ENGINEERING TEST REPORT

XBee 3 Global LTE-M/NB-IoT
Model: XB3M2
FCC ID: MCQ-XB3M2

Applicant:

Digi International Inc
9350 Excelsior Blvd. Suite 700
Hopkins, MN 55343

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Digital Modulation Systems (DTS) Operating in 2400 – 2483.5 MHz Band

UltraTech's File No.: 21DIGI169_FCC15C247

This Test report is Issued under the Authority of Tri M. Luu Vice President of Engineering UltraTech Group of Labs Date: November 4, 2021	
Report Prepared by: Dan Huynh Issued Date: November 4, 2021	Tested by: Nimisha Desai Test Dates: July 15 - 22, 2021 September 2 & 13, 2021

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UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Equipment Certification for Digital Modulation Systems (DTS) Operating Under §15.247
Test Procedures:	▪ ANSI C63.4 ▪ ANSI C63.10 ▪ FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
Environmental Classification:	[x] Commercial, industrial or business environment [x] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2021	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC, KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02	2019	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	Digi International Inc
Address:	9350 Excelsior Blvd. Suite 700 Hopkins, MN 55343 USA
Contact Person:	Erik Reynolds Phone #: +1 (952)-912-3444 Fax #: n/a Email Address: erik.reynolds@digi.com

Manufacturer	
Name:	Digi International Inc
Address:	10000 W 76th Street Eden Prairie, MN 55344 USA
Contact Person:	Dan Leveille Phone #: +1 (952) 912-4794 Fax #: n/a Email Address: dan.leveille@digi.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Digi International Inc
Product Name:	XBee 3 Global LTE-M/NB-IoT
Model Name or Number:	XB3M2
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	External DC Power Supply
Primary User Functions of EUT:	Digital Communications

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Mobile Base station (fixed use)
Intended Operating Environment:	Commercial, industrial or business environment Residential environment
Power Supply Requirement:	2.7 - 4.3 VDC, 3.3V (nominal)
RF Output Power Rating:	7.40 dBm maximum conducted power
Operating Frequency Range:	2402 - 2480 MHz
RF Output Impedance:	50 Ω
Duty Cycle:	Continuous
Modulation Type:	GFSK
Antenna Connector Types:	U.FL

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Antenna Type	Maximum Gain (dBi)
Dipole Antenna	2.1
Flex PCB Antenna	4.0

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Cellular RF port	1	U.FL	Shielded
2	GNSS/GPS RX	1	U.FL	Shielded
3	2.4GHz Bluetooth	1	U.FL	Shielded
4	UART, USB, GPIO	1	Custom 20 pin header	Direct connection

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Test Jig
Brand name:	Digi International
Model Name or Number:	N/A
Serial Number:	N/A
Connected to EUT's Port:	Pin header

Ancillary Equipment # 2	
Description:	Power Adaptor
Brand name:	Cincon Electronics Co., Ltd.
Model Name or Number:	TR10R120
Serial Number:	N/A
Connected to EUT's Port:	EUT Test Jig

Ancillary Equipment # 3	
Description:	Laptop
Brand name:	HP
Model Name or Number:	EliteBook 820
Serial Number:	N/A
Connected to EUT's Port:	EUT Test Jig

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 ^{o}C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	3.3 VDC nominal, 4.3 VDC Max.

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Test software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	Test Jig
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as non-integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	2402 - 2480 MHz
Frequency(ies) Tested:	2402 MHz, 2440 MHz, 2480 MHz
RF Power Output: (measured maximum output power at antenna terminals)	7.40 dBm Peak
Normal Test Modulation:	GFSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes*
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	Yes
15.247(b)(3)	Peak Conducted Output Power	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	Yes
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	Yes

* The EUT complies with the requirement; it employs a unique (non-standard) antenna connector or integral antenna.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

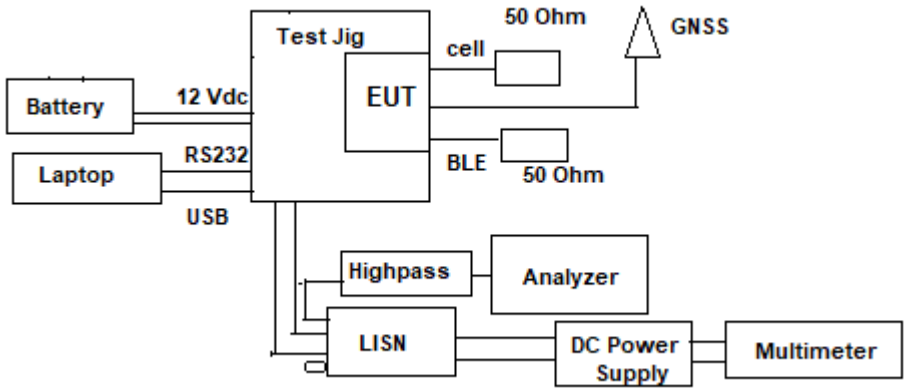
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ..……..	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

ANSI C63.4

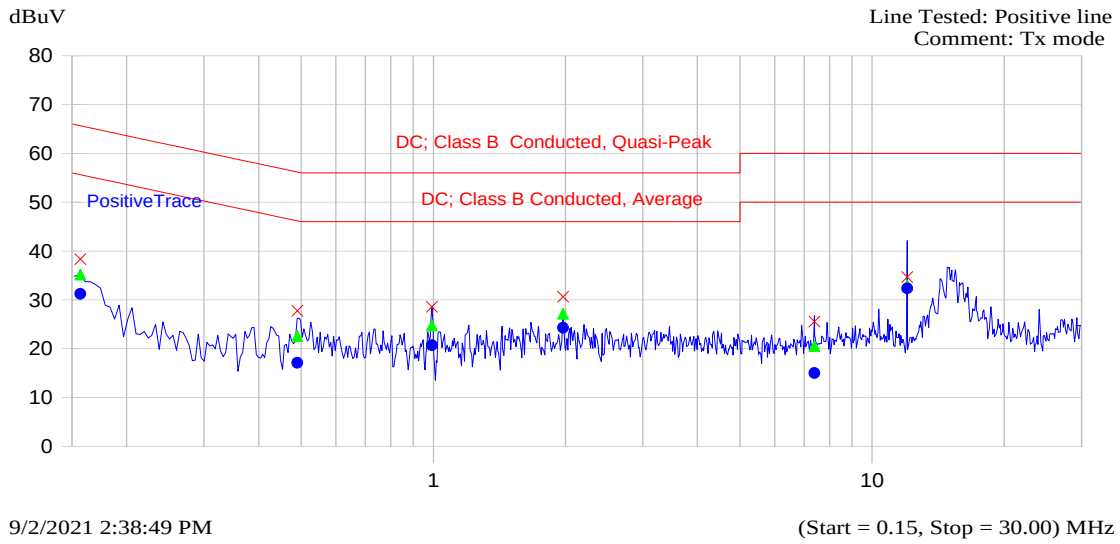
5.1.3. Test Arrangement



5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 4.3 VDC; Line Tested: Positive Line

Current Graph

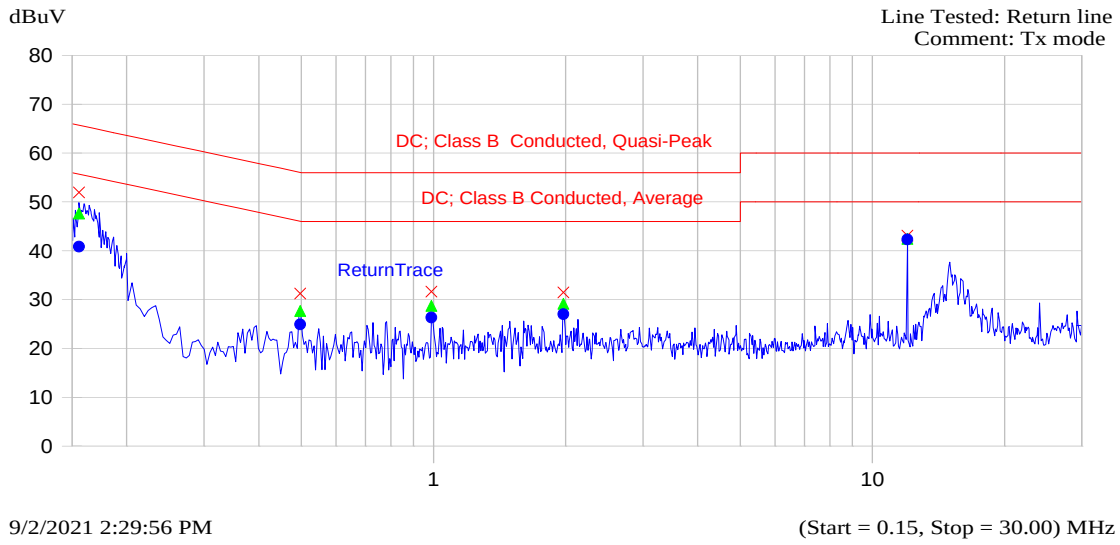


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.157	38.4	35.2	-30.4	31.2	-24.4	Positive Trace
0.490	27.7	22.6	-33.6	17.1	-29.1	Positive Trace
0.993	28.6	24.8	-31.2	20.7	-25.3	Positive Trace
1.976	30.6	27.2	-28.8	24.3	-21.7	Positive Trace
7.391	25.6	20.6	-39.4	15.0	-35.0	Positive Trace
12.015	34.6	33.0	-27.0	32.3	-17.7	Positive Trace

Plot 5.1.4.2. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 4.3 VDC; Line Tested: Return Line

Current Graph

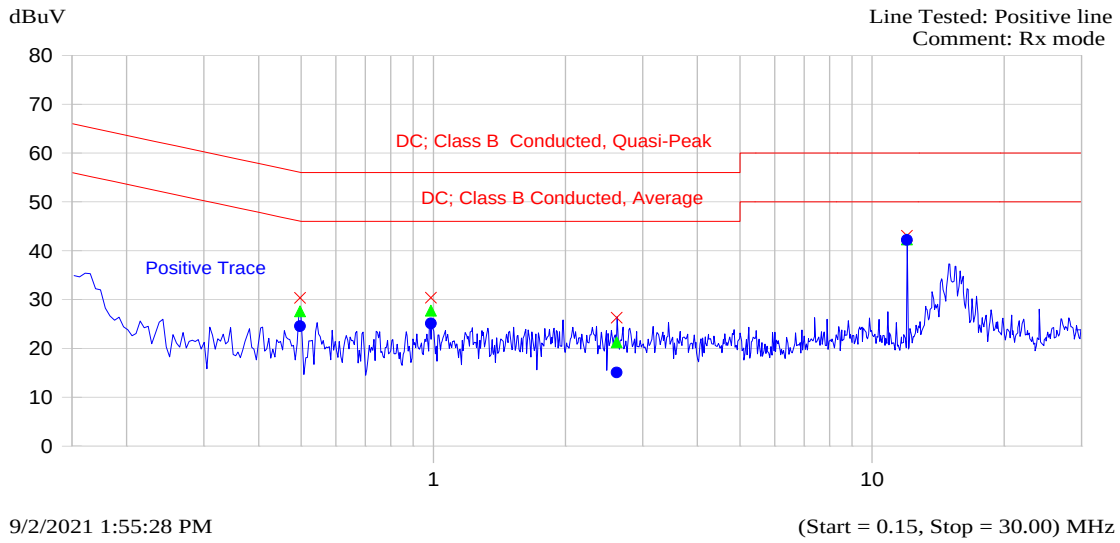


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.156	51.9	47.6	-18.1	40.8	-14.8	Return Trace
0.497	31.2	27.7	-28.4	24.9	-21.1	Return Trace
0.989	31.6	28.7	-27.3	26.3	-19.7	Return Trace
1.976	31.5	29.1	-26.9	27.0	-19.0	Return Trace
12.009	43.1	42.4	-17.6	42.3	-7.7	Return Trace

Plot 5.1.4.3. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 4.3 VDC; Line Tested: Positive Line

Current Graph

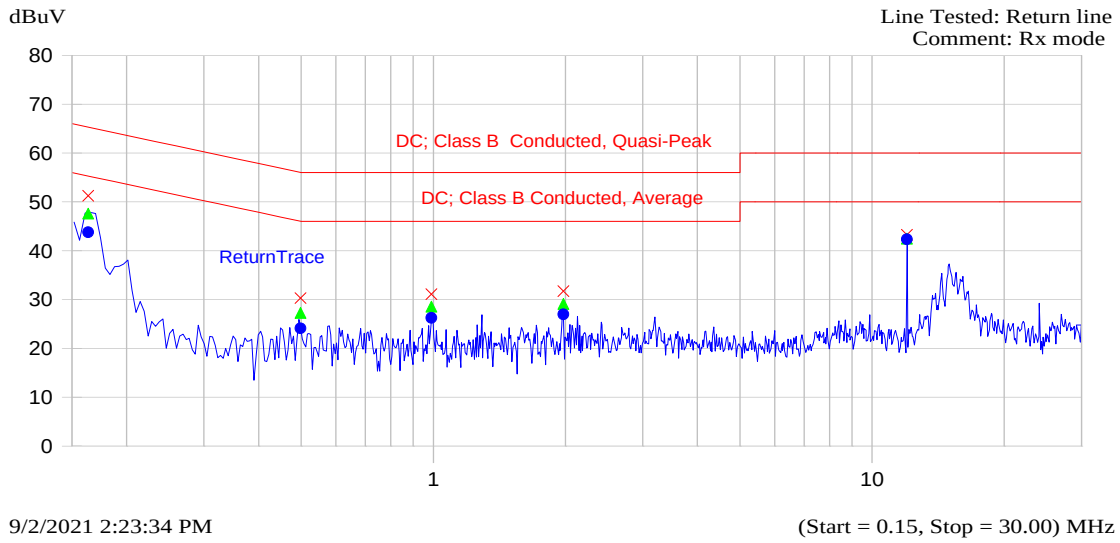


Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.497	30.3	27.6	-28.5	24.5	-21.5	Positive Trace
0.988	30.4	27.7	-28.3	25.1	-20.9	Positive Trace
2.619	26.3	21.2	-34.8	15.1	-30.9	Positive Trace
12.009	43.1	42.3	-17.7	42.2	-7.8	Positive Trace

Plot 5.1.4.4. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 4.3 VDC; Line Tested: Return LIne

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.163	51.2	47.6	-17.7	43.8	-11.5	Return Trace
0.498	30.3	27.3	-28.8	24.1	-21.9	Return Trace
0.989	31.1	28.6	-27.4	26.3	-19.7	Return Trace
1.978	31.7	29.1	-26.9	26.9	-19.1	Return Trace
12.009	43.2	42.5	-17.5	42.3	-7.7	Return Trace

5.2. OCCUPIED BANDWIDTH [§ 15.247(a)(2)]

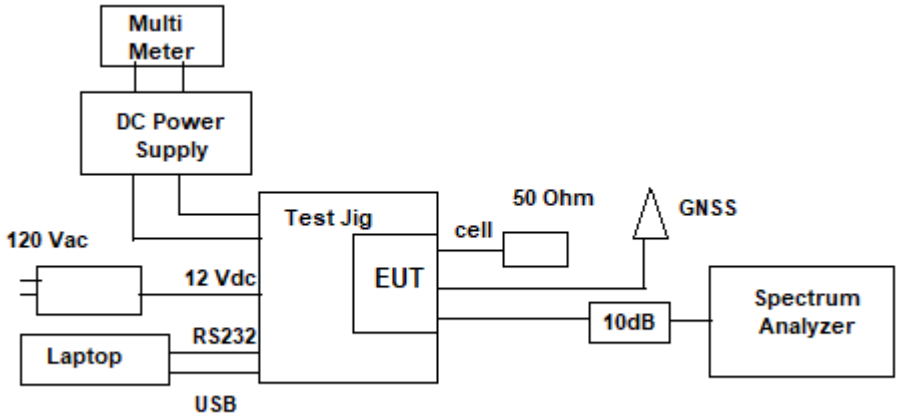
5.2.1. Limit(s)

The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.2. Method of Measurements

FCC KDB 558074 D01 15.247 Meas Guidance V05r02, Section 8.2, ANSI C63.10, 11.8.2 Option 2

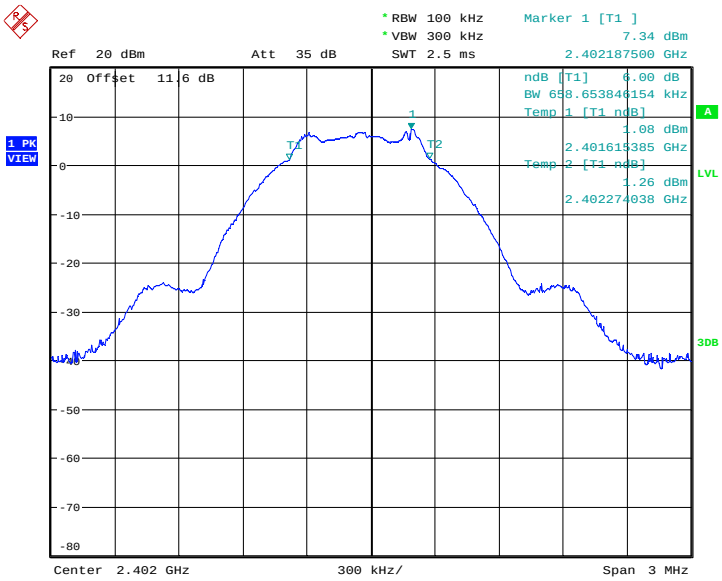
5.2.3. Test Arrangement



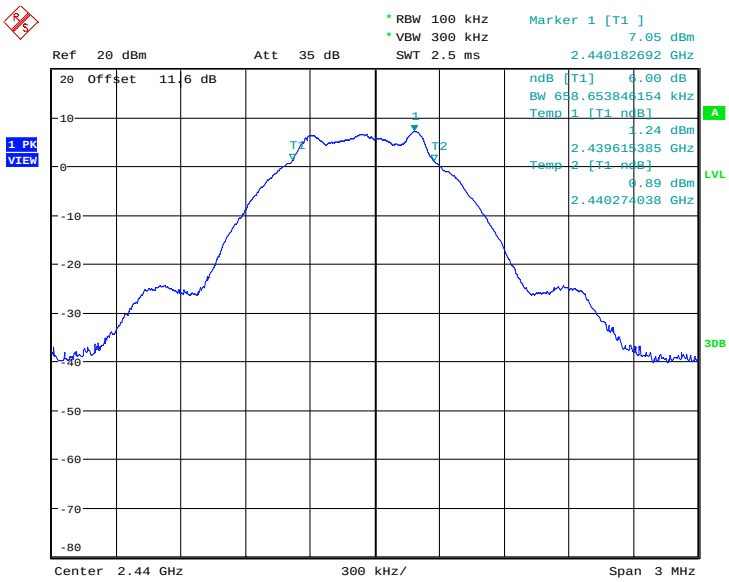
5.2.4. Test Data

Modulation	Power Setting	Frequency (MHz)	6dB BW, 1Mbps (kHz)	6dB BW, 2Mbps (MHz)	Min. Limit (kHz)
GFSK	6 dBm	2402	658.65	1.154	500
		2440	658.65	1.154	500
		2480	658.65	1.162	500

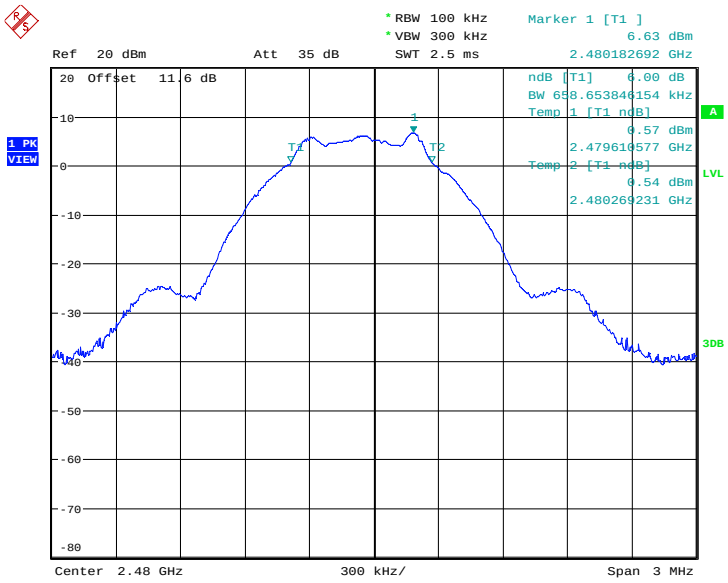
Plot 5.2.4.1. 6 dB Bandwidth, GFSK Modulation, 6 dBm Power Setting, 2402 MHz, 1 Mbps



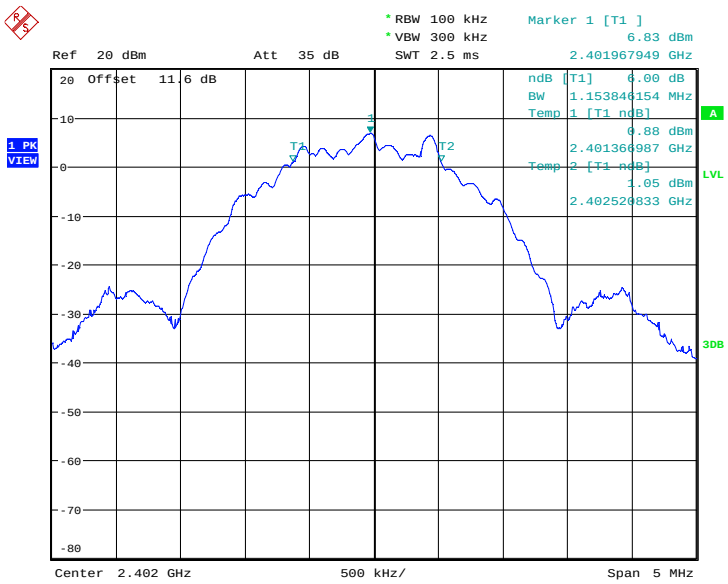
Plot 5.2.4.2. 6 dB Bandwidth, GFSK Modulation, 6 dBm Power Setting, 2440 MHz, 1 Mbps



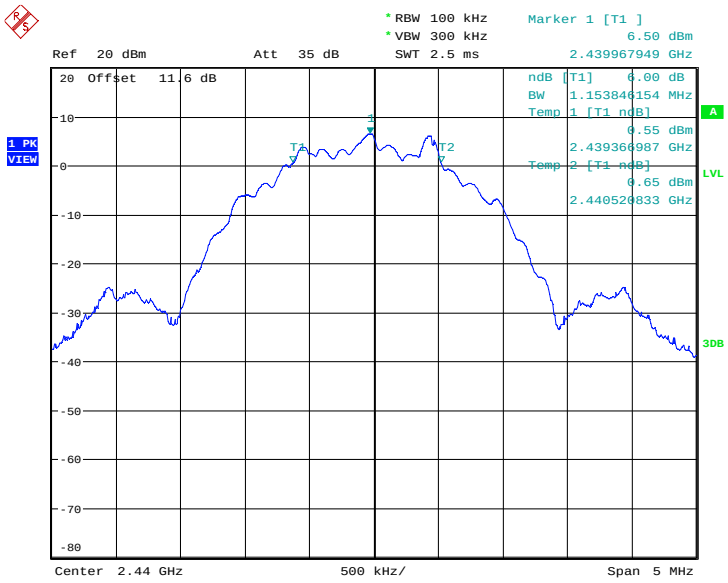
Plot 5.2.4.3. 6 dB Bandwidth, GFSK Modulation, 6 dBm Power Setting, 2480 MHz, 1 Mbps



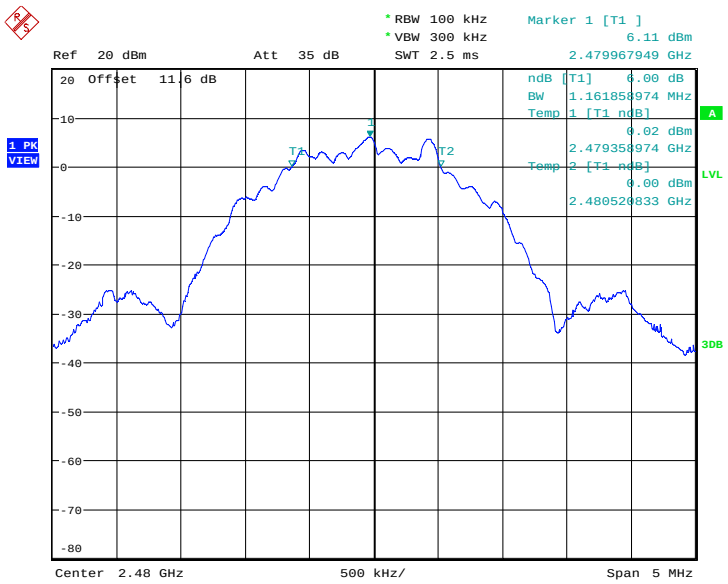
Plot 5.2.4.4. 6 dB Bandwidth, GFSK Modulation, 6 dBm Power Setting, 2402 MHz, 2 Mbps



Plot 5.2.4.5. 6 dB Bandwidth, GFSK Modulation, 6 dBm Power Setting, 2440 MHz, 2 Mbps



Plot 5.2.4.6. 6 dB Bandwidth, GFSK Modulation, 6 dBm Power Setting, 2480 MHz, 2 Mbps



5.3. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

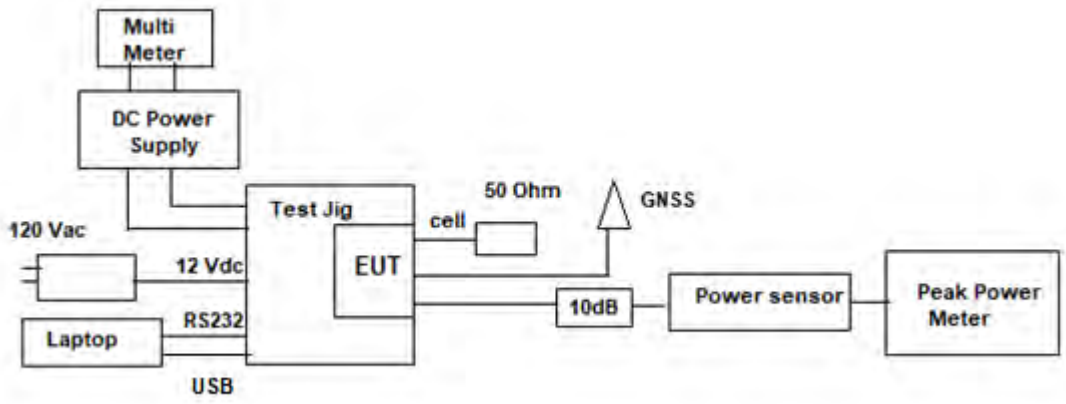
5.3.1. Limit(s)

§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

5.3.2. Method of Measurements & Test Arrangement

FCC KDB 558074 D01 15.247 Meas Guidance V05r02, Section 8.3.1.3 PKPM1 Peak Power meter Method

5.3.3. Test Arrangement



5.3.4. Test Data

Peak Conducted Power at High and Low Power Settings					
Modulation	**Power Setting**	**Data Rate (Mbps)**	**Frequency (MHz)**	**Peak Power (dBm)**	**Peak Power Limit (dBm)**
GFSK	High Power (6 dBm)	1	2402	7.40	30
			2440	6.99	30
			2480	6.67	30
		2	2402	7.39	30
			2440	6.95	30
			2480	6.63	30
	Low Power (-2 dBm)	1	2402	0.30	30
			2440	0.10	30
			2480	-0.15	30
		2	2402	0.30	30
			2440	0.09	30
			2480	-0.17	30

Power Level, Antenna Details and Resulting EIRP Values

Maximum Conducted Power: 7.40 dBm				
Assembly #	**Antenna Type**	**Maximum Gain (dBi)**	**Minimum Insertion / Cable Loss (dBm)**	**EIRP (dBm)**
1	Dipole Antenna	2.1	0	9.50
2	PCB Antenna	4.0	0	11.40

5.4. TRANSMITTER BAND-EDGE & SPURIOUS CONDUCTED EMISSIONS [§ 15.247(d)]

5.4.1. Limit(s)

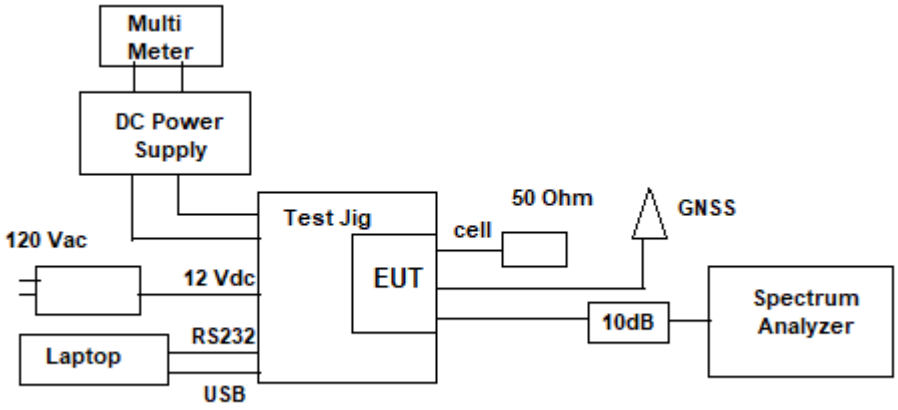
§ 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that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

5.4.2. Method of Measurements

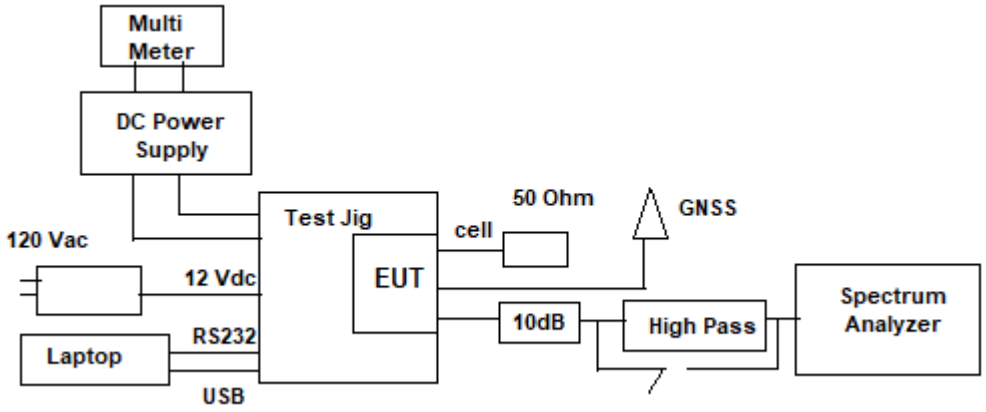
FCC KDB 558074 D01 15.247 Meas Guidance V05r02, Sections 8.5, 8.6 and 8.7
ANSI C63.10-2013 Sections 6.10.6.2, 11.11 and 11.12

5.4.3. Test Arrangement

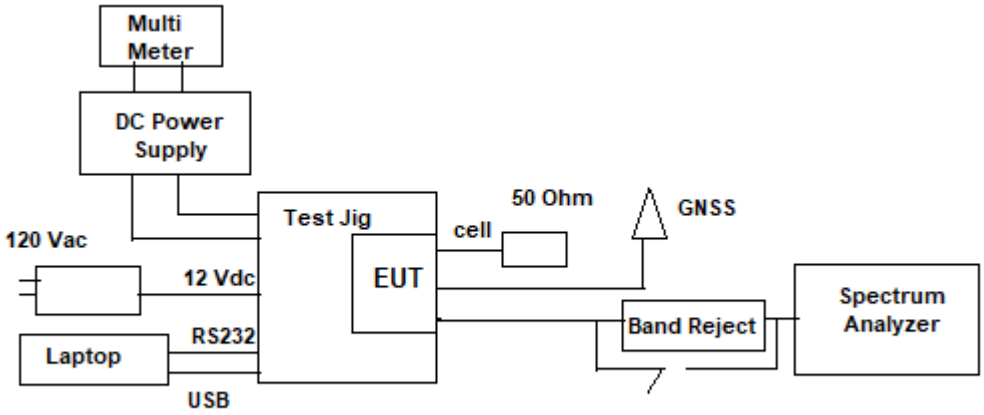
Band-Edge Conducted Emissions



Conducted Spurious Emissions in Non-Restricted Frequency Bands



Conducted Spurious Emissions in Restricted Frequency Bands

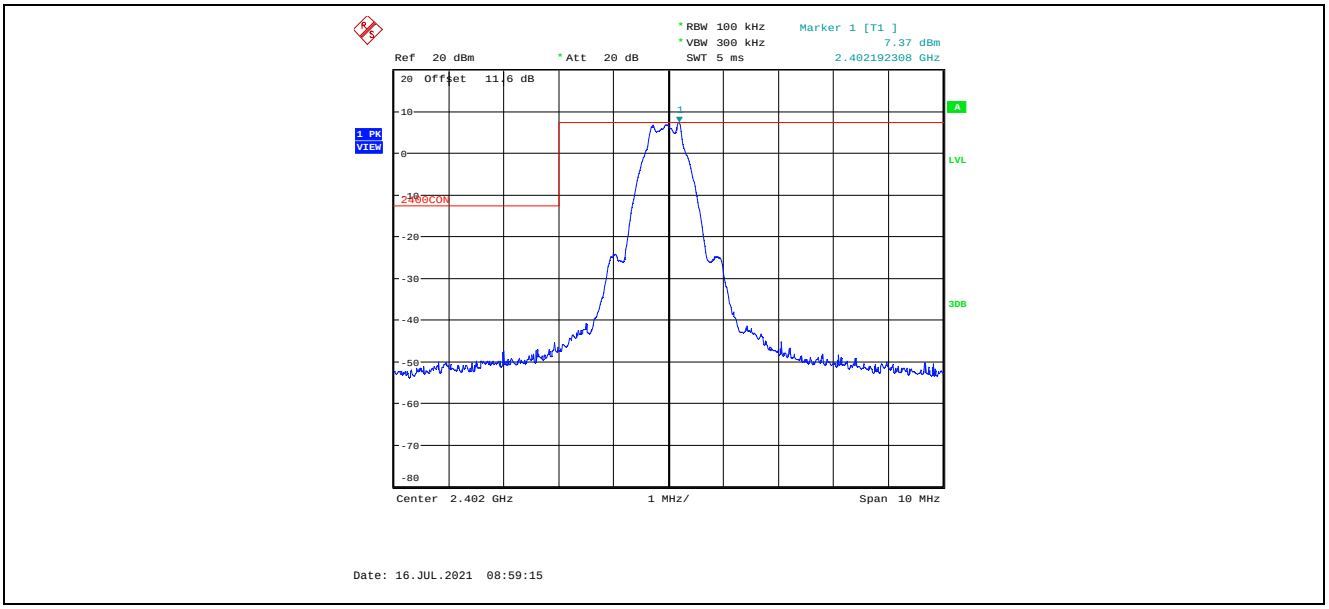


5.4.4. Test Data

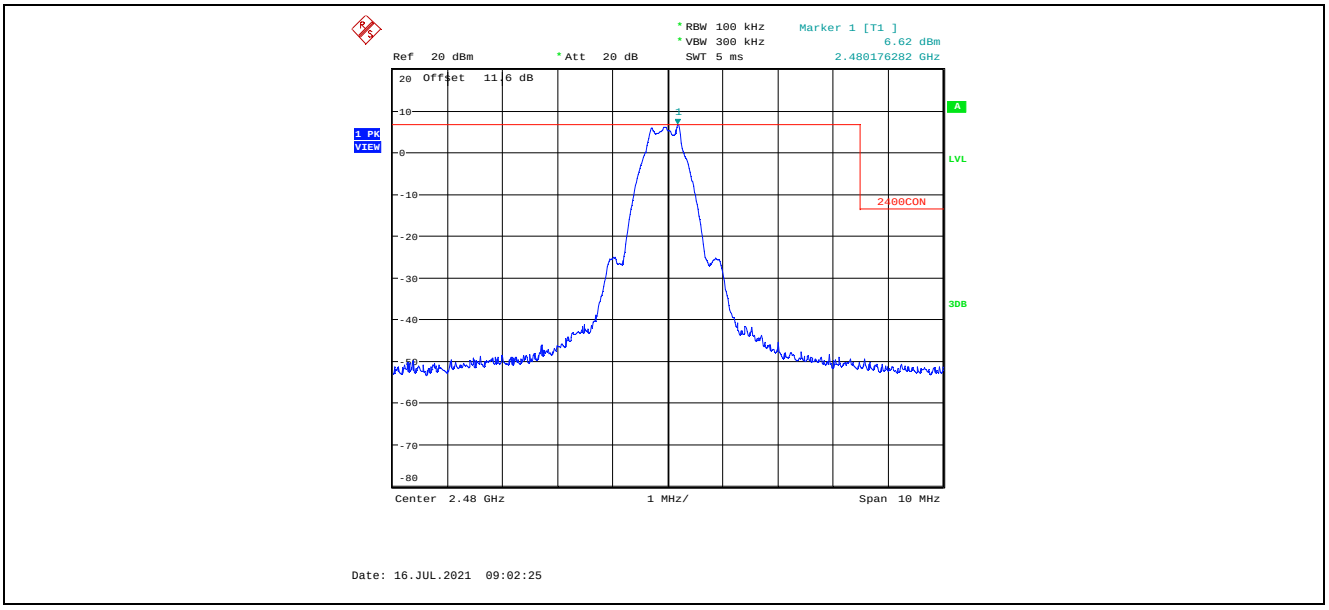
Remark(s): Exploratory tests performed to determined worst-case test configurations, the following test results represent the worst-case.

