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Ericsson AB

RF TEST REPORT

Report Type:
FCC Part 96 RF report

PRODUCT NAME:
Radio 4408 B48

REPORT NUMBER:
190801513SHA-001

ISSUE DATE:
August 19, 2019

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 190801513SHA-001

Applicant:	Ericsson AB
	Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden
Manufacturer:	Ericsson AB
	Isafjordsgatan 10 SE-164 80 Stockholm 16480 Sweden
FCC ID:	TA8AKRC161746-1

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
FCC CFR 47 Part 96: CITIZENS BROADBAND RADIO SERVICE

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

Content

TEST REPORT

Revision History

Report No.	Version	Description	Issued Date
190801513SHA-001	Rev. 01	Initial issue of report	August 19, 2019

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Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Power, PSD and Peak to Average Power Ratio	96.41(b)(c)(g) 2.1046	Pass
Occupied Bandwidth	96.41(e)(3) 2.1049	Pass
Unwanted Emissions at Band Edge	96.41(e)(1) 2.1051	Pass
Conducted Unwanted Emission	96.41(e)(2) 2.1051	Pass
Radiated Unwanted Emissions	96.41(e)(1)(2) 2.1053	Pass
Frequency Stability	- 2.1055	Pass

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Description:	Remote Radio Unit
Product name:	Radio 4408 B48
Product number:	KRC 161 746/1
Serial Number(s)	D829137628
Rating:	36V DC
Software Version:	CXP9013268%15_R79EZ
Hardware Version:	R1B
Sample received date:	July 19, 2019
Date of test:	July 19, 2019 ~ July 31, 2019

1.2 Technical Specification

Frequency Range:	3550MHz - 3700MHz
Number of Antenna ports:	4 TX/RX
Supported RAT:	TDD LTE
Max RF bandwidth (IBW):	150MHz
Supported Number of Carriers:	Maximum 6 carriers
Supported modulation:	QPSK, 16QAM, 64QAM, 256QAM
Supported Channel Bandwidth:	10MHz, 20MHz
ITU Designation of Emission:	10M0F9W, 20M0F9W
Output power without integrated antenna:	Maximum 37dBm (5W) per port
Output power with integrated antenna:	Maximum per port: Single carrier: 26.4dBm (0.44W) for 10MHz BW, 29.4dBm (0.87W) for 20MHz BW. Two carrier: 29.4dBm (0.87W) for 10MHz BW, 32.4dBm (1.74W) for 20MHz BW. Three carrier: 31.2dBm (1.32W) for 10MHz BW, 34.2dBm (2.63W) for 20MHz BW. Four carrier: 32.4dBm (1.74W) for 10MHz BW, 35.5dBm (3.55W) for 20MHz BW. Five carrier: 33.4dBm (2.19W) for 10MHz BW, 36.4dBm (4.37W) for 20MHz BW. Six carrier: 34.2dBm (2.63W) for 10MHz BW, 37.0dBm (5W) for 20MHz BW.
Antenna Gain:	12.5dBi

1.3 Description of Test Facility

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

2 TEST SPECIFICATIONS

2.1 Related documents

FCC Part 96 (2018)
FCC Part 2 (2018)
ANSI C63.26:2015
KDB 971168 D01 v03r01
KDB 662911 D01 v02r01
KDB 940660 D01 v02

2.2 Product Information

The Equipment Under Test (EUT) Radio 4408 B48 is an Ericsson Radio Unit working in the public mobile services 3550-3700MHz band which provides communication connections to 3550-3700MHz network. The Radio 4408 B48 operates from a -48V DC or a 120V AC power supply.

EUT has two configurations: Configuration A and Configuration B. Configuration A is the Radio Unit with integrated antenna, Configuration B is the Radio Unit without integrated antenna.

The EUT includes 4 TX/RX ports. It can be configured to transmit in MIMO mode, and the 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

This testing was performed in accordance with Part 96 PAG, as submitted to the FCC Tracking Number 996705.

Initial pre-testing was carried out to determine the worst case modulation scheme by measuring the output power from QPSK, 16QAM, 64QAM and 256QAM on the middle channel of one antenna port. From these tests, it was determined that 256QAM was the worst case modulation scheme and was used for all testing.

Initial pre-testing was carried out to determine the worst bandwidth on the middle channel of one antenna port. From these tests, it was determined that 20MHz was the worst case.

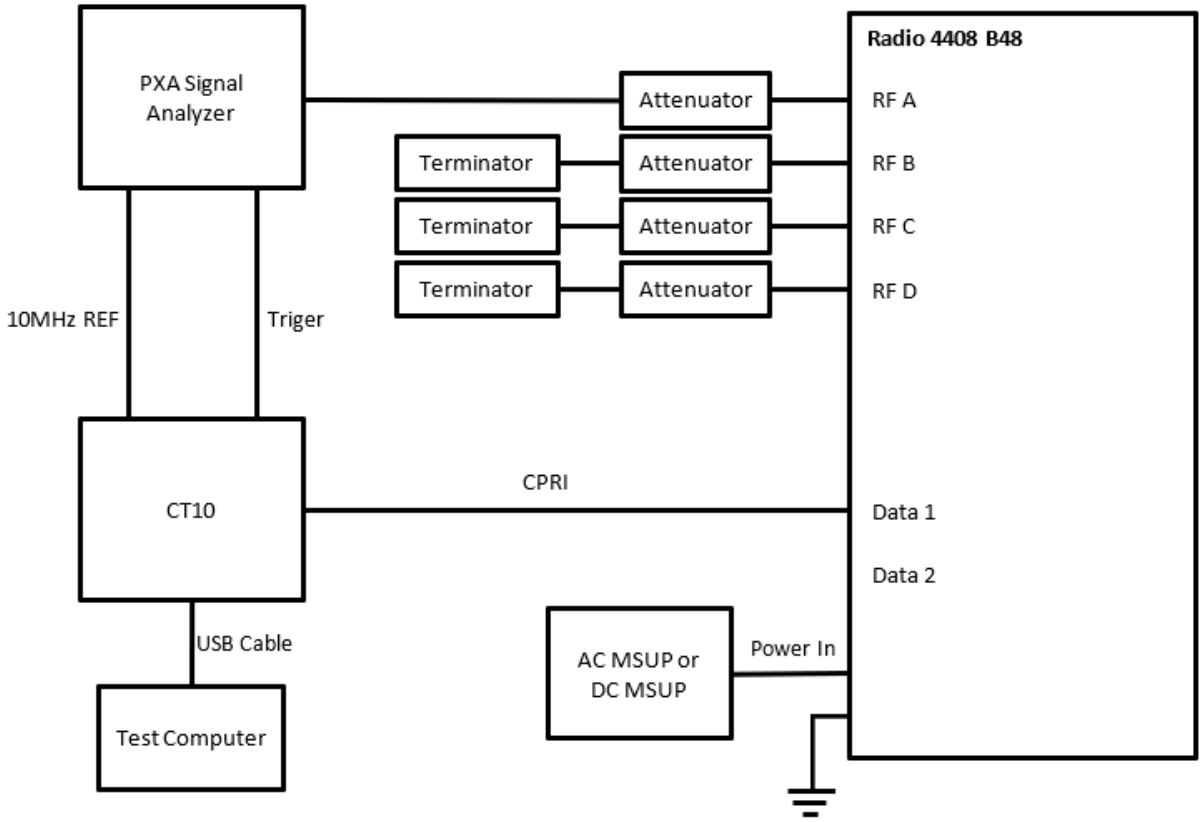
Complete testing was carried out on the worst case antenna port which was determined by the highest output power from the 4 measured ports on worst case modulation scheme and worst bandwidth. The worst antenna port was antenna B.

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

Configuration	Carrier	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
LTE-MIMO-1C-10	1C	10MHz	3555	3625	3695
LTE-MIMO-1C-20	1C	20MHz	3560	3625	3690
LTE-MIMO-2C-10-1	2C	10MHz	3555 + 3565	3620 + 3630	3685 + 3695
LTE-MIMO-2C-20-1	2C	20MHz	3560 + 3580	3615 + 3635	3670 + 3690
LTE-MIMO-2C-10-2	2C	10MHz	3555 + 3695		
LTE-MIMO-2C-20-2	2C	20MHz	3560 + 3690		
LTE-MIMO-3C-10	3C	10MHz	3555 + 3565 + 3695		
LTE-MIMO-3C-20	3C	20MHz	3560 + 3580 + 3690		
LTE-MIMO-6C-10	6C	10MHz	3555 + 3565 + 3575 + 3585 + 3595 + 3695		
LTE-MIMO-6C-20	6C	20MHz	3560 + 3580 + 3600 + 3620 + 3640 + 3690		

2.4 Test Setup

Conducted Measurement:



No.	Auxiliary Equipment	Product Number / Model Type	Version
1	Test computer	PowerEdge 220	-
2	CT10	LPC 102487/1	R1C
3	AC MSUP	Support 6501	-
4	DC MSUP	Support 6502	-
5	Power Supply	62024P-100-50	
6	Attenuator	47-40-33 LIM	-
7	Attenuator	2.4TS10-30dB-45G-JJ	-
8	Attenuator	2.92TS5-3dB-40G	
9	Terminator	TFZ50-3R	

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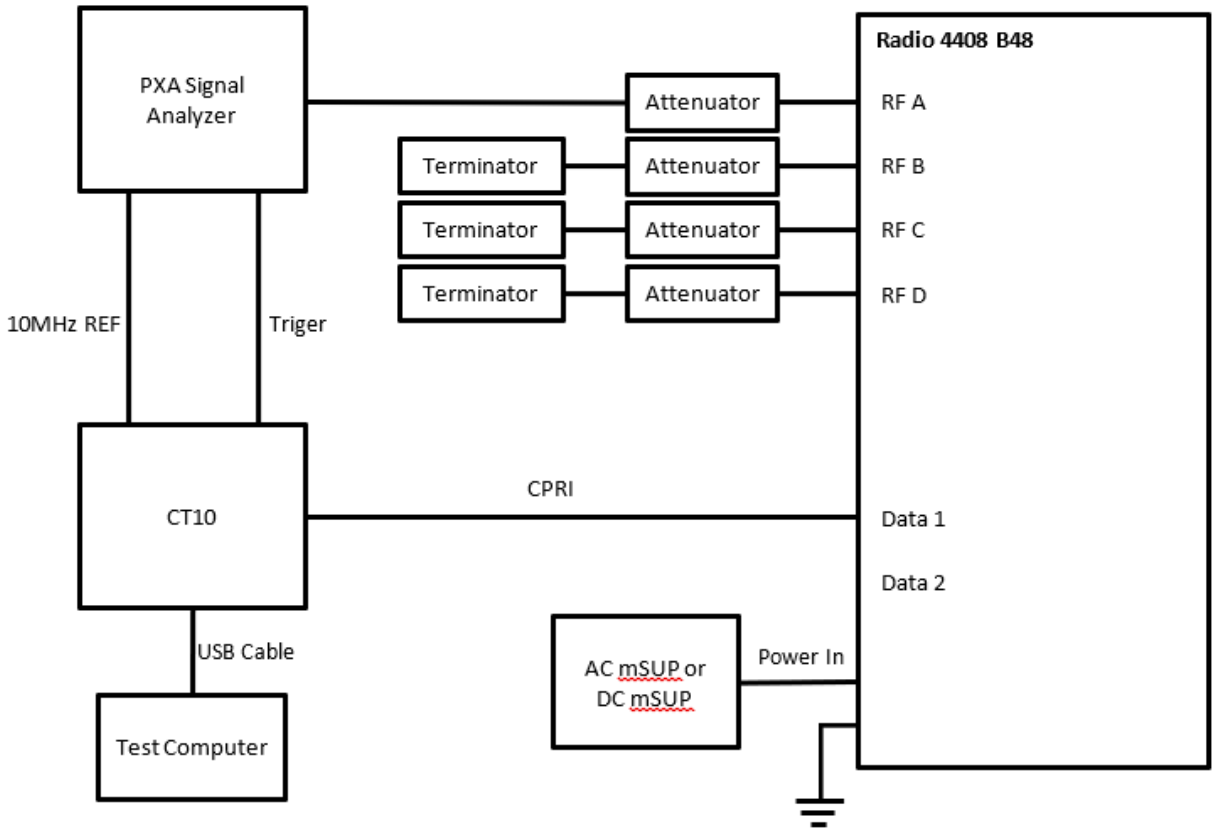
Radiated Measurement:



No.	Auxiliary Equipment	Product Number / Model Type	Version
1	Test computer	PowerEdge 220	-
2	CT10	LPC 102487/1	R1C
3	DC MSUP	Support 6502	-
4	Power Supply	DH1716A-10	-
5	Terminator	TFZ50-3R	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Power, PSD and Peak to Average Power Ratio	22°C	56% 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
☒	PXA Signal Analyzer	Keysight	N9030B	EC 6078	2020-06-11
☐	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

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☐	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	2020-07-01

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 Power, PSD and Peak to Average Power Ratio

Test result: Pass

3.1 Limit

Power limits:
Maximum effective isotropic radiated power (EIRP): 47dBm/10MHz
Maximum Power Spectral Density (PSD): 37dBm/MHz

Peak to Average Ratio: ≤13 dB

3.2 Measurement Procedure

The EUT was configured to transmit on maximum power and proper modulation. Measurements were performed with a Spectrum Analyzer using the Band Power measurement function. The detector was set to RMS with an RBW of at least 1% of the carrier bandwidth and a VBW of at least 3 times the RBW. The integration bandwidth was configured to be 10MHz as defined in 96.41(b). Where the carrier width was greater than 10MHz, the integration bandwidth was moved to the region with the highest PSD to find the maximum band power.

For PSD measurements in a 1MHz bandwidth, an RMS detector was used with a single sweep. The highest PSD was established over the entire emission bandwidth and the result recorded.

The measured results were summed in accordance with FCC KDB 662911 to account for 4 ports MIMO operation.

CCDF measurements were carried out in accordance with ANSI C63.26 Clause 5.2.3.4.

