

Prüfbericht-Nr.: Test report no.:	CN22ZW0R 001	Auftrags-Nr.: Order no.:	168376259	Seite 1 von 32 Page 1 of 32
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2022-05-26	
Auftraggeber: Client:	Shenzhen RAKwireless Technology Co.,Ltd. Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China			
Prüfgegenstand: Test item:	WisLink LPWAN Concentrator			
Bezeichnung / Typ-Nr.: Identification / Type no.:	RAK5147 (Trademark: RAK)			
Auftrags-Inhalt: Order content:	FCC and IC approval			
Prüfgrundlage: Test specification:	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 2: Section 2.1093 RSS-247 Issue 2 February 2017 RSS-Gen Issue 5 February 2021 RSS-102 Issue 5 February 2021			
Wareneingangsdatum: Date of sample receipt:	2022-06-08	Please refer to photo documents		
Prüfmuster-Nr.: Test sample no.:	A003275919			
Prüfzeitraum: Testing period:	2022-06-16 - 2022-06-27			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:			genehmigt von: authorized by:	
Datum: Date:	2022-07-19		Ausstellungsdatum: Issue date:	2022-07-21
	Signed by: Alex Lan		Signed by: Lin Lin	
Stellung / Position	Assistant Project Manager		Stellung / Position	Reviewer
Sonstiges / Other:	FCC ID: 2AF6B-RAK5147 IC: 25908-RAK5147, HVIN: RAK5147			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged:			
* 1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n) Legend: 1 = very good P(ass) = passed a.m. test specifications(s)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n) 2 = good F(ail) = failed a.m. test specifications(s)	3 = befriedigend 3 = satisfactory	4 = ausreichend N/A = nicht anwendbar 4 = sufficient N/A = not applicable	5 = mangelhaft N/T = nicht getestet 5 = poor N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 6dB BANDWIDTH

RESULT: Pass

5.1.5 20dB BANDWIDTH

RESULT: Pass

5.1.6 99% BANDWIDTH

RESULT: Pass

5.1.7 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH

RESULT: Pass

5.1.8 RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.9 CARRIER FREQUENCY SEPARATION

RESULT: Pass

5.1.10 NUMBER OF HOPPING FREQUENCY

RESULT: Pass

5.1.11 TIME OF OCCUPANCY

RESULT: Pass

5.1.12 CONDUCTED EMISSION ON AC MAINS

RESULT: Pass

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up.

Appendix B: Test Results.

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

Radio Spectrum Testing (SRD-Tonscend)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
EXA Signal Analyzer, Multi-touch	Keysight	N9010B	MY60241175	28.09.2022
MXG X-Series RF Vector Signal Generator	Keysight	N5182B	MY61250137	28.09.2022
EXG X-Series Microwave Analog Signal Generator	Keysight	N5173B	MY61250141	28.09.2022
DC Power Supply	Keysight	E3642A	MY61276100	28.09.2022
Wireless Connectivity Tester	R&S	CMW270	102505	28.09.2022
Power Control Unit	Tonscend	JS0806-4ADC	N/A	28.09.2022
Automation Control Unit	Tonscend	JS0806-2	21C8060396	28.09.2022
Test Software	Tonscend	JS1120-3	N/A	N/A
Control PC	Lenovo	TianYi510S-071MB	YLX23JMF	N/A
Unwanted Emission Testing (TS9975)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	10.08.2022
Signal Analyzer	R&S	FSV 40	101439	09.08.2022
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	09.08.2022
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	09.08.2022
Amplifier	R&S	SCU-18F	180070	09.08.2022
Amplifier	R&S	SCU40A	100475	09.08.2022
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	08.08.2022
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	08.08.2022
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	08.08.2022
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	13.09.2022
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	22.06.2024

Conducted Emission on AC Mains				
Equipment	Manufacturer	Model No.	Serial No.	Cali. until
EMI Test Receiver	R&S	ESR3	102428	10.08.2022
Artificial Mains Network	R&S	ENV216	102333	10.08.2022
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power (conducted)	± 2.5 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	± 6 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	± 6 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a WisLink LPWAN Concentrator which supports Lora and GNSS technologies.

This module has five different antennas, the details specifications for these antennas as below:

Antenna #	Model	Antenna Gain	Antenna Type	Connector Type
1#	RAKARG15	8dBi	Fiber Glass Antenna	N-type male connector
2#	RAKARG14	5.8dBi	Fiber Glass Antenna	N-type male connector
3#	RAKARG19	5.1dBi	Fiber Glass Antenna	N-type male connector
4#	RAKARJ14	2.3 dBi	Dipole Antenna	RPSMA connector
5#	RAKARJ16	2.3 dBi	Dipole Antenna	RPSMA connector

Note:

1. When connecting to the module, all antennas listed above need to transfer to an **IPEX connector**.
2. Antennas 1#, 2# and 3# have the same type and similar in-band and out-of-band characteristics, they are considered as equivalent antennas. Thus, the antenna 1# & 3# was selected to be tested.
3. Antennas 4# and 5# have the same type and similar in-band and out-of-band characteristics, they are considered as equivalent antennas. Thus, the antenna 4# with highest gain was selected to be tested.

Antenna 4# RAKARJ14 is identical with Antenna 5# RAKARJ16 except the color of enclosure different.

Data Rate	Configuration	Indicative physical bit rate [bit/sec]
0	LoRa Modulation: SF10 / Bandwidth 125 kHz	980
1	LoRa Modulation: SF9 / Bandwidth 125 kHz	1760
2	LoRa Modulation: SF8 / Bandwidth 125 kHz	3125
3	LoRa Modulation: SF7 / Bandwidth 125 kHz	5470
4	LoRa Modulation: SF8 / Bandwidth 500 kHz	12500
8	LoRa Modulation: SF12 / Bandwidth 500 kHz	980
9	LoRa Modulation: SF11 / Bandwidth 500 kHz	1760
10	LoRa Modulation: SF10 / Bandwidth 500 kHz	3900
11	LoRa Modulation: SF9 / Bandwidth 500 kHz	7000
12	LoRa Modulation: SF8 / Bandwidth 500 kHz	12500
13	LoRa Modulation: SF7 / Bandwidth 500 kHz	21900

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	WisLink LPWAN Concentrator
Type Designation	RAK5147
Trademark	RAK
FCC ID	2AF6B-RAK5147
IC	25908-RAK5147
HVIN	RAK5147
Operating Voltage	DC 3.3V (Supplied by socket of PCB board)

Technical Specification of Lora DTS	
Operating Frequency	904.6MHz, 923.3 - 927.5MHz
Type of Modulation	Lora
Data Rate	SF8 / DR4 for 904.6MHz SF7 – SF12 / DR8 – DR13 for 923.3 - 927.5MHz
Channel Number	8 channels for 923.3 - 927.5MHz
Occupied Bandwidth	500 KHz
Technical Specification of Lora Hybrid	
Frequency Range	903.9MHz - 905.3MHz
Type of Modulation	Lora
Data Rate	SF7 – SF10 / DR0 – DR3
Channel Number	8 channels
Channel Separation	200 KHz
Occupied Bandwidth	125 KHz

Table 3: RF Channel and Frequency of Lora DTS

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	904.6	3	924.5	6	926.3
1	923.3	4	925.1	7	926.9
2	923.9	5	925.7	8	927.5

Table 4: RF Channel and Frequency of Lora Hybrid

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	903.9	2	904.3	4	904.7	6	905.1
1	904.1	3	904.5	5	904.9	7	905.3

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Lora transmitting mode (DTS & Hybrid)
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Transmitting on Hopping channel (Hybrid)
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- ID Label and Location Info
- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013 and ANSI C63.4: 2014.

According to clause 3.1, all tests were performed on model RAK5147 with Ant#1, Ant#3 & Ant#4 in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 5: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N
Portable Laptop	Lenovo	ThinkPad T480	10Q67059
adapter	RAK	N/A	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

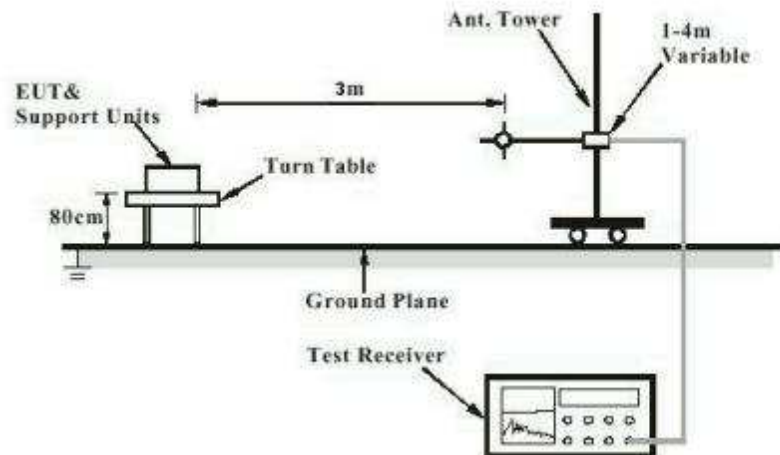


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

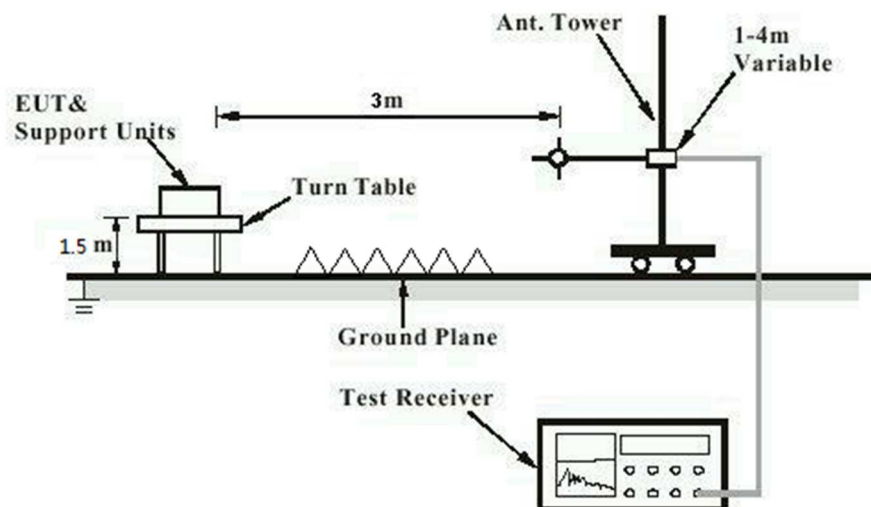


Diagram of Measurement Configuration for Mains Conduction Measurement

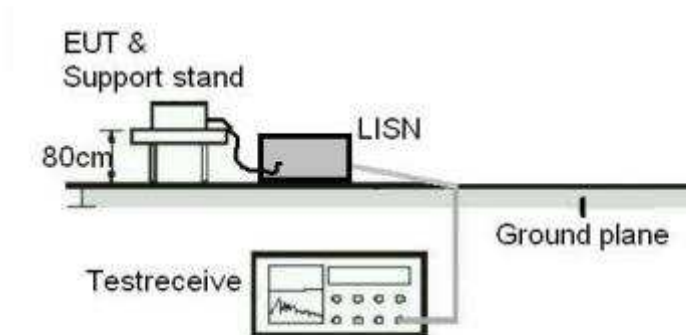
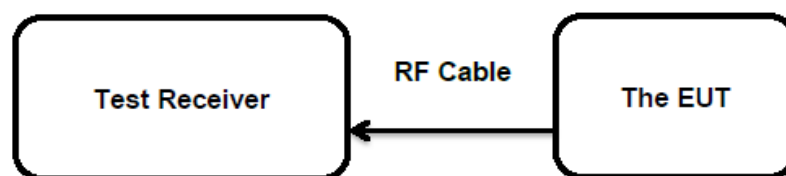


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.247(b)(4) and Part 15.203
RSS-Gen Clause 6.8

According to the manufacturer declared, the EUT has one external antennas, the maximum directional gain of antenna is 8dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum Conducted Output Power

RESULT:
Pass
Test Specification

Test standard	: FCC Part 15.247(b)(2)&(3) RSS-247 Clause 5.4(a)&(d)
Basic standard	: ANSI C63.10: 2013
Limits	: < 1.0 W (30 dBm) for antenna gain less than 6dBi : < 0.631 W (28 dBm) for antenna gain more than 6dBi
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2022-06-16 to 2022-06-27
Input voltage	: DC 3.3V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

For Antenna Gain (2.3dBi) less than 6dBi

Table 6: Test Result of Maximum Conducted Output Power, Lora DTS

Test Mode	Test Channel (MHz)	Measured Conducted Power		Limit
		(dBm)	(W)	
Lora DTS SF7	923.3	26.68	0.4656	< 1.0 W (30 dBm)
	925.1	26.59	0.4560	
	927.5	26.51	0.4477	
Lora DTS SF12	923.3	26.84	0.4831	
	925.1	26.77	0.4753	
	927.5	26.43	0.4395	
Lora DTS SF8	904.6	26.85	0.4842	
Max. Measured Value		26.85	0.4842	

Table 7: Test Result of Maximum Conducted Output Power, Lora Hybrid

Test Mode	Test Channel (MHz)	Measured Conducted Power		Limit (W)
		(dBm)	(W)	
Lora Hybrid SF7	903.9	19.93	0.0984	< 1.0 W (30 dBm)
	904.5	20.05	0.1012	
	905.3	20.14	0.1033	
Lora Hybrid SF9	903.9	21.34	0.1361	
	904.5	21.43	0.1390	
	905.3	21.69	0.1476	
Lora Hybrid SF10	903.9	19.84	0.0964	
	904.5	20.02	0.1005	
	905.3	20.21	0.1050	
Max. Measured Value		21.69	0.1476	

Note:

- 1) The cable loss is taken into account in results.
- 2) Maximum Antenna gain(G) : 2.3 dBi,
Maximum e.i.r.p.=29.15dBm = 0.822W, which is far below the 4 W

For Antenna Gain (5.1dBi) less than 6dBi

Table 8: Test Result of Maximum Conducted Output Power, Lora DTS

Test Mode	Test Channel (MHz)	Measured Conducted Power		Limit
		(dBm)	(W)	
Lora DTS SF7	923.3	25.88	0.3873	< 1.0 W (30 dBm)
	925.1	25.79	0.3793	
	927.5	25.71	0.3724	
Lora DTS SF12	923.3	26.04	0.4018	
	925.1	25.97	0.3954	
	927.5	25.63	0.3656	
Lora DTS SF8	904.6	26.05	0.4027	
Max. Measured Value		26.05	0.4027	

Table 9: Test Result of Maximum Conducted Output Power, Lora Hybrid

Test Mode	Test Channel (MHz)	Measured Conducted Power		Limit (W)
		(dBm)	(W)	
Lora Hybrid SF7	903.9	19.93	0.0984	< 1.0 W (30 dBm)
	904.5	20.05	0.1012	
	905.3	20.14	0.1033	
Lora Hybrid SF9	903.9	21.34	0.1361	
	904.5	21.43	0.1390	
	905.3	21.69	0.1476	
Lora Hybrid SF10	903.9	19.84	0.0964	
	904.5	20.02	0.1005	
	905.3	20.21	0.1050	
Max. Measured Value		21.69	0.1476	

Note:

- 3) The cable loss is taken into account in results.
- 4) Maximum Antenna gain(G) : 5.1 dBi,
Maximum e.i.r.p.=31.15dBm = 1.303W, which is far below the 4 W

For Antenna Gain (8dBi) more than 6dBi

Table 10: Test Result of Maximum Conducted Output Power, Lora DTS

Test Mode	Test Channel (MHz)	Measured Conducted Power		Limit
		(dBm)	(W)	
Lora DTS SF7	923.3	23.03	0.2009	< 0.631 W (28 dBm)
	925.1	23.12	0.2051	
	927.5	22.54	0.1795	
Lora DTS SF12	923.3	22.14	0.1637	
	925.1	22.91	0.1954	
	927.5	22.42	0.1746	
Lora DTS SF8	904.6	22.89	0.1945	
Max. Measured Value		23.12	0.2051	

Table 11: Test Result of Maximum Conducted Output Power, Lora Hybrid

Test Mode	Test Channel (MHz)	Measured Conducted Power		Limit (W)
		(dBm)	(W)	
Lora Hybrid SF7	903.9	18.02	0.0634	< 0.631 W (28 dBm)
	904.5	18.24	0.0667	
	905.3	18.28	0.0673	
Lora Hybrid SF9	903.9	19.88	0.0973	
	904.5	19.95	0.0989	
	905.3	20.10	0.1023	
Lora Hybrid SF10	903.9	17.97	0.0627	
	904.5	18.10	0.0646	
	905.3	18.26	0.0670	
Max. Measured Value		20.10	0.1023	

Note:

5) The cable loss is taken into account in results.

6) Maximum Antenna gain(G) : 8 dBi,

Maximum e.i.r.p.=31.12dBm = 1.294W, which is far below the 4 W

5.1.3 Conducted Power Spectral Density

RESULT:
Pass
Test Specification

Test standard	: FCC Part 15.247(e), FCC Part 15.247(f) RSS-247 Clause 5.2(b), RSS-247 Clause 5.3
Basic standard	: ANSI C63.10: 2013
Limits	: < 8 dBm / 3kHz for antenna gain less than 6dBi : < 6 dBm / 3kHz for antenna gain 8dBi
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2022-06-16 to 2022-06-27
Input voltage	: DC 3.3V
Operation mode	: B
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

For Antenna Gain (2.3dBi) less than 6dBi

Table 12: Test Result of Maximum Power Spectral Density, Lora DTS

Test Mode	Test Channel (MHz)	Measured Power Spectral Density (dBm/3KHz)
Lora DTS SF7	923.3	7.52
	925.1	7.36
	927.5	7.49
Lora DTS SF12	923.3	7.41
	925.1	7.26
	927.5	7.51
Lora DTS SF8	904.6	6.81
Maximum Measured Value		7.52

Table 13: Test Result of Maximum Power Spectral Density, Lora Hybrid

Test Mode	Test Channel (MHz)	Measured Power Spectral Density (dBm/3KHz)
Lora Hybrid SF7	903.9	7.03
	904.5	7.15
	905.3	7.52
Lora Hybrid SF9	903.9	7.02
	904.5	7.53
	905.3	7.28
Lora Hybrid SF10	903.9	7.27
	904.5	7.14
	905.3	7.46
Maximum Measured Value		7.53

For Antenna Gain (5.1dBi) less than 6dBi

Table 14: Test Result of Maximum Power Spectral Density, Lora DTS

Test Mode	Test Channel (MHz)	Measured Power Spectral Density (dBm/3KHz)
Lora DTS SF7	923.3	6.88
	925.1	6.72
	927.5	6.85
Lora DTS SF12	923.3	6.77
	925.1	6.62
	927.5	6.87
Lora DTS SF8	904.6	6.17
Maximum Measured Value		6.88

Table 15: Test Result of Maximum Power Spectral Density, Lora Hybrid

Test Mode	Test Channel (MHz)	Measured Power Spectral Density (dBm/3KHz)
Lora Hybrid SF7	903.9	7.03
	904.5	7.15
	905.3	7.52
Lora Hybrid SF9	903.9	7.02
	904.5	7.53
	905.3	7.28
Lora Hybrid SF10	903.9	7.27
	904.5	7.14
	905.3	7.46
Maximum Measured Value		7.53

For Antenna Gain (8dBi) more than 6dBi

Table 16: Test Result of Maximum Power Spectral Density, Lora DTS

Test Mode	Test Channel (MHz)	Measured Power Spectral Density (dBm/3KHz)
Lora DTS SF7	923.3	3.24
	925.1	3.49
	927.5	2.86
Lora DTS SF12	923.3	3.78
	925.1	3.82
	927.5	3.63
Lora DTS SF8	904.6	3.02
Maximum Measured Value		3.82

Table 17: Test Result of Maximum Power Spectral Density, Lora Hybrid

Test Mode	Test Channel (MHz)	Measured Power Spectral Density (dBm/3KHz)
Lora Hybrid SF7	903.9	5.13
	904.5	5.34
	905.3	5.27
Lora Hybrid SF9	903.9	5.48
	904.5	5.44
	905.3	5.36
Lora Hybrid SF10	903.9	4.61
	904.5	4.87
	905.3	4.94
Maximum Measured Value		5.48

5.1.4 6dB Bandwidth

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.247(a)(2)
 RSS-247 Clause 5.2(a)
 Basic standard : ANSI C63.10: 2013
 Limits : At least 500kHz for bandwidth(DTS)
 Kind of test site : Shielded Room

Test Setup

Date of testing : 2022-06-21
 Input voltage : DC 3.3V
 Operation mode : B
 Test channel : Low / Middle / High
 Ambient temperature : 25 °C
 Relative humidity : 56 %
 Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 18: Test Result of 6dB Bandwidth, Lora DTS

Test Mode	Test Channel (MHz)	6dB Bandwidth (KHz)	Limit (MHz)
Lora DTS SF7	923.3	579.0	>500KHz
	925.1	578.0	
	927.5	580.0	
Lora DTS SF12	923.3	620.0	
	925.1	616.0	
	927.5	617.0	
Lora DTS SF8	904.6	604.0	
Minimum Measured Value		578.0	

5.1.5 20dB Bandwidth

RESULT:
Pass
Test Specification

Test standard	: FCC Part 15.247(a)(1) (i) RSS-247 Clause 5.1(a)
Basic standard	: ANSI C63.10: 2013 Not more than 500kHz and
Limits	: < 250KHz for at least 50 hopping frequencies >=250KHz for at least 25 hopping frequencies
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2022-06-20
Input voltage	: DC 3.3V
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B.

Table 19: Test Result of 20dB Bandwidth, Lora Hybrid

Test Mode	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (MHz)
Lora Hybrid SF7	903.9	120.68	<500KHz
	904.5	120.58	
	905.3	120.63	
Lora Hybrid SF9	903.9	124.17	
	904.5	124.14	
	905.3	124.13	
Lora Hybrid SF10	903.9	123.99	
	904.5	124.00	
	905.3	123.92	
Maximum Measured Value		124.17	

5.1.6 99% Bandwidth

RESULT:
Pass
Test Specification

Test standard : RSS-Gen Clause 6.7
Basic standard : ANSI C63.10: 2013
Kind of test site : Shielded Room

Test Setup

Date of testing : 2022-06-21
Input voltage : DC 3.3V
Operation mode : A, B
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 56 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 20: Test Result of 99% Bandwidth, Lora DTS

Test Mode	Test Channel (MHz)	99% Bandwidth (KHz)	Limit (MHz)
Lora DTS SF7	923.3	472.88	/
	925.1	472.07	
	927.5	475.06	
Lora DTS SF12	923.3	500.01	
	925.1	500.21	
	927.5	501.09	
Lora DTS SF8	904.6	485.15	
Maximum Measured Value		501.09	

Table 21: Test Result of 99% Bandwidth, Lora Hybrid

Test Mode	Test Channel (MHz)	99% Bandwidth (KHz)	Limit (MHz)
Lora Hybrid SF7	903.9	120.65	/
	904.5	120.64	
	905.3	120.48	
Lora Hybrid SF9	903.9	124.18	
	904.5	124.15	
	905.3	124.07	
Lora Hybrid SF10	903.9	123.97	
	904.5	123.99	
	905.3	123.96	
Maximum Measured Value		124.18	

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Test Report No.Seite 24 von 32
Page 24 of 32**5.1.7 Conducted Spurious Emissions Measured in 100 kHz Bandwidth****RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.247(d) RSS-247 Clause 5.5
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: Refer to test result
Input voltage	: DC 3.3V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix B.

5.1.8 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d)
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2022-06-16 to 2022-06-21
Input voltage	: DC 3.3V
Operation mode	: A, B
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: 101 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics with all data rate and three channels (Lowest, middle and highest). Only the worst case spurious emissions configuration of the each mode were reported.

Radiated spurious emissions were performed on the EUT with antenna in three orthogonal orientations and only the worst (antenna vertical) orientations was recorded.

For the measurement records, refer to the appendix B.

5.1.9 Carrier Frequency Separation

RESULT:
Pass
Test Specification

Test standard : FCC Part 15.247(a)(1)
RSS-247 Clause 5.1(b)

Basic standard : ANSI C63.10: 2013

Limits : $\geq 20\text{dB}$ bandwidth

Kind of test site : Shielded Room

Test Setup

Date of testing : 2022-06-20

Input voltage : DC 3.3V

Operation mode : C

Test channel : Low / Middle / High

Ambient temperature : 25 °C

Relative humidity : 56 %

Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 22: Test Result of Carrier Frequency Separation

Test Mode	Channel	Measured Channel Separation (KHz)	Limit (kHz)	Result
Lora Hybrid (FHSS SF7)	Low Channel	212	≥ 20dB bandwidth	Pass
	Adjacency Channel			
	Middle Channel	217		Pass
	Adjacency Channel			
	High Channel	200		Pass
	Adjacency Channel			
Lora Hybrid (FHSS SF9)	Low Channel	200	≥ 20dB bandwidth	Pass
	Adjacency Channel			
	Middle Channel	191		Pass
	Adjacency Channel			
	High Channel	207.1		Pass
	Adjacency Channel			
Lora Hybrid (FHSS SF10)	Low Channel	211	≥ 20dB bandwidth	Pass
	Adjacency Channel			
	Middle Channel	212		Pass
	Adjacency Channel			
	High Channel	203		Pass
	Adjacency Channel			

Note:

The limit is maximum 20 dB bandwidth: 124.17KHz.

5.1.10 Number of Hopping Frequency**RESULT:****Pass****Test Specification**

Test standard : FCC part 15.247(a)(1)(iii)
RSS-247 Clause 5.1(d)
Basic standard : ANSI C63.10: 2013
Limits : ≥ 15 non-overlapping channels
Kind of test site : Shielded Room

Test Setup

Date of testing : 2022-06-20
Input voltage : DC 3.3V
Operation mode : C
Ambient temperature : 25 °C
Relative humidity : 56 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix B.

