FCC Part 15.247

TEST REPORT

For

Technology Solutions (UK) Ltd

Suite A, Loughborough Technology Centre, Epinal Way, Loughborough, Leicestershire, LE11 3GE, United Kingdom

FCC ID: S6J3419

Report Type:	**Product Type:**
Original Report	RAIN RFID Module

Report Producer : Lynette Wen

Report Number : RXZ230928139RF01

Report Date : 2023-12-26

Reviewed By: Andy Shih

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ230928139	RXZ230928139RF01	2023-12-26	Original Report	Lynette Wen

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1. General Information

1.1. Product Description for Equipment under Test (EUT)

Applicant	Technology Solutions (UK) Ltd
	Suite A, Loughborough Technology Centre, Epinal Way, Loughborough, Leicestershire, LE11 3GE, United Kingdom
Manufacturer	Technology Solutions (UK) Ltd
	Suite A, Loughborough Technology Centre, Epinal Way, Loughborough, Leicestershire, LE11 3GE, United Kingdom
Brand(Trade) Name	TSL
Product (Equipment)	RAIN RFID Module
Main Model Name	3419
Series Model Name	N/A
Frequency Range	902.75 ~ 927.25 MHz
Peak Conducted Output Power	DSB-ASK Mode: 29.62 dBm PR-ASK Mode: 29.74 dBm
Modulation Technique	DSB-ASK PR-ASK
Power Operation (Voltage Range)	☐ AC 120V/60Hz ☐ Adapter: ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☐ Battery ☒ Power Supply DC 5-15 V ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	2023/10/24
Date of Test	2023/11/09 ~ 2023/12/26

*All measurement and test data in this report was gathered from production sample serial number: RXZ230928139-1-1 (Assigned by BACL, New Taipei Laboratory).

1.2. Objective

This report is prepared on behalf of *Technology Solutions (UK) Ltd* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

1.3. Related Submittal(s)/Grant(s)

N/A.

1.4. Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
FCC 558074 D01 15.247 Meas Guidance v05r02.

1.5. Statement

Decision Rule: No, (The test results do not include MU judgment)

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.
Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.6. Measurement Uncertainty

Parameter		Uncertainty
AC Mains		±2.53 dB
RF output power, conducted		±3.74 dB
Power Spectral Density, conducted		±0.62 dB
Occupied Bandwidth		±0.09 %
Unwanted Emissions, conducted		±1.13 dB
Emissions, radiated	9 kHz~30MHz	±3.54 dB
	30 MHz~1GHz	±4.99 dB
	1 GHz~18 GHz	±7.56 dB
	18 GHz~40 GHz	±5.06 dB
Temperature		±0.79 ℃
Humidity		±0.44 %

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty

1.7. Environmental Conditions

Test Site	Test Date	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2023/11/22	22.7	65	1010	Jing
Radiation Spurious Emissions	2023/11/10~2023/12/26	18.3~23.7	61~68	1010	Aaron
Conducted Spurious Emissions	2023/11/09~2023/11/10	25.7~25.8	52~55	1010	Jing
20 dB Emission Bandwidth	2023/11/09~2023/11/10	25.7~25.8	52~55	1010	Jing
Channel Separation Test	2023/11/09~2023/11/10	25.7~25.8	52~55	1010	Jing
Time of Occupancy	2023/11/10	25.8	52	1010	Jing
Quantity of hopping channel	2023/11/10	25.8	52	1010	Jing
Maximum Output Power	2023/11/09~2023/11/10	25.7~25.8	52~55	1010	Jing
100 kHz Bandwidth of Frequency Band Edge	2023/11/10	25.8	52	1010	Jing

1.8. Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

2. System Test Configuration

2.1. Description of Test Configuration

For RFID mode, 50 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.75	26	915.25
2	903.25	27	915.75
3	903.75	28	916.25
4	904.25	29	916.75
5	904.75	30	917.25
6	905.25	31	917.75
7	905.75	32	918.25
8	906.25	33	918.75
9	906.75	34	919.25
10	907.25	35	919.75
11	907.75	36	920.25
12	908.25	37	920.75
13	908.75	38	921.25
14	909.25	39	921.75
15	909.75	40	922.25
16	910.25	41	922.75
17	910.75	42	923.25
18	911.25	43	923.75
19	911.75	44	924.25
20	912.25	45	924.75
21	912.75	46	925.25
22	913.25	47	925.75
23	913.75	48	926.25
24	914.25	49	926.75
25	914.75	50	927.25

Were tested with channel 1, 26 and 50.

The system was configured for testing in engineering mode, which was provided by manufacturer.

This device does not support MIMO mode.

2.2. Equipment Modifications

No modification was made to the EUT.

2.3. EUT Exercise Software

The test software was used "STORM RF Test USB App V1.3.0"

Mode	Frequency (MHz)	Power Level Setting			
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4
DSB-ASK	902.75	2850	2850	2850	2850
	915.25	2850	2850	2850	2850
	927.25	2850	2850	2850	2850
PR-ASK	902.75	2850	2850	2850	2850
	915.25	2850	2850	2850	2850
	927.25	2850	2850	2850	2850

This device does not support MIMO mode.

2.4. Test Mode

Full System (model: 3419) for all test item.

2.5. Support Equipment List and Details

Description	Manufacturer	Model Number
Adapter	TT Electronics	ATS065T-P150
Tablet	Amazon	R2SP8T
Developer Board	TSL	3117B V0.4
Termination	Woken	WTER-18S

2.6. External Cable List and Details

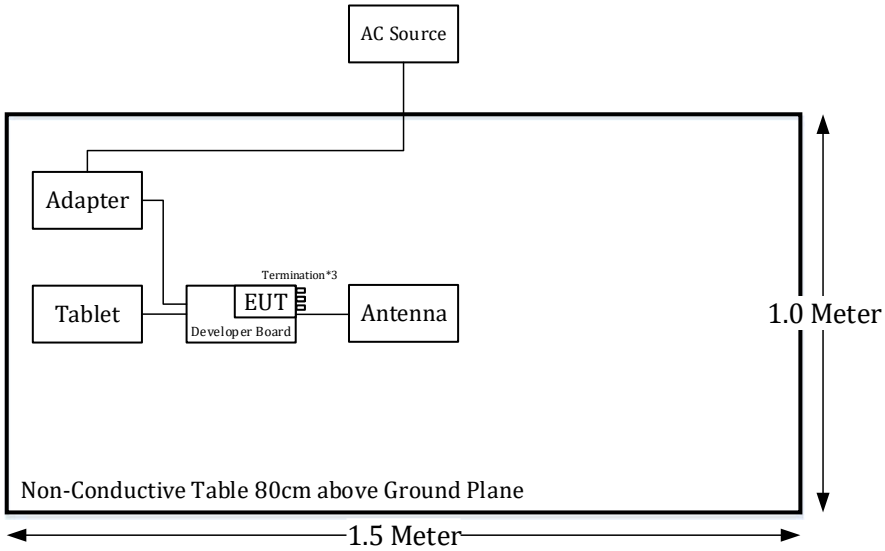
Description	Manufacturer	Model Number
Type-C Cable	PRO-SIGNAL	USB3C-901

2.7. Block Diagram of Test Setup

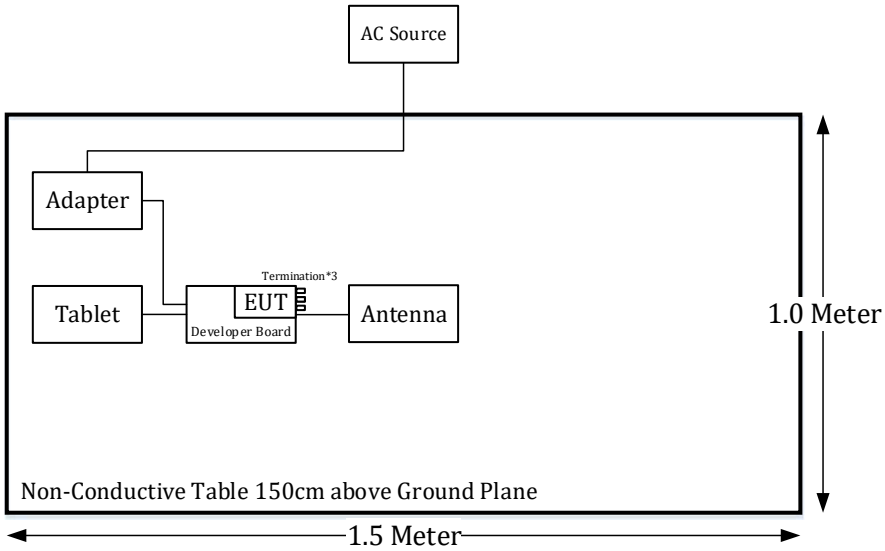
See test photographs attached in annex setup photos for the actual connections between EUT and support equipment.

Radiation:

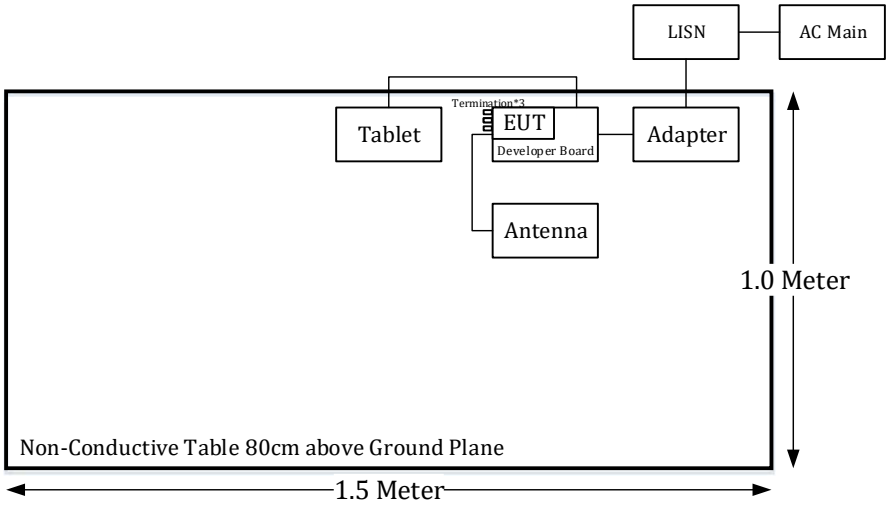
Below 1GHz:



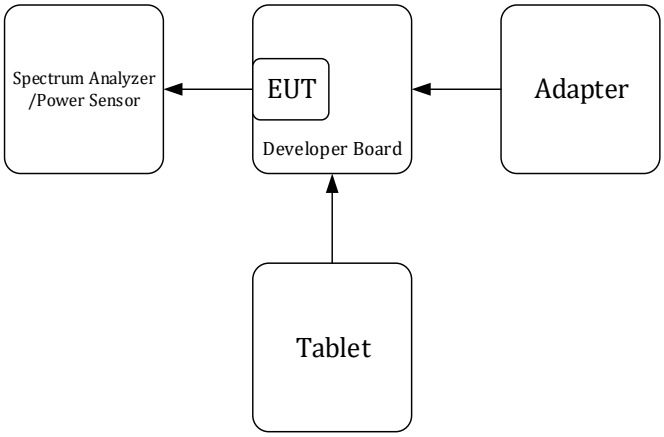
Above 1GHz:



Conduction:



Conducted:



3. Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247 (a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(i)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(i)	Quantity of hopping channel Test	Compliance
§15.247(b)(2)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance

4. Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2023/2/2	2024/2/1
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2023/5/22	2024/5/20
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2023/5/18	2024/5/16
RF Cable	EMEC	EM-CB5D	1	2023/6/6	2024/6/4
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation 3M Room (966-A)					
Active Loop Antenna	ETS-Lindgren	6502	35796	2023/3/27	2024/3/25
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2023/2/2	2024/2/1
Horn Antenna	EMCO	SAS-571	1020	2023/5/18	2024/5/16
Preamplifier	Sonoma	310N	130602	2023/6/16	2024/6/14
Preamplifier	Channel	ERA-100M-18G-01D1748	EC2300051	2023/04/01	2024/03/30
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2023/2/1	2024/1/31
EMI Test Receiver	Rohde & Schwarz	ESR3	102099	2023/6/16	2024/6/14
Band-reject filter (902-928MHz)	MICRO-TRONICS	BRC50722	G014	2023/10/2	2024/9/30
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2023/1/24	2024/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2022/12/24	2023/12/23
				2023/12/23	2024/12/22
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2023/1/24	2024/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2022/12/24	2023/12/23
				2023/12/23	2024/12/22
Cable	EMC	EMC105-SM-SM-10000	201003	2023/1/24	2024/1/23
Software	AUDIX	E3	18621a	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2023/2/10	2024/2/9
Cable	UTIFLEX	UFA210A	9435	2023/10/2	2024/9/30
Power Sensor	Boonton	RTP5006	11037	2023/5/23	2024/5/21
Attenuator	MCL	BW-S20W5+	1430	2023/6/6	2024/6/4

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements

5. FCC §15.247(i), §1.1307(b)(3)(i) – RF Exposure

5.1. Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, 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 of the Commission's guidelines.

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\,cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\,cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\,cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

5.2. RF Exposure Evaluation Result

Project info

RFID

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain + Cable Loss (dBi)	Distances (mm)	Tune-up Power (mW)	ERP (dBm)	ERP (mW)
DSB-ASK	902.75	30	-0.3	200	1000.00	27.55	568.85
PR-ASK	902.75	30	-0.3	200	1000.00	27.55	568.85

Cable loss is 0.3 dB

§ 1.1307(b)(3)(i)(A) and (C) method is not applicable.

§ 1.1307(b)(3)(i)(B)

Band	Freq (MHz)	Pth (mW)	X	ERP 20cm (mW)	Result Option B
DSB-ASK	902.75	1841.61	1.465	1841.61	exempt
PR-ASK	902.75	1841.61	1.465	1841.61	exempt

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater

This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Result: The device compliant the SAR-Based Exemption at 20cm distances.

6. FCC §15.203 – Antenna Requirements

6.1. Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

6.2. Antenna Information

Manufacturer	Model	Type	Antenna Gain	Cable Loss
TSL	ANT016015	Panel Antenna	0 dBi	0.3 dB

The antenna is connected to the EUT using a unique type of connector.

Result: Compliance

7. FCC §15.207(a) – AC Line Conducted Emissions

7.1. Applicable Standard

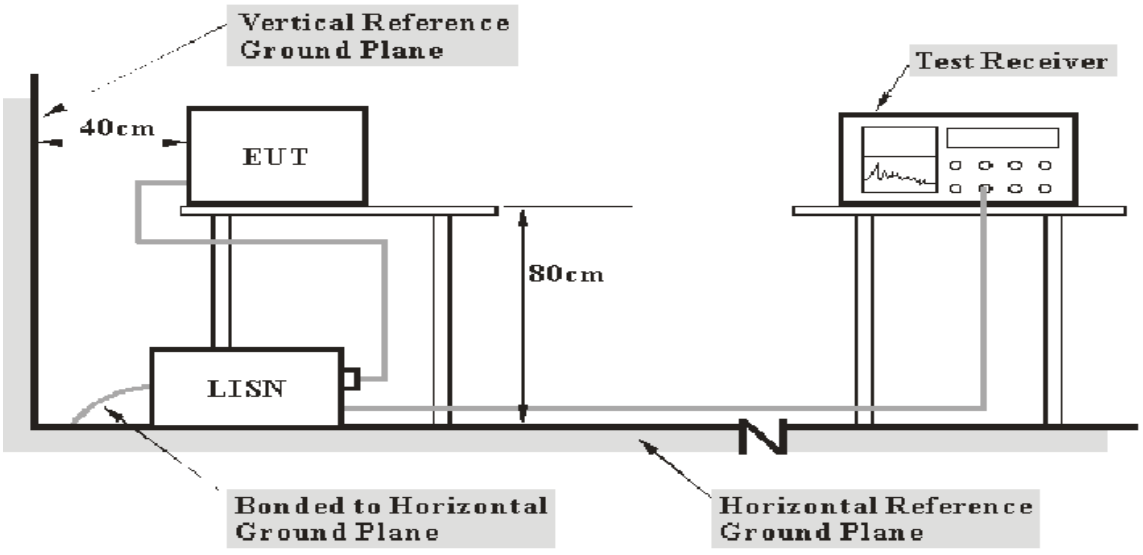
According to §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

7.2. EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

7.3. EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

7.4. Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

7.5. Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Result – Limit Line

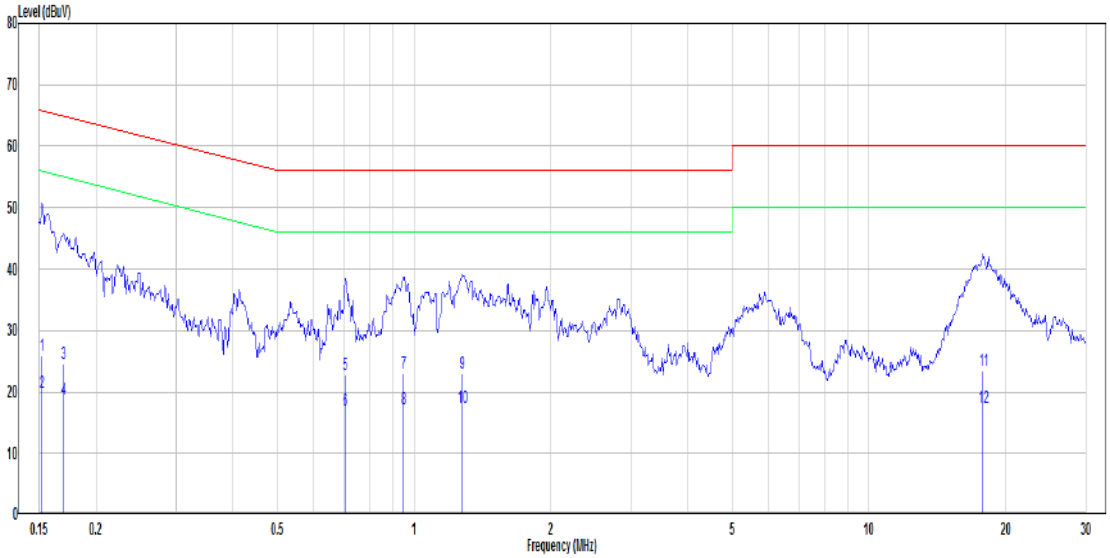
7.6. Test Results

Test Mode: Transmitting

DSB-ASK

(Worst case is Antenna Port 1, low channel)

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)		
1	0.152	6.41	19.50	25.91	65.87	-39.96	QP	Line
2	0.152	0.38	19.50	19.88	55.87	-35.99	Average	Line
3	0.169	5.16	19.50	24.66	64.99	-40.33	QP	Line
4	0.169	-0.76	19.50	18.74	54.99	-36.25	Average	Line
5	0.705	3.14	19.72	22.86	56.00	-33.14	QP	Line
6	0.705	-2.77	19.72	16.95	46.00	-29.05	Average	Line
7	0.948	3.21	19.84	23.05	56.00	-32.95	QP	Line
8	0.948	-2.57	19.84	17.27	46.00	-28.73	Average	Line
9	1.276	3.20	19.93	23.13	56.00	-32.87	QP	Line
10	1.276	-2.60	19.93	17.33	46.00	-28.67	Average	Line
11	17.849	2.98	20.39	23.37	60.00	-36.63	QP	Line
12	17.849	-2.95	20.39	17.44	50.00	-32.56	Average	Line

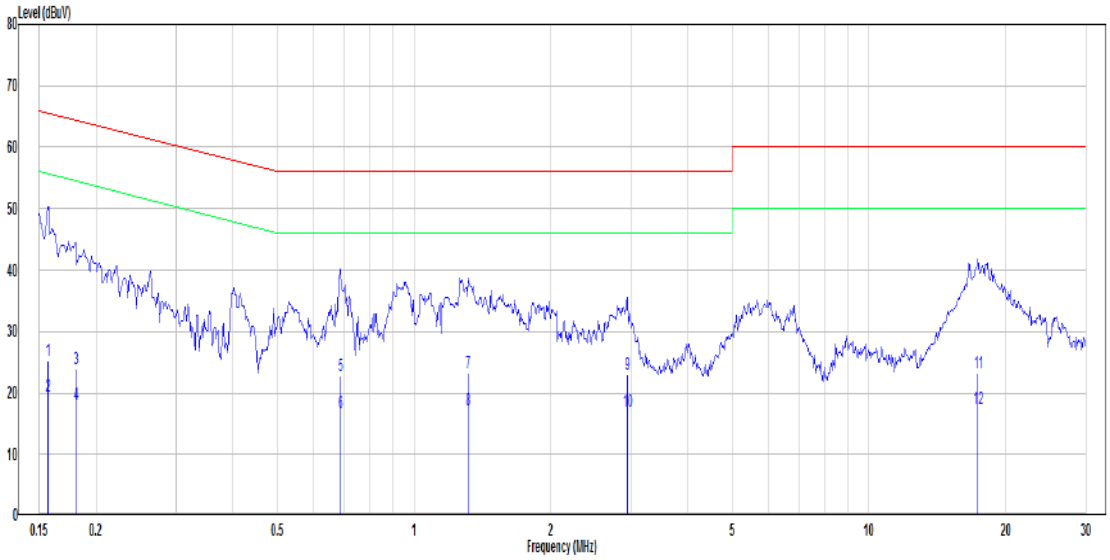
Note:

Result = Reading + Factor

Over Limit = Result – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)		
1	0.156	5.65	19.50	25.15	65.65	-40.50	QP	Neutral
2	0.156	-0.17	19.50	19.33	55.65	-36.32	Average	Neutral
3	0.181	4.52	19.50	24.02	64.46	-40.44	QP	Neutral
4	0.181	-1.30	19.50	18.20	54.46	-36.26	Average	Neutral
5	0.690	3.16	19.72	22.88	56.00	-33.12	QP	Neutral
6	0.690	-2.88	19.72	16.84	46.00	-29.16	Average	Neutral
7	1.317	3.31	19.93	23.24	56.00	-32.76	QP	Neutral
8	1.317	-2.64	19.93	17.29	46.00	-28.71	Average	Neutral
9	2.946	2.91	20.10	23.01	56.00	-32.99	QP	Neutral
10	2.946	-3.01	20.10	17.09	46.00	-28.91	Average	Neutral
11	17.383	2.89	20.42	23.31	60.00	-36.69	QP	Neutral
12	17.383	-2.88	20.42	17.54	50.00	-32.46	Average	Neutral

Note:

Result = Reading + Factor

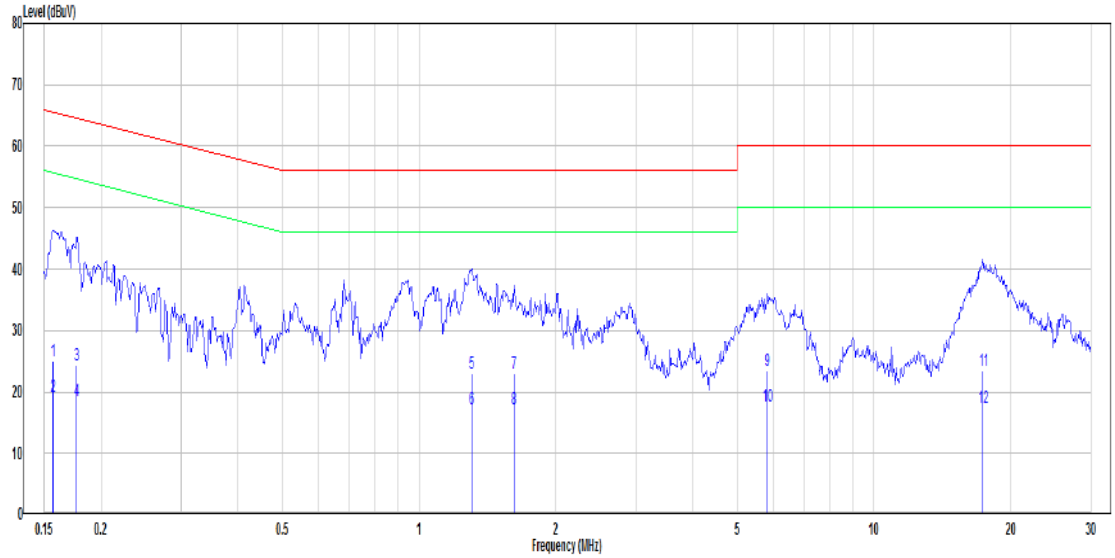
Over Limit = Result – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

PR-ASK

(Worst case is Antenna Port 1, low channel)

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)		
1	0.156	5.58	19.50	25.08	65.65	-40.57	QP	Line
2	0.156	-0.23	19.50	19.27	55.65	-36.38	Average	Line
3	0.177	4.80	19.49	24.29	64.64	-40.35	QP	Line
4	0.177	-1.03	19.49	18.46	54.64	-36.18	Average	Line
5	1.303	3.15	19.93	23.08	56.00	-32.92	QP	Line
6	1.303	-2.73	19.93	17.20	46.00	-28.80	Average	Line
7	1.619	3.00	19.99	22.99	56.00	-33.01	QP	Line
8	1.619	-2.75	19.99	17.24	46.00	-28.76	Average	Line
9	5.836	3.41	20.14	23.55	60.00	-36.45	QP	Line
10	5.836	-2.52	20.14	17.62	50.00	-32.38	Average	Line
11	17.383	3.05	20.37	23.42	60.00	-36.58	QP	Line
12	17.383	-2.87	20.37	17.50	50.00	-32.50	Average	Line

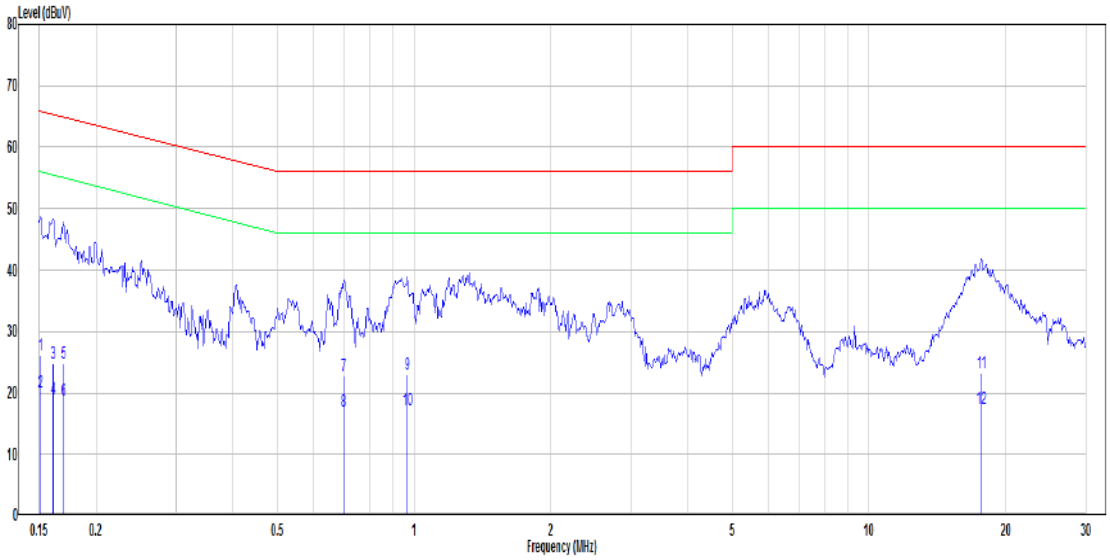
Note:

Result = Reading + Factor

Over Limit = Result – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)		
1	0.151	6.56	19.50	26.06	65.96	-39.90	QP	Neutral
2	0.151	0.58	19.50	20.08	55.96	-35.88	Average	Neutral
3	0.161	5.34	19.50	24.84	65.43	-40.59	QP	Neutral
4	0.161	-0.52	19.50	18.98	55.43	-36.45	Average	Neutral
5	0.169	5.19	19.50	24.69	64.99	-40.30	QP	Neutral
6	0.169	-0.77	19.50	18.73	54.99	-36.26	Average	Neutral
7	0.701	3.07	19.73	22.80	56.00	-33.20	QP	Neutral
8	0.701	-2.75	19.73	16.98	46.00	-29.02	Average	Neutral
9	0.968	3.25	19.85	23.10	56.00	-32.90	QP	Neutral
10	0.968	-2.62	19.85	17.23	46.00	-28.77	Average	Neutral
11	17.661	2.88	20.44	23.32	60.00	-36.68	QP	Neutral
12	17.661	-2.97	20.44	17.47	50.00	-32.53	Average	Neutral

Note:

Result = Reading + Factor

Over Limit = Result – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

8. FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

8.1. Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	608 – 614	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	5. 35 – 5. 46
2.1735 – 2.1905	16.80425 – 16.80475	1300 – 1427	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1435 – 1626.5	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1645.5 – 1646.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1660 – 1710	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1718.8 – 1722.2	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	2200 – 2300	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2310 – 2390	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2483.5 – 2500	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2690 – 2900	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	22.01 – 23.12
8.41425 – 8.41475	162.0125 –167.17	3.332 – 3.339	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3.600 – 4.400	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

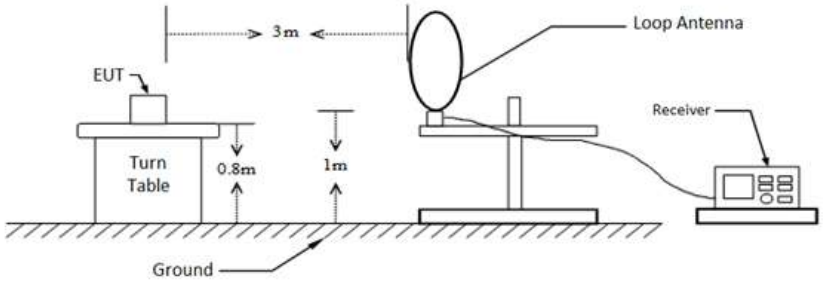
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains

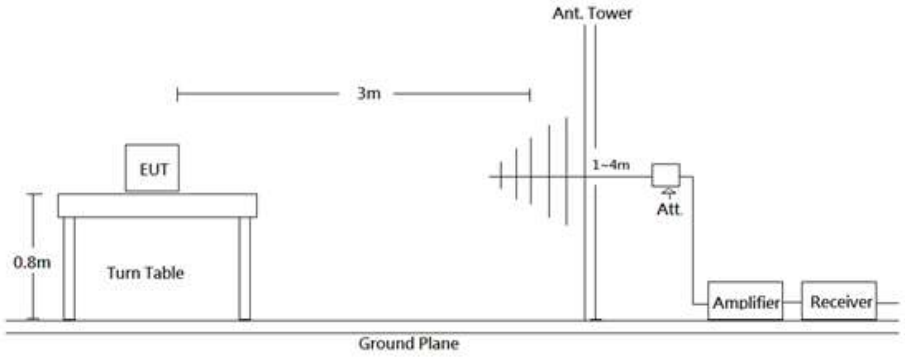
the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

8.2. EUT Setup

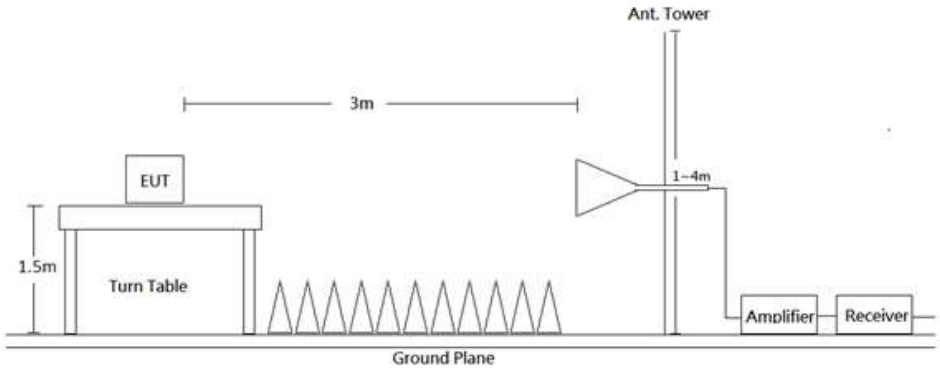
9 kHz - 30 MHz:



30 MHz - 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

8.3. EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz to 10 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Measurement method
9 -150 kHz	300 Hz	1 kHz	Ave
150 kHz-30 MHz	10 kHz	30 kHz	QP
30-1000 MHz	100 kHz	300 kHz	QP
Above 1 GHz	1 MHz	3 MHz	PK
	1 MHz	10 Hz	Ave

8.4. Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

8.5. Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Level – Limit

8.6. Test Results

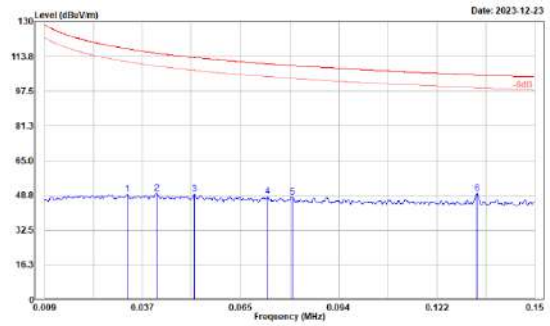
Test Mode: Transmitting

(Pre-scan with three orthogonal axis, and worse case as X axis.)

(Worst case is DSB-ASK mode, Antenna Port 1)

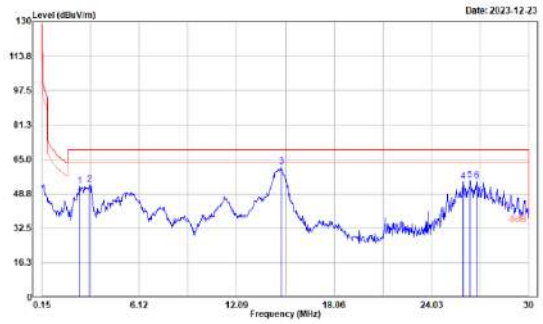
9kHz-30MHz: (Pre-scan with three Antenna orthogonal axis, and worse case as parallel.)

Low Channel / 9kHz-150kHz



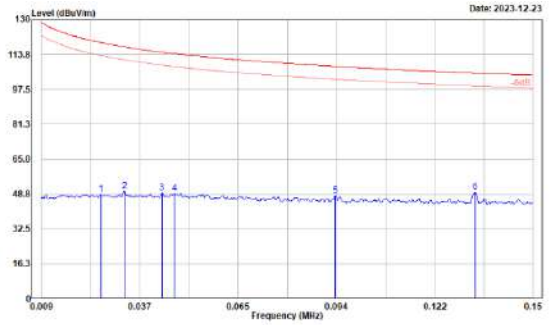
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.033	35.76	13.43	49.19	117.28	-68.09	100	202	Average
0.041	37.14	12.71	49.85	115.29	-65.44	100	9	Average
0.052	36.96	12.40	49.36	113.26	-63.90	100	318	Average
0.073	36.64	11.46	48.10	110.32	-62.22	100	149	Average
0.080	36.73	11.32	48.05	109.52	-61.47	100	29	Average
0.133	38.25	11.39	49.64	105.10	-55.46	100	33	Average

Low Channel / 150kHz-30MHz



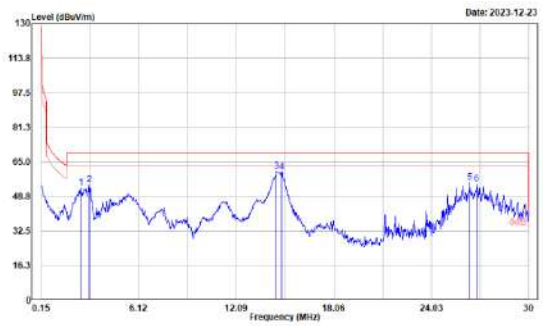
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2.448	41.73	10.62	52.35	69.54	-17.19	100	248	QP
3.045	42.64	10.46	53.10	69.54	-16.44	100	354	QP
14.806	50.01	11.51	61.52	69.54	-8.02	100	36	QP
25.970	42.86	11.71	54.57	69.54	-14.97	100	125	QP
26.388	43.62	11.72	55.34	69.54	-14.20	100	281	QP
26.806	43.07	11.72	54.79	69.54	-14.75	100	266	QP

Middle Channel / 9kHz-150kHz



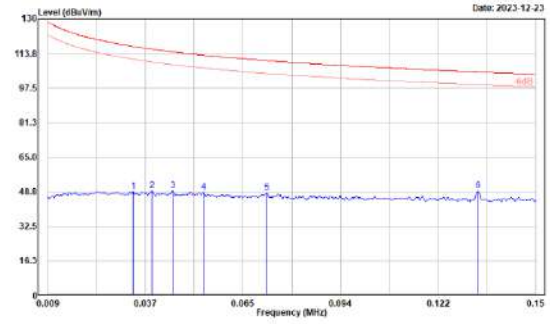
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.026	34.43	14.18	48.61	119.29	-70.68	100	283	Average
0.033	36.56	13.43	49.99	117.28	-67.29	100	0	Average
0.044	36.47	12.68	49.15	114.82	-65.67	100	191	Average
0.047	36.22	12.64	48.86	114.15	-65.29	100	41	Average
0.093	36.93	11.15	48.08	108.20	-60.12	100	248	Average
0.133	38.20	11.39	49.59	105.10	-55.51	100	21	Average

Middle Channel / 150kHz-30MHz



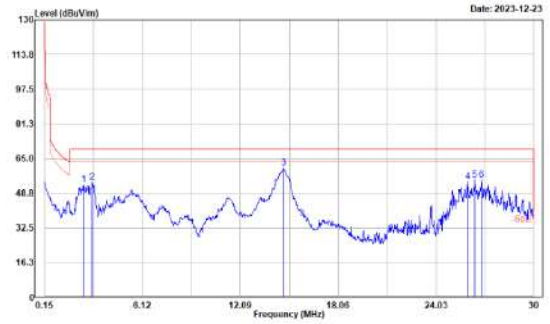
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2.568	42.21	10.58	52.79	69.54	-16.75	100	210	QP
3.075	43.76	10.47	54.23	69.54	-15.31	100	45	QP
14.568	48.99	11.50	60.49	69.54	-9.05	100	0	QP
14.866	48.76	11.51	60.27	69.54	-9.27	100	255	QP
26.388	43.43	11.72	55.15	69.54	-14.39	100	9	QP
26.806	42.84	11.72	54.56	69.54	-14.98	100	64	QP

High Channel / 9kHz-150kHz



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.034	35.52	13.34	48.86	117.06	-68.20	100	162	Average
0.039	36.36	12.82	49.18	115.78	-66.60	100	333	Average
0.045	36.57	12.66	49.23	114.52	-65.29	100	0	Average
0.054	36.55	12.20	48.75	112.96	-64.21	100	0	Average
0.072	36.76	11.47	48.23	110.42	-62.19	100	333	Average
0.133	37.77	11.39	49.16	105.10	-55.94	100	19	Average

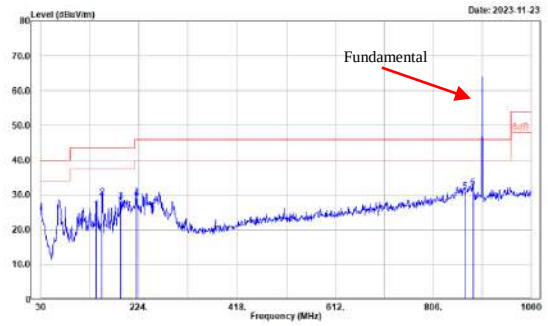
High Channel / 150kHz-30MHz



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2.538	42.14	10.59	52.73	69.54	-16.81	100	56	QP
3.045	43.43	10.46	53.89	69.54	-15.65	100	170	QP
14.717	49.15	11.51	60.66	69.54	-8.88	100	353	QP
25.970	42.56	11.71	54.27	69.54	-15.27	100	146	QP
26.388	43.08	11.72	54.80	69.54	-14.74	100	237	QP
26.806	43.29	11.72	55.01	69.54	-14.53	100	240	QP

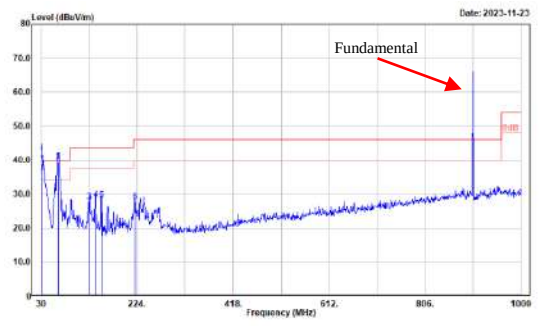
30MHz-1GHz:

Low Channel Horizontal



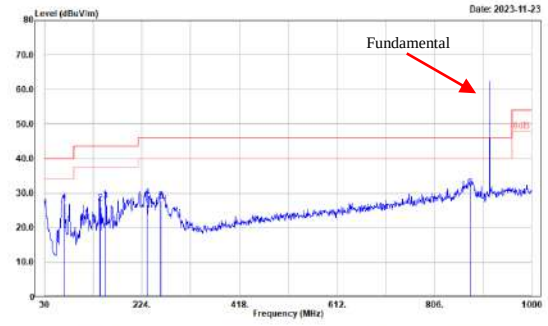
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
138.640	35.91	-10.04	25.87	43.50	-17.63	100	94	QP
151.250	39.65	-10.40	29.25	43.50	-14.25	100	97	QP
188.110	40.29	-12.06	28.23	43.50	-15.27	100	208	QP
219.150	41.29	-12.22	29.07	46.00	-16.93	100	192	QP
869.050	29.56	1.34	30.90	46.00	-15.10	100	39	QP
884.570	30.40	1.65	32.05	46.00	-13.95	100	27	QP

Low Channel Vertical



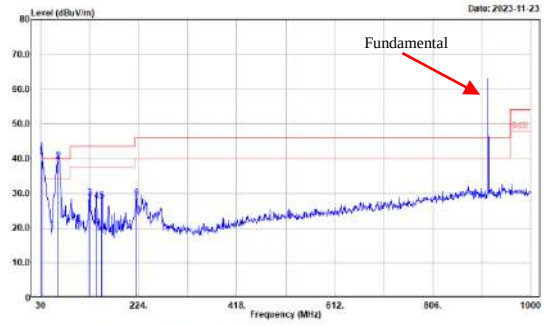
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	42.77	-3.87	38.90	40.00	-1.10	100	119	QP
63.950	55.42	-16.03	39.39	40.00	-0.61	100	37	QP
127.000	37.23	-9.57	27.66	43.50	-15.84	100	63	QP
139.610	38.55	-10.10	28.45	43.50	-15.05	100	146	QP
152.220	38.59	-10.49	28.10	43.50	-15.40	100	146	QP
219.150	40.03	-12.22	27.81	46.00	-18.19	100	163	QP

Middle Channel Horizontal



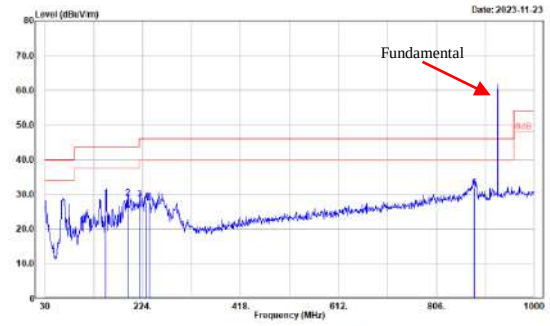
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
68.800	42.99	-15.81	27.18	40.00	-12.82	100	132	QP
139.610	37.15	-10.10	27.05	43.50	-16.45	100	97	QP
151.250	38.13	-10.40	27.73	43.50	-15.77	100	194	QP
233.700	40.40	-11.64	28.76	46.00	-17.24	100	206	QP
260.860	38.08	-10.34	27.74	46.00	-18.26	100	97	QP
875.840	30.24	1.37	31.61	46.00	-14.39	100	360	QP

Middle Channel Vertical



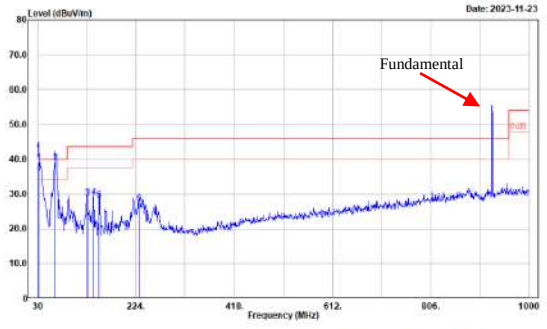
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	43.24	-3.87	39.37	40.00	-0.63	100	111	QP
64.920	55.41	-16.10	39.31	40.00	-0.69	100	35	QP
127.000	38.16	-9.57	28.59	43.50	-14.91	100	82	QP
139.610	37.95	-10.10	27.85	43.50	-15.65	100	144	QP
151.250	38.19	-10.40	27.79	43.50	-15.71	100	123	QP
219.150	40.86	-12.22	28.64	46.00	-17.36	100	155	QP

High Channel Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
151.250	39.18	-10.40	28.78	43.50	-14.72	100	98	QP
193.930	40.86	-11.26	28.80	43.50	-14.70	100	98	QP
218.180	40.96	-12.27	28.69	46.00	-17.31	100	197	QP
230.790	39.52	-11.76	27.76	46.00	-18.24	100	208	QP
236.610	39.07	-11.49	27.58	46.00	-18.42	100	236	QP
880.690	30.51	1.46	31.97	46.00	-14.03	100	360	QP

High Channel Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	42.92	-3.87	39.05	40.00	-0.95	100	33	QP
63.950	55.15	-16.03	39.12	40.00	-0.88	100	67	QP
127.970	38.51	-9.57	28.94	43.50	-14.56	100	91	QP
140.580	39.21	-10.20	29.01	43.50	-14.49	100	137	QP
151.250	38.68	-10.40	28.28	43.50	-15.22	100	144	QP
229.820	39.13	-11.79	27.34	46.00	-18.66	100	279	QP

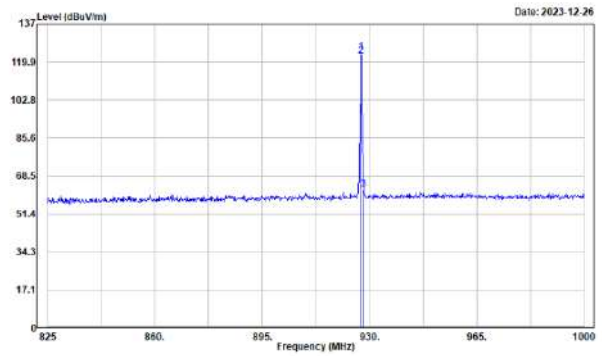
Level = Reading + Factor.
Margin = Level – Limit.
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

(Worst case is DSB-ASK mode High channel)