3.3 Measurement result

Configuration B:

LTE-MIMO-1C-10:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.77	36.77	27.643	8.93
B	256QAM	10	36.70	36.70	27.564	8.94
C	256QAM	10	36.52	36.52	27.281	8.95
D	256QAM	10	36.82	36.82	27.545	8.93
Total A-D			42.72	42.72	33.531	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.82	36.82	27.617	8.94
B	256QAM	10	36.79	36.79	27.423	8.94
C	256QAM	10	36.53	36.53	27.291	8.94
D	256QAM	10	36.75	36.75	27.456	8.94
Total A-D			42.74	42.74	33.449	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.98	36.98	27.852	8.93
B	256QAM	10	36.84	36.84	27.683	8.94
C	256QAM	10	36.69	36.69	27.532	8.93
D	256QAM	10	36.92	36.92	27.762	8.93
Total A-D			42.88	42.88	33.729	-

LTE-MIMO-1C-20:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.83	34.40	24.695	8.95
B	256QAM	20	36.83	34.36	24.656	8.94
C	256QAM	20	36.61	34.13	24.460	8.95
D	256QAM	20	36.72	34.24	24.520	8.94
Total A-D			42.77	40.30	30.604	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.87	34.37	24.668	8.95
B	256QAM	20	36.84	34.31	24.613	8.96
C	256QAM	20	36.49	34.03	24.304	8.94
D	256QAM	20	36.84	34.07	24.603	8.94
Total A-D			42.78	40.22	30.570	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	37.06	34.60	24.889	8.97
B	256QAM	20	37.12	34.64	24.983	8.96
C	256QAM	20	36.88	34.43	24.702	8.95
D	256QAM	20	37.03	34.54	24.931	8.95
Total A-D			43.04	40.57	30.898	-

LTE-MIMO-2C-10-1:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.68	33.75	24.681	-
B	256QAM	10	36.67	33.79	24.672	-
C	256QAM	10	36.52	33.56	24.548	-
D	256QAM	10	36.62	33.66	24.578	-
Total A-D			42.64	39.71	30.641	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.67	33.66	24.570	-
B	256QAM	10	36.60	33.62	24.528	-
C	256QAM	10	36.43	33.51	24.468	-
D	256QAM	10	36.55	33.56	24.416	-
Total A-D			42.58	39.61	30.516	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.80	33.91	24.825	-
B	256QAM	10	36.82	33.95	24.817	-
C	256QAM	10	36.64	33.70	24.611	-
D	256QAM	10	36.77	33.91	24.756	-
Total A-D			42.78	39.89	30.774	-

LTE-MIMO-2C-10-2:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.36	33.43	24.309	-
B	256QAM	10	36.41	33.47	24.299	-
C	256QAM	10	36.27	33.27	24.245	-
D	256QAM	10	36.40	33.46	24.366	-
Total A-D			42.38	39.43	30.326	-

LTE-MIMO-2C-20-1:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.60	31.11	21.557	-
B	256QAM	20	36.62	31.13	21.647	-
C	256QAM	20	36.34	30.94	21.269	-
D	256QAM	20	36.50	30.99	21.491	-
Total A-D			42.54	37.06	27.514	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.66	31.17	21.558	-
B	256QAM	20	36.66	31.15	21.545	-
C	256QAM	20	36.44	31.01	21.393	-
D	256QAM	20	36.54	31.03	21.477	-
Total A-D			42.60	37.11	27.514	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.69	31.31	21.672	-
B	256QAM	20	36.69	31.30	21.715	-
C	256QAM	20	36.53	31.15	21.552	-
D	256QAM	20	36.66	31.30	21.668	-
Total A-D			42.66	37.29	27.673	-

LTE-MIMO-2C-20-2:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
				Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.48	31.11	21.474	-
B	256QAM	20	36.46	31.03	21.379	-
C	256QAM	20	36.38	30.85	21.199	-
D	256QAM	20	36.40	30.96	21.305	-
Total A-D			42.45	37.01	27.361	-

LTE-MIMO-3C-10:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.38	31.72	22.523	-
B	256QAM	10	36.43	31.78	22.642	-
C	256QAM	10	36.41	31.59	22.413	-
D	256QAM	10	36.28	31.62	22.463	-
Total A-D			42.40	37.70	28.532	-

LTE-MIMO-3C-20:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.44	29.29	19.711	-
B	256QAM	20	36.51	29.41	19.827	-
C	256QAM	20	36.35	29.23	19.612	-
D	256QAM	20	36.45	29.31	19.708	-
Total A-D			42.46	35.33	25.736	-

LTE-MIMO-6C-10:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	36.50	28.86	19.787	-
B	256QAM	10	36.61	29.07	19.925	-
C	256QAM	10	36.40	28.76	19.670	-
D	256QAM	10	36.51	28.91	19.811	-
Total A-D			42.53	34.92	25.820	-

LTE-MIMO-6C-20:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.58	26.52	16.879	-
B	256QAM	20	36.65	26.54	16.922	-
C	256QAM	20	36.43	26.30	16.701	-
D	256QAM	20	36.57	26.57	16.914	-
Total A-D			42.58	32.50	22.876	-

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EIRP Compliance

The maximum allowable antenna gain + cable loss cannot exceed the values in the table below when the radio operating at the maximum output power in order to be compliant with the EIRP requirements in Part 96.41.

RF exposure compliance for the external antenna shall be addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of Part 1.1307(b)(3).

LTE Carrier Bandwidth MHz	Maximum Total output power dBm/MHz	Maximum Antenna gain + cable loss dBi	PSD dBm/MHz	EIRP dBm/10MHz	EIRP per Bandwidth dBm	EIRP per Bandwidth W
10	33.73	3.27	37	47	47	50
20	30.90	6.10	37	47	50	100

Configuration A:

LTE-MIMO-1C-10:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	26.27	26.27	17.246	8.63
B	256QAM	10	26.17	26.17	17.153	8.27
C	256QAM	10	26.01	26.01	16.999	8.45
D	256QAM	10	26.08	26.08	16.967	8.30
Total A-D			32.15	32.15	23.113	-
Antenna gain			12.5dBi			-
EIRP			44.65	44.65	35.613	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	26.09	26.09	16.890	8.43
B	256QAM	10	25.95	25.95	16.843	8.24
C	256QAM	10	25.87	25.87	16.847	8.34
D	256QAM	10	26.04	26.04	16.967	8.41
Total A-D			32.01	32.01	22.908	-
Antenna gain			12.5dBi			-
EIRP			44.51	44.51	35.408	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	26.36	26.36	17.252	8.65
B	256QAM	10	26.26	26.26	17.247	8.23
C	256QAM	10	26.22	26.22	17.050	8.38
D	256QAM	10	26.32	26.32	17.158	8.42
Total A-D			21.31	32.31	23.198	-
Antenna gain			12.5dBi			-
EIRP			44.81	44.81	35.698	-

LTE-MIMO-1C-20:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	29.37	26.84	17.188	8.44
B	256QAM	20	29.30	26.82	17.137	8.39
C	256QAM	20	29.11	26.62	16.952	8.30
D	256QAM	20	29.23	26.73	17.044	8.28
Total A-D			35.27	32.77	23.102	-
Antenna gain			12.5dBi			-
EIRP			47.77	45.27	35.602	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	29.27	26.72	17.186	8.46
B	256QAM	20	29.27	26.73	17.143	8.35
C	256QAM	20	29.11	26.56	17.073	8.41
D	256QAM	20	29.14	26.56	17.034	8.41
Total A-D			35.22	32.66	23.130	-
Antenna gain			12.5dBi			-
EIRP			47.72	45.16	35.630	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	29.44	26.94	17.270	8.48
B	256QAM	20	29.52	27.05	17.391	8.36
C	256QAM	20	29.25	26.80	17.069	8.42
D	256QAM	20	29.40	26.93	17.417	8.42
Total A-D			35.42	32.95	23.310	-
Antenna gain			12.5dBi			-
EIRP			47.92	45.45	35.810	-

LTE-MIMO-2C-10-1:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	29.27	26.33	17.266	-
B	256QAM	10	29.31	26.40	17.271	-
C	256QAM	10	29.16	26.20	17.174	-
D	256QAM	10	29.24	26.31	17.197	-
Total A-D			35.27	32.33	23.248	-
Antenna gain			12.5dBi			-
EIRP			47.77	44.83	35.748	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	29.15	26.18	17.146	-
B	256QAM	10	29.18	26.19	17.107	-
C	256QAM	10	29.06	26.11	17.079	-
D	256QAM	10	29.20	26.20	17.035	-
Total A-D			35.17	32.19	23.113	-
Antenna gain			12.5dBi			-
EIRP			47.67	44.69	35.613	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	29.34	26.45	17.382	-
B	256QAM	10	29.42	26.54	17.426	-
C	256QAM	10	29.19	26.28	17.211	-
D	256QAM	10	29.34	26.45	17.309	-
Total A-D			35.34	32.45	23.353	-
Antenna gain			12.5dBi			-
EIRP			47.84	44.95	35.853	-

LTE-MIMO-2C-10-2:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	28.93	25.93	16.808	-
B	256QAM	10	28.92	25.99	16.761	-
C	256QAM	10	28.71	25.72	16.666	-
D	256QAM	10	28.85	25.95	16.826	-
Total A-D			34.87	31.92	22.786	-
Antenna gain			12.5dBi			-
EIRP			47.37	44.42	35.286	-

LTE-MIMO-2C-20-1:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position B			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	32.09	26.60	17.049	-
B	256QAM	20	32.13	26.68	17.112	-
C	256QAM	20	32.03	26.64	16.970	-
D	256QAM	20	32.10	26.64	17.114	-
Total A-D			38.11	32.66	23.082	-
Antenna gain			12.5dBi			-
EIRP			50.61	45.16	35.582	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	32.12	26.64	17.048	-
B	256QAM	20	32.20	26.69	17.147	-
C	256QAM	20	31.91	26.45	16.875	-
D	256QAM	20	32.12	26.61	17.062	-
Total A-D			38.11	32.62	23.055	-
Antenna gain			12.5dBi			-
EIRP			50.61	45.12	35.555	-

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position T			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	32.27	26.84	17.264	-
B	256QAM	20	32.23	26.85	17.257	-
C	256QAM	20	32.10	26.71	17.103	-
D	256QAM	20	32.14	26.85	17.091	-
Total A-D			38.21	32.83	23.200	-
Antenna gain			12.5dBi			-
EIRP			50.71	45.33	35.700	-

LTE-MIMO-2C-20-2:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	31.80	26.59	16.810	-
B	256QAM	20	31.89	26.52	16.848	-
C	256QAM	20	31.76	26.37	16.689	-
D	256QAM	20	31.79	26.43	16.786	-
Total A-D			37.83	32.50	22.804	-
Antenna gain			12.5dBi			-
EIRP			50.33	45.00	35.304	-

LTE-MIMO-3C-10:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	30.62	26.13	16.948	-
B	256QAM	10	30.84	26.23	17.020	-
C	256QAM	10	30.69	26.04	16.832	-
D	256QAM	10	30.63	25.98	16.802	-
Total A-D			36.72	32.12	22.922	-
Antenna gain			12.5dBi			-
EIRP			49.22	44.62	35.422	-

LTE-MIMO-3C-20:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	33.75	26.73	16.963	-
B	256QAM	20	33.93	26.93	17.116	-
C	256QAM	20	33.72	26.62	16.991	-
D	256QAM	20	33.81	26.71	17.052	-
Total A-D			39.82	32.77	23.052	-
Antenna gain			12.5dBi			-
EIRP			52.32	45.27	35.552	-

LTE-MIMO-6C-10:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	10	33.77	26.18	17.108	-
B	256QAM	10	33.82	26.30	17.142	-
C	256QAM	10	33.65	26.07	16.911	-
D	256QAM	10	33.82	26.24	17.124	-
Total A-D			39.79	32.22	23.093	-
Antenna gain			12.5dBi			-
EIRP			52.29	44.72	35.593	-

LTE-MIMO-6C-20:

Antenna Port	Modulation	Carrier Bandwidth (MHz)	Power / PSD / Peak-to-Average Ratio (PAR)			
			Channel position M			
			Power (dBm)	Power (dBm/10MHz)	PSD (dBm/MHz)	PAR (dB)
A	256QAM	20	36.62	26.57	16.864	-
B	256QAM	20	36.74	26.64	16.931	-
C	256QAM	20	36.47	26.40	16.687	-
D	256QAM	20	36.60	26.58	16.857	-
Total A-D			42.63	32.57	22.856	-
Antenna gain			12.5dBi			-
EIRP			55.13	45.07	35.356	-

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 99% and 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 Clause 4.2.

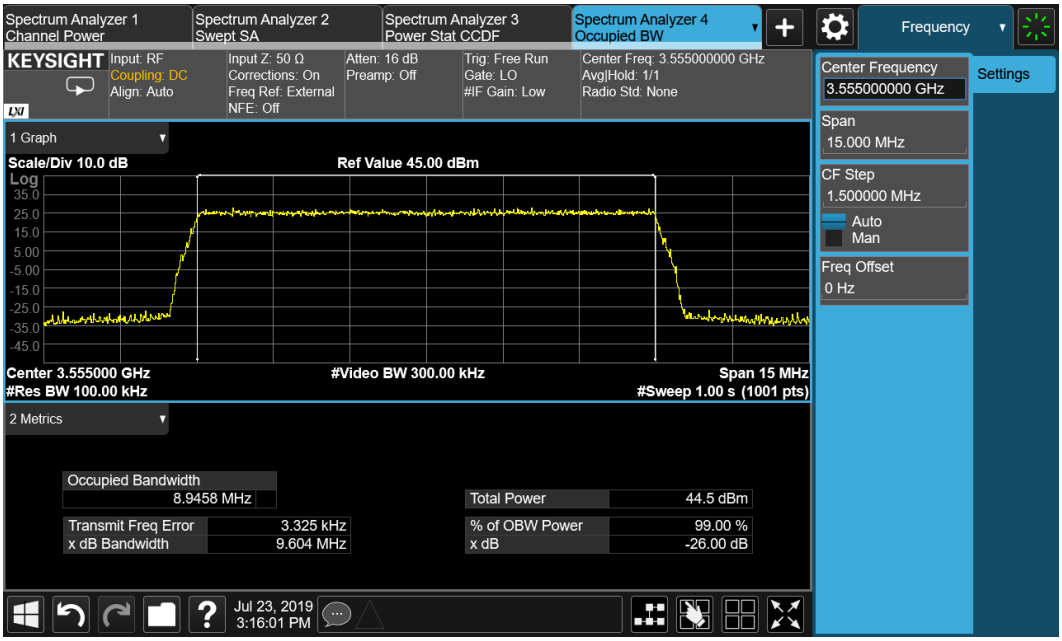
4.2 Measurement result

Configuration B:

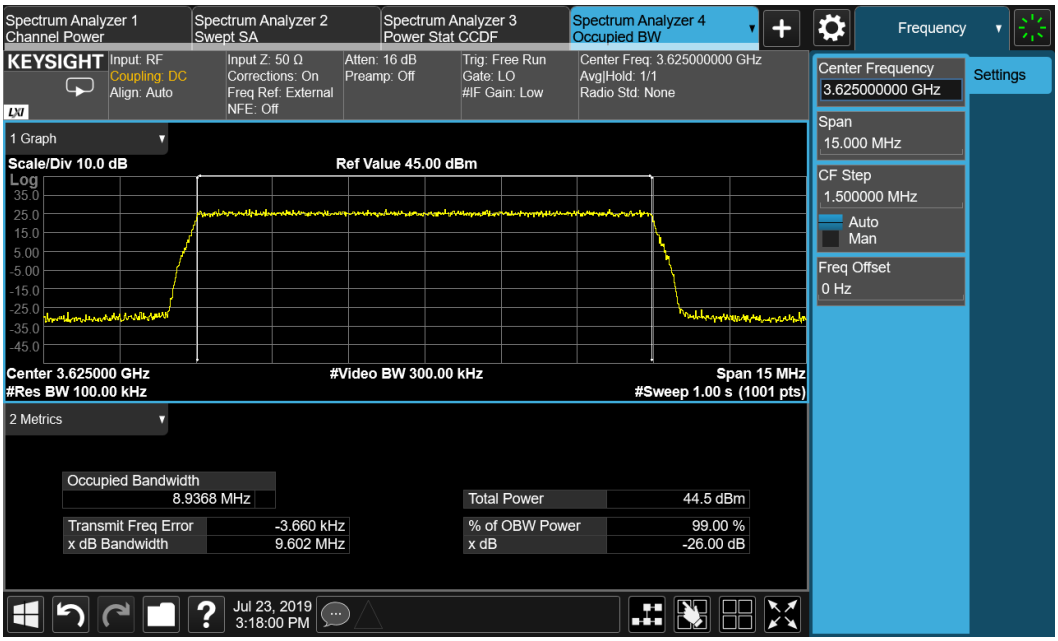
LTE-MIMO-1C-10:

Antenna Port	Modulation	Bandwidth	Channel Position B	Channel Position M	Channel Position T
B	256QAM	10MHz	99% Occupied Bandwidth (MHz)		
			8.9458	8.9368	8.9354
			26dB Occupied Bandwidth (MHz)		
			9.604	9.602	9.602

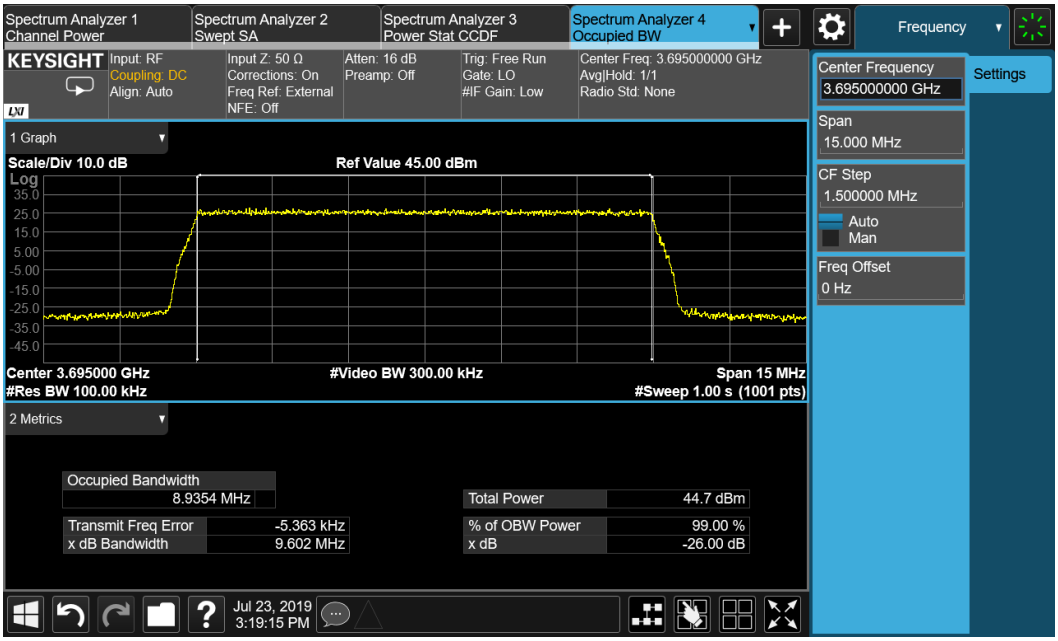
256QAM, 10MHz, Channel position B



256QAM, 10MHz, Channel position M



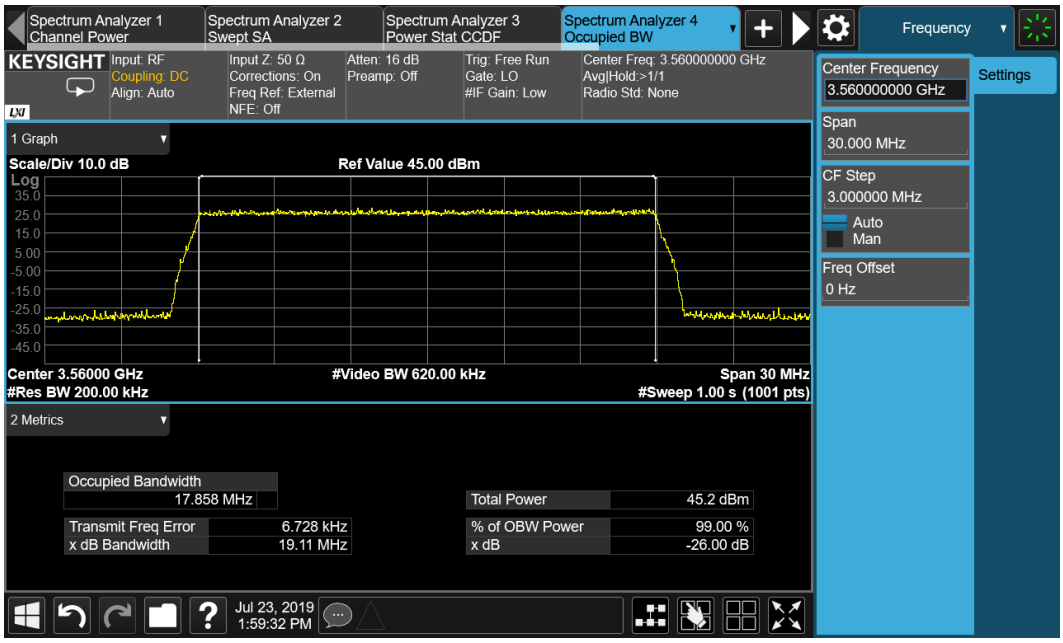
256QAM, 10MHz, Channel position T



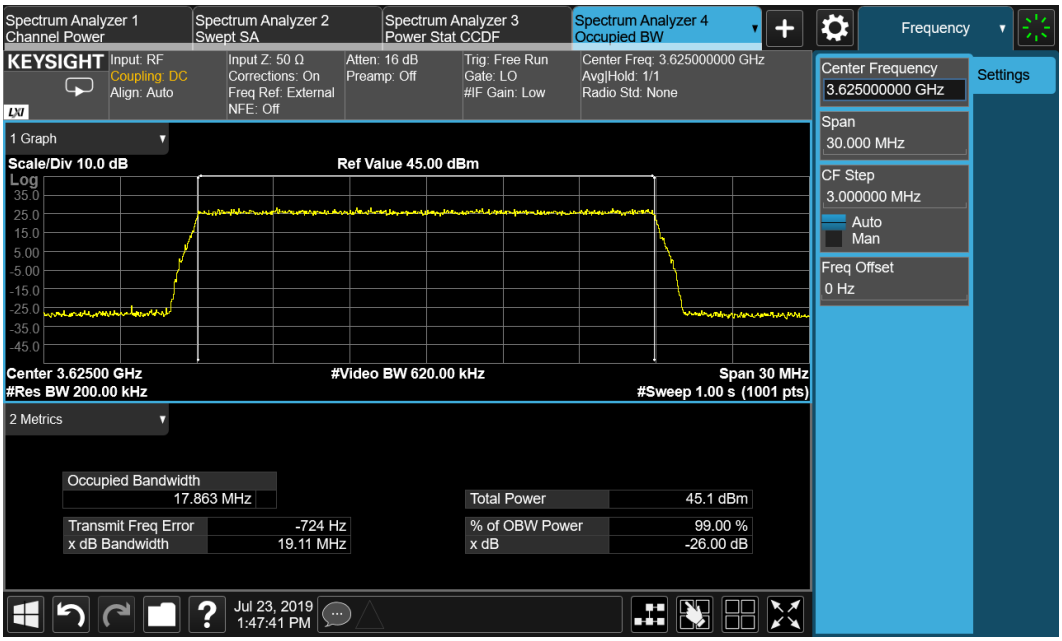
LTE-MIMO-1C-20:

Antenna Port	Modulation	Bandwidth	Channel Position B	Channel Position M	Channel Position T
B	256QAM	20MHz	99% Occupied Bandwidth (MHz)		
			17.858	17.863	17.860
			26dB Occupied Bandwidth (MHz)		
			19.11	19.11	19.11

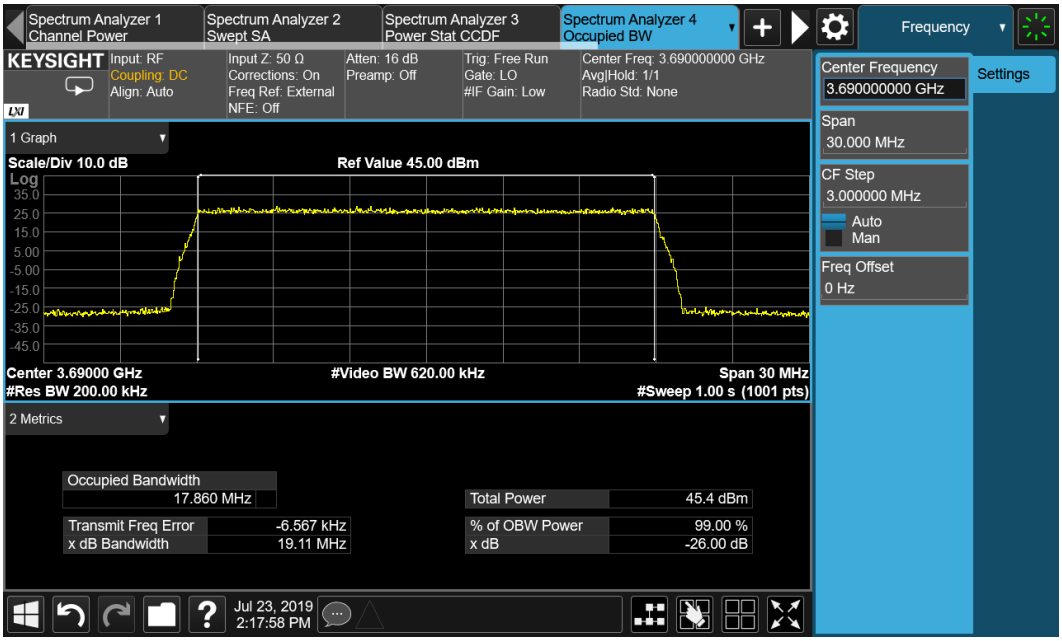
256QAM, 20MHz, Channel position B



256QAM, 20MHz, Channel position M



256QAM, 20MHz, Channel position T



5 Unwanted Emissions at Band Edge

Test result: **Pass**

5.1 Limit

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.

5.2 Measurement Procedure

All measurements were made according with KDB 971168 D01.

For MIMO mode configurations, the limit was adjusted with a correction of -6dB [10Log(1/4)] 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 .

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.

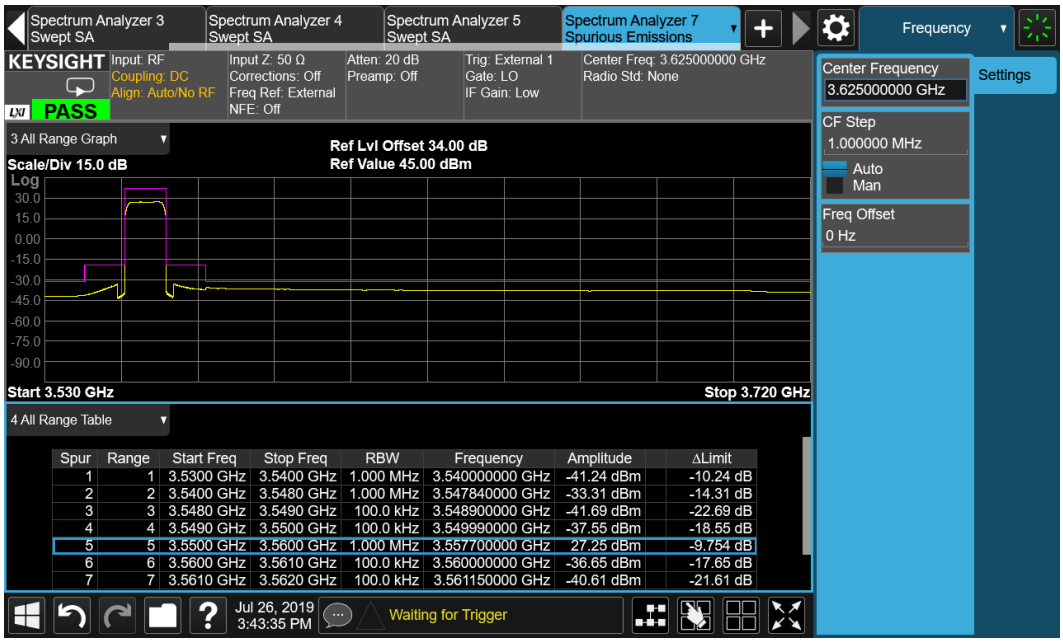
5.3 Measurement result

Configuration B:

LTE-MIMO-1C-10:

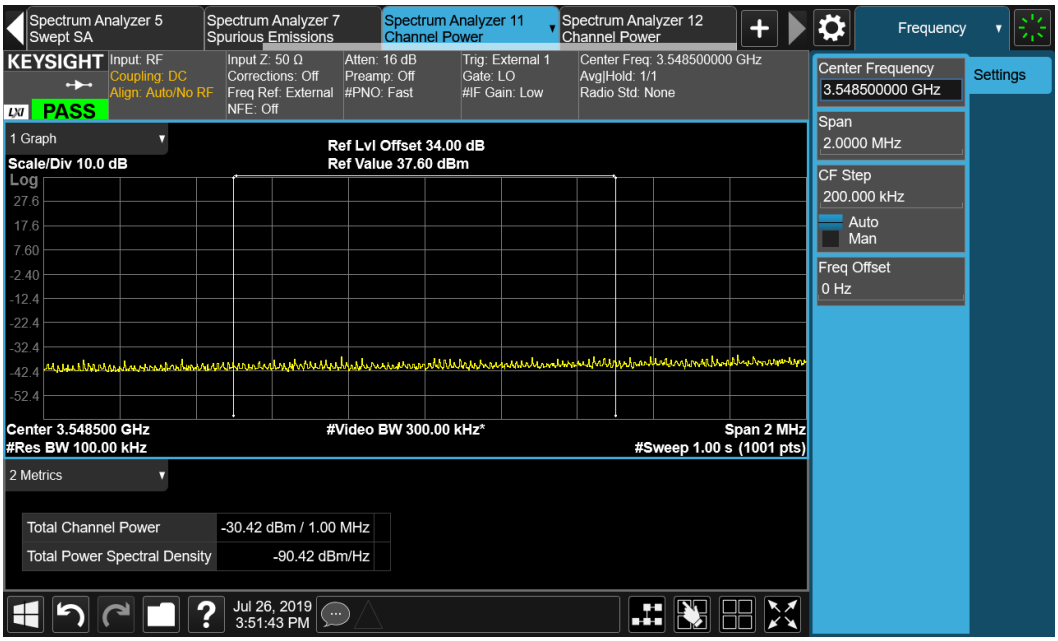
Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)
B	B	256QAM	10
B	M	256QAM	10
B	T	256QAM	10

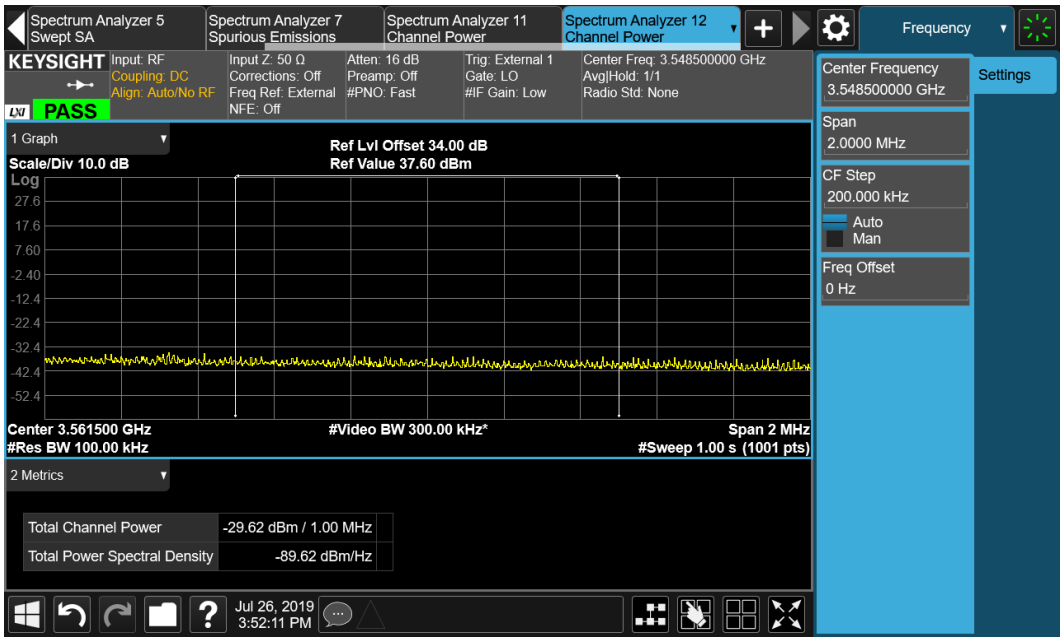
Channel Position B



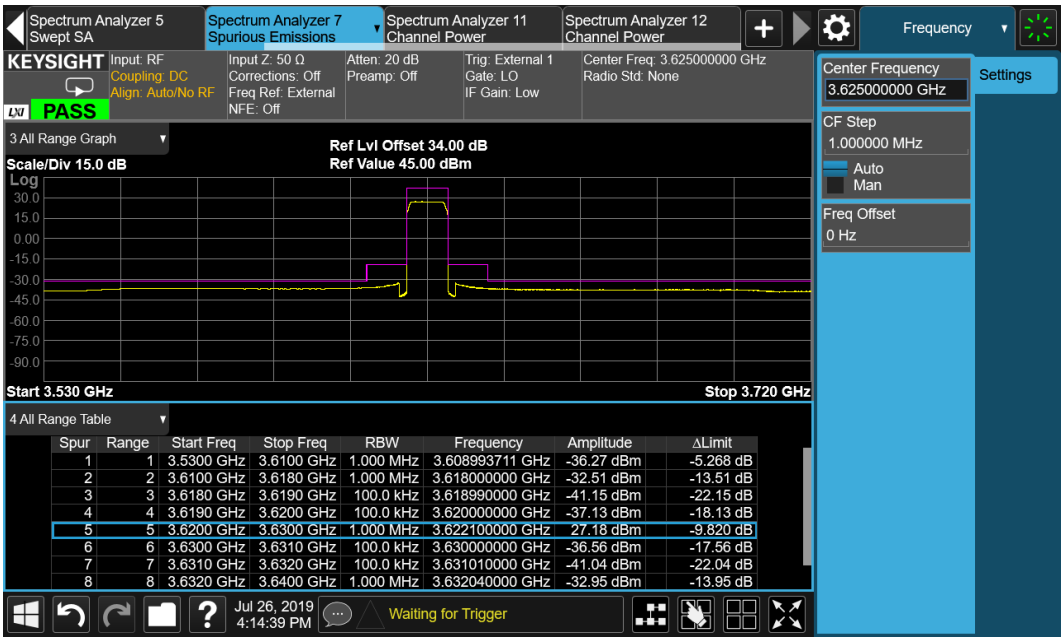
TEST REPORT

Frequency range 3548MHz-3549MHz and 3561MHz-3562MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

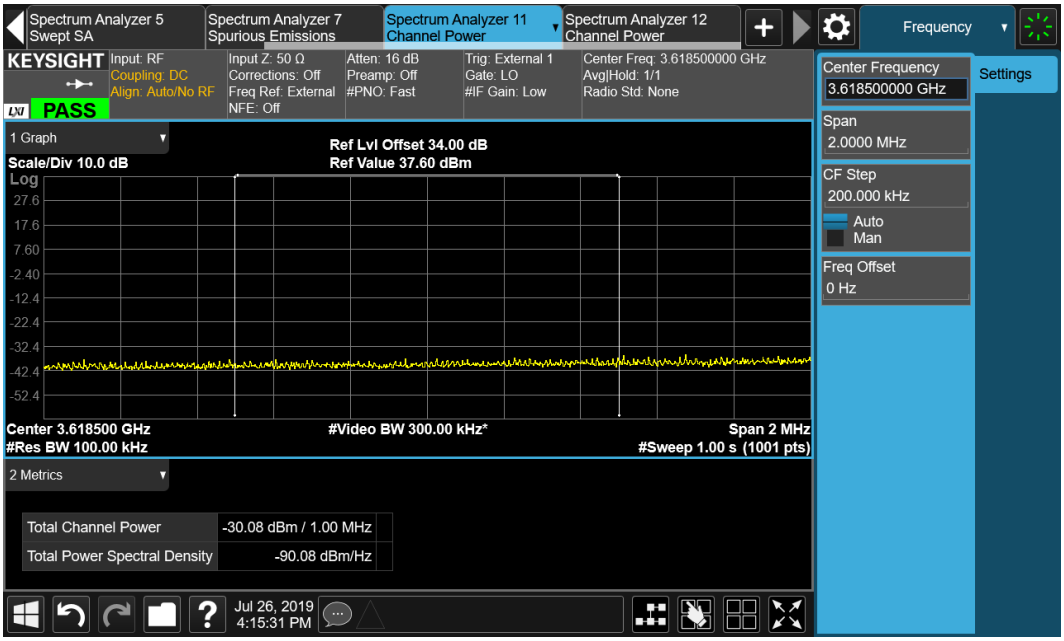




Channel Position M

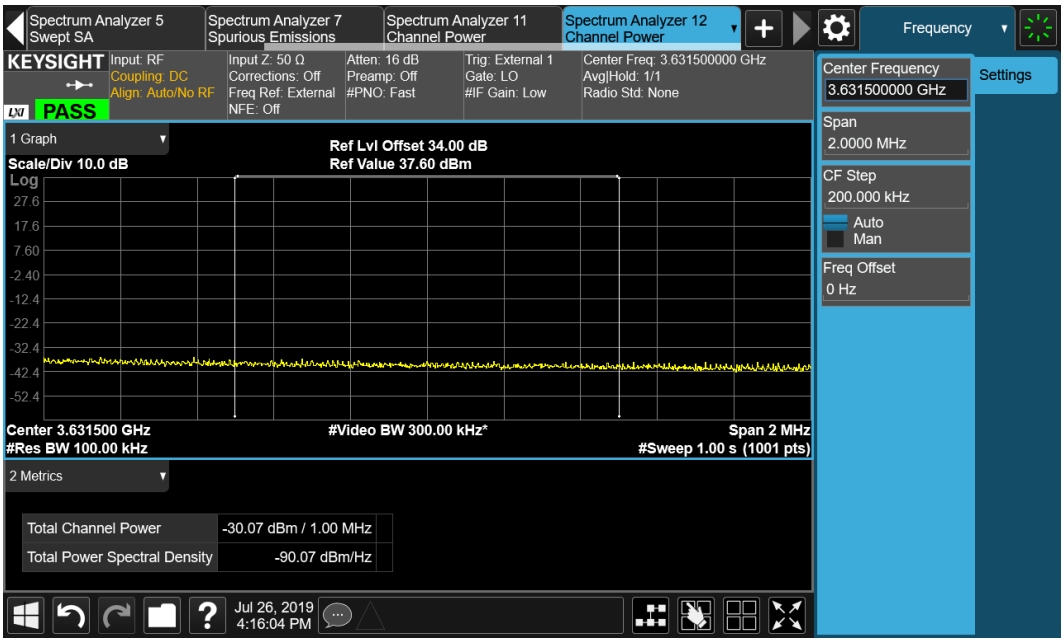


Frequency range 3618MHz-3619MHz and 3631MHz-3632MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

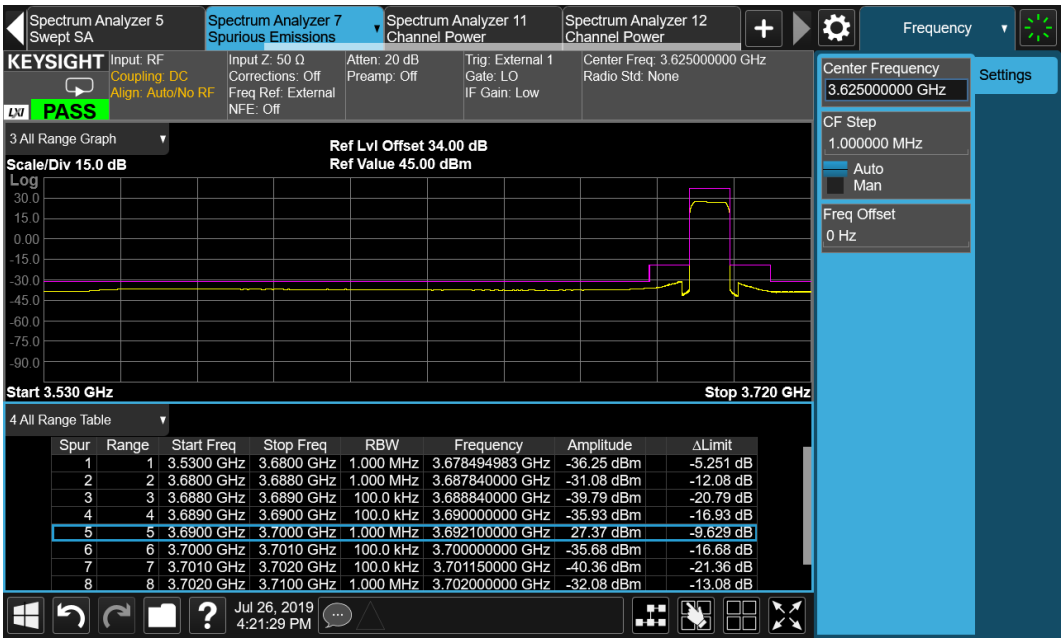


Total Quality. Assured.

