



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)

*The Bluetooth word mark and logos are owned by the Bluetooth SIG,
Inc. and any use of such marks by Cetecom ICT is under license*

Test report no. : 1-2159-01-04/10-C
Type identification : CRA-1
Applicant : ELMO COMPANY,LIMITED
FCC ID : X3XCRA-1
IC Certification No : 8804A-X3XCRA1
Test standards : 47 CFR Part 15
RSS - 210 Issue 7

Table of contents

1	General information.....	3
1.1	Notes	3
1.2	Testing laboratory	4
1.3	Details of applicant	4
1.4	Application details	4
2	Test standard/s	5
3	Technical tests	6
3.1	Details of manufacturer.....	6
3.1.1	Test item.....	6
3.1.2	Additional EUT information For IC Canada (appendix 2).....	7
3.1.3	EUT operating modes.....	8
3.1.4	Extreme conditions testing values	8
4	Summary of Measurement Results and list of all performed test cases	9
5	RF measurement testing	10
5.1	Description of test set-up.....	10
5.1.1	Radiated measurements.....	10
5.1.2	Conducted measurements.....	10
5.2	Referenced documents	11
5.3	Additional comments	11
5.4	Antenna gain	11
5.5	Peak Power Spectral density (digitally modulated systems) §15.247(e).....	12
5.6	Spectrum Bandwidth of a DSSS System / 6 dB Bandwidth §15.247(a)(2).....	12
5.7	Spectrum Bandwidth of a DSSS System / 20 dB Bandwidth.....	13
5.8	Max. peak output power (radiated) § 15.247 (b)(1)	13
5.9	Band-edge compliance of conducted emissions §15.247 (d)	14
5.10	Band-edge compliance of radiated emissions §15.205	15
5.11	Spurious Emissions - conducted (Transmitter) § 15.247 (c)(1)	16
5.12	Spurious Emissions > 30 MHz- radiated (Transmitter) § 15.247 (c)(1).....	17
5.13	Spurious Emissions - radiated (Receiver) § 15.109	25
5.14	Spurious Emissions < 30 MHz – Transmitter and Receiver radiated § 15.209.....	28
5.15	Conducted Emissions <30 MHz §15.107/207.....	29
6	Test equipment and ancillaries used for tests	30
7	Photographs of the Test Set-up.....	32
8	Photographs of the EUT	34

1 General information

1.1 Notes

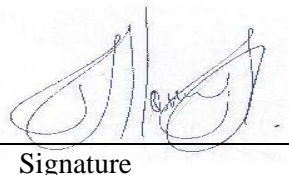
The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented 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.

Test laboratory manager:

2010-04-26 **Daniel Muyunga**

Date

Name


Signature

Technical responsibility for area of testing:

2010-04-26 **Stefan Bös**

Date

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: info@ICT.cetecom.de

Internet: <http://www.cetecom-ict.de>

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:	ELMO COMPANY,LIMITED
Street:	6-14 Meizen-cho Mizuho-ku
Town:	467-8567 Nagoya-city Aichi
Country:	JAPAN
Telephone:	+81-52-811-5136
Fax:	+81-52-811-5179
Contact:	Tomokazu Ito
E-mail:	ito_tomo@elmo.co.jp
Telephone:	+81-52-811-5136

1.4 Application details

Date of receipt of order:	2010-03-26
Date of receipt of test item:	2010-03-29
Date of start test:	2010-03-29
Date of end test	2010-04-01
Persons(s) who have been present during the test:	-/-

2 Test standard/s

47 CFR Part 15	2008-07	Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission subchapter A - general, Part 15-Radio frequency devices
RSS - 210 Issue 7	2007-06	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

3 Technical tests

3.1 Details of manufacturer

Name:	DSP Research, Inc.
Street:	1-4-3 Minatojima Minamimachi Chuo-ku
Town:	650-0047 Kobe City Hyogo
Country:	JAPAN

3.1.1 Test item

Kind of test item	:	Wireless Tablet
Type identification	:	CRA-1
S/N serial number	:	Rad: PP3-3 Cond: PP3-5
HW hardware status	:	Not specified
SW software status	:	Not specified
Frequency Band [MHz]	:	2402 MHz– 2479 MHz (ISM 2.400 MHz - 2.483,5 MHz)
Type of Modulation	:	DSSS - GFSK
Number of channels	:	78
Antenna	:	Internal PCB Antenna
Power Supply	:	3.7 V DC by Li-ion battery
Temperature Range	:	-20 °C to +55 °C

Max. power radiated: -0.56 dBm
Max. power conducted: not applicable (n.a.)

FCC ID: X3XCRA-1
IC: 8804A-X3XCRA1

3.1.2 Additional EUT information For IC Canada (appendix 2)

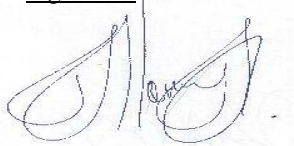
IC Registration Number:	8804A-X3XCRA1
Model Name:	CRA-1
Manufacturer (complete Address):	DSP Research, Inc. 1-4-3 Minatojima Minamimachi Chuo-ku 650-0047 Kobe City Hyogo JAPAN
Tested to Radio Standards Specification (RSS) No.:	RSS-210 Issue 7
Open Area Test Site Industry Canada Number:	IC 3462C-1
Frequency Range (or fixed frequency) [MHz]:	2402 MHz– 2479 MHz (ISM 2.400 MHz - 2.483,5 MHz)
RF: Power [W] (max):	Rad. EIRP: 0.88 mW Conducted : 0.73 mW *
Antenna Type:	Internal PCB antenna
Occupied Bandwidth (99% BW) [kHz]:	1300*
Type of Modulation:	DSSS – GFSK
Emission Designator (TRC-43):	1M30G1D (DSSS)*
Transmitter Spurious (worst case) [μ V/m in 3m]:	456 (PK)
Receiver Spurious (worst case) [μ V/m in 10m]:	13.33 (QP)

*) Value measured in test report no. 1-2159-01-05/10-C

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 the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:



Test engineer: Daniel Muyunga, Dipl.-Ing.

Date: 2010-04-26

3.1.3 EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
Op. 0	Normal mode	Normal temperature and power source conditions
Op. 1		low temperature, low power source conditions
Op. 2		low temperature, high power source conditions
Op. 3		high temperature, low power source conditions
Op. 4		high temperature, high power source conditions

*) EUT operating mode no. is used to simplify the test plan

3.1.4 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T _{nom}	°C	23
Nominal Humidity	H _{nom}	%	39
Nominal Power Source	V _{nom}	V	3.7

Type of power source: **DC by Li-ion battery**

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	FCC Part 15 §15.247 - CANADA RSS-210	Pass	2010-04-26	-/-

Test Specification Clause	Test Case	pass	fail	Not applicable	Not performed
None	Antenna Gain			Yes	
§ 15.247 (e)	Peak power spectral density			Yes	
§ 15.247(a)(2)	Spectrum Bandwidth of a DSSS System / 6dB BW			Yes	
§ 15.247(a)(2)	Spectrum Bandwidth of a DSSS System / 20dB BW			Yes	
§ 15.247 (b)(1)	Max. peak output power (radiated)	Yes			
§ 15.247 (d)	Band-edge compliance of conducted emissions			Yes	
§ 15.205	Band-edge compliance of radiated emissions			Yes	
§ 15.247 (d)	Spurious Emission - conducted (Transmitter)			Yes	
§ 15.247 (d)	Spurious Emission - radiated (Transmitter) >30 MHz	Yes			
§ 15.109	Spurious Emissions - radiated (Receiver)	Yes			
§ 15.209	Spurious Emissions - radiated (Transmitter) <30 MHz	Yes			

5 RF measurement testing

5.1 Description of test set-up

5.1.1 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 C63.4-2003 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 C63-4-2003 clause 4.2. Antennas are confirmed with ANSI C63.2-1996 item 15.

9 kHz - 150 kHz: Quasi Peak measurement, 200 Hz Bandwidth, active loop antenna.
150 kHz - 30 MHz: Quasi Peak measurement, 9 kHz Bandwidth, active loop antenna.
30 MHz - 1GHz: Quasi Peak measurement, 120 kHz Bandwidth, Trilog antenna
>1GHz: Average, RBW 1MHz, VBW 10 Hz, waveguide horn

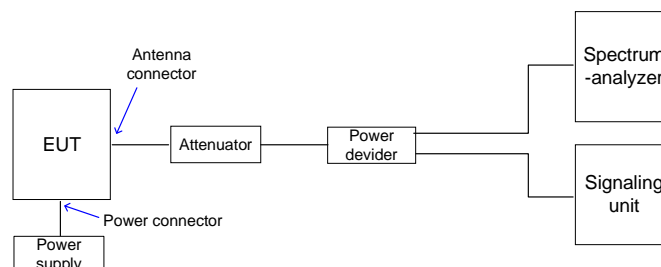
All measurements are done in accordance with the Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems DA 00-705 and Appendix A "BLUETOOTH APPROVALS"

The EUT is powered by an external power supply with nominal voltage. The signalling is performed from outside the chamber with a signalling unit (CMU200 or other) by air link using signalling antenna.

5.1.2 Conducted measurements

n.a.

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.



5.2 Referenced documents

*) Please refer to test report no.: 1-2159-01-05/10-C

5.3 Additional comments

This test report describes only delta-tests because the CRA-1 uses the same RF module as the EUT described in the full test report no. 1-2159-01-05/10-C.