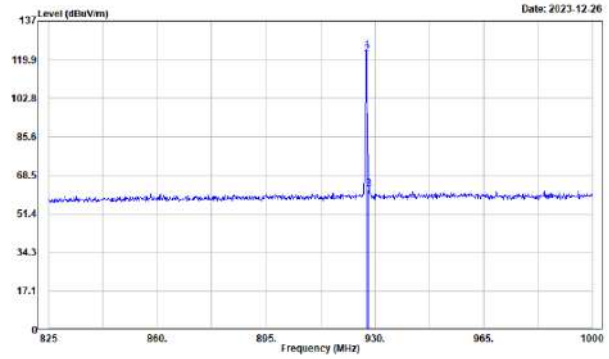
Band-Edge

Antenna Port 1

Horizontal	Vertical



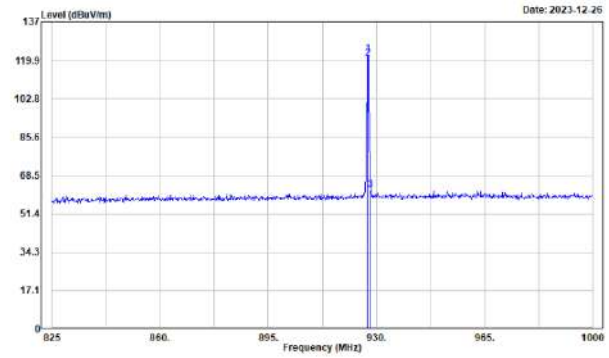
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	121.95	2.35	124.30			100	13	Peak
927.250	120.15	2.35	122.50			100	13	QP
928.000	59.88	2.38	62.26	102.50	-40.24	100	13	QP



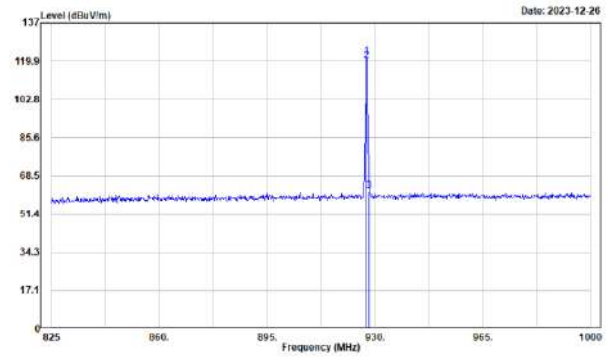
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.500	121.56	2.37	123.93			100	5	Peak
927.500	119.60	2.37	121.97			100	5	QP
928.000	59.86	2.38	62.24	101.97	-39.73	100	5	QP

Antenna Port 2

Horizontal	Vertical

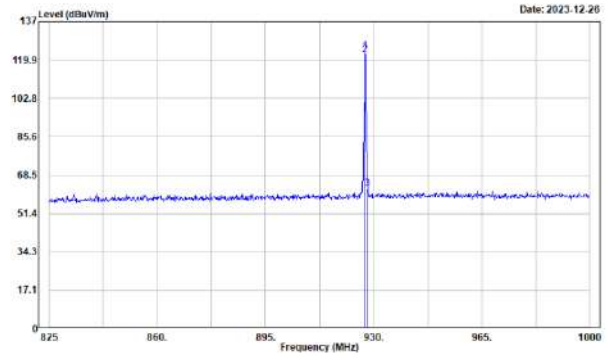
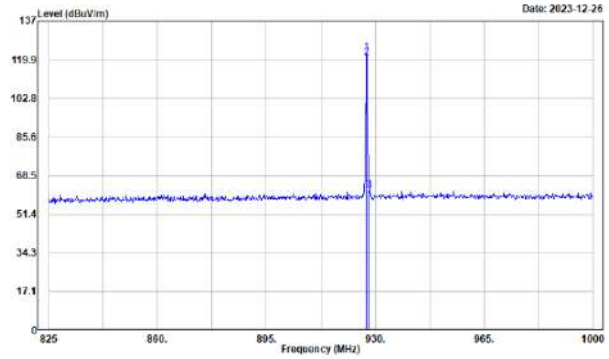


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.08	2.35	122.43			100	12	Peak
927.250	118.32	2.35	120.67			100	12	QP
928.000	59.71	2.38	62.09	100.67	-38.58	100	12	QP



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.52	2.35	121.87			100	8	Peak
927.250	117.40	2.35	119.75			100	8	QP
928.000	59.17	2.38	61.55	99.75	-38.20	100	8	QP

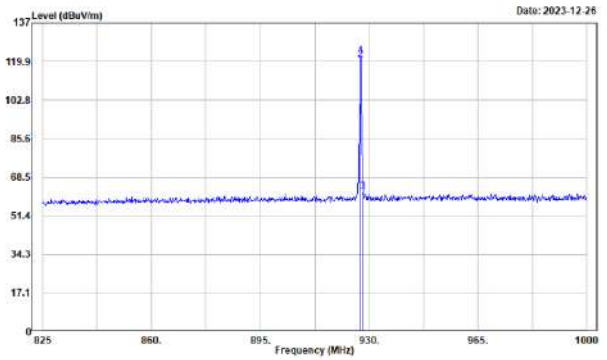
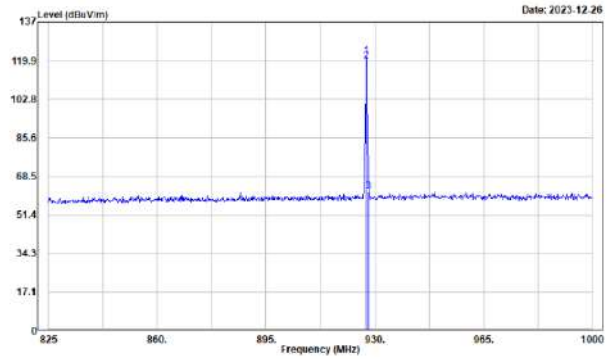
Antenna Port 3

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	121.13	2.35	123.48			100	7	Peak
927.250	119.75	2.35	122.10			100	7	QP
928.000	59.88	2.38	62.26	102.10	-39.84	100	7	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.53	2.35	122.88			100	11	Peak
927.250	118.34	2.35	120.69			100	11	QP
928.000	59.63	2.38	62.01	100.69	-38.68	100	11	QP

Antenna Port 4

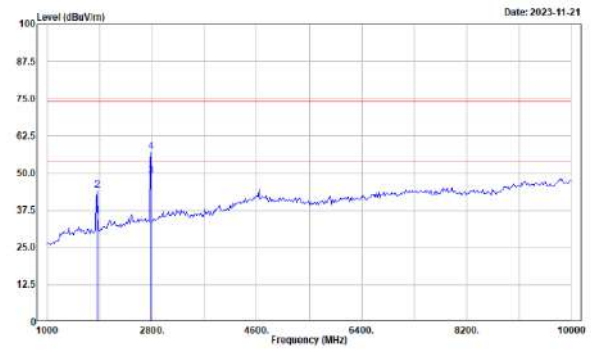
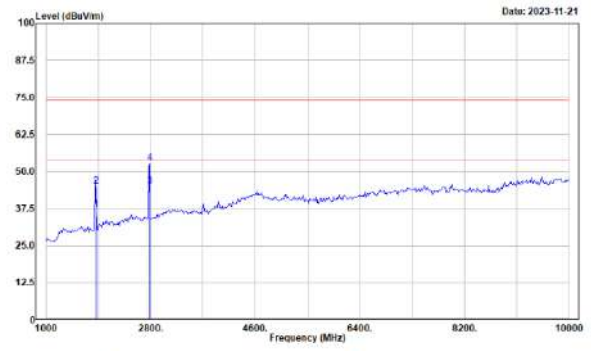
Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.92	2.35	122.27			100	0	Peak
927.250	118.25	2.35	120.60			100	0	QP
928.000	59.69	2.38	62.07	100.60	-38.53	100	0	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.49	2.35	121.84			100	25	Peak
927.250	117.35	2.35	119.70			100	25	QP
928.000	59.41	2.38	61.79	99.70	-37.91	100	25	QP

1GHz-10GHz:

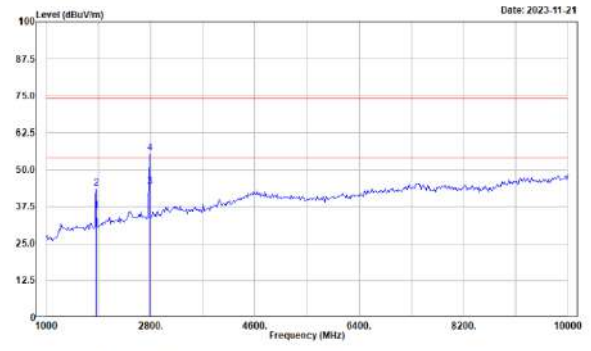
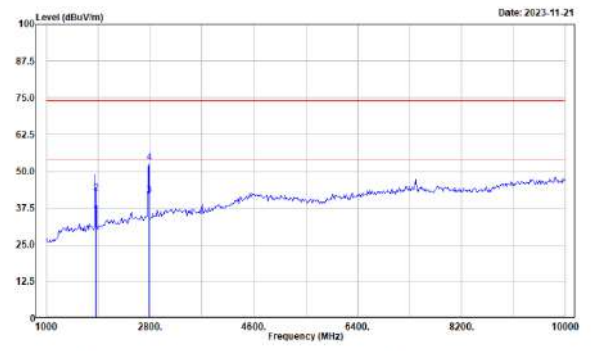
Antenna Port 1

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	49.11	-13.62	35.49	54.00	-18.51	166	275	Average
1854.500	57.87	-13.62	44.25	74.00	-29.75	166	275	Peak
2781.750	59.11	-10.07	49.04	54.00	-4.96	107	317	Average
2781.750	67.32	-10.07	57.25	74.00	-16.75	107	317	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	50.86	-13.62	37.24	54.00	-16.76	187	51	Average
1854.500	58.51	-13.62	44.89	74.00	-29.11	187	51	Peak
2781.750	55.16	-10.07	45.09	54.00	-8.91	148	337	Average
2781.750	62.91	-10.07	52.84	74.00	-21.16	148	337	Peak

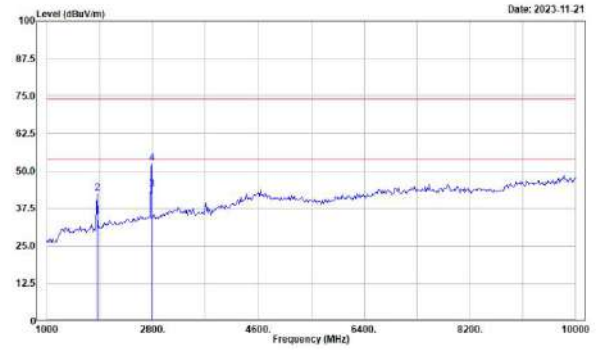
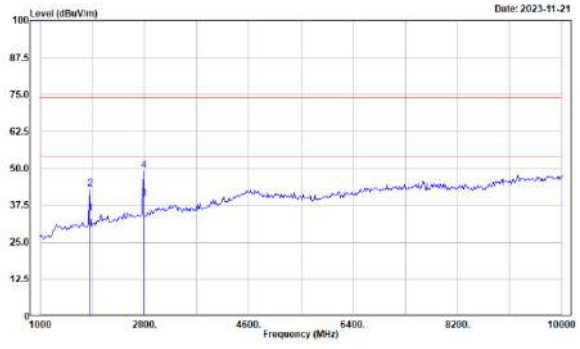
Antenna Port 2

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	49.67	-13.62	36.05	54.00	-17.95	159	351	Average
1854.500	57.12	-13.62	43.50	74.00	-30.50	159	351	Peak
2781.750	54.21	-10.07	44.14	54.00	-9.86	120	340	Average
2781.750	65.65	-10.07	55.58	74.00	-18.42	120	340	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.77	-13.62	35.15	54.00	-18.85	194	321	Average
1854.500	56.30	-13.62	42.68	74.00	-31.32	194	321	Peak
2781.750	51.68	-10.07	41.61	54.00	-12.39	150	328	Average
2781.750	62.97	-10.07	52.90	74.00	-21.10	150	328	Peak

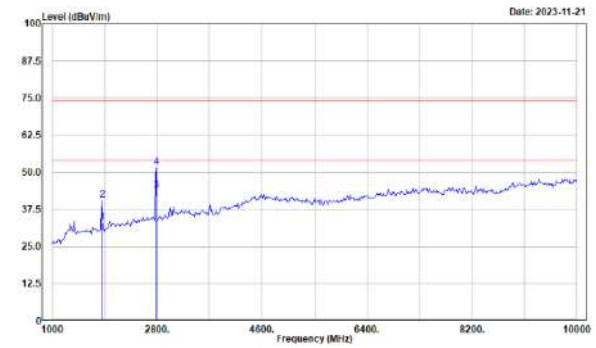
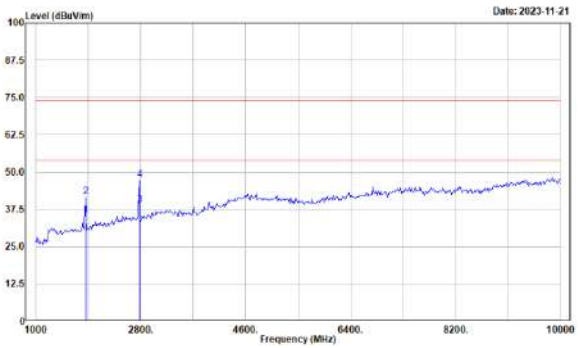
Antenna Port 3

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.58	-13.62	34.96	54.00	-19.04	175	231	Average
1854.500	56.30	-13.62	42.68	74.00	-31.32	175	231	Peak
2781.750	54.05	-10.07	43.98	54.00	-10.02	141	243	Average
2781.750	62.77	-10.07	52.70	74.00	-21.30	141	243	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.39	-13.62	34.77	54.00	-19.23	239	83	Average
1854.500	56.69	-13.62	43.07	74.00	-30.93	239	83	Peak
2781.750	49.88	-10.07	39.81	54.00	-14.19	113	192	Average
2781.750	59.40	-10.07	49.33	74.00	-24.67	113	192	Peak

Antenna Port 4

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	46.72	-13.62	33.10	54.00	-20.90	105	236	Average
1854.500	54.33	-13.62	40.71	74.00	-33.29	105	236	Peak
2781.750	54.07	-10.07	44.00	54.00	-10.00	107	248	Average
2781.750	61.84	-10.07	51.77	74.00	-22.23	107	248	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	49.20	-13.62	35.58	54.00	-18.42	168	79	Average
1854.500	55.25	-13.62	41.63	74.00	-32.37	168	79	Peak
2781.750	49.10	-10.07	39.03	54.00	-14.97	191	125	Average
2781.750	57.40	-10.07	47.33	74.00	-26.67	191	125	Peak

Above 1GHz

DSB-ASK Mode: Antenna Port 1

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.39	1.90	61.29	101.80	-40.51	100	316	QP
902.750	121.66	1.90	123.56			100	316	Peak
902.750	119.90	1.90	121.80			100	316	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	45.65	-14.00	31.65	54.00	-22.35	145	335	Average
1805.500	56.12	-14.00	42.12	74.00	-31.88	145	335	Peak
2708.250	55.30	-9.79	45.51	54.00	-8.49	102	161	Average
2708.250	65.01	-9.79	55.22	74.00	-18.78	102	161	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.86	1.90	61.76	102.40	-40.64	100	314	QP
902.750	122.12	1.90	124.02			100	314	Peak
902.750	120.50	1.90	122.40			100	314	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	48.32	-14.00	34.32	54.00	-19.68	103	130	Average
1805.500	59.16	-14.00	45.16	74.00	-28.84	103	130	Peak
2708.250	52.00	-9.79	42.21	54.00	-11.79	119	67	Average
2708.250	63.06	-9.79	53.27	74.00	-20.73	119	67	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	121.44	1.99	123.43			100	317	Peak
915.250	119.78	1.99	121.77			100	317	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	47.84	-13.80	34.04	54.00	-19.96	105	355	Average
1830.500	58.13	-13.80	44.33	74.00	-29.67	105	355	Peak
2745.750	54.55	-9.96	44.59	54.00	-9.41	140	223	Average
2745.750	63.74	-9.96	53.78	74.00	-20.22	140	223	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.55	1.98	122.53			100	317	Peak
915.250	118.93	1.98	120.91			100	317	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	48.10	-13.80	34.30	54.00	-19.70	121	308	Average
1830.500	59.32	-13.80	45.52	74.00	-28.48	121	308	Peak
2745.750	50.36	-9.96	40.40	54.00	-13.60	118	104	Average
2745.750	59.68	-9.96	49.72	74.00	-24.28	118	104	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	121.95	2.35	124.30			100	13	Peak
927.250	120.15	2.35	122.50			100	13	QP
928.000	59.88	2.38	62.26	102.50	-40.24	100	13	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	49.11	-13.62	35.49	54.00	-18.51	166	275	Average
1854.500	57.87	-13.62	44.25	74.00	-29.75	166	275	Peak
2781.750	59.11	-10.07	49.04	54.00	-4.96	107	317	Average
2781.750	67.32	-10.07	57.25	74.00	-16.75	107	317	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	121.56	2.37	123.93			100	5	Peak
927.250	119.60	2.37	121.97			100	5	QP
928.000	59.86	2.38	62.24	101.97	-39.73	100	5	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	50.86	-13.62	37.24	54.00	-16.76	187	51	Average
1854.500	58.51	-13.62	44.89	74.00	-29.11	187	51	Peak
2781.750	55.16	-10.07	45.09	54.00	-8.91	148	337	Average
2781.750	62.91	-10.07	52.84	74.00	-21.16	148	337	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

DSB-ASK Mode: Antenna Port 2

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.48	1.90	61.38	101.74	-40.36	100	314	QP
902.750	121.13	1.90	123.03			100	314	Peak
902.750	119.84	1.90	121.74			100	314	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	49.08	-14.00	35.08	54.00	-18.92	115	256	Average
1805.500	60.62	-14.00	46.62	74.00	-27.38	115	256	Peak
2708.250	51.69	-9.79	41.90	54.00	-12.10	107	215	Average
2708.250	64.20	-9.79	54.41	74.00	-19.59	107	215	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.64	1.90	61.54	101.85	-40.31	100	308	QP
902.750	121.40	1.90	123.30			100	308	Peak
902.750	119.95	1.90	121.85			100	308	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	48.22	-14.00	34.22	54.00	-19.78	105	305	Average
1805.500	59.12	-14.00	45.12	74.00	-28.88	105	305	Peak
2708.250	49.23	-9.79	39.44	54.00	-14.56	121	144	Average
2708.250	61.02	-9.79	51.23	74.00	-22.77	121	144	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.47	1.98	122.45			100	309	Peak
915.250	108.67	1.98	110.65			100	309	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	48.73	-13.80	34.93	54.00	-19.07	155	328	Average
1830.500	57.43	-13.80	43.63	74.00	-30.37	155	328	Peak
2745.750	52.46	-9.96	42.50	54.00	-11.50	190	21	Average
2745.750	65.08	-9.96	55.12	74.00	-18.88	190	21	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.56	1.98	122.54			100	305	Peak
915.250	118.78	1.98	120.76			100	305	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	47.97	-13.80	34.17	54.00	-19.83	116	119	Average
1830.500	58.15	-13.80	44.35	74.00	-29.65	116	119	Peak
2745.750	51.02	-9.96	41.06	54.00	-12.94	174	304	Average
2745.750	61.96	-9.96	52.00	74.00	-22.00	174	304	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.08	2.35	122.43			100	12	Peak
927.250	118.32	2.35	120.67			100	12	QP
928.000	59.71	2.38	62.09	100.67	-38.58	100	12	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	49.67	-13.62	36.05	54.00	-17.95	159	351	Average
1854.500	57.12	-13.62	43.50	74.00	-30.50	159	351	Peak
2781.750	54.21	-10.07	44.14	54.00	-9.86	120	340	Average
2781.750	65.65	-10.07	55.58	74.00	-18.42	120	340	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.52	2.35	121.87			100	8	Peak
927.250	117.40	2.35	119.75			100	8	QP
928.000	59.17	2.38	61.55	99.75	-38.20	100	8	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.77	-13.62	35.15	54.00	-18.85	194	321	Average
1854.500	56.30	-13.62	42.68	74.00	-31.32	194	321	Peak
2781.750	51.68	-10.07	41.61	54.00	-12.39	150	328	Average
2781.750	62.97	-10.07	52.90	74.00	-21.10	150	328	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

DSB-ASK Mode: Antenna Port 3

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.70	1.90	61.60	100.52	-38.92	100	310	QP
902.750	122.37	1.90	124.27			100	310	Peak
902.750	120.62	1.90	122.52			100	310	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	48.56	-14.00	34.56	54.00	-19.44	132	113	Average
1805.500	59.25	-14.00	45.25	74.00	-28.75	132	113	Peak
2708.250	50.31	-9.79	40.52	54.00	-13.48	130	237	Average
2708.250	62.03	-9.79	52.24	74.00	-21.76	130	237	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.82	1.90	61.72	101.57	-39.85	100	357	QP
902.750	121.28	1.90	123.18			100	357	Peak
902.750	119.67	1.90	121.57			100	357	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	48.95	-14.00	34.95	54.00	-19.05	194	148	Average
1805.500	59.28	-14.00	45.28	74.00	-28.72	194	148	Peak
2708.250	48.35	-9.79	38.56	54.00	-15.44	216	97	Average
2708.250	58.99	-9.79	49.20	74.00	-24.80	216	97	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	121.46	1.98	123.44			100	351	Peak
915.250	119.80	1.98	121.78			100	351	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	46.71	-13.80	32.91	54.00	-21.09	220	92	Average
1830.500	57.41	-13.80	43.61	74.00	-30.39	220	92	Peak
2745.750	53.19	-9.96	43.23	54.00	-10.77	255	92	Average
2745.750	64.82	-9.96	54.86	74.00	-19.14	255	92	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	118.66	1.98	120.64			100	338	Peak
915.250	116.94	1.98	118.92			100	338	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	48.59	-13.80	34.79	54.00	-19.21	202	107	Average
1830.500	57.95	-13.80	44.15	74.00	-29.85	202	107	Peak
2745.750	47.76	-9.96	37.80	54.00	-16.20	107	116	Average
2745.750	58.60	-9.96	48.64	74.00	-25.36	107	116	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	121.13	2.35	123.48			100	7	Peak
927.250	119.75	2.35	122.10			100	7	QP
928.000	59.88	2.38	62.26	102.10	-39.84	100	7	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.58	-13.62	34.96	54.00	-19.04	175	231	Average
1854.500	56.30	-13.62	42.68	74.00	-31.32	175	231	Peak
2781.750	54.05	-10.07	43.98	54.00	-10.02	141	243	Average
2781.750	62.77	-10.07	52.70	74.00	-21.30	141	243	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.53	2.35	122.88			100	11	Peak
927.250	118.34	2.35	120.69			100	11	QP
928.000	59.63	2.38	62.01	100.69	-38.68	100	11	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.39	-13.62	34.77	54.00	-19.23	239	83	Average
1854.500	56.69	-13.62	43.07	74.00	-30.93	239	83	Peak
2781.750	49.88	-10.07	39.81	54.00	-14.19	113	192	Average
2781.750	59.40	-10.07	49.33	74.00	-24.67	113	192	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

DSB-ASK Mode: Antenna Port 4

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.62	1.90	61.52	100.90	-39.38	100	313	QP
902.750	120.66	1.90	122.56			100	313	Peak
902.750	119.00	1.90	120.90			100	313	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	47.95	-14.00	33.95	54.00	-20.05	131	102	Average
1805.500	58.95	-14.00	44.95	74.00	-29.05	131	102	Peak
2708.250	50.40	-9.79	40.61	54.00	-13.39	194	231	Average
2708.250	61.75	-9.79	51.96	74.00	-22.04	194	231	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.43	1.90	61.33	99.83	-38.50	100	308	QP
902.750	119.47	1.90	121.37			100	308	Peak
902.750	117.93	1.90	119.83			100	308	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	47.46	-14.00	33.46	54.00	-20.54	123	294	Average
1805.500	58.18	-14.00	44.18	74.00	-29.82	123	294	Peak
2708.250	46.92	-9.79	37.13	54.00	-16.87	120	125	Average
2708.250	57.36	-9.79	47.57	74.00	-26.43	120	125	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.45	1.98	122.43			100	360	Peak
915.250	108.90	1.98	110.88			100	360	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	47.70	-13.80	33.90	54.00	-20.10	184	257	Average
1830.500	56.85	-13.80	43.05	74.00	-30.95	184	257	Peak
2745.750	50.98	-9.96	41.02	54.00	-12.98	118	269	Average
2745.750	60.78	-9.96	50.82	74.00	-23.18	118	269	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.48	1.98	122.46			100	311	Peak
915.250	118.52	1.98	120.50			100	311	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	47.99	-13.80	34.19	54.00	-19.81	203	93	Average
1830.500	57.86	-13.80	44.06	74.00	-29.94	203	93	Peak
2745.750	47.54	-9.96	37.58	54.00	-16.42	119	335	Average
2745.750	57.07	-9.96	47.11	74.00	-26.89	119	335	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.92	2.35	122.27			100	0	Peak
927.250	118.25	2.35	120.60			100	0	QP
928.000	59.69	2.38	62.07	100.60	-38.53	100	0	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	46.72	-13.62	33.10	54.00	-20.90	105	236	Average
1854.500	54.33	-13.62	40.71	74.00	-33.29	105	236	Peak
2781.750	54.07	-10.07	44.00	54.00	-10.00	107	248	Average
2781.750	61.84	-10.07	51.77	74.00	-22.23	107	248	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.49	2.35	121.84			100	25	Peak
927.250	117.35	2.35	119.70			100	25	QP
928.000	59.41	2.38	61.79	99.70	-37.91	100	25	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	49.20	-13.62	35.58	54.00	-18.42	168	79	Average
1854.500	55.25	-13.62	41.63	74.00	-32.37	168	79	Peak
2781.750	49.10	-10.07	39.03	54.00	-14.97	191	125	Average
2781.750	57.40	-10.07	47.33	74.00	-26.67	191	125	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

PR-ASK Mode: Antenna Port 1

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.67	1.90	61.57	102.03	-40.46	100	313	QP
902.750	121.65	1.90	123.55			100	313	Peak
902.750	120.13	1.90	122.03			100	313	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	51.19	-14.00	37.19	54.00	-16.81	200	103	Average
1805.500	58.44	-14.00	44.44	74.00	-29.56	200	103	Peak
2708.250	52.70	-9.79	42.91	54.00	-11.09	107	201	Average
2708.250	60.48	-9.79	50.69	74.00	-23.31	107	201	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.24	1.90	61.14	102.52	-41.38	100	317	QP
902.750	121.94	1.90	123.84			100	317	Peak
902.750	120.62	1.90	122.52			100	317	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	51.60	-14.00	37.60	54.00	-16.40	172	54	Average
1805.500	58.79	-14.00	44.79	74.00	-29.21	172	54	Peak
2708.250	48.32	-9.79	38.53	54.00	-15.47	123	128	Average
2708.250	55.73	-9.79	45.94	74.00	-28.06	123	128	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.07	1.98	122.05			100	356	Peak
915.250	118.90	1.98	120.88			100	356	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.19	-13.80	35.39	54.00	-18.61	145	104	Average
1830.500	56.16	-13.80	42.36	74.00	-31.64	145	104	Peak
2745.750	53.69	-9.96	43.73	54.00	-10.27	107	97	Average
2745.750	60.32	-9.96	50.36	74.00	-23.64	107	97	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	121.31	1.98	123.29			100	330	Peak
915.250	120.35	1.98	122.33			100	330	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.15	-13.80	35.35	54.00	-18.65	163	103	Average
1830.500	55.93	-13.80	42.13	74.00	-31.87	163	103	Peak
2745.750	49.53	-9.96	39.57	54.00	-14.43	105	349	Average
2745.750	57.16	-9.96	47.20	74.00	-26.80	105	349	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.35	2.35	122.70			100	8	Peak
927.250	119.23	2.35	121.58			100	8	QP
928.000	59.61	2.38	61.99	101.58	-39.59	100	8	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	50.80	-13.62	37.18	54.00	-16.82	162	236	Average
1854.500	56.26	-13.62	42.64	74.00	-31.36	162	236	Peak
2781.750	55.61	-10.07	45.54	54.00	-8.46	143	275	Average
2781.750	60.42	-10.07	50.35	74.00	-23.65	143	275	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.40	2.35	121.75			100	320	Peak
927.250	118.18	2.35	120.53			100	320	QP
928.000	59.58	2.38	61.96	100.53	-38.57	100	320	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.34	-13.62	34.72	54.00	-19.28	229	165	Average
1854.500	54.76	-13.62	41.14	74.00	-32.86	229	165	Peak
2781.750	51.93	-10.07	41.86	54.00	-12.14	202	157	Average
2781.750	57.57	-10.07	47.50	74.00	-26.50	202	157	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

PR-ASK Mode: Antenna Port 2

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.43	1.90	61.33	102.37	-41.04	100	314	QP
902.750	121.56	1.90	123.46			100	314	Peak
902.750	120.47	1.90	122.37			100	314	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	52.28	-14.00	38.28	54.00	-15.72	182	102	Average
1805.500	59.02	-14.00	45.02	74.00	-28.98	182	102	Peak
2708.250	54.65	-9.79	44.86	54.00	-9.14	111	196	Average
2708.250	62.20	-9.79	52.41	74.00	-21.59	111	196	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.67	1.90	61.57	102.74	-41.17	100	312	QP
902.750	121.99	1.90	123.89			100	312	Peak
902.750	120.84	1.90	122.74			100	312	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	51.77	-14.00	37.77	54.00	-16.23	181	97	Average
1805.500	59.19	-14.00	45.19	74.00	-28.81	181	97	Peak
2708.250	53.98	-9.79	44.19	54.00	-9.81	112	241	Average
2708.250	61.96	-9.79	52.17	74.00	-21.83	112	241	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	121.41	1.99	123.40			100	344	Peak
915.250	120.17	1.99	122.16			100	344	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.48	-13.80	35.68	54.00	-18.32	182	142	Average
1830.500	56.32	-13.80	42.52	74.00	-31.48	182	142	Peak
2745.750	54.71	-9.96	44.75	54.00	-9.25	120	224	Average
2745.750	61.87	-9.96	51.91	74.00	-22.09	120	224	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	121.19	1.98	123.17			100	348	Peak
915.250	119.94	1.98	121.92			100	348	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.77	-13.80	35.97	54.00	-18.03	199	101	Average
1830.500	56.34	-13.80	42.54	74.00	-31.46	199	101	Peak
2745.750	52.20	-9.96	42.24	54.00	-11.76	103	124	Average
2745.750	59.23	-9.96	49.27	74.00	-24.73	103	124	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.09	2.35	122.44			100	7	Peak
927.250	118.86	2.35	121.21			100	7	QP
928.000	59.48	2.38	61.86	101.21	-39.35	100	7	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	50.65	-13.62	37.03	54.00	-16.97	219	78	Average
1854.500	56.49	-13.62	42.87	74.00	-31.13	219	78	Peak
2781.750	55.52	-10.07	45.45	54.00	-8.55	226	145	Average
2781.750	60.08	-10.07	50.01	74.00	-23.99	226	145	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.38	2.35	122.73			100	311	Peak
927.250	119.19	2.35	121.54			100	311	QP
928.000	59.37	2.38	61.75	101.54	-39.79	100	311	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	53.24	-13.62	39.62	54.00	-14.38	268	99	Average
1854.500	58.22	-13.62	44.60	74.00	-29.40	268	99	Peak
2781.750	54.00	-10.07	43.93	54.00	-10.07	226	144	Average
2781.750	58.60	-10.07	48.53	74.00	-25.47	226	144	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

PR-ASK Mode: Antenna Port 3

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.95	1.90	61.85	103.30	-41.45	100	317	QP
902.750	122.46	1.90	124.36			100	317	Peak
902.750	121.40	1.90	123.30			100	317	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	52.10	-14.00	38.10	54.00	-15.90	154	111	Average
1805.500	59.22	-14.00	45.22	74.00	-28.78	154	111	Peak
2708.250	54.15	-9.79	44.36	54.00	-9.64	111	255	Average
2708.250	62.21	-9.79	52.42	74.00	-21.58	111	255	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.60	1.90	61.50	102.37	-40.87	100	309	QP
902.750	121.76	1.90	123.66			100	309	Peak
902.750	120.47	1.90	122.37			100	309	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	50.33	-14.00	36.33	54.00	-17.67	179	210	Average
1805.500	57.25	-14.00	43.25	74.00	-30.75	179	210	Peak
2708.250	48.10	-9.79	38.31	54.00	-15.69	238	95	Average
2708.250	57.14	-9.79	47.35	74.00	-26.65	238	95	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	121.29	1.98	123.27			100	308	Peak
915.250	120.12	1.98	122.10			100	308	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.44	-13.80	35.64	54.00	-18.36	184	256	Average
1830.500	56.29	-13.80	42.49	74.00	-31.51	184	256	Peak
2745.750	53.83	-9.96	43.87	54.00	-10.13	213	224	Average
2745.750	61.52	-9.96	51.56	74.00	-22.44	213	224	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	122.28	1.98	124.26			100	314	Peak
915.250	120.86	1.98	122.84			100	314	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	50.52	-13.80	36.72	54.00	-17.28	201	94	Average
1830.500	57.11	-13.80	43.31	74.00	-30.69	201	94	Peak
2745.750	48.95	-9.96	38.99	54.00	-15.01	112	109	Average
2745.750	56.45	-9.96	46.49	74.00	-27.51	112	109	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.23	2.35	121.58			100	1	Peak
927.250	118.14	2.35	120.49			100	1	QP
928.000	59.36	2.38	61.74	100.49	-38.75	100	1	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	53.52	-13.62	39.90	54.00	-14.10	179	238	Average
1854.500	58.50	-13.62	44.88	74.00	-29.12	179	238	Peak
2781.750	59.01	-10.07	48.94	54.00	-5.06	122	248	Average
2781.750	63.40	-10.07	53.33	74.00	-20.67	122	248	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.38	2.35	122.73			100	360	Peak
927.250	119.37	2.35	121.72			100	360	QP
928.000	59.74	2.38	62.12	101.72	-39.60	100	360	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	52.96	-13.62	39.34	54.00	-14.66	269	88	Average
1854.500	58.18	-13.62	44.56	74.00	-29.44	269	88	Peak
2781.750	52.80	-10.07	42.73	54.00	-11.27	117	193	Average
2781.750	58.37	-10.07	48.30	74.00	-25.70	117	193	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

PR-ASK Mode: Antenna Port 4

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.62	1.90	61.52	100.12	-38.60	100	305	QP
902.750	119.48	1.90	121.38			100	305	Peak
902.750	118.22	1.90	120.12			100	305	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	52.50	-14.00	38.50	54.00	-15.50	158	101	Average
1805.500	59.46	-14.00	45.46	74.00	-28.54	158	101	Peak
2708.250	52.28	-9.79	42.49	54.00	-11.51	104	233	Average
2708.250	60.48	-9.79	50.69	74.00	-23.31	104	233	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
902.000	59.27	1.90	61.17	102.78	-41.61	100	316	QP
902.750	122.01	1.90	123.91			100	316	Peak
902.750	120.88	1.90	122.78			100	316	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1805.500	53.02	-14.00	39.02	54.00	-14.98	222	200	Average
1805.500	59.15	-14.00	45.15	74.00	-28.85	222	200	Peak
2708.250	48.49	-9.79	38.70	54.00	-15.30	119	126	Average
2708.250	56.21	-9.79	46.42	74.00	-27.58	119	126	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.26	1.98	122.24			100	308	Peak
915.250	119.02	1.98	121.00			100	308	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.97	-13.80	36.17	54.00	-17.83	182	251	Average
1830.500	56.23	-13.80	42.43	74.00	-31.57	182	251	Peak
2745.750	54.48	-9.96	44.52	54.00	-9.48	269	88	Average
2745.750	60.91	-9.96	50.95	74.00	-23.05	269	88	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
915.250	120.54	1.98	122.52			100	341	Peak
915.250	119.43	1.98	121.41			100	341	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1830.500	49.61	-13.80	35.81	54.00	-18.19	126	99	Average
1830.500	56.35	-13.80	42.55	74.00	-31.45	126	99	Peak
2745.750	50.35	-9.96	40.39	54.00	-13.61	185	155	Average
2745.750	56.82	-9.96	46.86	74.00	-27.14	185	155	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	120.31	2.35	122.66			100	15	Peak
927.250	119.18	2.35	121.53			100	15	QP
928.000	59.47	2.38	61.85	101.53	-39.68	100	15	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	50.26	-13.62	36.64	54.00	-17.36	213	238	Average
1854.500	55.37	-13.62	41.75	74.00	-32.25	213	238	Peak
2781.750	55.80	-10.07	45.73	54.00	-8.27	110	238	Average
2781.750	60.55	-10.07	50.48	74.00	-23.52	110	238	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
927.250	119.34	2.35	121.69			100	352	Peak
927.250	118.27	2.35	120.62			100	352	QP
928.000	59.19	2.38	61.57	100.62	-39.05	100	352	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
1854.500	48.04	-13.62	34.42	54.00	-19.58	131	42	Average
1854.500	54.65	-13.62	41.03	74.00	-32.97	131	42	Peak
2781.750	52.93	-10.07	42.86	54.00	-11.14	116	188	Average
2781.750	58.26	-10.07	48.19	74.00	-25.81	116	188	Peak

Level = Reading + Factor.

Margin = Level – Limit.

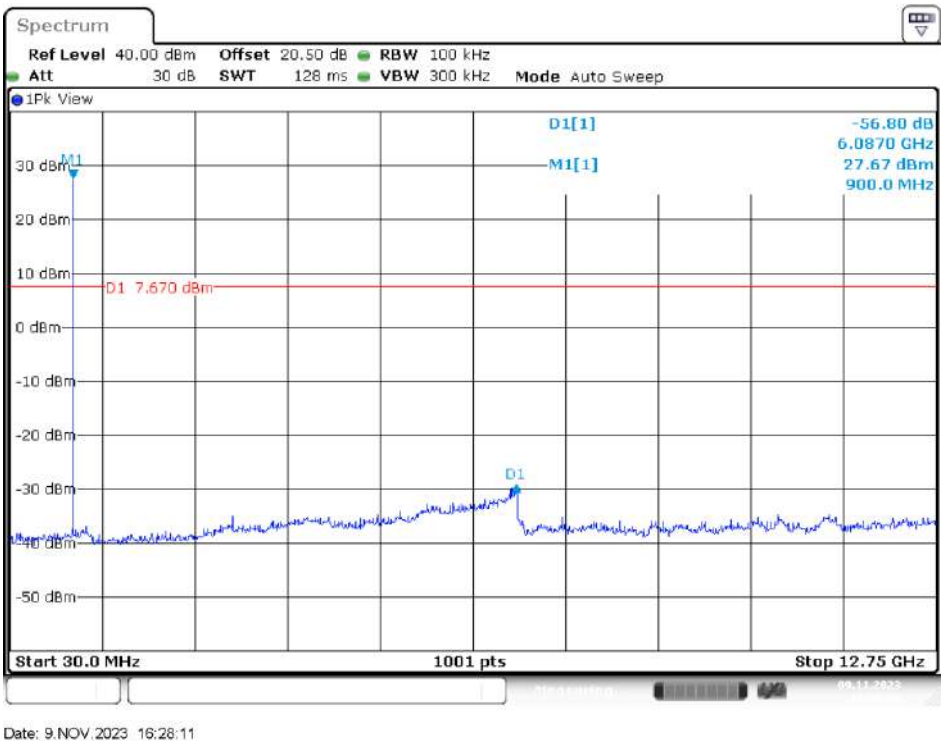
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Conducted Spurious Emissions:

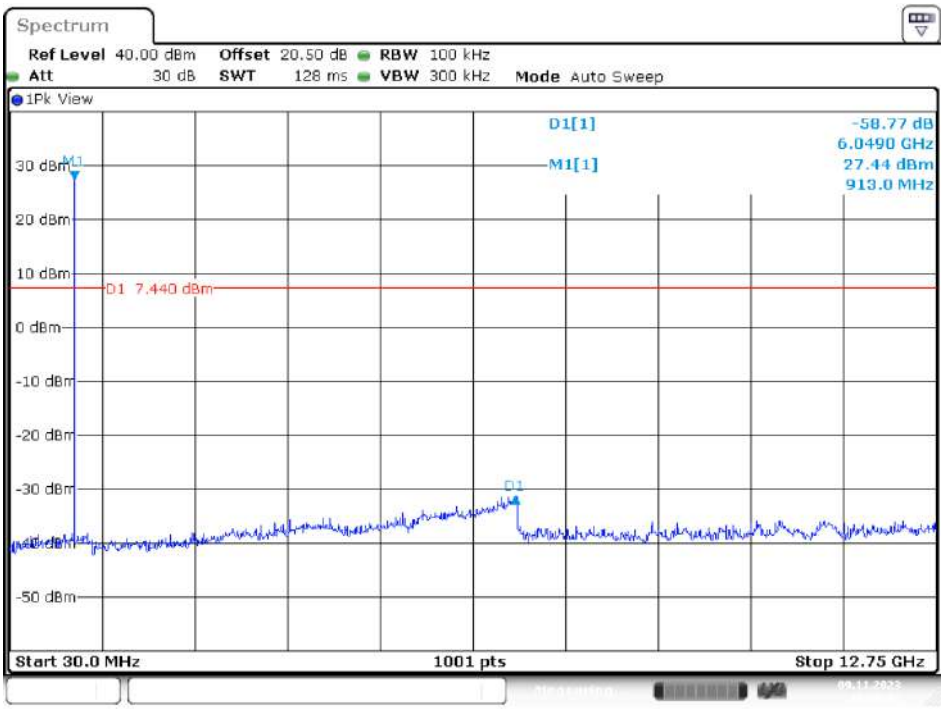
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)				Delta Peak to Band Emission (dBc)	Result
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4		
DSB-ASK							
Low	902.75	56.80	57.67	56.47	56.45	≥ 20	Pass
Mid	915.25	58.77	56.34	58.16	57.76	≥ 20	Pass
High	927.25	59.01	58.24	57.91	57.43	≥ 20	Pass
PR-ASK							
Low	902.75	58.55	57.85	57.71	58.44	≥ 20	Pass
Mid	915.25	58.32	57.29	57.50	58.32	≥ 20	Pass
High	927.25	58.07	58.95	58.68	57.95	≥ 20	Pass

