




Prüfbericht-Nr.: <i>Test Report No.:</i>	CN22YRZC 001	Auftrags-Nr.: <i>Order No.:</i>	158261742	Seite 1 von 26 <i>Page 1 of 26</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	25.10.2022		
Auftraggeber: <i>Client:</i>	Ravensburger Verlag GmbH Robert-Bosch Str. 1, 88214 Ravensburg, Germany				
Prüfgegenstand: <i>Test item:</i>	RC Toy with Bluetooth and 2.4GHz Transceiver				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Electronic parts GT-PWR Connect / 910589				
Auftrags-Inhalt: <i>Order content:</i>	FCC and ISED Certification				
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C; ANSI C63.10-2013 RSS-247 Issue 2; RSS-Gen Issue 5				
Wareneingangsdatum: <i>Date of receipt:</i>	10.11.2022				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003388064-001~003				
Prüfzeitraum: <i>Testing period:</i>	11.11.2022 - 01.01.2023				
Ort der Prüfung: <i>Place of testing:</i>	Hong Kong				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Hong Kong Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
 27.03.2023 Felicia Chan / Senior Engineer		 27.03.2023 Sharon Li / Unit Senior Manager			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other: FCC ID : 2A2XI589 IC : 27849-589 HVIN : 589 "Decision Rule" document announced in our website (https://www.tuv.com/landingpage/en/qm-gcn/) describes the statement of conformity and its rule of enforcement for test results are applicable throughout this test report.					
Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt <i>Condition of the test item at delivery:</i> Test item complete and undamaged					
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

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Product information

Manufacturers declarations

Bluetooth Radio	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	40
Channel separation	2 MHz
Type of antenna	Internal PCB
Antenna gain (dBi)	-4.58 dBi
Power level	fix
2.4GHz GFSK Radio	Transceiver
Operating frequency range	2402 - 2471 MHz
Type of modulation	GFSK
Number of channels	69
Channel separation	1 MHz
Type of antenna	Internal PCB
Antenna gain (dBi)	-3.48 dBi
Power level	fix
General	
Type of equipment	Stand-alone Radio Device
Connection to public utility power line	No
Nominal voltage	3.0 VDC
Independent Operation Modes	Transceiver

Product function and intended use

The equipment under test (EUT) is a toy product with Bluetooth low energy radio and 2.4GHz GFSK radio.

FCC ID : 2A2XI589

IC : 27849-589

HVIN : 589

Models	Product description
Electronic parts GT-PWR Connect / 910589	RC Toy with Bluetooth and 2.4GHz Transceiver

Submitted documents

Circuit Diagram
 Block Diagram
 Technical Description
 User manual
 Label

Independent Operation Modes

The basic operation modes are:

- Transceiver mode.

For further information refer to User Manual

Related Submittal(s) Grants

- This is a single application for certification of the Transceiver Module.

Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

Test Set-up and Operation Mode

Principle of Configuration Selection

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

Test Operation and Test Software

Test operation should refer to test methodology.

- During test, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power is fixed.

Special Accessories and Auxiliary Equipment

- Nil

Countermeasures to achieve EMC Compliance

- Nil

Test Methodology

Radiated Emission

The radiated emission measurements of the transmitter part were performed according to the procedures in ANSI C63.10-2013.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360 °, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

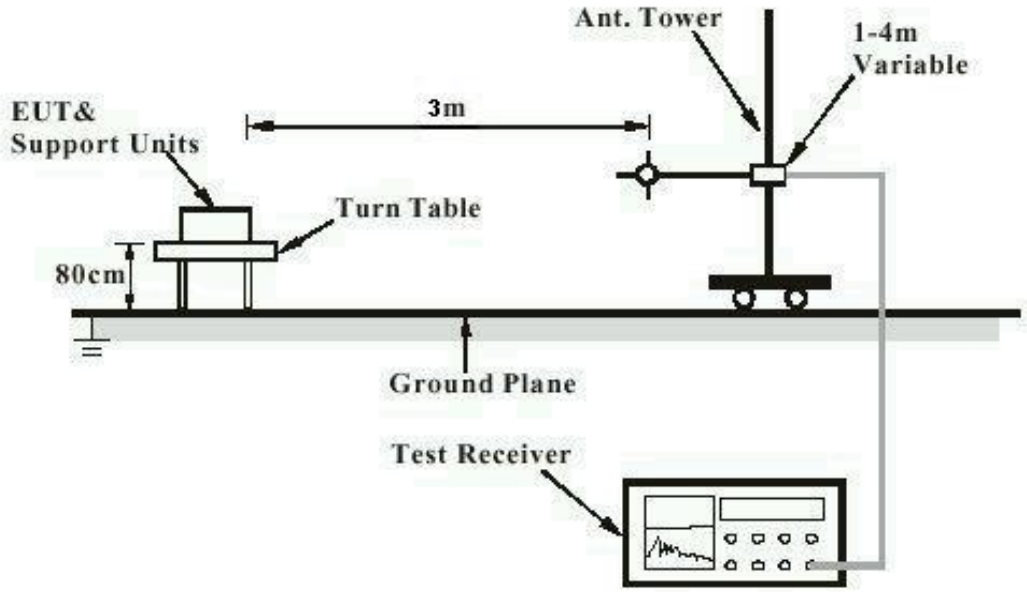
$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)

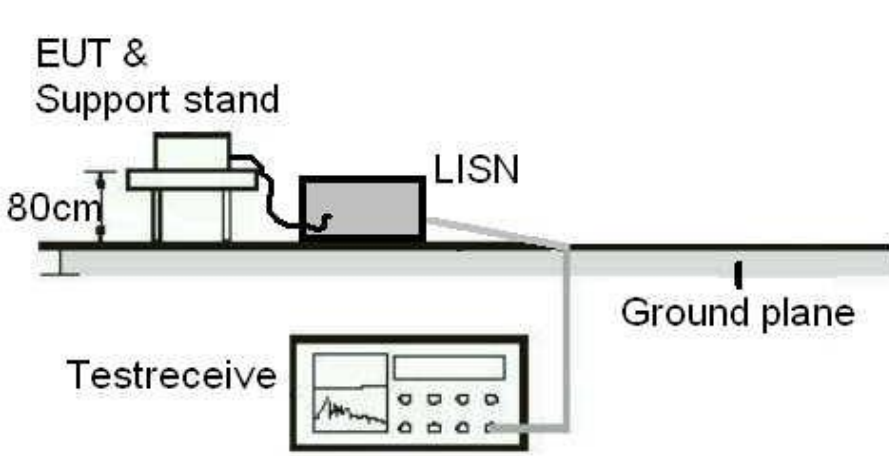
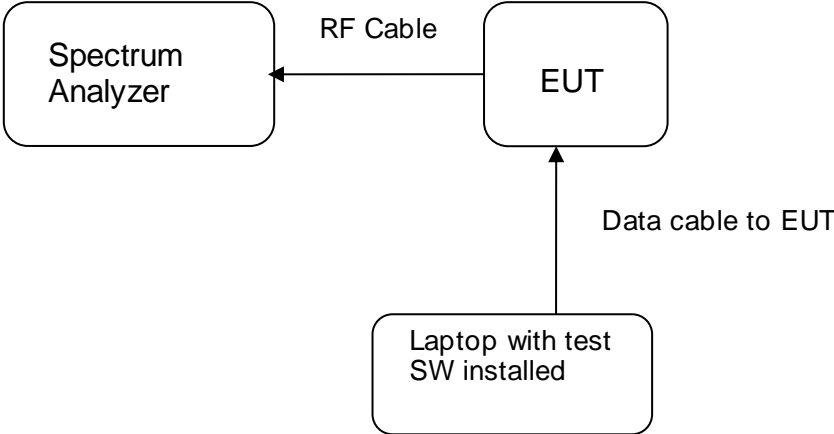


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)

Test Facility

Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.

Address: 3-4/F, Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong

Tel.: +852 2192 1000

Fax: +852 2192 1001

Email service-gc@tuv.com

The test facility is recognized or accredited by the following organizations:

FCC

Test Firm Registration Number : 371735

ISED / IC

Test Site Registration Number : 26152

List of Test and Measurement Instruments

Hong Kong Productivity Council

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	5-Mar-22	5-Mar-23
Multi-functional Anechoic Chamber	Albatross	Nil	04-Jan-22	04-Jan-23
Test Receiver	R & S	ESU40	13-Jan-22	13-Jan-23
Active Loop Antenna	EMCO	6502	30-Dec-20	30-Dec-22
Bi-conical Antenna	R & S	HK116	24-Oct-22	24-Oct-24
Log Periodic Antenna	R & S	HL223	31-Oct-22	31-Oct-24
Standard Gain Horn	ETS-Lindgren	3160-07	25-Nov-20	25-Nov-24
Standard Gain Horn	ETS-Lindgren	3160-08	22-Nov-20	22-Nov-24
Standard Gain Horn	ETS-Lindgren	3160-10	30-Nov-20	30-Nov-24
Double-Ridged Waveguide Horn	EMCO	3116	30-Nov-20	30-Nov-24
Double-Ridged Waveguide Horn	EMCO	3117	21-Nov-20	21-Nov-24
Coaxial cable	Harbour	SF118/11n/11n/12000.0	3-Aug-22	3-Aug-24
High Frequency Cable	Pasternack	PE3VNA4001-3M	29-Jan-21	29-Jan-23
Microwave amplifier 0.5-26.5GHz, 25dB gain	COM-POWER Corporation	PAM-118A	5-Mar-22	5-Mar-23
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	29-Jan-22	29-Jan-23

TÜV Rheinland Hong Kong Ltd.

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSV40	10 Jun 22	10 Jun 23

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is ± 2.42 dB.

The estimated combined standard uncertainty for radiated emissions measurements is ± 4.81 dB (9kHz to 30MHz) and ± 4.62 dB (30MHz to 200MHz) and ± 5.67 dB (200MHz to 1000MHz) and is ± 5.07 dB (1GHz to 8.2GHz) and ± 4.58 dB (8.2GHz to 12.4GHz) and ± 4.78 dB (12.4GHz to 18GHz)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for the level of confidence is approximately 95%.

Results FCC Part 15 – Subpart C / RSS-247 Issue 2

Bluetooth Transmitter

FCC 15.203 – Antenna Requirement 1		Pass
FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device		
Results:	a) Antenna type: Internal PCB b) Manufacturer and model no: N/A c) Peak Gain: -4.58 dBi dBi	
Verdict:	Pass	
FCC 15.204 – Antenna Requirement 2		N/A
FCC Requirement: An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.		
Results:	Only one integral antenna can be used.	
Verdict:	N/A	
RSS-Gen 6.3 – External Control		Pass
IC Requirement: The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the limits prescribed in the applicable RSS.		
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.	
Verdict:	Pass	
RSS-Gen 8.3 – Antenna Requirement		Pass
IC Requirement: When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer.		
Results:	a) Antenna type: Internal PCB b) Manufacturer: N/A c) model no: N/A d) Gain with reference to an isotropic radiator: -4.58 dBi dBi	
Verdict:	Pass	
FCC 15.207/ RSS-Gen 8.8 – Conducted Emission on AC Mains		N/A
There is no AC power input or output ports on the EUT.		

FCC 15.247 (a)(2) / RSS-247 5.2 – 6dB Bandwidth Measurement		Pass	
FCC/ IC Requirement: Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.			
Test Specification: ANSI C63.10 – 2013 Test date : 21.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1			
Channel Frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (kHz)
2402	2401.685	2402.345	659.3
2442	2441.685	2442.350	664.3
2480	2479.680	2480.345	664.3

RSS-Gen 6.6 – Occupied Bandwidth		Pass	
FCC/ IC Requirement: N/A			
Test Specification: RSS-Gen Test date : 21.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 23°C Humidity : 50%			
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1.			
Channel Frequency (MHz)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)
2402	2401.491	2402.534	1.044
2442	2441.491	2442.534	1.044
2480	2479.491	2480.540	1.049

FCC 15.247(b)(3) / RSS-247 5.4 – Maximum Peak Conducted Output Power		Pass	
FCC/ IC Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)			
Test Specification: ANSI C63.10 – 2013 Test date : 21.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1			
Frequency (MHz)	Measured Output Power (dBm) (mW)	Limit (dBm W)	Verdict
2402	-11.78 0.0664	30.0 1	Pass
2442	-11.18 0.0762	30.0 1	Pass
2480	-10.93 0.0807	30.0 1	Pass
FCC 15.247(e) / RSS-247 5.2 – Power Spectral Density		Pass	
FCC/ IC Requirement: 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.			
Test Specification: ANSI C63.10 – 2013 Test date : 21.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 23°C Humidity : 50%			
Results: Peak power below 8dBm, PSD deem to pass. PSD level is equal to the measured output power.			

FCC 15.247(d) / RSS-247 5.5 – Spurious Conducted Emissions						Pass
Test Specification: ANSI C63.10 – 2013 Test date : 21.11.2022 Mode of operation: Tx mode Supply voltage : 3.0 VDC Temperature : 25°C Humidity : 56%						
FCC Requirement: 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.						
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Only the worst cases is shown below. For test protocols refer to Appendix 1 Reference value from 6dB Bandwidth measurement, appendix 1						
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Limit (dBm)	Margin (dB)	Verdict
2402	4804.03	-51.83	-11.93	-31.93	19.9	Pass
2402	9608.06	-49.28	-11.93	-31.93	17.35	Pass
2442	4884.02	-52.17	-11.34	-31.34	20.83	Pass
2442	9768.05	-49.05	-11.34	-31.34	17.71	Pass
2480	4960.03	-51.42	-11.08	-31.08	20.34	Pass
2480	9920.05	-48.54	-11.08	-31.08	17.46	Pass

FCC 15.205 / RSS-Gen 8.9 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification: ANSI C63.10 – 2013 Test date : 11.11.2022 Mode of operation: Tx mode Frequency range : 9kHz – 10GHz Supply voltage : 3.0 VDC Temperature : 25.2°C Humidity : 50%		
FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission general limits.		
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.		
Mode: 2402 MHz TX		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	36.0	74.0 / PK
2400.000	22.7	54.0 / AV
4804.022	45.4	74.0 / PK
4804.022	39.3	54.0 / AV
9608.041	49.3	74.0 / PK
9608.041	42.2	54.0 / AV
Mode: 2402 MHz TX		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	36.4	74.0 / PK
2400.000	23.0	54.0 / AV
4804.022	49.3	74.0 / PK
4804.022	45.3	54.0 / AV
9608.044	49.0	74.0 / PK
9608.044	42.2	54.0 / AV
Mode: 2442 MHz TX		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4884.022	46.6	74.0 / PK
4884.022	40.7	54.0 / AV
9168.044	49.5	74.0 / PK
9168.044	42.6	54.0 / AV
Mode: 2442 MHz TX		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4884.022	51.3	74.0 / PK
4884.022	47.6	54.0 / AV
9168.044	50.8	74.0 / PK
9168.044	44.0	54.0 / AV

Mode: 2480 MHz TX			Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m	Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	36.7	74.0 / PK	2483.500	22.7	54.0 / AV
2483.500	22.7	54.0 / AV	4960.022	50.9	74.0 / PK
4960.022	50.9	74.0 / PK	4960.022	46.9	54.0 / AV
4960.022	46.9	54.0 / AV	9920.044	50.5	74.0 / PK
9920.044	50.5	74.0 / PK	9920.044	43.7	54.0 / AV
9920.044	43.7	54.0 / AV			
Mode: 2480 MHz TX			Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m	Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	38.5	74.0 / PK	2483.500	22.9	54.0 / AV
2483.500	22.9	54.0 / AV	4960.022	45.4	74.0 / PK
4960.022	45.4	74.0 / PK	4960.022	38.1	54.0 / AV
4960.022	38.1	54.0 / AV	9920.044	51.7	74.0 / PK
9920.044	51.7	74.0 / PK	9920.044	45.0	54.0 / AV
9920.044	45.0	54.0 / AV			

2.4GHz GFSK Transmitter

FCC 15.203 – Antenna Requirement 1		Pass
FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device		
Results:	a) Antenna type:	Internal PCB
	b) Manufacturer and model no:	N/A
	c) Peak Gain:	-3.48 dBi dBi
Verdict:	Pass	
FCC 15.204 – Antenna Requirement 2		N/A
FCC Requirement: An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.		
Results:	Only one integral antenna can be used.	
Verdict:	N/A	
RSS-Gen 6.3 – External Control		Pass
IC Requirement: The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the limits prescribed in the applicable RSS.		
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.	
Verdict:	Pass	
RSS-Gen 8.3 – Antenna Requirement		Pass
IC Requirement: When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer.		
Results:	a) Antenna type:	Internal PCB
	b) Manufacturer:	N/A
	c) model no:	N/A
	d) Gain with reference to an isotropic radiator:	-3.48 dBi dBi
Verdict:	Pass	
FCC 15.207/ RSS-Gen 8.8 – Conducted Emission on AC Mains		N/A
There is no AC power input or output ports on the EUT.		

FCC 15.247 (a)(2) / RSS-247 5.2 – 6dB Bandwidth Measurement		Pass	
FCC/ IC Requirement: Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.			
Test Specification: ANSI C63.10 – 2013 Test date : 22.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 22.1°C Humidity : 57%			
Results: For test protocols please refer to Appendix 1			
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (kHz)
2402	2401.597	2402.343	745.8
2441	2440.605	2441.342	736.8
2471	2470.598	2471.353	755.7

RSS-Gen 6.6 – Occupied Bandwidth		Pass	
FCC/ IC Requirement: N/A			
Test Specification: RSS-Gen Test date : 22.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 22.1°C Humidity : 57%			
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1.			
Frequency (MHz)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)
2402	2401.444	2402.571	1.126
2441	2440.446	2441.568	1.122
2471	2470.444	2471.578	1.134

FCC 15.247(b)(3) / RSS-247 5.4 – Maximum Peak Conducted Output Power		Pass	
FCC/ IC Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)			
Test Specification: ANSI C63.10 – 2013 Test date : 22.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 22.1°C Humidity : 57%			
Results: For test protocols please refer to Appendix 1			
Frequency (MHz)	Measured Output Power (dBm) (mW)	Limit (dBm W)	Verdict
2402	-12.26 0.0594	30.0 1	Pass
2441	-12.35 0.0582	30.0 1	Pass
2471	-12.74 0.0532	30.0 1	Pass
FCC 15.247(e) / RSS-247 5.2 – Power Spectral Density		Pass	
FCC/ IC Requirement: 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.			
Test Specification: ANSI C63.10 – 2013 Test date : 22.11.2022 Mode of operation: Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0 VDC Temperature : 22.1°C Humidity : 57%			
Results: Peak power below 8dBm, PSD deem to pass. PSD level is equal to the measured output power.			

