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Rev.1: 2014-02-20

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Equipment Authorization measurements on 2.45 GHz Handheld Transceiver Unit
FCC ID: 2AAYWDPII

(9 appendices)

Rev.1, 2014-02-20: This side and the following appendices have been reviewed,1, 2, 4 and 8. The numbering of the appendices have also been corrected. Added FCC Id at this page. New information/measurements of the duty cycle. Wrong frequency range in Appendix 4. Corrected and complementary of Appendix 8.

Test objects

Digitech Professional II, including the following units:

DP II Smart Scale	no: SS30005
DP II Computer Terminal	no: DPII 30005
DP Radio Button	no: -

The test objects was battery powered

Summary

See Appendix 1 for general information and Appendix 9 for photos.
Emission measurements as specified below have been performed.

Standard	Compliant	Appendix	Remarks
FCC 47 CFR Part 15 C 15.249 Operation within the band 2400-2483.5 MHz	**Yes**		
IC RSS-210 Issue 8, June 2010	**Yes**		
Duty cycle measurements	N/A	2	
15.249 (a) / RSS-210 A2.9(a) Field strength of fundamental	Yes	3	
15.249 (d) (e) / RSS-210 A2.9(b) Radiated emission	Yes	4	
15.215 (c) 20 dB bandwidth	Yes	5	
15.207 / RSS-Gen 7.2.4 Conducted emission limits	N/A	-	Note 1
2.1049 / RSS-Gen 4.6.1 Occupied bandwidth	Yes	6	
2.1049 / RSS-210 A2.9(b) Band Edge	Yes	7	
2.1093 / KDB 447498/ RSS-102 2.5.1 RF Exposure	Yes	8	

Note: Above RSS items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

Note 1: Test not applicable, not connected to the AC mains.

SP Technical Research Institute of Sweden
Electronics - EMC

Performed by

Fredrik Isakssson

Examined by

Anders Nordlöf

Performance test and requirements

The tests were performed to verify that Digitech Professional II meets the electromagnetic compatibility requirements of FCC 47 CFR part 15 C.

Test facility

The used anechoic chamber is compliant with the requirements of section 2.948 of the FCC rules and listed, registration number 96866, as a facility accepted for certification under parts 15 and 18. The site complies with RSS Gen and is accepted by Industry Canada for the performance of radiated measurements, IC-file number 3482A-2.

Test object

Transceiver units:	DP II Smart Scale DP II Computer Terminal DP Radio Button
Antenna connector	Not applicable
Antenna:	Integral
Frequencies:	DP II Smart Scale: 2450 MHz DP II Computer terminal: 2450 MHz IDP Radio Button: 2452 MHz
Frequencies used during test:	DP II Smart Scale: 2450 MHz DP II Computer terminal: 2450 MHz IDP Radio Button: 2452 MHz
Modulation:	GFSK
Data rate:	1 Mbps
Battery type:	DP II Smart Scale: Li-Ion 3.7V DP II Computer Terminal: Li-Ion 3.7V DP Radio Button:1xCR2032 3.0V

During the tests the EUT's were powered from external batteries, Li-Ion 3.7V.

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Edison	2013-11	504 114
R&S ESU26 Signal Analyser	2013-12	902 210
R&S ESI40 Signal Analyser	2014-07	503 125
Antenna Schaffner CBL 6143	2014-09	504 079
Horn antenna EMCO 3115	2014-01	501 548
Standard gain horn Flann 16240-25	-	503 939
Standard gain horn Flann 18240-25	-	503 900
Standard gain horn Flann 20240-20	-	503 674
Low Noise Amplifier Miteq	2014-08	503 277
Low Noise Amplifier Miteq	2014-08	504 160
High pass filter Wainwright	2014-08	504 200
Multimeter Fluke 83	2014-06	501 522
Temperature and humidity meter Testo 625	2014-06	504 117

Operational test mode

Justification measurements were performed with rotation of the EUT through three orthogonal axes determine which orientation the EUT's had the highest emission levels, see photos in Appendix 8.

The test was performed with continuous transmission, if not otherwise stated, and with normal modulation.

For duty cycle measurements see appendix 2.
The duty cycle of the tested EUT's was measured to:
DP II Smart Scale: 6.987 / 7.115 ms = 0.98 = 98.2%.
DP II Computer Terminal: 6.987 / 7.131 ms = 0.98 = 98.0%.
DP Radio Button: 6.634 / 6.715 ms = 0.98.8 = 98.8%.
The duty cycle correction factor was not used in this report.
The PRF was calculated to PRF = 1/T = 1/7.131 ms = 140 Hz, thus QP-detector was used without any correction for pulse desensitization.

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP QD 10885". The measurement uncertainties can be found in the table below. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).

The measurement uncertainties can be found in the table below:

Method	**Uncertainty**
Radiated emission, 30 – 1000 MHz	4.8/5.6 dB (V/H-pol)
Radiated emission, 1 – 40 GHz	2.6 dB

Compliancy evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test objects

The test objects were delivered: 2013-08-27

Test engineers

Martin Nilsson and Fredrik Isaksson, SP

Duty cycle measurements

Date	Temperature	Humidity
2013-10-29	23 °C ± 3 °C	40 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with normal modulation.

The radiated measurements were performed in a semi anechoic chamber. The measurements were performed with the EUT-axis, antenna at the position, polarization and the turntable in the position giving the highest level at the fundamental, see Appendix 5. The antenna distance was 3.0 m.

Test set-up photos during the tests can be found in Appendix 9.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
EMI measurement computer	-
Software: R&S EMC32, ver. 8.52.0	503 745
Horn antenna EMCO 3115	501 548
Multimeter Fluke 83	501 522
Temperature and humidity meter Testo 625	504 117

Results

The duty cycle measurements can be found in the diagrams below:

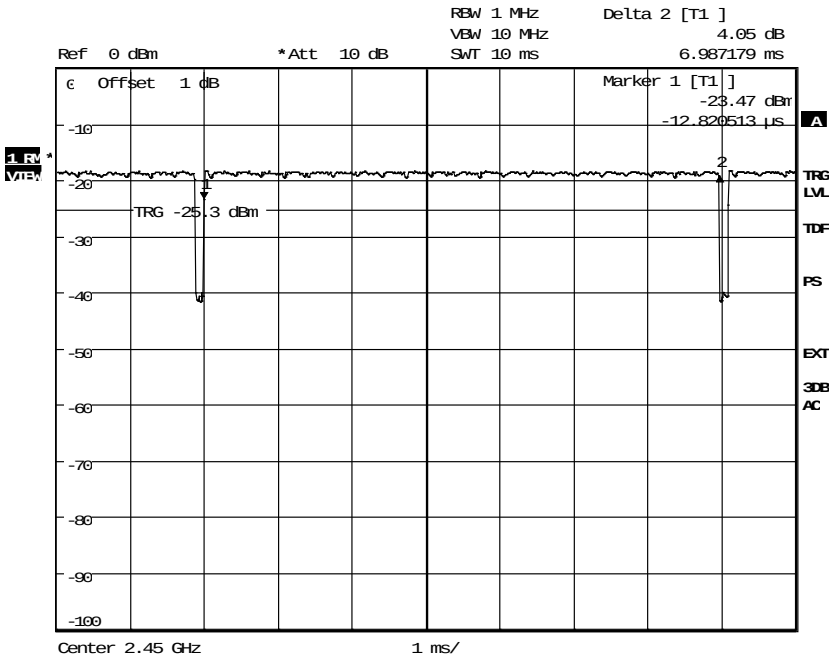
Diagram 1: DP II Smart Scale, Tx on
Diagram 2: DP II Smart Scale, Period time

Diagram 3: DP II Computer Terminal, Tx on
Diagram 4: DP II Computer Terminal, Period time

