

FCC Test Report

FCC ID : SWX-UAPROE
Equipment : UniFi Access
Brand Name : UBIQUITI
Model Name : UA-Pro
Applicant : Ubiquiti Networks, Inc
685 Third Avenue, 27th Floor New York,
New York 10017 USA
Manufacturer : Ubiquiti Networks, Inc
685 Third Avenue, 27th Floor New York,
New York 10017 USA
Standard : 47 CFR FCC Part 15.247

The product was received on Feb. 20, 2019, and testing was started from Feb. 20, 2019 and completed on Mar. 22, 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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PHOTOGRAPHS OF EUT V01



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:>20 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: Ben Tseng

Report Producer: Ann Hou

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

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	-	-	Internal antenna	I-PEX

Ant.	Port	Gain (dBi)
		BT
1	1	0.94

Note 1: The EUT has one antenna.

For BT function:

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

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

1.1.3 EUT Information

Operational Condition	
EUT Power Type	From PoE
EUT Function	<input checked="" type="checkbox"/> Point-to-multipoint <input type="checkbox"/> Point-to-point
Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device)
<input type="checkbox"/>	Combined Equipment - Brand Name / Model No.: ...
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems)
<input type="checkbox"/>	Host System - Brand Name / Model No.: ...
<input type="checkbox"/>	Other:

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) $\geq 1/T$
BT-LE(1Mbps)	0.628	2.02	392.5u	3k

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

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 v05r01

1.3 Testing Location Information

Testing Location		
<input checked="" type="checkbox"/>	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.		
<input checked="" type="checkbox"/>	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	CO01-HY	Joy	23~24°C / 52~53%	22/Mar/2019
RF Conducted	TH06-HY	Gary	23.1~23.9°C / 63~65%	22/Mar/2019
Radiated Below 1G	03CH02-HY	Paul	22.2~22.3°C / 50.7~52.3%	22/Mar/2019
Radiated Above 1G	03CH01-CB	Cola	22~24°C / 50~60%	20/Feb/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%
Conducted Emission	1.3 dB	Confidence levels of 95%
Temperature	0.7 °C	Confidence levels of 95%
Humidity	4 %	Confidence levels of 95%

Test Items	Uncertainty	Remark
Radiated Emissions 1GHz ~ 18GHz	3.7 dB	Confidence levels of 95%
Radiated Emissions 18GHz ~ 40GHz	3.5 dB	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Condition

RF Conducted	Abbreviation	Remark
TnomVnom	Tnom	20°C
-	Vnom	48V


2.2 Test Channel Mode

Test Software Version	QRCT v3.0.297.0
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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	PoE mode

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	PoE mode
Operating Mode > 1GHz	CTX
Orthogonal Planes of EUT	Y Plane 
Worst Planes of EUT	V

2.4 Support Equipment

Support Equipment – AC Conduction				
No.	Equipment	Brand Name	Model Name	FCC ID
1	PoE	UBNT	GP-C500-120G	-

Note: Support equipment No.1 was 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

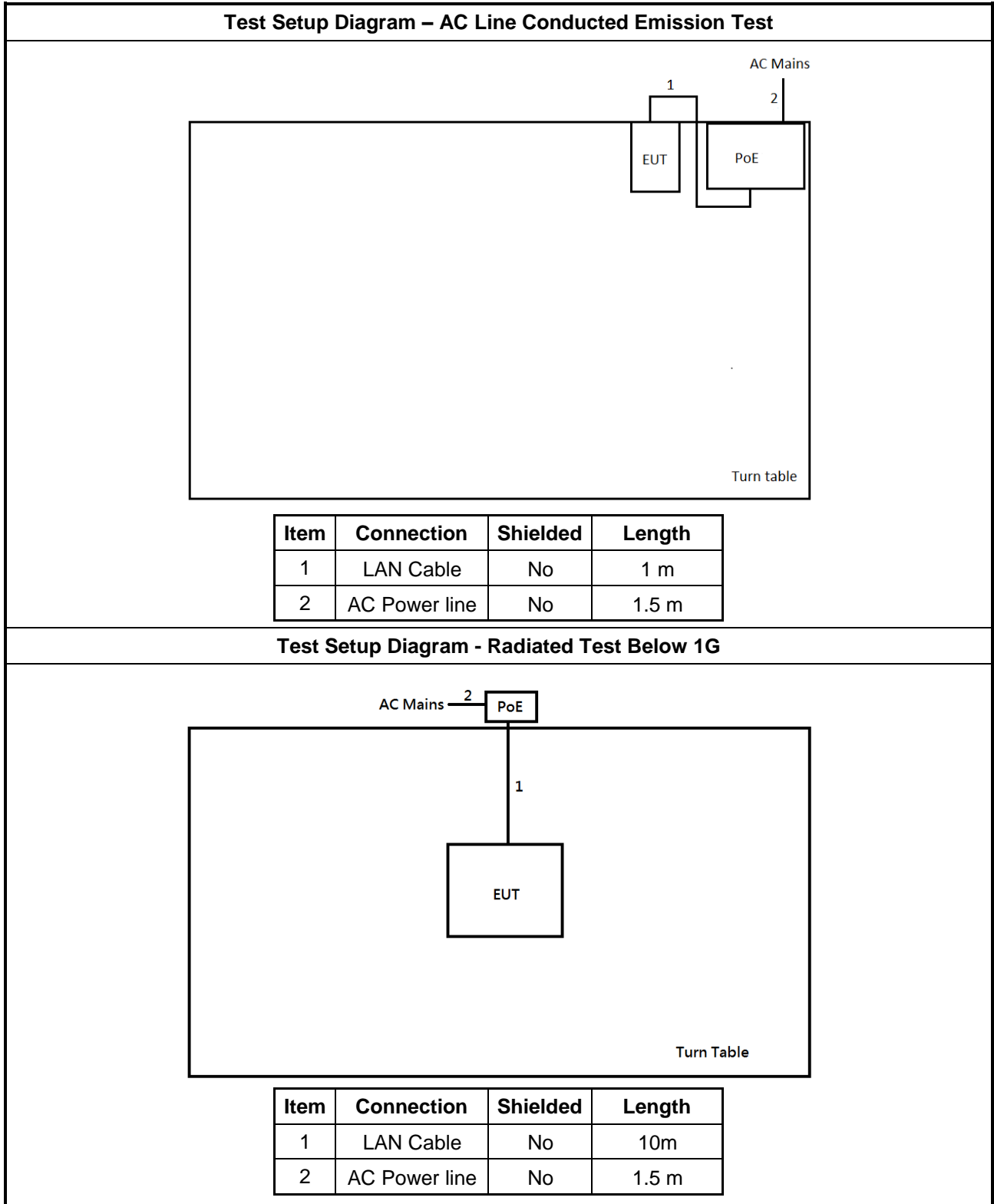
Support Equipment – Radiated Emission below 1G				
No.	Equipment	Brand Name	Model Name	FCC ID
1	PoE (Remote)	UBNT	GP-C500-120G	-

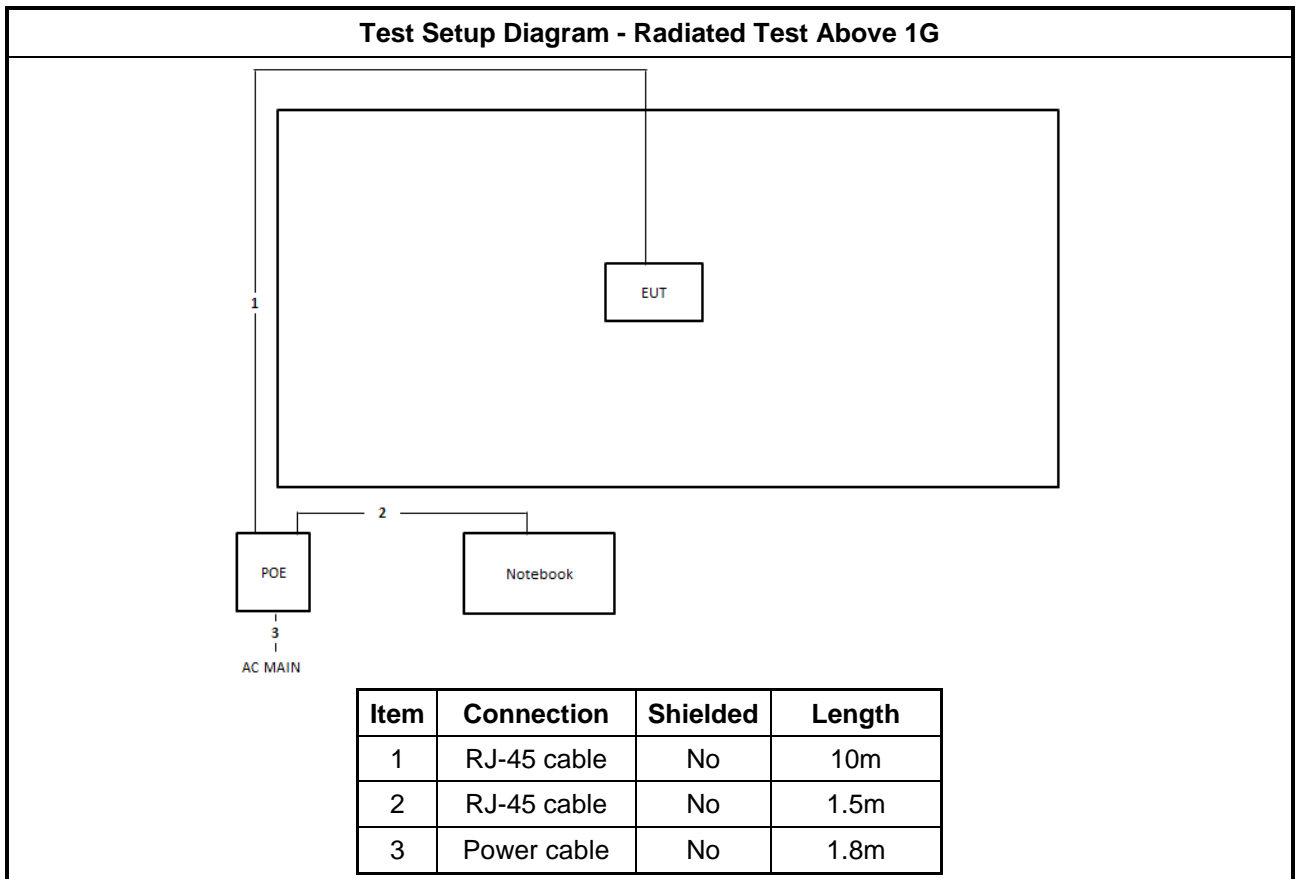
Note: Support equipment No.1 was provided by customer.

