CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10 . D-66117 Saarbrücken Phone: +49 (0) 681-598-0 Fax: -9075
RSC-Laboratory

Accredited testing-laboratory

DAR registration number: DGA-PL-176/94-D1

Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97

Recognized by the Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3462C-1 (IC)
Certification ID: DE 0001
Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

Test report no.	**:**	**1-2036-01-10/10-A**
Type identification	**:**	**Synexis TS2**
Applicant	**:**	**beyerdynamic GmbH & Co. KG**
FCC ID	**:**	**OSDSYNEXISTS2**
IC Certification No	**:**	**3628A-SYNEXISTS2**
Test standards	**:**	**47 CFR Part 2**
		47 CFR Part 95

Table of contents

1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The 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 the 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.

Test laboratory manager:	cn=Jakob Reschke, o=CETECOM ICT Services GmbH, ou=RES-100323, email=Jakob.Reschke@ict.cetecom.de, c=DE
Daniel K. Muyunga (i.A. Jakob Reschke)	2010.11.08 14:07:03 +01'00'
Name	Signature

Technical responsibility for area of testing:	cn=Stefan Boes, o=Cetecom ICT Services GmbH, ou=BOE-100817, email=Stefan.Boes@cetecom.com, c=DE
Stefan Bös	2010.11.09 09:17:08 +01'00'
Name	Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10
66117 Saarbrücken
Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
e-mail: ict@cetecom.com
Internet: http://www.cetecom.com

State of accreditation:	**The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 DAR registration number: DGA-PL-176/94-D1**
Accredited by:	**Federal Motor Transport Authority (KBA) DAR registration number: KBA-P 00070-97**

Testing location, if different from CETECOM ICT Services GmbH:

Name :
Street :
Town :
Country :
Phone :
Fax :

1.3 Details of applicant

Name:	**beyerdynamic GmbH & Co. KG**
Street:	**Theresienstraße 8**
Town:	**74072 Heilbronn**
Country:	**Germany**
Telephone:	**+49 (0) 7131 61 71-0**
Fax:	**+49 (0) 7131 617 215**
Contact:	**Ulrich Roth**
E-mail:	**roth@beyerdynamic.de**
Telephone:	**+49 (0) 7131 617 155**

1.4 Application details

Date of receipt of order:	**2010-05-05**
Date of receipt of test item:	**2010-09-23**
Date of start test:	**2010-09-23**
Date of end test:	**2010-09-24**
Persons(s) who have been present during the test:	**Oliver Spychala, Dipl.-Ing. (FH)**

2 Test standard/s

47 CFR Part 2	**2009-10**	**Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations**
47 CFR Part 95	**2009-10**	**Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission subchapter D - safety and special radio services; Part 95- Personal radio services**

3 Technical tests

3.1 Details of manufacturer

Name:	**beyerdynamic GmbH & Co. KG**
Street:	**Theresienstraße 8**
Town:	**74072 Heilbronn**
Country:	**Germany**

3.1.1 Test item

Kind of test item	:	**Auditory communication system Synexis**
Type identification	:	**Synexis TS2**
S/N serial number	:	**No information available!**
HW hardware status	:	**No information available!**
SW software status	:	**No information available!**
Frequency Band	:	**216 -217 MHz**
Type of Modulation	:	**F3E**
Number of channels	:	**19**
Antenna	:	**Stationary transmitter Synexis TS2 – external rod antenna** **For more information, please take a look at the sub-clause 8 → Photos of the EUT!**
Power Supply	:	**115 AC by AC / DC mains adapter**
Temperature Range	:	**-30 °C to +50 °C**

Stationary transmitter Synexis TS2:

Max. power radiated: 16.44 dBm

FCC ID: **OSDSYNEXISTS2**

IC: **3628A-SYNEXISTS2**

3.1.2 Additional EUT information For IC Canada (appendix 2)

IC Registration Number:	**3628A-SYNEXISTS2**
Model Name:	**Synexis TS2**
Manufacturer (complete Address):	**beyerdynamic GmbH & Co. KG Theresienstraße 8 74072 Heilbronn Germany**
Tested to Radio Standards Specification (RSS) No.:	**RSS-210 Issue 7**
Open Area Test Site Industry Canada Number:	**IC 3462C-1**
Frequency Range (or fixed frequency) [MHz]:	**216 -217 MHz**
RF: Power [W] (max):	**Stationary transmitter Synexis TS2 Rad. EIRP: 44.05 mW**
Antenna Type:	**Stationary transmitter Synexis TS2 – external rod antenna For more information, please take a look at the sub-clause 8 → Photos of the EUT!**
Occupied Bandwidth (99% BW) [kHz]:	**32.71 (refer to test report number 1-2036-01-04/10)**
Type of Modulation:	**F3E**
Emission Designator (TRC-43):	**32K7F3E**
Transmitter Spurious (worst case):	**-42.62 dBm**
Receiver Spurious (worst case):	**No receiver mode integrated!**

ATTESTATION:

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

Signature: 

Test engineer: Daniel K. Muyunga Date: 2010-10-08

3.1.3 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T_{nom}	°C	**20**
Nominal Humidity	H_{nom}	%	**41**
Nominal Power Source	V_{nom}	V	**115 AC**

Type of power source: **115 AC by AC / DC mains adapter**

4 Summary of Measurement Results and list of all performed test cases

☒ **No deviations from the technical specifications were ascertained**

☐ There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	47 CFR Part 2 47 CFR Part 95 G	PASSED	2010-09-24	Only delta tests

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
§ 2.1046 § 95.639 (e)	Radiated output power	Yes			
§ 2.1055 § 95.629 (d) (2)	Frequency tolerance				Yes
§ 2.1047	Modulation characteristics				Yes
§ 2.1047 (e) (3)	Occupied bandwidth				Yes
§ 95.635 (c) (2) (i)	Spectrum mask				Yes
§ 2.1053 § 2.1047 § 95.635 (c) (2) (ii)	Radiated spurious emissions	Yes			

5 RF measurement testing

5.1 Description of test setup

5.1.1 Radiated measurements

For Part 95 we use the substitution method (TIA/EIA 603).

5.2 Referenced Documents

This report only describes delta measurements according to test report number 1-2036-01-04/10.

5.3 Additional comments

The channel 216.475 MHz is disabled by the software.

The manufacturer increased the output power via firmware.
These tests were done to show compliance with the applicable standards.

5.4 Radiated output power

Standards:
FCC Part 2 – subpart J: Certification § 2.1046 FCC Part 95 – subpart E: Technical regulations § 95.639 (e)

Stationary transmitter Synexis TS2:

Low power mode:

Results:

Channel / frequency	Detected output power
01 / 216.025 MHz	7.90 dBm
10 / 216.525 MHz	7.55 dBm
19 / 216.975 MHz	7.73 dBm

High power mode:

Results:

Channel / frequency	Detected output power
01 / 216.025 MHz	16.37 dBm
10 / 216.525 MHz	16.34 dBm
19 / 216.975 MHz	16.44 dBm

Limits:

FCC Part 95 – subpart E: Technical regulations § 95.639 (e) LPRS 100 mW = 20 dBm

5.5 Frequency tolerance

Test not performed

Standards:
FCC Part 2 – subpart J: Certification § 2.1055 FCC Part 95 – subpart E: Technical regulations § 95.629 (d) (2)

5.6 Modulation characteristics

Test not performed

Standards:
FCC Part 2 – subpart J: Certification § 2.1047

5.7 Occupied bandwidth

Test not performed

Standards:
FCC Part 2 – subpart J: Certification § 2.1047 (e) (3)

5.8 Spectrum mask

Test not performed

Standards:
FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (i)

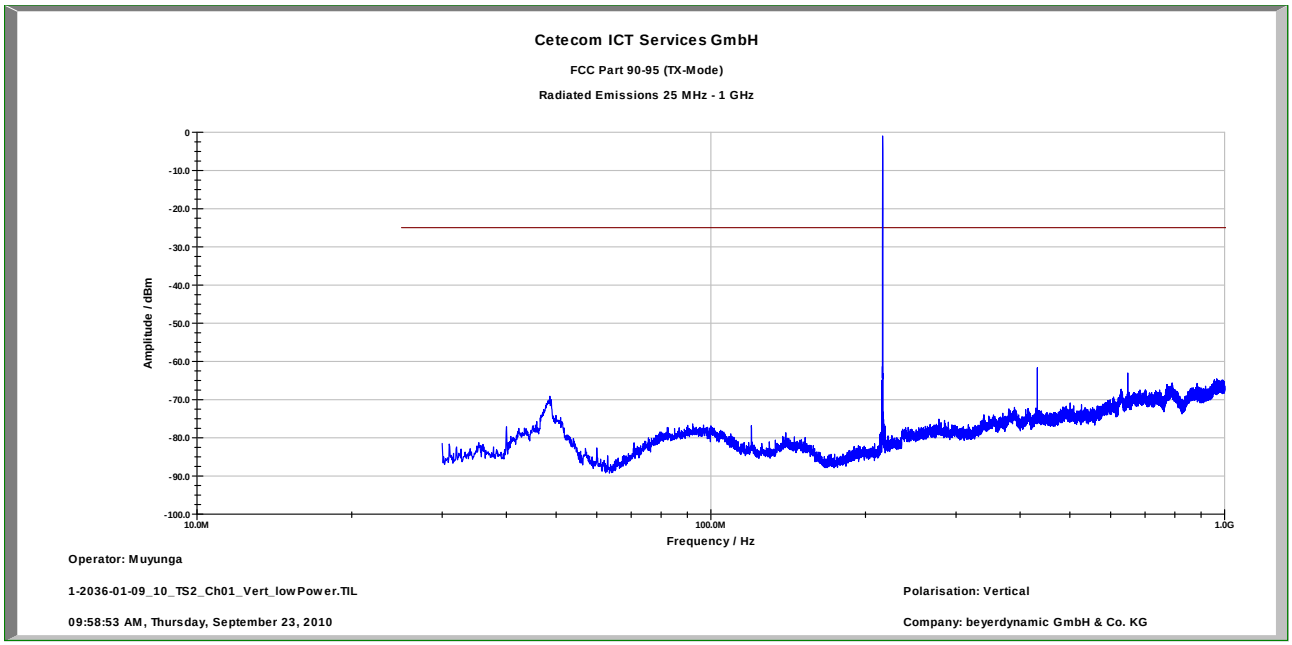
5.9 Radiated spurious emissions

Standards:
FCC Part 2 – subpart J: Certification § 2.1053 FCC Part 2 § 2.1047 FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (ii)

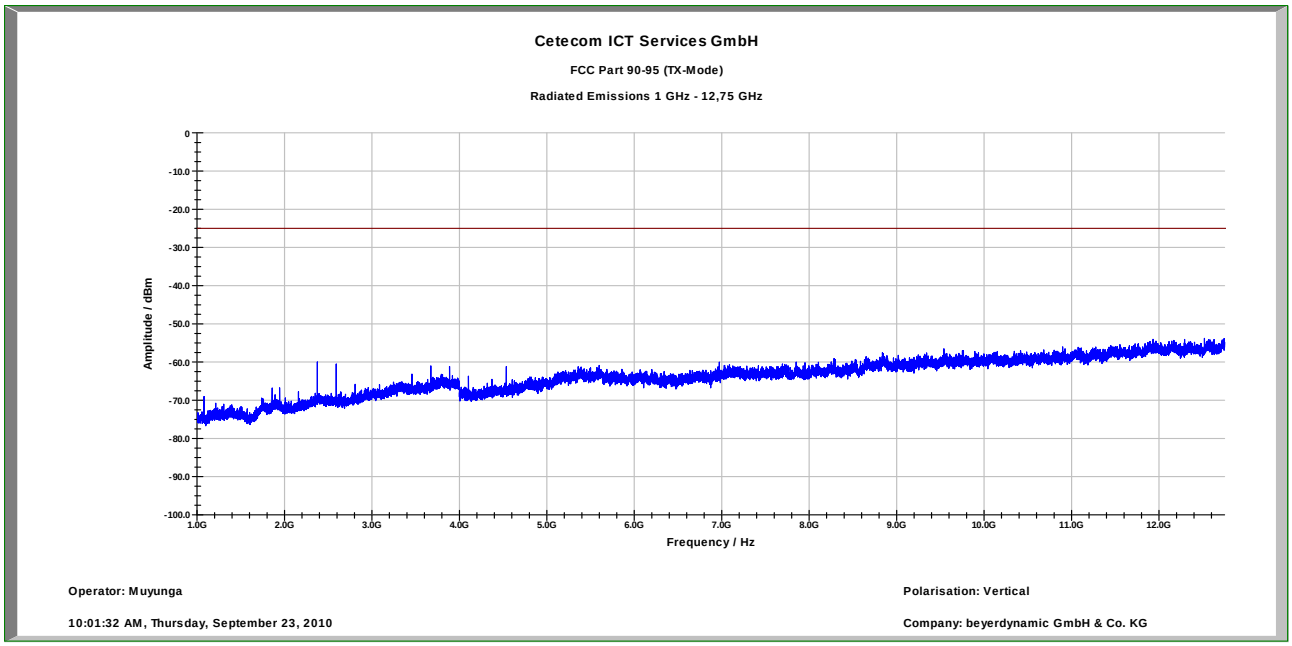
Stationary transmitter Synexis TS2:

Low power mode:

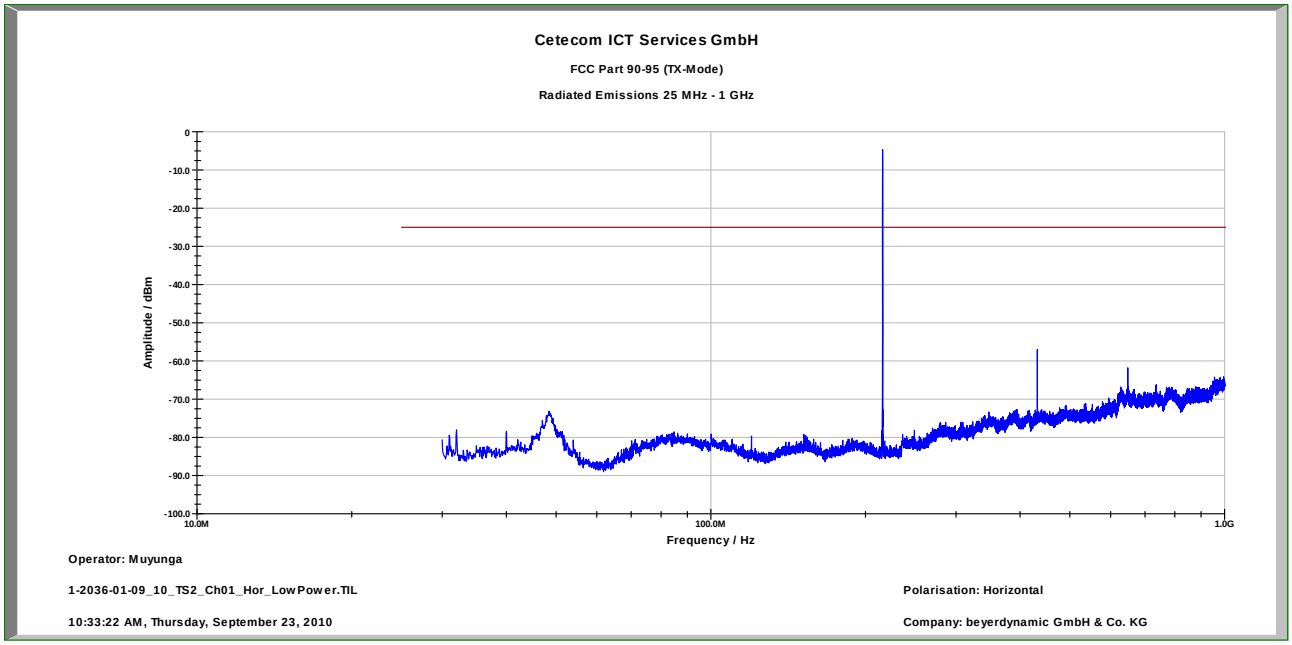
Plot 1: 0.03 – 1 GHz, vertical polarization, low channel, low power mode



