Test Report
19-1-0137401T05a-C01

D-PL-12047-01-01
D-PL-12047-01-03
D-PL-12047-01-04

Number of pages:	37	**Date of Report:**	2021-Jun-09
Testing company:	CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	**Applicant:**	Bosch Healthcare Solutions GmbH
Test Object / Tested Device(s):	**System for quantitative measurement of fractional nitric oxide (FeNO) in human breath, Vivatmo pro (Base Station)**		
FCC ID:	2AVQ9VMPBS1	**IC:**	25928-VMPBS1
Testing has been carried out in accordance with:	**Title 47 CFR, Chapter I** **FCC Regulations, Subchapter A** Subpart C: §15.247 (DTS) **RSS-247, Issue 2 (DTS)** **RSS-Gen., Issue 5** Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Tested Technology:	2.4GHz W-LAN (IEEE 802.11)		
Test Results:	**☒ The EUT complies with the requirements in respect of all parameters subject to the test.** The test results relate only to devices specified in this document		
	The current version of Test Report CETECOM_TR19_1_0137401T05a_C01 replaces the test report CETECOM_TR19_1_0137401T05a dated 2020-Nov-25. The replaced test report is herewith invalid.		
Signatures:			

Dipl.-Ing. Niels Jeß	Dipl.-Ing. Ninovic Perez
Head of Compliance Testing	Senior Test manager
Authorization of test report	Responsible of test report

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1 General information

1.1 Disclaimer and Notes

The test results of this test report relate exclusively to the test item specified in this test report as specified in chapter 2.7. CETECOM does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

1.1. Summary of Test Results

The EUT integrates a 2.4 GHz W-LAN transmitter. Other implemented wireless technologies were not considered within this test report.

Test case	Reference Clause FCC ☒	Reference Clause ISED ☒	Page	Remark	Result
Duty-Cycle	§15.35(c)	RSS-Gen Issue 5, §8.2	12	--	PASS
Minimum Emission Bandwidth 6 dB	§15.247 5.2(a)	RSS-247, § 5.2(a) RSS-Gen Issue 5,: § 6.7	18	--	PASS
Occupied Channel Bandwidth 99%	2.1049(h)	RSS-Gen Issue 5, § 6.7	19	--	PASS
RF output power	§15.247(b)(3)	RSS-247, § 5.4(d)	14	--	PASS
Emissions in non-restricted frequency bands	§15.247(d)	RSS-247, § 5.5	20	--	PASS
Radiated Band-Edge emissions	§15.205(b) §15.247(d)	RSS-Gen: Issue 5 §8.9, §8.10 RSS-247, § 5.5	30	--	PASS
Power spectral density	§15.247(e)	RSS-247, § 5.2(b)	16	--	PASS
Radiated field strength emissions below 30 MHz	§15.205(a) §15.209(a)	RSS-Gen: Issue 5 §8.9 Table 6	22	--	PASS
Radiated field strength emissions 30 MHz – 1GHz	§15.209 §15.247(d)	RSS-Gen: Issue 5 §8.9 Table 5 RSS-247, § 5.5	26	--	PASS
Radiated field strength emissions above 1 GHz	§15.209(a) §15.247(d)	RSS-Gen: Issue 5: §8.9 Table 5+7 RSS-247, § 5.5	28	--	PASS
AC-Power Lines Conducted Emissions	§15.207	RSS-Gen Issue 5: § 8.8, Table 4	32	--	PASS

PASS	The EUT complies with the essential requirements in the standard.
FAILED	The EUT does not comply with the essential requirements in the standard.
NP	The test was not performed by the CETECOM Laboratory.
N/A	Not applicable

*The calculation of the measurement uncertainty shows compliance with the "maximum measurement uncertainties" of the tested standard and therefore for result evaluation the stated uncertainties will not be additionally added to the measured results.

1.2. Summary of Test Methods

Test case	Test method
Duty-Cycle	ANSI 63.10:2013, §11.6(b)
Minimum Emission Bandwidth 6 dB	ANSI C63.10:2013, §6.9.2, §11.8
Occupied Channel Bandwidth 99%	ANSI C63.10:2013, §6.9.3
RF output power	ANSI C63.10:2013, §11.9
Power spectral density	ANSI C63.10:2013, §11.10
Emissions in non-restricted frequency bands	ANSI C63.10:2013, §11.11, §6.10.5
Radiated Band-Edge emissions	ANSI C63.10-2013; “Marker-Delta method”, §6.10.5, §11.13
Transmitter Peak output power radiated	Result calculated with measured conducted RF-power value and stated/measured antenna gain for band of interest
Radiated field strength emissions below 30 MHz	ANSI C63.10-2013 §6.3, §6.4
Radiated field strength emissions 30 MHz- 1 GHz	ANSI C63.4-2014 §8.2.3, ANSI C63.10-2013 §6.3, § 6.5
Radiated field strength emissions above 1 GHz	ANSI C63.4-2014 §8.3, ANSI C63.10-2013 §6.3, § 6.6
AC-Power Lines Conducted Emissions	ANSI C63.4-2014 §7, ANSI C63.10-2013 § 6.2

And reference also to Test methods in KDB558074

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. Ninovic Perez
Accreditation scope:	DAkkS Webpage
Test location:	CETECOM GmbH; Im Teelbruch 116; 45219 Essen - Kettwig

2.2 General limits for environmental conditions

Temperature:	22±2 °C
Relative. humidity:	45±15% rH

2.3 Test Laboratories sub-contracted

Company name:	--

2.4 Organizational Items

Order No.:	070-3640004734
Responsible test manager:	Dipl.-Ing. Ninovic Perez
Receipt of EUT:	2019-Nov-06
Date(s) of test:	2019-Nov-25 – 2020-Aug-26
Version of template:	14.2

2.5 Applicant's details

Applicant's name:	Bosch Healthcare Solutions GmbH
Address:	Stuttgarter Str. 130 71332 Waiblingen Baden-Württemberg Germany
Contact Person:	Markus Thürsam
Contact Person's Email:	Markus.Thuersam@de.bosch.com

2.6 Manufacturer's details

Manufacturer's name:	Bosch Healthcare Solutions GmbH
Address:	Please refer to applicant's details

