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**FCC Part 24/Part22 Test Report for S12000 Indoor and Outdoor Base stations      FCC ID#AB6S12000**

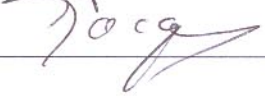
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|                  |                    |
|------------------|--------------------|
| Document number: | PCS/BTS/DJD/005653 |
| Document issue:  | V01.02/EN          |
| Document status: | Approved           |
| Date:            | 17/03/2003         |

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|                     |            |
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## **PUBLICATION HISTORY**

### **29/Jan/2003**

Issue V01.01 / EN

Status: Approved

Creation

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### **17/Mar/2003**

Issue V01.02 / EN

Status: Approved

Corrections (§5.5) concerning spurious in 8 PSK for configuration PCS1900 PA30W.

Alain CAILLE

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# **1. INTRODUCTION**

## **1.1. OBJECT**

This report presents the test data in accordance with FCC Part 24 Subpart E for the S12000 Indoor and Outdoor Basestations in PCS1900 band configured with:

- a new module introduction : HePA ( GMSK 60W / Edge 45W) 1900 .
- existing configuration with PA ( GMSK 30W / Edge 30W ) 1900 Band only

These results can be applied for mixed BTS configuration 1900 Band PA ( GMSK 30W / Edge 30W ) and HePA ( GMSK 60W / Edge 45W)

This report presents also the test data in accordance with FCC Part 22, Subpart H , for the S12000 Indoor and Outdoor Basestations in 850 Band configured with:

- 850 Band only - PA ( GMSK 30W / Edge 30W )

These results can be applied for 1900 / 850 Dual Band BTS configuration :

- 1900/ 850 Dual Band - PA ( GMSK 30W / Edge 30W )
- 1900 Band HePA ( GMSK 60W / Edge 45W ) mixed with 850 Band PA (GMSK 30W / Edge 30W )

This report presents test data for GMSK modulation and 8PSK modulation (EDGE functionality).

## **1.2. SCOPE**

This document applies to the S12000 BTS GSM 1900 Outdoor and Indoor versions.

RF Tests have been performed in the worst case S12000 BTS configuration ( 8HePA ).

S8000 BTS can integrate a maximum of 6 HePA modules. As we use same modules eDRX, HePA and duplexer in S8000/S12000 BTS , measurements available in this document can be applied to S12000 BTS and S8000 BTS.

## **1.3. PRODUCT CONFIGURATIONS**

Testing was conducted on the Outdoor S12000 BTS with a worst case configuration of 8 HePA modules. As the RF transmit paths are identical in both the Outdoor system and Indoor system, testing has been conducted on the Outdoor version only. Measurements were taken with all available coupling configurations including with duplexer involves the compliance with H2D (two input coupler with 3dB loss coupling associated with duplexer) and the H4D configuration (four input coupler with 7dB loss coupling associated with duplexer). The systems use both GMSK modulation and 8PSK, testing was done with both modulation types.

## **2. RELATED DOCUMENTS**

### **2.1. APPLICABLE DOCUMENTS**

|      |                  |                                                                                     |
|------|------------------|-------------------------------------------------------------------------------------|
| [A1] | CFR 47 - Part 2  | FREQUENCY ALLOCATIONS AND<br>RADIO TREATY MATTERS; GENERAL<br>RULES AND REGULATIONS |
| [A2] | CFR 47 - Part 24 | PERSONAL COMMUNICATIONS<br>SERVICES                                                 |
| [A3] | CFR 47 - Part 22 | PUBLIC MOBILE SERVICES                                                              |

### **2.2. REFERENCE DOCUMENTS**

|      |                  |                                                                                                              |
|------|------------------|--------------------------------------------------------------------------------------------------------------|
| [R1] | PE/BTS/DJD/0222  | FCC Part 24 Type Acceptance Filing for<br>Nortel's S8000 Outdoor BTS<br>AB6OUDS8000                          |
| [R2] | PCS/BTS/DJD/0234 | AB6OUDS8000: FCC Part 24 Class II<br>Permissive Change Application : S8000<br>Indoor BTS                     |
| [R3] | PCS/BTS/DJD/0730 | AB6OUDS8000: FCC Part 24 Class II<br>Permissive Change Application : S8000<br>Indoor BTS                     |
| [R4] | PCS/BTS/DJD/0743 | S8000 Outdoor and Indoor BTS GSM 1900<br>: FCC Part 24 Class II Permissive Change<br>Application AB6OUDS8000 |
| [R5] | PCS/BTS/DJD/0746 | S8000 Outdoor and Indoor BTS GSM 1900<br>: FCC Part 24 Class II Permissive Change<br>Application AB6OUDS8000 |

- [R6] PCS/BTS/DJD/04574 S8000 Outdoor and Indoor BTS GSM 1900  
: FCC Part 24 Class II Permissive Change  
Application AB6OUDS8000
- [R7] PE/BTS/DJD/002630 S8000 Outdoor and Indoor BTS eGSM 850  
FCC Part 22 : exhibits documents
- [R8] PE/BTS/DJD/4233 S12000 Indoor BTS GSM 850 / PCS 1900:  
FCC Part 22 / FCC Part 24 Certification  
Filing for Nortel AB6INDS12000  
exhibits document
- [R9] PE/BTS/DJD/4248 S12000 Outdoor BTS GSM 850 / PCS 1900:  
FCC Part 22 / FCC Part 24 Certification  
Filing for Nortel AB6OUTS12000  
exhibits document

### **3. ABBREVIATIONS & DEFINITIONS**

#### **3.1. ABBREVIATIONS**

|        |                                         |
|--------|-----------------------------------------|
| DRX    | Driver Receiver Unit                    |
| e-DRX  | EDGE DRX                                |
| BCF    | Base Common Function                    |
| BTS    | Base Transceiving Station               |
| GSM    | Global System for Mobile Communications |
| GPRS   | General Packet Radio Service            |
| EDGE   | Enhanced Data for GSM Evolution         |
| PDTCH  | Packet Data Logical Channel             |
| PA     | Power Amplifier                         |
| e-SCPA | EDGE Single Carrier PA                  |
| HePA   | Edge High Power Amplifier               |
| LNA    | Low Noise Amplifier                     |
| OMC    | Operation and Maintenance Center        |
| TCU    | Trans-Coding Unit                       |
| MSC    | Mobile Switching Center                 |
| RF     | Radio Frequency                         |
| Tx     | Transmitter                             |



## **4. EXHIBIT 1 : TEST REPORT – HEPA PCS1900**

### **4.1. INTRODUCTION**

The following information is submitted for update of the type acceptance of a Broadband PCS Base Station for Northern Telecom, Inc., in accordance with FCC Part 24, Subpart E and Part 2, Subpart J of the FCC Rules and Regulations.  
The measurement procedures were in accordance with the requirements of Part 2.

### **4.2. MEASUREMENT RESULTS**

Table 1 is a summary of the measurement results for this update.

**Table 1 : Measurement Results Summary**

| <b>FCC Measurement Specification</b> | <b>IC Limit Specification</b> | <b>Description</b>                         | <b>Result</b> | <b>Note</b>                                      |
|--------------------------------------|-------------------------------|--------------------------------------------|---------------|--------------------------------------------------|
| 2.1046(a),<br>2.1033(c)(8)<br>24.232 | 6.2                           | RF Power Output                            | Complies      |                                                  |
| 2.1049                               |                               | Occupied Bandwidth                         | Complies      |                                                  |
| 2.1051, 2.1057<br>24.238             | 6.3<br>6.4                    | Spurious Emissions at<br>Antenna Terminals | Complies      | With power<br>reduction at band<br>edge channels |
| 2.1055<br>24.235                     | 7.0                           | Frequency Stability                        | Complies      |                                                  |

#### **4.3. NAME OF TEST: RF POWER OUTPUT**

##### **4.3.1. FCC REQUIREMENTS – FCC PART 24.232**

Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 100 watts.

##### **4.3.2. TEST RESULTS**

**Table 2** shows the test results of RF Output Power for **GMSK modulation** with several coupling configurations :

| <b>Radio Channel</b> | <b>Frequency (MHz)</b> | <b>Duplexer Power (dBm)</b> | <b>H2D Power (dBm)</b> | <b>H4D Power (dBm)</b> | <b>HePA Output Power (dBm)</b>                    | <b>Limit (dBm)</b> |
|----------------------|------------------------|-----------------------------|------------------------|------------------------|---------------------------------------------------|--------------------|
| 512                  | 1930,2                 | 45.8                        | 42.2                   | 39.3                   | GMSK<br>( 60W )<br><br>47.8 dBm<br><br>+/- 0.5 dB | 50 dBm             |
| 548                  | 1937,4                 | 46.1                        | 42.4                   | 39.6                   |                                                   |                    |
| 585                  | 1944,8                 | 46.3                        | 42.6                   | 39.8                   |                                                   |                    |
| 587                  | 1945,2                 | 46.3                        | 42.6                   | 39.8                   |                                                   |                    |
| 598                  | 1947,4                 | 46.2                        | 42.6                   | 39.8                   |                                                   |                    |
| 610                  | 1949,8                 | 46.3                        | 42.6                   | 39.8                   |                                                   |                    |
| 612                  | 1950,2                 | 46.3                        | 42.6                   | 39.8                   |                                                   |                    |
| 648                  | 1957,4                 | 46.5                        | 42.9                   | 39.9                   |                                                   |                    |
| 685                  | 1964,8                 | 46.5                        | 42.8                   | 39.9                   |                                                   |                    |
| 687                  | 1965,2                 | 46.5                        | 42.8                   | 39.9                   |                                                   |                    |
| 698                  | 1967,4                 | 46.5                        | 42.9                   | 39.9                   |                                                   |                    |
| 710                  | 1969,8                 | 46.5                        | 42.9                   | 39.9                   |                                                   |                    |
| 712                  | 1970,2                 | 46.5                        | 42.9                   | 39.9                   |                                                   |                    |
| 723                  | 1972,4                 | 46.5                        | 42.8                   | 39.9                   |                                                   |                    |
| 735                  | 1974,8                 | 46.5                        | 42.8                   | 39.8                   |                                                   |                    |
| 737                  | 1975,2                 | 46.5                        | 42.8                   | 39.8                   |                                                   |                    |
| 773                  | 1982,4                 | 46.5                        | 42.7                   | 39.9                   |                                                   |                    |
| 810                  | 1989,8                 | 46.6                        | 42.9                   | 39.9                   |                                                   |                    |

**Table 3** shows the test results of RF Output Power for **8PSK modulation** supported by eDRX/HePA 1900 with several coupling configurations :

| Radio Channel | Frequency (MHz) | Duplexer Power (dBm) | H2D Power (dBm) | H4D Power (dBm) | HePA Output Power (dBm)                     | Limit (dBm) |
|---------------|-----------------|----------------------|-----------------|-----------------|---------------------------------------------|-------------|
| 512           | 1930,2          | 45                   | 41.9            | 38.5            | 8PSK<br>(45W)<br><br>46.5 dBm<br>+/- 0.5 dB | 50 dBm      |
| 548           | 1937,4          | 45.3                 | 41.6            | 38.8            |                                             |             |
| 585           | 1944,8          | 45.5                 | 41.8            | 39              |                                             |             |
| 587           | 1945,2          | 45.5                 | 41.8            | 39              |                                             |             |
| 598           | 1947,4          | 45.4                 | 41.8            | 39              |                                             |             |
| 610           | 1949,8          | 45.5                 | 41.8            | 39              |                                             |             |
| 612           | 1950,2          | 45.5                 | 41.8            | 39              |                                             |             |
| 648           | 1957,4          | 45.7                 | 42              | 39.1            |                                             |             |
| 685           | 1964,8          | 45.7                 | 42              | 39.1            |                                             |             |
| 687           | 1965,2          | 45.7                 | 42              | 39.1            |                                             |             |
| 698           | 1967,4          | 45.7                 | 42              | 39.1            |                                             |             |
| 710           | 1969,8          | 45.7                 | 42              | 39.1            |                                             |             |
| 712           | 1970,2          | 45.7                 | 42              | 39.1            |                                             |             |
| 723           | 1972,4          | 45.7                 | 42              | 39.1            |                                             |             |
| 735           | 1974,8          | 45.7                 | 42              | 39              |                                             |             |
| 737           | 1975,2          | 45.7                 | 42              | 39.1            |                                             |             |
| 773           | 1982,4          | 45.7                 | 41.9            | 39.1            |                                             |             |
| 810           | 1989,8          | 45.8                 | 42.1            | 39.2            |                                             |             |

**Table 4** shows the HePA Output RF Power reduction available

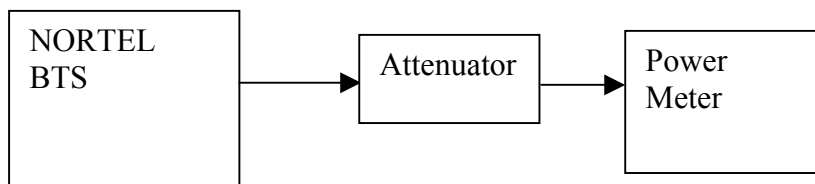
- For GMSK modulation
- For 8PSK modulation supported by eDRX/HePA 1900

| Power reduction available               | HePA (60W)<br>output Power<br>for<br>GMSK<br>modulation<br>(dBm) | HePA (45W)<br>output Power<br>for<br>8PSK<br>modulation<br>(dBm) |
|-----------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Pmax</b><br><i>Pmax – 1dB</i>        | <b>47.8</b>                                                      | <b>46.5</b>                                                      |
| <b>Pmax – 2 dB</b><br><i>Pmax – 3dB</i> | 45.8                                                             | 44.5                                                             |
| <b>Pmax – 4 dB</b><br><i>Pmax – 5dB</i> | 43.8                                                             | 42.5                                                             |
| <b>Pmax – 6 dB</b><br><i>Pmax – 7dB</i> | 41.8                                                             | 40.5                                                             |

### 4.3.3. TEST PROCEDURE

The equipment was configured as shown in schematic 1.

**Schematic 1: Test configuration for RF Output Power**



The BTS was configured to transmit at maximum power (static level 0) :

- for GMSK modulation, in mode GMSK no synchro,
- for 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Measurements were made at frequencies which are the bottom, middle and top of each of the licensed blocks.

The output power was measured using the power meter which has the following settings :

|                          |                                                         |
|--------------------------|---------------------------------------------------------|
| Mode :                   | Average                                                 |
| Reference Level Offset : | Corrected to account for cable(s) and attenuator losses |

#### **4.4. NAME OF TEST : OCCUPIED BANDWIDTH**

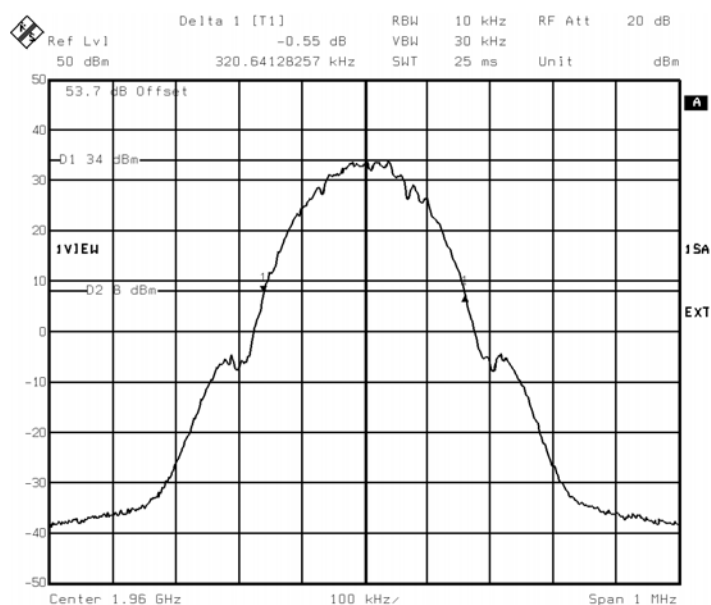
##### **4.4.1. FCC REQUIREMENTS**

The occupied bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

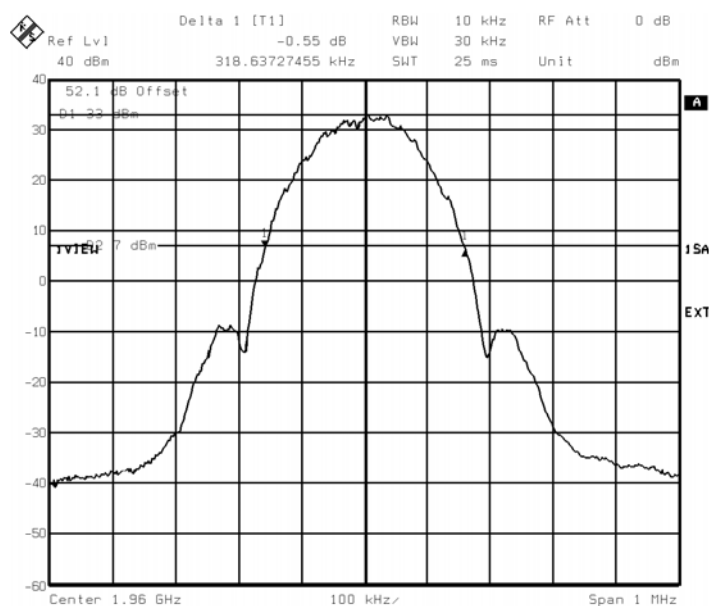
##### **4.4.2. TEST RESULTS**

The maximum occupied bandwidth was found to be:  
320.6 kHz, measured on channel 661, f=1960 MHz in GMSK modulation,  
317 kHz, measured on channel 661, f=1960 MHz in 8PSK modulation.

**Figure 1: Sample plot for occupied bandwidth in GMSK modulation**



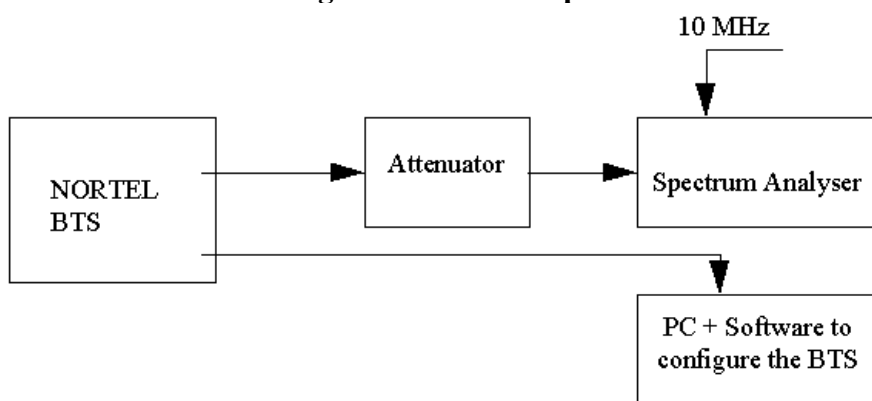
**Figure 2: Sample plot for occupied bandwidth in 8PSK modulation**



#### 4.4.3. TEST PROCEDURE

The equipment was configured as shown in schematic 2.