5.4.4.1. Band-Edge RF Conducted Emissions

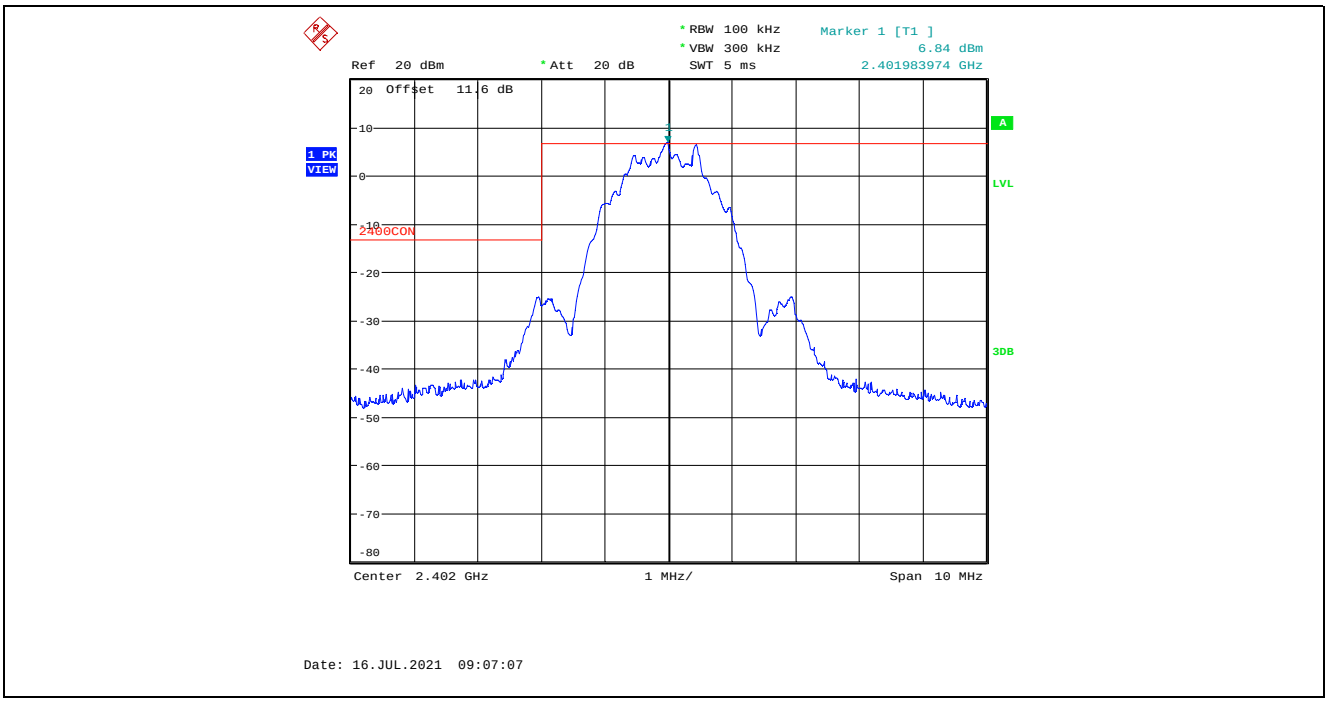
Plot 5.4.4.1.1. Band-Edge RF Conducted Emissions
GFSK Modulation, High Power, 1 Mbps, 2402 MHz, Lower Band-edge



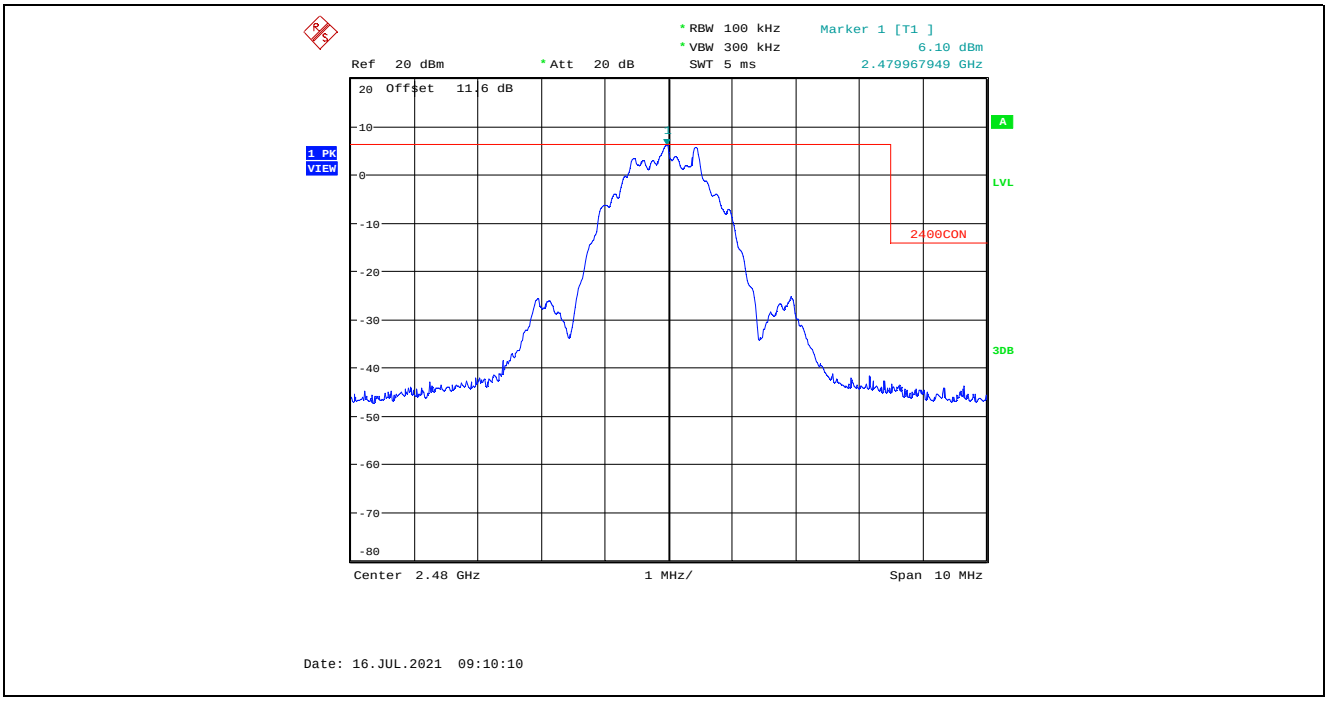
Plot 5.4.4.1.2. Band-Edge RF Conducted Emissions
GFSK Modulation, High Power, 1 Mbps, 2480 MHz, Higher Band-edge



Plot 5.4.4.1.3. Band-Edge RF Conducted Emissions
GFSK Modulation, High Power, 2 Mbps, 2402 MHz, Lower Band-edge

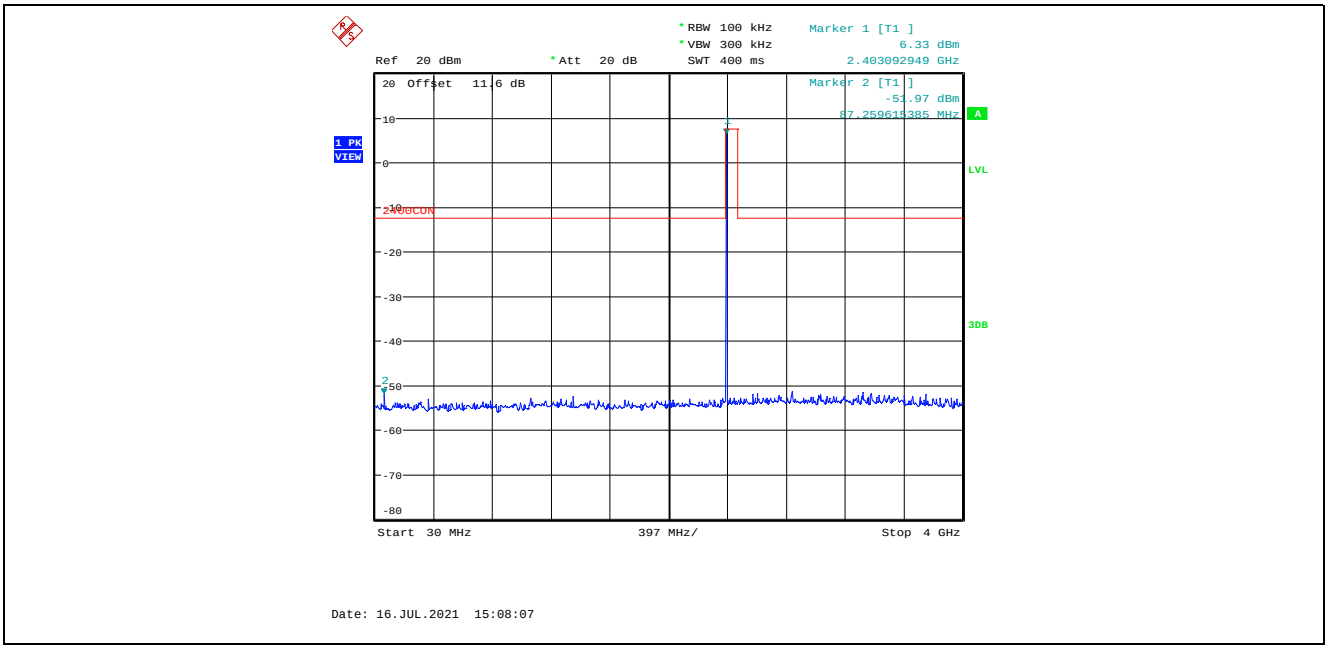


Plot 5.4.4.1.4. Band-Edge RF Conducted Emissions
GFSK Modulation, High Power, 2 Mbps, 2480 MHz, Higher Band-edge

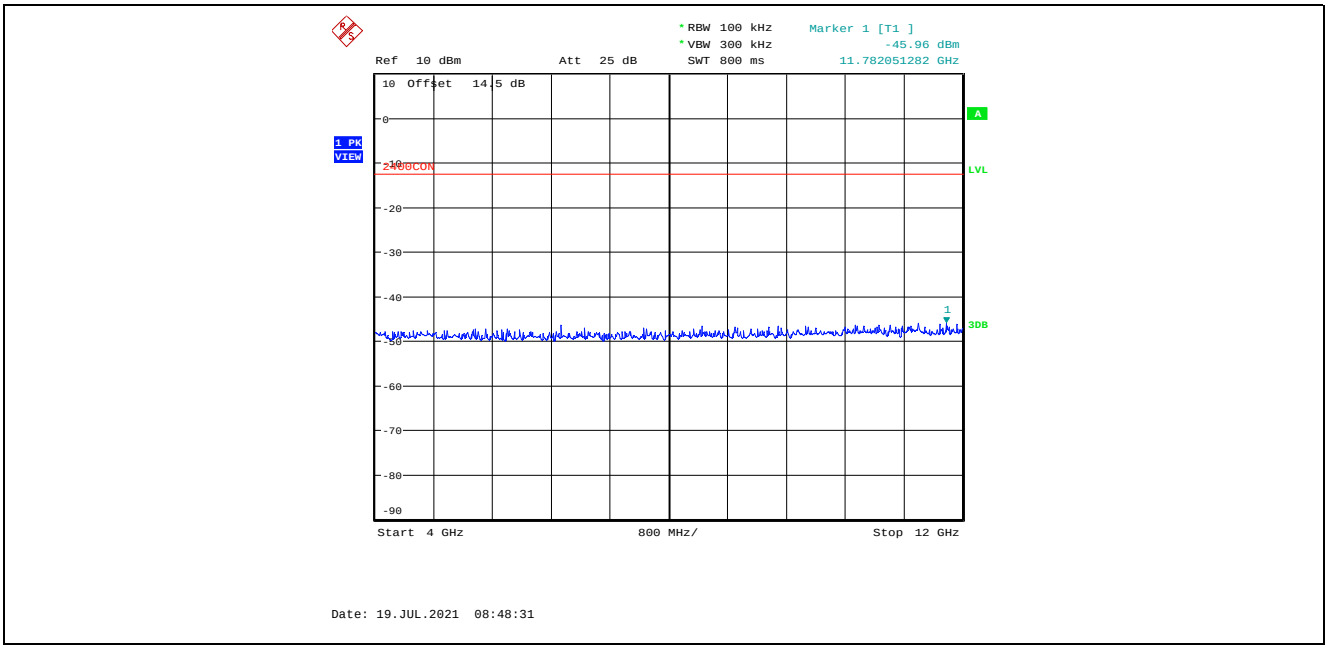


5.4.4.2. Conducted Spurious Emissions in Non-Restricted Frequency Bands, at High and Low Power Levels

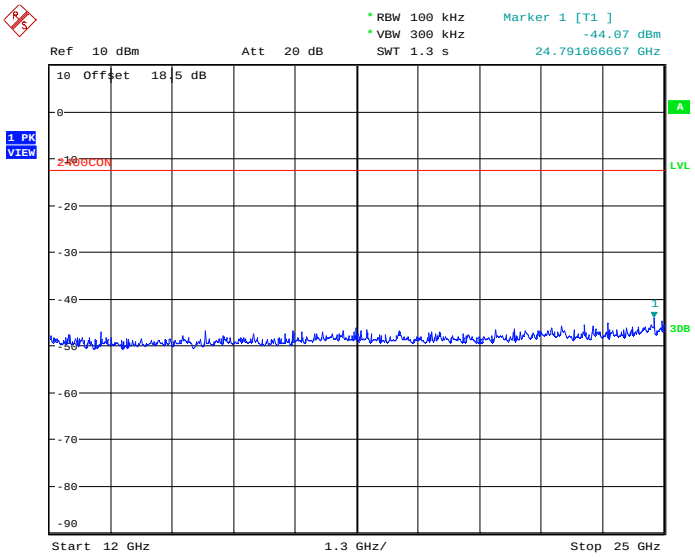
Plot 5.4.4.2.1. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 30 MHz – 4 GHz, Peak Detector



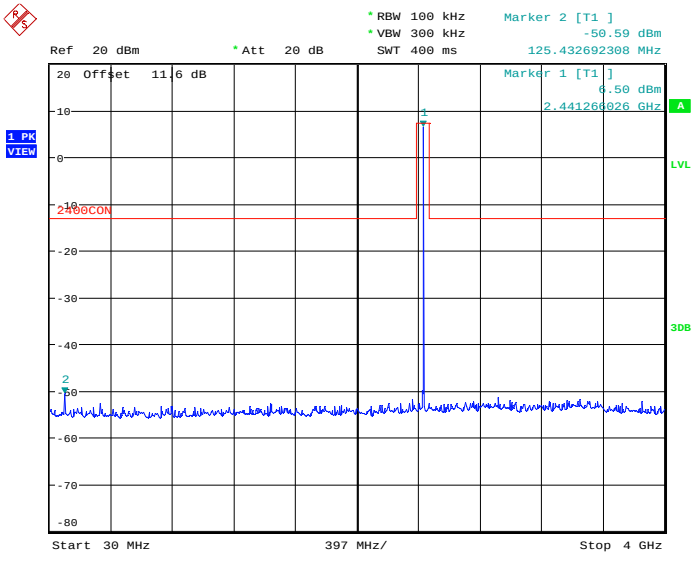
Plot 5.4.4.2.2. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 4 GHz – 12 GHz, Peak Detector



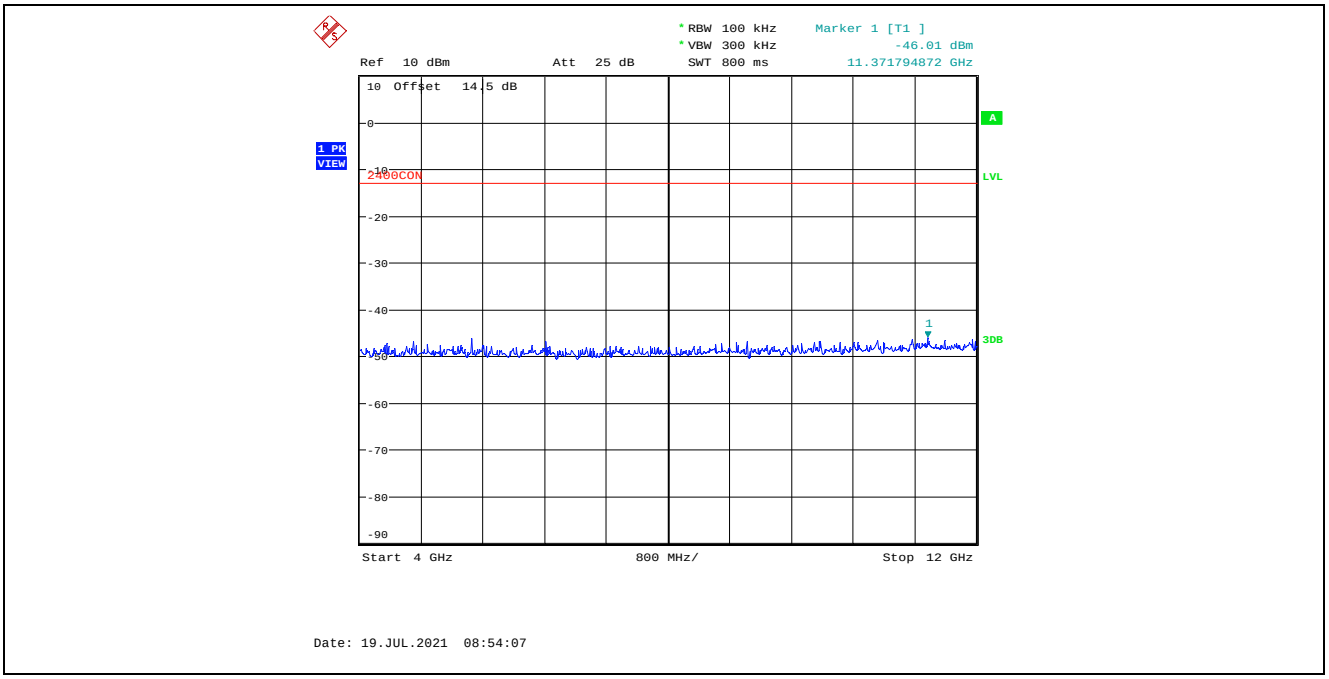
Plot 5.4.4.2.3. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 12 GHz – 25 GHz, Peak Detector



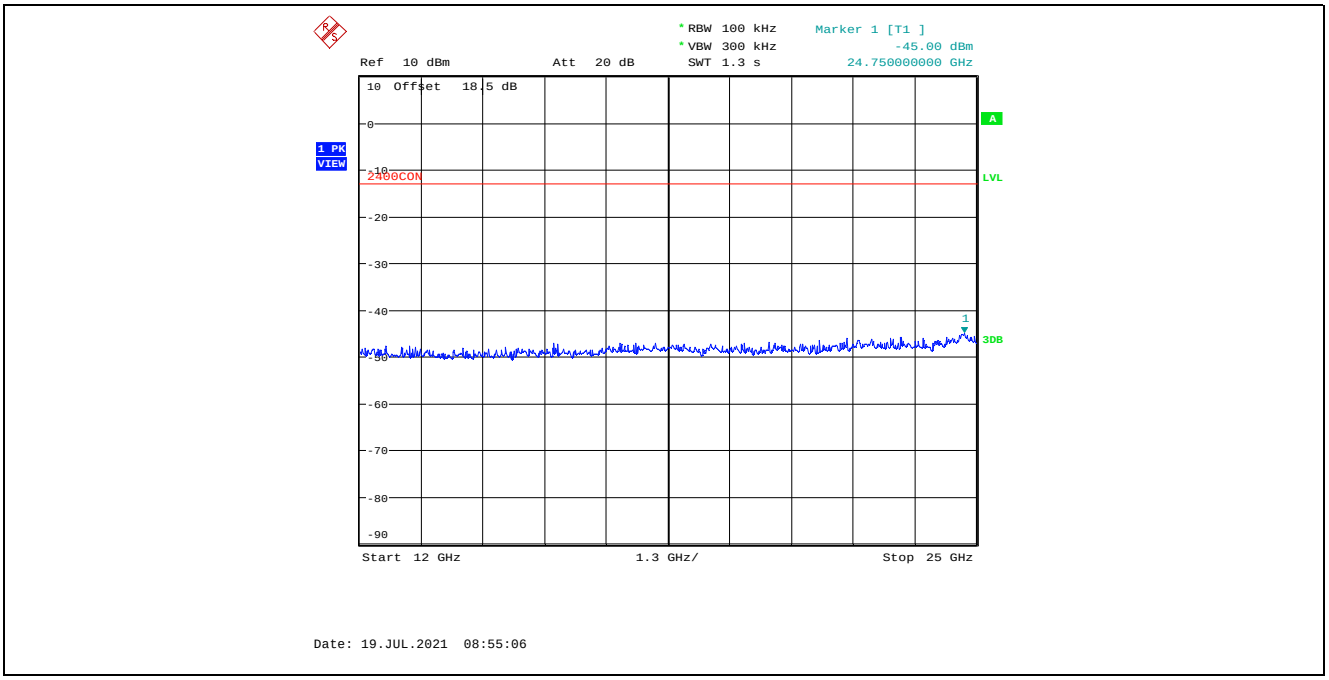
Plot 5.4.4.2.4. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 30 MHz – 4 GHz, Peak Detector



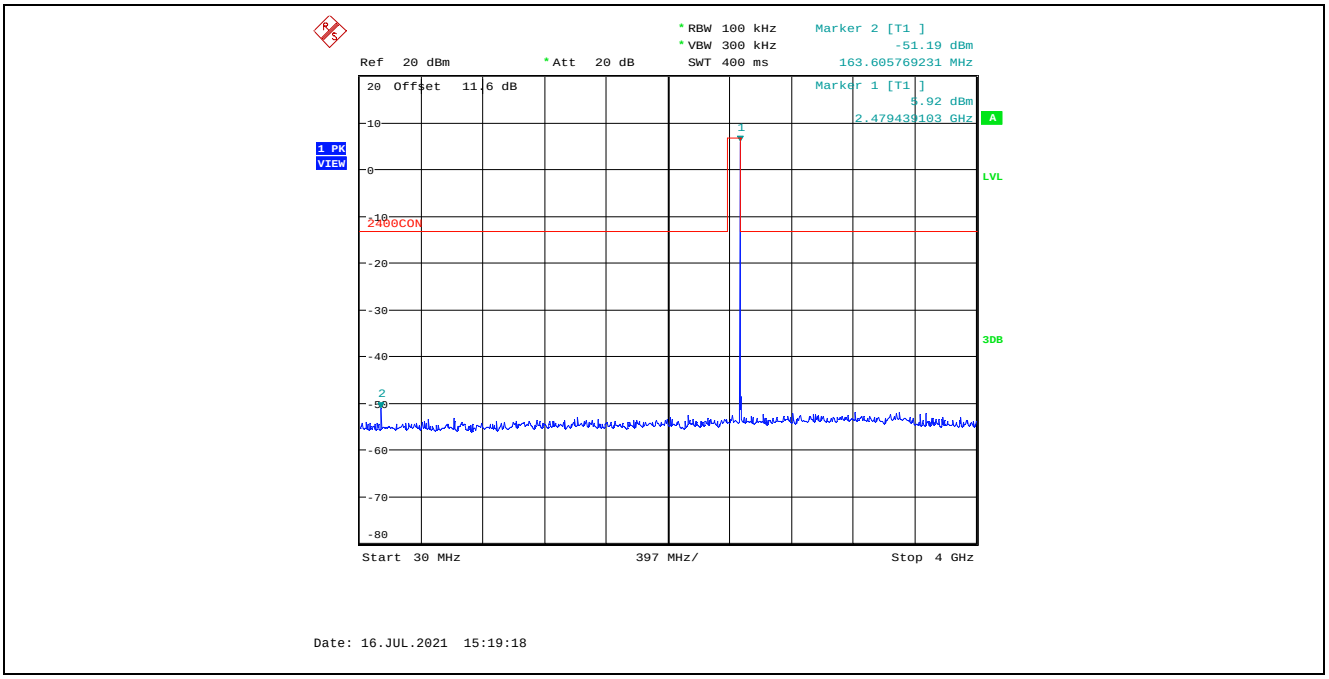
Plot 5.4.4.2.5. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 4 GHz – 12 GHz, Peak Detector



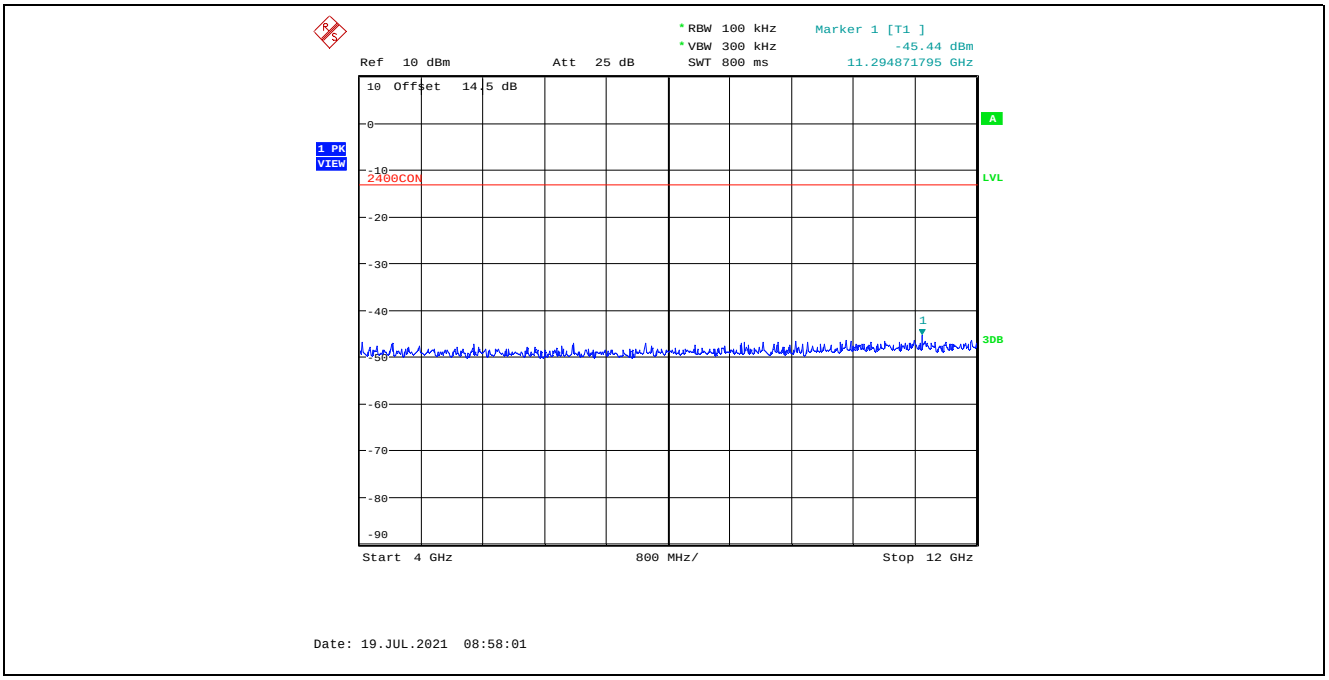
Plot 5.4.4.2.6. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 12 GHz – 25 GHz, Peak Detector



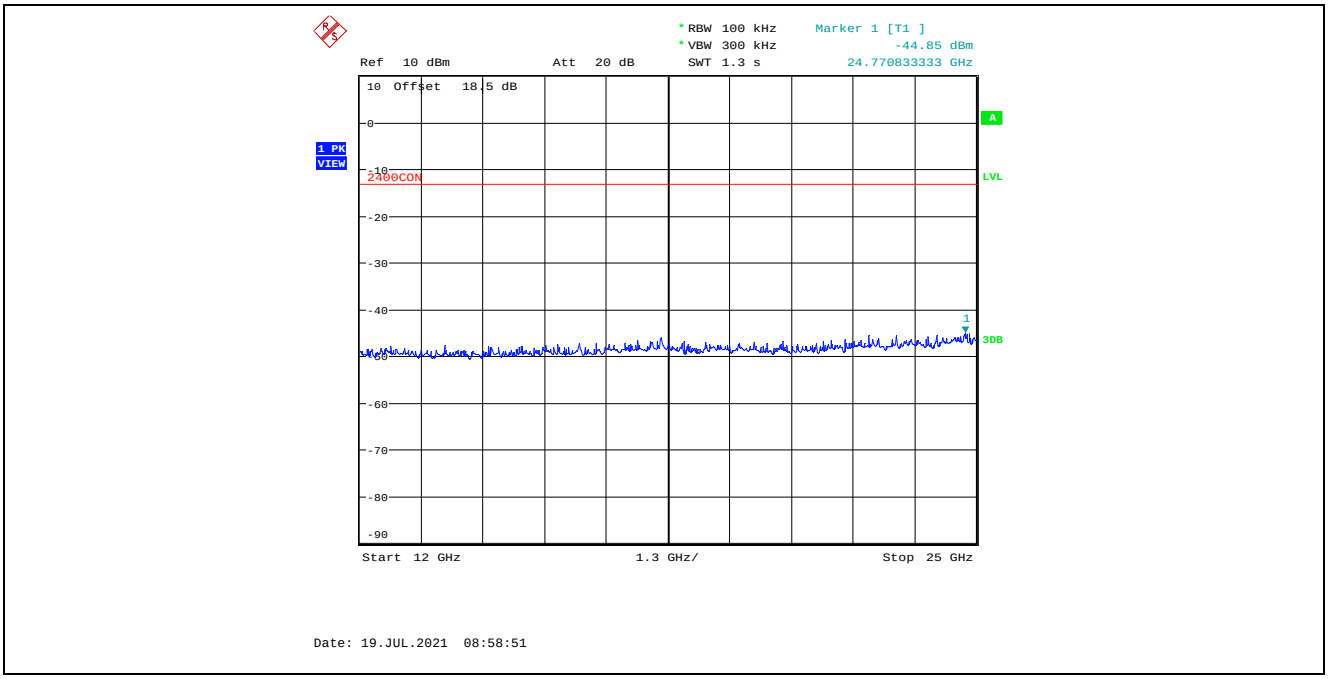
Plot 5.4.4.2.7. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 30 MHz – 4 GHz, Peak Detector



