

FCC - TEST REPORT

Report Number	:	68.950.18.0087.01	Date of Issue:	<u>February 22, 2018</u>
Model	:	R2B, R2P		
Product Type	:	<u>Laser Distance Meter</u>		
Applicant	:	<u>Shenzhen Mileseey Technology Co., Ltd</u>		
Address	:	<u>F/6, Building 9, Zhongguan Honghualing Industrial, South Park II,</u>		
	:	<u>1213 Liuxian Ave, Taoyuan Street, Nanshan District</u>		
	:	<u>518055 Shenzhen, PEOPLE'S REPUBLIC OF CHINA</u>		
Manufacturer	:	<u>Shenzhen Mileseey Technology Co., Ltd</u>		
Address	:	<u>F/6, Building 9, Zhongguan Honghualing Industrial, South Park II,</u>		
	:	<u>1213 Liuxian Ave, Taoyuan Street, Nanshan District</u>		
	:	<u>518055 Shenzhen, PEOPLE'S REPUBLIC OF CHINA</u>		
Test Result	:	<input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative		
Total pages including Appendices	:	<u>27</u>		

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint
Road 2, Nanshan District
Shenzhen 518052
P.R. China

Telephone: 86 755 8828 6998

Fax: 86 755 828 5299

FCC Registration No.: 502708

3 Description of the Equipment Under Test

Product:	Laser Distance Meter
Model no.:	R2B
FCC ID:	2AEOGMC180001
Options and accessories:	USB Cable
Rating:	5VDC through USB port or 3.6VDC by rechargeable batteries (size AAA 1.2V x 3) or 4.5VDC by non-rechargeable batteries (size AAA 1.5V x 3)
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Internal Antenna
Antenna Gain:	0dBi
Description of the EUT:	The Equipment Under Test (EUT) is Laser Distance Meter supports BLE function.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2016 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 DTS Meas Guidance v04 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Pages	Test Result
§15.207	Conducted emission AC power port	--	N/A
§15.247(b)(1)	Conducted peak output power	10	Pass
§15.247(e)	Power spectral density	12	Pass
§15.247(a)(2)	6dB bandwidth	14	Pass
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	14	Pass
§15.247(a)(1)	Carrier frequency separation	--	N/A
§15.247(a)(1)(iii)	Number of hopping frequencies	--	N/A
§15.247(a)(1)(iii)	Dwell Time	--	N/A
§15.247(d)	Spurious RF conducted emissions	16	Pass
§15.247(d)	Band edge	21	Pass
§15.247(d) & §15.209 & §15.203	Spurious radiated emissions for transmitter	22	Pass
§15.203	Antenna requirement	See note 1	Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a Chip antenna, which gain is 0dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

This submittal(s) (test report) is intended for FCC ID: 2AEOGMC180001 complies with Section 15.205, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

Modes R2B and R2P are identical except for the model name and color of appearance. therefore test were applied on model R2B, other models are deemed to fulfill relevant requirement without further testing.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: 5 February 2018

Testing Start Date: 6 February 2018

Testing End Date: 9 February 2018

- Jiangsu TÜV Product Service Ltd. – Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:



Trevor You
Section Project Engineer



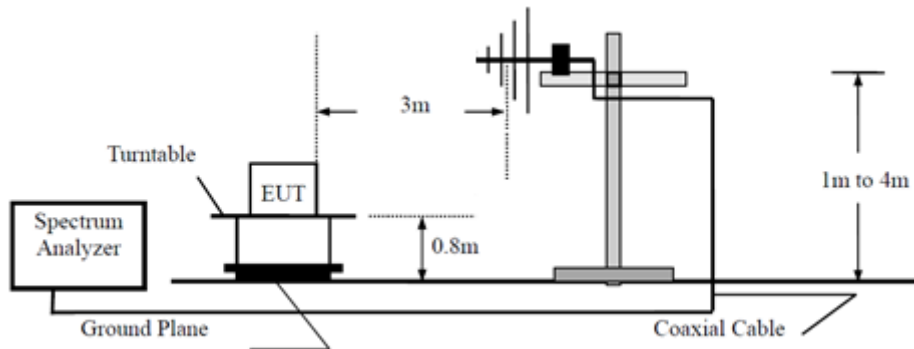
Ricky Yin
EMC Project Engineer



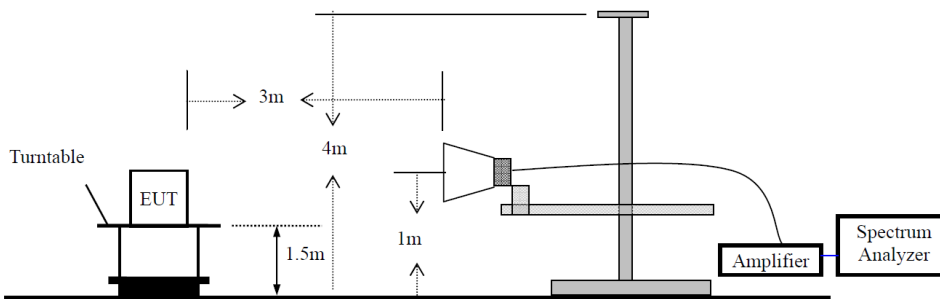
Tree Zhan
EMC Test Engineer

7 Test Setups

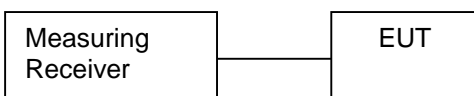
7.1 Below 1GHz



Above 1GHz



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	X220	---

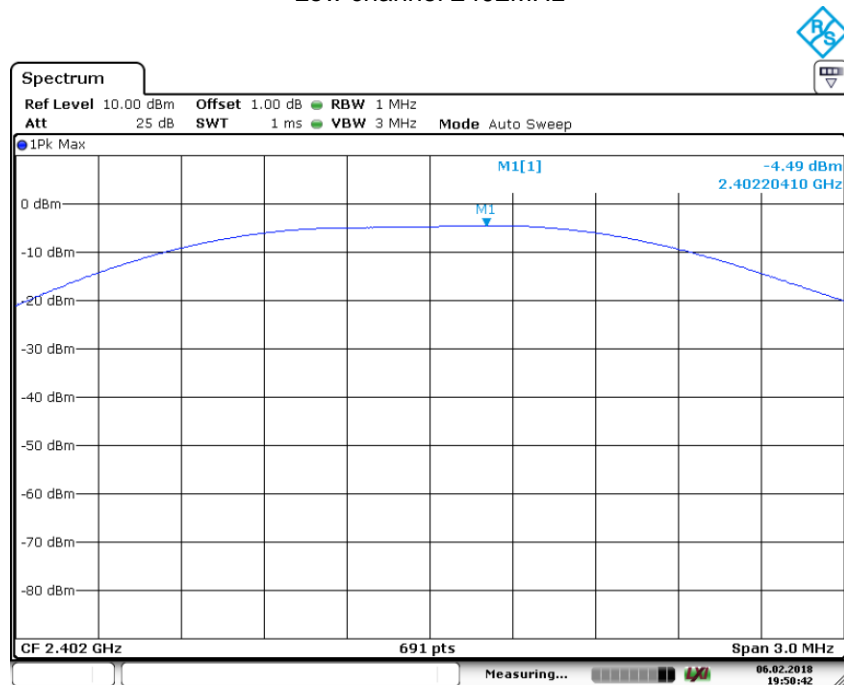
9 Technical Requirement

9.1 Conducted peak output power

Test result as below table

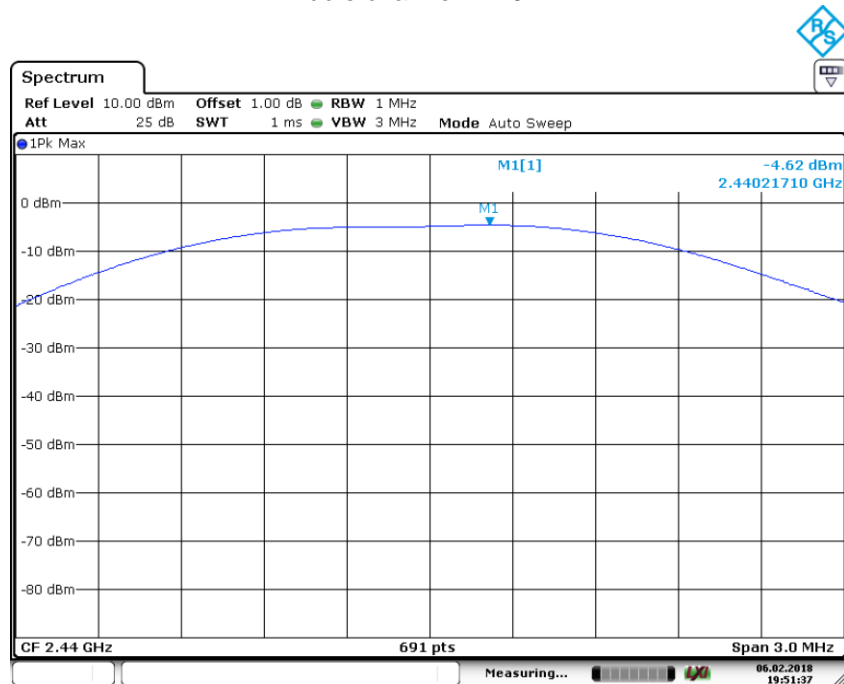
Frequency MHz	Conducted Peak Output Power dBm	Result
Bottom channel	-4.49	Pass
0	-4.62	Pass
Top	-4.77	Pass

