

TEST REPORT

of the accredited test laboratory

TÜV Nr.:INE-AT/FG-20/220

Applicant: ILVI GmbH
Business Park 4
8200 Gleisdorf
AUSTRIA

Tested Product: Wireless USB data transmitter and receiver

Product Name: ilviSmart UCI-MSD

FCC-ID: 2AXWB-UCIMSDV1

Manufacturer: ILVI GmbH
Business Park 4
8200 Gleisdorf
AUSTRIA

Output power / field strength: 49 mW average EIRP **power supply:** 5V DC

Frequency range: 2412 – 2462 MHz **Channel separation:** 20 MHz

Standard: FCC: 47 CFR Part 15 (Oct. 1st 2020 edition)

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Inspection Body,
Certification Body,
Calibration Laboratory,
Verifizierungsstelle**Notified Body 0408**
IC 2932K-1**Non-executive**
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10.02.2021

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

Contents

	Designation	PAGE
1.	Applicant	3
2.	Description of EUT	4
3.	Standards / Final result	5
4.	Test results	
4.1	Test Object Data	6
4.2	Emissions outside 2400 – 2483,5 MHz (15.209)	7
Appendix	Designation	PAGES
1	Test equipment used	4
2	Photodocumentation	8

1. Applicant

Company: ILVI GmbH

Department: -

Address: A – 8200 Gleisdorf; Businesspark 4

Contact person: DI Andreas Zangl

EUT received on: 29.10.2020

Tests were performed on: 29.10.2020

2. Description of EUT

EUT:	Wireless USB data transmitter and receiver
Product name:	ilviSmart UCI-MSD
Serial Number:	Prototype
Manufacturer:	ILVI GmbH A – 8200 Gleisdorf; Businesspark 4
Description:	ILVI GmbH provided the following configuration for the measurements: Prototype with special test-firmware for continuous transmission
Operating mode:	The measurements were carried out at the following running states: transmitting continuously
Technical data EUT:	Rated voltage: 5VDC Rated current: <1A Rated frequency: DC Mains voltage during the tests: 5VDC
Climatic conditions in the emc laboratory:	Relative humidity: 43% Temperature: 24°C

3. Standards / Final result

Name	Title	Deviation	Result
Title 47 CFR Part 15 1. October 2020 edition	RADIO FREQUENCY DEVICES	*)	OK
Result: Opinions and interpretation of testing laboratory OK: EUT passed NOK: EUT failed			

*) Only measurements of spurious emissions were performed, to show correct integration into the device.

4. TEST RESULTS

4.1 TEST OBJECT DATA

General EUT Description

The Equipment Under Test was a virtual USB Mass-Storage device. It uses WLAN technology for wireless file transfer. The Equipment Under Test contains a Raspberry Pi Zero W with the FCC-ID: 2ABCB-RPI0W.

The following informations are from the Test Report: UL-RPT-RP11287331JD07A

2.1033 (c) Technical description

2.1033 (4) Type of emission:

Technology Tested: WLAN (IEEE 802.11b,g,n) / Digital Transmission System

Type of Unit: Transceiver

Modulation Type: DBPSK, DPSK, BPSK, QPSK, 16QAM & 64 QAM

Channel Spacing: 20 MHz

Data Rates:

- 802.11b: 1,2,5.5 & 11 Mbps
- 802.11g: 6,9,12,18,24,36,48 & 54 Mbps
- 802.11n HT20 MCS0 to MCS7

2.1033 (5) Frequency range: 2412 to 2462 MHz.

