

TEST REPORT

No.: 17-1-0172601T17a-C2

According to:
FCC Regulations
Part 15.109, Class B

ISED-Regulations
ICES-003, Issue 6

for

Robert Bosch Tool Corporation

MI2C001-001-US
With integrated SARA-R410M LTE Cat-M1 Module

FCC ID: TXTGSH27
ISED: 909H-GSH27

Laboratory Accreditation



accredited according to DIN EN ISO/IEC 17025

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Table of contents

1. SUMMARY OF TEST RESULTS.....	3
1.1. RX mode, tests overview according FCC Part 15B and Canadian ISSED (RSS) Standards	3
1.2. Attestation.....	3
2. ADMINISTRATIVE DATA	4
2.1. Identification of the testing laboratory	4
2.2. Test location	4
2.3. Organizational items	4
2.4. Applicant's details	4
2.5. Customer's details	4
2.6. Manufacturer's details	4
3. EQUIPMENT UNDER TEST (EUT)	5
3.1. EUT: Type, S/N etc. and short descriptions used in this test report	5
3.2. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions	5
3.3. EUT set-ups	5
3.4. EUT operating modes	6
4. DESCRIPTION OF TEST SYSTEM SET-UP'S	7
4.1. Test system set-up for AC power-line conducted emission measurements	7
4.2. Test system set-up for radiated electric field measurement 30 MHz to 1 GHz	7
4.3. Test system set-up for radiated electric field measurement above 1 GHz	9
5. MEASUREMENTS	10
5.1. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz.....	11
5.2. General Limit - Radiated emissions, above 1 GHz.....	12
5.3. Measurement uncertainties	13
6. ABBREVIATIONS USED IN THIS REPORT	14
7. ACCREDITATION DETAILS OF CETECOM'S LABORATORIES AND TEST SITES	14
8. INSTRUMENTS AND ANCILLARY.....	15
8.1. Test software and firmware of equipment	15
8.2. Legend	18
9. VERSIONS OF TEST REPORTS (CHANGE HISTORY)	18
10. MEASUREMENT DIAGRAMS.....	19
10.1. EMI-AC mains	19
10.2. Radiated emissions in the frequency range 30 to 1000MHz.....	20
10.3. Radiated emissions in the frequency range above 1000MHz	22

Table of annex

	Total pages
Annex 1: Measurement diagrams (included in this report)	22
Annex 2: Internal photographs, separate document CETECOM_TR17_1_0172601T18a_C2_A2	6
Annex 3: External photographs, separate document CETECOM_TR17_1_0172601T18a_C2_A3	6
Annex 4: Test set-up photographs, separate document CETECOM_TR17_1_0172601T18a_C2_A4	3

The listed attachments are an integral part of this report.

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. 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 including UMTS/LTE. A typical operation mode was set-up as described in chapter 3.4 according applicants instructions.

Following tests have been performed to show compliance with applicable FCC Part 15, Subpart B (Unintentional Radiators) of the CFR 47 Rules, Edition 2017.

1.1. RX mode, tests overview according FCC Part 15B and Canadian ISSED (RSS) Standards

No. of Diagram group	Test case	Port	References & Limits			EUT set-up	EUT op-mode	Result
			FCC Standard	RSS Section	Test limit			
4	Receiver radiated emissions	Cabinet + Interconnecting cables	§ 15.109 § 15.33 § 15.35	ICES-003, Issue 6	FCC 15.109 class B limits ICES-003: Class B; Table 2, 5, 7	1	1	Passed

Remark:

1.2. 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.

The current version of the Test Report CETECOM_TR17-1-0172601T17a-C2 replaces the Test Report CETECOM_TR17-1-0172601T17a-C1 dated 2018-11-05. The replaced test report is herewith invalid.

.....
Dipl.-Ing. N. Jeß
Responsible for test section

.....
Dipl.-Ing. N. Perez
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. 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

Project leader:	B.Sc. Al-Amin Hossain
Responsible for test report:	Dipl.-Ing. Ninovic Perez
Receipt of EUT:	2018-04-09
Date(s) of test:	2018-05-04 and 2018-05-07
Date of report:	2019-04-29

2.4. Applicant's details

Applicant's name:	Robert Bosch Tool Corporation
Address:	1800 W, Central Road Mount Prospect IL, 60056 USA
Contact person:	Mr. Gerard Pasciak

