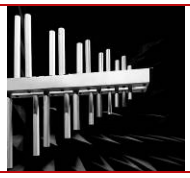
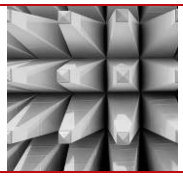




CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Test report no.: 1-2672-01-08/10

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
DAkkS registration number: D-PL-12076-01-01

Area of Testing: Radio/Satellite Communications

Applicant

FMS Force Measuring Systems AG

Aspstrasse 6
8154 Oberglatt / SWITZERLAND
Phone: +41-44-852 80-0
Fax: +41-44-850 60 06
Contact: Thomas Lammer
e-mail: thomas.lammer@fms-ag.ch
Phone: +41-44-852 80 80

Manufacturer

FMS Force Measuring Systems AG

Aspstrasse 6
8154 Oberglatt / SWITZERLAND

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 Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

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

Test item

Kind of test item:	**Radio Transmitted Tension Monitoring System (Receiver Unit)**
Model name:	**EMGZ482R**
FCC ID:	**YXYEMGZ482R**
IC:	**9377A-EMGZ482R**
Frequency:	**2412 – 2462 MHz**
Power supply:	**24 V DC**
Temperature range:	**26°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 performed:

cn=Jakob Reschke, o=CETECOM ICT Services GmbH, ou=RES-101109, email=Jakob.Reschke@cetecom.com, c=DE
2011.07.06 14:38:54 +02'00'

Jakob Reschke

Test report authorised:

cn=Stefan Boes, o=Cetecom ICT Services GmbH, ou=BOE-100817, email=Stefan.Boes@cetecom.com, c=DE
2011.07.06 13:25:02 +02'00'

Stefan Bös

1 Table of contents

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 electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2011-03-07
Date of receipt of test item:	2011-04-26
Start of test:	2011-04-26
End of test:	2011-07-06
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Version	Test standard description
47 CFR Part 15	2009-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	26	°C during room temperature tests
	T_{max}	-/-	°C during high temperature test
	T_{min}	-/-	°C during low temperature test
Relative humidity content:		41 %	
Air pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	24	V DC
	V_{max}	-/-	V
	V_{min}	-/-	V

5 Test item

Kind of test item	:	**Radio Transmitted Tension Monitoring System (Receiver Unit)**
Type identification	:	**EMGZ482R**
S/N serial number	:	**1095401**
HW hardware status	:	**V1.021**
SW software status	:	**Not defined**
Frequency band [MHz]	:	**2400.00 – 2483.50 MHz**
Type of modulation	:	**GFSK**
Number of channels	:	**11 (5 MHz Steps)**
Antenna	:	**External antenna with SMA connector**
Power supply	:	**24 V DC**
Temperature range	:	**26°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	CFR Part 15 RSS 210, Issue 8, Annex 8	Passed	2011-07-06	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Results (max.)
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth 6dB bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth 99% bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted	Nominal	Nominal	☒	☐	☐	☐	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	☒	☐	☐	☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	complies
§15.109 RSS-Gen.	RX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	complies
§15.107(a)	Conducted emissions < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

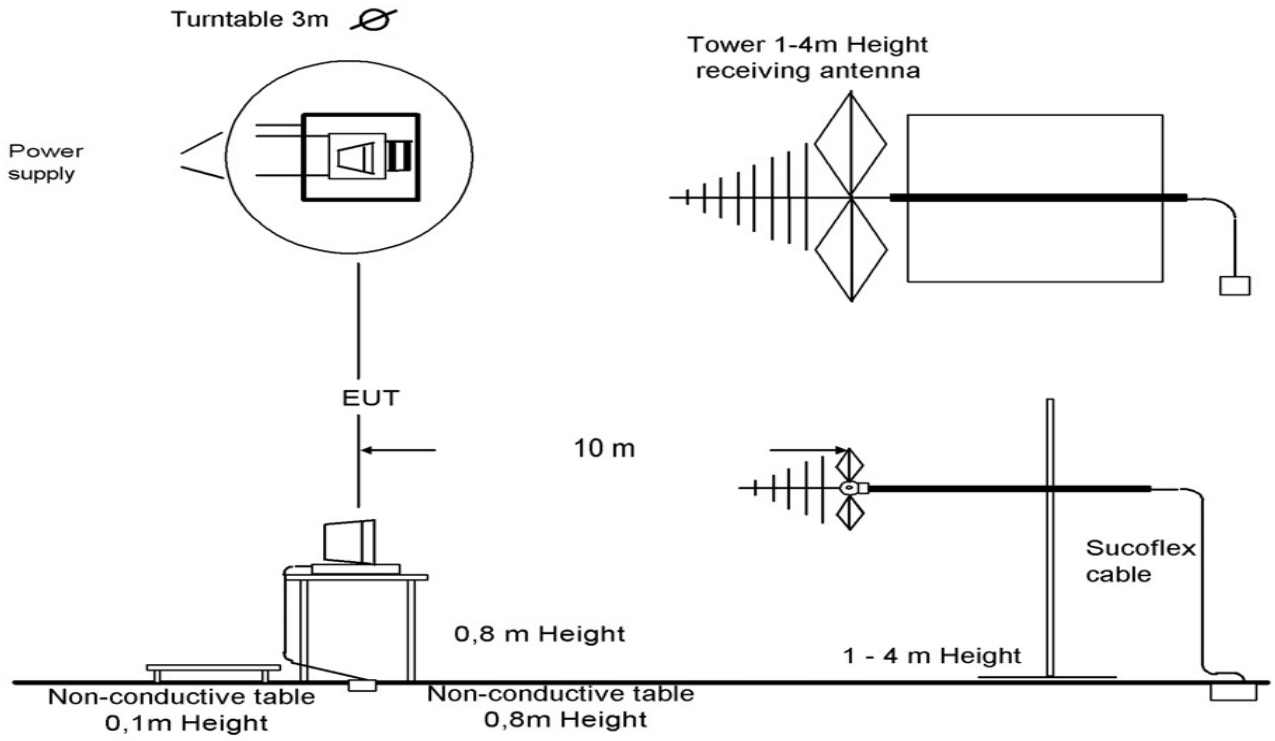
8 RF measurements

8.1 Description of test setup

8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 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 C63.2-1996 clause 15 and ANSI C63.4-2009 clause 4.1.5. 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 analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2009 clause 4.2.
Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



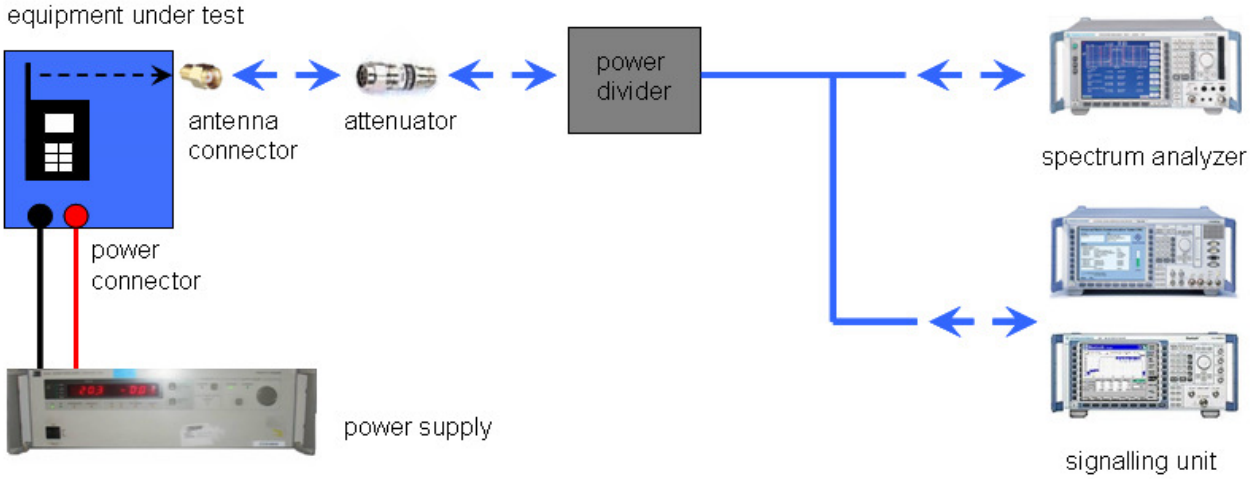
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

The EUT is powered by an external power supply with nominal voltage

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 first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/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.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☐ No test mode available.

☒ EUT is transmitting pseudo random data by itself

For Spurious from 30 MHz – 1 GHz and for AC-Conducted measurements a modified sample was used.

8.3 RSP100 test report cover sheet / performance test data

Test report number	:	**1-2672-01-08/10**
Equipment model number	:	**EMGZ482R**
Certification number	:	**9377A-EMGZ482R**
Manufacturer (complete address)	:	**FMS Force Measuring Systems AG Aspstrasse 6 8154 Oberglatt / SWITZERLAND**
Tested to radio standards specification no.	:	**RSS 210, Issue 8, Annex 8**
Open area test site IC No.	:	**IC 3462C-1**
Frequency range	:	**ISM band 2400 MHz to 2483.5 MHz**
RF-power (max.)	:	**cond.: 3.35 mW EIRP: 7.33 mW**
Occupied bandwidth (99%-BW) [kHz]	:	**1835**
Type of modulation	:	**GFSK**
Emission designator (TRC-43)	:	**1M84FXD**
Antenna information	:	**External dipole antenna with SMA connector RN-SMA-4**
Transmitter spurious (worst case) [µV/m @ 3m]	:	**125 µV/m @ 4824 MHz**
Receiver spurious (worst case) [µV/m @ 10m]:		**63 µV/m @ 46 MHz**

ATTESTATION:
DECLARATION OF COMPLIANCE:

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory manager:

cn=Jakob Reschke, o=CETECOM ICT Services GmbH,
ou=RES-101109, email=Jakob.Reschke@cetecom.com, c=DE
2011.07.06 14:38:34 +02'00'

2011-07-06	**Jakob Reschke**	
Date	Name	Signature

9 Measurement results

9.1 Maximum output power

Description:

Measurement of the maximum output power conduced and radiated

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	30 MHz
Resolution bandwidth:	30 MHz
Span:	50 MHz
Trace-Mode:	Max Hold

Result:

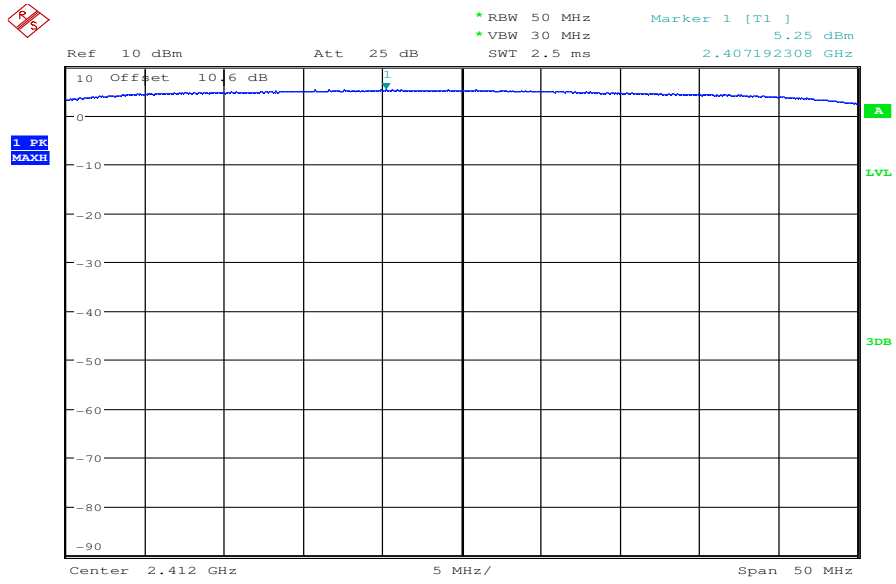
Modulation Channel	Maximum output power conducted [dBm]		
	Lowest	Middle	Highest
	5.25	4.99	4.89
Measurement uncertainty	± 1 dB		

Modulation Channel	Maximum output power radiated - EIRP [dBm]		
	Lowest	Middle	Highest
	8.65	8.22	8.80
Measurement uncertainty	± 3 dB		

Result: The result of the measurement is passed.

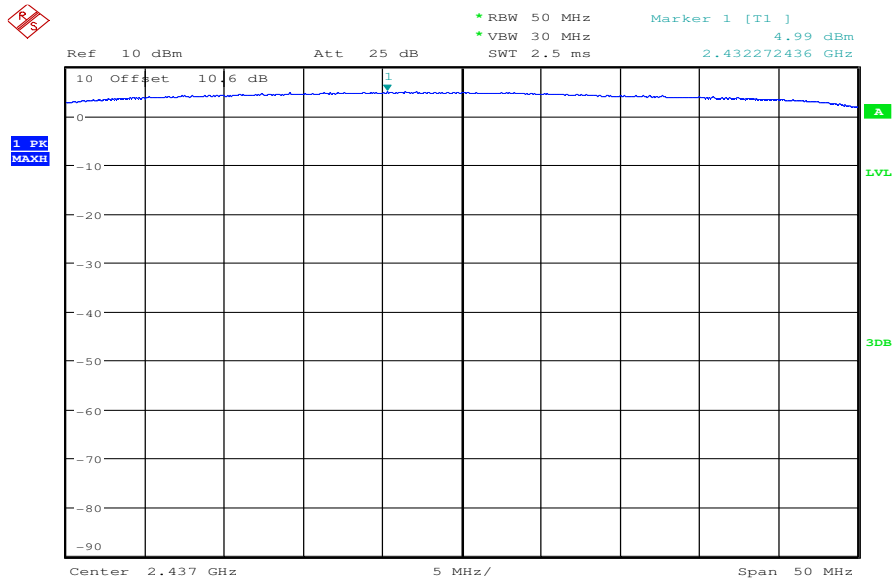
Plots:

Plot 1: lowest channel



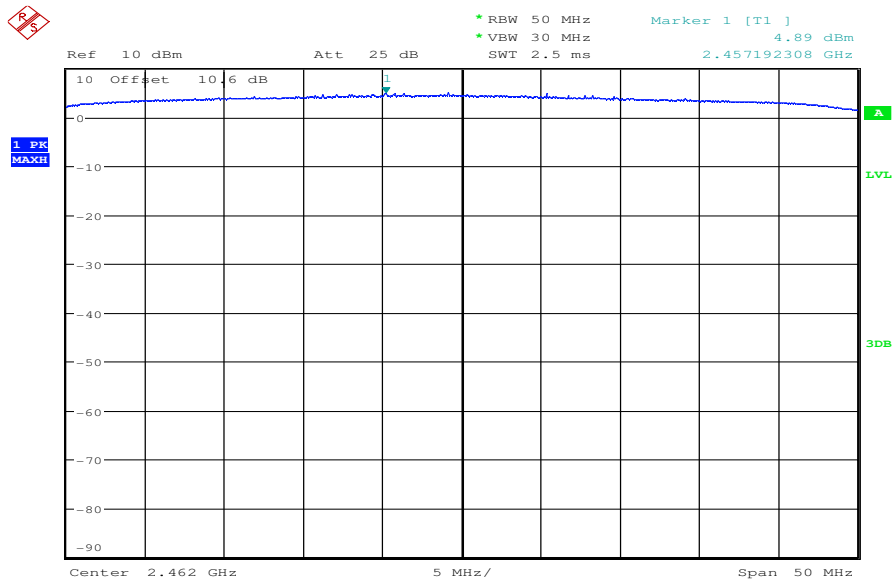
Date: 26.APR.2011 11:39:21

Plot 2: middle channel



Date: 26.APR.2011 11:40:46

Plot 3: highest channel



9.2 Antenna gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	3 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
CFR Part 15.247 (b)(4)	RSS 210, Issue 8, A 8.4(2)
Antenna Gain	
6 dBi	

Results:

T_{nom}	V_{nom}	lowest channel	middle channel	highest channel
Conducted power [dBm] Measured		5.25	4.99	4.89
Radiated power [dBm] Measured		8.65	8.22	8.80
Gain [dBi] Calculated		3.40	3.23	3.91

Result: **The result of the measurement is passed.**

9.3 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	500 s
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	1.5 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (e)	RSS 210, Issue 8, A 8.2(b)
Power Spectral Density	
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration.	

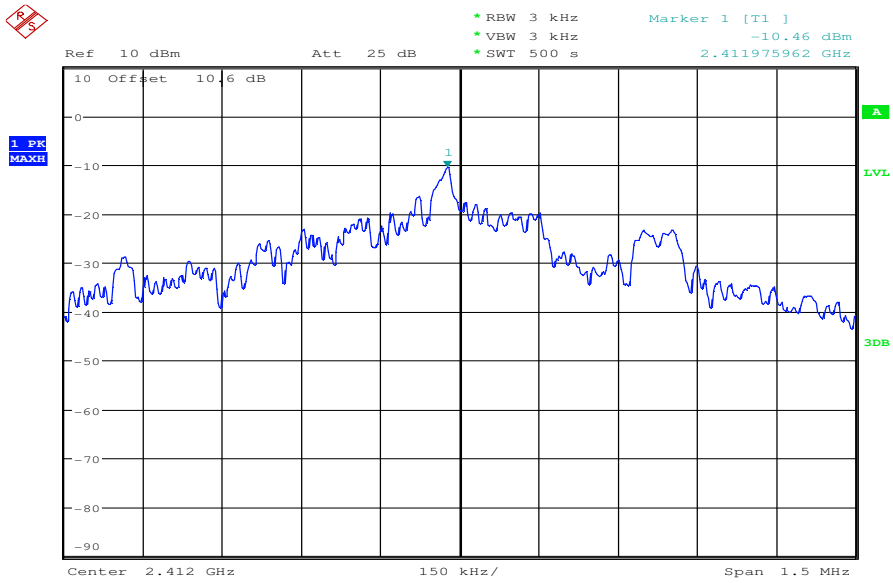
Results:

Modulation Channel	Power Spectral density [dBm/3kHz]		
	Lowest	Middle	Highest
	-10.46	-12.01	-12.37
Measurement uncertainty	± 1.5 dB		

Result: The result of the measurement is passed.