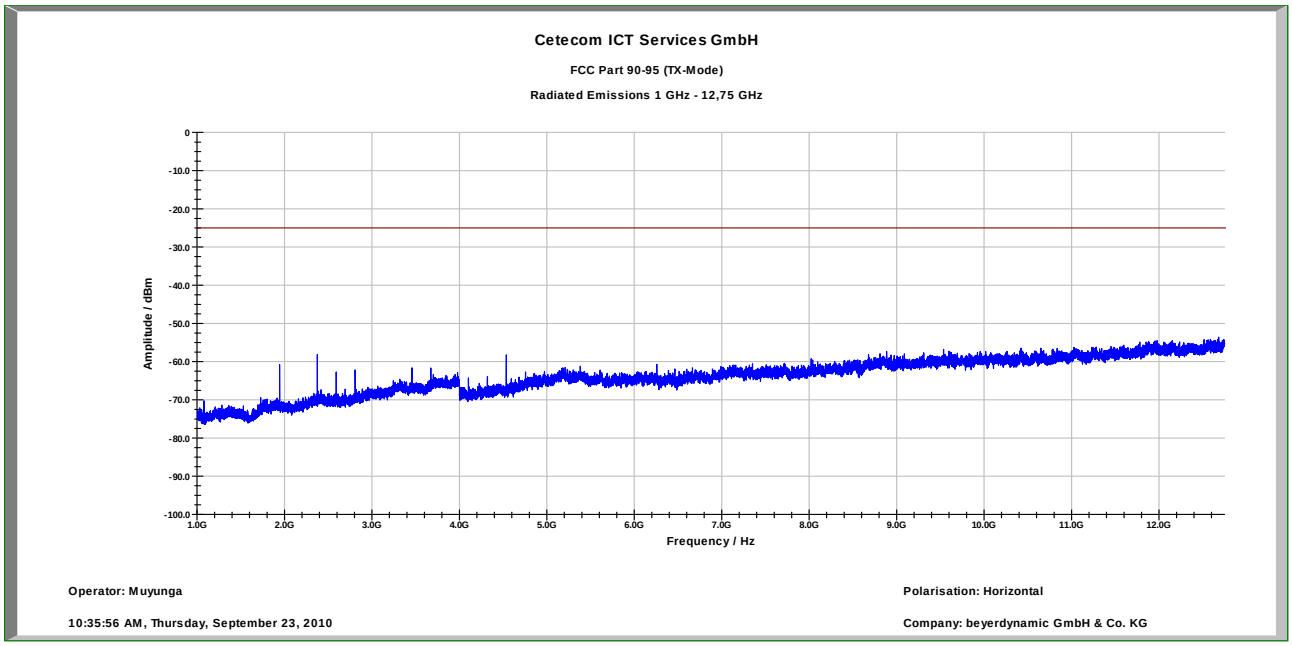
Plot 2: 1 – 12.75 GHz, vertical polarization, low channel, low power mode



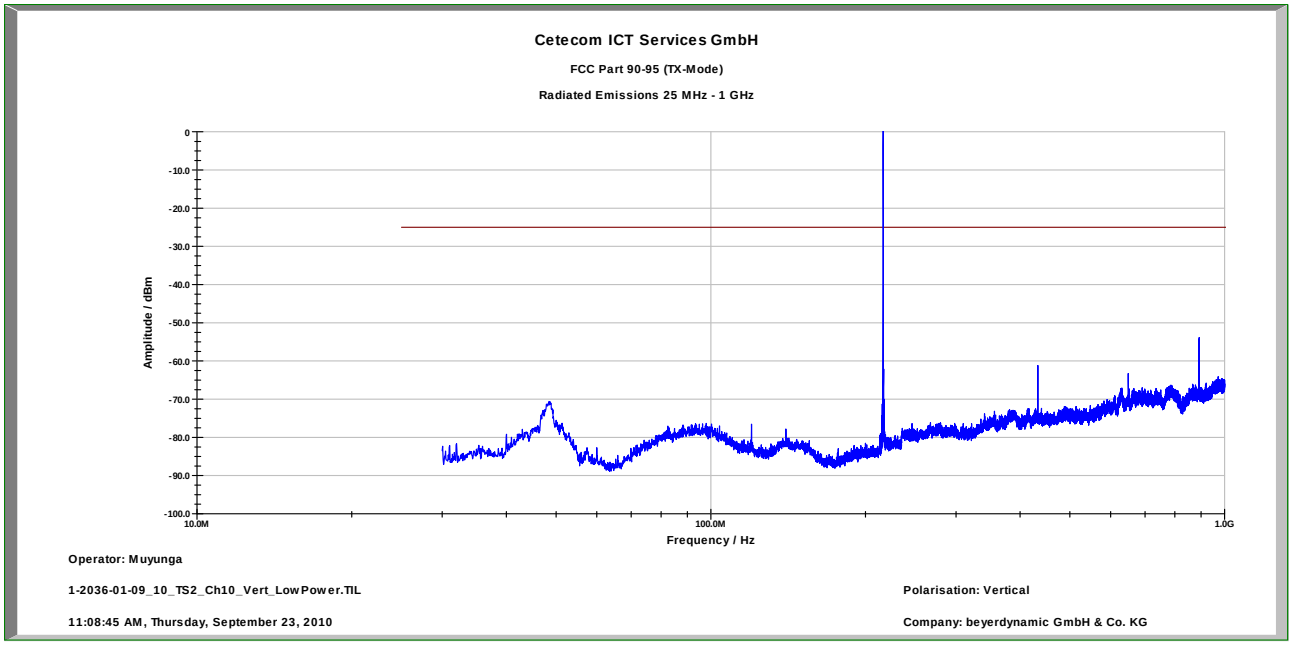
Plot 3: 0.03 – 1 GHz, horizontal polarization, low channel, low power mode



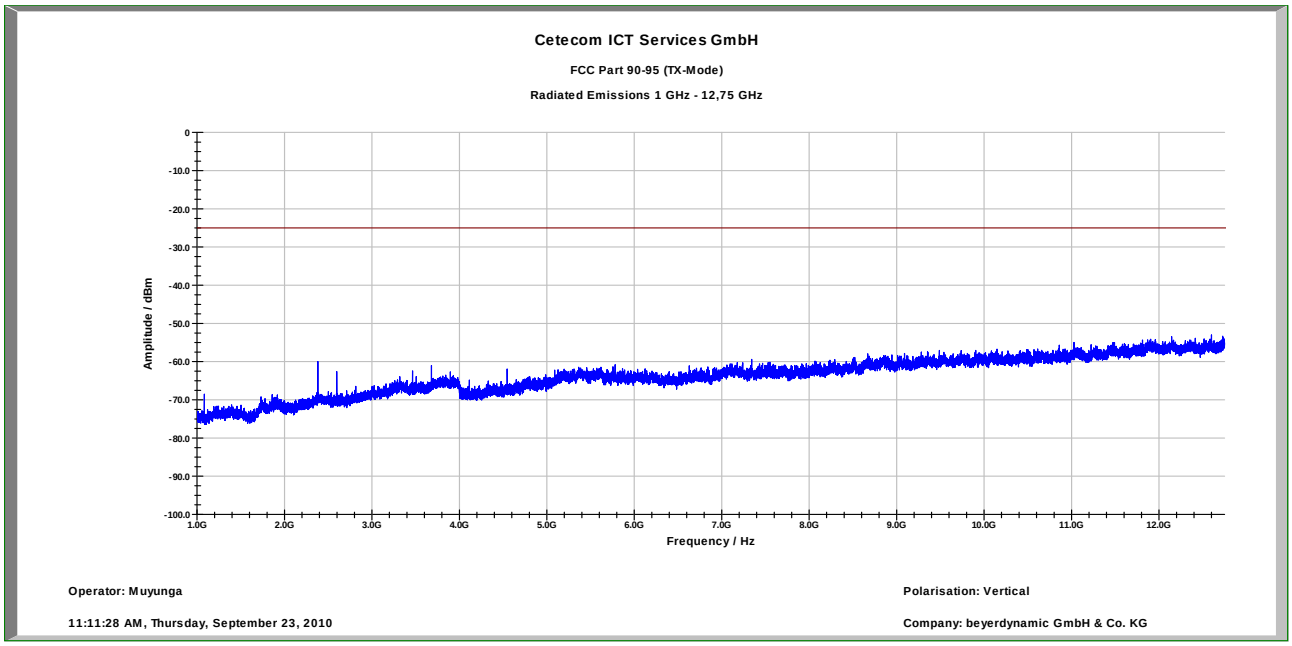
Plot 4: 1 – 12.75 GHz, horizontal polarization, low channel, low power mode



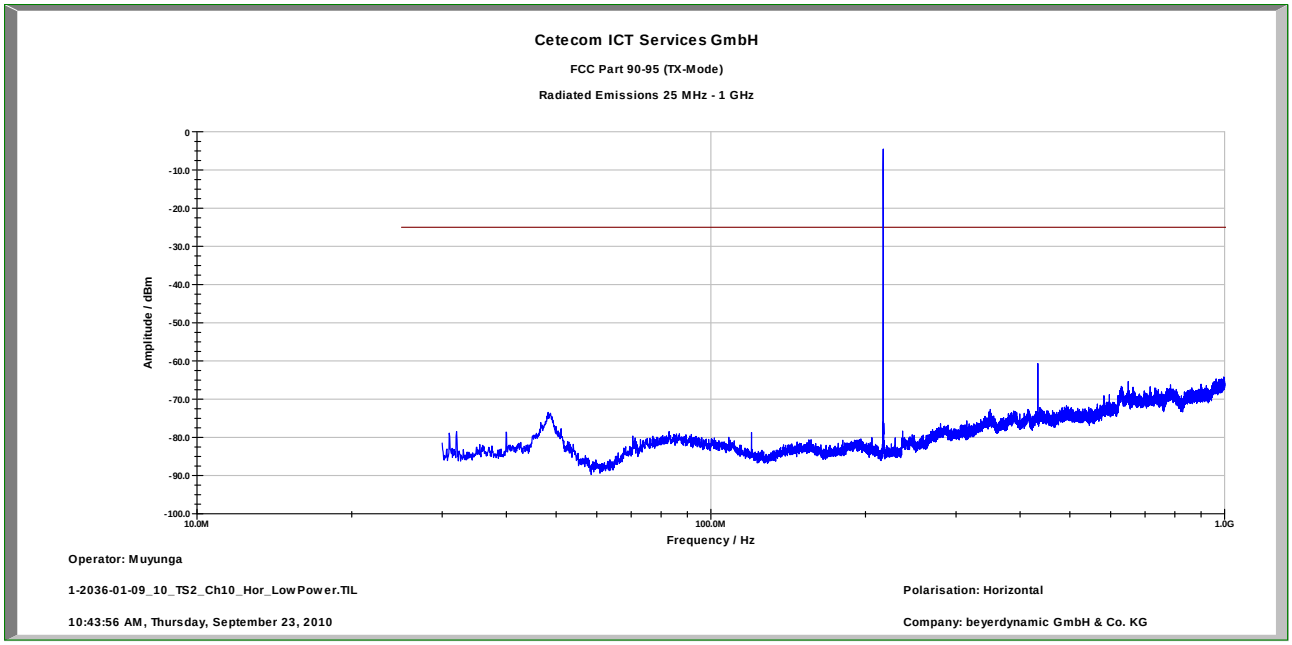
Plot 5: 0.03 – 1 GHz, vertical polarization, middle channel, low power mode



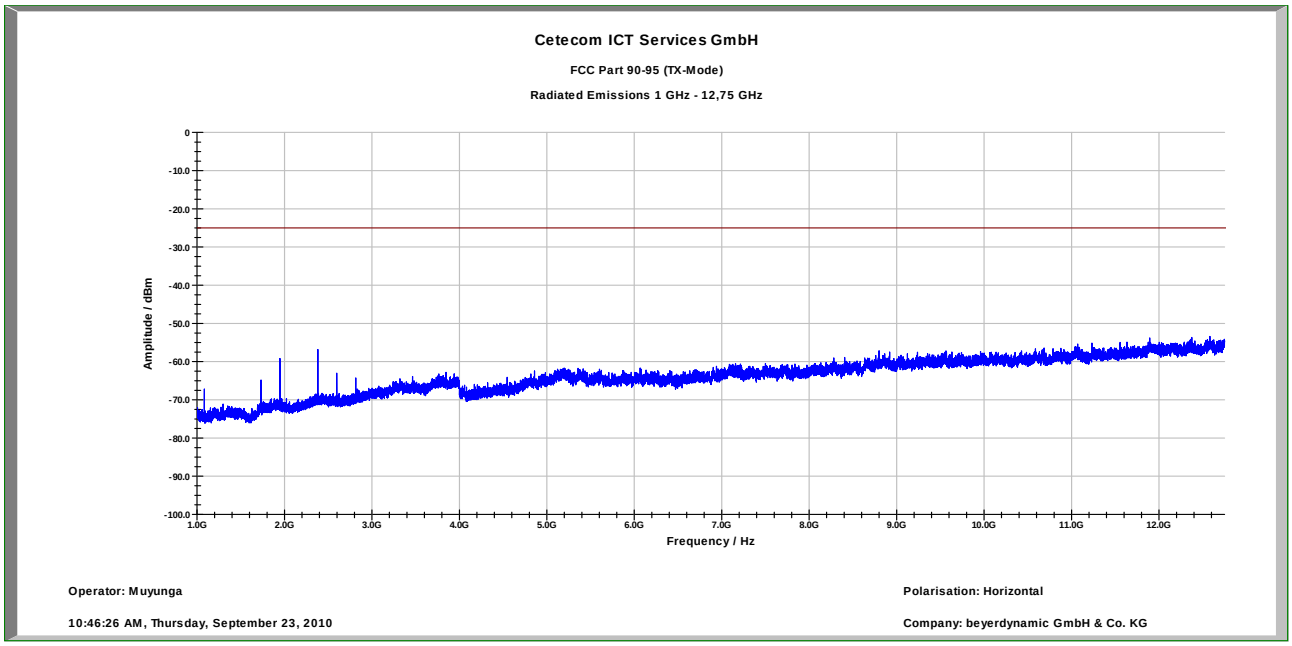
Plot 6: 1 – 12.75 GHz, vertical polarization, middle channel, low power mode



