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CETECOM ICT Services
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-0254/15-01-03



Deutsche
Akkreditierungsstelle
D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

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1130 Bruxelles / BELGIUM

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Manufacturer

Worldline SA

Chaussee de Haecht 1442

1130 Bruxelles / BELGIUM

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - 210 Issue 8

Spectrum Management and Telecommunications Radio Standards Specification - License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS - Gen Issue 4

Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: Terminal

Model name: YONEO / YONEO LCD

FCC ID: SEKNE0512

IC: 5264A-NEO512

Frequency: 13.56 MHz

Technology tested: RFID

Antenna: Integrated loop antenna

Power supply: 10.2 V to 14.03 V DC by battery

Temperature range: -20°C to +50°C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

Andreas Luckenbill
Lab Manager
Radio Communications & EMC

Test performed:

p.o.

Michael Berg
Lab Manager
Radio Communications & EMC

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH 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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2.2 Application details

Date of receipt of order:	2015-09-07
Date of receipt of test item:	2015-09-23
Start of test:	2015-09-23
End of test:	2015-11-18
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	December 2010	Spectrum Management and Telecommunications Radio Standards Specification - License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS - Gen Issue 4	November 2014	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

3.1 Measurement guidance

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature	:	T _{nom} T _{max} T _{min}	+22 °C during room temperature tests +50 °C during high temperature tests -20 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V _{nom} V _{max} V _{min}	12.0 V DC by battery 10.2 V 14.03 V

5 Test item

5.1 General description

Kind of test item	:	Terminal
Type identification	:	YONEO / YONEO LCD
PMN	:	YONEO Terminal YONEO Reader
HVIN	:	YONEO Master NFC YONEO Slave NFC
FVIN	:	-/-
HMN	:	-/-
S/N serial number	:	BBP8964 / BBQ1591
HW hardware status	:	No information available
SW software status	:	No information available
Frequency band	:	13.56 MHz
Type of radio transmission	:	
Use of frequency spectrum	:	Modulated carrier
Type of modulation	:	A1D
Number of channels	:	1
Antenna	:	Integrated loop antenna
Power supply	:	10.2 V to 14.03 V DC by battery
Temperature range	:	-20°C to +50°C

5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-0254/15-01-01_AnnexA
1-0254/15-01-01_AnnexB
1-0254/15-01-01_AnnexC

6 Test laboratories sub-contracted

None

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

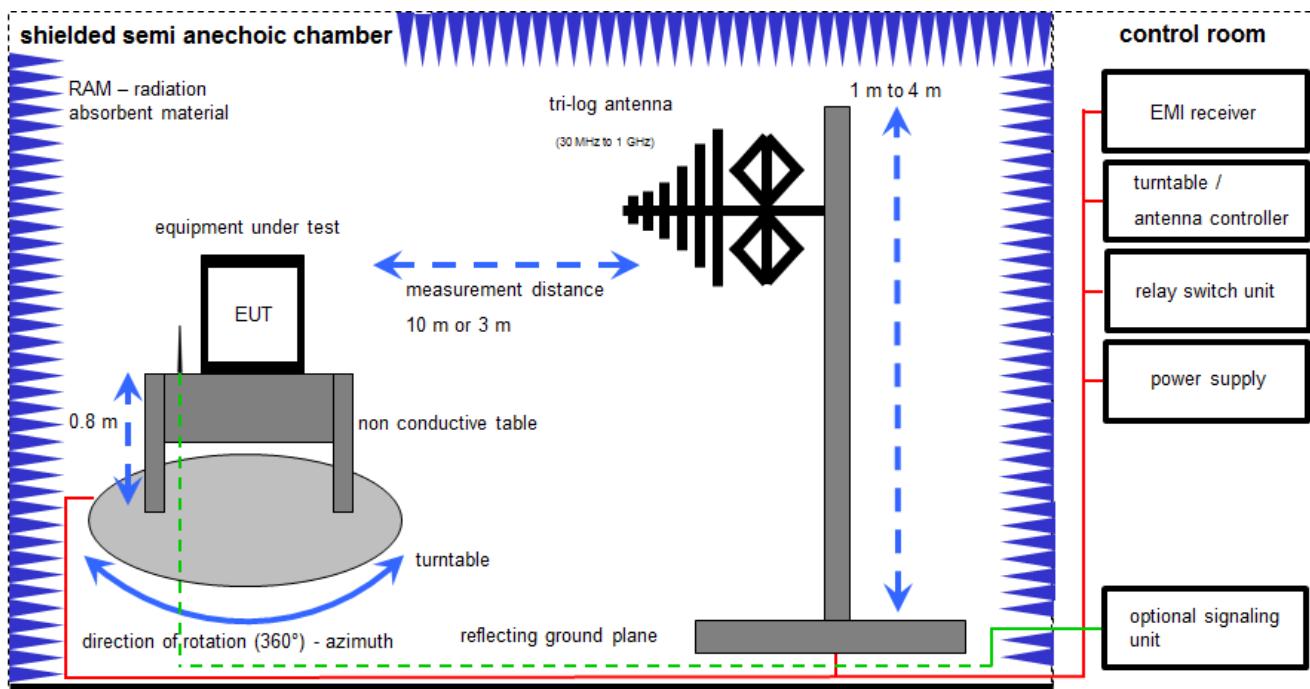
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



$$FS = UR + CL + AF$$

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

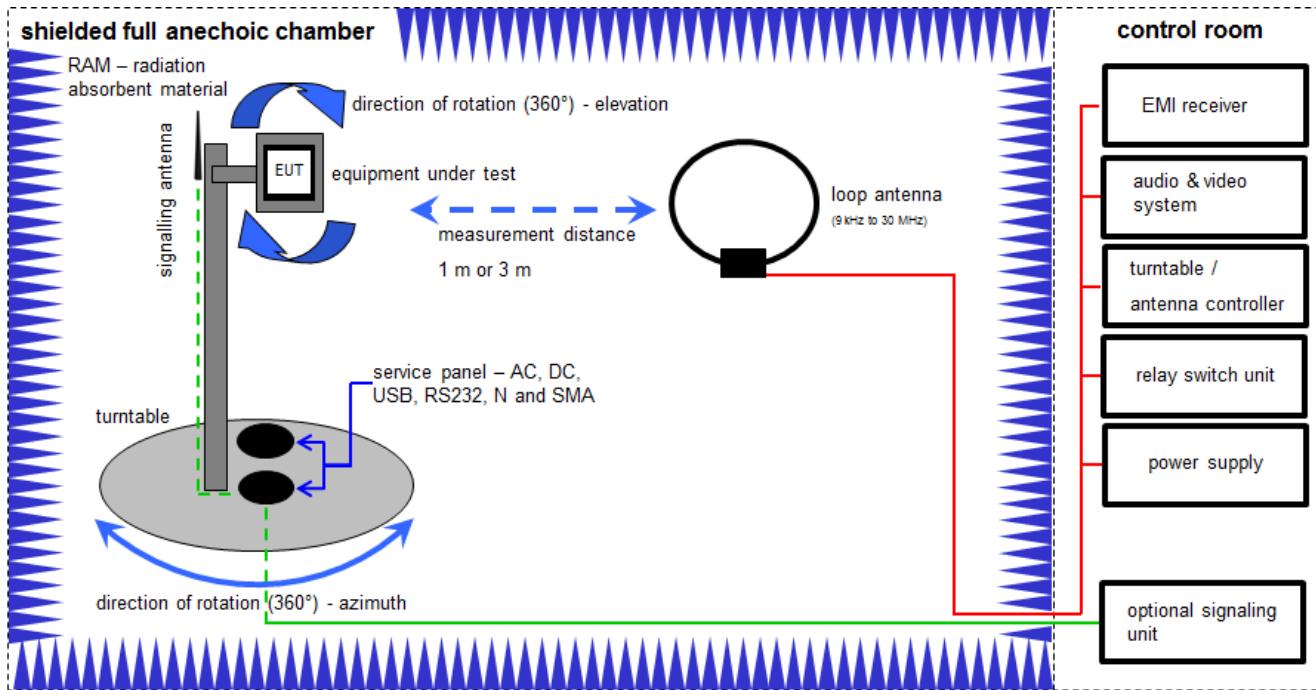
Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016