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

Short description*)	PMT Sample No.	EUT	Type	S/N	HW status	SW status
EUT 1	19-1-01374S27	Vivatmo pro (Base Station)	System for quantitative measurement of fractional nitric oxide (FeNO) in human breath	b827eb797911	F09G100168	1.4.0
EUT 2	19-1-01374S25	Vivatmo pro (Base Station)	System for quantitative measurement of fractional nitric oxide (FeNO) in human breath	b827eb034258	F09G100168	1.4.0
EUT 3	19-1-01374S23	Vivatmo pro (Base Station)	System for quantitative measurement of fractional nitric oxide (FeNO) in human breath	b827eb336d24	F09G100168	1.4.0

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

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

Short description*)	PMT Sample No.	Auxiliary Equipment	Type	S/N	HW status	SW status
AE 1	19-1-01374S24_C01	Power Supply Vivatmo pro	UE36LCP-240150SPA	--	--	--
AE 2	--	CAT6, 1m	Ethernet Cable	--	--	--
AE 3	--	Laptop	DELL Latitude E6430	CTC522013	--	Windows 7
AE 4	--	USB Stick	USB Data Stick	--	--	--
AE 5	--	USB Stick	USB Data Stick	--	--	--

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

2.9 Connected cables

Short description*)	PMT Sample No.	Cable type	Connectors	Lenght
CAB 1	--	Ethernet Cable	--	1m

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

2.10 EUT set-ups

set-up no.*)	Combination of EUT and AE	Description
1	EUT 2 + AE 1 + AE 2 + (AE 3)** + AE 4 + AE 5	Used for Radiated measurements
2	EUT 3 + AE 1 + AE 2 + (AE 3)** + AE 4 + AE 5	Used for Radiated measurements
3	EUT 1 + AE 1 + AE 2 + AE 3	Used for Conducted measurements

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

**) AE 3 was placed outside the Chamber after setting the Test mode

2.11 EUT operation modes

EUT operating mode no.*)	Operating modes	Additional information
op. 1	WLAN_TX-Mode	With help of special test Software TX-mode was set-up. We refer to applicants information/papers for details about necessary commands.

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

2.12 Worst case identification

The following WLAN modes were selected for testing after performing the maximum conducted transmitted power tests.

WLAN mode	Data rate
802.11b	2 Mbps
802.11g	9 Mbps
802.11n, 20MHz bandwidth	MCS0

2.13 Test Software

For setting the right test mode a terminal tool **putty v0.74** saved on "**C:\Users\InstallAdmin\Desktop**" of Laptop DELL Latitude E6430 CTC522013 was used to enter the following commands:
cd /home/pi

e.g. b-mode channel 6 2 Mbps

Beispiel Befehlssequenz für „TX“

```
./wl -i wlan0 down
./wl -i wlan0 country ALL
./wl -i wlan0 band b
./wl -i wlan0 chanspec -c 6 -b 2 -w 20 -s 0
./wl -i wlan0 mpc 0
./wl -i wlan0 ampdu 1
./wl -i wlan0 bi 65000
./wl -i wlan0 frameburst 1
./wl -i wlan0 rateset 11b
./wl -i wlan0 up
./wl -i wlan0 txant 0
./wl -i wlan0 antdiv 0
./wl -i wlan0 nrate -r 11
./wl -i wlan0 phy_watchdog 0
./wl -i wlan0 disassoc
./wl -i wlan0 phy_forcecal 1
./wl -i wlan0 phy_activecal
./wl -i wlan0 txpwr1 -1
sleep 3
./wl -i wlan0 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0
```

For more information please refer to documents:
- WICED-MFG203-RIT.pdf
80211-TI305-R.pdf

3 Equipment under test (EUT)

3.1 General Data of Main EUT as Declared by Applicant

Product name	Vivatmo pro (Base Station)	
Kind of product	System for quantitative measurement of fractional nitric oxide (FeNO) in human breath	
Firmware	☐ for normal use	☒ Special version for test execution
	☒ AC Mains	single Line (L1/N) 110 V 60 Hz
	☐ DC Mains	
	☐ Battery	-
EUT sample type	**Production**	
Weight	1350 g	
Size	265 x 213 x 160 mm	
Interfaces/Ports	Ethernet, USB	
For further details refer Applicants Declaration & following technical documents		
For further details regarding radio parameters, please refer to IEEE802.11 Specification		

3.2 Detailed Technical data of Main EUT as Declared by Applicant

Frequency Band	2.4 GHz ISM Band (2400 MHz - 2483.5 MHz)		
MIMO	☐		
Frequency | Channel | B.W. (USA bands only)	☒ WLAN 2.4 GHz 802.11b g n (SISO)	Ch 1 | 2 | 3| 4 | 5 | 6 | 7 Ch. 8| 9| 10 | 11	Bandwidth 20 MHz
	☐ WLAN 2.4 GHz 802.11n (SISO)	Ch 3| 4 | 5 | 6 | 7| 8| 9 | 10 | 11	Bandwidth 40 MHz
802.11b – Mode OFDM Modulation | Data Rates	☒ DBPSK | 1 Mbps ☒ DQPSK | 2 Mbps ☒ CCK-PBCC | 5.5 Mbps / 11 Mbps ☐ ERP-PBCC | 22 Mbps		
802.11g – Mode OFDM Modulation | Data Rates	☒ BPSK | 6 Mbps / 9 Mbps ☒ QPSK | 12 Mbps / 18 Mbps ☒ 16-QAM | 24 Mbps / 36 Mbps ☒ 64-QAM | 48 Mbps / 54 Mbps		
802.11n – Mode OFDM Modulation | Data Rates	☒ HT20(MCS0 to MCS7) | 7.2 / 14.4 / 21.7 / 28.9 / 43.3 / 57.8 / 65 / 72.2 Mbps ☐ HT40(MCS0 to MCS15) | 15/30/45/60/90/120/135/150/180/240/270/300 Mbps		
Other wireless options	☒ Bluetooth LE (not tested within this report) ☒ Bluetooth EDR (not tested within this report)		
Max. Conducted Output Power	b-mode: **17.3** dBm g-mode: **17.1** dBm n-mode(20 MHz): **17** dBm		
EIRP WLAN (Calculated EIRP)	b-mode: **17.3** dBm + **1.5** dBi = **18.8** dBm g-mode: **17.1** dBm+ **1.5** dBi = **18.6** dBm n-mode(20 MHz): **17** dBm + **1.5** dBi = **18.5** dBm		
Antenna Type(s)	Chip Antenna		
Antenna Gain(s)	1.5 dBi		
FCC label attached	No		
Test firmware / software and storage location	terminal tool putty v0.74 saved on “C:\Users\InstallAdmin\Desktop” of Laptop DELL Latitude E6430 / CTC522013		
For further details refer Applicants Declaration & following technical documents			
Description of Reference Document (supplied by applicant)		**Version**	**Total Pages**
AEL-A04 LTCC Antenna Data Sheet		**A2450M000000S007**	**9**

3.3 Modifications on Test sample

Additions/deviations or exclusions	--

4 Measurements

4.1 Duty-Cycle

Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

The necessary duty-cycle correction factor is determined on nominal conditions on middle channel only. It is assumed that no noticeable changes occur when tested on other channels or climatic conditions.

