

CETECOM™

CETECOM ICT Services
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-2651-01-04/10



Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Straße 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: <http://www.cetecom.com>
e-mail: ict@cetecom.com

Accredited test laboratory:

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025
DAR registration number: DGA-PL-176/94-D1

Area of Testing: Radio/Satellite Communications

Applicant

Grass Valley Nederland B.V.
Kapittelweg 10
4827 HG Breda / Netherlands
Fax: +31 76 5721 548
Contact: Pieter van Nijnatten
e-mail: pieter.vannijnatten@grassvalley.com
Phone: +31 76 5721 272

Manufacturer

Grass Valley Nederland B.V.
Kapittelweg 10
4827 HG Breda / Netherlands

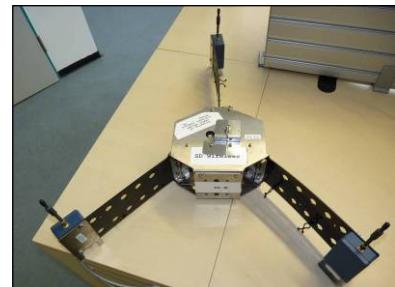
47 CFR Part 74

Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission
Experimental radio, auxiliary, special broadcast and other program distribution services

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

Test item

Kind of test item: SD Wireless Data Emitter 456 MHz
Model name: SD Wireless Data Emitter 456 MHz
FCC ID: Y2ULDK4454-20
IC: -/-
Frequency [MHz]: 455.03125 MHz to 455.61875 MHz
Power supply: 120 V / 60 Hz AC
Temperature range: -20 °C to +50 °C



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

Test performed:

Test report authorised:

Meheza Walla

Jakob Reschke

1 Table of contents

1	Table of contents.....	2
2	General information	3
2.1	Notes.....	3
2.2	Application details.....	3
3	Test standard/s	3
4	Test environment.....	3
5	Test item.....	4
6	Test laboratories sub-contracted	4
7	Summary of measurement results	5
8	RF measurement testing.....	6
8.1	Description of test setup	6
8.1.1	Radiated measurements.....	6
8.1.2	Conducted measurements.....	7
8.1.3	Referenced documents.....	8
8.1.4	Additional comments	10
9	Measurement results.....	11
9.1	Transmitter power (conducted).....	11
9.2	Transmitter power (radiated).....	12
9.3	Occupied bandwidth	13
9.4	Emission mask	14
9.5	Spurious emissions (conducted).....	18
9.6	Spurious emissions (radiated).....	22
9.7	Frequency tolerance	30
10	Test equipment and ancillaries used for tests	31
Annex A	Photographs of the test setup.....	32
Annex B	External photographs of the EUT.....	34
Annex C	Internal photographs of the EUT	43
Annex D	Document history	46
Annex E	Further information.....	46

2 General information

2.1 Notes

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 generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

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

2.2 Application details

Date of receipt of order:	2010-09-30
Date of receipt of test item:	2010-10-01
Start of test:	2010-10-04
End of test:	2010-10-22
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Version	Test standard description
47 CFR Part 74	2006-10	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission Experimental radio, auxiliary, special broadcast and other program distribution services

4 Test environment

Temperature:	T_{nom}	+20 °C during room temperature tests
	T_{max}	+50 °C during high temperature test
	T_{min}	-30 °C during low temperature test
Relative humidity content:		55 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	120 V / 60 Hz AC
	V_{max}	102 V
	V_{min}	138 V

5 Test item

Kind of test item :	SD Wireless Data Emitter 456 MHz
Type identification :	SD Wireless Data Emitter 456 MHz
S/N serial number :	LDK 4454/20 – 1GQ91
HW hardware status :	-/-
SW software status :	-/-
Frequency band [MHz] :	455.03125 MHz to 455.61875 MHz
Type of modulation :	FSK
Number of channels :	6 (455.10 MHz; 455.20 MHz; 455.30 MHz; 455.40 MHz; 455.50 MHz; 455.60 MHz)
Occupied Bandwidth :	22.04 kHz (99% BW)
Emission Designator :	22K0F1D
Antenna :	External antenna
Power supply :	120 V / 60 Hz AC
Temperature range :	-20°C to +50 °C

6 Test laboratories sub-contracted

None

7 Summary of measurement results

No deviations from the technical specifications were ascertained

There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	FCC CFR 47 Part 74	Passed	2010-12-07	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results (max.)
§ 74.461	Transmitter power (conducted)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.461	Transmitter power (radiated)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.462 / § 74.463	Occupied bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.462	Spurious emissions at antenna terminals Emission mask	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.462	Spurious emissions at antenna terminals Spurious Emissions (conducted)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.637	Spurious emissions at antenna terminals Band-Edge compliance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.462	Spurious Emissions (radiated)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 74.464	Frequency stability Frequency tolerance	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Note:NA = Not Applicable; NP = Not Performed

8 RF measurement testing

8.1 Description of test setup

8.1.1 Radiated measurements

EIRP Measurements

Measuring the EIRP using Substitution Method:

- (a) The measurements were performed with full rf output power and modulation.
- (b) Test was performed at listed 3m test site (listed with FCC, IC).
- (c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- (d) The TRILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- (e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
- Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
- $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (f) Set the EMI Receiver and #2 as follows:

Center Frequency	:	test frequency
Resolution BW	:	100 kHz
Video BW	:	same
Detector Mode	:	positive
Average	:	off
Span	:	3 x the signal bandwidth
- (g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- (h) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

- (a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency	:	equal to the signal source
Resolution BW	:	10 kHz
Video BW	:	same
Detector Mode	:	positive
Average	:	off
Span	:	3 x the signal bandwidth
- (b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
- Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
- $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (c) Select the frequency and E-field levels for ERP/EIRP measurements.
- (d) Substitute the EUT by a signal generator and one of the following transmitting antennas (substitution antenna): DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz}.
- (e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
- (f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
- (g) If the DIPOLE antenna is used, tune its elements to the frequency as specified in the calibration manual.
- (h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.

- (i) Tune the EMI Receivers to the test frequency.
- (j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- (k) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- (l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- (m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
- (n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

$$P = P_1 - L_1 = (P_2 + L_2) - L_1 = P_3 + A + L_2 - L_1$$

$$\text{EIRP} = P + G_1 = P_3 + L_2 - L_1 + A + G_1$$

$$\text{ERP} = \text{EIRP} - 2.15 \text{ dB}$$

Total Correction factor in EMI Receiver # 2 = $L_2 - L_1 + G_1$

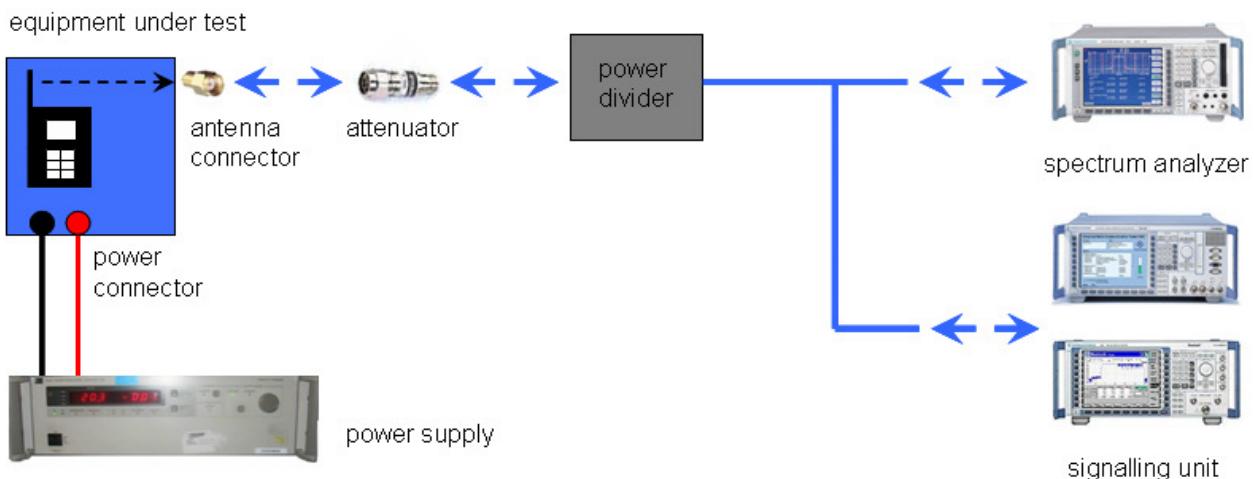
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
 P1: Power output from the signal generator
 P2: Power measured at attenuator A input
 P3: Power reading on the Average Power Meter
 EIRP: EIRP after correction
 ERP: ERP after correction

- (o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
- (p) Repeat step (d) to (o) for different test frequency
- (q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
- (r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is connected to the spectrum analyzer. The specific losses for signal path are first checked within a calibration. The measurement readings on the spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.

Exemplary test setup:



8.1.3 Referenced documents

Specifications (cont.)

RF receiver units

Dimensions	98mm x 64mm x 34mm (L x H x W)
Weight	300g / box
Operating temperature	-20°C to +45°C
Storage temperature	-20°C to +60°C
Environment	IP54 compliant
Frequency range	2.2 - 2.4 GHz, 2.4 - 2.5 Ghz or 2.5 - 2.7 Ghz depending on module
RF antenna	SMA connector
VHF output	BNC connector

RF data emitter unit

Dimensions	98mm x 64mm x 34mm (L x H x W)
Weight	300g
Operating temperature	-20°C to +45°C
Storage temperature	-20°C to +60°C
Environment	IP54 compliant
Modulation	FSK modulation
Return channel	sensitivity < -95dBm
Frequency range	433.100 – 434.600 MHz; 455.000 - 456.700 MHz (455.000 - 455.700 MHz for US market)
Number of channels	16
Bandwidth	25 KHz (max.)
Baud rate	14400 baud
Emitted power	8 dBm ± 2 dBm (conducted in 433 MHz range) 14 dBm ± 2 dBm (conducted in 456 MHz range)
Range	150m line-of-sight in open field conditions
RF antenna	BNC connector
Data input	9-pin, D connector female

Specifications (cont.)

Antenna management unit (AMU)

Dimensions	480mm x 250mm x 200mm (L x H x W)
Weight	8,5 Kg
Operating temperature	-20°C to +45°C
Storage temperature	-20°C to +60°C
Environment	IP54 compliant
Data output	9-pin, D connector female
UHF inputs	3 x BNC connectors with active loop-through
TRIAX output	Triax plug, towards WCU

Wireless control unit (WCU)

Dimensions	½ 19-inch rack; 3U height
Weight	7 kg
Operating temperature	0°C to +45°C
Storage temperature	-20°C to +60°C
Power	100-125 Vac 60Hz (3A) or 200-240 Vac 50Hz (1.5A) max. 150W depending on system configuration
Triax cable length	400m maximum with 8mm cable or 600m maximum with 11mm cable
Video (x3)	SDI x3 SMPTE 259M; BNC
CVBS	CVBS output monitoring quality; BNC
Genlock in	B&B input with loop through; BNC
POWER in	IEC type, 3 pin male
Intercom	Speech quality Input level 0 or +6 dBu selectable Output level +6 dBu nominal (adjustable +/- 12dB per 1.5 dB step)
Audio	Output level 0 or +6 dBu selectable
Applicable Standards	EMC : EN 301489-3 Radio: ETS 300 220; ETS 300 440 Safety : EN60950

These typical specifications are subject to change without notice.

8.1.4 Additional comments

The Customer extended the Data Emitter with an extra amplifier (Data Booster). For practical reasons the customer didn't put the Data Emitter and Booster in the same housing, but both the data booster and the data emitter are to be considered as 1 single unit.

During testing, the EUT was transmitting a modulated FSK carrier continuously. DC Power was applied from the Antenna Management Unit (AMU), which obtained power from the Wireless Connection Unit (WCU), which was powered from 120 V / 60 Hz AC power.

9 Measurement results

9.1 Transmitter power (conducted)

TEST CONDITIONS		TRANSMITTER POWER [dBm] (Power Meter values)		
Frequency (MHz)		455.10 MHz	455.20 MHz	455.30 MHz
T_{nom}	V_{nom}	28.10	28.12	28.12
Measurement uncertainty		$\pm 3\text{dB}$		

TEST CONDITIONS		TRANSMITTER POWER [dBm] (Power Meter values)		
Frequency (MHz)		455.40 MHz	455.50 MHz	455.60 MHz
T_{nom}	V_{nom}	28.11	28.10	28.10
Measurement uncertainty		$\pm 3\text{dB}$		

Limits:

CFR Part SUBCLAUSE §74.461(a), (b)	
Under normal test conditions only	<p>(a) Transmitter power is the power at the transmitter output terminals and delivered to the antenna, antenna transmission line, or any other impedance-matched, radio frequency load. For the purpose of this Subpart, the transmitter power is the carrier power.</p> <p>(b) The authorized transmitter power for a remote pickup broadcast station shall be limited to that necessary for satisfactory service and, in any event, shall not be greater than 100 watts (50 dBm), except that a station to be operated aboard an aircraft shall normally be limited to a maximum authorized power of 15 watts. Specific authorization to operate stations on board aircraft with an output power exceeding 15 watts will be issued only upon an adequate engineering showing of need, and of the procedures that will be taken to avoid harmful interference to other licensees.</p>

Result: The result of the measurement is passed.

9.2 Transmitter power (radiated)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER [dBm]		
Frequency (MHz)		455.10 MHz	455.20 MHz	455.30 MHz
T_{nom}	V_{nom}	27.78	27.82	27.98
Measurement uncertainty		$\pm 3\text{dB}$		

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER [dBm]		
Frequency (MHz)		455.40 MHz	455.50 MHz	455.60 MHz
T_{nom}	V_{nom}	27.85	27.80	28.00
Measurement uncertainty		$\pm 3\text{dB}$		

Limits:

CFR Part SUBCLAUSE §74.461(a), (b)	
Under normal test conditions only	<p>(a) Transmitter power is the power at the transmitter output terminals and delivered to the antenna, antenna transmission line, or any other impedance-matched, radio frequency load. For the purpose of this Subpart, the transmitter power is the carrier power.</p> <p>(b) The authorized transmitter power for a remote pickup broadcast station shall be limited to that necessary for satisfactory service and, in any event, shall not be greater than 100 watts (50 dBm), except that a station to be operated aboard an aircraft shall normally be limited to a maximum authorized power of 15 watts. Specific authorization to operate stations on board aircraft with an output power exceeding 15 watts will be issued only upon an adequate engineering showing of need, and of the procedures that will be taken to avoid harmful interference to other licensees.</p>

Result: The result of the measurement is passed.