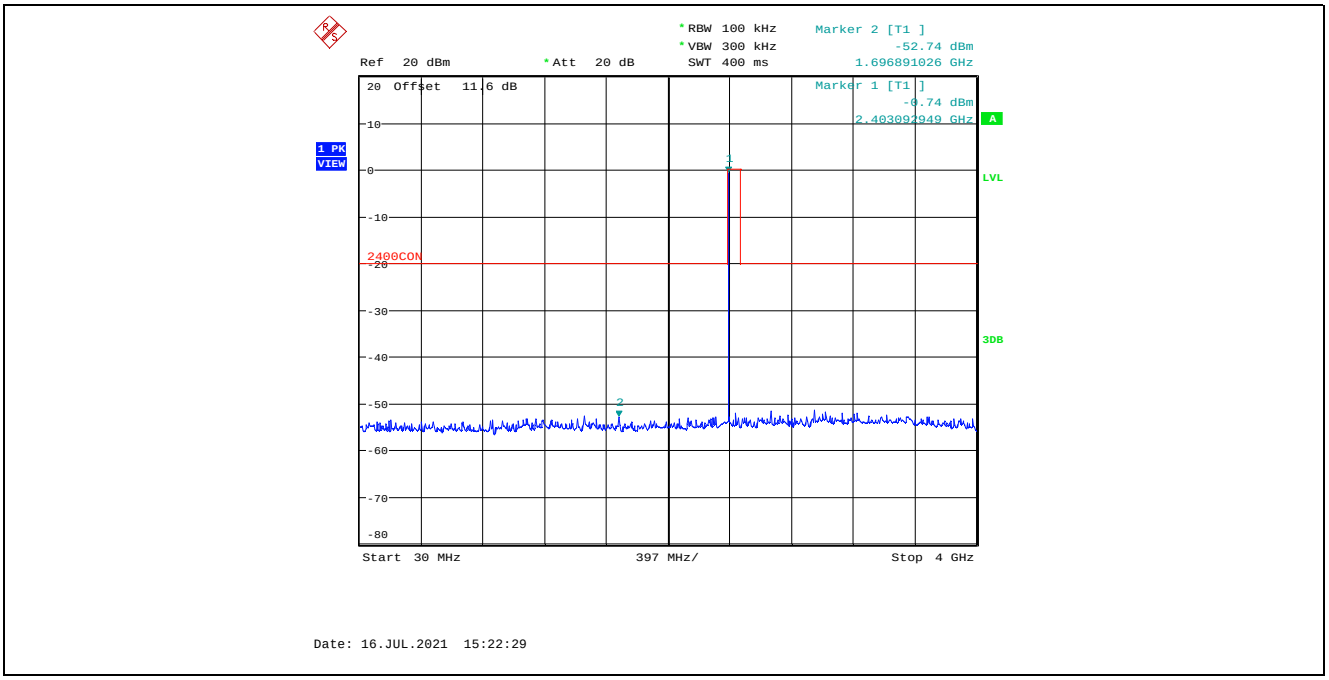
Plot 5.4.4.2.8. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 4 GHz – 12 GHz, Peak Detector



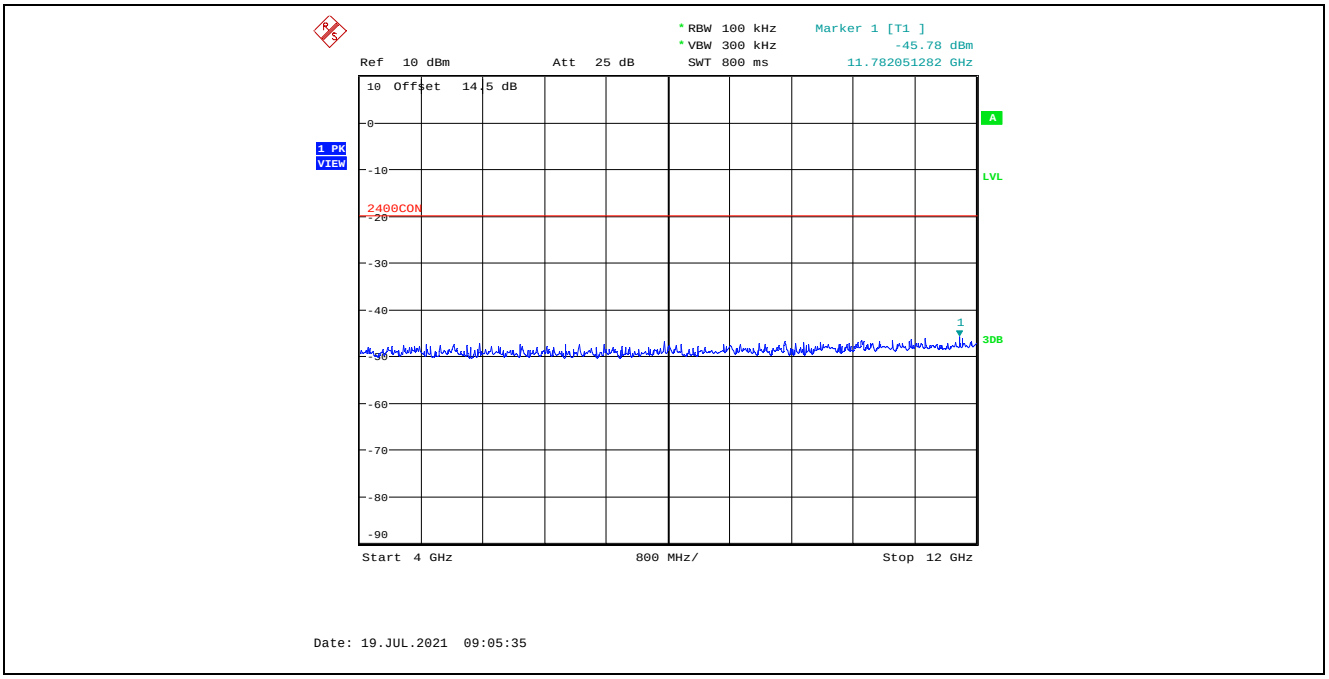
Plot 5.4.4.2.9. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 12 GHz – 25 GHz, Peak Detector



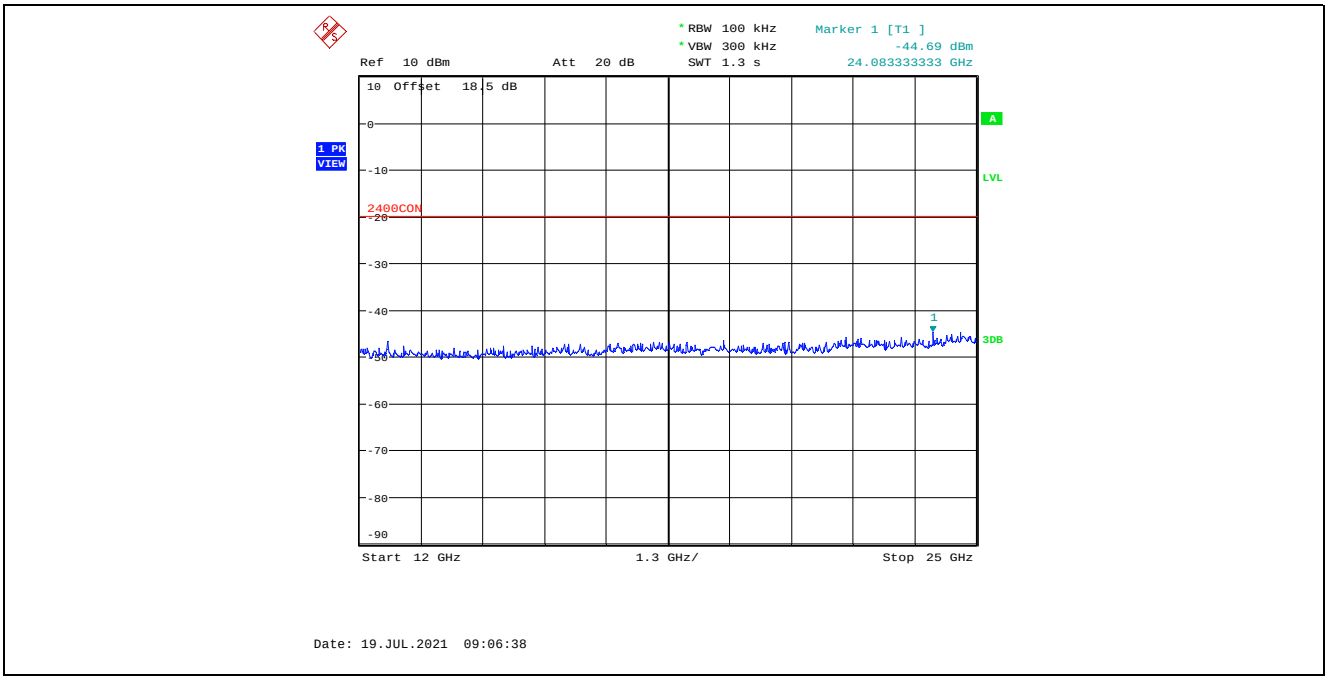
Plot 5.4.4.2.10. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2402 MHz, GFSK Modulation, 1 Mbps, 30 MHz – 4 GHz, Peak Detector



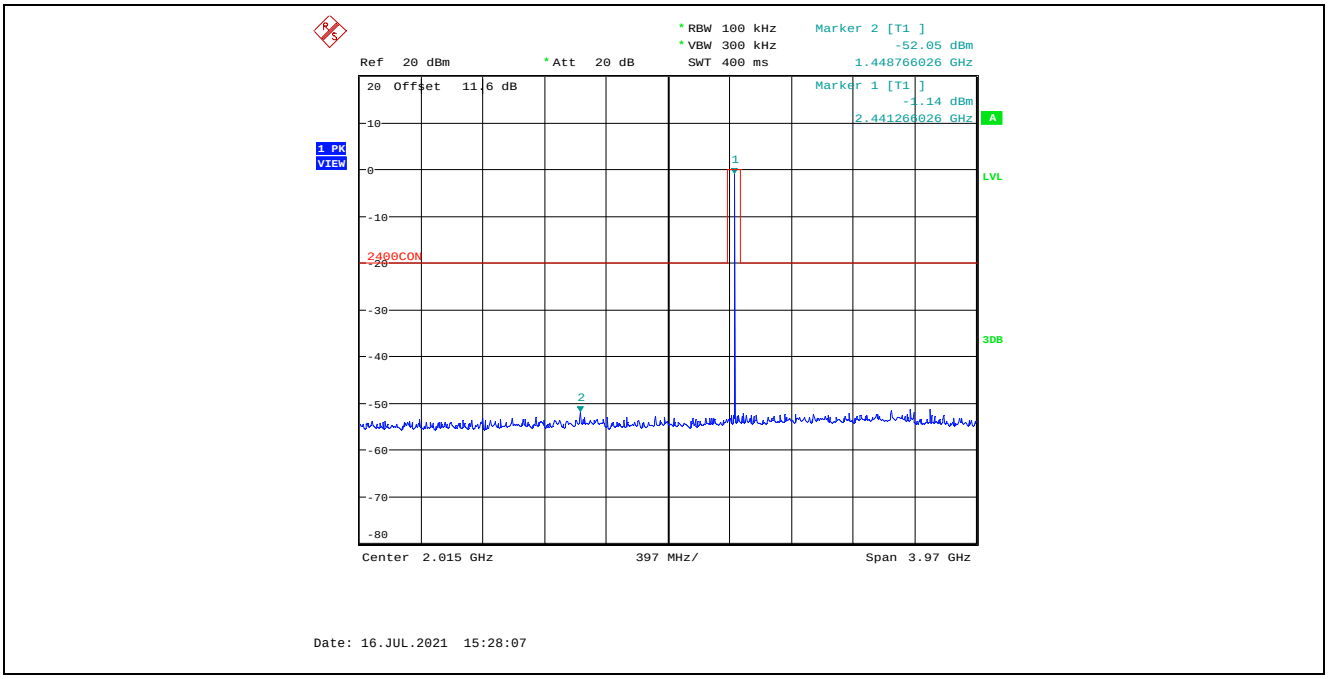
Plot 5.4.4.2.11. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2402 MHz, GFSK Modulation, 1 Mbps, 4 GHz – 12 GHz, Peak Detector



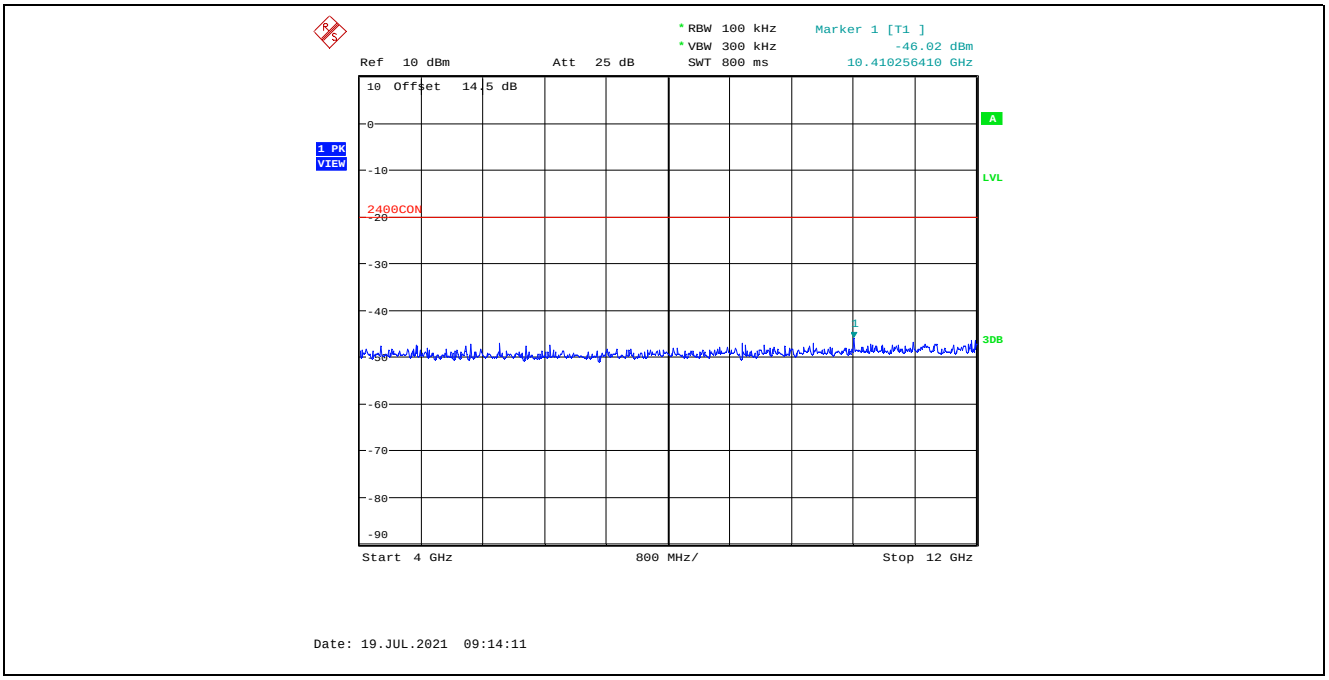
Plot 5.4.4.2.12. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2402 MHz, GFSK Modulation, 1 Mbps, 12 GHz – 25 GHz, Peak Detector



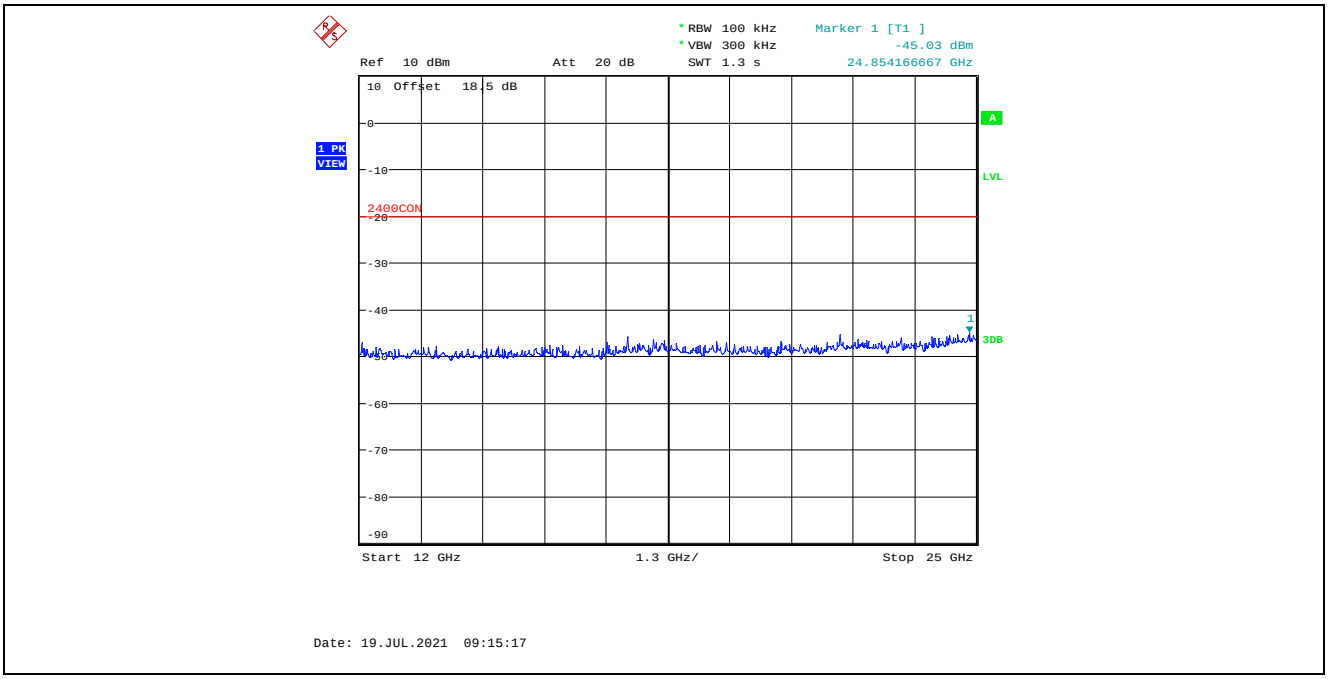
Plot 5.4.4.2.13. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2440 MHz, GFSK Modulation, 1 Mbps, 30 MHz – 4 GHz, Peak Detector



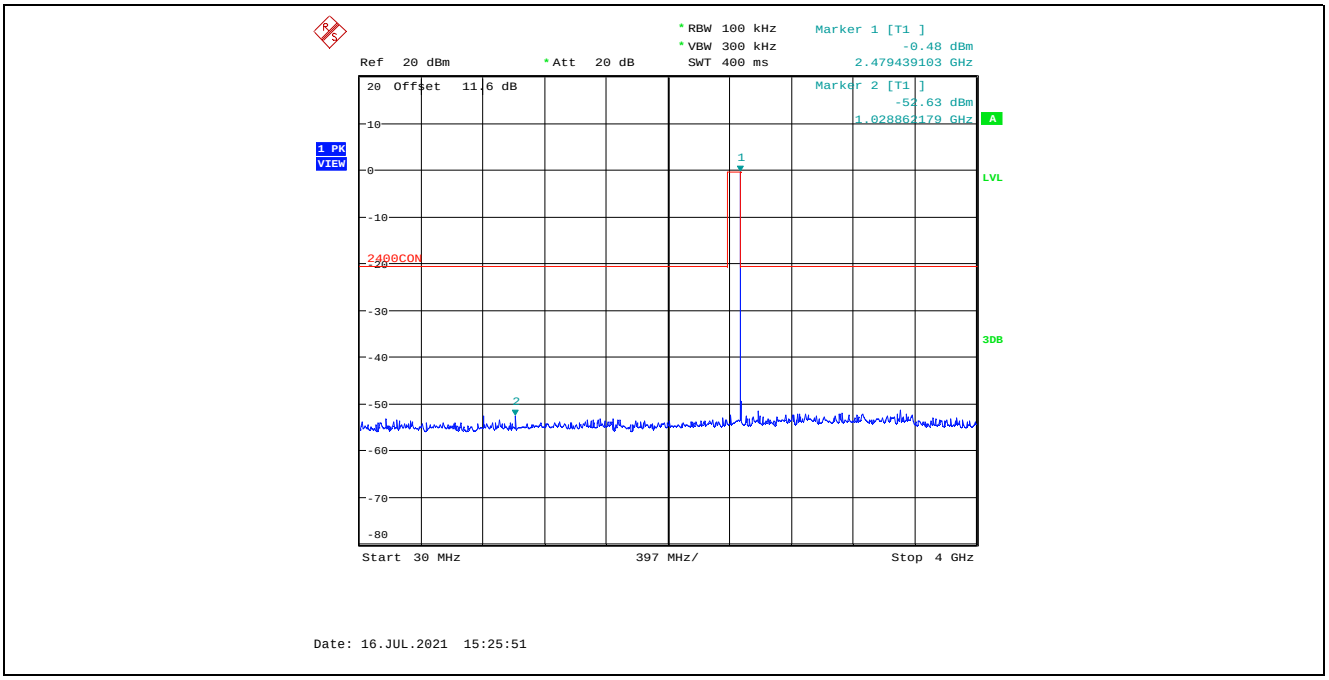
Plot 5.4.4.2.14. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2440 MHz, GFSK Modulation, 1 Mbps, 4 GHz – 12 GHz, Peak Detector



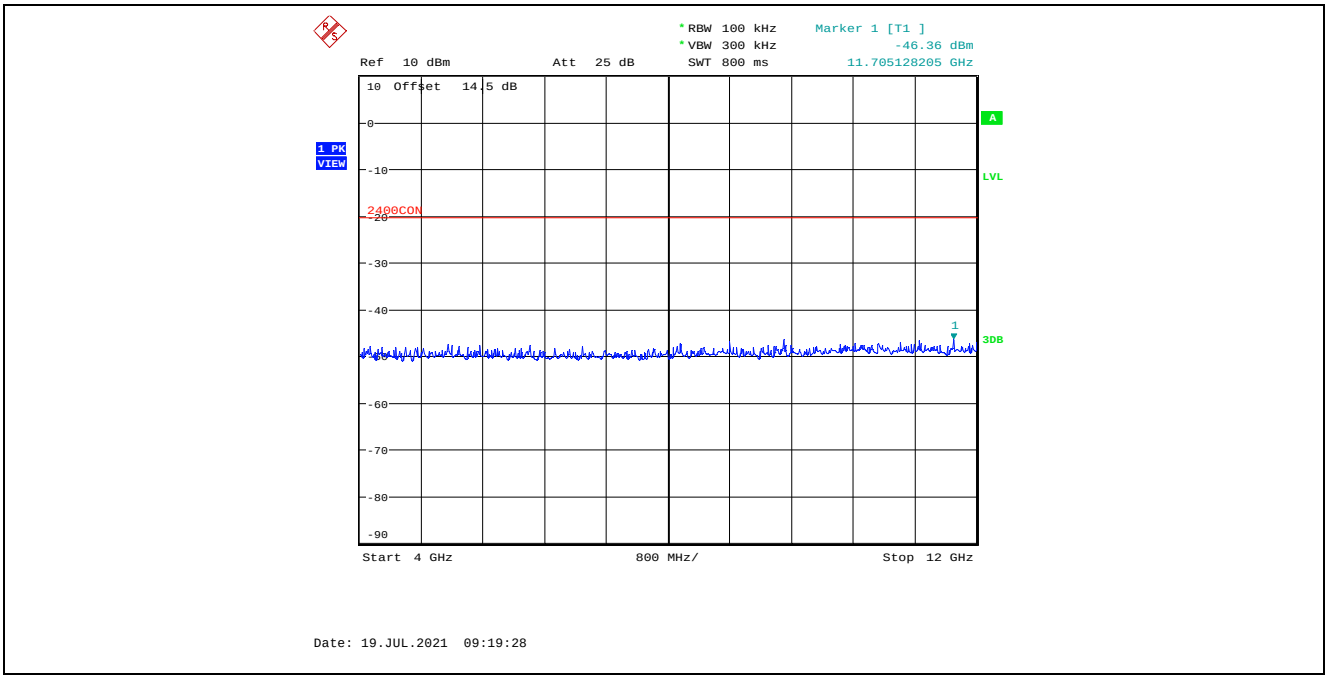
Plot 5.4.4.2.15. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2440 MHz, GFSK Modulation, 1 Mbps, 12 GHz – 25 GHz, Peak Detector



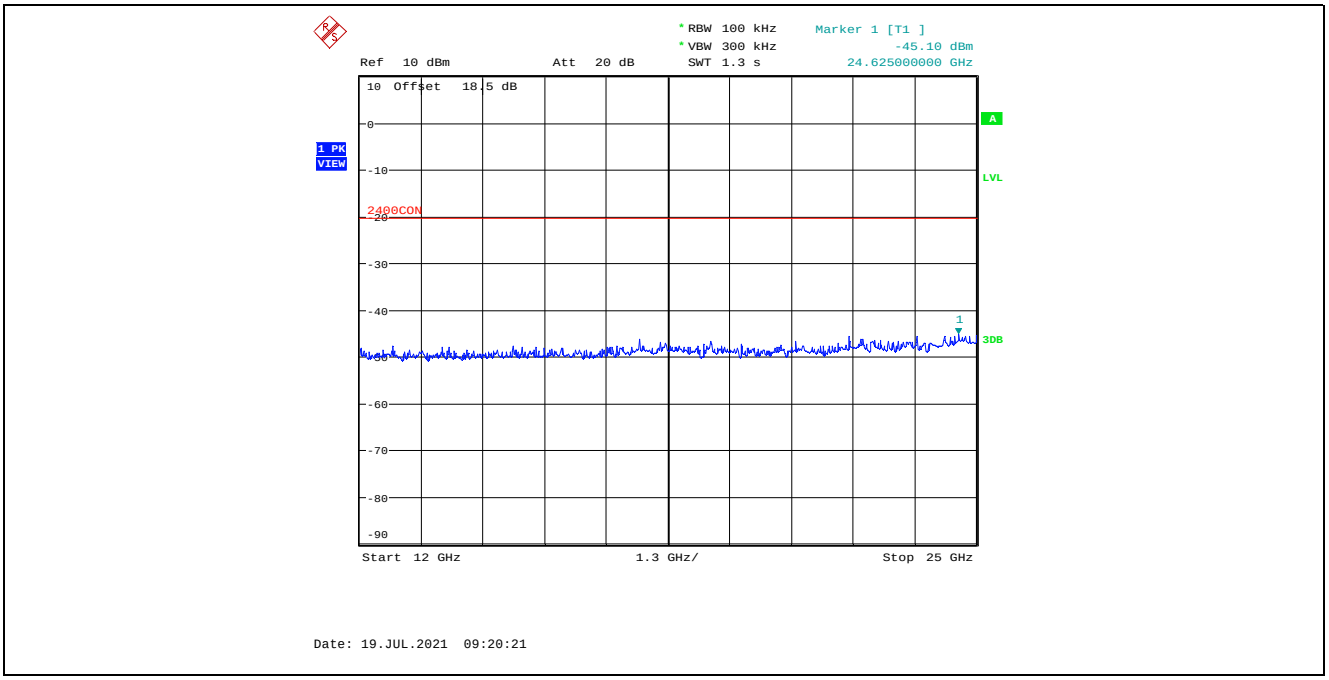
Plot 5.4.4.2.16. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2480 MHz, GFSK Modulation, 1 Mbps, 30 MHz – 4 GHz, Peak Detector



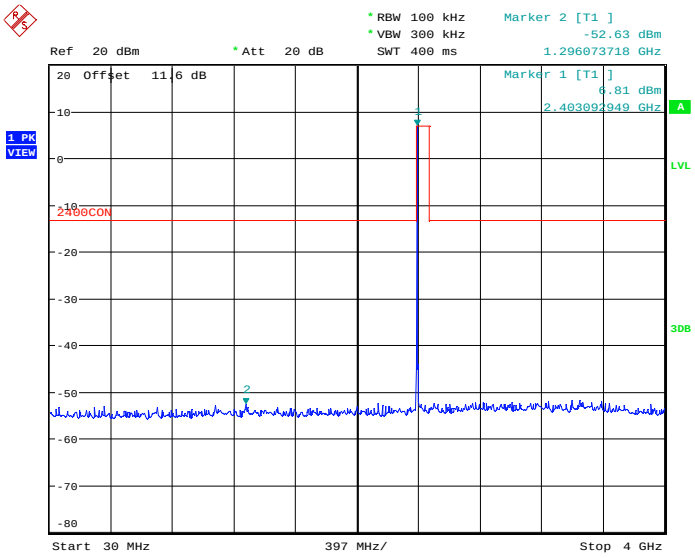
Plot 5.4.4.2.17. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2480 MHz, GFSK Modulation, 1 Mbps, 4 GHz – 12 GHz, Peak Detector



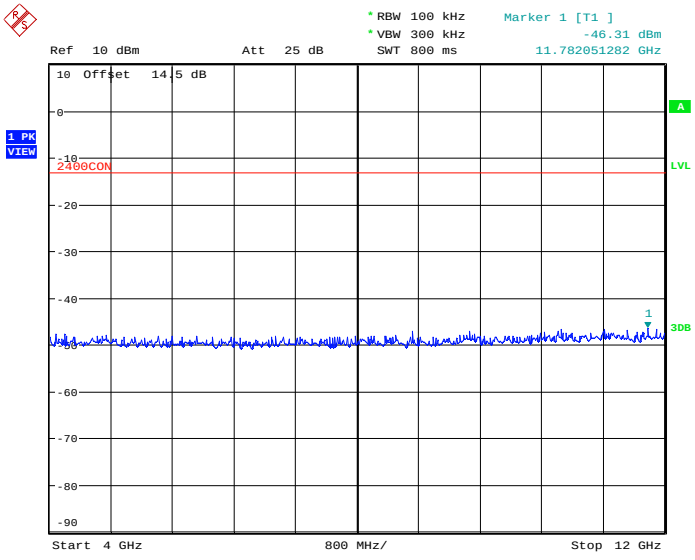
Plot 5.4.4.2.18. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2480 MHz, GFSK Modulation, 1 Mbps, 12 GHz – 25 GHz, Peak Detector



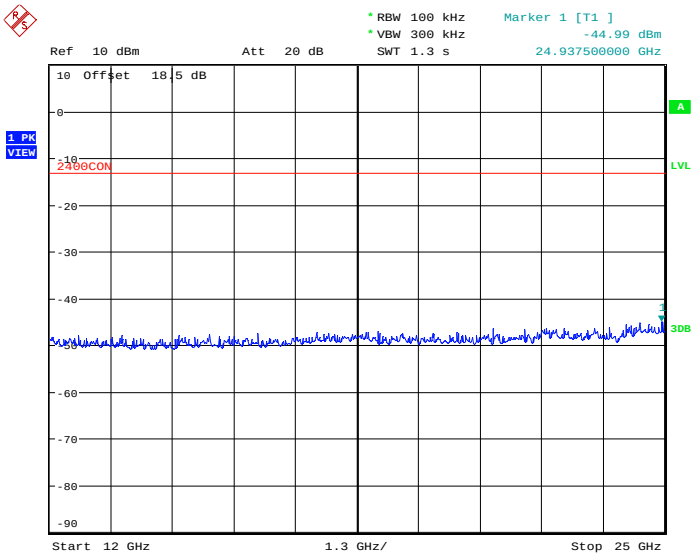
Plot 5.4.4.2.19. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 30 MHz – 4 GHz, Peak Detector



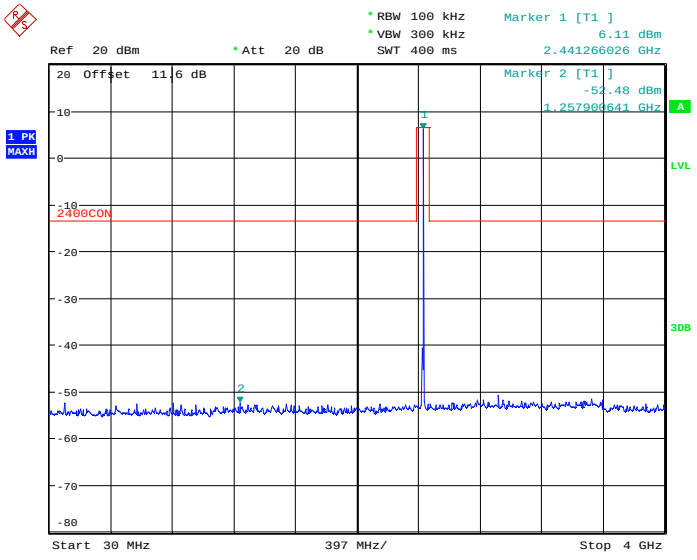
Plot 5.4.4.2.20. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 4 GHz – 12 GHz, Peak Detector