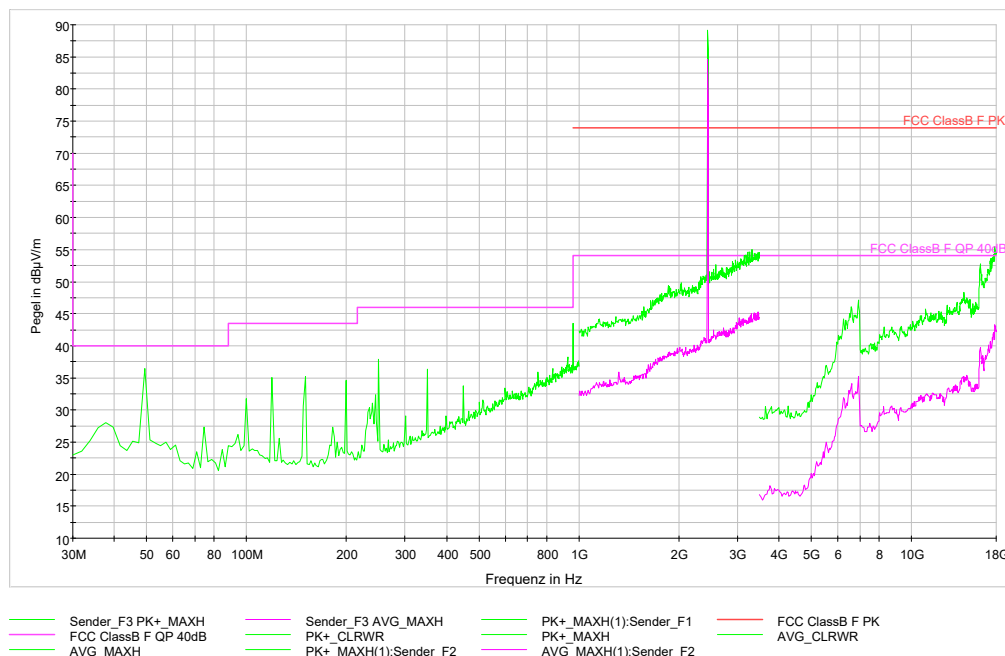
2.1033 (6) Power range and Controls: The maximum average output power is 49 mW eirp

2.1033 (7) Maximum output power rating: 49 mW eirp.

2.1033 (8) DC Voltage and Current: 5V DC

Tests were performed October 29 2020.

4.2 Emissions outside 2400 – 2483,5 MHz § 15.249 (d) (e) average values above 1 GHz are shown in magenta – green = peak



LIMIT

SUBCLAUSE 15.249(d) (e) (15.209)

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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

Test Equipment used:

NT-100; EMV-101; NT-110/1; NT-111/1; NT-112/2; NT-131/1; NT-139; NT-337/1; EMV-200; NT-416

Remark: Although the measurements were made up to the 10th harmonic (25 GHz) the frequency range above 18 GHz is not automatized, so no graphs are available. Nevertheless no emissions above noise level were found in the frequency range above 18 GHz.

Appendix 1

Test equipment used

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-20/220

Page: 1 of 4

Date: 10.02.2021

☐	Anechoic Chamber with 3m measurement distance	NT-100	☐	Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
☐	Stripline according to ISO 11452-5	NT-108	☐	Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
☐	MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐	DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐	ESI26 – Test receiver 20 Hz – 26,5 GHz	NT-207
☐	CO3000 Controller Mast+Turntable	NT-112/1	☐	Digital Radio Tester CMW500	NT-208/1
☐	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐	Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
☐	FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	☐	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐	3121C - Dipole Antenna 28 - 1000 MHz	NT-124	☐	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 M19HWD 40 GHz – 60 GHz	NT-218
☐	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐	Mixer M12HWD 60 GHz – 90 GHz	NT-219
☐	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	☐	B10 - Harmonics and flicker analyzer	NT-232
☐	Horn Antenna 500 MHz - 6000 MHz	NT-133/1	☐	SRM-3006 Spectrumanalyzer	NT-233/1a
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐	E-field probe SRM 75 MHz – 3 GHz	NT-234
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐	Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-e
☐	BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	☐	Hall-Teslameter ETM-1	NT-241
☐	Conical Dipol Antenna PCD8250	NT-138	☐	EFA-3 H-field- / E-field probe	NT-243
☐	HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	☐	EHP-50F H-field- / E-field probe	NT-243/1
☐	HZ-1 Antenna tripod	NT-150	☐	Field Meter EMR-200 100 kHz – 3 GHz	NT-244
☐	BN 1500 Antenna tripod	NT-151	☐	E-field probe 100 kHz – 3 GHz	NT-245
☐	Ant. tripod for EN61000-4-3 Model TP1000A	NT-156	☐	H-field probe 300 kHz – 30 MHz	NT-246

