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Ericsson AB

RF TEST REPORT

Report Type:
FCC Part 27 RF report

PRODUCT NAME:
AIR 6488 B41M

REPORT NUMBER:
190601822SHA-001

ISSUE DATE:
June 17, 2019

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 190601822SHA-001

Applicant:	Ericsson AB
	Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden
Manufacturer:	Ericsson AB
	Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden
Manufacturing site:	Ericsson AB
	Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden
FCC ID:	TA8AKRD901155

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
FCC CFR 47 Part 27: MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

PREPARED BY:	**REVIEWED BY:**
Project Engineer	Reviewer
Nemo Li	Daniel Zhao

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TEST REPORT

Content

Revision History

Report No.	Version	Description	Issued Date
190601822SHA-001	Rev. 01	Initial issue of report	June 17, 2019

TEST REPORT

Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Max Output Power and Peak to Average Power Ratio and EIRP	27.50(h) 2.1046	Pass
Occupied Bandwidth	27.53(m) 2.1049	Pass
Unwanted Emissions at Band Edge	27.53(m) 2.1051	Pass
Conducted Unwanted Emission	27.53(m) 2.1051	Pass
Radiated Unwanted Emissions	27.53(m) 2.1053	Pass
Frequency Stability	27.54 2.1055	Pass

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Description:	Remote Radio Unit
Product name:	AIR 6488 B41M
Product number:	KRD 901 155/2, KRD 901 155/21, KRD 901 155/1, KRD 901 155/11 (note)
Serial Number(s)	D828976374
Rating:	-48V DC
Software Version:	NR mode: PIS: CXP2030020/4_R22B20, UP: CXP2010046/5_R21B50 Split mode: PIS: CXP2030020/5_R9B19, UP: CXP2010053/1_R40B38
Hardware Version:	R1B
Sample received date:	June 3, 2019
Date of test:	June 3, 2019 ~ June 14, 2019

Note: The differences between the 4 variants are as below, and others are same.
KRD 901 155/2 (with un-secuity software and RDNB board for testing purpose).
KRD 901 155/21 (with secuity software and RDNB board for testing purpose).
KRD 901 155/1 (with un-secuity software and antenna).
KRD 901 155/11 (with secuity software and antenna).

1.2 Technical Specification

Frequency Range:	2590MHz - 2690MHz
Number of Antenna ports:	64 TX/RX
Supported RAT:	LTE, NR
Supported other mode:	Split mode of LTE (20MHz) and NR (40MHz)
Max RF bandwidth (IBW):	100MHz
Supported Number of Carriers:	LTE: up to 3 carriers NR: 1 carrier
Supported modulation:	LTE: QPSK, 16QAM, 64QAM, 256QAM NR: QPSK, 64QAM, 256QAM
Supported Channel Bandwidth:	NR: 40MHz and 100MHz LTE: 20MHz
Declaration output power:	Maximum 33.98dBm (2.5W) per port for NR 40MHz channel bandwidth Maximum 34.95dBm (3.125W) per port for NR 100MHz channel bandwidth Maximum 34.95dBm (3.125W) per port for LTE 20MHz channel bandwidth
Antenna Gain:	23dBi

1.3 Description of Test Facility

Conducted testing:

Name:	Intertek Testing Services Shanghai
Address 1:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Address 2:	No. 5 Lize East Street, Ericsson Tower, Chaoyang District, Beijing 100102 P.R.C.
Telephone:	+86 21 61278200
Telefax:	+86 21 54262353
The test facility is recognized, certified, or accredited by these organizations:	FCC Accredited Lab Designation Number: CN1175, CN1258
	IC Registration Lab CAB identifier.: CN0051
	A2LA Accreditation Lab Certificate Number: 3309.02, 3309.04

Radiated testing:

Name:	BEIJING BOOMWAVE TEST SERVICE CO. LTD.
Address:	EMC Building, No. 1 Wang Jing East Road Chao Yang District, Beijing, 100102 P.R.C.
Telephone:	+86 10 64711866 806
The test facility is recognized, certified, or accredited by these organizations:	FCC Accredited Lab Designation Number: CN1242
	IC Registration Lab CAB identifier.: CN0010
	A2LA Accreditation Lab Certificate Number: 4992.01

2 TEST SPECIFICATIONS

2.1 Related documents

FCC Part 27 (2018)
FCC Part 2 (2018)
ANSI C63.26:2015
KDB 971168 D01 v03r01
KDB 662911 D01 v02r01

2.2 Product Information

The Equipment Under Test (EUT) AIR 6488 B41M is an Ericsson Radio Unit working in the broadband radio service 2590-2690 MHz band which provides communication connections to 2590-2690 MHz network. The AIR 6488 B41M operates from a -48V DC supply.

The EUT includes 64 TX/RX ports. It can operate in single RAT NR and it can also operate in a split mode of LTE and NR whereby 32 ports can be assigned to LTE and 32 ports to NR. It can be configured to transmit in MIMO mode, and MIMO mode was used for measurements as the worst configuration. The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.
A full technical description can be found in the Manufacturer's documentation.

2.3 Configuration Description

The following settings were used to represent all traffic scenarios. The output power was measured on the bottom, middle and top channel of all applicable antenna ports. By measuring the output power of QPSK, 64QAM and 256QAM for NR on one of the antenna ports, it was determined that 256QAM was the worst case modulation scheme and was used for all testing. By measuring the output power of QPSK, 16QAM, 64QAM and 256QAM for LTE on one of the antenna ports, it was determined that 16QAM was the worst case modulation scheme and was used for all testing.

Complete testing was carried out on the worst case antenna port which was established as being the highest output power from the 64 measured ports (32 ports for LTE in split mode) on worst case modulation scheme. This antenna port was No.32 for LTE in split mode, No.20 for single RAT NR 40MHz and NR 100MHz channel bandwidths. In split mode, carriers cannot be placed on the same frequency. The power level from each port in split mode is identical to that in single RAT mode NR or LTE. The output power of NR carrier in split mode is deemed to have been covered by testing NR single RAT mode as this represents the highest output power with all 64 ports measured and summed in accordance with FCC KDB 662911.

The settings below were used for all measurements unless otherwise noted:

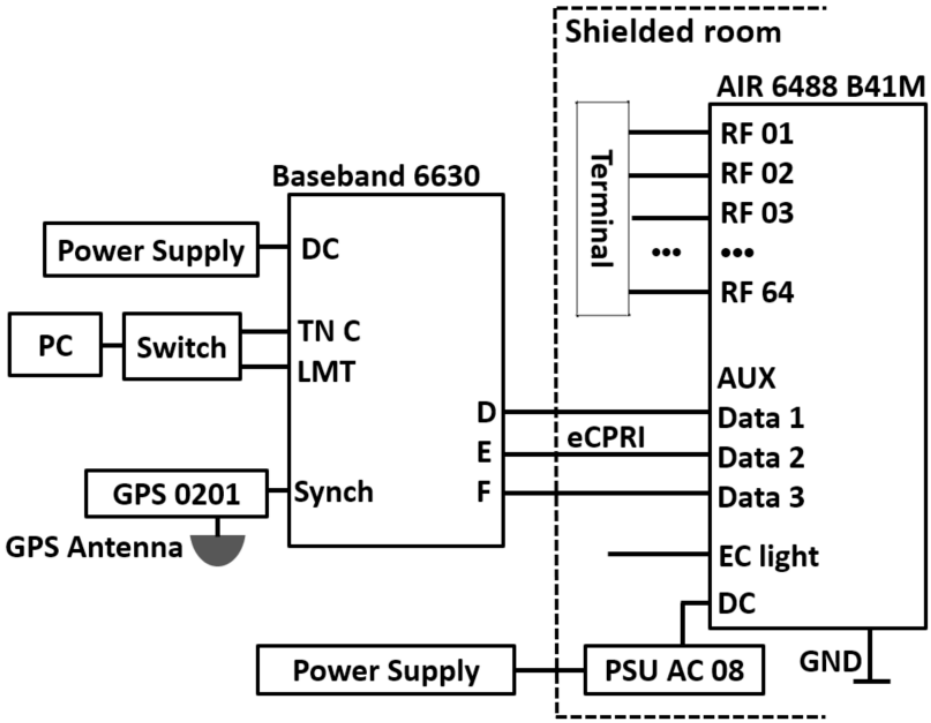
Configuration	Carrier	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NR-MIMO-1C-40	1C	40MHz	2610	2640	2670
NR-MIMO-1C-100	1C	100MHz	-	2640	-
NR-MIMO-1C-BE-40	1C	40MHz	2610	-	2670
NR-MIMO-1C-BE-100	1C	100MHz	-	2640	-

Configuration	Carrier	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
LTE+NR-MIMO-MC-1	1LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2670(NR)	2640(L)+2670(NR)	2680(L)+2610(NR)
LTE+NR-MIMO-MC-2	2LTE+1NR	LTE:20MHz NR:40MHz	-	-	2660(L)+2680(L)+2610(NR)
LTE+NR-MIMO-MC-3	3LTE+1NR	LTE:20MHz NR:40MHz	-	-	2640(L)+2660(L)+2680(L)+2610(NR)
LTE+NR-MIMO-MC-4-BE	1LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2630.01(NR)	-	2680(L)+2650.02(NR)
LTE+NR-MIMO-MC-5-BE	2LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2620(L)+2650.02(NR)	-	2660(L)+2680(L)+2630.01(NR)
LTE+NR-MIMO-MC-6-BE	3LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2620(L)+2640(L)+2670(NR)	-	2640(L)+2660(L)+2680(L)+2610(NR)
LTE+NR-MIMO-MC-4-UE	1LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2630.01(NR)	2640(L)+2610(NR)	2680(L)+2650.02(NR)
LTE+NR-MIMO-MC-5-UE	2LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2620(L)+2650.02(NR)	2640(L)+2660(L)+2610(NR)	2660(L)+2680(L)+2630.01(NR)
LTE+NR-MIMO-MC-6-UE	3LTE+1NR	LTE:20MHz NR:40MHz	2600(L)+2620(L)+2640(L)+2670(NR)	-	2640(L)+2660(L)+2680(L)+2610(NR)

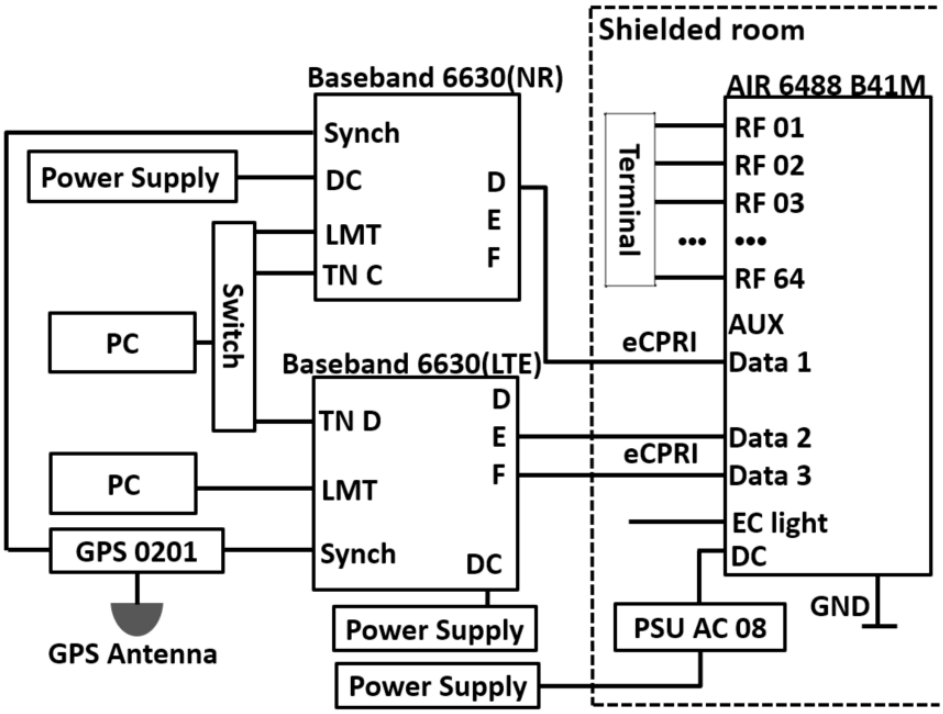
2.4 Test Setup

Conducted Measurement:

NR mode:



Split mode:



No.	Auxiliary Equipment	Product Number / Model Type	Version
1	Test computer	PowerEdge 220	-
2	Baseband 6630	KDU 137 848/1	R2C
3	Power supply	N8737A	-
4	Power supply	N5768A	-
5	PSU	AC 08	-
6	Terminator	SMAF10-6G-M	-

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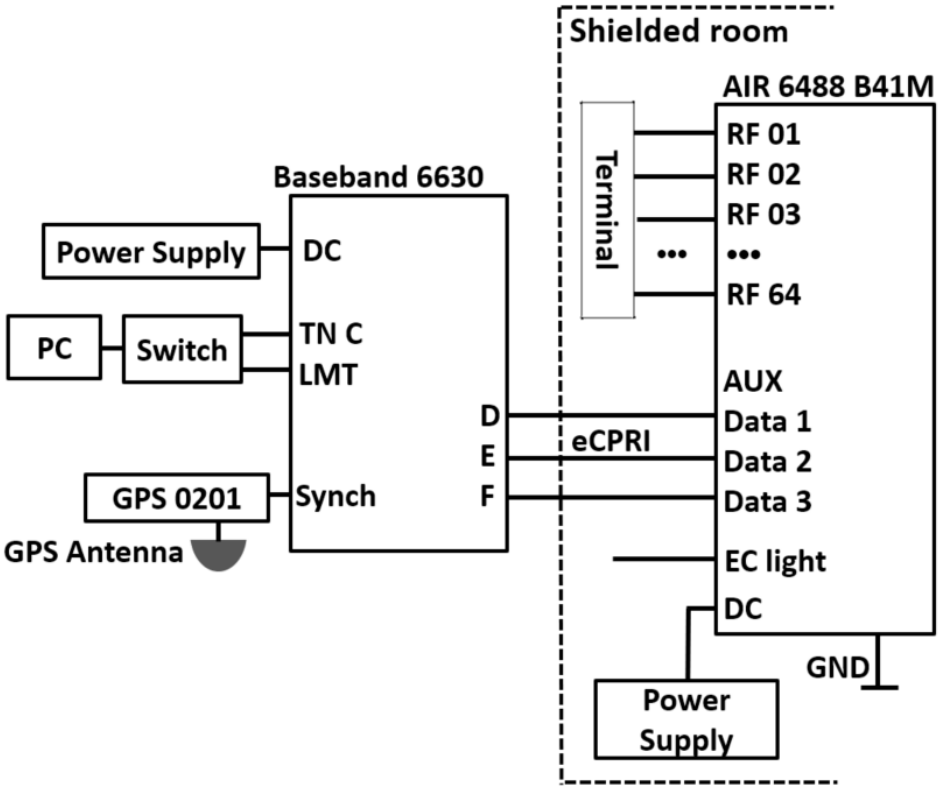
Radiated Measurement:

NR mode:



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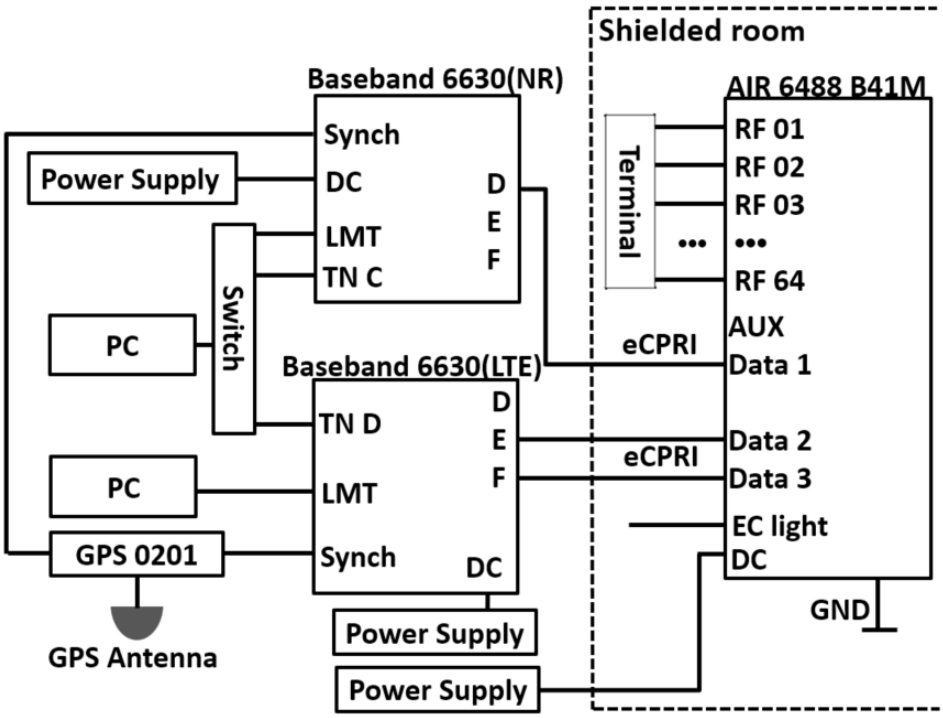
Split mode:



No.	Auxiliary Equipment	Product Number / Model Type	Version
1	Test computer	PowerEdge 220	-
2	Baseband 6630	KDU 137 848/1	R2C
3	Power supply unit	PCR2000M	-
4	Power supply	N5768A	-
5	Terminator	SMAF10-6G-M	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Max Output Power and Peak to Average Power Ratio and EIRP	22°C	54% RH
Occupied Bandwidth		
Unwanted Emissions at Band Edge		
Conducted Unwanted Emission		
Radiated Unwanted Emissions	22°C	56% RH
Frequency Stability	Please refer to clause 8	

2.6 Instrument list

Intertek Testing Services Shanghai					
Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Test Receiver	R&S	ESCS 30	EC 2107	2019-07-15
☐	A.M.N.	R&S	ESH2-Z5	EC 3119	2019-11-30
☐	A.M.N.	R&S	ENV 216	EC 3393	2019-07-04
☐	A.M.N.	R&S	ENV4200	EC 3558	2020-06-10
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Test Receiver	R&S	ESIB 26	EC 3045	2019-09-12
☐	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2020-06-10
☐	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2020-06-10
☐	Horn antenna	R&S	HF 906	EC 3049	2019-11-17
☐	Horn antenna	ETS	3117	EC 4792-1	2020-01-09
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
☐	Horn antenna	ETS-LINDGREN	3116C-PA	EC 5955	2020-01-28
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2020-03-07
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2020-03-05
☒	PXA Signal Analyzer	Keysight	N9030A	EC 1046	2019-11-15
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2020-03-05
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2020-03-05
☐	Spectrum analyzer	R&S	CMW500	EC5944	2019-12-22
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2020-03-05
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2020-01-08
☐	Test Receiver	R&S	ESCI 7	EC 4501	2019-09-12
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Shielded room	Zhongyu	-	EC 2838	2020-01-14
☐	Shielded room	Zhongyu	-	EC 2839	2020-01-14
☐	Semi-anechoic chamber	Albatross project	-	EC 3048	2019-07-31
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2019-07-31
☒	Climatic chamber	-	CEEC-WR16H-50W	EC 1052	2020-01-18

Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2020-02-28
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 2122	2020-03-11
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2020-01-18
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2020-03-28
☒	Humiture meter	-	TPJ-20	EC 1053	2020-01-14
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2019-07-01

BEIJING BOOMWAVE TEST SERVICE CO. LTD.					
Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Test Receiver	R&S	ESR26	101320	2019-12-28
☐	A.M.N.	R&S	ENV216	102328	2020-12-26
☐	A.M.N.	R&S	ENV4200	100401	2020-02-17
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB26	100158	2019-12-28
☒	Spectrum Analyzer	R&S	FSV40	101403	2020-01-01
☒	Horn Antenna	R&S	HF907	100096	2020-03-26
☒	Horn Antenna	SCHWARZBECK	BBHA9170	797	2019-10-19
☒	Hybrid antenna	SCHAFFNER	CBL6112B	2873	2019-08-23
☒	Pre-amplifier	R&S	SCU40	2046336	2020-03-26
☒	Pre-amplifier	R&S	SCU18	2046333	2020-03-26
☒	Pre-amplifier	R&S	SCU08	2017947	2020-03-26
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	TDK	F1SR	-	2020-04-20
☒	Semi-anechoic chamber	TDK	B1SAC	-	2022-12-24
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Tempreture and Humidity Recorder	YM3	TM320	015081	2020-04-23
☒	Tempreture and Humidity Recorder	YM3	TM320	015082	2020-04-23

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum output power	0.73dB
Occupied Bandwidth	0.88%
Unwanted Emissions at Band Edge	3.03dB
Conducted Unwanted Emission	3.03dB
Radiated Unwanted Emissions below 1GHz	4.90dB
Radiated Unwanted Emissions above 1GHz	5.02dB
Frequency stability	0.77×10^{-7}

3 Maximum Output Power and Peak to Average Power Ratio and EIRP

Test result: Pass

3.1 Limit

Output Power:

EIRP ≤ 33 dBW + 10log(X/Y) dBW + 10 log(360/Beamwidth) dBW

X = 20MHz or 40MHz channel bandwidth

Y = 5.5 or 6 MHz

Beamwidth = 12°

Peak to Average Ratio: ≤13 dB

3.2 Measurement Procedure

The EUT was configured to transmit on maximum power and proper modulation. The transmitter power shall be measured in terms of a root-mean-square (RMS) average value. In case of the EUT was configured to MIMO mode, since the EUT transmits on all antennas simultaneously in the same frequency range, using the Measure-and-Sum approach, the output power at all antennas were tested, and the total output power were then summed mathematically in linear power units according to FCC KDB 662911 D01.

A peak to average ratio measurement is performed at the conducted ports of the EUT for single carrier for single RAT mode. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) was used and 0.1% probability value recorded.

Two polarizations are generated for the beam. In single RAT mode, 32 ports are used to create each polarization. The antenna gain for each polarization is declared as 23 dBi, therefore the EIRP for each polarization is calculated as the sum of the power over 32 ports plus the antenna gain. In split mode, 16 ports are used to create each polarization. The antenna gain for each polarization is declared as 20 dBi, therefore the EIRP for each polarization is calculated as the sum of the power over 16 ports plus the antenna gain. This calculation is applied for each polarization and then each polarization EIRP is summed to calculate the overall EIRP.

3.3 Measurement result

Configuration NR-MIMO-1C-40
Maximum Output Power 33.98dBm per port for NR.

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)					
			Channel position B		Channel position M		Channel position T	
			Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)
0	256QAM	40	33.45	9.70	33.70	9.98	33.45	9.60
1	256QAM	40	33.45	9.84	33.70	9.99	33.47	9.68
2	256QAM	40	33.53	9.85	33.70	9.95	33.45	9.82
3	256QAM	40	33.45	9.98	33.63	10.10	33.43	9.91
4	256QAM	40	33.45	9.82	33.60	10.21	33.51	9.86
5	256QAM	40	33.44	9.31	33.65	9.92	33.62	9.80
6	256QAM	40	33.48	9.79	33.63	9.81	33.50	9.71
7	256QAM	40	33.47	9.85	33.63	9.93	33.45	9.73
8	256QAM	40	33.55	9.65	33.73	9.85	33.57	10.03
9	256QAM	40	33.51	9.67	33.63	9.90	33.59	9.74
10	256QAM	40	33.57	9.78	33.61	10.00	33.52	9.93
11	256QAM	40	33.50	9.81	33.68	9.64	33.57	9.90
12	256QAM	40	33.52	9.84	33.64	9.68	33.52	9.89
13	256QAM	40	33.48	9.89	33.65	9.81	33.49	9.93
14	256QAM	40	33.38	9.76	33.54	9.42	33.39	9.64
15	256QAM	40	33.35	9.95	33.57	9.64	33.40	9.73
16	256QAM	40	33.58	9.66	33.61	9.52	33.49	9.64
17	256QAM	40	33.63	10.01	33.49	9.59	33.48	9.76
18	256QAM	40	33.47	9.89	33.64	10.11	33.56	9.84
19	256QAM	40	33.44	9.73	33.58	9.64	33.45	9.78
20	256QAM	40	33.73	9.65	33.91	9.84	33.74	9.88
21	256QAM	40	33.40	9.94	33.72	9.50	33.59	10.08
22	256QAM	40	33.54	9.73	33.75	9.43	33.59	9.66
23	256QAM	40	33.56	9.95	33.78	10.02	33.60	10.03
24	256QAM	40	33.43	9.51	33.56	9.87	33.41	9.85
25	256QAM	40	33.45	9.55	33.52	9.73	33.47	9.81
26	256QAM	40	33.41	9.86	33.55	10.00	33.39	9.96
27	256QAM	40	33.30	9.86	33.48	9.42	33.33	10.02
28	256QAM	40	33.53	9.99	33.65	9.72	33.59	9.92
29	256QAM	40	33.55	9.81	33.81	9.47	33.58	9.93
30	256QAM	40	33.55	9.62	33.66	9.95	33.56	9.62
31	256QAM	40	33.50	10.04	33.65	10.13	33.54	10.00
Total power 0-31			48.54	-	48.70	-	48.56	-
Total power 0-31 + 23dBi			71.54	-	71.70	-	71.56	-
32	256QAM	40	33.58	9.77	33.70	9.99	33.59	9.91
33	256QAM	40	33.53	9.77	33.68	9.50	33.58	9.86
34	256QAM	40	33.45	9.91	33.63	9.93	33.49	10.03
35	256QAM	40	33.50	9.66	33.59	9.88	33.45	9.81

36	256QAM	40	33.40	9.78	33.64	9.51	33.47	9.83
37	256QAM	40	33.64	9.88	33.70	10.06	33.30	9.80
38	256QAM	40	33.54	9.92	33.68	9.43	33.54	9.85
39	256QAM	40	33.52	9.89	33.62	10.09	33.55	9.79
40	256QAM	40	33.34	9.77	33.60	9.88	33.49	9.94
41	256QAM	40	33.28	9.82	33.57	10.03	33.48	9.83
42	256QAM	40	33.51	9.82	33.61	9.76	33.47	9.99
43	256QAM	40	33.52	9.96	33.55	9.97	33.41	9.95
44	256QAM	40	33.59	9.52	33.73	9.48	33.56	9.95
45	256QAM	40	33.60	9.78	33.75	9.95	33.55	10.05
46	256QAM	40	33.52	9.76	33.66	9.68	33.54	9.97
47	256QAM	40	33.53	9.92	33.70	9.70	33.57	9.90
48	256QAM	40	33.52	9.98	33.59	9.96	33.42	9.88
49	256QAM	40	33.47	9.48	33.65	9.75	33.43	10.18
50	256QAM	40	33.49	9.88	33.62	9.86	33.47	10.12
51	256QAM	40	33.54	9.84	33.62	10.06	33.46	9.83
52	256QAM	40	33.62	10.04	33.67	9.59	33.49	9.82
53	256QAM	40	33.60	9.82	33.73	9.40	33.60	9.79
54	256QAM	40	33.43	9.96	33.66	9.76	33.49	9.85
55	256QAM	40	33.51	9.89	33.59	10.07	33.54	9.97
56	256QAM	40	33.55	10.03	33.68	9.89	33.59	9.88
57	256QAM	40	33.52	9.85	33.66	9.91	33.52	10.04
58	256QAM	40	33.57	10.09	33.67	9.69	33.47	9.79
59	256QAM	40	33.44	9.65	33.58	9.98	33.46	9.85
60	256QAM	40	33.49	9.93	33.66	9.99	33.54	9.79
61	256QAM	40	33.44	9.79	33.67	9.58	33.53	9.96
62	256QAM	40	33.46	10.01	33.62	9.86	33.49	10.01
63	256QAM	40	33.49	9.95	33.60	9.95	33.44	9.97
Total power 32-63			48.56	-	48.70	-	48.55	-
Total power 32-63 + 23dBi			71.56	-	71.70	-	71.55	-
EIRP			74.56	-	74.71	-	74.57	-

Configuration NR-MIMO-1C-100

Maximum Output Power 34.95dBm per port for NR.

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)					
			Channel position B		Channel position M		Channel position T	
			Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)
0	256QAM	100	-	-	34.36	9.56	-	-
1	256QAM	100	-	-	34.41	9.82	-	-
2	256QAM	100	-	-	34.47	9.59	-	-
3	256QAM	100	-	-	34.43	9.64	-	-
4	256QAM	100	-	-	34.46	9.53	-	-
5	256QAM	100	-	-	34.53	9.44	-	-
6	256QAM	100	-	-	34.46	9.71	-	-
7	256QAM	100	-	-	34.37	9.54	-	-

8	256QAM	100	-	-	34.52	9.57	-	-
9	256QAM	100	-	-	34.48	9.78	-	-
10	256QAM	100	-	-	34.36	10.22	-	-
11	256QAM	100	-	-	34.45	9.55	-	-
12	256QAM	100	-	-	34.42	9.56	-	-
13	256QAM	100	-	-	34.44	9.60	-	-
14	256QAM	100	-	-	34.34	9.53	-	-
15	256QAM	100	-	-	34.34	9.95	-	-
16	256QAM	100	-	-	34.34	9.56	-	-
17	256QAM	100	-	-	34.30	9.53	-	-
18	256QAM	100	-	-	34.40	9.49	-	-
19	256QAM	100	-	-	34.37	9.34	-	-
20	256QAM	100	-	-	34.71	9.57	-	-
21	256QAM	100	-	-	34.52	9.56	-	-
22	256QAM	100	-	-	34.54	9.43	-	-
23	256QAM	100	-	-	34.55	9.43	-	-
24	256QAM	100	-	-	34.25	9.80	-	-
25	256QAM	100	-	-	34.33	9.70	-	-
26	256QAM	100	-	-	34.26	9.62	-	-
27	256QAM	100	-	-	34.18	9.66	-	-
28	256QAM	100	-	-	34.41	9.51	-	-
29	256QAM	100	-	-	34.53	9.59	-	-
30	256QAM	100	-	-	34.39	9.60	-	-
31	256QAM	100	-	-	34.37	9.80	-	-
Total power 0-31			-	-	49.47	-	-	-
Total power 0-31 + 23dBi			-	-	72.47	-	-	-
32	256QAM	100	-	-	34.40	9.45	-	-
33	256QAM	100	-	-	34.46	9.64	-	-
34	256QAM	100	-	-	34.37	9.44	-	-
35	256QAM	100	-	-	34.30	9.45	-	-
36	256QAM	100	-	-	34.40	9.55	-	-
37	256QAM	100	-	-	34.44	9.56	-	-
38	256QAM	100	-	-	34.45	9.67	-	-
39	256QAM	100	-	-	34.38	9.71	-	-
40	256QAM	100	-	-	34.33	9.42	-	-
41	256QAM	100	-	-	34.30	9.54	-	-
42	256QAM	100	-	-	34.40	9.25	-	-
43	256QAM	100	-	-	34.29	9.59	-	-
44	256QAM	100	-	-	34.44	9.56	-	-
45	256QAM	100	-	-	34.47	9.60	-	-
46	256QAM	100	-	-	34.45	9.57	-	-
47	256QAM	100	-	-	34.44	9.53	-	-
48	256QAM	100	-	-	34.40	9.33	-	-
49	256QAM	100	-	-	34.29	9.50	-	-
50	256QAM	100	-	-	34.35	9.58	-	-
51	256QAM	100	-	-	34.37	9.58	-	-
52	256QAM	100	-	-	34.42	9.53	-	-

53	256QAM	100	-	-	34.50	9.72	-	-
54	256QAM	100	-	-	34.41	9.64	-	-
55	256QAM	100	-	-	34.41	9.71	-	-
56	256QAM	100	-	-	34.45	9.69	-	-
57	256QAM	100	-	-	34.47	9.70	-	-
58	256QAM	100	-	-	34.43	9.57	-	-
59	256QAM	100	-	-	34.31	9.63	-	-
60	256QAM	100	-	-	34.41	9.62	-	-
61	256QAM	100	-	-	34.44	9.79	-	-
62	256QAM	100	-	-	34.33	9.59	-	-
63	256QAM	100	-	-	34.36	9.54	-	-
Total power 32-63			-	-	49.45	-	-	-
Total power 32-63 + 23dBi			-	-	72.45	-	-	-
EIRP			-	-	75.47	-	-	-

Configuration LTE+NR-MIMO-MC-1 (1LTE+1NR)
Maximum Output Power 30.97dBm per port for LTE.

