

TEST REPORT
No.: 2-20842790-15-12a

According to:
FCC Regulations
Part 15.107
Part 15.109

IC-Regulations
ICES-003, Issue 6

for

Datalogic ADC S.r.l.

JOYA TOUCH
Type: P00AN04HL0GT0W7-GBB

FCC-ID: U4GJNGWB
IC: 3862E-JNGWB
PMN: JOYA TOUCH
HVIN: JNG P GUN







Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 FEDERAL COMMUNICATIONS COMMISSION FC MRA US-EU 0003	 Industry Canada Reg. No.: 3462D-2 Reg. No.: 3462D-3	 Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2666 C-2914, T-1967, G-301
 WiFi ALLIANCE	 CTIA Authorized Test Lab LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			
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1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests. Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

The Equipment Under Test (in this report, hereinafter referred as EUT) is a digital device with support of radiofrequency technologies. Those wireless technologies are not covered by this test report. A typical non wireless digital functions operating mode was tested according to intended use of the equipment.

Following tests have been performed to show compliance with applicable FCC Part 15, Subpart B (Unintentional Radiators) of the CFR 47 Rules, Edition 2015 and Canadian ICES-003, Issue 6 standard.

1.1. TEST OVERVIEW ACCORDING FCC PART 15B AND CANADIAN RSS- OR ICES STANDARDS

No. of Diagram group	Test Cases	Port	References, Standards & Limits			EUT set-up	EUT op-mode	Result
			FCC	IC	Limits			
1	AC Power Lines Conducted emissions 0.15 – 30 MHz	AC Power lines	§15.107	ICES-003, Issue 6 Chapter 6.1 Table 2	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B	2	2	Pass
3	Radiated emissions 30 MHz-1 GHz	Cabinet + Inter-connecting cables	§15.109	ICES-003, Issue 6 Chapter 6.2.1 Table 5	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B	1	1	Pass
4	Radiated emissions above 1 GHz	Cabinet + Inter-connecting cables	§15.109	ICES-003, Issue 6 Chapter 6.2.2 Table 7	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B	1	1	Pass

Remark: --

Attestation:

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All requirements as shown in above table are met in accordance with enumerated standards.

.....
Dipl.-Ing. Ch. Lorenz
Responsible for test section

.....
MSc. Ajit Phadtare
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Dipl.-Ing. Rachid Acharkaoui
Deputy:	Dipl.-Ing. Niels Jeß

2.2. Test location

2.2.1. Test laboratory "CTC"

Company name:	see chapter 2.1. Identification of the testing laboratory
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2.3. Organizational items

Responsible for test report :	MSc. Ajit Phadtare
Project leader:	Dipl.-Ing. V. Krueger
Receipt of EUT:	2016-04-08
Date(s) of test:	2016-04-26 to 2016-10-12
Date of report:	2016-10-13

Version of template:	13.02 ,

2.4. Applicant's details

Applicant's name:	Datalogic ADC S.r.l.
Address:	Via S. Vitalino, 13 40012, Lippo di Calderara di Reno (BO) ITALY
Contact person:	Mr. Eucarpio Guarisco

2.5. Manufacturer's details

Manufacturer's name:	please see Applicant's details
Address:	please see Applicant's details

3. Equipment under test (EUT)

3.1. EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	JOYA TOUCH	Type: P00AN04HL0GT0W7 -GBB	Z16P00321	Beta 3 HW Version P/N: 911350011	SW Version:WEC7 Firmware Version: 2.18
EUT B	JOYA TOUCH	Type: P00AN04HL0HT0W7 -GB0	Z16P00310	Beta 3 HW Version P/N: 911350010	SW Version:WEC7 Firmware Version: 2.18
Remark	Variant type P00AN04HL0HT0W7-GB0(EUT B) not tested. For further details & compliance please refer applicant's declaration of variant equality.				

*) EUT short description is used to simplify the identification of the EUT in this test report.

3.2. EUT: Additional information used in this test report

EUT	FCC 15B Hardware Modifications
EUT A	<p>Following Wireless technologies were put in Idle Mode using special software commands to carry out the unintentional tests acc. to FCC 15B</p> <ul style="list-style-type: none"> - <input checked="" type="checkbox"/> W-LAN 2.4 GHz - <input checked="" type="checkbox"/> W-LAN 5 GHz - <input checked="" type="checkbox"/> Bluetooth® - <input checked="" type="checkbox"/> NFC - <input checked="" type="checkbox"/> Wireless battery charging option (WPC)

3.3. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

AE short description*)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	Laptop	DELL Inspiron	--	--	Windows 7
AE 2	USB-LWL-Converter	OLS-1	007/2006	CTC091	--

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.4. EUT set-ups

EUT set-up no.*)	Combination of EUT and AE	Remarks
set. 1	EUT A + Cable 1+AE2+AE1	Radiated field strength measurements (AE 1 was placed outside measurement chambers only to control data transfer status)
set. 2	EUT A + Cable 1+AE1	AC-Power Lines Conducted Emissions set up

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.5. EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	Continuous Barcode reading + USB Data Transfer + USB Charging + All Wireless technologies in Idle Mode	With help of installed Datalogic test firmware version 2.18 following modes were activated simultaneously: Continuous Barcode reading: - activated using “DcdTestNet” application. - a sample Barcode was placed in front of EUT’s Barcode scanner to ensure nonstop barcode reading - before & after test percentage of barcode counts were controlled USB Data Transfer: - activated using USB file transfer (Terminal –PC)instructions - Host PC (AE1) was used to control the data transfer status before & after test USB Charging: -Whenever a USB connection with host PC is detected EUT starts automatically battery charging.
op. 2	USB Data Transfer + USB Charging + All Wireless technologies in Idle Mode	With help of installed Datalogic test firmware version 2.18 following modes were activated simultaneously: USB Data Transfer: - activated using USB file transfer (Terminal –PC)instructions - Host PC (AE1) was used to control the data transfer status before & after test USB Charging: -Whenever a USB connection with host PC is detected EUT starts automatically battery charging.

*) EUT operating mode no. is used to simplify the test report.

3.6. Additional declaration and description of EUT

EUT A	<input type="checkbox"/> table-top <input type="checkbox"/> floor-standing <input type="checkbox"/> wall-mounted <input checked="" type="checkbox"/> not defined	typical use <input checked="" type="checkbox"/> portable use <input type="checkbox"/> fixed use <input type="checkbox"/> vehicular use	typical operating cycle of EUT. <input checked="" type="checkbox"/> < 0,5 sec. <input type="checkbox"/> :	
Place of use	<input checked="" type="checkbox"/> Residential, commercial and light industry <input type="checkbox"/> Industrial environment <input type="checkbox"/> vehicular use			
Highest internal frequency generated by EUT and required upper frequency of radiated disturbance measurement	<input type="checkbox"/> less than 108 MHz -> up to 1 GHz <input type="checkbox"/> 108 MHz - 500 MHz -> up to 2 GHz** (**Assumed frequency range No declaration from manufacturer) <input checked="" type="checkbox"/> 500 MHz - 1 GHz -> up to 5 or 6 GHz			
Power line:		EUT-grounding:		
<input checked="" type="checkbox"/> DC	<input checked="" type="checkbox"/> Internal battery Li-Io 3.41V DC to 4.35 V DC (nominal 3.75 V DC)	<input checked="" type="checkbox"/> none <input type="checkbox"/> with power supply <input type="checkbox"/> additional: <small>(in case of deviation during tests the single details are described on chapter 4)</small>		
Other Ports (description of interconnecting cables)		possible total cable length	shielding	
	Connector		connected during test	
Micro USB Port	Micro USB type b female	<input checked="" type="checkbox"/> < 3m <input type="checkbox"/> > 3m <input type="checkbox"/> : other	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
Does EUT contain devices susceptible to magnetic fields, e.g. Hall elements, electrodynamics microphones, etc.?			<input checked="" type="checkbox"/> yes <input type="checkbox"/> no	
Is mounting position / usual operating position defined?			<input type="checkbox"/> yes <input checked="" type="checkbox"/> no	

3.7. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	CABLETECH TECHNOLOGY	High-speed revision2.0	--	AWM 2725 FT2 E237114	1.2 m

4. Description of test system set-up's

4.1. Test system set-up for AC power-line conducted emission measurements

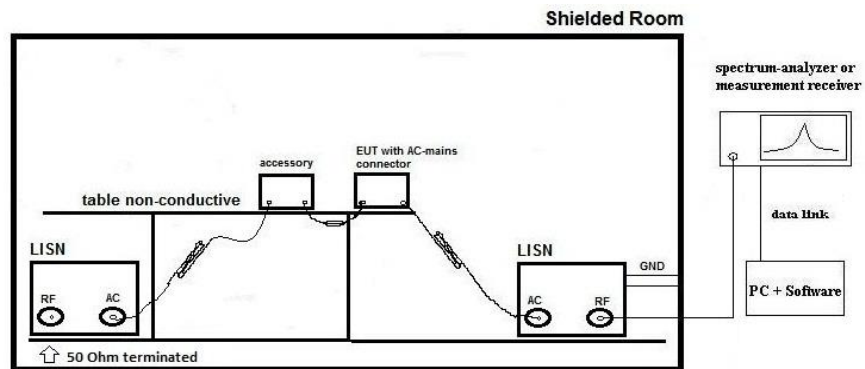
Specification: ANSI C63.4-2009 chapter 7, ANSI C63.10-2013 chapter 6.2

General Description: The radio frequency voltage conducted back into the AC power line in the frequency range 150 kHz to 30 MHz has to be investigated. Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range.