Diagram 5: DP Radio Button, Tx on
Diagram 6: DP Radio Button, Period time

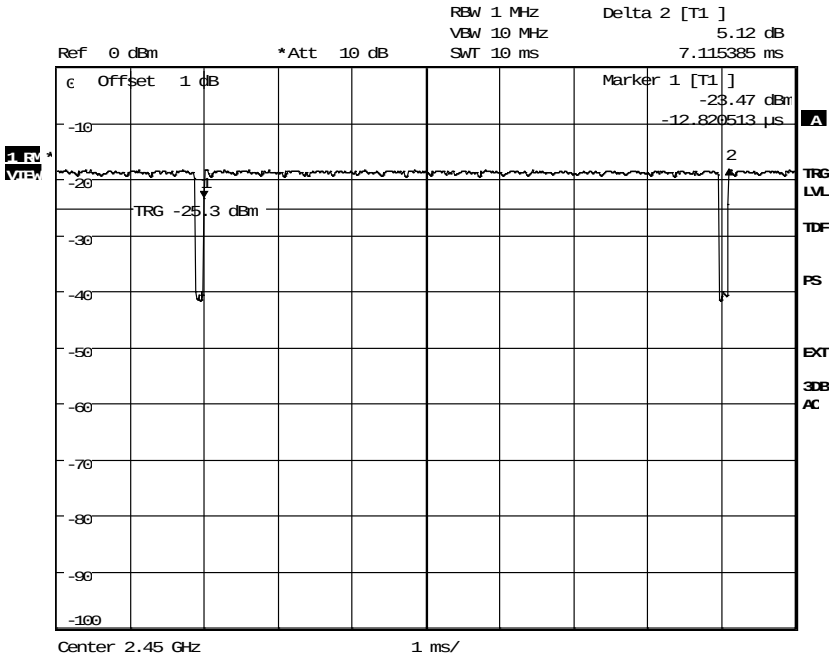
Complies?	N/A

Diagram 1



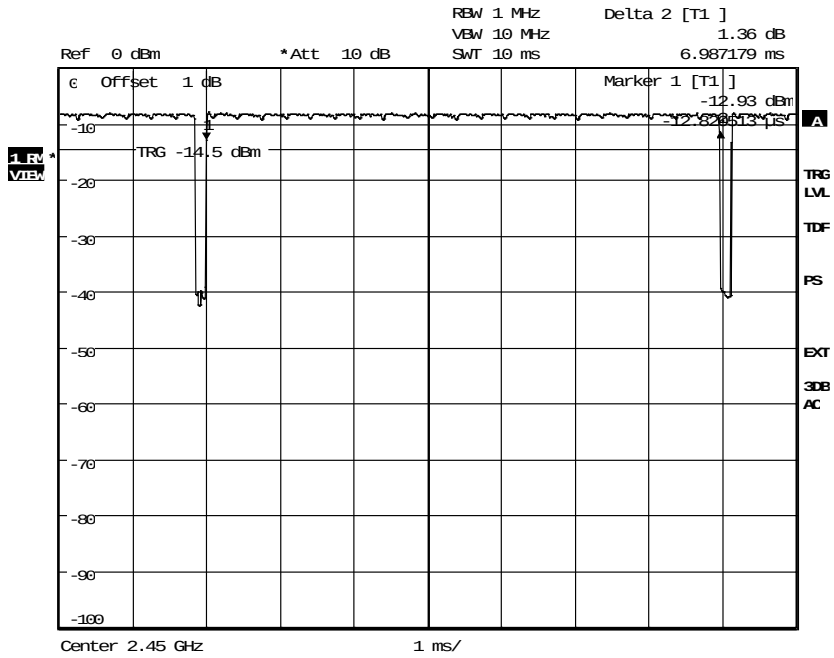
Date: 29.OCT.2013 07:32:23

Diagram 2



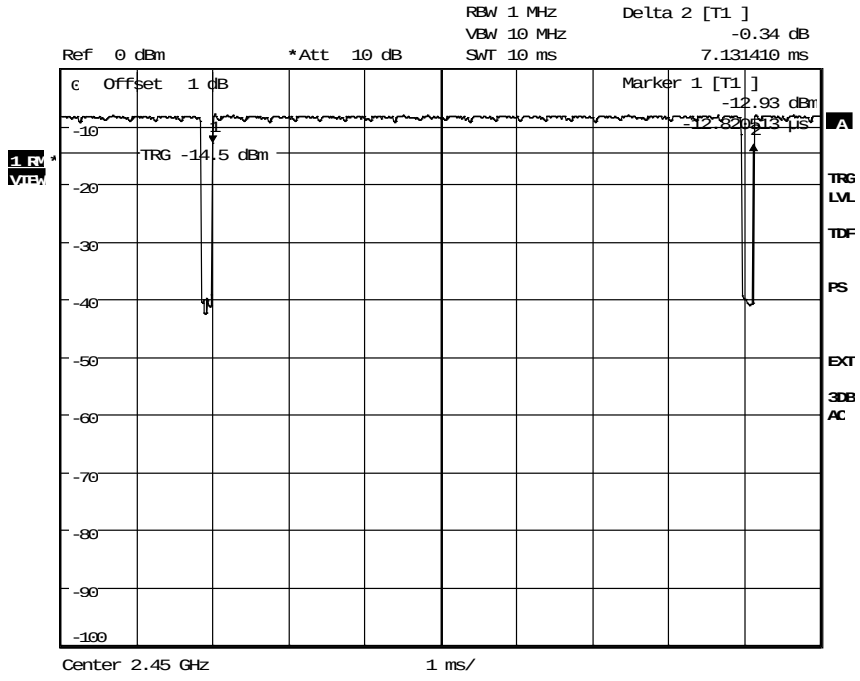
Date: 29.OCT.2013 07:33:06

Diagram 3



Date: 28.OCT.2013 11:19:00

Diagram 4



Date: 28.OCT.2013 11:19:40

Diagram 5

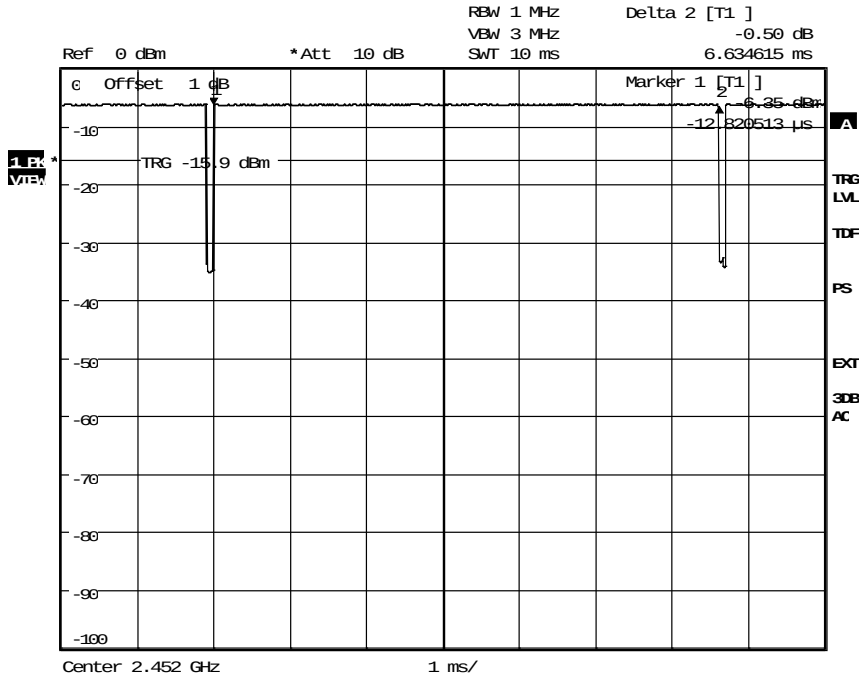


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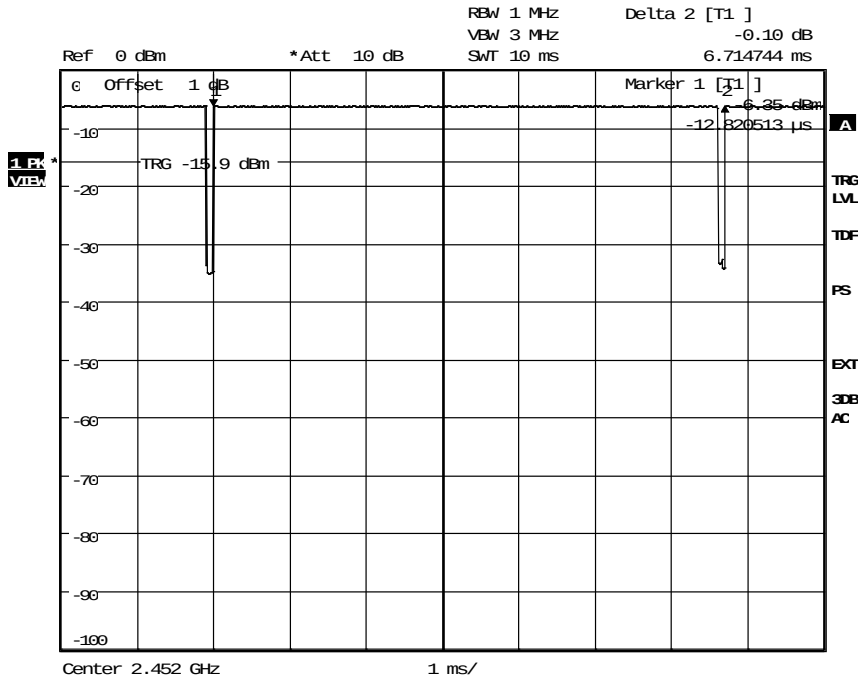
Diagram 6



Date: 29.OCT.2013 07:14:09

Field strength of fundamental measurements according to FCC 47 CFR part 15.249 (a) / RSS-210 A2.9 (a)

Date	Temperature	Humidity
2013-09-02	23 °C ± 3 °C	47 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with continuous transmission (for duty cycle see Appendix 1) and with normal modulation.

The radiated maximum peak output power measurements were performed in the semi-anechoic chamber.
The fundamental was scanned with peak detector with the antenna height 1-4 m and the turntable was varied between 0-360 degrees for maximum response. The antenna distance during the measurements was 3.0 m.
Final measurement was performed with detector according to the FCC rules.

Test set-up photos during the tests can be found in Appendix 9.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
EMI measurement computer	-
Software: R&S EMC32, ver. 8.52.0	503 745
Horn antenna EMCO 3115	501 548
Multimeter Fluke 83	501 522
Temperature and humidity meter Testo 625	504 117

Appendix 3

Results

Field strength of fundamental measurements:
RBW=1 MHz

DP II Smart Scale		Max peak radiated output power Average detector		
		2450 MHz	2450 MHz	2450 MHz
	EUT axis	X	Y	Z
	Antenna height	1.22 m	1.55 m	1.00 m
	Azimuth	170 deg	345 deg	340 deg
	Polarization	Vertical	Vertical	Horizontal
T_{nom} 22°C	V_{nom} 3.7 V DC Note 1	89.0 dBµV/m	86.7 dBµV/m	88.8 dBµV/m

DP II Computer Terminal		Max peak radiated output power Average detector		
		2450 MHz	2450 MHz	2450 MHz
	EUT axis	X	Y	Z
	Antenna height	1.55 m	1.00 m	1.65 m
	Azimuth	10 deg	10 deg	125 deg
	Polarization	Horizontal	Horizontal	Horizontal
T_{nom} 22°C	V_{nom} 3.7 V DC Note 1	84.8 dBµV/m	86.6 dBµV/m	85.1 dBµV/m

DP Radio Button		Max peak radiated output power Average detector		
		2452 MHz	2452 MHz	2452 MHz
	EUT axis	X	Y	Z
	Antenna height	1.05 m	1.30 m	1.10 m
	Azimuth	173 deg	165 deg	300 deg
	Polarization	Horizontal	Vertical	Vertical
T_{nom} 22°C	V_{nom} 3.7 V DC Note 1	88.5 dBµV/m	86.8 dBµV/m	87.5 dBµV/m

Note 1: According 47CFR 15.31(e), for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Limits

According to 47CFR 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

According to RSS-210 A2.9 (a), the field strength measured at 3 meter shall not exceed the following:

Fundamental Frequency	Field strength of fundamental
2450 & 2452 MHz	50 mV/m = 94 dBµV/m

Complies?	Yes

Radiated emission measurements according to FCC 47 CFR part 15.249 (d) (e) / RSS 210-210 A2.9 (b)

Date	Temperature	Humidity
2013-09-02	23 °C ± 3 °C	47 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with continuous transmission (for duty cycle see Appendix 1) and with normal modulation.