5.4 Antenna gain

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

	low channel 2402 MHz	mid channel 2441 MHz	high channel 2480 MHz
Conducted power [dBm] Measured, GFSK modulation	-1.34*	-1.58*	-2.03*
Radiated power [dBm] Measured, GFSK modulation	-0.56	-1.52	-1.37
Gain [dBi] Calculated	0.78	0.06	0.66

*) Value measured in test report no. 1-2159-01-05/10-C

5.5 Peak Power Spectral density (digitally modulated systems) §15.247(e)

n.a.

Results: Plot 1: Power density: dBm / 3 kHz
Plot 2: Power density: dBm / 3 kHz
Plot 3: Power density: dBm / 3 kHz

Limits :

Under normal test conditions only	For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission
-----------------------------------	---

5.6 Spectrum Bandwidth of a DSSS System / 6 dB Bandwidth §15.247(a)(2)

n.a.

Results:

Test conditions		6 dB BANDWIDTH [kHz]		
Frequency [MHz]		2402	2441	2479
T _{nom}	V _{nom}			
Measurement uncertainty		±10 kHz		

RBW: 10 kHz / VBW 10 kHz

Limits:

Under normal test conditions only	> 500 kHz
-----------------------------------	-----------

5.7 Spectrum Bandwidth of a DSSS System / 20 dB Bandwidth

n.a.

Results:

Test conditions		20 dB BANDWIDTH [MHz]		
Frequency [MHz]		2402	2441	2479
T _{nom}	V _{nom}			
Measurement uncertainty		±10 kHz		

RBW: 10 kHz / VBW 10 kHz

5.8 Max. peak output power (radiated) § 15.247 (b)(1)

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		2402	2441	2479
T _{nom}	V _{nom}	-0.56	-1.52	-1.37
Measurement uncertainty		±3dB		

RBW / VBW: 3 MHz

Measured at a distance of 3m

Limits:

Under normal test conditions only, for frequency range 2400-2483.5 MHz	Max. 1.0 Watt
--	---------------

5.9 Band-edge compliance of conducted emissions §15.247 (d)**n.a.**Results:

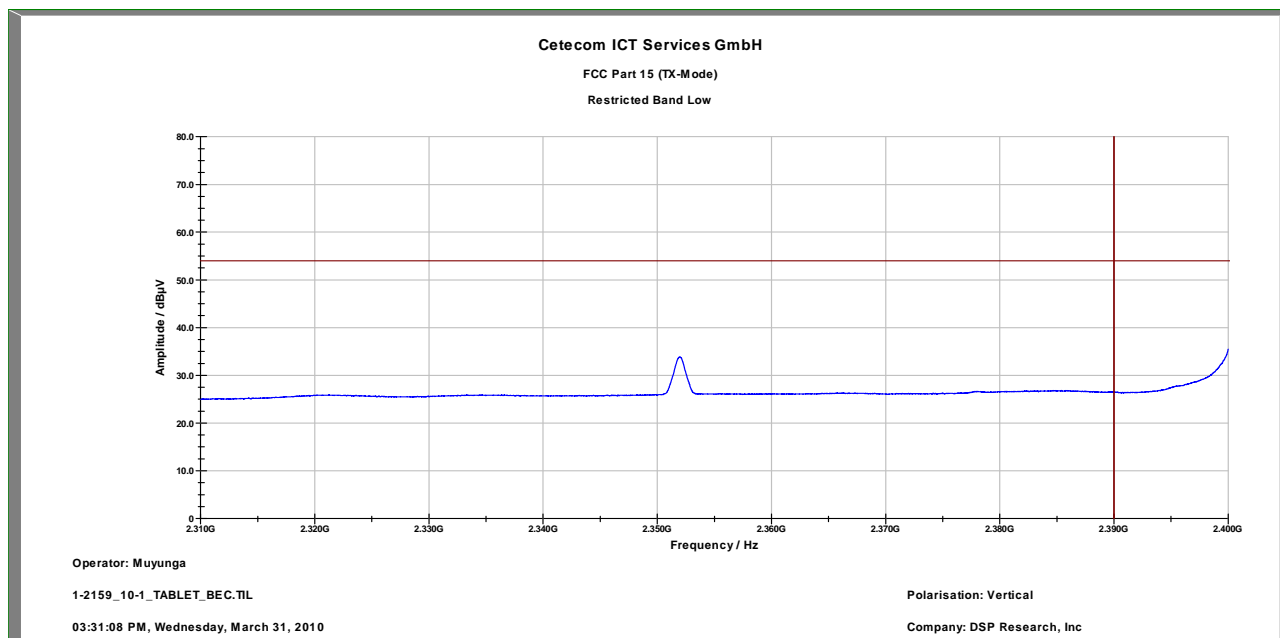
SZENARIO	DELTA VALUE [DB]
hopping off, lowest frequency	
hopping on, lowest frequency	
hopping off, highest frequency	
hopping on, highest frequency	
Measurement uncertainty	±1,5dB

Limits:

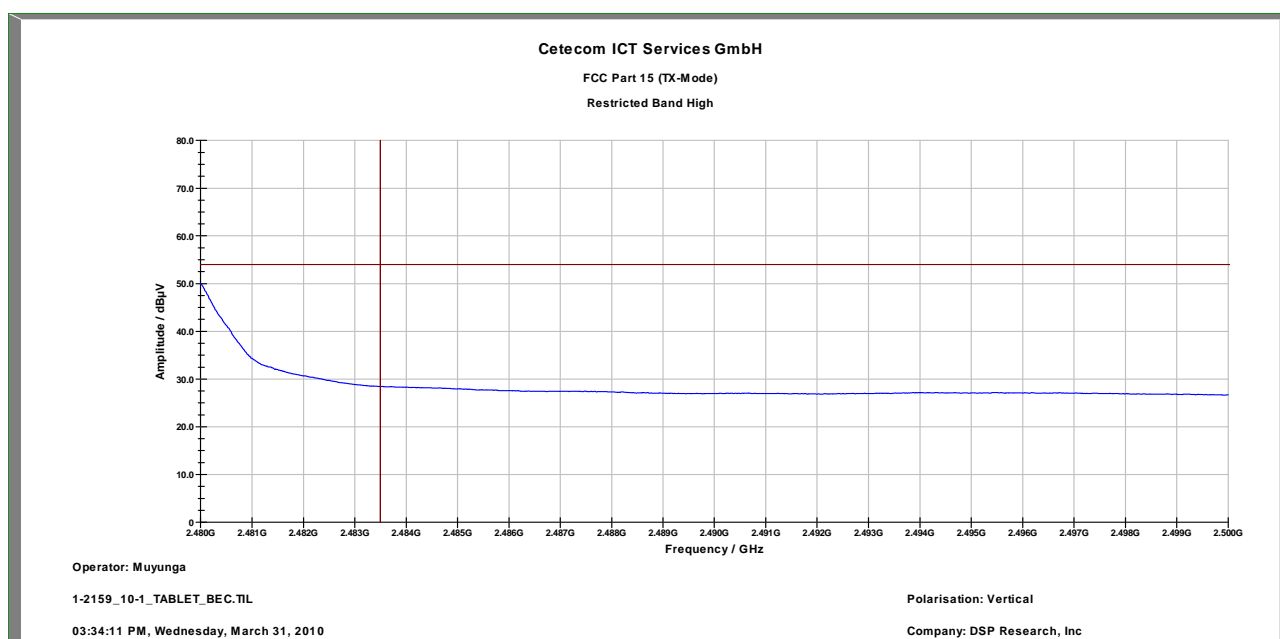
Under normal test conditions only	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth 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)).
-----------------------------------	--

5.10 Band-edge compliance of radiated emissions §15.205

Plot 1: Lowest channel



Plot 2: Highest channel



5.11 Spurious Emissions - conducted (Transmitter) § 15.247 (c)(1)

n.a.

Result & Limits:

Emission Limitation					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2402			30 dBm		Operating frequency
			-20 dBc		
2441			30 dBm		Operating frequency
			-20 dBc		
2480			30 dBm		Operating frequency
			-20 dBc		
Measurement uncertainty		± 3dB			

F < 1 GHz: RBW: 100 kHz VBW: 100 kHz

F > 1 GHz: RBW: 1 MHz VBW: 1 MHz

Under normal test conditions only	In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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)).
-----------------------------------	--

Note: For emissions that fall into restricted bands you find the radiated emissions later in the report.