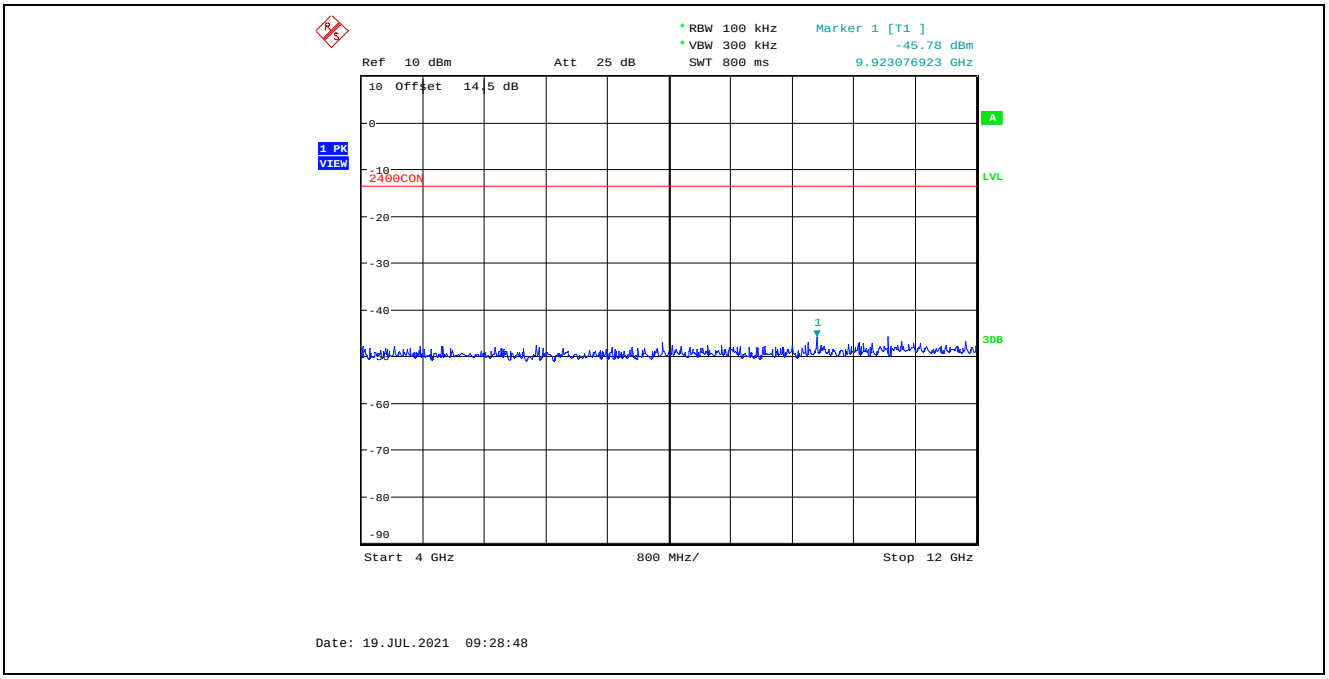
Plot 5.4.4.2.21. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 12 GHz – 25 GHz, Peak Detector



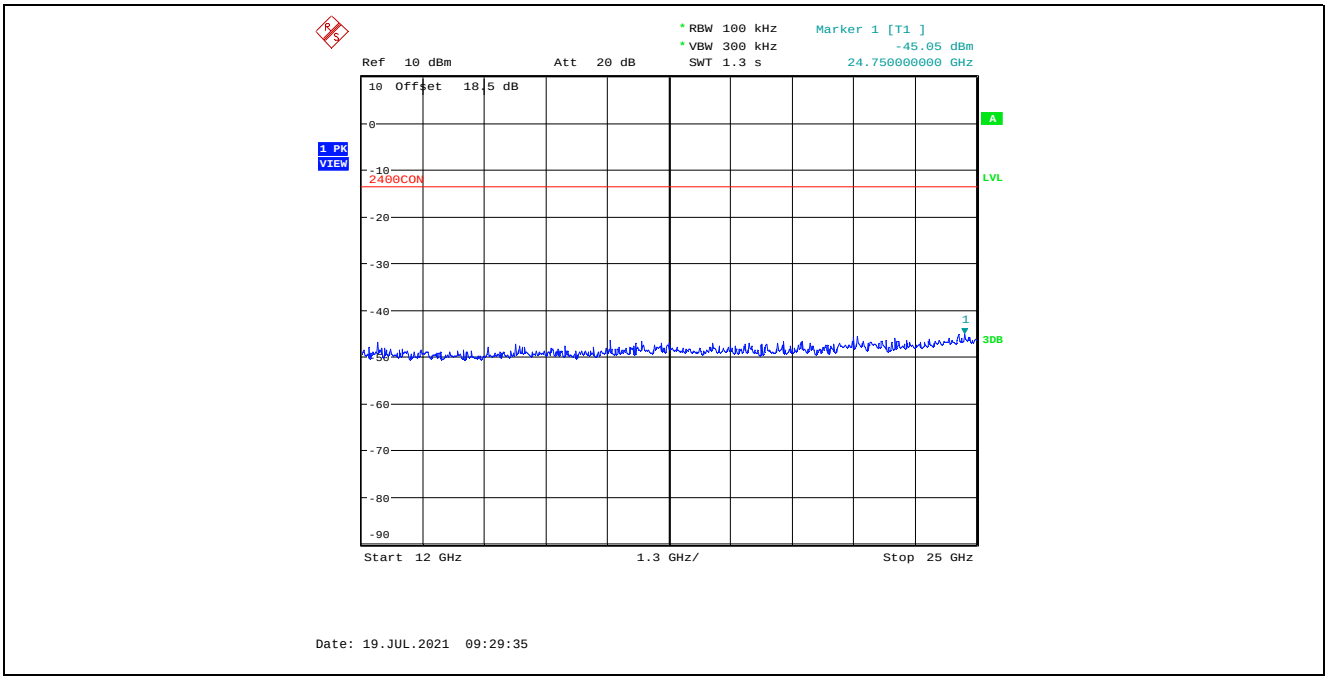
Plot 5.4.4.2.22. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 30 MHz – 4 GHz, Peak Detector



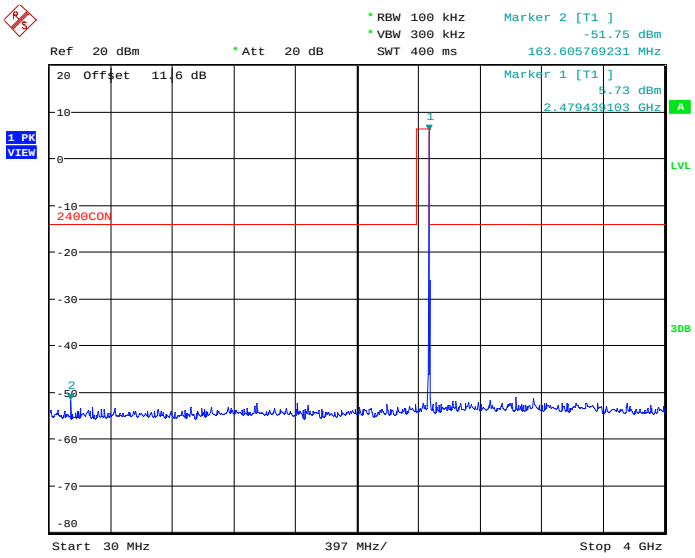
Plot 5.4.4.2.23. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 4 GHz – 12 GHz, Peak Detector



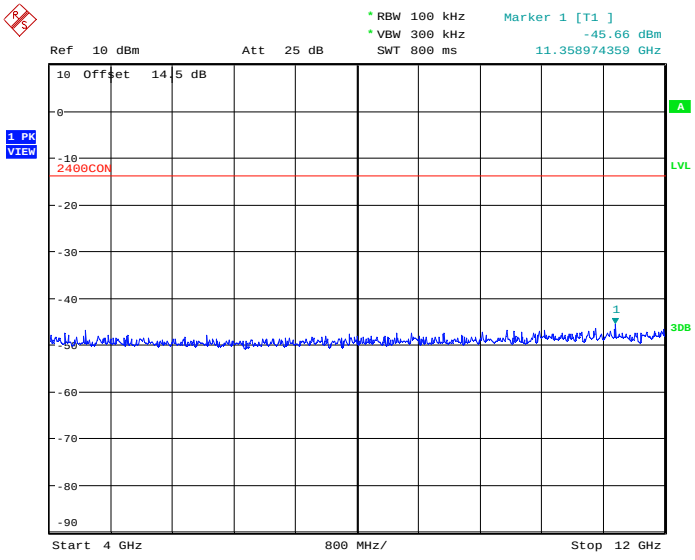
Plot 5.4.4.2.24. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 12 GHz – 25 GHz, Peak Detector



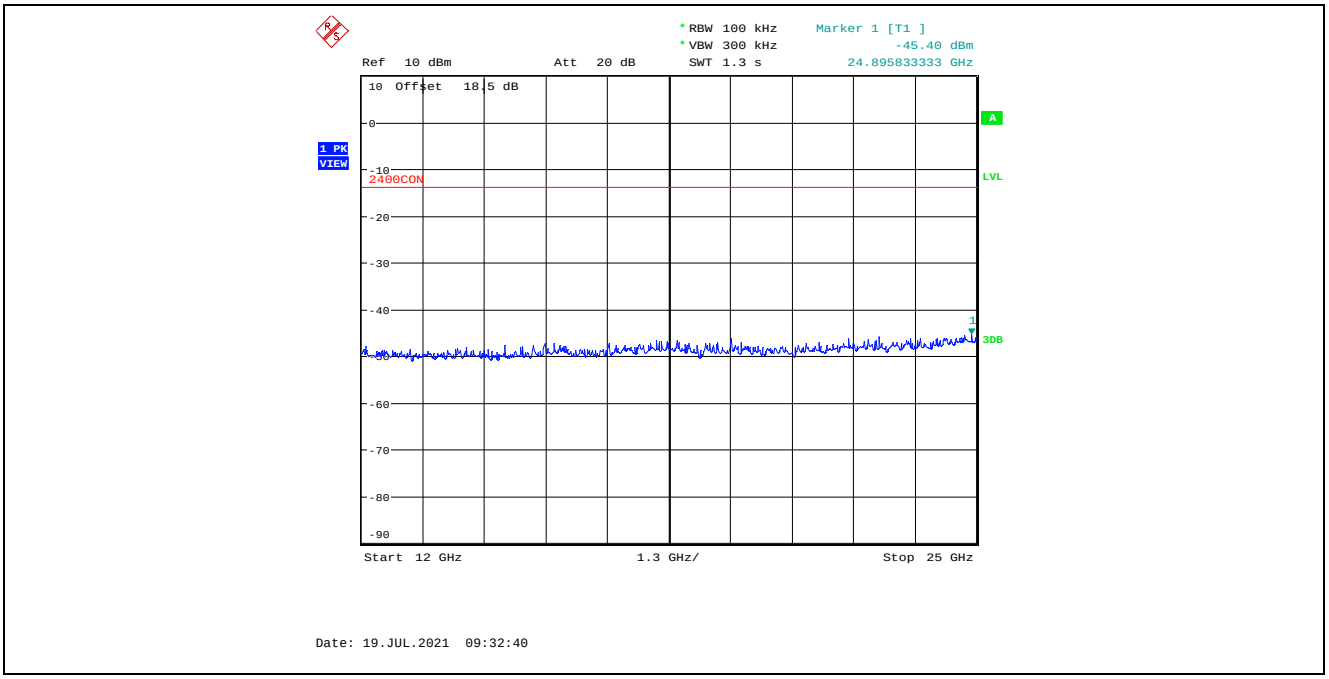
Plot 5.4.4.2.25. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 30 MHz – 4 GHz, Peak Detector



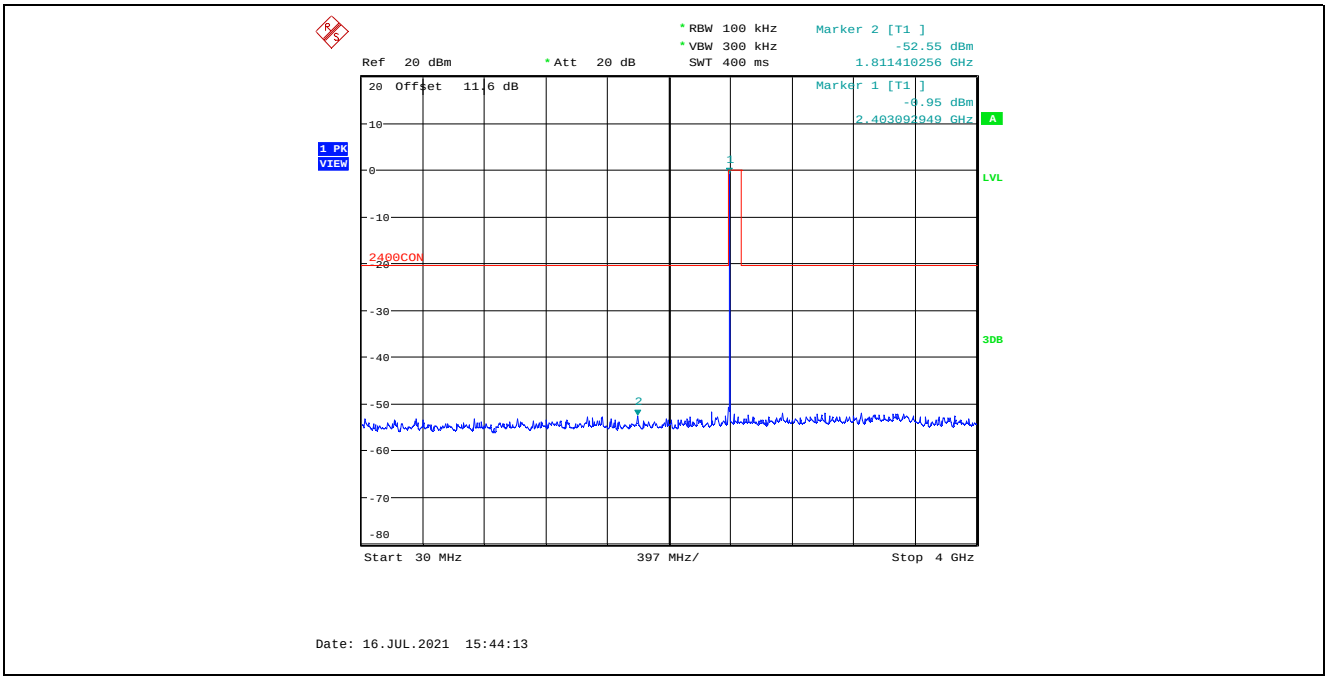
Plot 5.4.4.2.26. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 4 GHz – 12 GHz, Peak Detector



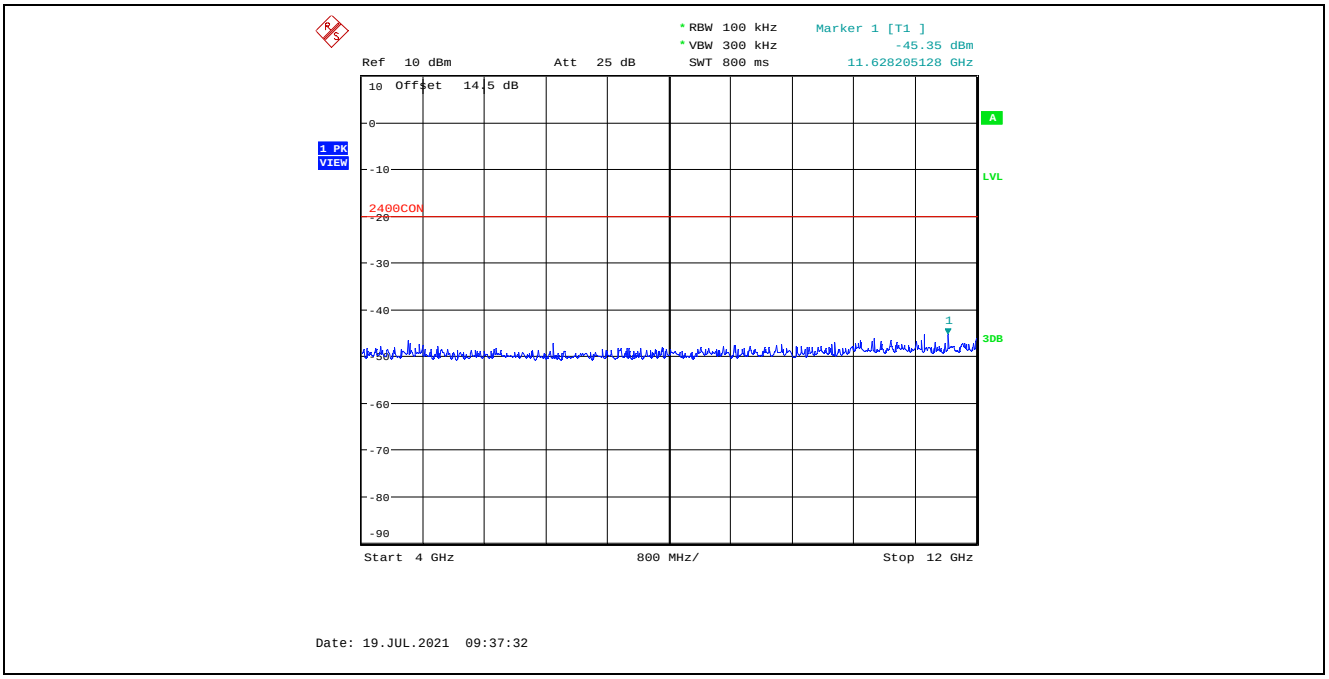
Plot 5.4.4.2.27. Conducted Spurious Emissions in Non-Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 12 GHz – 25 GHz, Peak Detector



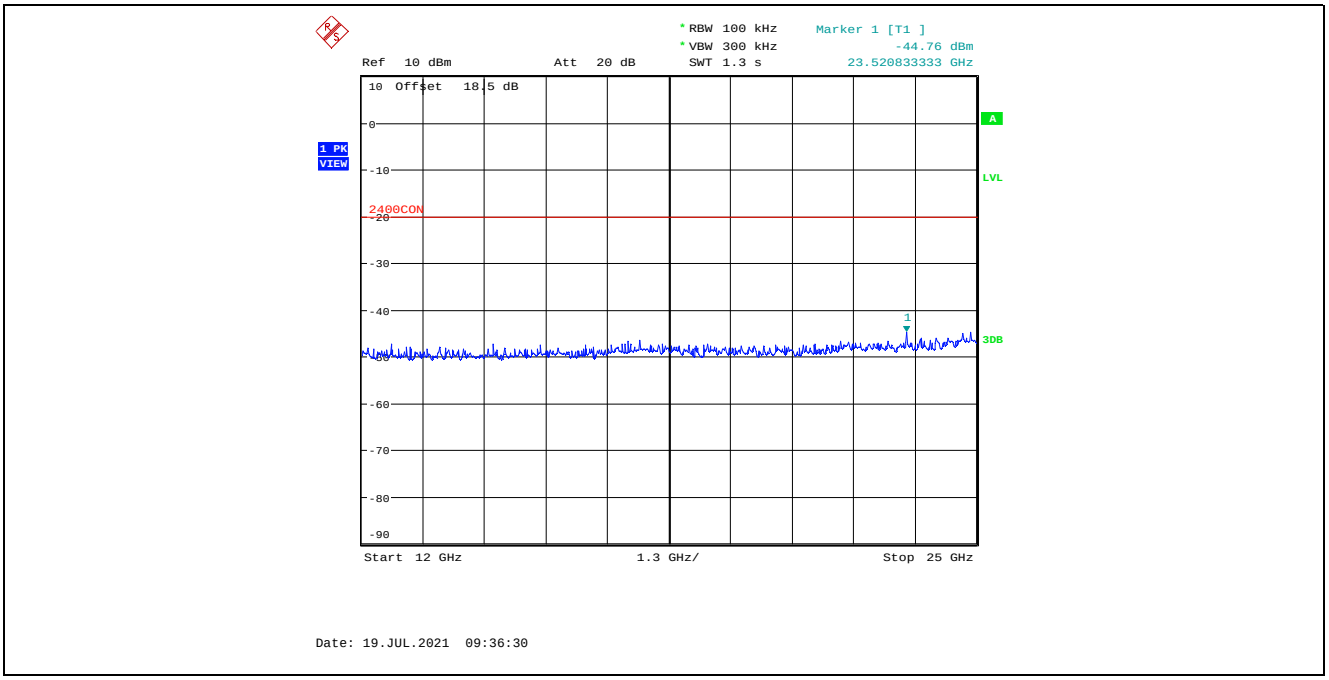
Plot 5.4.4.2.28. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2402 MHz, GFSK Modulation, 2 Mbps, 30 MHz – 4 GHz, Peak Detector



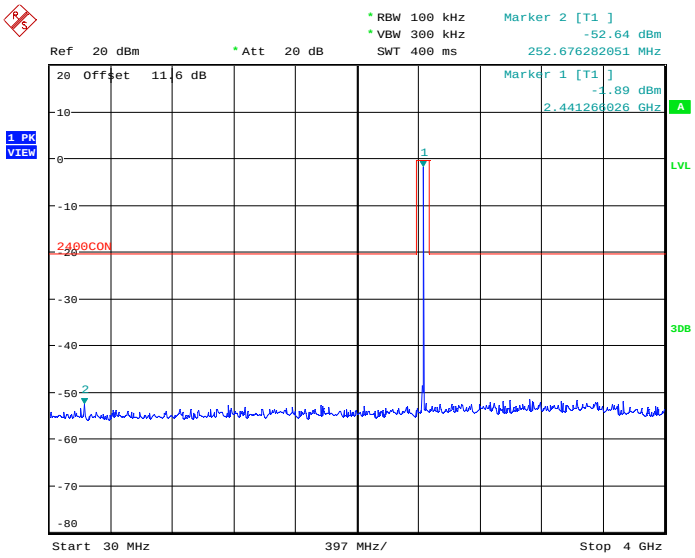
Plot 5.4.4.2.29. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2402 MHz, GFSK Modulation, 2 Mbps, 4 GHz – 12 GHz, Peak Detector



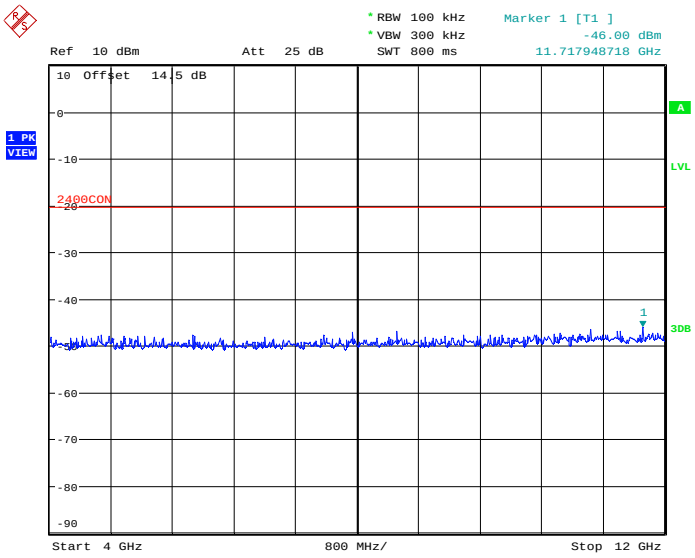
Plot 5.4.4.2.30. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2402 MHz, GFSK Modulation, 2 Mbps, 12 GHz – 25 GHz, Peak Detector



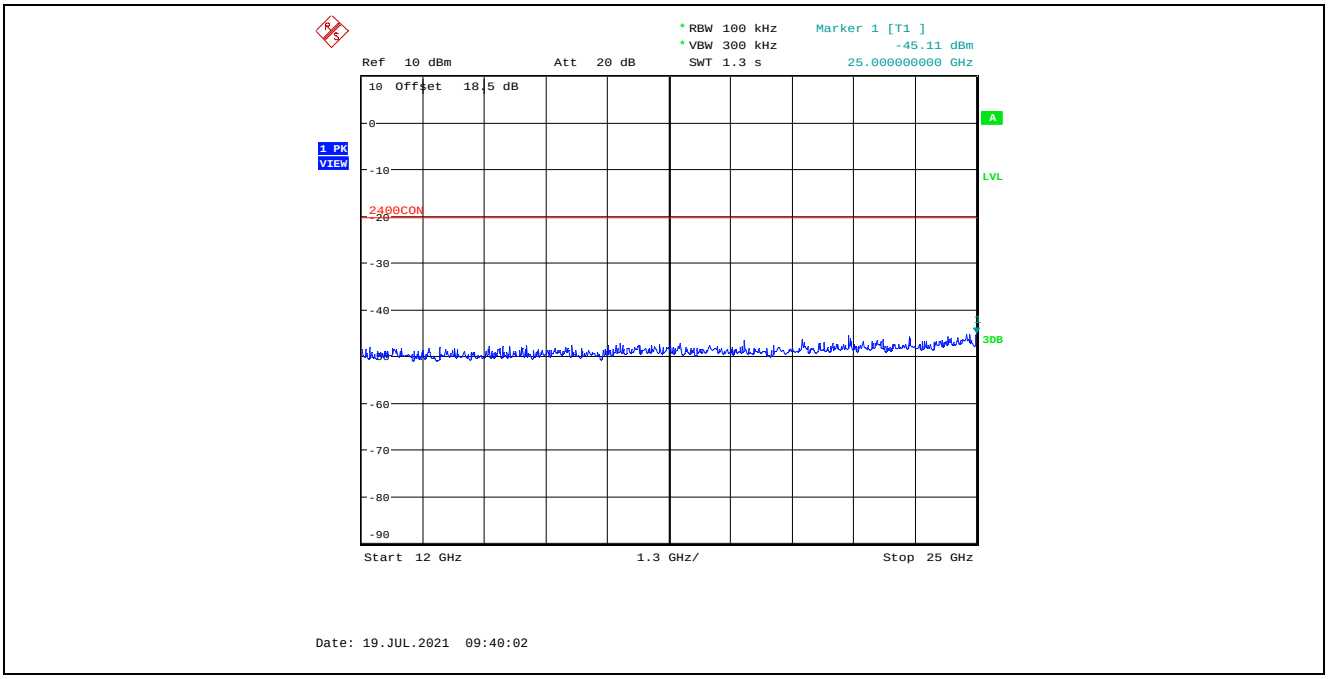
Plot 5.4.4.2.31. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2440 MHz, GFSK Modulation, 2 Mbps, 30 MHz – 4 GHz, Peak Detector



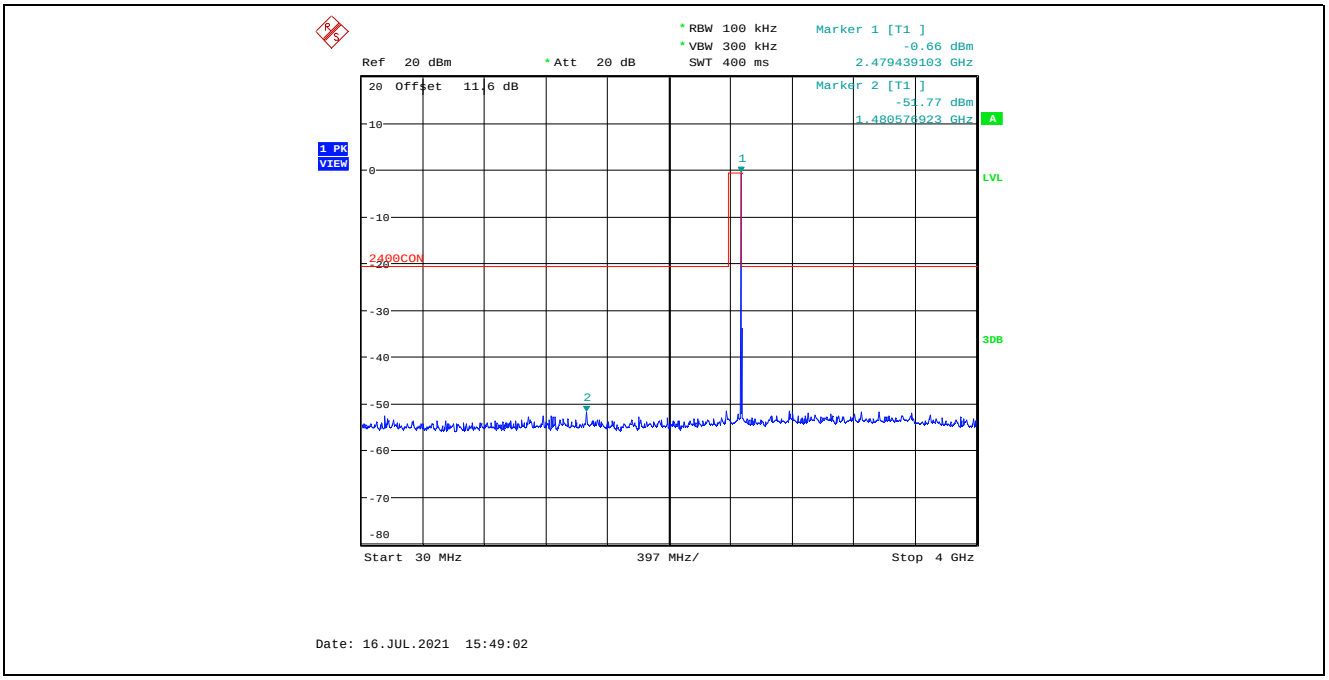
Plot 5.4.4.2.32. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2440 MHz, GFSK Modulation, 2 Mbps, 4 GHz – 12 GHz, Peak Detector



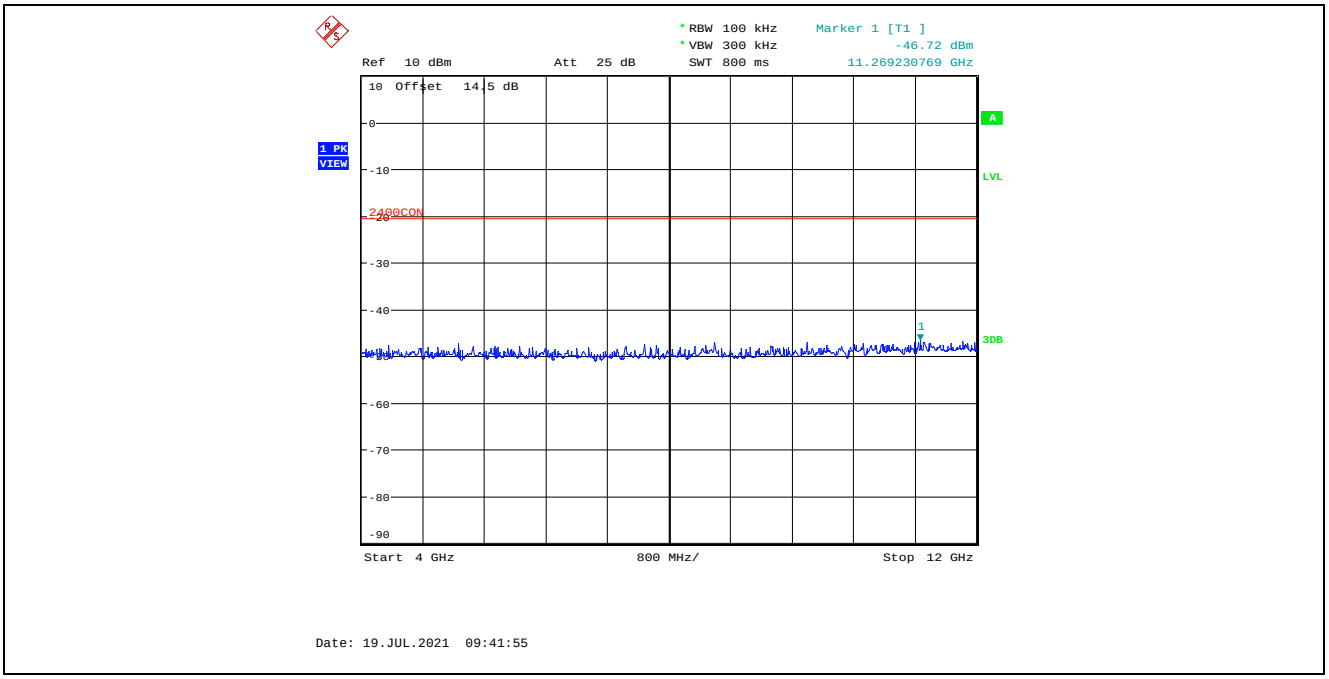
Plot 5.4.4.2.33. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2440 MHz, GFSK Modulation, 2 Mbps, 12 GHz – 25 GHz, Peak Detector



