

Produkte
Products

Prüfbericht-Nr.: <i>Test Report No.:</i>	CN22BRXU 001	Auftrags-Nr.: <i>Order No.:</i>	158258555	Seite 1 von 15 <i>Page 1 of 15</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	31.08.2022	
Auftraggeber: <i>Client:</i>	BRIO AB Skeppshbron 1A, Malmo, Skane 201 23, Sweden			
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Remote Control Toy Transmitter (2.4GHz)			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	03881			
Auftrags-Inhalt: <i>Order content:</i>	FCC and ISCED Certification			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C, ANSI C63.10-2013 RSS-210 Issue 10, RSS-Gen Issue 5			
Wareneingangsdatum: <i>Date of receipt:</i>	31.08.2022			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003325498-001			
Prüfzeitraum: <i>Testing period:</i>	01.09.2022-14.09.2022			
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:		
				
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>
30.09.2022	Felicia Chan / Senior Engineer		30.09.2022	Sharon Li / Unit Senior Manager
Sonstiges / Other: FCC ID: 2AITT0388-1 IC ID: 21632-03881 "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: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* 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>				

Table of Content

Page

Cover Page	1
Table of Content	2
Product information	4
Manufacturers declarations	4
Product function and intended use	4
Submitted documents	4
Independent Operation Modes	4
Related Submittal(s) Grants	4
Remark	4
Test Set-up and Operation Mode	5
Principle of Configuration Selection	5
Test Operation and Test Software	5
Special Accessories and Auxiliary Equipment	5
Test Methodology	6
Radiated Emission	6
Field Strength Calculation	6
Test Setup Diagram	7
Test Facility	8
Test Laboratory Information	8
List of Test and Measurement Instruments	9
Measurement Uncertainty	10
Results FCC Part 15 – Subpart C / RSS-210 Issue 10	11
FCC 15.203 – Antenna Requirement 1	Pass 11
FCC 15.204 – Antenna Requirement 2	Pass 11
RSS-Gen 6.3 – External Control	Pass 11
RSS-Gen 8.3 – Antenna Requirement	Pass 11
FCC 15.207/ RSS-Gen 8.8 – Conducted Emission on AC Mains	N/A 11
Subclause 15.215 (c) – 20 dB Bandwidth	Pass 12
RSS-Gen 6.6 – Occupied Bandwidth	Pass 12
Subclause 15.249(a)/RSS-210 B.10(a) – Field Strength of Fundamental and Harmonics	Pass 13
Subclause 15.249(d), 15.205/RSS-210 B.10(b) – Out Of Band Radiated Emission	Pass 15
Appendix 1 – Test protocols	5 pages

Appendix 2 – Test setup	3 pages
Appendix 3 – EUT External Photos	2 pages
Appendix 4 – EUT Internal Photos	3 pages
Appendix 5 – RF exposure information.....	2 pages

Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2415 - 2472MHz
Type of modulation	GFSK
Number of channels	3
Antenna gain	2 dBi
Type of antenna	Fixed Integral wire antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	4.5 VDC

Product function and intended use

The equipment under test (EUT) is a radio control toy transmitter operating at 2.4GHz. It is powered by battery only.

FCC ID: 2AITT0388-1 / IC ID: 21632-03881

Models	Product description
03881	Short Range Device - Remote Control Toy Transmitter (2.4GHz)

Submitted documents

Nil

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

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.

- Test mode samples with maximum RF output power and duty cycle and capable to transmit continuously at the lowest, middle and highest frequency channels is provided by the applicant for the testing.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- None

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:

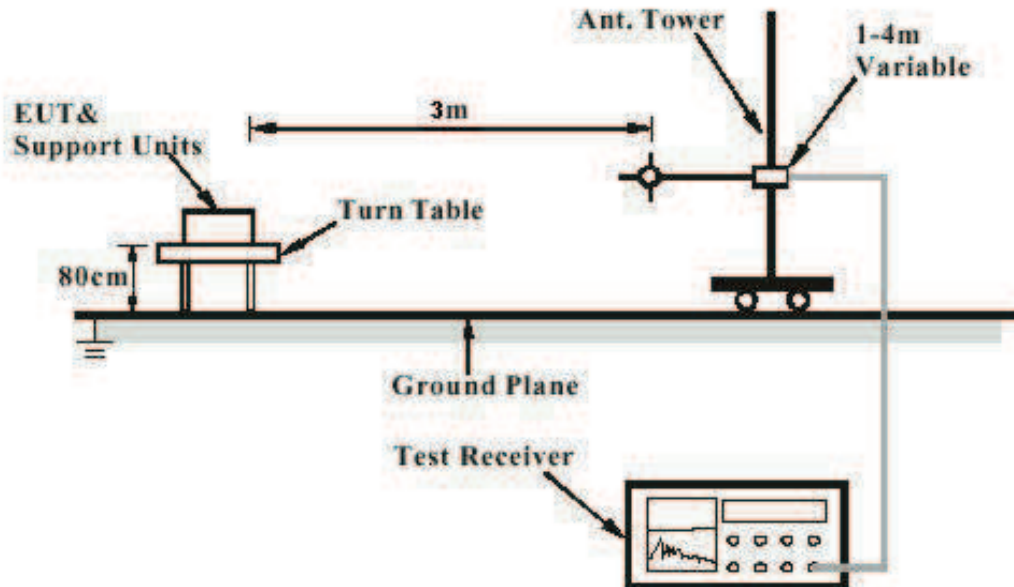
$$FS = R + AF + CF + FA - PA$$

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.

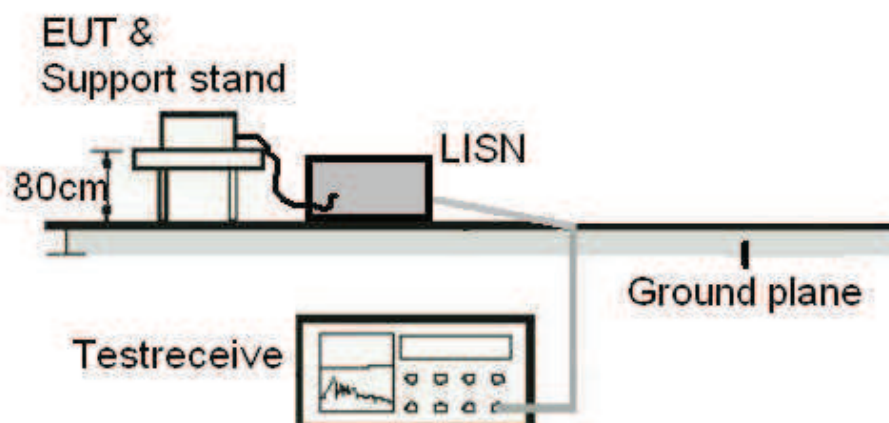
Test Setup Diagram

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)



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

Test Site Registration Number : 26152

List of Test and Measurement Instruments

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	4-Mar-22	4-Mar-23
Multi-functional Anechoic Chamber	Albatross	Nil	4-Jan-22	4-Jan-23
Test Receiver	R & S	ESU40	13-Jan-22	13-Jan-23
Active Loop Antenna	EMCO	6502	3-Nov-20	3-Nov-22
Bi-conical Antenna	R & S	HK116	15-Sep-20	15-Sep-22
Log Periodic Antenna	R & S	HL223	15-Sep-20	15-Sep-22
Standard Gain Horn	ETS-Lindgren	3160-07	24-Nov-20	24-Nov-22
Standard Gain Horn	ETS-Lindgren	3160-08	24-Nov-20	24-Nov-22
Standard Gain Horn	ETS-Lindgren	3160-10	30-Oct-20	30-Oct-22
Double-Ridged Waveguide Horn	EMCO	3116	30-Oct-20	30-Oct-22
Double-Ridged Waveguide Horn	EMCO	3117	11-Nov-20	11-Nov-22
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	4-Mar-22	4-Mar-23
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	28-Jan-22	28-Jan-23
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30-Oct-21	30-Oct-23

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	9-Nov-21	9-Nov-22

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is $\pm 2.42\text{dB}$.

The estimated combined standard uncertainty for radiated emissions measurements is $\pm 4.81\text{dB}$ (9kHz to 30MHz) and $\pm 4.62\text{dB}$ (30MHz to 200MHz) and $\pm 5.67\text{dB}$ (200MHz to 1000MHz) and is $\pm 5.07\text{dB}$ (1GHz to 8.2GHz) and $\pm 4.58\text{dB}$ (8.2GHz to 12.4GHz) and $\pm 4.78\text{dB}$ (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-210 Issue 10

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: Fixed Integral wire antenna b) Manufacturer and model no: N/A c) Peak Gain: 2 dBi	
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		Pass
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:	Pass	

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: Fixed Integral wire antenna b) Manufacturer: N/A c) Model no: N/A d) Gain with reference to an isotropic radiator: 2 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.		

