



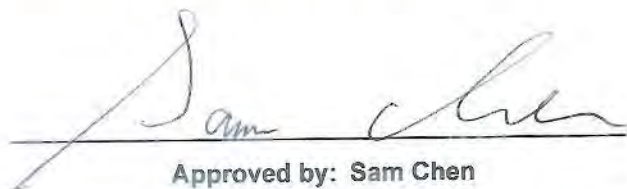
FCC RADIO TEST REPORT

FCC ID : 2AFXU-PL22888
Equipment : PL22
Brand Name : **M2COMM**
Model Name : PL22
Applicant : M2Communication Inc.
15F-1, No.32, Gaotie 2nd Rd., Zhubei City, Hsinchu
County 302, Taiwan (R.O.C.)
Manufacturer : M2Communication Inc.
15F-1, No.32, Gaotie 2nd Rd., Zhubei City, Hsinchu
County 302, Taiwan (R.O.C.)
Standard : 47 CFR FCC Part 15.247

The product was received on Aug. 28, 2018, and testing was started from Sep. 07, 2018 and completed on Nov. 06, 2018. 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: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB Ver1.0



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
-	15.207	AC Power-line Conducted Emissions	N/A	Note
3.1	15.247(a)	DTS Bandwidth	PASS	-
3.2	15.247(b)	Maximum Conducted Output Power	PASS	-
3.3	15.247(e)	Power Spectral Density	PASS	-
3.4	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.5	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Note: It was supplied power by AA battery for EUT; it's not necessary to apply to AC Power-line Conducted Emissions test

Declaration of Conformity:

The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.

Comments and Explanations:

None

Reviewed by: Sam Chen

Report Producer: Cindy Peng

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range	Modulation	Ch. Frequency (MHz)	Channel Number
902 ~ 928 MHz	2FSK	903-927	9

Band	Mode	BWch (MHz)	Nant
902-928MHz	2FSK	1	1TX

Note:

- ♦ 902-928 MHz Band uses a combination of 2FSK modulation.
- ♦ BWch is the nominal channel bandwidth.
- ♦ Nss-Min is the minimum number of spatial streams.
- ♦ Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

1.1.2 Table for Carrier Frequencies

Channel No.	Frequency	Channel No.	Frequency
1	903 MHz	6	921 MHz
2	906 MHz	7	923 MHz
3	909 MHz	8	924 MHz
4	915 MHz	9	927 MHz
5	918 MHz	-	-

1.1.3 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	ARISTOTLE	RFA-LORA-AP393	PCB Dipole Antenna	N/A	-4.03

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) $\geq 1/T$
2FSK	1	0	n/a (DC \geq 0.98)	n/a (DC \geq 0.98)

Note:

- ♦ DC is Duty Cycle.
- ♦ DCF is Duty Cycle Factor.

**1.1.5 EUT Operational Condition**

EUT Power Type	From AA battery (3V)		
Beamforming Function	<input type="checkbox"/> With beamforming	<input checked="" type="checkbox"/> Without beamforming	
Test Software Version	Tera Term.exe(V4.75)		

1.1.6 Table for Panel Type

The EUT has two panels which are identical to each other in all aspects except for the following table:

Source of Panels	Brand Name	Model Name
Main source	WEIFENG	WF0213T1PCZ04230HU57
Second source	Holitech	HINK-E0213A26



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
- ♦ FCC KDB 558074 D01 v05

1.3 Testing Location Information

Testing Location				
<input 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
<input checked="" type="checkbox"/>	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.	TEL : 886-3-656-9065	FAX : 886-3-656-9085

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-CB	Justin Lin	25°C / 56%	Sep. 15, 2018~Sep. 19, 2018
Radiated (Below 1GHz)	03CH01-CB	KJ Chang	22°C / 54%	Sep. 07, 2018~Nov. 06, 2018
Radiated (Above 1GHz)	03CH01-CB	KJ Chang	22°C / 54%	Sep. 07, 2018~Sep. 10, 2018

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.



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
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	9.74×10^{-8}	Confidence levels of 95%



2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	PowerSetting
2FSK_Nss1_1TX	-
903MHz	11
915MHz	11
927MHz	11

2.2 The Worst Case Measurement Configuration

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	Normal Link
1	Main source of EUT X axis
2	Main source of EUT Y axis
3	Main source of EUT Z axis
Mode 1 has been evaluated to be the worst case among Mode 1~ Mode 3, thus measurement for Mode 4 will follow this same test mode.	
4	Second source of EUT X axis
For operating mode 1 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
1	Main source of EUT X axis
2	Main source of EUT Y axis
3	Main source of EUT Z axis
Mode 2 has been evaluated to be the worst case after evaluating. Consequently, measurement will follow this same test mode.	



2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

2.4 Accessories

N/A

2.5 Support Equipment

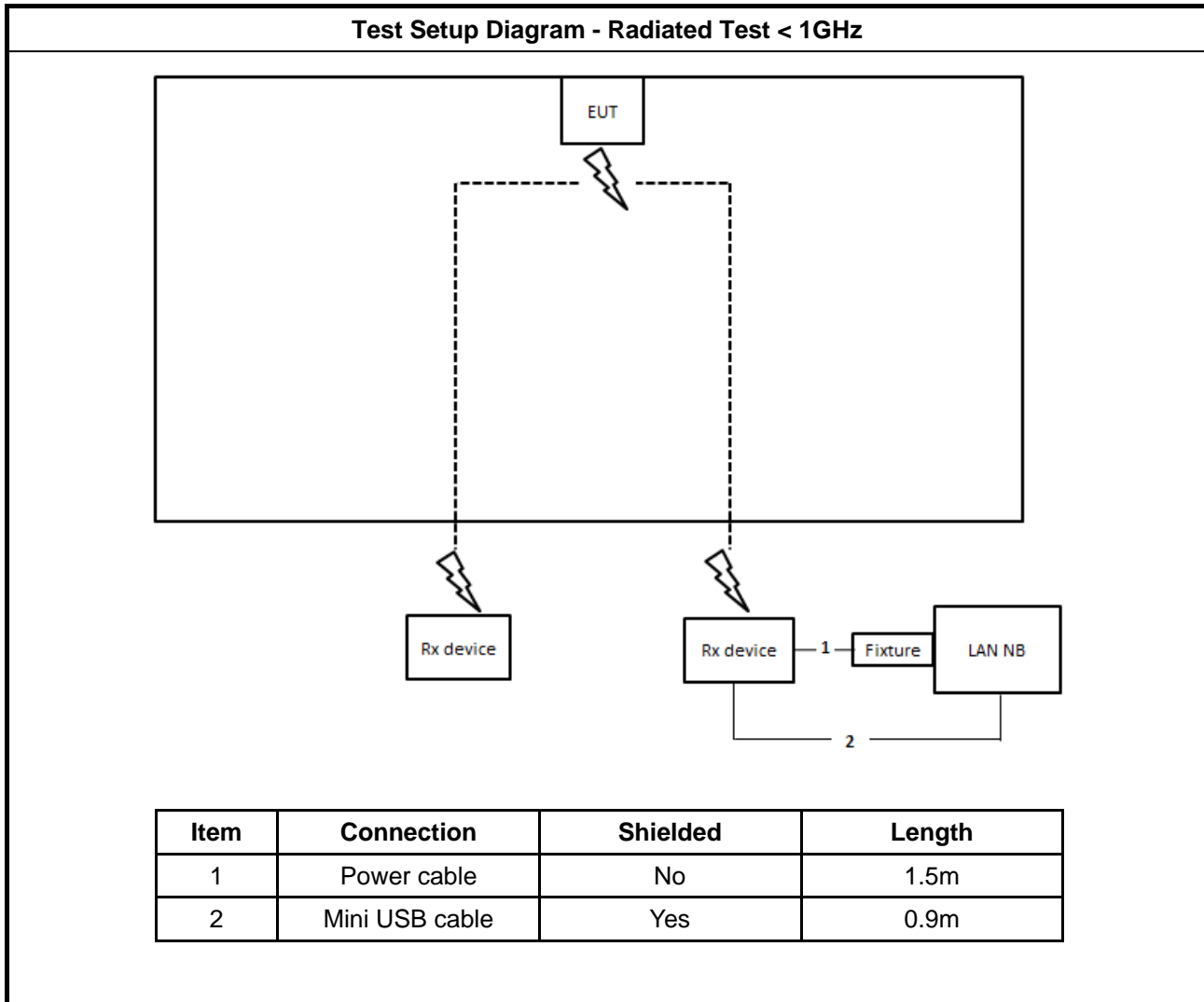
For Test Site No: 03CH01-CB (below 1GHz)

