FCC Test Report

FCC ID	:	**TE7KC300**
Equipment	:	**Kasa Wire-Free Camera System**
Brand Name	:	**tp-link**
Model Name	:	**KC300**
Applicant/ Manufacturer	:	**TP-Link Technologies Co., Ltd. Building 24 (floors 1,3,4,5) and 28 (floors1-4), Central Science and Technology Park,Nanshan Shenzhen, 518057 China**
Standard	:	**47 CFR FCC Part 15.247**

The product was received on Mar. 28, 2019, and testing was started from Apr. 11, 2019 and completed on May 14, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

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

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

Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

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History of this test report

Report No.	Version	Description	Issued Date
FR8O2218-01AF	01	Initial issue of report	Jun. 17, 2019

Summary of Test Result

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

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
None.

Reviewed by: Jackson Tsai

Report Producer: Michelle Tsai

General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Modulation	Ch. Frequency (MHz)	Channel Number
902-928	DSSS	904-924	11

Channel list (MHz)	
904	916
906	918
908	920
910	922
912	924
914	-

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

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

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	TP-LINK	I1030-JI035REV1.0	PCB dipole	I-PEX
2	TP-LINK	I1030-JI035REV1.0	PCB dipole	I-PEX
3	TP-LINK	I2020-ED000REV1.0	Monopole	I-PEX

Ant.	Port	Gain (dBi)	
		2.4G	DSSS(902~928MHz)
1	1	3.24	-
2	2	3.24	-
3	1	-	1.66

Note 1: The EUT has three antennas.

For 2.4GHz function:

For IEEE 802.11 b/g/n mode (1TX/1RX)

Support diversity function and pre-tested on Ant 1 and Ant 2, the worst case was Ant. 2(port 2) and it was record in this test report.

For DSSS (902~928MHz):

Only Ant. 3 (port 1) could transmit/receive simultaneously.

1.1.3 EUT Information

Operational Condition					
EUT Power Type	From AC Adapter / Battery				
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
DSSS	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)

1.2 Testing Applied Standards

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

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

1.3 Testing Location Information

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

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH06-HY	Gary	23.1~24.6°C/61~69%	11/Apr/2019~14/May/2019
Radiated	03CH02-HY	Edward	22.3~25.1°C/50.6~61.2%	11/Apr/2019~09/May/2019
AC Conduction	CO04-HY	Lego	20.2-22.5°C/54.2-56.5%	12/Apr/2019

1.4 Measurement Uncertainty

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

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

Mode	PowerSetting
DSSS	-
904MHz	14
914MHz	14
924MHz	14

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	

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Operating Mode	
1	WLAN 2.4GHz+DSSS(902~928MHz)
Refer to Sporton Test Report No.: FA8O2218-01 for Co-location RF Exposure Evaluation.	

2.4 Accessories

Accessories				
AC Adapter	Brand Name	TEN PAO INTERNATIONAL LTD.	Model Name	SO18BYU1200150
	Manufacturer	TEN PAO INTERNATIONAL LTD.	SN	N/A
	Power Rating	I/P: 100 - 240Vac, 0.6 A, O/P: 12Vdc, 1.5A / 9Vdc, 2A / 5Vdc, 3A		
Battery	Brand Name	tp-link	Model Name	KA300B
	Manufacturer	TP-Link Technologies Co., Ltd.	SN	1ICR19/66-2
	Power Rating	3.63Vdc,6700mAh	Type	Li-ion
Type C Data cable	Brand Name	Freeport Resources Enterprises Corp	Model Name	VC-02
	Manufacturer	Freeport Resources Enterprises Corp	SN	N/A
	Signal Line	2.14meter, non-shielded cable, w/o ferrite core		

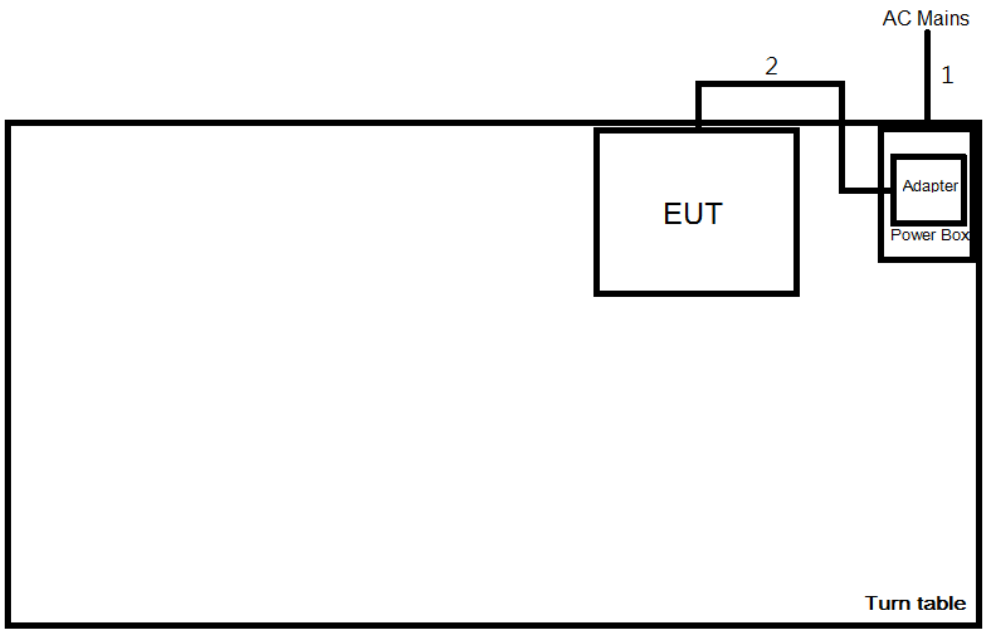
Reminder: Regarding to more detail and other information, please refer to user manual.

2.5 Support Equipment

Support Equipment – RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	DoC
2	Adapter for NB	DELL	HA65NM130	DoC

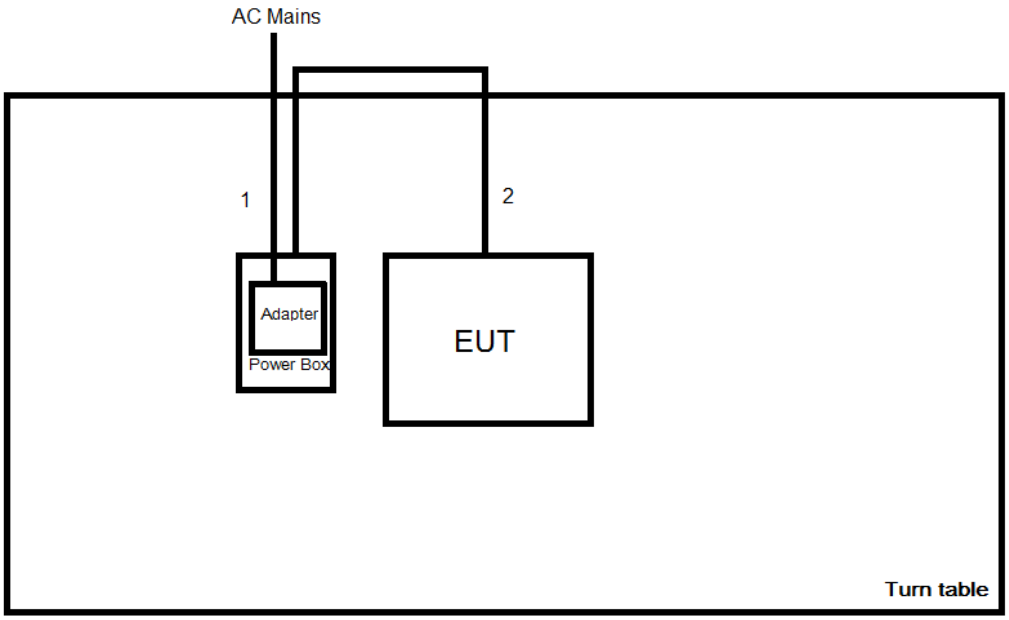
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1.	AC Power line	No	1.5	-
2.	Type C Data cable	No	2.14	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1.	AC Power line	No	1.5	-
2.	Type C Data cable	No	2.14	-

