

Prüfbericht-Nr.: Test report no.:	CN240JYO 001	Auftrags-Nr.: Order no.:	158296387	Seite 1 von 36 Page 1 of 36
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2024-08-27	
Auftraggeber: Client:	BRIO AB Skeppsbron 1 BOX 305 211 20 MALMÖ Sweden			
Prüfgegenstand: Test item:	Short Range Device - Remote Control Toy Transmitter (2.4GHz)			
Bezeichnung / Typ-Nr.: Identification / Type no.:	34605			
Auftrags-Inhalt: Order content:	FCC and ISED Certification			
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C, ANSI C63.10-2013, RSS-210 Issue 10 RSS-Gen Issue 5+Amendment 1+Amendment 2			
Wareneingangsdatum: Date of sample receipt:	2024-09-27			
Prüfmuster-Nr.: Test sample no.:	A003828054-001			
Prüfzeitraum: Testing period:	2024-09-27 - 2024-10-04			
Ort der Prüfung: Place of testing:	Hong Kong			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland Hong Kong Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by/ supervised by:	X 	genehmigt von: authorized by:	X 	
Datum: Date:	2024-10-10	Ausstellungsdatum: Issue date:	2024-10-10	
Stellung / Position:	Assistant Test Engineer	Stellung / Position:	Laboratory Manager	
Sonstiges / Other:	"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. FCC ID: 2AITT4605 IC ID: 21632-4605			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
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Anmerkungen Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

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Product Information

PMN: Builder RC Kit	HVIN: 4605
FVIN: N/A	HMN: N/A

Manufacturers declarations

	Transmitter
Operating frequency range	2410 - 2470MHz
Type of modulation	GFSK
Number of channels	61
Type of antenna	Fixed Integral wire antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	3.0 VDC
Rated transmitter power	Maximum 10 mW
Occupied bandwidth	Not available
Channel bandwidth	1MHz
Emission designator	F7DXN
Frequency stability	Not available

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: 2AITT4605 / IC ID: 21632-4605

Models	Product description
34605	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.

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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

Countermeasures to achieve EMC Compliance

- None

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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.

Conducted Emission Calculation

Receiver reading R_r (dBμV)
LISN insertion loss L_I (dB)
Cable loss C_I (dB)

