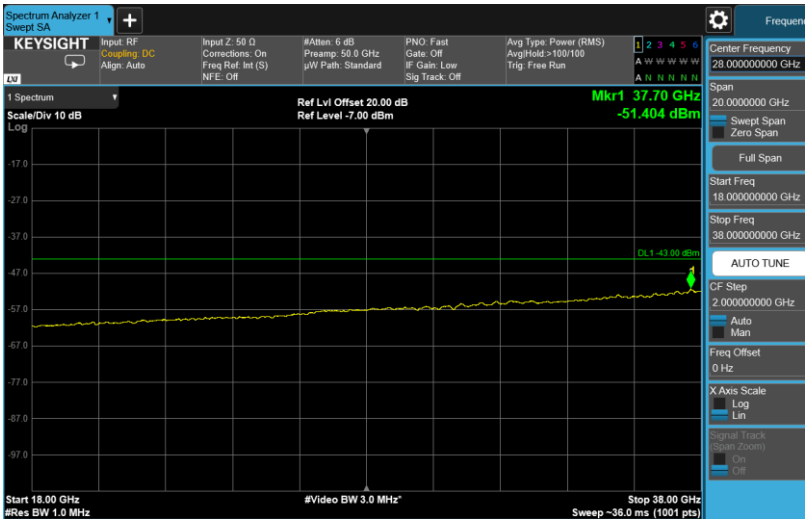
Channel: BOTTOM, Modulation: 256QAM, BW=5MHz, Range: 30MHz - 1GHz



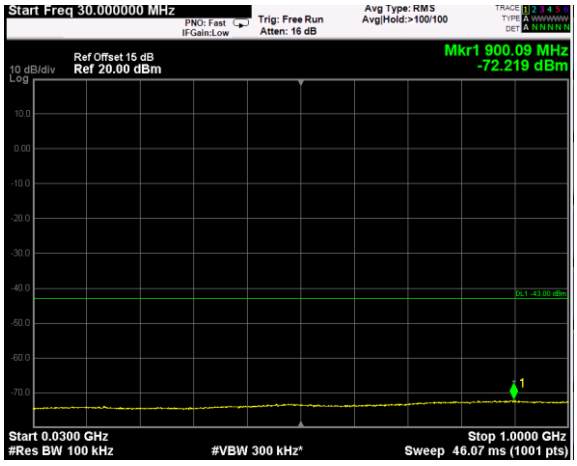
Channel: BOTTOM, Modulation: 256QAM, BW=5MHz, Range: 1GHz - 3530MHz



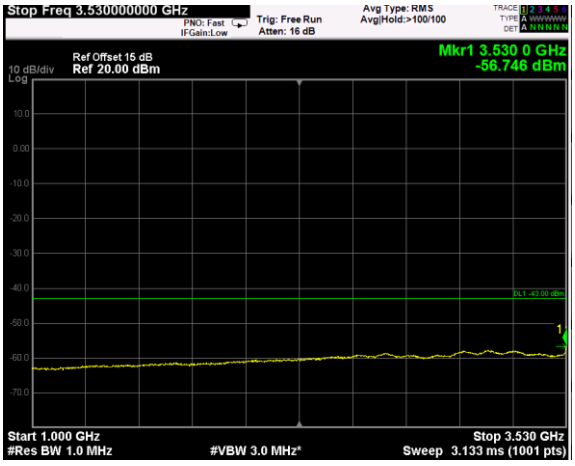
Channel: BOTTOM, Modulation: 256QAM, BW=5MHz, Range: 3720MHz - 18GHz