Table 23: Test result of hopping channel number

Test Mode	Hopping frequencies	Limit
Lora Hybrid (FHSS SF7)	8	/
Lora Hybrid (FHSS SF9)	8	/
Lora Hybrid (FHSS SF10)	8	/

5.1.11 Time of Occupancy**RESULT:****Pass****Test Specification**

Test standard : FCC part 15.247(f)
RSS-247 Clause 5.3
Basic standard : ANSI C63.10: 2013
Limits : < 0.4s
Kind of test site : Shielded Room

Test Setup

Date of testing : 2022-06-21
Input voltage : DC 3.3V
Operation mode : C
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 56 %
Atmospheric pressure : 101 kPa

Table 24: Test result of Channel Occupancy

Test Mode	Period (s)	Channel Occupancy Time (ms)	Limit (ms)
Lora Hybrid (FHSS SF7)	20	38.40	400
Lora Hybrid (FHSS SF9)	20	124.4	400
Lora Hybrid (FHSS SF10)	20	246.7	400

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Test Report No.Seite 29 von 32
Page 29 of 32**5.1.12 Conducted Emission on AC Mains****RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.207(a) RSS-Gen Clause 8.8
Basic standard	: ANSI C63.10: 2013
Frequency range	: 0.15 – 30MHz
Limits	: FCC Part 15.207(a) RSS-Gen Table 3
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2022-06-16
Input voltage	: Powered by Adapter
Operation mode	: A, B
Earthing	: Not connected
Ambient temperature	: 24.4 °C
Relative humidity	: 53.6 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B.

6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Pass****Test Specification**

Test standard : CFR47 FCC Part 2: Section 2.1091
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 v06
FCC KDB Publication 865664 D02 v01r02
OET Bulletin 65 (Edition 97-01)
RSS-102 Issue 5 February 2021

This module has five different antennas, and the maximum e.r.i.p. configuration be evaluated as below:

FCC requirement: Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20cm normally can be maintained between the user and the device.

MPE Calculation Method according to OET Bulletin 65

Power Density: $S_{(mW/cm^2)} = PG/4\pi R^2$ or $EIRP/4\pi R^2$

Where:

S = power density (mW/cm²)

P = power input to the antenna (mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm)

The worst-case mode (the configuration having highest EIRP) specified:

Lora DTS: 26.05 dBm with 5.1 dBi antenna gain

From the peak RF output power, the minimum mobile separation distance, d=20 cm, the RF power density can be calculated as below:

For Lora DTS: $S_{(mW/cm^2)} = PG/4\pi R^2 = 0.259 \text{ mW/cm}^2$

Limits for Maximum Permissible Exposure (MPE) according to FCC Part 1.1310: 0.6026 mW/cm²

➤ **IC requirements:** The EUT shall comply with the requirement of RSS-102 section 2.5.2.

Exemption from Routine Evaluation Limits – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

- RF exposure evaluation exempted power for Lora Hybrid & DTS: 1.37 W

The worst-case mode (the configuration having highest EIRP) specified:

Lora DTS: 26.05 dBm

Antenna Gain: 5.1 dBi

The Max. e.i.r.p. for Lora DTS: 31.15dBm = 1.303 W

Both e.i.r.p. for the Lora FHSS and Lora DTS are less than the RF exposure evaluation exempted power. So RF exposure evaluation is not required.

“RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”

7 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

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Appendix B.1: 6dB Bandwidth

Lora DTS SF8
904.6MHz



Lora DTS SF7
Low Channel



Middle Channel



High Channel



Lora DTS SF12

Low Channel



Middle Channel



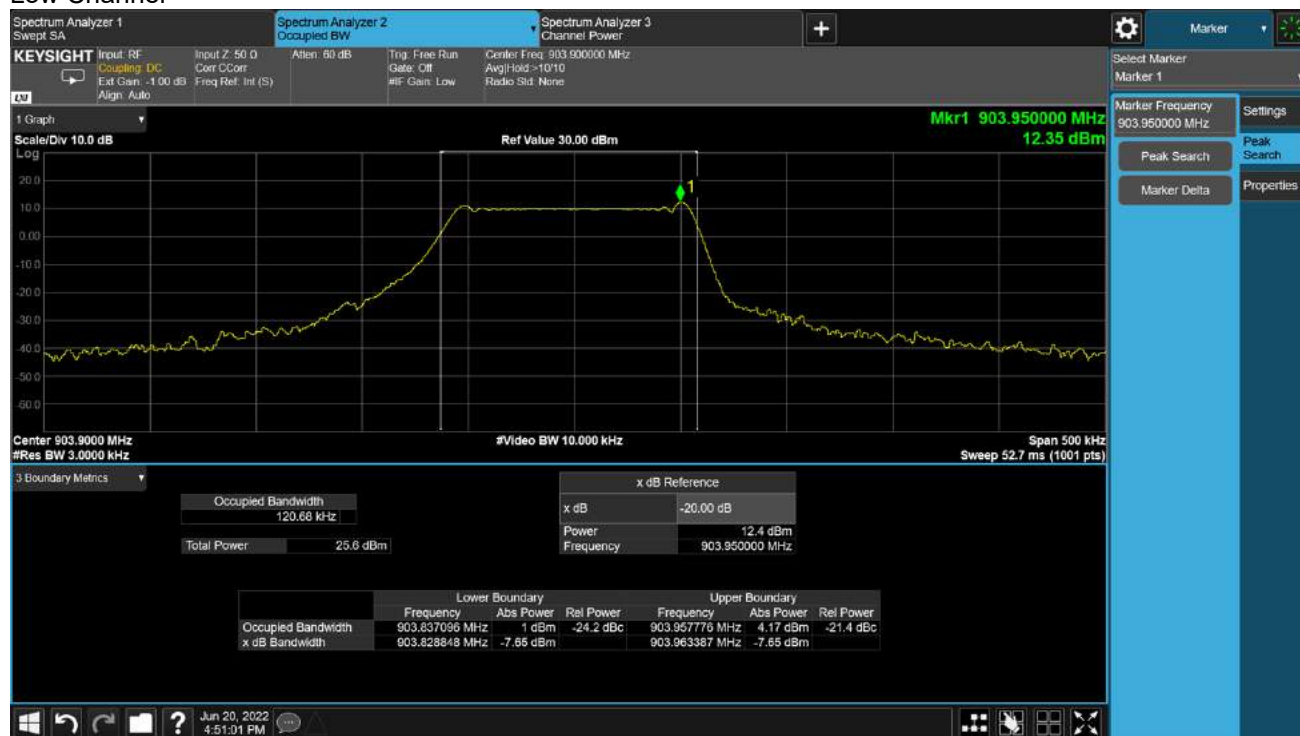
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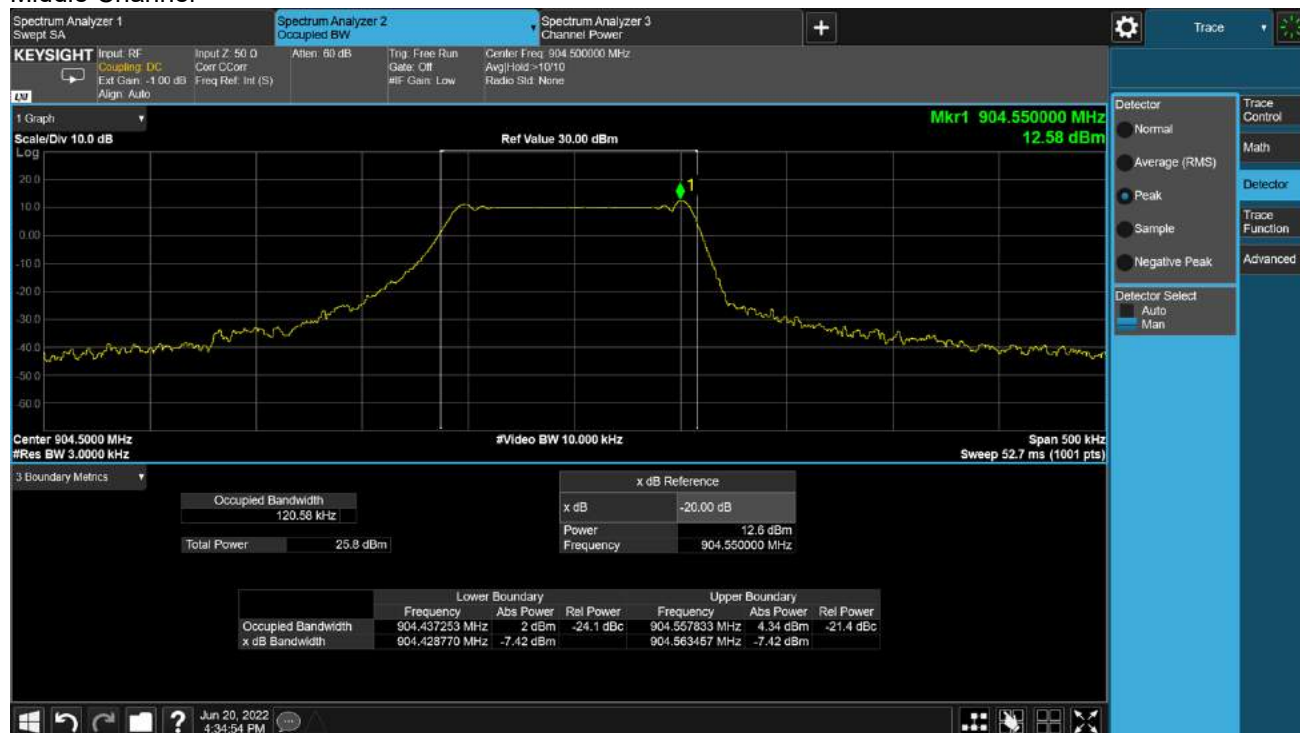
Appendix B.2: 20dB Bandwidth

Lora Hybrid SF7

Low Channel



Middle Channel



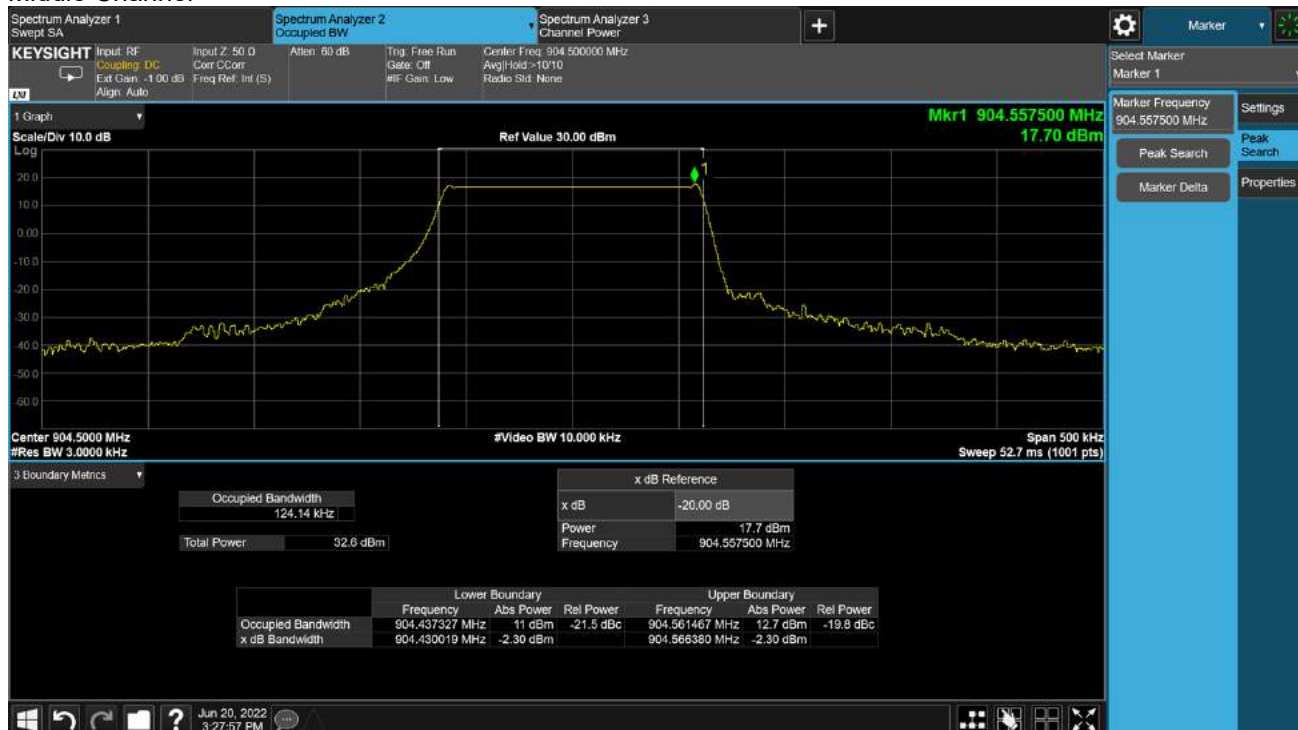
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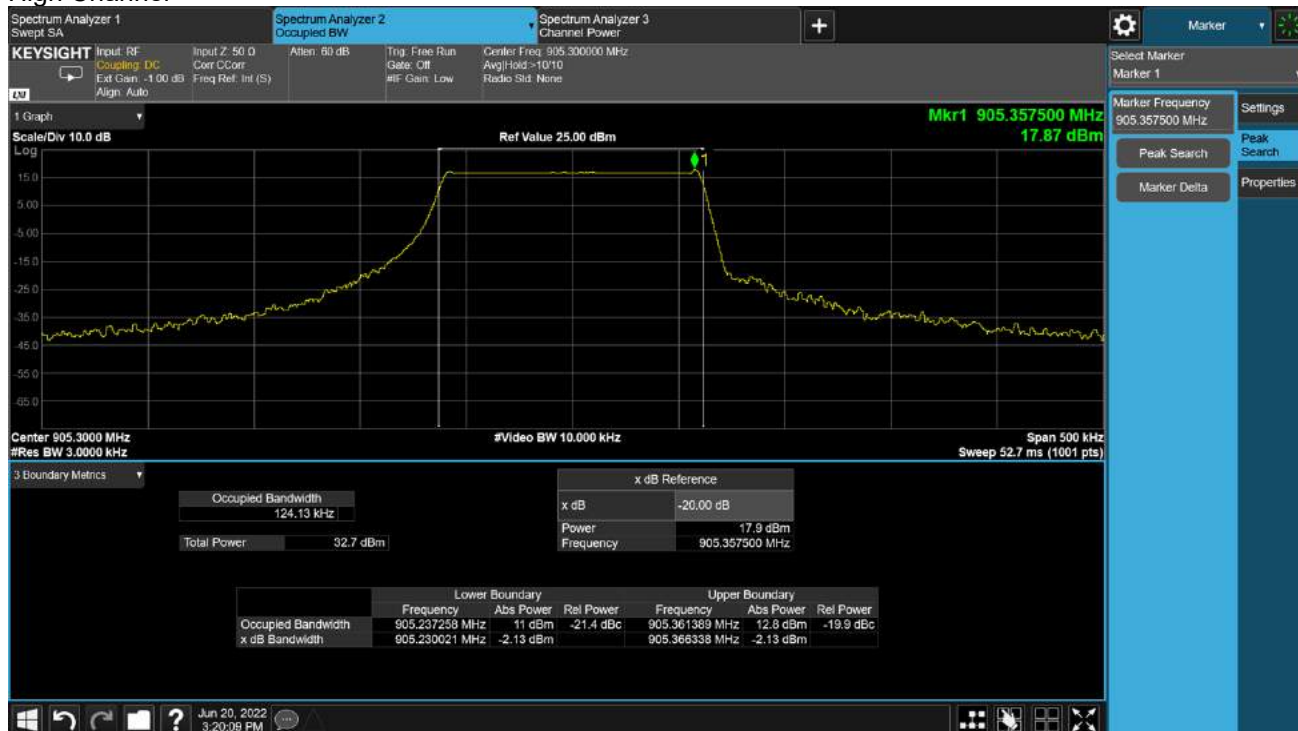
Lora Hybrid SF9 Low Channel



