

# TEST REPORT

No.: 16-1-0188601T01a

According to:

**FCC Regulations**







Part 15.205  
Part 15.209  
Part 15.407

for

Intel Corporation

VLMTX58G Video Link Module TX 5.8GHz  
+  
WALSIN PCB ANTENNA RFPCA201018IM5B301 (2 pcs)

FCC-ID: 2AJ2A-VLMTX58G

Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 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
 <b>WiFi</b> <sup>TM</sup> ALLIANCE	 <b>Authorized</b> <sup>TM</sup> Test Lab Lab Code: 20011130-00		
accredited according to DIN EN ISO/IEC 17025			
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## Table of Contents

<b>1. SUMMARY OF TEST RESULTS .....</b>	<b>3</b>
1.1. Tests measurement overview according of US CFR Title 47, Subpart 15C .....	3
<b>2. ADMINISTRATIVE DATA .....</b>	<b>5</b>
2.1. Identification of the testing laboratory .....	5
2.2. Test location .....	5
2.3. Organizational items .....	5
2.4. Applicant's details .....	5
2.5. Manufacturer's details .....	5
<b>3. EQUIPMENT UNDER TEST (EUT) .....</b>	<b>6</b>
3.1. TECHNICAL DATA OF MAIN EUT AS DECLARED BY APPLICANT .....	6
3.2. EUT: Type, S/N etc. and short descriptions used in this test report .....	7
3.3. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions .....	7
3.4. EUT set-ups .....	7
3.5. EUT operating modes .....	8
3.6. Configuration of cables used for testing .....	8
<b>4. DESCRIPTION OF TEST SYSTEM SET-UP'S .....</b>	<b>9</b>
4.1. Test system set-up for conducted measurements on antenna port .....	9
4.2. Test system set-up for radiated magnetic field measurements below 30 MHz .....	11
4.3. Test system set-up for radiated electric field measurement 30 MHz to 1 GHz .....	12
4.4. Test system set-up for radiated electric field measurement above 1 GHz .....	13
<b>5. MEASUREMENTS .....</b>	<b>14</b>
5.1. Duty-Cycle .....	14
5.2. RF-Parameter - Transmitter Peak output power (conducted and radiated) .....	15
5.3. RF Parameter – Peak Power Spectral Density (PSD) .....	17
5.4. RF Parameter - 26 dB and 99% occupied Bandwidth .....	19
5.5. General Limit - Radiated field strength emissions below 30 MHz .....	21
5.6. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz .....	24
5.7. General Limit - Radiated emissions, above 1 GHz .....	26
5.8. RF-Parameter - Radiated Band-Edge compliance measurements .....	30
5.9. Measurement uncertainties .....	32
<b>6. INSTRUMENTS AND ANCILLARY .....</b>	<b>33</b>
<b>7. VERSIONS OF TEST REPORTS (CHANGE HISTORY) .....</b>	<b>36</b>

Table of Annex			
Annex No.	Contents	Reference Description	Total Pages
<b>Annex 1</b>	Test results	<b>CETECOM_TR16-1-0188601T01a-A1</b>	95
<b>Annex 2</b>	External photographs of EUT	<b>CETECOM_TR16-1-0188601T01a-A2</b>	9
<b>Annex 4</b>	Test set-up photographs	<b>CETECOM_TR16-1-0188601T01a-A4</b>	8
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.

**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 with 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 presented Equipment Under Test (in this report, hereinafter referred as EUT) **VLMTX58G** supports radiofrequency technologies with WLAN technology and operating frequency range from 5150 – 5850 MHz with specified protocol implementation. Other implemented wireless technologies were not considered within this test report.

**Measurements only valid and pass result with power setting: +10 dBm**

Following test cases have been performed to show compliance with valid Part 15.205/15.209/15.247 of the FCC CFR Title 47 Rules, Edition 4<sup>th</sup> November 2016.

### 1.1. Tests measurement overview according of US CFR Title 47, Subpart 15C

Test cases	Port	References and Limits		EUT set-up	EUT op. mode	Result
		FCC Standard	Test limit			
99% occupied bandwidth	Antenna terminal (conducted)	2.1049(h)	99% Power bandwidth	--	--	Performed
Duty-Cycle	Antenna terminal (conducted)	--	No pass/fail criteria To be reported accord. KDB789033 or ANSI C63.10:2013	--	--	Performed
Maximum output power	Antenna terminal (conducted)	§15.407(a) (1)(i) (2) (3) (4)	(1) 1 W Antenna Gain < 6 dBi (2): lesser of 250mW or 11dBm+10logB (3): lesser of 250mW or 11dBm+10logB (4): 1 W	2	1	Pass
Peak Power Spectral density	Antenna terminal (conducted)	§15.407(a) (1)(i) (2) (3) (4)	1):17dBm/MHz (2):11dBm/MHz (3):11dBm/MHz (4): 30dBm/500kHz	2	1	Pass Remark 3)
Antenna gain information	Antenna terminal (conducted)	§15.407(a) (1)(2)(3)(4)	< 6dBi or reduction of Max. power/power density by the amount in dB that the directional gain of the antenna exceeds 6 dBi	--	--	Applicants declaration + Array Gain: [uncorrelated MIMO] 5.47 dBi
General field strength emissions within restricted bands	Enclosure + Inter-connecting cables (radiated)	§15.407(6) §15.407(b) §15.205 §15.209	FCC: Emissions in restricted bands must meet the general field-strength radiated limits	1	1	Pass

Band-Edge compliance radiated	Enclosure + Inter-connecting cables (radiated)	§15.205 §15.209	Emissions in restricted bands must meet the general field-strength radiated limits chapter 8.9 Table 6	1	1	Pass
		§15.407(b) (1)(2)(3)(4)	Out-of-band emission EIRP < -27dBm/MHz or Spectrum Mask for U-NII-3 band	1	1	Pass
Transmit power control + Dynamic frequency selection (DFS)	Antenna terminal (conducted)	§15.407 (h1)(h2)	Requirements: Masters Active clients Passive clients	--	--	No tested within this test report Remark 2)
Discontinuous transmissions + Device security	FIRMWARE	§15.407(i)	No transmissions + protection of firmware	--	--	Not tested  Applicants declaration of implementation
AC-Power Lines  Conducted Emissions	AC-Power lines	§15.207	FCC §15.207 class B limits	--	--	N/A* Remark 1)

Remark 1) : Not applicable as EUT employ only battery power for operations & which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

Remark 2) : For further details please refer original modular reports under FCC ID : VQSAMNPTTX01

Remark 3) : In this case Antenna Gain [uncorrelated MIMO] = 5.47dBi.

RF-Exposure Evaluation (separation distance user to RF-radiating element greater 20cm)						
Test cases	Port	References & Limits		EUT set-up	EUT op. mode	Result
		FCC Standard	Test Limit			
Radio frequency radiation exposure requirements	Cabinet + Inter-connecting cables (radiated)	§2.1091 §2.1093	<b>RF-Field Strength Limits:</b> <b>FCC:</b> "general population/ uncontrolled" environment Table 1	1	1	See separate test report CETECOM_1-16-10188601T03a



Dipl.-Ing. Rachid Acharkaoui  
Responsible for test section

M.Sc. 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 and project leader:	M.Sc. Ajit Phadtare
Receipt of EUT:	2017-01-12
Date(s) of test:	2017-02-01 o 2017-02-28
Date of report:	2017-04-24
-----	
Version of template:	13.02

### 2.4. Applicant's details

Applicant's name:	Intel Corporation
Address:	2200 Mission College Boulevard Santa Clara, CA 95054 USA
Contact :	+1 408-765-8080

### 2.5. Manufacturer's details

Manufacturer's name:	Intel Deutschland GmbH
Address:	Konrad-Zuse-Bogen 4, 82152 Krailling, GERMANY