9.3 Occupied bandwidth

TEST CONDITIONS		OCCUPIED BANDWIDTH [kHz]		
Frequency (MHz)		455.10 MHz	455.20 MHz	455.30 MHz
T_{nom}	V_{nom}	22.04	21.32	20.84
Measurement uncertainty	± 5 kHz			

TEST CONDITIONS		OCCUPIED BANDWIDTH [kHz]		
Frequency (MHz)		455.40 MHz	455.50 MHz	455.60 MHz
T_{nom}	V_{nom}	20.52	20.84	20.84
Measurement uncertainty	± 5 kHz			

Remark:

The internal function of the spectrum analyzer was used to determine the occupied bandwidth (99%).

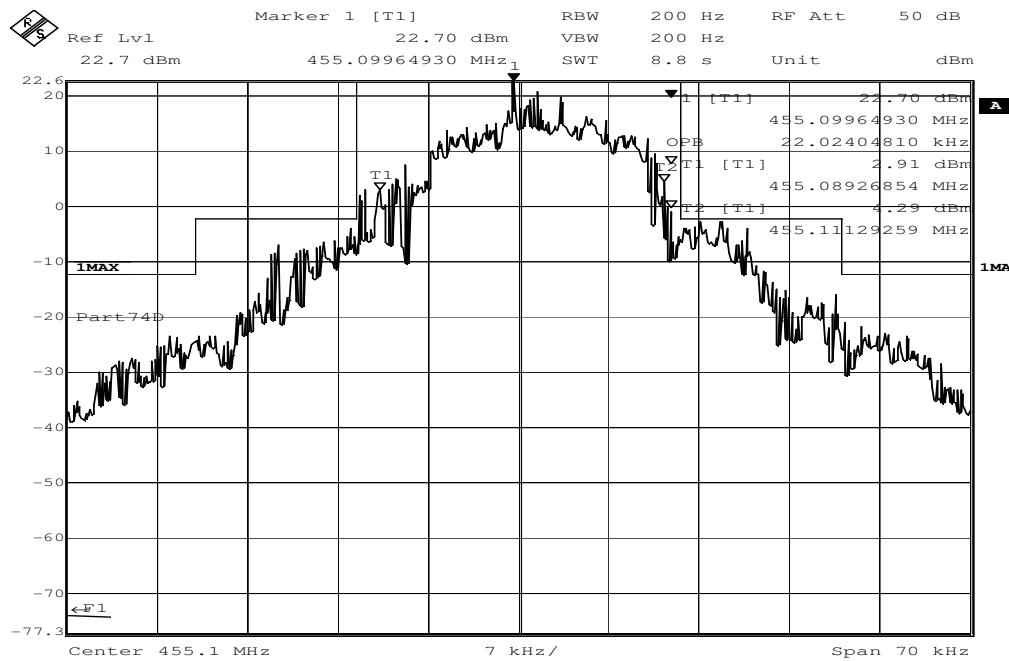
Limits:

CFR Part SUBCLAUSE §74.462(b), §74.463(c)	
Under normal test conditions only	The maximum authorized bandwidth is 25 kHz

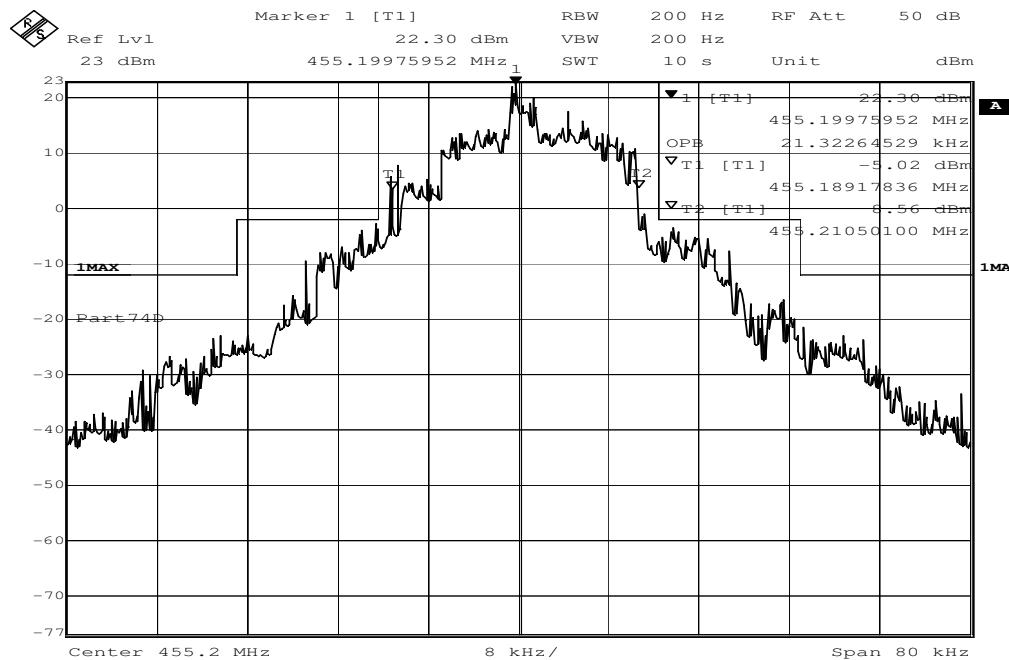
Result: The result of the measurement is passed.

9.4 Emission mask

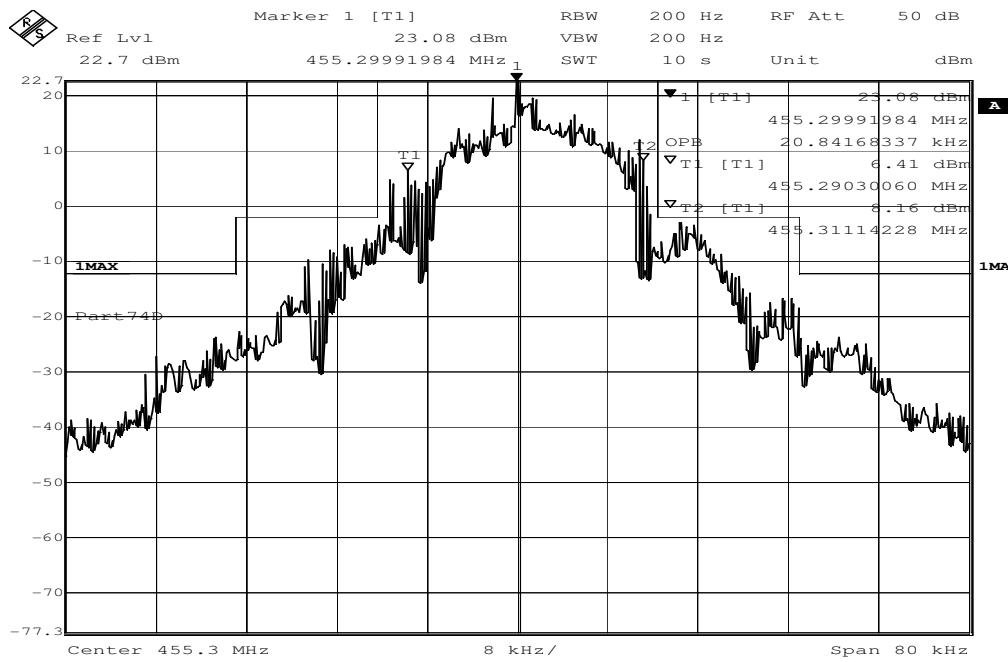
Plot 1: Emission Mask 455.10 MHz



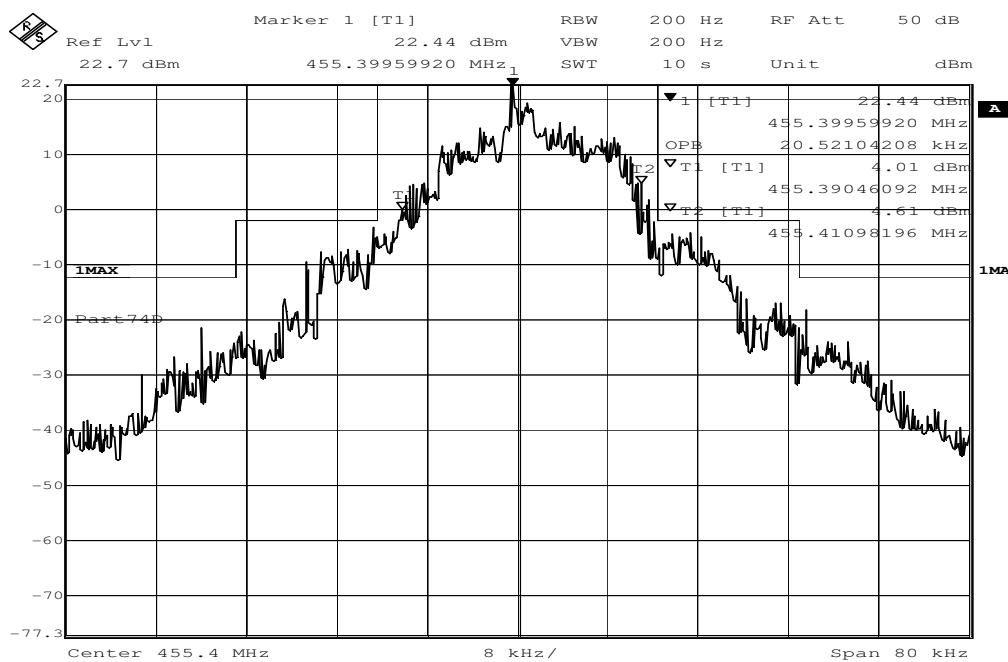
Plot 2: Emission Mask 455.20 MHz



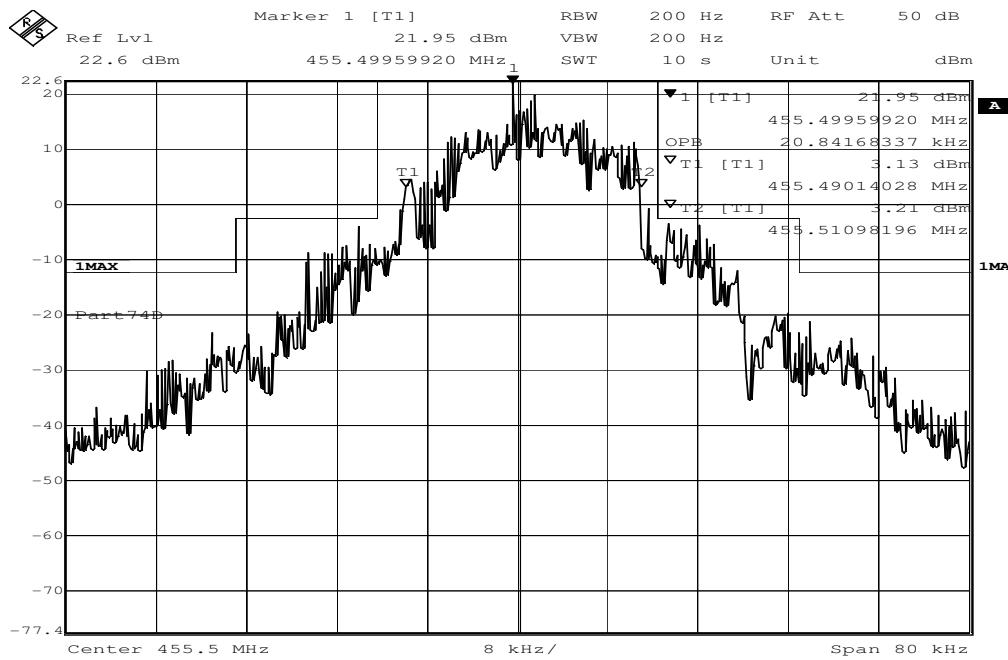
Plot 3: Emission Mask 455.30 MHz



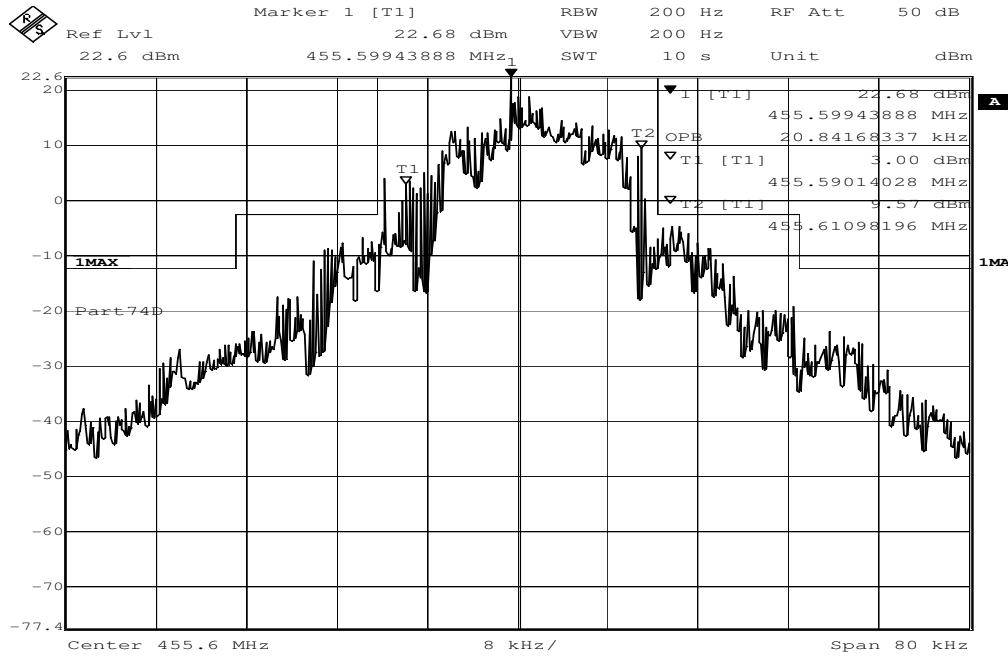
Plot 4: Emission Mask 455.40 MHz



Plot 5: Emission Mask 455.50 MHz



Plot 6: Emission Mask 455.60 MHz



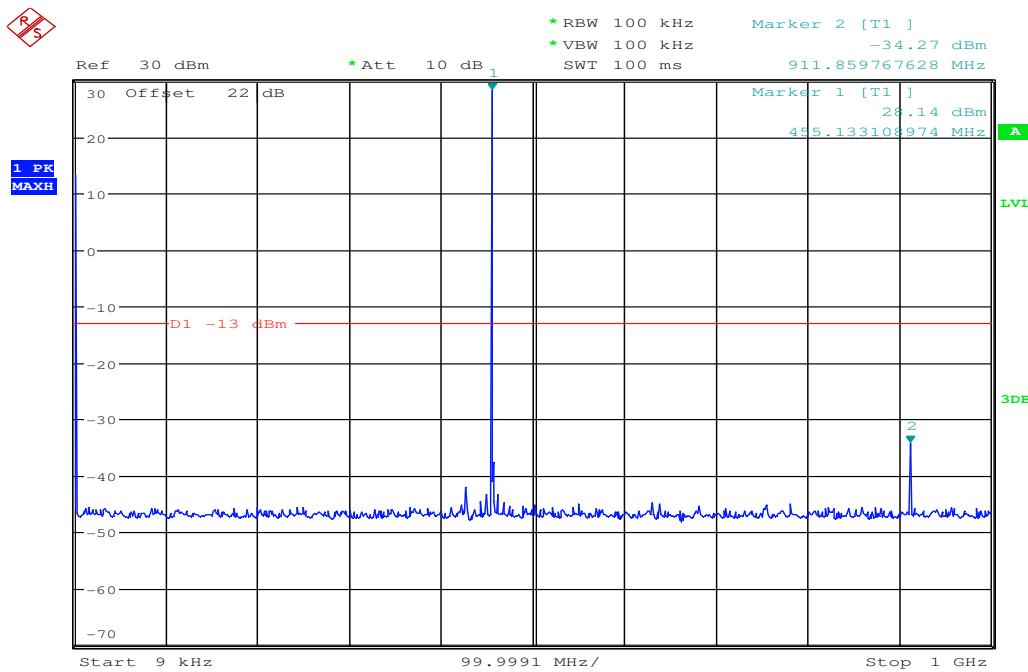
Limits:

CFR Part SUBCLAUSE §74.462(c)(1-3)	
Under normal test conditions only	<p>(c) For emissions on frequencies above 25 MHz with authorized bandwidths up to 30 kHz, the emissions shall comply with the emission mask and transient frequency behavior requirements of §§ 90.210 and 90.214 of this chapter. For all other emissions, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:</p> <p>(1) On any frequency removed from the assignment frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;</p> <p>(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;</p> <p>(3) On any frequency removed from the assigned frequency by more than 250 percent on the authorized bandwidth; at least 43 plus 10 log₁₀ (mean output power, in watts) dB.</p>

Result: The result of the measurement is passed.

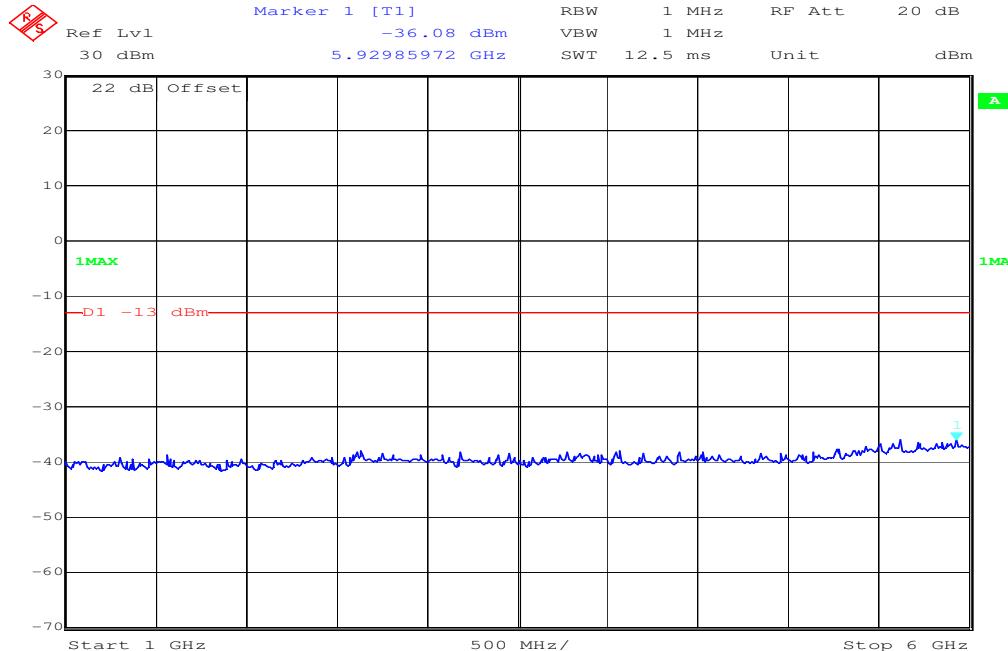
9.5 Spurious emissions (conducted)

Plot 7: 9 kHz – 1 GHz (455.10 MHz)

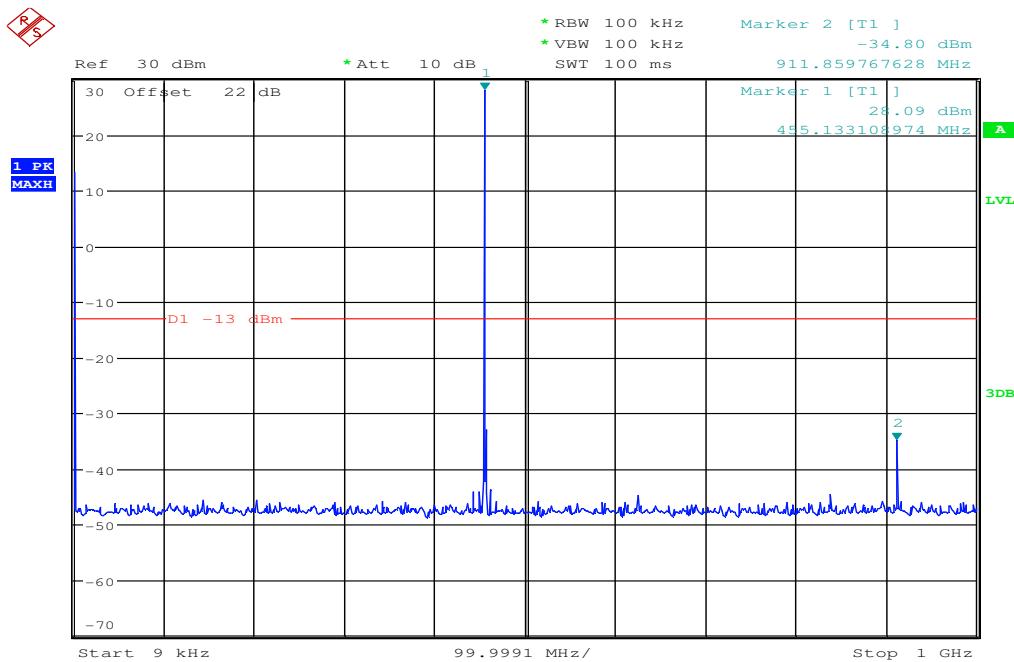


The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.

Plot 8: 1 GHz – 6 GHz (455.10 MHz)

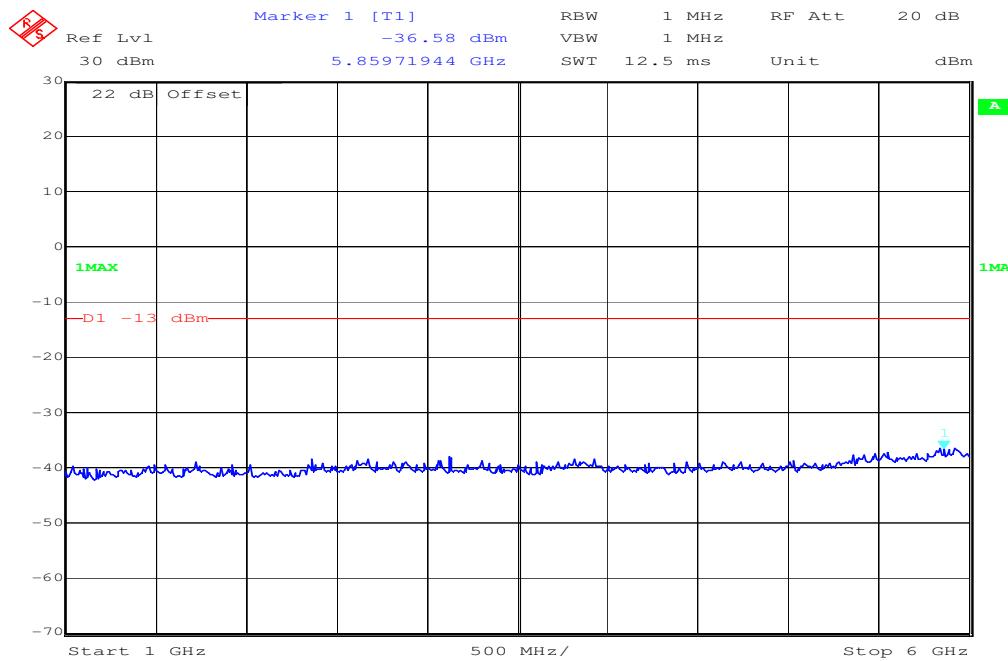


Plot 9: 9 kHz – 1 GHz (455.40 MHz)

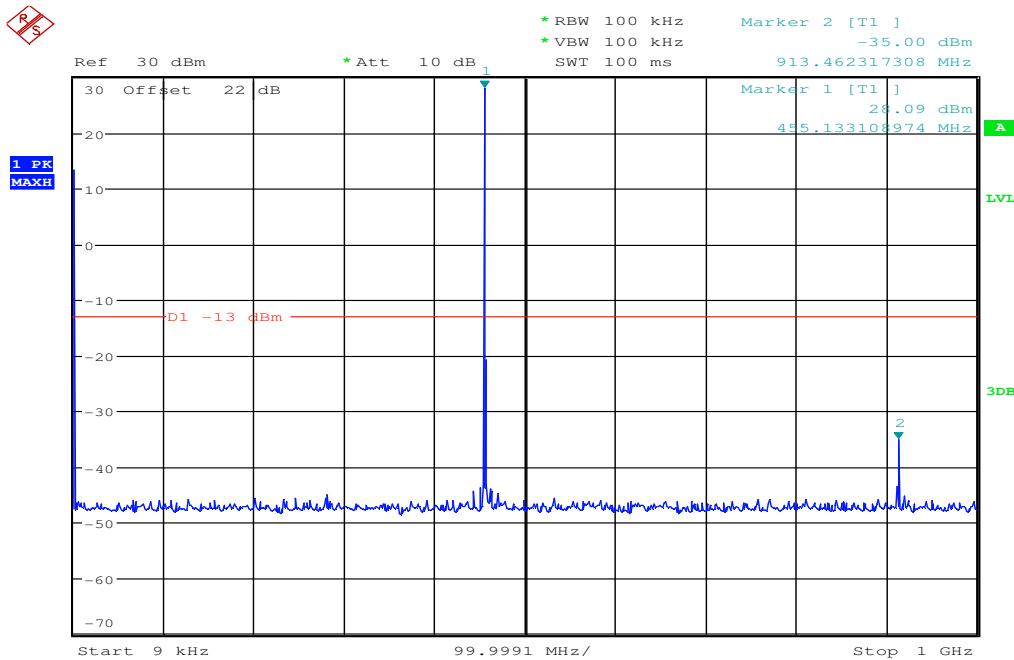


The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.

Plot 10: 1 GHz – 6 GHz (455.40 MHz)

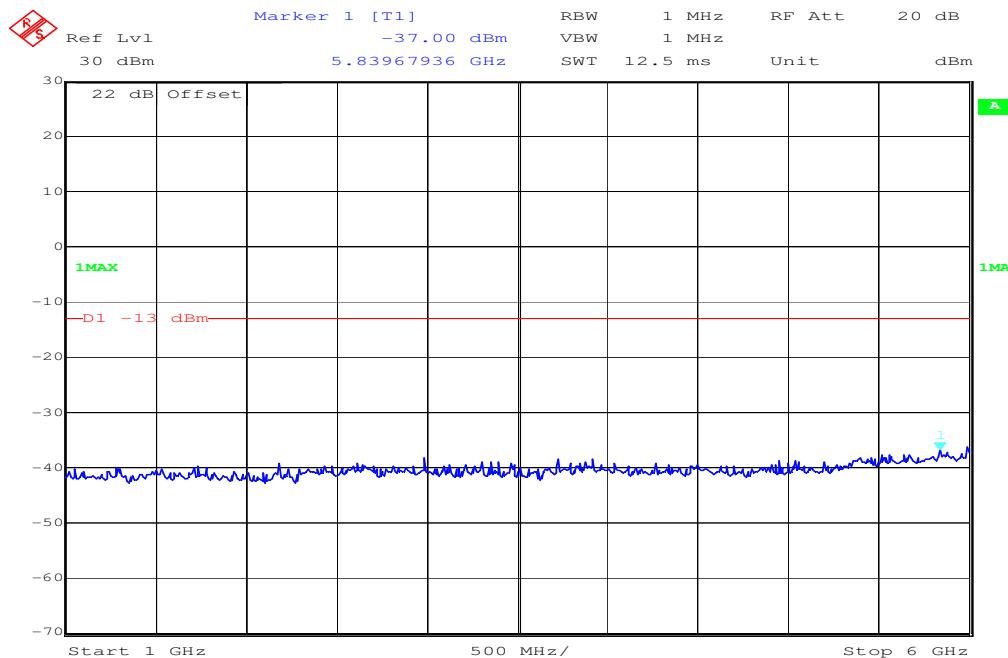


Plot 11: 9 kHz – 1 GHz (455.60 MHz)



The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.

