Test Report acc. to FCC Title 47 CFR Part 15
relating to
Hammer-IMS nv
Tokyo

Title 47 - Telecommunication
Part 15 - Radio Frequency Devices
Subpart C – Intentional Radiators
Measurement Procedure:
ANSI C63.4-2014
ANSI C63.10-2013

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12053-01-03

MANUFACTURER	
Manufacturer name	Hammer-IMS nv
Manufacturer's grantee code	**2BEPW**
Manufacturer's address	Industrieweg 1401 3540 Herk-de-Stad Belgium
Phone	(+32) 11 36 55 02
Fax	---
Email	bart.goossens@hammer-ims.com

TESTING LABORATORY	
Test engineer	Mr. Ralf Trepper
Testing laboratory name	TÜV NORD Hochfrequenztechnik GmbH & Co. KG
Testing laboratory address	LESKANPARK, Gebäude 10 Waltherstr. 49-51 51069 Köln, Germany
Phone	+49 221 8888 950
Email	rtreppe@tuev-nord.de

RELEVANT STANDARD	
Title	47 - Telecommunication
Part	15 - Radio Frequency Devices
Subpart	Subpart C – Intentional Radiators - Section 15.258
Measurement procedure	ANSI C63.4-2014 & ANSI C63.10-2013

TESTING LABORATORY	
Equipment category	Field disturbance sensor
Trade name	Hammer-IMS
Type designation	**Tokyo**
Serial no.	BA010071
Variants	---

0 Test results

The following tables summarize the results for the tested equipment. Full testing may not be required. If partial testing was performed, this shall be indicated in the relevant column (N.t.[x]) of the table below.

Clause	Requirements headline	FCC Rule	Test result
7.1	Antenna requirement	§15.203	**Pass**
7.2	AC power line conducted limits	§15.207 (a)	**Pass**
7.3	Radiated emission limits	§15.209	**Pass**
7.4	Radiated power (EIRP)	§15.258 (b)	**Pass**
7.5	Transmitter spurious emission	§15.258 (c)	**Pass**
7.6	Occupied Bandwidth	§15.258 (d)	**Pass**
7.7	Frequency stability	§15.258 (d)	**Pass**
7.8	RF radiation exposure	§1.1310 & §2.1091	**Pass**

As far as in this report statements on conformity are made, decision rules according to DIN EN ISO/IEC 17025:2018, 7.8.6 have been applied. If the report does not state otherwise, procedure 1 according to IEC Guide 115 ed.1.0 2007 (uncertainty of measurement calculated) has been applied on measurement and test procedures which are the base of this report.

The equipment has passed all the conducted tests	
☒ Yes	☐ No

Signature	TÜVNORD Digital unterschrieben von Shrestha Anup Datum: 2024.05.23 12:44:10 +02'00'	TÜVNORD Digital unterschrieben von Trepper Ralf Datum: 2024.05.23 13:12:21 +02'00'
Name	**Mr. Anup Shrestha**	**Mr. Ralf Trepper**
Designation	**RF Test Engineer**	**Laboratory-Manager**
Date of issue	**2024-04-15**	**2024-04-15**

Table of contents:

1 Revision history

Revision	Date of issue	Creator	Content of change
00	15.04.2024	R. Trepper	Initial release

Note: If the document has been changed by revision number, all previous documents are no longer valid and must be destroyed.

2 Introduction

This test report **is not an expert opinion** and consists of:

- Test result summary
- List of contents
- Introduction and further information
- Performance assessment
- Detailed test information
- List of measurement equipment with calibration validity
- Photographs and further test results (plots, graphs, etc.)

The tests were carried out in a representative assembly and in accordance with the test methods and/or requirements stated in:

Item	Applied Standard
Radio test	FCC Title 47 CFR Part 15 Subpart C Section 15.258, ANSI C63.4-2014 & ANSI C63.10-2013

3 Administrative Data

3.1 Testing laboratory

TÜV NORD Hochfrequenztechnik GmbH & Co. KG
LESKANPARK, Building 10
Waltherstr. 49-51
51069 Cologne
Germany

Phone:+49 221 8888 950

FCC Registration Number: **763407**

Accredited by:

DAkkS Deutsche Akkreditierungsstelle GmbH
DAkkS accreditation number: D-PL-12053-01

3.2 Applicant´s details

Company name	: Hammer-IMS nv
Address	: Industrieweg 1401
	3540 Herk-de-Stad
Country	: Belgium
Contact person	: Mr. Bart Goossens
Telephone	: +32 11 36 55 02
Fax	: ---
Email	: bart.goossens@hammer-ims.com
Date of order	: 2023-07-28
Date of receipt	: 2023-09-18
Period of testing time	: 2023-09-18 - 2024-01-11

3.3 Manufacturer´s details

Manufacturer´s name	: (please see Applicant´s details)
Address	: (please see Applicant´s details)

4 Equipment under test

4.1 EUT short description

EUT Type designation	**Type** of equipment	**Trademark**	**S/N** Serial no.	**HW** Hardware status	**SW** Software status
Tokyo	Field disturbance sensor	Hammer-IMS	BA010071	V 3.0	V 3.16

4.2 Additionally Equipment: Short description

Additionally Equipment	Type
---	---
---	---

4.3 EUT operating mode

EUT operating mode no.	Description of operating modes	Additional information
OP 1	Normal operation mode	Continuous transmit and receive
OP 2	---	---
OP 3	---	---

4.4 Additional declaration and description of EUT

(Application´s declaration: ☐= not selected, ☒= selected)

<table>
<tr><td colspan="3">EUT</td><td colspan="2">☐ table top unit
☒ floor-standing
☐ wall-mounted
☐ not defined</td><td colspan="2">Typical use
☒ fixed use
☐ portable use
☐ vehicular use</td><td>Typical operating cycle of EUT
☒ ≤ 1 sec
☐ ____________</td></tr>
<tr><td colspan="3">Place of use</td><td colspan="5">☐ Residential, commercial and light industry
☒ Industrial environment
☐ Telecom centres only
☐ Vehicular use</td></tr>
<tr><td colspan="3">Generated or used frequencies</td><td colspan="5">12 MHz (Crystal), 75 MHz (Crystal)
250 MHz (Clock), 120GHZ (IQ transceiver)</td></tr>
<tr><td colspan="3">Frequency used</td><td colspan="5">119.98 GHz – 123 GHz</td></tr>
<tr><td colspan="3">Environment(s) in which the equipment is intended to be used</td><td colspan="5">15 – 35°C</td></tr>
<tr><td colspan="3">ITU emission class</td><td colspan="5">1G45F0N</td></tr>
<tr><td colspan="3">FCC ID</td><td colspan="5">2BEPW-TOKYO</td></tr>
<tr><td colspan="8">Power line</td></tr>
<tr><td>☐ AC</td><td colspan="2">☐ L1, ☐ L2, ☐ L3, ☐ N, ☐ PE</td><td>--- V/ AC</td><td colspan="2">☐ 50 Hz
☐ 60 Hz</td><td colspan="2" rowspan="2">EUT grounding:
☒ none
☐ with power supply
☐ additional</td></tr>
<tr><td>☒ DC</td><td colspan="5">6 - 48 V/ DC</td></tr>
<tr><td colspan="8">Other ports</td></tr>
<tr><td colspan="2">Port type</td><td colspan="3">Function</td><td colspan="2">Shielding</td><td>Total cable length used during the test</td></tr>
<tr><td colspan="2">DC</td><td colspan="3">DC power line</td><td colspan="2">☐ screened
☒ unscreened</td><td>< 3m</td></tr>
<tr><td colspan="2">Ethernet</td><td colspan="3">LAN port</td><td colspan="2">☒ screened
☐ unscreened</td><td>> 3m</td></tr>
<tr><td colspan="2"></td><td colspan="3"></td><td colspan="2">☐ screened
☐ unscreened</td><td></td></tr>
<tr><td colspan="2"></td><td colspan="3"></td><td colspan="2">☐ screened
☐ unscreened</td><td></td></tr>
</table>

For issuing this report, the following product documentation was used:

Title	Description	Version

List of annexes belonging to this document:

Description	Date	Identification
External photographs of the **E**quipment **U**nder **T**est (EUT)	2024-04-15	Annex no. 1
Internal photographs of the **E**quipment **U**nder **T**est (EUT)	2023-04-15	Annex no. 2
Channel occupancy / bandwidth	2024-04-15	Annex no. 3
Label sample	2023-04-15	Annex no. 4
Functional description / User manual	2024-04-15	Annex no. 5
Test setup photos	2023-04-15	Annex no. 6
Block diagram	2024-04-15	Annex no. 7
Operational description	2023-04-15	Annex no. 8
Schematics	2024-04-15	Annex no. 9
Parts list	2023-04-15	Annex no. 10
Antenna description	2024-04-15	Annex no. 11

5 Conclusions, observations and comments

The test report will be filed at TÜV NORD Hochfrequenztechnik GmbH & Co. KG for a period of 10 years following the issue of this report. It may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of TÜV NORD Hochfrequenztechnik GmbH & Co. KG.

The results of the tests as stated in this report are exclusively applicable to the EUT as identified in this report.
TÜV NORD Hochfrequenztechnik GmbH & Co. KG cannot be held liable for properties of the EUT that have not been observed during these tests.

TÜV NORD Hochfrequenztechnik GmbH & Co. KG assumes the sample to comply with the requirements of FCC Title 47 CFR Part 15 for the respective test sector, if the test results turn out positive.

Comments: ---

6 Operational description

6.1 EUT details

The Tokyo module is the mm-wave basis-weight measurement device developed by Hammer-IMS. The board is equipped with a 120 GHz measurement transceiver. The measurement data is available on a proprietary LAN interface. The Tokyo Module is installed in host devices of the Marveloc-CURTAIN product family. Installation should only be performed by qualified personnel.

6.2 EUT configuration

After applying the supply voltage, the device starts to work. No additional equipment or operating software is required.

6.3 EUT measurement description

6.3.1 Radiated measurements

The EUT was tested in a typical fashion. During preliminary emission tests the EUT was operated in the continuous measuring mode for worst case emission mode investigation. Therefore, the final qualification testing was completed with the EUT operated in continuous measuring mode. All tests were performed with the EUT's typical voltage: 12 V DC

In order to establish the maximum radiation, firstly, there have been viewed all orthogonal adjustments of the test samples, secondly the test ample have been rotated at all adjustments around the own axis between 0° and 360°, and thirdly, the antenna polarization between horizontal and vertical had been varied.

Radiated measurement above 1 GHz is made by placing loose-laid RF absorber material on the ground plane.

Additionally, radiated emission measurements above 1 GHz are made using calibrated linearly polarized antennas, which may have a smaller beamwidth (main lobe) than do the antennas used for frequencies below 1 GHz. The measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal.

6.3.2 AC Powerline Conducted measurements

The EUT is connected via the LAN Port to a laptop with the laptop directly connected to the artificial mains network. It has been tested in two runs: first with Laptop (inactive EUT), second with activated EUT via LAN port of the laptop.

7 Compliance assessment

7.1 Antenna requirement

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 so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

7.1.1 Results

Antenna Type	Antenna description	Frequency	Gain	Number of Antennas
TX Patch Array Antenna	Integrated in 120GHZ IQ transceiver TRX _120_01 Single-Chip 60- to 64-GHz mmWave Sensor	**117 – 128**	**9.0**	4
RX Patch Array Antenna	Integrated in 120GHZ IQ transceiver TRX _120_01 Single-Chip 60- to 64-GHz mmWave Sensor	**117 – 128**	**10.0**	4
Lense Antenna	HF Lense	**117 – 128**	**2.1**	1

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	Yes	No	Annex no.:

7.2 AC powerline conducted limits

7.2.1 Regulations

(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 limits in the following table, as measured using a 50 µH /50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Conducted Limits		
Frequency of Emission	**Quasi-Peak (QP)**	**Average (AV)**
MHz	**dBµV**	**dBµV**
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		

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

1) For carrier current system containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 µV within the frequency band 535–1705 kHz, as measured using a 50 µH /50 Ω LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

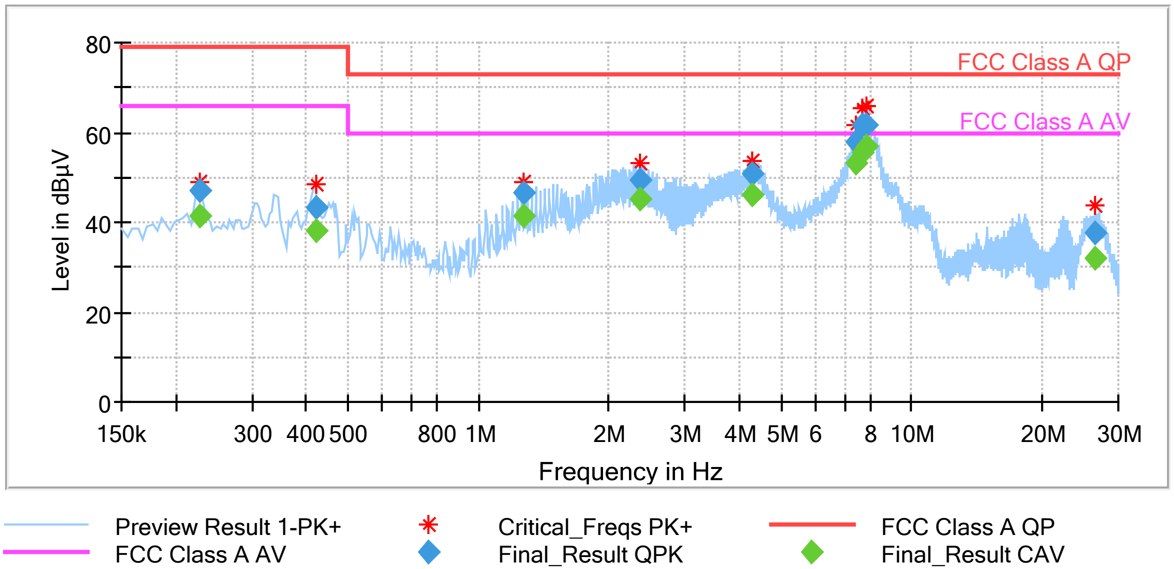
7.2.2 Test procedures

The EUT and the additional equipment (if required) are connected to the main power through a line impedance stabilization network (LISN). The LISN must be appropriate to ANSI C63.10-2013 Section 6. Additional equipment must also be connected to a second LISN with the same specifications described in the above section (if required).

