Recognized by Bundesnetzagentur
BNetzA-CAB-02/21-01

Test report

AXI02a02

Product / EUT:	Smart sporting gun
Type designation:	iP1 SmartSystem
Tested type:	iP1 SmartSystem - Watch
EUT authorization:	☒ Certification ☐ Declaration of Conformity ☐ Verification
Production level:	06/11
S/N:	n/a
Manufacturer:	Armatix GmbH Feringastr. 4 85774 Unterföhring / Germany
Test remit:	FCC Rules 47 CFR Part 15 – Subpart C – Intentional radiators in accordance with the procedures given in §15.207; 15.209; 15.249(a) ANSI C63.4-2003
The standards were:	☒ kept* ☐ not kept*
***Remark:**	☒ Validation covered by the accredited scope ☐ Validation not covered by the accredited scope according:_____ ☐ Validation of the EMC-requirements partly proceeded
Applicant:	Armatix GmbH Feringastr. 4 85774 Unterföhring / Germany
EUT-	
Date of arrival:	2011-06-01
Test ID:	PRH22_02
Date(s) of test:	2011-06-01

Burgrieden, 2012-02-15

Released by:

Principal engineer - Christian Vogelmann

Test laboratory:	☒ EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung Untere Wiesen 1 / 88483 Burgrieden / Germany DAkkS-Registration No.: D-PL-12122-01-01 CAB-Registration No.: BnetzA-CAB-02/21-01/1 FCC-Registration No.: 90568 – old FCC-Registration No.: 219415 – new
Additional test site:	☐ University of Applied Sciences Eberhard-Finckh-Str. 11 / 89075 Ulm / Germany The susceptibility test according EN 61000-4-3 performed in the EMC-testing laboratory of the University of Applied Sciences
Responsible inspector:	Peter Hauser EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung
Contact person:	Mr. Manfred Weinzierl
EUT-	
Description:	The iP1 SmartSystem consists of a sporting gun enabled with a RF ID signal generated by a dedicated watch and an USB stick provided for data transfer between sportive gun and a PC system.
Voltage supply:	Internal
Frequency list:	5.3kHz / 32.768kHz / 4MHz / 916.35MHz
Temperature range:	n/a
Size:	Watch (LxWxH) / mm - approx. 57x40x13mm

Supplied /
used equipment:

Designation	Type	Manufacturer	S/N

Configuration: ☒ As-delivered condition*
☐ Modified*
* _____

Cable designation	Type	Length	Remarks

Antenna: Antenna requirement according 47CFR Part 15 - Section 15.203
☒ Internal antenna
☐ Permanently attached antenna
☐ Antenna with unique coupling to the intentional radiator

Remarks: n/a

State of revision:

Source document	New Document	Date / Reviser	Modifications
AXI02_02	AXI02a02	2012-02-14 / Chr. Vogelmann	Calibration information of the used equipment adjusted to test date. / Antenna HFH2-Z2 marked as used in test module “radio disturbances” / Summary actualised.

Test equipment list of EMCE GmbH:

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
001	Test receiver	ESS 5Hz - 1000 MHz	Rohde & Schwarz	833776/008	1 Year(s)/ 2011-10-15
002	Probe	ESH2-Z3	Rohde & Schwarz		1 Year(s)/ 2011-08-31
003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007	1 Year(s)/ 2012-02-16
004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003	1 Year(s)/ 2011-12-27
006	LISN	NNBM 8125	Schwarzbeck	8125371	1 Year(s)/ 2011-12-21
007	Absorbing clamp	MDS 21	Schwarzbeck	942436	1 Year(s)/ 2012-04-08
008	Loop antenna 9kHz-30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002	3 Year(s)/ 2013-11-03
009	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	435	2 Year(s)/ 2011-08-31
010	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	108	3 Year(s)/ 2012-06-19
011	Antenna 30-300MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94	3 Year(s)/ 2012-06-19
012	Antenna 250-1200MHz	UHALP 9108A	Schwarzbeck	166	2 Year(s)/ 2011-08-31
013	Antenna 9kHz-30MHz	Ø 1.5m	EMCE GmbH		1 Year(s)/ 2011-08-31
014	OATS	3m	EMCE GmbH		1 Year(s)/ 2011-08-30
015	OATS	10m	EMCE GmbH		1 Year(s)/ 2011-08-30
020	Coupling clamp	IP4A	Haefely	082672-13	1 Year(s)/ 2011-08-31
022	ESD-Gun	NSG 435	Schaffner	577	1 Year(s)/ 2012-06-10
024	RF-Generator	SMY01	Rohde & Schwarz	844146/046	1 Year(s)/ 2011-08-31
025	Current clamp BCI	F-120-2	FCC	47	1 Year(s)/ 2011-08-31
026	Coupling device network	CDN 801-M3-25	FCC	92	1 Year(s)/ 2011-08-31
030	Coupling device network	CDN 801-S1/9pol.DSUB	EMCE GmbH		1 Year(s)/ 2011-08-31

