

Test report no. : 91316/14

Item tested : LC7 Remote control

Type of equipment: Low Power Transceiver

Client : Silicon & Software Systems Polska Sp. z O. O.

FCC Part 15.249

Low Power Transceiver
2400 – 2483.5 MHz Band

RSS210 Issue 7 & RSS Gen Issue 2

Low-Power Licence-exempt Radiocommunications devices
2400 – 2483.5 MHz Band

28 March 2008

Authorized by :

Frode Sveinsen
Technical Verificator

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1 GENERAL INFORMATION

1.1 Testhouse Info

Name : Nemko Comlab
Address : Gåsevikveien 8, Box 96
N-2027 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
E-mail: post@comlab.no
FCC test firm
registration # : 994405
Industry Canada
OATS registration # : 4443

1.2 Client Information

Name : Silicon & Software Systems Polska Sp.Z O.O.
Address : ul. Nyska 83/85, 50-505 Wroclaw, Poland
Telephone : +48 71 3348177

Contact:

Name : Sebastian Roslan
Telephone : +48 71 3348177
E-mail : Sebastian.roslan@s3group.com

1.3 Manufacturer (if other than client)

Name : Philips Lighting
Address : BU Consumer Lamps, Mathildelaan 1, 5611 BD, Eindhoven , The Netherlands
Telephone : +31 40 2755531

Contact:

Name : Bao Trinh
Telephone : +31 40 2755531
E-mail : bao.trinh@philips.com

2 Test Information

2.1 Test Item

Name :	Remote control for Philips Living Colours (LED Ambience Lamp)
Model/version :	LC7 Remote control
Serial number :	TX: S/N 339 , RX: S/N 342 , Regular: S/N 356
Hardware identity and/or version:	Not stated
Software identity and/or version :	Not stated
Operating frequency:	2433 MHz
Transmitter data rate:	250kbit/s
Tuneable Bands :	None
Emissions Designator :	/
Number of Channels :	1
Operating Modes :	Transceiver
Channel spacing:	None
Channel bandwidth:	200kHz (TX) , 540kHz (RX)
Type of Modulation :	MSK
User Frequency Adjustment :	None
Rated Output Power :	-4dBm (0.4 mW)
Type of Power Supply :	Battery 4.5Vdc
Antenna gain:	/
Antenna Connector :	Integral
Antenna Diversity Supported :	None

¹ The tested equipment has integrated antenna only

Theory of Operation

The handheld RF remote control unit is a transceiver. It is a single channel battery operated unit.

Description of Test Item

The required frequencies, modulation and modes are selected by preprogrammed software on the EUT.

All measurements were performed with fully charged batteries. And measurements were performed only at normal conditions.

All radiated measurements were performed on three axes.

2.2 Test Environment

2.2.1 Normal test condition

Temperature: 20 - 22 °C
Relative humidity: 30 - 40 %
Normal test voltage: 3x1.5V DC Battery

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2007-09-03
Test period : 2007-09-05 to 2007-09-07

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Philips Lighting
Model No.: LC7(Current) Remote Control
Serial No.: /

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15.249 and Industry Canada RSS-210 Issue 7.

Radiated tests were conducted in accordance with ANSI C63.4-2003. The radiated tests were made in a semi-anechoic chamber at measuring distances of 3 and 10metres.

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

DXT Equipment Code


☐ Family Listing

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".



TEST REPORT #: 91316/14

TESTED BY: 
G.Suwanthakumar, Test engineer

DATE: 28.03.2008

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3.2 Test Summary

Name of test	FCC Part 15 reference	RSS210 Issue 7 & RSS Gen Issue 2	Result
Supply Voltage Variations	15.31(e)	4.5	Complies ²
Transmitter frequency stability	15.31(m)	7.2.4	Complies
Antenna Requirement	15.203	7.1.4	Integral ¹
Powerline Conducted Emission	15.207(C)	7.2.2	N/A ²
6 dB bandwidth	15.215(c)	-	Complies
Peak Power Output	15.249(a)(c)	A2.9	Complies
Spurious Emissions (Radiated)	15.249 (e)	A2.9 & 4.3	Complies
Spurious Emissions (Antenna Conducted)	15.249	7.2.3.1	N/A ¹
Receiver Spurious Emissions (Radiated)	N/A	6	Complies

¹ The EUT has only integral antenna.

² Fully charged Batteries were used

RSS Gen issue 2 covers section 6 & 7

RSS 210 issue 7 covers section A2.9

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

The EUT is delivered with pre-programmed 1 channel to operate in TX or RX mode.

The LC7 has integral antenna only.

For all measurements fully charged batteries were used.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

4.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: -	Date of Test: -
----------------------	-----------------

Measurement procedure: ANSI C63.4-2003 using 50 μ H/50 ohms LISN.

Test Results: Not applicable, the EUT can only be powered from batteries.

Measurement Data: NA

4.2 Transmitter Frequency Stability

Para. No.: /

Test Performed By: G.Suwanthakumar

Date of Test: 05.09.07

Measurement Data:

Temperature	Channel nr.	Given Frequency (MHz)	Measured value (MHz)	Deviation (Hz)
20 ° C	-	2433	2433	+1

Fully charged batteries were used.

Comment:

For information only:

There are no requirements to frequency tolerance for low power devices in the 2400 – 2483.5 MHz band according to 15.249 or RSS 210

4.3 6 dB bandwidth

Para. No.: 15.215(c)

Test Performed By: G.Suwanthakumar

Date of Test: 05.09.2007

Test Results: Complies

Measurement Data:

	2433 MHz
Measured 6 dB bandwidth (kHz)	340.68

See the attached graphs

4.4 Peak Power Output

Para. No.: 15.249 (a)

Test Performed By: G.Suwanthakumar

Date of Test: 05.09.2007

Test Results: Complies

Measurement Data:

Maximum field strength: 73.93dB μ V/m

RF channel	2433 MHz
Measured maximum field strength – Vertical polarization	70.36 dB μ V/m
Measured maximum field strength – Horizontal polarization	73.93 dB μ V/m

The used instrument settings are : RBW/VBW: 1MHz , Peak detector.

See attached graph

Detachable antenna?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

The tested equipments have integral antennas only.

Requirements:

The maximum peak output power shall be ≤ 94 dB μ V/m

4.5 Spurious Emissions (Radiated)

Para. No.: 15.249 (e)

Test Performed By: G.Suwanthakumar

Date of Test: 05.09.2007

Test Results: Complies

Measurement Data:

Radiated emission 9 kHz - 25 GHz, see attached table

Highest value: Peak 50.1 dB μ V/m, average 36.9 dB μ V/m, 4.8 GHz

The worst case is obtained at vertical polarization .Measured Peak values are lower than 51 dB μ V/m

In RX mode no spurious emission detected in the frequency range 9kHz – 25 GHz.