5.12 Spurious Emissions > 30 MHz- radiated (Transmitter) § 15.247 (c)(1)

Plot 1: 0.03 - 1 GHz vertical/horizontal (lowest channel)

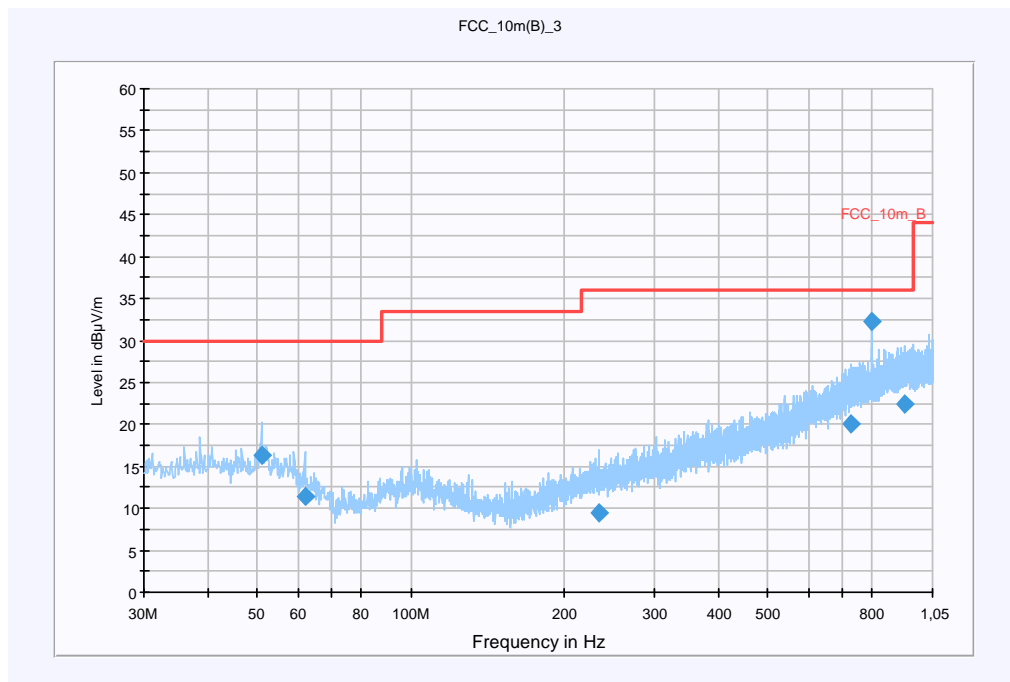
Common Information

EUT:	CRA-1 / CRA-1R
Serial Number:	PP3-3 Prototyp
Test Description:	FCC part 15
Operating Conditions:	Tx2402 MHz
Operator Name:	EMM
Comment:	

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB μ V/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

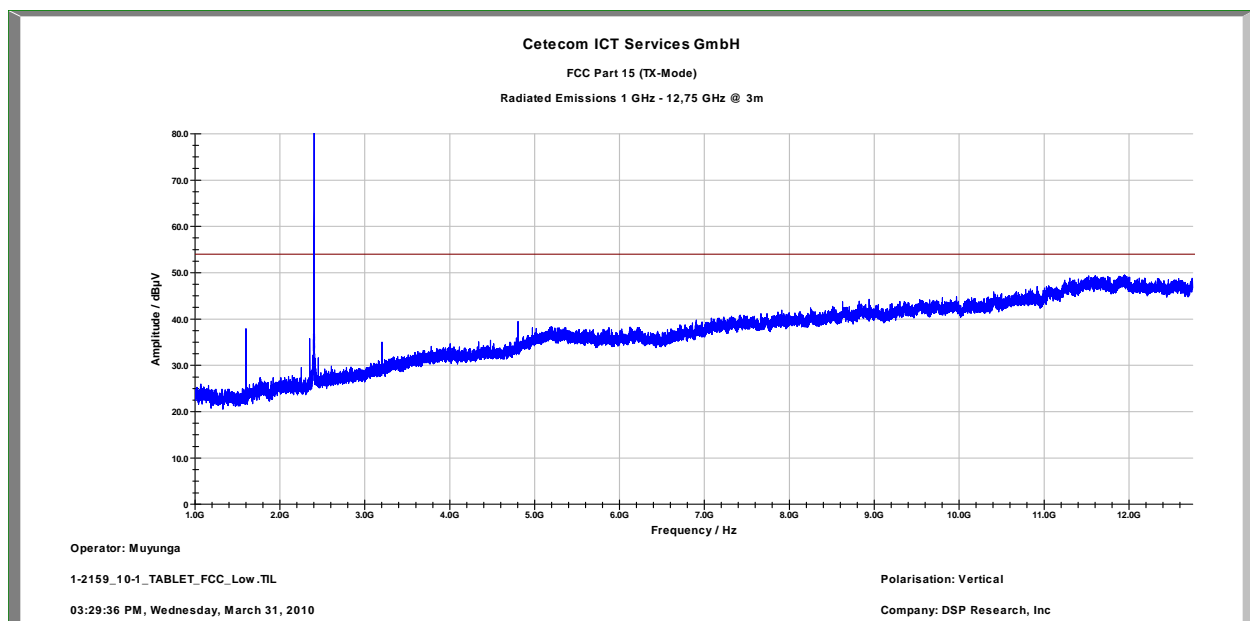
Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Distance (meter)	Limit (dB μ V/m)
50.978250	16.4	15000.000	120.000	130.0	V	30.0	13.3	13.6	10	30.0
62.033850	11.4	15000.000	120.000	105.0	V	-6.0	11.1	18.6	10	30.0
232.686450	9.4	15000.000	120.000	220.0	V	14.0	12.7	26.6	10	36.0
724.304550	20.1	15000.000	120.000	167.0	V	204.0	23.0	15.9	10	36.0
800.665250	32.3	15000.000	120.000	120.0	H	268.0	23.8	3.7	10	36.0
925.153800	22.5	15000.000	120.000	129.0	H	4.0	25.3	13.5	10	36.0

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

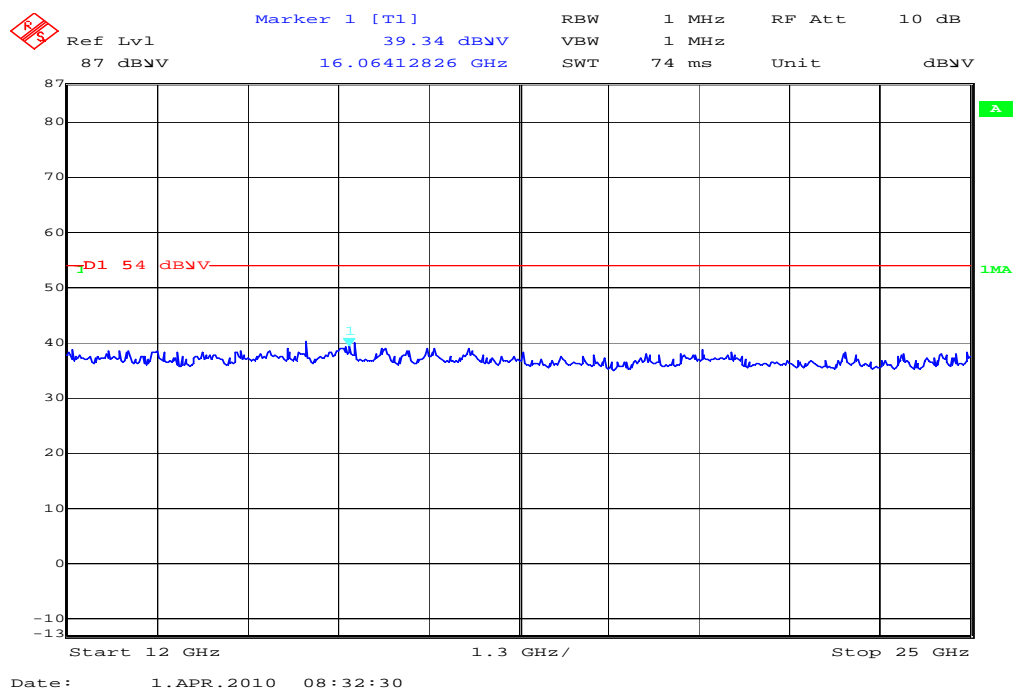
Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.32
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cable_EN_1GHz (0909)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

Plot 2: 1 - 12 GHz (lowest channel)



Plot 3: 12- 25 GHz (valid for all channels)



Plot 5: 0.03 - 1 GHz vertical/horizontal (middle channel)

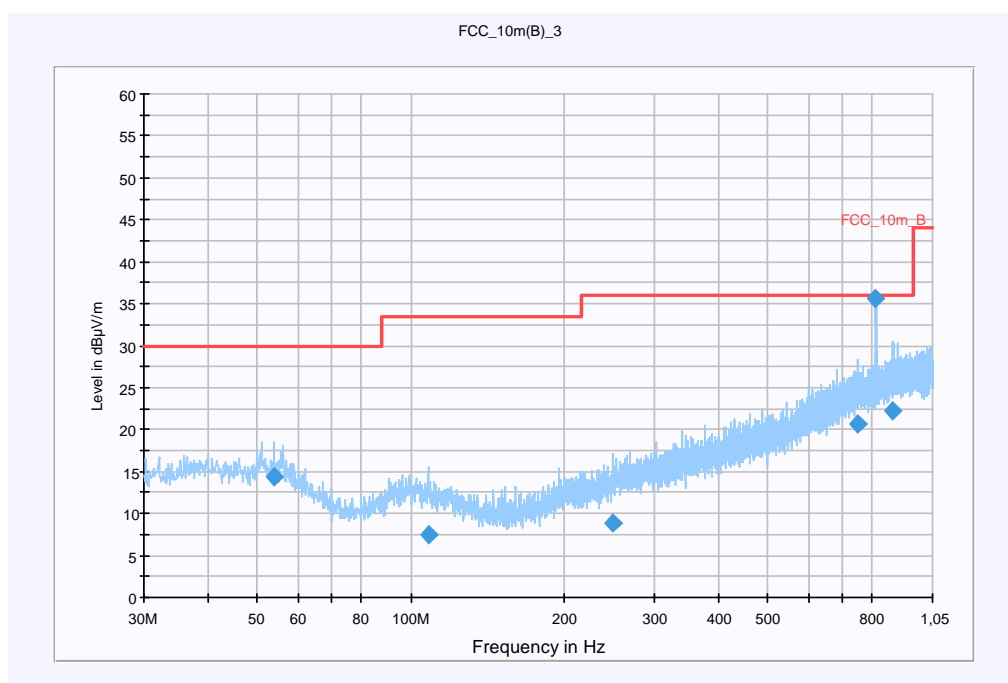
Common Information

EUT:	CRA-1 / CRA-1R
Serial Number:	PP3-3 Prototyp
Test Description:	FCC part 15
Operating Conditions:	Tx2441 MHz
Operator Name:	EMM
Comment:	