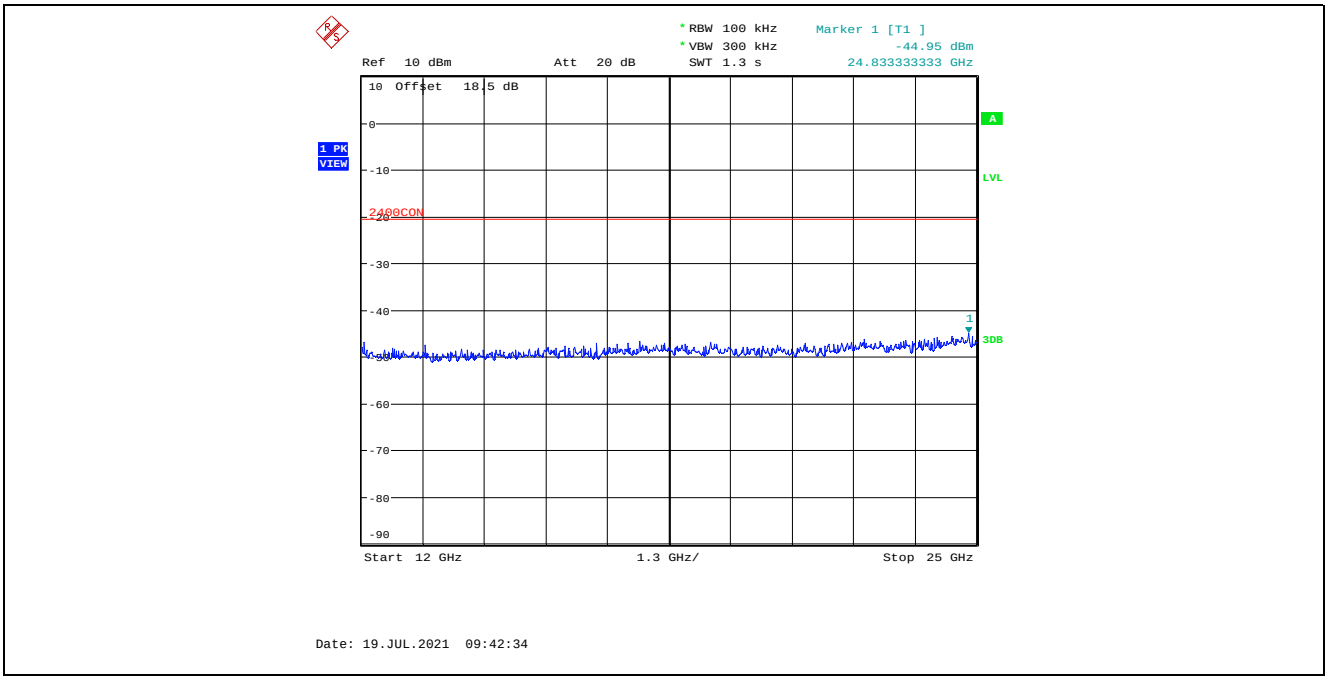
Plot 5.4.4.2.34. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2480 MHz, GFSK Modulation, 2 Mbps, 30 MHz – 4 GHz, Peak Detector



Plot 5.4.4.2.35. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2480 MHz, GFSK Modulation, 2 Mbps, 4 GHz – 12 GHz, Peak Detector



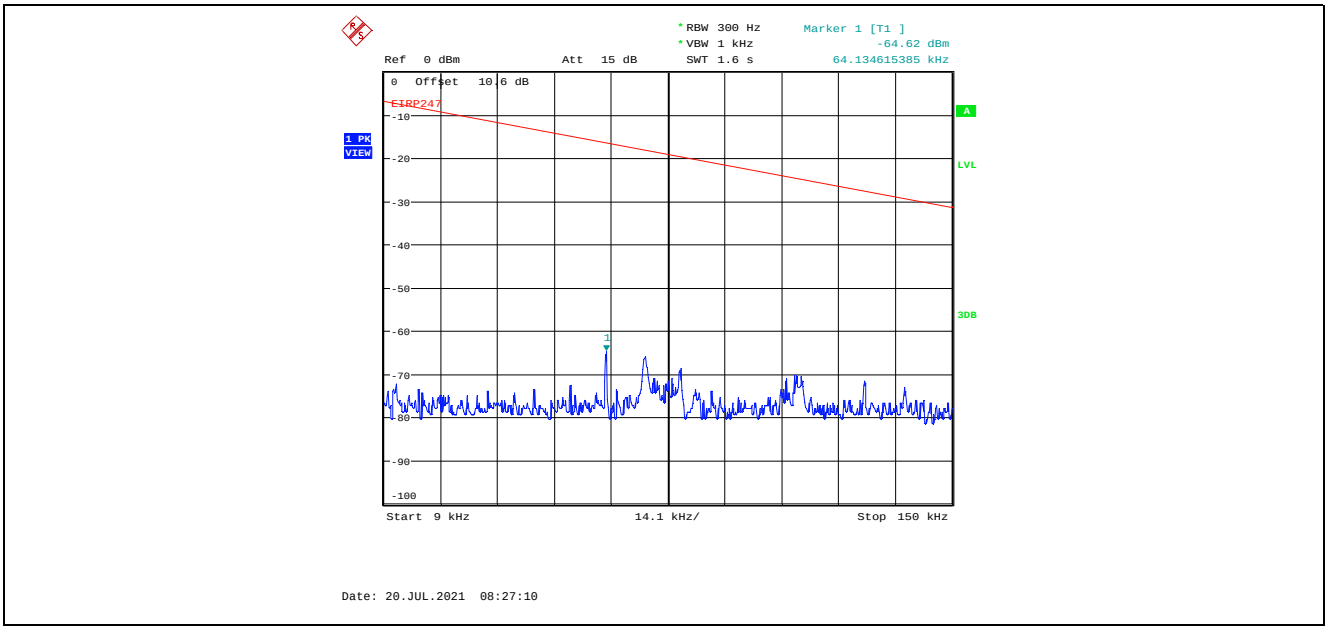
Plot 5.4.4.2.36. Conducted Spurious Emissions in Non-Restricted Frequency Bands, Low Power
2480 MHz, GFSK Modulation, 2 Mbps, 12 GHz – 25 GHz, Peak Detector



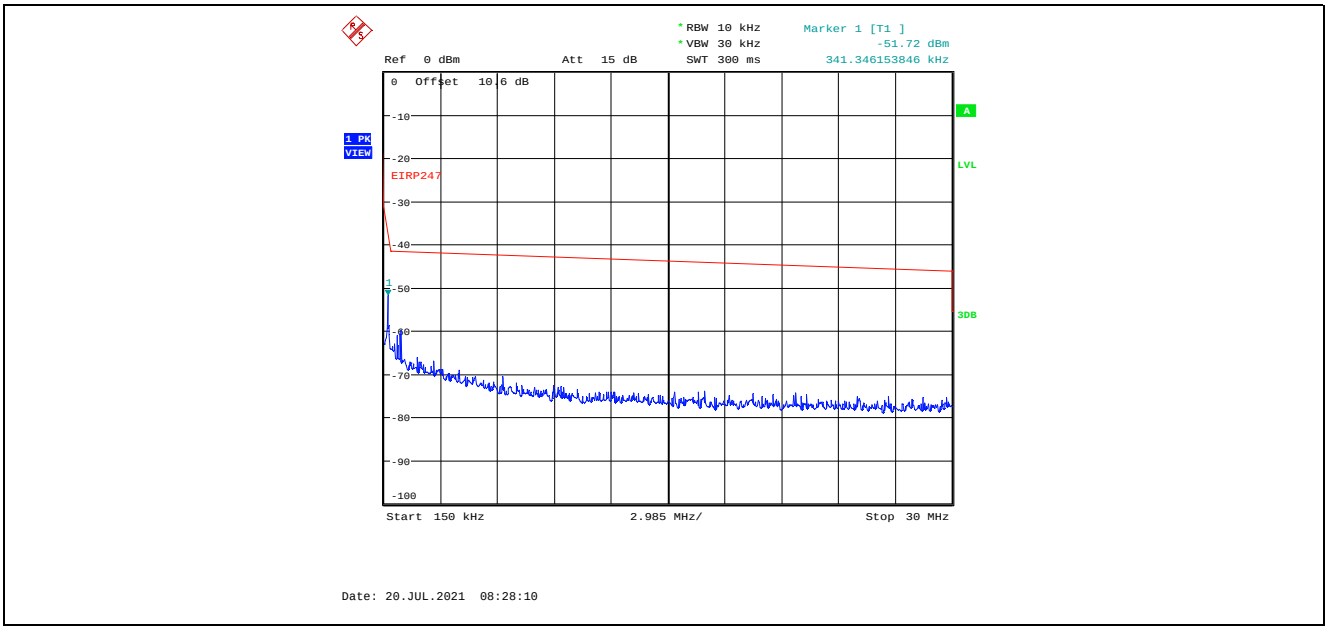
5.4.4.3. Conducted Spurious Emissions in Restricted Frequency Bands with Antenna Assembly Gain of 4.0 dBi)

Remark: Offset = [Insertion Loss] + [Transmit Antenna Gain (in dBi)] + [Maximum Ground Reflection Factor]

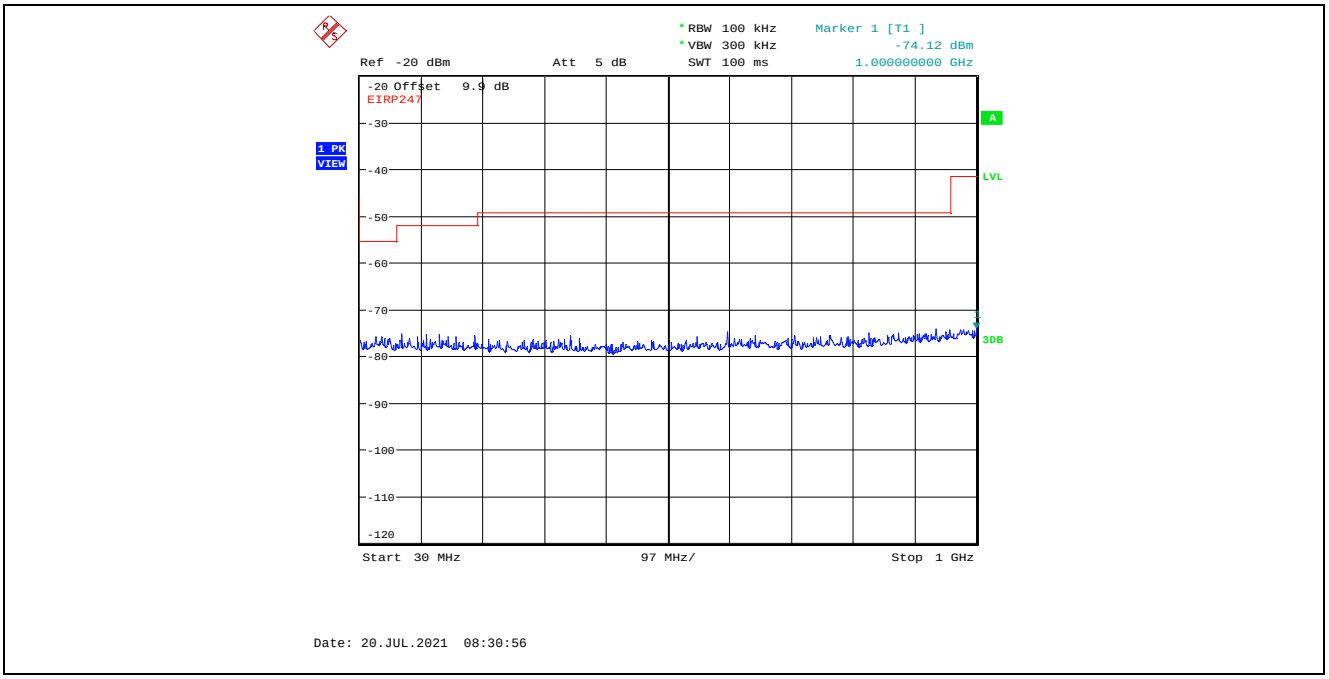
Plot 5.4.4.3.1. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 9 kHz - 150 kHz, Peak Detector



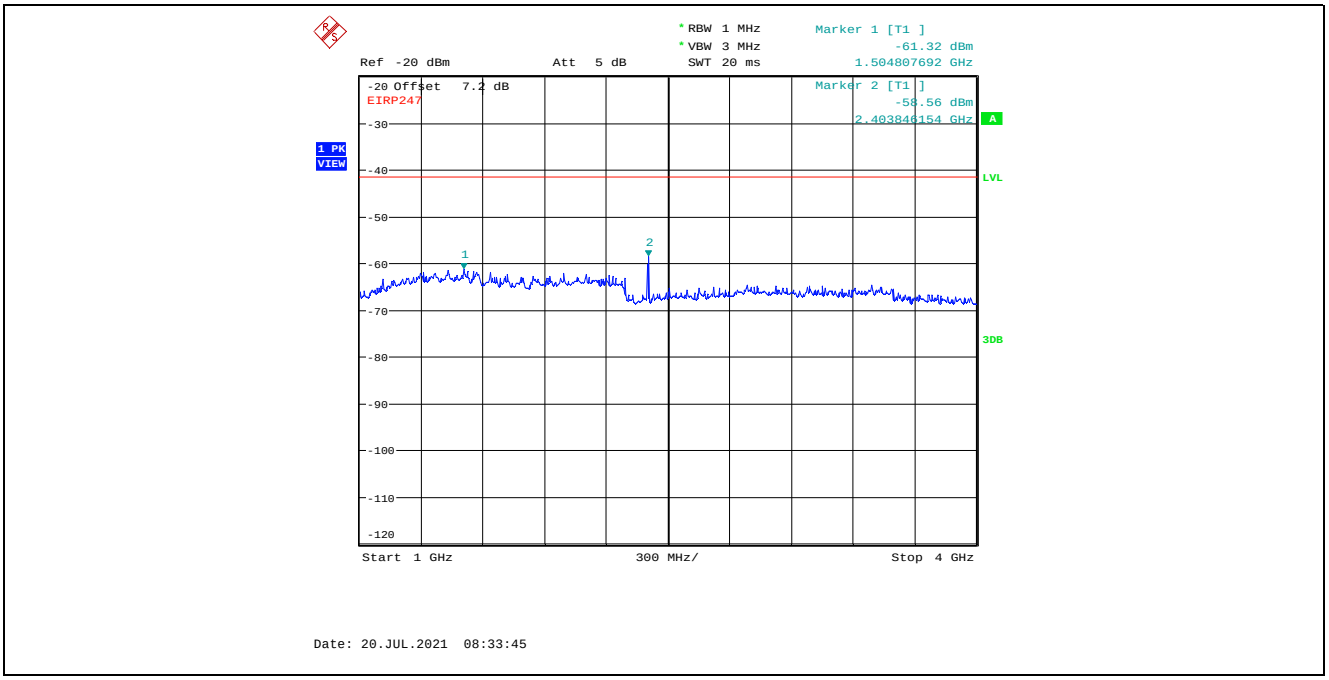
Plot 5.4.4.3.2. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 150 kHz - 30 MHz, Peak Detector



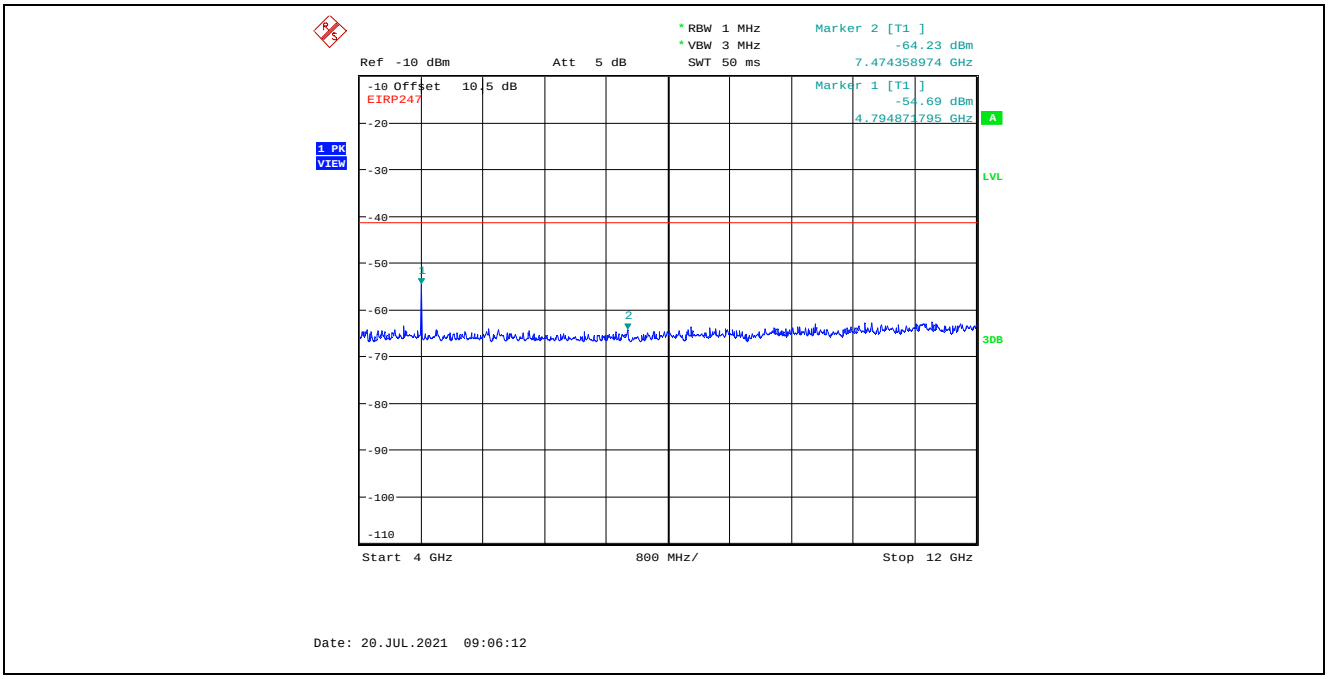
Plot 5.4.4.3.3. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 30 MHz - 1 GHz, Peak Detector



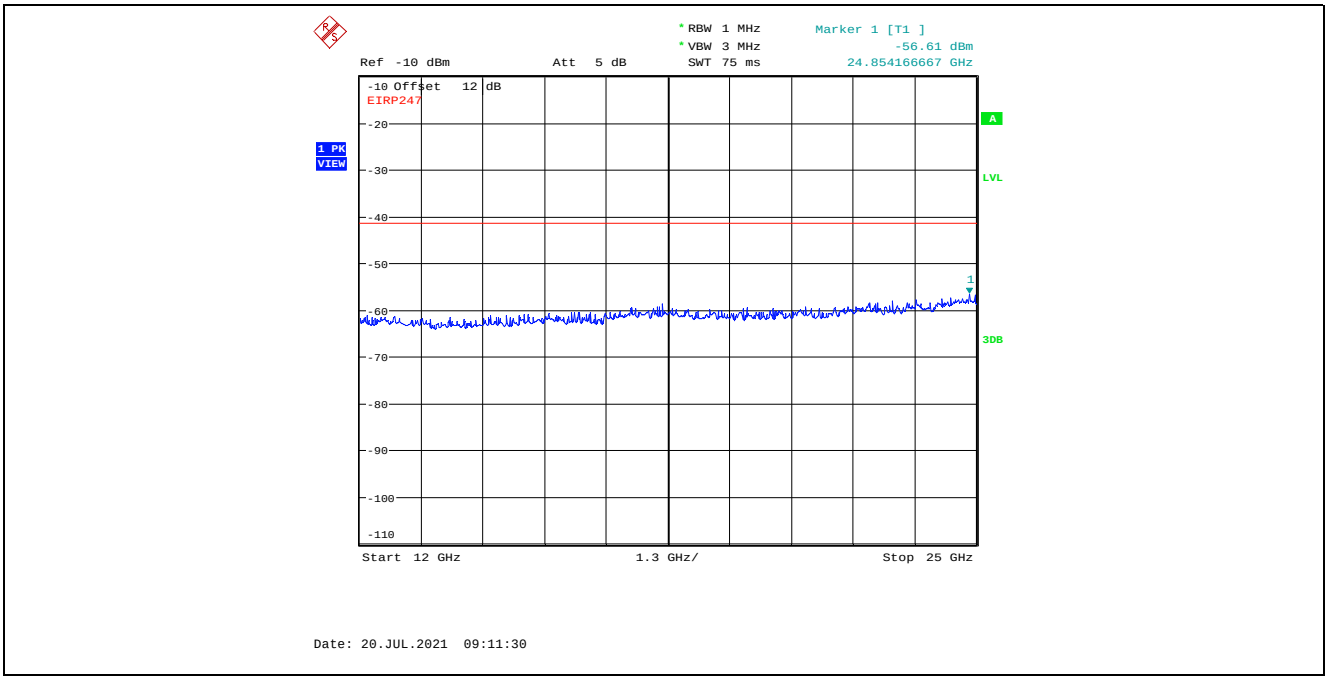
Plot 5.4.4.3.4. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 1 GHz - 4 GHz, Peak Detector



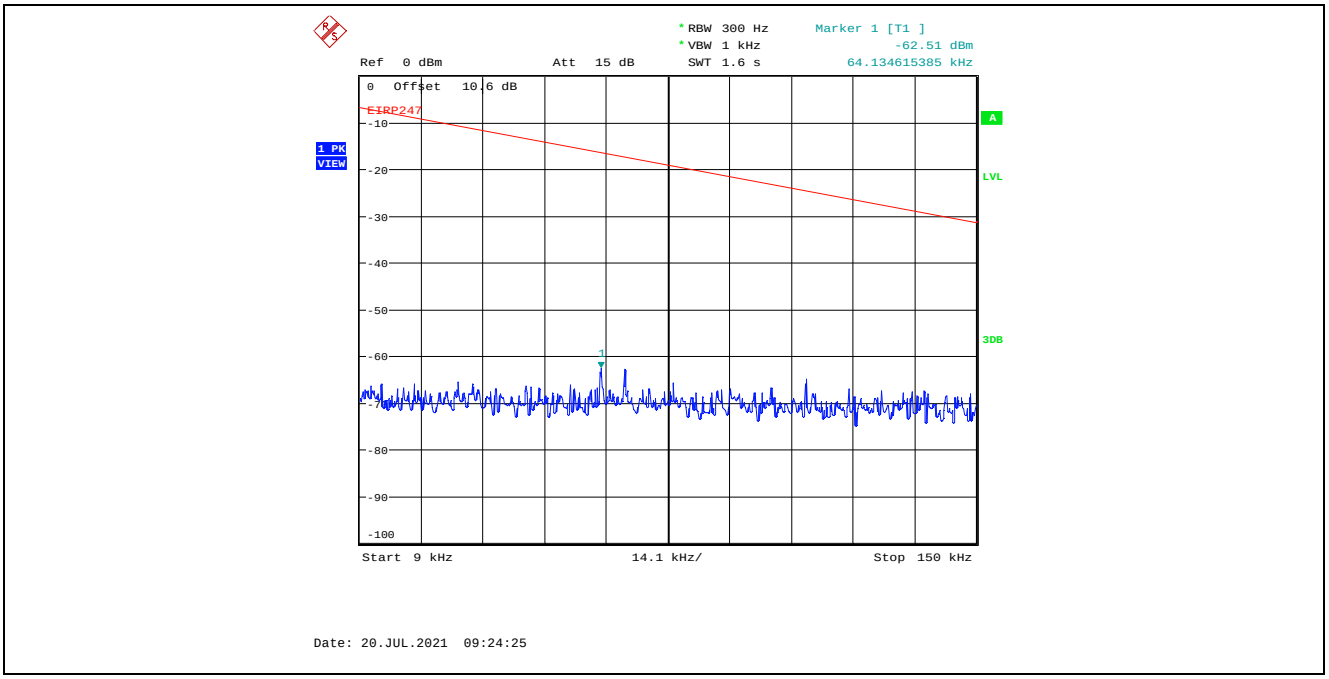
Plot 5.4.4.3.5. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 4 GHz - 12 GHz, Peak Detector



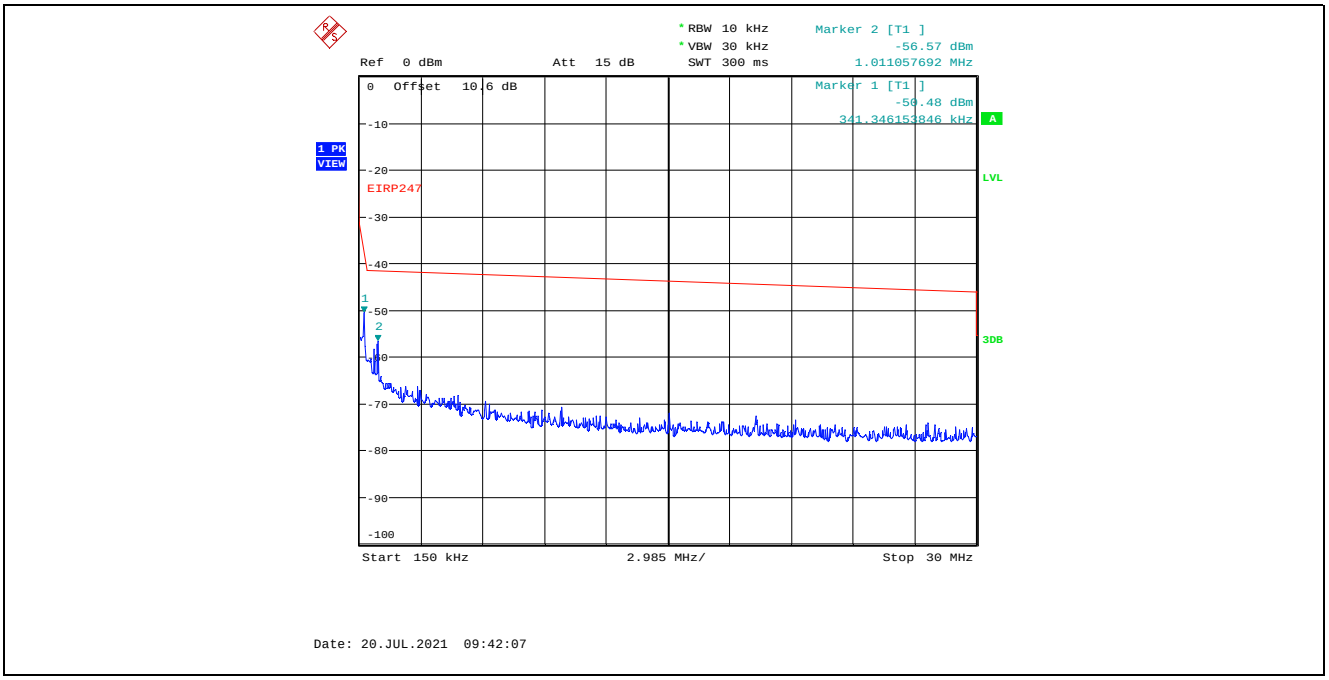
Plot 5.4.4.3.6. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 1 Mbps, 12 GHz - 25 GHz, Peak Detector



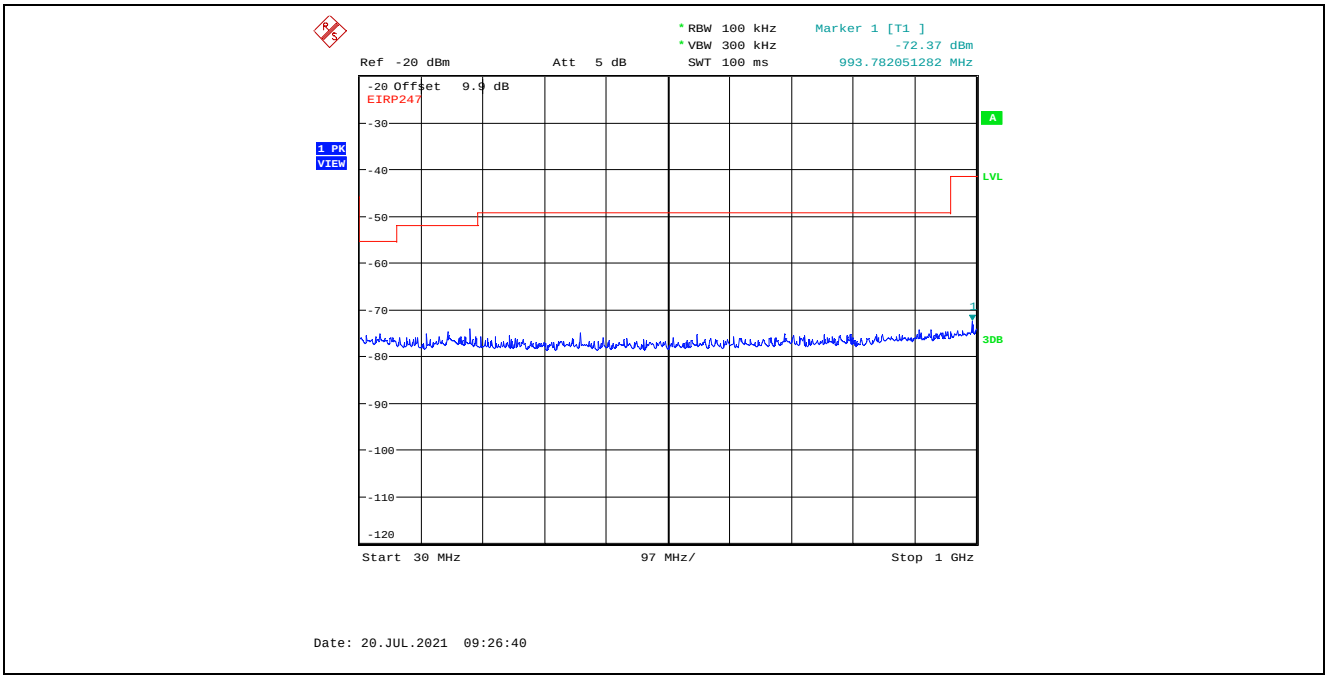
Plot 5.4.4.3.7. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 9 kHz - 150 kHz, Peak Detector



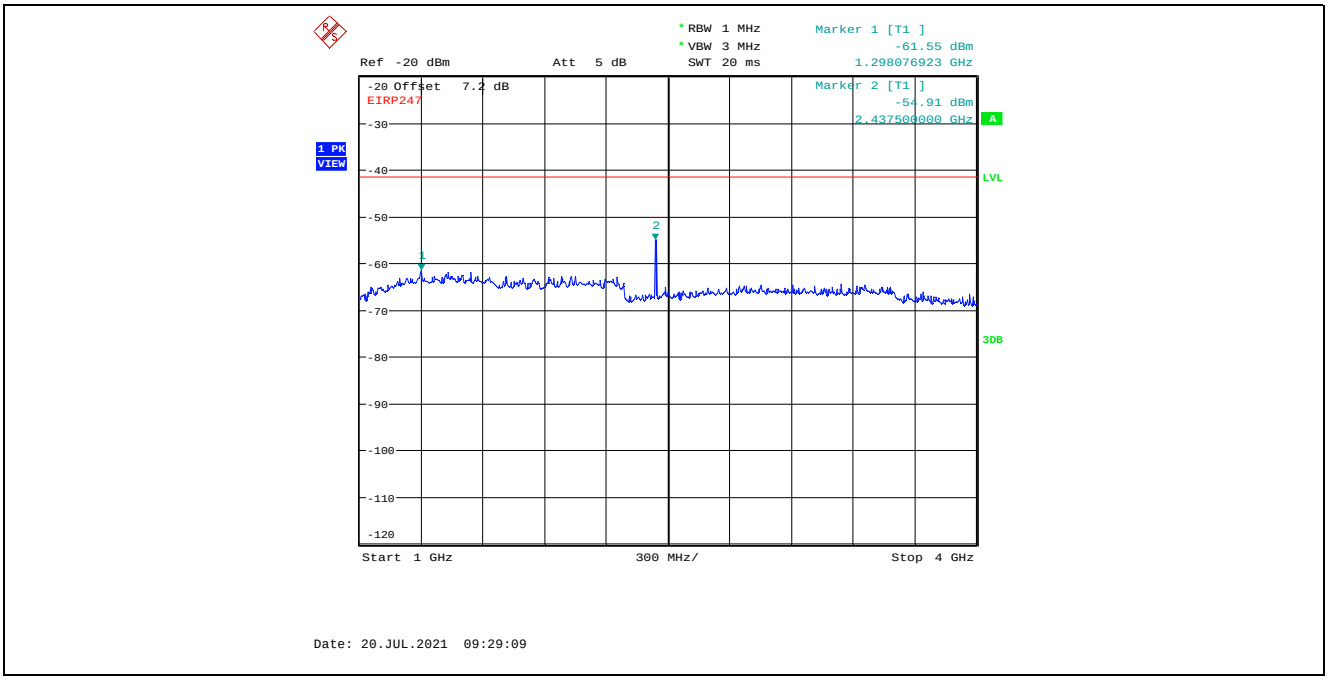
Plot 5.4.4.3.8. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 150 kHz - 30 MHz, Peak Detector



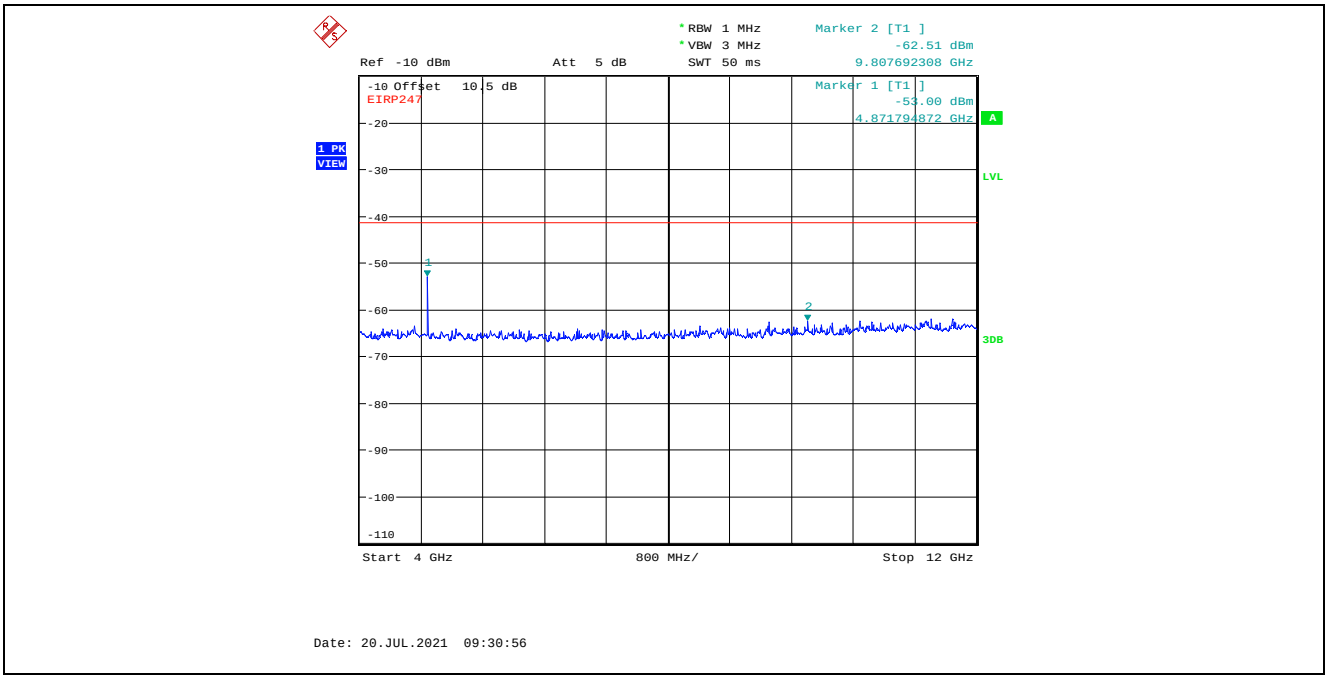
Plot 5.4.4.3.9. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 30 MHz - 1 GHz, Peak Detector