**Schematic 2 : Test configuration for Occupied bandwidth**



The BTS was configured to transmit at maximum power (static level 0) :

- for GMSK modulation, in mode GMSK no synchro,
- for 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

The occupied bandwidth was measured by determining the bandwidth out of which all emissions are attenuated at least 26 dB below the transmitter power.

The spectrum analyzer had the following settings :

|                          |                                                            |
|--------------------------|------------------------------------------------------------|
| Detector :               | Sample                                                     |
| Trace :                  | Average                                                    |
| Resolution bandwidth :   | 10 kHz                                                     |
| Video bandwidth :        | 30 kHz                                                     |
| Span :                   | 1 MHz                                                      |
| Reference Level Offset : | Corrected to account for cable(s)<br>and attenuator losses |
| Level range :            | 100 dB                                                     |
| Sweep time :             | 25 ms                                                      |

#### **4.5. NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

##### **4.5.1. FCC REQUIREMENTS LIMITS – FCC PART 24.238**

- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.
- (b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- (c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (d) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

#### 4.5.2. TEST RESULTS WITH DUPLEXER CONFIGURATION

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (46.3 dBm = 42.63 Watts).

Therefore the spurious emissions must be attenuated by at least  $43 + 10 \cdot \log(42.63) = 59.3\text{dB}$   
The measured output power was 46.3 dBm ; therefore the limit is  $46.3 - 59.3 = -13\text{ dBm}$ .

Spurious measurement is performed with the worst configuration with Duplexer coupling and 60W High Power amplifier .

The Nominal power at antenna connector : PD max =46.5 dBm.

The test compliance with duplexer involves the compliance with H2D (two input coupler with 3dB loss coupling associated with duplexer) and the compliance with H4D configuration (four input coupler with 7dB loss coupling associated with duplexer).

Tables 5 and 6 show the results for Spurious Emissions at Antenna Terminals.

**Table 5 : Spurious emissions with the diplexer for GMSK modulation**

|   | Channel | Power emission level | Spurious emissions level (dBm) | Limit (dB) | Margin (dB) |
|---|---------|----------------------|--------------------------------|------------|-------------|
| A | 512     | Pmax-4               | -16.2                          | -13        | 3.2         |
| A | 585     | Pmax-4               | -14.7                          | -13        | 1.7         |
| D | 587     | Pmax-4               | -15.4                          | -13        | 2.4         |
| D | 610     | Pmax-4               | -14.3                          | -13        | 1.3         |
| B | 612     | Pmax-4               | -15.1                          | -13        | 2.1         |
| B | 685     | Pmax-4               | -14.1                          | -13        | 1.1         |
| E | 687     | Pmax-4               | -15                            | -13        | 2           |
| E | 710     | Pmax-4               | -14.6                          | -13        | 1.6         |
| F | 712     | Pmax-4               | -15.2                          | -13        | 2.2         |
| F | 735     | Pmax-4               | -14.5                          | -13        | 1.5         |
| C | 737     | Pmax-4               | -14.6                          | -13        | 1.6         |
| C | 810     | Pmax-4               | -13.9                          | -13        | 0.9         |

**Tables 6: Spurious emissions with the diplexer for 8PSK modulation**

|   | Channel | Power<br>emission<br>level | Spurious<br>emissions<br>level (dBm) | Limit (dB) | Margin (dB) |
|---|---------|----------------------------|--------------------------------------|------------|-------------|
| A | 512     | Pmax-2                     | -16.3                                | -13        | 3.3         |
| A | 585     | Pmax-2                     | -16.8                                | -13        | 3.8         |
| D | 587     | Pmax-2                     | -15.8                                | -13        | 2.8         |
| D | 610     | Pmax-2                     | -16.2                                | -13        | 3.2         |
| B | 612     | Pmax-2                     | -15.4                                | -13        | 2.4         |
| B | 685     | Pmax-2                     | -15.8                                | -13        | 2.8         |
| E | 687     | Pmax-2                     | -15.2                                | -13        | 2.2         |
| E | 710     | Pmax-2                     | -16                                  | -13        | 3           |
| F | 712     | Pmax-2                     | -14.6                                | -13        | 1.6         |
| F | 735     | Pmax-2                     | -16.1                                | -13        | 3.1         |
| C | 737     | Pmax-2                     | -15.3                                | -13        | 2.3         |
| C | 810     | Pmax-2                     | -15.2                                | -13        | 2.2         |

**Notes :**

GMSK modulation measurements:

Figures from 3 to 6 show sample plots for the case when the transmitter was tuned with the power reduced by 4 dB in diplexer configuration for different Edge Channel 512 , 585, 737, 810.

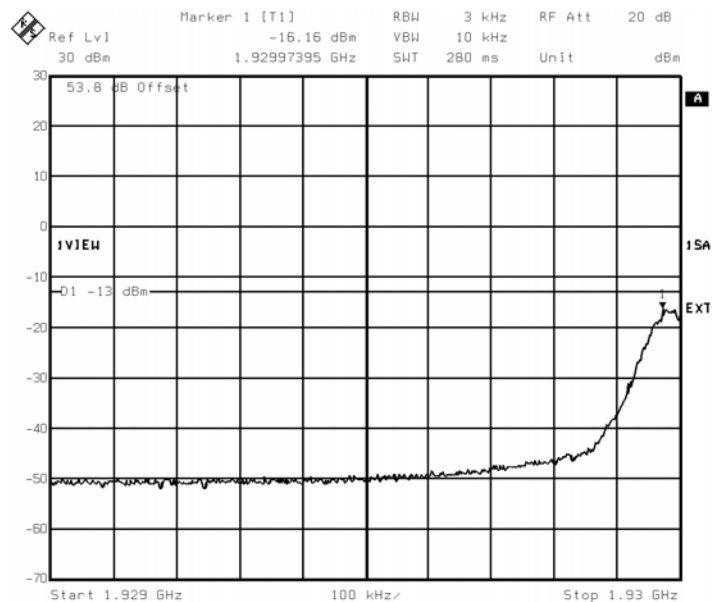
8PSK modulation measurements:

Figures from 7 to 10 show sample plots for the case when the transmitter was tuned at the power reduced by 2dB in diplexer configuration.

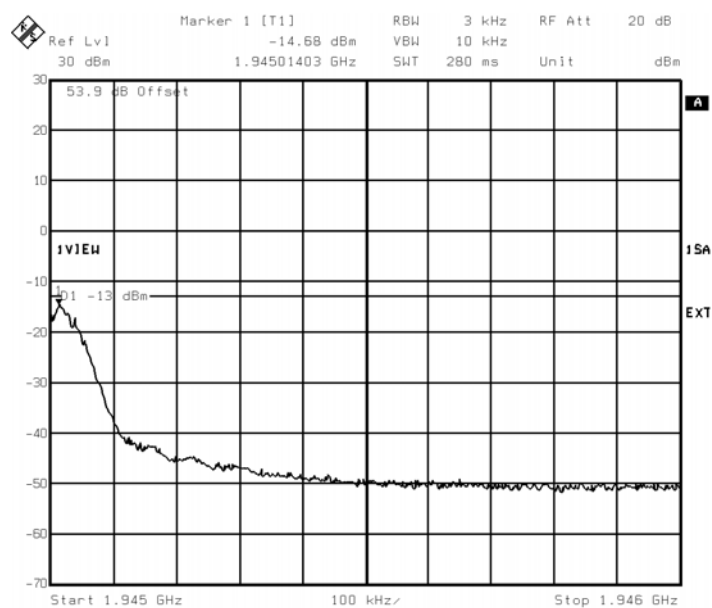
Out of band measurement in GMSK modulation:

Figures from 11 to 20 show sample plots for frequency spans from 0 to 20 GHz with emission on channel 810 at maximum power with diplexer configuration.

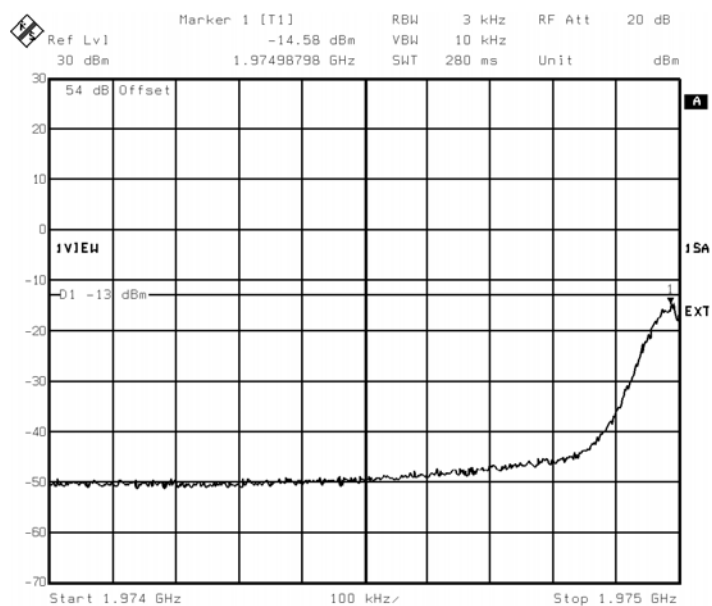
**Figure 3 :**  
-1 MHz adjacent band (Channel 512, Pmax-4),  
Diplexer only, GMSK modulation



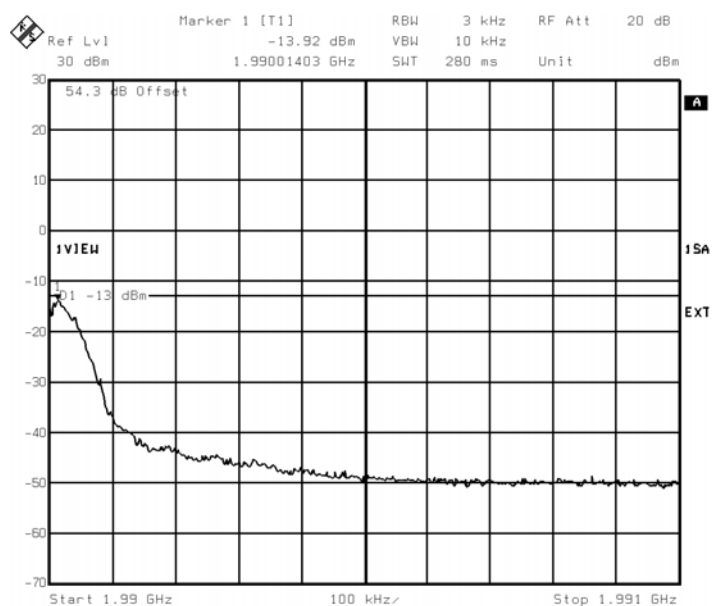
**Figure 4 :**  
+1 MHz adjacent band (Channel 585, Pmax-4),  
Diplexer only, GMSK modulation



**Figure 5 :**  
-1 MHz adjacent band (Channel 737, Pmax-4),  
Diplexer only, GMSK modulation

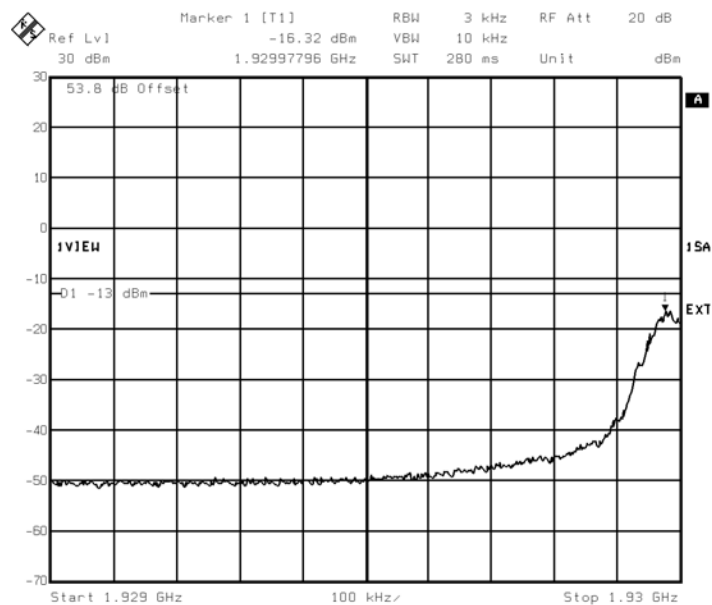


**Figure 6:**  
+1 MHz adjacent band (Channel 810, Pmax-4),  
Diplexer only, GMSK modulation



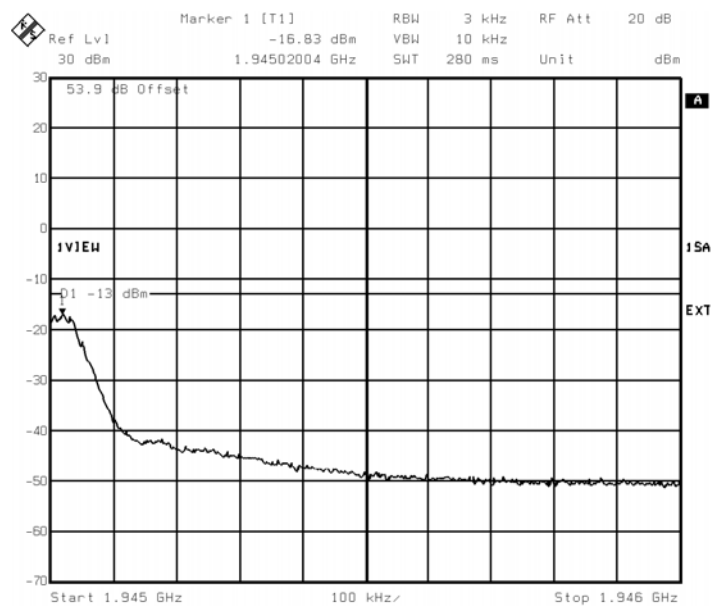
**Figure 7:**

-1 MHz adjacent band (Channel 512, Pmax-2),  
Diplexer only, 8PSK modulation

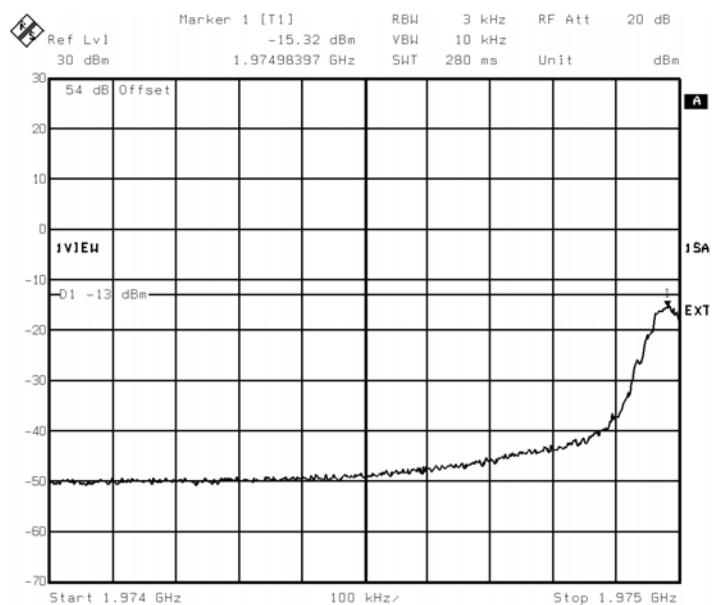


**Figure 8:**

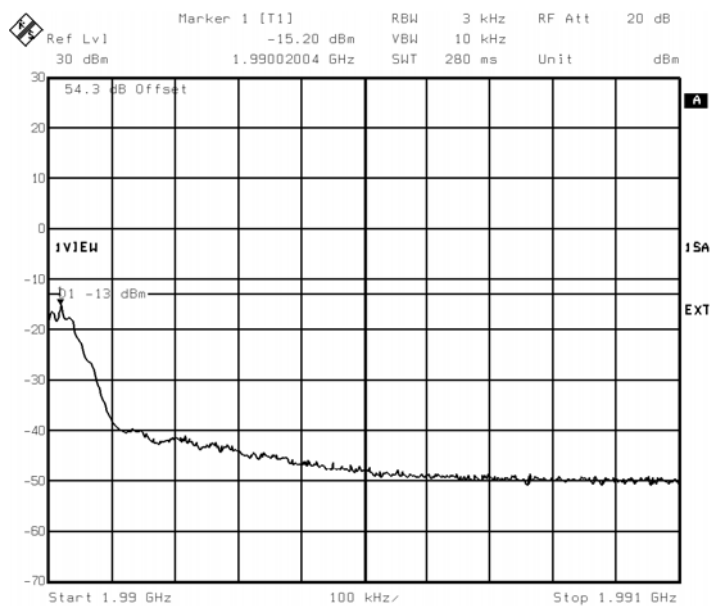
+1 MHz adjacent band (Channel 585, Pmax-2),  
Diplexer only, 8PSK modulation



**Figure 9:**  
-1 MHz adjacent band (Channel 737, Pmax-2),  
Diplexer only, 8PSK modulation



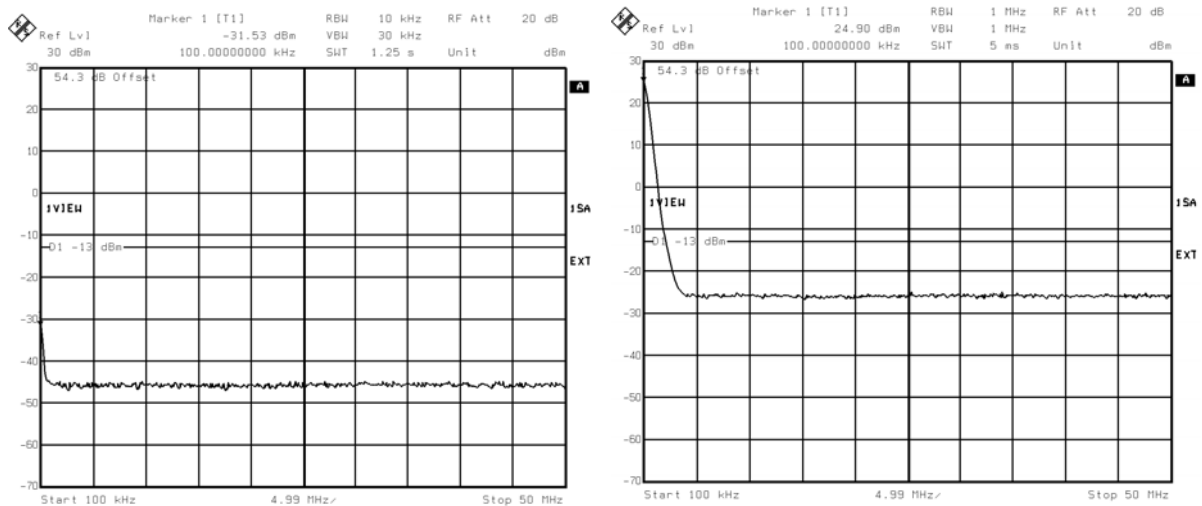
**Figure 10:**  
+1 MHz adjacent band (Channel 810, Pmax-2),  
Diplexer only, 8PSK modulation



