TEST REPORT

Application No.:	SHCR2202000375HS
Applicant:	Lumi United Technology Co., Ltd.
Address of Applicant:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
Manufacturer:	Lumi United Technology Co., Ltd.
Address of Manufacturer:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
Factory:	Siterwell Electronics Co., Limited
Address of Factory:	No.666 Qingfeng Road, Jiangbei District, Ningbo, 315034, Zhejiang Province, China
Equipment Under Test (EUT):	
EUT Name:	Smart Radiator Thermostat E1
Model No.:	SRTS-A01
Trade Mark:	Aqara
Standard(s) :	EN 300 328 V2.2.2
Date of Receipt:	2022-02-25
Date of Test:	2022-03-24 to 2022-03-24
Date of Issue:	2022-04-02
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan
Laboratory Manager

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2022-04-02	

Authorized for issue by:				
		Wade Zhang		
		Wade Zhang/Project Engineer		
		Parlam Zhan		
		Parlam Zhan/Reviewer		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Geo-location capability	EN 300 328 V2.2.2	N/A	EN 300 328 Clause 4.3.2.12.3	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
RF Output Power	EN 300 328 V2.2.2	EN 300 328 Clause 5.4.2.2.1.2	EN 300 328 Clause 4.3.2.2.3	Pass
Power Spectral Density		EN 300 328 Clause 5.4.3.2.1	EN 300 328 Clause 4.3.2.3.3	Pass
Adaptivity		EN 300 328 Clause 5.4.6.2.1.4	EN 300 328 Clause 4.3.2.6	Pass
Occupied Channel Bandwidth		EN 300 328 Clause 5.4.7.2.1	EN 300 328 Clause 4.3.2.7.3	Pass
Transmitter unwanted emissions in the OOB domain		EN 300 328 Clause 5.4.8.2.1	EN 300 328 Clause 4.3.2.8.3	Pass
Transmitter unwanted emissions in the spurious domain		EN 300 328 Clause 5.4.9.2	EN 300 328 Clause 4.3.2.9.3	Pass
Receiver spurious emissions		EN 300 328 Clause 5.4.10.2	EN 300 328 Clause 4.3.2.10.3	Pass
Receiver Blocking		EN 300 328 Clause 5.4.11.2.1	EN 300 328 Clause 4.3.2.11.4	Pass

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3V
Operation Frequency:	2405-2480MHz
Modulation Type:	O-QPSK
Channel Spacing:	5MHz
Number of Channels:	16
Antenna Type:	PCB Antenna
Adaptive Type:	LBE under LBT based DAA
Antenna Gain:	0 dBi (Provided by manufacturer)
Receiver Category:	1

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--
The EUT has been tested as an independent unit.			

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10-8
2	Timeout	2s
3	Duty cycle	0.4%
4	Occupied Bandwidth	3%
5	RF conducted power	0.6dB
6	RF power density	2.9dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious emission test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)
10	Temperature test	1°C
11	Humidity test	3%
12	Supply voltages	1.5%
13	Time	3%

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

4.4 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China
Tel: +86 21 6191 5666 Fax: +86 21 6191 5678
No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L0599)

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 6332.01)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

• FCC (Designation Number: CN1301)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• ISED (CAB Identifier: CN0020)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 8617A

• VCCI (Member No.: 3061)

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

None

4.6 Abnormalities from Standard Conditions

None

5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Spectrum Analyzer	Keysight	N9020B	SHEM241-1	2021-08-30	2022-08-29
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2021-08-13	2022-08-12
Signal Generator	R&S	SMR20	SHEM006-1	2021-08-13	2022-08-12
Signal Generator	Agilent	N5182A	SHEM182-1	2021-08-13	2022-08-12
Communication Tester	R&S	CMW270	SHEM183-1	2021-07-28	2022-07-27
Communication Tester	R&S	CMW500	SHEM183-2	2021-04-16	2022-04-15
Switcher	Tonscend	JS0806	SHEM184-1	2021-08-13	2022-08-12
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2021-08-13	2022-08-12
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2019-09-25	2022-09-24
AC Power Stabilizer	APC	KDF-31020T-V0-F0	SHEM216-1	2021-12-20	2022-12-19
DC Power Supply	MCH	MCH-303A	SHEM210-1	2021-12-20	2022-12-19
Conducted test Cable	/	RF01~RF04	/	2021-12-20	2022-12-19
Test software	Tonscend	JS Tonscend BT/WIFI System	Version: 2.6	/	/
RF Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2021-12-20	2022-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Communication Tester	R&S	CMW500	SHEM183-2	2021-04-16	2022-04-15
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2021-12-20	2022-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2020-04-30	2022-04-29
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2019-10-24	2022-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2021-09-18	2023-09-17
Pre-Amplifier	HP	8447D	SHEM236-1	2021-05-27	2022-05-26
Pre-Amplifier	PANSHAN	LNA 1-18G	SHEM235-1	2021-05-27	2022-05-26
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2021-12-20	2022-12-19
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2021-12-20	2022-12-19
Test software	ESE	E3	Version: 6.111221a	/	/

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6 Radio Spectrum Technical Requirement

6.1 Geo-location capability

6.1.1 Test Requirement:

EN 300 328 Clause 4.3.2.12.3

Limit:

The geographical location determined by the non-FHSS equipment as defined in clause 4.3.2.12.2 shall not be accessible to the user in a way that would allow the user to alter it.

Definition:

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

6.1.2 Conclusion

The applicant declares:

The product does not have the geo-location function.

7 Radio Spectrum Matter Test Results

7.1 RF Output Power

Test Requirement EN 300 328 Clause 4.3.2.2.3
Test Method: EN 300 328 Clause 5.4.2.2.1.2

Limit:

Frequency band(MHz)	Limit
2400-2483.5	20dBm/(100mw) (e.i.r.p)

7.1.1 E.U.T. Operation

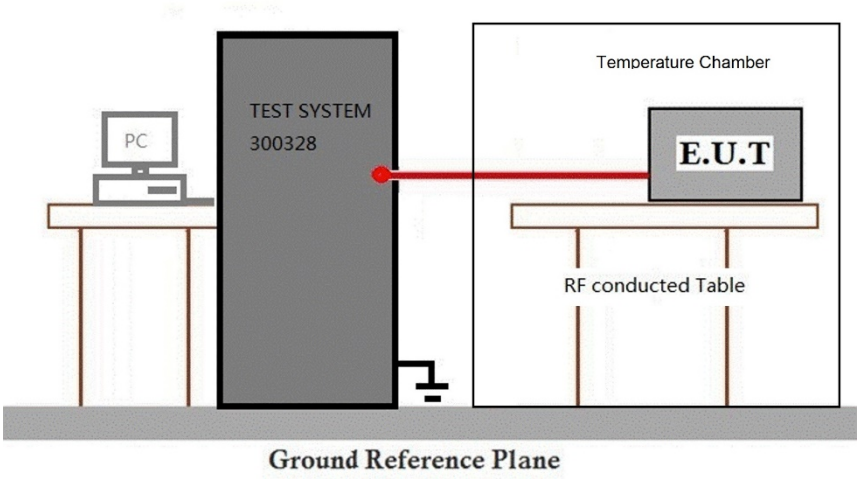
Operating Environment:

Temperature: 23.2 °C Humidity: 33.5 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.2 Power Spectral Density

Test Requirement EN 300 328 Clause 4.3.2.3.3
Test Method: EN 300 328 Clause 5.4.3.2.1

Limit:

Frequency band(MHz)	Limit
2400-2483.5	≤10dBm per MHz

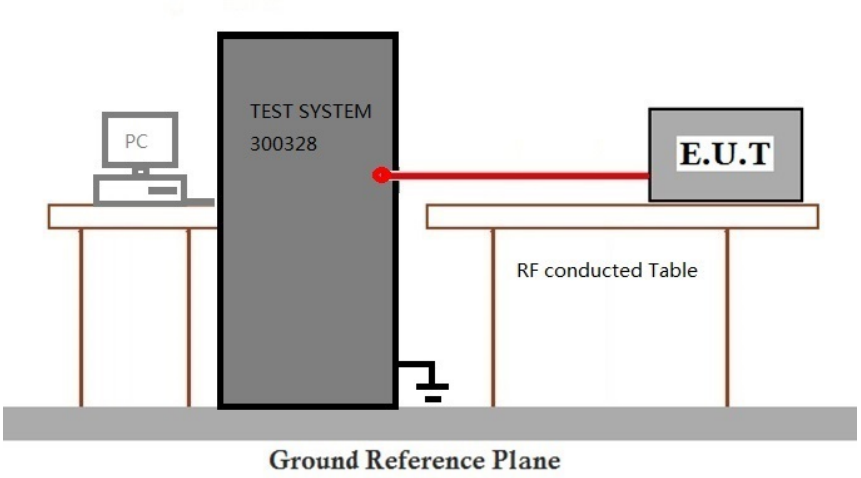
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 23.2 °C Humidity: 33.5 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.3 Adaptivity

Test Requirement EN 300 328 Clause 4.3.2.6

Test Method: EN 300 328 Clause 5.4.6.2.1.4

Limit:

Adaptive Type	Limit
Adaptive Frequency Hopping using LBT based DAA	The CCA observation time shall be not less than 0,2 % of the Channel Occupancy Time with a minimum of 18 µs.
	The Channel Occupancy Time for a given hopping frequency, which starts immediately after a successful CCA, shall be less than 60 ms followed by an Idle Period of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs.
	For LBT based adaptive frequency hopping equipment with a dwell time < 60 ms, the maximum Channel Occupancy Time is limited by the dwell time.
Adaptive Frequency Hopping using other forms of DAA (non-LBT based)	The hopping frequency shall remain unavailable for a minimum time equal to 1 second or 5 times the actual number of hopping frequencies in the current (adapted) channel map used by the equipment, multiplied with the Channel Occupancy Time whichever is greater.
	The Channel Occupancy Time for a given hopping frequency shall be less than 40 ms. For equipment using a dwell time > 40 ms that wants to have other transmissions during the same hop (dwell time) an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Period with a minimum of 100 µs shall be implemented.
	For non-LBT based frequency hopping equipment with a dwell time < 40 ms, the maximum Channel Occupancy Time may be non-contiguous, i.e. spread over a number of hopping sequences (equal to 40 ms divided by the dwell time [ms]).
Short Control Signalling Transmissions	If implemented, Short Control Signalling Transmissions shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms or within an observation period equal to the dwell time, whichever is less.
Non-LBT based Detect and Avoid	The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed by an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs.
LBT based Detect and Avoid (FBE)	The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs.
	The Channel Occupancy Time shall be in the range 1 ms to 10 ms followed by an Idle Period of at least 5 % of the Channel Occupancy Time used in the equipment for the current Fixed Frame Period.
	The threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p. the CCA threshold level may be relaxed to: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)
LBT based Detect and Avoid (LBE)	The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs.
	This Channel Occupancy Time shall be less than 13 ms
	The threshold level (TL) may be corrected for the (receive) antenna assembly gain

	(G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p. the CCA threshold level may be relaxed to: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)

7.3.1 E.U.T. Operation

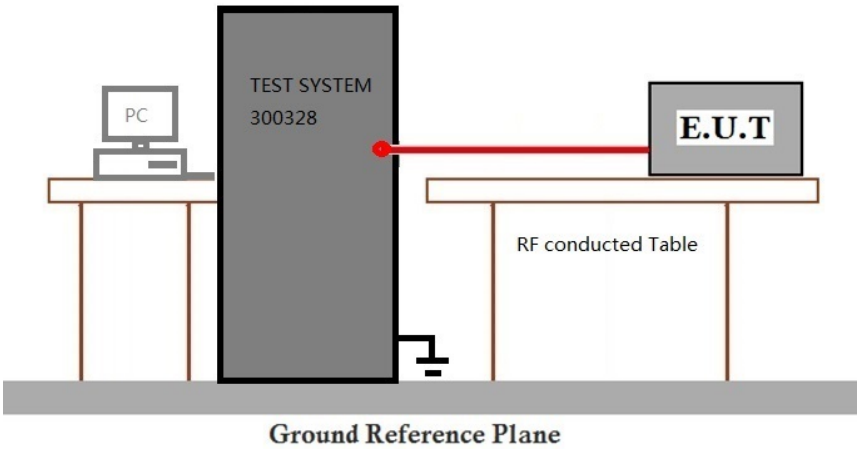
Operating Environment:

Temperature: 23.2 °C Humidity: 33.5 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	Normal operating_Keep the EUT communication with the companion device.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.4 Occupied Channel Bandwidth

Test Requirement EN 300 328 Clause 4.3.2.7.3
Test Method: EN 300 328 Clause 5.4.7.2.1

Limit:

The Occupied Channel Bandwidth shall be within the band given in table 1.

In addition, for non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

7.4.1 E.U.T. Operation

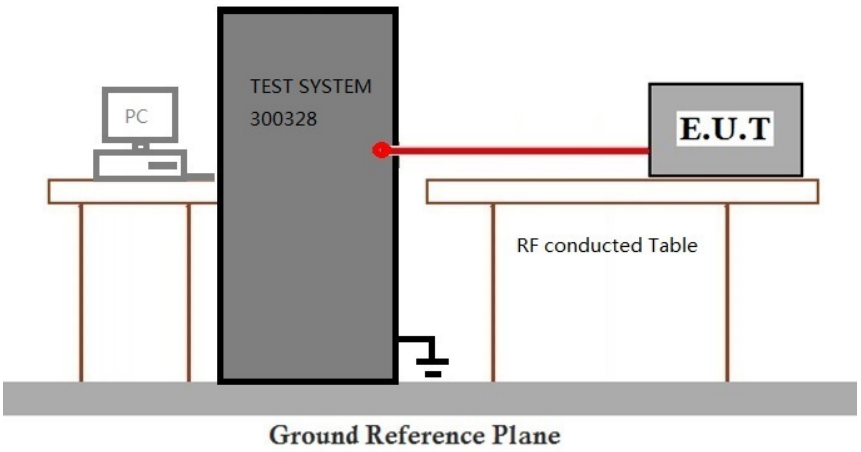
Operating Environment:

Temperature: 23.2 °C Humidity: 33.5 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.4.3 Test Setup Diagram



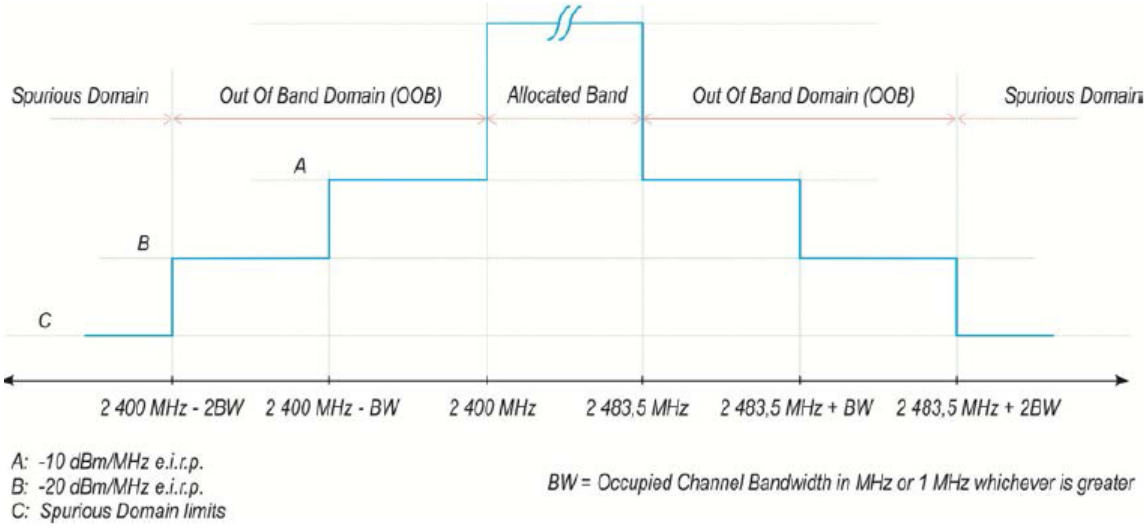
7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.5 Transmitter unwanted emissions in the OOB domain

Test Requirement EN 300 328 Clause 4.3.2.8.3
Test Method: EN 300 328 Clause 5.4.8.2.1

Limit:



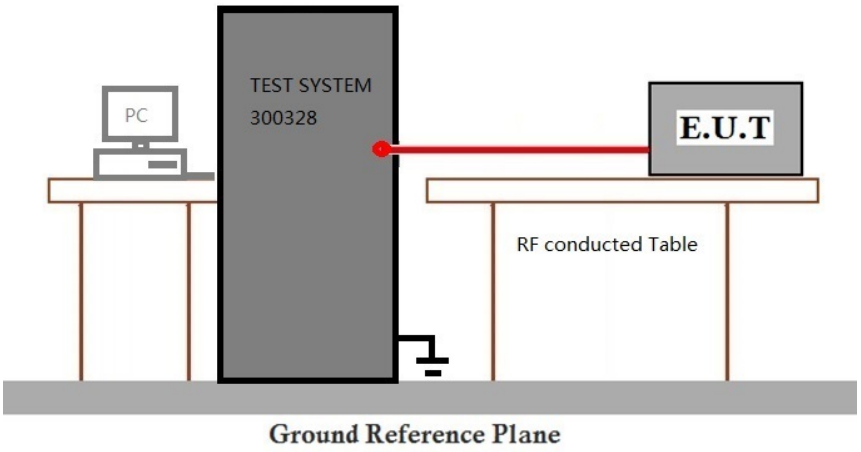
7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 22.3 °C Humidity: 33.7 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.6 Transmitter unwanted emissions in the spurious domain

Test Requirement EN 300 328 Clause 4.3.2.9.3
Test Method: EN 300 328 Clause 5.4.9.2

Limit:

Table 1: Transmitter limits for spurious emissions

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87,5 MHz	-36dBm	100 kHz
87,5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 694 MHz	-54dBm	100 kHz
694 MHz to 1 GHz	-36dBm	100 kHz
1 GHz to 12,75 GHz	-30dBm	1MHz

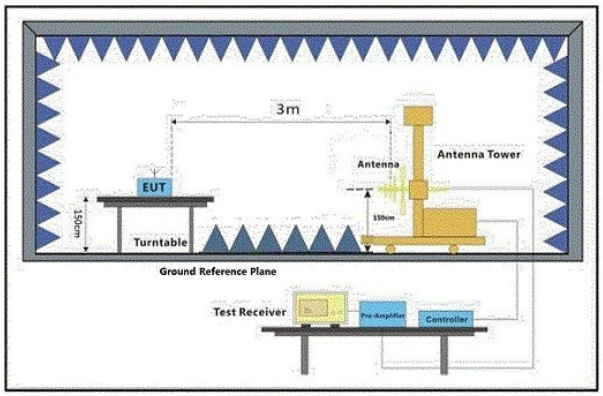
7.6.1 E.U.T. Operation

Operating Environment:
Temperature: 23.2 °C Humidity: 33.6 % RH Atmospheric Pressure: 1010 mbar

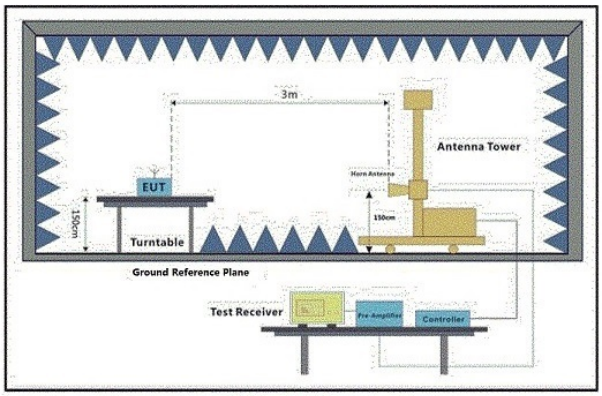
7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.6.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.6.4 Measurement Procedure and Data

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.

