

RF-TEST REPORT

- FCC Part 15.255, RSS210 -

Type / Model Name	:	60TR13EM011
Product Description	:	Form Factor Module with BGT60TR13C Radar
Applicant	:	Infineon Technologies AG
Address	:	Am Campeon 1-15
		85579 NEUBIBERG, GERMANY
Licence holder	:	Infineon Technologies AG
Address	:	Am Campeon 1-15
		85579 NEUBIBERG, GERMANY

Test Result according to the standards listed in clause 1 test standards:			POSITIVE
Test Report No. :	T46134	-02-00HS	02. June 2021 Date of issue



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Rev. No. 6.0, 2020-04-1



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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2019)Part 15, Subpart A, Section 15.31Measurement standards

FCC Rules and Regulations Part 15, Subpa Part 15, Subpart C, Section 15.203	rt C - Intentional Radiators (September, 2019) Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.255	Operation within the band 57-71 GHz.
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2



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 Photo documentation of the EUT – Detailed photos see attachment A

2.4 Equipment category

The EUT is a field distubance sensor

2.5 Short description of the equipment under test (EUT)

Form Factor Module with BGT60TR13C Radar for use cases such as presence detection.

Number of tested samples:	1
Serial number:	B5F695102A222FED
Firmware ID:	V1.0.0

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

2.6 Variants of the EUT

There are no variants.

2.7 Operation frequency and channel plan

The operating frequency is 61.0 GHz to 61.5 GHz. The operation range is used as one channel.

2.8 Transmit operating modes

As soon as the equipment is powered on, TX starts operating independent of a possible connected control PC in last operation mode that was set before the devices switched off.

The device has one operating mode available: Stand alone: Primary radar 0.5 GHz OBW



2.9 Antenna

The following integrated antennas are used with the EUT: - Integrated linear polarised strip patch array antenna, gain 5.0 dBi.

2.10 Power supply system utilised

Power supply voltage

: 5 VDC (USB supply)

2.11 Peripheral devices and interface cables

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

-	Control PC	Model : Siemens	
-	USB cable, 1.5 m	Model : <u>Common</u>	
-	-	Model :	

2.12 Determination of worst case conditions for final measurement

Exploratory measurements have been made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement, the EUT is set in flat position.

As worst case, the following channels and test modes are selected for the final test:

Due to the need of FCC 15.31 c), the sweep has to be stopped for measurement, 3 frequencies are selected for measurement:

Frequency	Tested Channel	Power setting	Modulation	Modulation type
60.5 GHz	1	Pdef	FMCW	-

2.12.1 Test jig

No test jig is used.

2.12.2 Test software

For test mode TX CW a test software is used.



3 TEST RESULT SUMMARY

Operating in the 61.0 GHz – 61.5 GHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.203	RSS-Gen 6.7	Antenna requirement	passed
15.205(a)	RSS-Gen 8.10	Emissions in restricted bands	passed
15.207(a)	RSS-Gen 8.8	AC power line conducted emissions	passed
15.209(a)	RSS-Gen 8.9	Radiated emission limits; general requirements	passed
15.255(c)(2)	RSS210 J.2.2	EIRP	passed
15.255(d)	RSS210 J.3	Spurious emissions	passed
15.255(e)	RSS210 J.4	Peak conducted output power	n.a.
15.255(f)	RSS210 J.6	Frequency stability	passed

n.a. not applicable

The mentioned RSS Rule Parts in the above table are related to: RSS Gen, Issue 5, Amendment 2019 RSS 210, Issue 9, August 2016

3.1 Final assessment

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

Date of receipt of test sample

: acc. to storage records

Testing commenced on

: _27 March 2020

Testing concluded on

: <u>11 May 2020</u>

Checked by:

Tested by:

Jürgen Pessinger Radio Team Hermann Smetana Radio Team

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH Ohmstrasse 1-4 94342 STRASSKIRCHEN GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:

15-35 ° C	

Humidity: <u>30-60 %</u>

Atmospheric pressure: 86-106 kPa

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 / 11.2003 "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 Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
Output power ERP, radiated	40000 MHz to 110000 MHz	95%	± 5.41 dB
Field strength of the fundamental	1000 MHz to 40000 MHz	95%	± 2.34 dB
Field strength of the fundamental	40000 MHz to 110000 MHz	95%	± 5.41 dB
Power spectral density	40000 MHz to 110000 MHz	95%	± 5.41 dB
Spurious Emissions, conducted	9 kHz to 10000 MHz	95%	± 2.15 dB
Spurious Emissions, conducted	10000 MHz to 40000 MHz	95%	± 3.47 dB
Spurious Emissions, radiated	9 kHz to 30 MHz	95%	± 3.53 dB
Spurious Emissions, radiated	30 MHz to 1000 MHz	95%	± 4.44 dB
Spurious Emissions, radiated	1000 MHz to 40000 MHz	95%	± 2.89 dB
Spurious Emissions, radiated	40000 MHz to 60000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	60000 MHz to 90000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	75000 MHz to 110000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	110000 MHz to 170000 MHz	95%	± 5.04 dB
Spurious Emissions, radiated	140000 MHz to 220000 MHz	95%	± 5.04 dB

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 for FCC and ISED

4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011 ISED: DE0009

4.5.2 General Standard information

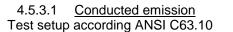
The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

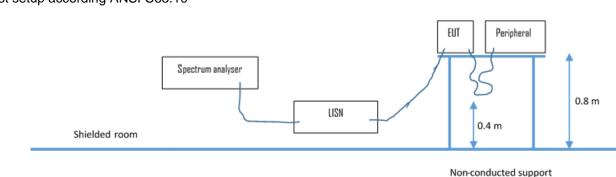
4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.



4.5.3 Details of test procedures





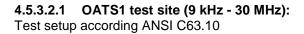
The final level, expressed in $dB\mu V$, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

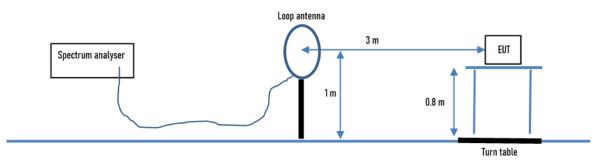
To convert between $dB\mu V$ and μV , the following conversions apply:

 $dB\mu V = 20(\log \mu V)$ $\mu V = Inverse \log(dB\mu V/20)$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.5.3.2 Radiated emission





Emissions from the EUT are measured in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres from the EUT. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

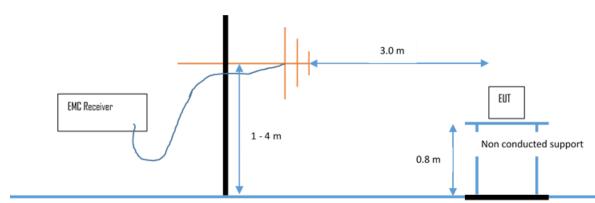
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4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

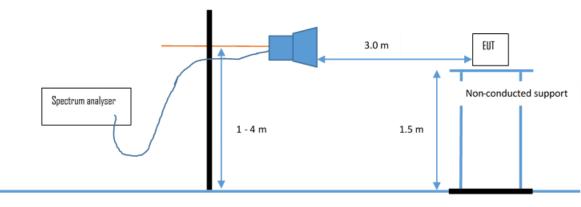
The resolution bandwidth setting: 30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	= Level (dBµV/m)	- Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	= 107.6	- 110.0	=	-2.4

4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Tilt antenna mast

Turn table

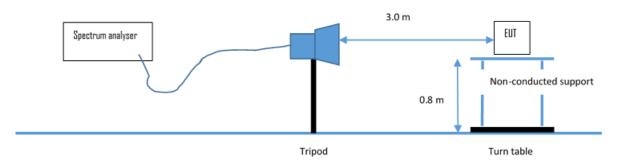
Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded

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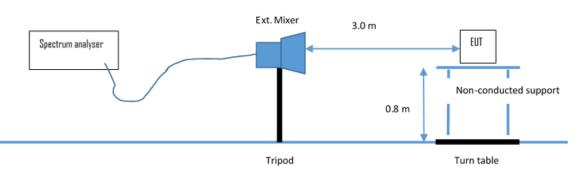
back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.5.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 0.8 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limits will be adopted.

4.5.3.2.5 Anechoic chamber 1 (40 GHz – 200 GHz)



Emissions from the EUT are measured in the frequency range 40 GHz up to 200 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and external mixer with standard gain horn. Table top equipment is placed on a non-conducting table, 0.8 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limits are adopted.

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5 TEST CONDITIONS AND RESULTS

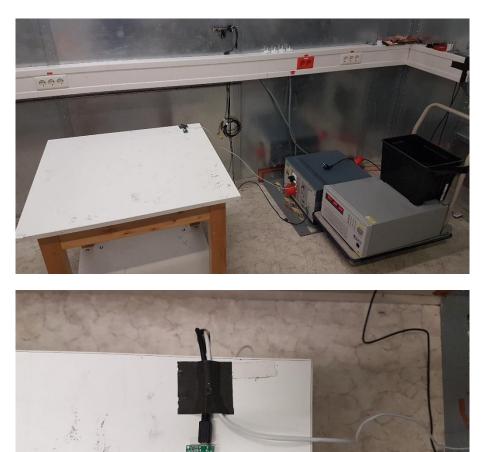
5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.



5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range:	0.15 MHz - 30 MHz
Min. limit margin	-18.7 at 0.449 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission	Conducted limit (dBµV)				
(MHz)	Quasi-peak	Average			
0.15-0.5	66 to 56 *	56 to 46 *			
0.5-5	56	46			
5-30	60	50			

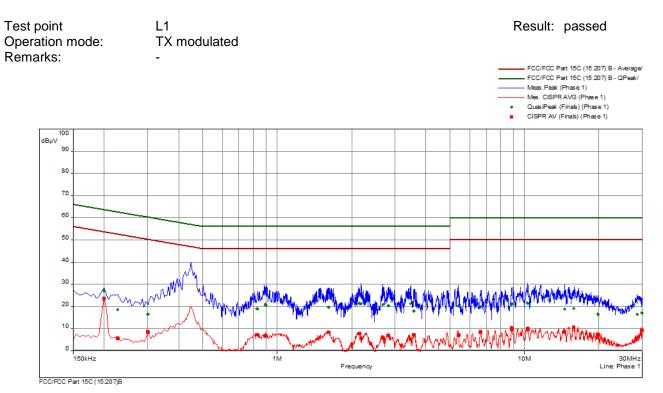
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED.**

Remarks: For detailed test result please refer to following test protocols.