DSB-ASK Mode Antenna Port 1

Low Channel

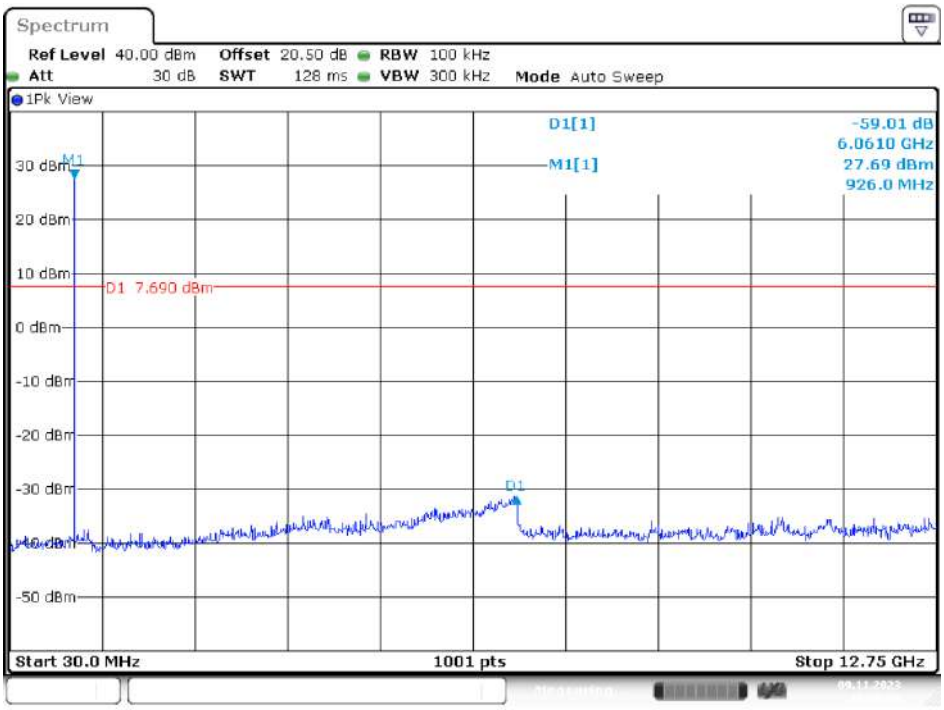


Middle Channel



Date: 9.NOV.2023 16:56:57

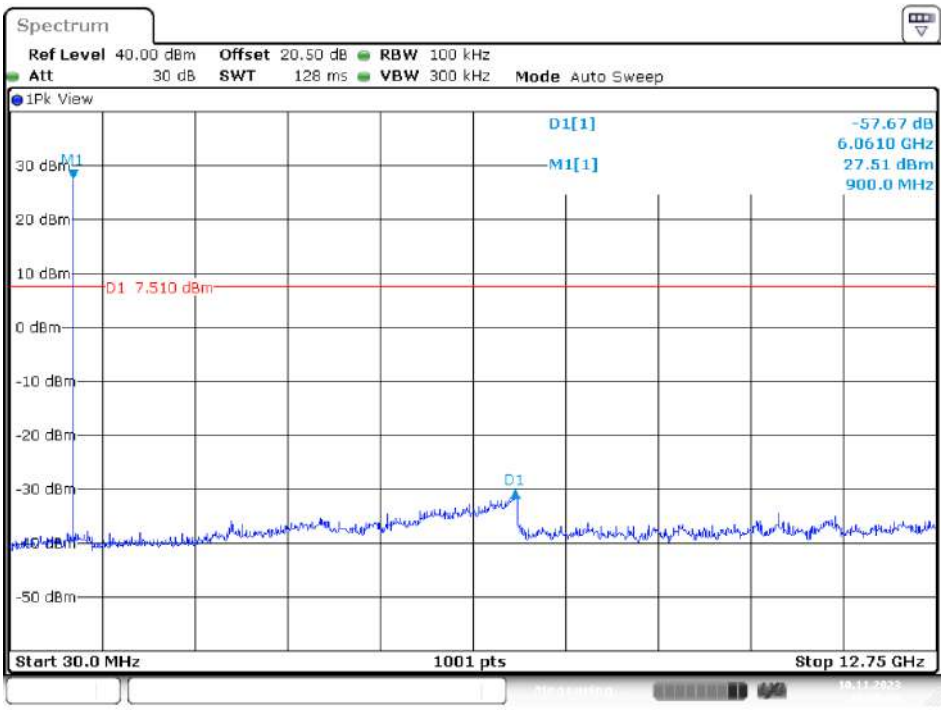
High Channel



Date: 9.NOV.2023 16:59:19

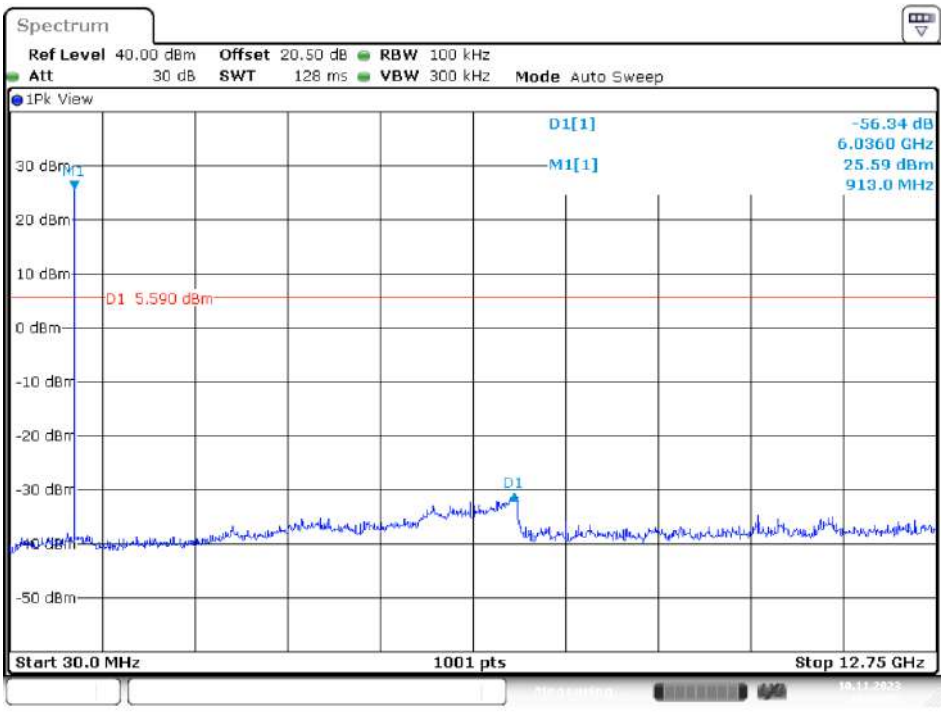
DSB-ASK Mode Antenna Port 2

Low Channel



Date: 10.NOV.2023 14:55:21

Middle Channel



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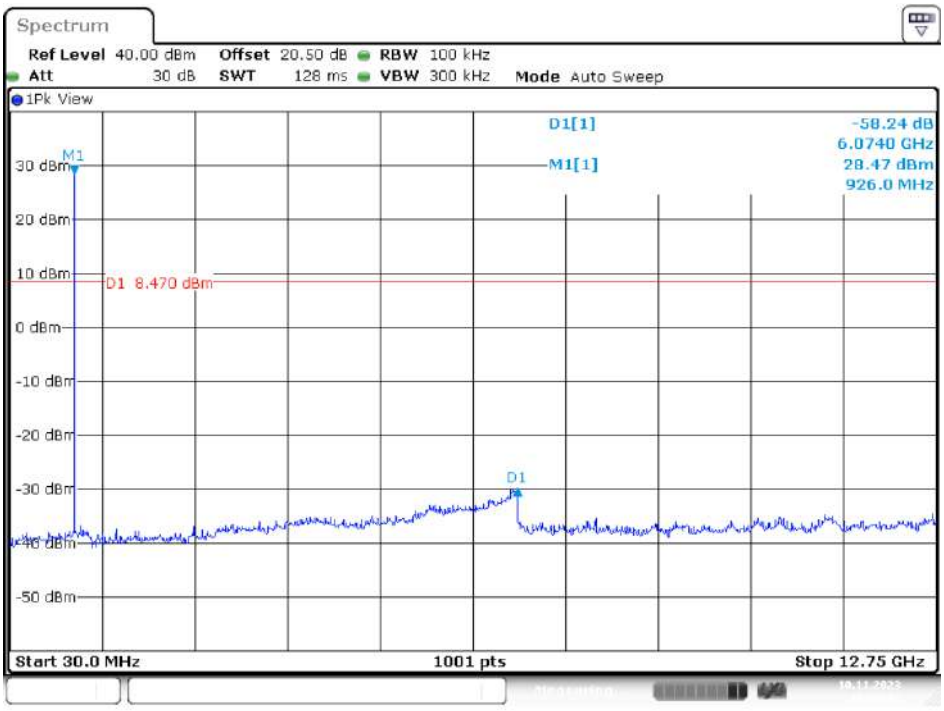
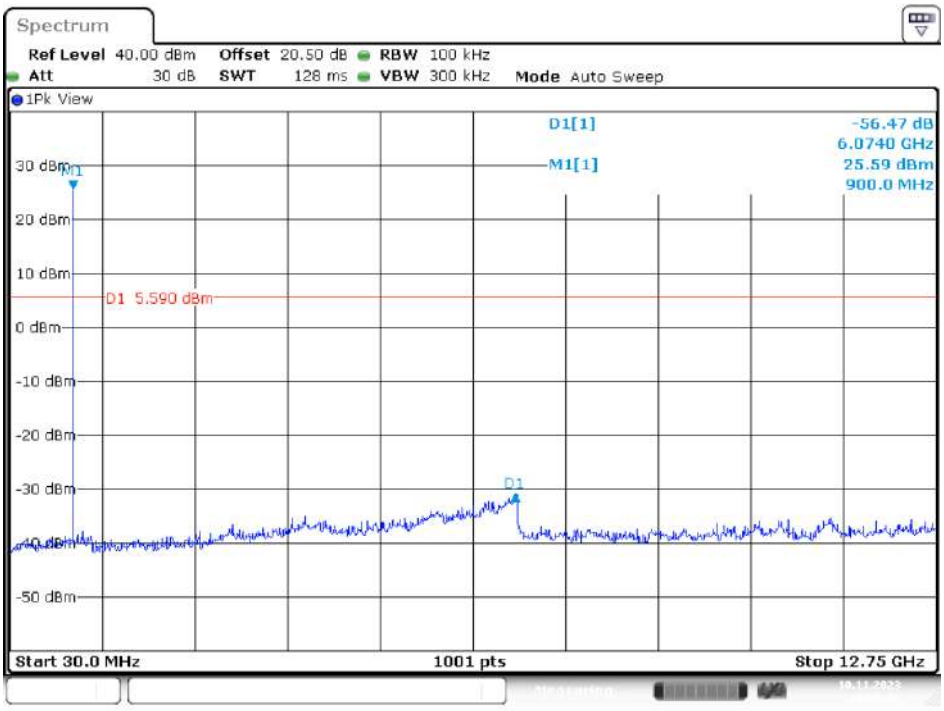
High Channel



Date: 10.NOV.2023 15:03:43

DSB-ASK Mode Antenna Port 3

Low Channel



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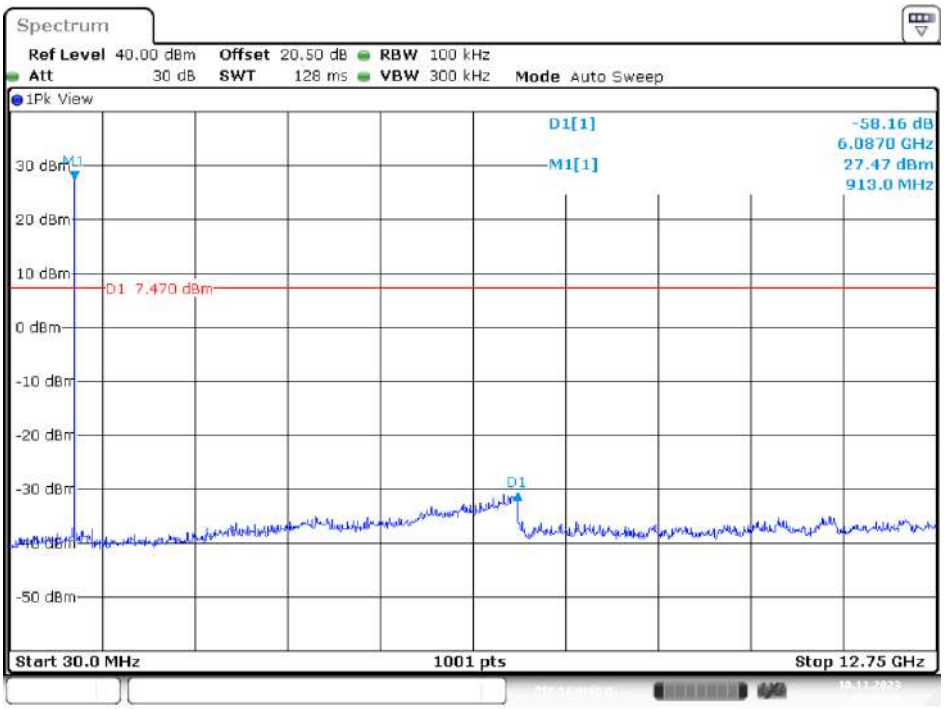
Middle Channel



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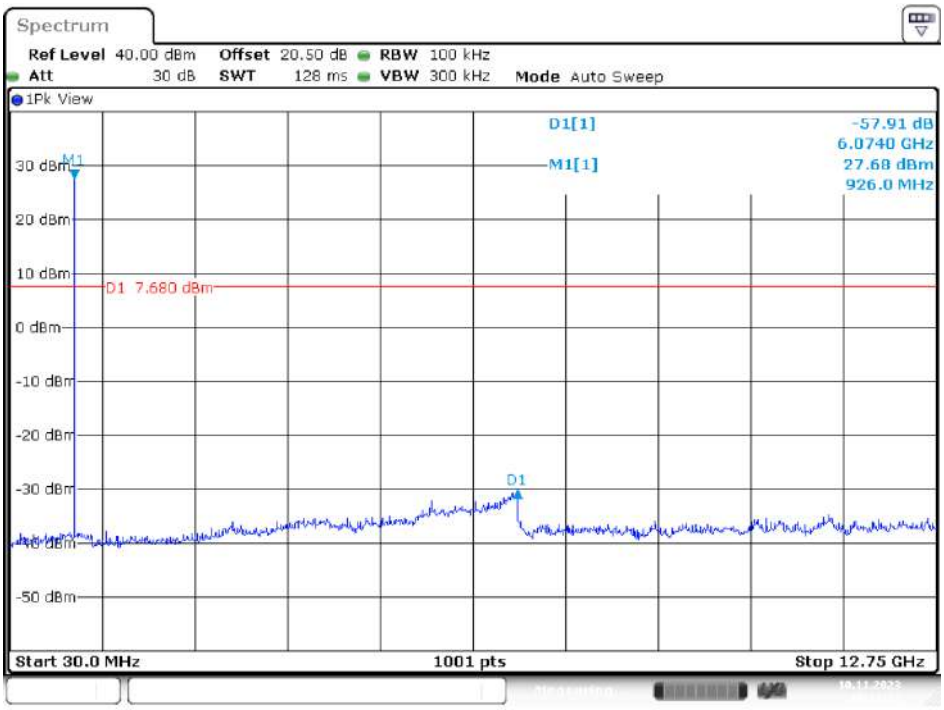
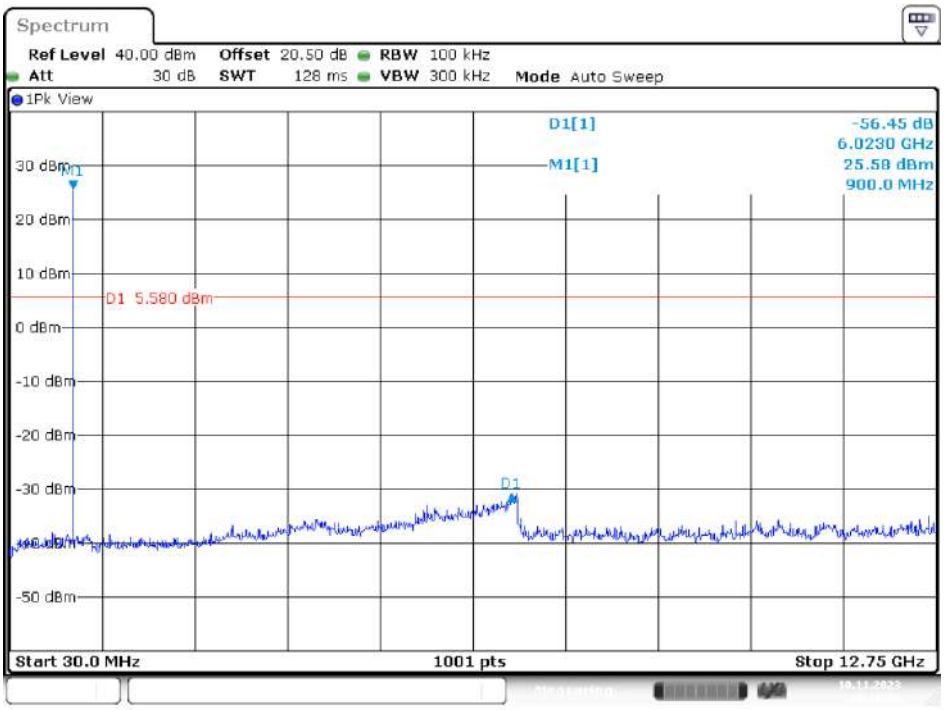
High Channel



Date: 10.NOV.2023 15:11:28

DSB-ASK Mode Antenna Port 4

Low Channel



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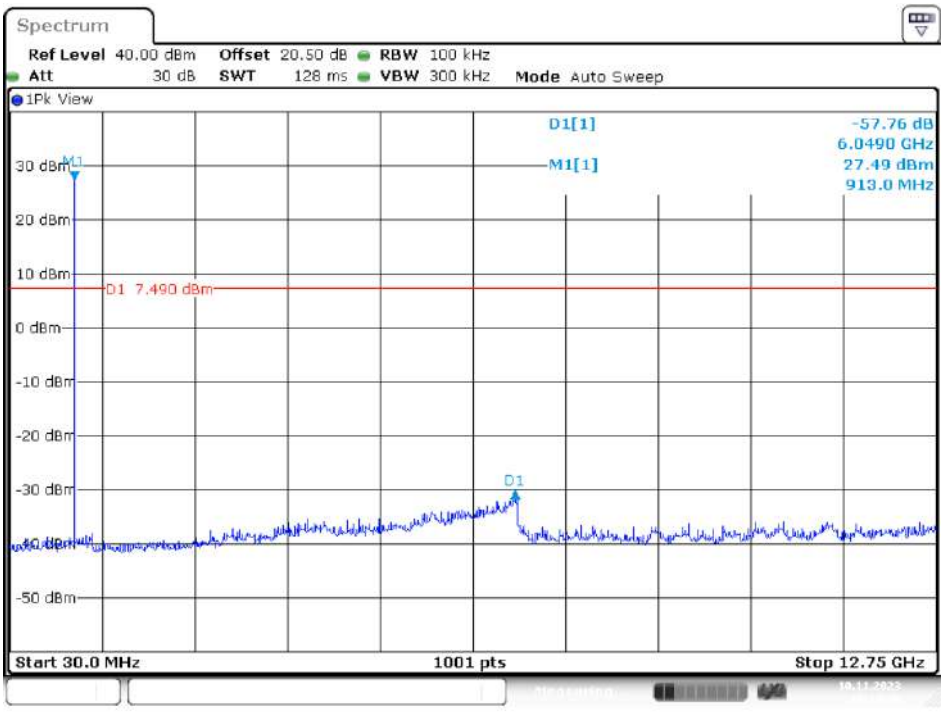
Middle Channel



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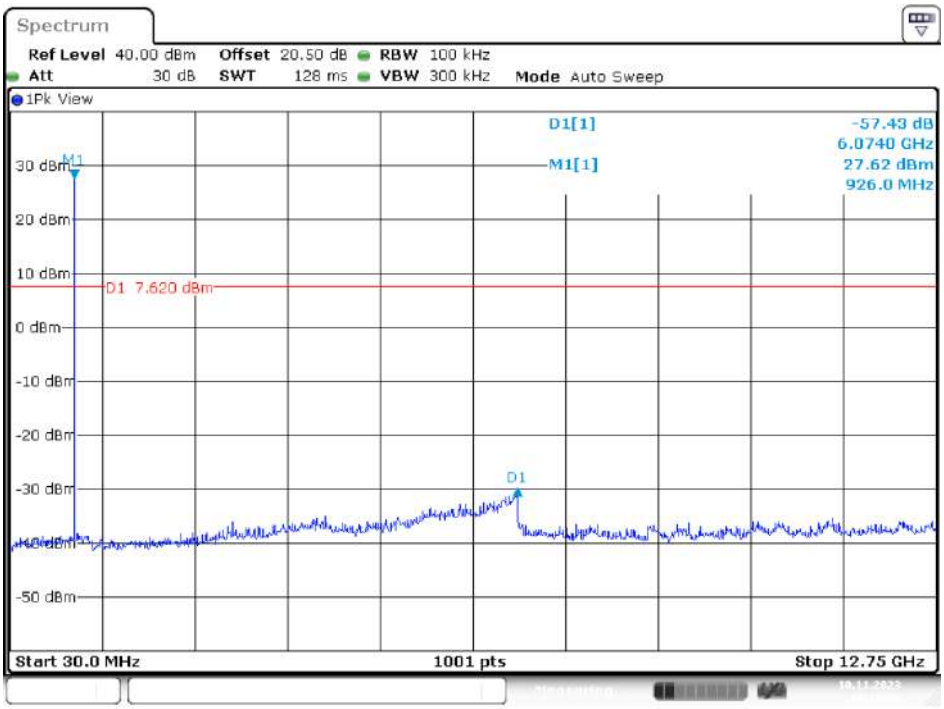
High Channel



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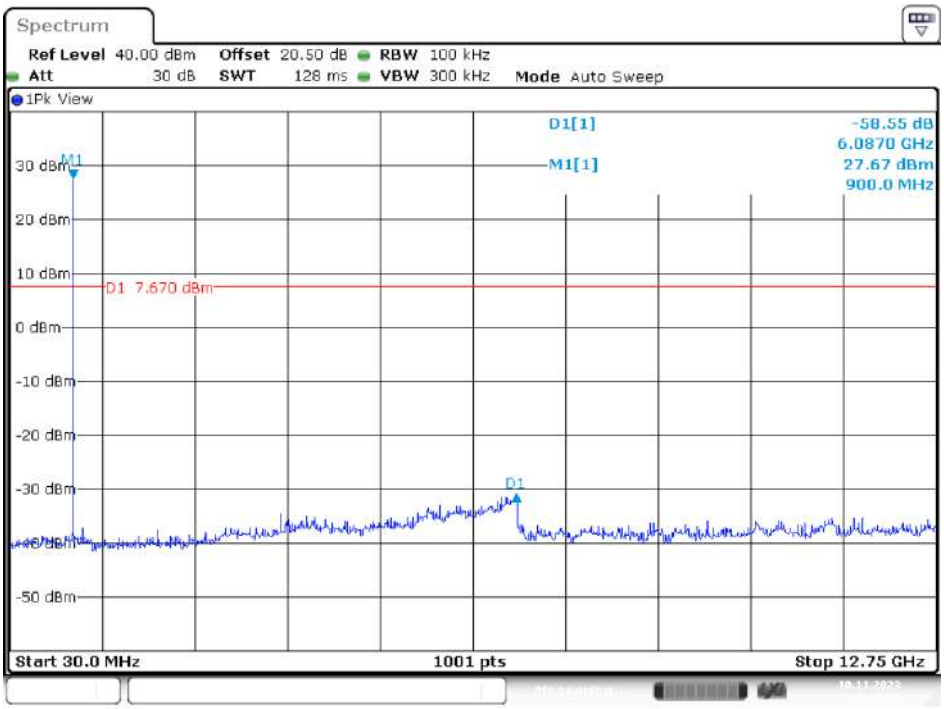
PR-ASK Mode Antenna Port 1

Low Channel



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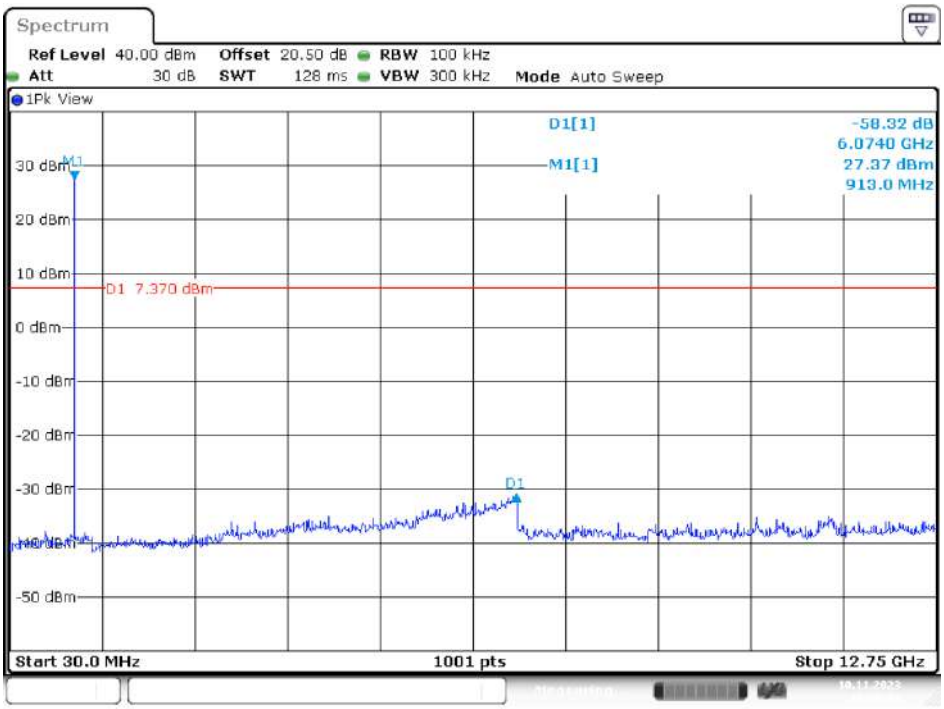
Middle Channel



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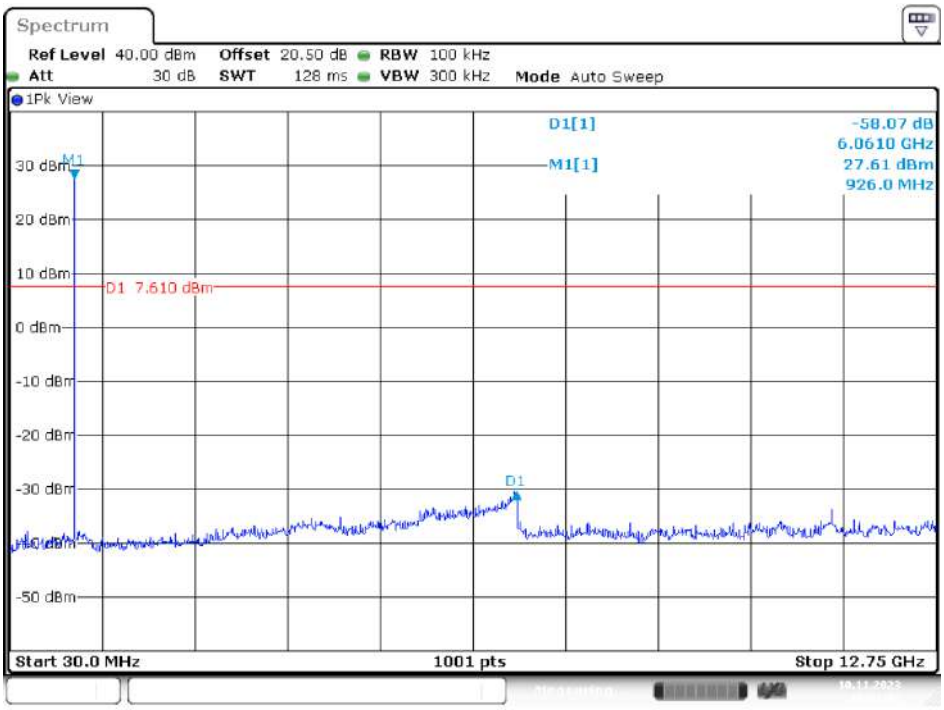
High Channel



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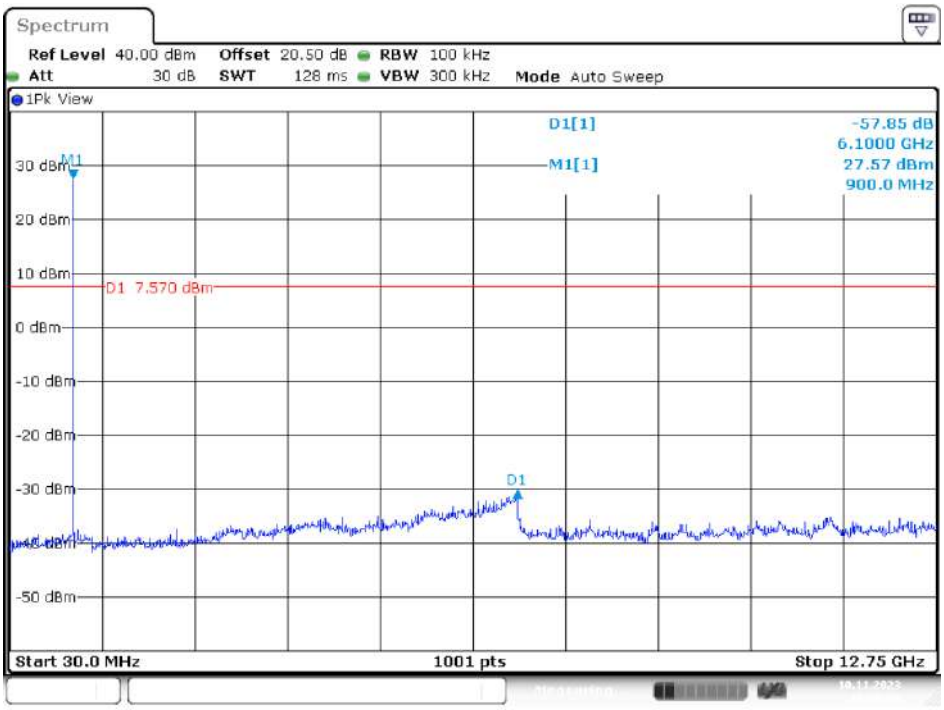
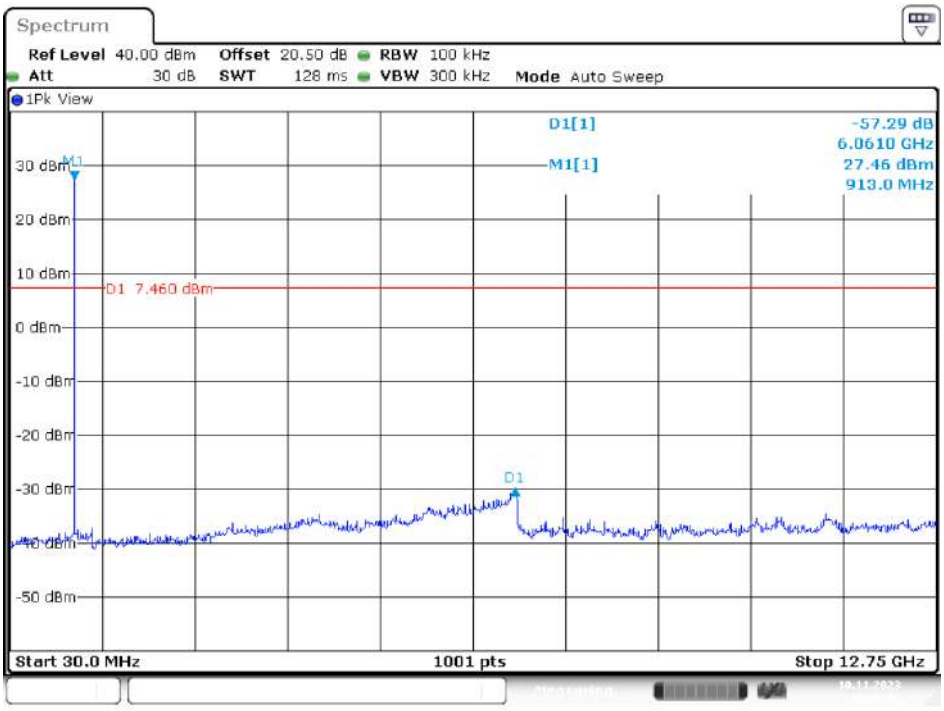
PR-ASK Mode Antenna Port 2

Low Channel



Date: 10.NOV.2023 15:28:21

Middle Channel



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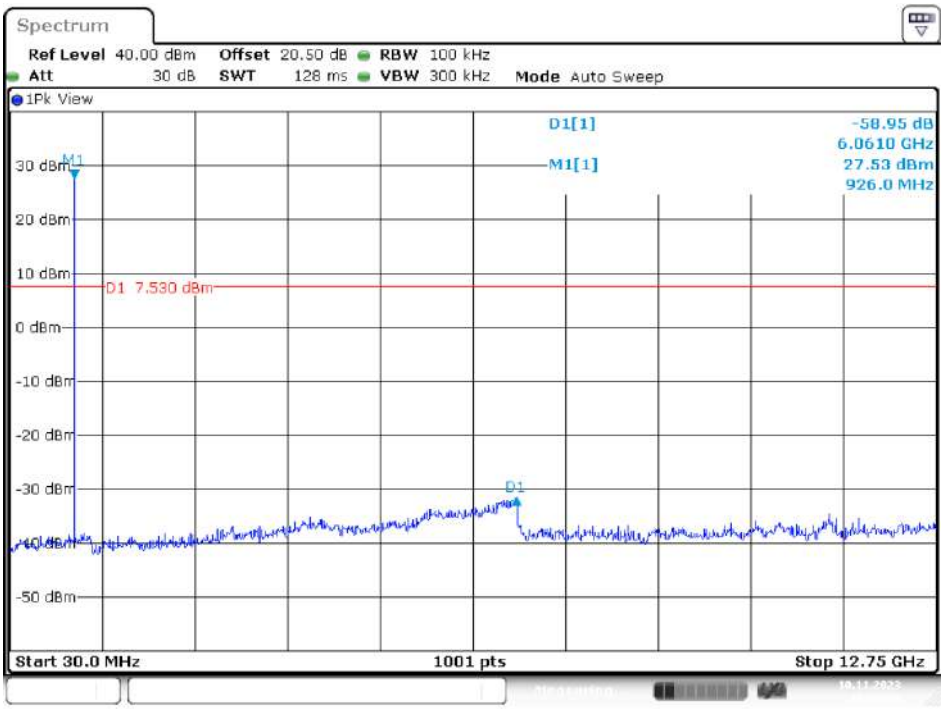
High Channel



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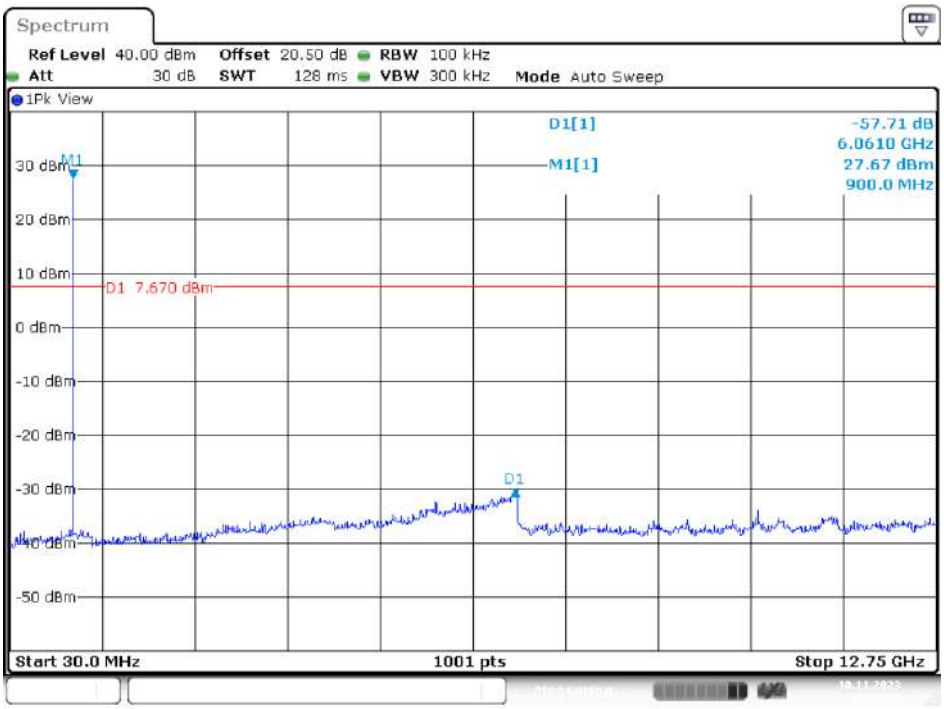
PR-ASK Mode Antenna Port 3

Low Channel



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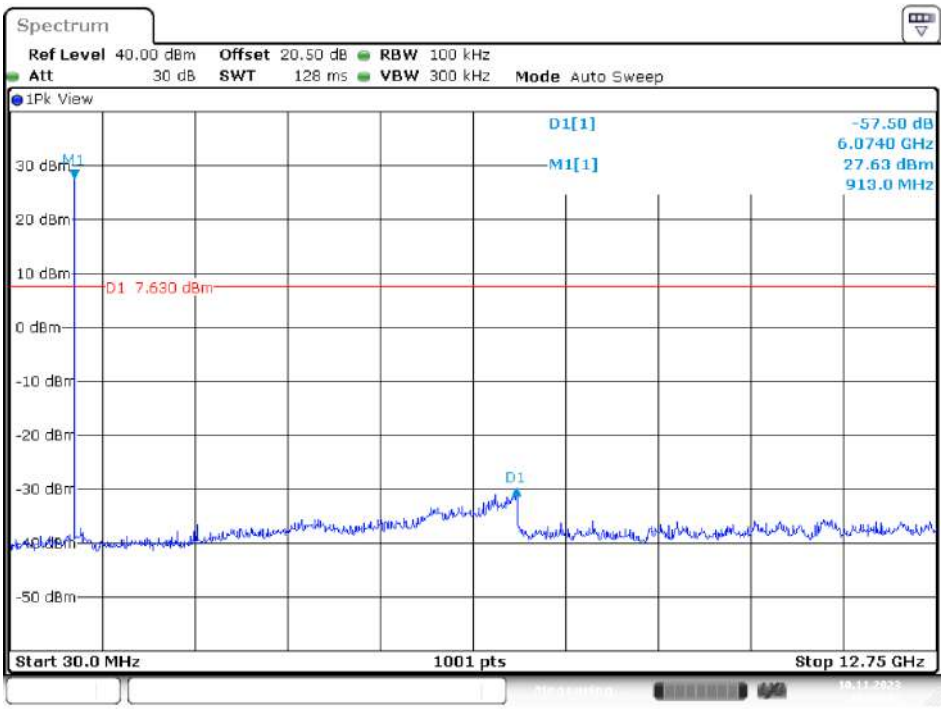
Middle Channel



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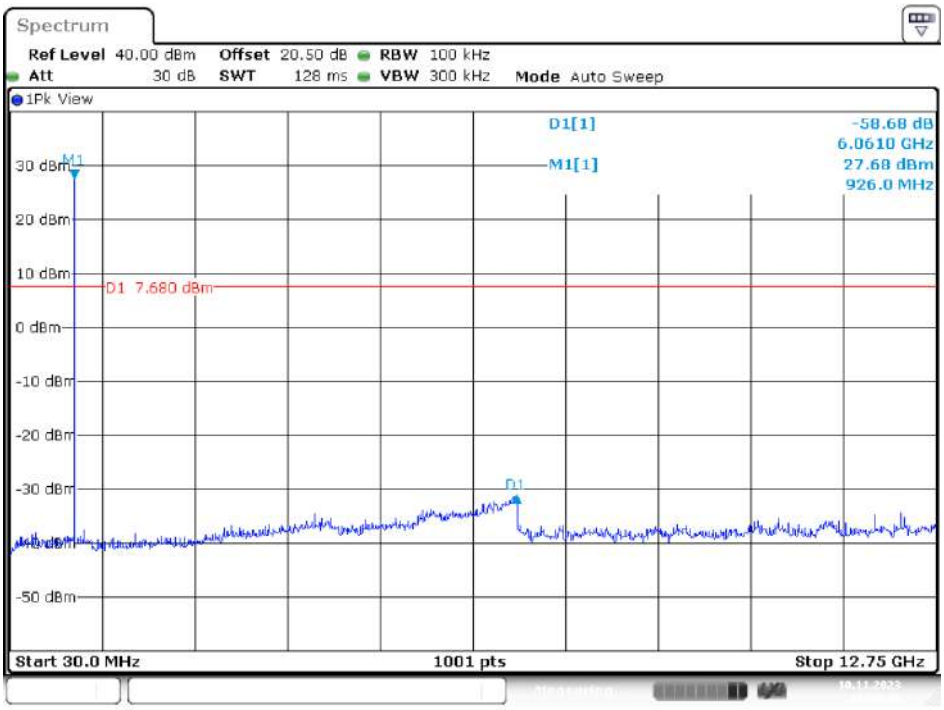
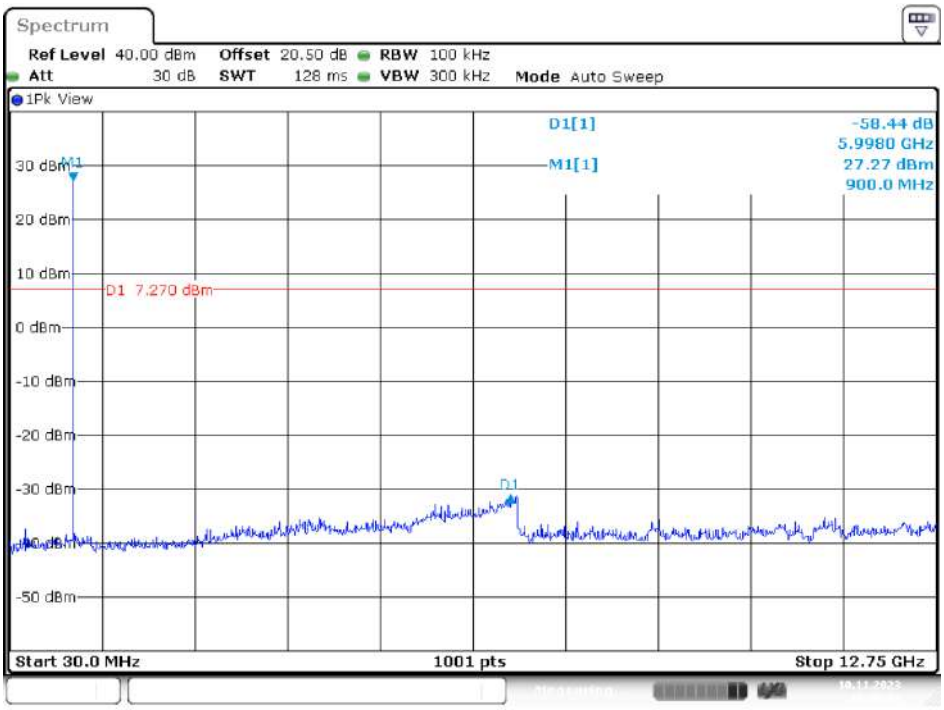
High Channel



Date: 10.NOV.2023 15:39:49

PR-ASK Mode Antenna Port 4

Low Channel



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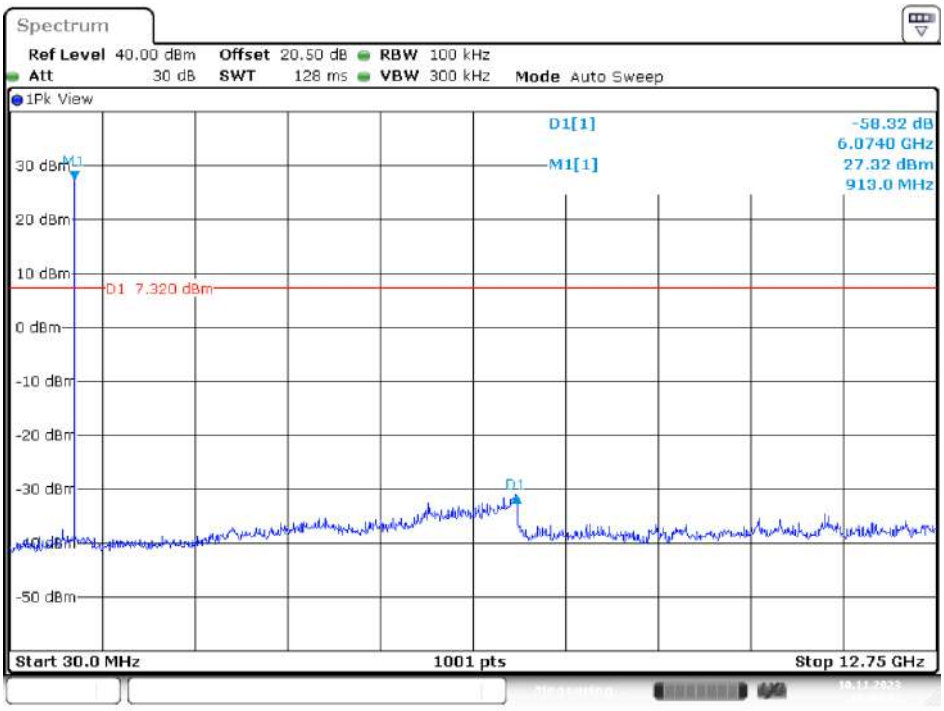
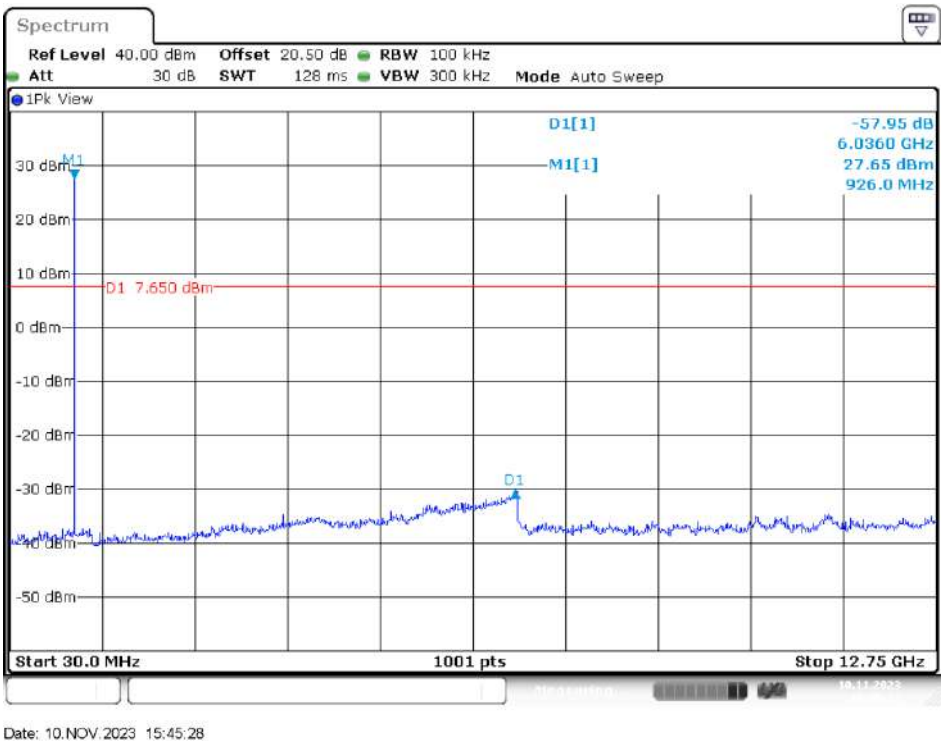
Middle Channel



Date: 10.NOV.2023 15:47:05

High Channel



Date: 10.NOV.2023 15:45:28

9. FCC §15.247(a)(1) – 20 dB Emission Bandwidth

9.1. Applicable Standard

According to FCC §15.247(a) (1) the maximum 20 dB bandwidth of the hopping channel shall be presented.

9.2. Test Procedure

According to ANSI C63.10-2013 Section 6.9.2

(1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
(2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
(3) Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
(4) Repeat above procedures until all frequencies measured were complete.