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance was 3.0 m.

The measurement procedure is as follows:

1. A pre-measurement is performed with peak detector. The test object is measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m (above 1 GHz pre-measurement was only performed at 1.0 m due to the small EUT size).
2. If the emission is close or above the limit during the pre-measurement, the test object is scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response. Then the emission is measured with the quasi-peak detector on frequencies below 1 GHz and with the average detector above 1 GHz.

The measurement was first performed with peak detector.
The following RBW were used:
30 MHz-1 GHz: RBW=120 kHz
1-25 GHz: RBW=1 MHz

Test set-up photos during the tests can be found in Appendix 9.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
EMI measurement computer	-
Software: R&S EMC32, ver. 8.52.0	503 745
Antenna Schaffner Bilog CBL6143	504 079
Horn antenna EMCO 3115	501 548
Low Noise Amplifier Miteq	504 160
Low Noise Amplifier Miteq	503 277
Standard gain horn Flann 16240-25	503 939
Standard gain horn Flann 18240-25	503 900
Standard gain horn Flann 20240-20	503 674
High pass filter	504 200
Multimeter Fluke 83	501 522
Temperature and humidity meter Testo 625	504 117

Results

The pre-measurement emission spectra can be found in the diagrams below:

Diagram 1:	Ambient, 30-1000 MHz vertical and horizontal polarization
Diagram 2:	30-1000 MHz, DP II Smart scale+DPII Computer Terminal+DP Radio Button, X-axis, vertical and horizontal polarization
Diagram 3:	Ambient, 1-3 GHz vertical and horizontal polarization
Diagram 4:	1-3 GHz, Terminal, Radio Button , X-axis, vertical and horizontal polarization
Diagram 5:	1-3 GHz, DP II Smart scale, X-axis, vertical and horizontal polarization
Diagram 6:	3-8.2 GHz, DP II Smart scale+DP Radio Button Terminal, X-axis, vertical and horizontal polarization
Diagram 7:	8.2-12 GHz, DP II Smart scale+ DP II Computer Terminal +DP Radio Button Terminal, X-axis, vertical and horizontal polarization
Diagram 8:	12-18 GHz, DP II Smart scale+ DP II Computer Terminal +DP Radio Button Terminal, X-axis, vertical and horizontal polarization

18-25 GHz: All emission > 10 dB below limit.

The highest detected levels during the final measurement in the frequency range 30 MHz-25 GHz are listed in the tables below.

DP II Smart scale, X-axis:

Frequency (MHz)	QP level (dBµV/m)	CISPRAV level (dBµV/m)	Peak level (dBµV/m)	Corr (dB)	CAV Limit (dBµV/m)	Height (m)	Azimuth (deg)	Polarization
4900	N/A	41.6	48.6	-11.0	53.9	183	188	Vertical
7350	N/A	39.8	49.9	-2.8	53.9	142	202	Vertical

DP II Computer Terminal, X-axis:

Frequency (MHz)	QP level (dBµV/m)	CISPRAV level (dBµV/m)	Peak level (dBµV/m)	Corr (dB)	CAV Limit (dBµV/m)	Height (m)	Azimuth (deg)	Polarization
9799	N/A	38.3	47.8	-15.1	53.9	100	126	Vertical

DP Radio Button, X-axis:

Frequency (MHz)	QP level (dBµV/m)	CISPRAV level (dBµV/m)	Peak level (dBµV/m)	Corr (dB)	QP Limit (dBµV/m)	Height (m)	Azimuth (deg)	Polarization
45.85	27.3	N/A	N/A	14.5	40.0	121	45	Vertical

Limits

According to 47CFR 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of harmonics
2400-2483.5 MHz	500 µV/m = 54 dBµV/m

According to 47CFR 15.249(d), emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

According to 47CFR 15.249(e), the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

According to RSS-210 A2.9(b), emissions radiated the outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to table 2 limits, whichever is the less stringent.