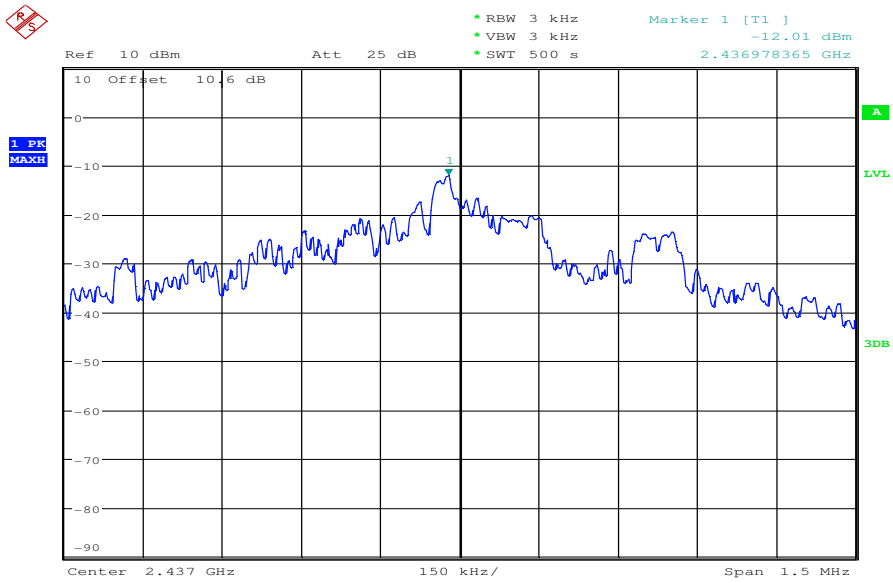
Plots:

Plot 1: lowest channel



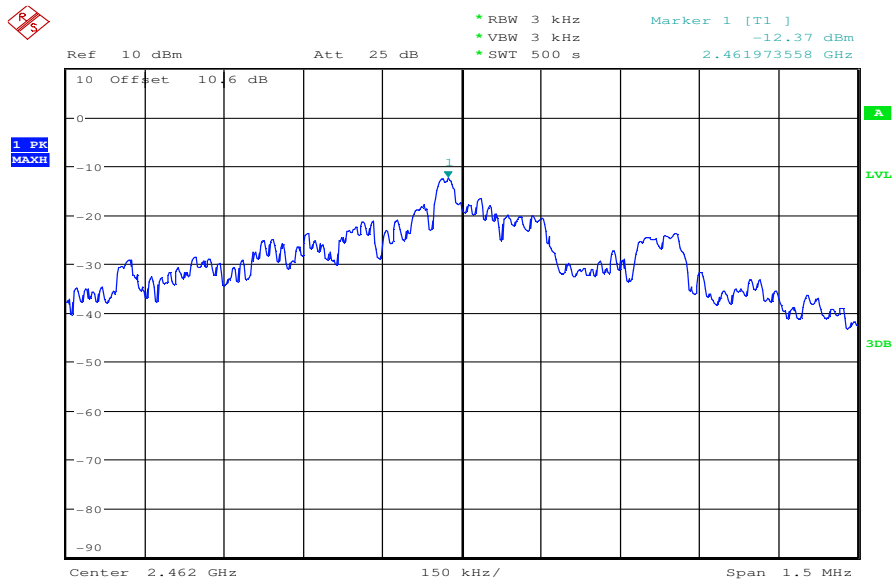
Date: 26.APR.2011 13:25:44

Plot 2: middle channel



Date: 26.APR.2011 13:11:17

Plot 3: highest channel



Date: 26.APR.2011 13:02:03

9.4 Spectrum bandwidth – 6 dB bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	See plots
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(2)	RSS 210, Issue 8, A 8.2(a)
Spectrum Bandwidth – 6 dB Bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

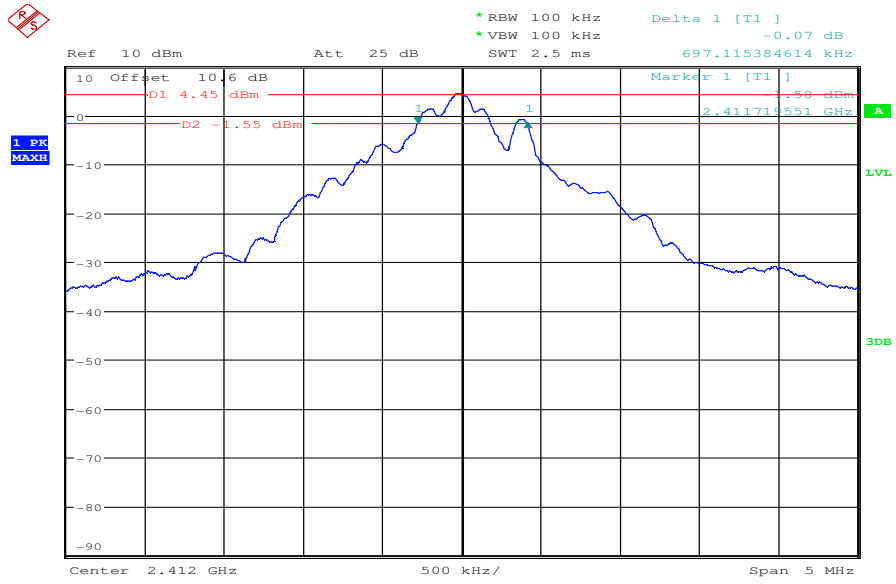
Results:

Modulation Channel	6 dB BANDWIDTH [kHz]		
	Lowest	Middle	Highest
	697	705	697
Measurement uncertainty	± 100 kHz		

Result: **The result of the measurement is passed.**

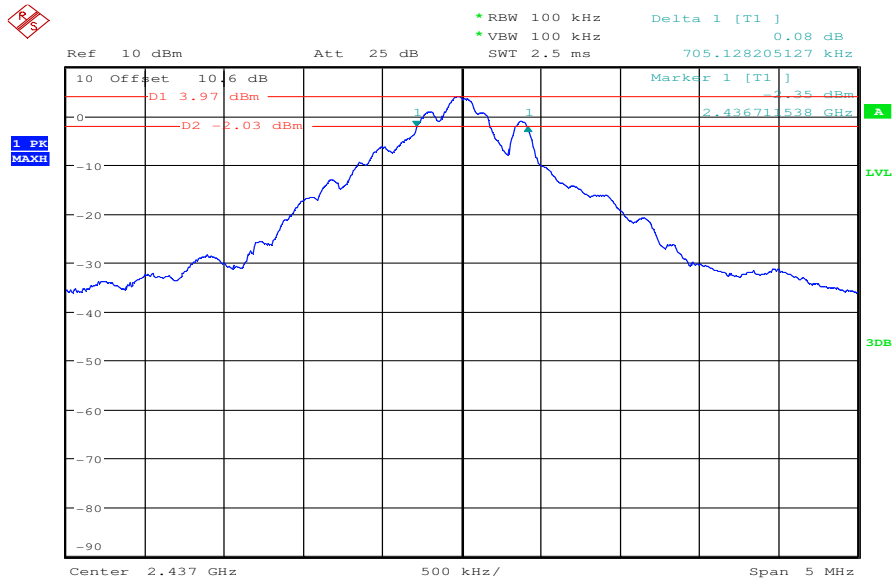
Plots:

Plot 1: lowest channel



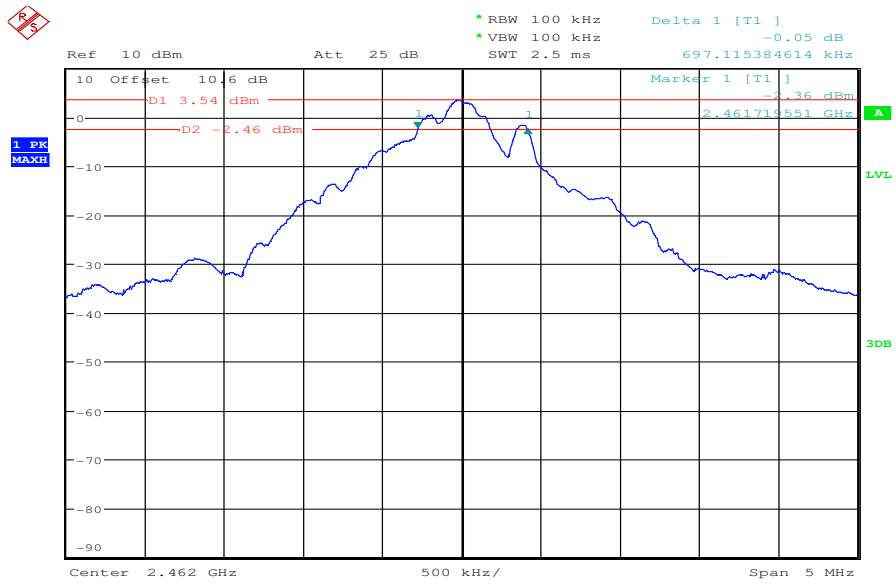
Date: 27.APR.2011 07:21:08

Plot 2: middle channel



Date: 27.APR.2011 07:26:24

Plot 3: highest channel



Date: 27.APR.2011 07:36:38

9.5 Spectrum bandwidth – 99% bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	8 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(2)	RSS 210, Issue 8, A 8.2(a)
Spectrum Bandwidth – 99% Bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

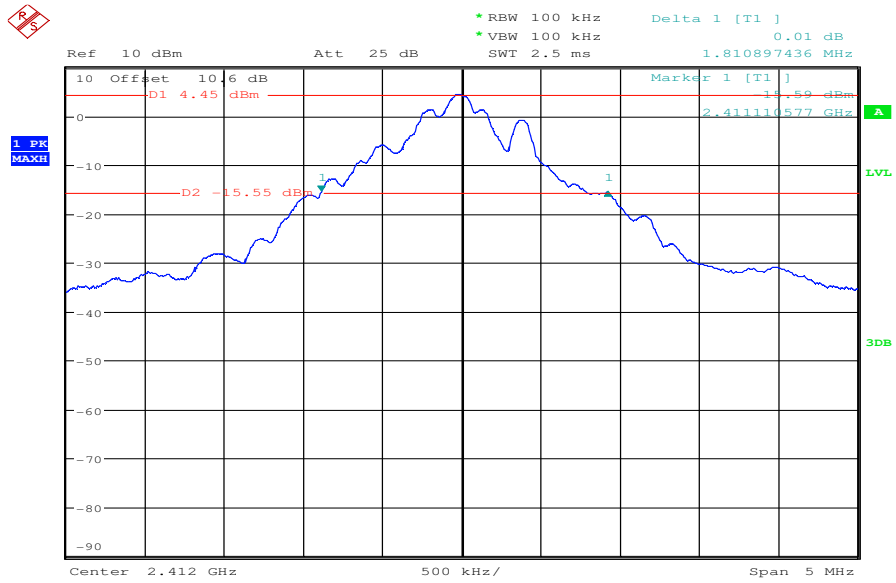
Results:

Modulation	99% BANDWIDTH [kHz]		
Channel	Lowest	Middle	Highest
	1811	1835	1819
Measurement uncertainty	± 100 kHz		

Result: **The result of the measurement is passed.**

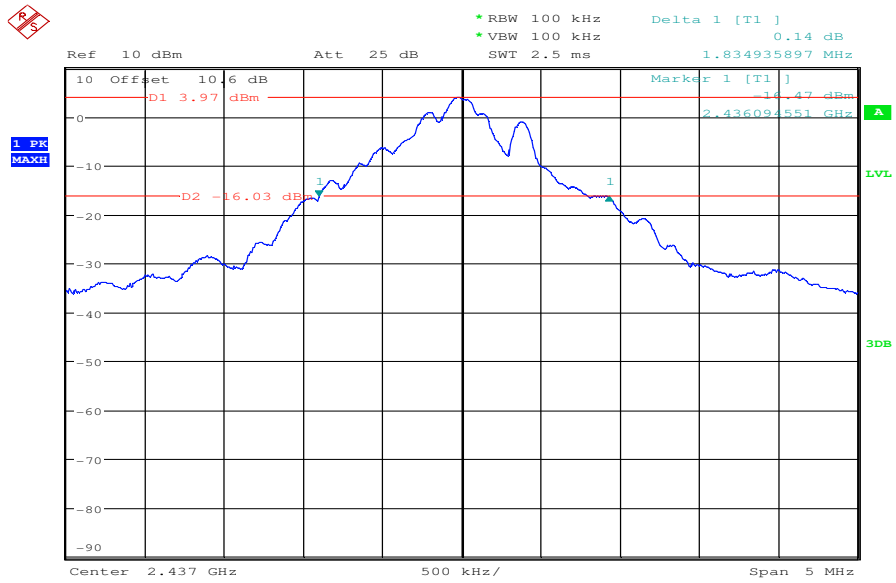
Plots:

Plot 1: lowest channel



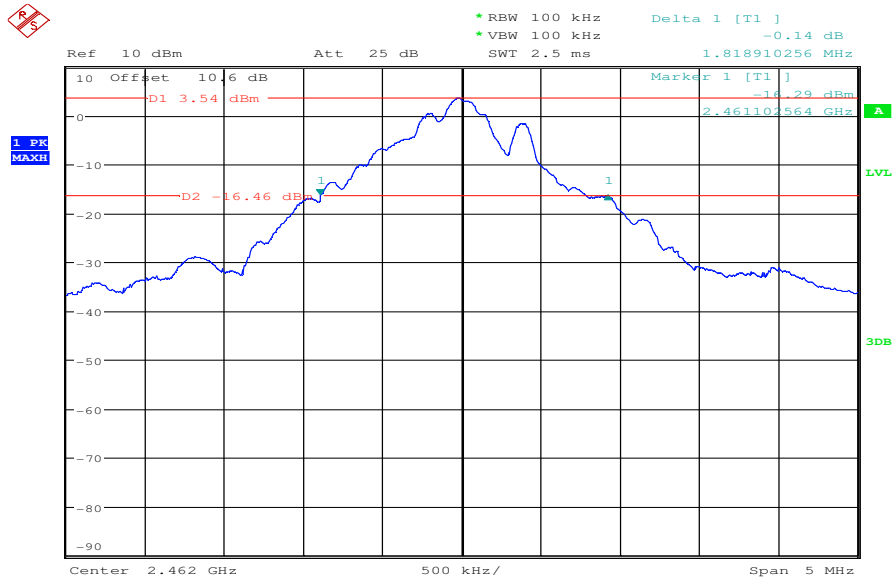
Date: 27.APR.2011 07:21:44

Plot 2: middle channel



Date: 27.APR.2011 07:27:07

Plot 3: highest channel



Date: 27.APR.2011 07:37:24

9.6 Band edge compliance conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	See plots
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (d)	RSS 210, Issue 8, A 8.5
Band Edge Compliance Conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.	

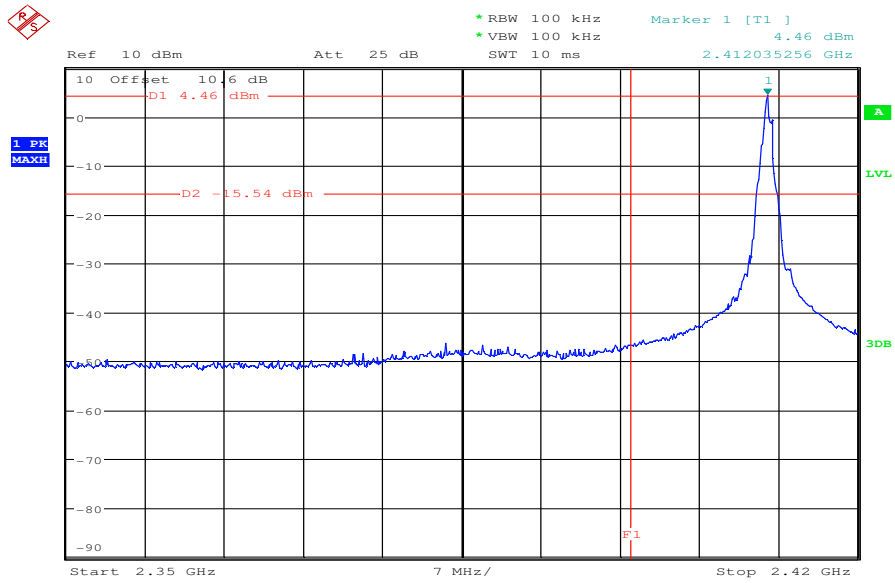
Result:

Szenario	Band Edge Compliance Conducted [dB]
Lower Band Edge	> 20 dB (see plot 1)
Upper Band Edge	> 20 dB (see plot 2)
Measurement uncertainty	± 1.5 dB

Result: **The result of the measurement is passed.**

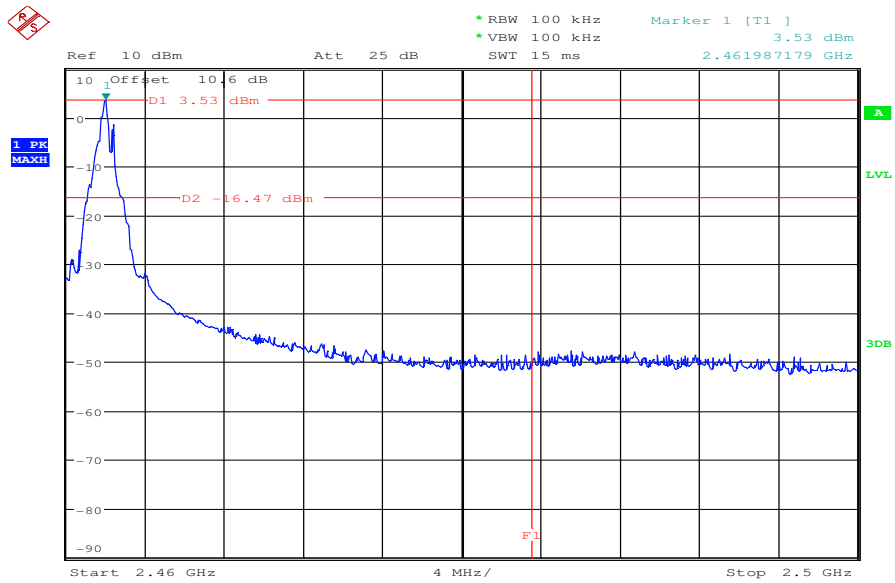
Plots:

Plot 1: lowest channel



Date: 27.APR.2011 09:54:10

Plot 2: highest channel



Date: 27.APR.2011 07:42:42

9.7 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to channel 00 for the lower restricted band and to channel 78 for the upper restricted band. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	10 Hz
Resolution bandwidth:	1 MHz
Span:	Lower Band: 2300 – 2400 MHz Higher Band: 2480 – 2500 MHz
Trace-Mode:	Max Hold

Limits:

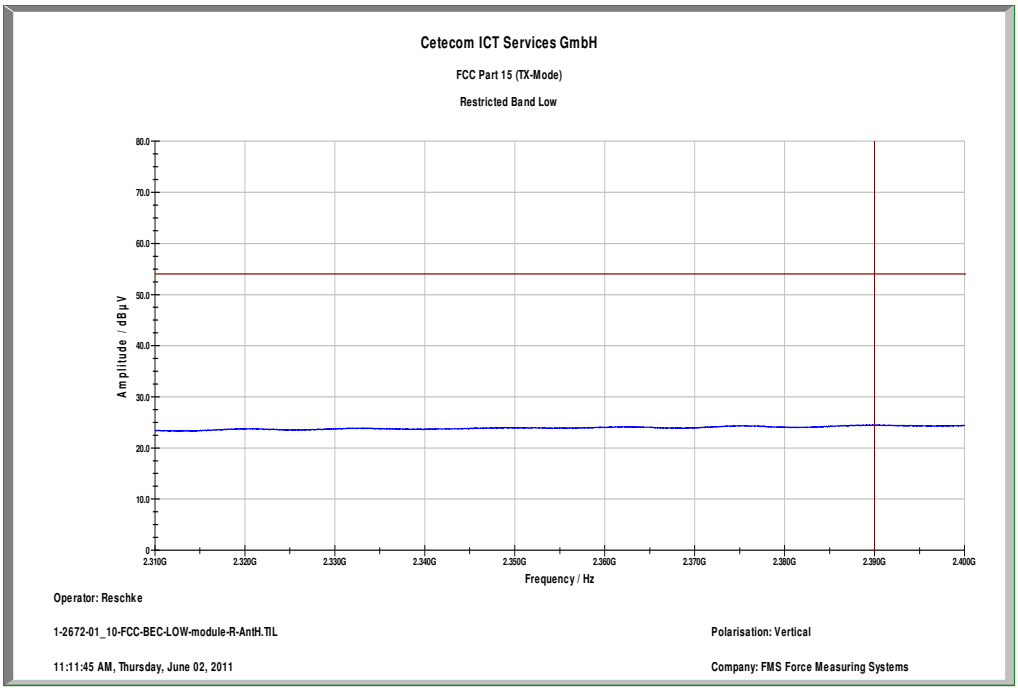
FCC	IC
CFR Part 15.205	RSS 210, Issue 8, A 8.5
Band Edge Compliance Radiated	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).	
54 dBµV/m AVG	

Result:

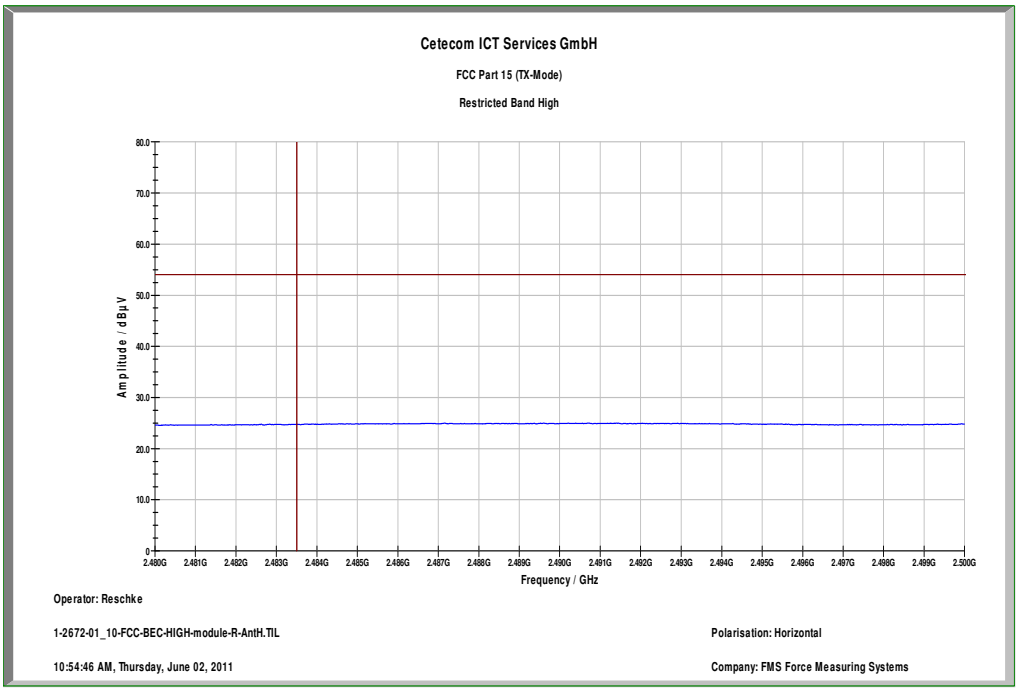
Szenario	Band Edge Compliance Radiated [dBµV/m]
Lower Band Edge	< 54 dBµV/m (see plots 1/3)
Upper Band Edge	< 54 dBµV/m (see plot 2/4)
Measurement uncertainty	± 3 dB

Plots:

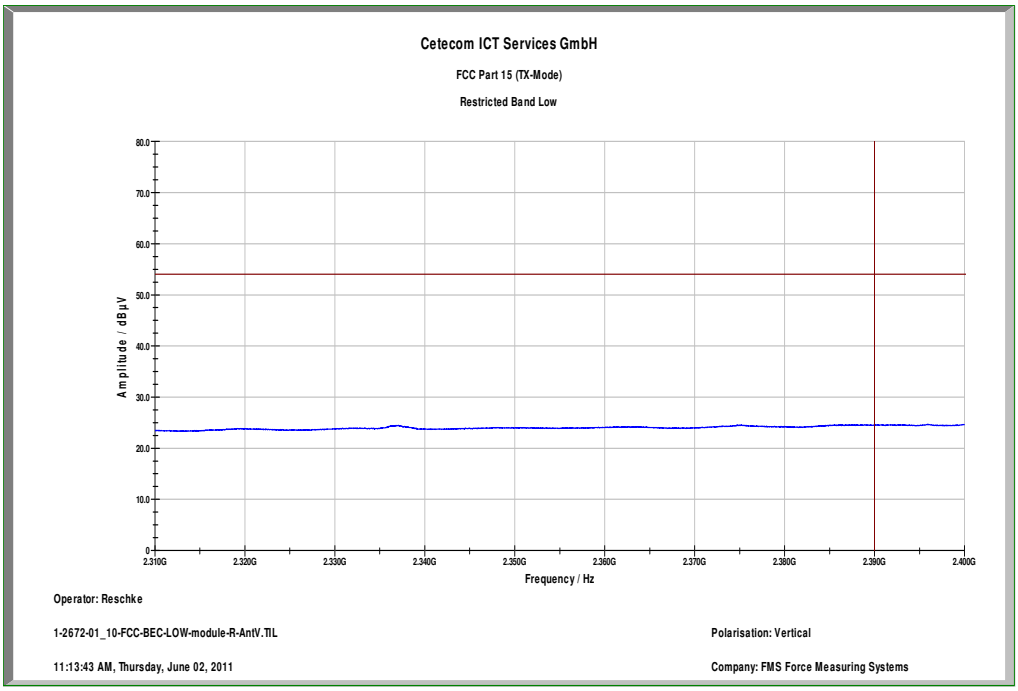
Plot 1: lower band edge, horizontal polarization



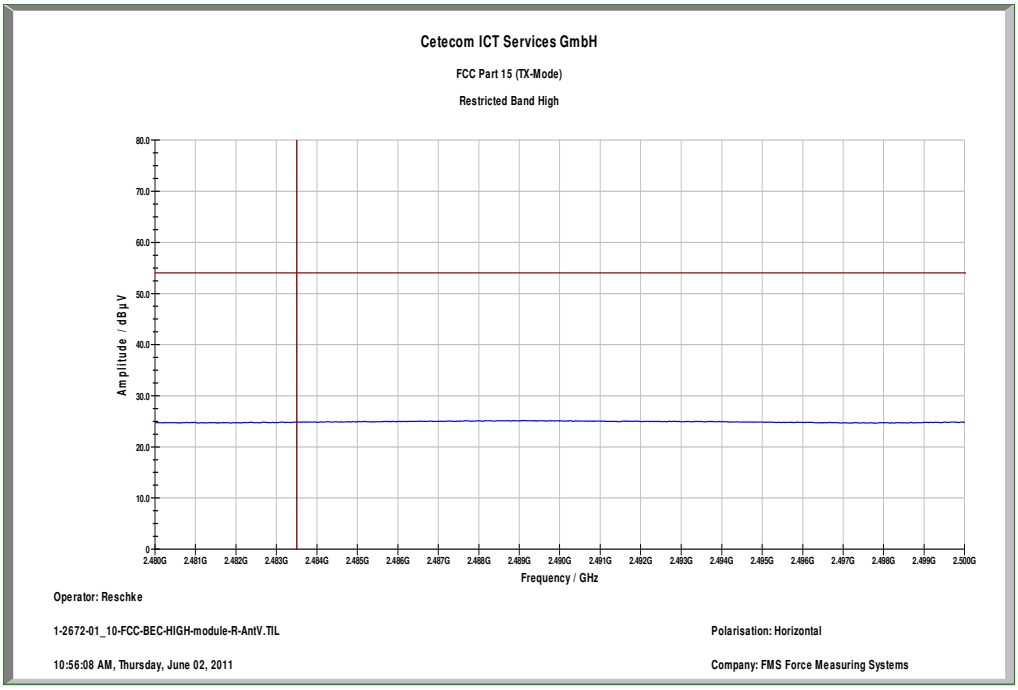
Plot 2: upper band edge, horizontal polarization



Plot 3: lower band edge, vertical polarization



Plot 4: upper band edge, vertical polarization



Result: The result of the measurement is passed.

9.8 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247(d)	RSS 210, Issue 8, A 8.5
TX Spurious Emissions Conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required	

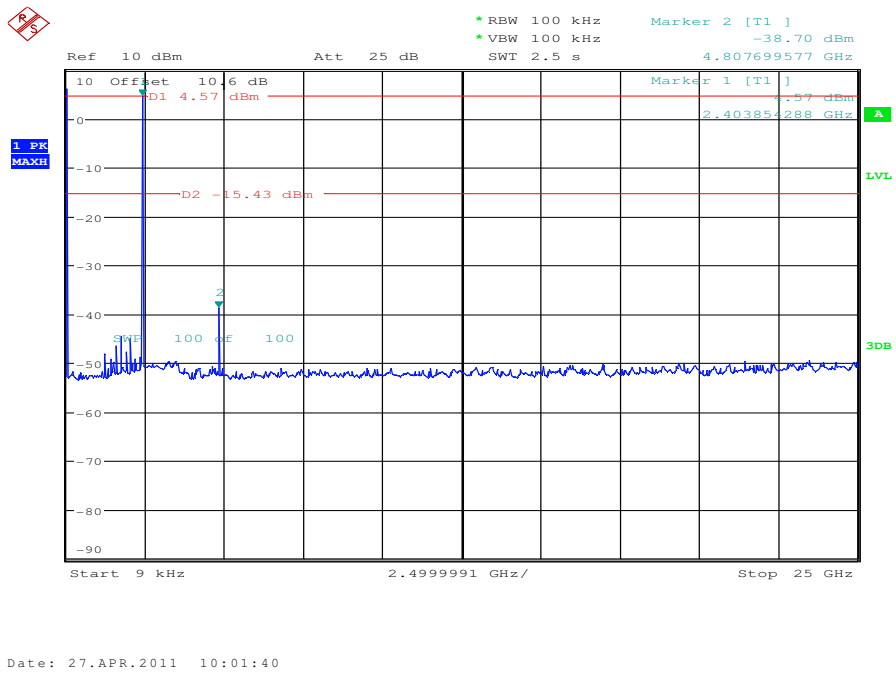
Results:

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Low		4.57	30 dBm		Operating frequency
No critical peaks found			-20 dBc		complies
Middle		2.61	30 dBm		Operating frequency
No critical peaks found			-20 dBc		complies
High		3.20	30 dBm		Operating frequency
No critical peaks found			-20 dBc		complies
Measurement uncertainty			± 3 dB		

Result: **The result of the measurement is passed.**

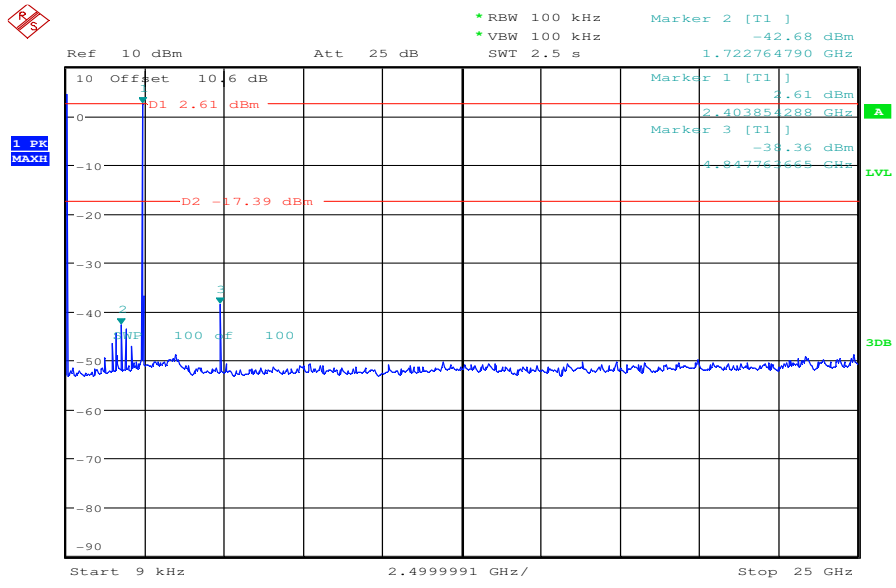
Plots:

Plot 1: lowest channel



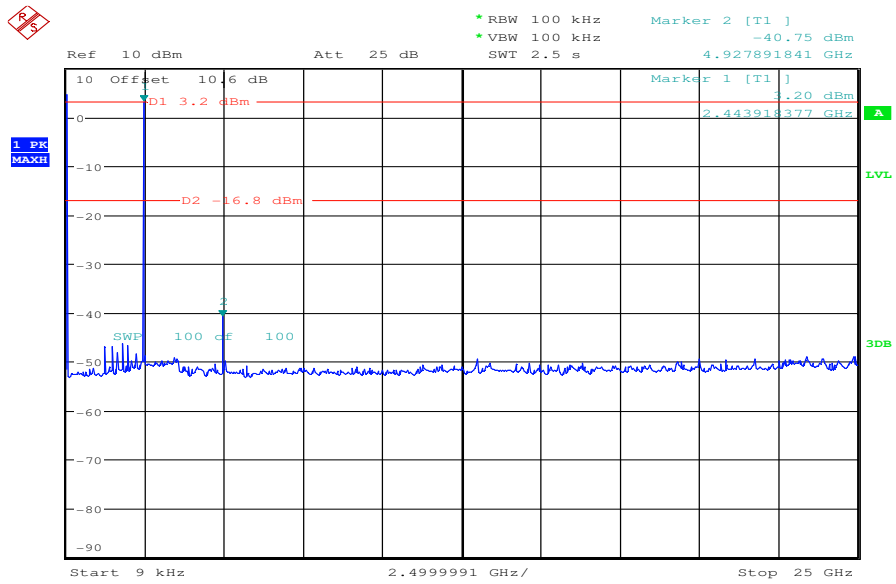
The peak at the beginning of the Plot is the LO from the SA

Plot 2: middle channel



The peak at the beginning of the Plot is the LO from the SA

Plot 3: highest channel



The peak at the beginning of the Plot is the LO from the SA

9.9 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC	
CFR Part 15.247(d)	RSS 210, Issue 8, A 8.5	
TX Spurious Emissions Radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

TX Spurious Emissions Radiated [dBµV/m]								
Lowest			Middle			Highest		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
						No critical peaks found		
1582	PK	48.25	1600	PK	50.79			
1733	PK	44.03	1674	PK	38.75			
1884	PK	44.31	1751	PK	43.78			
2034	PK	49.43	1900	PK	45.65			
2185	PK	48.08	2055	PK	49.29			
4824	AV	42.00	2208	PK	49.04			
			4873	AV	40.00			
Measurement uncertainty			± 3 dB					

Result: **The result of the measurement is passed.**

Plots:

Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

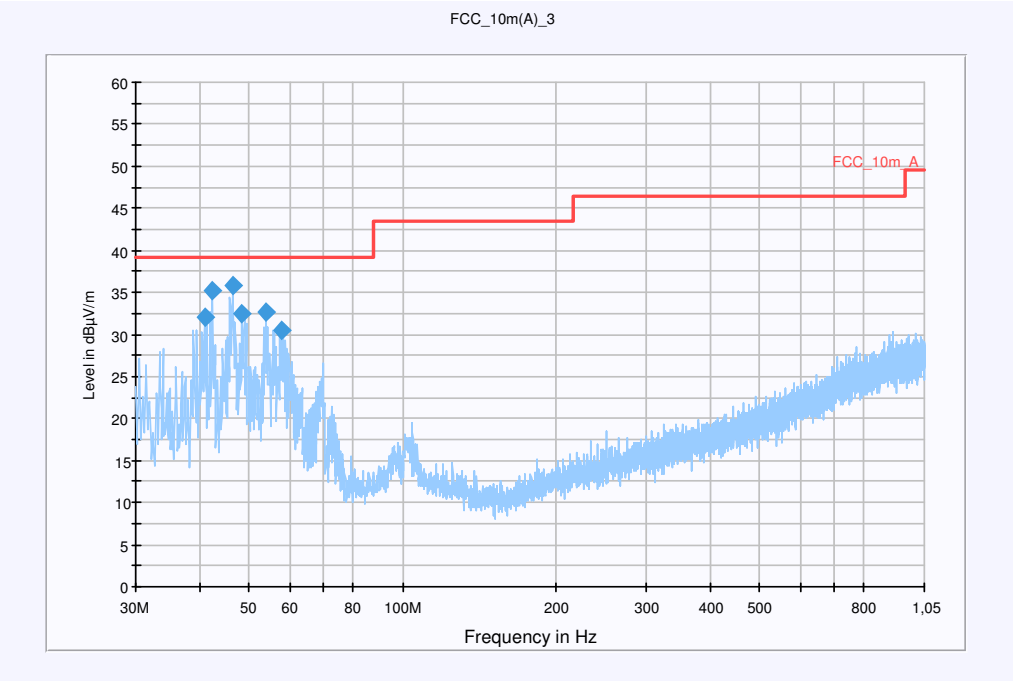
Common Information

EUT:	EMGZ492R
Serial Number:	1095401
Test Description:	FCC part 15 class A @ 10 m
Operating Conditions:	tx channel 1
Operator Name:	WLD
Comment:	DC: 24 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