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
031	Coupling device network	CDN 801-S1/9pol.DSUB	EMCE GmbH		1 Year(s)/ 2011-08-31
032	RF Power Amplifier	75A250	Amplifier Research	22789	1 Year(s)/ 2011-08-31
033	Coupling device network	CDN-AF2	EMCE GmbH		1 Year(s)/ 2011-08-31
034	Coupling device network	CDN-AF2	EMCE GmbH		1 Year(s)/ 2011-08-31
035	3-phase coupling device network	086	EMC-Partner	CDN-1000-45	3 Year(s)/ 2012-07-21
036	Coupling device network	CDN 801-M5-25	EMCE GmbH		1 Year(s)/ 2011-08-31
037	Coupling device network	CDN 801-S1	EMCE GmbH		1 Year(s)/ 2011-08-31
038	Helmholtz coil	1 m x 1 m	EMCE GmbH		1 Year(s)/ 2011-08-31
039	Helmholtz coil	1 m x 1 m	EMCE GmbH		1 Year(s)/ 2011-08-31
040	Current transformer		EMCE GmbH		1 Year(s)/ 2011-08-31
041	Loop antenna, shielded	HZ-10 0816.2511.02	Rohde & Schwarz	849788/0020	3 Year(s)/ 2013-11-02
042	AC-Source / Analyser / Norm impedance	EMV D 5000/PAS	Spitzenberger + Spies	A2747 00/0 0501 A2747 07/00501 (ARS16/3)	2 Year(s)/ 2011-08-31
043	Receiver	3DH/E Fieldmeter ESM-100	Maschek	971521	3 Year(s)/ 2014-01-28
044	CDN	CN-U	EMC-Partner	86	1 Year(s)/ 2011-08-31
045	CDN	DN-HF	EMC-Partner	86	1 Year(s)/ 2011-08-31
046	CDN	DN-LF2	EMC-Partner	86	1 Year(s)/ 2011-08-31
047	CDN	DN-LF1	EMC-Partner	86	1 Year(s)/ 2011-08-31
048	ESD/Burst/Surge-Generator	Transient 2000	EMC-Partner	561	1 Year(s)/ 2012-06-08
050	Data Acquisition/Switch Unit	Agilent 34970A	Agilent Technologies Inc.	MY41019453	3 Year(s)/ 2013-02-02
051	20 Channel Multiplexer	Agilent 34901A	Agilent Technologies Inc.	MY41013531	3 Year(s)/ 2013-02-02