Complies?	Yes

Appendix 4

Diagram 1

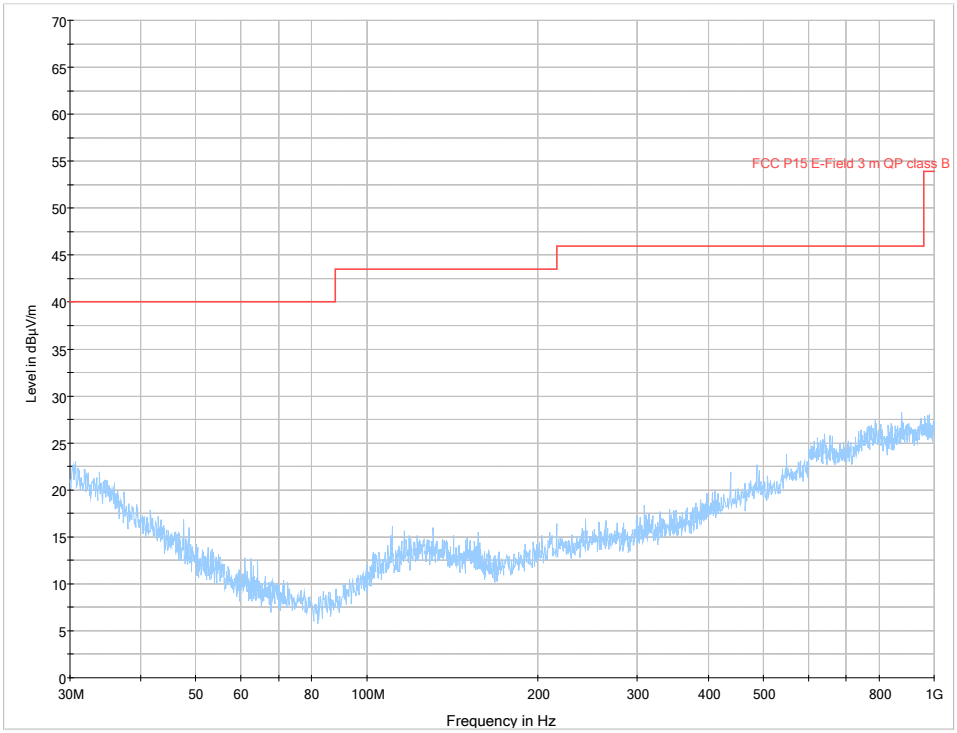


Diagram 2

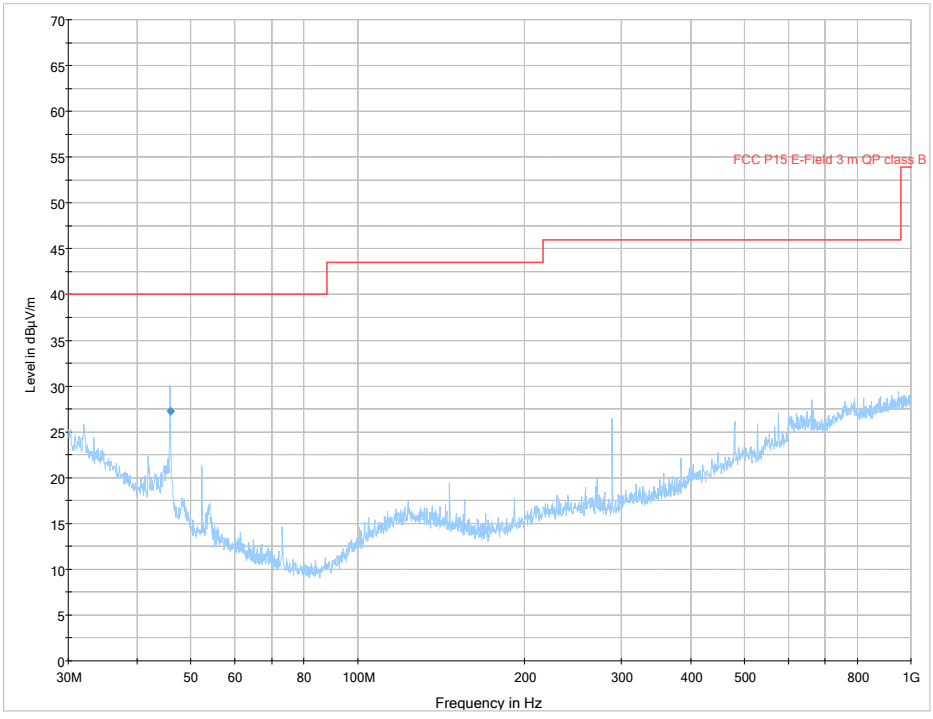


Diagram 3

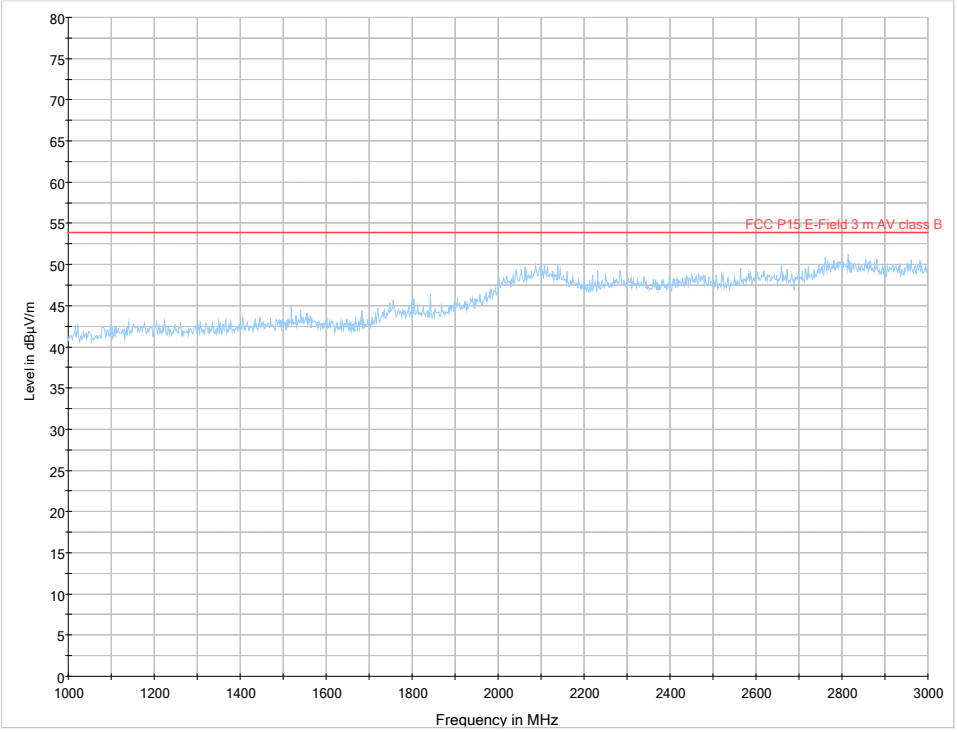


Diagram 4

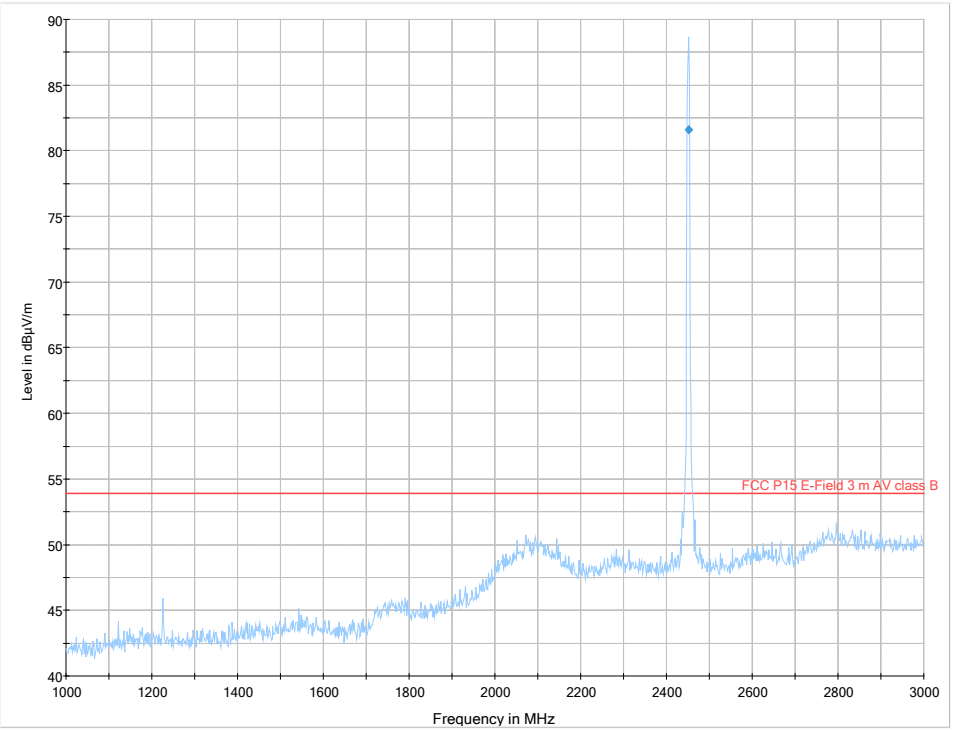


Diagram 5

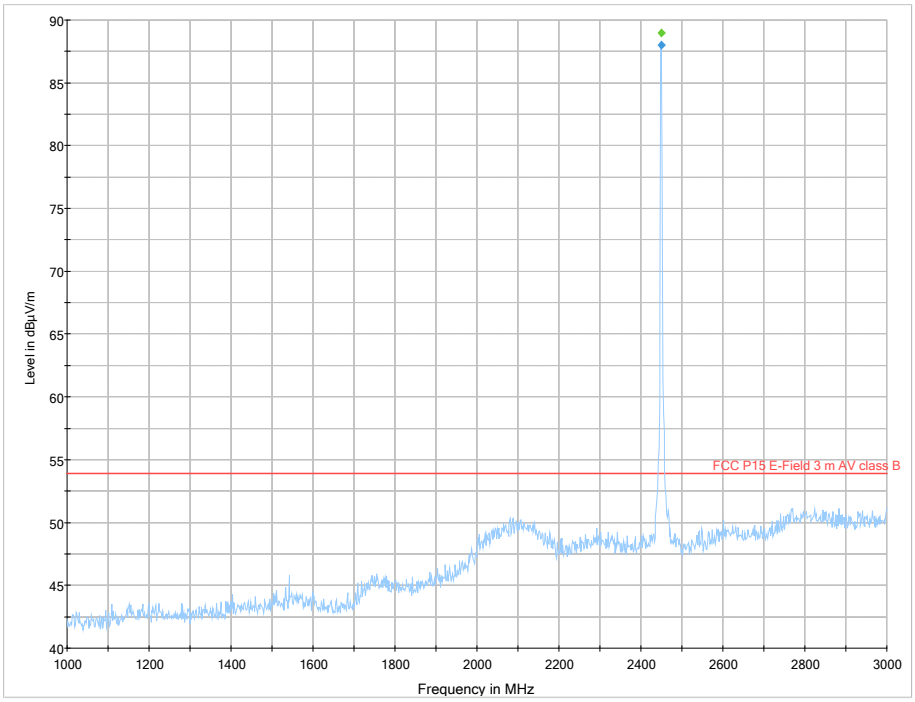


Diagram 6

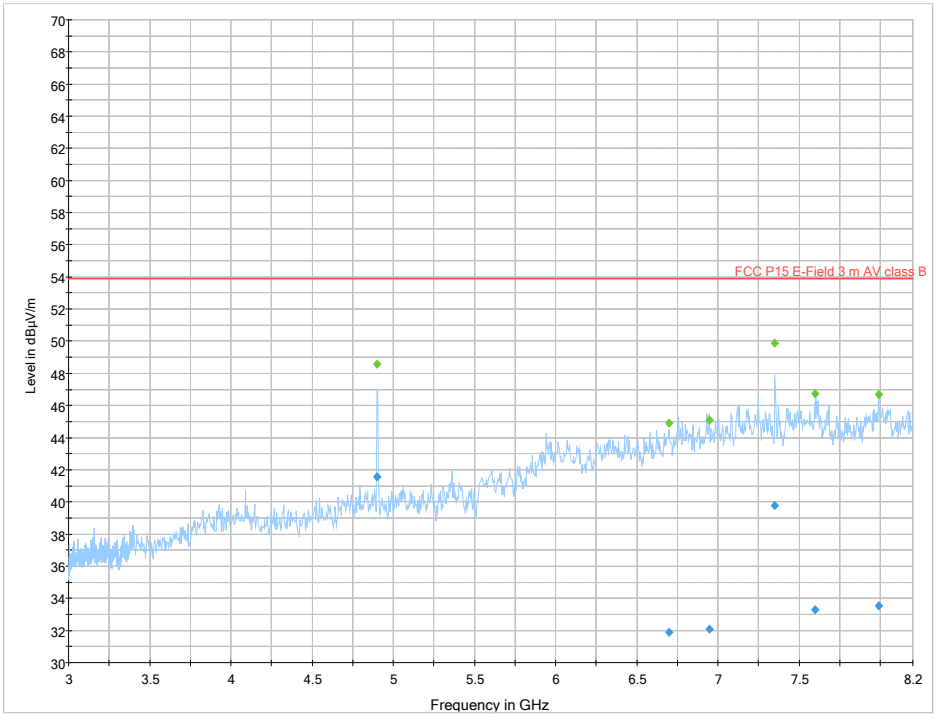


Diagram 7

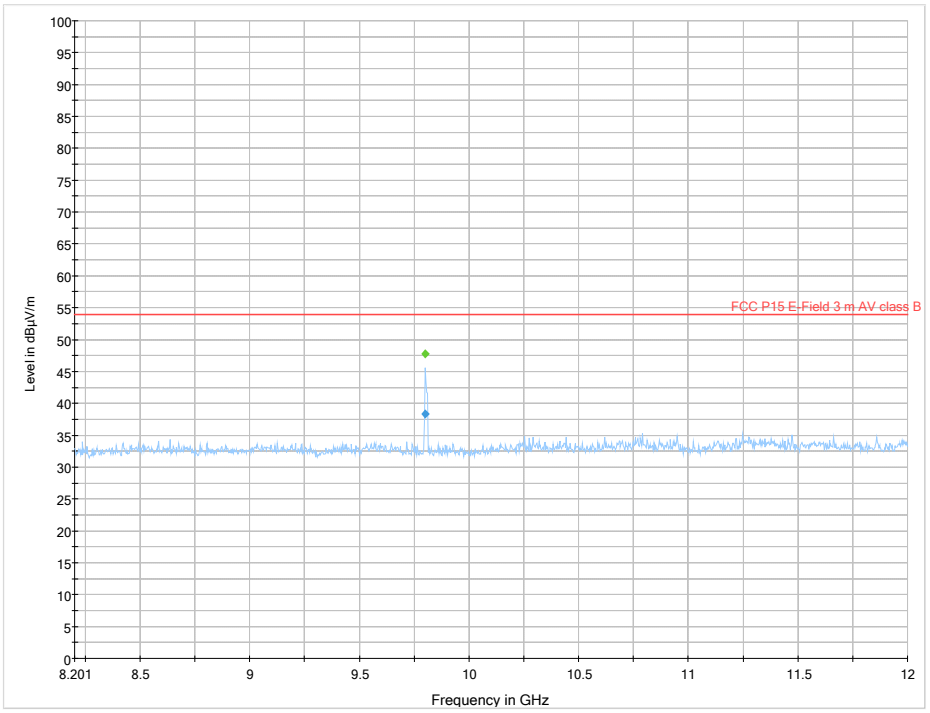
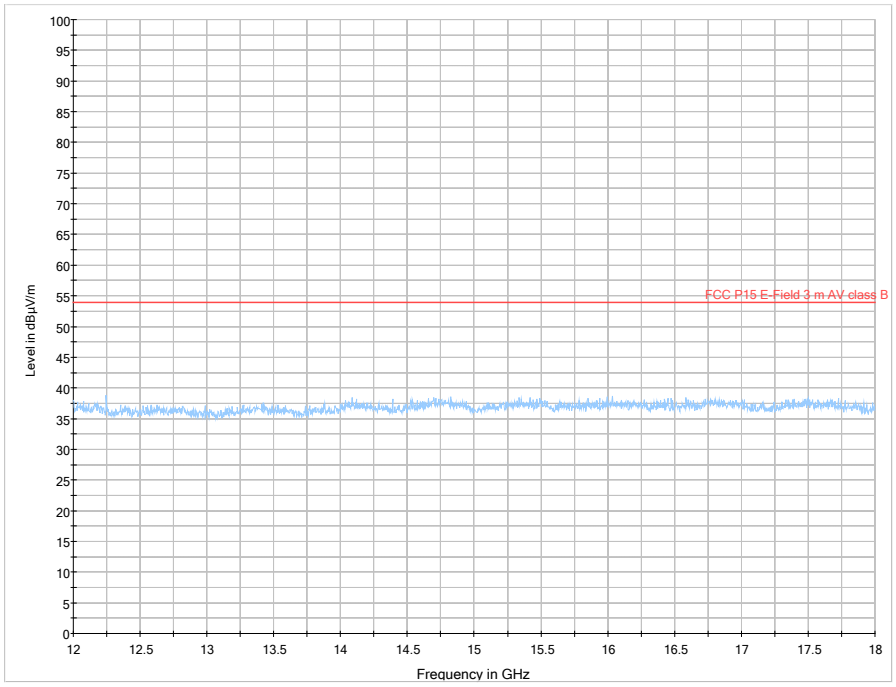