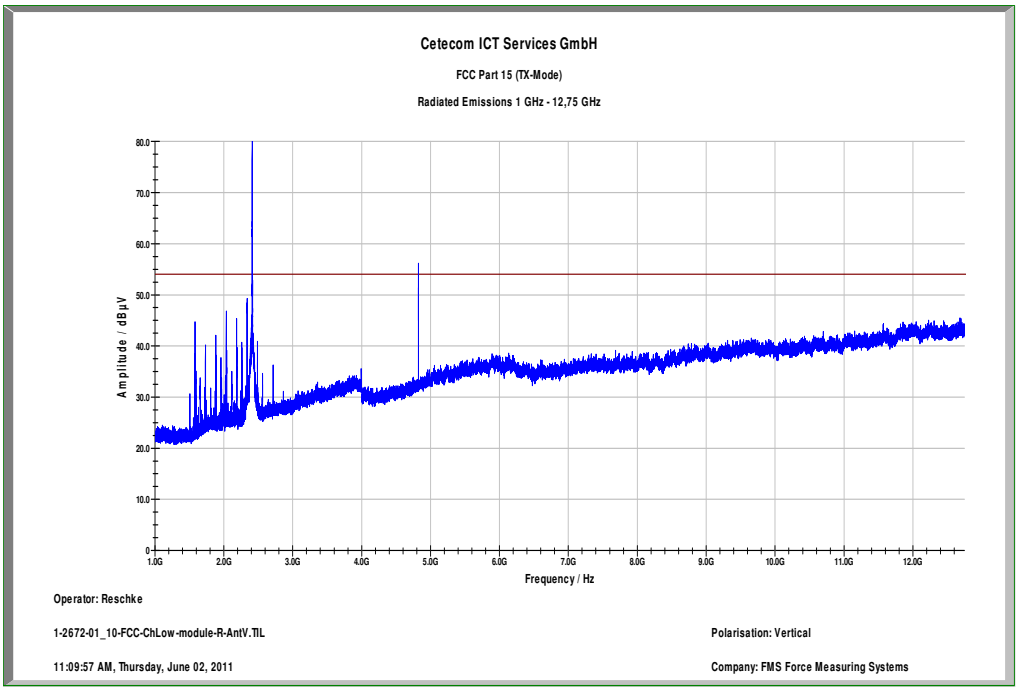
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver



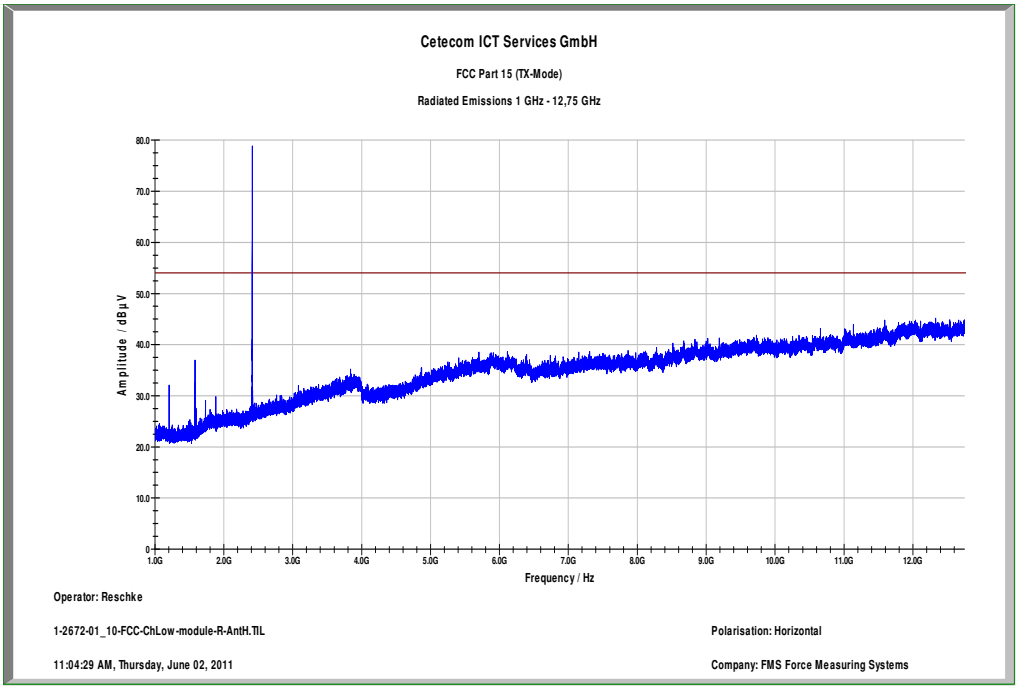
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
41.008650	32.1	15000.000	120.000	98.0	V	39.0	13.4	7.0	39.1	
42.497700	35.2	15000.000	120.000	98.0	V	96.0	13.3	3.9	39.1	
46.495350	35.9	15000.000	120.000	98.0	V	30.0	13.3	3.2	39.1	
48.505200	32.5	15000.000	120.000	98.0	V	273.0	13.3	6.6	39.1	
54.010050	32.7	15000.000	120.000	220.0	V	325.0	13.0	6.4	39.1	
58.007700	30.4	15000.000	120.000	120.0	V	62.0	12.1	8.7	39.1	

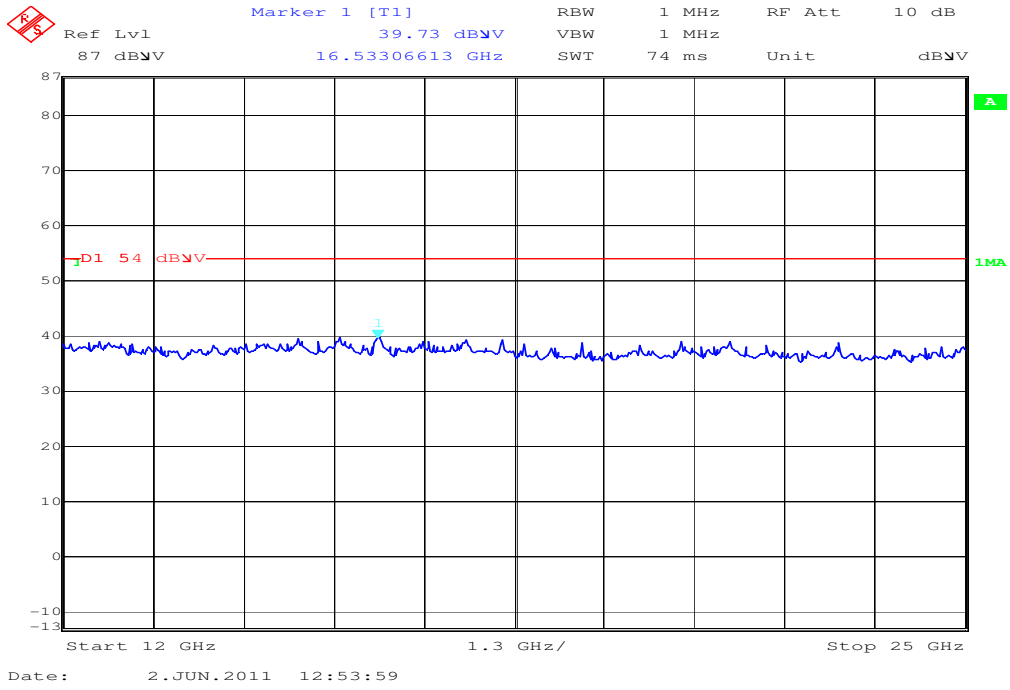
Plot 2: 1 GHz to 12.75 GHz, vertical polarization



Plot 3: Lowest channel, 1 GHz to 12.75 GHz, horizontal polarization



Plot 4: Lowest channel, 12 GHz to 25 GHz (valid for all channels)



Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

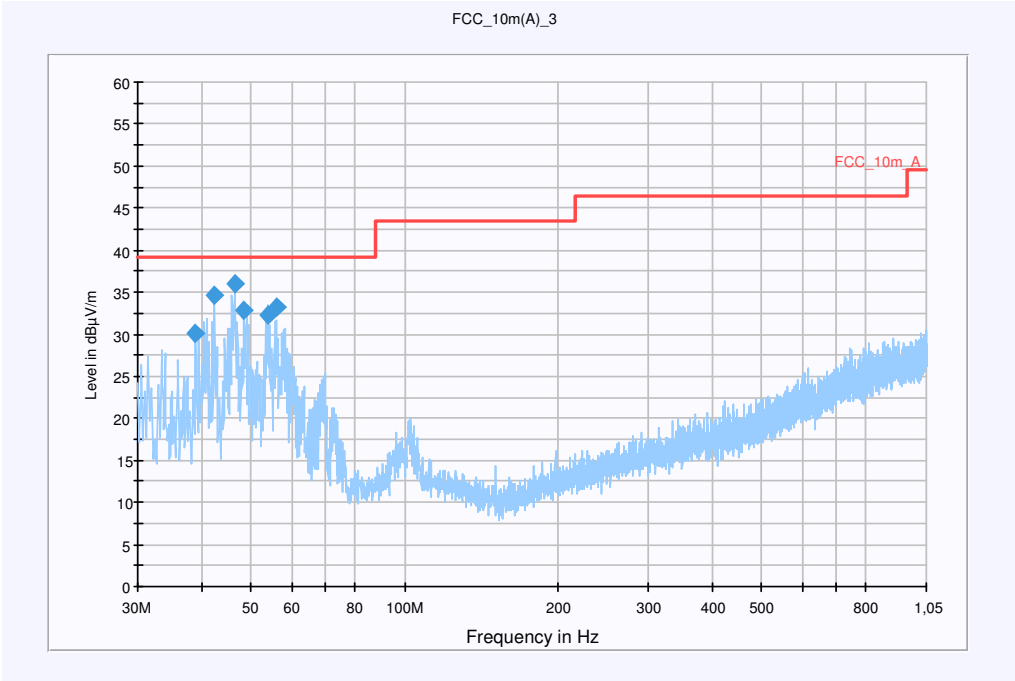
Common Information

EUT:	EMGZ492R
Serial Number:	1095401
Test Description:	FCC part 15 class A @ 10 m
Operating Conditions:	tx channel 6
Operator Name:	WLD
Comment:	DC: 24 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

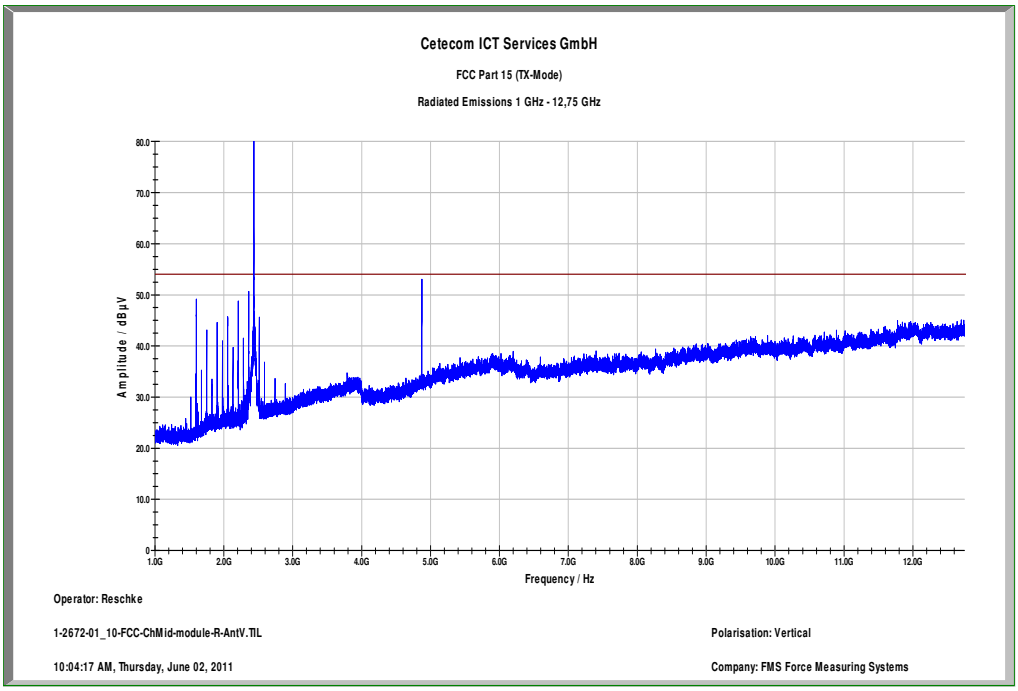
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver



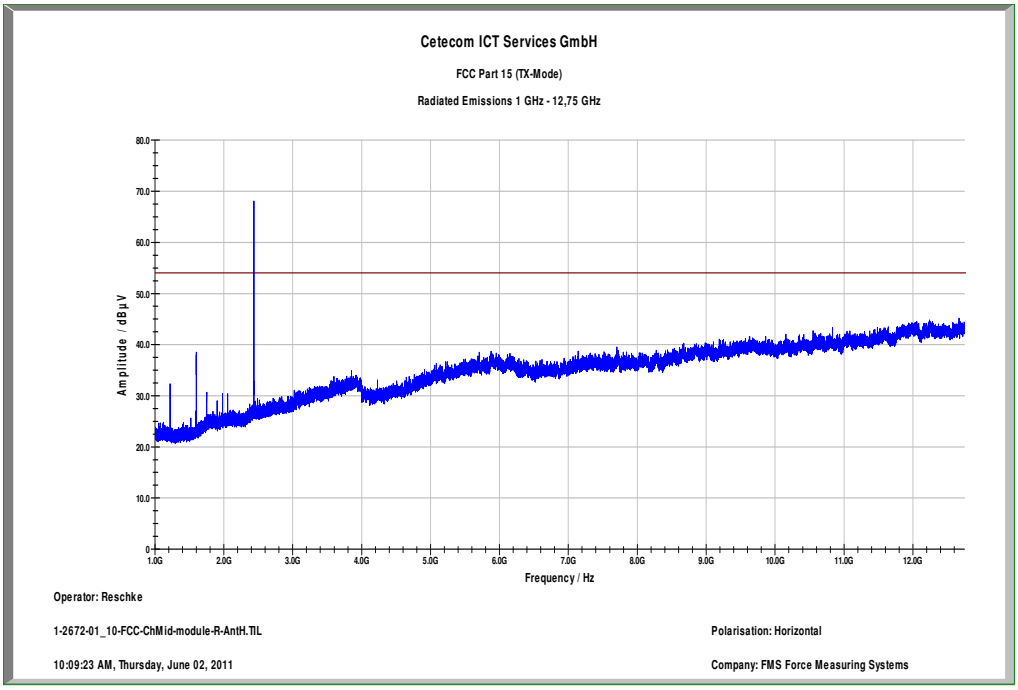
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
38.988150	30.1	15000.000	120.000	98.0	V	52.0	13.4	9.1	39.1	
42.503550	34.7	15000.000	120.000	98.0	V	109.0	13.3	4.4	39.1	
46.504950	36.0	15000.000	120.000	98.0	V	78.0	13.3	3.1	39.1	
48.501000	32.8	15000.000	120.000	98.0	V	324.0	13.3	6.3	39.1	
54.013950	32.2	15000.000	120.000	220.0	V	324.0	13.0	6.9	39.1	
55.996050	33.2	15000.000	120.000	220.0	V	291.0	12.6	5.9	39.1	

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical polarization



Plot 7: Middle channel, 1 GHz to 12.75 GHz, horizontal polarization



Plot 8: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

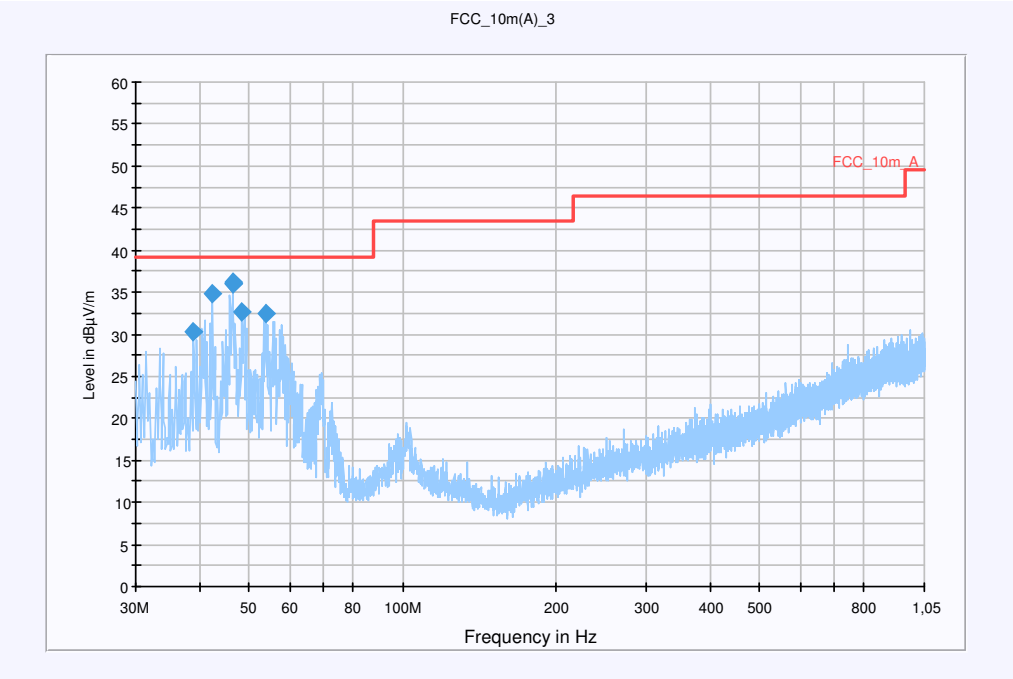
Common Information

EUT:	EMGZ492R
Serial Number:	1095401
Test Description:	FCC part 15 class A @ 10 m
Operating Conditions:	tx channel 11
Operator Name:	WLD
Comment:	DC: 24 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

