

FCC Test Report

FCC ID : COF-MS01PRO
Equipment : LTE SOM Module
Brand Name : USI
Model Name : MS-01 PRO, MS-01 PRO-V
Applicant : Universal Global Scientific Industrial Co., Ltd
141, Lane 351, Sec. 1, Taiping Road, Tsao-tuen,
Nantou 54261, Taiwan
Manufacturer : Universal Global Scientific Industrial Co., Ltd
141, Lane 351, Sec. 1, Taiping Road, Tsao-tuen,
Nantou 54261, Taiwan
Standard : 47 CFR FCC Part 15.247

The product was received on Mar. 04, 2019, and testing was started from Mar. 12, 2019 and completed on Mar. 15, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

TEL : 886-3-3273456
FAX : 886-3-3270973
Report Template No.: HE1-C10 Ver3.4
FCC ID: COF-MS01PRO

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	FCC 15.203
3.1	15.207	AC Power-line Conducted Emissions	PASS	FCC 15.207
3.2	15.247(a)	DTS Bandwidth	PASS	≥500kHz
3.3	15.247(b)	Maximum Conducted Output Power	PASS	Power [dBm]:30
3.4	15.247(e)	Power Spectral Density	PASS	PSD [dBm/3kHz]:8
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	Non-Restricted Bands: >30 dBc
3.6	15.247(d)	Emissions in Restricted Frequency Bands	PASS	Restricted Bands: FCC 15.209

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and explanations:

None

Reviewed by: Jackson Tsai

Report Producer: Jenny Yang

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number
2400-2483.5	LE	2402-2480	0-39 [40]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	BT-LE(1Mbps)	1.0	1TX
2.4-2.4835GHz	BT-LE(2Mbps)	2.0	1TX

Note:

- ♦ Bluetooth LE uses a GFSK (1Mbps) modulation for DSSS.
- ♦ BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	Aristotle	RFA-25-C2H1-70-250A1	Dipole antenna	mini murata
2	Aristotle	RFA-25-C2H1-70-250A1	Dipole antenna	mini murata

Ant.	Port	Gain (dBi)		
		2.4G	5G	BT
1	1	1.44	2.16	1.44
2	2	1.44	2.16	-

Note 1: The EUT has two antennas.

Note 2: The antenna mentioned above will not be sold with the EUT in the market.

For 2.4GHz function:

For IEEE 802.11 b/g/n mode (2TX/2RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

For BT function:

For IEEE 802.15.1 Bluetooth mode (1TX/1RX)

Only Ant. 1 (port 1) can be used as transmitting/receiving antenna.

For 5GHz function:

For IEEE 802.11 a/n/ac mode (2TX/2RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

1.1.3 EUT Information

Operational Condition			
EUT Power Type	From AC Adapter		
EUT Function	☒ Point-to-multipoint	☐ Point-to-point	
Type of EUT			
☒	Stand-alone		
☐	Combined (EUT where the radio part is fully integrated within another device)		
	Combined Equipment - Brand Name / Model No.: ...		
☐	Plug-in radio (EUT intended for a variety of host systems)		
	Host System - Brand Name / Model No.: ...		
☐	Other:		

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) $\geq 1/T$
BT-LE(1Mbps)	0.63	2.007	393.75u	3k
BT-LE(2Mbps)	0.333	4.776	207.813u	10k

Note. If DC < 0.98, the DCF was added while measuring Output power and PSD.

1.1.5 Table for Multiple Listing

Model Name	Firmware Version	WWAN Voice Function	Description
MS-01 PRO	sdm660_64-userdebug 9 MS01Pro-P-DO-V1.00	X	The difference is WWAN voice function and firmware version, and firmware version does not affect RF function.
MS-01 PRO-V	sdm660_64-userdebug 9 MS01Pro-P-V1.00	V	

Note: Only "MS-01 PRO" configuration was measured during the test.

1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2013
- ♦ KDB 558074 D01 v05r02

1.3 Testing Location Information

Testing Location			
☒	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
Test site Designation No. TW1190 with FCC.			
☐	JHUBEI	ADD : No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085
Test site Designation No. TW0006 with FCC.			

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO04-HY	Lego	22.1~23.6°C / 57.6~58.4%	13/Mar/2019
RF Conducted	TH06-HY	Clara	20.8~22.6°C / 59.5~61.7%	13/Mar/2019~ 15/Mar/2019
Radiated	03CH02-HY	Lego	20.3~22.8°C / 60.1~65.3%	12/Mar/2019~ 14/Mar/2019

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.54 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	1.6 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.9 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.3 dB	Confidence levels of 95%
Temperature	0.7 °C	Confidence levels of 95%
Humidity	4 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Condition

RF Conducted	Abbreviation	Remark
TnomVnom	Tnom	20°C
-	Vnom	120V

2.2 Test Channel Mode

Test Software Version	QRCT v3.0.297.0
-----------------------	-----------------

Mode	Power Setting
BT-LE(1Mbps)	-
2402MHz	default
2440MHz	default
2480MHz	default
BT-LE(2Mbps)	-
2402MHz	default
2440MHz	default
2480MHz	default

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral
Operating Mode	CTX
1	Adapter mode, BT 4.0
2	Adapter mode, BT 5.0

The Worst Case Mode for Following Conformance Tests	
Tests Item	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	CTX
1	Adapter mode
Operating Mode > 1GHz	CTX
Orthogonal Planes of EUT	Z Plane 
Worst Planes of EUT	V

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Operating Mode	CTX
1	Bluetooth+WLAN 2.4GHz
2	Bluetooth+WLAN 5GHz
Refer to Sporton Test Report No.: FA922713 for Co-location RF Exposure Evaluation.	

2.4 Support Equipment

Support Equipment – AC Conduction				
No.	Equipment	Brand Name	Model Name	FCC ID
1	AC Adapter	FUJITSU	US-05	-
2	Test Fixture	-	-	-

Note: Support equipment No.1 & 2 were provided by customer.

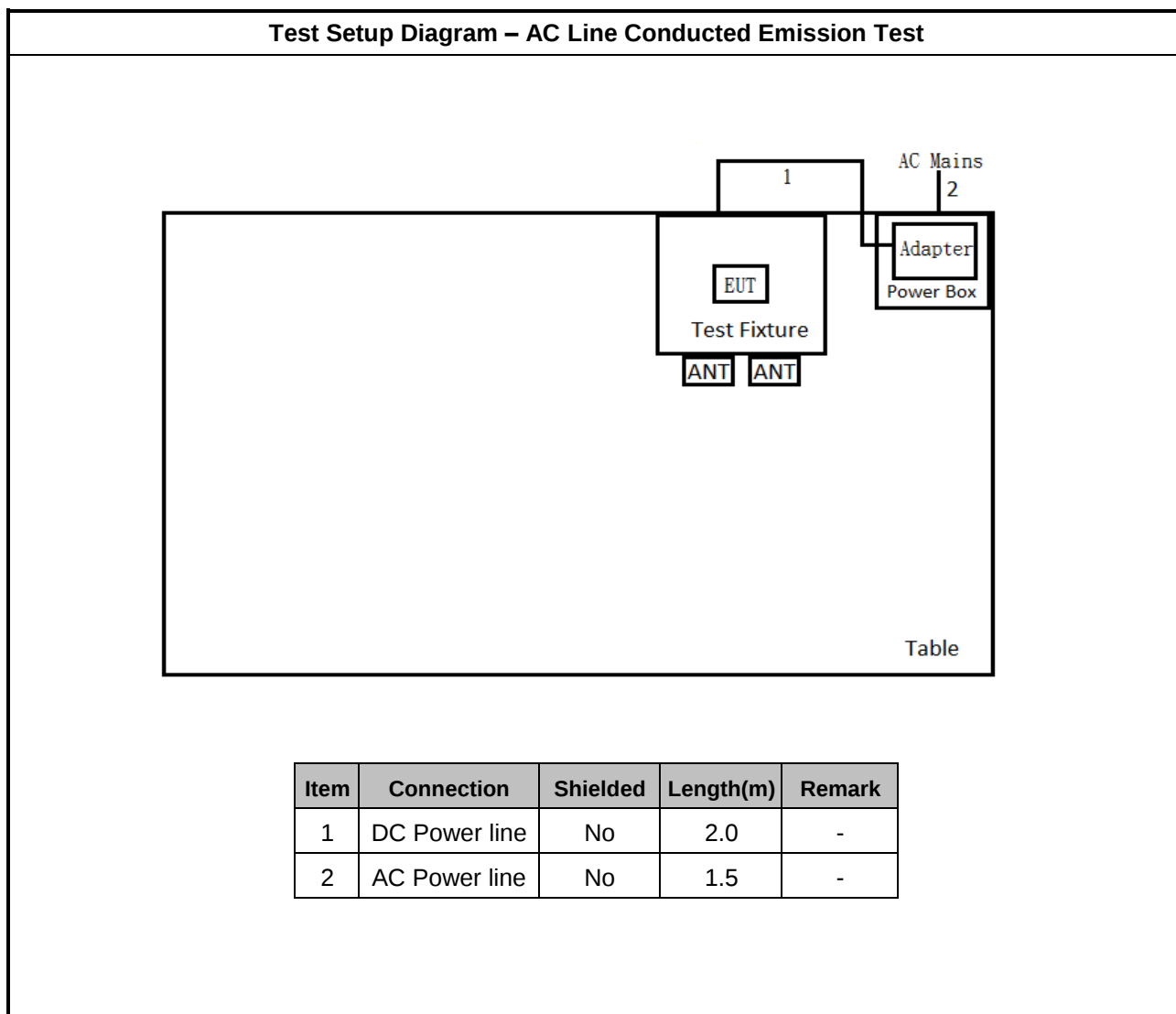
Support Equipment – RF Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5410	DoC
2	Adapter for NB	DELL	HA65NM130	DoC
3	AC Power Source	GW	APS-9102	-
4	Test Fixture	-	-	-

Note: Support equipment No.4 was provided by customer.

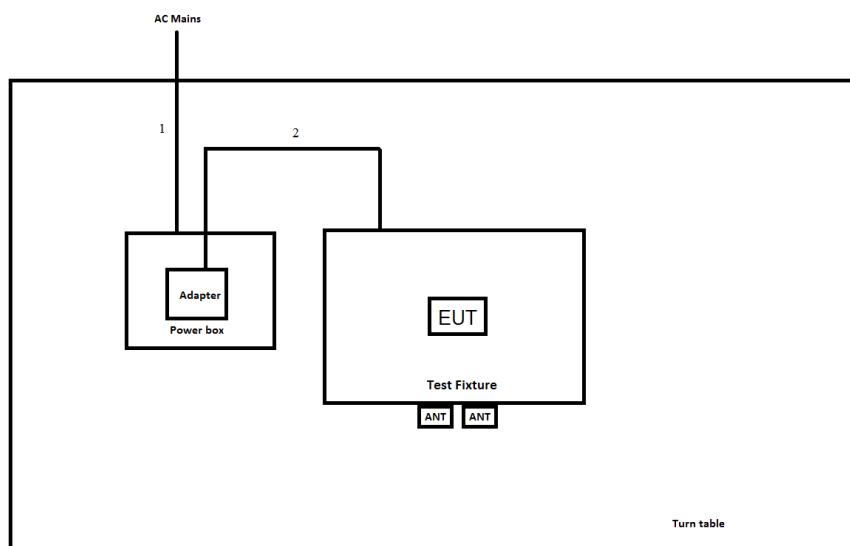
Support Equipment – Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	AC Adapter	FUJITSU	US-05	-
2	Test Fixture	-	-	-

Note: Support equipment No.1 & 2 were provided by customer.

2.5 Test Setup Diagram



Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power line	No	1.5	-
2	DC Power line	No	2.0	-

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

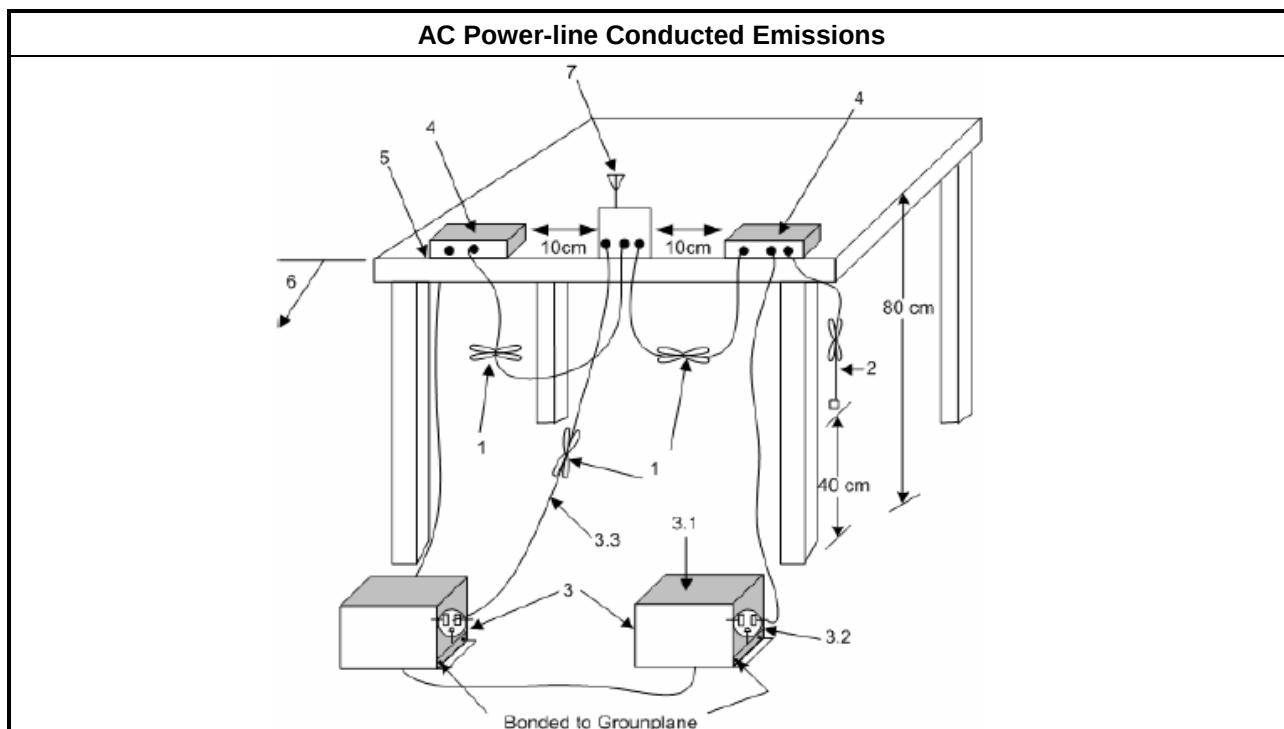
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method
Refer as ANSI C63.10-2013, clause 6.2 foray power-line conducted emissions.