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

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 one channel in each operable frequency-band. It is assumed that no noticeable changes occur when tested on other channels or climatic conditions. The Duty-Cycle was constant, means without variations.

Formula to calculate Duty-Cycle:

Duty cycle calculations: $x = {TX_{ON}}/{(TX_{ON} + TX_{OFF})}$	Duty cycle factor: DC=	Regarding power: $10 * log({1}/{x})$ dB Regarding field strength: $20 * log({1}/{x})$ dB

☐ 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%**

4.1.1 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.1.2 Result

Duty-Cycle [%]	Duty-Cycle correction Field Strength [dB]	Remark
99.155	0.07	No correction needed
99.155	0.07	No correction needed
99.154	0.07	No correction needed
95.899	0.36	Applied on Fieldstrength Emissions
95.897	0.36	Applied on Fieldstrength Emissions
95.9	0.36	Applied on Fieldstrength Emissions
97.047	0.26	Applied on Fieldstrength Emissions
97.046	0.26	Applied on Fieldstrength Emissions
97.045	0.26	Applied on Fieldstrength Emissions

4.2 RF output power

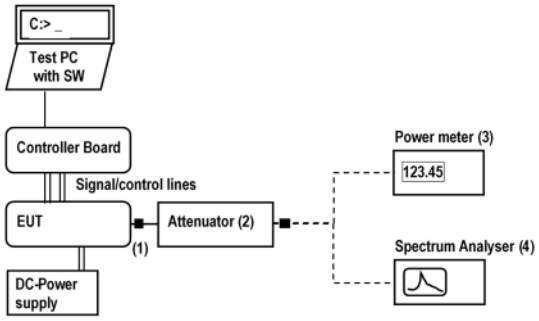
4.2.1 Description of the general test setup and methodology, see below example:

The EUT's RF-signal is coupled out by a suitable antenna coupling connector (1). The signal is first attenuated (2) then connected to power meter (3) or 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.

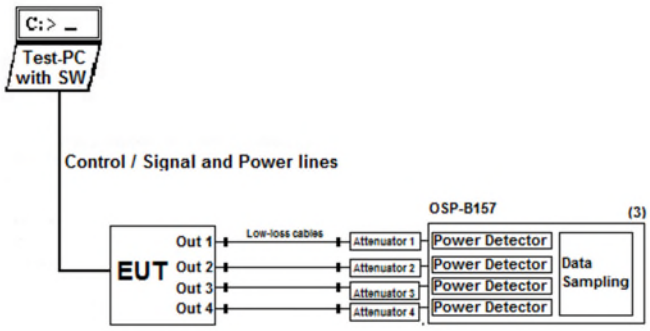
MIMO

The EUT use MIMO technology as it use multiple antennas for receive and transmit. The measurements are performed by using R&S TS8997 (Ref.No. 693) test system which is able to perform measurements simultanuously and time-synchronized on maximum 8 antenna conducted RF-ports. A common trigger ensures the sampling time is minimized so the total power represents a sampling value calculated for all 8-ports simultanuously for each time bin/frame. A high data sampling rate together with a wide band power measurement capability ensures that latest modulation schemes are correctly measured. Therefore testing method Subchapter E1 of KDB662911 is fulfilled. (measure-and-sum technique).

Schematic:



Schematic MIMO:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Measurement is made using Rohde & Schwarz TS8997 test system.

Test method	AVGSA-1 / AVGSA-1 alternative (duty-cycle > 98%)
SISO	☒
MIMO	☐ Summation of values from two antenna ports
Remarks	

The measurement was performed in non-hopping transmission mode with the carrier set to lowest/middle and highest channel.

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

4.2.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.2.3 Limit

Frequency Range [MHz]	Limit [W]	Limit [dBm]	Detector	RBW / VBW [MHz]
2400 - 2483.5	1	30	RMS	20 / 30

4.2.4 Result

Mode	Channel	Frequency [MHz]	Maximum output power [RMS]	Result
b-mode 2M	1	2412	17.1	PASS
b-mode 2M	6	2437	17.0	PASS
b-mode 2M	11	2462	**17.3**	PASS
g-mode 9M	1	2412	16.9	PASS
g-mode 9M	6	2437	16.9	PASS
g-mode 9M	11	2462	**17.1**	PASS
n-mode MCS0	1	2412	16.7	PASS
n-mode MCS0	6	2437	16.6	PASS
n-mode MCS0	11	2462	**17.0**	PASS

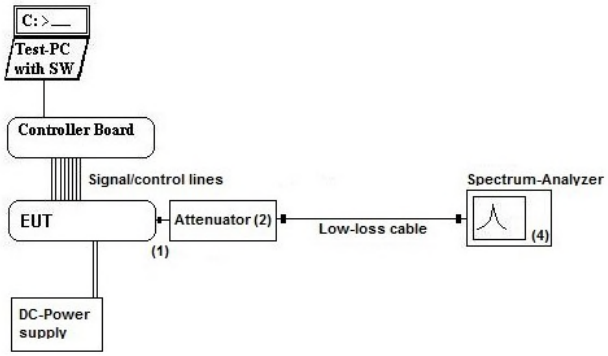
Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.3 Power spectral density

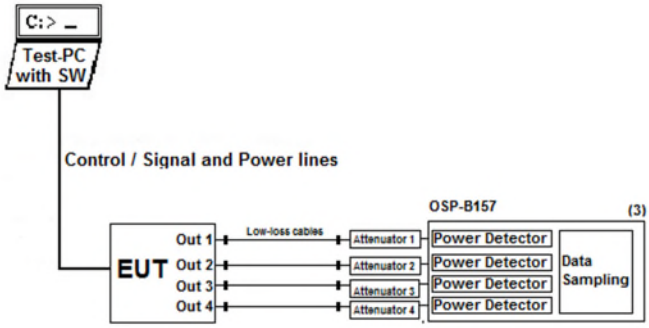
4.3.1 Description of the general test setup and methodology, see below example:

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:



Schematic MIMO:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Measurement is made using Rohde & Schwarz TS8997 test system.