A 50 Ohm / 50 μH line impedance stabilization network (LISN) is used coupling the interface to the measurement equipment. The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the ground plane. The measuring instrument is connected to the coaxial output of the LISN.

Tabletop devices were set-up on a 80 cm height above reference ground plane, floor standing equipment 10 cm raised above ground plane. Measurements have been performed on each phase line and neutral line of the devices AC-power lines. The EUT was power supplied with 110 V/60 Hz. The EUT was tested in the defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

Schematic:



Only schematic view, we refer to figure 6, 7 and 8 of ANSI C63.4-2009 for more details.

Testing method:

Exploratory, preliminary measurements as a first step, determines the worst-case phase line (neutral or phase) as well as the most critical operating mode of the equipment. A complete frequency-sweep with PK-Detector is performed on each current-carrying conductor.

Final testing for power phases and critical frequencies (Margin to AV- or QP limit lower than 3 dB) as a second step includes measurements with receivers detector set to Quasi-Peak and Average.

Formula:

$$V_C = V_R + C_L \quad (1)$$

$$M = L_T - V_C \quad (2)$$

V_C = measured Voltage –corrected value

V_R = Receiver reading

C_L = Cable loss

M = Margin

L_T = Limit

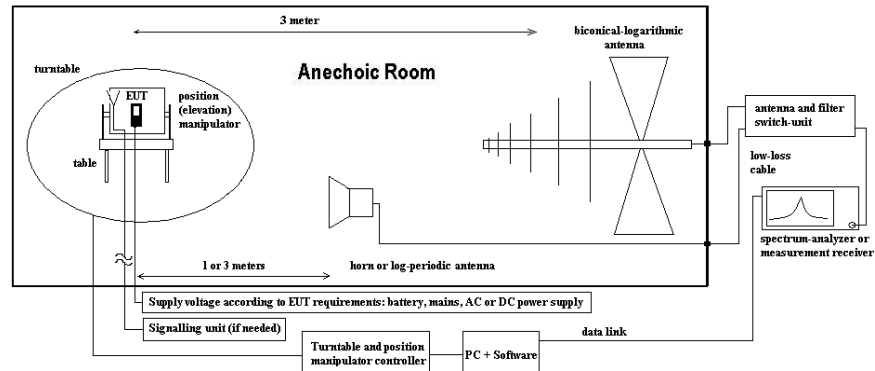
Values are in dB, positive margin means value is below limit.

4.2. Test system set-up for radiated electric field measurement 30 MHz to 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.5

General Description: Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m as worst-case determined by an exploratory emission measurements. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height between 1 m and 4 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

E_C = Electrical field – corrected value

E_R = Receiver reading

G_A = Gain of pre-amplifier (if used)

L_T = Limit

M = Margin

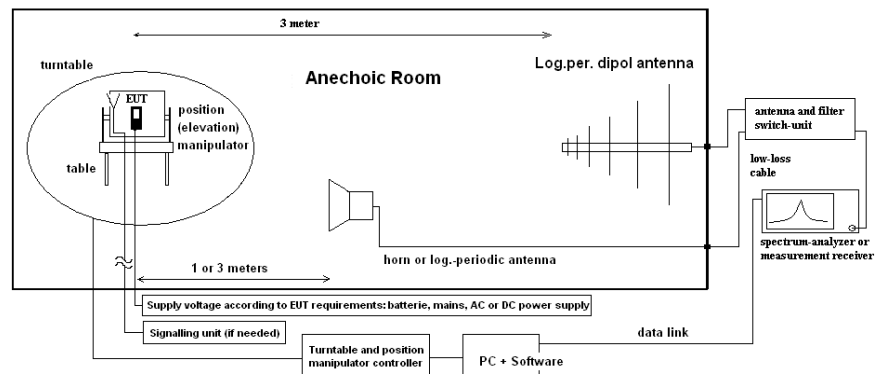
All units are dB-units, positive margin means value is below limit.

4.3. Test system set-up for radiated electric field measurement above 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.6

General Description: Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a CISPR 16-4 compliant fully anechoic room (FAR) recognized by the regulatory commissions. The measurement distance was set to 3 meter for frequencies up to 20 GHz and 1 meter above 20 GHz. The horn antenna is used for frequency range 1 GHz to 40 GHz. Due to use of a fully anechoic room the measurement antennas are set to fixed antenna height of 1.55 m (no height scan necessary) and the site validation criteria accord. ANSI63.10:2009 is fulfilled. The EUT is aligned within 3 dB beam width of the measurement antenna, on big EUTs several surface measurements are performed.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by maintaining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height is fixed to 1.55 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

E_C = Electrical field – corrected value

E_R = Receiver reading

M = Margin

L_T = Limit

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

G_A = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

5. Measurements

5.1. General Limit - Conducted emissions on AC-Power lines

5.1.1. Test location and equipment

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter 2.2.1)	<input type="checkbox"/> Please see Chapter 2.2.2	<input type="checkbox"/> Please see Chapter 2.2.3
test site	<input type="checkbox"/> 333 EMI field	<input checked="" type="checkbox"/> 348 EMI cond.	
receiver	<input type="checkbox"/> 001 ESS	<input checked="" type="checkbox"/> 377 ESCS 30	<input type="checkbox"/> 489 ESU 40 <input type="checkbox"/> 620 ESU 26
LISN	<input checked="" type="checkbox"/> 005 ESH2-Z5	<input type="checkbox"/> 007 ESH3-Z6	<input type="checkbox"/> 300 ESH3-Z5 & 50Ω used for AE <input type="checkbox"/> no LISN for AE
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 436 CMU	<input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW
line voltage	<input checked="" type="checkbox"/> 4.35 V DC (fully charged internal battery)		<input type="checkbox"/> 060 120 V 60 Hz via PAS 5000

5.1.2. Requirements

FCC	Part 15, Subpart B, §15.107		
IC	RSS-Gen Issue 4, Chapter 8.8, Table 3		
ANSI	C63.4-2014, § 5.2, 6, 7		
Limit	Frequency [MHz]	<input checked="" type="checkbox"/> Conducted limit Class B	
		QUASI-Peak [dBμV]	AVERAGE [dBμV]
	0.15 – 0.5	66 to 56*	56 to 46*
	0.5 – 5	56	46
	5 – 30	60	50
Remark: * decreases with the logarithm of the frequency			

5.1.3. Test condition and test set-up

Signal link to test system (if used):	<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/> none
EUT-grounding	<input type="checkbox"/> none	<input checked="" type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top (40 cm distance to reference ground plane (wall))		<input type="checkbox"/> floor standing EUT stands isolated on reference ground plane (floor)
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver or Analyzer settings	Scan data	<input type="checkbox"/> 9 – 150 kHz, RBW = 200 Hz, Step = 61 Hz <input checked="" type="checkbox"/> 150 kHz – 30 MHz RBW = 9 kHz, Step = 4 kHz <input type="checkbox"/> other:	
	Scan-Mode	6 dB EMI-Receiver Mode	
	Pre-measurement Final measurement	Peak detector, Repetitive-Scan, max-hold, sweep-time 50 μs per frequency point Average & Quasi-peak detector at critical frequencies	
General measurement procedures	Please see chapter "Test system set-up for AC power line conducted emissions measurements"		

5.1.4. Measurement results

The results are presented below in summary form only. For more information please see the diagrams

Set-up no.:2			EUT OP-mode no.: 2		
Diagram-No.	Used Detector	Power line	Additional (scan-) information	Remarks	Result
1.01	<input checked="" type="checkbox"/> Peak (pre-scan) <input type="checkbox"/> CAV (final) <input checked="" type="checkbox"/> QP (final)	L1/ N	USB Data Transfer + USB Charging.	Remark 1)	Pass

Remarks: 1.)For further details please refer chapter 10.1 for test result diagrams.

2.) Please refer Annex TR2-20842790-15-12a-A4 for relevant test setup photographs.

