Testing Laboratory 1190

FCC Test Report

FCC ID	**:**	**PPQ-L-HUB-01**
Contains ID	**:**	**WS2-WG7833B0**
Equipment	**:**	**Locix Outdoor Hub**
Brand Name	**:**	**LOCIX**
Model Name	**:**	**L-HUB-01-IP65, L-HUB-01**
Applicant	**:**	**LITE-ON Technology Corp. Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C**
Manufacturer	**:**	**LITE-ON Network Communication (Dongguan) Limited 30#Keji Rd.,Yin Hu Industrial Area,Qingxi Town,DongGuan City,Guangdong,China**
Standard	**:**	**47 CFR FCC Part 15.247**

The product was received on Sep. 05, 2018, and testing was started from Sep. 18, 2018 and completed on Sep. 20, 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.

Allen Lin

Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR862001-01AF	01	Initial issue of report	Oct. 08, 2018
FR862001-01AF	02	Update Description of EUT's material in 1.1.5 section. This report is the latest version replacing for the report issued on Oct. 08, 2018	Oct. 11, 2018

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

Reviewed by: Sam Tsai

Report Producer: Debby Hung

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Modulation	Ch. Frequency (MHz)	Channel Number
902-928	2-GFSK	923.6-927.6	5

Band	Mode	BWch (MHz)	Nant
902-928MHz	GFSK	0.5	1TX

Note:
- 902-928 MHz Band uses a combination of 2-GFSK modulation.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Model Name:L-HUB-01-IP65

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Walsin Technology Corporation	RFDPA161300SBBB801	Dipole antenna	I-PEX	0.05

Model Name: L-HUB-01

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Walsin Technology Corporation	RFDPA870900SBBB803	Dipole antenna	I-PEX	0.05

For 923-928MHz function:

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

1.1.3 EUT Information

Identify EUT			
RF Chip	TI/CC1310		
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) ≥ 1/T
GFSK	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)

1.1.5 Table for Multiple Listing

The brand/model names in the following table are all refer to the identical product.

Brand Name	Model Name	Enclosure	Description
LOCIX	L-HUB-01-IP65	Black	All models are identical, including the material. The only differences are enclosure color and white device's antenna can be bent.
	L-HUB-01	White	

Note : The model : L-HUB-01-IP65 was chosen and 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 v05

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
RF Conducted	TH01-HY	Andy	25.5°C / 64.5%	20/Sep/2018
Radiated	03CH02-HY	Terry	25°C / 57%	19/Sep/2018
AC Conduction	CO04-HY	Daniel	23.1°C / 52%	18/Sep/2018

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)	3.6 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.0 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 ℃	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	Setup_SmartRF_Studio_7-2.8.0

Mode	PowerSetting
GFSK	-
923.6MHz	11
925.6MHz	11
927.6MHz	4

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

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	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT			V

2.4 Accessories

Accessories				
AC Adapter	Brand Name	Asian Power Devices Inc.	Model Name	WB-10E05FU
	Power Rating	I/P: 100 - 240Vac,50-60Hz, 0.4 A Max. O/P: 5 Vdc, 2 A		
	Power Cord	1.8 meter, Non-Shielded cable, w/o ferrite core		

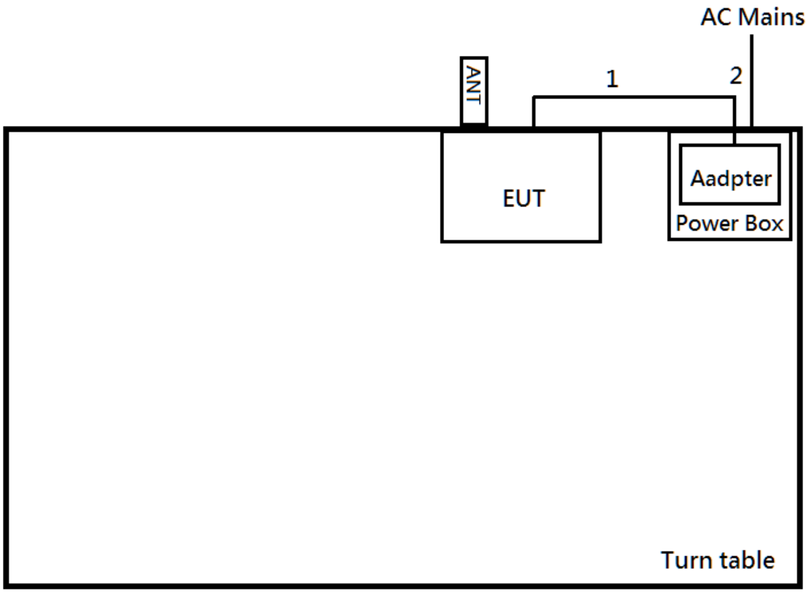
Reminder: Regarding to more detail and other information, please refer to user manual.

2.5 Support Equipment

Support Equipment – RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	R33002 / DOC
2	Adapter for NB	DELL	HA65NM130	R35737 / DOC
3	AC Power Source	GW	APS-9102	-

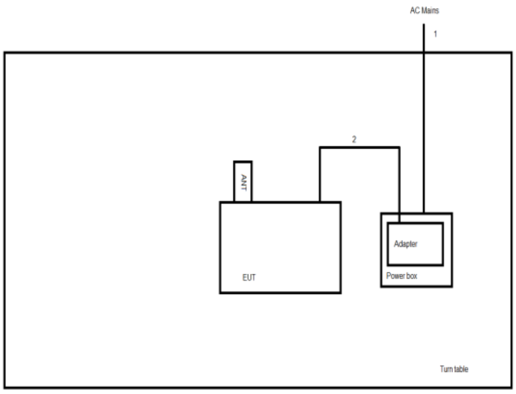
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1	DC Power line	No	1.8	-
2	AC Power line	No	1.0	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power line	No	1.5	-
2	DC Power line	No	1.8	-