Support Equipment – Radiated Emission above 1G				
No.	Equipment	Brand Name	Model Name	FCC ID
1	PoE (Remote)	UBNT	GP-C500-120G	-
2	Notebook (Remote)	DELL	E4300	N/A

Note: Support equipment No.1 was provided by customer.

2.5 Test Setup Diagram





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.

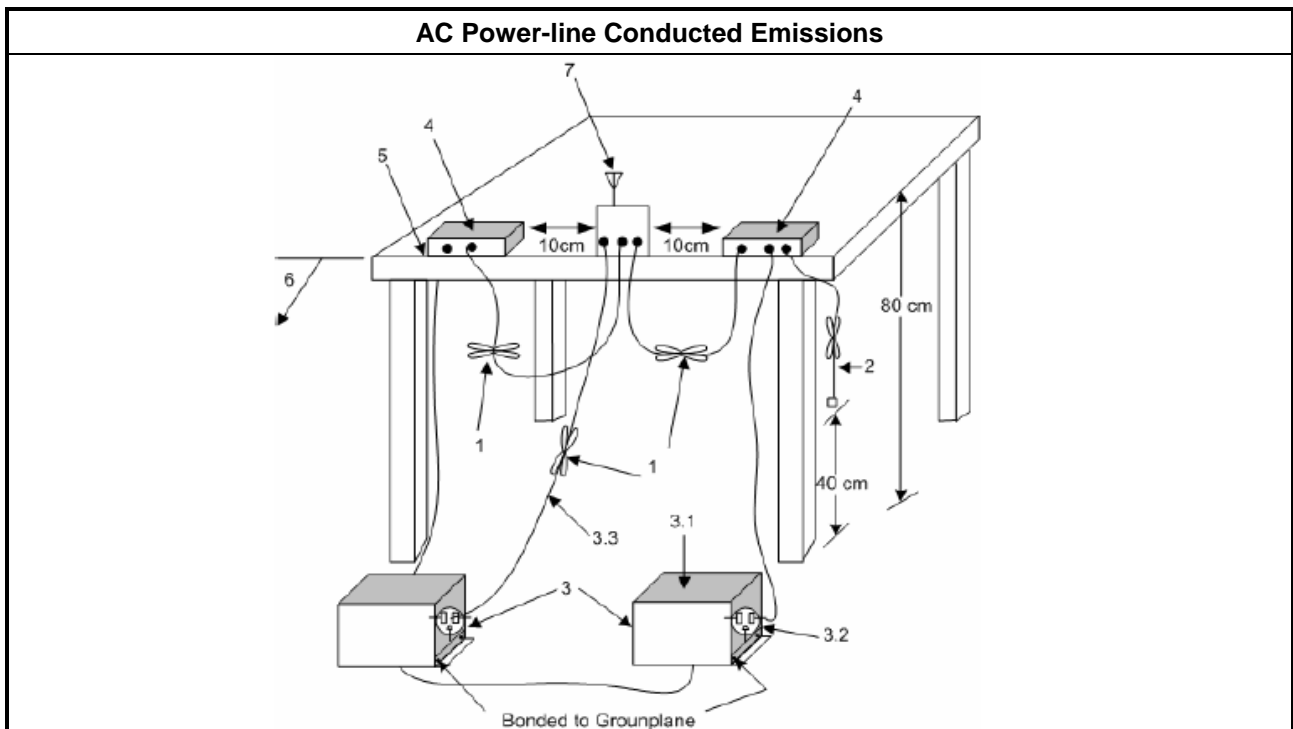
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

Test Method
<ul style="list-style-type: none"> 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:
<ul style="list-style-type: none"> ▪ 6 dB bandwidth \geq 500 kHz.

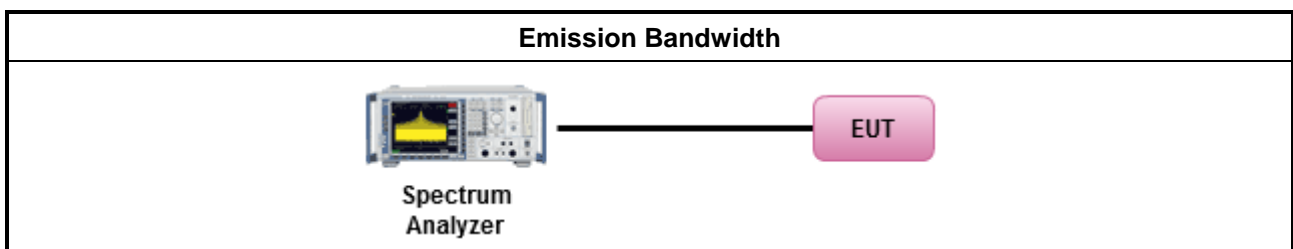
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method
<ul style="list-style-type: none"> ▪ For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/> Refer as KDB 558074, clause 8.2 (11.8 of ANSI C63.10) DTS bandwidth measurement.
<input type="checkbox"/> Refer as RSS-Gen, clause 6.7 for for occupied bandwidth testing.
<input type="checkbox"/> 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	
	<ul style="list-style-type: none"> ▪ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
	<ul style="list-style-type: none"> ▪ Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
	<ul style="list-style-type: none"> ▪ Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	<ul style="list-style-type: none"> ▪ Smart antenna system (SAS):
	<ul style="list-style-type: none"> - Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	<ul style="list-style-type: none"> - Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm
	<ul style="list-style-type: none"> - 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:	
	<ul style="list-style-type: none"> ▪ 2400-2483.5 MHz Band
	<ul style="list-style-type: none"> ▪ Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
	<ul style="list-style-type: none"> ▪ Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm
	<ul style="list-style-type: none"> ▪ Smart antenna system (SAS)
	<ul style="list-style-type: none"> - Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	<ul style="list-style-type: none"> - Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	<ul style="list-style-type: none"> - 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.	

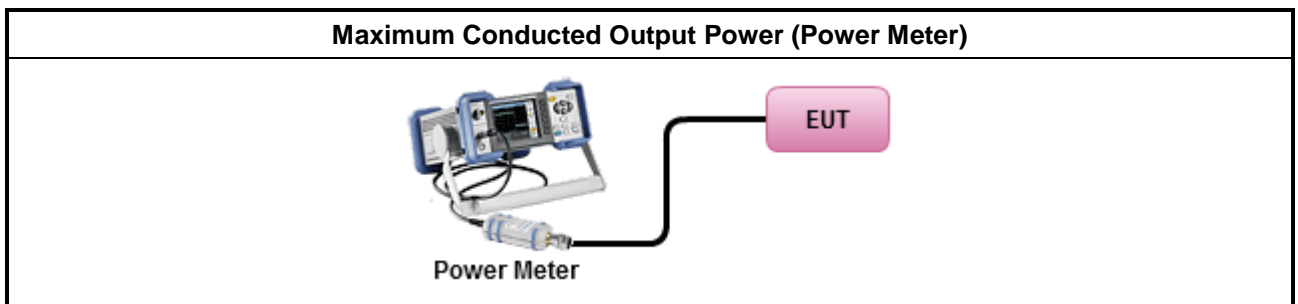
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> ▪ Maximum Peak Conducted Output Power 	
<input type="checkbox"/>	Refer as KDB 558074, clause 8.3.1.1 (11.9.1.1 of ANSI C63.10) RBW ≥ EBW method.
<input type="checkbox"/>	Refer as KDB 558074, clause 8.3.1.2 (11.9.1.2 of ANSI C63.10) integrated band power method.
<input type="checkbox"/>	Refer as KDB 558074, clause 8.3.1.3 (11.9.1.3 of ANSI C63.10) peak power meter.
<ul style="list-style-type: none"> ▪ Maximum Average Conducted Output Power 	
<input type="checkbox"/>	Refer as KDB 558074, clause 8.3.2.2 (11.9.2.2 of ANSI C63.10) using a spectrum analyzer.
<input checked="" type="checkbox"/>	Refer as KDB 558074, clause 8.3.2.3 (11.9.2.3 of ANSI C63.10) using a power meter.
<ul style="list-style-type: none"> ▪ For conducted measurement. 	
<ul style="list-style-type: none"> ▪ 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. 	
<ul style="list-style-type: none"> ▪ 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
<ul style="list-style-type: none"> Power Spectral Density (PSD) ≤ 8 dBm/3kHz

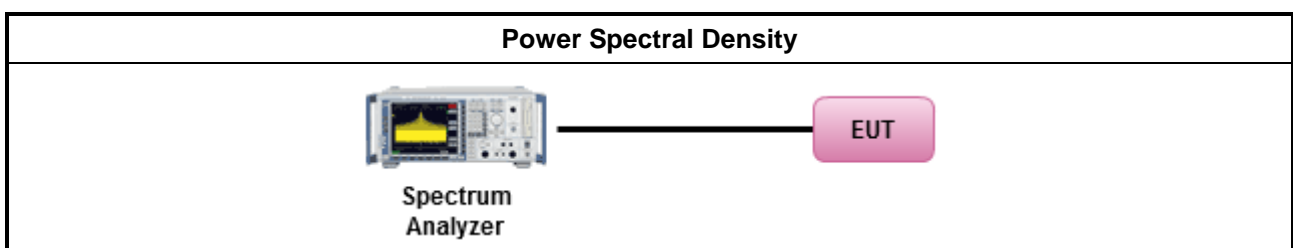
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method
<ul style="list-style-type: none"> 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).
<input checked="" type="checkbox"/> Refer as KDB 558074, clause 8.4 (11.10 of ANSI C63.10) Method PKPSD.
<ul style="list-style-type: none"> For conducted measurement. <ul style="list-style-type: none"> If The EUT supports multiple transmit chains using options given below: <ul style="list-style-type: none"> 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.