Diagram 8



Appendix 5

20 dB bandwidth measurements according to FCC 47 CFR part 15.215 (c)

Date	Temperature	Humidity
2013-09-02	23 °C ± 3 °C	47 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with continuous transmission (for duty cycle see Appendix 1) and with normal modulation.

The radiated measurements were performed in the semi-anechoic chamber with the EUT in the axis with the highest fundamental power, see Appendix 3.
Peak detector was used during the measurement.

Test set-up photos during the tests can be found in Appendix 9.

Measurement equipment	SP number
Test site, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
Temperature and humidity meter Testo 625	504 117

Measurement uncertainty: 2.6 %

Results

The 20 dB BW measurements can be found in the diagrams below:

Diagram 1	DP II Smart scale	20 dB BW = **1.34 MHz**
Diagram 2	DP II Computer terminal	20 dB BW = **1.28 MHz**
Diagram 3	DP Radio Button	20 dB BW = **1.39 MHz**

Limits

According to 47CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Complies?	Yes

Appendix 5

Diagram 1

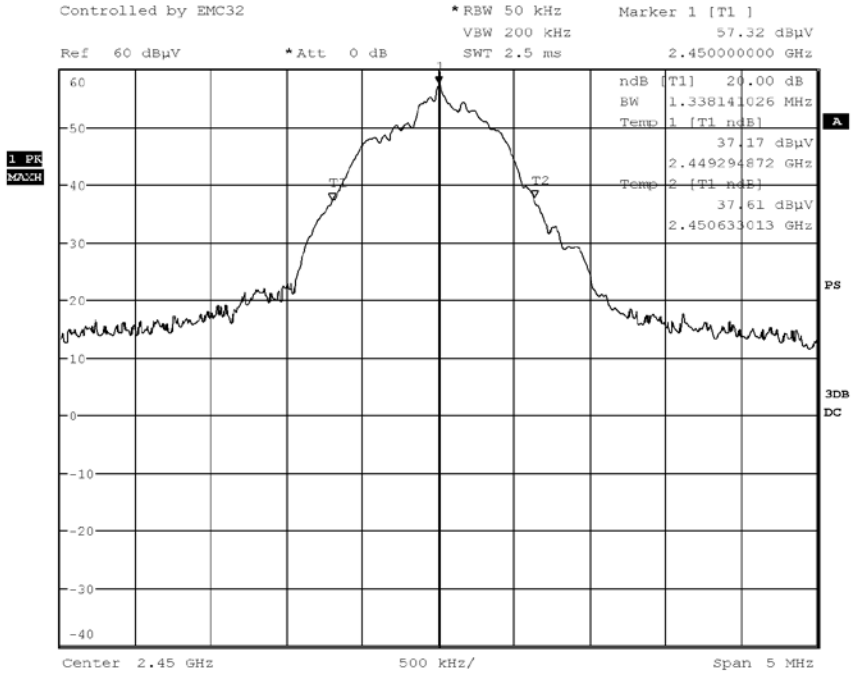


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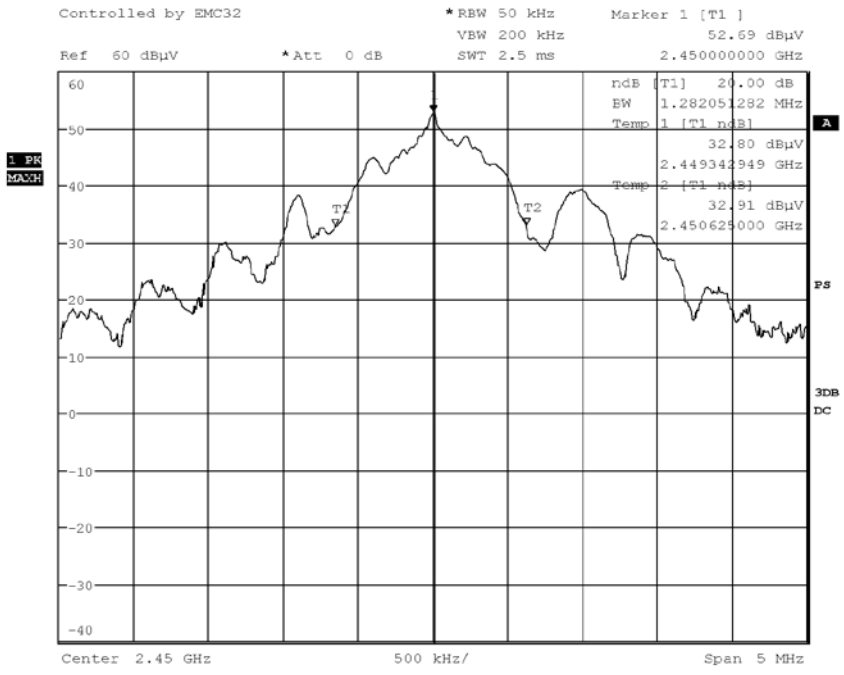
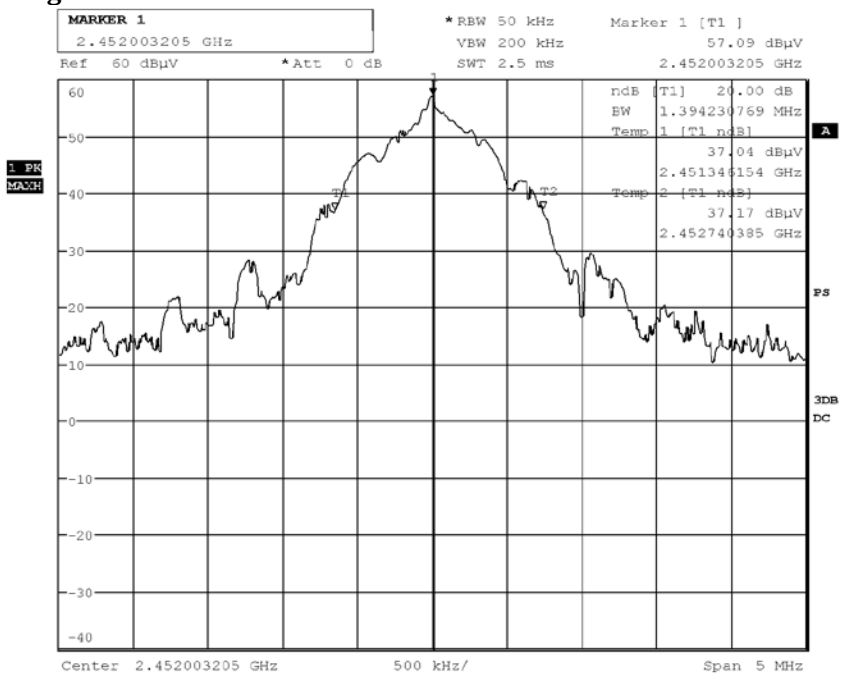
Diagram 2



Date: 2.SEP.2013 10:39:40

Appendix 5

Diagram 3



Date: 2.SEP.2013 14:57:58

Appendix 6

Occupied bandwidth measurements according to 47CFR 2.1049 / RSS-Gen 7.2.2

Date	Temperature	Humidity
2013-09-02	23 °C ± 3 °C	47 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with continuous transmission (for duty cycle see Appendix 1) and with normal modulation.

The radiated measurements were performed in the semi-anechoic chamber with the EUT in the axis with the highest fundamental power, see Appendix 3.
RMS detector was used during the measurement.

Test set-up photos during the tests can be found in Appendix 9.