Low channel 2402MHz



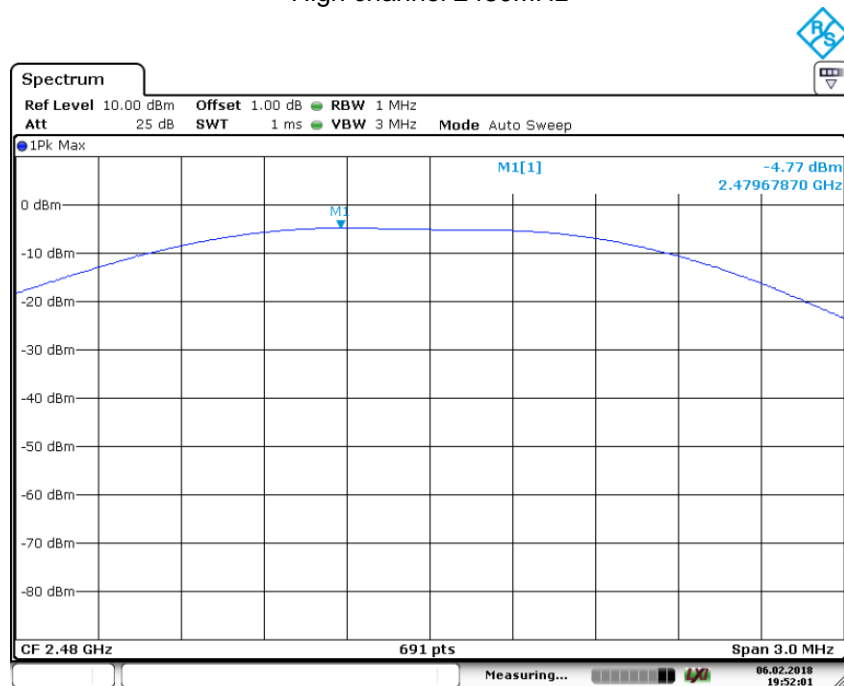
Date: 6.FEB.2018 19:50:43

Middle channel 2440MHz



Date: 6.FEB.2018 19:51:37

High channel 2480MHz



Date: 6.FEB.2018 19:52:00

9.2 Power spectral density

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

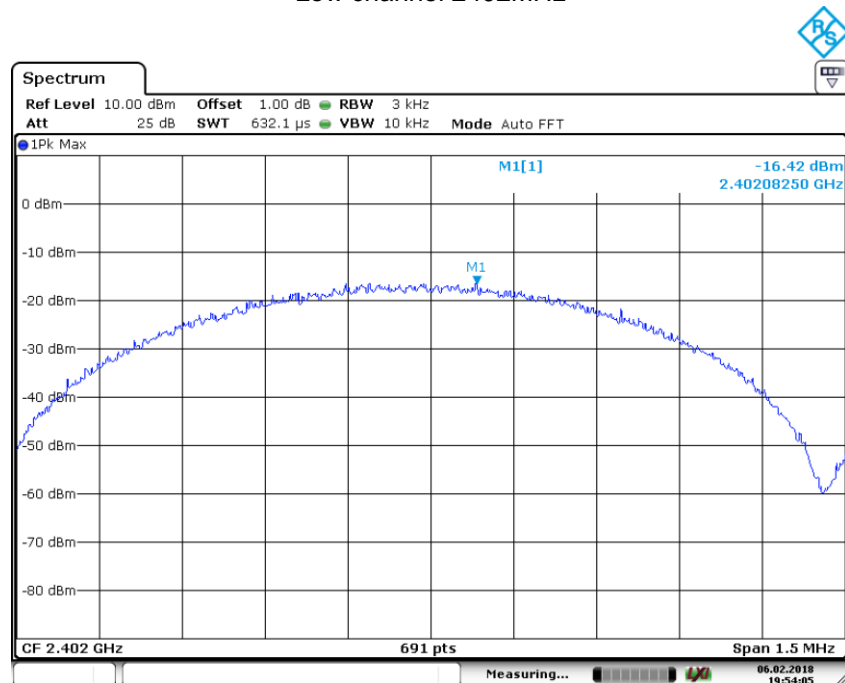
1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW \geq 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

other frequencies.

Test result

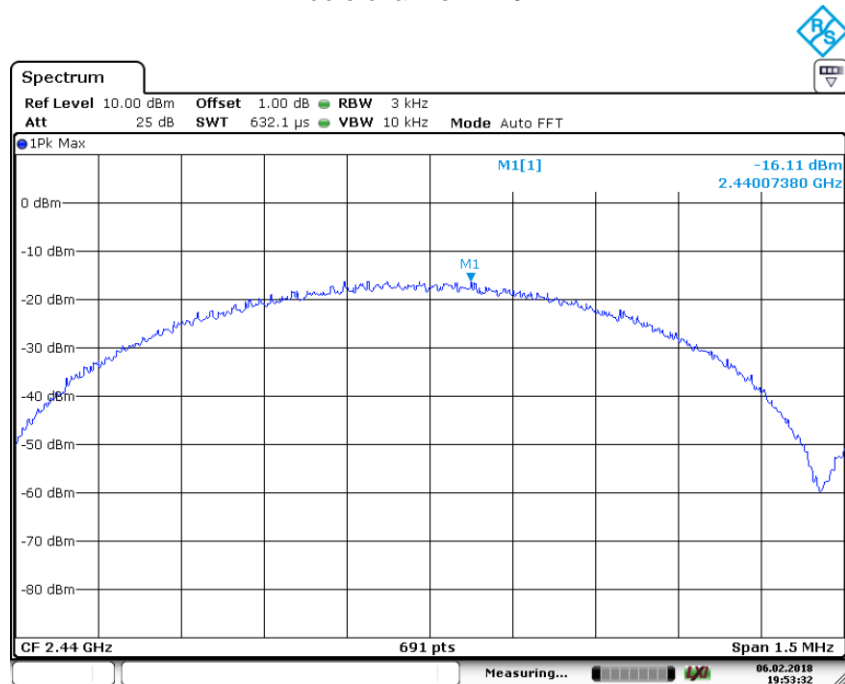
Frequency MHz	Power spectral density dBm	Result
Top channel 2402MHz	-16.42	Pass
Middle channel 2440MHz	-16.11	Pass
Bottom channel 2480MHz	-16.27	Pass