### 3. Equipment under test (EUT)

#### 3.1. TECHNICAL DATA OF MAIN EUT AS DECLARED BY APPLICANT

Module	VLMTX58G		
Module Type	VLMTX58G (Video Link Module TX 5.8GHz)		
FCC ID	2AJ2A-VLMTX58G		
FCC Filing Type:	Class II permissive change		
Main Function	Wireless HD Video Transceiver		
Frequency Band   Channels (USA bands only)	U-NII 1: (5150-5250MHz)   <b>5190 MHz &amp; 5230 MHz</b>		
	U-NII2A: (5250-5350MHz)   <b>5270 MHz &amp; 5310 MHz</b>		
	U-NII 2C (5470-5725MHz)   <b>5510 MHz, 5550 MHz, 5590 MHz, 5670 MHz</b>		
	U-NII-3 (5725 -5850 MHz)   <b>5755 MHz &amp; 5795 MHz</b>		
Nominal Channel Bandwidth	<input checked="" type="checkbox"/> 40MHz		
Type of Modulations	BPSK, OFDM		
Antenna Connections	<input checked="" type="checkbox"/> External, separate Two RF-connectors (MIMO)		
Antenna Details	<b>WALSIN PCB ANTENNA - RFPCA201018IM5B301</b>		
Antenna Type	DIPOLE		
Antenna Gain (Peak) [Single antenna gain]	According to Applicant's declaration 5150 to 5250 MHz: 5.47 dBi 5250 to 5350 MHz: 5.47 dBi 5470 to 5725s MHz: 5.47 dBi 5725 to 5850 MHz: 5.47 dBi		
Total Number of Antennas	<b>2 (WALSIN PCB ANTENNA - RFPCA201018IM5B301)</b>		
MIMO Antenna Gain: [uncorrelated signal ]	5.47dBi		
Max. Power Settings	<b>+10 dBm</b> (Using Power Scripts + AppCom-Version 4.0.4.26 Software)		
MAX Field Strength (Radiated@3m)	U-NII 1: (5150-5250MHz):108.613 dB $\mu$ V/m (PK)   97.618 dB $\mu$ V/m (AV)		
	U-NII2A: (5250-5350MHz):107.434 dB $\mu$ V/m (PK)   97.450 dB $\mu$ V/m (AV)		
	U-NII 2C (5470-5725MHz):108.615 dB $\mu$ V/m (PK)   97.455 dB $\mu$ V/m (AV)		
	U-NII-3 (5725 -5850 MHz):108.979dB $\mu$ V/m (PK)   98.569 dB $\mu$ V/m (AV)		
Installed Options	None		
Power Supply	<input checked="" type="checkbox"/> DC power only: 5 V DC using Laboratory Power Supply		
Special EMI Components	--		
EUT Sample Type	<input checked="" type="checkbox"/> Production	<input type="checkbox"/> Pre-Production	<input type="checkbox"/> Engineering
Firmware	<input type="checkbox"/> for normal use		<input checked="" type="checkbox"/> Special version for test execution
FCC label attached	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	

### 3.2. 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	VLMTX58G	Video Link Module TX 5.8 GHz	1ABOPTX10PTXD1006160905	MAC Version 4.10.37.8	APP Version 3.13.20.0
EUT B	WALSIN PCB ANTENNA RFPCA201018IM5B301	DIPOLE	N/A	HW Version N/A Single Antenna Gain 5.47 dBi	--
EUT C	WALSIN PCB ANTENNA RFPCA201018IM5B301	DIPOLE	N/A	Antenna Cable Length : 20 cm	--

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

### 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	Test Tablet	Inari 8.3" AAVmobile	--	Intel® Atom™ CPU Z3795 RAM: 4 GB Full Touch Support	Windows Embedded 8.1 Industry Pro 64 bit + AppCom-Version 4.0.4.26 Software

\*) 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 + EUT B + EUT C + (AE 1) (AE 1 : was only used to activate test mode & kept outside test chamber)	Radiated measurements Set-up
set. 2	EUT A + EUT B + Cable 1 + ( AE1) (EUT B was used to terminate unused port) (AE 1: was only used activate test mode)	Conducted measurements 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	Fixed Channel (Modulated) Continuous Transmitter Mode	The EUT was put to Fixed Channel (Modulated) Continuous transmissions mode with help of a AppCom-Version 4.0.4.26 Software and +10dBm power scripts for each usable channels. AppCom-Version 4.0.4.26 was installed on Test Tablet (AE 1)

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

### 3.6. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	uUFL to SMA Cable	--	--	--	10 cm



## 4. Description of test system set-up's

### 4.1. Test system set-up for conducted measurements on antenna port

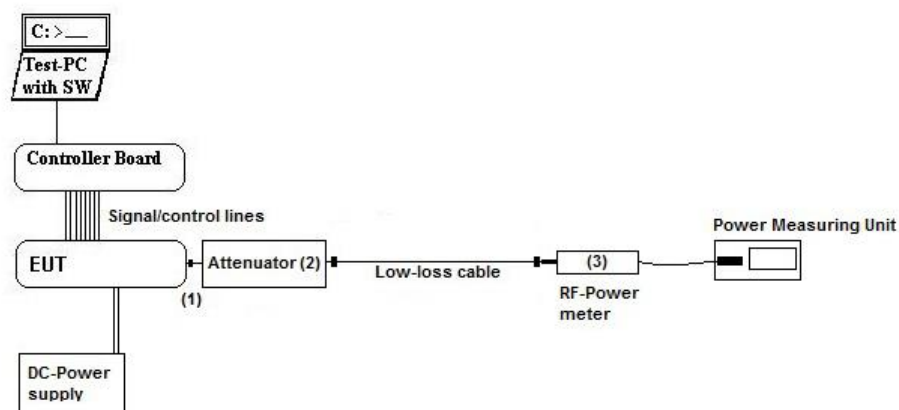
#### Conducted Set-up W1

##### Conducted RF-Setup 1 (W1 Set-up)

#### General description:

The EUT's RF-signal is coupled out by a suitable antenna coupling connector (1). The signal is first attenuated (2) then connected to the power meter (3) for conducted power measurements. The specific attenuation loss is determined prior to the measurement within a set-up attenuation measurement. These are then taken into account by correcting the measurement readings.

#### Schematic:



#### Testing method:

ANSI C63.10:2013,  
KDB 789033 D02 General UNII Test Procedures New Rules v01r03  
KDB 662911 D01 Multiple Transmitter Output v02r01

#### Used Equipment

Passive Elements	Test Equipment	Remark:
<input checked="" type="checkbox"/> 20 dB Attenuator	<input checked="" type="checkbox"/> Power Meter	See List of equipment under each test case and chapter 6 for calibration info
<input checked="" type="checkbox"/> Low loss RF-cables	<input checked="" type="checkbox"/> DC-Power Supply	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Spectrum-Analyser	

#### Measurement uncertainty

See chapter 5.9

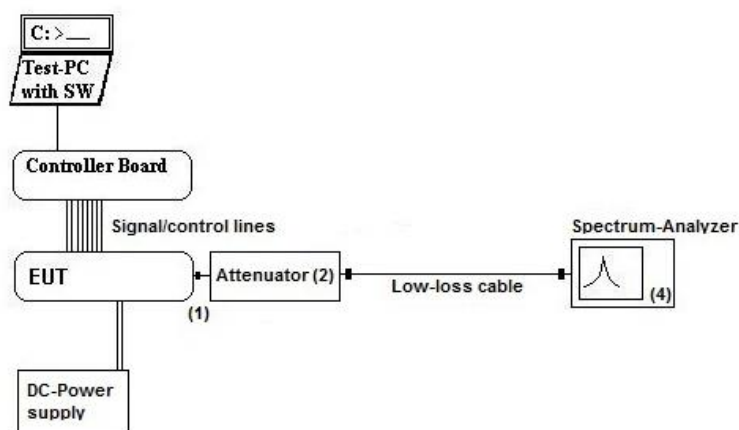
## Conducted Set-up W2

### Conducted RF-Setup 2 (W2 Set-up)

#### General description:

The EUT's RF-signal is coupled out by a suitable antenna coupling connector (1). The signal is first attenuated (2) then connected to spectrum-analyzer (4) for RF-conducted measurements. The specific attenuation loss is determined prior to the measurement within a set-up attenuation measurement. These are then taken into account by correcting the measurement readings of the spectrum-analyzer.