$$\text{Result (dBμV)} = R_r + L_I + C_I$$

Sample: $R_r = 40.2$ dBμV

$L_I = 10.2$ dB

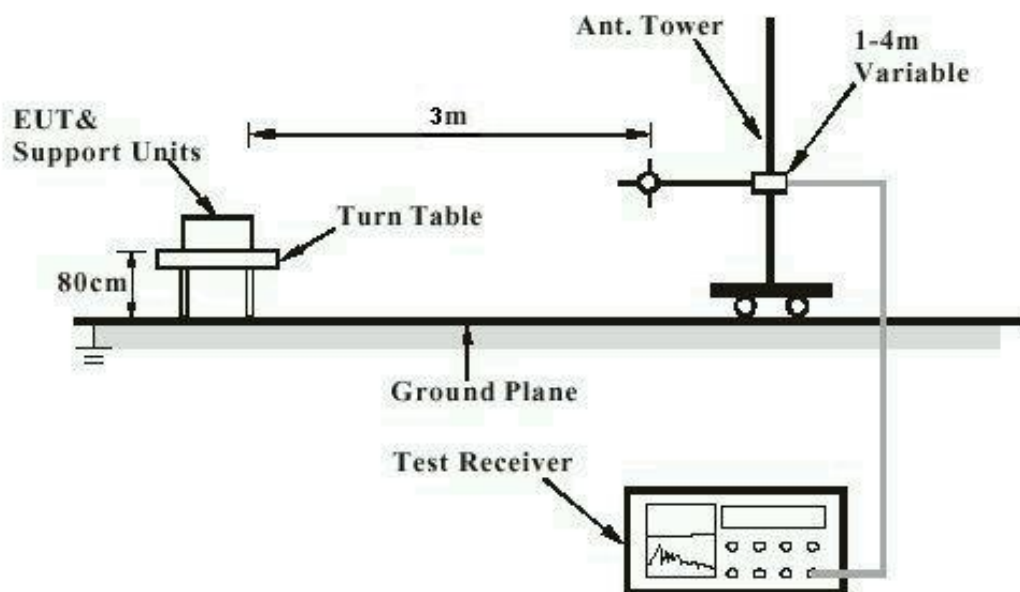
$C_I = 0.3$ dB

$$\text{Result} = 40.2 + 10.2 + 0.3 = 50.7 \text{ dBμV}$$

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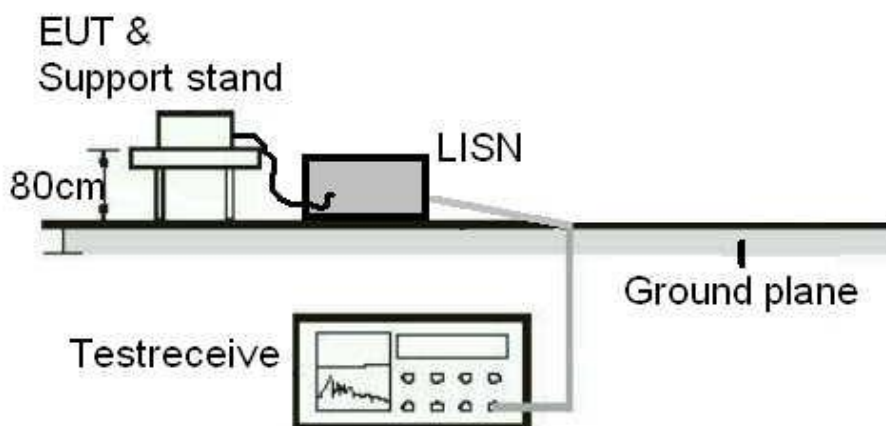
Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



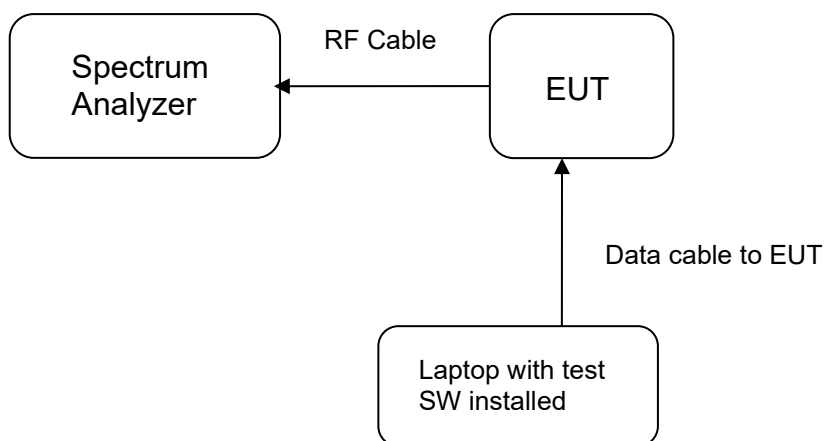
Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

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



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



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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

Designation Number : HK0013

ISED/IC

Company Number : 26152

Hong Kong Productivity Council

Address: LG1/F, HKPC Building 78 Tat Chee Avenue, Kowloon, Hong Kong

Tel.: +852 2788 6396

Fax: +852 2788 5405

Email: emc@hkpc.org

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

FCC

Designation Number : HK0012

ISED/IC

Company Number : 4780A

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List of Test and Measurement Instruments

Hong Kong Productivity Council

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Multi-functional Anechoic Chamber (NSA)	Albatross	---	2024-01-06	2025-01-06
Multi-functional Anechoic Chamber (VSWR)	Albatross	---	2024-01-04	2025-01-04
Test Receiver	Rohde & Schwarz	ESU40	2024-03-09	2025-03-09
Double-Ridged Waveguide Horn	EMCO	3117	2023-11-21	2024-11-21
Bi-conical Antenna	Rohde & Schwarz	HK116	2022-10-24	2024-10-24
Log Periodic Antenna	Rohde & Schwarz	HL223	2022-10-25	2024-10-25
Cable	SF118/11N/11 N/12000MM	Huber+Suhner	2024-01-06	2025-01-06
Microwave amplifier	COM-POWER Corporation	PAM-118A	2024-03-03	2025-03-03
High Pass Filter	Trilithic	23042	2023-10-29	2025-10-29

TÜV Rheinland Hong Kong Ltd.