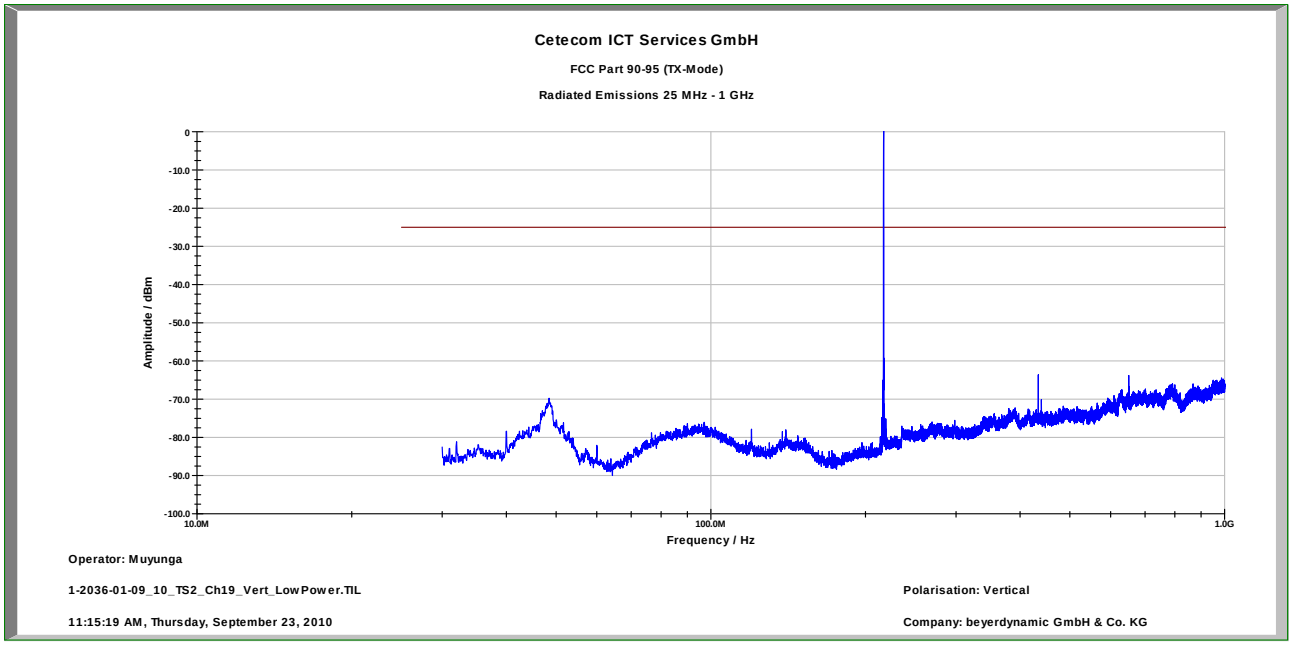
Plot 7: 0.03 – 1 GHz, horizontal polarization, middle channel, low power mode



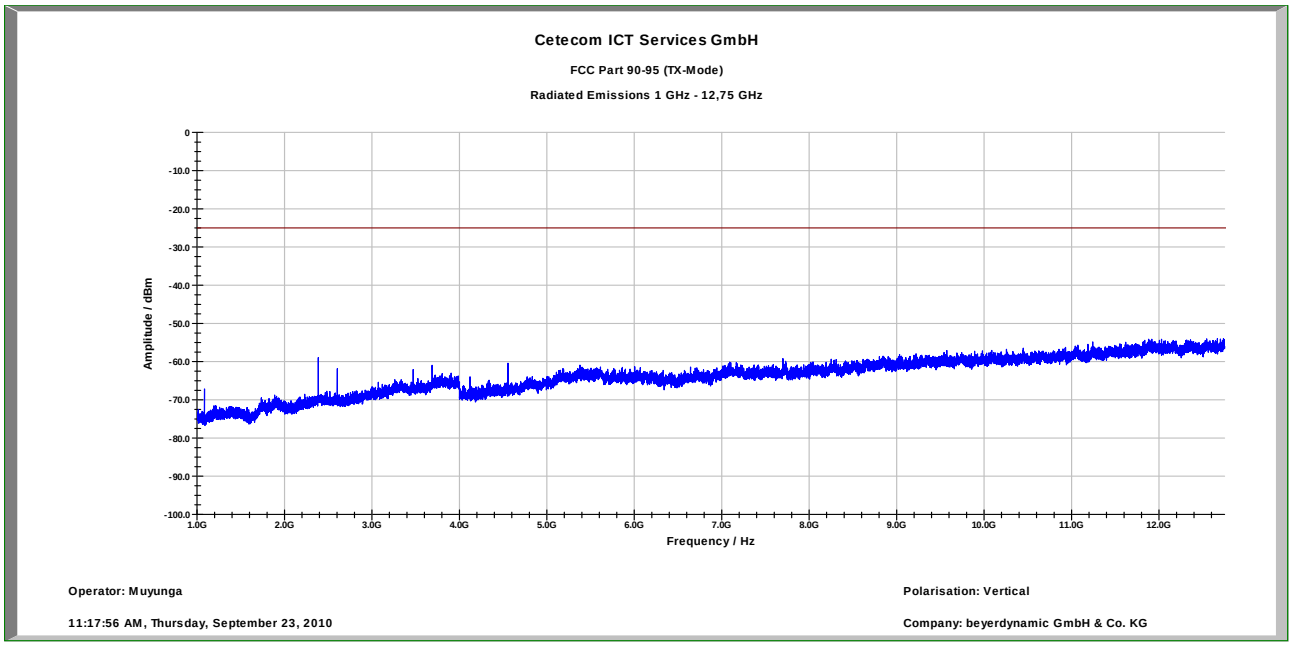
Plot 8: 1 – 12.75 GHz, horizontal polarization, middle channel, low power mode



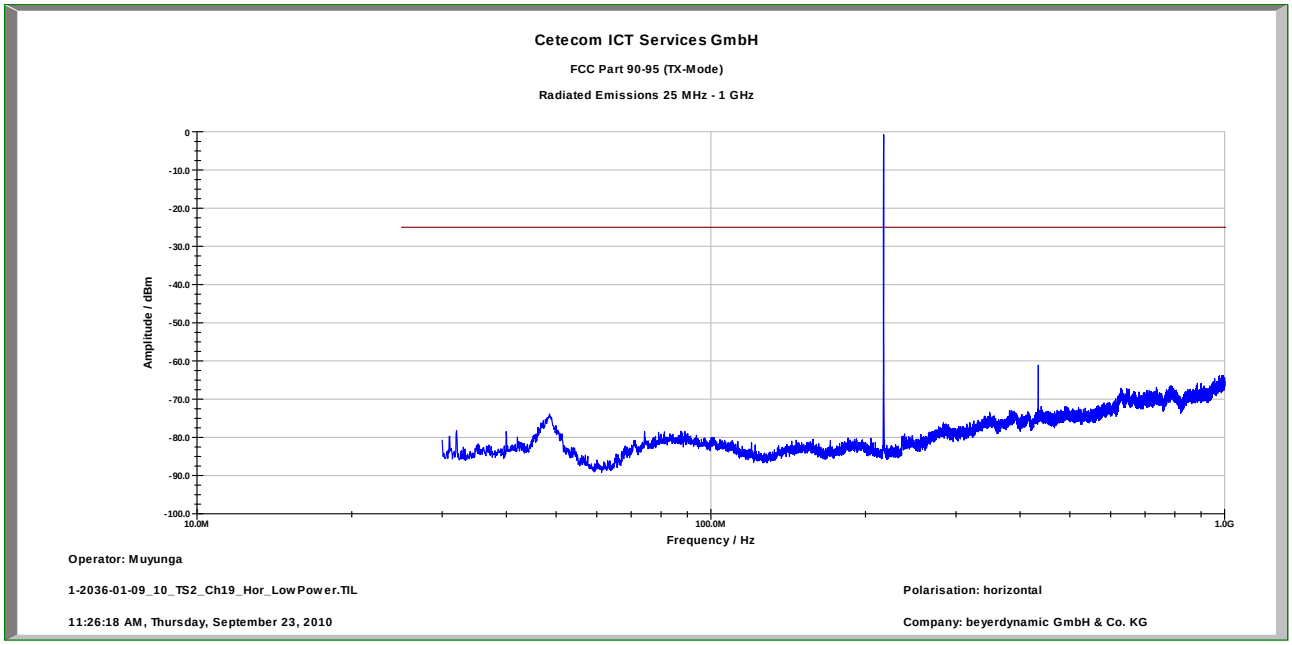
Plot 9: 0.03 – 1 GHz, vertical polarization, high channel, low power mode



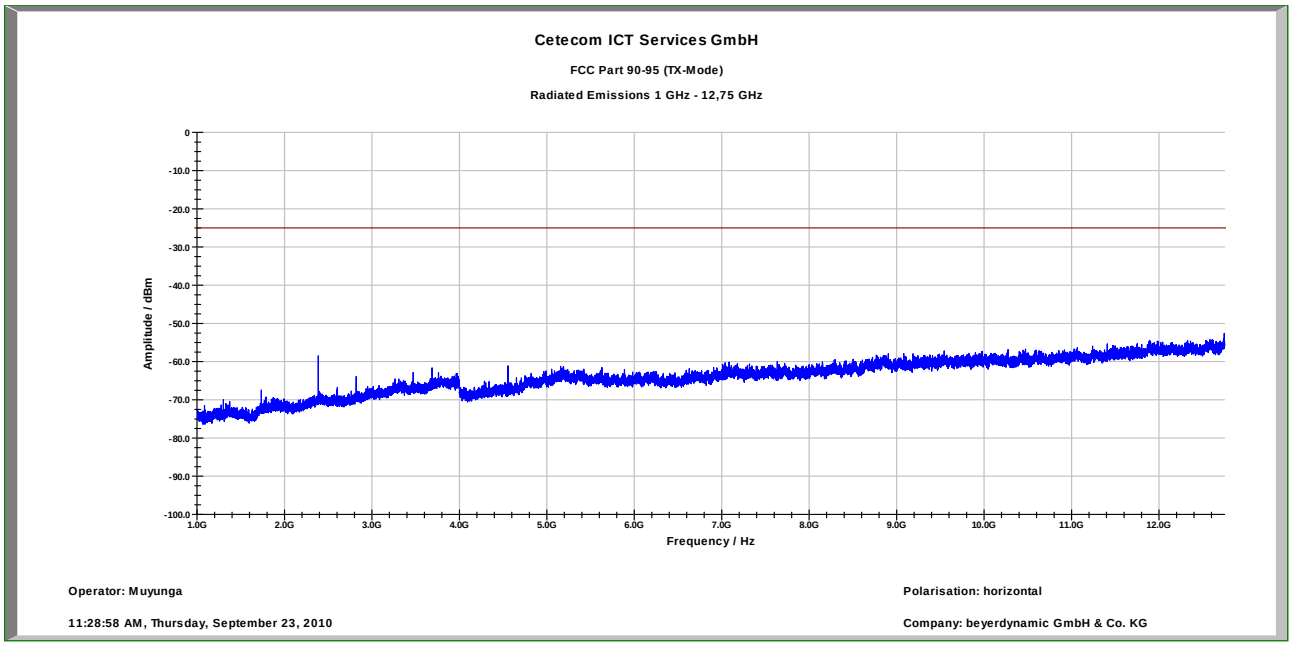
Plot 10: 1 – 12.75 GHz, vertical polarization, high channel, low power mode