#### Schematic:



#### Testing method:

ANSI C63.10:2013,  
KDB 789033 D02 General UNII Test Procedures New Rules v01r03  
KDB 662911 D01 Multiple Transmitter Output v02r01

#### Used Equipment

##### Passive Elements

- ☒ 20 dB Attenuator
- ☒ Low loss RF-cables

##### Test Equipment

- ☒ Power Meter
- ☒ DC-Power Supply
- ☒ Spectrum-Analyser

##### Remark:

See List of equipment under each test case and chapter 6 for calibration info

#### Measurement uncertainty

See chapter 5.9

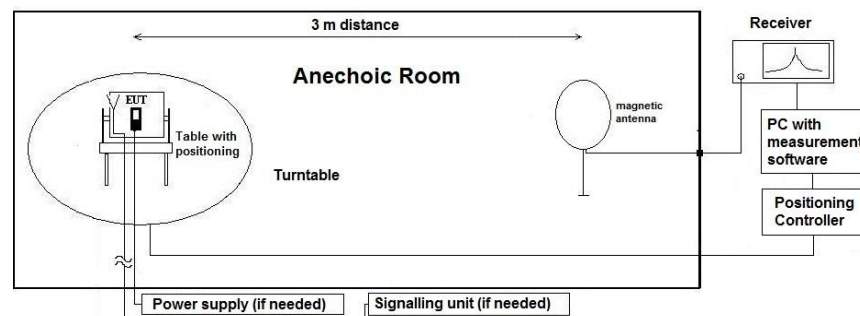
## 4.2. Test system set-up for radiated magnetic field measurements below 30 MHz

**Specification:** ANSI C63.4-2014 §5.3, §8.2.1, §8.3.1.1+§8.3.2.1 , ANSI C63.10-2013 chapter 6.4 (§6.4.4.2)

**General Description:** Evaluating the radiated field emissions are done first by an exploratory emission measurement and a final measurement for most critical frequencies determined.

The loop antenna was placed at 1 m height above ground plane and 3 m measurement distance from set-up for investigations. Because of reduced measurement distance, correction data were applied, as stated in chapter “General Limit - Radiated field strength emissions below 30 MHz”. The tests are performed in the semi anechoic room recognized by the regulatory commission.

**Schematic:**



**Testing method:**

### Exploratory, preliminary measurement

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 (step 90°, range 0° to 360°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT), the emission spectrum was recorded. The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a data reduction table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case. 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).

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

**Formula:**

$$E_C = E_R + AF + C_L + D_F - G_A$$

$$M = L_T - E_C$$

AF = Antenna factor

C<sub>L</sub> = Cable loss

D<sub>F</sub> = Distance correction factor

E<sub>C</sub> = Electrical field – corrected value

E<sub>R</sub> = Receiver reading

G<sub>A</sub> = Gain of pre-amplifier (if used)

L<sub>T</sub> = Limit

M = Margin

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

**Distance correction:**

Reference for applied correction (extrapolating) factors due to reduced measurement distance:

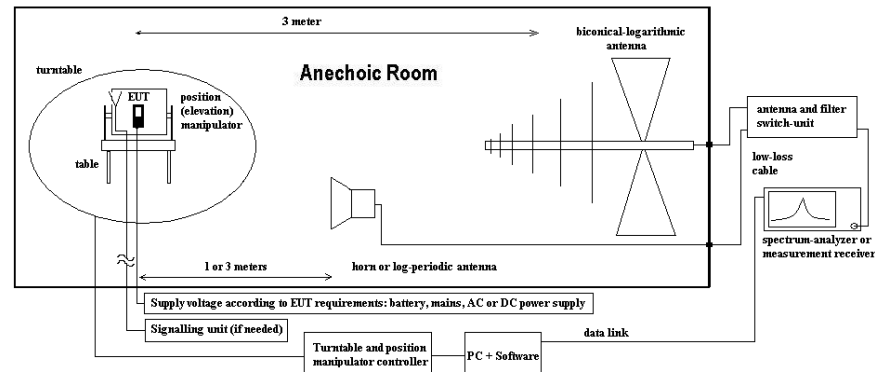
ANSI C63.10:2013, §6.4.4.2 - Equations (2) + (3) + (4)

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

**Specification:** ANSI C63.4-2014 chapter 8.2.3, 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. either on 10m OATS or 3m semi-anechoic room.

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<sub>L</sub> = Cable loss

D<sub>F</sub> = Distance correction factor (if used)

E<sub>C</sub> = Electrical field – corrected value

E<sub>R</sub> = Receiver reading

G<sub>A</sub> = Gain of pre-amplifier (if used)

L<sub>T</sub> = Limit

M = Margin

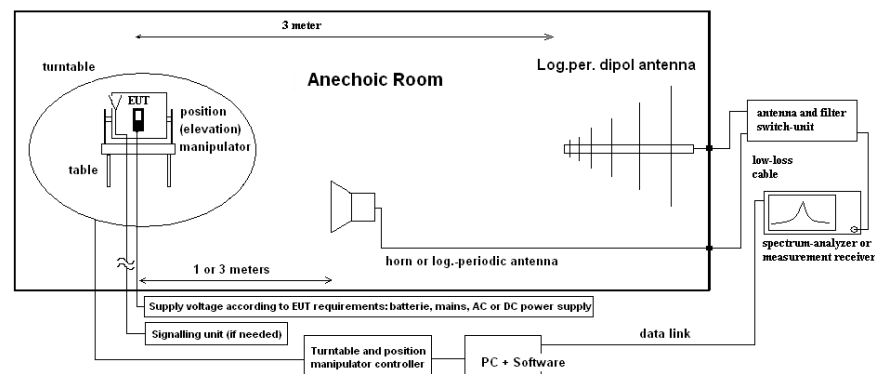
All units are dB-units, positive margin means value is below limit.

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

**Specification:** ANSI C63.4-2014 chapter 8.3, ANSI C63.10-2013 chapter 6.6.3.3 & 6.6.4

**General Description:** Evaluating the 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 16-1-4:2010 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 3 meter for frequencies up to 18 GHz and 2 meter above 18 GHz. A logarithmic periodic antenna is used for the frequency range 30 MHz to 1 GHz. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT.

**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 over 3-orthogonal axis and the height for EUT with large dimensions.

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

5.1.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

Ambient Climatic conditions			Temperature: (22±2)°C		Rel. humidity: (45±15)%	
Test Site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 348 EMI cond.	<input type="checkbox"/> 443 EMI FAR	<input checked="" type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/> 337 OATS	<input type="checkbox"/>
Equipment	<input type="checkbox"/> 331 HC 4055	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spectr. Analys.	<input checked="" type="checkbox"/> 683 FSU26	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Meter	<input type="checkbox"/> 262 NRV-S	<input type="checkbox"/> 266 NRV-Z31	<input type="checkbox"/> 265 NRV-Z33	<input type="checkbox"/> 261 NRV-Z55	<input type="checkbox"/> 356 NRV-Z1	<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"/>
DC Power	<input type="checkbox"/> 086 LNG50-10	<input type="checkbox"/> 087 EA3013	<input checked="" type="checkbox"/> 354 NGPE 40	<input type="checkbox"/> 349 car battery	<input type="checkbox"/> 350 Car battery	<input type="checkbox"/> 463 HP3245A
Line Voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input type="checkbox"/> 060 120 V 60 Hz via PAS 5000			
Otherwise	<input checked="" type="checkbox"/> 530 Attenuator 10dB	<input checked="" type="checkbox"/> K4 Cable				

Method of measurement: ☒ conducted  
☐ radiated

A special firmware program is used for test purposes. In opposite to normal operating mode a higher duty-cycle is set in order to facilitate the measurements. This is maximized at the extent possible.