7.2.3 Results

Conducted emissions - AC port acc to § 15.107 Tokyo inside the Host device MARVELOC-CURTAIN-O-T-22004								
Frequency (MHz)	**QuasiPeak (dBµV)**	**CAverage (dBµV)**	**Limit (dBµV)**	**Margin (dB)**	**Bandwidth (kHz)**	**Line**	**PE**	**Corr. (dB)**
0.226500	---	41.25	66.00	24.75	9.000	L1	GND	20.1
0.226500	47.13	---	79.00	31.87	9.000	L1	GND	20.1
0.420000	---	38.15	66.00	27.85	9.000	L1	GND	20.1
0.420000	43.27	---	79.00	35.73	9.000	L1	GND	20.1
1.266000	---	41.21	60.00	18.79	9.000	L1	GND	20.1
1.266000	46.43	---	73.00	26.57	9.000	L1	GND	20.1
2.350500	---	45.11	60.00	14.89	9.000	N	GND	20.2
2.350500	49.28	---	73.00	23.72	9.000	N	GND	20.2
4.303500	50.83	---	73.00	22.17	9.000	N	GND	20.2
4.303500	---	45.98	60.00	14.02	9.000	N	GND	20.2
7.413000	57.83	---	73.00	15.17	9.000	L1	GND	20.4
7.413000	---	53.04	60.00	6.96	9.000	L1	GND	20.4
7.723500	---	55.40	60.00	4.60	9.000	L1	GND	20.5
7.723500	61.44	---	73.00	11.56	9.000	L1	GND	20.5
7.858500	---	56.82	60.00	3.18	9.000	L1	GND	20.5
7.858500	61.88	---	73.00	11.12	9.000	L1	GND	20.5
26.488500	---	32.03	60.00	27.97	9.000	N	GND	21.3
26.488500	37.84	---	73.00	35.16	9.000	N	GND	21.3

Full Spectrum



Measurement uncertainty < ± 2 dB

Test Cables used	KISN2
Test equipment used	60, 272, 551, 665

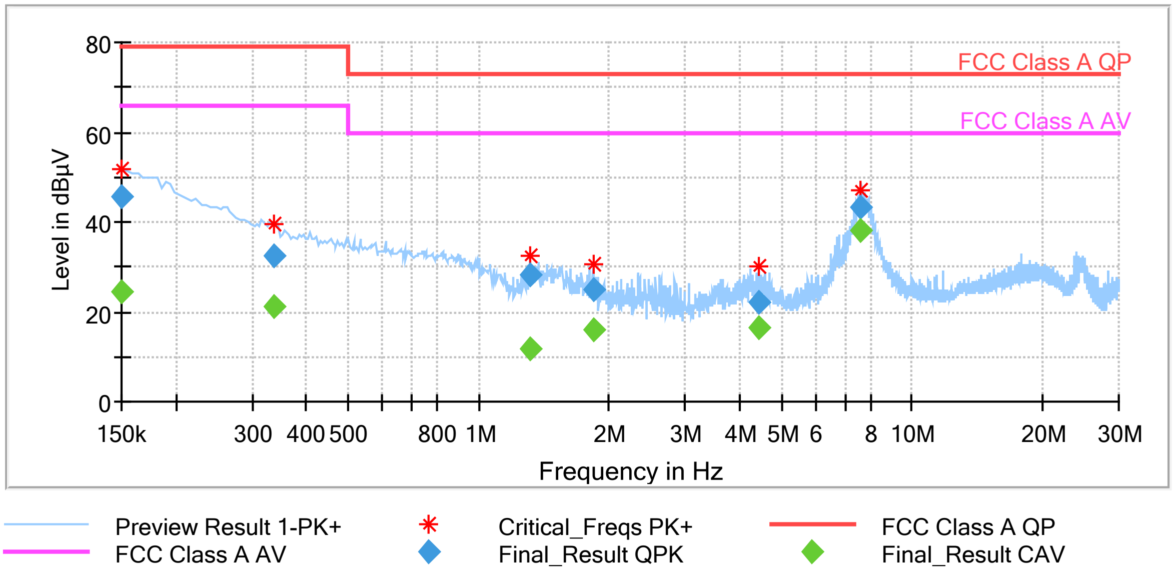
The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.2.4 Results

Conducted emissions - AC port acc to § 15.107 Tokyo inside the Host device MARVELOC-CURTAIN-O-T-22004 Ethernet Port connected to the AC port via laptop								
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.150000	45.71	---	79.00	33.29	9.000	N	GND	20.1
0.150000	---	24.52	66.00	41.48	9.000	N	GND	20.1
0.339000	32.57	---	79.00	46.43	9.000	L1	GND	20.1
0.339000	---	21.10	66.00	44.90	9.000	L1	GND	20.1
1.315500	28.42	---	73.00	44.58	9.000	L1	GND	20.1
1.315500	---	11.90	60.00	48.10	9.000	L1	GND	20.1
1.833000	---	16.16	60.00	43.84	9.000	L1	GND	20.1
1.833000	24.75	---	73.00	48.25	9.000	L1	GND	20.1
4.434000	22.10	---	73.00	50.90	9.000	N	GND	20.2
4.434000	---	16.49	60.00	43.51	9.000	N	GND	20.2
7.624500	---	37.90	60.00	22.10	9.000	L1	GND	20.5
7.624500	43.50	---	73.00	29.50	9.000	L1	GND	20.5

Full Spectrum



Measurement uncertainty < ± 2 dB

Test Cables used	KISN2
Test equipment used	60, 272, 551, 665

The equipment passed the conducted tests	Yes	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	Yes	~~No~~	Annex no.: 6

7.3 Radiated emission limits

7.3.1 Regulations

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	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
**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.		

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators, which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

7.3.2 Test procedure

The EUT and this peripheral (when additional equipment exists) are placed on a turn table which is 0.8 m above the ground. The turn table would be allowed to rotate 360° to determine the position of the maximum emission level. The test distance between the EUT and the receiving antenna are 3m. To find the maximum emission, the polarization of the receiving antenna is changed in horizontal and vertical polarization; the position of the EUT was changed in different orthogonal determinations.

ANSI C63.4-2014 Section 8 “Radiated Emissions Testing”

Measurement procedures for electric field radiated emissions from 9 kHz - 1 GHz & 1 GHz - 40 GHz are covered in Clause 8 of ANSI C63.4-2014. The ANSI C63.4-2014 measurement procedure consists of both an exploratory test and a final measurement. The exploratory test is critical to determine the frequency of all significant emissions. For each mode of operation required to be tested, the frequency spectrum is monitored. Variations in antenna height, antenna orientation, antenna polarization, EUT azimuth, and cable or wire placement is explored to produce the emission that has the highest amplitude relative to the limit.

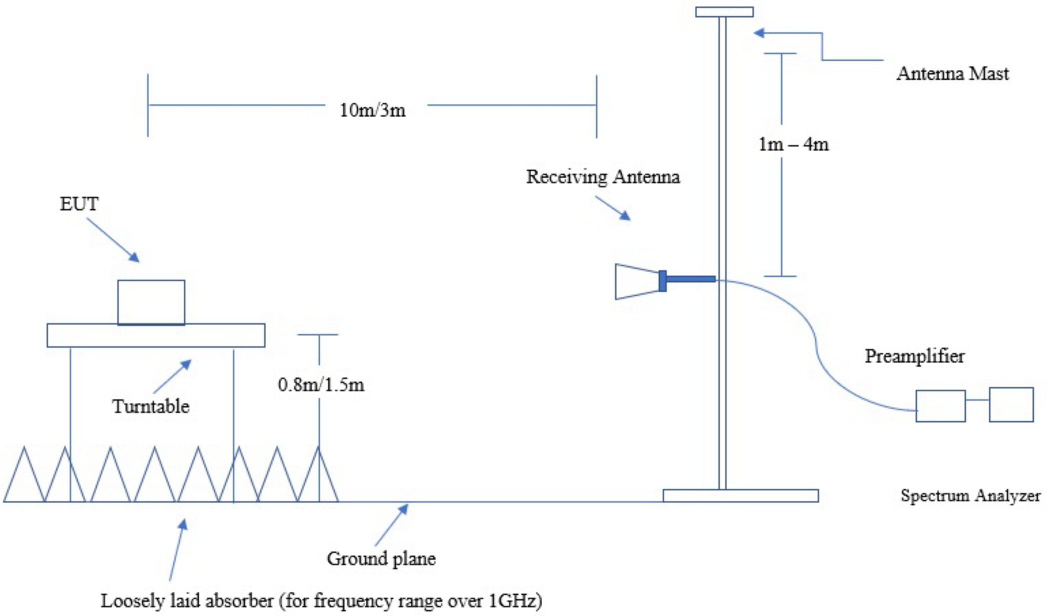
The final measurements are made based on the findings in the exploratory testing. When making exploratory and final measurements it is necessary to maximize the measured radiated emission. Sub clause 8.3.2 of ANSI C63.4-2014 states that the measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” We consider the “cone of radiation” to be the 3 dB beam width of the measurement antenna.

While the “bore-sighting” technique is not explicitly mentioned in ANSI C63.4-2014, it is a useful technique for measurements using a directional antenna, such as a double-ridged waveguide antenna. Several precautions must be observed, including: knowledge of the beam width of the antenna and the resulting illumination area relative to the size of the EUT, estimation for source of the emission and general location within larger EUTs, measuring system sensitivity, etc.

ANSI C63.4-2014 requires that the measurement antenna is kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. That means that if the directional radiation pattern of the EUT results in a maximum emission at an upwards angle from the EUT, when a directional antenna is used to make the measurement it will be necessary for it to be pointed towards the source of the emission within the EUT. This can be done by either pointing the antenna at an angle towards the source of the emission, or by rotating the EUT, in both height and polarization, to maximize the measured emission. The emission must be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT is measured.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz - 1,000 MHz
Test distance	10 m, 3 m*
Test instrumentation resolution bandwidth	9 kHz (20 kHz – 30 MHz)
	120 kHz (30 MHz – 1.000 MHz)
Receive antenna height	1 m (20 kHz – 30 MHz)
Receive antenna polarization	0° or 90° (20 kHz – 30 MHz)
Receive antenna scan height	1 m - 4 m (30 MHz – 1.000 MHz)
Receive antenna polarization	Vertical or Horizontal (30 MHz – 1.000 MHz)
* According to Section 15.31 (f) (1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).	

7.3.3 Test setup



7.3.4 Calculation of the field strength

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of a pre-amplifier)

Corrected Level = Receiver Level + Correction Factor – Pre-amplifier (with the use of a pre-amplifier)

Receiver Level : Receiver reading without correction factors
Correction Factor : Antenna factor + cable loss

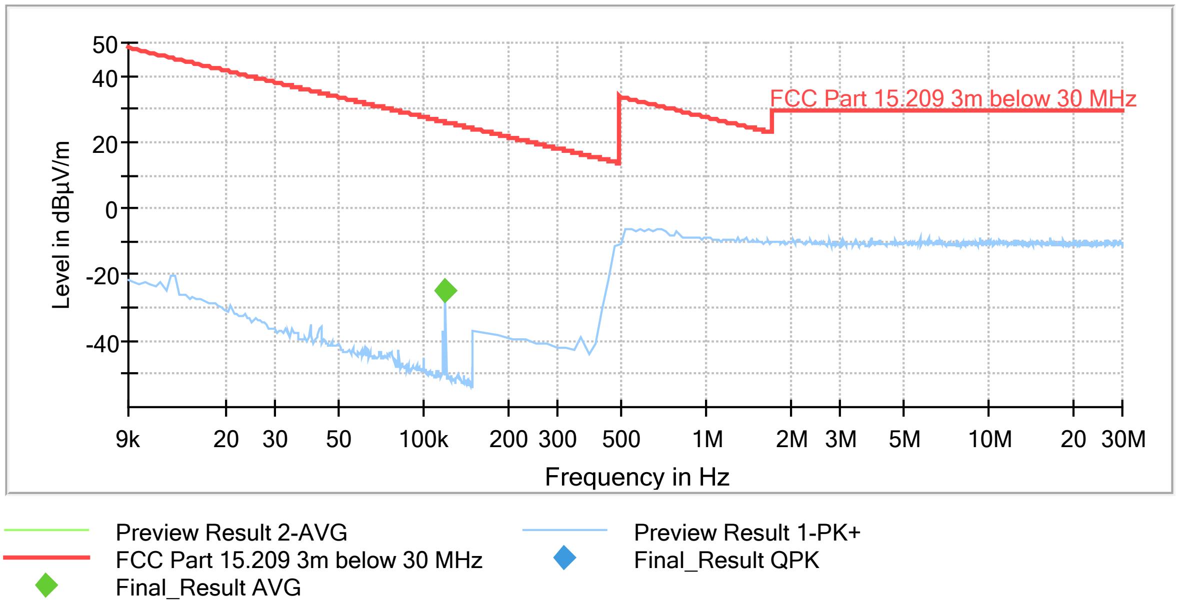
For example:
The receiver reading is 32.7 dBµV. The antenna factor for the measured frequency is +2.5 dB (1/m) and the cable factor for the measured frequency is 0.71 dB, giving a field strength of 35.91dBµV/m.
The 35.91dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/m = Common Antilogarithm (35.91/20) = 62.44

For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f) (1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements).