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

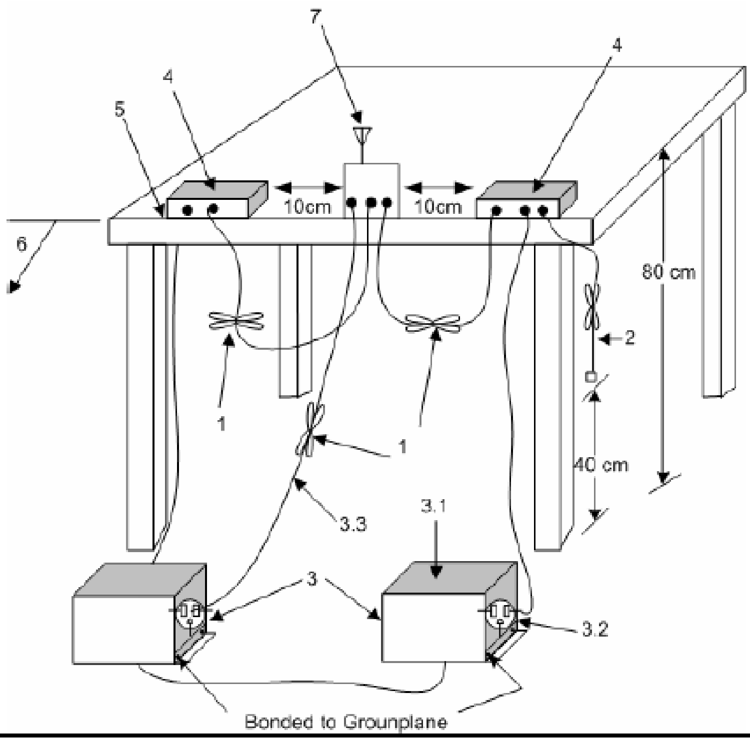
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

3.1.4 Test Setup

AC Power-line Conducted Emissions



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 ≥ 500 kHz.

3.2.2 Measuring Instruments

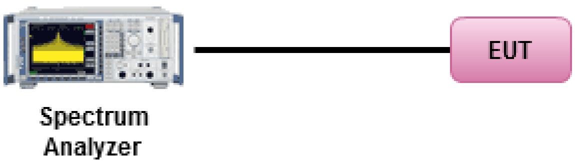
Refer a test equipment and calibration data table in this test report.

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 (11.9.2.2 of ANSI C63.10) DTS bandwidth measurement.
	☐ Refer as RSS-Gen, clause 6.7 for for occupied bandwidth testing.
	☐ Refer as ANSI C63.10, clause 6.9.3 for occupied bandwidth testing.

3.2.4 Test Setup

Emission Bandwidth



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 $G_{TX} \le 6$ dBi, then $P_{Out} \le 30$ 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): $P_{eirp} \le 36$ dBm (4 W)	
	▪ Point-to-point systems (P2P): $P_{eirp} \le \mathrm{MAX}(36, [P_{Out} + G_{TX}])$ dBm	
	▪ Smart antenna system (SAS)	
		- Single beam: $P_{eirp} \le \mathrm{MAX}(36, P_{Out} + G_{TX})$ dBm
		- Overlap beam: $P_{eirp} \le \mathrm{MAX}(36, P_{Out} + G_{TX})$ dBm
		- Aggregate power on all beams: $P_{eirp} \le \mathrm{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm
$\mathbf{P_{Out}}$ = maximum peak conducted output power or maximum conducted output power in dBm, $\mathbf{G_{TX}}$ = the maximum transmitting antenna directional gain in dBi.		

3.3.2 Measuring Instruments

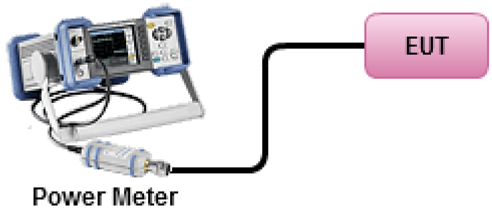
Refer a test equipment and calibration data table in this test report.

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: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup

Maximum Conducted Output Power (Power Meter)



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

Power Spectral Density

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

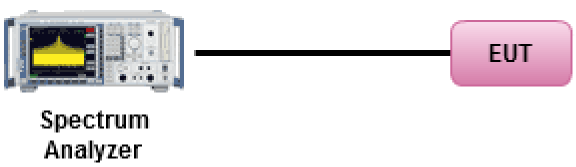
Refer a test equipment and calibration data table in this test report.

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

Emissions in Non-restricted Frequency Bands



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.

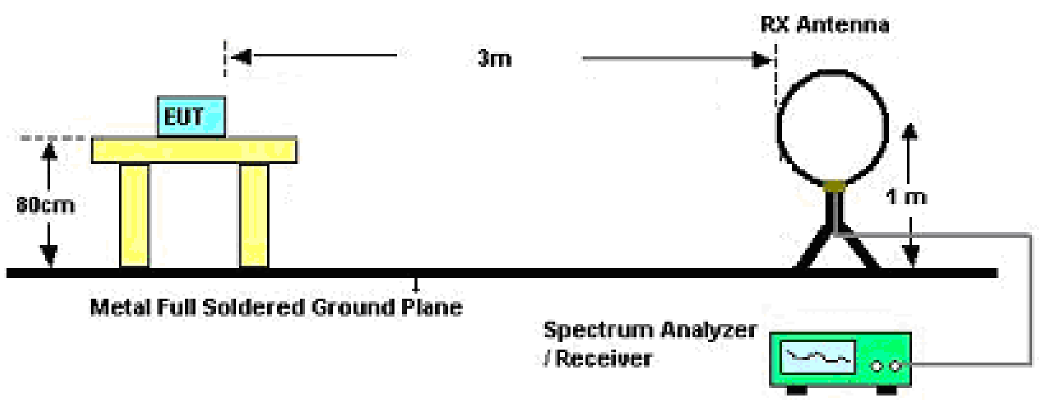
3.6.3 Test Procedures

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).