The necessary duty-cycle correction factor is determined on nominal conditions on 4 channels for each sub-band one. It is assumed that no noticeable changes occur when tested on other channels or climatic conditions.

#### Results:

Set-up No.:	2		
Op. Mode:	1		
5 GHz Band	Channel Frequency [MHz]	Channel Nominal Bandwidth [MHz]	Plot No. (Remark 1)
U-NII-1	5190	40	1
U-NII-2A	5310	40	2
U-NII-2C	5510	40	3
U-NII-3	5795	40	4
Remark 1: For further details please refer → Annex 1: Test results - CETECOM_TR16-1-0188601T01a-A1			

Calculated with following formulas:

Duty cycle:	$x = \frac{T_{x_{on}}}{T_{x_{on}} + T_{x_{off}}}$	Duty cycle factor [dB]:	$10 \log \left( \frac{1}{x} \right)$
-------------	---	-------------------------	--------------------------------------

- ☐ The results were corrected in order to evaluate for worst-case result each time when average values are necessary for example average radiated emissions or similar  
☒ No correction necessary: Duty-Cycle > 98%

## 5.2. RF-Parameter - Transmitter Peak output power (conducted and radiated)

### 5.2.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)		<input checked="" type="checkbox"/> 443 System CTC-FAR-EMI-		<input type="checkbox"/> Please see Chapter. 2.2.3	
test site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 337 OATS	<input checked="" type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/>	<input type="checkbox"/>
receiver	<input type="checkbox"/> 377 ESCS30	<input type="checkbox"/> 001 ESS	<input type="checkbox"/> 489 ESU 40	<input type="checkbox"/> 620 ESU 26	<input type="checkbox"/>	<input type="checkbox"/>
otherwise	<input checked="" type="checkbox"/> 600 NRVD	<input checked="" type="checkbox"/> 357 NRV-Z1	<input checked="" type="checkbox"/> 693 TS8997			
spectr. analys.	<input type="checkbox"/> 215 FSU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
power supply	<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 checked="" type="checkbox"/> 354 NGPE 40
otherwise	<input checked="" type="checkbox"/> 613 20 dB Attenuator	<input type="checkbox"/> 248 6 dB Attenuator	<input type="checkbox"/> 529 Power divider	<input type="checkbox"/> - cable OTA20	<input type="checkbox"/> 530 10dB Atten	<input type="checkbox"/> K5 Cable
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input type="checkbox"/> 60 120 V 60 Hz via PAS 5000			

### 5.2.2. Reference:

<b>FCC</b>	<input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(a)(1)(2)(3)(4)
<b>ANSI</b>	<input checked="" type="checkbox"/> C63.10-2013
<b>KDB Guidance no.</b>	<input checked="" type="checkbox"/> KDB 789033 D02 General UNII Test Procedures New Rules v01r03: Subchapter E, Method PM (3)(a) <input checked="" type="checkbox"/> KDB 662911 D01 Multiple Transmitter Output v02r01 ( MIMO, Smart-antenna)
<b>Limits</b> (For the band 5600–5650 MHz, no operation in Canada is permitted)	<input checked="" type="checkbox"/> U-NII 1: 5.15-5.25 GHz: <b>FCC Outdoor access point:</b> 1W + antenna gain max. 6dBi + Elevation > 30° 21 dBm EIRP <b>FCC Indoor Access Point:</b> 1W + antenna gain max. 6dBi <b>FCC Mobile &amp; Portable client:</b> 250mW + antenna gain max. 6dBi
	<input checked="" type="checkbox"/> U-NII2: 5.25-5.35 GHz: <b>FCC:</b> lesser of 250mW or 11dBm+10log <sub>10</sub> (B)
	<input checked="" type="checkbox"/> U-NII2extension: 5.470-5.725 GHz: <b>FCC:</b> lesser of 250mW or 11dBm+10log <sub>10</sub> (B) + Antenna gain < 6dBi
	<input checked="" type="checkbox"/> U-NII3: 5.725-5.850 GHz: <b>FCC:</b> <input checked="" type="checkbox"/> max. conducted power: 1 Watt (30dBm) <input checked="" type="checkbox"/> Antenna gain less 6dBi <input type="checkbox"/> Antenna gain more 6dBi (-> reduction necessary)

### 5.2.3. Antenna characteristics:

- ☒ directional gain < 6 dBi (measured: difference between measured conducted and radiated eirp. power)  
☐ directional gain > 6 dBi (measured / applicant's declaration) -> conducted power reduction necessary

### 5.2.4. EUT settings:

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.

### 5.2.5. Measurement method:

Method used	Reference to KDB	Remarks:
<input type="checkbox"/> SA	KDB 789033 D02 General UNII Test Procedures New Rules v01r03	Integration bandwidth method
<input checked="" type="checkbox"/> Power Meter	a.) Method PM	A wideband thermocouple RF-power meter as described by KDB was used. <input checked="" type="checkbox"/> Duty-Cycle correction necessary <input type="checkbox"/> A value correction is not necessary since the EUT is transmitting continuously at duty-cycle > 98%.
<input checked="" type="checkbox"/> MIMO Measurements	Method PM + KDB 789033 D02 General UNII Test Procedures New Rules v01r03 + KDB 662911 D01 Multiple Transmitter Output v02r01	Measurements of conducted output emissions of devices that employ a single transmitter with multiple outputs in the same band.

### 5.2.6. Conducted power measurement and EIRP calculation

- Duty cycle correction factor not necessary (please refer at Chapter 5.1)
- Maximum declared antenna peak gain [isotropical & uncorrelated MIMO]: 5.47 dBi at 5 GHz Band Range

Set-up No.:	2
Op. Mode:	1

FCC 15.407 Limits												
U-NII-1 HT40												
Frequency (MHz)	CH 0 (dBm)	CH 1 (dBm)	CH 0 (mW)	CH 1 (mW)	Sum (CH 0,CH 1) (mW)	Sum (CH 0,CH 1) (dBm)	Conducted Limit (dBm)	Margin to Limit (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin to EIRP-Limit (dB)
5190,00	11,55	11,63	14,2889	14,5546	28,8435	14,60	30,00	15,40	5,47	20,07	21,00	0,93
5230,00	10,14	10,50	10,3276	11,2202	21,5478	13,33	30,00	16,67	5,47	18,80	21,00	2,20
U-NII-2A HT40												
Frequency (MHz)	CH 0 (dBm)	CH 1 (dBm)	CH 0 (mW)	CH 1 (mW)	Sum (CH 0,CH 1) (mW)	Sum (CH 0,CH 1) (dBm)	Conducted Limit (dBm)	Margin to Limit (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin to EIRP-Limit (dB)
5270,00	9,09	9,50	8,1096	8,9125	17,0221	12,31	23,98	11,67	5,47	17,78	29,98	12,20
5310,00	8,80	9,30	7,5858	8,5114	16,0972	12,07	23,98	11,91	5,47	17,54	29,98	12,44
U-NII-2C HT40												
Frequency (MHz)	CH 0 (dBm)	CH 1 (dBm)	CH 0 (mW)	CH 1 (mW)	Sum (CH 0,CH 1) (mW)	Sum (CH 0,CH 1) (dBm)	Conducted Limit (dBm)	Margin to Limit (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin to EIRP-Limit (dB)
5510,00	9,70	9,64	9,3325	9,2045	18,5370	12,68	23,98	11,30	5,47	18,15	29,98	11,83
5550,00	9,25	9,25	8,4140	8,4140	16,8279	12,26	23,98	11,72	5,47	17,73	29,98	12,25
5590,00	8,15	8,58	6,5313	7,2111	13,7424	11,38	23,98	12,60	5,47	16,85	29,98	13,13
5670,00	8,77	9,70	7,5336	9,3325	16,8661	12,27	23,98	11,71	5,47	17,74	29,98	12,24
U-NII-3 HT40												
Frequency (MHz)	CH 0 (dBm)	CH 1 (dBm)	CH 0 (mW)	CH 1 (mW)	Sum (CH 0,CH 1) (mW)	Sum (CH 0,CH 1) (dBm)	Conducted Limit (dBm)	Margin to Limit (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin to EIRP-Limit (dB)
5755,00	9,54	9,79	8,9950	9,5280	18,5229	12,68	30,00	17,32	5,47	18,15	36,00	17,85
5795,00	10,23	9,89	10,5439	9,7499	20,2938	13,07	30,00	16,93	5,47	18,54	36,00	17,46
The conducted power values listed above are measured using RF Average Power Meter.												