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB μ V/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver

**Final Result 1**

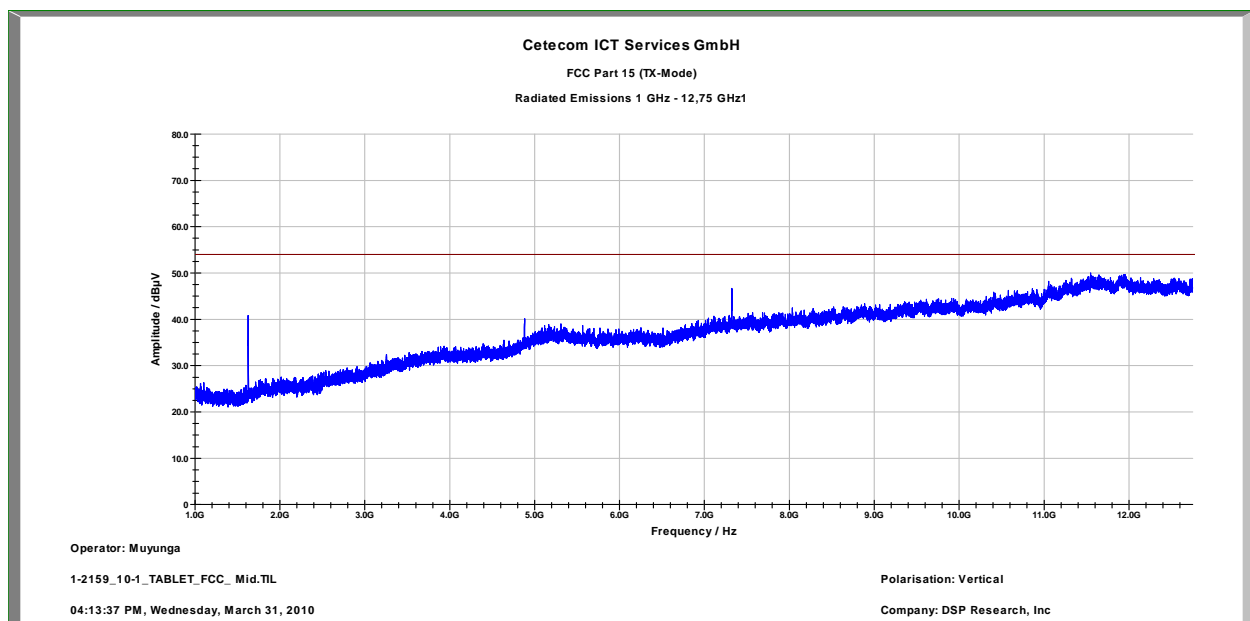
Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Distance (meter)	Limit (dB μ V/m)
54.011550	14.4	15000.000	120.000	177.0	V	23.0	13.0	15.6	10	30.0
108.406050	7.4	15000.000	120.000	191.0	V	207.0	11.2	26.1	10	33.5
247.922550	8.8	15000.000	120.000	220.0	V	27.0	13.1	27.2	10	36.0
747.262800	20.7	15000.000	120.000	177.0	V	156.0	23.5	15.3	10	36.0
813.655650	35.7	15000.000	120.000	122.0	H	184.0	24.0	0.3	10	36.0
878.554950	22.2	15000.000	120.000	220.0	H	42.0	24.9	13.8	10	36.0

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.32
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cable_EN_1GHz (0909)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

Plot 5: 1 - 12 GHz (middle channel)



Signal suppressed with a 2.4 GHz band-reject filter

Plot 8: 0.03 - 1 GHz vertical/horizontal (highest channel)

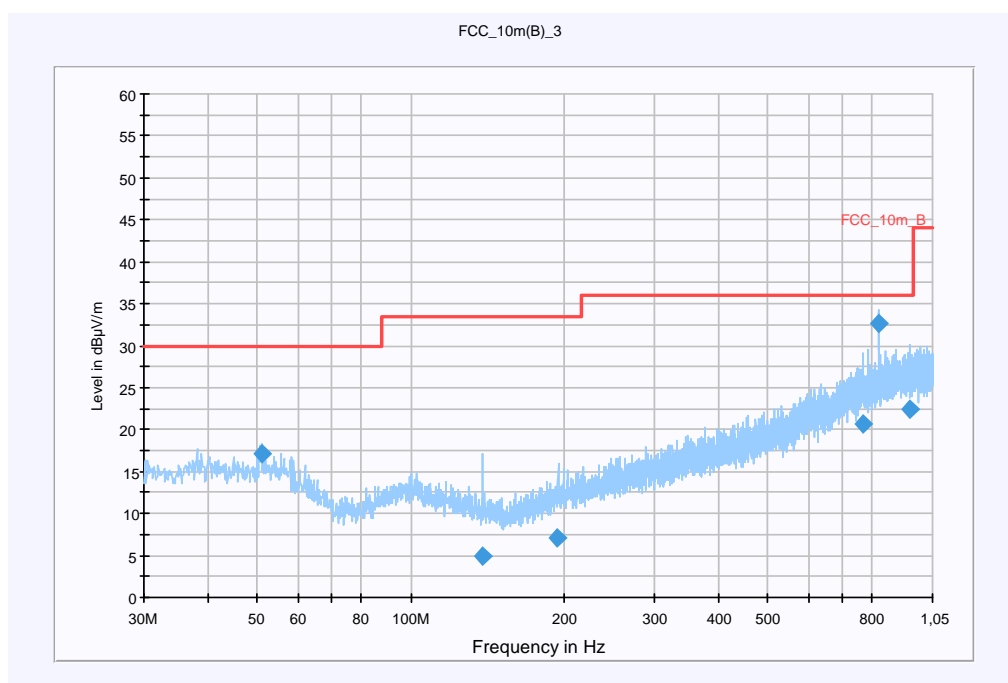
Common Information

EUT:	CRA-1 / CRA-1R
Serial Number:	PP3-3 Prototyp
Test Description:	FCC part 15
Operating Conditions:	Tx2479 MHz
Operator Name:	EMM
Comment:	

Scan Setup: STAN_Fin [EMI radiated]

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

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver

**Final Result 1**

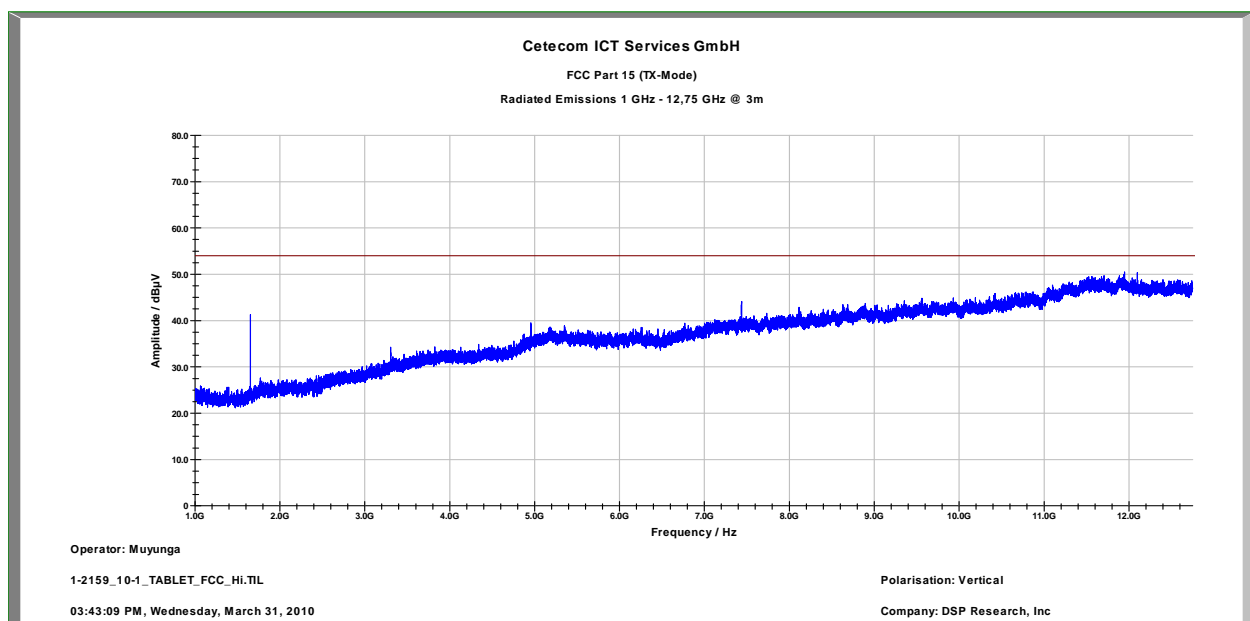
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Distance (meter)	Limit (dBμV/m)
50.988300	17.0	15000.000	120.000	105.0	V	231.0	13.3	13.0	10	30.0
138.265350	4.8	15000.000	120.000	204.0	H	210.0	8.8	28.7	10	33.5
194.040450	7.1	15000.000	120.000	220.0	H	18.0	11.2	26.4	10	33.5
769.277100	20.7	15000.000	120.000	185.0	V	155.0	23.7	15.3	10	36.0
826.461000	32.6	15000.000	120.000	105.0	H	182.0	24.2	3.4	10	36.0
948.018150	22.5	15000.000	120.000	220.0	H	145.0	25.3	13.5	10	36.0