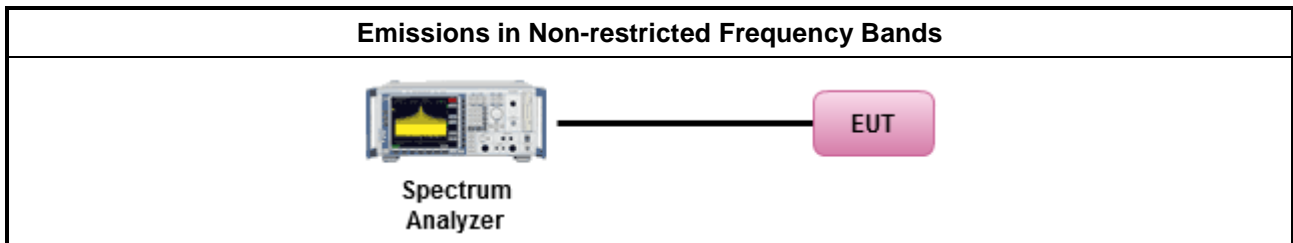
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method
<ul style="list-style-type: none"> 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.

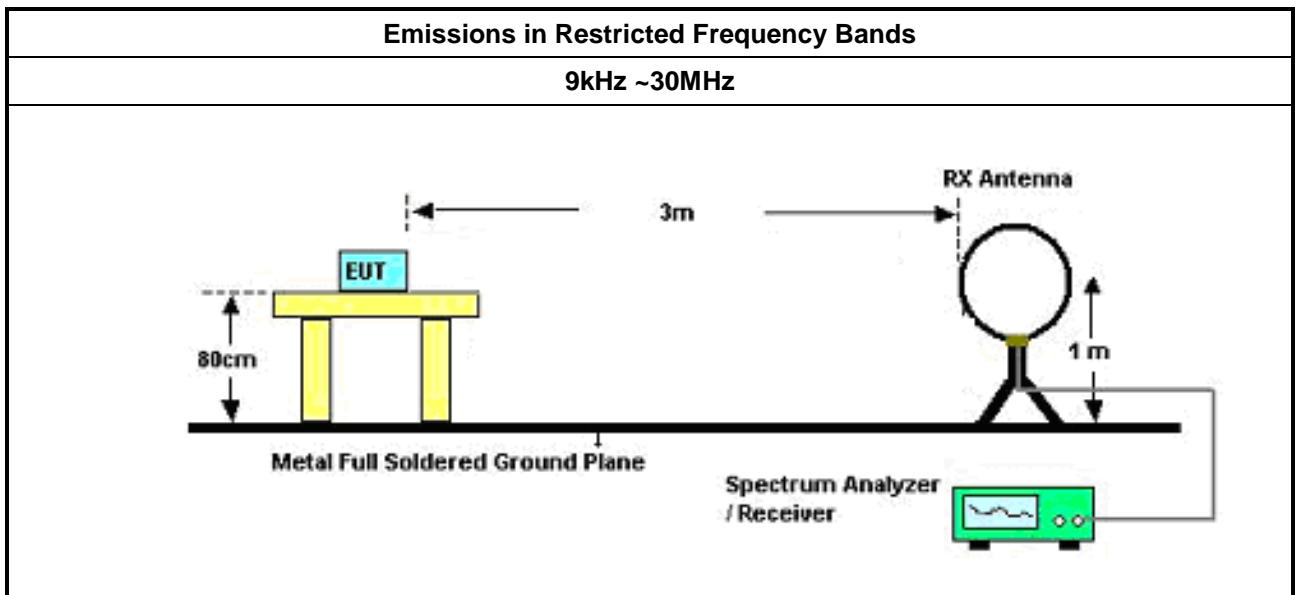
3.6.2 Measuring Instruments

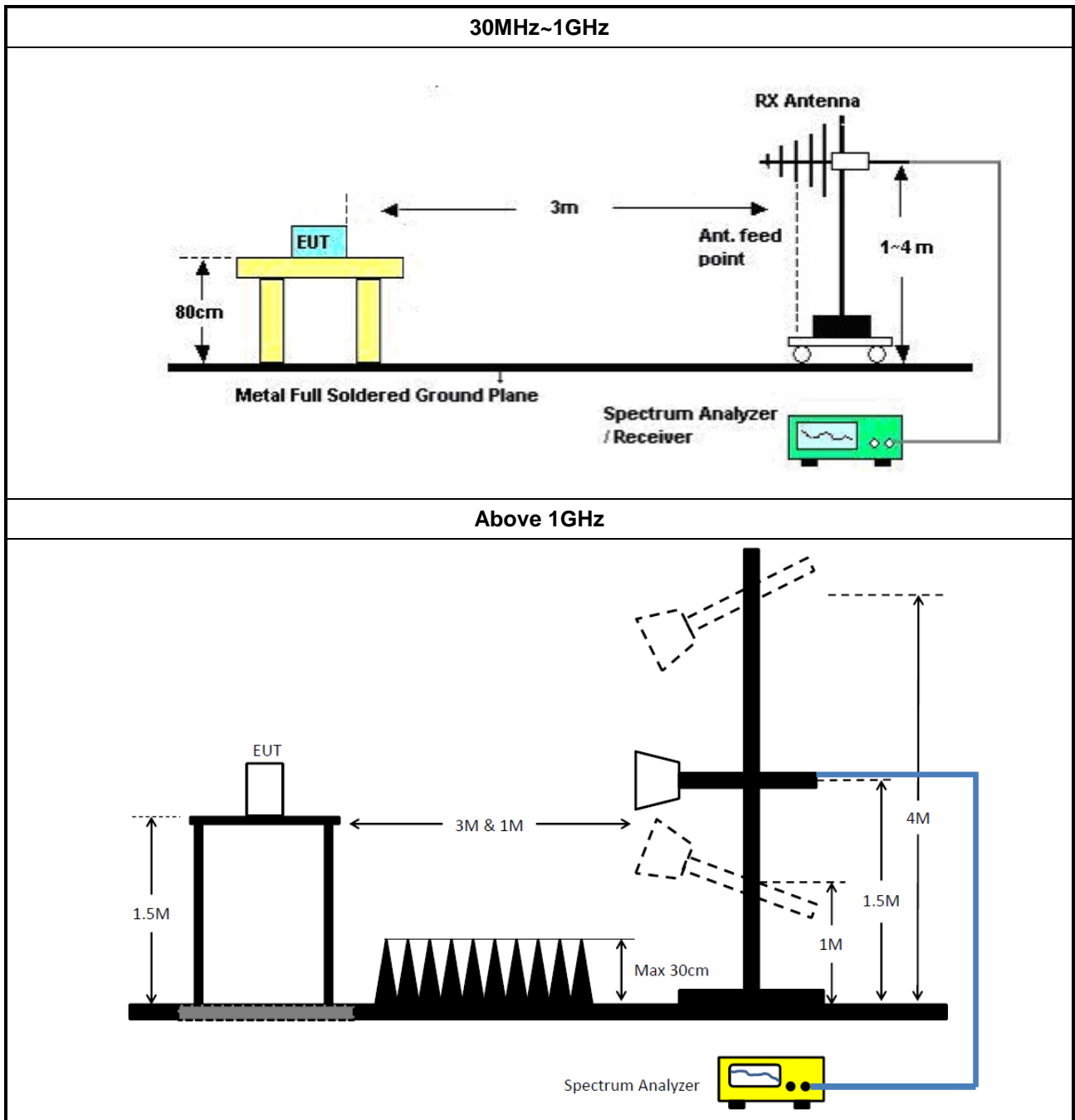
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method	
	<ul style="list-style-type: none"> ▪ The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
	<ul style="list-style-type: none"> ▪ 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.
	<ul style="list-style-type: none"> ▪ For the transmitter unwanted emissions shall be measured using following options below: <ul style="list-style-type: none"> ▪ Refer as KDB 558074, clause 8.6 (11.12 of ANSI C63.10) for restricted frequency bands.
	<ul style="list-style-type: none"> ▪ For the transmitter band-edge emissions shall be measured using following options below: <ul style="list-style-type: none"> ▪ 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).
	<ul style="list-style-type: none"> ▪ Use the following spectrum analyzer settings: <ul style="list-style-type: none"> ▪ 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
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	10/Apr/2018	09Apr/2019
Two-Line V Network (LISN)	R&S	ENV 216	101274	9kHz ~ 30MHz	12/Jun/2018	11/Jun/2019
LISN- Two-Line V Network (Support Unit)	MessTec	NNB-2/16Z	2001/009	9kHz ~ 30MHz	22/Oct/2018	21/Oct/2019
Pulse Limiter	SCHWARZBECK	VTSD 9561F	9495	9kHz ~ 30MHz	11/Oct/2018	10/Oct/2019
Software	Sporton	SENSE-EMI	V5.10.2	-	NCR	NCR