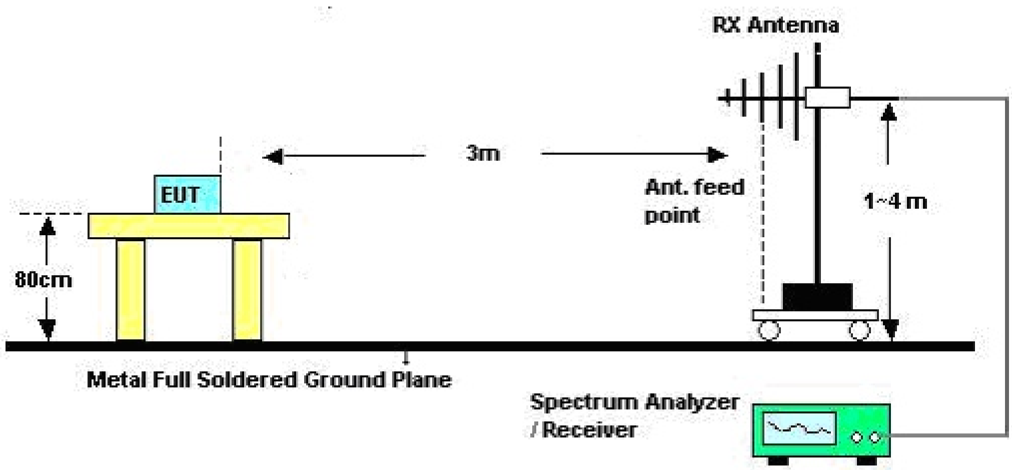
3.6.4 Test Setup

Transmitter Radiated Emissions

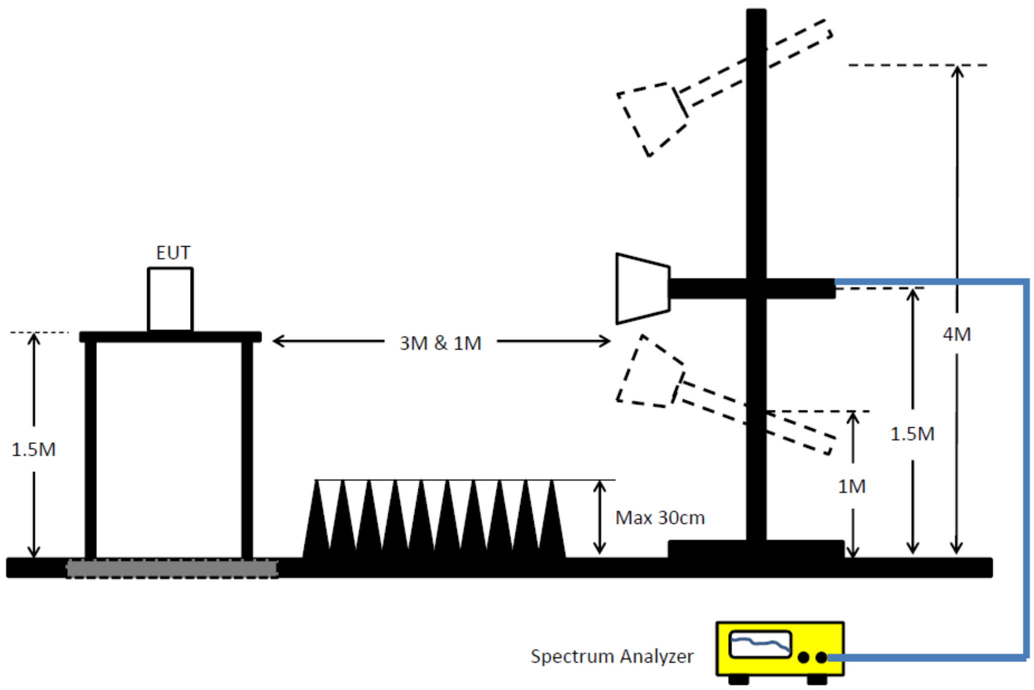
9kHz ~30MHz



30MHz~1GHz



Above 1GHz



3.6.5 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.

3.6.6 Test Result of Transmitter Radiated Unwanted Emissions

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	17/Nov/2017	16/Nov/2018
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	06/Oct/2017	05/Oct/2018
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/2017	11/Oct/2018

NCR : Non-Calibration Require

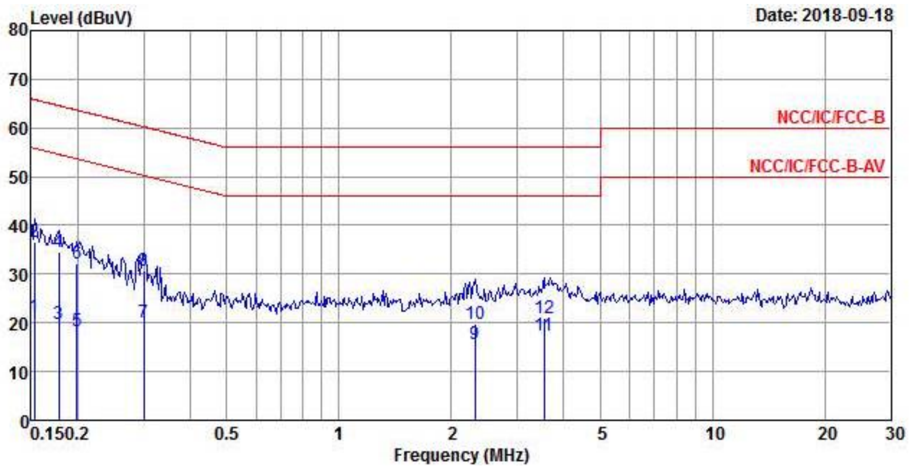
Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	31/Oct/2017	30/Oct/2018
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 18GHz 3m	27/Oct/2017	26/Oct/2018
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	27Jul/2018	02/Jul/2019
Microwave Preamplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	28/Sep/2017	27/Sep/2018
Spectrum Analyzer	Rohde & Schwarz	FSP40	100593	9KHz - 40GHz	12/Dec/2017	11/Dec/2018
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100354	9kHz ~ 2.75GHz	08/Dec/2017	07/Dec/2018
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	19/Jan/2018	18/Jan/2019
RF Cable-high	SUHNER	SUCOFLEX104	MY34918/4	1GHz ~ 40GHz	19/Jan/2018	18/Jan/2019
Bilog Antenna & 5db Attenuator	SCHAFFNER/ MTJ	CBL6112D / MTJ6102-05	2678 / 001	30MHz ~ 2GHz	07/Jul/2018	06/Jul/2019
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	29/Mar/2018	28/Mar/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA 9120 D 1531	1GHz ~ 18GHz	18/Apr/ 2018	17/Apr/2019

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
Power Sensor	Anritsu	MA2411B	1339407	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
Power Meter	Anritsu	ML2495A	1517010	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
RF Cable-1.5m	HUBER+SUHNER	SUCOFLEX_104	MY12585/4	30MHz ~ 26.5GHz	26/Jan/2018	25/Jan/2019
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10710/4	30MHz ~ 26.5GHz	26/Jan/2018	25/Jan/2019
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10709/4	30MHz ~ 26.5GHz	26/Jan/2018	25/Jan/2019
Signal Generator	R&S	SMB100A	175727	100kHz~40GHz	26/Oct/2017	25/Oct/2018