5.1.6 Test protocol

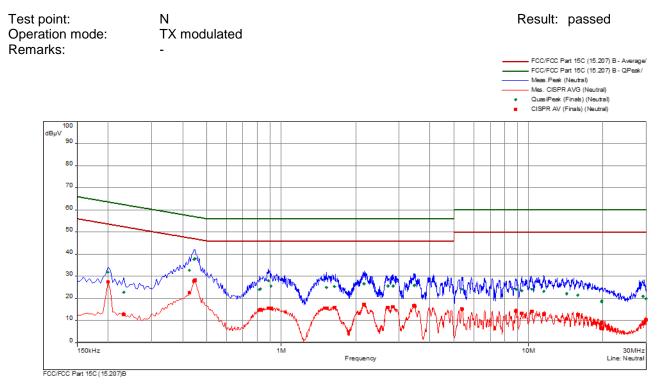


freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.200	1	27.1	-36.6	63.6	23.5	-30.2	53.6	Phase 1	10.3
0.227	1	18.6	-44.0	62.6	5.6	-47.0	52.6	Phase 1	10.3
0.300	1	16.5	-43.8	60.2	8.4	-41.8	50.2	Phase 1	10.2
0.830	3	19.0	-37.0	56.0	7.2	-38.8	46.0	Phase 1	10.2
0.834	3	18.8	-37.2	56.0	7.1	-38.9	46.0	Phase 1	10.2
0.897	3	21.0	-35.0	56.0	6.8	-39.2	46.0	Phase 1	10.2
0.902	3	20.5	-35.5	56.0	6.7	-39.3	46.0	Phase 1	10.2
1.610	4	19.6	-36.4	56.0	8.4	-37.6	46.0	Phase 1	10.3
1.614	4	19.8	-36.2	56.0	8.3	-37.7	46.0	Phase 1	10.3
2.150	4	21.4	-34.6	56.0	7.8	-38.2	46.0	Phase 1	10.3
2.186	4	21.2	-34.8	56.0	5.6	-40.4	46.0	Phase 1	10.3
2.675	5	20.9	-35.1	56.0	5.8	-40.2	46.0	Phase 1	10.3
2.819	5	20.3	-35.7	56.0	6.9	-39.1	46.0	Phase 1	10.3
3.462	5	21.2	-34.8	56.0	5.2	-40.8	46.0	Phase 1	10.3
3.575	5	17.9	-38.1	56.0	7.2	-38.8	46.0	Phase 1	10.3
5.403	6	20.2	-39.8	60.0	7.0	-43.0	50.0	Phase 1	10.4
6.654	6	19.8	-40.2	60.0	8.5	-41.6	50.0	Phase 1	10.4
8.873	6	20.9	-39.1	60.0	10.3	-39.7	50.0	Phase 1	10.5
8.904	6	21.2	-38.8	60.0	9.6	-40.4	50.0	Phase 1	10.5
10.307	7	21.6	-38.4	60.0	10.0	-40.0	50.0	Phase 1	10.5
10.311	7	21.3	-38.7	60.0	9.7	-40.3	50.0	Phase 1	10.5
14.541	7	18.8	-41.2	60.0	8.5	-41.5	50.0	Phase 1	10.6
15.797	7	19.1	-40.9	60.0	10.5	-39.6	50.0	Phase 1	10.7
19.803	8	16.4	-43.6	60.0	7.5	-42.5	50.0	Phase 1	10.7
19.826	8	16.3	-43.7	60.0	7.0	-43.0	50.0	Phase 1	10.7
28.533	8	16.3	-43.7	60.0	5.4	-44.7	50.0	Phase 1	11.1
29.816	8	17.0	-43.0	60.0	9.2	-40.8	50.0	Phase 1	11.1

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freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.200	9	31.8	-31.8	63.6	27.5	-26.1	53.6	Neutral	10.3
0.231	9	22.8	-39.6	62.4	12.7	-39.7	52.4	Neutral	10.3
0.426	10	32.7	-24.6	57.3	22.6	-24.7	47.3	Neutral	10.2
0.444	10	37.6	-19.4	57.0	27.8	-19.2	47.0	Neutral	10.2
0.449	10	38.1	-18.9	56.9	28.2	-18.7	46.9	Neutral	10.2
0.816	11	24.0	-32.0	56.0	14.7	-31.3	46.0	Neutral	10.2
0.825	11	24.3	-31.7	56.0	14.9	-31.1	46.0	Neutral	10.2
0.888	11	28.0	-28.0	56.0	15.7	-30.3	46.0	Neutral	10.2
0.911	11	25.6	-30.4	56.0	15.6	-30.5	46.0	Neutral	10.2
1.524	12	25.0	-31.0	56.0	15.6	-30.4	46.0	Neutral	10.3
1.641	12	25.4	-30.6	56.0	15.9	-30.1	46.0	Neutral	10.3
2.163	12	26.6	-29.4	56.0	17.2	-28.8	46.0	Neutral	10.3
2.168	12	26.6	-29.4	56.0	17.2	-28.8	46.0	Neutral	10.3
2.702	13	25.6	-30.4	56.0	16.0	-30.0	46.0	Neutral	10.3
2.832	13	25.7	-30.4	56.0	16.2	-29.9	46.0	Neutral	10.3
3.449	13	25.8	-30.2	56.0	16.8	-29.2	46.0	Neutral	10.3
3.462	13	26.0	-30.0	56.0	16.6	-29.4	46.0	Neutral	10.3
5.385	14	24.2	-35.8	60.0	15.3	-34.7	50.0	Neutral	10.4
8.900	14	24.1	-35.9	60.0	14.3	-35.7	50.0	Neutral	10.5
9.399	14	23.5	-36.5	60.0	13.4	-36.6	50.0	Neutral	10.5
10.302	15	24.3	-35.8	60.0	14.3	-35.7	50.0	Neutral	10.5
11.531	15	23.2	-36.8	60.0	12.9	-37.1	50.0	Neutral	10.6
14.285	15	22.2	-37.8	60.0	10.6	-39.4	50.0	Neutral	10.6
15.824	15	21.5	-38.5	60.0	12.7	-37.4	50.0	Neutral	10.7
19.731	16	18.4	-41.6	60.0	6.6	-43.4	50.0	Neutral	10.7
19.781	16	18.9	-41.1	60.0	9.1	-40.9	50.0	Neutral	10.7
29.105	16	21.0	-39.0	60.0	8.7	-41.3	50.0	Neutral	11.1
29.816	16	19.9	-40.2	60.0	10.3	-39.7	50.0	Neutral	11.1

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5.2 EIRP

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

5.2.1 Description of the test location

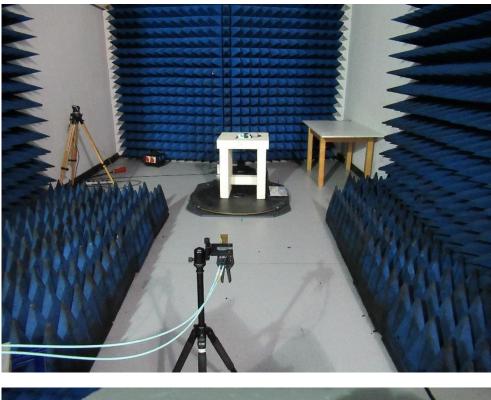
Test location:Anechoic chamber 2Test distance:3 m

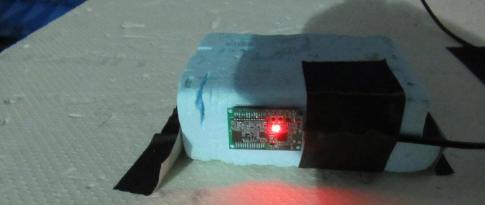
5.2.2 Applicable standard

According to FCC Part 15C, Section 15.255(c)(2):

For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm.

5.2.3 Photo documentation of the test set-up





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5.2.4 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 9.11. The EUT is measured in TX continuous unmodulated under normal conditions.

Analyser settings:				
PK measurement:	RBW: 1 MHz	VBW: 3 MHz	Detector: PK	Trace. Max hold
AV measurement:	RBW: 10 MHz	VBW: 28 MHz	Detector: RMS	Trace. Max hold

ANSI C63.10, 2013, Item 9.11 f) 1):

For radiated measurements:

 Calculate the maximum peak and average field strength of the emission at the measurement distance, using Equation (19) and the peak and average (respectively) substitution power at the output of the test antenna (input to the instrumentation system) as recorded in step e).

Equation (19): λ (61.0 GHz) = 0.00491; G = 24 dBi; P (meas) (Pk) = -44.3 dBm; P (meas) (AVG) = -45.9 dBm; Emeas (Pk) = 126.8 + 46.2 - 44.5 - 24 = 104.5 dBµV/m; Emeas (AVG) = 126.8 + 46.2 - 44.9 - 24 = 104.1 dBµV/m;

2) Calculate the peak and average EIRP from the measured peak and average (respectively) field strength using Equation (22), and then convert to linear form using Equation (24).

Example:

Example:

Example. Equation (22): $d_{Meas} = 3 \text{ m};$ Equation (24): Equation (24): EIRP (Pk) = 104.5 + 9.5 - 104.7 = 9.3 dBm; EIRP (AVG) = 104.1 + 9.5 - 104.7 = 8.9 dBm; EIRPLinear = 10^{[[EIRPLog -30]/10]}; EIRP (Pk) = 0.008546 W; EIRP (AVG) = 0.007785 W;

For peak measurements, calculate the peak conducted output power from the peak EIRP using Equation (27).

Example:	
Equation (27):	$P_{cond} = EIRPI_{in} / G_{EUT};$
G _{EUT} = 5.0 dBi; 3.16	
	$P_{cond} = 11.4 / 3.16 = 3.6 \text{ mW};$

5.2.5 Test result

Frequency	Level PK	Limit PK	Margin PK	Level AV	Limit AV	Margin AV
(GHz)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
61.019	9.3	43.0	-33.7	8.9	40.0	-31.1
61.249	10.6	43.0	-32.4	10.2	40.0	-29.8
61.479	9.9	43.0	-33.1	9.2	40.0	-30.8

Note: The peak and average values are radiated values.



EIRP limit according to FCC Part 15C, Section 15.255(c)(2):

For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm.

The requirements are **FULFILLED**.