### 5.2.7. Verdict: Pass



### 5.3. RF Parameter – Peak Power Spectral Density (PSD)

#### 5.3.1. Test location and equipment (for reference numbers please see chapter 'List of test 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"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 337 OATS
receiver	<input type="checkbox"/> 377 ESCS30	<input type="checkbox"/> 001 ESS	<input checked="" type="checkbox"/> 347 Radio.lab.
spectr. analys.	<input type="checkbox"/> 215 FSU	<input type="checkbox"/> 120 FSEM	<input checked="" type="checkbox"/> 683 FSU26
power supply	<input type="checkbox"/> 456 EA 3013A	<input type="checkbox"/> 457 EA 3013A	<input type="checkbox"/> 264 FSEK
otherwise	<input checked="" type="checkbox"/> 530 10dB Attenuator	<input type="checkbox"/> 268 EA- 3050	<input type="checkbox"/> 494 AG6632A
		<input checked="" type="checkbox"/> cable	<input checked="" type="checkbox"/> 354 NGPE 40

#### 5.3.2. References

FCC	<input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(a)(1)(2)(3)(4)
ANSI	<input checked="" type="checkbox"/> C63.10-2013
KDB Guidance no.	<input checked="" type="checkbox"/> KDB 789033 D02 General UNII Test Procedures New Rules v01r03: Subchapter F <input checked="" type="checkbox"/> KDB 662911 D01 Multiple Transmitter Output v02r01
Limits [dBm/MHz]	<input checked="" type="checkbox"/> U-NII-1: 5.15-5.25 GHz: FCC Outdoor access point: 17dBm/MHz FCC Indoor Access Point: 17dBm/MHz FCC Mobile & Portable client: 11dBm/MHz <input checked="" type="checkbox"/> U-NII-2A: 5.25-5.35 GHz: FCC: 11dBm <input checked="" type="checkbox"/> U-NII-2C+extension: 5.47-5.725 GHz: FCC: 11dBm/MHz
Limits [dBm/500kHz]	<input checked="" type="checkbox"/> U-NII-3: 5.725-5.85 GHz: FCC: 30dBm/500kHz

#### 5.3.3. EUT settings

- Different channels have been measured for each transmitting sub-band
- The EUT was instructed to send with maximum power (if adjustable) according applicants instructions
- ☒ MIMO applicable measurement techniques (KDB 662911 D01 Multiple Transmitter Output v02r01)
- ☐ no MIMO applicable

#### 5.3.4. Measurement Method:

☒ SA-1: The procedures were followed for measuring the average power spectrum as described under chapter “maximum conducted output power”: steps (i) to (viii). The measurements have been performed for each output RF-port if applicable. A screenshot and data bins transfer for further calculations were recorded. If the device contains more than one RF-output port, MIMO calculation procedures have been followed according KDB662911, Chapter E.2 a) “Measure and sum spectra across the outputs”. Resulting maximum PSD is reported for the MIMO condition.

The measured value is corrected due to external measuring set-up path losses and the resulting value is compared with the standard requirement. If the limit is E.I.R.P limit the antenna gain is added, eventually the array gain for MIMO systems.

### 5.3.4.1. Results:

Set-up No.:	2						
Op. Mode:	1						
5 GHz Band	Channel Frequency [MHz]	Channel Nominal Bandwidth [MHz]	Power Spectral Density [dBm/MHz]			Limits (Remark 4) [dBm/MHz]	Plot No. (Remark 1)
			Port 0	Port 1	Port 0 + Port1		
U-NII-1	5190	40	0.69	-3.15	1.96	<b>17.0</b>	5/6/7
	5230	40	-0.44	-2.48	1.33	<b>17.0</b>	8/9/10
U-NII-2A	5270	40	-1.42	-3.01	0.68	<b>11.0</b>	11/12/13
	5310	40	0.73	-2.41	2.11	<b>11.0</b>	14/15/16
U-NII-2C	5510	40	-1.43	-2.13	1.01	<b>11.0</b>	17/18/19
	5550	40	0.91	-1.94	2.38	<b>11.0</b>	20/21/22
	5590	40	0.22	-2.54	1.64	<b>11.0</b> Remark 3)	23/24/25
	5670	40	-1.42	-2.37	1.12	<b>11.0</b>	26/27/28
5 GHz Band	Channel Frequency [MHz]	Channel Nominal Bandwidth [MHz]	Power Spectral Density [dBm/500kHz]			Limits [dBm/500kHz]	Plot No. (Remark 1)
			Port 0	Port 1	Port 0 + Port1		
U-NII-3	5755	40	-2.72	-1.80	0.27	<b>30.0</b>	29/30/31
	5795	40	-3.24	-5.29	-1.58	<b>30.0</b>	32/33/34
<p>Remark 1: For further details please refer → Annex 1: Test results - <b>CETECOM_TR16-1-0188601T01a-A1</b></p> <p>Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm</p> <p>Remark 3: 5590 MHz Channel not allowed in Canada. No channel shall be used between 5600-5650MHz in Canada according RSS-247, Issue 2 regulations</p> <p>Remark 4: If transmitting antennas of directional gain greater than 6 dBi are used then Maximum Power Spectral Density Limits shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. <b>In this case Antenna Gain [Uncorrelated MIMO] = 5.47dBi.</b> <b>Therefore no Power Spectral Density Limits reduction is necessary.</b></p>							

### 5.3.5. Verdict: Pass

## 5.4. RF Parameter - 26 dB and 99% occupied Bandwidth

### 5.4.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

test site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 348 EMI cond.	<input type="checkbox"/> 443 EMI FAR	<input checked="" 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 type="checkbox"/> 489 ESU40	<input checked="" type="checkbox"/> 683 FSU26	<input type="checkbox"/>
attenuator	<input checked="" type="checkbox"/> 530 10 dB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
signaling	<input type="checkbox"/> 392 MT8820A	<input type="checkbox"/> 436 CMU	<input type="checkbox"/> 547 CMU			
DC power	<input type="checkbox"/> 463 Power source	<input type="checkbox"/> 087 EA3013	<input checked="" type="checkbox"/> 354 NGPE 40	<input type="checkbox"/> 086 LNG50-10	<input type="checkbox"/>	<input type="checkbox"/>
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input type="checkbox"/> 060 120 V 60 Hz via PAS 5000			

### 5.4.2. Test condition and measurement test set-up

link to test system (if used):	<input type="checkbox"/> air link	<input checked="" type="checkbox"/> cable connection	<input type="checkbox"/>
Climatic conditions	Temperature: (22±3°C)		Rel. humidity: (40±20)%

### 5.4.3. References of occupied and emission bandwidth

FCC	<input checked="" type="checkbox"/> FCC 2.202 for information <input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(e)
ANSI	<input checked="" type="checkbox"/> C63.10-2013
KDB Guidance no.	<input checked="" type="checkbox"/> 789033 D02 General UNII test procedures v01r03, Subchapter C
Limits	<input checked="" type="checkbox"/> necessary for maximum power limits depending of B <input checked="" type="checkbox"/> FCC: decision if DFS necessary for decision if due 26dBc emissions falling in 5250-5350MHz band <input checked="" type="checkbox"/> FCC §15.407(e): Minimum 500kHz for band 5725-5850MHz

### 5.4.4. EUT Settings:

The EUT was instructed to send with different power/ data rates (if adjustable) according applicants instructions. Different modulation characteristics have been checked, e.g. data rates which EUT can operate.