3.1.4 Test Setup



3.1.5 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit	
Systems using digital modulation techniques:	
▪	6 dB bandwidth $\geq$ 500 kHz.

3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
▪ For the emission bandwidth shall be measured using one of the options below:	
☒	Refer as KDB 558074, clause 8.2 (11.8 of ANSI C63.10) DTS bandwidth measurement.
☐	Refer as RSS-Gen, clause 6.7 for occupied bandwidth testing.
☐	Refer as ANSI C63.10, clause 6.9.3 for occupied bandwidth testing.

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit	
	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
	Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	Smart antenna system (SAS):
	- Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	- Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	- Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3 + 8$ dB dBm
e.i.r.p. Power Limit:	
	2400-2483.5 MHz Band
	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
	Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm
	Smart antenna system (SAS)
	- Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	- Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	- Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

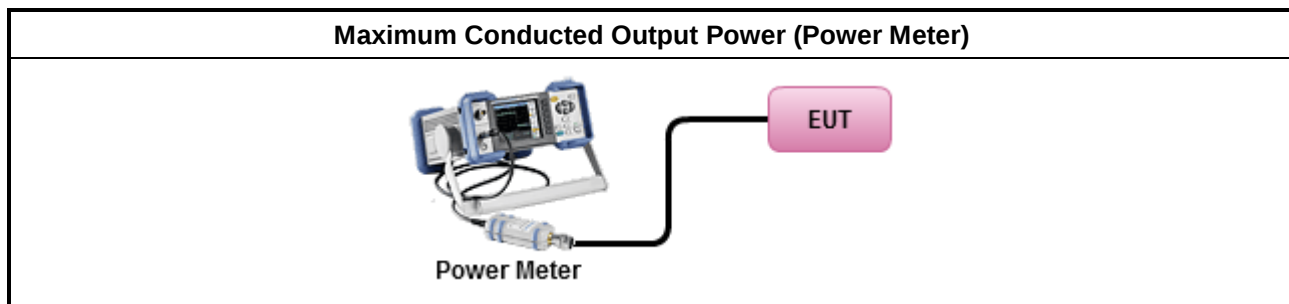
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method	
Maximum Peak Conducted Output Power	
☐	Refer as KDB 558074, clause 8.3.1.1 (11.9.1.1 of ANSI C63.10) RBW ≥ EBW method.
☐	Refer as KDB 558074, clause 8.3.1.2 (11.9.1.2 of ANSI C63.10) integrated band power method.
☐	Refer as KDB 558074, clause 8.3.1.3 (11.9.1.3 of ANSI C63.10) peak power meter.
Maximum Average Conducted Output Power	
☐	Refer as KDB 558074, clause 8.3.2.2 (11.9.2.2 of ANSI C63.10) using a spectrum analyzer.
☒	Refer as KDB 558074, clause 8.3.2.3 (11.9.2.3 of ANSI C63.10) using a power meter.
For conducted measurement.	
If the EUT supports multiple transmit chains using options given below: Refer as KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.	
If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$	

3.3.4 Test Setup



3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
Power Spectral Density (PSD) ≤ 8 dBm/3kHz

3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method
Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).
☒ Refer as KDB 558074, clause 8.4 (11.10 of ANSI C63.10) Method PKPSD.
For conducted measurement.
If The EUT supports multiple transmit chains using options given below:
Measure and sum the spectra across the outputs. Refer as KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.

3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

Refer as Appendix D

3.5 Emissions in Non-restricted Frequency Bands

3.5.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit	
RF output power procedure	Limit (dB)
Peak output power procedure	20
Average output power procedure	30
Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level. Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.	

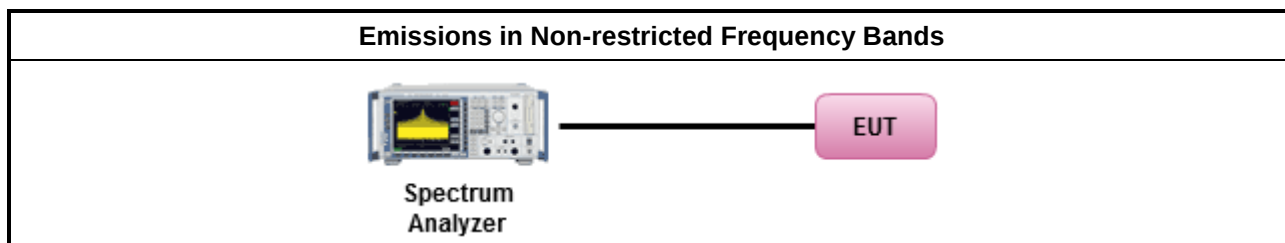
3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method
Refer as KDB 558074, clause 8.5 (11.11 of ANSI C63.10) for non-restricted frequency bands.

3.5.4 Test Setup



3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

3.6 Emissions in Restricted Frequency Bands

3.6.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB / decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

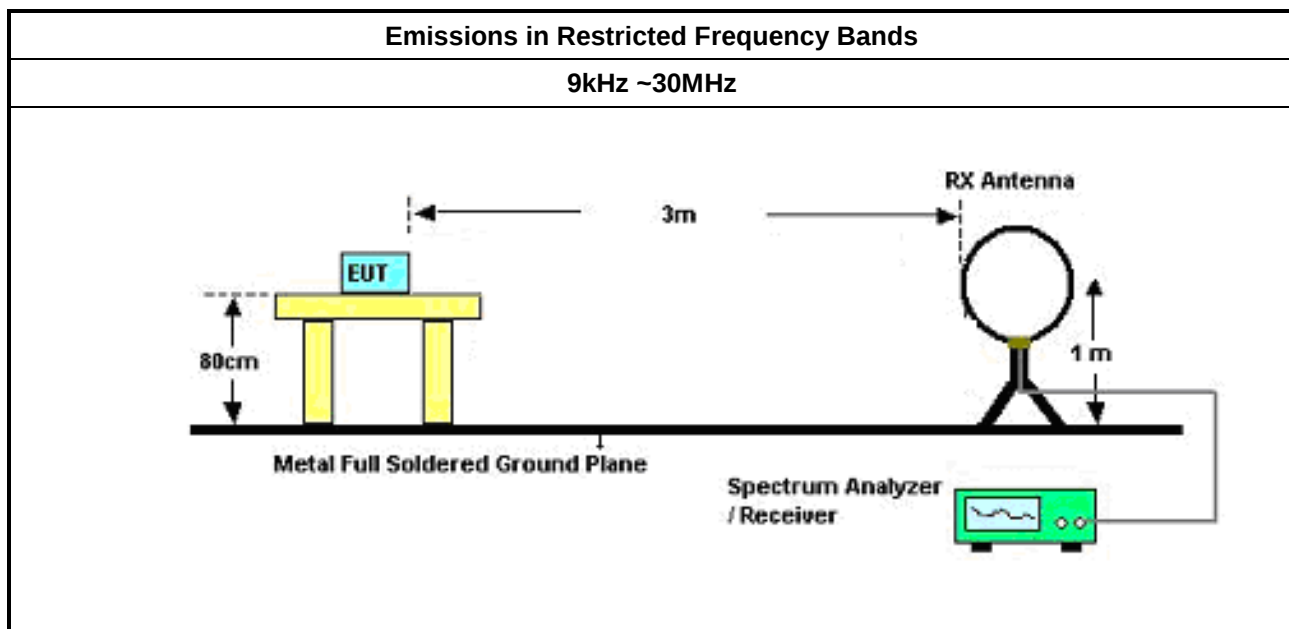
3.6.2 Measuring Instruments

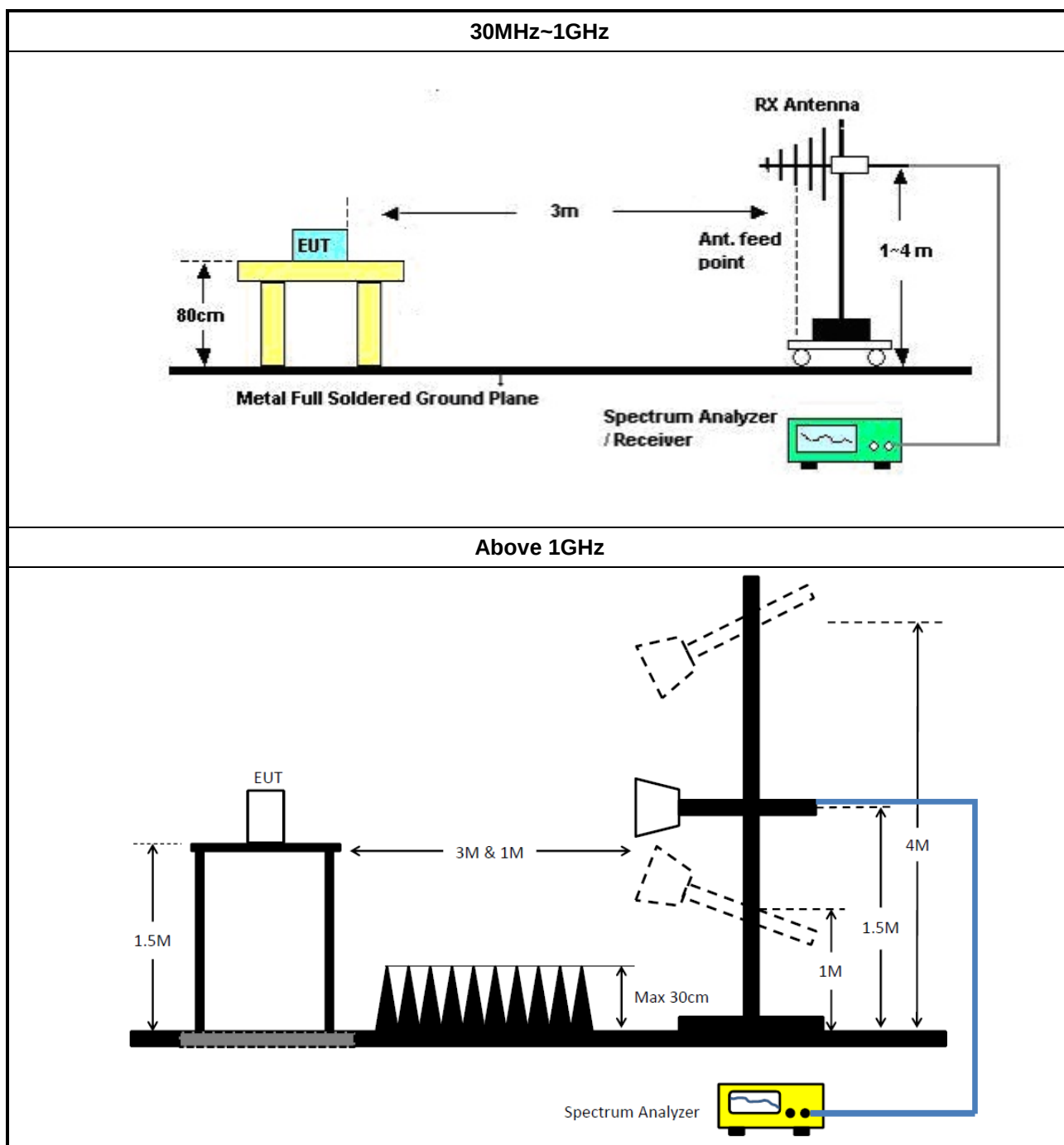
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method	
The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].	
Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.	
For the transmitter unwanted emissions shall be measured using following options below:	
	Refer as KDB 558074, clause 8.6 (11.12 of ANSI C63.10) for restricted frequency bands.
For the transmitter band-edge emissions shall be measured using following options below:	
	Refer as KDB 558074 clause 8.7.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.
	Refer as KDB 558074, clause 8.7.2 (6.10.6 of ANSI C63.10) for marker-delta method for band-edge measurements.
	Refer as KDB 558074, clause 8.7.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
Use the following spectrum analyzer settings:	
	Set RBW=100 kHz for $f < 1$ GHz; VBW=3 * RBW; Sweep = auto; Detector function = peak; Trace = max hold.
	Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement. For average measurement, refer as 1.1.4.