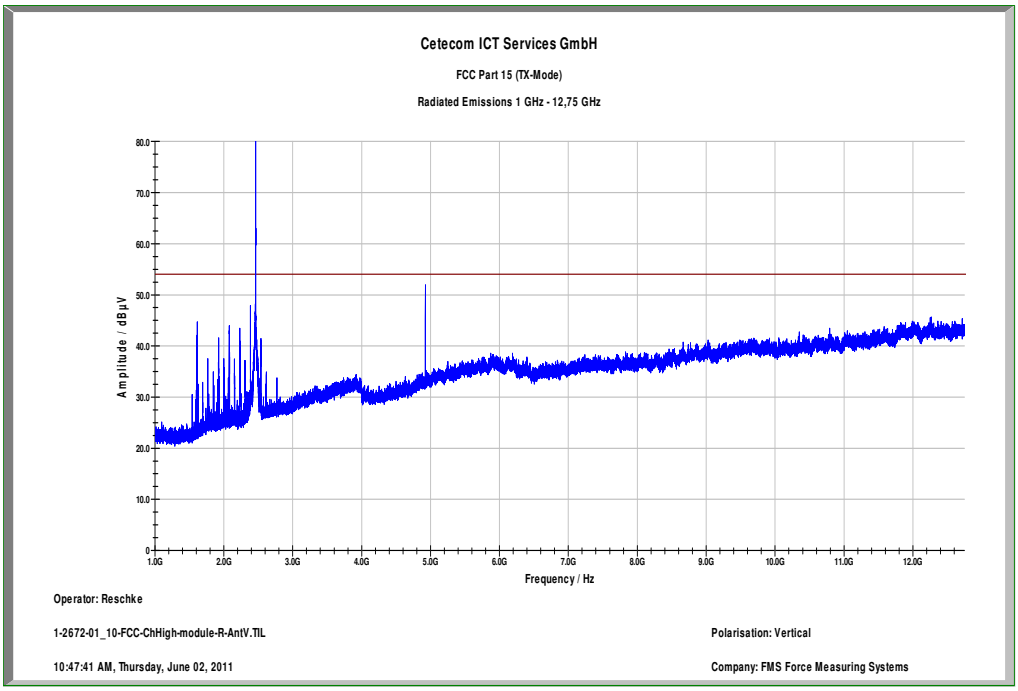
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver



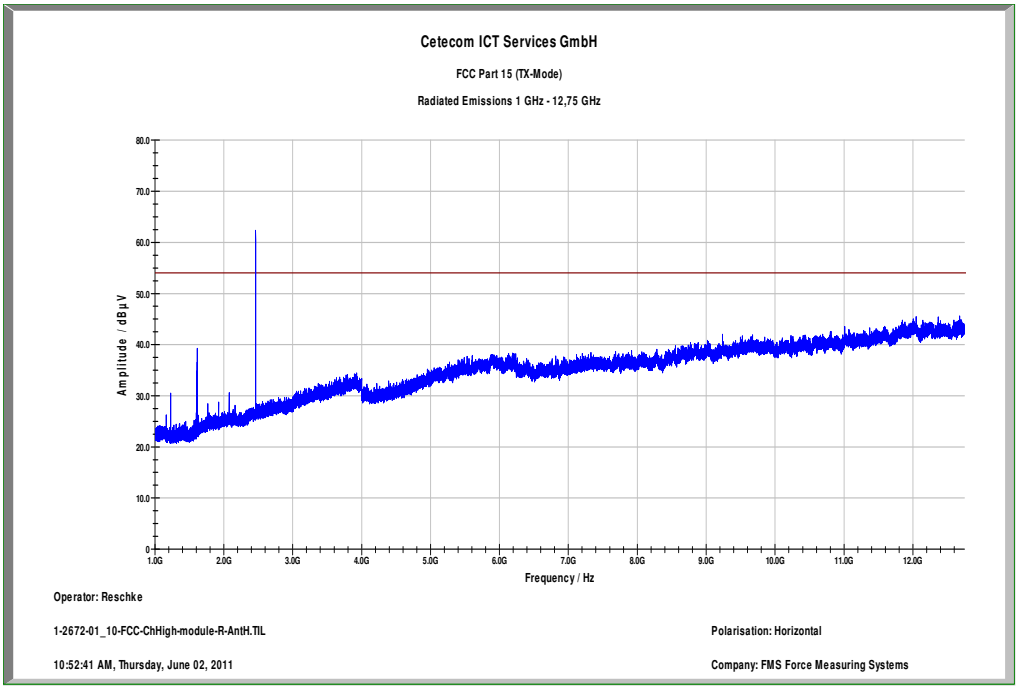
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
38.997900	30.3	15000.000	120.000	106.0	V	39.0	13.4	8.8	39.1	
42.502200	34.9	15000.000	120.000	98.0	V	109.0	13.3	4.2	39.1	
46.500750	36.2	15000.000	120.000	98.0	V	65.0	13.3	2.9	39.1	
46.507950	36.1	15000.000	120.000	98.0	V	146.0	13.3	3.0	39.1	
46.510050	36.1	15000.000	120.000	98.0	V	52.0	13.3	3.0	39.1	
48.514050	32.8	15000.000	120.000	98.0	V	325.0	13.3	6.3	39.1	
54.012450	32.4	15000.000	120.000	124.0	V	325.0	13.0	6.7	39.1	

Plot 9: Highest channel, 1 GHz to 12.75 GHz, vertical polarization



Plot 10: Highest channel, 1 GHz to 12.75 GHz, horizontal polarization



9.10 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
CFR Part 15.109		RSS Gen, Issue 2, 4.10
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

RX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No critical peaks found		
Measurement uncertainty	± 3 dB	

Result: **The result of the measurement is passed.**

Plots: RX / Idle – mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization

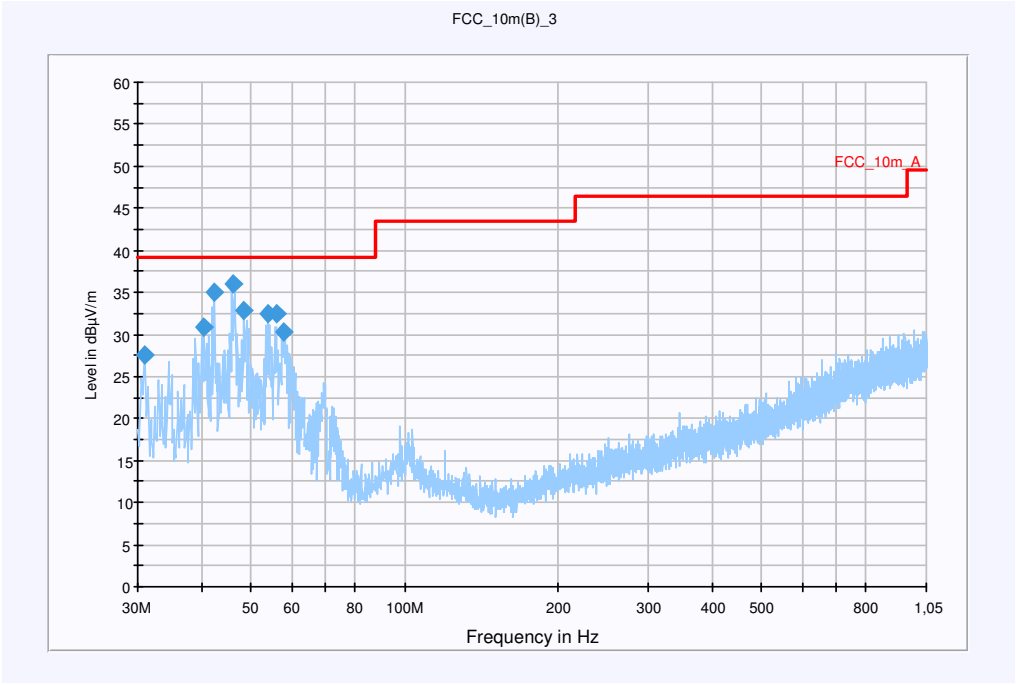
Common Information

EUT:	EMGZ492R
Serial Number:	1095401
Test Description:	FCC part 15 class A @ 10 m
Operating Conditions:	idle
Operator Name:	Hennemann
Comment:	DC: 24 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

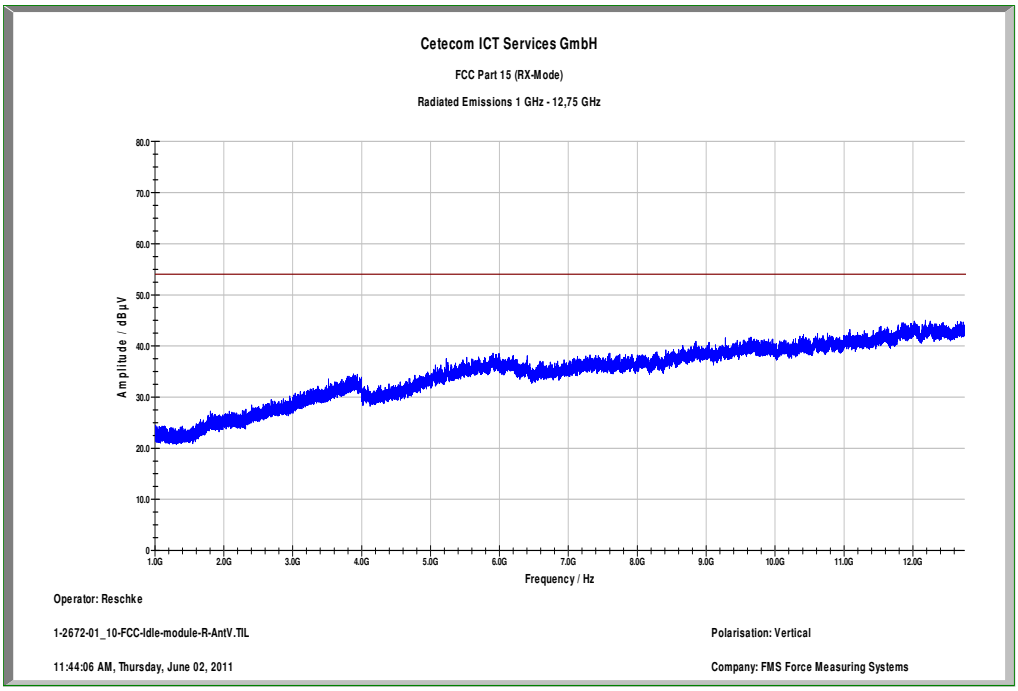
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver



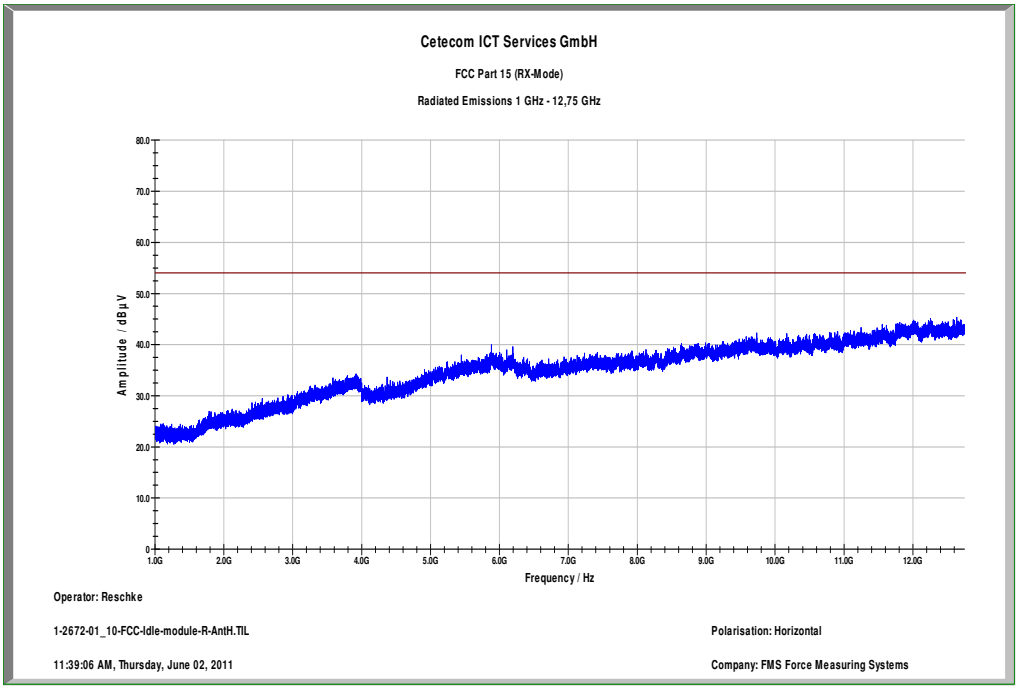
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
31.009200	27.6	15000.000	120.000	98.0	V	106.0	12.6	11.5	39.1	
40.495500	30.9	15000.000	120.000	98.0	V	106.0	13.4	8.2	39.1	
42.500250	35.1	15000.000	120.000	98.0	V	106.0	13.3	4.0	39.1	
46.001700	36.0	15000.000	120.000	98.0	V	173.0	13.3	3.1	39.1	
48.513600	32.9	15000.000	120.000	98.0	V	270.0	13.3	6.2	39.1	
54.003750	32.4	15000.000	120.000	124.0	V	274.0	13.0	6.7	39.1	
56.005950	32.5	15000.000	120.000	170.0	V	283.0	12.6	6.6	39.1	
58.006800	30.3	15000.000	120.000	120.0	V	9.0	12.1	8.8	39.1	

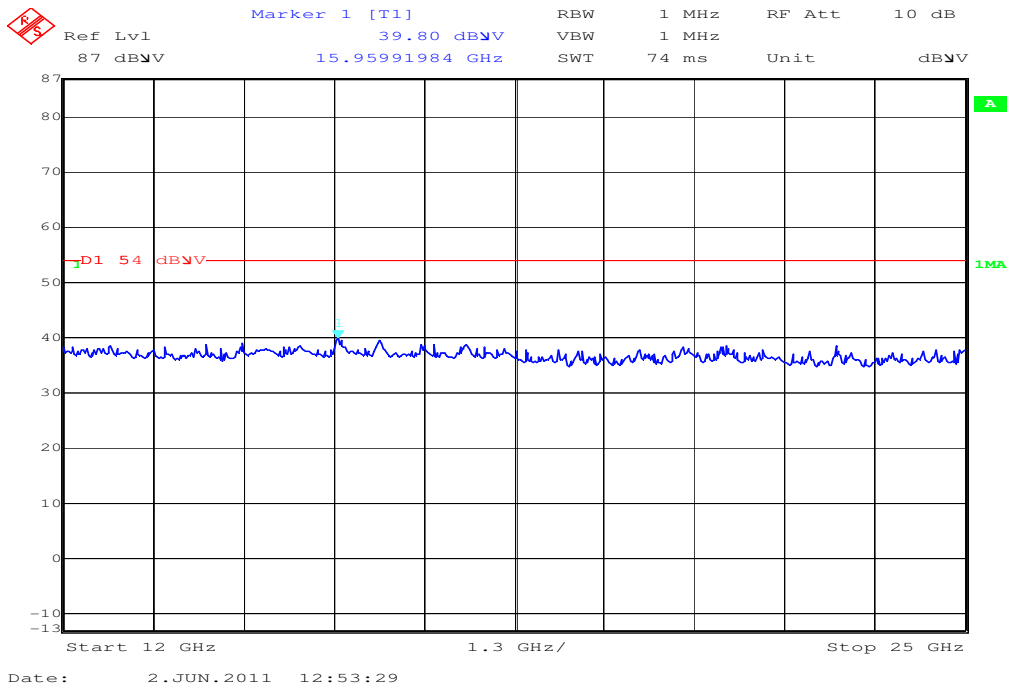
Plot 2: 1 GHz to 12.75 GHz, vertical polarization



Plot 3: 1 GHz to 12.75 GHz, horizontal polarization



Plot 4: 12 GHz to 25 GHz



9.11 TX spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
CFR Part 15.209(a)		RSS –Gen
TX Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

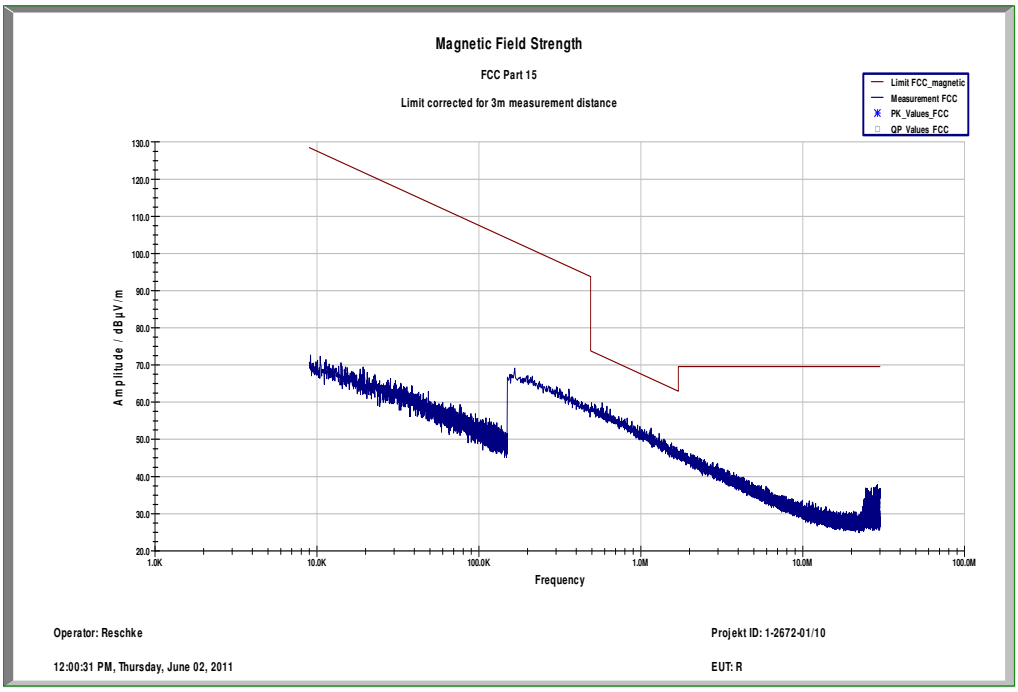
Results:

TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No critical peaks found		
Measurement uncertainty	± 3 dB	

Result: **The result of the measurement is passed.**

Plots:

Plot 1: 9 kHz to 30 MHz / channel 39 (valid for all channels)



9.12 TX spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 39. If critical peaks are found channel 00 and channel 78 will be measured too. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
CFR Part 15.107(a)		ICES-003, Issue 4
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

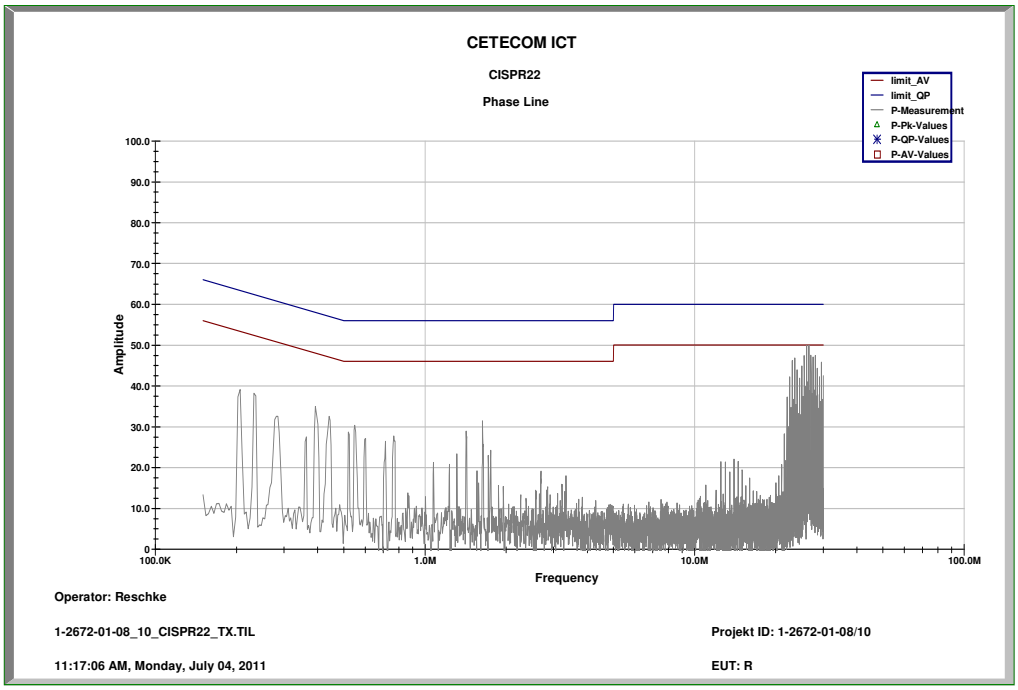
*Decreases with the logarithm of the frequency

Results:

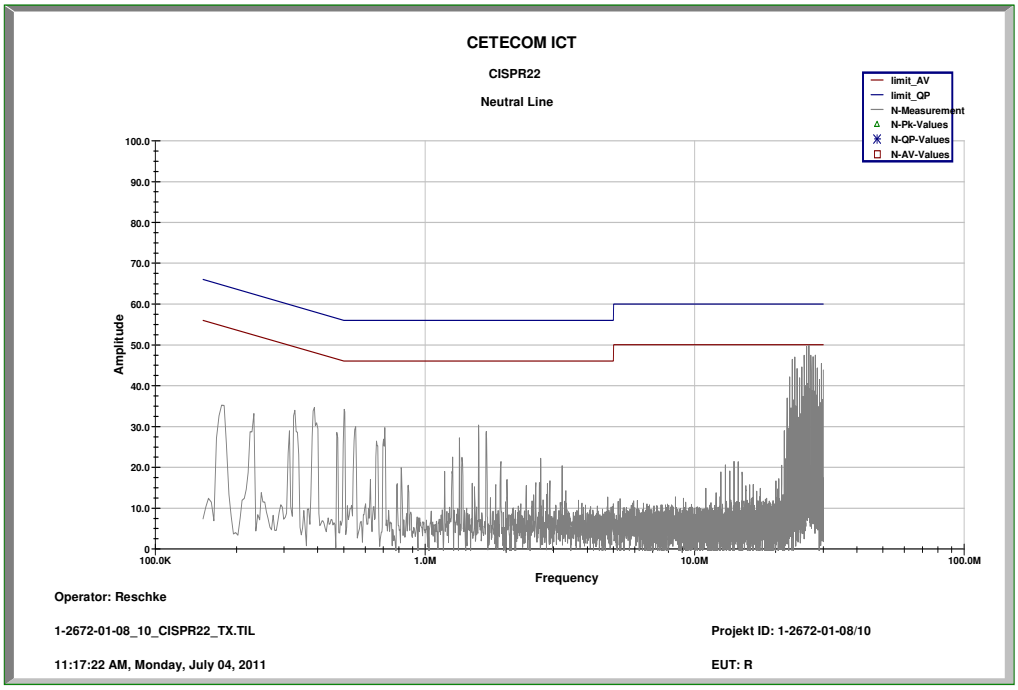
TX Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No critical peaks found		
Measurement uncertainty	± 3 dB	

Result: **The result of the measurement is passed.**

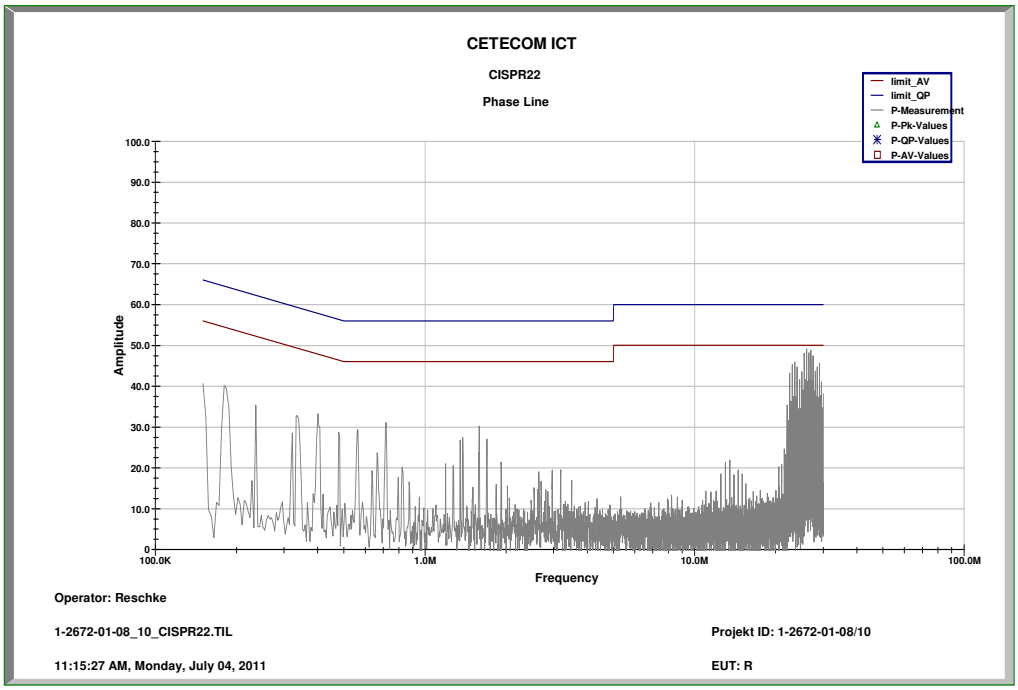
Plot 1: 9 kHz to 30 MHz / phase Line, TX mode



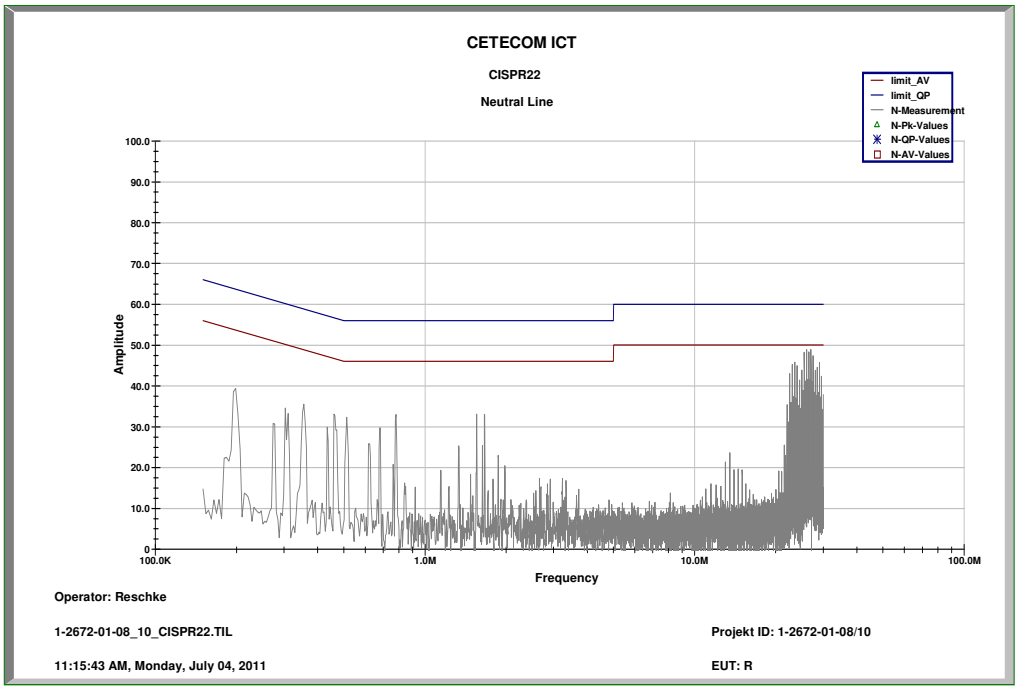
Plot 2: 9 kHz to 30 MHz / neutral Line, TX mode



Plot 3: 9 kHz to 30 MHz / phase Line, RX mode



Plot 4: 9 kHz to 30 MHz / neutral Line, RX mode



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.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	05.01.2011	05.01.2013
5	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	31.07.2009	31.07.2011
6	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
11	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	10.01.2011	10.01.2013
12	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
13	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
14	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
15	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	05.03.2009	05.09.2011
16	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
17	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
18	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
19	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
20	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
21	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
22	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
23	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		

24	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
25	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
26	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
27	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
28	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
29	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
30	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
31	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
32	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
33	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012
34	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vlKl!	08.09.2010	08.09.2012
35	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKl!	17.12.2008	17.12.2011
36	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	ve	01.07.2010	01.07.2012
37	19	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	Ve	19.10.2010	19.10.2012
38	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	04.11.2010	04.11.2012

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 documentation

Photo 1:

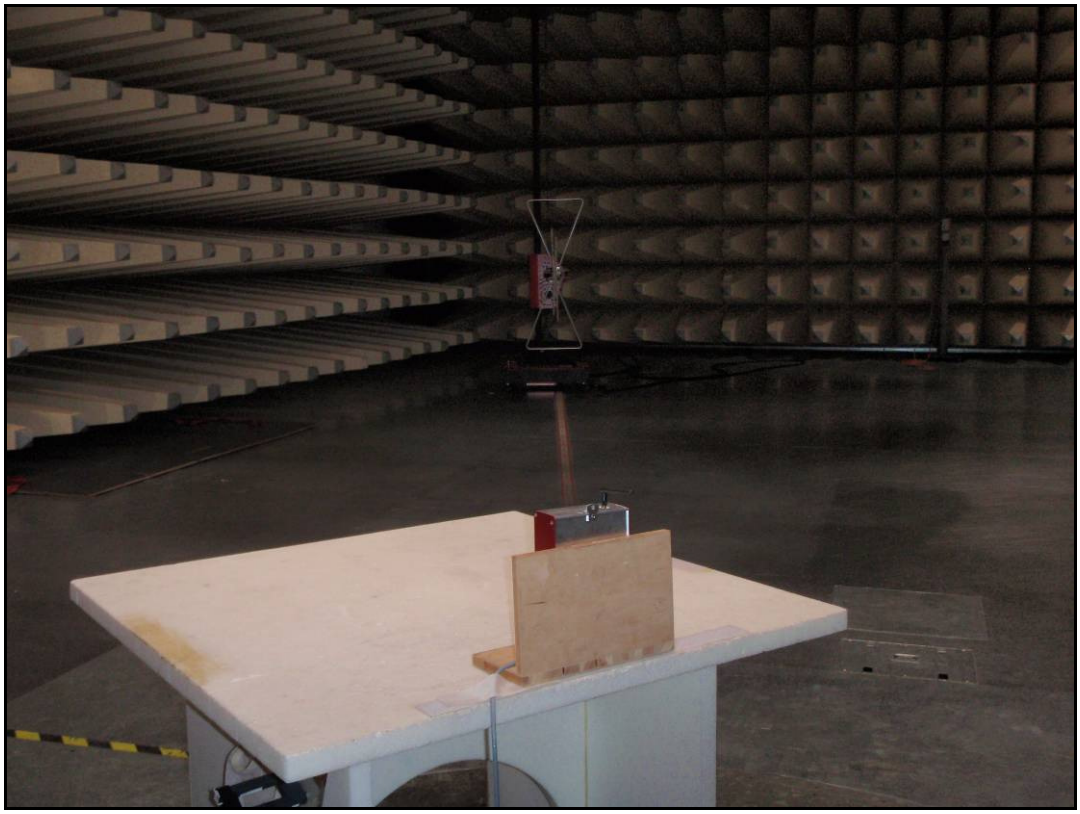


Photo 2:

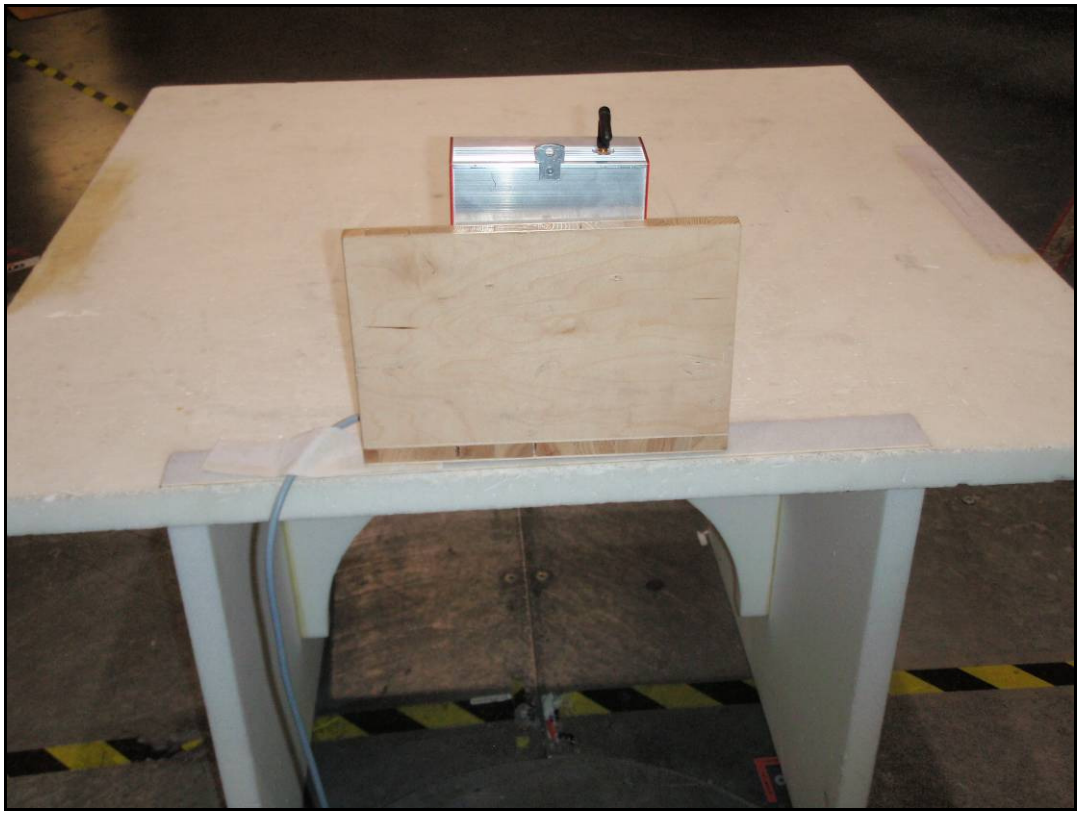
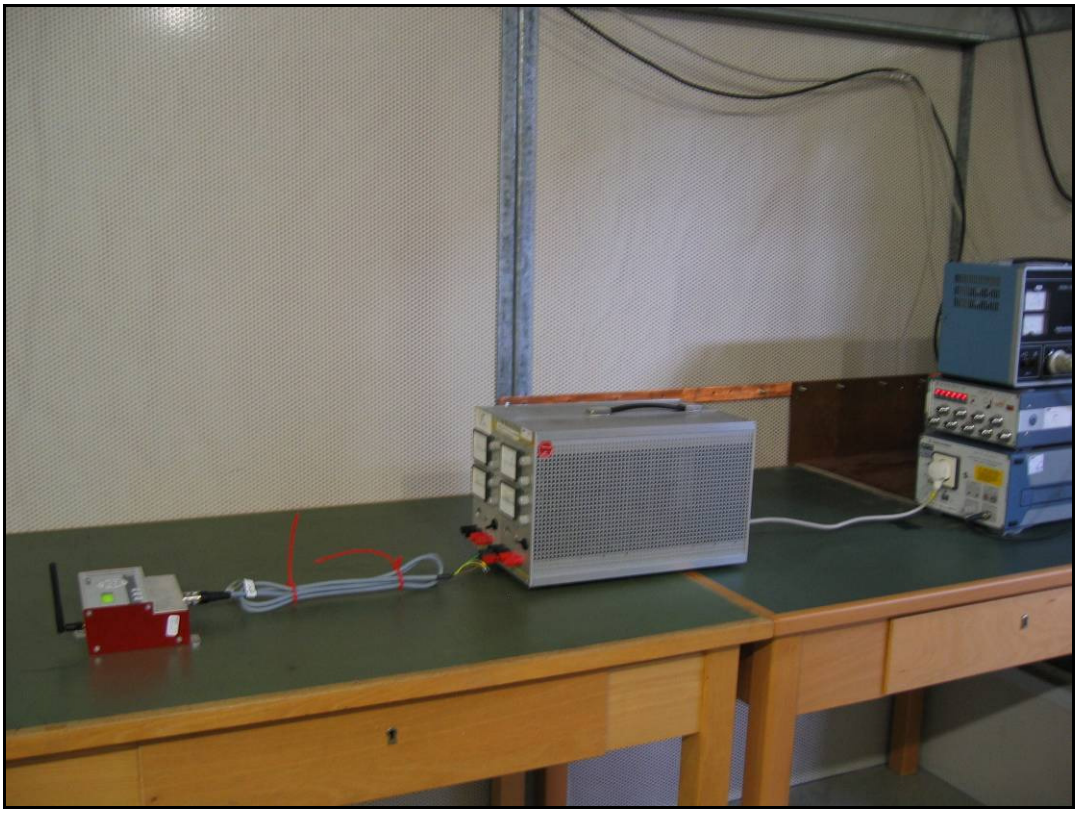