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)					
			Channel position B		Channel position M		Channel position T	
			Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)
0	16QAM	20	30.80	9.48	30.40	9.60	30.45	9.69
1	16QAM	20	30.40	9.56	30.32	9.70	30.39	9.60
2	16QAM	20	30.89	9.59	30.38	9.98	31.00	9.62
3	16QAM	20	30.79	9.57	30.84	9.47	30.92	9.39
4	16QAM	20	31.19	9.42	31.27	9.86	31.40	9.73
5	16QAM	20	31.15	9.46	31.31	9.64	31.48	9.58
6	16QAM	20	31.16	9.52	30.71	9.62	31.40	9.87
7	16QAM	20	30.87	9.70	30.74	9.59	31.41	9.66
8	16QAM	20	30.43	9.55	30.90	9.64	30.96	9.60
9	16QAM	20	30.79	9.94	30.85	9.59	30.73	9.88
10	16QAM	20	30.46	9.53	30.50	9.61	30.65	9.87
11	16QAM	20	30.49	9.51	30.64	9.72	30.67	9.71
12	16QAM	20	31.15	9.52	30.94	9.52	31.32	9.39
13	16QAM	20	30.91	9.47	31.16	9.68	31.09	9.28
14	16QAM	20	31.05	9.46	30.84	9.72	31.04	9.75
15	16QAM	20	30.79	9.40	30.89	9.67	31.03	9.29
Total power 0-15			42.88	-	42.84	-	43.05	-
Total power 0-15 + 20dBi			62.88	-	62.84	-	63.05	-
32	16QAM	20	31.39	9.80	31.36	9.95	31.51	9.85
33	16QAM	20	30.73	9.50	31.30	9.46	31.42	9.58
34	16QAM	20	31.26	9.35	31.25	9.74	30.84	9.62
35	16QAM	20	30.67	9.51	31.22	9.67	30.78	9.57
36	16QAM	20	30.27	9.56	30.36	9.62	30.48	9.35
37	16QAM	20	30.38	9.60	30.36	9.53	30.51	9.50
38	16QAM	20	30.28	9.53	30.42	10.00	30.02	9.52

39	16QAM	20	30.37	9.44	30.38	9.74	30.56	9.75
40	16QAM	20	30.94	9.70	30.91	9.72	31.25	9.81
41	16QAM	20	30.66	9.41	30.86	9.81	31.21	9.59
42	16QAM	20	31.11	9.56	30.89	9.68	30.97	9.79
43	16QAM	20	31.09	9.75	30.86	9.72	30.95	9.76
44	16QAM	20	30.27	9.55	30.14	9.38	30.45	9.57
45	16QAM	20	30.21	9.30	30.06	9.91	30.15	9.60
46	16QAM	20	30.25	9.59	30.33	9.58	30.50	9.67
47	16QAM	20	30.27	9.62	30.14	9.49	30.19	9.55
Total power 32-47			42.69	-	42.74	-	42.80	-
Total power 32-47 + 20dBi			62.69	-	62.74	-	62.80	-
EIRP			65.80	-	65.80	-	65.94	-

Configuration LTE+NR-MIMO-MC-2 (2LTE+1NR)
Maximum Output Power 33.98dBm per port for LTE.

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)					
			Channel position B		Channel position M		Channel position T	
			Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)
0	16QAM	20	-	-	-	-	33.66	-
1	16QAM	20	-	-	-	-	33.65	-
2	16QAM	20	-	-	-	-	33.72	-
3	16QAM	20	-	-	-	-	33.62	-
4	16QAM	20	-	-	-	-	34.11	-
5	16QAM	20	-	-	-	-	34.19	-
6	16QAM	20	-	-	-	-	34.14	-
7	16QAM	20	-	-	-	-	34.02	-
8	16QAM	20	-	-	-	-	33.77	-
9	16QAM	20	-	-	-	-	33.70	-
10	16QAM	20	-	-	-	-	33.36	-
11	16QAM	20	-	-	-	-	33.74	-
12	16QAM	20	-	-	-	-	34.12	-
13	16QAM	20	-	-	-	-	34.17	-
14	16QAM	20	-	-	-	-	34.05	-
15	16QAM	20	-	-	-	-	34.14	-
Total power 0-15			-	-	-	-	45.93	-
Total power 0-15 + 20dBi			-	-	-	-	65.93	-
32	16QAM	20	-	-	-	-	34.11	-
33	16QAM	20	-	-	-	-	34.14	-
34	16QAM	20	-	-	-	-	34.09	-
35	16QAM	20	-	-	-	-	33.97	-
36	16QAM	20	-	-	-	-	33.17	-
37	16QAM	20	-	-	-	-	33.22	-
38	16QAM	20	-	-	-	-	33.25	-
39	16QAM	20	-	-	-	-	33.19	-
40	16QAM	20	-	-	-	-	34.12	-

41	16QAM	20	-	-	-	-	34.01	-
42	16QAM	20	-	-	-	-	34.03	-
43	16QAM	20	-	-	-	-	33.97	-
44	16QAM	20	-	-	-	-	33.26	-
45	16QAM	20	-	-	-	-	33.36	-
46	16QAM	20	-	-	-	-	33.32	-
47	16QAM	20	-	-	-	-	33.25	-
Total power 32-47			-	-	-	-	45.71	-
Total power 32-47 + 20dBi			-	-	-	-	65.71	-
EIRP			-	-	-	-	68.84	-

Configuration LTE+NR-MIMO-MC-3 (3LTE+1NR)
Maximum Output Power 34.95dBm per port for LTE.

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Output power / Peak-to-Average Ratio (PAR)					
			Channel position B		Channel position M		Channel position T	
			Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)	Power (dBm)	PAR (dB)
0	16QAM	20	-	-	-	-	34.53	-
1	16QAM	20	-	-	-	-	34.54	-
2	16QAM	20	-	-	-	-	34.57	-
3	16QAM	20	-	-	-	-	34.44	-
4	16QAM	20	-	-	-	-	34.91	-
5	16QAM	20	-	-	-	-	34.99	-
6	16QAM	20	-	-	-	-	34.94	-
7	16QAM	20	-	-	-	-	34.92	-
8	16QAM	20	-	-	-	-	34.72	-
9	16QAM	20	-	-	-	-	34.68	-
10	16QAM	20	-	-	-	-	34.56	-
11	16QAM	20	-	-	-	-	34.64	-
12	16QAM	20	-	-	-	-	34.99	-
13	16QAM	20	-	-	-	-	35.09	-
14	16QAM	20	-	-	-	-	34.97	-
15	16QAM	20	-	-	-	-	34.94	-
Total power 0-15			-	-	-	-	46.82	-
Total power 0-15 + 20dBi			-	-	-	-	66.82	-
32	16QAM	20	-	-	-	-	35.02	-
33	16QAM	20	-	-	-	-	34.99	-
34	16QAM	20	-	-	-	-	34.95	-
35	16QAM	20	-	-	-	-	34.80	-
36	16QAM	20	-	-	-	-	33.99	-
37	16QAM	20	-	-	-	-	34.07	-
38	16QAM	20	-	-	-	-	34.07	-
39	16QAM	20	-	-	-	-	34.03	-
40	16QAM	20	-	-	-	-	35.00	-
41	16QAM	20	-	-	-	-	35.02	-
42	16QAM	20	-	-	-	-	34.99	-

43	16QAM	20	-	-	-	-	34.91	-
44	16QAM	20	-	-	-	-	34.22	-
45	16QAM	20	-	-	-	-	34.13	-
46	16QAM	20	-	-	-	-	34.27	-
47	16QAM	20	-	-	-	-	34.18	-
Total power 32-47			-	-	-	-	46.60	-
Total power 32-47 + 20dBi			-	-	-	-	66.60	-
EIRP			-	-	-	-	69.72	-

4 Occupied Bandwidth

Test result: Pass

4.1 Measurement Procedure

The EUT was set to transmit at maximum power and testing was carried out on bottom, middle and top channels. Using the Occupied Bandwidth measurement function in the spectrum analyzer, the 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 Clause 4.2.

The measurement method is from KDB 971168 4.2:
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation product s including the emission skirts (i.e., two to five times the OBW).
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
d) Set the detection mode to peak, and the trace mode to max hold.
e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

4.2 Measurement result

Configuration NR-MIMO-1C-40

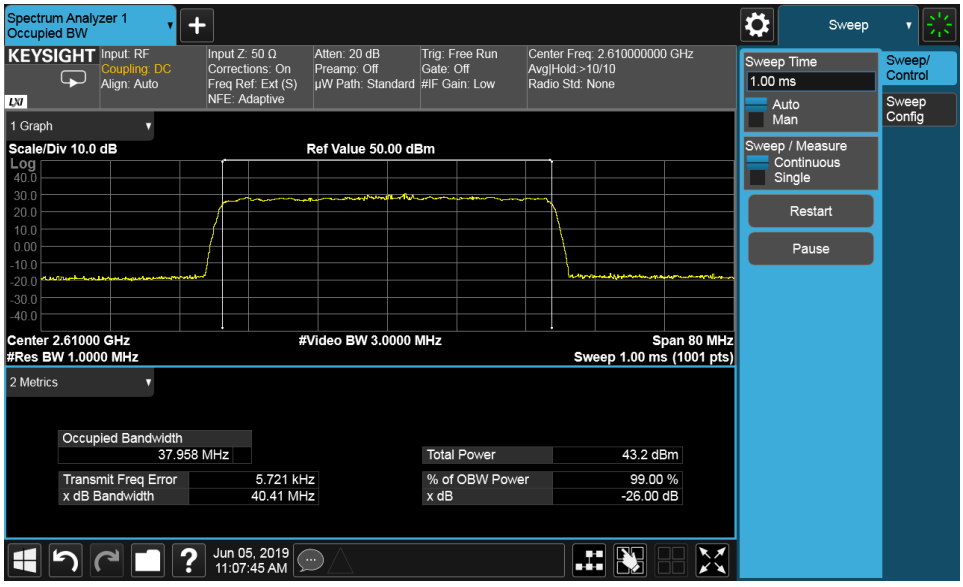
99% Occupied Bandwidth

Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
20	QPSK	40MHz	37.958	37.999	37.974
20	64QAM	40MHz	37.887	37.954	37.903
20	256QAM	40MHz	37.951	37.991	37.959

-26dBc Occupied Bandwidth

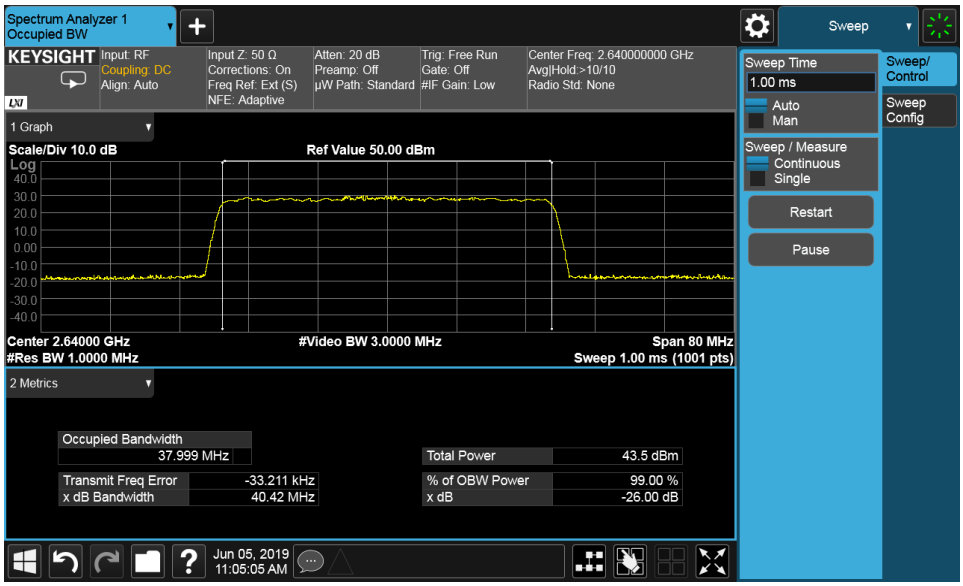
Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
20	QPSK	40MHz	40.41	40.42	40.56
20	64QAM	40MHz	40.47	40.39	40.55
20	256QAM	40MHz	40.62	40.59	40.54