3.6.4 Test Setup





3.6.5 Test Result of Emissions in Restricted Frequency Bands (Below 30MHz)

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

3.6.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
EMC Receiver	R&S	ESR	102051	9KHz ~ 3.6GHz	03/May/2018	02/May/2019
LISN	R&S	ENV216	101295	9kHz ~ 30MHz	08/Nov/2018	07/Nov/2019
RF Cable-CON	MTJ	RG142	CB002-CO	9kHz ~ 200MHz	17/Sep/2018	16/Sep/2019
AC POWER	APC	AFC-11005G	F310050055	47Hz~63Hz 5~300V	NCR	NCR
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9 kHz ~ 30 MHz	12/Oct/2018	11/Oct/2019

NCR : Non-Calibration Require

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101500	10Hz~40GHz	18/Jul/2018	17/Jul/2019
Power Sensor	Anritsu	MA2411B	1339407	300MHz ~ 40GHz	17/Nov/2018	16/Nov/2019
Power Meter	Anritsu	ML2495A	1517010	300MHz ~ 40GHz	17/Nov/2018	16/Nov/2019
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	30MHz ~18G	10/Jan/2019	09/Jan/2020
Cable 0.2m	HUBER	MY10711/4	RF Cable - 02	30MHz ~18G	10/Jan/2019	09/Jan/2020
Cable 0.5m	HUBER	MY39470/4	RF Cable - 29	30MHz ~18G	10/Jan/2019	09/Jan/2020
SMB100A Signal Generator	R&S	SMB100A03	181147	100kHz~40GHz	12/Nov/2018	10/Nov/2020

Instrument for Radiated Test

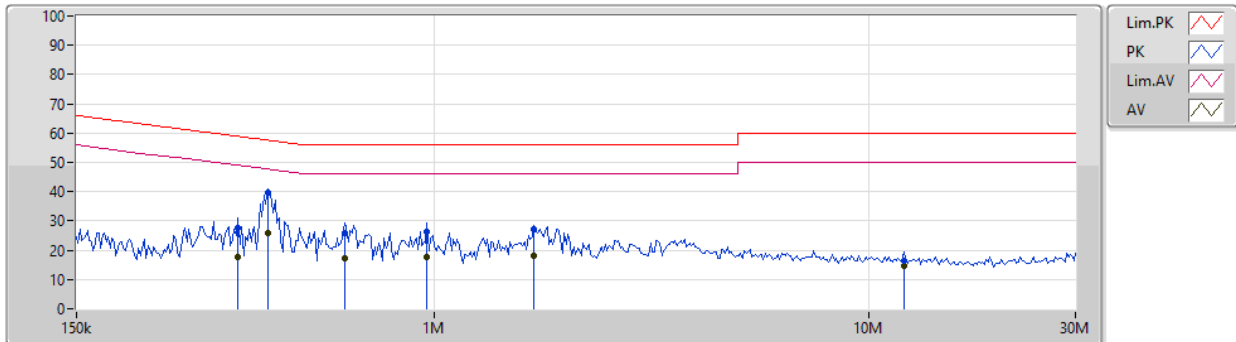
Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	19/Oct/2018	18/Oct/2019
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 18GHz 3m	17/Oct/2018	16/Oct/2019
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	27Jul/2018	02/Jul/2019
Microwave Preamplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	23/Oct/2018	22/Oct/2019
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	18/Jan/2019	17/Jan/2020
RF Cable-high	SUHNER	SUCOFLEX104	MY34918/4	1GHz ~ 40GHz	18/Jan/2019	17/Jan/2020
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz ~ 1GHz	08/Sep/2018	07/Sep/2019
Preamplifier	MITEQ	TTA1840-35-HG	1864481	18GHz ~ 40GHz	24/Aug/2018	23/Aug/2019
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	10/Apr/2018	09/Apr/2019
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	29/Mar/2018	28/Mar/2019
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170339	18GHz ~ 40GHz	11/Apr/2018	10/Apr/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 01543	1GHz ~ 18GHz	11/May/2018	10/May/2019

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Neutral
Operating Function	Adapter mode, BT4.0		

AC Conduction

13/03/2019



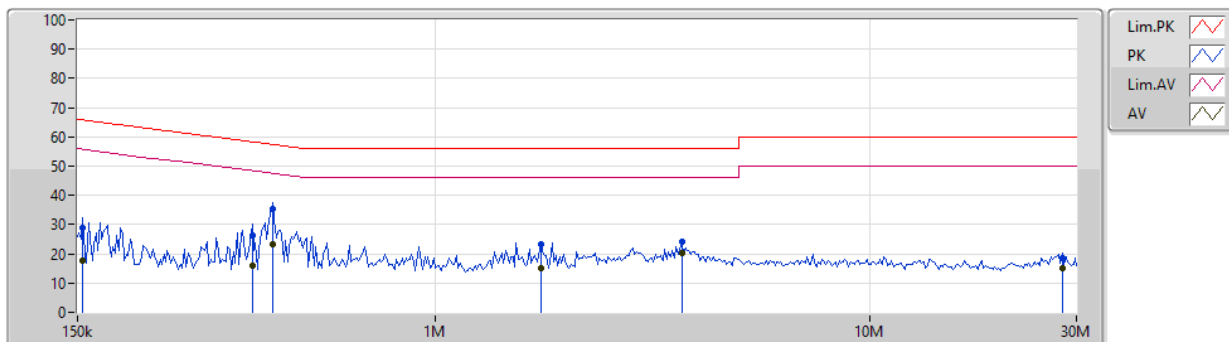
Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	352.963k	27.48	58.89	-31.41	19.48	Neutral	-	8.00	9.59	0.01	9.88			
AV	352.963k	17.85	48.89	-31.04	19.48	Neutral	-	-1.63	9.59	0.01	9.88			
QP	413.877k	39.45	57.57	-18.12	19.48	Neutral	"Worst"	19.97	9.59	0.01	9.88			
AV	413.877k	26.05	47.57	-21.52	19.48	Neutral	-	6.57	9.59	0.01	9.88			
QP	622.369k	26.01	56.00	-29.99	19.48	Neutral	-	6.53	9.59	0.01	9.88			
AV	622.369k	17.26	46.00	-28.74	19.48	Neutral	-	-2.22	9.59	0.01	9.88			
QP	964.247k	26.25	56.00	-29.75	19.49	Neutral	-	6.76	9.59	0.02	9.88			
AV	964.247k	17.60	46.00	-28.40	19.49	Neutral	-	-1.89	9.59	0.02	9.88			
QP	1.7M	27.20	56.00	-28.80	19.53	Neutral	-	7.67	9.61	0.03	9.89			
AV	1.7M	18.10	46.00	-27.90	19.53	Neutral	-	-1.43	9.61	0.03	9.89			
QP	12.073M	16.18	60.00	-43.82	19.64	Neutral	-	-3.46	9.67	0.08	9.89			
AV	12.073M	14.64	50.00	-35.36	19.64	Neutral	-	-5.00	9.67	0.08	9.89			

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Adapter mode, BT4.0		

AC Conduction

13/03/2019



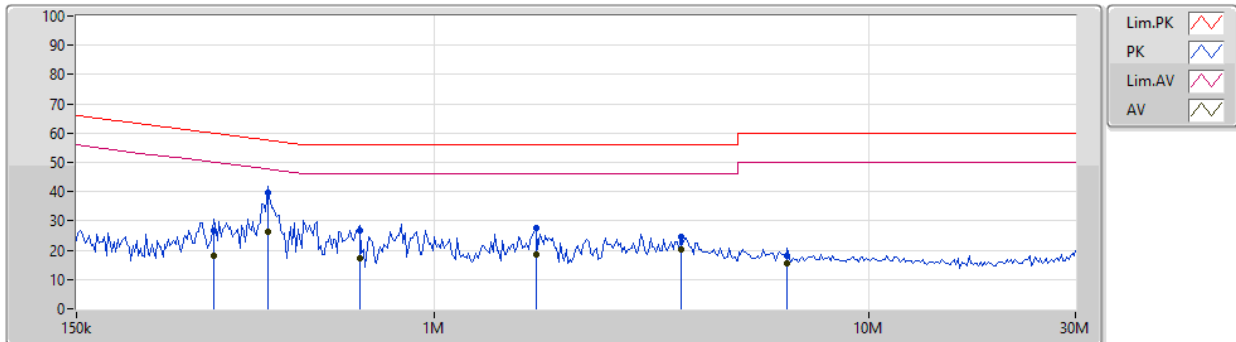
Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	154.545k	28.96	65.75	-36.79	19.48	Line	-	9.48	9.60	0.01	9.87			
AV	154.545k	17.87	55.75	-37.88	19.48	Line	-	-1.61	9.60	0.01	9.87			
QP	378.424k	26.50	58.31	-31.81	19.48	Line	-	7.02	9.59	0.01	9.88			
AV	378.424k	15.90	48.31	-32.41	19.48	Line	-	-3.58	9.59	0.01	9.88			
QP	422.196k	35.39	57.40	-22.01	19.48	Line	"Worst"	15.91	9.59	0.01	9.88			
AV	422.196k	23.39	47.40	-24.01	19.48	Line	-	3.91	9.59	0.01	9.88			
QP	1.752M	23.26	56.00	-32.74	19.54	Line	-	3.72	9.62	0.03	9.89			
AV	1.752M	15.24	46.00	-30.76	19.54	Line	-	-4.30	9.62	0.03	9.89			
QP	3.695M	24.10	56.00	-31.90	19.56	Line	-	4.54	9.63	0.04	9.89			
AV	3.695M	20.05	46.00	-25.95	19.56	Line	-	0.49	9.63	0.04	9.89			
QP	27.849M	18.64	60.00	-41.36	19.58	Line	-	-0.94	9.55	0.13	9.90			
AV	27.849M	15.21	50.00	-34.79	19.58	Line	-	-4.37	9.55	0.13	9.90			

AC Power-line Conducted Emissions Result

Operating Mode	2	Power Phase	Neutral
Operating Function	Adapter mode, BT5.0		

AC Conduction

13/03/2019



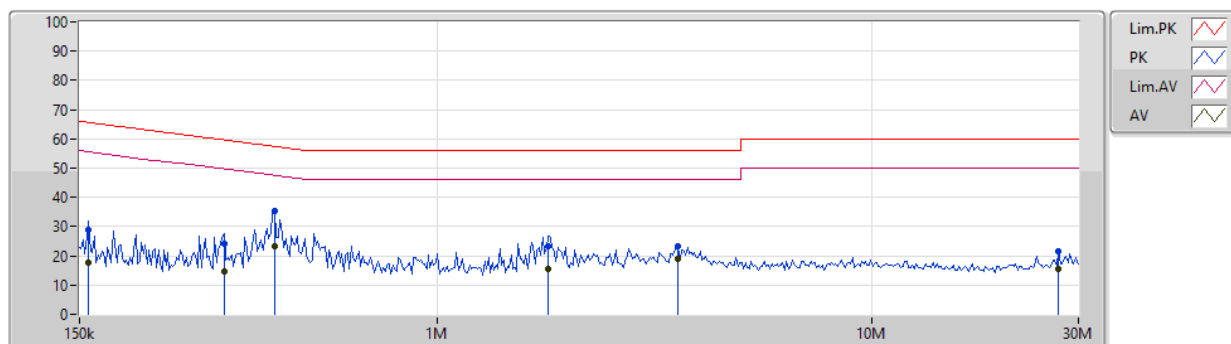
Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	310.136k	26.65	59.96	-33.31	19.48	Neutral	-	7.17	9.59	0.01	9.88			
AV	310.136k	17.98	49.96	-31.98	19.48	Neutral	-	-1.50	9.59	0.01	9.88			
QP	413.877k	39.78	57.57	-17.79	19.48	Neutral	"Worst"	20.30	9.59	0.01	9.88			
AV	413.877k	26.50	47.57	-21.07	19.48	Neutral	-	7.02	9.59	0.01	9.88			
QP	673.936k	26.71	56.00	-29.29	19.48	Neutral	-	7.23	9.59	0.01	9.88			
AV	673.936k	17.39	46.00	-28.61	19.48	Neutral	-	-2.09	9.59	0.01	9.88			
QP	1.717M	27.54	56.00	-28.46	19.53	Neutral	-	8.01	9.61	0.03	9.89			
AV	1.717M	18.56	46.00	-27.44	19.53	Neutral	-	-0.97	9.61	0.03	9.89			
QP	3.695M	24.59	56.00	-31.41	19.54	Neutral	-	5.05	9.61	0.04	9.89			
AV	3.695M	20.16	46.00	-25.84	19.54	Neutral	-	0.62	9.61	0.04	9.89			
QP	6.515M	18.05	60.00	-41.95	19.59	Neutral	-	-1.54	9.64	0.06	9.89			
AV	6.515M	15.51	50.00	-34.49	19.59	Neutral	-	-4.08	9.64	0.06	9.89			

AC Power-line Conducted Emissions Result

Operating Mode	2	Power Phase	Line
Operating Function	Adapter mode, BT5.0		

AC Conduction

13/03/2019



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	157.652k	28.95	65.58	-36.63	19.48	Line	-	9.47	9.60	0.01	9.87			
AV	157.652k	17.66	55.58	-37.92	19.48	Line	-	-1.82	9.60	0.01	9.87			
QP	322.728k	24.13	59.63	-35.50	19.48	Line	-	4.65	9.59	0.01	9.88			
AV	322.728k	14.79	49.63	-34.84	19.48	Line	-	-4.69	9.59	0.01	9.88			
QP	422.196k	35.47	57.40	-21.93	19.48	Line	"Worst"	15.99	9.59	0.01	9.88			
AV	422.196k	23.27	47.40	-24.13	19.48	Line	-	3.79	9.59	0.01	9.88			
QP	1.805M	23.49	56.00	-32.51	19.54	Line	-	3.95	9.62	0.03	9.89			
AV	1.805M	15.43	46.00	-30.57	19.54	Line	-	-4.11	9.62	0.03	9.89			
QP	3.586M	23.10	56.00	-32.90	19.56	Line	-	3.54	9.63	0.04	9.89			
AV	3.586M	19.16	46.00	-26.84	19.56	Line	-	-0.40	9.63	0.04	9.89			
QP	27.03M	21.73	60.00	-38.27	19.58	Line	-	2.15	9.56	0.12	9.90			
AV	27.03M	15.70	50.00	-34.30	19.58	Line	-	-3.88	9.56	0.12	9.90			

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	667.5k	1.028M	1M03F1D	665k	1.027M
BT-LE(2Mbps)	1.145M	2.036M	2M04F1D	1.138M	2.031M