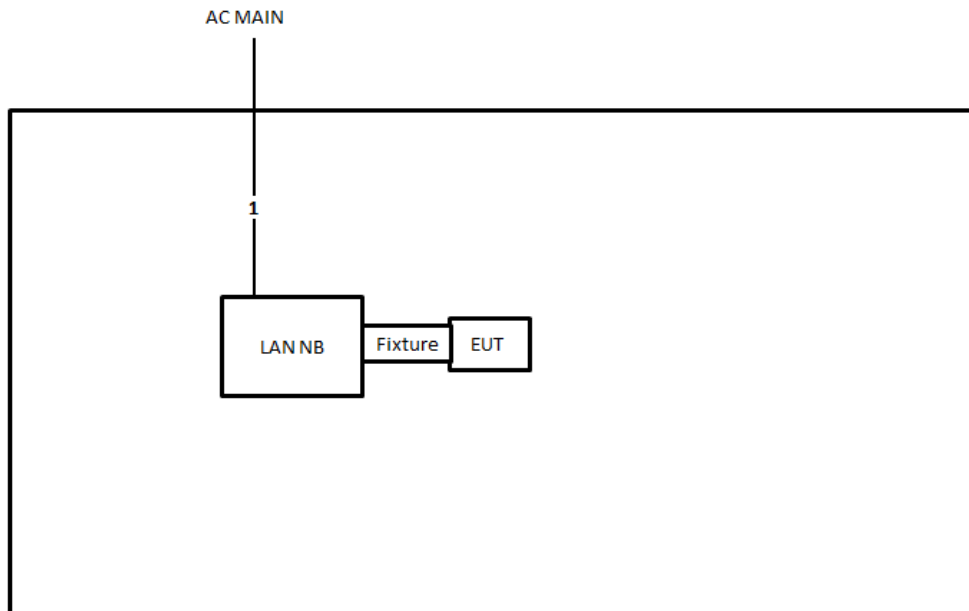
Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E4300	N/A
2	Rx device	M2COMM	PRT2.X.JPA0	2AFXU-MA903A1
3	Rx device	M2COMM	PAP2.X.JPA0	2AFXU-MA903A1
4	Fixture	M2COMM	USB console	N/A

For Test Site No: 03CH01-CB (above 1GHz) and TH01-CB

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E4300	N/A
2	Fixture	M2COMM	USB console	N/A

2.6 Test Setup Diagram



Test Setup Diagram - Radiated Test > 1GHz


Item	Connection	Shielded	Length
1	Power cable	No	2.6m

3 Transmitter Test Result

3.1 DTS Bandwidth

3.1.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
<ul style="list-style-type: none"> 6 dB bandwidth \geq 500 kHz.

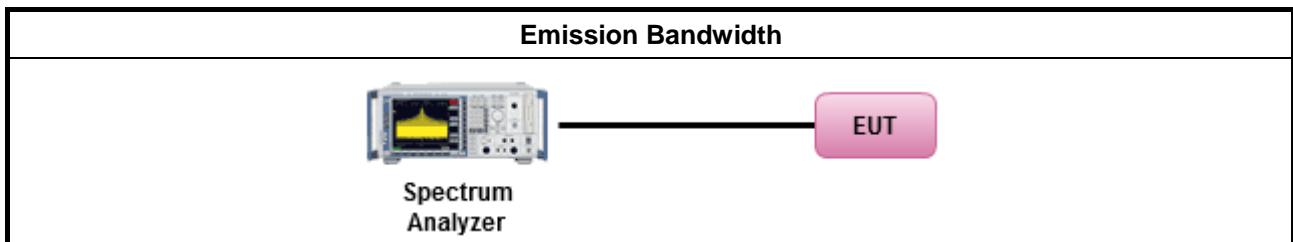
3.1.2 Measuring Instruments

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"> For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.2 Option 2 for 6 dB bandwidth measurement.
<input type="checkbox"/> Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.

3.1.4 Test Setup



3.1.5 Test Result of Emission Bandwidth

Refer as Appendix A

3.2 Maximum Conducted Output Power

3.2.1 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
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

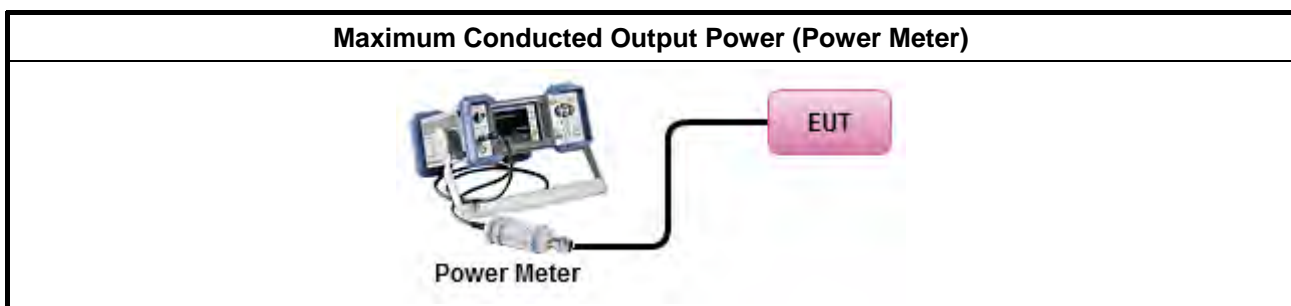
3.2.2 Measuring Instruments

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"> Maximum Peak Conducted Output Power 	
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.1.1 & C63.10 clause 11.9.1.1 (RBW ≥ EBW method).
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.1.3 & C63.10 clause 11.9.1.3 (peak power meter).
<ul style="list-style-type: none"> Maximum Conducted Output Power 	
[duty cycle ≥ 98% or external video / power trigger]	
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.2 Method AVGSA-1.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.3 Method AVGSA-1A. (alternative)
duty cycle < 98% and average over on/off periods with duty factor	
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.4 Method AVGSA-2.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.5 Method AVGSA-2A (alternative)
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.6 Method AVGSA-3
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.7 Method AVGSA-3A (alternative)
Measurement using a power meter (PM)	
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.1 Method AVGPM (using an RF average power meter).
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.2 Method AVGPM-G (using an gate RF average 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 FCC 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]) $EIRP_{total} = P_{total} + DG$ 	

3.2.4 Test Setup





3.2.5 Test Result of Maximum Conducted Output Power

Refer as Appendix B



3.3 Power Spectral Density

3.3.1 Power Spectral Density Limit

Power Spectral Density Limit
<ul style="list-style-type: none"> Power Spectral Density (PSD) ≤ 8 dBm/3kHz