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

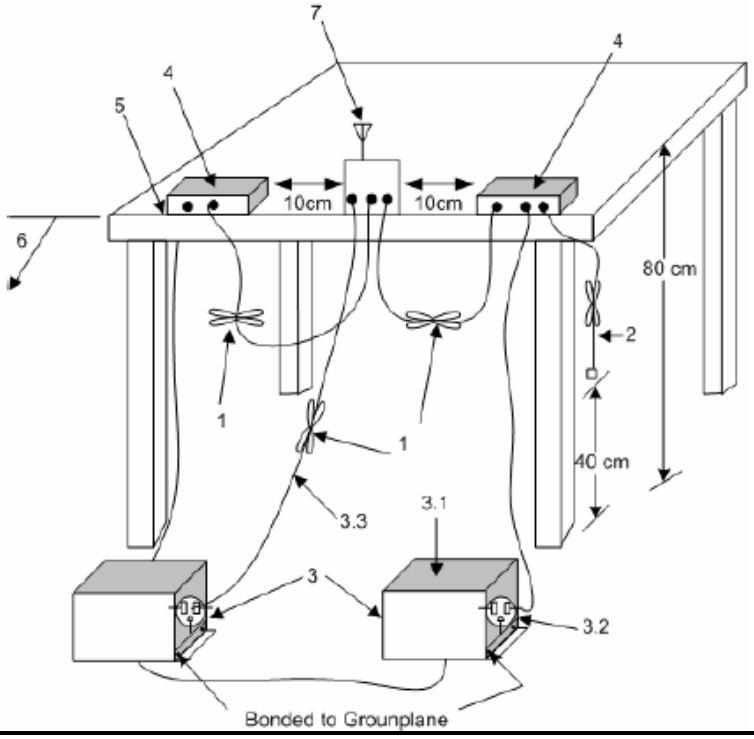
Refer a test equipment and calibration data table in this test report.

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.

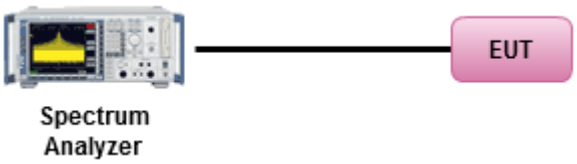
3.2.2 Measuring Instruments

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
 Spectrum Analyzer

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

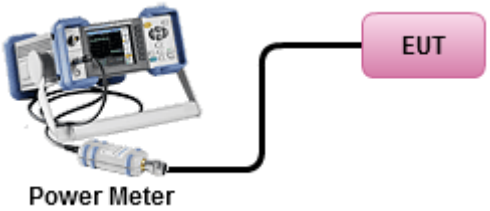
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

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

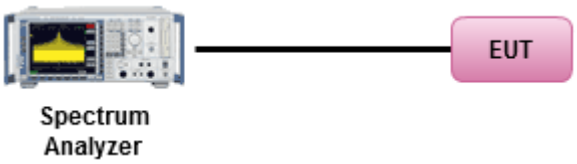
3.4.2 Measuring Instruments

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.	

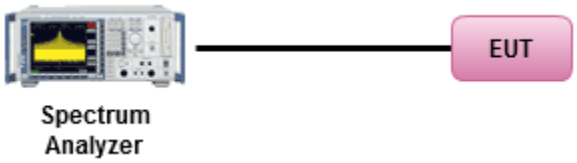
3.5.2 Measuring Instruments

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.

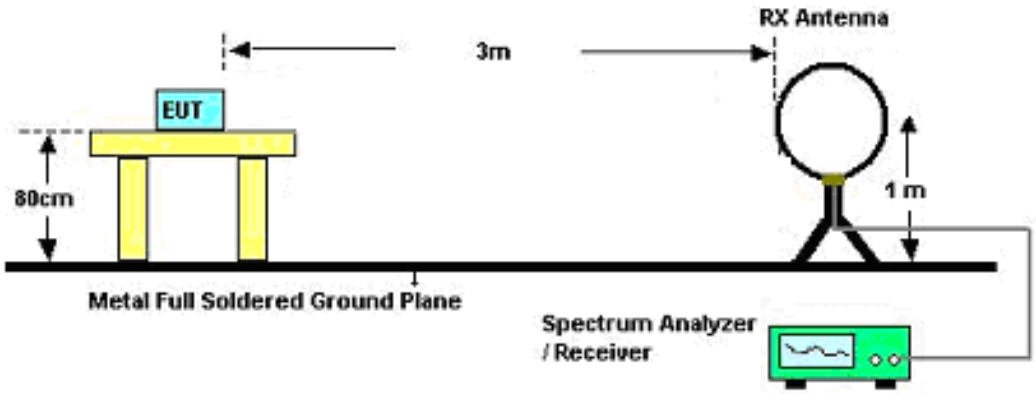
3.6.2 Measuring Instruments

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

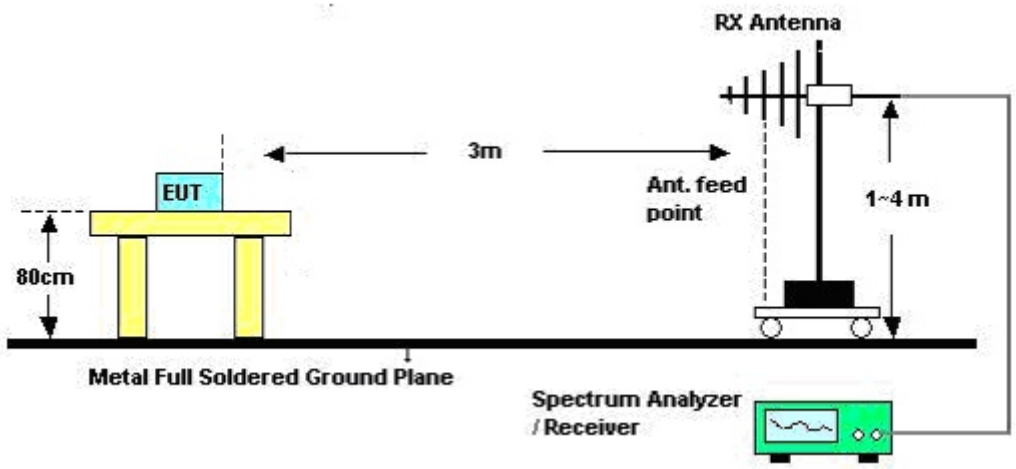
3.6.3 Test Procedures

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).

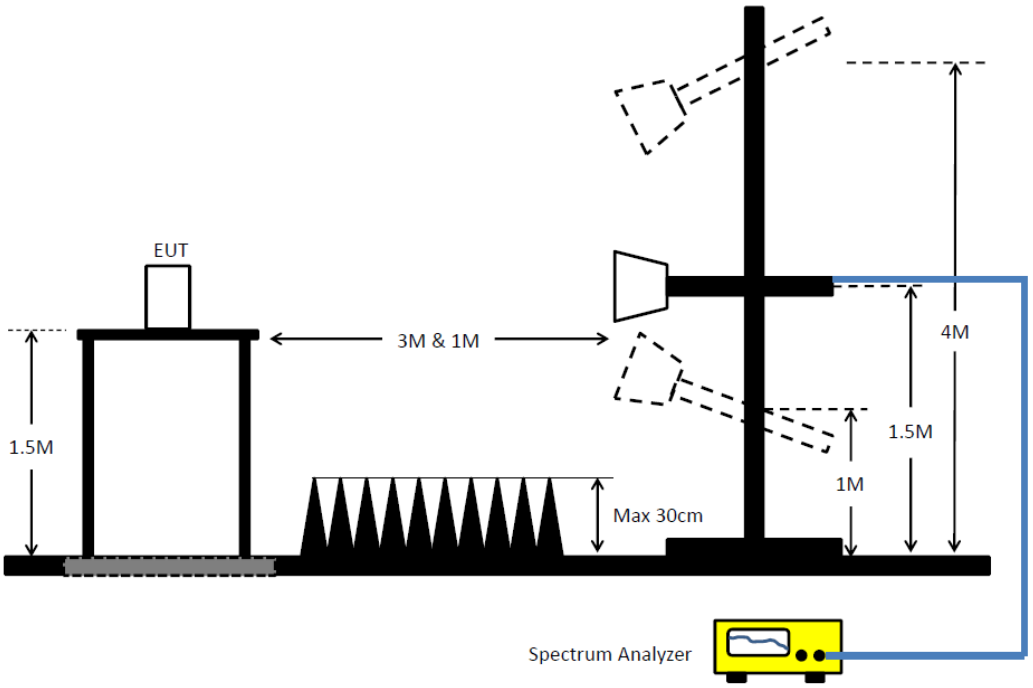
3.6.4 Test Setup

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	08/Nov/2018	07/Nov/2019
RF Cable-CON	MTJ	RG142	CB002-CO	9kHz ~ 200MHz	17/Sep/2018	16/Sep/2019
AC POWER	APC	AFC-11005G	F310050055	47Hz~63Hz 5~300V	NCR	NCR
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9 kHz ~ 30 MHz	12/Oct/2018	11/Oct/2019