Max-N dB = Maximum 6dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;

Min-N dB = Minimum 6dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

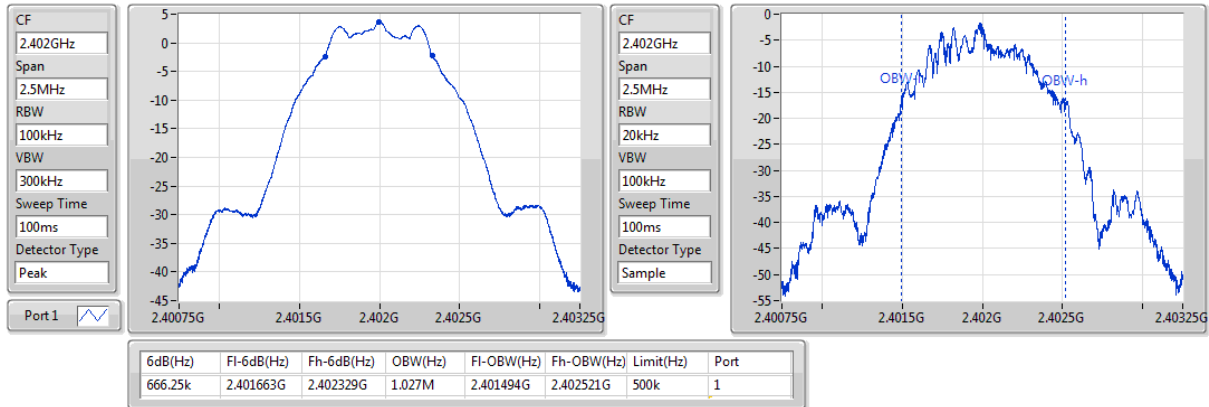
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	500k	666.25k	1.027M
2440MHz_TnomVnom	Pass	500k	667.5k	1.028M
2480MHz_TnomVnom	Pass	500k	665k	1.028M
BT-LE(2Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	500k	1.138M	2.036M
2440MHz_TnomVnom	Pass	500k	1.145M	2.031M
2480MHz_TnomVnom	Pass	500k	1.143M	2.036M

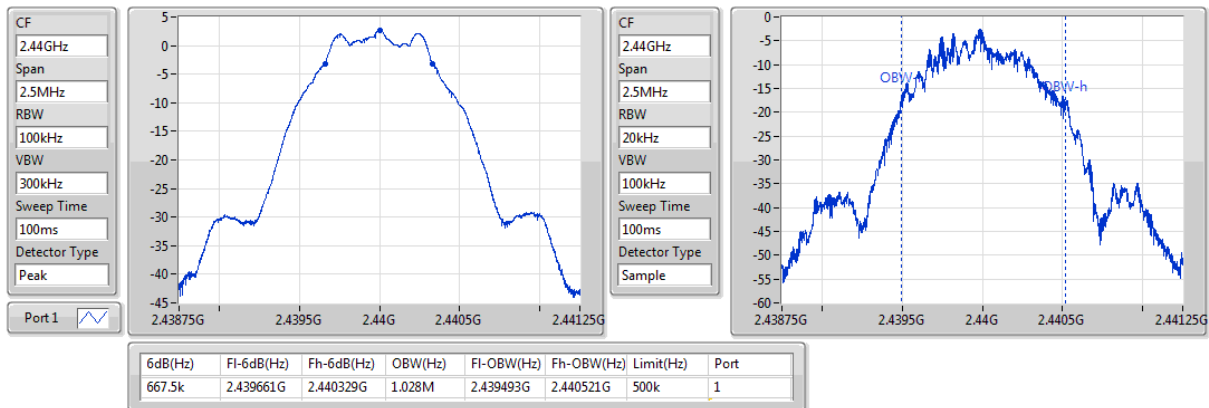
Port X-N dB = Port X 6dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

BT-LE(1Mbps)
EBW
2402MHz

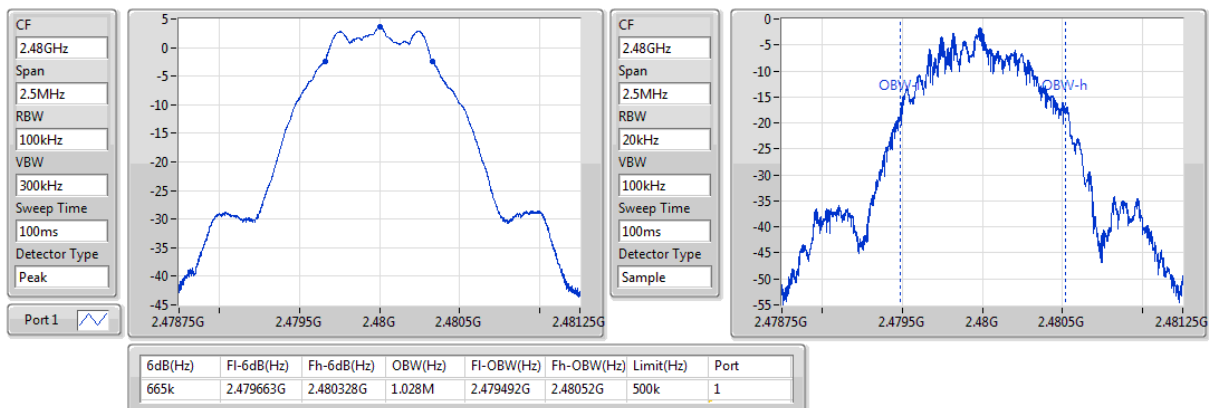
13/03/2019


BT-LE(1Mbps)
EBW
2440MHz

13/03/2019


BT-LE(1Mbps)
EBW
2480MHz

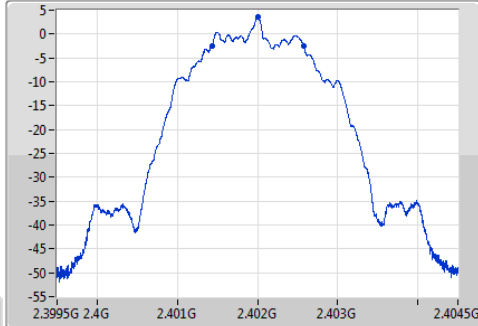
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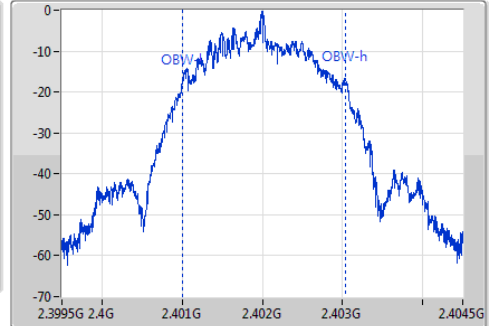
BT-LE(2Mbps)
EBW
2402MHz

13/03/2019

CF
2.402GHz
Span
5MHz
RBW
100kHz
VBW
300kHz
Sweep Time
100ms
Detector Type
Peak
Port 1



CF
2.402GHz
Span
5MHz
RBW
30kHz
VBW
100kHz
Sweep Time
100ms
Detector Type
Sample
Port 1

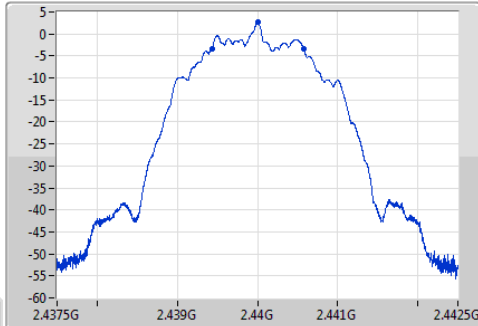


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.138M	2.401435G	2.402573G	2.036M	2.401G	2.403037G	500k	1

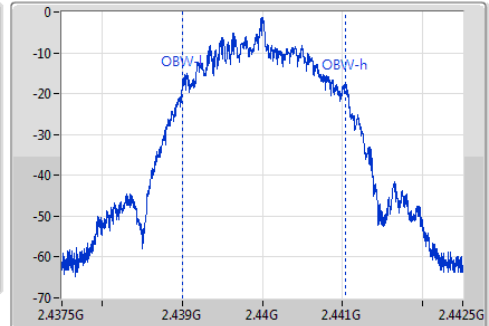
BT-LE(2Mbps)
EBW
2440MHz

13/03/2019

CF
2.44GHz
Span
5MHz
RBW
100kHz
VBW
300kHz
Sweep Time
100ms
Detector Type
Peak
Port 1



CF
2.44GHz
Span
5MHz
RBW
30kHz
VBW
100kHz
Sweep Time
100ms
Detector Type
Sample
Port 1

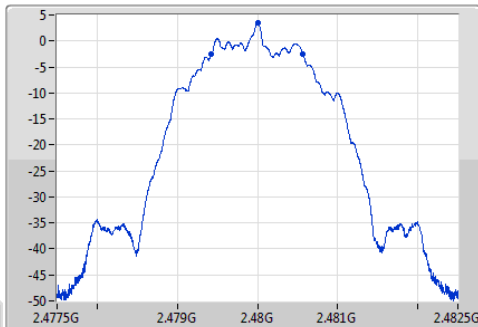


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.145M	2.43943G	2.440575G	2.031M	2.439003G	2.441034G	500k	1

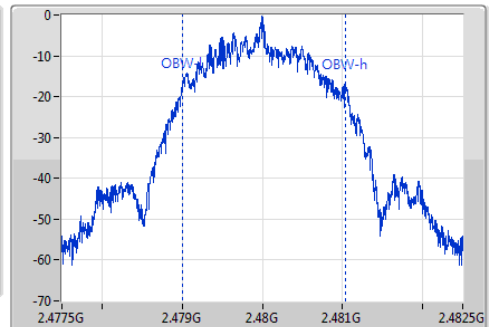
BT-LE(2Mbps)
EBW
2480MHz

13/03/2019

CF
2.48GHz
Span
5MHz
RBW
100kHz
VBW
300kHz
Sweep Time
100ms
Detector Type
Peak
Port 1



CF
2.48GHz
Span
5MHz
RBW
30kHz
VBW
100kHz
Sweep Time
100ms
Detector Type
Sample
Port 1



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.143M	2.479428G	2.48057G	2.036M	2.478998G	2.481034G	500k	1

Summary

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	2.70	0.00186
BT-LE(2Mbps)	2.27	0.00169

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	1.44	2.70	30.00
2440MHz_TnomVnom	Pass	1.44	1.89	30.00
2480MHz_TnomVnom	Pass	1.44	2.69	30.00
BT-LE(2Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	1.44	2.27	30.00
2440MHz_TnomVnom	Pass	1.44	1.38	30.00
2480MHz_TnomVnom	Pass	1.44	2.17	30.00

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-12.41
BT-LE(2Mbps)	-14.77

RBW=3kHz.

Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	1.44	-12.49	8.00
2440MHz_TnomVnom	Pass	1.44	-12.41	8.00
2480MHz_TnomVnom	Pass	1.44	-12.47	8.00
BT-LE(2Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	1.44	-14.96	8.00
2440MHz_TnomVnom	Pass	1.44	-15.55	8.00
2480MHz_TnomVnom	Pass	1.44	-14.77	8.00

RBW=3kHz.

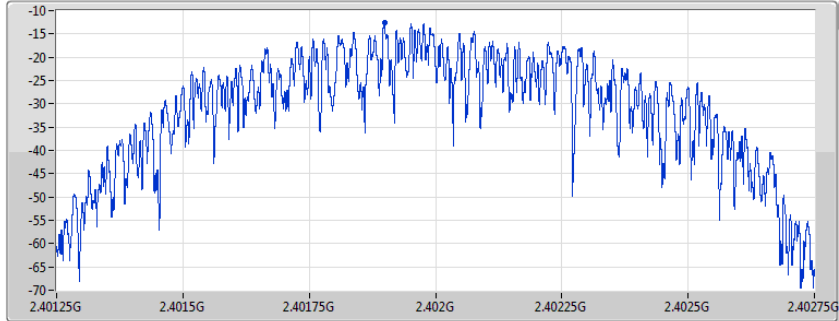
BT-LE(1Mbps)

PSD

2402MHz

13/03/2019

CF
2.402GHz
Span
1.5MHz
RBW
3kHz
VBW
10kHz
Sweep Time
32.1ms
Detector Type
Peak



Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.49	-12.49	-12.49

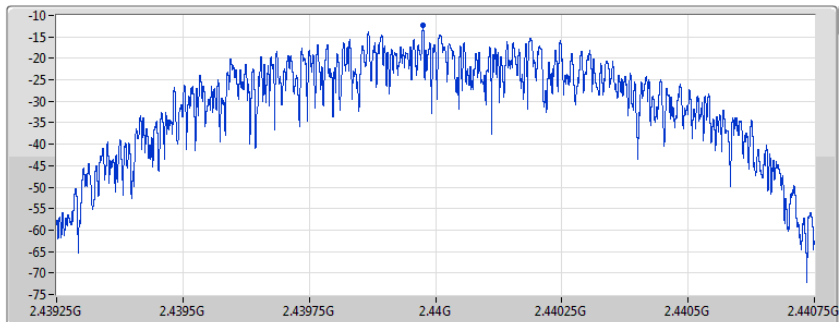
BT-LE(1Mbps)