Test method	AVGPSD Method
SISO	☒
MIMO	☐ Summation of values from two antenna ports
Remarks	

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

4.3.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.3.3 Limit

Limit [dBm] @ 3 kHz	Detector [MaxHold]	RBW / VBW [kHz]
<= 8	**RMS**	**3 / 10**

4.3.4 Result

Mode	Channel	Frequency [MHz]	PSD [dBm]	Result
b-mode 2M	1	2412	5.975	PASS
b-mode 2M	6	2437	5.312	PASS
b-mode 2M	11	2462	5.769	PASS
g-mode 9M	1	2412	2.607	PASS
g-mode 9M	6	2437	2.766	PASS
g-mode 9M	11	2462	2.873	PASS
n-mode MCS0	1	2412	2.379	PASS
n-mode MCS0	6	2437	2.198	PASS
n-mode MCS0	11	2462	3.355	PASS

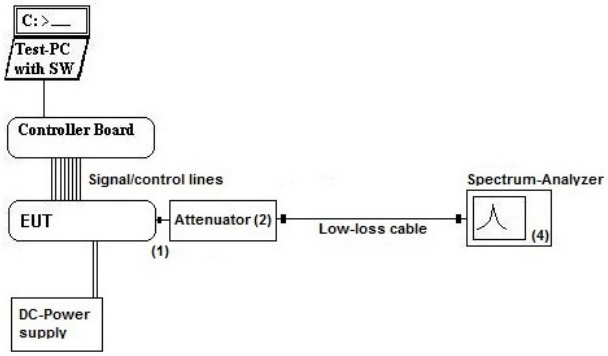
Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.4 Minimum Emission Bandwidth 6 dB

4.4.1 Description of the general test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Measurement is made using Rohde & Schwarz TS8997 test system.

4.4.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.4.3 Limit

Limit [kHz]	Detector [MaxHold]	RBW / VBW [kHz]
>= 500	**MaxPeak**	**100 / 300**

4.4.4 Result

Mode	Channel	Frequency [MHz]	6 dB bandwidth [MHz]	Result
b-mode 2M	1	2412	9.600000	PASS
b-mode 2M	6	2437	9.700000	PASS
b-mode 2M	11	2462	9.750000	PASS
g-mode 9M	1	2412	15.200000	PASS
g-mode 9M	6	2437	15.200000	PASS
g-mode 9M	11	2462	15.200000	PASS
n-mode MCS0	1	2412	15.200000	PASS
n-mode MCS0	6	2437	15.200000	PASS
n-mode MCS0	11	2462	15.200000	PASS

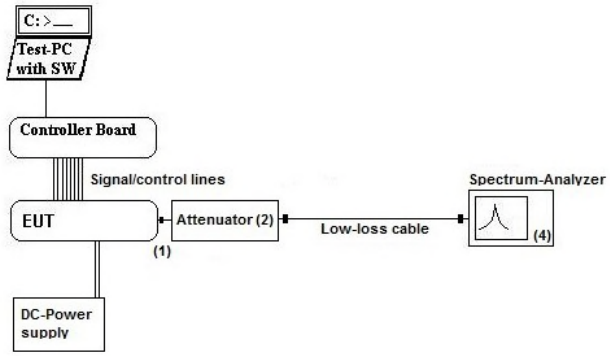
Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.5 Occupied Channel Bandwidth 99%

4.5.1 Description of the general test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Measurement is made using Rohde & Schwarz TS8997 test system.

4.5.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.5.3 Limit

When the occupied bandwidth limit is not stated in the applicable reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

4.5.4 Result

Mode	Channel	Frequency [MHz]	99% Occupied bandwidth [MHz]
b-mode 2M	1	2412	14.100000
b-mode 2M	6	2437	14.100000
b-mode 2M	11	2462	14.100000
g-mode 9M	1	2412	16.400000
g-mode 9M	6	2437	16.500000
g-mode 9M	11	2462	16.400000
n-mode MCS0	1	2412	17.500000
n-mode MCS0	6	2437	17.500000
n-mode MCS0	11	2462	17.500000

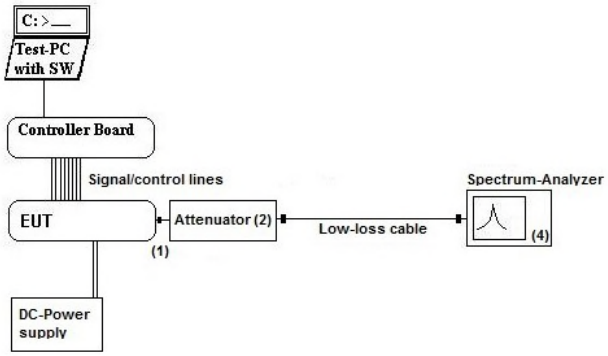
Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.6 Emissions in non-restricted frequency bands

4.6.1 Description of the general conducted test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

The measurements were performed with the RBW set to 100 kHz & maximum carrier level was indicated with MAX-Hold positive peak detector using markers. Then a frequency line was set 20 or 30 dB below this measured maximum carrier level.

Then using RBW 100 kHz & spectrum analyzer span from 150 kHz to 25 GHz in three steps spurious emissions were measured with MAX-Hold positive peak detector.

The sweep time set as long as necessary to capture the full signal burst per hopping channel. The burst on-period is captured by setting appropriate markers in the rising and falling edges.