3.3.2 Measuring Instruments

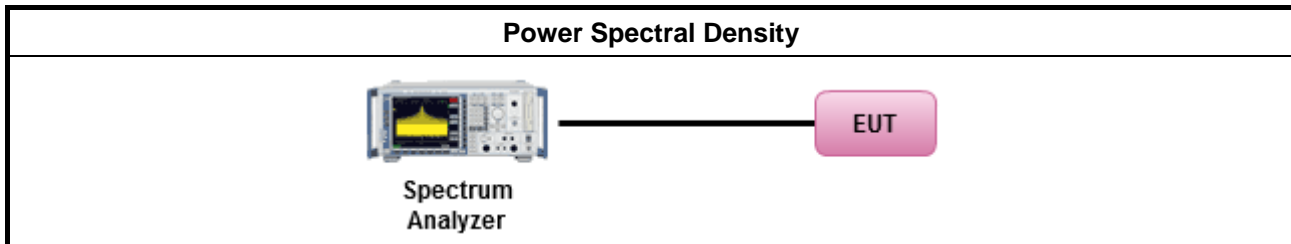
Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method
<ul style="list-style-type: none"> 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 FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.2 Method PKPSD. [duty cycle $\geq 98\%$ or external video / power trigger]
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.3 Method AVGPS-1.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.5 Method AVGPS-2.
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.7 Method AVGPS-3.
duty cycle $< 98\%$ and average over on/off periods with duty factor
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.4 Method AVGPS-1A. (alternative).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPS-2A. (alternative)
<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPS-3A. (alternative)
<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:
<input checked="" type="checkbox"/> Option 1: Measure and sum the spectra across the outputs. Refer as FCC 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.
<input type="checkbox"/> Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,

- | | |
|--|--|
| | <input type="checkbox"/> Option 3: Measure and add $10 \log(N)$ dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with $10 \log(N)$. Or each transmit chains shall be add $10 \log(N)$ to compared with the limit. |
|--|--|

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Refer as Appendix C

3.4 Emissions in Non-restricted Frequency Bands

3.4.1 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
<p>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.</p> <p>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.</p>	

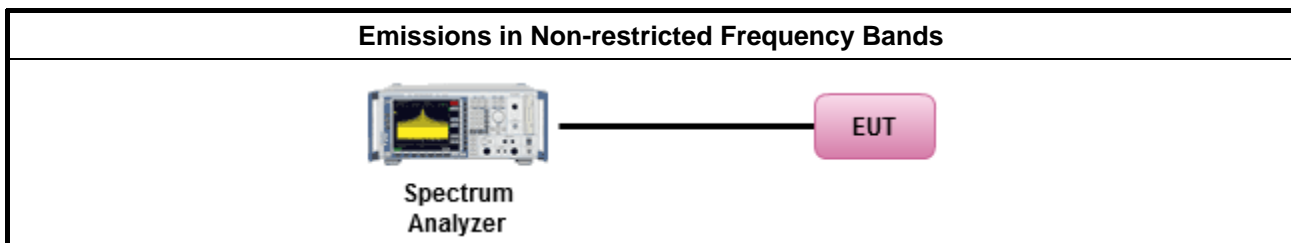
3.4.2 Measuring Instruments

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"> Refer as FCC KDB 558074, clause 8.5 for unwanted emissions into non-restricted bands.

3.4.4 Test Setup



3.4.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix D



3.5 Emissions in Restricted Frequency Bands

3.5.1 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.

3.5.2 Measuring Instruments

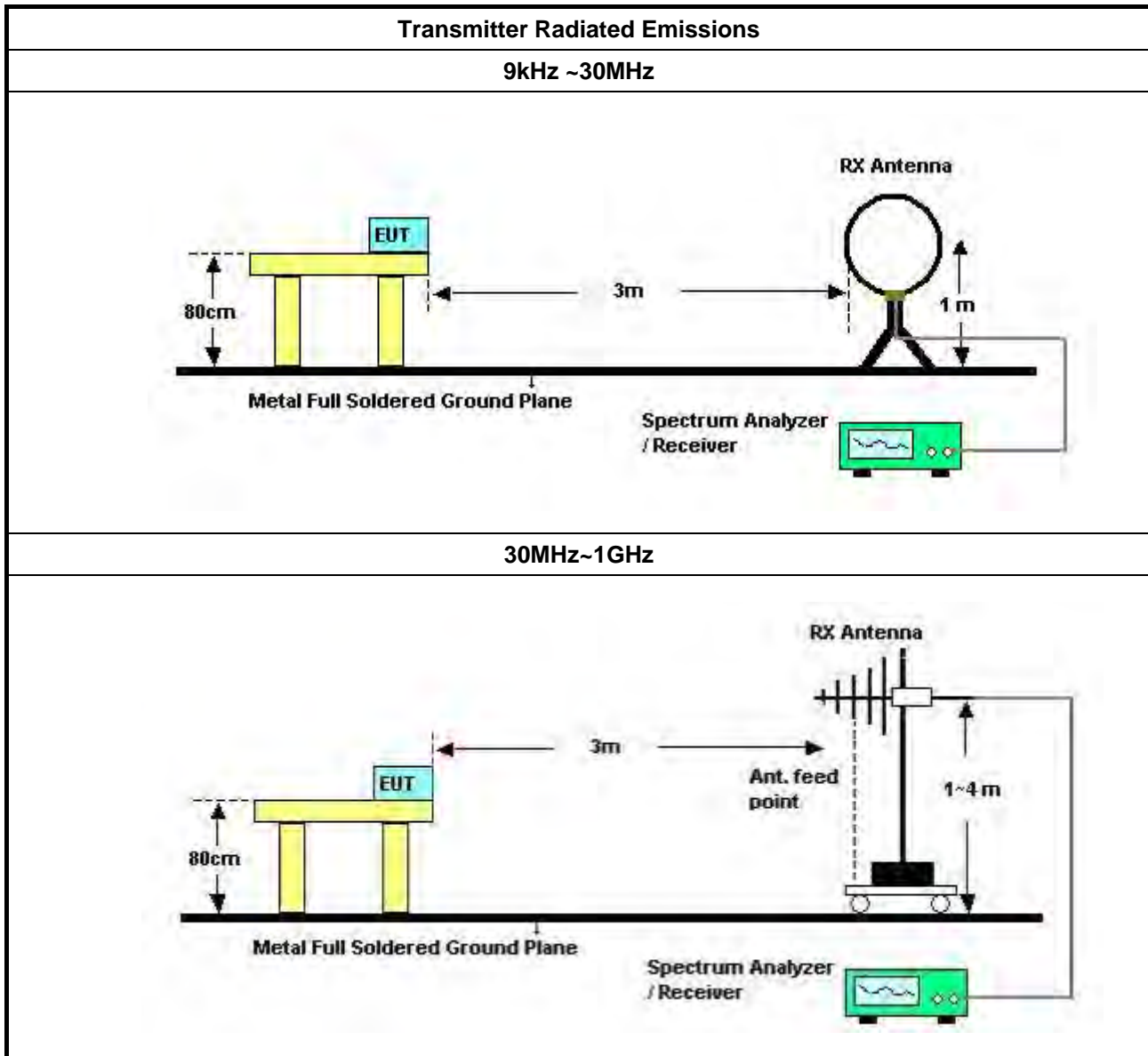
Refer a test equipment and calibration data table in this test report.