NCR : Non-Calibration Require

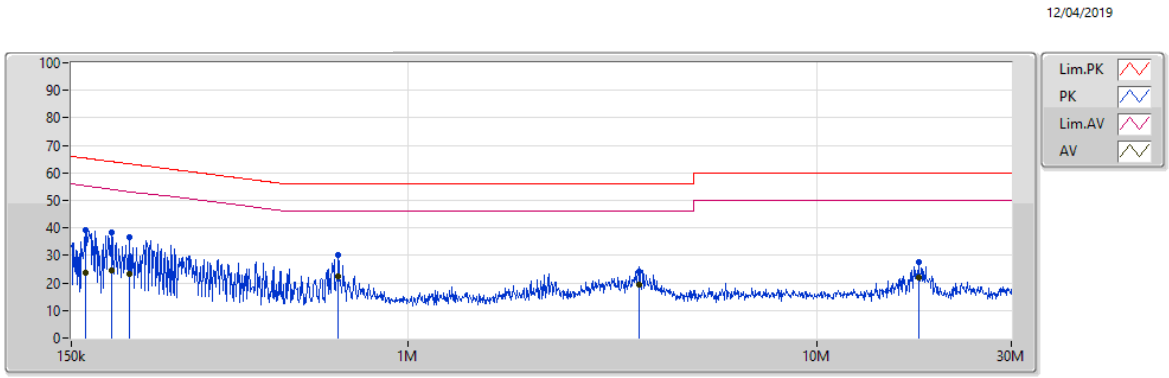
Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	19/Oct/2018	18/Oct/2019
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 18GHz 3m	17/Oct/2018	16/Oct/2019
Amplifier	Agilent	8447D	2944A11149	100kHz ~ 1.3GHz	27Jul/2018	02/Jul/2019
Microwave Preamplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	23/Oct/2018	22/Oct/2019
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	18/Jan/2019	17/Jan/2020
RF Cable-high	SUHNER	SUCOFLEX104	MY34918/4	1GHz ~ 40GHz	18/Jan/2019	17/Jan/2020
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz ~ 1GHz	08/Sep/2018	07/Sep/2019
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	09/Apr/2019	08/Apr/2020
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	15/Mar/2019	14/Mar/2020
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170221	15GHz ~ 40GHz	22/Mar/2019	21/Mar/2020
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 01543	1GHz ~ 18GHz	11/May/2018	10/May/2019

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101029	10Hz~40GHz	11/Sep/2018	10/Sep/2019
SMB100A Signal Generator	R&S	SMB100A03	181147	100kHz~40GHz	19/Feb/2019	18/Feb/2020
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	19/Feb/2019	18/Feb/2020
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	19/Feb/2019	18/Feb/2020
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	30MHz~1G	11/Jan/2019	10/Jan/2020
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	1G~18G	11/Jan/2019	10/Jan/2020
Cable 0.5m	HUBER	MY10714/4	RF Cable – 05	30MHz~1G	11/Jan/2019	10/Jan/2020

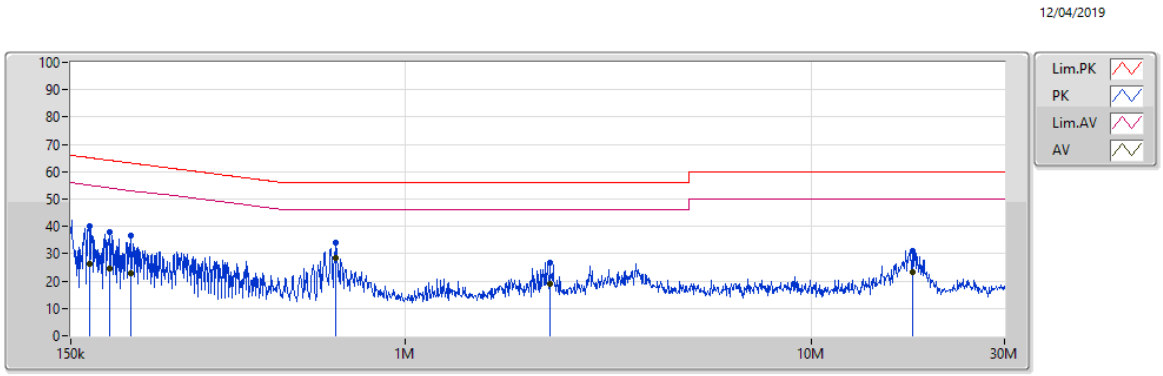
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	Adapter Mode		



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	162.467k	39.40	65.33	-25.93	19.48	Line	-	19.92	9.60	0.01	9.87
AV	162.467k	23.89	55.33	-31.44	19.48	Line	-	4.41	9.60	0.01	9.87
QP	188.327k	38.36	64.11	-25.75	19.48	Line	-	18.88	9.60	0.01	9.87
AV	188.327k	24.43	54.11	-29.68	19.48	Line	-	4.95	9.60	0.01	9.87
QP	208.092k	36.50	63.28	-26.78	19.48	Line	-	17.02	9.60	0.01	9.87
AV	208.092k	23.39	53.28	-29.89	19.48	Line	-	3.91	9.60	0.01	9.87
QP	675.618k	30.08	56.00	-25.92	19.49	Line	-	10.59	9.60	0.01	9.88
AV	675.618k	22.60	46.00	-23.40	19.49	Line	"Worst"	3.11	9.60	0.01	9.88
QP	3.671M	24.31	56.00	-31.69	19.56	Line	-	4.75	9.63	0.04	9.89
AV	3.671M	19.54	46.00	-26.46	19.56	Line	-	-0.02	9.63	0.04	9.89
QP	17.838M	27.74	60.00	-32.26	19.64	Line	-	8.10	9.64	0.10	9.90
AV	17.838M	21.78	50.00	-28.22	19.64	Line	-	2.14	9.64	0.10	9.90

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		



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	166.406k	40.00	65.14	-25.14	19.48	Neutral	-	20.52	9.60	0.01	9.87
AV	166.406k	26.09	55.14	-29.05	19.48	Neutral	-	6.61	9.60	0.01	9.87
QP	186.83k	38.05	64.18	-26.13	19.47	Neutral	-	18.58	9.59	0.01	9.87
AV	186.83k	24.66	54.18	-29.52	19.47	Neutral	-	5.19	9.59	0.01	9.87
QP	210.599k	36.51	63.19	-26.68	19.47	Neutral	-	17.04	9.59	0.01	9.87
AV	210.599k	23.00	53.19	-30.19	19.47	Neutral	-	3.53	9.59	0.01	9.87
QP	675.618k	33.92	56.00	-22.08	19.48	Neutral	-	14.44	9.59	0.01	9.88
AV	675.618k	28.50	46.00	-17.50	19.48	Neutral	"Worst"	9.02	9.59	0.01	9.88
QP	2.274M	26.91	56.00	-29.09	19.54	Neutral	-	7.37	9.61	0.04	9.89
AV	2.274M	18.92	46.00	-27.08	19.54	Neutral	-	-0.62	9.61	0.04	9.89
QP	17.767M	30.99	60.00	-29.01	19.68	Neutral	-	11.31	9.68	0.10	9.90
AV	17.767M	23.46	50.00	-26.54	19.68	Neutral	-	3.78	9.68	0.10	9.90