2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Below 1GHz test procedure as below:

1) The EUT was powered on and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.

2) Rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

3) Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.

4) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.

5) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.

6) The output power into the substitution antenna was then measured.

7) Steps 5) and 6)were repeated with both antennas vertically polarized.

8) Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) - cable loss (dB) + antenna gain (dBi)

where:

Pg is the generator output power into the substitution antenna.

Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.

2) Calculate power in dBm by the following formula:

EIRP(dBm) = Pg(dBm) - cable loss (dB) + antenna gain (dBi)

EIRP=ERP+2.15dB

where:

Pg is the generator output power into the substitution antenna.

Remark:

The disturbance below 1GHz was very low and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

Test Mode: 02; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:Low

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4810	-39.92	-30	-9.92	peak
7215	-37.47	-30	-7.47	peak
9620	-36.25	-30	-6.25	peak

Test Mode: 02; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:Low

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4810	-38.47	-30	-8.47	peak
7215	-36.58	-30	-6.58	peak
9620	-35.64	-30	-5.64	peak

Test Mode: 02; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:High

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4960	-37.94	-30	-7.94	peak
7440	-36.28	-30	-6.28	peak
9920	-35.56	-30	-5.56	peak

Test Mode: 02; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:High

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4960	-38.48	-30	-8.48	peak
7440	-35.28	-30	-5.28	peak
9920	-34.69	-30	-4.69	peak

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7.7 Receiver spurious emissions

Test Requirement EN 300 328 Clause 4.3.2.10.3
Test Method: EN 300 328 Clause 5.4.10.2

Limit:

The spurious emissions of the receiver shall not exceed the values in tables in the indicated bands:

Frequency Range	Limit
30 MHz to 1 GHz	2nW(-57dBm)
Above 1GHz	20nW(-47dBm)

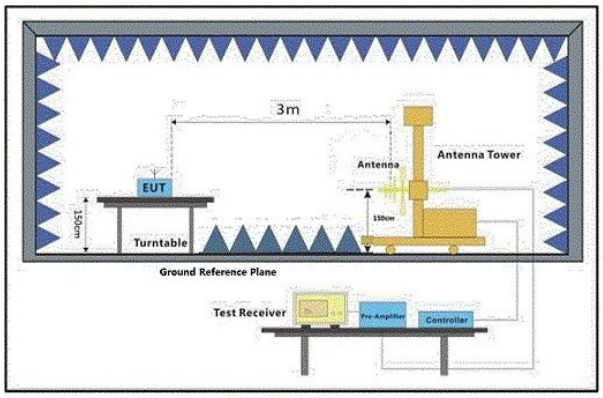
7.7.1 E.U.T. Operation

Operating Environment:
Temperature: 23.2 °C Humidity: 33.6 % RH Atmospheric Pressure: 1010 mbar

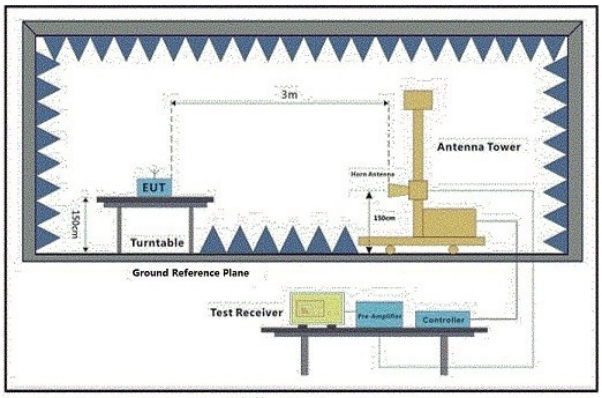
7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	RX_Keep the EUT in receiving with O-QPSK modulation mode.

7.7.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.7.4 Measurement Procedure and Data

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.

2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Below 1GHz test procedure as below:

1) The EUT was powered on and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.

2) Rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

3) Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.

4) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.

5) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.

6) The output power into the substitution antenna was then measured.

7) Steps 5) and 6)were repeated with both antennas vertically polarized.

8) Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) - cable loss (dB) + antenna gain (dBi)

where:

Pg is the generator output power into the substitution antenna.

Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.

2) Calculate power in dBm by the following formula:

EIRP(dBm) = Pg(dBm) - cable loss (dB) + antenna gain (dBi)

EIRP=ERP+2.15dB

where:

Pg is the generator output power into the substitution antenna.

Remark:

The disturbance below 1GHz was very low and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

Test Mode: 03; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:Low

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4810	-55.64	-47	-8.64	peak
7215	-53.12	-47	-6.12	peak
9620	-51.66	-47	-4.66	peak

Test Mode: 03; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:Low

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4810	-54.52	-47	-7.52	peak
7215	-53.65	-47	-6.65	peak
9620	-52.36	-47	-5.36	peak

Test Mode: 03; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:High

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4960	-55.47	-47	-8.47	peak
7440	-54.12	-47	-7.12	peak
9920	-52.64	-47	-5.64	peak

Test Mode: 03; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:High

Frequency	Emission	Limit	Over Limit	Detector
MHz	dBm	dBm	dB	
4960	-55.16	-47	-8.16	peak
7440	-54.29	-47	-7.29	peak
9920	-52.64	-47	-5.64	peak

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7.8 Receiver Blocking

Test Requirement EN 300 328 Clause 4.3.2.11.4
Test Method: EN 300 328 Clause 5.4.11.2.1

Limit:

For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

The blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided below table.

<table>
<tr><td colspan="4">Receiver Blocking parameters for Receiver Category 1 equipment</td></tr>
<tr><td>Wanted signal mean power from companion device (dBm) (see notes 1 and 4)</td><td>Blocking signal frequency (MHz)</td><td>Blocking signal power (dBm) (see note 4)</td><td>Type of blocking signal</td></tr>
<tr><td>(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)</td><td>2380
2504</td><td rowspan="2">-34</td><td rowspan="2">CW</td></tr>
<tr><td>(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)</td><td>2 300
2 330
2 360
2 524
2 584
2 674</td></tr>
<tr><td colspan="4">NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.</td></tr>
</table>

Receiver Blocking parameters for Receiver Category 2 equipment			
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log10(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Blocking parameters for Receiver Category 3 equipment			
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

7.8.1 E.U.T. Operation

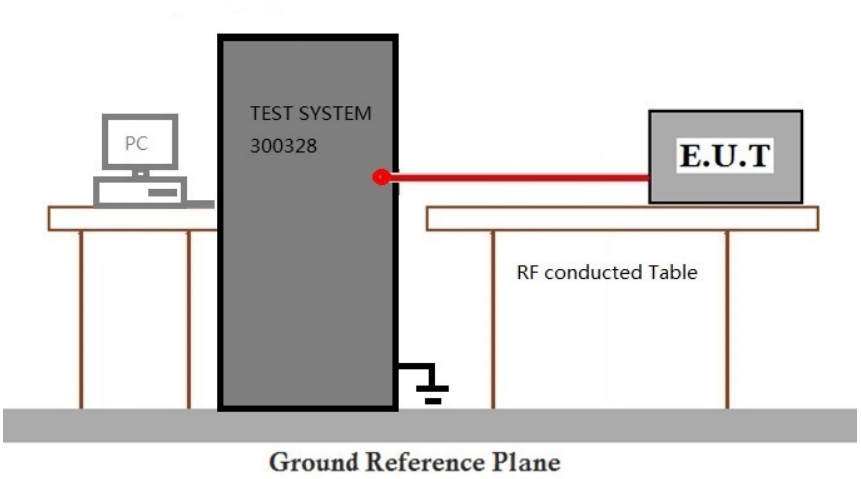
Operating Environment:

Temperature: 23.5 °C Humidity: 33.6 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	Normal operating_Keep the EUT communication with the companion device.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details