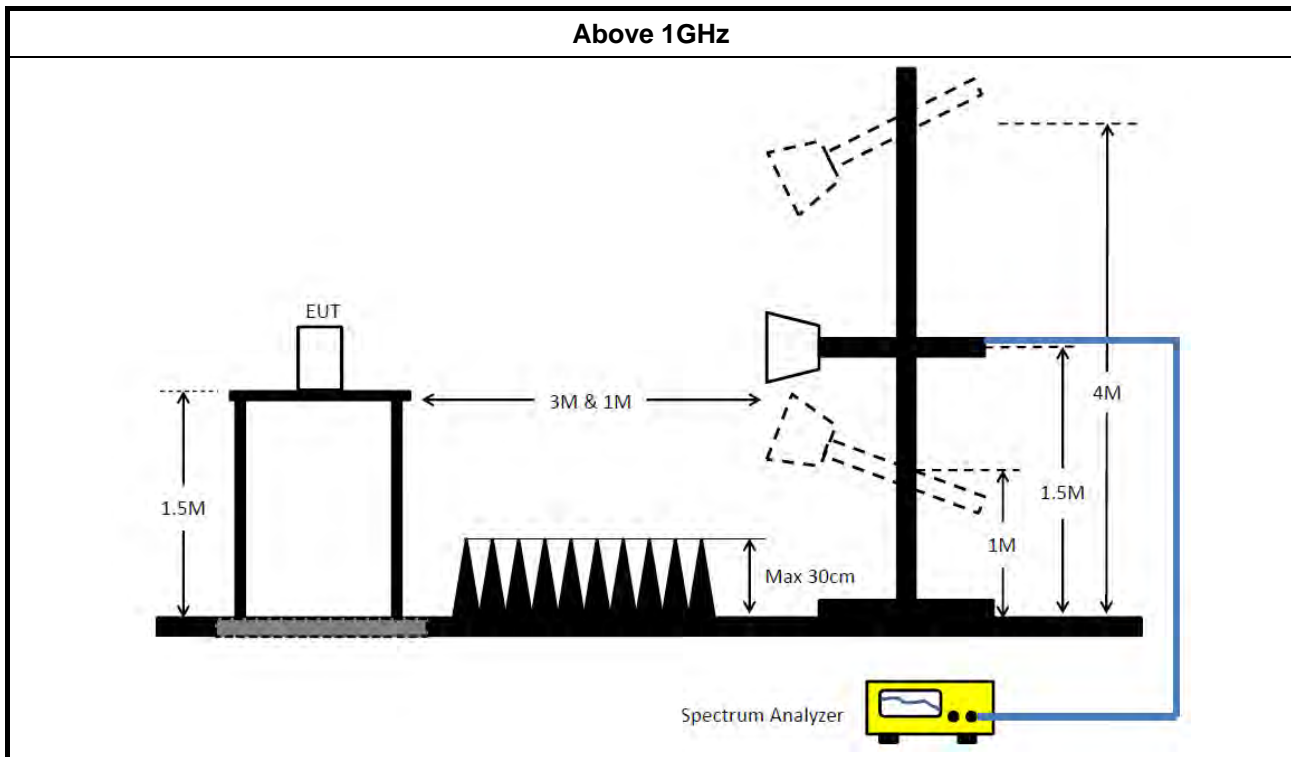


3.5.3 Test Procedures

Test Method	
<ul style="list-style-type: none"> The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor]. 	
<ul style="list-style-type: none"> Refer as ANSI C63.10, clause 6.9.2.2 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 FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle $\geq 98\%$).
	<input type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW $\geq 1/T$).
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$, where T is pulse time.
	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
	<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
<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 FCC KDB 558074 clause 8.7 & c63.10 clause 11.13.1, 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.
	<ul style="list-style-type: none"> Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.
	<ul style="list-style-type: none"> Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
	<ul style="list-style-type: none"> For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB
	<ul style="list-style-type: none"> For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

3.5.4 Test Setup





3.5.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

3.5.6 Test Result of Transmitter Radiated Unwanted Emissions

Refer as Appendix E



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 23, 2017	Nov. 22, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100354	9kHz ~ 2.75GHz	Dec. 08, 2017	Dec. 07, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 21, 2017	Dec. 20, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz ~ 26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz ~ 26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz ~ 26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz ~ 26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz ~ 26.5 GHz	Oct. 11, 2017	Oct. 10, 2018	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 20, 2017	Nov. 19, 2018	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
902-928MHz	-	-	-	-	-
2FSK_Nss1_1TX	543.75k	671.25k	671KD1D	541.25k	658.75k

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;

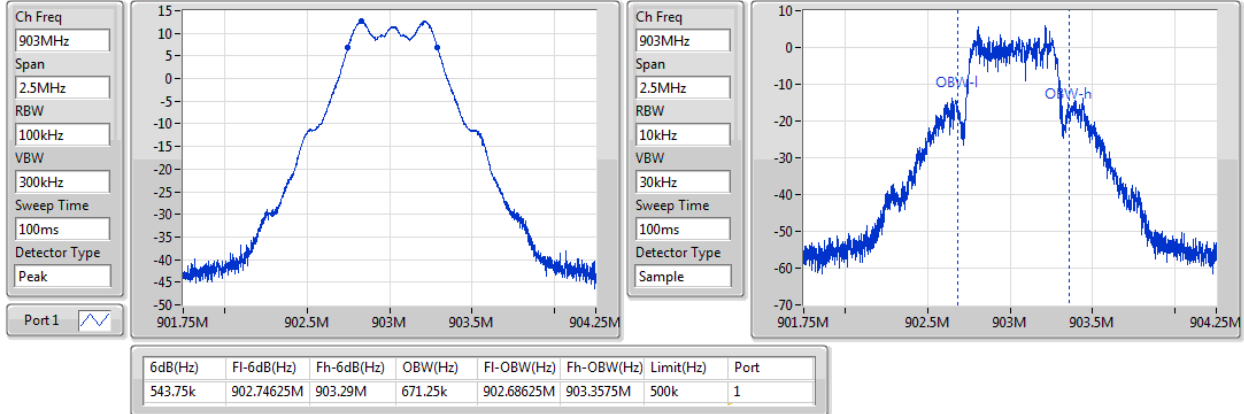
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
2FSK_Nss1_1TX	-	-	-	-
903MHz	Pass	500k	543.75k	671.25k
915MHz	Pass	500k	543.75k	658.75k
927MHz	Pass	500k	541.25k	665k

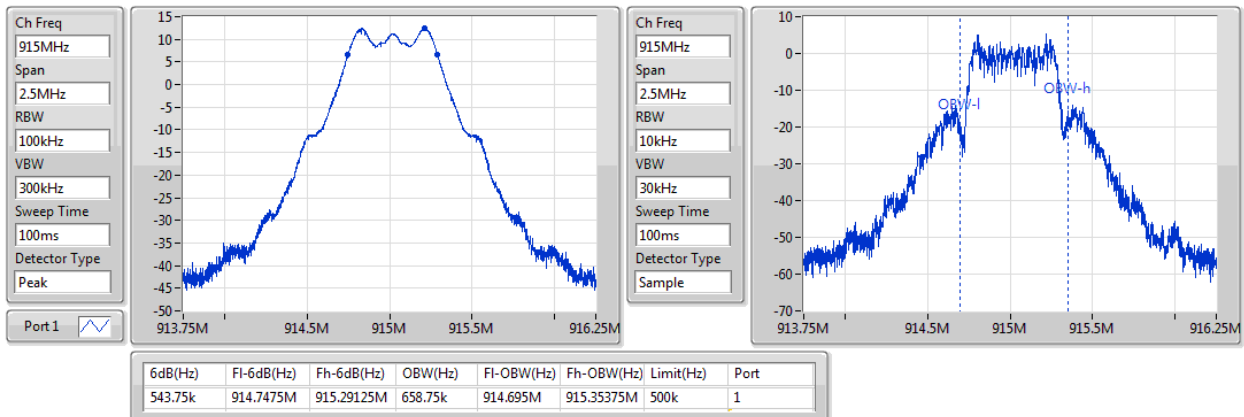
Port X-N dB = Port X 6dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

2FSK_Nss1_1TX
EBW
903MHz

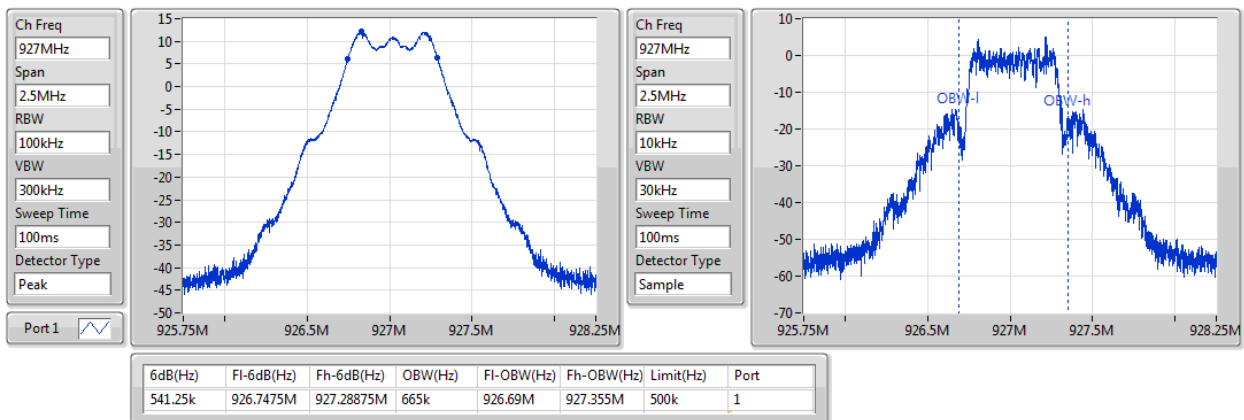
15/09/2018


2FSK_Nss1_1TX
EBW
915MHz

15/09/2018


2FSK_Nss1_1TX
EBW
927MHz

15/09/2018



**Summary**

Mode	Total Power (dBm)	Total Power (W)
902-928MHz	-	-
2FSK_Nss1_1TX	11.90	0.01549