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSV40	2024-08-07	2025-08-06

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Measurement Uncertainty

The estimated combined standard uncertainty for powerline conducted emissions measurements is $\pm 3.36\text{dB}$.

The estimated combined standard uncertainty for radiated emissions measurements is $\pm 2.70\text{dB}$ (9kHz to 30MHz) and $\pm 4.98\text{dB}$ (30MHz to 200MHz) and $\pm 5.74\text{dB}$ (200MHz to 1000MHz) and is $\pm 4.90\text{dB}$ (1GHz to 8.2GHz) and $\pm 4.90\text{dB}$ (8.2GHz to 12.4GHz) and $\pm 4.98\text{dB}$ (12.4GHz to 18GHz)

The estimated combined standard uncertainty for antenna conducted emission is $\pm 1.94\text{dB}$

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%.

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Results FCC Part 15 - Subpart C / RSS-210 Issue 10

FCC 15.203 – Antenna Requirement 1		Pass
FCC Requirements:	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:	0 dBi
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		Pass
FCC Requirements:	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	

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.		

RSS-Gen 6.3 – External Control		Pass
IC Requirements:	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 Requirements:	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) Peak Gain:	0 dBi
Verdict:	Pass	

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FCC 15.215 (c) - 20 dB Bandwidth				Pass
Test Specification : ANSI C63.10 – 2013 Test date : 04.10.2024 Mode of operation : Tx mode Port of testing : Antenna port Supply voltage : 3.0 VDC Temperature : 20°C Humidity : 55%				
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)
2410	2408.459	> 2400	2410.796	< 2483.5
2440	2438.517	> 2400	2441.302	< 2483.5
2470	2468.625	> 2400	2471.349	< 2483.5

RSS-Gen 6.7 – Occupied Bandwidth				N/A
Test Specification : RSS-Gen Test date : 04.10.2024 Mode of operation : Tx mode Port of testing : Antenna port Supply voltage : 3.0 VDC Temperature : 20°C Humidity : 55%				
FCC/ IC Requirement : N/A				
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)	
2410	2408.444	2411.056	2.612	
2440	2438.473	2441.126	2.793	
2470	2468.538	2471.331	2.793	

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FCC 15.249(a) / RSS-210 B.10(a) – Field Strength of Fundamental and Harmonics

Pass

Test Specification : ANSI C63.10 – 2013
Test date : 02.10.2024
Mode of operation : Tx mode
Port of testing : Enclosure
Frequency range : 9kHz - 25GHz
Supply voltage : 3.0 VDC
Temperature : 21°C
Humidity : 59%

Requirement: The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.

Results:

Fundamental Frequency: 2410MHz Vertical Polarization

Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
2410.000	95.1	114.0 / PK
2410.000	69.4	94.0 / AV

Fundamental Frequency: 2410MHz Horizontal Polarization

Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
2410.000	97.1	114.0 / PK
2410.000	71.4	94.0 / AV

Harmonicas: 2410MHz Vertical Polarization

Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
4820.000	56.5	74.0 / PK
4820.000	35.4	54.0 / AV
7230.000	46.1	74.0 / PK
7230.000	30.4	54.0 / AV

Harmonicas: 2410MHz Horizontal Polarization

Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
4820.000	59.3	74.0 / PK
4820.000	36.8	54.0 / AV
7230.000	44.0	74.0 / PK
7230.000	30.6	54.0 / AV

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Fundamental Frequency: 2440MHz			Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
2440.000	98.5	114.0 / PK	2440.000	98.5	114.0 / PK
2440.000	72.8	94.0 / AV	2440.000	72.8	94.0 / AV
Fundamental Frequency: 2440MHz			Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
2440.000	98.5	114.0 / PK	2440.000	98.5	114.0 / PK
2440.000	72.8	94.0 / AV	2440.000	72.8	94.0 / AV
Harmonicas: 2440MHz			Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
4880.000	61.2	74.0 / PK	4880.000	61.2	74.0 / PK
4880.000	37.4	54.0 / AV	4880.000	37.4	54.0 / AV
7320.000	44.3	74.0 / PK	7320.000	44.3	74.0 / PK
7320.000	30.0	54.0 / AV	7320.000	30.0	54.0 / AV
Hormonicas: 2440MHz			Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m
4880.000	60.8	74.0 / PK	4880.000	60.8	74.0 / PK
4880.000	37.0	54.0 / AV	4880.000	37.0	54.0 / AV
7320.000	43.5	74.0 / PK	7320.000	43.5	74.0 / PK
7320.000	30.1	54.0 / AV	7320.000	30.1	54.0 / AV