Appendix 1 (continued)

Test equipment used

☐ E-field probe 3 MHz – 18 GHz	NT-247	☐ T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331
☐ H-field probe 27 MHz – 1 GHz	NT-248	☐ 500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332
☐ ELT-400 1 Hz – 400 kHz	NT-249	☐ AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
☐ MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	☐ APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐ FCC-203I EM Injection clamp	NT-251	☐ Preamplifier 1 GHz - 4 GHz	NT-335
☐ FCC-203I-DCN Ferrite decoupling network	NT-252	☐ Preamplifier for GPS MKU 152 A	NT-336
☐ PR50 Current Probe	NT-253	☐ Preamplifier 100 MHz – 23 GHz	NT-337
☐ i310s Current Probe	NT-254/1	☐ DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐ Fluke 87 V True RMS Multimeter	NT-260	☐ 2-97201 Electronic load	NT-341
☐ Model 2000 Digital Multimeter	NT-261	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐ Fluke 87 V Digital Multimeter	NT-262/1	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐ ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	☐ VDS 200 Mobil-impuls-generator	NT-350
☐ ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	☐ LD 200 Mobil-impuls-generator	NT-351
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	☐ MPG 200 Mobil-Impuls-Generators	NT-352
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	☐ EFT 200 Mobil-impuls-generator	NT-353
☐ PHE 4500/B Power amplifier	NT-304	☐ 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
☐		☐ Highpass-Filter 600 MHz – 4 GHz	NT-413
☐ PSURGE 4.1 Surge generator	NT-324	☐ Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐ IMU4000 Immunity test system	NT-325/1	☐ Highpass-Filter 1800 MHz – 16 GHz	NT-415
☐ VCS 500-M6 Surge-Generator	NT-326		
☐ Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c		
☐ BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330		

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-20/220

Page: 2 of 4

Date: 10.02.2021

Appendix 1 (continued)

Test equipment used

☐	Highpass-Filter 3500 MHz – 18 GHz	NT-416	☐	FCC-801-AF10 Coupling decoupling network	NT-461	Division: Industry & Energy
☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417	☐	FCC-801-S25 Coupling decoupling network	NT-462	Department: FG
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	☐	FCC-801-T4 Coupling decoupling network	NT-463	Test report number: INE-AT/FG-20/220
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	☐	FCC-801-C1 Coupling decoupling network	NT-464	Page: 3 of 4
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	☐	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1	Date: 10.02.2021
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468	
☐	RF-Attenuator 30 dB	NT-424	☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471	
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480	
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483	
☐	RF-Attenuator 6 dB	NT-428	☐	Van der Hoofden Test Head	NT-484	
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	EMC Video/Audiosystem	NT-511/1	
☐	WRU 27 - Band blocking 27 MHz	NT-430	☐	ES-K1 Version 1.71 SP2 Test software	NT-520	
☐	WHJ450C9 AA - High pass 450 MHz	NT-431	☐	EMC32 Version 10.60.15 Test software	NT-520/1	
☐	WHJ250C9 AA - High pass 250 MHz	NT-432	☐	SRM-TS Version 1.3 software for SRM-3000	NT-522	
☐	RF-Load 150 W	NT-433	☐	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1	
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	☐	Spitzenberger und Spies Test software V4.1	NT-525	
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	Noise power test apparatus according to EN 55014	NT-530	
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	Vertical coupling plane (ESD)	NT-531	
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☐	Test cable #4 for EN 61000-4-6	NT-553	
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Test cable #3 for conducted emission	NT-554	
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556	
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #8 Sucoflex 104EA	NT-559	
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #9 (for outdoor measurements)	NT-580	
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Test cable #10 (for outdoor measurements)	NT-581	
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445	☐	Test cable #13 Sucoflex 104PE	NT-584	
☐	Tube imitations according to EN 55015	NT-450	☐	Test cable #21 for SRM-3000	NT-592	
☐	FCC-801-M3-16A Coupling decoupling network	NT-458	☐	Shield chamber	NT-600	
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Climatic chamber	M-1200	
☐	FCC-801-M5-25 Coupling decoupling network	NT-460				