Plot 12: 1 GHz – 6 GHz (455.60 MHz)



Transmitter Spurious Emissions Conducted [dBm]								
455.10 MHz			455.40 MHz			455.60 MHz		
Frequency [MHz]	Detector	Level [dBm]	Frequency [MHz]	Detector	Level [dBm]	Frequency [MHz]	Detector	Level [dBm]
912	Peak	-34.27	912	Peak	-34.80	913	Peak	-35.00
Measurement uncertainty			± 3 dB					

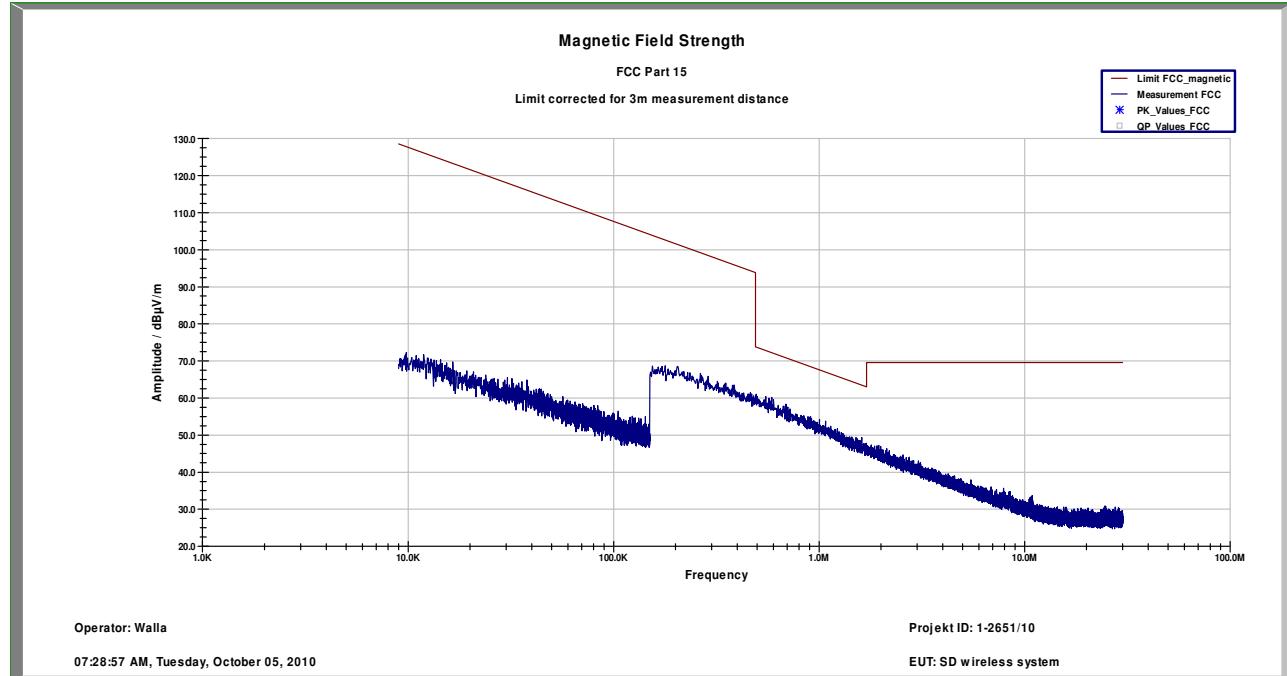
Limits:

CFR Part SUBCLAUSE §74.462(c)	
Under normal test conditions only	All spurious emissions must not exceed -13 dBm, using a 100 kHz bandwidth below 1 GHz and a 1 MHz resolution bandwidth above 1 GHz.

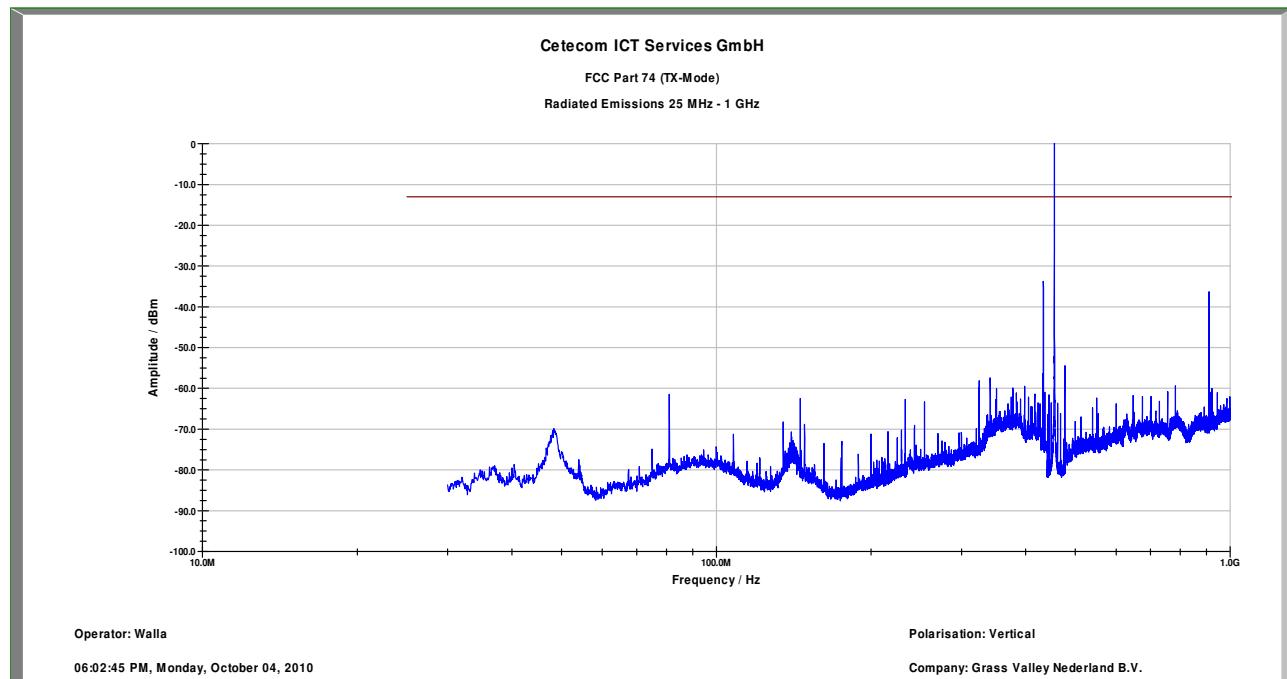
Result: The result of the measurement is passed.

9.6 Spurious emissions (radiated)

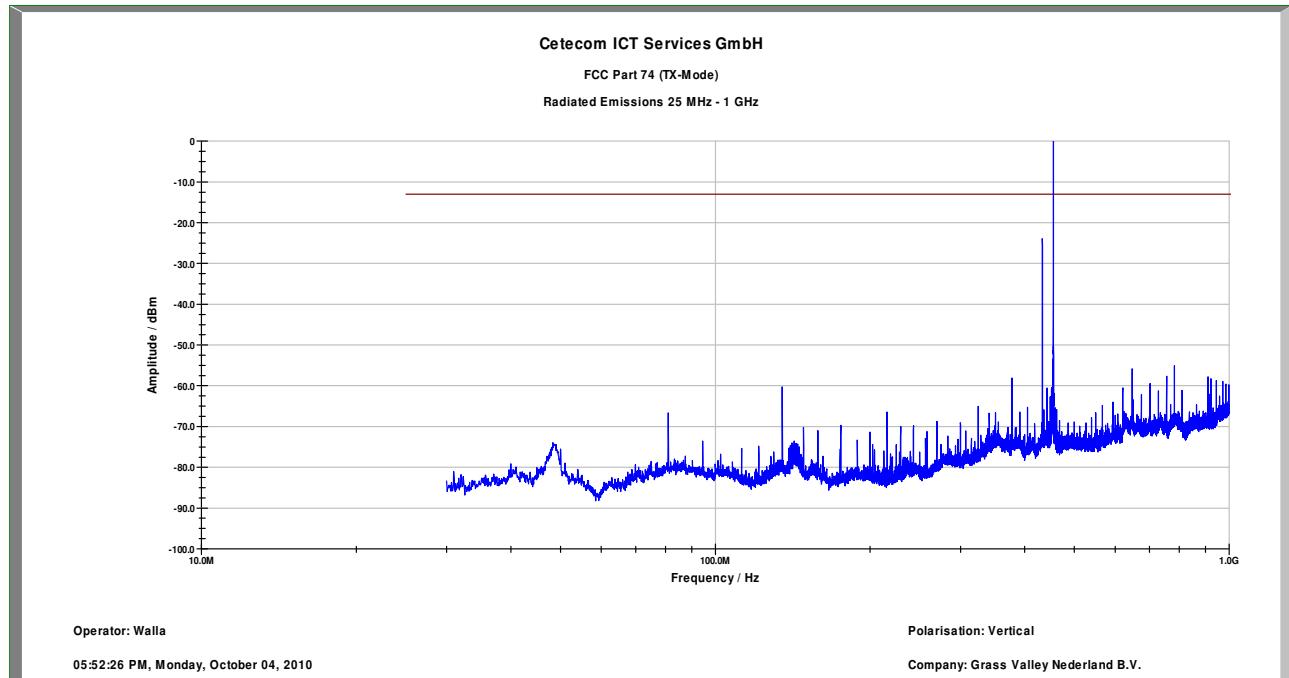
Plot 13: 9 kHz – 30 MHz (valid for all channels)



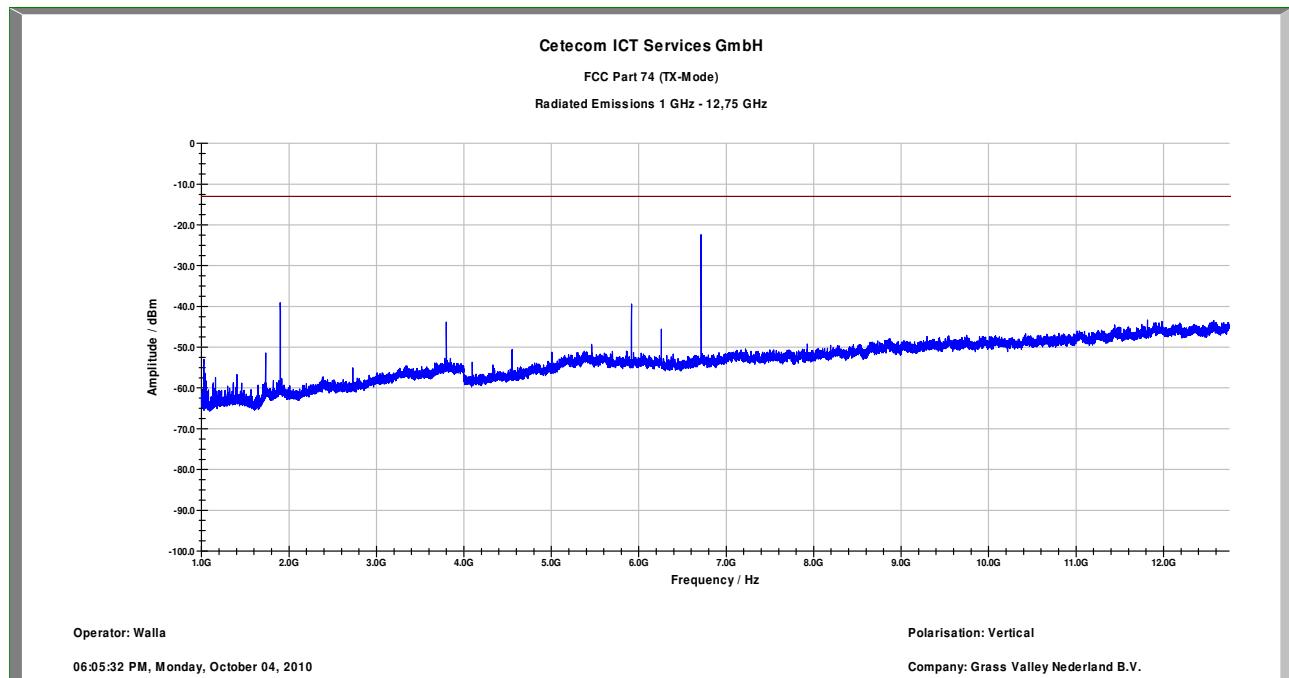
Plot 14: 30 MHz – 1 GHz, 455.10 MHz, antenna vertical



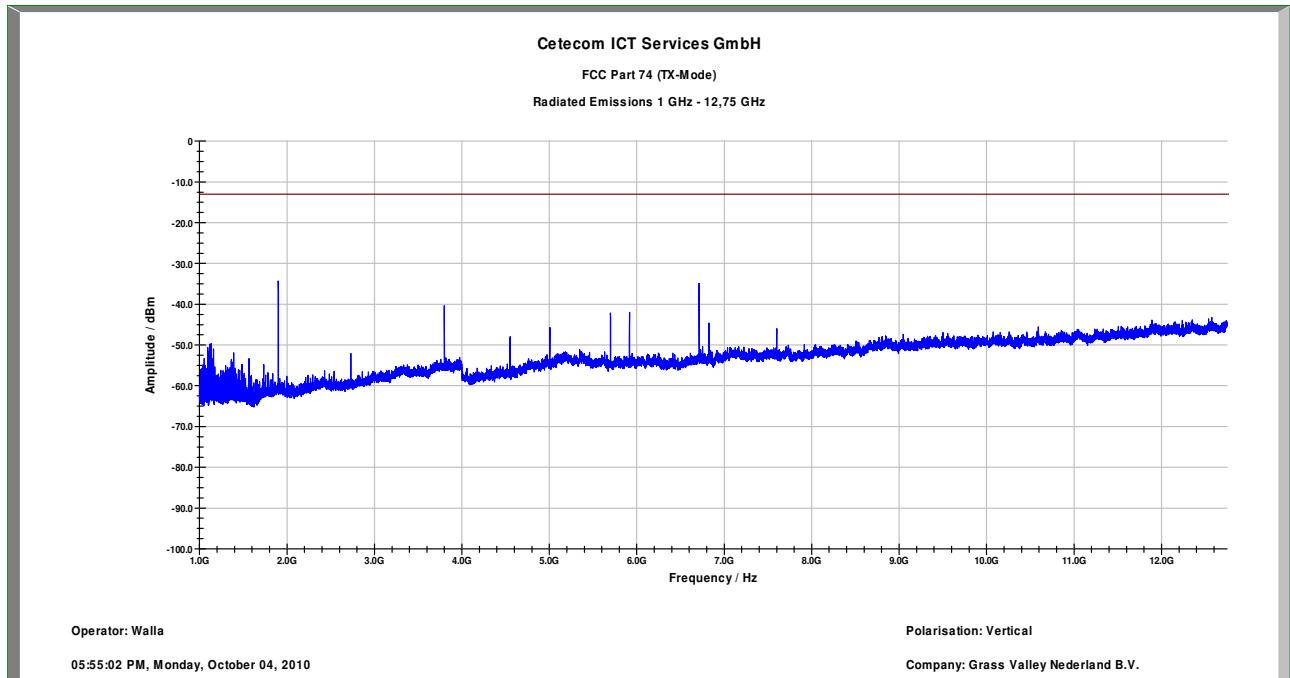
Plot 15: 30 MHz – 1 GHz, 455.10 MHz, antenna horizontal