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.32
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cable_EN_1GHz (0909)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

Plot 7: 1 - 12 GHz (highest channel)



Signal suppressed with a 2.4 GHz band-reject filter

Results:

SPURIOUS EMISSIONS LEVEL (dB μ V/m)								
2402 MHz			2441 MHz			2480 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [μ V/m]
1601	Peak	48.98	1627	Peak	49.89	1652	Peak	50.32
3202	Peak	47.44	3254	Peak	47.12	3305	Peak	49.71
4804	Peak	53.19	4882	Peak	52.33	4958	Peak	52.56
Measurement uncertainty			± 3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f \geq 1GHz : RBW/VBW: 1 MHz

Limits: § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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)).

Limits: § 15.109

Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

5.13 Spurious Emissions - radiated (Receiver) § 15.109

Plot 1: 0.03 - 1 GHz vertical/horizontal (receiver)

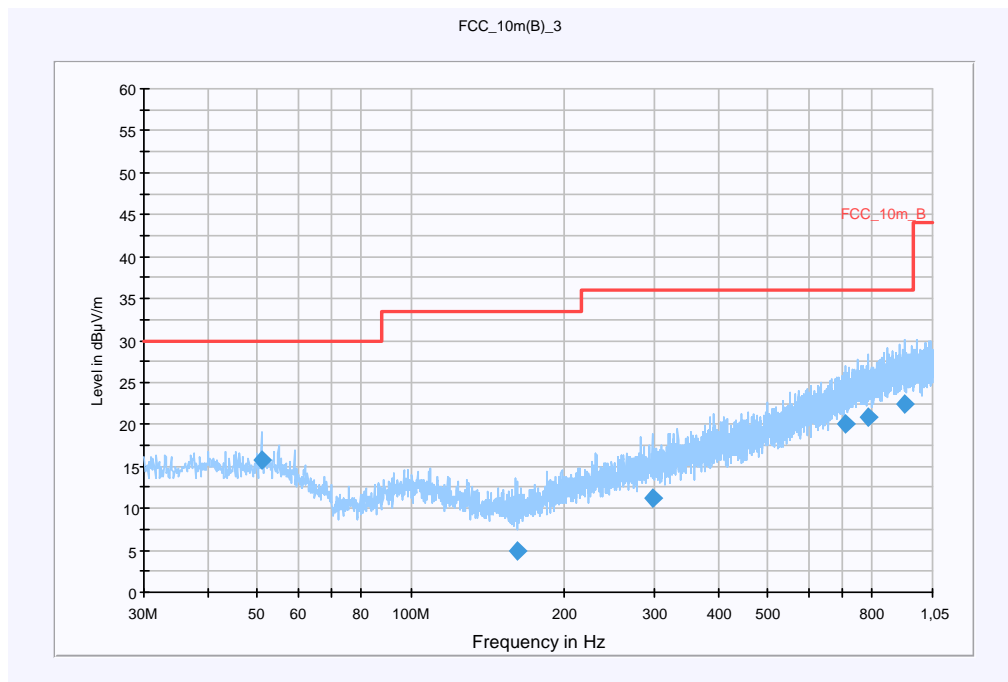
Common Information

EUT:	CRA-1 / CRA-1R
Serial Number:	PP3-3 Prototyp
Test Description:	FCC part 15
Operating Conditions:	RX
Operator Name:	EMM
Comment:	

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB μ V/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Distance (meter)	Limit (dB μ V/m)
50.981100	15.8	15000.000	120.000	220.0	V	145.0	13.3	14.2	10	30.0
161.083200	4.9	15000.000	120.000	220.0	H	231.0	9.2	28.6	10	33.5
296.854650	11.2	15000.000	120.000	220.0	H	38.0	14.3	24.8	10	36.0
711.217200	20.0	15000.000	120.000	220.0	H	262.0	22.7	16.0	10	36.0
787.228950	20.8	15000.000	120.000	220.0	V	235.0	23.8	15.2	10	36.0
927.267450	22.5	15000.000	120.000	220.0	H	132.0	25.3	13.5	10	36.0

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range: 30 MHz - 2 GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 4.32

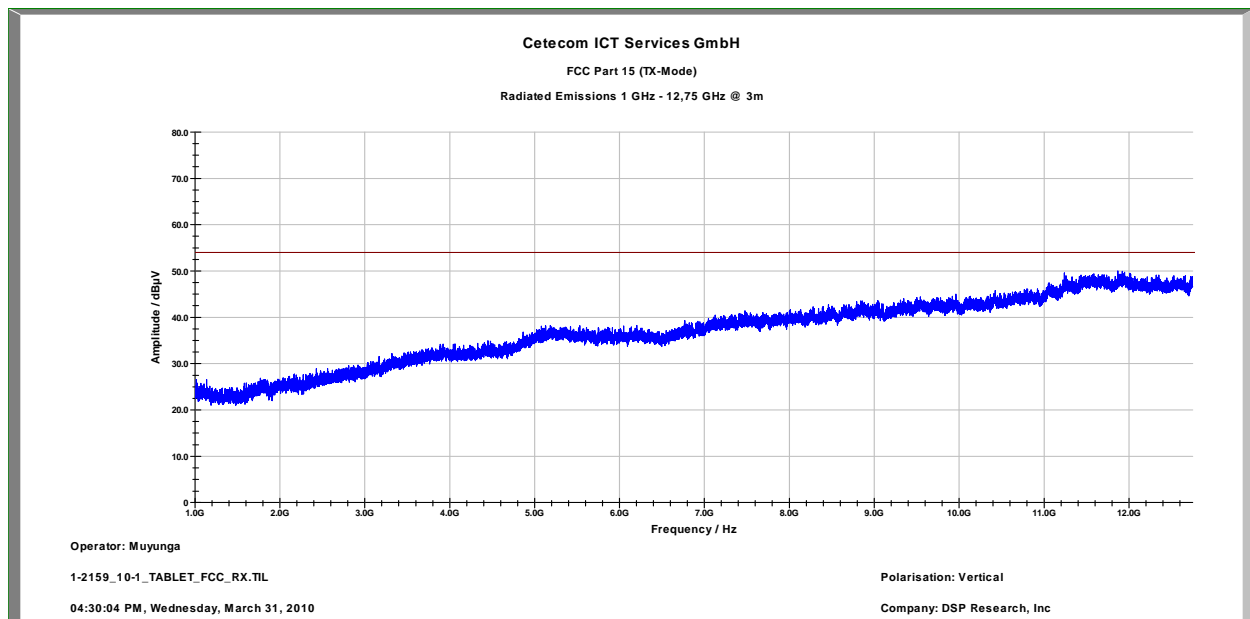
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cable_EN_1GHz (0909)

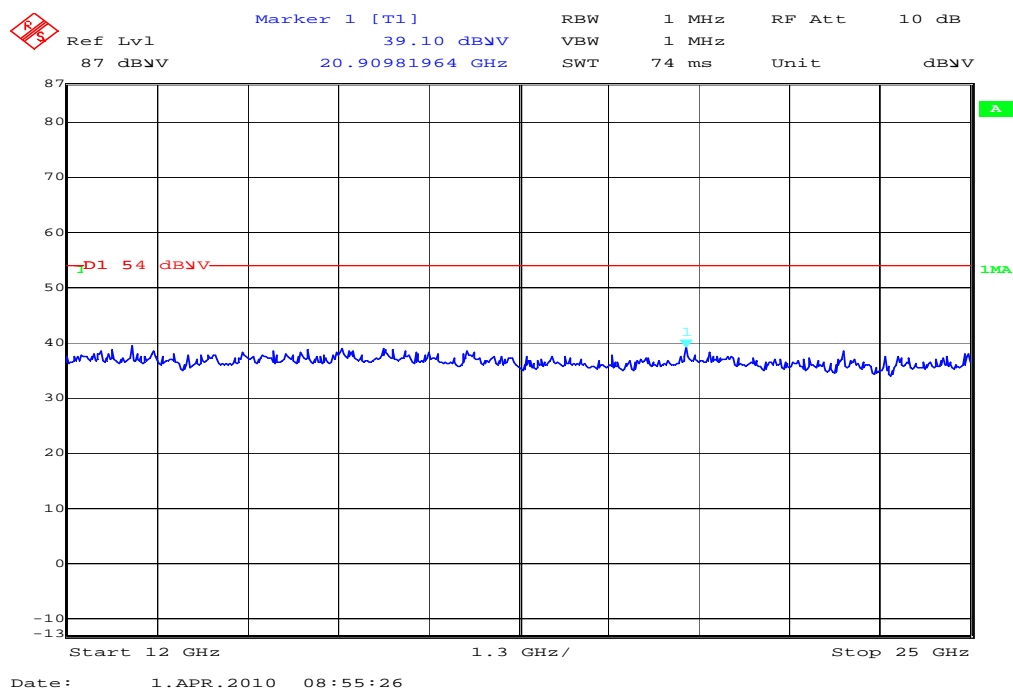
Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9), FW REV 3.12