**Out-of-block emissions (Channel 810, Pmax),  
Diplexer, GMSK modulation**

**Figure 11:**

100 kHz – 50 MHz



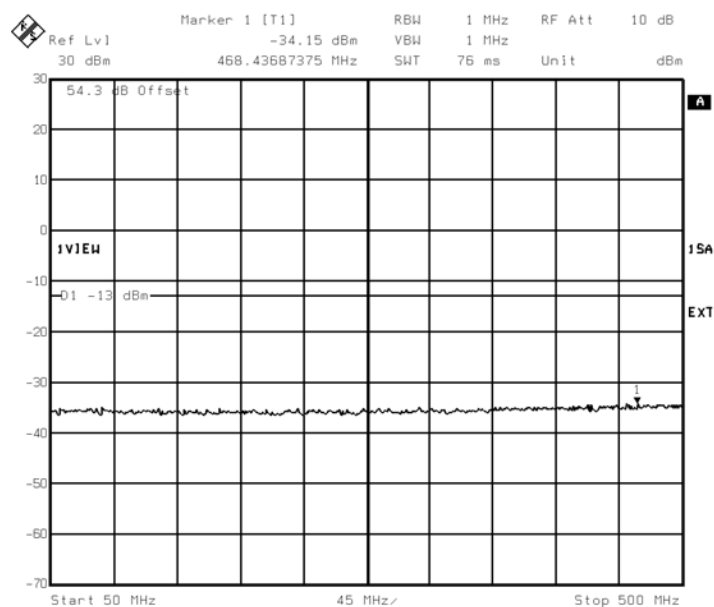
RBW=10 kHz

RBW=1 MHz (\*)

(\*) Note: spectrum line at 100 kHz is internal DC spectrum line of analyser

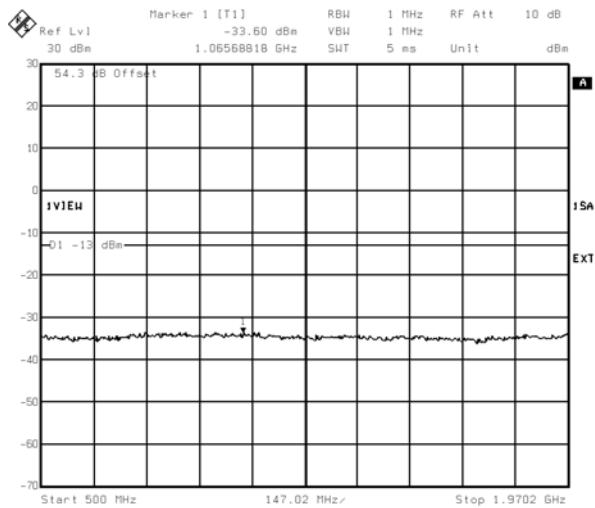
**Figure 12:**

50 MHz – 500 MHz

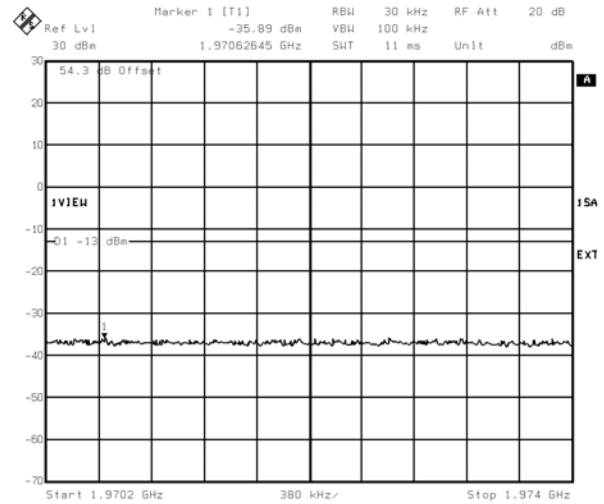


**Out-of-block emissions (Channel 810, Pmax),  
Duplexer, GMSK modulation**

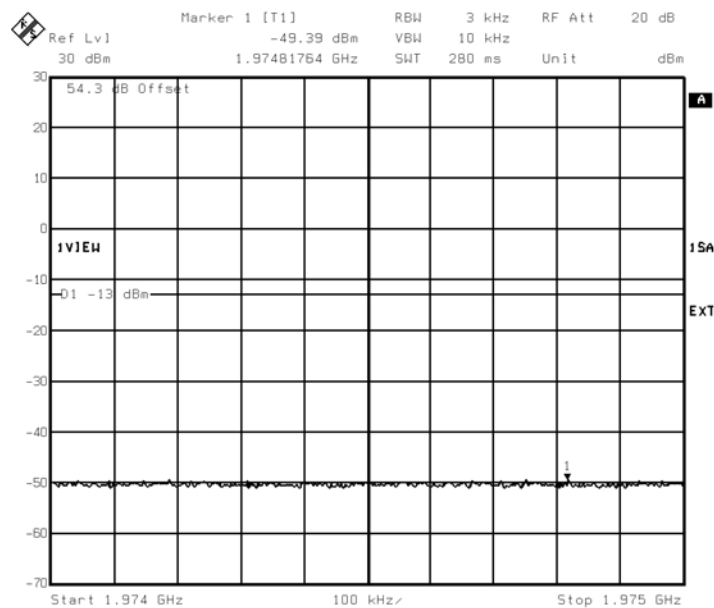
**Figure 13 : 500 MHz – 1970.2 MHz**



**Figure 14 : 1970.2 – 1974 MHz**

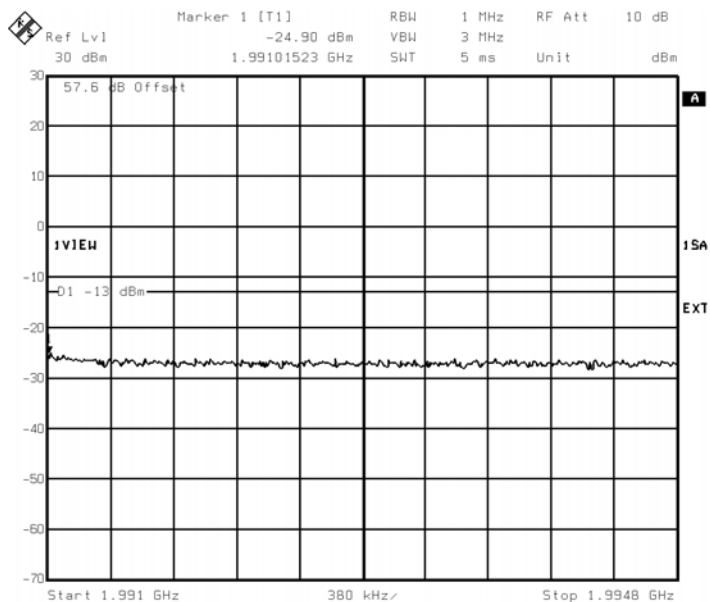


**Figure 15 : 1974 – 1975 MHz**

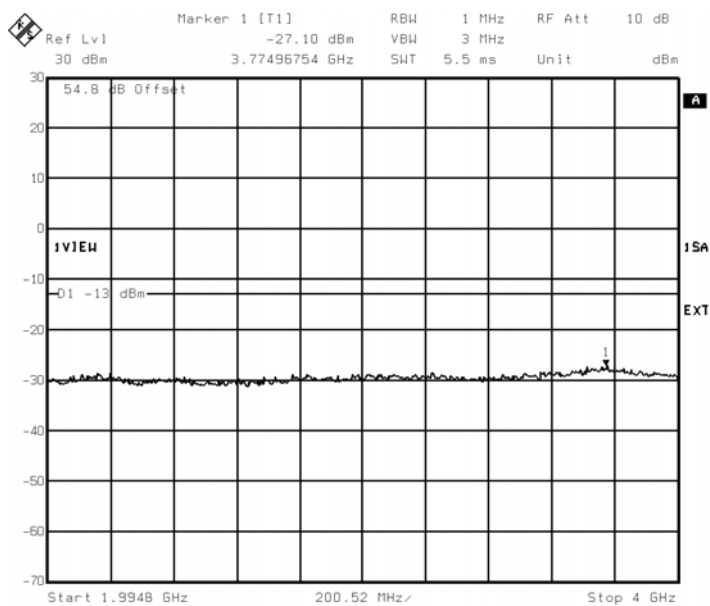


**Out-of-block emissions (Channel 810, Pmax),  
Diplexer, GMSK modulation**

**Figure 16 : 1991 – 1994.8 MHz**

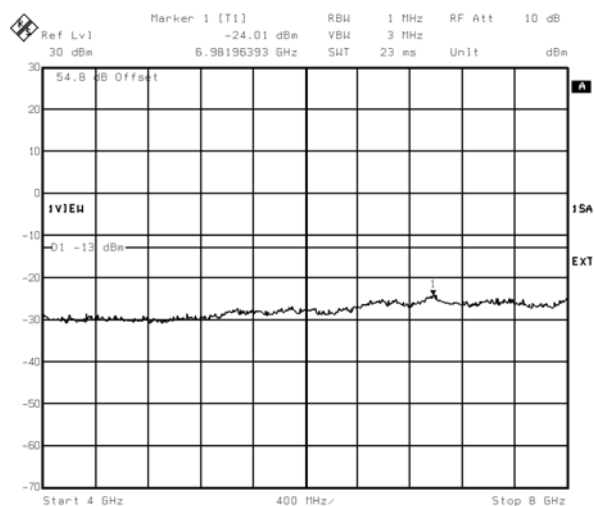


**Figure 17 : 1994.8 MHz – 4 GHz**

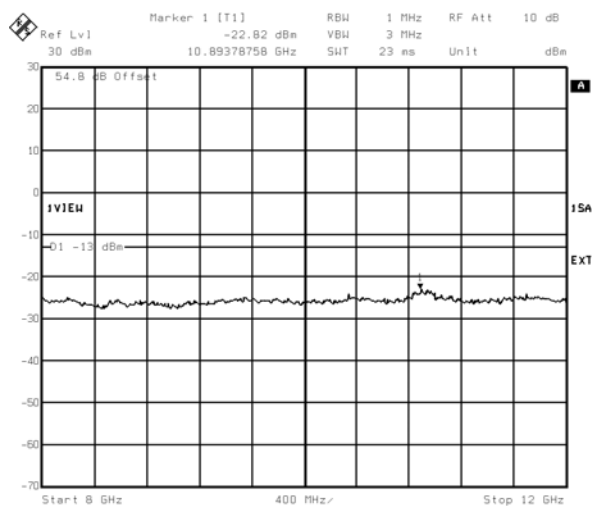


**Out-of-block emissions (Channel 810, Pmax),  
Diplexer, GMSK modulation**

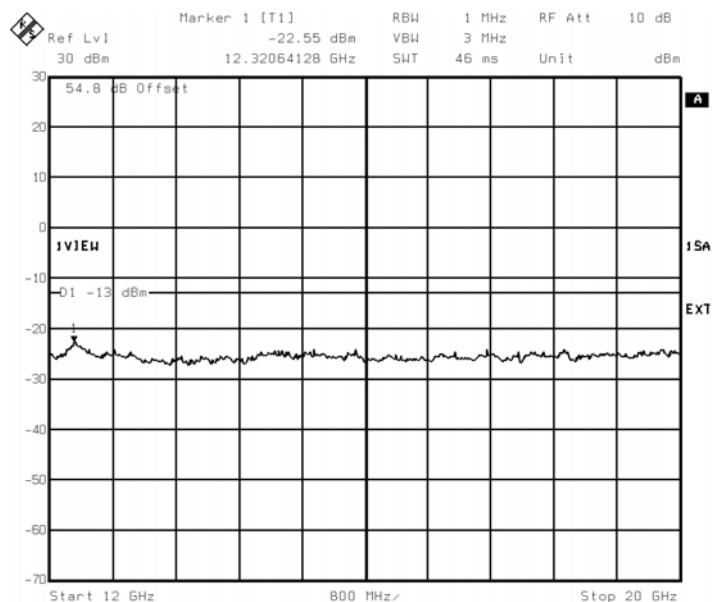
**Figure 18 : 4 – 8 GHz**



**Figure 19 : 8 – 12 GHz**



**Figure 20 : 12 – 20 GHz**



### 4.5.3. TEST RESULTS WITH H2D DUPLEXER CONFIGURATION

Table 7: Spurious emissions with the H2D for GMSK modulation

|   | Channel | Power level | Spurious emissions level (dBm) | Limit (dB) | Margin (dB) |
|---|---------|-------------|--------------------------------|------------|-------------|
| A | 512     | Pmax        | -15.1                          | -13        | 2.1         |
| A | 585     | Pmax        | -14.1                          | -13        | 1.1         |
| D | 587     | Pmax        | -14.9                          | -13        | 1.9         |
| D | 610     | Pmax        | -14.1                          | -13        | 1.1         |
| B | 612     | Pmax        | -15.2                          | -13        | 2.2         |
| B | 685     | Pmax        | -13.7                          | -13        | 0.7         |
| E | 687     | Pmax        | -14.4                          | -13        | 1.4         |
| E | 710     | Pmax        | -14.1                          | -13        | 1.1         |
| F | 712     | Pmax        | -14.4                          | -13        | 1.4         |
| F | 735     | Pmax        | -13.9                          | -13        | 0.9         |
| C | 737     | Pmax        | -14.3                          | -13        | 1.3         |
| C | 810     | Pmax        | -13.5                          | -13        | 0.5         |

GMSK modulation measurements:

Figures from 21 to 24 show sample plots for the case when the transmitter was tuned with the maximum power in H2D diplexer configuration for different Edge Channel 512 , 585, 737, 810.

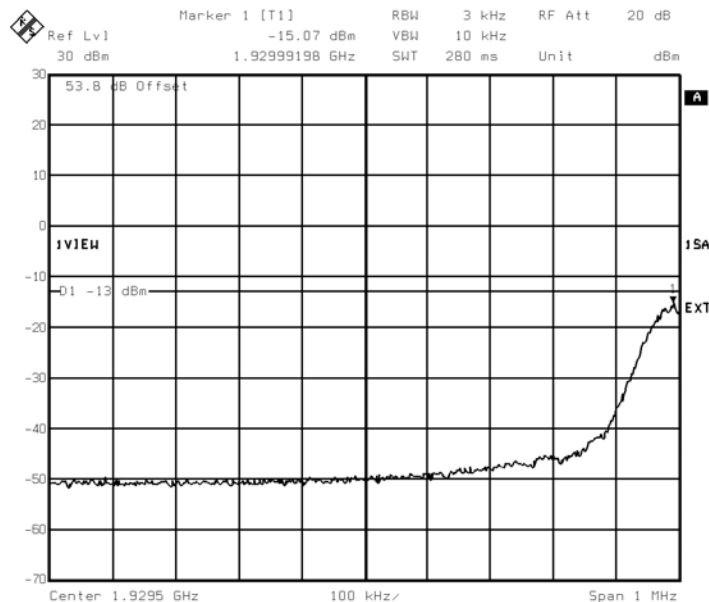
Table 8: Spurious emissions with the H2D for 8PSK modulation

|   | Channel | Power level | Spurious emissions level (dBm) | Limit (dB) | Margin (dB) |
|---|---------|-------------|--------------------------------|------------|-------------|
| A | 512     | Pmax        | -16.9                          | -13        | 3.9         |
| A | 585     | Pmax        | -17.7                          | -13        | 4.7         |
| D | 587     | Pmax        | -16.5                          | -13        | 3.5         |
| D | 610     | Pmax        | -17.2                          | -13        | 4.2         |
| B | 612     | Pmax        | -16.8                          | -13        | 3.8         |
| B | 685     | Pmax        | -17                            | -13        | 4           |
| E | 687     | Pmax        | -16.2                          | -13        | 3.2         |
| E | 710     | Pmax        | -17.4                          | -13        | 4.4         |
| F | 712     | Pmax        | -16.2                          | -13        | 3.2         |
| F | 735     | Pmax        | -17.1                          | -13        | 4.1         |
| C | 737     | Pmax        | -16.2                          | -13        | 3.2         |
| C | 810     | Pmax        | -16.5                          | -13        | 3.5         |

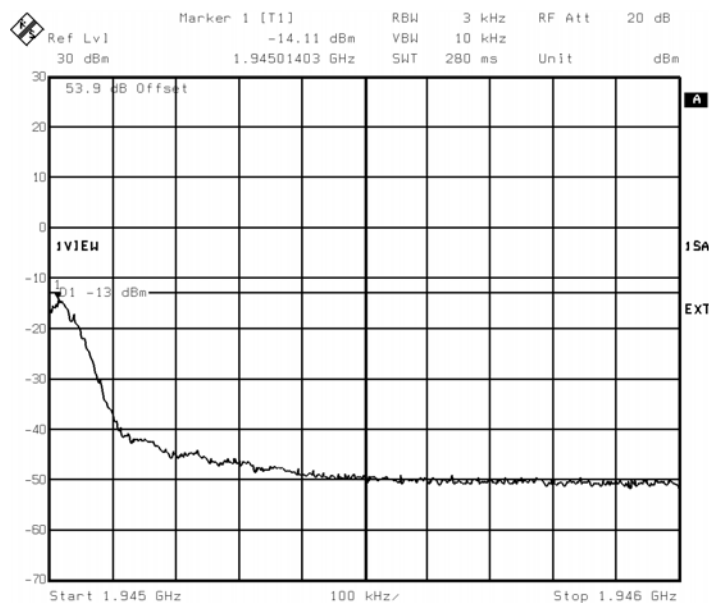
8PSK modulation measurements:

Figures from 25 to 28 show sample plots for the case when the transmitter was tuned at the maximum power in H2D diplexer configuration.