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	-	-	-	-	-
LoRa_Nss1_1TX	544.375k	890.18k	890KF1D	539.375k	885.807k

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

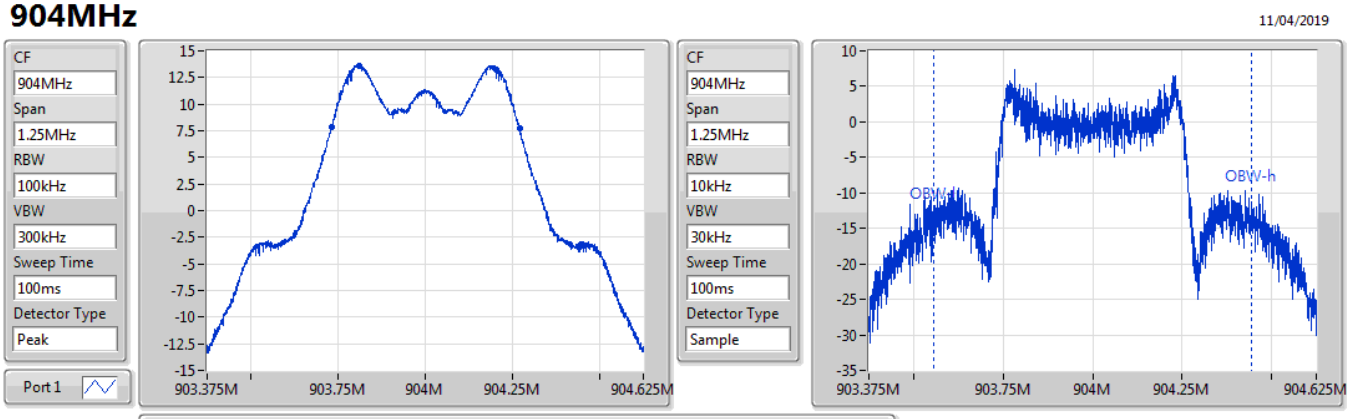
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
LoRa_Nss1_1TX	-	-	-	-
904MHz	Pass	500k	539.375k	886.432k
914MHz	Pass	500k	540.625k	890.18k
924MHz	Pass	500k	544.375k	885.807k

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

LoRa_Nss1_1TX

EBW

904MHz

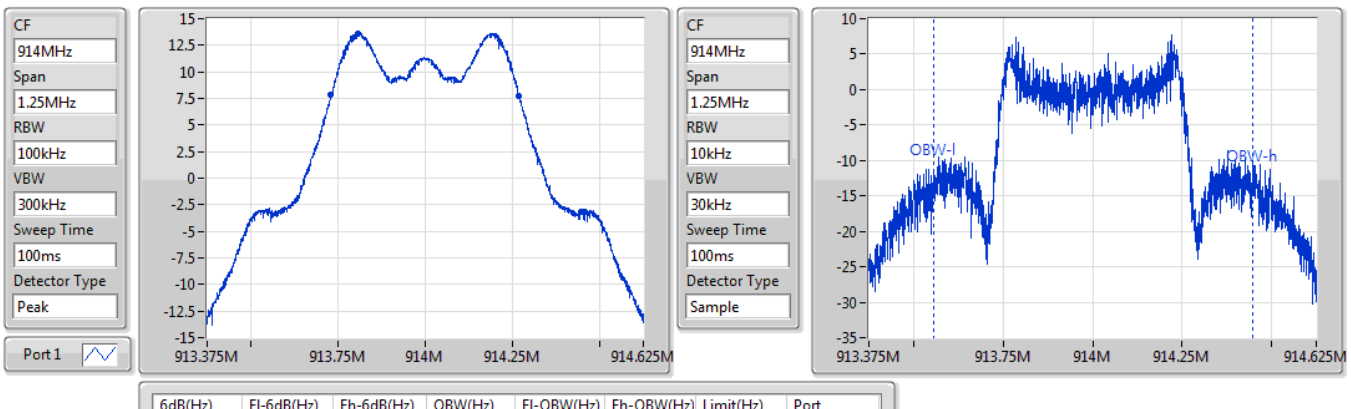


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
539.375k	903.730625M	904.27M	886.432k	903.557721M	904.444153M	500k	1

LoRa_Nss1_1TX

EBW

914MHz

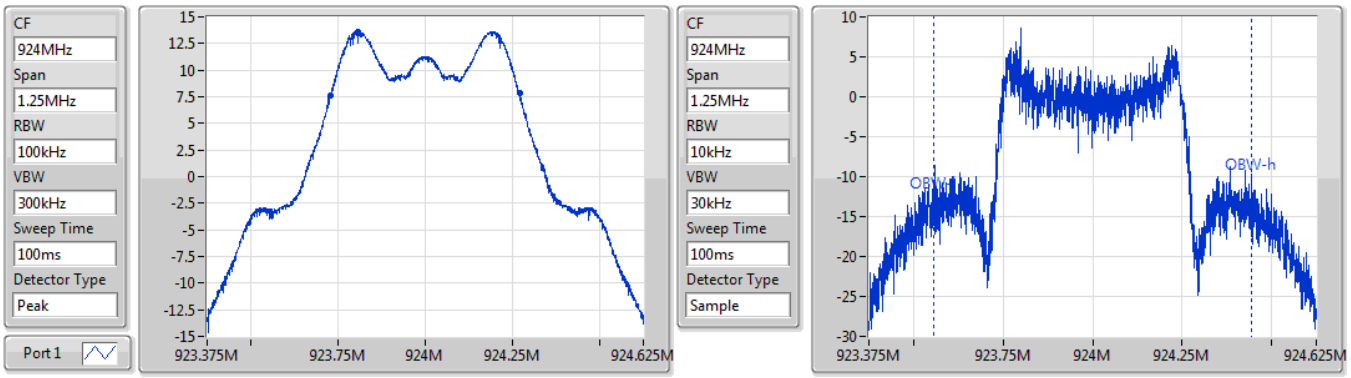


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
540.625k	913.72875M	914.269375M	890.18k	913.556472M	914.446652M	500k	1

LoRa_Nss1_1TX **EBW**

924MHz

11/04/2019



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
544.375k	923.726875M	924.27125M	885.807k	923.556472M	924.442279M	500k	1

Summary

Mode	Power (dBm)	Power (W)
902-928MHz	-	-
LoRa_Nss1_1TX	13.67	0.02328

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
LoRa_Nss1_1TX	-	-	-	-
904MHz	Pass	1.66	13.64	30.00
914MHz	Pass	1.66	13.67	30.00
924MHz	Pass	1.66	13.66	30.00

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

Summary

Mode	PD (dBm/RBW)
902-928MHz	-
LoRa_Nss1_1TX	4.00

RBW=3 kHz.

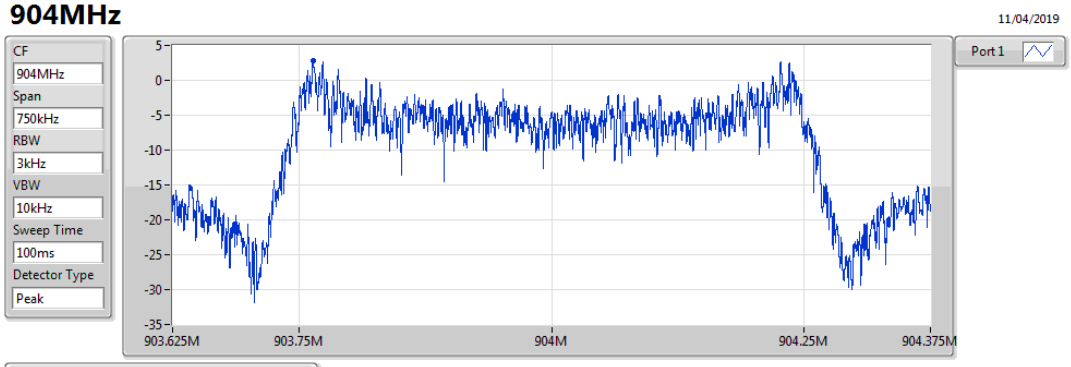
Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
LoRa_Nss1_1TX	-	-	-	-
904MHz	Pass	1.66	2.84	8.00
914MHz	Pass	1.66	4.00	8.00
924MHz	Pass	1.66	1.90	8.00