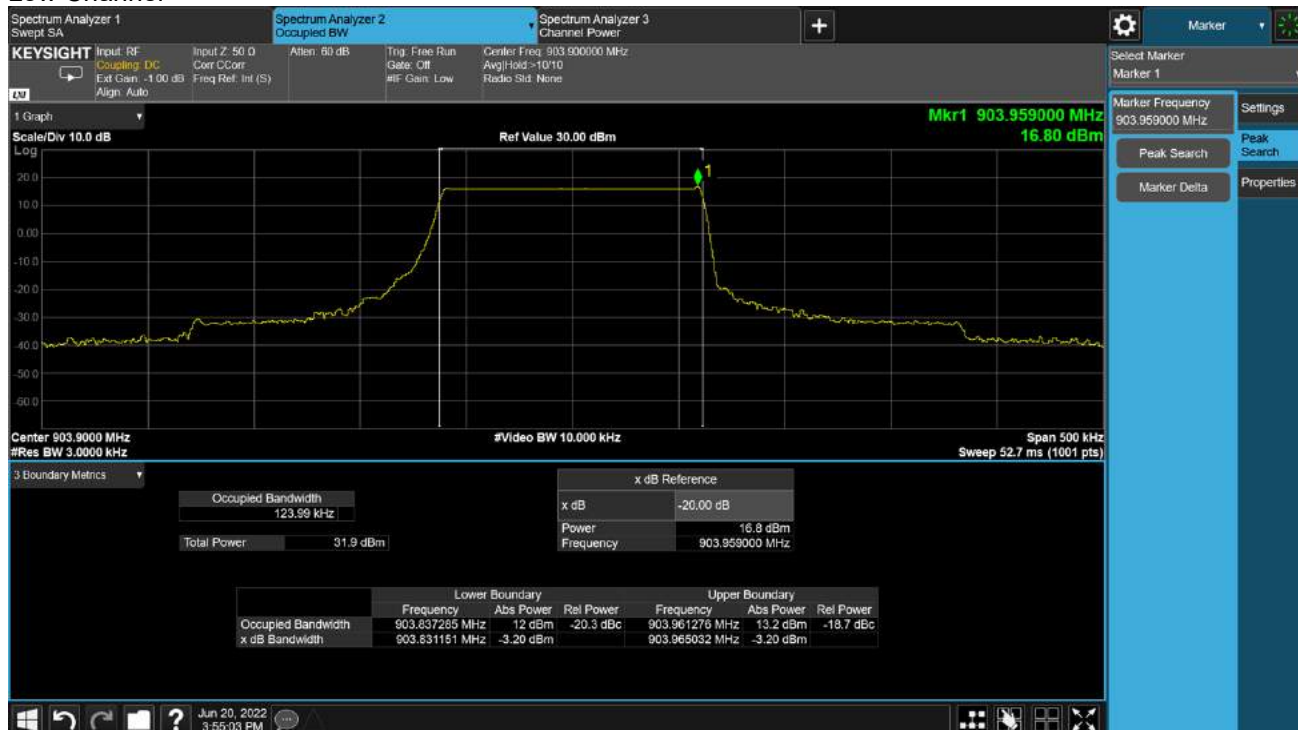
Middle Channel



High Channel



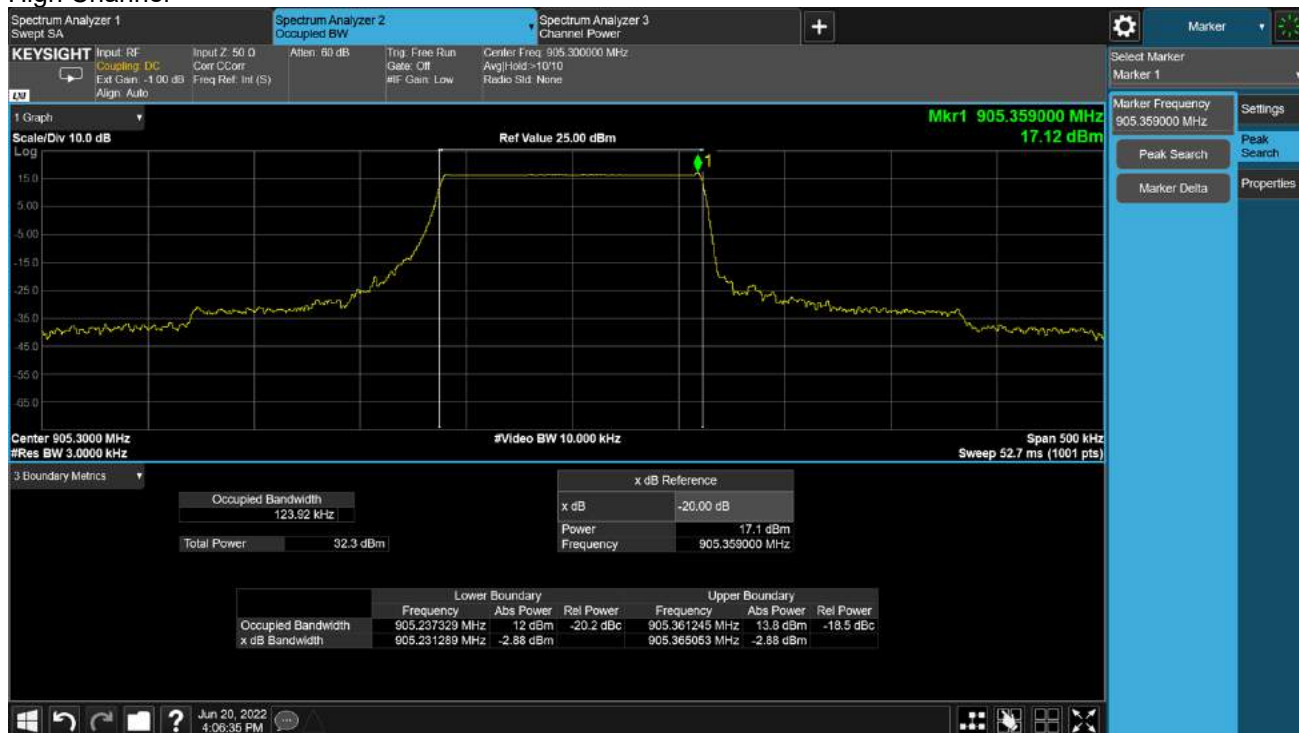
Lora Hybrid SF10 Low Channel



Middle Channel



High Channel

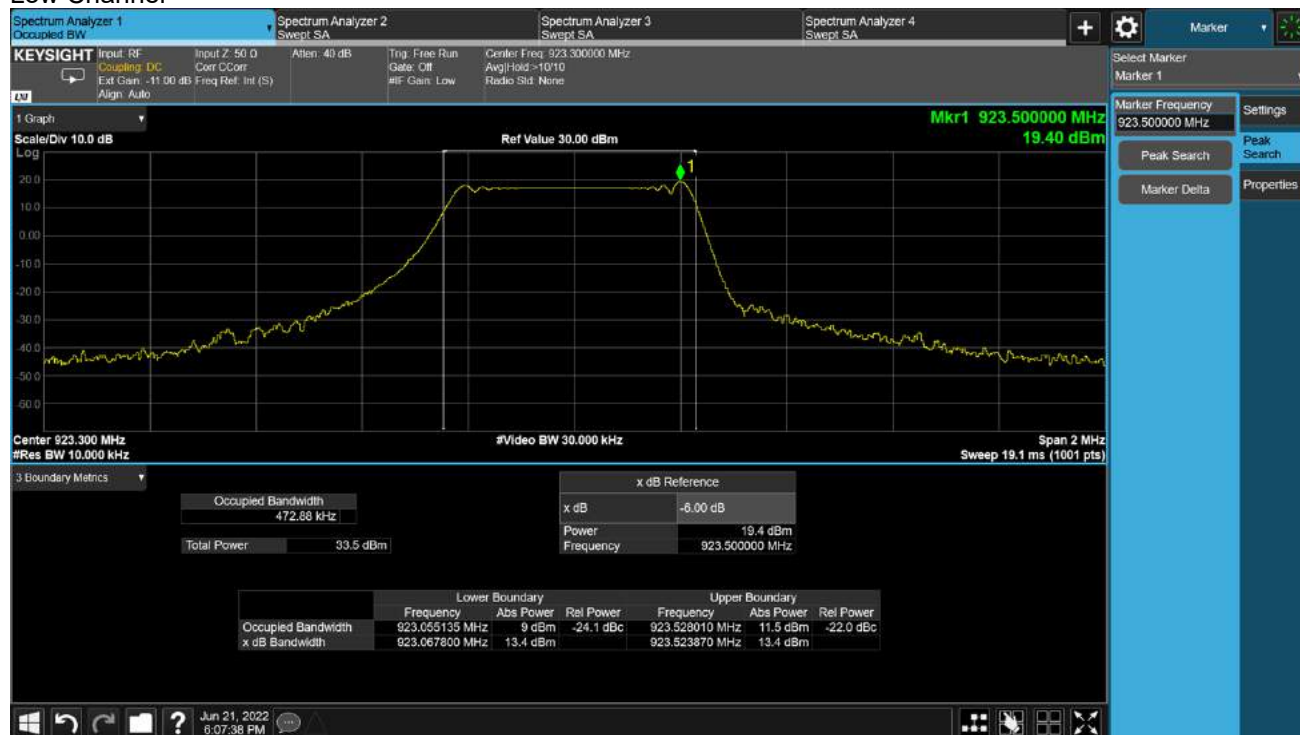


Appendix B.3: 99% Bandwidth

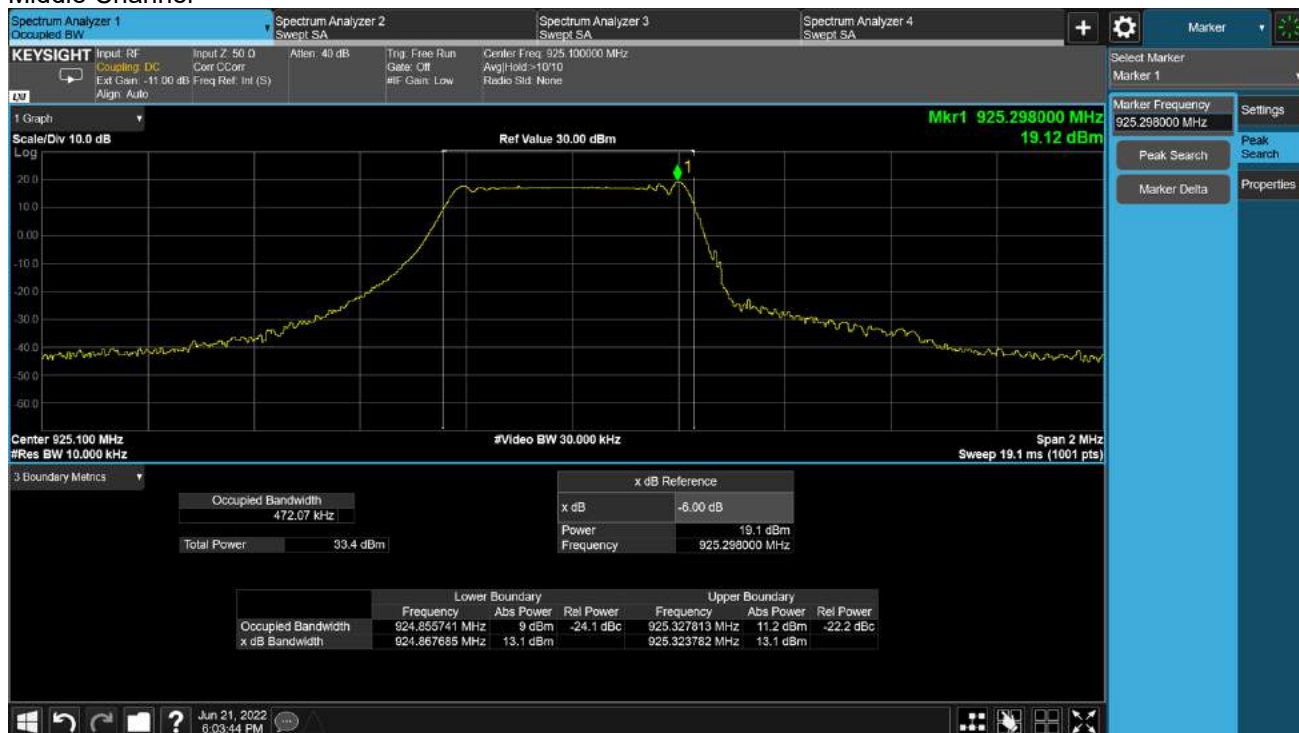
Lora DTS SF8 904.6MHz



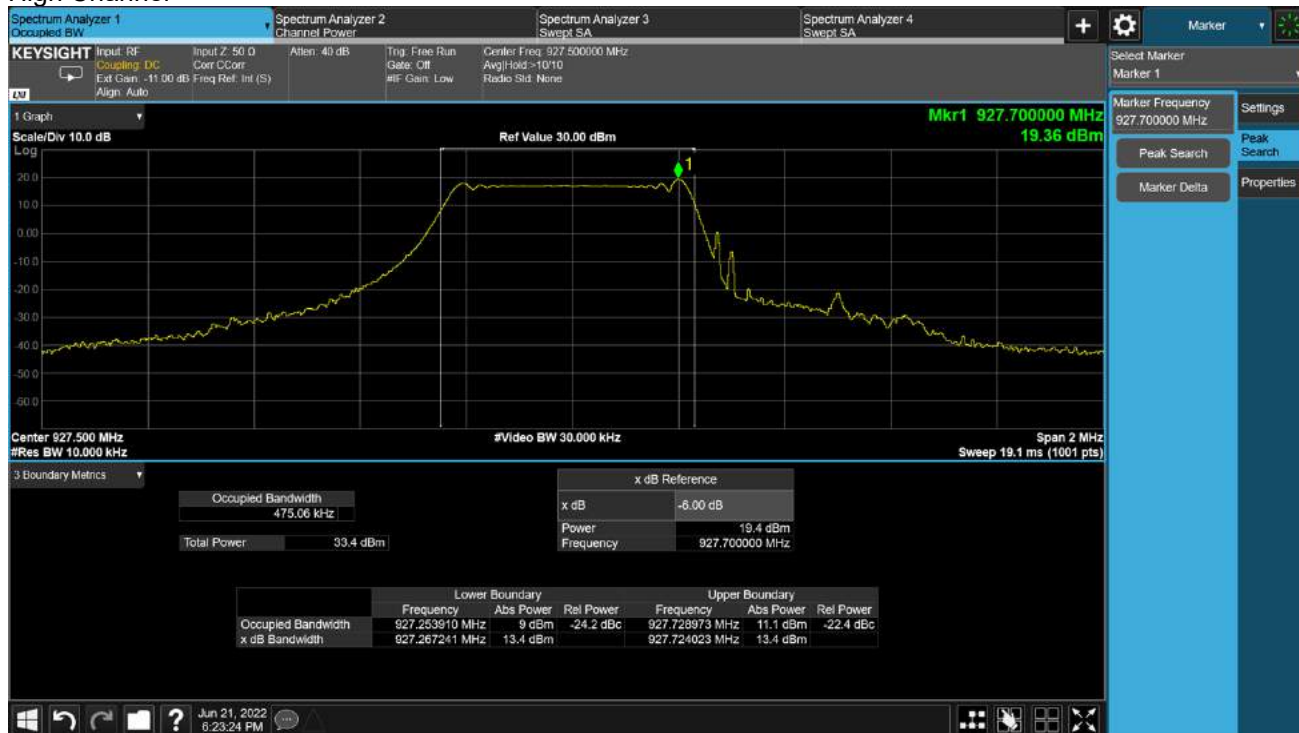
Lora DTS SF7 Low Channel



Middle Channel

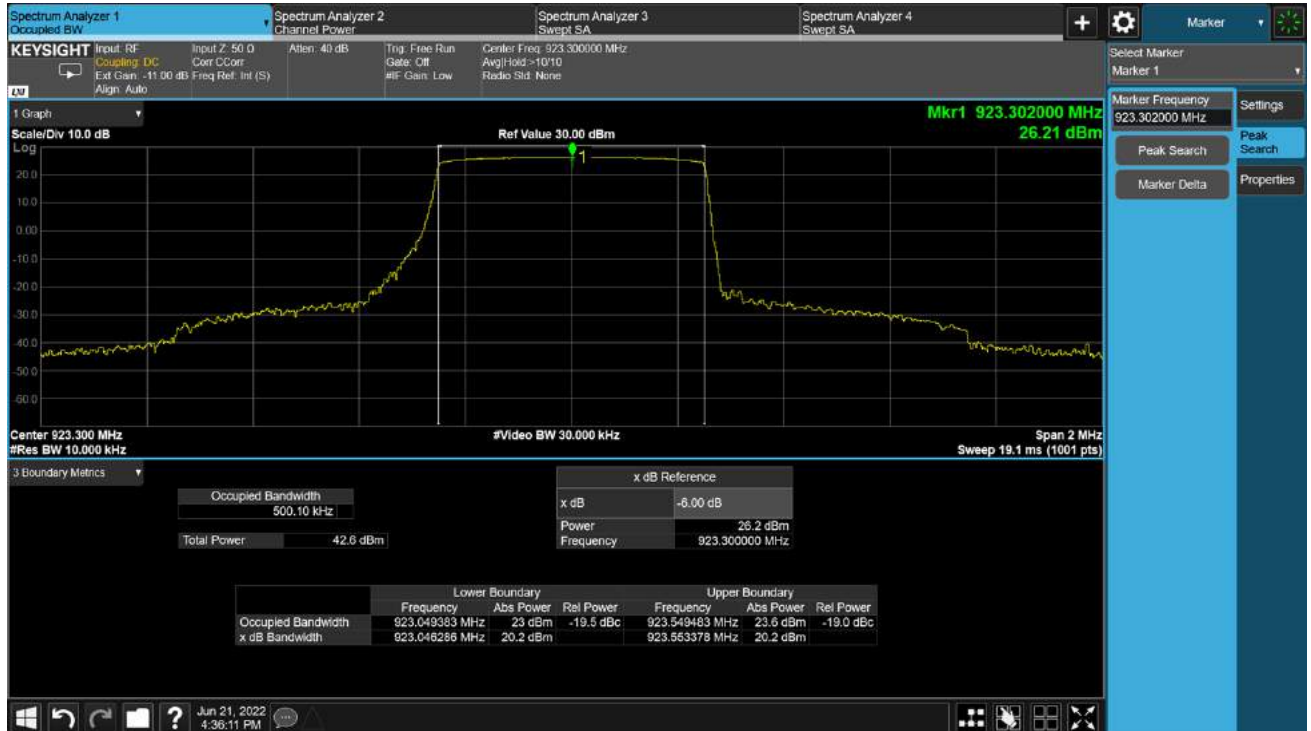


High Channel



Lora DTS SF12

Low Channel



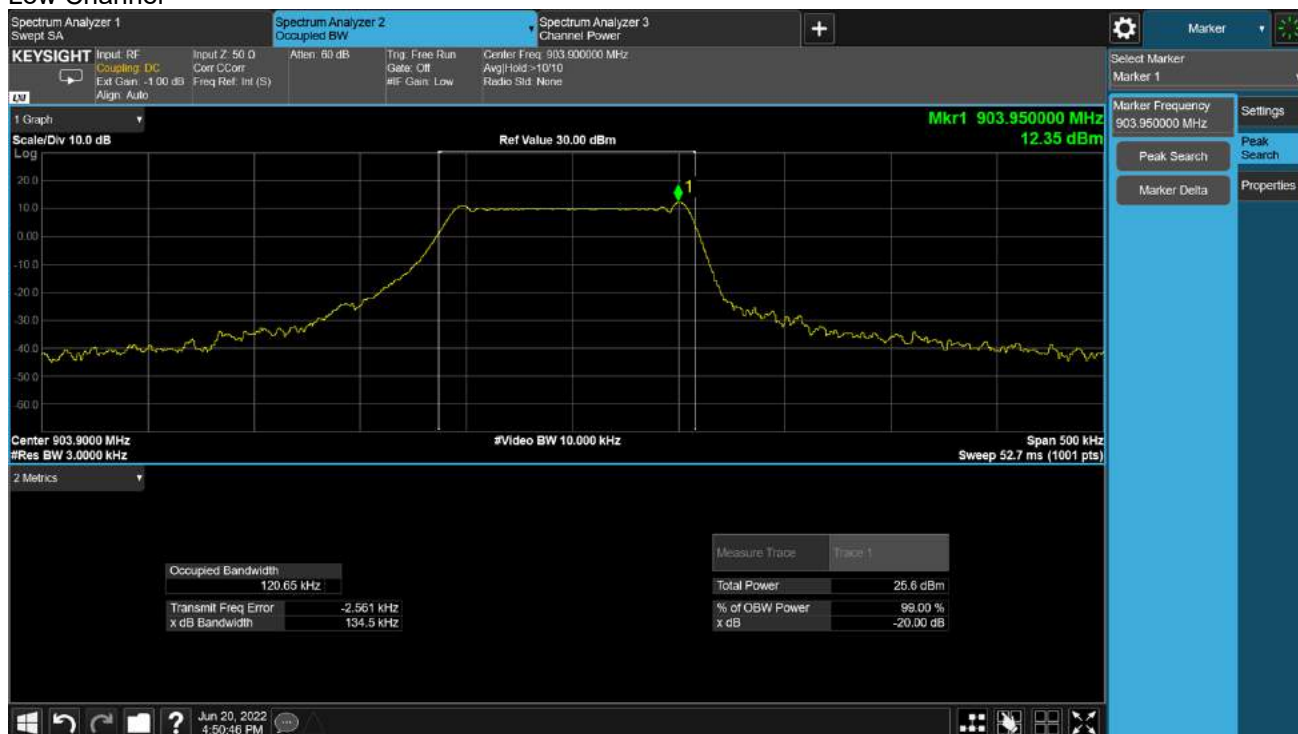
Middle Channel



High Channel

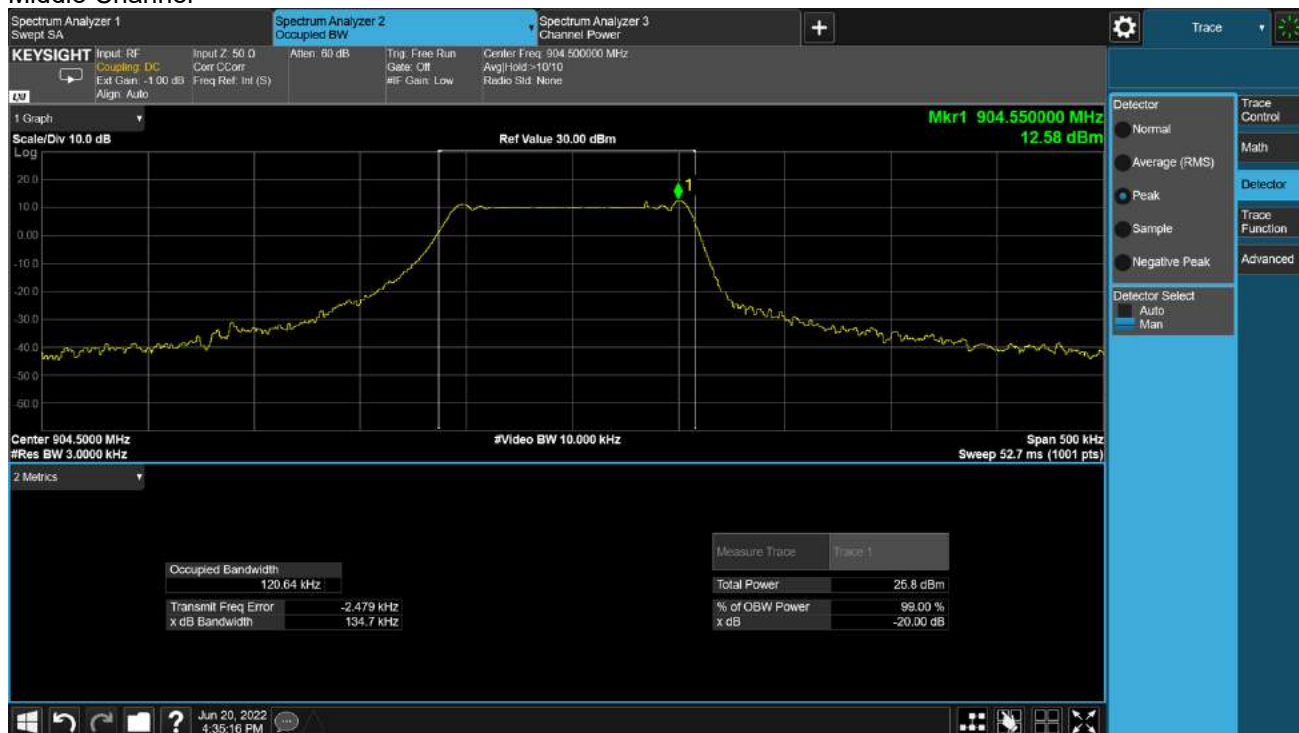


Lora Hybrid SF7 Low Channel



Prüfbericht - Produkte
Test Report - Products

Middle Channel

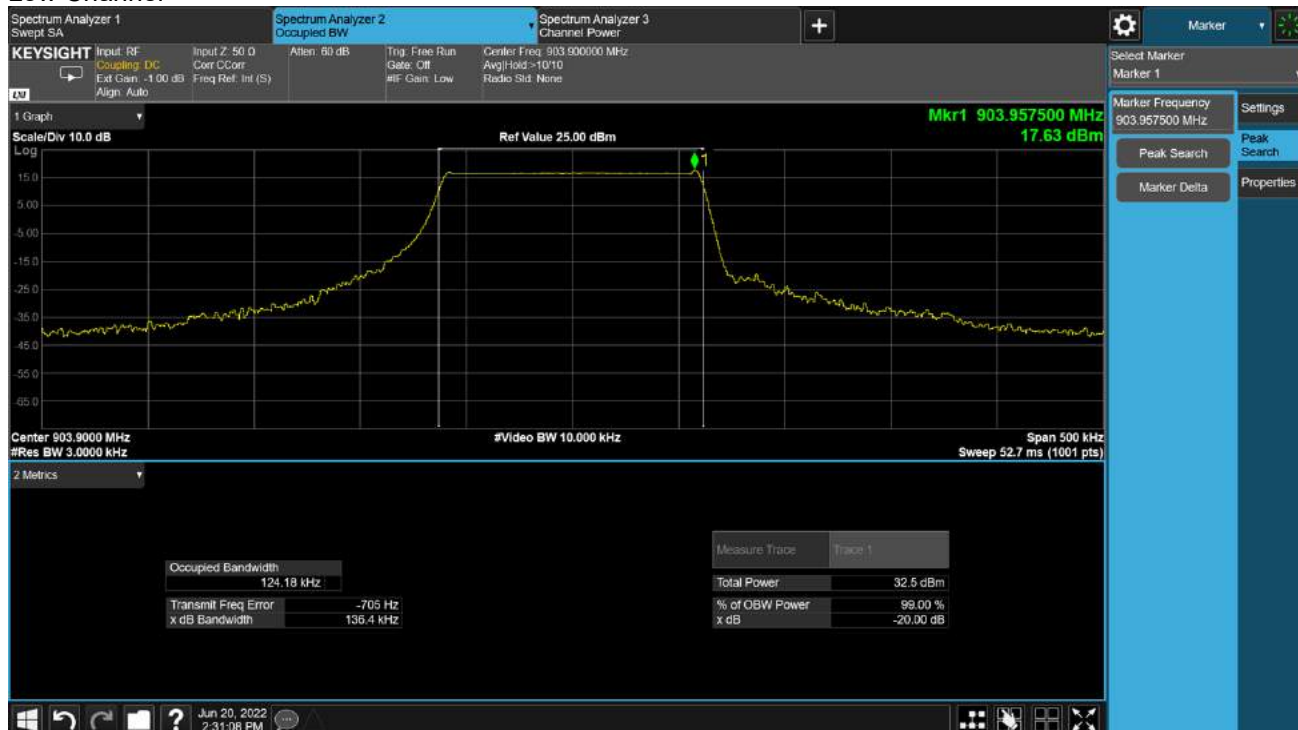


High Channel



Prüfbericht - Produkte
Test Report - Products

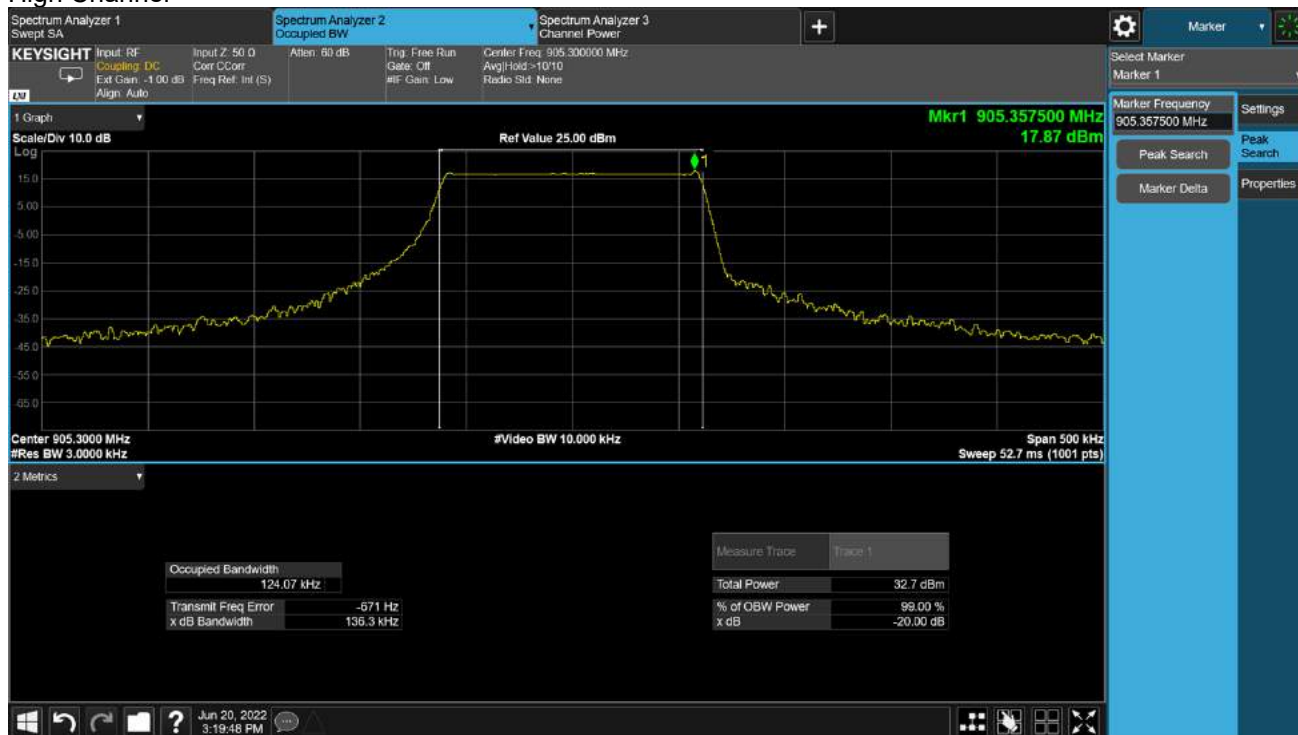
Lora Hybrid SF9
Low Channel



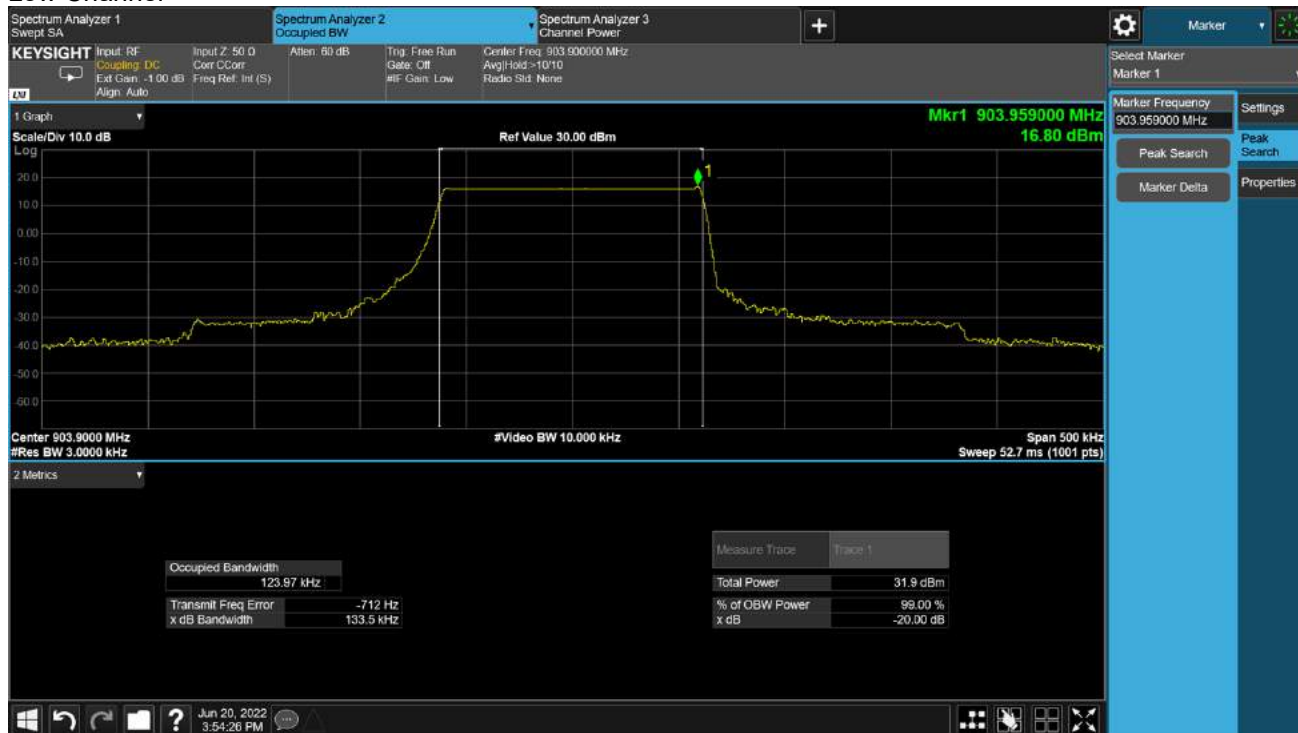
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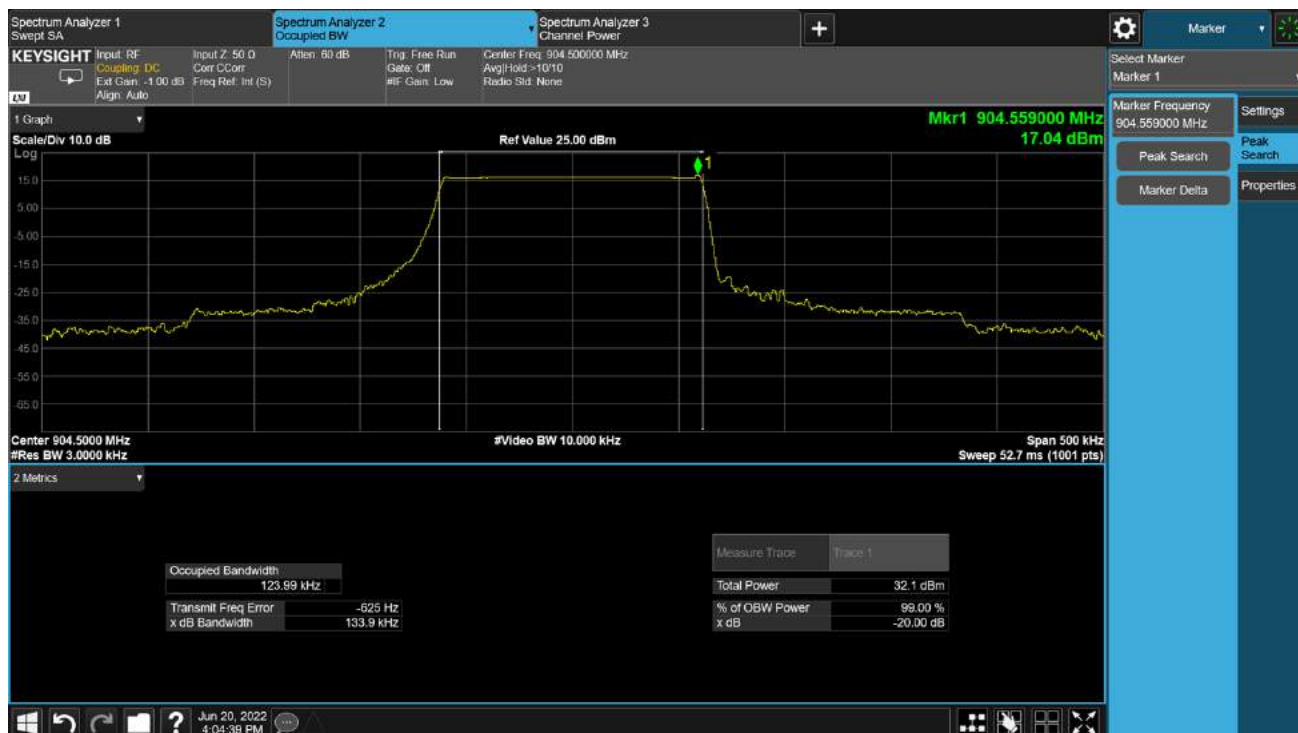
High Channel