Duty Cycle Correction Factor Calculation:

RF duty cycle Correction Factor: Calculation according to RF burst Para 15.35 (c):

Measured duty cycle: on time 0.84 ms , ON+OFF time: 38.6ms (see attached graphs)

$$-20 \cdot \log (0.84/38.6) = 33 \text{ dB}$$

Maximum duty cycle according to Para 15.35 (b): **20 dB**

This value is used for calculating the Peak limit for spurious emissions and for calculating the Spurious Emissions value with Average Detector when measuring with Peak Detector above 1 GHz.

Radiated spurious emissions are performed from 9kHz to 25 GHz .

Example of frequency graph of radiated emission is also attached.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

No components above 4.8 GHz were detected

Radiated Emission 1 – 25 GHz, Peak , LC7

Measured with Peak Detector

The maximum emission is obtained at vertical polarization (worst case).

Frequency	RF channel	Dist. corr. factor	Field strength, Peak, 3 metres	DC Corr. Factor	Limit	Margin
GHz		dB	dB μ V/m	dB	dB μ V/m	dB
4.8	2433	0	50.1	-	74	23.9
Above 2 nd	2433	0	None detected	-	74	-

Radiated emission 1- 25 GHz, Average , LC7

Measured with Peak Detector

Frequency	RF channel	Dist. corr. factor	Field strength, Peak, 3 metres	DC Corr. Factor	Limit	Margin
GHz		dB	dB μ V/m	dB	dB μ V/m	dB
4.8	2433	0	50.1	20	54	23.9
Above 2 nd	2433	0	None detected	20	54	-

Radiated Emission 30 – 1000 MHz, LC7**Measured with Q-Peak Detector**

The maximum emission is obtained at vertical polarization (worst case).

Frequency	Operational condition	Field strength	Measuring distance	Limit FCC15.209	Margin
MHz		dB μ V/m	metres	dB μ V/m	dB
30 - 88	TX on	18.5	3	40.0	21.5
88 - 216	TX on	34	3	43.5	9.5
216 - 960	TX on	34	3	46.0	12

4.6 Receiver Spurious Emissions (Radiated)

Para. No.: 6

Test Performed By: G.Suhandhakumar

Date of Test: 05.09.2007

Test Results: Complies

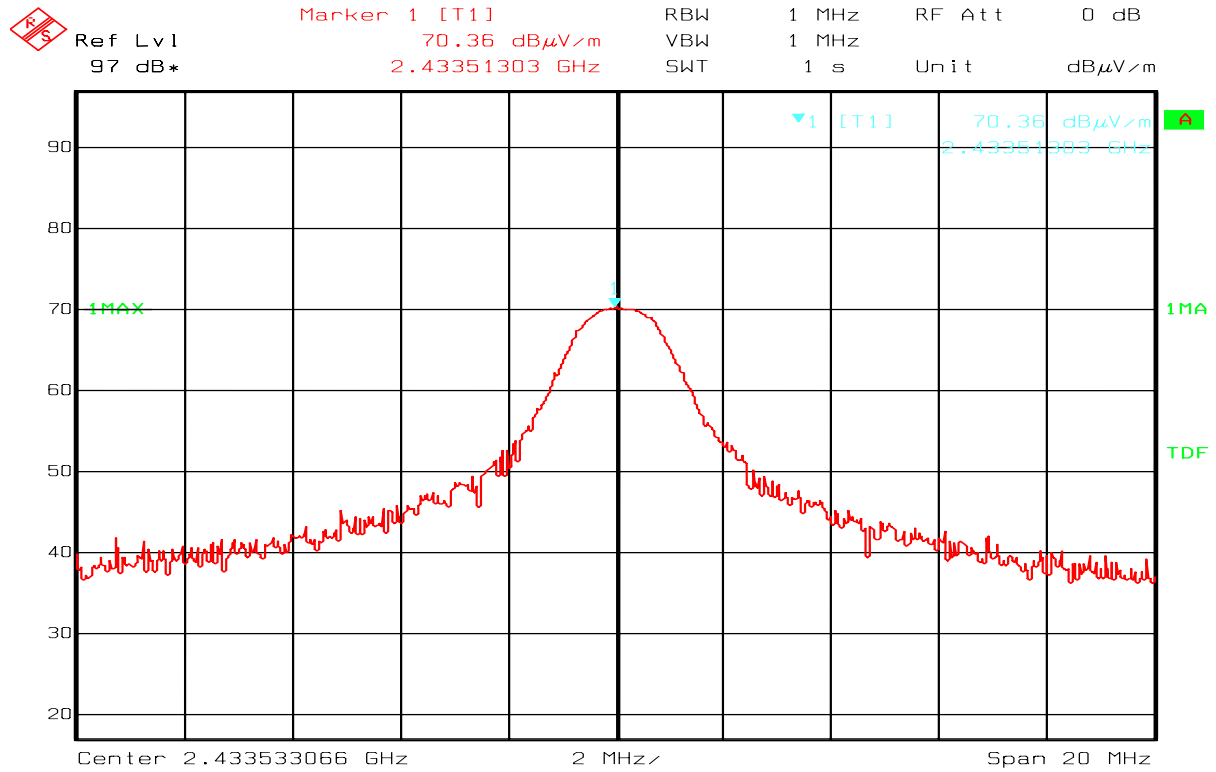
Measurement Data:

Radiated emission 9 kHz - 25 GHz, see attached table

In RX mode no spurious emission detected in the frequency range 9kHz – 25 GHz.