TEST REPORT



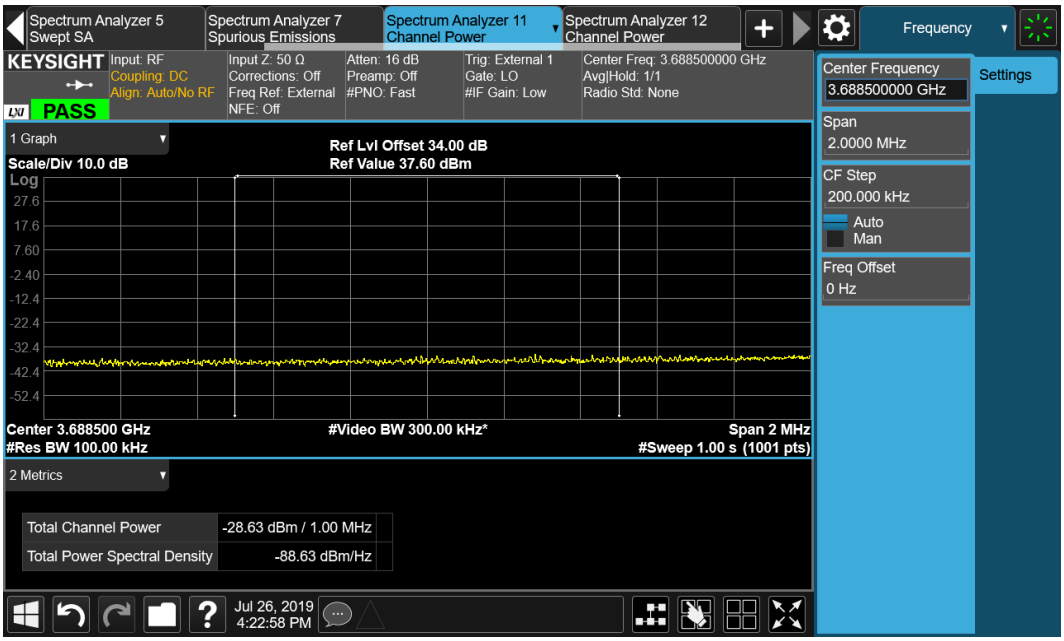
Channel Position T

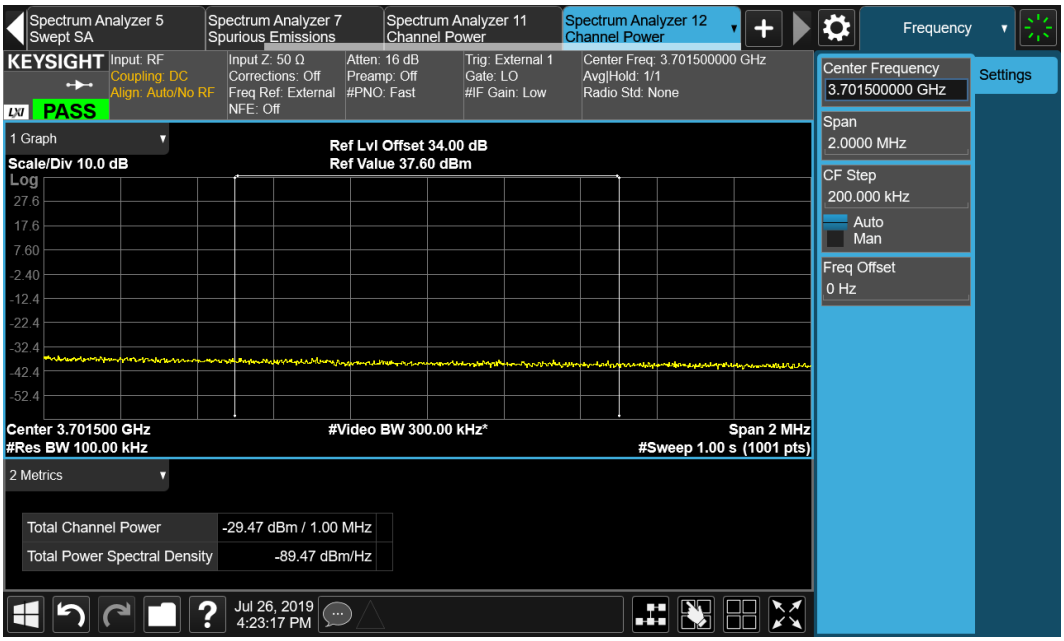


Total Quality. Assured.

TEST REPORT

Frequency range 3688MHz-3689MHz and 3701MHz-3702MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

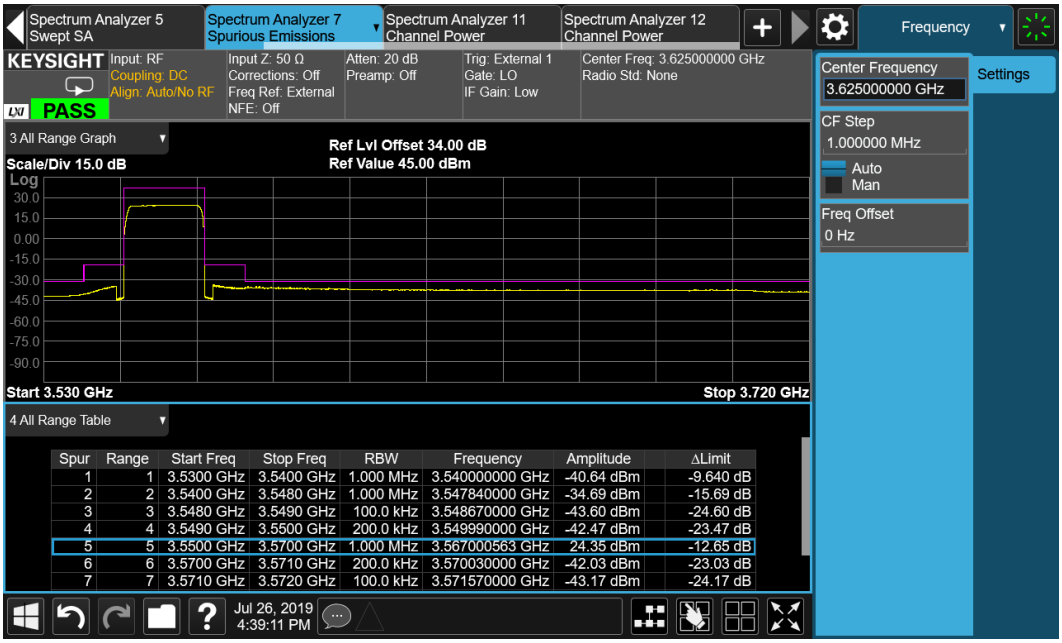




LTE-MIMO-1C-20:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)
B	B	256QAM	20
B	M	256QAM	20
B	T	256QAM	20

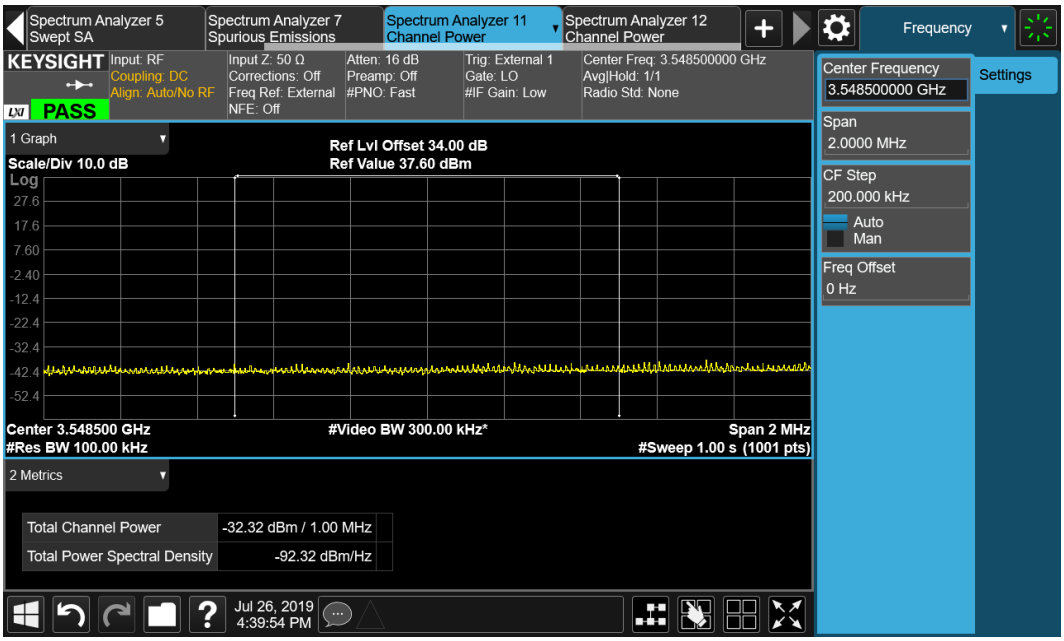
Channel Position B

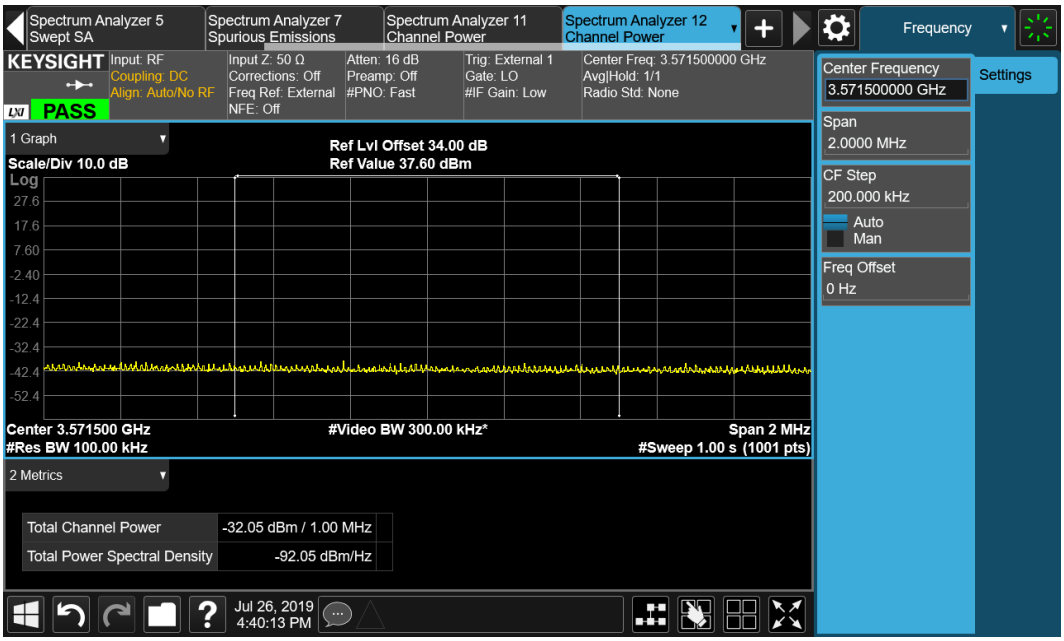


Total Quality. Assured.

TEST REPORT

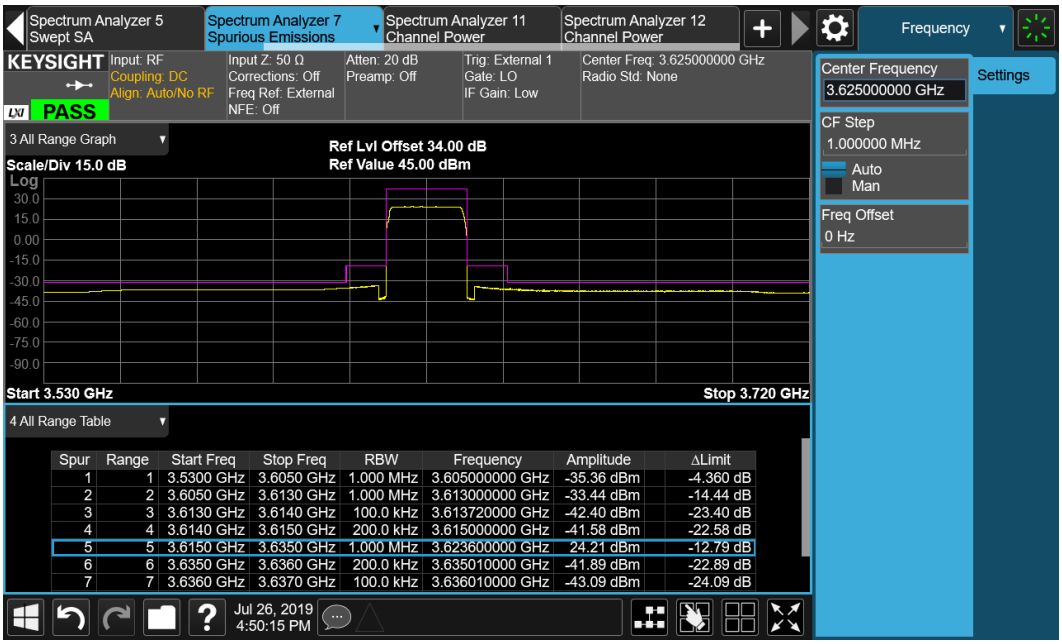
Frequency range 3548MHz-3549MHz and 3571MHz-3572MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.



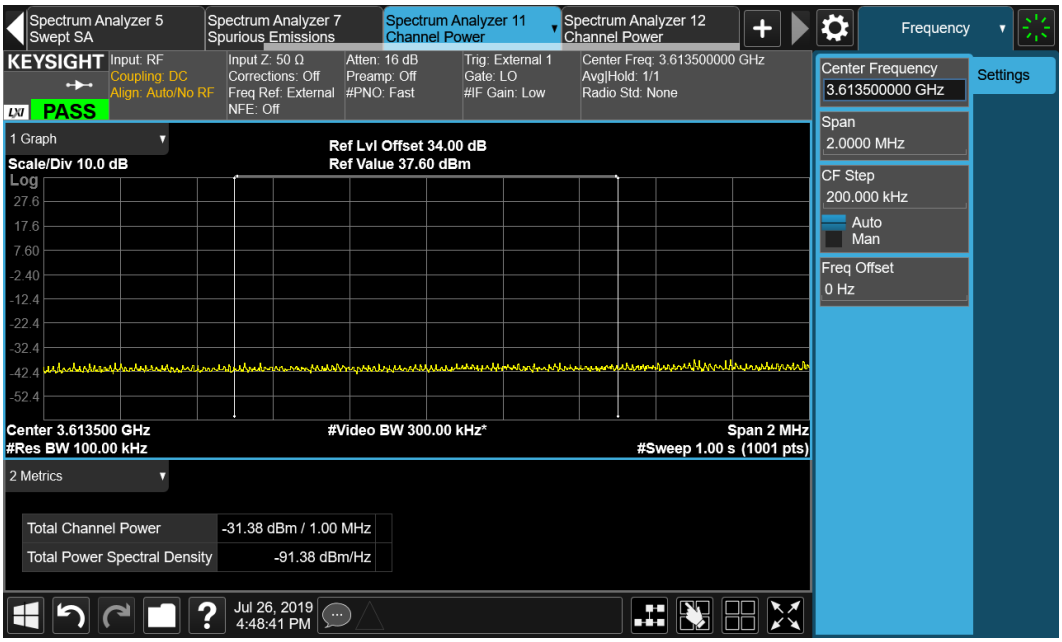


TEST REPORT

Channel Position M

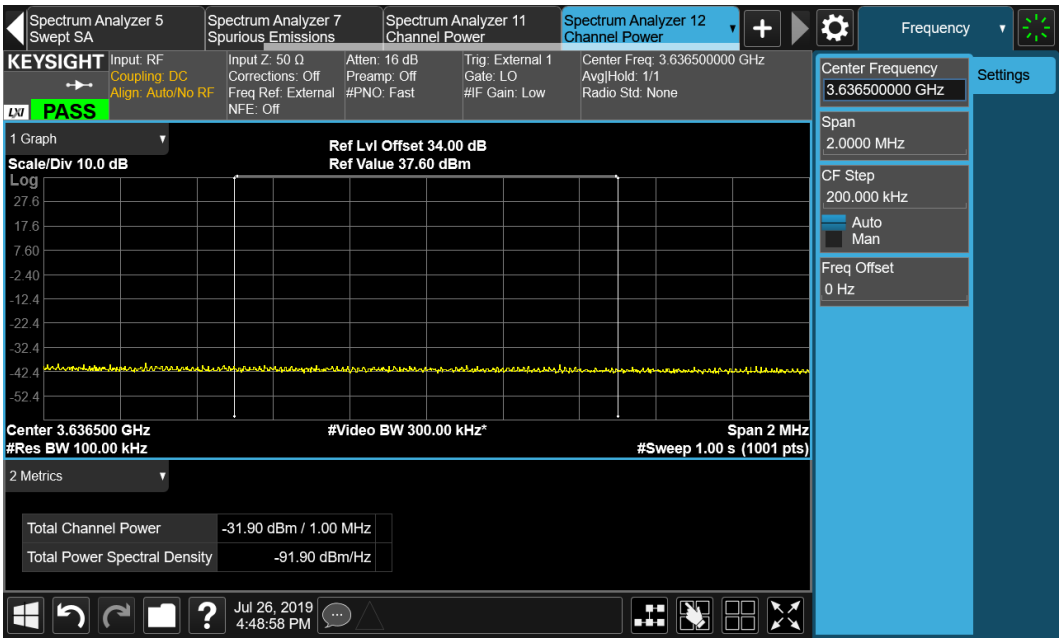


Frequency range 3613MHz-3614MHz and 3636MHz-3637MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