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	1027452	300MHz ~ 40GHz	14/Mar/2019	13/Mar/2020
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	14/Mar/2019	13/Mar/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 Below 1G

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
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	27Jul/2018	02/Jul/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
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz ~ 1GHz	08/Sep/2018	07/Sep/2019
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	10/Apr/2018	09/Apr/2019
Loop Antenna	Rohde & Schwarz	HFH2 - Z2	100315	9k ~ 30MHz	15/Mar/2019	14/Mar/2020



Instrument for Radiated Test Above 1G

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	27/Aug/2018	26/Aug/2019
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	13/Nov/2018	12/Nov/2019
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	28/Jun/2018	27/Jun/2019
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	02/May/2018	01/May/2019
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	08/Jan/2019	07/Jan/2020
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	04/Jul/2018	03/Jul/2019
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	31/Jan/2019	30/Jan/2020
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	03/Jul/2018	02/Jul/2019
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	08/Oct/2018	07/Oct/2019
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	08/Oct/2018	07/Oct/2019
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	08/Oct/2018	07/Oct/2019
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	27/Jul/2018	26/Jul/2019
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	27/Jul/2018	26/Jul/2019

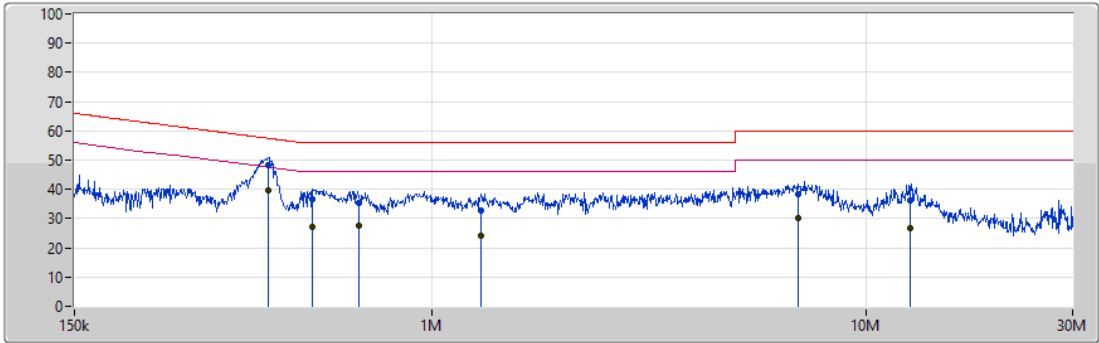


AC Power-line Conducted Emissions Result

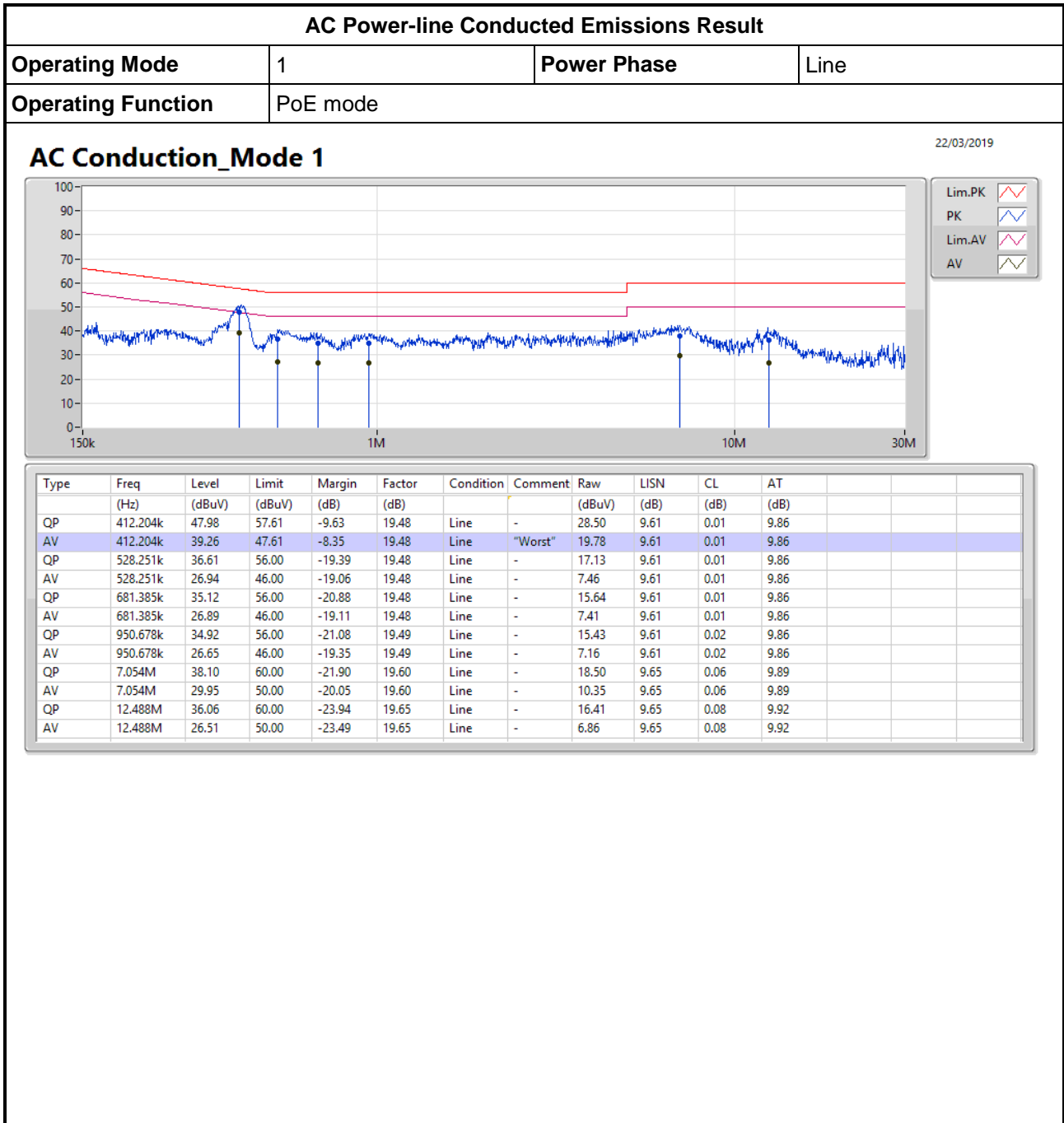
Operating Mode	1	Power Phase	Neutral
Operating Function	PoE mode		

AC Conduction_Mode 1

22/03/2019



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)
QP	418.726k	48.42	57.47	-9.05	19.51	Neutral	-	28.91	9.64	0.01	9.86
AV	418.726k	39.84	47.47	-7.63	19.51	Neutral	"Worst"	20.33	9.64	0.01	9.86
QP	530.096k	36.48	56.00	-19.52	19.51	Neutral	-	16.97	9.64	0.01	9.86
AV	530.096k	27.12	46.00	-18.88	19.51	Neutral	-	7.61	9.64	0.01	9.86
QP	677.116k	35.52	56.00	-20.48	19.51	Neutral	-	16.01	9.64	0.01	9.86
AV	677.116k	27.44	46.00	-18.56	19.51	Neutral	-	7.93	9.64	0.01	9.86
QP	1.295M	32.86	56.00	-23.14	19.52	Neutral	-	13.34	9.64	0.02	9.86
AV	1.295M	24.35	46.00	-21.65	19.52	Neutral	-	4.83	9.64	0.02	9.86
QP	6.986M	38.15	60.00	-21.85	19.64	Neutral	-	18.51	9.69	0.06	9.89
AV	6.986M	30.05	50.00	-19.95	19.64	Neutral	-	10.41	9.69	0.06	9.89
QP	12.672M	36.23	60.00	-23.77	19.72	Neutral	-	16.51	9.71	0.08	9.93
AV	12.672M	26.74	50.00	-23.26	19.72	Neutral	-	7.02	9.71	0.08	9.93