Remarks:



5.2.6 Test protocols

Ref Level -10.00 dBm	n erbw	10 🔶 🗙 110-170 1 MHz	× 170-200	60-902	★ 60-903	★ 60-90-	= <mark>+</mark> ×
	● SWT 100 ms ● VBW						
TDF "E-EIRP3" Inp: Ext 1 Zero Span	tMix E						
							M1[1]
20 dBm							2
10.dBm	M1						
0 dBm							
-10-dBm -10	0.000 dBm						
-20 dBm							
-30 dBm							
-40 dBm							
-50 dBm							
-60 dBm							
	X 40-60 ¥ 90-1		40001 pts	60-902	X 60-903	× 60-90-	• <mark>*</mark> >
MultiView 📰 18-40 😤 RefLevel -10.00 dBm	n • RBW • SWT 100 ms • VBW	1 MHz	_	60-902	★ 60-903	× 60-90-	* * ×
MultiView = 18-40 * Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext	n • RBW • SWT 100 ms • VBW	1 MHz	_	60-902	★ 60-903	★ 60-90-	
MultiView 📰 18-40 😤 RefLevel -10.00 dBm	n • RBW • SWT 100 ms • VBW	1 MHz	_	60-902	60-903	60-90-	
MultiView 18-40 Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 1 Zero Span	n • RBW • SWT 100 ms • VBW	1 MHz	_	★ ★ 60-902	66-903	X 60-90-	M1[1]
MultiView = 18-40 * Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext	n • RBW • SWT 100 ms • VBW	1 MHz	_	÷ × 60-902	× 60-903	50-50-	M1[1]
MultiView 18-40 Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 1 Zero Span 20 dBm	n • RBW • SWT 100 ms • VBW	1 MHz 3 MHz	_	÷ × 60-902	60-903	60-50-	M1[1]
MultiView 18-40 Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 1 Zero Span	n • RBW • SWT 100 ms • VBW	1 MHz 3 MHz	_	÷ × 60-902	60-903	60-30-	M1[1]
MultiView 19-40 Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 1 Zero Span 20 dBm 10 dBm 10 dBm	n • RBW • SWT 100 ms • VBW	1 MHz 3 MHz	_	÷ × 60-902	60-903	60-304	M1[1]
MultiView 18-40 Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 1 Zero Span 20 dBm	n • RBW • SWT 100 ms • VBW	1 MHz 3 MHz	_	÷ × 60-992	60-903	60-50-	M1[1]
MultiView 19-40 Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 1 Zero Span 20 dBm 10 dBm 0 dBm	n • RBW • SWT 100 ms • VBW	1 MHz 3 MHz	_	* × 60-902	× 00-903	X 50-90-	M1[1]
MultiView 19-40 # Ref Level -10.00 dBm # TDF "E-EIRP3" Inp: Ext 1 20 dBm	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_	* × 60-902	× 00-903	X 50-90-	M1[1]
MultiView 19-40 # Ref Level -10.00 dBm # TDF "E-EIRP3" Inp: Ext 1 20 dBm	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_	* × 60-902	× 00-903	X 50-90-	M1[1]
MultiView 19-40 # Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 12 odBm 10 dBm 10 dBm 10 dBm 10 dBm 10 dBm	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_	••••••••••••••••••••••••••••••••••••	× 00-903	X 50-90-	M1[1]
MultiView 19-40 # Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 12 odBm 10 dBm 10 dBm 10 dBm 10 dBm 10 dBm	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_	••••••••••••••••••••••••••••••••••••	× 00-903		M1[1]
MultiView 18-40 # Ref Level -10.00 dBm	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_	••••••••••••••••••••••••••••••••••••	× 00-903		M1[1]
MultiView 18-40 # Ref Level -10.00 dBm	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_		× 60-903		M1[1]
Multiview Image: I	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_		80-903		M1[1]
Multiview Image: I	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_				M1[1]
Multiview Is-40 Here Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 12 dBm 1 20 dBm 1 10 dBm 1 -10 -dBm 1 -20 dBm 1 -30 dBm 1	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_				
Multiview Is-40 Here Ref Level -10.00 dBm TDF "E-EIRP3" Inp: Ext 12 dBm 1 20 dBm 1 10 dBm 1 -10 -dBm 1 -20 dBm 1 -30 dBm 1	n RBW SWT 100 ms VBW Mix E	1 MHz 3 MHz	_				M1[1]

GROUP"

Mid:

Multi¥iew 📒 18	-40 🔆 🗙 40-1	60 🔆 🗙 90-	110 🔶 🗙 1	10-170	170-200 🔆 🗙	60-902	60-903	X 60-904 🔆	× •
Ref Level -1	0.00 dBm	• RBV 100 ms • VBV	V 1 MHz						
TDF "E-EIRP3" 1 Zero Span	Inp: ExtMix E	100 110 - 101							o1Pk Max
								M1[1] 10.57 dBm 61.30250 ms
20 dBm									
10 dBm						M1			
0 dBm									
	-10.000 dBm	l							
-20 dBm									
-30 dBm									
-40 dBm									
-50 dBm									
-60 dBm									
CF 61.24938	ĠHz	1	1	4000	1 nte		1		
-	V 1			_	_				
MultiView 18 Ref Level -1	0.00 dBm • SWT	60	V 1 MHz	_	_	60-902	60-903	X 60-904 🔆	10.0 ms/
Ref Level -1	0.00 dBm	• RBV	V 1 MHz	_	_	00-902 ×	60-903	_	• • • • • • • • • • • • • • • • • • •
Ref Level -1 TDF "E-EIRP3" 1 Zero Span	0.00 dBm • swt	• RBV	V 1 MHz	_	_	60-902 X	60-903	_	• 0 1Rm Max 0 10.19 dBm
Ref Level -1	0.00 dBm • swt	• RBV	V 1 MHz	_	_	60-902 X	50-903 B	_	• 01Rm Max 01Rm Max 10.19 dBm 99.50750 ms
Ref Level -1 TDF "E-EIRP3" 1 Zero Span	0.00 dBm • swt	• RBV	V 1 MHz	_	_	60-902 ×	60-903	_	• 01Rm Max 01Rm Max 10.19 dBm 99.50750 ms
Ref Level -1 TDF "E-EIRP3" 1 Zero Span 20 dBm-	0.00 dBm • swt	• RBV	V 1 MHz	_	_	60-902	66-183	_	• 01Rm Max 01Rm Max 10.19 dBm 99.50750 ms
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm	0.00 dBm • swt	• RBV	V 1 MHz	_	_	60-902 ×	60-903	_	• 01Rm Max 01Rm Max 10.19 dBm 99.50750 ms
Ref Level -11 TDF "E-EIRP3" 1 Zero Span 20 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_	60-902	60-903	_	• • • • • • • • • • • • • • • • • • •
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_	60-902 ×	60-903	_	• 01Rm Max 01Rm Max 10.19 dBm 99.50750 ms
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_	00-992 ×	90-903	_	• 01Rm Max 01Rm Max 10.19 dBm 99.50750 ms
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm -10-dBm -20 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_	60-992 ×	so-so3	_	• • • • • • • • • • • • • • • • • • •
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm -10-dBm -20 dBm -20 dBm -30 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_	00-992 ×	90-903	_	• • • • • • • • • • • • • • • • • • •
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm -10-dBm -20 dBm -20 dBm -30 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_	60-992 ×	60-903	_	• • • • • • • • • • • • • • • • • • •
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm -10-dBm -20 dBm -30 dBm -40 dBm	0.00 dBm • swt	■ RBV	V 1 MHz	_	_			_	• • • • • • • • • • • • • • • • • • •
Ref Level - 11 TDF "E-EIRP3" 1 Zero Span 20 dBm -10-dBm -20 dBm -30 dBm -30 dBm -50 dBm	0.00 dBm	■ RBV	V 1 MHz		_		60-903	_	0 1Rm Max] 10.19 dBm

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GROUP"

High:

TDF "E-EIRP3" Inp:	 SWT 100 ms ExtMix E 							
Zero Span								o 1Pk Ma
							M1[:	l] 9.86 dE 86.35750 r
20 dBm								
							M1	
0.dBm	······						X	
dBm								
10-dBm	-10.000 dBm							
20 dBm								
30 dBm								
40 dBm								
50 dBm								
50 dBm								
bo ubin								
ulti¥iew 📕 18-40	₩ 40-60 ₩ >	_	110-170	40001 pts	★ 60-902	X 60-903	× 60-904 🔾	10.0 m
ulti¥iew = 18-40 RefLevel -10.00 c	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	60-902	X 60-903	66-904	_
ulti¥iew 18-40 Ref Level -10.00 c DF "E-EIRP3" Inp:	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	60-902	60-903	_	× 01Rm Ma
ultiview = 18-40 Ref Level -10.00 c IDF "E-EIRP3" Inp:	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	118-170	_	★ ★ 00-902	X 60-903	× 60-904 ×	• 1Rm Ma
uttiview = 18-40 RefLevel -10.00 c IDF "E-EIRP3" Inp: Zero Span	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	★ €0-902	X 50-903	_	• 1Rm Ma
ultView = 18-40 Ref Level - 10.00 c DF "E-EIRP3" Inp: Zero Span	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	★ 60-902	60-903	_	• 1Rm Ma
uttiview = 18-40 Ref Level - 10.00 c TDF "E-EIRP3" Inp: Zero Span 0 dBm	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	60-902	60-903	M1[:	• 1Rm Ma
ultView = 18-40 Ref Level - 10.00 c DF "E-EIRP3" Inp: Zero Span 0 dBm	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	60-902	60-903	M1[:	• 1Rm Ma
ultView = 18-40 Ref Level - 10.00 c DF "E-EIRP3" Inp: Zero Span 0 dBm	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	★ ★ 00-902	× 60-903	M1[:	• 1Rm Ma
ultiview 18-40 Ref Level -10.00 c DF "E-EIRP3" Inp: Zero Span 0 dBm	IBm • • • • • • • • • • • • • • • • • • •	RBW 1 MHz	110-170	_	60-902	× 60-903	M1[:	• 1Rm Ma
altiview 18-40 Ref Level -10.00 c DF "E-EIRP3" Inp: Zero Span 0 dBm	IBm SWT 100 ms ExtMix E	RBW 1 MHz	118-170	_	60-902	× 60-903	M1[:	• 1Rm Ma
itiview 18-40 Ref Level -10.00 c DF "E-EIRP3" Inp: Zero Span 0 dBm 1 dBm dBm 10-dBm	IBm SWT 100 ms ExtMix E	RBW 1 MHz	110-170	_	60-902	60-903	M1[:	•1Rm Ma
altiview 18-40 Ref Level -10.00 c DF "E-EIRP3" Inp: Zero Span D dBm	IBm SWT 100 ms ExtMix E	RBW 1 MHz	110-170	_	60-902	60-903	M1[:	•1Rm Ma
ultiview 18-40 Ref Level -10.00 c IDF "E-EIRP3" Inp: Zero Span 0 dBm 0 0 dBm 0 10-dBm	IBm SWT 100 ms ExtMix E	RBW 1 MHz		_	★ ★ 00-902	X 60-903	M1[:	• 1Rm Ma
ultiview 18-40 Ref Level -10.00 c IDF "E-EIRP3" Inp: Zero Span 0 dBm 0 0 dBm 0	IBm SWT 100 ms ExtMix E	RBW 1 MHz	110-170	_	► ► 00-902	× 60-903	M1[:	• 1Rm Ma
wittView 18-40 Ref Level -10.00 c DF "E-EIRP3" Inp: Zero Span 0 0 dBm 0 0 dBm 0 10-dBm 0 20 dBm 0 10-dBm 0 10-dBm 0 10-dBm 0 40 dBm 0	IBm SWT 100 ms ExtMix E	RBW 1 MHz	110-170	_	60-902	X 60-903	M1[:	• 1Rm Ma
ultiview 18-40 Ref Level -10.00 c IDF "E-EIRP3" 0 dBm 0 0 dBm 0 0 dBm 0 0 dBm 0 10-dBm 0	IBm SWT 100 ms ExtMix E	RBW 1 MHz		_	60-902	50-903	M1[:	• 1Rm Ma
F 61.4791 GHz wdwiew 18-40 Ref Level -10.00 c TDF "E-EIRP3" Inp: Zero Span 20 dBm 0 10 dBm 0 20 dBm 0 30 dBm 0 40 dBm 0 50 dBm 0	IBm SWT 100 ms ExtMix E	RBW 1 MHz		_	60-902		M1[:	• 1Rm Ma



5.3 Peak conducted output power

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

5.3.1 Description of the test location

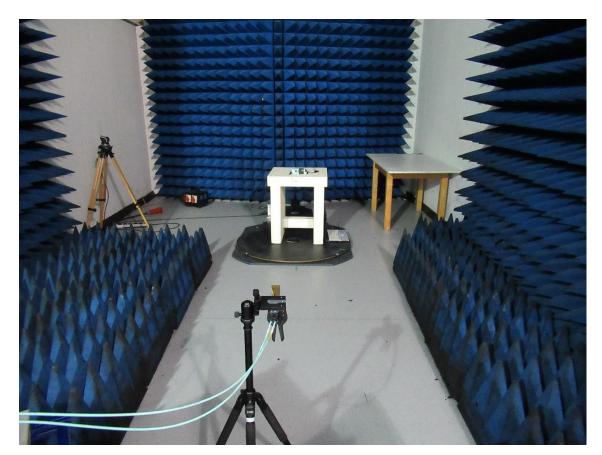
Test location:Anechoic chamber 2Test distance:3 m

5.3.2 Applicable standard

According to FCC Part 15C, Section 15.255(e):

Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (c) of this section.