Low channel 2402MHz



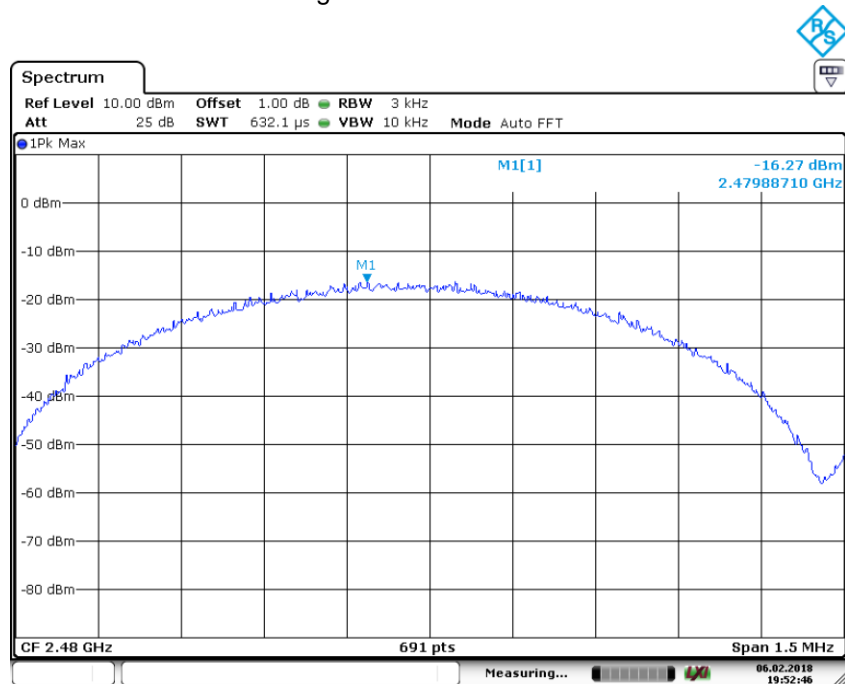
Date: 6.FEB.2018 19:54:06

Middle channel 2440MHz



Date: 6.FEB.2018 19:53:32

High channel 2480MHz



Date: 6.FEB.2018 19:52:46

9.3 6 dB Bandwidth and 99% Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

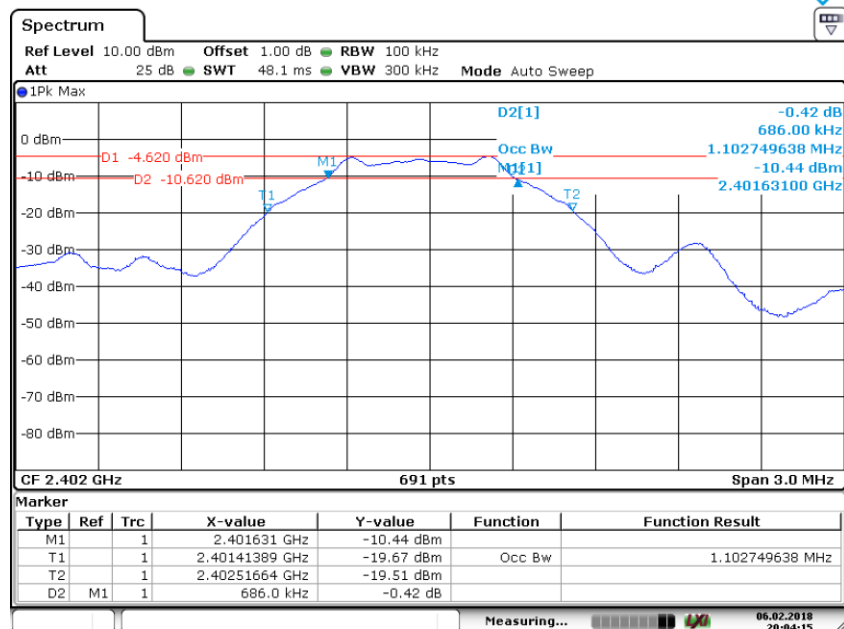
Limit [kHz]

≥ 500

Test result

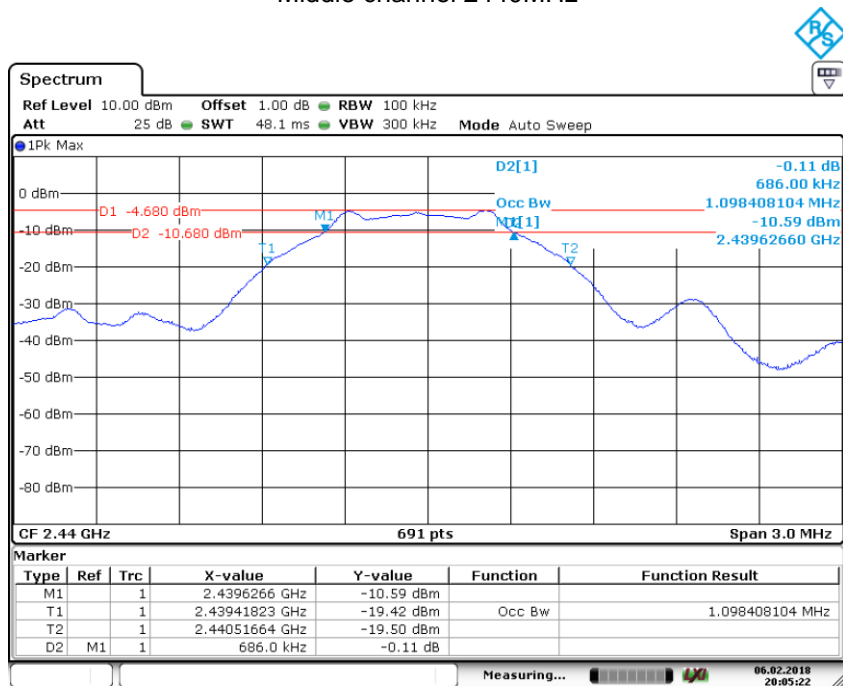
Frequency MHz	6dB bandwidth kHz	99% bandwidth kHz	Result
Bottom channel 2402MHz	677.3	1102.7	Pass
Middle channel 2440MHz	686.0	1085.4	Pass
Top channel 2480MHz	686.0	1098.4	Pass