8 Photographs

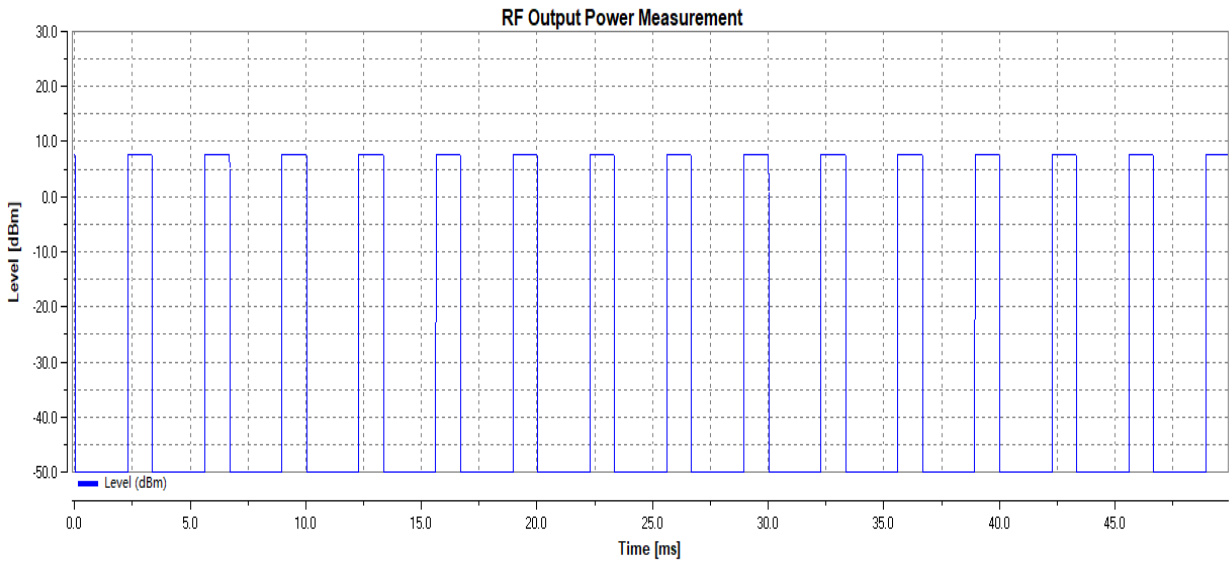
Refer to the < Photographs >

9 Appendix

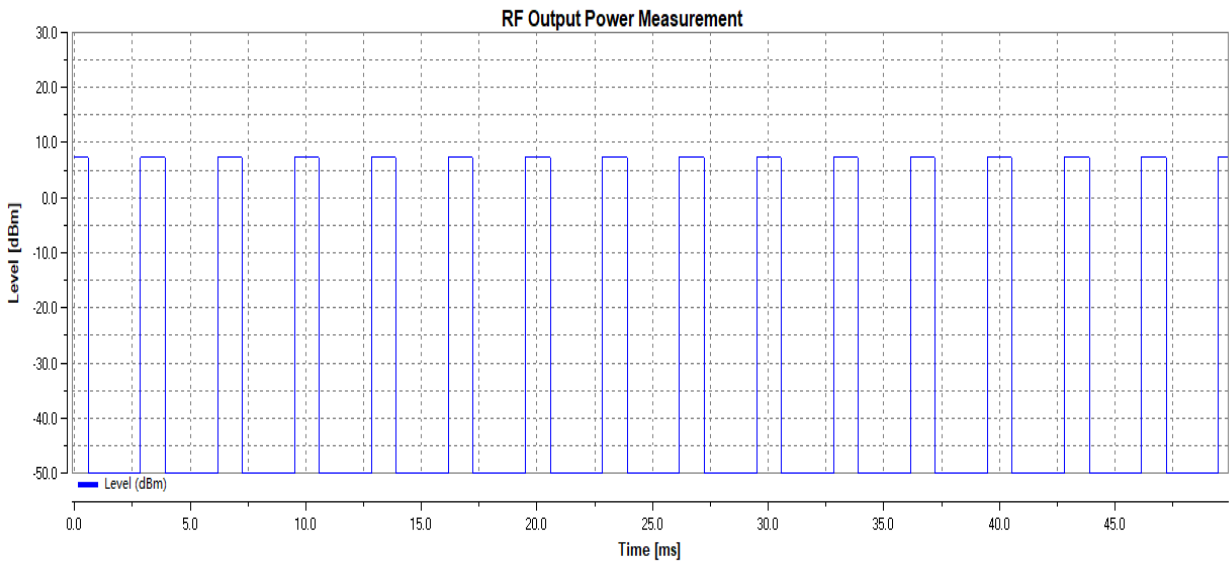
1.RF Output Power

Test Condition	Test Mode	Test Channel	Ant	Power [dBm]	EIRP [dBm]	Limit [dBm]	Verdict
TNVN	BLE	2405	Ant1	7.64	7.64	<=20	PASS
TNVN	BLE	2440	Ant1	7.43	7.43	<=20	PASS
TNVN	BLE	2480	Ant1	7.41	7.41	<=20	PASS
TLVN	BLE	2405	Ant1	7.89	7.89	<=20	PASS
TLVN	BLE	2440	Ant1	7.44	7.44	<=20	PASS
TLVN	BLE	2480	Ant1	7.5	7.5	<=20	PASS
THVN	BLE	2405	Ant1	7.63	7.63	<=20	PASS
THVN	BLE	2440	Ant1	7.7	7.7	<=20	PASS
THVN	BLE	2480	Ant1	7.46	7.46	<=20	PASS