FCC 15.247(d)/ RSS-247 5.5 – Spurious Conducted Emissions						Pass
Test Specification: ANSI C63.10 – 2013 Test date : 22.11.2022 Mode of operation: Tx mode Supply voltage : 3.0 VDC Temperature : 25°C Humidity : 56%						
FCC Requirement: 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.						
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Only the worst cases is shown below. For test protocols refer to Appendix 1. Reference value from 6dB Bandwidth measurement, appendix 1						
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Limit (dBm)	Margin (dB)	Verdict
2402	4803.98	-36.40	-12.30	-32.30	4.10	Pass
2441	4881.99	-35.90	-12.39	-32.39	3.51	Pass
2471	4941.97	-36.15	-12.73	-32.73	3.42	Pass

FCC 15.205 / RSS-Gen 8.9 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification: ANSI C63.10 – 2013 Test date : 01.01.2023 Mode of operation: Tx mode Frequency range : 9kHz – 10GHz Supply voltage : 3.0 VDC Temperature : 22.1°C Humidity : 57%		
FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission general limits.		
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.		
Mode: 2402 MHz TX		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	55.6	74.0 / PK
2400.000	28.8	54.0 / AV
4803.399	43.2	74.0 / PK
4803.399	34.0	54.0 / AV
7205.983	52.8	74.0 / PK
7205.983	47.3	54.0 / AV
Mode: 2402 MHz TX		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	64.1	74.0 / PK
2400.000	37.1	54.0 / AV
4803.987	45.2	74.0 / PK
4803.987	38.1	54.0 / AV
7205.982	51.9	74.0 / PK
7205.982	45.6	54.0 / AV
Mode: 2441 MHz TX		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4881.990	42.0	74.0 / PK
4881.990	32.9	54.0 / AV
7322.984	60.1	74.0 / PK
7322.984	46.9	54.0 / AV
Mode: 2441 MHz TX		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4881.990	45.1	74.0 / PK
4881.990	36.3	54.0 / AV
7322.984	51.7	74.0 / PK
7322.984	45.4	54.0 / AV

Mode: 2471 MHz TX		Vertical Polarization	
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	40.1	74.0 / PK	
2483.500	21.9	54.0 / AV	
4941.987	46.7	74.0 / PK	
4941.987	35.6	54.0 / AV	
7412.986	53.9	74.0 / PK	
7412.986	48.9	54.0 / AV	
Mode: 2471 MHz TX		Horizontal Polarization	
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	44.7	74.0 / PK	
2483.500	24.6	54.0 / AV	
4941.990	45.7	74.0 / PK	
4941.990	37.2	54.0 / AV	
7412.983	50.9	74.0 / PK	
7412.983	44.8	54.0 / AV	

Bluetooth and 2.4GHz GFSK Simultaneous Transmission

FCC 15.205 / RSS-Gen 8.9 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification: ANSI C63.10 – 2013 Test date : 01.01.2023 Mode of operation: Tx mode Frequency range : 9kHz – 10GHz Supply voltage : 3.0 VDC Temperature : 22.1°C Humidity : 57%		
FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission general limits.		
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.		
Mode: BT 2402 MHz + GFSK 2402 TX Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	53.8	74.0 / PK
2400.000	27.9	54.0 / AV
7205.983	53.9	74.0 / PK
7205.983	48.2	54.0 / AV
Mode: BT 2402 MHz + GFSK 2402 TX Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	63.8	74.0 / PK
2400.000	37.0	54.0 / AV
4803.987	45.5	74.0 / PK
4803.987	38.1	54.0 / AV
7205.982	50.1	74.0 / PK
7205.982	43.2	54.0 / AV
Mode: BT 2402 MHz + GFSK 2471 TX Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	37.9	74.0 / PK
2400.000	21.3	54.0 / AV
7412.983	51.5	74.0 / PK
7412.983	45.8	54.0 / AV
Mode: BT 2402 MHz + GFSK 2471 TX Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	43.6	74.0 / PK
2400.000	25.3	54.0 / AV
7412.980	49.3	74.0 / PK
7412.980	42.3	54.0 / AV
Mode: BT 2442 MHz + GFSK 2441 TX Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
7322.980	52.7	74.0 / PK
7322.980	47.6	54.0 / AV

Mode: BT 2442 MHz + GFSK 2441 TX Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4883.993	53.1	74.0 / PK
4883.993	47.6	54.0 / AV
7322.983	50.0	74.0 / PK
7322.983	42.8	54.0 / AV
Mode: BT 2480 MHz + GFSK 2402 TX Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	53.5	74.0 / PK
2400.000	27.1	54.0 / AV
2483.500	35.1	74.0 / PK
2483.500	21.6	54.0 / AV
4803.983	43.9	74.0 / PK
4803.983	34.2	54.0 / AV
4960.000	45.4	74.0 / PK
4960.000	38.8	54.0 / AV
7205.977	55.6	74.0 / PK
7205.977	50.6	54.0 / AV
Mode: BT 2480 MHz + GFSK 2402 TX Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	65.3	74.0 / PK
2400.000	37.5	54.0 / AV
2483.500	37.4	74.0 / PK
2483.500	24.5	54.0 / AV
7205.983	51.9	74.0 / PK
7205.983	46.0	54.0 / AV
Mode: BT 2480 MHz + GFSK 2471 TX Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	38.0	74.0 / PK
2483.500	24.2	54.0 / AV
7412.983	53.3	74.0 / PK
7412.983	48.1	54.0 / AV
Mode: BT 2480 MHz + GFSK 2471 TX Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	38.2	74.0 / PK
2483.500	25.2	54.0 / AV
7412.983	49.0	74.0 / PK
7412.983	42.1	54.0 / AV