5.2. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz

5.2.1. Test location and equipment

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)	<input type="checkbox"/> Please see Chapter. 2.2.2	<input type="checkbox"/> Please see Chapter. 2.2.3
test site	<input checked="" type="checkbox"/> 441 EMI SAR	<input checked="" type="checkbox"/> 487 SAR NSA	
receiver	<input type="checkbox"/> 377 ESCS30	<input checked="" type="checkbox"/> 001 ESS	<input type="checkbox"/> 489 ESU 40 <input type="checkbox"/> 620 ESU 26
spectr. analys.	<input type="checkbox"/> 584 FSU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK
antenna	<input checked="" type="checkbox"/> 574 BTA-L	<input type="checkbox"/> 133 EMCO3115	<input type="checkbox"/> 302 BBHA9170 <input type="checkbox"/> 289 CBL 6141 <input type="checkbox"/> 030 HFH-Z2 <input type="checkbox"/> 477 GPS
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 371 CBT32	<input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW
otherwise	<input type="checkbox"/> 400 FTC40x15E	<input type="checkbox"/> 401 FTC40x15E	<input type="checkbox"/> 110 USB LWL <input checked="" type="checkbox"/> 482 Filter Matrix
DC power	<input type="checkbox"/> 456 EA 3013A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 459 EA 2032-50 <input type="checkbox"/> 268 EA- 3050 <input type="checkbox"/> 494 AG6632A <input type="checkbox"/> 498 NGPE
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input checked="" type="checkbox"/> 4.35 V DC (fully charged internal battery)

5.2.2. Requirements/Limits

FCC		<input checked="" type="checkbox"/> Part 15 Subpart B, §15.109, class B <input type="checkbox"/> Part 15 Subpart C, §15.209 @ frequencies defined in §15.205	
IC		<input type="checkbox"/> RSS-Gen., Issue 4, Chapter 8.9, Table 4+6 <input checked="" type="checkbox"/> ICES-003, Issue 6, Chapter 6.2.1, Table 5	
ANSI		<input checked="" type="checkbox"/> C63.4-2014 <input type="checkbox"/> C63.10-2009	
Limit	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [μ V/m]	QUASI-Peak [dB μ V/m]
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	above 960	500	54.0

5.2.3. Test condition and measurement test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link	<input checked="" type="checkbox"/> cable connection	<input type="checkbox"/> none
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top 0.8m height		<input type="checkbox"/> floor standing
Climatic conditions	Temperature: (22 \pm 3 $^{\circ}$ C)		Rel. humidity: (40 \pm 20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range: <input checked="" type="checkbox"/> 30 – 1000 MHz <input type="checkbox"/> other:	<input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3 dB spectrum analyser mode	
	Scan-Mode	Peak / Quasi-peak	
	Detector	100 kHz/300 kHz	
	RBW/VBW	Repetitive-Scan, max-hold	
	Mode:	80 kHz	
	Scan step	Coupled – calibrated display if continuous tx-signal otherwise adapted to EUT's individual duty-cycle	
	Sweep-Time		
General measurement procedures	Please see chapter "Test system set-up for electric field measurement in the range 30 MHz to 1 GHz"		

5.2.4. MEASUREMENT RESULTS

Table of measurement results:

Diagram no.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
					PK	AV	QP	
3.12	30 MHz – 1 GHz	1	1	1.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass

Remarks: 1.) For further details please refer chapter 10.2 for test result diagrams.

2.) Please refer Annex TR2-20842790-15-12a-A4 for relevant test setup photographs.

5.3. General Limit - Radiated emissions, above 1 GHz

5.3.1. Test location and equipment FAR

test site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 348 EMI cond.	<input checked="" type="checkbox"/> 443 EMI FAR	<input type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/> 337 OATS	<input type="checkbox"/>
spectr. analys.	<input type="checkbox"/> 584 FSU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input checked="" type="checkbox"/> 489 ESU 40	<input type="checkbox"/>	<input type="checkbox"/>
antenna meas	<input type="checkbox"/> 574 BTA-L	<input type="checkbox"/> 289 CBL 6141	<input type="checkbox"/> 608 HL 562	<input checked="" type="checkbox"/> 549 HL025	<input checked="" type="checkbox"/> 302 BBHA9170	<input type="checkbox"/> 477 GPS
antenna meas	<input type="checkbox"/> 123 HUF-Z2	<input type="checkbox"/> 132 HUF-Z3	<input type="checkbox"/> 030 HFH-Z2	<input checked="" type="checkbox"/> 376 BBHA9120E	<input type="checkbox"/>	<input type="checkbox"/>
antenna subst	<input type="checkbox"/> 071 HUF-Z2	<input type="checkbox"/> 020 EMCO3115	<input type="checkbox"/> 063 LP 3146	<input type="checkbox"/> 303 BBHA9170	<input type="checkbox"/>	<input type="checkbox"/>
multimeter	<input type="checkbox"/> 341 Fluke 112	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 371 CBT32	<input type="checkbox"/> 547 CMU	<input type="checkbox"/> 594 CMW	<input type="checkbox"/>	<input type="checkbox"/>
DCpower	<input type="checkbox"/> 086 LNG50-10	<input type="checkbox"/> 087 EA3013	<input type="checkbox"/> 354 NGPE 40	<input type="checkbox"/> 349 car battery	<input type="checkbox"/> 350 Car battery	<input type="checkbox"/>
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input checked="" type="checkbox"/> 4.35 V DC (fully charged internal battery)			

5.3.2. Requirements/Limits (CLASS B equipment)

FCC	<input checked="" type="checkbox"/> Part 15 Subpart B, §15.109 class B <input type="checkbox"/> Part 15 Subpart C, §15.209 for frequencies defined in §15.205 <input type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3) 9			
IC	<input checked="" type="checkbox"/> RSS-Gen., Issue 4, Chapter 8.9, Table 4+6 (transmitter licence exempt) <input type="checkbox"/> RSS-Gen., Issue 4, Chapter 8.9, Table 2 (receiver) <input checked="" type="checkbox"/> ICES-003, Issue 6, Chapter 6.2.2, Table 7 (class B)			
ANSI	<input checked="" type="checkbox"/> C63.4-2014 <input type="checkbox"/> C63.10-2013			
	Limits			
Frequency [MHz]	AV [µV/m]	AV [dBµV/m]	Peak [µV/m]	Peak [dBµV/m] or [dBm/MHz]
above 1 GHz for frequencies as defined in §15.205 or RSS-Gen., Issue 4, §8.10 - Table 6	500	54.0	5000	74.0 dBµV/m

5.3.3. Test condition and measurement test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link	<input checked="" type="checkbox"/> cable connection	<input type="checkbox"/> none
EUT-grounding	<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply	<input type="checkbox"/> additional connection
Equipment set up	<input checked="" type="checkbox"/> table top 1.5m height		<input type="checkbox"/> floor standing
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%
Spectrum-Analyzer settings	Scan frequency range: <input checked="" type="checkbox"/> 1 – 18 GHz <input checked="" type="checkbox"/> 18 – 25 GHz <input checked="" type="checkbox"/> 25 – 30 GHz <input type="checkbox"/> other: <input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3 dB Spectrum analyser Mode Peak and Average 1 MHz / 3 MHz Mode: Repetitive-Scan, max-hold Scan step: 400 kHz Sweep-Time: Coupled – calibrated display if CW signal otherwise adapted to EUT’s individual duty-cycle		
General measurement procedures	Please see chapter “Test system set-up for radiated electric field measurements above 1 GHz”		

5.3.4. Measurement Results

The results are presented below in summary form only. For more information please see diagrams.

Diagram no.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
					PK	AV	QP	
4.12a	1 GHz – 2.8 GHz	1	1	1.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.12b	2.8 GHz – 12.75 GHz	1	1	1.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.12c	12.75 GHz – 18.0 GHz	1	1	1.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.12d	18.0 GHz – 25.0 GHz	1	1	1.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.12e	25.0 GHz – 30.0 GHz	1	1	1.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass

Remarks: 1.) For further details please refer chapter 10.3 for test result diagrams.

2.) Please refer Annex TR2-20842790-15-12a-A4 for relevant test setup photographs.