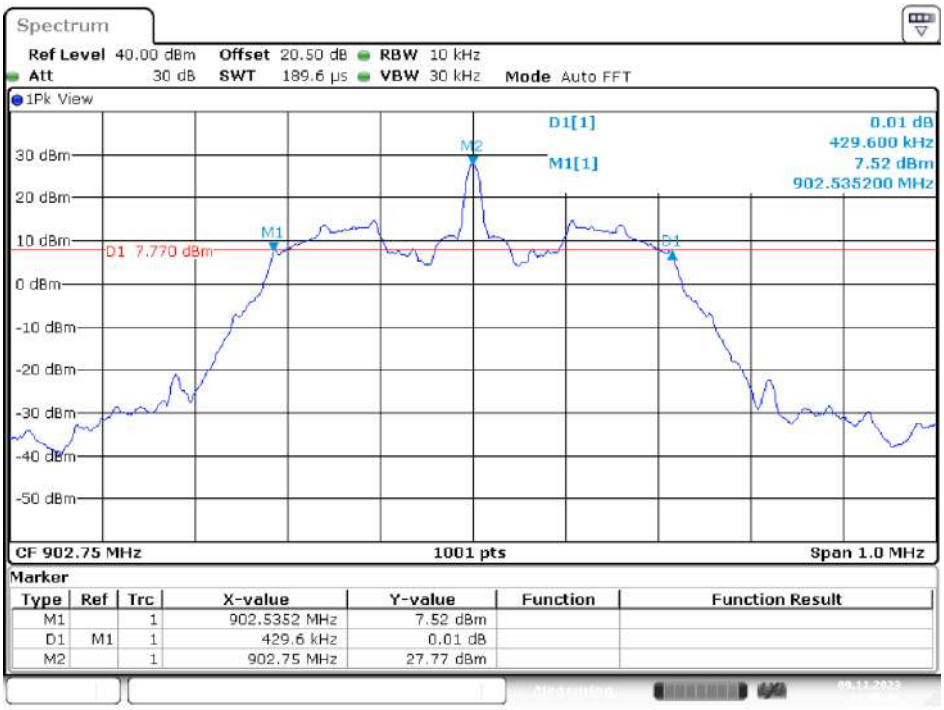
9.3. Test Results

Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)				Limit (kHz)	Result
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4		
DSB-ASK							
Low	902.75	429.60	428.70	429.60	426.60	<500	Pass
Mid	915.25	430.60	429.60	429.60	429.60	<500	Pass
High	927.25	403.60	392.60	391.60	391.60	<500	Pass
PR-ASK							
Low	902.75	210.80	210.80	210.80	210.80	<500	Pass
Mid	915.25	211.80	210.80	210.80	210.80	<500	Pass
High	927.25	208.80	209.80	209.80	209.80	<500	Pass

Please refer to the following plots

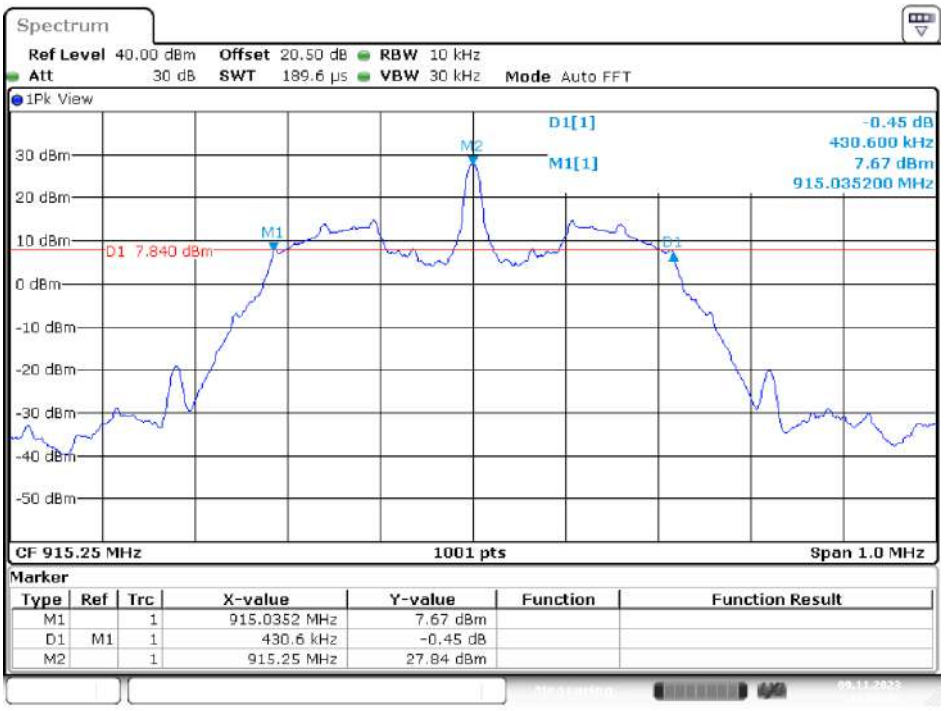
DSB-ASK Mode Antenna Port 1

Low Channel



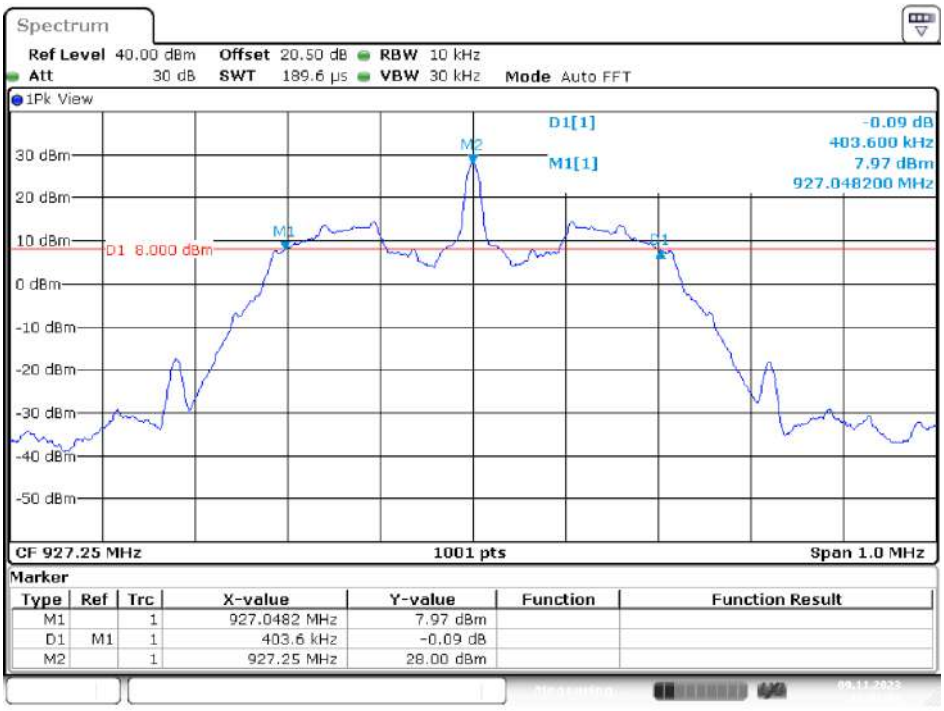
Date: 9.NOV.2023 13:45:47

Middle Channel



Date: 9.NOV.2023 13:39:44

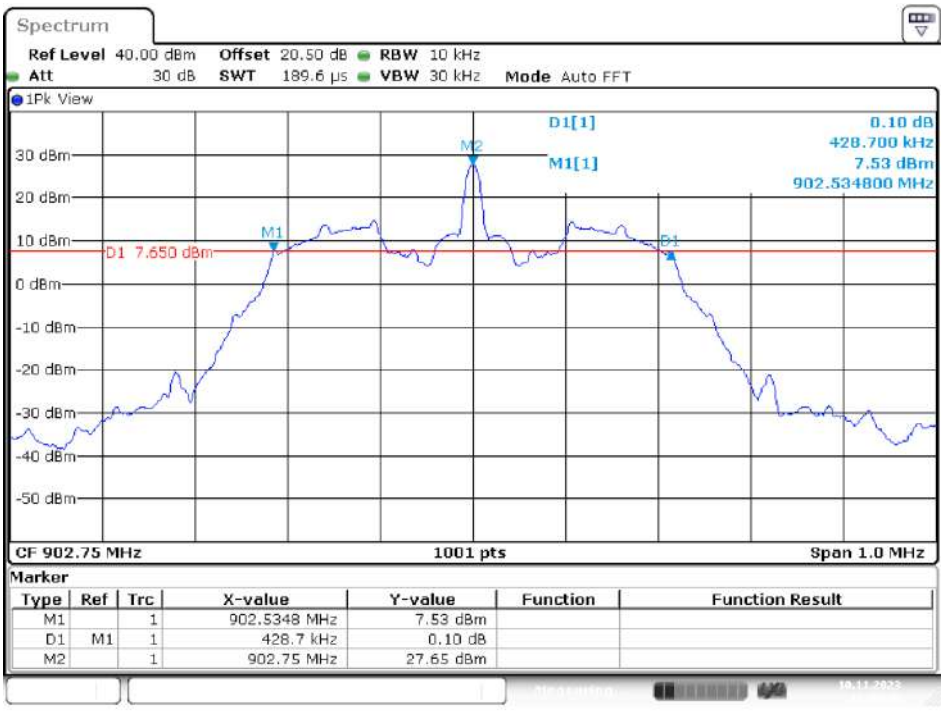
High Channel



Date: 9.NOV.2023 13:41:34

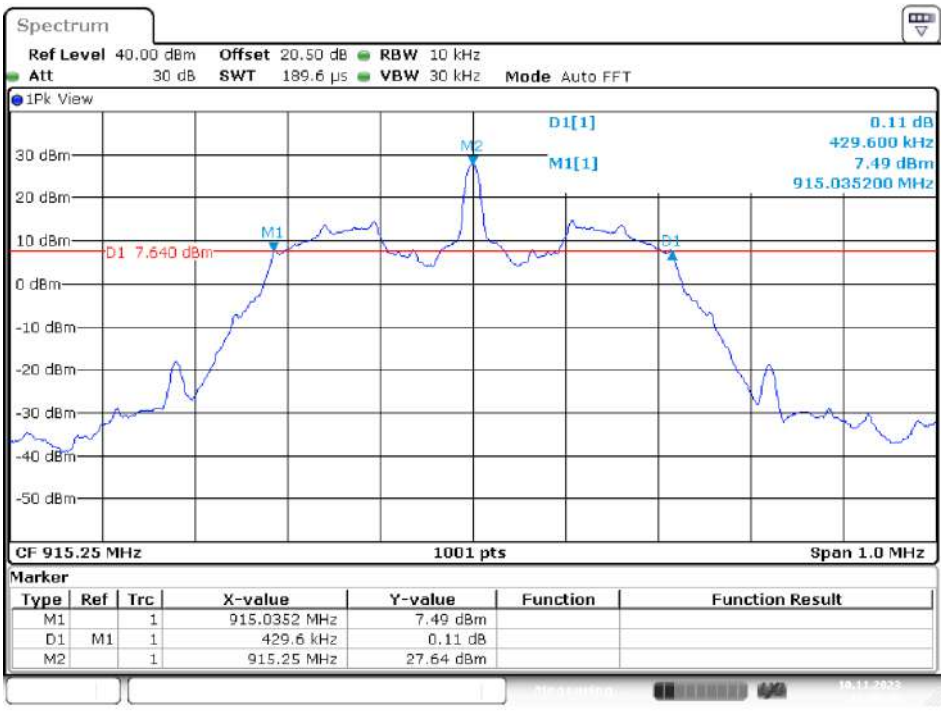
DSB-ASK Mode Antenna Port 2

Low Channel



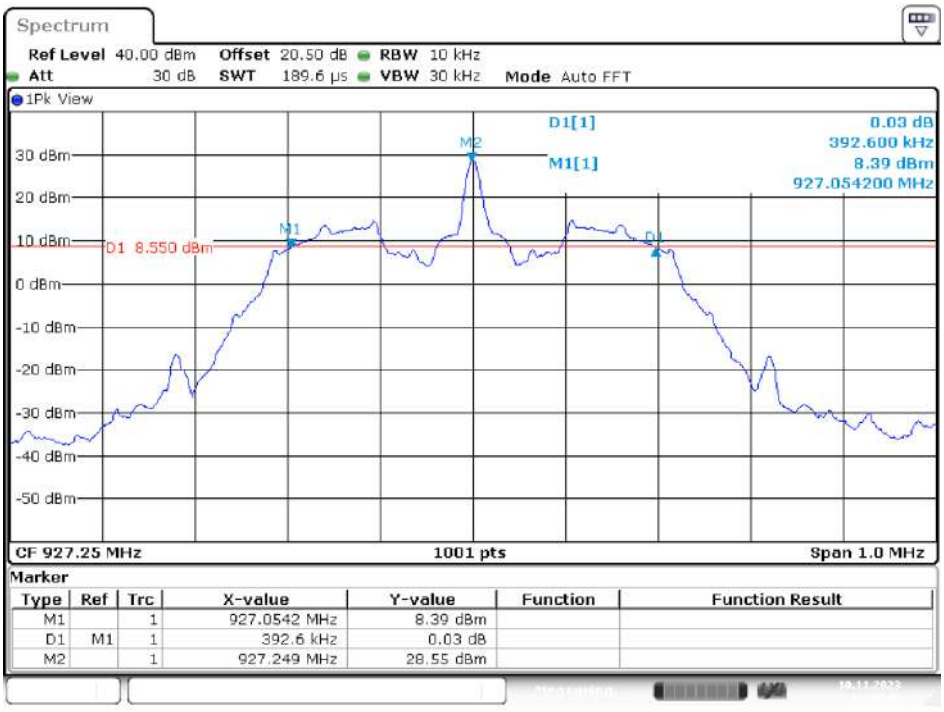
Date: 10.NOV.2023 13:47:36

Middle Channel



Date: 10.NOV.2023 13:49:47

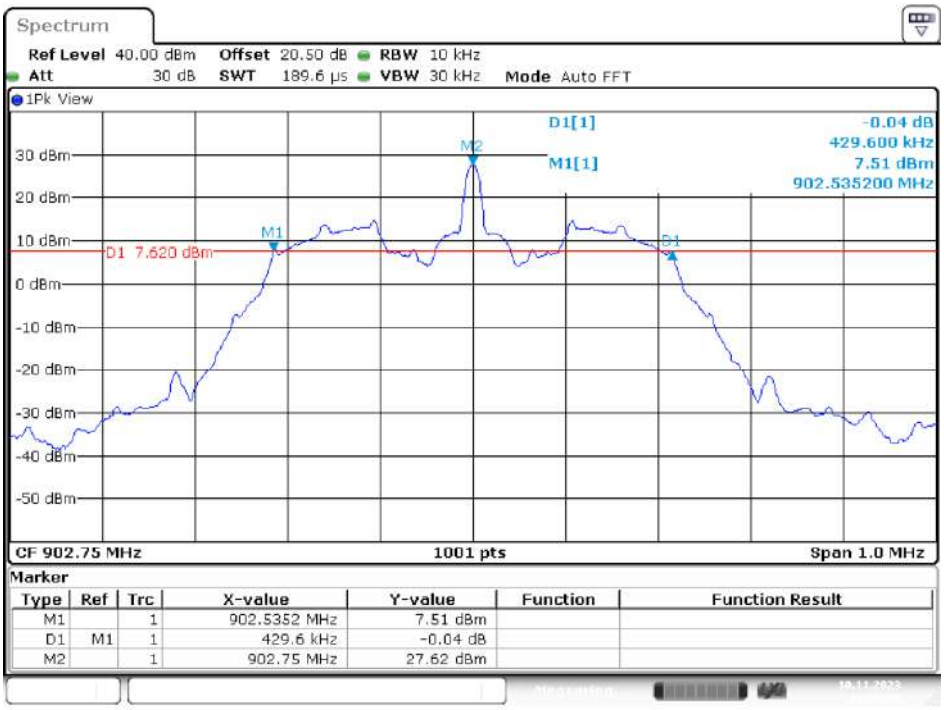
High Channel



Date: 10.NOV.2023 13:52:46

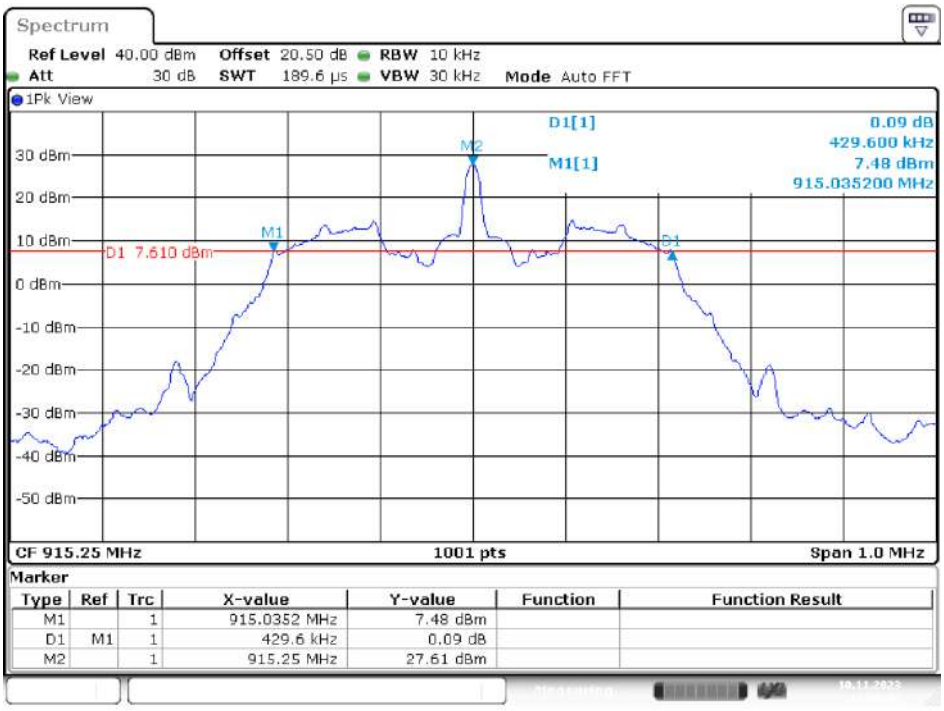
DSB-ASK Mode Antenna Port 3

Low Channel



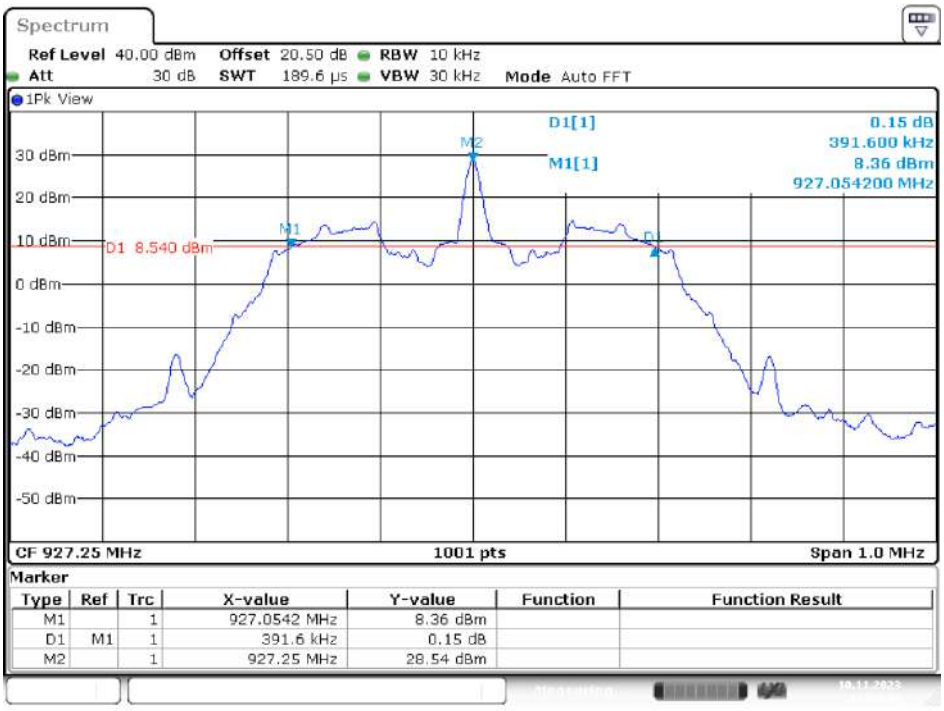
Date: 10.NOV.2023 13:59:19

Middle Channel



Date: 10.NOV.2023 13:56:43

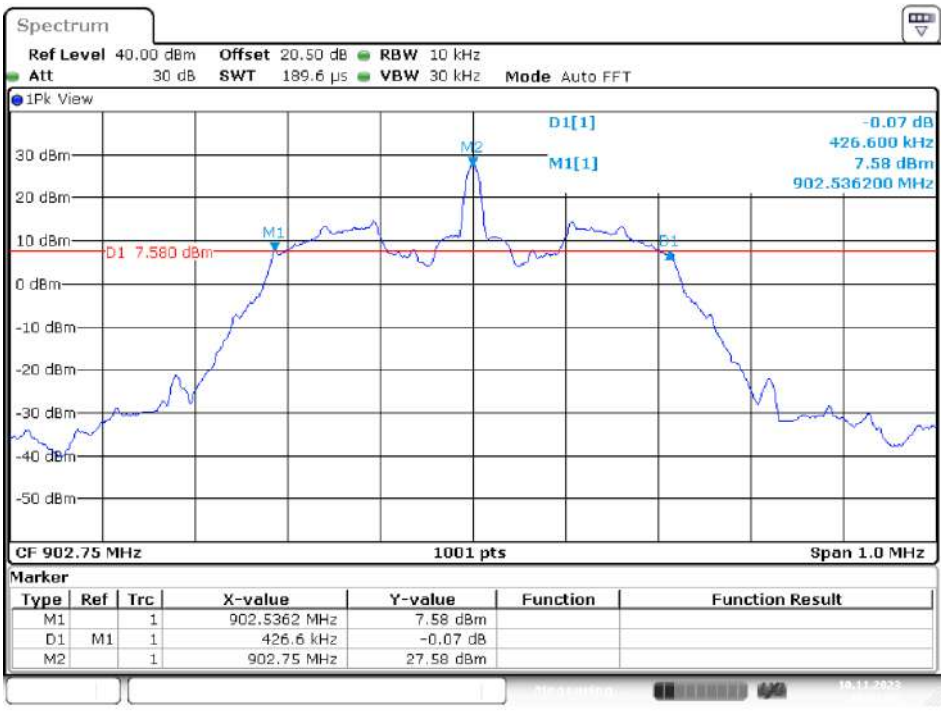
High Channel



Date: 10.NOV.2023 13:54:44

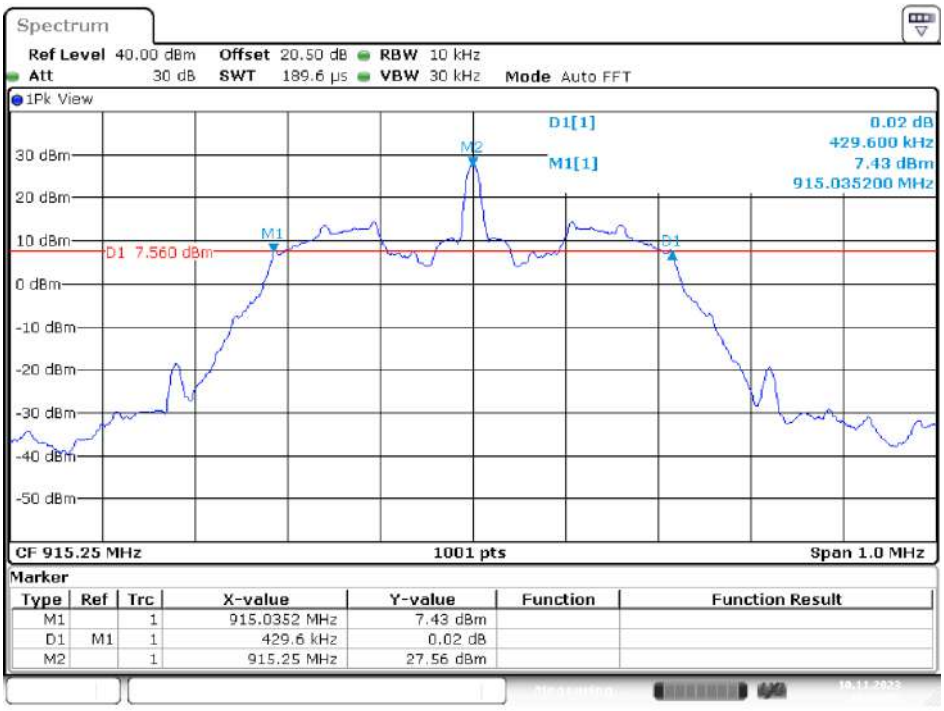
DSB-ASK Mode Antenna Port 4

Low Channel



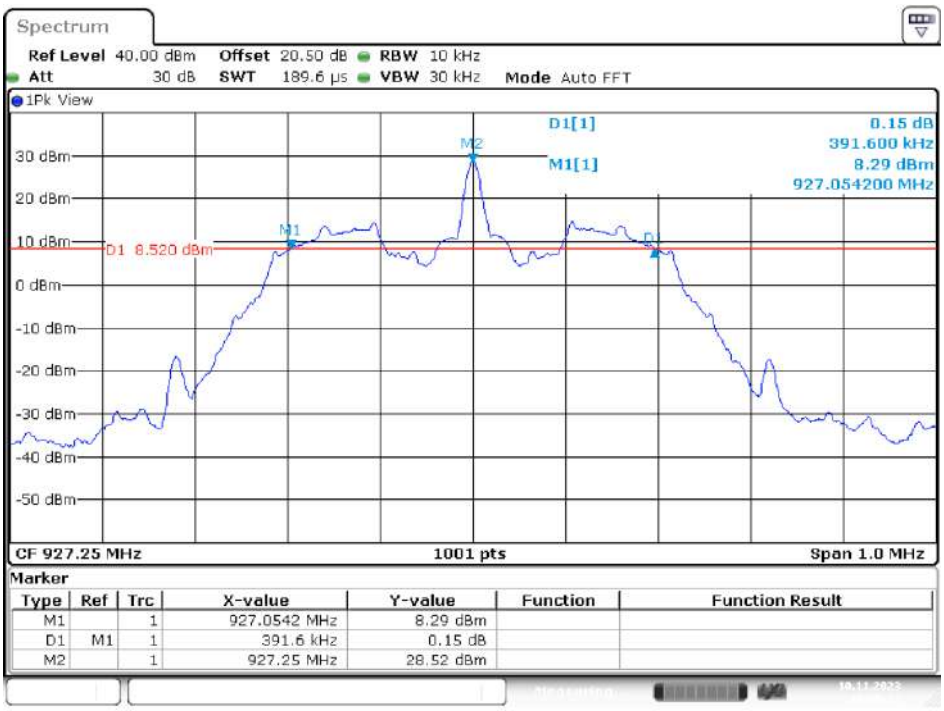
Date: 10.NOV.2023 14:01:22

Middle Channel



Date: 10.NOV.2023 14:02:56

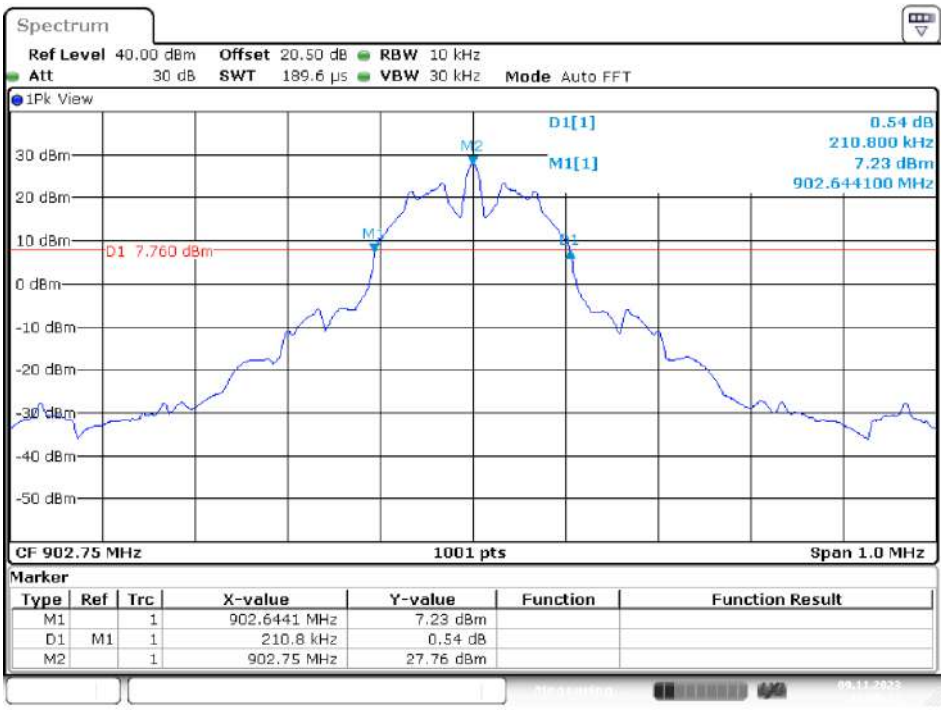
High Channel



Date: 10.NOV.2023 14:05:13

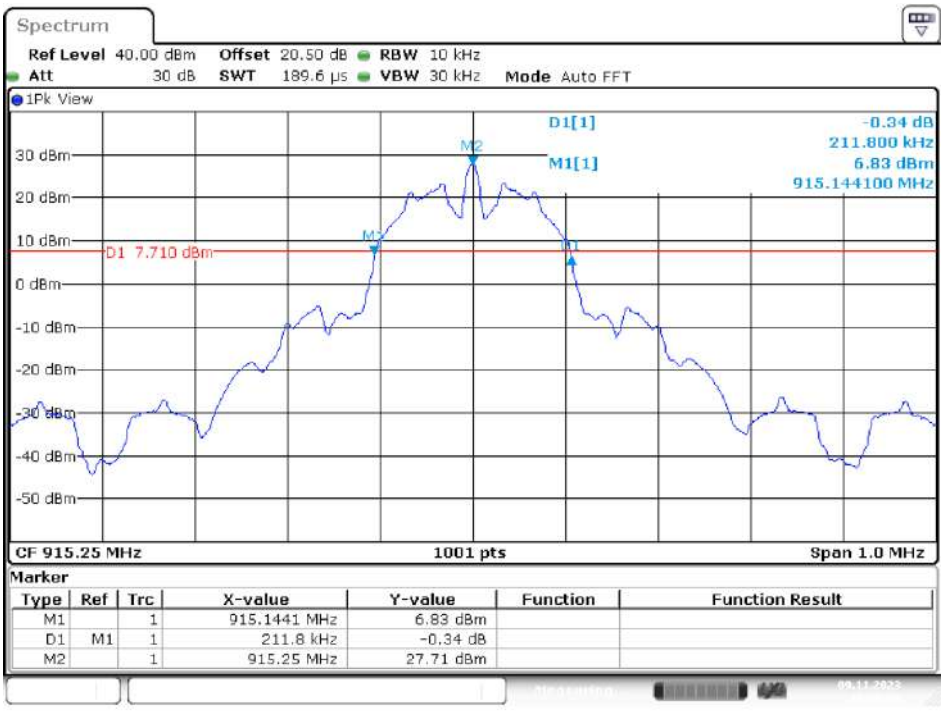
PR-ASK Mode Antenna Port 1

Low Channel



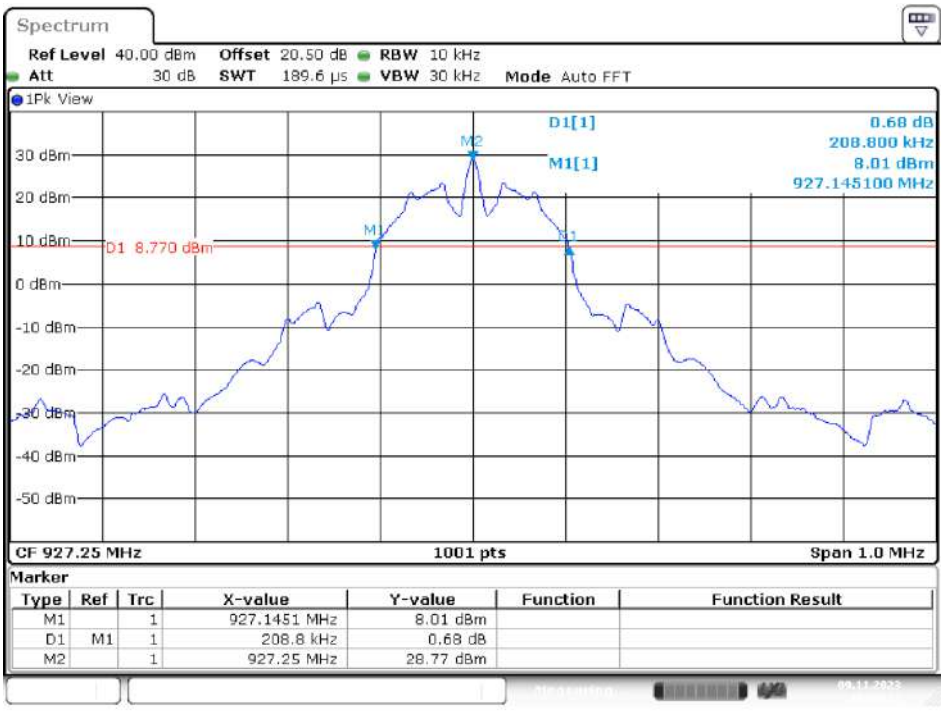
Date: 9.NOV.2023 13:55:27

Middle Channel



Date: 9.NOV.2023 14:00:21

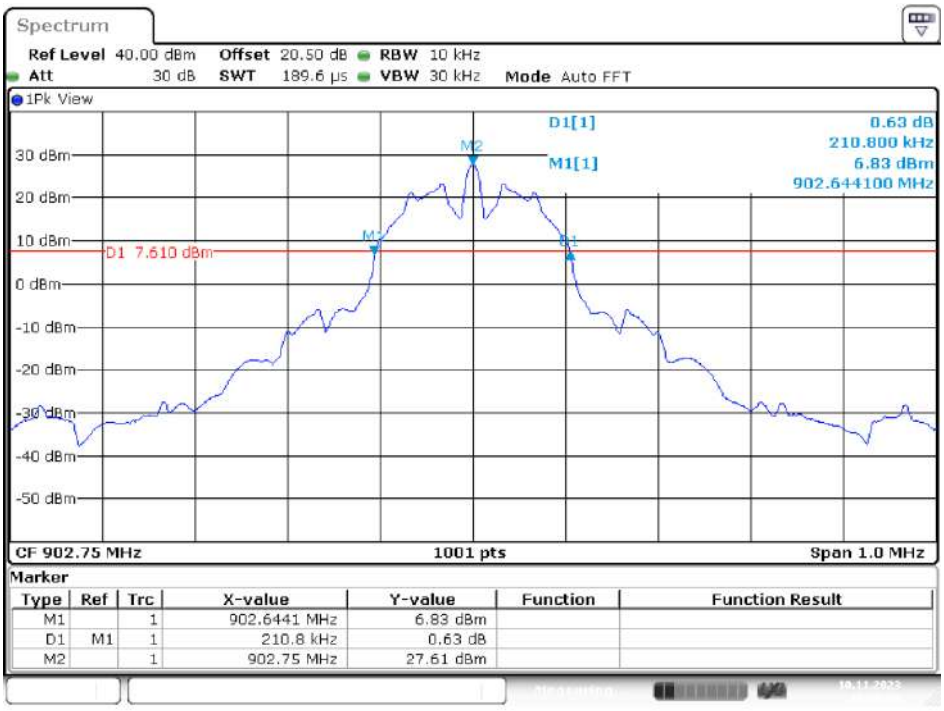
High Channel



Date: 9.NOV.2023 14:02:12

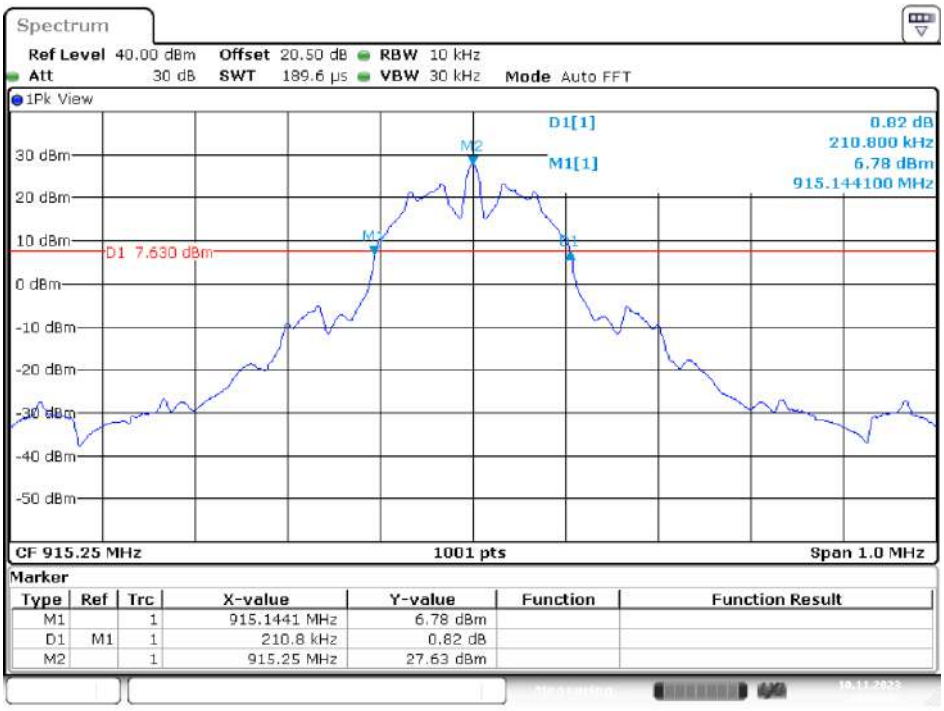
PR-ASK Mode Antenna Port 2

Low Channel



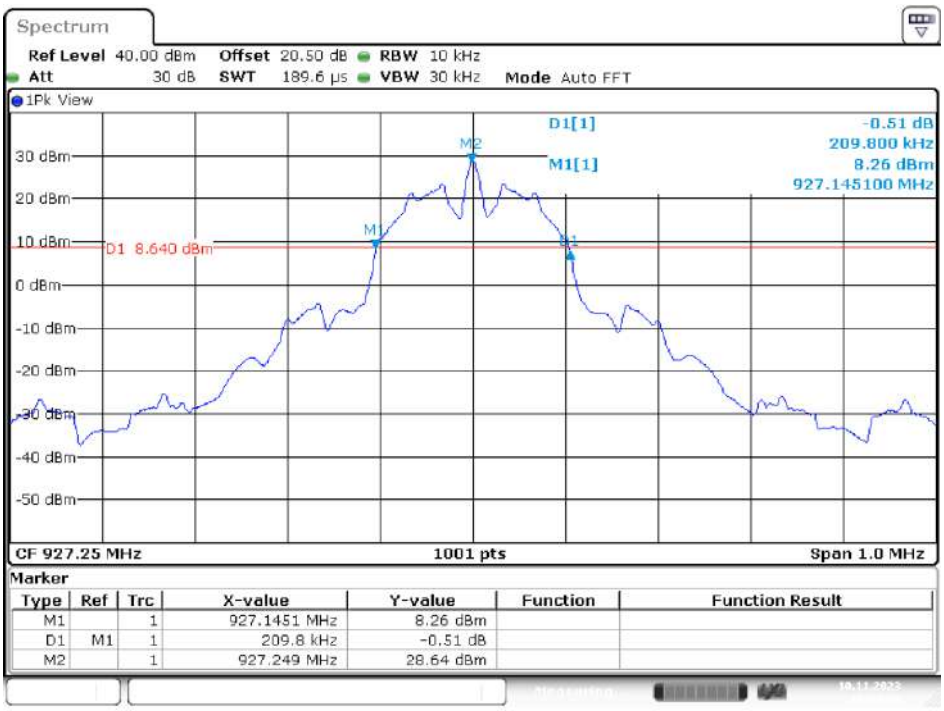
Date: 10.NOV.2023 14:20:10

Middle Channel



Date: 10.NOV.2023 14:22:15

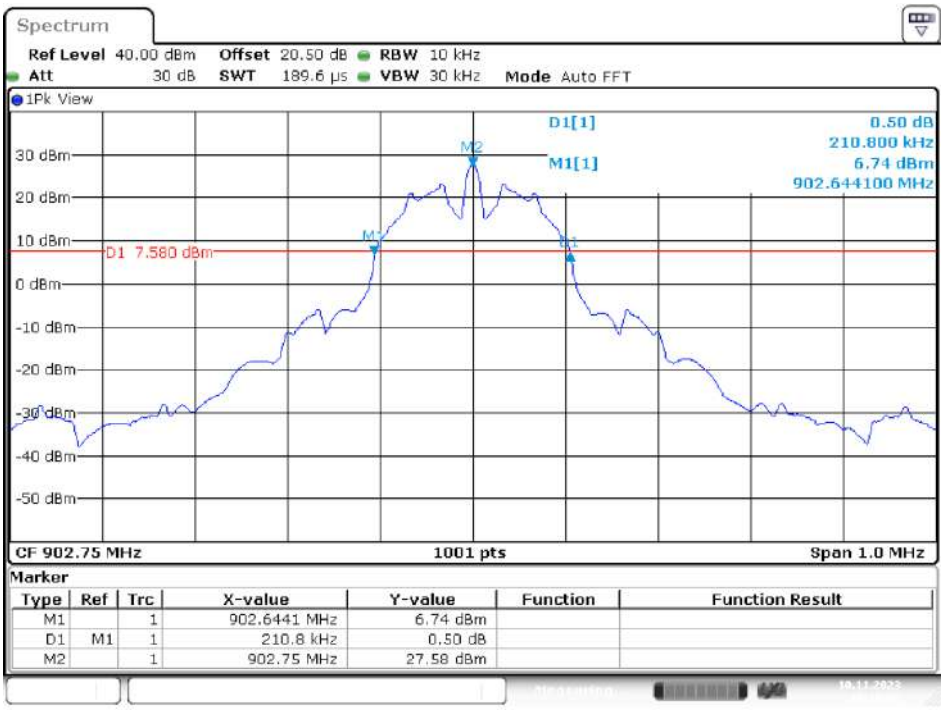
High Channel



Date: 10.NOV.2023 14:24:21

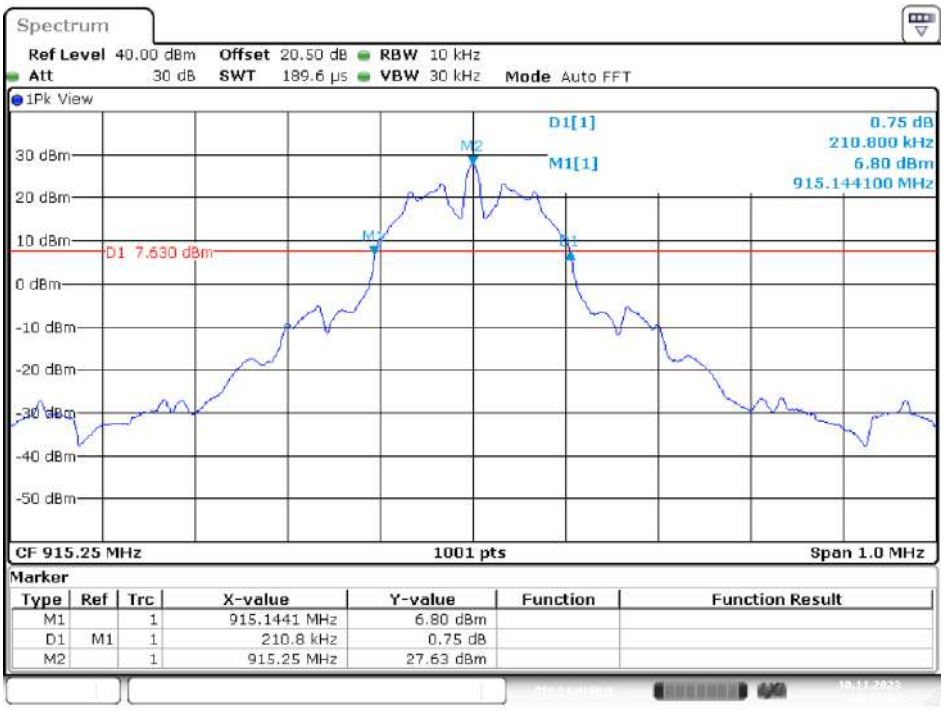
PR-ASK Mode Antenna Port 3

Low Channel



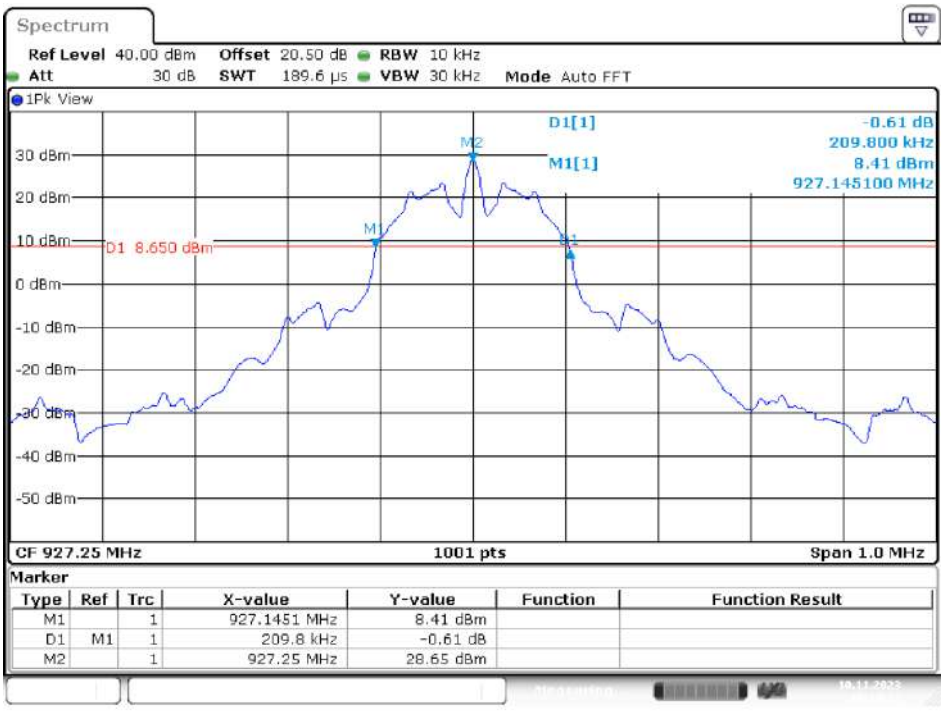
Date: 10.NOV.2023 14:18:23

Middle Channel



Date: 10.NOV.2023 14:16:33

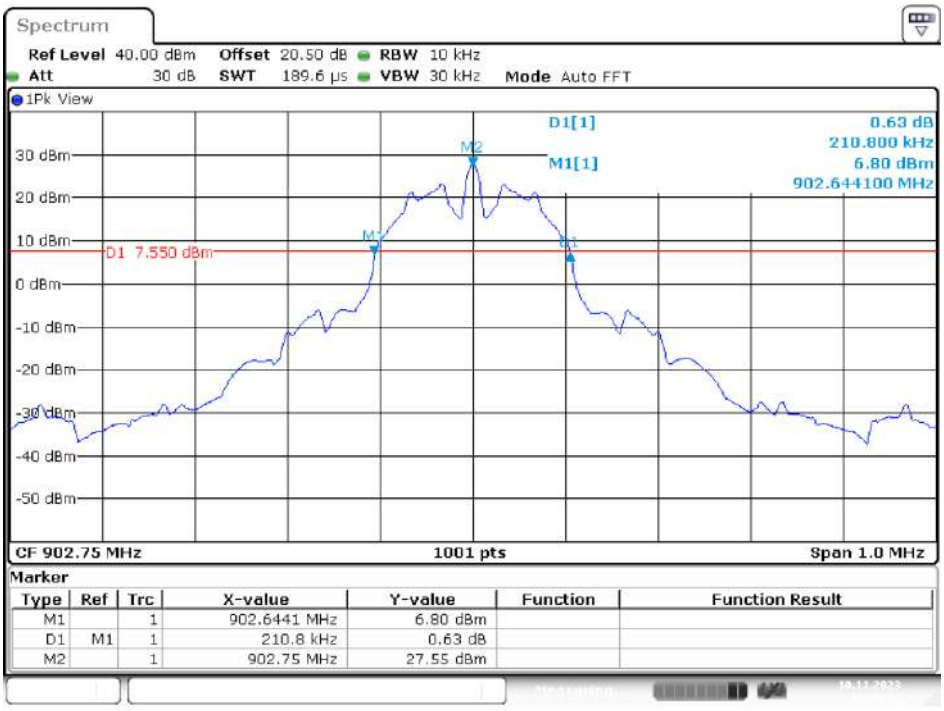
High Channel



Date: 10.NOV.2023 14:14:17

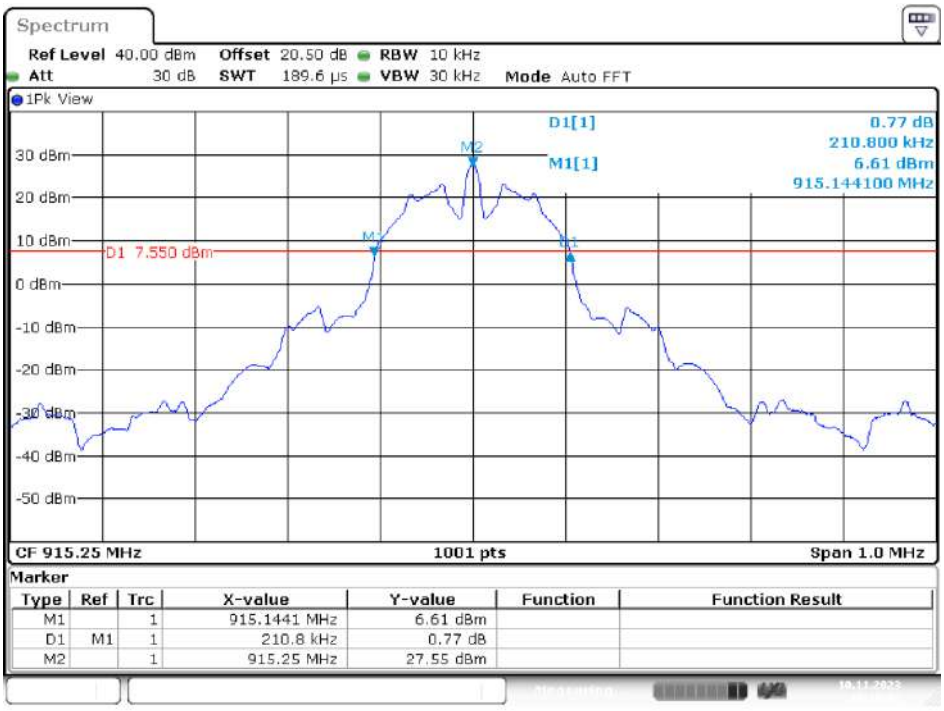
PR-ASK Mode Antenna Port 4

Low Channel



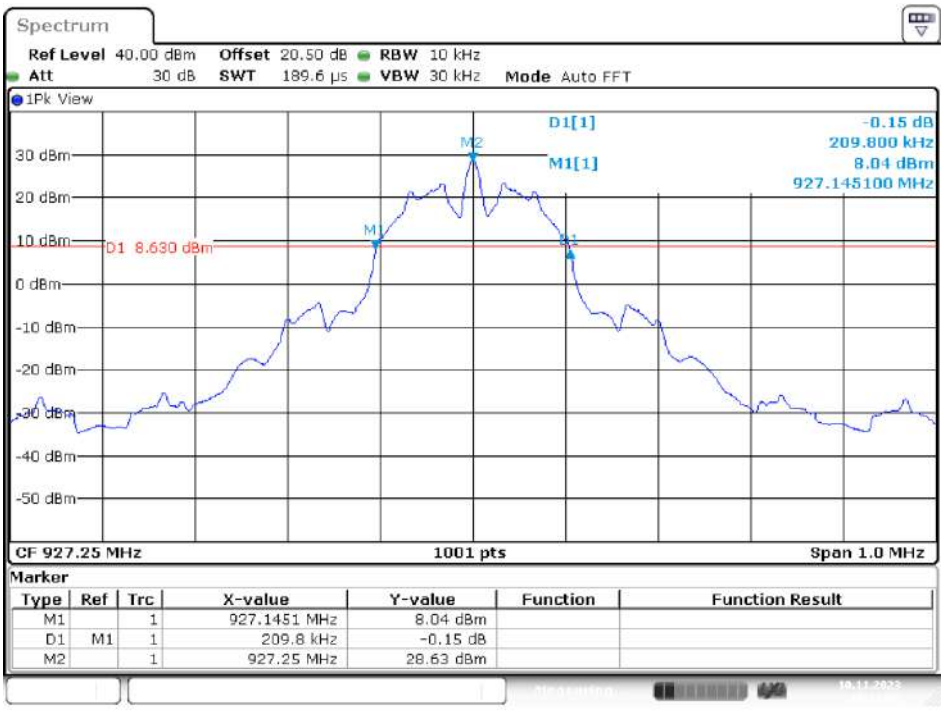
Date: 10.NOV.2023 14:08:12

Middle Channel



Date: 10.NOV.2023 14:10:03

High Channel



Date: 10.NOV.2023 14:11:52

10. FCC §15.247(a)(1) – Channel Separation Test

10.1. Applicable Standard

According to FCC §15.247(a) (1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

