

**Nemko Comlab AS**

Office address: Gåsevikveien 8, Kjeller  
Postal address: P.O.Box 96, N-2027 Kjeller  
Telephone: +47 64 84 57 00  
Facsimile: +47 64 84 57 05  
E-mail: [post@comlab.no](mailto:post@comlab.no)  
<http://www.comlab.no>  
Enterprise no: NO 984 592 418 MVA

Pages : 32  
Total no. of sheets : 32

**Test report** : 04/720/3  
**Item tested** : 13192-SARD  
**Type of equipment** : Zigbee transceiver  
**FCC ID** : O2O13192-SARD  
**Client** : Digianswer A/S

**Tested according to :**

**FCC part 15.247**  
DTS Transmitter  
2405 - 2480 MHz

**Date of issue :** 16 July 2004

**Authorized by :** .....

  
for  
Kjell G. Haga  
Managing Director

  
Egil Hauger  
Technical Supervisor

The results detailed in this test report applies only to the particular sample(s) tested and with configuration(s) as implemented during testing. This test report shall not be reproduced, except in full, without the written approval of Nemko Comlab AS.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Comlab AS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

## CONTENTS

|     |                                                           |    |
|-----|-----------------------------------------------------------|----|
| 1   | GENERAL INFORMATION.....                                  | 3  |
| 1.1 | Test house Info .....                                     | 3  |
| 1.2 | Client Information .....                                  | 3  |
| 1.3 | Manufacturer .....                                        | 3  |
| 2   | Test Information .....                                    | 4  |
| 2.1 | Tested Item .....                                         | 4  |
| 2.2 | Test Environment .....                                    | 4  |
| 2.3 | Test Period .....                                         | 4  |
| 3   | TEST REPORT SUMMARY .....                                 | 5  |
| 3.1 | General .....                                             | 5  |
| 3.2 | Test Summary .....                                        | 6  |
| 3.3 | Description of modification for Modification Filing ..... | 6  |
| 3.4 | Comments .....                                            | 6  |
| 3.5 | Family List Rational .....                                | 6  |
| 4   | TEST RESULTS .....                                        | 7  |
| 4.1 | Power line Conducted Emissions .....                      | 7  |
| 4.2 | Bandwidth .....                                           | 12 |
| 4.3 | Peak Power Output .....                                   | 15 |
| 4.4 | Out-of-band emissions (Radiated) .....                    | 18 |
| 4.5 | Power Spectral Density (PSD) .....                        | 29 |
|     | LIST OF TEST EQUIPMENT .....                              | 30 |
| 5   | BLOCK DIAGRAM .....                                       | 31 |
| 5.1 | System set up .....                                       | 31 |
| 5.2 | Power line Conducted Emission .....                       | 31 |
| 5.3 | Test Site Radiated Emission and peak power output .....   | 32 |

## **1 GENERAL INFORMATION**

### **1.1 Test house Info**

Name : Nemko Comlab AS  
Address : Gåsevikveien 8, Box 96  
N-2027 Kjeller, NORWAY  
Telephone : +47 64 84 57 00  
Fax : +47 64 84 57 05  
E-mail: <mailto:post@comlab.no>  
Managing Director: Kjell G. Haga  
FCC test firm registration number : 994405  
Industry Canada OATS registration number : 4443

### **1.2 Client Information**

Name : Digianswer A/S  
Address : Skalhuse 5, 9240 Nibe, Denmark  
Telephone : +45 967 10 000  
Fax : +45 983 50 052

**Contact:**

Name : Johnny Jonassen  
Telephone : +45 967 12 153  
E-mail : [jjonas1@freescale.com](mailto:jjonas1@freescale.com)

### **1.3 Manufacturer**

Name : Digianswer A/S  
Address : Skalhuse 5, 9240 Nibe, Denmark  
Telephone : +45 967 10 000  
Fax : +45 983 50 052

## 2 Test Information

### 2.1 Tested Item

|                                    |                            |
|------------------------------------|----------------------------|
| Name :                             | 13192-SARD                 |
| FCC ID :                           | O2O13192-SARD              |
| Model/version :                    | DIG536-2                   |
| Serial number :                    | Marked on PCB "13192-SARD" |
| Hardware identity and/or version:  | 80000536000_R0201          |
| Software identity and/or version : | PTC Demo ver.0.99          |
| Frequency Range :                  | 2405 - 2480 MHz            |
| Tunable Bands :                    | 1                          |
| Number of Channels :               | 16 <sup>1</sup>            |
| Modulation :                       | 0-QPSK                     |
| Emissions Designator :             | G1D                        |
| User Frequency Adjustment :        | None, Software controlled. |
| Rated Output Power :               | 10 mW                      |

1) 16 channels in use.

#### Theory of Operation

The 13192-SARD is a "Zigbee" low data rate wireless device according to IEEE 802.15.4, with 5MHz channel bandwidth.

### 2.2 Test Environment

#### 2.2.1 Normal test condition

|                      |            |
|----------------------|------------|
| Temperature:         | 20 - 23 °C |
| Relative humidity:   | 29 - 50 %  |
| Normal test voltage: | 9.0 V DC   |

The values are the limit registered during the test period.

### 2.3 Test Period

|                     |                               |
|---------------------|-------------------------------|
| Item received date: | 2004-07-02                    |
| Test period :       | from 2004-07-06 to 2004-07-07 |

### 3 TEST REPORT SUMMARY

#### 3.1 General

Manufacturer: Digianswer A/S  
Model No.: 13192-SARD  
Serial No.: Marked on PCB "13192-SARD"

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC §15.247 for Digital Modulation devices. Radiated tests were conducted in accordance with ANSI C63.4-1992.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3 and 10 meters.

|                                                     |                                                     |
|-----------------------------------------------------|-----------------------------------------------------|
| <input checked="" type="checkbox"/> New Submission  | <input checked="" type="checkbox"/> Production Unit |
| <input type="checkbox"/> Class II Permissive Change | <input type="checkbox"/> Pre-production Unit        |
| <b>DTS</b> Equipment Code                           | <input type="checkbox"/> Family Listing             |

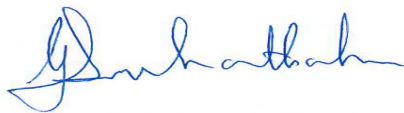
**THIS TEST REPORT RELATES ONLY TO THE ITEM (S) TESTED.**

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

**COMLAB**

**NEMKO COMLAB REF: 04/720/3**

TESTED BY:



G.Suhanthakumar, Test engineer

DATE: **16 July 2004**

Nemko Comlab AS authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Comlab AS accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

### 3.2 Test Summary

| Name of test                                   | Paragraph #  | Result           |
|------------------------------------------------|--------------|------------------|
| Supply voltage variations                      | 15.31 (e)    | Complied         |
| Number of operating frequencies                | 15.31 (m)    | Complied         |
| Conducted Emission (Receiver)                  | 15.107(a)    | ref. 15.207(a)   |
| Radiated Emission limits (receiver)            | 15.109(a)    | ref. 15.209(a)   |
| Antenna requirement                            | 15.203       | Complied         |
| Radiated emissions limits for restricted bands | 15.205(a)    | Complied         |
| Power line Conducted Emission                  | 15.207(a)    | Complied         |
| Radiated emission limits                       | 15.209(a)    | Complied         |
| Bandwidth                                      | 15.247(a)(2) | Complied         |
| Peak Power Output                              | 15.247(b)(3) | Complied         |
| Power Spectral Density                         | 15.247(d)    | Complied         |
| Out-of-band emissions (Antenna Conducted)      | 15.247(c)    | N/A <sup>1</sup> |
| Out-of-band emissions (Radiated)               | 15.247(c)    | Complied         |

<sup>1</sup> The tested equipment has integrated antennas only.

### 3.3 Description of modification for Modification Filing

Not Applicable.

### 3.4 Comments

The channels are selected with a laptop PC connected to the EUT. The laptop and the software for communication/test mode is delivered for testing by the manufacturer. The laptop is only used for selection of channels. The measurements are performed at channels near top ch 11, near middle ch 19 and near bottom ch 26. And the output level is set to maximum in the software (code 00FF)The EUT complies at these channels.

The measurements are done with battery (DC power ) and AC adapter. All ports were populated during spurious emissions measurements.

### 3.5 Family List Rational

None.

## 4 TEST RESULTS

### 4.1 Power line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: G.Suwanthakumar

Date of Test: 07 July 2004

Measurement procedure: CISPR 22 1997 Clause 5.1 Class B ITE using 50  $\mu$ H/50 ohms LISN.

Test Results: **Complies.**

Measurement Data: **See attached graph, (Peak detector).**

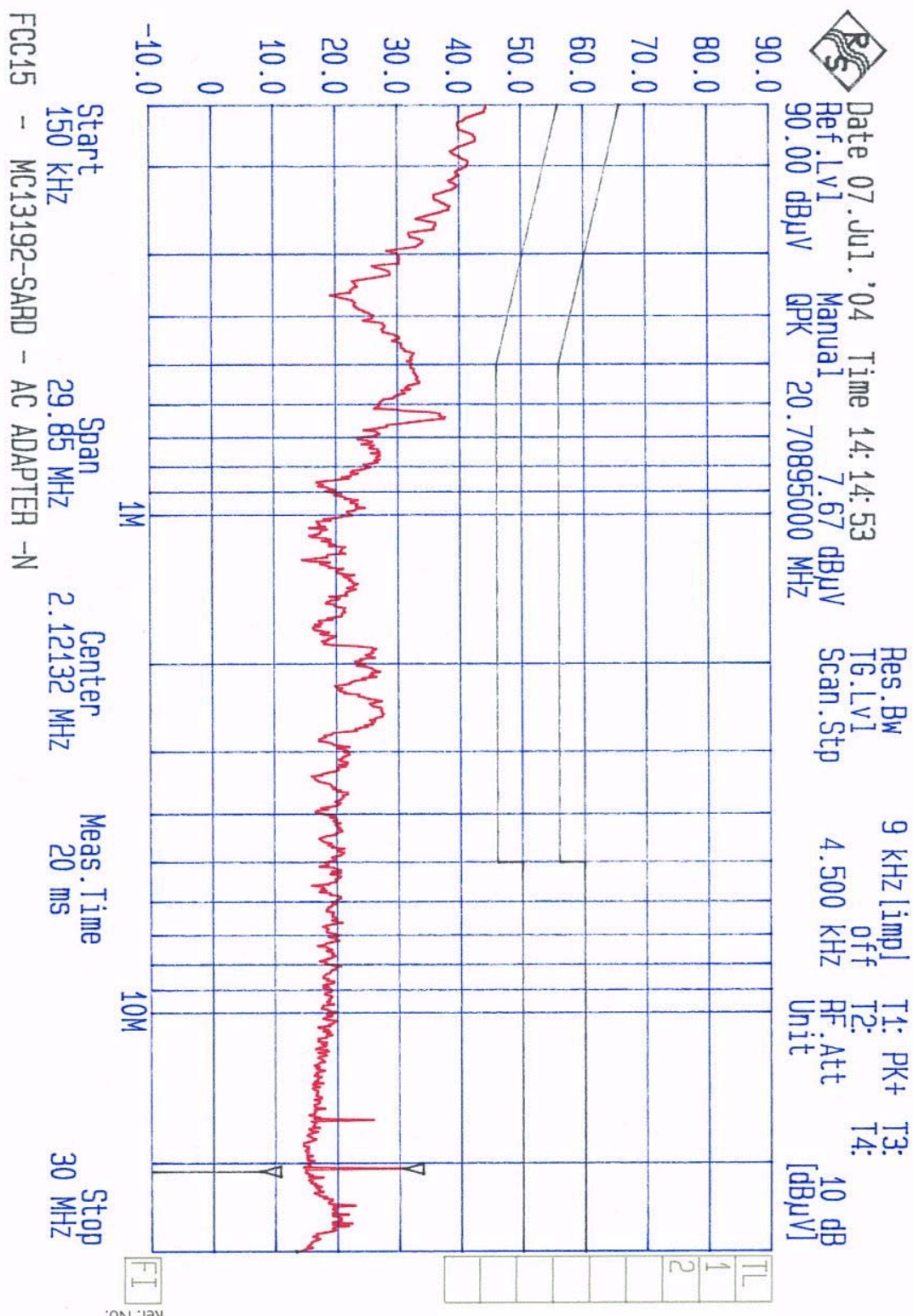
Highest measured value: for AC adapter

| Frequency | Line     | Detector   | Measured value            | Limit                     | Margin      |
|-----------|----------|------------|---------------------------|---------------------------|-------------|
| MHz       | L1/<br>N | Peak/QP/AV | $\text{dB}_{\mu\text{V}}$ | $\text{dB}_{\mu\text{V}}$ | $\text{dB}$ |
| 0.63457   | L1       | QP         | 32,03                     | 56                        |             |
| 0.63457   | L1       | AV         | 31,05                     | 46                        |             |
| 2,056     | L1       | QP         | 21,89                     | 56                        |             |
| 2.056     | L1       | AV         | 21,45                     | 46                        |             |
| 2,53      | L1       | QP         | 21,89                     | 60                        |             |
| 2,53      | L1       | AV         | 21.00                     | 50                        |             |
| 26,6      | L1       | QP         | 11,53                     | 60                        |             |
| 26,6      | L1       | AV         | 11,20                     | 50                        |             |
| 20.461    | N        | QP         | 7,72                      | 60                        |             |
| 20,461    | N        | AV         | 7,70                      | 50                        |             |

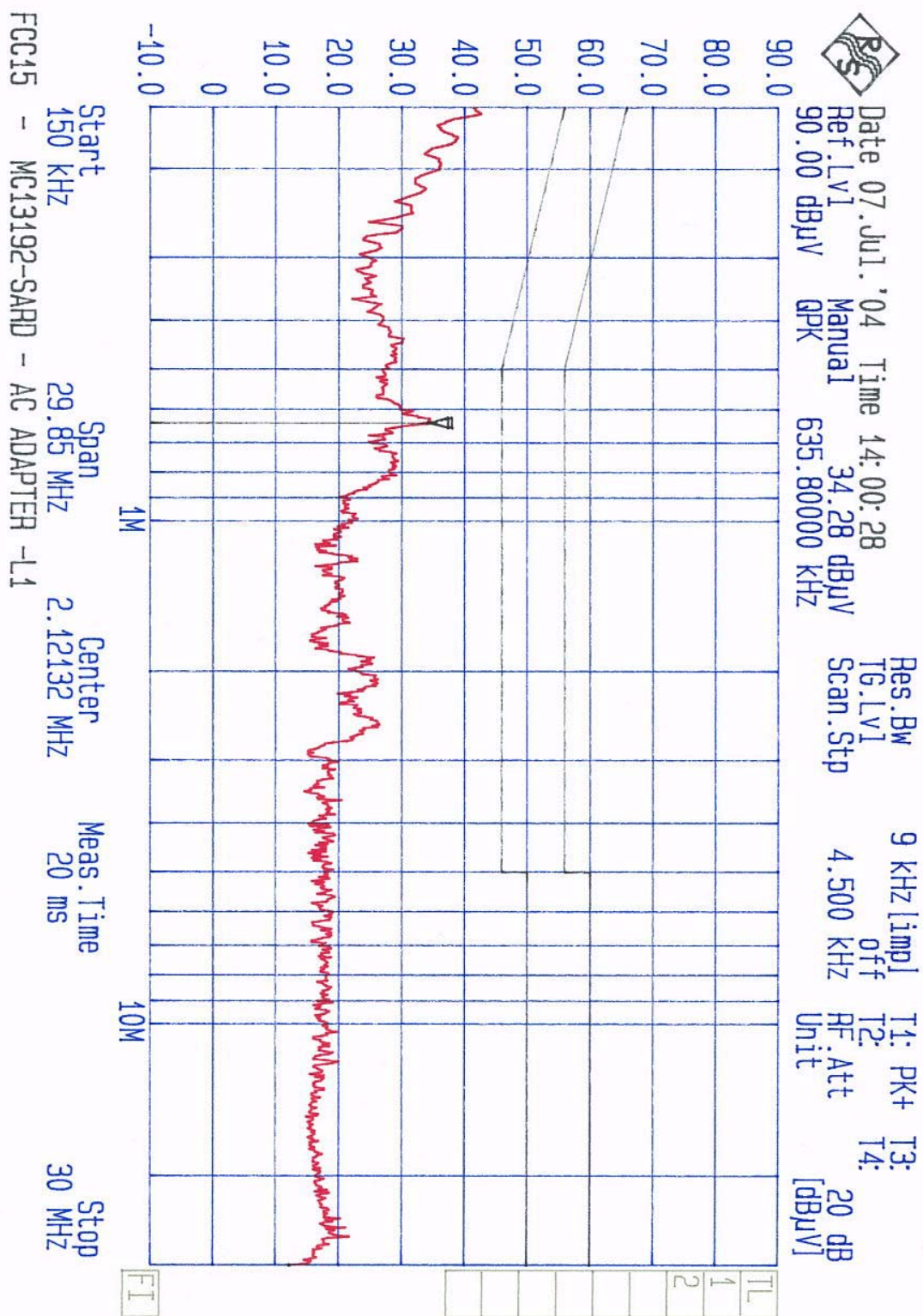
Highest measured value: for external DC power supply

| Frequency | Line     | Detector   | Measured value            | Limit                     | Margin      |
|-----------|----------|------------|---------------------------|---------------------------|-------------|
| MHz       | L1/<br>N | Peak/QP/AV | $\text{dB}_{\mu\text{V}}$ | $\text{dB}_{\mu\text{V}}$ | $\text{dB}$ |
| 0.236     | N        | QP         | 27.38                     | 56                        |             |
| 0.236     | N        | AV         | 26.40                     | 46                        |             |

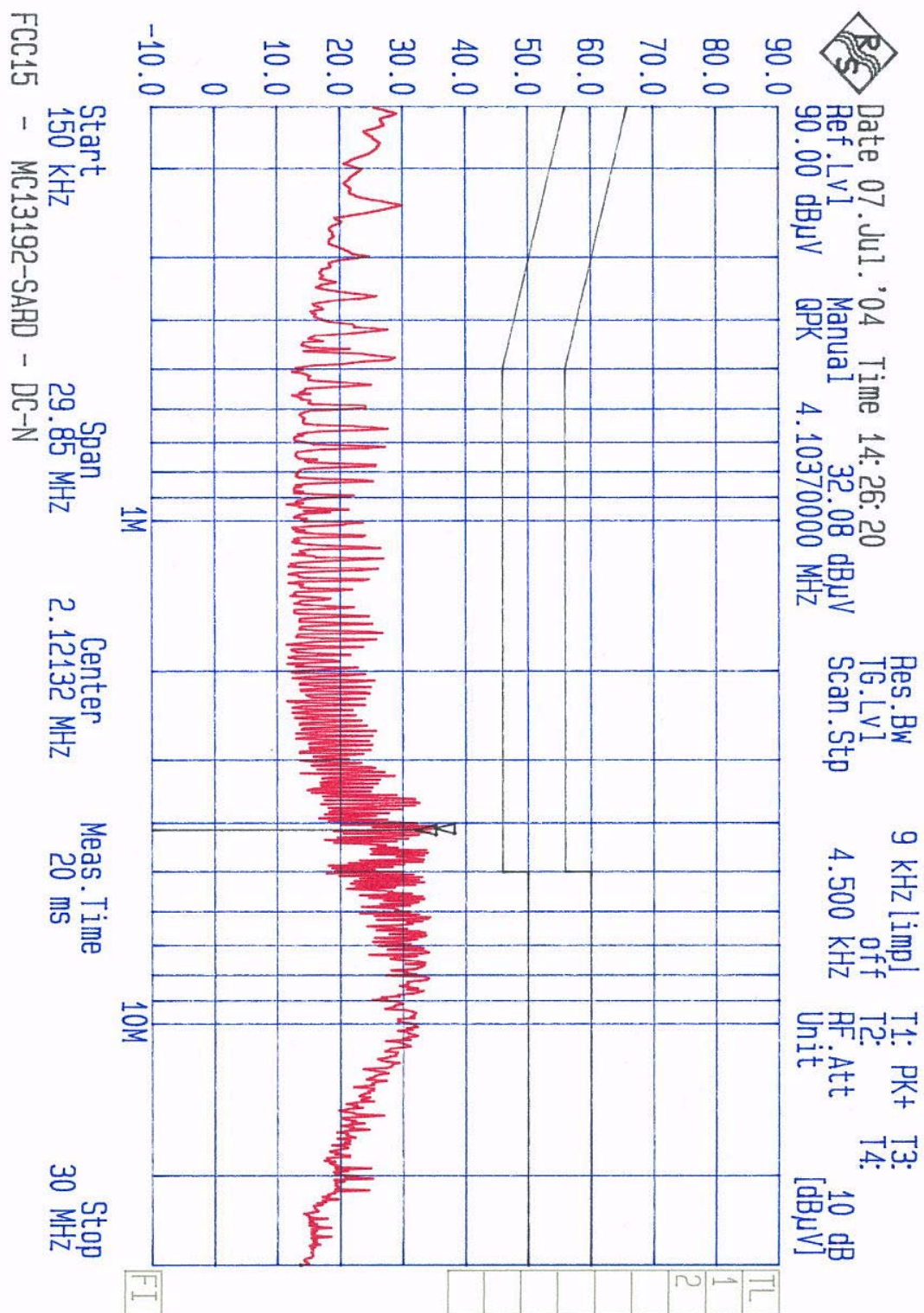
Test equipments used: 2, 4 & 16



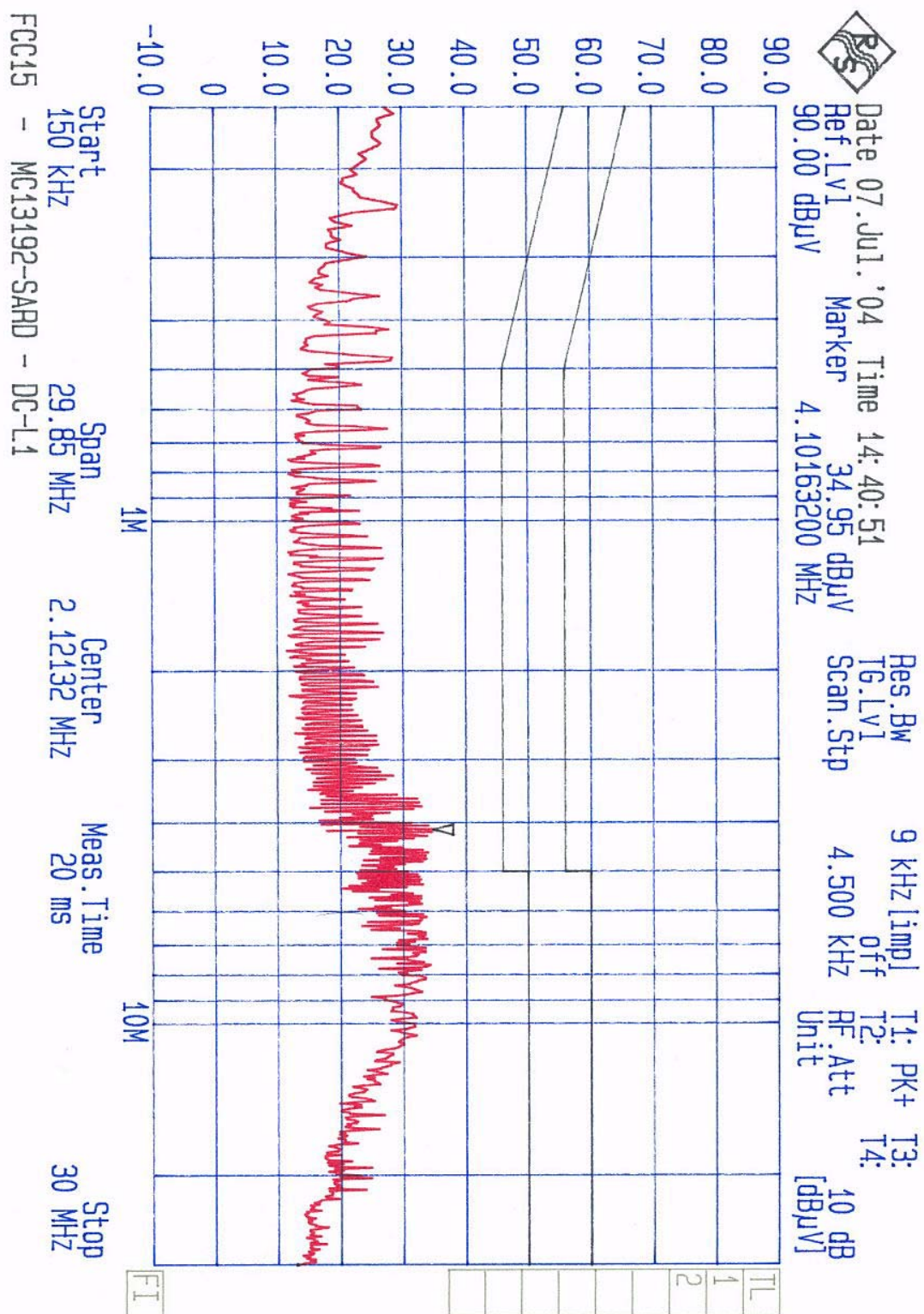
AC adapter, phase N



AC adapter, phase L1



DC power supply, phase N



DC power supply, Phase L1

## 4.2 Bandwidth

Para. No.: 15.247 (a)(2)

Test Performed By: G.Suhandhakumar

Date of Test: 07. July 2004

Test Results: Complies

Measurement Data:

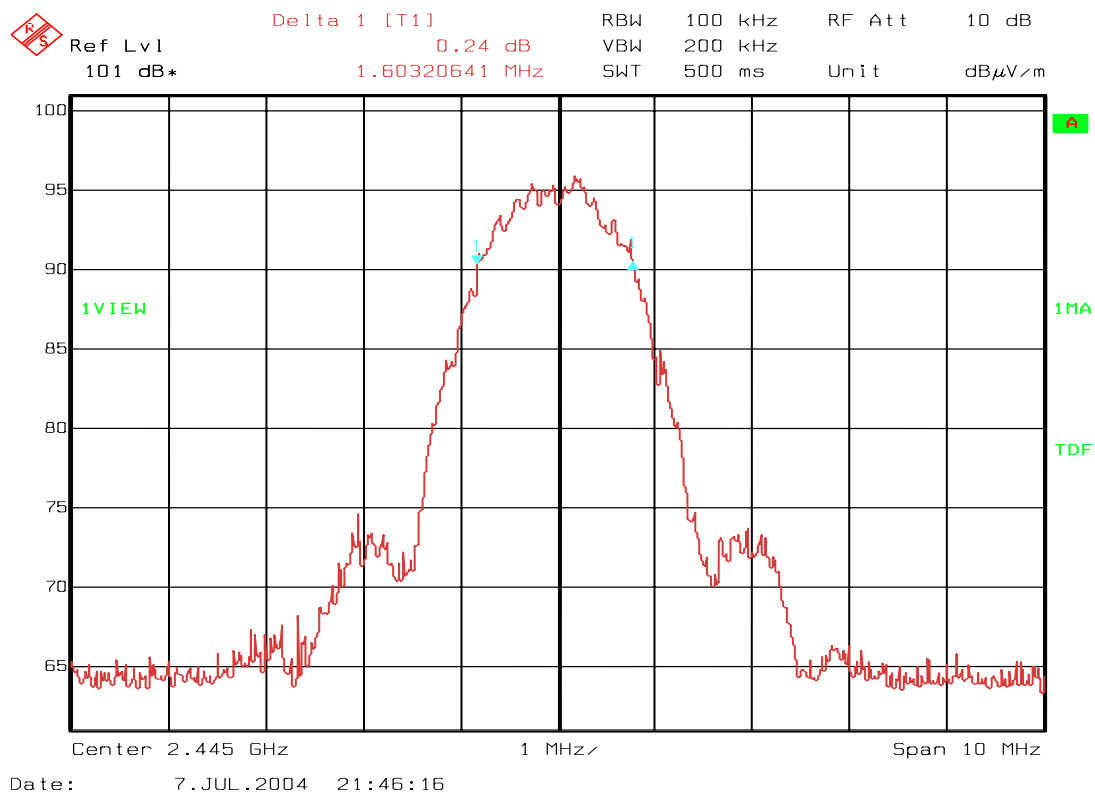
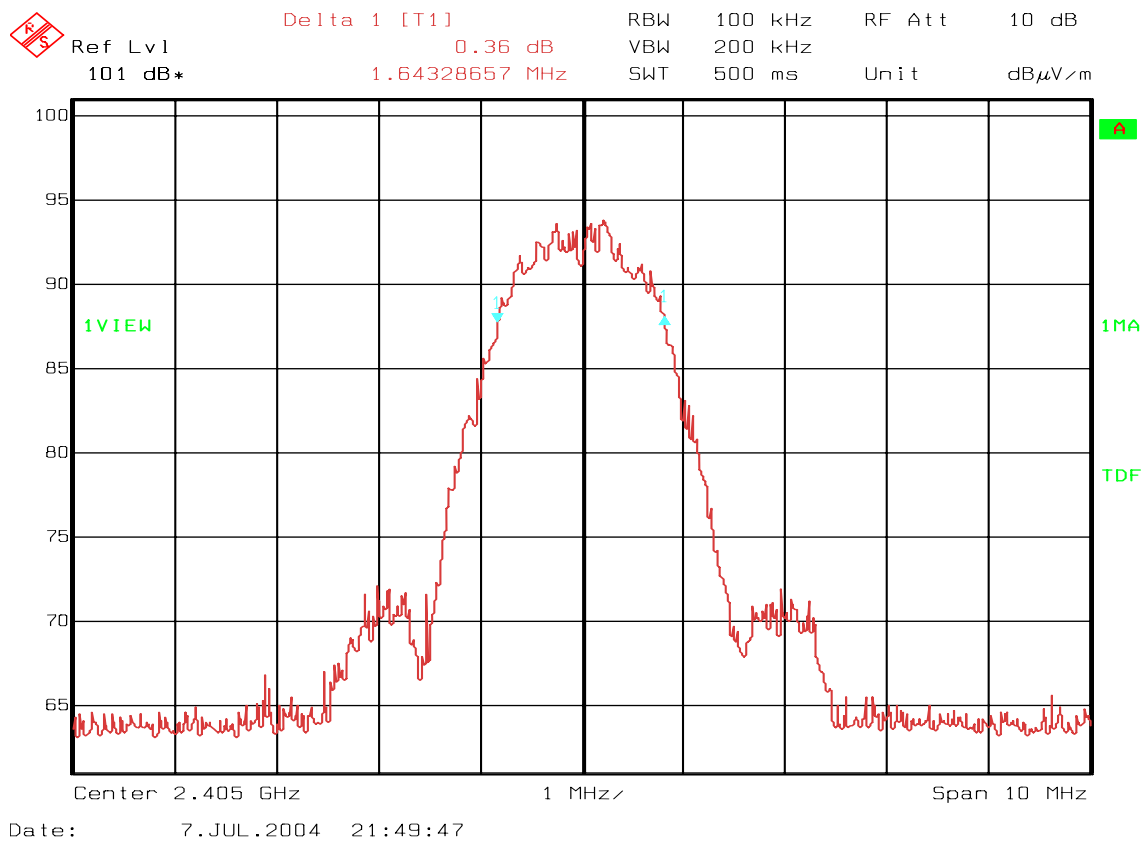
| 6 dB Bandwidth (MHz) |       |       |
|----------------------|-------|-------|
| Ch 11                | Ch 19 | Ch 26 |
| 1.64                 | 1.60  | 1.68  |

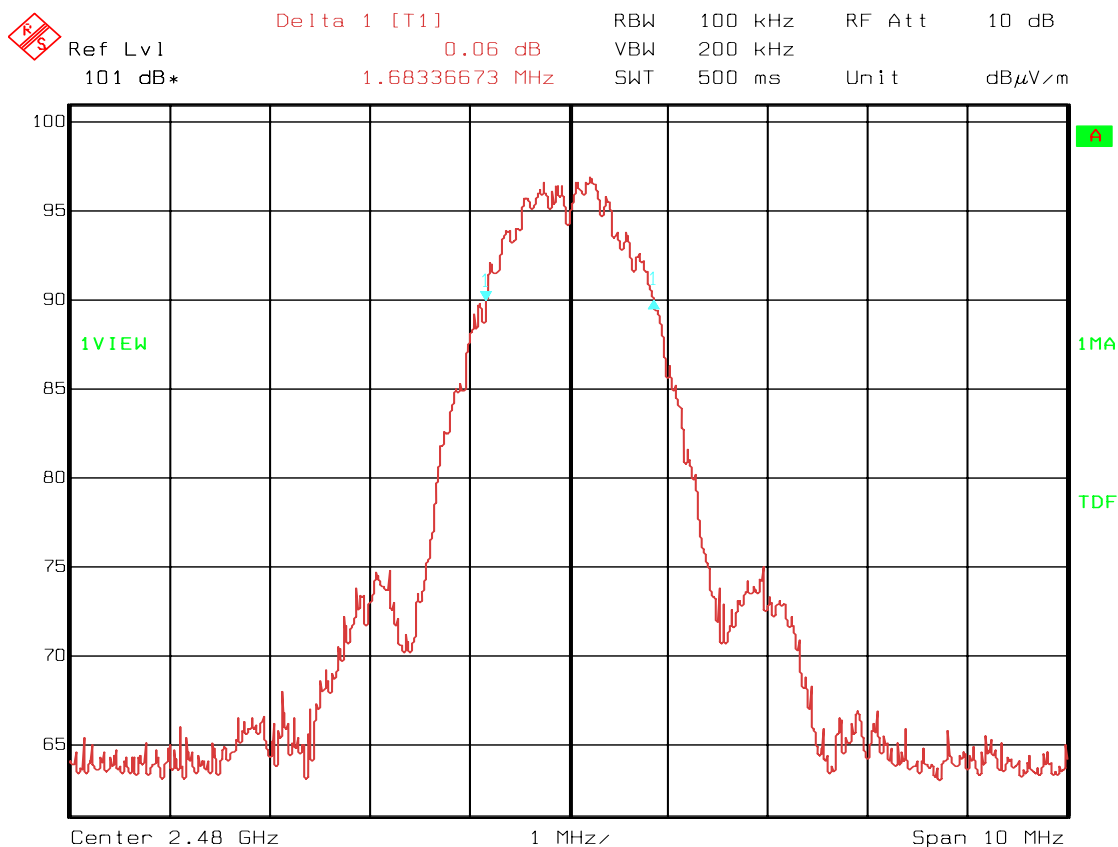
Power supply variation within 85 % to 115% of nominal value has no influence on measured value.

### Requirements:

The minimum 6 dB bandwidth shall be at least 500 KHz.

Test equipments used: 1, 3, 12 & 19





Date: 7.JUL.2004 21:43:57

Ch 26, 6 dB bandwidth - 1.68 MHz

### 4.3 Peak Power Output

Para. No.: 15.247 (b)(3)

Test Performed By: G.Suethakumar

Date of Test: 07. July 2004

Rated output power level (maximum) 10 mW (10 dBm)

| Calculated Transmitter Power , EIRP (mW) |       |       |
|------------------------------------------|-------|-------|
| Ch 11                                    | Ch 19 | Ch 26 |
| 6.3                                      | 10.1  | 16.3  |

#### Test Results: Passed.

Power supply variation within 85 % to 115% of nominal value has no influence on Peak output power.

#### Measurement Data:

The maximum field strength of fundamental, RBW=10MHz, Ch 11 : 103.23dB $\mu$ V/m

The maximum field strength of fundamental, RBW=5MHz, Ch 19 : 105.24 dB $\mu$ V/m

The maximum field strength of fundamental, RBW=5MHz, Ch 26 : 107.35 dB $\mu$ V/m

#### Calculated Data:

- The maximum field strength of fundamental in V/m ( $10^{((103.23)/20)} \times 1^{-6}$ ) Ch11: 0.145V/m
- The maximum field strength of fundamental in V/m ( $10^{((105.24)/20)} \times 1^{-6}$ ) Ch19: 0.183V/m
- The maximum field strength of fundamental in V/m ( $10^{((107.35)/20)} \times 1^{-6}$ ) Ch26: 0.233V/m

Calculated maximum EIRP using free field formula:

- Ch11: P(EIRP) watts:  $(3 \times 0.145)^2 / 30 = 6.3$  mW
- Ch19: P(EIRP) watts:  $(3 \times 0.183)^2 / 30 = 10.1$  mW
- Ch26: P(EIRP) watts:  $(3 \times 0.233)^2 / 30 = 16.3$  mW

The maximum power is obtained at Horizontal polarization and measured at 3 meters.

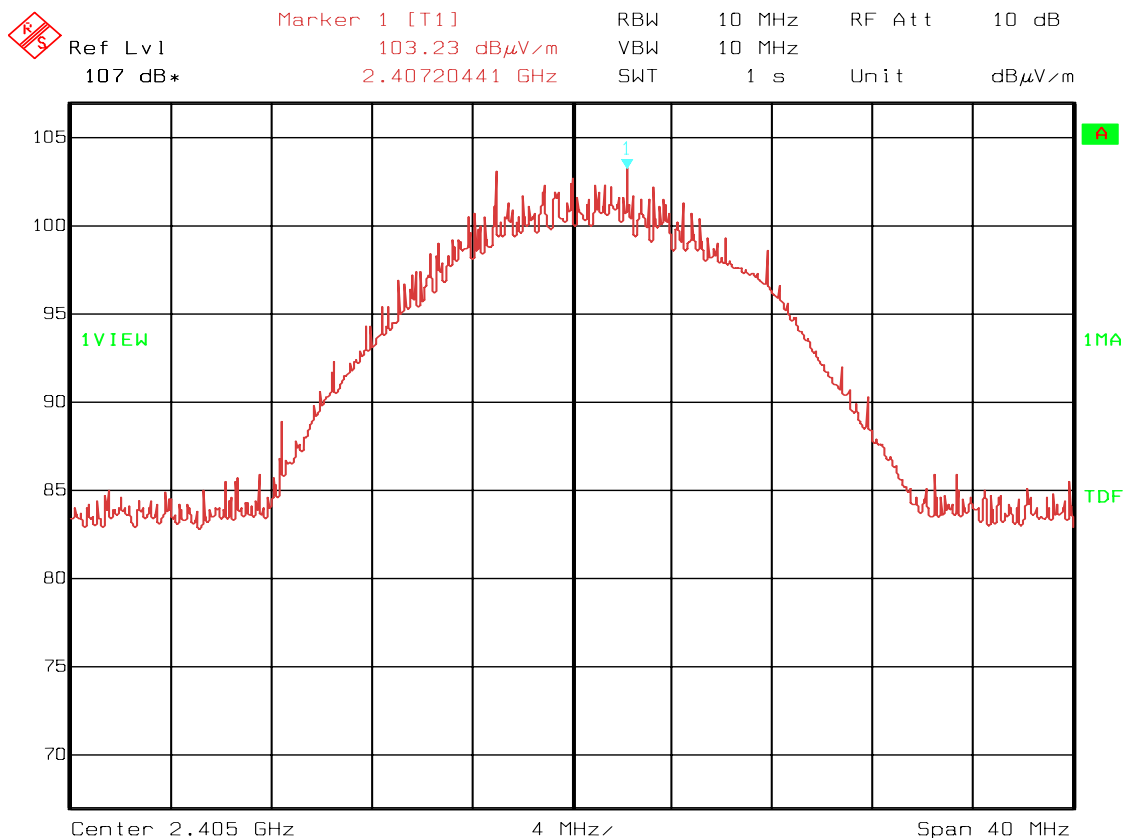
The antenna gain of the measurement antenna and cable loss have been taken into consideration.

#### Requirements:

The maximum peak output power for DS systems shall not exceed the following limits:

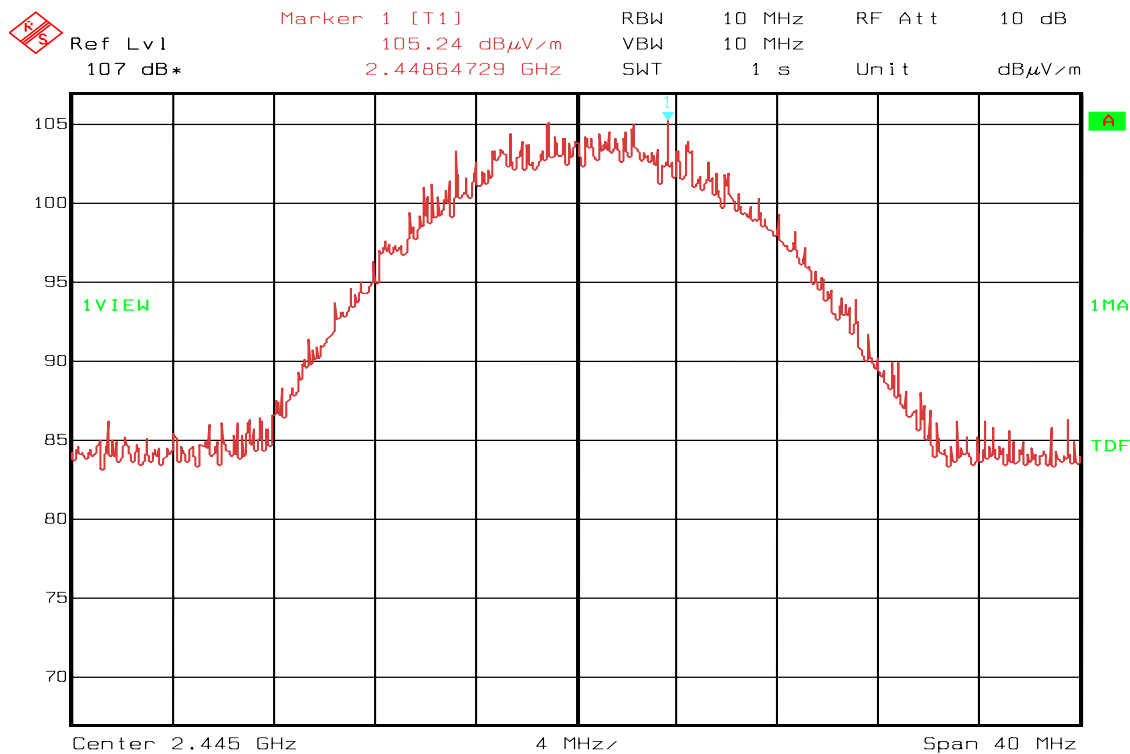
For systems using Digital Modulation in the 2400 - 2483.5 MHz band: less than or equal to 1 watt

Test equipments used: 1, 3, 12 & 19



Date: 7.JUL.2004 21:01:25

#### Ch 11, Peak output power



Date: 7.JUL.2004 21:03:41

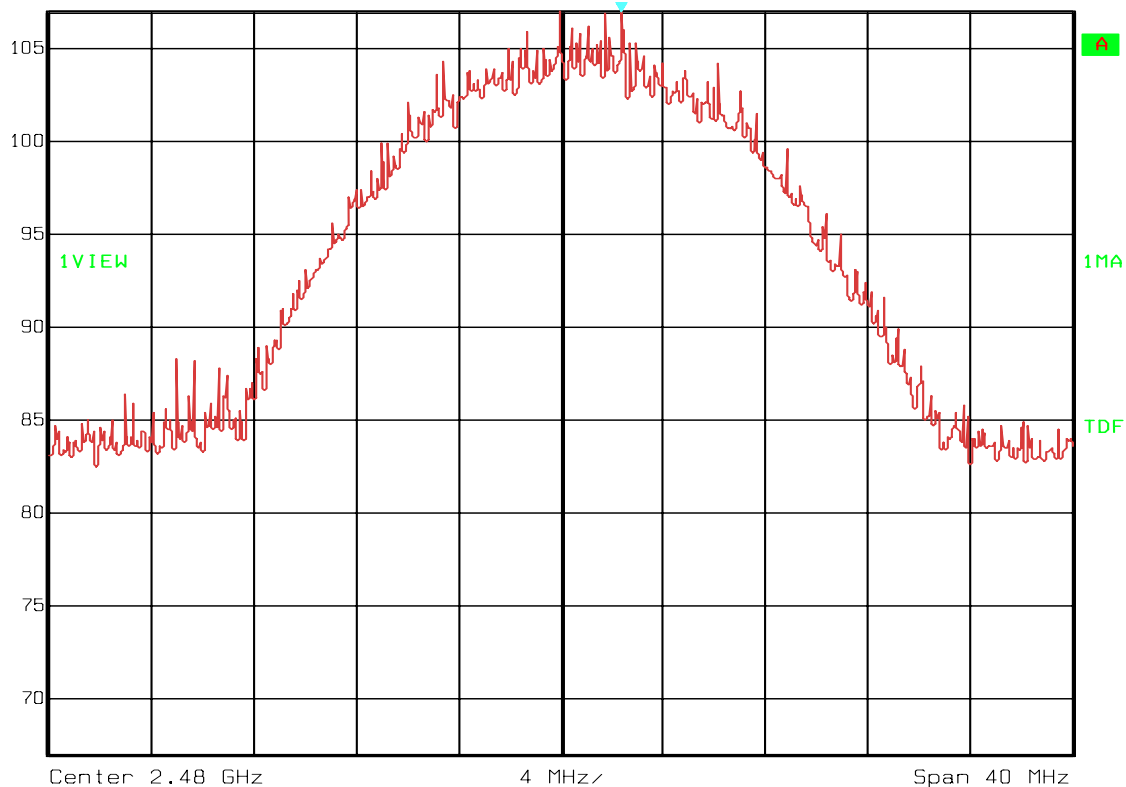
#### Ch 19, Peak output power



Ref Lvl  
107 dB\*

Marker 1 [T1]  
107.35 dB $\mu$ V/m  
2.48236473 GHz

RBW 10 MHz RF Att 10 dB  
VBW 10 MHz  
SWT 1 s Unit dB $\mu$ V/m



Date: 7.JUL.2004 21:08:16

Ch 26, Peak output power

#### **4.4 Out-of-band emissions (Radiated)**

**Para. No.: 15.247 (c)**

|                                           |
|-------------------------------------------|
| <b>Test Performed By: G.Suwanthakumar</b> |
|-------------------------------------------|

|                                    |
|------------------------------------|
| <b>Date of Test: 07. July 2004</b> |
|------------------------------------|

**Test Results: complies**

**Measurement Data:**

**Radiated emission (Integrated ant),** 1-25 GHz, see attached table.

Highest value RF Ch 11: Peak 58.92 dB $\mu$ V/m, average 44.23 dB $\mu$ V/m, 7.214GHz

Ch 19: Peak 50.18 dB $\mu$ V/m, average 43.44 dB $\mu$ V/m, 1.830 GHz

Ch 26: Peak 49.52 dB $\mu$ V/m, average 42.78 dB $\mu$ V/m, 1.849 GHz

**Duty Cycle Calculation:**

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

$$20 \cdot \log (1.5\text{ms}/30.16\text{ms}) = -26 \text{ dB}$$

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

No components above 2.7 GHz were detected

This value is used when measuring average field strength above 1 GHz with Peak Detector function employed on the spectrum analyzer.

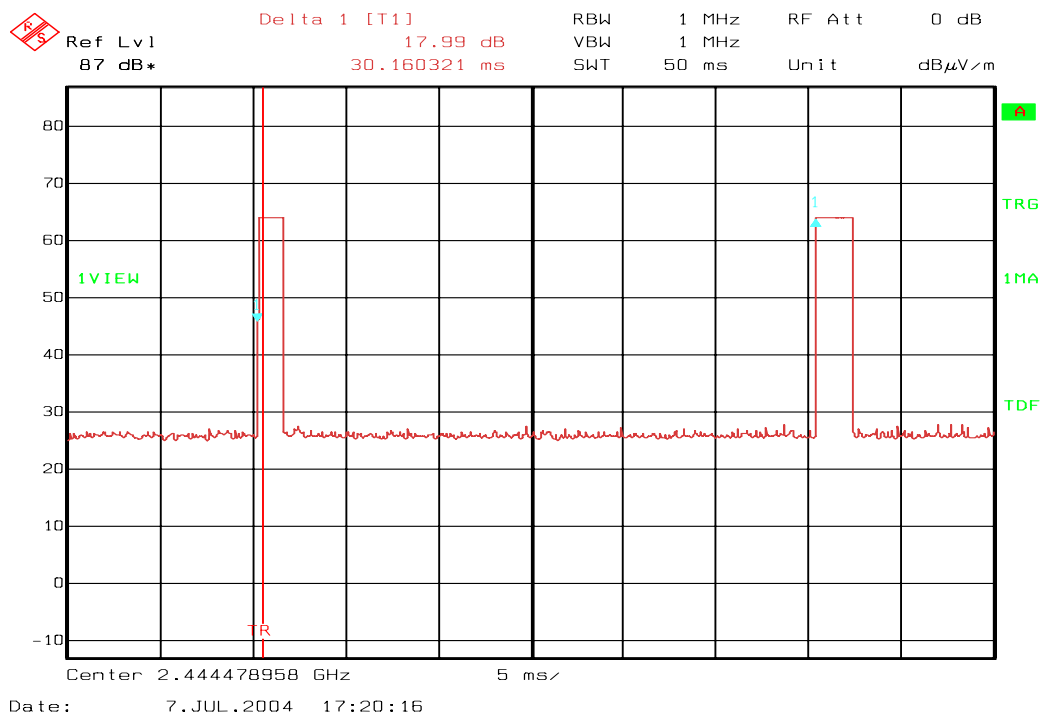
Example of frequency graph of radiated emission is also attached.

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

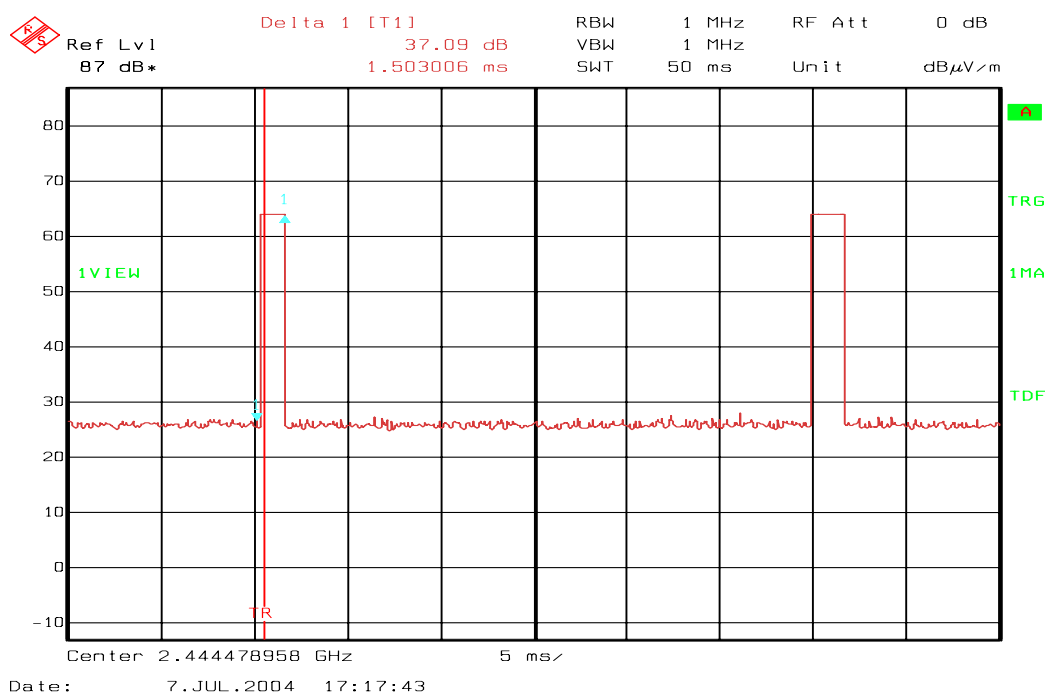
**Requirements:**

Not greater than -20dBc

**Test equipments used: 1, 3, 7,8,9,10,11,12,17,18 , 19 & 20**



OFF time



ON time

### Radiated Emission 1 – 25 GHz, Peak

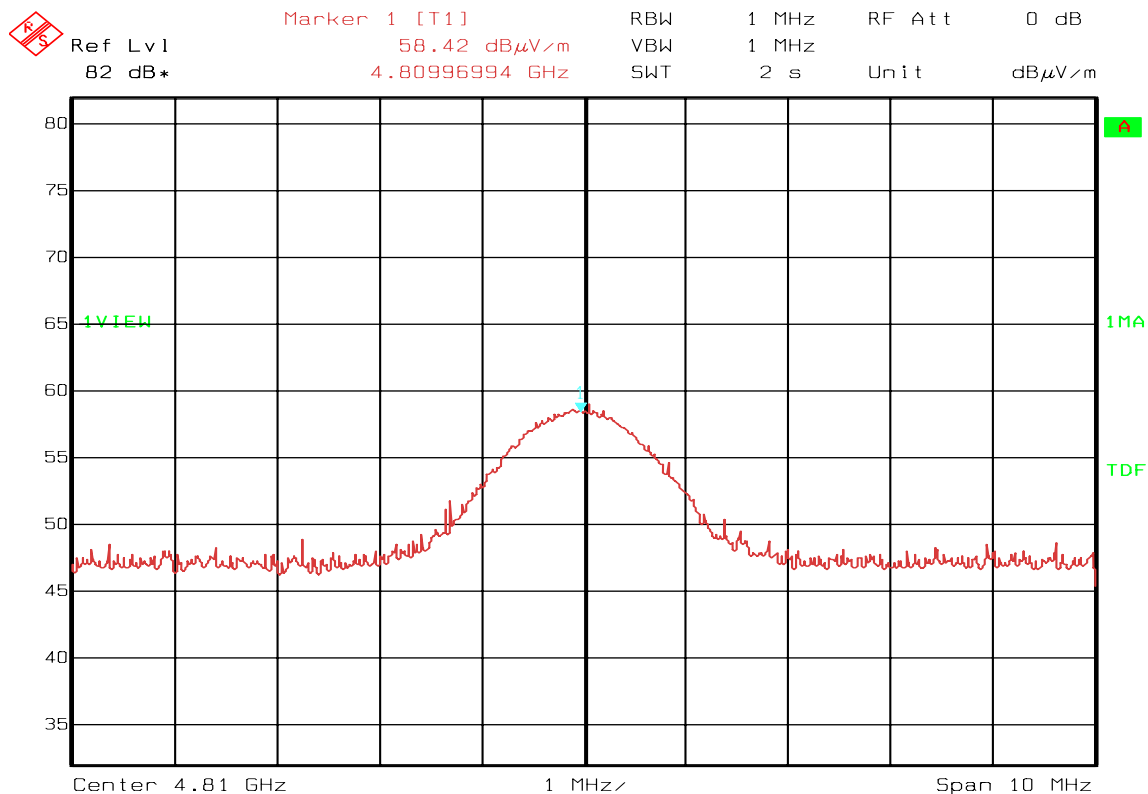
#### Measured with Peak Detector

| Frequency | RF channel | Dist. corr. factor | Field strength, Peak, 3m | Duty cycle corr. factor | Limit        | Margin |
|-----------|------------|--------------------|--------------------------|-------------------------|--------------|--------|
| GHz       | 11-26      | dB                 | dB $\mu$ V/m             | dB                      | dB $\mu$ V/m | dB     |
| 4.809     | 11         | 0                  | 58.42                    | -                       | 74           | 15.58  |
| 4.889     | 19         | 0                  | 61.64                    | -                       | 74           | 12.36  |
| 4.959     | 26         | 0                  | 58.71                    | -                       | 74           | 15.29  |
| 7.214     | 11         | 0                  | 58.92                    | -                       | 74           | 15.08  |
| 7.334     | 19         | 0                  | 57.55                    | -                       | 74           | 16.45  |
| 7.440     | 26         | 0                  | 59.58                    | -                       | 74           | 14.42  |
| 7.5 -24   | 11         | 0                  | None detected            | -                       | 74           | -      |
| 7.5 -24   | 19         | 0                  | None detected            | -                       | 74           | -      |
| 7.5 - 24  | 26         | 0                  | None detected            | -                       | 74           | -      |

### Radiated emission 1- 25 GHz, Average

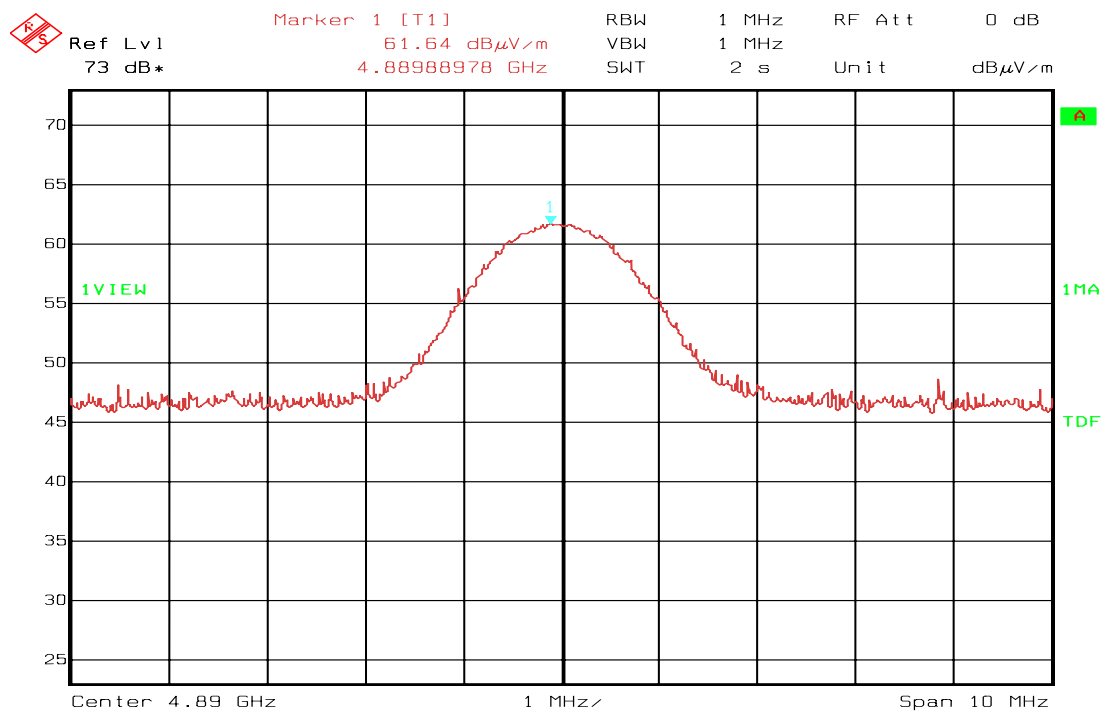
#### Measured with Peak Detector

| Frequency | RF channel | Dist. corr. factor | Field strength, Peak, 3 meters | Duty cycle corr. factor | Limit        | Margin |
|-----------|------------|--------------------|--------------------------------|-------------------------|--------------|--------|
| GHz       | 11-26      | dB                 | dB $\mu$ V/m                   | DB                      | dB $\mu$ V/m | dB     |
| 4.809     | 11         | 0                  | 58.42                          | -20                     | 54           | 15.58  |
| 4.889     | 19         | 0                  | 61.64                          | -20                     | 54           | 12.36  |
| 4.959     | 26         | 0                  | 58.71                          | -20                     | 54           | 15.29  |
| 7.214     | 11         | 0                  | 58.92                          | -20                     | 54           | 15.08  |
| 7.334     | 19         | 0                  | 57.55                          | -20                     | 54           | 16.45  |
| 7.440     | 26         | 0                  | 59.58                          | -20                     | 54           | 14.42  |
| 7.5 -24   | 11         | 0                  | None detected                  | -20                     | 54           | -      |
| 7.5 -24   | 19         | 0                  | None detected                  | -20                     | 54           | -      |
| 7.5 - 24  | 26         | 0                  | None detected                  | -20                     | 54           | -      |



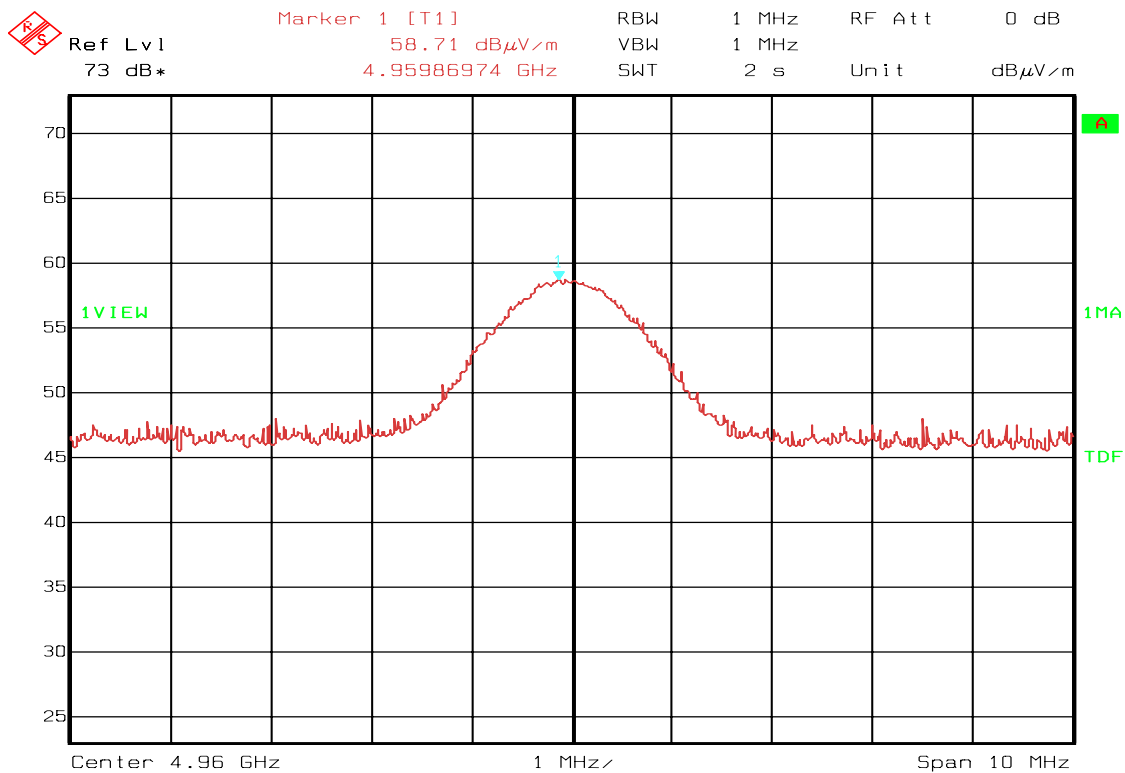
Date: 7.JUL.2004 20:32:45

Max field strength – radiated emission, 2<sup>nd</sup> Harmonic , ch 11



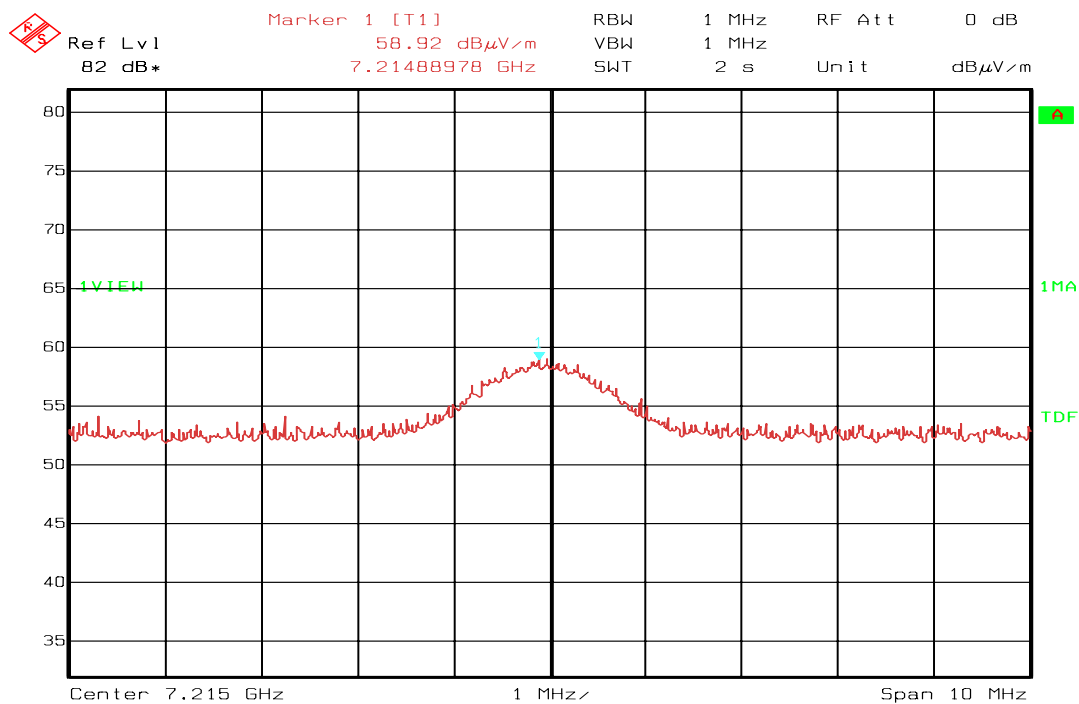
Date: 7.JUL.2004 22:04:08

Max field strength – radiated emission, 2<sup>nd</sup> Harmonic , ch 19



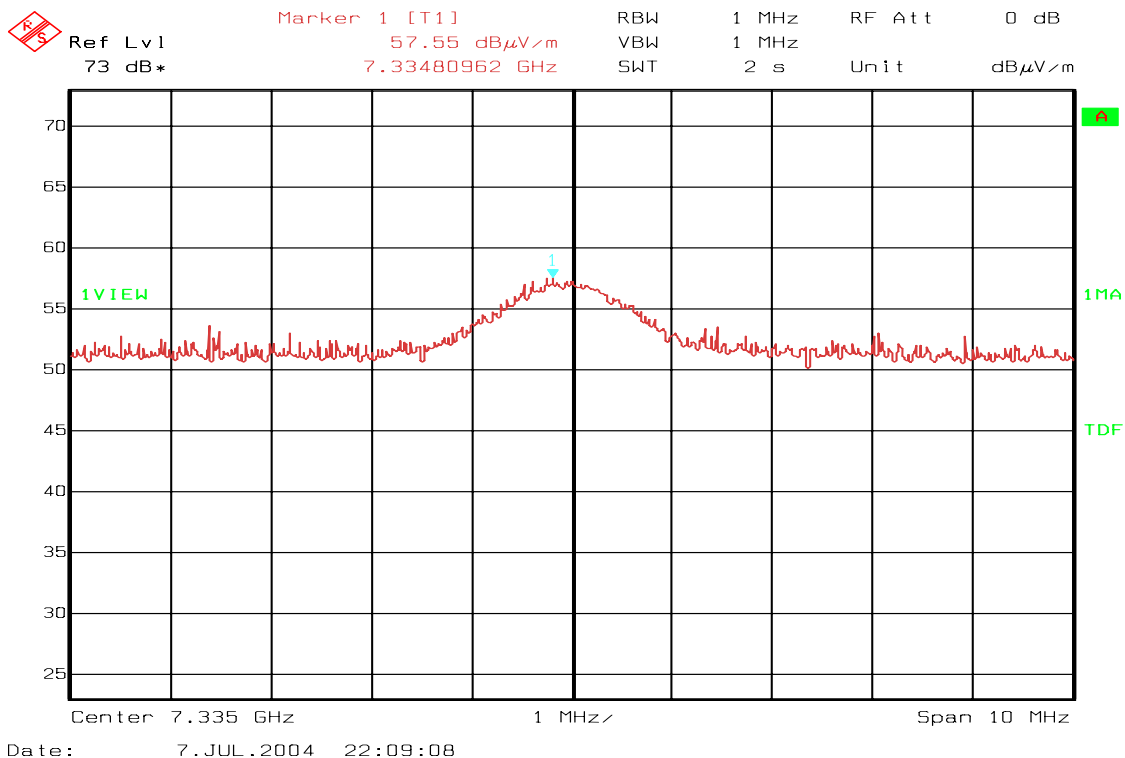
Date: 7.JUL.2004 22:10:45

Max field strength –radiated emission, 2<sup>nd</sup> Harmonic , ch 26

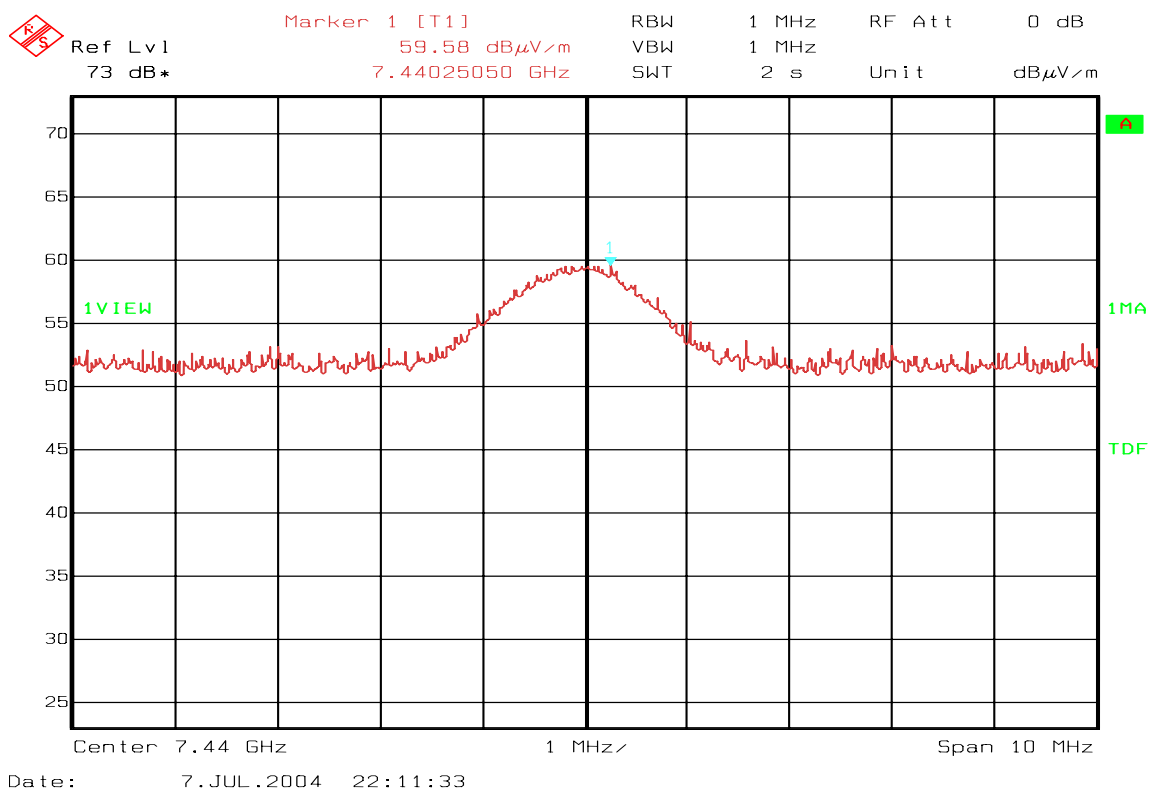


Date: 7.JUL.2004 20:33:56

Max field strength –radiated emission, 3<sup>rd</sup> Harmonic , ch 11.



Max field strength –radiated emission, 3<sup>rd</sup> Harmonic , ch 19



Max field strength –radiated emission, 3<sup>rd</sup> Harmonic , ch 26

**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).

**Nemko Comlab AS  
Peak**

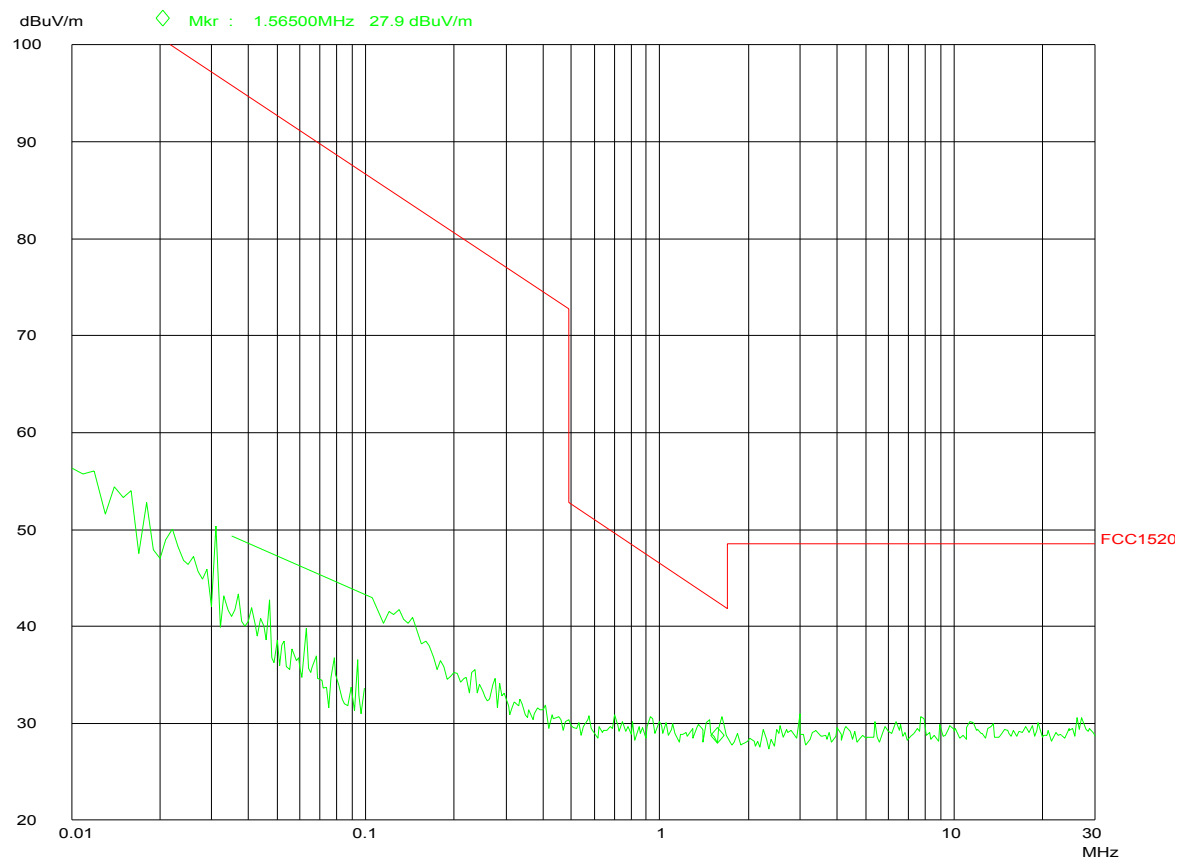
07. Jul 04 22:37

Operator: gns  
Comment: MC13192/sard  
FCC 15

**Scan Settings (4 Ranges)**

| Frequencies |      |      |       | Receiver Settings |                  |           |              |
|-------------|------|------|-------|-------------------|------------------|-----------|--------------|
| Start       | Stop | Step | IF BW | Detector          | M-Time           | Atten     | Preamp OpRge |
| 10k         | 100k | 1k   | 1k    | PK                | 20ms             | 0dBLN OFF | 60dB         |
| 20k         | 20k  | 5k   | 9k    | PK                | 20ms AUTO LN ON  | 60dB      |              |
| 20k         | 10M  | 5k   | 9k    | PK                | 20ms AUTO LN OFF | 60dB      |              |
| 10M         | 30M  | 5k   | 9k    | PK                | 20ms AUTO LN OFF | 60dB      |              |

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



10 kHz – 30MHz –radiated emission

### Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3 m according to CISPR 22.

No component detected, see attached graphs.

Nemko Comlab AS  
 pk

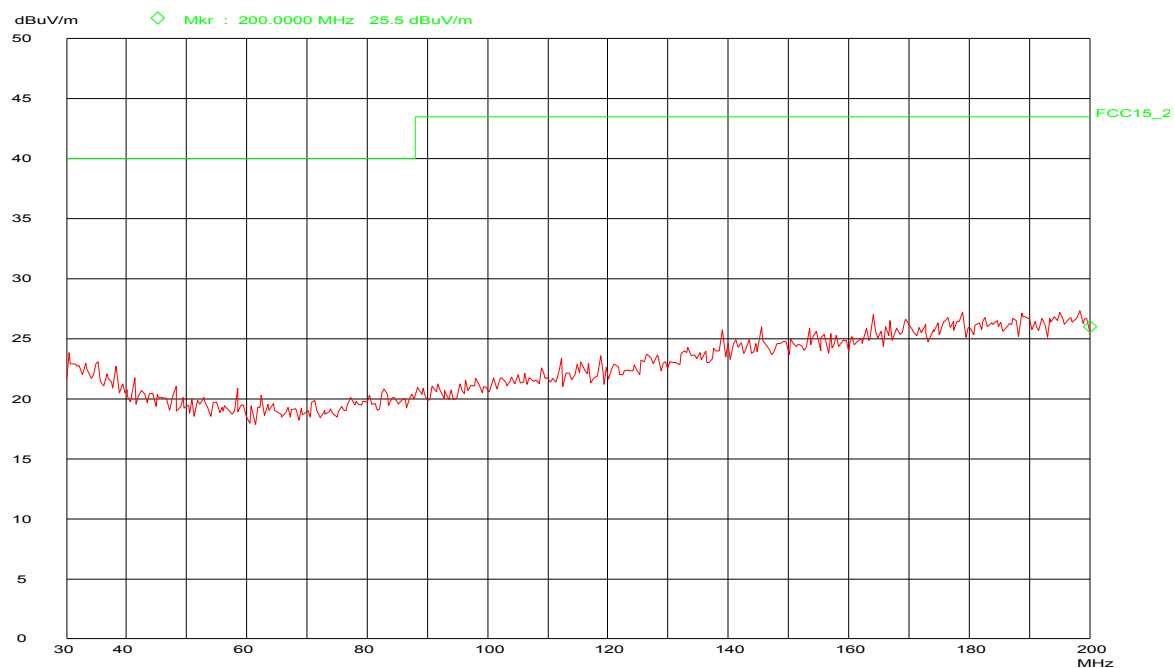
06. Jul 04 12:43

EUT: MC13192/SARD  
 Manuf: Freescale Semiconductor Danmark AS  
 Op Cond: hp 3m  
 Operator: gns  
 Test Spec: FCC15

#### Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |        |       |        |       |
|-------------|------|------|-------------------|----------|--------|-------|--------|-------|
| Start       | Stop | Step | IF BW             | Detector | M-Time | Atten | Preamp | OpRge |
| 30M         | 200M | 50k  | 120k              | PK       | 20ms   | AUTO  | LN ON  | 60dB  |

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



Radiated emission 30 –200MHz, Horizontal polarization

| Frequency | Operational condition | Field strength | Measuring distance | Limit<br>FCC15.209 | Margin |
|-----------|-----------------------|----------------|--------------------|--------------------|--------|
| MHz       |                       | dB $\mu$ V/m   | meters             | dB $\mu$ V/m       | dB     |
| 200       | TX on                 | 25.5           | 3                  | 43.5               | 18     |

In the column 3 peak values are given for 3 meter.

Nemko Comlab AS

06. Jul 04 12:46

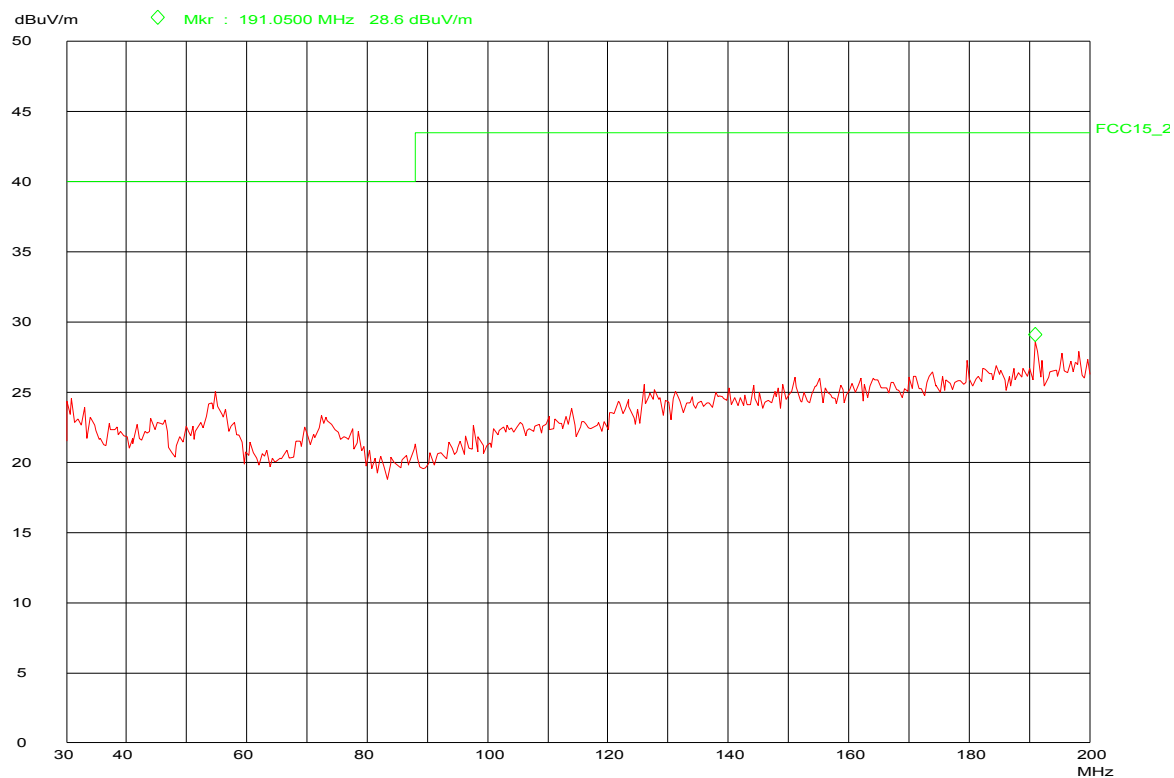
pk

EUT: MC13192/SARD  
Manuf: Freescale Semiconductor Danmark AS  
Op Cond: vp 3m  
Operator: gns  
Test Spec: FCC15

## Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |        |       |        |       |
|-------------|------|------|-------------------|----------|--------|-------|--------|-------|
| Start       | Stop | Step | IF BW             | Detector | M-Time | Atten | Preamp | OpRge |
| 30M         | 200M | 50k  | 120k              | PK       | 20ms   | AUTO  | LN ON  | 60dB  |

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



Radiated emission 30 –200MHz, Vertical polarization

| Frequency | Operational condition | Field strength | Measuring distance | Limit<br>FCC15.209 | Margin |
|-----------|-----------------------|----------------|--------------------|--------------------|--------|
| MHz       |                       | dB $\mu$ V/m   | meters             | dB $\mu$ V/m       | dB     |
| 191.05    | TX on                 | 28.6           | 3                  | 43.5               | 14.9   |

Nemko Comlab AS  
pk

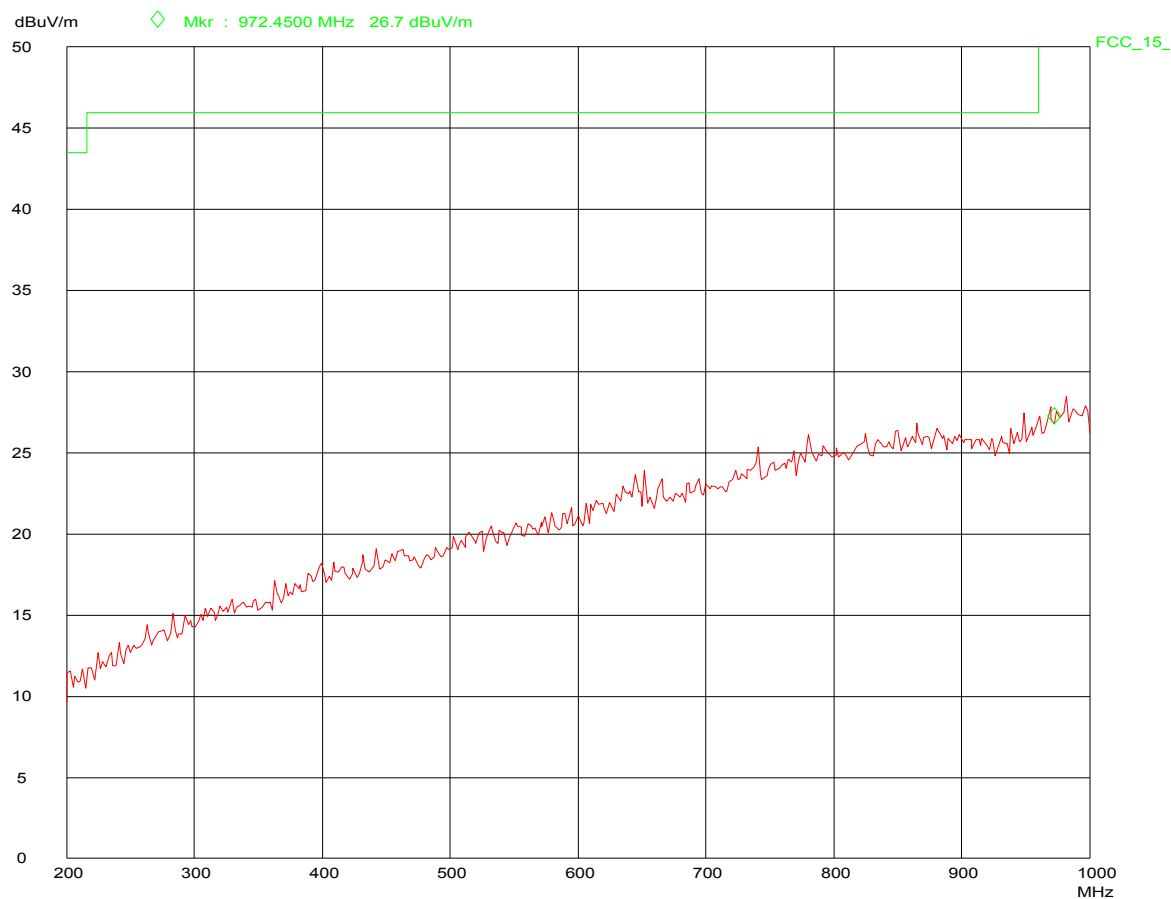
06. Jul 04 12:23

EUT: MC13192/SARD  
Manuf: Freescale Semiconductor Danmark AS  
Op Cond: hp 3m  
Operator: gns  
Test Spec: FCC15

Scan Settings (1 Range)

| Frequencies |       |      | Receiver Settings |          |        |       |        |       |
|-------------|-------|------|-------------------|----------|--------|-------|--------|-------|
| Start       | Stop  | Step | IF BW             | Detector | M-Time | Atten | Preamp | OpRge |
| 200M        | 1000M | 50k  | 120k              | PK       | 20ms   | AUTO  | LN ON  | 60dB  |

| Transducer No. | Start | Stop  | Name    |
|----------------|-------|-------|---------|
| 22             | 200M  | 1000M | HL223HP |



Radiated emission 200 –902 MHz, Horizontal polarization

Nemko Comlab AS  
pk

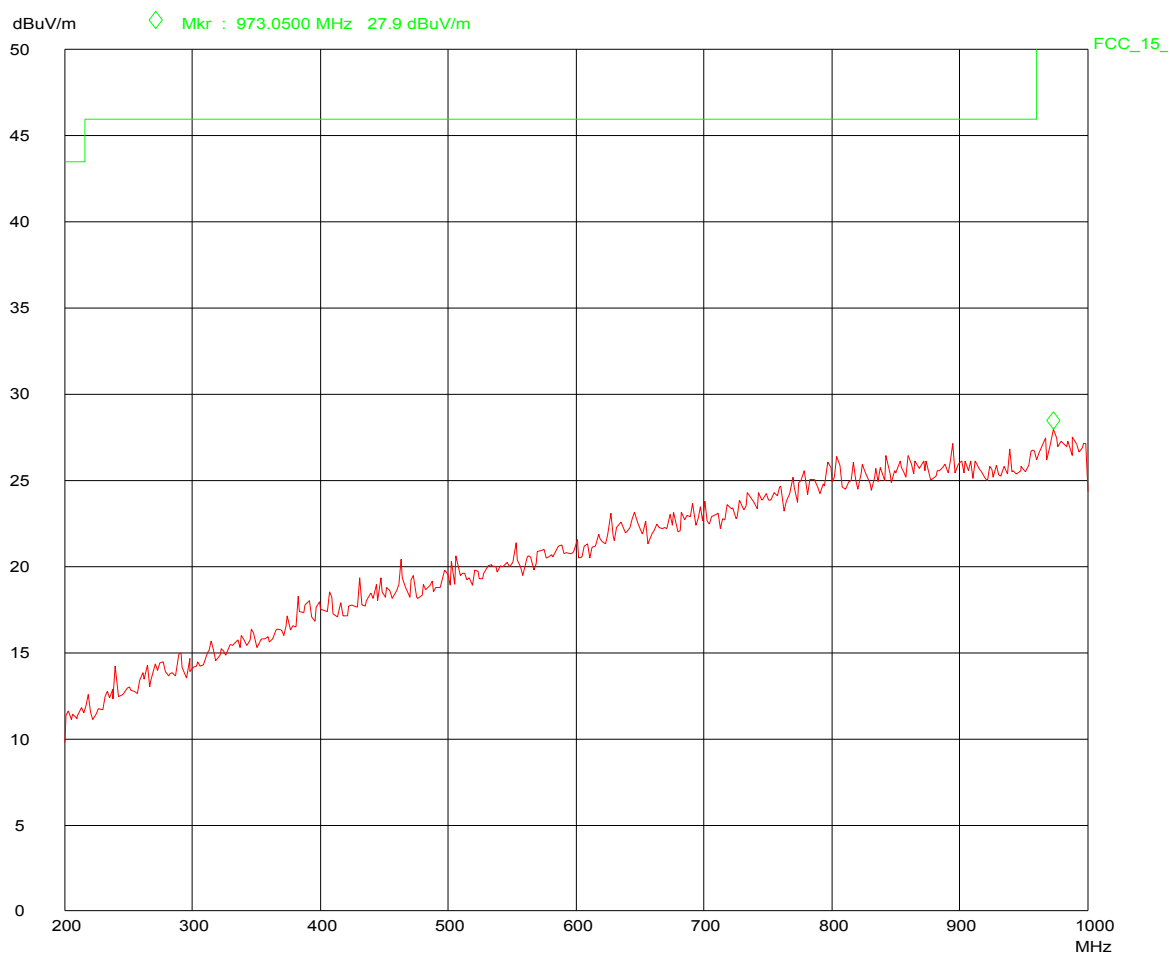
06. Jul 04 12:14

EUT: MC13192/SARD  
Manuf: Freescale Semiconductor Danmark AS  
Op Cond: vp 3m  
Operator: gns  
Test Spec: FCC15

Scan Settings (1 Range)

| Frequencies |       |      | Receiver Settings |          |        |       |        |       |
|-------------|-------|------|-------------------|----------|--------|-------|--------|-------|
| Start       | Stop  | Step | IF BW             | Detector | M-Time | Atten | Preamp | OpRge |
| 200M        | 1000M | 50k  | 120k              | PK       | 20ms   | AUTO  | LN ON  | 60dB  |

| Transducer No. | Start | Stop  | Name    |
|----------------|-------|-------|---------|
| 22             | 200M  | 1000M | HL223HP |



Radiated emission 200 - 902MHz, Vertical polarization

#### **4.5 Power Spectral Density (PSD)**

**Para. No.: 15.247 (d)**

**Test Performed By: G.Suwanthakumar**

**Date of Test: 07.July.2004**

**Test Results: Passed**

##### **Measured and Calculated Data:**

The alternative test procedures in point 2) A , B and formula 1 described in guidance on measurements for Digital Transmission Systems is used.

EUT's antenna gain G : 0 dBi -->  $10^{(0)} = 1$

**Ch11:**

- The measured peak level at RBW= 3kHz, VBW= 10kHz, Span =300kHz, Sweep= 100sec is 85.75 dB $\mu$ V/m

The calculated field strength  $E = 19.38$  mV/m

The calculated PSD using formula  $P = (E \times d)^2 / (30 \times G) = (19.38 \text{mV/m} \times 3)^2 / (30 \times 1) = 112.67 \mu \text{ Watts}$

PSD in dBm =  $10 \log (P/1\text{mW}) = -9.48$  dBm

**Ch19:**

- The measured peak level at RBW= 3kHz, VBW= 10kHz, Span =300kHz, Sweep= 100sec is 87.40 dB $\mu$ V/m

The calculated field strength  $E = 23.44$  mV/m

The calculated PSD using formula  $P = (E \times d)^2 / (30 \times G) = (0.02344 \text{V/m} \times 3)^2 / (30 \times 1) = 164.83 \mu \text{ Watts}$

PSD in dBm =  $10 \log (P/1\text{mW}) = -7.83$  dBm

**Ch26:**

- The measured peak level at RBW= 3kHz, VBW= 10kHz, Span =300kHz, Sweep= 100sec is 87.63 dB $\mu$ V/m

The calculated field strength  $E = 24.07$  mV/m

The calculated PSD using formula  $P = (E \times d)^2 / (30 \times G) = (0.02407 \text{V/m} \times 3)^2 / (30 \times 1) = 173.8 \mu \text{ Watts}$

PSD in dBm =  $10 \log (P/1\text{mW}) = -7.59$  dBm

##### **Requirements:**

No greater than +8 dBm in any 3kHz band

**The Test equipments used: 1, 3, 12 & 19**

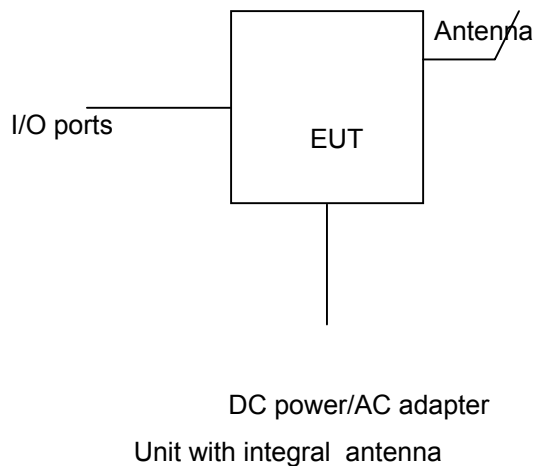
## LIST OF TEST EQUIPMENT

To facilitate inclusion of the test equipment used for related tests on each page, each item is numbered by the test house.

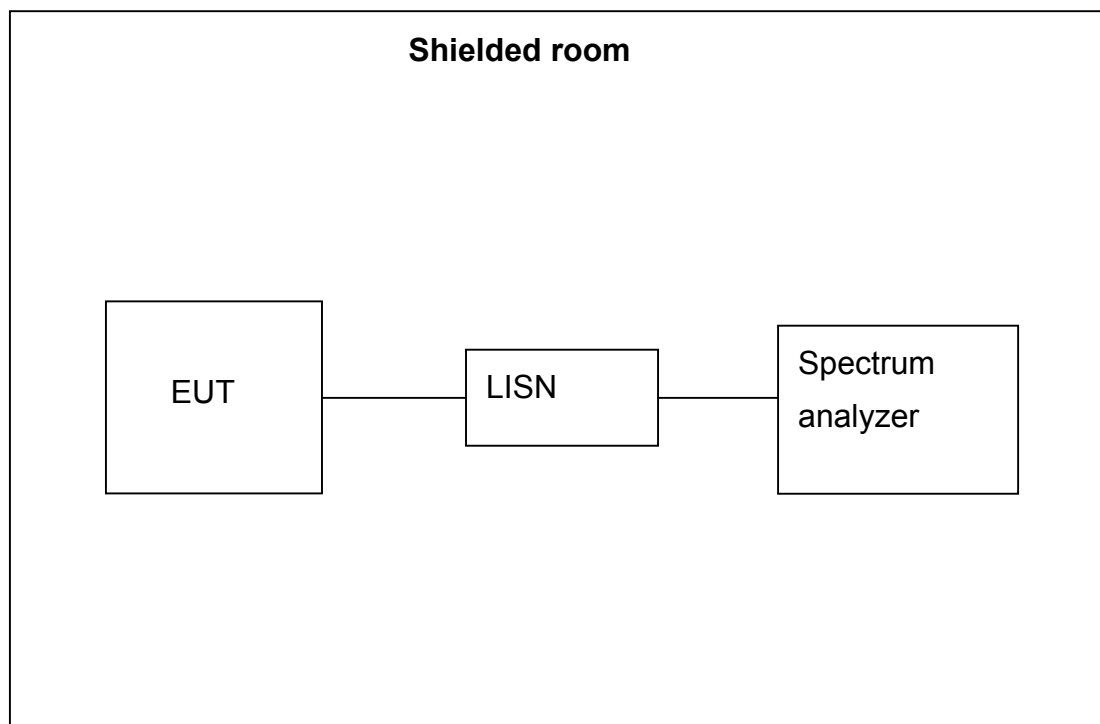
| No. | Instrument/ancillary | Type of instrument/ancillary | Manufacturer      | Ref. no. |
|-----|----------------------|------------------------------|-------------------|----------|
| 1.  | FSEK                 | Spectrum Analyzer            | Rohde & Schwarz   | 1337     |
| 2.  | ESAI                 | Spectrum Analyzer            | Rohde & Schwarz   | 1090     |
| 3.  | 3115                 | Antenna horn                 | EMCO              | 1330     |
| 4.  | ESH3-Z3              | LISN                         | Rohde & Schwarz   | 1076     |
| 5.  | 8449B                | Amplifier                    | Hewlett Packard   | 1322     |
| 6.  | 959C                 | Printer                      | Hewlett Packard   | 1414     |
| 7.  | HFH2-Z2              | Antenna loop                 | Rohde and Schwarz | 285      |
| 8.  | 10855A               | Amplifier                    | Hewlett Packard   | 1445     |
| 9.  | HL223                | Antenna log.per              | Rohde & Schwarz   | 1261     |
| 10. | 3104C                | Antenna biconical            | EMCO              | 1262     |
| 11. | ESN                  | Test Receiver                | R&S               | 1237     |
| 12. | HP6032A              | Power Supply, program.       | HP                | 1062     |
| 13. | 5VF2000/400          | Filter Band Pass             | Texn              | 042      |
| 14. | 5VF1000/2000         | Filter Band Pass             | Trilithic         | 1174     |
| 15. | 77                   | Multimeter, Digital          | Fluke             | 302      |
| 16. | B504D                | Power Supply                 | Oltronix          | 600      |
| 17. | EMCO                 | Antenna Horn                 | 3116              | 1328     |
| 18. | Suhner               | Cable Microwave              | Sucoflex 102E     | 1369     |
| 19. | ETS                  | Shielded room                | Semi-anechoic     | 1410     |
| 20. | ESVS30               | EMI-Receiver                 | R&S               | 1101     |

## 5 BLOCK DIAGRAM

### 5.1 System set up



### 5.2 Power line Conducted Emission



### 5.3 Test Site Radiated Emission and peak power output