5.4. Measurement uncertainties

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved. For uncertainty determination, each component used in the concrete measurement set-up was taken in account and it's contribution to the overall uncertainty according to its statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%						Remarks
Conducted emissions (U _{CISPR})	CISPR 16-2-1	9 kHz - 150 kHz	4.0 dB						-
		150 kHz - 30 MHz	3.6 dB						
Radiated emissions Enclosure	CISPR 16-2-3	30 MHz - 1 GHz	4.2 dB						E-Field
		1 GHz - 18 GHz	5.1 dB						
Disturbance power	CISPR 16-2-2	30 MHz - 300 MHz	-						-
Power Output radiated	-	30 MHz - 4 GHz	3.17 dB						Substitution method
Power Output conducted	-	Set-up No.	Cel-C1	Cel-C2	BT1	W1	W2	--	
		9 kHz - 12.75 GHz	N/A	0.60	0.7	0.25	N/A	--	-
		12.75 - 26.5GHz	N/A	0.82	--	N/A	N/A	--	
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	0.70	N/A	0.69	--	N/A - not applicable
		2.8 GHz - 12.75GHz	1.48	N/A	1.51	N/A	1.43	--	
		12.75 GHz - 18GHz	1.81	N/A	1.83	N/A	1.77	--	
		18 GHz - 26.5GHz	1.83	N/A	1.85	N/A	1.79	--	
Occupied bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)						Frequency error
			1.0 dB						Power
Emission bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)						Frequency error
			See above: 0.70 dB						Power
Frequency stability	-	9 kHz - 20 GHz	0.0636 ppm						-
Radiated emissions Enclosure	-	150 kHz - 30 MHz	5.0 dB						Magnetic field E-field Substitution
		30 MHz - 1 GHz	4.2 dB						
		1 GHz - 20 GHz	3.17 dB						

Table: measurement uncertainties, valid for conducted/radiated measurements

6. Abbreviations used in this report

The abbreviations	
ANSI	American National Standards Institute
AV , AVG, CAV	Average detector
EIRP	Equivalent isotropically radiated power, determined within a separate measurement
EGPRS	Enhanced General Packet Radio Service
EUT	Equipment Under Test
FCC	Federal Communications Commission, USA
IC	Industry Canada
n.a.	not applicable
Op-Mode	Operating mode of the equipment
PK	Peak
RBW	resolution bandwidth
RF	Radio frequency
RSS	Radio Standards Specification, Dokuments from Industry Canada
Rx	Receiver
TCH	Traffic channel
Tx	Transmitter
QP	Quasi peak detector
VBW	Video bandwidth
ERP	Effective radiated power

7. Accreditation details of CETECOM's laboratories and test sites

Ref.-No.	Accreditation Certificate	Valid for laboratory area or test site	Accreditation Body
-	D-PL-12047-01-01	All laboratories and test sites of CETECOM GmbH, Essen	DAkkS, Deutsche Akkreditierungsstelle GmbH
337 487 558 348 348	736496	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurment.	FCC, Federal Communications Commission Laboratory Division, USA (MRA US-EU 0003)
337 487 550 558	3462D-1 3462D-2 3462D-2 3462D-3	Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR)	IC, Industry Canada Certification and Engineering Bureau
487 550 348 348	R-2666 G-301 C-2914 T-1967	Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurment.	VCCI, Voluntary Control Council for Interference by Information Technology Equipment, Japan

OATS = Open Area Test Site, SAR = Semi Anechoic Room, FAR = Fully Anechoic Room

8. Instruments and Ancillary

31. Jul. 15

8.1. Used equipment “CTC”

The “Ref.-No” in the left column of the following tables allows the clear identification of the laboratory equipment.

8.1.1. Test software and firmware of equipment

Ref.-No.	Equipment	Type	Serial-No.	Version of Firmware or Software during the test
001	EMI Test Receiver	ESS	825132/017	Firm.= 1.21 , OTP=2.0, GRA=2.0
012	Signal Generator (EMS-cond.)	SMY 01	839069/027	Firm.= V 2.02
013	Power Meter (EMS cond.)	NRVD	839111/003	Firm.= V 1.51
017	Digital Radiocommunication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT = D2.87 13.01.99
053	Audio Analyzer	UPA3	860612/022	Firm. V 4.3
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	Firm.= V 3.1DHG
140	Signal Generator	SMHU	831314/006	Firm.= 3.21
261	Thermal Power Sensor	NRV-Z55	825083/0008	EPROM-Datum 02.12.04, SE EE 1 B
262	Power Meter	NRV-S	825770/0010	Firm.= 2.6
263	Signal Generator	SMP 04	826190/0007	Firm.=3.21
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04, SW-DSP=1.02, Hardboot=1.02, Softboot=2.02
298	Univ. Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f. all band used
323	Digital Radiocommunication Tester	CMD 55	825878/0034	Firm.= 3.52 .22.01.99
335	CTC-EMS-Conducted	System EMS Conducted	-	EMC 32 V 8.52
340	Digital Radiocommunication Tester	CMD 55	849709/037	Firm.= 3.52 .22.01.99
355	Power Meter	URV 5	891310/027	Firm.= 1.31
365	10V Insertion Unit 50 Ohm	URV5-Z2	100880	Eprom Data = 31.03.08
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	Firm. UCS 500=001925/3.06a02, rc=ISMIEC 4.10
371	Bluetooth Tester	CBT32	100153	CBT V5.30+ SW-Option K55, K57
377	EMI Test Receiver	ESCS 30	100160	Firm.= 2.30, OTP= 02.01, GRA= 02.36
378	Broadband RF Field Monitor	RadiSense III	03D00013SNO-08	Firm.= V.03D13
389	Digital Multimeter	Keithley 2000	0583926	Firm. = A13 (Mainboard) A02 (Display)
392	Radio Communication Tester	MT8820A	6K00000788	Firm.= 4.50 #005, IPL=4.01#001,OS=4.02#001, GSM=4.41#013, W-CDMA= 4.54#004, scenario= 4.52#002
436	Univ. Radio Communication Tester	CMU 200	103083	R&S Test Firmware Base=5.14, Mess-Software= GSM:5.14 WCDMA:5.14 (current Testsoftw. F. all band
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR)	-	EMC 32 Version 8.52
442	CTC-SAR-EMS	System EMS field (SAR)	-	EMC 32 Version 8.40
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	Spuri 7.2.5 or EMC 32 Ver. 9.15.00
444	CTC-FAR-EMS field	System-EMS-Field (FAR)	-	EMC 32 Version 9.15.00
460	Univ. Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used,
489	EMI Test Receiver	ESU40	1000-30	Firmware=4.43 SP3, Bios=V5.1-16-3, Spec. =01.00
491	ESD Simulator dito	ESD dito	dito307022	V 2.30
524	Voltage Drop Simulator	VDS 200	0196-16	Software Nr. 000037 Version V4.20a01
526	Burst Generator	EFT 200 A	0496-06	Software Nr. 000034 Version V2.32
527	Micro Pulse Generator	MPG 200 B	0496-05	Software-Nr. 000030 Version V2.43
528	Load Dump Simulator	LD 200B	0496-06	Software-Nr. 000031 Version V2.35a01
546	Univ. Radio Communication Tester	CMU 200	106436	R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used
547	Univ. Radio Communication Tester	CMU 200	835390/014	R&S Test Firmware Base=V5.1403 (current Testsoftw., f. all band used, GSM = 5.14 WCDMA: = 5.14
584	Spectrum Analyzer	FSU 8	100248	2.82_SP3
597	Univ. Radio Communication Tester	CMU 200	100347	R&S Test Firmware Base=5.01, GSM=5.02 WCDMA= not installed, Mainboard= µP1=V.850
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Firmware Bios 3.40 , Analyzer 3.40 Sp 2
620	EMI Test Receiver	ESU 26	100362	4.43_SP3
642	Wideband Radio Communication Tester	CMW 500	126089	Setup V03.26, Test programm component V03.02.20
670	Univ. Radio Communication Tester	CMU 200	106833	µP1 =V8.50, Firmware = V.20
689	Vector Signal Generator	SMU200	100970	02.20.360.142
692	Bluetooth Tester	CBT 32	100236	CBT V 5.40, FW: V.2.41 (FPGA Digital, V. 3.09 FPGA RF)