10.2. Test Procedure

According to ANSI C63.10-2013 Section 7.8.2

1. Set the EUT in transmitting mode, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.

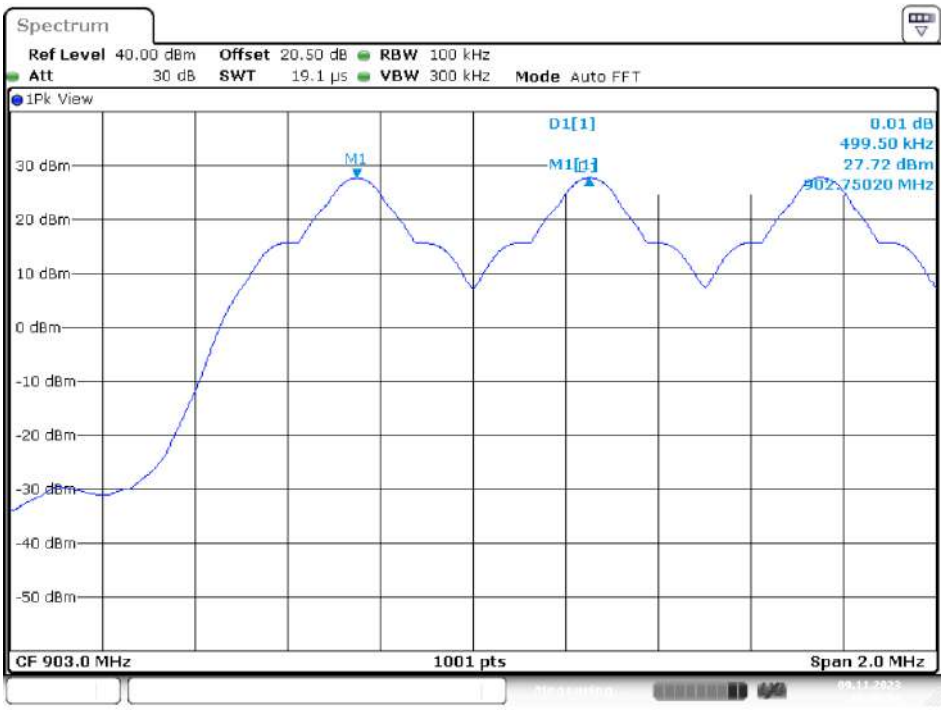
10.3. Test Results

Channel	Frequency (MHz)	Channel Separation (kHz)				20 dB bandwidth (kHz)	Channel Separation Limit	Result
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4			
DSB-ASK								
Low	902.75	499.50	499.50	499.50	499.50	429.60	25 kHz or the 20 dB bandwidth, whichever is greater	Pass
Mid	915.25	499.50	499.50	499.50	499.50	430.60		Pass
High	927.25	499.50	499.50	499.50	499.50	403.60		Pass
PR-ASK								
Low	902.75	499.50	499.50	499.50	499.50	210.80	25 kHz or the 20 dB bandwidth, whichever is greater	Pass
Mid	915.25	499.50	499.50	499.50	499.50	211.80		Pass
High	927.25	499.50	499.50	499.50	499.50	209.80		Pass

Please refer to the following plots.