2.5. Customer's details

Customer's name:	Rosenberger Hochfrequenztechnik GmbH & Co.KG
Address:	Hauptstr.1 83413, Fridolfing Germany
Contact person:	Mr. Matthias Rappl

2.6. Manufacturer's details

Manufacturer's name:	Robert Bosch Power Tools GmbH.
Address:	70538, Stuttgart Germany
Contact person:	Mr. Thomas Moser

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 S04	MI2C001-001-US	SARA-R410M	IMEI-No: 352753090048 834	MI2C001-001-US#200	Doberman- intern-US-1.0.0

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

3.2. 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	EUT Battery	ABI-L18650-1S1P	--	--	--

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

3.3. EUT set-ups

EUT set-up no. *)	Combination of EUT and AE	Remarks
set. 1	EUT A + AE 1	--

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

3.4. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	Data Communication and GNSS receiving	<ul style="list-style-type: none">- LTE Cat M1 active and IDLE Mode- DUT is attached(IDLE) in CMW 500 Signal generator- EUT Battery is connected- EUT LED's: D501 blinking and D500 glowing

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

4. Description of test system set-up's

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

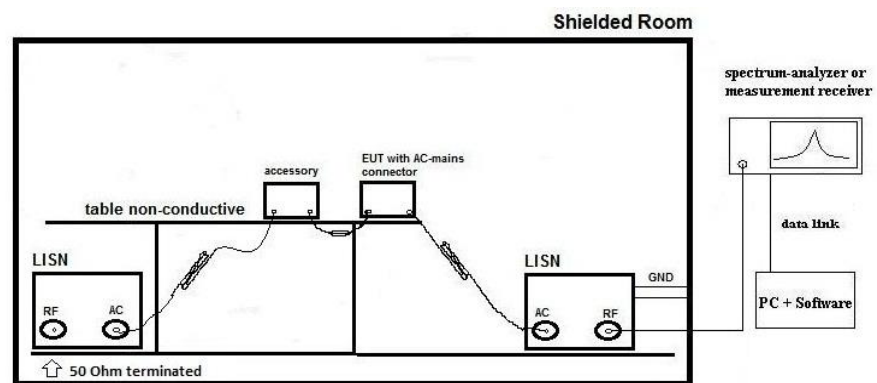
Specification: ANSI C63.4-2014 chapter 7, ANSI C63.10-2013 chapter 6.2

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 μ H 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 120 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

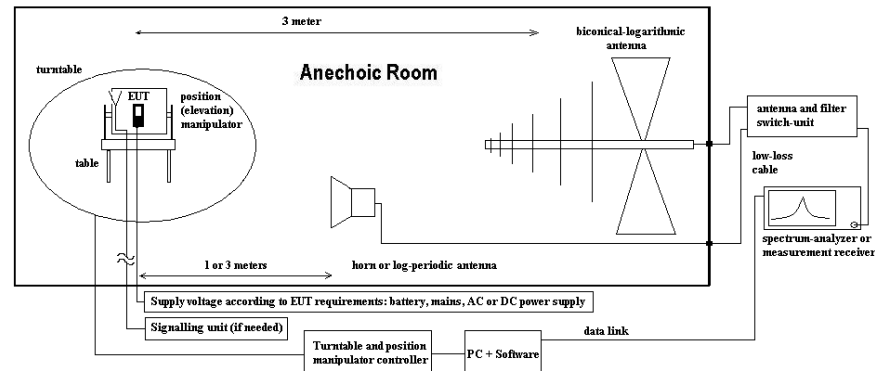
Values are in dB, positive margin means value is below limit.

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

Specification: ANSI C63.4-2014 chapter 8, ANSI C63.10-2013 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

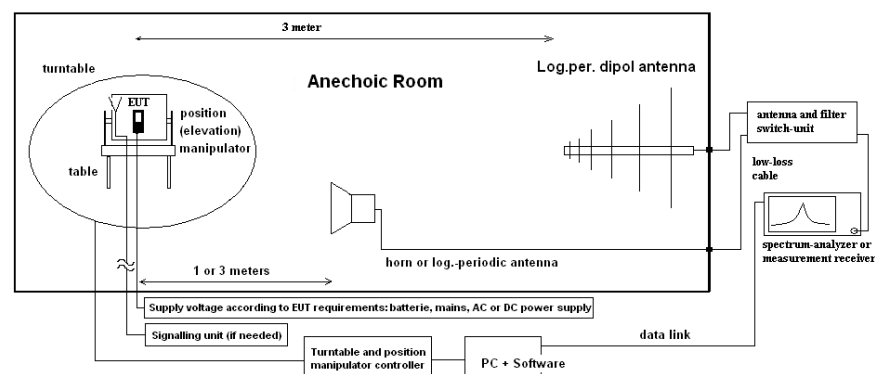
All units are dB-units, positive margin means value is below limit.