8.1.2. Single instruments and test systems

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
001	EMI Test Receiver	ESS	825132/017	Rohde & Schwarz	12 M	-	30.05.2017
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	30.05.2017
007	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	30.05.2017
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	30.04.2017
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	30.05.2019
020	Horn Antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36/12 M	-	31.03.2017
021	Loop Antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	30.04.2018
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	30.04.2018
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	30.04.2017
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	pre-m	1a	
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger+Spies	-	3	
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1g	30.06.2016
086	DC - power supply, 0 -10 A	LNG 50-10	-	Heinzinger Electronic	pre-m	2	
087	DC - power supply, 0 -5 A	EA-3013 S	-	Elektro Automatik	pre-m	2	
091	USB-LWL-Converter	OLS-1	007/2006	Ing. Büro Scheiba	-	4	
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	30.04.2018
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	30.04.2018
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	
119	RT Harmonics Analyzer dig. Flickermeter	B10	G60547	BOCONSULT	36 M	-	30.05.2019
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	36 M	-	30.04.2018
140	Signal Generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	30.05.2018
248	attenuator	SMA 6dB 2W	-	Radiall	pre-m	2	
249	attenuator	SMA 10dB 10W	-	Radiall	pre-m	2	
252	attenuator	N 6dB 12W	-	Radiall	pre-m	2	
256	attenuator	SMA 3dB 2W	-	Radiall	pre-m	2	
257	hybrid	4031C	04491	Narda	pre-m	2	
260	hybrid coupler	4032C	11342	Narda	pre-m	2	
261	Thermal Power Sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24 M	-	30.05.2018
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	30.05.2018
263	Signal Generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	30.05.2019
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	30.05.2018
266	Peak Power Sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	30.05.2018
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	pre-m	2	
270	termination	1418 N	BB6935	Weinschel	pre-m	2	
271	termination	1418 N	BE6384	Weinschel	pre-m	2	
272	attenuator (20 dB) 50 W	Model 47	BF6239	Weinschel	pre-m	2	
273	attenuator (10 dB) 100 W	Model 48	BF9229	Weinschel	pre-m	2	
274	attenuator (10 dB) 50 W	Model 47 (10 dB) 50 W	BG0321	Weinschel	pre-m	2	
275	DC-Block	Model 7003 (N)	C5129	Weinschel	pre-m	2	
276	DC-Block	Model 7006 (SMA)	C7061	Weinschel	pre-m	2	
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	1c	30.06.2017
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright GmbH	12 M	1c	30.06.2017
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	30.05.2017
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel	pre-m	2	
302	horn antenna 40 GHz (Meas 1)	BBHA9170	155	Schwarzbeck	36 M	-	31.03.2017
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	31.03.2017
331	Climatic Test Chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	Pre-m	2	
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	30.05.2018
342	Digital Multimeter	Volcraft M-4660A	IB 255466	Volcraft	24 M	-	30.04.2017
347	laboratory site	radio lab.	-	-	-	5	
348	laboratory site	EMI conducted	-	-	-	5	
354	DC - Power Supply 40A	NGPE 40/40	448	Rohde & Schwarz	pre-m	2	
355	Power Meter	URV 5	891310/027	Rohde & Schwarz	24 M	-	30.05.2018
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	30.04.2017
371	Bluetooth Tester	CBT32	100153	R&S	36 M	-	30.05.2019
373	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	100535	Rohde & Schwarz	12 M	-	30.05.2017
377	EMI Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	30.05.2017
389	Digital Multimeter	Keithley 2000	0583926	Keithley	24 M	-	30.04.2017
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	30.05.2017
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	30.04.2017
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	31.03.2017
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	30.06.2017
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	30.06.2017

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	30.06.2017
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
456	DC-Power supply 0-5 A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
459	DC -Power supply 0-5 A , 0-32 V	EA-PS 2032-50	910722	Elektro Automatik	pre-m	2	
460	Univ. Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	30.04.2017
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	30.05.2018
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	36 M	-	30.04.2018
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	36 M	-	30.04.2018
477	ReRadiating GPS-System	AS-47	-	Automotive Cons. Fink	-	3	
480	power meter (Fula)	NRVS	838392/031	Rohde & Schwarz	24 M	-	30.04.2017
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-10P	1244554	Miteq	12 M	-	30.06.2017
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren / CETECOM	24 M	-	31.07.2017
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	30.05.2017
502	band reject filter	WRCG 1709/1786-1699/1796-	SN 9	Wainwright	pre-m	2	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	pre-m	2	
512	notch filter GSM 850	WRCA 800/960-02/40-6EEK	SN 24	Wainwright	12 M	1c	30.06.2017
517	relais switch matrix	HF Relais Box Keithley	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	30.04.2017
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	pre-m	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	pre-m	2	
546	Univ. Radio Communication Tester	CMU 200	106436	R&S	12 M	-	30.05.2017
547	Univ. Radio Communication Tester	CMU 200	835390/014	Rohde & Schwarz	12 M	-	30.04.2017
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.07.2018
550	System CTC S-VSWR Verification SAR-EMI	System EMI Field SAR S-VSWR	-	ETS Lindgren/CETECOM	24 M	-	31.07.2017
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	30.06.2017
557	System CTC-OTA-2	R&S TS8991	-	Rohde & Schwarz	12 M	5	30.09.2016
558	System CTC FAR S-VSWR	System CTC FAR S-VSWR	-	CTC	24 M	-	19.04.2017
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	31.03.2019
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
594	Wideband Radio Communication Tester	CMW 500	101757	Rohde & Schwarz	12 M	-	30.04.2017
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	pre-m	-	
598	Spectrum Analyzer	FSEM 30 (Reserve)	831259/013	Rohde & Schwarz	24 M	-	30.04.2017
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	30.04.2017
601	medium-sensitivity diode sensor	NRV-Z5 (Reserve)	8435323/003	Rohde & Schwarz	24 M	-	30.04.2017
602	peak power sensor	NRV-Z32 (Reserve)	835080	Rohde & Schwarz	24 M	-	
611	DC power supply	E3632A	KR 75305854	Agilent	pre-m	2	
612	DC power supply	E3632A	MY 40001321	Agilent	pre-m	2	
613	Attenuator	R416120000 20dB 10W	Lot. 9828	Radiall	pre-m	2	
616	Digitalmultimeter	Fluke 177	88900339	Fluke	24 M	-	30.05.2018
617	Power Splitter/Combiner	ZFSC-2-2-S+	S F987001108	Mini Circuits	-	2	
618	Power Splitter/Combiner	50PD-634	600994	JFW Industries USA	-	2	
619	Power Splitter/Combiner	50PD-634	600995	JFW Industries, USA	-	3	
620	EMI Test Receiver	ESU 26	100362	Rohde-Schwarz	12 M	-	30.05.2017
621	Step Attenuator 0-139 dB	RSP	100017	Rohde & Schwarz	pre-m	2	
625	Generic Test Load USB	Generic Test Load USB	-	CETECOM	-	2	
627	data logger	OPUS 1	201.0999.9302.6.4.1.4 3	G. Lufft GmbH	24 M	-	30.04.2017
634	Spectrum Analyzer	FSM (HF-Unit)	826188/010	Rohde & Schwarz	pre-m	2	
637	High Speed HDMI with Ethernet 1m	HDMI cable with Ethernet 1m	-	Kogilink	-	2	
638	HDMI Kabel with Ethernet 1,5 m flach	HDMI cable with Ethernet	-	Reichelt	-	2	
640	HDMI cable 2m rund	HDMI cable 2m rund	-	Reichelt	-	2	
641	HDMI cable with Ethernet	Certified HDMI cable with	-	PureLink	-	2	
644	Amplifierer	ZX60-2534M+	SN865701299	Mini-Circuits	-	-	
670	Univ. Radio Communication Tester	CMU 200	106833	Rohde & Schwarz	24 M	-	30.05.2018
671	DC-power supply 0-5 A	EA-3013S	-	Elektro Automatik	pre-m	2	
678	Power Meter	NRP	101638	Rohde&Schwarz	pre-m	-	
683	Spectrum Analyzer	FSU 26	200571	Rohde & Schwarz	12 M	-	30.05.2017
686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	24 M	-	30.04.2017
687	Signal Generator	SMF 100A	102073	Rohde&Schwarz	12 M	-	30.05.2017
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
690	Spectrum Analyzer	FSU	100302/026	Rohde&Schwarz	12 M	-	30.05.2017
692	Bluetooth Tester	CBT 32	100236	Rohde & Schwarz	36 M	-	31.03.2017

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
697	Power Splitter	ZN4PD-642W-S+	165001445	Mini-Circuits	-	2	

8.1.3. Legend

Note / remarks	Calibrated during system calibration:
1a	System CTC-SAR-EMS (Ref.-No. 442)
1b	System-CTC-EMS-Conducted (Ref.-No. 335)
1c	System CTC-FAR-EMI-RSE (Ref.-No . 443)
1d	System CTC-SAR-EMI (Ref.-No . 441)
1e	System CTC-OATS (EMI radiated) (Ref.-No. 337)
1 f	System CTC-CTIA-OTA (Ref.-No . 420)
1 g	System CTC-FAR-EMS (Ref.-No . 444)
2	Calibration or equipment check immediately before measurement
3	Regulatory maintained equipment for functional check or support purpose
4	Ancillary equipment without calibration e.g. mechanical equipment or monitoring equipment
5	Test System

Interval of calibration	12 M	12 month
	24 M	24 month
	36 M	36 month
	24/12 M	Calibration every 24 months, between this every 12 months internal validation
	36/12 M	Calibration every 36 months, between this every 12 months internal validation
	Pre-m	Check before starting the measurement
	-	Without calibration

9. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2016-10-13
--	--	--
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10. Measurement diagrams of emission test