Appendix 1 (continued)

Test equipment used

☐	Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	☐	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305
☐	Turntabel 6 m diameter	EMV-101	☐	HF- Amplifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306
☐	Antenna mast + controller	EMV-102+ EMV-103	☐	ISO11451-2 TLS 10 kHz – 30 MHz	EMV-307
☐	EMC Video/Audiosystem	EMV-104	☐	Load Dump Generator LD 200N	EMV-350
☐	EMC Software EMC32 Version 10.60.15	EMV-105	☐	Ultra Compact Symulator UCS 200N100	EMV-351
☐	Hornantenna 1 – 18 GHz HF 907	EMV-110	☐	Automotive Power fail module PFM 200N100.1	EMV-352
☐	Antennapre.amp. 1 – 18 GHz ERZ-LNA0200-1800-30-2	EMV-111	☐	Voltage Drop Symulator VDS 200Q100	EMV-353
☐	Trilog Antenna 30-3000 MHz VULB9163	EMV-112	☐	Arb. Generator AutoWave	EMV-354
☐	Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113	☐	Ultra Compact Symulator UCS 500N7	EMV-355
☐	Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114	☐	Coupling decoupling network CNI 503B7 / 32 A	EMV-356
☐	Hornantenna 200 – 2000 MHz AH-220	EMV-115	☐	Coupling decoupling network CNI 503B7 / 63 A	EMV-357
☐	DC Artificial Network PVDC 8300	EMV-150	☐	Telecom Surge Generator TSurge 7	EMV-358
☐	AC Artificial Network NNLK 8121 RC	EMV-151	☐	Coupling decoupling network CNI 508N2	EMV-359
☐	EMI Receiver ESR26	EMV-200	☐	Coupling decoupling network CNV 504N2.2	EMV-360
☐	Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201	☐	Immunity generator NSG4060/NSG4060-1	EMV-361
☐	GPS Frequency normal B-88	EMV-202	☐	Coupling network CDND M316-2	EMV-362
☐	DC Power supply N5745A	EMV-203	☐	Coupling network CT419-5	EMV-363
☐	Spektrum Analyzator FSV40	EMV-205	☐	ESD Generator NSG 437	EMV-364
☐	Thd Multimeter Model 2015	EMV-206	☐	Pulse Limiter VTSD 9561-F BNC	EMV-405
☐	Poweramplifier PAS15000	EMV- 207/abc	☐	Transient emission BSM200N40+BS200N100	EMV- 450+451
☐	Inrush Current Source	EMV- 208/abc	☐	Cap. Coupling Clamp HFK	EMV-455
☐	Arb.-generator Sycore	EMV-209	☐	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458
☐	Harmonics/Flicker analyzer ARS 16/3	EMV-210	☐	Coupling network CDN M2-100A	EMV-459
☐	HF- Amplifier 9 kHz-250 MHz BBA150	EMV-300	☐	Coupling network CDN M3-32A	EMV-460
☐	HF- Amplifier 80 -1000 MHz BBA150	EMV-301	☐	Coupling network CDN M5-100A	EMV-461
☐	HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302	☐	Current Clamp CIP 9136A	EMV-462
☐	High Power Ant. 20-200 MHz HPBA-2510	EMV-303/1	☐	DC Artificial Network HV-AN 150	EMV- 464+465
☐	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304	☐	Coupling Clamp EM 101	EMV-466
			☐	Decoupling Clamp FTC 101	EMV-467
			☐	Power attenuator 10 dB / 250 Watt	EMV-469/2