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Fundamental Frequency: 2470MHz		Vertical Polarization	
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	
2470.000	99.5	114.0 / PK	
2470.000	73.6	94.0 / AV	
Fundamental Frequency: 2470MHz		Horizontal Polarization	
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	
2470.000	98.8	114.0 / PK	
2470.000	73.0	94.0 / AV	
Harmonicas: 2470MHz		Vertical Polarization	
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	
4940.000	63.0	74.0 / PK	
4940.000	38.0	54.0 / AV	
7410.000	45.0	74.0 / PK	
7410.000	30.1	54.0 / AV	
Hormonicas: 2470MHz		Horizontal Polarization	
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	
4940.000	60.2	74.0 / PK	
4940.000	36.1	54.0 / AV	
7410.000	43.6	74.0 / PK	
7410.000	29.8	54.0 / AV	

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FCC 15.249(d) 15.205 / RSS-210 B.10(b) – Out of Band Radiated Emission			Pass
Test Specification : ANSI C63.10 – 2013 Test date : 02.10.2024 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz - 25GHz Supply voltage : 3.0 VDC Temperature : 21°C Humidity : 59%			
Requirement:		The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.	
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: 2410MHz		Vertical Polarization	
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	
2400.000	59.1	74.0 / PK	
2400.000	29.1	54.0 / AV	
2390.000	53.8	74.0 / PK	
2390.000	28.5	54.0 / AV	
TX Frequency: 2410MHz		Horizontal Polarization	
Frequency MHz	Level dBuV/m	Limit / Detector dBuV/m	
2400.000	61.6	74.0 / PK	
2400.000	27.0	54.0 / AV	
2390.000	55.8	74.0 / PK	
2390.000	26.5	54.0 / AV	

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TX Frequency: 2440MHz			Vertical Polarization		
Frequency MHz		Level dBuV/m		Limit / Detector dBuV/m	
No Peak Found		---		74.0 / PK	
No Peak Found		---		54.0 / AV	
TX Frequency: 2440MHz			Horizontal Polarization		
Frequency MHz		Level dBuV/m		Limit / Detector dBuV/m	
No Peak Found		---		74.0 / PK	
No Peak Found		---		54.0 / AV	
TX Frequency: 2470MHz			Vertical Polarization		
Frequency MHz		Level dBuV/m		Limit / Detector dBuV/m	
2483.500		62.0		74.0 / PK	
2483.500		26.4		54.0 / AV	
TX Frequency: 2470MHz			Horizontal Polarization		
Frequency MHz		Level dBuV/m		Limit / Detector dBuV/m	
2483.500		61.0		74.0 / PK	
2483.500		26.8		54.0 / AV	

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Appendix 1

Test Results

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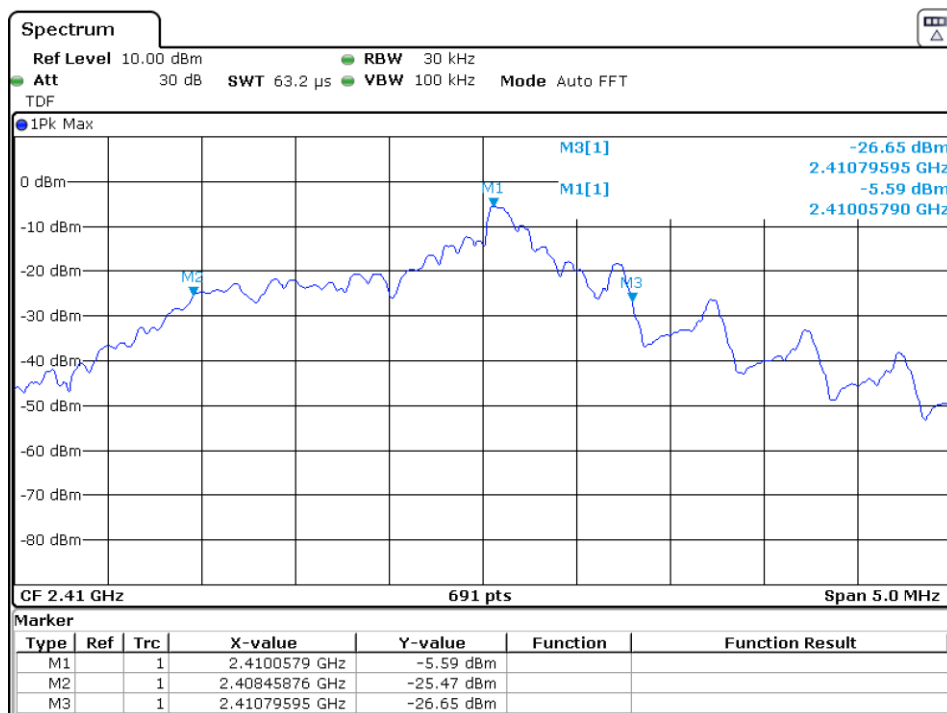
Absatz
Clause