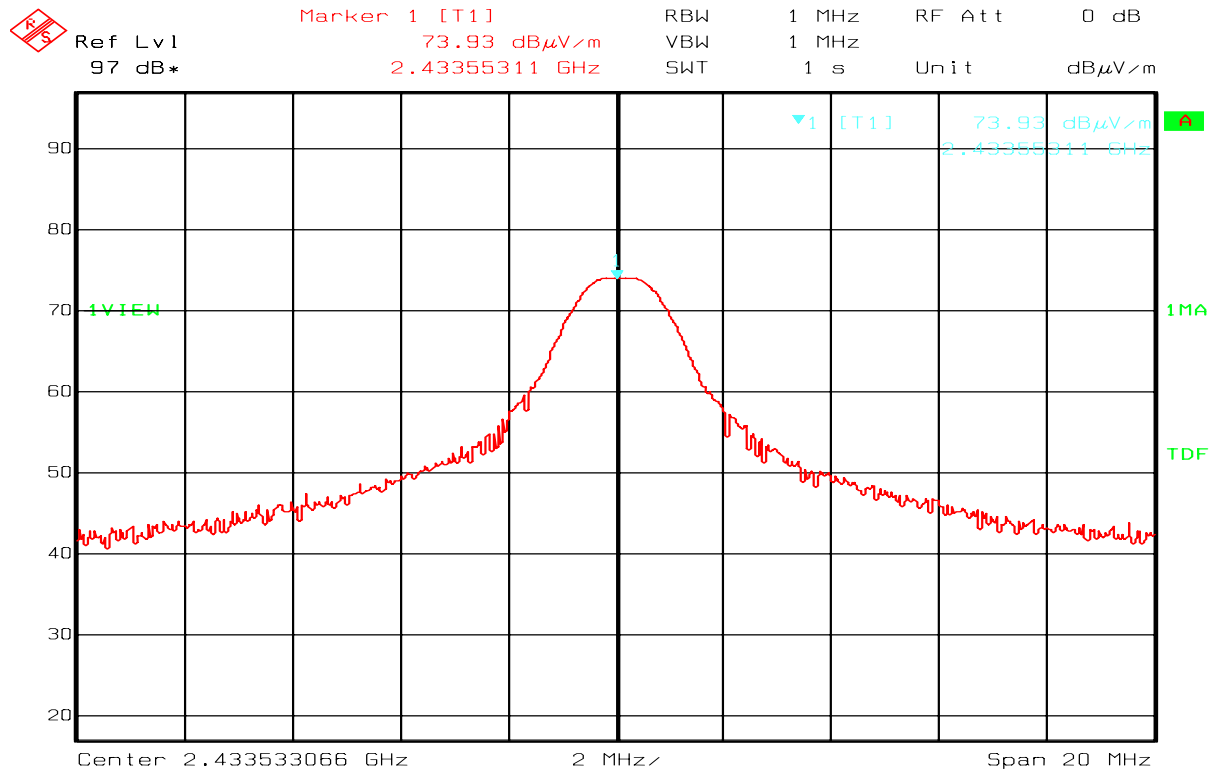
This value is used for calculating the Peak limit for spurious emissions and for calculating the Spurious Emissions value with Average Detector when measuring with Peak Detector above 1 GHz.

Example of frequency graph of radiated emission is also attached.



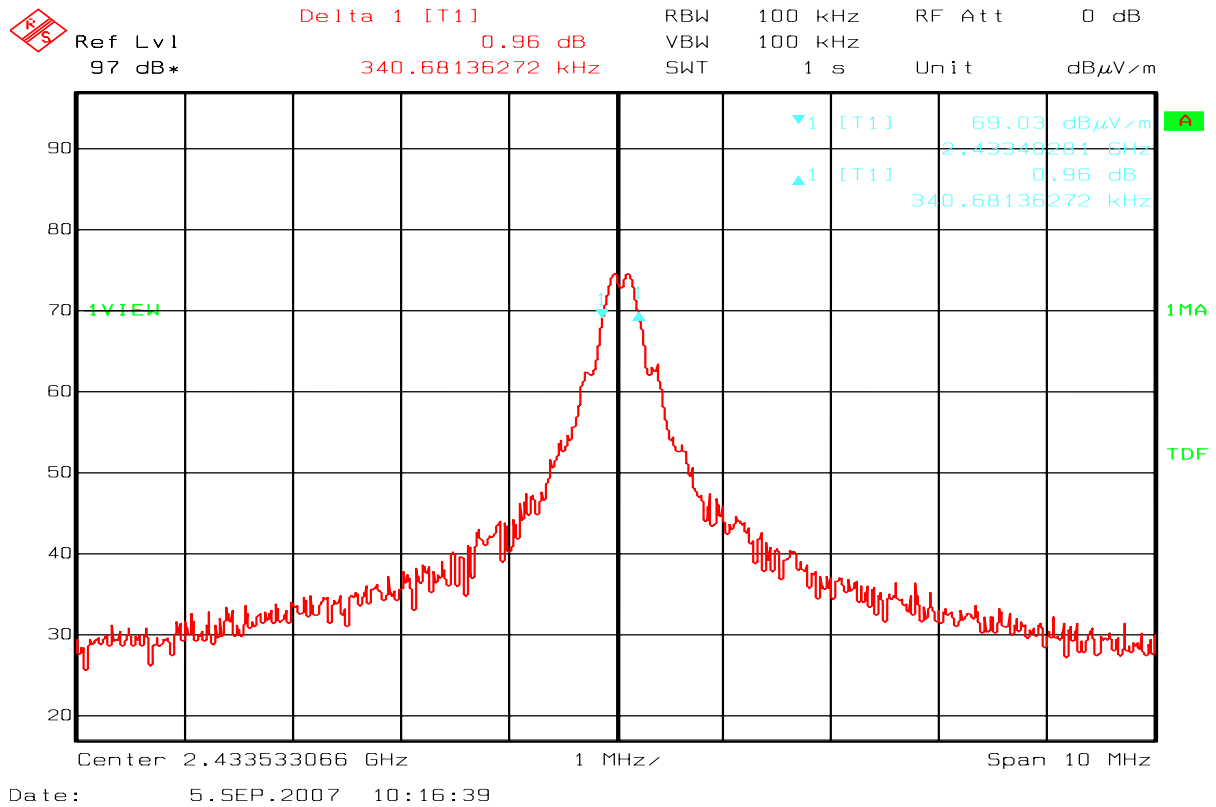
Date: 5.SEP.2007 10:10:24

LC7 (remote control)- Maximum field strength – 70.36 dB μ V/m - Vertical polarization