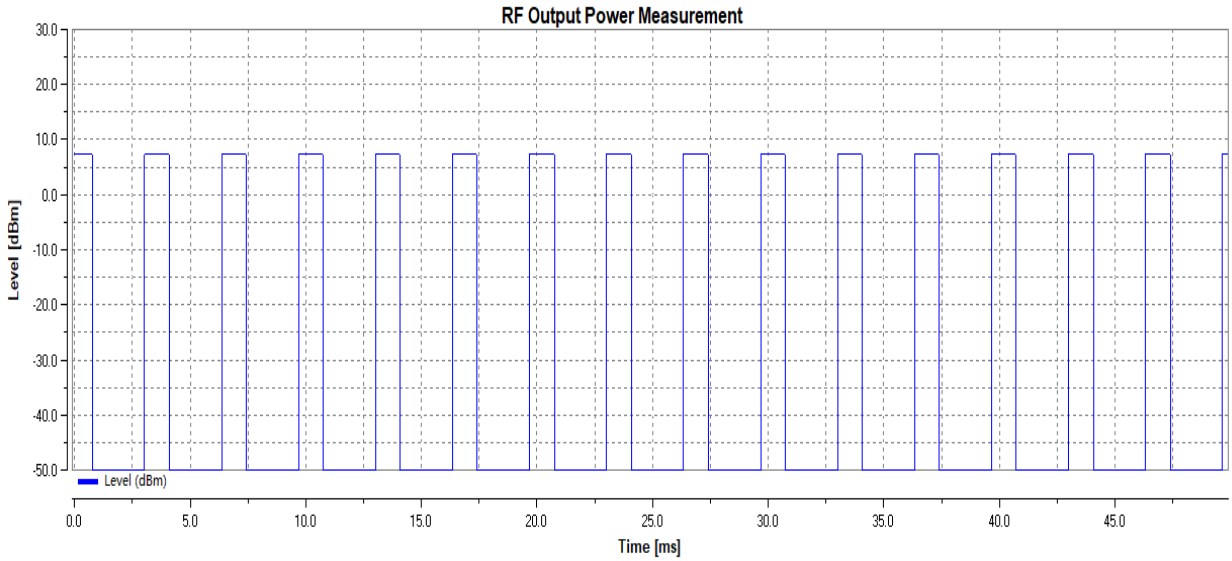
RF Output Power_TNVN_BLE_2405_Ant1



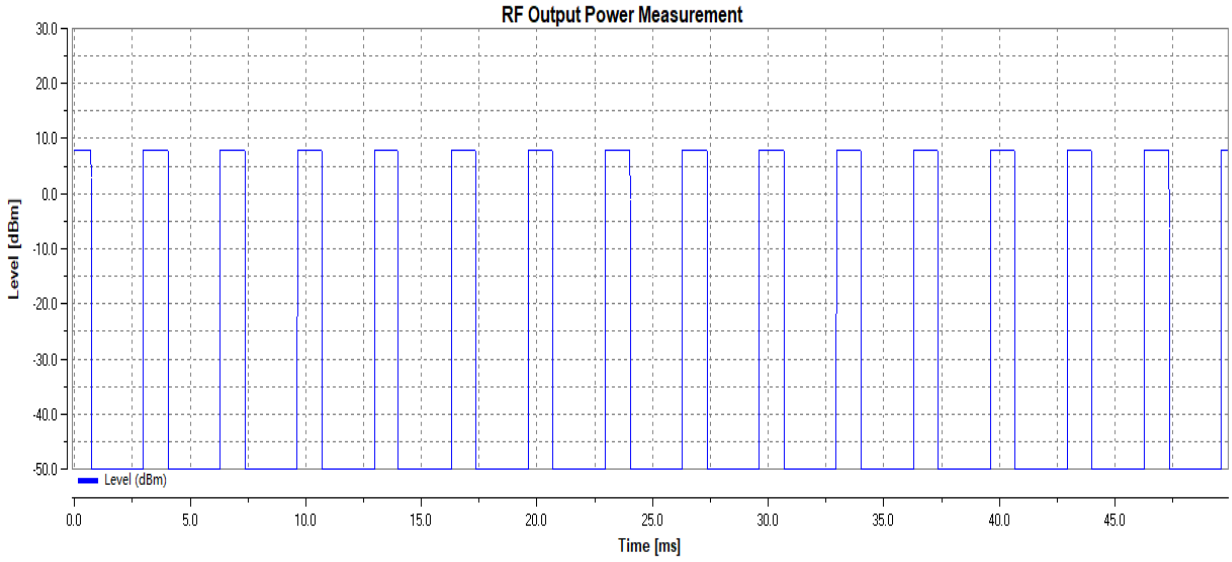
RF Output Power_TNVN_BLE_2440_Ant1



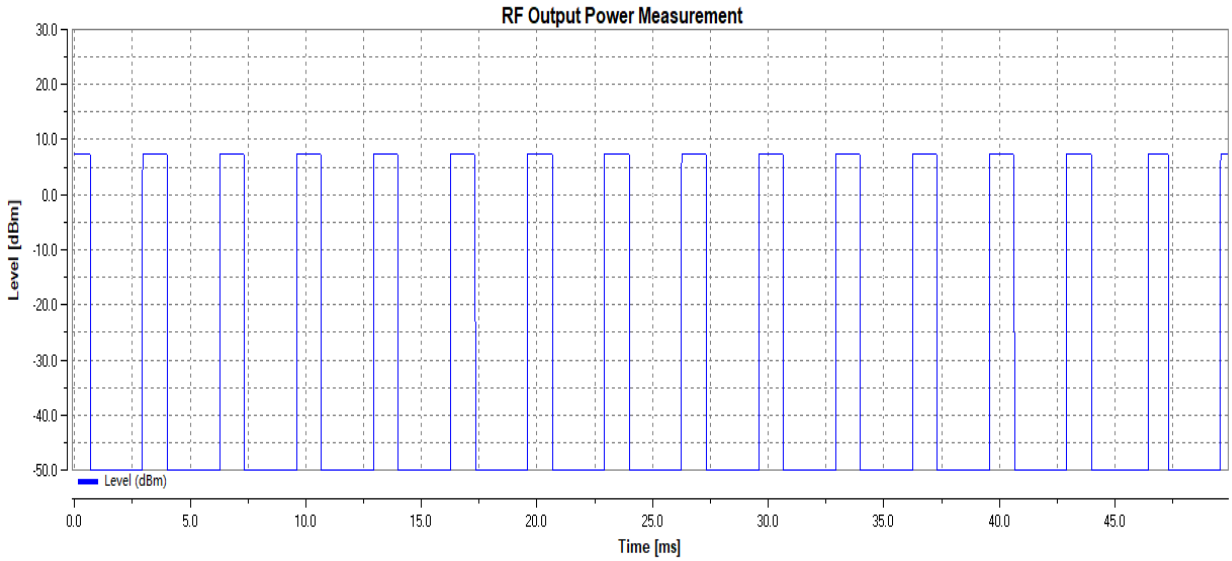
RF Output Power_TNVN_BLE_2480_Ant1



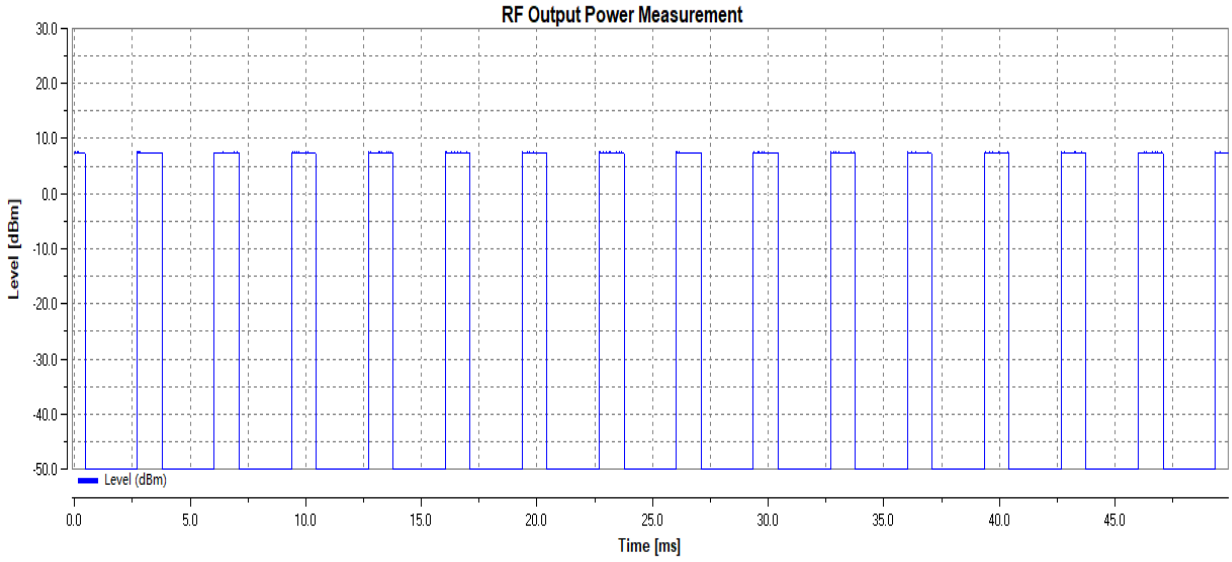
RF Output Power_TLVN_BLE_2405_Ant1



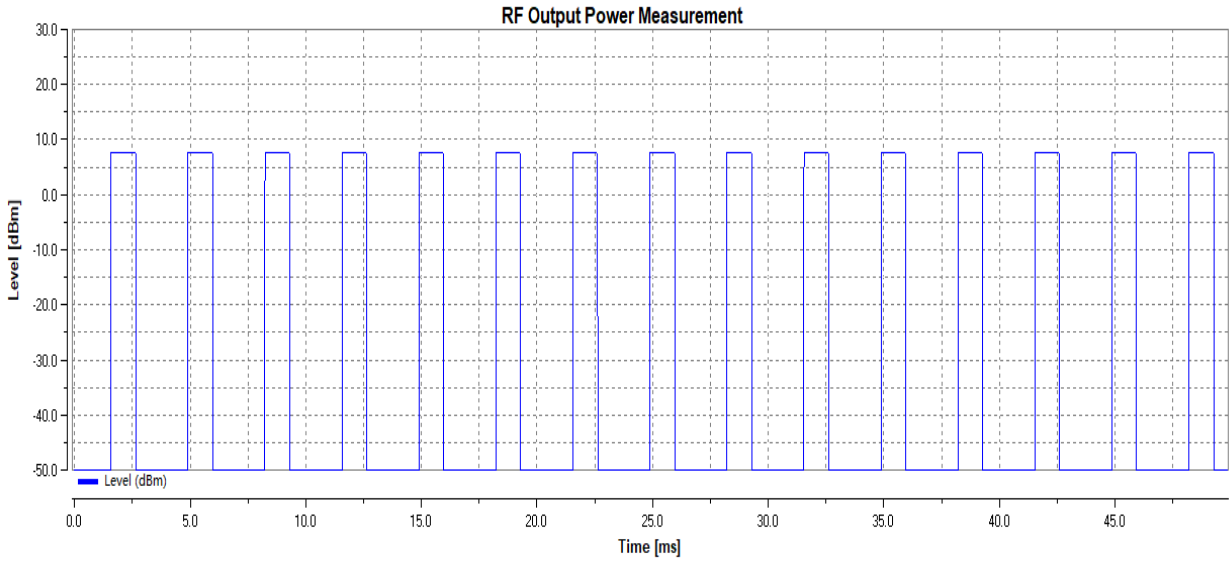
RF Output Power_TLVN_BLE_2440_Ant1



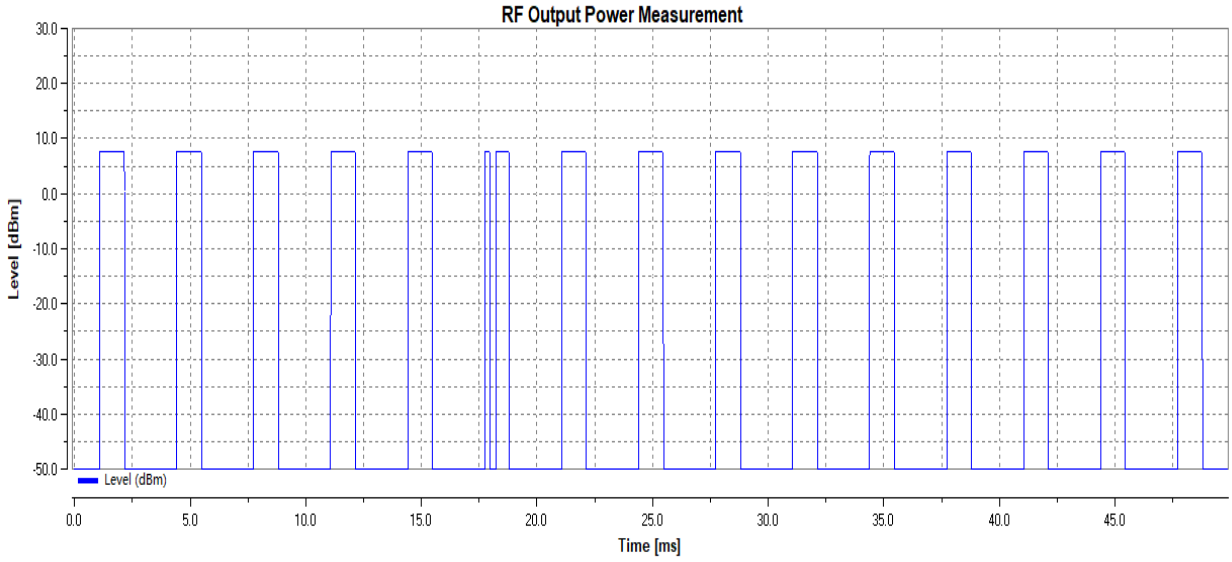
RF Output Power_TLVN_BLE_2480_Ant1



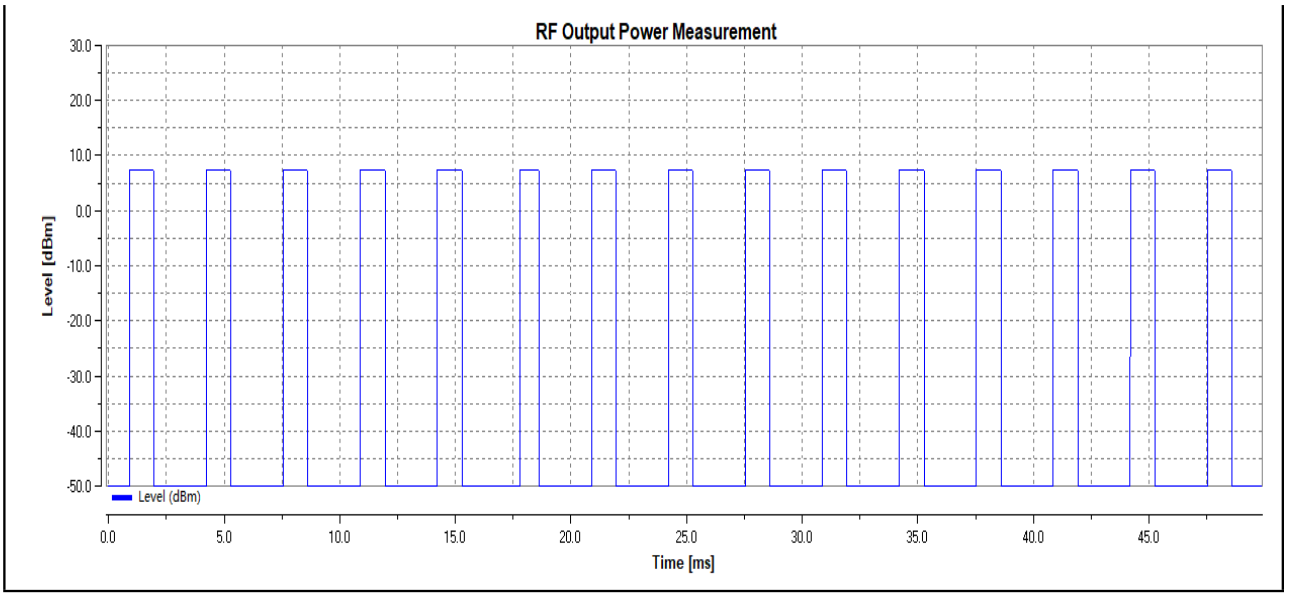