QPSK, 20MHz, Channel position B

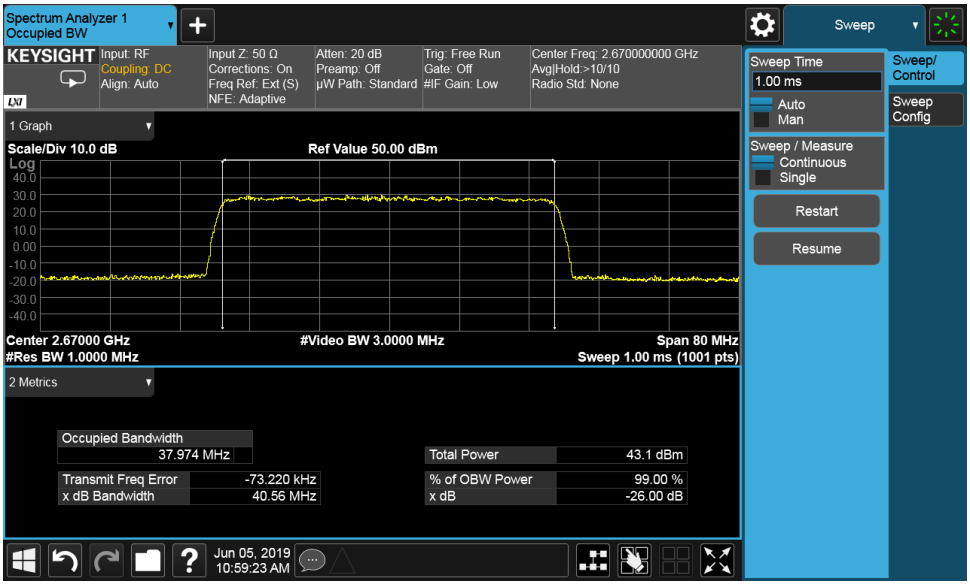


TEST REPORT

QPSK, 20MHz, Channel position M

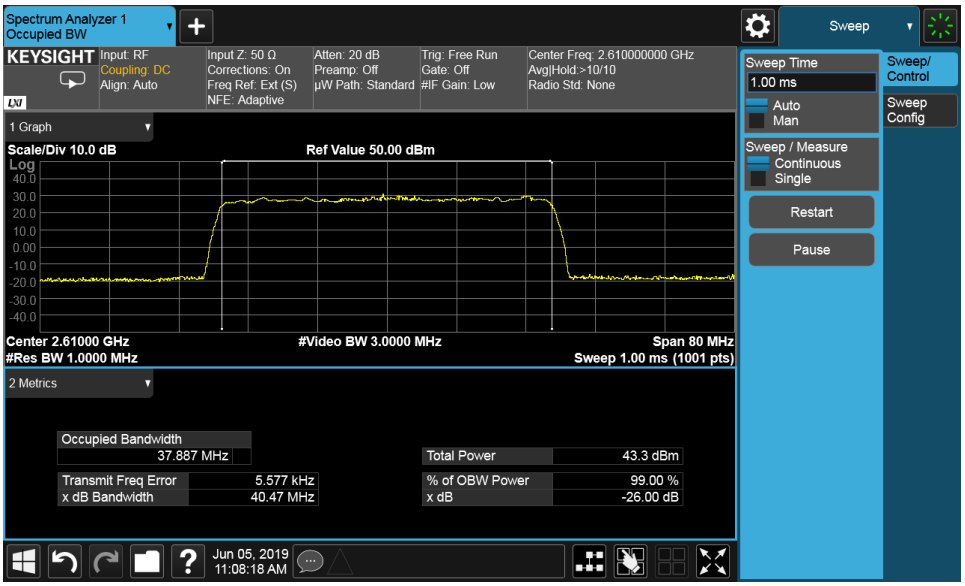


QPSK, 20MHz, Channel position T

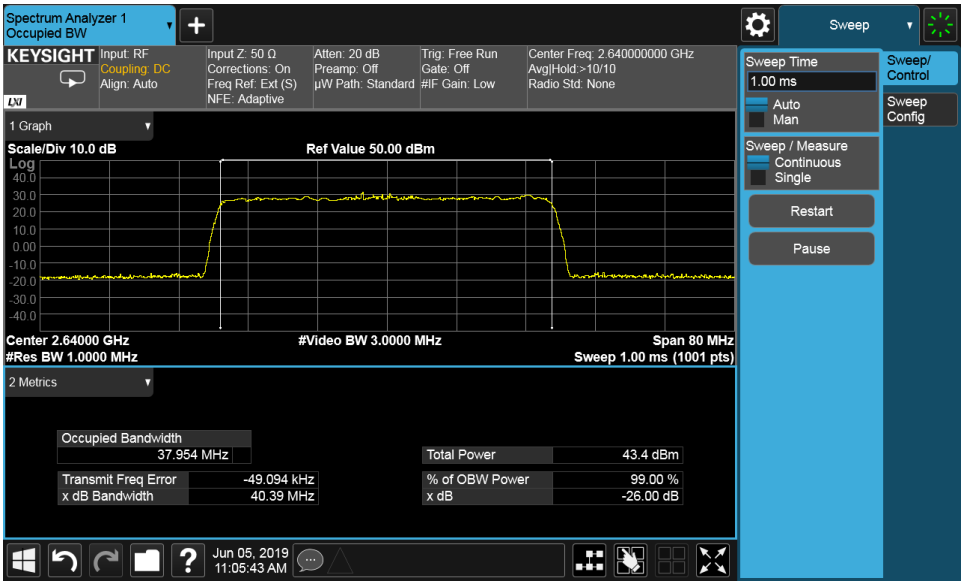


TEST REPORT

64QAM, 20MHz, Channel position B

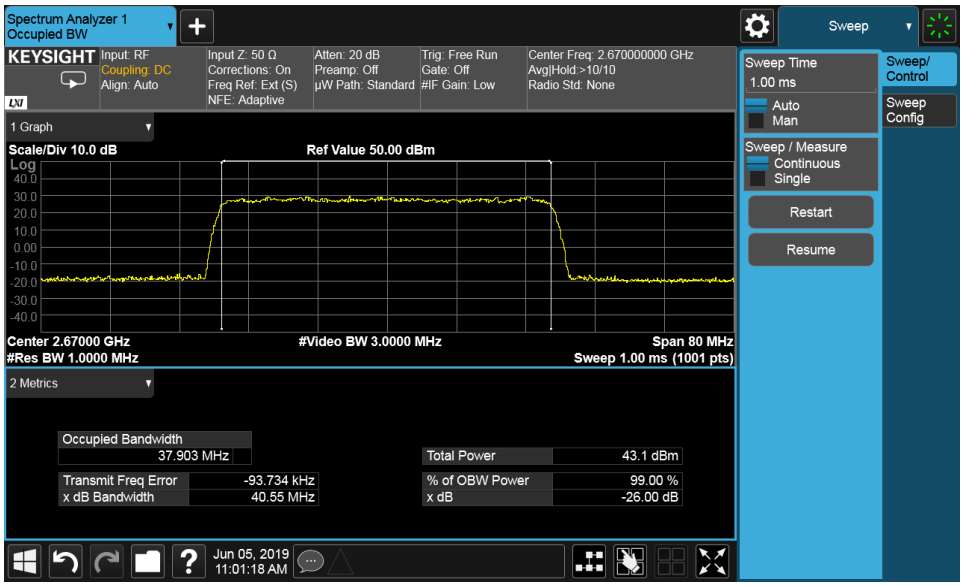


64QAM, 20MHz, Channel position M

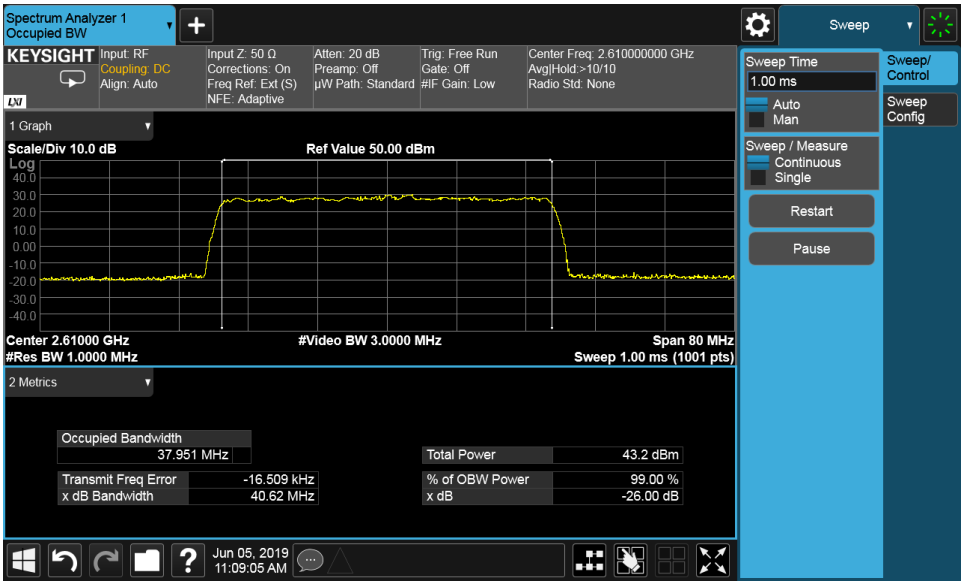


TEST REPORT

64QAM, 20MHz, Channel position T

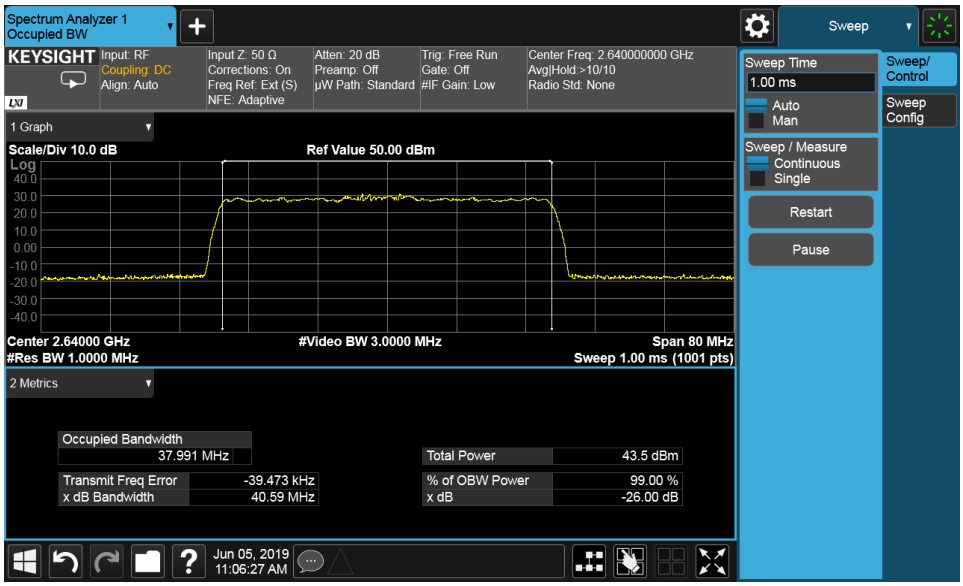


256QAM, 20MHz, Channel position B

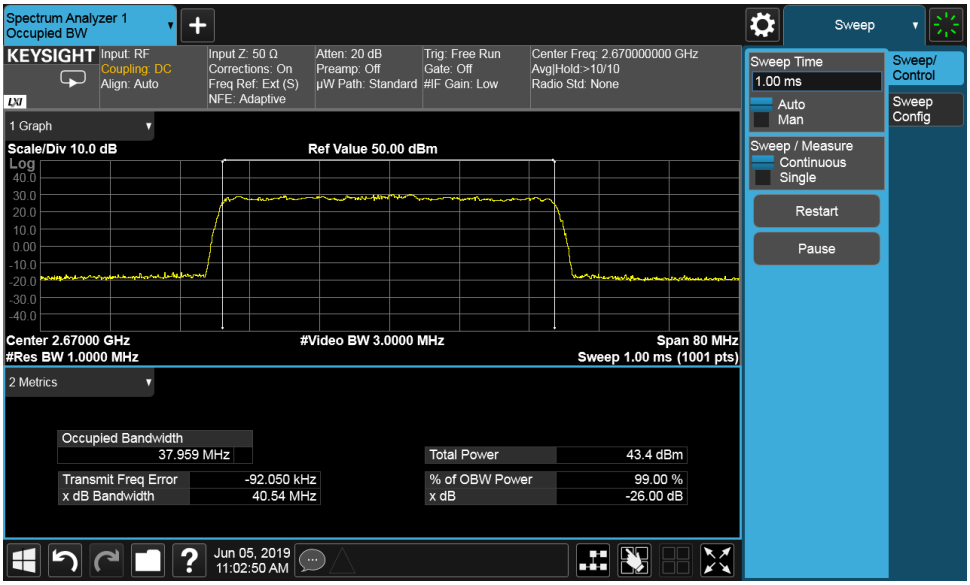


TEST REPORT

256QAM, 20MHz, Channel position M



256QAM, 20MHz, Channel position T



Configuration NR-MIMO-1C-100

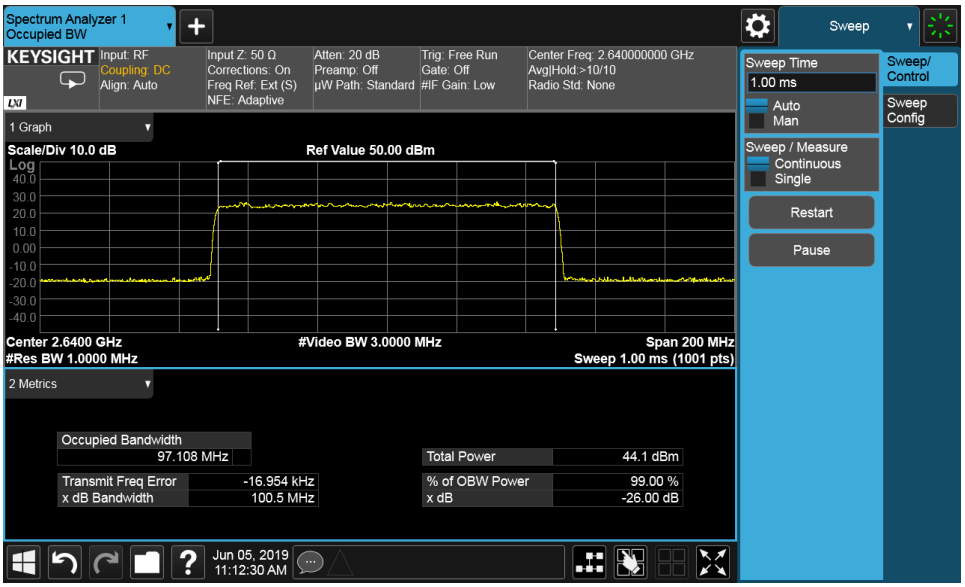
99% Occupied Bandwidth

Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
20	QPSK	100MHz	-	97.108	-
20	64QAM	100MHz	-	97.134	-
20	256QAM	100MHz	-	97.081	-

-26dBc Occupied Bandwidth

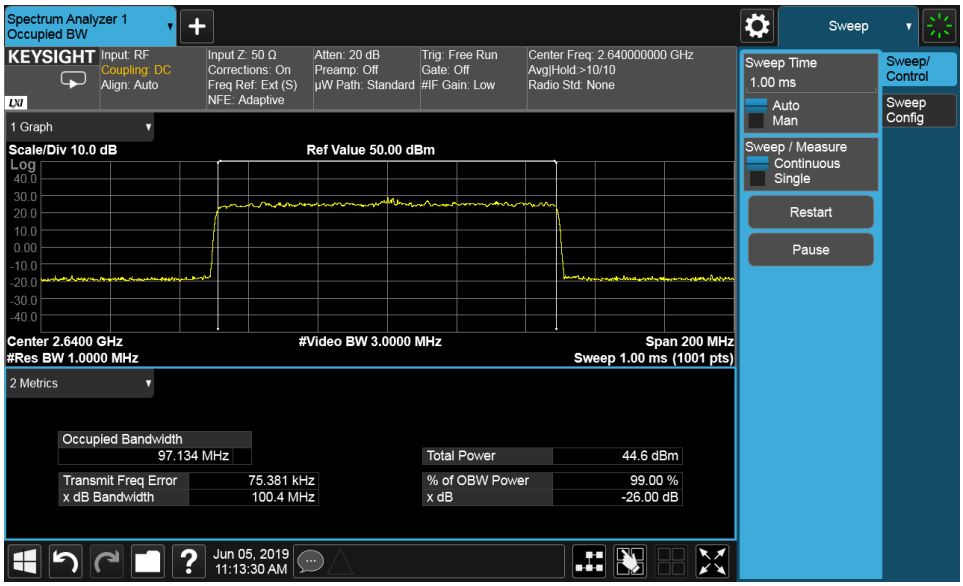
Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
20	QPSK	100MHz	-	100.5	-
20	64QAM	100MHz	-	100.4	-
20	256QAM	100MHz	-	100.4	-