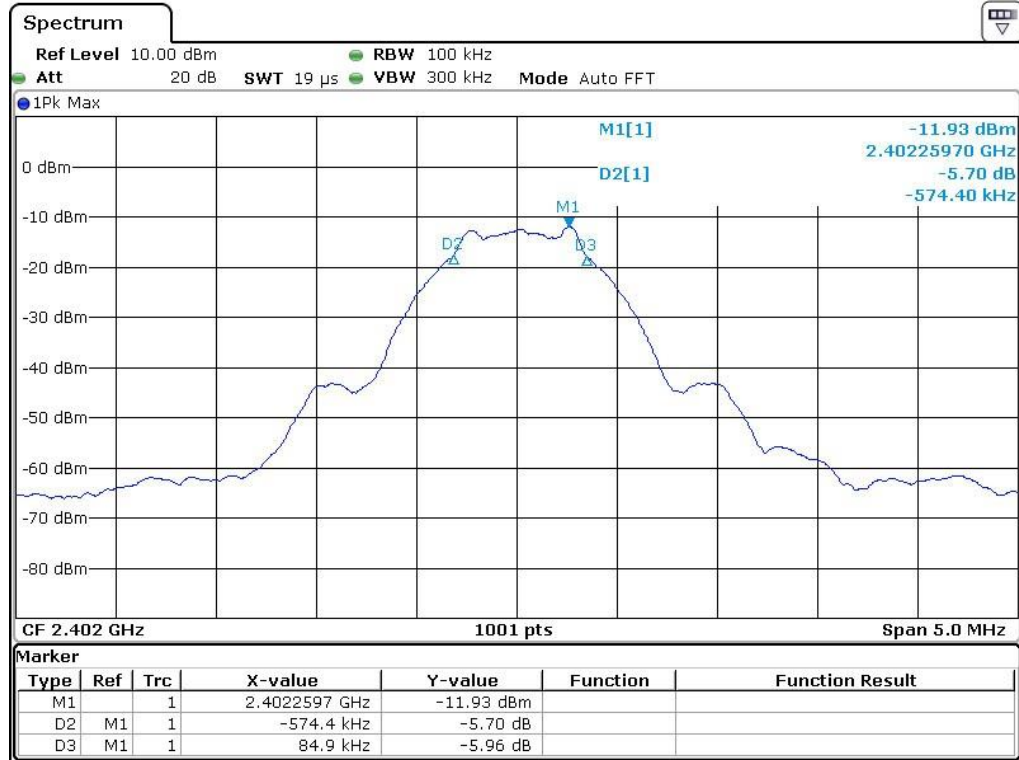
Appendix 1

Test Protocol

Bluetooth Transmitter

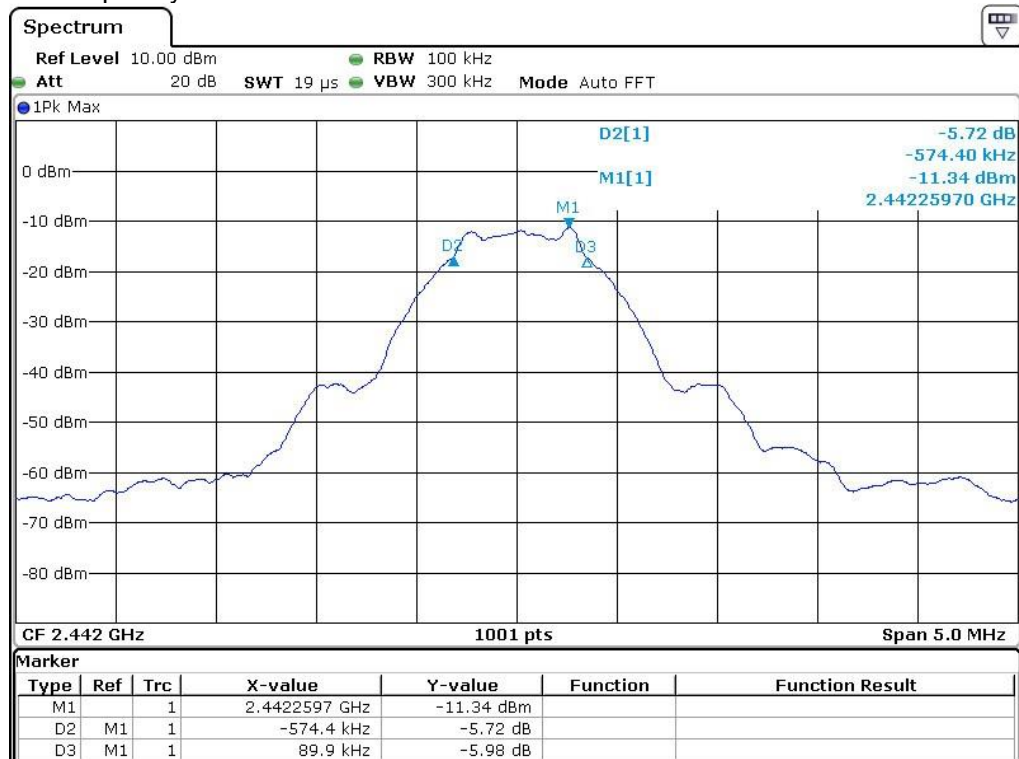
6 dB Bandwidth Measurement

TX Frequency 2402MHz

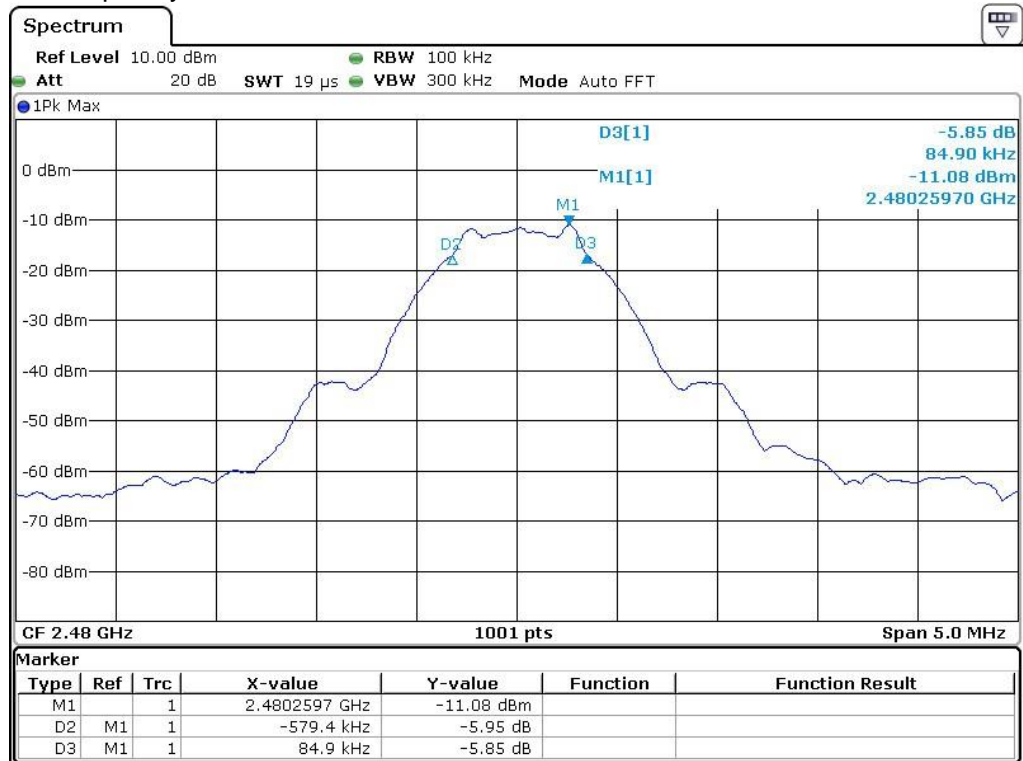


Date: 21.NOV.2022 15:20:09

TX Frequency : 2442MHz



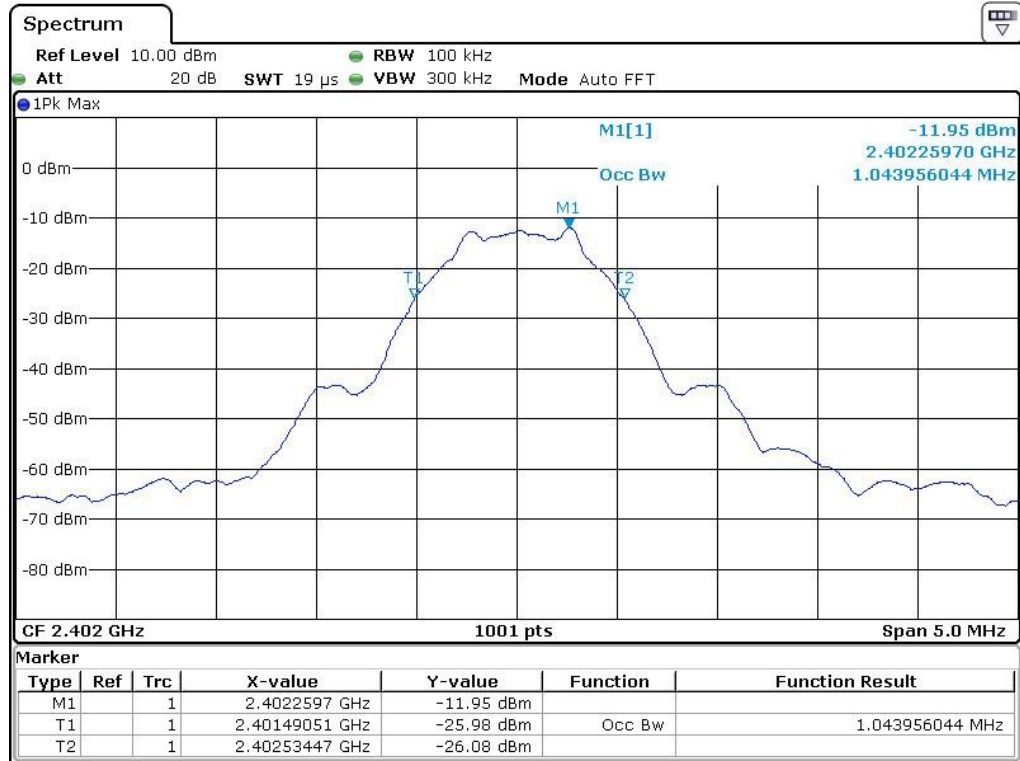
Date: 21.NOV.2022 15:27:41

TX Frequency 2480MHz


Date: 21.NOV.2022 15:30:12

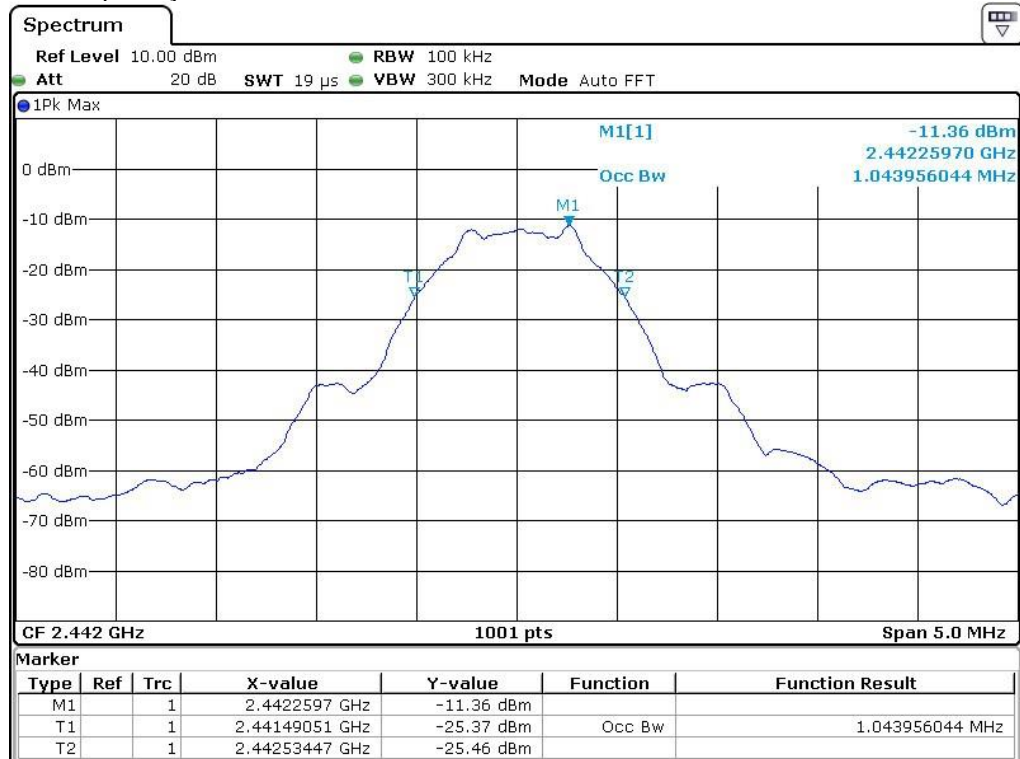
Occupied Bandwidth Measurement

TX Frequency 2402MHz

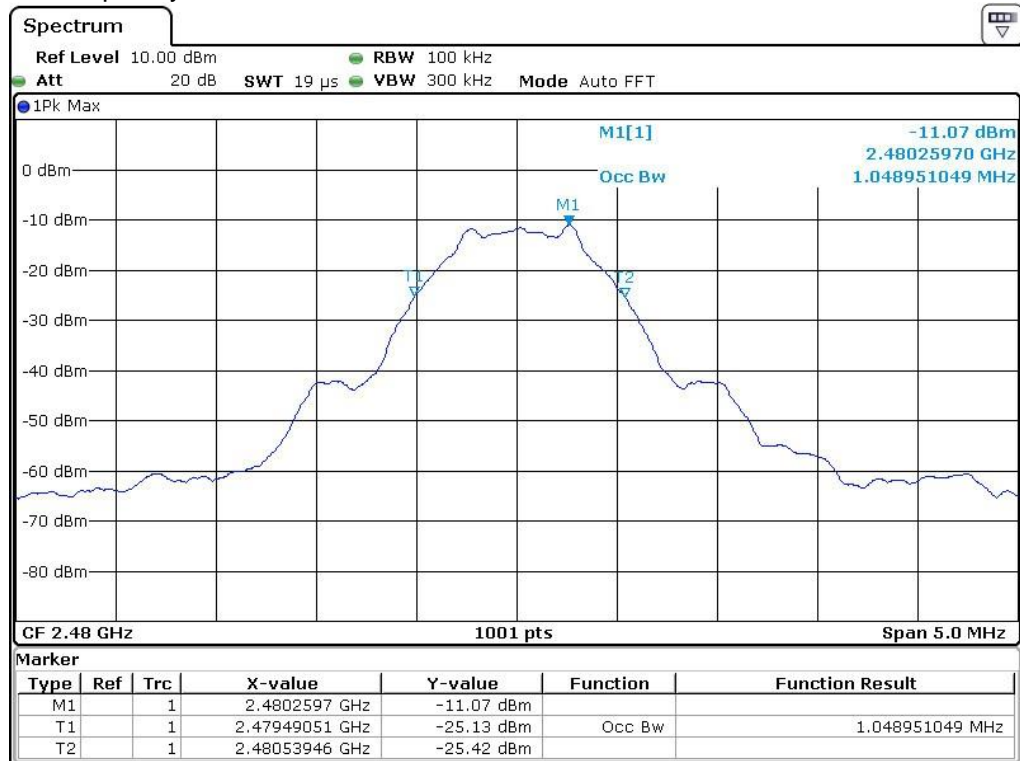


Date: 21. NOV.2022 15:20:58

TX Frequency : 2442MHz



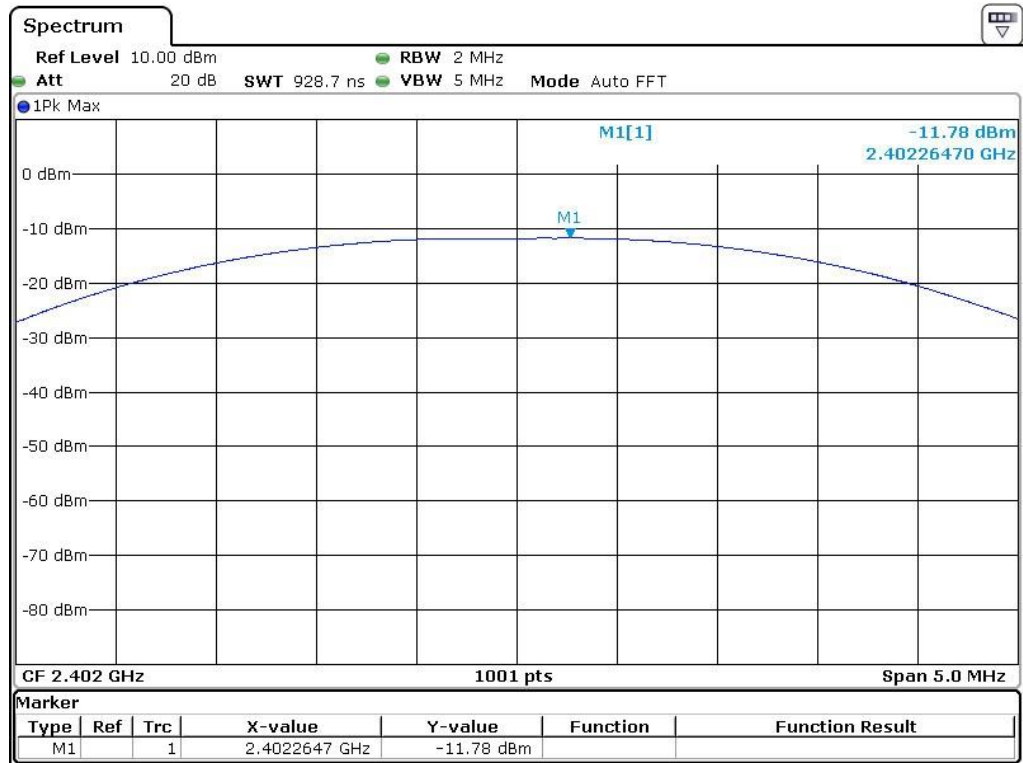
Date: 21. NOV.2022 15:28:20