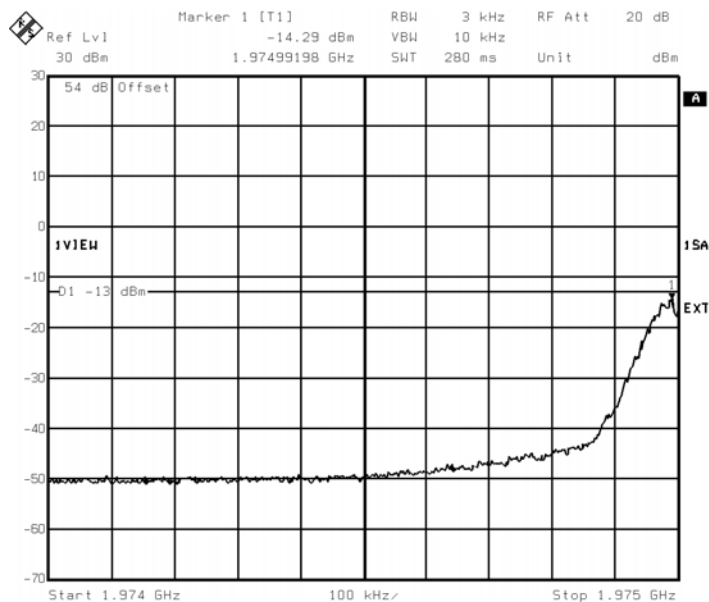
**Figure 21:**  
-1 MHz adjacent band (Channel 512, Pmax),  
H2D, GMSK modulation



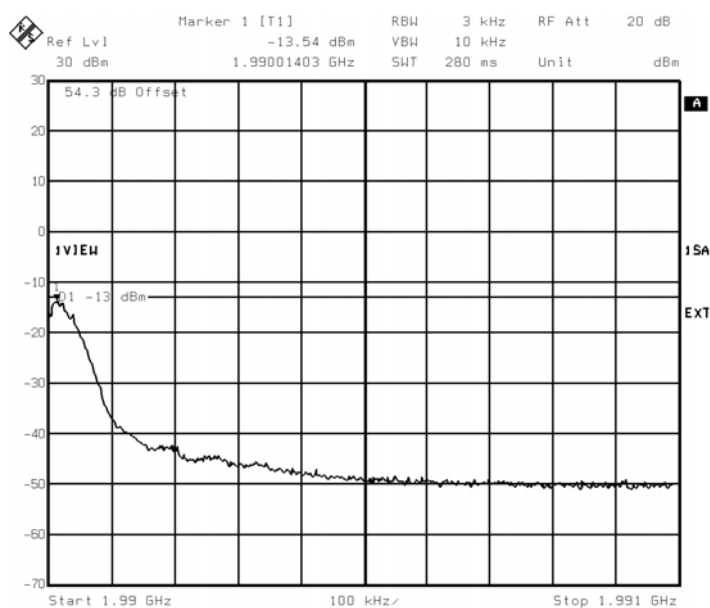
**Figure 22 :**  
+1 MHz adjacent band (Channel 585, Pmax),  
H2D, GMSK modulation



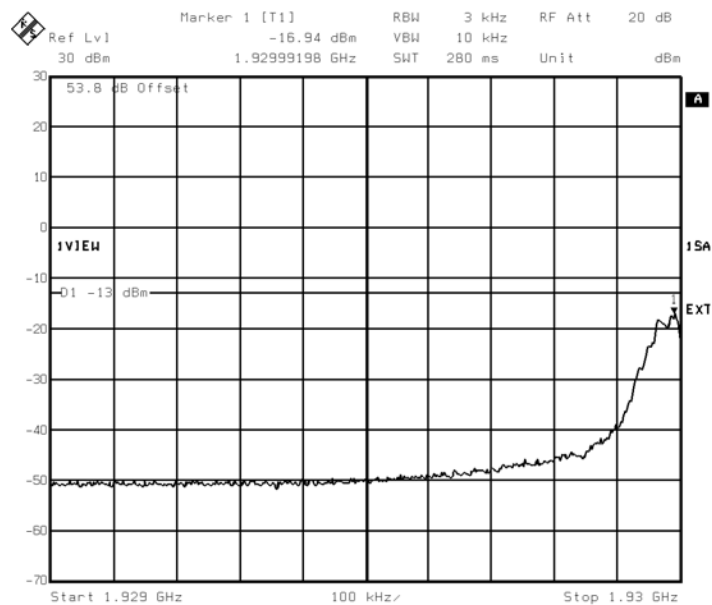
**Figure 23 :**  
-1 MHz adjacent band (Channel 737, Pmax),  
H2D, GMSK modulation



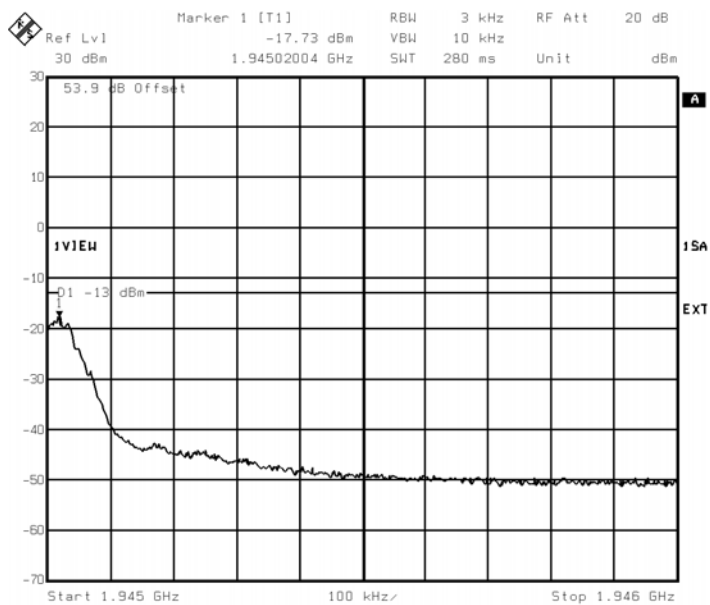
**Figure 24 :**  
+1 MHz adjacent band (Channel 810, Pmax),  
H2D, GMSK modulation



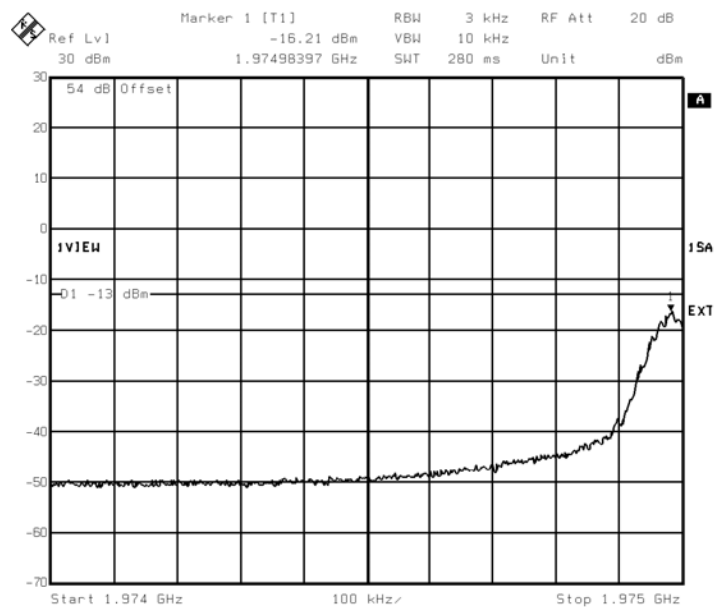
**Figure 25 :**  
-1 MHz adjacent band (Channel 512, Pmax),  
H2D, 8PSK modulation



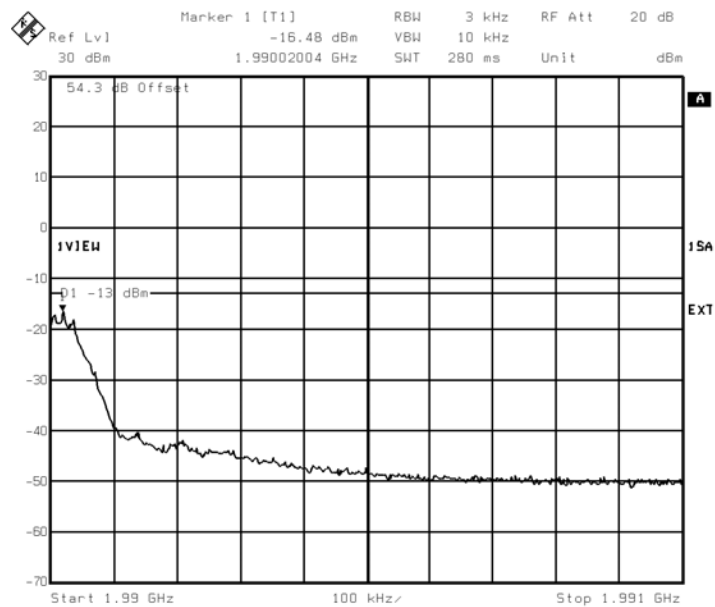
**Figure 26 :**  
+1 MHz adjacent band (Channel 585, Pmax),  
H2D, 8PSK modulation



**Figure 27 :**  
-1 MHz adjacent band (Channel 737, Pmax),  
H2D, 8PSK modulation



**Figure 28 :**  
+1 MHz adjacent band (Channel 810, Pmax),  
H2D, 8PSK modulation



#### 4.5.4. TEST RESULTS WITH H4D DUPLEXER CONFIGURATION

Table 9: Spurious emissions with the H4D for GMSK modulation

|   | Channel | Power level | Spurious emissions level (dBm) | Limit (dB) | Margin (dB) |
|---|---------|-------------|--------------------------------|------------|-------------|
| A | 512     | Pmax        | -17.8                          | -13        | 4.8         |
| A | 585     | Pmax        | -17.1                          | -13        | 4.1         |
| D | 587     | Pmax        | -18                            | -13        | 5           |
| D | 610     | Pmax        | -16.3                          | -13        | 3.3         |
| B | 612     | Pmax        | -18.1                          | -13        | 5.1         |
| B | 685     | Pmax        | -16.4                          | -13        | 3.4         |
| E | 687     | Pmax        | -17.6                          | -13        | 4.6         |
| E | 710     | Pmax        | -16.6                          | -13        | 3.6         |
| F | 712     | Pmax        | -17.1                          | -13        | 4.1         |
| F | 735     | Pmax        | -16.6                          | -13        | 3.6         |
| C | 737     | Pmax        | -17.7                          | -13        | 4.7         |
| C | 810     | Pmax        | -16.3                          | -13        | 3.3         |

GMSK modulation measurements:

Figures from 29 to 32 show sample plots for the case when the transmitter was tuned with the maximum power in H4D diplexer configuration for different Edge Channel 512 , 585, 737, 810.

Table 10: spurious emissions with the H4D for 8PSK modulation

|   | Channel | Power level | Spurious emissions level (dBm) | Limit (dB) | Margin (dB) |
|---|---------|-------------|--------------------------------|------------|-------------|
| A | 512     | Pmax        | -20.2                          | -13        | 7.2         |
| A | 585     | Pmax        | -20.3                          | -13        | 7.3         |
| D | 587     | Pmax        | -19.2                          | -13        | 6.2         |
| D | 610     | Pmax        | -20.5                          | -13        | 7.5         |
| B | 612     | Pmax        | -18.9                          | -13        | 5.9         |
| B | 685     | Pmax        | -20.1                          | -13        | 7.1         |
| E | 687     | Pmax        | -18.8                          | -13        | 5.8         |
| E | 710     | Pmax        | -20                            | -13        | 7           |
| F | 712     | Pmax        | -19                            | -13        | 6           |
| F | 735     | Pmax        | -19.9                          | -13        | 6.9         |
| C | 737     | Pmax        | -19.4                          | -13        | 6.4         |
| C | 810     | Pmax        | -19.9                          | -13        | 6.9         |

8PSK modulation measurements:

Figures from 33 to 36 show sample plots for the case when the transmitter was tuned at the maximum power in H4D diplexer configuration.

Figure 29:

-1 MHz adjacent band (Channel 512, Pmax),  
H4D, GMSK modulation

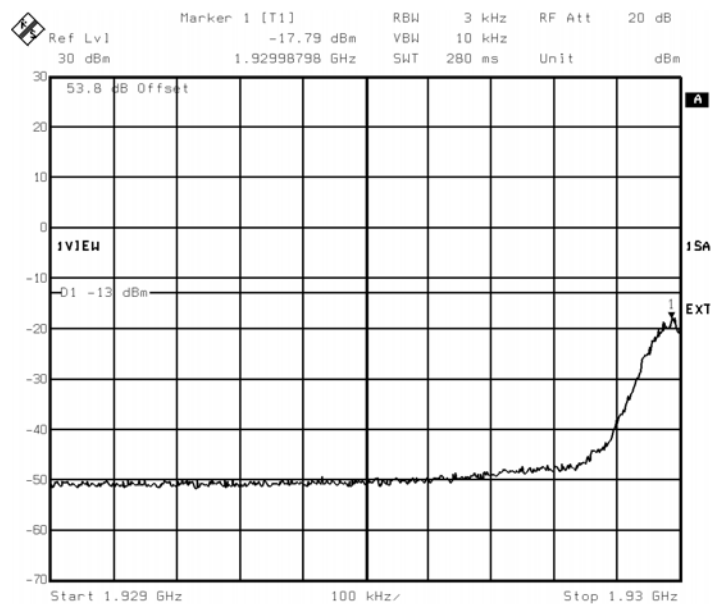


Figure 30 :

+1 MHz adjacent band (Channel 585, Pmax),  
H4D, GMSK modulation

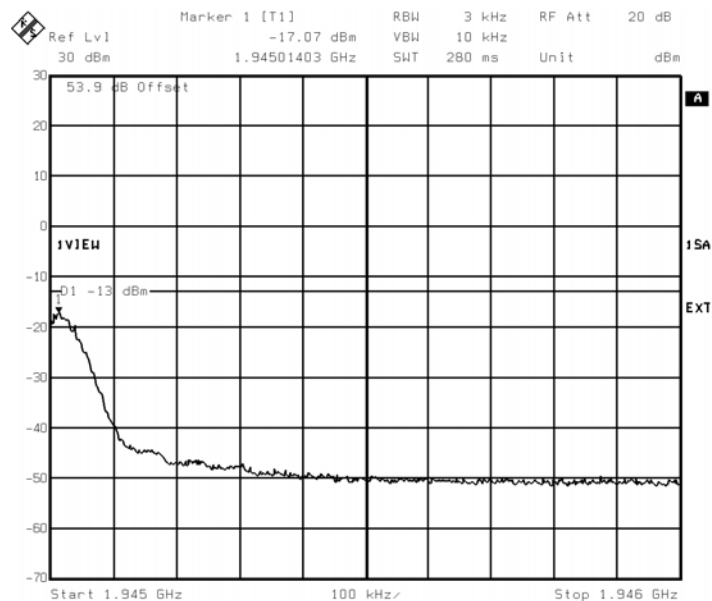


Figure 31 :  
-1 MHz adjacent band (Channel 737, Pmax),  
H4D, GMSK modulation

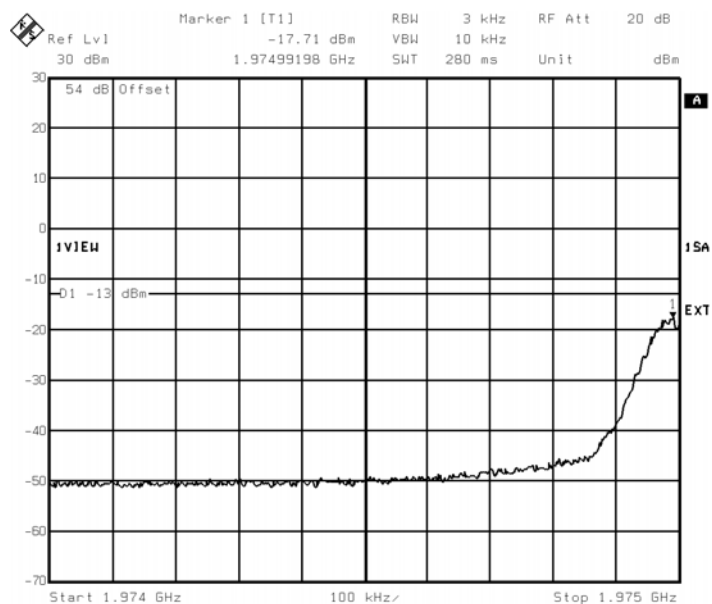


Figure 32 :  
+1 MHz adjacent band (Channel 810, Pmax),  
H4D, GMSK modulation

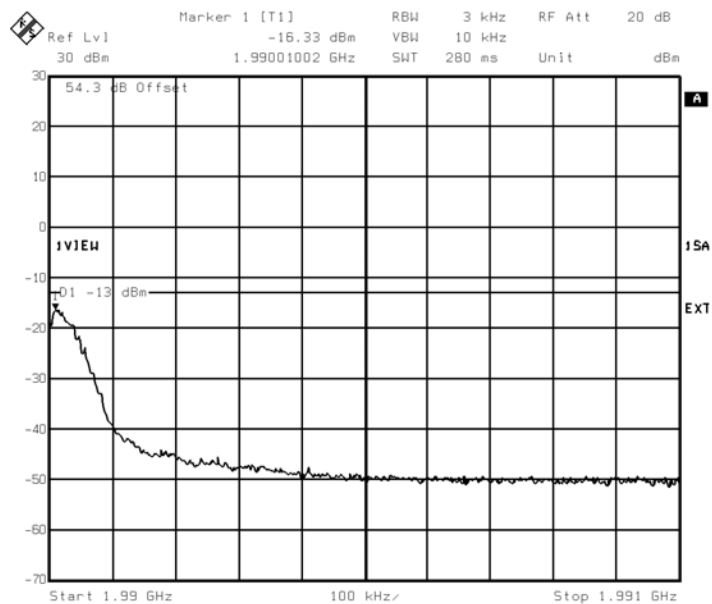


Figure 33:

-1 MHz adjacent band (Channel 512, Pmax),  
H4D, 8PSK modulation

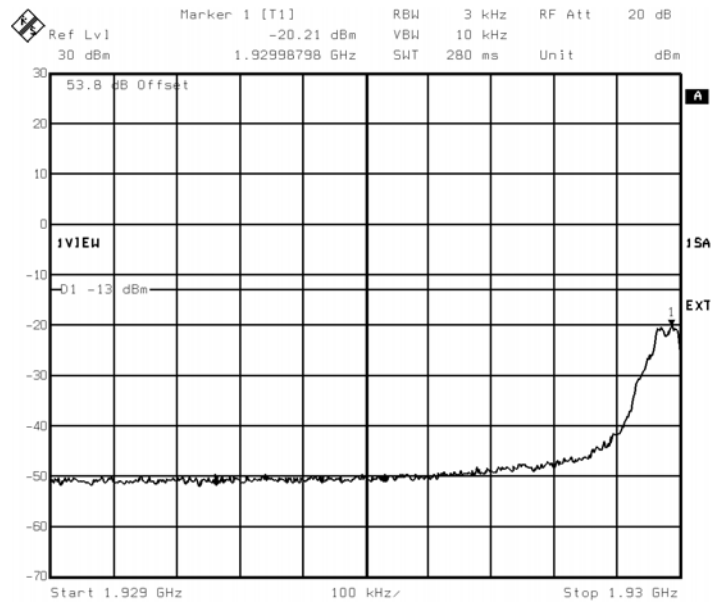


Figure 34 :

+1 MHz adjacent band (Channel 585, Pmax),  
H4D, 8PSK modulation

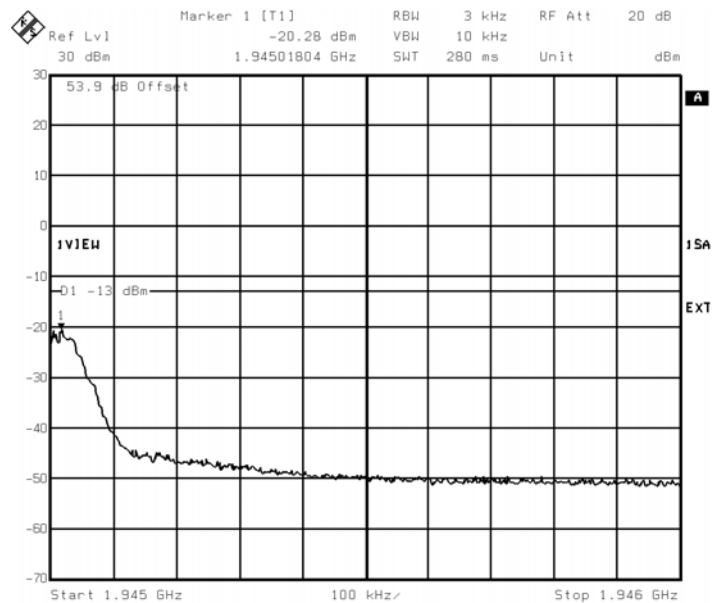


Figure 35:  
-1 MHz adjacent band (Channel 737, Pmax),  
H4D, 8PSK modulation

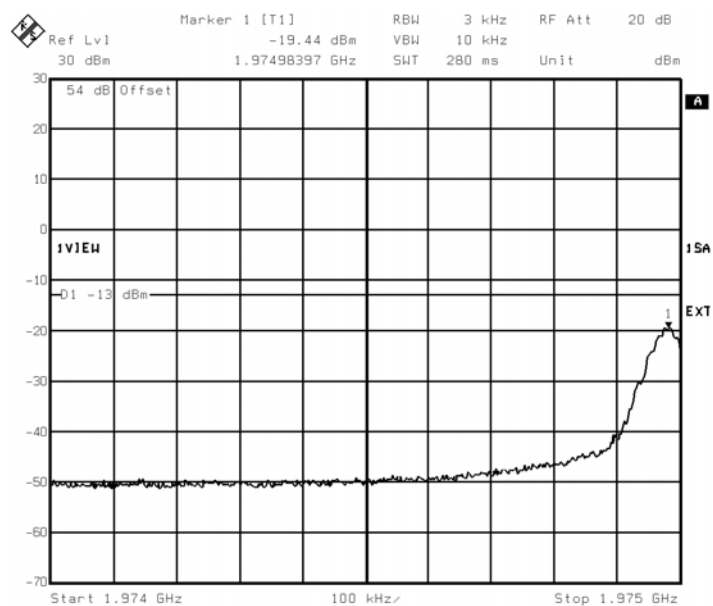
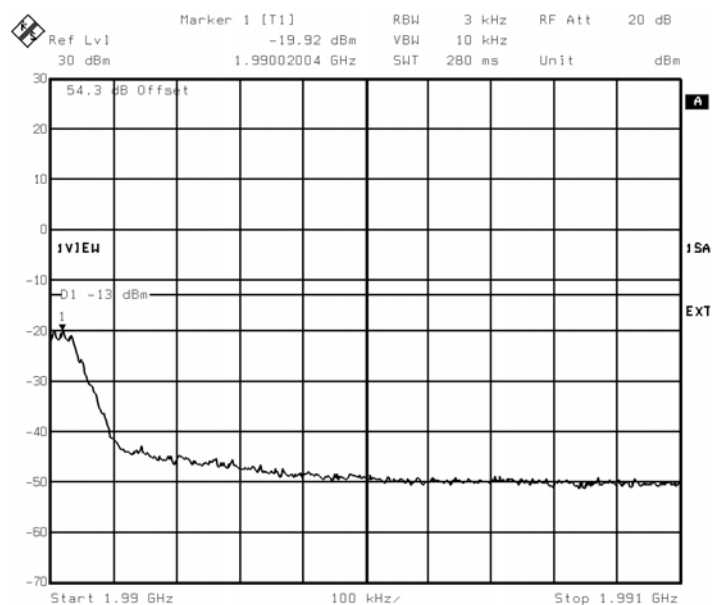


Figure 36 :  
+1 MHz adjacent band (Channel 810, Pmax),  
H4D, 8PSK modulation



#### 4.5.5. CONCLUSION

▪ **GMSK modulation:**

| <b>Coupling Configuration</b> | <b>Antenna Output power (dBm)</b> | <b>Power reduction Measurement</b><br>( qualification modules) | <b>System Power limitation<br/>GMSK modulation</b>             |
|-------------------------------|-----------------------------------|----------------------------------------------------------------|----------------------------------------------------------------|
| <b>Diplexer</b>               | 46.5                              | $P_{\max} - 4 \text{ dB} = 42.5 \text{ dBm}$                   | <b><math>P_{\max} - 6 \text{ dB} = 40.5 \text{ dBm}</math></b> |
| <b>H2D</b>                    | 43                                | $P_{\max} = 43 \text{ dBm}$                                    | <b><math>P_{\max} - 2 \text{ dB} = 41 \text{ dBm}</math></b>   |
| <b>H4D</b>                    | 40                                | $P_{\max} = 40 \text{ dBm}$                                    | <b><math>P_{\max} = 40 \text{ dBm}</math></b>                  |

For system limit, 2dB power reduction margin is taken to ensure the compliance for the case of diplexer and H2D due to eDRX/HePA products tolerances.

In order to comply with the emission limits in the 1 MHz bands immediately outside and adjacent to the frequency block, the absolute transmit power level of the block edge channels has been done at  **$P_{\max} - 6 \text{ dB} = 40.5 \text{ dBm}$**  for the worst case in diplexer configuration.

▪ **8PSK modulation:**

eDRX and HePA 1900 support 8 PSK modulation.

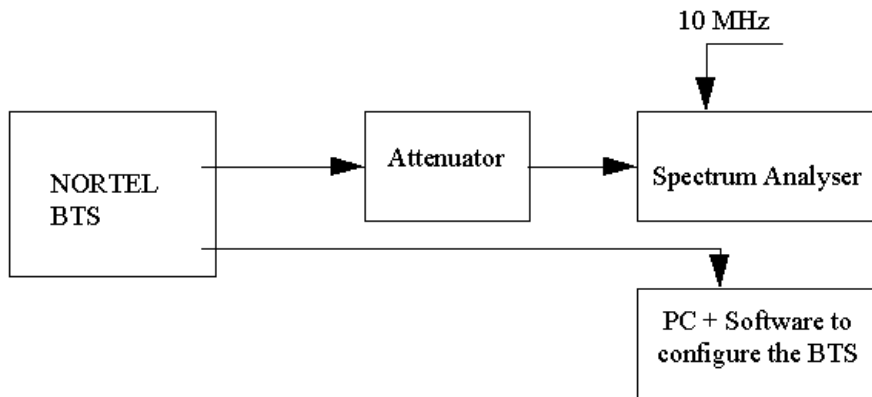
| <b>Coupling</b> | <b>Antenna port Output power (dBm)</b> | <b>Power reduction measurement</b>           | <b>System Power limitation<br/>8 PSK modulation</b>            |
|-----------------|----------------------------------------|----------------------------------------------|----------------------------------------------------------------|
| <b>Diplexer</b> | 45.8                                   | $P_{\max} - 2 \text{ dB} = 43.8 \text{ dBm}$ | <b><math>P_{\max} - 2 \text{ dB} = 43.8 \text{ dBm}</math></b> |
| <b>H2D</b>      | 42                                     | $P_{\max} = 42 \text{ dBm}$                  | <b><math>P_{\max} = 42 \text{ dBm}</math></b>                  |
| <b>H4D</b>      | 39                                     | $P_{\max} = 39 \text{ dBm}$                  | <b><math>P_{\max} = 39 \text{ dBm}</math></b>                  |

In the worst configuration (Diplexer) , the maximum power emission with 2dB reduced ( **$P_{\max}-2\text{dB}$** ) allows to be compliant with the spurious emission limits (-13 dBm) in the 1 MHz bands immediately outside and adjacent to the frequency block for 8PSK modulation .

#### 4.5.6. TEST PROCEDURE

The equipment was configured as shown in schematic 3 .

**Schematic 3 : Test configuration for Spurious emissions at antenna terminals**



For adjacent channels emissions, the BTS nominal carrier frequency was adjusted to each block edge channel.

Channels 512 and 810 are those channels which are at the lower and upper edges of the PCS band respectively.

The BTS was configured to transmit at maximum power (static level 0) or a reduced power :

- for GMSK modulation, in mode GMSK no synchro
- for 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5 .

For these measurements, the resolution bandwidth of the spectrum analyzer was set to at least 1% of the emission bandwidth. In this case the emission bandwidth measured was closed to 300 kHz. Therefore, the resolution bandwidth was set to 3 kHz.

The spectrum analyzer had the following settings for adjacent band:

|                          |                                                                    |
|--------------------------|--------------------------------------------------------------------|
| Resolution bandwidth :   | 3 kHz                                                              |
| Video bandwidth :        | 10 kHz                                                             |
| Span :                   | 1 MHz                                                              |
| Reference Level Offset : | Corrected to account for cable(s),<br>filter and attenuator losses |
| Level range :            | 100 dB                                                             |
| Sweep time :             | Coupled                                                            |
| Detector :               | Sample                                                             |
| Trace :                  | Average                                                            |
| Sweep count :            | 200                                                                |

For all other measurements the BTS carrier frequency was adjusted to Channel 810.

The spectrum analyzer had the following settings for out of block emissions.

|                        |       |
|------------------------|-------|
| Resolution bandwidth : | 1 MHz |
| Video bandwidth :      | 1 MHz |

The emissions were investigated up to the tenth harmonic of the fundamental emission (20 GHz).

The measured level of the emissions was recorded and compared to the -13 dBm limit.

#### **4.6. NAME OF TEST: FREQUENCY STABILITY**

Table 6 shows the Frequency Stability for channel 661 (F=1960 MHz) in BTS 12000 OUTDOOR configuration (8 HePA) under extreme conditions.

**Table 11: Frequency Stability in BTS S12000 Outdoor configuration – Channel 661**

| Temperature<br>(°C) | Maximum Carrier Frequency<br>Deviation (Hz) |                                      |                                            |
|---------------------|---------------------------------------------|--------------------------------------|--------------------------------------------|
|                     | 85% Nominal<br>Supply voltage<br>195 V AC   | Nominal Supply<br>voltage<br>230V AC | 115% Nominal<br>Supply voltage<br>264 V AC |
| -30                 | 50.3                                        | 56.8                                 | 47.4                                       |
| -20                 | 56.9                                        | 56.5                                 | 45.4                                       |
| -10                 | 57.7                                        | 56.6                                 | 43.7                                       |
| 0                   | 62.3                                        | 49.2                                 | 61.5                                       |
| 10                  | 49.7                                        | 54.6                                 | 48.0                                       |
| 20                  | 49.2                                        | 58.7                                 | 56.3                                       |
| 30                  | 56.5                                        | 49.4                                 | 53.9                                       |
| 40                  | 58.7                                        | 71.0                                 | 63.0                                       |
| 50                  | 60.7                                        | 61.0                                 | 56.6                                       |

The maximum frequency deviation allowed is 90 Hz.

The maximum deviation measured (71Hz) is sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The S12000 Outdoor BTS complies with the requirement.

Thermal tests have been performed with OUTDOOR BTS S12000.

The BTS S12000 must operate under the following external extreme temperatures:

- BTS S12000 Outdoor : - 30°C / + 50 °C

Frequency stability test is performed under following extreme conditions:

- Temperature from -30°C to +50°C at intervals of 10 degrees.
- With AC power supply variations: 195 VAC , 230 VAC, 264 VAC.

All Modules (eDRX and HePA) run with nominal power regulation at maximum power (60W) in GMSK modulation. The eDRX/HePA were configured to transmit at maximum power (Static level 0).

BTS S12000 is equipped with eDRX/HePA in slots 0, 1, 2, 3, 6, 7, 8, 9 with following emission configuration :

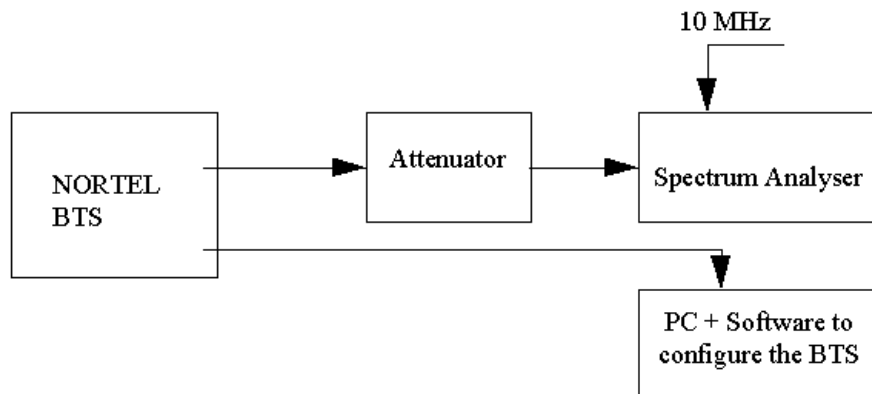
|                 |      |
|-----------------|------|
| slot 0 : BCCH → | C542 |
| slot 1 : TCH →  | C661 |
| slot 2 : BCCH → | C572 |
| slot 3 : BCCH → | C602 |
| slot 6 : BCCH → | C632 |
| slot 7 : BCCH → | C692 |
| slot 8 : BCCH → | C722 |
| slot 9 : BCCH → | C752 |

Frequency deviation is measured in slot 1 on channel C661.

A period of at least one hour was allowed prior to measurement to ensure that all the components of the oscillator circuit was stabilized at each temperature.

The equipment was configured as shown in figure 16.

**Figure 16: Test configuration for Frequency Stability**



## **5. EXHIBIT 2: TEST REPORT FOR PA30W PCS1900/GSM850**

### **5.1. INTRODUCTION**

The following information is submitted to introduce a Certification of a Broadband PCS Base Station for Northern Telecom, Inc:

- According to FCC Part 24, Subpart E and Part 2,
- According to FCC Part 22, Subpart H and Part 2,

Subpart J of the FCC Rules and Regulations. The measurement procedures were in accordance with the requirements of Part 2.999.

### **5.2. MEASUREMENT RESULTS**

Tables 1, 2 are a summary of the measurement results performed in this report.

**Table 1: PCS 1900 Measurement Results Summary**

| <b>FCC Measurement Specification</b> | <b>IC Limit Specification</b> | <b>Description</b>                      | <b>Results</b> | <b>Note</b>                          |
|--------------------------------------|-------------------------------|-----------------------------------------|----------------|--------------------------------------|
| 2.1046 , 24.232                      | 6.2                           | RF Power Output                         | Compliant      | Reference to<br>[R5]<br>[R8]<br>[R9] |
| 2.1047                               |                               | Modulation characteristics              |                |                                      |
| 2.1049                               |                               | Occupied Bandwidth                      |                |                                      |
| 2.1051, 2.1057, 24.238               | 6.3 , 6.4                     | Spurious Emissions at Antenna Terminals |                |                                      |
| 2.1055 , 24.235                      | 7.0                           | Frequency Stability                     |                |                                      |

**Table 2: GSM 850 Measurement Results Summary**

| <b>FCC Measurement Specification</b> | <b>IC Limit Specification RSS 128 Section</b> | <b>Description</b>                      | <b>Results</b> | <b>Note</b>                          |
|--------------------------------------|-----------------------------------------------|-----------------------------------------|----------------|--------------------------------------|
| 2.1046                               | 7.1                                           | RF Power Output                         | Compliant      | Reference to<br>[R7]<br>[R8]<br>[R9] |
| 2.1047                               | 7.2                                           | Modulation characteristics              |                |                                      |
| 2.1049                               |                                               | Occupied Bandwidth                      |                |                                      |
| 2.1051                               | 7.4 , 7.5                                     | Spurious Emissions at Antenna Terminals |                |                                      |
| 2.1055                               | 8.1 , 8.2                                     | Frequency Stability                     |                |                                      |

Measurements in GSMK modulation for GSM 850 Band are available in document [R7].

Additional GMSK tests are performed for the Edge channel of sub-band A'', A, B, A', B'. Additional Tests are also performed in 8PSK modulation.

### **5.3. TEST NAME: 2.1046 RF OUTPUT POWER**

#### **FCC REQUIREMENTS**

##### **FCC Limit (Part 22.913) Effective radiated power limits**

The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

##### **FCC Limit (Part 24.232) Power and antenna height limits**

Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 100 watts.