10.1. Diagrams of AC-Power Line Conducted Emissions

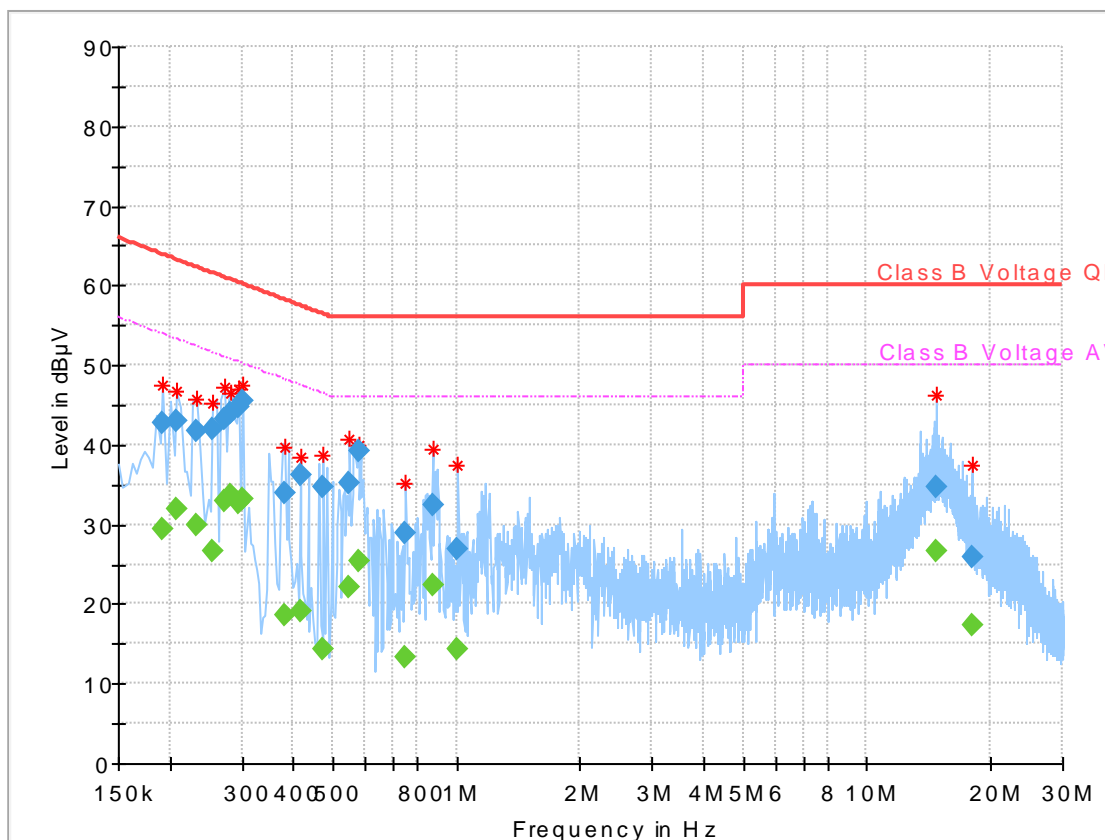
Common Information

Test Description:	Conducted Voltage Measurement Class B
Test Site & Location:	Conducted Emission, CETECOM GmbH Essen
Test Software:	R&S EMC32 v9.15
Test Specification:	EN 55022
Operating Mode:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured on line:	N/L1
Diagram details:	Shows the peak values as a sum of measured ports in maxhold mode
Environmental Conditions:	Humidity: 50% rH; Temperature: 22°C
Operator:	HLA
Comments:	--

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.192969	---	29.36	53.91	24.55	15000.0	9.000	N	GND	0.1
0.192969	42.80	---	63.91	21.11	15000.0	9.000	N	GND	0.1
0.208594	---	31.92	53.26	21.34	15000.0	9.000	N	GND	0.1
0.208594	43.01	---	63.26	20.25	15000.0	9.000	N	GND	0.1
0.232031	---	29.80	52.38	22.58	15000.0	9.000	N	GND	0.1
0.232031	41.85	---	62.38	20.53	15000.0	9.000	N	GND	0.1
0.255469	---	26.60	51.58	24.98	15000.0	9.000	N	GND	0.1
0.255469	42.00	---	61.58	19.58	15000.0	9.000	N	GND	0.1
0.271094	---	33.05	51.08	18.03	15000.0	9.000	N	GND	0.2
0.271094	43.16	---	61.08	17.92	15000.0	9.000	N	GND	0.2
0.282813	---	33.70	50.73	17.03	15000.0	9.000	N	GND	0.1
0.282813	43.92	---	60.73	16.81	15000.0	9.000	N	GND	0.1
0.294531	---	32.75	50.40	17.65	15000.0	9.000	N	GND	0.1
0.294531	44.78	---	60.40	15.62	15000.0	9.000	N	GND	0.1
0.302344	---	33.23	50.18	16.95	15000.0	9.000	N	GND	0.1
0.302344	45.51	---	60.18	14.67	15000.0	9.000	N	GND	0.1
0.380469	---	18.55	48.27	29.72	15000.0	9.000	N	GND	0.1
0.380469	34.05	---	58.27	24.22	15000.0	9.000	N	GND	0.1
0.415625	---	19.20	47.54	28.34	15000.0	9.000	N	GND	0.1
0.415625	36.09	---	57.54	21.45	15000.0	9.000	N	GND	0.1
0.474219	---	14.33	46.44	32.11	15000.0	9.000	N	GND	0.1
0.474219	34.71	---	56.44	21.73	15000.0	9.000	N	GND	0.1
0.548438	---	22.20	46.00	23.80	15000.0	9.000	N	GND	0.1
0.548438	35.07	---	56.00	20.93	15000.0	9.000	N	GND	0.1
0.575781	---	25.39	46.00	20.61	15000.0	9.000	N	GND	0.1
0.575781	39.18	---	56.00	16.82	15000.0	9.000	N	GND	0.1
0.751563	---	13.29	46.00	32.71	15000.0	9.000	N	GND	0.2
0.751563	28.97	---	56.00	27.03	15000.0	9.000	N	GND	0.2
0.872656	---	22.48	46.00	23.52	15000.0	9.000	N	GND	0.3
0.872656	32.50	---	56.00	23.50	15000.0	9.000	N	GND	0.3
1.009375	---	14.41	46.00	31.59	15000.0	9.000	N	GND	0.3
1.009375	26.91	---	56.00	29.09	15000.0	9.000	N	GND	0.3
14.700781	---	26.69	50.00	23.31	15000.0	9.000	N	GND	0.6
14.700781	34.62	---	60.00	25.38	15000.0	9.000	N	GND	0.6
18.150000	---	17.28	50.00	32.72	15000.0	9.000	N	GND	0.6
18.150000	25.81	---	60.00	34.19	15000.0	9.000	N	GND	0.6