Low channel 2402MHz



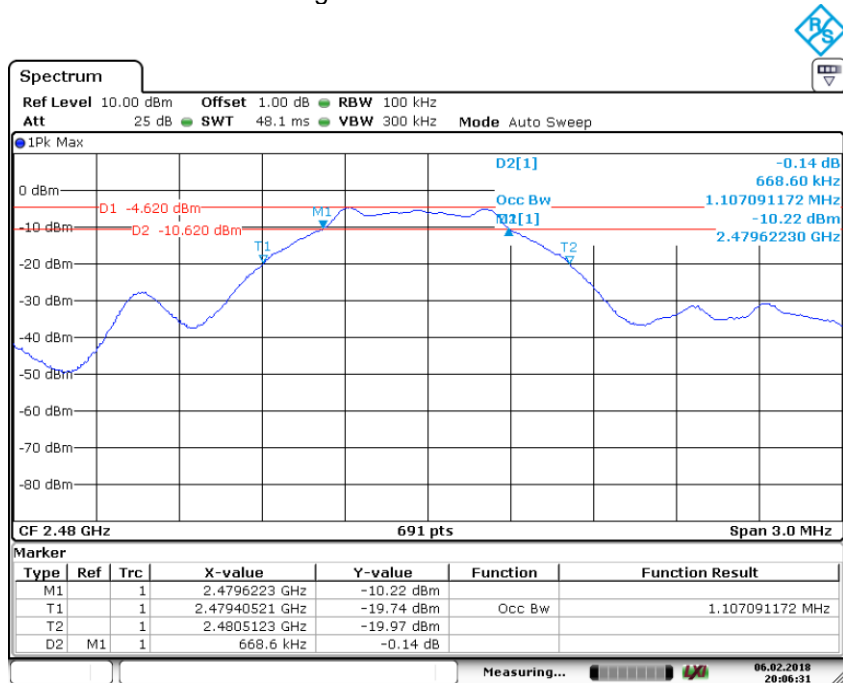
Date: 6.FEB.2018 20:04:15

Middle channel 2440MHz



Date: 6.FEB.2018 20:05:22

High channel 2480MHz



Date: 6.FEB.2018 20:06:30

9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.

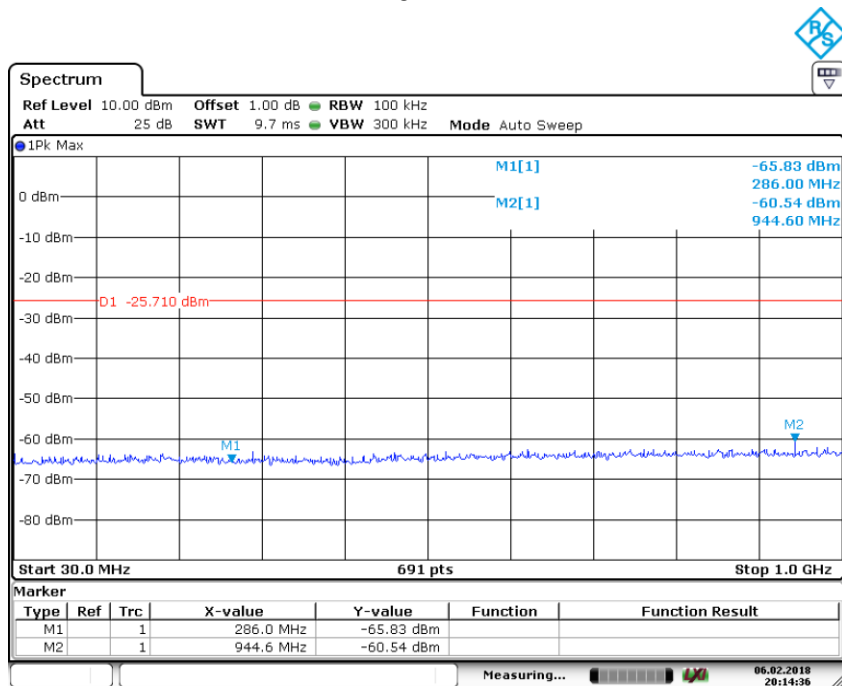
other frequencies.

Limit

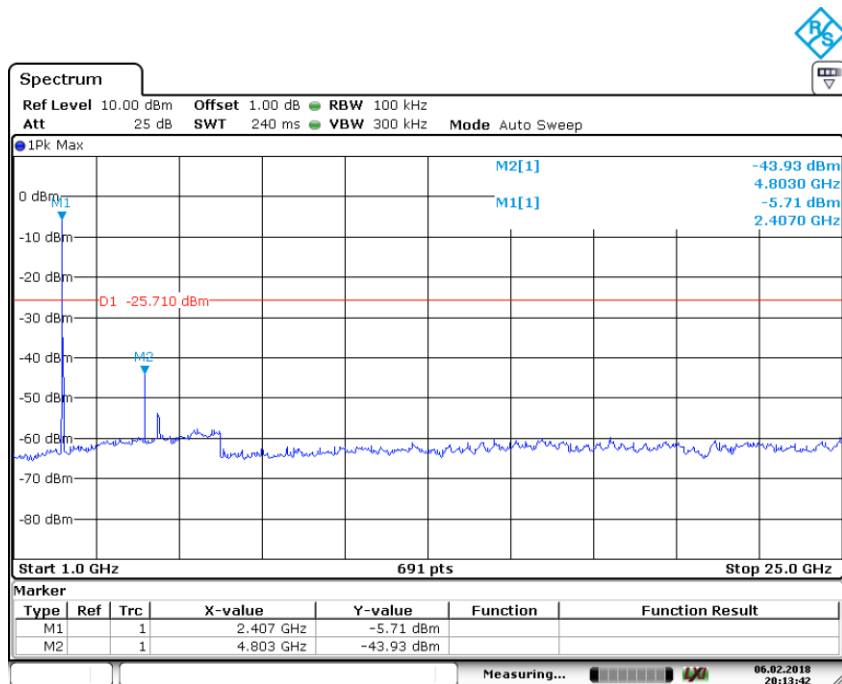
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

2402MHz

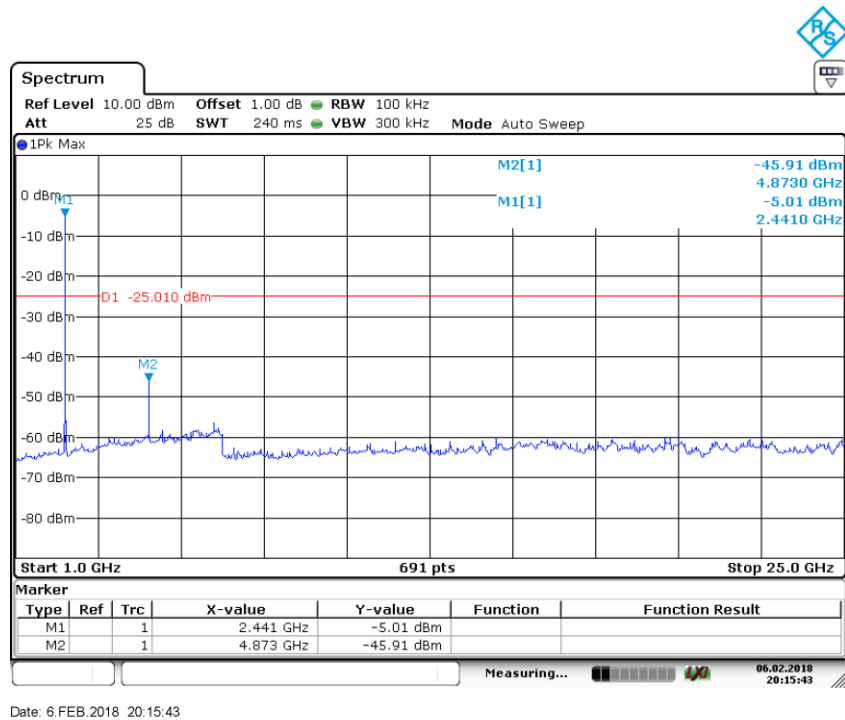
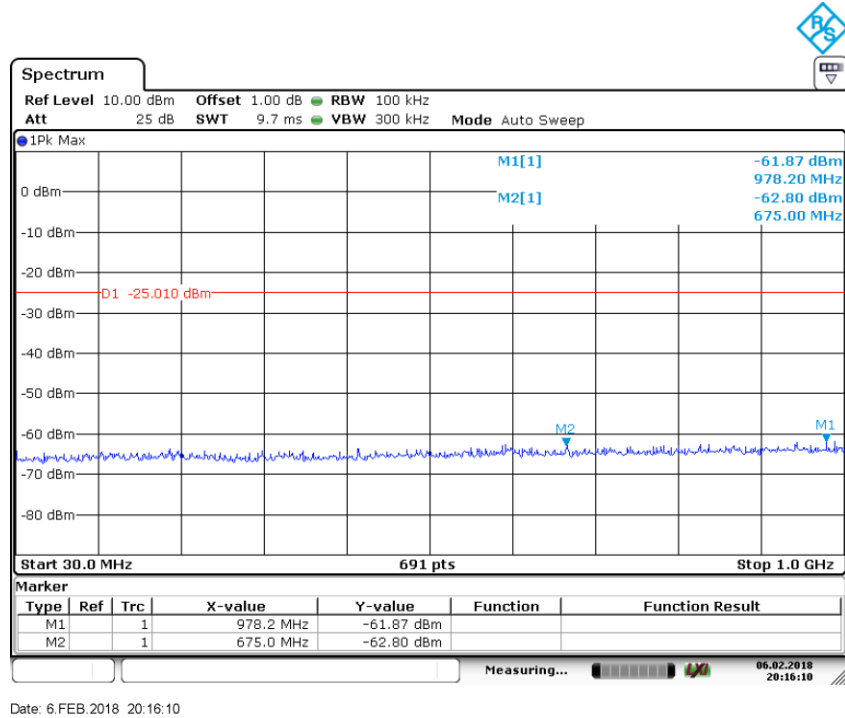