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
054	Helmholtz coil	1.25 m x 1.25 m	EMCE GmbH		1 Year(s)/ 2011-08-31
055	Helmholtz coil	1.25 m x 1.25 m	EMCE GmbH		1 Year(s)/ 2011-08-31
057	Field probe	HI-6005	Holaday	34274	1 Year(s)/ 2011-11-23
058	Receiver	ESIB 40	Rohde & Schwarz	100200	3 Year(s)/ 2011-08-05
059	Log.-per. antenna	HL050	Rohde & Schwarz	100006	1 Year(s)/ 2011-11-08
062	Semi anechoic chamber #2	13,0m x 7,0m x 5,0m	EMC-Technik & Consulting GmbH		1 Year(s)/ 2012-06-30
067	LISN	ESH2-Z5	Rohde&Schwarz	872460/043	1 Year(s)/ 2012-01-04
068	LISN	ESH2-Z5	Rohde&Schwarz	872460/042	1 Year(s)/ 2011-12-13
070	Pulse Limiter for ESH3	ESH3-Z2	Rohde&Schwarz	357.8810.52	1 Year(s)/ 2012-03-14
073	Absorbing clamp	MDS21	Schwarzbeck	881757	1 Year(s)/ 2011-11-08
074	Synthesizer signal generator	SMX	Rohde&Schwarz	5SM02675	2 Year(s)/ 2013-06-30
087	DSO	HP54502A 400MHz	Hewlett Packard	2934A03381	2 Year(s)/ 2013-04-26
107	Distortion generator	CAR-TESTER II	HILO-TEST	20073238	1 Year(s)/ 2012-07-29
115	Strip line 50 Ohm		EMCE GmbH		1 Year(s)/ 2012-08-31
116	Vertical rod antenna	VAMP 9243	Schwarzbeck	9243-205	1 Year(s)/ 2011-11-09
117	LISN	ESH3-Z6	Rohde & Schwarz	100521	1 Year(s)/ 2011-11-04
118	Current Probe	F-52	Fischer Custom Communications Inc.	08398	1 Year(s)/ 2012-01-31
119	10V Insertion Unit 50 Ohm	URV5-Z2	Rohde & Schwarz	100911	2 Year(s)/ 2013-05-27
122	Power Meter	NRVS	Rohde & Schwarz	833430 / 0017	2 Year(s)/ 2013-05-17
123	Directional coupler	BDC 0100-50/500	BONN Elektronik	087261	1 Year(s)/ 2011-08-31
126	Power amplifier	CBA1G-150	Teseq	T43818	1 Year(s)/ 2012-05-13

Inv.-No.	Designation	Type	Manufacturer	S/N	Calibration: Interval /valid until
127	Function / Arbitrary Waveform Generator	Agilent 33220A	Agilent Technologies Inc.		3 Year(s)/ 2012-09-08
128	Signal Generator	SMF100A	Rohde & Schwarz	100137	2 Year(s)/ 2012-02-24
129	ESD-Gun	P 30N	EM TEST GmbH	V1012106114	3 Year(s)/ 2013-05-06
130	Microwave Log.-Per-Antenna	STLP 9149	Schwarzbeck Mess-Elektronik		5 Year(s)/ 2015-06-29
131	Coupling network	M3/AC	Dr. Hubert GmbH	A3052006	1 Year(s)/ 2011-08-20
132	LF-Amplifier	A1110-05	Dr. Hubert GmbH	111A1110	1 Year(s)/ 2012-07-20
134	10 V Insertion Unit 50 Ohm	URV5-Z2	Rohde & Schwarz	101025	1 Year(s)/ 2011-11-09
136	Directional coupler	BDC 0842-40/200	Bonn Elektronik	108082	1 Year(s)/ 2011-08-31
137	Power Amplifier	CBA3G-100	Teseq	T43943	1 Year(s)/ 2011-08-31
138	Microwave Biconical Broadband Antenna	SBA 9119	Schwarzbeck Mess-Elektronik	9119-058	3 Year(s)/ 2014-01-26

Scope:

1 EMC-Test(s)

1.1 Emission according 47 CFR Part 15 Subpart C - 10/2010

1.1.1 Terminal voltage according 47 CFR Part 15 Subpart C - 10/2010

☐ Full compliance
☐ Precompliance
☒ Test not requested*
☐ Test not carried out*

* The device is battery powered, no external leads.