10.2. Diagrams of radiated field strength emissions, 30 MHz - 1 GHz

Diagram No. 3.12_Barcode reading+ USB PC data transfer mode

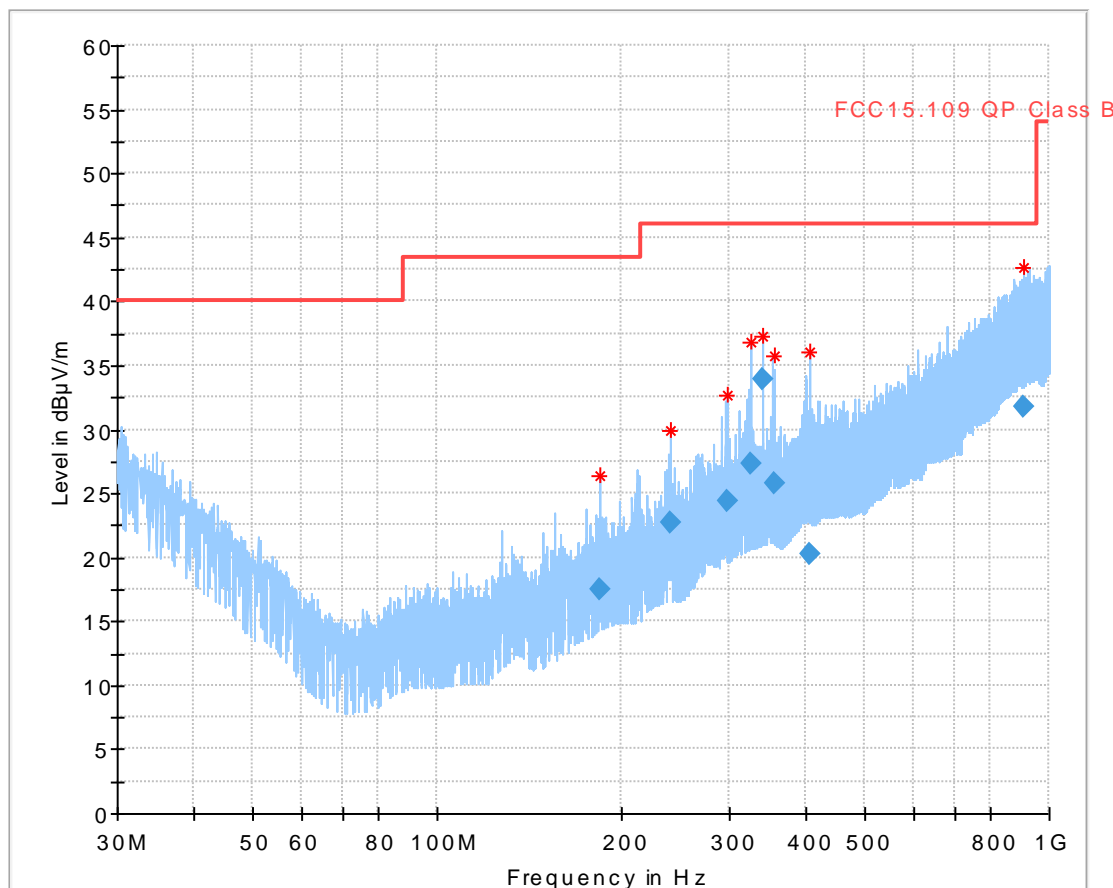
Common Information

Test description:	Electric Field Strength Measurement
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Distance correction:	not used
Technical Data:	Please see page 2 for detailed data of measurement setup
Used filter:	not used
Test specification:	FCC15.109, class B; RSS-Gen.: Issue 4
Operator:	APh
Operating conditions:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured sides of EUT:	front, right, rear, left
Power during tests:	Fully Charged Battery

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
184.490000	17.47	43.50	26.03	1000.0	120.000	154.0	H	163.0	0.0	11.1
241.070000	22.79	46.00	23.21	1000.0	120.000	109.0	H	164.0	0.0	13.1
297.770000	24.40	46.00	21.60	1000.0	120.000	113.0	H	202.0	90.0	15.0
326.210000	27.34	46.00	18.66	1000.0	120.000	105.0	H	185.0	90.0	16.1
340.350000	33.91	46.00	12.09	1000.0	120.000	105.0	H	172.0	0.0	16.5
354.570000	25.75	46.00	20.25	1000.0	120.000	105.0	H	178.0	90.0	16.7
407.600000	20.23	46.00	25.77	1000.0	120.000	214.0	H	322.0	90.0	18.6
910.880000	31.74	46.00	14.26	1000.0	120.000	314.0	V	191.0	0.0	27.4

10.3. Diagrams of radiated emission above 1 GHz

Diagram No.4.12a:1 GHz-2.8 GHz

Common Information

Test Description:	Electric Field Strength Measurement
Test site and distance:	Fully Anechoic Room (FAR) with 3m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification:	FCC15.109, class B; RSS-Gen.: Issue 4
Operator:	PSa/APh
Operating conditions:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured sides of EUT:	front, right, rear, left
Power during tests:	Fully Charged Battery

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

Full Spectrum

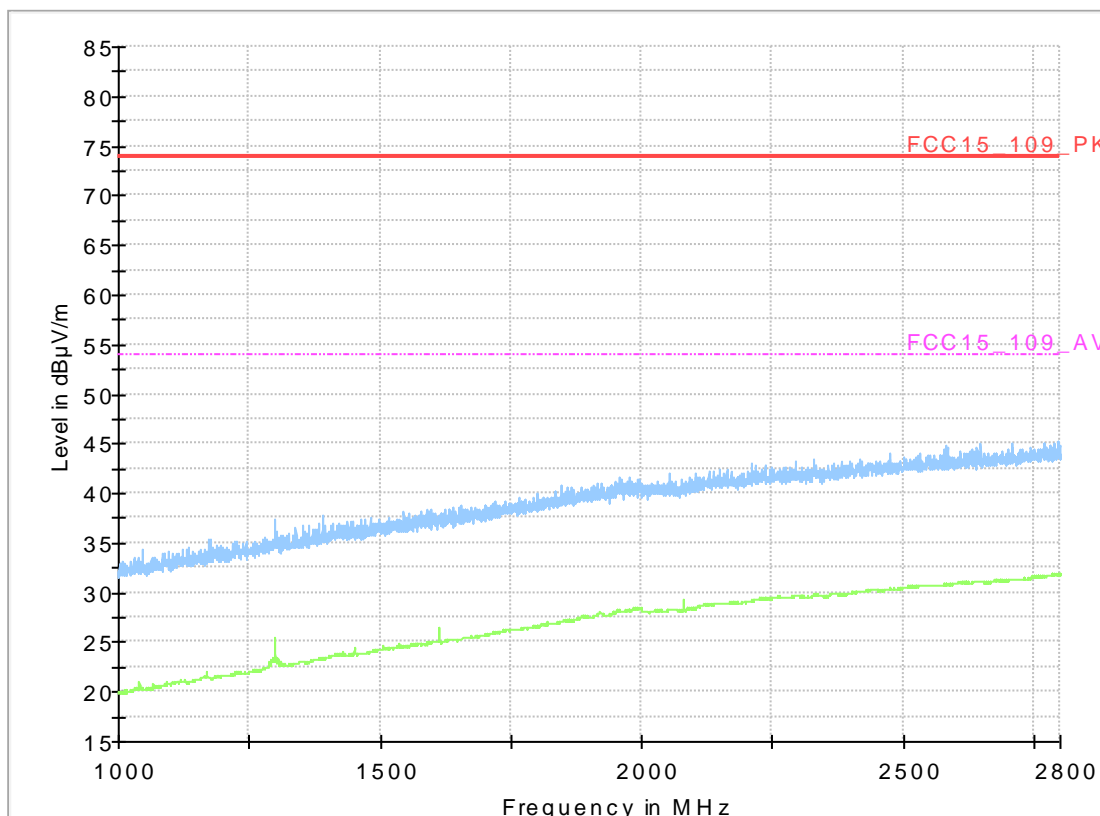


Diagram No.4.12b: 2.8 GHz- 12.75 GHz

Common Information

Test Description:	Electric Field Strength Measurement
Test site and distance:	Fully Anechoic Room (FAR) with 3m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification:	FCC15.109, class B; RSS-Gen.: Issue 4
Operator:	PSa/APh
Operating conditions:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured sides of EUT:	front, right, rear, left
Power during tests:	Fully Charged Battery

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

Full Spectrum

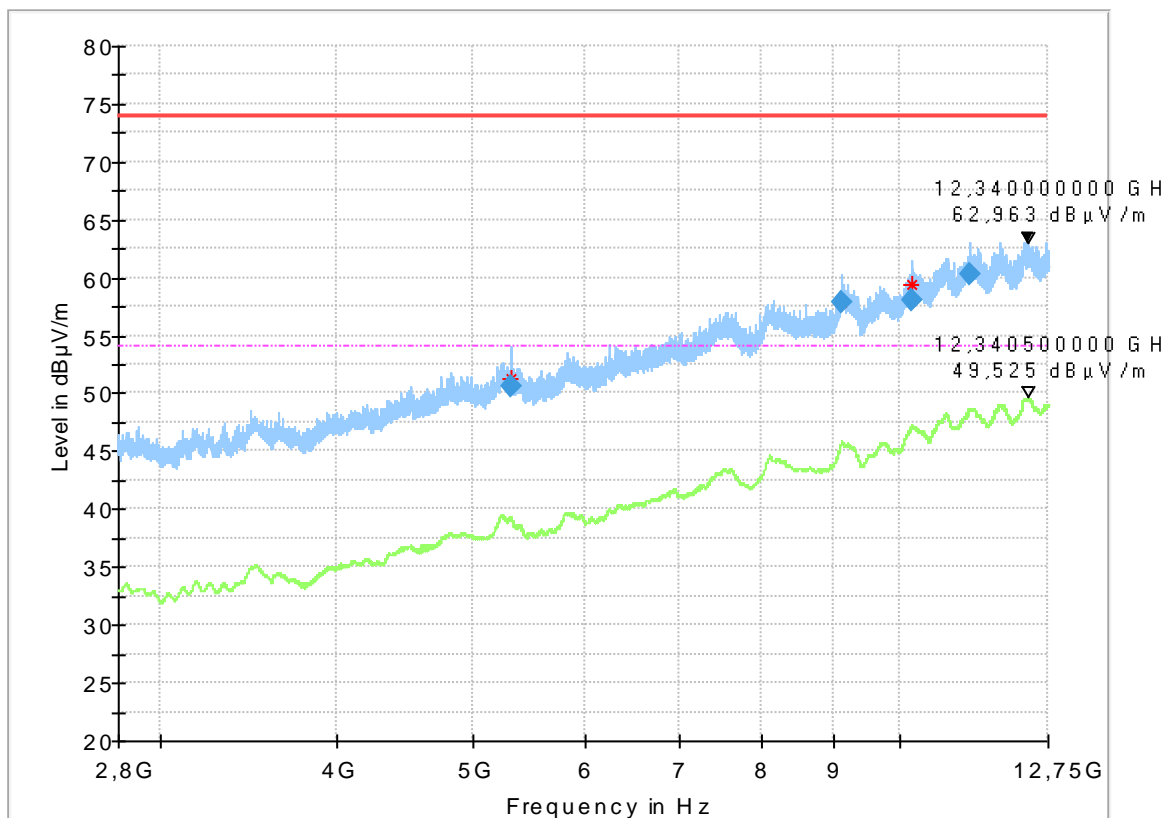


Diagram No.4.12c: 12.75 GHz- 18.0 GHz**Common Information**

Test Description:	Electric Field Strength Measurement
Test site and distance:	Fully Anechoic Room (FAR) with 3m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification:	FCC15.109, class B; RSS-Gen.: Issue 4
Operator:	PSa/APh
Operating conditions:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured sides of EUT:	front, right, rear, left
Power during tests:	Fully Charged Battery