DG = Directional Gain; RBW=3 kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

LoRa_Nss1_1TX **PSD**

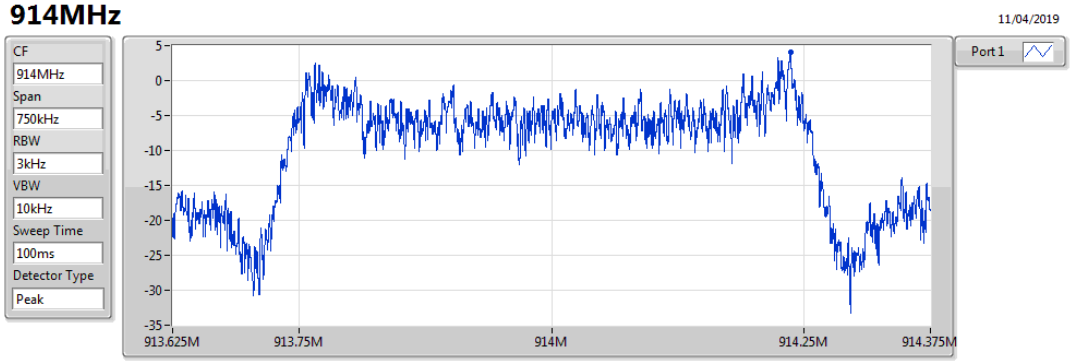
904MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
2.84	2.84	2.84

LoRa_Nss1_1TX **PSD**

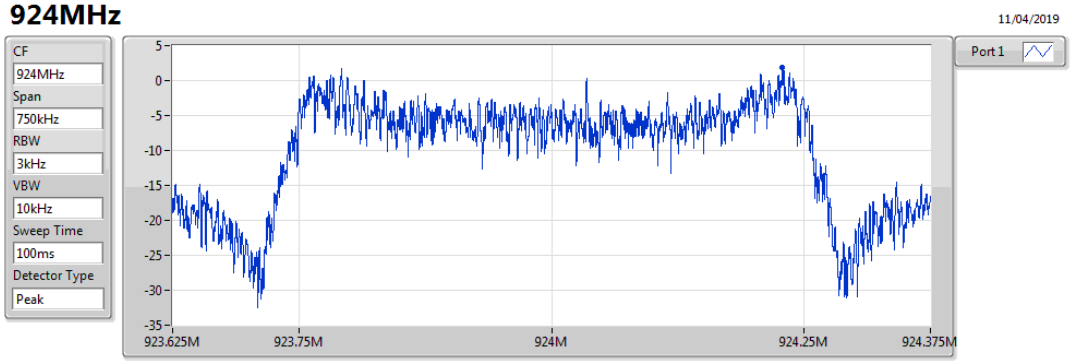
914MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
4.00	4.00	4.00

LoRa_Nss1_1TX **PSD**

924MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.90	1.90	1.90

Summary

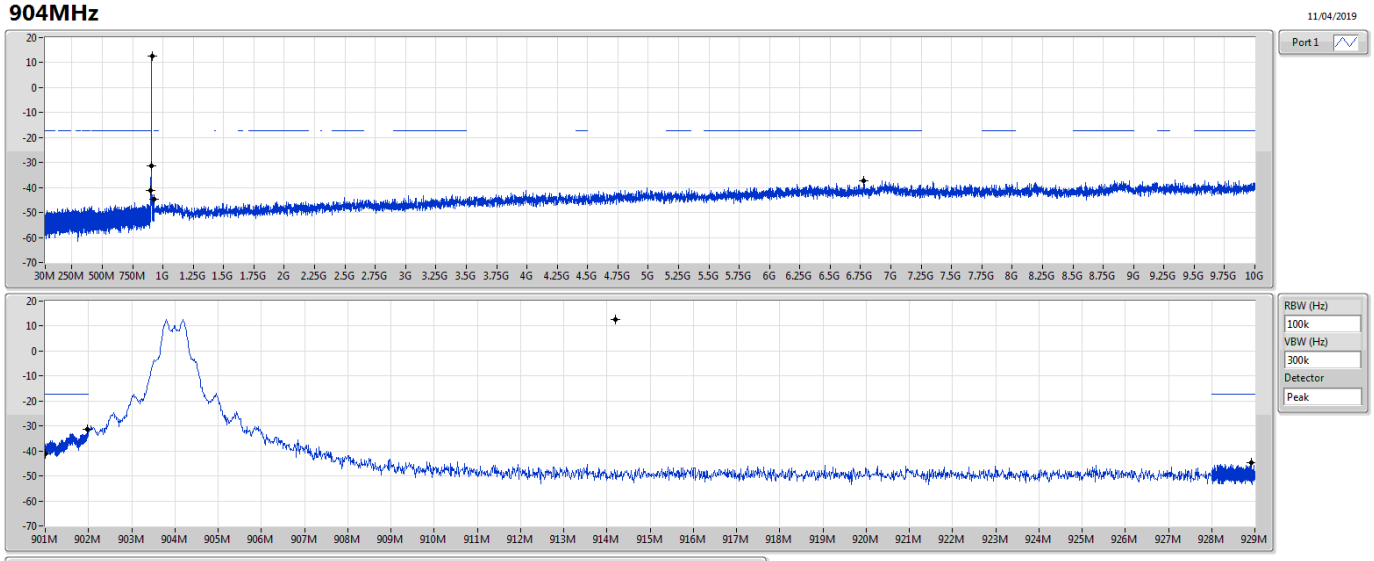
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
902-928MHz	-	-	-	-	-	-	-	-	-	-	-	-	-
LoRa_Nss1_1TX	Pass	914.19M	12.75	-17.25	901M	-41.10	901.98M	-31.33	928.91M	-44.56	6.77866G	-37.18	1

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
LoRa_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
904MHz	Pass	914.19M	12.75	-17.25	901M	-41.10	901.98M	-31.33	928.91M	-44.56	6.77866G	-37.18	1
914MHz	Pass	914.19M	12.75	-17.25	871.28M	-45.94	901.94M	-44.89	928.04M	-45.49	9.20742G	-36.62	1
924MHz	Pass	914.19M	12.75	-17.25	897.3M	-46.82	901.62M	-44.15	928.01M	-39.86	9.56006G	-36.64	1

LoRa_Nss1_1TX **CSE NdB**

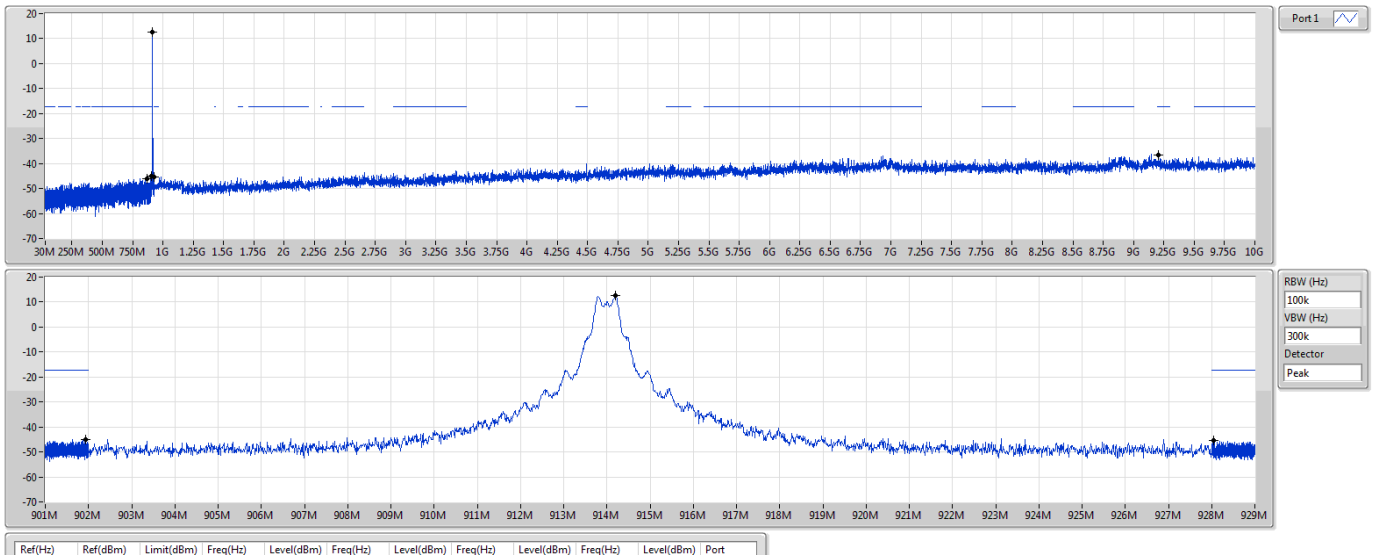
904MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
914.19M	12.75	-17.25	901M	-41.10	901.98M	-31.33	928.91M	-44.56	6.77866G	-37.18	1

