



RF - TEST REPORT

- Jp ARIB-T91 -

Type / Model Name : Radio frequency module/ MUPS-RF

Product Description : Probing system with UWB transmission

Applicant : Marposs S.p.A.

Address : Via Saliceto 13

40010 BENTIVOGLIO, ITALY

Manufacturer : Marposs S.p.A.

Address : Via Saliceto 13

40010 BENTIVOGLIO, ITALY

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : **80215526-00 Rev_1**

02. June 2025

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00

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Attachment A as separate supplement

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

1 TEST STANDARDS

The tests were performed according to following standards:

ARIB STD-T91 Ver. 4.0, 5. August 2022 UWB (Ultra Wideband) Radio Systems

Radio Law (Law No. 131 of May 1950). Amended last by Law 21 of 2005.

Chapter III, Radio Equipment, Article 28 Quality of Radio Waves

Chapter III, Radio Equipment, Article 29 Requirements for receiving equipment

Radio Law Enforcement Regulations Abstract Article 6, Item 4, 4(1)
Latest revision – Law 91 on 31. May 2006

Ordinance concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment
(as of August of 2007), Chapter 1, Article 2, Item 19

Ordinance Regulating Radio Equipment Chapter IV, Section 4.25 Radio Equipment of Radio Stations of
Ultra Wide-band Wireless System (UWB) (Article 49.27)

TELEC-T406 Characteristics Test Methods for Radio Equipment Used for
Radio Station of Ultra-Wideband Radio System (2019)

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

2.3 General remarks

None.

2.4 Photo documentation of the EUT – Detailed photos see attachment A

2.5 Equipment type

Ultra Wideband Wireless System

2.6 Short description of the equipment under test (EUT)

The EUT is a radio frequency module which integrates two synchronous and identical low power UWB transceivers, each one with its reference crystal and its antenna, together on the same PCB.

Number of tested samples: 1
 Serial number: n. a. (pre-production sample)
 Firmware version: v0.014

2.7 Variants of the EUT

There are no variants.

2.8 Operation frequency and channel plan

The EUT is a radio equipment for indoor use only. The operating frequency is 7.25 GHz to 10.25 GHz.

Channel plan for UWB:

Channel number	Frequency (MHz)
9	7987.2

2.9 Transmit operating modes

Modulation: variable pulse position modulation (PPM) in combination with binary phase shift keying (BPSK).

Data rate: 250 kbit/s

2.10 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Type	Plug	f-range (GHz)	Max. Gain (dBi)
1	Omni	Johanson Technology p/n 7000AT19A1600	PCB	6.2 -7.8	2.0

2.11 Power supply system utilised

Power supply voltage range: : 2.5 V DC
 $V_{\min}$: n/a
 $V_{\max}$: n/a

2.12 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- WLC Cable Model : 618092W003
- Programming and debug board Model : 6303323340

2.13 Determination of worst-case conditions for final measurement

The device has a special firmware allowing to set channels for conducted tests. The EUT shows a fixed power setting to perform the test modes TX continuous, modulated and RX continuous for the channels listed in section 2.8.

2.13.1 Test jig

The measurements were performed with the entire device. No special test jig was used.

2.13.2 Test software

Special software is used for setting the EUT in a continuous Tx and Rx mode. The power setting is 0x9999.

3 Test result summary

ORRE Article Reference	Report chapter	Test items	Test Results
Chapter I – General Provisions, Section 2 Quality of Emissions			
5	5.1	Frequency tolerance and OBW	passed
7	5.2	Spurious emissions	passed
Chapter II – Transmitting Equipment, Section 1 General			
14	5.7	Antenna power tolerance	passed
Chapter III – Receiving Equipment			
24 (17)	5.3	Limit on secondary radiated emissions	passed
Chapter IV – Radio Equipment of Radio Stations of Ultra Wide-band Wireless System (UWB)			
49.27 5) (a)	5.4	Antenna power – mean power value	passed
49.27 5) (b)	5.5	Antenna power – peak power value	passed
49.27 6)	---	Antenna gain	not applicable
49.27 7)	5.6	Frequency bandwidth	passed

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80215526-00	0	23 October 2024	Initial test report
	1	02 June 2025	Cause 5.7: implementation of antenna power tolerance

The test report with the highest revision number replaces the previous test reports.

3.2 Final assessment

The equipment under test **fulfills** the RF requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 30 July 2024

Testing concluded on : 17 October 2024

Checked by:



Klaus Gegenfurtner
I confirm the correctness
and integrity of this
document
2025.06.02 15:48:02
+02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:



I am the author of
this document
2025.06.02 13:02:28
+02'00'

Franz-Xaver Schrettenbrunner
Radio Team

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Straubinger Strasse 100
94447 PLATTILING
GERMANY

4.2 Environmental conditions

The conducted measurements were performed in Shielded Room SR6. During the measurements, the environmental conditions were as follows:

Temperature: 23 ° C

Humidity: 59 %

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement uncertainty table	
Measurement output power, conducted	±1.5 dB
Measurement output power, radiated	±3.0 dB
Measurement PSD, conducted	±1.5 dB
Measurement PSD, radiated	±3.0 dB
Measurement spurious emissions, conducted	±3.0 dB
Measurement spurious emissions, radiated	±6.0 dB
Measurement frequency	±1 x 10 ⁻⁸

4.4 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

4.5 Measurement protocol

4.5.1 General information

4.5.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures of TELECOM-T406 as shown under section 1 of this test report.

Radiated measurements of the EIRP in the range 30 MHz to 1000 MHz are performed at 10 m distance because only this distance is calibrated regularly.

4.5.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum disturbances from the unit.

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5 TEST CONDITIONS AND RESULTS

5.1 Frequency tolerance and Occupied Bandwidth

For test instruments and accessories used see section 6 Part FE.

5.1.1 Description of the test location

Test location: Shielded Room SR6

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (6):

Permissible values for the occupied bandwidth shall be as follows:

- For those with use of the frequency between 3.4 GHz or higher and lower than 4.8 GHz 1.4 GHz
- For those with use of the frequency between 7.25 GHz or higher and lower than 10.25 GHz

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.1.4 Description of Measurement

The EUT is operated in continuous transmission mode. The transmitter output is connected to the spectrum analyser through an attenuator. The centre frequency of the spectrum analyser is set to the fundamental frequency.

Spectrum analyser settings:

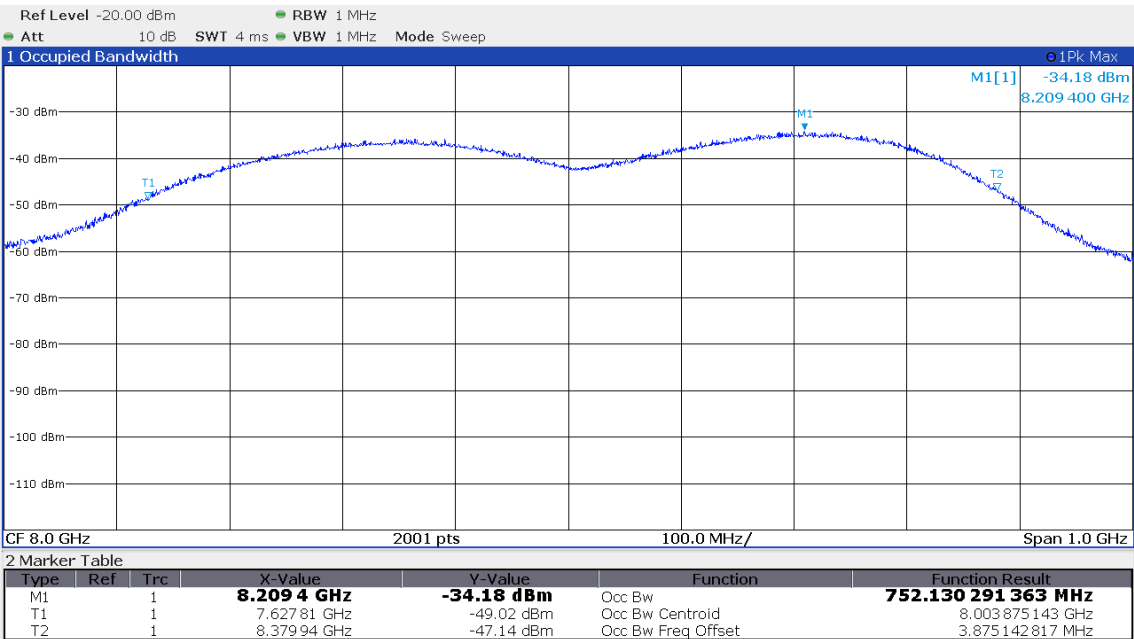
RBW: 1 MHz,
Det.: pos. Peak

VBW: 1 MHz,
trace: max. hold

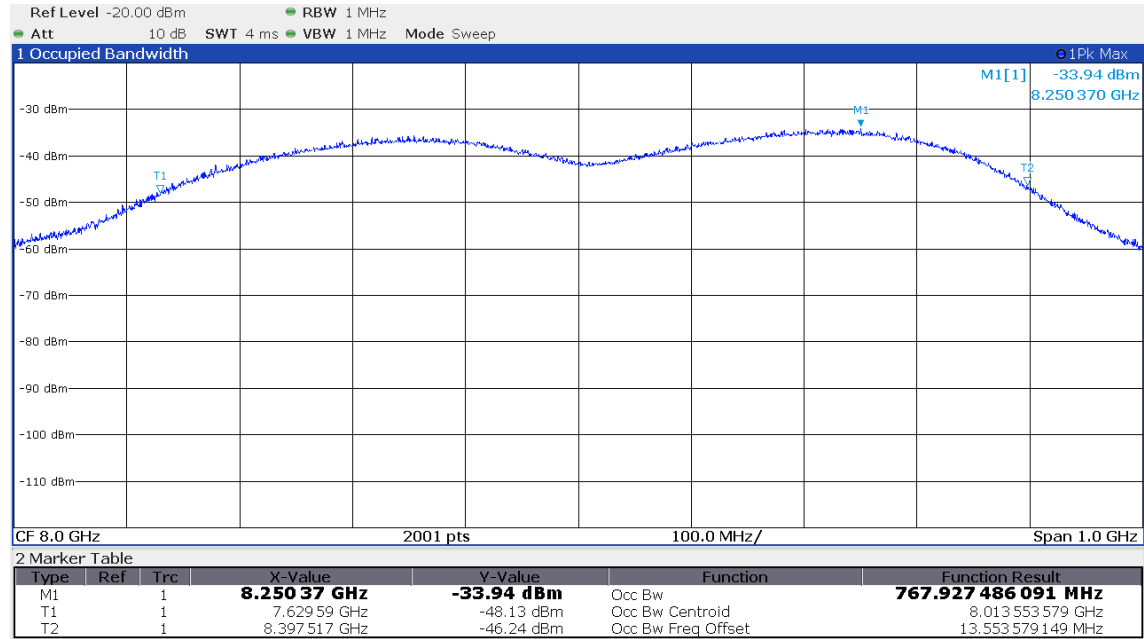
SPAN: 1 GHz
sweep: cont.

5.1.5 Test result

Chip A



Chip B



CH	Chip	Lower frequency T1 (GHz)	Lower limit (GHz)	Upper Frequency T2 (GHz)	Upper Limit (GHz)	OBW (MHz)	result
9	A	7.62781	7.25	8.37994	10.25	752.13	passed
9	B	7.62959	7.25	8.397517	10.25	767.93	passed

Limit according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (6):

Lower limit 7.25 GHz

Upper limit 10.25 GHz

The requirements are **FULFILLED**.

Remarks: Due to the input voltage stabilisation of the RF-Module the measurement was done at the rated
input voltage only.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.2 Spurious emissions conducted

For test instruments and accessories used, see section 6 Part **SEC 1-3**.

5.2.1 Description of the test location

Test location: Shielded Room SR6

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

The permissible values for the spurious emissions are given in the table according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (7).

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.2.4 Description of Measurement

A Spectrum analyser is connected to the output of the transmitter while the EUT was in continuous transmit mode at the assigned frequency.

Analyser settings (average power):

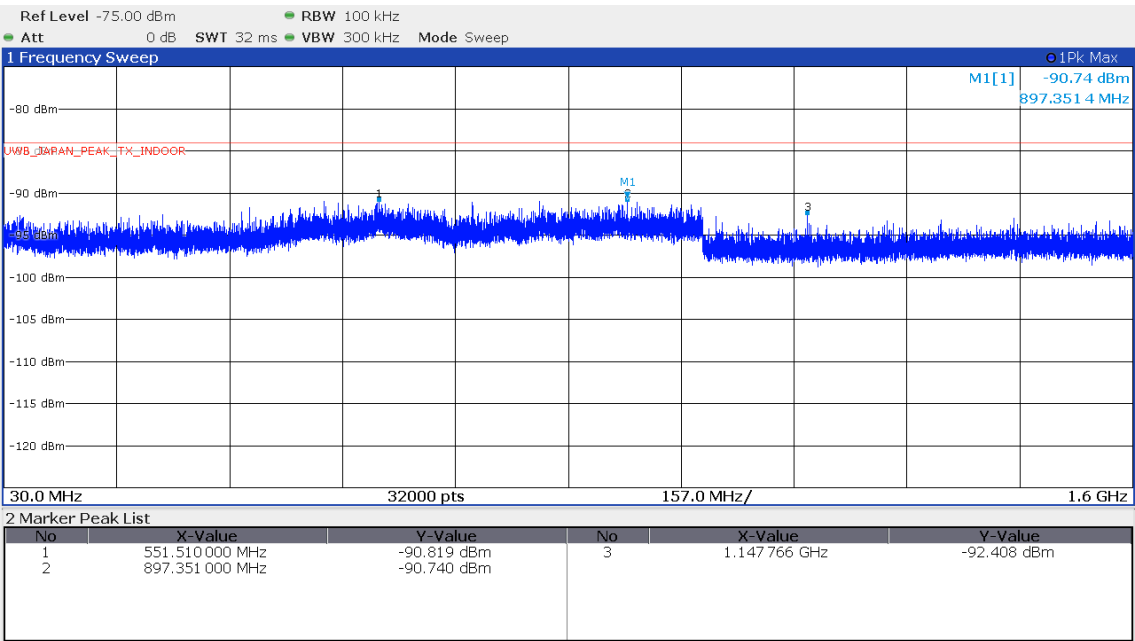
f < 1.6 GHz RBW = 1 MHz VBW = 3 MHz Detector: RMS
f > 1.6 GHz RBW = 1 MHz VBW = 3 MHz Detector: RMS

Analyser settings (peak power):

f < 1.6 GHz RBW = 100 kHz VBW = 300 kHz Detector: Peak
f > 1.6 GHz RBW = 1 MHz VBW = 3 MHz Detector: Peak