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

Specification: ANSI C63.4-2014 chapter 8, ANSI C63.10-2013 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 18 GHz and 2 meter above 18 GHz. A bicon-log or 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 and the site validation criteria accord. CISPR 16-1-4:2010, Chapter 8.3 is fulfilled. The EUT is aligned within 3 dB beamwidth 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 15°) 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

5.0.1. 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
signalling	<input type="checkbox"/> 392 MT8820A <input type="checkbox"/> 436 CMU	<input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW	
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains	<input checked="" type="checkbox"/> 060 120 V 60 Hz via PAS 5000	

5.0.2. Requirements Un-Intentional EUT

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		<input type="checkbox"/> Conducted limit Class A	
		QUASI-Peak [dBμV]	AVERAGE [dBμV]	QUASI-Peak [dBμV]	AVERAGE [dBμV]
	0.15 – 0.5	66 to 56*	56 to 46*	79	66
	0.5 – 5	56	46	73	60
	5 – 30	60	50	73	60
Remark: * decreases with the logarithm of the frequency					

5.0.3. Test condition and test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link <input type="checkbox"/> cable connection <input checked="" 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 (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
EMI-Receiver or Analyzer settings	Scan-Mode
	Pre-measurement
	Final measurement
General measurement procedures	Please see chapter "Test system set-up for AC power line conducted emissions measurements"

5.0.4. Measurement results

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

EUT set-up no.:			set-up 1		
Diagram No.	EUT operating mode no. or commend	Used Detector	Power line	Additional (scan-) information or remarks	Result
1.01	EUT operating mode 1	<input checked="" type="checkbox"/> Peak (pre-scan) <input checked="" type="checkbox"/> AV (final) <input checked="" type="checkbox"/> QP (final)	L1/ N	--	passed

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

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 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"/> via laptop	<input checked="" type="checkbox"/> 060 120 V 60 Hz via PAS 5000	

5.1.2. 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	
ANSI		<input checked="" type="checkbox"/> C63.4-2014 <input type="checkbox"/> C63.10-2013	
Limit	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [$\mu\text{V/m}$]	QUASI-Peak [$\text{dB}\mu\text{V/m}$]
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	above 960	500	54.0

5.1.3. Test condition and measurement test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link <input 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°C) Rel. humidity: (40 \pm 20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range: <input checked="" type="checkbox"/> 30 – 1000 MHz <input type="checkbox"/> other: Scan-Mode: <input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3 dB spectrum analyser mode Detector: Peak / Quasi-peak RBW/VBW: 100 kHz/300 kHz Mode: Repetitive-Scan, max-hold Scan step: 80 kHz Sweep-Time: Coupled – calibrated display if continuous tx-signal otherwise adapted to EUT's individual duty-cycle
General measurement procedures	Please see chapter "Test system set-up for electric field measurement in the range 30 MHz to 1 GHz"

5.1.4. MEASUREMENT RESULTS

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

Table of measurement results:

Dia-gram no.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
					PK	AV	QP	
3.01a	30 MHz – 1 GHz	Set. 1	Op. 1	EUT_Position_laying	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Passed
3.01b	30 MHz – 1 GHz	Set. 1	Op. 1	EUT_Position_standing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Passed

Remark: --

5.2. General Limit - Radiated emissions, above 1 GHz

5.2.1. 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"/>
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		
DCpower	<input type="checkbox"/> 086 LNG50-10	<input checked="" 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"/> via laptop		<input type="checkbox"/> 060 120 V 60 Hz via PAS 5000			

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 for frequencies defined in §15.205 <input type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3)(4)			
ANSI	<input checked="" type="checkbox"/> C63.4-2014 <input type="checkbox"/> C63.10-2013			
Frequency [MHz]	Limits			
	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

5.2.3. Test condition and measurement test set-up

Signal link to test system (if used):	<input type="checkbox"/> air link	<input 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		
Climatic conditions	Temperature: (22±3°C)		
Spectrum-Analyzer settings	Rel. humidity: (40±20)% <input checked="" type="checkbox"/> 1 – 18 GHz <input type="checkbox"/> 18 – 25 GHz <input type="checkbox"/> 18 – 40 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 Repetitive-Scan, max-hold 400 kHz 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"		