Plot 11: 0.03 – 1 GHz, horizontal polarization, high channel, low power mode

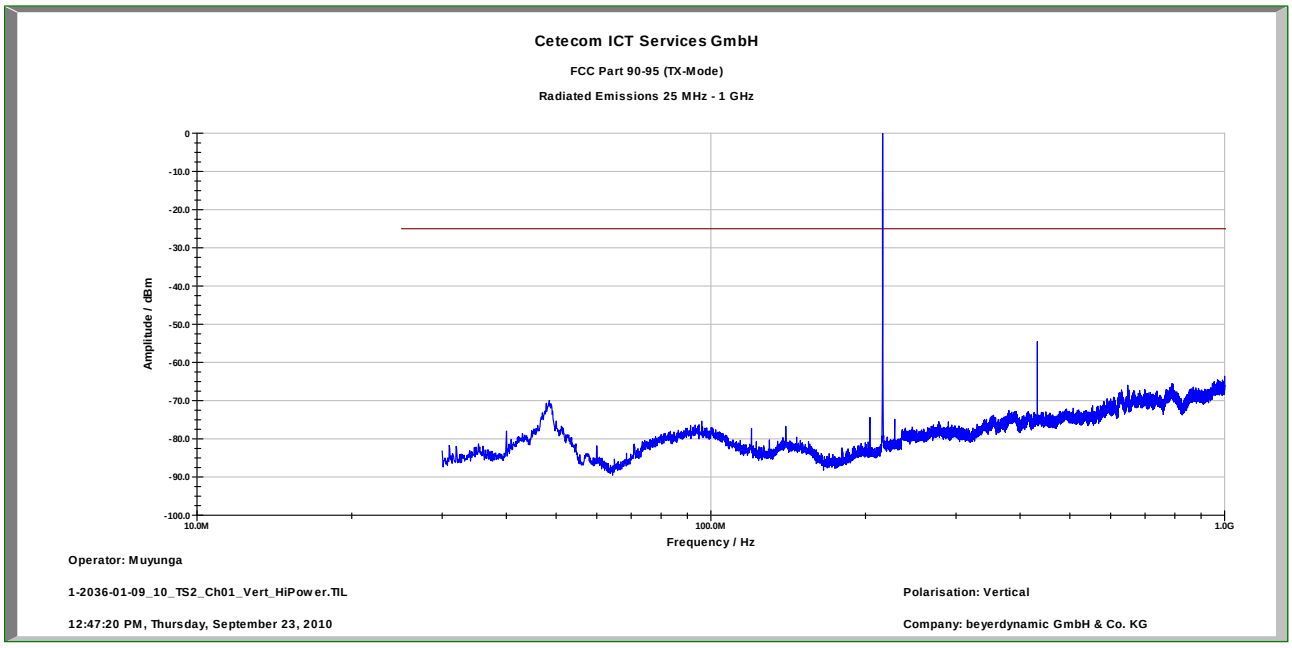


Plot 12: 1 – 12.75 GHz, horizontal polarization, high channel, low power mode

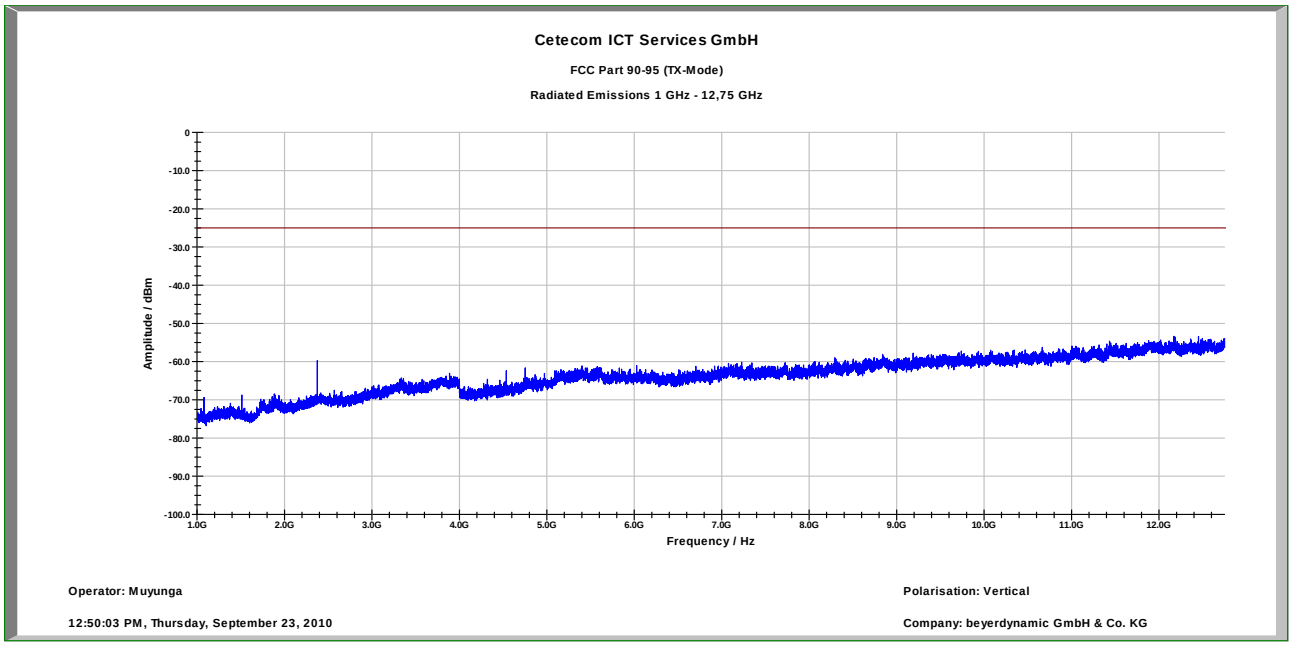


High power mode:

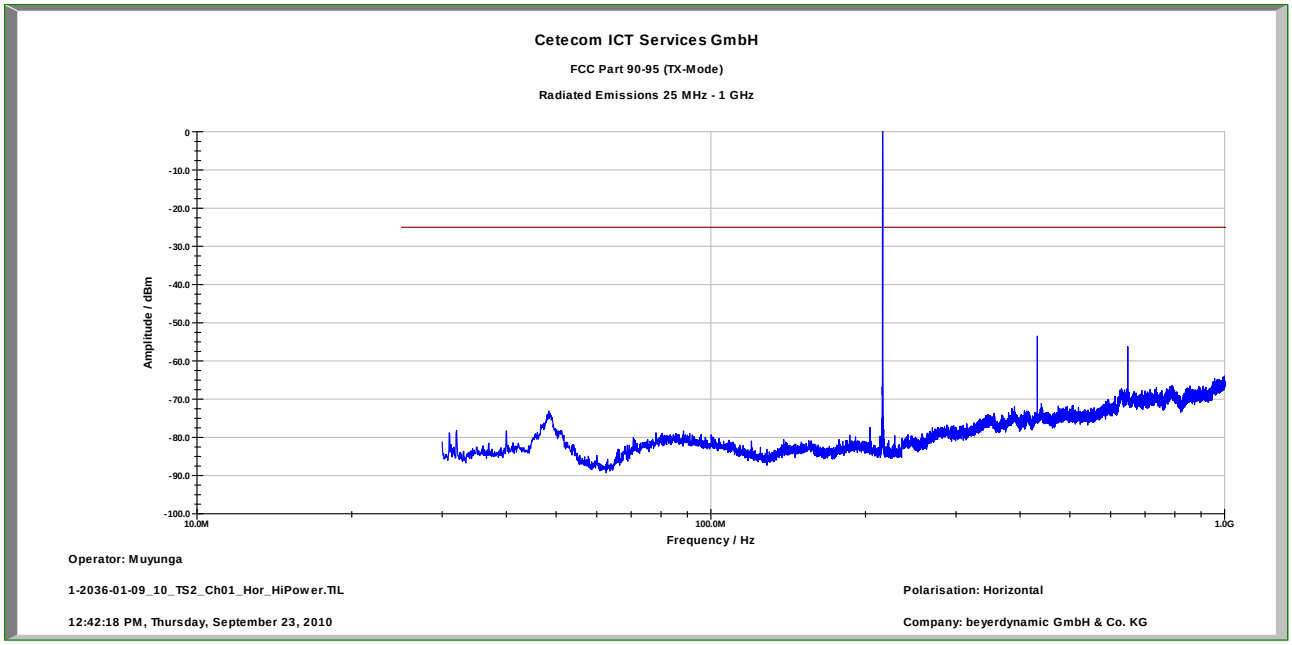
Plot 1: 0.03 – 1 GHz, vertical polarization, low channel, high power mode



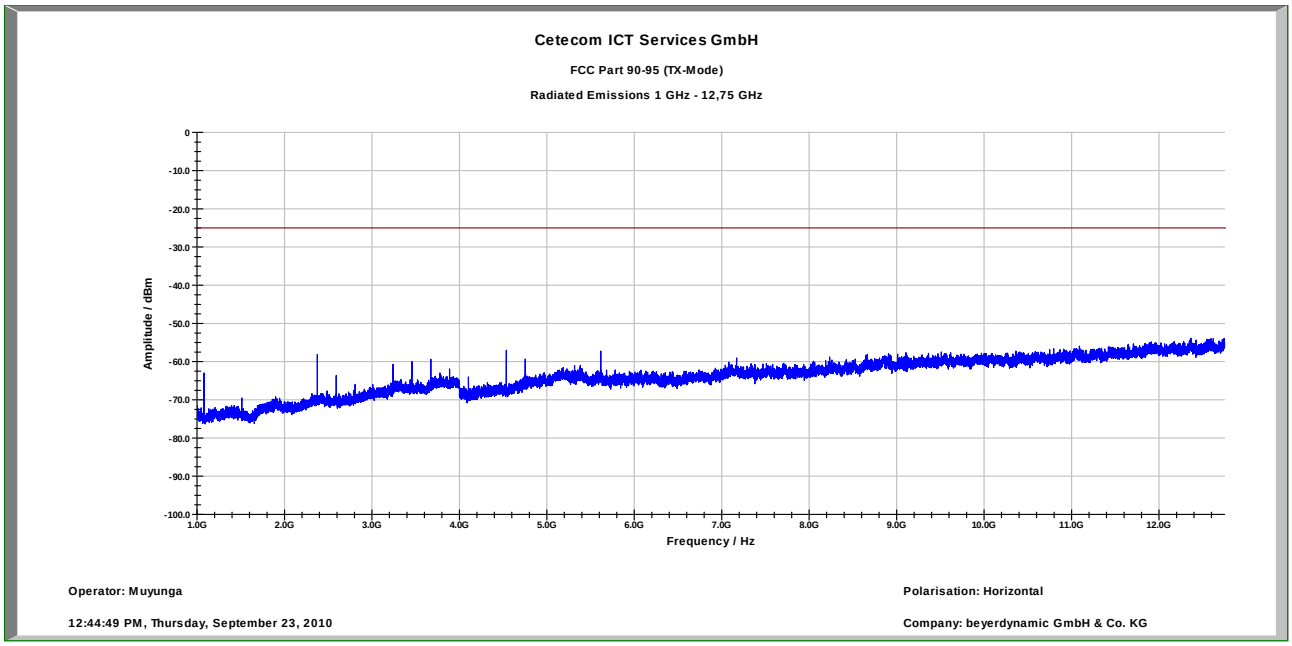
Plot 2: 1 – 12.75 GHz, vertical polarization, low channel, high power mode



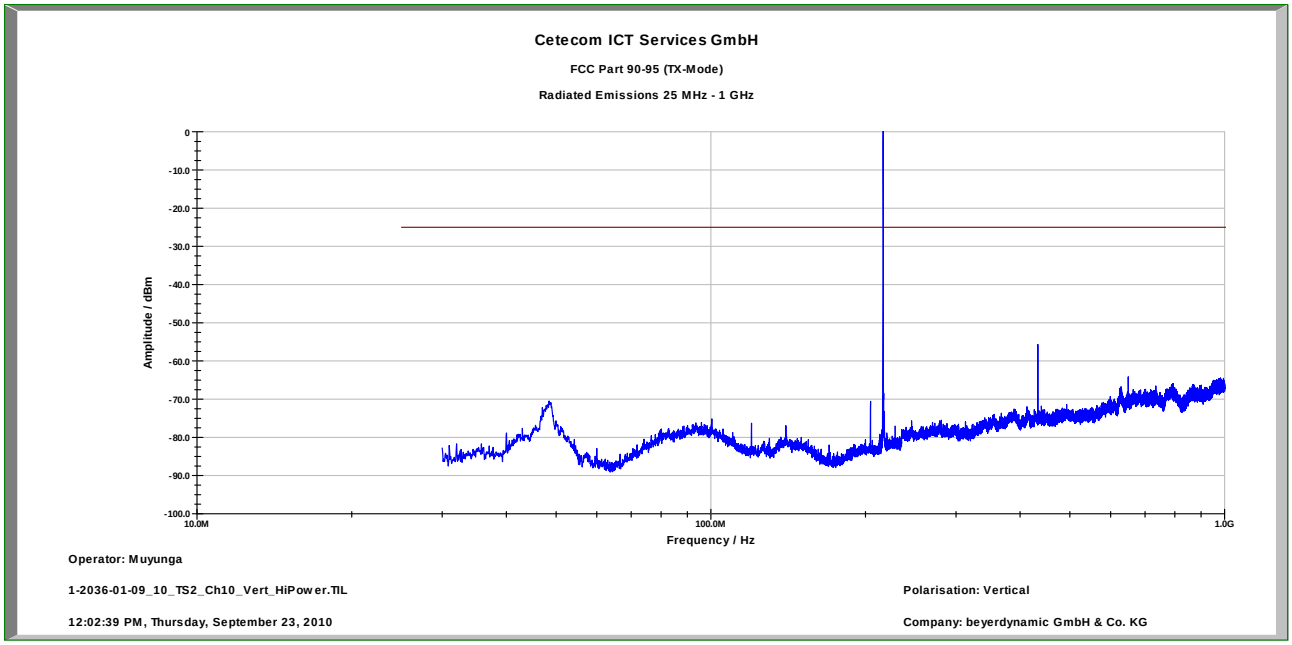
Plot 3: 0.03 – 1 GHz, horizontal polarization, low channel, high power mode



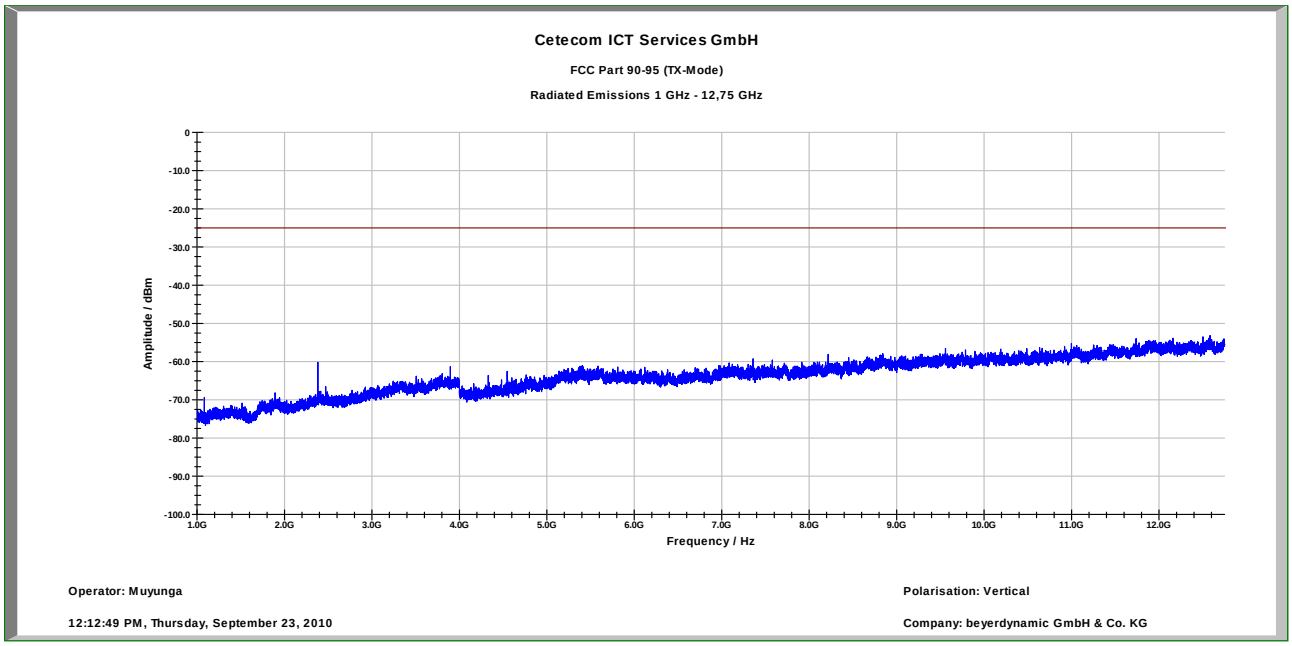
Plot 4: 1 – 12.75 GHz, horizontal polarization, low channel, high power mode