QPSK, 20MHz, Channel position M

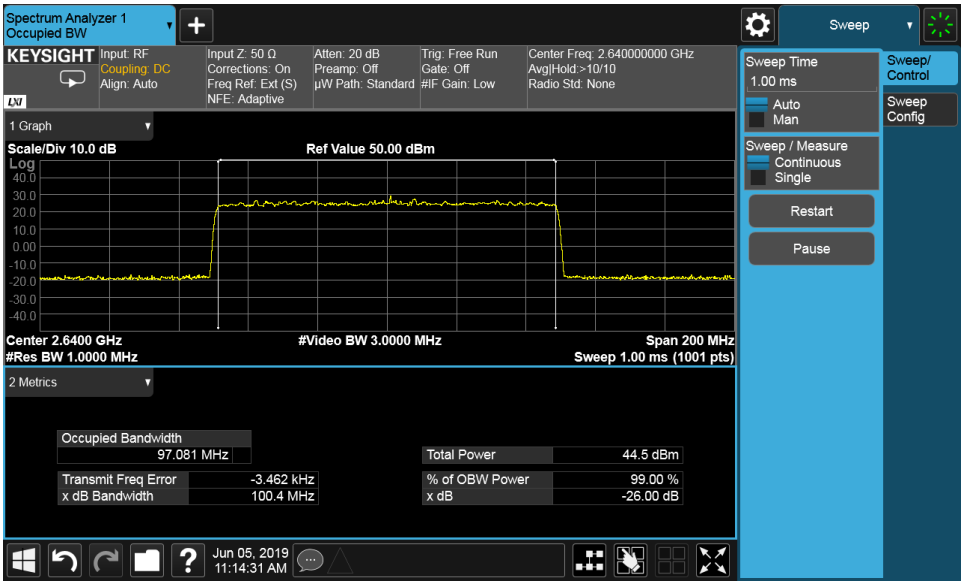


TEST REPORT

64QAM, 20MHz, Channel position M



256QAM, 20MHz, Channel position M



Configuration LTE+NR-MIMO-MC-1 (1LTE+1NR)

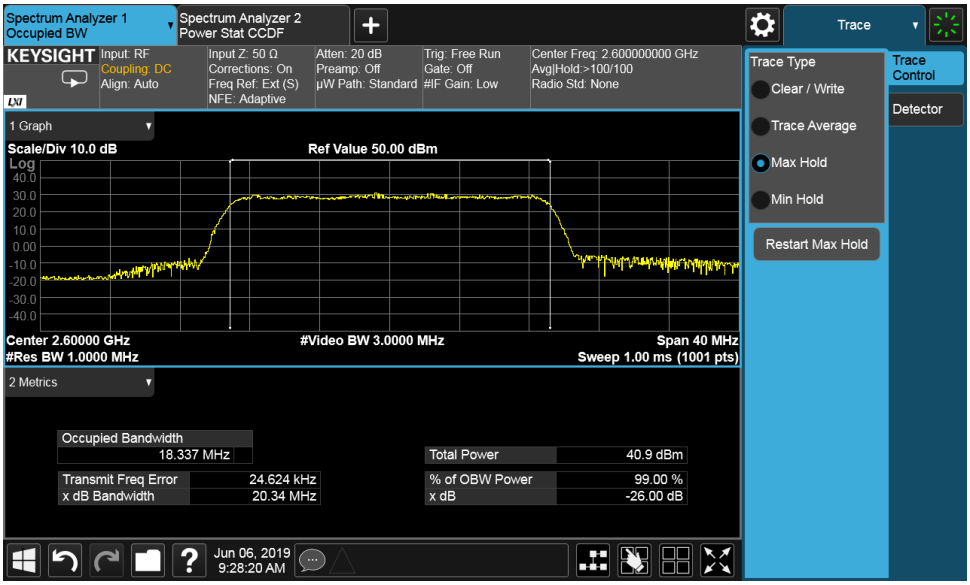
99% Occupied Bandwidth

Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
32	QPSK	20MHz	18.337	18.358	18.326
32	16QAM	20MHz	18.444	18.424	18.623
32	64QAM	20MHz	18.471	18.525	18.326
32	256QAM	20MHz	18.446	18.470	18.328

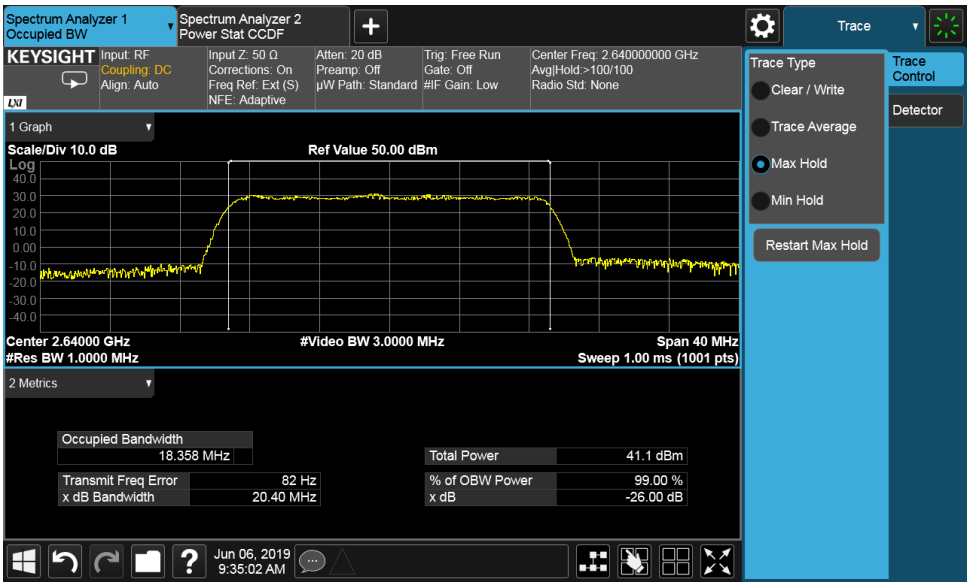
-26dBc Occupied Bandwidth

Antenna Port	Modulation	Bandwidth	Occupied Bandwidth (MHz)		
			Channel Position B	Channel Position M	Channel Position T
32	QPSK	20MHz	20.34	20.40	20.30
32	16QAM	20MHz	20.23	20.28	20.13
32	64QAM	20MHz	20.48	20.46	20.30
32	256QAM	20MHz	20.50	20.46	20.41