7.2 Shielded fully anechoic chamber



FS = UR + CA + AF

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

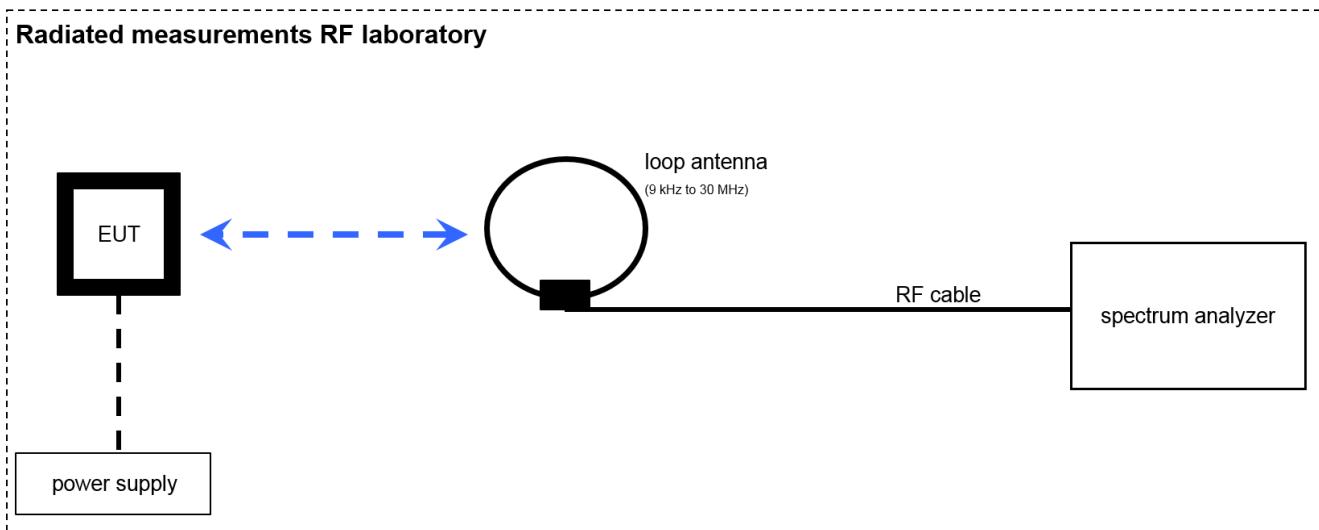
Example calculation:

$$\text{FS [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} (71.61 \mu\text{V/m})$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
2	A	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
3	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
4	A	MXE EMI Receiver 20 Hz to 26.5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
5	A	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-

7.3 Radiated measurements RF Laboratory

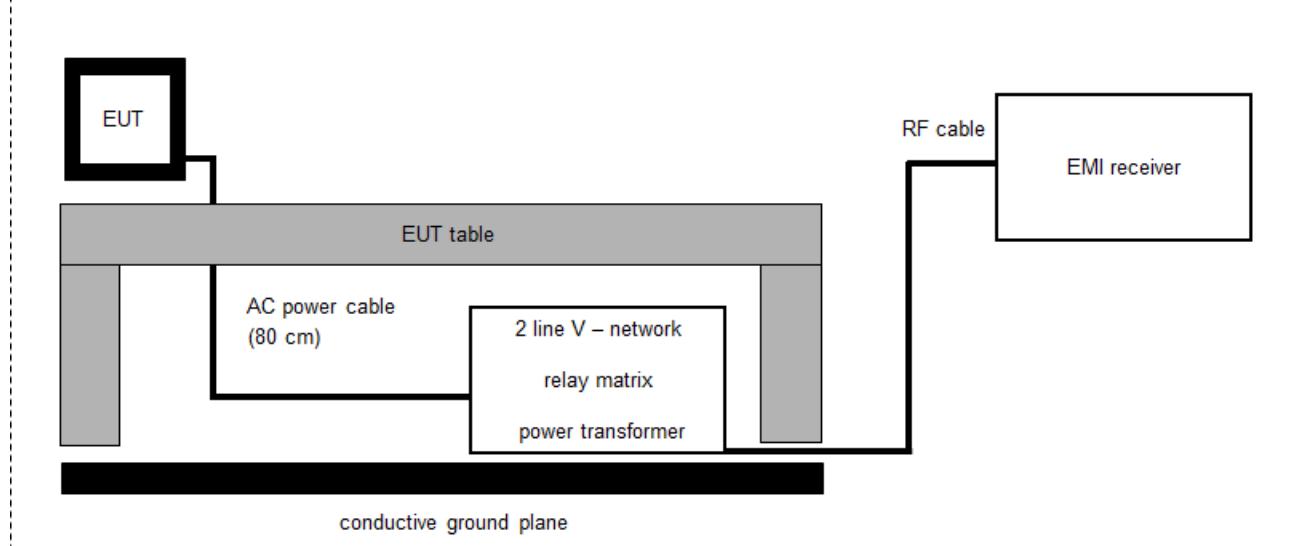


Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	23.01.2015	23.01.2016
2	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
3	A	RF Cable BNC	RG58	Huber & Suhner		400001209	ev	-/-	-/-
4	A	Radiocom. Analyzer	CMTA 84	R&S	894199/012	300001176	viK!!	29.01.2014	29.01.2016