1.1.2 Radio disturbances according 47 CFR Part 15 Subpart C - 10/2010

☒ Full compliance
☐ Precompliance
☐ Test not requested*
☐ Test not carried out*

*

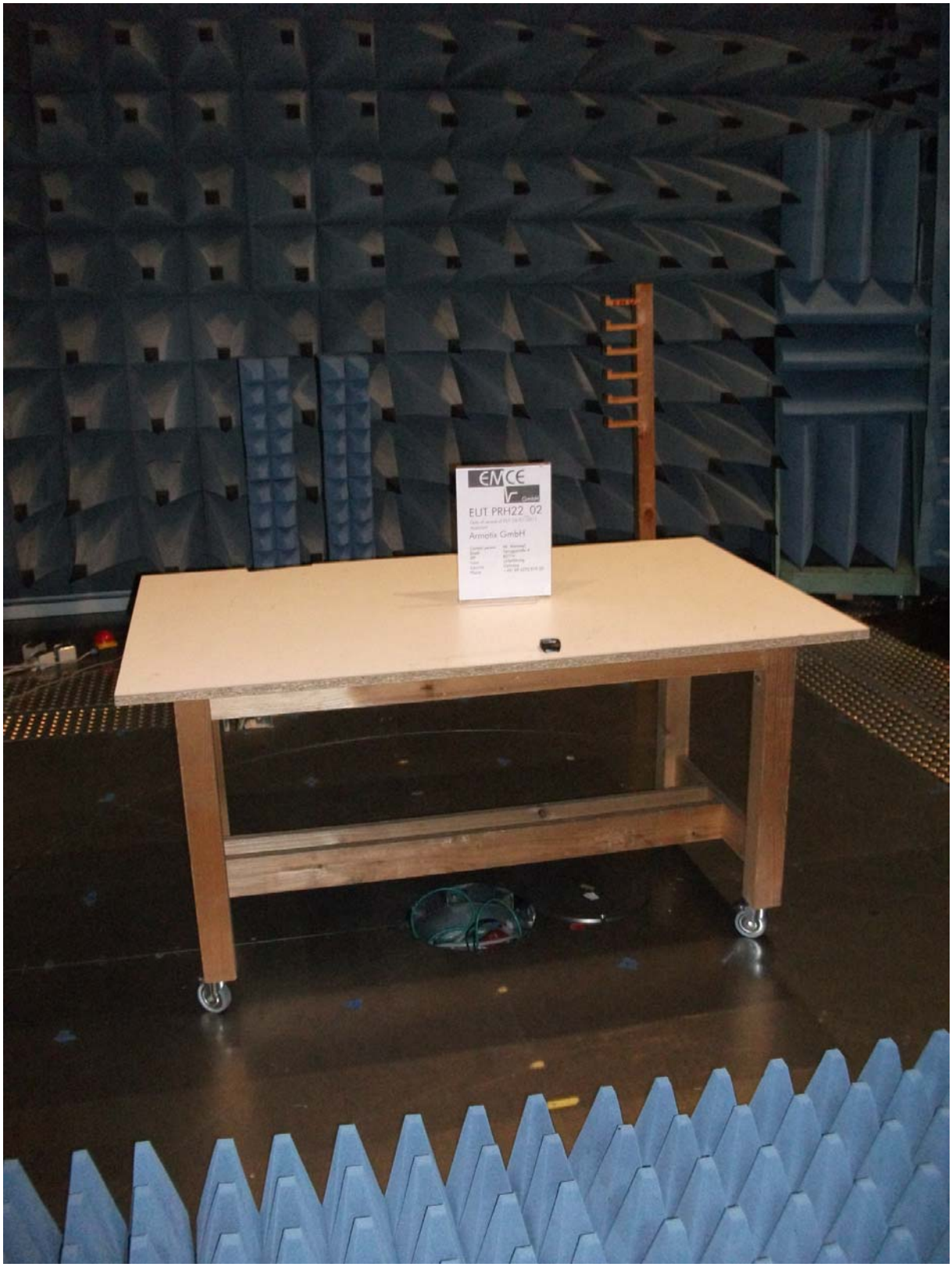
Test location

☒	Inv.-No.	Designation	Type (LxWxH)	Manufacturer	Location
	504	Shielded room #1	6.4 x 4.0 x 2.3m	Frankonia EMV-Messsysteme GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	588	Shielded room #2	8.3/5.8 x 5.5/2.9 x 3.4m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	584	Shielded room #3	3.6 x 3.6 x 2.5m	Siemens AG	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	061	Semi anechoic chamber #1	4.0 x 4.0 x 3.5m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
☒*	062	Semi anechoic chamber #2	13.5 x 6.1 x 5.5m	EMC-Technik & Consulting GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	807	Full anechoic chamber #3	7.6 x 4.6 x 3.6m	Siemens AG	University of Applied Sciences Eberhard-Finckh-Str. 11 89075 Ulm
☒	014	OATS	3m – Test distance	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	015	OATS	10m – Test distance	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
	066	OATS	30m – Test distance	EMCE GmbH	EMCE GmbH Untere Wiesen 1 88483 Burgrieden
		Alternative test site			

* Test location used for radiated emissions with f > 1000MHz.