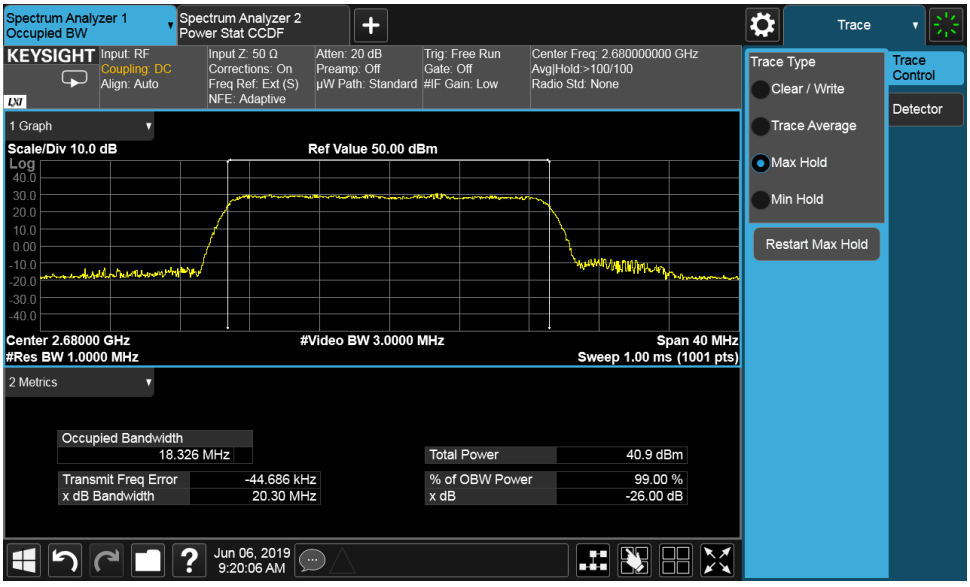
QPSK, 20MHz, Channel position B



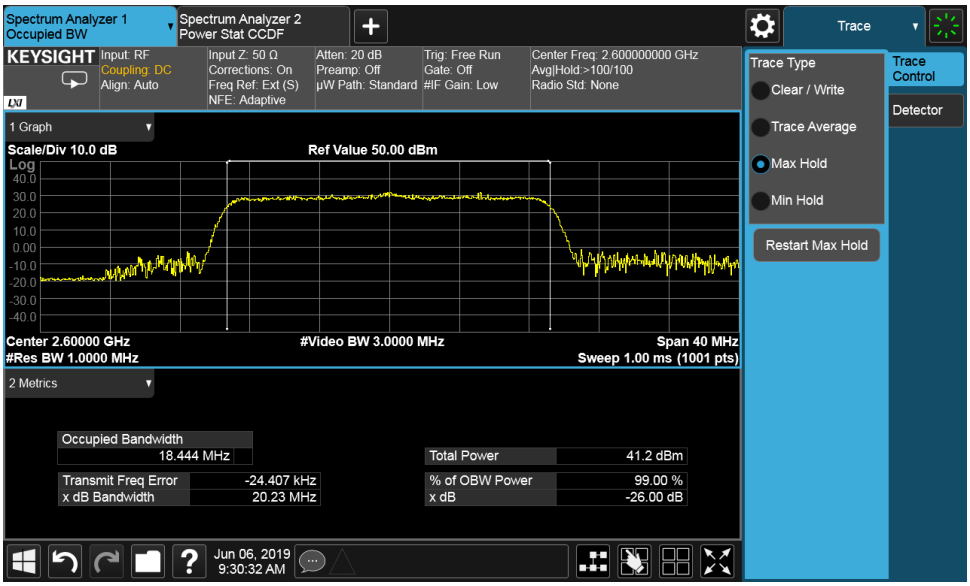
QPSK, 20MHz, Channel position M



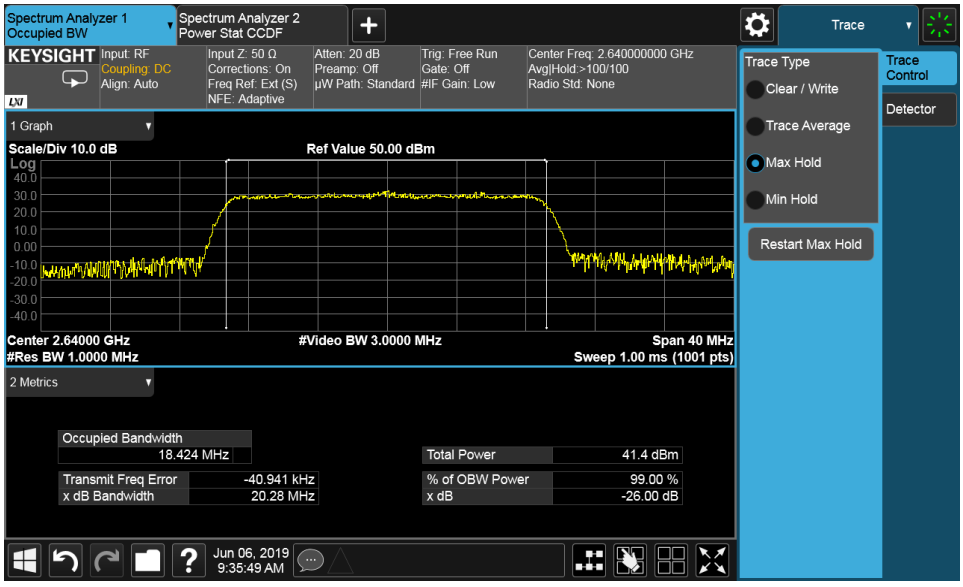
QPSK, 20MHz, Channel position T



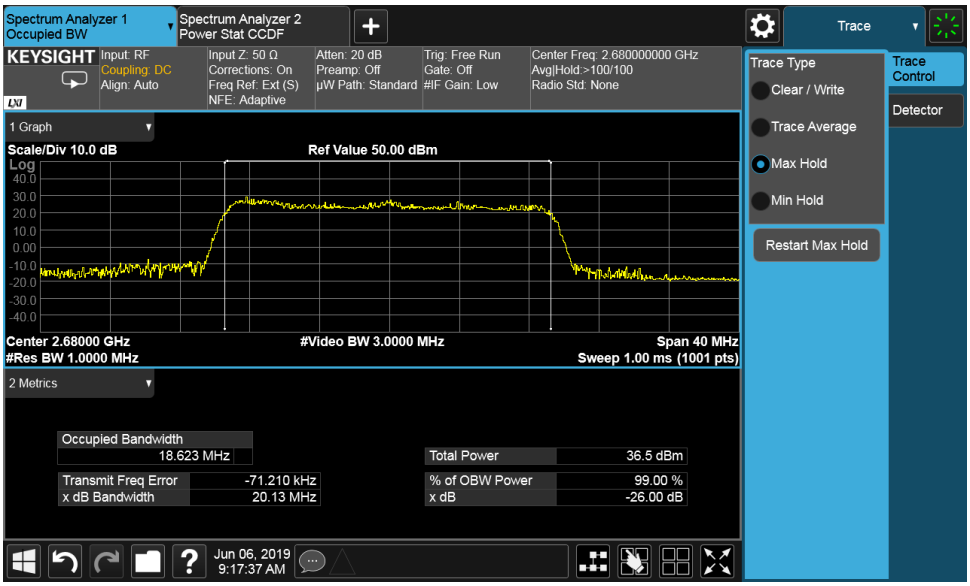
16QAM, 20MHz, Channel position B



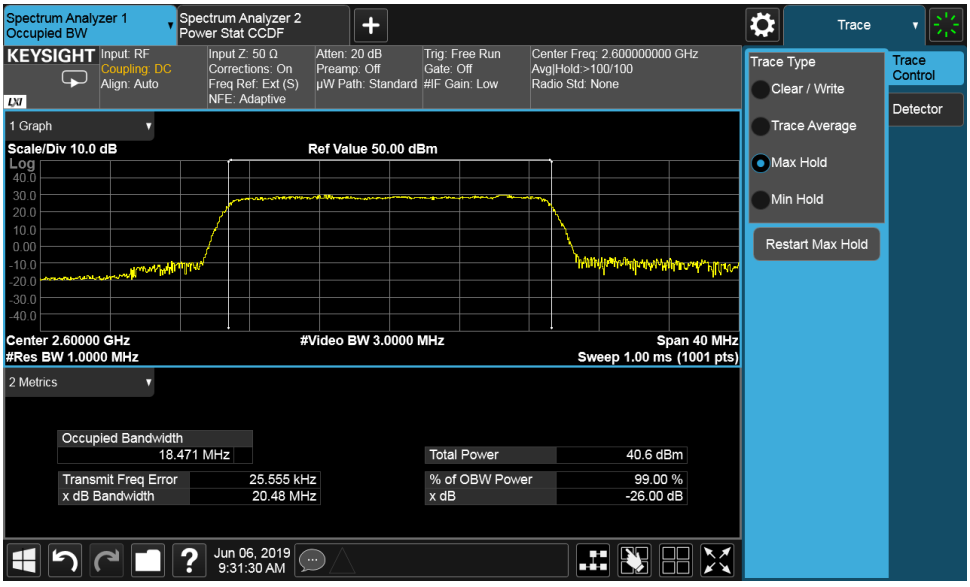
16QAM, 20MHz, Channel position M



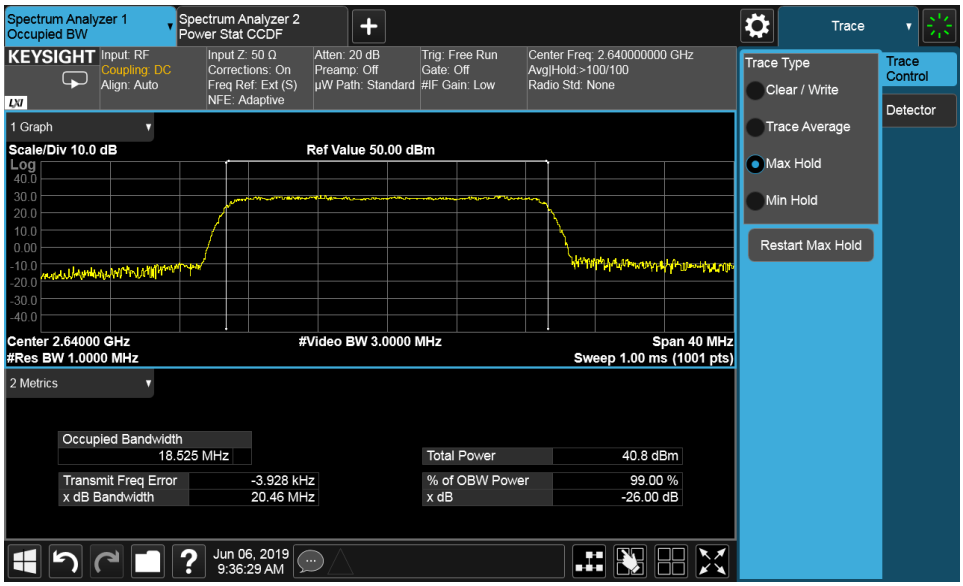
16QAM, 20MHz, Channel position T



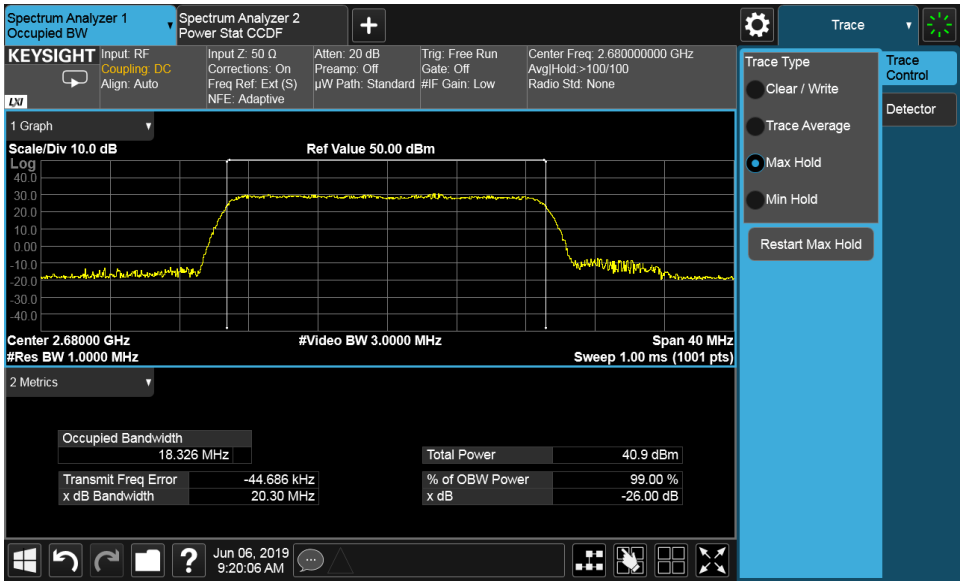
64QAM, 20MHz, Channel position B



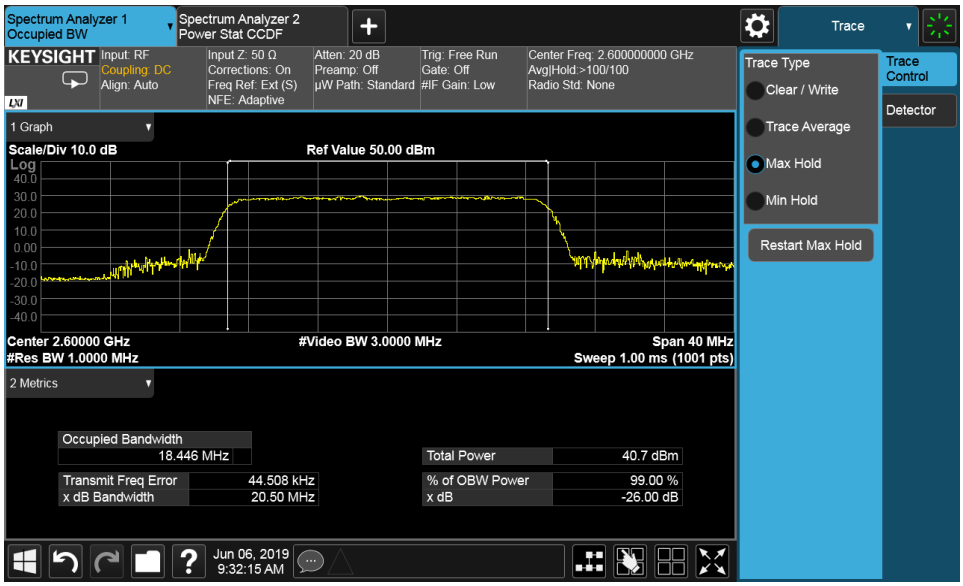
64QAM, 20MHz, Channel position M



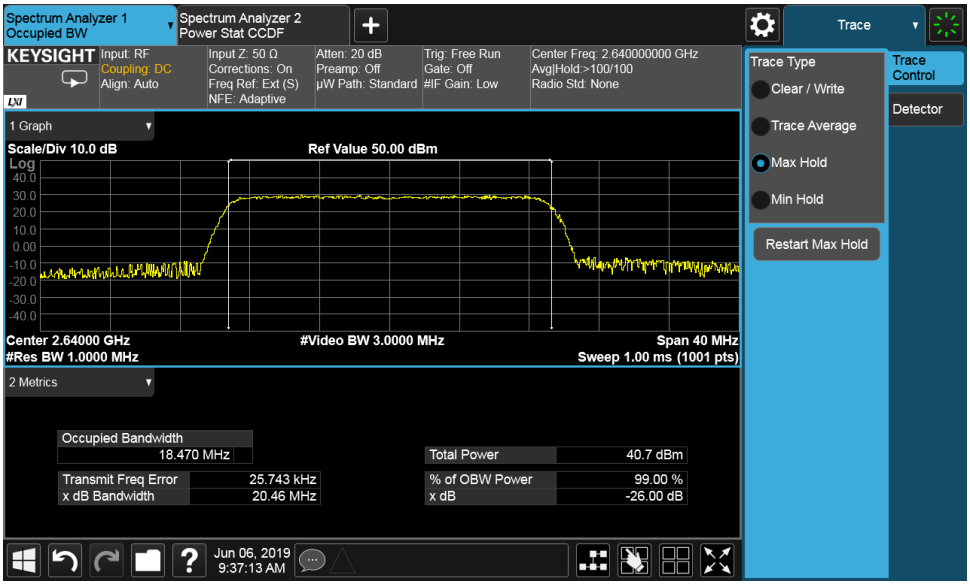
64QAM, 20MHz, Channel position T



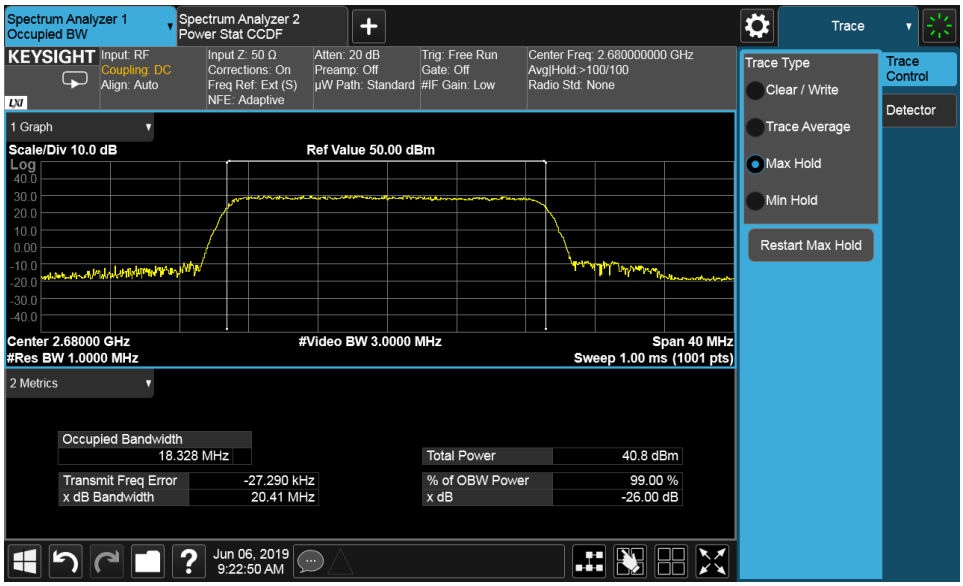
256QAM, 20MHz, Channel position B



256QAM, 20MHz, Channel position M



256QAM, 20MHz, Channel position T



5 Unwanted Emissions at Band Edge

Test result: **Pass**

5.1 Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

5.2 Measurement Procedure

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

For MIMO mode configurations, the limit was adjusted with a correction of -18.06dB [10Log(1/64)] by using the Measure and Add 10Log(N) dB technique according to KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports . Then the limit was adjusted to -31.06dBm.

In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed and a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges.

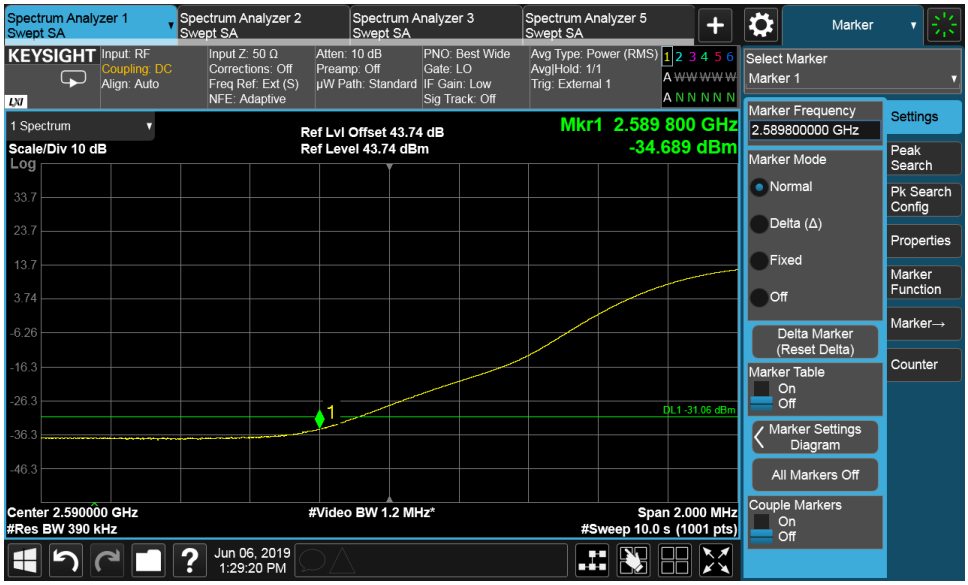
Spectrum analyzer detector was set as RMS.

5.3 Measurement result

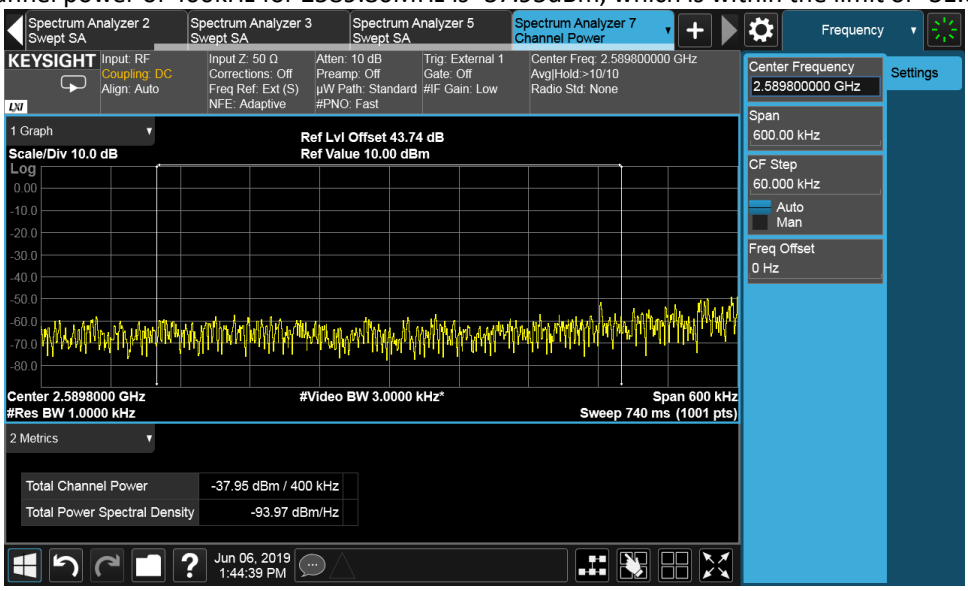
Configuration NR-MIMO-1C-BE-40

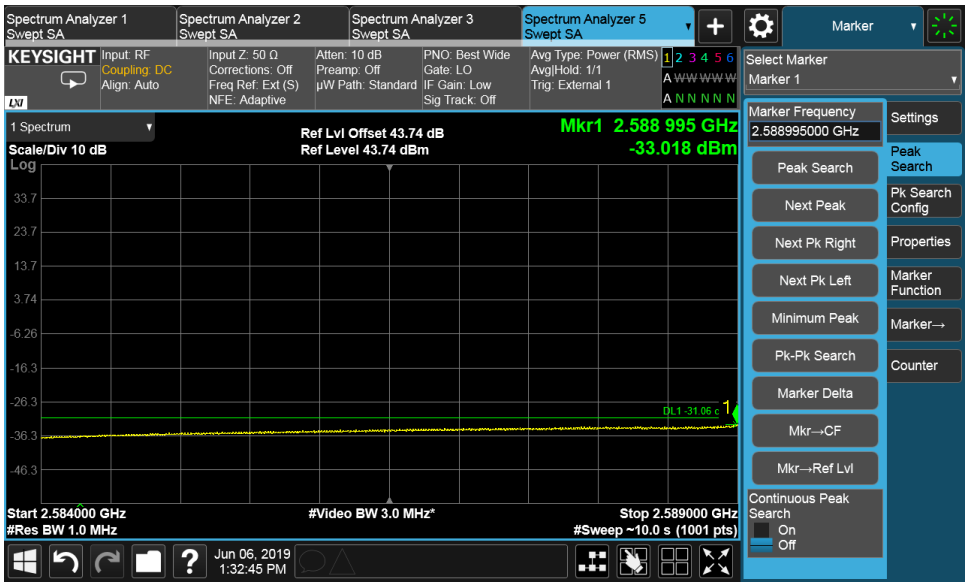
Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
20	B	256QAM	40	400	-31.06
20	T	256QAM	40	400	-31.06

Channel Position B

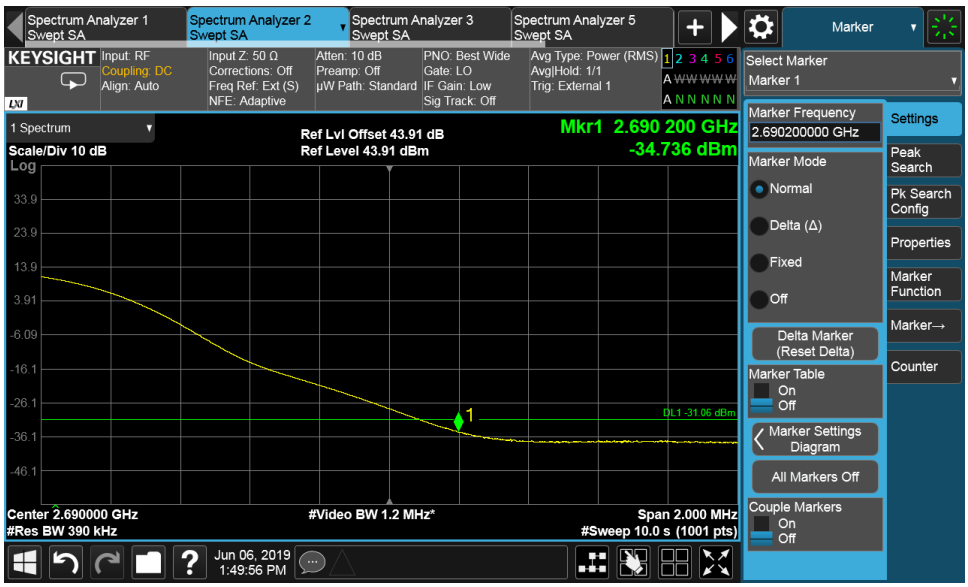


The channel power of 400kHz for 2589.80MHz is -37.95dBm, which is within the limit of -31.06dBm.