Summary

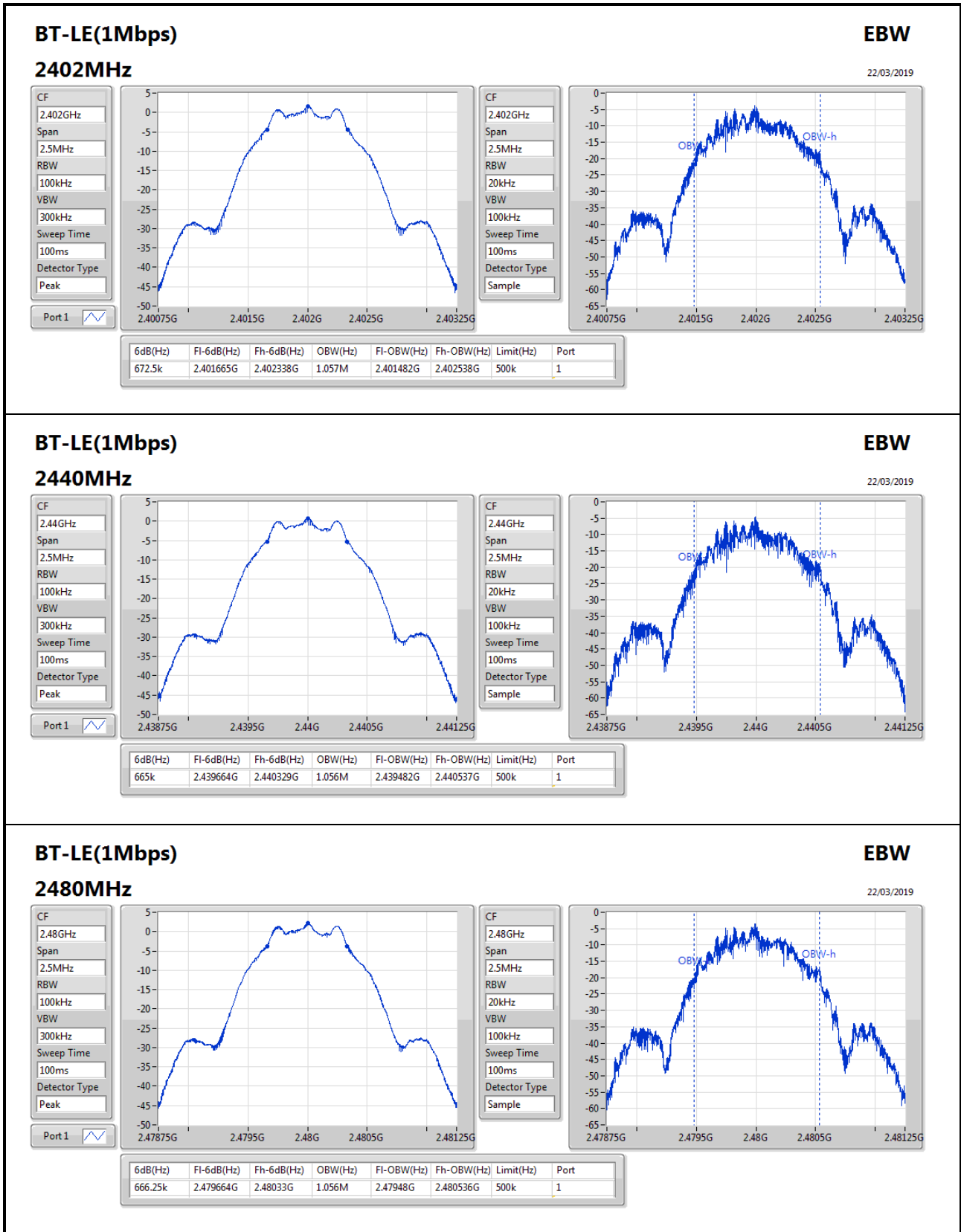
Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	672.5k	1.057M	1M06F1D	665k	1.056M

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	Pass	500k	672.5k	1.057M
2440MHz	Pass	500k	665k	1.056M
2480MHz	Pass	500k	666.25k	1.056M

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





Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	2.84	0.00192

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.94	2.50	30.00
2440MHz	Pass	0.94	1.75	30.00
2480MHz	Pass	0.94	2.84	30.00



Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	1.57	0.00144

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.94	1.10	30.00
2440MHz	Pass	0.94	-1.04	30.00
2480MHz	Pass	0.94	1.57	30.00



Summary

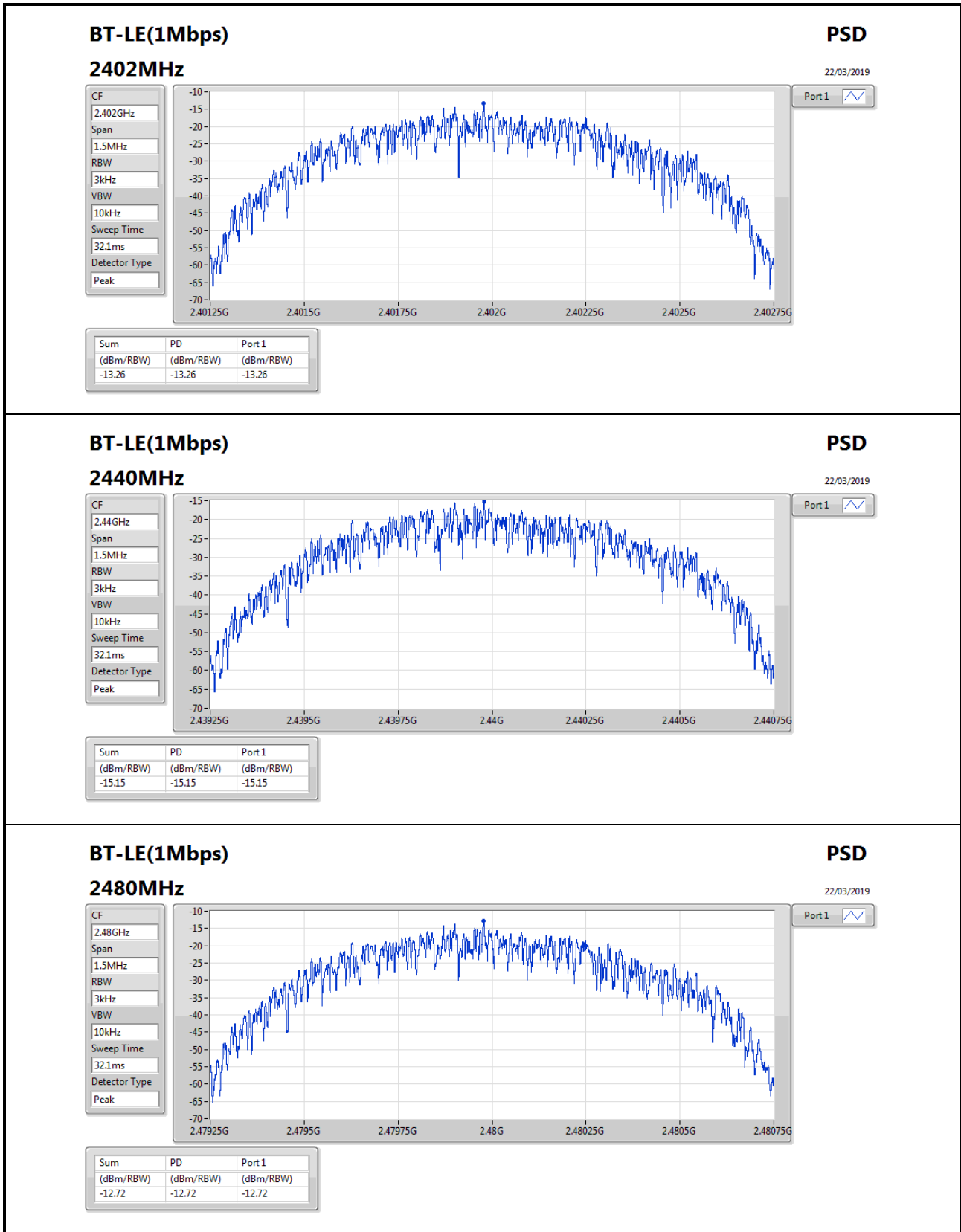
Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-12.72

RBW=3kHz.

Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.94	-13.26	8.00
2440MHz	Pass	0.94	-15.15	8.00
2480MHz	Pass	0.94	-12.72	8.00

RBW=3kHz.