5.2.4. Measurement Results

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

Dia-gram no.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
					PK	AV	QP	
4.01	1 - 18 GHz	Set. 1	Op. 1	--	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Passed

Remark: --

5.3. 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 it's 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 150 kHz - 30 MHz	4.0 dB 3.6 dB							-
Radiated emissions Enclosure	CISPR 16-2-3	30 MHz - 1 GHz 1 GHz - 18 GHz	4.2 dB 5.1 dB							E-Field
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	--		
Power density	-	1 – 2.8GHz	1.40 dB							--
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	(MRA US-EU 0003)	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 Measur.	FCC, Federal Communications Commission Laboratory Division, USA
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-20013 G-20013 C-20009 T-20006	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 Measur.	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

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

8.1. 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
607	Signal Generator	SMR 20	832033/011	V1.25
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)

8.1.1. 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	-	16.05.2018
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	15.05.2018
007	Single-Line V-Network (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	17.05.2018
009	Power Meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	24 M	-	15.05.2019
016	Line Impedance Simulating Network	Op. 24-D	B6366	Spitzenberger+Spies	36 M	-	30.05.2019
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	-	15.05.2019
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	
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	Passedive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	30.04.2018
100	Passedive 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
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36 M	1c	10.03.2020
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	36 M	-	10.03.2020
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	
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	-	17.05.2018
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	-	14.03.2020
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	36 M	-	20.03.2020
331	Climatic Test Chamber -40/+180 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	30.10.2018
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	30.05.2018
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	17.05.2019
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	-	24.05.2019
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	-	17.05.2018
377	EMI Test Receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	15.05.2018
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	12 M	-	18.05.2018
405	Thermo-/Hygrometer	OPUS 10 THI	126.0604.0003.3.3.3.22	LUFFT Mess u. Regeltechnik	24 M	-	30.03.2019
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	24.05.2018
439	UltraLog-Antenna	HL 562	100248	Rohde & Schwarz	36 M	-	10.03.2020
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	30.09.2018
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	
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
466	Digital Multimeter	Fluke 112	89210157	Fluke USA	24 M	-	30.05.2018

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
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	-	16.05.2019
482	filter matrix	Filter matrix SAR 1	-	CETECOM (Brl)	-	1d	
487	System CTC NSA-Verification SAR-EMI	System EMI field (SAR) NSA	-	ETS Lindgren / CETECOM	24 M	-	31.09.2018
489	EMI Test Receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	18.05.2019
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	30.06.2018
517	relais switch matrix	HF Relais Box Keithley	SE 04	Keithley	pre-m	2	
523	Digital Multimeter	L4411A	MY46000154	Agilent	24 M	-	18.05.2019
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	-	30.03.2018
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	-	31.07.2018
574	Biconilog Hybrid Antenna	BTA-L	980026L	Frankonia	36/12 M	-	31.03.2019
584	Spectrum Analyzer	FSU 8	100248	Rohde & Schwarz	pre-m	-	
597	Univ. Radio Communication Tester	CMU 200	100347	Rohde & Schwarz	pre-m	-	
600	power meter	NRVD (Reserve)	834501/018	Rohde & Schwarz	24 M	-	17.05.2019
601	medium-sensitivity diode sensor	NRV-Z5 (Reserve)	8435323/003	Rohde & Schwarz	24 M	-	15.05.2019
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 P987001108	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	-	16.05.2018
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	201.0999.9302.6.4.1.43	G. Luft GmbH	24 M	-	30.03.2019
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	
642	Wideband Radio Communication Tester	CMW 500	126089	Rohde&Schwarz	12 M	-	24.05.2018
644	Amplifier	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	-	17.05.2018
686	Field Analyzer	EHP-200A	160WX30702	Narda Safety Test Solutions	24 M	-	29.03.2019
687	Signal Generator	SMF 100A	102073	Rohde&Schwarz	12 M	-	17.05.2018
688	Pre Amp	JS-18004000-40-8P	1750117	Miteq	pre-m	-	
690	Spectrum Analyzer	FSU	100302/026	Rohde&Schwarz	12 M	-	16.05.2018
691	OSP120 Base Unit	OSP120	101183	Rohde & Schwarz	12 M	-	22.05.2018
692	Bluetooth Tester	CBT 32	1002366	Rohde & Schwarz	36 M	-	29.05.2020
697	Power Splitter	ZN4PD-642W-S+	165001445	Mini-Circuits	-	2	
703	INNCO Antennen Mast	MA 4010-KT080-XPET-ZSS3	MA4170-KT100-XPET-	INNCO	pre-m	-	
704	INNCON Controller	CO 3000-4port	CO3000/933/38410516/L	INNCO Systems GmbH	pre-m	-	
711	Harmonic Mixer 90 GHz - 140GHz	RPG FS-Z140	101004	RPG	12 M	-	22.02.2018
712	Harmonic Mixer 75 GHz - 110GHz	FS-Z110	101468	Rohde & Schwarz	12 M	-	22.02.2018
713	Harmonic Mixer, 50 GHz - 75GHz	FS-Z75	101022	Rohde & Schwarz	12 M	-	22.05.2018
714	Signal Analyzer 67GHz	FSW67	104023	Rohde & Schwarz	24 M	-	03.03.2019
715	Harmonic Mixer, 140 GHz - 220GHz	FS-Z220	101009	RPG Radiometer Physics	12 M	-	03.08.2018
716	Harmonic Mixer 220 GHz to 325 GHz	FS-Z325	101005	RPG Radiometer Physics	12 M	-	13.02.2018
747	Spectrum Analyzer	FSU 26	200152	Rohde & Schwarz	12 M	-	18.05.2018
748	Pickett-Potter Horn Antenna	FH-PP 4060	010001	Radiometer Physics	-	-	
749	Pickett-potter Horn Antenna	FH-PP 60-90	010003	Radiometer Physics	-	-	
750	Pickett-Potter Horn Antenna	FH-PP 140-220	010011	Radiometer Physics	-	-	