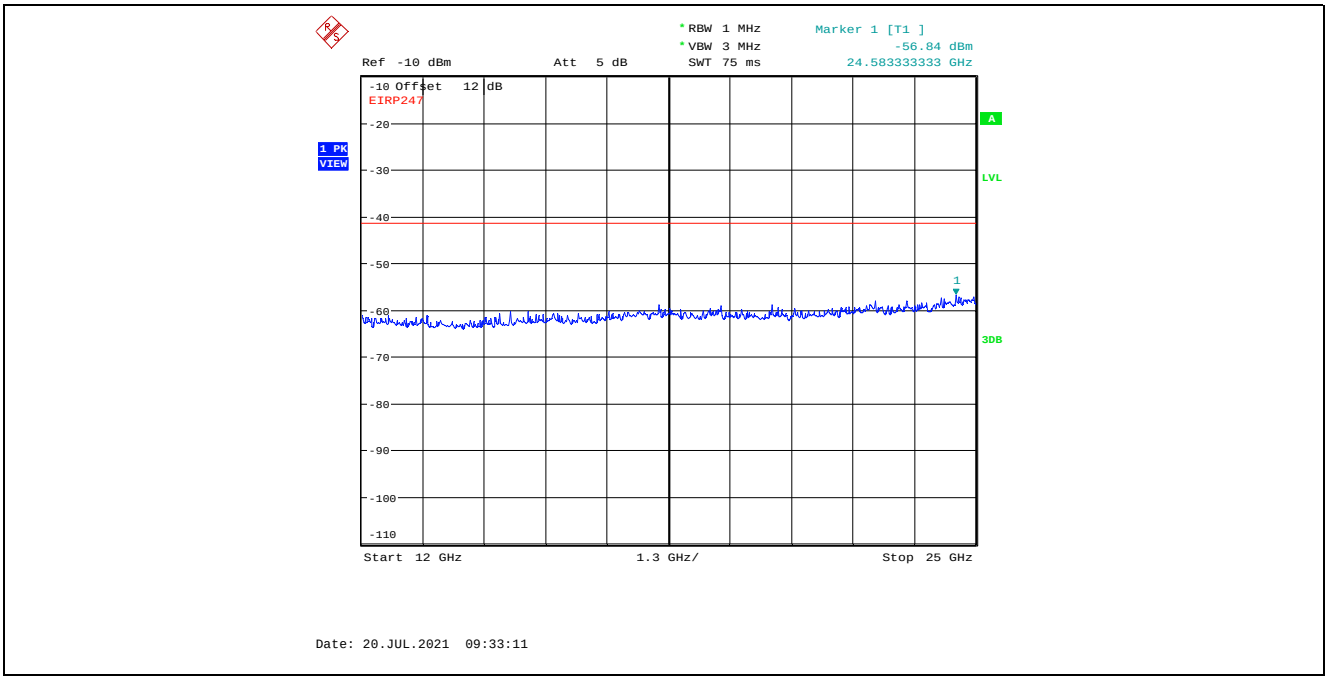
Plot 5.4.4.3.10. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 1 GHz - 4 GHz, Peak Detector



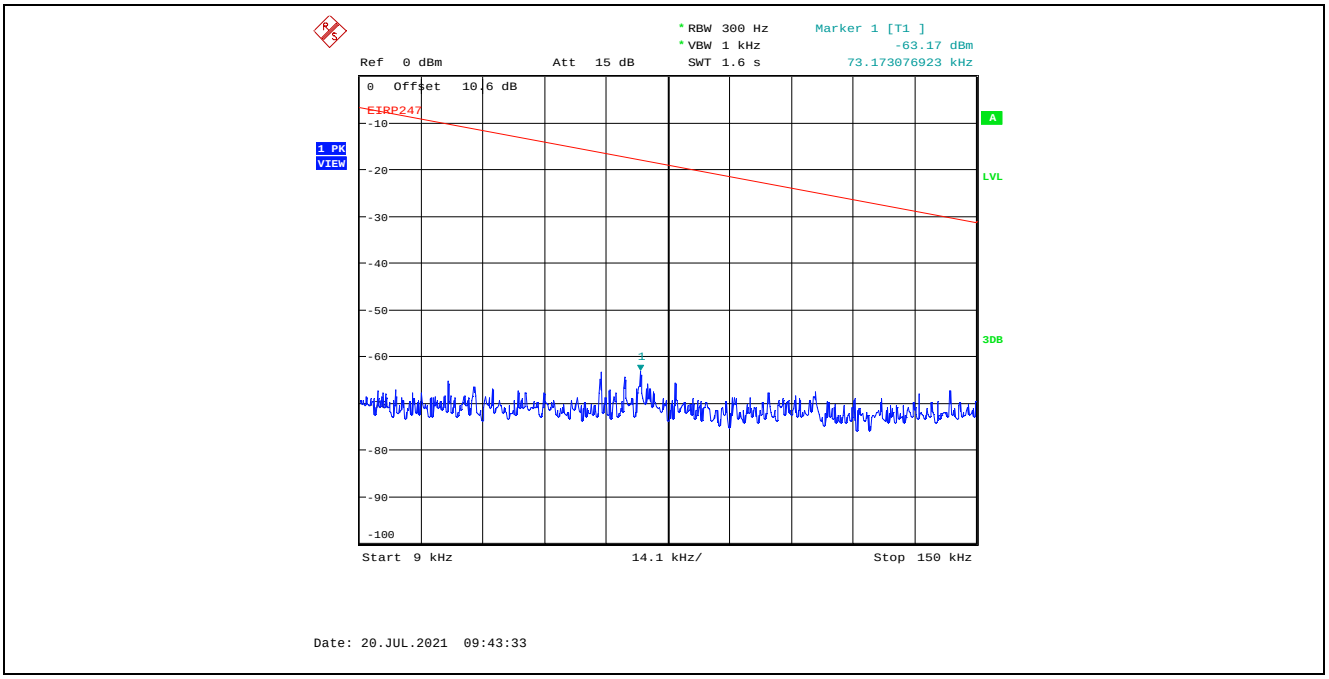
Plot 5.4.4.3.11. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 4 GHz - 12 GHz, Peak Detector



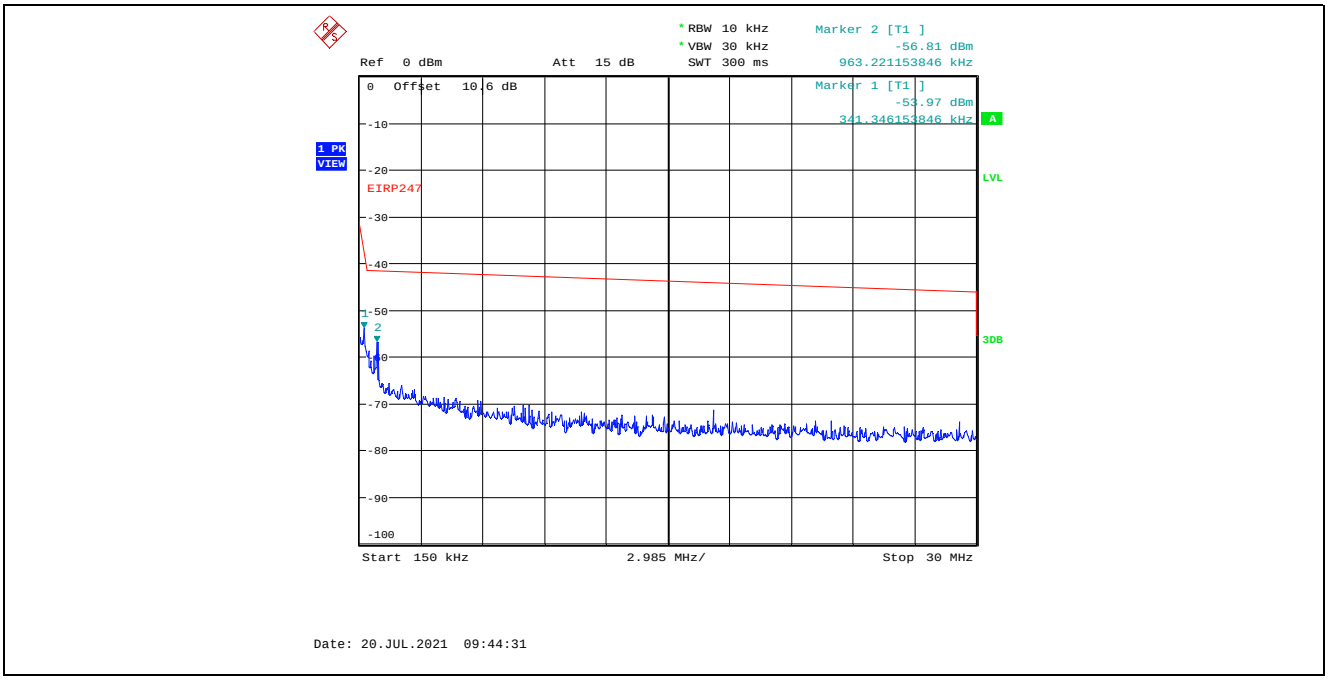
Plot 5.4.4.3.12. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 1 Mbps, 12 GHz - 25 GHz, Peak Detector



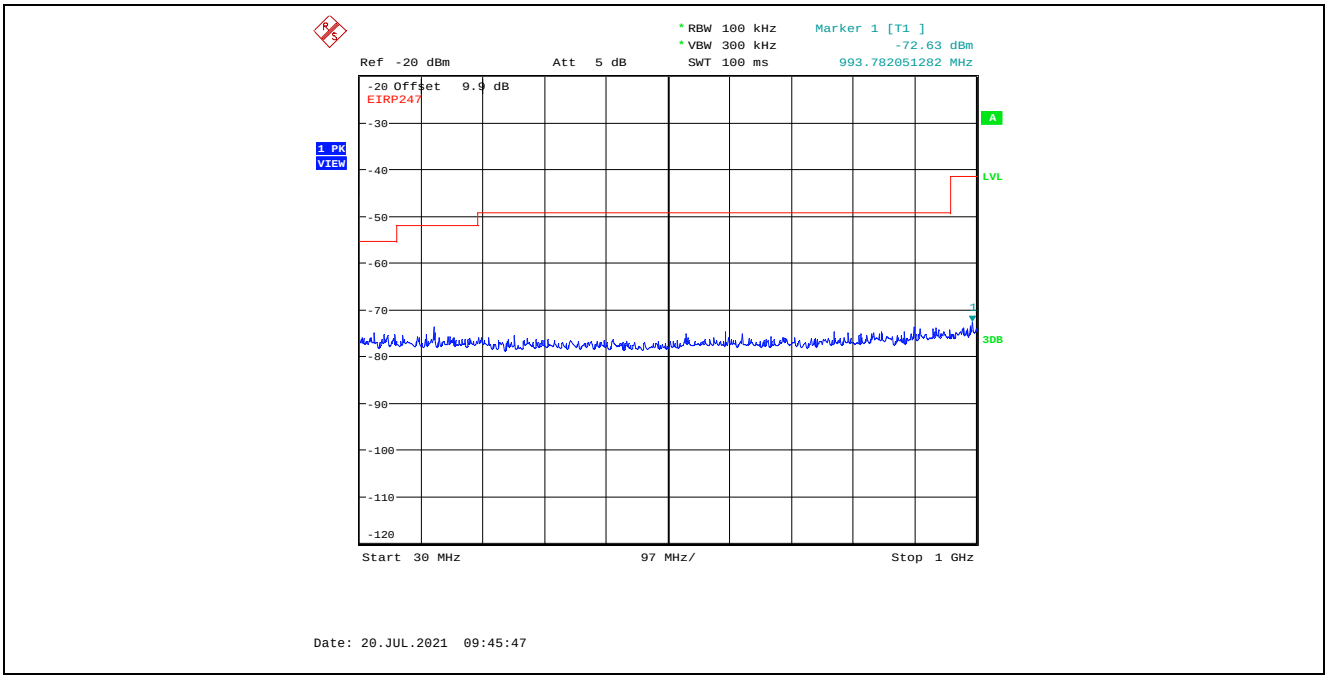
Plot 5.4.4.3.13. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 9 kHz - 150 kHz, Peak Detector



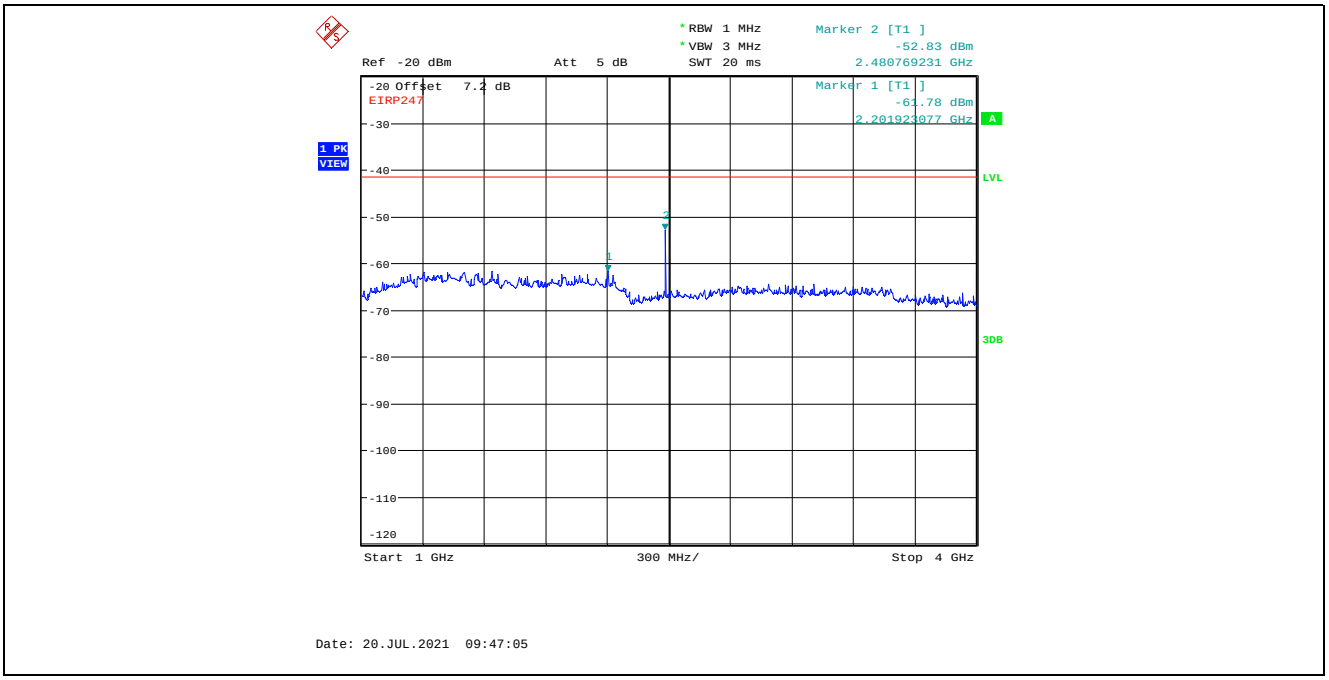
Plot 5.4.4.3.14. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 150 kHz - 30 MHz, Peak Detector



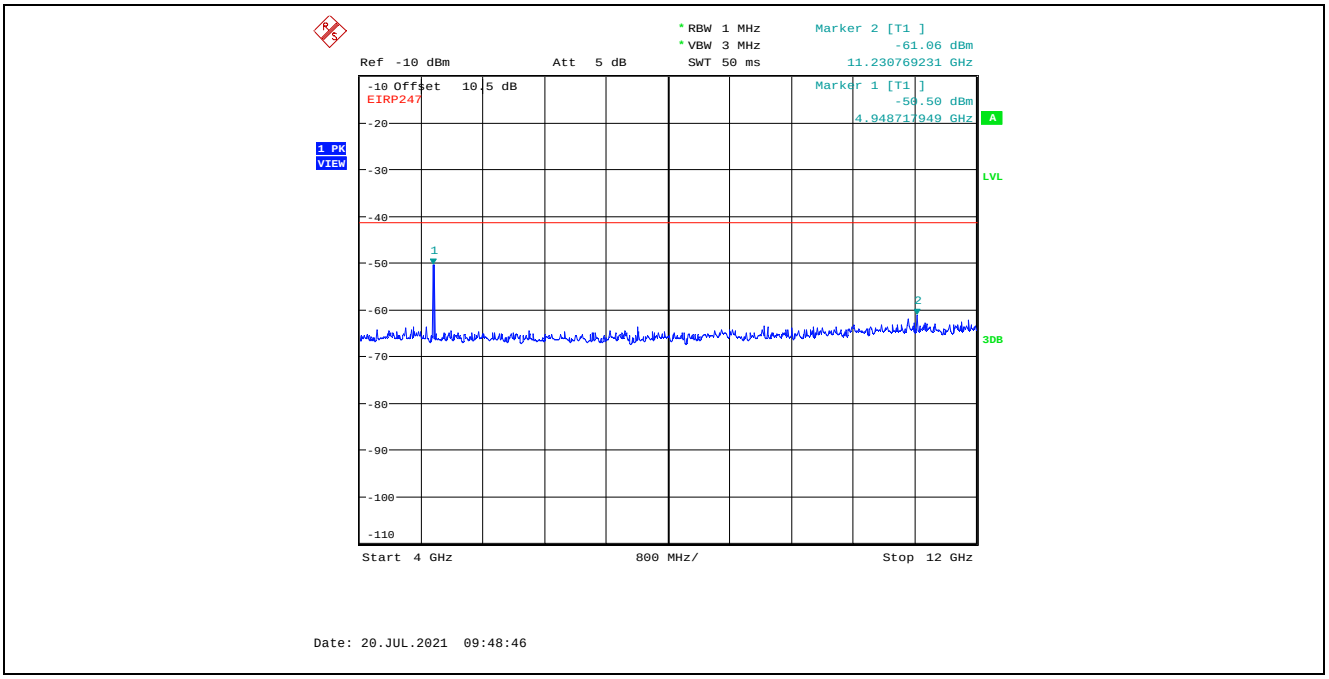
Plot 5.4.4.3.15. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 30 MHz - 1 GHz, Peak Detector



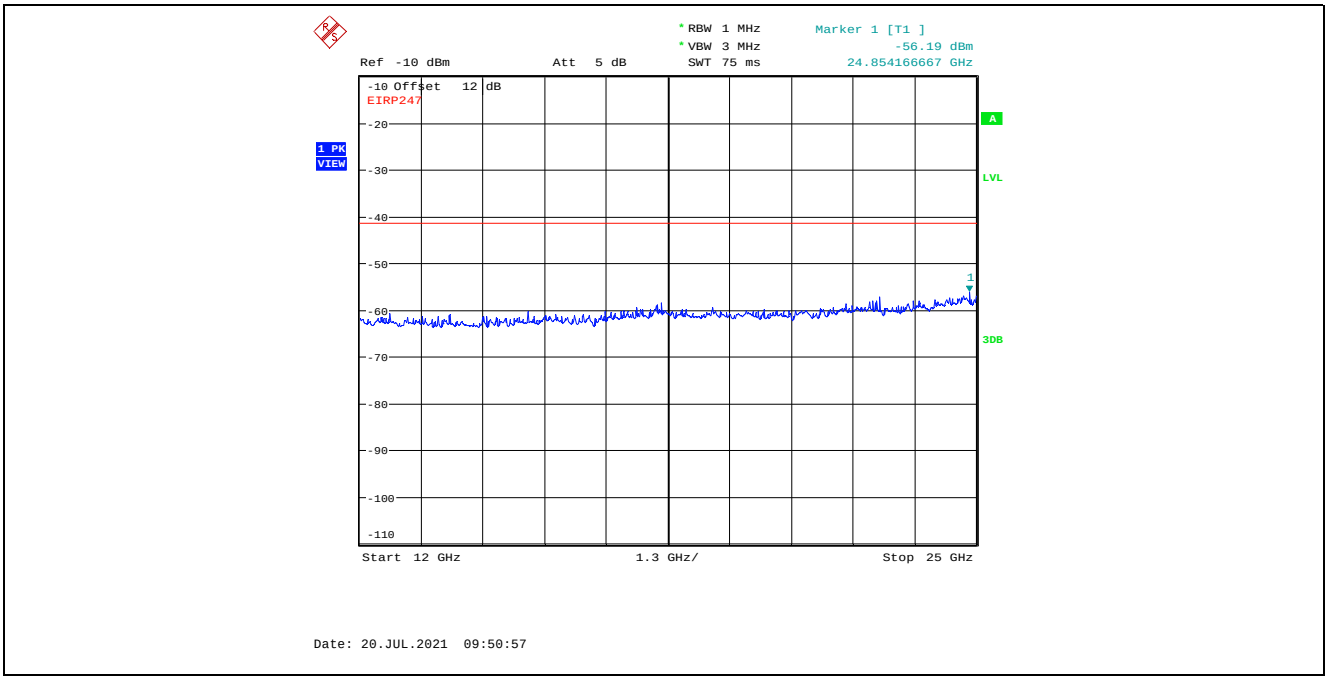
Plot 5.4.4.3.16. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 1 GHz - 4 GHz, Peak Detector



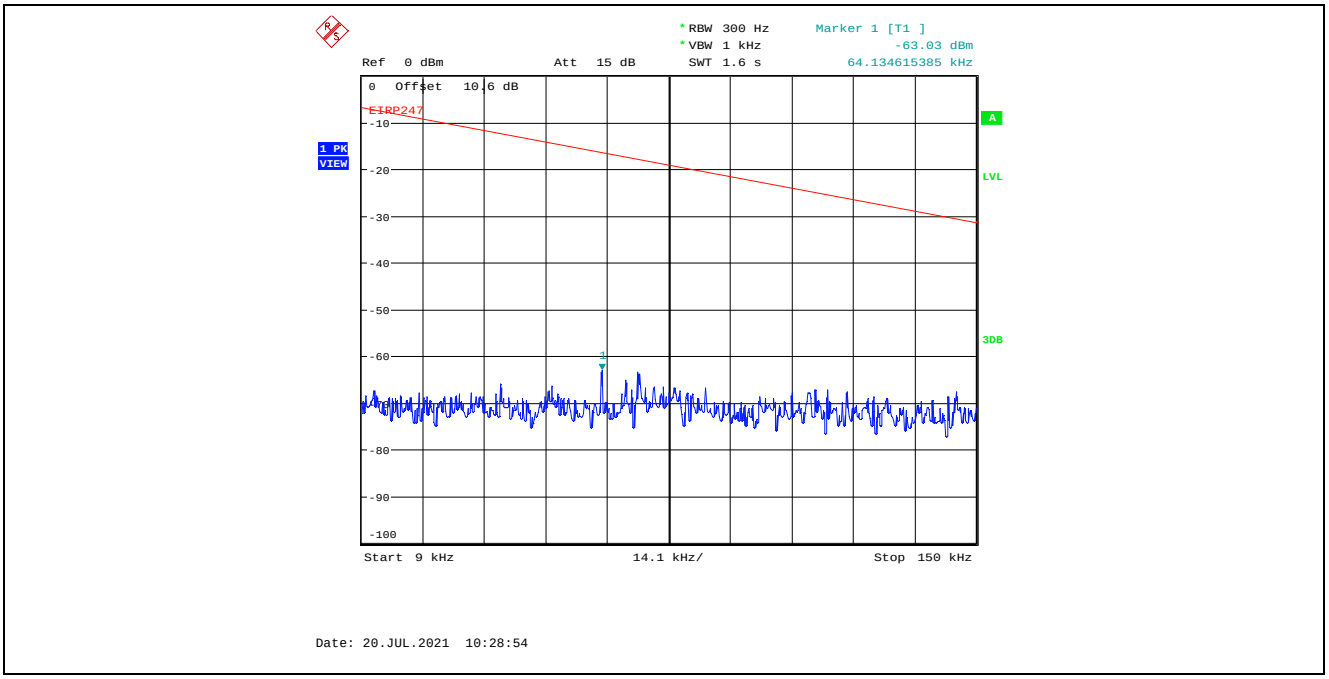
Plot 5.4.4.3.17. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 4 GHz - 12 GHz, Peak Detector



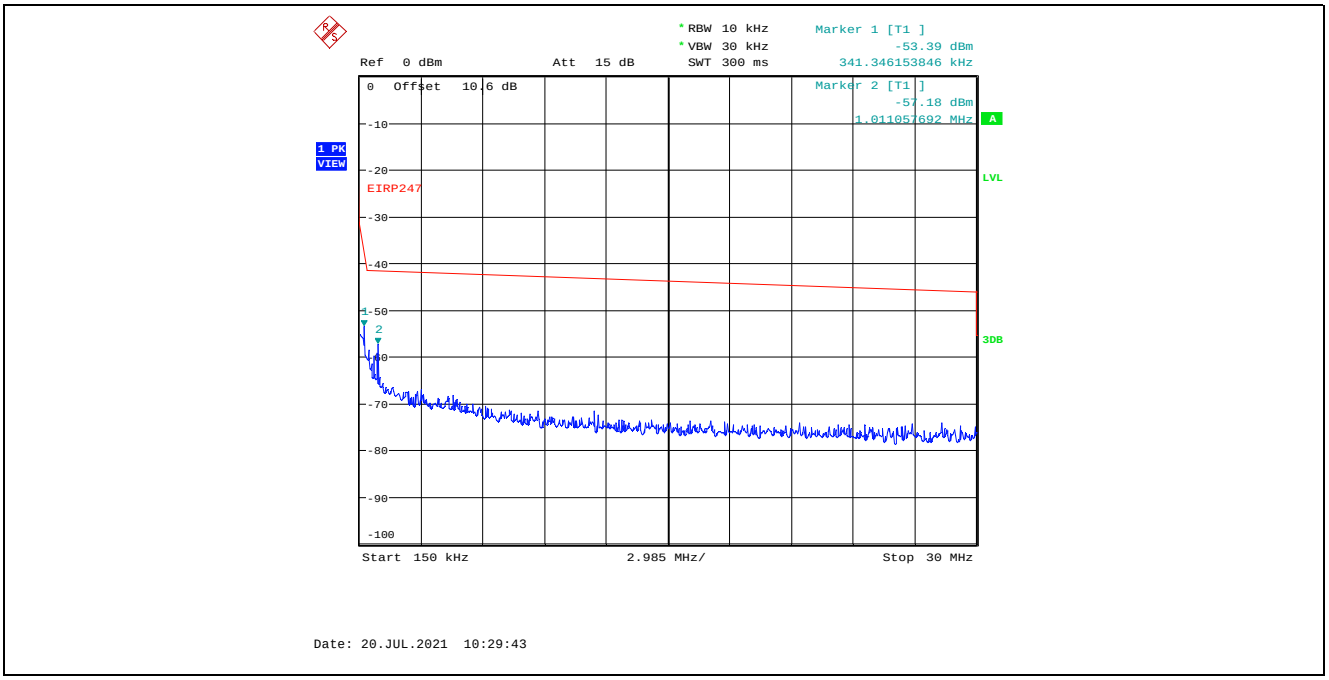
Plot 5.4.4.3.18. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 1 Mbps, 12 GHz - 25 GHz, Peak Detector



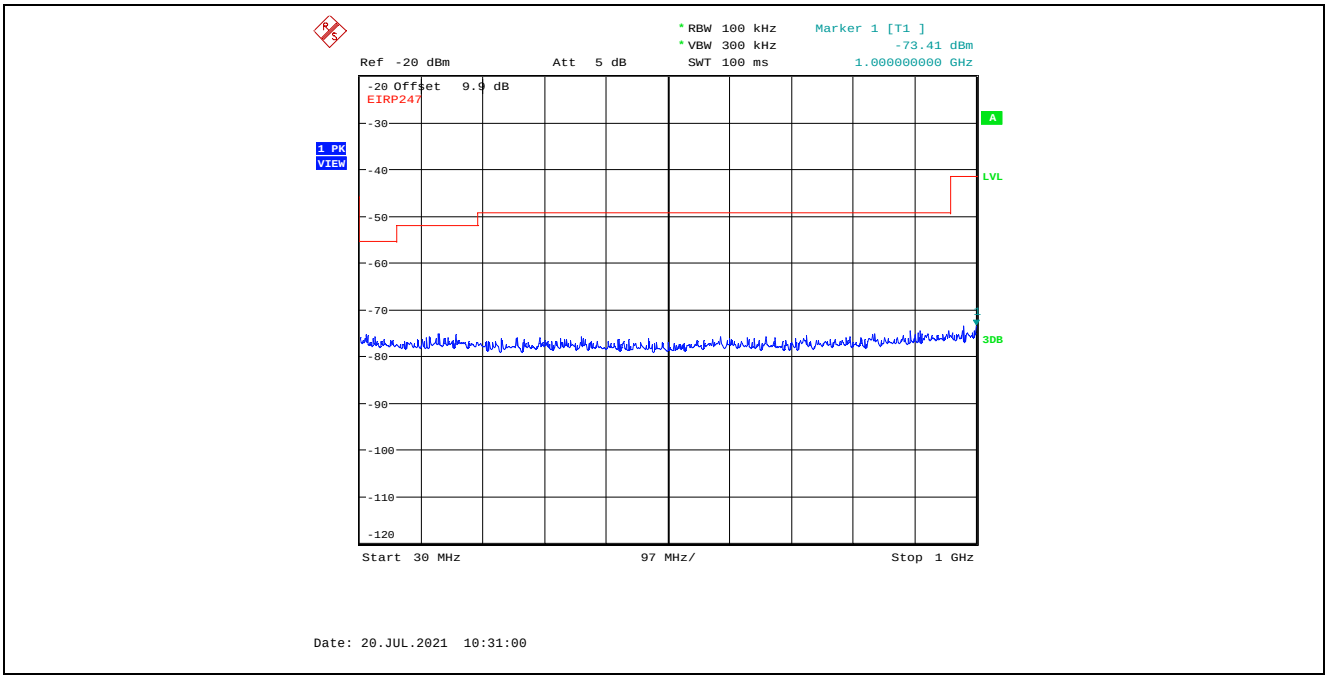
Plot 5.4.4.3.19. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 9 kHz - 150 kHz, Peak Detector



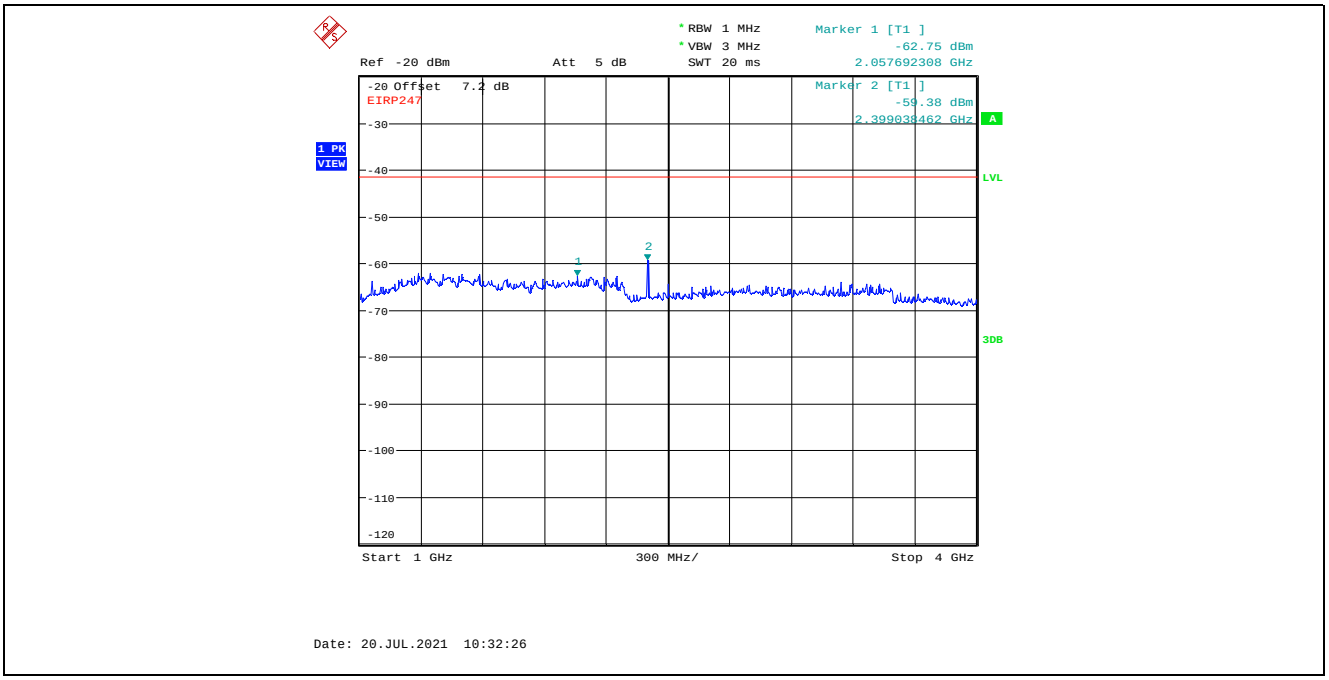
Plot 5.4.4.3.20. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 150 kHz - 30 MHz, Peak Detector