5.3.3 Photo documentation of the test set-up







5.3.4 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 9.11. The EUT is measured in TX continuous unmodulated under normal conditions.

Analyser settings:				
PK measurement:	RBW: 1 MHz	VBW: 3 MHz	Detector: PK	Trace. Max hold
AV measurement:	RBW: 10 MHz	VBW: 28 MHz	Detector: RMS	Trace. Max hold

5.3.5 Test result

...

The conducted output power is calculated because it can not be measured. The calculation is based on the following formula: Conducted peak level = Peak EIRP – Antenna gain; Example: Conducted peak level = 20.2 dBm – 5.0 dBi = 15.2 dBm

Frequency	Frequency Level PK		Level Pk	Limit PK	Margin PK
Trequency	Leverric	Gain	cond	cond	cond
(GHz)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
61.019	9.3	5.0	4.3	27.0	-22.7
61.249	10.6	5.0	5.6	27.0	-21.4
61.479	9.9	5.0	4.9	27.0	-22.1



EIRP limit according to FCC Part 15C, Section 15.255(e):

Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (c) of this section. (1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

Determination of the limit:

Emission bandwidth 6 dB

Multi¥iew - OBW	/+PSD X	maxPeakPow	X SER 1-4	× SER 4-12.75	× SER 12	2.75-18	SER 18-40	×	-
Ref Level 20.0			100 kHz					_	
TDF "E-EIRP3"		44.1 ms 🗢 VBW	300 kHz Mode	e Auto Sweep					
1 Frequency S									o1Pk Max
								M3[1]	-16.36 dBm
10 dBm								6	.4796210 GHz
0.40.0								M1[1]	-10.82 dBm
0 dBm						M1		61	.3584980 GHz
-10 dBm		M2	1		the second descent		M3		
tide i en un ultru	——H1 -16.000 dB	m		Platence and south sources. They are a set of the set o		in the second beauty of the second	and a subdictor on a size	and a second a second	and a subartite still as a loss
420sdBm+skn.dtdm									
-30 dBm									
40.40.0									
-40 dBm									
-50 dBm									
-60 dBm									
-70 dBm								_	
CF 61.25 GHz			44001 pt	ts	10	0.0 MHz/			Span 1.0 GHz
2 Marker Peak									
No	X-Valu		Y-Va		No	X-Valu		Y-Va	
1	61.053732	GHZ	-13.122	abm	2	61.358498	GHZ	-10.818	abm
3 Marker Table Type Ref		X-Value		Y-Value		Function		Function Re	a ult
M1		1.358498 G	Hz -:	10.82 dBm		FUNCTION		FULCION R	esuit
M2	1 6	1.019642 G	Hz -:	16.42 dBm					
M3	1 6	1.479621 G	Hz -:	16.36 dBm					
The limit is g	niven as 50	0 mW * FRV	V 6 dB (100	kHz RBW/	/ 100 MH7				
	9.1011 40 00				,	,			
			· ·				1 ins it		
For 60.5 GH	iz pand: EE	5VV = 460 IVI	HZ;				Limit = 5	SUU MVV;	

The requirements are FULFILLED.

Remarks:

CSA Group Bayern GmbH Ohmstrasse 1-4 · 94342 STRASSKIRCHEN · GERMANY Tel.: +49(0)9424-94810 · Fax: +49(0)9424-9481440

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5.4 Correction for pulse operation (duty cycle)

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

5.4.1 Description of the test location

Test location: NONE

5.4.1 Applicable standard

According to FCC Part 15A, Section 15.35(c):

When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

5.4.2 Description of Measurement

Global	Intering Barry Dr.	and the state of the second state of the secon	ange Doppler Doppler Spectrogram Range	A Concernant Villation Concern	ion Bable Different	on Plantal Ph	and and an a Version of
	Timing (Data SI	pectral Peak R	ange Doppier Doppier Spectrogram (Kange	e / Crossrange Clutter Correc	ion katio Differen	ice Signal Di	eviation (large
Sequence Trigger	escala						
Trigger Stop / Reset	65GH2-						
Data Slice Size: 128	64GHz- 63GHz-		Chirp: 61-61.5 GHz				
	62012-	(· · · · · · · · · · · · · · · · · · ·				
Set Calibration Clear Calibration	61GH2-						
Average over 1 🗢 Frames	59GH2-						
1	58GHz-						
Auto-Restart on Overflow	57GHz- Power	Sche	IIAI	Idle			
Current Frame:	128						
- Frame Sequence	(0%)						
and the second se	FIFO						
#Frames 0 - +							
#Frames 0 - +			1				
Shape 1 Repeat 1 © times							
Shape 1 Repeat 1 times Idle after last repetition	Start Time	Duration	Description	FrequencyRange	Associated Bitfi	Power Mode	Power Consump
Shape 1 Repeat 1 times	Start Time	Duration	anne a	FrequencyRange		Power Mode	
Shape 1 Repeat 1 times Idle after last repetition							
Shape 1 Repeat 1 Itimes Idle Idle after last repetition End Delay (T_SED): 366,488µs		40.003.003	anne a		14. 1_4114.1 A	anonomp	
Shape 1 Repeat 1 0 times Idle 0 after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off 0 times	£103001110	1.125µs	Start of Shape Set 1, Shape 1, Repetition 1	010001011 0100010	z T_PAEN, T_S	anonomp	404.705mW
Shape 1 Repeat 1 0 times Idle 0 after last repetition End Delay (T_SED): 366,488µs	1.06864ms	1.125µs 1.875µs	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay	61.0051GHz - 61.0051G	z T_PAEN, T_S	Interchirp Interchirp	404.705mW 377.865mW
Shape 1 Repeat 1 • times Idle • after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off • times Shape 5et Repeat 1 • times	1.06864ms 1.06976ms	1.125µs 1.875µs 3.1125µs	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay PA Delay, Ramp in Progress	61.0051GHz - 61.0051G 61.0051GHz - 61.0051G	tz T_PAEN, T_S tz T_PAEN, TLU z T_SSTART, R	Interchirp Interchirp Active	404.705mW 377.865mW 377.865mW
Shape 1 Repeat 1 0 times Idle 0 after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off 0 times	1.06864ms 1.06976ms 1.07164ms	1.125µs 1.875µs 3.1125µs 54.4µs	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay PA Delay, Ramp in Progress ADC Delay, Ramp in Progress	61.0051GHz - 61.0051GH 61.0051GHz - 61.0051GH 61.0201GHz - 61.0201GH	Image: Non-State Image: Non-State Az T_PAEN, T_S Az T_PAEN, RTU z T_SSTART, R z APU, ADC_DI	Interchirp Interchirp Active	404.705mW 377.865mW 377.865mW 406.665mW
Shape 1 Repeat 1 • times Idle • after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off • times Shape 5et Repeat 1 • times	1.06864ms 1.06976ms 1.07164ms 1.07475ms	1.125µs 1.875µs 3.1125µs 54.4µs 12.5ns	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay PA Delay, Ramp in Progress ADC Delay, Ramp in Progress Sampling, Ramp in Progress	61.0051GHz - 61.0051GH 61.0051GHz - 61.0051GH 61.0201GHz - 61.045GH 61.045GHz - 61.4806GH	t tz T_PAEN, T_S tz T_PAEN, RTU z T_SSTART, R z APU, ADC_DI tz RTU	Interchirp Interchirp Active Active	404.705mW 377.865mW 377.865mW 406.665mW 406.665mW
Shape 1 Repeat 1 0 times Idle 0 after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off 0 times Shape Set Repeat 1 • times Idle © after last repetition	1.06864ms 1.06976ms 1.07164ms 1.07475ms 1.12915ms	1.125µs 1.875µs 3.1125µs 54.4µs 12.5ns 75ns	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay PA Delay, Ramp in Progress ADC Delay, Ramp in Progress Sampling, Ramp in Progress Wait for Ramp End, Ramp in Progress	61.0051GHz - 61.0051G 61.0051GHz - 61.0201G 61.0251GHz - 61.0201G 61.0201GHz - 61.045GH 61.045GHz - 61.4806GH 61.4806GHz - 61.4807G	Image: Second	Interchirp Active Interchirp Active Interchirp	404.705mW 377.865mW 377.865mW 406.665mW 406.665mW 377.865mW
Shape 1 Repeat 1 times Idle after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off times Shape Set Repeat 1 times Idle after last repetition End Delay (T_FED): 4.86415ms	1.06864ms 1.06976ms 1.07164ms 1.07475ms 1.12915ms 1.12916ms	1.125µs 1.875µs 3.1125µs 54.4µs 12.5ns 75ns 1.0625µs	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay PA Delay, Ramp in Progress ADC Delay, Ramp in Progress Sampling, Ramp in Progress Wait for Ramp End, Ramp in Progress Wait for Ramp End, Fast Down Ramp	61.0051GHz - 61.0051G 61.0051GHz - 61.0201G 61.0201GHz - 61.045GH 61.045GHz - 61.4806GH 61.4806GHz - 61.4807G 61.4807GHz - 61.0051G	Image: Second	Active Interchirp Active Interchirp Interchirp Interchirp	404.705mW 377.865mW 377.865mW 406.665mW 377.865mW 377.865mW 377.865mW
Shape 1 Repeat 1 times Idle after last repetition End Delay (T_SED): 366.488µs Shape 2 Repeat Off times Shape Set Repeat 1 times Idle after last repetition End Delay (T_FED): 4.86415ms	1.06864ms 1.06976ms 1.07164ms 1.07475ms 1.12915ms 1.12916ms 1.12924ms	1.125µs 1.875µs 3.1125µs 54.4µs 12.5ns 75ns 1.0625µs 25ns	Start of Shape Set 1, Shape 1, Repetition 1 PA Delay, Pre-Chirp Delay PA Delay, Ramp in Progress ADC Delay, Ramp in Progress Sampling, Ramp in Progress Wait for Ramp End, Ramp in Progress Wait for Ramp End, Fast Down Ramp Wait for Ramp End, Post-Chirp Delay	61.0051GHz - 61.0051G 61.0051GHz - 61.0201G 61.0201GHz - 61.045GH 61.045GHz - 61.4806GH 61.4806GHz - 61.4807G 61.4807GHz - 61.051G 61.0051GHz - 61.0051G	Image: Second	Interchirp Interchirp Active Active Interchirp Interchirp Interchirp	404.705mW 377.865mW 406.665mW 406.665mW 377.865mW 377.865mW 377.865mW 377.865mW

Note: This time schedule is delivered by the customer.