Lora Hybrid SF10 Low Channel



Middle Channel

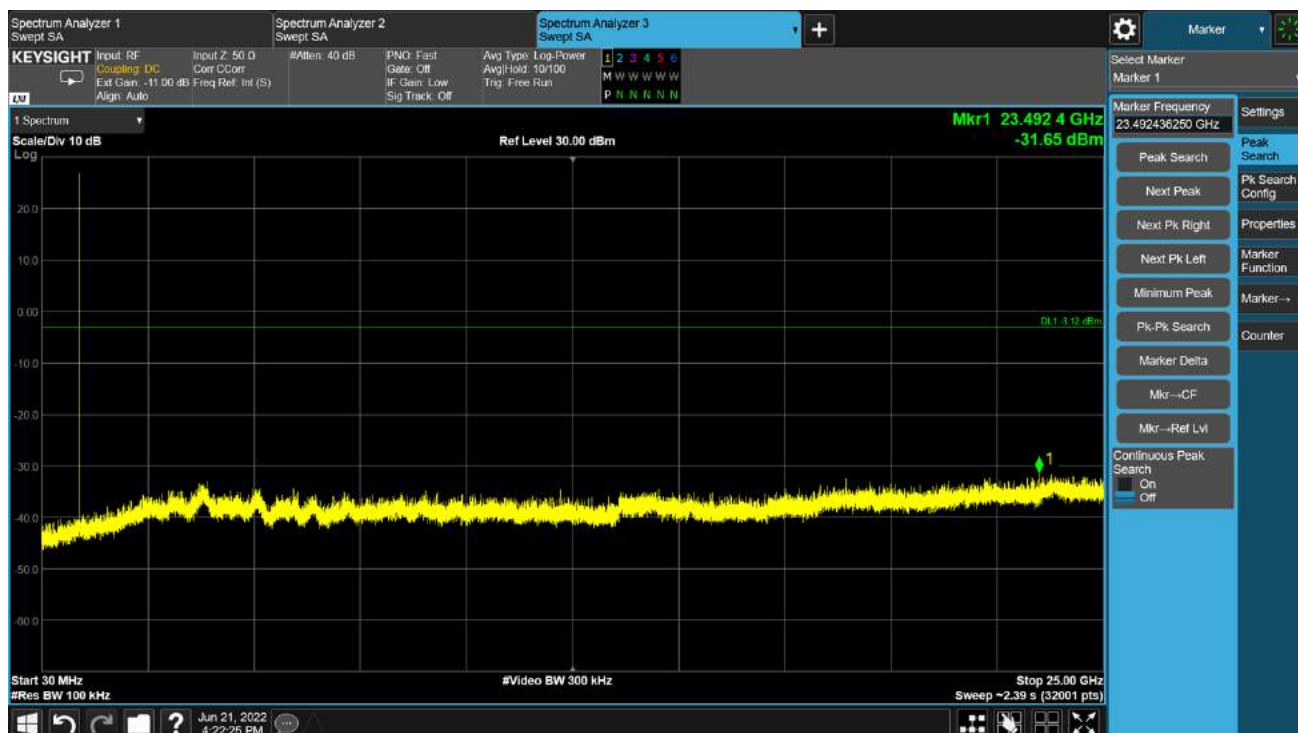
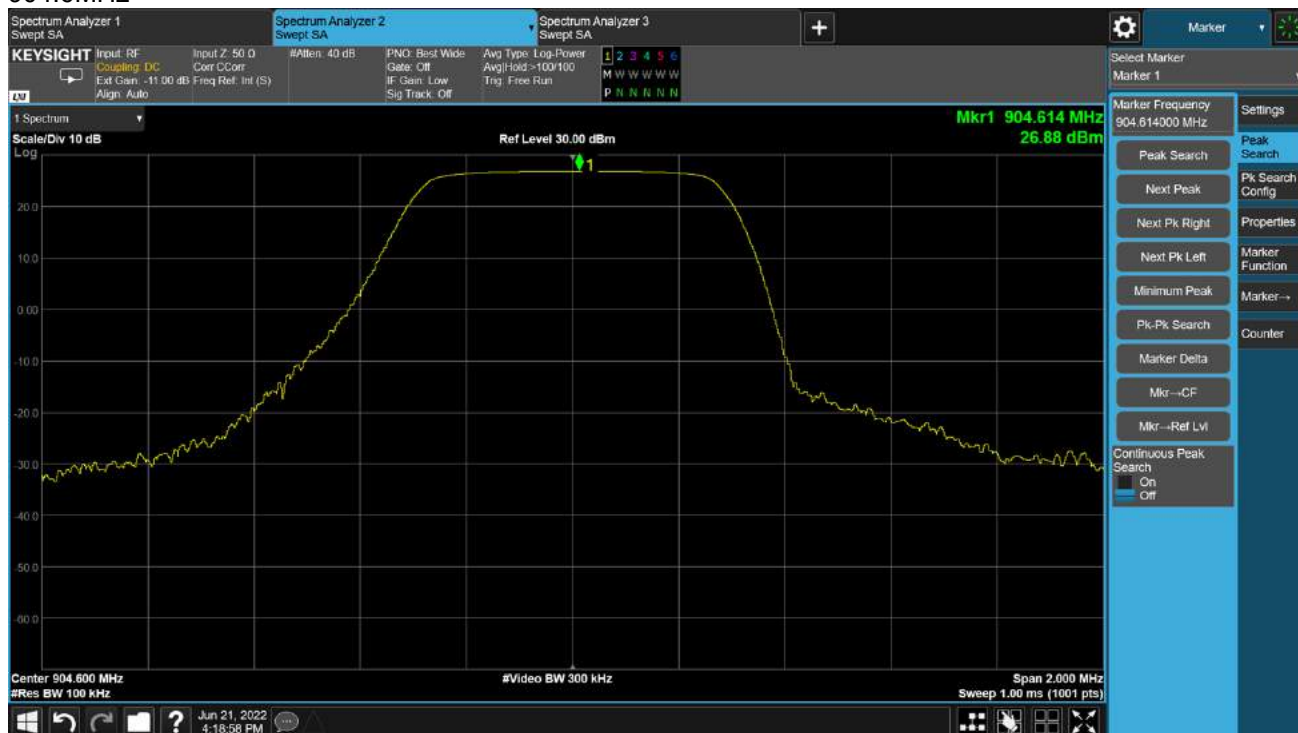


High Channel



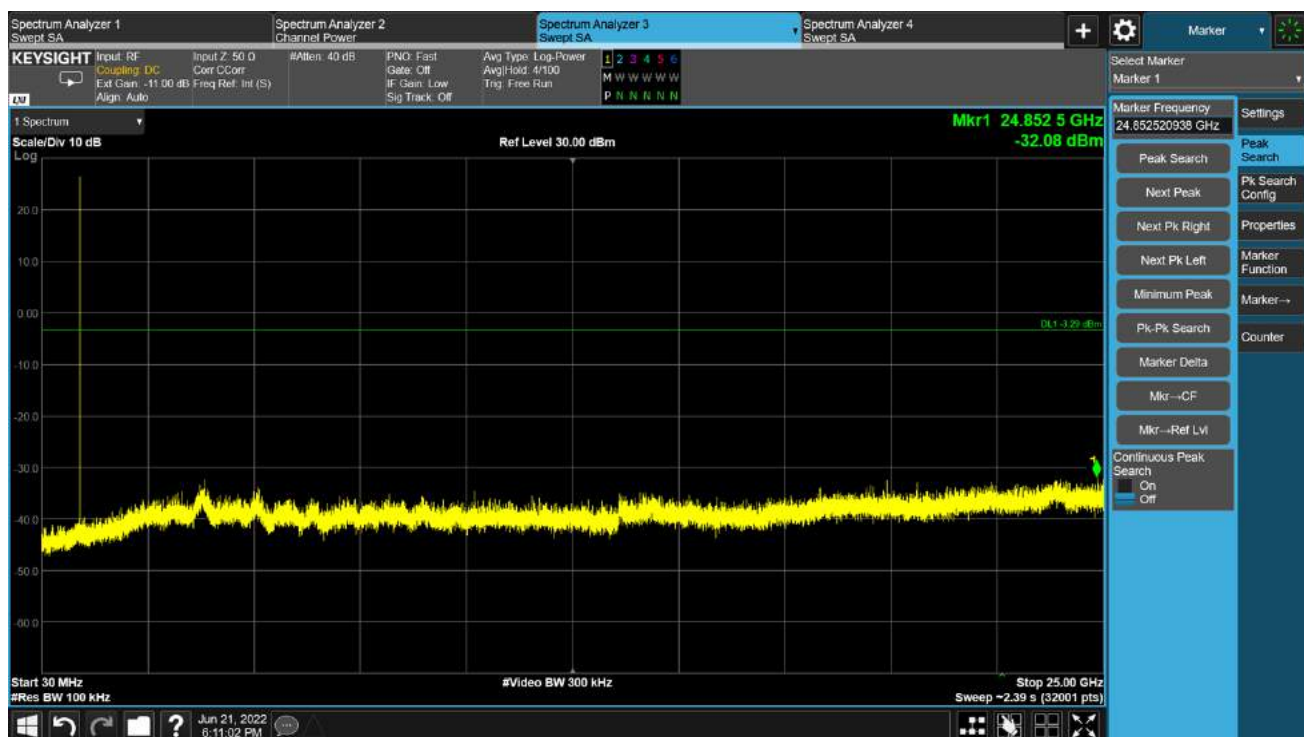
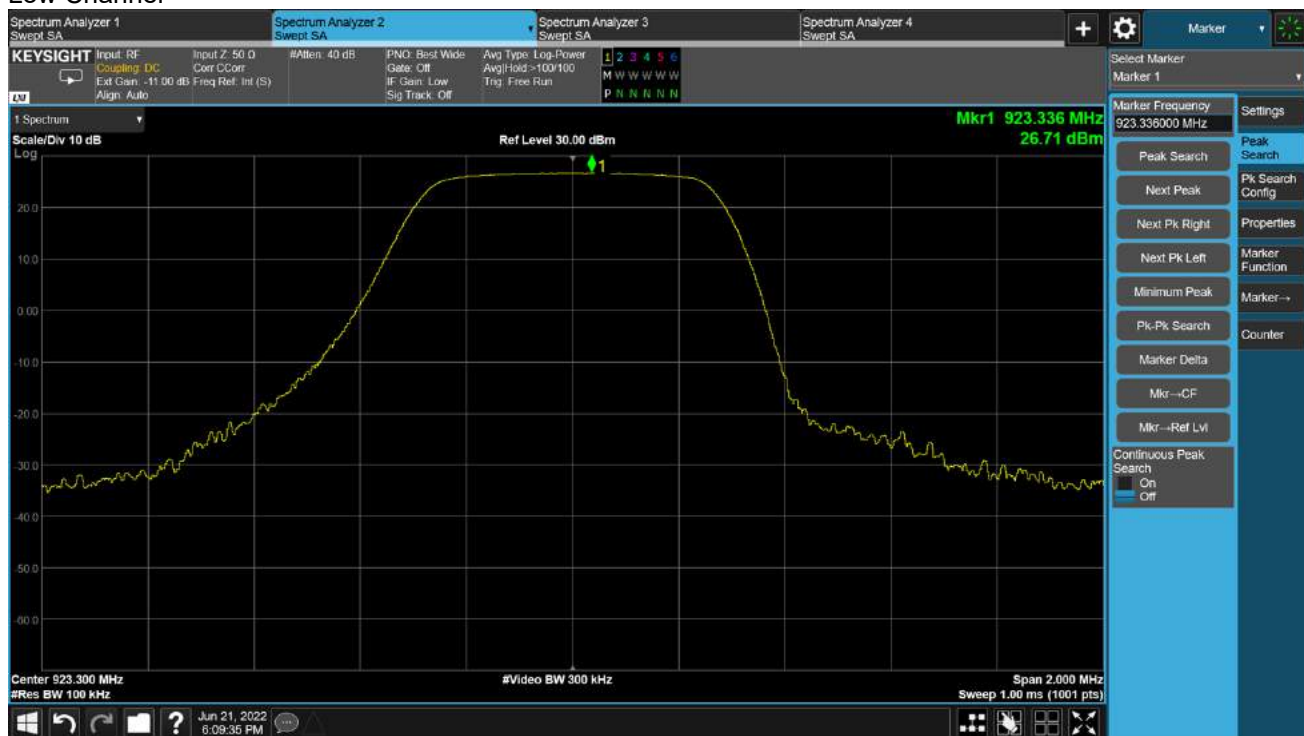
Appendix B.4: Conducted Spurious Emissions Measured in 100 kHz Bandwidth

Lora DTS SF8
904.6MHz

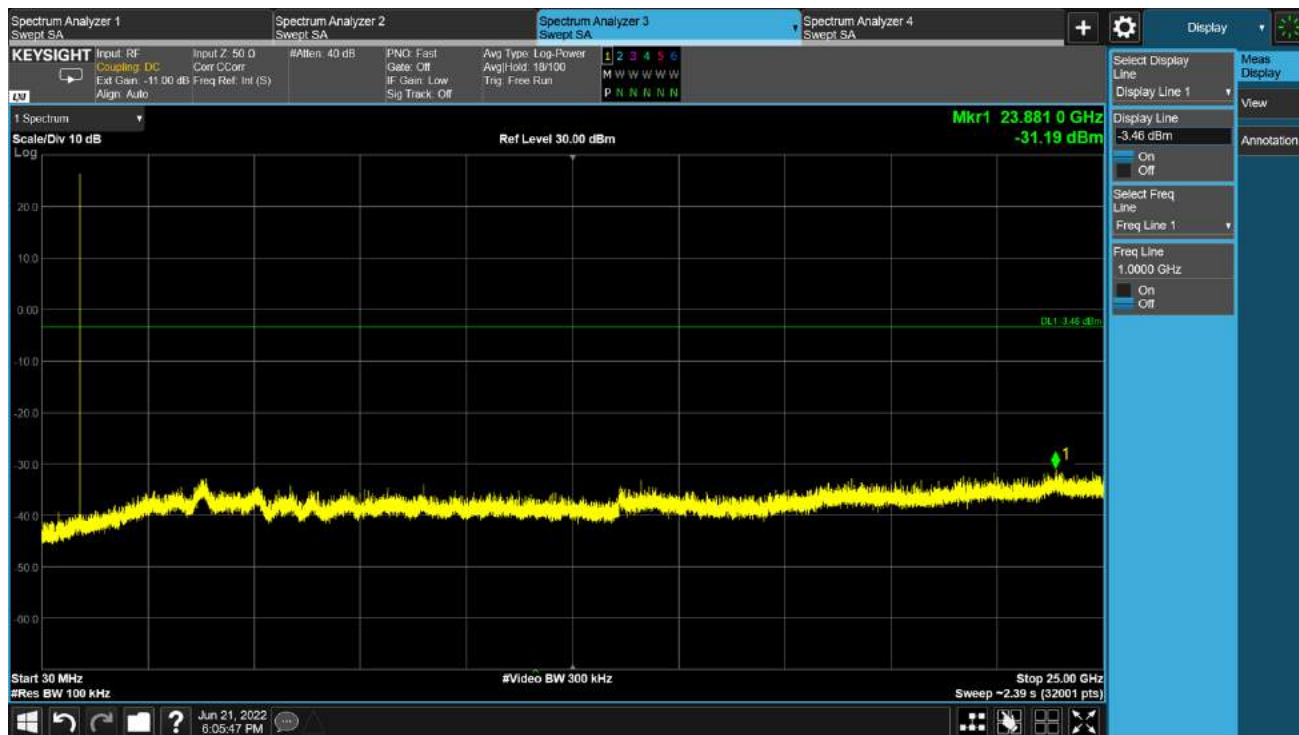


Lora DTS SF7

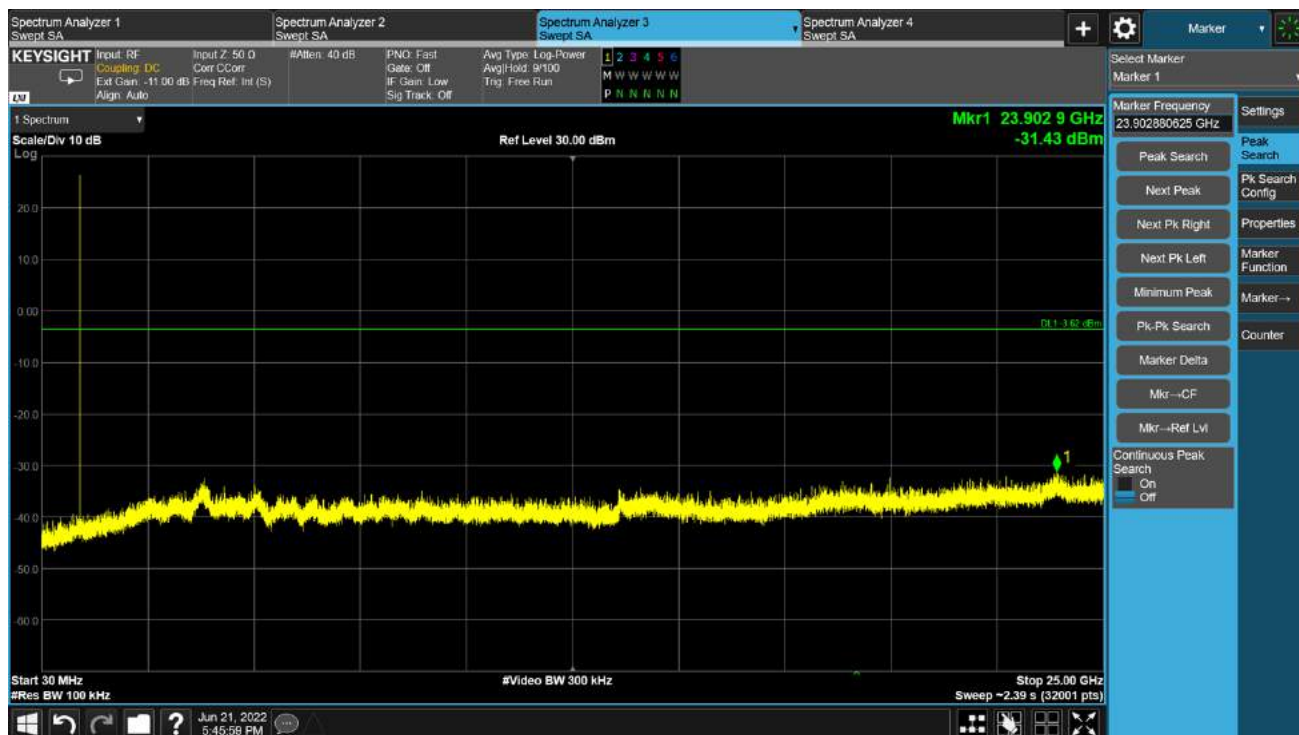
Low Channel



Middle Channel

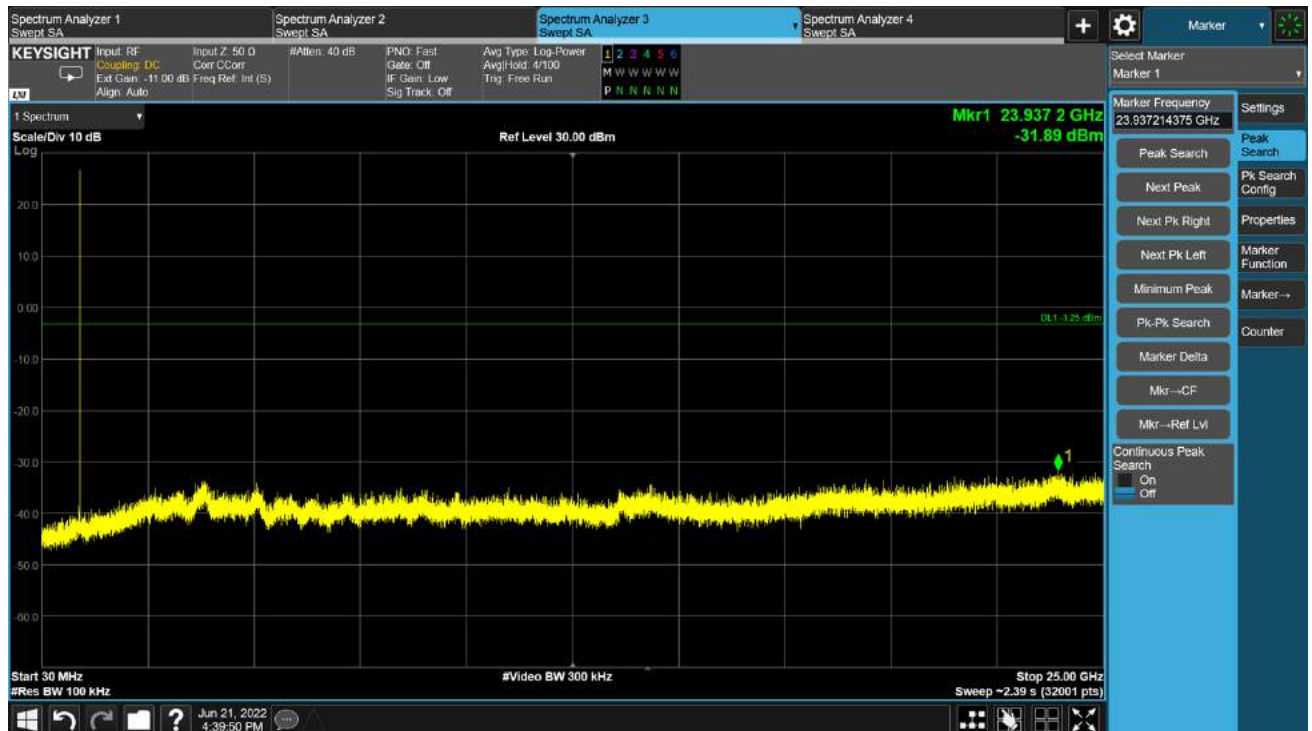
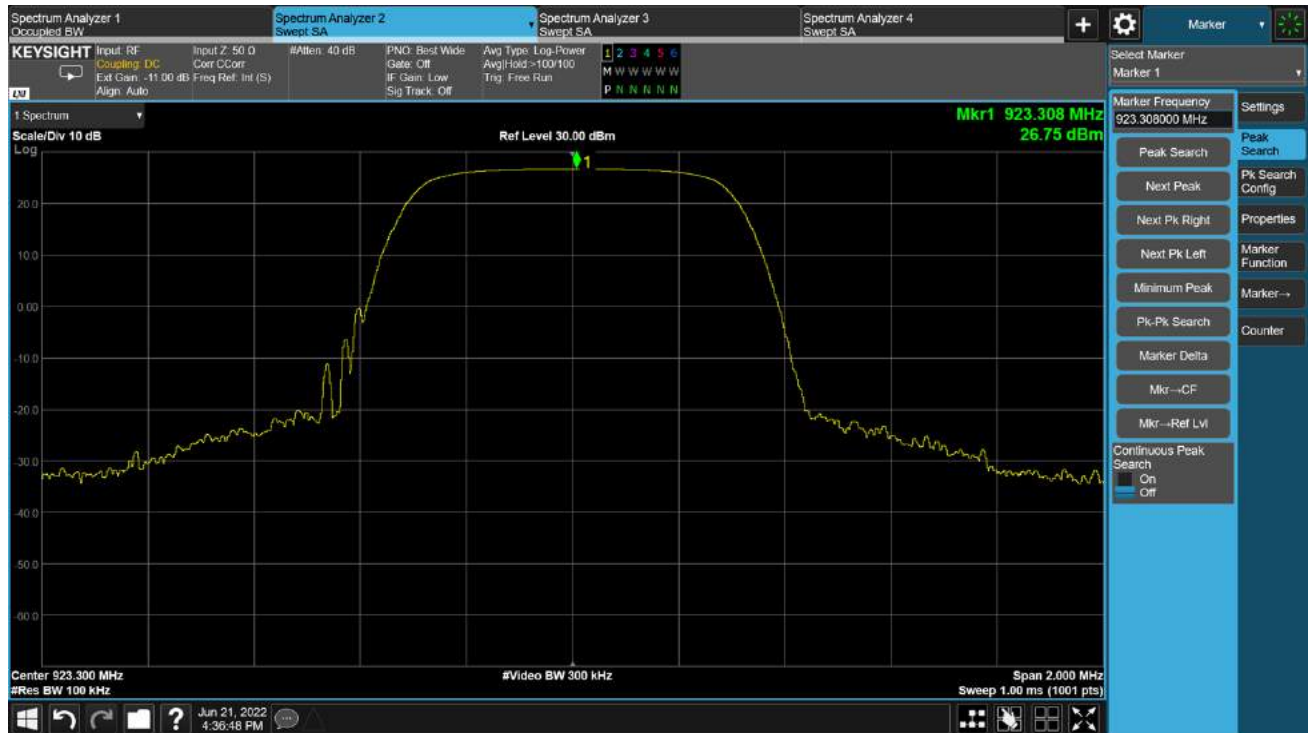