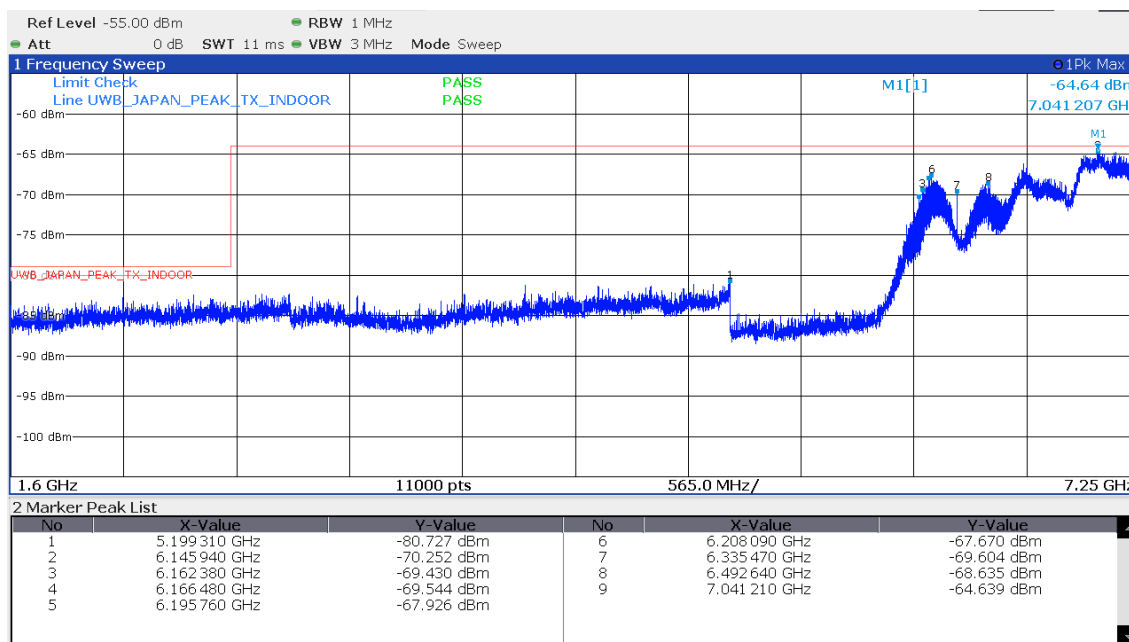
5.2.5 Test result

Chip A peak power: f < 1.6 GHz

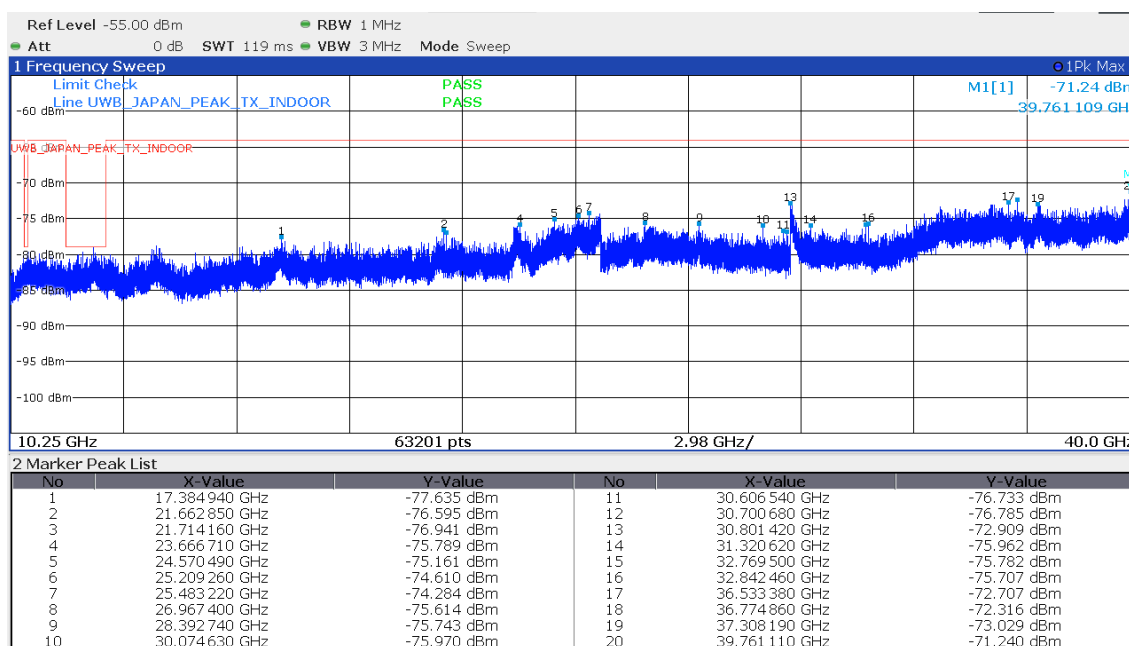


Note: RBW is reduced to increase dynamic range

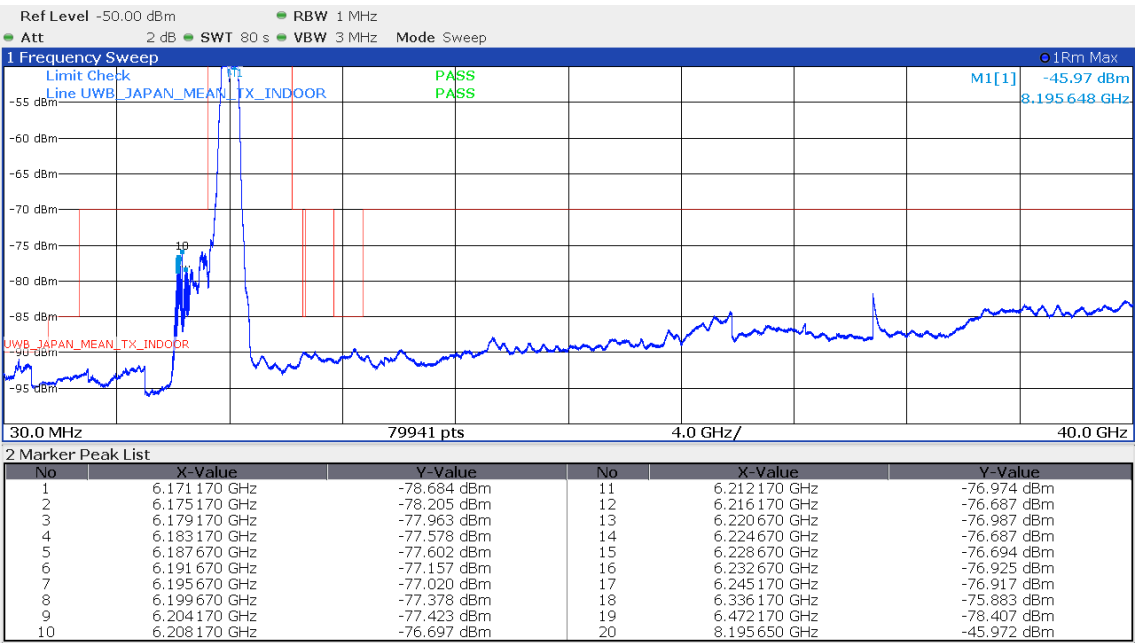
Chip A peak power: $1.6 \text{ GHz} < f < 7.25 \text{ GHz}$



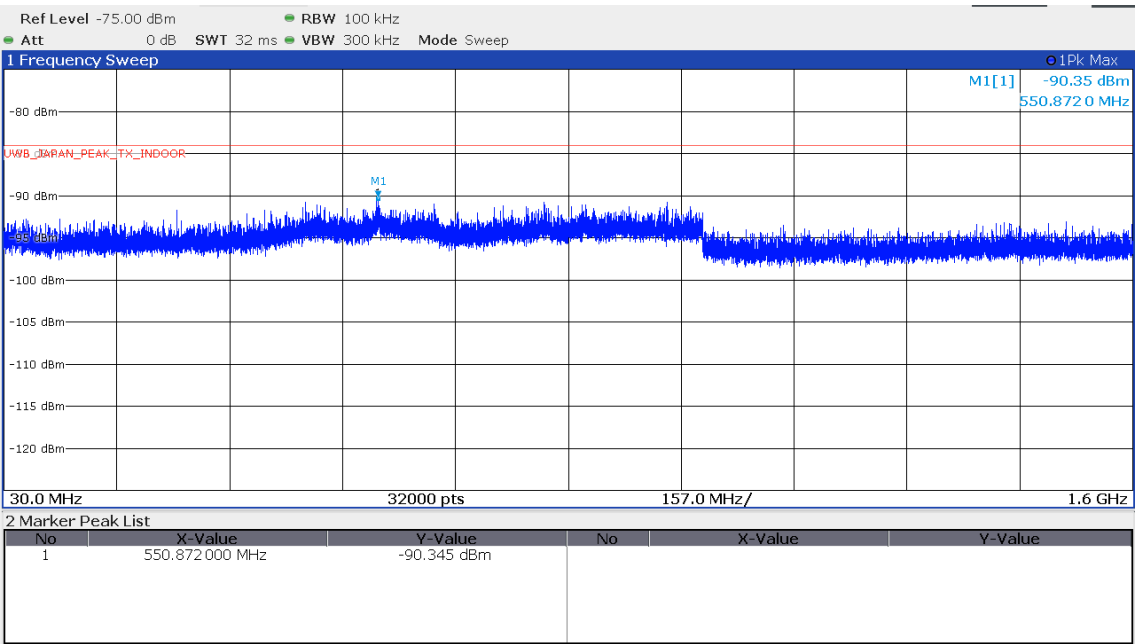
Chip A peak power: $f > 10.25 \text{ GHz}$



Chip A average power:

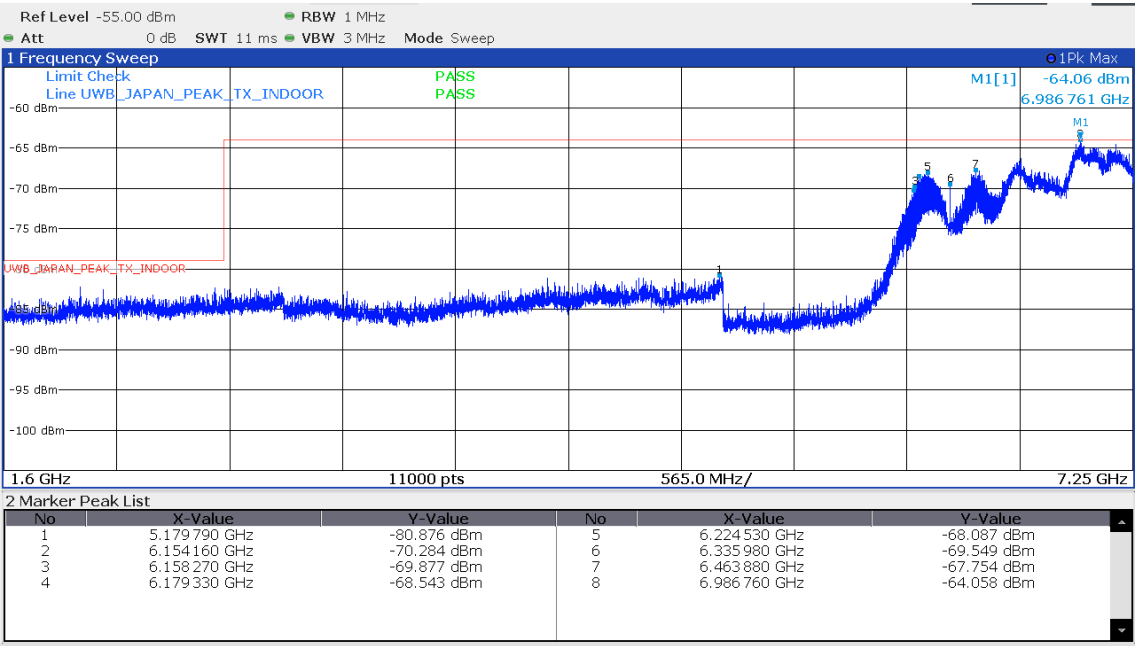


Chip B peak power: $f < 1.6$ GHz

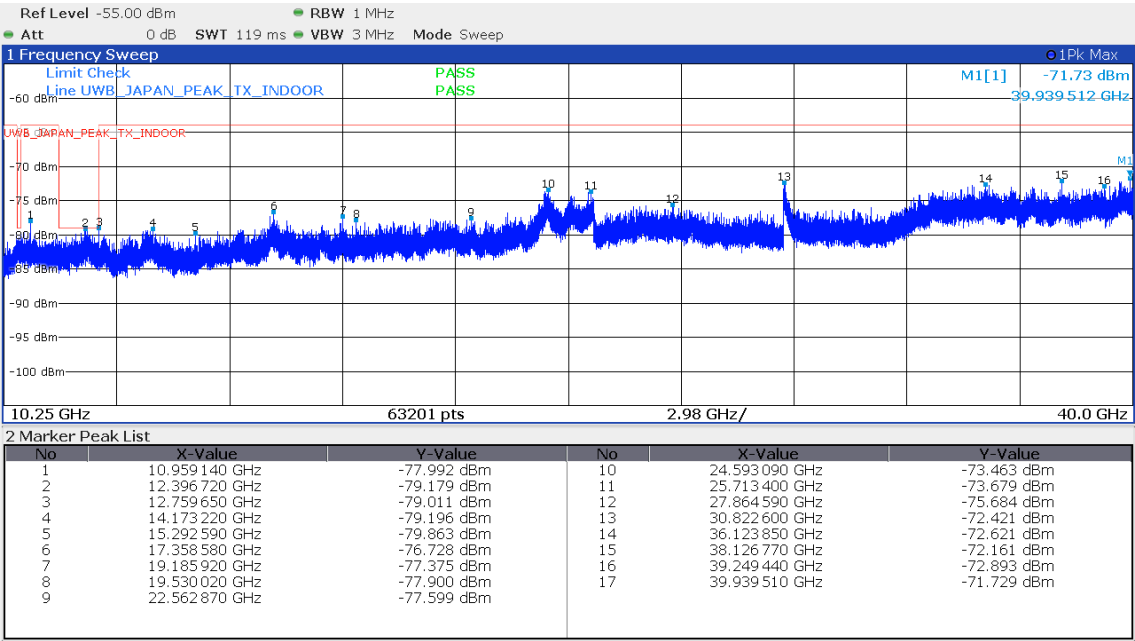


Note: RBW is reduced to increase dynamic range

Chip B peak power: 1.6 GHz < f < 7.25 GHz



Chip B peak power: f > 10.25 GHz



Chip B average power:



Limit according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (7):

frequency (GHz)	limit	
	average power per 1MHz (dBm)	peak power per 1MHz (dBm)
< 1.6	-90	-84
1,6 – 2,7	-85	-79
2,7 – 7,25	-70	-64
7.25– 8.5	-59,3	-35
8.5 -10.25	-60	-35,7
10.25 -10.6	-70	-64
10.6 -10.7	-85	-79
10.7 – 11.7	-70	-64
11.7 – 12.75	-85	-79
> 12.75	-70	-64

The requirements are **FULFILLED**.

Remarks: None.

5.3 Limit on secondary radiated emissions

Test instruments and accessories used see section 6 Part **SEC 1-3**.

5.3.1 Description of the test location

Test location: Shielded Room SR6

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

The permissible values for the spurious emissions are given in the table according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.3 (1).

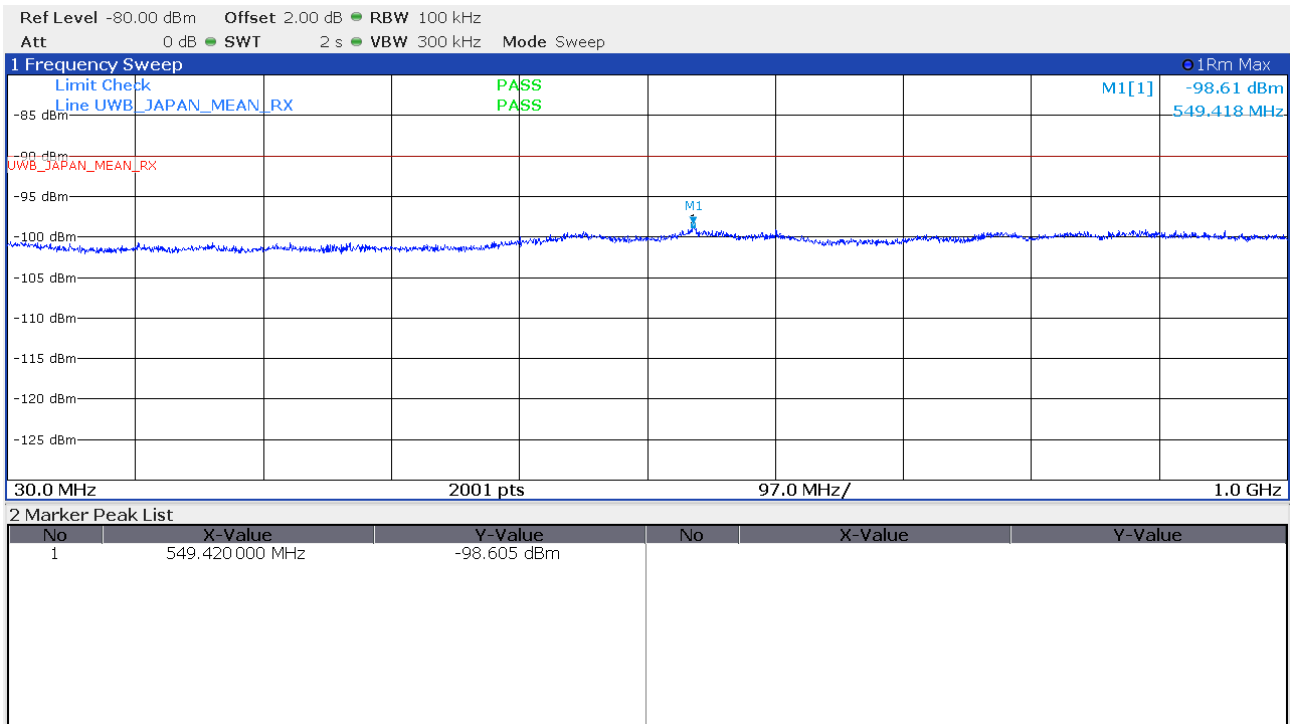
5.3.4 Description of Measurement

A Spectrum analyser is connected to the output of the transmitter while the EUT was in continuous receive mode at the assigned frequency.