The radar emits one chirp every 5ms The active time (chirp emission) is ca. 57.5 μ s 20 chip within 100 ms. Active time within 100 ms: 20 chip * 57.5 μ s = 1150 μ s

The duty cycle factor (dB) is calculated applying the following formula:

 $KE = 20 \log ((t_{iw}/T_w) * (t_{iB}/T_B))$

KE: pulse operation correction factor

tiw pulse duration for one complete pulse track

 T_w a period of the pulse track



Total length of period (T_w)	100 ms
Max. On time Port4 (t _{iw})	1.150 ms
KE	0.0115
Log. Correction factor	-38.8 dB

Remarks: The pulse train (*Tw*) exceeds 100 ms, therefore the duty cycle has been calculated by averaging

the sum of the pulse widths over the 100 ms with the highest average value.



5.5 Spurious emissions

For test instruments and accessories used see section 6 Part SER 2, SER 3.

5.5.1 Description of the test location

Test location:OATS 1Test distance:3 m

Test location:Anechoic chamber 2Test distance:3 m

5.5.2 Photo documentation of the test set-up

30 MHz – 1 GHz

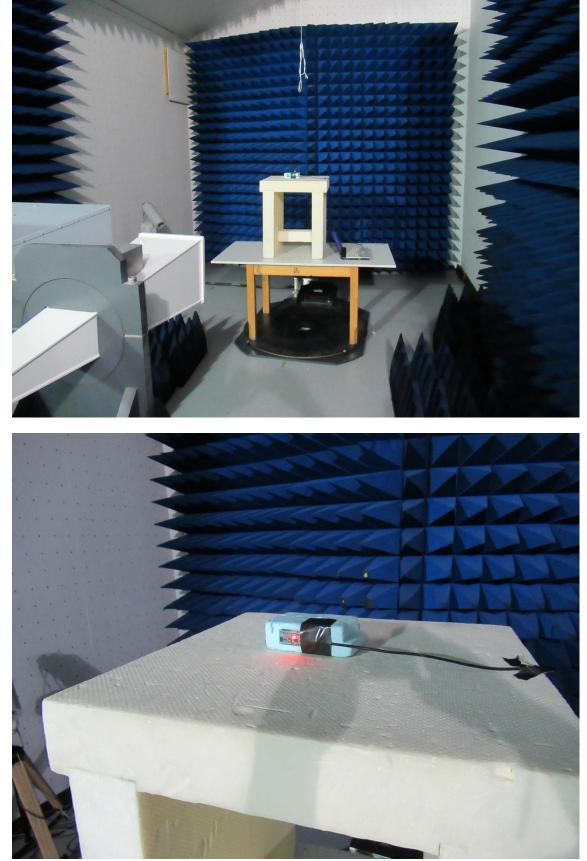




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1 GHz – 1<u>8 GHz</u>

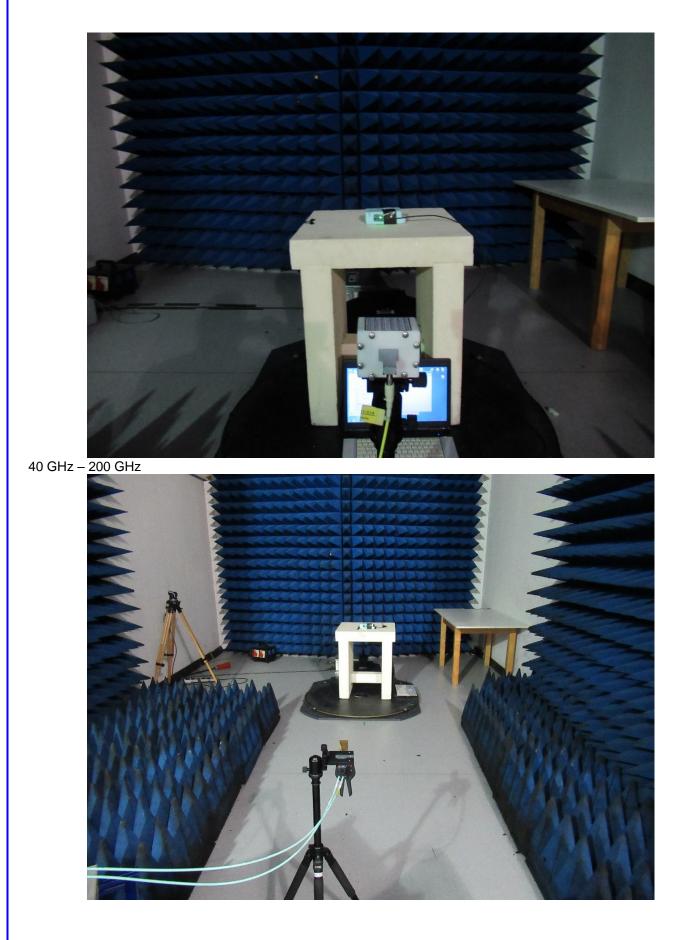


18 GHz – 40 GHz

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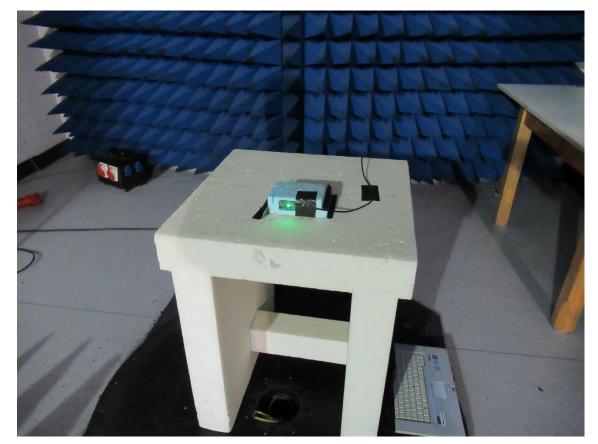
Rev. No. 6.0, 2020-04-1





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5.5.3 Applicable standard

According to FCC Part 15C, Section 15.255 (d):

- (1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.
- (2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.
- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm2 at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

5.5.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 9. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EUT is measured in TX continuous mode under normal conditions.

Instrument settings:		
30 MHz – 1000 MHz:	RBW: 120 kHz;	
1000 MHz – 200 GHz	RBW: 1 MHz,	VBW: 3 MHz;



5.5.5 Test result f < 1 GHz

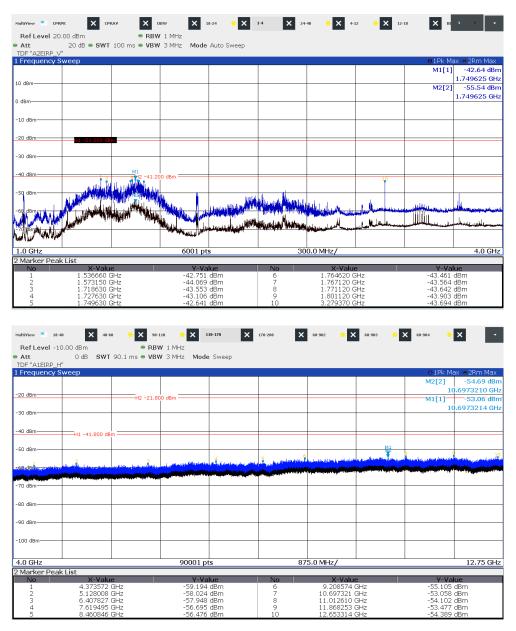
Tx sweeping:

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
50.00	5.3	2.6	15.2	14.2	20.5	16.8	40.0	-19.5
150.00	1.1	0.5	13.9	14.8	15.0	15.3	43.5	-28.2
200.00	5.7	3.2	11.3	12.0	17.0	15.2	43.5	-26.5
400.00	2.4	3.9	19.8	19.6	22.2	23.5	46.0	-22.5
600.00	3.8	2.5	25.5	25.3	29.3	27.8	46.0	-16.7

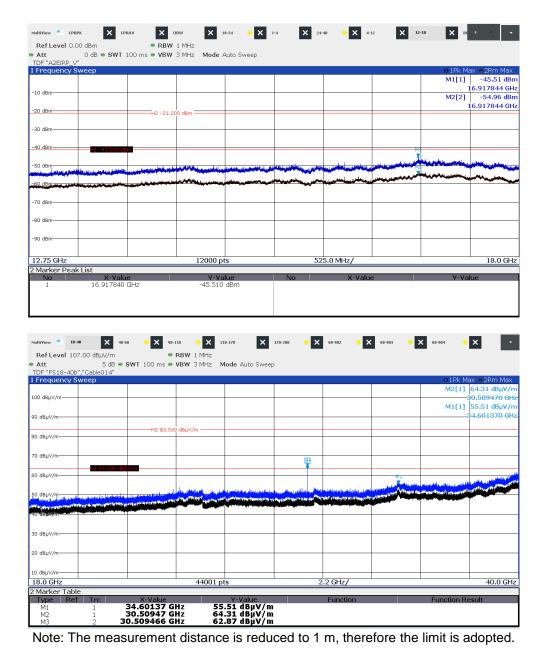
Note: For frequencies < 1 GHz the general radiated limits has been applied.

5.5.6 Test result f > 1 GHz

5.5.6.1 <u>Low</u>



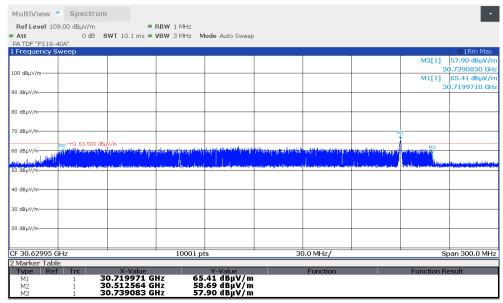
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AV-Limit at 1m distance: $54 \text{ dB}\mu\text{V/m} + 20\log(d) = 54 + 9.5 = 63.5 \text{ dB}\mu\text{V/m}$ PK-Limit at 1m distance: $74 \text{ dB}\mu\text{V/m} + 20\log(d) = 74 + 9.5 = 83.5 \text{ dB}\mu\text{V/m}$

AV value of emission 30.509 GHz = PK value – DC; DC= $1.15 \% (20\log(0.0115)=-38.8 \text{ dB})$ = $64.3 - 38.8 = 25.5 \text{ dB}\mu\text{V/m}$





Note: The emission at 30.6299 GHz is part of the basic band generation and sweeps as the carrier, the emission is assessed with the duty cycle of the carrier for calculating the AV value.

