

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CWLAN_RM-681V_10.docx	Date of Report:	14-Jul-2011
Number of pages:	15	Customer's Contact person:	Swapna Murala
Testing laboratory:	TCC Nokia Tampere Laboratory P.O. Box 68 Sinitaival 5 FIN-33720 TAMPERE, FINLAND Tel. +358 (0) 7180 46800 Fax. +358 (0) 7180 46880	Customer:	Nokia Corporation Beacon Hill Road Church Crookham, Hampshire United Kingdom, GU52 8DY Tel. +44 1252 611000 Fax. +44
FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-681V / AC charger AC-31 VERTU / Data cable CA-101V / Headset WH-1V		
FCC ID:	P7QRM-681V	IC:	4299A-RM681V
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), Public Notice DA 00-705, DTS procedures KDB 558074, IC standards, RSS-210 (Issue 8, December 2010). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
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		
Date and signature for the contents:			

Kalle Hannila, Engineer, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	27-May-2011
Testing completed	2-Jun-2011
The customer's contact person	Swapna Murala
Test Plan referred to	T:\Projects\RM-696\TestPlan\RS_testplan_RM-696.xls
Notes	-
Document name	T:\Projects\RM-681\EMC\FCC15CWLAN_RM-681V_10.docx

1.1. EUT and Accessory Information

The EUT is a 11-band mobile phone:

GSM850/900/1800/1900/GPRS/EGPRS/Monopole without GND reflector (GSM/WCDMA)

WCDMA I/II(1900)/IV(1700)/V(850)/VIII/HSUPA/HSUPA/Monopole without GND reflector (GSM/WCDMA)

WLAN/Bluetooth

The EUT is tested with maximum rated TX power, modulated with pseudo random bit sequence (PRBS9).

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-681V	004402132008362	3000	-	021.611	42588
AC charger	AC-31 VERTU	091314-11	-	-	-	42590
Data cable	CA-101V	0730642935501301689	-	-	-	42591
Headset	WH-1V	0694886020211100106	-	-	-	42592

1.2. Summary of Test Results

WLAN:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8.4 (4)	Conducted peak output power	-
15.247(d)	A8.5	Band edge compliance of RF emissions	PASSED
15.247(d)	A8.5	Spurious RF conducted emissions	-
15.247(d), 15.209	A8.5	Spurious radiated emissions	PASSED
15.207	7.2.2	AC powerline conducted emissions	-
15.247(a)(2)	A8.2 (a)	6dB(bandwidth)	-
15.247(e)	A8.2 (b)	Power spectral density	-

PASSED

FAILED

NP

The EUT complies with the essential requirements in the standard.

The EUT does not comply with the essential requirements in the standard.

The test was not performed by the TCC Nokia Laboratory.

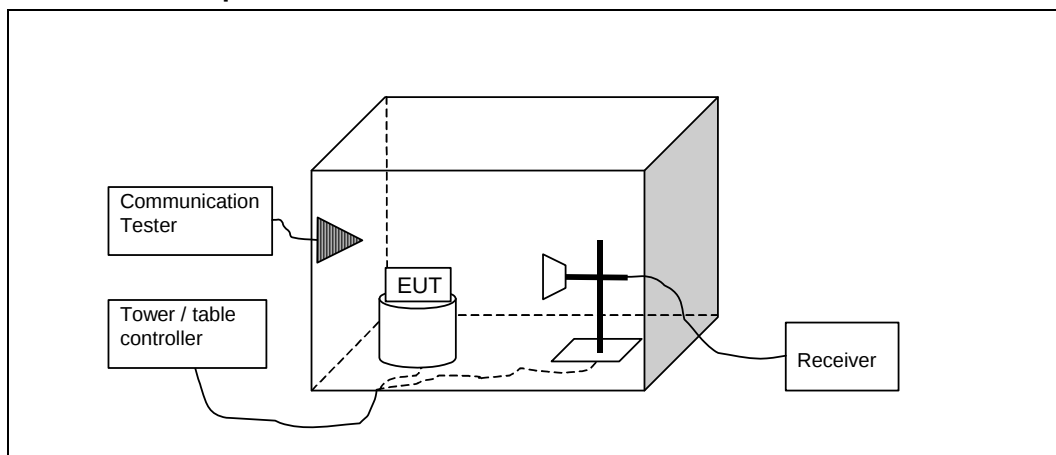
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2. Band edge compliance of RF emissions (FCC §15.247(d), RSS-210 A8.5)