TX Frequency 2480MHz


Date: 21.NOV.2022 15:29:37

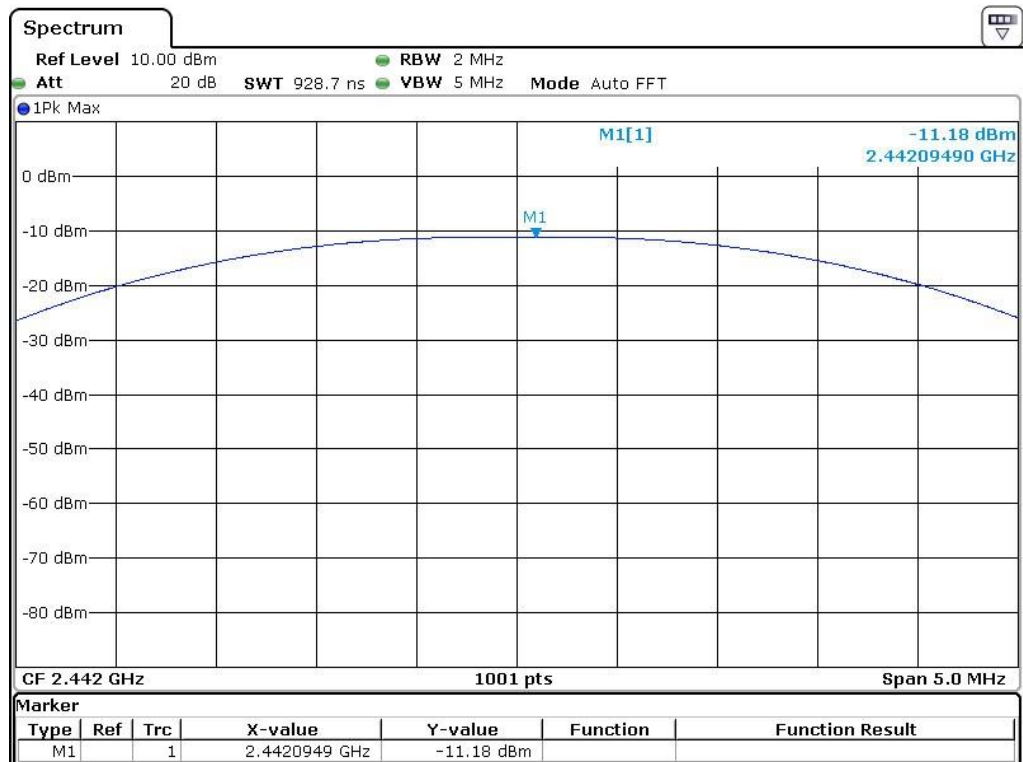
Maximum Peak Conducted Output Power

TX Frequency 2402MHz

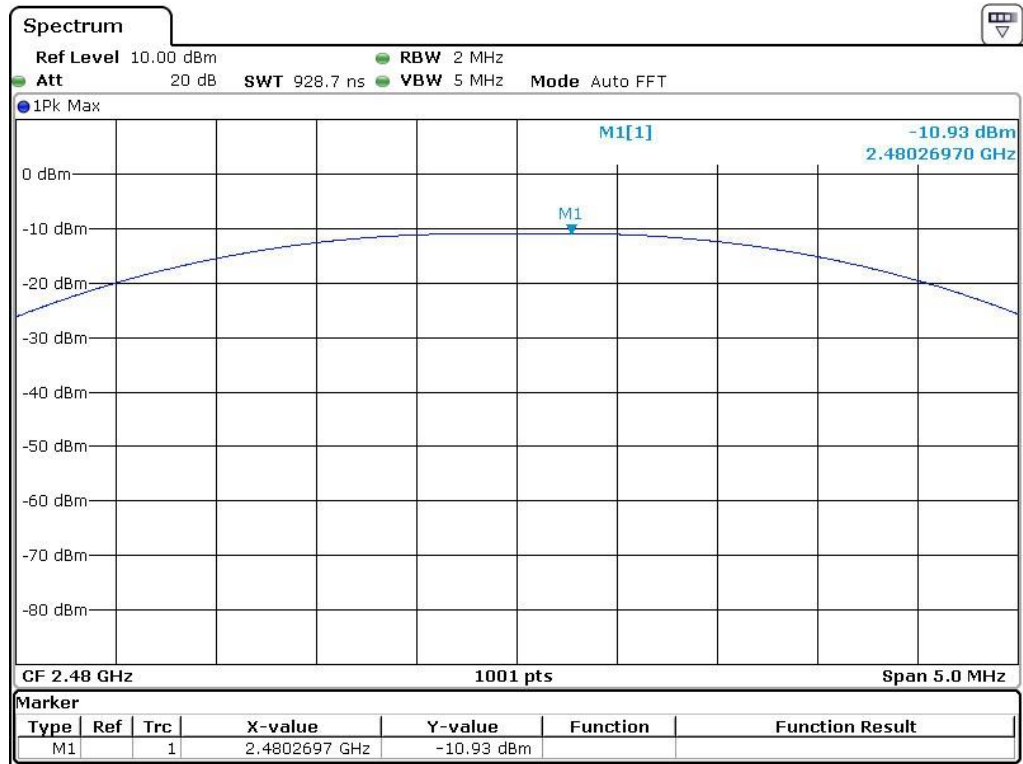


Date: 21. NOV.2022 15:21:51

TX Frequency : 2442MHz



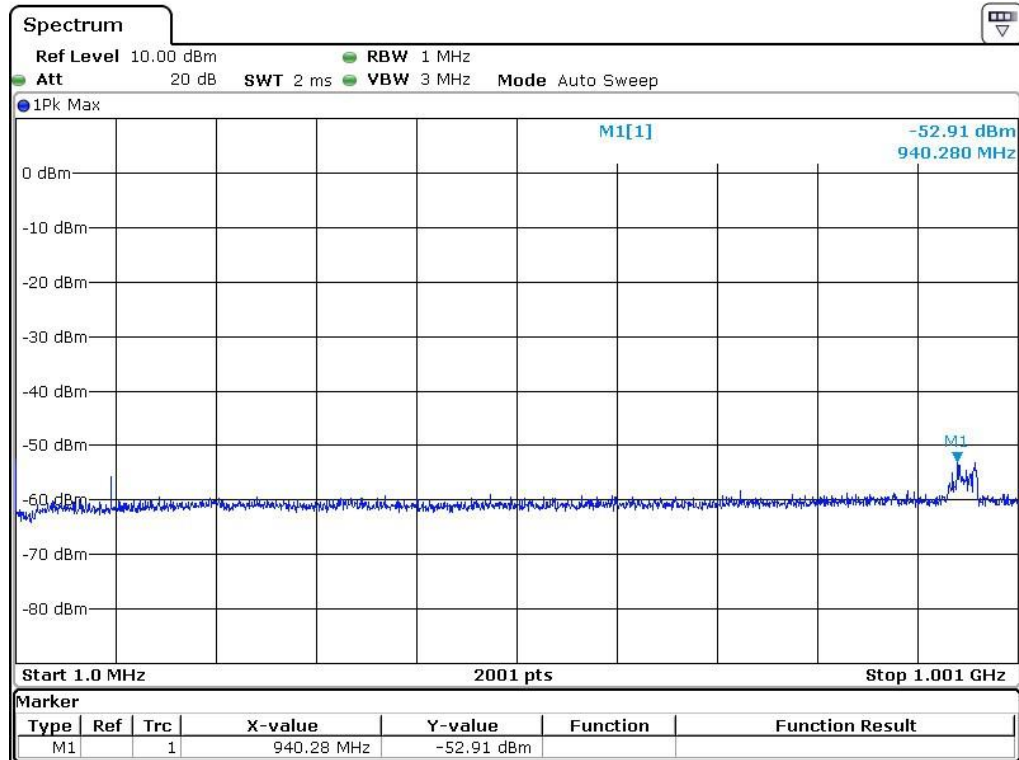
Date: 21. NOV.2022 15:26:11

TX Frequency 2480MHz


Date: 21.NOV.2022 15:30:37

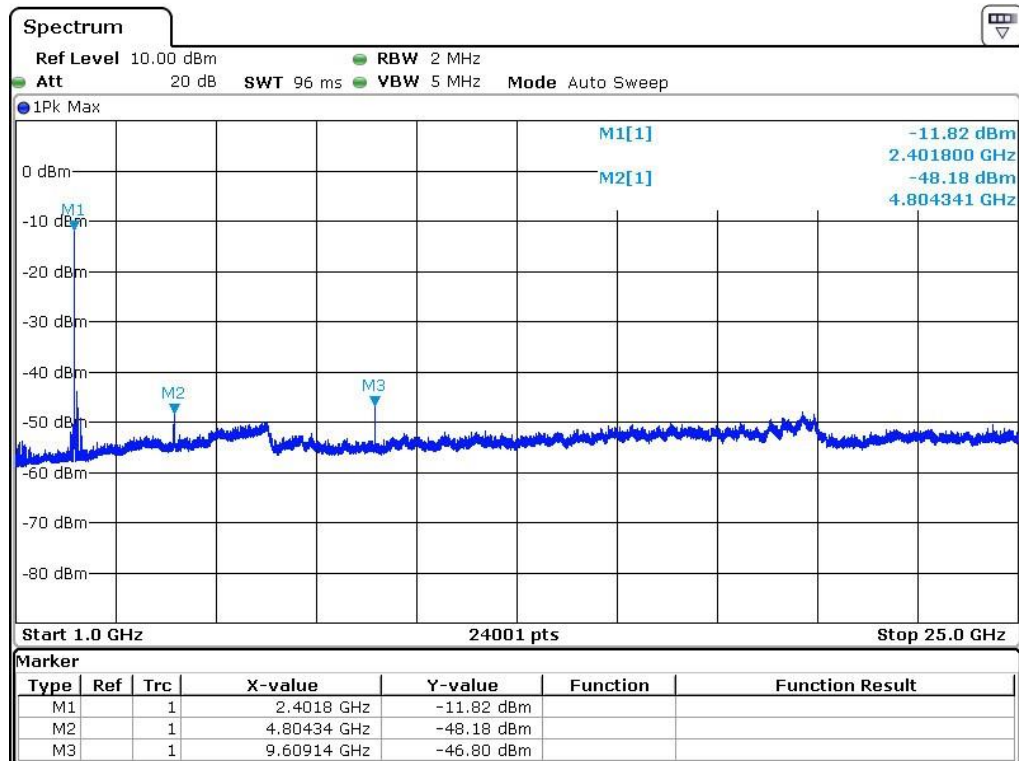
Spurious Conducted Emissions

TX Frequency 2402MHz _ 1M~1GHz Pre-scan

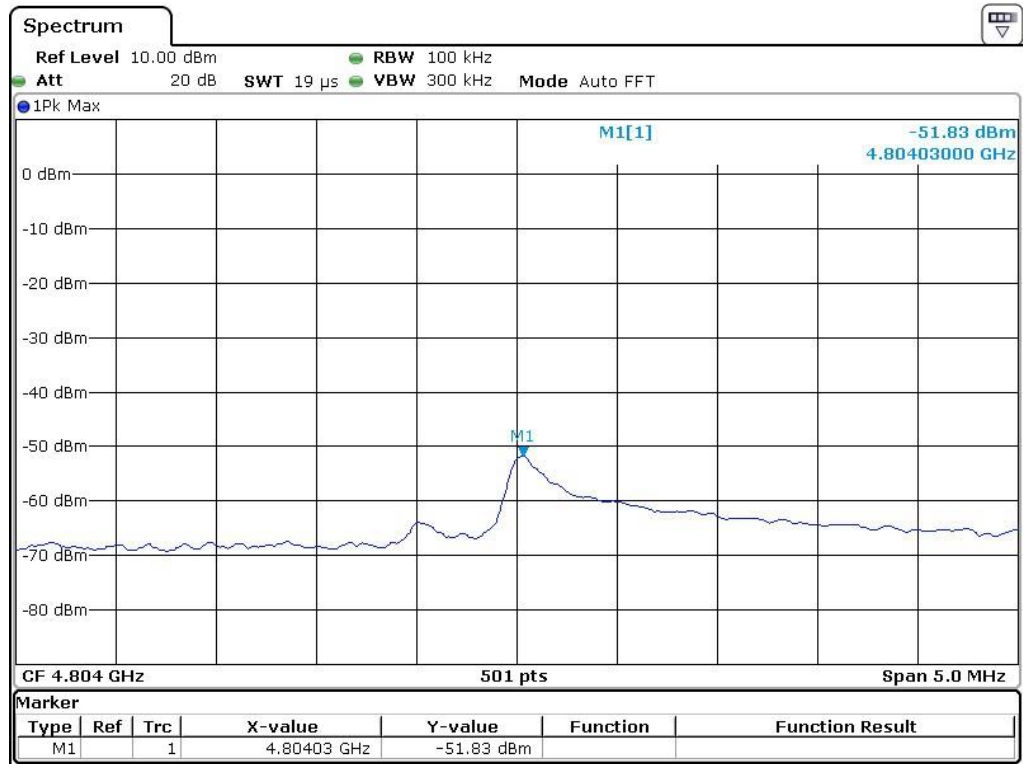


Date: 21. NOV. 2022 16:55:01

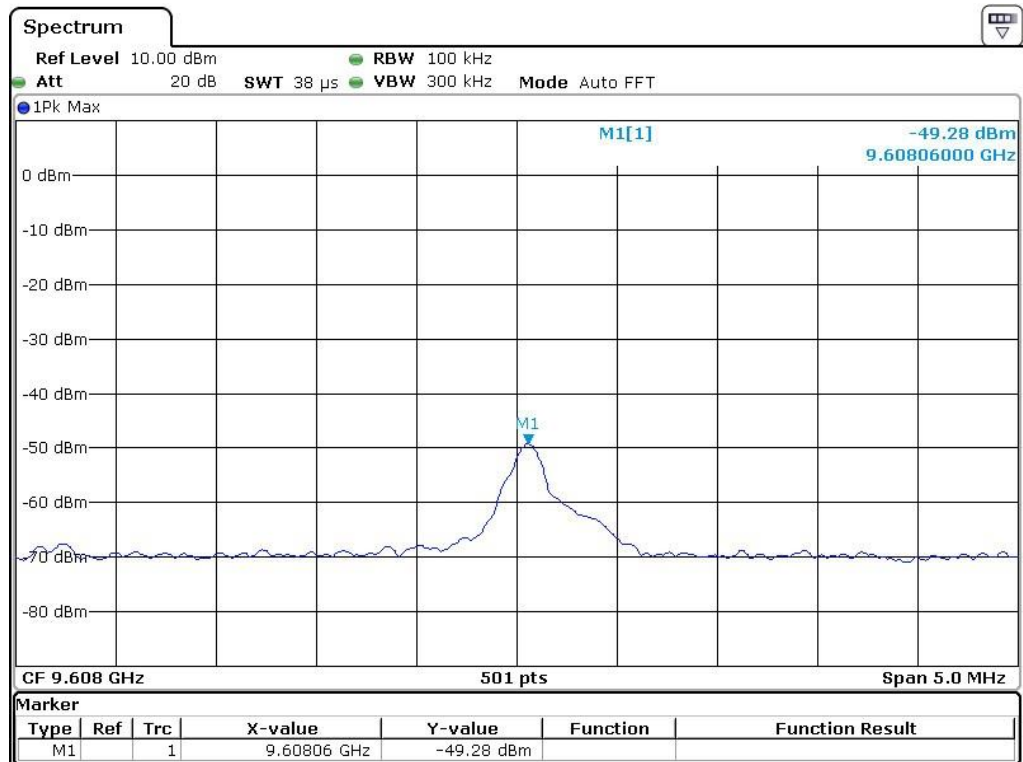
TX Frequency : 2402MHz _ 1G~25GHz Pre-scan