#### **TEST RESULTS GSM 850**

**Table 3: measured RF Output Power in GSM 850 band**

| <b>Sub band</b> | <b>Radio Channel</b> | <b>Frequency (MHz)</b> | <b>RF Output Power (dBm) GMSK</b> | <b>RF Output Power (dBm) 8PSK</b> | <b>Maximum Rated Power (dBm)</b> | <b>Limit (dBm)</b> |
|-----------------|----------------------|------------------------|-----------------------------------|-----------------------------------|----------------------------------|--------------------|
| A''             | 128                  | 869.2                  | 43.5                              | 44.0                              | 44,8 (30 W)                      | 50                 |
|                 | 131                  | 869.8                  | 43.5                              | 44.1                              |                                  |                    |
| A               | 133                  | 870.2                  | 43.6                              | 44.1                              |                                  |                    |
|                 | 181                  | 879.8                  | 43.7                              | 44.3                              |                                  |                    |
| B               | 183                  | 880.2                  | 43.6                              | 44.3                              |                                  |                    |
|                 | 231                  | 889.8                  | 43.5                              | 44.2                              |                                  |                    |
| A'              | 233                  | 890.2                  | 43.4                              | 44.2                              |                                  |                    |
|                 | 238                  | 891.2                  | 43.4                              | 44.1                              |                                  |                    |
| B'              | 241                  | 891.8                  | 43.4                              | 44.2                              |                                  |                    |
|                 | 251                  | 893.8                  | 43.2                              | 44.0                              |                                  |                    |

## TEST RESULTS PCS 1900

**Table 4 : measured RF Output Power in PCS 1900 band**

| Band | Radio Channel | Frequency (MHz) | Measured RF Output Power (dBm) | Measured RF Output Power (dBm) 8PSK | Maximum Rated Power (dBm) | Limit (dBm) |
|------|---------------|-----------------|--------------------------------|-------------------------------------|---------------------------|-------------|
| A    | 512           | 1930,2          | 42.9                           | 43                                  | 44.8                      | 50          |
| A    | 548           | 1937,4          | 43.0                           | 43.2                                |                           |             |
| A    | 585           | 1944,8          | 43.2                           | 43.5                                |                           |             |
| D    | 587           | 1945,2          | 43.2                           | 43.5                                |                           |             |
| D    | 598           | 1947,4          | 43.2                           | 43.5                                |                           |             |
| D    | 610           | 1949,8          | 43.2                           | 43.5                                |                           |             |
| B    | 612           | 1950,2          | 43.2                           | 43.5                                |                           |             |
| B    | 648           | 1957,4          | 43.4                           | 43.5                                |                           |             |
| B    | 685           | 1964,8          | 43.4                           | 43.6                                |                           |             |
| E    | 687           | 1965,2          | 43.3                           | 43.5                                |                           |             |
| E    | 698           | 1967,4          | 43.3                           | 43.5                                |                           |             |
| E    | 710           | 1969,8          | 43.4                           | 43.7                                |                           |             |
| F    | 712           | 1970,2          | 43.4                           | 43.7                                |                           |             |
| F    | 723           | 1972,4          | 43.4                           | 43.7                                |                           |             |
| F    | 735           | 1974,8          | 43.5                           | 43.8                                |                           |             |
| C    | 737           | 1975,2          | 43.5                           | 43.8                                |                           |             |
| C    | 773           | 1982,4          | 43.5                           | 43.8                                |                           |             |
| C    | 810           | 1989,8          | 43.3                           | 43.6                                |                           |             |

## **5.4. TEST NAME: 2.1049 OCCUPIED BANDWIDTH**

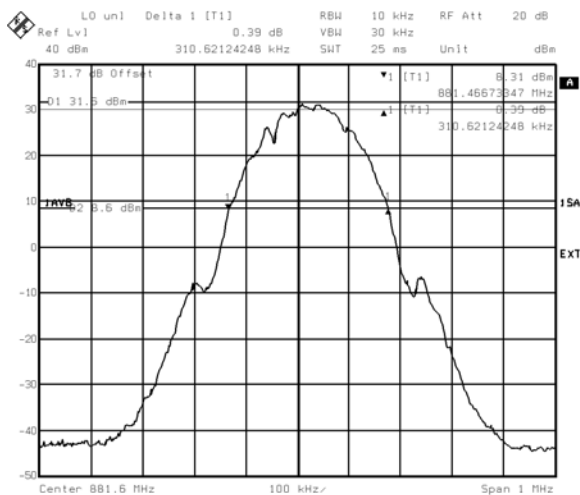
### **FCC REQUIREMENTS**

The occupied bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated of at least 26 dB.

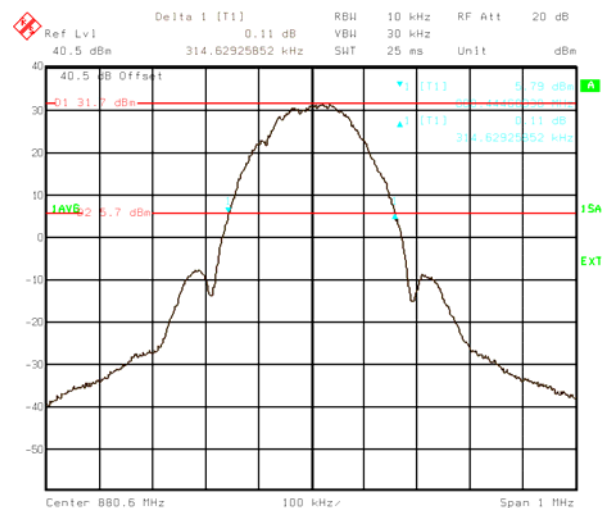
### **TEST RESULTS GSM 850**

**Figure 1: sample plot for occupied bandwidth, @ M (GSM 850 band)**

#### **GMSK modulation**



#### **8PSK Modulation**



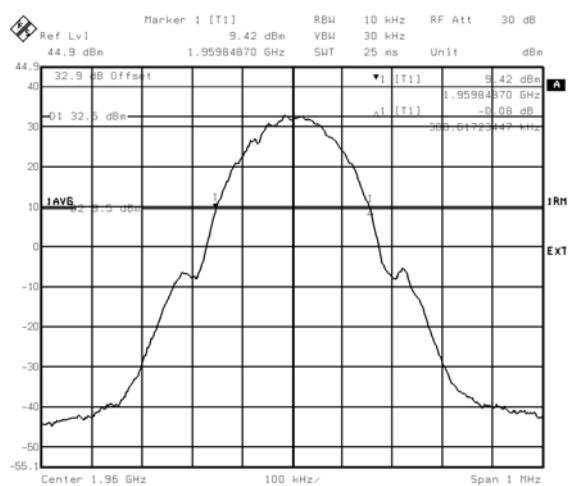
The maximum occupied bandwidth was found 320 kHz for GMSK modulation

The maximum occupied bandwidth was found 314 kHz for 8PSK modulation

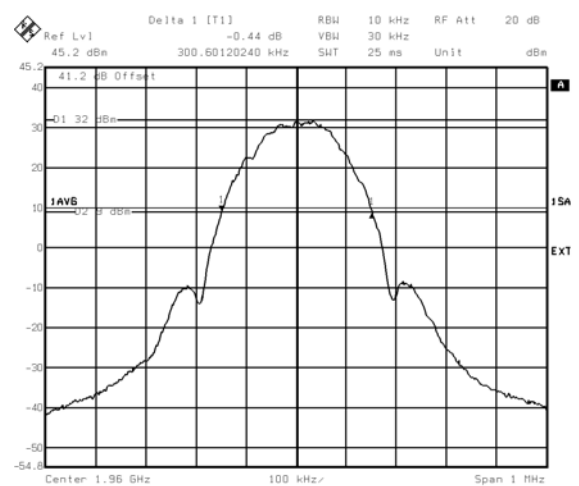
## TEST RESULTS PCS 1900

**Figure 2: sample plot for occupied bandwidth @ M (PCS 1900 band)**

### GMSK modulation



### 8PSK Modulation



The maximum occupied bandwidth was found to be:

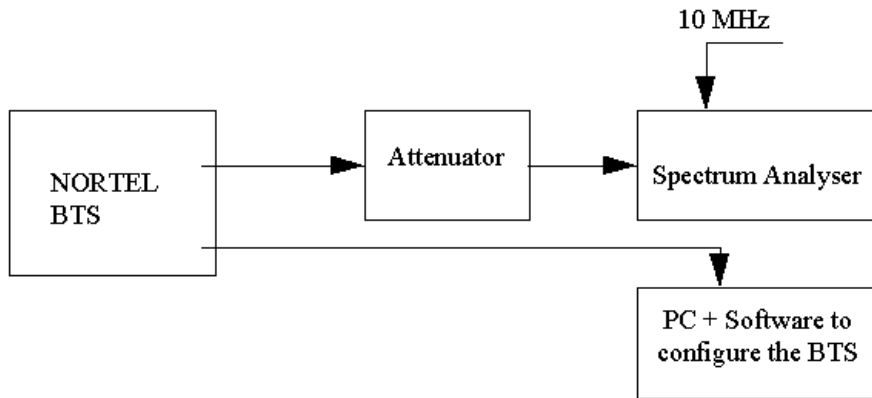
320 kHz , measured on channel 661,  $f = 1960.0$  MHz GSMK modulation.

318 kHz , measured on channel 661,  $f = 1960.0$  MHz 8PSK modulation.

## TEST PROCEDURE

The equipment was configured as shown in Schematic1.

**Schematic1 : Test configuration for Occupied bandwidth**



The BTS was configured to transmit at maximum power (Static Level 0).  
Measurements were performed at middle frequency of the transmit band.

The occupied bandwidth was measured by determining the bandwidth out of which all emissions are attenuated of at least 26 dB.

The spectrum analyzer had the following settings:

|                         |                                                             |
|-------------------------|-------------------------------------------------------------|
| Resolution bandwidth:   | 10 kHz                                                      |
| Video bandwidth:        | 30 kHz                                                      |
| Span:                   | 1 MHz and 2.2 MHz                                           |
| Sweep time:             | 25 ms                                                       |
| Reference Level Offset: | Corrected to take into account cables and attenuator losses |

## **5.5. TEST NAME: 2.1051 SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

### **FCC REQUIREMENTS**

- (c) At any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.
- (d) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- (e) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (f) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

## TEST RESULTS GSM 850

The reference level for spurious emissions at the antenna terminals is taken from the measured output power (43.9 dBm = 24.5 Watts).

Therefore the spurious emissions must be attenuated by at least  $43 + 10 \cdot \log(24.5) = 56.9$  dB.  
The measured output power was 43.9 dBm ; therefore the limit is  $43.9 - 56.9 = -13$  dBm.

Spurious measurement is performed in the following coupling configuration with 30W Power amplifier and with duplexer .

The nominal power at antenna connector : Pduplexer max = 44dBm

Tables 5 and 6 show the results for Spurious Emissions at Antenna Terminals.

**Table 5: Test results for Spurious Emissions in GMSK modulation**

|     | Channel | Power emission level | Spurious Emissions Level (dBm) | Limit (dBm) | Margin (dB) |
|-----|---------|----------------------|--------------------------------|-------------|-------------|
| A'' | 128     | Pmax – 2 dB          | -13.4                          | -13         | 0.4         |
| A'' | 131     | Pmax – 2 dB          | -13.4                          | -13         | 0.4         |
| A   | 133     | Pmax – 2 dB          | -13.6                          | -13         | 0.6         |
| A   | 181     | Pmax – 2 dB          | -13.2                          | -13         | 0.2         |
| B   | 183     | Pmax – 2 dB          | -13.9                          | -13         | 0.9         |
| B   | 231     | Pmax – 2 dB          | -13.7                          | -13         | 0.7         |
| A'  | 233     | Pmax – 2 dB          | -14.3                          | -13         | 1.3         |
| A'  | 238     | Pmax                 | -35.8                          | -13         | 22.8        |
| B'  | 241     | Pmax                 | -34                            | -13         | 21          |
| B'  | 251     | Pmax – 2 dB          | -13.5                          | -13         | 0.5         |

**Table 6: Test results for Spurious Emissions in 8PSK Modulation**

|     | Channel | Power emission level | Spurious Emissions Level (dBm) | Limit (dBm) | Margin (dB) |
|-----|---------|----------------------|--------------------------------|-------------|-------------|
| A'' | 128     | Pmax – 2 dB          | -14.8                          | -13         | 1.8         |
| A'' | 131     | Pmax – 2 dB          | -14.9                          | -13         | 1.9         |
| A   | 133     | Pmax – 2 dB          | -14.0                          | -13         | 1.0         |
| A   | 181     | Pmax – 2 dB          | -14.9                          | -13         | 1.9         |
| B   | 183     | Pmax – 2 dB          | -14.4                          | -13         | 1.4         |
| B   | 231     | Pmax – 2 dB          | -14.8                          | -13         | 1.8         |
| A'  | 233     | Pmax – 2 dB          | -14.3                          | -13         | 1.3         |
| A'  | 238     | Pmax                 | -31.5                          | -13         | 18.5        |
| B'  | 241     | Pmax                 | -33.6                          | -13         | 20.6        |
| B'  | 251     | Pmax – 2 dB          | -14.8                          | -13         | 1.8         |

**Table 7 : Spurious Out of Tx band – GMSK modulation**

| Frequency (MHz) | Spurious Emissions (dBm) | Margin (dB) | Limit (dBm) |
|-----------------|--------------------------|-------------|-------------|
| 0.1-50          | -37.7                    | 24.7        | -13         |
| 50-500          | -36.9                    | 23.9        |             |
| 500-880.4       | -28.8                    | 15.8        |             |
| 882..8-1000     | -28.2                    | 15.2        |             |
| 1000-2000       | -29                      | 16          |             |
| 2000-40000      | -28                      | 15          |             |
| 4000-120000     | -25.5                    | 12.5        |             |
| 12000-20000     | -25.7                    | 12.7        |             |

**Notes :**

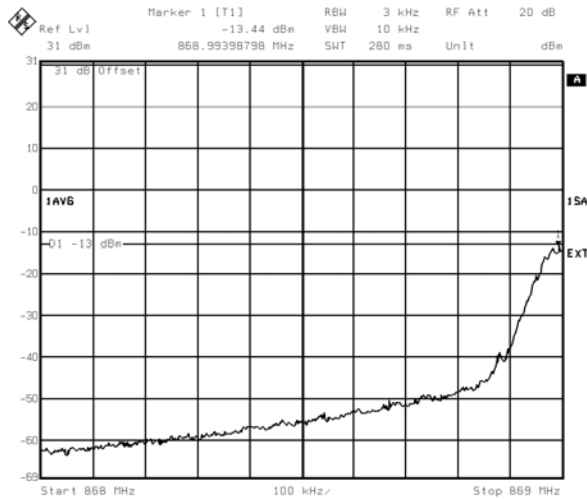
Figures 3,4,5 show sample plots for the case when the transmitter was respectively tuned to edge channels in Tx band for GMSK modulation.

Figures 6,7,8 show sample plots for the case when the transmitter was respectively tuned to edge channels in Tx band for 8PSK modulation.

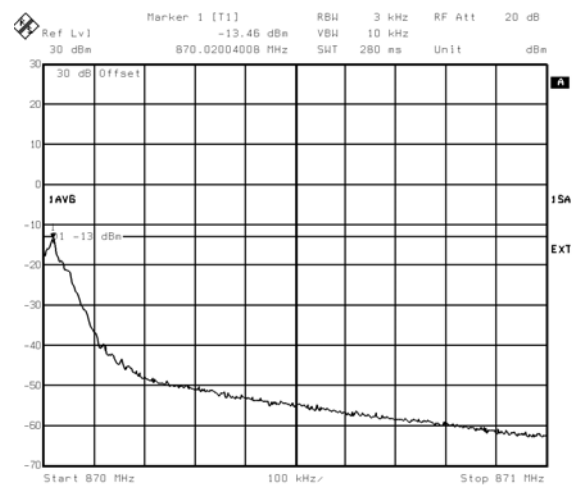
Figure 9,10,11 show sample plots for frequency spans from 0 to 20 GHz with emission on channel 190 at Pmax = 44 dBm with Duplexer module.