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

4.6.2 Measurement Location

Test site	120910 - Radio Laboratory 1 (TS 8997)

4.6.3 Limit

Frequency Range [MHz]	Limit [dBc]
0.15 – 25000	-20 (PK) / -30 (AV)

4.6.4 Result

Maximum Level Peak [dBc]

Mode	Channel	Frequency [MHz]	Result
b-mode 2M	1	2412	PASS
b-mode 2M	6	2437	PASS
b-mode 2M	11	2462	PASS
g-mode 9M	1	2412	PASS
g-mode 9M	6	2437	PASS
g-mode 9M	11	2462	PASS
n-mode MCS0	1	2412	PASS
n-mode MCS0	6	2437	PASS
n-mode MCS0	11	2462	PASS

Remark1: every RF-Port tested separatelly in case on MIMO device
Remark2: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

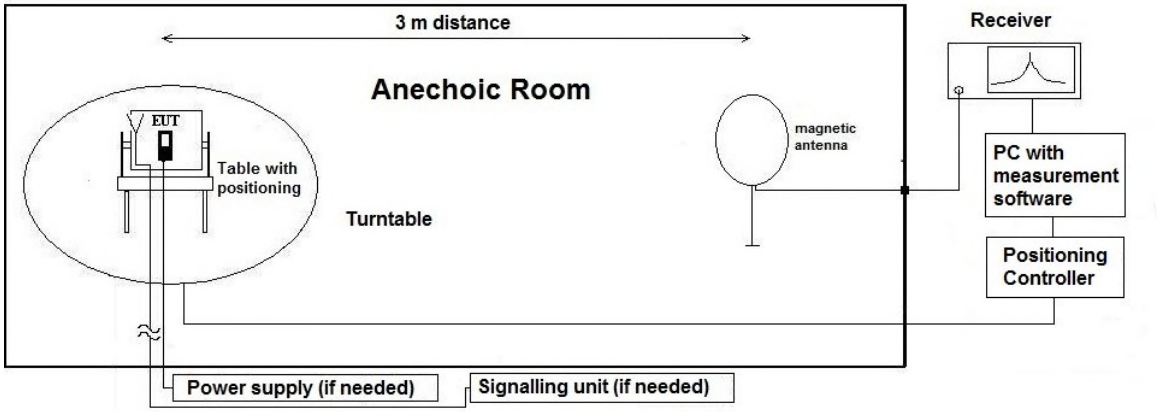
4.7 Radiated field strength emissions below 30 MHz

4.7.1 Description of the general test setup and methodology, see below example:

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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

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 (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_L = Cable loss
D_F = Distance correction factor (if used)
E_C = Electrical field – corrected value
E_R = Receiver reading
G_A = Gain of pre-amplifier (if used)
L_T = Limit
M = Margin

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

4.7.2 Measurement Location

Test site	120901 – SAC1 – Radiated Emission < 1GHz

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< Dnear-field)	2'te Condition (Limit distance bigger dnear-field)	Distance Correction accord. Formula
kHz	9.00E+03	33333.33	5305.17	300		fullfilled	not fullfilled	-80.00
	1.00E+04	30000.00	4774.65			fullfilled	not fullfilled	-80.00
	2.00E+04	15000.00	2387.33			fullfilled	not fullfilled	-80.00
	3.00E+04	10000.00	1591.55			fullfilled	not fullfilled	-80.00
	4.00E+04	7500.00	1193.66			fullfilled	not fullfilled	-80.00
	5.00E+04	6000.00	954.93			fullfilled	not fullfilled	-80.00
	6.00E+04	5000.00	795.78			fullfilled	not fullfilled	-80.00
	7.00E+04	4285.71	682.09			fullfilled	not fullfilled	-80.00
	8.00E+04	3750.00	596.83			fullfilled	not fullfilled	-80.00
	9.00E+04	3333.33	530.52			fullfilled	not fullfilled	-80.00
	1.00E+05	3000.00	477.47			fullfilled	not fullfilled	-80.00
	1.25E+05	2400.00	381.97			fullfilled	not fullfilled	-80.00
	2.00E+05	1500.00	238.73			fullfilled	fullfilled	-78.02
	3.00E+05	1000.00	159.16			fullfilled	fullfilled	-74.49
	4.00E+05	750.00	119.37			fullfilled	fullfilled	-72.00
	4.90E+05	612.24	97.44			fullfilled	fullfilled	-70.23
	5.00E+05	600.00	95.49	30		fullfilled	not fullfilled	-40.00
	6.00E+05	500.00	79.58			fullfilled	not fullfilled	-40.00
	7.00E+05	428.57	68.21			fullfilled	not fullfilled	-40.00
	8.00E+05	375.00	59.68			fullfilled	not fullfilled	-40.00
	9.00E+05	333.33	53.05			fullfilled	not fullfilled	-40.00
MHz	1.00	300.00	47.75			fullfilled	not fullfilled	-40.00
	1.59	188.50	**30.00**			fullfilled	not fullfilled	-40.00
	2.00	150.00	23.87			fullfilled	fullfilled	-38.02
	3.00	100.00	15.92			fullfilled	fullfilled	-34.49
	4.00	75.00	11.94			fullfilled	fullfilled	-32.00
	5.00	60.00	9.55			fullfilled	fullfilled	-30.06
	6.00	50.00	7.96			fullfilled	fullfilled	-28.47
	7.00	42.86	6.82			fullfilled	fullfilled	-27.13
	8.00	37.50	5.97			fullfilled	fullfilled	-25.97
	9.00	33.33	5.31			fullfilled	fullfilled	-24.95
	10.00	30.00	4.77			fullfilled	fullfilled	-24.04
	10.60	28.30	4.50			fullfilled	fullfilled	-23.53
	11.00	27.27	4.34			fullfilled	fullfilled	-23.21
	12.00	25.00	3.98			fullfilled	fullfilled	-22.45
	13.56	22.12	3.52			fullfilled	fullfilled	-21.39
	15.00	20.00	3.18			fullfilled	fullfilled	-20.51
	15.92	18.85	**3.00**			fullfilled	fullfilled	-20.00
	17.00	17.65	2.81			not fullfilled	fullfilled	-20.00
	18.00	16.67	2.65			not fullfilled	fullfilled	-20.00
	20.00	15.00	2.39			not fullfilled	fullfilled	-20.00
	21.00	14.29	2.27			not fullfilled	fullfilled	-20.00
	23.00	13.04	2.08			not fullfilled	fullfilled	-20.00
	25.00	12.00	1.91			not fullfilled	fullfilled	-20.00
	27.00	11.11	1.77			not fullfilled	fullfilled	-20.00
	29.00	10.34	1.65			not fullfilled	fullfilled	-20.00
	30.00	10.00	1.59			not fullfilled	fullfilled	-20.00

4.7.3 Limit

Radiated emissions limits (3 meters)					
Frequency Range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Distance [m]	Detector	RBW [kHz]
0.009 – 0.09	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Pk & Avg	0.2
0.09 – 0.11	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Quasi peak	0.2
0.11 – 0.15	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Pk & Avg	0.2
0.15 – 0.49	2400 / f [kHz]	67.6 – 20Log(f) (kHz)	300	Pk & Avg	9
0.49 – 1.705	24000 / f [kHz]	87.6 – 20Log(f) (kHz)	30	Quasi peak	9
1.705 - 30	30	29.5	30	Quasi peak	9