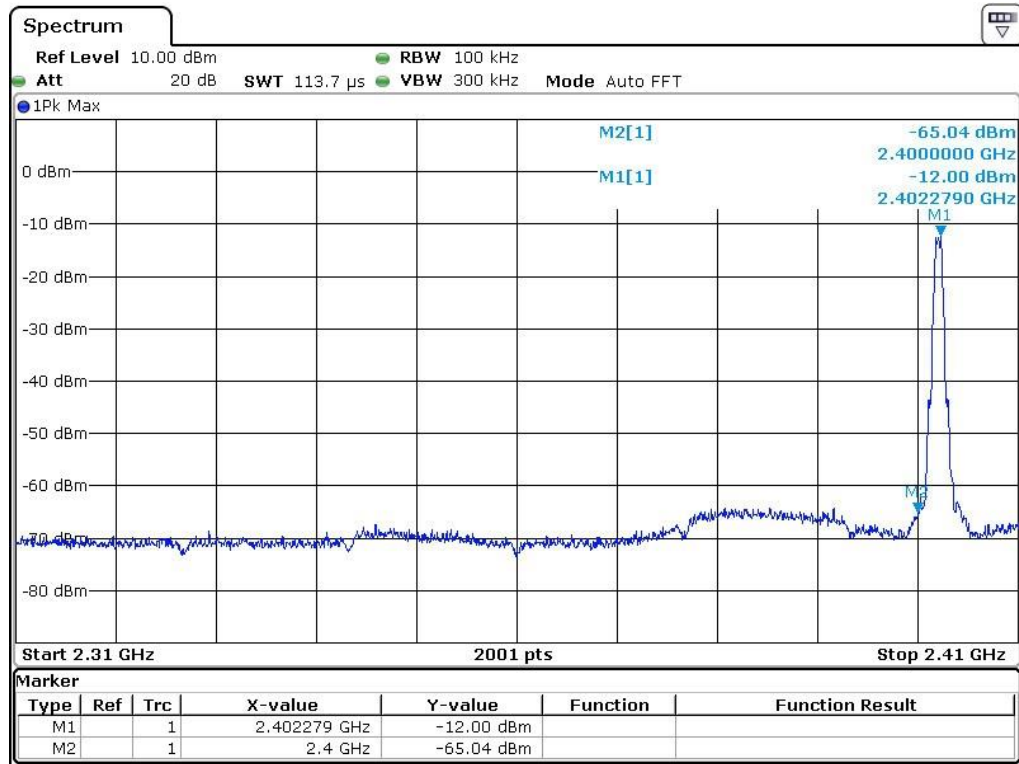
Date: 21. NOV. 2022 16:39:01

TX Frequency 2402MHz _ 2nd Harmonic


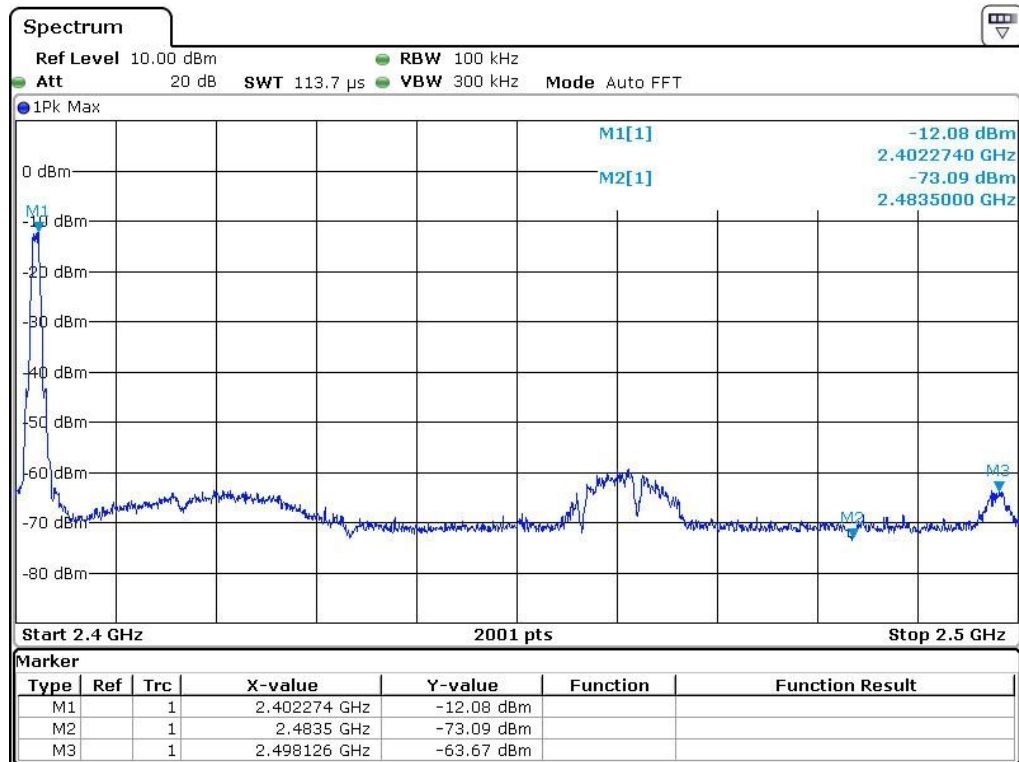
Date: 21.NOV.2022 17:06:31

TX Frequency : 2402MHz _ 4th Harmonic


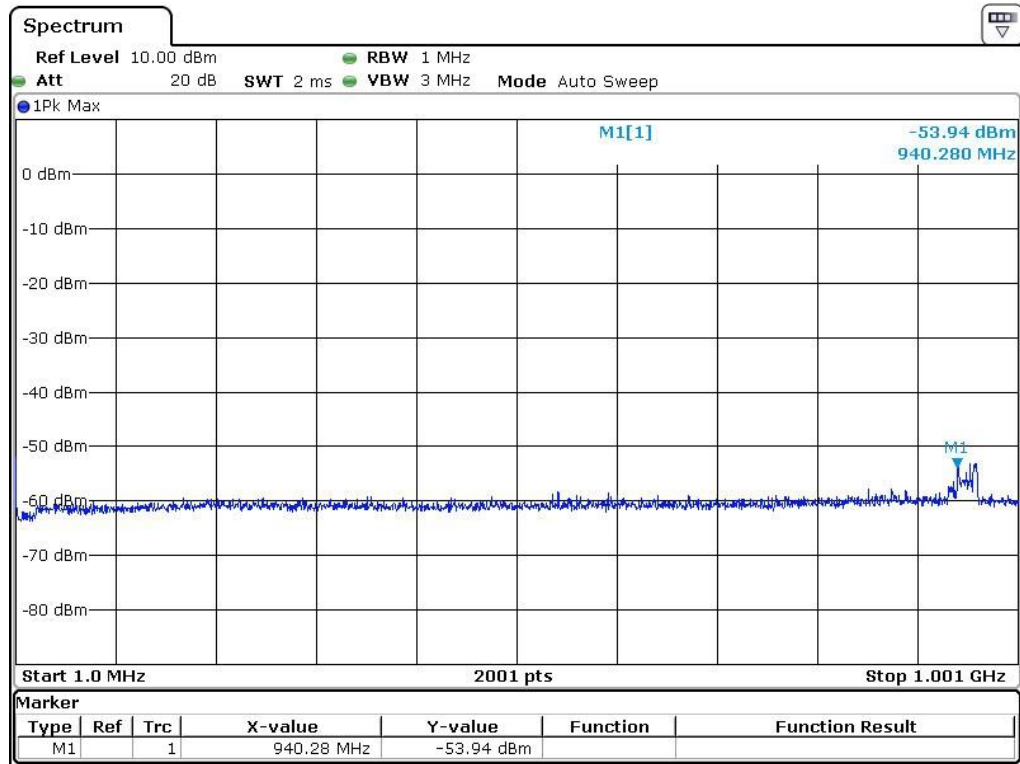
Date: 21.NOV.2022 17:07:49

TX Frequency 2402MHz _ Band Edge 2,400MHz


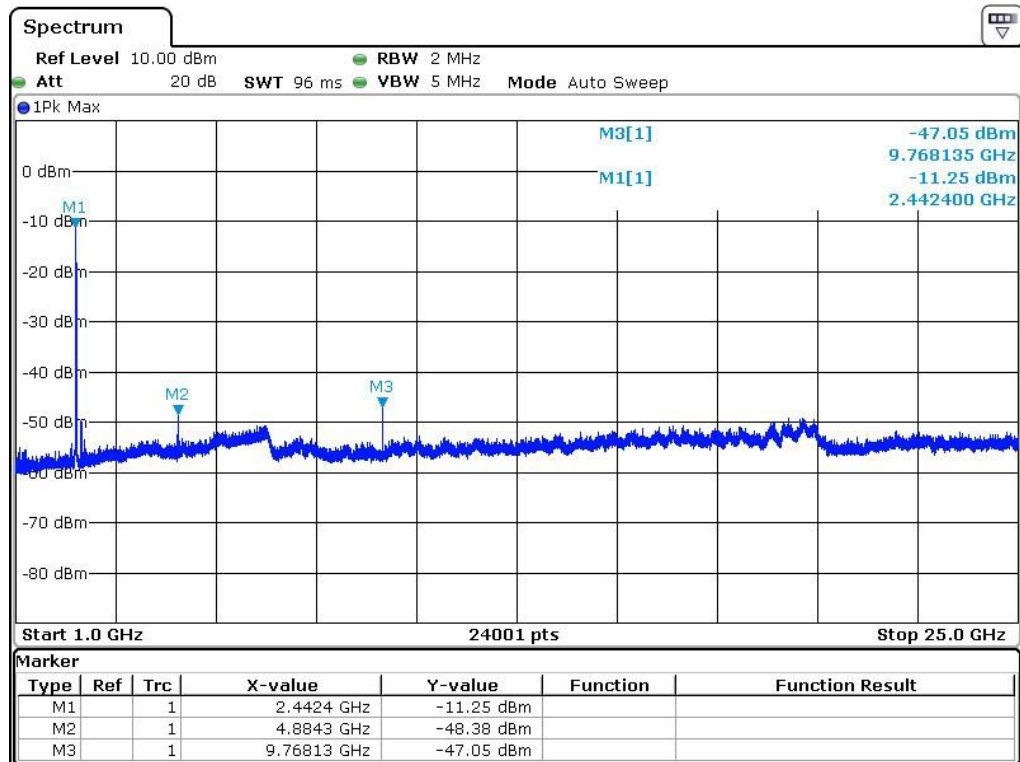
Date: 21.NOV.2022 17:17:36

TX Frequency : 2402MHz _ Band Edge 2,483.5MHz


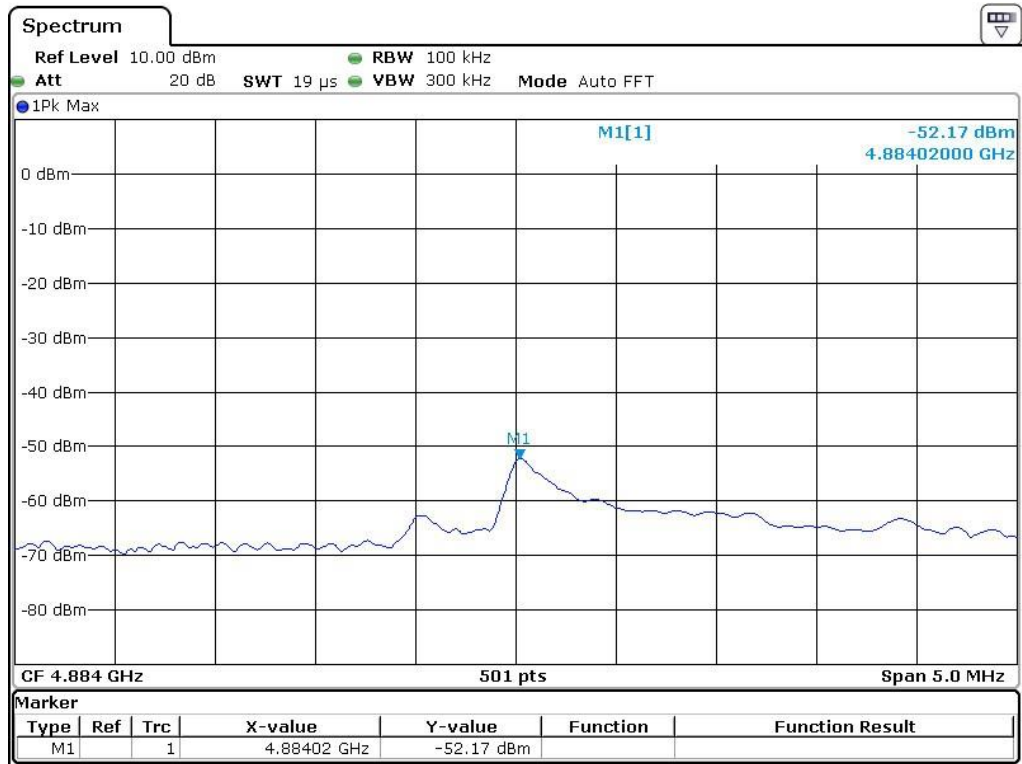
Date: 21.NOV.2022 17:19:25

TX Frequency 2442MHz _ 1M~1GHz Pre-scan


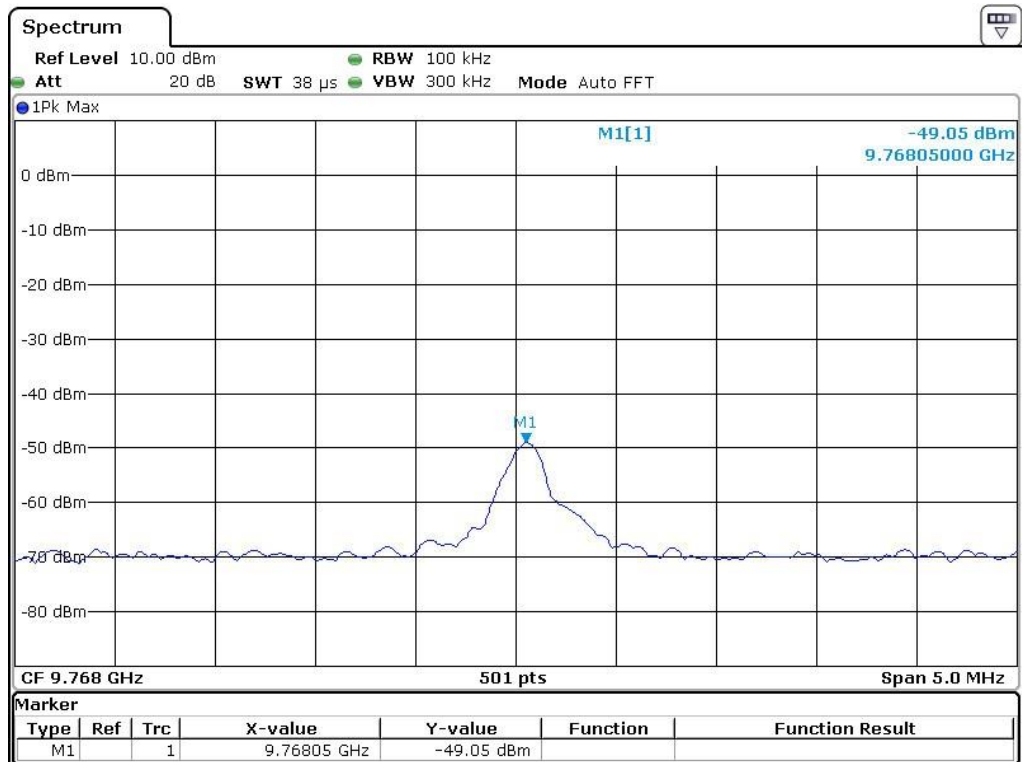
Date: 21. NOV. 2022 16:56:44

TX Frequency : 2442MHz _ 1G~25GHz Pre-scan


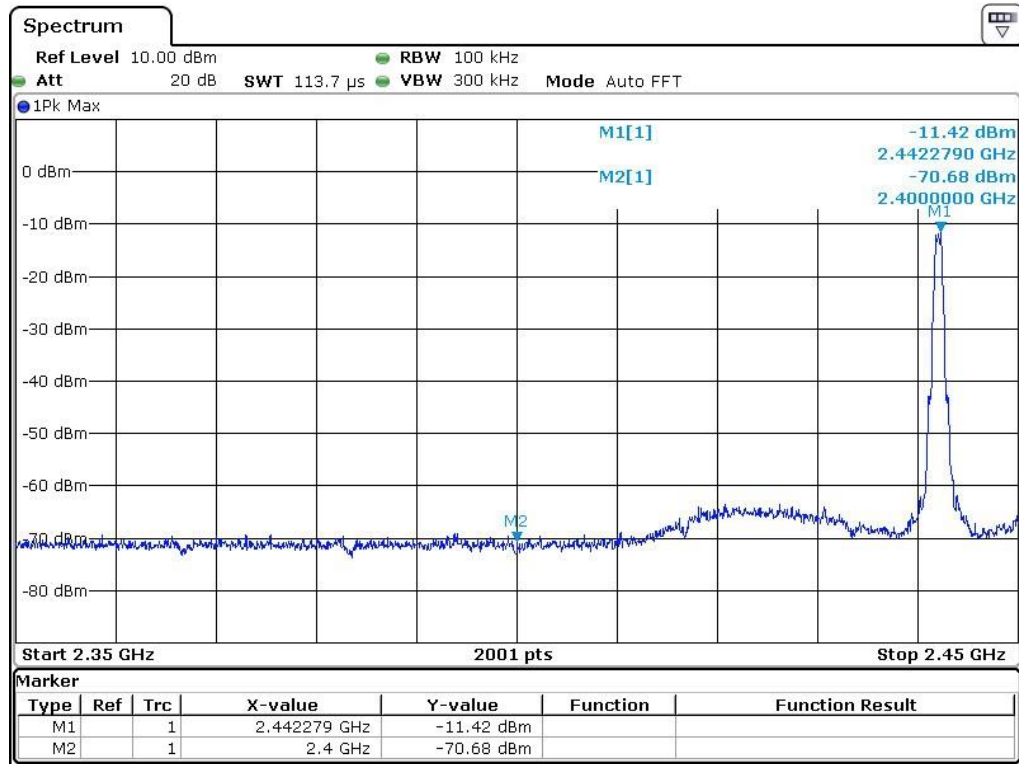
Date: 21. NOV. 2022 16:42:23

TX Frequency 2442MHz _ 2nd Harmonic


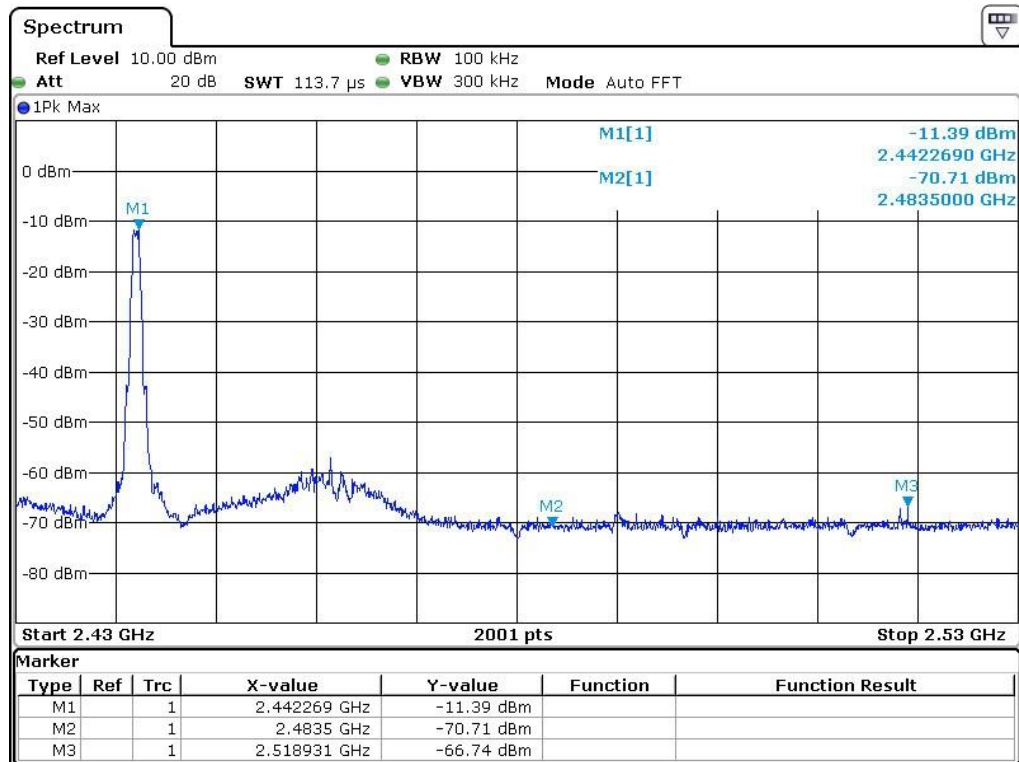
Date: 21.NOV.2022 17:08:55

TX Frequency : 2442MHz _ 4th Harmonic


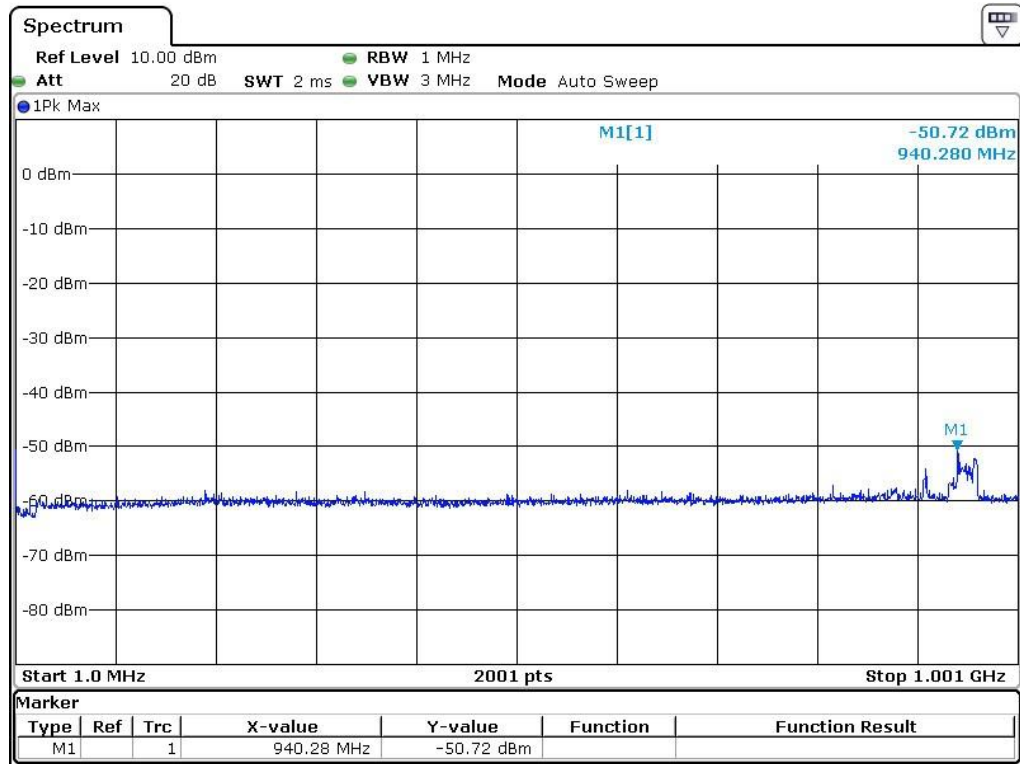