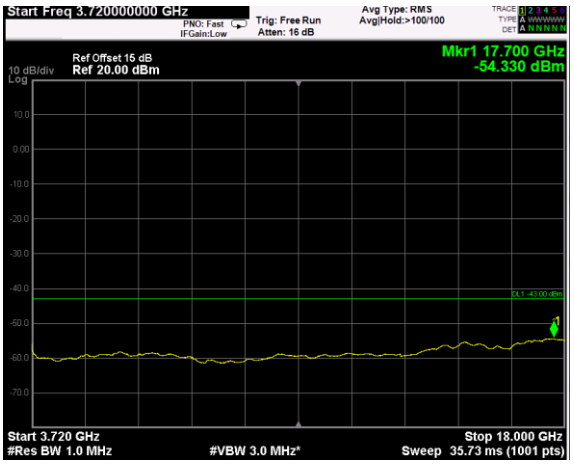
Channel: BOTTOM, Modulation: 256QAM, BW=5MHz, Range: 18GHz - 38GHz



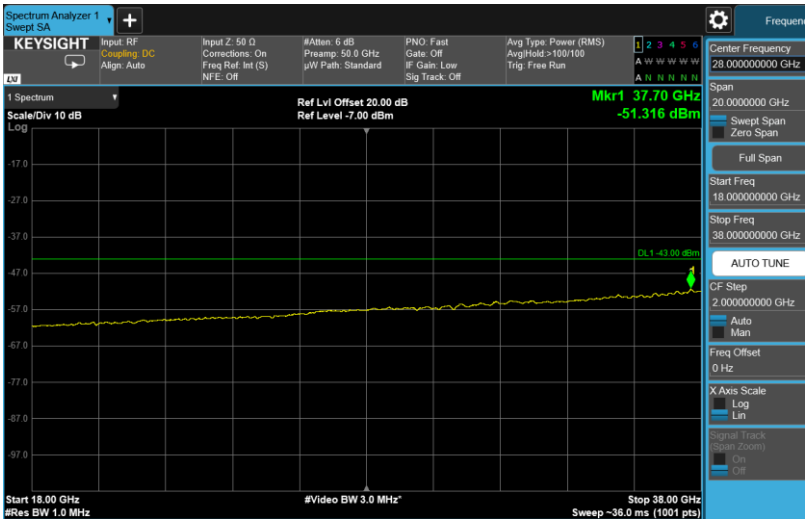
Channel: MIDDLE, Modulation: QPSK, BW=5MHz, Range: 30MHz - 1GHz



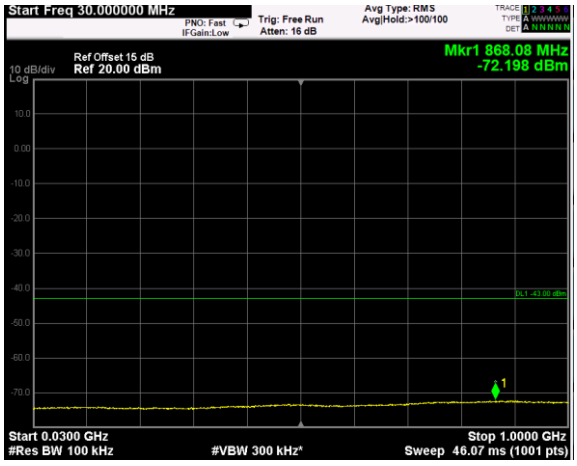
Channel: MIDDLE, Modulation: QPSK, BW=5MHz, Range: 1GHz - 3530MHz



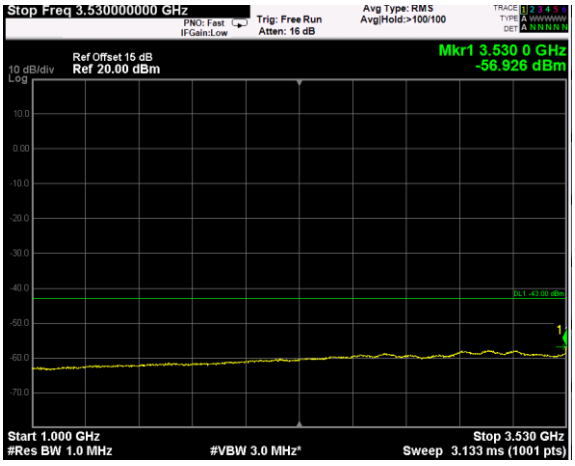
Channel: MIDDLE, Modulation: QPSK, BW=5MHz, Range: 3720MHz - 18GHz