8.2. 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
V1	Initial release	2018-08-21
C1	Manufacturer changed,	2018-11-05
C2	Applicant and coversheet logo changed	2019-04-29

10. Measurement diagrams

10.1. EMI-AC mains

1.01

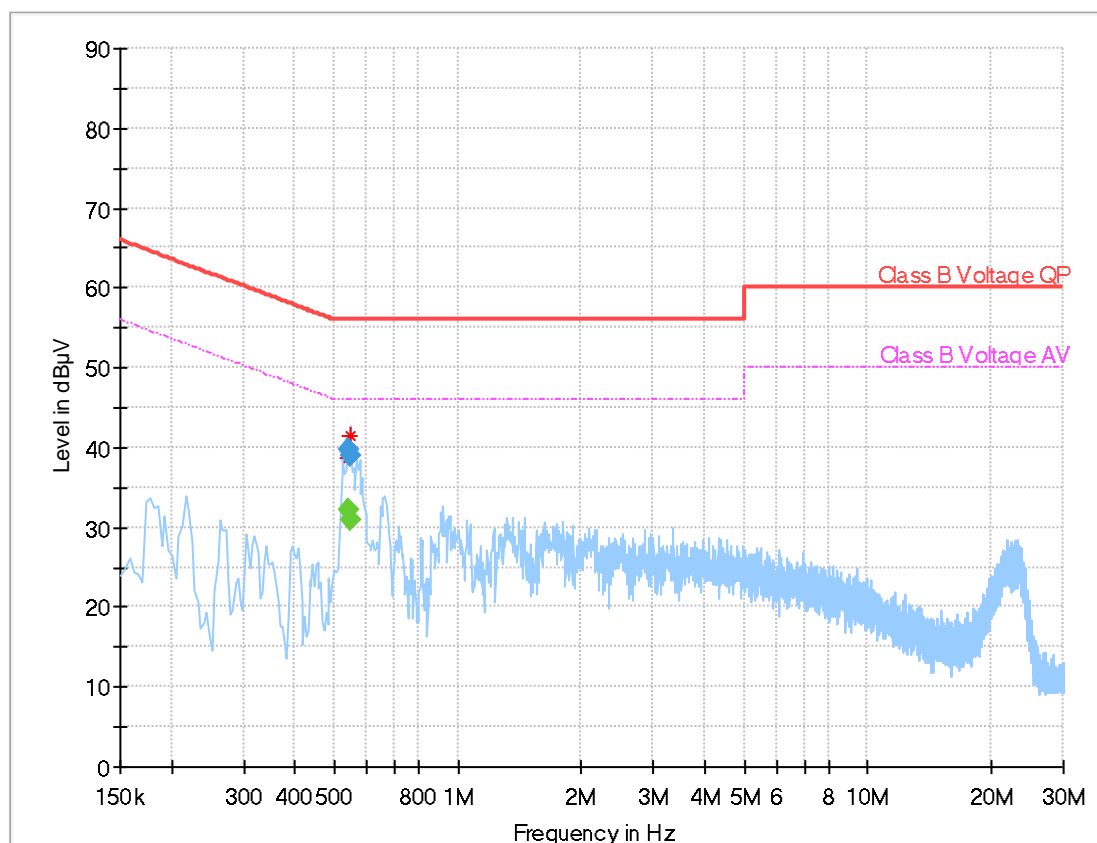
Common Information

Test Description:	Conducted Voltage Measurement Class B
Test Site & Location:	Conducted Emission, CETECOM GmbH Essen
Test Software:	R&S EMC32 v9.15
Test Specification:	FCC 15.107, FCC 15.207
Operating Mode:	Op 1
Measured on line:	N/L1
Diagram details:	Shows the peak values as a sum of measured ports in maxhold mode
Environmental Conditions:	Humidity: 40.5%rH; Temperature: 21°C
Operator:	LKu

EUT Information

Manufacturer:	Robert Bosch Power Tools GmbH