PSD

2440MHz

13/03/2019

CF
2.44GHz
Span
1.5MHz
RBW
3kHz
VBW
10kHz
Sweep Time
32.1ms
Detector Type
Peak



Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.41	-12.41	-12.41

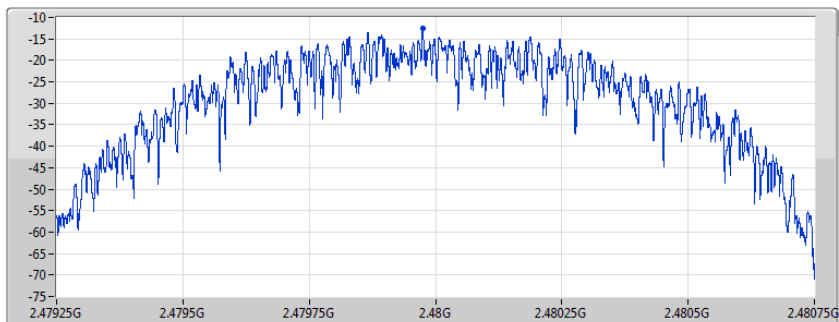
BT-LE(1Mbps)

PSD

2480MHz

13/03/2019

CF
2.48GHz
Span
1.5MHz
RBW
3kHz
VBW
10kHz
Sweep Time
32.1ms
Detector Type
Peak



Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.47	-12.47	-12.47

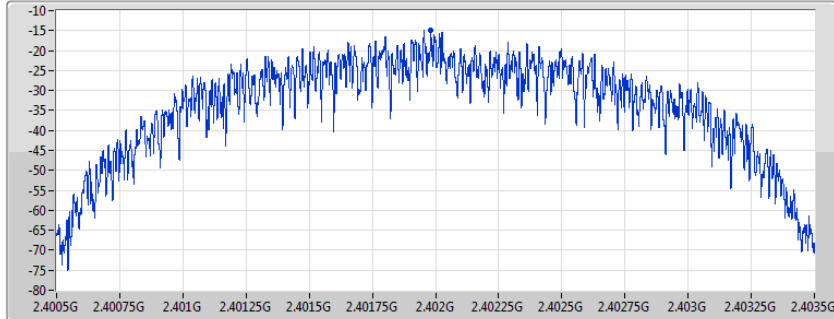
BT-LE(2Mbps)

PSD

2402MHz

13/03/2019

CF
2.402GHz
Span
3MHz
RBW
3kHz
VBW
10kHz
Sweep Time
33.4ms
Detector Type
Peak



Port 1

Sum (dBm/Hz)	PD (dBm/Hz)	Port 1 (dBm/Hz)
-14.96	-14.96	-14.96

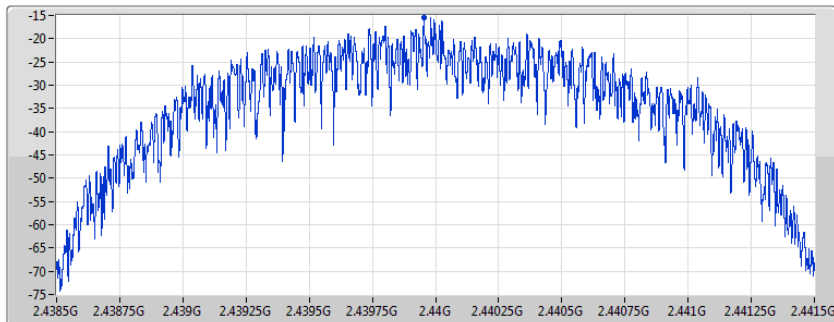
BT-LE(2Mbps)

PSD

2440MHz

13/03/2019

CF
2.44GHz
Span
3MHz
RBW
3kHz
VBW
10kHz
Sweep Time
33.4ms
Detector Type
Peak



Port 1

Sum (dBm/Hz)	PD (dBm/Hz)	Port 1 (dBm/Hz)
-15.55	-15.55	-15.55

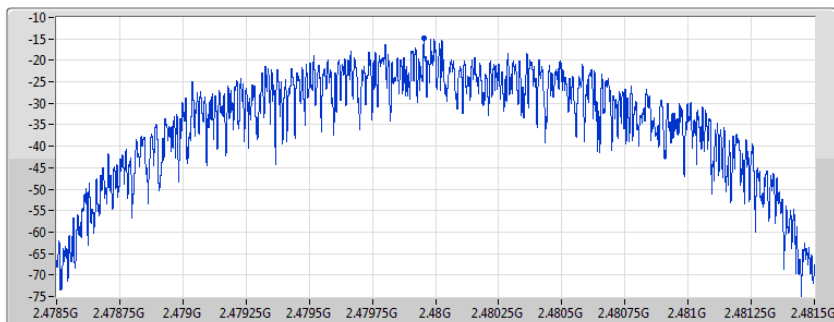
BT-LE(2Mbps)

PSD

2480MHz

13/03/2019

CF
2.48GHz
Span
3MHz
RBW
3kHz
VBW
10kHz
Sweep Time
33.4ms
Detector Type
Peak



Port 1

Sum (dBm/Hz)	PD (dBm/Hz)	Port 1 (dBm/Hz)
-14.77	-14.77	-14.77

Summary

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.40221G	2.43	-27.57	2.02918G	-54.88	2.4G	-50.76	2.48495G	-53.61	23.59847G	-39.81	1
BT-LE(2Mbps)	Pass	2.40192G	1.19	-28.81	936.47M	-54.76	2.4G	-35.83	2.48636G	-53.03	23.51699G	-40.84	1

Result

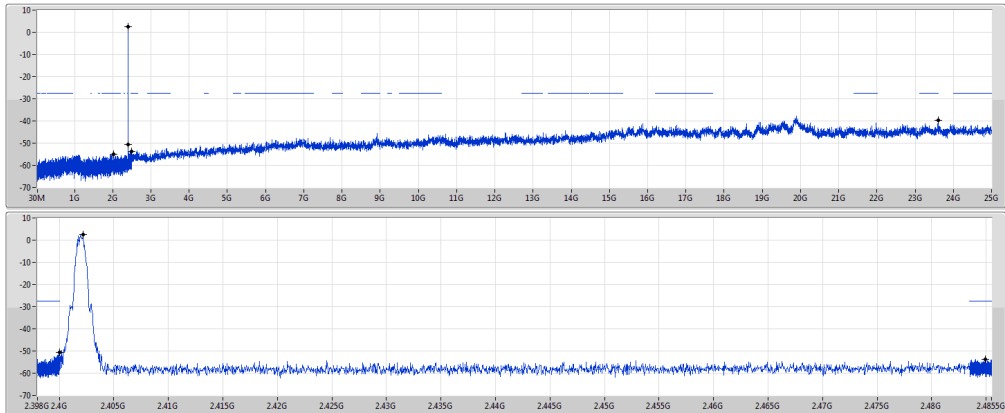
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.40221G	2.43	-27.57	2.02918G	-54.88	2.4G	-50.76	2.48495G	-53.61	23.59847G	-39.81	1
2440MHz_TnomVnom	Pass	2.40221G	2.43	-27.57	2.00254G	-54.83	2.39804G	-53.69	2.48522G	-52.44	24.9212G	-40.41	1
2480MHz_TnomVnom	Pass	2.40221G	2.43	-27.57	1.98301G	-54.45	2.39874G	-54.06	2.48453G	-52.88	23.34237G	-41.33	1
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.40192G	1.19	-28.81	936.47M	-54.76	2.4G	-35.83	2.48636G	-53.03	23.51699G	-40.84	1
2440MHz_TnomVnom	Pass	2.40192G	1.19	-28.81	1.82461G	-54.62	2.3981G	-53.10	2.48582G	-52.38	24.94653G	-40.99	1
2480MHz_TnomVnom	Pass	2.40192G	1.19	-28.81	2.13988G	-53.75	2.3985G	-53.74	2.48568G	-53.30	23.28624G	-41.07	1

BT-LE(1Mbps)

2402MHz

CSE NdB

13/03/2019

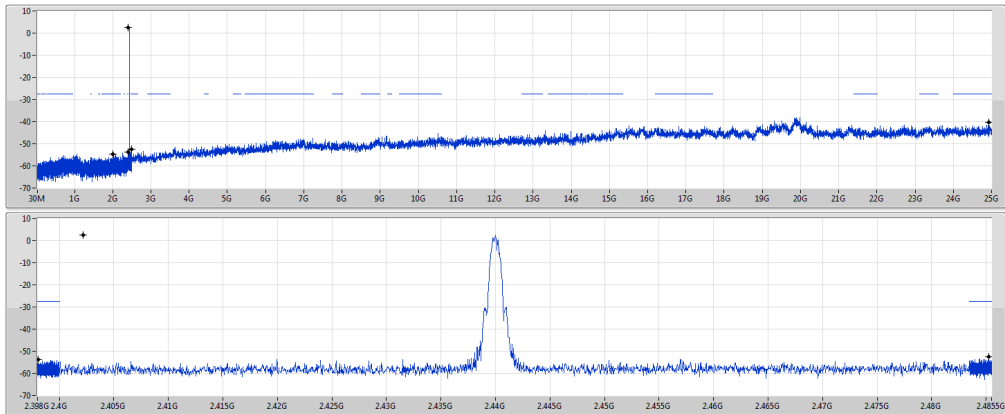


BT-LE(1Mbps)

2440MHz

CSE NdB

13/03/2019

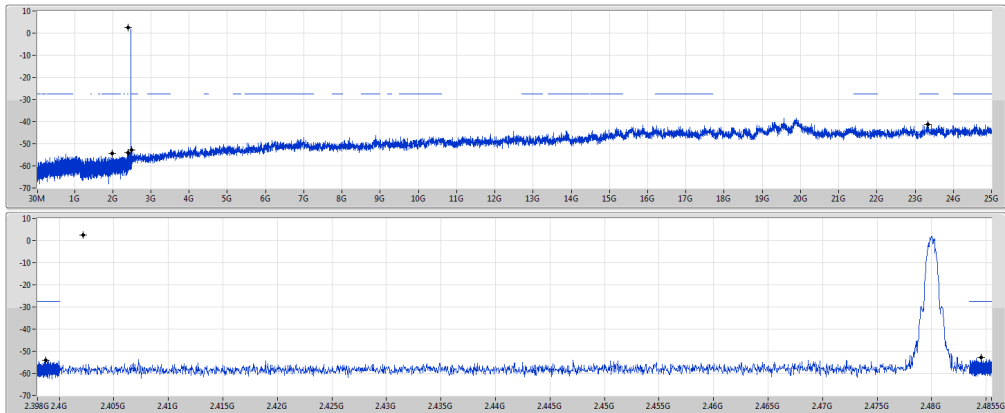


BT-LE(1Mbps)

2480MHz

CSE NdB

13/03/2019



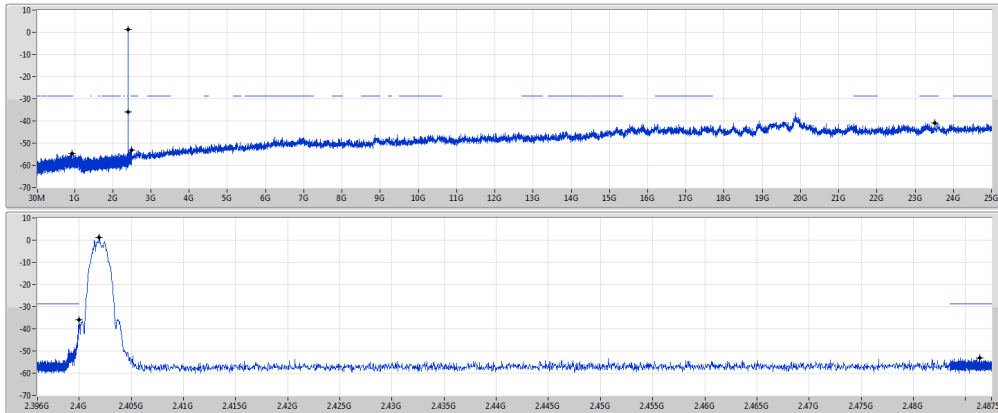
BT-LE(2Mbps)

2402MHz

CSE NdB

13/03/2019

Port 1



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
240192G	1.19	-28.81	936.47M	-54.76	2.4G	-35.83	2.48636G	-53.03	23.51699G	-40.84	1

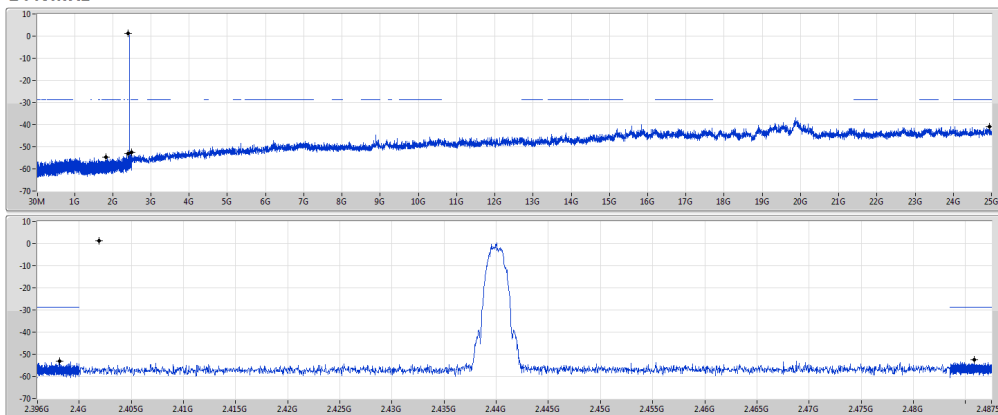
BT-LE(2Mbps)

2440MHz

CSE NdB

13/03/2019

Port 1



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
240192G	1.19	-28.81	1.82461G	-54.62	2.3981G	-53.10	2.48582G	-52.38	24.9453G	-40.99	1