7.3.5 Results

7.3.5.1 Radiated emissions 9 kHz to 30 MHz



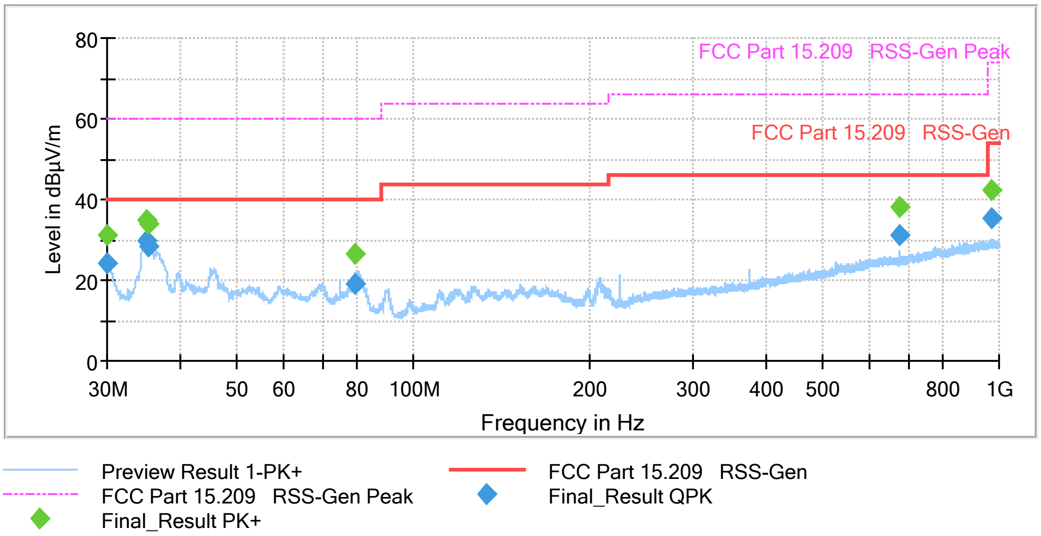
Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
0.119410	---	-24.72	---	---	0.200	H	259.0	-59.6
0.119410	-24.87	---	26.06	50.92	0.200	H	259.0	-59.6
Measurement uncertainty ± 4 dB								

Test Cables used	K189, K191, K194
Test equipment used	660, 665, 667, 668, 669, 697

The equipment passed the conducted tests	Yes	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	Yes	~~No~~	Annex no.: 6

7.3.5.2 Radiated emissions 30 MHz to 1 GHz



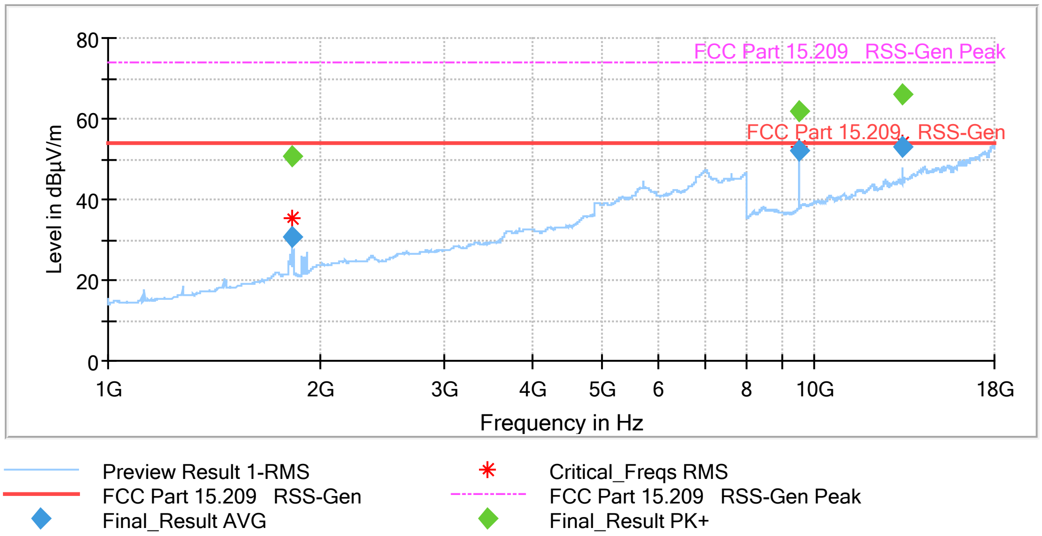
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.000000	---	31.29	60.00	28.71	120.000	103.0	V	151.0	16.4
30.000000	24.39	---	40.00	15.61	120.000	103.0	V	151.0	16.4
34.940000	---	34.66	60.00	25.34	120.000	100.0	V	151.0	16.4
34.940000	29.86	---	40.00	10.14	120.000	100.0	V	151.0	16.4
35.250000	---	33.78	60.00	26.22	120.000	100.0	V	165.0	16.4
35.250000	28.16	---	40.00	11.84	120.000	100.0	V	165.0	16.4
79.670000	19.07	---	40.00	20.93	120.000	247.0	H	239.0	13.5
79.670000	---	26.33	60.00	33.67	120.000	247.0	H	239.0	13.5
675.000000	31.01	---	46.00	14.99	120.000	140.0	V	180.0	26.3
675.000000	---	37.92	66.00	28.08	120.000	140.0	V	180.0	26.3
972.480000	---	42.30	74.00	31.70	120.000	400.0	V	119.0	30.5
972.480000	35.14	---	54.00	18.86	120.000	400.0	V	119.0	30.5
Measurement uncertainty ± 4 dB									

Test Cables used	K189, K191, K194
Test equipment used	406, 660, 665, 667, 668, 669

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.3.5.3 Radiated emissions above1 GHz up to 18 GHz



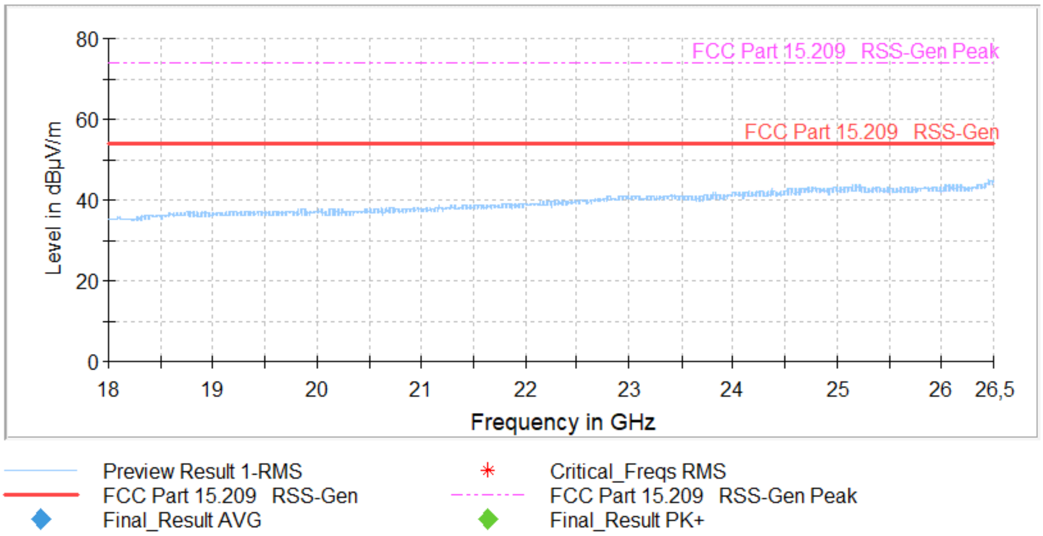
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1821.375000	---	50.70	74.00	23.30	1000.000	162.0	V	218.0	31.6
1821.375000	30.74	---	54.00	23.26	1000.000	162.0	V	218.0	31.6
9539.125000	51.97	---	54.00	2.03	1000.000	201.0	H	330.0	51.7
9539.125000	---	61.94	74.00	12.06	1000.000	201.0	H	330.0	51.7
13364.375000	52.88	---	54.00	1.12	1000.000	352.0	V	3.0	56.1
13364.375000	---	65.90	74.00	8.10	1000.000	352.0	V	3.0	56.1
Measurement uncertainty ± 4 dB									

Test Cables used	K189, K191, K194
Test equipment used	445a, 660, 665, 667, 668, 669

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.3.5.4 Radiated emissions above18 GHz up to 26.5 GHz



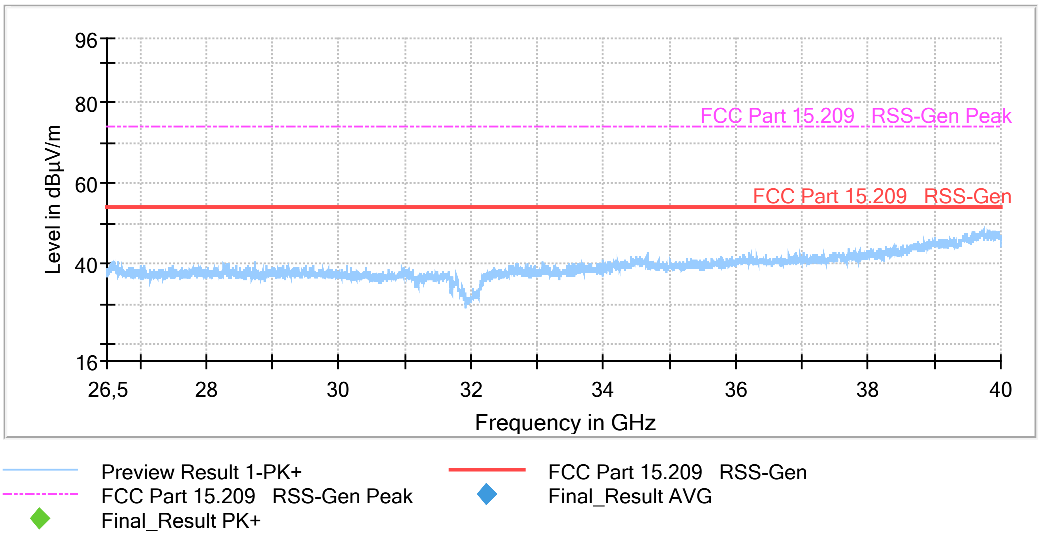
Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
**	---	---	---	---	---	---	---	---	---
Measurement uncertainty ± 5.7 dB									
** All spurious emissions lower than the noise level of the measuring equipment!									

Test Cables used	K189
Test equipment used	442, 443, 660, 667, 668, 669, 696

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.3.5.5 Radiated emissions above26.5 GHz up to 40 GHz



Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
**	---	---	---	---	---	---	---	---	---
Measurement uncertainty ± 5.7 dB									
** All spurious emissions lower than the noise level of the measuring equipment!									

Test Cables used	K189
Test equipment used	223a, 442, 660, 667, 668, 669, 696

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*
Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.4 Radiated average and peak power (EIRP)

7.4.1 Regulation

According to FCC §15.258 (b) Emission levels within the 116-123 GHz, 174.8-182 GHz, 185-190 GHz and 244-246 GHz bands shall not exceed the following equivalent isotropically radiated power (EIRP) limits as measured during the transmit interval:

(1) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(2) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions in this paragraph (b)(2) for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (b)(1) of this section.

(3) The peak power shall be measured with a detection bandwidth that encompasses the entire occupied bandwidth within the intended band of operation, e.g., 116-123 GHz, 174.8-182 GHz, 185-190 GHz or 244-246 GHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

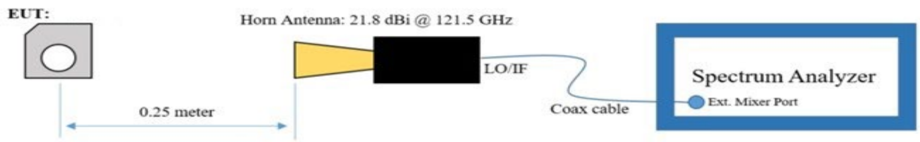
(4) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak radiated power to the product of the maximum permissible radiated power (in milliwatts) times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph (b)(4), emission bandwidth is defined as 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).

7.4.2 Test procedure

Maximum measurement distance for the final radiated measurements above 40 GHz was determined according to ANSI C63.10-2013 section 9.8. To achieve maximum level of emission, maximizing procedure was applied according to ANSI C63.10-2013 section 9.8 where initially an exploratory search for emissions was carried out to determine the approximate direction at which each observed emissions emanates from the EUT. Secondly, for each emission observed a final measurement was executed to find the final position, polarization and orientation at which the maximum level of emission was observed. Measurement of the fundamental emission can be done using an RF detector according to the procedure ANSI C63.10-2013 section 9.11.