### 5.4.5. Measurement method:

The measurement was performed with the RBW set to approximately 1% of the emission bandwidth. The span was set to cover the complete carrier. Three carrier frequencies were used for showing the compliance with this requirement. A DELTA Marker method was set to measure the bandwidth compared to the highest In-Band power. The operating modes have been varied for **26 dB bandwidth** (e.g. data rate, modulation scheme, etc.).

Also the **99% occupied bandwidth** was measured. Two markers are placed on frequency points such that left to lower f-marker and right to higher f-marker only 1% of the TX-power is contained. Between the markers, 99% of the power is laying. The RBW value is readjusted and the measurement repeated until the RBW/EBW ratio is around 1%. The operating modes have been taken the maximum data rates, which had been found out at the output power conducted measurements.

### 5.4.6. Spectrum-Analyzer Settings:

Span	Set as to fully display the emissions and at least 26 dB below the PEAK level
Resolution Bandwidth (RBW)	Set to approx.. 1% to max. 5%
Video Bandwidth (VBW)	3 times the resolution bandwidth
Sweep time	Coupled
Detector	PK (26 dB BW)/PK (99% OBW)
Sweep mode	Repetitive Mode, MAX-HOLD

### 5.4.7. Results:

Set-up No.:	2						
Op. Mode:	1						
5 GHz Band	Channel Frequency [MHz]	Channel Nominal Bandwidth [MHz]	RF Port No.	26 dB Bandwidth [MHz]	99% Occupied Bandwidth [MHz]	Plot No. (Remark 1)	Remarks
U-NII-1	5190	40	0	40.929487	37.740000	35/36	--
		40	1	40.705128	37.660000	37/38	--
	5230	40	0	39.903846	37.403846	39/40/41	For 26dBc: Right 26dB point lower than 5250MHz -> no DFS requirements
		40	1	39.903846	37.500000	42/43/44	
U-NII-2A	5270	40	0	40.096153	37.500000	45/46/47	26dBc point falls within 5150-5250MHZ -> no requirement for DFS or spurious emission in the U-NII-1 band (99% OBW falls in 5250-5350 MHz band)
		40	1	40.673076	37.680000	48/49	
	5310	40	0	40.705128	37.770000	50/51	--
		40	1	41.057692	37.640000	52/53	--
U-NII-2C	5510	40	0	40.769230	37.770000	54/55	--
		40	1	41.025641	37.660000	56/57	--
	5670	40	0	40.865384	37.760000	58/59	--
		40	1	41.025641	37.680000	60/61	--
U-NII-3	5755	40	0	40.929487	37.780000	62/63	--
		40	1	41.025641	37.670000	64/65	--
	5795	40	0	40.769230	37.760000	66/67	--
		40	1	40.929487	37.660000	68/69	--
Remark 1: For further details please refer → Annex 1: Test results - CETECOM_TR16-1-0188601T01a-A1							
Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm							

### 5.4.8. Verdict: Pass

## 5.5. General Limit - Radiated field strength emissions below 30 MHz

### 5.5.1. 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 type="checkbox"/> 487 SAR NSA <input type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/>	<input type="checkbox"/>
receiver	<input type="checkbox"/> 377 ESCS30 <input checked="" type="checkbox"/> 001 ESS <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
spectr. analys.	<input type="checkbox"/> 584 FSU <input type="checkbox"/> 120 FSEM <input type="checkbox"/> 264 FSEK <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
antenna	<input type="checkbox"/> 574 BTA-L <input type="checkbox"/> 133 EMCO3115 <input type="checkbox"/> 302 BBHA9170 <input type="checkbox"/> 289 CBL 6141 <input checked="" 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 type="checkbox"/> 482 Filter Matrix <input type="checkbox"/> 378 RadiSense		
DC power	<input checked="" type="checkbox"/> 671 EA-3013S <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"/> 354 NGPE 40		
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains <input checked="" type="checkbox"/> 060 120 V 60 Hz via PAS 5000		

### 5.5.2. Requirements

FCC	Part 15, Subpart C, §15.205 & §15.209			
ANSI	C63.10-2013			
Frequency [MHz]	Field strength limit [μV/m] [dBμV/m]		Distance [m]	Remarks
0.009 – 0.490	2400/f (kHz)	67.6 – 20Log(f) (kHz)	300	Correction factor used due to measurement distance of 3 m
0.490 – 1.705	24000/f (kHz)	87.6 – 20Log(f) (kHz)	30	Correction factor used due to measurement distance of 3 m
1.705 – 30	30	29.5	30	Correction factor used due to measurement distance of 3 m

### 5.5.3. 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 <input type="checkbox"/> floor standing
Climatic conditions	Temperature: (22±3°C) Rel. humidity: (40±20)%
EMI-Receiver or Analyzer Settings	Scan data
	<input checked="" type="checkbox"/> 9 – 150 kHz RBW/VBW = 200 Hz Scan step = 80 Hz
	<input checked="" type="checkbox"/> 150 kHz – 30 MHz RBW/VBW = 9 kHz Scan step = 4 kHz
	<input type="checkbox"/> other:
EMI-Receiver or Analyzer Settings	Scan-Mode
	Detector
	Mode:
	Sweep-Time
General measurement procedures	Please see chapter “Test system set-up radiated magnetic field measurements below 30 MHz”

### 5.5.4. Measurement Results

Diagram No.  (Remark 1)	Carrier Channel		Frequency range of measurement	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Band Range [MHz]	Frequency [MHz]					PK	AV	QP	
2.01	U-NII-1	5190	9 kHz-30 MHz	1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.02	5150-5250	5230		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.03	U-NII-2A	5270		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.04	5250-5350	5310		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.05	U-NII-2C 5470-5700	5510		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.06		5590		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass (Remark 3)
2.07		5670		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.08	U-NII-3	5755		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
2.09	5725-5850	5795		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
Remark 1: For further details please refer → Annex 1: Test results - <b>CETECOM_TR16-1-0188601T01a-A1</b> Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm Remark 3: Channel not allowed in Canada. No channel shall be used between 5600-5650MHz in Canada according RSS-247, Issue 2 regulations										

### 5.5.5. Correction factors due to reduced meas. distance (f< 30 MHz)

The used correction factors when the measurement distance is reduced compared to regulatory measurement distance, are calculated according Extrapolation formulas valid for EUT's with maximum dimension of 0.625xLambda. Formula 2+3+4 as presented in ANSI C63.10, Chapter 6.4.4 are used for the calculations of proper extrapolation factors.