Photo 3:



Annex B External photographs of the EUT

Photo documentation

Photo 4:

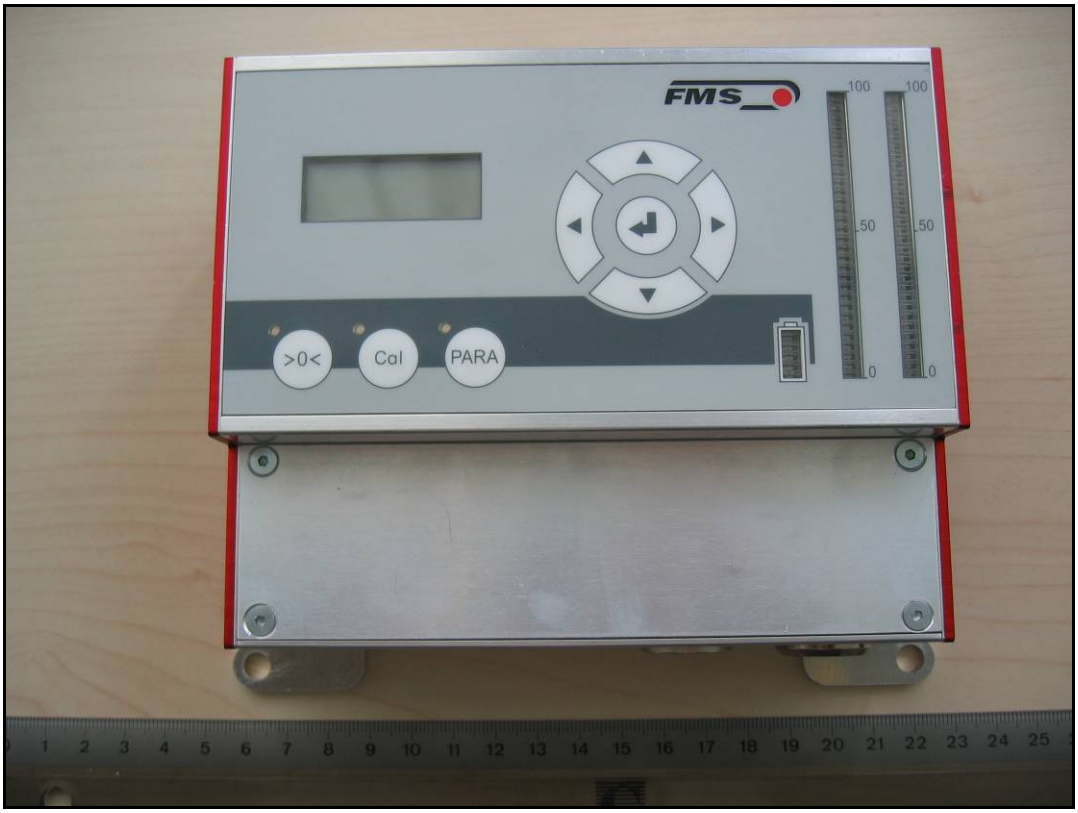


Photo 5:

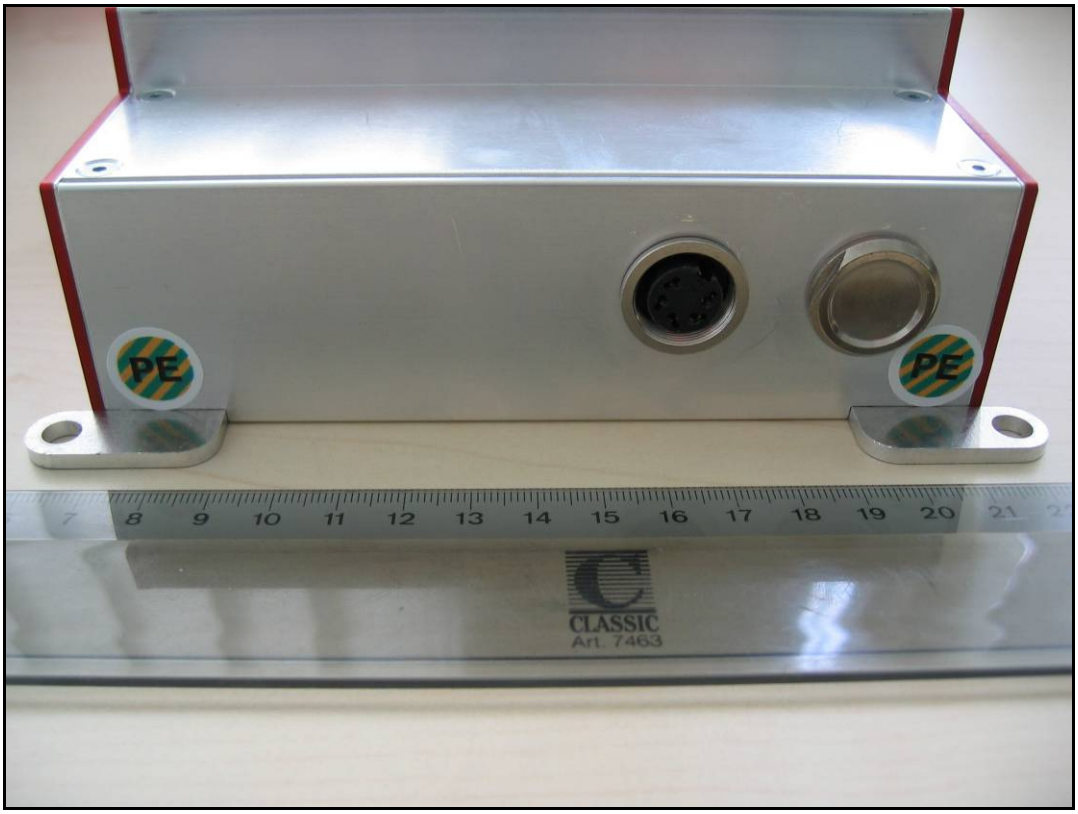


Photo 6:

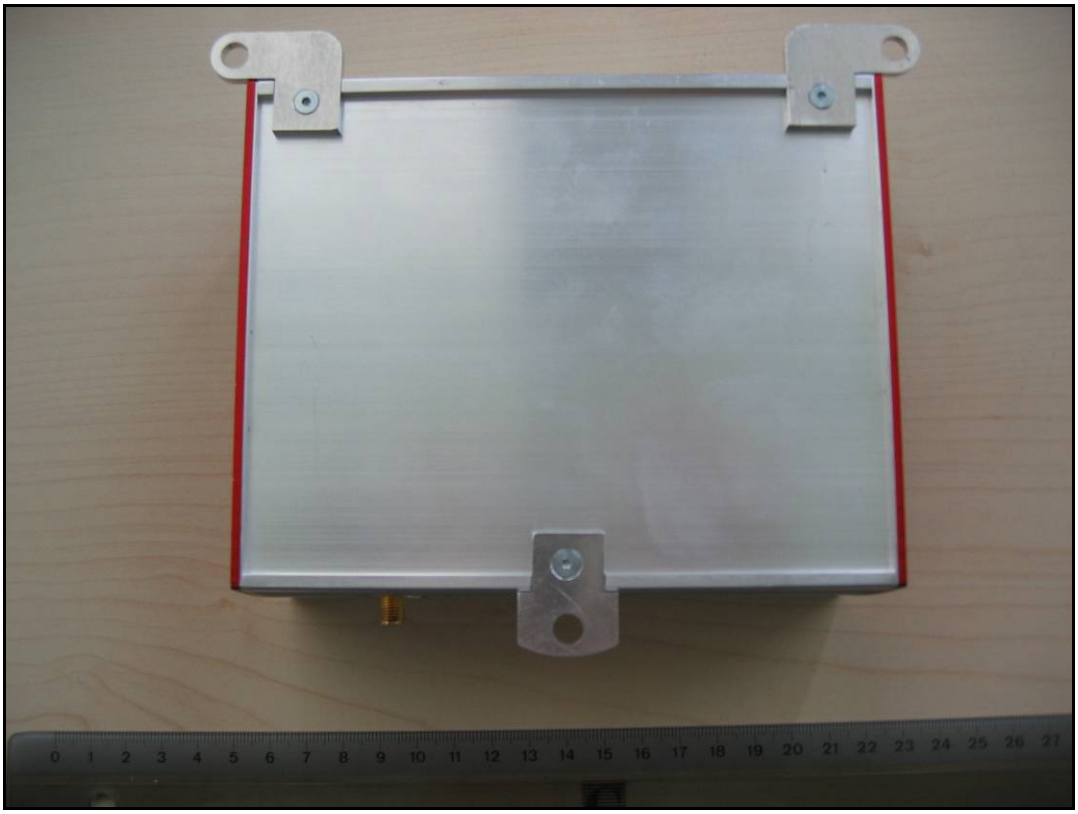


Photo 7:

Photo 8:

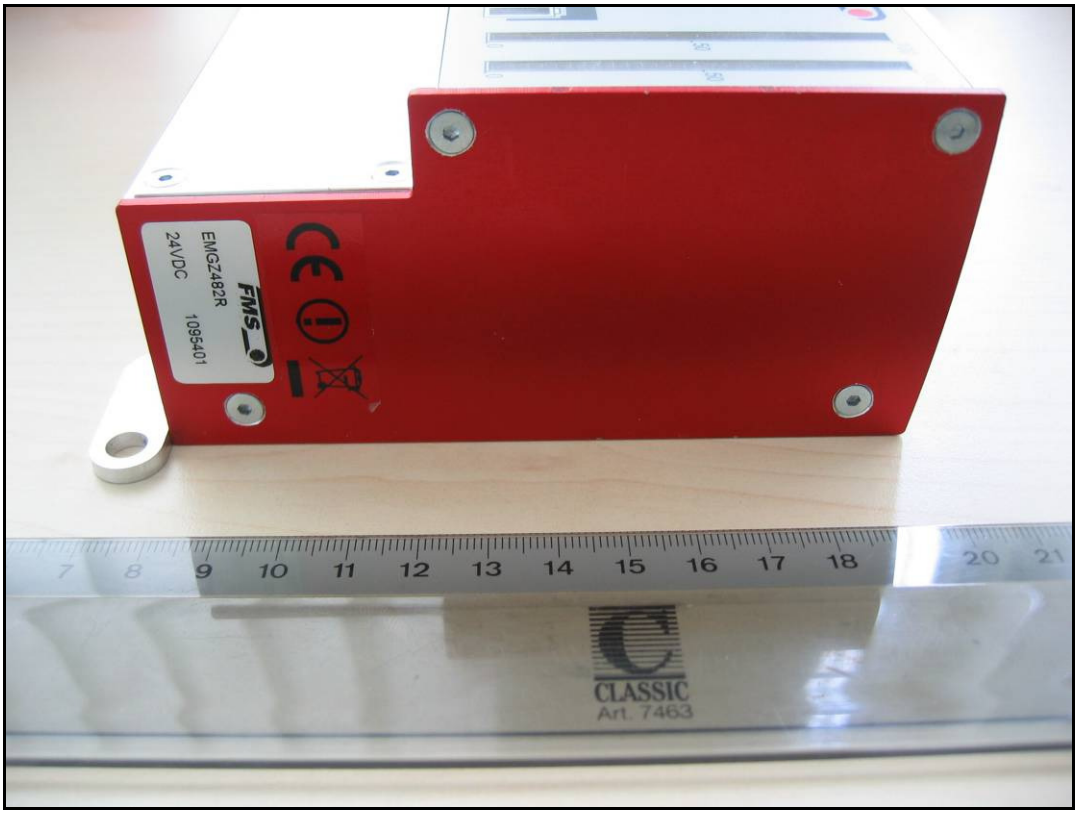
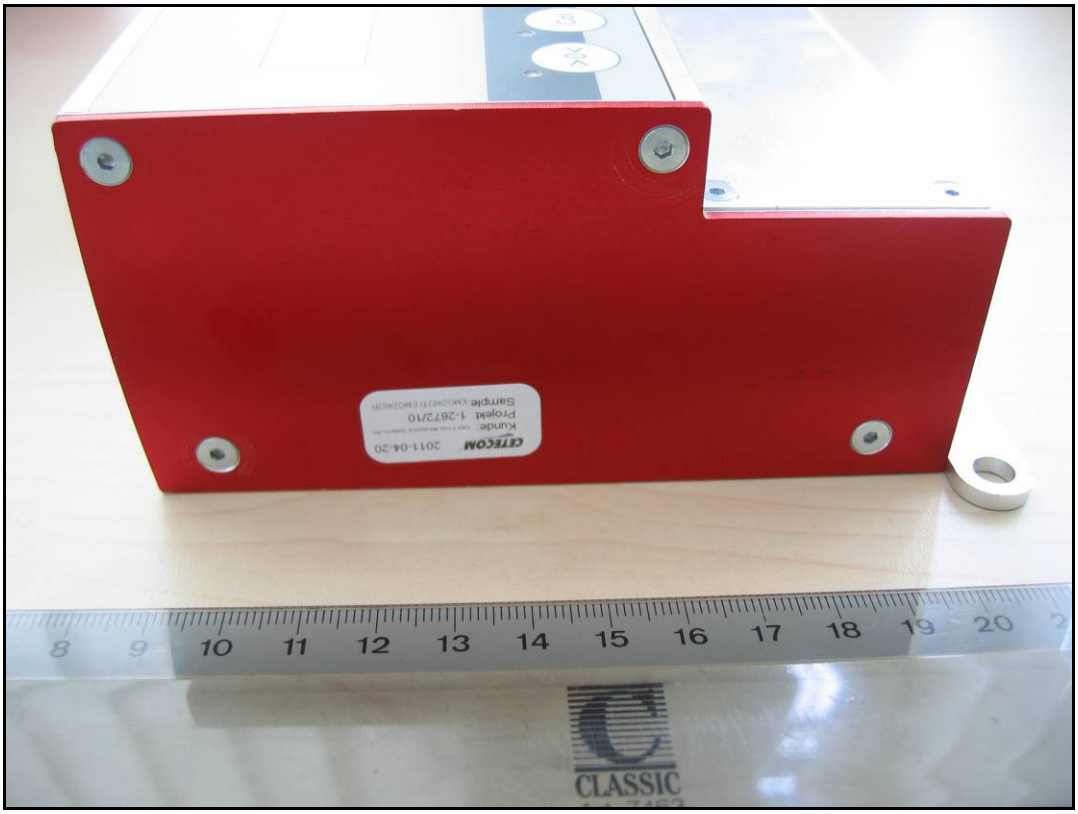


Photo 9:


CETECOM
2011-04-20
Kunde:
Prüfnr.: 1-2672/10
Sample
8 9 10 11 12 13 14 15 16 17 18 19 20
CLASSIC

Annex C Internal photographs of the EUT

Photo documentation

Photo 10:

Photo 11:

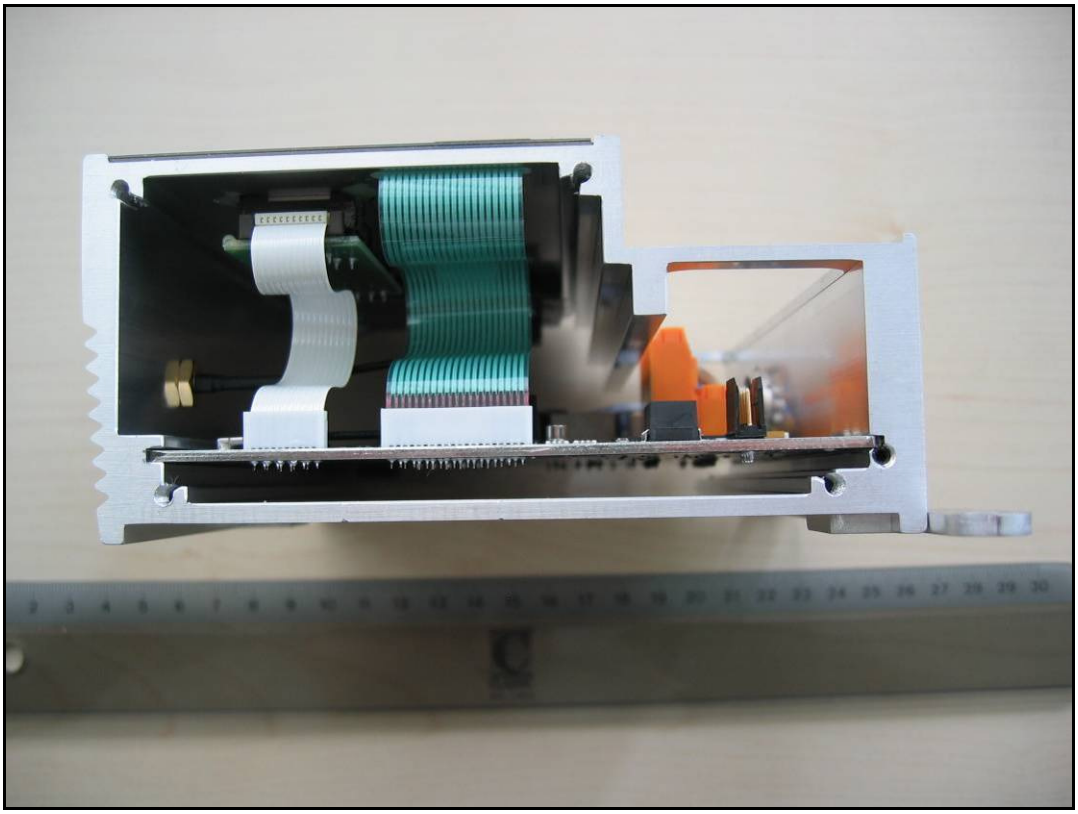


Photo 12:

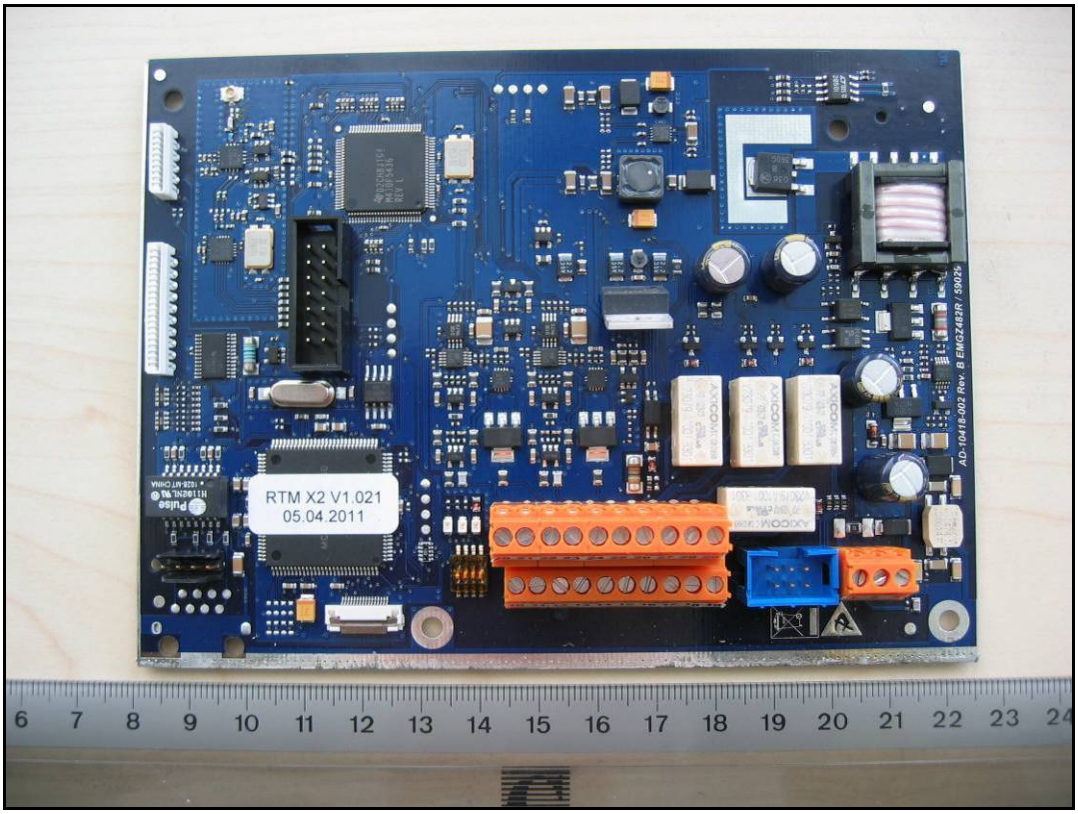


Photo 13:

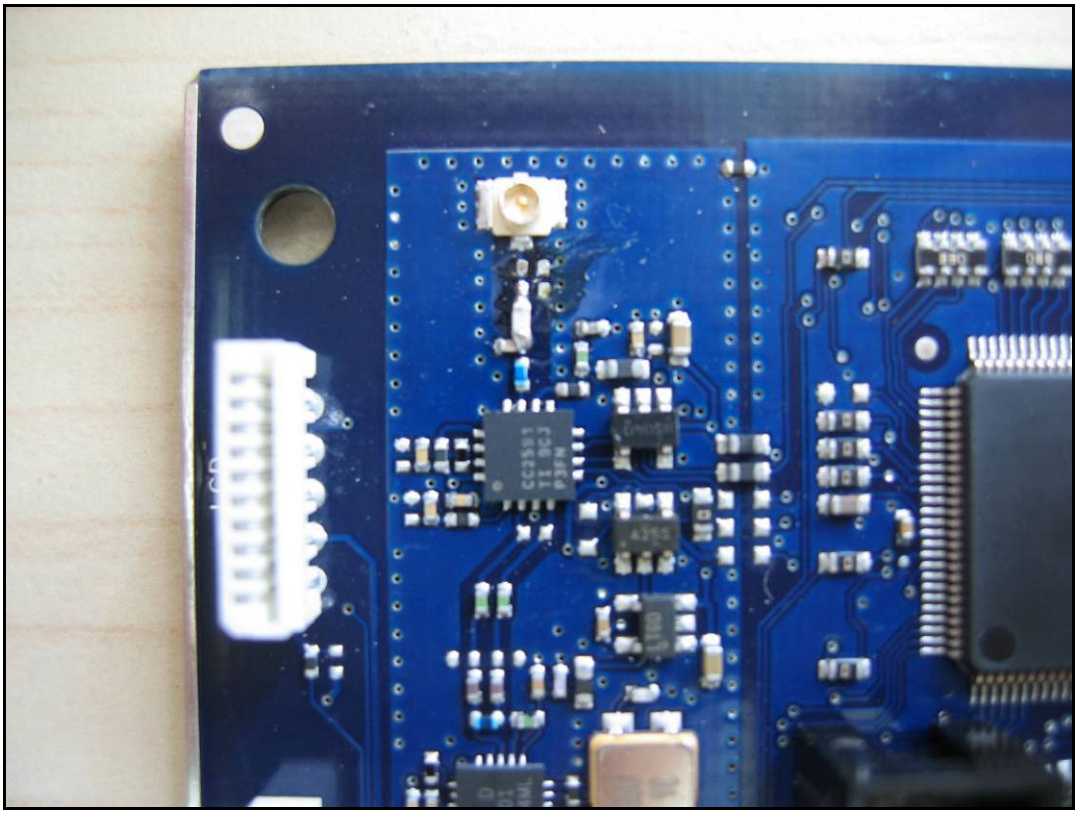
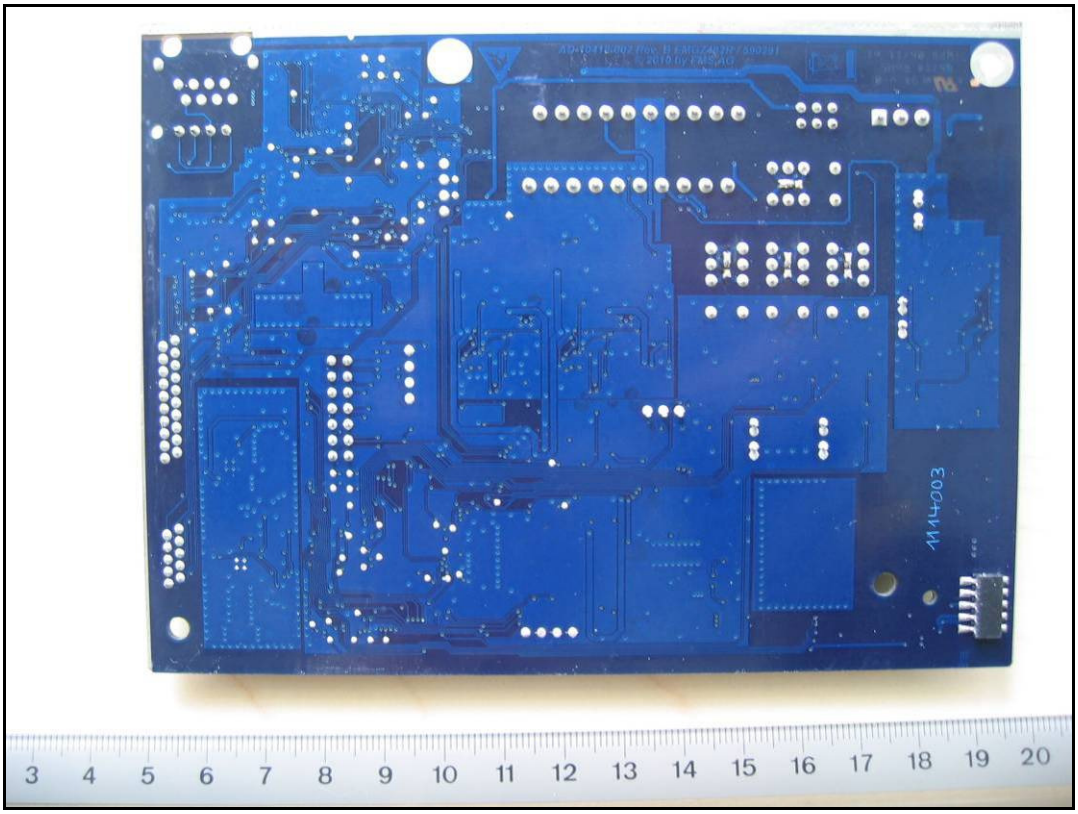


Photo 14:



Annex D Internal photographs of the modified EUT

Photo documentation

Photo 15:

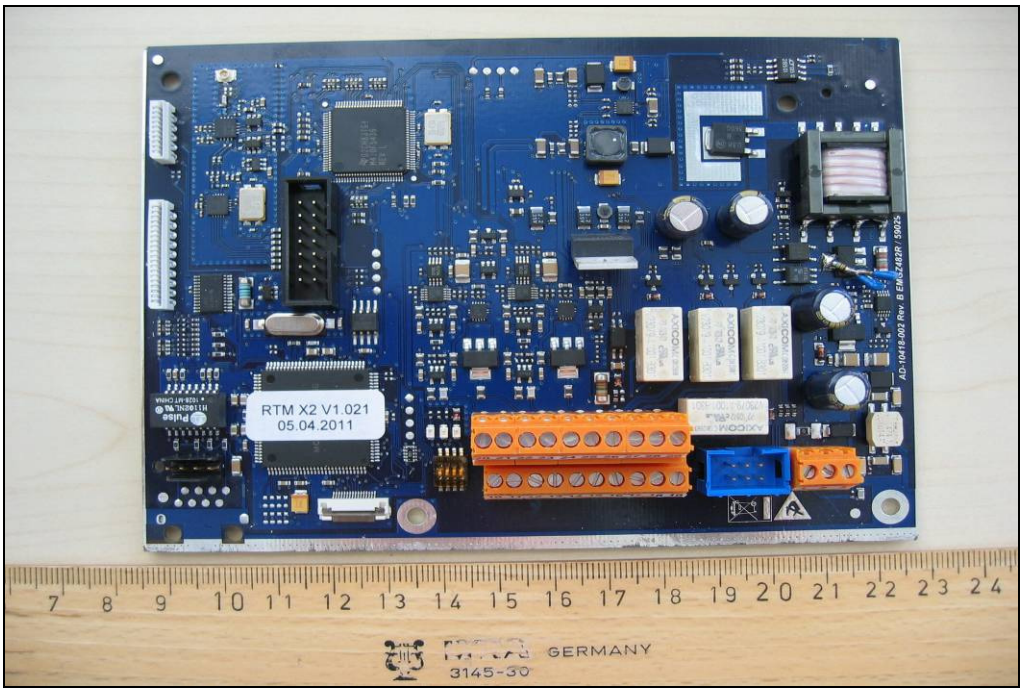


Photo 16:

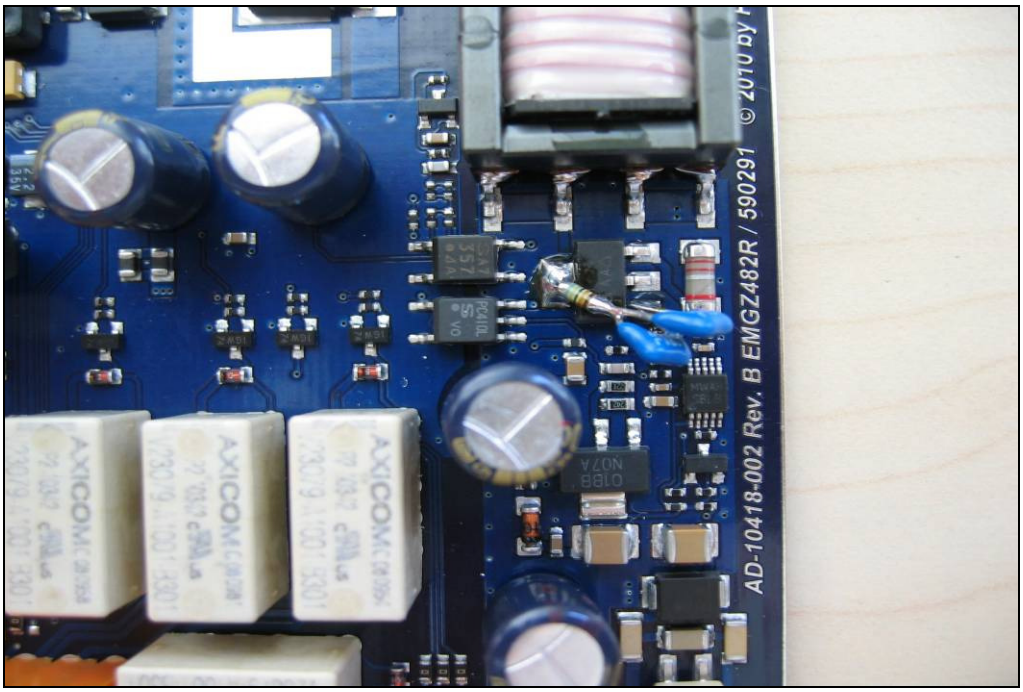


Photo 17:

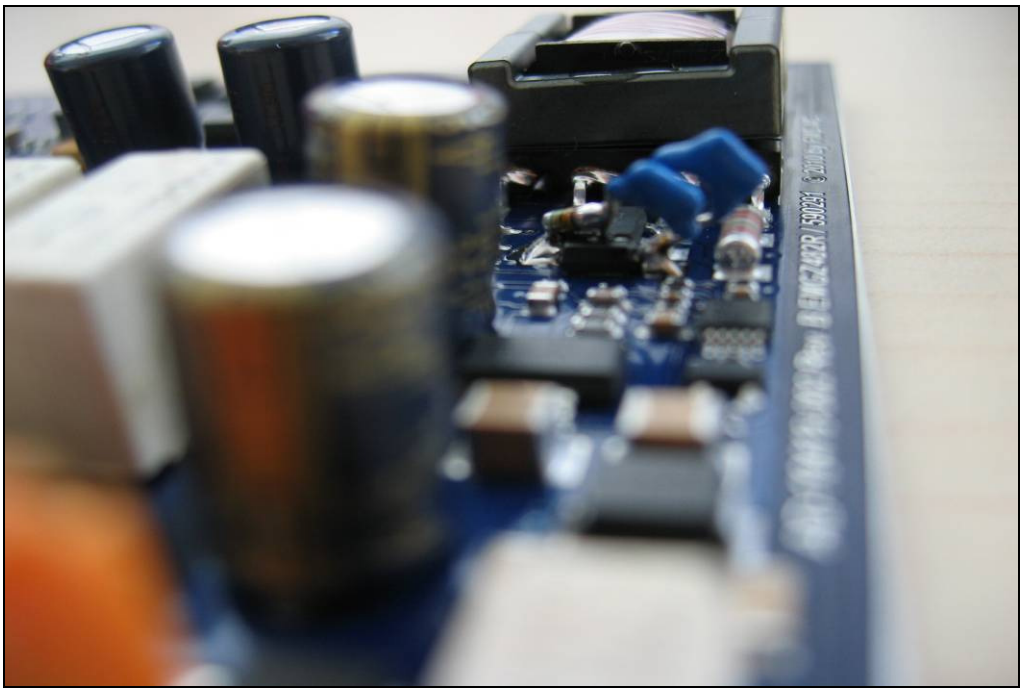
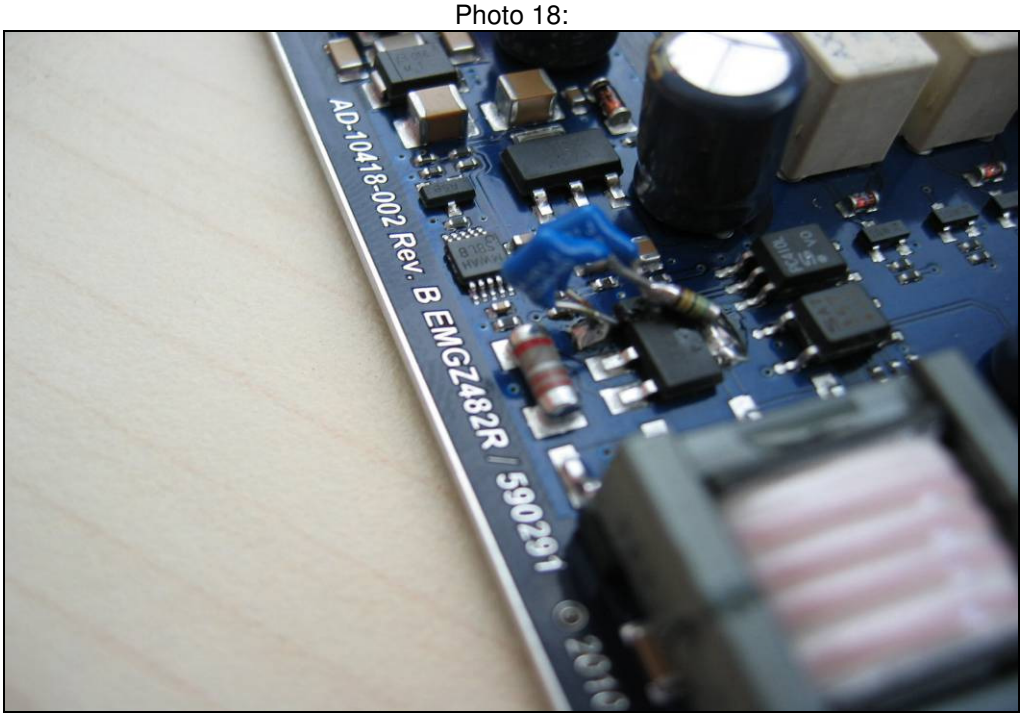


Photo 18:



Annex E Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-07-06

Annex F 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