7.4.3 Test setup

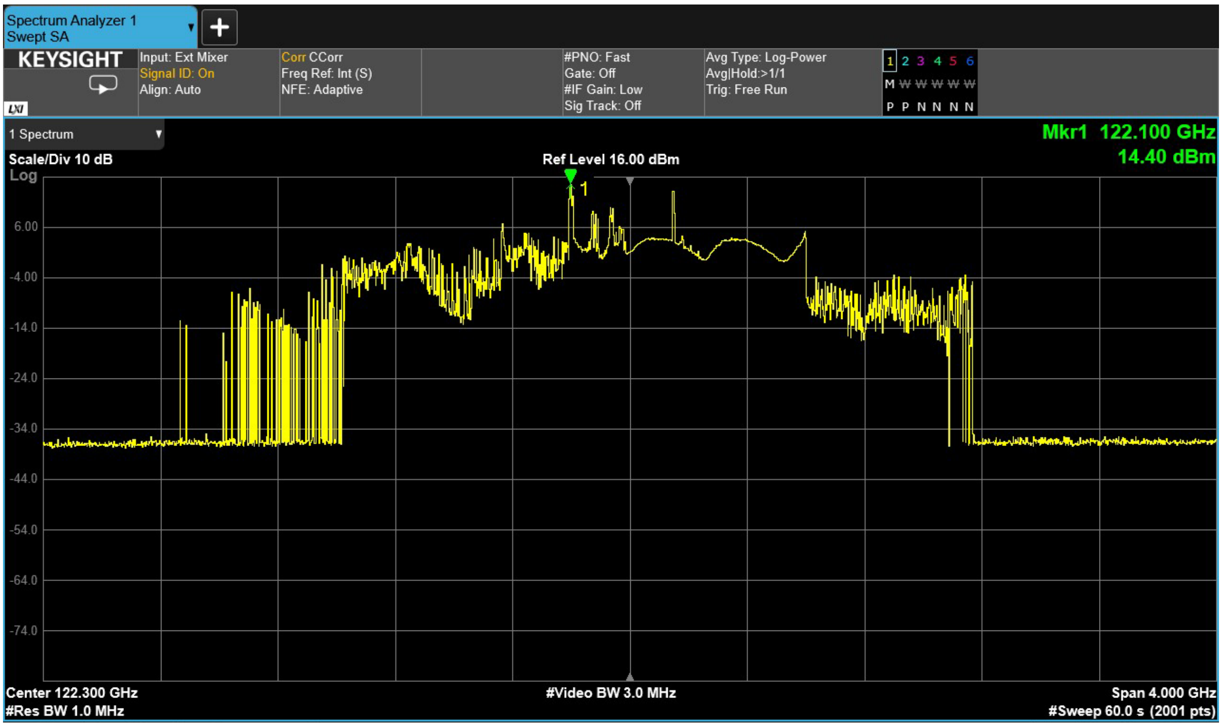
Radiated measurements setup (Radiated output power)



7.4.4 Result

Radiated peak output power acc. to FCC §15.258 (b)(1)				
Frequency	Detector	EIRP Power	EIRP Limit	Margin
GHz	Type	dBm	dBm	dB
122.100	PK	14.40	43.0	28.60
Measurement uncertainty: ± 2.5 dB				

Test Plot:



Test Cables used	K163
Test equipment used	660, 665, 666, 667, 668, 669, 675, 687

The equipment passed the conducted tests	Yes	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	Yes	~~No~~	Annex no.: 6

Radiated average output power acc. to FCC §15.258 (b)(1)				
Frequency	**Detector**	**EIRP Power**	**EIRP Limit**	**Margin**
GHz	**Type**	**dBm**	**dBm**	**dB**
122.100	AV	10.62	40	29.38
Measurement uncertainty: ± 2.5 dB				

Test Plot:

Test Cables used	K163
Test equipment used	660, 665, 666, 667, 668, 669, 675, 687

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.5 Transmitter spurious emissions above 40 GHz

7.5.1 Regulations

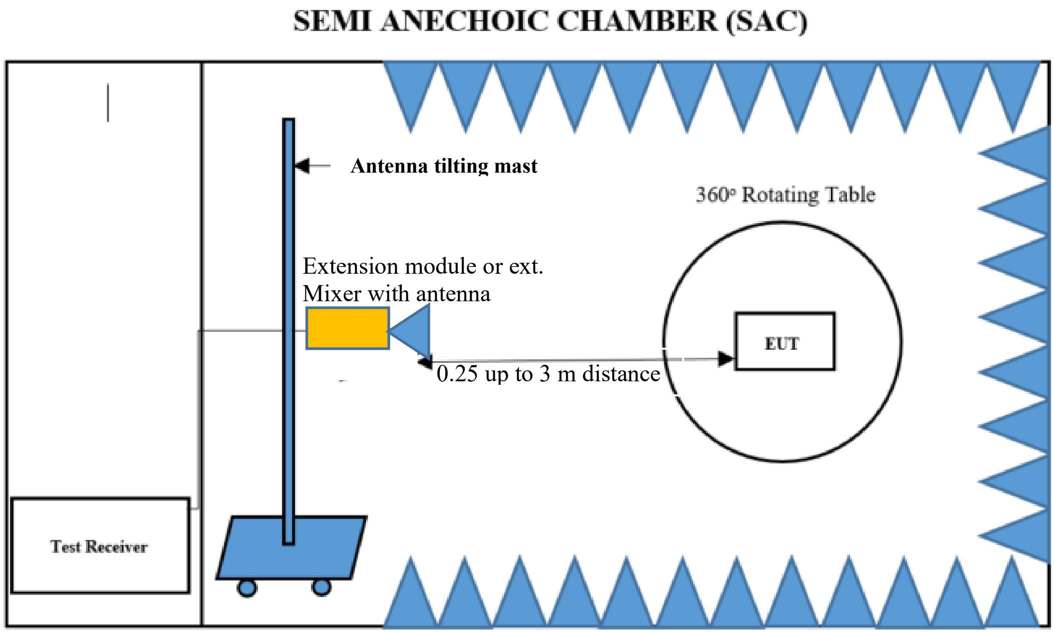
Note 1: According to FCC §15.258 (c)(3)
Note 2: The measurement distance is between 0.25 m and 3.0 m.
Note 3: The Mixers and it`s RF cables are calibratet as system, the conversion factor was added into the Spectrum Analyzer.
Note 5:Limit conversion at the specified distance of 3 m
$\text{EIRP[dBm]} = 10\log10\,(4*\pi\times d^2*\text{PD[W/m}^2\text{]})$
where,
PD = Power density at the distance specified by the limit = 90 [pW/cm²]
EIRP = Equivalent isotropically radiated power in [dBm]
d_{meas} : Distance at which the power density limit is specified = 3 [m]
The emission limit of PD = 90 pW/cm² at a distance of 3 meters corresponds to EIRP = -9.9 dBm.
Note 6: radiated output power calculation:
EIRP[dBm] = RL[dBm] + FSPL[dB] - G [dBi] + CL [dB]
where,
EIRP = Effective radiated power // RL = Receiver reading // FSPL = Free Space Loss at measurement distance (dB) // G = Antenna gain // CL = conversion loss signal path

7.5.2 Test procedure

The measurement of harmonic and spurious emissions above 40 GHz was carried out in accordance with the test procedure ANSI C63.10-2013 section 9.12.
In accordance with the FCC subpart A §15.35 and the FCC subpart C §15.258, the radiated emission measurements were made using a peak detector or average detector.

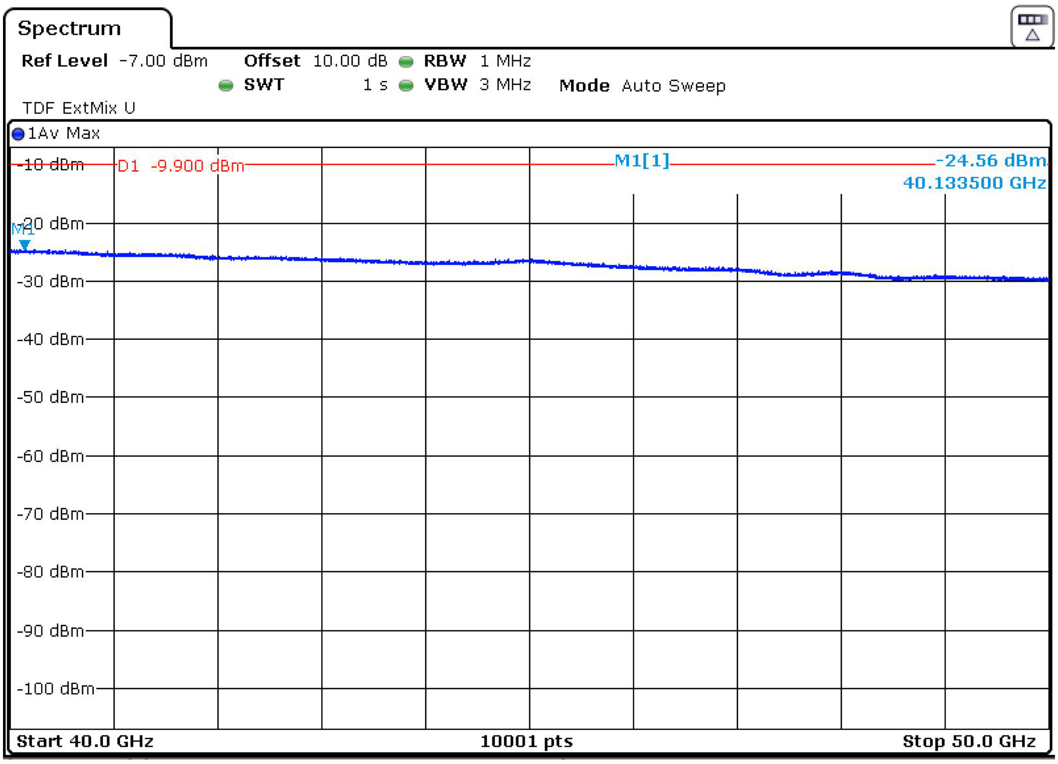
7.5.3 Test setup

Radiated measurements setup above 40 GHz



7.5.4 Results

Transmitter spurious radiation (40 GHz – 50 GHz) (FCC § 15.258 (c)(3))									
Frequency	Av erage Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	dB	dBm	dBm	dB
**	---	---	---	---	---	---	---	---	---



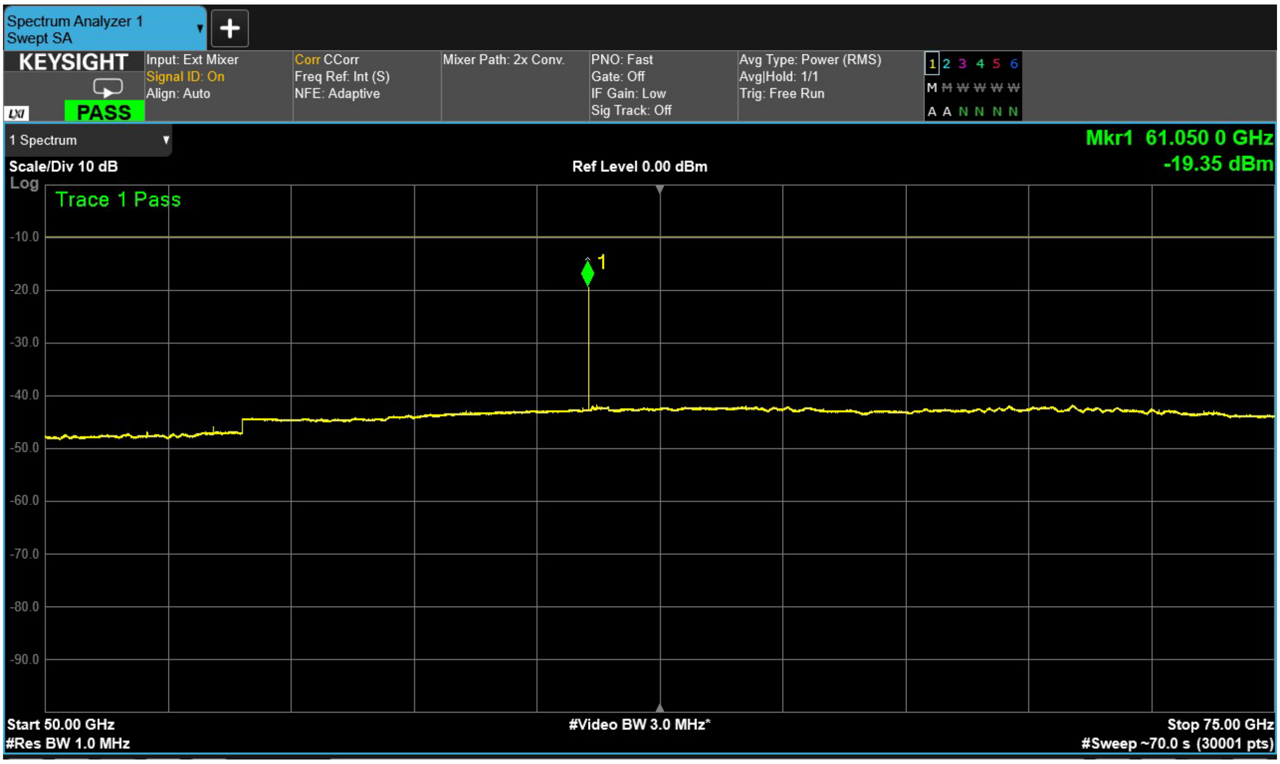
Measurement uncertainty: ± 6.8 dB

**** All spurious emissions lower than the noise level of the measuring equipment!**

Test Cables used	K163
Test equipment used	502, 515, 518, 660, 667, 668, 669

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*
Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

Transmitter spurious radiation (50 GHz – 75 GHz) (FCC § 15.258 (c)(3))									
Frequency	Average Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	dB	dBm	dBm	dB
61.050	AV	1000	-75.83	62.28	25.1	19.3	-19.35	-9.9	9.45