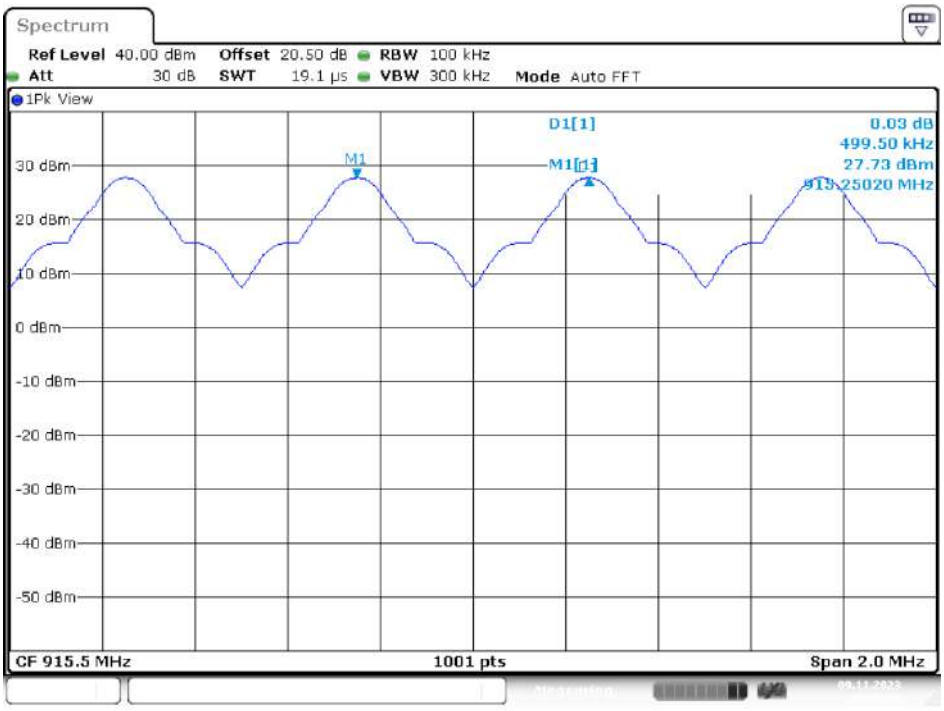
DSB-ASK Mode Antenna Port 1

Low Channel



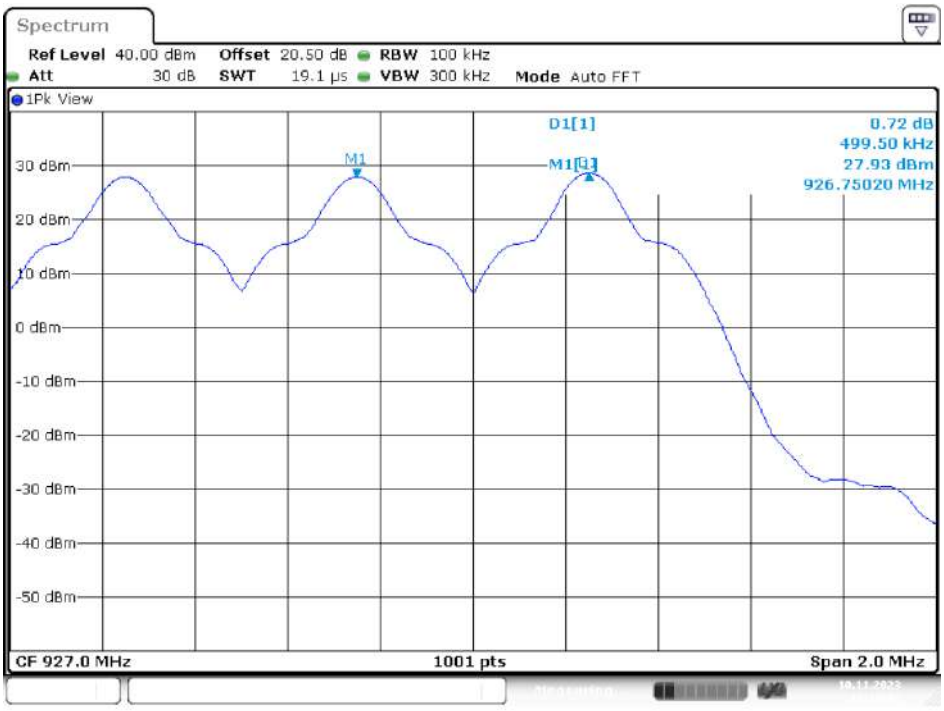
Date: 9.NOV.2023 16:40:55

Middle Channel



Date: 9.NOV.2023 16:39:06

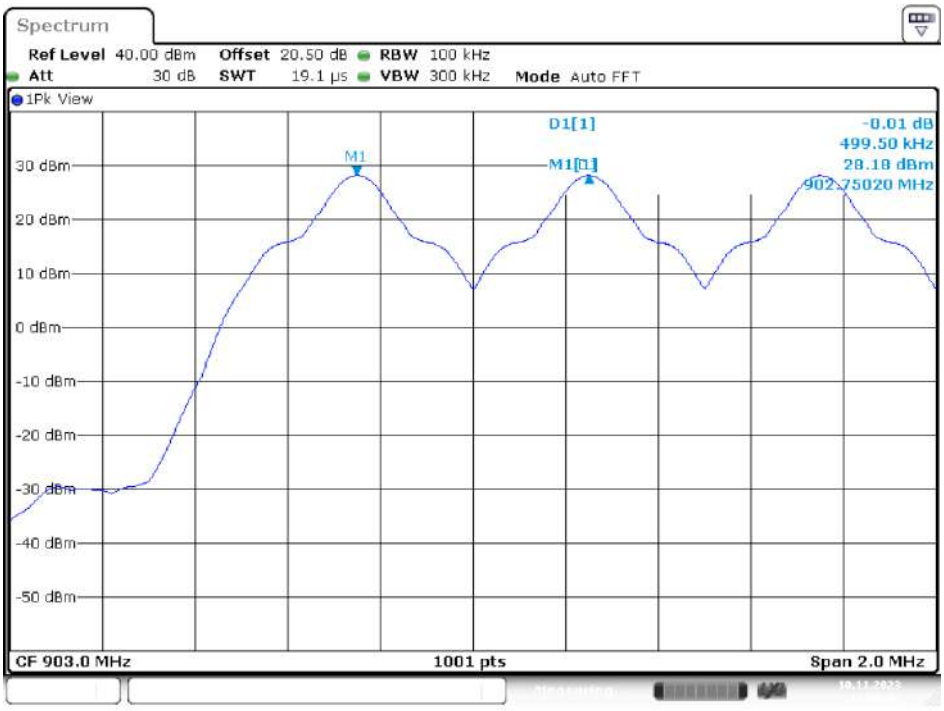
High Channel



Date: 10.NOV.2023 13:17:03

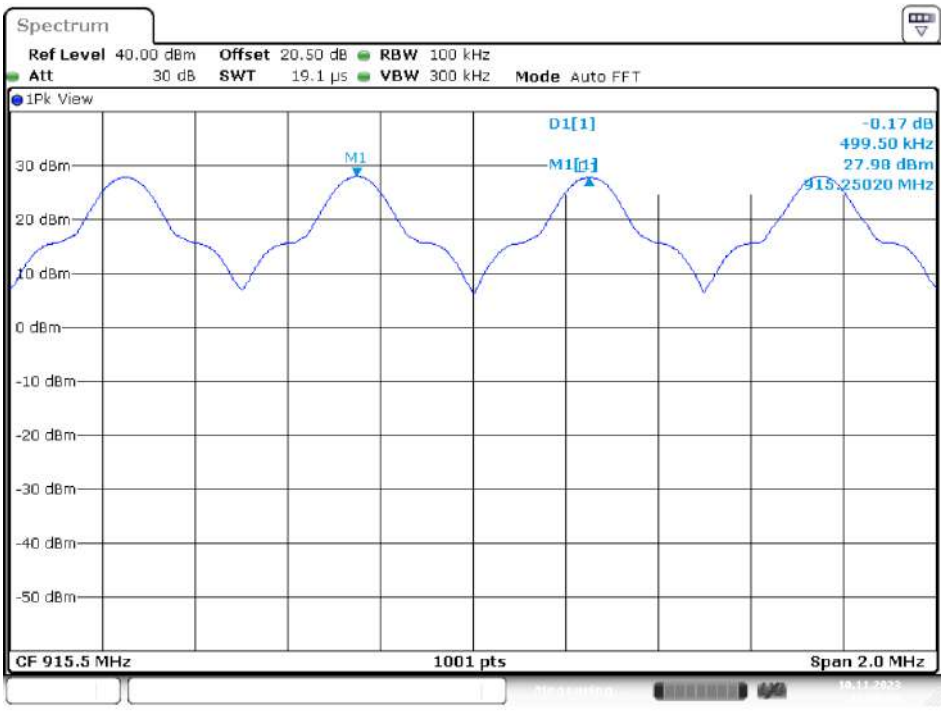
DSB-ASK Mode Antenna Port 2

Low Channel



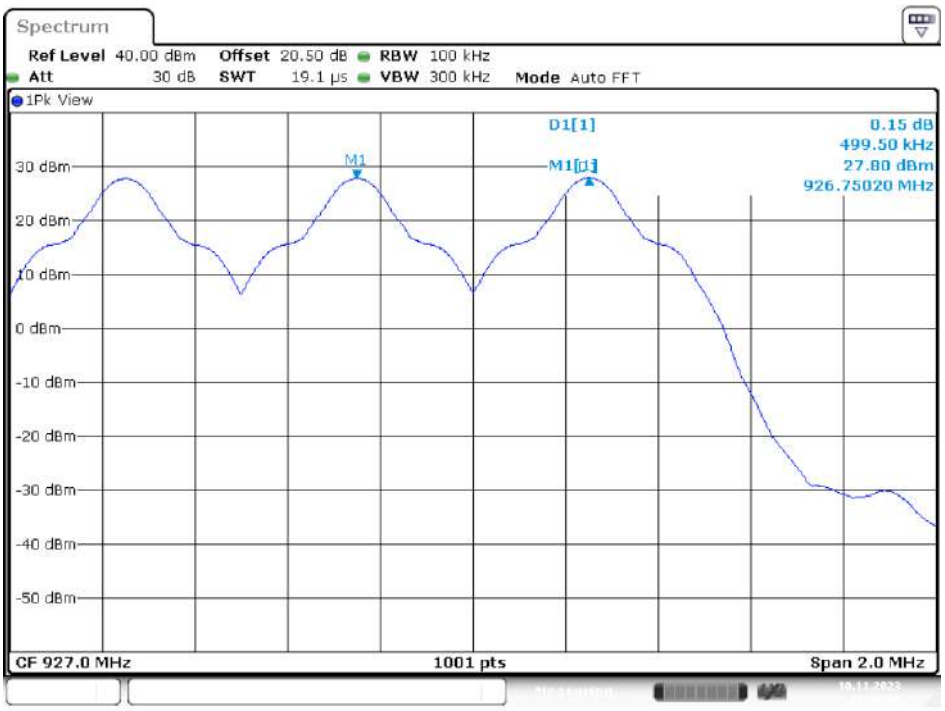
Date: 10.NOV.2023 13:06:47

Middle Channel



Date: 10.NOV.2023 13:08:18

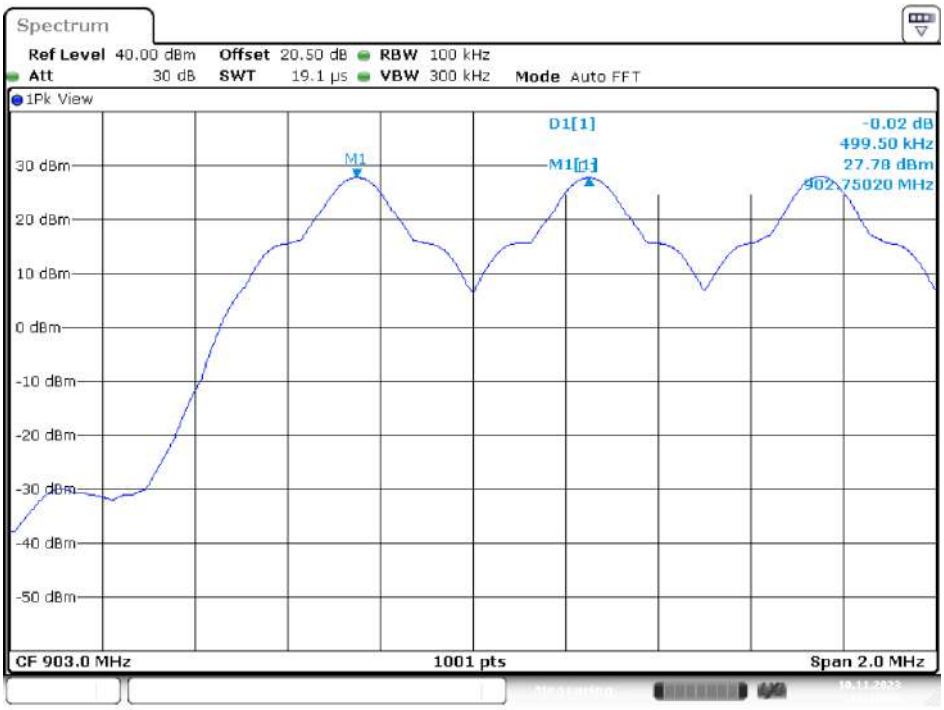
High Channel



Date: 10.NOV.2023 13:09:05

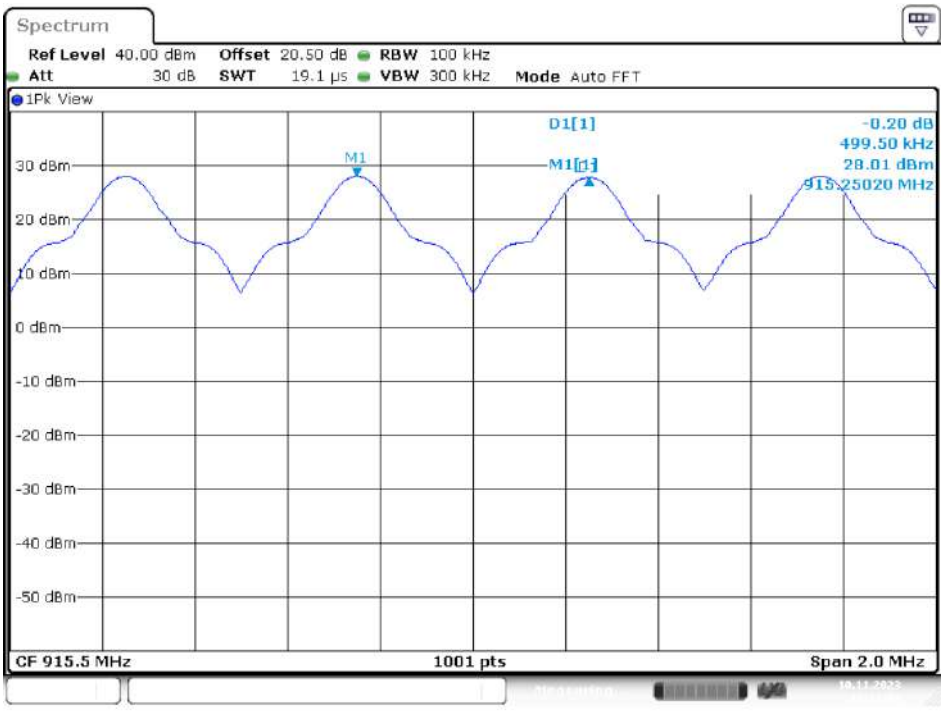
DSB-ASK Mode Antenna Port 3

Low Channel



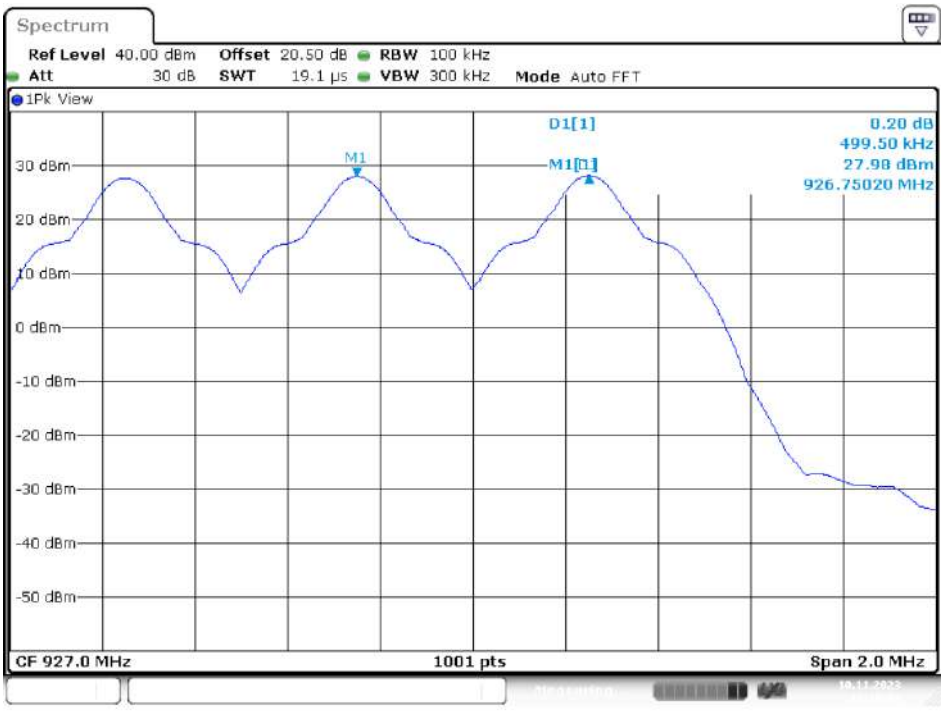
Date: 10.NOV.2023 13:12:21

Middle Channel



Date: 10.NOV.2023 13:11:04

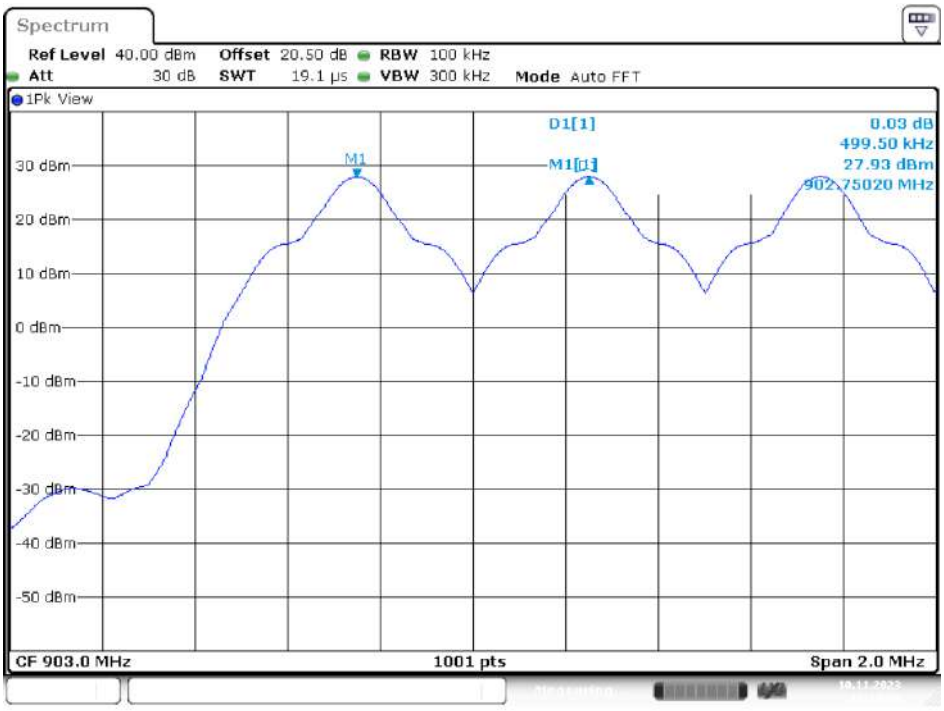
High Channel



Date: 10.NOV.2023 13:10:24

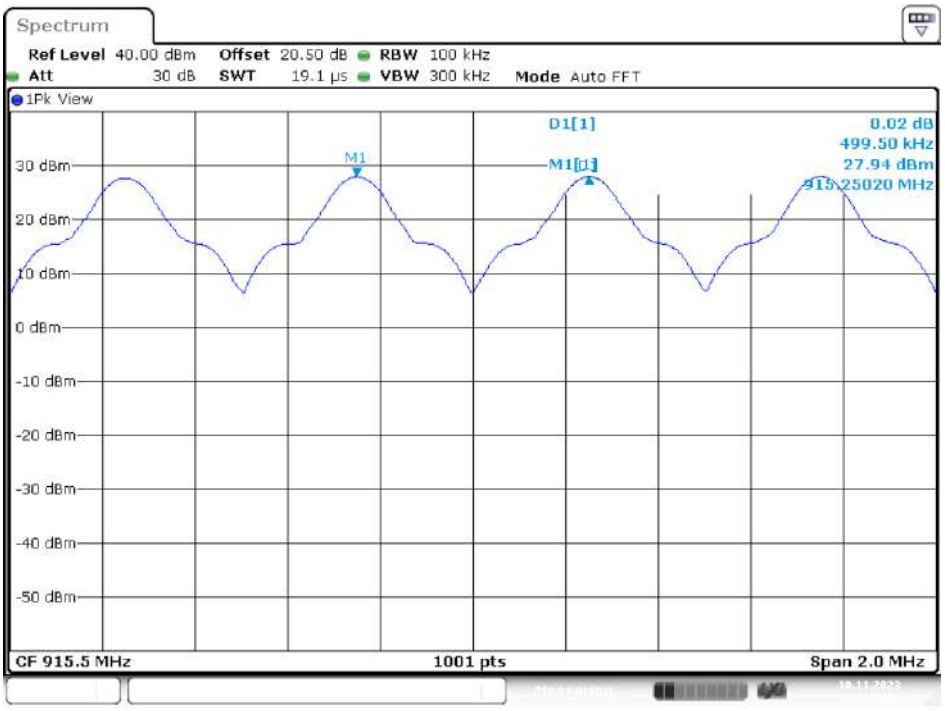
DSB-ASK Mode Antenna Port 4

Low Channel



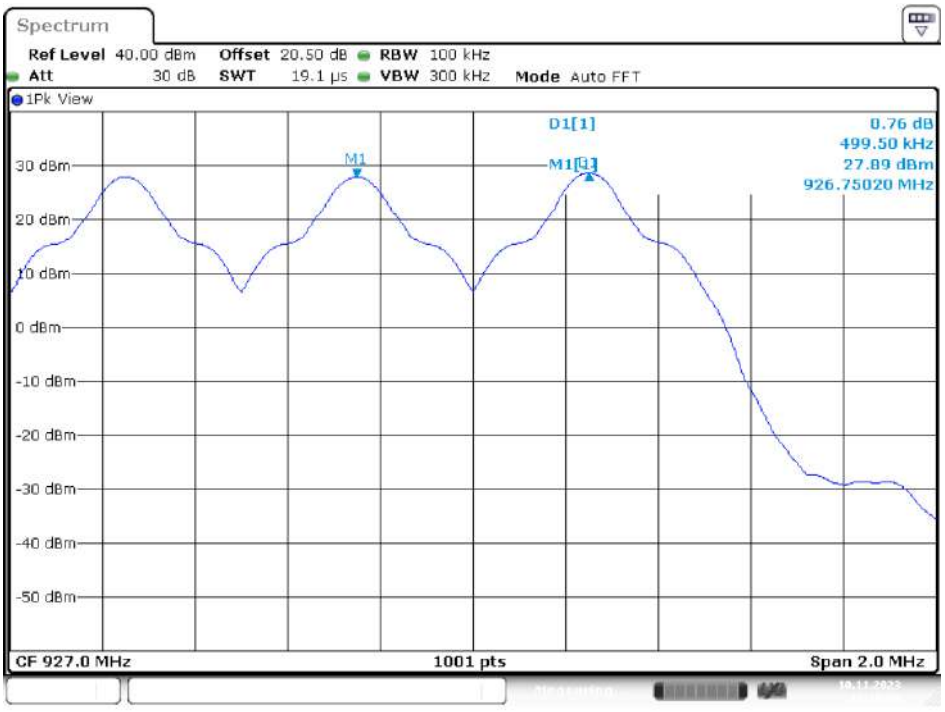
Date: 10.NOV.2023 13:14:28

Middle Channel



Date: 10.NOV.2023 13:13:43

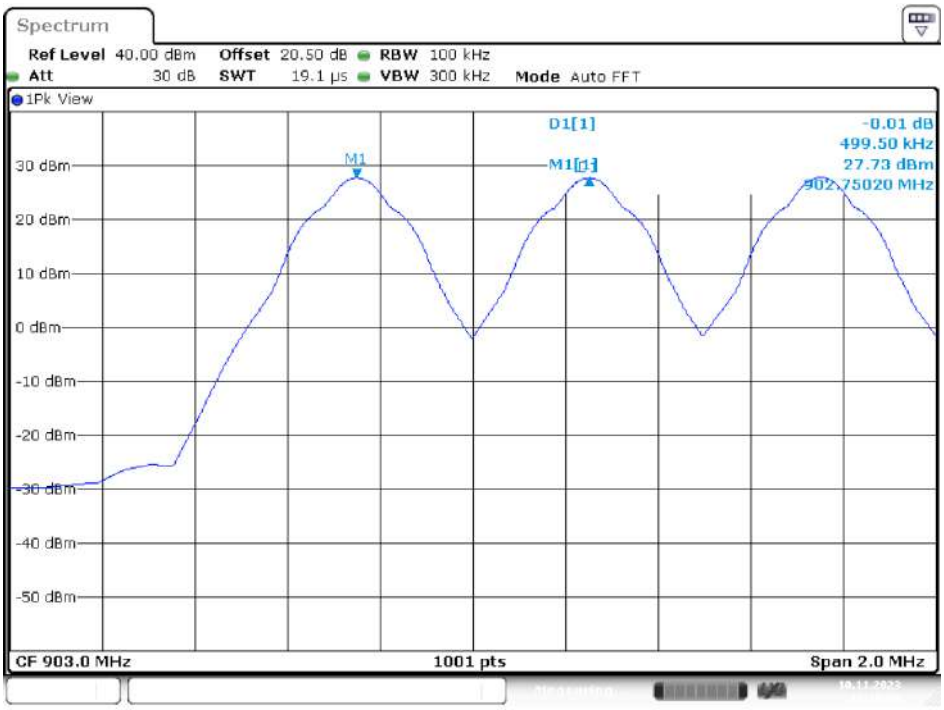
High Channel



Date: 10.NOV.2023 13:16:08

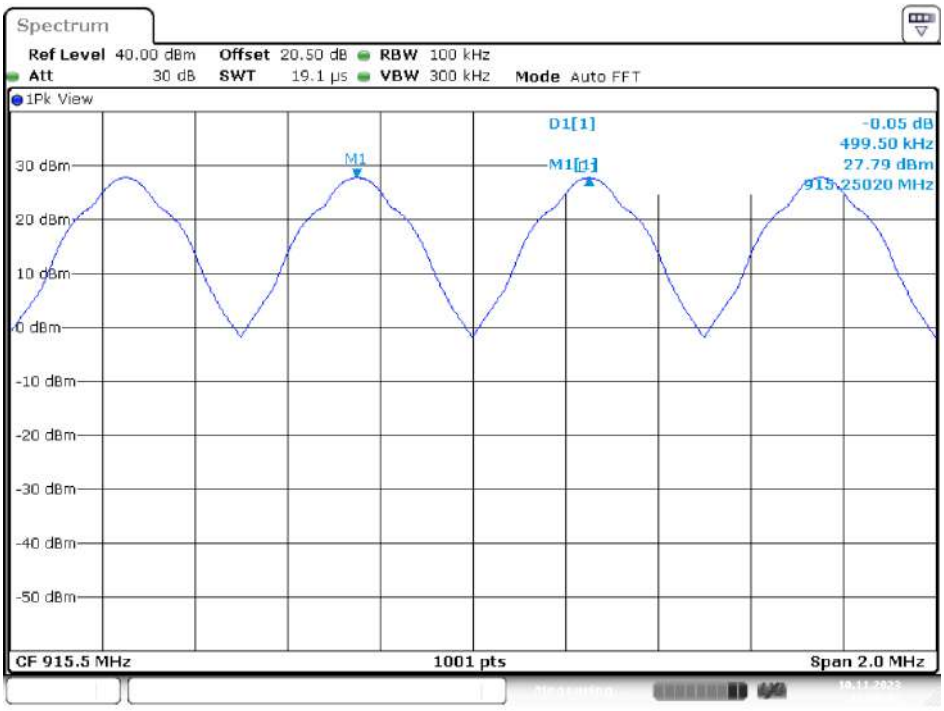
PR-ASK Mode Antenna Port 1

Low Channel



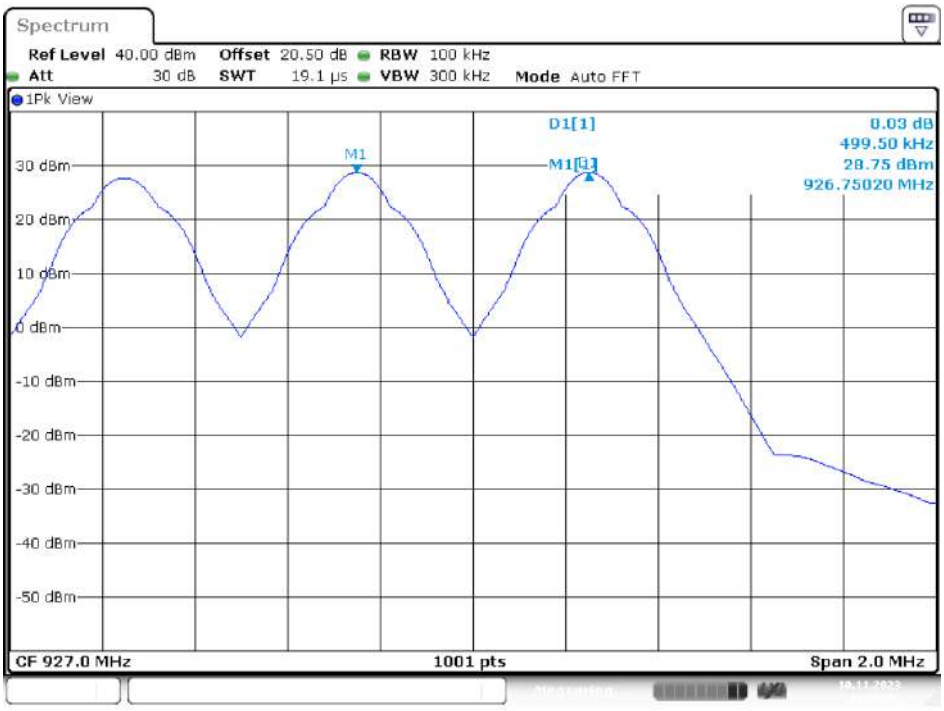
Date: 10.NOV.2023 13:18:20

Middle Channel



Date: 10.NOV.2023 13:20:02

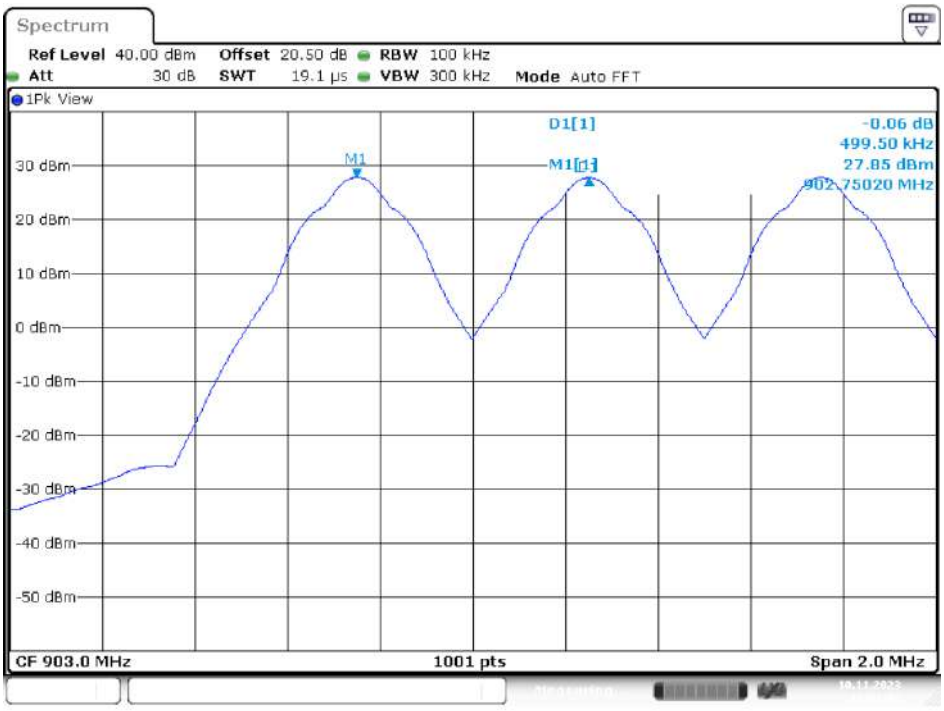
High Channel



Date: 10.NOV.2023 13:20:42

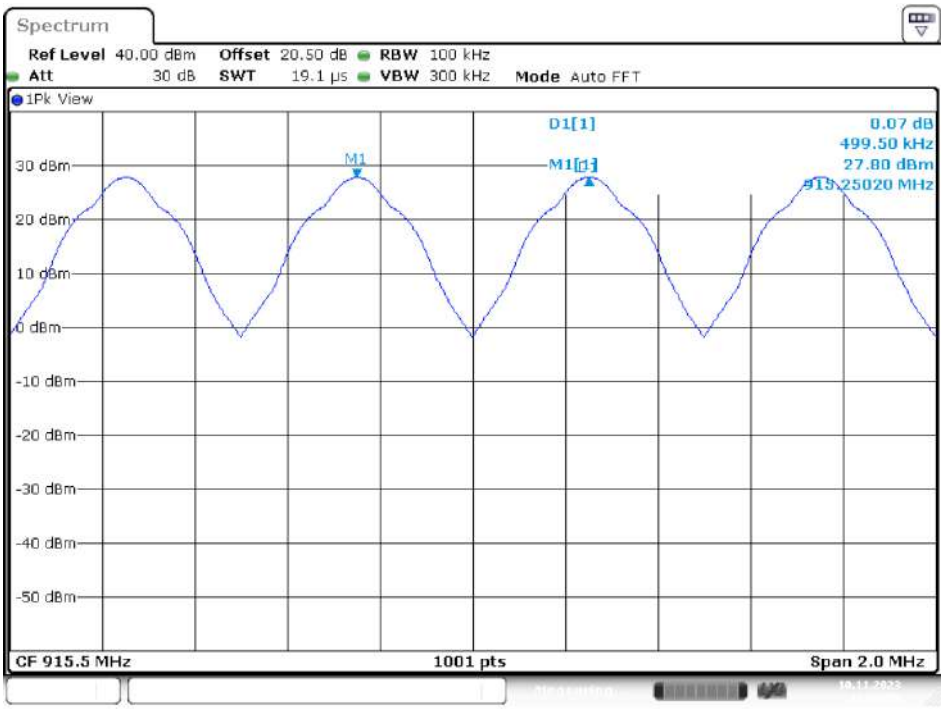
PR-ASK Mode Antenna Port 2

Low Channel



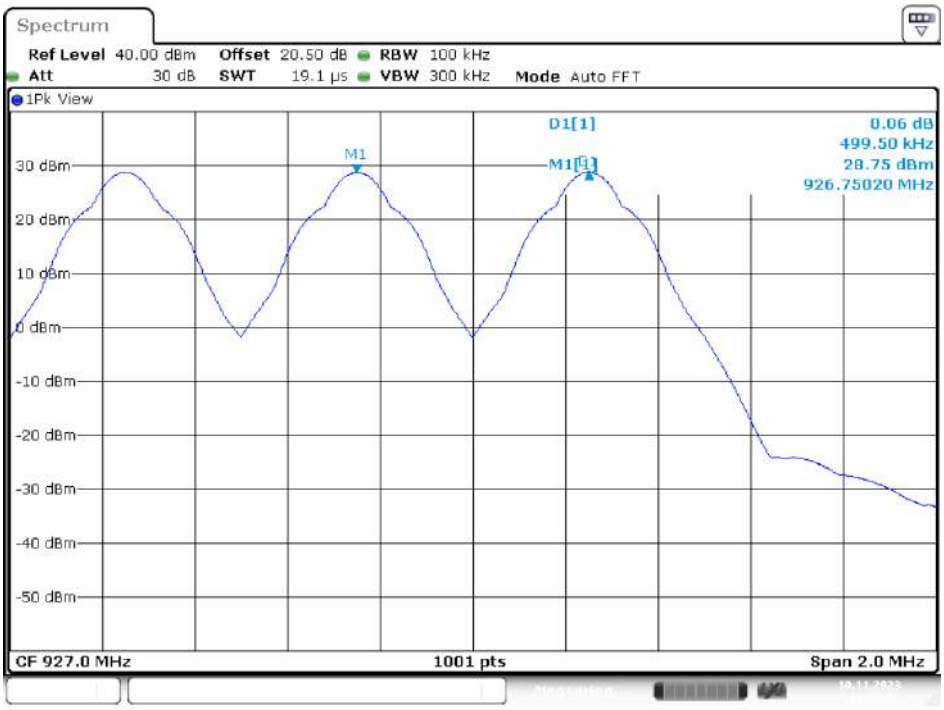
Date: 10.NOV.2023 13:21:34

Middle Channel



Date: 10.NOV.2023 13:22:29

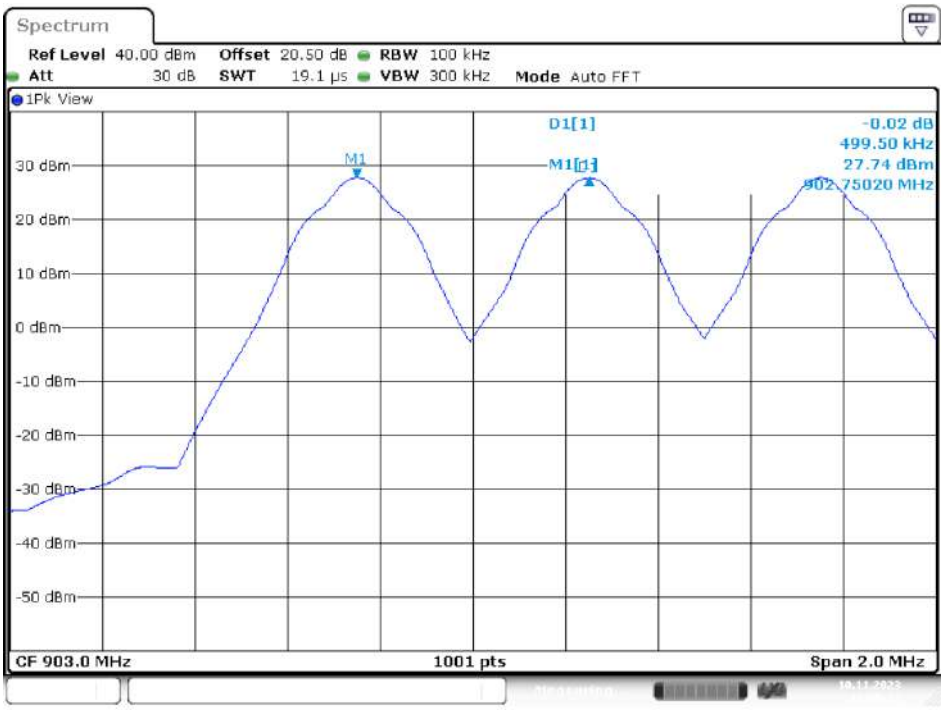
High Channel



Date: 10.NOV.2023 13:23:04

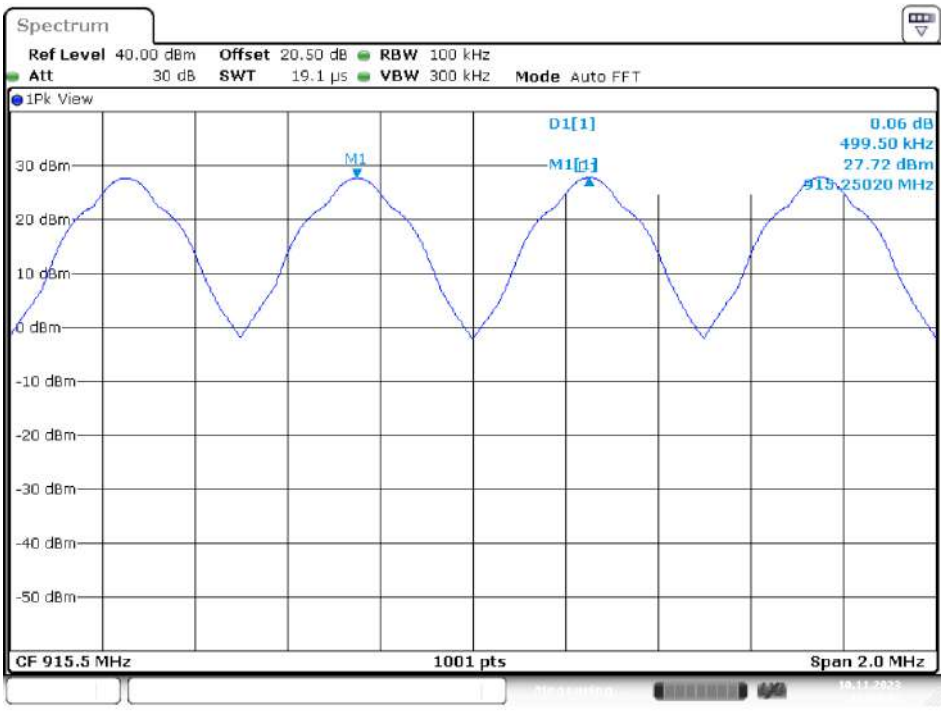
PR-ASK Mode Antenna Port 3

Low Channel



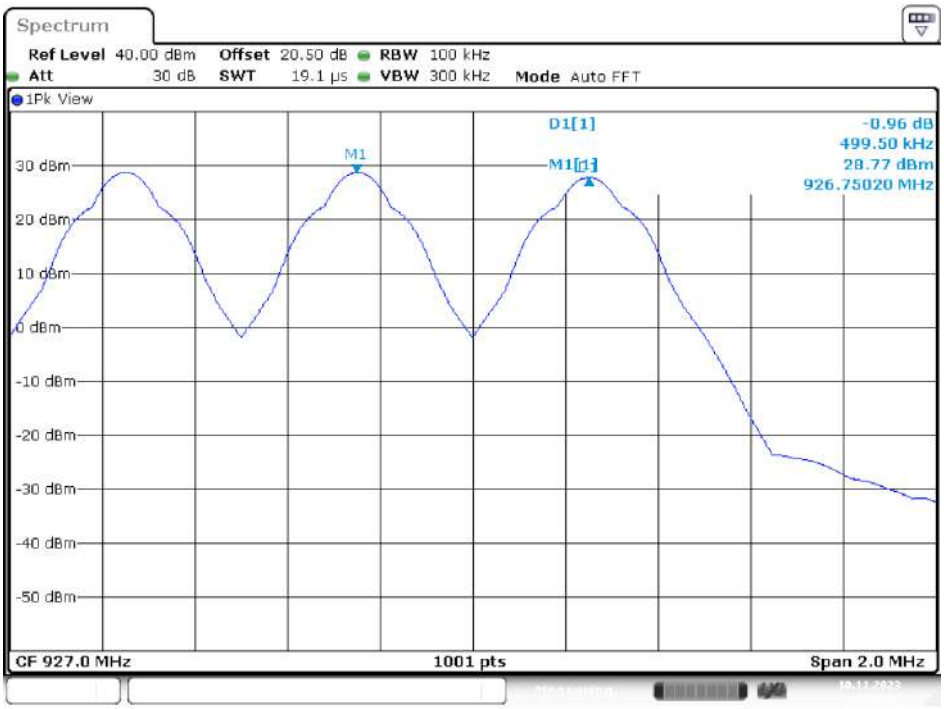
Date: 10.NOV.2023 13:25:21

Middle Channel



Date: 10.NOV.2023 13:24:33

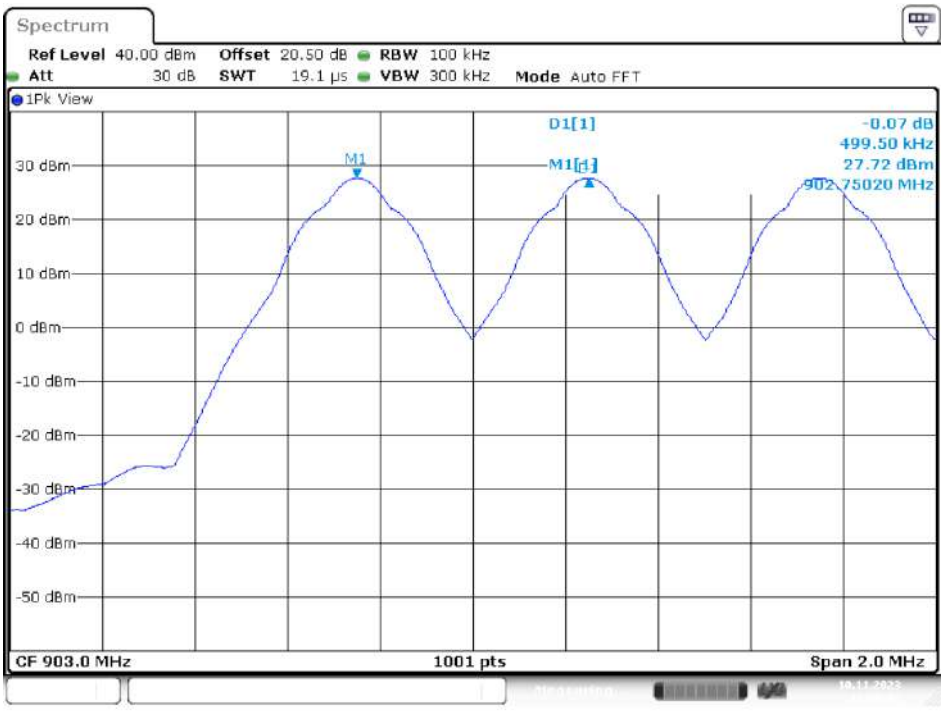
High Channel



Date: 10.NOV.2023 13:23:57

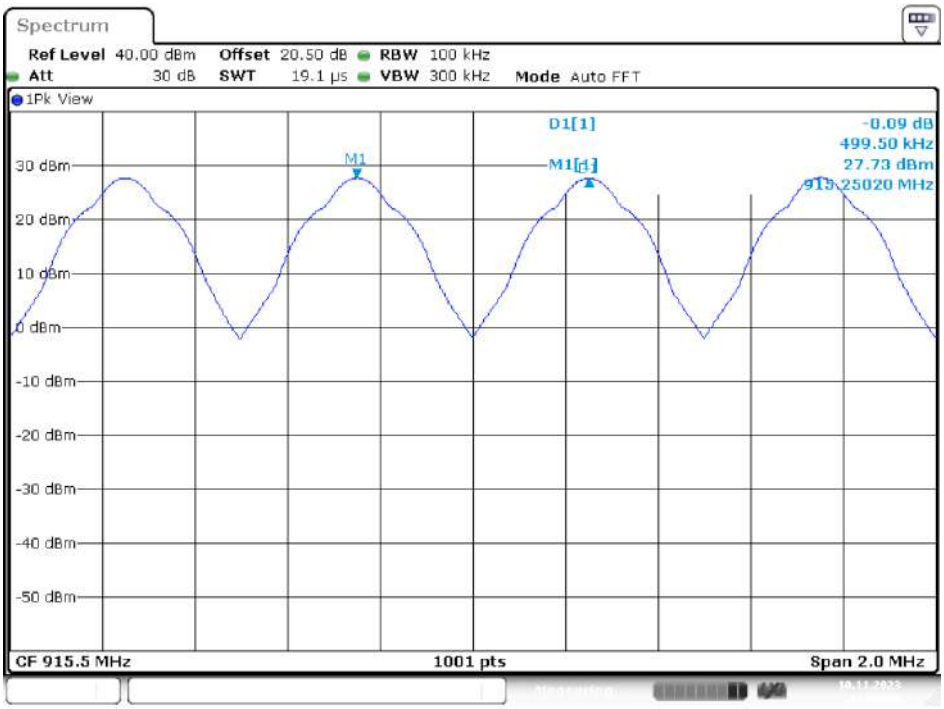
PR-ASK Mode Antenna Port 4

Low Channel



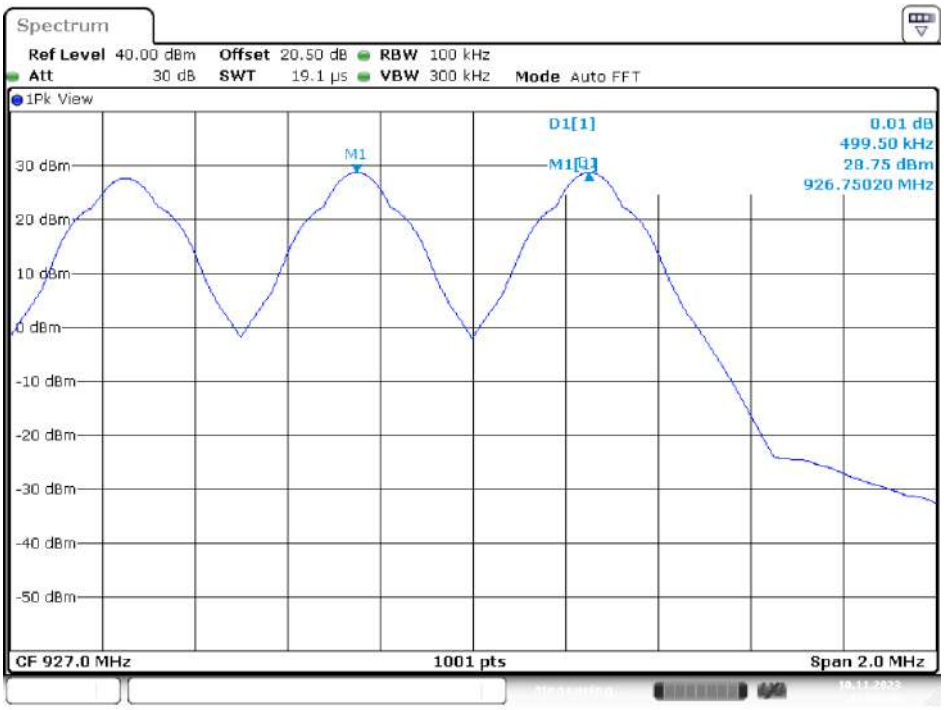
Date: 10.NOV.2023 13:26:32

Middle Channel



Date: 10.NOV.2023 13:27:11

High Channel



Date: 10.NOV.2023 13:27:46

11. FCC§15.247(a)(1)(i) –Time of Occupancy (Dwell Time)

11.1. Applicable Standard

According to FCC §15.247(a) (1) (i).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

11.2. Test Procedure

According to ANSI C63.10-2013 Section 7.8.4

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel.

RBW ≤ channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel.

Sweep = as necessary to capture the entire dwell time per hopping channel.

Detector function = peak.

Trace = max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements.

Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) x (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

11.3. Test Results

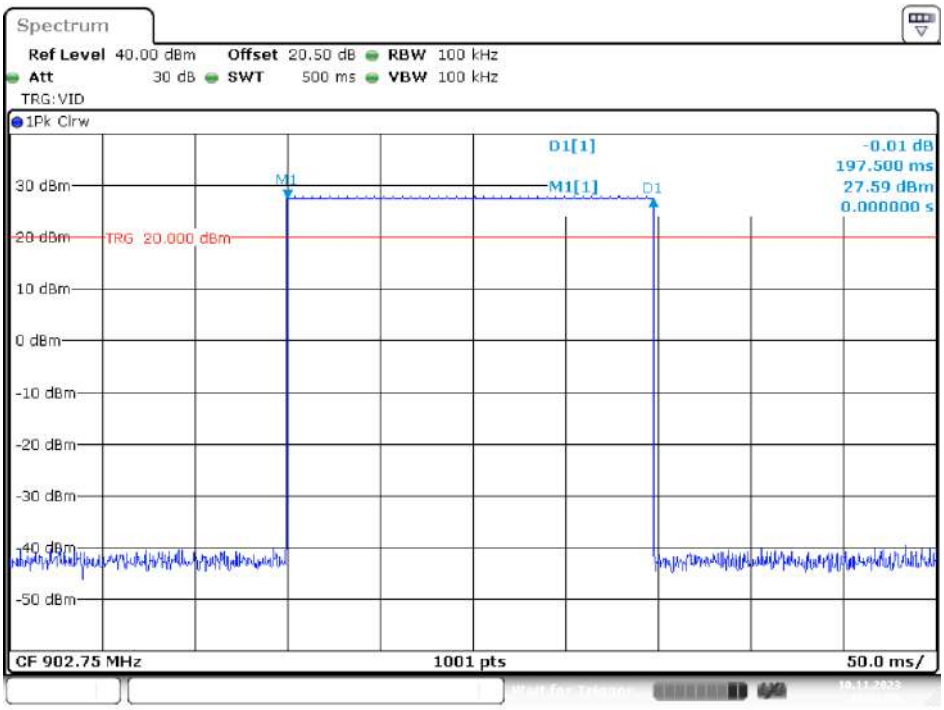
Antenna Port	Pulse Time (ms)	Hopping Number	Period Time (s)	Total of Dwell (ms)	Limit (ms)	Result
Test mode: DSB-ASK mode / 902.75~927.25MHz						
1	197.50	1	10	197.50	<400	PASS
2	197.50	1	10	197.50	<400	PASS
3	197.50	1	10	197.50	<400	PASS
4	197.50	1	10	197.50	<400	PASS
Test mode: PR-ASK mode / 902.75~927.25MHz						
1	197.50	2	20	395	<400	PASS
2	197.50	2	20	395	<400	PASS
3	197.50	2	20	395	<400	PASS
4	197.50	2	20	395	<400	PASS

Note: Total of Dwell=Pulse Time * Hopping Number

Please refer to the following plots

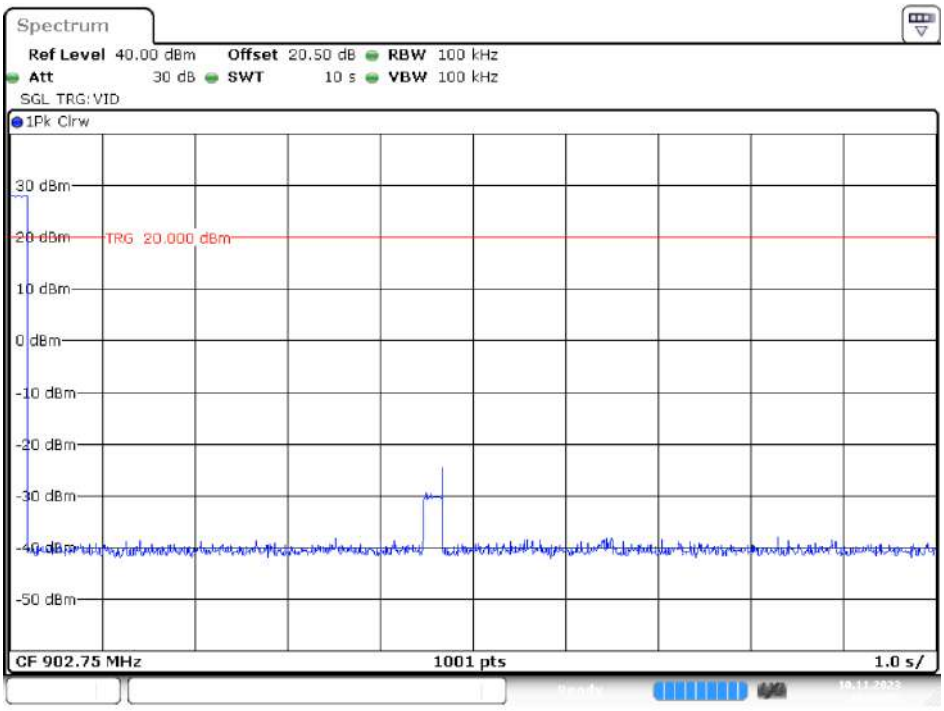
DSB-ASK Mode Antanne Port 1

Pulse Width



Date: 10.NOV.2023 14:31:30

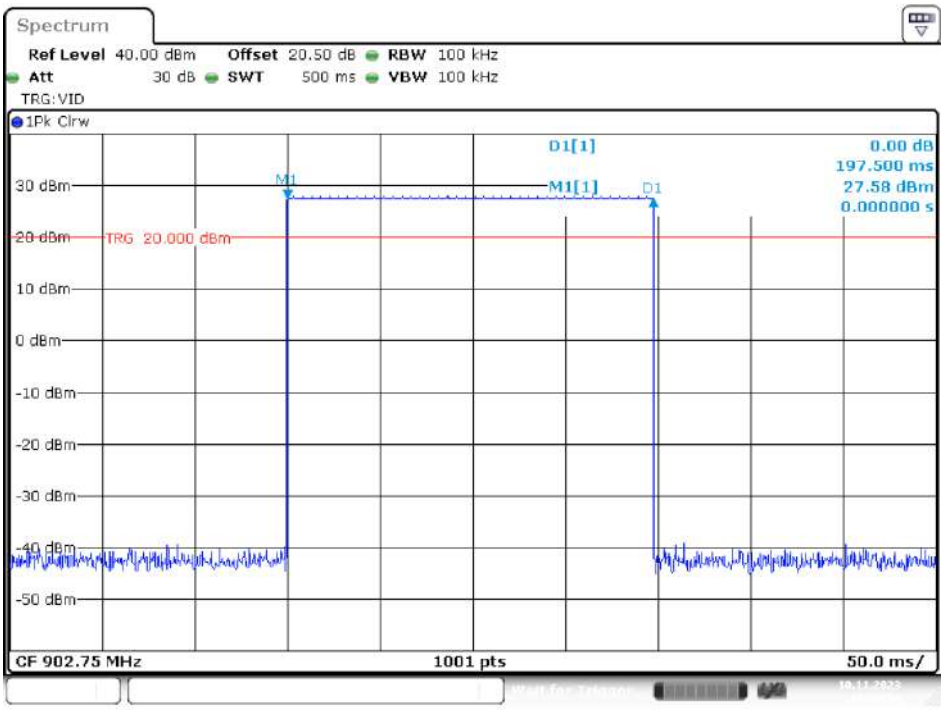
Hopping Number



Date: 10.NOV.2023 14:32:25

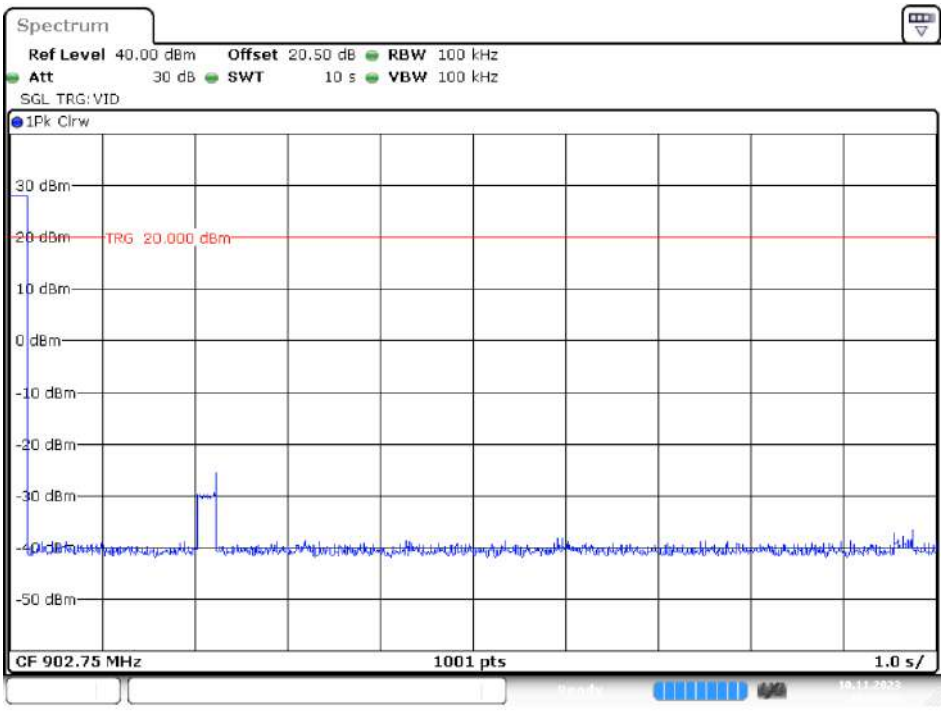
DSB-ASK Mode Antanne Port 2

Pulse Width



Date: 10.NOV.2023 14:33:55

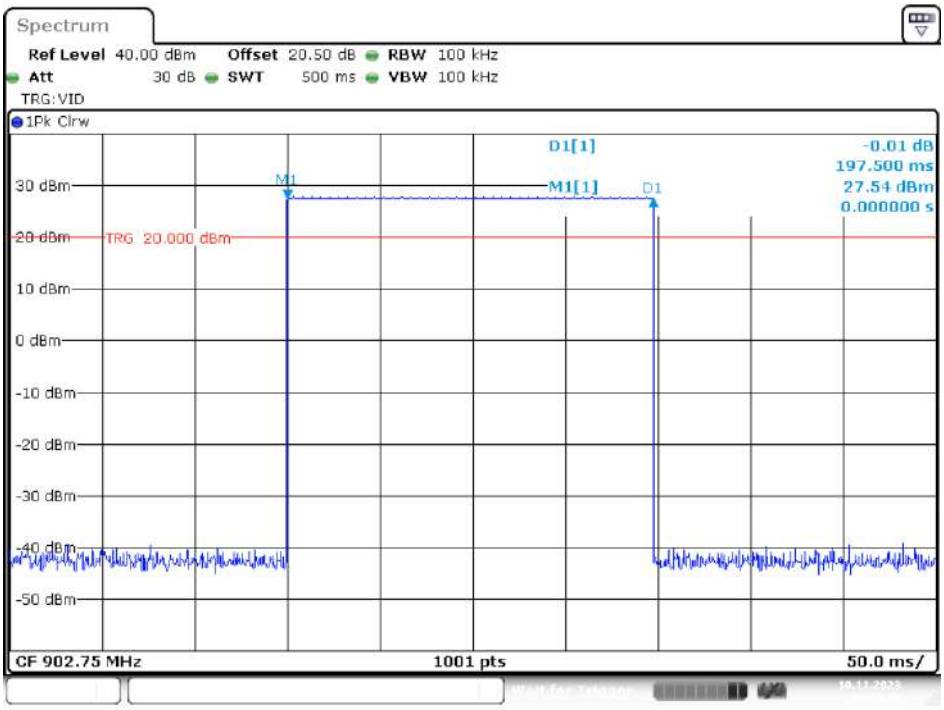
Hopping Number



Date: 10.NOV.2023 14:33:26

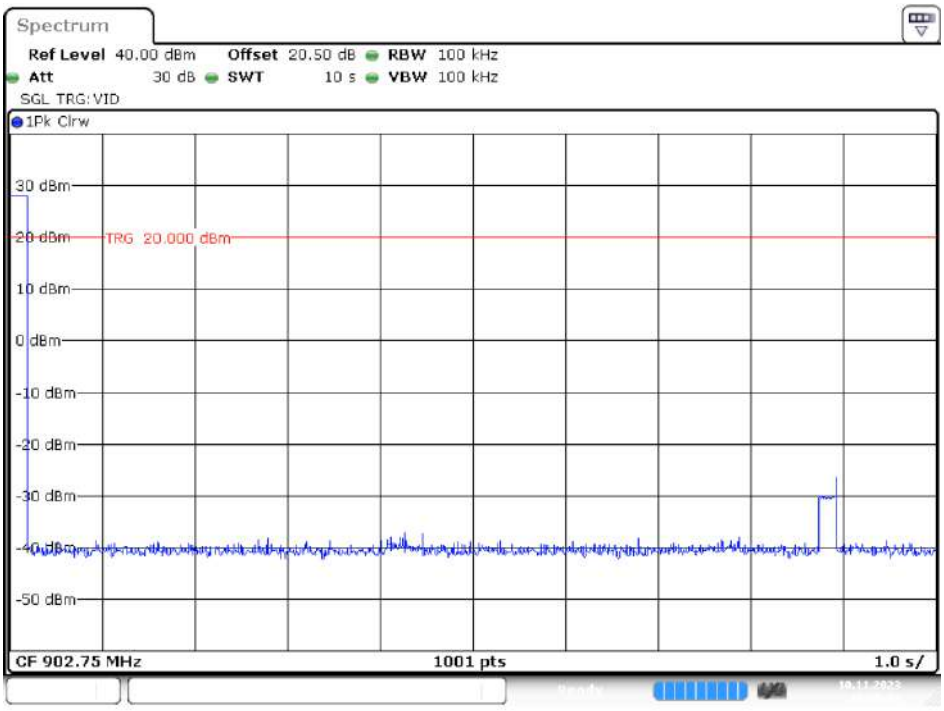
DSB-ASK Mode Antanne Port 3

Pulse Width



Date: 10.NOV.2023 14:34:47

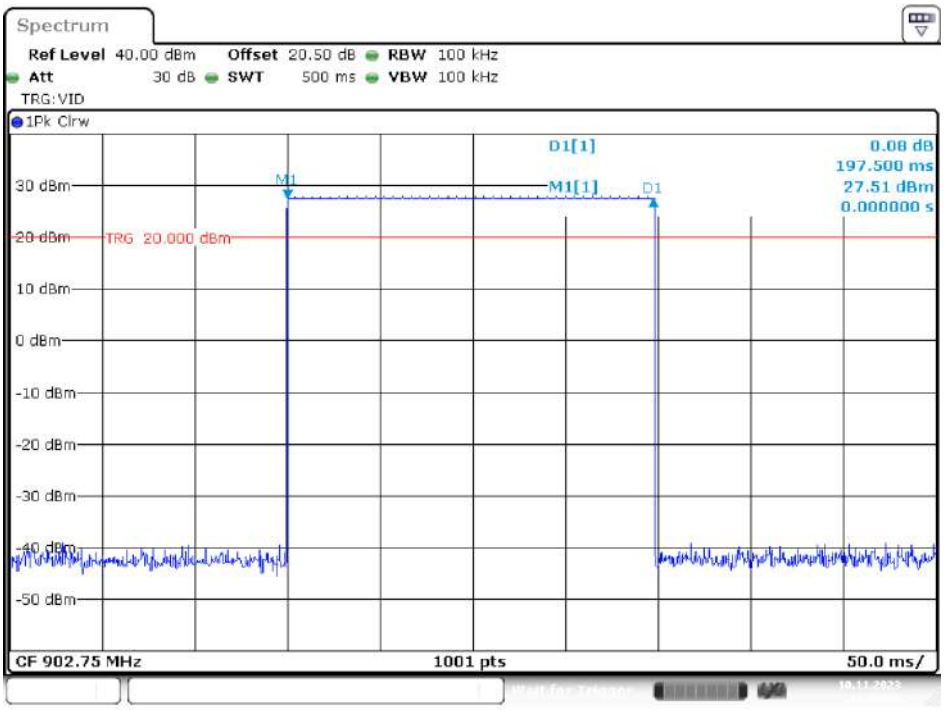
Hopping Number



Date: 10.NOV.2023 14:35:35

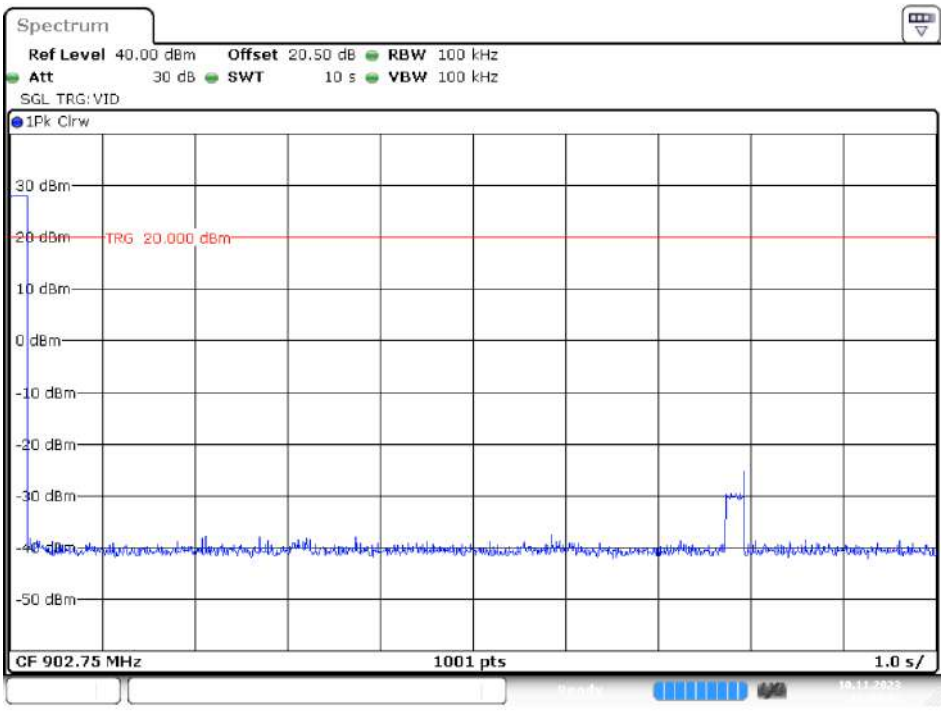
DSB-ASK Mode Antanne Port 4

Pulse Width



Date: 10.NOV.2023 13:43:09

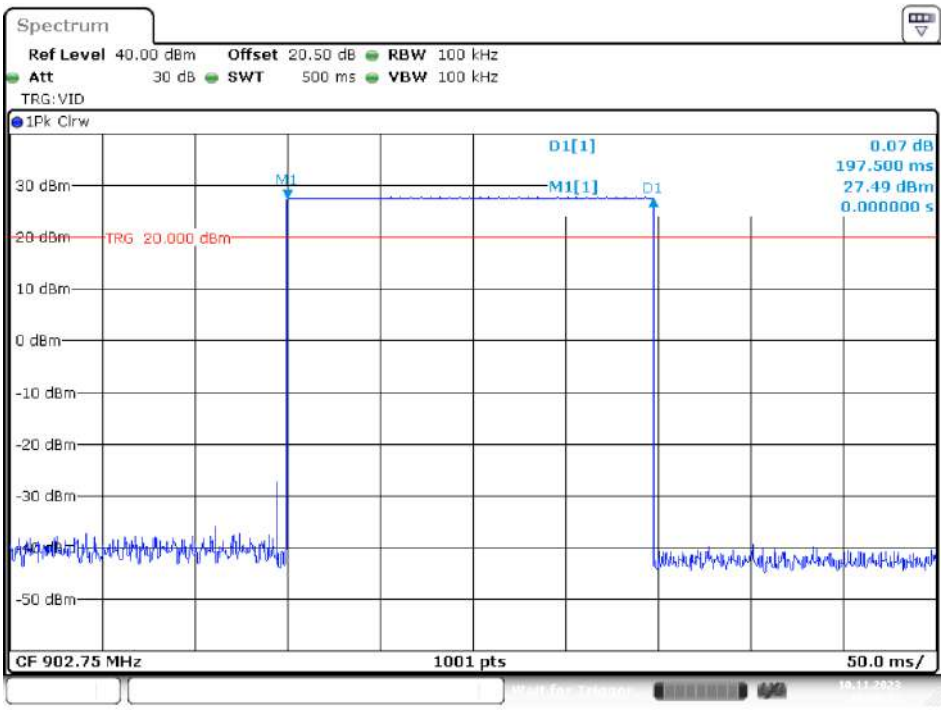
Hopping Number



Date: 10.NOV.2023 13:44:04

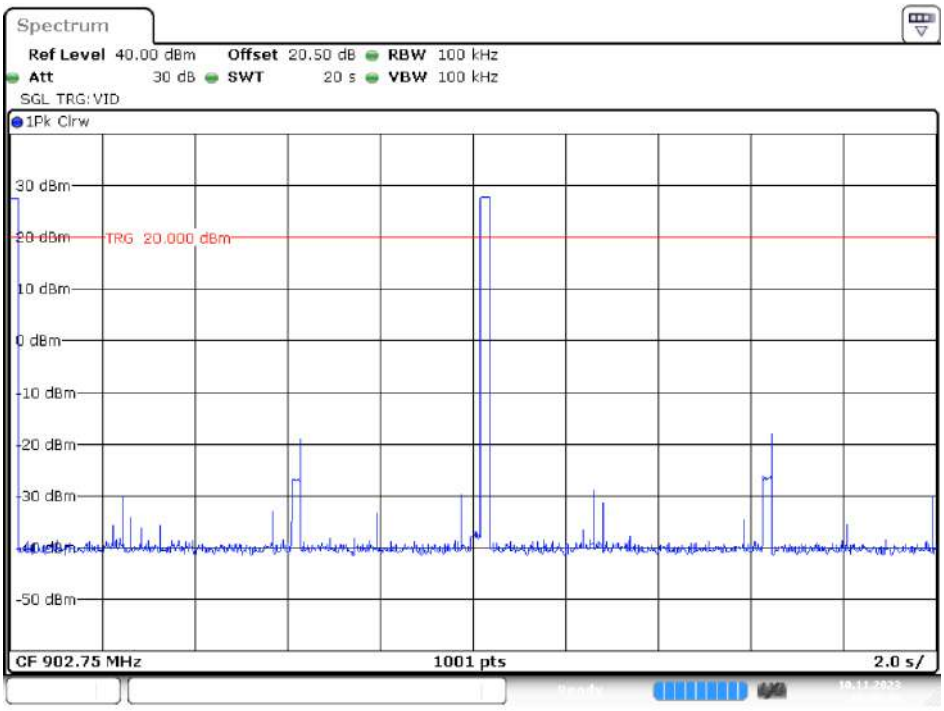
PR-ASK Mode Antanne Port 1

Pulse Width



Date: 10.NOV.2023 14:39:23

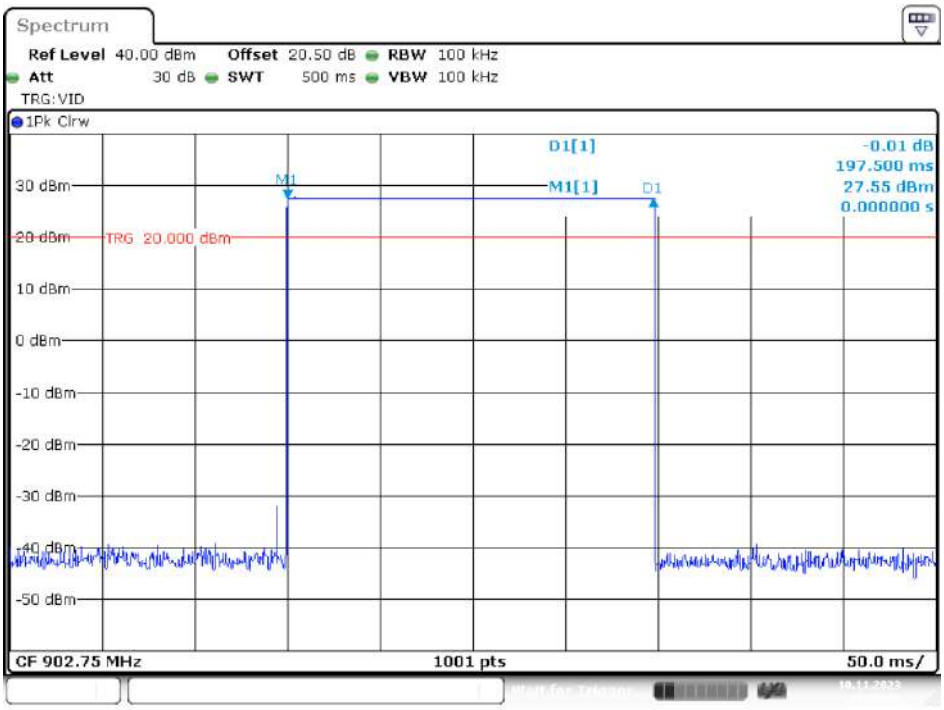
Hopping Number



Date: 10.NOV.2023 14:40:50

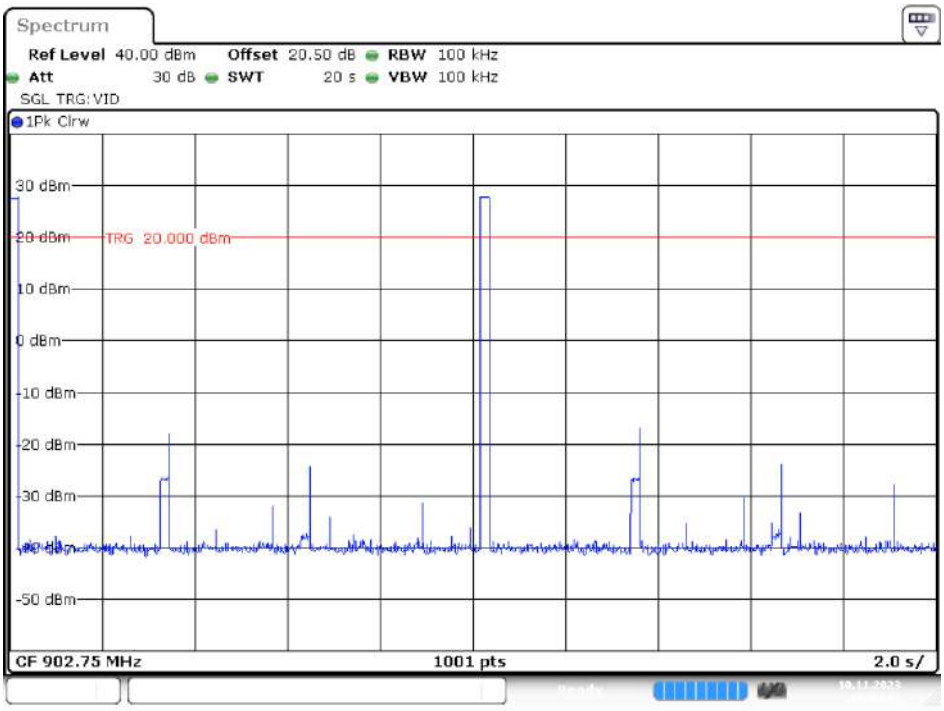
PR-ASK Mode Antanne Port 2

Pulse Width



Date: 10.NOV.2023 14:43:25

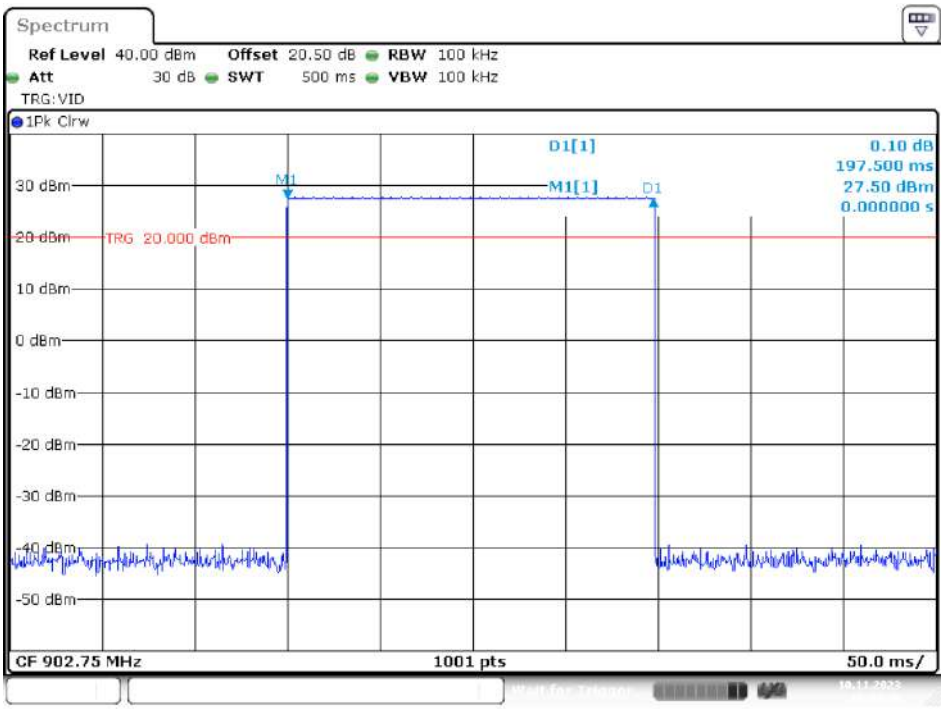
Hopping Number



Date: 10.NOV.2023 14:42:32

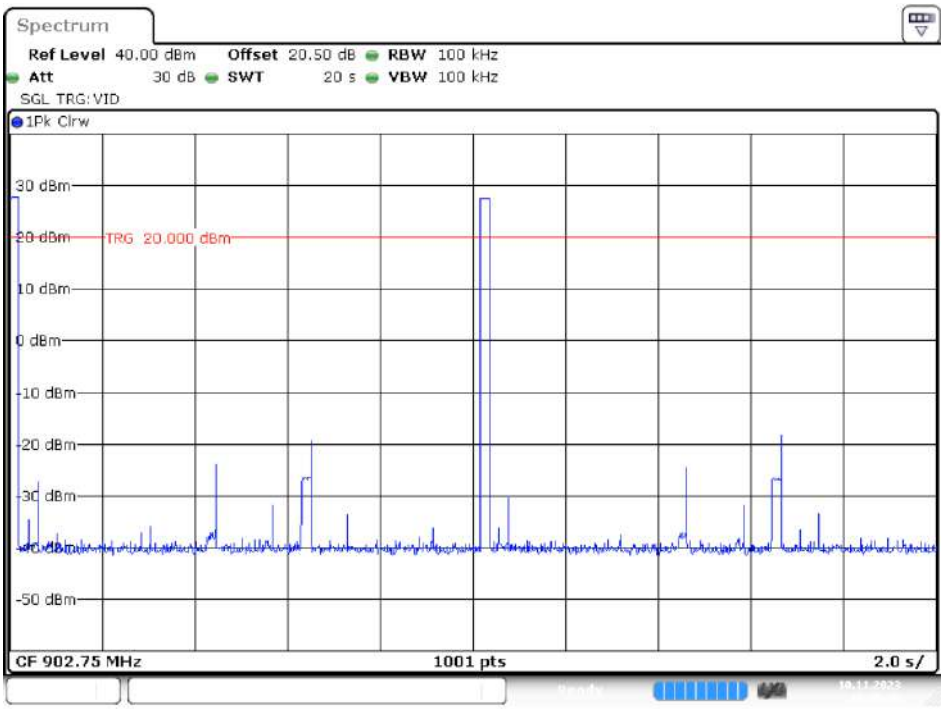
PR-ASK Mode Antanne Port 3

Pulse Width



Date: 10.NOV.2023 14:44:39

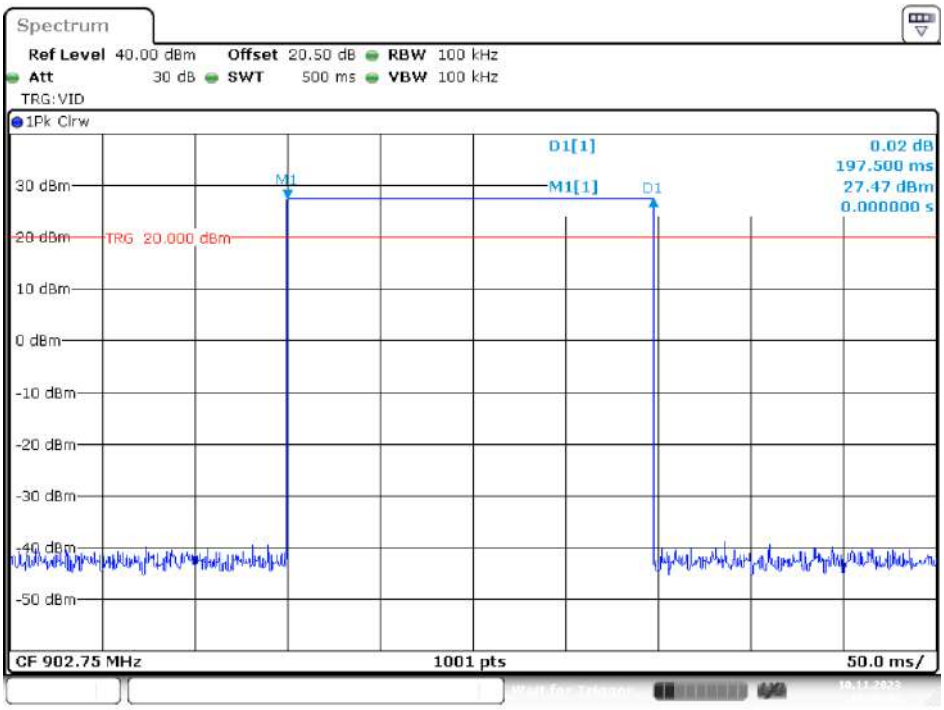
Hopping Number



Date: 10.NOV.2023 14:45:36

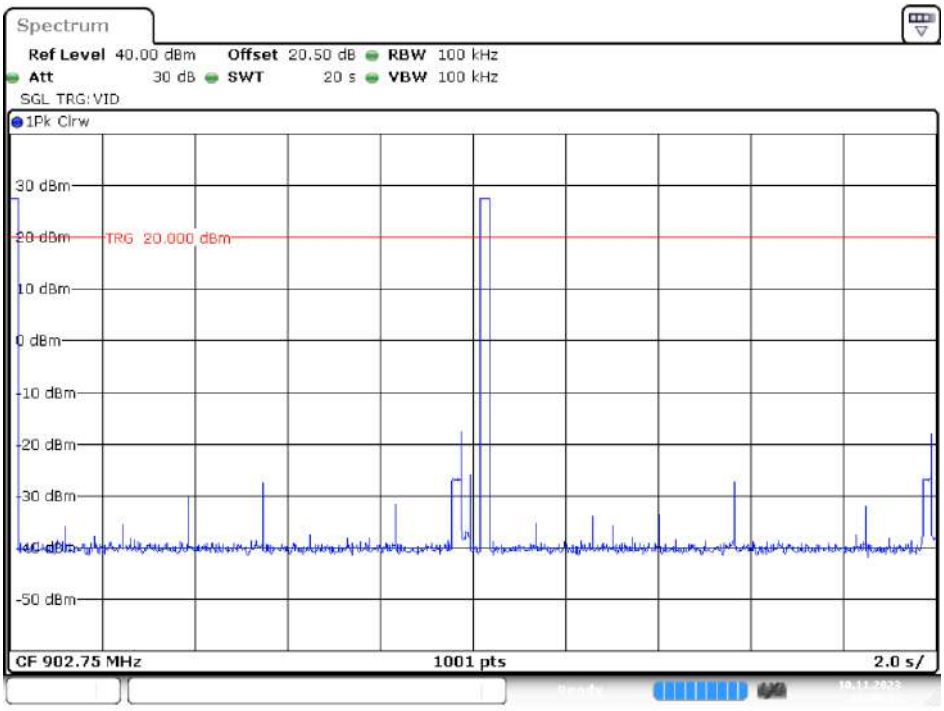
PR-ASK Mode Antanne Port 4

Pulse Width



Date: 10.NOV.2023 14:48:54

Hopping Number



Date: 10.NOV.2023 14:48:23

12. FCC §15.247(a)(1)(i) –Quantity of hopping channel Test

12.1. Applicable Standard

According to FCC §15.247(a) (1) (i).