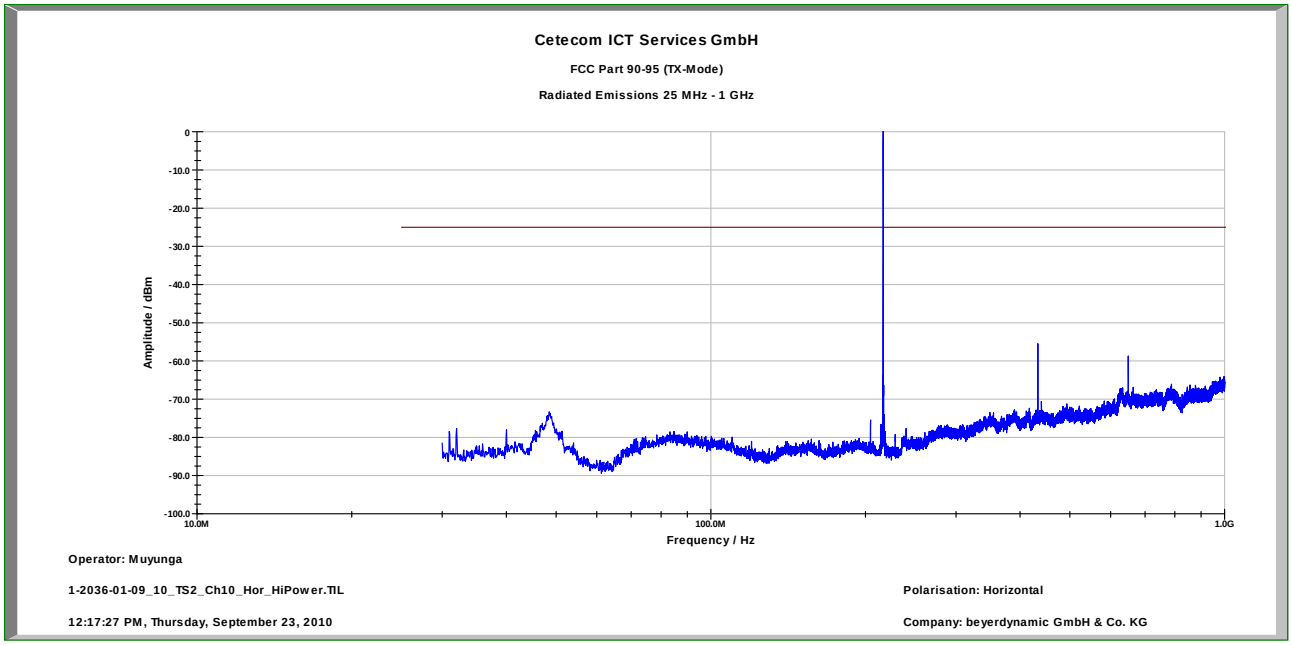
Plot 5: 0.03 – 1 GHz, vertical polarization, middle channel, high power mode



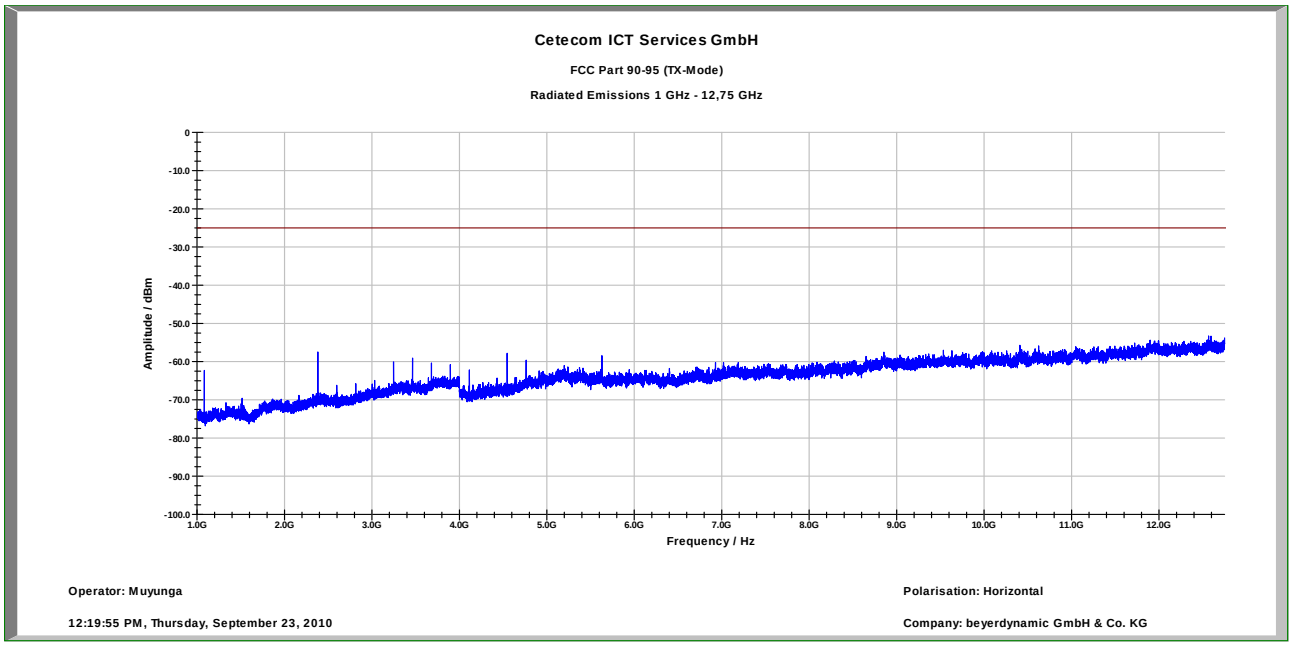
Plot 6: 1 – 12.75 GHz, vertical polarization, middle channel, high power mode



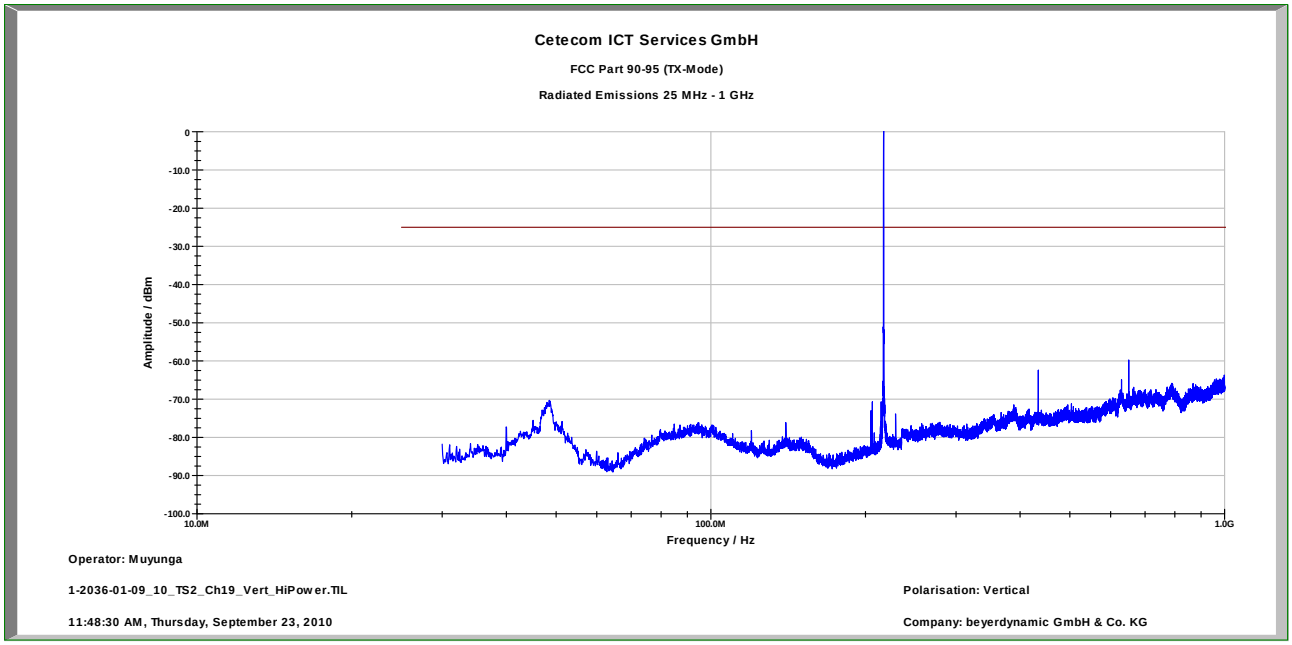
Plot 7: 0.03 – 1 GHz, horizontal polarization, middle channel, high power mode



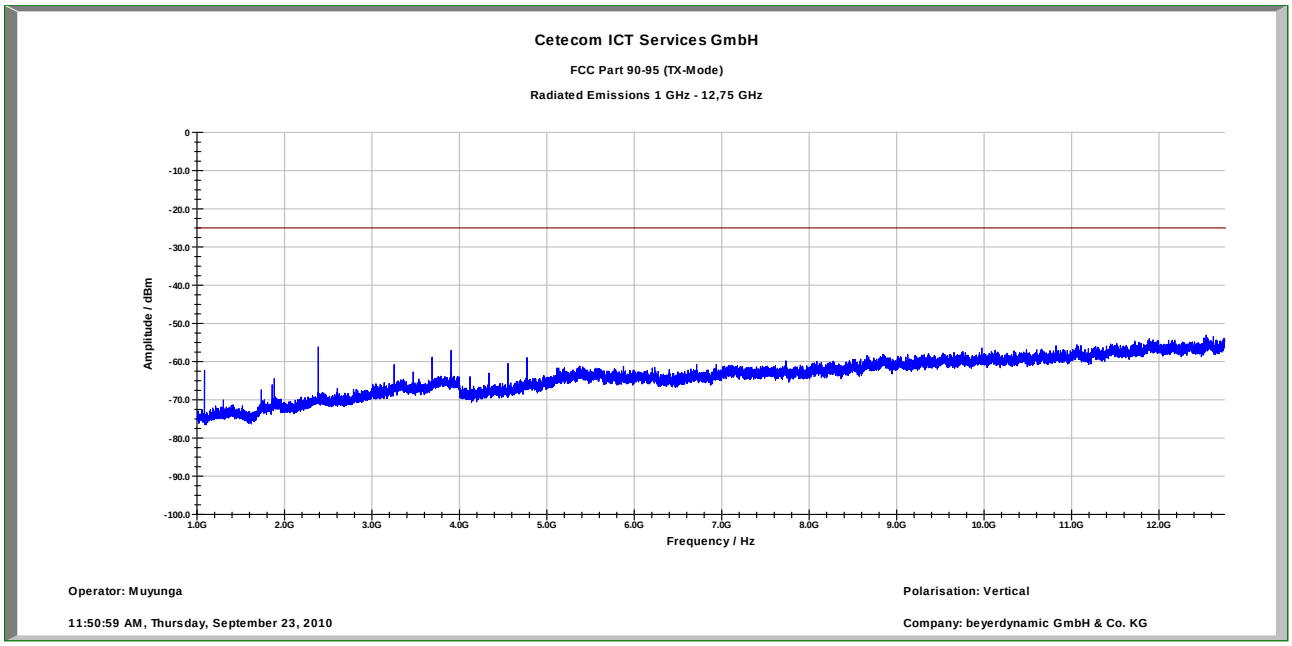
Plot 8: 1 – 12.75 GHz, horizontal polarization, middle channel, high power mode



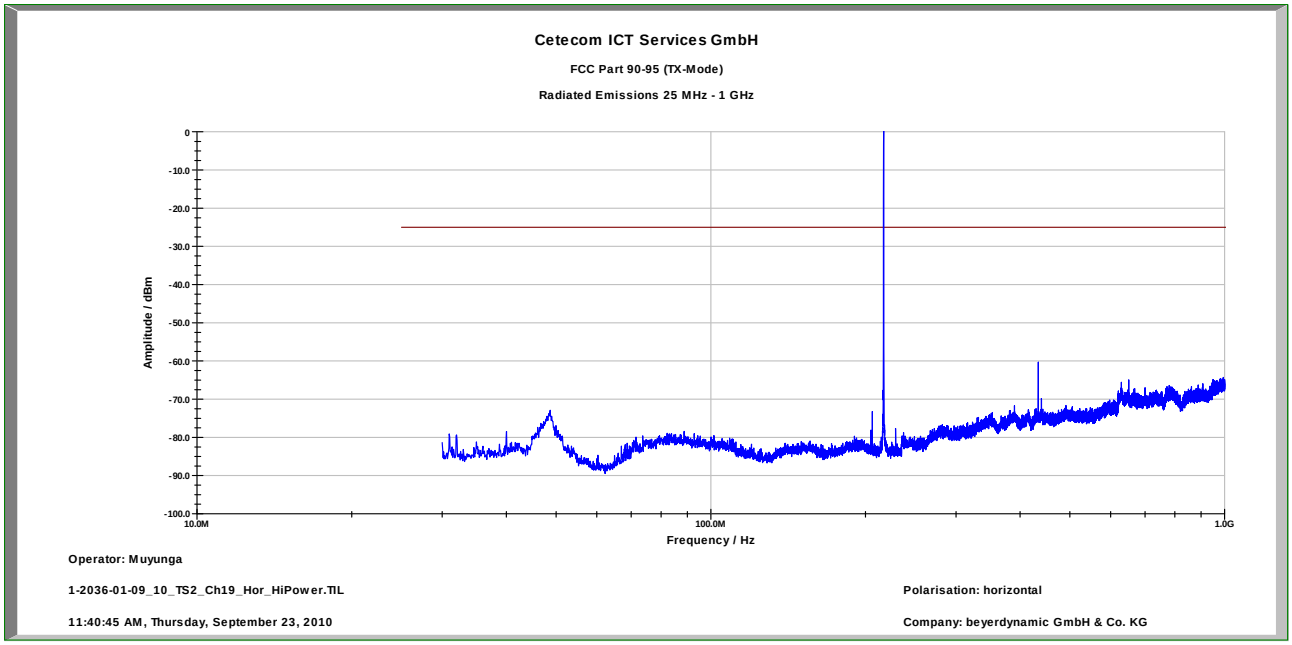
Plot 9: 0.03 – 1 GHz, vertical polarization, high channel, high power mode



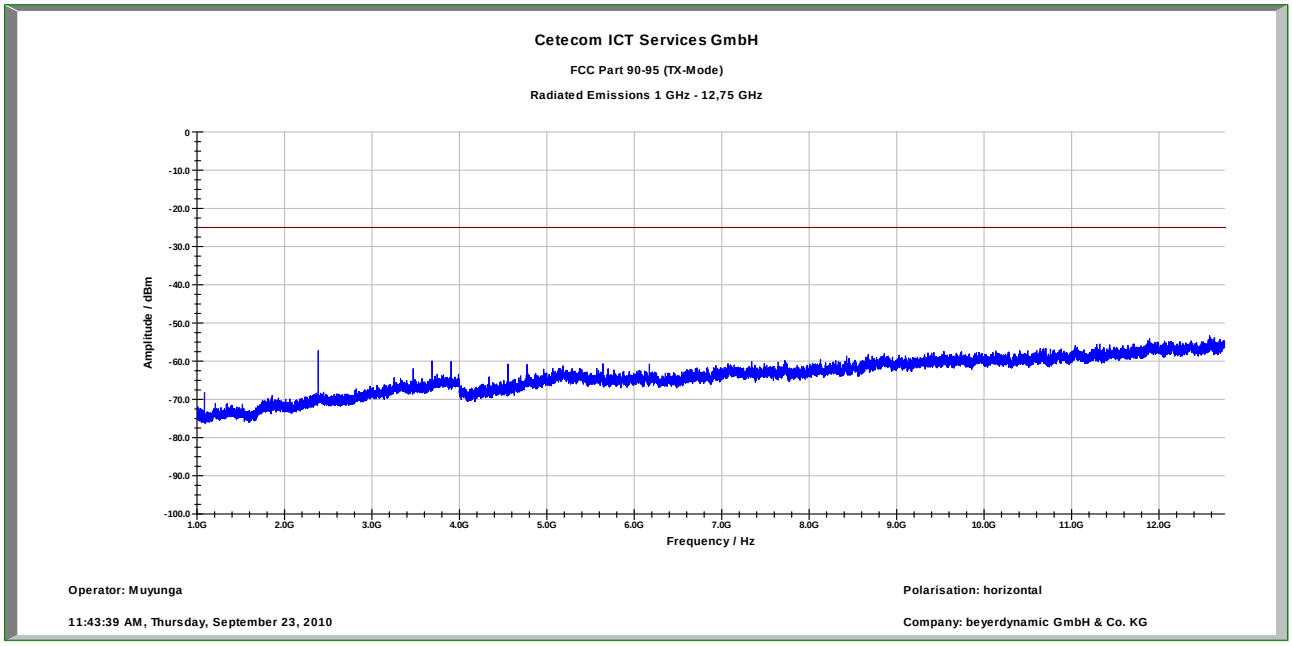
Plot 10: 1 – 12.75 GHz, vertical polarization, high channel, high power mode