**Figure 3 : 1 MHz adjacent band  
GMSK MODULATION – Duplexer configuration  
Power limitation :Pmax - 2 dB**

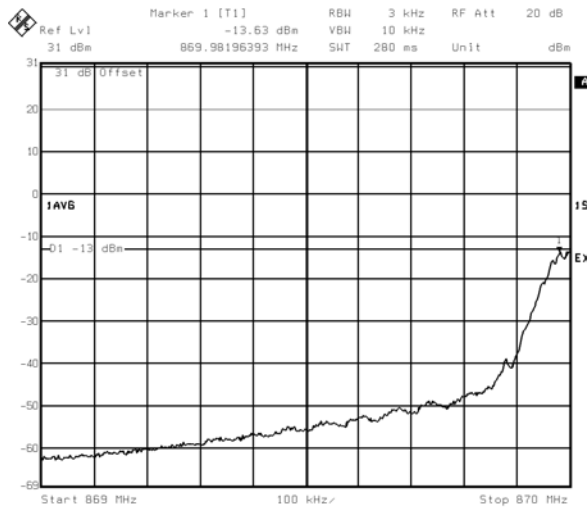
**Channel 128**



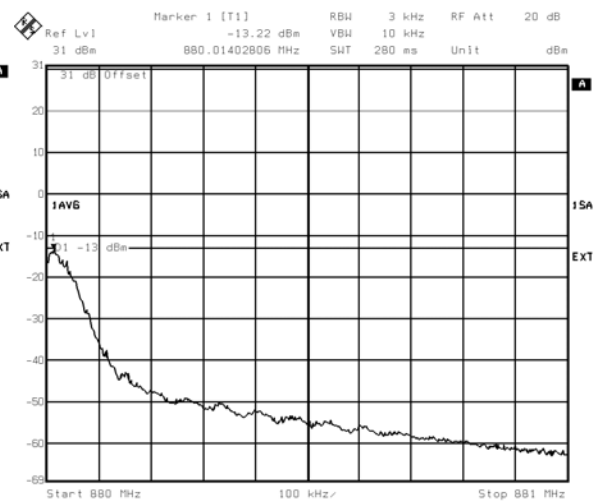
**Channel 131**



**Channel 133**

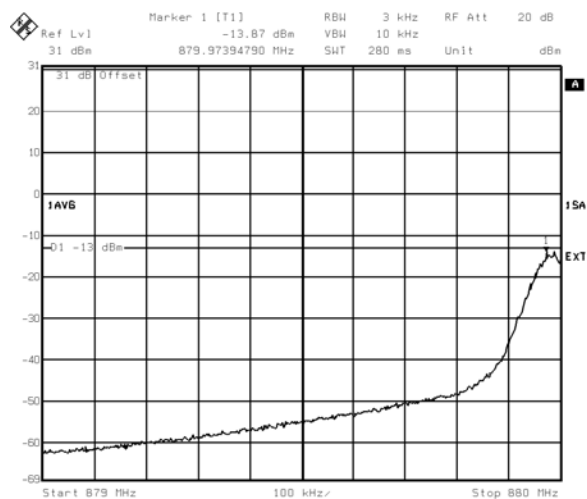


**Channel 181**

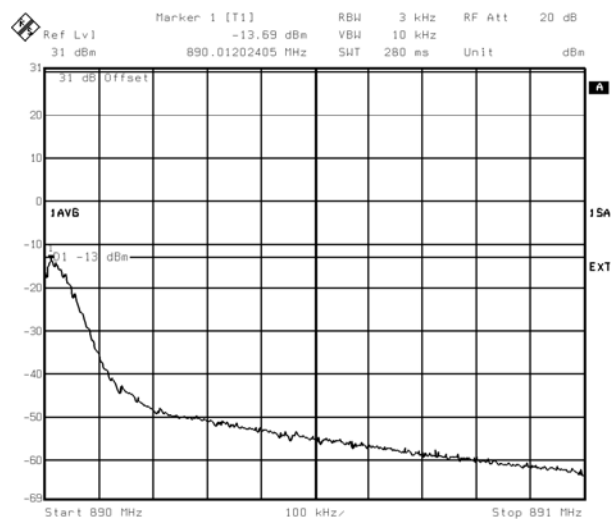


**Figure 4 : 1 MHz adjacent band  
GMSK MODULATION – Duplexer configuration  
Power limitation :Pmax - 2 dB**

**Channel 183**



**Channel 231**

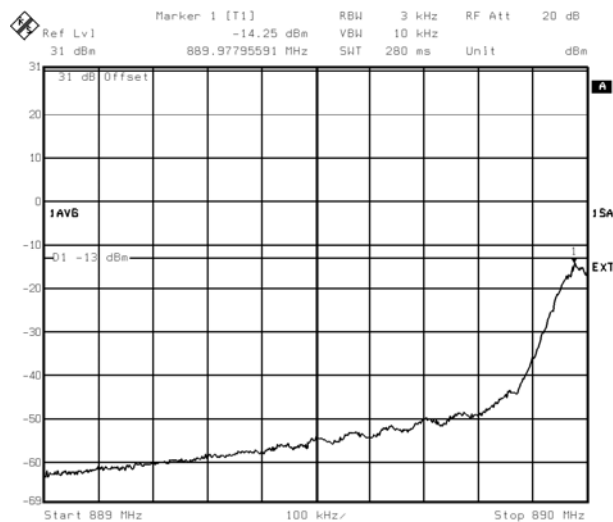


**Figure 5: 1 MHz adjacent band  
GMSK MODULATION – Duplexer configuration**

**Channel 233**

**-1 MHz adjacent band,**

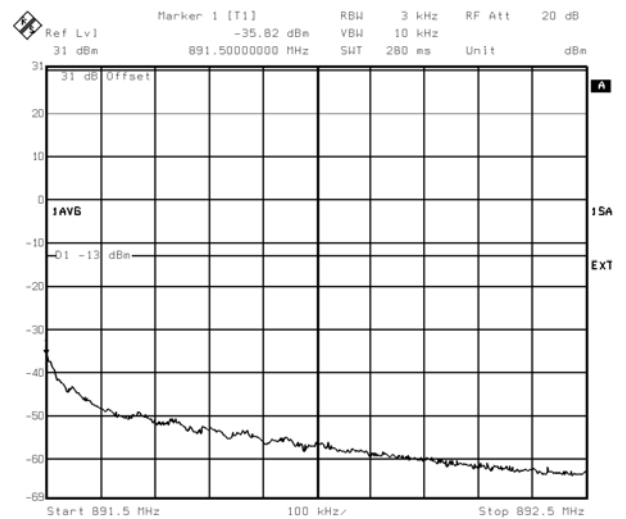
**Power limitation Pmax -2dB**



**Channel 238**

**+1 MHz adjacent band**

**Power limitation: Pmax**



**-1MHz adjacent band**

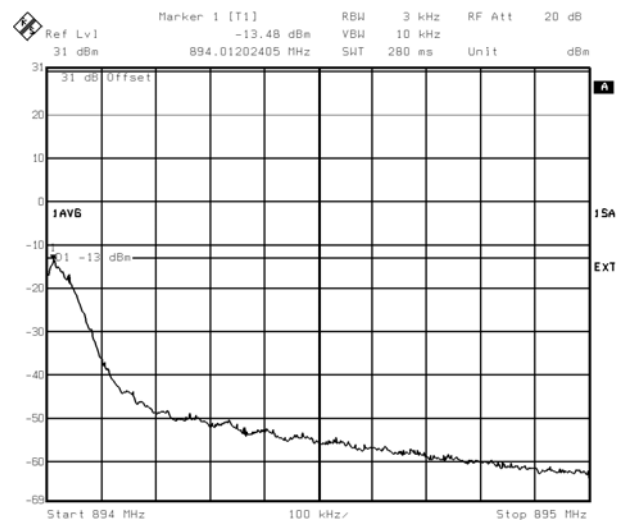
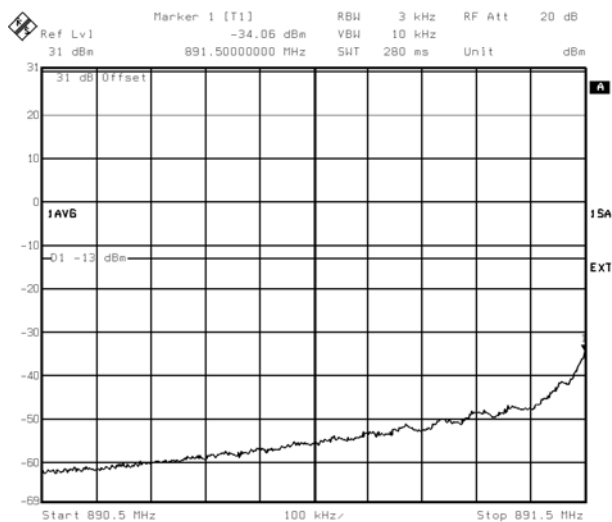
**+ 1MHz adjacent band**

**Channel 241**

**Channel 251**

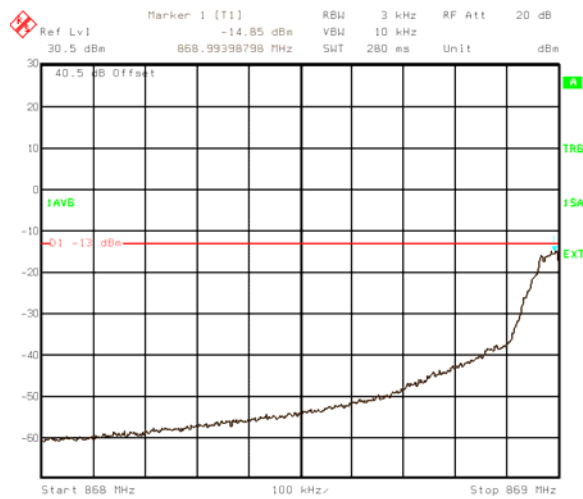
**Power limitation P Max**

**Pmax -2dB**

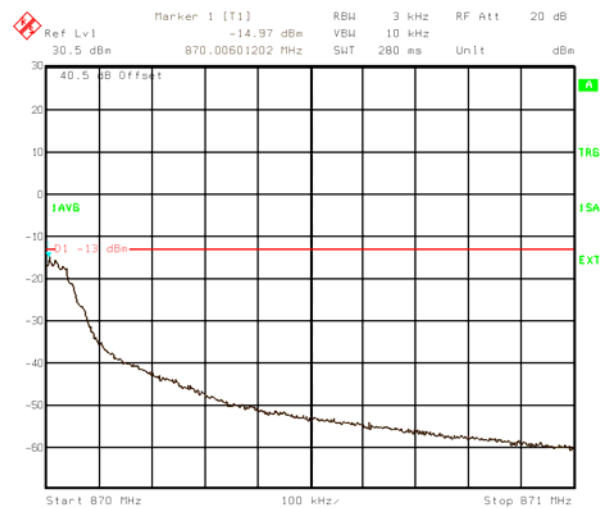


**Figure 6 : 1 MHz adjacent band  
8PSK MODULATION – Duplexer configuration  
Power limitation :Pmax - 2 dB**

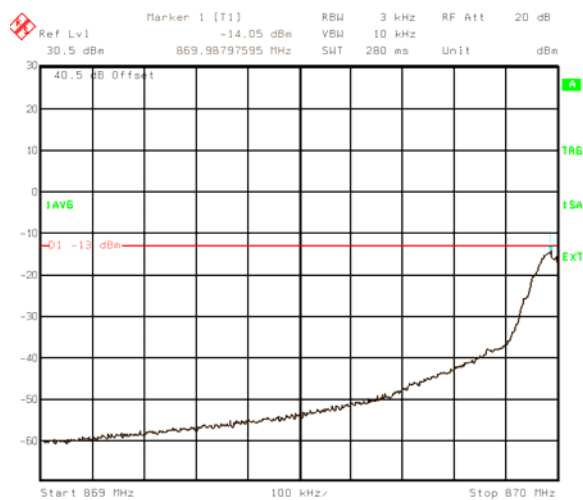
**Channel 128**



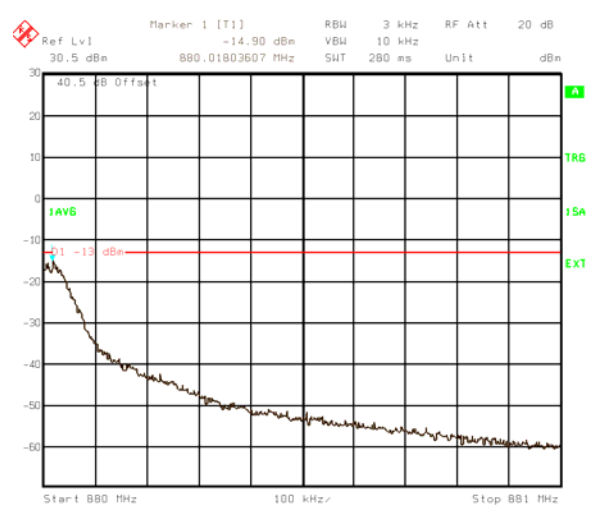
**Channel 131**



**Channel 133**

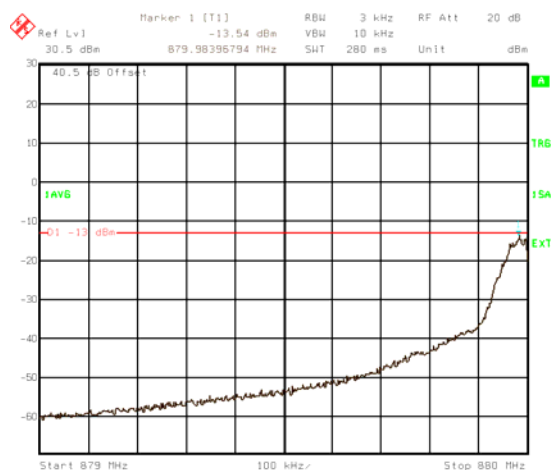


**Channel 181**

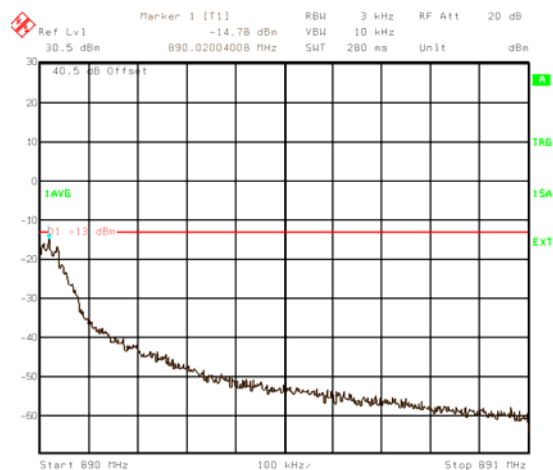


**Figure 7 : 1 MHz adjacent band  
8PSK MODULATION – Duplexer configuration  
Power limitation :Pmax - 2 dB**

**Channel 183**



**Channel 231**

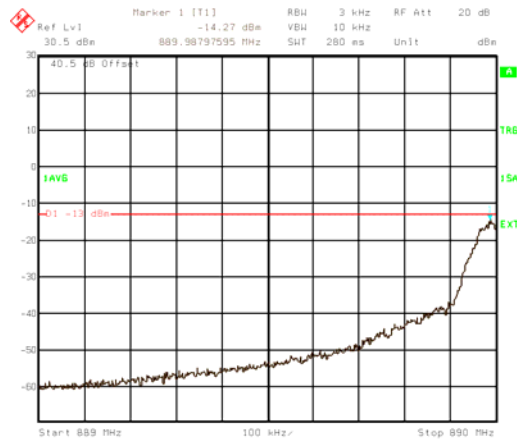


**Figure 8 : 1 MHz adjacent band  
8PSK MODULATION – Duplexer configuration**

**Channel 233**

**-1 MHz adjacent band,**

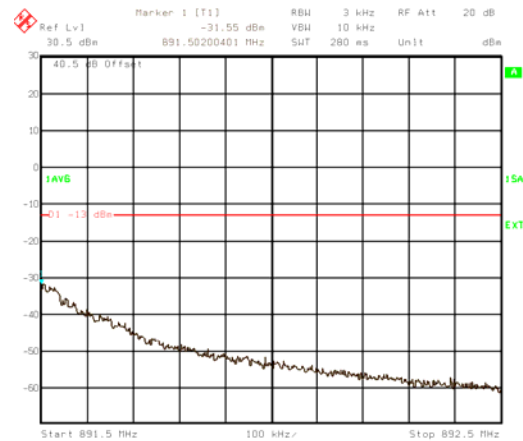
**Power limitation Pmax –2dB**



**Channel 238**

**+1 MHz adjacent band**

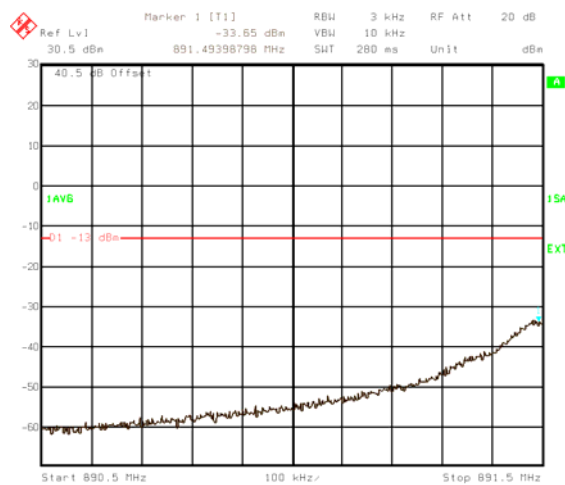
**Power limitation: Pmax**



**-1MHz adjacent band**

**Channel 241**

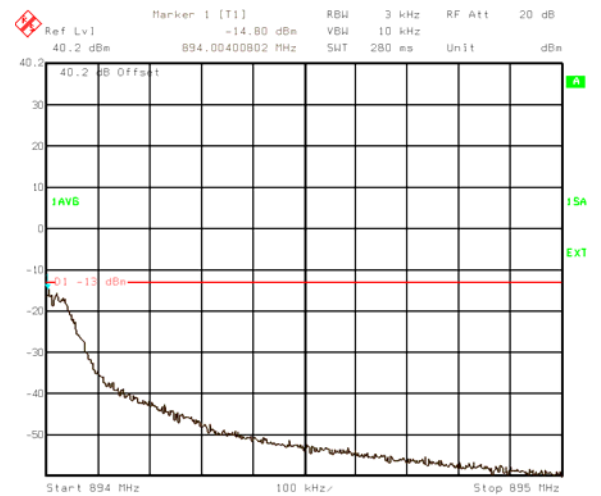
**Power limitation P Max**



**+ 1MHz adjacent band**

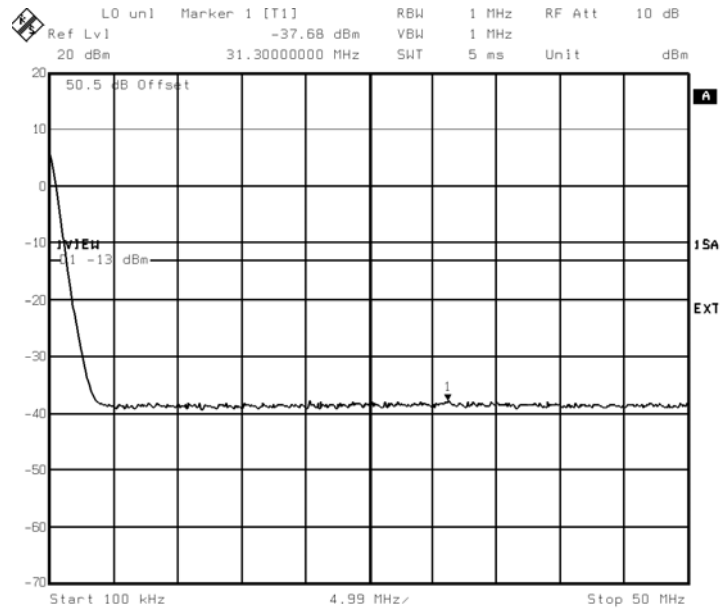
**Channel 251**

**Pmax –2dB**



**Figure 9: Out of block emissions (channel 190, Pmax)**

**100 kHz-50 Mhz**

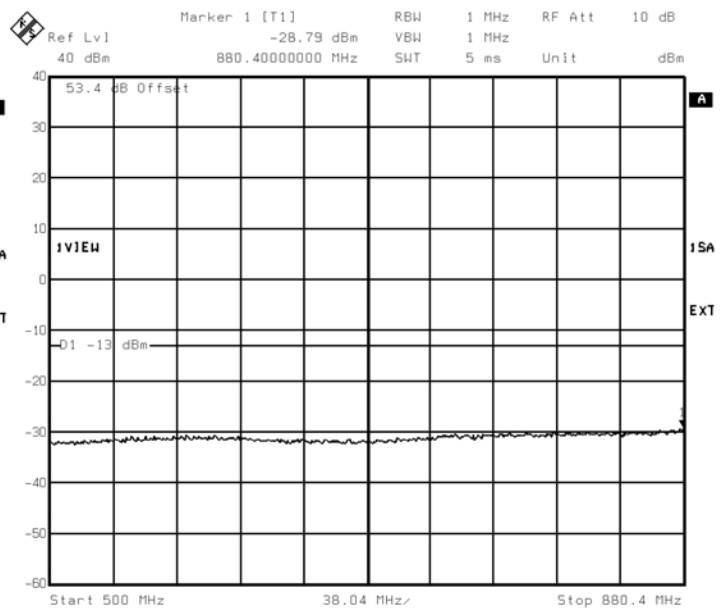
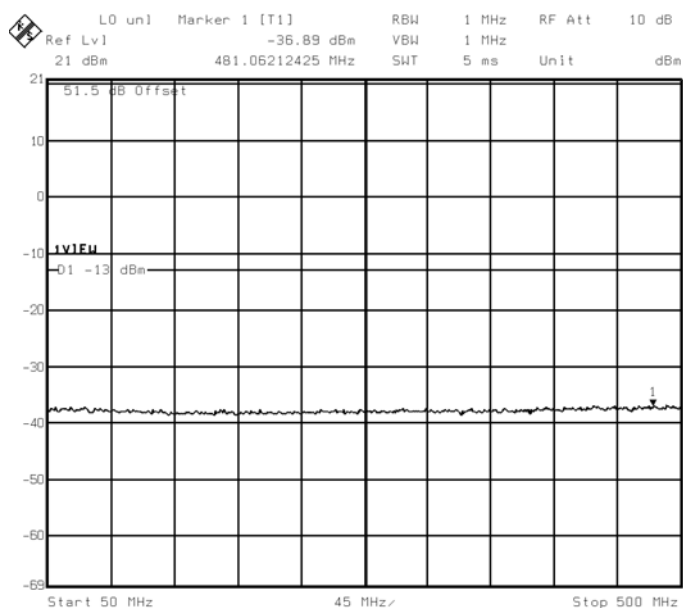