RF Output Power_THVN_BLE_2405_Ant1



RF Output Power_THVN_BLE_2440_Ant1



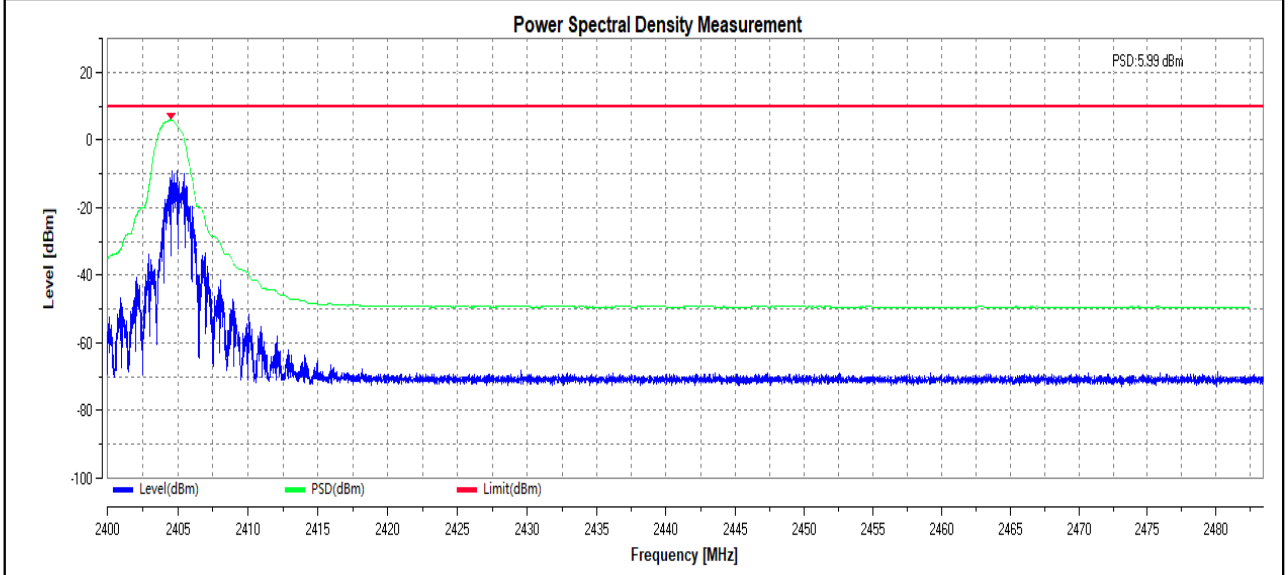
RF Output Power_THVN_BLE_2480_Ant1



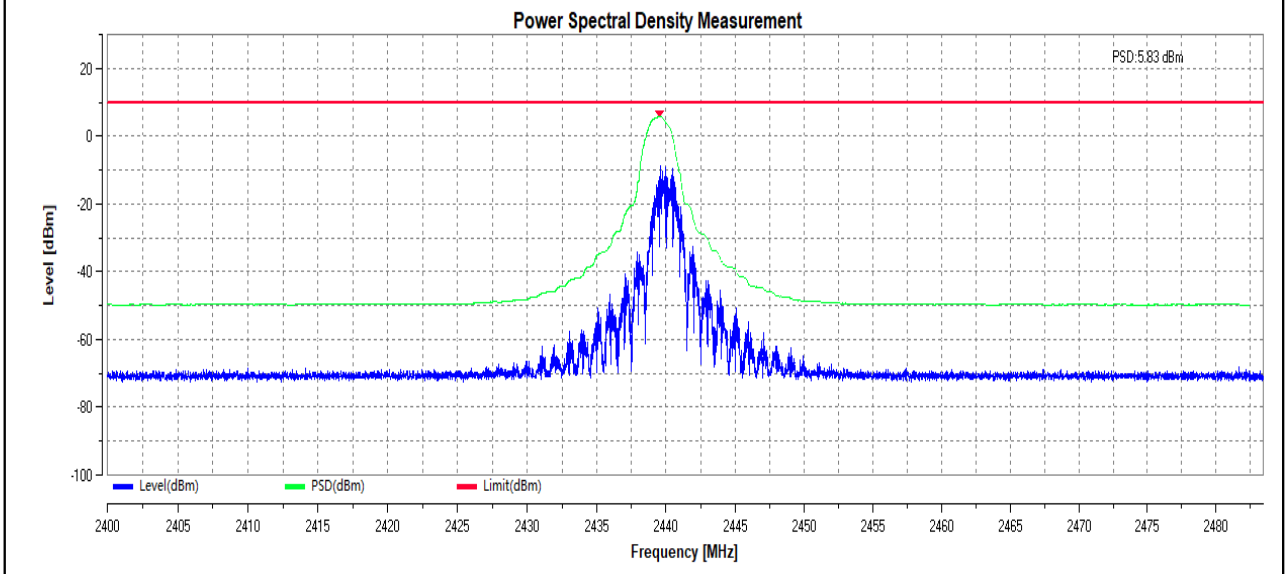
2.Power Spectral Density

Test Condition	Test Mode	Test Channel	Ant	PSD [dBm/MHz]	Limit [dBm/MHz]	Verdict
TNVN	BLE	2405	Ant1	5.99	<=10	PASS
TNVN	BLE	2440	Ant1	5.83	<=10	PASS
TNVN	BLE	2480	Ant1	5.78	<=10	PASS

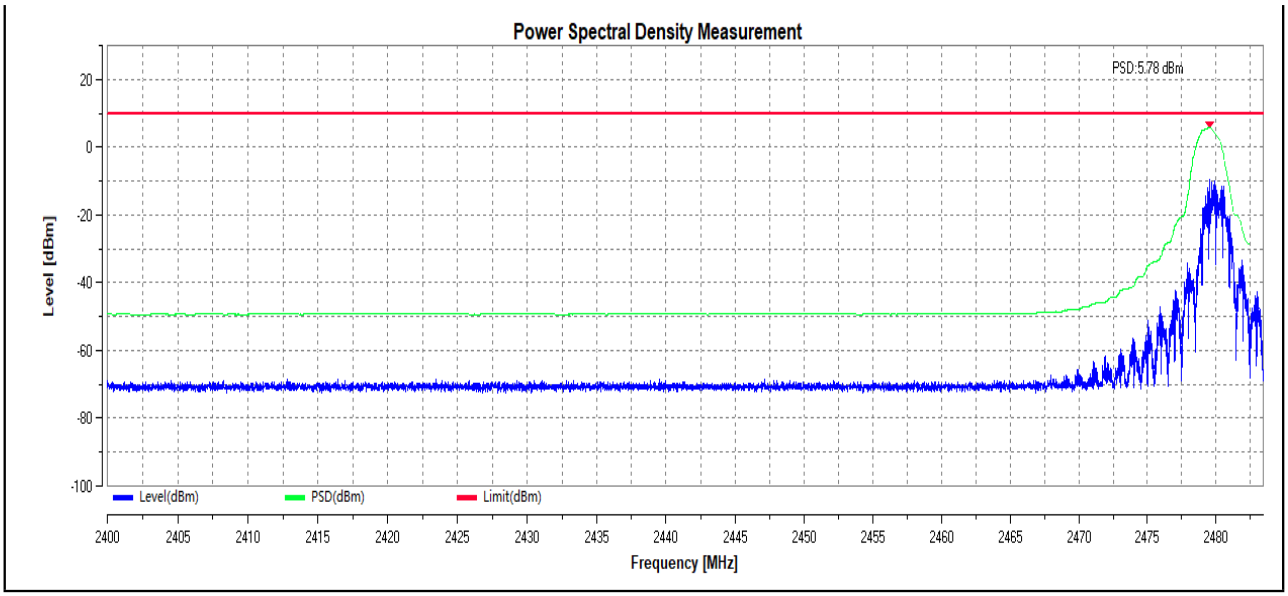
Power Spectral Density_TNVN_BLE_2405_Ant1