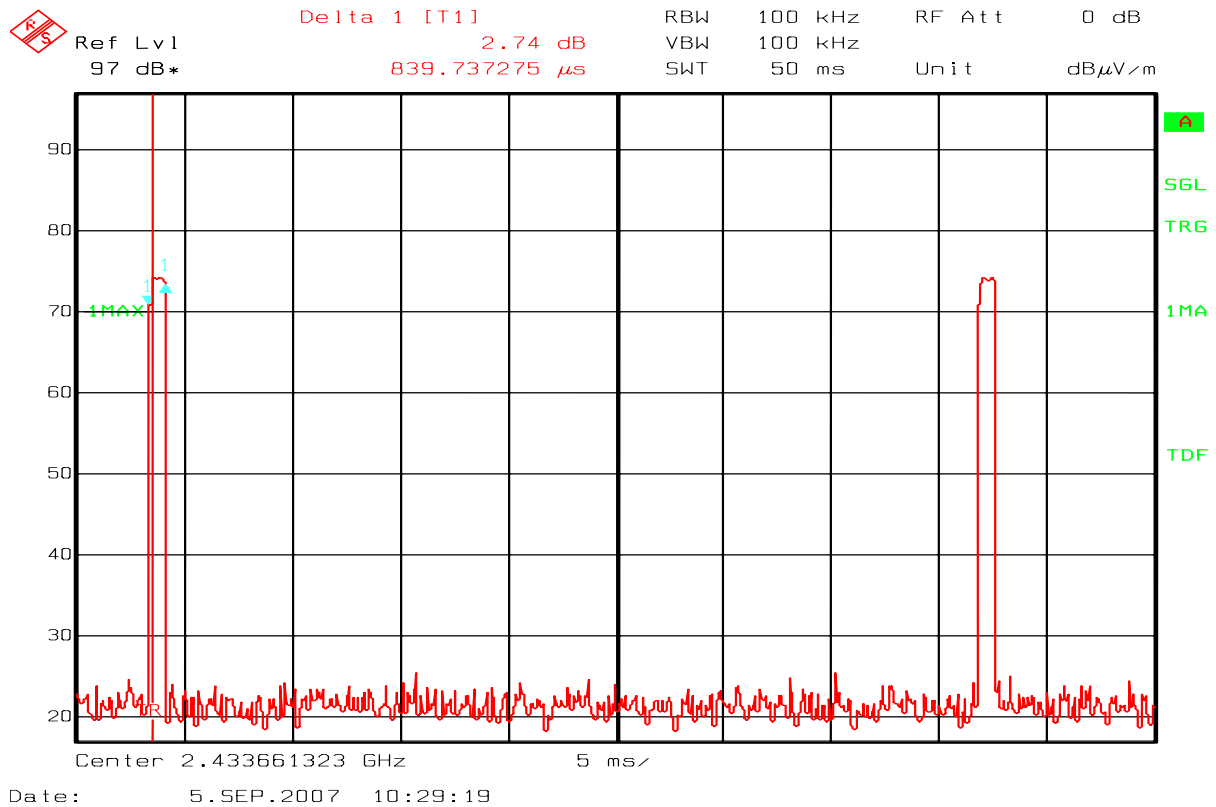


Date: 5.SEP.2007 9:55:47

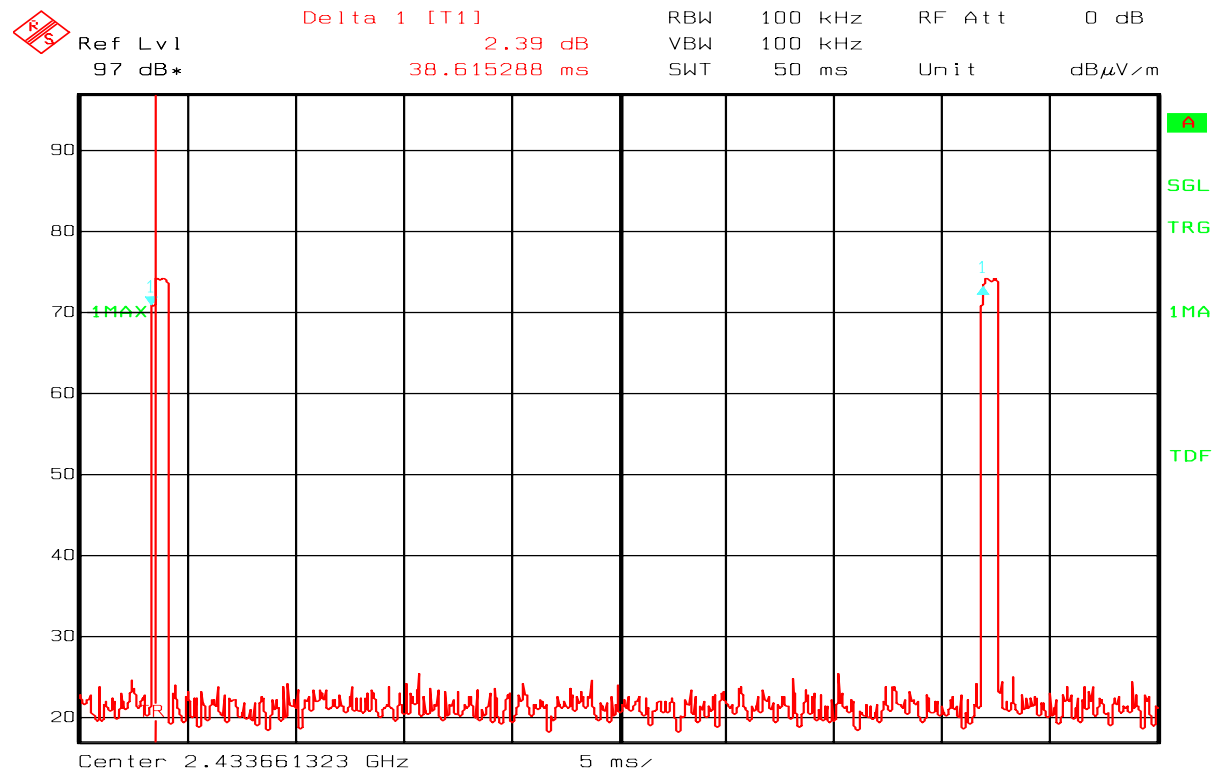
LC7 (Remote Control)- Maximum field strength – 73.93 dB μ V/m - Horizontal polarization



6 dB bandwidth



Duty cycle ON time



Date: 5.SEP.2007 10:29:57

Duty cycle ON+OFF time

Radiated emission 10 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see attached graph.

Limit is converted to 10 m using 40 dB/decade according to 15.31 (f) (2).