EUT with DUT number	RM-681V, DUT 42588
Accessories with DUT numbers	AC-31 VERTU, DUT 42590 ; CA-101V, DUT 42591 ; WH-1V, DUT 42592
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 45 / 101.6
Date of measurements	01-Jun-2011
Measured by	Hannu Söderholm

2.1.1 Test Setup



2.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit Average [dBμV/m]	Limit Peak [dBμV/m]
Below 2390 and above 2483.5	<=54	<=74

2.3. WLAN Test results

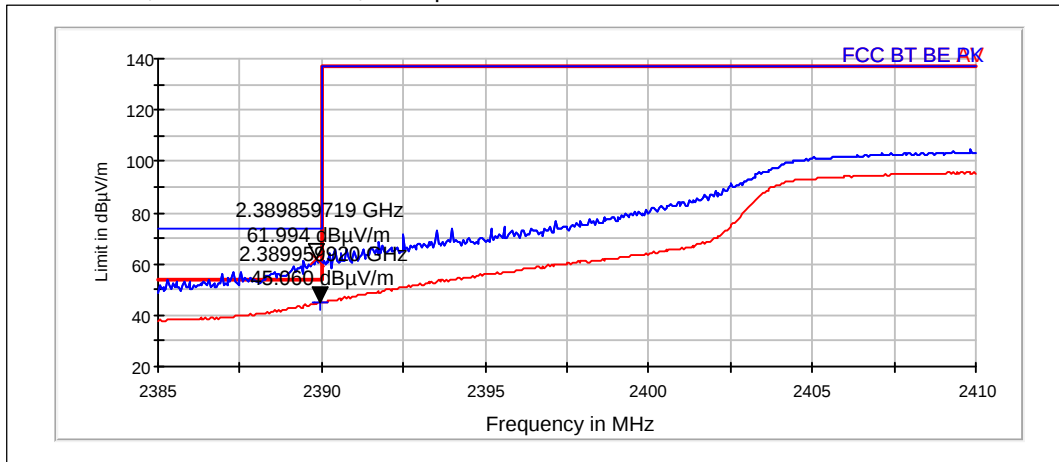
Average (RBW: 1 MHz, VBW: 1 MHz)

Channel / f_c [MHz]	E [dB μ V/m]	Result
1 / 2412 (OFDM, BPSK, 6)	45.06	PASSED
11 / 2462 (OFDM, BPSK, 6)	52.54	PASSED
1 / 2412 (DSSS, QSPK, 11)	35.78	PASSED
11 / 2462 (DSSS, QPSK, 11)	42.46	PASSED
1 / 2412 (802.11n HT20 MCS 0)	45.49	PASSED
11 / 2462 (802.11n HT20 MCS 0)	53.56	PASSED