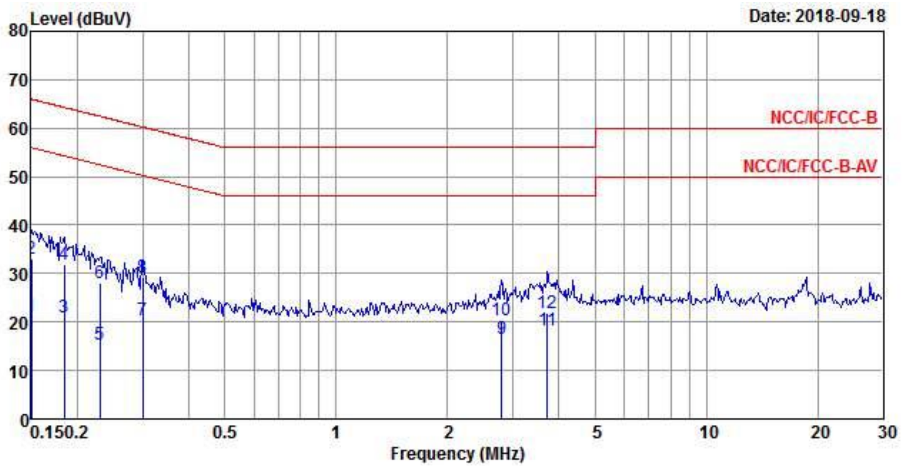
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	Adapter mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	21.11	-34.71	55.82	11.44	9.63	0.04	Average
2	0.15	36.56	-29.26	65.82	26.89	9.63	0.04	QP
3	0.18	19.67	-34.92	54.59	10.03	9.62	0.02	Average
4	0.18	34.60	-29.99	64.59	24.96	9.62	0.02	QP
5	0.20	18.30	-35.37	53.67	8.68	9.62	0.00	Average
6	0.20	32.25	-31.42	63.67	22.63	9.62	0.00	QP
7	0.30	20.06	-30.18	50.24	10.39	9.61	0.06	Average
8	0.30	30.81	-29.43	60.24	21.14	9.61	0.06	QP
9	2.31	15.79	-30.21	46.00	6.14	9.63	0.02	Average
10	2.31	19.83	-36.17	56.00	10.18	9.63	0.02	QP
11 MAX	3.55	17.53	-28.47	46.00	7.82	9.64	0.07	Average
12	3.55	21.09	-34.91	56.00	11.38	9.64	0.07	QP

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	Adapter mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	21.25	-34.75	56.00	11.58	9.63	0.04	Average
2	0.15	32.96	-33.04	66.00	23.29	9.63	0.04	QP
3	0.18	20.86	-33.42	54.28	11.23	9.62	0.01	Average
4	0.18	32.01	-32.27	64.28	22.38	9.62	0.01	QP
5	0.23	15.47	-36.97	52.44	5.83	9.62	0.02	Average
6	0.23	27.98	-34.46	62.44	18.34	9.62	0.02	QP
7	0.30	20.25	-29.99	50.24	10.58	9.61	0.06	Average
8	0.30	29.29	-30.95	60.24	19.62	9.61	0.06	QP
9	2.79	16.53	-29.47	46.00	6.86	9.63	0.04	Average
10	2.79	20.32	-35.68	56.00	10.65	9.63	0.04	QP
11 MAX	3.72	18.26	-27.74	46.00	8.54	9.64	0.08	Average
12	3.72	21.70	-34.30	56.00	11.98	9.64	0.08	QP

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
902-928MHz	-	-	-	-	-
GFSK	519.375k	581.584k	582KF1D	516.875k	573.463k

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)
GFSK	-	-	-	-
923.6MHz_TnomVnom	Pass	500k	518.125k	581.584k
925.6MHz_TnomVnom	Pass	500k	516.875k	578.461k
927.6MHz_TnomVnom	Pass	500k	519.375k	573.463k

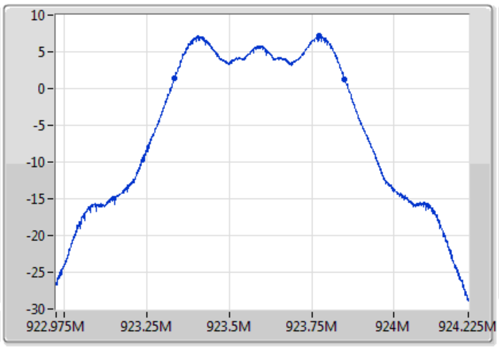
Port X-N dB = Port **X** 6dB down bandwidth; **Port X-OBW** = Port **X** 99% occupied bandwidth;

GFSK EBW

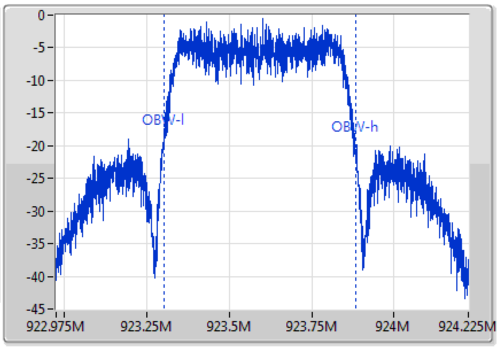
923.6MHz 20/09/2018

Ch Freq	923.6MHz
Span	1.25MHz
RBW	100kHz
VBW	300kHz
Sweep Time	100ms
Detector Type	Peak

Port 1



Ch Freq	923.6MHz
Span	1.25MHz
RBW	10kHz
VBW	30kHz
Sweep Time	100ms
Detector Type	Sample



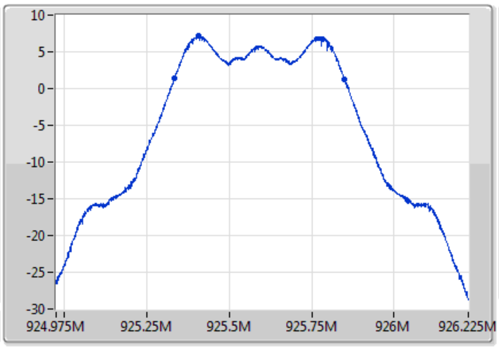
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
518.125k	923.3325M	923.850625M	581.584k	923.302024M	923.883608M	500k	1

GFSK EBW

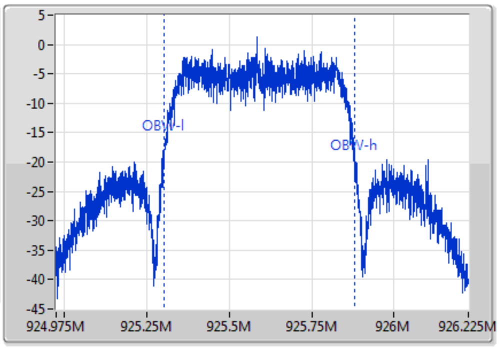
925.6MHz 20/09/2018

Ch Freq	925.6MHz
Span	1.25MHz
RBW	100kHz
VBW	300kHz
Sweep Time	100ms
Detector Type	Peak