Subclause 15.215 (c) – 20 dB Bandwidth				Pass
Test Specification : ANSI C63.10 – 2013 Test date : 05.09.2022 Mode of operation : Tx mode Port of testing : Antenna port Supply voltage : 4.5 VDC Temperature : 23°C Humidity : 50%				
Requirement: The intentional radiators must be designed to ensure that the 20dB bandwidth of the emission, is contained within the frequency band designated in the rule section under which the equipment is operated.				
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)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
2415	2411.093	> 2400	2416.708	< 2483.5
2450	2445.160	> 2400	2452.931	< 2483.5
2472	2467.116	> 2400	2475.517	< 2483.5

RSS-Gen 6.6 – Occupied Bandwidth				Pass
FCC/ IC Requirement : N/A				
Test Specification : RSS-Gen Test date : 05.09.2022 Mode of operation : Tx mode Port of testing : Antenna port Supply voltage : 4.5 VDC Temperature : 25°C Humidity : 55%				
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)	
2415	2411.150	2416.244	5.09	
2450	2445.311	2452.474	7.16	
2472	2467.332	2475.082	7.74	

Subclause 15.249(a)/RSS-210 B.10(a) – Field Strength of Fundamental and Harmonics Pass		
Test Specification : ANSI C63.10 – 2013 Test date : 01.09.2022 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 4.5 VDC Temperature : 24°C Humidity : 52%		
Requirement: The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.		
Results: PASS.		
Fundamental Frequency 2415MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2414.993	96.1	114.0 / PK
2414.993	78.1	94.0 / AV
Fundamental Frequency 2415MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2414.993	99.6	114.0 / PK
2414.993	81.6	94.0 / AV
Harmonics 2415MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4829.983	61.2	74.0 / PK
4829.983	43.0	54.0 / AV
Harmonics 2415MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4829.983	64.8	74.0 / PK
4815.986	46.4	54.0 / AV
7244.977	67.0	74.0 / PK
7244.977	47.4	54.0 / AV
Fundamental Frequency 2450MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2449.993	95.4	114.0 / PK
2449.993	77.4	94.0 / AV
Fundamental Frequency 2450MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2449.993	100.8	114.0 / PK
2449.993	82.7	94.0 / AV

Harmonics 2450MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4899.983	59.5	74.0 / PK
4899.983	40.6	54.0 / AV
7349.977	57.3	74.0 / PK
7349.977	38.7	54.0 / AV
Harmonics 2450MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4880.000	57.9	74.0 / PK
4880.000	40.3	54.0 / AV
4899.983	55.8	74.0 / PK
4899.983	37.8	54.0 / AV
Fundamental Frequency 2472MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2471.958	86.2	114.0 / PK
2471.958	68.4	94.0 / AV
Fundamental Frequency 2472MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2471.951	93.1	114.0 / PK
2471.951	75.2	94.0 / AV
Harmonics 2472MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4943.903	53.8	74.0 / PK
4943.903	30.1	54.0 / AV
Harmonics 2472MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4943.918	54.0	74.0 / PK
4943.918	31.0	54.0 / AV