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05. Sep 07 14:55

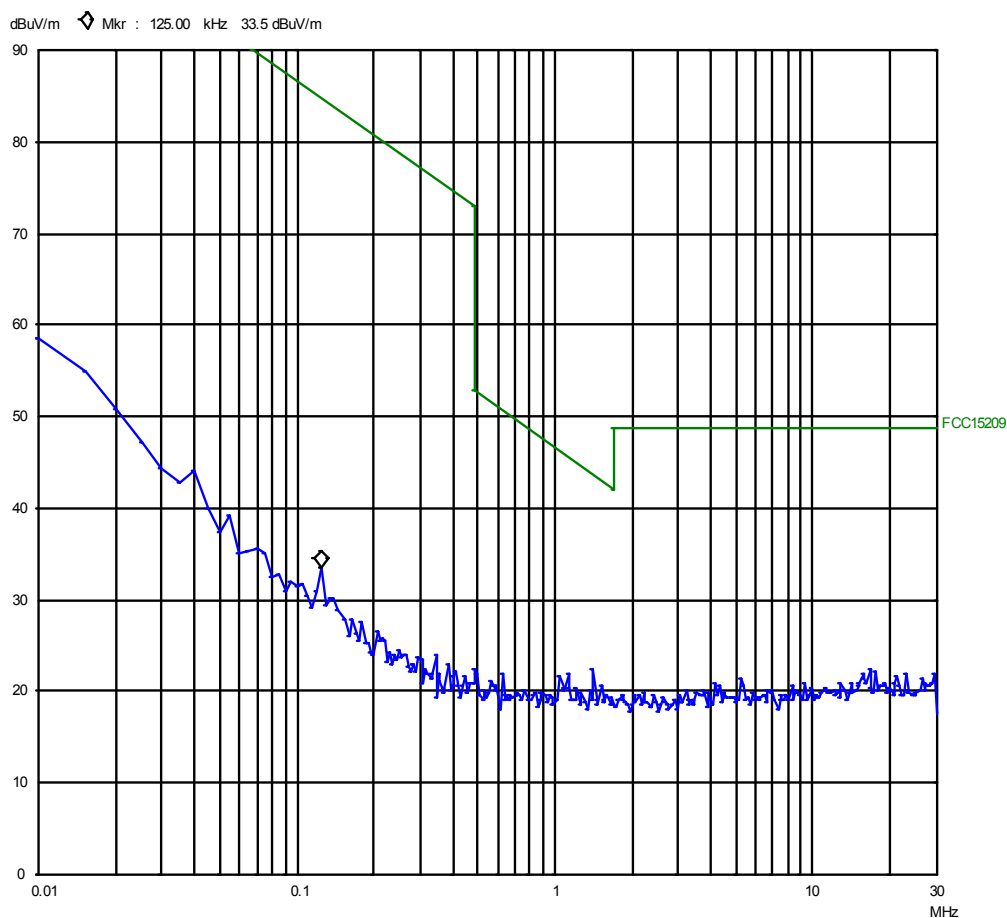
PK

Operator: gns
Comment: lc7 remote control
s3
fcc part 15

Scan Settings (1 Range)

Transmitter Settings			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
10k	30M	5k	1k	PK	50ms	0dB	LN OFF	60dB

Transducer No.	Start	Stop	Name
13	10k	30M	HFH2Z2



LC7 - 10 kHz – 30MHz –radiated emission - (TX/RX mode)

Measuring distance 3 m .
No component detected, see attached graphs.

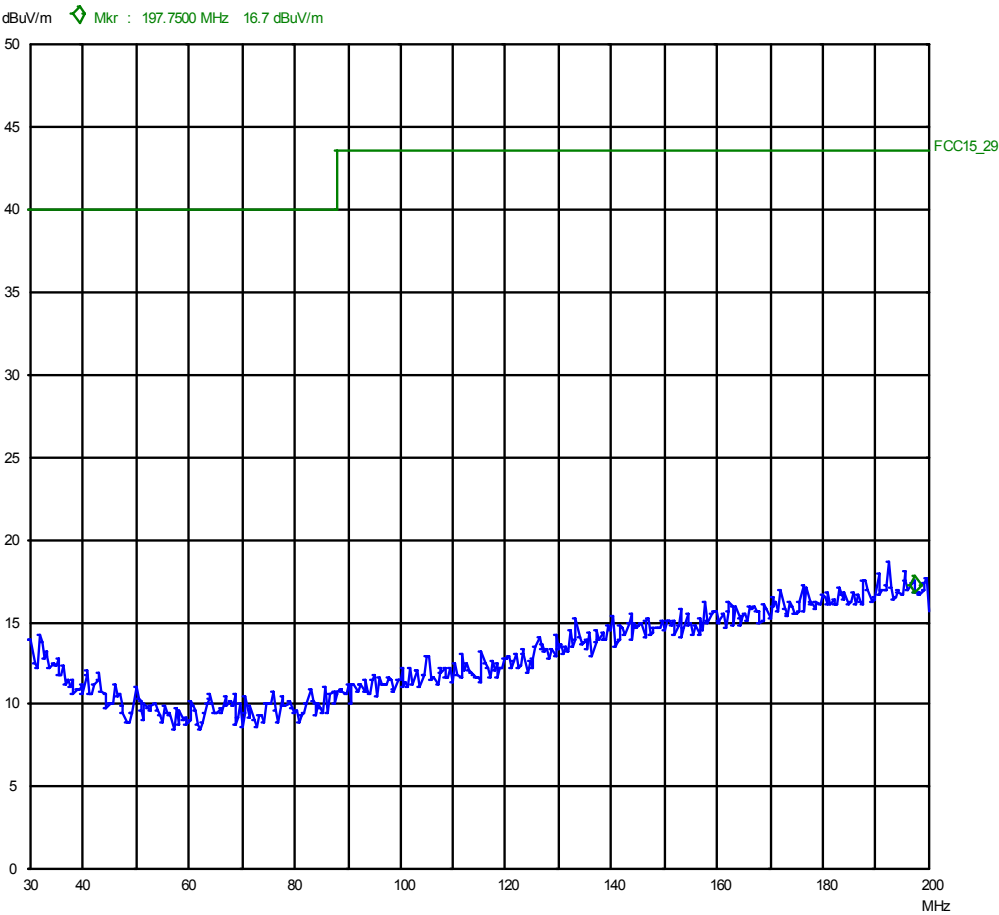
Nemko Comlab 05. Sep 07 12:29

pk

EUT: LC7(remote control)
Manuf: S3
Op Cond: 3m hp
Operator: gns
Test Spec: FCC part 15
Comment: tx mode

Scan Settings (1 Range)				Receiver Settings			
Frequencies							
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON 60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