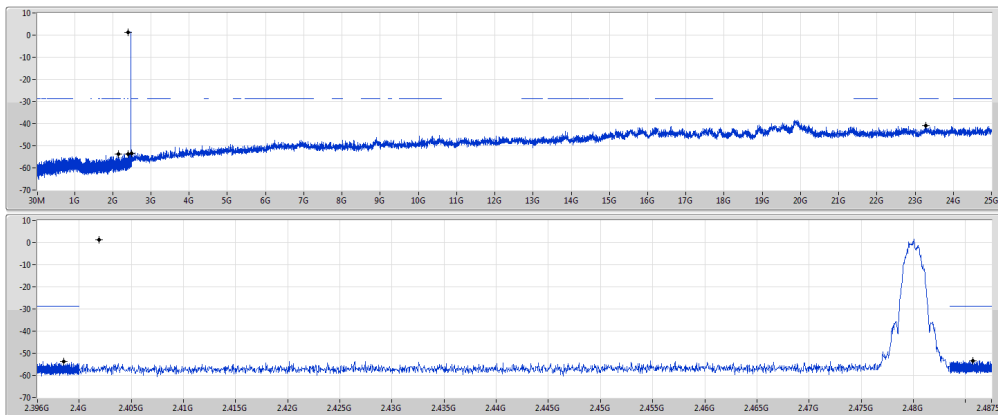
BT-LE(2Mbps)

2480MHz

CSE NdB

13/03/2019

Port 1



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
240192G	1.19	-28.81	2.13988G	-53.75	2.3985G	-53.74	2.48566G	-53.30	23.28624G	-41.07	1

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(2Mbps)	Pass	PK	856.44M	34.07	46.00	-11.93	1.92	3	Horizontal	360	1.00	-

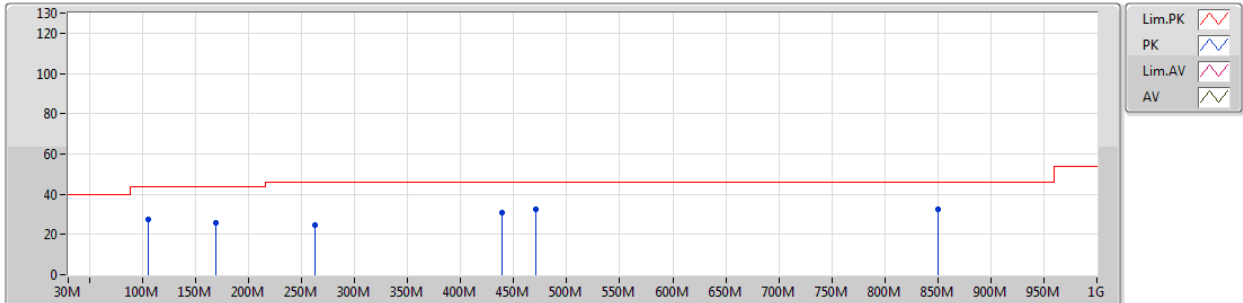
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	105.66M	27.31	43.50	-16.19	-9.66	3	Vertical	0	2.00	-
2440MHz	Pass	PK	169.68M	25.98	43.50	-17.52	-10.75	3	Vertical	0	2.00	-
2440MHz	Pass	PK	262.8M	24.65	46.00	-21.35	-5.85	3	Vertical	0	2.00	-
2440MHz	Pass	PK	439.34M	30.99	46.00	-15.01	-3.03	3	Vertical	0	2.00	-
2440MHz	Pass	PK	470.38M	32.34	46.00	-13.66	-2.55	3	Vertical	0	2.00	-
2440MHz	Pass	PK	850.62M	32.72	46.00	-13.28	1.84	3	Vertical	0	2.00	-
2440MHz	Pass	PK	138.64M	29.34	43.50	-14.16	-9.58	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	191.02M	25.77	43.50	-17.73	-11.05	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	256.98M	25.30	46.00	-20.70	-6.13	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	509.18M	29.83	46.00	-16.17	-2.37	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	643.04M	31.24	46.00	-14.76	-0.35	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	856.44M	34.07	46.00	-11.93	1.92	3	Horizontal	360	1.00	-

BT-LE(2Mbps)

2440MHz_Adapter

14/03/2019

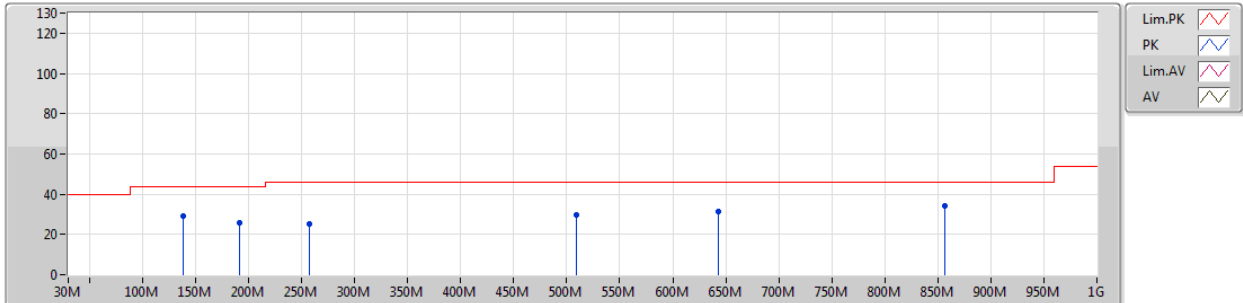


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	105.66M	27.31	43.50	-16.19	-9.66	3	Vertical	0	2.00	-
PK	169.68M	25.98	43.50	-17.52	-10.75	3	Vertical	0	2.00	-
PK	262.8M	24.65	46.00	-21.35	-5.85	3	Vertical	0	2.00	-
PK	439.34M	30.99	46.00	-15.01	-3.03	3	Vertical	0	2.00	-
PK	470.38M	32.34	46.00	-13.66	-2.55	3	Vertical	0	2.00	-
PK	850.62M	32.72	46.00	-13.28	1.84	3	Vertical	0	2.00	-

BT-LE(2Mbps)

2440MHz_Adapter

14/03/2019



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	138.64M	29.34	43.50	-14.16	-9.58	3	Horizontal	360	1.00	-
PK	191.02M	25.77	43.50	-17.73	-11.05	3	Horizontal	360	1.00	-
PK	256.98M	25.30	46.00	-20.70	-6.13	3	Horizontal	360	1.00	-
PK	509.18M	29.83	46.00	-16.17	-2.37	3	Horizontal	360	1.00	-
PK	643.04M	31.24	46.00	-14.76	-0.35	3	Horizontal	360	1.00	-
PK	856.44M	34.07	46.00	-11.93	1.92	3	Horizontal	360	1.00	-

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	2.4835G	47.40	54.00	-6.60	32.29	3	Vertical	170	1.01	-
BT-LE(2Mbps)	Pass	AV	2.4835G	48.31	54.00	-5.69	32.29	3	Vertical	169	1.00	-

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.3704G	45.25	54.00	-8.75	31.94	3	Vertical	170	1.49	-
2402MHz	Pass	AV	2.402G	93.29	Inf	-Inf	32.04	3	Vertical	170	1.49	-
2402MHz	Pass	PK	2.3842G	56.87	74.00	-17.13	31.98	3	Vertical	170	1.49	-
2402MHz	Pass	PK	2.4022G	94.63	Inf	-Inf	32.05	3	Vertical	170	1.49	-
2402MHz	Pass	AV	4.80381G	31.84	54.00	-22.16	3.44	3	Vertical	27	1.50	-
2402MHz	Pass	PK	4.80535G	45.09	74.00	-28.91	3.44	3	Vertical	27	1.50	-
2402MHz	Pass	AV	4.80564G	32.17	54.00	-21.83	3.44	3	Horizontal	308	1.50	-
2402MHz	Pass	PK	4.8019G	44.24	74.00	-29.76	3.43	3	Horizontal	308	1.50	-
2440MHz	Pass	AV	2.3632G	45.30	54.00	-8.70	31.91	3	Vertical	12	2.79	-
2440MHz	Pass	AV	2.44G	93.17	Inf	-Inf	32.16	3	Vertical	12	2.79	-
2440MHz	Pass	AV	2.4892G	45.54	54.00	-8.46	32.30	3	Vertical	12	2.79	-
2440MHz	Pass	PK	2.3676G	56.12	74.00	-17.88	31.93	3	Vertical	12	2.79	-
2440MHz	Pass	PK	2.4396G	94.51	Inf	-Inf	32.16	3	Vertical	12	2.79	-
2440MHz	Pass	PK	2.5G	55.89	74.00	-18.11	32.34	3	Vertical	12	2.79	-
2440MHz	Pass	AV	4.87946G	32.18	54.00	-21.82	3.62	3	Vertical	110	1.50	-
2440MHz	Pass	PK	4.88027G	45.12	74.00	-28.88	3.62	3	Vertical	110	1.50	-
2440MHz	Pass	AV	4.87823G	32.29	54.00	-21.71	3.62	3	Horizontal	359	1.50	-
2440MHz	Pass	PK	4.8785G	44.73	74.00	-29.27	3.62	3	Horizontal	359	1.50	-
2480MHz	Pass	AV	2.48G	94.19	Inf	-Inf	32.28	3	Vertical	170	1.01	-
2480MHz	Pass	AV	2.4835G	47.40	54.00	-6.60	32.29	3	Vertical	170	1.01	-
2480MHz	Pass	PK	2.4798G	95.53	Inf	-Inf	32.28	3	Vertical	170	1.01	-
2480MHz	Pass	PK	2.4836G	56.78	74.00	-17.22	32.29	3	Vertical	170	1.01	-
2480MHz	Pass	AV	4.95942G	32.40	54.00	-21.60	3.83	3	Vertical	310	1.50	-
2480MHz	Pass	PK	4.95971G	44.75	74.00	-29.25	3.83	3	Vertical	310	1.50	-
2480MHz	Pass	AV	4.95791G	32.50	54.00	-21.50	3.82	3	Horizontal	86	1.01	-
2480MHz	Pass	PK	4.96217G	44.92	74.00	-29.08	3.83	3	Horizontal	86	1.01	-
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.3638G	46.15	54.00	-7.85	31.91	3	Vertical	168	1.00	-
2402MHz	Pass	AV	2.402G	91.67	Inf	-Inf	32.04	3	Vertical	168	1.00	-
2402MHz	Pass	PK	2.3714G	56.44	74.00	-17.56	31.94	3	Vertical	168	1.00	-
2402MHz	Pass	PK	2.402G	94.53	Inf	-Inf	32.04	3	Vertical	168	1.00	-
2402MHz	Pass	AV	4.80598G	33.74	54.00	-20.26	3.44	3	Vertical	18	2.09	-
2402MHz	Pass	PK	4.79374G	44.57	74.00	-29.43	3.41	3	Vertical	18	2.09	-
2402MHz	Pass	AV	4.79914G	33.55	54.00	-20.45	3.43	3	Horizontal	186	2.13	-
2402MHz	Pass	PK	4.79338G	44.96	74.00	-29.04	3.41	3	Horizontal	186	2.13	-
2440MHz	Pass	AV	2.3608G	46.52	54.00	-7.48	31.91	3	Vertical	167	1.01	-
2440MHz	Pass	AV	2.44G	90.15	Inf	-Inf	32.16	3	Vertical	167	1.01	-
2440MHz	Pass	AV	2.492G	46.33	54.00	-7.67	32.32	3	Vertical	167	1.01	-
2440MHz	Pass	PK	2.3744G	56.06	74.00	-17.94	31.95	3	Vertical	167	1.01	-
2440MHz	Pass	PK	2.4396G	93.13	Inf	-Inf	32.16	3	Vertical	167	1.01	-
2440MHz	Pass	PK	2.4924G	56.18	74.00	-17.82	32.32	3	Vertical	167	1.01	-
2440MHz	Pass	AV	4.86602G	34.21	54.00	-19.79	3.60	3	Vertical	173	1.07	-
2440MHz	Pass	PK	4.87784G	44.70	74.00	-29.30	3.62	3	Vertical	173	1.07	-
2440MHz	Pass	AV	4.87184G	33.72	54.00	-20.28	3.61	3	Horizontal	75	1.45	-
2440MHz	Pass	PK	4.88012G	45.19	74.00	-28.81	3.62	3	Horizontal	75	1.45	-
2480MHz	Pass	AV	2.48G	92.65	Inf	-Inf	32.28	3	Vertical	169	1.00	-
2480MHz	Pass	AV	2.4835G	48.31	54.00	-5.69	32.29	3	Vertical	169	1.00	-



RSE TX above 1GHz Result

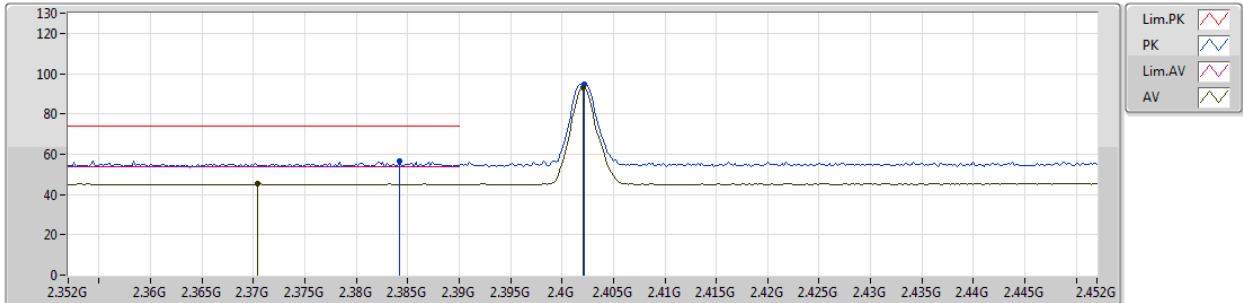
Appendix F.2

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2480MHz	Pass	PK	2.4796G	95.57	Inf	-Inf	32.28	3	Vertical	169	1.00	-
2480MHz	Pass	PK	2.4836G	57.34	74.00	-16.66	32.29	3	Vertical	169	1.00	-
2480MHz	Pass	AV	4.96954G	33.96	54.00	-20.04	3.86	3	Vertical	91	1.82	-
2480MHz	Pass	PK	4.96906G	45.57	74.00	-28.43	3.85	3	Vertical	91	1.82	-
2480MHz	Pass	AV	4.9747G	34.31	54.00	-19.69	3.86	3	Horizontal	158	2.31	-
2480MHz	Pass	PK	4.951G	45.14	74.00	-28.86	3.81	3	Horizontal	158	2.31	-