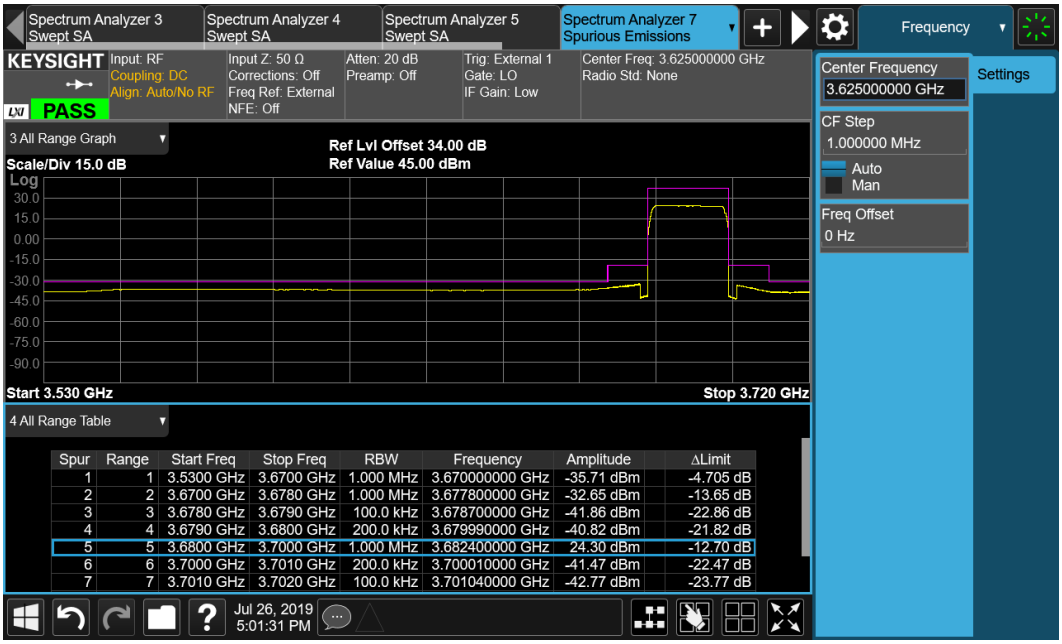


Total Quality. Assured.

TEST REPORT

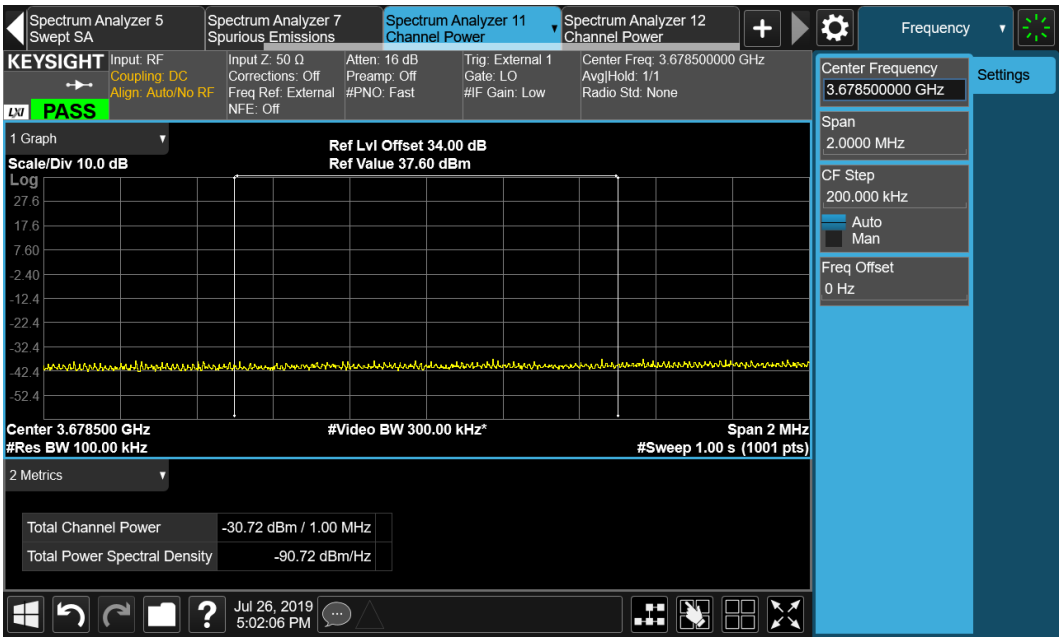


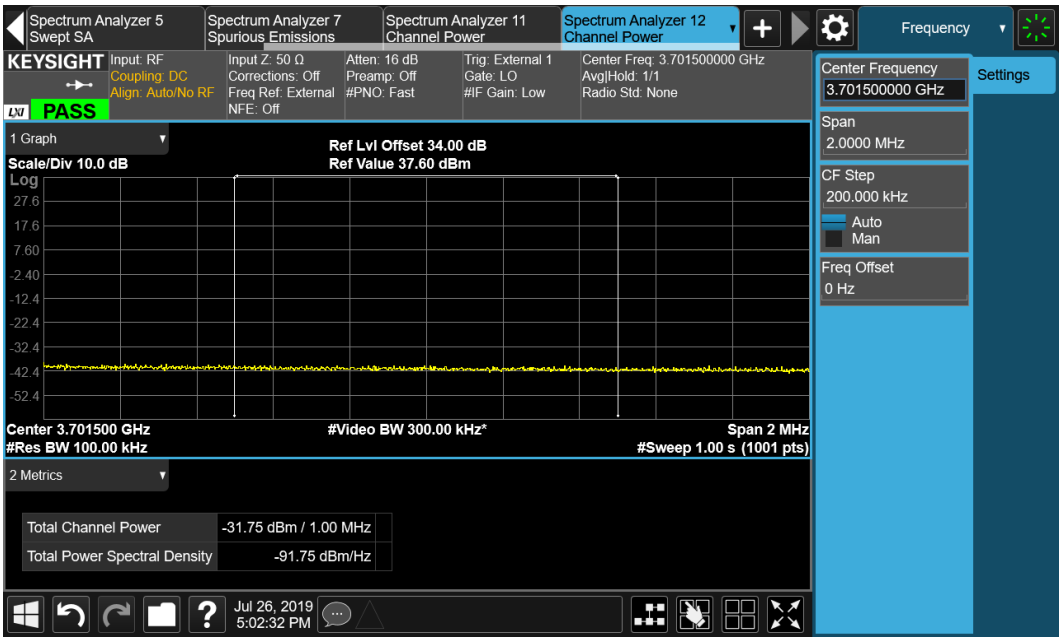
Channel Position T



TEST REPORT

Frequency range 3678MHz-3679MHz and 3701MHz-3702MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

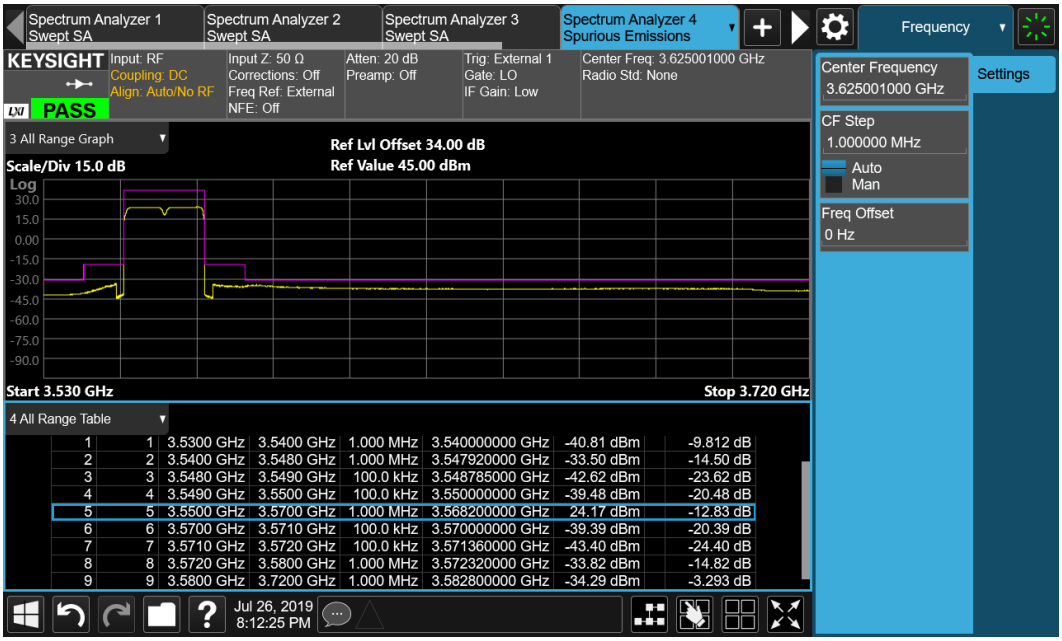




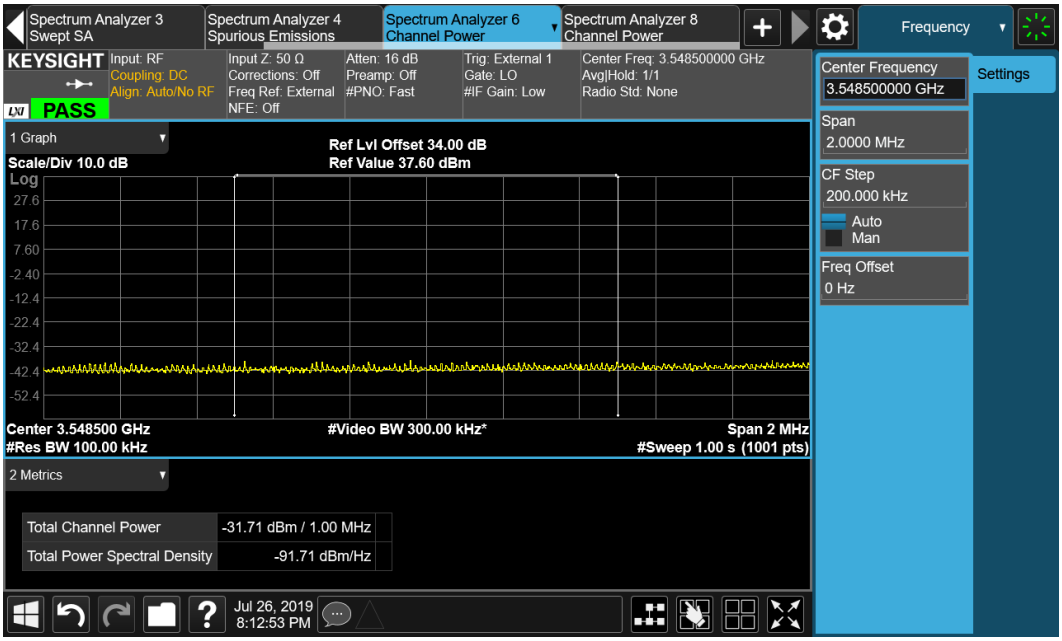
LTE-MIMO-2C-10-1:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)
B	B	256QAM	10
B	M	256QAM	10
B	T	256QAM	10

Channel Position B

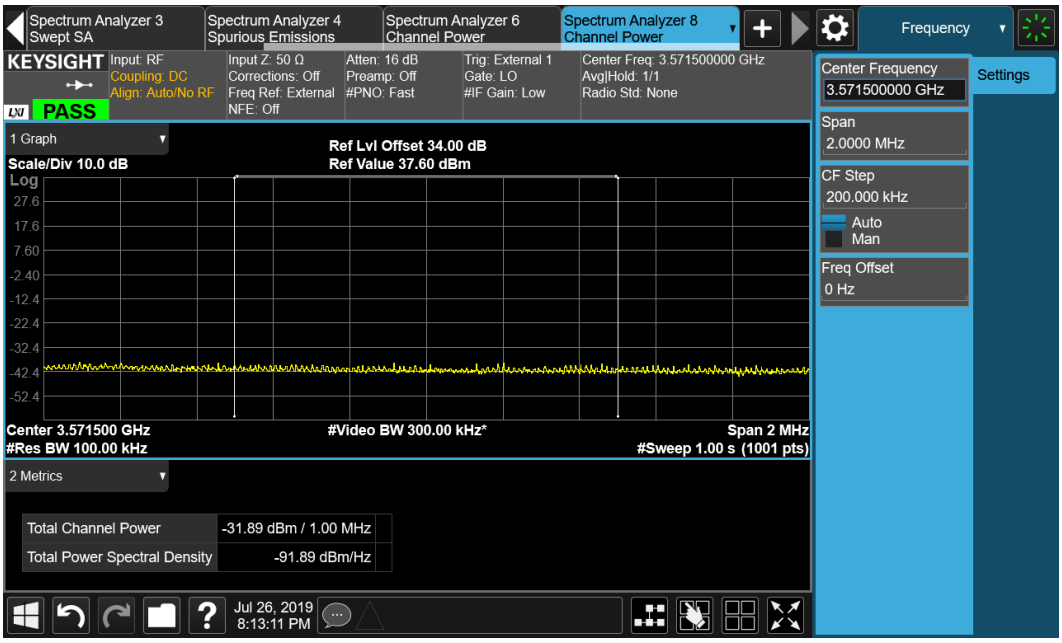


Frequency range 3548MHz-3549MHz and 3571MHz-3572MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