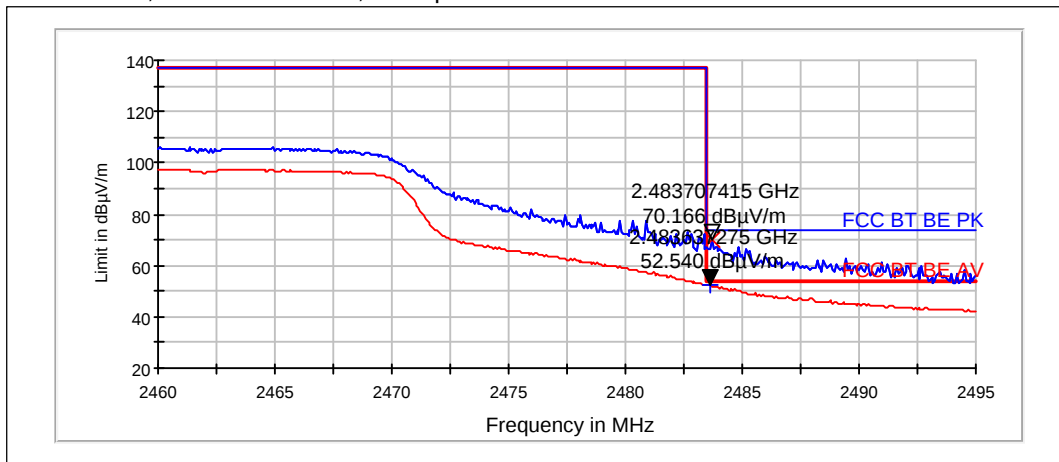
Peak (RBW: 1 MHz, VBW: 1 MHz)

Channel / f_c [MHz]	E [dB μ V/m]	Result
1 / 2412 (OFDM, BPSK, 6)	61.99	PASSED
11 / 2462 (OFDM, BPSK, 6)	70.17	PASSED
1 / 2412 (DSSS, QSPK, 11)	46.77	PASSED
11 / 2462 (DSSS, QPSK, 11)	52.09	PASSED
1 / 2412 (802.11n HT20 MCS 0)	64.06	PASSED
11 / 2462 (802.11n HT20 MCS 0)	70.56	PASSED

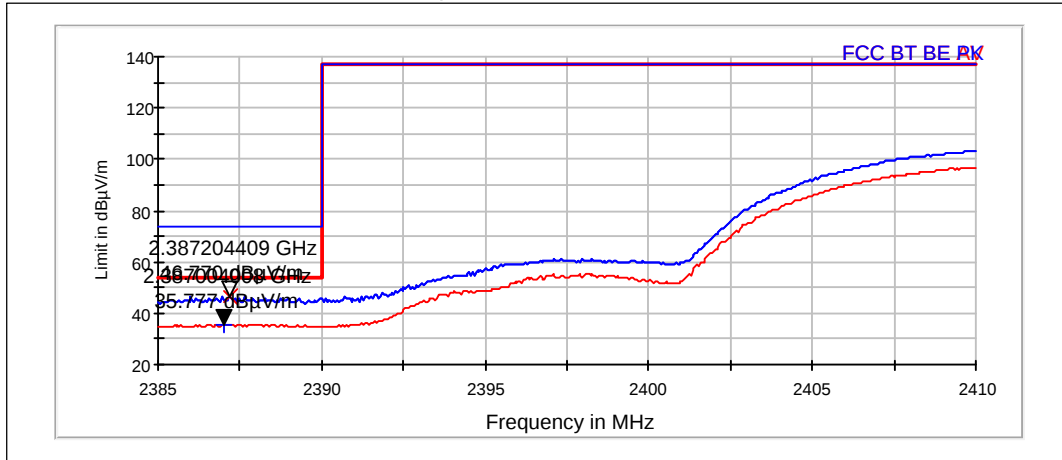
OFDM mode, BPSK modulation, 6 Mbps data rate. Channel 1 / 2412 MHz