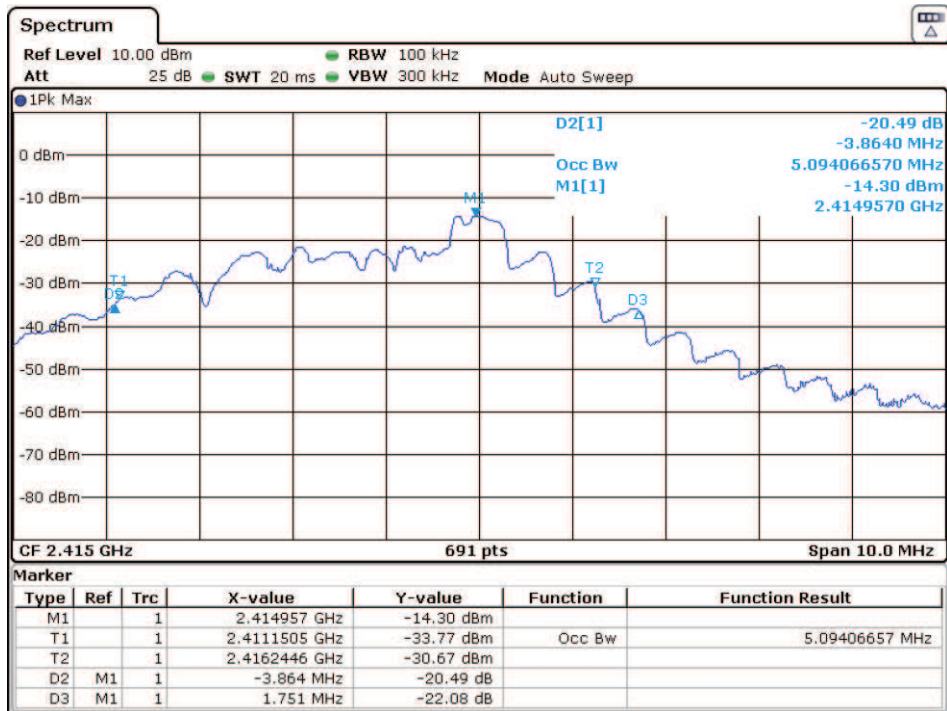
Subclause 15.249(d), 15.205/RSS-210 B.10(b) – Out Of Band Radiated Emission		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 01.09.2022 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 4.5 VDC Temperature : 24°C Humidity : 55%		
Requirement: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.		
Results: All three transmit frequency modes comply with the field strength limit of section 15.209. There is no spurious found below 30MHz.		
Tx frequency 2415MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	54.4	74.0 / PK
2400.000	24.9	54.0 / AV
Tx frequency 2415MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	60.0	74.0 / PK
2400.000	23.5	54.0 / AV
Tx frequency 2450MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Tx frequency 2450MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Tx frequency 2472MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	55.9	74.0 / PK
2483.500	22.6	54.0 / AV
Tx frequency 2472MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	65.1	74.0 / PK
2483.500	25.0	54.0 / AV