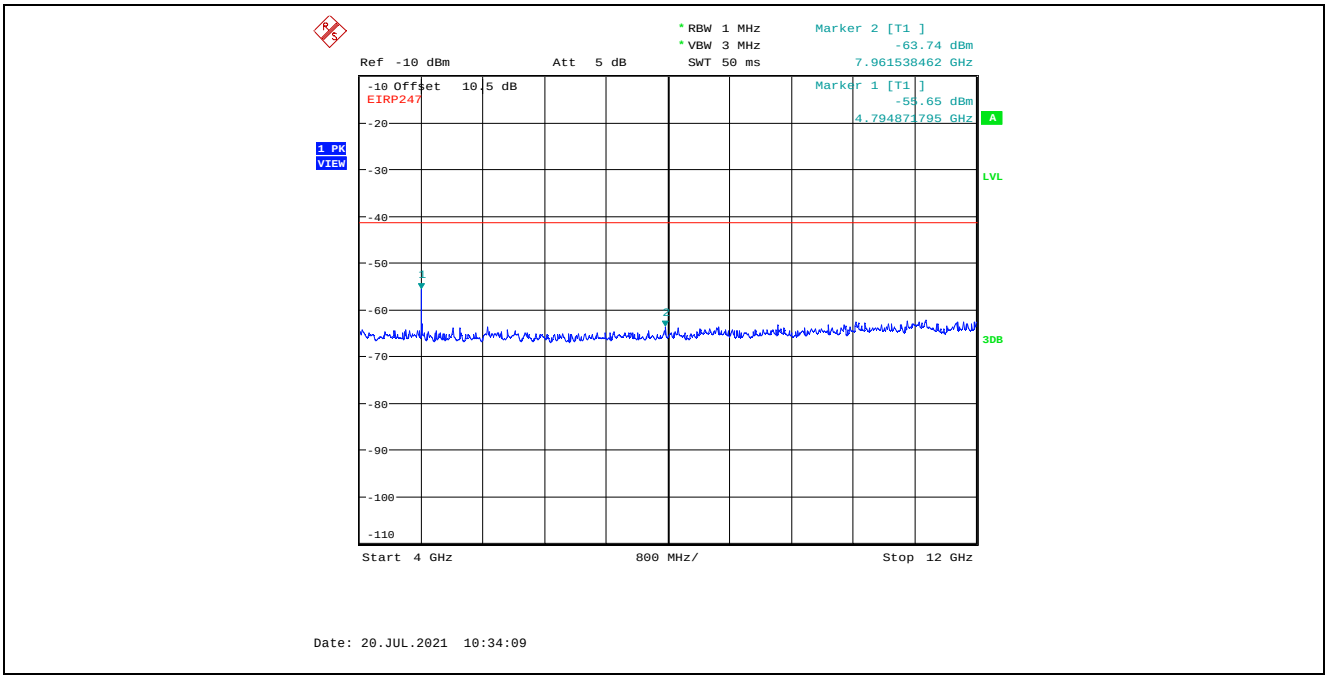
Plot 5.4.4.3.21. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 30 MHz - 1 GHz, Peak Detector



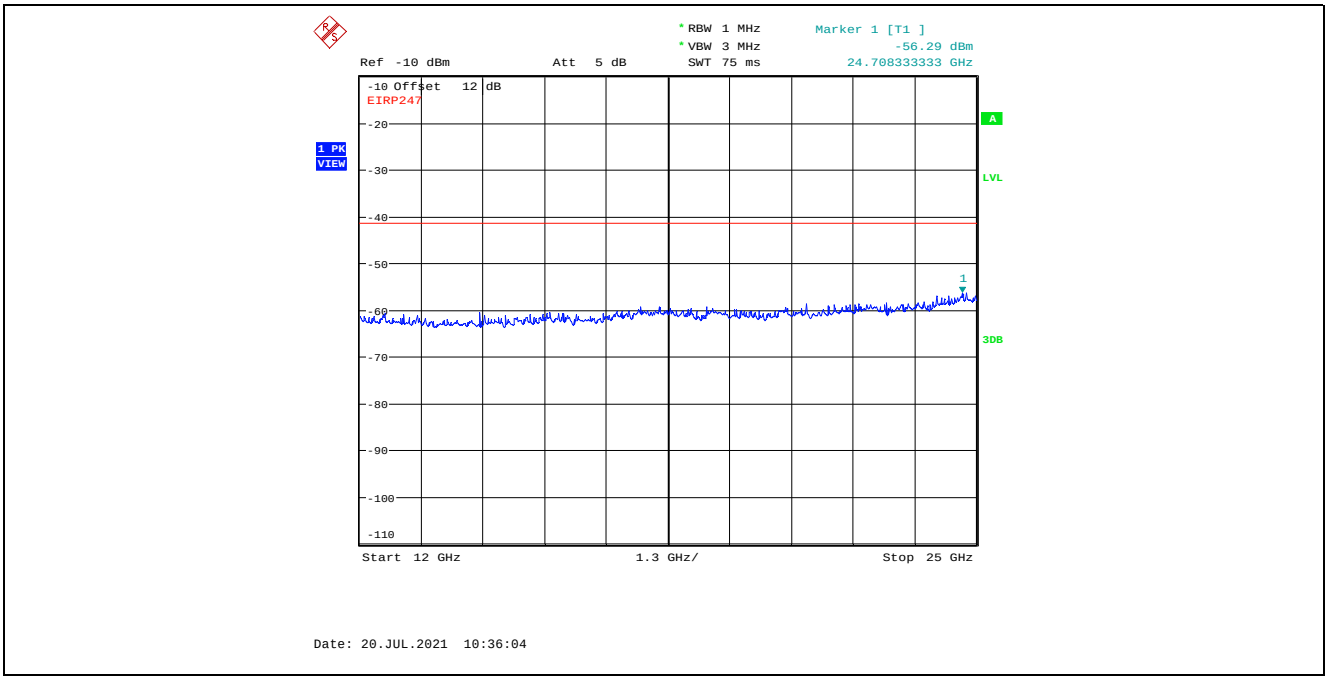
Plot 5.4.4.3.22. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 1 GHz - 4 GHz, Peak Detector



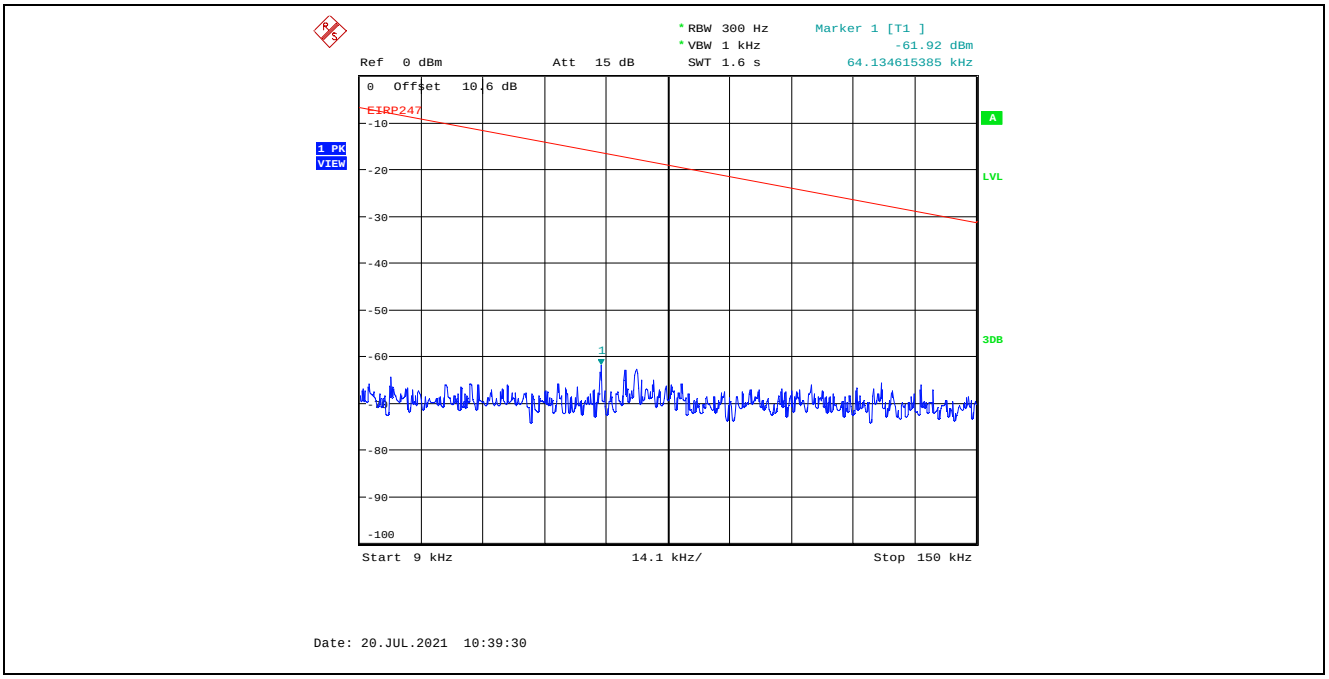
Plot 5.4.4.3.23. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 4 GHz - 12 GHz, Peak Detector



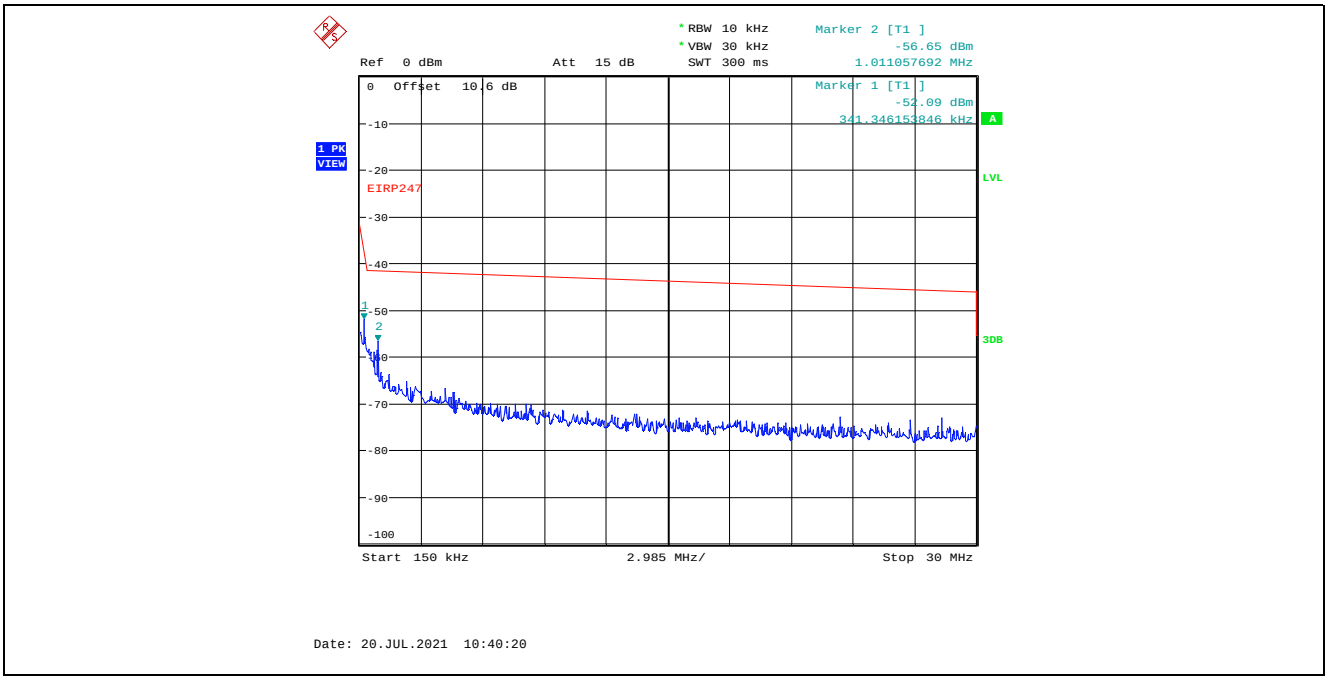
Plot 5.4.4.3.24. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2402 MHz, GFSK Modulation, 2 Mbps, 12 GHz - 25 GHz, Peak Detector



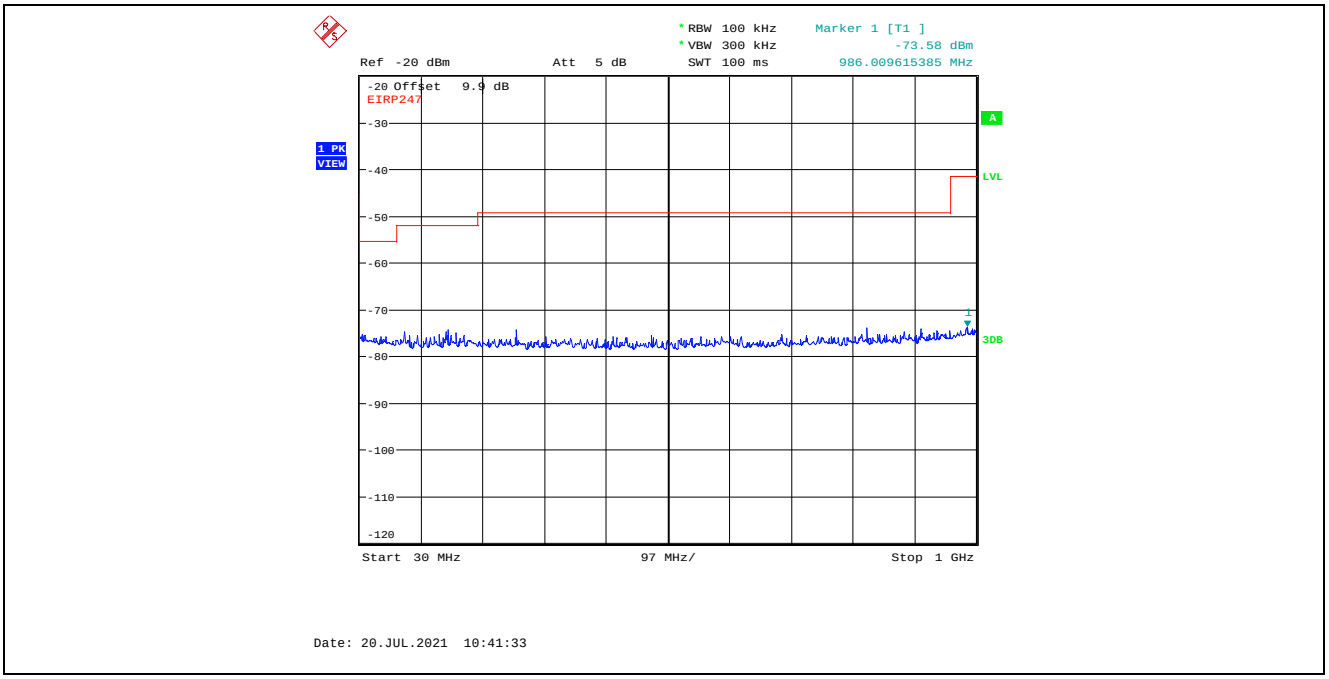
Plot 5.4.4.3.25. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 9 kHz - 150 kHz, Peak Detector



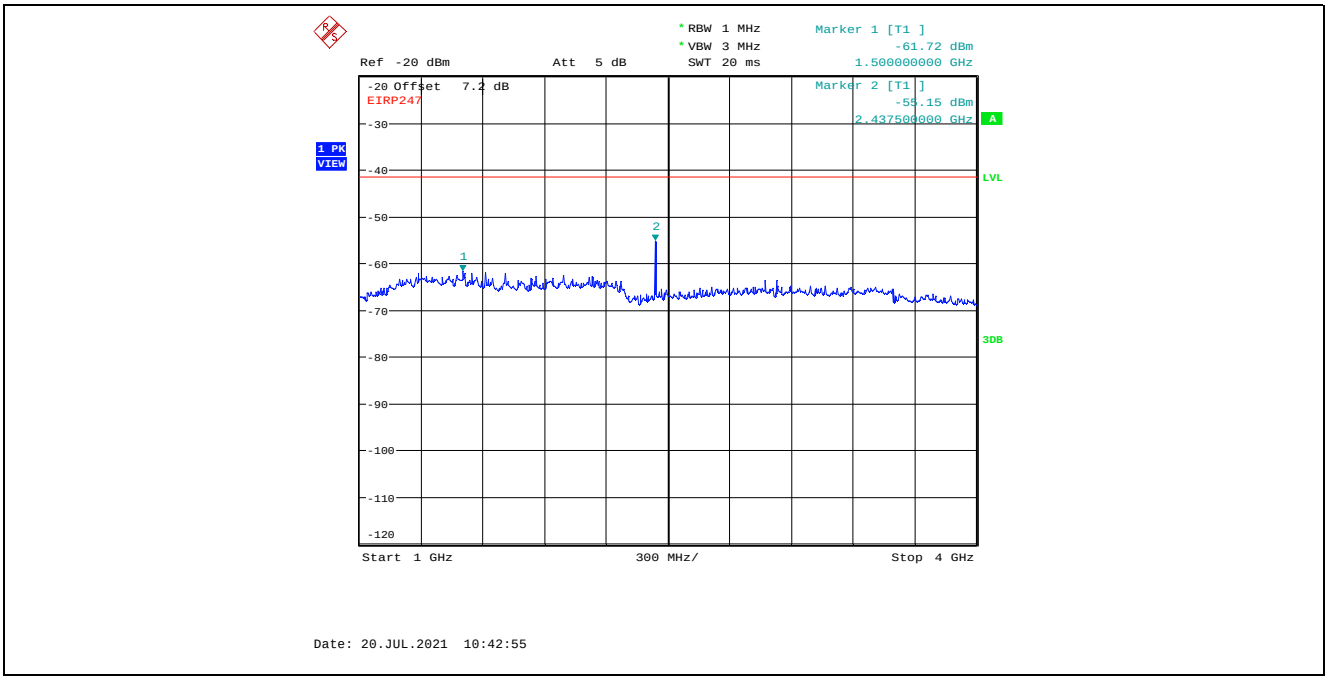
Plot 5.4.4.3.26. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 150 kHz - 30 MHz, Peak Detector



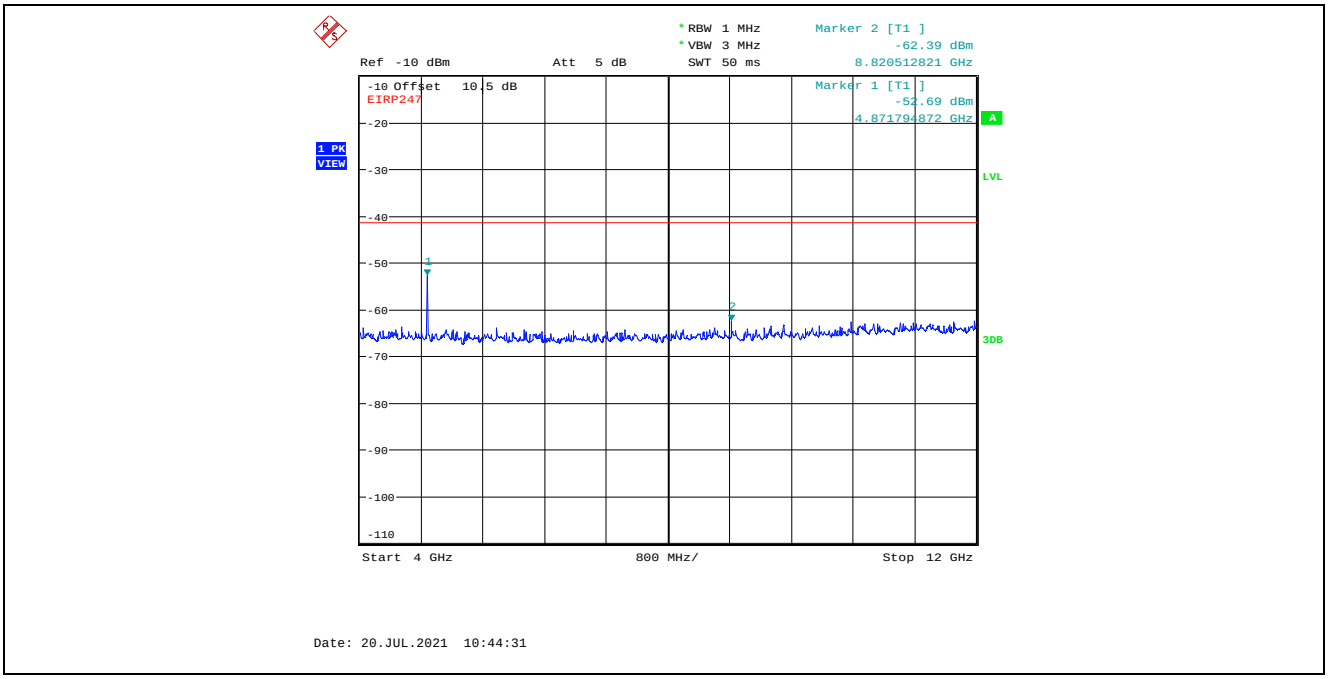
Plot 5.4.4.3.27. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 30 MHz - 1 GHz, Peak Detector



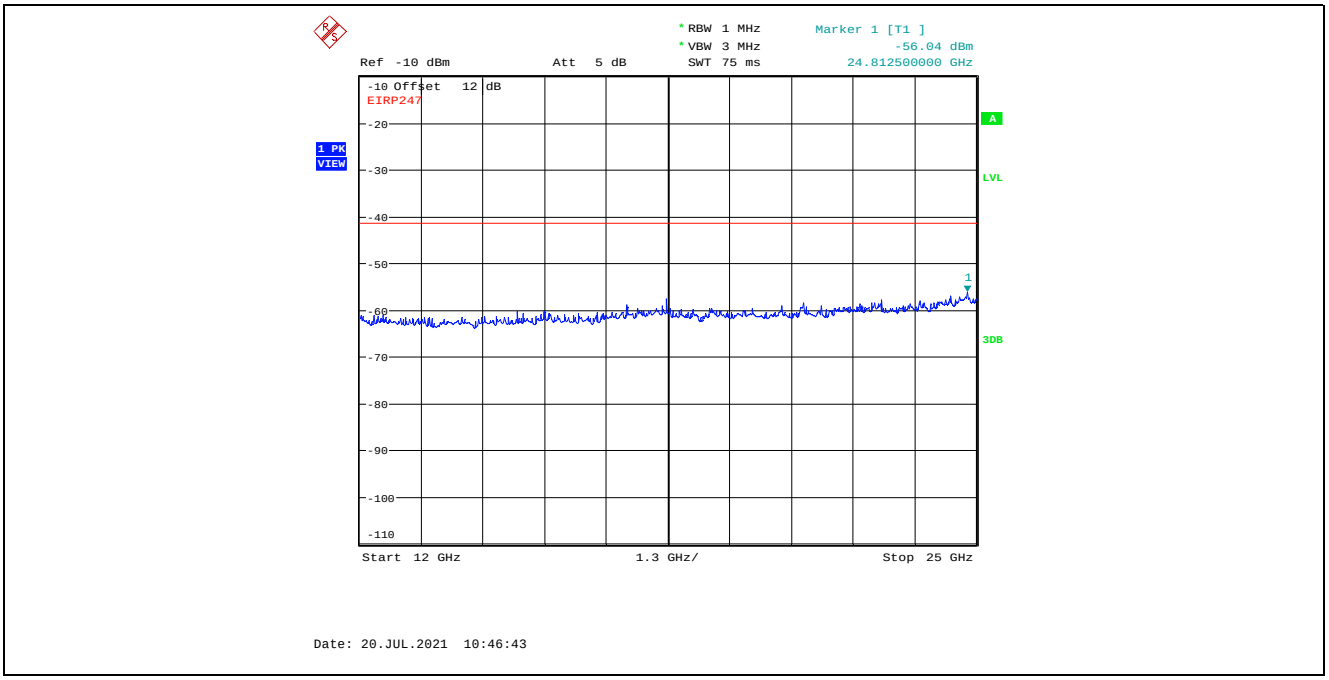
Plot 5.4.4.3.28. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 1 GHz - 4 GHz, Peak Detector



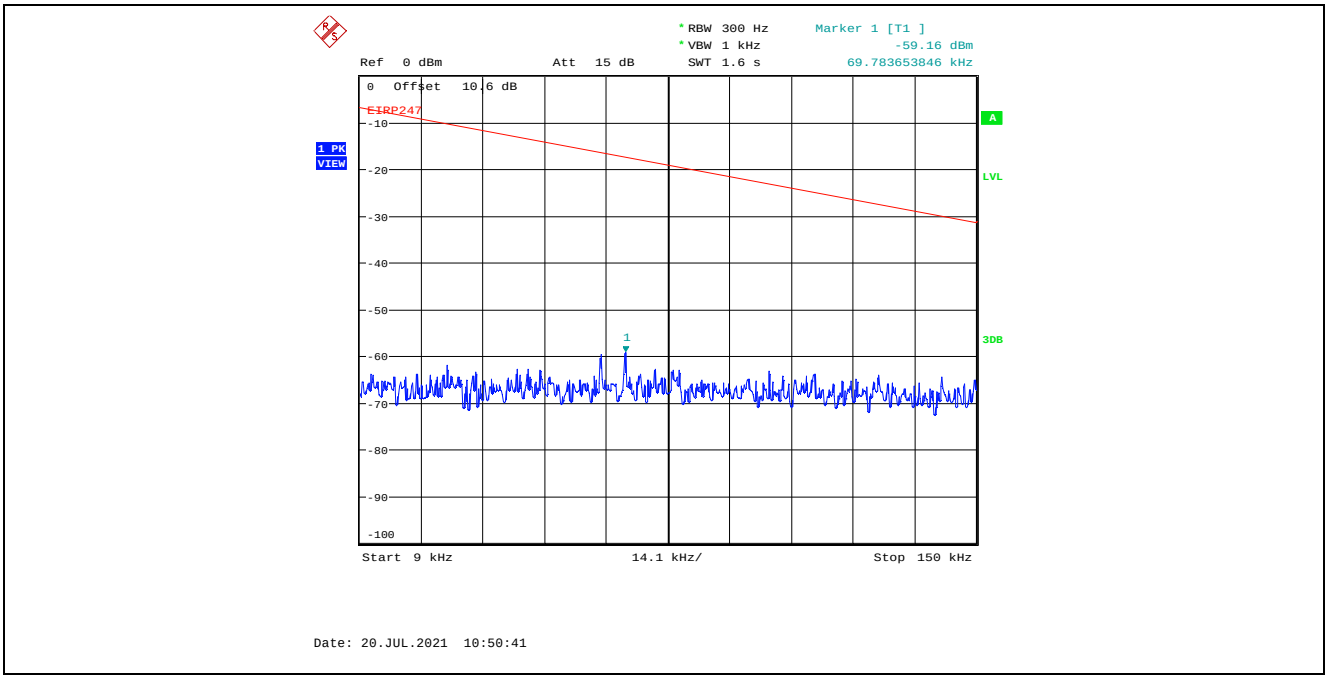
Plot 5.4.4.3.29. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 4 GHz - 12 GHz, Peak Detector



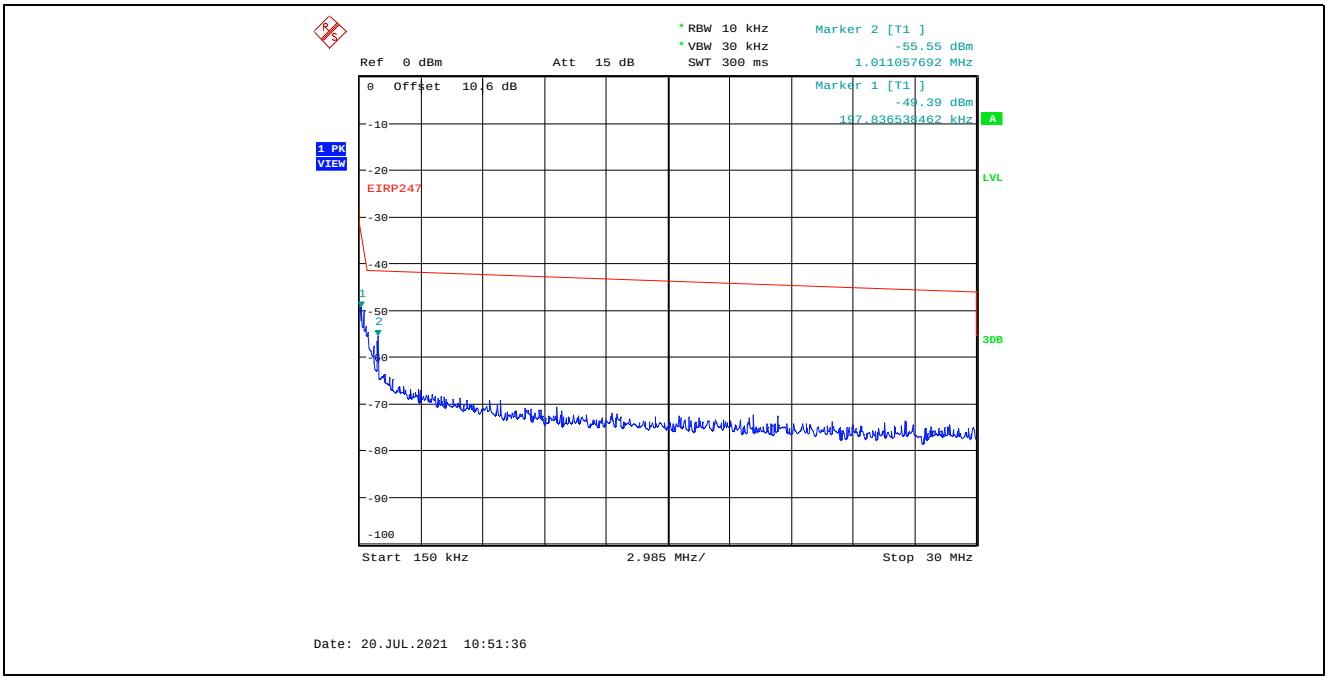
Plot 5.4.4.3.30. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2440 MHz, GFSK Modulation, 2 Mbps, 12 GHz - 25 GHz, Peak Detector



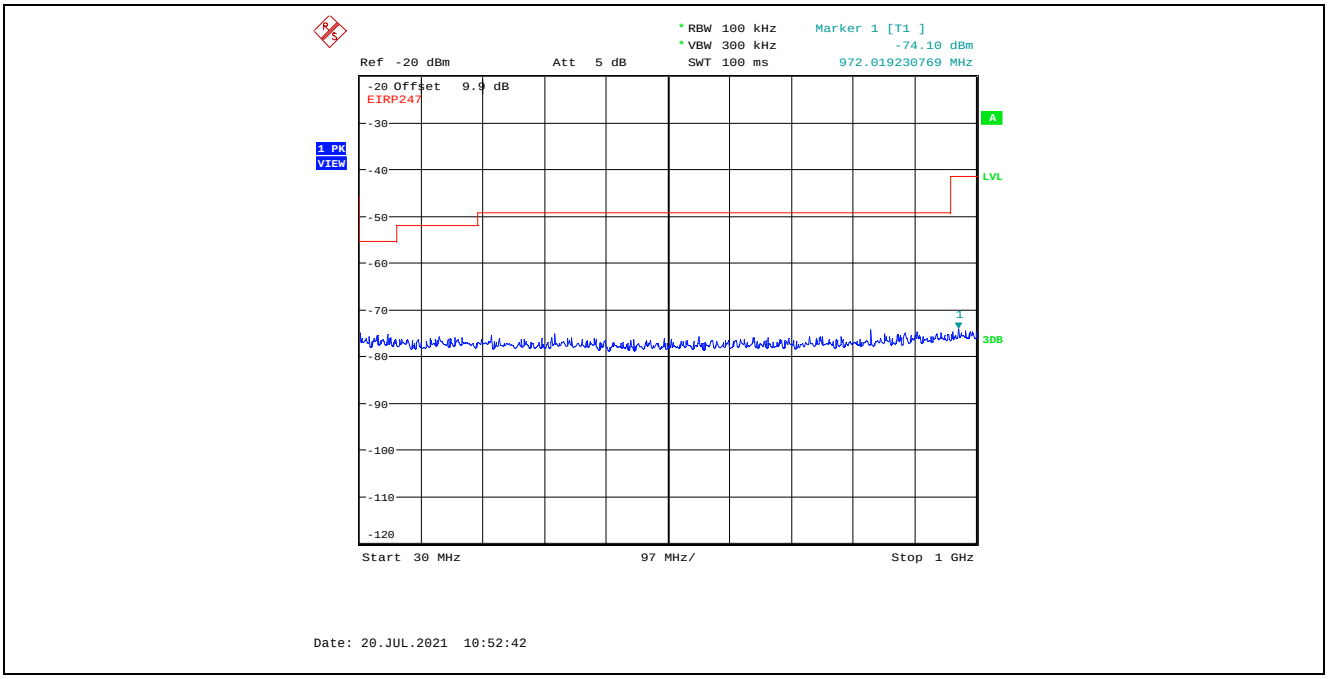
Plot 5.4.4.3.31. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 9 kHz - 150 kHz, Peak Detector