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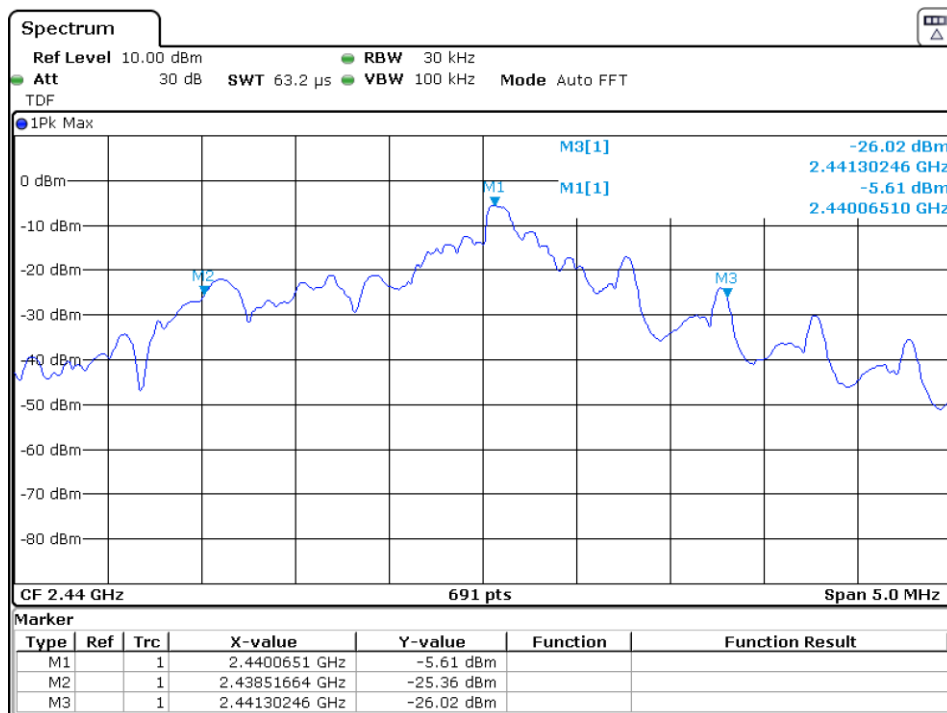
Ergebnis
Result