High Channel

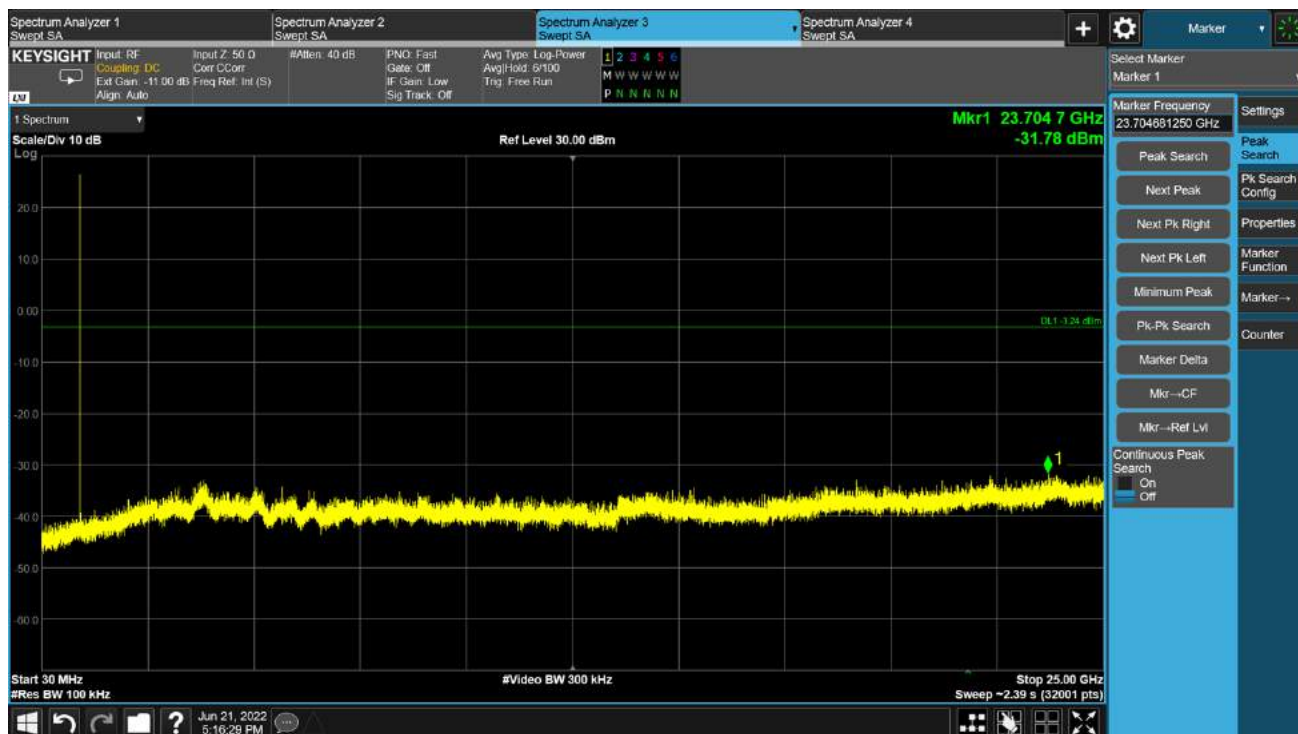
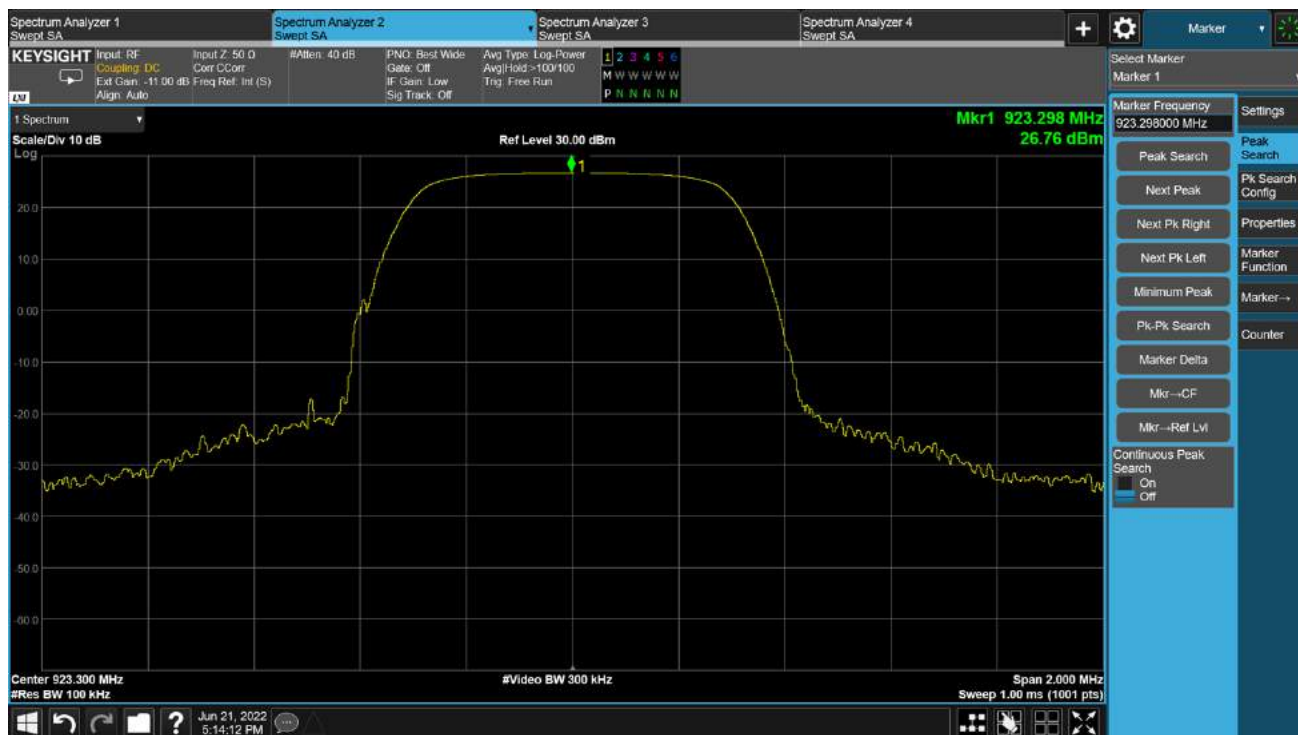


Lora DTS SF12

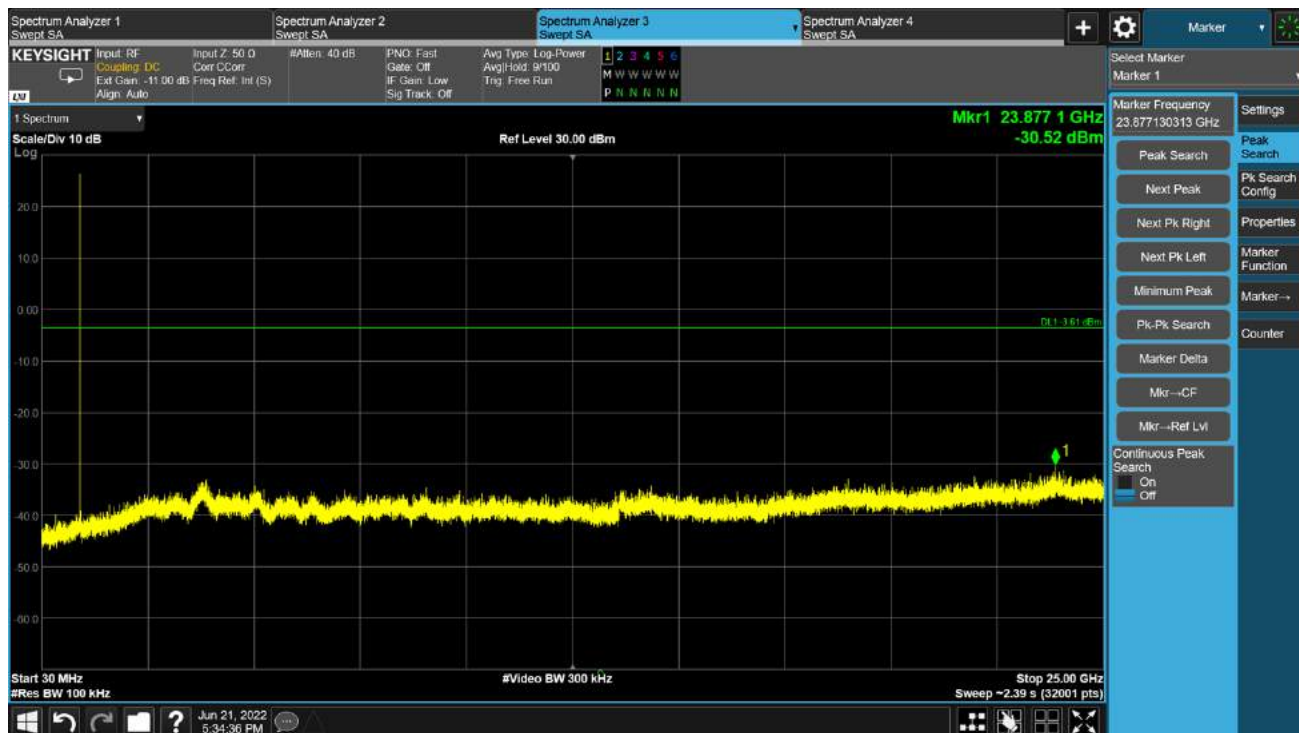
Low Channel



Middle Channel

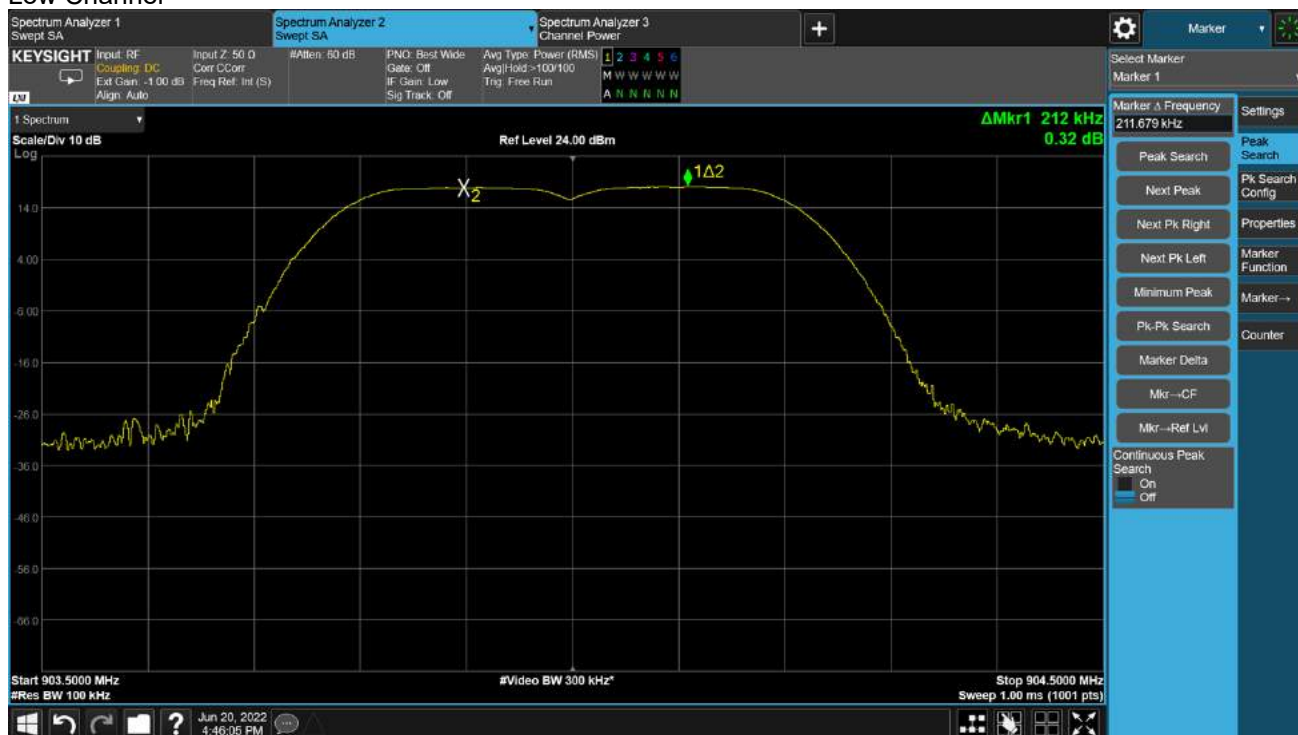


High Channel



Appendix B.5: Carrier Frequency Separation

Lora Hybrid SF7 Low Channel



Middle Channel



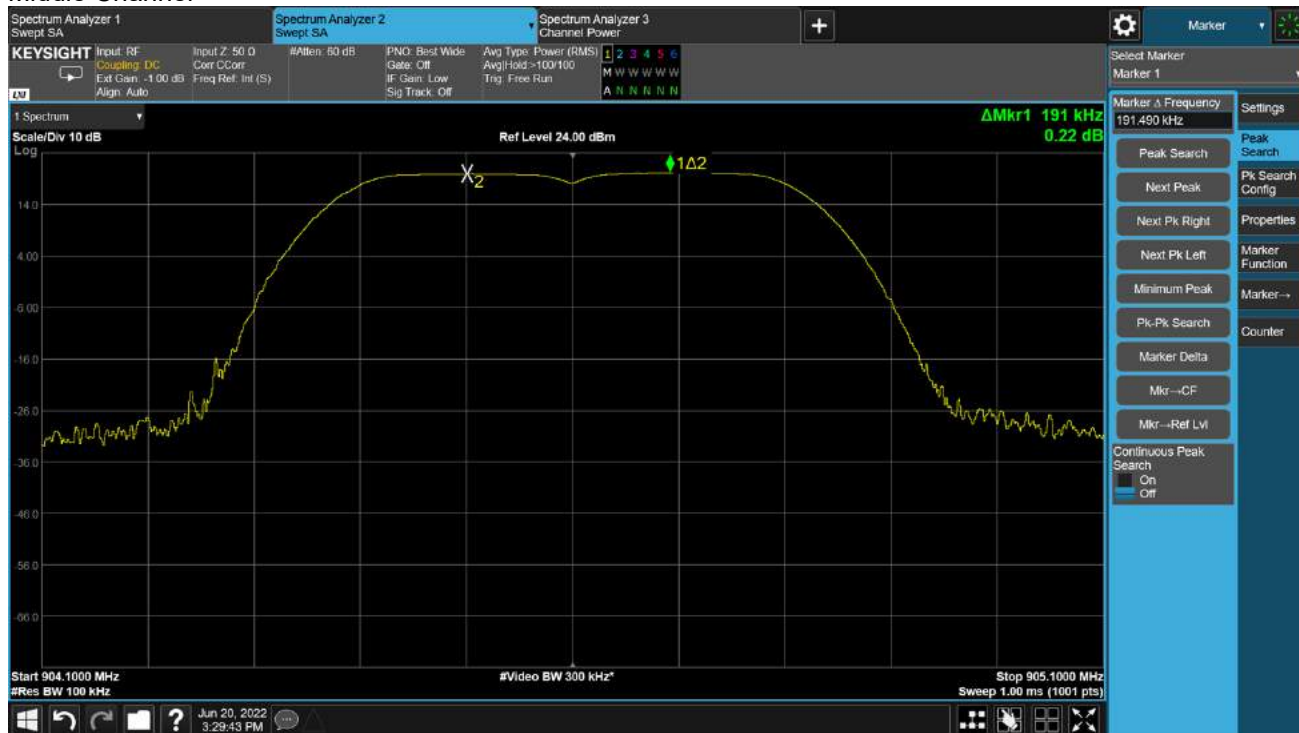
High Channel



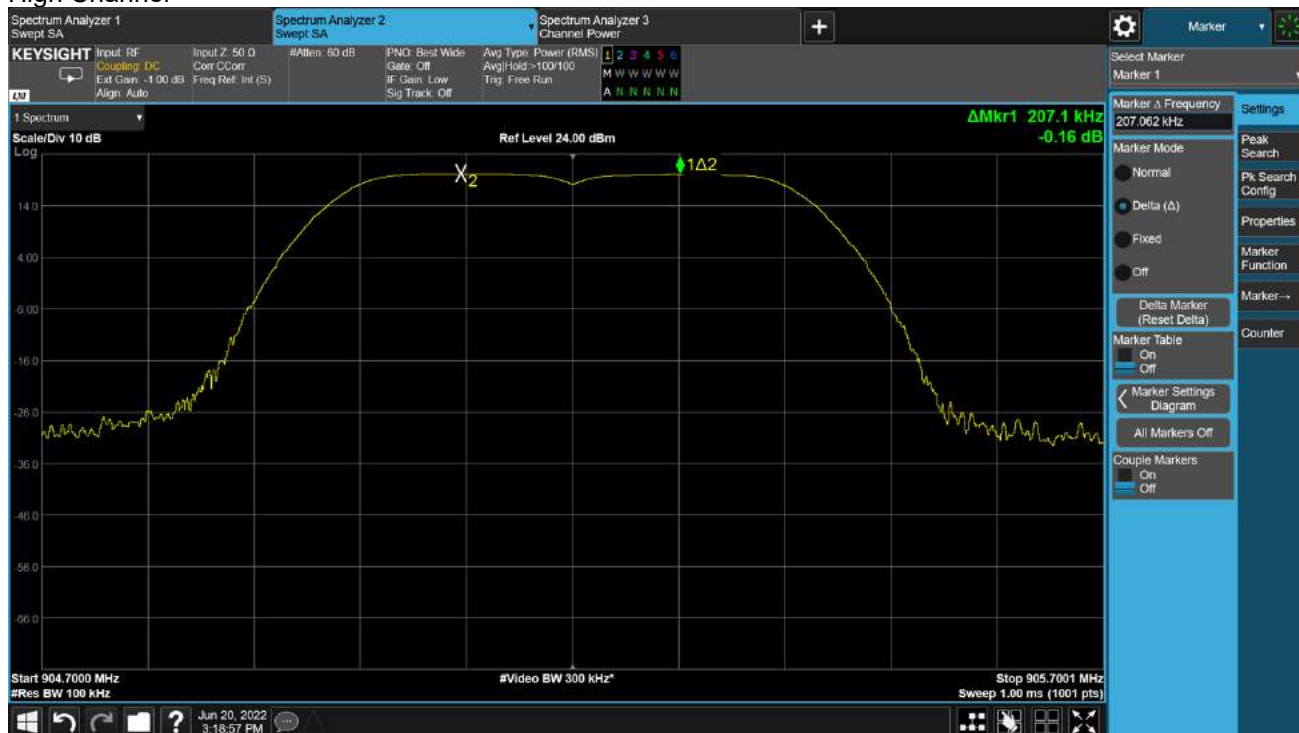
Lora Hybrid SF9 Low Channel



Middle Channel

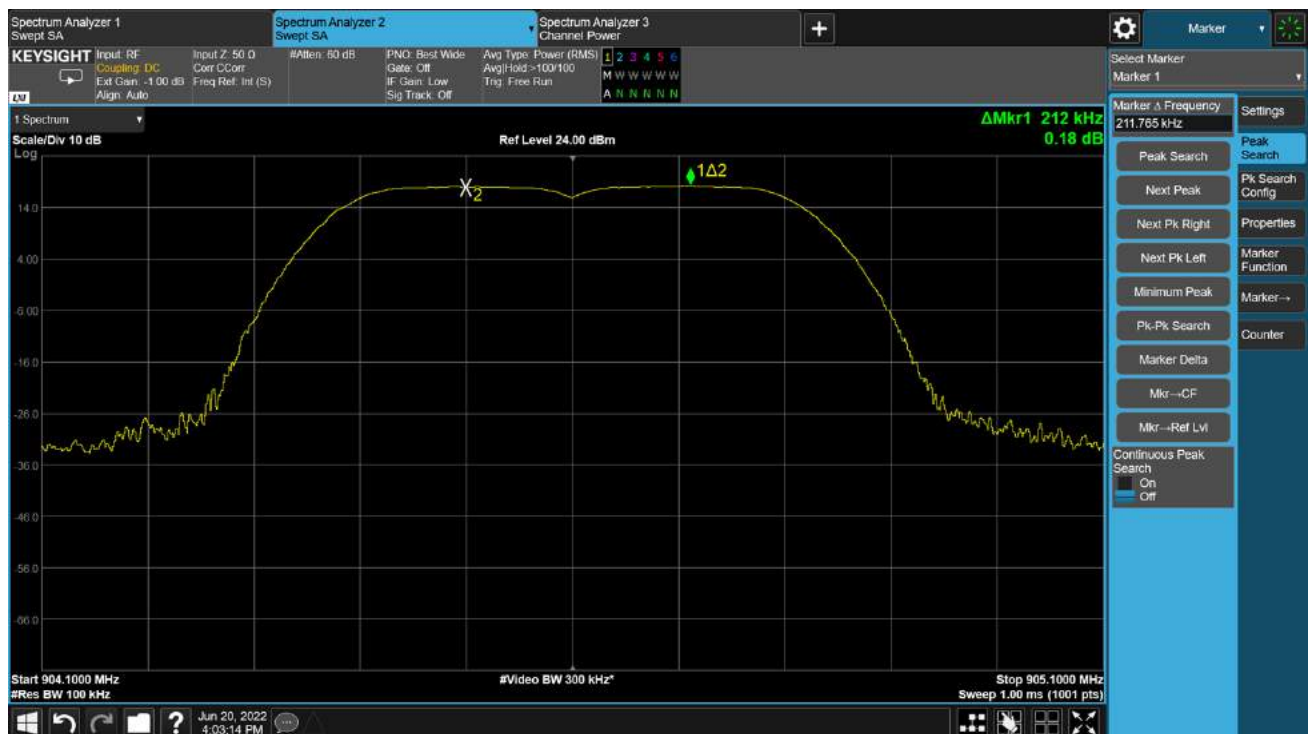


High Channel

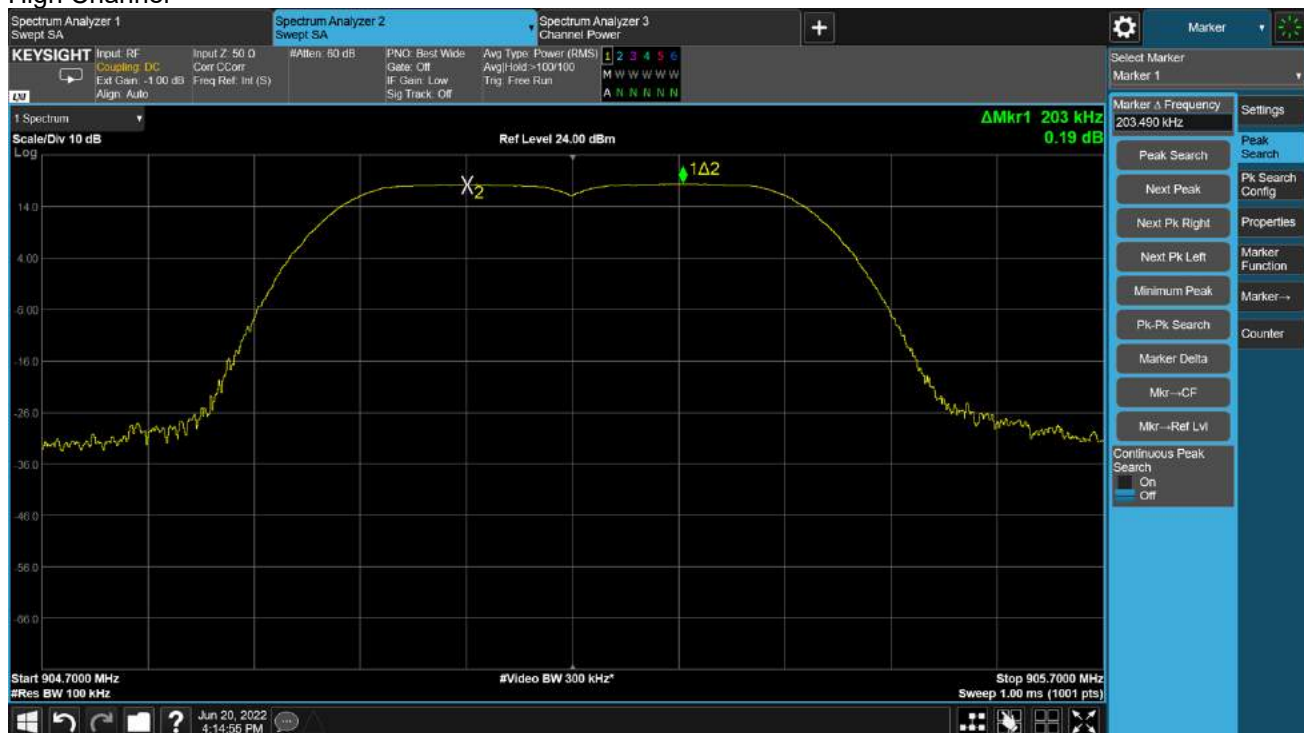


Lora Hybrid SF10
Low Channel

Middle Channel



High Channel

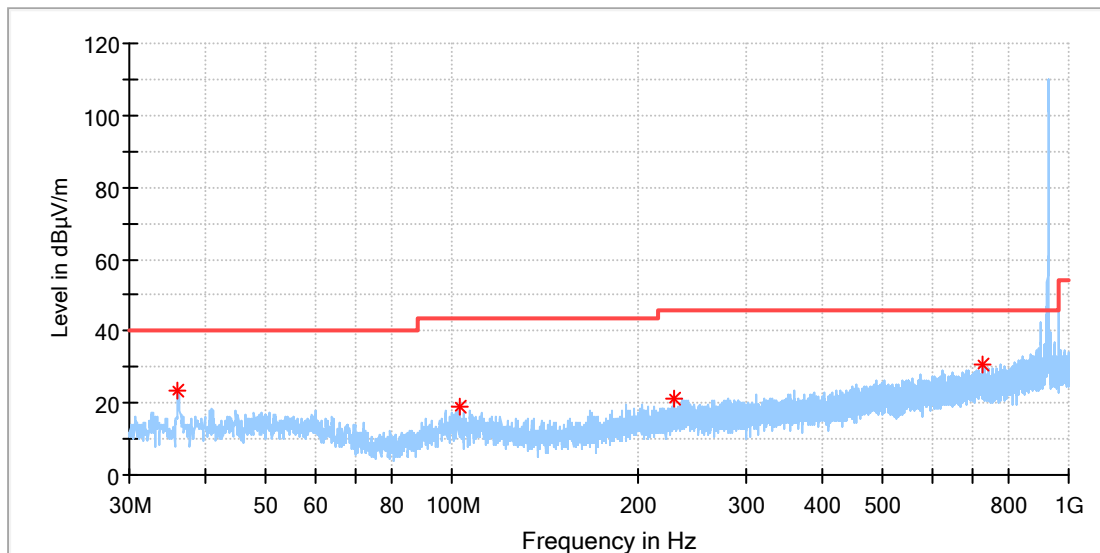


Appendix B.6: Test Results of Radiated Spurious Emissions

Lora DTS SF7 with 8 dBi antenna

EUT Information

EUT Name: WisLink LPWAN Concentrator
Model: RAK5147
Test Mode: Lora DTS 500K_SF7_925.1MHz
Order No/Sample No: 168376259/A003275919-006
Test Voltage:: DC 5V via USB
Remark: Temp 22 Humi:55%
Test Standard: FCC 15.247
Tested By: Kei Zhang
Reviewed By: Terry Yin

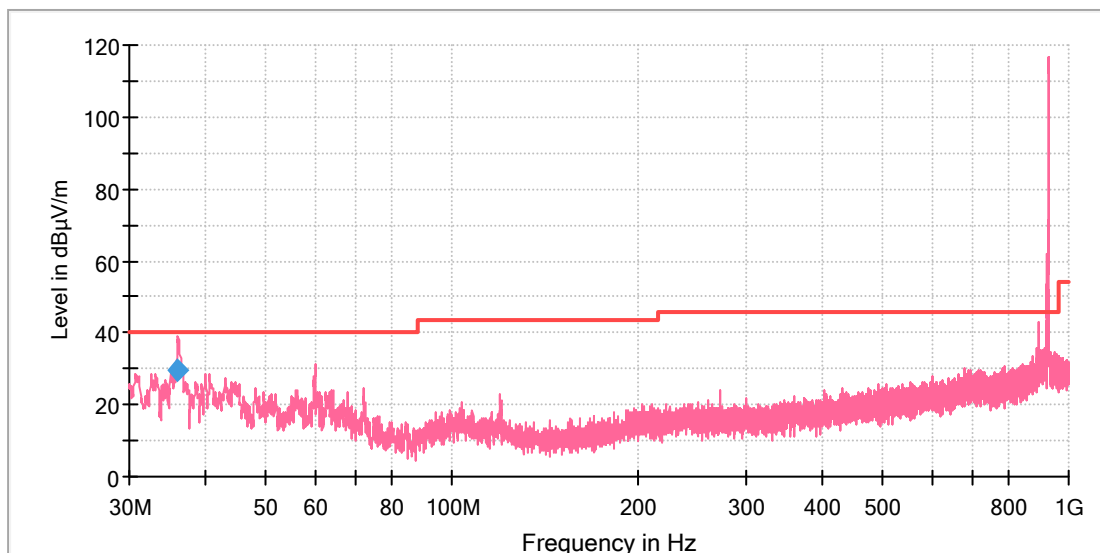


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
36.006539	23.59	40.00	16.41	100.0	H	33.0	-21.8
103.272308	18.97	43.50	24.53	100.0	H	0.0	-19.2
228.476923	21.30	46.00	24.70	100.0	H	25.0	-18.5
722.542692	30.65	46.00	15.35	100.0	H	15.0	-8.0