Appendix 1

Test Results

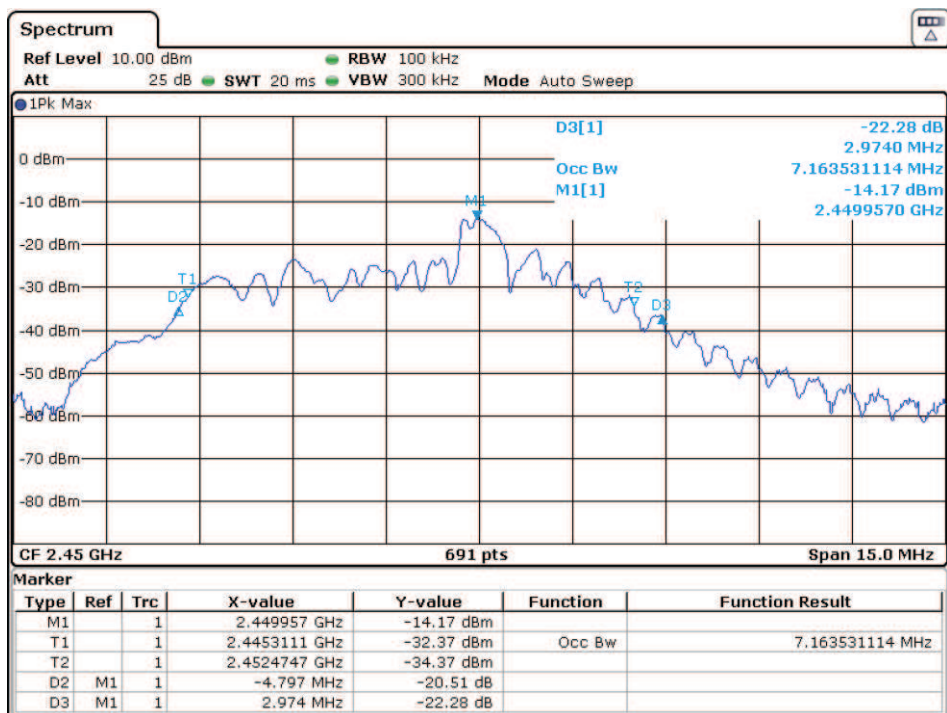
20dB Bandwidth

Tx frequency: 2415MHz



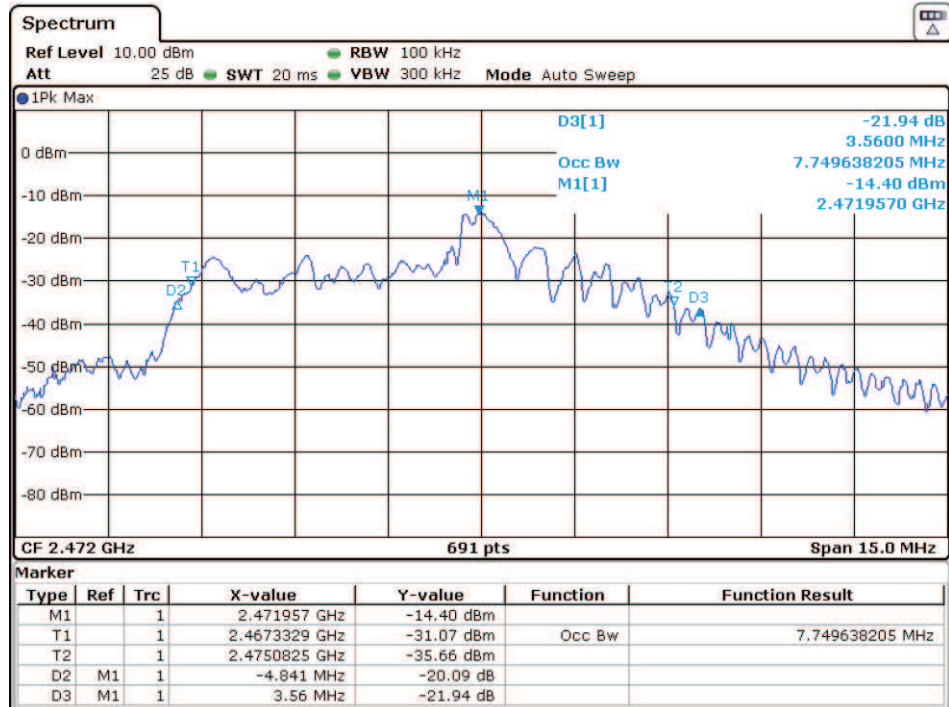
Date: 5.SEP.2022 15:34:08

Tx frequency: 2450MHz



Date: 5.SEP.2022 15:36:16

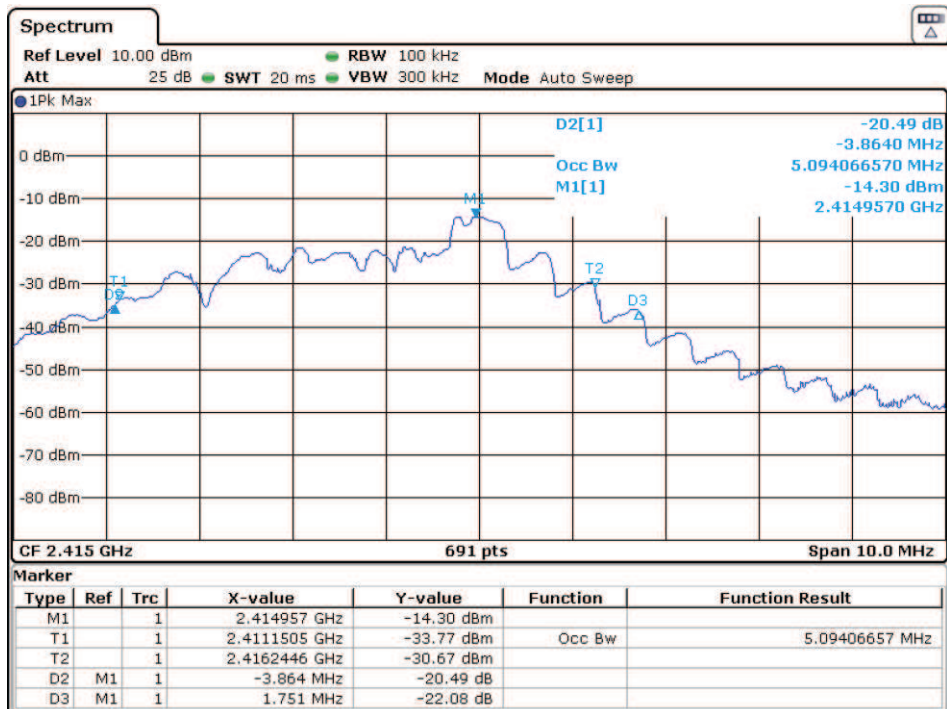
Tx frequency: 2472MHz