Determination of the EIRP emission limit for > 40 GHz:

For calculation the limit the friis formula is used.

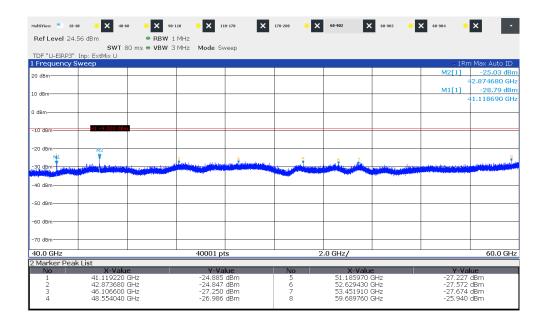
$$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

 $EIRP = P_d *4*\pi r^2$ EIRP = -9.9 dBm

Pout * G = EIRP; Therefore

Where:

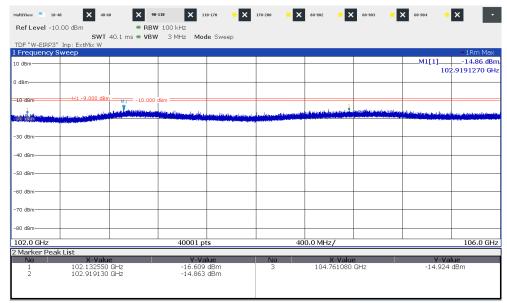
r is the measurement distance (3 m) P_d is the emission density (90 pW/cm²)



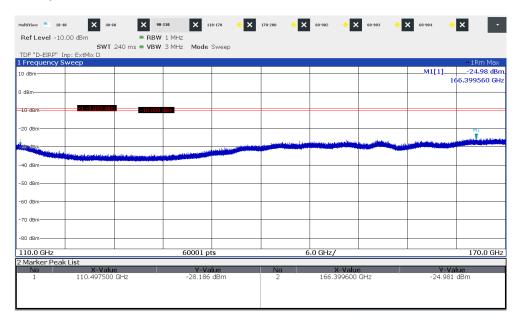


Note: The emission at 63.653 GHz is caused by the external mixer.

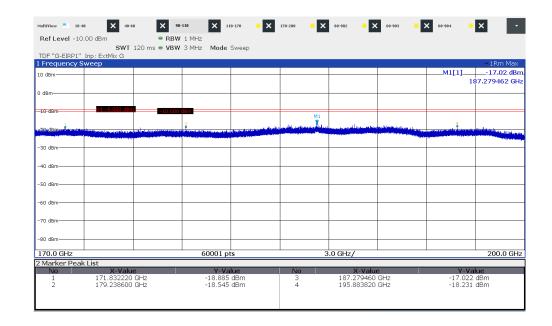
TOE "W EIDOR	SWT ' Inp: ExtMix W	80 ms 🖷 VBW	3 MHz Mode S	weep						
Frequency									e 1 Rm Max	
.0 dBm								M1[1]	-8.79 dB	
o abiii								1	02.992925 GH	
) dBm										
abiii						M1				
10-dBm	H1 -9.000 dBr	- 10,000	dBm		. h	1	a particular in the second second			
			ويروع ليتك فالمعلقانين والم	المتراجع والمور ومتاوا والمروي				and the state of the	A Share and a start of the	
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	T									
30 dBm										
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70 dBm									-	
80 dBm										
90.0 GHz			10001						110.0 GH	
			40001 p	ls		.0 GHz/			110.0 GF	
Marker Pea	K LIST X-Valu	10	Y-Va	lue	No	X-Valu	0	V_Va	lue	
1 102.992930 GHz) GHz	-8.794 dBm		2	109.955750		Y-Value -11.499 dBm		



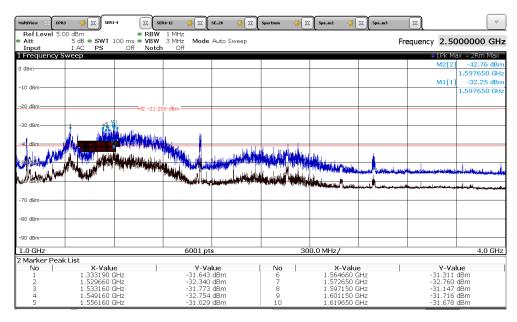
Note: The range from 102 GHz to 106 GHz is re-measured with RBW=100 kHz in order to show that there is no emission hide by the noise level.



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5.5.6.2 <u>Mid</u>



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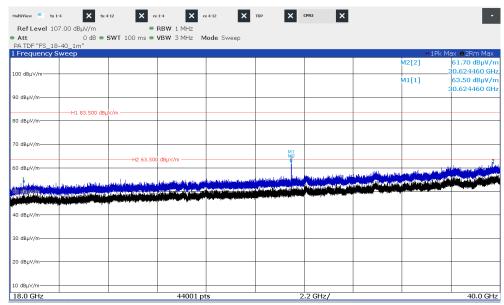
CSA GROUP"

	R1-4 🔆 🖾 SER4-12	🔀 SE26 🍦	Spectrum	🔆 🔀 Spem2 🚽	🔆 🔀 Spem3	X	~
Input 1 AC PS	BBW 1 MHz Off Notch Off	Mode Auto Swe	ep			Frequency 8.	3750000 GHz
TDF Input1 "A2EIRPV" 1 Frequency Sweep							1Pk Max
0 dBm						M1[1	
o dom							12.744750 GHz
-10 dBm							
aa 10							
-20 dBm	H2 -21.200 dBm -						
-30 dBm							
-40 dBm H1 -41.200 d A -20.000 d	18m 18						
-50 dBm							In a strike field a die strike
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addidem - United and the second							
-70 dBm							
70 dbm							
-80 dBm							
-90 dBm							
4.0 GHz 2 Marker Peak List]	7501 pts		875.0 MHz/			12.75 GHz
Multi¥iew 🕀 CPR3 👹 🕱 SEI	R1-4 🔆 🛛 SER4-12	SE26	Spectrum	Spem2	≽ ∑ Spem3	¥	▽
Ref Level 5.00 dBm Att 5 dB • SWT Input 1 AC PS	RI-4 → RBW 1 MHz 100 ms → VBW 3 MHz Off Notch Off	Mode Auto Swe		Spem2			⊽ 3750000 GH2
Ref Level 5.00 dBm Att 5 dB • SWT Input 1 AC PS TDF Input1 "A2EIRPV"	• RBW 1 MHz 100 ms • VBW 3 MHz	Mode Auto Swe		Spem2			
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input1 "A2EIRPV" 1 Frequency Sweep	• RBW 1 MHz 100 ms • VBW 3 MHz	Mode Auto Swe		Spem2			● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1AC TDF Input1 "A2EIRP/" I Frequency Sweep 0 dBm	• RBW 1 MHz 100 ms • VBW 3 MHz	Mode Auto Swe		Spem2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input1 "A2EIRPV" 1 Frequency Sweep	• RBW 1 MHz 100 ms • VBW 3 MHz	Mode Auto Swe		Spem2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF input! "A2EIRP/" 1 IFrequency Sweep 0 dBm -10 dBm -10 dBm -10 dBm		Mode Auto Swe		X Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1AC TDF Input1 "A2EIRP/" I Frequency Sweep 0 dBm	• RBW 1 MHz 100 ms • VBW 3 MHz	Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF input! "A2EIRP/" 1 IFrequency Sweep 0 dBm -10 dBm -10 dBm -10 dBm		Mode Auto Swe		X Spem2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input! 1 AC PS 0 dBm -10 dBm -20 dBm		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm • Att 5 dB • SWT Input 1 AC PS TDF Input! "AZENPA" 1 I Frequency Sweep 0 dBm -10 dBm -20 dBm -20 dBm -20 dBm		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input! 1 AC PS 0 dBm -10 dBm -20 dBm		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 db SWT Input 1 AC PS TDF Input! 1 AC PS I Frequency Sweep 0 d8m		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input: "AZEIRPA" IFrequency Sweep 0 dBm -10 dBm -20.dBm -30 dBm -30 dBm -30 dBm		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 db SWT Input 1 AC PS TDF Input! 1 AC PS I Frequency Sweep 0 d8m		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input! 1 AC PS I Frequency Sweep 0 d8m		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 dB SWT Input 1 AC PS TDF Input! 1 AC PS 0 dBm		Mode Auto Swe		Spe.m2		requency 15.3	● 1Pk Max] -46.18 dBm
Ref Level 5.00 dBm Att 5 db SW1 Input 1 AC PS TDF input: "A2EIRAV" IFrequency Sweep 0 dBm		Mode Auto Swe		Spe.m2		requency 15.3	●1Pk Max
Ref Level 5.00 dBm Att 5 db SW1 Input 1 AC PS TDF Input: "A2EIRAV" IFrequency Sweep 0 d8m -10 d8m	RBW 1 MHz 100 ms • VBW 3 MHz Off Notch Off	Mode Auto Swe				requency 15.3	• 1 Pk Max -46.18 dBm 17.147299 GHz
Ref Level 5.00 dBm Att 5 db SW1 Input 1 AC PS TDF input: "A2EIRAV" IFrequency Sweep 0 dBm	RBW 1 MHz 100 ms • VBW 3 MHz Off Notch Off	Mode Auto Swe		Spe.m2		requency 15.3] -46.18 dBm

X-Value 17.147300 GHz

Y-Value -46.185 dBm



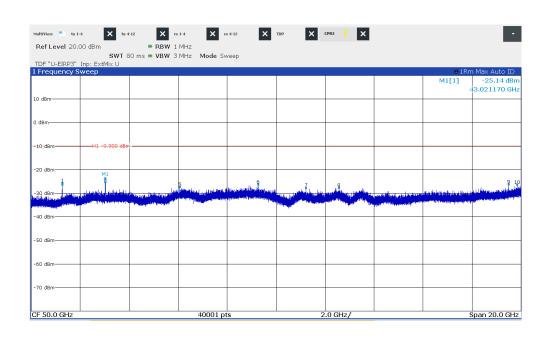


Note: The measurement distance is reduced to 1 m, therefore the limit is adopted.

AV-Limit at 1m distance: $54 \text{ dB}\mu\text{V/m} + 20\log(d) = 54 + 9.5 = 63.5 \text{ dB}\mu\text{V/m}$ PK-Limit at 1m distance: $74 \text{ dB}\mu\text{V/m} + 20\log(d) = 74 + 9.5 = 83.5 \text{ dB}\mu\text{V/m}$

Note: The emission at 30.624 GHz is part of the basic band generation and sweeps as the carrier, the emission is assessed with the duty cycle of the carrier for calculating the AV value.