7.4 AC conducted

AC conducted



$$FS = UR + CF + VC$$

(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

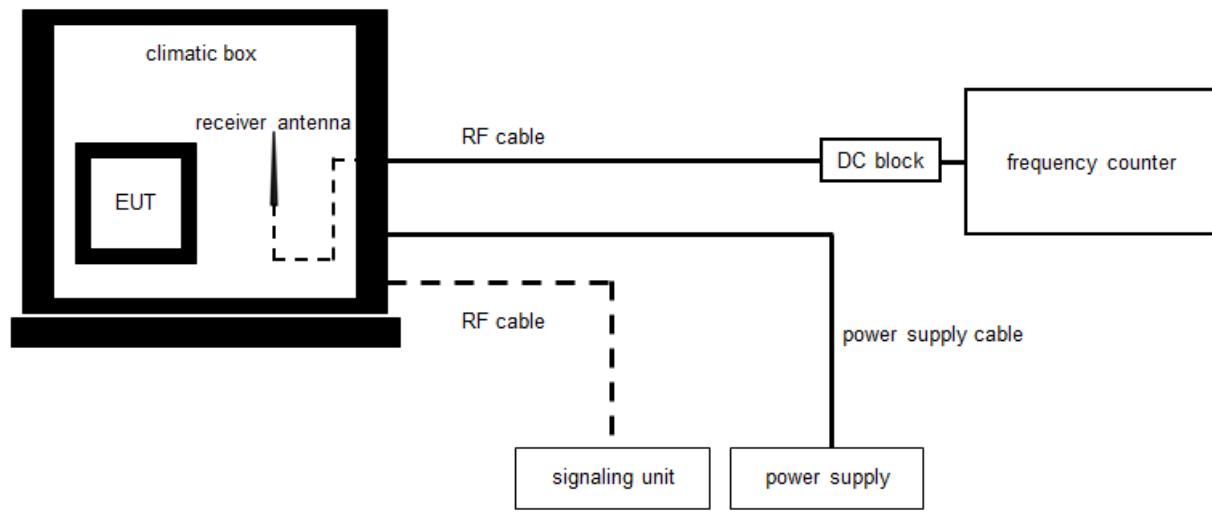
$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	A	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2015	28.01.2016
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	11.02.2014	11.02.2016

7.5 Relative measurements normal and extreme conditions

frequency error



Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	EMI Test Receiver 9 kHz - 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	23.01.2015	23.01.2016
2	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
3	A	RF Cable BNC	RG58	Huber & Suhner		400001209	ev	-/-	-/-
4	2	Radiocom. Analyzer	CMTA 84	R&S	894199/012	300001176	viKI!	29.01.2014	29.01.2016

8 Measurement uncertainty

Measurement uncertainty	
Test case	Uncertainty
Antenna gain	± 3 dB
Spectrum bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Detailed conducted spurious emissions @ the band edge	± 1 dB
Band edge compliance radiated	± 3 dB
Spurious emissions conducted	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

9 Sequence of testing

9.1 Sequence of testing 9 kHz to 30 MHz

Setup

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axis (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK (QPK / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

9.2 Sequence of testing 30 MHz to 1 GHz

Setup

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 10 or 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.
-

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions
-

Final measurement

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP (Quasi-Peak / see ANSI C 63.4) detector with an EMI receiver
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

10 Summary of measurement results

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input type="checkbox"/>	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210 Issue 8 RSS Gen Issue 4	See table!	2015-11-18	-/-

Test specification clause	Test case	Temperature conditions	Power source conditions	C	NC	NA	NP	Remark
RSS Gen Issue 4	Occupied bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.225 (a)	Field strength of the fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.209 & § 15.225 (b-d)	Field strength of the harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.109	Receiver spurious emissions and cabinet radiations	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.107 § 15.207	Conducted limits	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§ 15.225 (a)	Frequency tolerance	Normal & extreme conditions	Normal & extreme conditions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

11 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

12 Measurement results

12.1 Occupied bandwidth

Measurement:

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

Measurement parameters	
Detector:	Peak
Resolution bandwidth:	1 % – 5 % of the occupied bandwidth
Video bandwidth:	≥ 3x RBW
Trace mode:	Max hold
Analyser function:	99 % power function
Used equipment:	See chapter 7.5 - A
Measurement uncertainty:	See chapter 8

Limit:

IC

for RSP-100 test report coversheet only

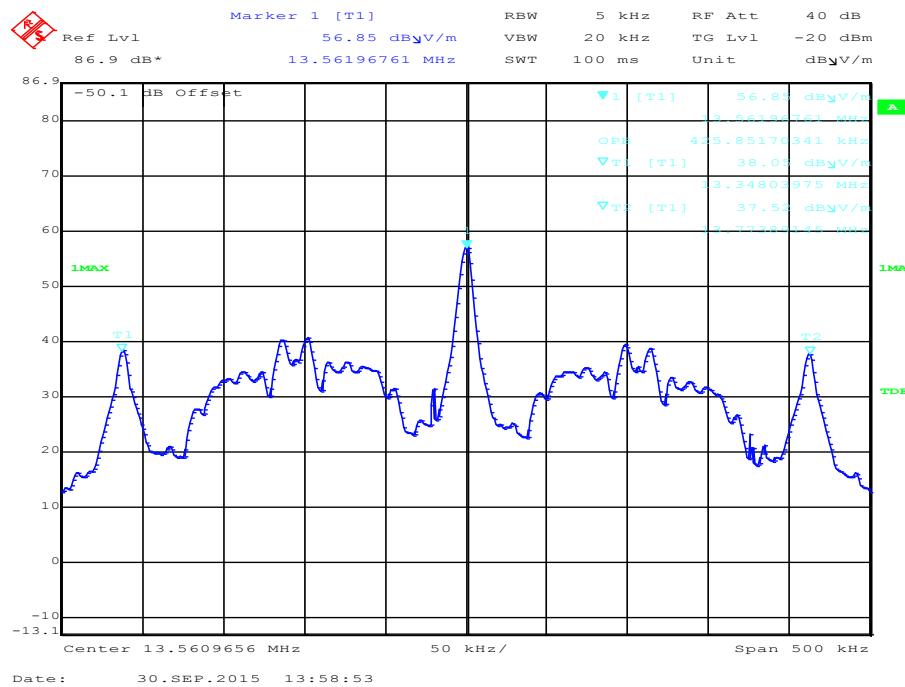
Result:

99% emission bandwidth

425.9 kHz

Plot:

Plot 1: 99 % emission bandwidth



12.2 Field strength of the fundamental

Measurement:

The maximum detected field strength for the carrier signal.

Measurement parameters	
Detector:	Quasi peak / peak (worst case)
Resolution bandwidth:	120 kHz
Video bandwidth:	$\geq 3 \times$ RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.2 – A
Measurement uncertainty:	See chapter 8

Limit:

FCC & IC		
Frequency (MHz)	Field strength (μ V/m)	Measurement distance (m)
13.553 to 13.567	15,848 (84 dB μ V/m)	30

Recalculation:

According to ANSI C63.10		
Frequency	Formula	Correction value
13.56 MHz	$FS_{limit} = FS_{max} - 40 \log\left(\frac{d_{nearfield}}{d_{measure}}\right) - 20 \log\left(\frac{d_{limit}}{d_{nearfield}}\right)$	-21.39

According to ANSI C63.10

Result: (worst case)

Field strength of the fundamental		
Frequency	13.56 MHz	
Distance	@ 3 m	@ 30 m
Measured / calculated value	73.1 dB μ V/m	51.7 dB μ V/m

12.3 Field strength of the harmonics and spurious

Measurement:

The maximum detected field strength for the harmonics and spurious.