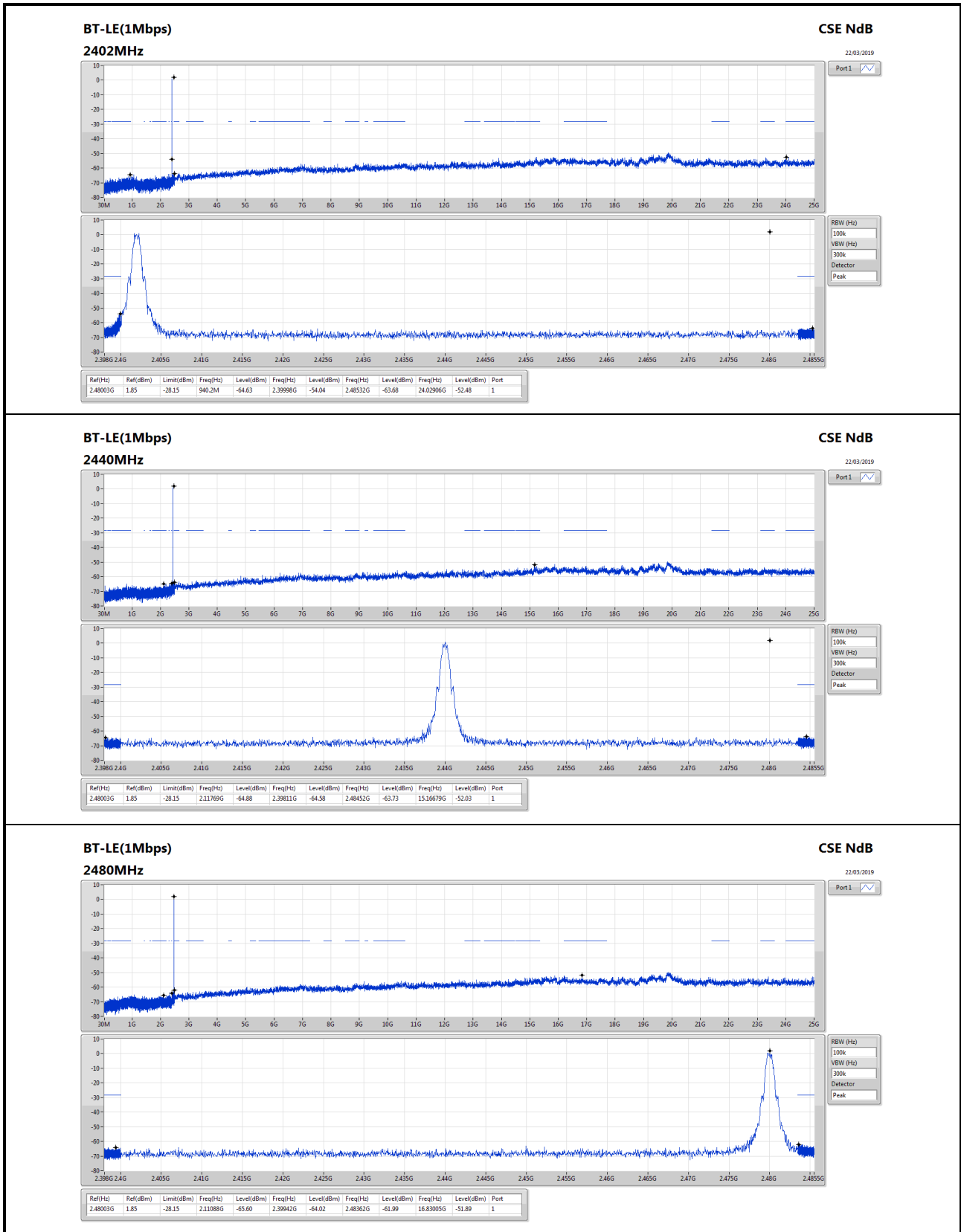


Summary

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	2.48003G	1.85	-28.15	2.11088G	-65.60	2.39942G	-64.02	2.48362G	-61.99	16.83005G	-51.89	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	Pass	2.48003G	1.85	-28.15	940.2M	-64.63	2.39998G	-54.04	2.48532G	-63.68	24.02906G	-52.48	1
2440MHz	Pass	2.48003G	1.85	-28.15	2.11769G	-64.88	2.39811G	-64.58	2.48452G	-63.73	15.16679G	-52.03	1
2480MHz	Pass	2.48003G	1.85	-28.15	2.11088G	-65.60	2.39942G	-64.02	2.48362G	-61.99	16.83005G	-51.89	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(1Mbps)	Pass	PK	49.4M	30.35	40.00	-9.65	-13.73	3	Vertical	0	2.00	-



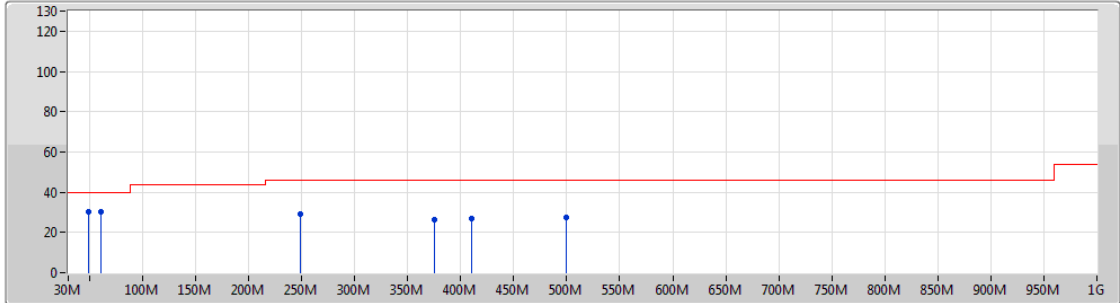
Result





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)	-	-	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	49.4M	30.35	40.00	-9.65	-13.73	3	Vertical	0	2.00	-
2440MHz	Pass	PK	61.04M	30.08	40.00	-9.92	-15.49	3	Vertical	0	2.00	-
2440MHz	Pass	PK	249.22M	29.19	46.00	-16.81	-7.05	3	Vertical	0	2.00	-
2440MHz	Pass	PK	375.32M	26.07	46.00	-19.93	-4.48	3	Vertical	0	2.00	-
2440MHz	Pass	PK	410.24M	27.05	46.00	-18.95	-3.30	3	Vertical	0	2.00	-
2440MHz	Pass	PK	499.48M	27.33	46.00	-18.67	-2.38	3	Vertical	0	2.00	-
2440MHz	Pass	PK	37.76M	23.09	40.00	-16.91	-8.64	3	Horizontal	0	2.00	-
2440MHz	Pass	PK	154.16M	24.66	43.50	-18.84	-10.35	3	Horizontal	0	2.00	-
2440MHz	Pass	PK	224M	26.36	46.00	-19.64	-10.09	3	Horizontal	0	2.00	-
2440MHz	Pass	PK	249.22M	30.03	46.00	-15.97	-7.05	3	Horizontal	0	2.00	-
2440MHz	Pass	PK	321M	27.09	46.00	-18.91	-5.50	3	Horizontal	0	2.00	-
2440MHz	Pass	PK	416.06M	28.85	46.00	-17.15	-3.01	3	Horizontal	0	2.00	-

BT-LE(1Mbps)

22/03/2019

2440MHz_PoE



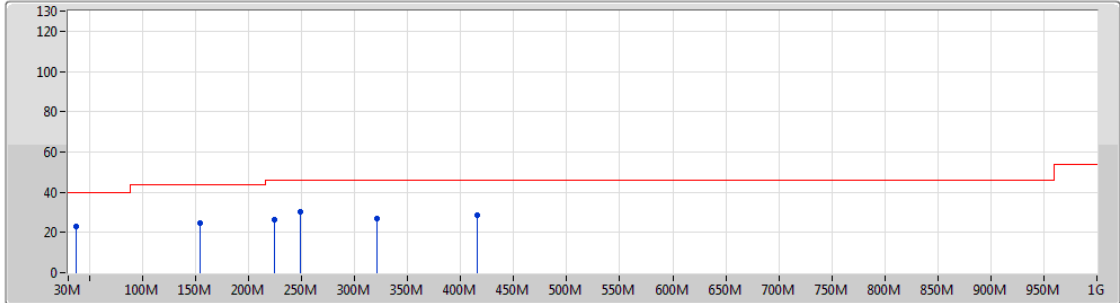
Lim.PK 
 PK 
 Lim.AV 
 AV 

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	49.4M	30.35	40.00	-9.65	-13.73	3	Vertical	0	2.00	-
PK	61.04M	30.08	40.00	-9.92	-15.49	3	Vertical	0	2.00	-
PK	249.22M	29.19	46.00	-16.81	-7.05	3	Vertical	0	2.00	-
PK	375.32M	26.07	46.00	-19.93	-4.48	3	Vertical	0	2.00	-
PK	410.24M	27.05	46.00	-18.95	-3.30	3	Vertical	0	2.00	-
PK	499.48M	27.33	46.00	-18.67	-2.38	3	Vertical	0	2.00	-

BT-LE(1Mbps)

22/03/2019

2440MHz_PoE



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	37.76M	23.09	40.00	-16.91	-8.64	3	Horizontal	0	2.00	-
PK	154.16M	24.66	43.50	-18.84	-10.35	3	Horizontal	0	2.00	-
PK	224M	26.36	46.00	-19.64	-10.09	3	Horizontal	0	2.00	-
PK	249.22M	30.03	46.00	-15.97	-7.05	3	Horizontal	0	2.00	-
PK	321M	27.09	46.00	-18.91	-5.50	3	Horizontal	0	2.00	-
PK	416.06M	28.85	46.00	-17.15	-3.01	3	Horizontal	0	2.00	-



RSE TX above 1GHz Result

Appendix F.2

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	45.32	54.00	-8.68	32.41	3	Vertical	281	2.57	-



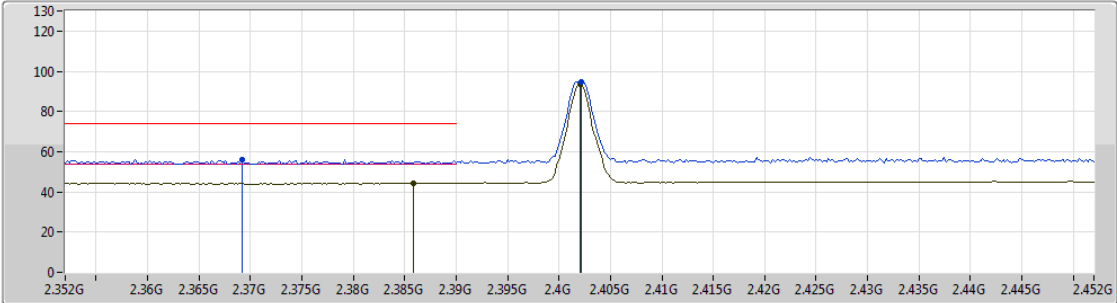
RSE TX above 1GHz Result

Appendix F.2

BT-LE(1Mbps)

20/02/2019

2402MHz_TX



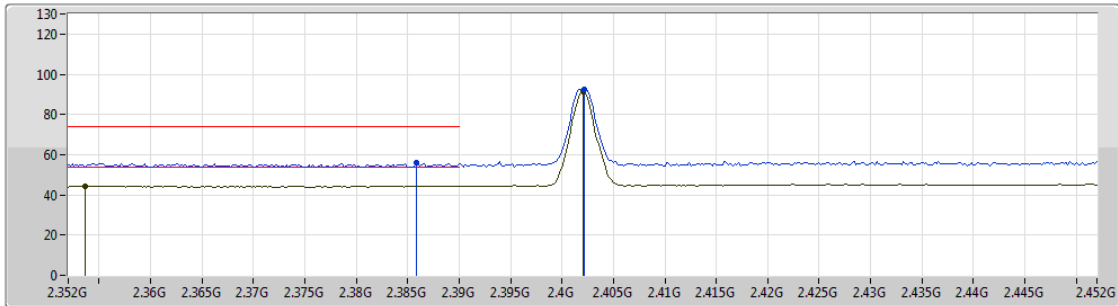
EUT_Y_1TX
Setting 9dBm
03-C-4
FSP(100019)





Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3692G	56.17	74.00	-17.83	32.00	3	Vertical	300	2.48	-
AV	2.3858G	44.48	54.00	-9.52	32.05	3	Vertical	300	2.48	-
PK	2.4022G	94.77	Inf	-Inf	32.10	3	Vertical	300	2.48	-
AV	2.402G	93.31	Inf	-Inf	32.10	3	Vertical	300	2.48	-