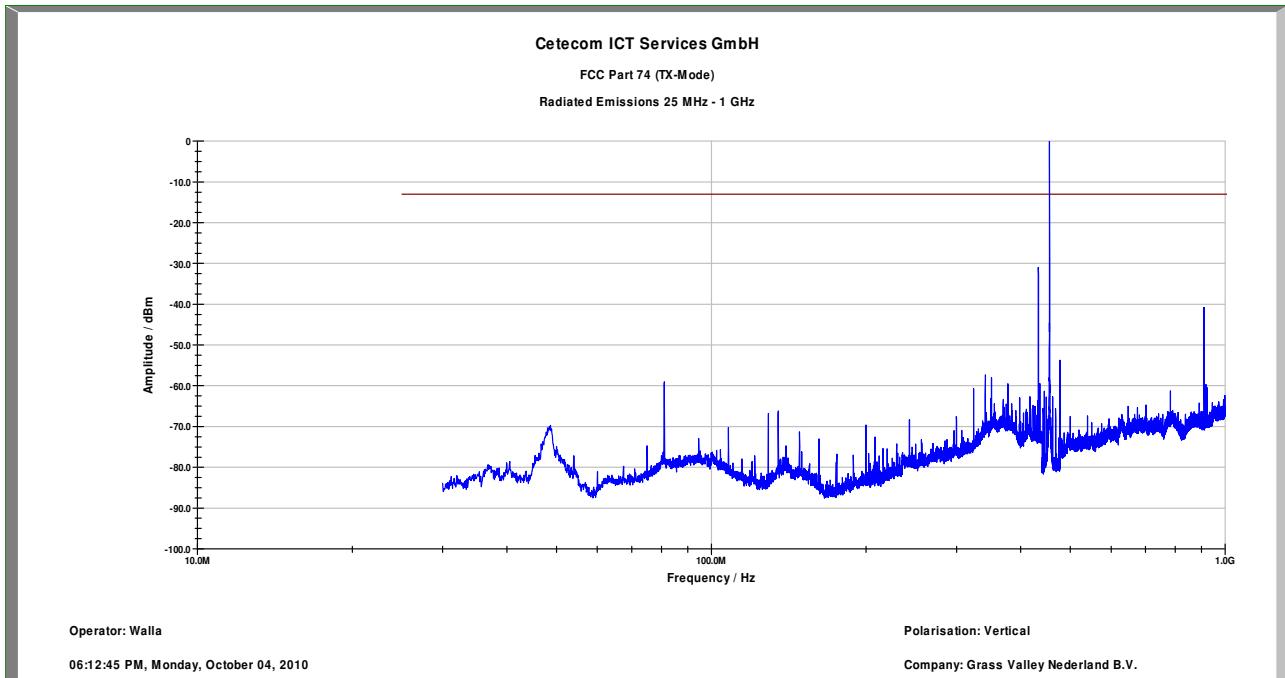
Plot 16: 1 GHz – 12 GHz, 455.10 MHz, antenna vertical



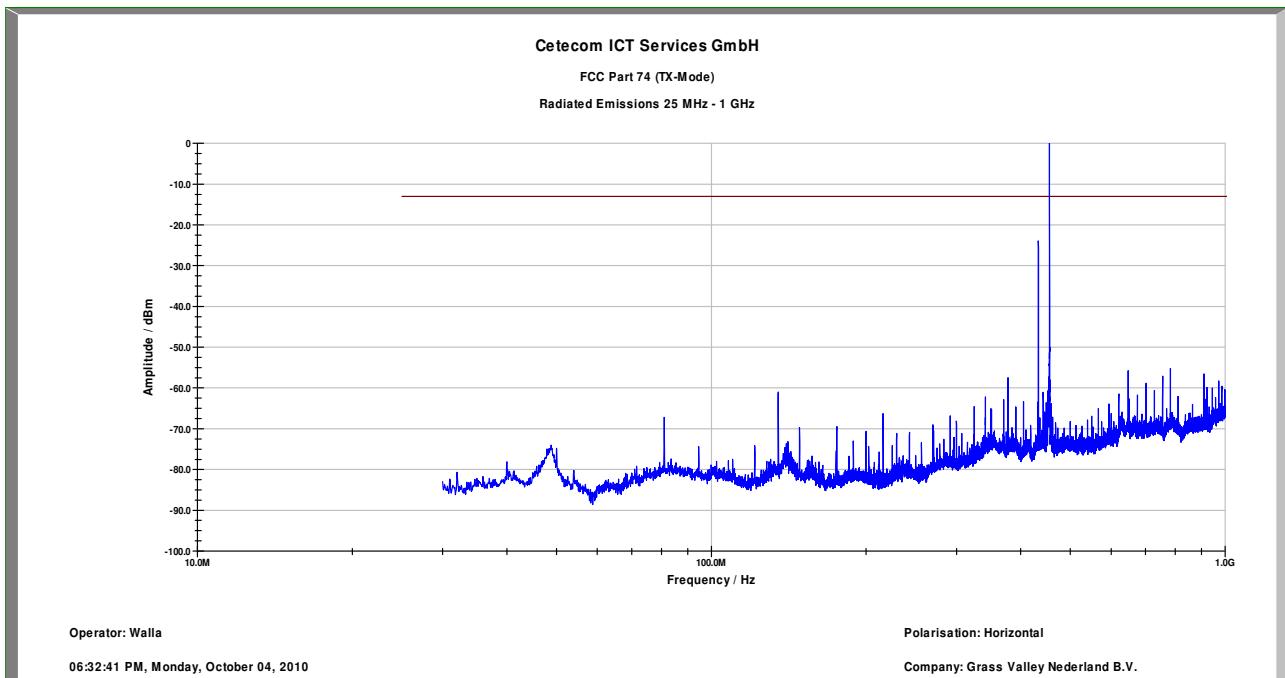
Plot 17: 1 GHz – 12 GHz, 455.10 MHz, antenna horizontal



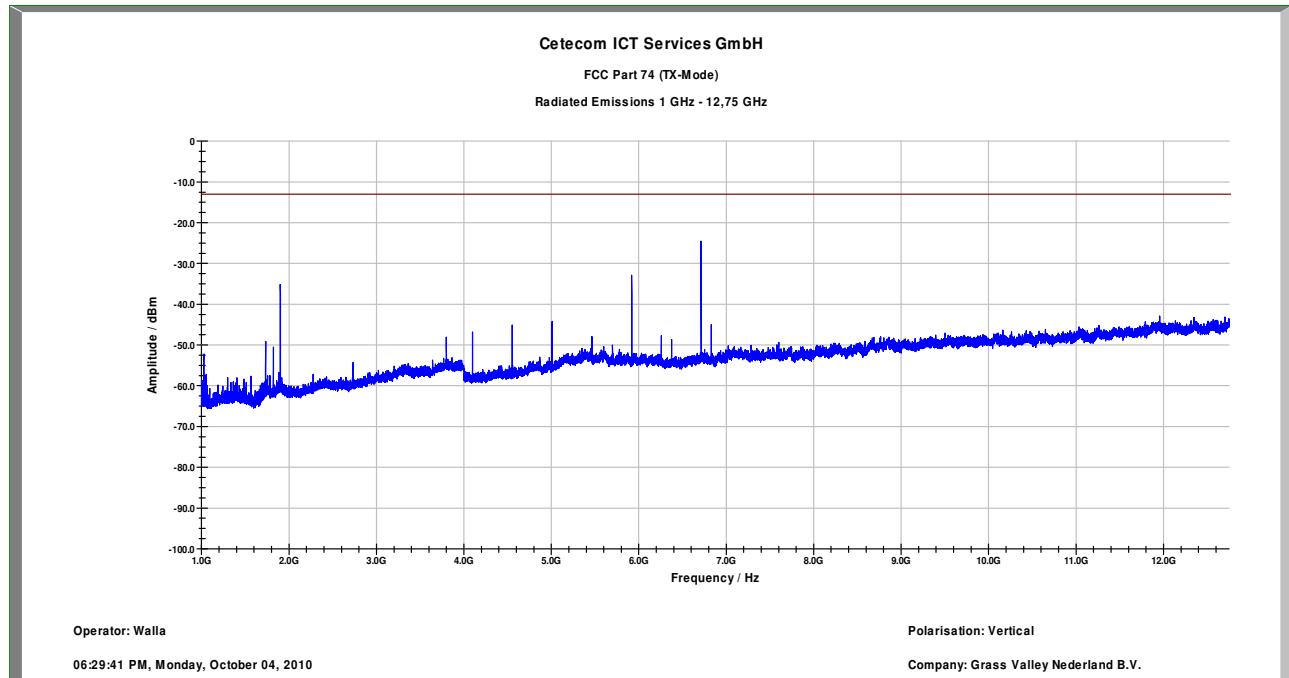
Plot 18: 30 MHz – 1 GHz, 455.40 MHz, antenna vertical



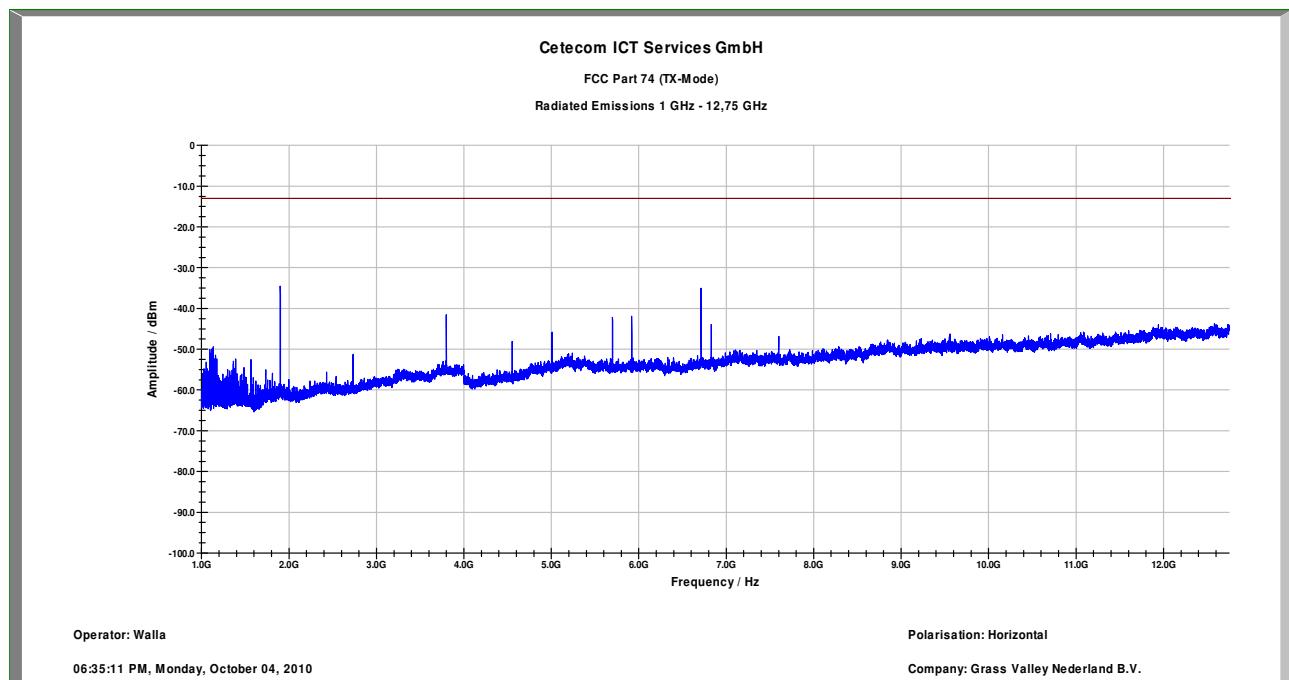
Plot 19: 30 MHz – 1 GHz, 455.40 MHz, antenna horizontal



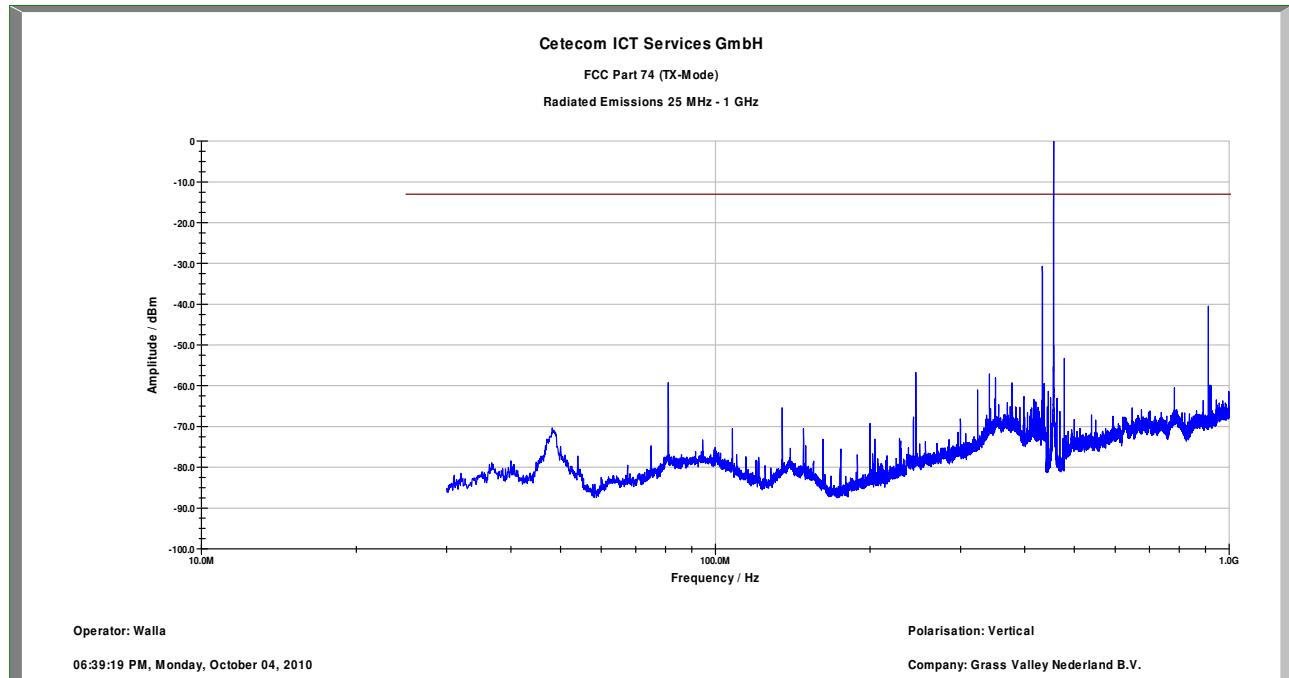
Plot 20: 1 GHz – 12 GHz, 455.40 MHz, antenna vertical