Plot 2: 1 - 12 GHz vertical / horizontal (receiver)



Plot 3: 12- 25 GHz (receiver)



Results:

Spurious Emissions level [dBμV/m]		
f[MHz]	Detector	Level [dBμV/m]
No critical peaks detected		
Measurement uncertainty		±3 dB

f < 1 GHz: RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

See above plots

Measurement distance see table

Limits: § 15.109

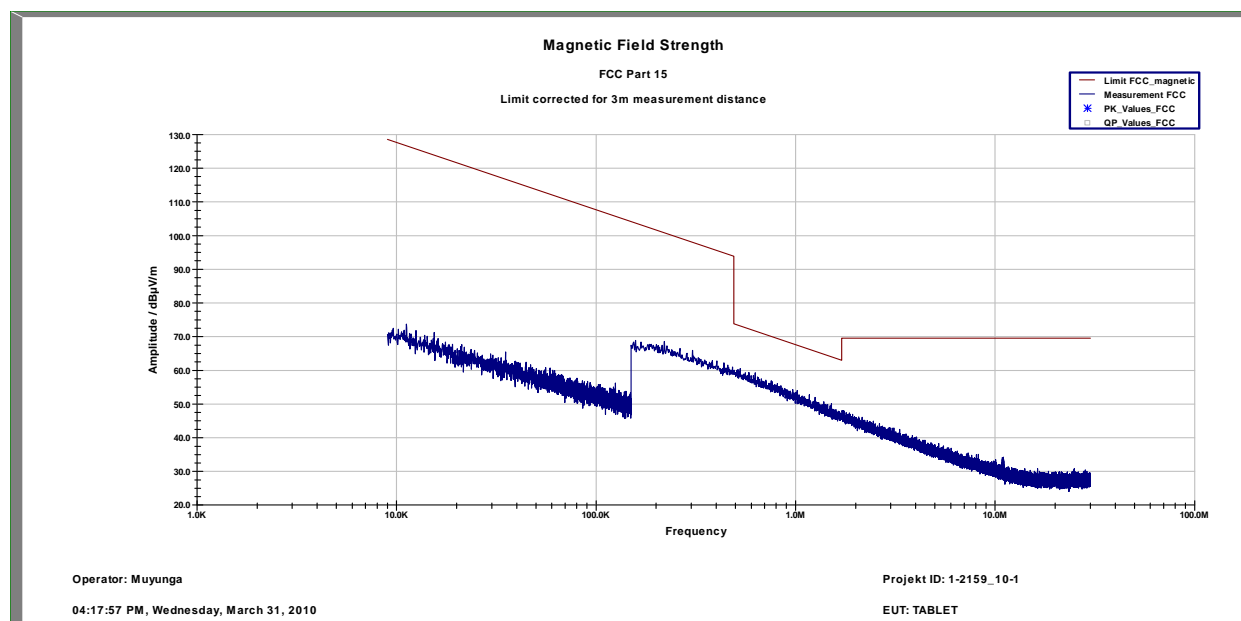
Frequency (MHz)	Field strength (dBμV/m)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

5.14 Spurious Emissions < 30 MHz – Transmitter and Receiver radiated § 15.209

Measured at 10 m distance.

Values recalculated with 40 dB/decade according to FCC rules.

Plot 1:

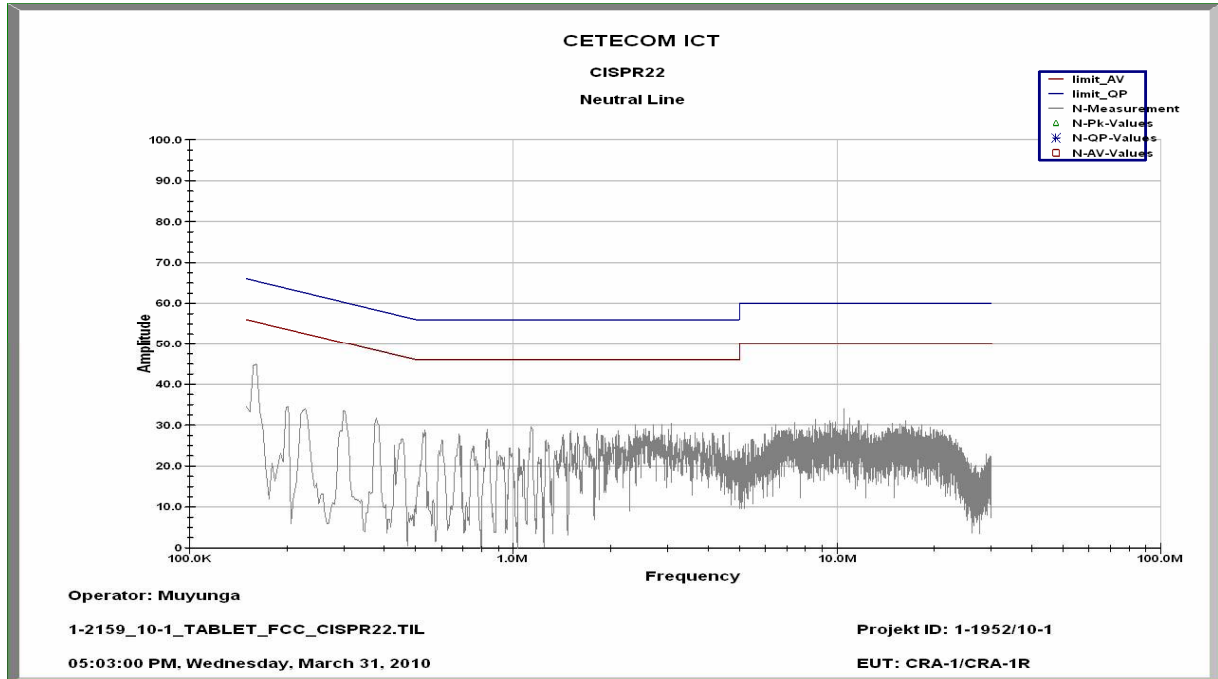


Limits:

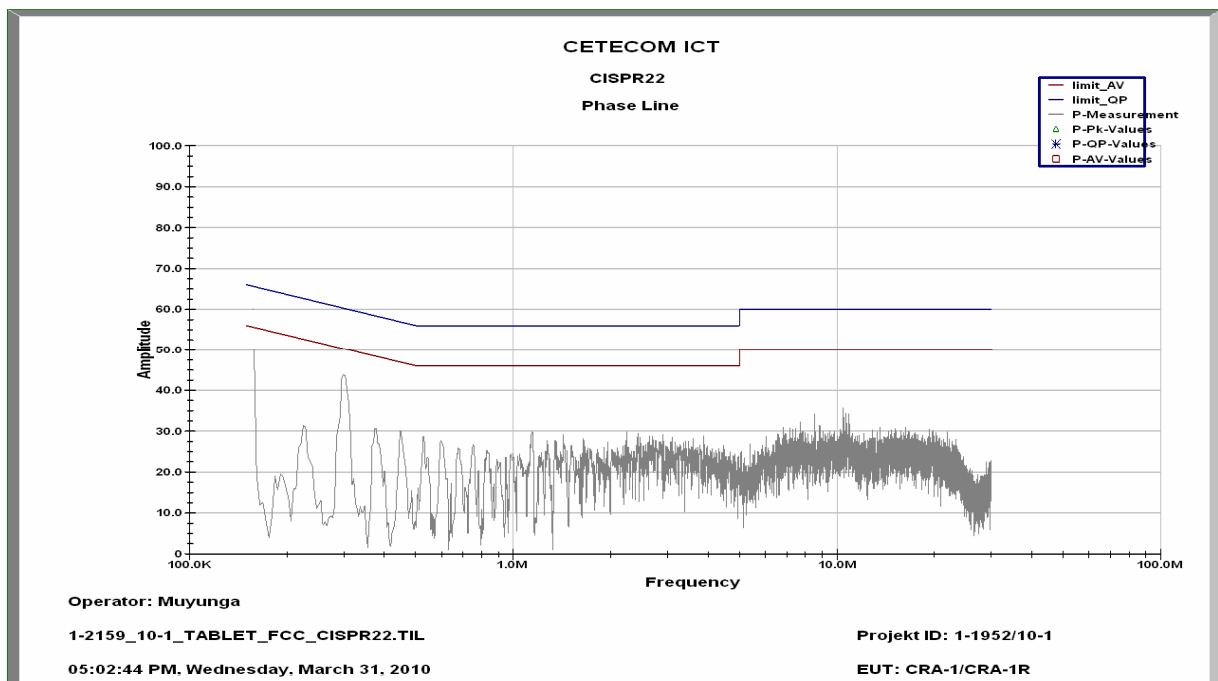
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dB $\mu\text{V/m}$	30

5.15 Conducted Emissions <30 MHz §15.107/207

Plot 1: CISPR 22, Neutral Line



Plot 2: CISPR 22, Phase Line



We measured in TX and RX mode, L1 and N floating and grounded, max value was hold.