Port 1



Ch Freq	925.6MHz
Span	1.25MHz
RBW	10kHz
VBW	30kHz
Sweep Time	100ms
Detector Type	Sample



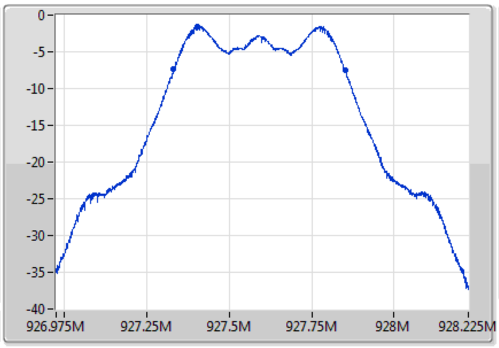
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
516.875k	925.333125M	925.85M	578.461k	925.302649M	925.881109M	500k	1

GFSK EBW

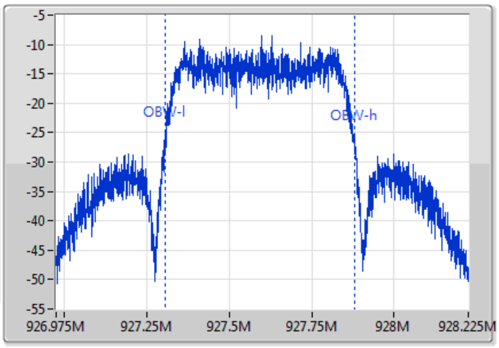
927.6MHz 20/09/2018

Ch Freq	927.6MHz
Span	1.25MHz
RBW	100kHz
VBW	300kHz
Sweep Time	100ms
Detector Type	Peak

Port 1



Ch Freq	927.6MHz
Span	1.25MHz
RBW	10kHz
VBW	30kHz
Sweep Time	100ms
Detector Type	Sample



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
519.375k	927.331875M	927.85125M	573.463k	927.305772M	927.879235M	500k	1

Summary

Mode	Power	Power
	(dBm)	(W)
902-928MHz	-	-
GFSK	9.93	0.00984

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
GFSK	-	-	-	-
923.6MHz_TnomVnom	Pass	0.05	9.93	30.00
925.6MHz_TnomVnom	Pass	0.05	9.90	30.00
927.6MHz_TnomVnom	Pass	0.05	0.99	30.00

Summary

Mode	PD (dBm/RBW)
902-928MHz	-
GFSK	-5.55

RBW=3kHz.

Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
GFSK	-	-	-	-
923.6MHz_TnomVnom	Pass	0.05	-5.55	8.00
925.6MHz_TnomVnom	Pass	0.05	-5.98	8.00
927.6MHz_TnomVnom	Pass	0.05	-13.97	8.00

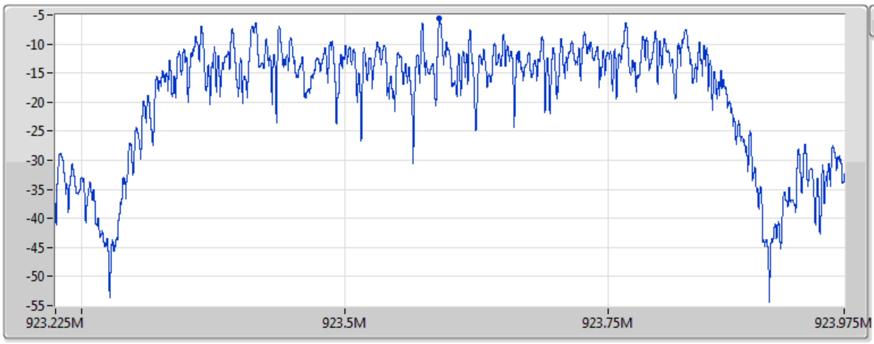
RBW=3kHz.

GFSK **PSD**

923.6MHz

20/09/2018

Ch Freq	923.6MHz
Span	750kHz
RBW	3kHz
VBW	10kHz
Sweep Time	32.1ms
Detector Type	Peak



Port 1

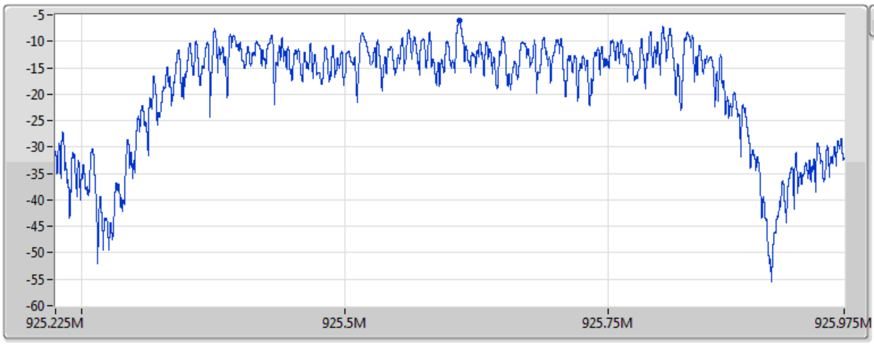
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.55	-5.55	-5.55

GFSK **PSD**

925.6MHz

20/09/2018

Ch Freq	925.6MHz
Span	750kHz
RBW	3kHz
VBW	10kHz
Sweep Time	32.1ms
Detector Type	Peak



Port 1

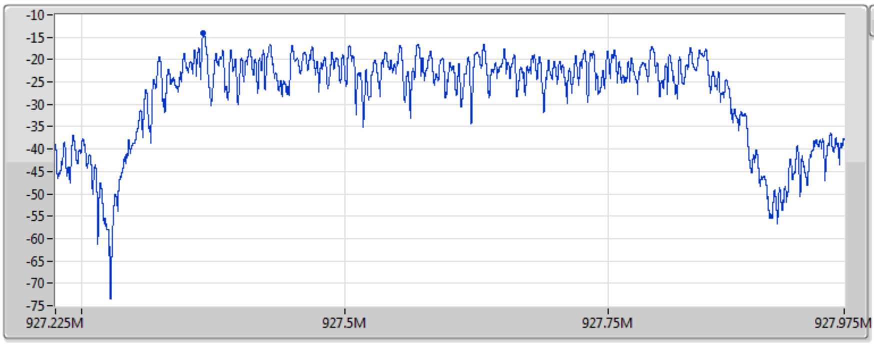
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.98	-5.98	-5.98

GFSK **PSD**

927.6MHz

20/09/2018

Ch Freq	927.6MHz
Span	750kHz
RBW	3kHz
VBW	10kHz
Sweep Time	32.1ms
Detector Type	Peak



Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.97	-13.97	-13.97

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	-	-	-	-	-	-	-	-	-	-	-	-	-
GFSK	Pass	923.424M	7.39	-22.61	463.758M	-52.32	901.326M	-57.40	928.008M	-22.71	6.978223G	-49.76	1

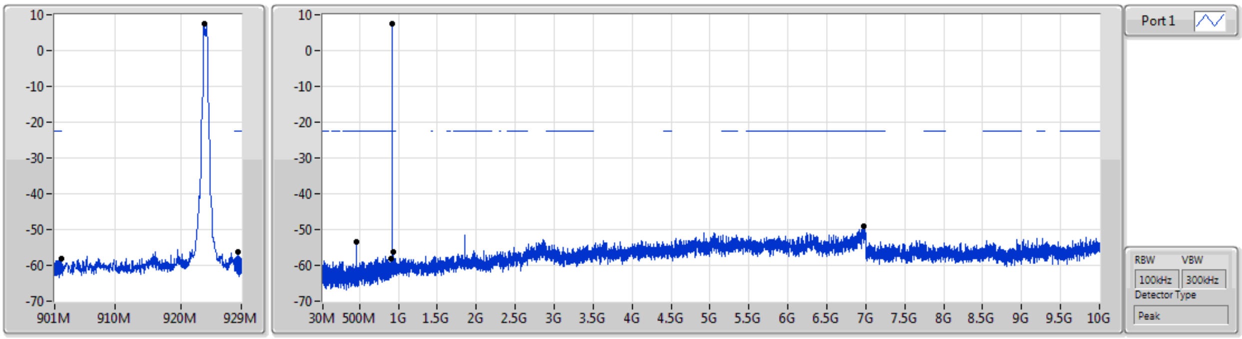
Result

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
GFSK	-	-	-	-	-	-	-	-	-	-	-	-	-
923.6MHz_TnomVnom	Pass	923.424M	7.39	-22.61	461.5805M	-53.50	901.96M	-58.18	928.498M	-56.20	6.978223G	-48.94	1
925.6MHz_TnomVnom	Pass	923.424M	7.39	-22.61	462.887M	-51.89	901.198M	-56.52	928.002M	-56.01	6.977089G	-48.18	1
927.6MHz_TnomVnom	Pass	923.424M	7.39	-22.61	463.758M	-52.32	901.326M	-57.40	928.008M	-22.71	6.978223G	-49.76	1

GFSK **CSE NdB**

923.6MHz

20/09/2018

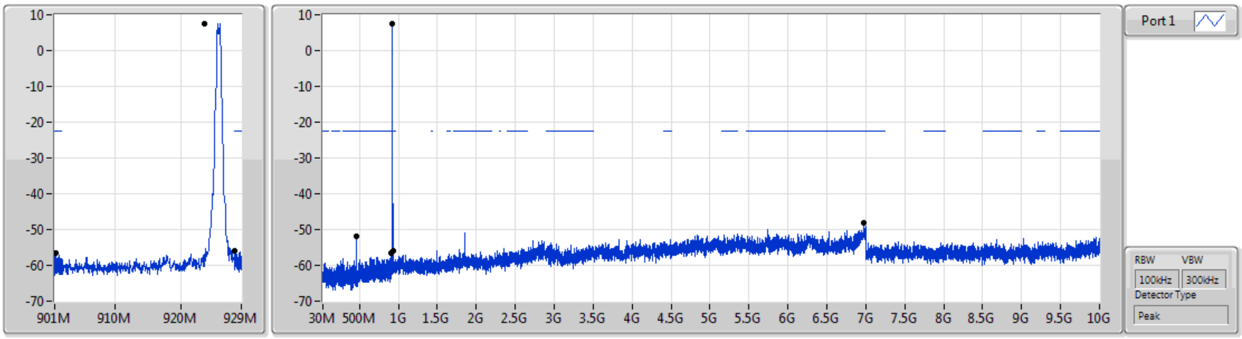


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
923.424M	7.39	-22.61	461.5805M	-53.50	901.96M	-58.18	928.498M	-56.20	6.978223G	-48.94	1

GFSK **CSE NdB**

925.6MHz

20/09/2018

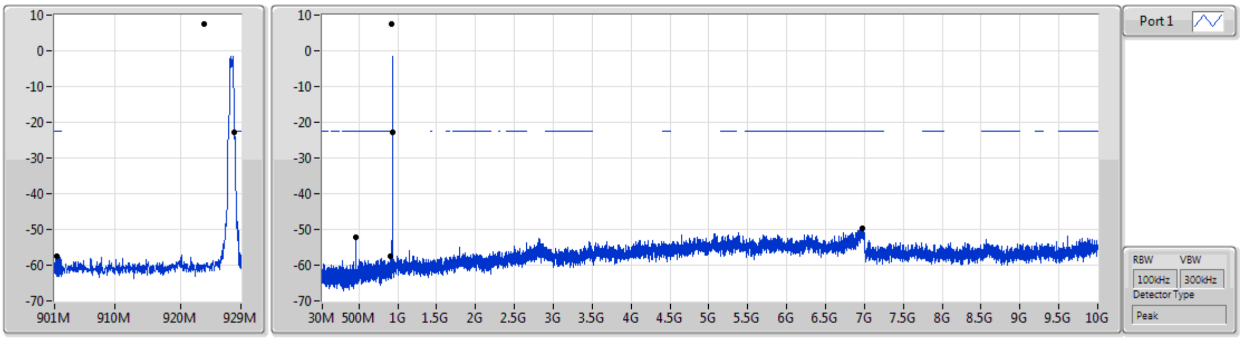


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
923.424M	7.39	-22.61	462.887M	-51.89	901.198M	-56.52	928.002M	-56.01	6.977089G	-48.18	1

GFSK **CSE NdB**

927.6MHz

20/09/2018



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
923.424M	7.39	-22.61	463.758M	-52.32	901.326M	-57.40	928.008M	-22.71	6.978223G	-49.76	1

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	-	-	-	-	-	-	-	-	-	-	-	-
GFSK_Nss1_1TX	Pass	PK	449.04M	40.29	46.00	-5.71	-2.85	3	Vertical	0	2.00	-