Frequency -Range	f [kHz/MHz]	Lambda [m]	Far-Field Point [m]	Distance Limit accord. 15.209 [m]	1st Condition (dmeas < D <sub>near-field</sub> )	2 <sup>te</sup> Condition (Limit distance bigger d <sub>near-field</sub> )	Distance Correction accord. Formula
kHz	9,00E+03	33333,33	5305,17	300	fulfilled	not fulfilled	-80,00
	1,00E+04	30000,00	4774,65		fulfilled	not fulfilled	-80,00
	2,00E+04	15000,00	2387,33		fulfilled	not fulfilled	-80,00
	3,00E+04	10000,00	1591,55		fulfilled	not fulfilled	-80,00
	4,00E+04	7500,00	1193,66		fulfilled	not fulfilled	-80,00
	5,00E+04	6000,00	954,93		fulfilled	not fulfilled	-80,00
	6,00E+04	5000,00	795,78		fulfilled	not fulfilled	-80,00
	7,00E+04	4285,71	682,09		fulfilled	not fulfilled	-80,00
	8,00E+04	3750,00	596,83		fulfilled	not fulfilled	-80,00
	9,00E+04	3333,33	530,52		fulfilled	not fulfilled	-80,00
	1,00E+05	3000,00	477,47		fulfilled	not fulfilled	-80,00
	1,25E+05	2400,00	381,97		fulfilled	not fulfilled	-80,00
	2,00E+05	1500,00	238,73	30	fulfilled	fulfilled	-78,02
	3,00E+05	1000,00	159,16		fulfilled	fulfilled	-74,49
	4,00E+05	750,00	119,37		fulfilled	fulfilled	-72,00
	4,90E+05	612,24	97,44		fulfilled	fulfilled	-70,23
	5,00E+05	600,00	95,49		fulfilled	not fulfilled	-40,00
	6,00E+05	500,00	79,58		fulfilled	not fulfilled	-40,00
	7,00E+05	428,57	68,21		fulfilled	not fulfilled	-40,00
	8,00E+05	375,00	59,68		fulfilled	not fulfilled	-40,00
	9,00E+05	333,33	53,05		fulfilled	not fulfilled	-40,00
	1,00	300,00	47,75		fulfilled	not fulfilled	-40,00
MHz	1,59	188,50	30,00		fulfilled	not fulfilled	-40,00
	2,00	150,00	23,87		fulfilled	fulfilled	-38,02
	3,00	100,00	15,92		fulfilled	fulfilled	-34,49
	4,00	75,00	11,94		fulfilled	fulfilled	-32,00
	5,00	60,00	9,55		fulfilled	fulfilled	-30,06
	6,00	50,00	7,96		fulfilled	fulfilled	-28,47
	7,00	42,86	6,82		fulfilled	fulfilled	-27,13
	8,00	37,50	5,97		fulfilled	fulfilled	-25,97
	9,00	33,33	5,31		fulfilled	fulfilled	-24,95
	10,00	30,00	4,77		fulfilled	fulfilled	-24,04
	10,60	28,30	4,50		fulfilled	fulfilled	-23,53
	11,00	27,27	4,34		fulfilled	fulfilled	-23,21
	12,00	25,00	3,98		fulfilled	fulfilled	-22,45
	13,56	22,12	3,52		fulfilled	fulfilled	-21,39
	15,00	20,00	3,18		fulfilled	fulfilled	-20,51
	15,92	18,85	3,00		fulfilled	fulfilled	-20,00
	17,00	17,65	2,81		not fulfilled	fulfilled	-20,00
	18,00	16,67	2,65		not fulfilled	fulfilled	-20,00
	20,00	15,00	2,39		not fulfilled	fulfilled	-20,00
	21,00	14,29	2,27		not fulfilled	fulfilled	-20,00
	23,00	13,04	2,08		not fulfilled	fulfilled	-20,00
	25,00	12,00	1,91		not fulfilled	fulfilled	-20,00
	27,00	11,11	1,77		not fulfilled	fulfilled	-20,00
	29,00	10,34	1,65		not fulfilled	fulfilled	-20,00
	30,00	10,00	1,59		not fulfilled	fulfilled	-20,00

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

### 5.6.1. 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 EMISAR <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 checked="" type="checkbox"/> 671 EA-3013S <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"/> 060 120 V 60 Hz via PAS 5000		

### 5.6.2. Requirements/Limits

<b>FCC</b>		<input type="checkbox"/> Part 15 Subpart B, §15.109, class B <input checked="" type="checkbox"/> Part 15 Subpart C, §15.209 @ frequencies defined in §15.205	
<b>ANSI</b>		<input type="checkbox"/> C63.4-2014 <input checked="" type="checkbox"/> C63.10-2013	
<b>Limit</b>	Frequency [MHz]	Radiated emissions limits, 3 meters	
		QUASI Peak [ $\mu$ V/m]	QUASI-Peak [dB $\mu$ V/m]
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	above 960	500	54.0

### 5.6.3. Restricted bands of operation (FCC §15.205)

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.20725-4.20775	37.5-38.25	1645.5-1646.5	9.3-9.5
6.215-6.218	73-74.6	1660-1710	10.6-12.7
6.26775-6.26825	74.8-75.2	1718.8-1722.2	13.25-13.4
6.31175-6.31225	108-121.94	2200-2300	14.47-14.5
8.291-8.294	123-138	2310-2390	15.35-16.2
8.362-8.366	149.9-150.05	2483.5-2500	17.7-21.4
8.37625-8.38675	156.52475-156.52525	2690-2900	22.01-23.12
8.41425-8.41475	156.7-156.9	3260-3267	23.6-24.0
12.29-12.293	162.0125-167.17	3332-3339	31.2-31.8
12.51975-12.52025	167.72-173.2	3345.8-3358	36.43-36.5
12.57675-12.57725	240-285	3600-4400	--
13.36-13.41	322-335.4	--	--
Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209			



#### 5.6.4. 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 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 0.8m height	<input type="checkbox"/> floor standing	
Climatic conditions		Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver (Analyzer) Settings	Scan frequency range: Scan-Mode Detector RBW/VBW Mode: Scan step Sweep-Time	<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 Peak / Quasi-peak 100 kHz/300 kHz Repetitive-Scan, max-hold 80 kHz 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"		

#### 5.6.5. MEASUREMENT RESULTS

The results are presented below in summary form only. For more information please consult the diagrams included in annex 1.

Table of measurement results:

Table of measurement results.										
Diagram No.  (Remark 1)	Carrier Channel		Frequency range of measurement	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Band Range [MHz]	Frequency [MHz]					PK	AV	QP	
3.01	U-NII-1	5190	30 MHz – 1GHz	1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
3.02	5150-5250	5230		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
3.03	U-NII-2A	5270		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
3.04	5250-5350	5310		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
3.05	U-NII-2C 5470-5700	5510		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pass
3.06		5590		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass (Remark 3)
3.07		5670		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
3.08	U-NII-3	5755		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
3.09	5725-5850	5795		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pass
Remark 1: For further details please refer → Annex 1: Test results - <b>CETECOM_TR16-1-0188601T01a-A1</b>										
Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm										
Remark 3: Channel not allowed in Canada.										
No channel shall be used between 5600-5650MHz in Canada according RSS-247, Issue 2 regulations										

## 5.7. General Limit - Radiated emissions, above 1 GHz

### 5.7.1. 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 checked="" type="checkbox"/> 611 E3632A	<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"/> 060 120 V 60 Hz via PAS 5000			

### 5.7.2. Requirements/Limits

<b>FCC</b>	<input type="checkbox"/> Part 15 Subpart B, §15.109 class B <input checked="" type="checkbox"/> Part 15 Subpart C, §15.209 for frequencies defined in §15.205 <input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3)(4)			
<b>ANSI</b>	<input type="checkbox"/> C63.4-2014 <input checked="" 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	500	54.0	5000	74.0 dBµV/m
§15.407(b)(1)(2)(3)(4)	--	--	--	(b)(1): 5.15-5.25GHz: -27dBm eirp (b)(2): 5.25-5.35GHz: -27dBm eirp (b)(3): 5.47-5.725 GHz: -27dBm eirp (b)(4): 5.725-5.85GHz: Spectrum mask

### 5.7.3. 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 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 1.5m height		<input type="checkbox"/> floor standing
Climatic conditions		Temperature: (22±3°C)		Rel. humidity: (40±20)%
Spectrum-Analyzer settings	Scan frequency range: Scan-Mode Detector RBW/VBW Mode: Scan step Sweep-Time	<input checked="" type="checkbox"/> 1 – 18 GHz <input type="checkbox"/> 18 – 25 GHz <input checked="" 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"		