Date: 5.SEP.2022 15:37:26

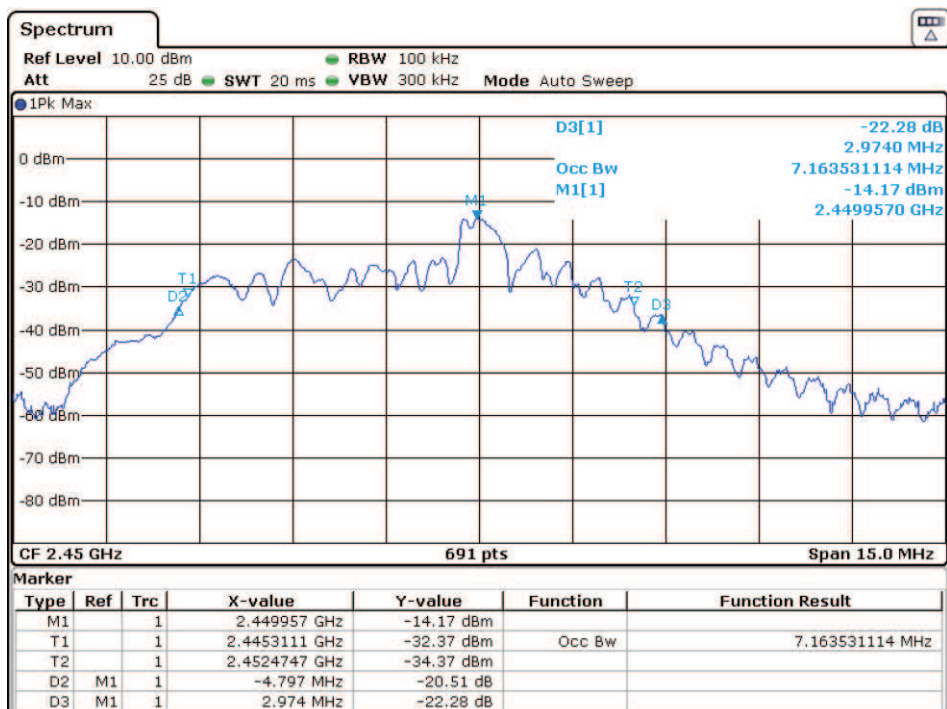
99% Bandwidth

Tx frequency: 2415MHz



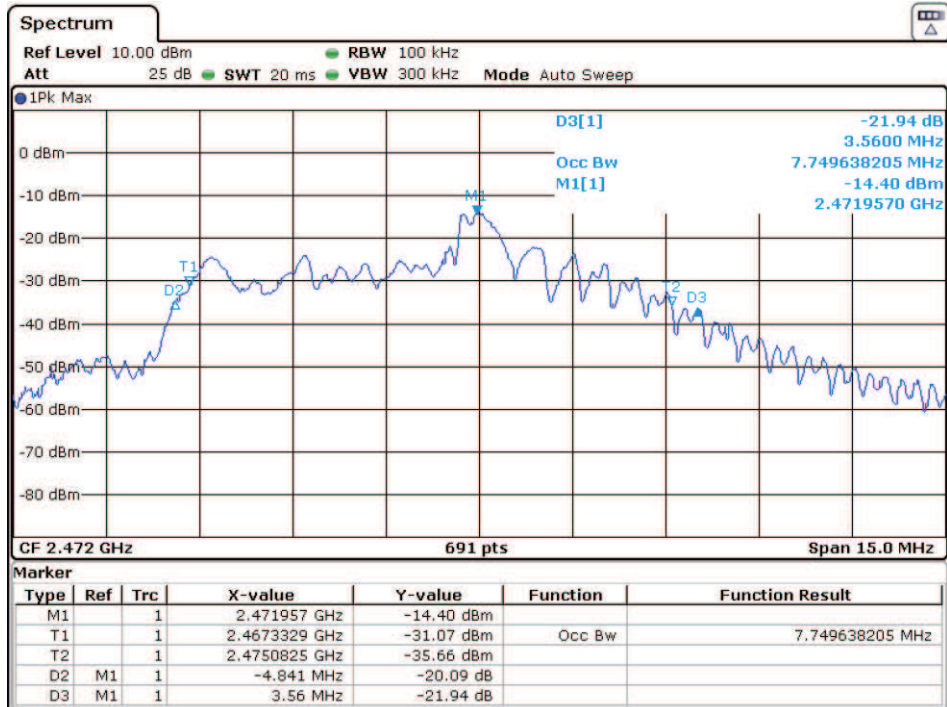
Date: 5.SEP.2022 15:34:08

Tx frequency: 2450MHz



Date: 5.SEP.2022 15:36:16

Tx frequency: 2472MHz



Date: 5.SEP.2022 15:37:26