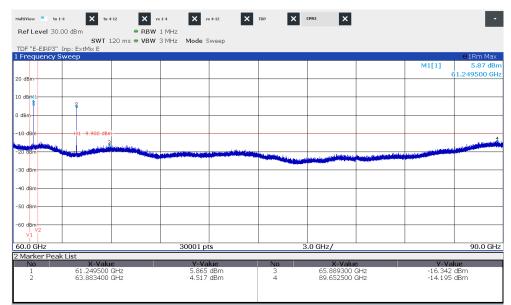
AV value of emission 30.624 GHz = PK value – DC; DC= $1.15 \% (20\log(0.0115)=-38.8 \text{ dB})$ = $63.5 - 38.8 = 25.7 \text{ dB}\mu\text{V/m}$



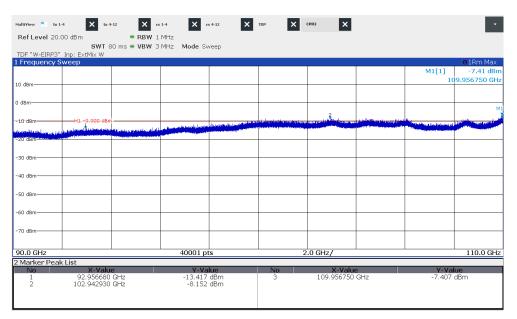
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory

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Note: The emission at 63.883 GHz is caused by the external mixer.

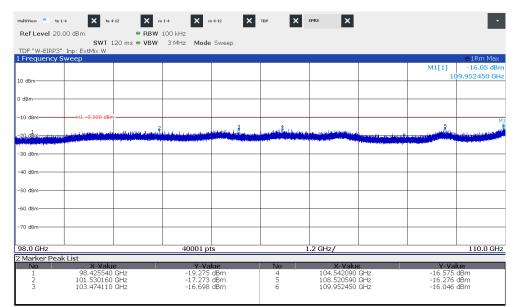


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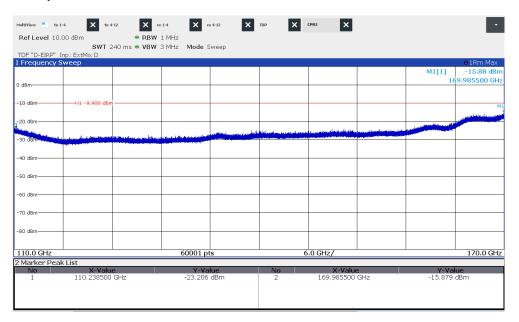
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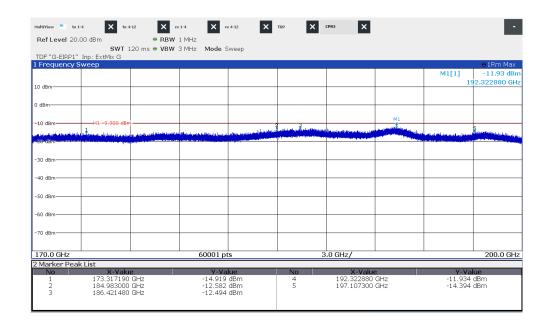


Note: The range from 98 GHz to 110 GHz is re-measured with RBW=100 kHz in order to show that there is no emission hide by the noise level.

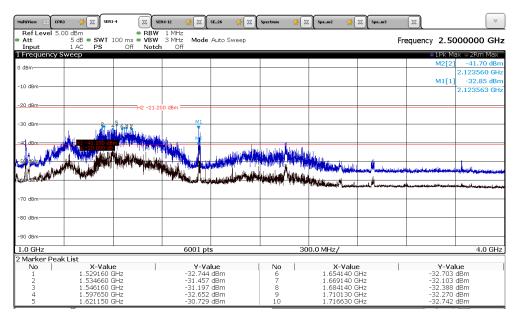


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5.5.6.3 <u>High</u>



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GROUP"

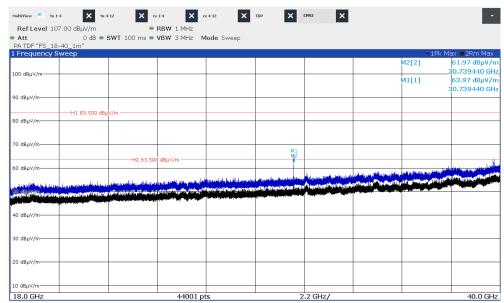
MultiView 88 CPF	13 🔆 🕅 SER	1-4 🔆 🕱 SE	R4-12	SE26	Spectrum	🔆 🗶 Spe	n2 🧩 🕱	Spem3	X	▽
Ref Level 5.1 Att Input	5 dB • SWT 1 AC PS	100 ms • RBW Off • VBW Notch	3 MHz Mod	le Auto Swe	ер			Fr	equency 8.3	750000 GHz
TDF Input1 "A2 1 Frequency S										• 1Pk Max
									M1[1]	-48.78 dBm
0 dBm										11.824303 GHz
-10 dBm										
-20_dBm		H2 -21.2	00 dBm	_						
-30 dBm										
-40 dBm	H1 -41.200 dF									
	∆ -20.000 de	r -							м	1
-50 dBm							and a state to be the second	and the second second	الأسع والبلو ورسور الرقرم	
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-80 dBm				_						
-90 dBm										
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2 Marker Pea No		ie		∕alue	No		X-Value	1	Y-Va	
l										
				<u>}</u>						
MultiView 🕀 CPF	\sim		R4-12	SE26	Spectrum	Spe	n2 🔆 🕱	Spem3 🗳		
Ref Level 5. Att Input	00 dBm 5 dB • SWT 1 AC PS	I-4 ≱⊠ se ● RBW 100 ms ● VBW Off Notch	1 MHz 3 MHz Mod	se26 le Auto Swe		Spe.,	n2 🎽 🖾			⊽ 750000 GHz
Ref Level 5. Att	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	• RBW 100 ms • VBW	1 MHz 3 MHz Mod			Spe.,	nz 🏄 🖾		quency 15.3	IPk Max
Ref Level 5.1 Att Input TDF Input1 "A2	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	• RBW 100 ms • VBW	1 MHz 3 MHz Mod			Spei	n2 🔆 🕱			● 1Pk Max -46.09 dBm
Ref Level 5,1 Att Input TDF Input1 "A2 I Frequency S	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	• RBW 100 ms • VBW	1 MHz 3 MHz Mod			Spe	n2 🔆 🕱		quency 15.3	IPk Max
Ref Level 5,1 Att Input TDF Input1 "A2 I Frequency S	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	• RBW 100 ms • VBW	1 MHz 3 MHz Mod			Spe	n2 🔆 🕱		quency 15.3	●1Pk Max -46.09 dBm
Ref Level 5. Att Input TDF Input1 "A2 I Frequency S 0 dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off			Spe	n2 🥳 🕱		quency 15.3	●1Pk Max -46.09 dBm
Ref Level 5. Att Input TDF Input1 "A2 I Frequency S 0 dBm-	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	• RBW 100 ms • VBW	1 MHz 3 MHz Mod Off			Spe.d	n2 🔆 🕱		quency 15.3	● 1Pk Max -46.09 dBm
Ref Level 5. Att Input TDF Input1 "A2 I Frequency S 0 dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off			Spe.ul	nz 🔆 🕱		quency 15.3	● 1Pk Max -46.09 dBm
Ref Level 5.0 Att Input TDF input1 "A2 1 Frequency S 0 dBm -10 dBm -20_dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off			Spe.	n2 🔆 🖾		quency 15.3	● 1Pk Max -46.09 dBm
Ref Level 5.0 Att Input TDF input1 "A2 1 Frequency S 0 dBm -10 dBm -20_dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off			Species Species	n2 ¥ 🕱		quency 15.3	● 1Pk Max -46.09 dBm
Ref Level 5.0 Att Input TDF Input! "A2 1 Frequency S 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off			Species Species	n2 🎉 🗵		quency 15.3	● 1Pk Max -46.09 dBm
Ref Level 5.7 Att Input TDF Input1 "A2 1 Frequency S 0 dBm- -10 dBm- -20 dBm- -30 dBm-	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off	le Auto Swe		Specific Spe			quency 15.3	●1Pk Max -46.09 dBm
Ref Level 5.1 Att Input TDF Input! "A2 I Frequency 5 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off Mod	le Auto Swe					quency 15.3	●1Pk Max -46.09 dBm
Ref Level 5.1 Att Input TDF Input TDF and the second	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off Mod	le Auto Swe			n2 🌾 🖾		quency 15.3	● 1Pk Max -46.09 dBm
Ref Level 5.1 Att Input TDF Input1 "A2 I Frequency 5 0 dbm -10 dbm -20 dbm -30 dbm -40 dbm -50 dbm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off Mod	le Auto Swe			n2 🔆 🖾		quency 15.3	●1Pk Max -46.09 dBm
Ref Level 5.1 Att Input "A2 I Firequency S 0 d8m -10 d8m -20 d8m -30 d8m -50 d8m -50 d8m -60 d8m -70 d8m	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off Mod	le Auto Swe					quency 15.3	-46.09 dBm
Ref Level 5.1 Att Input TDF Input TDF Input "Add Bm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off Mod	le Auto Swe					quency 15.3	●1Pk Max -46.09 dBm
Ref Level 5.1 Att Input "A2 TDF input "A2 I Frequency S 0 dBm -10 dBm -20 dBm -30 dBm -50 dBm -60 dBm -70 dBm	00 dBm 5 dB • SWT 1 AC PS EEIRPV"	RBW Off Notch	1 MHz 3 MHz Mod Off Mod	le Auto Swe					quency 15.3	●1Pk Max -46.09 dBm

2 Marker Peak List No | 1 1

X-Value 17.145800 GHz Y-Value -46.088 dBm No X-Value

Y-Value



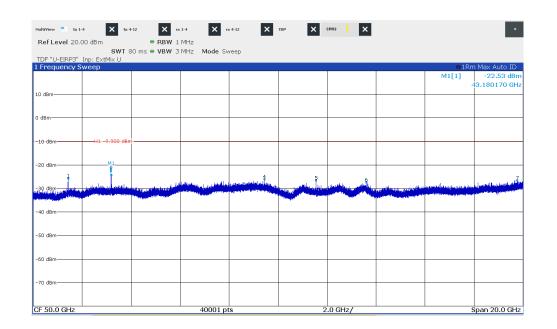


Note: The measurement distance is reduced to 1 m, therefore the limit is adopted.