Division:
Industry & Energy

Department: FG

Test report number:
INE-AT/FG-21/220

Page: 4 of 4

Date: 10.02.2021

Appendix 2

Photodocumentation

Description: view #1

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 1 of 9

Date: 10.02.2021



Appendix 2 Photodocumentation

Description: view #2

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 2 of 9

Date: 10.02.2021



Appendix 2 Photodocumentation

Description: view #3

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 3 of 9

Date: 10.02.2021



Appendix 2 Photodocumentation

Description: view #4

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 4 of 9

Date: 10.02.2021



Appendix 2 Photodocumentation

Description: Case opened

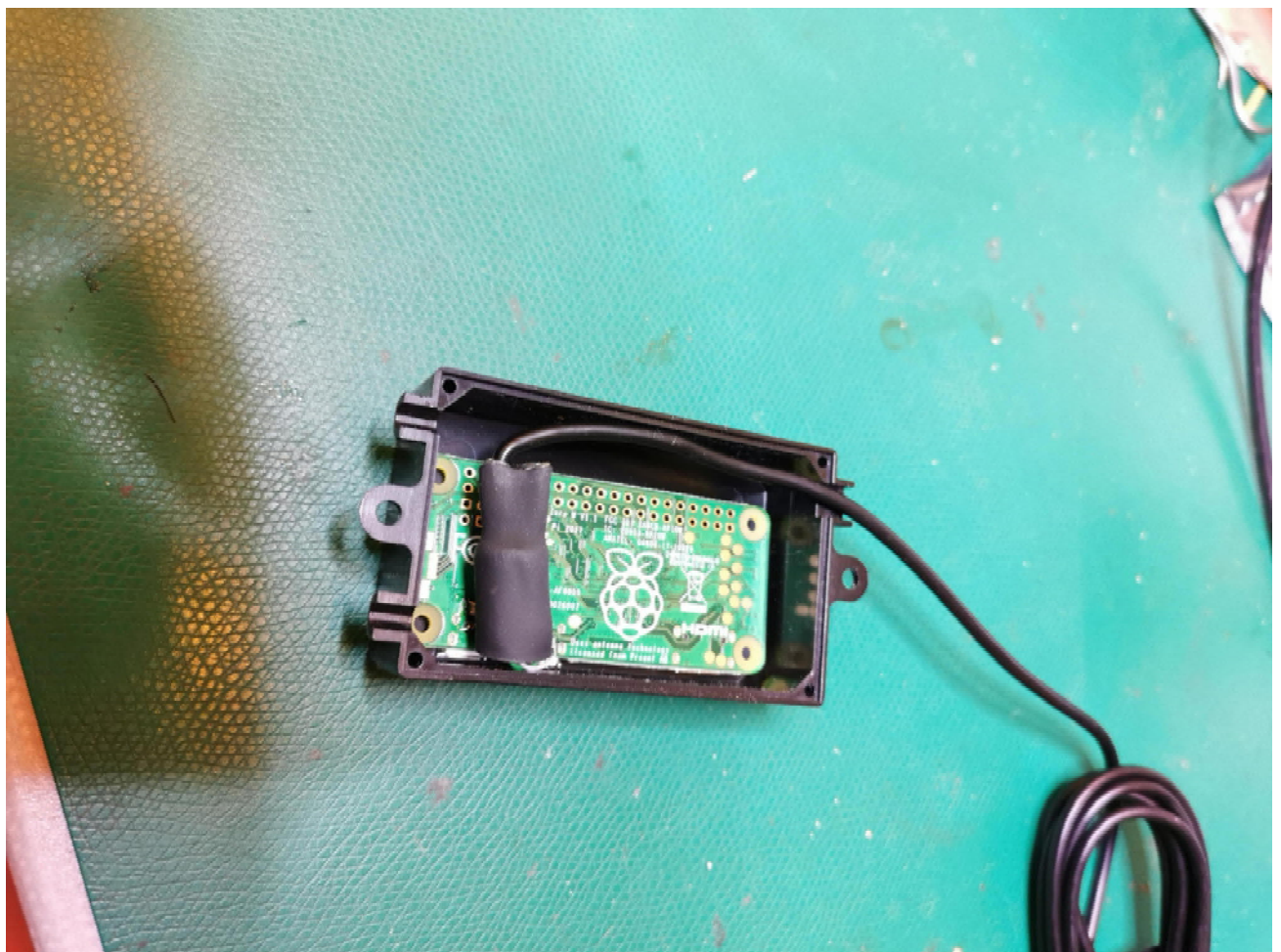
Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 5 of 9