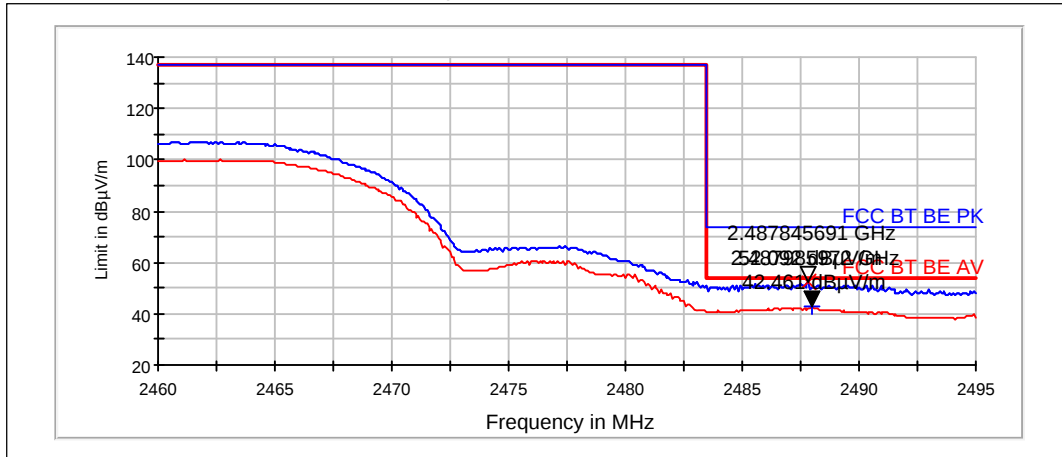
OFDM mode, BPSK modulation, 6 Mbps data rate. Channel 11 / 2462 MHz



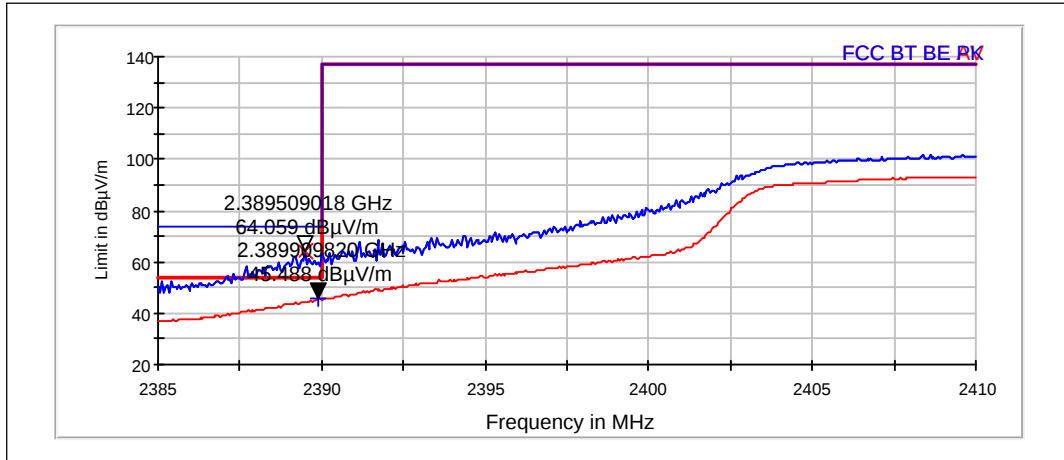
DSSS mode, QSPK modulation, 11 Mbps data rate. Channel 1 / 2412 MHz



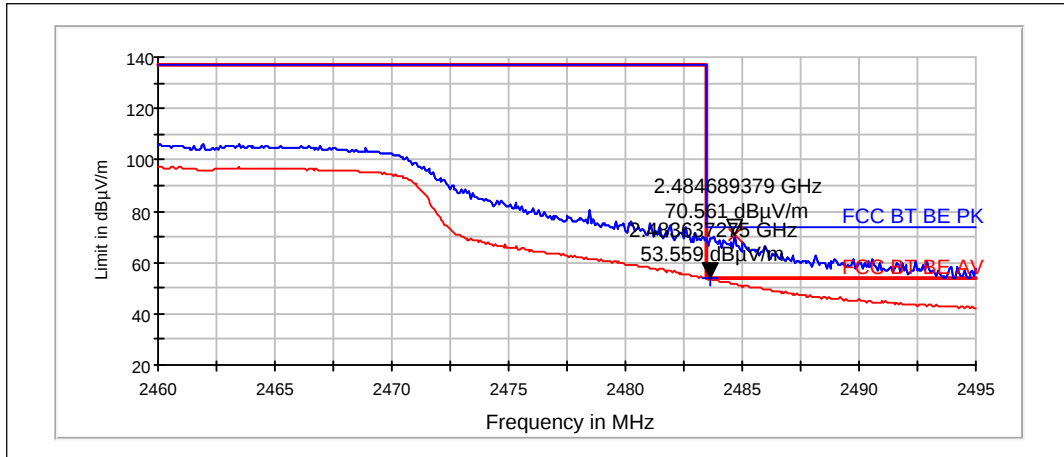
DSSS mode, QPSK modulation, 11 Mbps data rate. Channel 11 / 2462 MHz