Date: 6.FEB.2018 20:14:36

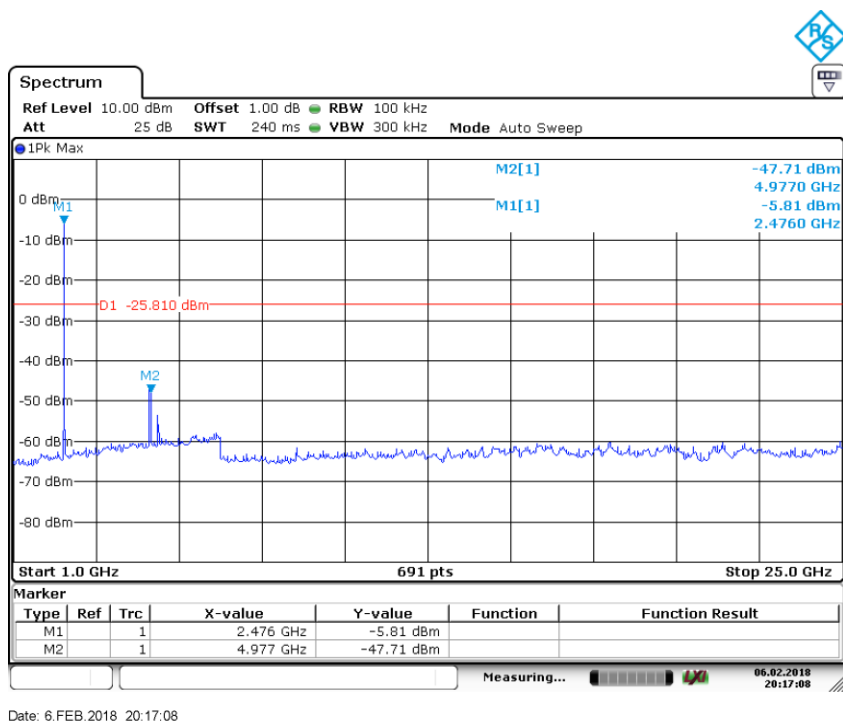
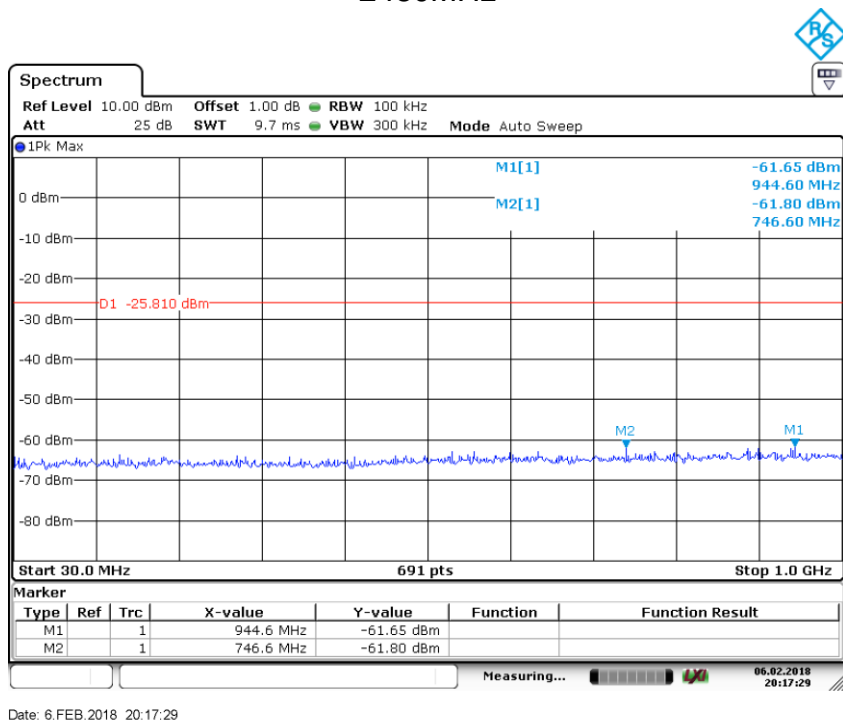