*Remark: In Canada same limits apply, just unit reference is different

4.7.4 Result

Diagram	Channel	Mode	Maximum Level [dBµV/m] Frequency Range 0.009 – 30 MHz	Result
2.01a	11	WLAN 2.4 GHz b-mode ch11 2 MBit	14.25	Pass
2.01b	11	WLAN 2.4 GHz b-mode ch11 2 MBit	14.54	Pass

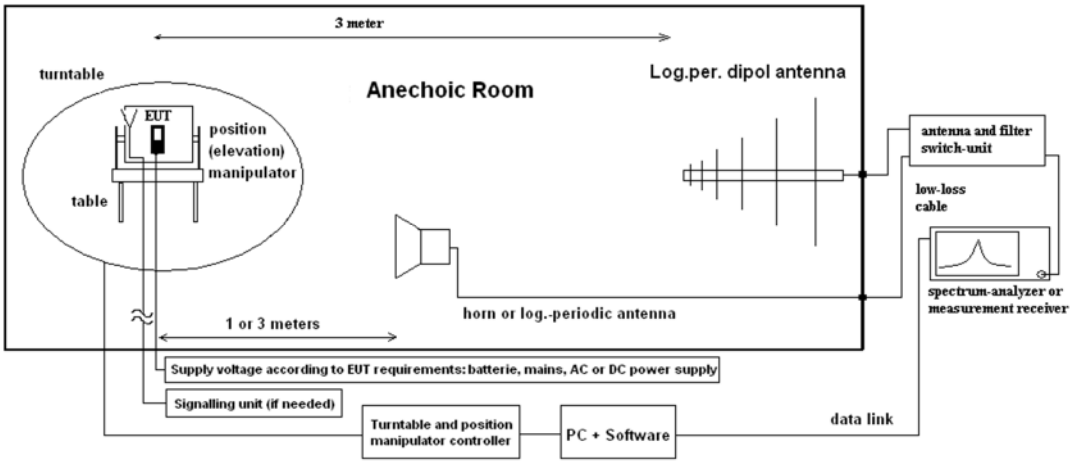
Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.8 Radiated field strength emissions 30 MHz – 1 GHz

4.8.1 Description of the general test setup and methodology, see below example:

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 semi anechoic room (SAR) and 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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

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:

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

$M = L_T - E_C$ (2)

AF = Antenna factor
C_L = Cable loss
D_F = Distance correction factor (if used)
E_C = Electrical field – corrected value
E_R = Receiver reading
G_A = Gain of pre-amplifier (if used)
L_T = Limit
M = Margin

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

4.8.2 Measurement Location

Test site	120902 – SAC1 – Radiated Emission > 1GHz

4.8.3 Limit

Radiated emissions limits (3 meters)				
Frequency Range [MHz]	Limit [µV/m]	Limit [dBµV/m]	Detector	RBW / VBW [kHz]
30 - 88	100	40.0	Quasi peak	100 / 300
88 - 216	150	43.5	Quasi peak	100 / 300
216 - 960	200	46.0	Quasi peak	100 / 300
960 - 1000	500	54.0	Quasi peak	100 / 300

4.8.4 Result

Diagram	Channel	Mode	Maximum Level [dBµV/m] Frequency Range 30 – 1000 MHz	Result
3.01b	11	WLAN 2.4 GHz b-mode ch11 2 MBit	32.23	Pass
3.01a	11	WLAN 2.4 GHz b-mode ch11 2 MBit	34.12	Pass
3.02a	6	WLAN 2.4GHz g-mode ch6 9 MBit	31.56	Pass
3.02a	6	WLAN 2.4 GHz g-mode ch6 9 MBit	33.25	Pass
3.03a	1	WLAN 2.4 GHz n-mode ch1 MCS0	32.10	Pass
3.03b	1	WLAN 2.4 GHz n-mode ch1 MCS0	32.16	Pass

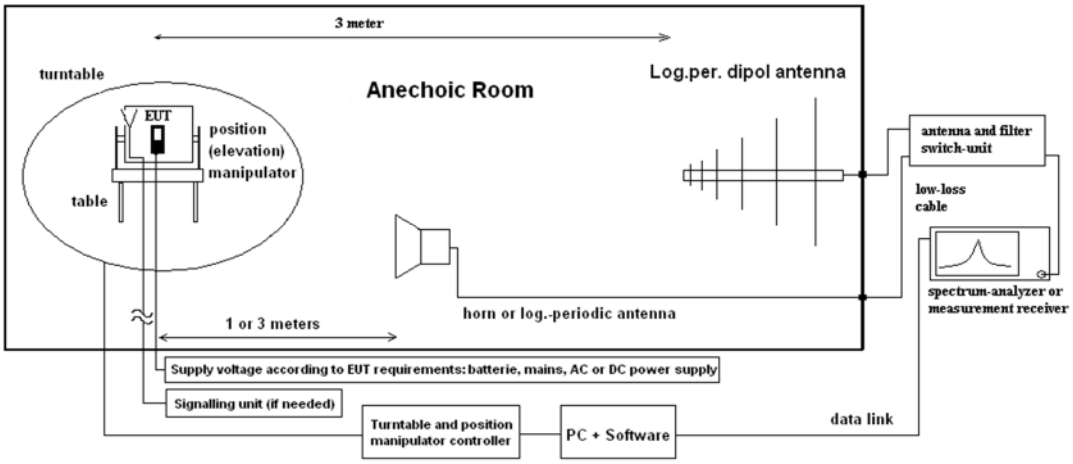
Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.9 Radiated field strength emissions above 1 GHz

4.9.1 Description of the general test setup and methodology, see below example:

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 18-1-4:2010 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:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

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 or three axis scan for portable/small equipment.

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

Formula:

$E_C = E_R + A_F + C_L + D_F - G_A$ (1)

$M = L_T - E_C$ (2)

E_C = Electrical field – corrected value
E_R = Receiver reading
M = Margin
L_T = Limit
A_F = 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.