Date: 10.02.2021



Appendix 2 Photodocumentation

Description: test setup

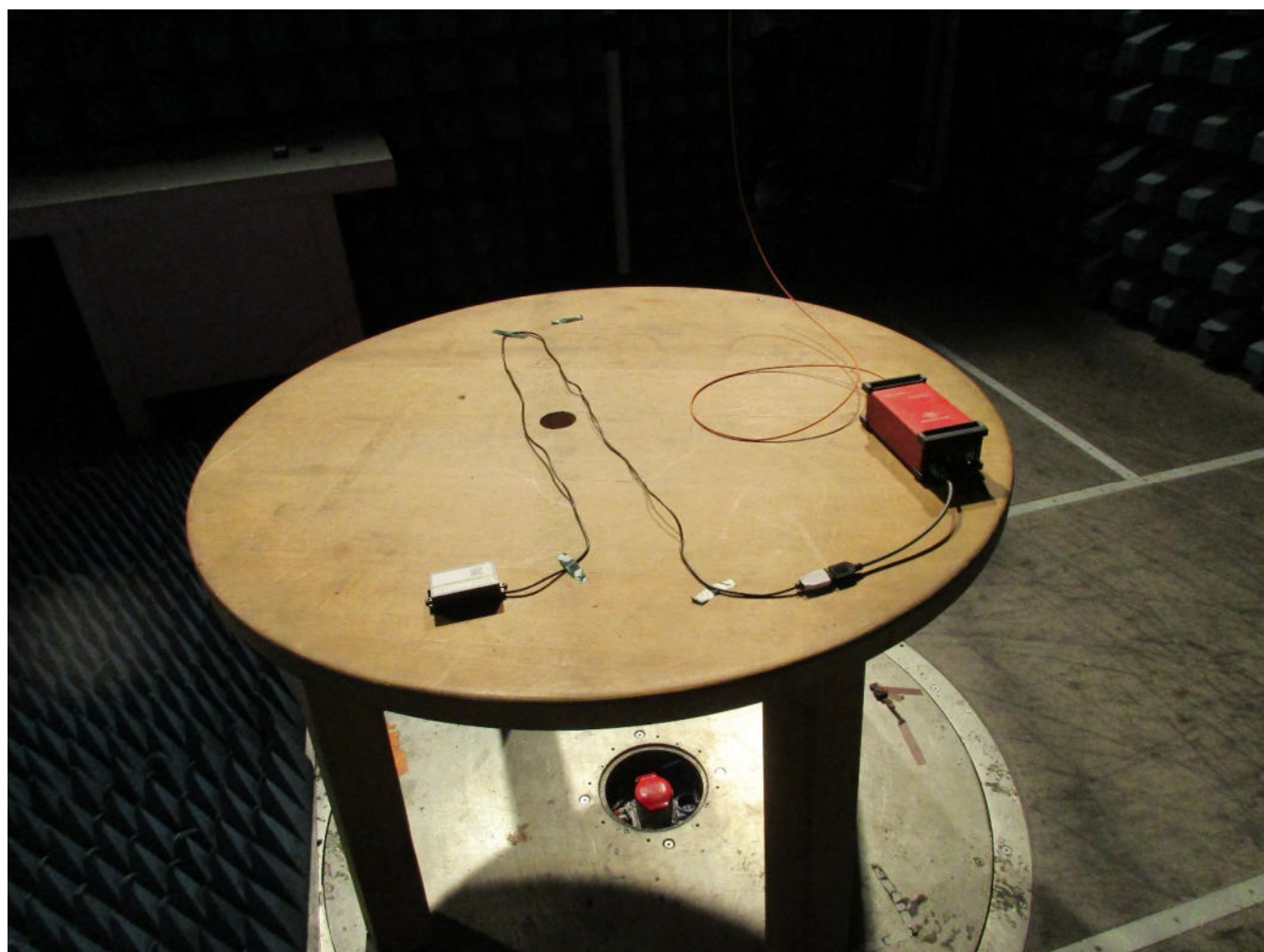
Division:
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Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 6 of 9