Date: 21.NOV.2022 17:09:58

TX Frequency 2442MHz _ Band Edge 2,400MHz


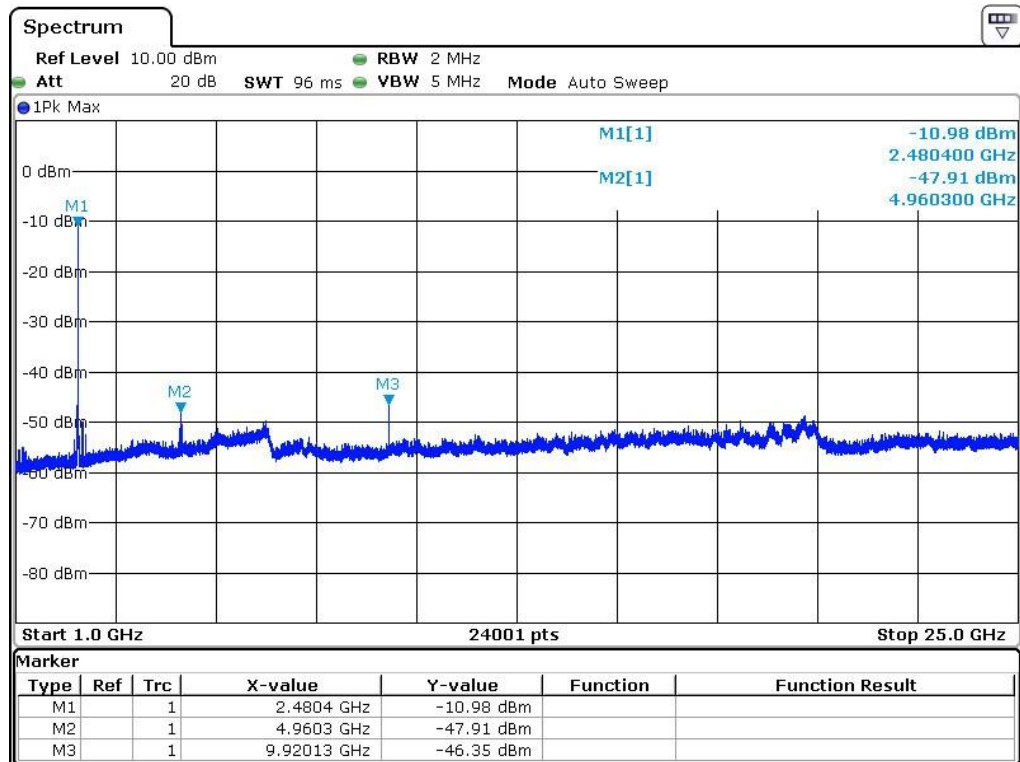
Date: 21.NOV.2022 17:21:24

TX Frequency : 2442MHz _ Band Edge 2,483.5MHz


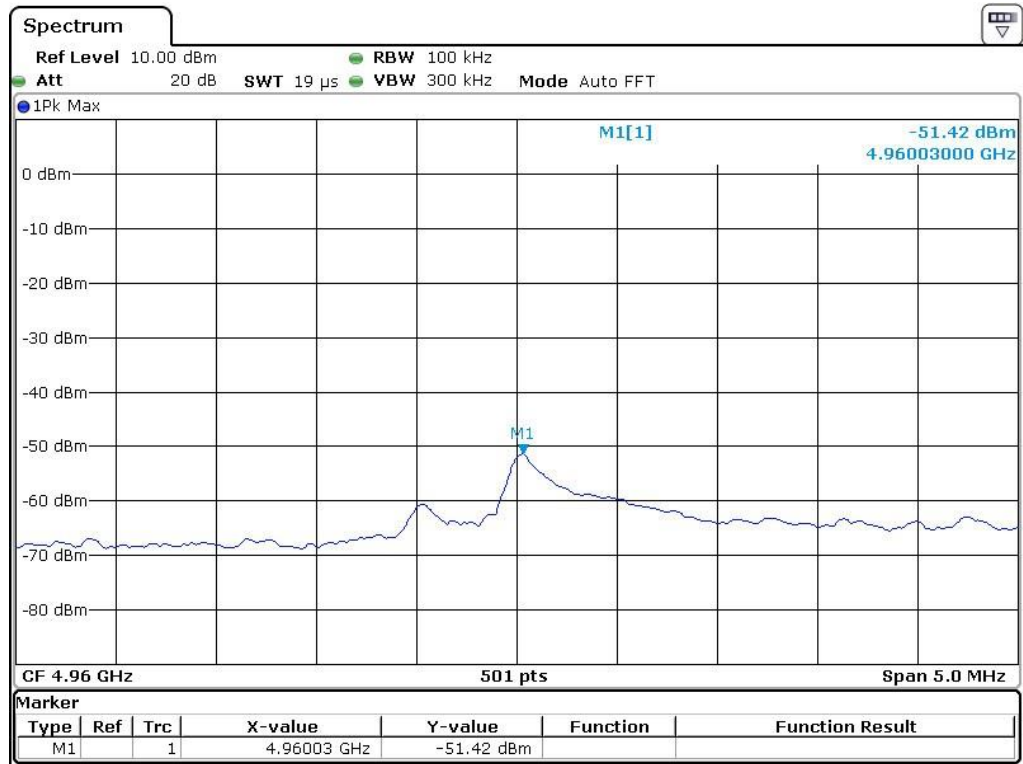
Date: 21.NOV.2022 17:23:44

TX Frequency 2480MHz _ 1M~1GHz Pre-scan


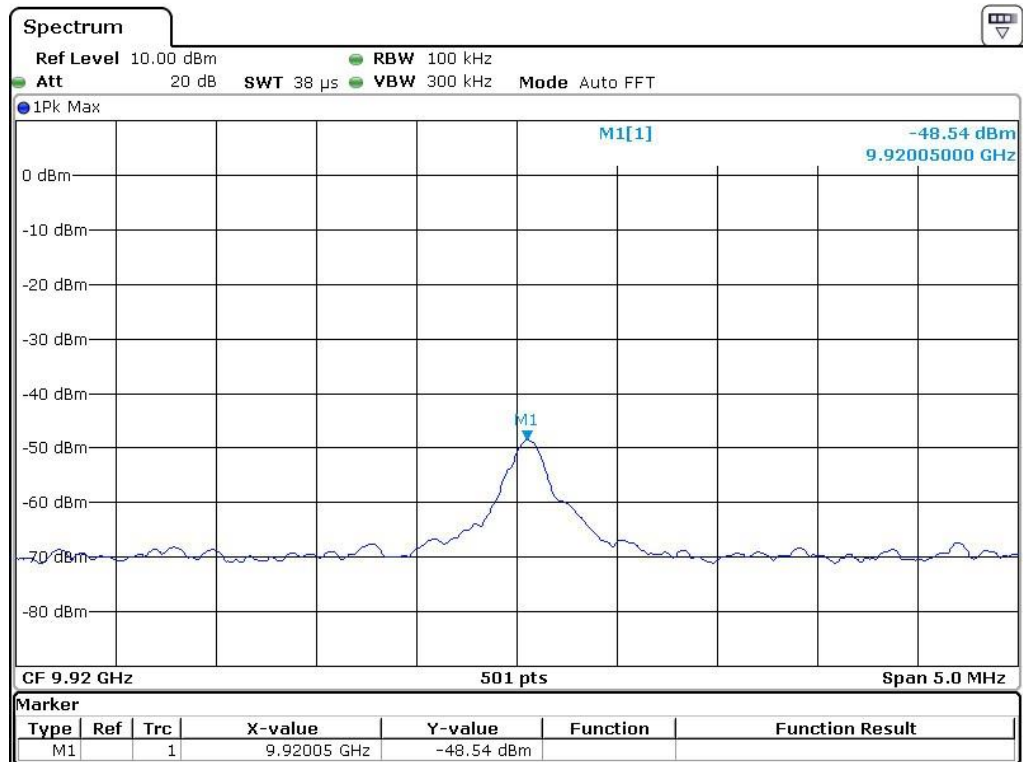
Date: 21. NOV. 2022 16:53:27

TX Frequency : 2480MHz _ 1G~25GHz Pre-scan


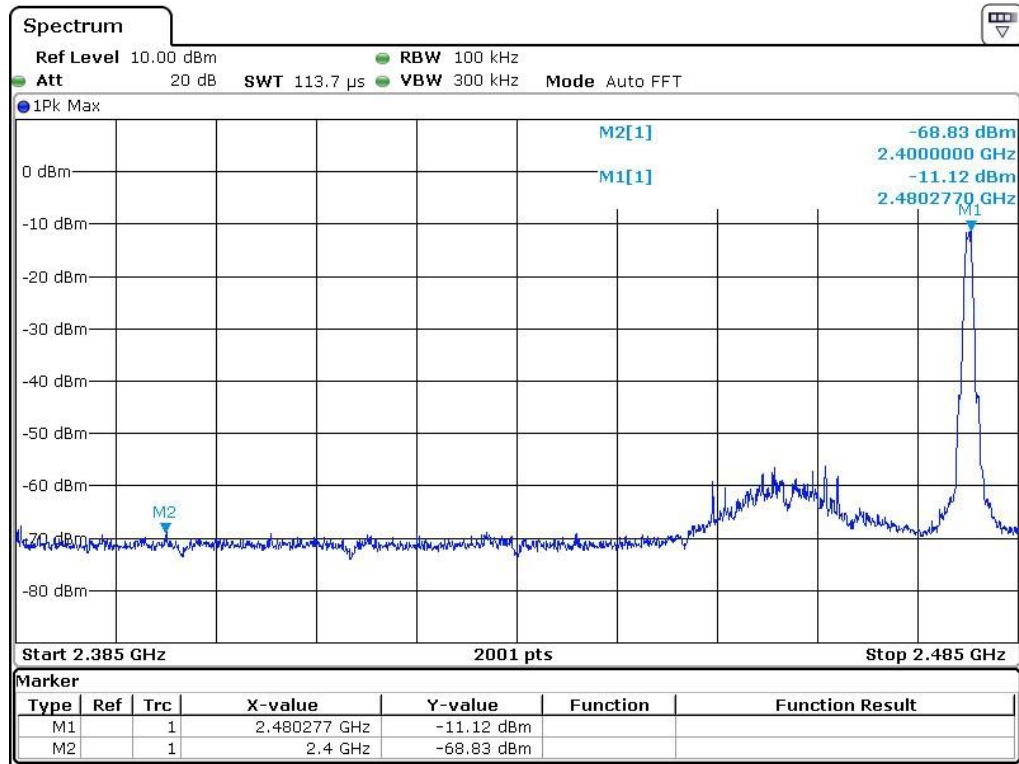
Date: 21. NOV. 2022 16:44:58

TX Frequency 2480MHz _ 2nd Harmonic


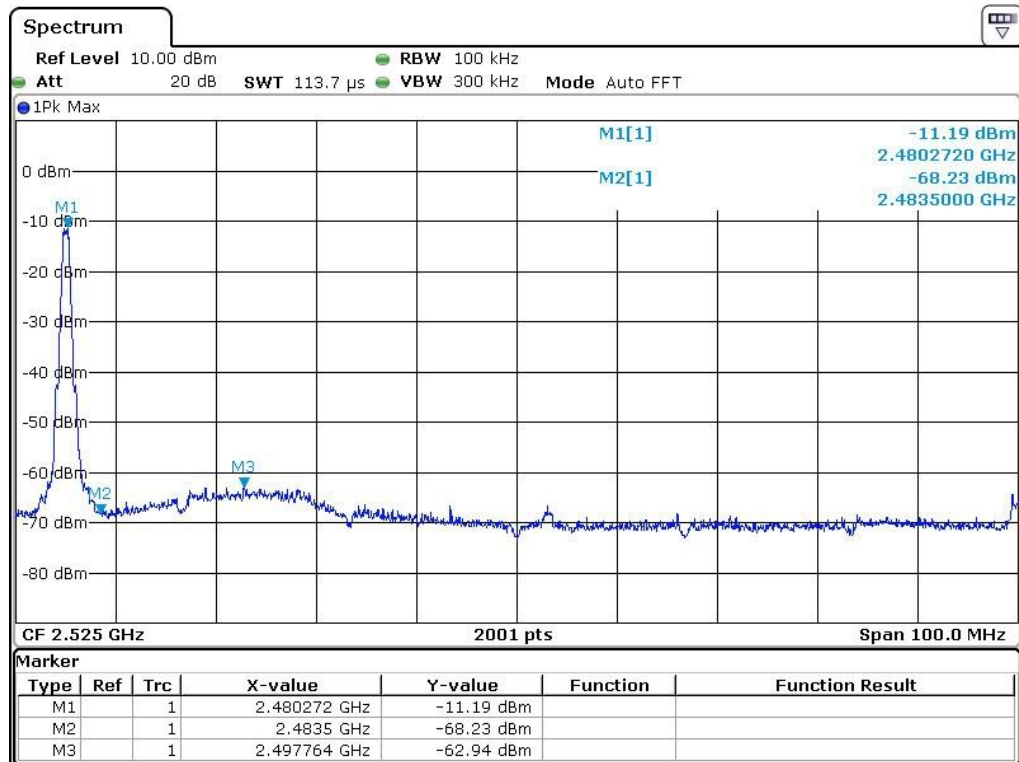
Date: 21.NOV.2022 17:11:40

TX Frequency : 2480MHz _ 4th Harmonic


Date: 21.NOV.2022 17:13:01

TX Frequency 2480MHz _ Band Edge 2,400MHz


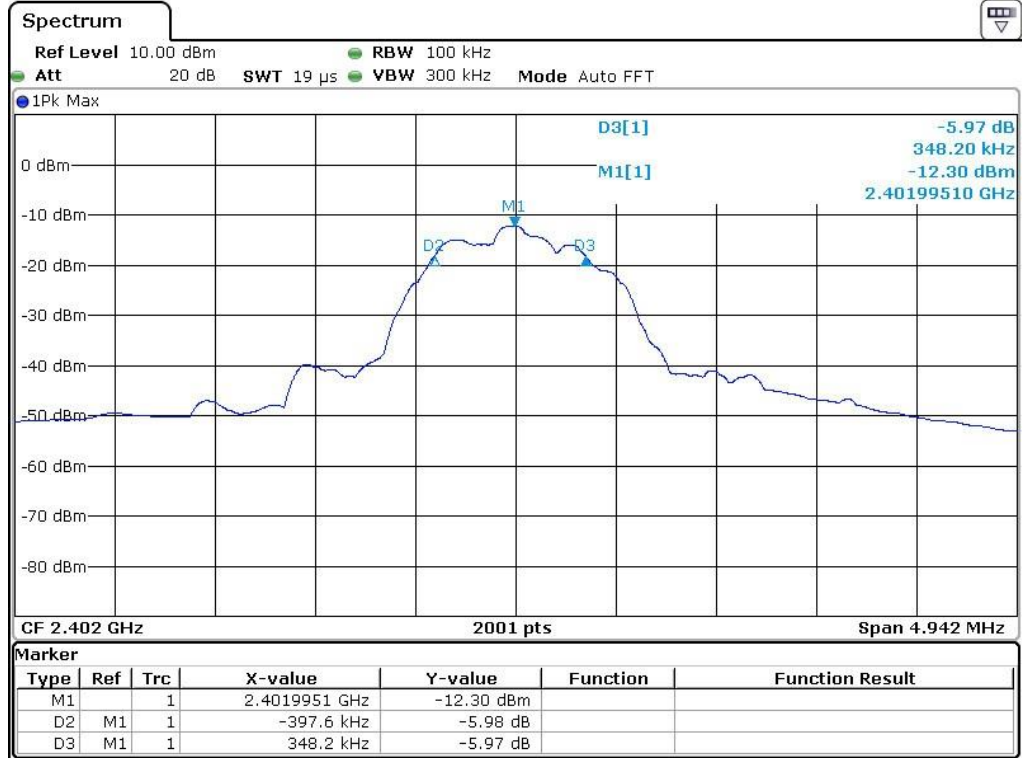
Date: 21.NOV.2022 17:26:19

TX Frequency : 2480MHz _ Band Edge 2,483.5MHz


Date: 21.NOV.2022 17:28:14

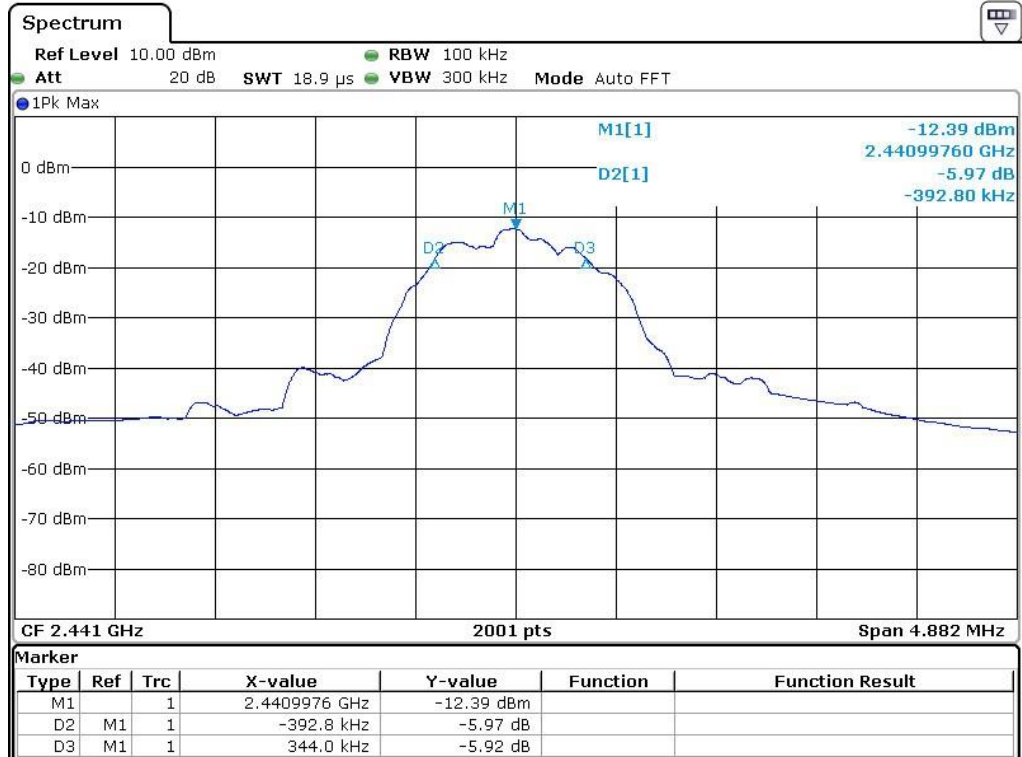
2.4GHz GFSK Transmitter 6 dB Bandwidth Measurement