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)
2FSK_Nss1_1TX	-	-	-	-	-
903MHz	Pass	-4.03	11.9	11.90	30.00
915MHz	Pass	-4.03	11.5	11.50	30.00
927MHz	Pass	-4.03	11.22	11.22	30.00

DG = Directional Gain; Port X = Port X output power

Note : Conducted average output power is for reference only

Summary

Mode	PD (dBm/RBW)
902-928MHz	-
2FSK_Nss1_1TX	0.36

RBW=3kHz.

Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
2FSK_Nss1_1TX	-	-	-	-	-
903MHz	Pass	-4.03	-0.19	-0.19	8.00
915MHz	Pass	-4.03	0.36	0.36	8.00
927MHz	Pass	-4.03	0.06	0.06	8.00

DG = Directional Gain; RBW=3kHz;

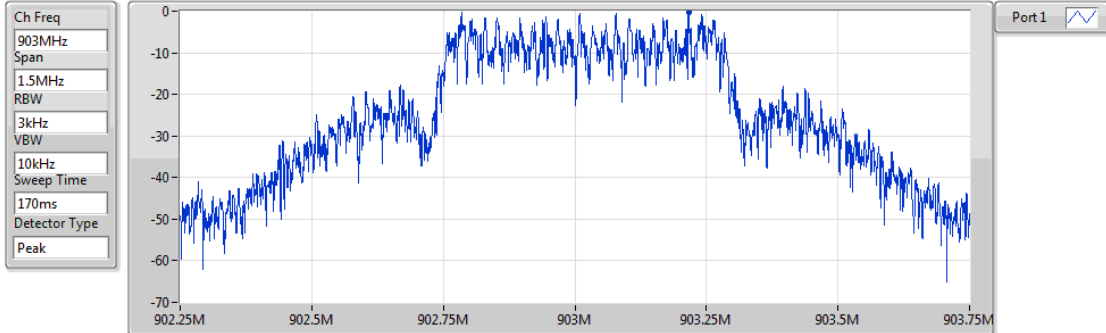
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port Xpower density;

2FSK_Nss1_1TX

PSD

903MHz

15/09/2018



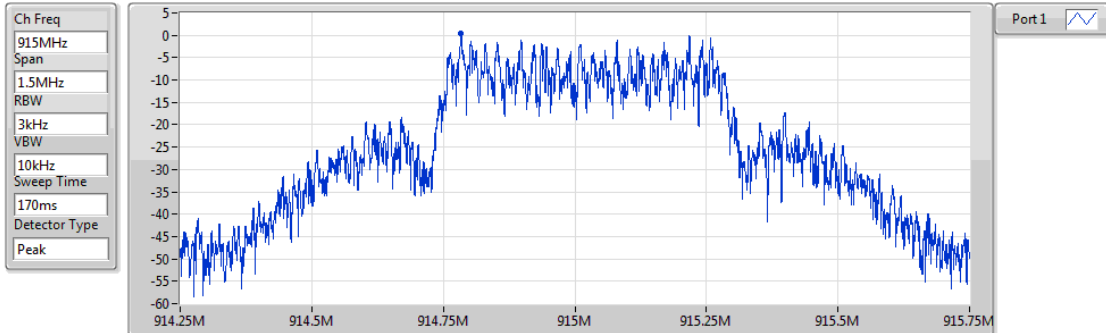
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-0.19	-0.19	-0.19

2FSK_Nss1_1TX

PSD

915MHz

15/09/2018



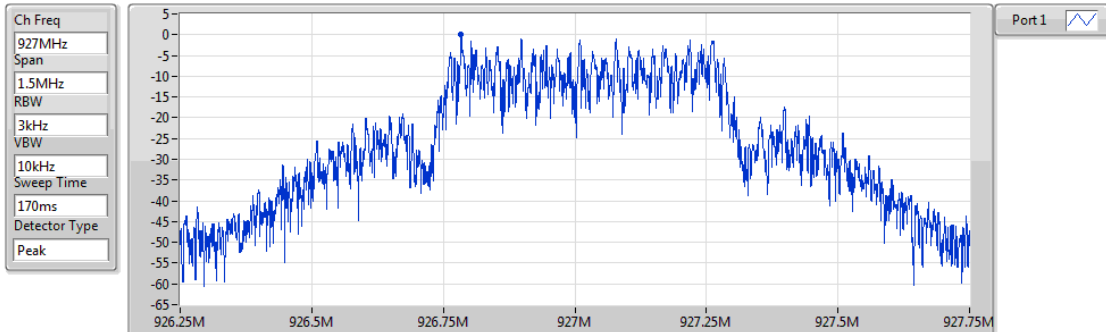
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
0.36	0.36	0.36

2FSK_Nss1_1TX

PSD

927MHz

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Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
0.06	0.06	0.06

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
902-928MHz	-	-	-	-	-	-	-	-	-	-	-	-	-
2FSK_Nss1_1TX	Pass	902.78M	-8.39	-28.39	900M	-70.97	901.992M	-60.96	929.924M	-73.02	3.151016G	-65.80	1

Result

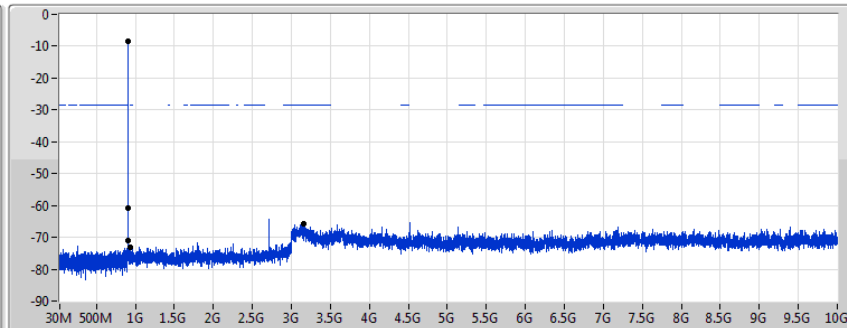
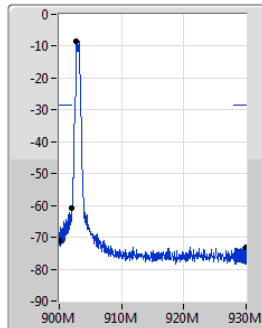
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2FSK_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
903MHz	Pass	902.78M	-8.39	-28.39	900M	-70.97	901.992M	-60.96	929.924M	-73.02	3.151016G	-65.80	1
915MHz	Pass	902.78M	-8.39	-28.39	572.88M	-73.17	900.34M	-72.68	929.08M	-72.39	3.095463G	-65.41	1
927MHz	Pass	902.78M	-8.39	-28.39	693.375M	-73.47	900.928M	-72.14	928.216M	-61.34	3.216774G	-65.12	1