Date: 6.FEB.2018 20:13:41

2440MHz

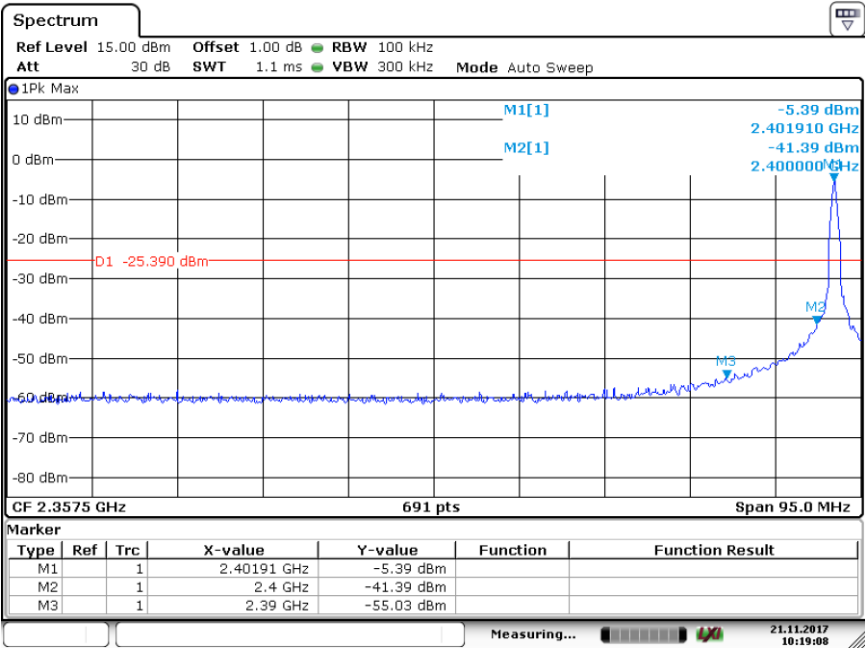


2480MHz





2402MHz



Date: 21.NOV.2017 10:19:08

9.5 Band edge

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limit:

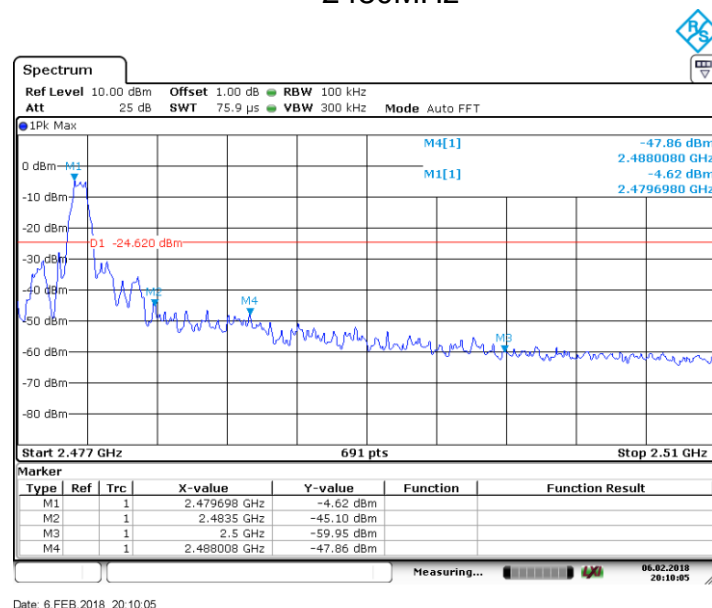
Frequency Range	Limit (dBc)
MHz	
30-25000	-20

2402MHz



Date: 6.FEB.2018 20:11:52

2480MHz



Date: 6.FEB.2018 20:10:05

9.6 Spurious radiated emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW ≥ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBμV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

Remark: According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Low channel 2402MHz Test Result

Frequency Band	Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Factor dB	Margin dBuV/m	Result
30-1000MHz	288.88	31.00	H	46	QP	-22.3	15.00	Pass
	288.88	35.35	V	46	QP	-22.0	10.65	Pass
1000-25000MHz	10164.84	41.76	H	74	PK	2.5	32.24	Pass
	--	--	H	54	AV	--	--	Pass
	10008.28	40.78	V	74	PK	9.8	32.22	Pass
	--	--	V	54	AV	--	--	Pass

Middle channel 2440MHz Test Result

Frequency Band	Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Factor dB	Margin dBuV/m	Result
30-1000MHz	--	--	H	43.5	QP	--	--	Pass
	--	--	H	46	QP	--	--	Pass
1000-25000MHz	4879.22	42.47	H	74	PK	2.5	31.53	Pass
	--	--	H	54	AV	--	--	Pass
	8784.84	40.71	V	74	PK	8.9	33.29	Pass
	--	--	V	54	AV	--	--	Pass

High channel 2480MHz Test Result

Frequency Band	Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Factor dB	Margin dBuV/m	Result
30-1000MHz	--	--	H	43.5	QP	--	--	Pass
	--	--	H	46	QP	--	--	Pass
1000-25000MHz	10096.40	41.97	H	74	PK	9.6	32.03	Pass
	--	--	H	54	AV	--	--	Pass
	8757.19	41.46	V	74	PK	8.9	32.54	Pass
	--	--	V	54	AV	--	--	Pass

Remark:

- (1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.
- (3) QP Emission Level= Antenna Factor +Cable Loss + Reading
 PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading
 AV Emission Level= PK Emission Level+20log(dutycycle)

10 List of Test Instruments

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-14
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-8-2
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14
3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-8-2
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2018-7-14
LISN	Rohde & Schwarz	ENV4200	100249	2018-7-14
LISN	Rohde & Schwarz	ENV216	100326	2018-7-14
ISN	Rohde & Schwarz	ENY81	100177	2018-7-14
ISN	Rohde & Schwarz	ENY81-CA6	101664	2018-7-14
High Voltage Probe	Rohde & Schwarz	TK9420(VT94 20)	9420-58	2018-7-14
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2018-7-14

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.98dB; Vertical: 5.06dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.95dB; Vertical: 4.94dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.14dB; Vertical: 5.12dB;
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 2.06dB Frequency test involved: 1.16×10^{-7}