BT-LE(1Mbps)

20/02/2019

2402MHz_TX



Lim.PK 
 PK 
 Lim.AV 
 AV 

EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

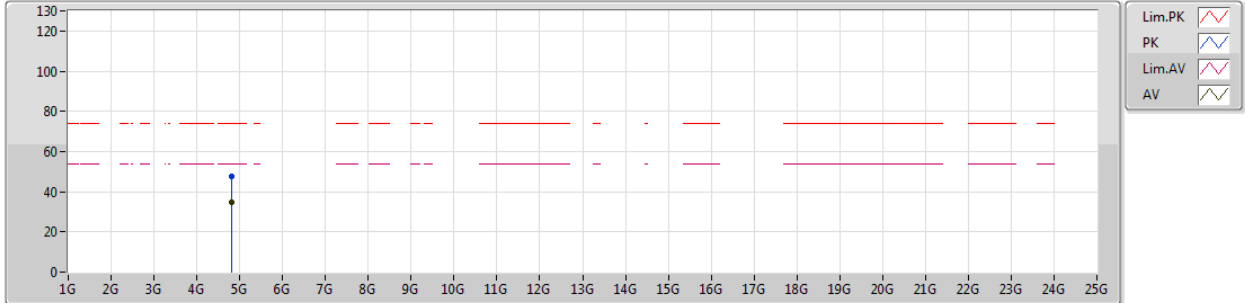
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3858G	55.88	74.00	-18.12	32.05	3	Horizontal	32	1.20	-
AV	2.3536G	44.46	54.00	-9.54	31.96	3	Horizontal	32	1.20	-
PK	2.4022G	92.67	Inf	-Inf	32.10	3	Horizontal	32	1.20	-
AV	2.402G	91.17	Inf	-Inf	32.10	3	Horizontal	32	1.20	-



BT-LE(1Mbps)

20/02/2019

2402MHz_TX



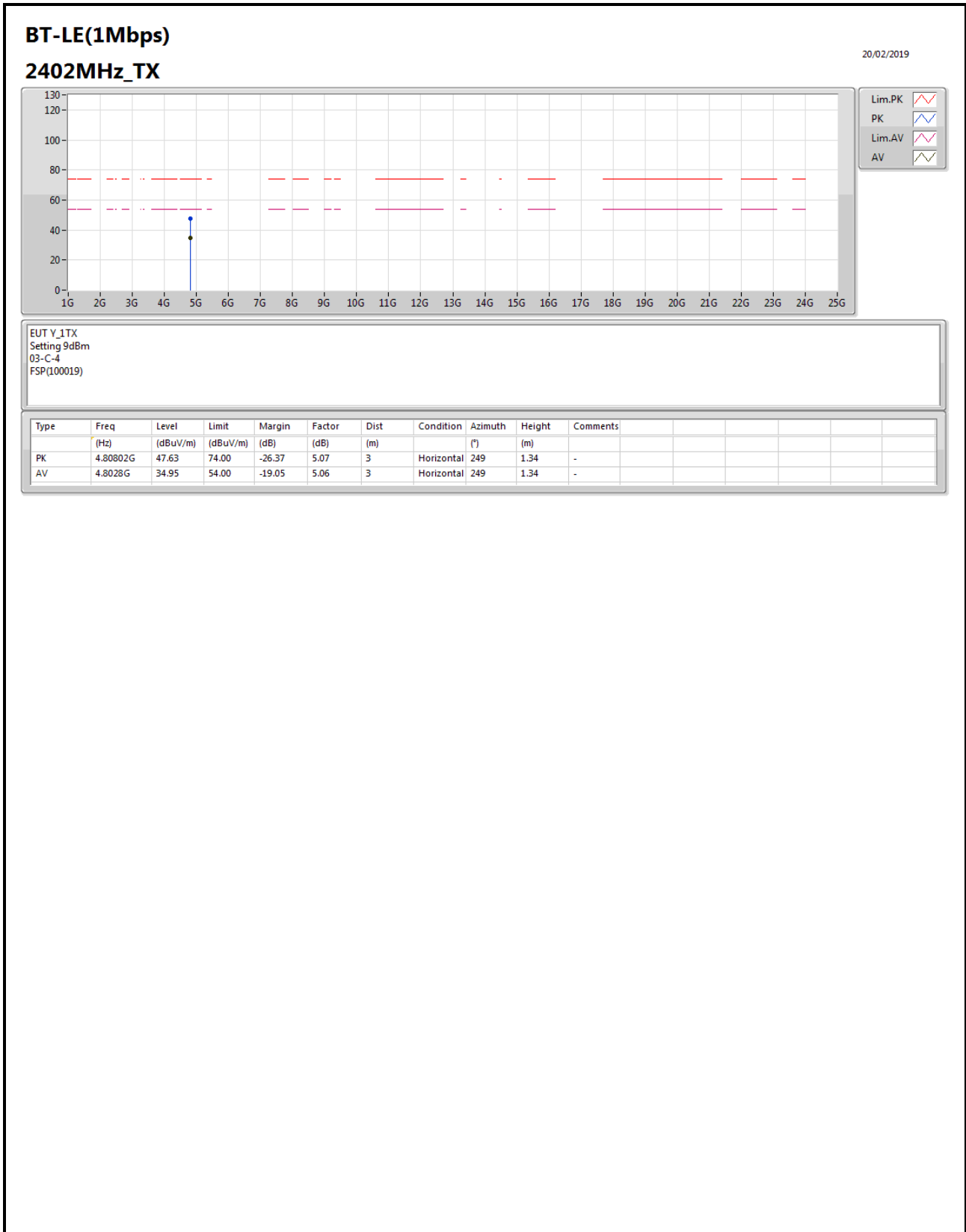
EUT Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.81384G	47.49	74.00	-26.51	5.09	3	Vertical	168	1.18	-
AV	4.80328G	35.00	54.00	-19.00	5.06	3	Vertical	168	1.18	-



RSE TX above 1GHz Result

Appendix F.2

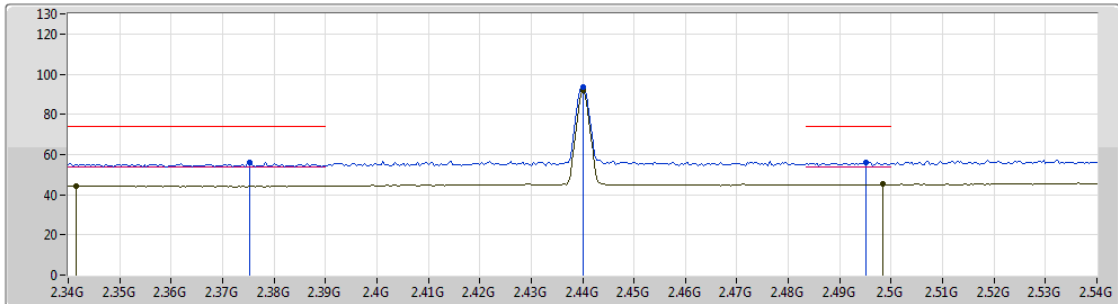




BT-LE(1Mbps)

2440MHz_TX

20/02/2019



Lim.PK
 PK
 Lim.AV
 AV

EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3752G	56.00	74.00	-18.00	32.02	3	Vertical	130	1.82	-
AV	2.3416G	44.45	54.00	-9.55	31.92	3	Vertical	130	1.82	-
PK	2.44G	93.49	Inf	-Inf	32.24	3	Vertical	130	1.82	-
AV	2.44G	92.04	Inf	-Inf	32.24	3	Vertical	130	1.82	-
PK	2.4952G	56.15	74.00	-17.85	32.46	3	Vertical	130	1.82	-
AV	2.4984G	45.15	54.00	-8.85	32.47	3	Vertical	130	1.82	-



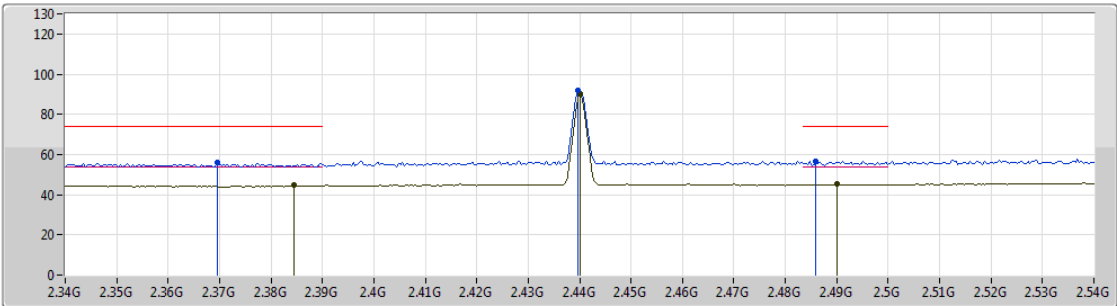
RSE TX above 1GHz Result

Appendix F.2

BT-LE(1Mbps)