BT-LE(1Mbps)

2402MHz_TX

14/03/2019

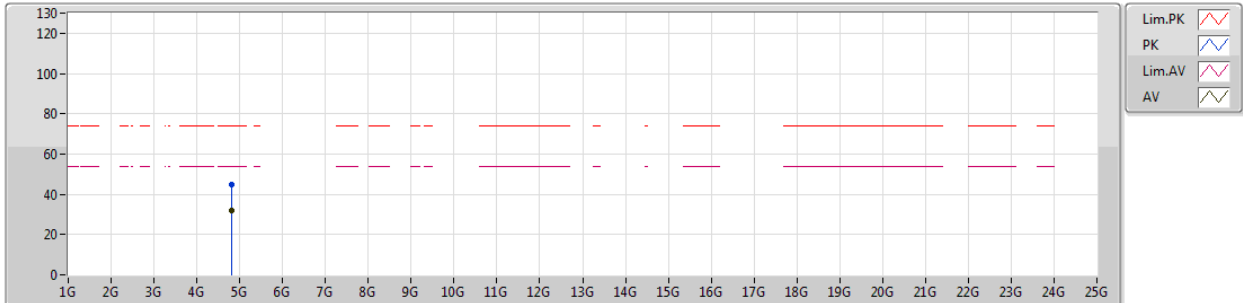


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3704G	45.25	54.00	-8.75	31.94	3	Vertical	170	1.49	-
AV	2.402G	93.29	Inf	-Inf	32.04	3	Vertical	170	1.49	-
PK	2.3842G	56.87	74.00	-17.13	31.98	3	Vertical	170	1.49	-
PK	2.4022G	94.63	Inf	-Inf	32.05	3	Vertical	170	1.49	-

BT-LE(1Mbps)

2402MHz_TX

14/03/2019

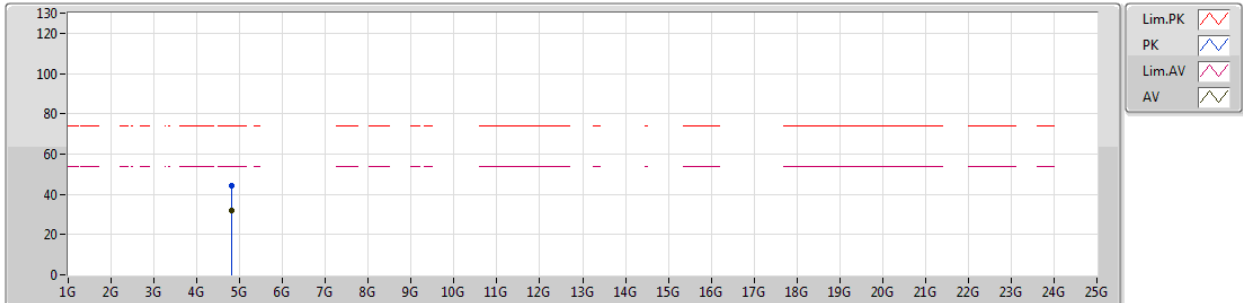


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments								
AV	4.80381G	31.84	54.00	-22.16	3.44	3	Vertical	27	1.50	-								
PK	4.80535G	45.09	74.00	-28.91	3.44	3	Vertical	27	1.50	-								

BT-LE(1Mbps)

2402MHz_TX

14/03/2019

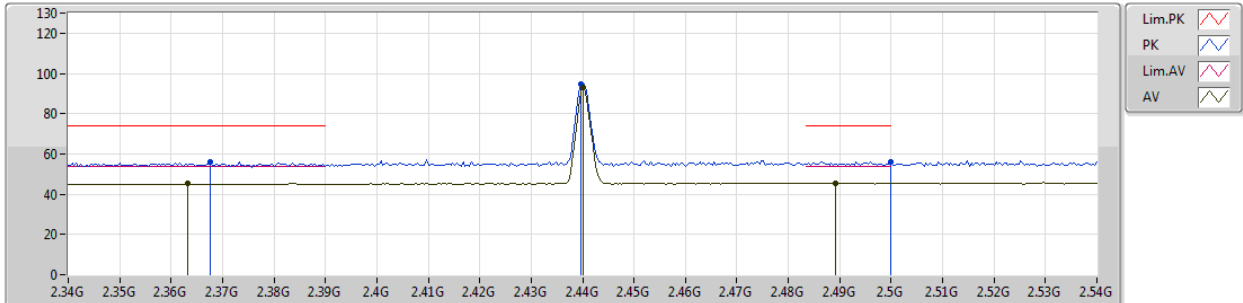


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments							
AV	4.80564G	32.17	54.00	-21.83	3.44	3	Horizontal	308	1.50	-							
PK	4.8019G	44.24	74.00	-29.76	3.43	3	Horizontal	308	1.50	-							

BT-LE(1Mbps)

2440MHz_TX

14/03/2019

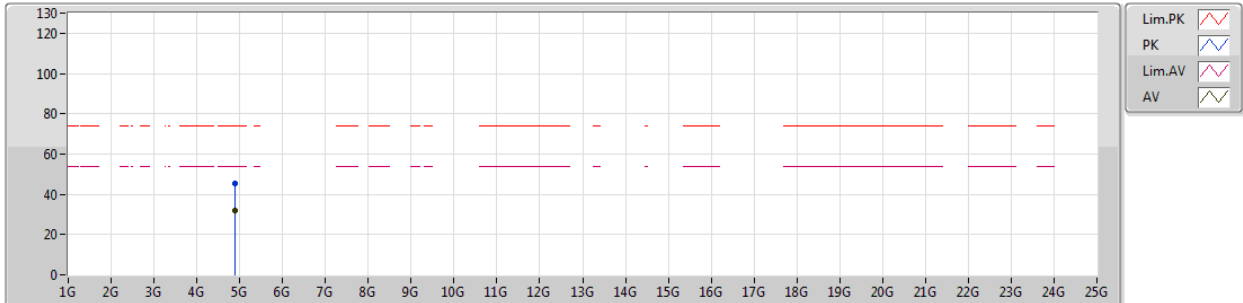


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3632G	45.30	54.00	-8.70	31.91	3	Vertical	12	2.79	-
AV	2.44G	93.17	Inf	-Inf	32.16	3	Vertical	12	2.79	-
AV	2.4892G	45.54	54.00	-8.46	32.30	3	Vertical	12	2.79	-
PK	2.3676G	56.12	74.00	-17.88	31.93	3	Vertical	12	2.79	-
PK	2.4396G	94.51	Inf	-Inf	32.16	3	Vertical	12	2.79	-
PK	2.5G	55.89	74.00	-18.11	32.34	3	Vertical	12	2.79	-

BT-LE(1Mbps)

2440MHz_TX

14/03/2019

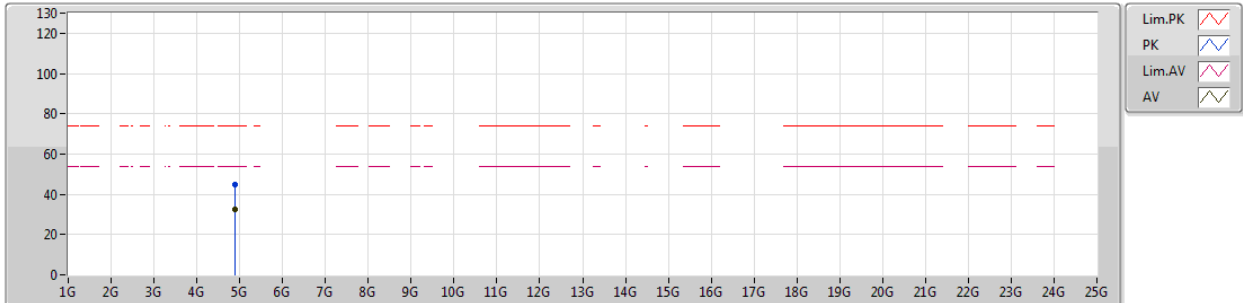


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments								
AV	4.87946G	32.18	54.00	-21.82	3.62	3	Vertical	110	1.50	-								
PK	4.88027G	45.12	74.00	-28.88	3.62	3	Vertical	110	1.50	-								

BT-LE(1Mbps)

2440MHz_TX

14/03/2019

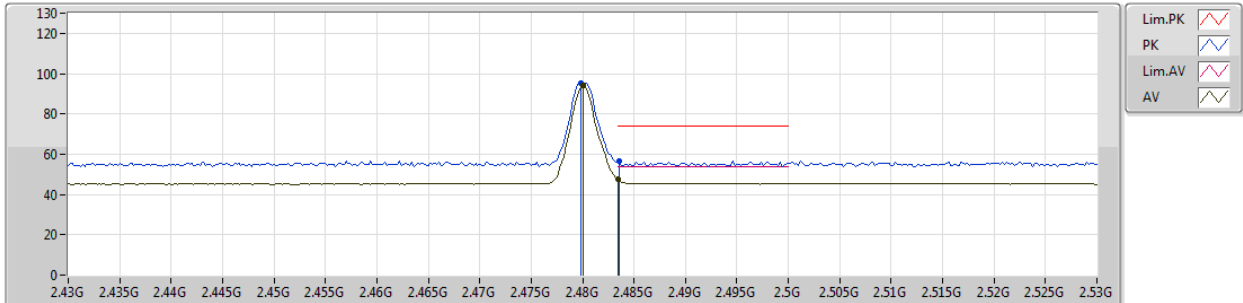


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.87823G	32.29	54.00	-21.71	3.62	3	Horizontal	359	1.50	-
PK	4.8785G	44.73	74.00	-29.27	3.62	3	Horizontal	359	1.50	-

BT-LE(1Mbps)

2480MHz_TX

14/03/2019

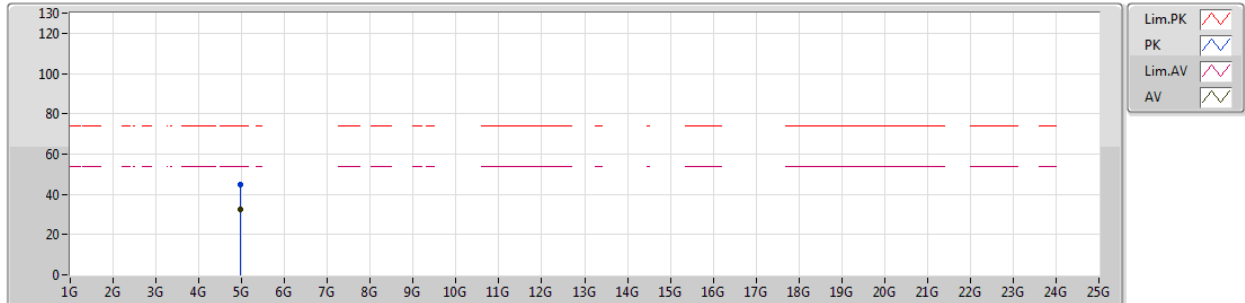


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.48G	94.19	Inf	-Inf	32.28	3	Vertical	170	1.01	-
AV	2.4835G	47.40	54.00	-6.60	32.29	3	Vertical	170	1.01	-
PK	2.4798G	95.53	Inf	-Inf	32.28	3	Vertical	170	1.01	-
PK	2.4836G	56.78	74.00	-17.22	32.29	3	Vertical	170	1.01	-

BT-LE(1Mbps)

2480MHz_TX

14/03/2019

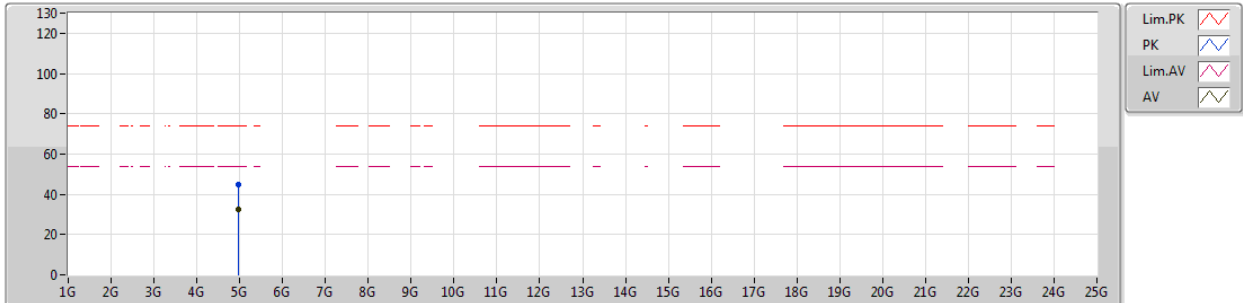


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.95942G	32.40	54.00	-21.60	3.83	3	Vertical	310	1.50	-
PK	4.95971G	44.75	74.00	-29.25	3.83	3	Vertical	310	1.50	-

BT-LE(1Mbps)