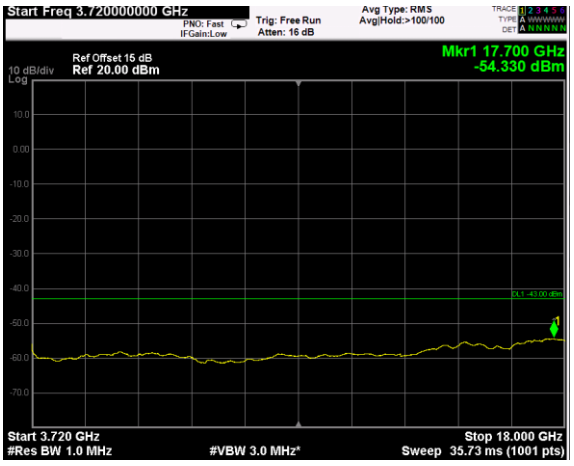
Channel: MIDDLE, Modulation: QPSK, BW=5MHz, Range: 18GHz - 38GHz



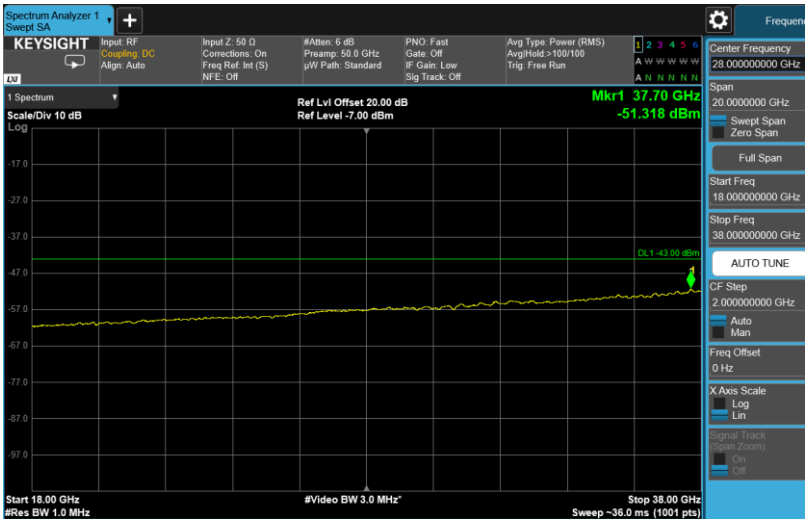
Channel: MIDDLE, Modulation: 16QAM, BW=5MHz, Range: 30MHz - 1GHz



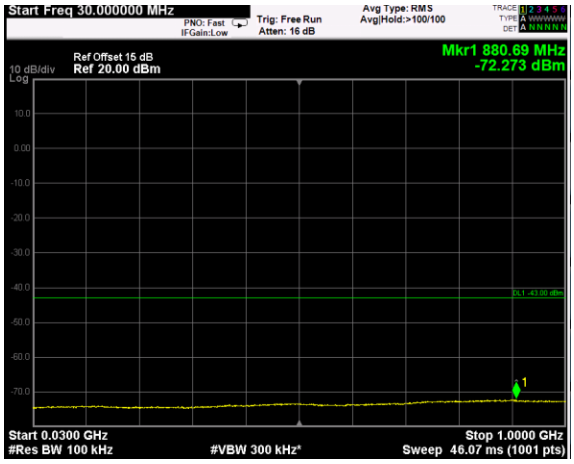
Channel: MIDDLE, Modulation: 16QAM, BW=5MHz, Range: 1GHz - 3530MHz