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	$F < 150 \text{ kHz}$: 200 Hz $150 \text{ kHz} < F < 30 \text{ MHz}$: 9 kHz $30 \text{ MHz} < F < 1 \text{ GHz}$: 120 kHz
Video bandwidth:	$F < 150 \text{ kHz}$: 1 kHz $150 \text{ kHz} < F < 30 \text{ MHz}$: 100 kHz $30 \text{ MHz} < F < 1 \text{ GHz}$: 300 kHz
Trace mode:	Max hold
Used equipment:	See chapter 7.1, 7.2, 7.3 (A)
Measurement uncertainty:	See chapter 8

Limit:

FCC & IC		
Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dB μ V/m)	30
30 – 88	100 (40 dB μ V/m)	3
88 – 216	150 (43.5 dB μ V/m)	3
216 – 960	200 (46 dB μ V/m)	3

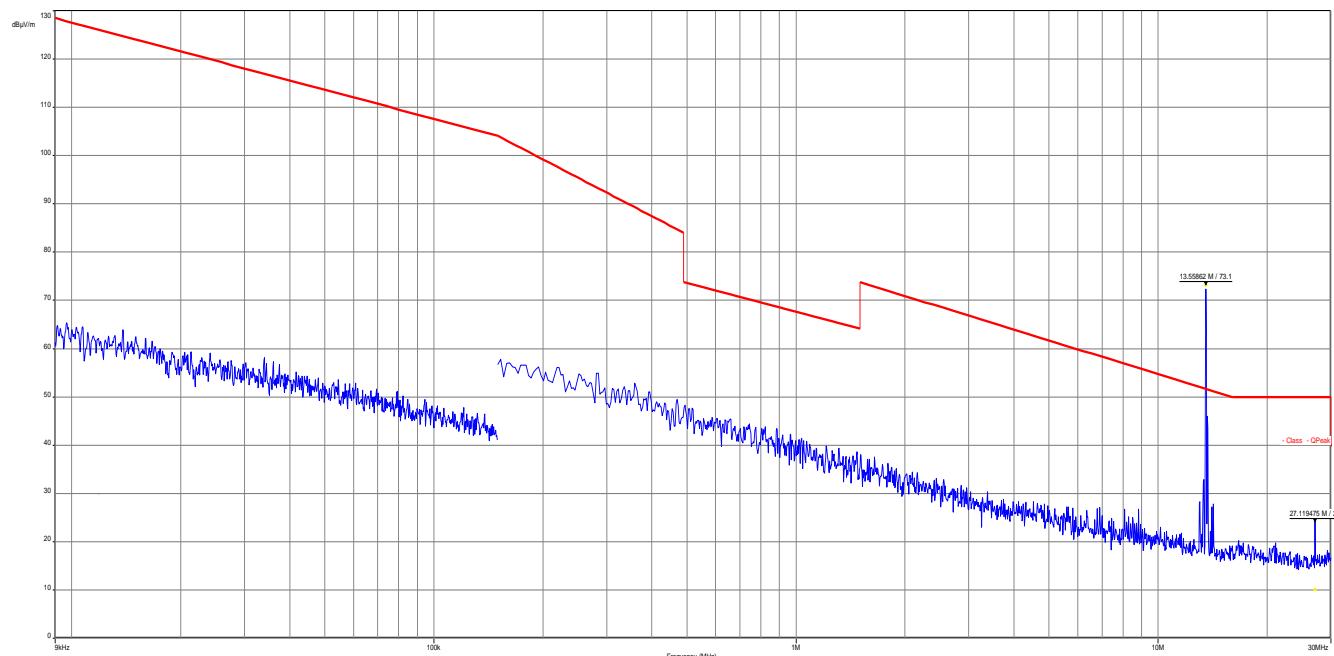
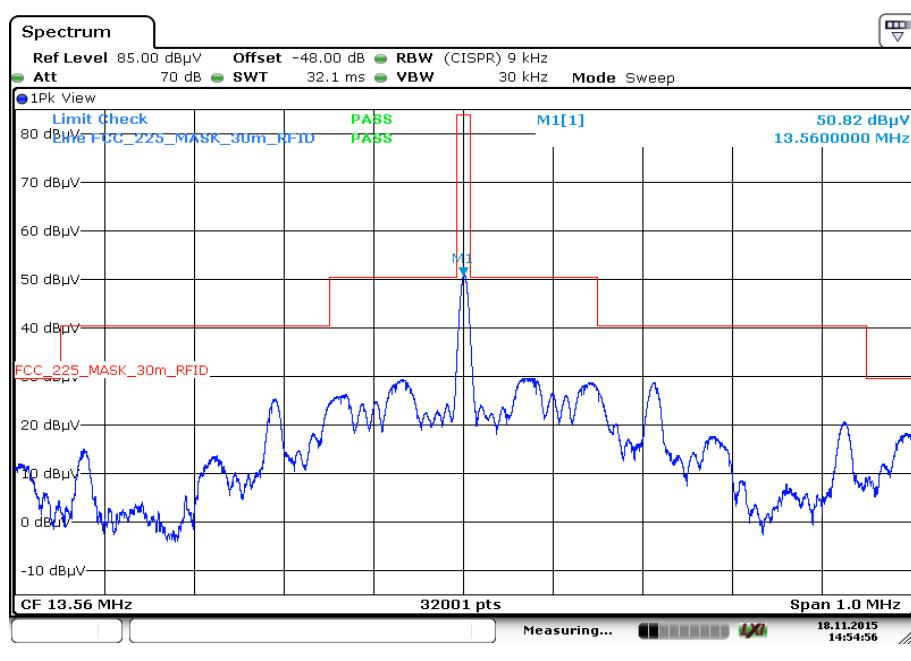
Note: For a reduced measurement distance, please take a look at the limit line and the ANSI C63.10-2013 sub clause 6.4 radiated emissions from unlicensed wireless devices below 30 MHz.

Result:

Detected emissions			
Frequency (MHz)	Detector	Resolution bandwidth (kHz)	Detected value
27.12	QP	9 kHz	24.0 dB μ V/m @ 3m