1.1.2.1 Test set up

According ANSI C63.4-2003


EMCE
ELT PRH22 02
Armotix GmbH

Used test equipment

☒	Inv.-No.	Designation	Type	Manufacturer	S/N
☒	001	Test receiver	ESS 5Hz - 1000 MHz	Rohde & Schwarz	833776/008
	003	LISN 1	ESH3-Z5	Rohde & Schwarz	835268/007
	004	LISN 2	ESH3-Z5	Rohde & Schwarz	835268/003
	005	LISN 3	NNB 4/32T	Rolf Heine HF-Technik	4/32T-96015
	006	LISN	NNBM 8125	Schwarzbeck	8125371
	007	Absorbing clamp	MDS 21	Schwarzbeck	942436
☒	008	Antenna 9kHz – 30MHz	HFH2-Z2	Rohde & Schwarz	835776/0002
	009	Antenna 30 – 300MHz	VHBA9123 / BBA9106	Schwarzbeck	435
☒	010	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck	108
☒	011	Antenna 30 – 300MHz	VHBA9123 / BBA9106	Schwarzbeck	0408/94
	012	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck	166
	013	Antenna 9kHz – 30 MHz	Loop antenna 1.5m ∅	EMCE GmbH	
	025	Current clamp BCI	F-120-2	FCC	47
	041	HZ-10	Shielded coil	Rohde & Schwarz	849788/020
	042	AC-Source / Analyser / Norm impedance	EMV D5000/PAS	Spitzenberger + Spies	A274700/ 0 0501
☒	058	Test receiver	ESIB 40	Rohde & Schwarz	100200
☒	059	Logper. Antenna	HL050	Rohde & Schwarz	100006
	060	HF coupling clamp	KEMA 801	Schaffner	20808
	063	Logper. Antenna	HL023 A2	Rohde & Schwarz	
	067	LISN 5	ESH2-Z5	Rohde & Schwarz	0872460/043
	068	LISN 4	ESH2-Z5	Rohde & Schwarz	0872460/042
	073	Absorbing clamp	MDS 21	Schwarzbeck	881757
	116	Vertical rod antenna	VAMP 9243	Schwarzbeck	9243-205

All used test equipment are checked resp. calibrated periodically.

☒ Test equipment was checked and complied to the requirements

Test / Measurement uncertainty

The measurement uncertainty in the test met the guideline of CISPR16-4-2 or better.

Measurement uncertainty of the radiated emission with an extended coverage factor of k=2:

Frequency	Measurement uncertainty
9kHz – 30MHz	on request
30MHz – 300MHz	4.4dB
300MHz – 1GHz	3.4dB
1GHz – 18GHz	on request

1.1.2.2 Test – intentional radiation

Regulation

47 CFR Part 15 Subpart C - 10/2010

	☐ 9kHz - 30MHz	☐ 150kHz – 1GHz
	☐ 30MHz - 1000MHz	☐ 1 – 10GHz
	☒ Section 15.249 – Fundamental frequency and harmonics	
Limits:	☐ Section 15.209	☒ Section 15.249
Test distance:	☒ 3m	☐ 5m
	☐ 10m	☐ 30m

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☐ 5VDC via USB	☒ Internal
Rated voltage variation:	☐ 85%	☐ 115%
ISM-Frequency:	☐ __MHz	☐ __MHz
Fundamental frequency:	☒ 916.35MHz	☐ __MHz

Continuous operation provided by a test software while transmitting data permanently.

Environmental conditions

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

Environmental conditions during the test:
- ☒ kept
- ☐ not kept

Test - / Measurement procedure

Measurements are made with a receiver according CISPR guidelines. Frequencies equal or below 1000MHz are tested with quasi-peak detector and related bandwidths. Average detector is used for frequencies above 1000MHz and a related bandwidth of 1MHz. The limit on peak RF emissions is 20dB above the maximum permitted average emission limit. Emissions are tested up to the tenth harmonic of the highest fundamental frequency of the intentional radiator.

Test result

Limit for radiated fundamental:
- ☒ kept
- ☐ not kept

Limit for radiated harmonics:
- ☒ kept
- ☐ not kept

Limits for radiated frequencies outside the frequency bands others than harmonics:
- ☐ kept
- ☐ not kept
- ☒ kept according Section 15.209
- ☐ not kept according Section 15.209

Remarks: Harmonics below the limit with a margin >20dB to the limit are generally not listed.
For frequencies outside the frequency bands see radiated emissions – general requirements.