2480MHz_TX

14/03/2019

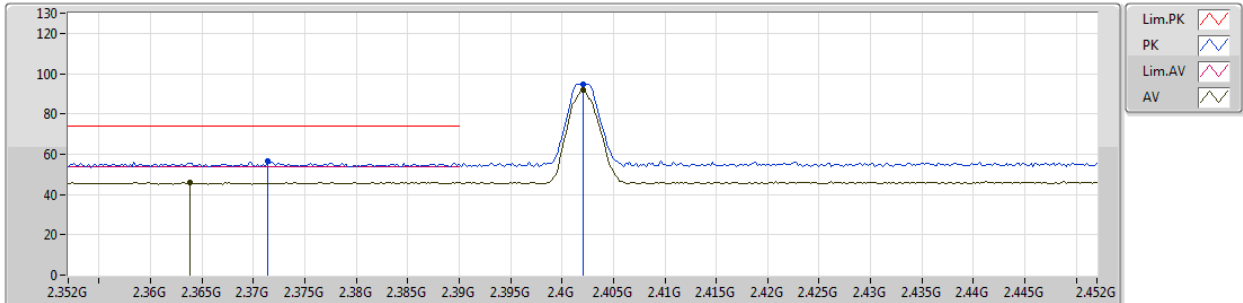


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.95791G	32.50	54.00	-21.50	3.82	3	Horizontal	86	1.01	-
PK	4.96217G	44.92	74.00	-29.08	3.83	3	Horizontal	86	1.01	-

BT-LE(2Mbps)

2402MHz_TX

14/03/2019

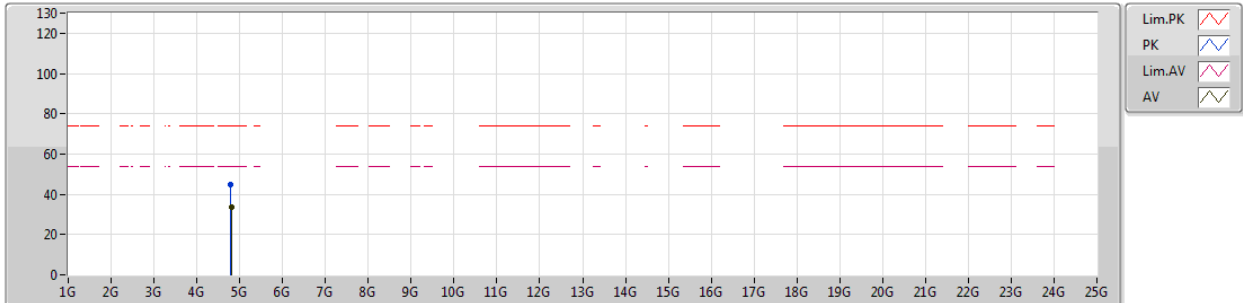


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments							
AV	2.3638G	46.15	54.00	-7.85	31.91	3	Vertical	168	1.00	-							
AV	2.402G	91.67	Inf	-Inf	32.04	3	Vertical	168	1.00	-							
PK	2.3714G	56.44	74.00	-17.56	31.94	3	Vertical	168	1.00	-							
PK	2.402G	94.53	Inf	-Inf	32.04	3	Vertical	168	1.00	-							

BT-LE(2Mbps)

2402MHz_TX

14/03/2019

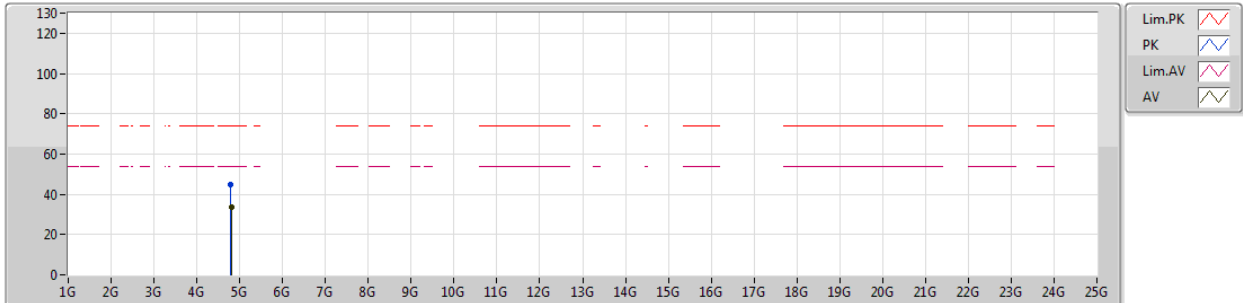


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.80598G	33.74	54.00	-20.26	3.44	3	Vertical	18	2.09	-
PK	4.79374G	44.57	74.00	-29.43	3.41	3	Vertical	18	2.09	-

BT-LE(2Mbps)

2402MHz_TX

14/03/2019

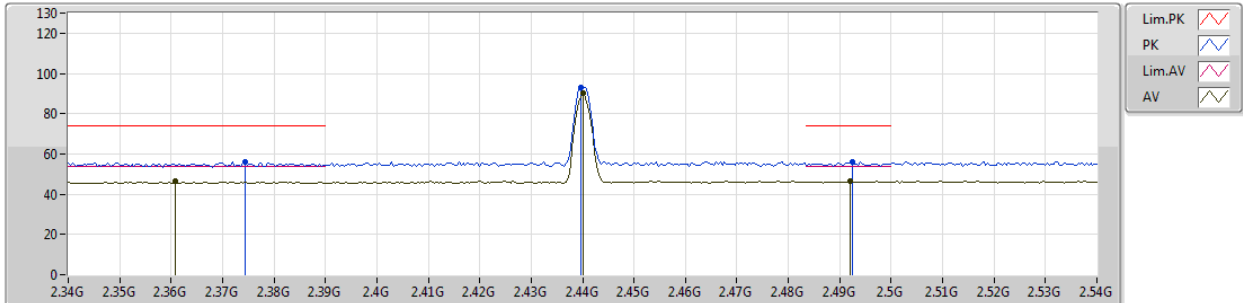


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.79914G	33.55	54.00	-20.45	3.43	3	Horizontal	186	2.13	-
PK	4.79338G	44.96	74.00	-29.04	3.41	3	Horizontal	186	2.13	-

BT-LE(2Mbps)

2440MHz_TX

14/03/2019

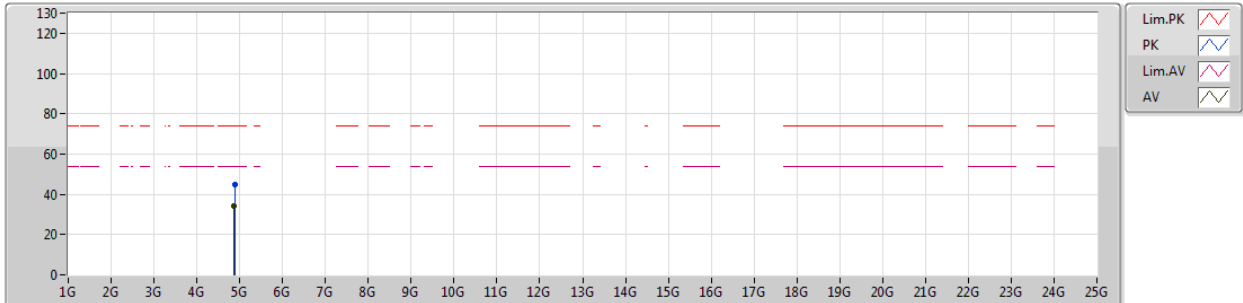


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3608G	46.52	54.00	-7.48	31.91	3	Vertical	167	1.01	-
AV	2.44G	90.15	Inf	-Inf	32.16	3	Vertical	167	1.01	-
AV	2.492G	46.33	54.00	-7.67	32.32	3	Vertical	167	1.01	-
PK	2.3744G	56.06	74.00	-17.94	31.95	3	Vertical	167	1.01	-
PK	2.4396G	93.13	Inf	-Inf	32.16	3	Vertical	167	1.01	-
PK	2.4924G	56.18	74.00	-17.82	32.32	3	Vertical	167	1.01	-

BT-LE(2Mbps)

2440MHz_TX

14/03/2019

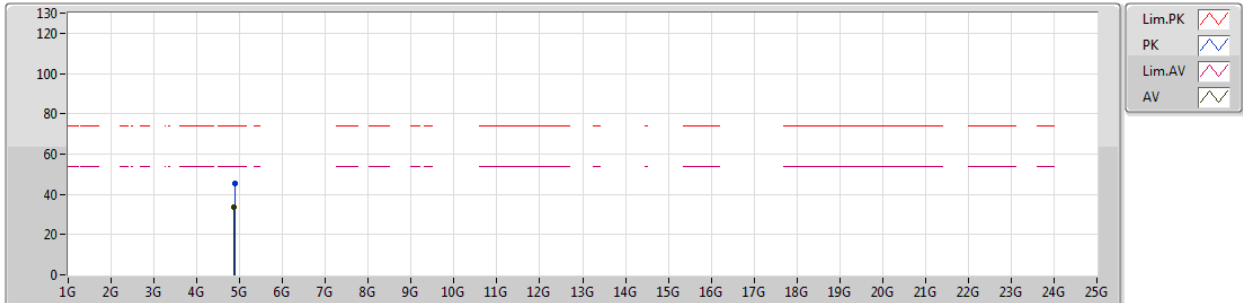


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.86602G	34.21	54.00	-19.79	3.60	3	Vertical	173	1.07	-
PK	4.87784G	44.70	74.00	-29.30	3.62	3	Vertical	173	1.07	-

BT-LE(2Mbps)

2440MHz_TX

14/03/2019

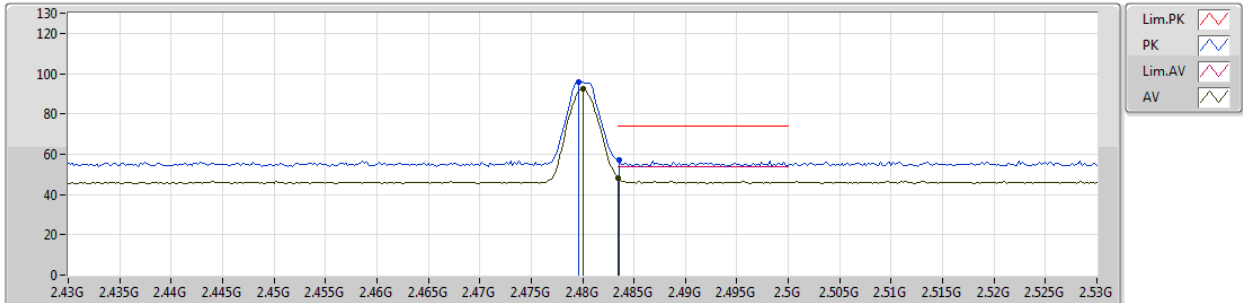


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.87184G	33.72	54.00	-20.28	3.61	3	Horizontal	75	1.45	-
PK	4.88012G	45.19	74.00	-28.81	3.62	3	Horizontal	75	1.45	-

BT-LE(2Mbps)

2480MHz_TX

14/03/2019

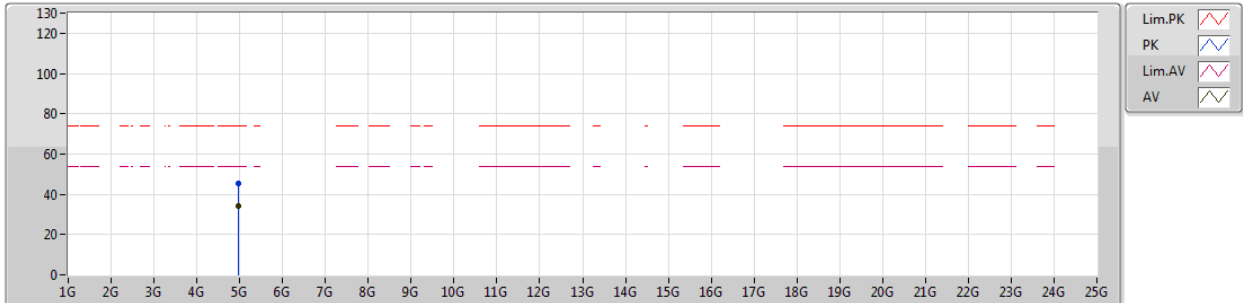


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.48G	92.65	Inf	-Inf	32.28	3	Vertical	169	1.00	-
AV	2.4835G	48.31	54.00	-5.69	32.29	3	Vertical	169	1.00	-
PK	2.4796G	95.57	Inf	-Inf	32.28	3	Vertical	169	1.00	-
PK	2.4836G	57.34	74.00	-16.66	32.29	3	Vertical	169	1.00	-

BT-LE(2Mbps)

2480MHz_TX

14/03/2019

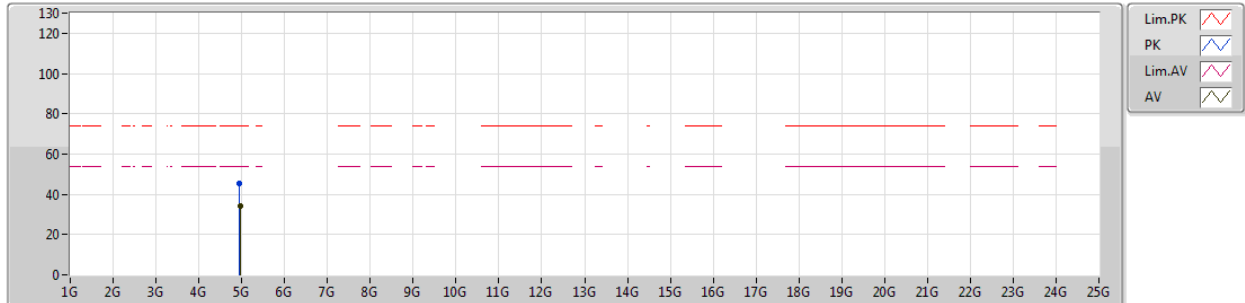


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.96954G	33.96	54.00	-20.04	3.86	3	Vertical	91	1.82	-
PK	4.96906G	45.57	74.00	-28.43	3.85	3	Vertical	91	1.82	-

BT-LE(2Mbps)

2480MHz_TX

14/03/2019



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.9747G	34.31	54.00	-19.69	3.86	3	Horizontal	158	2.31	-
PK	4.951G	45.14	74.00	-28.86	3.81	3	Horizontal	158	2.31	-