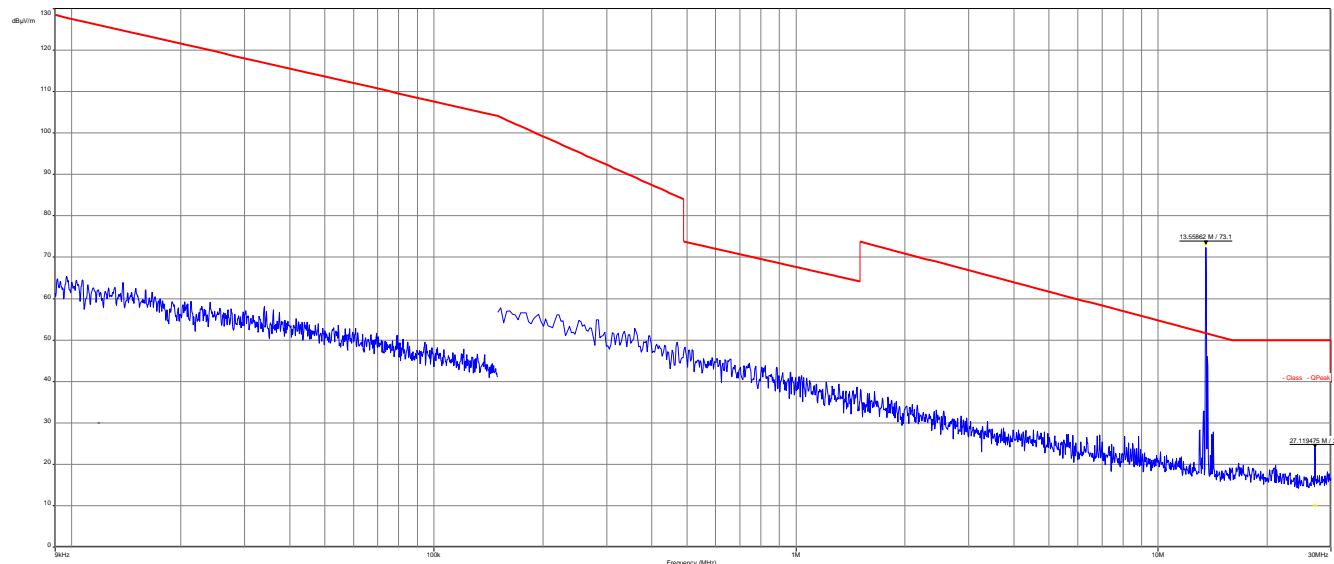
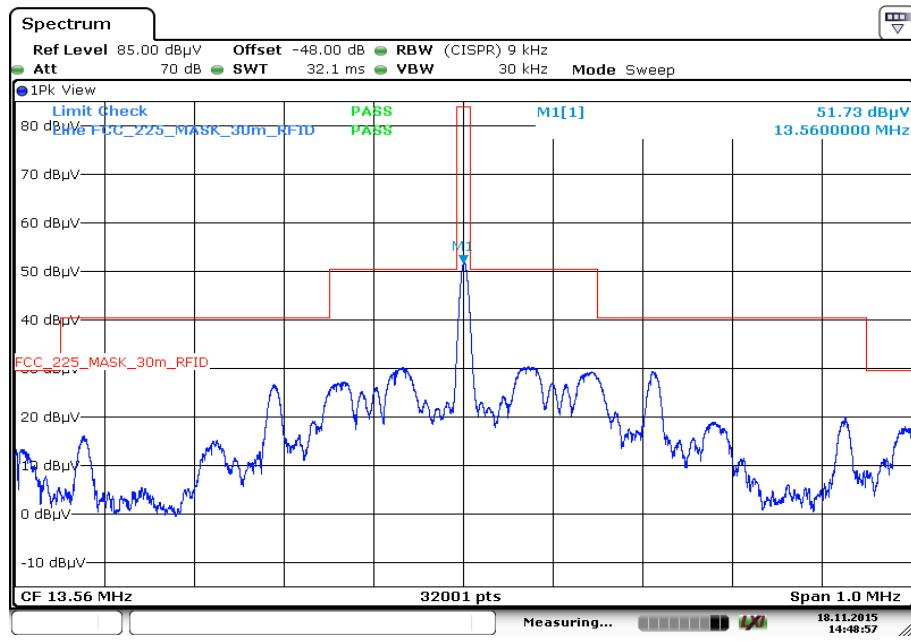
Plots:

YONEO LCD

Plot 1: 9 kHz – 30 MHz, magnetic emissions

Plot 2: Spectrum mask


Date: 18.NOV.2015 14:54:56

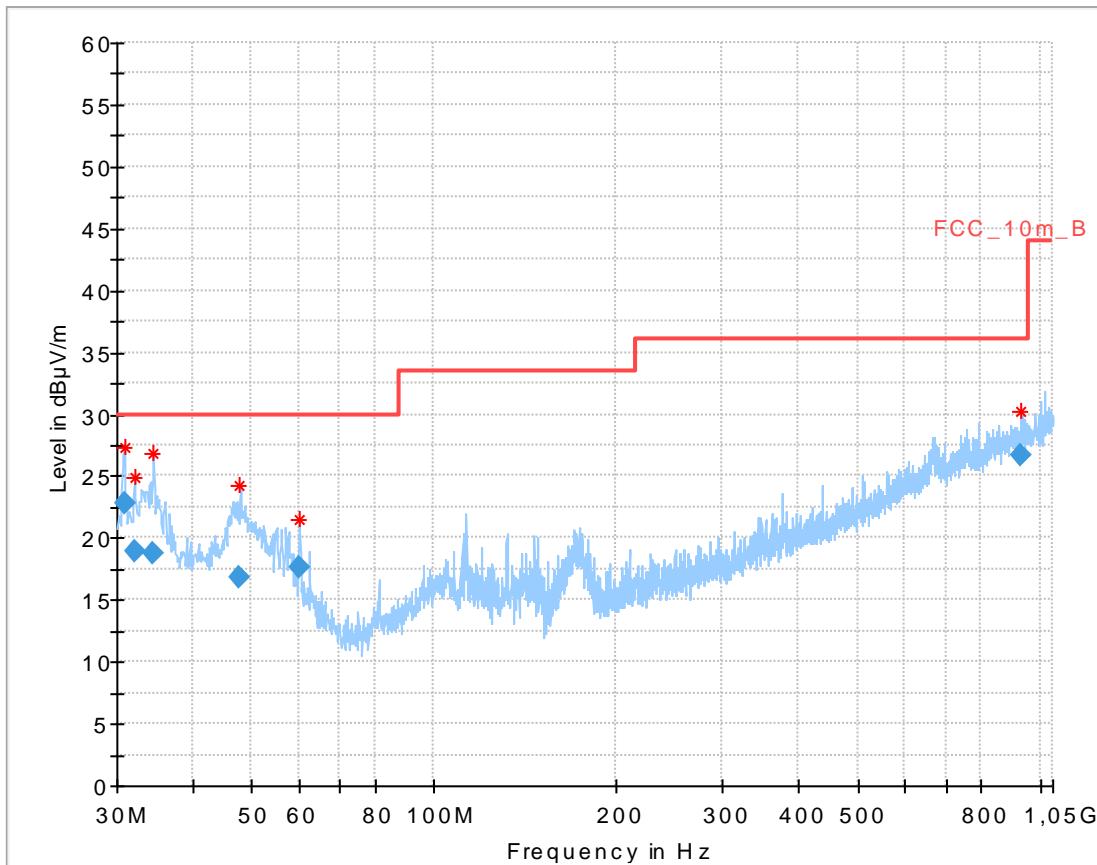
YONEO

Plot 3: 9 kHz – 30 MHz, magnetic emissions**Plot 4: Spectrum mask**

Date: 18.NOV.2015 14:48:58

YONEO LCD

Plot 5: 30 MHz – 1 GHz, vertical and horizontal polarisation

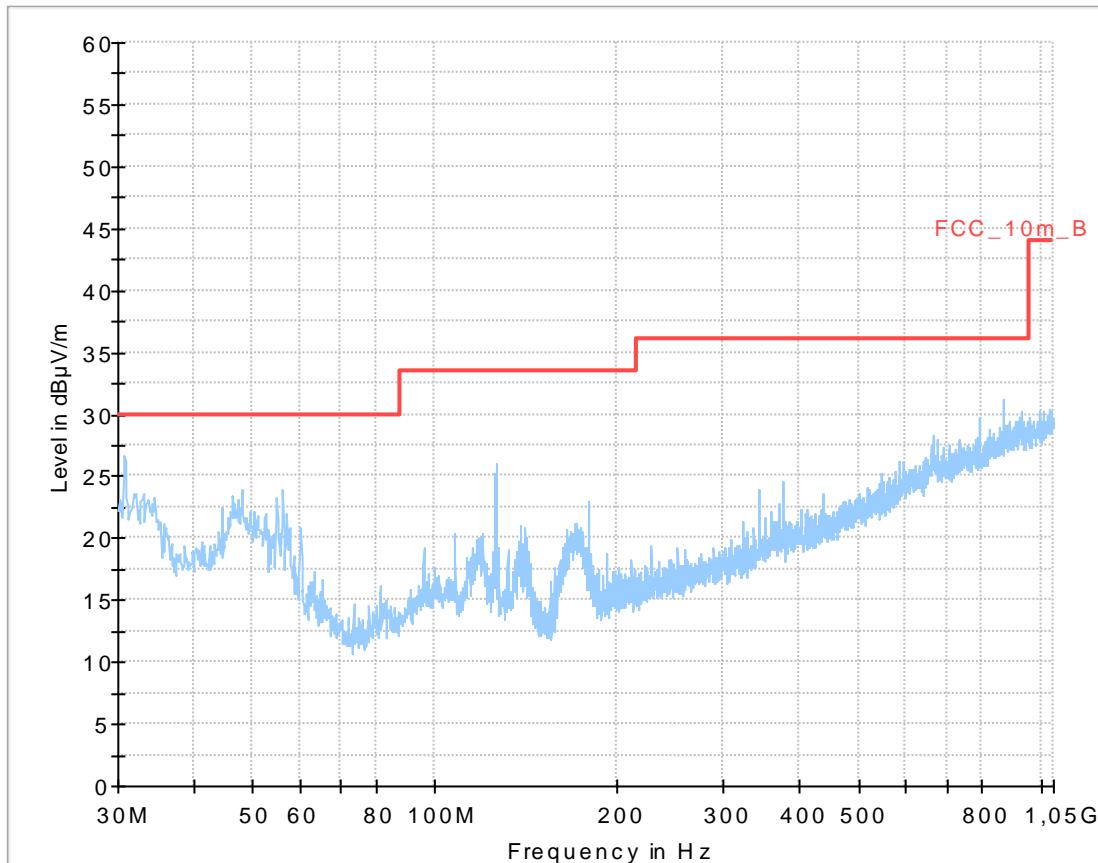


Final_Result

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.827550	22.85	30.00	7.15	1000.0	120.000	106.0	V	97	13.4
32.098050	18.92	30.00	11.08	1000.0	120.000	103.0	V	297	13.5
34.504650	18.83	30.00	11.17	1000.0	120.000	200.0	V	140	13.7
47.858400	16.90	30.00	13.10	1000.0	120.000	103.0	V	220	13.1
59.955600	17.57	30.00	12.43	1000.0	120.000	173.0	V	2	10.6
927.439200	26.61	36.00	9.39	1000.0	120.000	400.0	H	52	24.2

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Plot 6: 30 MHz – 1 GHz, vertical and horizontal polarisation



12.4 Conducted limits

Measurement:

Measurement of the conducted spurious emissions for an intentional radiator that is designed to be connected to the public utility (AC) power line.

Measurement parameters	
Detector:	Quasi peak / average or peak (worst case – pre-scan)
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Trace mode:	Max hold
Used equipment:	See chapter 7.4
Measurement uncertainty:	See chapter 8

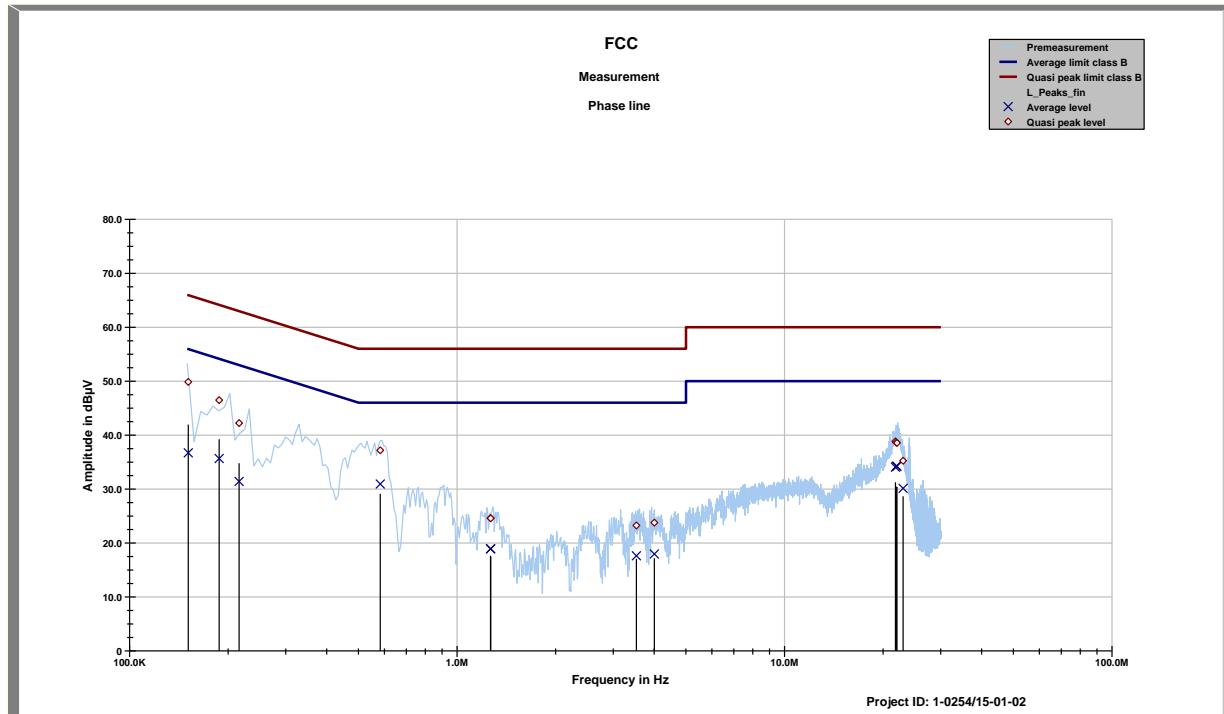
Limit:

FCC & IC		
Frequency (MHz)	Quasi-peak (dB μ V/m)	Average (dB μ V/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