LoRa_Nss1_1TX **CSE NdB**

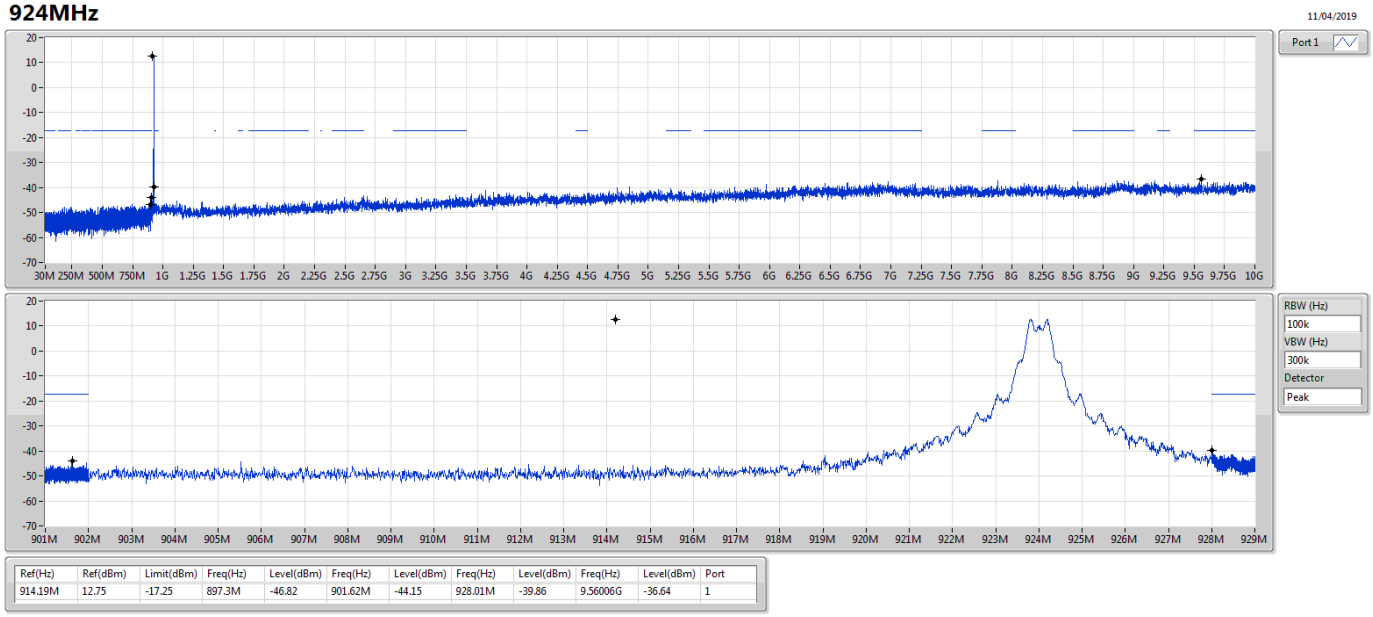
914MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
914.19M	12.75	-17.25	871.28M	-45.94	901.94M	-44.89	928.04M	-45.49	9.20742G	-36.62	1

LoRa_Nss1_1TX **CSE NdB**

924MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
914.19M	12.75	-17.25	897.3M	-46.82	901.62M	-44.15	928.01M	-39.86	9.56006G	-36.64	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	-	-	-	-	-	-	-	-	-	-	-	-
DSSS_Nss1_1TX	Pass	QP	53.28M	36.31	40.00	-3.69	-14.69	3	Vertical	110	1.00	-

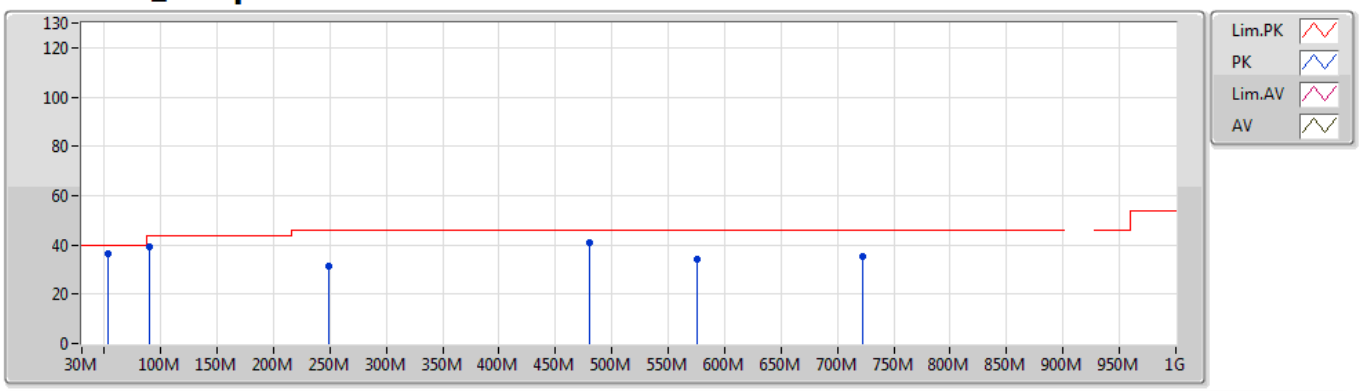
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
DSSS_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
914MHz_Adapter	Pass	PK	90.14M	39.13	43.50	-4.37	-12.55	3	Vertical	360	1.00	-
914MHz_Adapter	Pass	PK	249.22M	31.64	46.00	-14.36	-7.05	3	Vertical	360	1.00	-
914MHz_Adapter	Pass	PK	480.08M	40.74	46.00	-5.26	-2.34	3	Vertical	360	1.00	-
914MHz_Adapter	Pass	PK	575.14M	34.41	46.00	-11.59	-1.31	3	Vertical	360	1.00	-
914MHz_Adapter	Pass	PK	722.58M	35.10	46.00	-10.90	0.29	3	Vertical	360	1.00	-
914MHz_Adapter	Pass	QP	53.28M	36.31	40.00	-3.69	-14.69	3	Vertical	110	1.00	-
914MHz_Adapter	Pass	PK	90.14M	33.50	43.50	-10.00	-12.55	3	Horizontal	0	1.00	-
914MHz_Adapter	Pass	PK	233.7M	35.50	46.00	-10.50	-8.93	3	Horizontal	0	1.00	-
914MHz_Adapter	Pass	PK	260.86M	30.44	46.00	-15.56	-5.80	3	Horizontal	0	1.00	-
914MHz_Adapter	Pass	PK	400.54M	38.66	46.00	-7.34	-3.78	3	Horizontal	0	1.00	-
914MHz_Adapter	Pass	PK	765.26M	34.17	46.00	-11.83	1.09	3	Horizontal	0	1.00	-
914MHz_Adapter	Pass	QP	951.5M	40.32	46.00	-5.68	3.55	3	Horizontal	50	1.00	-