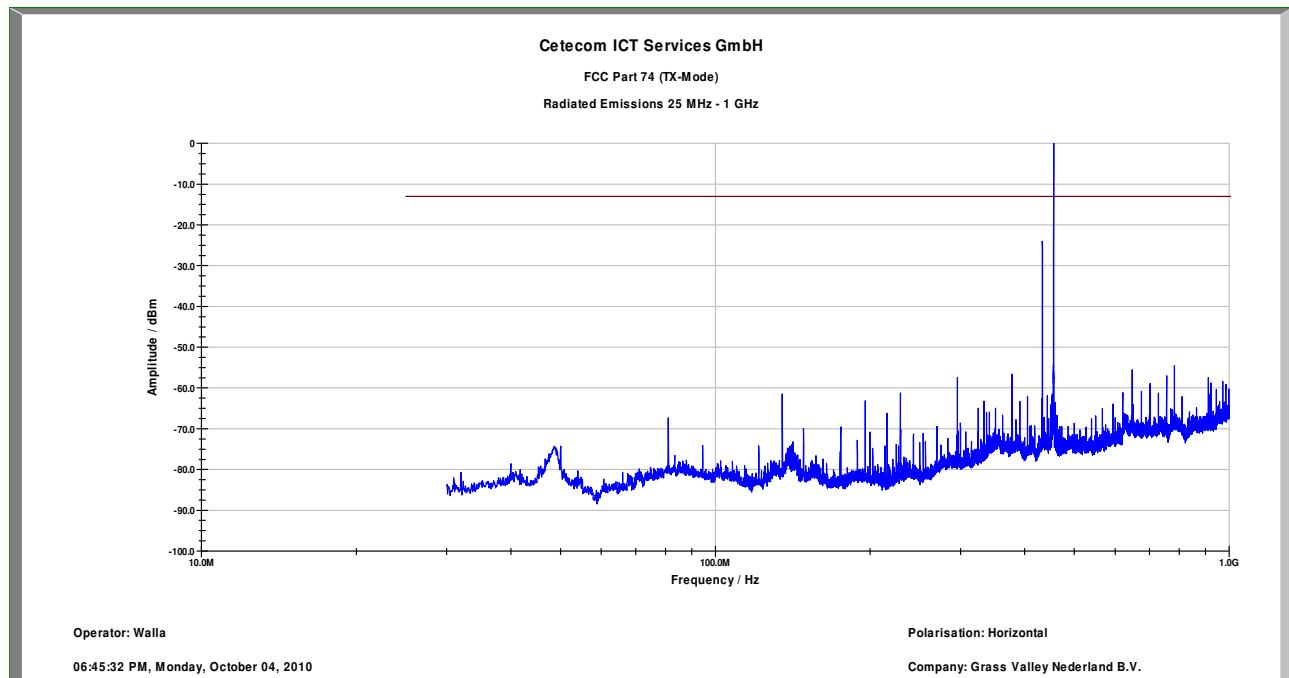
Plot 21: 1 GHz – 12 GHz, 455.40 MHz, antenna horizontal



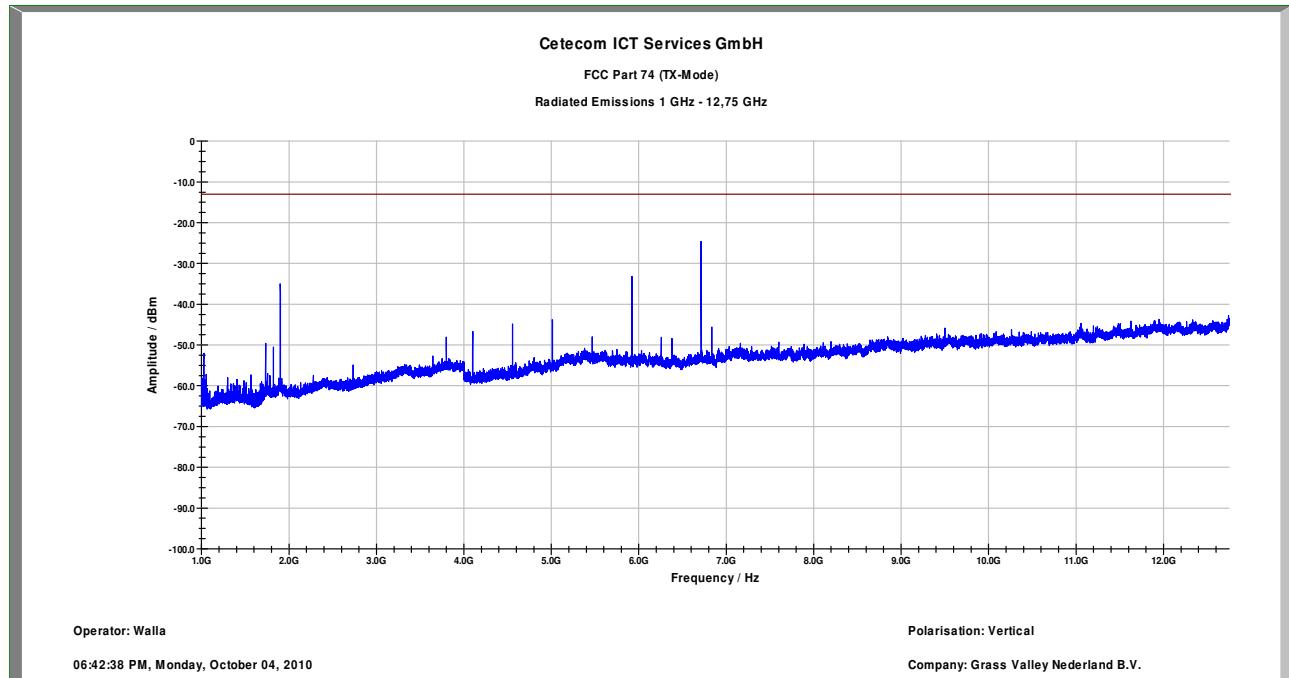
Plot 22: 30 MHz – 1 GHz, 455.60 MHz, antenna vertical



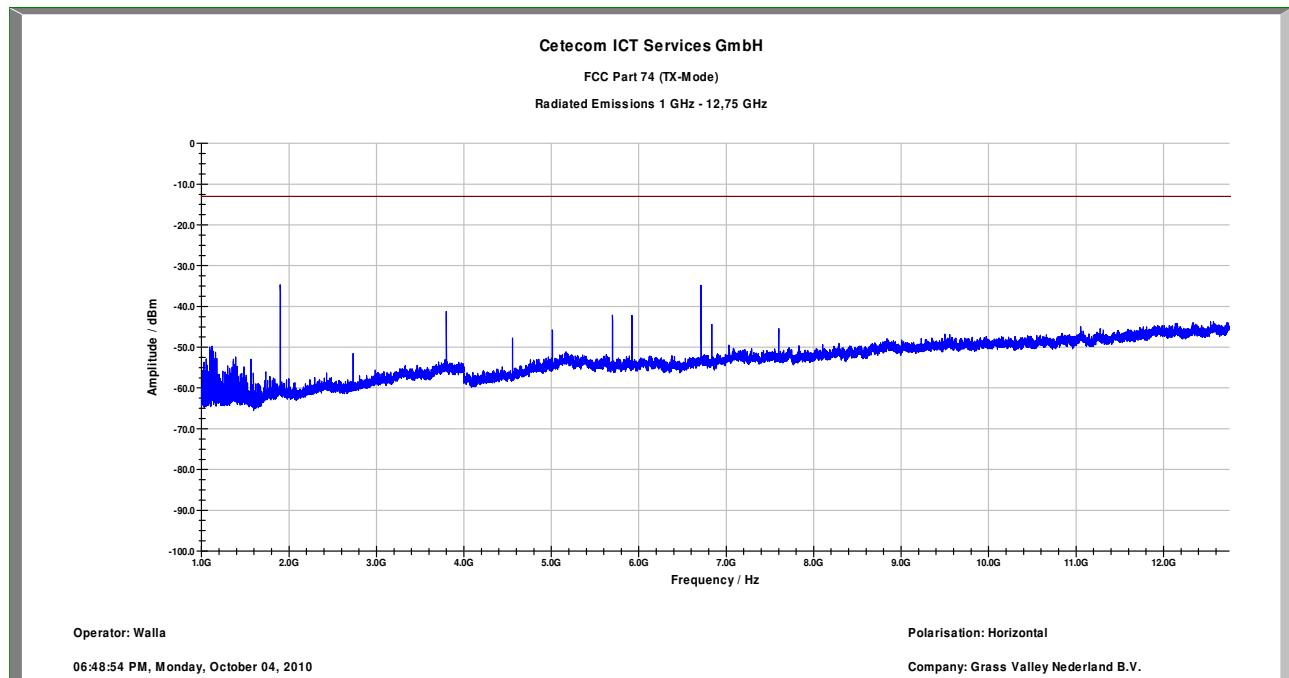
Plot 23: 30 MHz – 1 GHz, 455.60 MHz, antenna horizontal



Plot 24: 1 GHz – 12 GHz, 455.60 MHz, antenna vertical



Plot 25: 1 GHz – 12 GHz, 455.60 MHz, antenna horizontal



TX Spurious Emissions Radiated [dBm]								
455.10 MHz			455.40 MHz			455.60 MHz		
Frequency [MHz]	Detector	Level [dBm]	Frequency [MHz]	Detector	Level [dBm]	Frequency [MHz]	Detector	Level [dBm]
433	Peak	-22.35 (h)	433	Peak	-23.98 (h)	433	Peak	-22.14 (h)
910	Peak	-36.40 (v)	910	Peak	-36.45 (v)	910	Peak	-38.68 (v)
1900	Peak	-26.85 (h)	1900	Peak	-34.65 (h)	1900	Peak	-34.35 (h)
6713	Peak	-20.95 (h)	6713	Peak	-19.65 (v)	6713	Peak	-22.44 (v)
Measurement uncertainty			± 3 dB					

(v) = measurement antenna vertical

(h) = measurement antenna horizontal

Re-measurements over azimuth scan 360°, both polarizations (horizontal and vertical) and EUT 0°.

Limits:

CFR Part SUBCLAUSE §74.462(c)	
Under normal test conditions only	All spurious emissions must not exceed -13 dBm, using a 100 kHz bandwidth below 1 GHz and a 1 MHz resolution bandwidth above 1 GHz.

Result: The result of the measurement is passed.

9.7 Frequency tolerance

Temperature [°C]	U _{AC} [V]	Carrier frequency [MHz]	Measured frequency [MHz]	Difference [kHz]	Difference [ppm]
-30.0	120	455.40	455.40	0.2	0.4
-20.0	120	455.40	455.40	0.2	0.4
-10.0	120	455.40	455.40	0.2	0.4
0.0	120	455.40	455.40	0.3	0.7
+10.0	120	455.40	455.40	0.3	0.7
+20.0	120	455.40	455.40	0.5	1.1
+20.0	120	455.40	455.40	0.5	1.1
+20.0	120	455.40	455.40	0.5	1.1
+30.0	120	455.40	455.40	0.4	0.9
+40.0	120	455.40	455.40	0.4	0.9
+50.0	120	455.40	455.40	0.5	1.0

Temperature [°C]	U _{AC} [V]	Carrier frequency [MHz]	Measured frequency [MHz]	Difference [kHz]	Difference [ppm]
+20.0	102	455.40	455.40	0.5	1.1
+20.0	120	455.40	455.40	0.5	1.1
+20.0	138	455.40	455.40	0.5	1.1

Remark:

For measuring the frequency stability it was not possible to switch off the modulation.
Resolution bandwidth was reduced until the carrier was clearly visible on the spectrum analyzer display.

Limits:

CFR Part SUBCLAUSE §74.464

The carrier frequency must remain within 0.00025% (2.5 ppm) of the assigned frequency.

Result: The result of the measurement is passed.

10 Test equipment and ancillaries used for tests

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 signalling 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 (Labor/Item).