Measurement equipment	SP number
Test site, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
Temperature and humidity meter Testo 625	504 117

Measurement uncertainty: 2.6 %

Results

The OBW measurements can be found in the diagrams below:

Diagram 1	DP II Smart scale	OBW = **1.13 MHz** (99%)
Diagram 2	DP II Computer terminal	OBW = **1.15 MHz** (99%)
Diagram 3	DP Radio Button	OBW = **1.08 MHz** (99%)

Appendix 6

Diagram 1

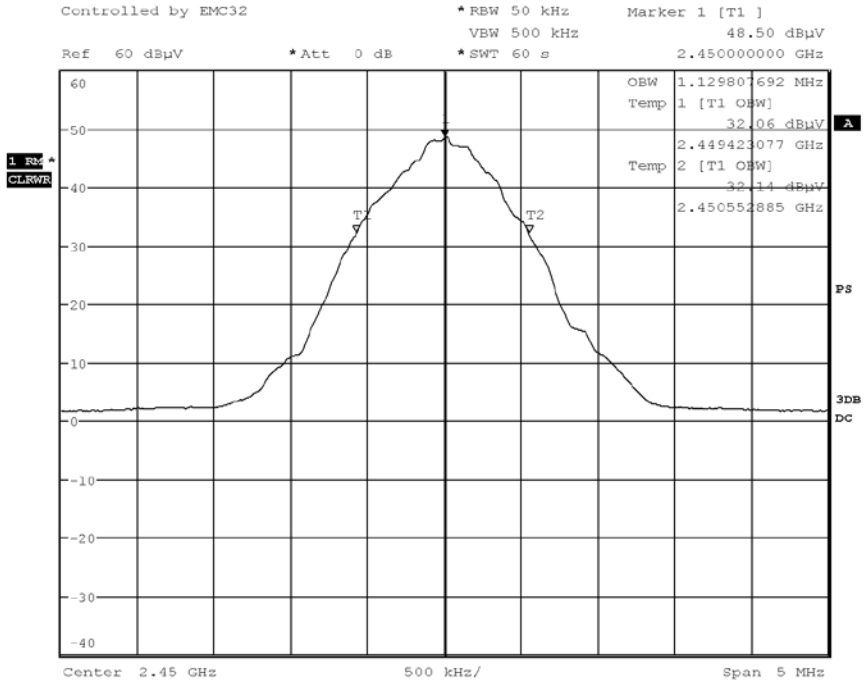


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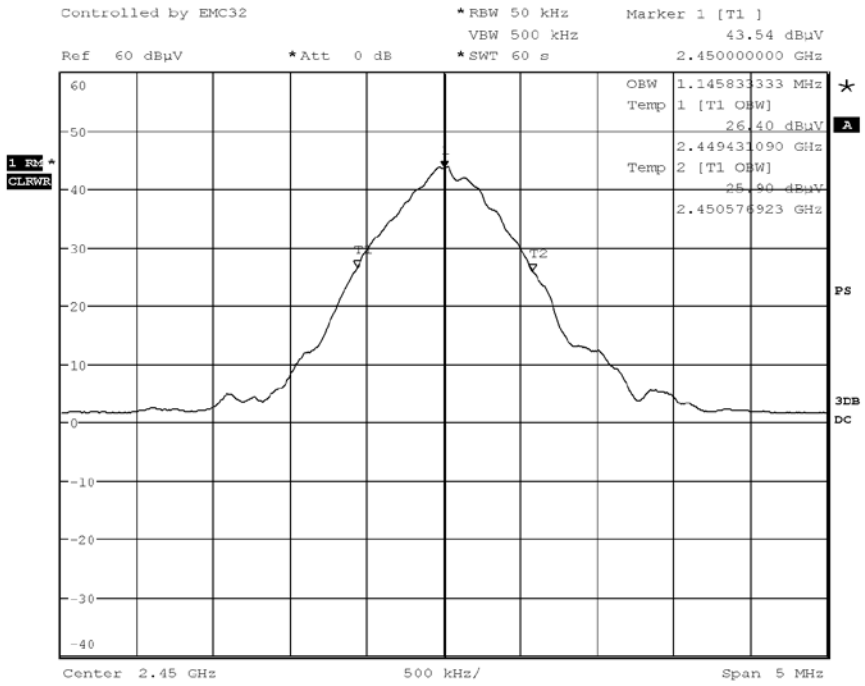
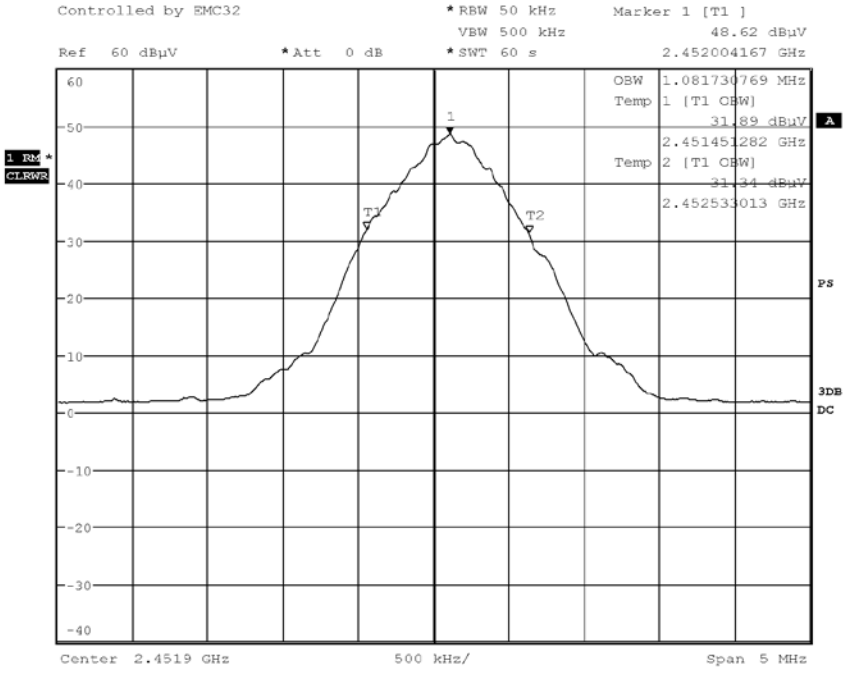
Diagram 2



Date: 2.SEP.2013 10:43:05

Appendix 6

Diagram 3



Appendix 7

Band edge measurements according to 47CFR 2.1049 / RSS-210 A2.9 (b)

Date	Temperature	Humidity
2013-09-02	23 °C ± 3 °C	47 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with continuous transmission (for duty cycle see Appendix 1) and with normal modulation.

The radiated measurements were performed in the semi-anechoic chamber with the EUT in the axis with the highest fundamental power, see Appendix 3.
CISPR average detector was used during the final measurement.

Test set-up photos during the tests can be found in Appendix 9.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
Software: R&S EMC32, ver. 6.30.10	503 745
Antenna Schaffner Bilog CBL6143	504 079
Temperature and humidity meter Testo 625	504 117

Appendix 7

Results

Operation band 2400-2483.5 MHz

The pre-measurement with peak detector can be found in the diagrams below:

Diagram 1	DP II Smart scale	Band edge at 2400 - 2483.5 MHz
Diagram 2	DP II Computer terminal	Band edge at 2400 - 2483.5 MHz
Diagram 3	DP Radio Button	Band edge at 2400 - 2483.5 MHz

Final measurements with CISPR-Average detector:

DP II Smart scale	CAV level at band edge at 2400 MHz: **49.6 dBµV/m**
DP II Smart scale	CAV level at band edge at 2483.5 MHz: **49.6 dBµV/m**
DP II Computer terminal	CAV level at band edge at 2400 MHz: **50.0 dBµV/m**
DP II Computer terminal	CAV level at band edge at 2483.5 MHz: **50.0 dBµV/m**
DP Radio Button	CAV level at band edge at 2400 MHz: **50.1 dBµV/m**
DP Radio Button	CAV level at band edge at 2483.5 MHz: **50.1 dBµV/m**

Limits

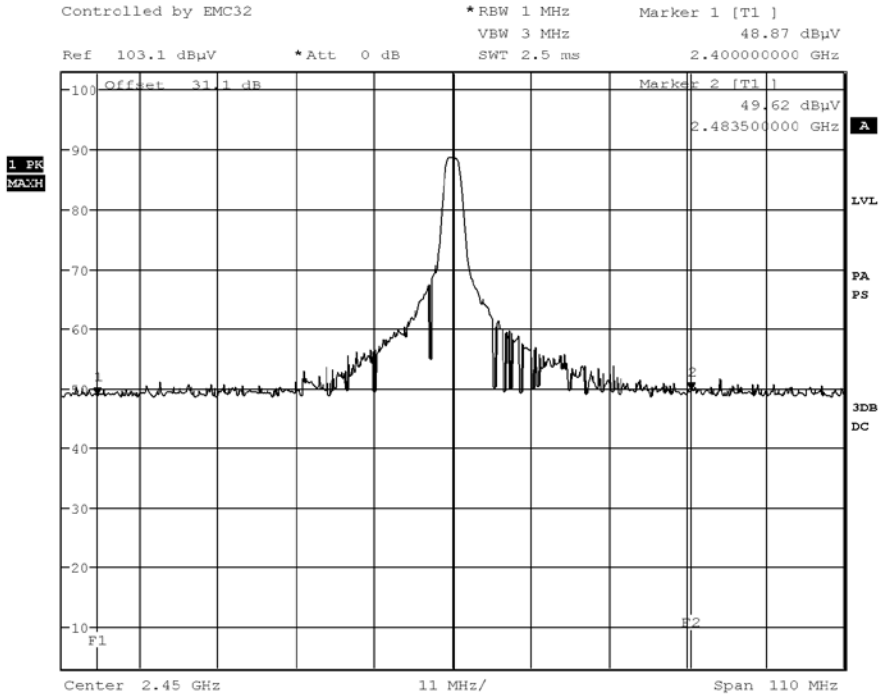
According to 47CFR 15.249(d), emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

According to RSS-210 A2.9(b), emissions radiated the outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is the less stringent.