DSSS_Nss1_1TX

914MHz_Adapter

11/04/2019

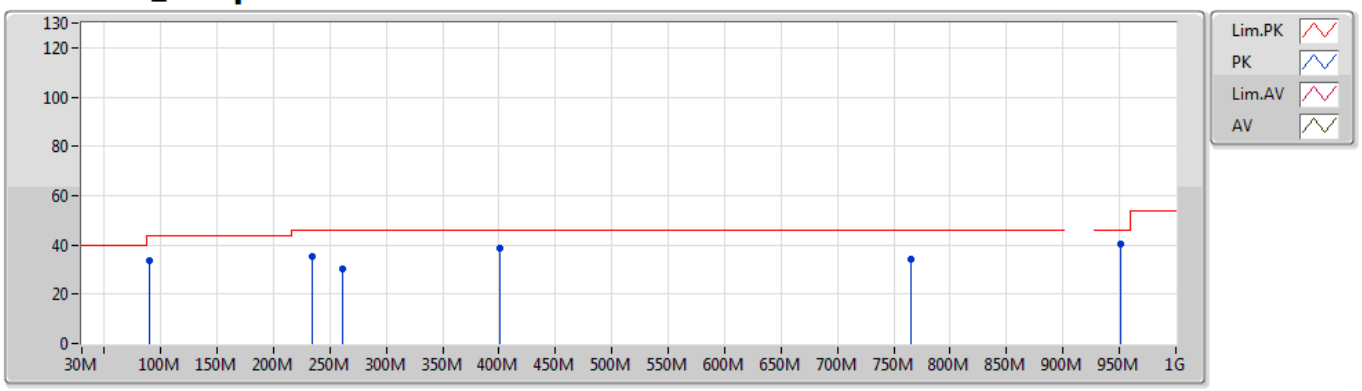


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	90.14M	39.13	43.50	-4.37	-12.55	3	Vertical	360	1.00	-
PK	249.22M	31.64	46.00	-14.36	-7.05	3	Vertical	360	1.00	-
PK	480.08M	40.74	46.00	-5.26	-2.34	3	Vertical	360	1.00	-
PK	575.14M	34.41	46.00	-11.59	-1.31	3	Vertical	360	1.00	-
PK	722.58M	35.10	46.00	-10.90	0.29	3	Vertical	360	1.00	-
QP	53.28M	36.31	40.00	-3.69	-14.69	3	Vertical	110	1.00	-

DSSS_Nss1_1TX

914MHz_Adapter

11/04/2019



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	90.14M	33.50	43.50	-10.00	-12.55	3	Horizontal	0	1.00	-
PK	233.7M	35.50	46.00	-10.50	-8.93	3	Horizontal	0	1.00	-
PK	260.86M	30.44	46.00	-15.56	-5.80	3	Horizontal	0	1.00	-
PK	400.54M	38.66	46.00	-7.34	-3.78	3	Horizontal	0	1.00	-
PK	765.26M	34.17	46.00	-11.83	1.09	3	Horizontal	0	1.00	-
QP	951.5M	40.32	46.00	-5.68	3.55	3	Horizontal	50	1.00	-

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
902-928MHz	-	-	-	-	-	-	-	-	-	-	-	-
DSSS_Nss1_1TX	Pass	AV	2.71148G	53.68	54.00	-0.32	-1.70	3	Vertical	334	2.97	-

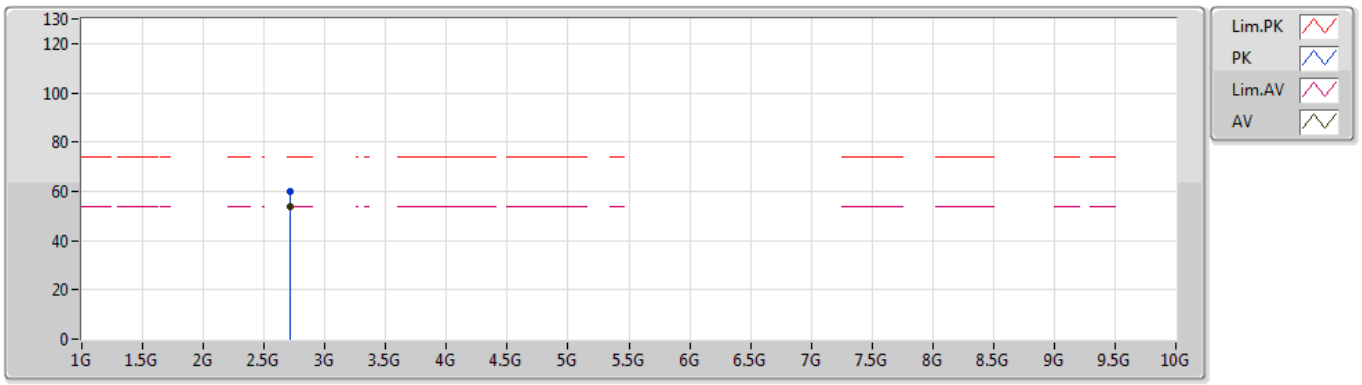
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
DSSS_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
904MHz_TX	Pass	AV	2.71148G	53.68	54.00	-0.32	-1.70	3	Vertical	334	2.97	-
904MHz_TX	Pass	PK	2.71144G	59.87	74.00	-14.13	-1.70	3	Vertical	334	2.97	-
904MHz_TX	Pass	AV	2.71148G	46.42	54.00	-7.58	-1.70	3	Horizontal	67	1.01	-
904MHz_TX	Pass	PK	2.71252G	53.23	74.00	-20.77	-1.69	3	Horizontal	67	1.01	-
914MHz_TX	Pass	AV	2.74252G	53.44	54.00	-0.56	-1.60	3	Vertical	358	2.50	-
914MHz_TX	Pass	PK	2.7414G	59.55	74.00	-14.45	-1.61	3	Vertical	358	2.50	-
914MHz_TX	Pass	AV	2.74144G	45.31	54.00	-8.69	-1.61	3	Horizontal	139	1.50	-
914MHz_TX	Pass	PK	2.74248G	51.65	74.00	-22.35	-1.61	3	Horizontal	139	1.50	-
924MHz_TX	Pass	AV	2.77146G	53.65	54.00	-0.35	-1.53	3	Vertical	356	2.40	-
924MHz_TX	Pass	PK	2.7726G	59.87	74.00	-14.13	-1.51	3	Vertical	356	2.40	-
924MHz_TX	Pass	AV	2.77248G	44.54	54.00	-9.46	-1.52	3	Horizontal	143	1.49	-
924MHz_TX	Pass	PK	2.77254G	51.64	74.00	-22.36	-1.51	3	Horizontal	143	1.49	-

DSSS_Nss1_1TX

11/04/2019

904MHz_TX

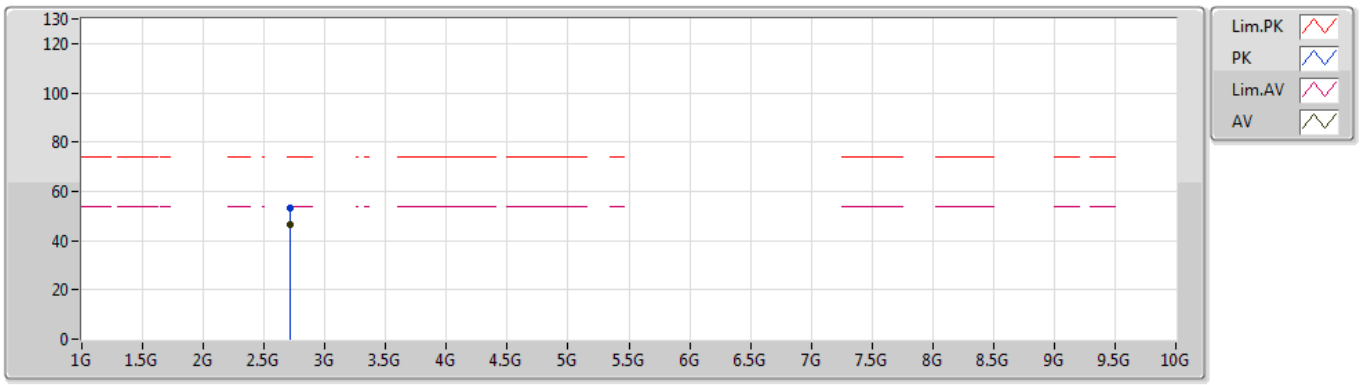


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.71148G	53.68	54.00	-0.32	-1.70	3	Vertical	334	2.97	-
PK	2.71144G	59.87	74.00	-14.13	-1.70	3	Vertical	334	2.97	-