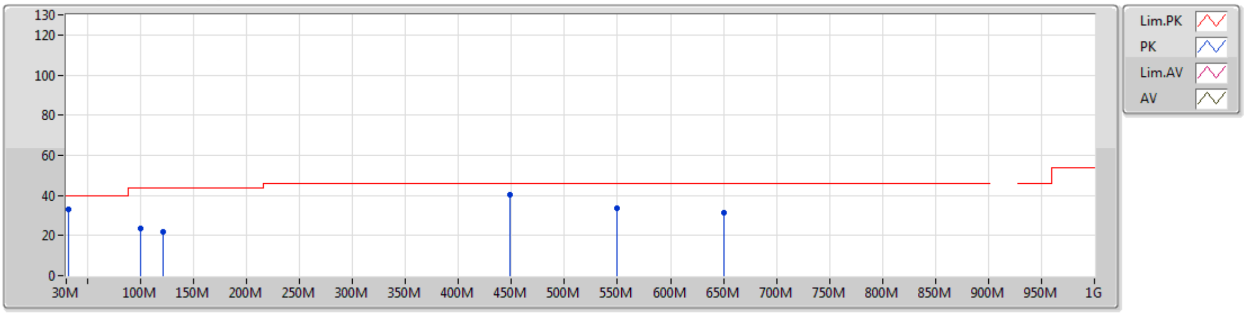
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
GFSK_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
923.6MHz	Pass	PK	31.94M	33.02	40.00	-6.98	-5.45	3	Vertical	0	2.00	-
923.6MHz	Pass	PK	99.84M	23.38	43.50	-20.12	-10.34	3	Vertical	0	2.00	-
923.6MHz	Pass	PK	121.18M	21.91	43.50	-21.59	-8.77	3	Vertical	0	2.00	-
923.6MHz	Pass	PK	449.04M	40.29	46.00	-5.71	-2.85	3	Vertical	0	2.00	-
923.6MHz	Pass	PK	549.92M	33.43	46.00	-12.57	-0.73	3	Vertical	0	2.00	-
923.6MHz	Pass	PK	650.8M	31.44	46.00	-14.56	-0.32	3	Vertical	0	2.00	-
923.6MHz	Pass	PK	31.94M	32.42	40.00	-7.58	-5.45	3	Horizontal	360	2.00	-
923.6MHz	Pass	PK	41.64M	24.88	40.00	-15.12	-10.41	3	Horizontal	360	2.00	-
923.6MHz	Pass	PK	148.34M	23.86	43.50	-19.64	-10.15	3	Horizontal	360	2.00	-
923.6MHz	Pass	PK	400.54M	34.48	46.00	-11.52	-3.53	3	Horizontal	360	2.00	-
923.6MHz	Pass	PK	449.04M	38.90	46.00	-7.10	-2.85	3	Horizontal	360	2.00	-
923.6MHz	Pass	PK	730.34M	40.11	46.00	-5.89	0.69	3	Horizontal	360	2.00	-

GFSK_Nss1_1TX

19/09/2018

923.6MHz_Adapter

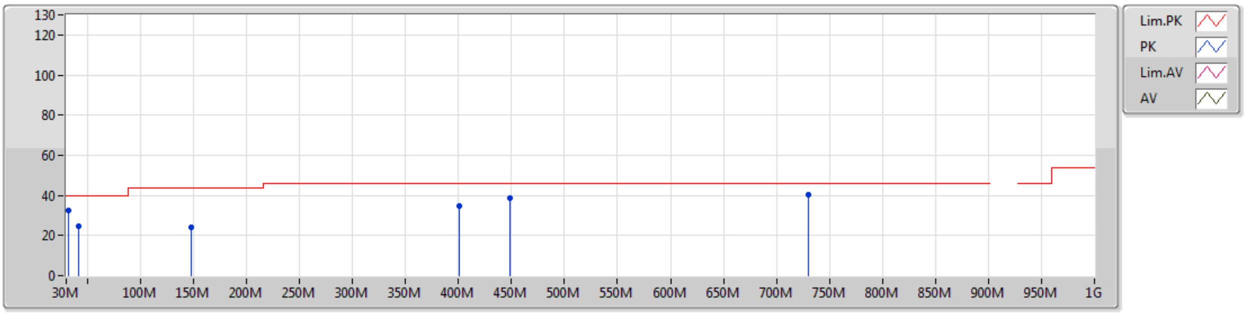


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	31.94M	33.02	40.00	-6.98	-5.45	3	Vertical	0	2.00	-
PK	99.84M	23.38	43.50	-20.12	-10.34	3	Vertical	0	2.00	-
PK	121.18M	21.91	43.50	-21.59	-8.77	3	Vertical	0	2.00	-
PK	449.04M	40.29	46.00	-5.71	-2.85	3	Vertical	0	2.00	-
PK	549.92M	33.43	46.00	-12.57	-0.73	3	Vertical	0	2.00	-
PK	650.8M	31.44	46.00	-14.56	-0.32	3	Vertical	0	2.00	-

GFSK_Nss1_1TX

923.6MHz_Adapter

19/09/2018



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	31.94M	32.42	40.00	-7.58	-5.45	3	Horizontal	360	2.00	-
PK	41.64M	24.88	40.00	-15.12	-10.41	3	Horizontal	360	2.00	-
PK	148.34M	23.86	43.50	-19.64	-10.15	3	Horizontal	360	2.00	-
PK	400.54M	34.48	46.00	-11.52	-3.53	3	Horizontal	360	2.00	-
PK	449.04M	38.90	46.00	-7.10	-2.85	3	Horizontal	360	2.00	-
PK	730.34M	40.11	46.00	-5.89	0.69	3	Horizontal	360	2.00	-

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	-	-	-	-	-	-	-	-	-	-	-	-
GFSK_Nss1_1TX	Pass	AV	2.7704G	40.52	54.00	-13.48	-1.16	3	Horizontal	123	2.65	-