EUT:	MI2C001-001-US
HW version:	MI2C001-001-US #200
SW version:	Doberman-intern-US-1.0.0
Serial number:	IMEI-No: 352753090048834
Power Supply:	120V AC

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)
0.541563	---	32.13	46.00
0.541563	39.70	---	56.00
0.544219	---	30.86	46.00
0.544219	39.02	---	56.00

10.2. Radiated emissions in the frequency range 30 to 1000MHz

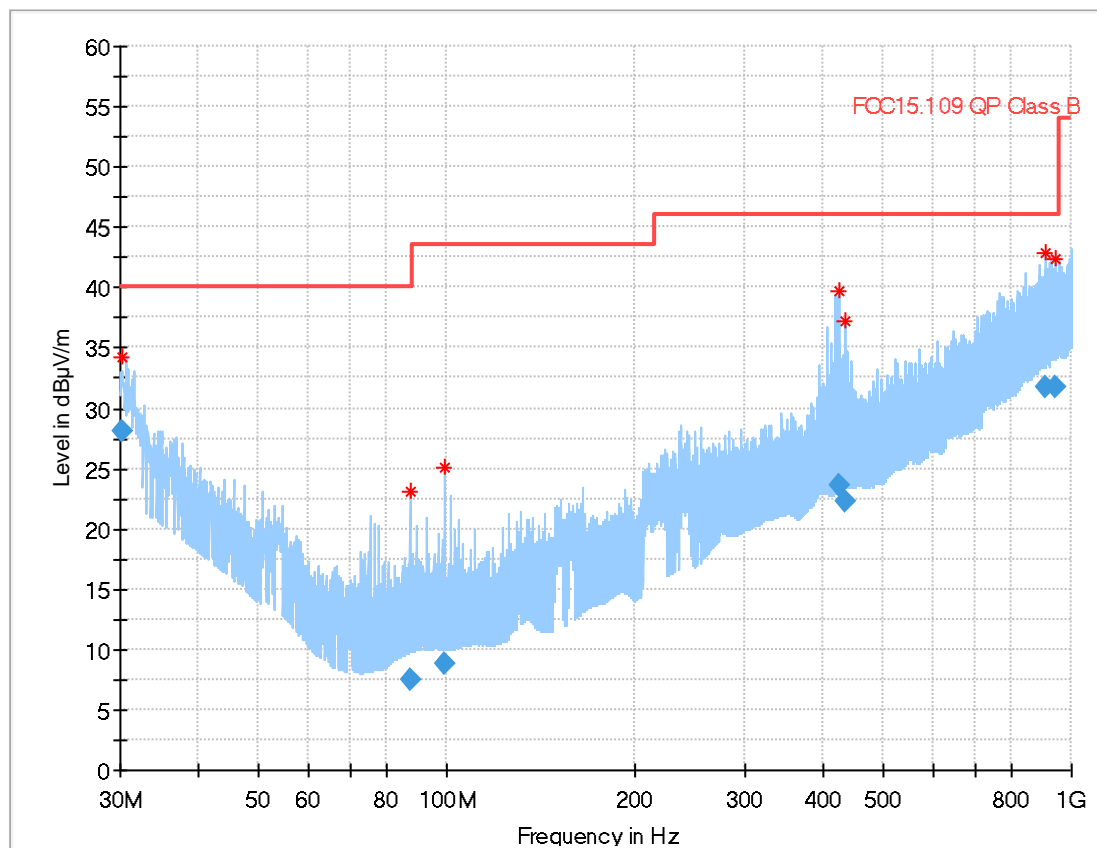
10.2.1. Part 15B

3.01a_laying

Test description:	Electric Field Strength Measurement
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification.:	FCC 15.109 Class B; RSS-Gen. Issue 4
Operator:	LKu
Operating mode	Op 1
Power during tests:	120V
Environmental Conditions:	Humidity: 40.5%rH; Temperature: 21°C