Test results of 20 dB Bandwidth



Date: 4.OCT.2024 15:58:23

Tx frequency: 2410MHz



Date: 4.OCT.2024 16:01:23

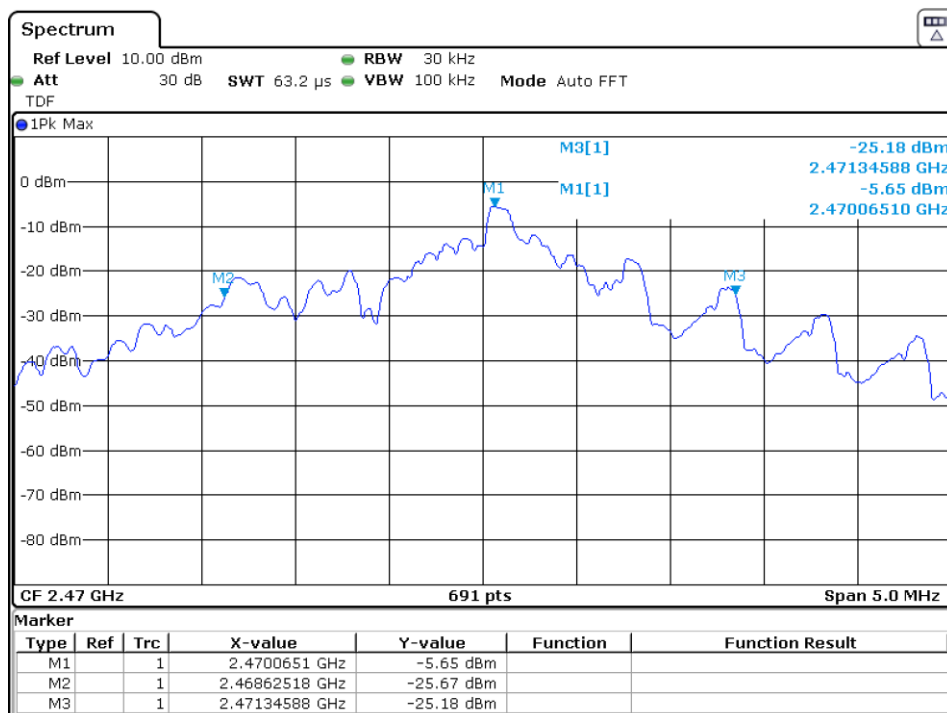
Tx frequency: 2440MHz

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Date: 4.OCT.2024 16:03:37

Tx frequency: 2470MHz

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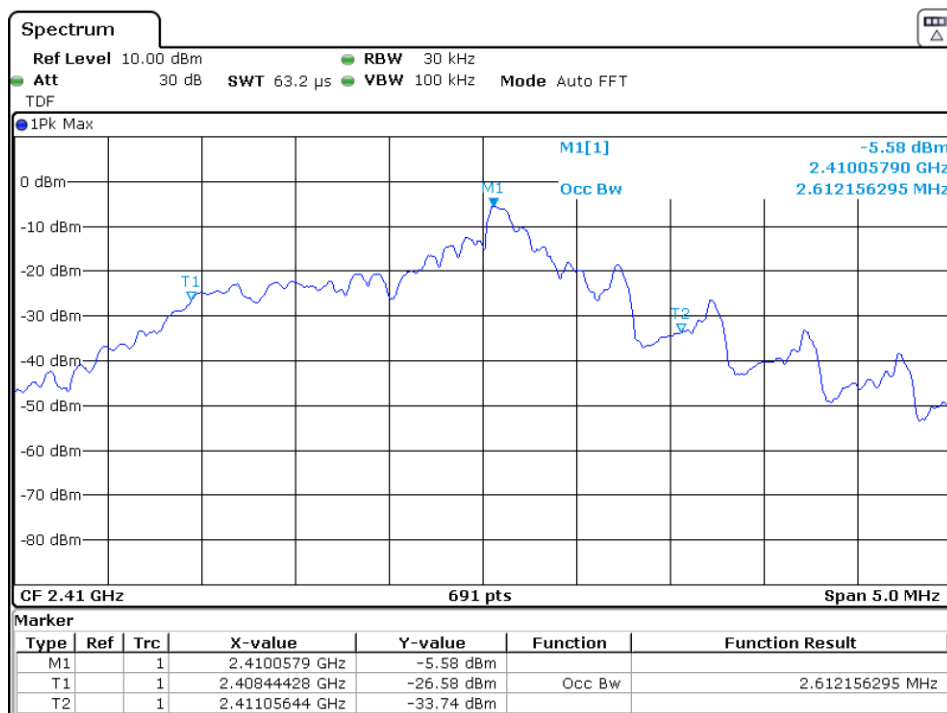
Absatz
Clause