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

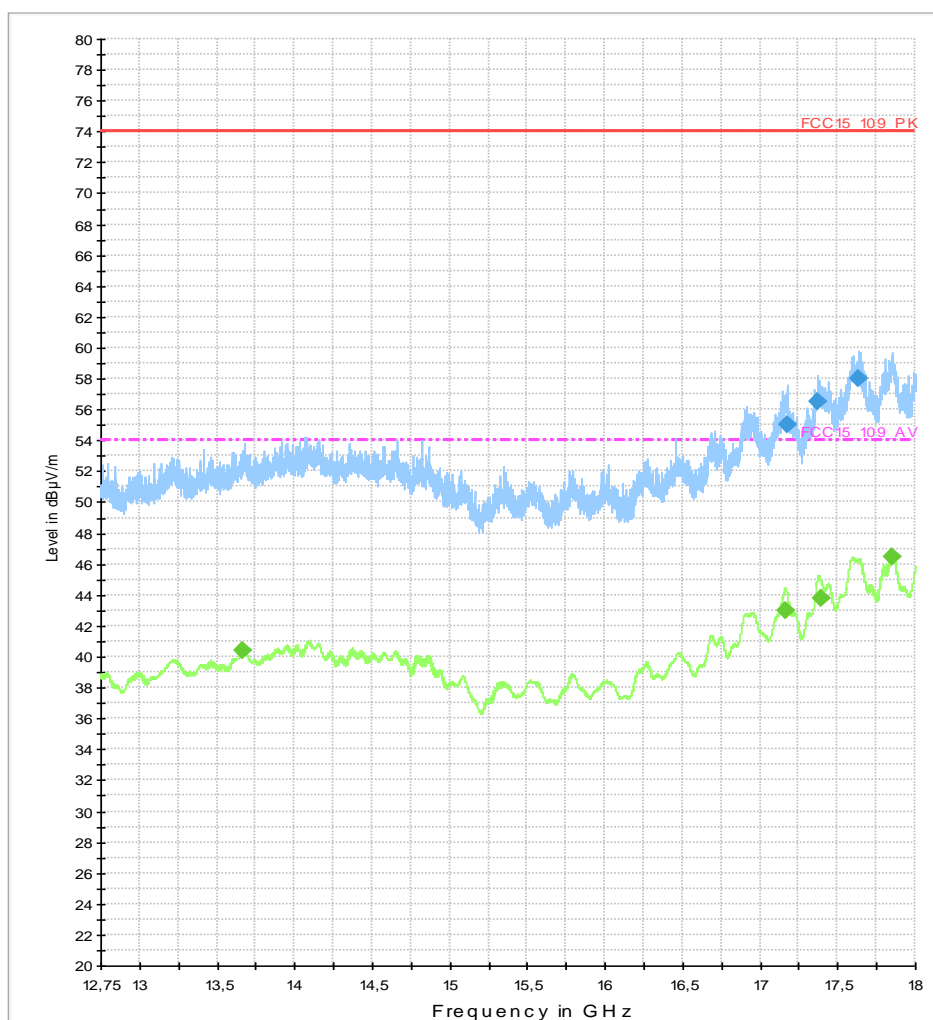


Diagram No.4.12d: 18.0 GHz- 25.0 GHz

Common Information

Test Description:	Electric Field Strength Measurement
Test site and distance:	Fully Anechoic Room (FAR) with 3m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification:	FCC15.109, class B; RSS-Gen.: Issue 4
Operator:	PSa/APh
Operating conditions:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured sides of EUT:	front, right, rear, left
Power during tests:	Fully Charged Battery

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

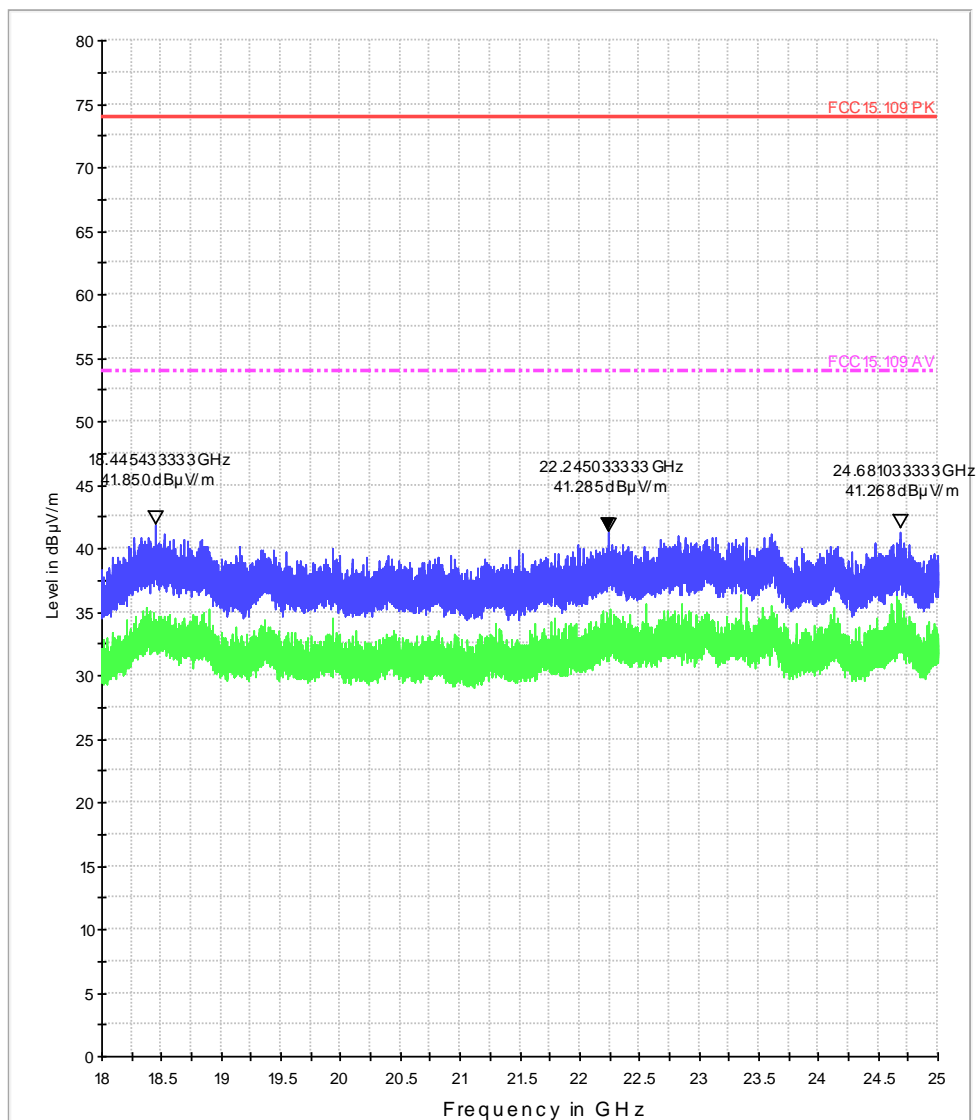


Diagram No.4.12e: 25.0 GHz- 30.0 GHz

Common Information

Test Description:	Electric Field Strength Measurement
Test site and distance:	Fully Anechoic Room (FAR) with 3m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification:	FCC15.109, class B; RSS-Gen.: Issue 4
Operator:	PSa/APh
Operating conditions:	continuous barcode reading with USB data transfer _ WLAN+ BT+NFC+WPC Idle
Measured sides of EUT:	front, right, rear, left
Power during tests:	Fully Charged Battery

EUT Information

Manufacturer:	Datalogic ADCL S.r.l.
MODEL:	JOYA TOUCH
EuT Type:	P00AN04HL0GT0W7-GBB
P/N:	911350011
S/N:	Z16P00321
HW Version:	Beta 3
SW Version:	WEC7
Firmware Version:	2.18
Input:	Fully Charged Internal Battery
Comments:	FCC 15B modified sample