Power Spectral Density_TNVN_BLE_2440_Ant1



Power Spectral Density_TNVN_BLE_2480_Ant1



3.Occupied Channel Bandwidth

Test Condition	Test Mode	Test Channel	Ant	OBW [MHz]	FL OBW [MHz]	FH OBW [MHz]	Verdict
TNVN	BLE	2405	Ant1	2.32	2403.87014	---	PASS
TNVN	BLE	2440	Ant1	2.32	---	---	PASS
TNVN	BLE	2480	Ant1	2.32	---	2481.19405	PASS

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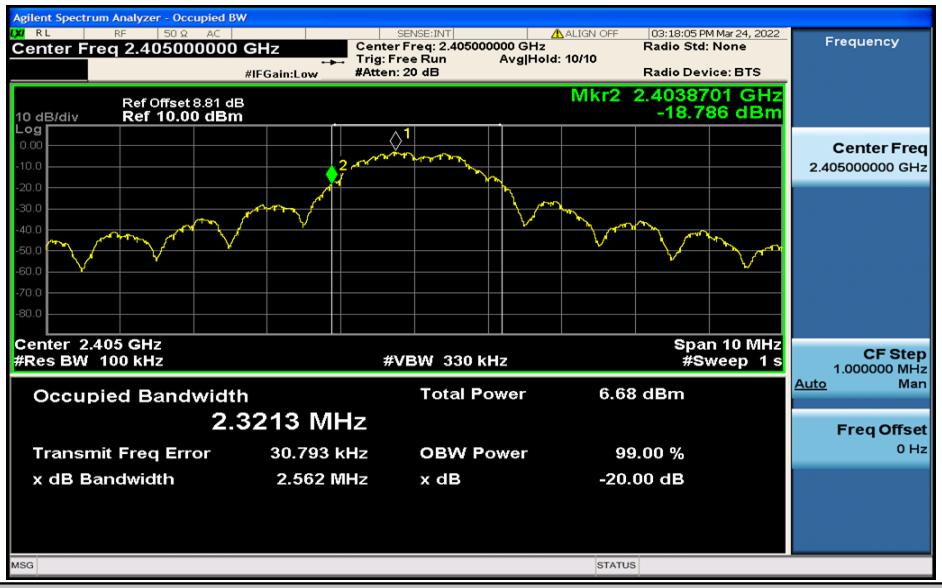
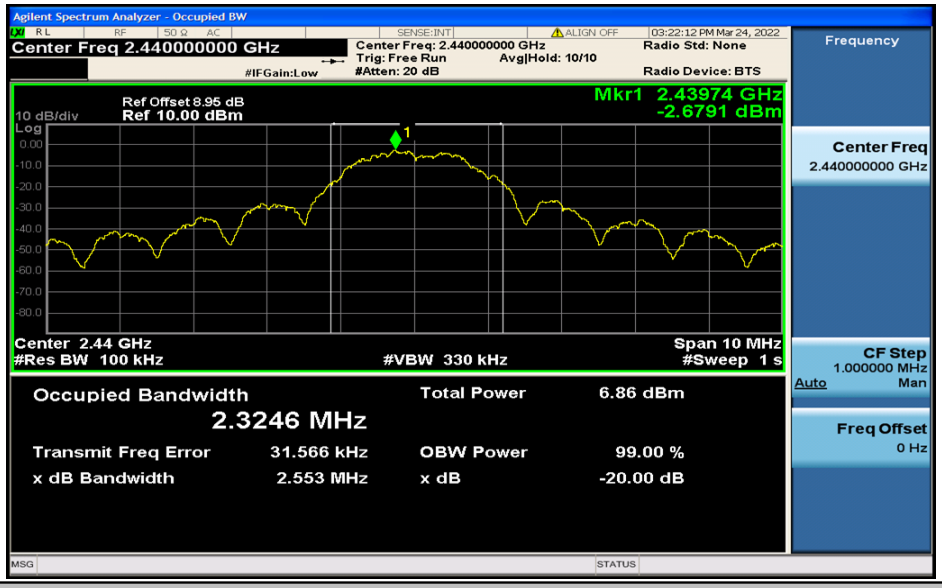
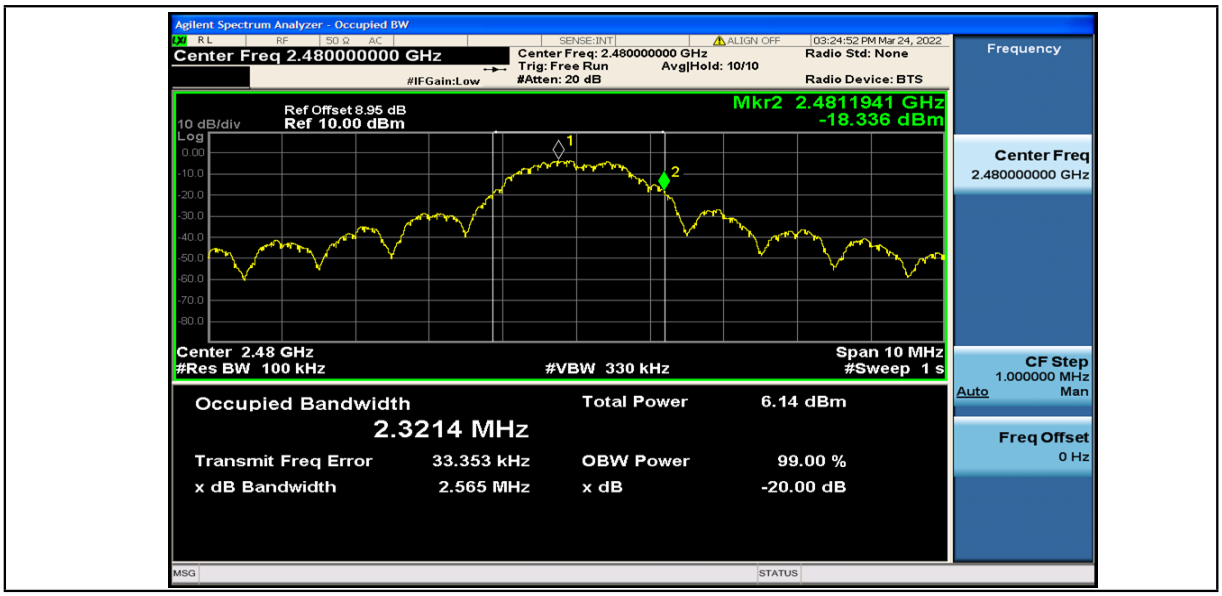
Occupied Channel Bandwidth_TNVN_BLE_2405_Ant1



Occupied Channel Bandwidth_TNVN_BLE_2440_Ant1



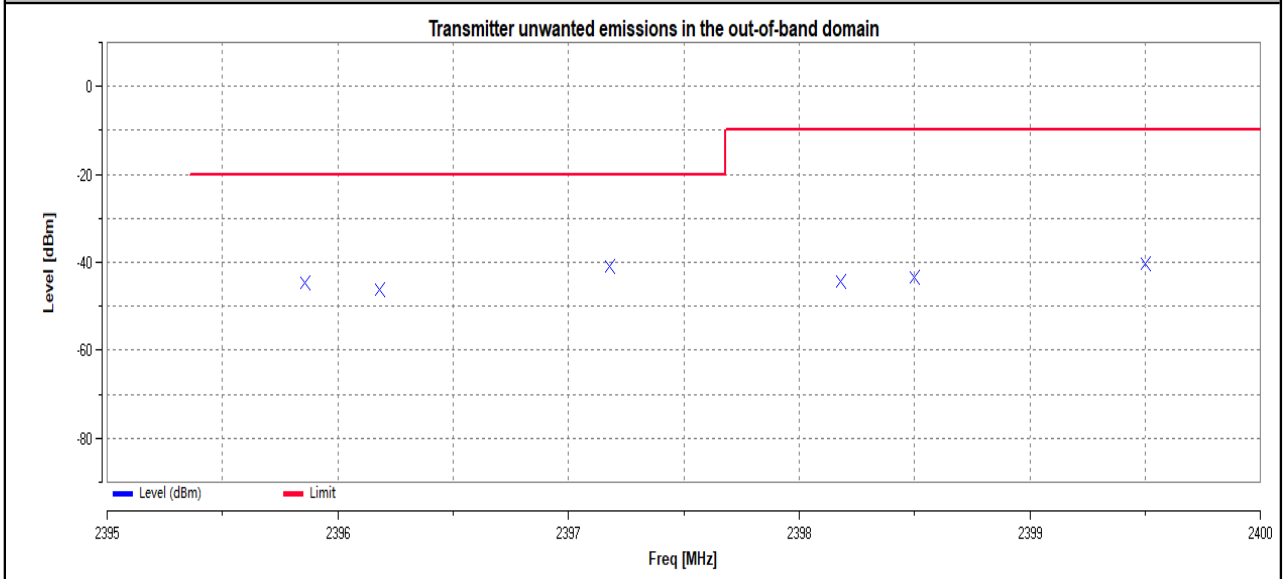
Occupied Channel Bandwidth_TNVN_BLE_2480_Ant1