Protocol scope

- ☒ Readings – Field strength fundamental
- ☐ Diagram - Field strength fundamental
- ☒ Readings - Field strength harmonics
- ☐ Diagram - Field strength harmonics
- ☒ Bandwidth fundamental
- ☐ Bandwidth fundamental – Frequency response vs. supply voltage

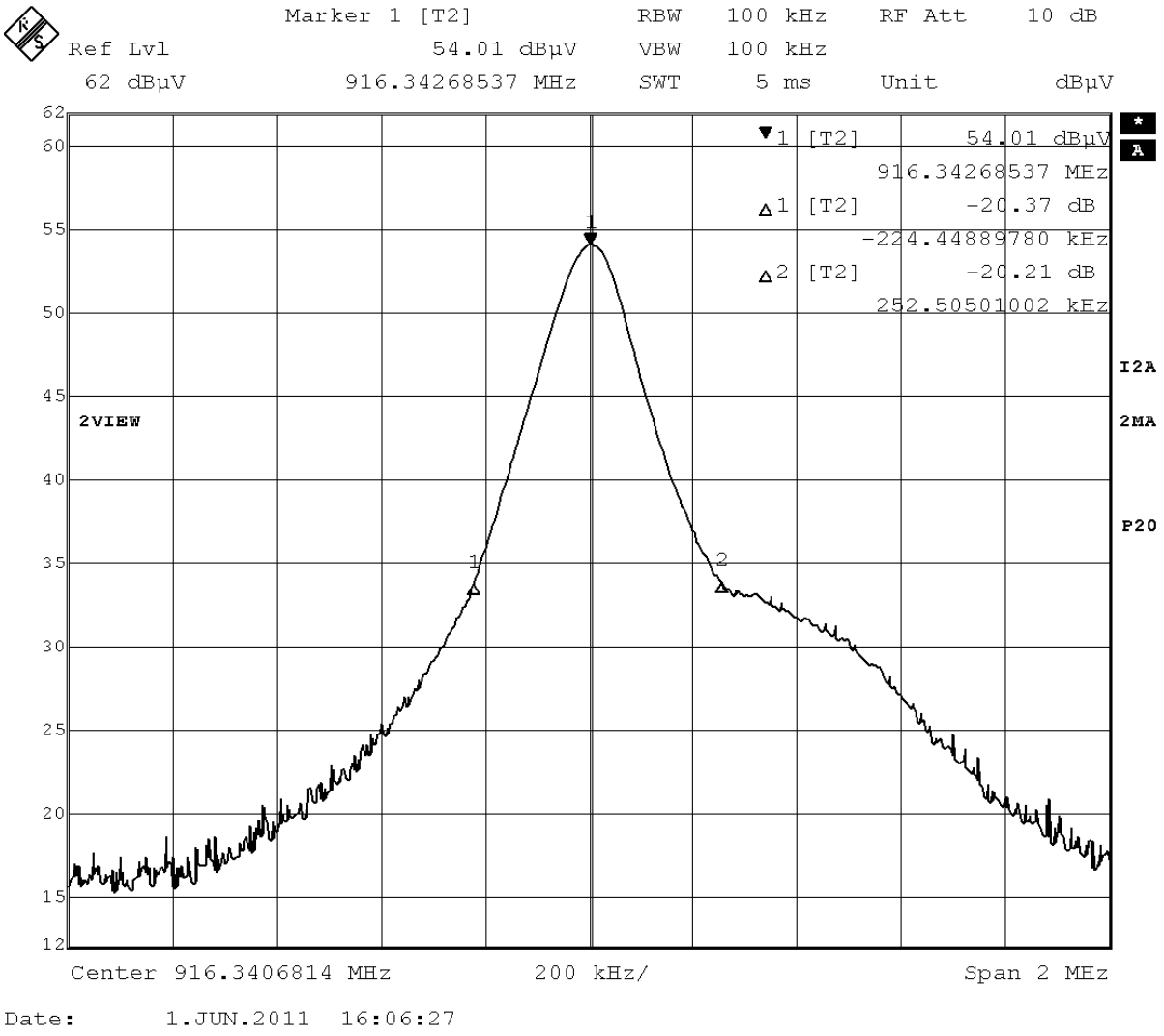
Field strength - Fundamental

Frequency / MHz	Max. field strength – Peak / dBµV/m	Max. field strength – QP / dBµV/m	Limit – QP / dBµV/m	Margin – QP / dB	Antenna polarization
916.3452	43.0	43.0	94.0	51.0	Vertical
916.3452	48.0	48.0	94.0	46.0	Horizontal