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

12.2. Test Procedure

According to ANSI C63.10-2013 Section 7.8.3

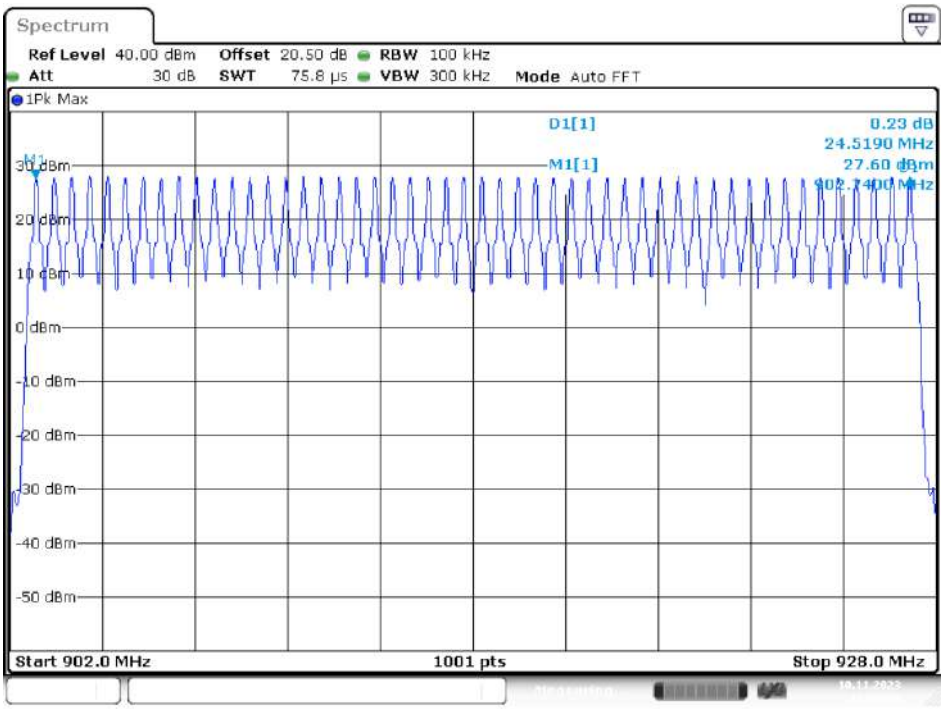
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

12.3. Test Results

Mode	Frequency Range (MHz)	Number of Hopping Channel				Limit	Result
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4		
DSB-ASK	902.75~927.25	50				≥25	Pass
PR-ASK	902.75~927.25	50				≥50	Pass

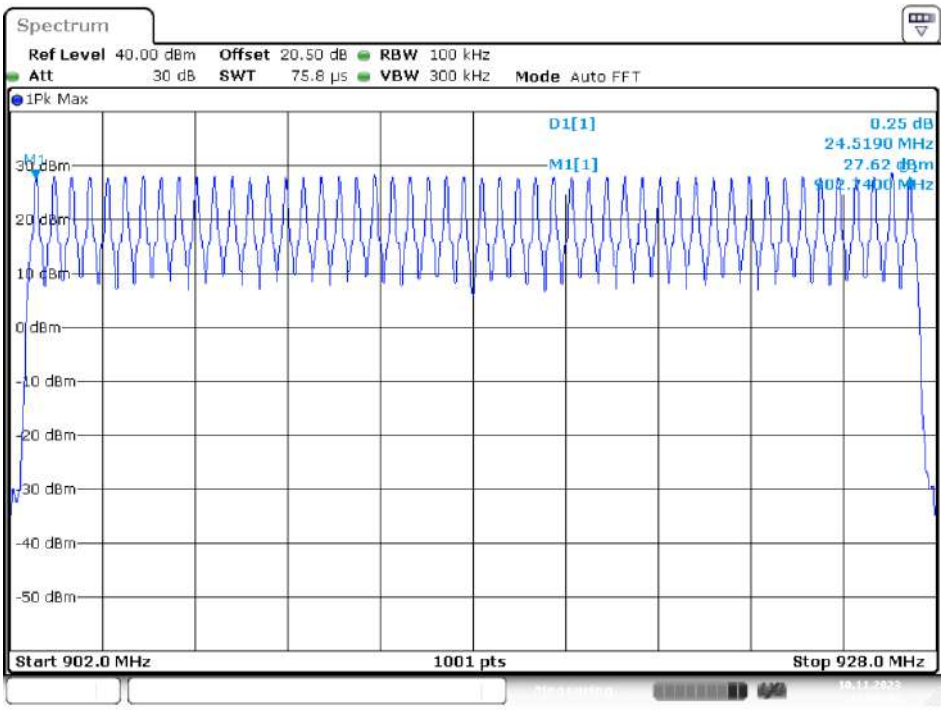
Please refer to the following plots

DSB-ASK Mode Antenna Port 1



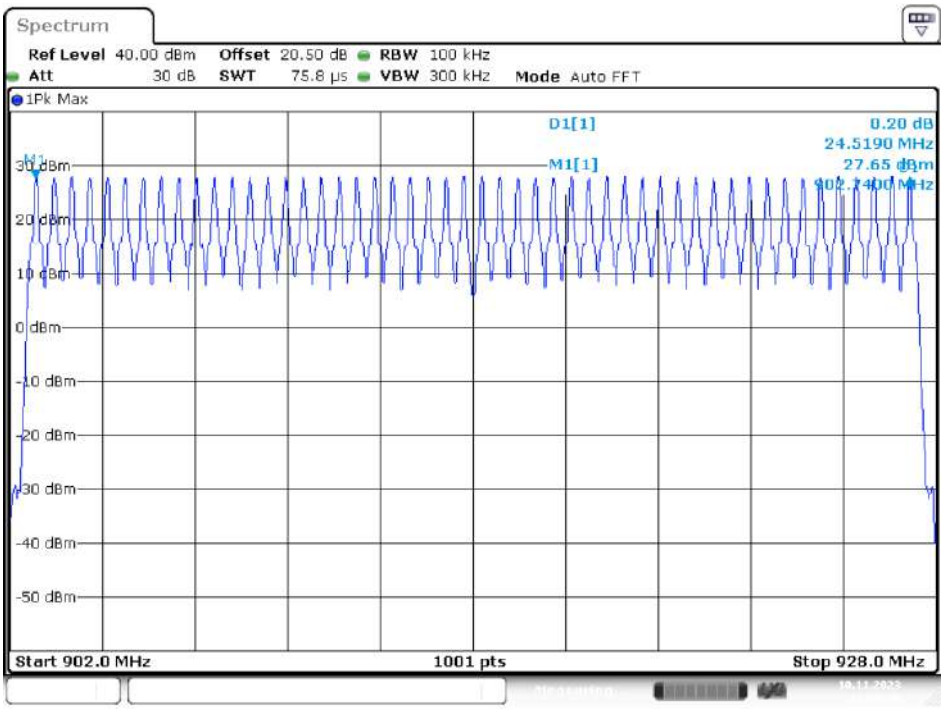
Date: 10.NOV.2023 13:37:58

DSB-ASK Mode Antenna Port 2



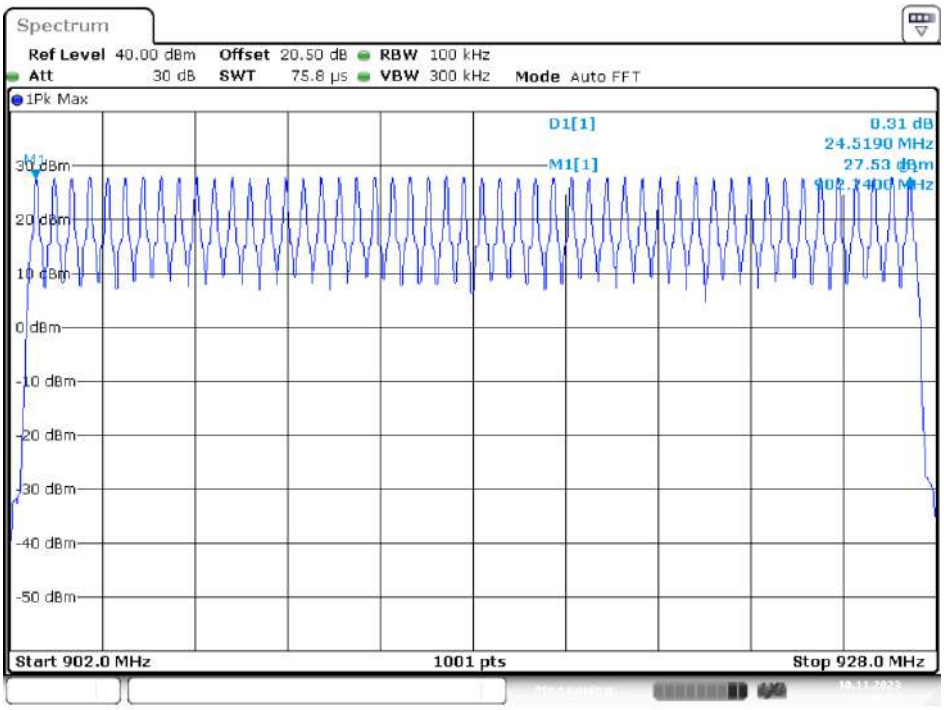
Date: 10.NOV.2023 13:36:04

DSB-ASK Mode Antenna Port 3



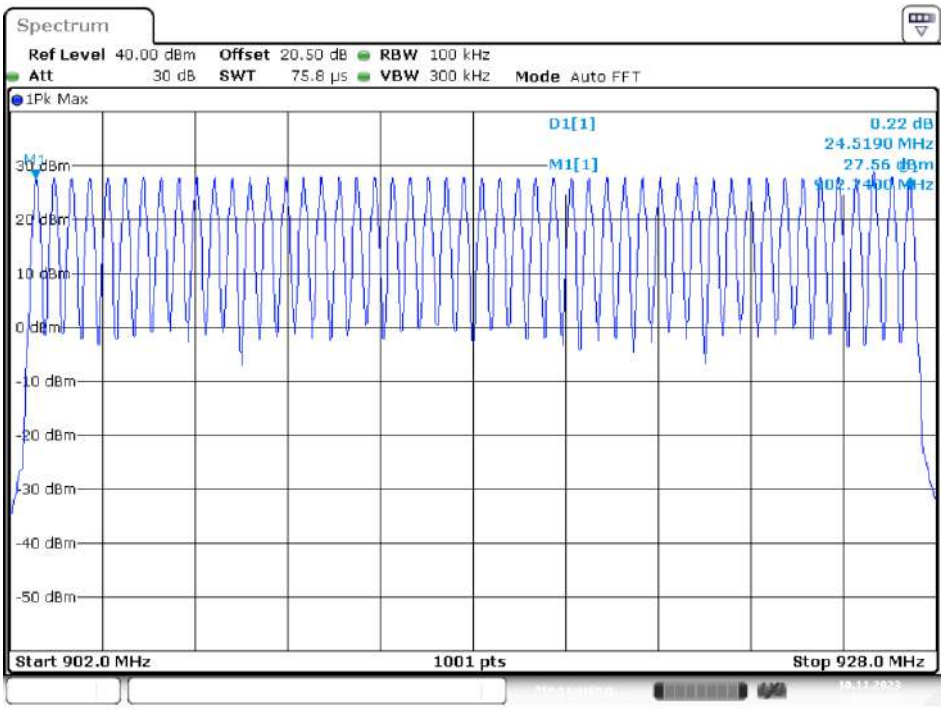
Date: 10.NOV.2023 13:38:49

DSB-ASK Mode Antenna Port 4



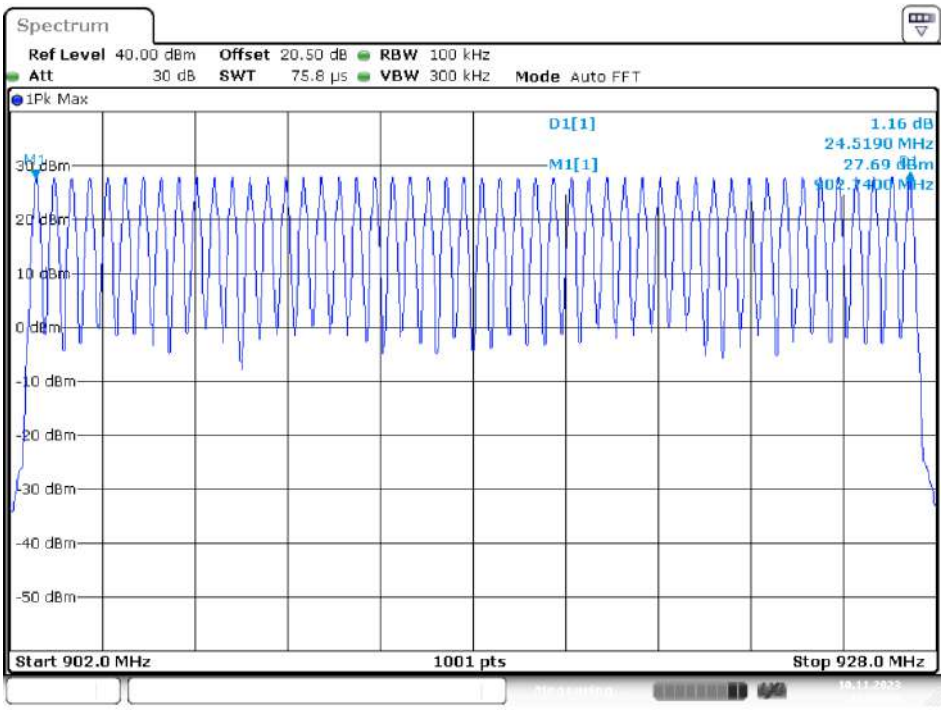
Date: 10.NOV.2023 13:40:23

PR-ASK Mode Antenna Port 1



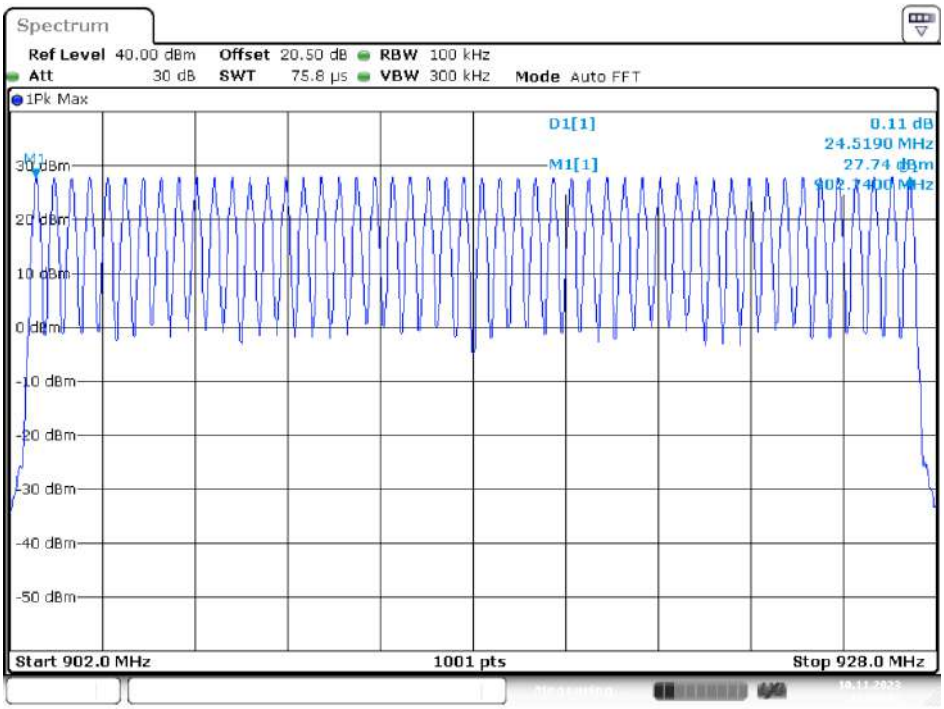
Date: 10.NOV.2023 13:34:35

PR-ASK Mode Antenna Port 2



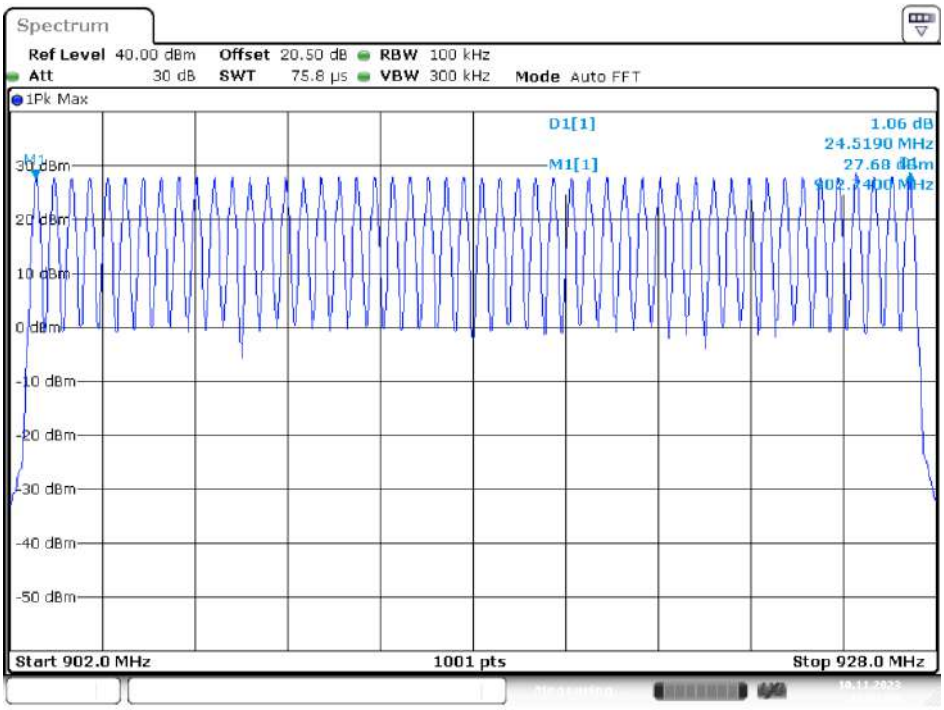
Date: 10.NOV.2023 13:33:40

PR-ASK Mode Antenna Port 3



Date: 10.NOV.2023 13:32:42

PR-ASK Mode Antenna Port 4



Date: 10.NOV.2023 13:31:08

13. FCC §15.247(b)(2) – Maximum Output Power

13.1. Applicable Standard

According to FCC §15.247(b) (2).

For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

13.2. Test Procedure

According to ANSI C63.10-2013 Section 7.8.5

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

13.3. Test Results

Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)				Limit (dBm)	Result
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4		
DSB-ASK Mode							
Low	902.75	28.75	28.79	28.72	28.73	30	PASS
Mid	915.25	28.76	28.81	28.73	28.75	30	PASS
High	927.25	29.49	29.47	29.46	29.62	30	PASS
PR-ASK Mode							
Low	902.75	28.52	28.56	28.53	28.51	30	PASS
Mid	915.25	28.56	28.57	28.59	28.52	30	PASS
High	927.25	29.74	29.65	29.61	29.36	30	PASS

14. FCC §15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

14.1. Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

14.2. Test Procedure

According to ANSI C63.10-2013 Section 7.8.6

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.

RBW = 100 kHz VBW = 300 kHz

Sweep = auto coupled

Detector function = peak , Trace = max hold

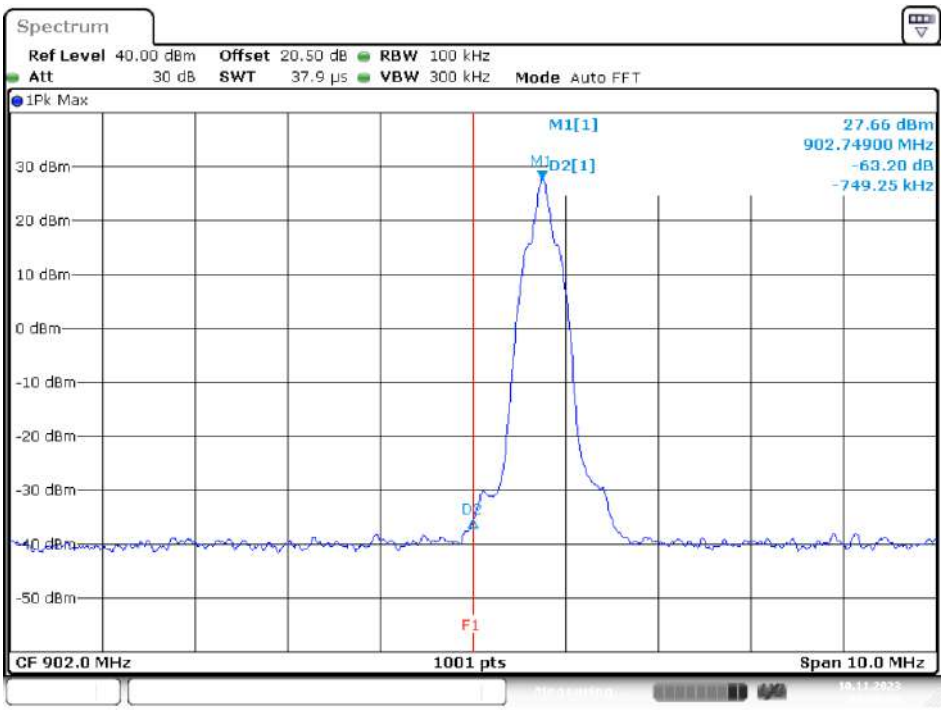
14.3. Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)				Limit (dBc)	Result
		Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4		
DSB-ASK Mode							
Low	902.75	63.20	63.84	62.78	63.27	≥ 20	PASS
High	927.25	63.58	64.08	63.85	64.26	≥ 20	PASS
DSB-ASK Hopping Mode							
Low	902.75	66.14	66.48	66.60	66.66	≥ 20	PASS
High	927.25	66.55	66.14	66.74	66.58	≥ 20	PASS
PR-ASK Mode							
Low	902.75	61.55	61.86	61.49	60.92	≥ 20	PASS
High	927.25	61.00	61.02	61.05	61.43	≥ 20	PASS
PR-ASK Hopping Mode							
Low	902.75	63.49	65.16	66.04	66.26	≥ 20	PASS
High	927.25	62.28	62.56	62.93	63.15	≥ 20	PASS

Please refer to the following plots.