Complies?	Yes

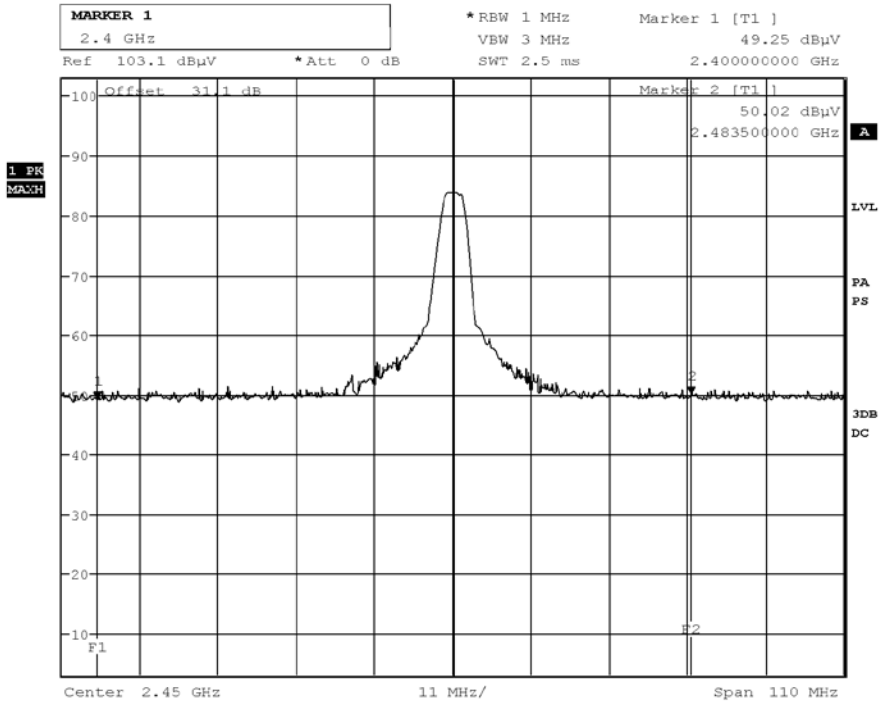
Appendix 7

Diagram 1



Date: 2.SEP.2013 15:17:01

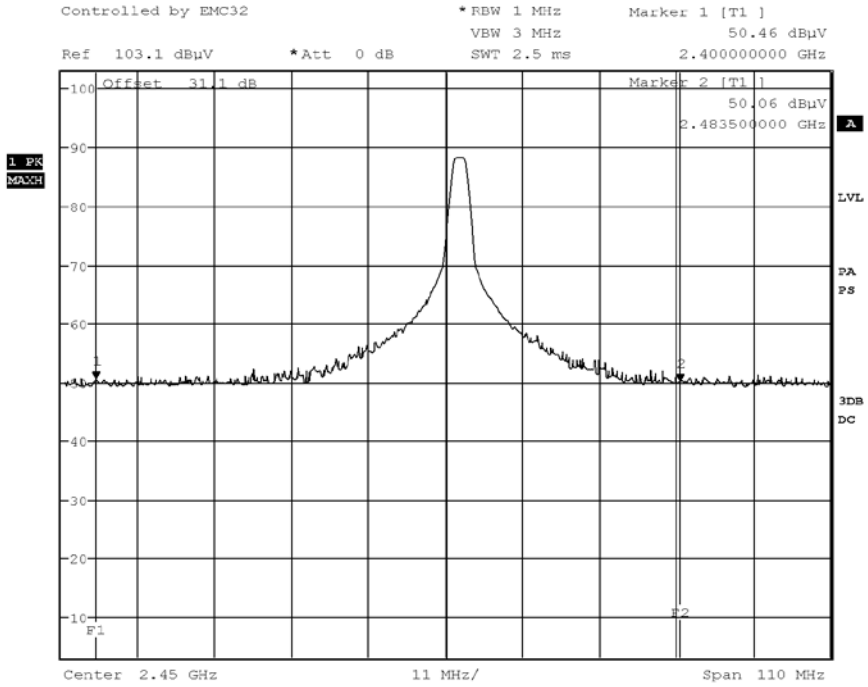
Diagram 2



Date: 2.SEP.2013 10:26:54

Appendix 7

Diagram 3



Date: 2.SEP.2013 14:45:22

RF exposure evaluation: 2.1093 Portable devices / KDB 447498/ RSS-102 2.5.1

Date	Temperature	Humidity
2013-09-02	23 °C ± 3 °C	47 % ± 5 %

Procedure

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1093 this device has been defined as a portable device to be used within 20 centimetres of the body of the user.

Results

Standalone SAR exclusion:

The following formula was used to calculate the RF exposure SAR exclusion threshold,
Thld = [Pout /r] x [√f]

where,
Thld = SAR exclusion threshold
Pout = Peak output power , in mW
r = minimum test separation distance , in mm
f=frequency, in GHz

Unit	Frequency f, (GHz)	Peak output power Pout, (mW)	Distance r, (mm)	Exclusion threshold Thld	Limit Threshold 1-g SAR	Limit Threshold 10-g SAR
Scale	2.450	0.2399	5	0.0751	< 3	< 7.5
Terminal	2.450	0.2754	5	0.0862	< 3	< 7.5
Button	2.452	0.2138	5	0.0670	< 3	< 7.5

The maximum radiated peak output power from Appendix 3 was used for calculation.

Unit	EIRP Peak output power (dBm)	Peak output power (mW)
DP II Smart scale	-6.2 Note 1	0.2399
DP II Computer terminal	-5.6 Note 1	0.2754
DP Radio Button	-6.7 Note 1	0.2138

Note 1: The measurements were performed in field strength in dBµV/m. The EIRP level was then calculated by the formula $P = (Exd)^2/30xG$, with G as unity gain of 1.

Simultaneous transmission SAR exclusion:

The DP II Computer terminal is co-located with a transmitter (FCC ID: QOQWT12).

The following formula was used to calculate the RF exposure simultaneous transmission SAR estimation for test separation distance ≤ 50 mm
st-SARe= [Pout /r] x [√f/x]

where,
st-SARe = Simultaneous transmission SAR estimation
Pout = Peak output power , in mW
r = minimum test separation distance , in mm
f=frequency, in GHz
x=7.5 for 1-g SAR

Unit	Frequency f, (GHz)	Peak output power Pout, (mW)	Distance r, (mm)	st-SARe W/kg	Sum of st-SARe W/kg	Limit Estimated 1-g SAR W/kg
Terminal	2.450	0.2754	5	0.011	0.104	0.4
QOQWT12	2402.0 - 2480.0	2.22	5	0.093		

Limits

FCC- 2.1093 / KDB 447498 (ver 5 rev 2)

4.3.1 Standalone SAR exclusion:

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] x [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

• f(GHz) is the RF channel transmit frequency in GHz
• Power and distance are rounded to the nearest mW and mm before calculation
• The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following,
a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

4.3.2 Simultaneous transmission SAR exclusion

2) When the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:

• (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
• 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

IC-2.5.1 Exemption from Routine Evaluation Limits – SAR Evaluation

SAR evaluation is required if the separation distance between the user and the radiating element of the device is less than or equal to 20 cm, except when the device operates as follows:

from 3 kHz up to 1 GHz inclusively, and with output power (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 200 mW for general public use and 1000 mW for controlled use;

above 1 GHz and up to 2.2 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 100 mW for general public use and 500 mW for controlled use;

above 2.2 GHz and up to 3 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use and 100 mW for controlled use;

above 3 GHz and up to 6 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 10 mW for general public use and 50 mW for controlled use.

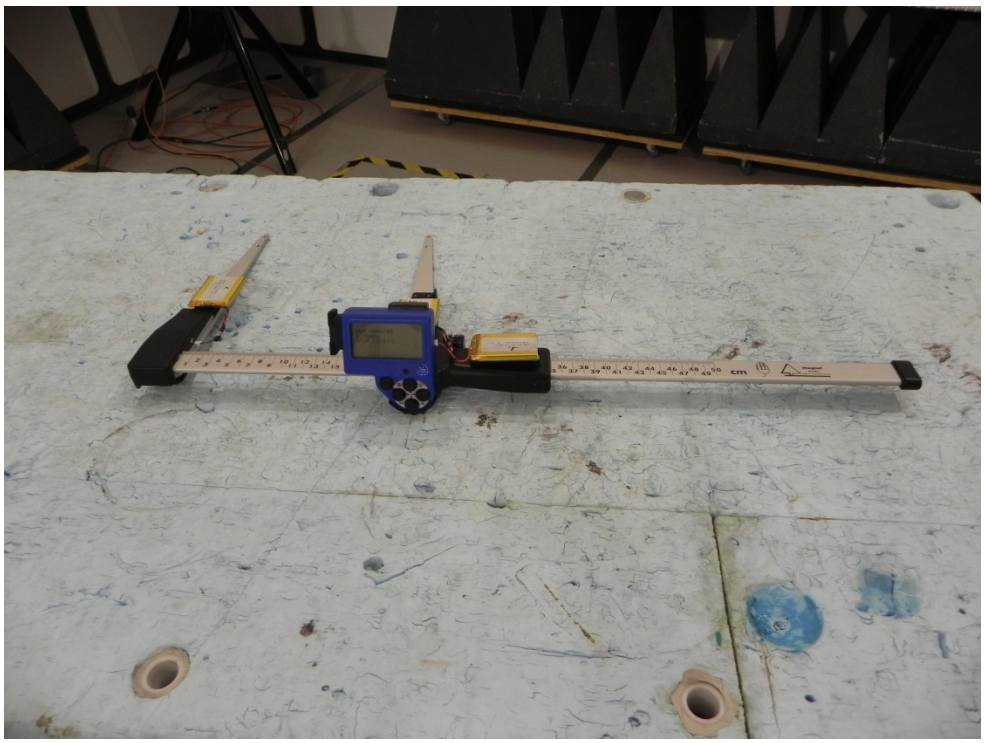
In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the output power of the device was derived.

Complies?	Yes

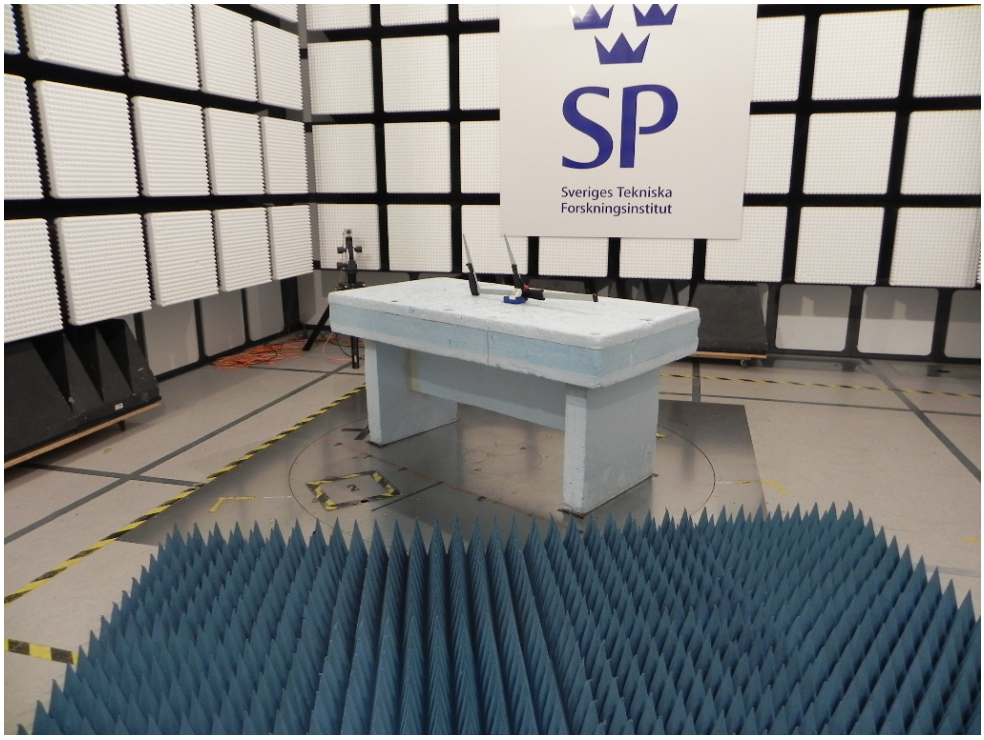
Appendix 9

Photos

The test set-up during the radiated tests can be seen in the pictures below.