No.	Labor / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	n. a.	Horn Antenne 1-26.5GHz	3115	EMCO	9005-3440	300002190	ev		
2	n. a.	Horn Antenne 1-26.5GHz	3115	EMCO Elektronik	9709-5290	300000212	ev		
3	n. a.	Ultra Stable Notch Filter	WRCD1887.82/1889.55-5EE		1	300000115	ne		
4	n. a.	Funkstörmessempfänger 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	08.01.2010	08.01.2011
5	n. a.	HF-Schaltmatrixgrundgerät	TS-RSP 1144.1500K03	R&S	100300	300003556	ev		
6	n. a.	Signalgenerator 1-20 GHz	SMR20	R&S	101697/020	300003593	k	08.01.2010	08.01.2012
7	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
8	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	k	06.01.2009	06.01.2011
9	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
10	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
11	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	01.06.2009	01.06.2011
12	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
13	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
14	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
15	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
16	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
17	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012
18	n. a.	Isolating Transformer	913501	Erfi		300001205	ne		
19	4	Radiocom. Analyzer	CMTA 54	R&S	894043/010	300001175	NK!	06.06.2007	
20	n. a.	DC Power Supply 0 – 32V	1108-32	Heiden	001802	300001383	Ve	23.06.2010	23.06.2013
21	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04590	300001041	Ve	08.01.2009	08.01.2012
22	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	Ve	28.05.2009	28.05.2011
23	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSIQ26	R&S	835111/0004	300002678	Ve	06.01.2009	06.01.2011
24	n. a.	Temperature Test Chamber	T-40/50	CTS GmbH	064023	300003540	vlkl!	04.06.2009	04.06.2011

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

Annex A Photographs of the test setup

Photo 1:

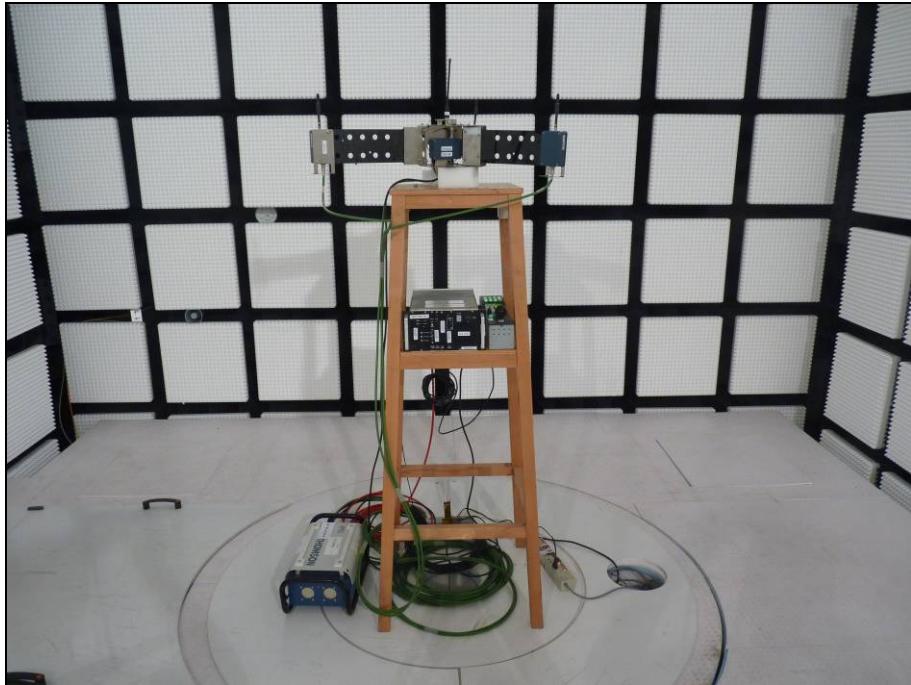


Photo 2:

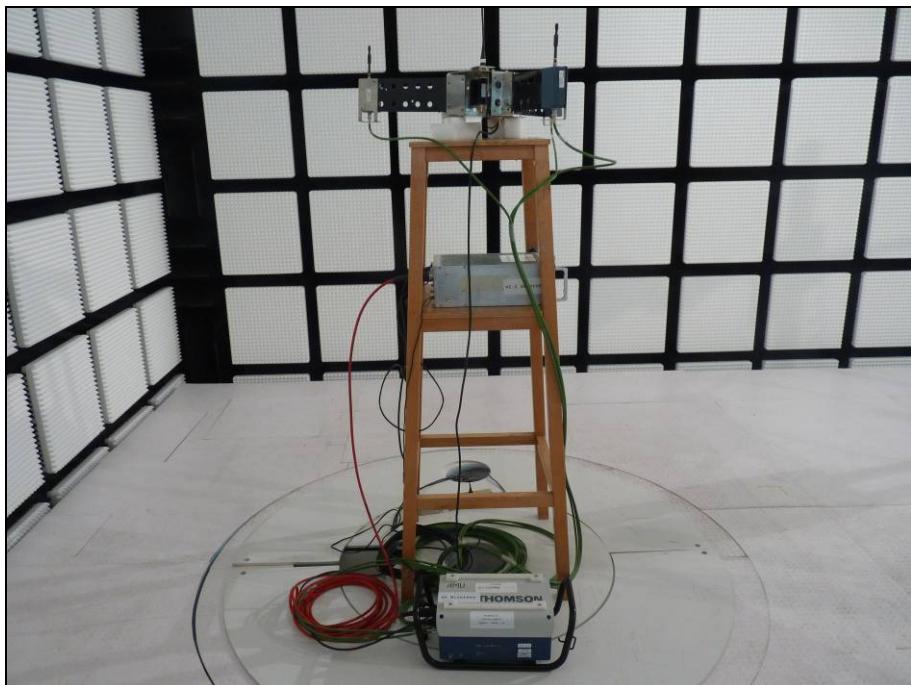


Photo 3:

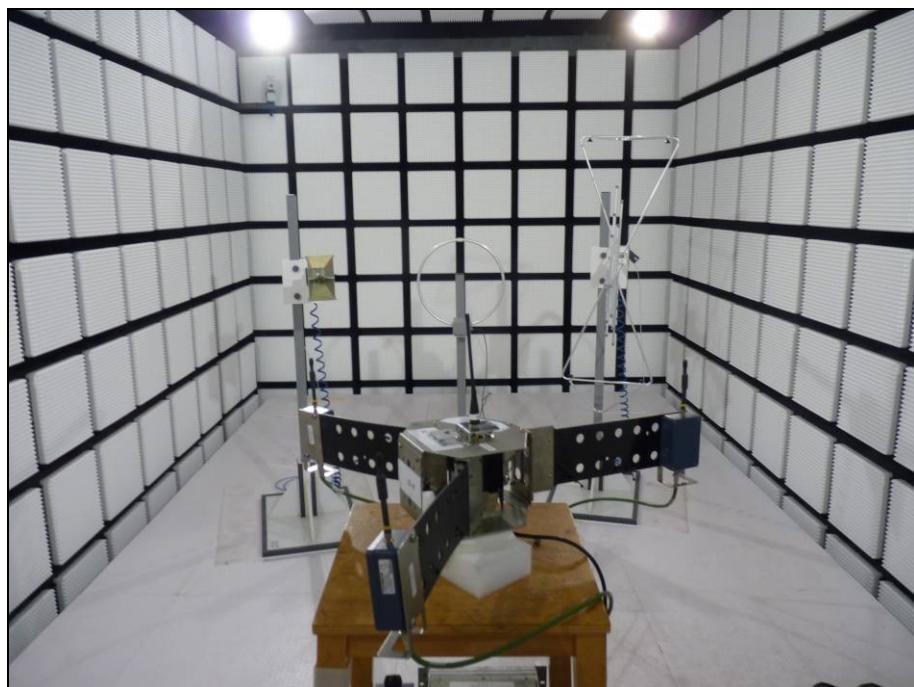


Photo 4:



Annex B External photographs of the EUT

Photo 5:

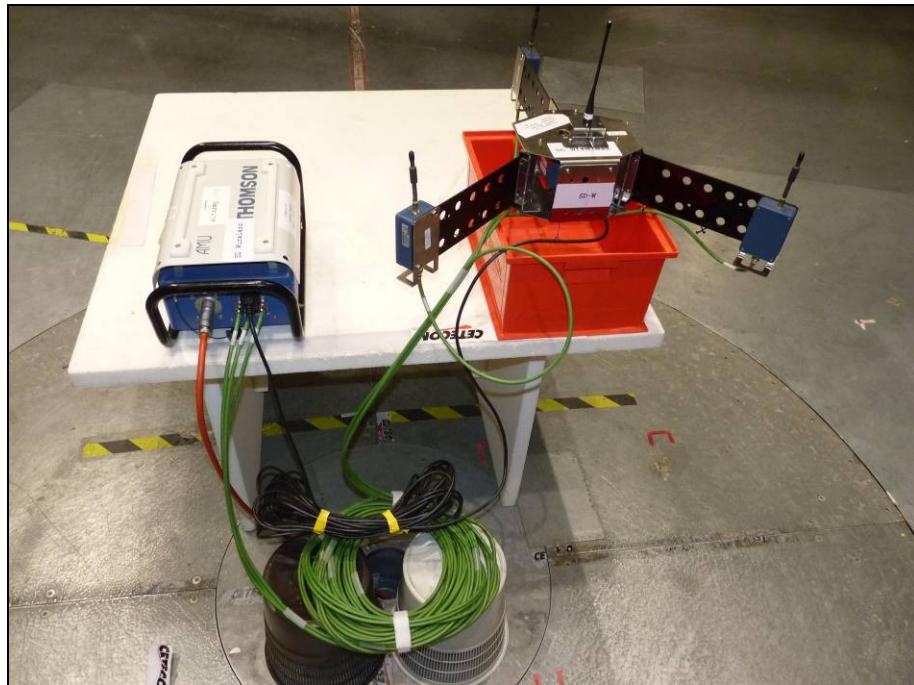


Photo 6:

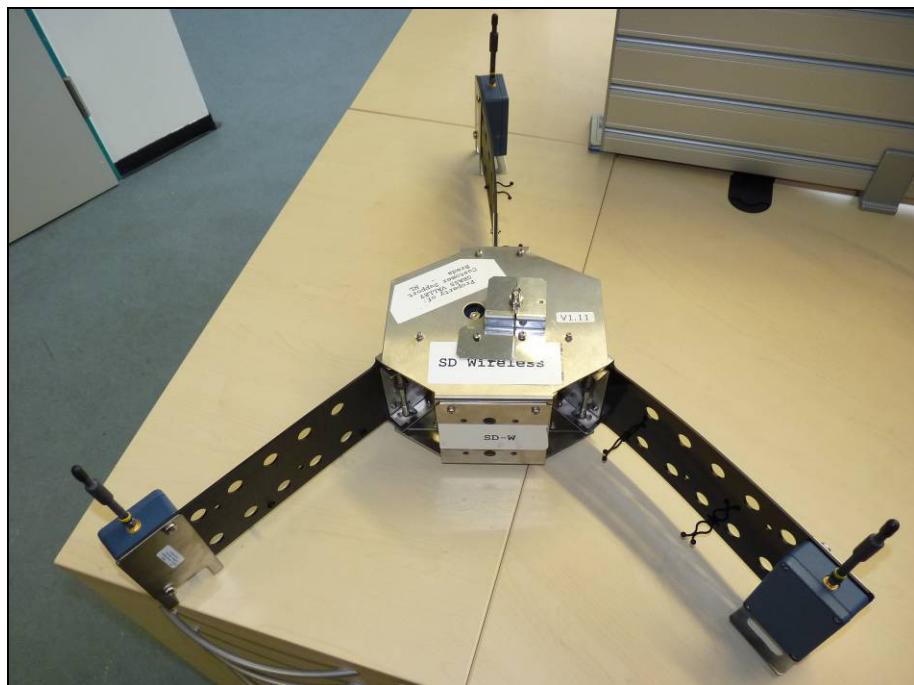


Photo 7:

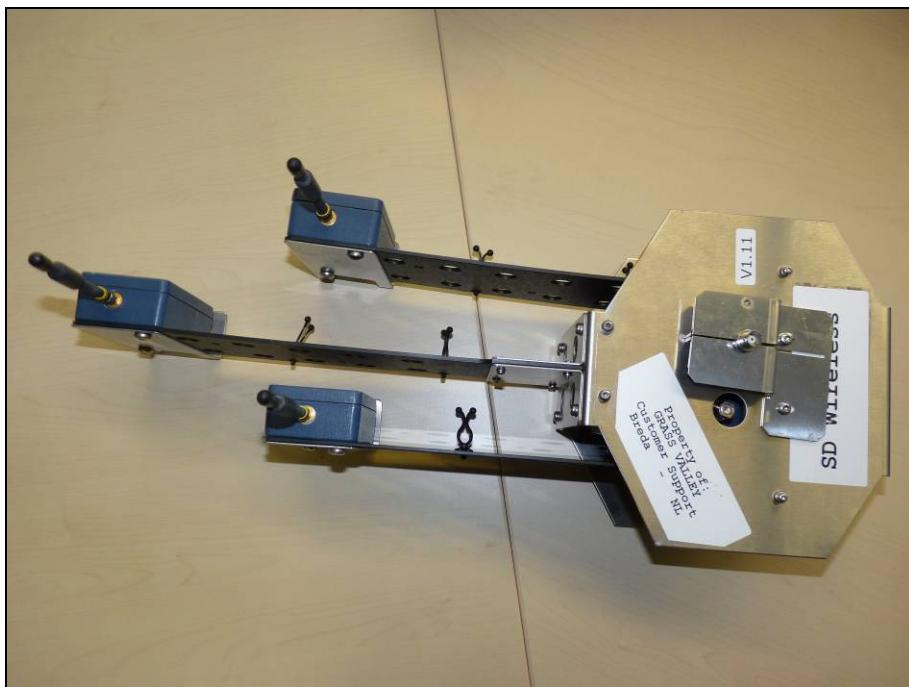


Photo 8:

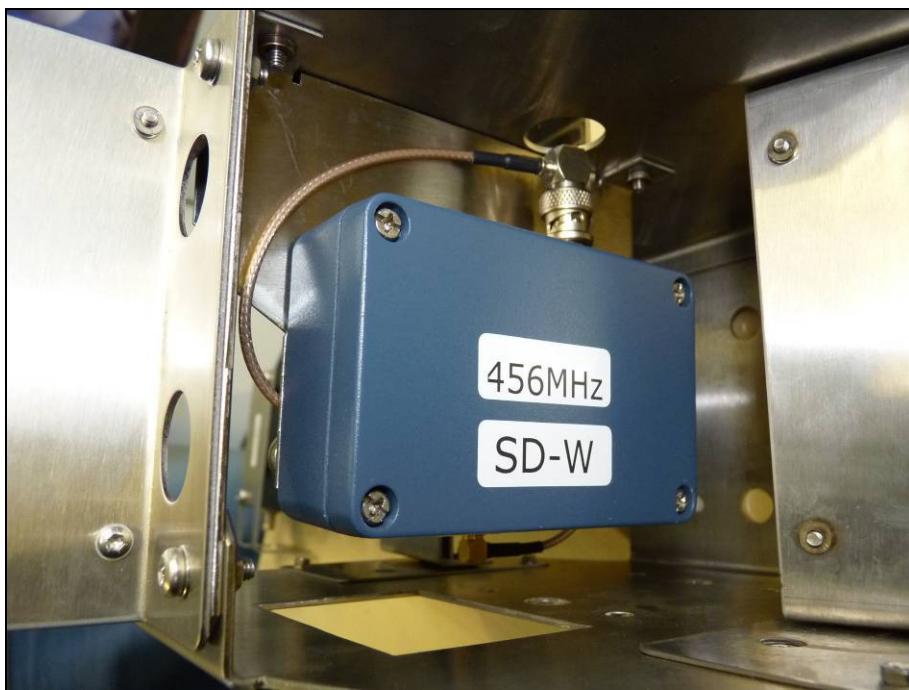


Photo 9:

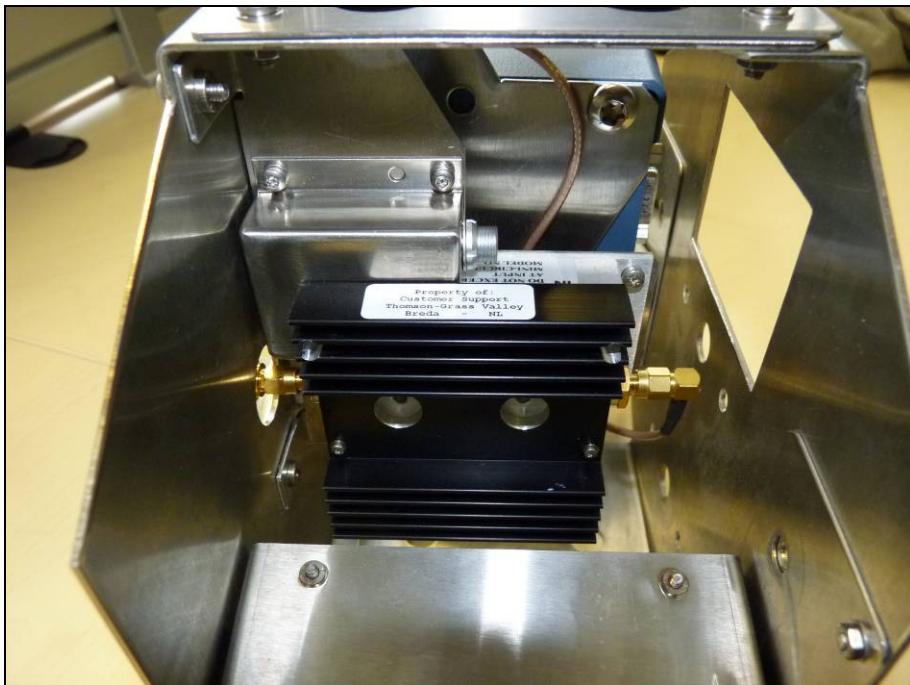


Photo 10:

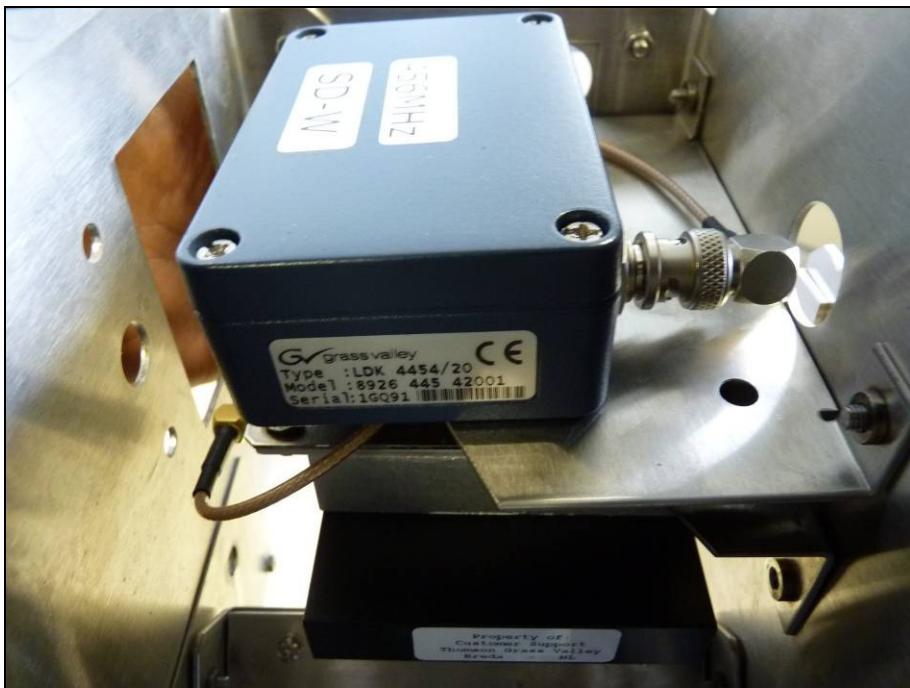


Photo 11:



Photo 12:



Photo 13:

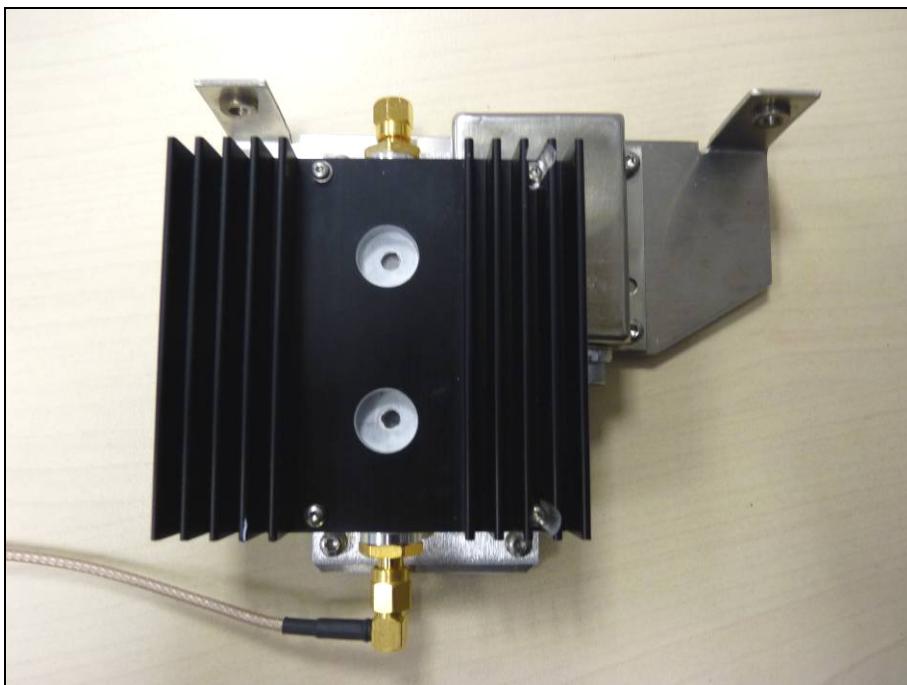


Photo 14:



Photo 15:



Photo 16:



Photo 17:



Photo 18:



Photo 19:



Photo 20:



Photo 21:

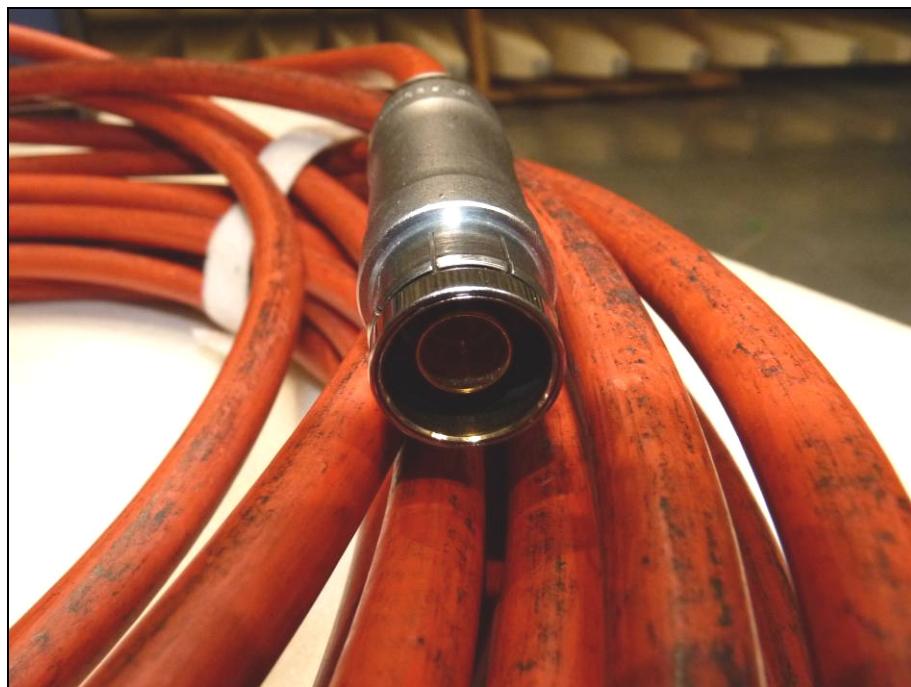


Photo 22:



Annex C Internal photographs of the EUT

Photo 23:

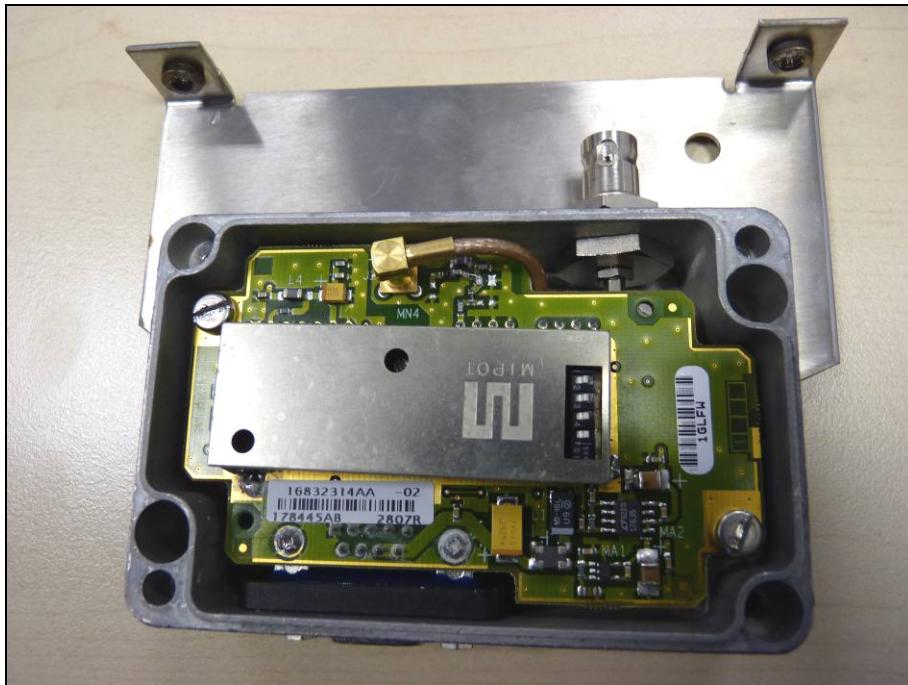


Photo 24:

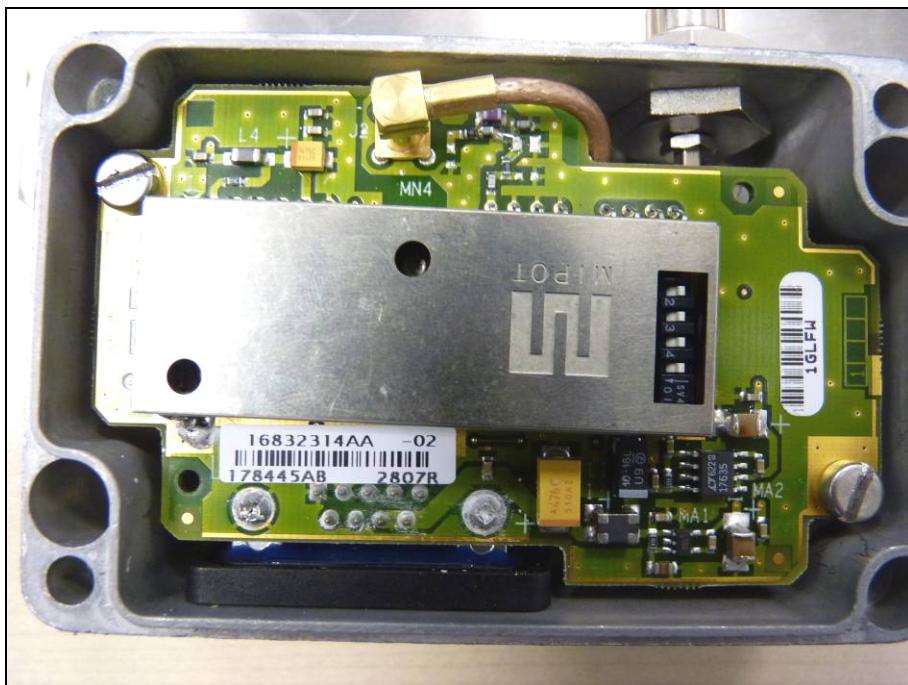


Photo 25:

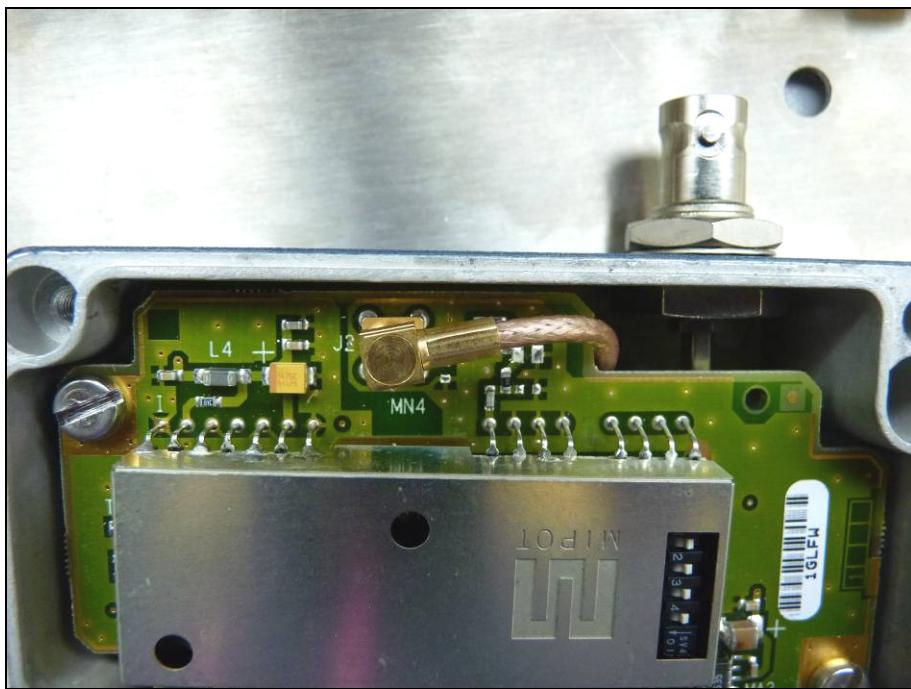


Photo 26:



Photo 27:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2010-12-07

Annex E Further information

Glossary

DUT	-	Device under Test
EMC	-	Electromagnetic Compatibility
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	not applicable
S/N	-	Serial Number
SW	-	Software