Analyser Settings RBW = 1 MHz VBW = 3 MHz Detector: RMS

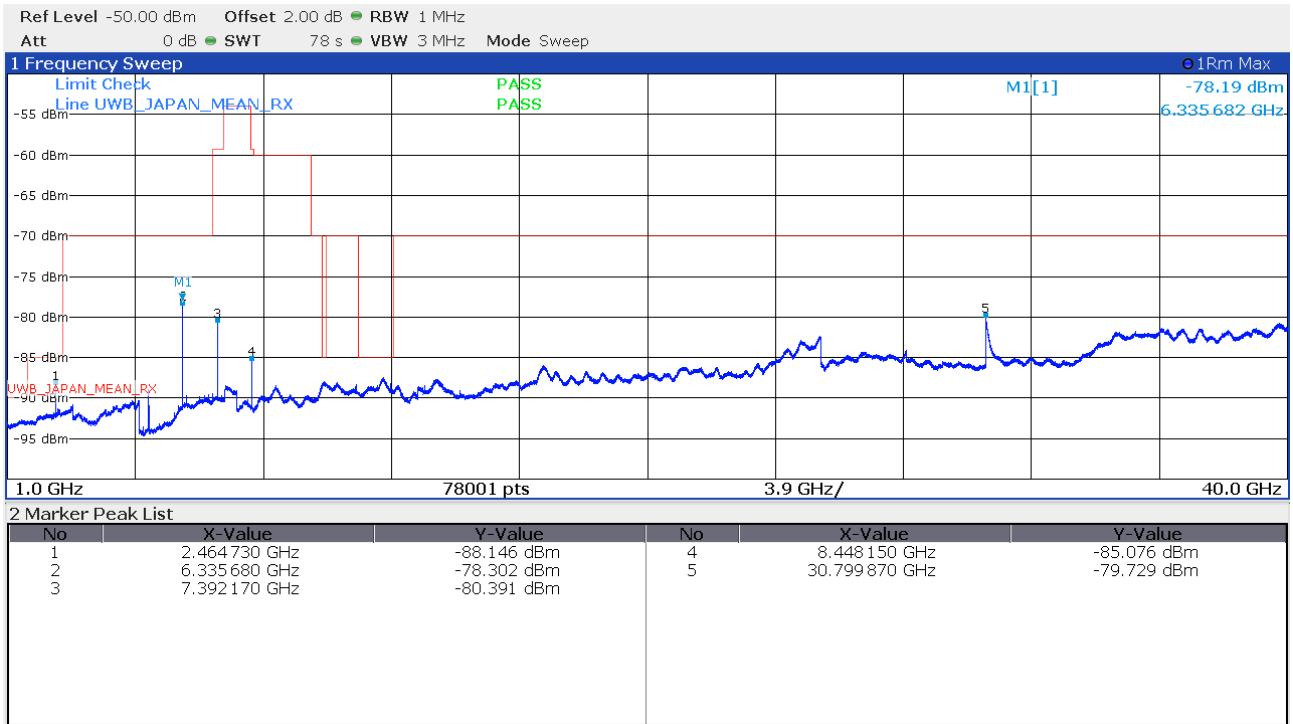
5.3.5 Test result

Chip A: $f < 1\text{ GHz}$

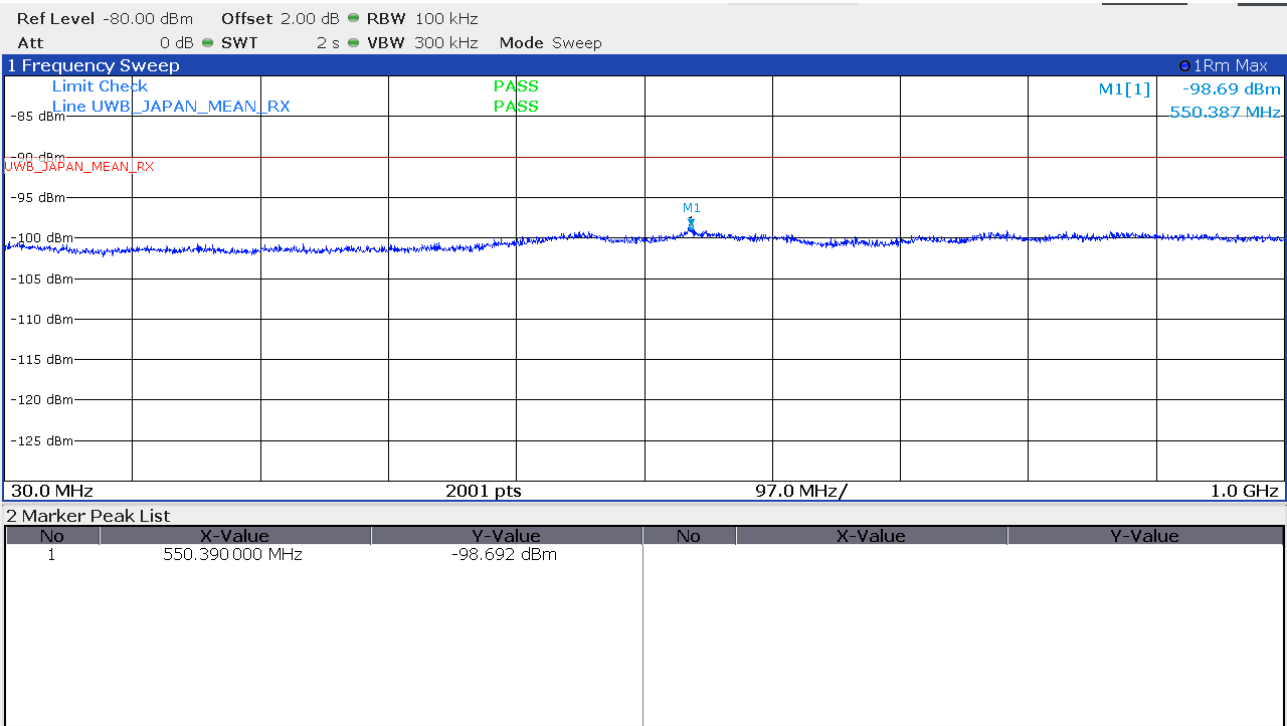


Note: RBW is reduced to increase dynamic range

Chip A: $f > 1\text{ GHz}$

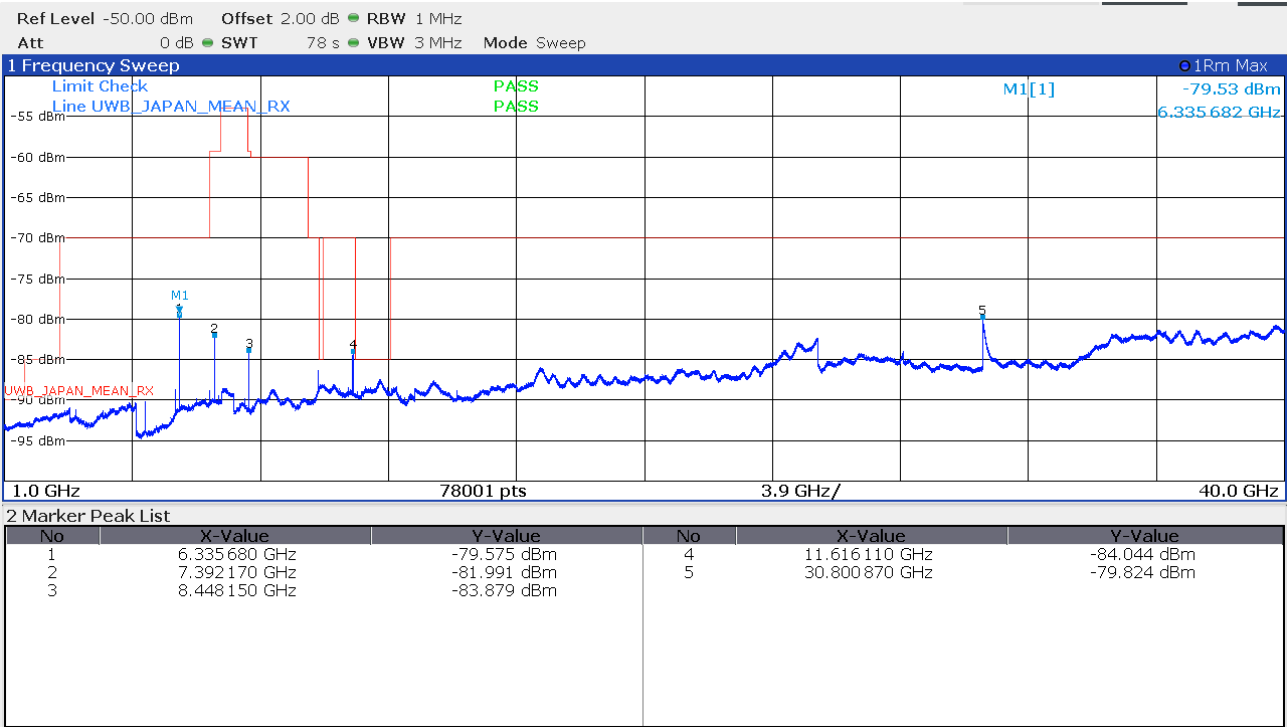


Chip B: $f < 1\text{ GHz}$



Note: RBW is reduced to increase dynamic range

Chip B: $f > 1\text{ GHz}$



Limit according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.3 (1):

frequency (GHz)	average power per 1MHz (dBm)
< 1.6	-90
1,6 – 2,7	-85
2,7 – 7,25	-70
7,25 – 7,587	-59,3
7,587– 8,4	-54
8,4 -8,5	-59,3
8,5 -10,25	-60
10,25 -10,6	-70
10,6 – 10,7	-85
10,7 – 11,7	-70
11,7 – 12,75	-85
> 12.75 GHz	-70

The requirements are **FULFILLED**.

Remarks: None.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.4 Antenna power – mean power value

For test instruments and accessories used see section 6 Part **CPC 3**.

5.4.1 Description of the test location

Test location: Shielded Room SR6

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (2):

Antenna power for the operating frequency band shall satisfy respective values as follows:

- Average power per 1MHz bandwidth shall be -41.3 dBm or less.

5.4.4 Description of Measurement

The transmitter output is connected to the spectrum analyser. The range of the spectrum analyser is set to the operating frequency range for searching the maximal power. In a second step the centre frequency is set to the value which is identified as maximum power level.

Analyser settings (search for maximum):

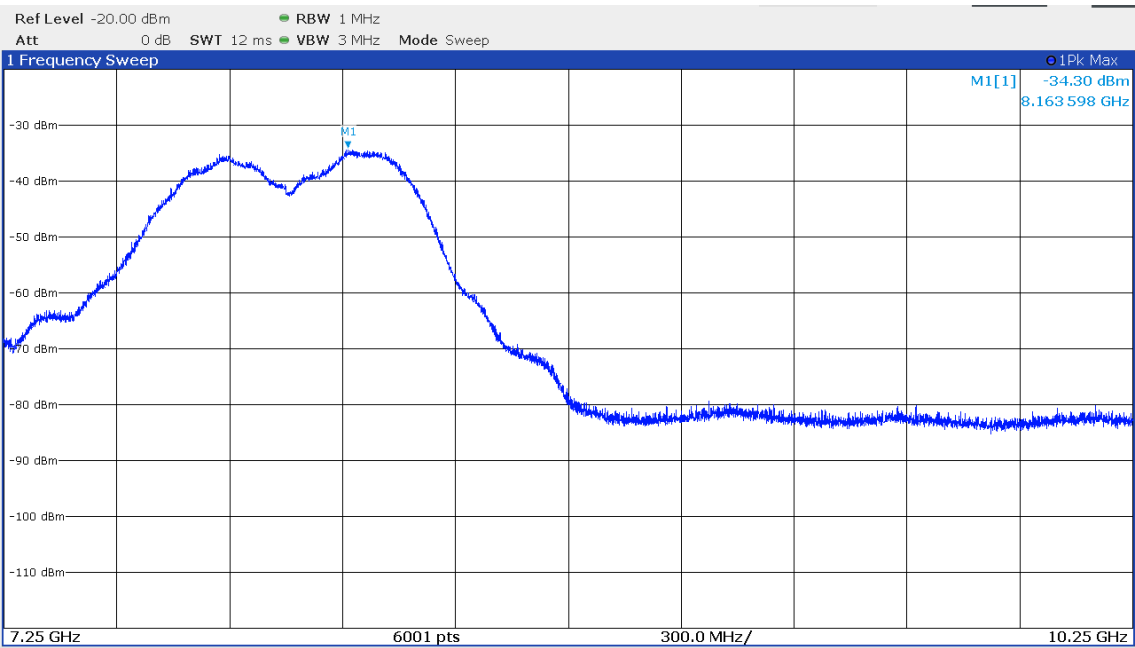
RBW: 1 MHz, VBW: 3 MHz, Detector: Peak

Analyser settings (measurement):