802.11n HT20 MCS 0, Channel 1 / 2412 MHz



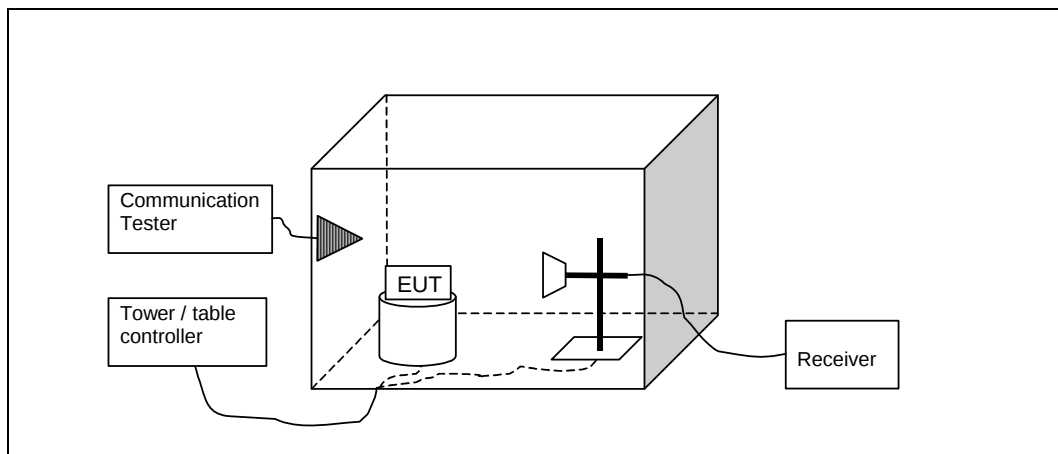
802.11n HT20 MCS 0, Channel 11 / 2462 MHz



3. Spurious radiated emissions (FCC §15.247(d), §15.209, RSS-210 A8.5)

EUT with DUT number	RM-681V, DUT 42588
Accessories with DUT numbers	AC-31 VERTU, DUT 42590 ; CA-101V, DUT 42591 ; WH-1V, DUT 42592
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21-23 / 47-50 / 99.2-99.8
Date of measurements	01.. 02-Jun-2011
Measured by	Hannu Söderholm

3.1.1 Test Setup



3.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [\mu V/m] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [$\mu V/m$]	Limit [dB $\mu V/m$]	Detector
30 - 88	100	40	Quasi peak
88 – 216	150	43.5	Quasi peak
216 – 960	200	46	Quasi peak
960 – 1000	500	54	Quasi peak
Above 1000	500	54	Average
Above 1000	5000	74	Peak

3.3. WLAN Test results

3.3.1 OFDM, 6Mbps

Channel 1 / 2412 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824.5	40.71	108.48	43.39	-2.68	HORIZONTAL	PASSED
7237	44.53	168.442	43.39	1.14	VERTICAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824.5	27.53	23.801	30.21	-2.68	HORIZONTAL	PASSED
7237	31.05	35.666	29.91	1.14	VERTICAL	PASSED