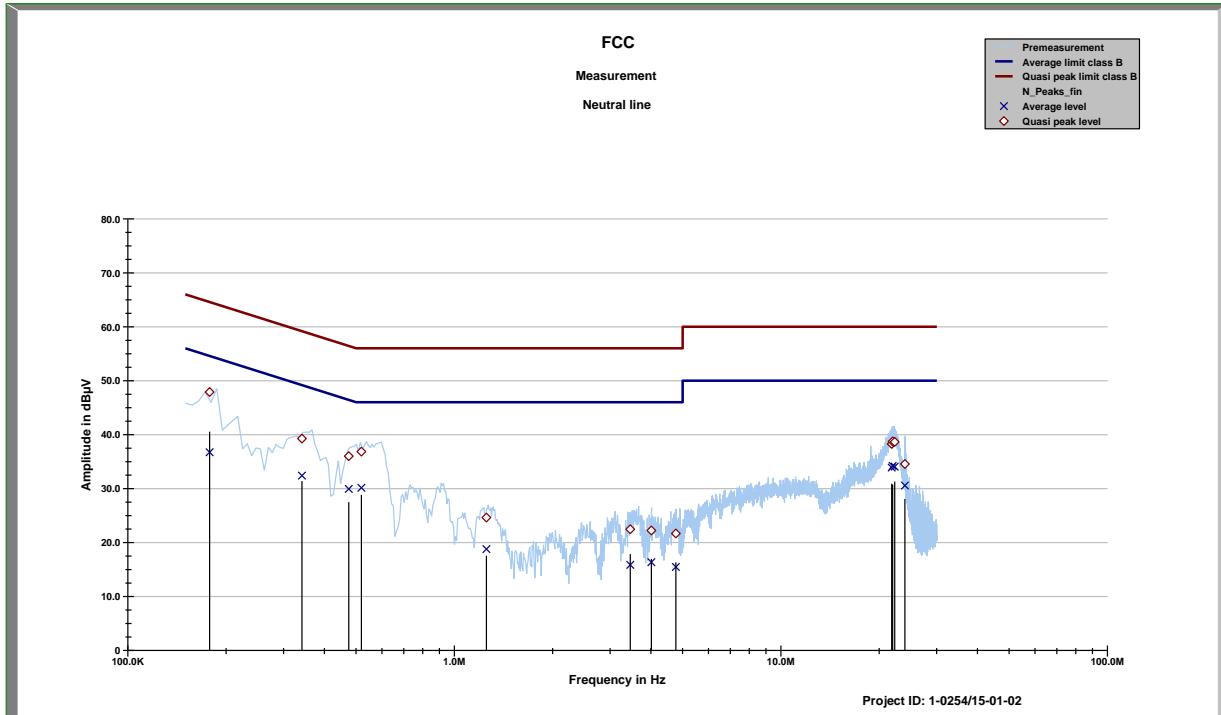
Plots:

Yoneo LCD

Plot 1: 150 kHz to 30 MHz, phase line



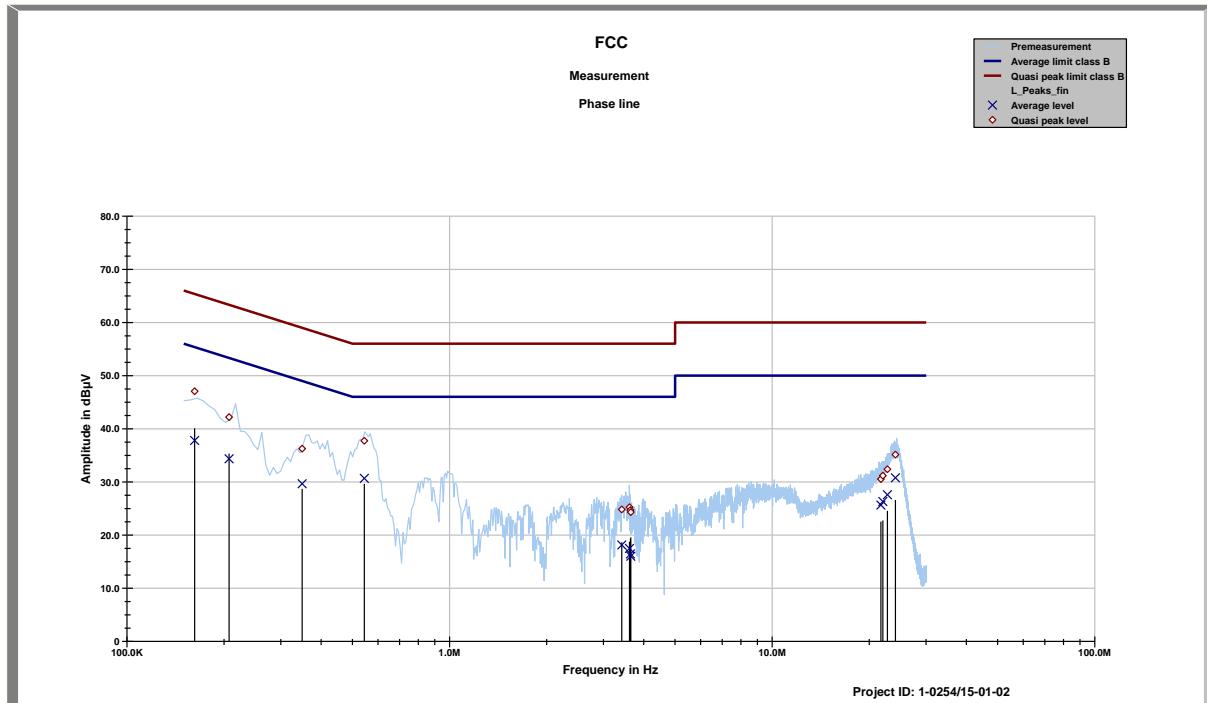
Frequency MHz	Quasi peak level dB μ V	Margin quasi peak dB μ V	Average level dB μ V	Margin average dB μ V
0.15111	49.85	16.09	36.72	19.25
0.18771	46.48	17.66	35.66	19.26
0.21599	42.22	20.76	31.41	22.71
0.5826	37.18	18.82	30.93	15.07
1.2649	24.63	31.37	18.89	27.11
1.2666	24.58	31.42	18.93	27.07
3.5263	23.25	32.75	17.63	28.37
4.0021	23.77	32.23	17.95	28.05
21.799	38.83	21.17	34.06	15.94
21.93	38.61	21.39	34.25	15.75
22.026	38.55	21.45	34.22	15.78
23.009	35.23	24.77	30.13	19.87

Plot 2: 150 kHz to 30 MHz, neutral line

Frequency MHz	Quasi peak level dB μ V	Margin quasi peak dB μ V	Average level dB μ V	Margin average dB μ V
0.17799	47.89	16.69	36.73	18.47
0.34128	39.27	19.90	32.40	18.14
0.47491	36.01	20.42	29.94	16.78
0.51902	36.85	19.15	30.15	15.85
1.2531	24.63	31.37	18.78	27.22
3.4554	22.46	33.54	15.85	30.15
4.0087	22.22	33.78	16.34	29.66
4.7672	21.67	34.33	15.46	30.54
21.82	38.27	21.73	33.88	16.12
21.968	38.75	21.25	34.20	15.80
22.299	38.65	21.35	34.06	15.94
23.95	34.56	25.44	30.57	19.43