2FSK_Nss1_1TX

CSE NdB

903MHz

15/09/2018



Port1 

RBW VSW
100kHz 300kHz
Detector Type
Peak

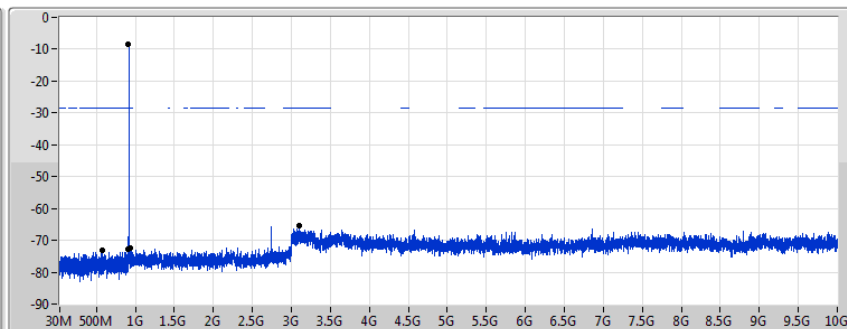
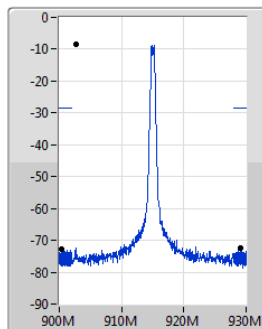
Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
902.78M	-8.39	-28.39	900M	-70.97	901.992M	-60.96	929.924M	-73.02	3.151016G	-65.80	1

2FSK_Nss1_1TX

CSE NdB

915MHz

15/09/2018



Port1 

RBW VSW
100kHz 300kHz
Detector Type
Peak

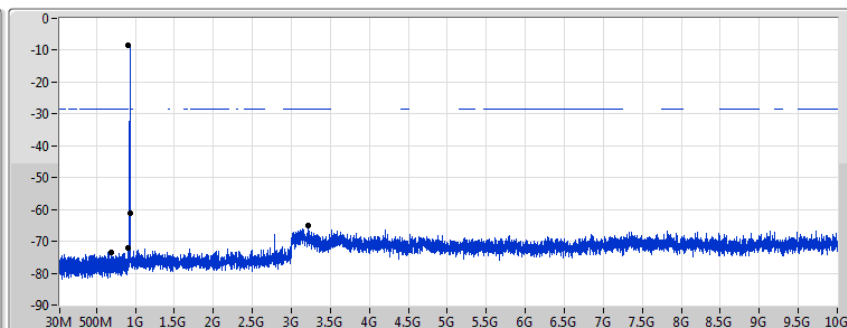
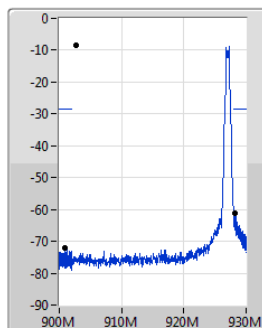
Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
902.78M	-8.39	-28.39	572.88M	-73.17	900.34M	-72.68	929.08M	-72.39	3.095463G	-65.41	1

2FSK_Nss1_1TX

CSE NdB

927MHz

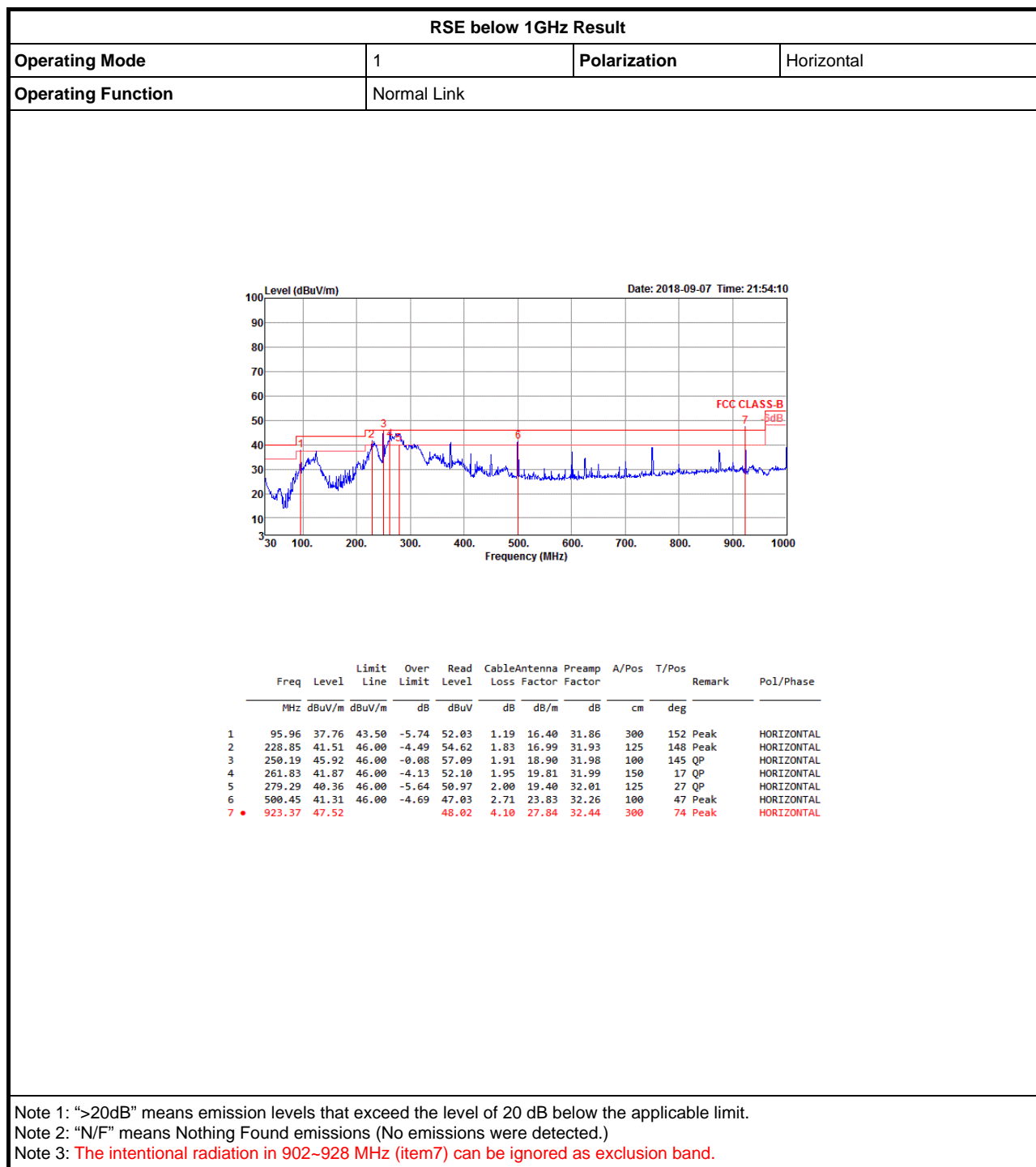
15/09/2018

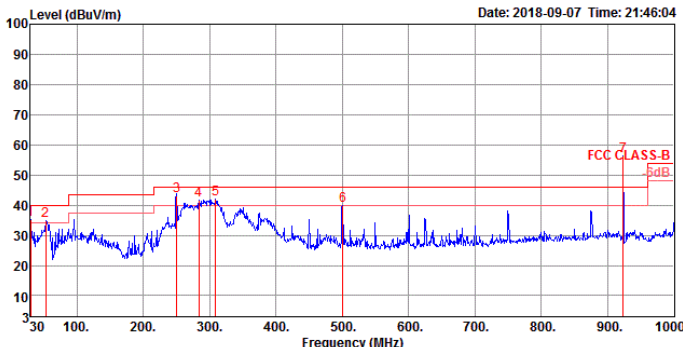


Port1 

RBW VSW
100kHz 300kHz
Detector Type
Peak

Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
902.78M	-8.39	-28.39	693.375M	-73.47	900.928M	-72.14	928.216M	-61.34	3.216774G	-65.12	1