Channel 7 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
56.332	23.37	14.745	55.36	-31.99	HORIZONTAL	PASSED
56.543	23.58	15.108	55.63	-32.05	HORIZONTAL	PASSED
56.746	30.33	32.836	62.44	-32.11	HORIZONTAL	PASSED
56.762	28.27	25.915	60.38	-32.11	HORIZONTAL	PASSED
56.774	31.49	37.519	63.61	-32.12	HORIZONTAL	PASSED
56.985	29.3	29.181	61.48	-32.18	HORIZONTAL	PASSED
56.995	31.36	36.97	63.54	-32.18	HORIZONTAL	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
3905.611	40.72	108.63	43.39	-2.67	VERTICAL	PASSED
3929.56	40.58	106.93	43.25	-2.67	HORIZONTAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
3905.611	27.46	23.605	30.13	-2.67	VERTICAL	PASSED
3929.56	27.61	24.024	30.28	-2.67	HORIZONTAL	PASSED

Channel 11 / 2462 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4925.9	42.18	128.469	44.08	-1.9	VERTICAL	PASSED
7387.4	44.27	163.531	42.73	1.54	VERTICAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4925.9	29.3	29.168	31.2	-1.9	VERTICAL	PASSED
7387.4	31.24	36.492	29.7	1.54	VERTICAL	PASSED

3.3.2 DSSS, 11Mbps

Channel 1 / 2412 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824	40.24	102.79	42.86	-2.62	HORIZONTAL	PASSED
7237.3	43.87	156.189	42.73	1.14	VERTICAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4824	27.63	24.066	30.25	-2.62	HORIZONTAL	PASSED
7237.3	30.84	34.846	29.7	1.14	VERTICAL	PASSED

Channel 7 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
33.58	30.75	34.467	53.55	-22.8	VERTICAL	PASSED
33.646	21.01	11.233	43.83	-22.82	VERTICAL	PASSED
33.7	31.18	36.212	54.02	-22.84	VERTICAL	PASSED
35.497	31.06	35.715	54.62	-23.56	VERTICAL	PASSED
56.564	30.2	32.374	62.25	-32.05	HORIZONTAL	PASSED
56.656	29.63	30.301	61.71	-32.08	HORIZONTAL	PASSED
56.855	29.32	29.242	61.46	-32.14	HORIZONTAL	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
3917.231	40.45	105.305	43.12	-2.67	VERTICAL	PASSED
4883.968	47.81	245.669	49.99	-2.18	VERTICAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
3917.231	27.43	23.51	30.1	-2.67	VERTICAL	PASSED
4883.968	34.06	50.455	36.24	-2.18	VERTICAL	PASSED

Channel 11 / 2462 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4925.7	42.04	126.488	43.94	-1.9	VERTICAL	PASSED
7384.1	43.63	151.792	42.11	1.52	HORIZONTAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4925.7	29.12	28.576	31.02	-1.9	VERTICAL	PASSED
7384.1	31.04	35.641	29.52	1.52	HORIZONTAL	PASSED

3.3.3 802.11n HT20 MCS 0

Channel 1 / 2412 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4823.2	41.04	112.707	43.66	-2.62	VERTICAL	PASSED
7237.9	43.75	154.01	42.61	1.14	HORIZONTAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4823.2	27.37	23.372	29.99	-2.62	VERTICAL	PASSED
7237.9	30.78	34.586	29.64	1.14	HORIZONTAL	PASSED

Channel 7 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
31.296	25.58	19.004	47.48	-21.9	VERTICAL	PASSED
33.64	30.99	35.432	53.81	-22.82	VERTICAL	PASSED
34.957	30.58	33.799	53.92	-23.34	VERTICAL	PASSED
34.971	31.16	36.158	54.5	-23.34	VERTICAL	PASSED
35.03	31.44	37.304	54.81	-23.37	VERTICAL	PASSED
35.102	25.04	17.863	48.44	-23.4	VERTICAL	PASSED
35.568	24.95	17.689	48.53	-23.58	VERTICAL	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
3903.204	40.44	105.233	43.11	-2.67	VERTICAL	PASSED
3937.472	40.57	106.758	43.26	-2.69	HORIZONTAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
3903.204	27.28	23.115	29.95	-2.67	VERTICAL	PASSED
3937.472	27.37	23.356	30.06	-2.69	HORIZONTAL	PASSED