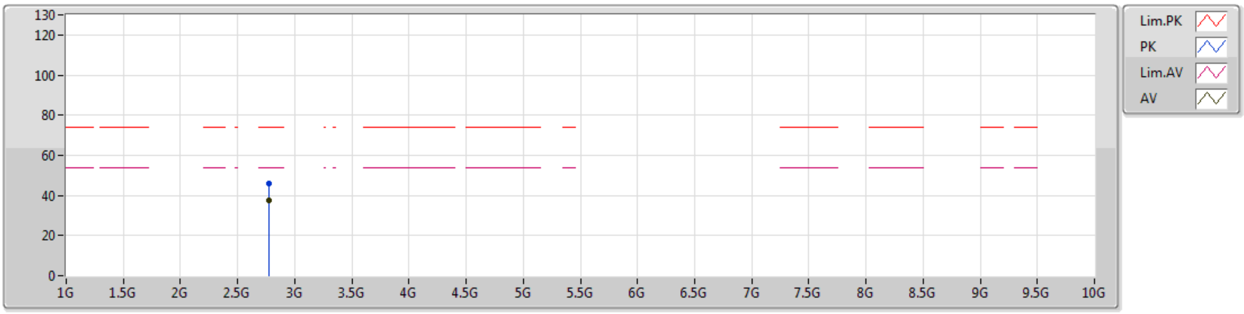
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
GFSK_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
923.6MHz	Pass	AV	2.77122G	37.49	54.00	-16.51	-1.16	3	Vertical	326	1.00	-
923.6MHz	Pass	PK	2.77134G	45.79	74.00	-28.21	-1.16	3	Vertical	326	1.00	-
923.6MHz	Pass	AV	2.7704G	40.52	54.00	-13.48	-1.16	3	Horizontal	123	2.65	-
923.6MHz	Pass	PK	2.77128G	47.38	74.00	-26.62	-1.16	3	Horizontal	123	2.65	-
927.6MHz	Pass	AV	2.78241G	35.71	54.00	-18.29	-1.13	3	Vertical	342	1.03	-
927.6MHz	Pass	PK	2.78328G	45.40	74.00	-28.60	-1.12	3	Vertical	342	1.03	-
927.6MHz	Pass	AV	2.78228G	40.05	54.00	-13.95	-1.13	3	Horizontal	125	2.68	-
927.6MHz	Pass	PK	2.78225G	47.31	74.00	-26.69	-1.13	3	Horizontal	125	2.68	-

GFSK_Nss1_1TX

19/09/2018

923.6MHz_TX

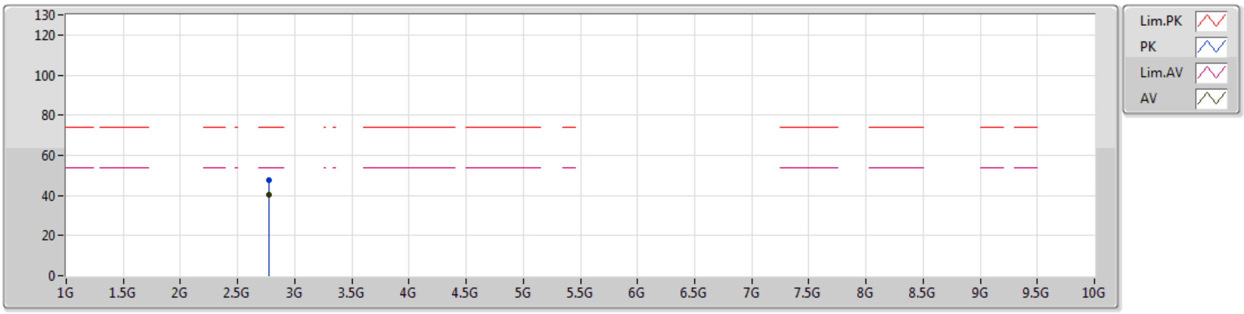


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.77122G	37.49	54.00	-16.51	-1.16	3	Vertical	326	1.00	-
PK	2.77134G	45.79	74.00	-28.21	-1.16	3	Vertical	326	1.00	-

GFSK_Nss1_1TX

19/09/2018

923.6MHz_TX

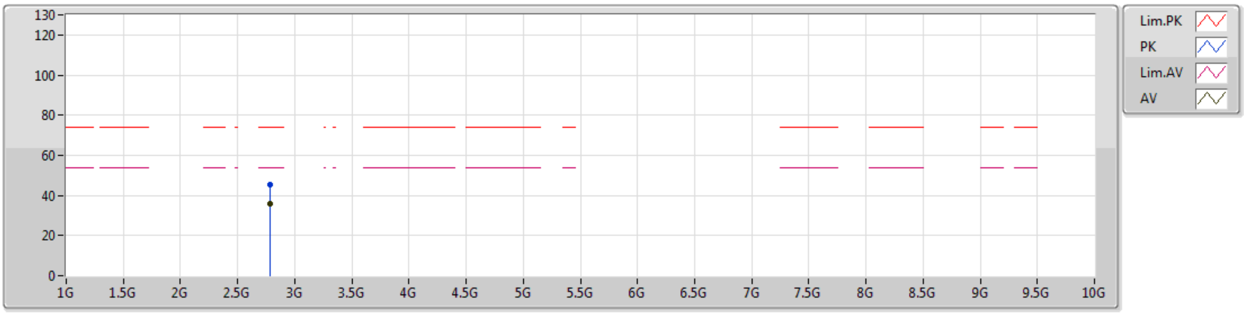


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.7704G	40.52	54.00	-13.48	-1.16	3	Horizontal	123	2.65	-
PK	2.77128G	47.38	74.00	-26.62	-1.16	3	Horizontal	123	2.65	-

GFSK_Nss1_1TX

19/09/2018

927.6MHz_TX

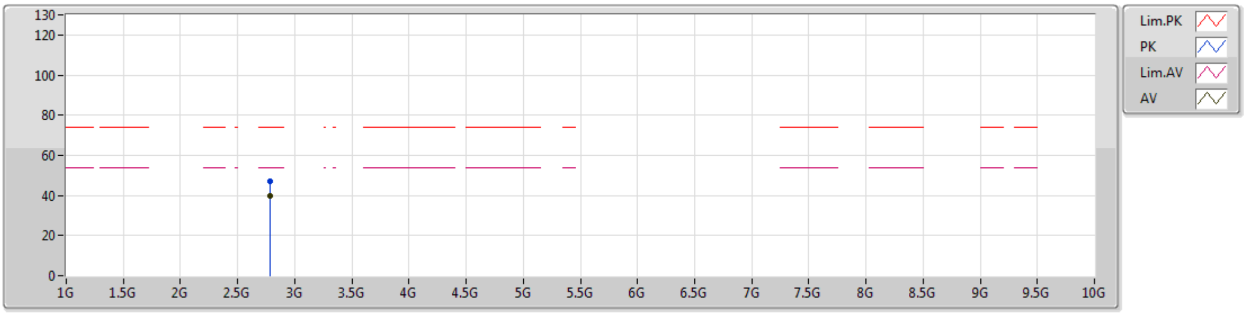


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.78241G	35.71	54.00	-18.29	-1.13	3	Vertical	342	1.03	-
PK	2.78328G	45.40	74.00	-28.60	-1.12	3	Vertical	342	1.03	-

GFSK_Nss1_1TX

19/09/2018

927.6MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.78228G	40.05	54.00	-13.95	-1.13	3	Horizontal	125	2.68	-
PK	2.78225G	47.31	74.00	-26.69	-1.13	3	Horizontal	125	2.68	-