2440MHz_TX

20/02/2019



Lim.PK
 PK
 Lim.AV
 AV

EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

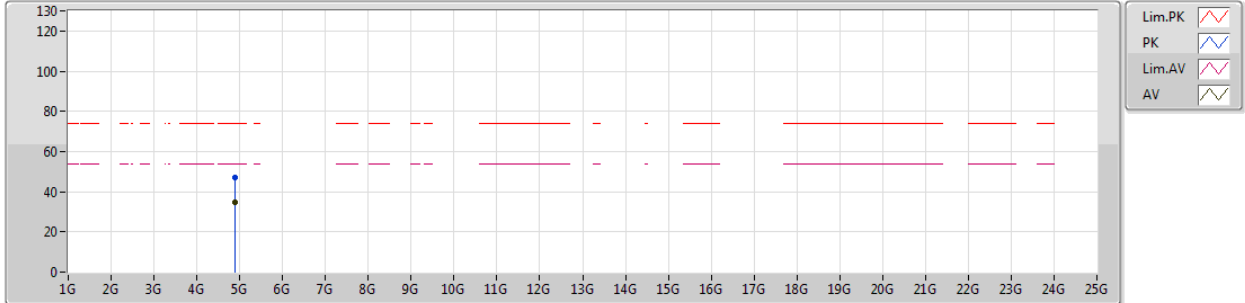
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3696G	55.82	74.00	-18.18	32.00	3	Horizontal	122	1.20	-
AV	2.3844G	44.60	54.00	-9.40	32.05	3	Horizontal	122	1.20	-
PK	2.4396G	91.69	Inf	-Inf	32.24	3	Horizontal	122	1.20	-
AV	2.44G	90.24	Inf	-Inf	32.24	3	Horizontal	122	1.20	-
PK	2.486G	56.59	74.00	-17.41	32.42	3	Horizontal	122	1.20	-
AV	2.49G	45.19	54.00	-8.81	32.43	3	Horizontal	122	1.20	-



BT-LE(1Mbps)

20/02/2019

2440MHz_TX



EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.88924G	47.27	74.00	-26.73	5.27	3	Vertical	287	1.76	-
AV	4.8866G	34.95	54.00	-19.05	5.26	3	Vertical	287	1.76	-



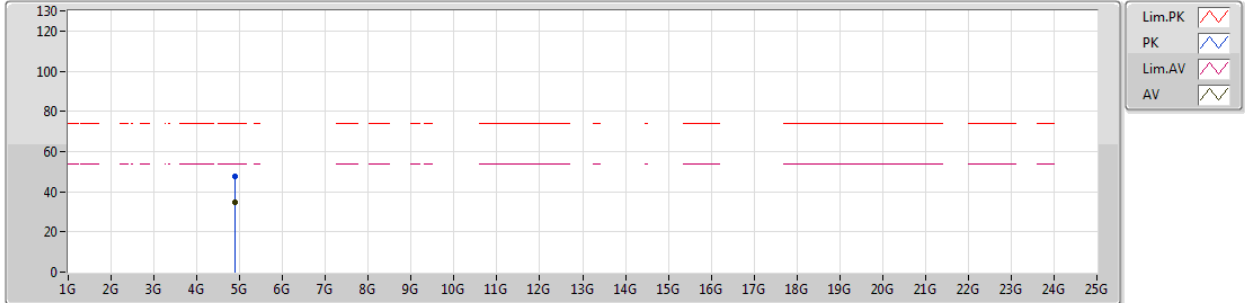
RSE TX above 1GHz Result

Appendix F.2

BT-LE(1Mbps)

20/02/2019

2440MHz_TX



EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.89086G	47.51	74.00	-26.49	5.28	3	Horizontal	118	2.44	-
AV	4.89416G	34.73	54.00	-19.27	5.29	3	Horizontal	118	2.44	-



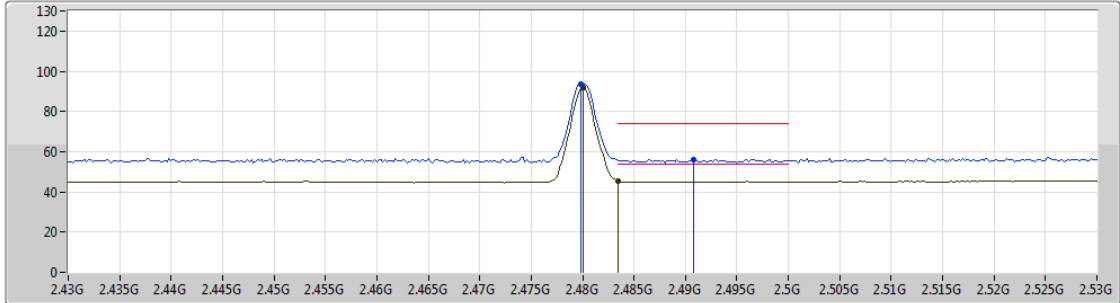
RSE TX above 1GHz Result

Appendix F.2

BT-LE(1Mbps)

2480MHz_TX

20/02/2019



EUT_Y_1TX
Setting 9dBm
03-C-4
FSP(100019)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.4798G	93.54	Inf	-Inf	32.39	3	Vertical	281	2.57	-
AV	2.48G	92.00	Inf	-Inf	32.39	3	Vertical	281	2.57	-
PK	2.4908G	56.12	74.00	-17.88	32.43	3	Vertical	281	2.57	-
AV	2.4835G	45.32	54.00	-8.68	32.41	3	Vertical	281	2.57	-

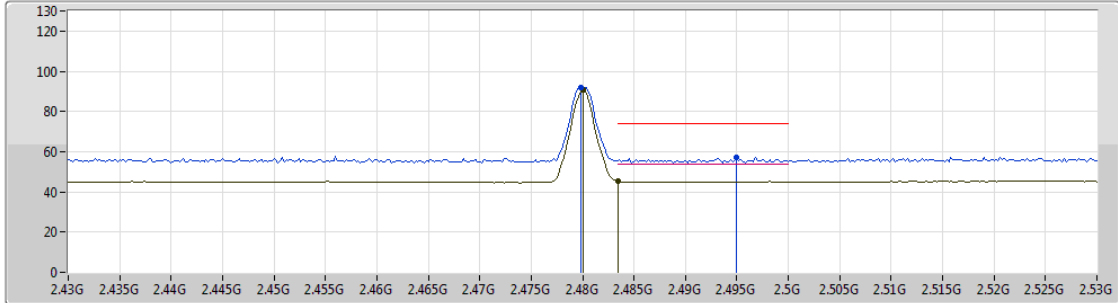


RSE TX above 1GHz Result

BT-LE(1Mbps)

2480MHz_TX

20/02/2019



- Lim.PK
- PK
- Lim.AV
- AV

EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

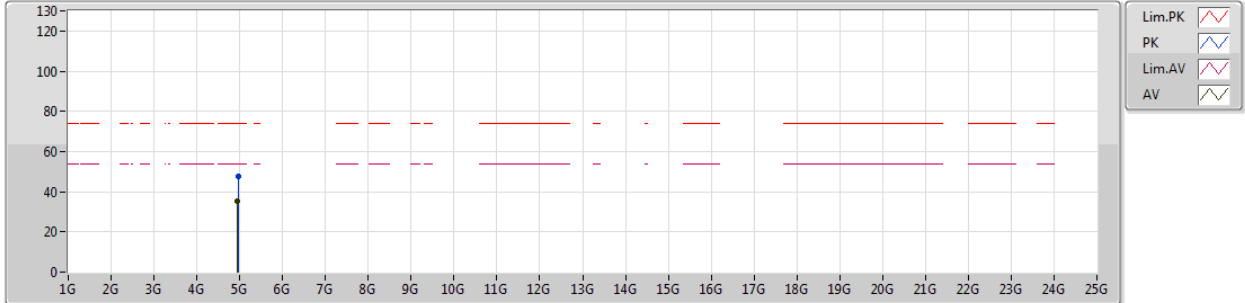
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.4798G	92.17	Inf	-Inf	32.39	3	Horizontal	0	1.01	-
AV	2.48G	90.66	Inf	-Inf	32.39	3	Horizontal	0	1.01	-
PK	2.495G	57.41	74.00	-16.59	32.46	3	Horizontal	0	1.01	-
AV	2.4835G	45.18	54.00	-8.82	32.41	3	Horizontal	0	1.01	-



BT-LE(1Mbps)

20/02/2019

2480MHz_TX



EUT_Y_1TX
 Setting 9dBm
 03-C-4
 FSP(100019)

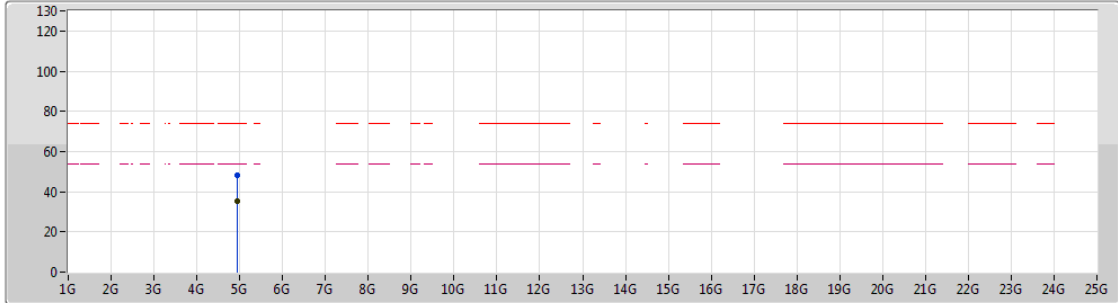
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.96708G	47.75	74.00	-26.25	5.46	3	Vertical	97	1.87	-
AV	4.9456G	35.28	54.00	-18.72	5.41	3	Vertical	97	1.87	-



BT-LE(1Mbps)

20/02/2019

2480MHz_TX



Legend for the plot:

- Lim.PK: Red dashed line with a red triangle marker
- PK: Blue solid line with a blue triangle marker
- Lim.AV: Pink dashed line with a pink triangle marker
- AV: Black solid line with a black triangle marker

EUT_Y_1TX
Setting 9dBm
03-C-4
FSP(100019)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.94728G	47.93	74.00	-26.07	5.41	3	Horizontal	61	1.36	-
AV	4.94992G	35.45	54.00	-18.55	5.42	3	Horizontal	61	1.36	-