EUT Information

EUT Name: WisLink LPWAN Concentrator
Model: RAK5147
Test Mode: Lora DTS 500K_SF7_925.1MHz
Order No/Sample No: 168376259/A003275919-006
Test Voltage:: DC 5V via USB
Remark: Temp 22 Humi:55%
Test Standard: FCC 15.247
Tested By: Kei Zhang
Reviewed By: Terry Yin



Critical_Freqs

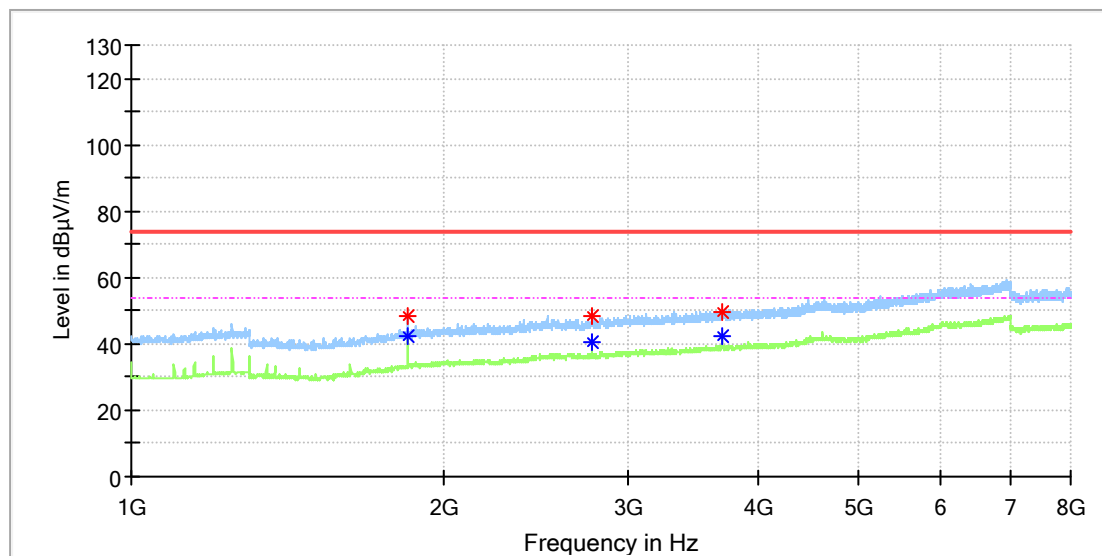
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
59.995385	31.34	40.00	8.66	100.0	V	38.0	-19.3
119.986154	22.81	43.50	20.69	100.0	V	43.0	-21.1
273.059615	24.10	46.00	21.90	100.0	V	-1.0	-17.2
675.460385	30.28	46.00	15.72	100.0	V	-1.0	-8.9

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.956962	29.33	40.00	10.67	100.0	V	-3.0	-21.9

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_923.3MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

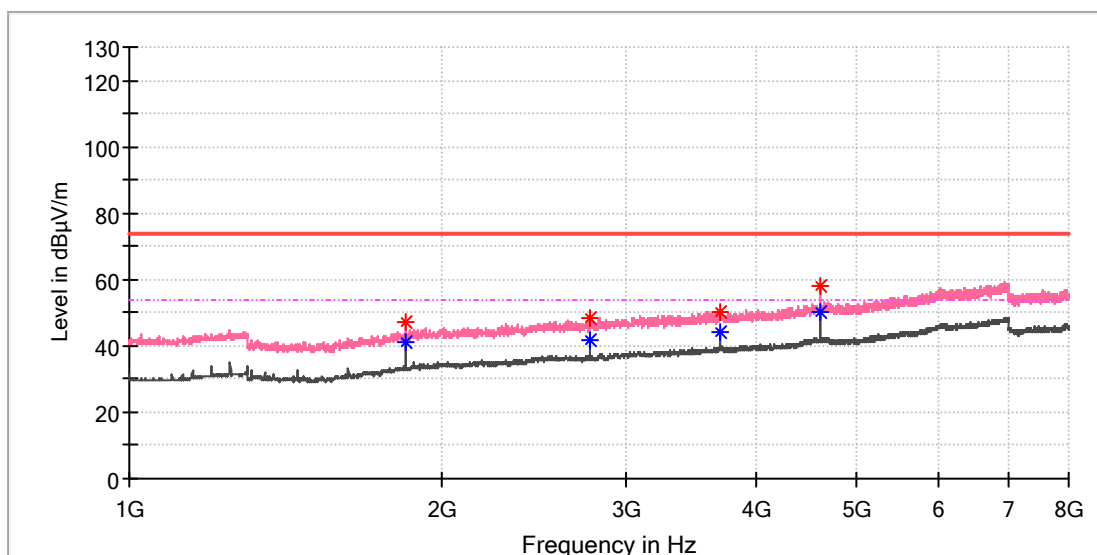


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1846.050000	48.24	---	74.00	25.76	100.0	H	291.0	5.0
1846.050000	---	42.54	54.00	11.46	100.0	H	291.0	5.0
2769.812500	48.07	---	74.00	25.93	100.0	H	338.0	7.9
2769.812500	---	40.44	54.00	13.56	100.0	H	338.0	7.9
3692.737500	---	42.30	54.00	11.70	100.0	H	33.0	9.6
3693.575000	49.42	---	74.00	24.58	100.0	H	33.0	9.6

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_923.3MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

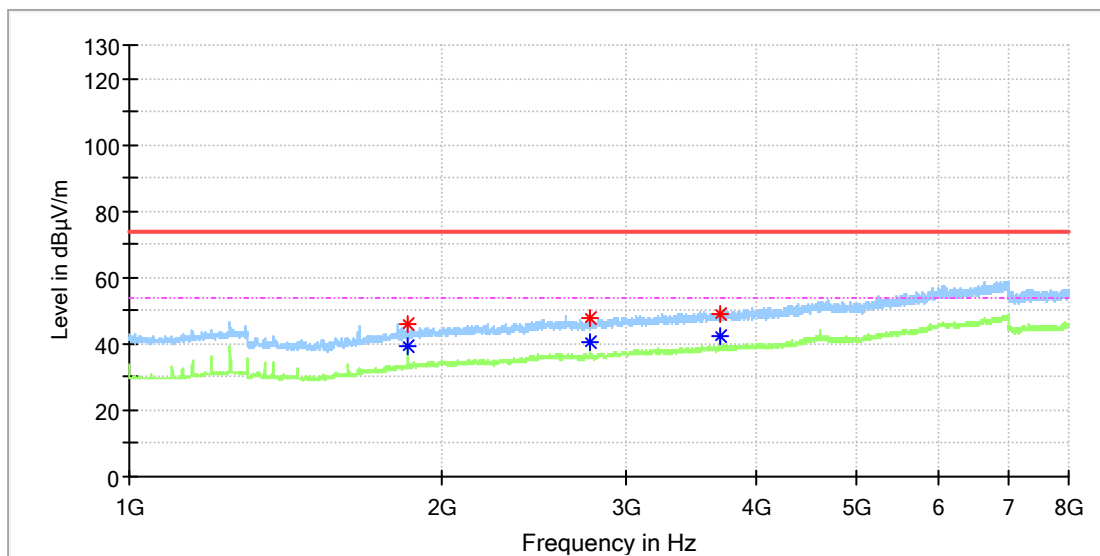


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1846.050000	47.24	---	74.00	26.76	100.0	V	214.0	5.0
1846.050000	---	41.37	54.00	12.63	100.0	V	214.0	5.0
2768.975000	---	41.52	54.00	12.48	100.0	V	338.0	7.9
2769.812500	48.27	---	74.00	25.73	100.0	V	329.0	7.9
3692.737500	---	43.92	54.00	10.08	100.0	V	259.0	9.6
3695.250000	50.34	---	74.00	23.66	100.0	V	355.0	9.6
4615.662500	57.78	---	74.00	16.22	100.0	V	24.0	12.0
4616.500000	---	49.91	54.00	4.09	100.0	V	186.0	12.0

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_925.1MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

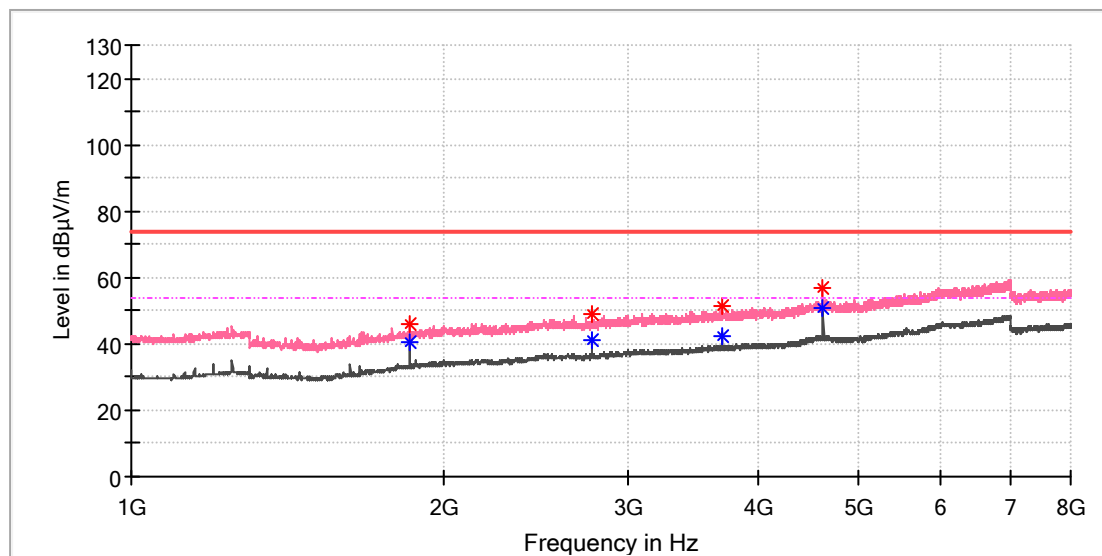


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1849.400000	---	39.06	54.00	14.94	100.0	H	318.0	5.0
1850.237500	45.68	---	74.00	28.32	100.0	H	289.0	5.0
2774.837500	---	40.72	54.00	13.28	100.0	H	6.0	7.9
2775.675000	47.78	---	74.00	26.22	100.0	H	16.0	7.9
3692.737500	49.15	---	74.00	24.85	100.0	H	203.0	9.6
3700.275000	---	42.29	54.00	11.71	100.0	H	327.0	9.6

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_925.1MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

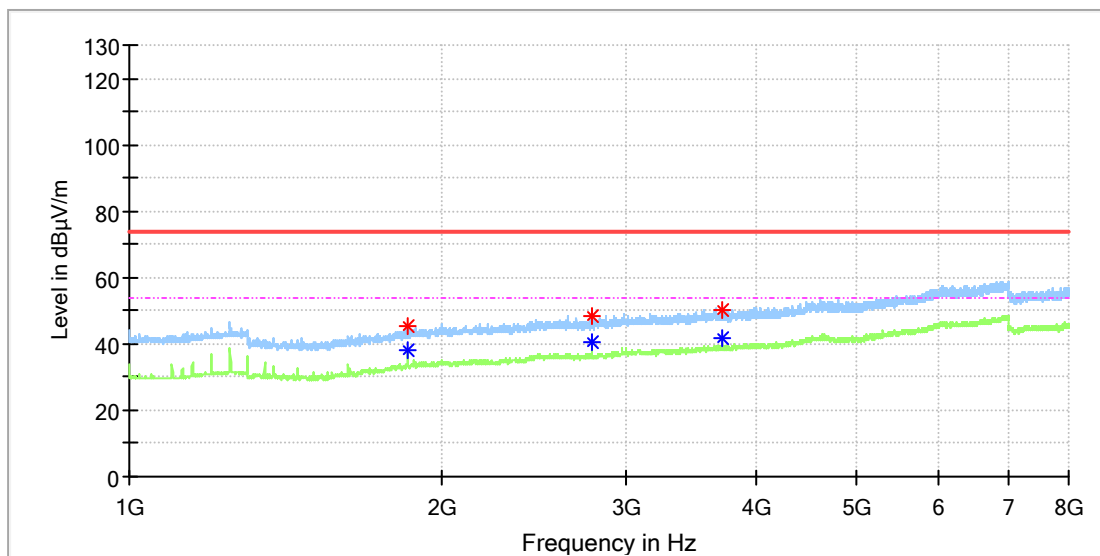


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1849.400000	45.76	---	74.00	28.24	100.0	V	216.0	5.0
1850.237500	---	40.62	54.00	13.38	100.0	V	206.0	5.0
2775.675000	48.75	---	74.00	25.25	100.0	V	188.0	7.9
2775.675000	---	40.87	54.00	13.13	100.0	V	188.0	7.9
3699.437500	---	42.49	54.00	11.51	100.0	V	197.0	9.6
3700.275000	51.15	---	74.00	22.85	100.0	V	251.0	9.6
4625.712500	56.56	---	74.00	17.44	100.0	V	18.0	12.0
4626.550000	---	50.76	54.00	3.24	100.0	V	28.0	12.0

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

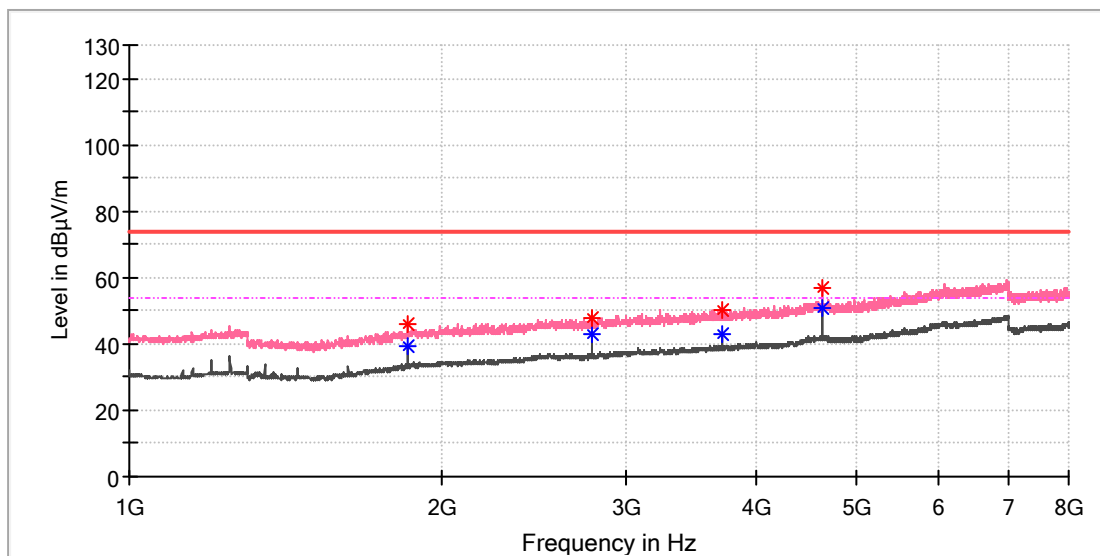


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.425000	45.25	---	74.00	28.75	100.0	H	154.0	5.0
1854.425000	---	38.05	54.00	15.95	100.0	H	154.0	5.0
2781.537500	48.33	---	74.00	25.67	100.0	H	316.0	7.9
2782.375000	---	40.56	54.00	13.44	100.0	H	335.0	7.9
3709.487500	---	41.95	54.00	12.05	100.0	H	56.0	9.6
3710.325000	49.91	---	74.00	24.09	100.0	H	235.0	9.6

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_927.5MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

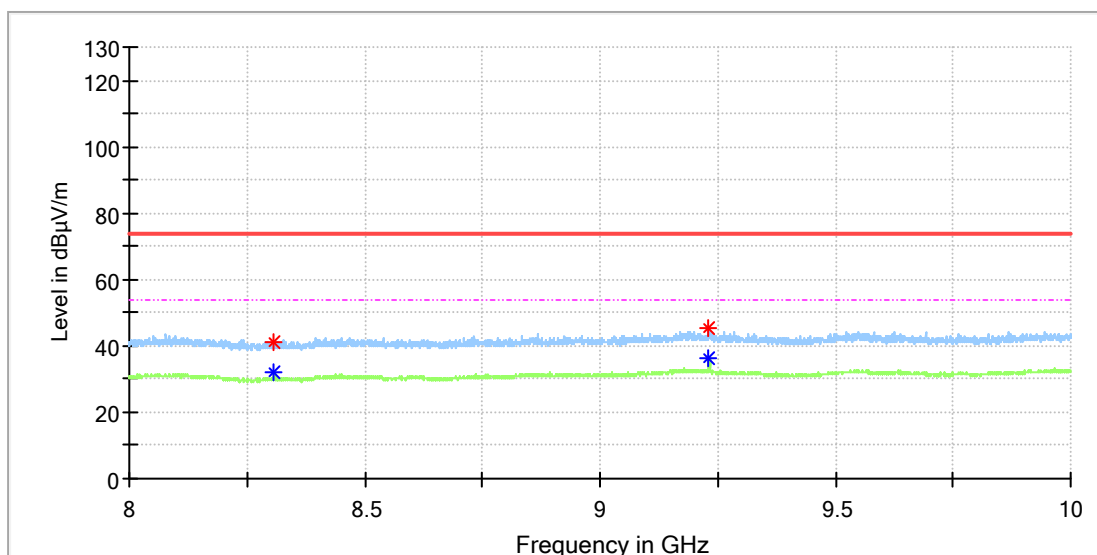


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.425000	45.68	---	74.00	28.32	100.0	V	164.0	5.0
1854.425000	---	39.31	54.00	14.69	100.0	V	164.0	5.0
2781.537500	47.55	---	74.00	26.45	100.0	V	295.0	7.9
2782.375000	---	42.65	54.00	11.35	100.0	V	353.0	7.9
3709.487500	50.18	---	74.00	23.82	100.0	V	198.0	9.6
3710.325000	---	42.82	54.00	11.18	100.0	V	110.0	9.6
4636.600000	---	51.02	54.00	2.98	100.0	V	11.0	12.0
4638.275000	56.74	---	74.00	17.26	100.0	V	3.0	12.0

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_923.3MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

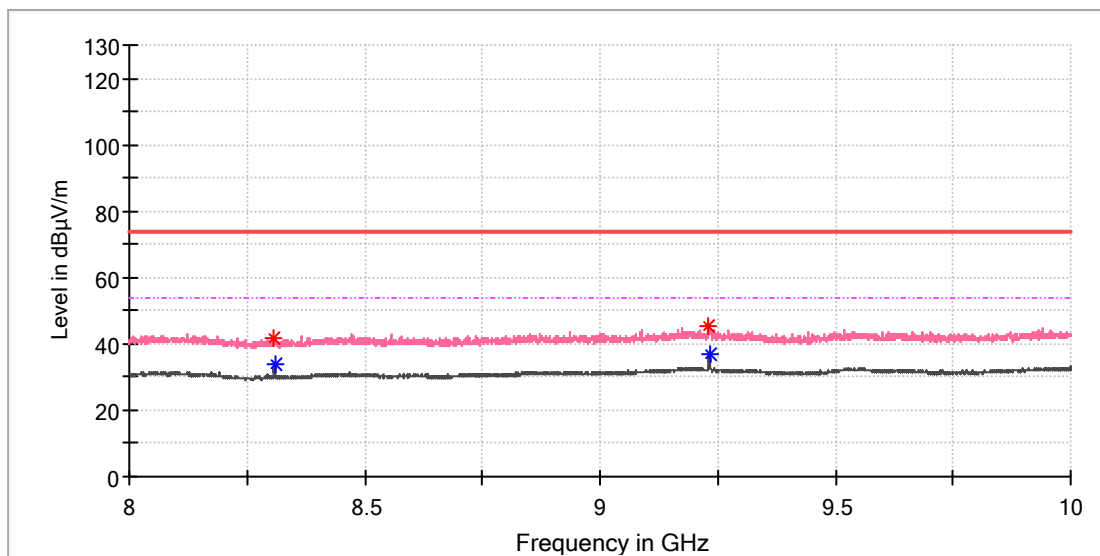


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8308.000000	41.30	---	74.00	32.70	100.0	H	3.0	8.3
8308.500000	---	31.89	54.00	22.11	100.0	H	309.0	8.3
9231.000000	45.13	---	74.00	28.87	100.0	H	350.0	10.4
9231.500000	---	36.44	54.00	17.56	100.0	H	277.0	10.4

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_923.3MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

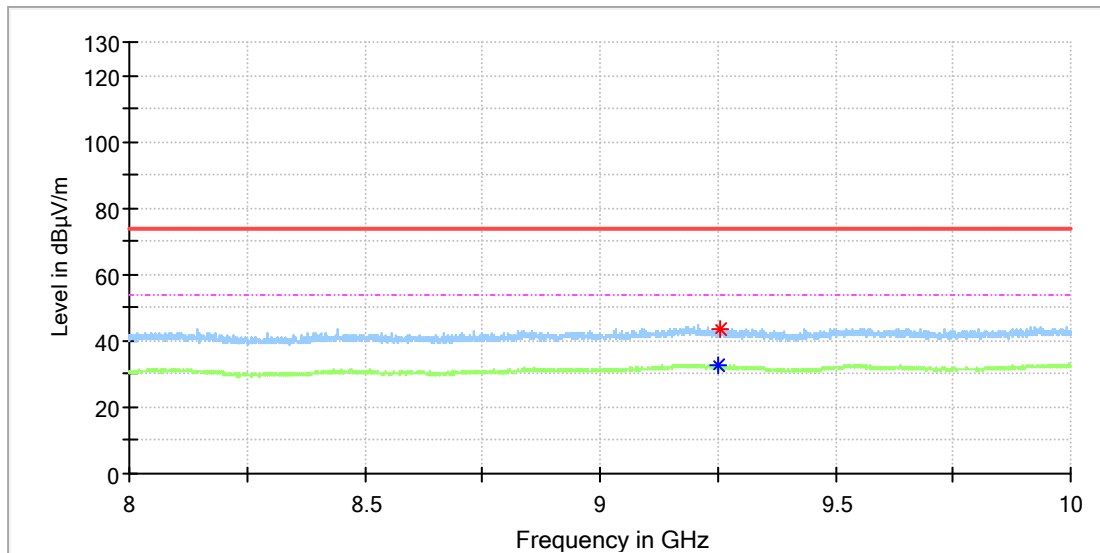


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8308.000000	41.87	---	74.00	32.13	100.0	V	161.0	8.3
8310.500000	---	33.60	54.00	20.40	100.0	V	26.0	8.3
9231.500000	45.46	---	74.00	28.54	100.0	V	350.0	10.4
9235.000000	---	37.11	54.00	16.89	100.0	V	350.0	10.4

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_925.1MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

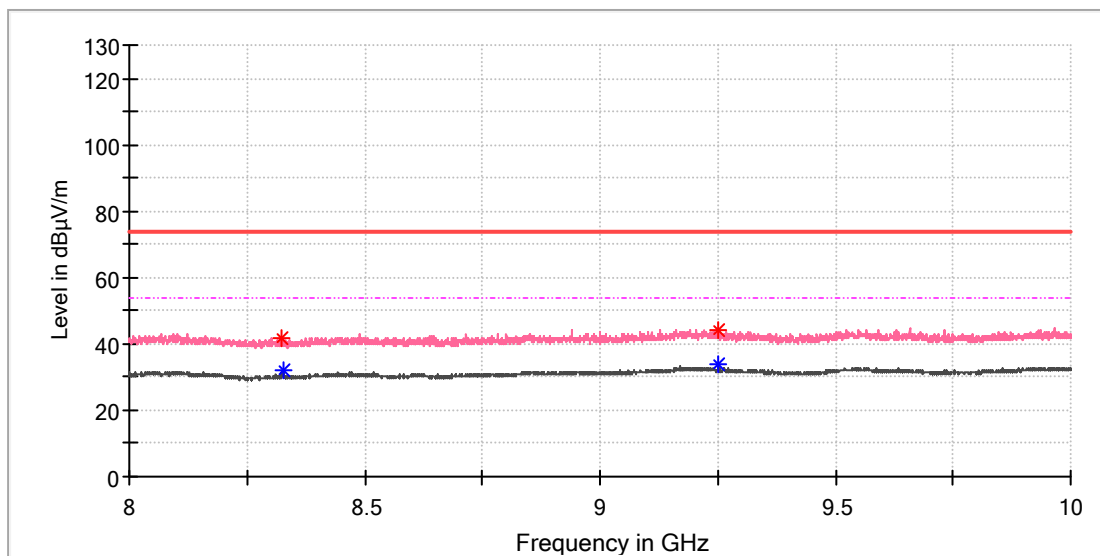


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9252.500000	---	32.57	54.00	21.43	100.0	H	247.0	10.4
9254.000000	43.47	---	74.00	30.53	100.0	H	45.0	10.4

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_925.1MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