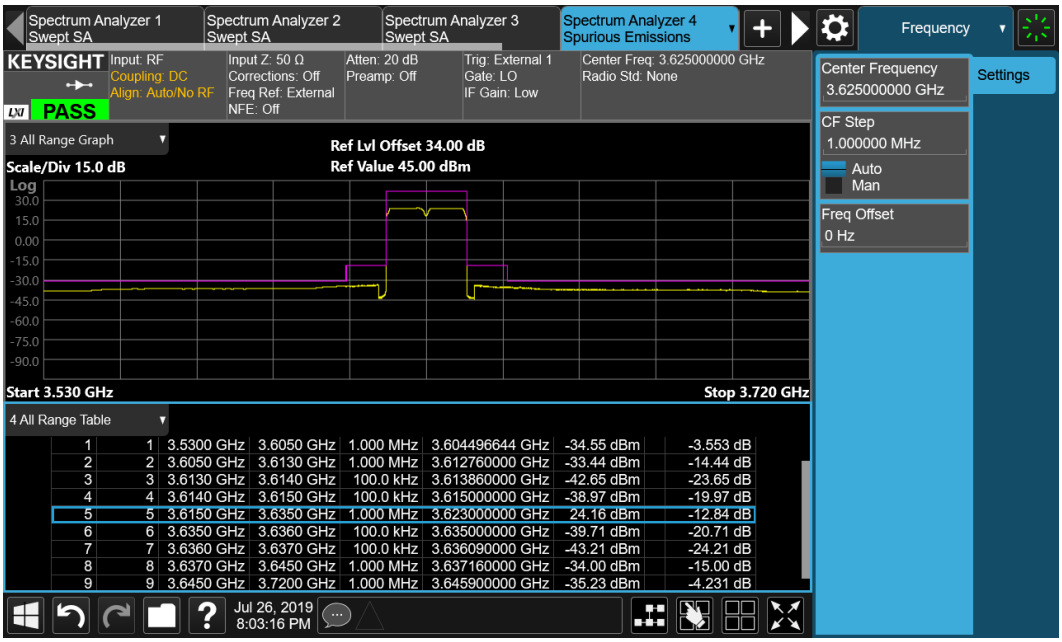


Total Quality. Assured.

TEST REPORT



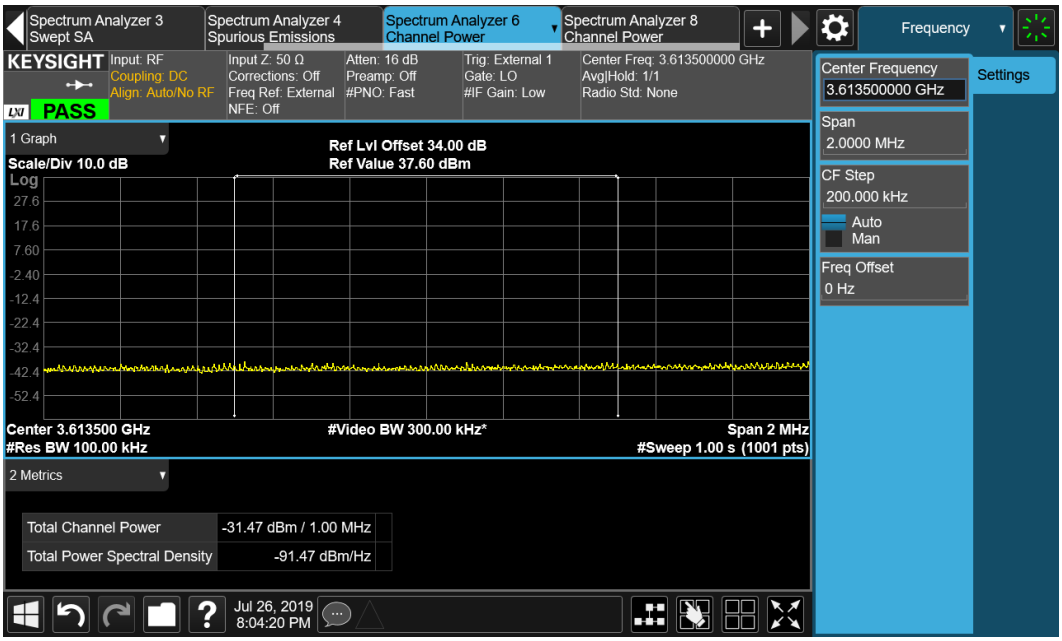
Channel Position M

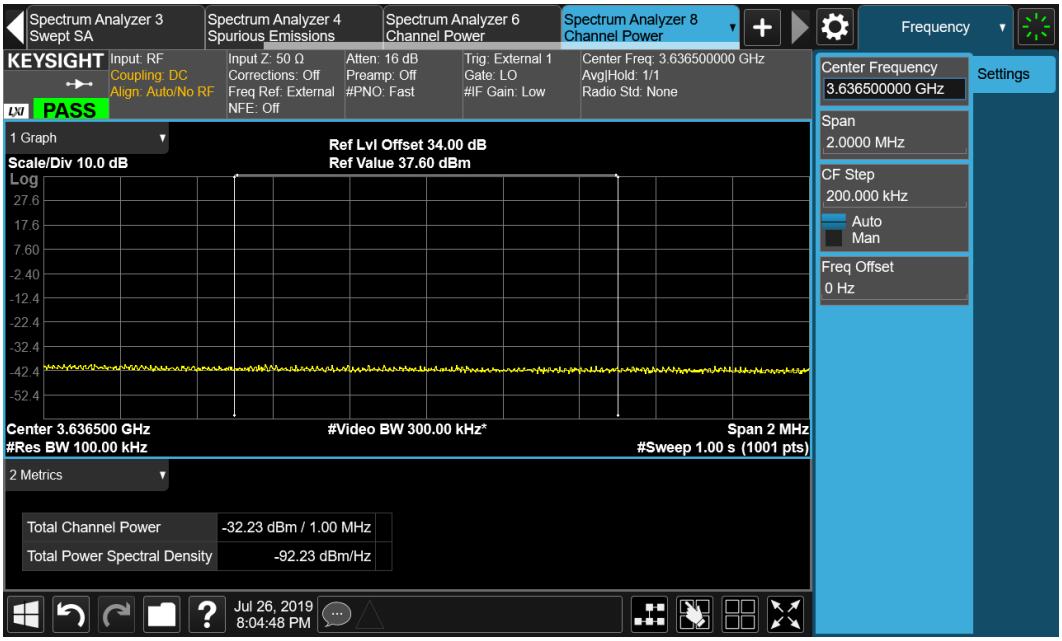


Total Quality. Assured.

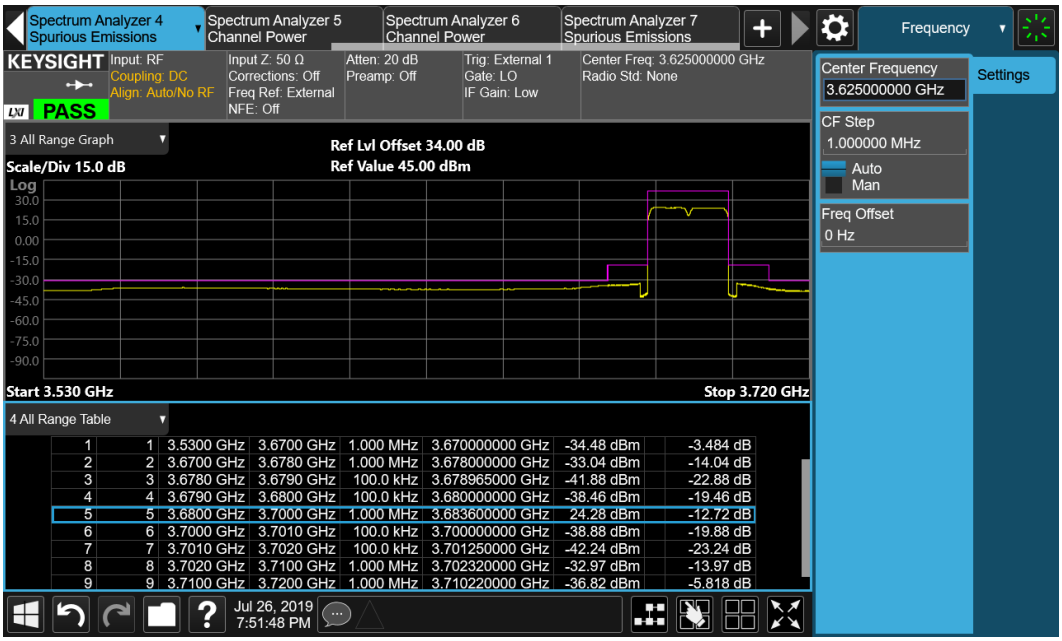
TEST REPORT

Frequency range 3613MHz-3614MHz and 3636MHz-3637MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

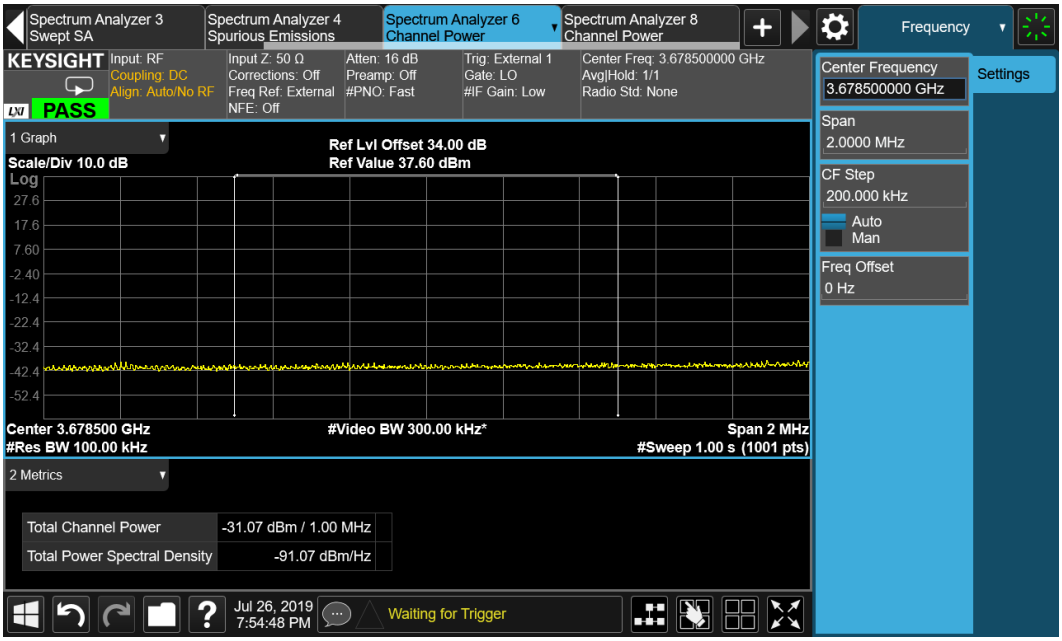


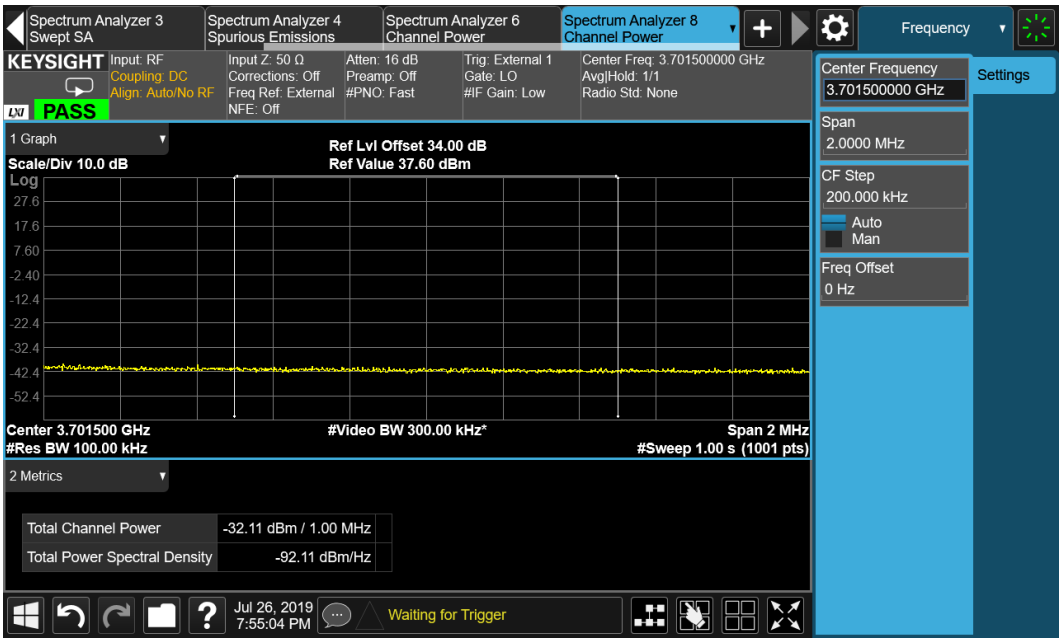


Channel Position T



Frequency range 3678MHz-3679MHz and 3701MHz-3702MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