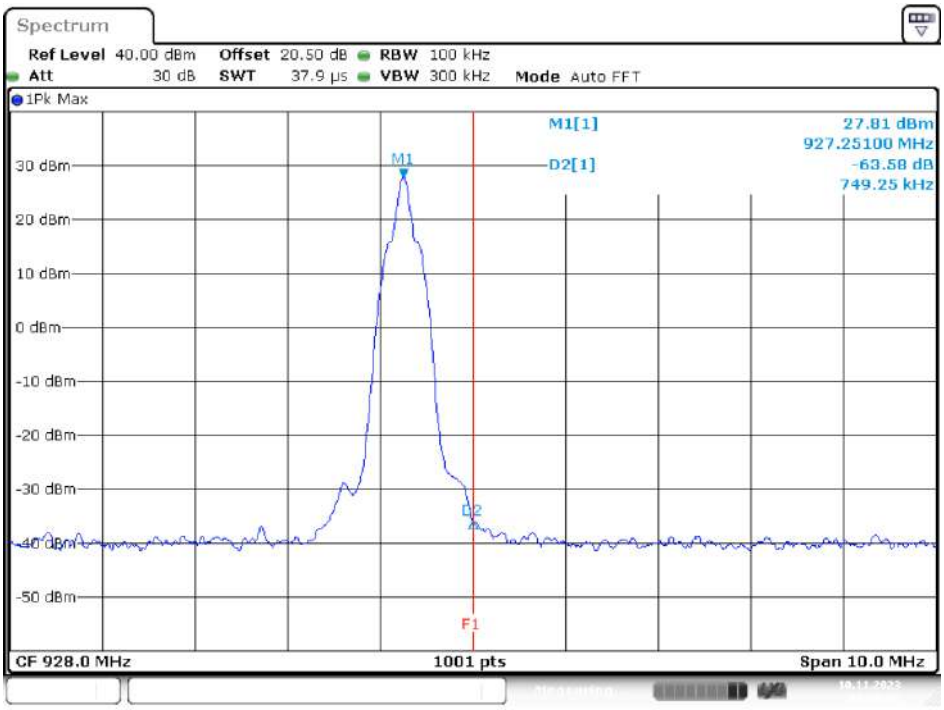
DSB-ASK Mode Antenna Port 1

Band Edge, CH Low



Date: 10.NOV.2023 09:58:18

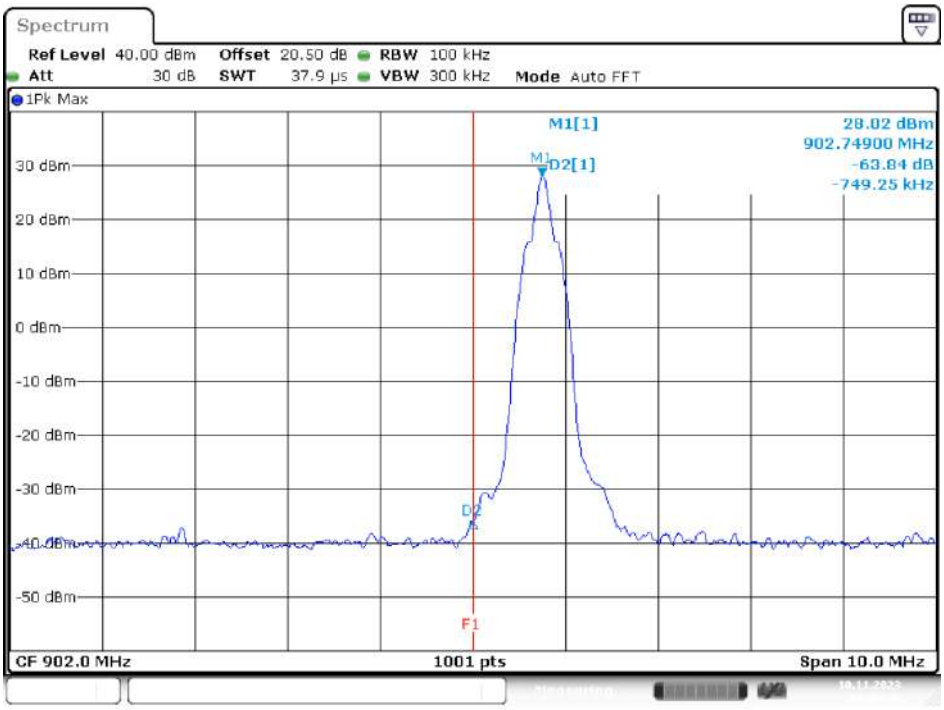
Band Edge, CH High



Date: 10.NOV.2023 09:56:22

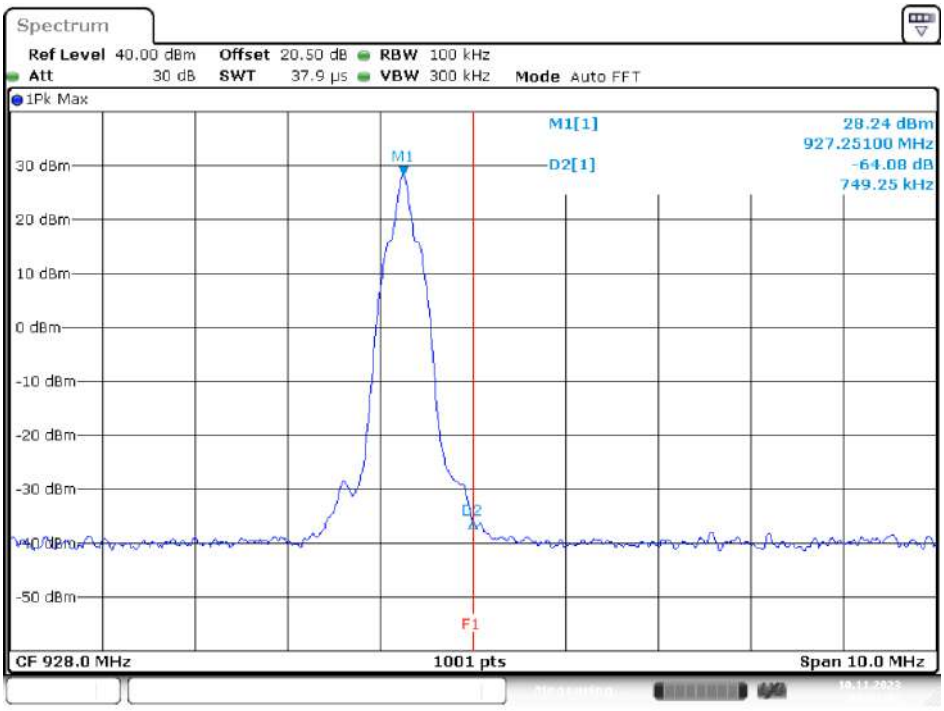
DSB-ASK Mode Antenna Port 2

Band Edge, CH Low



Date: 10.NOV.2023 09:43:48

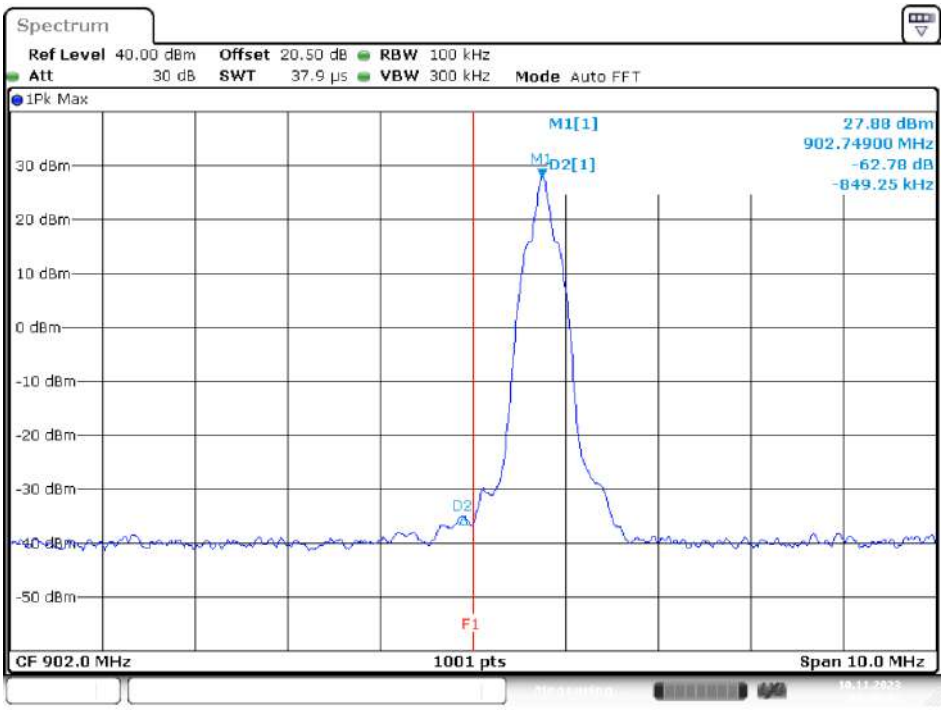
Band Edge, CH High



Date: 10.NOV.2023 09:51:43

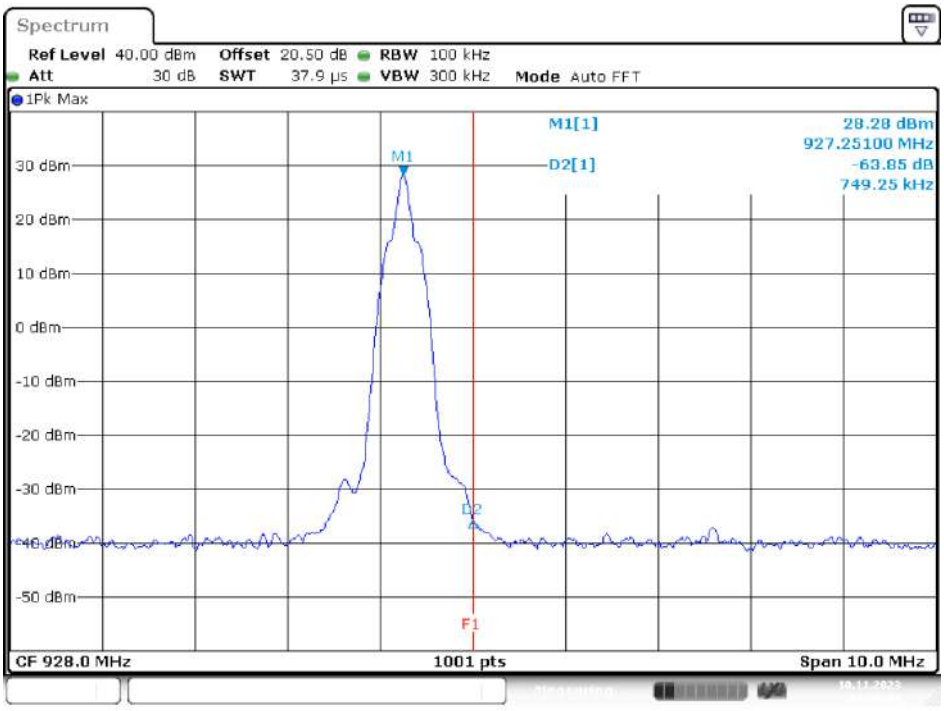
DSB-ASK Mode Antenna Port 3

Band Edge, CH Low



Date: 10.NOV.2023 09:46:15

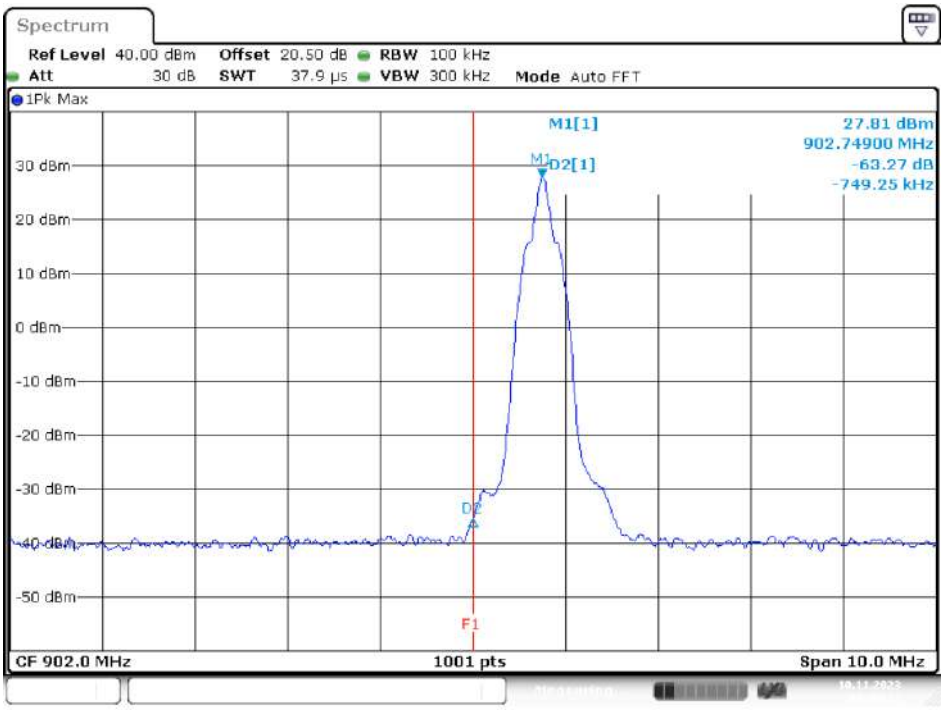
Band Edge, CH High



Date: 10.NOV.2023 09:50:44

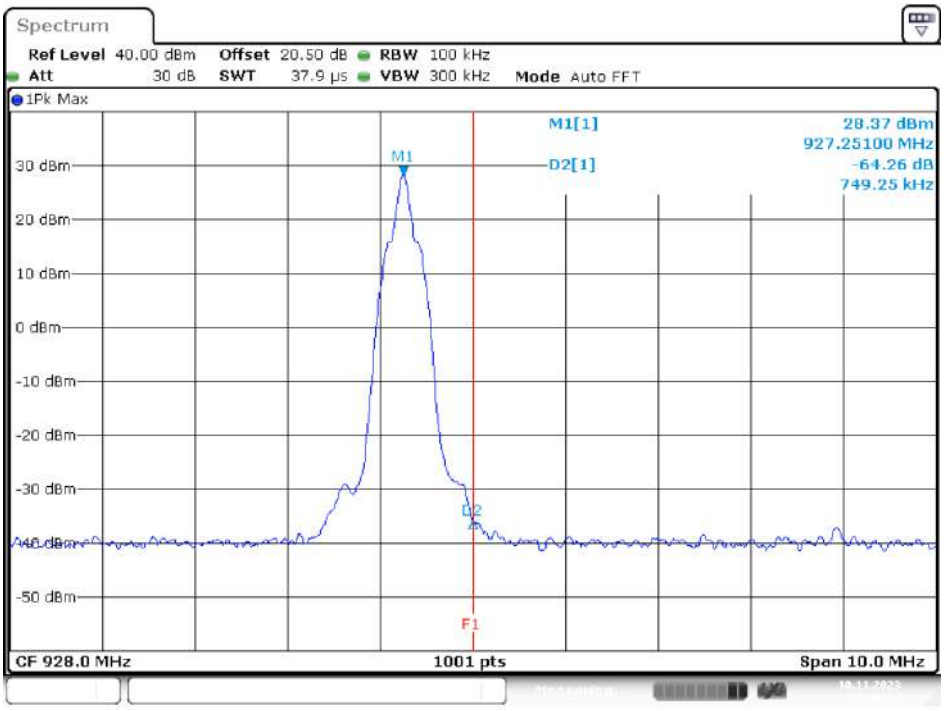
DSB-ASK Mode Antenna Port 4

Band Edge, CH Low



Date: 10.NOV.2023 09:47:22

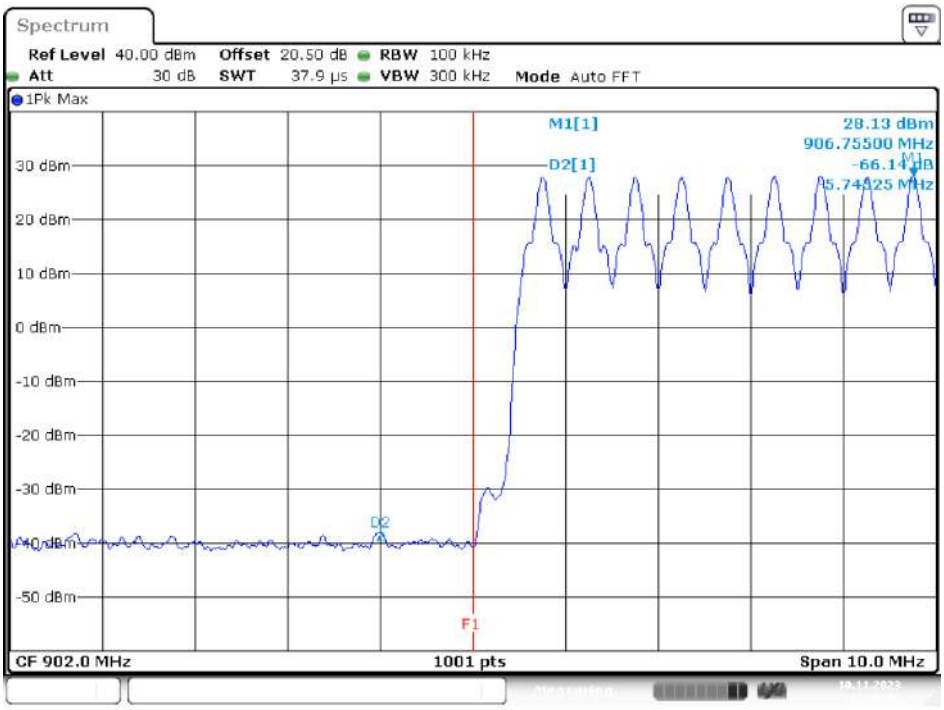
Band Edge, CH High



Date: 10.NOV.2023 09:49:27

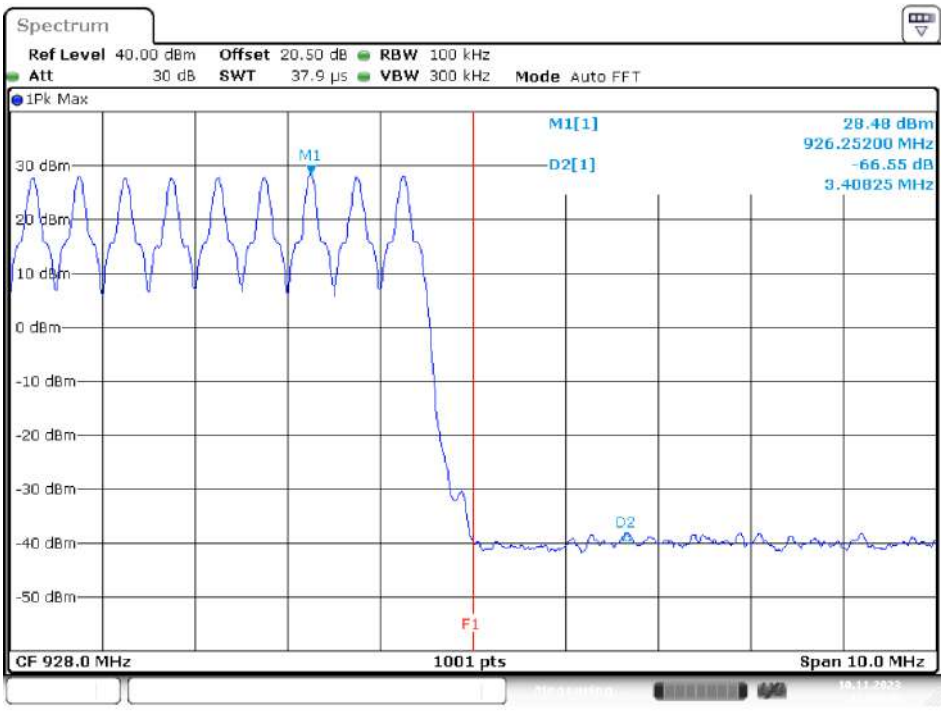
DSB-ASK Hopping Mode Antenna Port 1

Band Edge, CH Low



Date: 10.NOV.2023 11:00:33

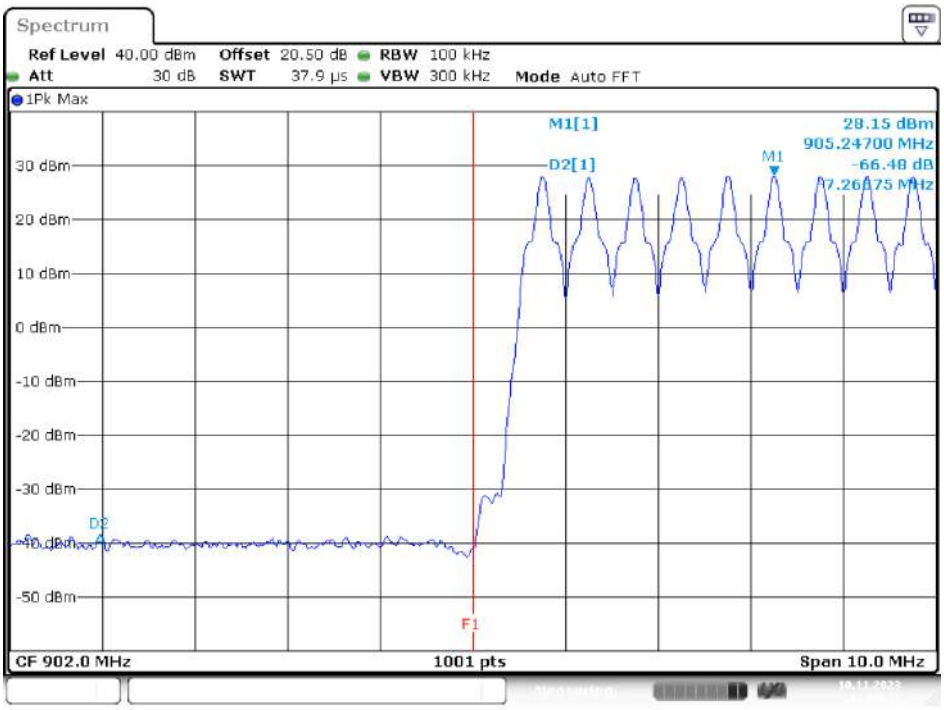
Band Edge, CH High



Date: 10.NOV.2023 11:03:46

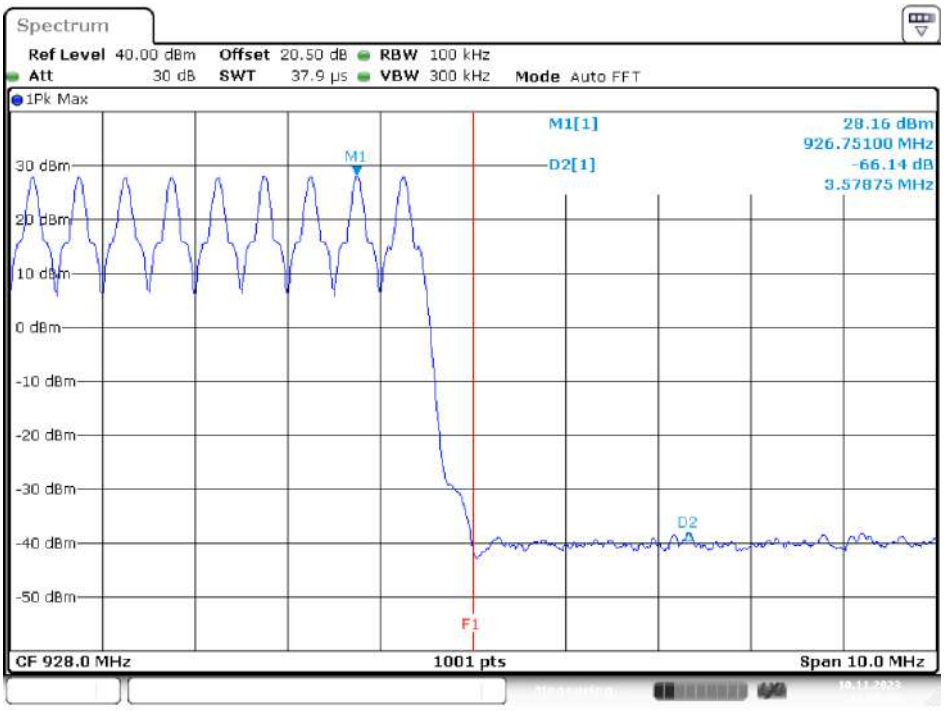
DSB-ASK Hopping Mode Antenna Port 2

Band Edge, CH Low



Date: 10.NOV.2023 11:06:18

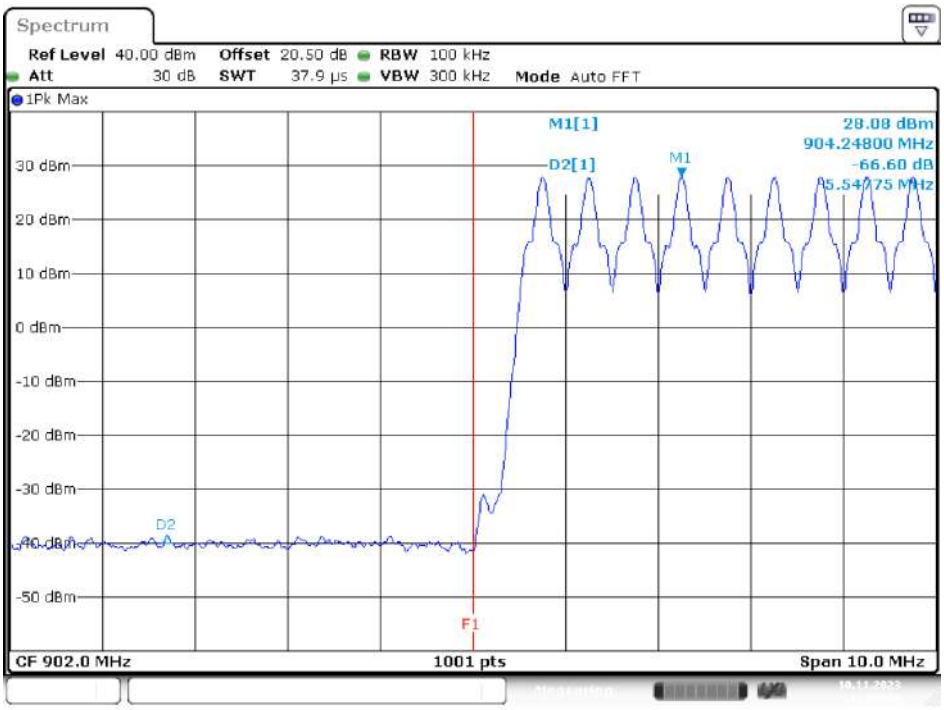
Band Edge, CH High



Date: 10.NOV.2023 11:05:06

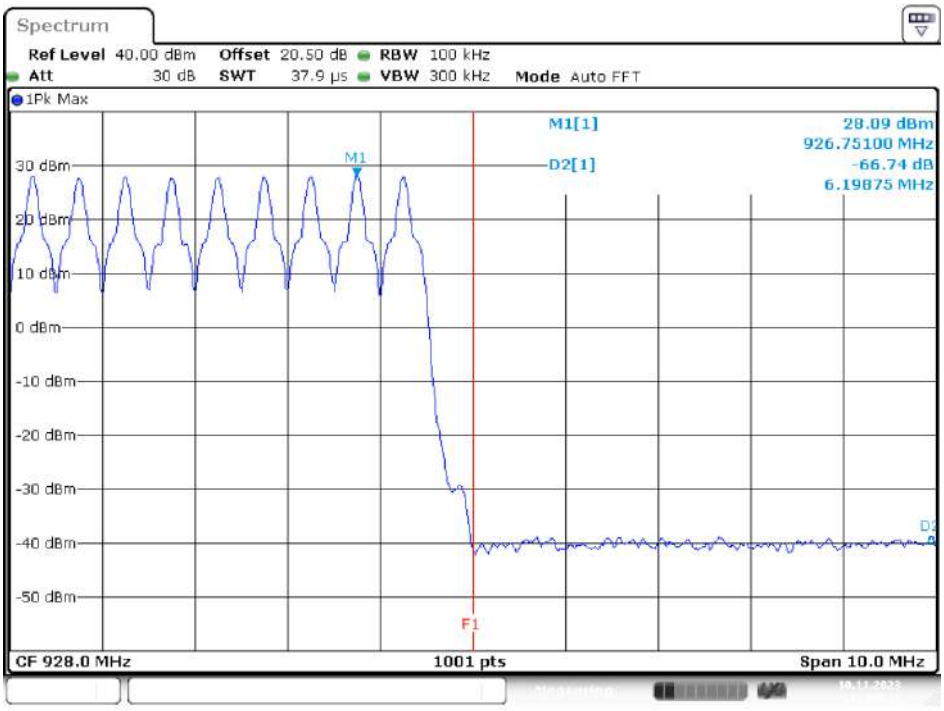
DSB-ASK Hopping Mode Antenna Port 3

Band Edge, CH Low



Date: 10.NOV.2023 11:07:34

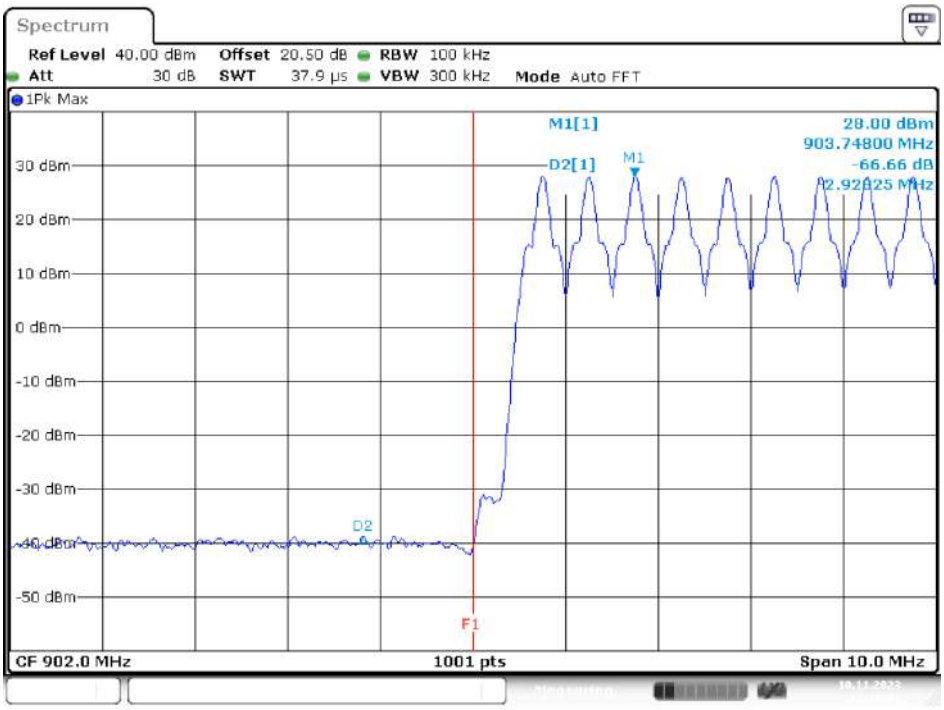
Band Edge, CH High



Date: 10.NOV.2023 11:08:27

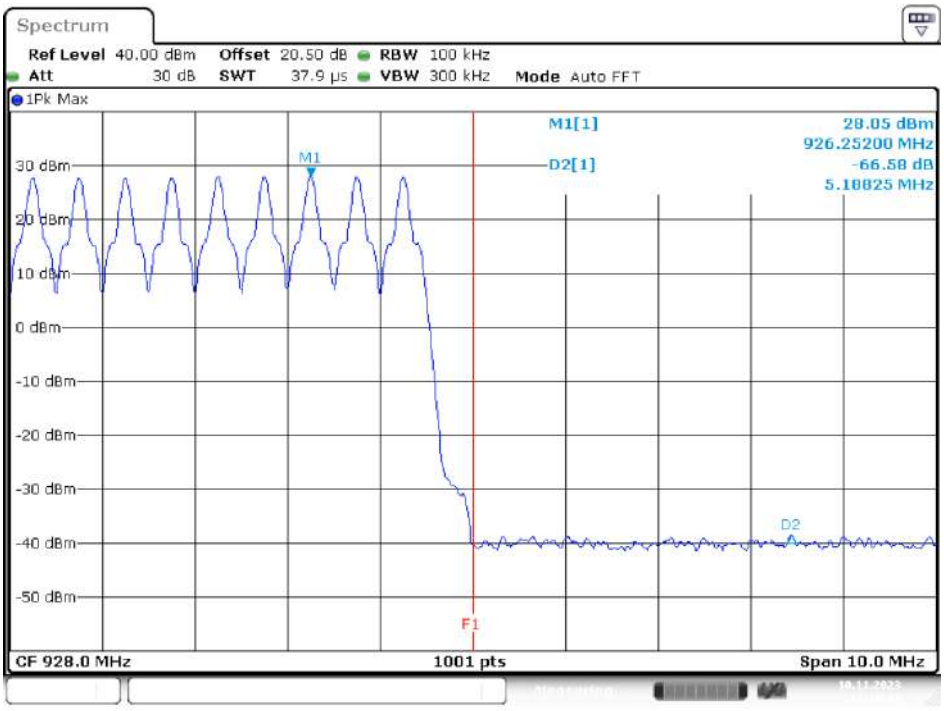
DSB-ASK Hopping Mode Antenna Port 4

Band Edge, CH Low



Date: 10.NOV.2023 11:10:57

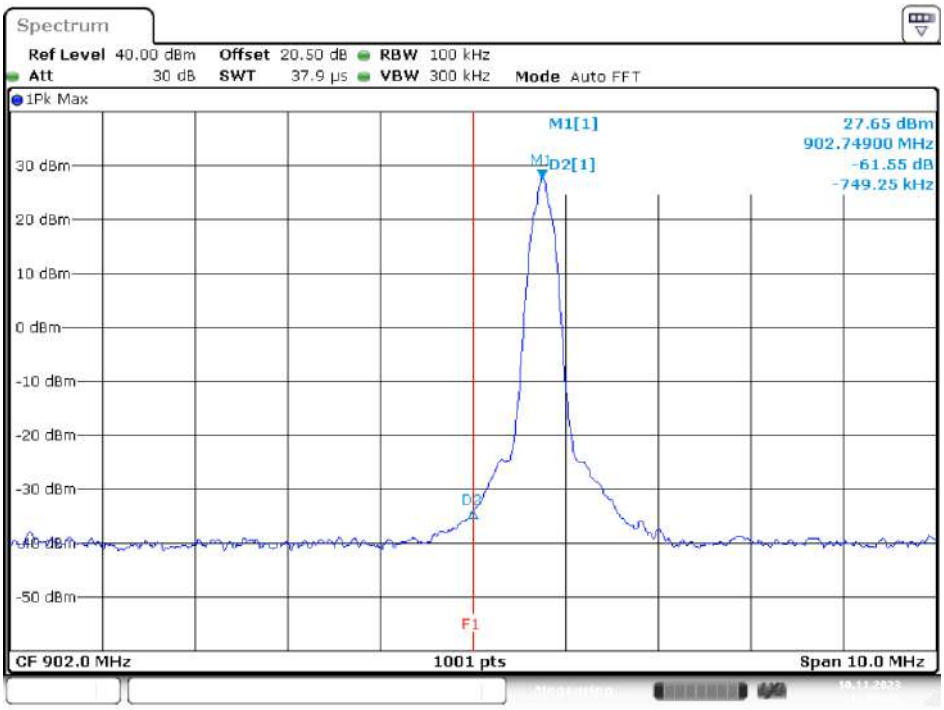
Band Edge, CH High



Date: 10.NOV.2023 11:10:15

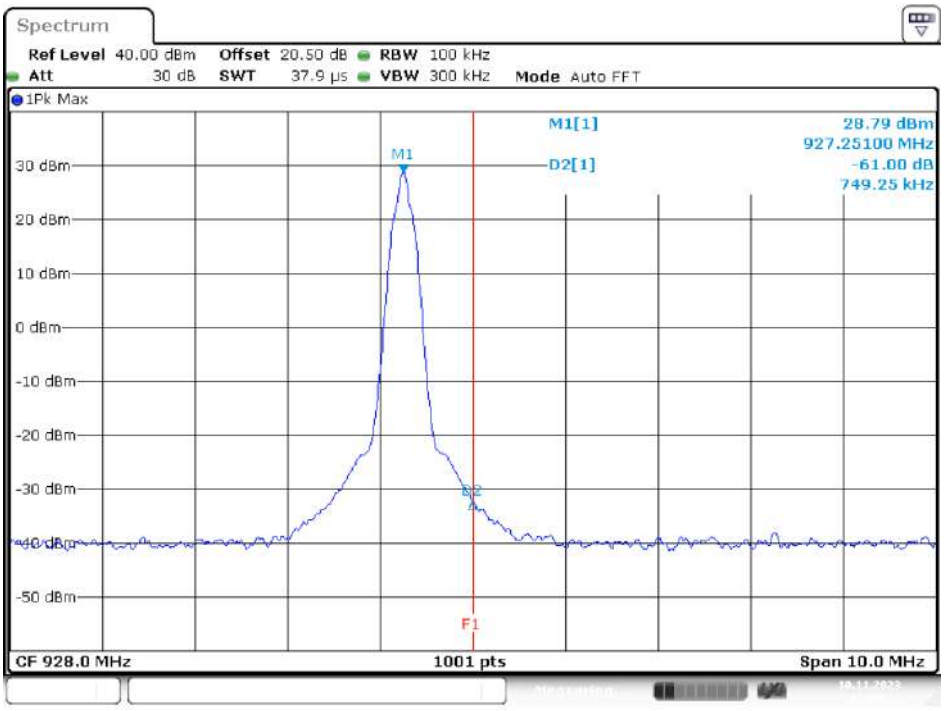
PR-ASK Mode Antenna Port 1

Band Edge, CH Low



Date: 10.NOV.2023 11:36:07

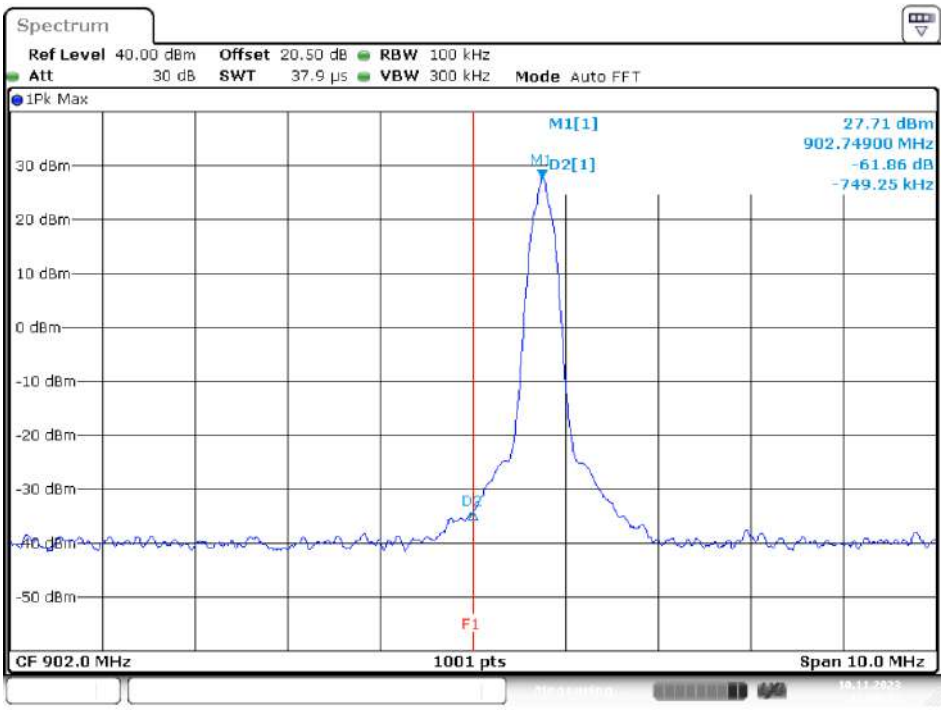
Band Edge, CH High



Date: 10.NOV.2023 11:37:13

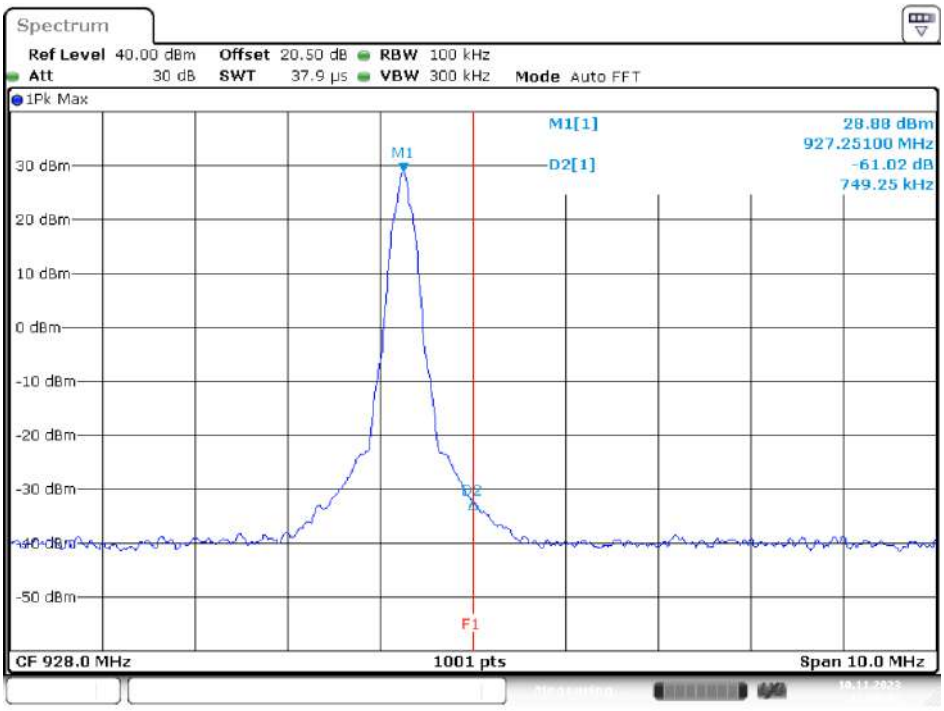
PR-ASK Mode Antenna Port 2

Band Edge, CH Low



Date: 10.NOV.2023 11:39:23

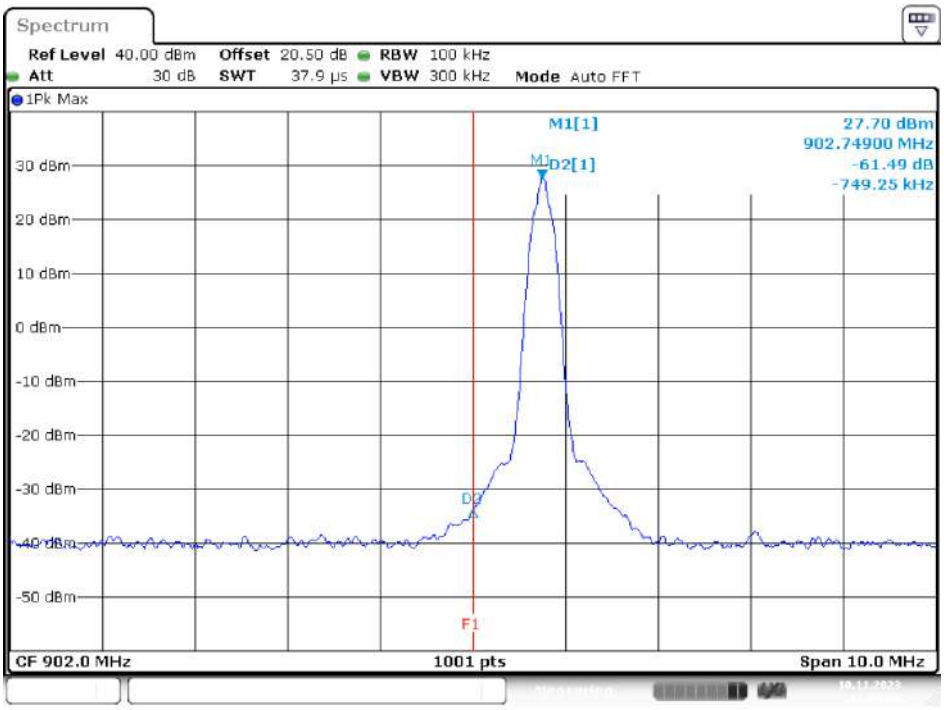
Band Edge, CH High



Date: 10.NOV.2023 11:38:31

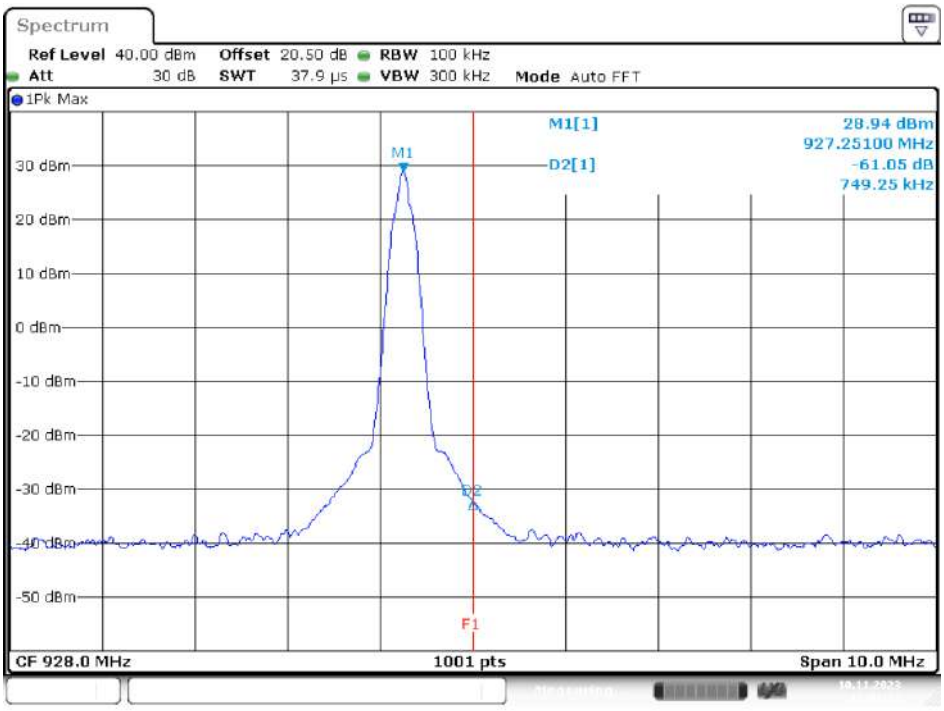
PR-ASK Mode Antenna Port 3

Band Edge, CH Low



Date: 10.NOV.2023 11:40:19

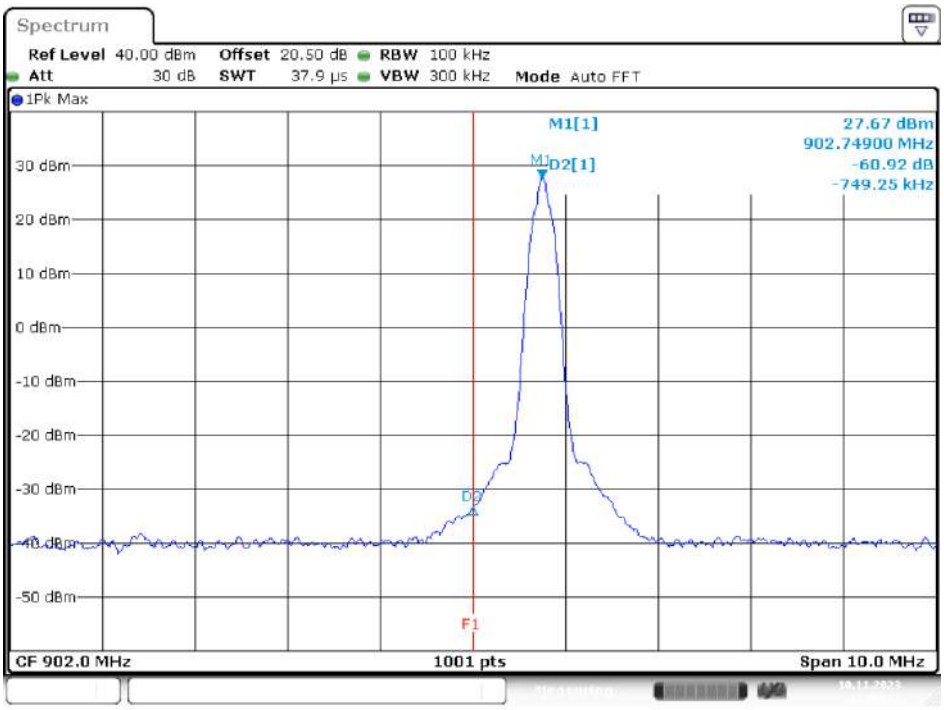
Band Edge, CH High



Date: 10.NOV.2023 11:41:13

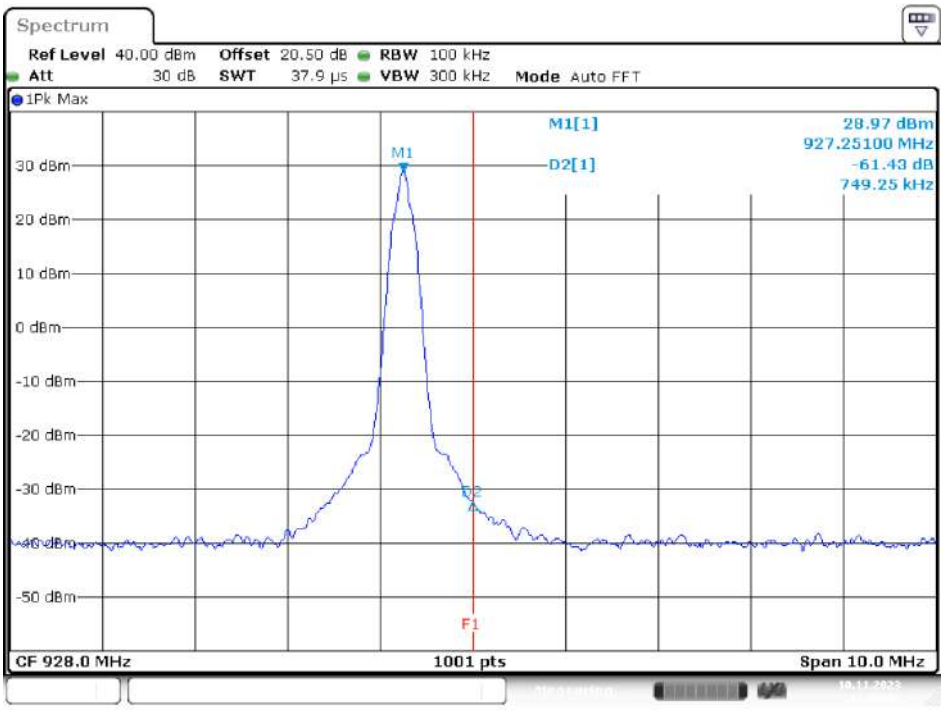
PR-ASK Mode Antenna Port 4

Band Edge, CH Low



Date: 10.NOV.2023 11:43:13

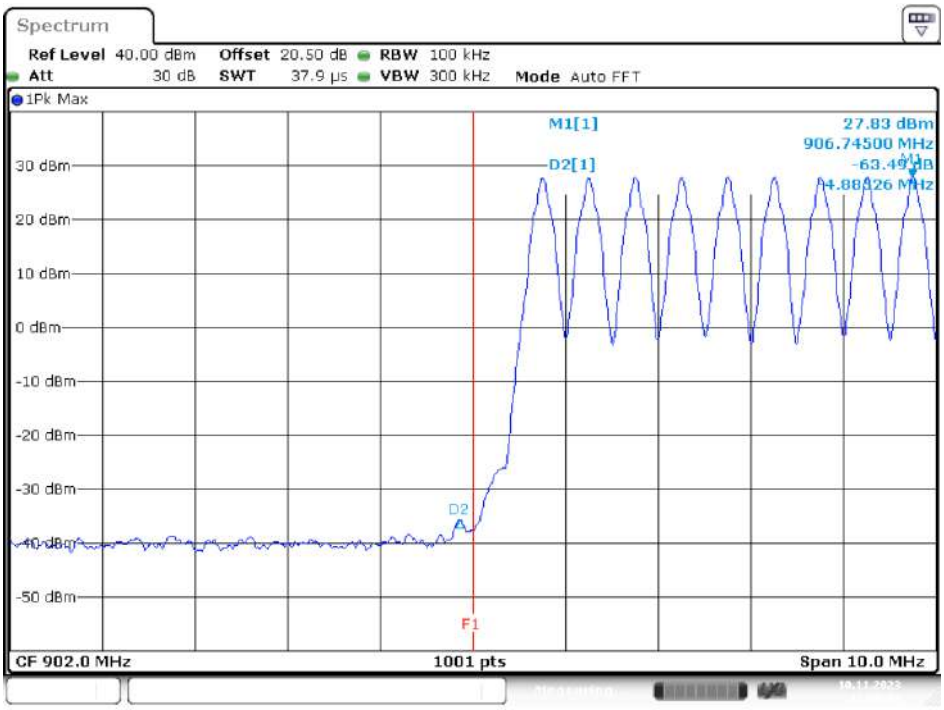
Band Edge, CH High



Date: 10.NOV.2023 11:42:15

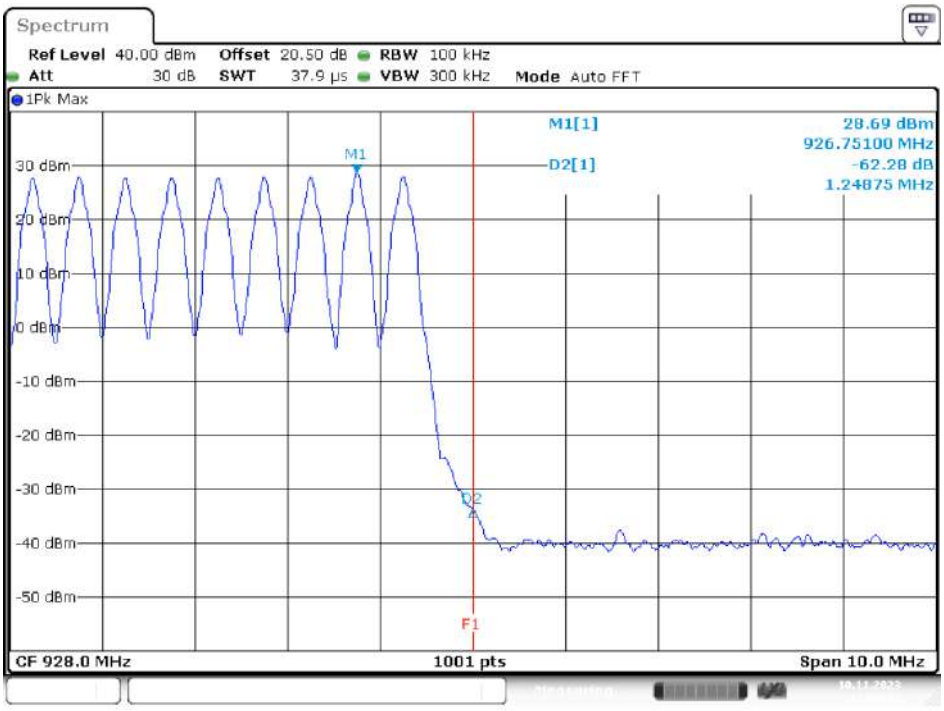
PR-ASK Hopping Mode Antenna Port 1

Band Edge, CH Low



Date: 10.NOV.2023 11:28:04

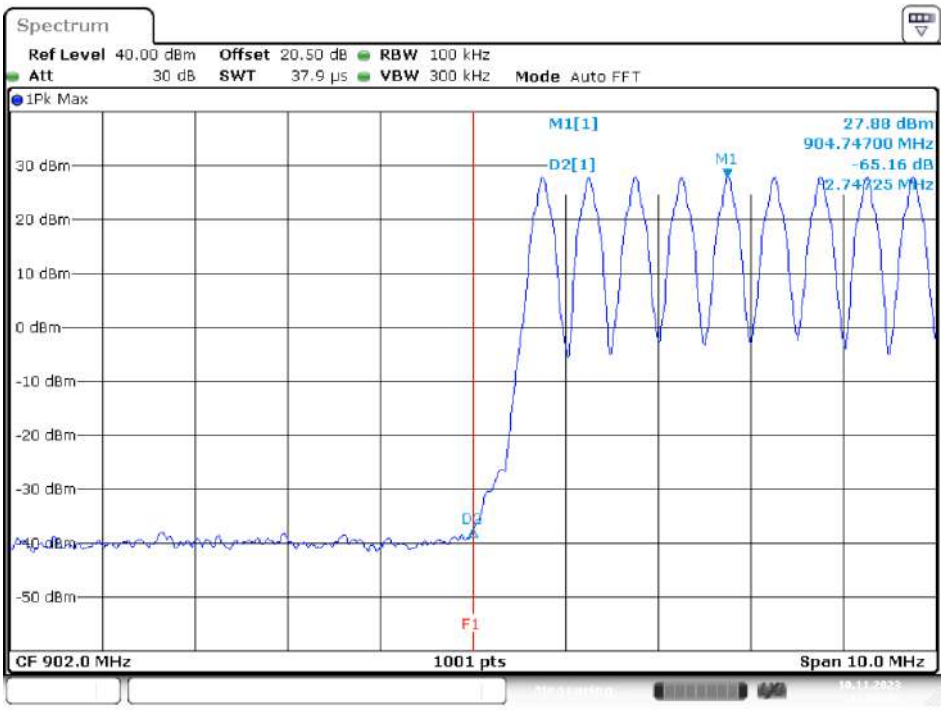
Band Edge, CH High



Date: 10.NOV.2023 11:27:24

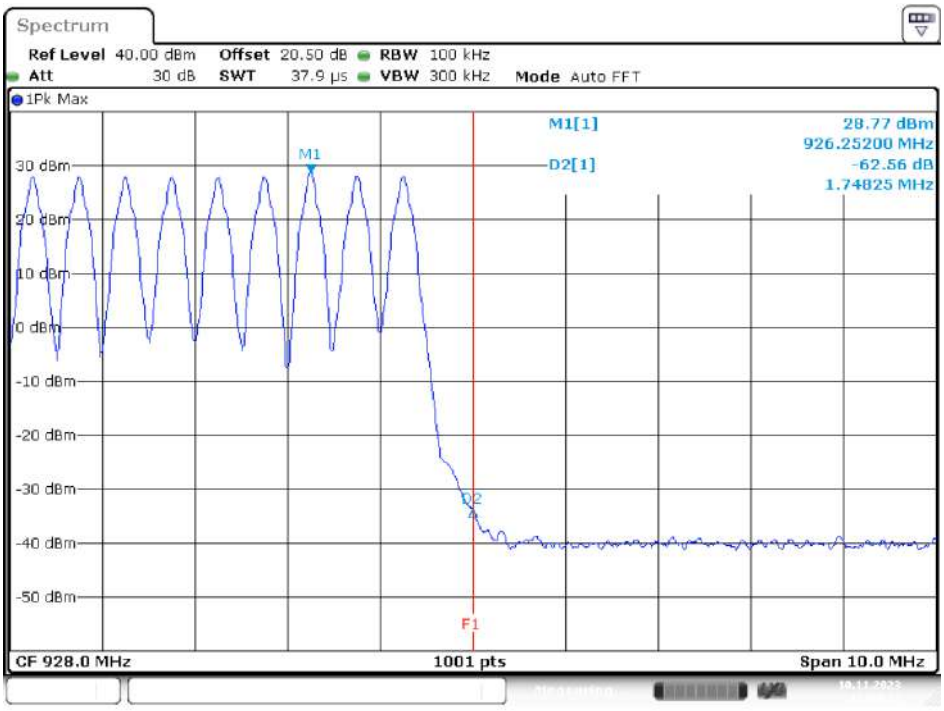
PR-ASK Hopping Mode Antenna Port 2

Band Edge, CH Low



Date: 10.NOV.2023 11:20:15

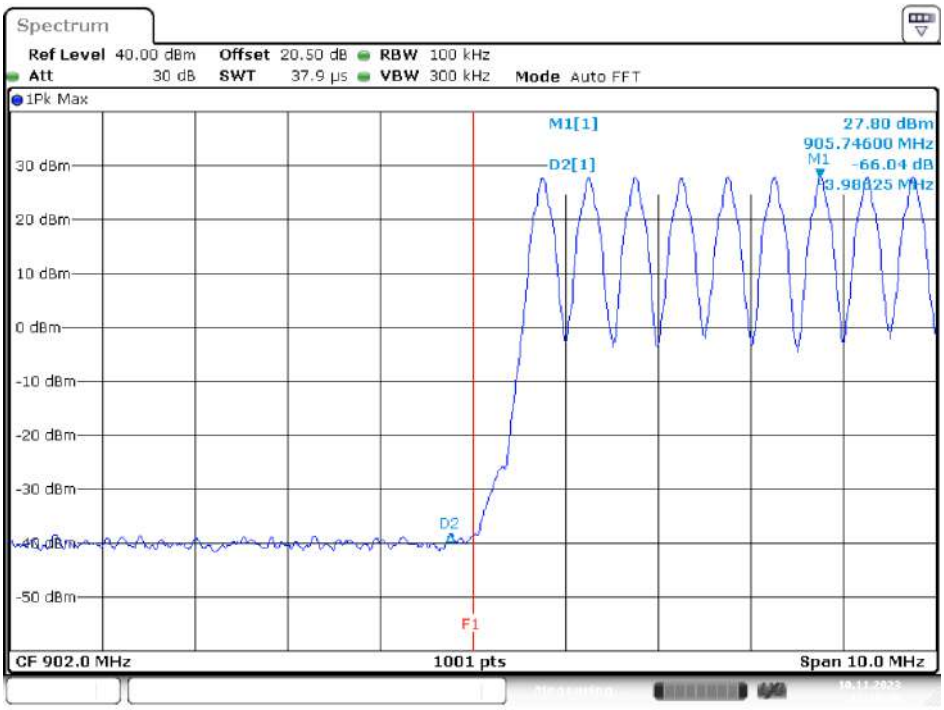
Band Edge, CH High



Date: 10.NOV.2023 11:24:11

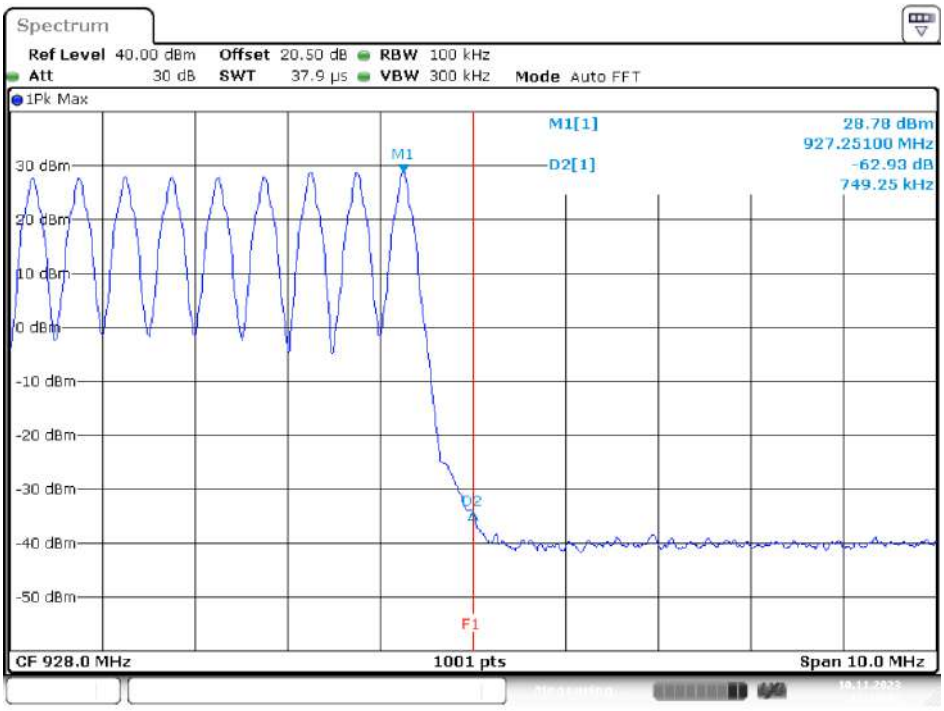
PR-ASK Hopping Mode Antenna Port 3

Band Edge, CH Low



Date: 10.NOV.2023 11:18:31

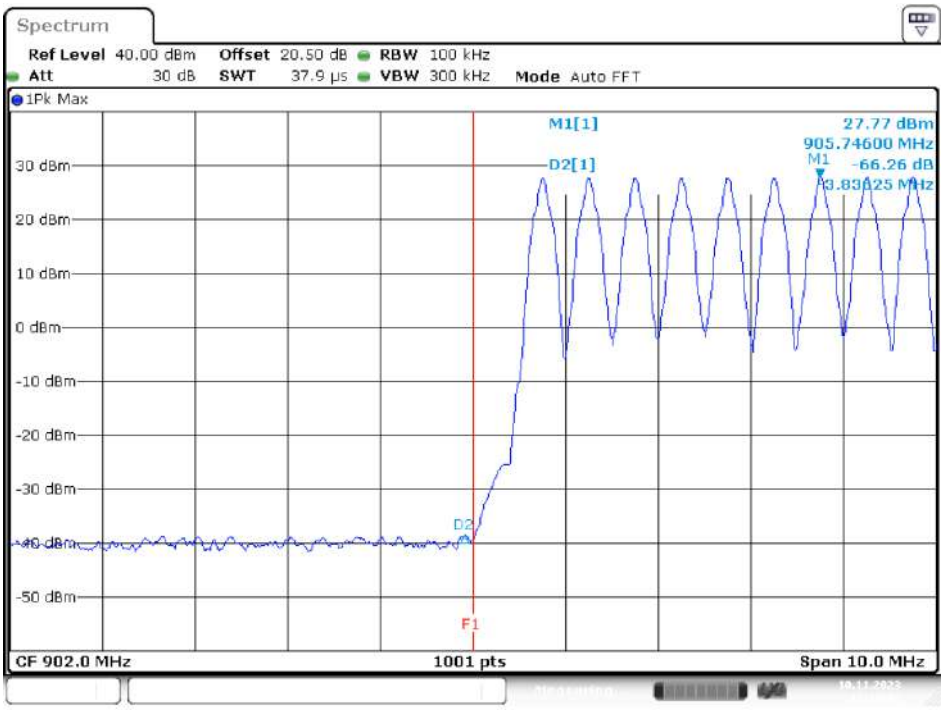
Band Edge, CH High



Date: 10.NOV.2023 11:17:01

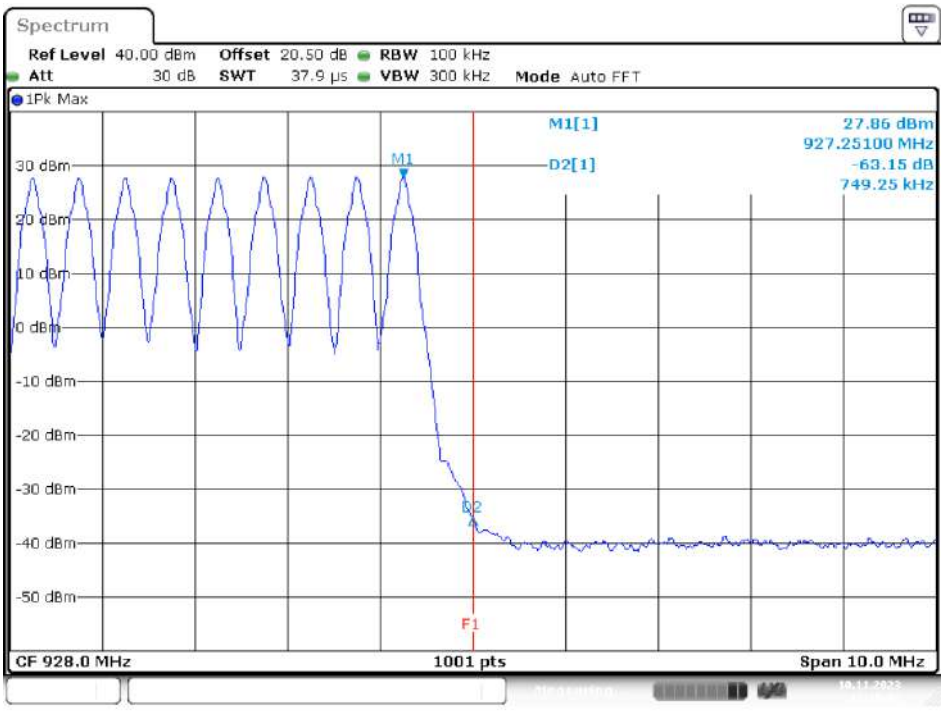
PR-ASK Hopping Mode Antenna Port 4

Band Edge, CH Low



Date: 10.NOV.2023 11:13:32

Band Edge, CH High



Date: 10.NOV.2023 11:15:42

******* END OF REPORT *******