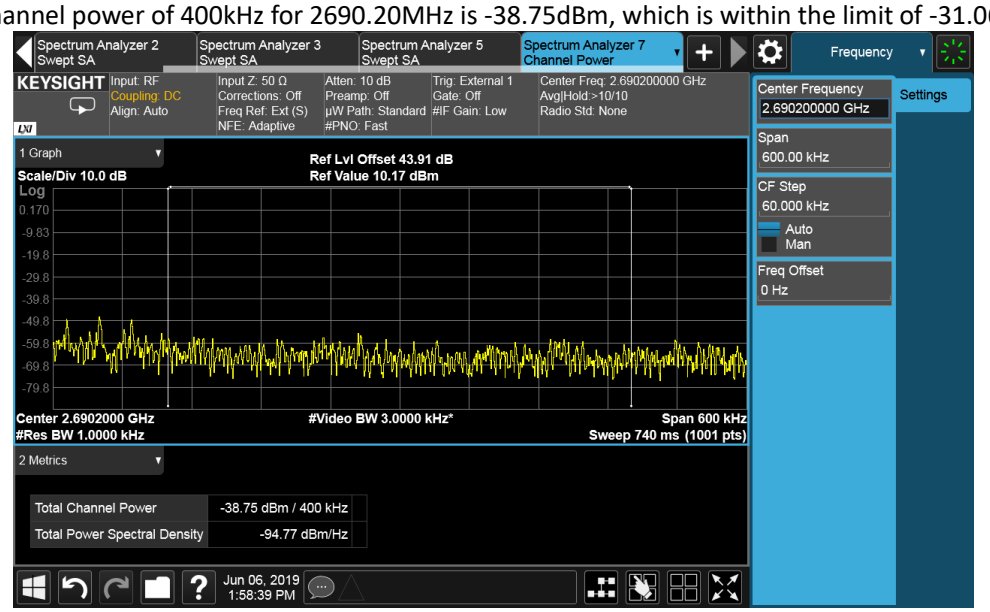


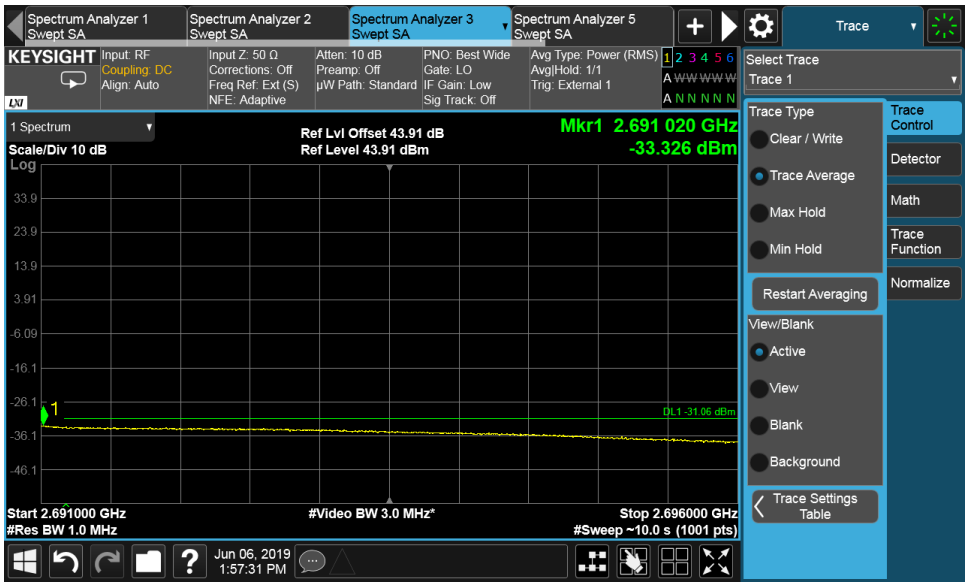


Channel Position T



The channel power of 400kHz for 2690.20MHz is -38.75dBm, which is within the limit of -31.06dBm.



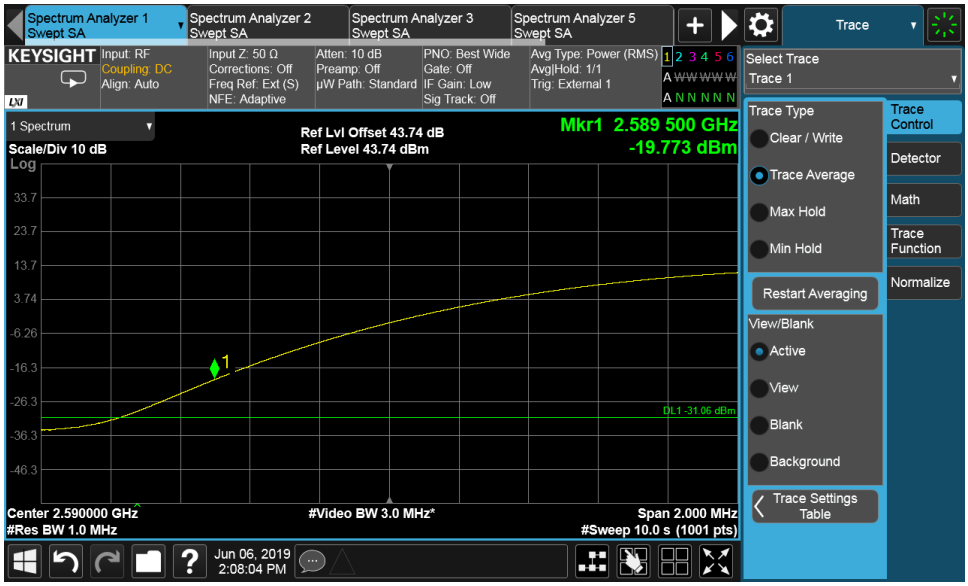


TEST REPORT

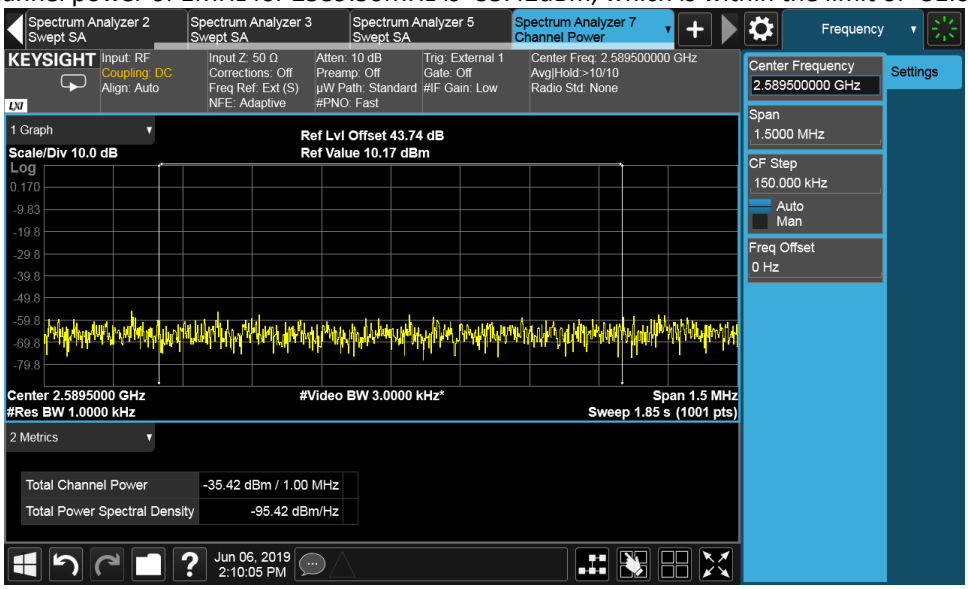
Configuration NR-MIMO-1C-BE-100

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
20	M	256QAM	100	1000	-31.06

Channel Position M

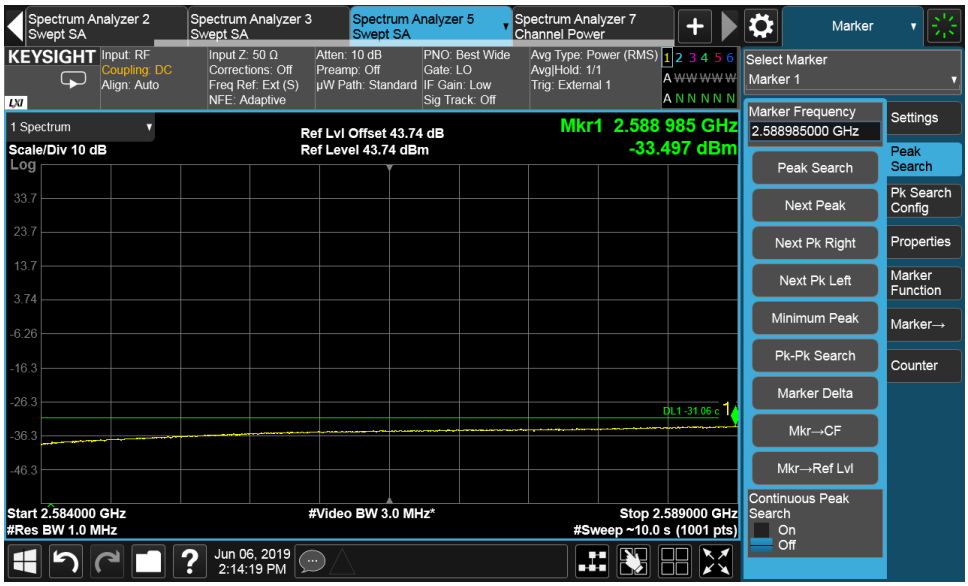


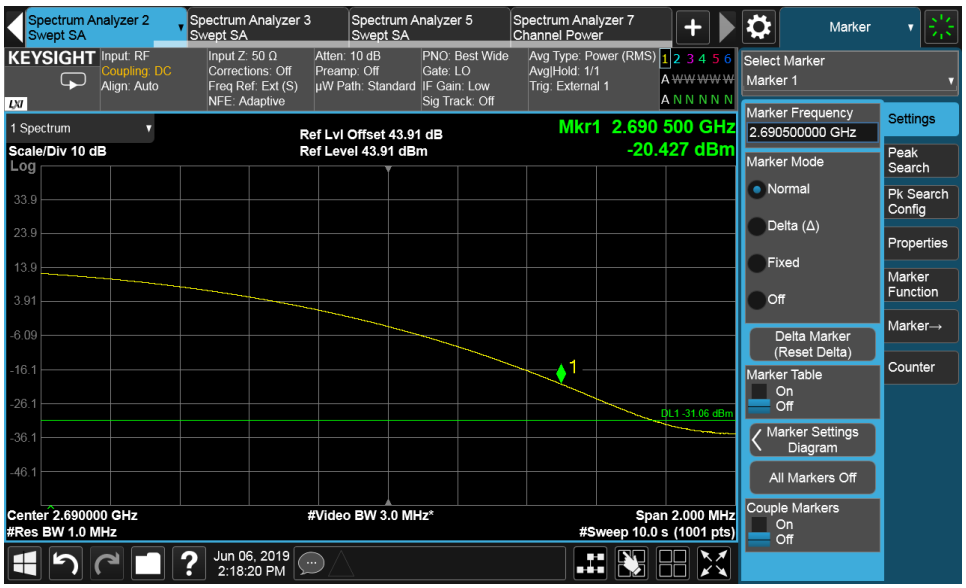
The channel power of 1MHz for 2589.50MHz is -35.42dBm, which is within the limit of -31.06dBm.



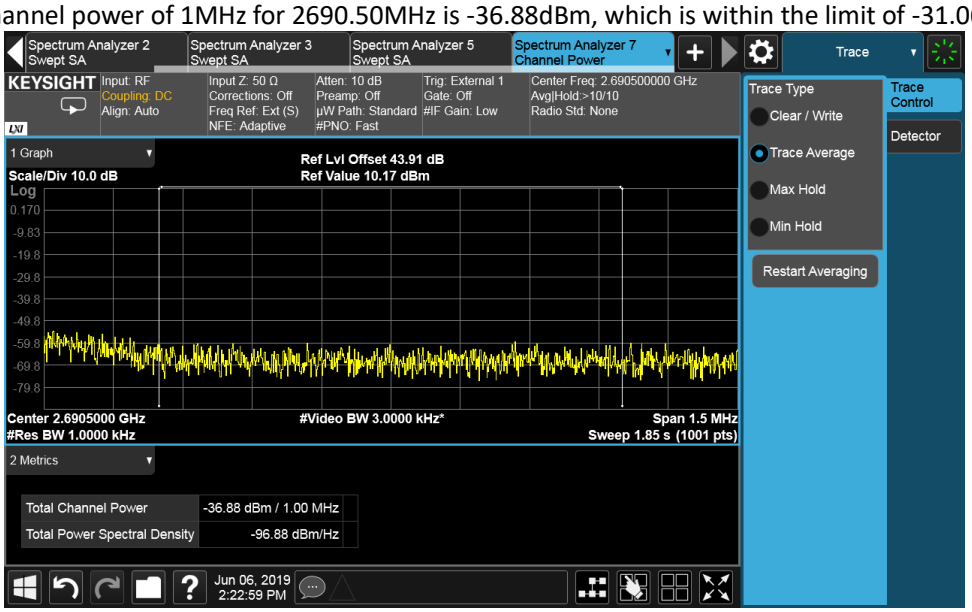
Total Quality. Assured.

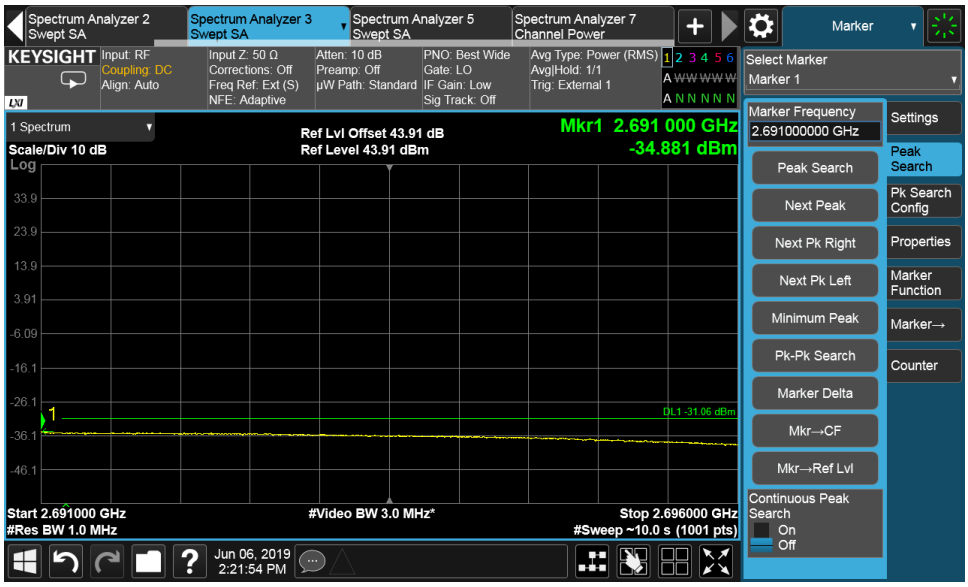
TEST REPORT





The channel power of 1MHz for 2690.50MHz is -36.88dBm, which is within the limit of -31.06dBm.