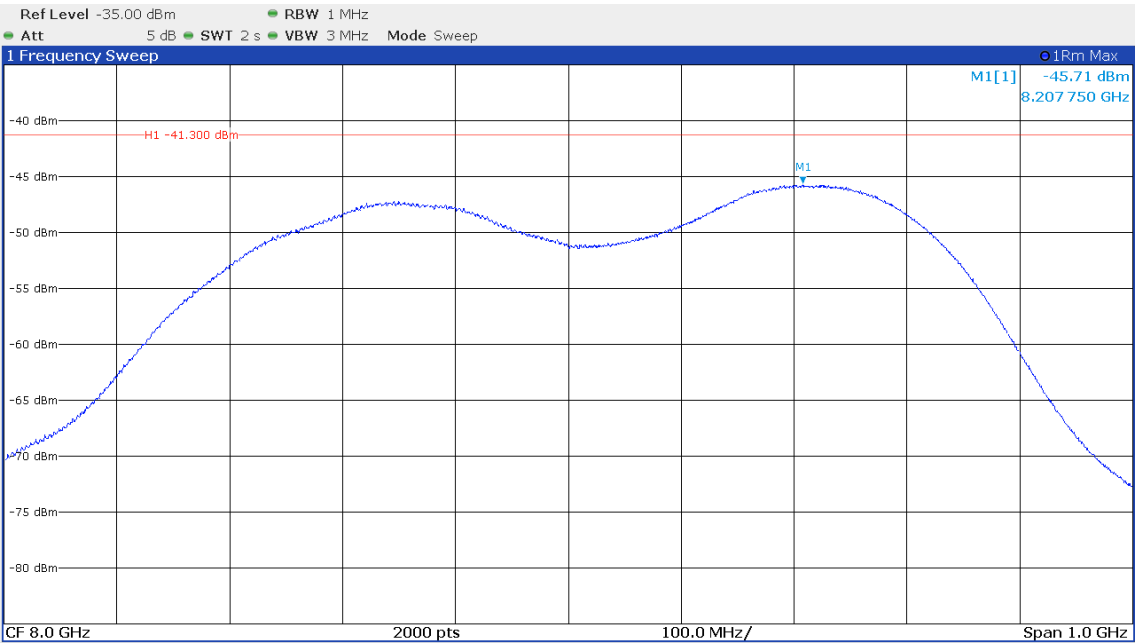
RBW: 1 MHz, VBW: 3 MHz, Detector: RMS

5.4.5 Test result

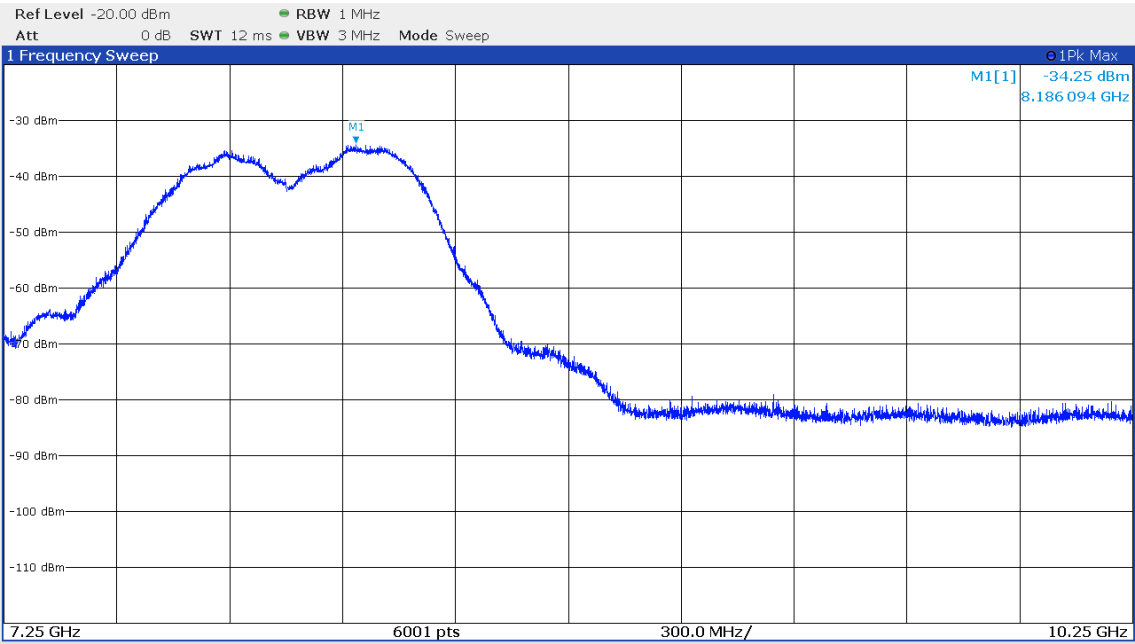
Chip A pre-scan



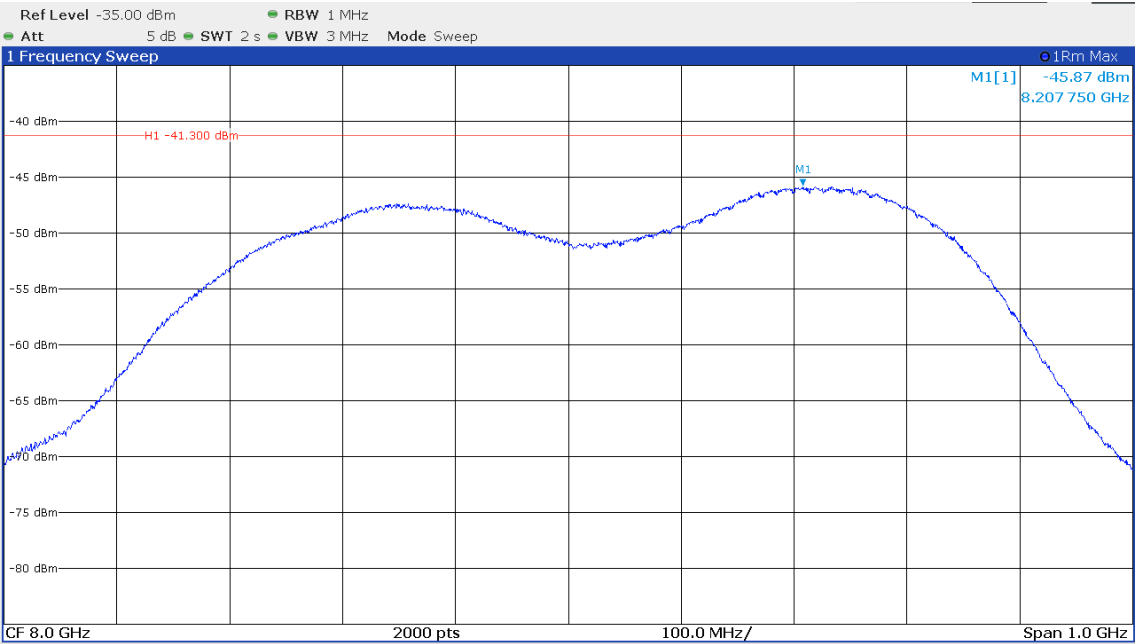
Chip A final scan



Chip B pre-scan



Chip B final scan



result chip A: EIRP = -45.7 dBm/MHz + 2 dBi = -43.7 dBm/MHz
result chip B: EIRP = -45.9 dBm/MHz + 2 dBi = -43.9 dBm/MHz

Limit according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (2):

operation frequency range	Limit
7.25 GHz – 10.25 GHz	≤ -41.3 dBm/MHz

The requirements are **FULFILLED**.

Remarks: None.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.5 Antenna power – peak power value

For test instruments and accessories used see section 6 Part **CPC 3**.

5.5.1 Description of the test location

Test location: Shielded Room SR6

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (2):

Antenna power for the operating frequency band shall satisfy respective values as follows:

- Peak power per 50MHz bandwidth shall be 0 dBm or less.

5.5.4 Description of Measurement

The transmitter output is connected to the spectrum analyser. The range of the spectrum analyser is set to the operating frequency range for searching the maximal power. In a second step the centre frequency is set to the value which is identified as maximum power level.