#### 5.7.4. Measurement Results

Diagram No.  (Remark 1)	Carrier Channel		Frequency range of measurement	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Band Range [MHz]	Frequency [MHz]					PK	AV	QP	
4.01	U-NII-1	5190	1 GHz – 7 GHz	1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.02	5150-5250	5230		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.03	U-NII-2A	5270		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.04	5250-5350	5310		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.05	U-NII-2C 5470-5700	5510		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.06		5590		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass (Remark 3)
4.07		5670		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.08	U-NII-3	5755		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.09	5725-5850	5795		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
Remark 1: For further details please refer → Annex 1: Test results - <b>CETECOM_TR16-1-0188601T01a-A1</b> Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm Remark 3: Channel not allowed in Canada. No channel shall be used between 5600-5650MHz in Canada according RSS-247, Issue 2 regulations										

Diagram No.  (Remark 1)	Carrier Channel		Frequency range of measurement	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Band Range [MHz]	Frequency [MHz]					PK	AV	QP	
4.01a	U-NII-1	5190	7 GHz – 18 GHz	1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.02a	5150-5250	5230		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.03a	U-NII-2A	5270		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.04a	5250-5350	5310		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.05a	U-NII-2C 5470-5700	5510		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.06a		5590		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass (Remark 3)
4.07a		5670		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.08a	U-NII-3	5755		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.09a	5725-5850	5795		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
Remark 1: For further details please refer → Annex 1: Test results - <b>CETECOM_TR16-1-0188601T01a-A1</b> Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm Remark 3: Channel not allowed in Canada. No channel shall be used between 5600-5650MHz in Canada according RSS-247, Issue 2 regulations										

Diagram No.  (Remark 1)	Carrier Channel		Frequency range of measurement	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Band Range [MHz]	Frequency [MHz]					PK	AV	QP	
4.01b	U-NII-1	5190	18 GHz – 40 GHz	1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.02b	5150-5250	5230		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.03b	U-NII-2A	5270		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.04b	5250-5350	5310		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.05b	U-NII-2C 5470-5700	5510		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.06b		5590		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass (Remark 3)
4.07b		5670		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.08b	U-NII-3	5755		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
4.09b	5725-5850	5795		1	1	Nominal B.W. 40 MHz 10 dBm power setting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Pass
Remark 1: For further details please refer → Annex 1: Test results - <b>CETECOM_TR16-1-0188601T01a-A1</b> Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm Remark 3: Channel not allowed in Canada. No channel shall be used between 5600-5650MHz in Canada according RSS-247, Issue 2 regulations										

## 5.8. RF-Parameter - Radiated Band-Edge compliance measurements

### 5.8.1. 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 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 type="checkbox"/>	<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"/>
DC power	<input checked="" type="checkbox"/> 611 E3632A	<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"/> 060 120 V 60 Hz via PAS 5000			

### 5.8.2. Requirements/Limits

<b>FCC</b>	<input type="checkbox"/> Part 15 Subpart B, §15.109 class B <input checked="" type="checkbox"/> Part 15 subpart C, §15.209 @ frequencies defined in §15.205 <input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3)(4)
<b>ANSI</b>	<input type="checkbox"/> C63.4-2014 <input checked="" type="checkbox"/> C63.10-2013, Chapter 6.10.6

### 5.8.3. 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 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 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 type="checkbox"/> 1 – 18 GHz <input type="checkbox"/> 18 – 25 GHz <input type="checkbox"/> 18 – 40 GHz <input checked="" type="checkbox"/> other: see diagrams <input type="checkbox"/> 6 dB EMI-Receiver Mode <input checked="" type="checkbox"/> 3 dB Spectrum analyser Mode Peak and Average Left band-edge: 100kHz/300kHz Right band-edge: 1 MHz / 3 MHz Repetitive-Scan, max-hold 40kHz or 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" for general measurements procedures in anechoic chamber.		

### 5.8.4. Measurement Method

For uncritical results where a measurement resolution bandwidth of 1MHz can clearly show the compliance without influencing the results, a field strength measurement was performed to show compliance.

For critical results a Marker-Delta marker method was used for showing compliance to restricted bands. The method is according ANSI C63.10:2013, Chapter 6.10.6 "Marker-Delta method". The method consists of three independent steps:

- 1. Step:** Prior to the measurement the fundamental radiated In-Band field strength was performed. The determined value is used as reference value.
- 2. Step:** Second step consist of finding the relative attenuation between the fundamental emission and the maximum local out-of-band emission (within 2 MHz range around the band edge either on the band-edge directly or some modulation product if the level is greater than that on the band-edge) when measured with lower resolution bandwidth.
- 3. Step:** The delta value recorded in step 2 will be subtracted from value recorded in step 1, thus giving the required field strength at the band-edge. This value must fulfil the requirements for radiated spurious emissions in restricted bands in FCC §15.205 with the general limits of FCC §15.209.

### 5.8.5. EUT settings

The EUT was instructed to send with maximum power (if adjustable) according to applicants instructions.

### 5.8.6. Results for non-restricted bands near-by

#### 5.8.6.1. Non-restricted bands near-by - limits according FCC §15.407 limits

Set-up No.:	1
Op. Mode:	1

Diagram no.	Channel no.	Restricted band ?	Fundamental Value [dBuV/m]		Peak-Value at Band-Edge [dBuV/m]	Limit [dBuV/m @3m]	Margin [dB]	Verdict	Remark:
			Peak -Value	Average -Value					
9.05	5510	no	108,61	96,75	63,7	68,5	4,80	PASS	PWR-VALUE=10 dBm used
9.07	5670	no	107,59	96,44	54,6	68,5	13,90	PASS	PWR-VALUE=10 dBm used
9.08	5755	no	108,16	97,00	65,0	68,5	3,50	PASS	PWR-VALUE =10 dBm used
9.09	5795	no	108,97	98,56	56,5	68,5	12,0	PASS	PWR-VALUE = 10 dBm used

Remark 1: For further details please refer → Annex 1: Test results - **CETECOM\_TR16-1-0188601T01a-A1**

Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm

### 5.8.6.2. Results for restricted bands near-by

(§15.205 with limits accord. FCC §15.209)

Set-up No.:	1
Op. Mode:	1

Diagram no.	Channel no.	Restricted band ?	Fundamental Value [dBuV/m]		Value at Band-Edge [dBuV/m]		Limits [dBuV/m]		Margin [dB]		Verdict	Remark:
			Peak -Value	Average -Value	Peak -Value	Average -Value	Peak -Value	Average -Value	Peak	Average		
9.01	5190	yes	108,61	97,61	64,04	52,94	74,00	54,00	9,96	1,06	PASS	PWR-Level 10 dBm used
9.02	5230	yes	107,98	96,41	54,00	43,8	74	54	20	10,2	PASS	PWR-Level 10 dBm used
9.04	5310	yes	107,43	97,45	60,56	50,7	74	54	13,44	3,3	PASS	PWR-Level 10 dBm used

Remark 1: For further details please refer → Annex 1: Test results - **CETECOM\_TR16-1-0188601T01a-A1**

Remark 2: Measurements results are only valid and compliant with power setting: +10 dBm

Remark 3: No Duty-cycle correction factors are necessary

### 5.8.7. Verdict: Pass

## 5.9. 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 <sub>CISPR</sub> )	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	--		
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. Instruments and Ancillary

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

### 6.0.1. 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 Communication 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 Communication 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 Communication 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)

## 6.0.2. 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	30.06.2017
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	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	-	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
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	05.06.2017
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren / CETECOM	12 M	5	30.06.2017

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-	5	Wainwright Instruments GmbH	12 M	1c	30.06.2017
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	-	30.07.2017
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	-	31.07.2017
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	Digital multimeter	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	
642	Wideband Radio Communication Tester	CMW 500	126089	Rohde&Schwarz	12 M	-	07.07.2017
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	-	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

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
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
693	TS8997	CTC-Radio Lab 1_TS8997	-	Rohde&Schwarz	12 M	5	06.06.2017
697	Power Splitter	ZN4PD-642W-S+	165001445	Mini-Circuits	-	2	
701	CMW500 wide. Radio Comm.	CMW500	158150	Rohde & Schwarz	12 M	-	01.05.2017
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	-	

### 6.0.3. 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

## 7. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2017-04-24
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