RSE below 1GHz Result																																																																																																																														
Operating Mode	1				Polarization				Vertical																																																																																																																					
Operating Function	Normal Link																																																																																																																													
<div><div><div>Level (dBuV/m)</div><div>Date: 2018-09-07 Time: 21:46:04</div></div><table><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>CableAntenna</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th><th>Pol/Phase</th></tr><tr><th></th><th>MHz</th><th>dBuV/m</th><th>dBuV/m</th><th>dB</th><th>dBuV</th><th>dB</th><th>dB/m</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>30.00</td><td>35.24</td><td>40.00</td><td>-4.76</td><td>40.27</td><td>0.70</td><td>25.70</td><td>31.43</td><td>150</td><td>258</td><td>Peak</td><td>VERTICAL</td></tr><tr><td>2</td><td>53.28</td><td>34.77</td><td>40.00</td><td>-5.23</td><td>51.62</td><td>0.89</td><td>14.04</td><td>31.78</td><td>100</td><td>284</td><td>Peak</td><td>VERTICAL</td></tr><tr><td>3</td><td>250.19</td><td>42.98</td><td>46.00</td><td>-3.02</td><td>54.15</td><td>1.91</td><td>18.90</td><td>31.98</td><td>200</td><td>160</td><td>QP</td><td>VERTICAL</td></tr><tr><td>4</td><td>284.14</td><td>41.79</td><td>46.00</td><td>-4.21</td><td>52.30</td><td>2.02</td><td>19.48</td><td>32.01</td><td>200</td><td>30</td><td>Peak</td><td>VERTICAL</td></tr><tr><td>5</td><td>309.36</td><td>41.88</td><td>46.00</td><td>-4.12</td><td>51.74</td><td>2.10</td><td>20.05</td><td>32.01</td><td>150</td><td>172</td><td>Peak</td><td>VERTICAL</td></tr><tr><td>6</td><td>500.45</td><td>39.89</td><td>46.00</td><td>-6.11</td><td>45.61</td><td>2.71</td><td>23.83</td><td>32.26</td><td>125</td><td>197</td><td>Peak</td><td>VERTICAL</td></tr><tr><td>7</td><td>923.37</td><td>56.21</td><td></td><td></td><td>56.71</td><td>4.10</td><td>27.84</td><td>32.44</td><td>125</td><td>147</td><td>Peak</td><td>VERTICAL</td></tr></table></div>													Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		1	30.00	35.24	40.00	-4.76	40.27	0.70	25.70	31.43	150	258	Peak	VERTICAL	2	53.28	34.77	40.00	-5.23	51.62	0.89	14.04	31.78	100	284	Peak	VERTICAL	3	250.19	42.98	46.00	-3.02	54.15	1.91	18.90	31.98	200	160	QP	VERTICAL	4	284.14	41.79	46.00	-4.21	52.30	2.02	19.48	32.01	200	30	Peak	VERTICAL	5	309.36	41.88	46.00	-4.12	51.74	2.10	20.05	32.01	150	172	Peak	VERTICAL	6	500.45	39.89	46.00	-6.11	45.61	2.71	23.83	32.26	125	197	Peak	VERTICAL	7	923.37	56.21			56.71	4.10	27.84	32.44	125	147	Peak	VERTICAL
	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase																																																																																																																			
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg																																																																																																																				
1	30.00	35.24	40.00	-4.76	40.27	0.70	25.70	31.43	150	258	Peak	VERTICAL																																																																																																																		
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4	284.14	41.79	46.00	-4.21	52.30	2.02	19.48	32.01	200	30	Peak	VERTICAL																																																																																																																		
5	309.36	41.88	46.00	-4.12	51.74	2.10	20.05	32.01	150	172	Peak	VERTICAL																																																																																																																		
6	500.45	39.89	46.00	-6.11	45.61	2.71	23.83	32.26	125	197	Peak	VERTICAL																																																																																																																		
7	923.37	56.21			56.71	4.10	27.84	32.44	125	147	Peak	VERTICAL																																																																																																																		
<div><div>Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.</div><div>Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)</div><div>Note 3: The intentional radiation in 902~928 MHz (item7) can be ignored as exclusion band.</div></div>																																																																																																																														



RSE TX above 1GHz Result

Appendix E.2

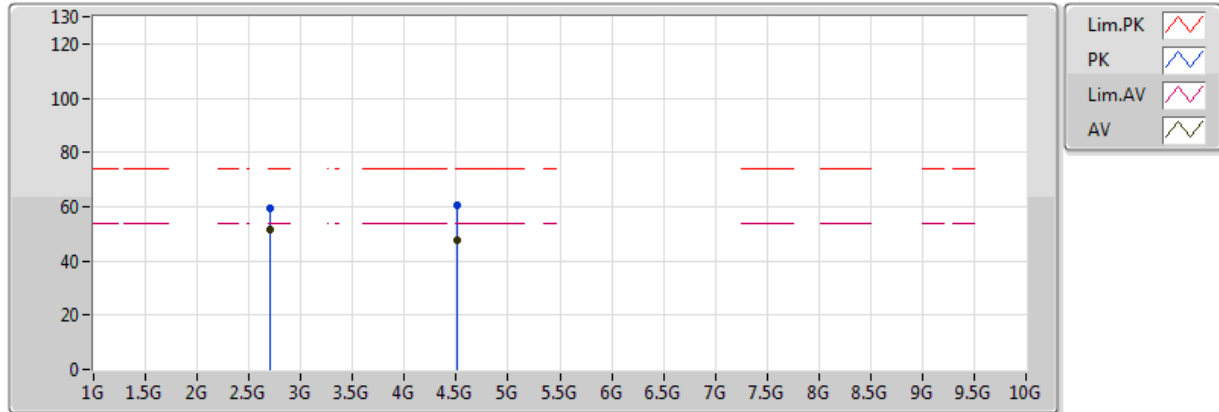
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
902-928MHz	-	-	-	-	-	-	-	-	-	-	-	-
2FSK_Nss1_1TX	Pass	AV	4.63556G	53.74	54.00	-0.26	4.74	3	Horizontal	182	2.52	-

2FSK_Nss1_1TX

903MHz_TX

10/09/2018



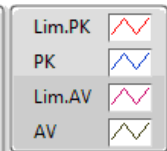
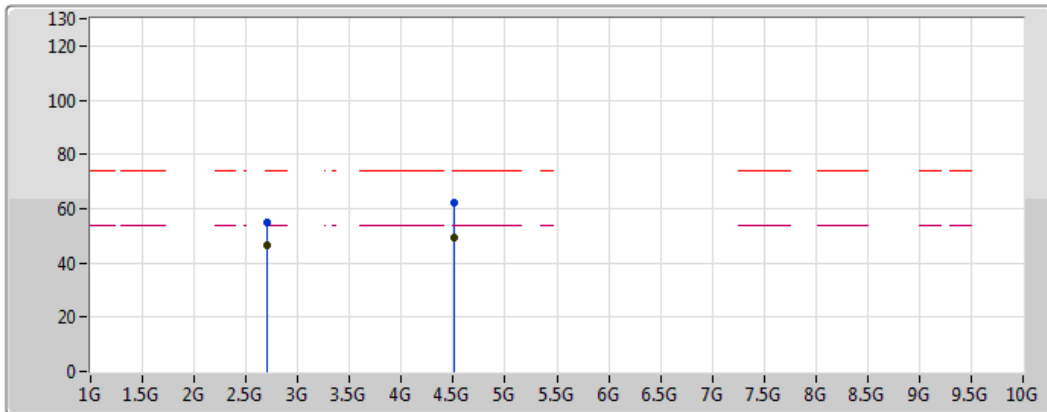
EUT Y_1TX
Setting 11
03-J-1
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.70849G	59.17	74.00	-14.83	-0.91	3	Vertical	158	1.50	-
AV	2.70908G	51.74	54.00	-2.26	-0.91	3	Vertical	158	1.50	-
PK	4.51608G	60.34	74.00	-13.66	4.35	3	Vertical	315	1.10	-
AV	4.5158G	47.55	54.00	-6.45	4.35	3	Vertical	315	1.10	-