Analyser settings (search for maximum):

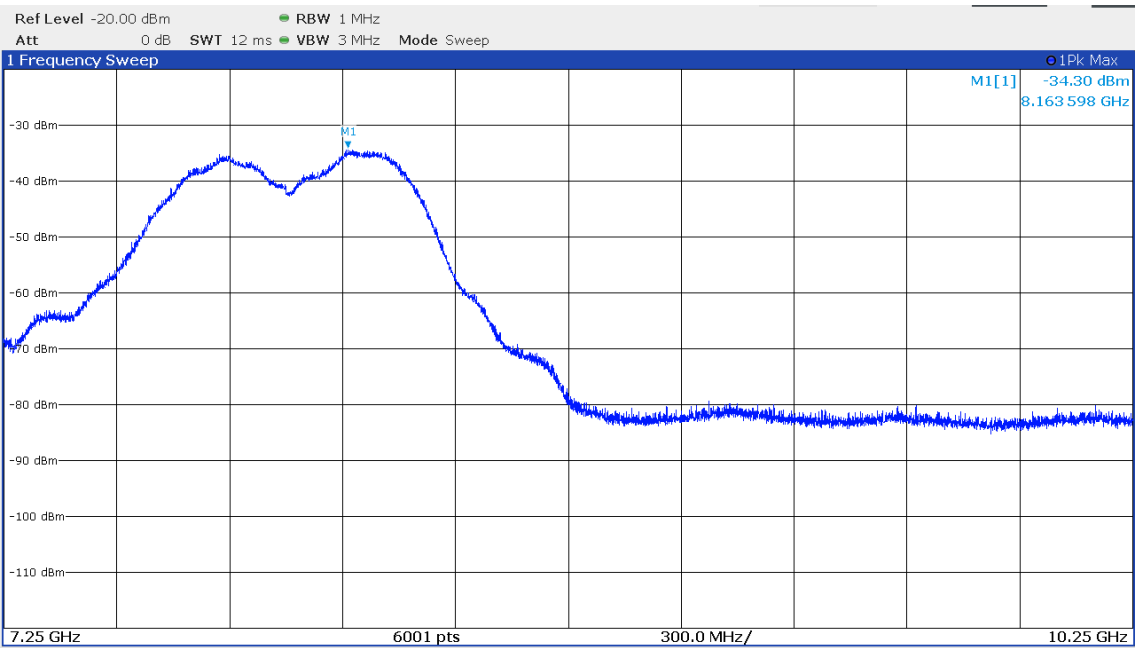
RBW: 1 MHz, VBW: 3 MHz, Detector: Peak

Analyser settings (measurement):

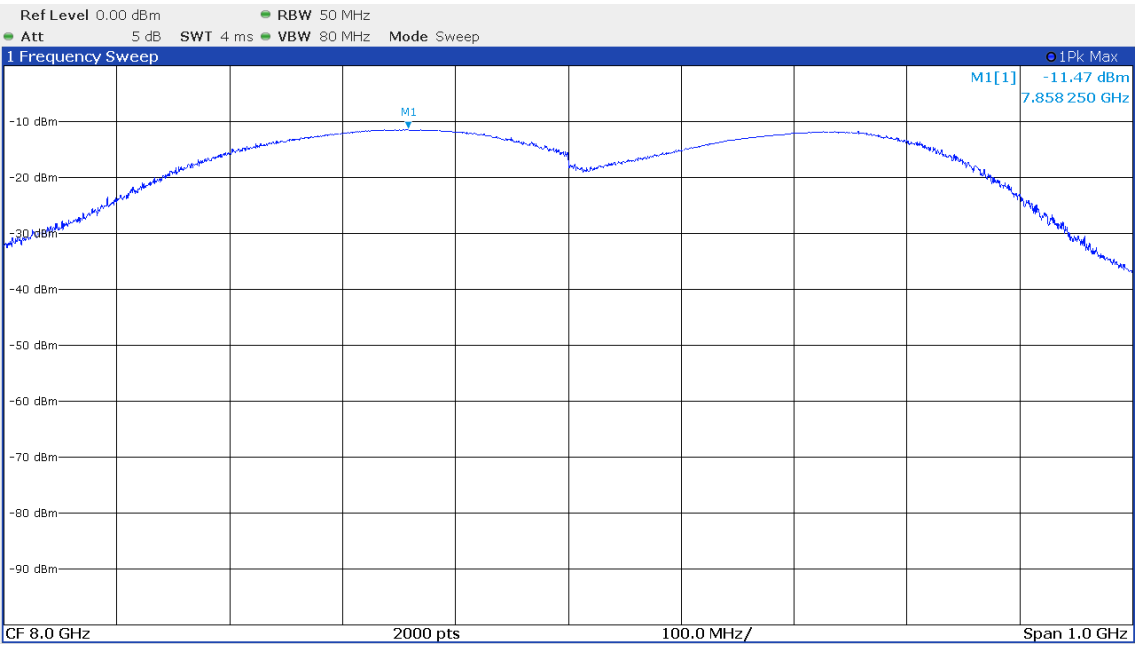
RBW: 50 MHz, VBW: 80 MHz, Detector: Peak

5.5.5 Test result

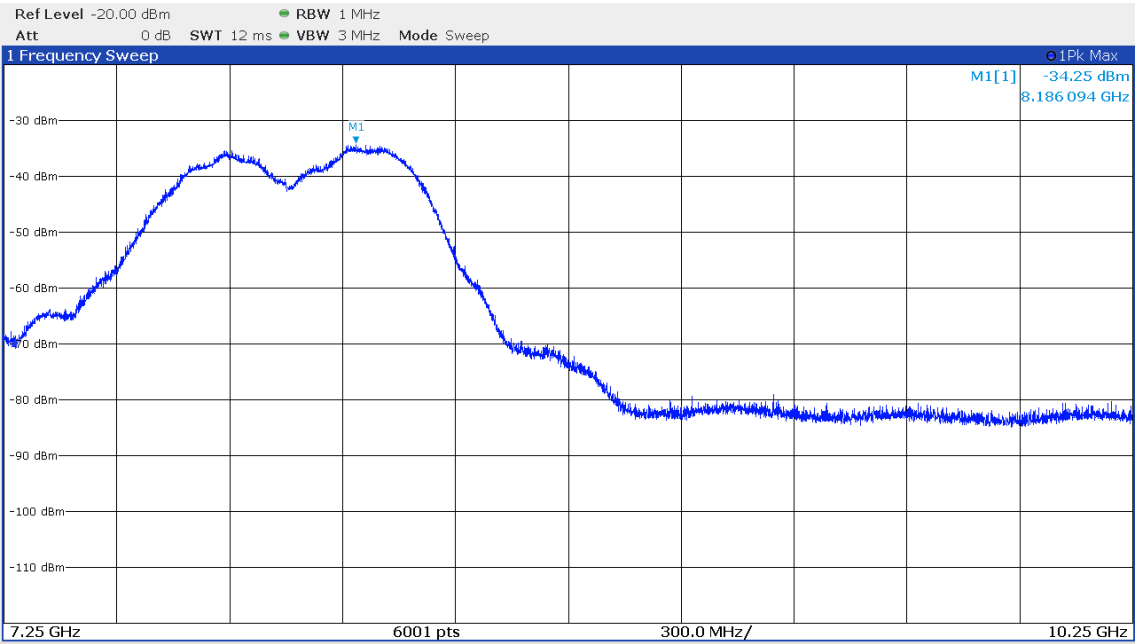
Chip A pre-scan



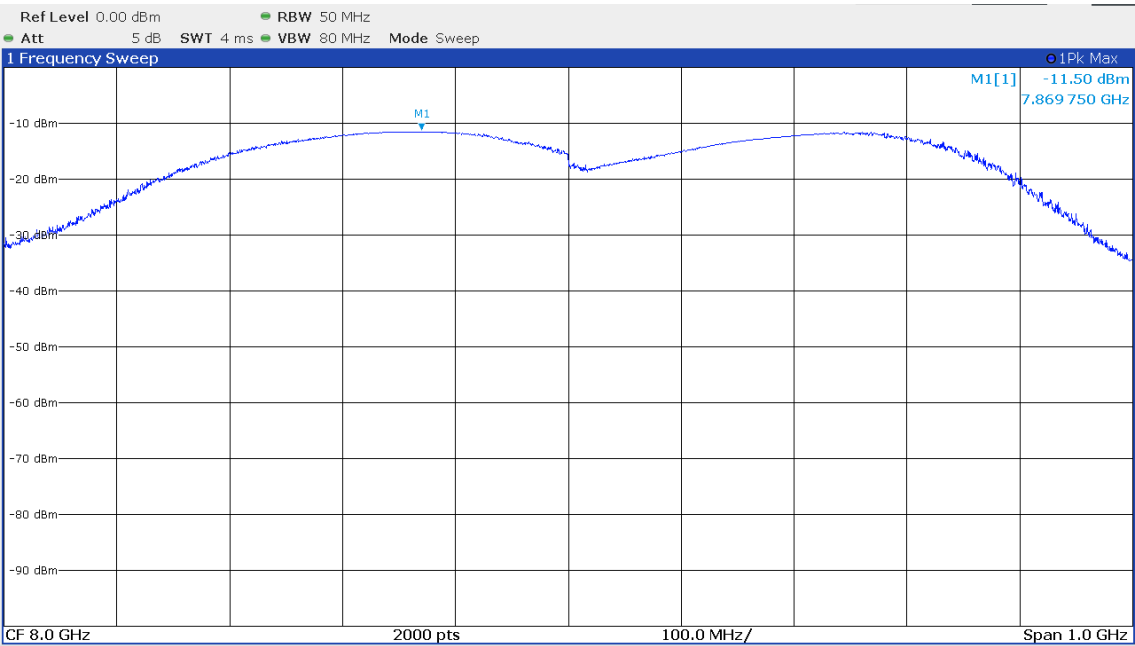
Chip A final scan



Chip B pre-scan



Chip B final scan



result chip A: $\text{EIRP} = -11.5 \text{ dBm} / 50 \text{ MHz} + 2.0 \text{ dBi} = -9.5 \text{ dBm} / 50 \text{ MHz}$
result chip B: $\text{EIRP} = -11.5 \text{ dBm} / 50 \text{ MHz} + 2.0 \text{ dBi} = -9.5 \text{ dBm} / 50 \text{ MHz}$

Limit according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (2):

operation frequency range	Limit
7.25 GHz – 10.25 GHz	$\leq 0 \text{ dBm} / 50 \text{ MHz}$

The requirements are **FULFILLED**.