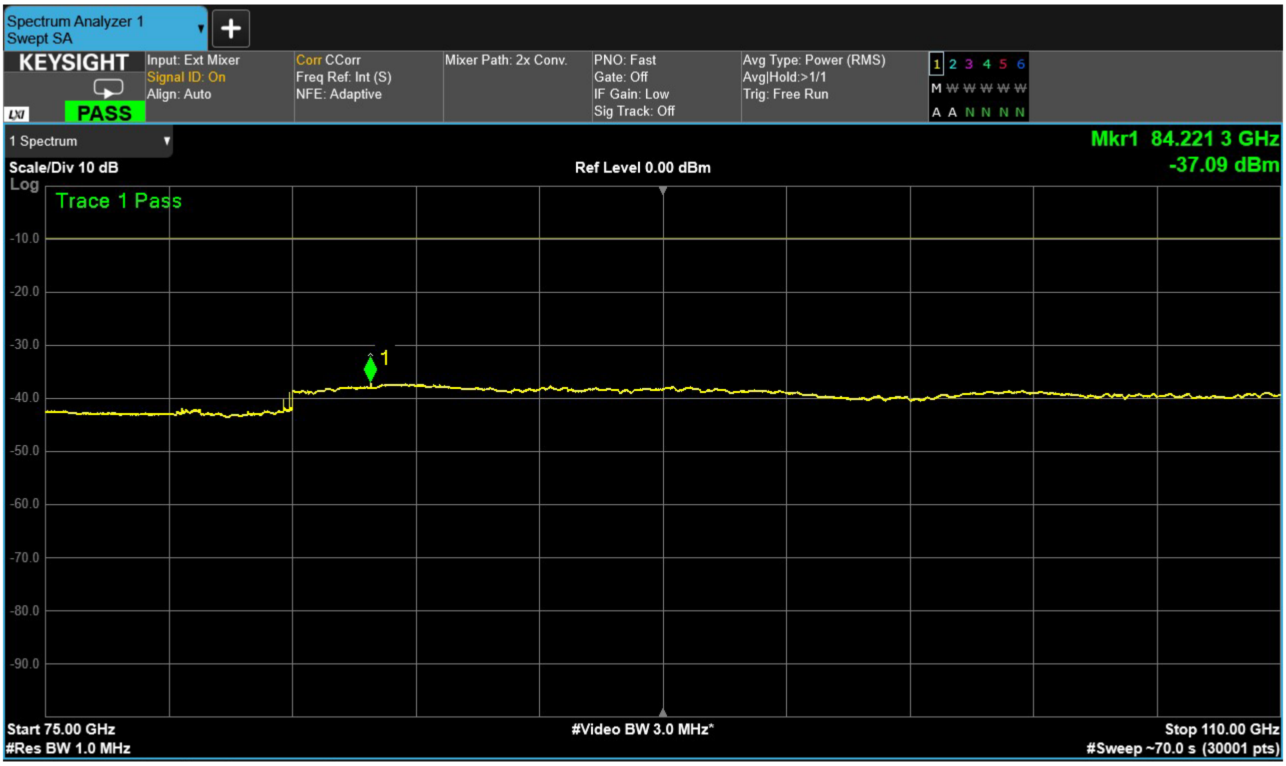
Measurement uncertainty: ± 6.8 dB

**** All other emissions lower than the noise level of the measuring equipment!**

Test Cables used	K163
Test equipment used	384, 673, 660, 666, 667, 668, 669

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*
Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

Transmitter spurious radiation (75 GHz – 110 GHz) (FCC § 15.258 (c)(3))									
Frequency	Receiver Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	db	dBm	dBm	dB
**	---	---	---	---	---	---	---	---	---



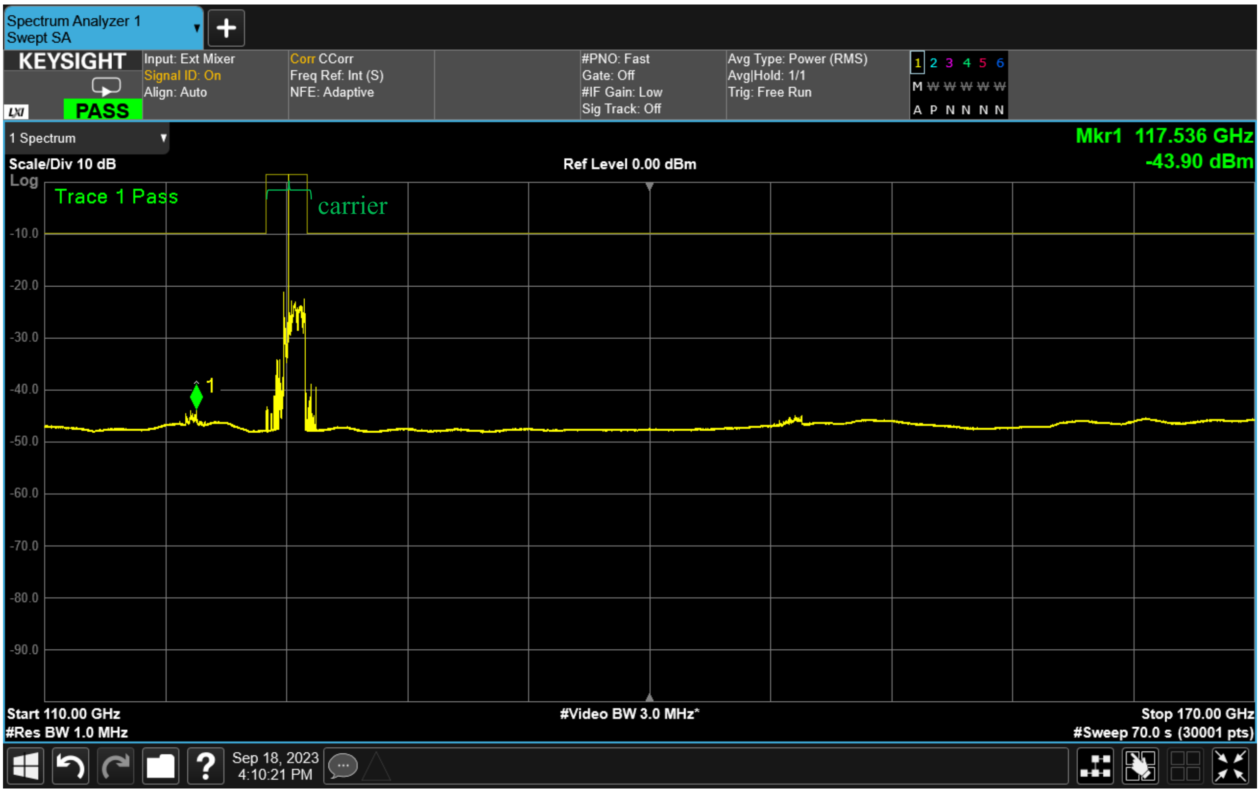
Measurement uncertainty: ± 6.8 dB

**** All emissions lower than the noise level of the measuring equipment!**

Test Cables used	K163
Test equipment used	384, 673, 660, 666, 667, 668, 669

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.*~~
Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

Transmitter spurious radiation (110 GHz – 170 GHz) (FCC § 15.258 (c)(3))									
Frequency	Receiver Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	db	dBm	dBm	dB
**	---	---	---	---	---	---	---	---	---



Measurement uncertainty: ± 6.8 dB

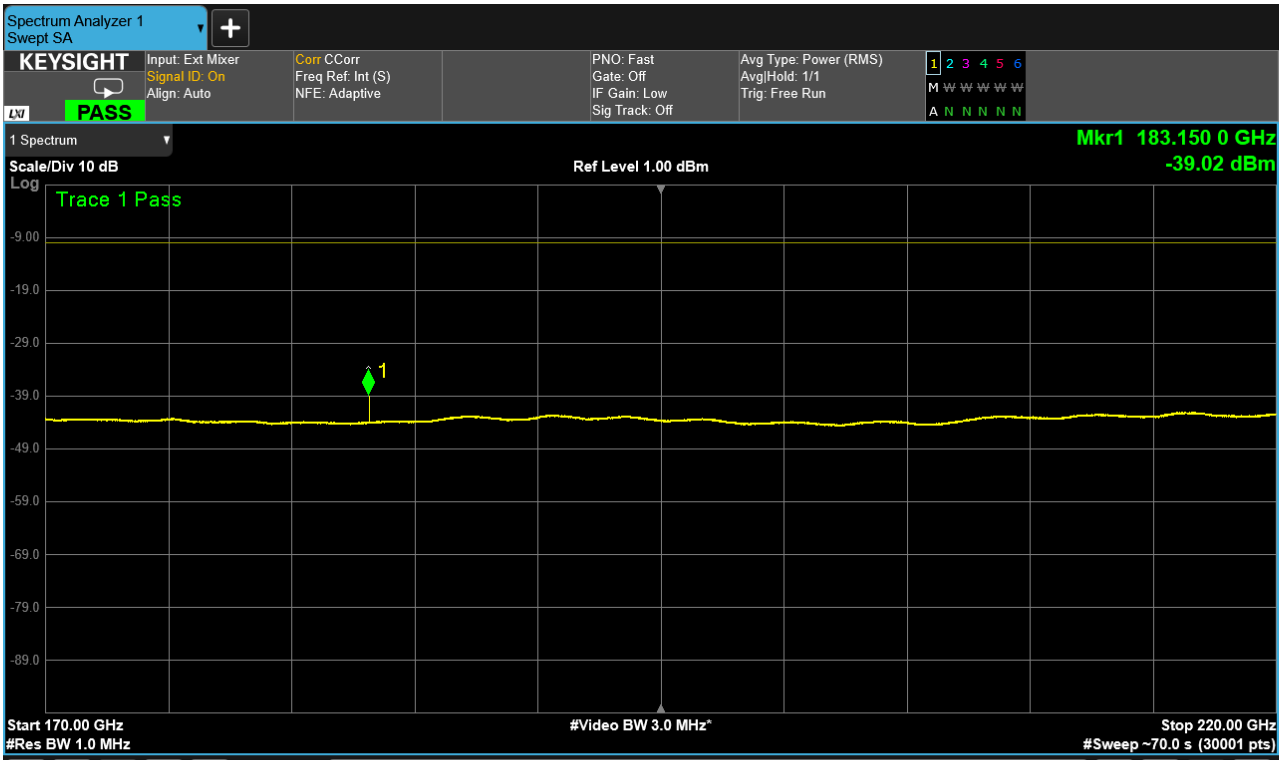
**** All spurious emissions lower than the noise level of the measuring equipment!**

Test Cables used	K163
Test equipment used	660, 666, 667, 668, 669, 675, 687

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

Transmitter spurious radiation (170 GHz – 220 GHz) (FCC § 15.258 (c)(3))									
Frequency	Receiver Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	db	dBm	dBm	dB
146.42	AV	1000	-98.50	69.73	21.5	11.25	-39.02	-9.9	29.12



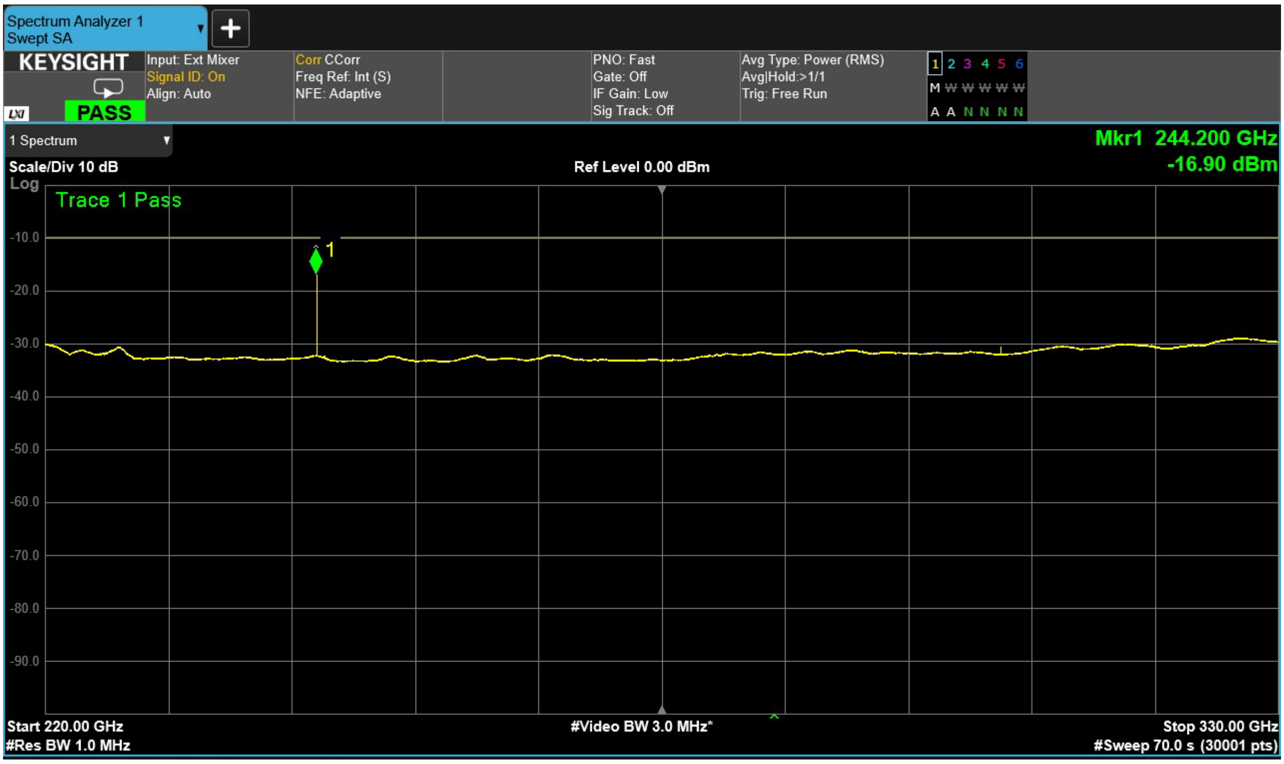
Measurement uncertainty: ± 6.8 dB

**** All other emissions lower than the noise level of the measuring equipment!**

Test Cables used	K163
Test equipment used	660, 666, 667, 668, 669, 677, 688

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*
Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