Channel 11 / 2462 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.4	42.16	128.189	44.08	-1.92	VERTICAL	PASSED
7387.1	44.27	163.493	42.73	1.54	VERTICAL	PASSED

Average(RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Polarisation	Result
4924.4	29.15	28.678	31.07	-1.92	VERTICAL	PASSED
7387.1	31.03	35.616	29.49	1.54	VERTICAL	PASSED

4. Test Equipment

4.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38112	Power supply	6632A	Agilent	22/24/27, 15C
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15B
OM06312	Signal Generator	E4422B	Agilent	22/24
TM37678	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
TM37773	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
TM30600	Impulse limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
TM26491	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum Analyzer	FSU26	R&S	22/24/27, 15C
TM22806	Battery	BAT 20/E	Fiskars	15C, 15B
TM22805	UPS	PS 20/1.2	Fiskars	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
-	Temperature test chamber	VT 4002	Vötsch	22/24
2058	Receiver	ESPC	R&S	15C, 15B
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
2002	Communication Tester	CMU200	R&S	22/24/27
2009	LISN 50 µH	ENV216	R&S	15C, 15B
2010	LISN 50 µH	ENV216	R&S	15C, 15B
2012	Power splitter	11667B	Agilent	22/24/27, 15C
2013	Attenuator	8493C	Agilent	22/24/27, 15C
2014	Attenuator	8493C	Agilent	22/24/27, 15C
2019	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2020	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E

4.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15B
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15B
TM38323	Preamplifier	PA-02 18-26 GHz	EMC Automation	22/24/27, 15C, 15B
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM26497	Antenna	3115	Emco	22/24/27, 15C, 15B
TM37678	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
TM37773	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
TM38845	Receiver	ESIB 26	R&S	22/24/27, 15C, 15B
-	Antenna	HL562	R&S	22/24/27, 15C, 15B
-	Turntable	2188	EMCO	22/24/27, 15C, 15B
-	Turntable controller	2090	EMCO	22/24/27, 15C, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 15B
-	Mini mast	2075-2	ETS Lindgren	22/24/27, 15C, 15B
TM38843	Mini mast	2075	Emco	22/24/27, 15C, 15B
TM38842	Antenna mast controller	2090	Emco	22/24/27, 15C, 15B
TM30643	LISN 50 μ H	LISN-5-20-2	FCC	22/24/27, 15C, 15B
TM30644	LISN 50 μ H	LISN-5-20-2	FCC	22/24/27, 15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C, 15B
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
TM39180	Laser distance meter	Disto Pro	Leica	22/24/27, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	Miteq	22/24/27, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	Miteq	22/24/27, 15C, 15B
TM30599	Semi anechoic chambre	UNKNOWN	TDK	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	-	22/24/27, 15C, 15B
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	22/24/27, 15C, 15B
-	High pass filter	WHKX 1.6/15G-12SS	Wainwright	22/24/27, 15C, 15B
TM37545	Tunable notch filter	800.0/960.0-0.2/40-8SSK	Wainwright	22
TM26512	Tunable notch filter	WRCD1850/1910-0.2/40-10SSK	Wainwright	24
-	Band reject filter	WRCG1877/1883-1870/1890-40/6EE	Wainwright	24
-	Band reject filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
-	Band reject filter	WRCG832/838-825/848-40/5SS	Wainwright	22
TM23892	Controller	G-1000SDX	Yaesu	22/24/27
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
6023	Antenna	VUBA 9117	Schwarzbeck	22/24/27, 15C