AV-Limit at 1m distance: $54 \text{ dB}\mu\text{V/m} + 20\log(d) = 54 + 9.5 = 63.5 \text{ dB}\mu\text{V/m}$ PK-Limit at 1m distance: $74 \text{ dB}\mu\text{V/m} + 20\log(d) = 74 + 9.5 = 83.5 \text{ dB}\mu\text{V/m}$

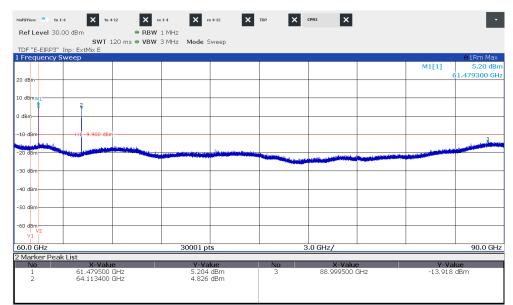
Note: The emission at 30.739 GHz is part of the basic band generation and sweeps as the carrier, the emission is assessed with the duty cycle of the carrier for calculating the AV value.

AV value of emission 30.739 GHz = PK value – DC; DC= 1.15 % (20log(0.0115)=-38.8 dB) = 64.0 - 38.8 = 25.2 dBµV/m



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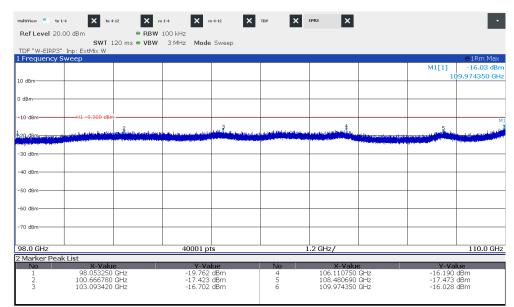


Note: The emission at 64.113 GHz is caused by the external mixer.

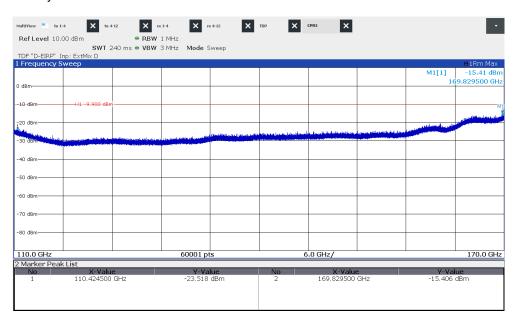
Multi¥iew 📒 tx 1	-4 X ts 4-12 X	ns 1-4 X ns 4-12 X	тор 🗙	CPR3 X	
Ref Level 20.		1 MHz		_	_
TDF "W-EIRP3" 1 Frequency S					⊖1Rm Max
1 Frequency a	sweep				M1[1] -7.90 dBm
					109.919750 GHz
10 dBm					
0 dBm					
U UBM					M
-10-dBm-	H1 -9.900 dBm			1	
determinentia an area	and the second	and the state of the second state of the sta		a line of a line of the second s	
-20 dBm-	and the second state of the black is and a first state of the second state of the seco				
-30 dBm					
-40 dBm					
-50 dBm					
-60 dBm					
-00 0011					
-70 dBm					
90.0 GHz		40001 pts		2.0 GHz/	110.0 GHz
2 Marker Peal	klist	+0001 pts	2		110.0 GHz
No	X-Value	Y-Value	No	X-Value	Y-Value
1	105.250870 GHz	-8.599 dBm	2	109.998250 GHz	-7.669 dBm

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Note: The range from 98 GHz to 110 GHz is re-measured with RBW=100 kHz in order to show that there is no emission hide by the noise level.



Frequency S	Sweep								⊖1Rm Ma
								M1[1]	-11.86 d
) dBm								1	85.053000 6
dBm									
					41				
.0 dBm	H1 -9.900 dBm	.2			المرابعة والمراجعة والمراجعة والمراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع	the set of a second	Juni and a sugar		5
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o ubm									
i0 dBm									
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70.0 GHz			60001 p	ts	3	.0 GHz/		1	200.0 0

Average limit according to FCC Part 15C, Section 15.255(d):

- (1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.
- (2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.
- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters. (4) The levels of the appricate emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

General radiated limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits (μV/m)	Measurement distance (m)
0.0090.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3



Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 – 2.1905	16.80425 - 16.80475	960 - 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 - 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 - 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 - 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 - 2390	15.35 – 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 - 8.38675	156.7 – 156.9	2690 - 2900	22.01 – 23.12
8.41425 - 8.41475	162.0125 – 167.17	3260 – 3267	23.6 - 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 - 12.52025	240 – 285	3345.8 – 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	Above 38.6

RSS-Gen, Table 6 – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	12.57675 - 12.57725	399.9 - 410	7.250 - 7.750
0.495 - 0.505	13.36 - 13.41	608 - 614	8.025 - 8.500
2.1735 - 2.1905	16.42 - 16.423	960 - 1427	9.0 - 9.2
3.020 - 3.026	16.69475 - 16.69525	1435 - 1626.5	9.3 - 9.5
4.125 - 4.128	16.80425 - 16.80475	1645.5 - 1646.5	10.6 - 12.7
4.17725 - 4.17775	25.5 - 25.67	1660 - 1710	13.25 - 13.4
4.20725 - 4.20775	37.5 - 38.25	1718.8 - 1722.2	14.47 - 14.5
5.677 - 5.683	73 - 74.6	2200 - 2300	15.35 - 16.2
6.215 - 6.218	74.8 - 75.2	2310 - 2390	17.7 - 21.4
6.26775 - 6.26825	108 – 138	2483.5 - 2500	22.01 - 23.12
6.31175 - 6.31225	149.9 - 150.05	2655 - 2900	23.6 - 24.0
8.291 - 8.294	156.52475 - 156.52525	3260 - 3267	31.2 - 31.8
8.362 - 8.366	156.7 - 156.9	3332 - 3339	36.43 - 36.5
8.37625 - 8.38675	162.0125 - 167.17	3345.8 - 3358	Above 38.6
8.41425 - 8.41475	167.72 - 173.2	3500 - 4400	
12.29 - 12.293	240 – 285	4500 - 5150	
12.51975 - 12.52025	322 - 335.4	5350 - 5460	

The requirements are **FULFILLED.**

Remarks:

The measurement was performed up to 200 GHz.



5.6 Frequency stability

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

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up





5.6.3 Applicable standard

According to FCC Part 15C, Section 15.255(f):

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.



5.6.4 **Description of Measurement**

The frequency stability is measured with the spectrum analyser. The sweep points are set to maximum for higher the frequency resolution or the function "frequency counter" is used. The signal is unmodulated; the marker of the analyser is set to maximum amplitude at normal temperature, the frequency is recorded. Then the maximum supply voltage is set and the marker of the analyser is set to maximum amplitude. This procedure is done again for the minimum supply voltage. The EUT is now driven at normal supply voltage but in the climatic chamber to range the temperature from -20 °C to +50 °C in steps of 10 degrees. The drifting carrier is measured by setting the marker at the analyser.

5.6.5 Result

61.0 -61.5 GHz Range:

Test as	Test conditions					
Test co						
Т _{тіп} (-20°С)	V _{nom}	61.02050				
T (-10°C)	V _{nom}	61.02048				
T (0°C)	V _{nom}	61.02030				
T (10°C)	V _{nom}	61.02012				
Τ _{nom} (20°C)	V _{min} (4.25 V)	61.01973				
Τ _{nom} (20°C)	V _{nom} (5 V)	61.01973				
T _{nom} (20°C)	V _{max} (5.75 V)	61.01973				
T (30°C)	V _{nom}	61.01972				
T (40°C)	V _{nom}	61.01955				
T _{max} (50°C)	V _{nom}	61.01950				

Carrier frequency f_c	61.019729 MHz
Max tolerance	no limit
Highest frequency f _h	61.0205 MHz
Lowest frequency f	61.0195 MHz
Negative tolerance $f_l - f_c$	-0.229 kHz
Positive tolerance f_h - f_c	0.771 kHz

Limit according to FCC Part 15C, Section 15.255(f):

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

The requirements are FULFILLED.

Remarks:

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5.7 Antenna requirement

5.7.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

The EUT has an integrated antenna. No other antenna can be used with the device.

The supplied antenna meets the requirements of part 15.203 and 15.204.

Remarks:



6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID A 4	Model Type BAT-EMC 3.18.0.26	Equipment No. 01-02/68-13-001	Next Calib.	Last Calib.	Next Verif.	Last Verif.
	ESCI ESH 2 - Z 5 N-4000-BNC N-1500-N	02-02/03-15-001 02-02/20-05-004 02-02/50-05-138 02-02/50-05-140	02/07/2020 31/10/2021	02/07/2019 31/10/2019	04/11/2020	04/05/2020
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	12/11/2020	12/05/2020
CPR 3	FS-Z90 FSW43 QWH-EPRR00/WR-12/60-90	02-02/11-14-003 02-02/11-15-001 02-02/24-14-004	09/04/2021 02/04/2021	09/04/2020 02/04/2020	09/10/2020	09/04/2020
MB	FS-Z90 FSW43 QWH-EPRR00/WR-12/60-90	02-02/11-14-003 02-02/11-15-001 02-02/24-14-004	09/04/2021 02/04/2021	09/04/2020 02/04/2020	09/10/2020	09/04/2020
	WK-340/40	02-02/45-05-001	18/07/2020	18/04/2019	23/10/2020	23/04/2020
SER 2	ESVS 30 VULB 9168 NW-2000-NB KK-EF393/U-16N-21N20 m KK-SD_7/8-2X21N-33,0M	02-02/03-05-006 02-02/24-05-005 02-02/50-05-113 02-02/50-12-018 02-02/50-15-028	19/08/2020 19/07/2020	19/08/2019 19/07/2019		
SER 3	FS-Z110 FS-Z90 FSW43 RPG FS-Z170 RPG FS-Z220	02-02/11-14-002 02-02/11-14-003 02-02/11-15-001 02-02/11-17-001 02-02/11-17-002	08/04/2021 09/04/2021 02/04/2021 09/04/2021 20/04/2021	08/04/2020 09/04/2020 02/04/2020 09/04/2020 20/04/2020		08/04/2020 09/04/2020
	FS-Z60 JS4-18004000-30-5A AFS5-12001800-18-10P-6 AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P	02-02/11-18-001 02-02/17-05-017 02-02/17-06-002 02-02/17-13-002 02-02/17-13-003	08/04/2021	08/04/2020	08/10/2020	08/04/2020
	BBHA 9120 E 251 BBHA 9170 WBH2-18NHG QWH-UPRR00/WR-19/40-60 QWH-EPRR00/WR-12/60-90 QWH-WPRR00/WR-10/75-11 FH-SG-170 05-HA25 Sucoflex N-2000-SMA KMS102-0.2 m SF104/11SMA/11N/2000MM SF104/11SMA/11N/2000MM	02-02/24-05-006 02-02/24-05-014 02-02/24-08-002 02-02/24-14-001 02-02/24-14-004	15/07/2020 12/06/2021 15/07/2020	15/07/2019 12/06/2018 15/07/2019	14/01/2021	05/03/2020 14/01/2020 05/03/2020

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