4.9.2 Measurement Location

Test site 1 – 18 GHz	120904 - FAC1 - Radiated Emissions
Test site 18 – 26.5 GHz	120907 - FAC2

4.9.3 Limit

Radiated emissions limits (3 meters)				
Frequency Range [MHz]	**Limit [µV/m]**	**Limit [dBµV/m]**	**Detector**	**RBW / VBW [kHz]**
Above 1000	500	54	Average	1000 / 3000
Above 1000	5000	74	Peak	1000 / 3000

4.9.4 Result

Diagram	Channel	Mode	Maximum Level [dBµV/m] Frequency Range 1 – 18 GHz	Result
4.01a	11	b-mode | 2 Mbit| ch11	63.036 (PK), 50.210 (AV)	Pass
4.02a	6	g-mode | 9 MBit| ch06	62.526 (PK), 50.512 (AV)	Pass
4.03a	1	n-mode | MCS0 | ch01	63.127 (PK), 50.229 (AV)	Pass

Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

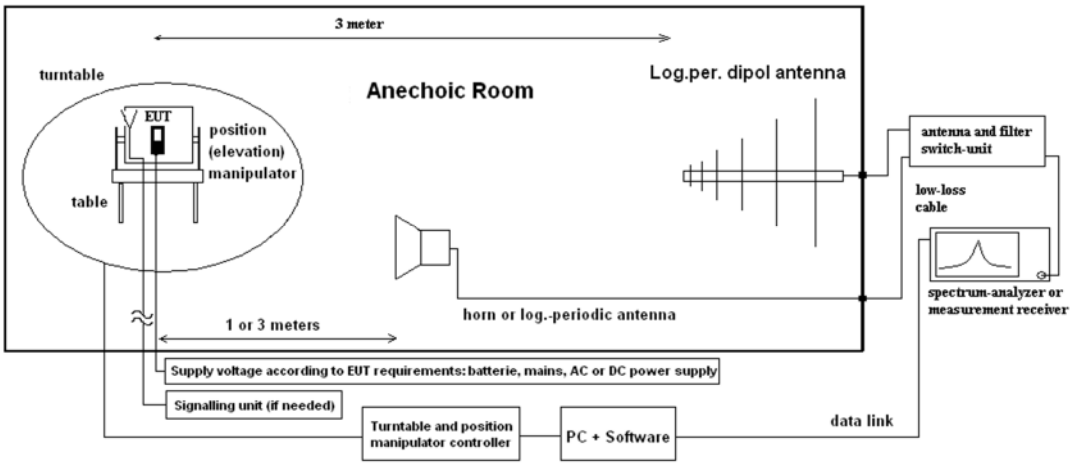
Diagram	Channel	Mode	Maximum Level [dBµV/m] Frequency Range 18 – 26.5 GHz	Result
4.01b	11	b-mode | 2 Mbit| ch11	56.52 (PK), 44.92 (AV)	Pass
4.02b	6	g-mode | 9 MBit| ch06	56.54 (PK), 44.82 (AV)	Pass
4.03b	1	n-mode | MCS0 | ch01	56.42 (PK), 45.08 (AV)	Pass

Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.10 Radiated Band-Edge emissions

4.10.1 Description of the general test setup and methodology, see below example:

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

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 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

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

4.10.2 Measurement Location

Test site	120904 - FAC1 - Radiated Emissions

4.10.3 Limit

Frequency Range [MHz]	Pk Limit [dBc]	Avg Limit [dBc]	Avg Limit [dBµV/m]	Pk Limit [dBµV/m]	Detector	RBW / VBW [kHz]
Below 2390	-	-	54	74	Average / Peak	100 / 300
Above 2483.5	-	-	54	74	Average / Peak	1000 / 3000
2390 - 2400	-20	-	-	-	Peak	100 / 300
2390 - 2400	-	-30	-	-	Average	100 / 300

4.10.4 Result

Non-restricted bands near-by

Diagram	Channel	Mode	Peak [dBc]	Average [dBc]	Result
9.01a	01	b-mode | 2 Mbit	46.40	46.46	Pass
9.02a	01	g-mode | 9 Mbit	21.40	21.04	Pass
9.03a	01	n-mode | MCS0	31.88	33.12	Pass

Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

Restricted bands near-by

Diagram	Channel	Mode	Peak [dBµV/m]	Average [dBµV/m]	Result
9.01b	11	b-mode | 2 Mbit	59.80	48.22	Pass
9.02b	11	g-mode | 9 Mbit	63.35	49.79	Pass
9.03b	11	n-mode | MCS0	62.59	48.78	Pass

Remark1: Average value corrected with Duty Cycle - Factor
Remark2: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

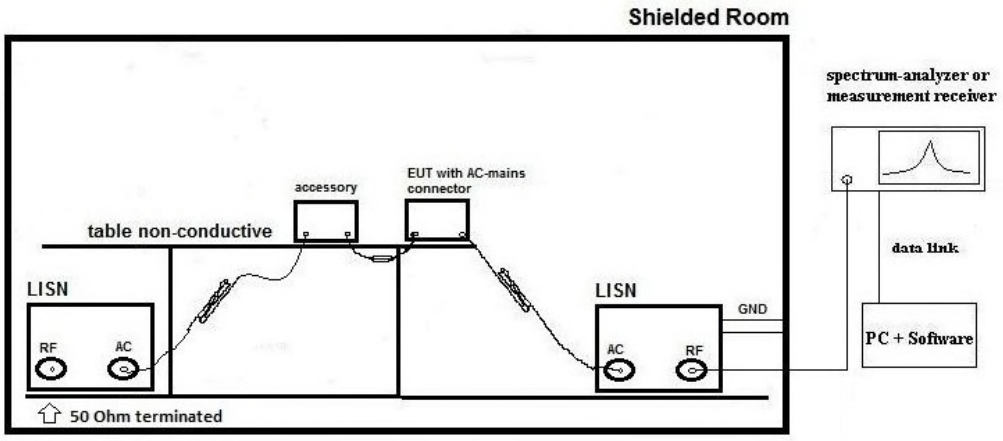
4.11 AC-Power Lines Conducted Emissions

4.11.1 Description of the general test setup and methodology, see below example:

The radio frequency voltage conducted back into the AC power line in the frequency range 150 kHz to 30 MHz has to be investigated.
Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range.
A 50 Ohm / 50 µH line impedance stabilization network (LISN) is used coupling the interface to the measurement equipment.
The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the ground plane. The measuring instrument is connected to the coaxial output of the LISN.

Tabletop devices were set-up on an 80 cm height above reference ground plane, floor standing equipment 10 cm raised above ground plane.
Measurements have been performed on each phase line and neutral line of the devices AC-power lines.
The EUT was power supplied with 120 V/60 Hz. The EUT was tested in the defined operating mode
and installed (connected) to accessory equipment according the general description of use given by the applicant.