2FSK_Nss1_1TX

903MHz_TX

10/09/2018



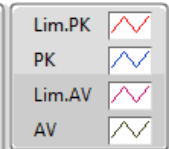
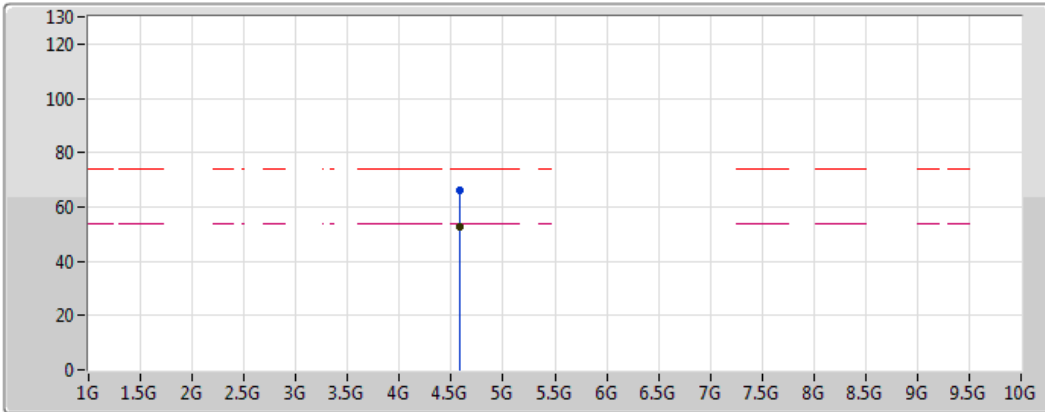
EUT Y_1TX
Setting 11
03-J-1
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.708536G	54.71	74.00	-19.29	-0.91	3	Horizontal	165	1.29	-
AV	2.709092G	46.63	54.00	-7.37	-0.91	3	Horizontal	165	1.29	-
PK	4.51612G	62.33	74.00	-11.67	4.35	3	Horizontal	360	2.53	-
AV	4.51576G	49.06	54.00	-4.94	4.35	3	Horizontal	360	2.53	-

2FSK_Nss1_1TX

915MHz_TX

10/09/2018



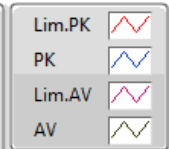
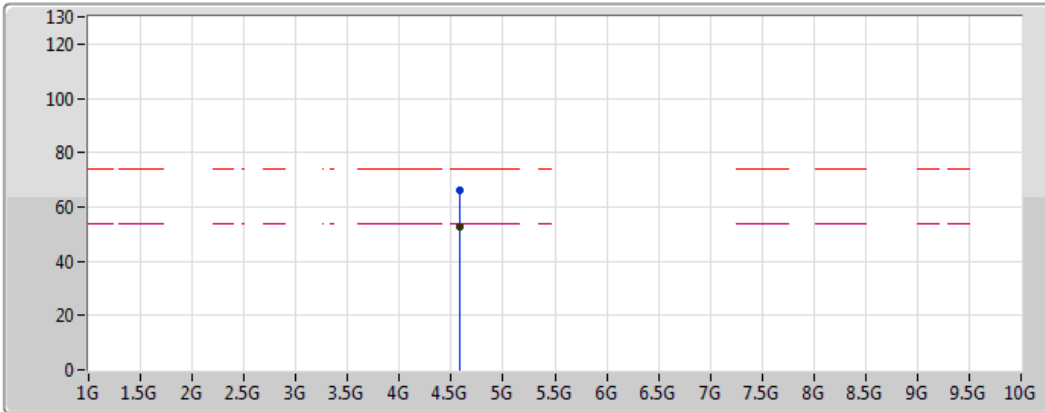
EUT Y_1TX
Setting 11
03-J-1
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.57612G	66.06	74.00	-7.94	4.58	3	Vertical	308	1.13	-
AV	4.5756G	52.70	54.00	-1.30	4.58	3	Vertical	308	1.13	-

2FSK_Nss1_1TX

915MHz_TX

10/09/2018



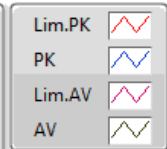
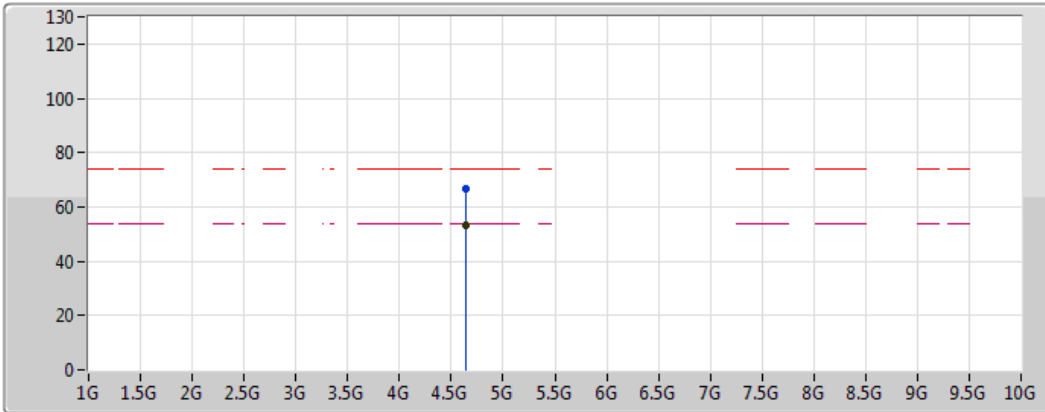
EUT Y_1TX
Setting 11
03-J-1
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.57616G	66.13	74.00	-7.87	4.58	3	Horizontal	344	2.61	-
AV	4.5756G	52.84	54.00	-1.16	4.58	3	Horizontal	344	2.61	-

2FSK_Nss1_1TX

927MHz_TX

10/09/2018



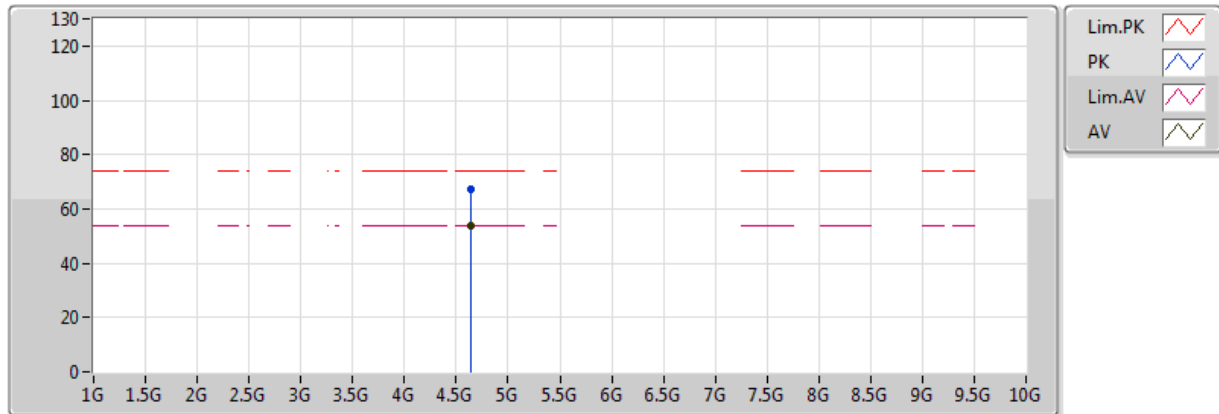
EUT Y_1TX
Setting 11
03-E-2
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.63415G	66.74	74.00	-7.26	4.73	3	Vertical	160	2.33	-
AV	4.63556G	53.41	54.00	-0.59	4.74	3	Vertical	160	2.33	-

2FSK_Nss1_1TX

927MHz_TX

10/09/2018



EUT Y_1TX
Setting 11
03-E-2
FSP

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	4.63415G	67.04	74.00	-6.96	4.73	3	Horizontal	182	2.52	-
AV	4.63556G	53.74	54.00	-0.26	4.74	3	Horizontal	182	2.52	-