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Requirements - Tests

Messergebnisse – Bemerkungen/
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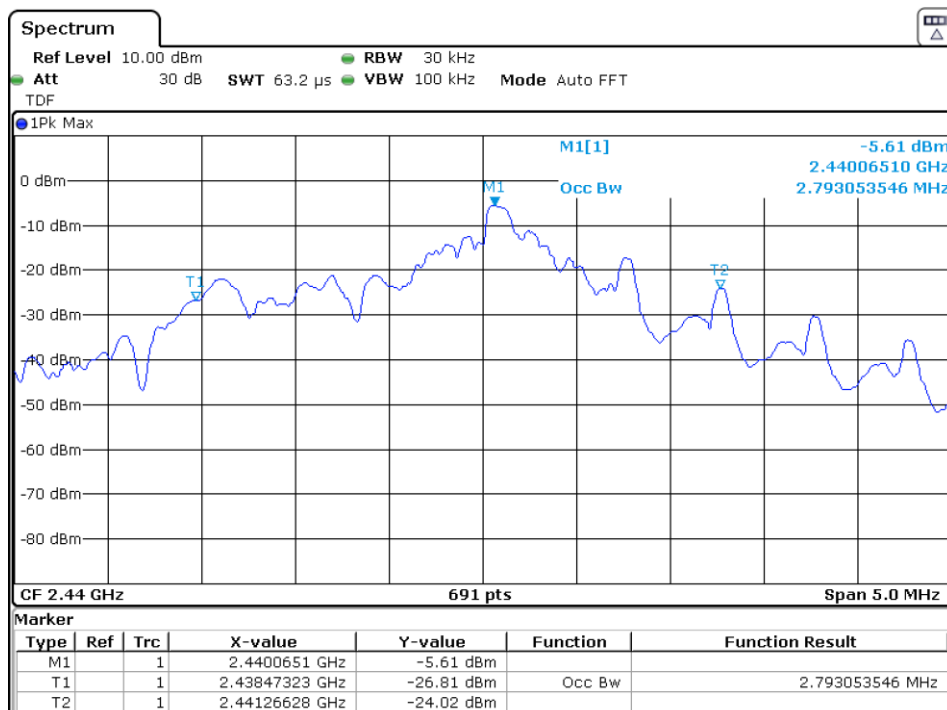
Ergebnis
Result

Test results of 99% Occupied Bandwidth



Date: 4.OCT.2024 15:59:57

Tx frequency: 2410MHz



Date: 4.OCT.2024 16:02:33

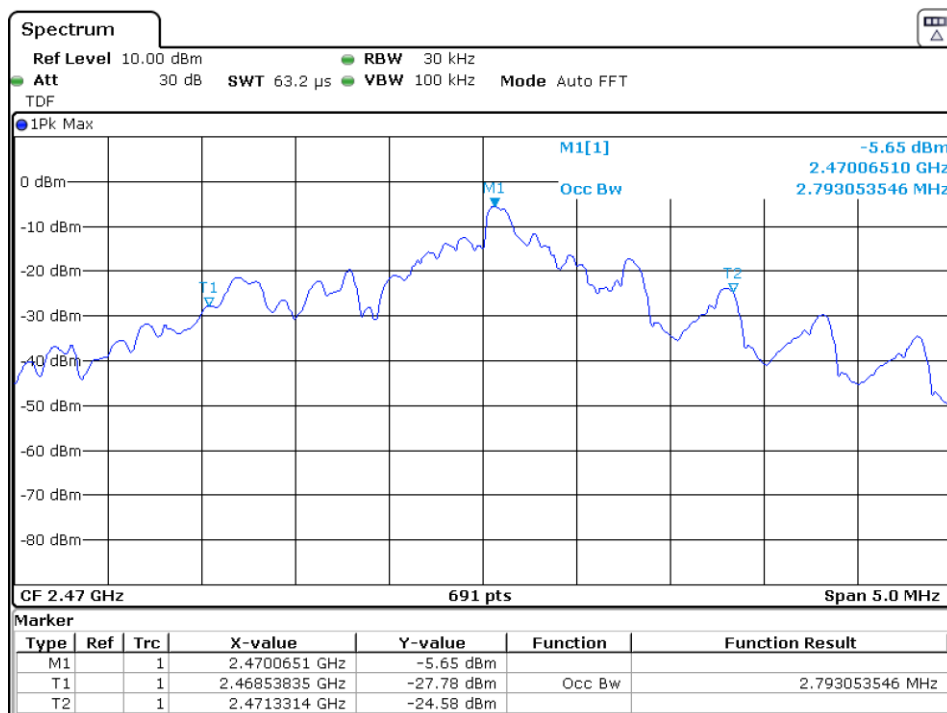
Tx frequency: 2440MHz

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Date: 4.OCT.2024 16:04:31

Tx frequency: 2470MHz