Plot 11: 0.03 – 1 GHz, horizontal polarization, high channel, high power mode



Plot 12: 1 – 12.75 GHz, horizontal polarization, high channel, high power mode



Results: Synexis TS2– high power mode (Worst case scenario)

Results:

SPURIOUS EMISSIONS LEVEL FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (ii)								
Low channel (216.025 MHz)			Middle channel (216.525 MHz)			High channel (216.975 MHz)		
Frequency	Detector	Level	Frequency	Detector	Level	Frequency	Detector	Level
432.05 MHz	120 kHz PP	-49.52 dBm horizontal	433.05 MHz	120 kHz PP	-46.07dBm horizontal	433.95 MHz	120 kHz PP	-47.99 dBm horizontal
648.075 MHz	120 kHz PP	-42.62 dBm horizontal	649.575 MHz	120 kHz PP	-43.32 dBm horizontal	650.925 MHz	120 kHz PP	-44.31 dBm horizontal
1080.125 MHz	1 MHz PP	-57.49 dBm horizontal	1082.625 MHz	1 MHz PP	-57.36 dBm horizontal	1084.875 MHz	1 MHz PP	-57.88 dBm horizontal
2376.275 MHz	1 MHz PP	-50.89 dBm horizontal	2381.775 MHz	1 MHz PP	-50.78 dBm horizontal	2386.725 MHz	1 MHz PP	-50.63 dBm horizontal
All other detected emissions are more than 20 dB below the limit and < -50 dBm.			All other detected emissions are more than 20 dB below the limit and < -50 dBm.			All other detected emissions are more than 20 dB below the limit and < -50 dBm.		
Measurement uncertainty ± 3 dB								

f < 1 GHz : RBW/VBW: 120 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

Limits:

FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (ii) -13 dBm

6 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	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
2	n. a.	PowerAttenuator	8325	Byrd	1530	300001595			
3	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKI!	05.03.2009	05.03.2011
4	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
5	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
6	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
7	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
8	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
9	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
10	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
11	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
12	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
13	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
14	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
15	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
16	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
17	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
18	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
19	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2011
20	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2011
21	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vlKI!	08.09.2010	08.09.2011
22	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2010

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
vlkI!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7 Photographs of the Test Setup

Photo documentation:

Photo 1:

Photo 2:

8 Photographs of the EUT

Photo documentation: external photos

Photo 1:

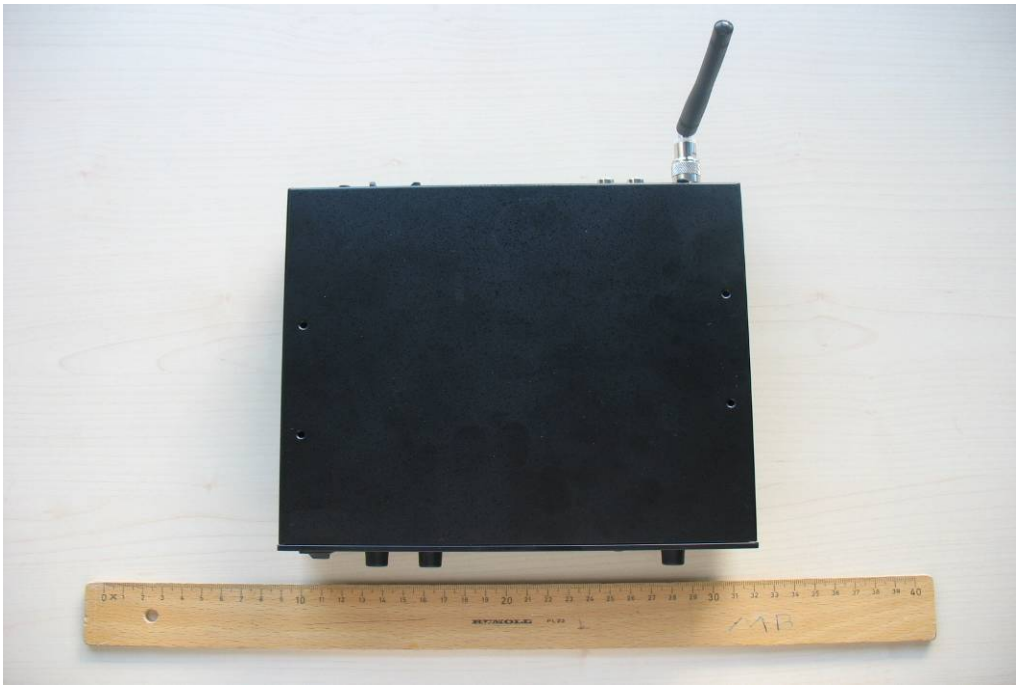


Photo 2:

Photo 3:

Photo 4:

Photo 5:

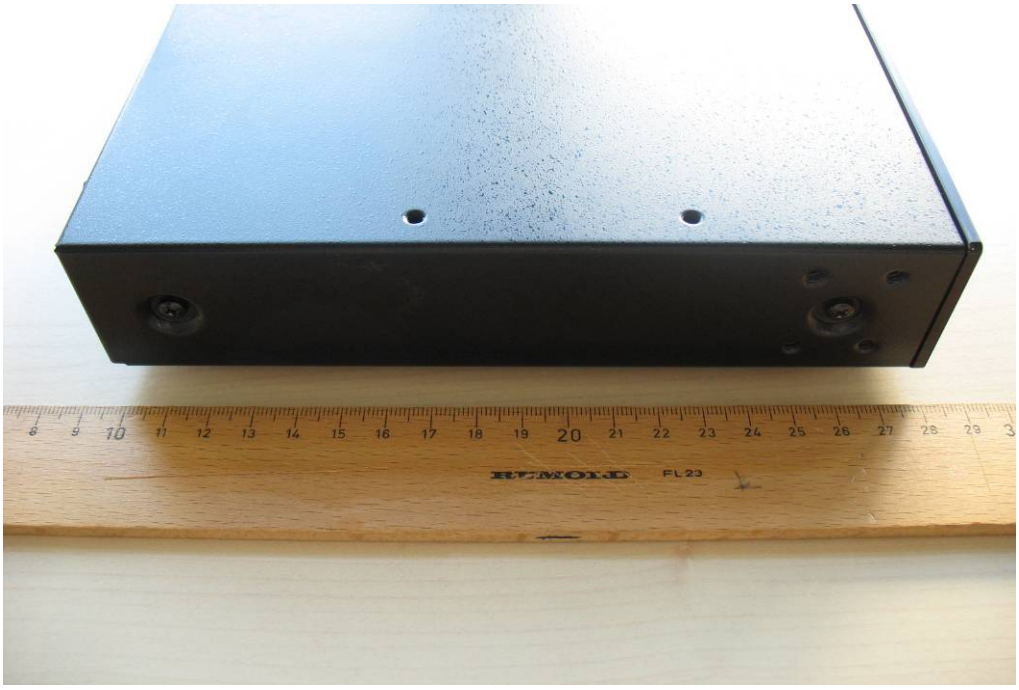


Photo 6:

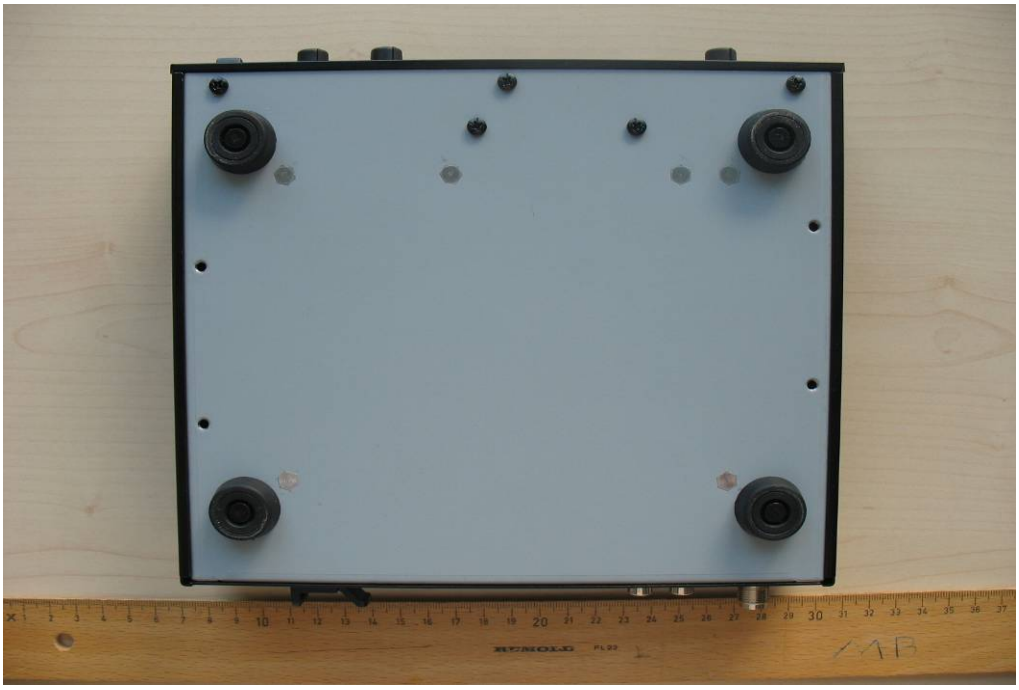


Photo 7:

Photo 8:

Photo 9:

Photo 10:

Photo 11:

Photo 12:

Photo 13:

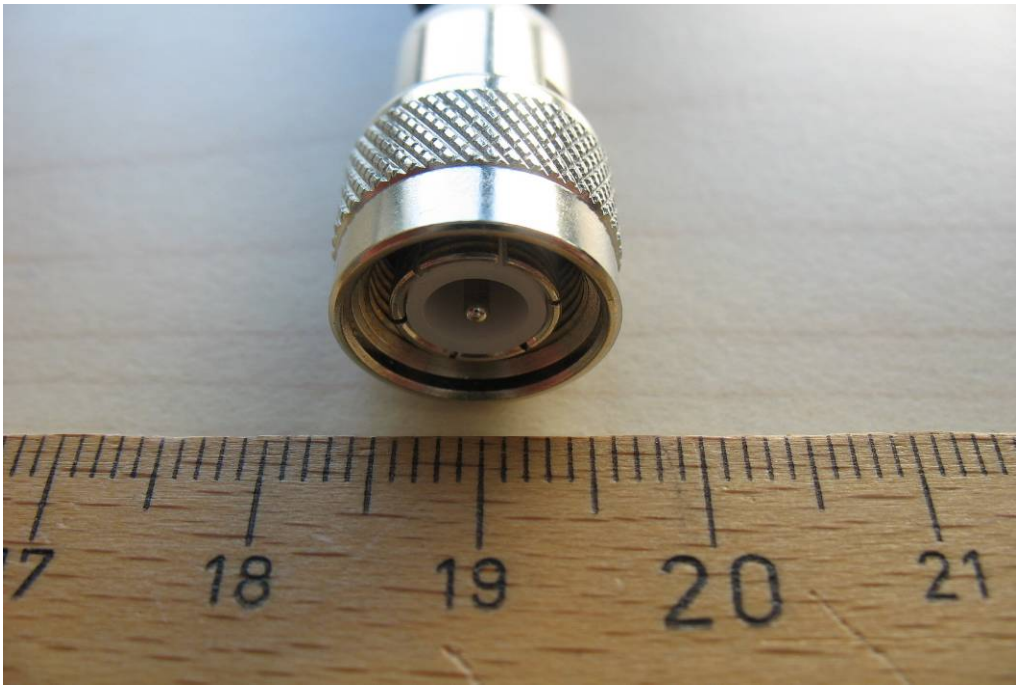
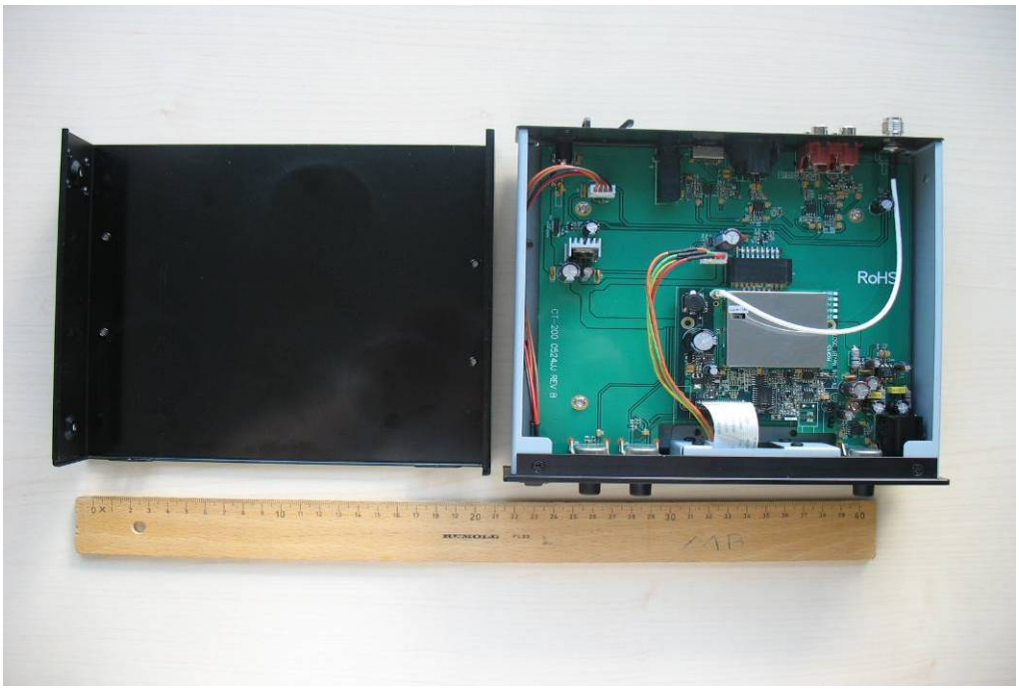