Transmitter spurious radiation (220 GHz – 330 GHz) (FCC § 15.258 (c)(3))									
Frequency	Receiver Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	db	dBm	dBm	dB
244.200	AV	1000	-81.50	74.18	20.7	11.12	-16.90	-9.9	7.0



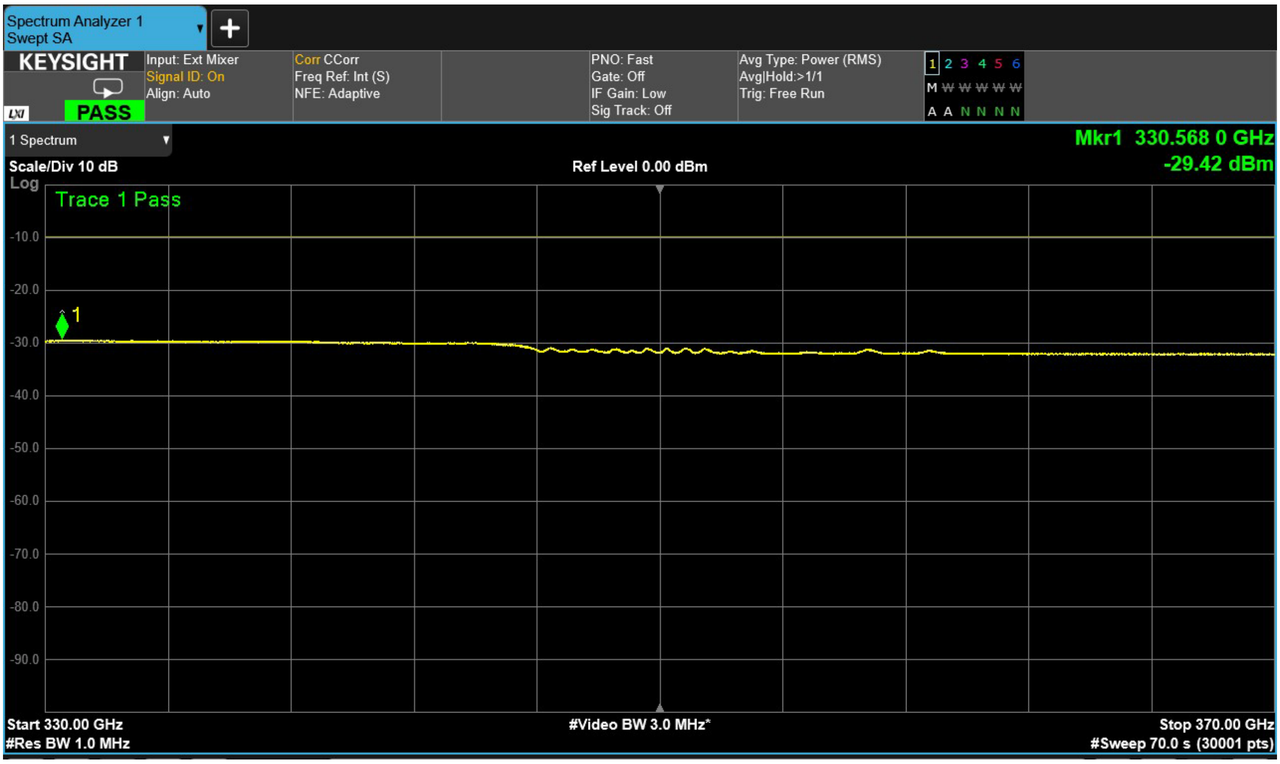
Measurement uncertainty: ± 6.8 dB

**** All other emissions lower than the noise level of the measuring equipment!**

Test Cables used	K163
Test equipment used	660, 666, 667, 668, 669, 679, 689

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*
Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

Transmitter spurious radiation (330 GHz – 370 GHz) (FCC § 15.258 (c)(3))									
Frequency	Receiver Detector	BW	RL	FSPL	G	CL	EIRP	Limit	Margin
GHz	Type	kHz	dBm	dB	dBi	db	dBm	dBm	dB
**	---	---	---	---	---	---	---	---	---



Measurement uncertainty: ± 6.8 dB
** All spurious emissions lower than the noise level of the measuring equipment!

Test Cables used	K163
Test equipment used	660, 666, 667, 668, 669, 679, 689

The equipment passed the conducted tests	Yes	~~No~~	~~N.t.*~~

Test setup photos / test results are attached	Yes	~~No~~	Annex no.: 6

7.6 Bandwidth

7.6.1 Regulation

According to FCC § 15.258 (d) 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.

7.6.2 Test procedure

6 dB Bandwidth and Occupied Bandwidth (99 % Bandwidth) were measured. The Occupied Bandwidth was measured directly from the spectrum analyzer’s in-built measurement function with correct analyzer settings (RBW, VBW, detector, span and etc). For 6 dB Bandwidth, the measurement settings and procedure were carried out in accordance with the ANSI C63.10-2013 section 9.3. The bandwidth measurements were also performed in extreme environmental conditions.

7.6.3 Results

Measured 99% BW GHz	**Measured 6dB BW GHz**
1.4509	0.00673

Test Cables used	K163
Test equipment used	666, 675, 687

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.~~*

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 3, 6

7.7 Frequency tolerance

7.7.1 Regulation

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.

7.7.2 Test procedures

Stability with respect to ambient temperature:

Supply the EUT with nominal ac voltage, or install a new or fully charged battery in the EUT. If possible, a dummy load should be connected to the EUT, because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn the EUT on, and tune it to one of the number of frequencies required.

Couple the intentional radiator output to the measuring instrument by connecting an antenna to the measurement instrument with a suitable length of coaxial cable and placing the measurement antenna near the EUT (e.g., 15 cm away) or by connecting a dummy load to the measuring instrument through an attenuator, if necessary.

Supply the EUT with nominal ac voltage, or install a new or fully charged battery in the EUT. Turn the EUT on, and couple its output to the measuring instrument by connecting an antenna to the measurement instrument with a suitable length of coaxial cable.

Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

Tune the EUT to any one of the number of frequencies specified. Turn the EUT off, and place it inside an environmental chamber if appropriate. Allow the chamber to stabilize at +20 °C before proceeding. Turn on the EUT, and record the operating frequency of the intentional radiator at startup and two, five, and ten minutes after startup. Turn the EUT off and allow it to cool to the ambient temperature, and then repeat this procedure for the number of the frequencies specified. Four measurements are made at each operating frequency.

Stability with respect to input voltage:

Supply the EUT with nominal ac voltage, or install a new or fully charged battery in the EUT. If possible, a dummy load should be connected to the EUT, because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn the EUT on, and tune it to one of the number of frequencies required.

Couple the intentional radiator output to the measuring instrument by connecting an antenna to the measurement instrument with a suitable length of coaxial cable and placing the measurement antenna near the EUT (e.g., 15 cm away) or by connecting a dummy load to the measuring instrument through an attenuator, if necessary.

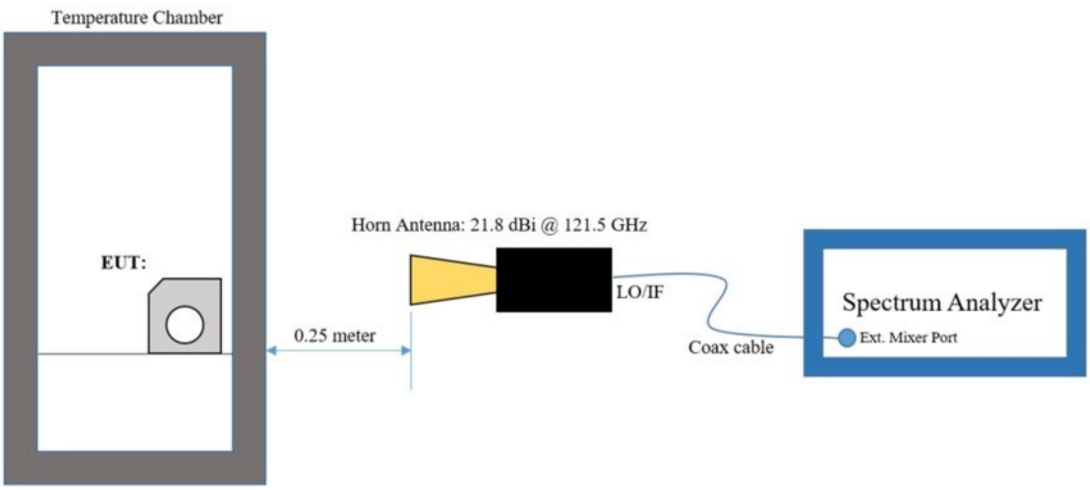
Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Turn the EUT off, and place it inside an environmental temperature chamber. For devices that are normally operated continuously, the EUT may be energized while inside the test chamber. For devices that have oscillator heaters, energize only the heater circuit while the EUT is inside the chamber.

Set the temperature control on the chamber to the highest specified EUT operating temperature, and allow the temperature inside the chamber to stabilize at the set temperature before starting frequency measurements.

While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup and two, five, and ten minutes after the EUT is energized. Four measurements in total are made.

Repeat the above procedure until the number of frequencies specified has been measured. After all measurements have been made at the highest specified temperature, turn the EUT off. Repeat the above measurement process for the EUT with the test chamber set at the lowest temperature specified by the regulatory or procuring agency. Measurements shall be made at the number of frequencies specified.

7.7.3 Test setup



7.7.4 Result

Test conditions	Frequency tolerance			
	Frequency (GHz)			
T_{nom} = +20° C	f_L Measured	f_H Measured	f_L Limit	f_H Limit
V_{min} = 12 V DC	**121.451581**	**122.902506**	**116.000**	**123.000**
V_{nom} = 18 V DC	**121.451581**	**122.902506**	**116.000**	**123.000**
V_{max} = 24 V DC	**121.451581**	**122.902506**	**116.000**	**123.000**
Measurement uncertainty	± 5*10^{-8}			

Test conditions	Frequency tolerance			
	Frequency Measured (GHz)			
V_{nom} = 18 V DC	f_L Measured	f_H Measured	f_L Limit	f_H Limit
T_{min} -20 °C	**121.496004**	**122.905514**	**116.000**	**123.000**
T_{min} -10 °C	**121.482192**	**122.980850**	**116.000**	**123.000**
T_{min} 0 °C	**121.446205**	**122.963295**	**116.000**	**123.000**
T_{min} +10 °C	**121.451727**	**122.990473**	**116.000**	**123.000**
T_{min} +20 °C	**121.451581**	**122.902506**	**116.000**	**123.000**
T_{min} +30 °C	**121.440968**	**122.967487**	**116.000**	**123.000**
T_{min} +40 °C	**121.455258**	**122.913393**	**116.000**	**123.000**
T_{min} +50 °C	**121.451445**	**122.901820**	**116.000**	**123.000**
Measurement uncertainty	±5*10^{-8}			

Test Cables used	K163
Test equipment used	102a, 666, 675, 687, 401, 226

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.*~~

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

7.8 RF radiation exposure

7.8.1 Regulation

According to FCC § 15.255 (g), Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note 1: f = frequency in MHz; * = Plane-wave equivalent power density
Note 2: RF exposure calculation according to §1.1310 and §2.1091

7.8.2 result

These equations are generally accurate in the far field of an antenna but will over predict power density in the near field, where they could be used for making a “worst case” prediction.