DSSS_Nss1_1TX

11/04/2019

904MHz_TX

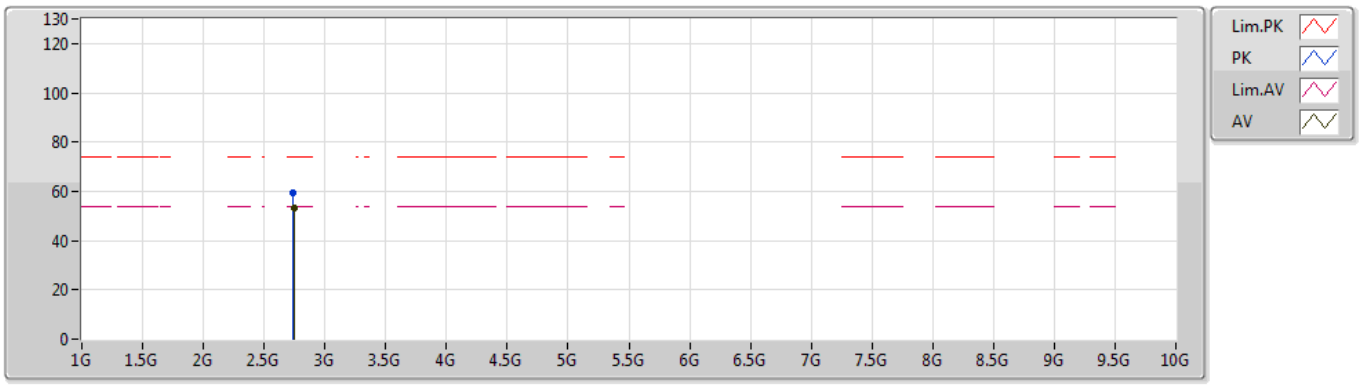


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.71148G	46.42	54.00	-7.58	-1.70	3	Horizontal	67	1.01	-
PK	2.71252G	53.23	74.00	-20.77	-1.69	3	Horizontal	67	1.01	-

DSSS_Nss1_1TX

11/04/2019

914MHz_TX

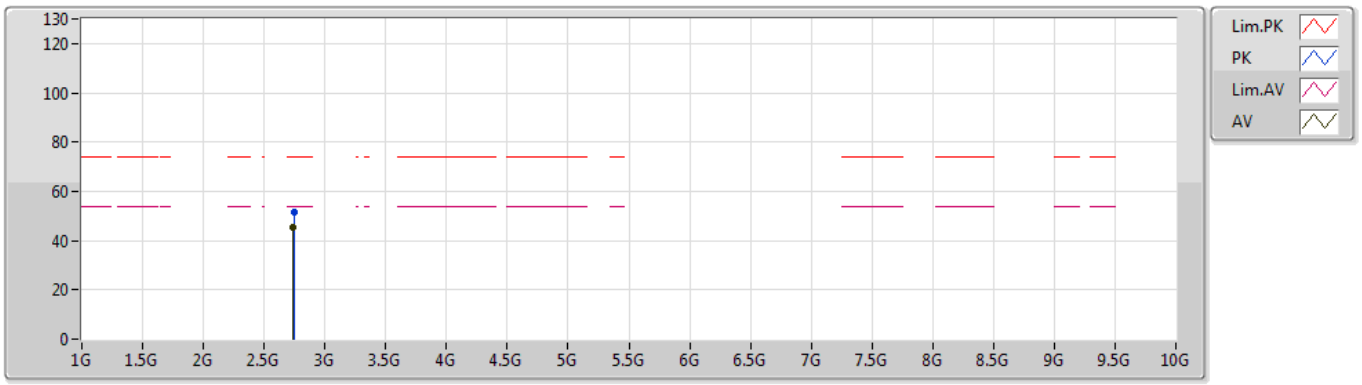


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.74252G	53.44	54.00	-0.56	-1.60	3	Vertical	358	2.50	-
PK	2.7414G	59.55	74.00	-14.45	-1.61	3	Vertical	358	2.50	-

DSSS_Nss1_1TX

11/04/2019

914MHz_TX

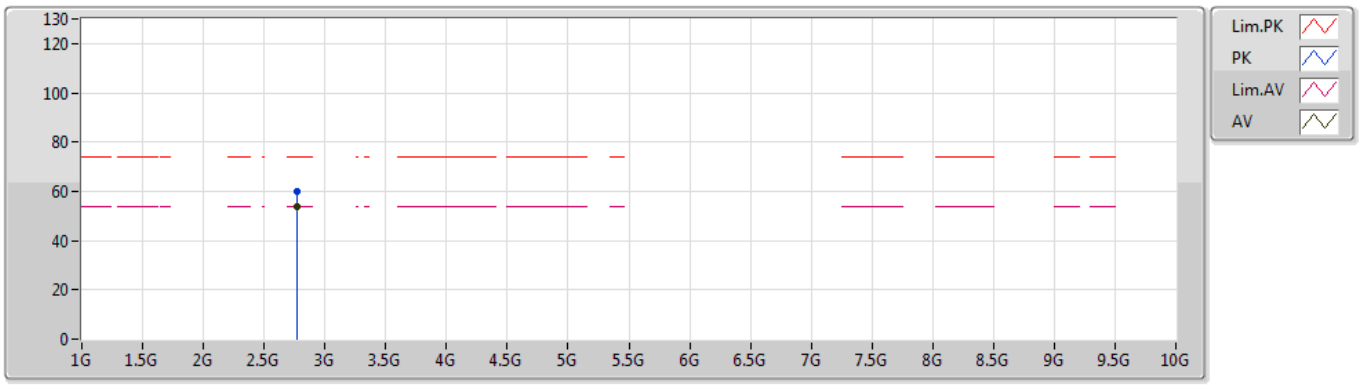


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.74144G	45.31	54.00	-8.69	-1.61	3	Horizontal	139	1.50	-
PK	2.74248G	51.65	74.00	-22.35	-1.61	3	Horizontal	139	1.50	-

DSSS_Nss1_1TX

11/04/2019

924MHz_TX

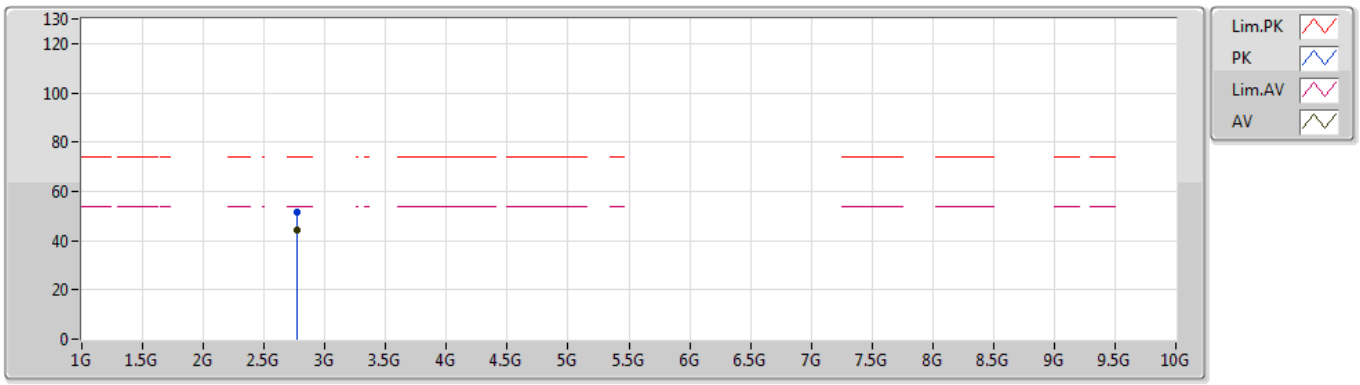


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.77146G	53.65	54.00	-0.35	-1.53	3	Vertical	356	2.40	-
PK	2.7726G	59.87	74.00	-14.13	-1.51	3	Vertical	356	2.40	-

DSSS_Nss1_1TX

11/04/2019

924MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.77248G	44.54	54.00	-9.46	-1.52	3	Horizontal	143	1.49	-
PK	2.77254G	51.64	74.00	-22.36	-1.51	3	Horizontal	143	1.49	-