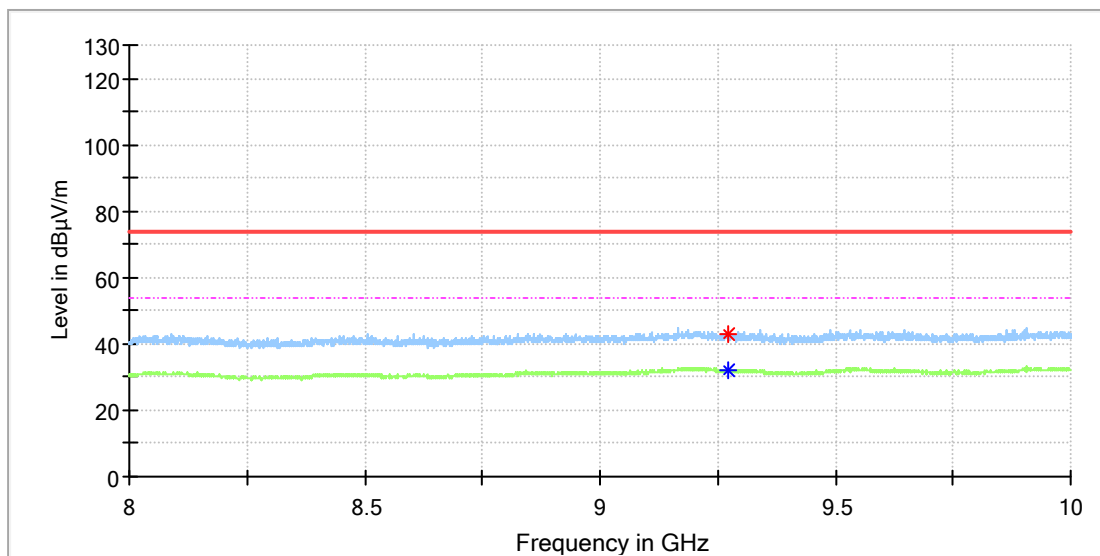


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8325.000000	41.46	---	74.00	32.54	100.0	V	25.0	8.3
8327.000000	---	31.91	54.00	22.09	100.0	V	36.0	8.4
9250.000000	43.97	---	74.00	30.03	100.0	V	346.0	10.5
9252.500000	---	33.90	54.00	20.10	100.0	V	346.0	10.4

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

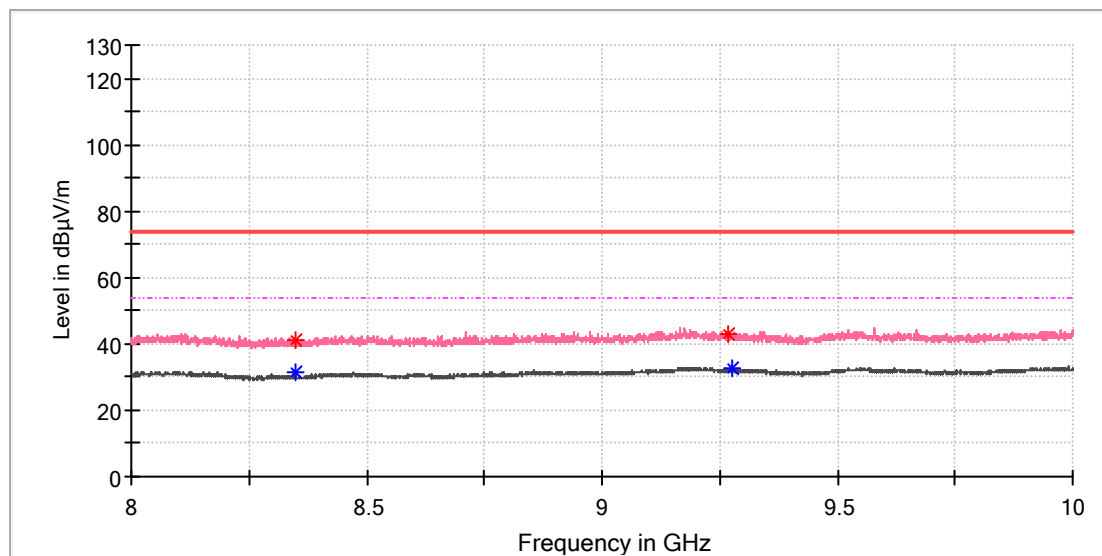


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9273.000000	43.18	---	74.00	30.82	100.0	H	0.0	10.2
9273.000000	---	32.08	54.00	21.92	100.0	H	0.0	10.2

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF7_927.5MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin



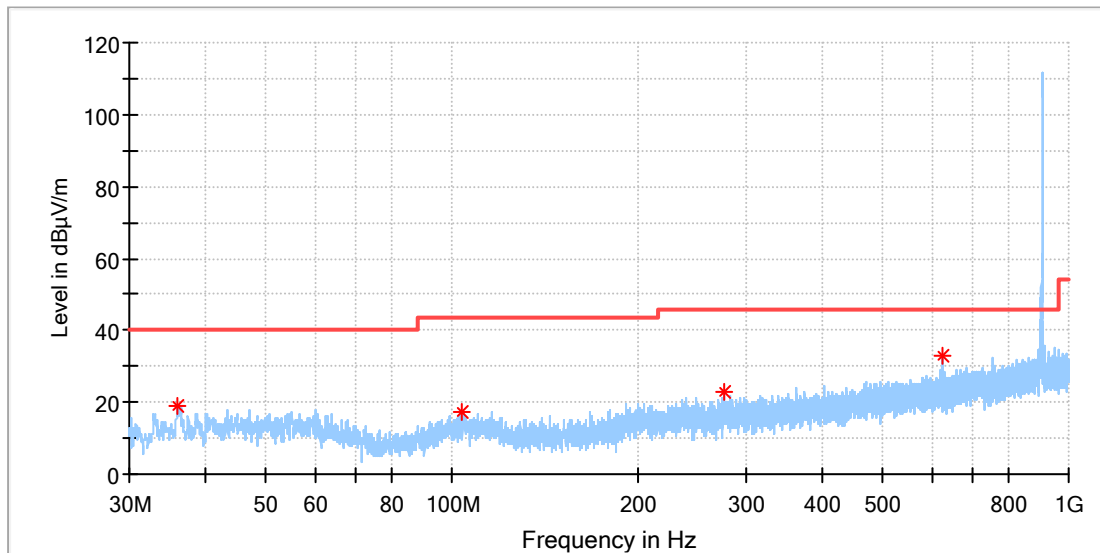
Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8347.000000	41.34	---	74.00	32.66	100.0	V	34.0	8.4
8347.000000	---	31.47	54.00	22.53	100.0	V	34.0	8.4
9269.000000	42.97	---	74.00	31.03	100.0	V	327.0	10.2
9275.000000	---	32.93	54.00	21.07	100.0	V	344.0	10.2

Lora DTS SF8 with 8 dBi antenna

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

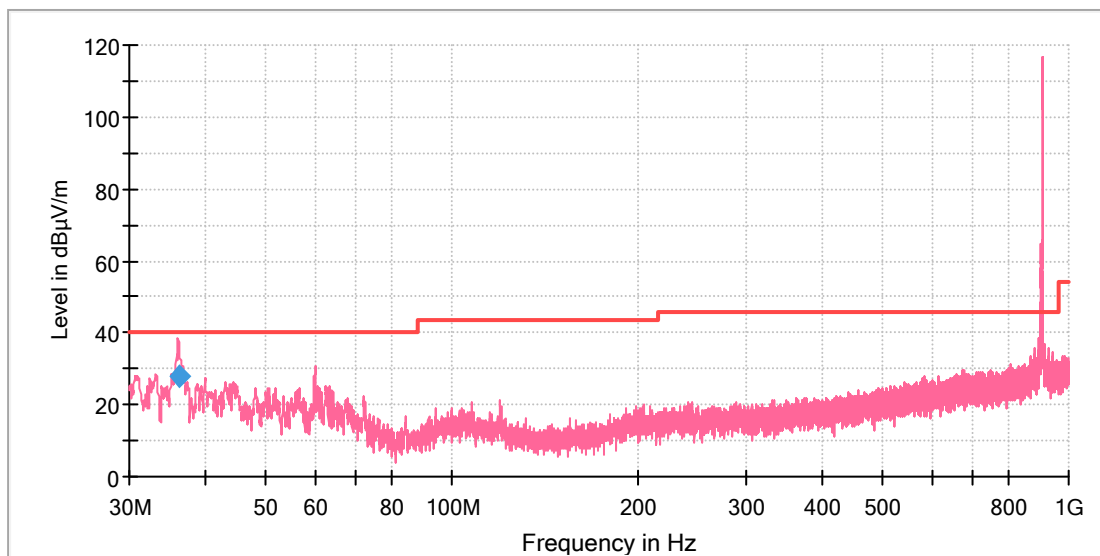


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.969231	18.92	40.00	21.08	100.0	H	43.0	-21.9
103.458846	17.31	43.50	26.19	100.0	H	21.0	-19.2
276.865000	22.73	46.00	23.27	100.0	H	43.0	-17.1
625.020385	33.14	46.00	12.86	100.0	H	0.0	-9.8

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF8_904.6MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin



Critical_Freqs

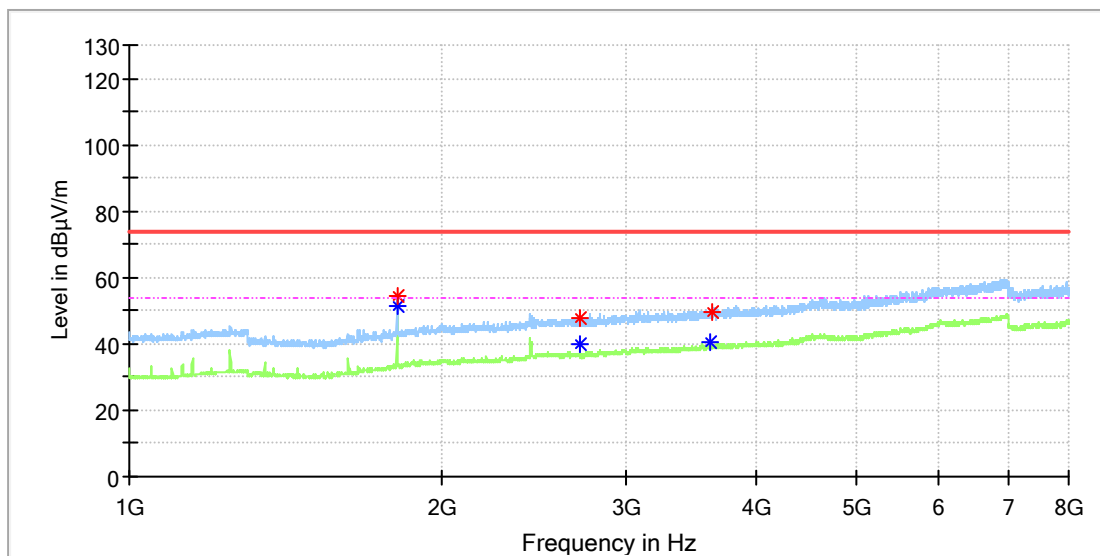
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
59.995385	30.52	40.00	9.48	100.0	V	30.0	-19.3
119.986154	21.33	43.50	22.17	100.0	V	45.0	-21.1
581.706154	27.66	46.00	18.34	100.0	V	12.0	-10.6

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
36.070000	28.05	40.00	11.95	105.0	V	5.0	-21.8

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

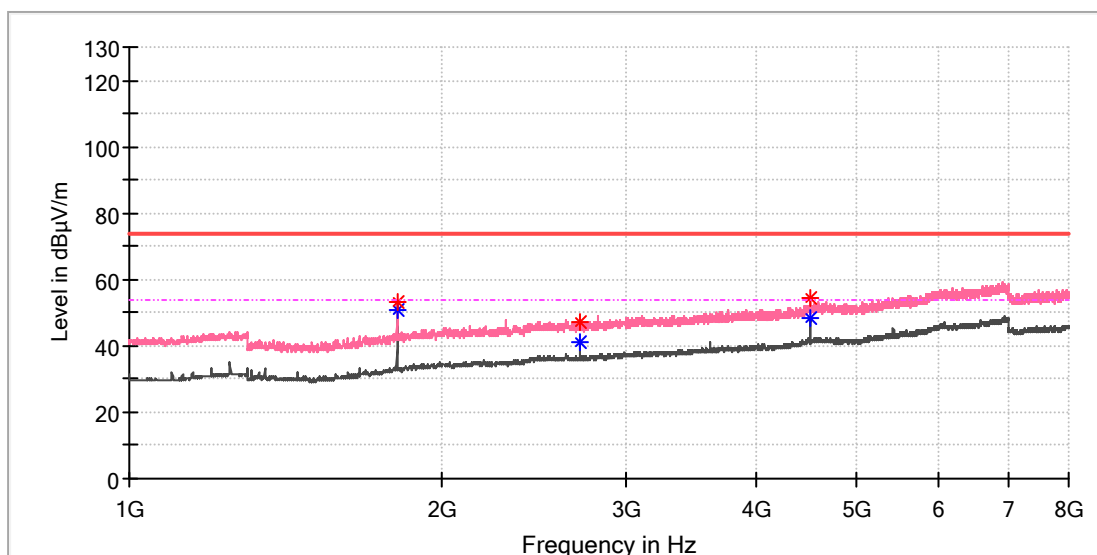


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1808.362500	---	51.51	54.00	2.49	100.0	H	307.0	4.8
1809.200000	54.48	---	74.00	19.52	100.0	H	299.0	4.8
2712.862500	---	39.90	54.00	14.10	100.0	H	335.0	7.6
2714.537500	47.53	---	74.00	26.47	100.0	H	166.0	7.6
3618.200000	---	40.81	54.00	13.19	100.0	H	67.0	9.4
3629.925000	49.67	---	74.00	24.33	100.0	H	325.0	9.4

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

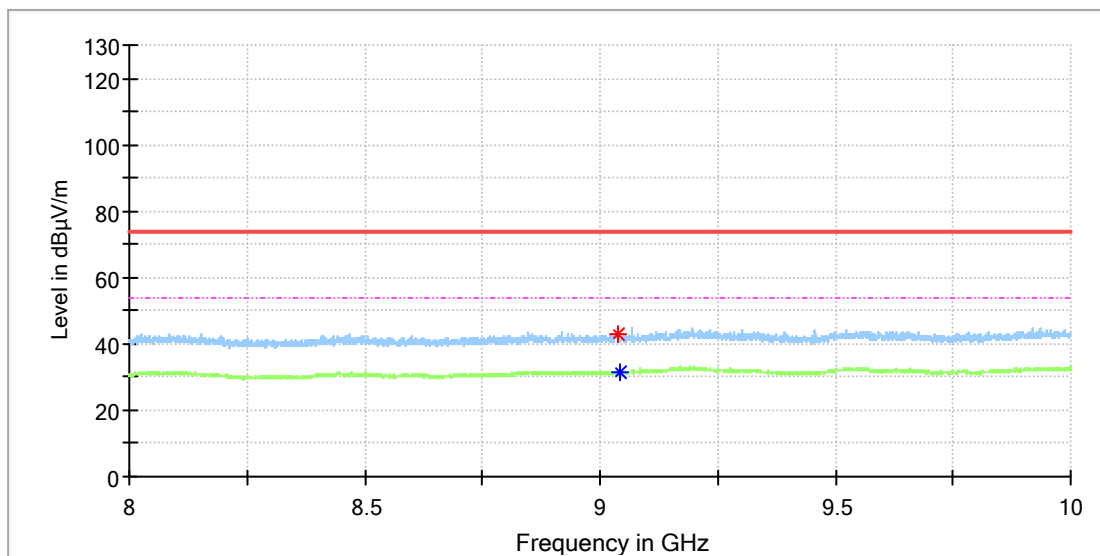


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1808.362500	53.20	---	74.00	20.80	100.0	V	323.0	4.8
1809.200000	---	50.68	54.00	3.32	100.0	V	21.0	4.8
2712.862500	---	41.03	54.00	12.97	100.0	V	218.0	7.6
2712.862500	47.31	---	74.00	26.69	100.0	V	218.0	7.6
4522.700000	54.57	---	74.00	19.43	100.0	V	31.0	11.7
4523.537500	---	48.56	54.00	5.44	100.0	V	21.0	11.7

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

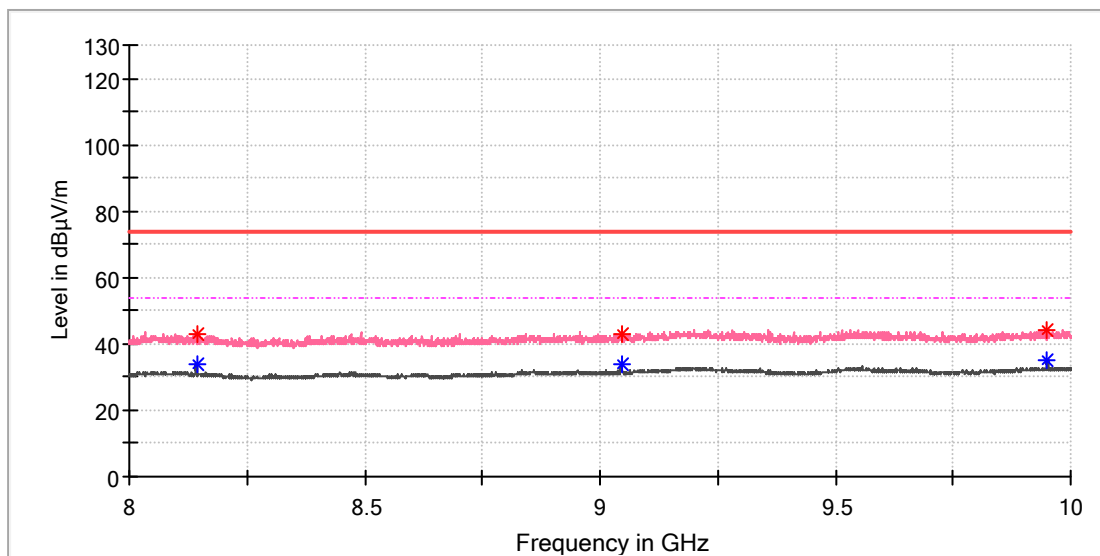


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9040.000000	42.63	---	74.00	31.37	100.0	H	39.0	8.9
9042.000000	---	31.51	54.00	22.49	100.0	H	152.0	8.9

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF8_904.6MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin



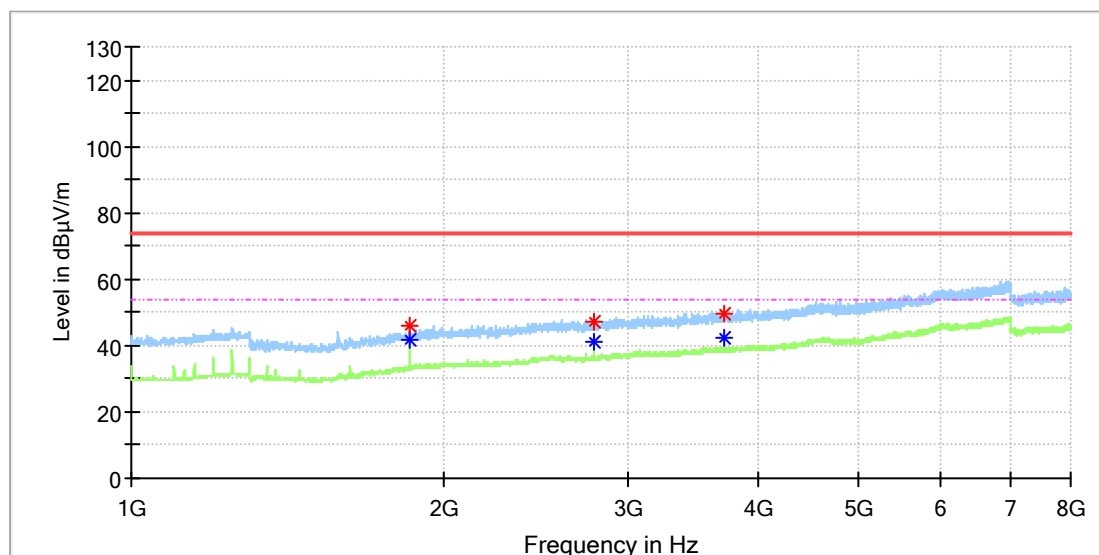
Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8143.000000	42.65	---	74.00	31.35	100.0	V	14.0	8.5
8143.000000	---	33.99	54.00	20.01	100.0	V	14.0	8.5
9045.000000	42.67	---	74.00	31.33	100.0	V	54.0	9.0
9046.500000	---	34.05	54.00	19.95	100.0	V	6.0	9.0
9950.000000	---	35.09	54.00	18.91	100.0	V	336.0	10.4
9951.000000	44.14	---	74.00	29.86	100.0	V	328.0	10.4

Lora DTS SF12 with 8 dBi antenna

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF12_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

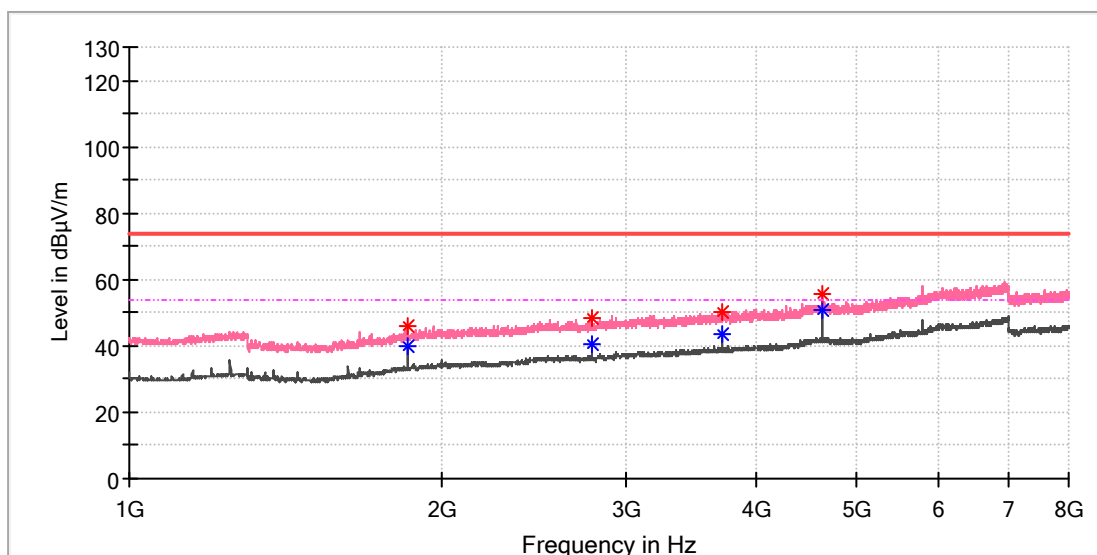


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.425000	45.95	---	74.00	28.05	100.0	H	355.0	5.0
1854.425000	---	41.44	54.00	12.56	100.0	H	355.0	5.0
2779.025000	47.10	---	74.00	26.90	100.0	H	95.0	7.9
2782.375000	---	41.19	54.00	12.81	100.0	H	291.0	7.9
3709.487500	49.45	---	74.00	24.55	100.0	H	39.0	9.6
3709.487500	---	42.16	54.00	11.84	100.0	H	39.0	9.6

EUT Information

EUT Name: WisLink LPWAN Concentrator
Model: RAK5147
Test Mode: Lora DTS 500K_SF12_927.5MHz
Order No/Sample No: 168376259/A003275919-006
Test Voltage:: DC 5V via USB
Remark: Temp 22 Humi:55%
Test Standard: FCC 15.247
Tested By: Kei Zhang
Reviewed By: Terry Yin

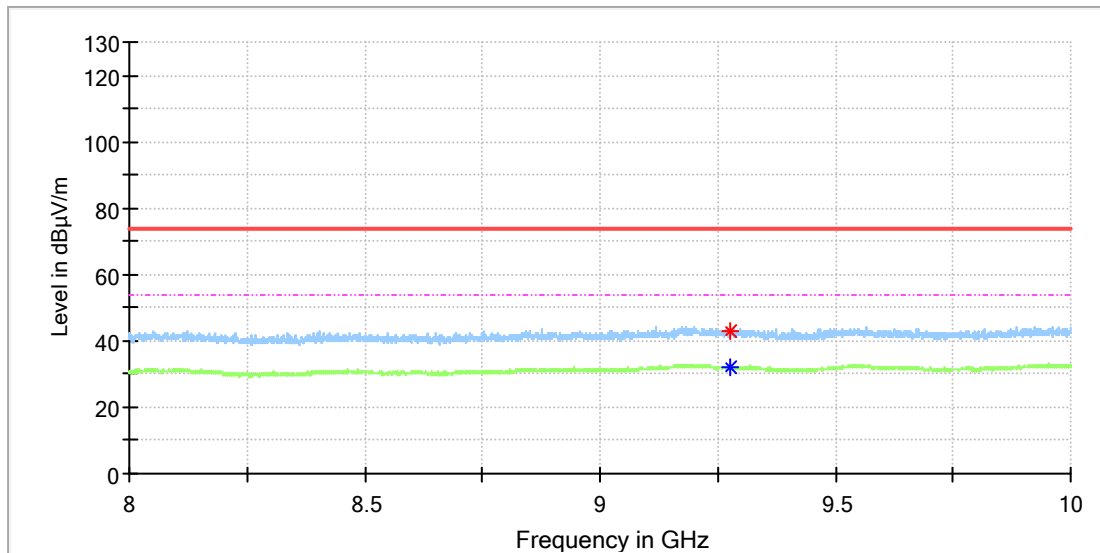


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.425000	45.66	---	74.00	28.34	100.0	V	199.0	5.0
1854.425000	---	39.82	54.00	14.18	100.0	V	199.0	5.0
2781.537500	48.10	---	74.00	25.90	100.0	V	15.0	7.9
2781.537500	---	40.38	54.00	13.62	100.0	V	15.0	7.9
3710.325000	50.25	---	74.00	23.75	100.0	V	199.0	9.6
3710.325000	---	43.39	54.00	10.61	100.0	V	199.0	9.6
4638.275000	55.89	---	74.00	18.11	100.0	V	32.0	12.0
4638.275000	---	50.85	54.00	3.15	100.0	V	32.0	12.0

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF12_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

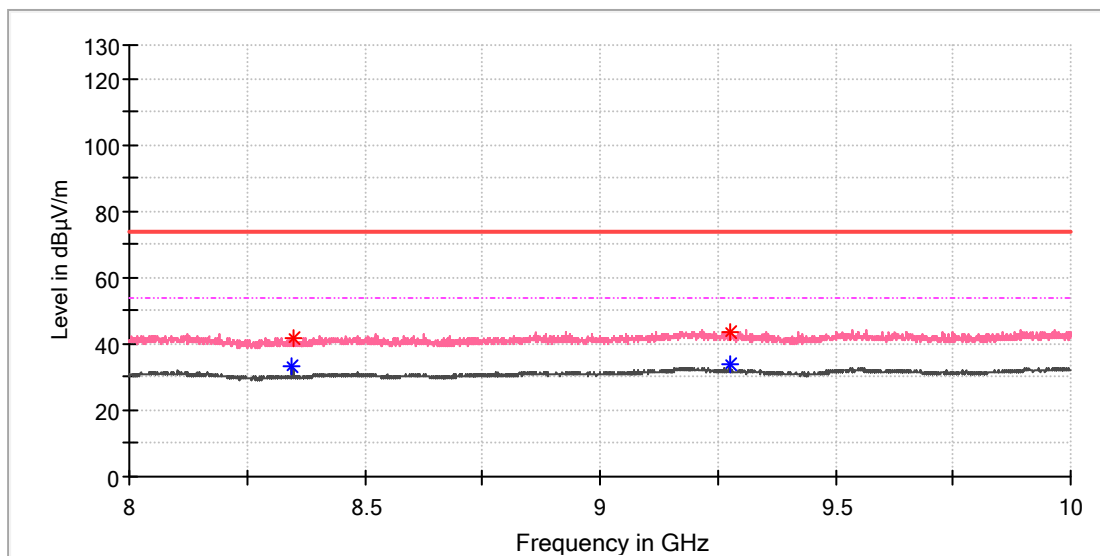


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9276.500000	---	32.10	54.00	21.90	100.0	H	98.0	10.2
9278.000000	43.13	---	74.00	30.87	100.0	H	98.0	10.2