S = PG/4πR2

where S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units e.g. mW)
G = power gain of the antenna in the direction of interest relative to the isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units e.g. cm)

OR, $S = EIRP/(4\pi R^2)$

where, EIRP = equivalent isotropically radiated power

Operating Frequency	**EIRP**		**Power density (S) @ 20 cm**	
			Calculated	**Limit**
GHz	**dBm**	**mW**	**mW/ cm^2**	
122.100	**14.4**	**27.54**	**0.0055**	**1.0**

Test Cables used	K163
Test equipment used	660, 665, 666, 667, 668, 669, 675, 687

The equipment passed the conducted tests	**Yes**	~~No~~	~~N.t.*~~

Test setup photos / test results are attached	**Yes**	~~No~~	Annex no.: 6

8 Additional information to the test report

Remark	Description
N.t.[1]	Not tested, because the antenna is part of the PCB
N.t.[2]	Not tested, because the EUT is directly battery powered
N.t.[3]	Not tested, because not applicable to the EUT
N.t.[4]	Not tested, because not ordered

9 List of test equipment

State January 10, 2024					
Marking	**Manufacturer**	**SW/Type/Serial-No.**	**Last Cal./Val.**	**Next Cal. /Val. (± 1 month)**	**No.**
1 Measuring Instruments					
Attenuator	Radiall	---	Nov 22	Nov 25	62
Attenuator 3dB	Suhner	6803/17	Nov 22	Nov 25	137
Attenuator 3dB / 18 GHz	Suhner	3dB/18GHz	Nov 22	Nov 25	299
Attenuator 6dB / 18 GHz	Suhner	6dB/18GHz	Nov 22	Nov 25	344
Attenuator 20dB / 20GHz	Parzich	40AH-20	Nov 22	Nov 25	354
Terminator	KDI	T173CS	Nov 22	Nov 25	490
Variable transformer	RFT	LS 002	---	---	154a
Variable transformer	Schunt+Ben	---	---	---	155
Power sensor	Marconi	6914	Dec 22	Dec 24	258
Power sensor	Rohde & Schwarz	NRP18SN	Feb 22	Feb 24	651
3-Path Diode Power Sensor 10 MHz to 8 GHz	Rohde & Schwarz	NRP8S	Dec 22	Dec 24	663
3-Path Diode Power Sensor 10 MHz to 18 GHz	Rohde & Schwarz	NRP18S-20	Dec 22	Dec 24	664
Diode Power Sensor 100 kHz – 6 GHz	Rohde & Schwarz	NRV-Z5 S/N: 829562/008	Nov 22	Nov 24	390
Coaxial Directional Coupler	Narda	3003-20	Jan 21	Jan 24	370/342
Coaxial directional coupler	Mini Circuits	ZFDC-20-5	May 22	May 24	434
Coaxial directional coupler	Narda+Suhner	4246B-20	Sep 22	Sep 25	472/492
Coaxial directional coupler	Narda	3045C-10	Sep 22	Sep 25	110a
Coaxial directional coupler	Narda	3044B-10	Sep 22	Sep 25	21a
Coaxial directional coupler	Narda	3044B-30	Sep 22	Sep 25	327
Coaxial directional coupler	Narda	3022 / 50204	Sep 22	Sep 25	303
Coaxial High Pass Filter	Mini circuits	NHP-700	Apr 21	Apr 24	435
Coaxial High Pass Filter	Mini circuits	NHP-200	Apr 21	Apr 24	405
Coaxial High Pass Filter	Mini circuits	NHP-25+	Apr 21	Apr 24	455
High Pass Filter	Mini circuits	VHF-3500+	Sep 22	Sep 25	451
High Pass Filter	Mini circuits	VHF-1200+	Apr 21	Apr 24	452
High Pass Filter	Morita Tech	MT-SCHLC-500/T300-0/0	Oct 23	Oct 26	703
High Pass Filter	Morita Tech	MT-SCHPFF-1000-T855-0/0	Oct 23	Oct 26	704
High Pass Filter	Morita Tech	MT-SCHPF-2000/ T1720-0/0	Oct 23	Oct 26	705
Bandpass Filter	Schomandl	BN86871	Nov 21	Nov 24	66
Bandpass Filter	Schomandl	BN68673	Nov 21	Nov 24	67
Band Reduction Filter	Morita Tech	MT-SC12FVRC-5250/X200-0/0	Oct 23	Oct 26	701
Band Reduction Filter	Morita Tech	MT-SCBRF-5597.5/255-0/0	Oct 23	Oct 26	702
Low Pass Filter	Mini circuits	SLP550	Apr 21	Apr 24	273
Low Pass Filter	Mini circuits	SLP550	Apr 21	Apr 24	274
RF Current Probe 9 kHz – 30 MHz	Rohde & Schwarz	ESH2-Z1	Aug 21	Aug 24	42
Passive Test Probe – 9 kHz – 30 MHz	TÜV NORD	VDE 0876	Apr 21	Apr 24	45
Coaxial Fixed Attenuator DC – 1 GHz	Texscan	HFP50/10	Aug 23	Aug 26	60
8 Wire Impedance Stabilisation Network	Schwarzbeck	CAT5 8158	Nov 21	in calibration	71a
T-Section - 50 W	Rohde & Schwarz	BN 42441/50	Nov 21	Nov 24	93
RF Current Injection Clamp 0.15 – 1GHz	Lüthi GmbH	EM 101	Jan 23	Jan 25	156
Absorbing Clamp MDS 30MHz – 1GHz	Lüthi GmbH	MDS-21	Jan 23	Jan 26	160
Insertion Unit	Rohde & Schwarz	URV5-Z4	Jul 22	Jul 24	162
Coaxial RF Termination - 0 – 1000 MHz	Telewave Inc.	TWL 35	Nov 21	Nov 24	164
Coaxial RF Termination - 0 – 1000 MHz	Telewave Inc.	TWL 60	Nov 21	Nov 24	165
Fixed Attenuator - DC – 1.5GHz	Bird	Mod/ 8343-060	May 23	May 26	177
CDN up to 230 MHz	MEB	KEN-M 2 /M 3	Oct 22	Oct 24	262

CDN up to 230 MHz	MEB	KEN-M 2 /M 3	Dec 21	Dec 23	264
Coupling Filter	HAEFELY	FP 16/3-1	Jan 23	Jan 25	366
Impulse limiter 10 dB	Rohde & Schwarz	ESH3 Z2	Jun 22	Jun 24	272
Fixed Attenuator - DC – 18 GHz | 30 dB	MTS	---	May 22	May 24	276
Termination Resistor 50 W	Radiall	404011	Nov 21	Nov 24	309
Branching device (4x) 50W	Rohde & Schwarz	892228/20	Sep 22	Sep 25	320
Dummy-Load - 2 – 18 GHz	Narda	MODEL 367NF	Jan 23	Jan 26	343
DC Block Adapter - 0.045 – 26.5 GHz	Hewlett-Packard	11742A	Apr 21	Apr 24	356
RF Probe 0.02 – 1000 MHz	Rohde & Schwarz	URY-Z7	Aug 22	Aug 25	368
150W attenuator	Weinschel	49-20-33	Nov 22	Nov 25	374
Fixed Coaxial Attenuator - DC – 18 GHz	Weinschel	23-6-34	Mar 23	Mar 26	375
Attenuator 60 dB (10 MHz – 8 GHz)	---	---	Mar 23	Mar 26	376
Insertion Unit 100V | 100 kHz – 2 GHz	Rohde & Schwarz	URY-Z4	Jun 22	Jun 24	417
Panoramic Adapter (Monitoring)	Schwarzbeck	PAN1550	---	---	429
DC-BLOCK - DC – 6.0 GHz |50 W	Mini Circuits	BLK-6-N+	Nov 21	Nov 24	462
Terminating resistor 50Ω SMA	---	---	Jan 23	Jan 26	493
Terminating resistor 50Ω SMA	---	SC 60-601-0000-31	Jan 23	Jan 26	497
Fixed Attenuator –0 – 40 GHz	Anritsu	41KC-10	Jan 23	Jan 26	504
Fixed Attenuator – 0 – 40 GHz	Anritsu	41KC-10	Jan 23	Jan 26	505
Fixed Attenuator – 0 – 40 GHz	Anritsu	41KC-3	Jan 23	Jan 26	507
Electric Dummy Load	RA-NAV Lab.	DA-75U	---	---	526
Power Splitter / Combiner	Mini Circuits	ZESC-2-11	Nov 22	Nov 25	527
3 Way Power Splitter / Combiner	Mini Circuits	ZFSC-3-1	Mar 23	Mar 26	529
3 Way Power Splitter / Combiner	Mini Circuits	ZFSC-3-1	Mar 23	Mar 26	530
RF-Attenuator - 6 dB	Haefely	---	Mar 23	Mar 26	540
RF-Attenuator - 1– 120 MHz | 12 dB	Haefely	---	Mar 23	Mar 26	541
RF-Attenuator - 1– 120 MHz | 39 dB	Haefely	---	Mar 23	Mar 26	542
LISN 9kHz – 30 MHz	Schwarzbeck	NNLA 8120 (SN: 8120499A)	Oct 22	Oct 24	551
HV Probe P6013A	Tektronix	P6013A	Jul 22	Jul 24	559
VLISN 5µH	Schwarzbeck	8125-1944	Nov 21	in calibration	585
VLISN 5µH	Schwarzbeck	8125-1945	Nov 21	in calibration	586
20dB Attenuator, up to 18 GHz	Mini Circuit	BW-N20W5+	Nov 22	Nov 25	594
Step Attenuator - DC-18 GHz | 0 to 11 dB	Hewlett-Packard	8494B	Nov 22	Nov 25	604
Analyser Reference System	Spitzenberger & Spies	PAS 1000 SyCore + ARS 16/1	Mar 22	Mar 24	606a/b/c
Capacitive Coupling Clamp 5 kV	Schlöder	SFT 415	Jul 23	Jul 26	608
RF Probes for 50 Ω Receivers	Schwarzbeck	TK 9416	Jun 22	Jun 24	612
Current probe TRMS	BEHA APROB	CHB35	Nov 22	Nov 24	652
Semi Anechoic Chamber	COMTEST	SAC-3m	Apr 23	Apr 25	660
Maturo Turntable	Maturo	TT2.0SI (SN: TT2.05SI/817 SW: 1.0.0.4473)	---	---	667
Maturo Antenna Mast	Maturo	TAM4.5-E-10kg (SN: 10011/216/2588.01)	---	---	668
Maturo Controller	Maturo	FCU3.0/009/2588.01 (SN: 10014/2019)	---	---	669
Current probe 20 Hz – 100 MHz	Rohde & Schwarz	EZ-17 (0816.2063.03)	May 23	May 26	670
Coupling Decoupling Network	AMETEK	CDN ST08A	Oct 22	Oct 24	672
BONN HF Switch Matrix DC – 8 GHz	BONN Elektronik	BAS 0080-3	---	---	682
External Directional Coupler	BONN Elektronik	BDC 1060-40/500	Jan 22	Jan 24	683
BI-Directional Coax. Coup. 50-1000 MHz	Narda	3020A	Nov 24	Nov 26	141
Vertical coupling plate	TÜV NORD HFT	---	---	---	265
Measuring table	TÜV NORD HFT	---	---	---	106
Data line coupling network	EM Test AG	CNV 504/ 508	---	---	285

OSP230 BASE Unit 2HU with TS	OSP230	S/N: 102031	June 23 Factory cal.	June 25	698
2 Generators					
EFT/Burst Generator	Schlöder	SFT 1400	Sep 22	Sep 24	46a
ESD Generator	Schlöder	SESD 216	Dec 21	Dec 23	653
Signal Generator	Rohde & Schwarz	SMB100A SW 4.20.028.58	Sep 22	Sep 24	571
RF Generator	Rohde & Schwarz	SGT100A	Jun 22	Jun 24	636
Signal Generator	Rohde & Schwarz	SMG	Jun 22	Jun 24	136a
Signal Generator	Marconi	2042	Jul 22	Jul 24	6
Signal Generator	Marconi	2024	Jul 22	Jul 24	213
Puls Generator	EM Test	MPG 200	Apr 23	Apr 25	181
Surge Generator	H+H	MIG063 IN S-T	Jun 23	Jun 25	561
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500 S/N: 171332	Aug 22 Factory cal.	Aug 24	691
3. Antennas					
Active Loop Antenna 8.3 kHz – 30 MHz	Rohde & Schwarz	HFH2-Z2E S/N: 101171	May 23	May 25	697
Biconical Ant. 30-300 MHz	Schwarzbeck	VHA9103/BBA9106	May 22	May 24	80/616
Biconical Ant. 20-300 MHz	Schwarzbeck	VHBB 9124 / BBA9106	Jan 23 Factory cal.	Jan 25	692
Biconical Ant. 20-300 MHz	Schwarzbeck	VHBB 9124 / BBA9106	Jan 23 Factory cal.	Jan 25	693
Biconical Antenna 9 kHz – 300 MHz	Schwarzbeck	EFS9218 / 9218-194	Jul 23	Jul 25	523
Double Ridged Horn	Schwarzbeck	BBHA9120C	Feb 22	Feb 24	169
Double Ridged Horn	Schwarzbeck	BBHA 9120A	May 20	May 24	284
Tri-Log Broadband	Schwarzbeck	VULB9168	Jun 23	Jun 25	406
Broadband Horn 14-40 GHz	Schwarzbeck	BBHA9170	Feb 22	Feb 24	442
Log Per Antenna 0.7-20 GHz	Schwarzbeck	STLP9148	Jun 23	Jun 25	445a
Log Per Antenna 0.2 – 3.5 GHz	Schwarzbeck	VUSLP 9111B	Jan 23 Factory cal.	Jan 25	694
Log Per Antenna 0.2 – 3.5 GHz	Schwarzbeck	VUSLP 9111B	Jan 23 Factory cal.	Jan 25	695
Log Per Antenna 1 GHz – 18 GHz	Rohde & Schwarz	S/N 352886/009	Jun 23 (Val. only)	Jun 25	700
Bilog Ant.	CHASE	CBL6111	Cal. before use	Cal. before use	167
Spectrum analyser Mixer 220 – 325 GHz	Radiometer Physics	SAM325 / 20029	Oct 23	Oct 25	591
Dual Mode Potter Horn 220-325 GHz	Radiometer Physics	325-WR2	---	---	592
Dual Mode Potter Horn 75-110 GHz	Radiometer Physics	---	---	---	649
Gain Horn Antenna 50-75 GHz	Dorado	GH-15-20	---	---	511
Standard Gain Horn 1.7 – 2.6 GHz	Narda	645	---	---	514
W-band active Sextupler with input drive amplifier	Spacek Labs Inc.	AW-6XW-0	---	---	221a
60 to 65 GHz active frequency quadrupler	Spacek Labs Inc.	A625-4XW-0	---	---	222a
Harmonic Mixer 40-60 GHz	Rohde & Schwarz	FS-Z60/ 100037	Oct 23	Oct 25	515
Gain Horn Antenna 40-60 GHz	Dorado	GH-19-20 / 070106	---	---	518
Spectrum analyser Mixer 90-140 GHz	Radiometer Physics	SAM140 / 20006	Oct 23	Oct 25	545
Dual Mode Potter Horn 90-140 GHz	Radiometer Physics	140-WR8	---	---	547
Spectrum analyser Mixer 140-220GHz	Radiometer Physics	SAM220 / 20002	Oct 23	Oct 25	546
Dual Mode Potter Horn 140-220 GHz	Radiometer Physics	220-WR5.1	---	---	548
Harmonic Mixer 60-90 GHz	Rohde & Schwarz	FS-Z90 / 100062	Oct 23	Oct 25	501
Dual Mode Potter Horn 60-90 GHz	Radiometer Physics	90-W12	---	---	549
Gain Horn 33-55 GHz	Dorado	040810	---	---	383
Gain Horn 50-75 GHz	Dorado	031003	---	---	384
Gain Horn 75-110 GHz	Dorado	040808	---	---	385
Standard Gain Ant. 26.5-40 GHz	Maury Microwave	U211C	---	---	532/628
Waveguide Harmonic Mixer 50 – 75 GHz	Keysight	M1971V	Jan 22	Jan 24	673

Waveguide Harmonic Mixer 75 – 110 GHz	Keysight	M1971W	Jan 22	Jan 24	674
Stacked Log.-Per. Antenna 70 MHz – 10 GHz	Schwarzbeck	STLP 9129	---	---	662
Spectrum/Signal Analyzer Extension Module 110 GHz – 170 GHz (WR-6.5)	Virginia Diodes, Inc.	SAX 637	Jun 22	Jun 24	675
Spectrum/Signal Analyzer Extension Module 140 GHz – 220 GHz (WR-5.1)	Virginia Diodes, Inc.	SAX 636	Jun 22	Jun 24	677
Spectrum/Signal Analyzer Extension Module 220 GHz – 330 GHz (WR-3.4)	Virginia Diodes, Inc.	SAX 635	Jun 22	Jun 24	679
Conical Gain Horn Ant. 110 GHz – 170 GHz [21 dBi]	Virginia Diodes, Inc.	Conical Antenna WR-6.5	---	---	687
Conical Gain Horn Ant. 140 GHz – 220 GHz [21 dBi]	Virginia Diodes, Inc.	Conical Antenna WR-5.1	---	---	688
Diagonal Gain Horn Ant. 220 GHz – 330 GHz [26 dBi]	Virginia Diodes, Inc.	Diagonal Antenna WR-3.4	---	---	689
4. Amplifier					
RF-Power Amplifier 250 kHz – 150 MHz	ENI	3100LA	---	---	123
RF pre-amplifier 100kHz-1.3GHz	HP	8447E	Sep 20	Sep 24	166a
Mitteq amplifier 26.5-40 GHz	Mitteq	---	Sep 22	Sep 24	223a
RF pre-amplifier 1-18GHz	Narda	---	Sep 22	Sep 24	345
Mitteq Amplifier 18-26GHz	Mitteq	---	Jun 23	Jun 26	433
Microwave amplifier 12-28GHz	Schwarzbeck	BBV9719	Sep 22	Sep 24	443
Microwave amplifier 0.5-18GHz	Schwarzbeck	BBV9718	Sep 22	Sep 24	444
RF-Power Amplifier 10kHz-1000 MHz	Poetschke	8100 (Band 1) BHED (Band 2) BHED (Band 3)	---	---	684
RF-Power Amplifier 800 MHz – 4,2 GHz	Amplifier Research	10S1G4	---	---	685
RF-Power Amplifier 4 GHz – 8 GHz	Amplifier Research	35S4G8A	---	---	686
RF-Power Amplifier 0.69 GHz – 6 GHz	Rohde & Schwarz	BBA150-D110/E60	---	---	690
5. Power supplies					
Programmable Power Supply	Fluke	PM 2813	---	---	28a
Power Supply	HP	---	---	---	125
Power Supply	Sorensen	LM 30-6	---	---	134a
Power Supply	HP	6034L	---	---	226
Regulated Power Supply	Farnell	AP60-50	---	---	408
Power Supply	EA	PSI 8080-40-DT	---	---	560
Power Supply	HP	6032A	---	---	644
6. Meters					
Microwave Frequency Counter	Hewlett-Packard	5351B	Jun 23	Jun 25	432
Temperature test cabinet	Heraeus Vötsch	VMT04/35	---	---	102a
Temperature and Climate Test Chamber	Weiß Umwelttechnik, WKL 34/40	S.N.: 5667998 // SW: Simpac 1.4.4.0	Nov 21	in calibration	562
Temperature test cabinet	Brabender	TTE 32/40 H	---	---	87
Digital-Hygro-Thermometer	Greisinger	GFTH95	Feb 23	Feb 25	57a
Volt & RF Power Meter	Rohde & Schwarz	URV35	Jun 22	Jun 25	161
Power Meter	Marconi	6960/ S.N: 1214	Dec 22	Dec 25	139a
Spectrum Analyzer - 9 kHz – 18 GHz	Rohde & Schwarz	FSL18	Cal. before use	Cal. before use	171a
Multimeter	Gossen Metrawatt	Metrahit pro	Nov 21	in calibration	215a
Humidity/Temperature Measuring device	TESTO	Testo 625	Nov 21	in calibration	259a
Volt & RF Power Meter	Rohde & Schwarz	URV35	Cal. before use	Cal. before use	271
Multimeter	Gossen Metrawatt	Metrahit 26S	Oct 22	Oct 24	313
Level and Power Meter - 9 kHz – 3 GHz	Rohde & Schwarz	URY	Apr 22	Apr 24	307
Temperature test device	Ahlhorn	Almemo 2390-5 PT100	Apr 23	Apr 26	401/402
Digital-Vacuum-/Barometer	Greisinger	GDH12AN	Jan 22	Jan 25	558

Digital Storage Oscilloscope	Tektronix	TDS 2012C	Nov 22	Nov 24	568
Miniature Flat, Zero-Biased Schottky Detector –0.1– 18 GHz	Narda	4503A-03	Val. before use	Val. before use	613
Digital-Vacuum-/Barometer	Greisinger	GDH-200-14	Nov 21	in calibration	632
Network Analyser 9 kHz -6 GHz	Rohde & Schwarz	ZVL6 (SN: 101268)	Sep 22	Sep 24	534
Signal Analyser 10 Hz – 30 GHz	Rohde & Schwarz	FSV 30 S/N: 100932	Oct 23	Oct 25	502
EMI Test receiver ESW26	Rohde & Schwarz	R&S ESW26 (SN: 101383/26 SW: R&S ESW2.10)	Nov 21	in calibration	665
EMI Test Receiver ESW44	Rohde & Schwarz	R&S ESW44 SN: 103281	May 23	May 25	696
Signal analyser Keysight 50GHz	Keysight	UXA N9040B (SN: MY57213006 SW: A.27.02/2020 1.0)	Jan 22	Jan 24	666
7. test/control software					
EMC32	Rohde & Schwarz	V10.60.20	---	---	---
Maturo mcApp	Maturo	SW: V3.4.9.4537 (19.04.04)	---	---	---
SPS EMC	Spitzenberger & Spies	SW: V4.1.3	---	---	---
EMV-Soft	Schlöder GmbH	SW: V11.95	---	---	---
ISMISO	EM Test AG	SW:V3.63	---	---	---

10 Cable list

Internal Cable Number	Connector Type	Frequency Range (MHz)	Cable Length (m)	Manufacturer
3	N	0,5 - 8000	3	Cellflex
4	N	0,5 - 8000	3	Cellflex
4a	BNC	10 – 1500	0.50	Telemeter
12a	N	10 – 265000	6	Huber + Suhner
14a	BNC	10 – 1000	1.00	Telemeter
17a	APC3.5	10 – 26500	2.13	Huber + Suhner
18a	APC3.5	10 – 26500	2.13	Huber + Suhner
22	BNC	10 – 1000	1.50	---
27	BNC	10 – 1000	1.00	Fabrica Milanese Cond.
35	N	10 – 2000	1.10	Fujikura
40	BNC	---	0.50	Aircell
43	SMA	10 – 18000	0.50	Rosenberger
44	SMA	---	0.50	Huber + Suhner
45	SMA	10 – 18000	0.50	Huber + Suhner
48	SMA		0.50	Huber + Suhner
49	N	10 – 18000	1.00	Huber + Suhner
50	N	10 – 18000	1.00	Huber + Suhner
51	N	10 – 18000	1.00	Huber + Suhner
52	N	10 – 18000	1.00	Huber + Suhner
54	BNC	10 – 3500	1.00	Aircell
58	N	10 – 18000	2.00	Huber + Suhner
59	N	10 – 18000	1.00	Huber + Suhner
60	N	10 – 18000	2.00	Huber + Suhner
61	N	10 – 18000	1.00	Huber + Suhner
62	SMA	---	0.50	Huber + Suhner
63	SMA	10 – 18000	0.50	Huber + Suhner
64	SMA	10 – 18000	0.50	Huber + Suhner
65	APC3.5	10 – 26500	0.60	---
66	APC3.5	10 – 26500	0.60	---
67	APC3.5	10 – 26500	0.60	---
68	APC3.5	10 – 26500	0.60	---
72	BNC	---	0.40	---
73	BNC	---	0.40	---
76	SMA	10 – 30000	3.00	Gore
79	BNC/N	10 – 1000	5.00	---
80	SMA	---	0.25	Huber + Suhner
87	SMA	10 – 18000	0.15	Huber + Suhner
88	SMA	10 – 18000	0.15	Huber + Suhner
89	SMA	10 – 18000	0.15	Huber + Suhner
90	SMA	10 – 18000	0.15	Huber + Suhner
91	SMA	---	1.50	Huber + Suhner
94	BNC	---	1.10	---
95	BNC	---	0.80	---
96	BNC	---	0.80	---
100	N	10 – 26500	6.00	Rosenberg
101	N	10 – 18000	2.90	Huber + Suhner
102	SMA	10 – 18000	2.00	Huber + Suhner
111	BNC	10 – 1000	0.50	---
112	BNC	10 – 1000	0.50	---
114	SMA	10 – 18000	0.25	Huber + Suhner
116	SMA	10 – 18000	0.25	Huber + Suhner
119	N	10 – 20000	8.00	Jyebao
121	SMA	10 – 18000	1.50	Huber + Suhner
122	SMA	10 – 18000	2.00	Huber + Suhner

Internal Cable Number	Connector Type	Frequency Range (MHz)	Cable Length (m)	Manufacturer
123	SMA	10 – 18000	2.00	Huber + Suhner
145	SMA	10 – 26500	8.00	Huber + Suhner
147	APC3.5	10 – 40000	1.50	Jyebao
148	APC3.5	10 – 40000	3.00	Jyebao
151	SMA	10 – 18000	0.50	Rosenberger
152	SMA	10 – 18000	0.50	Rosenberger
154	BNC	10 – 1000	1.00	---
155	N/BNC	---	0.85	---
157	BNC	---	0.50	---
158	SMA	10 – 26500	2.00	Huber + Suhner
160	SMA	10 – 18000	0.40	Nortel Networks
161	SMA	10 – 18000	1.00	Huber + Suhner
162	APC3.5	10 – 26500	2.00	Huber + Suhner
163	APC3.5	10 - 26500	2.00	Huber + Suhner
164	APC3.5	10 – 26500	2.00	Huber + Suhner
165	APC2.9	10 – 26500	2.00	Huber + Suhner
166	APC3.5	10 – 26500	5.70	Rosenberger
167	APC3.5	10 – 40000	1.00	Jyebao
168	APC3.5	10 – 40000	1.00	Jyebao
169	APC3.5	10 – 40000	1.00	Jyebao
170	APC3.5	10 – 40000	1.00	Jyebao
171	APC3.5	10 – 40000	1.00	Jyebao
172	SAM	---	0.90	Huber + Suhner
173	APC	10 – 26500	2.00	Huber + Suhner
174	APC	10 – 26500	---	Huber + Suhner
175	SMA	10 – 18000	0.40	Huber + Suhner
176	N-SMA	10 – 18000	0.50	Huber + Suhner
188	N	10 – 18000	5.00	Huber + Suhner
189	PC-PC	10 – 26500	6.00	Jyebao
190	PC-PC	10 – 26500	6.00	Jyebao
192	N-N	10 – 18000	3.0	Jyebao
193	N-N	10 – 18000	3.0	Jyebao
194	N-SMA	10 – 18000	2.0	Jyebao
195	N-SMA	10 – 18000	2.0	Jyebao
EMV 1	BNC	---	2.00	Henn
EMV 2	BNC	10 – 1000	2.00	Henn
EMV 4	BNC	---	9.70	Henn
EMV 5	BNC	---	3.80	Henn
EMV 6	BNC/N	10 – 1000	5.00	Lüthi
EMV 7	BNC	10 – 1000	1.50	Henn
EMV 8	BNC	10 – 1500	1.70	Henn
EMV 9	BNC	10 – 1000	1.70	Henn
EMV 11	BNC	---	5.20	Hasselt
EMV 12	BNC	10 – 1000	2.40	Hasselt
EMV 13	BNC	10 – 1000	4.10	Hasselt
EMV 14	BNC	10 – 1000	2.50	Hasselt
EMV 15	BNC	---	0.90	Henn
EMV 16	Fischer	---	2.00	---
EMV 18a	Fischer	---	1.00	---
EMV 19a	Fischer	---	1.50	---
KISN2	BNC	10 – 2000	4.80	---

End of test report