Date: 10.02.2021



Appendix 2 Photodocumentation

Description: Test setup Emissions below 1 GHz

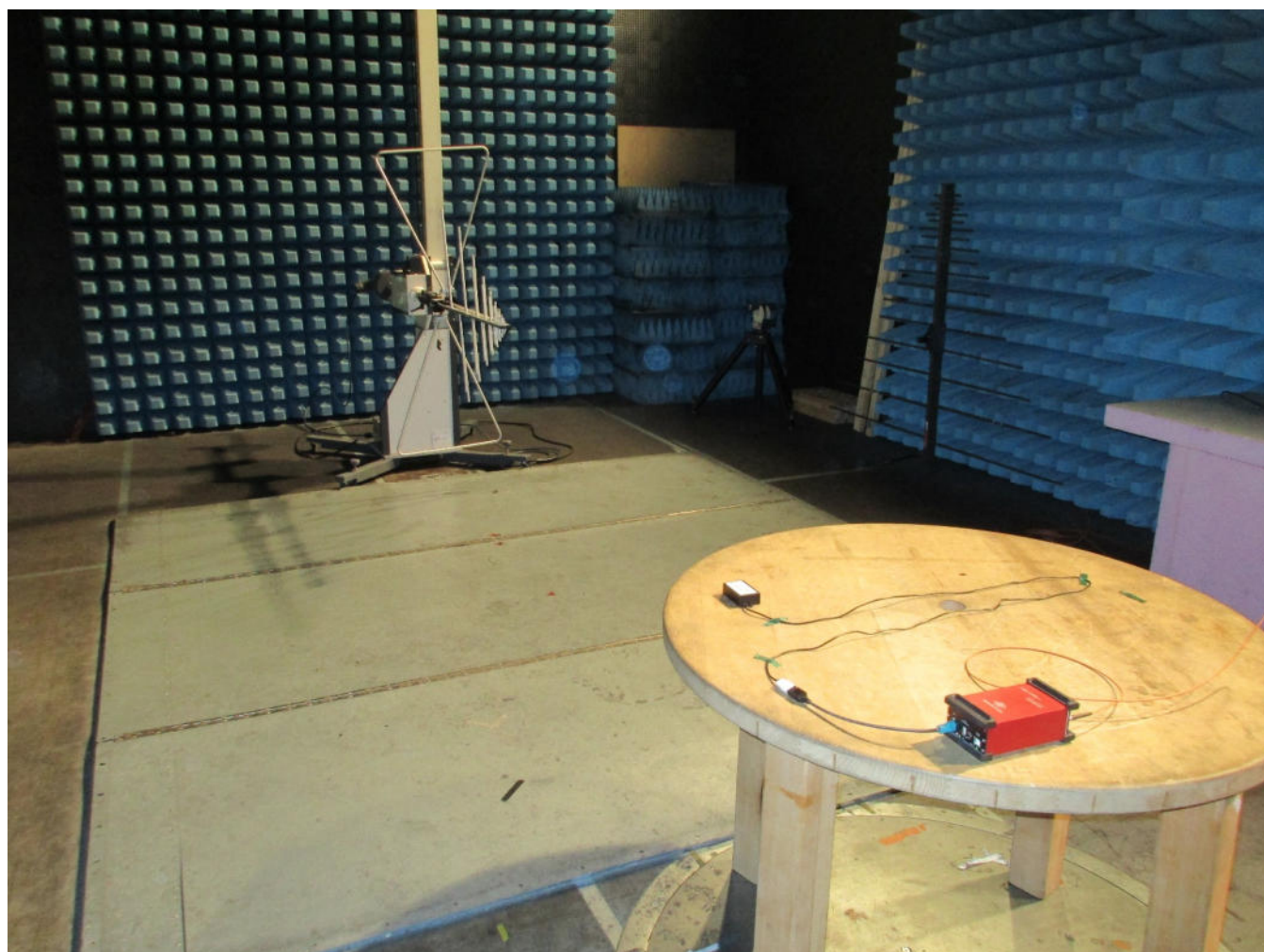
Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 8 of 9

Date: 10.02.2021



Appendix 2

Photodocumentation

Description: Test setup Emissions above 1 GHz

Division:
Industry & Energy

Department: FG

Test report reference:
INE-AT/FG-20/221

Page: 9 of 9

Date: 10.02.2021