EUT Information

Please see Diagram Number 1.01



Final Result

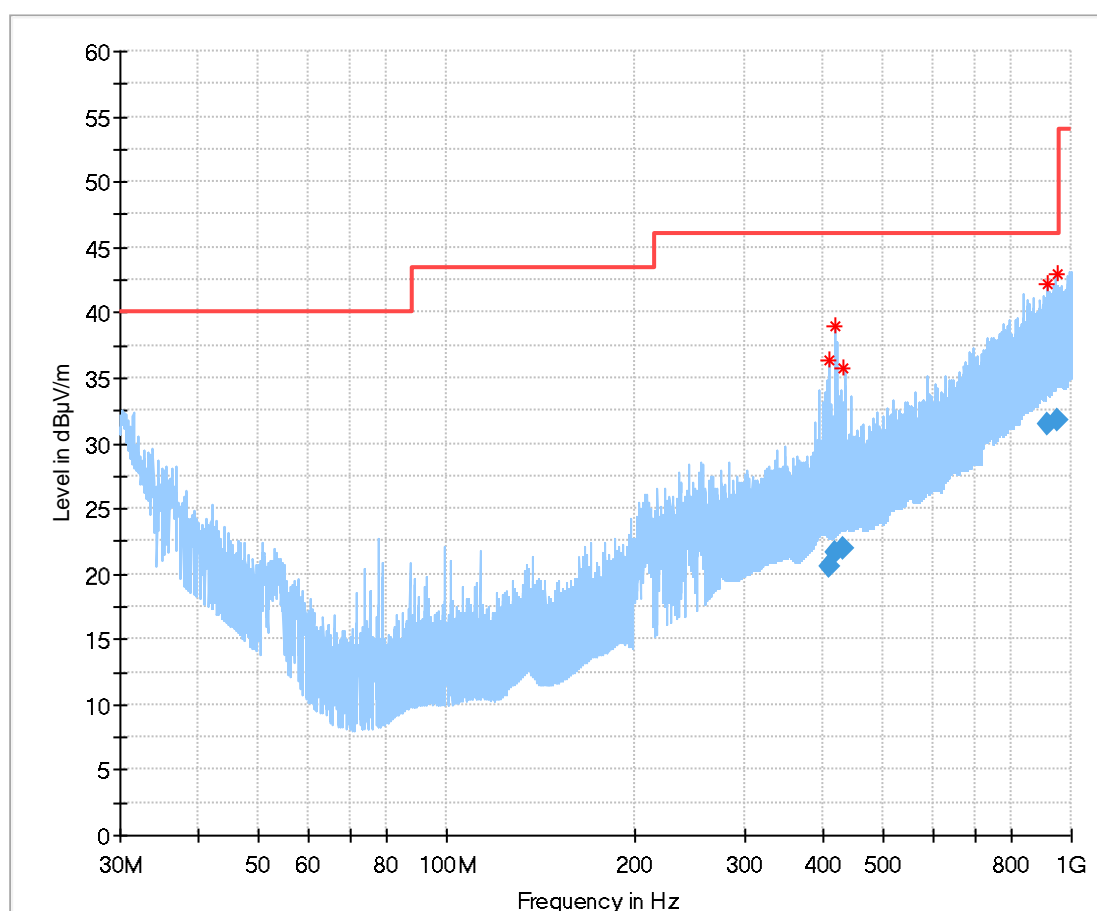
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Correction (dB)
30.19000	28.09	40.00	120.000	114.0	H	159.0	21.5
87.25000	7.50	40.00	120.000	368.0	H	240.0	8.0
98.89000	8.77	43.50	120.000	173.0	V	12.0	8.1
423.63000	23.66	46.00	120.000	348.0	V	168.0	19.1
432.77000	22.28	46.00	120.000	335.0	V	308.0	19.3
911.80000	31.71	46.00	120.000	162.0	H	88.0	27.3
943.89000	31.72	46.00	120.000	337.0	V	325.0	26.9