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

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

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

Formula:

$V_C = V_R + C_L$ (1)
$M = L_T - V_C$ (2)

V_C = measured Voltage –corrected value
V_R = Receiver reading
C_L = Cable loss
M = Margin
L_T = Limit

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

4.11.2 Measurement Location

Test site	120919 – Conducted Emissions

4.11.3 Limit

Frequency Range [MHz]	QUASI-Peak [dBµV]	AVERAGE [dBµV]
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

4.11.4 Result

Diagram	Mode	Power Line	Max [dBµV]	Detector	Result
1.01	b-mode | 2 Mbit | ch11	N/L1	51.92	Peak	Pass
1.02	g-mode | 9 Mbit | ch06	N/L1	43.67	QuasiPeak	Pass
1.03	n-mode | MCS0 | ch01	N/L1	23.01	QuasiPeak	Pass

Remark: for more informations and graphical plot see annex A1 **CETECOM_TR19_1_0137401T05a_C01_A1**

4.12 Results from external laboratory

None	-

4.13 Opinions and interpretations

None	-

4.14 List of abbreviations

None	-

5 Equipment lists

ID	Description	Manufacturer	SerNo	Cal due date
	120904 - FAC1 - Radiated Emissions			
20341	Digital Multimeter Fluke 112	Fluke Deutschland GmbH	81650455	2022-May-25
20720	EMC32 [FAC]	Rohde & Schwarz Messgerätebau GmbH	V10.xx	--
20489	EMI Test Receiver ESU40	Rohde & Schwarz Messgerätebau GmbH	1000-30	2022-May-13
20020	Horn Antenna 3115 (Subst 1)	EMCO Elektronik GmbH	9107-3699	2021-Jul-19
20302	Horn Antenna BBHA9170 (Meas 1)	Schwarzbeck Mess-Elektronik OHG	155	2023-Apr-15
20549	Log.Per-Antenna HL025	Rohde & Schwarz Messgerätebau GmbH	1000060	2021-Jul-31
20611	Power Supply E3632A	Agilent Technologies Deutschland GmbH	KR 75305854	--
20338	Pre-Amplifier 100MHz - 26GHz JS4-00102600-38-5P	Miteq Inc.	838697	--
20484	Pre-Amplifier 2,5GHz - 18GHz AMF-5D-02501800-25-10P	Miteq Inc.	1244554	--
20287	Pre-Amplifier 25MHz - 4GHz AMF-2D-100M4G-35-10P	Miteq Inc.	379418	--
20439	UltraLog-Antenna HL 562	Rohde & Schwarz Messgerätebau GmbH	100248	2023-Mar-10
	120910 - Radio Laboratory 1 (TS 8997)			
20805	Open Switch and control Platform OSP B157WX 40GHz 8Port Switch	Rohde & Schwarz Messgerätebau GmbH	101264	2023-May-13
20691	Open Switch and control Platform OSP120	Rohde & Schwarz Messgerätebau GmbH	101056	2023-May-13
	120907 - FAC2			
20302	Horn Antenna BBHA9170 (Meas 1)	Schwarzbeck Mess-Elektronik OHG	155	2023-Apr-15
20732	Signal- and Spectrum Analyzer FSW67	Rohde & Schwarz Messgerätebau GmbH	104023	2021-May-27
	120919 - Conducted Emission			

ID	Description	Manufacturer	SerNo	Cal due date
20300	AC - LISN (50 Ohm/50µH, 1-phase) ESH3-Z5	Rohde & Schwarz Messgerätebau GmbH	892 239/020	2021-May-13
20005	AC - LISN 50 Ohm/50µH ESH2-Z5	Rohde & Schwarz Messgerätebau GmbH	861741/005	2021-May-13
20468	Digital Multimeter Fluke 112	Fluke Deutschland GmbH	90090455	2021-May-16
20377	EMI Test Receiver ESCS30	Rohde & Schwarz Messgerätebau GmbH	100160	2021-May-12
20536	Impedance Stabilization Network ISN ST08	Teseq GmbH	25867	2023-May-20
20533	Impedance Stabilization Network ISN T200A	Teseq GmbH	25706	2023-May-20
20534	Impedance Stabilization Network ISN T400A	Teseq GmbH	24881	2023-May-20
20541	Impedance Stabilization Network ISN T8-Cat6	Teseq GmbH	26373	2023-May-20
20535	Impedance Stabilization Network ISN T800	Teseq GmbH	26321	2023-May-20
20099	Passive Voltage Probe ESH2-Z3	Rohde & Schwarz Messgerätebau GmbH	299.7810.52	2021-May-16
20100	passive voltage probe TK 9416	Schwarzbeck Mess-Elektronik OHG	without	2021-May-16
20033	RF-current probe (100kHz-30MHz) ESH2-Z1	Rohde & Schwarz Messgerätebau GmbH	879581/18	2021-May-23
20373	Single-Line V-Network (50 Ohm/5µH) ESH3-Z6	Rohde & Schwarz Messgerätebau GmbH	100535	2021-May-13
20007	Single-Line V-Network (50 Ohm/5µH) ESH3-Z6	Rohde & Schwarz Messgerätebau GmbH	892563/002	2021-May-13
20556	Thermo-/Hygrometer WS-9400	Conrad Electronic GmbH	--	--
20051	VHF-Current Probe 20-300 MHz ESV-Z1	Rohde & Schwarz Messgerätebau GmbH	872421	2021-May-16

6 Measurement Uncertainty valid for conducted/radiated measurements

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 contribution to the overall uncertainty according its statistical distribution calculated.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%						Remarks
Conducted emissions (U_{CISPR})	-	9 kHz - 150 kHz 150 kHz - 30 MHz	4.0 dB 3.6 dB						-
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 - 26.5 GHz	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 - 12.75 GHz	1.48	N/A	1.51	N/A	1.43	--	
		12.75 GHz – 18 GHz	1.81	N/A	1.83	N/A	1.77	--	
		18 GHz - 26.5 GHz	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	5.01dB						Magnetic field strength
		30 MHz - 1 GHz 1 GHz - 18 GHz 18-26.5 GHz	5.83 dB 4.91 dB 5.06 dB						Electrical Field strength

7 Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2020-Nov-25
C01	Updated maximum level in chapter 4.9, marker set on diagrams in annex 1	2021-Jun-09
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End Of Test Report