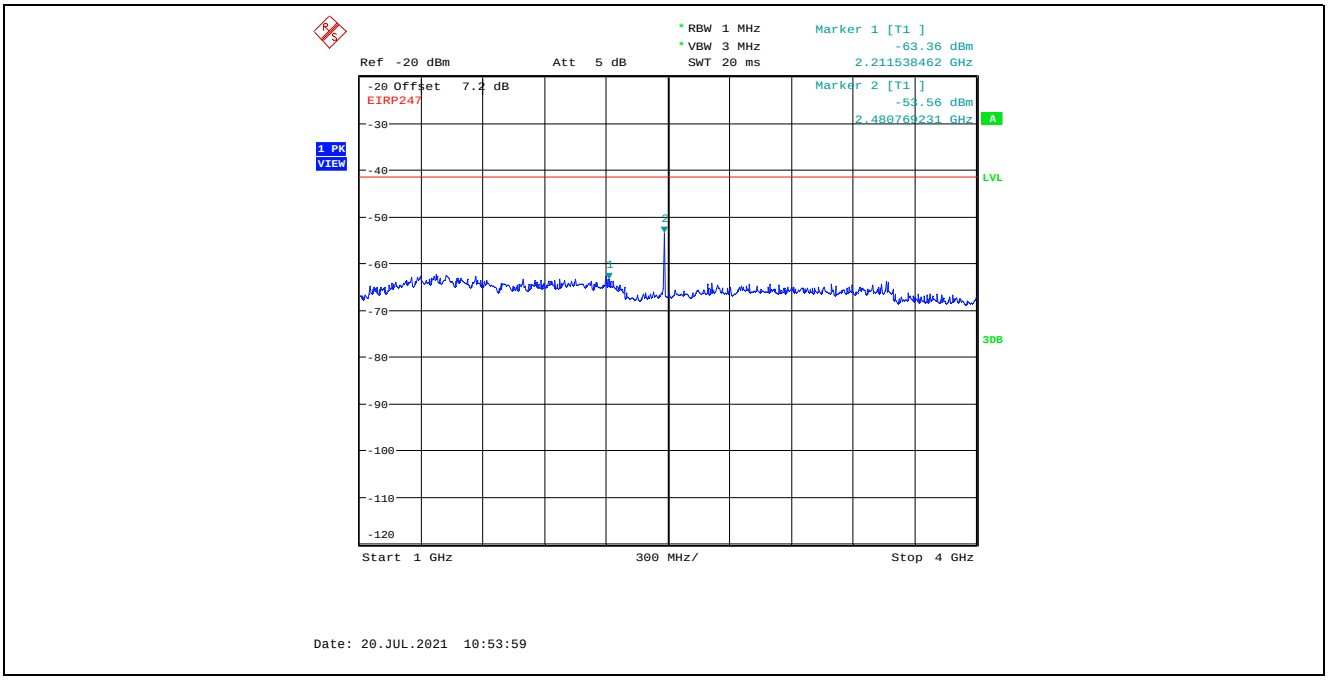
Plot 5.4.4.3.32. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 150 kHz - 30 MHz, Peak Detector



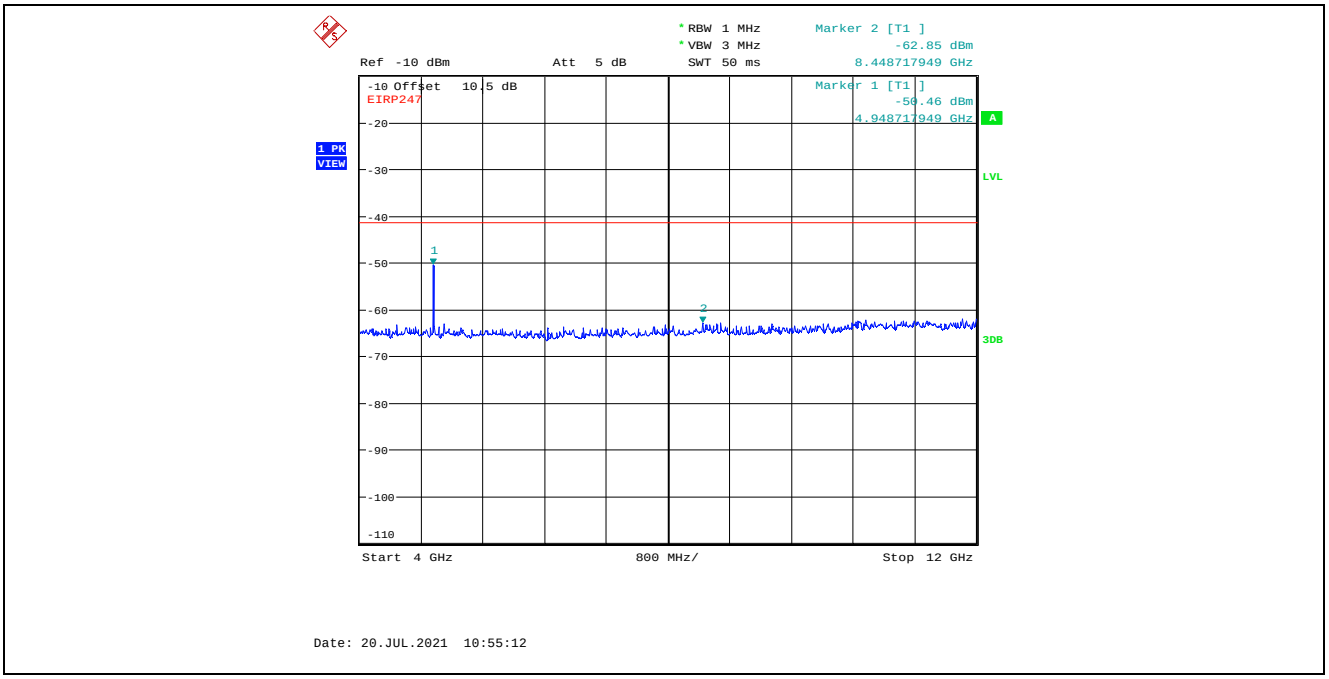
Plot 5.4.4.3.33. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 30 MHz - 1 GHz, Peak Detector



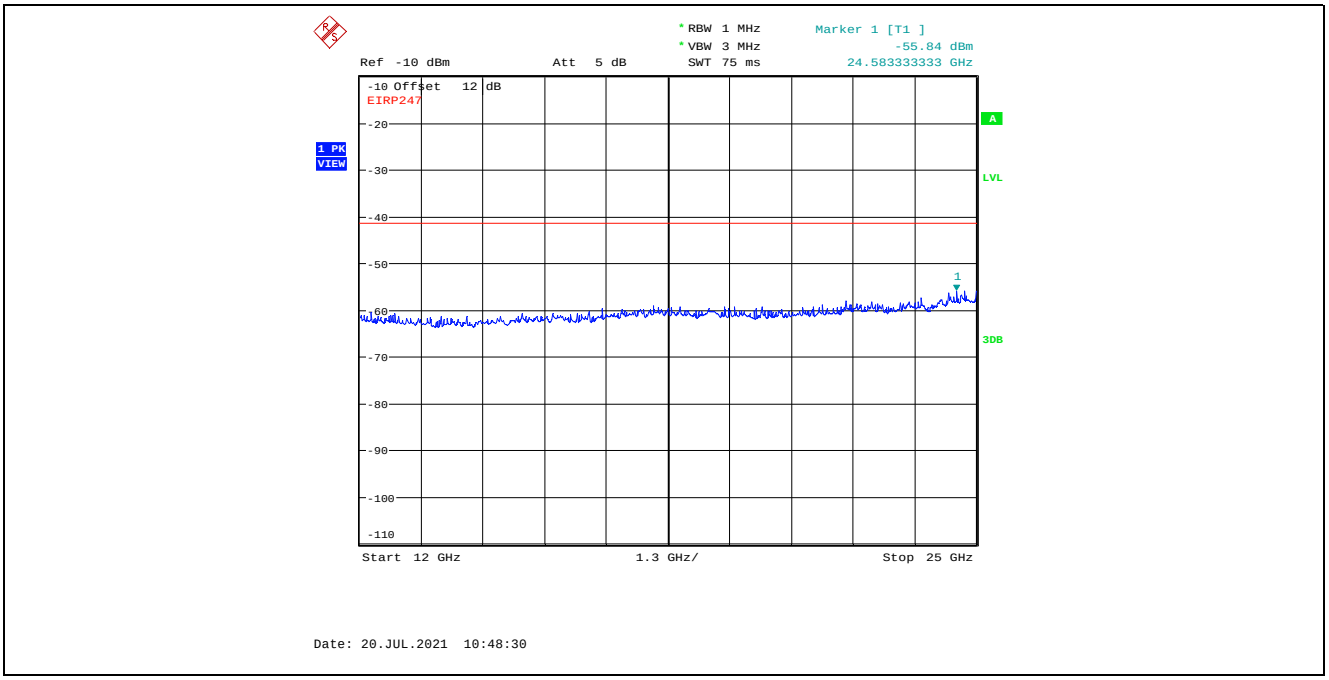
Plot 5.4.4.3.34. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 1 GHz - 4 GHz, Peak Detector



Plot 5.4.4.3.35. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 4 GHz - 12 GHz, Peak Detector



Plot 5.4.4.3.36. Conducted Spurious Emissions in Restricted Frequency Bands, High Power
2480 MHz, GFSK Modulation, 2 Mbps, 12 GHz - 25 GHz, Peak Detector



5.5. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.5.1. Limit(s)

§ 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

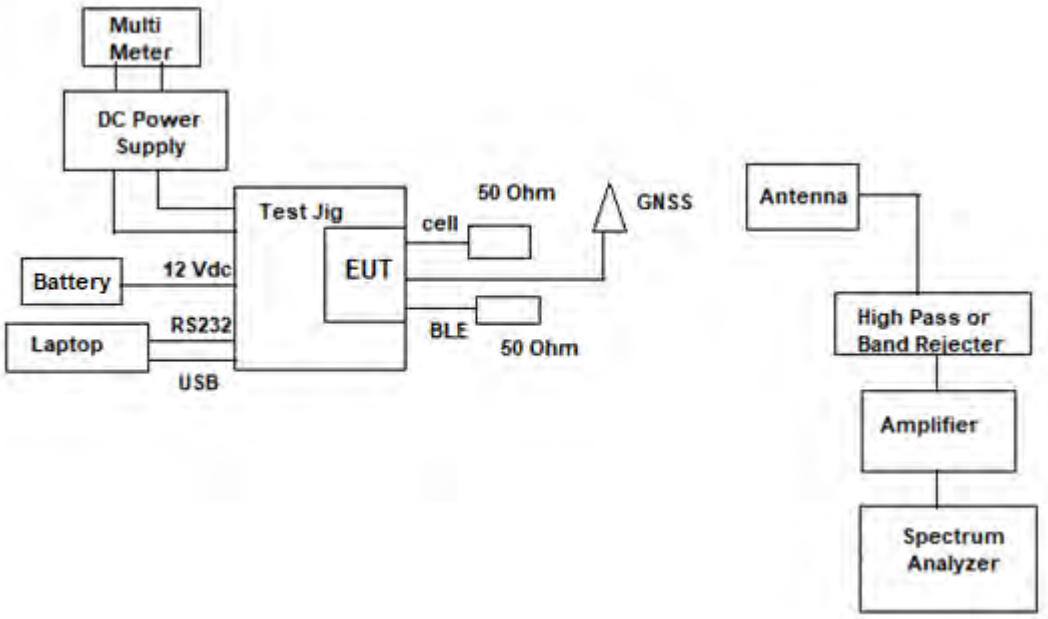
Section 15.209(a) - Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / 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

5.5.2. Method of Measurements

KDB 558074 D01 DTS Meas Guidance v05r02 Sections 8.5 and 8.6 and ANSI C63.10.

5.5.3. Test Arrangement



5.5.4. Test Data

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- § 15.247 (d) spurious emission limit:
  $E_{dB\mu V/m} = (EIRP_{dBm} - 20\log(d_m) + 104.8) – 20$
- Exploratory tests performed to determined worst-case test configurations, the following test results at high power setting and at 1 Mbps data rate represent the worst-case.

Fundamental Frequency:	2402 MHz						
EIRP:	11.40 dBm						
Frequency Test Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
4804	50.83	37.93	V	54.0	86.7	-16.1	Pass*
4804	51.83	41.10	H	54.0	86.7	-12.9	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz						
EIRP:	10.99 dBm						
Frequency Test Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
4880	50.84	37.89	V	54.0	86.2	-16.1	Pass*
4880	51.54	39.17	H	54.0	86.2	-14.8	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2480 MHz						
EIRP:	10.67 dBm						
Frequency Test Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
4960	50.61	37.84	V	54.0	85.9	-16.2	Pass*
4960	51.23	37.90	H	54.0	85.9	-16.1	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.6. POWER SPECTRAL DENSITY [§ 15.247(e)]

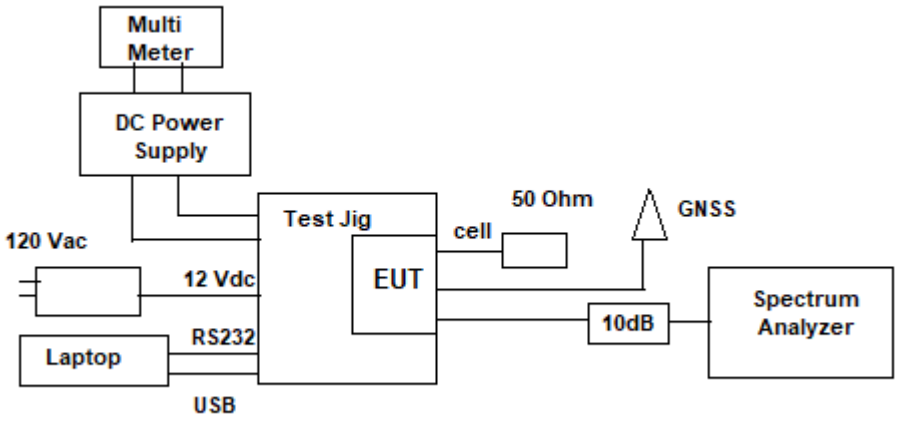
5.6.1. Limit(s)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.6.2. Method of Measurements

FCC KDB 558074 D01 15.247 Meas Guidance V05r02, Section 8.4 and ANSI C63.10, 11.10.2 PKPSD

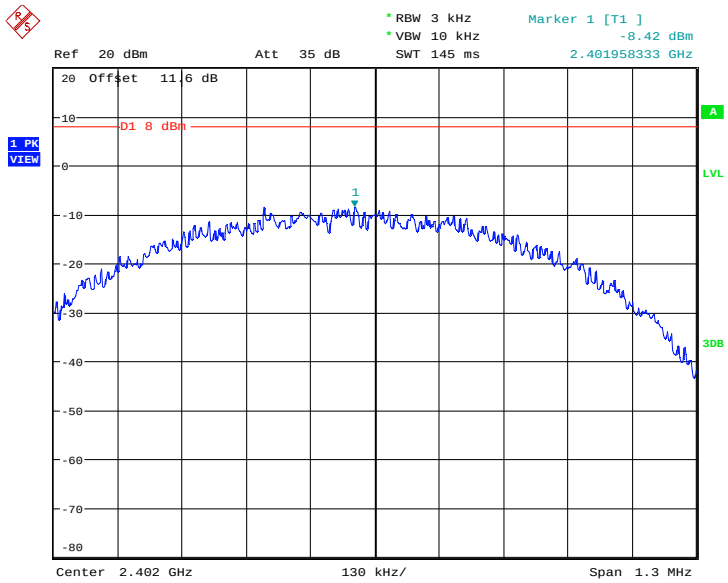
5.6.3. Test Arrangement



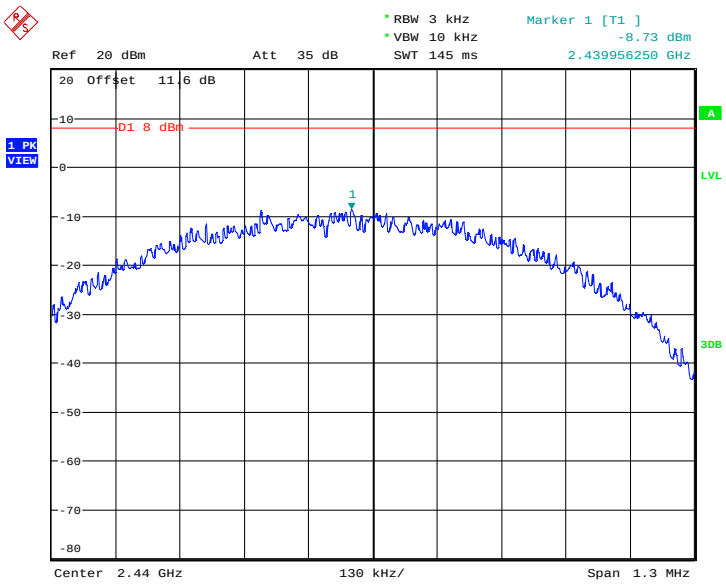
5.6.4. Test Data

Modulation	Power Setting	Data Rate (Mbps)	Frequency (MHz)	PSD (dBm)	Max. Limit (dBm)	Margin (dBm)
GFSK	High Power (6 dBm)	1	2402	-8.42	8	-16.42
			2440	-8.73	8	-16.73
			2480	-9.07	8	-17.07
		2	2402	-11.53	8	-19.53
			2440	-11.86	8	-19.86
			2480	-12.30	8	-20.30

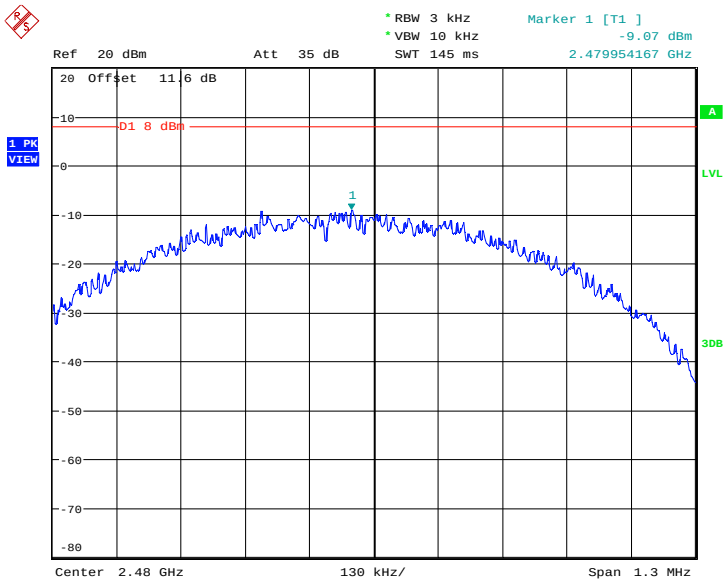
Plot 5.6.4.1. Power Spectral Density, GFSK Modulation, High Power, 2402 MHz, 1 Mbps



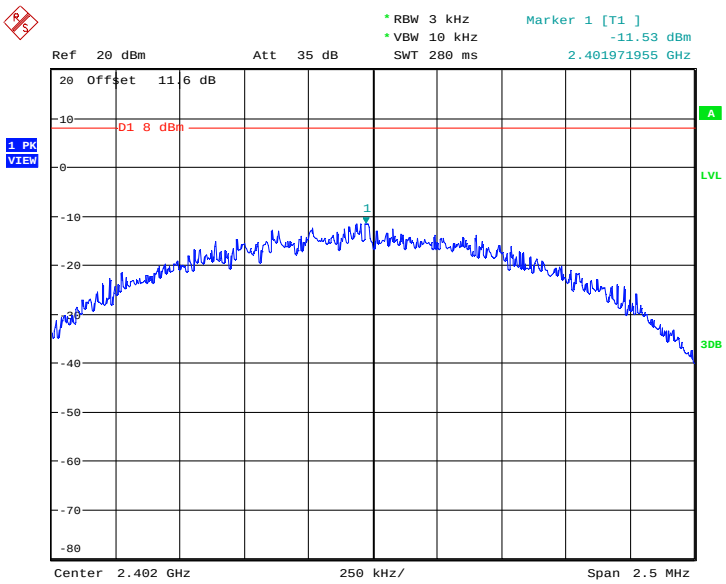
Plot 5.6.4.2. Power Spectral Density, GFSK Modulation, High Power, 2440 MHz, 1 Mbps



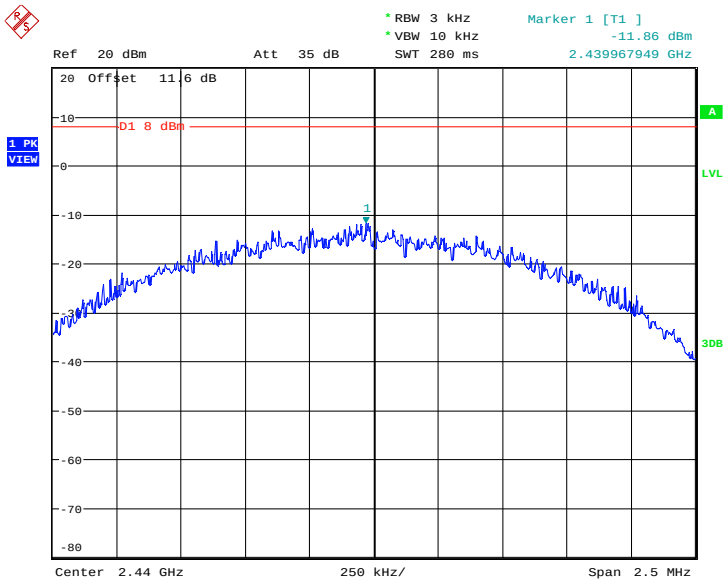
Plot 5.6.4.3. Power Spectral Density, GFSK Modulation, High Power, 2480 MHz, 1 Mbps



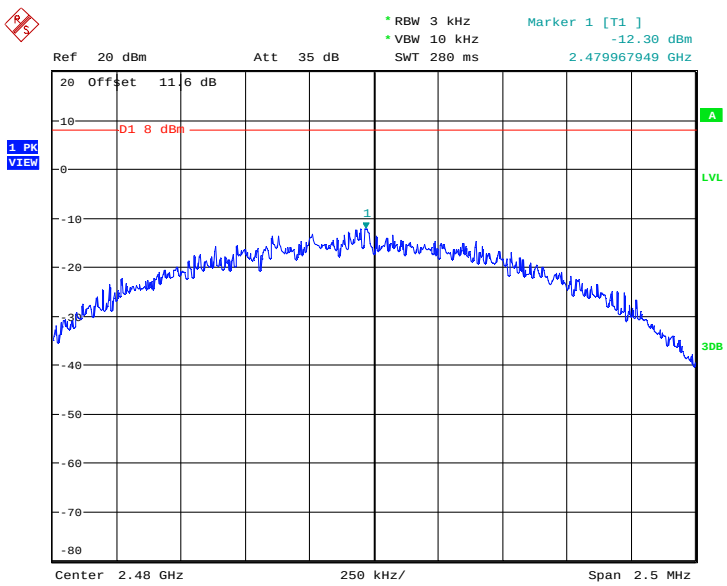
Plot 5.6.4.4. Power Spectral Density, GFSK Modulation, High Power, 2402 MHz, 2 Mbps



Plot 5.6.4.5. Power Spectral Density, GFSK Modulation, High Power, 2440 MHz, 2 Mbps



Plot 5.6.4.6. Power Spectral Density, GFSK Modulation, High Power, 2480 MHz, 2 Mbps



5.7. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091]

5.7.1. Limits

§ **1.1310:** The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.7.2. Method of Measurements

Calculation Method of Power Density/RF Safety Distance:

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where, P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.7.3. RF Evaluation

Pursuant to FCC KDB 447498 D01 General RF Exposure Guidance v06, Section 7.2:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0, according to calculated/estimated, numerically modeled, or measured field strengths or power density.

The EUT consisted of a BLE Module and a certified Telit Communications S.p.A. Data Terminal Module (FCC ID: RI7ME310G1WW, IC: 5131A-ME310G1WW). The Telit Data Terminal Module basic operation modes are GPRS/EGPRS, eMTC and NB-IoT, these modes cannot transmit simultaneous. The table below is a summary of the calculated MPE ratios for co-location at an evaluation distance of 25 cm.

Source	Maximum MPE Ratio
BLE module	0.002
Telit Communications S.p.A. data terminal module	0.641

The sum of the MPE ratios from all sources = 0.002 + 0.641 = 0.643 < 1. Thus, in compliant with general population/uncontrolled exposure MPE limit.

For detailed MPE ratio calculation for BLE Module and Telit Communications S.p.A. Data Terminal Module, refer to the following tables.

Calculated MPE Ratio for EUT with 4.0 dBi Antenna						
Frequency (MHz)	EUT EIRP (dBm)	EUT EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE Ratio
2402	11.40	13.804	25	0.002	1.0	**0.002**

Calculated MPE Ratio for Telit Data Terminal Module Operating in NB-IoT and eMTC Modes										
Operating Mode	**Band**	**[1]Measured Power (dBm)**	**[1]Max. Power incl. tune-up (dBm)**	**[2]Antenna Gain (dBi)**	**Max. E.I.R.P. (dBm)**	**Max. E.I.R.P. (mW)**	**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**[1]MPE Limit (mW/cm^2)**	**MPE Ratio**
NB-IoT	2	24.5	25	8.0	33.0	1995.26	25	0.254	1.0	0.254
	4	24.6	25	5.0	30.0	1000.00	25	0.127	1.0	0.127
	5	24.8	25	9.4	34.4	2754.23	25	0.351	0.549	0.639
	12	24.9	25	8.7	33.7	2344.23	25	0.298	0.466	**0.641**
	13	25.0	25	9.1	34.1	2570.40	25	0.327	0.518	0.632
	25	24.4	25	8.0	33.0	1995.26	25	0.254	1.0	0.254
	26	25.0	25	9.3	34.3	2691.53	25	0.343	0.543	0.631
	66	24.7	25	5.0	30.0	1000.00	25	0.127	1.0	0.127
	71	20.7	22	11.4	33.4	2187.76	25	0.279	0.442	0.630
	85	24.9	25	8.6	33.6	2290.87	25	0.292	1.0	0.292
eMTC	2	23.5	24	8.0	32	1584.89	25	0.202	1.0	0.202
	4	23.5	24	5.0	29	794.33	25	0.101	1.0	0.101
	5	23	24	9.5	33.5	2238.72	25	0.285	0.549	**0.519**
	12	23	24	8.7	32.7	1862.09	25	0.237	0.466	0.509
	13	23.6	24	9.1	33.1	2041.74	25	0.260	0.518	0.502
	25	24	24	8.0	32	1584.89	25	0.202	1.0	0.202
	26	23.2	24	9.3	33.3	2137.96	25	0.272	0.543	0.501
	66	23.5	24	5.0	29	794.33	25	0.101	1.0	0.101
	85	23.2	24	8.6	32.6	1819.70	25	0.232	0.465	0.498

[1] Data derived from Telit Communications S.p.A. Data Terminal Module RF exposure evaluation test report, Test Report No. 60356613 004 (FCC ID: RI7ME310G1WW, IC: 5131A-ME310G1WW).

[2] Maximum permitted antenna gain.

Calculated MPE Ratio for Telit Data Terminal Module Operating in Private Network in NB-IoT Configuration									
Operating Mode	**Band**	**Frequency (MHz)**	**Max Conducted EUT Power (dBm)**	**Maximum Antenna Gain (dBi)**	**Averaged Max EUT EIRP (mW)**	**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**Power Density FCC Limit (mW/cm2)**	**FCC Power Density MPE Ratio**
NB-IoT	8_39D 897.5-900.5 MHz	897.5	25	8.9	2454.709	25	0.313	0.598	**0.523**

Calculated MPE ratio for Telit Data Terminal Module Operating in GPRS and EGPRS Modes											
Operating Mode	**Band**	**[2] Measured Power (dBm)**	**[2] Max. Power incl. tune- up (dBm)**	**[1] Division factor (dB)**	**[3] Antenna Gain (dBi)**	**Max. E.I.R.P. (dBm)**	**Max. E.I.R.P. (mW)**	**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**[2] MPE Limit (mW/cm^2)**	**MPE Ratio**
GPRS	850(1slot)	32.3	33.5	-9.03	6.9	31.37	1370.88	25	0.175	0.549	0.318
	850(2slots)	31.7	33.5	-6.02	6.9	34.38	2741.57	25	0.349	0.549	**0.636**
	850(3slots)	28.8	30	-4.26	6.9	32.64	1836.54	25	0.234	0.549	0.426
	850(4slots)	26.8	28	-3.01	6.9	31.89	1545.25	25	0.197	0.549	0.358
	1900(1slot)	30.2	30.5	-9.03	2.5	23.97	249.46	25	0.032	1.0	0.032
	1900(2slots)	28.9	30.5	-6.02	2.5	26.98	498.88	25	0.064	1.0	0.064
	1900(3slots)	28.1	30	-4.26	2.5	28.24	666.81	25	0.085	1.0	0.085
	1900(4slots)	27.2	29	-3.01	2.5	28.49	706.32	25	0.090	1.0	0.090
EGPRS	850(1slot)	26.8	28	-9.03	6.9	25.87	386.37	25	0.049	0.549	0.090
	850(2slots)	26.4	28	-6.02	6.9	28.88	772.68	25	0.098	0.549	0.179
	850(3slots)	26.3	28	-4.26	6.9	30.64	1158.78	25	0.148	0.549	0.269
	850(4slots)	26.1	27	-3.01	6.9	30.89	1227.44	25	0.156	0.549	**0.285**
	1900(1slot)	26.1	27	-9.03	2.5	20.47	111.43	25	0.014	1.0	0.014
	1900(2slots)	26	27	-6.02	2.5	23.48	222.84	25	0.028	1.0	0.028
	1900(3slots)	25.8	27	-4.26	2.5	25.24	334.20	25	0.043	1.0	0.043
	1900(4slots)	25.1	27	-3.01	2.5	26.49	445.66	25	0.057	1.0	0.057

[1] Division factors, 1Tx slot = 1 transmit time slot out of 8 time slots= -9.03dB; 2Tx slots= 2 transmit time slots out of 8 time slots= - 6.02dB; 3Tx slots= 3 transmit time slots out of 8 time slots= -4.26dB; 4Tx slots= 4 transmit time slots out of 8 time slots= -3.01dB

[2] Data derived from Telit Communications S.p.A. Data Terminal Module RF exposure evaluation test report, Test Report No. 60356613 004 (FCC ID: RI7ME310G1WW, IC: 5131A-ME310G1WW).

[3] Maximum permitted antenna gain.

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
EMC Analyzer	HP	8593EM	3412A00103	9 kHz - 1.5 GHz	22 Jan 2022
LISN	EMCO	3825/2	8907-1531	150 kHz – 30 MHz	01 Feb 2022
LISN	Schwarz beck	NSLK8127	8127276	150 kHz – 30 MHz	12 Sep 2021*
High Pass Filter	Rhode Schwarz	EZ-25	830164/006	150 kHz – 30 MHz	06 Aug 2022
DC Power Supply	HQ Power	PS 613U	--	0 - 30 Vdc	See Note 1
Multi-meter	Fluke	8842A	5021295	20 mV - 1 kV	12 Jan 2023
Spectrum Analyzer	Rohde & Schwarz	FSU26	100398	20Hz–26.5 GHz	23 Oct 2021
Attenuator	Hewlett Packard	8493C	0461	DC–26.5 GHz	See Note 1
Peak Power Analyzer	HP	8991A	3342A00657	Sensor dependant	12 Sep 2021*
Power Sensor	HP	84814A	3205A00175	0.5-40GHz	12 Sep 2021*
High pass Filter	K & L	11SH-10-4000/T 12000	4	Cut off 2.4GHz	See Note 1
Band Reject Filter	Microtronics	BRM50701	105	Cut off 2.170-3 GHz	See Note 1
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	01 Sep 2022
RF Amplifier	Com-Power	PAM-0118A	551052	0.5 – 18 GHz	11 Sep 2022
RF Amplifier	Com-Power	PAM-0118A	551016	0.5 – 18 GHz	15 Mar 2022
Biconilog	EMCO	3142C	00034792	26-2000 MHz	16 May 2022
Horn Antenna	EMCO	3115	5061	1 – 18 GHz	10 Jun 2022
Horn Antenna	ETS-Lindgren	3160-09	001183858	18 – 26.5 GHz	22 Jan 2023
Note 1: Internal Verification/Calibration check					

*Equipment used before calibration due date.

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

Test Description	Expanded Uncertainty, K=2 for 95% Confidence Level
Power Line Conducted Emissions	± 2.62
Conducted Output Power	±0.62 dB
Power Spectral Density	±0.20 Hz / ±0.63 dB
Occupied Bandwidth and Emission Limitation	±0.20 Hz / ±0.63 dB
Transmitter Spurious Conducted Emissions	±0.72 dB
Transmitter Spurious Radiated Emissions	±4.20 dB (30 MHz – 1 GHz)
	±2.70 dB (1 – 18 GHz)

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)