Limits:

Under normal test conditions only	See plots
-----------------------------------	-----------

6 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

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).

No.	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	Double-Ridged Waveguide Horn Antenna 1-26.5GHz	3115	EMCO	8812-3088	300001032	vIKI!	05.03.2009	05.03.2011
2	Anechoic chamber		MWB	87400/02	300000996			
3	Relaismatrix (FTA)	HP3488A	HP Meßtechnik	2719A15013	300000151	ne		
4	Broadband Horn Antenna EMI	35155P	HP Meßtechnik		300002300	ne		
5	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
6	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
7	Hygro-Thermometer	-/-, 5-45°C, 20-100%rF		-/-	400000110	izw	08.04.2009	08.04.2010
8	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
9	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
10	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Vertr. Bad Hom	MY48250080	300003812	k	05.08.2008	05.08.2010
11	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Vertr. Bad Hom	MY48260003	300003825	vIKI!	19.08.2008	19.08.2010
12	TRILOG Super Breitband Antenne	VULB9163	Schwarzbeck	371	300003854	vIKI!	17.12.2008	17.12.2010
13	High Pass Filter	VHF-3500+	Mini Circuits	-/-	400000193	ne		
14	Double-Ridged Waveguide Horn Antenna 1-26.5GHz	3115	EMCO	9107-3697	300001605	Ve	30.06.2008	30.06.2010
15	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	06.01.2009	06.01.2011
16	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
17	Netzgerät	6032A	HP Meßtechnik	2920A04466	300000580	k	06.01.2009	06.01.2011
18	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	k	03.09.2001	03.09.2003
19	EMI-Mesempfänger	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
20	Analysator-Referenz-System (Harmonics u. Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	06.06.2007	06.06.2009

21	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
22	Antennenmast	Model 2175	ETS-LINDGREN	64762	300003745	izw		
23	Steuergerät	Model 2090	ETS-LINDGREN	64672	300003746	izw		
24	Interface-Box für Drehtisch	Model 105637	ETS-LINDGREN	44583	300003747	izw		
25	Breitbandantenne	VULB9163	Schwarzbeck	295	300003787	k	01.04.2008	01.04.2010
26	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012

7 Photographs of the Test Set-up

Photo documentation

Photo 1:



Photo 2:



Photo 3:



8 Photographs of the EUT

Photo documentation

Photo 1:



Photo 2:



Photo 3:



Photo 4:



Photo 5:

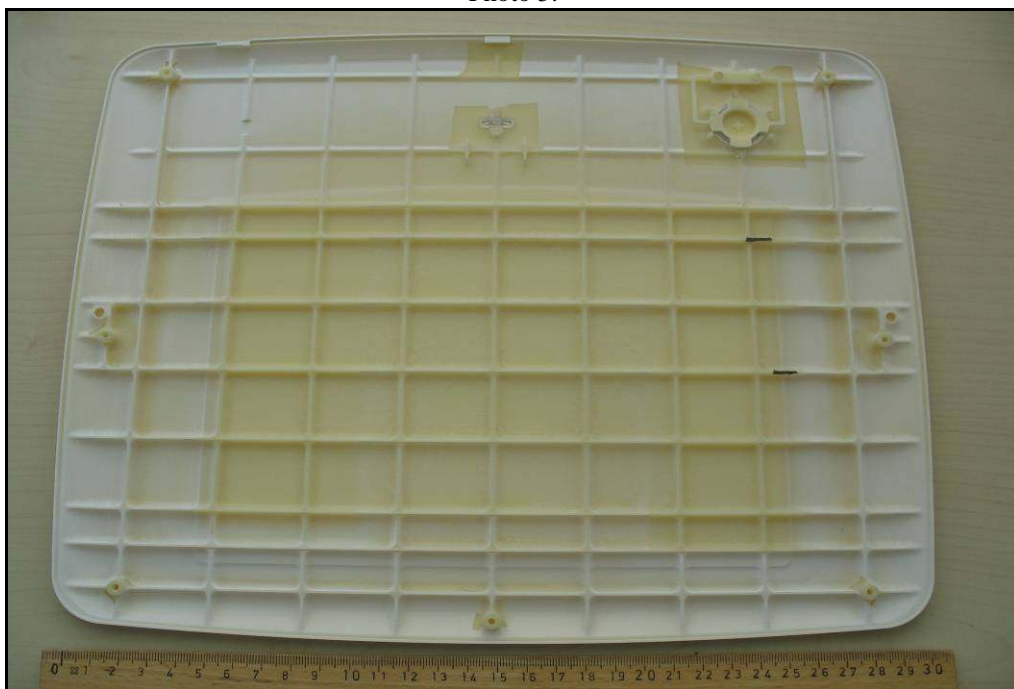


Photo 6:

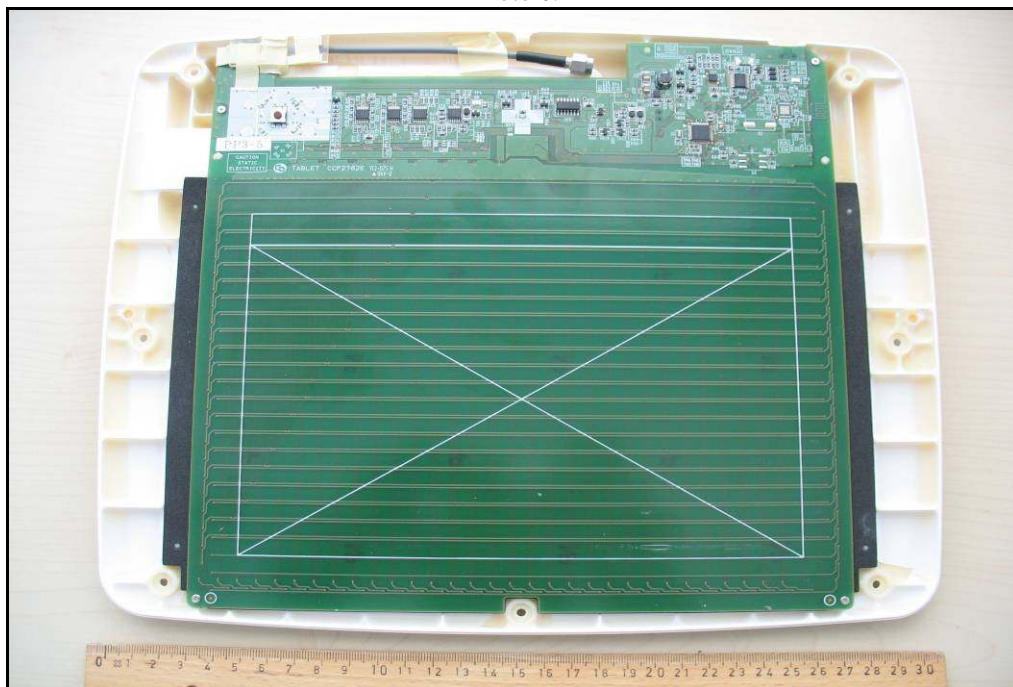


Photo 7:



Photo 8:

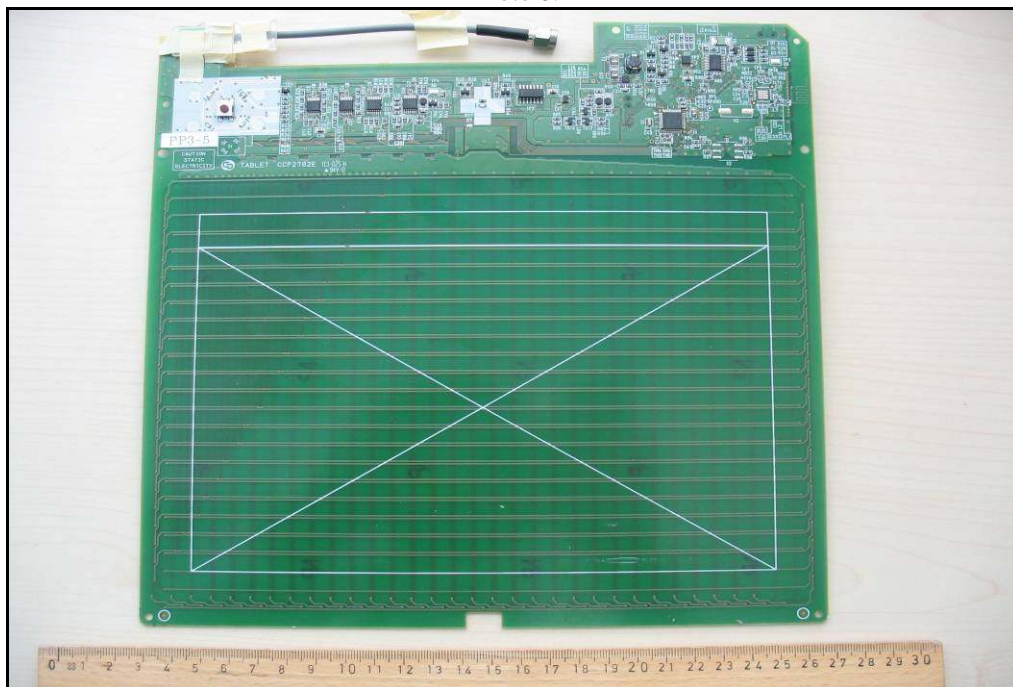


Photo 9:

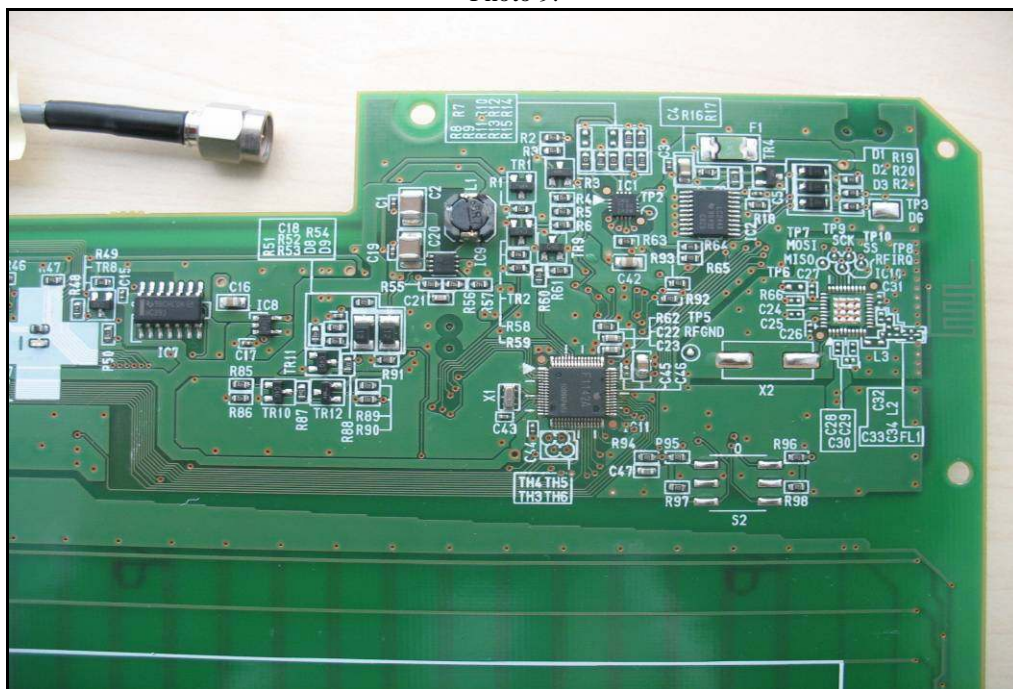


Photo 10:

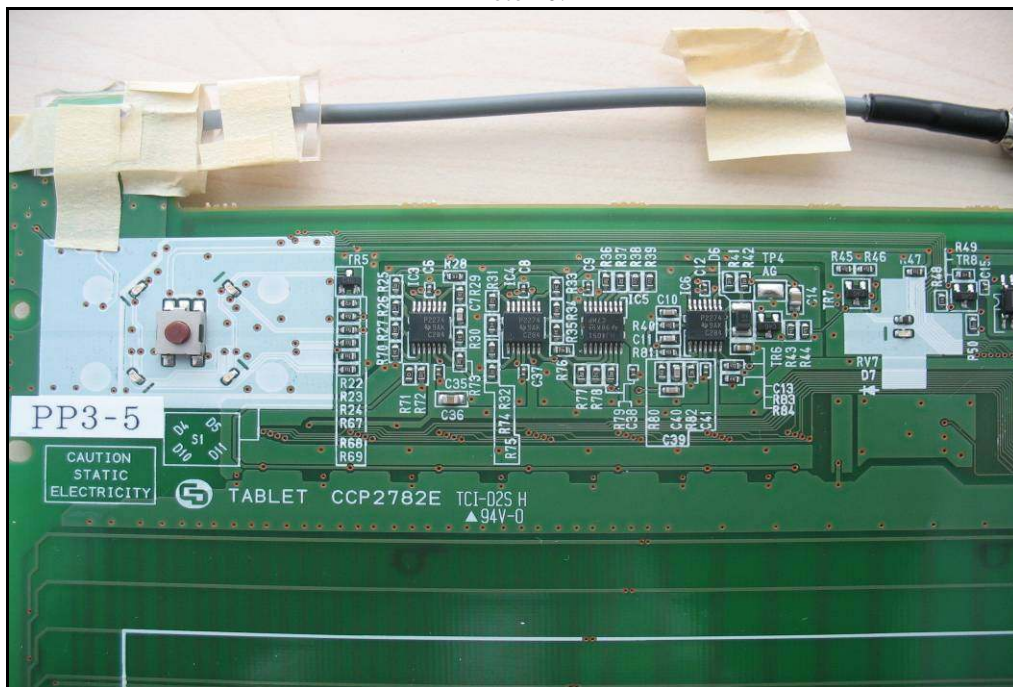


Photo 11:

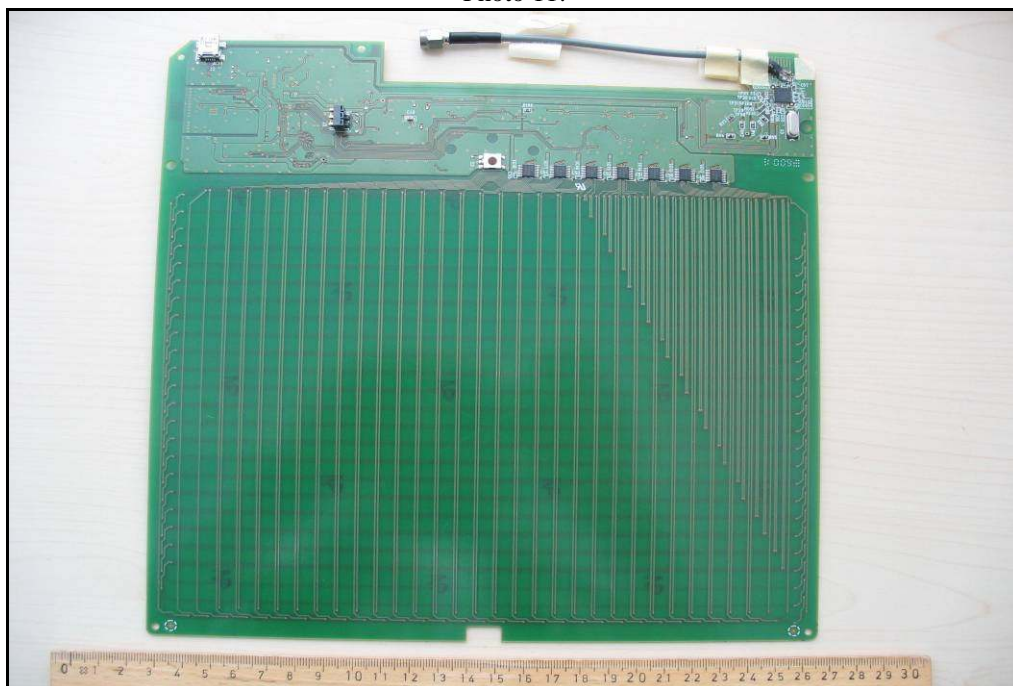


Photo 12:

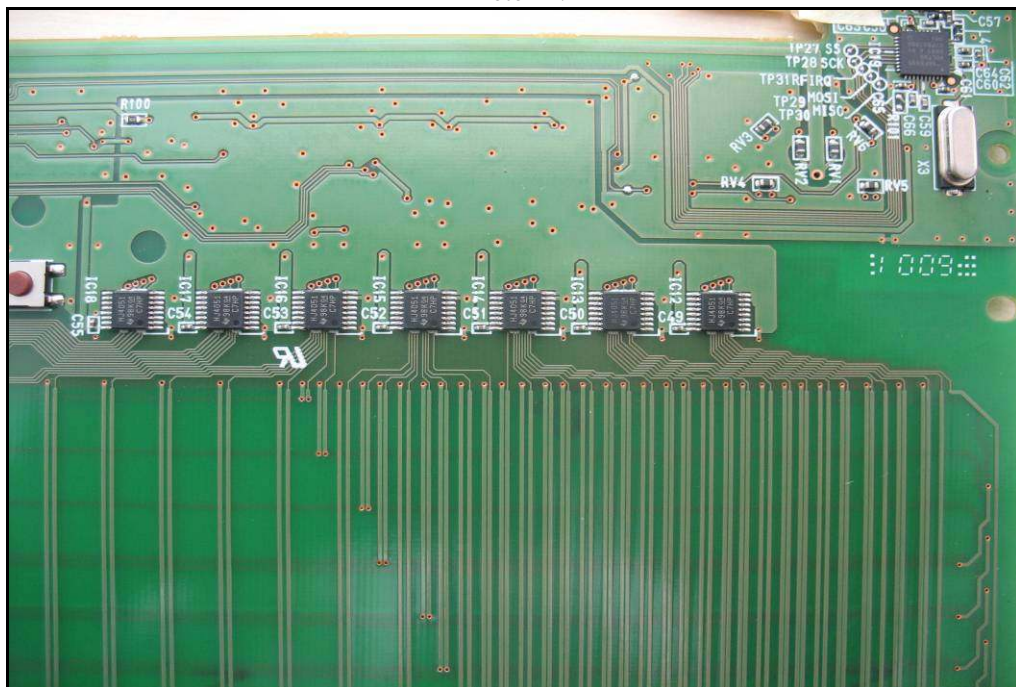


Photo 13:

