

TEST REPORT

of the accredited test laboratory

TÜV Nr.: **2022-IN-AT-TICL-E-EX-000246-FG-004-Rev1**

Applicant: Harman Professional, Inc.
8500 Balboa Blvd.
Northridge, CA91329,USA

Tested Product: Wireless microphone handheld transmitter

Product Name: HT 40 MINI PRO US25D

FCC-ID: **2AUHEHT4025D**

IC: 6132A-HT4025D

Manufacturer: VTech Communications Ltd.
Xia Ling Bei Management Zone, Liaobu, Dongguan,
Guangdong Province
523411 China

Output power / field strength: 5,56 mW EIRP **power supply:** 1,5V DC
Channel separation: 350 kHz

Frequency range: 540,4 MHz

Standard: EN 300 422-1 V1.4.2; EN 300 422-1 V2.1.2;
47 CFR Part 74 (eCFR July 25th 2022 Edition);
47 CFR Part 15 (eCFR July 25th 2022 Edition);
47 CFR Part 1 (eCFR July 25th 2022 Edition);
RSS-210 Issue 10;
RSS-102 Issue 5;
ANSI C63.26-2015; ANSI C63.10-2013;

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25.04.2023

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The results of this test report only refer to the provided equipment.

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1. Applicant

Company: Harman Professional, Inc.

Department: R&D

Address: 8500 Balboa Blvd.
Northridge, CA91329,USA

Contact person: Mr. Gabor Mikovics

EUT received on: 25.07.2022

Tests were performed on: 25.07. till 18.08.2022

2. Description of EUT

EUT:	Wireless microphone handheld transmitter
Product name:	HT 40 MINI PRO US25D
Serial Number:	Prototype
Manufacturer:	VTech Communications Ltd. Xia Ling Bei Management Zone, Liaobu, Dongguan, Guangdong Province 523411 China
Description:	Harman Professional, Inc. provided the following configuration for the measurements: Prototype
Operating mode:	The measurements were carried out at the following running states: Transmitting
Technical data EUT:	Rated voltage: 1,5VDC Rated current: 500mA Rated frequency: DC Mains voltage during the tests: 1,5VDC via internal battery
Climatic conditions in the emc laboratory:	Relative humidity: 61% Temperature: 23°C

3. Standards / Final result

Name	Title	Deviation	Result
EN 300422-1 V2.1.2	Wireless Microphones; Audio PMSE up to 3 GHz; Part 1: Class A Receivers; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU	none	OK
EN 300422-1 V1.4.2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement	*)	OK
47 CFR Part 15 (eCFR July 25 th 2022 Edition)	RADIO FREQUENCY DEVICES	none	OK
47 CFR Part 74 (eCFR July 25 th 2022 Edition)	EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCAST AND OTHER PROGRAM DISTRIBUTIONAL SERVICES; Subpart H—Low Power Auxiliary Stations	none	OK
47 CFR Part 1 (eCFR July 25 th 2022 Edition)	GENERAL	none	OK
RSS-210 Issue 10	Licence-Exempt Radio Apparatus: Category I Equipment; Annex G—Low-Power Radio Apparatus Operating in the Television Bands	none	OK
ANSI C36.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	none	OK
ANSI C36.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	none	OK
RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)	none	OK
Result: Opinions and interpretation of testing laboratory OK: EUT passed NOK: EUT failed			

*) Only Spurious Emissions and Necessary bandwidth were measured

4. TEST RESULT

4.1. Frequency stability

**ETSI EN 300 422-1 V2.1.2
SUBCLAUSE 8.1**

ETSI requirements

Rated output power: 5,56 mW

Operating condition		Frequency Error kHz			Frequency Error ppm		
			540,4 MHz			540,4 MHz	
T _{nom} (23)°C	V _{nom} (1,5)V		0,724			1,340	
T _{min} (-10)°C	V _{min} (1,05)V		0,289			0,535	
	V _{nom} (1,5)V		0,695			1,286	
T _{max} (45)°C	V _{min} (1,05)V		-1,158			-2,143	
	V _{nom} (1,5)V		-1,187			-2,197	
Measurement uncertainty					± 0,1 ppm		

LIMIT

ETSI EN 300 422-1 V2.1.2 SUBCLAUSE 8.1.3

The frequency error shall not exceed 20 parts per million for frequencies below 1 GHz, 15 parts per million between 1 GHz and 2 GHz and 10 ppm above 2 GHz.

Test Equipment used: EMV-205; M-1200

Frequency stability

47 CFR § 74.861 (e) (3)
 47 CFR § 74.861 (e) (4)
 47 CFR § 15.236 (f) (3)
 RSS-210 G3

FCC/ISED requirements

Rated output power: 5,56 mW

Operating condition	Frequency Error kHz			Frequency Error ppm		
Operating voltage at 20°C ambient temperature		540,4 MHz			540,4 MHz	
1,72 V		0,753			1,393	
1,05 V		0,579			1,071	
Measurement uncertainty				± 0,1 ppm		
Operating condition	Frequency Error kHz			Frequency Error ppm		
ambient temperature at 1,5V operating voltage		540,4 MHz			540,4 MHz	
-30°C		-3,994			-7,391	
-20°C		-0,926			-1,714	
-10°C		0,695			1,286	
0°C		1,447			2,678	
10°C		1,389			2,570	
20°C		0,724			1,340	
30°C		0,000			0,000	
40°C		-0,926			-1,714	
50°C		-1,389			-2,570	
Measurement uncertainty				± 0,1 ppm		

LIMIT 47 CFR § 74.861 (e) (4) / Table G.1

The frequency tolerance of the transmitter shall be 0,005 percent (50ppm).

LIMIT 47 CFR § 74.861 (e) (3)

Any form of modulation may be used. A maximum deviation of ± 75 kHz is permitted when frequency modulation is employed

LIMIT 47 CFR § 15.236 (f) (3)

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.005\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

LIMIT RSS-210 G5

The devices may employ any type of modulation. The type of modulation used shall be reported.

Equipment employing amplitude modulation (AM) or frequency modulation (FM) shall have a modulation index that does not exceed 100% or a frequency deviation that does not exceed ± 75 kHz, respectively.

Test Equipment used: EMV-205; M-1200

4.2 Rated output power

ETSI EN 300 422-1 V2.1.2
 SUBCLAUSE 8.2.3
 47 CFR § 74.861 (e) (1) (ii)
 47 CFR § 15.236 (d) (1)
 RSS-210 G.1

Radiated Measurement

Rated output power: 5,56 mW

Test conditions		Transmitter power (mW) (erp)		
			540,4 MHz	
T_{nom} (23)°C	V_{nom} (1,5)V		3,39	
Maximum deviation from rated output power under normal test conditions (%)			0	
Measurement uncertainty		$\pm 0,75$ dB		

Test conditions		Transmitter power (mW) (eirp)		
			540,4 MHz	
T_{nom} (23)°C	V_{nom} (1,5)V		5,56	
Measurement uncertainty		$\pm 0,75$ dB		

Conducted Measurement

Test conditions		Transmitter power (mW) (erp)		
			540,4 MHz	
T_{nom} (23)°C	V_{nom} (1,5)V		6,03	
Maximum deviation from rated output power under normal test conditions (%)			0	
Measurement uncertainty		$\pm 0,75$ dB		

LIMIT ETSI EN 300 422-1 V2.1.2 SUBCLAUSE 8.2.3

The measured value shall be within +20 % and -50 % of the manufacturers declared rated output power.

LIMIT 47 CFR § 74.861 (e) (1) (ii)

The he power may not exceed the following values: 250 mW conducted power

LIMIT 47 CFR § 15.236 (d) (1)

In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP

LIMIT RSS-210 G.1

The transmit power shall be measured in average value as a conducted emission over any period of continuous transmission.

The frequency bands, transmit e.i.r.p., authorized bandwidth and frequency stability limits for devices are provided in table G1.

requeency bands (MHz)	Transmit e.i.r.p. (mW)	Authorized bandwidth (kHz)	Frequency stability (± ppm)
54-72 76-88 174-216	50	200	50
470-608	250	200	50
614-616 653-663	20	200	50

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-112/1; NT-131/1; NT-207/1

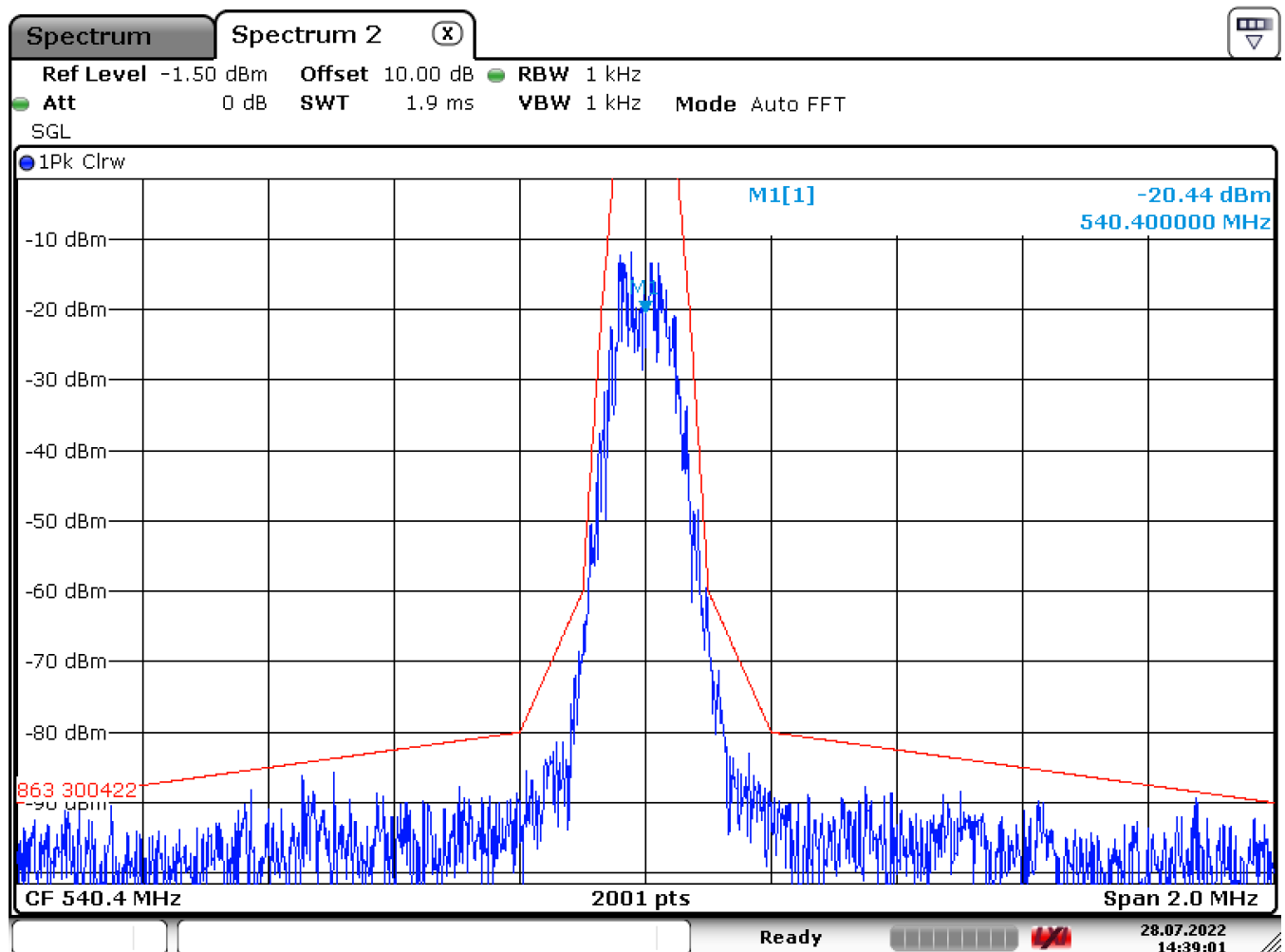
4.3 NECESSARY BANDWIDTH

ETSI EN 300 422-1 V2.1.2
ETSI EN 300 422-1 V1.4.2
SUBCLAUSE 8.3
47 CFR § 15.236 (g)
47 CFR § 15.236 (f) (2)
47 CFR § 74.861 (e) (5)
47 CFR § 74.861 (e) (7)
RSS-210 G.2
RSS-210 G.4

The operating Bandwidth was measured at an acoustic input level 12 dB higher than the limiting threshold, determined with 500 Hz signal.

Rated output power: 5,56 mW

Measurement with weighted noise source signal @ 540,4 MHz centered.



Date: 28.JUL.2022 14:39:02

LIMIT

ETSI EN 300 422-1 V2.1.2 SUBCLAUSE 8.3.2.2 ETSI EN 300 422-1 V1.4.2 SUBCLAUSE 8.3.2.2

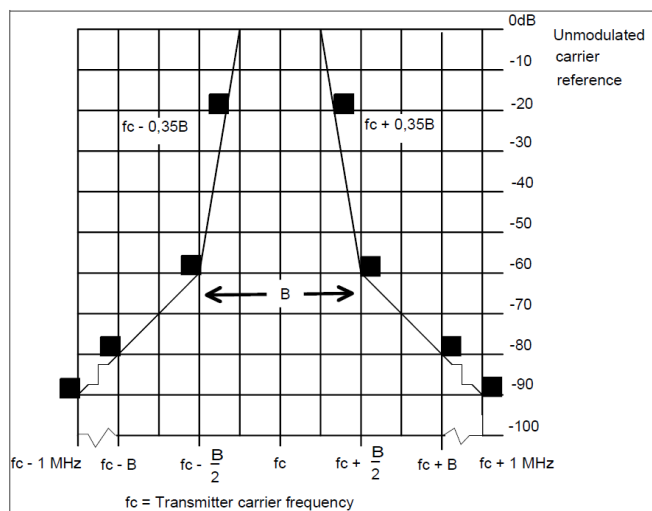


Figure 3 shows the spectrum mask for all analogue systems in the band. The -90 dBc point shall be ± 1 MHz from f_c measured with an average detector. To comply, a measured value shall fall below the mask limit as shown in figure 3.

LIMIT

47 CFR § 15.236 (f) (2)

One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

LIMIT

47 CFR § 15.236 (g)

Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in § 8.3 of ETSI EN 300 422-1 V1.4.2

LIMIT

47 CFR § 74.861 (e) (5)

The operating bandwidth shall not exceed 200 kHz.

LIMIT

47 CFR § 74.861 (e) (7)

Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2

LIMIT

RSS-210 G.2

The occupied bandwidth for wireless microphones shall not exceed the authorized bandwidth specified in G1: 200 kHz.

LIMIT

RSS-210 G.4

The transmitter unwanted emissions shall meet and be measured according to the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1.

TEST EQUIPMENT USED: EMV-205

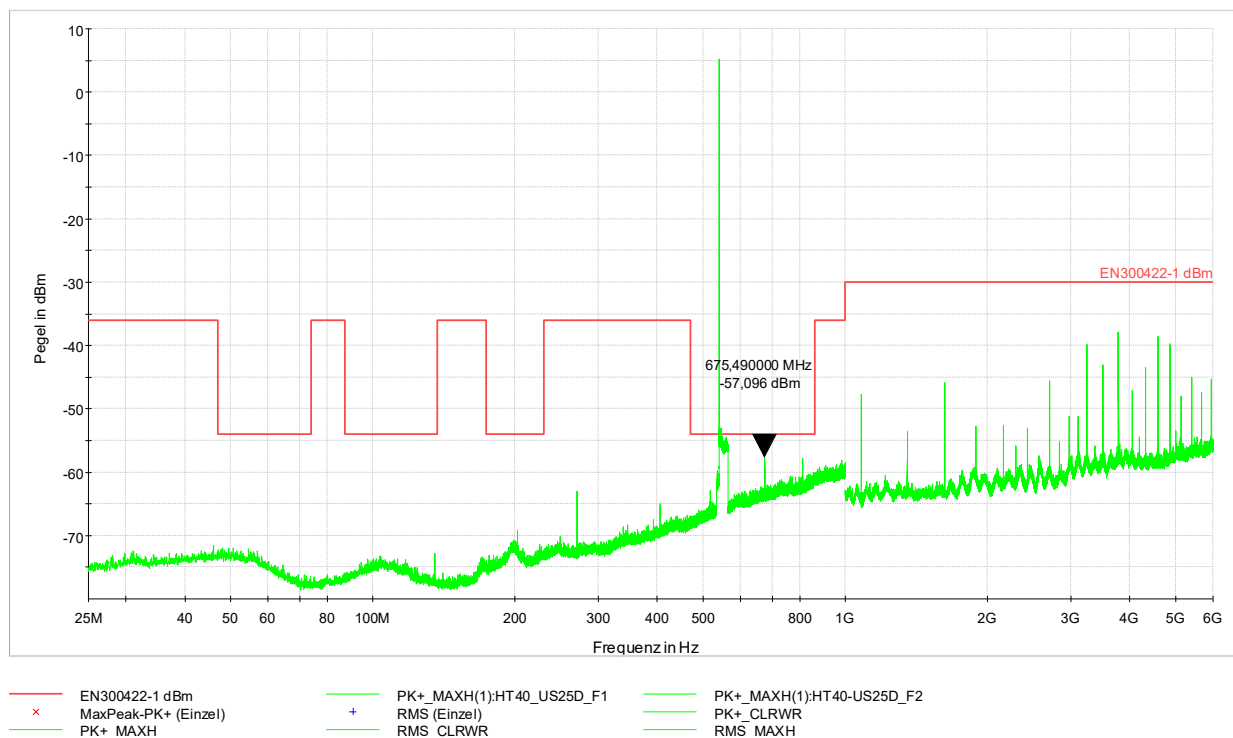
4.4 TRANSMITTER SPURIOUS EMISSIONS radiated

ETSI EN 300 422-1 V2.1.2
 ETSI EN 300 422-1 V1.4.2
 47 CFR § 15.236 (g)
 47 CFR § 74.861 (e) (7)
 RSS-210 G.4

Operating mode: transmitter operating at 540,4 MHz

Rated output power: 5,56 mW

Modulation: unmodulated carrier



LIMIT **ETSI EN 300 422-1 V2.1.2 SUBCLAUSE 8.4.3**
ETSI EN 300 422-1 V1.4.2 SUBCLAUSE 8.4.3

47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies $\leq$ 1000 MHz	Frequencies > 1000 MHz
4,0 nW (-54 dBm)	250 nW (-36 dBm)	1,00 μ W (-30 dBm)

Spurious Emissions were investigated up to the 10th harmonic of the fundamental and compliance is demonstrated with ETSI EN 300 422-1 according to KDB 206256 D01.

LIMIT **47 CFR § 15.236 (g)**

Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).

Spurious Emissions were investigated up to the 10th harmonic of the fundamental and compliance is demonstrated with ETSI EN 300 422-1 according to KDB 206256 D01.

LIMIT **47 CFR § 74.861 (e) (7)**

Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08).

Spurious Emissions were investigated up to the 10th harmonic of the fundamental and compliance is demonstrated with ETSI EN 300 422-1 according to KDB 206256 D01.

LIMIT **RSS-210 G.4**

The transmitter unwanted emissions shall meet and be measured according to the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-112/1; NT-131/1; NT-139; NT-337/1; NT-207/1; NT-492

TRANSMITTER SPURIOUS EMISSIONS radiated radiated

**ETSI EN 300 422-1 V2.1.2
SUBCLAUSE 8.4**

Operating mode: transmitter standby

Because the transmitter is operating after switching on, there is no standby mode available and no measurement was performed.

4.5 Transmitter intermodulation distortion

ETSI EN 300 422-1 V2.1.2
SUBCLAUSE 8.5

Radiated measurement

TX-IMD (dBc)			
Unwanted Signal		540,4 MHz	
fw + 5 MHz		-52,6	
fw – 5 MHz		-57,3	
Measurement uncertainty	± 3dB		

LIMIT

ETSI EN 300 422-1 V2.1.2 SUBCLAUSE 8.5.3

The maximum resulting IMD product shall be at least 40 dB below the output power of the DUT.

Measuring equipment used:

NT-100; NT-111/1; NT-112/1; NT-113/1; NT-131/1; NT-210; NT-310/1; EMV-205

4.6 RF Exposure

47 CRF § 1.1307
 KDB 447498 D04 v01

Regarding the rule changes per FCC 19-126 Order

Title 47 §1.1307(b)(3)(i)(B):

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Revision 1:

Added max. antenna gain for URGENT CLARIFICATION - FCC Area of Concern-Antenna Gain Information from 26th August 2022 and Fall 2022 workshop guidance:

All part 15 applications will need to show how the antenna gain was derived either from a manufacturer data sheet or a measurement.

Conducted power [mW] (from 4.2)	Max. EIRP [mW] (from 4.2)	Max gain [dBi]
6,03	5,56	-0,35

Revision 1:

Added production tolerance to Single RF source, SAR based, RF exposure exemption calculation according to KDB 447498 D04 v01.

Conducted power [mW] (from 4.2)	Duty cycle [1]	Production variance [1] (declared by manufacturer)	Max. time-averaged available power [mW]
6,03	1	5,5 dBm cond.	9,58

ERP [mW] (from 4.2)	Duty cycle [1] (worst case assumption)	Production variance [1] (declared by manufacturer)	Max. time-averaged ERP [mW]
3,39	1	5,5 dBm cond.	5,39

SAR-based exemption calculation

Single RF source, calculated for $d = 0.5$ cm (worst case, actual antenna might be further away)

Frequency [MHz]	Maximum of available power or ERP [mW]	Pth [mW]	P / Pth	P / Pth < 1
40,4	9,58	17,03	0,56	OK

RF Exposure

RSS-102, Issue 5

2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

RSS-102 2.5.1 Exemption calculation

Frequency (MHz)	cond. P (mW)	max. EIRP (mW)	Duty Cycle (1)	Avg. cond. P (mW)	Avg. EIRP (mW)	separation distance (mm)	Limit (mW)	
540,4	6,03	5,56	1	6,03	5,56	5	43,78	OK

*) Duty cycle was not measured, factor 1 is a worst case assumption.

**) Calculations are done for a minimum separation distance of 0.5 cm without considerations of limb worn exposure. The distance is derived from the device casing. The calculation is conservative. The exemption limit for limb-worn exposure would be 109,45 mW.

The time-averaged output power is below the exemption limit for routine evaluation.

Appendix 1

Test equipment used

☐ Anechoic Chamber with 3m measurement distance	NT-100	☐ Ant. tripod for EN61000-4-3 Model TP1000A	NT-156
☐ Stripline according to ISO 11452-5	NT-108	☐ Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
☐ MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐ Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
☐ DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐ ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐ CO3000 Controller Mast+Turntable	NT-112/1	☐ ESR – Test receiver 20 Hz – 26,5 GHz	NT-207/1
☐ HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐ Digital Radio Tester CMW500	NT-208/1
☐ FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	☐ Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
☐ HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐ CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐ Dipole Antenna VHA9103 30 - 300 MHz	NT-124/1a	☐ 3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐ Dipole Antenna UHA9105 300 - 1000 MHz	NT-124/1b	☐ Digital Radio Tester Aeroflex 3920	NT-212/1
☐ 3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	☐ Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐ 3116 - Horn Antenna 18 - 40 GHz	NT-126	☐ RubiSource T&M Timing reference	NT-216
☐ SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	☐ Radiocommunicationanalyzer SWR 1180 MD	NT-217
☐ AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	☐ Mixer FS-Z60 40 GHz – 60 GHz	NT-218/1
☐ HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐ Mixer FS-Z90 60 GHz – 90 GHz	NT-219/1
☐ HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	☐ DSO9104 Digital scope	NT-220/1
☐ 3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	☐ TPS 2014 Digital scope	NT-222
☐ VULB 9163 Trilog Antenna 30 – 3000 MHz	NT-131/1	☐ Artificial Ear according to IEC 60318	NT-224
☐ Loop Antenna H-Field	NT-132	☐ 1 kHz Sound calibrator	NT-225
☐ Horn Antenna 500 MHz - 2900 MHz	NT-133	☐ SRM-3006 Spectrumanalyzer	NT-233/1a
☐ Horn Antenna 500 MHz - 6000 MHz	NT-133/1	☐ E-field probe SRM 75 MHz – 3 GHz	NT-234
☐ Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐ Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-e
☐ Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐ Magnetometer HP-01	NT-241/1
☐ BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	☐ EFA-3 H-field- / E-field probe	NT-243
☐ Conical Dipol Antenna PCD8250	NT-138	☐ EHP-50F H-field- / E-field probe	NT-243/1
☐ HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	☐ Field Meter EMR-200 100 kHz – 3 GHz	NT-244
☐ HZ-1 Antenna tripod	NT-150	☐ E-field probe 100 kHz – 3 GHz	NT-245
☐ BN 1500 Antenna tripod	NT-151	☐ H-field probe 300 kHz – 30 MHz	NT-246

Division:
Industry & Energy

Test report number:
[2022-IN-AT-TICL-E-EX-000246-FG-004-Rev1](#)

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Date: [25.04.2023](#)

Appendix 1 (continued)

Test equipment used

☐ E-field probe 3 MHz – 18 GHz	NT-247	☐ Prana N-MT 500 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332/1
☐ H-field probe 27 MHz – 1 GHz	NT-248	☐ BBA150 RF-Amplifier 1 GHz - 6 GHz	NT-333/1
☐ ELT-400 1 Hz – 400 kHz	NT-249	☐ APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐ MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	☐ Preamplifier 1 GHz - 4 GHz	NT-335
☐ FCC-203I EM Injection clamp	NT-251	☐ Preamplifier for GPS MKU 152 A	NT-336
☐ FCC-203I-DCN Ferrite decoupling network	NT-252	☐ Preamplifier 1 GHz – 18 GHz	NT-337/1
☐ PR50 Current Probe	NT-253	☐ DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐ i310s Current Probe	NT-254/1	☐ 2-97201 Electronic load	NT-341
☐ Fluke 87 V True RMS Multimeter	NT-260	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐ Model 2000 Digital Multimeter	NT-261	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐ Fluke 87 V Digital Multimeter	NT-262/1	☐ VDS 200 Mobil-impuls-generator	NT-350
☐ ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	☐ LD 200 Mobil-impuls-generator	NT-351
☐ ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	☐ MPG 200 Mobil-Impuls-Generators	NT-352
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	☐ EFT 200 Mobil-impuls-generator	NT-353
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	☐ AN 200 S1 Artificial Network	NT-354
☐ EZ10 T-Artificial Network	NT-305	☐ FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
☐ SMG - Signal generator 0,1 - 1000 MHz	NT-310	☐ PHE 4500 - Mains impedance network	NT-401
☐ SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	☐ IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐ RefRad Reference generator	NT-312	☐ TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
☐ SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	☐ ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐ 40 MHz Arbitrary Generator TGA1241	NT-315	☐ IP 4 - Capacitive clamp (Burst)	NT-411
☐ Artificial mains network NSLK 8127-PLC	NT-316	☐ Highpass-Filter 100 MHz – 3 GHz	NT-412
☐ PSURGE 4.1 Surge generator	NT-324	☐ Highpass-Filter 600 MHz – 4 GHz	NT-413
☐ IMU4000 Immunity test system	NT-325/1a-e	☐ Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐ VCS 500-M6 Surge-Generator	NT-326	☐ Highpass-Filter 1800 MHz – 16 GHz	NT-415
☐ Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c		
☐ BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330		

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Test equipment used

☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417/1	☐	FCC-801-T4 Coupling decoupling network	NT-463
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	☐	FCC-801-C1 Coupling decoupling network	NT-464
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	☐	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
☐	RF-Attenuator 30 dB	NT-424	☐	WHKX12-2700-3000-18000 3 GHz Highpass filter	NT-472
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	☐	WHKX10-3870-4500-18000 4,5 GHz Highpass filter	NT-473
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
☐	RF-Attenuator 6 dB	NT-428	☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	Van der Hoofden Test Head	NT-484
☐	WRU 27 - Band blocking 27 MHz	NT-430	☐	WRCJV12-5820-5850-5950-5980 5,9 GHz Band Reject Filter	NT-490
☐	WHJ450C9 AA - High pass 450 MHz	NT-431	☐	WHKX10-5670-6300-18000 6 GHz Highpass filter	NT-491
☐	WHJ250C9 AA - High pass 250 MHz	NT-432	☐	WHK12-935-1000-7000 1 GHz Highpass filter	NT-492
☐	RF-Load 150 W	NT-433	☐	EMC Video/Audiosystem	NT-511/1
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	☐	ES-K1 Version 1.71 SP2 Test software	NT-520
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	EMC32 Version 10.60.20 Test software	NT-520/1
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	SRM-TS Version 1.3 software for SRM-3000	NT-522
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☐	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Spitzenberger und Spies Test software V4.1	NT-525
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Vertical coupling plane (ESD)	NT-531
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #4 for EN 61000-4-6	NT-553
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #3 for conducted emission	NT-554
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445	☐	Test cable #8 Sucoflex 104EA	NT-559
☐	Tube imitations according to EN 55015	NT-450	☐	Test cable #9 (for outdoor measurements)	NT-580
☐	FCC-801-M3-16A Coupling decoupling network	NT-458	☐	Test cable #10 (for outdoor measurements)	NT-581
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Test cable #13 Sucoflex 104PE	NT-584
☐	FCC-801-M5-25 Coupling decoupling network	NT-460	☐	Test cable #21 for SRM-3000	NT-592
☐	FCC-801-AF10 Coupling decoupling network	NT-461	☐	Shield chamber	NT-600
☐	FCC-801-S25 Coupling decoupling network	NT-462	☐	Climatic chamber	M-1200

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Test equipment used

☐	Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	☐	HF- Amplifier 9 kHz-225 MHz BBL200	EMV-300/1
☐	Turntabel 6 m diameter	EMV-101	☐	HF- Amplifier 80 -1000 MHz BBA150	EMV-301
☐	Antenna mast + controller	EMV-102+ EMV-103	☐	HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302
☐	EMC Video/Audiosystem	EMV-104	☐	High Power Ant. 20-200 MHz HPBA-2510	EMV-303/1
☐	EMC Software EMC32 Version 10.60.20	EMV-105	☐	High Power Ant. 20-200 MHz S12018-21	EMV-303/2
☐	Hornantenna 1 – 18 GHz HF 907	EMV-110	☐	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304
☐	Antennapre.amp. 1 – 18 GHz BBV 9718 D	EMV-111/1	☐	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305
☐	Trilog Antenna 30-3000 MHz VULB9163	EMV-112	☐	HF- Amplifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306
☐	Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113	☐	ISO11451-2 TLS 10 kHz – 30 MHz	EMV-307
☐	Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114	☐	Load Dump Generator LD 200N	EMV-350
☐	Hornantenna 200 – 2000 MHz AH-220	EMV-115	☐	Ultra Compact Symulator UCS 200N100	EMV-351
☐	DC Artificial Network PVDC 8300	EMV-150	☐	Automotive Power fail module PFM 200N100.1	EMV-352
☐	AC Artificial Network NNLK 8121 RC	EMV-151	☐	Voltage Drop Symulator VDS 200Q100	EMV-353
☐	AC Artificial Network NNLK 140	EMV- 153a-d	☐	Arb. Generator AutoWave	EMV-354
☐	EMI Receiver ESW44	EMV-200/1	☐	Ultra Compact Symulator UCS 500N7	EMV-355
☐	Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201	☐	Coupling decoupling network CNI 503B7 / 32 A	EMV-356
☐	GPS Frequency normal B-88	EMV-202	☐	Coupling decoupling network CNI 503B7 / 63 A	EMV-357
☐	DC Power supply N5745A	EMV-203	☐	Telecom Surge Generator TSurge 7	EMV-358
☐	Spektrum Analyzator FSV40	EMV-205	☐	Coupling decoupling network CNI 508N2	EMV-359
☐	Thd Multimeter Model 2015	EMV-206	☐	Coupling decoupling network CNV 504N2.2	EMV-360
☐	Poweramplifier PAS15000	EMV- 207/abc	☐	Immunity generator NSG4060/NSG4060-1	EMV-361
☐	Inrush Current Source	EMV- 208/abc	☐	Coupling network CDND M316-2	EMV-362
☐	Arb.-generator Sycore	EMV-209	☐	Coupling network CT419-5	EMV-363
☐	Harmonics/Flicker analyzer ARS 16/3	EMV-210	☐	ESD Generator NSG 437	EMV-364
☐	Power Supply Regatron AC	EMV-214	☐	Pulse Limiter VTSD 9561-F BNC	EMV-405
☐	Power Supply Regatron DC	EMV-215	☐	Transient emission BSM200N40+BS200N100	EMV- 450+451
☐	Harmonics/Flicker analyser Zimmer	EMV-216	☐	Cap. Coupling Clamp HFK	EMV-455
☐	Flicker Impedanz Newtons4th 753	EMV-218	☐	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458
☐	Comemso	EMV-219			

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☐	Coupling network CDN M2-100A	EMV-459
☐	Coupling network CDN M3-32A	EMV-460
☐	Coupling network CDN M5-100A	EMV-461
☐	Current Clamp CIP 9136A	EMV-462
☐	DC Artificial Network HV-AN 150	EMV-464+465
☐	Coupling Clamp EM 101	EMV-466
☐	Decoupling Clamp FTC 101	EMV-467
☐	Power attenuator 10 dB / 250 Watt	EMV-469/2
☐	HV AMN NNHV 8123 800A	EMV-472
☐	HV AMN NNHV 8123 800A	EMV-473

Appendix 2 Photodocumentation

Division:
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Description: Front view

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Division:
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Description: Rear view

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Photodocumentation

Division:
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Description: Battery compartment opened

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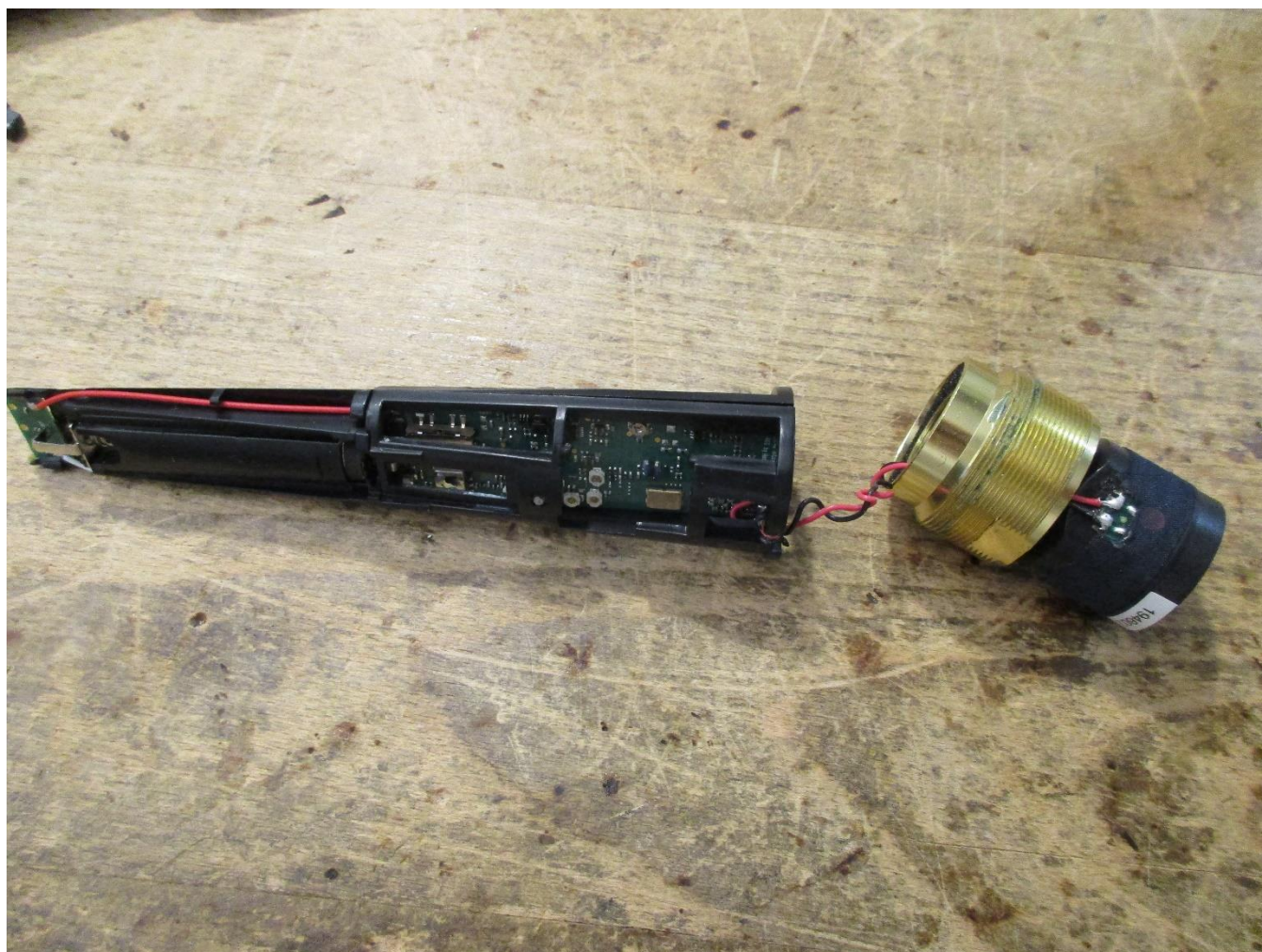
Division:
Industry & Energy

Description: Case opened

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Photodocumentation

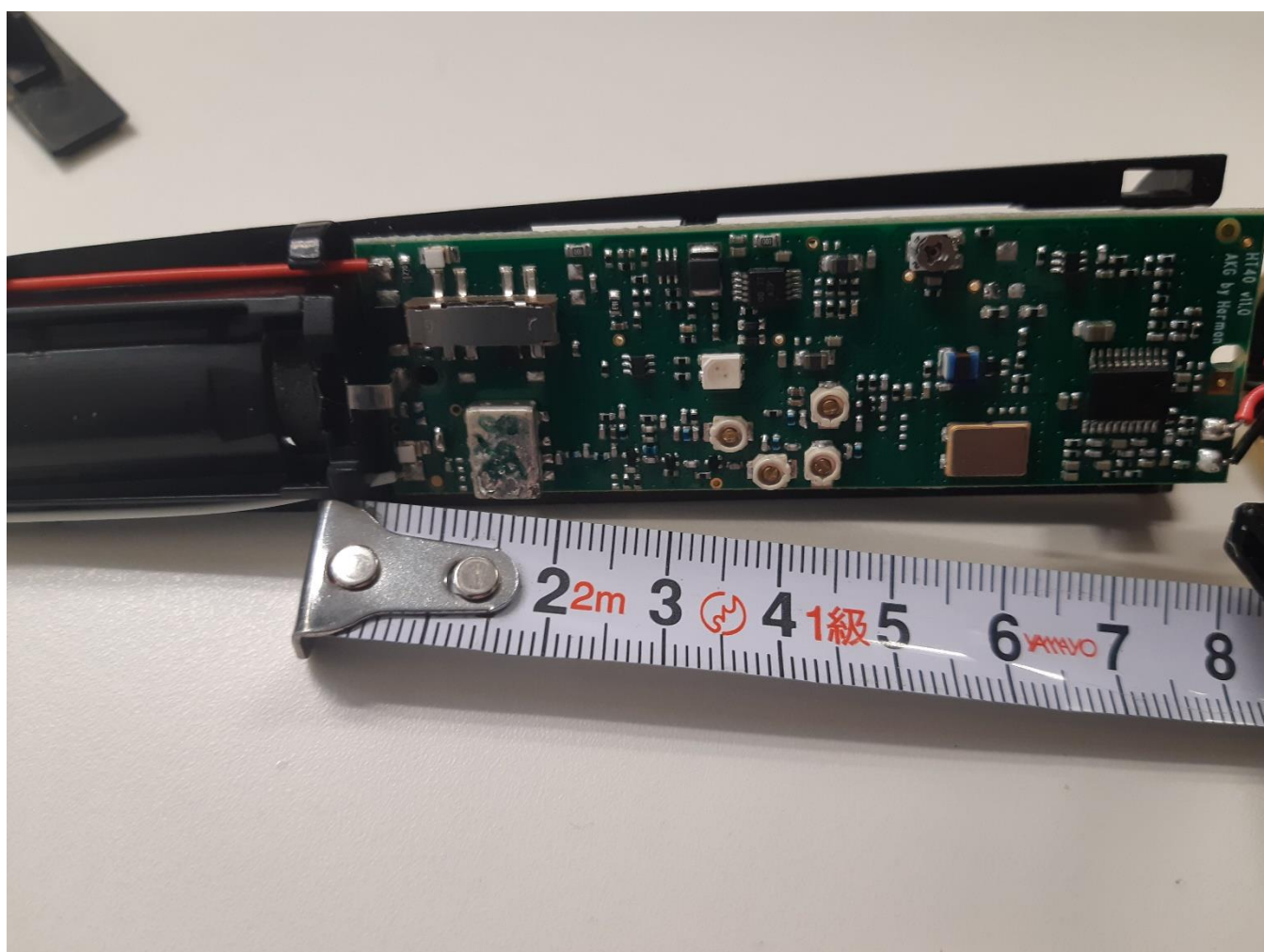
Division:
Industry & Energy

Description: PCB view #1, antenna close-up,
measuring tape dimensions are in cm

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Appendix 2 Photodocumentation

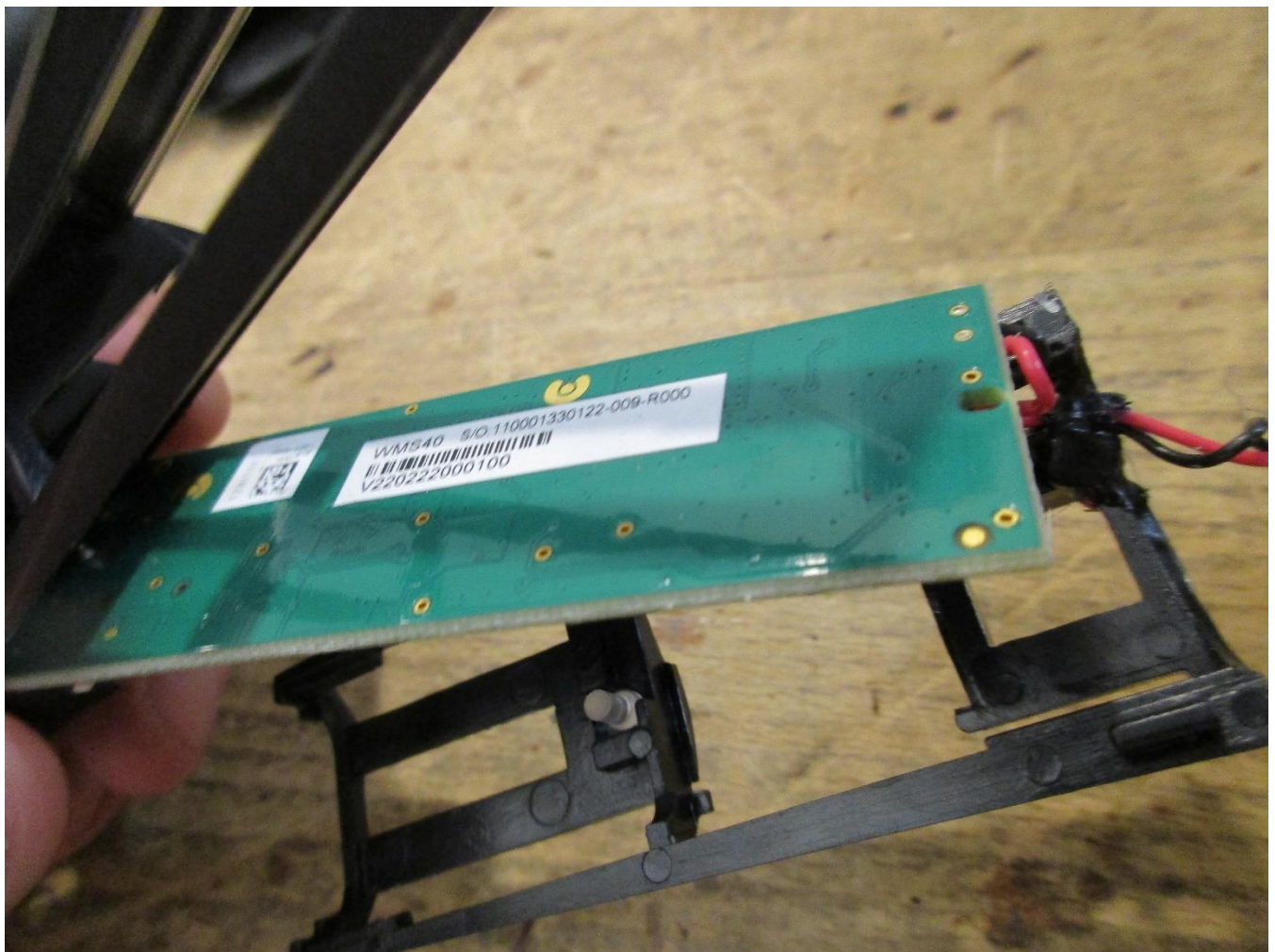
Division:
Industry & Energy

Description: PCB view #2

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Appendix 2 Photodocumentation

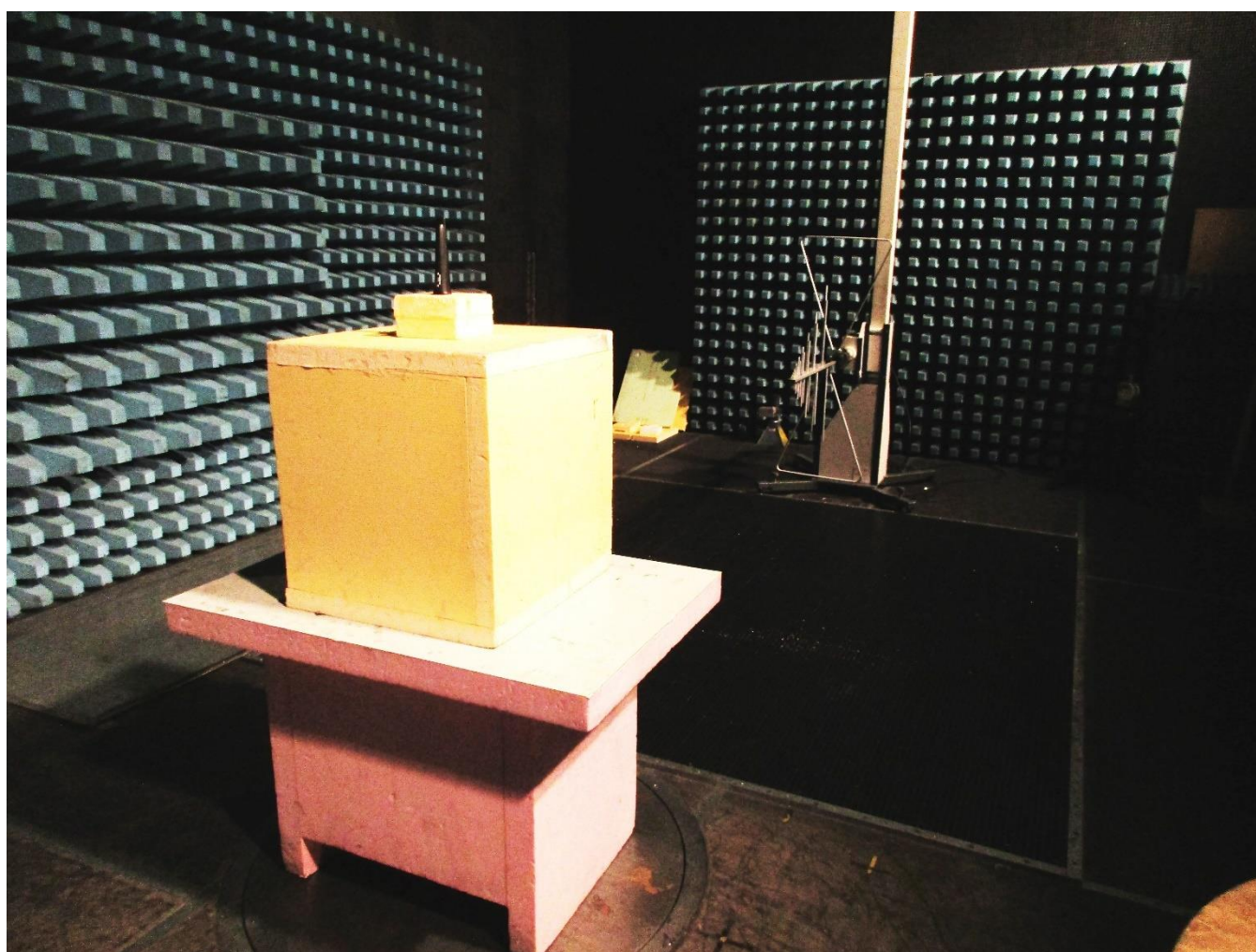
Division:
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Description: Test setup Emissions 25 MHz - 1 GHz

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Appendix 2 Photodocumentation

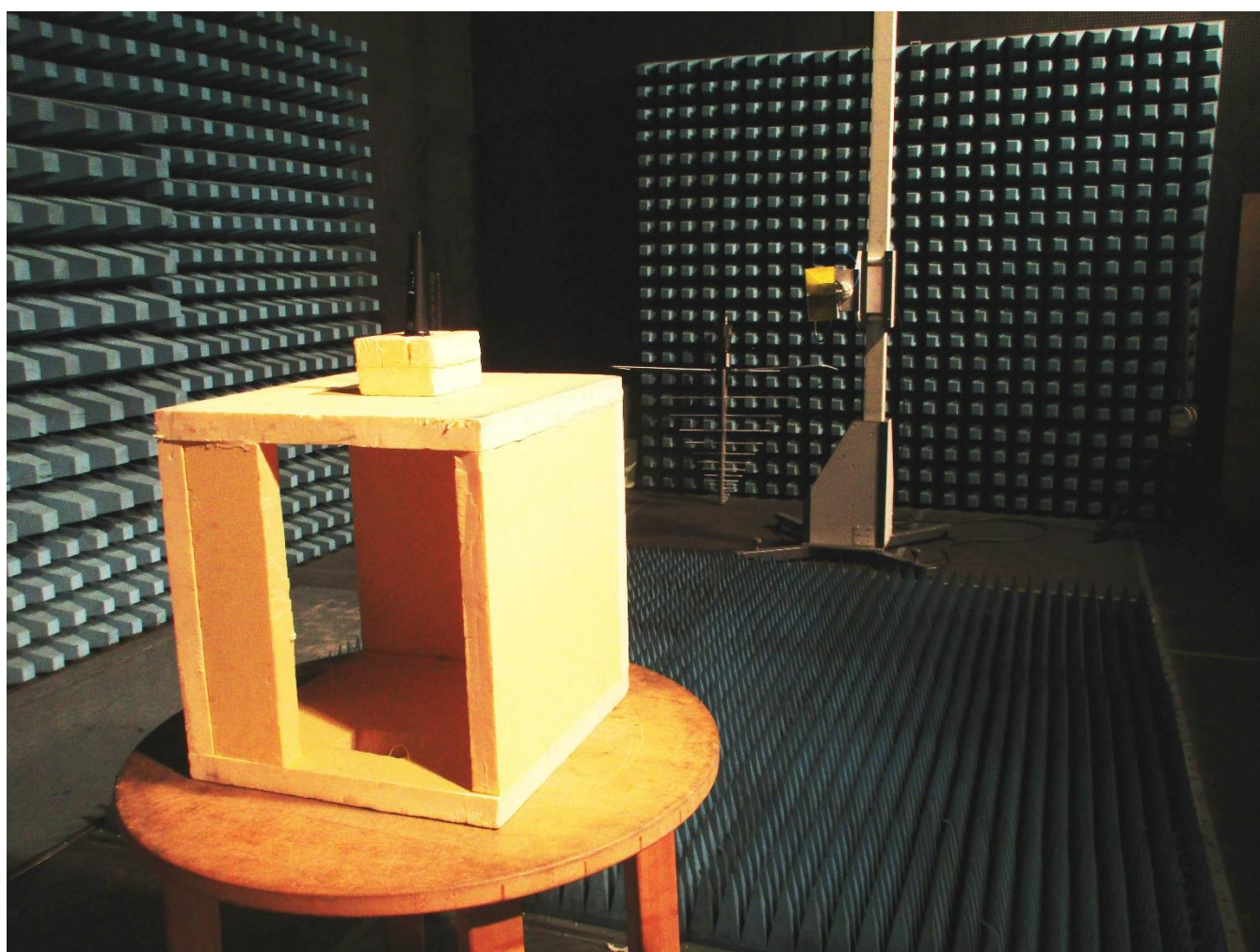
Division:
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Description: Test setup Emissions 1 - 6 GHz

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--- END OF TEST REPORT ---