3.01b_standing

Test description:	Electric Field Strength Measurement
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Version of Testsoftware:	EMC32 V9.25.0
Test specification.:	FCC 15.109 Class B; RSS-Gen. Issue 4
Operator:	LKu
Operating mode:	Op 1
Power during tests:	120V
Environmental Conditions:	Humidity: 40.5%rH; Temperature: 21°C

EUT Information

Please see Diagram Number 1.01



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
408.920000	20.49	46.00	25.51	1000.0	120.000	169.0	V	206.0	18.5
420.000000	21.57	46.00	24.43	1000.0	120.000	344.0	V	77.0	18.8
432.300000	21.94	46.00	24.06	1000.0	120.000	347.0	V	246.0	19.3
916.560000	31.52	46.00	14.48	1000.0	120.000	342.0	V	113.0	26.9
946.480000	31.82	46.00	14.18	1000.0	120.000	176.0	V	181.0	27.1

10.3. Radiated emissions in the frequency range above 1000MHz

10.3.1. Part 15B

4.01

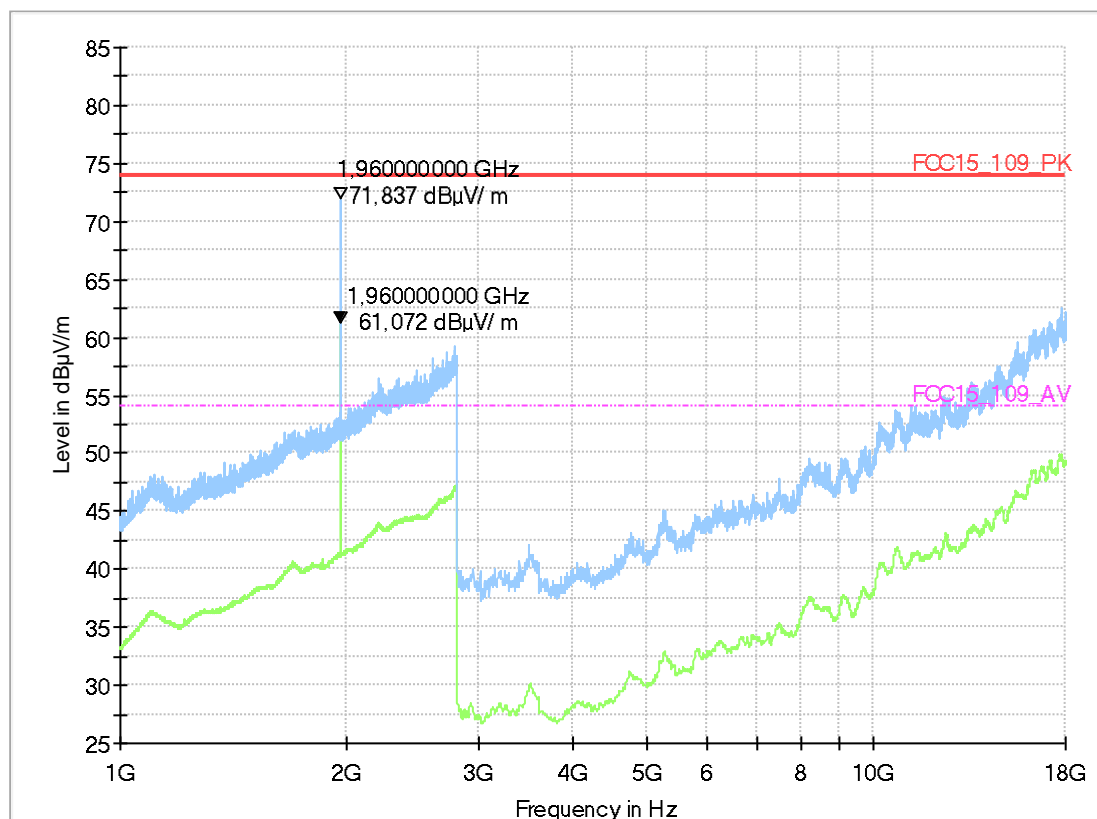
Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.109 Unintentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	Op 1
Operator Name:	Rls
Environmental Conditions:	Humidity: 40.5%rH; Temperature: 21°C
Comment:	120V AC

EUT Information

Please see Diagram Number 1.01

Full Spectrum



Remarks:

Emission at 1,960000000GHz is from LTE_Signal Generator_CMW 500(downlink) which has not considered as Pass or Fail

End Of Test Report