TX/RX mode: LC7 - Radiated emission 30 –200MHz, Horizontal polarization

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05. Sep 07 12:24

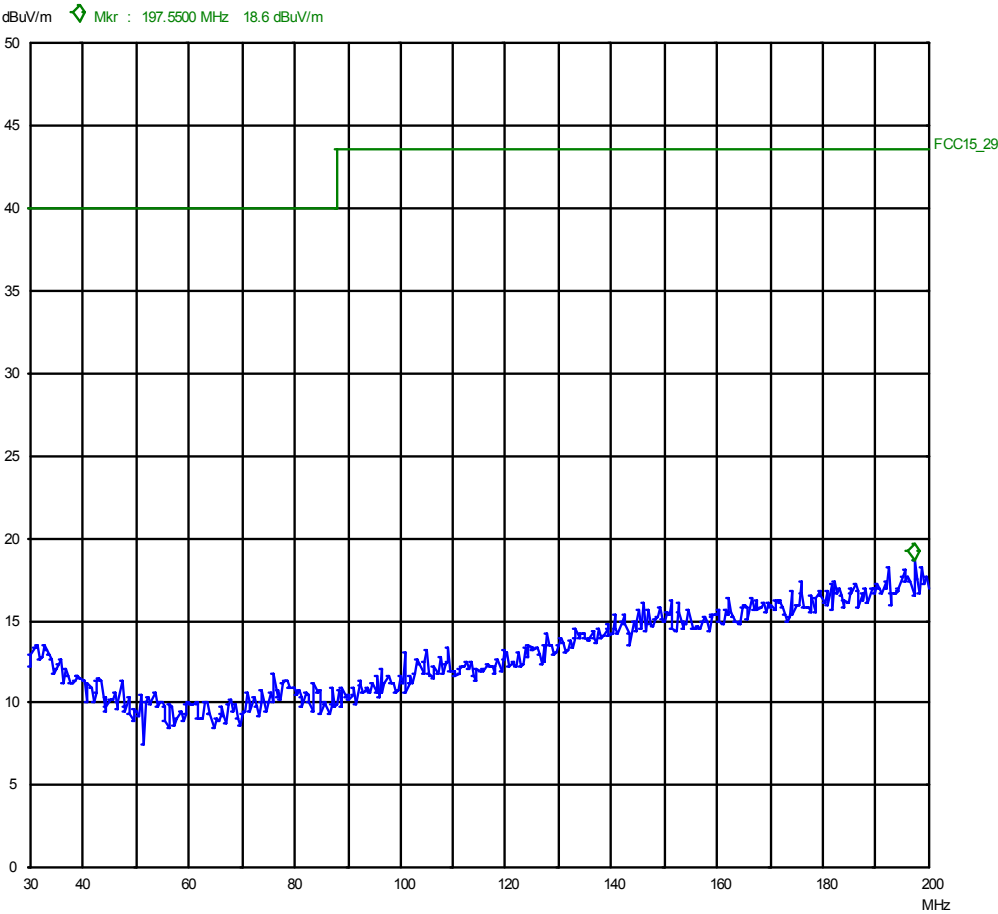
pk

EUT: LC7(remote control)
Manuf: S3
Op Cond: 3m vp
Operator: gns
Test Spec: FCC part 15
Comment: tx mode

Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON 60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



TX/RX mode: TC7 - Radiated emission 30 –200MHz, Vertical polarization

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05. Sep 07 12:54

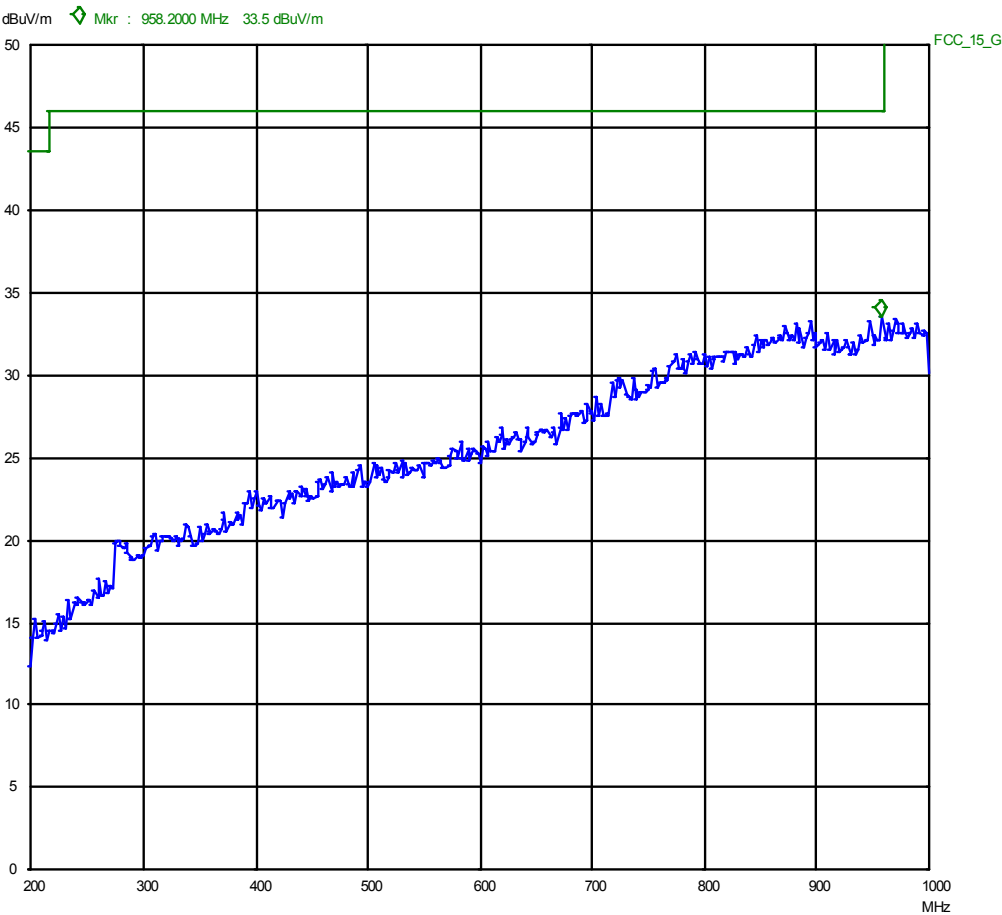
pk

EUT: LC7(remote control)
Manuf: S3
Op Cond: 3m hp
Operator: gns
Test Spec: FCC part 15
Comment: rx mode

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
200M	1000M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
21	200M	1000M	HL223



TX/RX mode: LC7 - Radiated emission 200 –1000 MHz, Horizontal polarization

Nemko Comlab

05. Sep 07 12:36

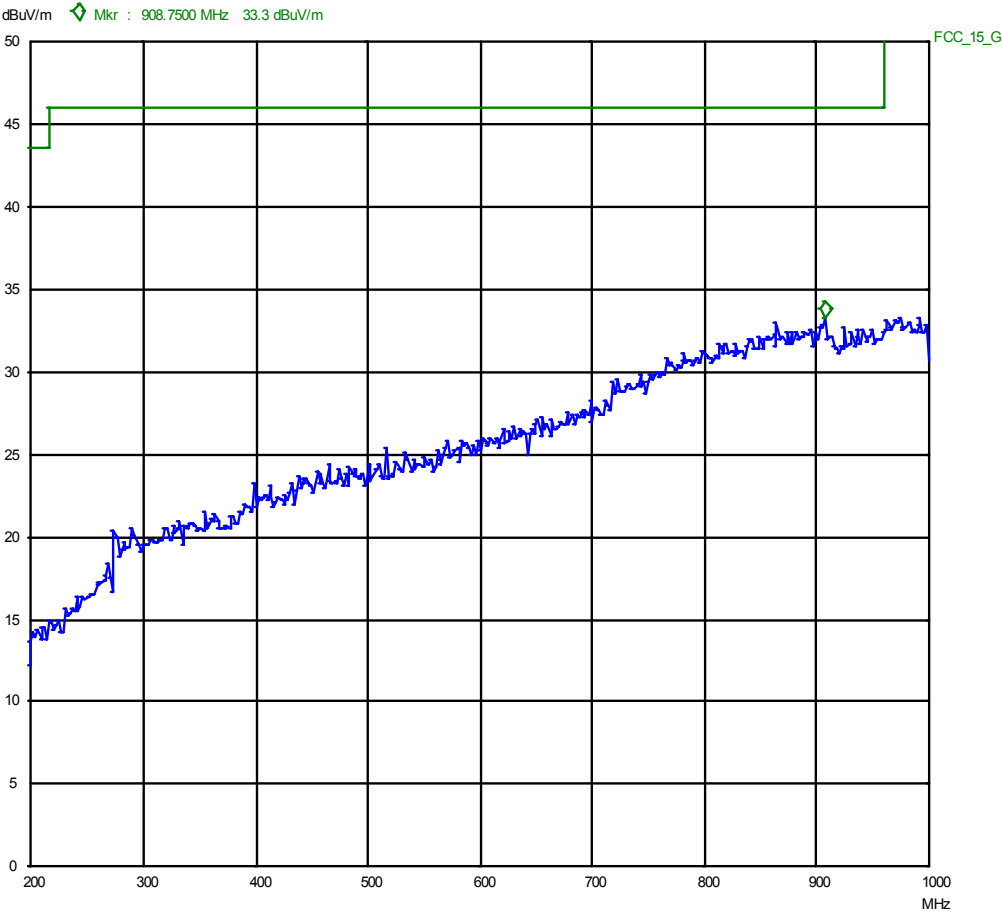
pk

EUT: LC7(remote control)
Manuf: S3
Op Cond: 3m hp
Operator: gns
Test Spec: FCC part 15
Comment: rx mode

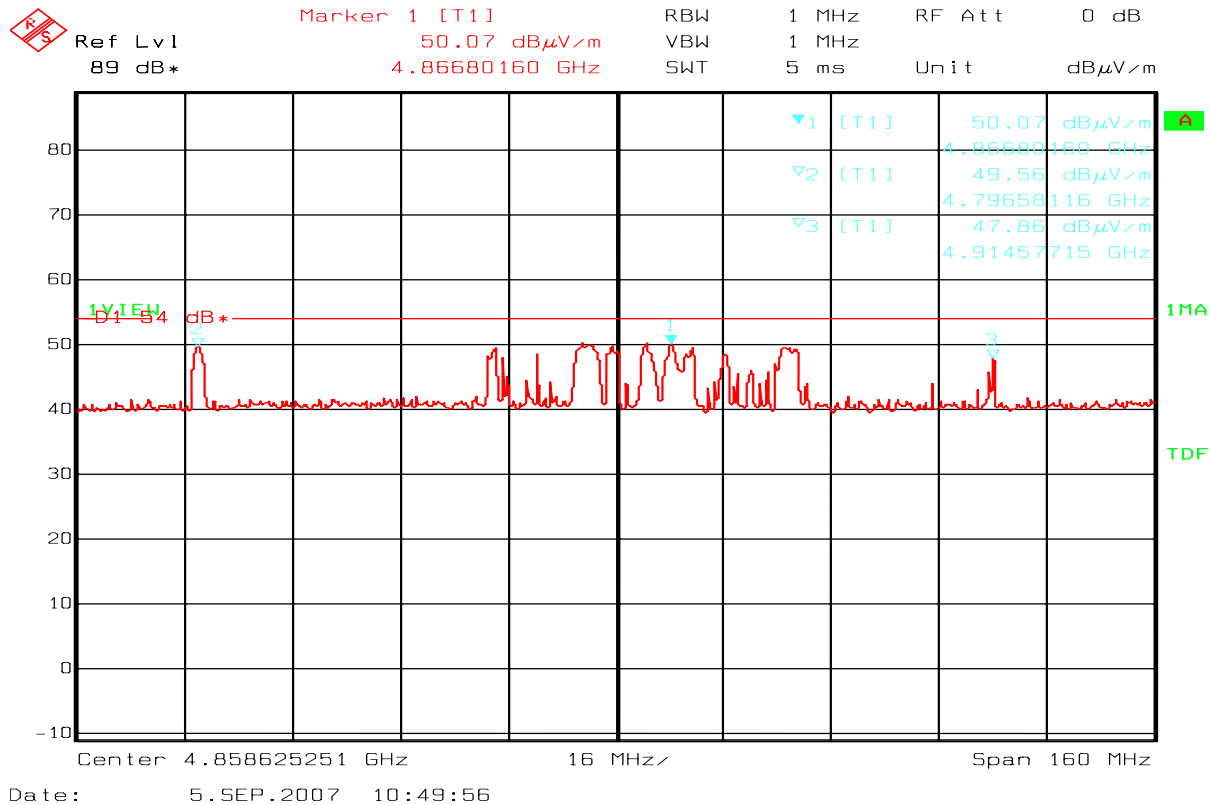
Scan Settings (1 Range)

----- Frequencies -----||----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
200M 1000M 50k 120k PK 50ms AUTO LN ON 60dB

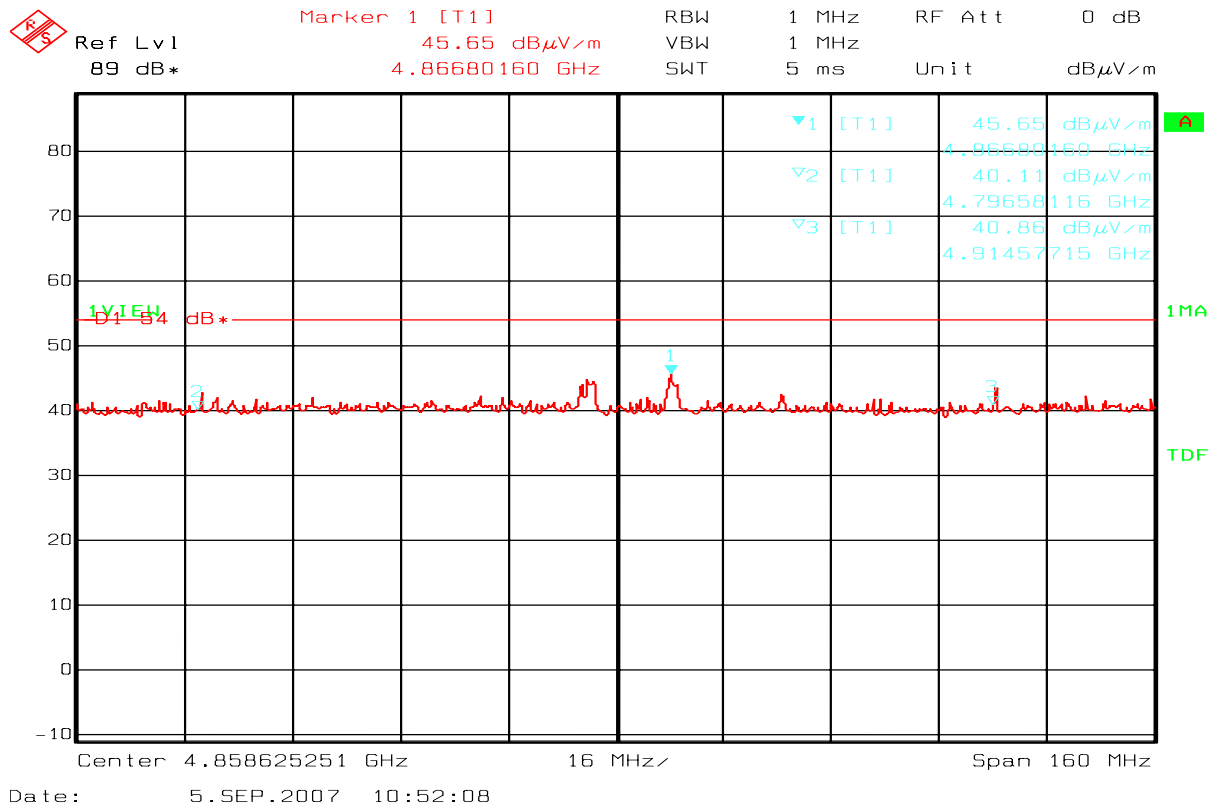
Transducer No. Start Stop Name
21 200M 1000M HL223



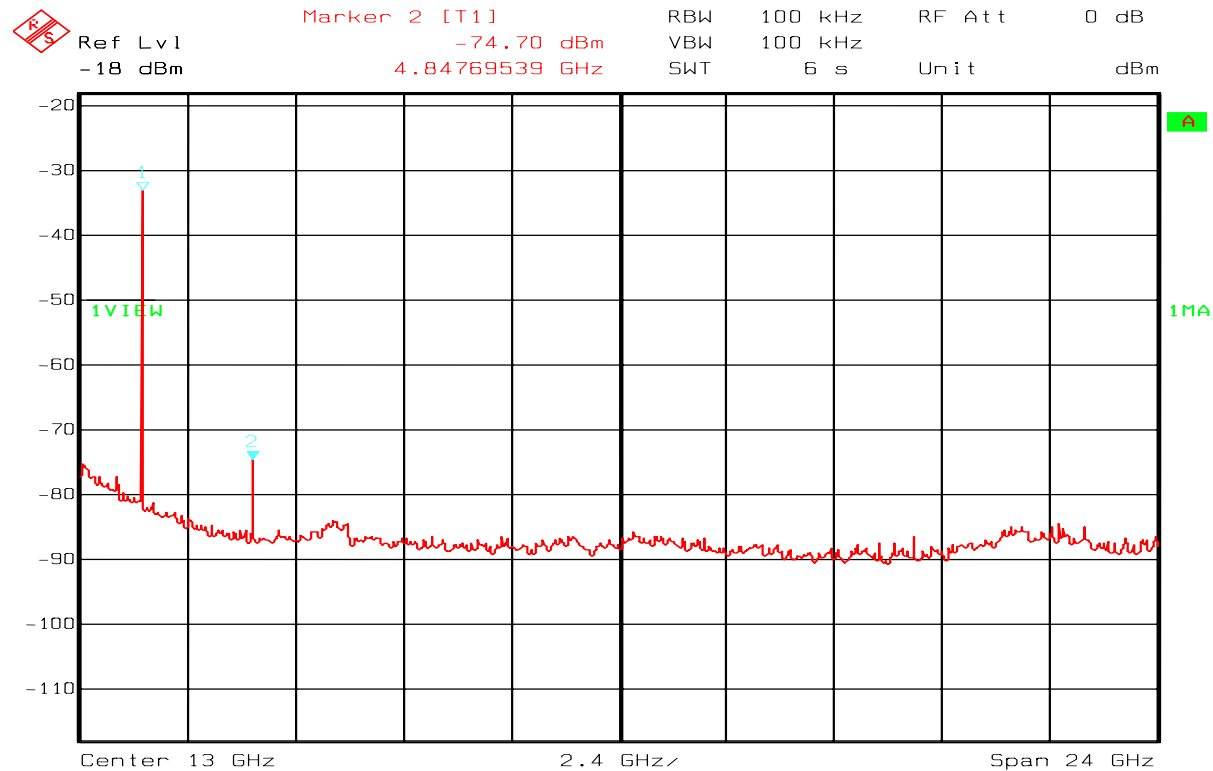
TX/RX mode: LC7 - Radiated emission 200 –1000 MHz, Vertical polarization



2nd harmonic – Vertical Polarization



2nd harmonic – Horizontal Polarization



Date: 5.SEP.2007 10:35:20

TX mode: Spurious scan 1 - 25 GHz (peak detector)

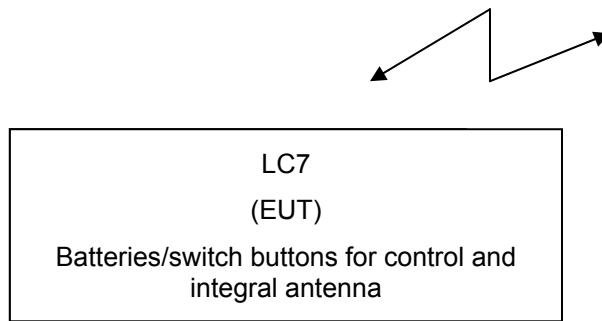
5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Instrument/ancillary	Type of instrument/ancillary	Manufacturer	Ref. no.
1	FSEK30	Spectrum Analyzer	Rohde & Schwarz	LR 1337
2	ESN	EMI Reciever	Rohde & Schwarz	LR 1237
3	3115	Antenna horn	EMCO	LR 1330
4	643	Antenna horn	Narda	LR 093
5	642	Antenna horn	Narda	LR 220
6	PM7320X	Antenna horn	Siverts lab	LR 103
7	DBF-520-20	Antenna horn	Systron Donner	LR 101
8	638	Antenna horn	Narda	LR 098
9	5VF1000/2000	BP filter	Trilithic	LR 1174
10	5VF2000/4000	BP filter	Texscan	LR 42
11	ESH3-Z3	LISN	Rohde & Schwarz	LR 1076
12	8449B	Amplifier	Hewlett Packard	LR 1322
13	-	Shielded room	ETS	LR 1410
14	HFH2-Z2	Antenna loop	Rohde and Schwarz	LR 285
15	10855A	Amplifier	Hewlett Packard	LR 1445
16	HL223	Antenna log.per	Rohde & Schwarz	LR 1261
17	HK116	Antenna biconic	Rohde & Schwarz	LR 1260
18	ESVS 30	Test Receiver	Rohde & Schwarz	LR 1101
19	R3271	Spectrum Analyser	Advantest	LR 1123

6 BLOCK DIAGRAM

6.1 System set up



LC7

6.2 Test Site Radiated Emission