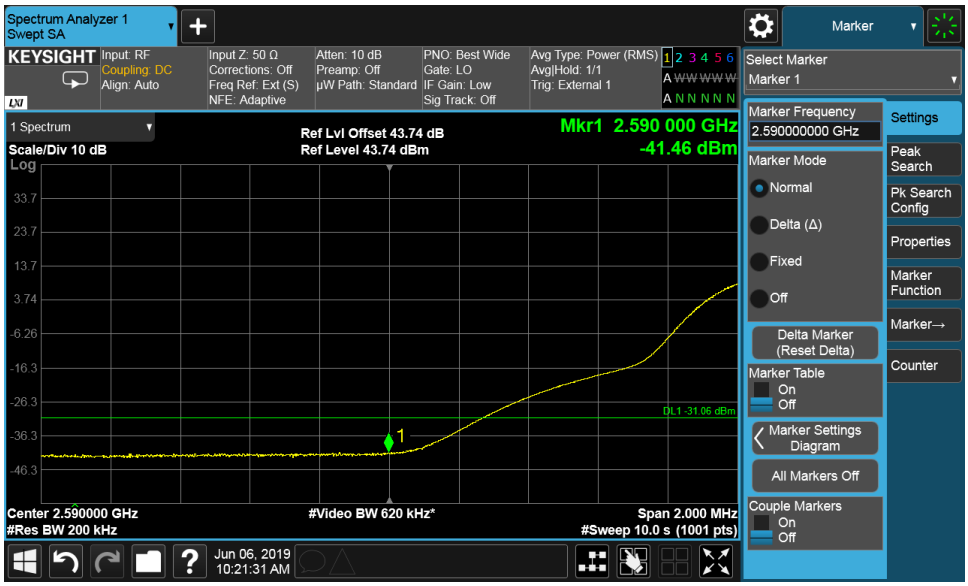


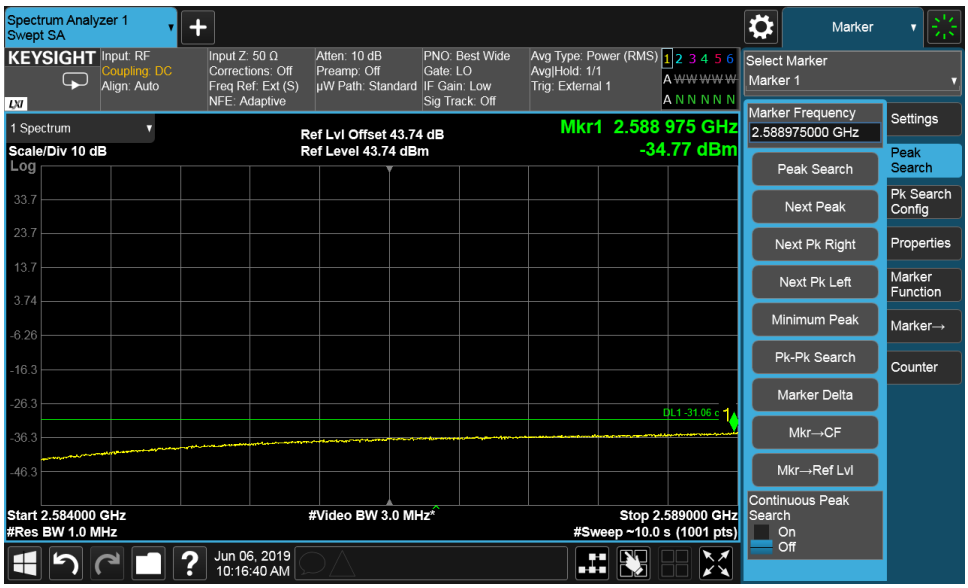
TEST REPORT

Configuration LTE+NR-MIMO-MC-4-BE (1LTE+1NR)

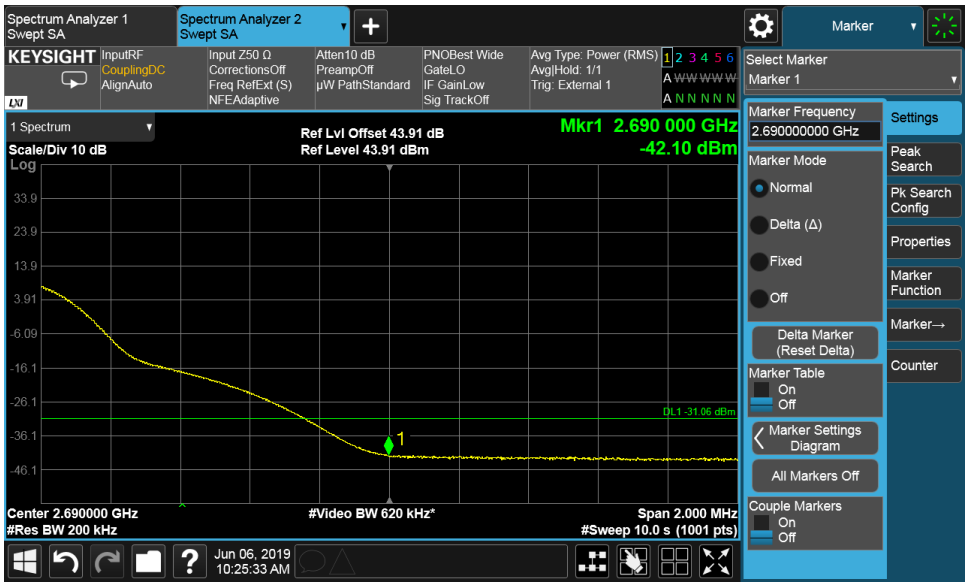
Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
32	B	16QAM	20	200	-31.06
32	T	16QAM	20	200	-31.06

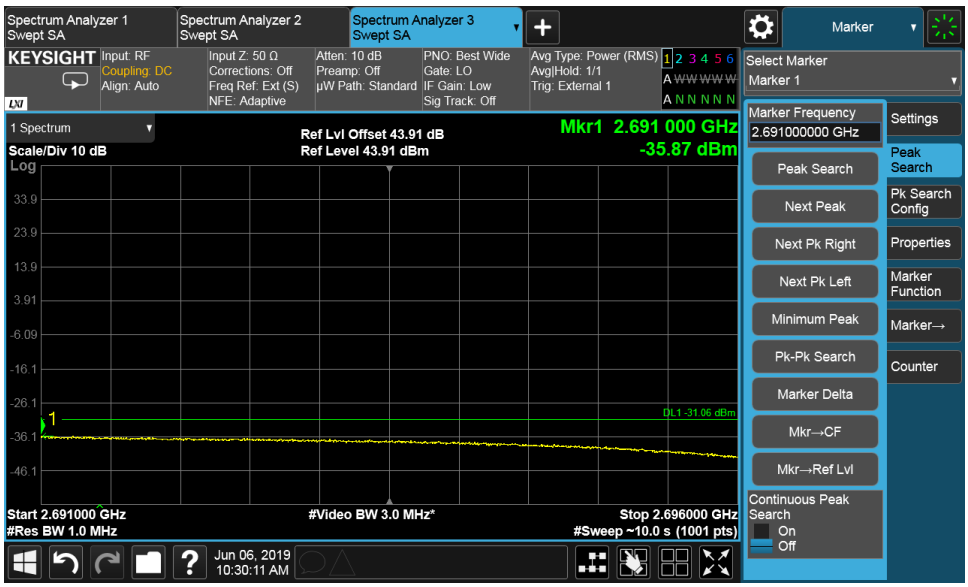
Channel Position B





Channel Position T



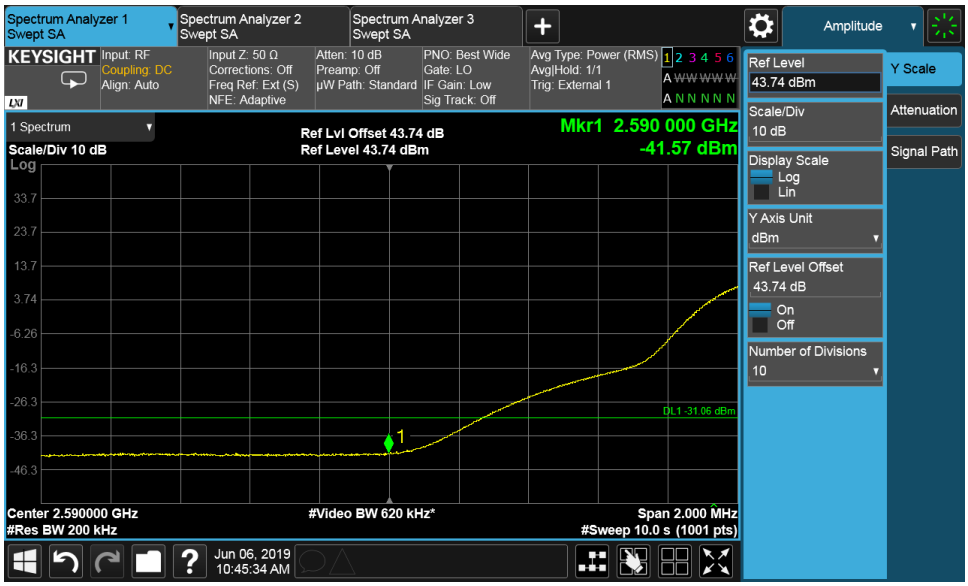


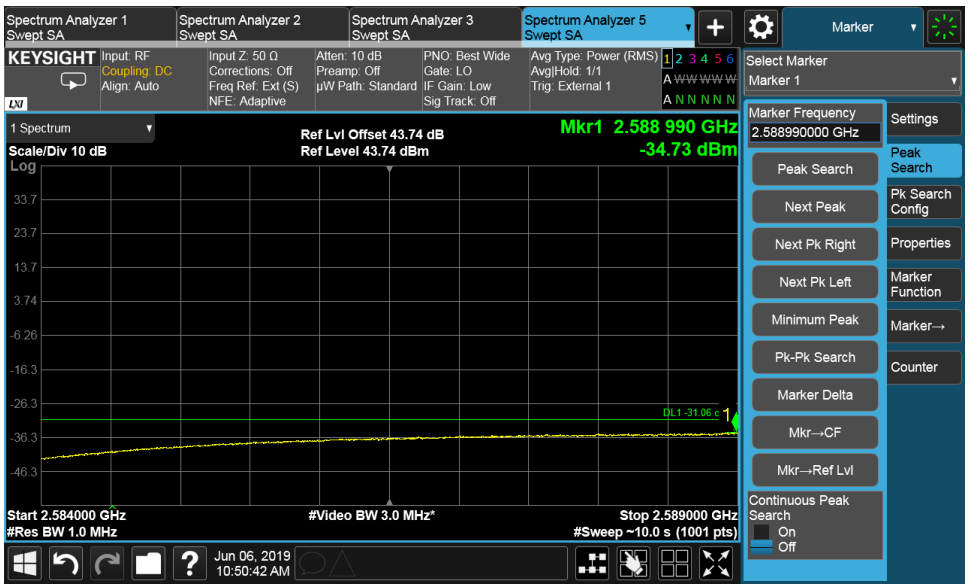
TEST REPORT

Configuration LTE+NR-MIMO-MC-5-BE (2LTE+1NR)

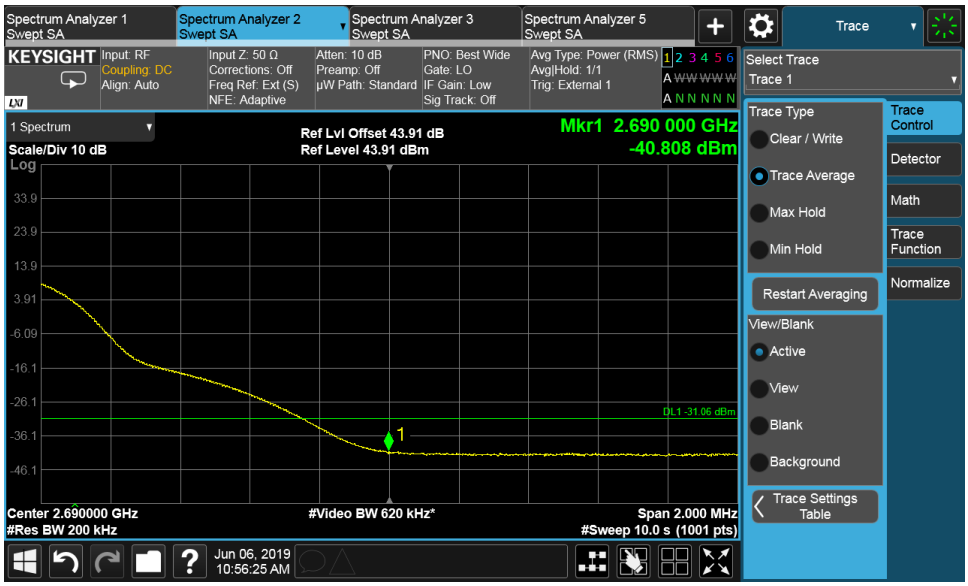
Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
32	B	16QAM	20	200	-31.06
32	T	16QAM	20	200	-31.06

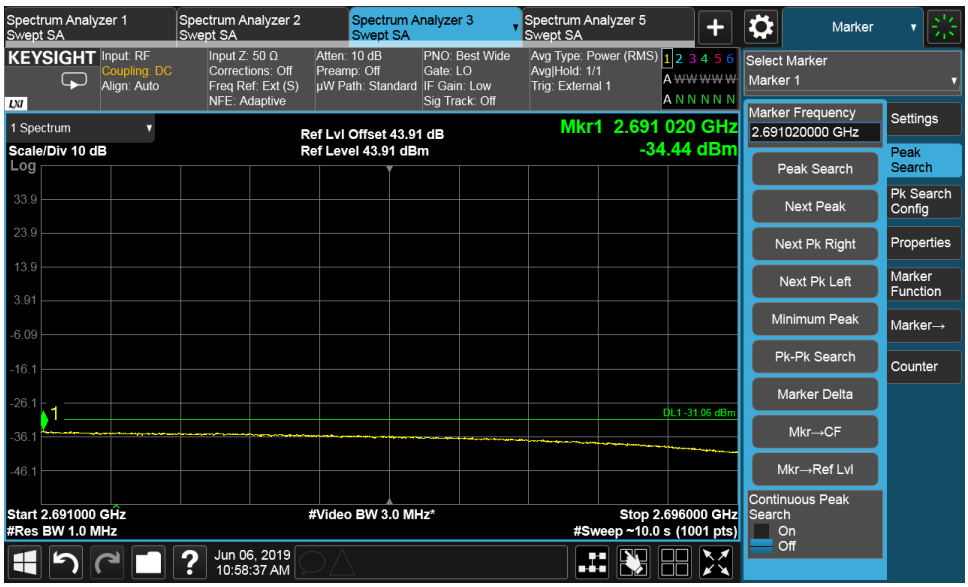
Channel Position B





Channel Position T





Configuration LTE+NR-MIMO-MC-6-BE (3LTE+1NR)

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)	RBW (kHz)	Limit (dBm)
32	B	16QAM	20	200	-31.06
32	T	16QAM	20	200	-31.06

Channel Position B