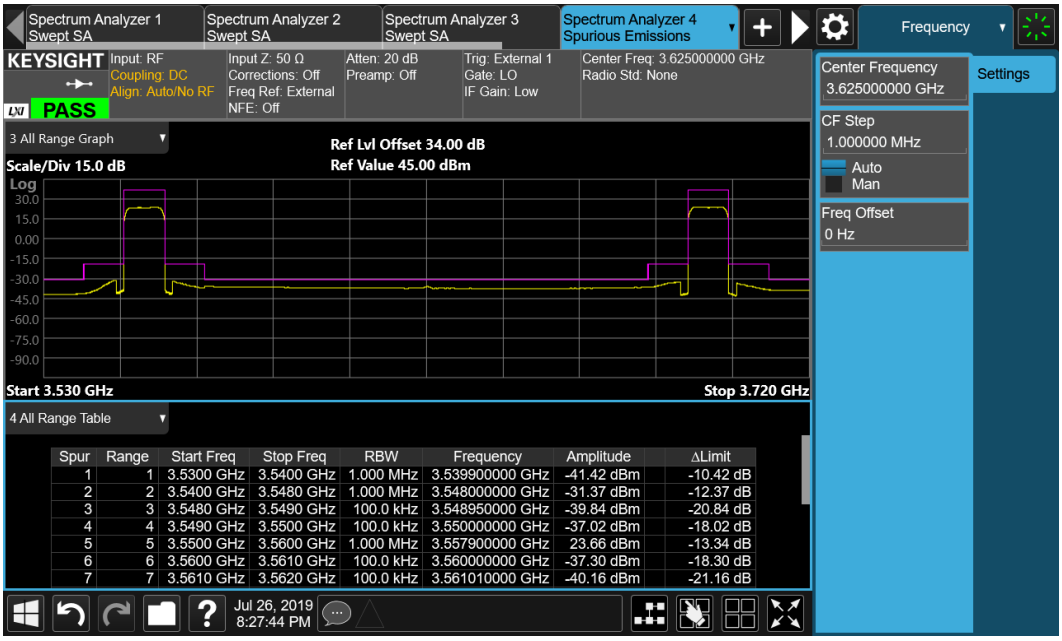




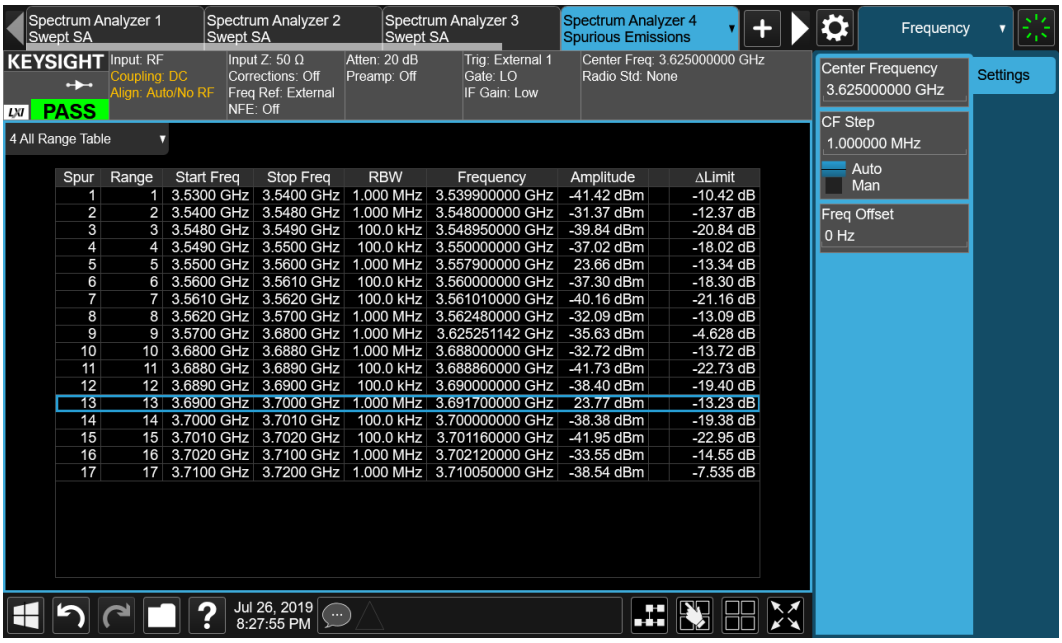
LTE-MIMO-2C-10-2:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)
B	M	256QAM	10

Channel Position M

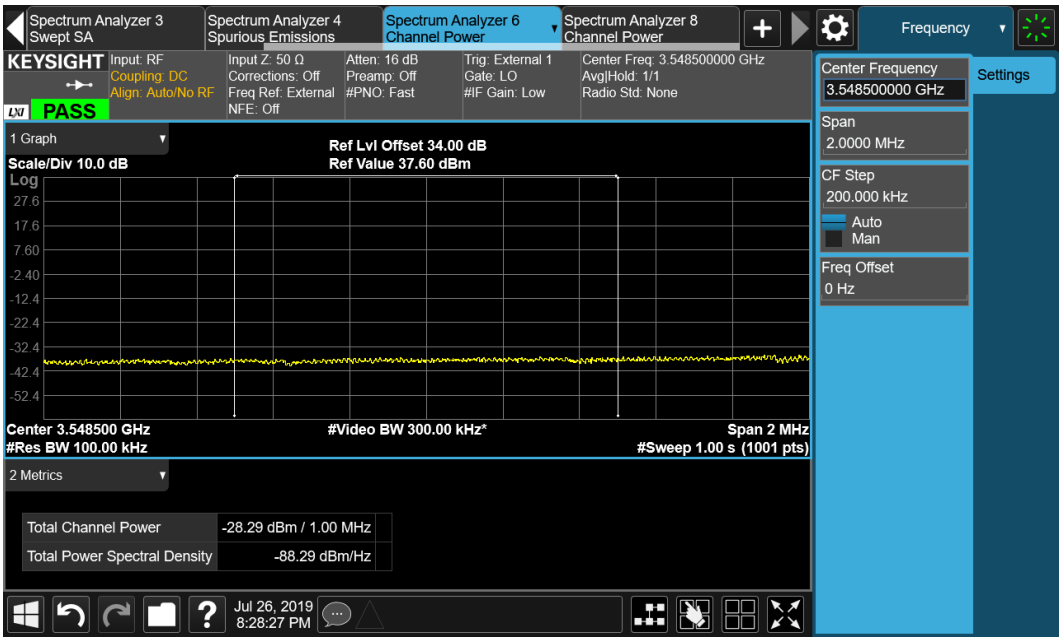


TEST REPORT



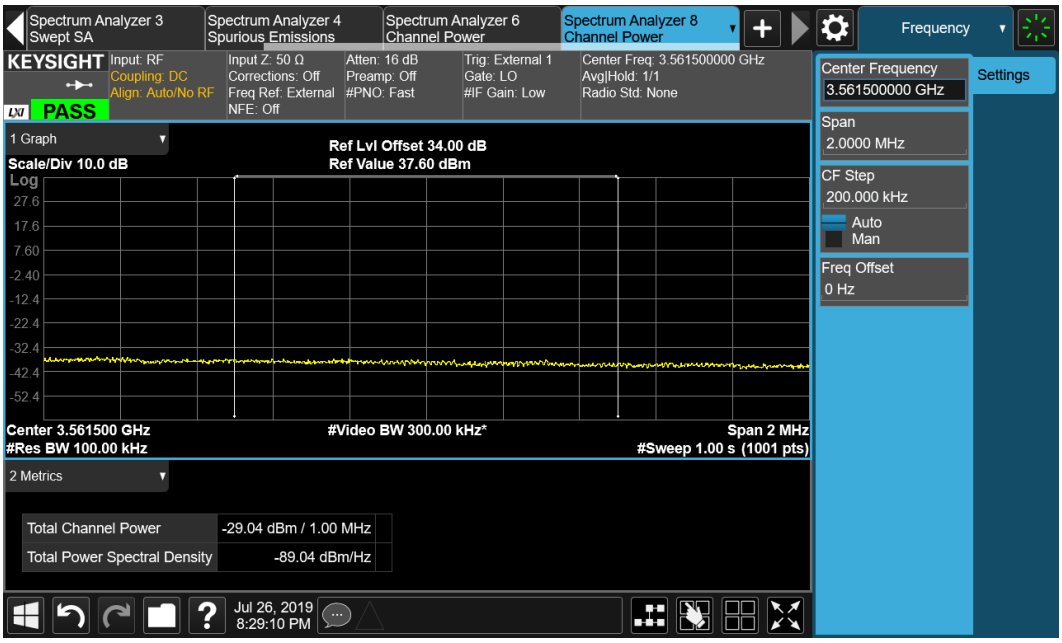
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	ΔLimit
1	1	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539900000 GHz	-41.42 dBm	-10.42 dB
2	2	3.5400 GHz	3.5480 GHz	1.000 MHz	3.548000000 GHz	-31.37 dBm	-12.37 dB
3	3	3.5480 GHz	3.5490 GHz	100.0 kHz	3.548950000 GHz	-39.84 dBm	-20.84 dB
4	4	3.5490 GHz	3.5500 GHz	100.0 kHz	3.550000000 GHz	-37.02 dBm	-18.02 dB
5	5	3.5500 GHz	3.5600 GHz	1.000 MHz	3.557900000 GHz	23.66 dBm	-13.34 dB
6	6	3.5600 GHz	3.5610 GHz	100.0 kHz	3.560000000 GHz	-37.30 dBm	-18.30 dB
7	7	3.5610 GHz	3.5620 GHz	100.0 kHz	3.561010000 GHz	-40.16 dBm	-21.16 dB
8	8	3.5620 GHz	3.5700 GHz	1.000 MHz	3.562480000 GHz	-32.09 dBm	-13.09 dB
9	9	3.5700 GHz	3.6800 GHz	1.000 MHz	3.625251142 GHz	-35.63 dBm	-4.628 dB
10	10	3.6800 GHz	3.6880 GHz	1.000 MHz	3.688000000 GHz	-32.72 dBm	-13.72 dB
11	11	3.6880 GHz	3.6890 GHz	100.0 kHz	3.688860000 GHz	-41.73 dBm	-22.73 dB
12	12	3.6890 GHz	3.6900 GHz	100.0 kHz	3.690000000 GHz	-38.40 dBm	-19.40 dB
13	13	3.6900 GHz	3.7000 GHz	1.000 MHz	3.691700000 GHz	23.77 dBm	-13.23 dB
14	14	3.7000 GHz	3.7010 GHz	100.0 kHz	3.700000000 GHz	-38.38 dBm	-19.38 dB
15	15	3.7010 GHz	3.7020 GHz	100.0 kHz	3.701160000 GHz	-41.95 dBm	-22.95 dB
16	16	3.7020 GHz	3.7100 GHz	1.000 MHz	3.702120000 GHz	-33.55 dBm	-14.55 dB
17	17	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710050000 GHz	-38.54 dBm	-7.535 dB

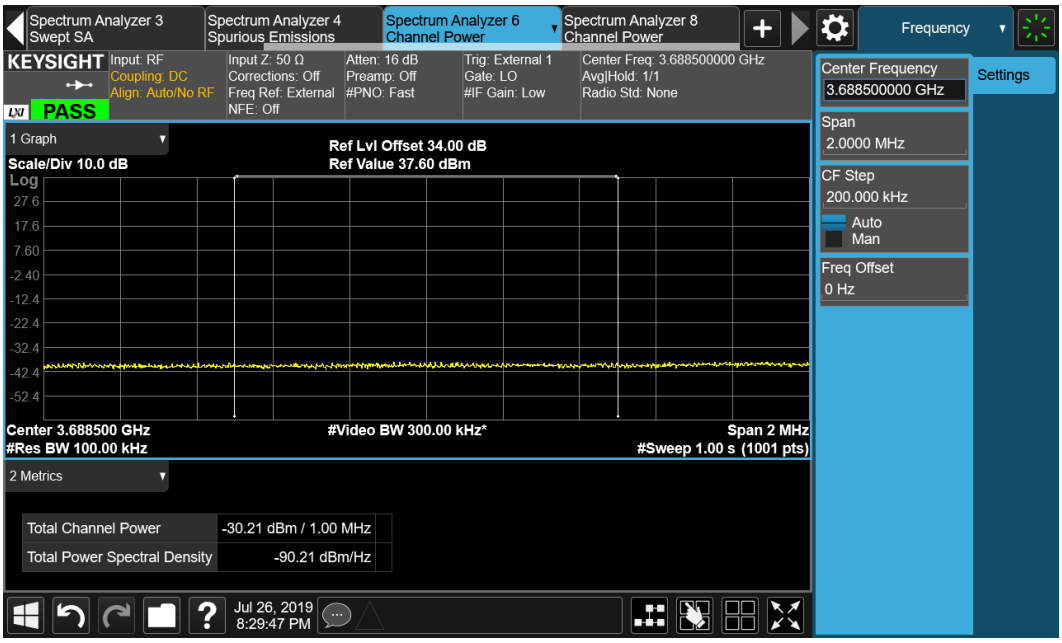
Frequency range 3548MHz-3549MHz, 3561MHz-3562MHz, 3688MHz-3689MHz and 3701MHz-3702MHz were measured with RBW 100kHz, the channel power of 1MHz was measured and passed as below.

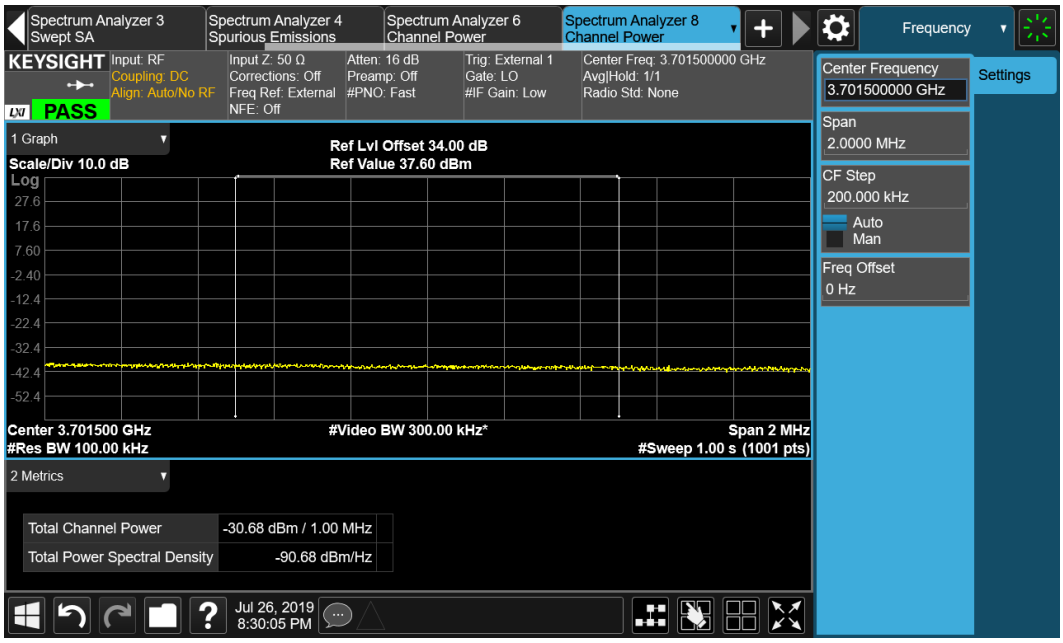


Total Quality. Assured.

TEST REPORT







LTE-MIMO-2C-20-1:

Antenna Port	Channel Position	Modulation	Channel Bandwidth (MHz)
B	B	256QAM	20
B	M	256QAM	20
B	T	256QAM	20

Channel Position B