Remarks: None.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.6 Diffusion bandwidth

For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: Shielded Room SR6

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

According to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (5), frequency bandwidth between the upper and lower frequencies for the radiation power points which are 10 dB below the maximum radiation power level shall be 450 MHz or more.

5.6.4 Description of Measurement

The transmitter output is connected to the spectrum analyser. The centre frequency of the spectrum analyser is set to the fundamental frequency. The 10dBc down values are determined.

Analyser settings:

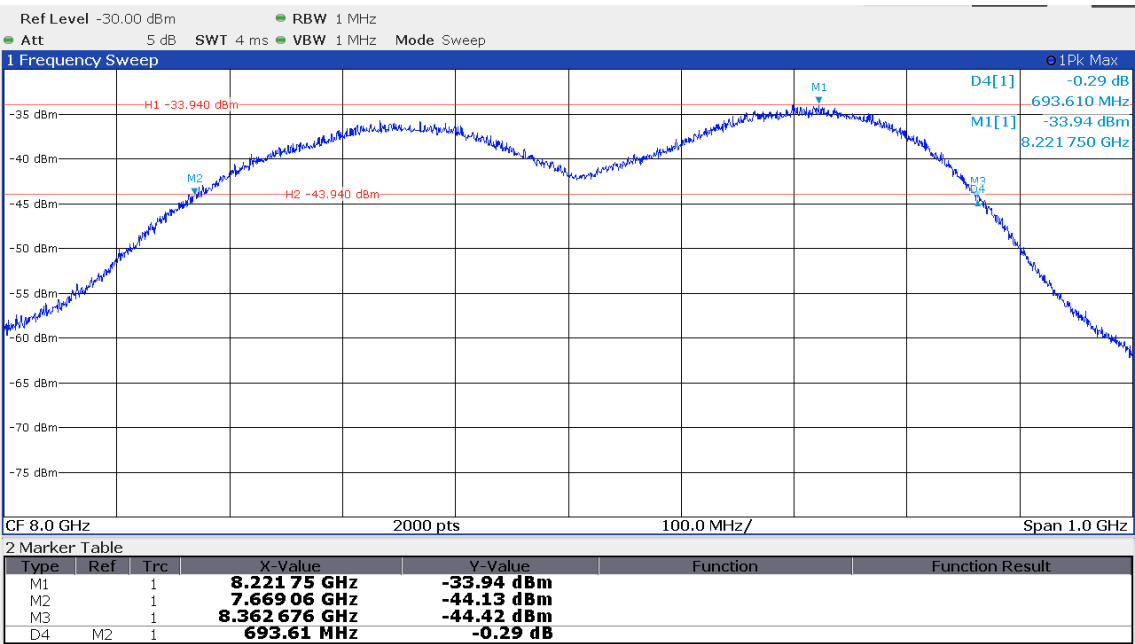
RBW: 1 MHz

VBW: 1 MHz

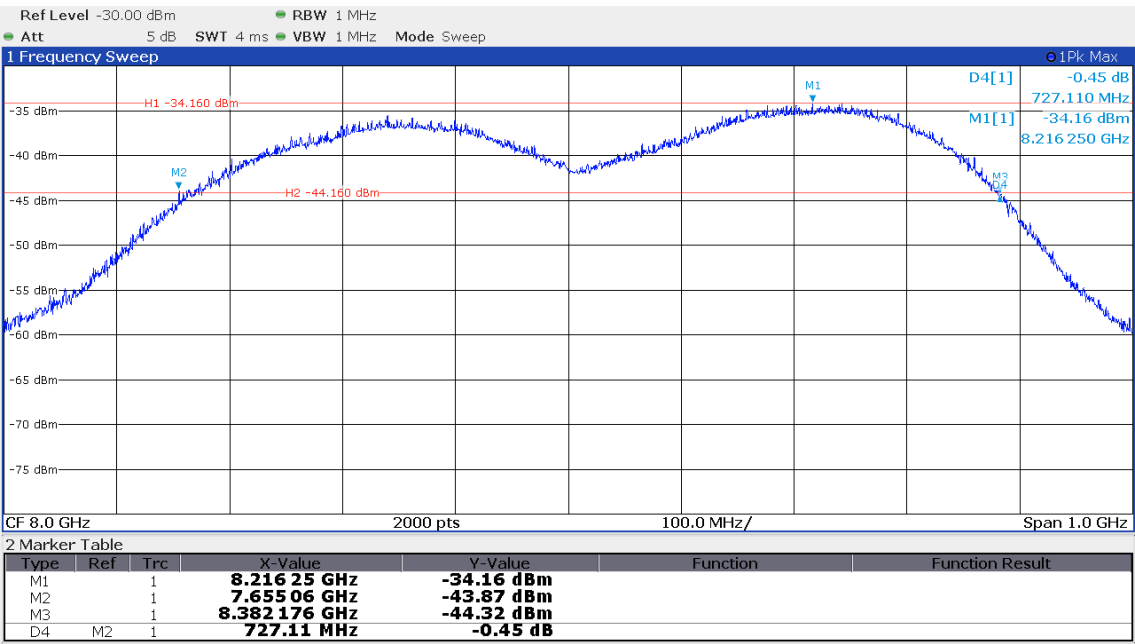
Span: 1 GHz

5.6.5 Test result

Chip A



Chip B



chip	f _c (GHz)	f _{lower} (GHz)	f _{upper} (GHz)	BW (MHz)	limit (MHz)	result
A	8.22175	7.66906	8.36268	693.61	≥ 450	passed
B	8.21625	7.65506	8.38218	727.11	≥ 450	passed

Limit according to ARIB STD-T91, Ver. 4.0, Vol. 1, section 3.2 (5):

operation frequency range	Limit
7.25 GHz – 10.25 GHz	≥ 450 MHz

The requirements are **FULFILLED**.

Remarks: None.

5.7 Antenna power tolerance

5.7.1 Applicable standard

According to Ordinance Regulating Radio Equipment, Chapter II, Section 1, Article 14, Item 7(5):
The tolerance for antenna power of the transmitter shall be as stipulated in the table below.

5.7.2 Calculation of the tolerance

Rated peak antenna power	$P_R =$	-8.0	dBm / 50MHz
Rated peak antenna power	$P_R =$	0.158	mW / 50MHz
Measured output power max	$P_{Max} =$	0.071	mW / 50MHz
Max deviation +	$P_{Max} - P_R =$	-0.087	mW / 50MHz
Max power tolerance +		-55.1	%

Rated peak antenna power	$P_R =$	-42.0	dBm / 1MHz
Rated mean antenna power	$P_R =$	63.1	μ W / 1MHz
Measured output power max	$P_{Max} =$	26.9	μ W / 1MHz
Max deviation +	$P_{Max} - P_R =$	-36.2	μ W / 1MHz
Max power tolerance +		-57.4	%

Limit according to Ordinance Regulating Radio Equipment, Chapter II, Section 1, Article 14, Item 7(3):

The measured antenna power has to be max. up to +20 % of declared power

The requirements are **FULFILLED**.

Remarks: None

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

6.1 Full name of calibration companies

- Rohde & Schwarz GmbH & Co. KG

6.2 Calibration information

The calibrations are conducted in foreign countries, which is equivalent to calibration conducted by the NICT or a designated calibration agency under Article 102-18-1 of the Radio Act.

6.3 Test systems

Test ID	Model Type	Kind of Equipment	Equipment No.	Next Calib.	Last Calib.	Calibrated by
CPC3	FSW43	Spectrum Analyser	02-02/11-15-001	13/05/2025	13/05/2024	Rohde & Schwarz
FE	FSW43	Spectrum Analyser	02-02/11-15-001	13/05/2025	13/05/2024	Rohde & Schwarz
MB	FSW43	Spectrum Analyser	02-02/11-15-001	13/05/2025	13/05/2024	Rohde & Schwarz
SEC 1-3	FSW43	Spectrum Analyser	02-02/11-15-001	13/05/2025	13/05/2024	Rohde & Schwarz