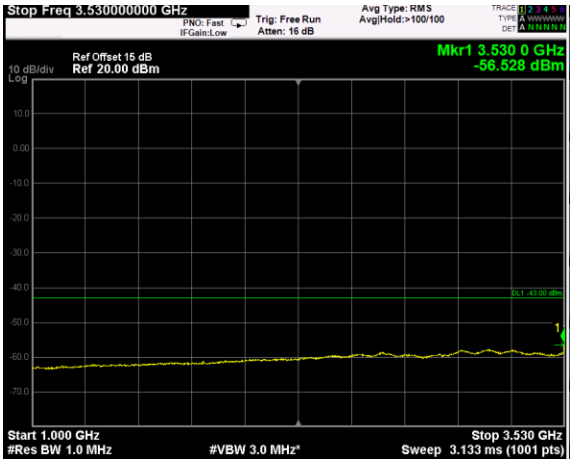
Channel: MIDDLE, Modulation: 16QAM, BW=5MHz, Range: 3720MHz - 18GHz



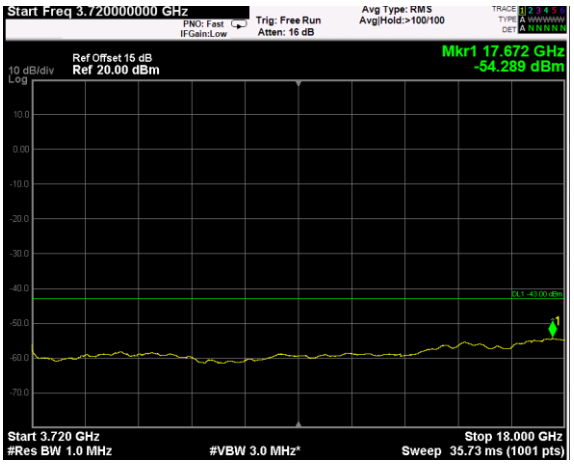
Channel: MIDDLE, Modulation: 16QAM, BW=5MHz, Range: 18GHz - 38GHz



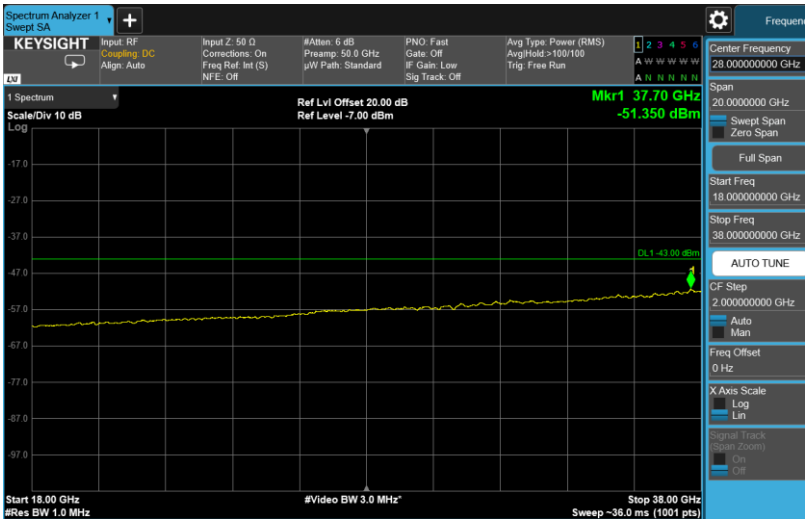
Channel: MIDDLE, Modulation: 64QAM,
BW=5MHz, Range: 30MHz - 1GHz



Channel: MIDDLE, Modulation: 64QAM,
BW=5MHz, Range: 1GHz - 3530MHz



Channel: MIDDLE, Modulation: 64QAM,
BW=5MHz, Range: 3720MHz - 18GHz



Channel: MIDDLE, Modulation: 64QAM,
BW=5MHz, Range: 18GHz - 38GHz