EUT Information

EUT Name: WisLink LPWAN Concentrator
Model: RAK5147
Test Mode: Lora DTS 500K_SF12_927.5MHz
Order No/Sample No: 168376259/A003275919-006
Test Voltage:: DC 5V via USB
Remark: Temp 22 Humi:55%
Test Standard: FCC 15.247
Tested By: Kei Zhang
Reviewed By: Terry Yin



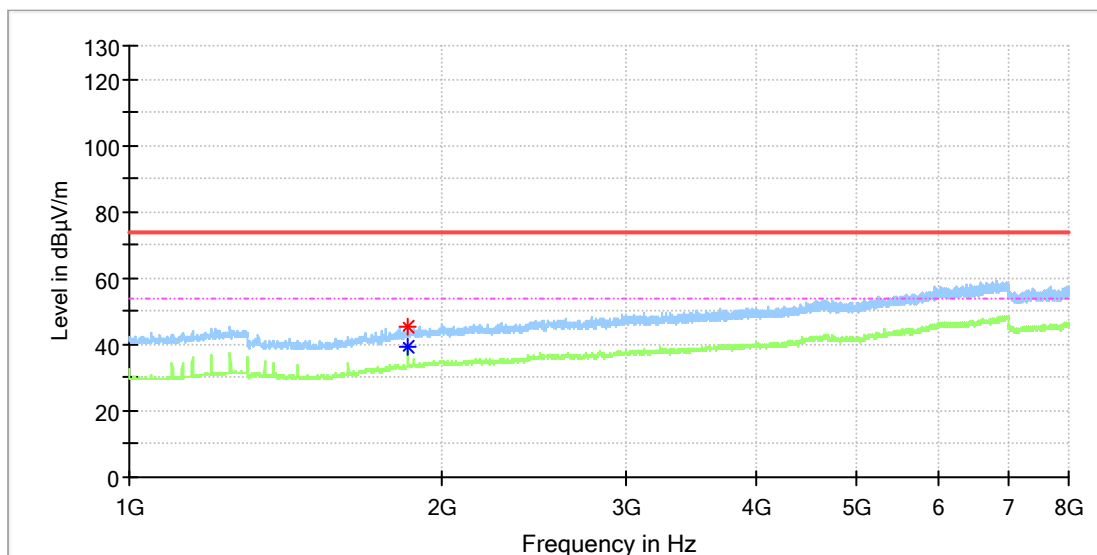
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8345.500000	---	33.05	54.00	20.95	100.0	V	164.0	8.4
8350.000000	41.72	---	74.00	32.28	100.0	V	164.0	8.5
9274.500000	43.54	---	74.00	30.46	100.0	V	335.0	10.2
9274.500000	---	34.16	54.00	19.84	100.0	V	335.0	10.2

Lora DTS SF7 with 2.3dBi antenna

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

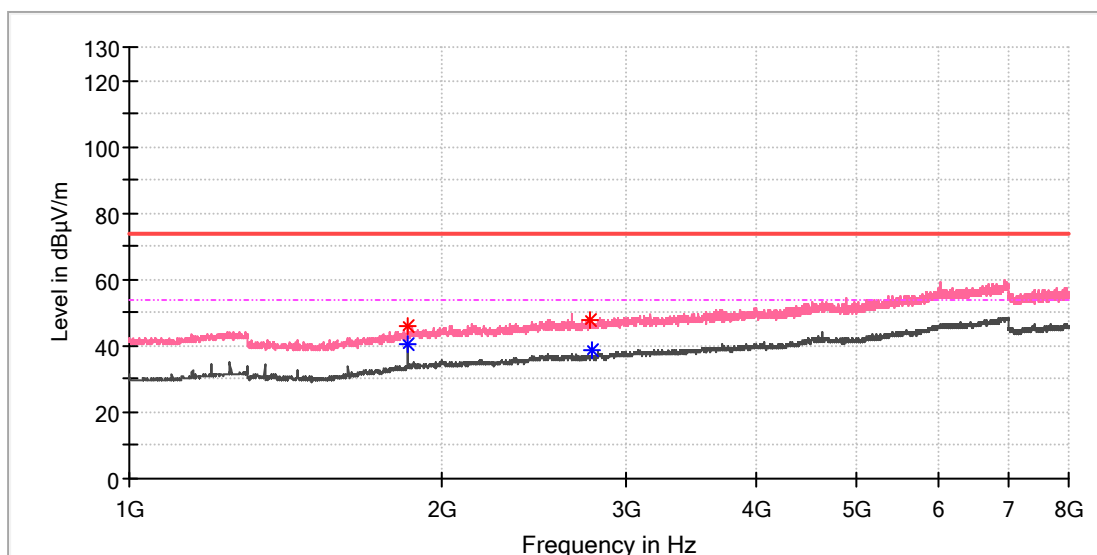


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.425000	45.48	---	74.00	28.52	100.0	H	111.0	5.0
1854.425000	---	39.58	54.00	14.42	100.0	H	111.0	5.0

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

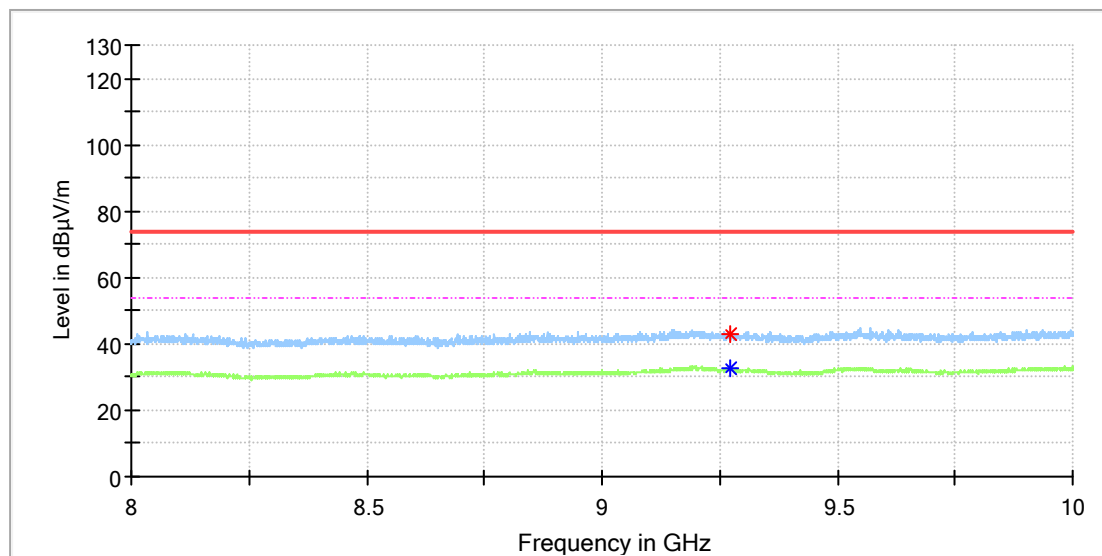


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1854.425000	46.12	---	74.00	27.88	100.0	V	89.0	5.0
1854.425000	---	40.31	54.00	13.69	100.0	V	89.0	5.0
2771.487500	47.87	---	74.00	26.13	100.0	V	121.0	7.9
2782.375000	---	38.76	54.00	15.24	100.0	V	1.0	7.9

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

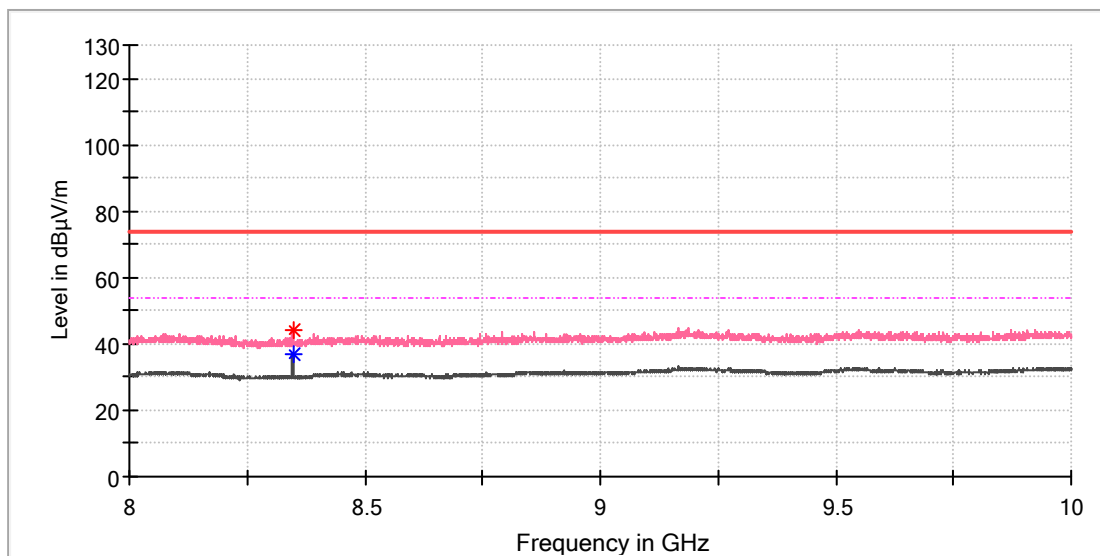


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9273.500000	---	32.47	54.00	21.53	100.0	H	86.0	10.2
9274.000000	42.79	---	74.00	31.21	100.0	H	108.0	10.2

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF7_927.5MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



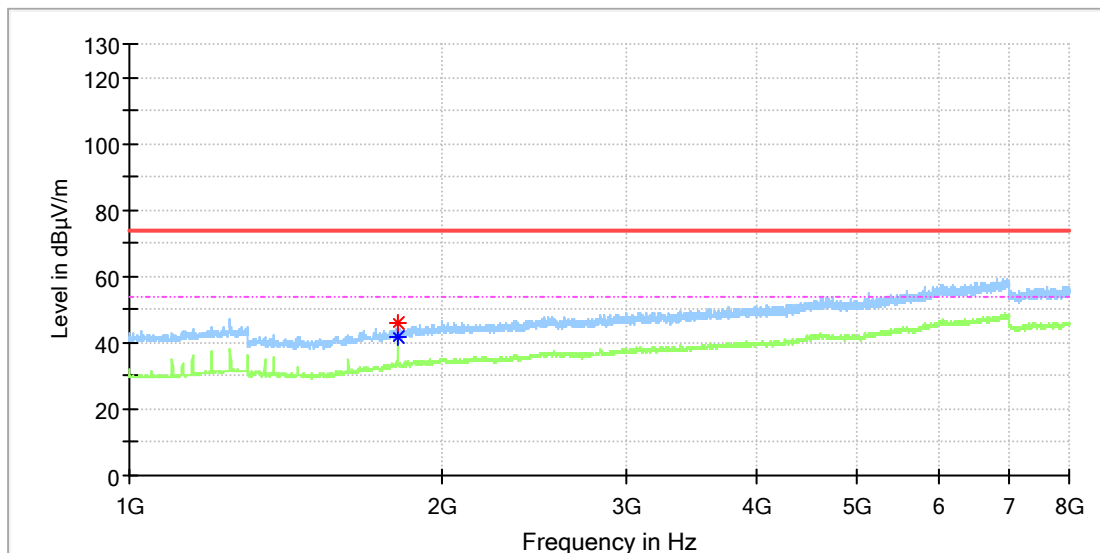
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8347.000000	---	36.73	54.00	17.27	100.0	V	2.0	8.4
8348.500000	43.88	---	74.00	30.12	100.0	V	169.0	8.5

Lora DTS SF8 with 2.3dBi antenna

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

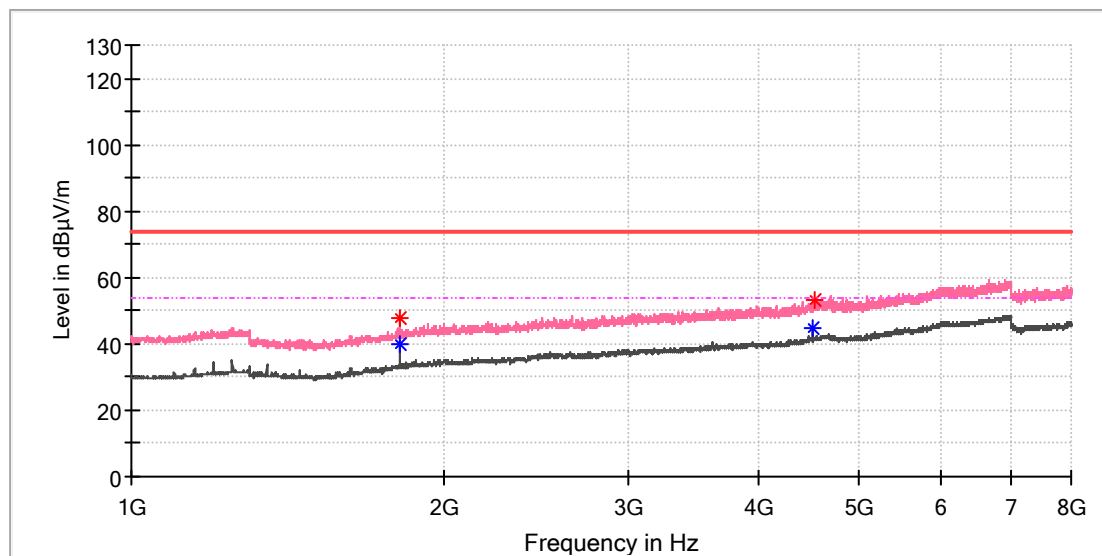


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1808.362500	46.24	---	74.00	27.76	100.0	H	176.0	4.8
1809.200000	---	41.48	54.00	12.52	100.0	H	326.0	4.8

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora DTS 500K_SF8_904.6MHz
 Order No/Sample No: 168376259/A003275919-006
 Test Voltage:: DC 5V via USB
 Remark: Temp 22 Humi:55%
 Test Standard: FCC 15.247
 Tested By: Kei Zhang
 Reviewed By: Terry Yin

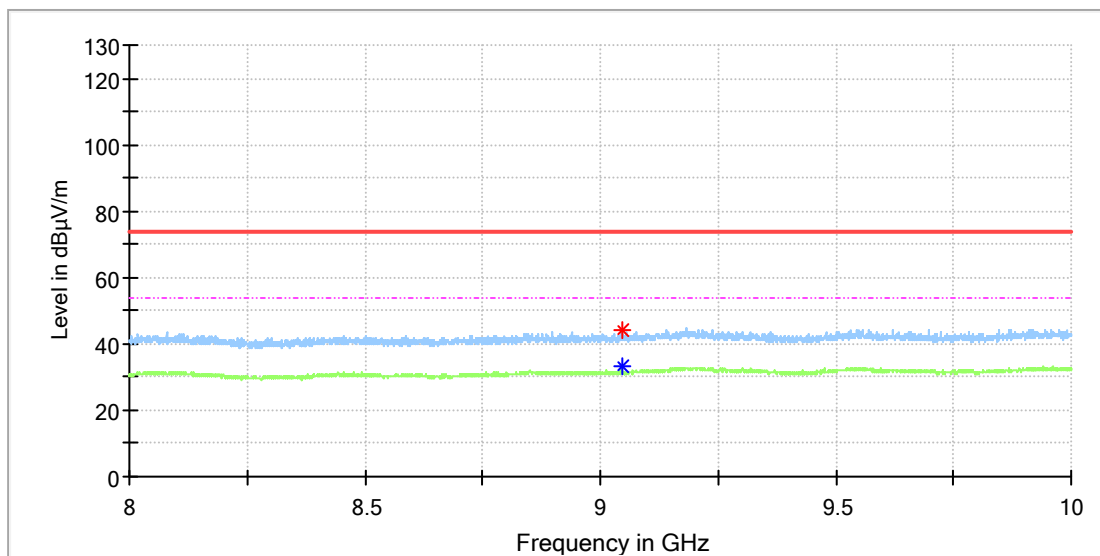


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1808.362500	---	39.70	54.00	14.30	100.0	V	304.0	4.8
1809.200000	47.53	---	74.00	26.47	100.0	V	20.0	4.8
4523.537500	---	44.56	54.00	9.44	100.0	V	20.0	11.7
4533.587500	53.09	---	74.00	20.91	100.0	V	65.0	11.8

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin

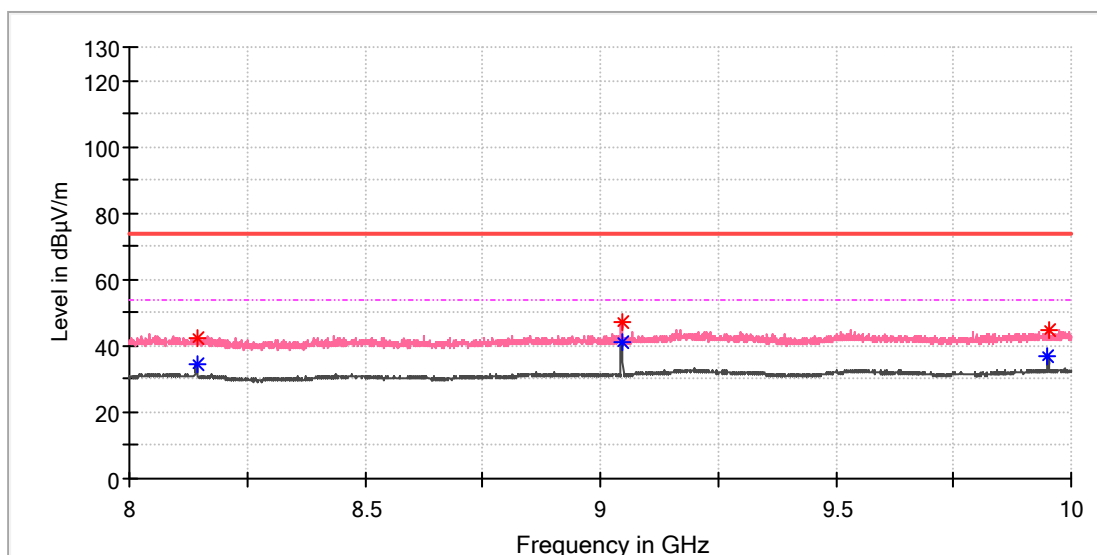


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9045.000000	44.19	---	74.00	29.81	100.0	H	27.0	9.0
9045.000000	---	33.45	54.00	20.55	100.0	H	27.0	9.0

EUT Information

EUT Name:	WisLink LPWAN Concentrator
Model:	RAK5147
Test Mode:	Lora DTS 500K_SF8_904.6MHz
Order No/Sample No:	168376259/A003275919-006
Test Voltage::	DC 5V via USB
Remark:	Temp 22 Humi:55%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



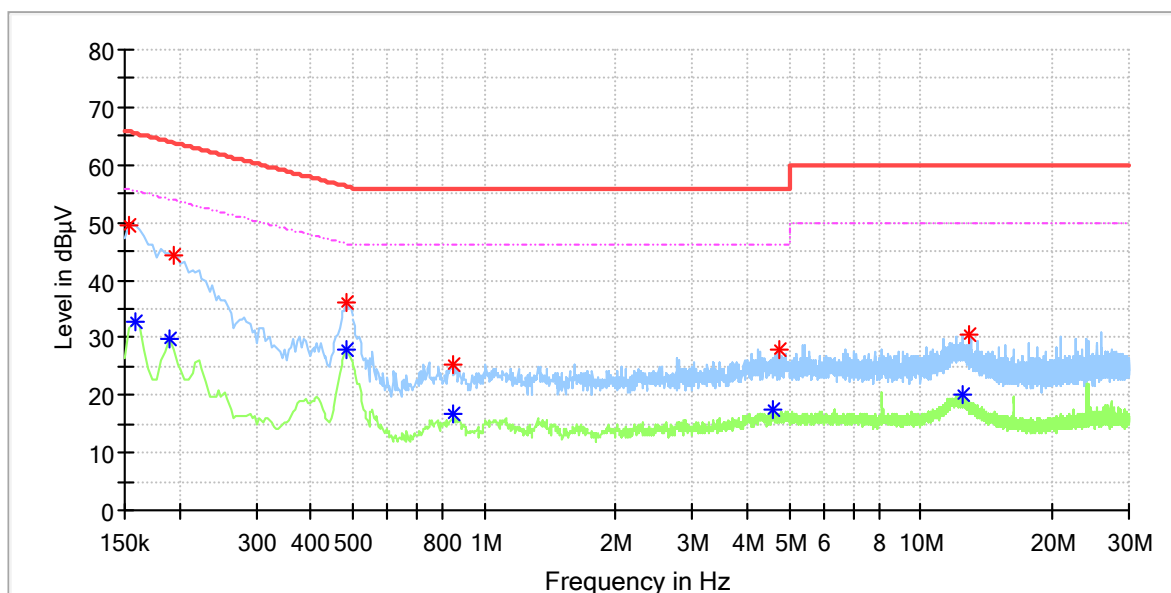
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8143.000000	---	34.70	54.00	19.30	100.0	V	0.0	8.5
8144.000000	42.53	---	74.00	31.47	100.0	V	355.0	8.5
9046.500000	---	41.38	54.00	12.62	100.0	V	112.0	9.0
9047.000000	47.03	---	74.00	26.98	100.0	V	0.0	9.0
9951.000000	---	36.80	54.00	17.20	100.0	V	340.0	10.4
9951.500000	44.74	---	74.00	29.26	100.0	V	348.0	10.4

Appendix B.7: Test Results of Conducted Emission on AC Mains

EUT Information

EUT Name: WisLink LPWAN Concentrator
Model: RAK5147
Test Mode: Lora TX
Test Voltage: DC 5V via USB
Test By/Review By: Mac Xie/Gary Chen
Test Standard: FCC part 15C
Tem./Hum./Pressure: 24.4°C/53.6%/101kPa
Remark: SR1

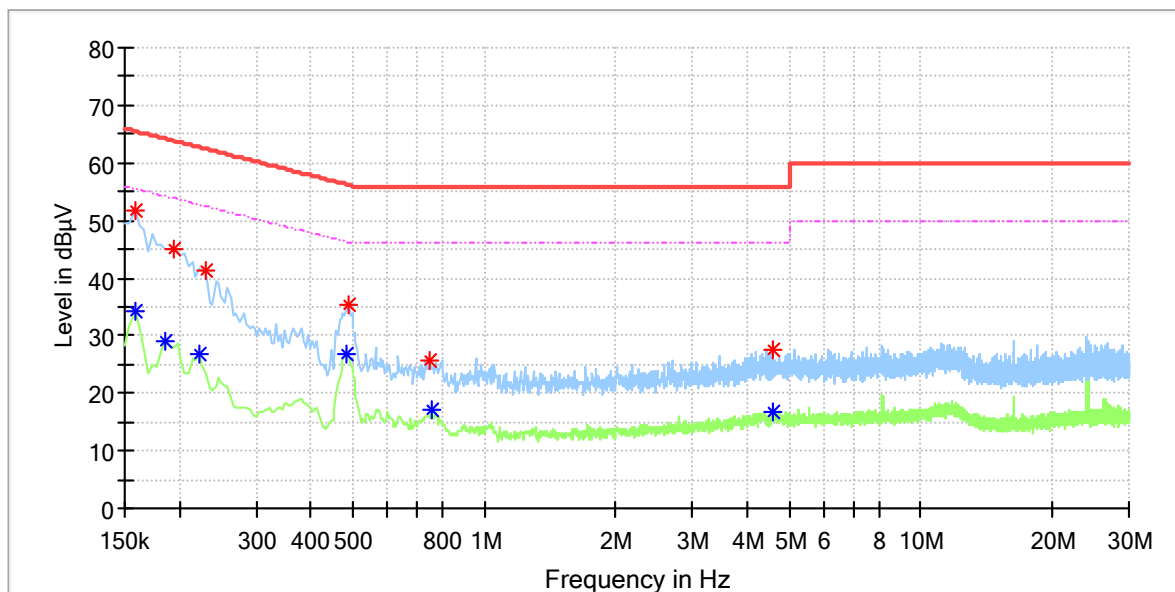


Critical Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.154000	49.66	---	65.78	16.12	L1	9.6
0.158000	---	32.73	55.57	22.84	L1	9.6
0.190000	---	29.60	54.04	24.44	L1	9.6
0.194000	44.45	---	63.86	19.41	L1	9.6
0.482000	---	28.08	46.31	18.23	L1	9.7
0.482000	36.27	---	56.31	20.04	L1	9.7
0.844000	25.14	---	56.00	30.86	L1	9.7
0.848000	---	16.81	46.00	29.19	L1	9.7
4.604000	---	17.52	46.00	28.48	L1	10.0
4.740000	27.97	---	56.00	28.03	L1	10.0
12.460000	---	19.94	50.00	30.06	L1	10.1
12.944000	30.48	---	60.00	29.52	L1	10.1

EUT Information

EUT Name: WisLink LPWAN Concentrator
 Model: RAK5147
 Test Mode: Lora TX
 Test Voltage: DC 5V via USB
 Test By/Review By: Mac Xie/Gary Chen
 Test Standard: FCC part 15C
 Tem./Hum./Pressure: 24.4°C/53.6%/101kPa
 Remark: SR1



Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.158000	51.89	---	65.57	13.68	N	9.6
0.158000	---	34.13	55.57	21.44	N	9.6
0.186000	---	28.99	54.21	25.22	N	9.6
0.194000	44.93	---	63.86	18.93	N	9.6
0.222000	---	26.96	52.74	25.78	N	9.6
0.230000	41.33	---	62.45	21.12	N	9.6
0.482000	---	26.63	46.31	19.67	N	9.7
0.490000	35.35	---	56.17	20.82	N	9.7
0.752000	25.57	---	56.00	30.43	N	9.7
0.756000	---	17.14	46.00	28.86	N	9.7
4.560000	---	16.64	46.00	29.36	N	10.0
4.592000	27.66	---	56.00	28.34	N	10.0