Photo documentation: internal photos

Photo 1:



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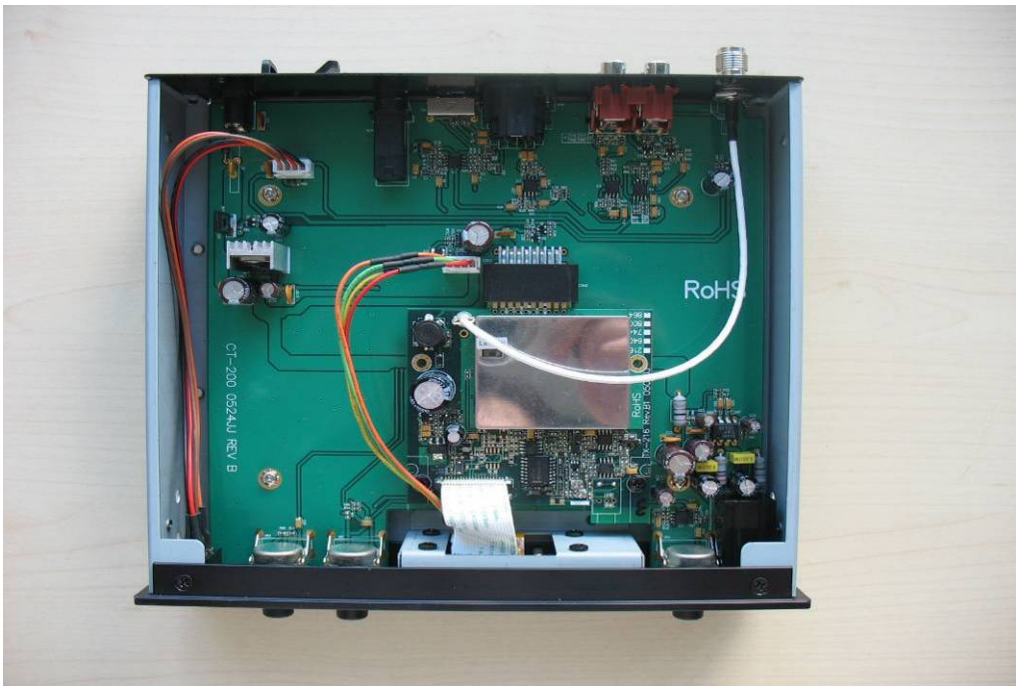

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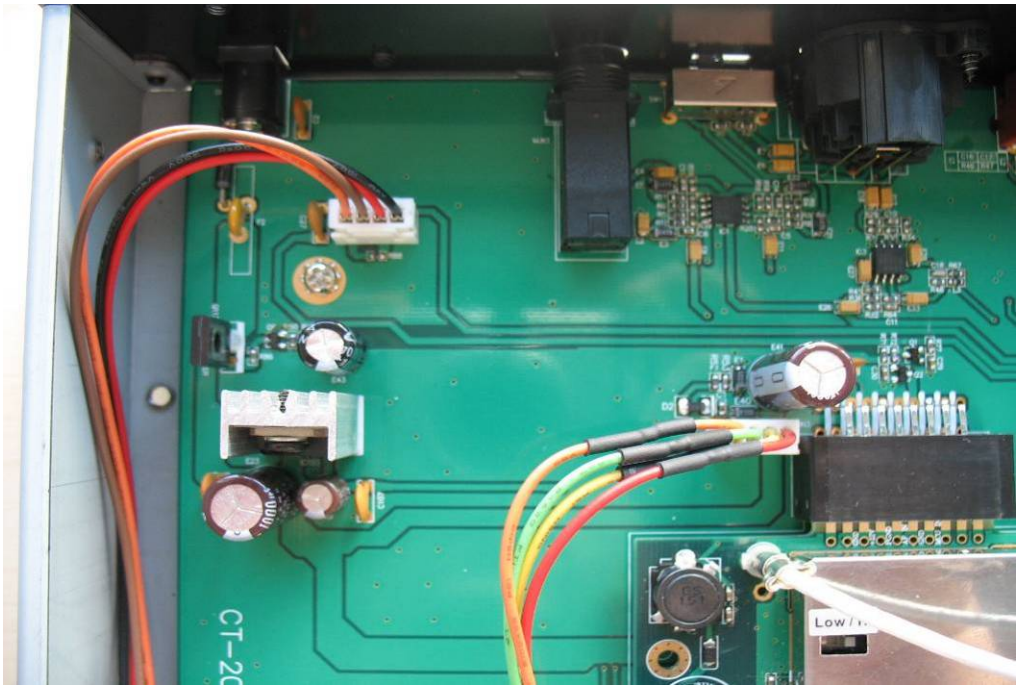


Photo 4:

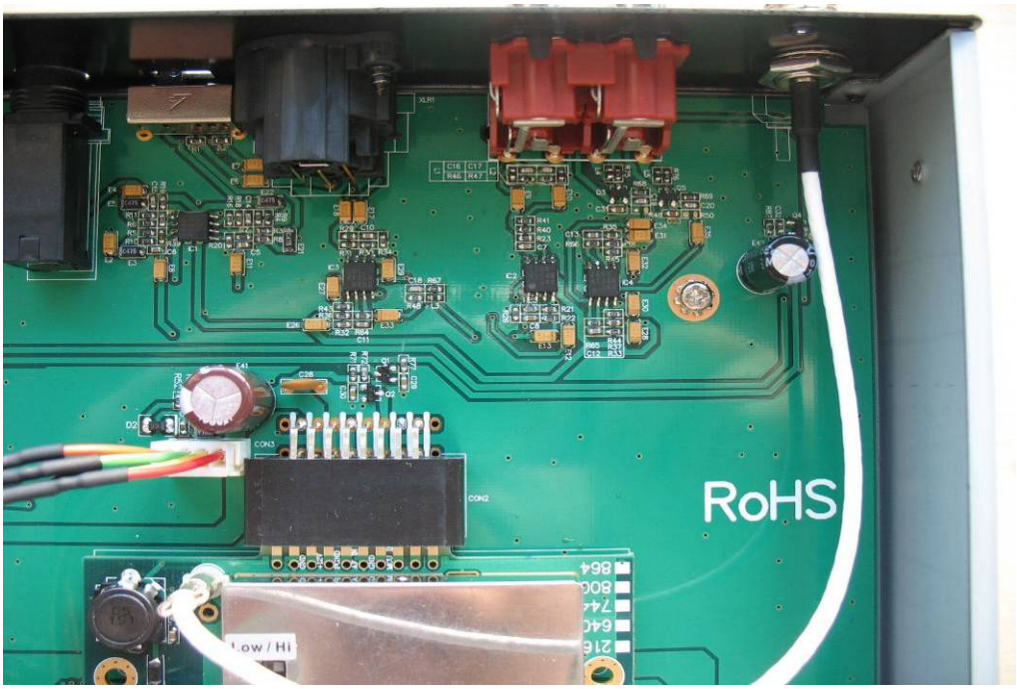
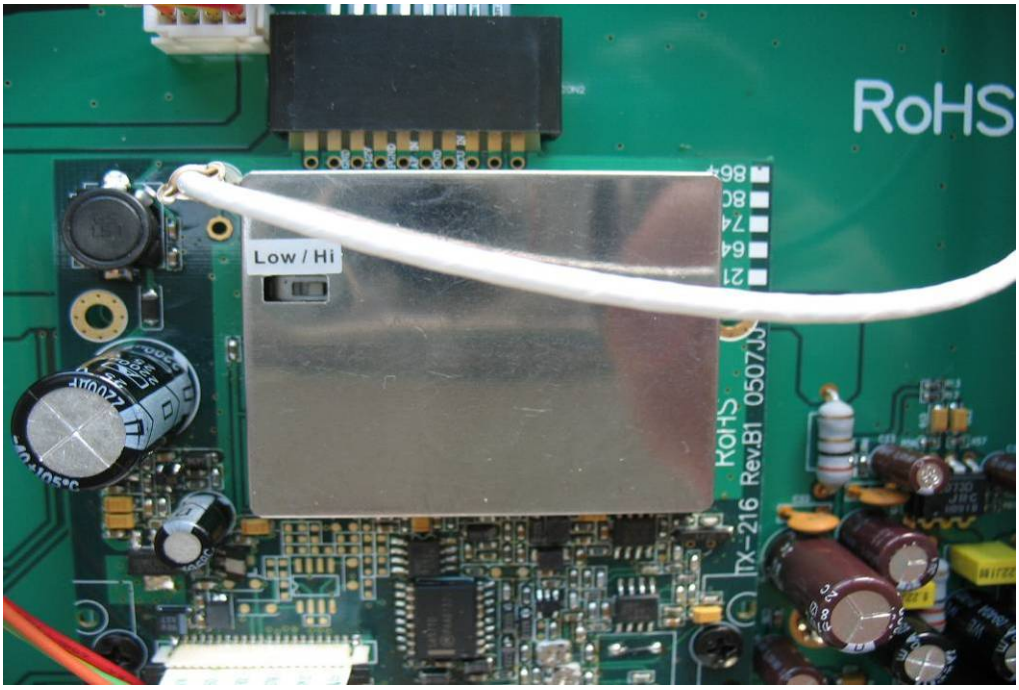


Photo 5:



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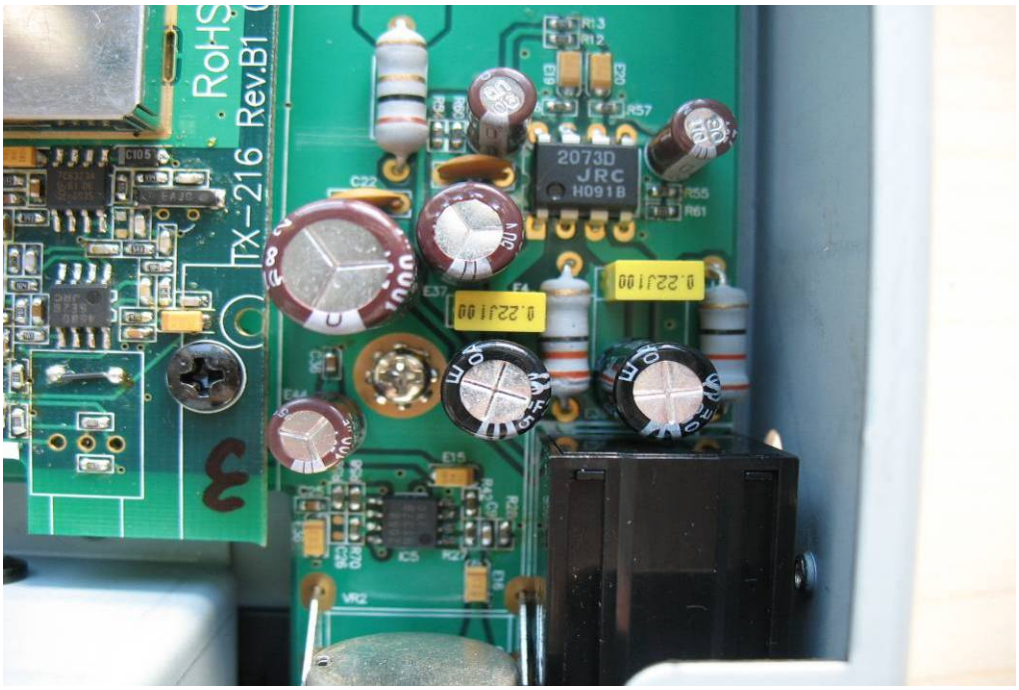

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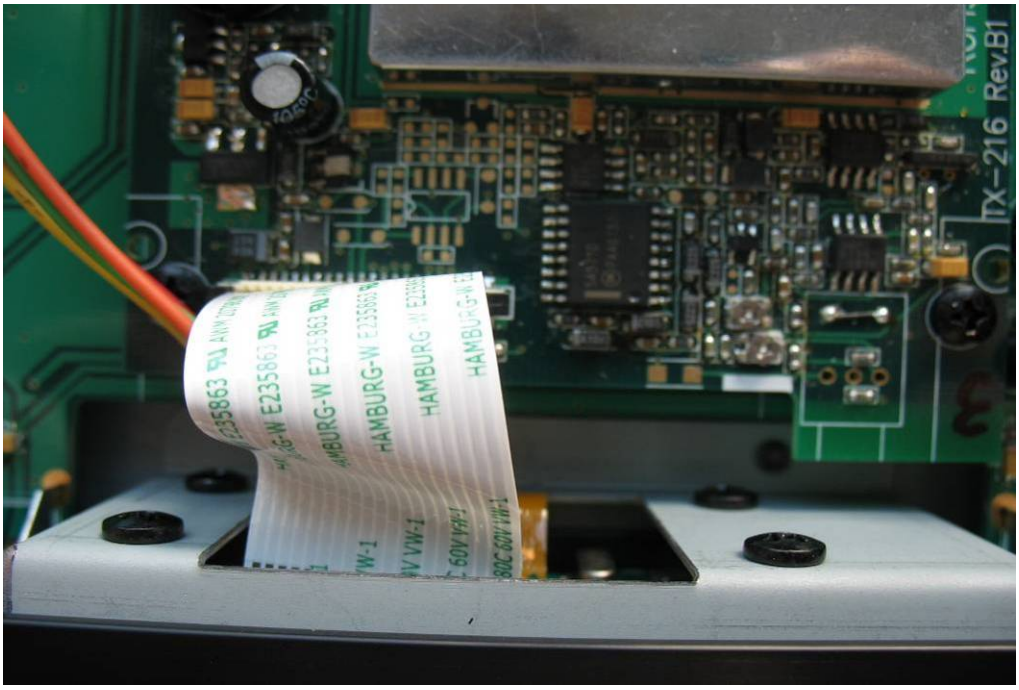


Photo 8:

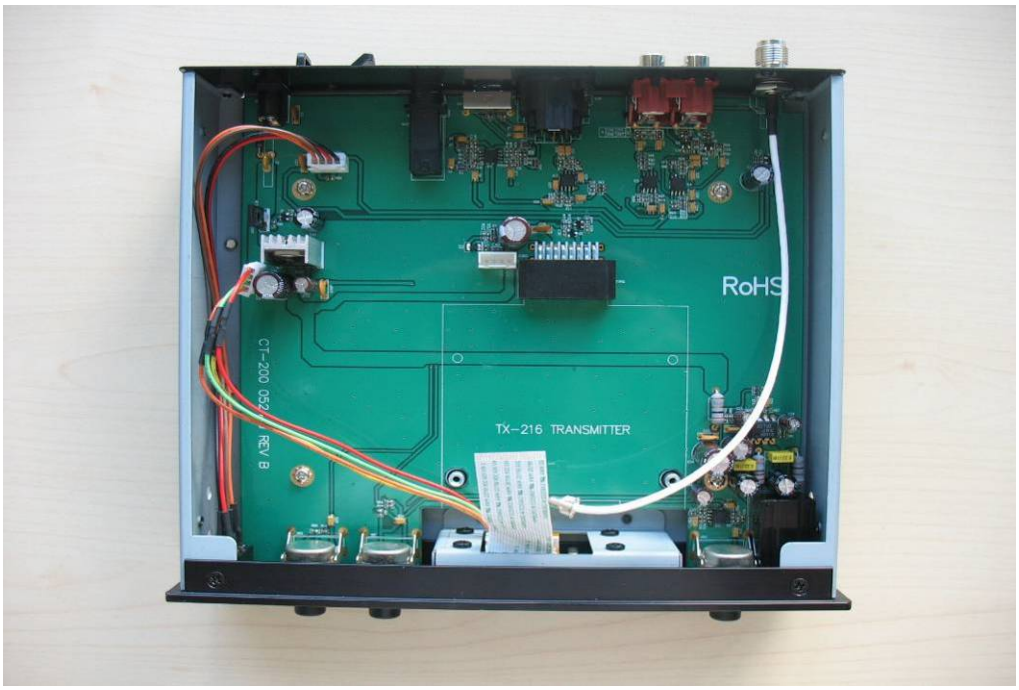


Photo 9:

Photo 10:

Photo 11:

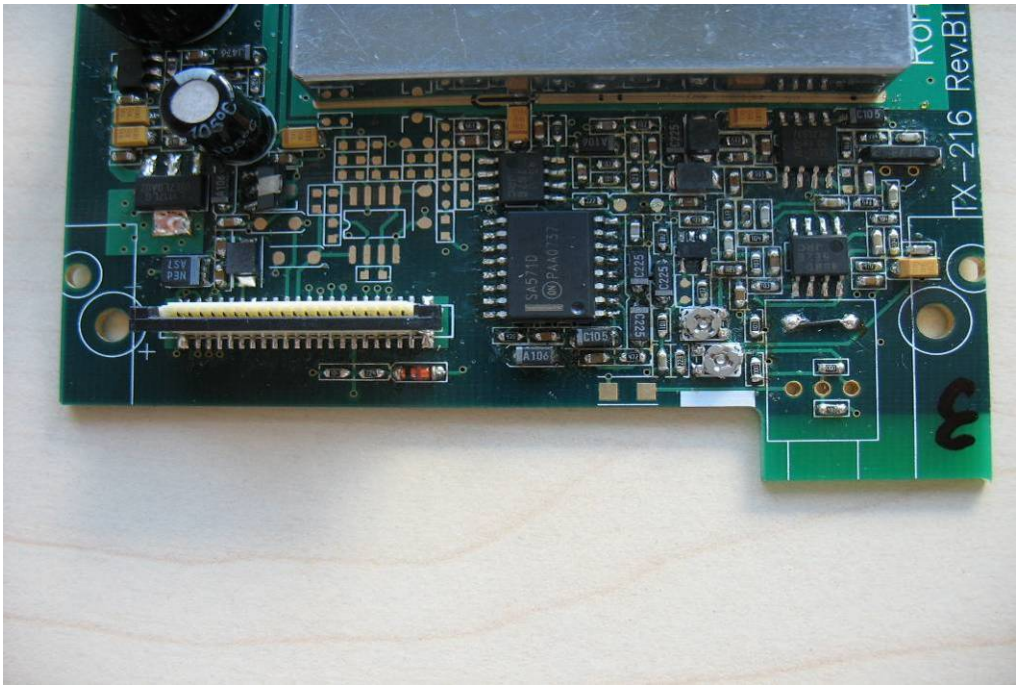


Photo 12:

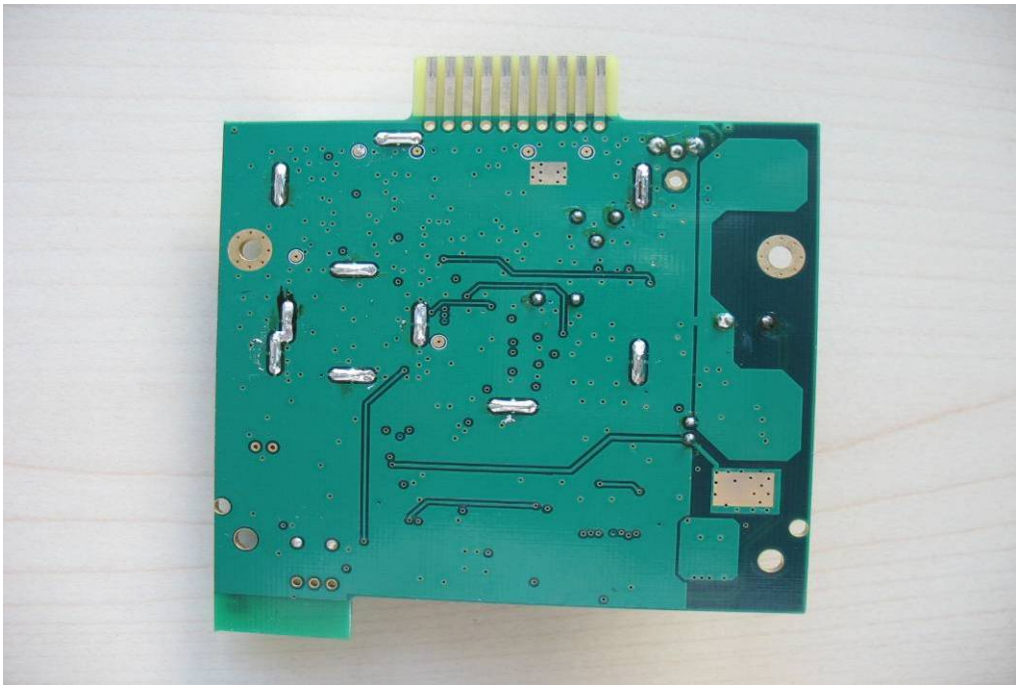


Photo 13:

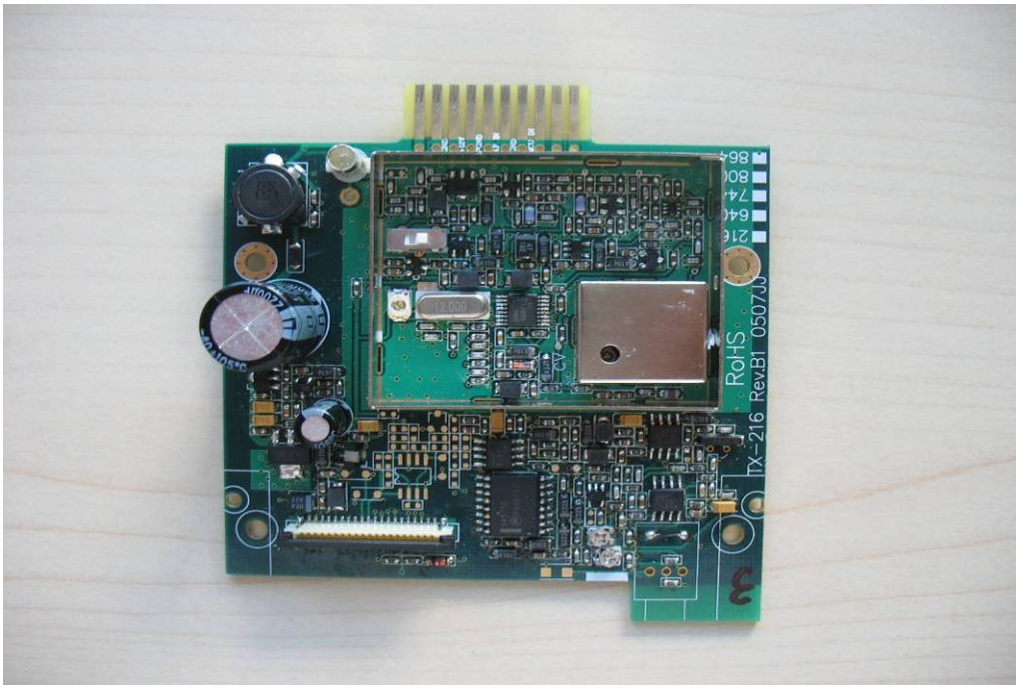


Photo 14:

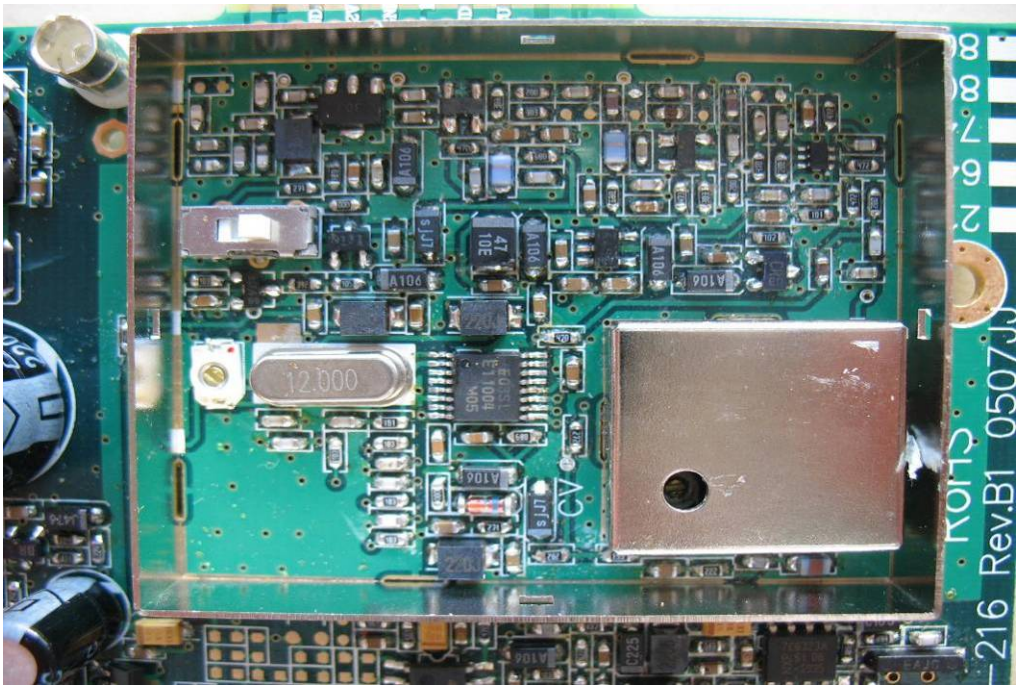


Photo 15:

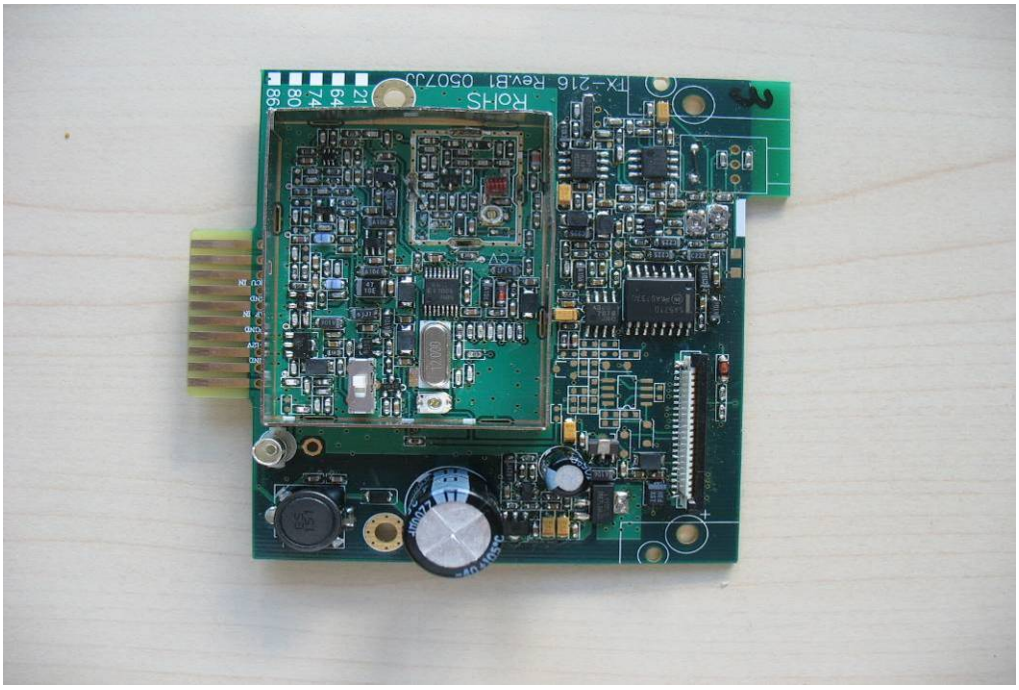
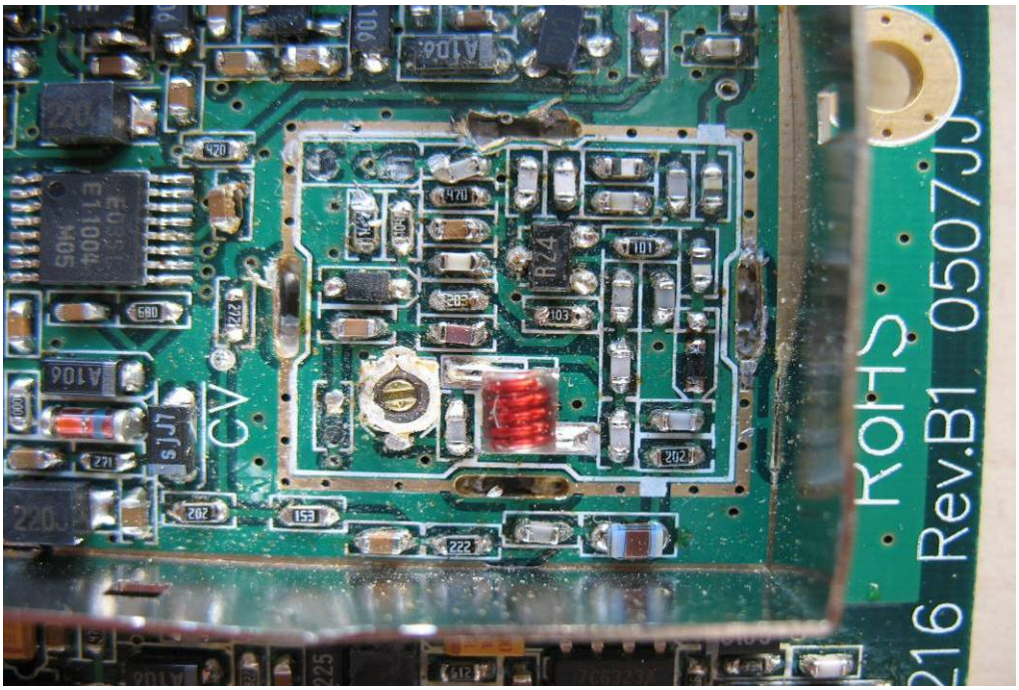


Photo 16:



9 Document history

Version	Applied changes	Date of release
1.0	Initial release	2010-09-24
A	Additional comments added	2010-11-08

10 Further information

Glossary

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