TX Frequency 2402MHz

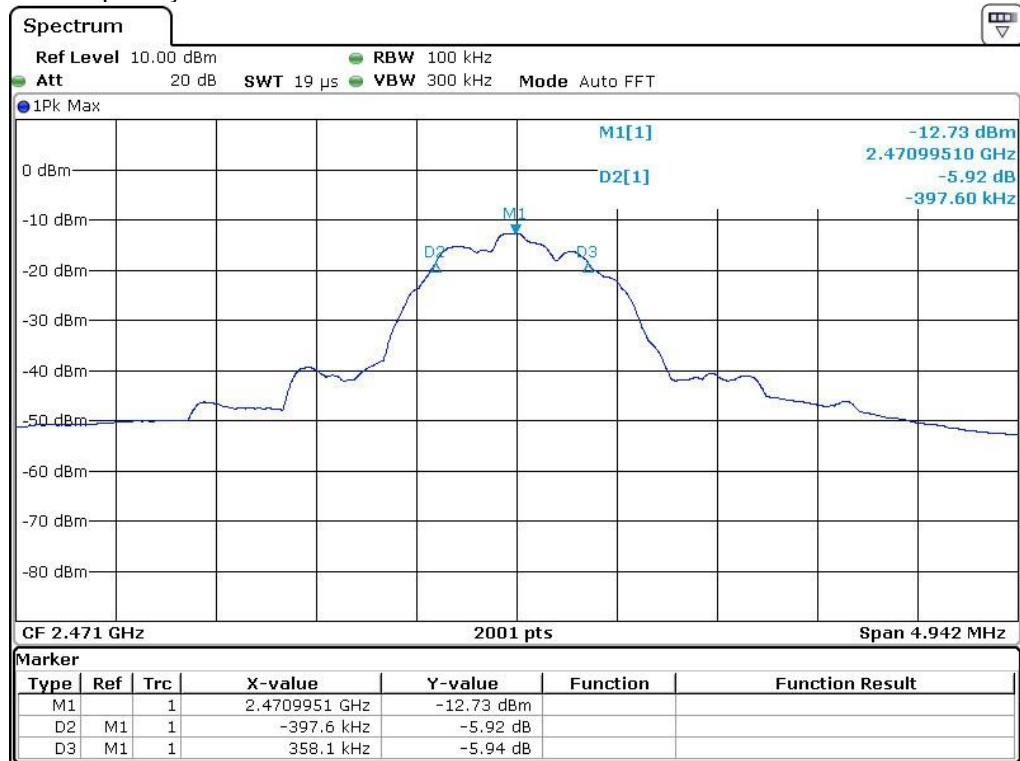


Date: 22.NOV.2022 10:50:29

TX Frequency : 2441MHz



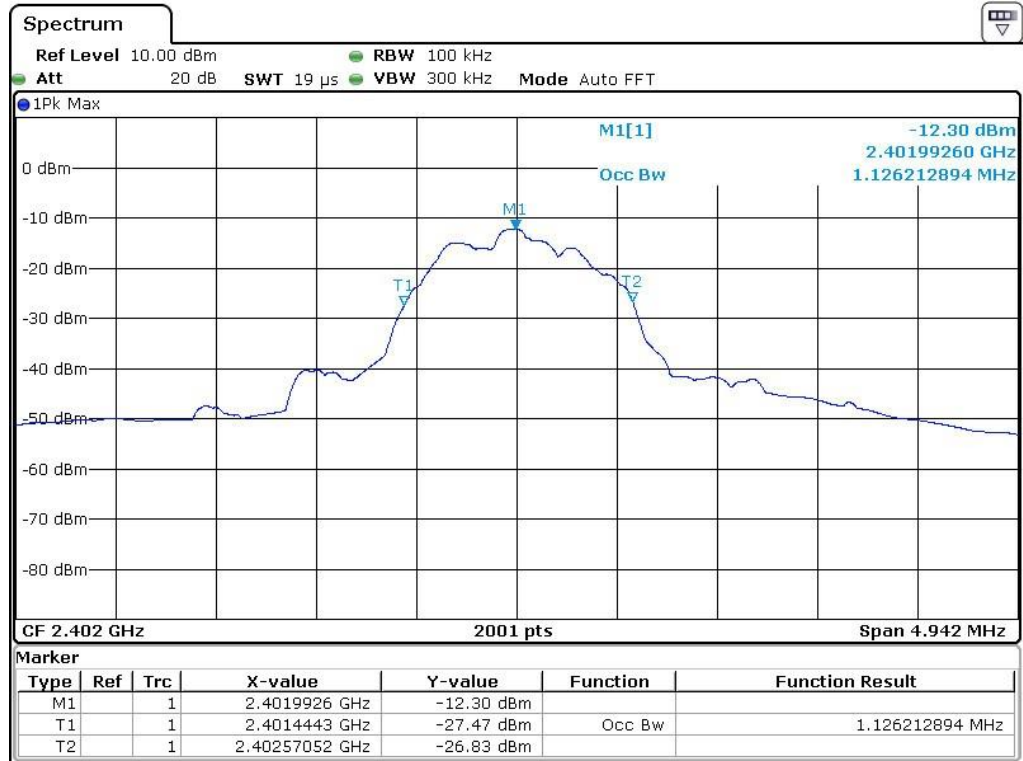
Date: 22.NOV.2022 10:52:04

TX Frequency 2471MHz


Date: 22.NOV.2022 10:47:45

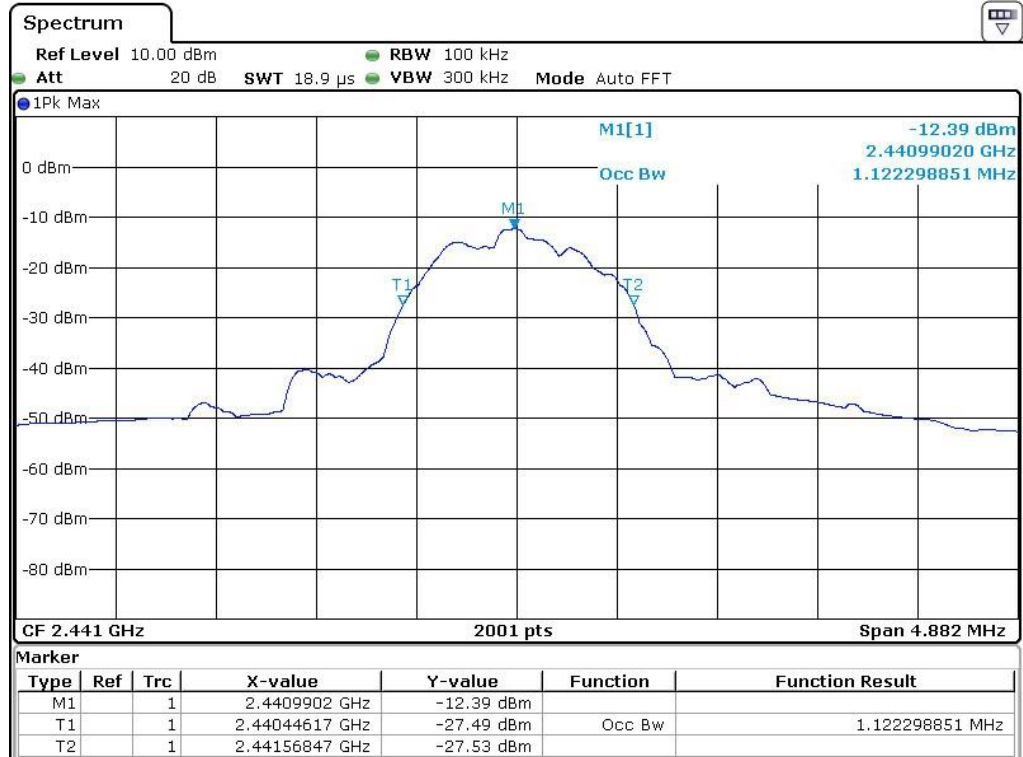
Occupied Bandwidth Measurement

TX Frequency 2402MHz

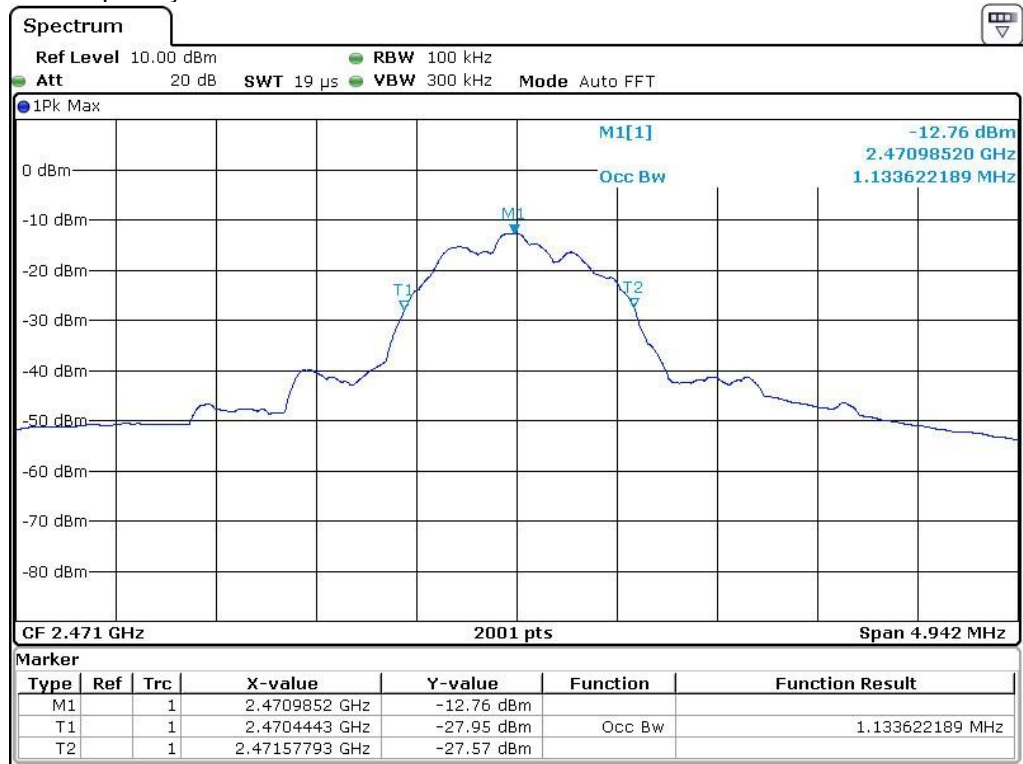


Date: 22.NOV.2022 10:49:14

TX Frequency : 2441MHz



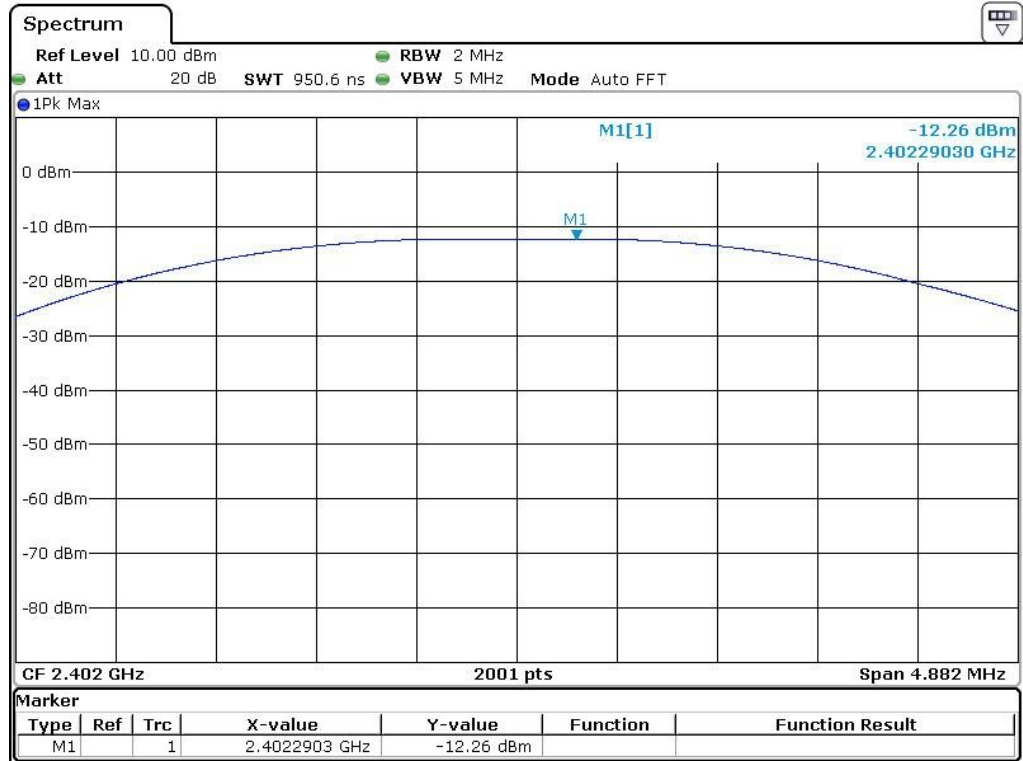
Date: 22.NOV.2022 10:52:38

TX Frequency 2471MHz


Date: 22.NOV.2022 10:48:30

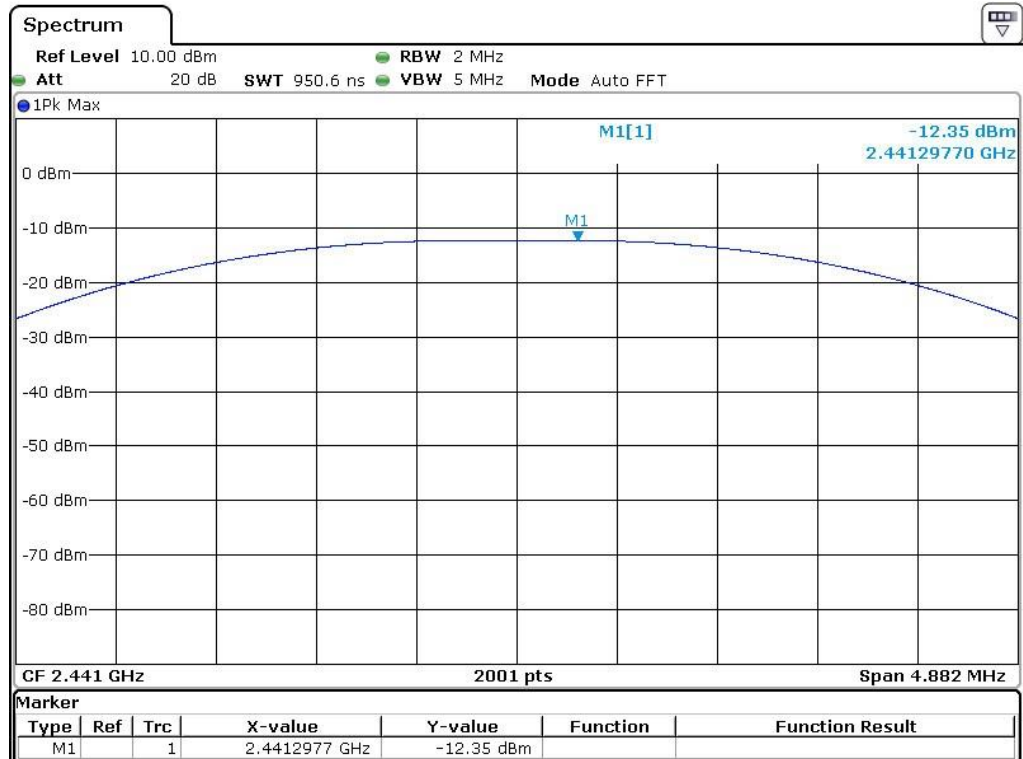
Maximum Peak Conducted Output Power

TX Frequency 2402MHz

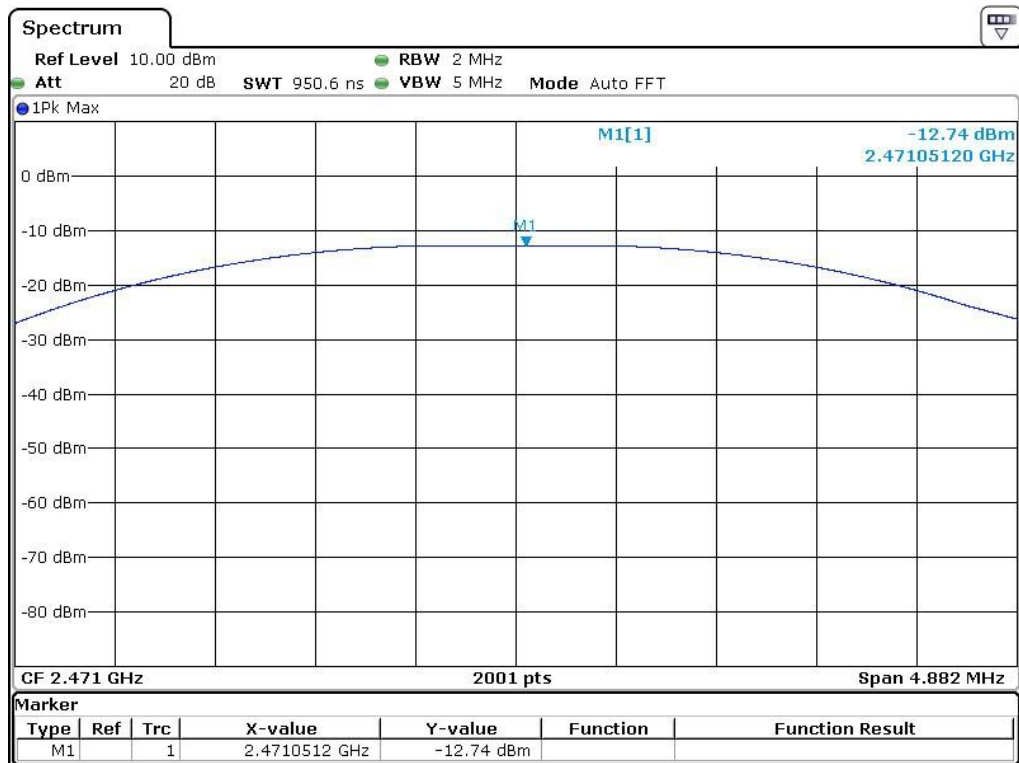


Date: 22.NOV.2022 10:54:04

TX Frequency : 2441MHz



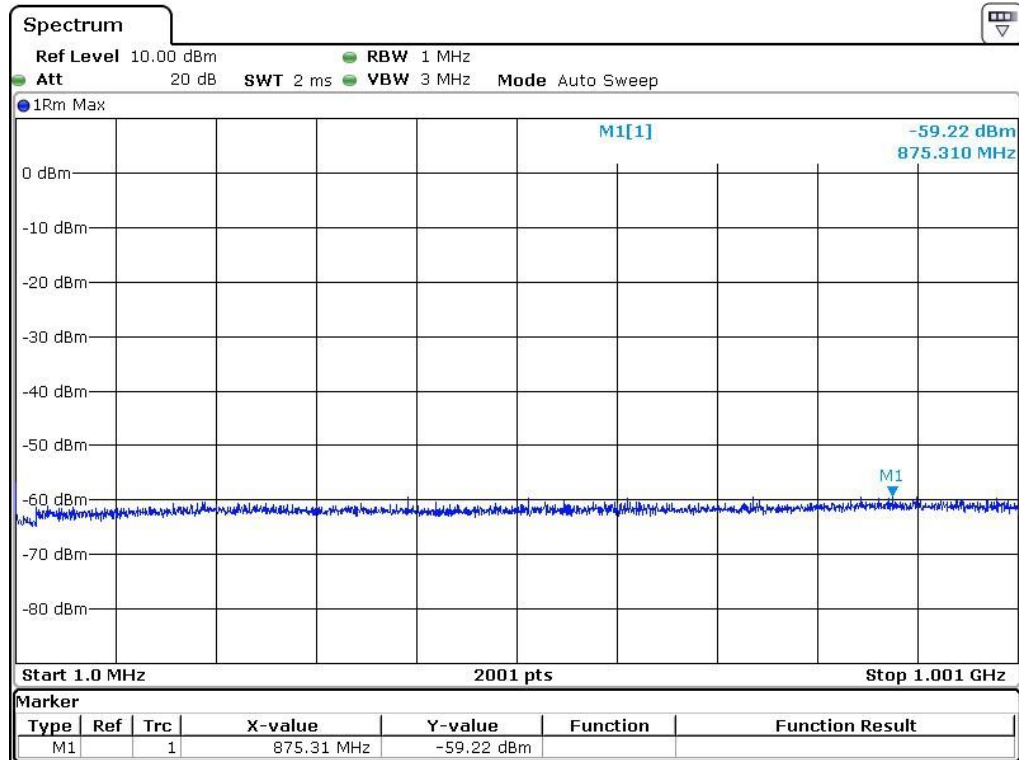
Date: 22.NOV.2022 10:53:16

TX Frequency 2471MHz


Date: 22.NOV.2022 10:53:39

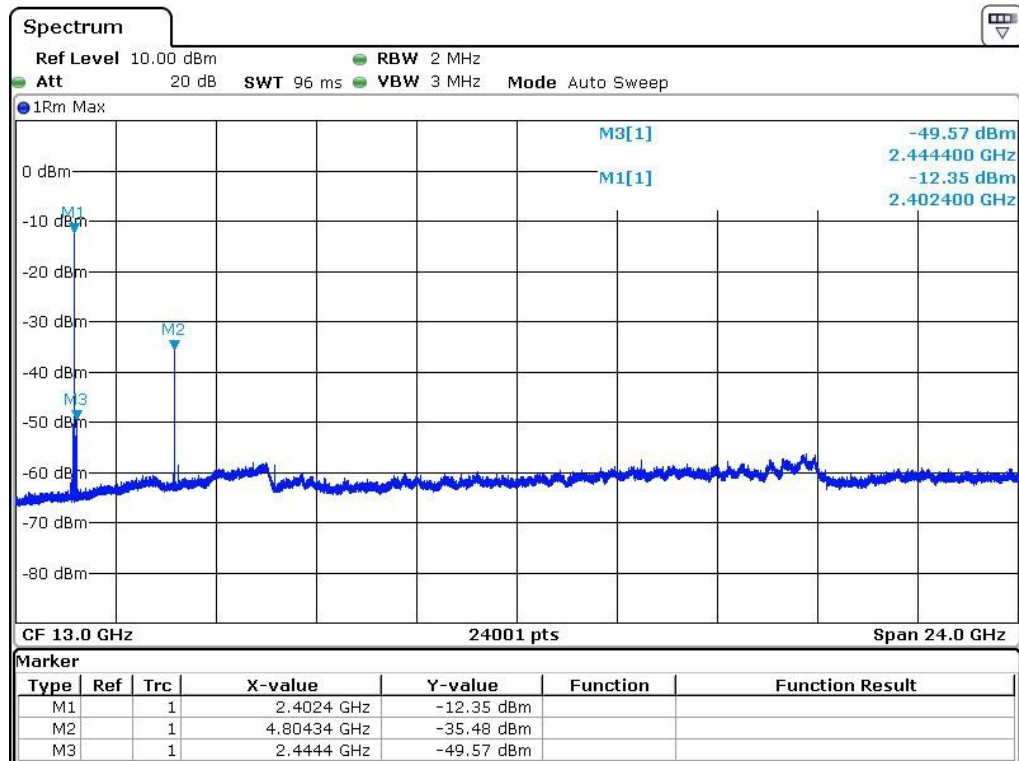
Spurious Conducted Emissions

TX Frequency 2402MHz _ 1M~1GHz Pre-scan

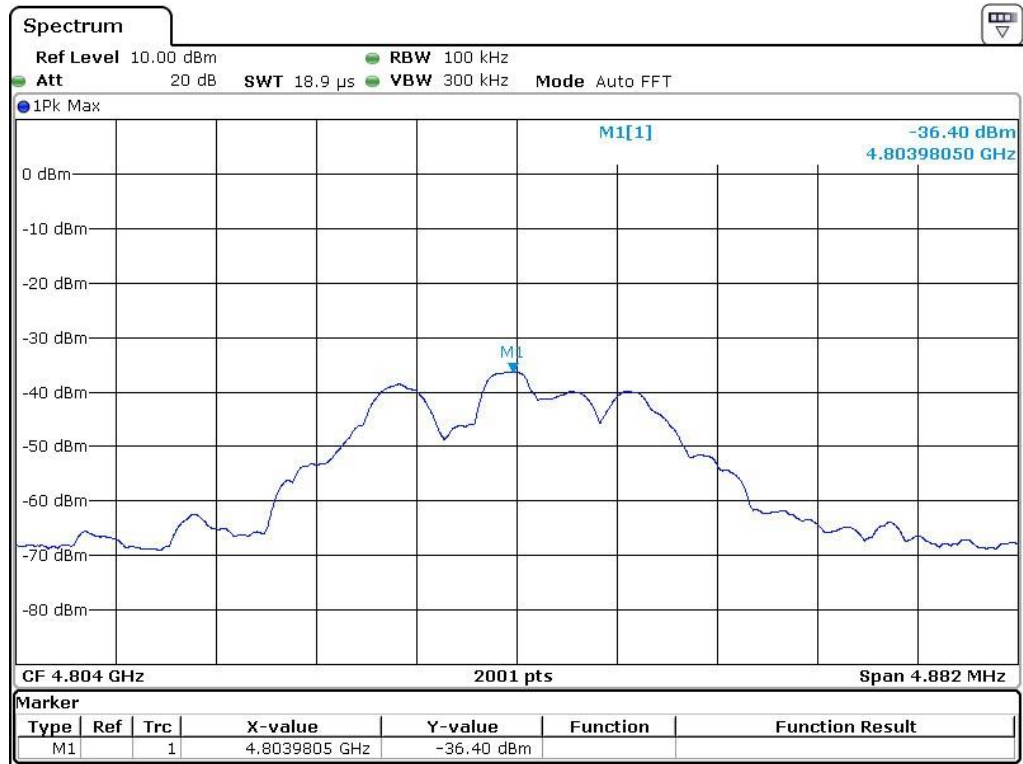


Date: 18.NOV.2022 15:34:24

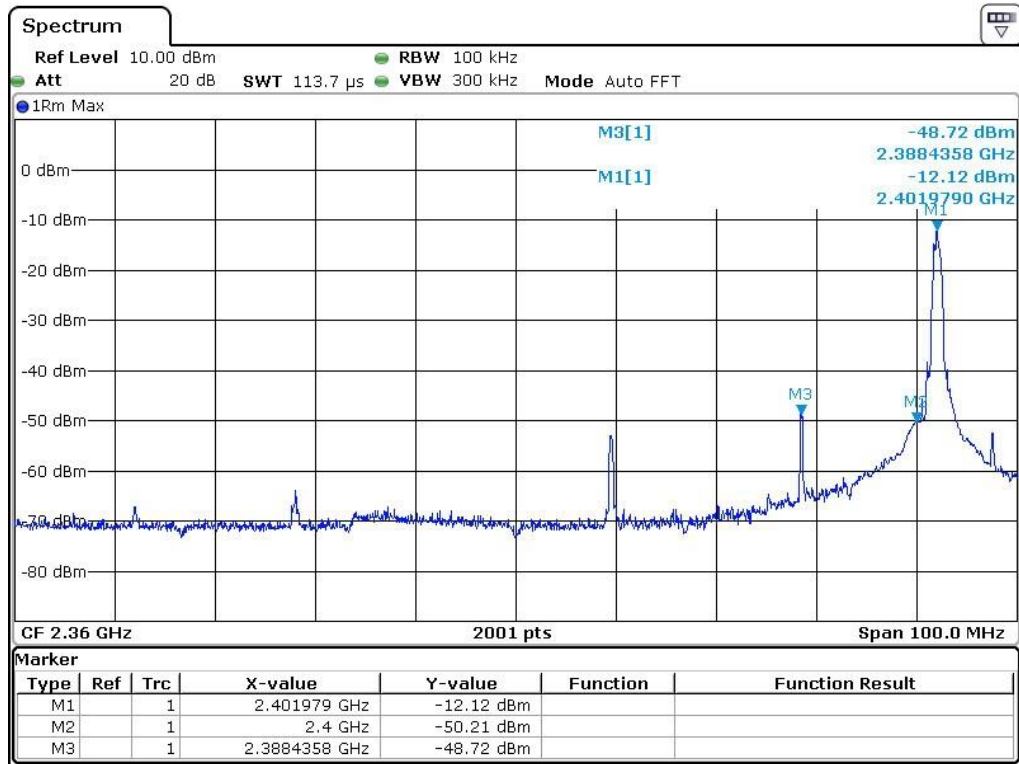
TX Frequency : 2402MHz _ 1G~25GHz Pre-scan