Field strength - Harmonics

Device	Frequency / GHz	Max. field strength – Peak / dBµV/m	Max. field strength – AV / dBµV/m	Limit – AV / dBµV/m	Margin – AV / dB	Antenna polarization
Watch	4.5817	50.1	36.0	54.0	18.0	Vertical
	2.7490	46.2	34.2	54.0	19.8	Horizontal
	3.6653	47.2	34.2	54.0	19.8	Horizontal
	4.5817	50.1	36.9	54.0	17.1	Horizontal

Bandwidth – informative



1.1.2.3 Test – radiated emission general requirements

Regulation

47 CFR Part 15 Subpart C - 10/2010

☒ Section 15.205 [9kHz – 10GHz]
☒ Section 15.209 [9kHz – 10GHz]

Exception bands
☒ Section 15.249 –
Fundamental frequency and harmonics

Limits:	☒ Section 15.209*	☐ __
Test distance:	☒ 3m	☐ 5m
	☐ 10m	☐ 30m

* The limits for frequencies below 30MHz were corrected for a closer measuring distance by using an extrapolation factor of 40 dB/decade - (+40*log(measurement distance / test distance)).

Operation mode

EUT arrangement:	☒ Tabletop	☐ Floor standing
Power supply:	☐ 5VDC via USB	☒ Internal
Rated voltage variation:	☐ 85%	☐ 115%
ISM-Frequencies:	☐ __MHz	☐ __MHz
Fundamental frequency:	☒ 916.35MHz	☐ __MHz

Continuous operation provided by a test software while transmitting data permanently.

Environmental conditions

Temperature:	15 - 35 °C
Humidity:	30 - 60 %
Air pressure:	860 - 1060 hPa

Environmental conditions during the test: ☒ kept ☐ not kept

Test - / Measurement procedure

Measurements are made with a receiver according CISPR guidelines. Frequencies equal or below 1000MHz are tested with quasi-peak detector and related bandwidths. Except for the frequency bands 9-90kHz and 110-490kHz an average detector is employed. Average detector is also used for frequencies above 1000MHz with a related bandwidth of 1MHz. At a pre-test in the shielded room the required frequency range is scanned in an automatically operation with peak detector. If the emanation is closer than 6dB to the limits or more, the receiver will retest the exact value with quasipeak or average detector. The determined frequencies are re-tested in an OATS measurement.

Test result

Limits for radiated disturbances: ☒ kept ☐ not kept

Remarks: Radio disturbances below the limit line with a margin >10dB to the limit are generally not listed.

Protocol scope

☒ Readings - Antenna horizontal polarized.
☐ Diagram - Antenna horizontal polarized.
☒ Readings - Antenna vertical polarized.
☐ Diagram - Antenna vertical polarized.
☐ Precompliance measurement(s).

Readings - Antenna horizontal polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna-Height	Antenna-Polarization	Turn Table-Position
MHz	dBµV	dB/m	dB	dBµV/m	dBµV/m	dB	m	hor./ver.	Degree

No results

Readings - Antenna vertical polarized

Frequency	Readings	+ AF Antenna correction factor	+ KF Cable correction factor	Field strength	Limit	Margin	Antenna-Height	Antenna-Polarization	Turn Table-Position
MHz	dBµV	dB/m	dB	dBµV/m	dBµV/m	dB	m	hor./ver.	Degree

No results

2 Summary

Regulation	Class / Test level	Result	Remark(s)
FCC Rules 47 CFR Part 15 Subpart C			
Terminal voltage [0.15-30MHz]	Section 15.207		Not relevant
Radiated emissions – general requirements [0.009-30MHz] [30-1000MHz] [1-10GHz]	Section 15.209	Limits kept	
Radiated emissions – intentional radiators Fundamental frequency [902-928MHz] Harmonics N* fundamental frequency [N= 2....11]	Section 15.249	Limits kept	

Burgrieden, 2012-02-15

Report generated by:

Acceptance inspector – Peter Hauser