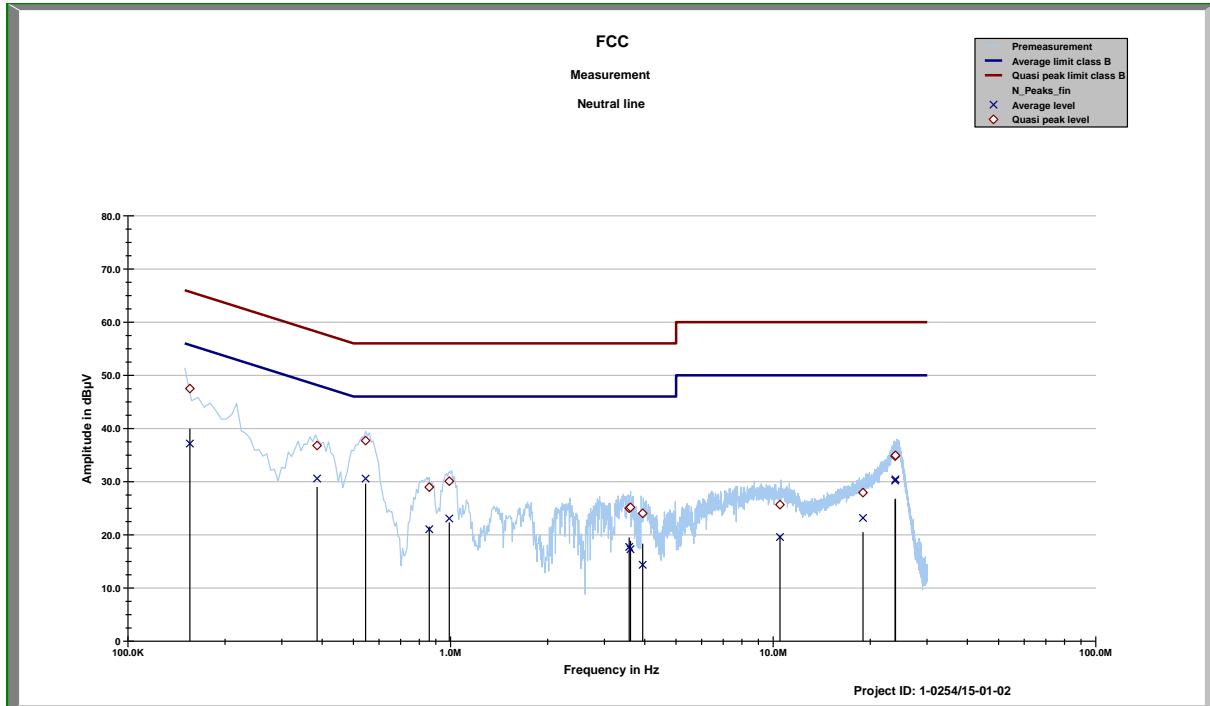
Yoneo

Plot 1: 150 kHz to 30 MHz, phase line



Frequency MHz	Quasi peak level dB μ V	Margin quasi peak dB μ V	Average level dB μ V	Margin average dB μ V
0.16209	47.06	18.29	37.80	17.86
0.20736	42.19	21.12	34.35	20.01
0.34911	36.25	22.74	29.66	20.65
0.54409	37.75	18.25	30.67	15.33
3.417	24.82	31.18	18.13	27.87
3.6112	25.24	30.76	17.47	28.53
3.6352	24.69	31.31	16.44	29.56
3.6449	24.31	31.69	16.01	29.99
21.712	30.52	29.48	25.65	24.35
22.021	31.18	28.82	26.31	23.69
22.751	32.38	27.62	27.59	22.41
24.087	35.13	24.87	30.77	19.23

Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dB μ V	dB μ V	dB μ V	dB μ V
0.15557	47.51	18.18	37.17	18.67
0.3857	36.79	21.36	30.60	18.67
0.54511	37.73	18.27	30.59	15.41
0.85873	28.97	27.03	21.06	24.94
0.99043	30.09	25.91	23.08	22.92
3.5777	25.00	31.00	17.72	28.28
3.6111	25.17	30.83	17.29	28.71
3.9395	24.04	31.96	14.37	31.63
10.4903	25.67	34.33	19.58	30.42
18.975	27.94	32.06	23.18	26.82
23.863	34.80	25.20	30.19	19.81
23.915	34.94	25.06	30.44	19.56

12.5 Frequency error

Measurement:

The maximum detected field strength for the spurious.

Measurement parameters	
Detector:	Peak detector
Resolution bandwidth:	10 Hz
Video bandwidth:	> RBW
Trace mode:	Max hold
Used equipment:	See chapter 7.5
Measurement uncertainty:	See chapter 8

Limit:

FCC

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. (± 1.356 kHz)

Result: Temperature variation

Frequency tolerance		
frequency tolerance (MHz)	Conditions	Result
+713	-20 °C & 100% voltage	compliant
+709	-10 °C & 100% voltage	compliant
+666	0 °C & 100% voltage	compliant
+607	+10 °C & 100% voltage	compliant
+572	+20 °C & 100% voltage	compliant
+557	+30 °C & 100% voltage	compliant
+551	+40 °C & 100% voltage	compliant
+559	+50 °C & 100% voltage	compliant

Result: Voltage variation

Frequency tolerance		
frequency tolerance (MHz)	Temperature	Result
601	+20 °C & 85% voltage	compliant
572	+20 °C & 100% voltage	compliant
563	+20 °C & 115% voltage	compliant

12.6 Observations

No observations except those reported with the single test cases have been made.

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-11-18

Annex B Further information

Glossary

AVG	- Average
DUT	- Device under test
EMC	- Electromagnetic Compatibility
EN	- European Standard
EUT	- Equipment under test
ETSI	- European Telecommunications Standard Institute
FCC	- Federal Communication Commission
FCC ID	- Company Identifier at FCC
HW	- Hardware
IC	- Industry Canada
Inv. No.	- Inventory number
N/A	- Not applicable
PP	- Positive peak
QP	- Quasi peak
S/N	- Serial number
SW	- Software
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number

Annex C Accreditation Certificate

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Befehlsgemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichner der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung 

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen
durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL
VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi-Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der
Akkreditierungsnr. D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der
Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-00

Frankfurt am Main, 07.03.2014


In Auftrag D-PL-12076-01
Ralf Ignor
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Blünderallee 300
38115 Braunschweig

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die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstellen (AkkStelleG) vom
31. Juli 2009 (BGBl. I, S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments
und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung
im Zusammenhang mit der Vermarktung von Produkten (ABl. L 218 vom 9. Juli 2008, S. 39).

Die DAkkS ist Unterzeichner des Multilateralen Abkommen zur gegenseitigen Anerkennung der
Europäischen Organisation für Akkreditierung (EA), des International Accreditation Forum (IAF) und
der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen
erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

<https://www.cetecom.com/en/cetecom-group/europe/germany-saarbruecken/accreditations.html>