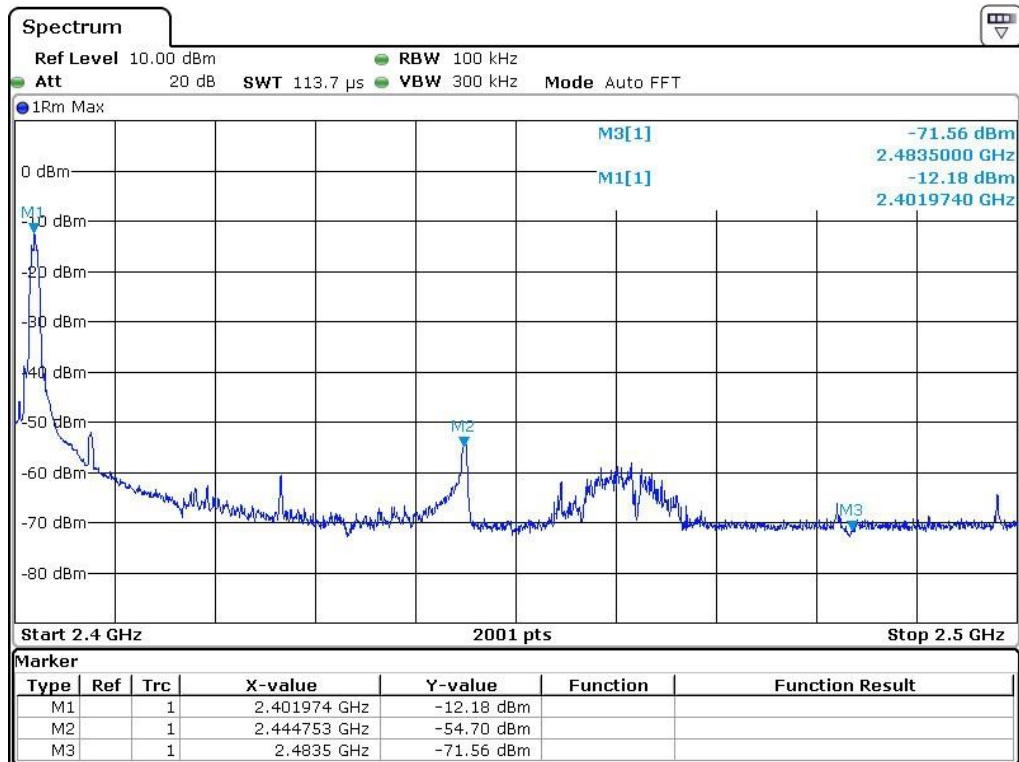
Date: 18.NOV.2022 14:15:32

TX Frequency 2402MHz _ 2nd Harmonic


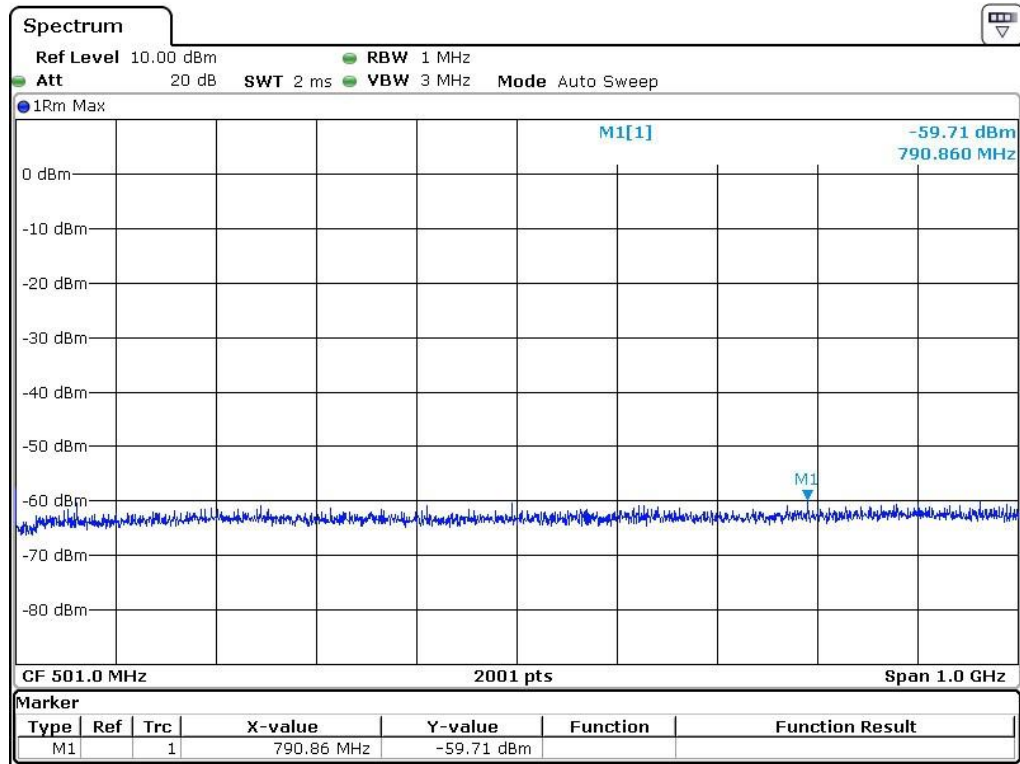
Date: 22.NOV.2022 10:55:29

TX Frequency 2402MHz _ Band Edge 2,400MHz


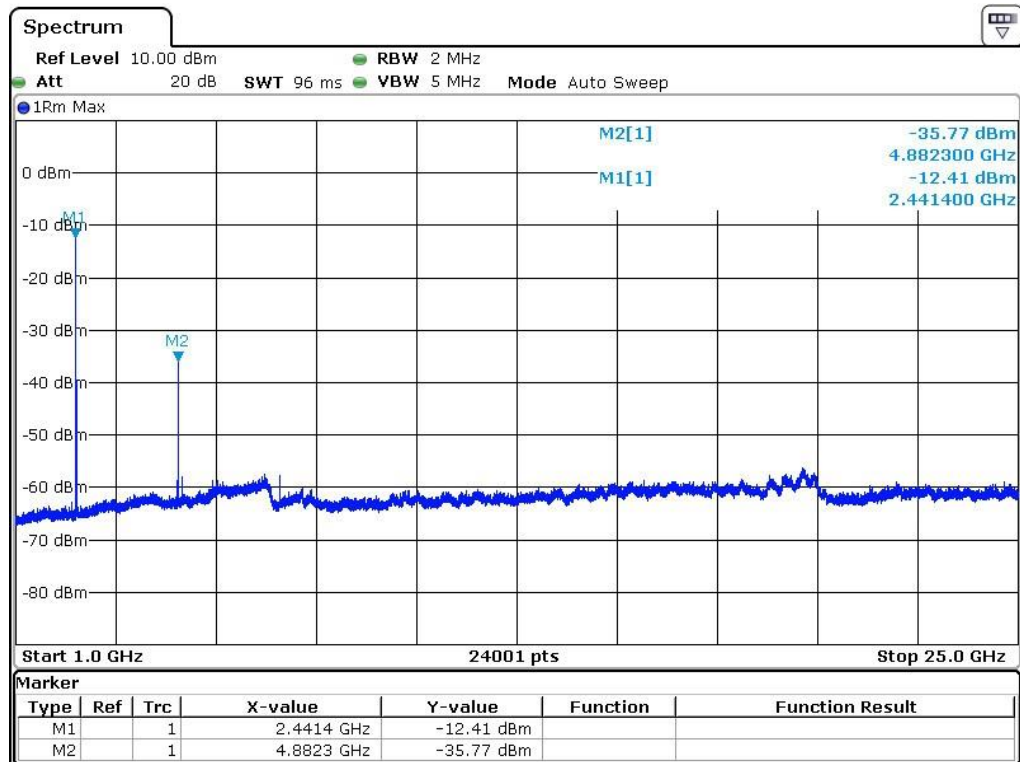
Date: 18.NOV.2022 14:58:35

TX Frequency : 2402MHz _ Band Edge 2,483.5MHz


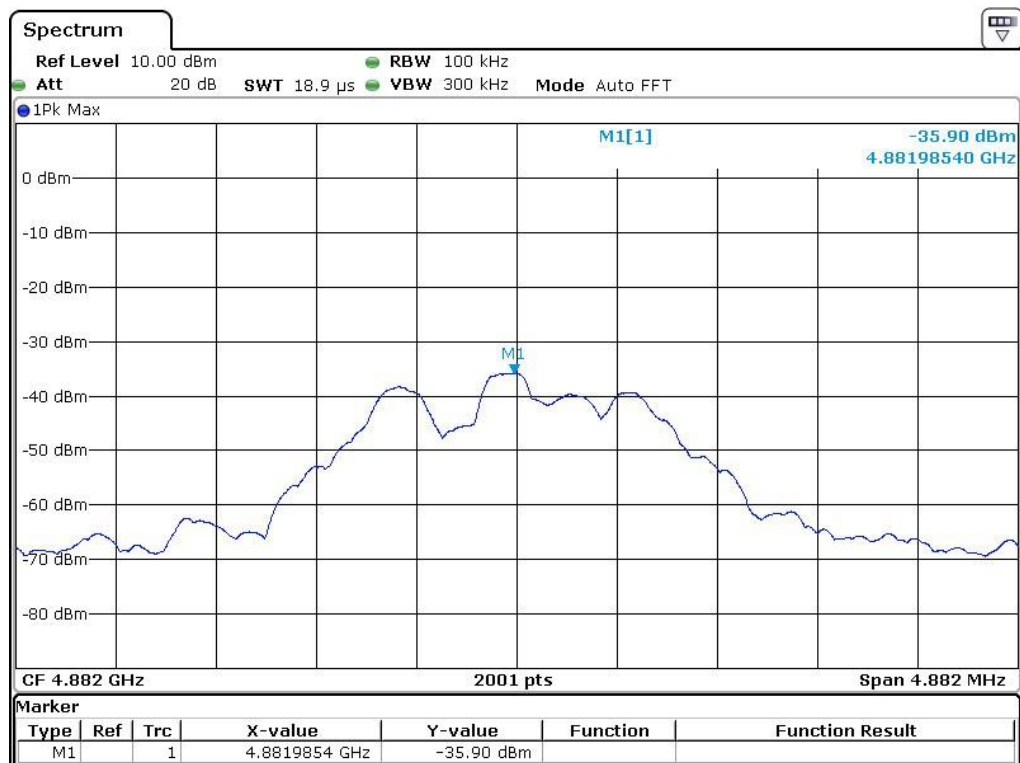
Date: 18.NOV.2022 15:03:48

TX Frequency 2441MHz _ 1M~1GHz Pre-scan


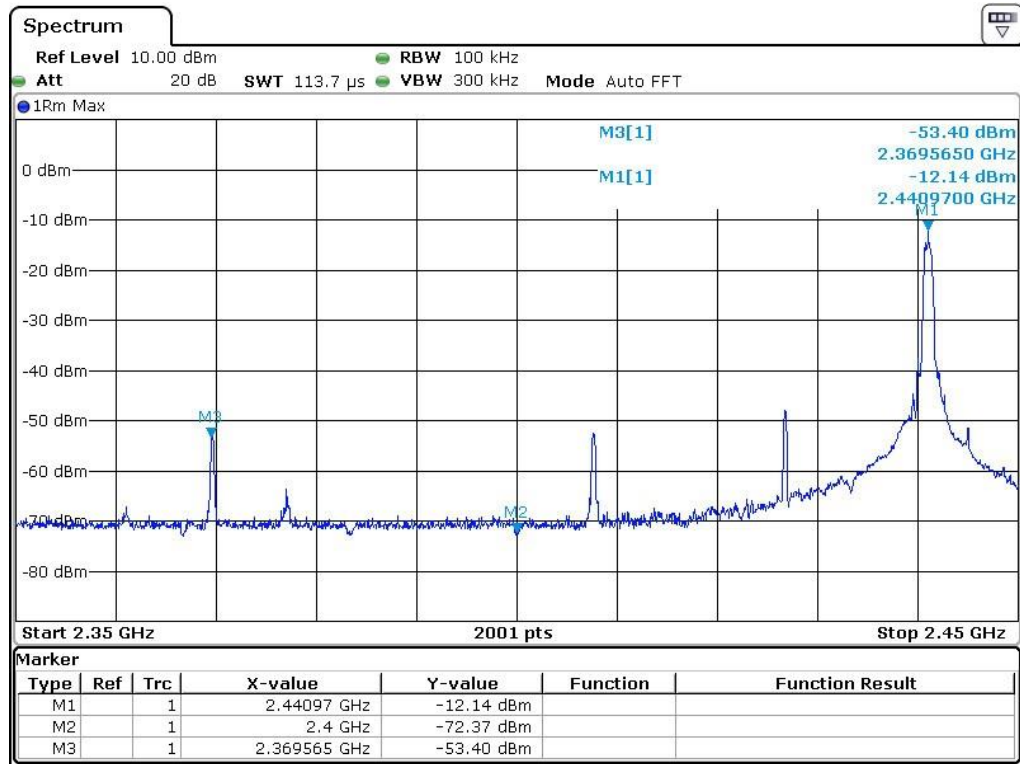
Date: 18.NOV.2022 15:36:00

TX Frequency : 2441MHz _ 1G~25GHz Pre-scan


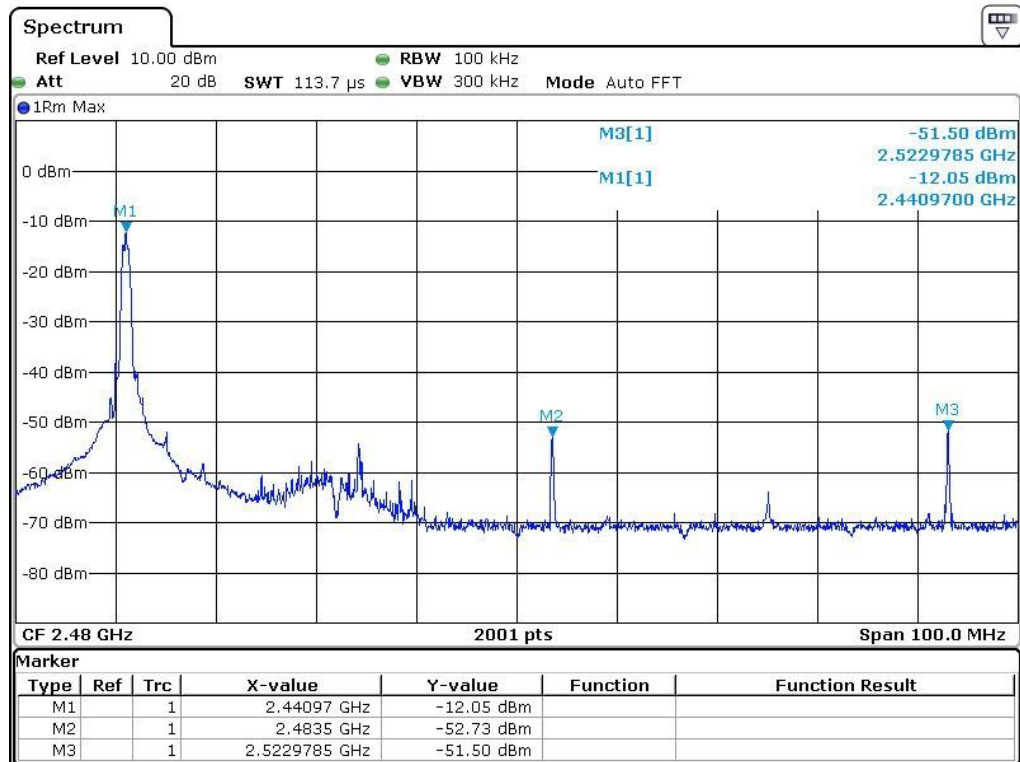
Date: 18.NOV.2022 14:44:29

TX Frequency 2441MHz _ 2nd Harmonic


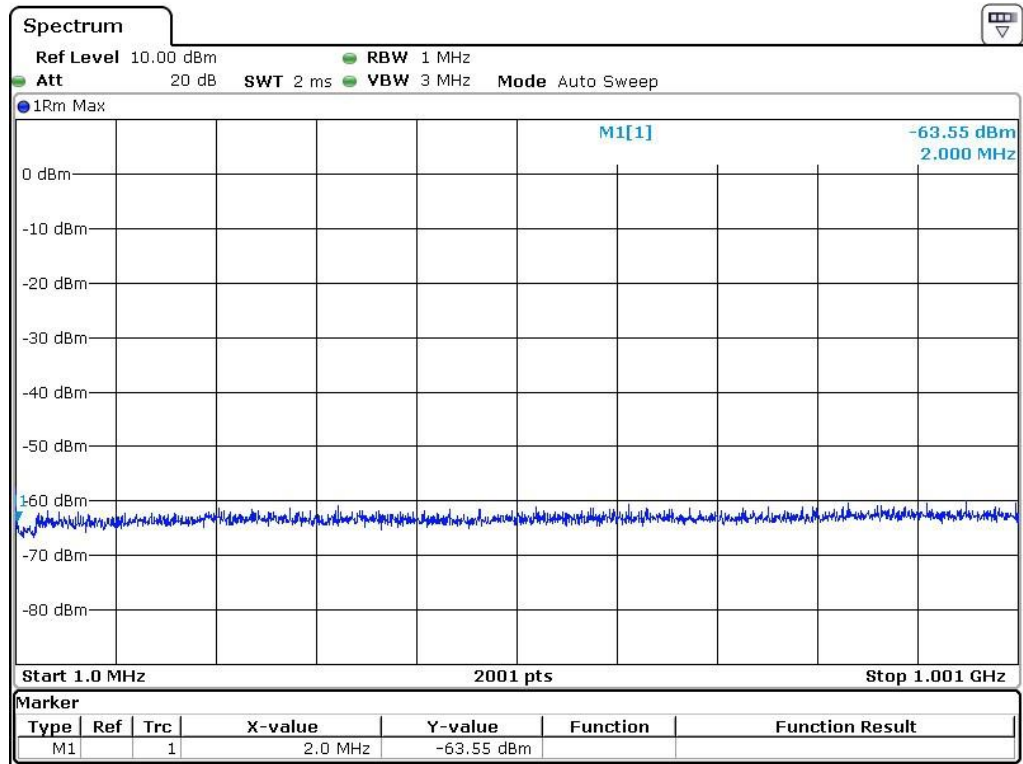
Date: 22.NOV.2022 10:56:48

TX Frequency 2441MHz _ Band Edge 2,400MHz


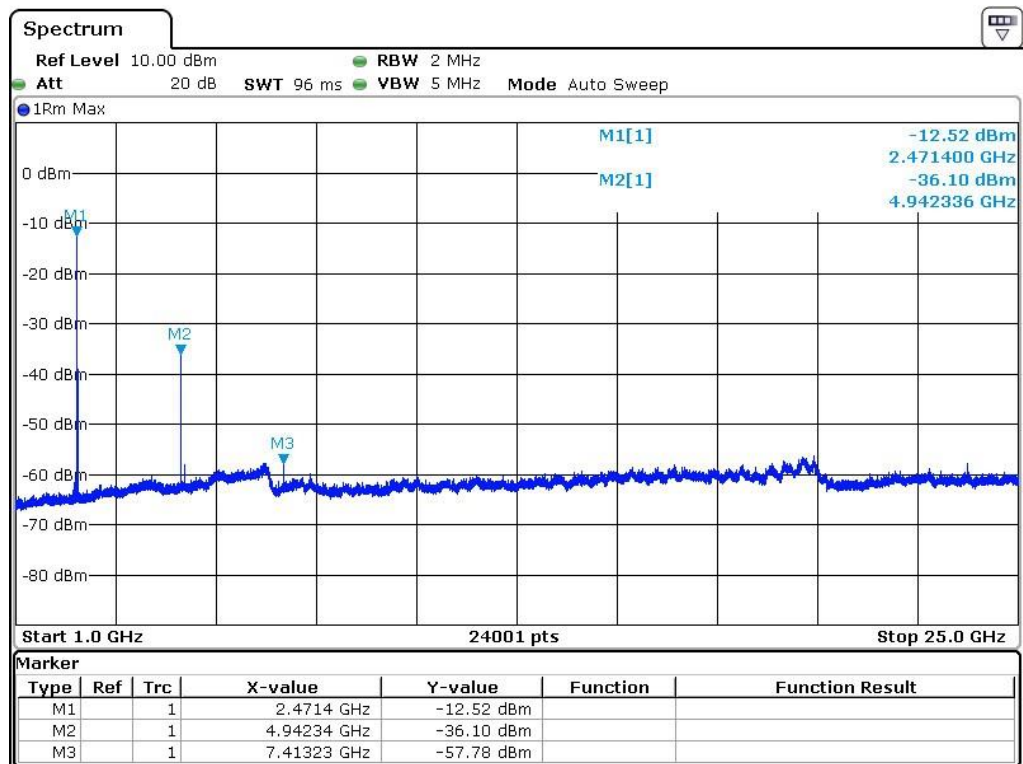
Date: 18.NOV.2022 15:12:48

TX Frequency : 2441MHz _ Band Edge 2,483.5MHz


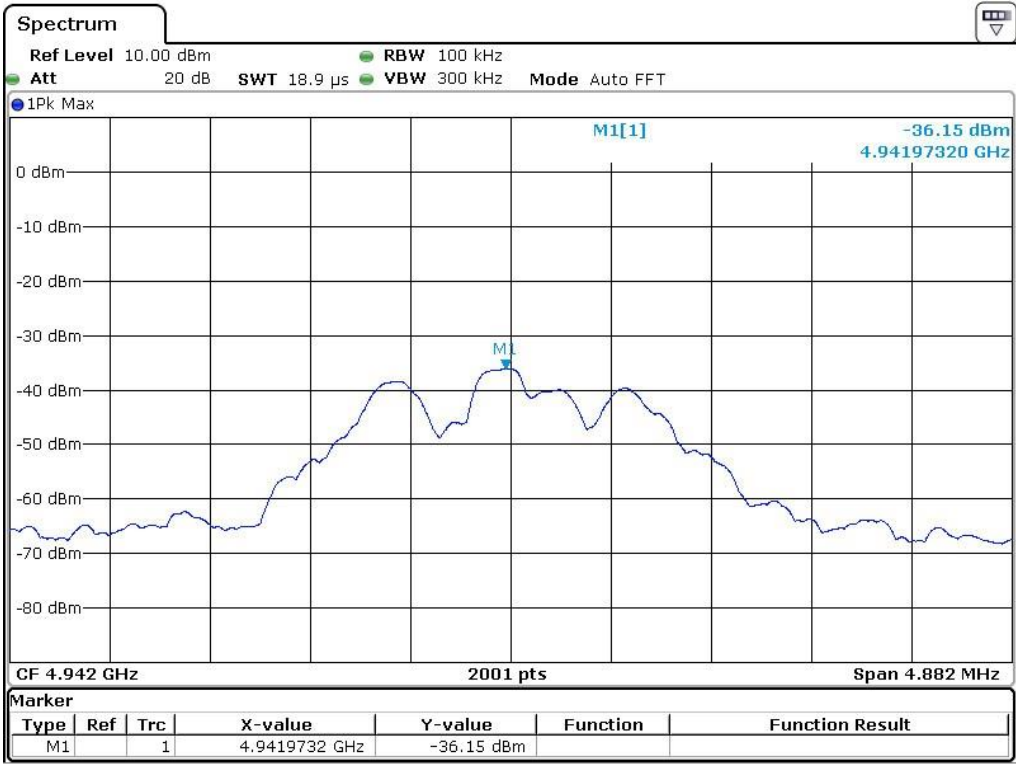
Date: 18.NOV.2022 15:07:47

TX Frequency 2471MHz _ 1M~1GHz Pre-scan


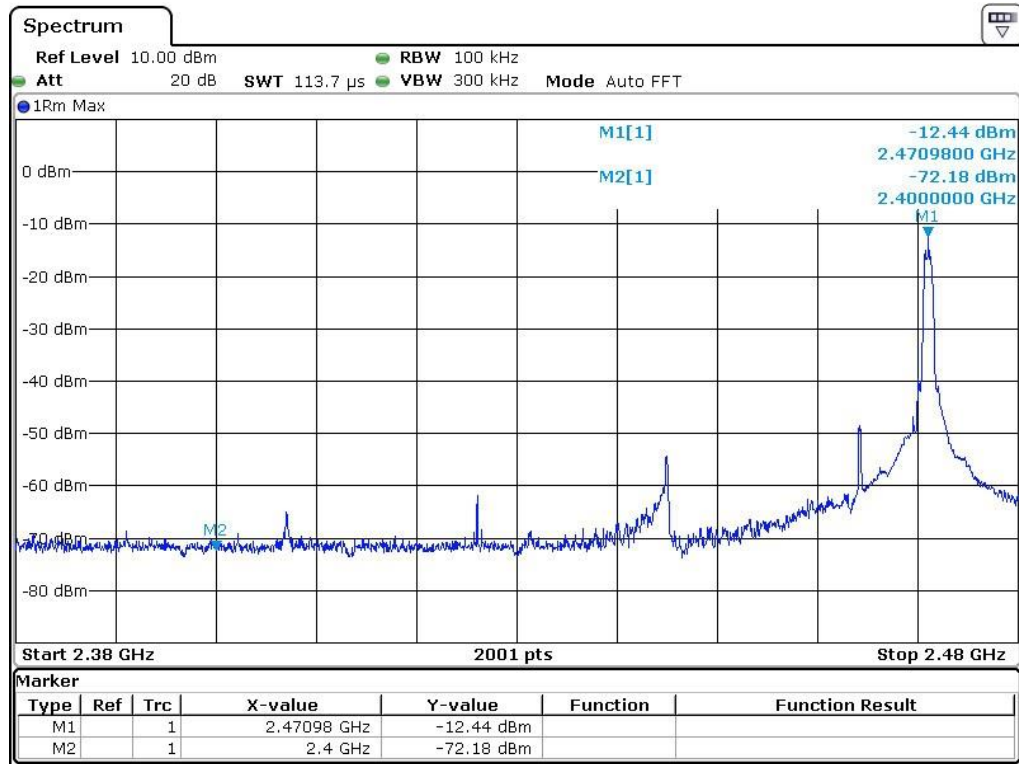
Date: 18.NOV.2022 15:39:04

TX Frequency : 2471MHz _ 1G~25GHz Pre-scan


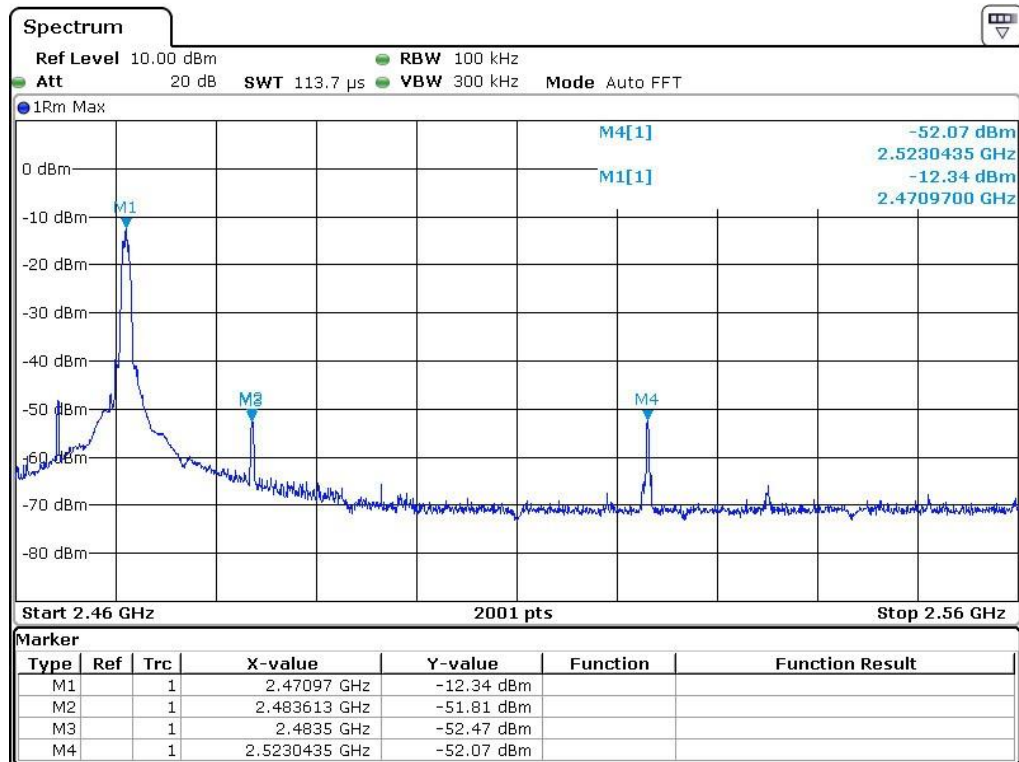
Date: 18.NOV.2022 15:45:21

TX Frequency 2471MHz _ 2nd Harmonic


Date: 22.NOV.2022 10:57:41

TX Frequency 2471MHz _ Band Edge 2,400MHz


Date: 18.NOV.2022 15:42:52

TX Frequency : 2471MHz _ Band Edge 2,483.5MHz


Date: 18.NOV.2022 15:41:34