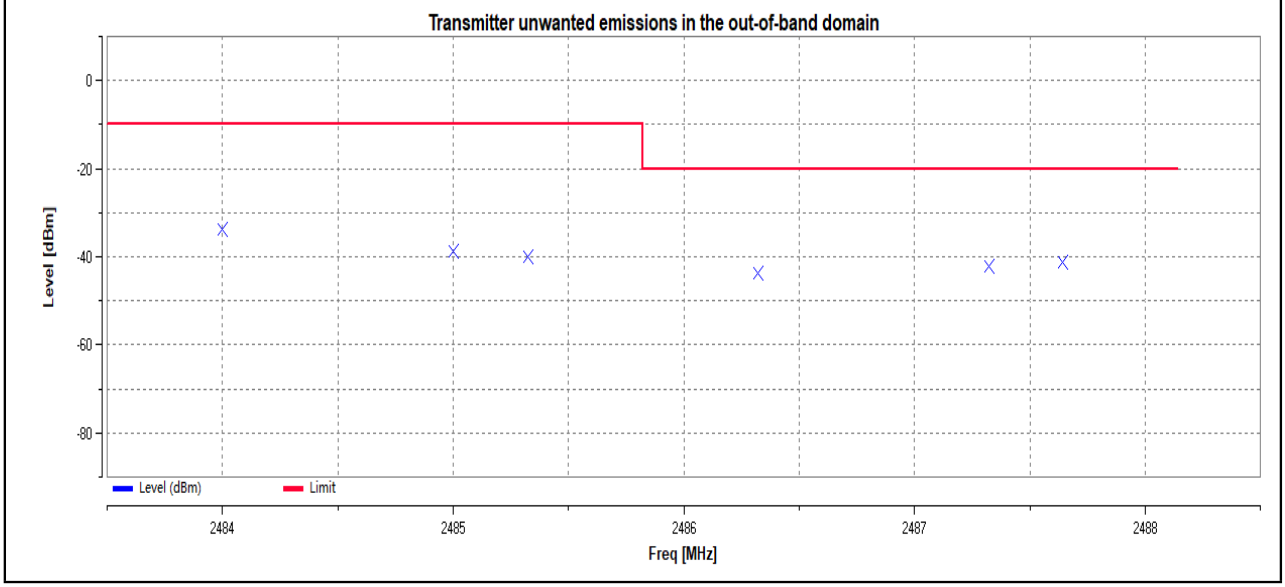
4.Transmitter unwanted emissions in the out-of-band domain

Test Condition	Test Mode	Test Channel	Ant	Freq [MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Verdict
TNVN	BLE	2405	Ant1	2395.86	-44.55	<=-20	PASS
TNVN	BLE	2405	Ant1	2396.18	-46.21	<=-20	PASS
TNVN	BLE	2405	Ant1	2397.18	-40.85	<=-20	PASS
TNVN	BLE	2405	Ant1	2398.18	-44.39	<=-10	PASS
TNVN	BLE	2405	Ant1	2398.50	-43.38	<=-10	PASS
TNVN	BLE	2405	Ant1	2399.50	-40.45	<=-10	PASS
TNVN	BLE	2480	Ant1	2484.00	-33.73	<=-10	PASS
TNVN	BLE	2480	Ant1	2485.00	-38.88	<=-10	PASS
TNVN	BLE	2480	Ant1	2485.32	-39.85	<=-10	PASS
TNVN	BLE	2480	Ant1	2486.32	-43.77	<=-20	PASS
TNVN	BLE	2480	Ant1	2487.32	-42.20	<=-20	PASS
TNVN	BLE	2480	Ant1	2487.64	-41.10	<=-20	PASS

TX_OOB_TNVN_BLE_2405_Ant1_2400MHz-2BW to 2400MHz



TX_OOB_TNVN_BLE_2480_Ant1_2483.5MHz to 2483.5MHz+2BW



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5.Receiver Blocking

TestMode	Antenna	Channel	Wanted signal [dBm]	Freq. [MHz]	CW [dBm]	PER [%]	Limit [%]	Verdict
ZIGEBEE	Ant1	2405	-65.35	2300	-34.00	1.50	<=10	PASS
			-65.35	2380	-34.00	2.20	<= 10	PASS
		2480	-65.35	2504	-34.00	1.80	<=10	PASS
			-65.35	2584	-34.00	1.00	<= 10	PASS

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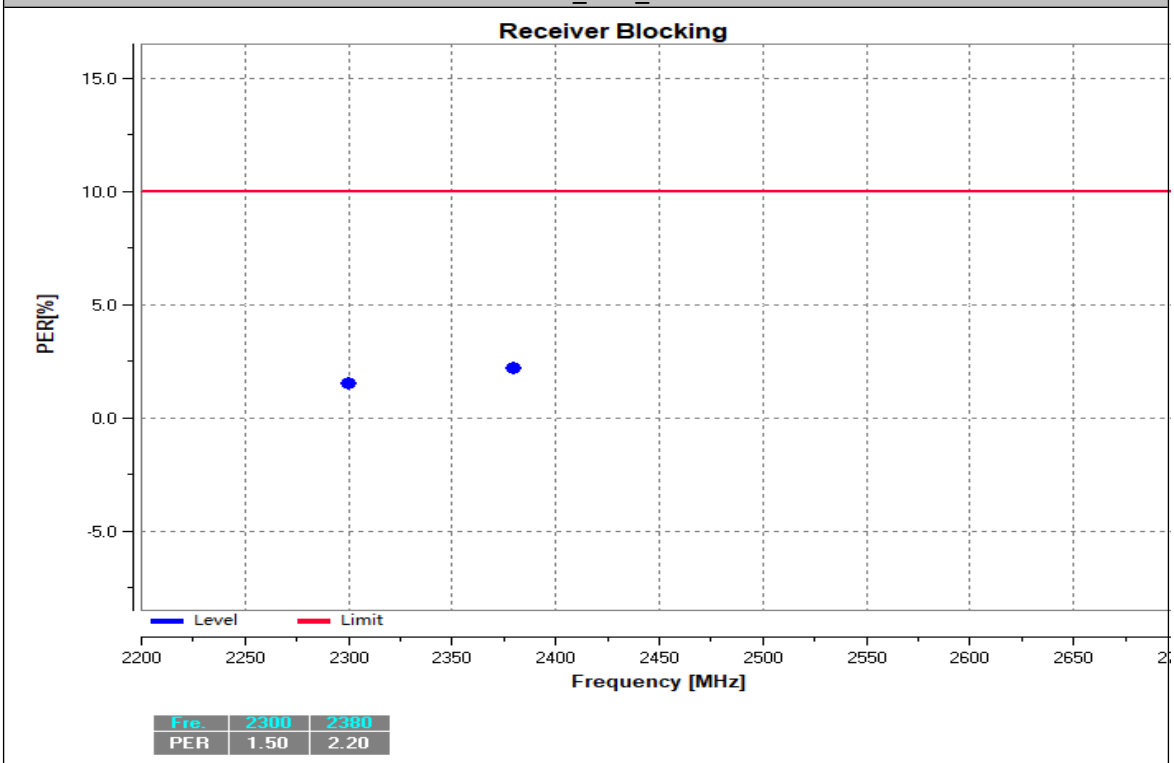
ZIGEBEE_Ant1_2405



ZIGEBEE_Ant1_2480

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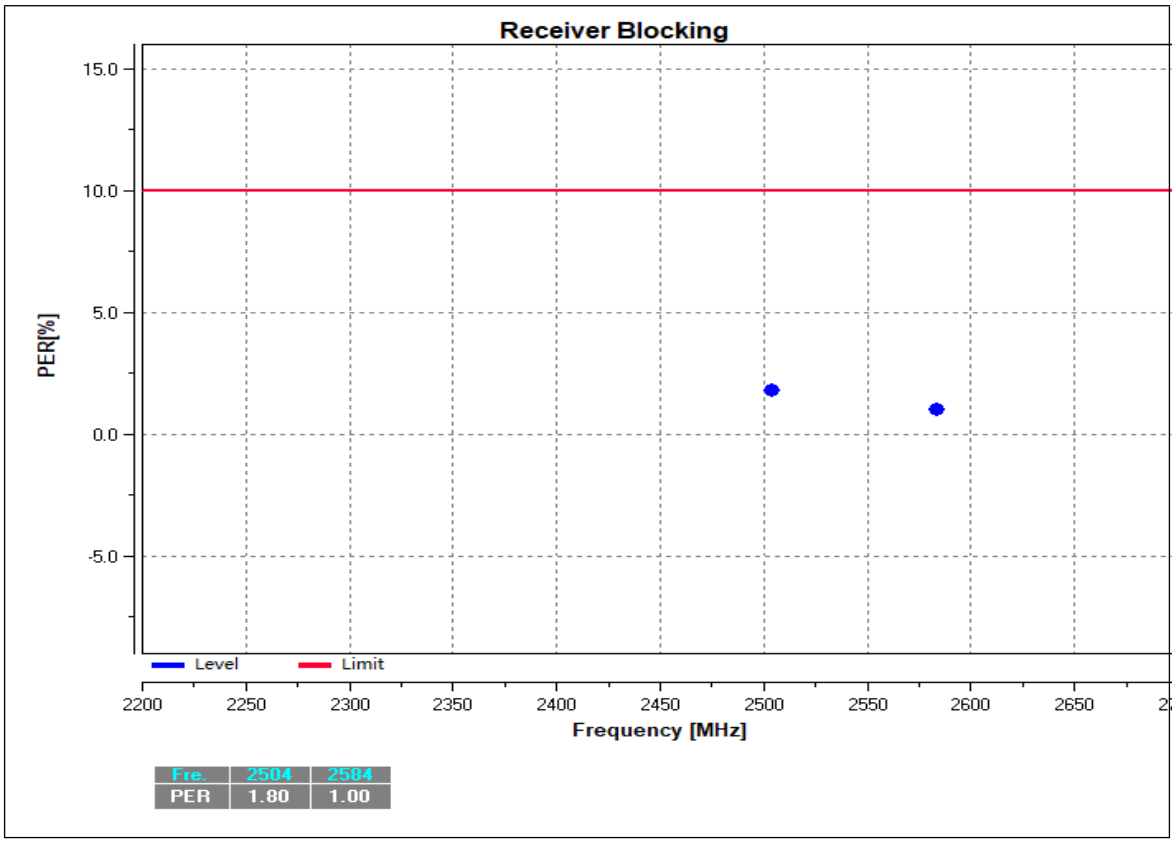

-- End of the Report --

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