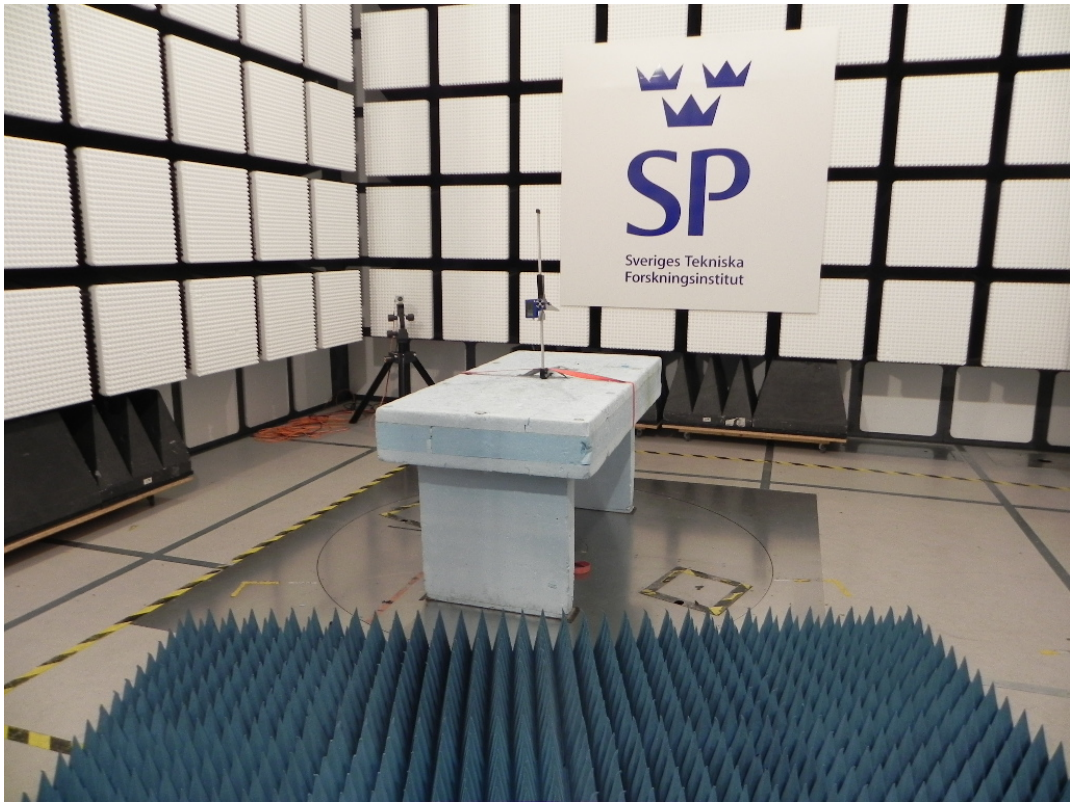


EUT in X-axis



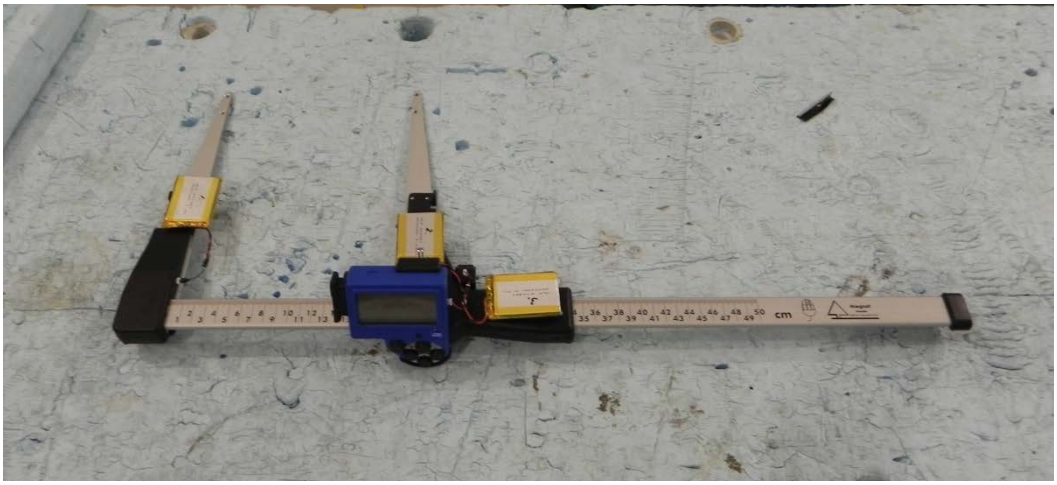
EUT in Y-aixs

Appendix 9

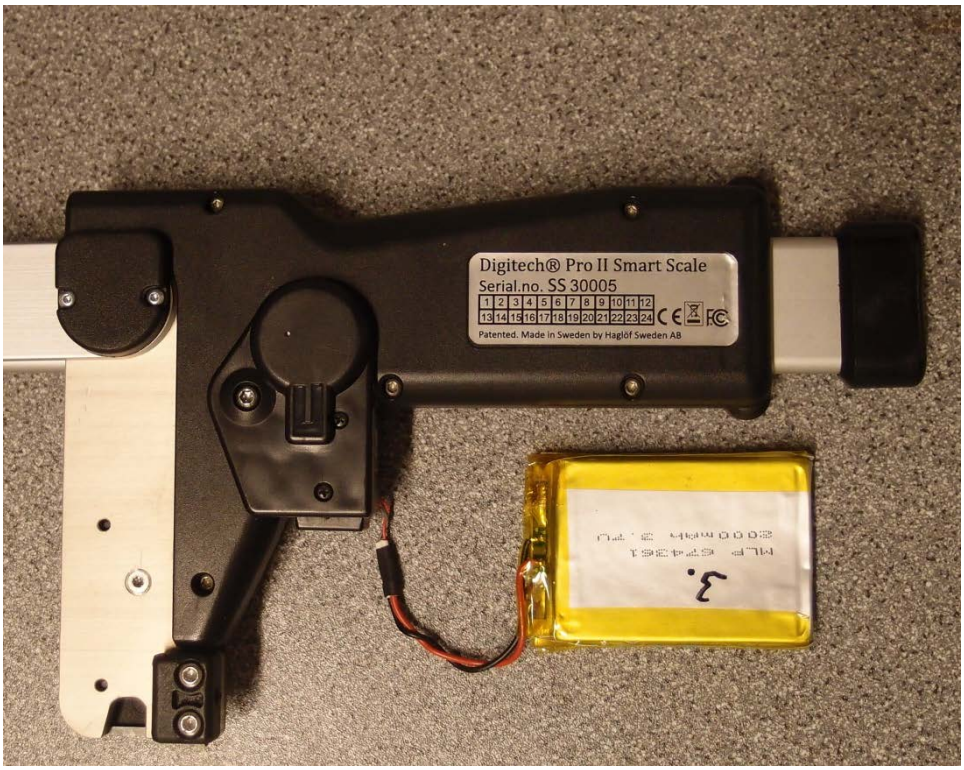


EUT in Z-axis

Appendix 9



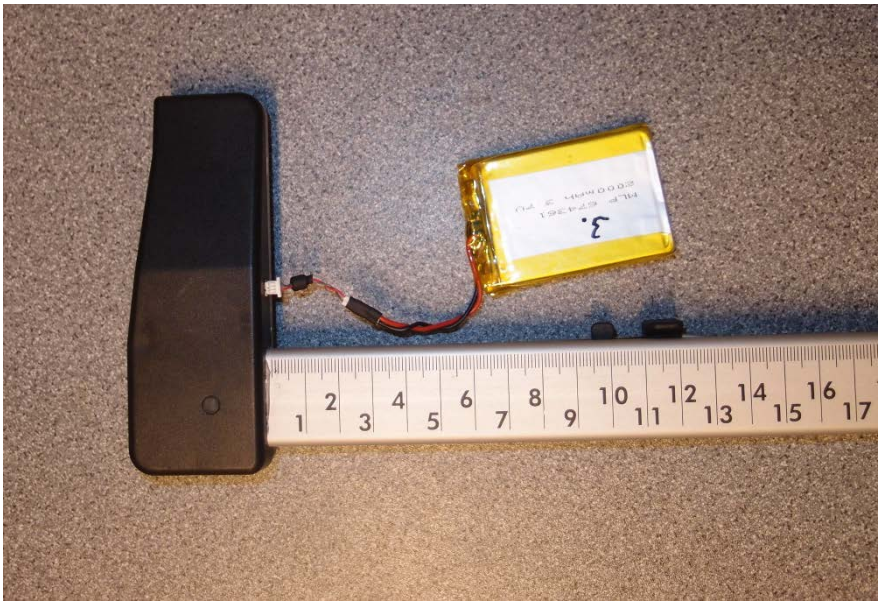
EUT with all three transceivers and external large capacity batteries.



Identity

Appendix 9

DP II Computer Terminal



DP II Smart Scale

Appendix 9

DP Radio Button