RBW = 1 MHz

*Note: spectrum lines at 100 kHz are internal DC spectrum line of Analyser*

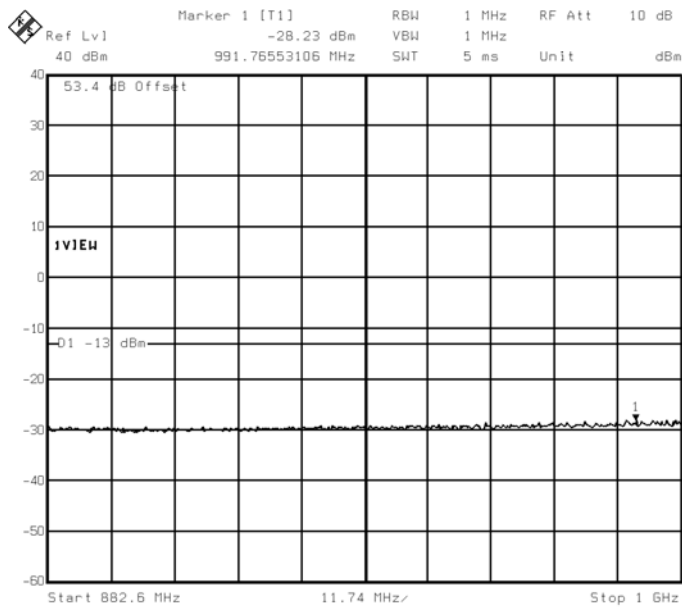
**50 Mhz-500 MHz**

**500 MHz-880.4 MHz**

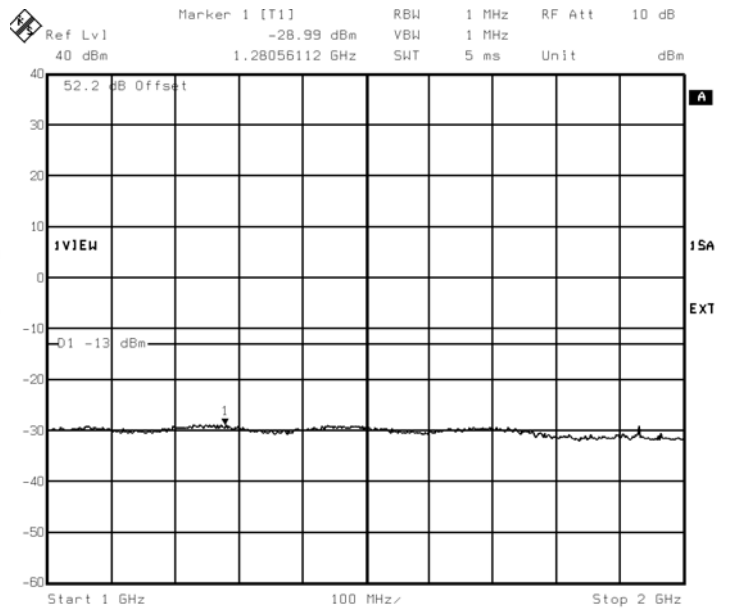


**Figure 10: Out of block emissions (channel 190, Pmax)**

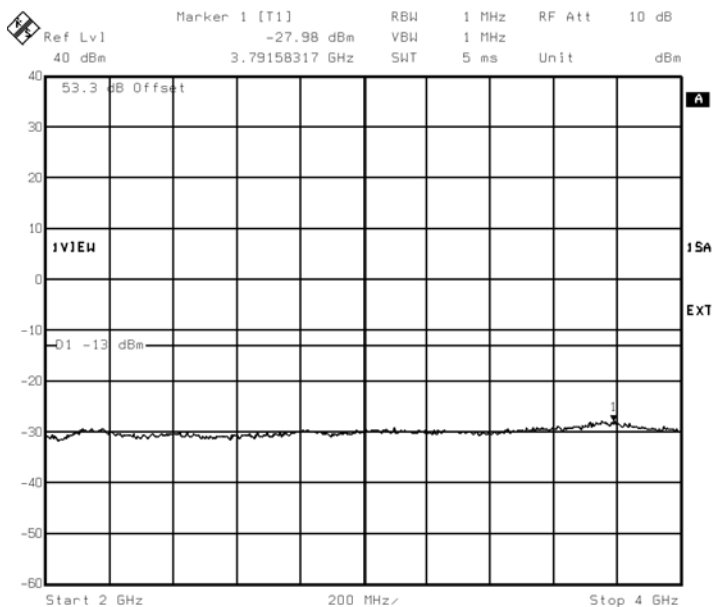
**882.8 MHz-1000 MHz**



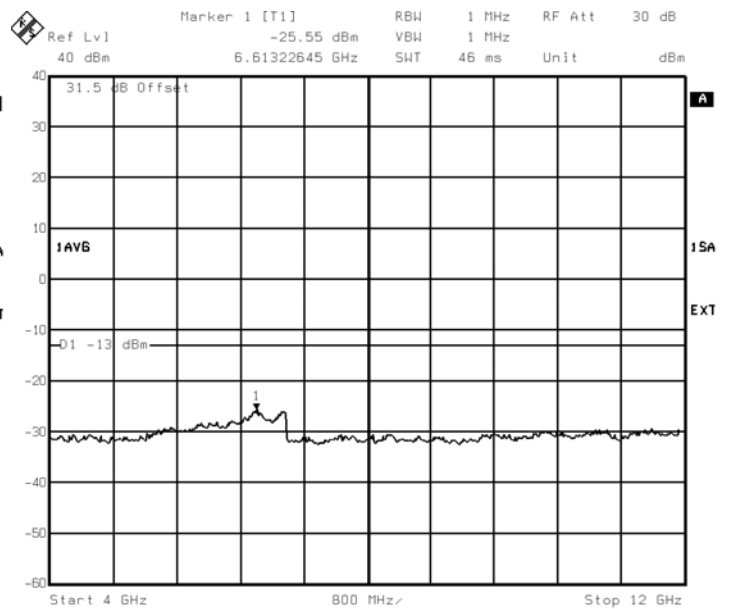
**1000 MHz-2000 MHz**



**2 GHz-4 GHz**

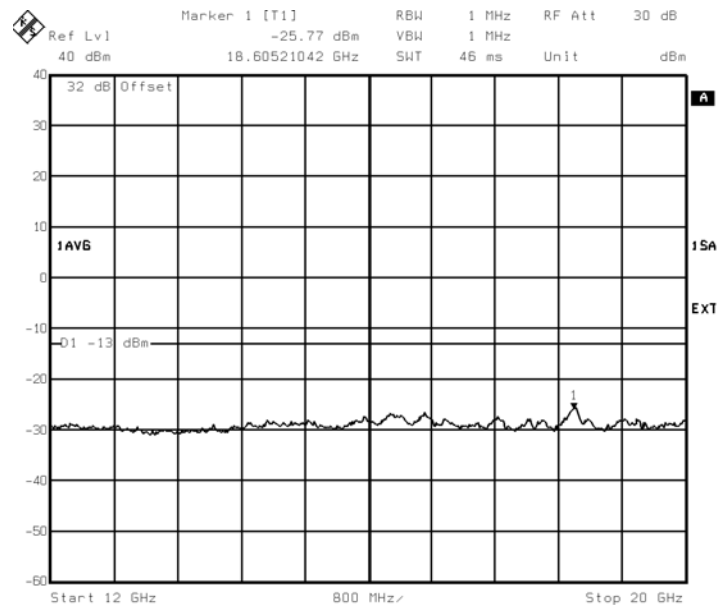


**4 GHz-12 GHz**



**Figure 11 : Out of block emissions (channel 190, Pmax)**

**12 GHz-20 GHz**



**Conclusion :**

For both modulation GMSK and 8PSK, the worst case is the Duplexer configuration and it has been done at  $P_D \text{ max} - 2\text{dB} = 42 \text{ dBm}$ .

For Edge Channel ARFCN 128, 131, 133, 181, 183, 231, 233, 251, power has to be reduced by 2dB in order to meet spurious emission requirement.

**For Edge Channel ARFCN 238, 241, the maximum power (44dBm) has allowed to meet spurious emission requirement.**

The H2D configuration has been done at maximum power  $P_{H2D\text{max}} = 44 \text{ dBm}$ .

## TEST RESULTS PCS 1900

Spurious measurement is performed with the worst configuration with Duplexer coupling and 30W Power amplifier. The Nominal power at antenna connector :  $P_{D\max} = 44\text{dBm}$ . The test compliance with duplexer involves the compliance with H2D (two input coupler with 3dB loss coupling associated with duplexer) and the compliance with H4D configuration (four input coupler with 7dB loss coupling associated with duplexer).

**Table 8: Test results for Spurious Emissions at Antenna Terminals**

**- Duplexer configuration - In band – GMSK modulation**

| Band | Channel | Emission Level(dBm) | Spurious (dBm) | Margin (dB) | Limit (dBm) |
|------|---------|---------------------|----------------|-------------|-------------|
| A    | 512     | Pmax                | -13.4          | 0.4         | -13         |
|      |         | Pmax-2              | -15            | 2           |             |
| A    | 585     | Pmax                | -13            | 0           |             |
|      |         | Pmax-2              | -13.7          | 0.7         |             |
| D    | 587     | Pmax                | -12.8          | -0.2        | -13         |
|      |         | Pmax-2              | -15            | 2           |             |
| D    | 610     | Pmax                | -11.3          | -1.7        |             |
|      |         | Pmax-2              | -12.6          | -0.4        |             |
|      |         | Pmax-4              | -15            | 2           |             |
| B    | 612     | Pmax                | -12.5          | -0.5        | -13         |
|      |         | Pmax-2              | -14.5          | 1.5         |             |
| B    | 685     | Pmax                | -11.3          | -1.7        |             |
|      |         | Pmax-2              | -12.6          | -0.4        |             |
|      |         | Pmax-4              | -15            | 2           |             |
| E    | 687     | Pmax                | -12.4          | -0.6        | -13         |
|      |         | Pmax-2              | -14.4          | 1.4         |             |
|      |         | Pmax-4              | -15.3          | 2.3         |             |
| E    | 710     | Pmax                | -10.8          | -2.2        |             |
|      |         | Pmax-2              | -12.8          | -0.2        |             |
|      |         | Pmax-4              | -14.5          | 1.5         |             |
| F    | 712     | Pmax                | -12.4          | -0.6        | -13         |
|      |         | Pmax-4              | -16.3          | 3.3         |             |
| F    | 735     | Pmax                | -11.5          | -1.5        |             |
|      |         | Pmax-4              | -14.6          | 1.6         |             |
| C    | 737     | Pmax                | -12.2          | -0.8        | -13         |
|      |         | Pmax-4              | -16            | 3           |             |
| C    | 810     | Pmax                | -11.5          | -1.5        |             |
|      |         | Pmax-4              | -15.5          | 2.5         |             |

**Tables 9: Spurious emissions with the diplexer for 8PSK modulation**

|   | Channel | Power<br>emission<br>level | Spurious<br>Emissions Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---|---------|----------------------------|--------------------------------------|----------------|----------------|
| A | 512     | P max                      | -14.9                                | -13            | 1.9            |
| A | 585     | P max                      | -13.3                                | -13            | 0.3            |
| D | 587     | P max                      | -15.1                                | -13            | 2.1            |
| D | 610     | P max                      | -13.8                                | -13            | 0.8            |
| B | 612     | P max                      | -14.9                                | -13            | 1.9            |
| B | 685     | P max                      | -13.3                                | -13            | 0.3            |
| E | 687     | P max                      | -14.6                                | -13            | 1.6            |
| E | 710     | P max                      | -13.5                                | -13            | 0.5            |
| F | 712     | P max                      | -14.5                                | -13            | 1.5            |
| F | 735     | P max                      | -13.8                                | -13            | 0.8            |
| C | 737     | P max                      | -14.6                                | -13            | 1.6            |
| C | 810     | P max                      | -14.1                                | -13            | 1.1            |

**Notes :**

GMSK modulation measurements:

Figures from 12 to 14 show sample plots for the case when the transmitter was tuned with the power reduced by 4 dB in diplexer configuration for different Edge Channel from 512 to 810.

8PSK modulation measurements:

Figures from 15 to 16 show sample plots for the case when the transmitter was tuned at the maximum power in diplexer configuration.

Out of band measurement in GMSK modulation:

Figures from 17 to 19 show sample plots for frequency spans from 0 to 20 GHz with emission on channel 810 at maximum power with diplexer configuration.

**Table 10: Spurious emissions Out of Tx band – GMSK modulation**

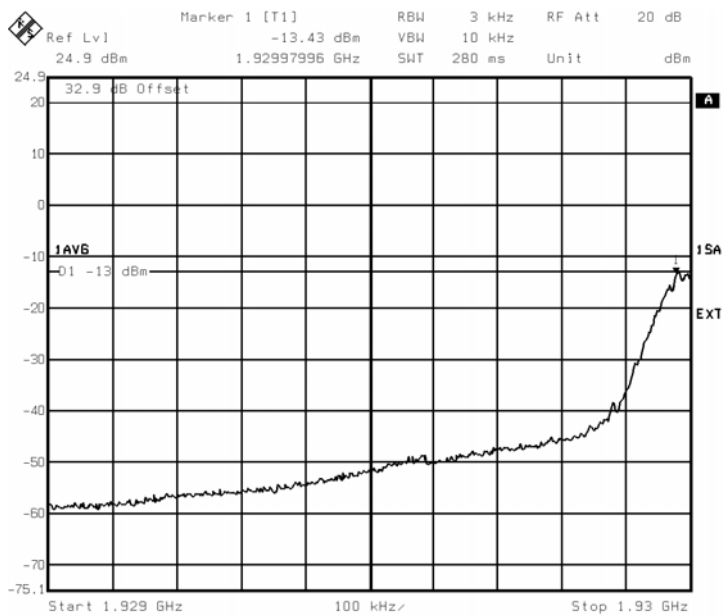
| <b>Frequency<br/>(MHz)</b> | <b>Spurious Emissions<br/>Level (dBm)</b> | <b>Margin (dB)</b> | <b>Limit<br/>(dBm)</b> |
|----------------------------|-------------------------------------------|--------------------|------------------------|
| 0.1-50                     | -34.2                                     | 21.2               | -13                    |
| 50-500                     | -33                                       | 20                 |                        |
| 500-1970.2                 | -33.7                                     | 20.7               |                        |
| 1970.2-1974                | -40                                       | 27                 |                        |
| 1974-1975                  | -55                                       | 42                 |                        |
| 1991-1994.8                | -34                                       | 21                 |                        |
| 1994.8-4000                | -35                                       | 22                 |                        |
| 4000-8000                  | -35                                       | 22                 |                        |
| 8-12 GHz                   | -35.2                                     | 22.2               |                        |
| 12-20 GHz                  | -34                                       | 21                 |                        |

**Figure 12 :**

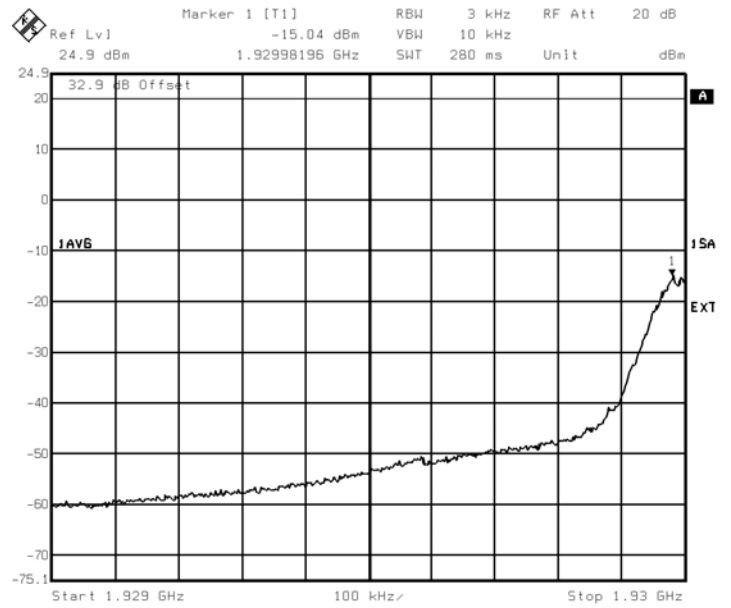
**GMSK modulation**

**-1 MHz adjacent band (Channel 512)**

**Pmax**

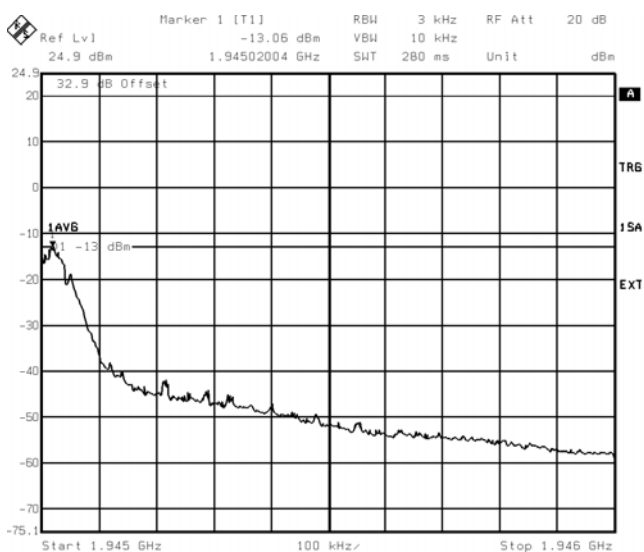


**Pmax-2dB**

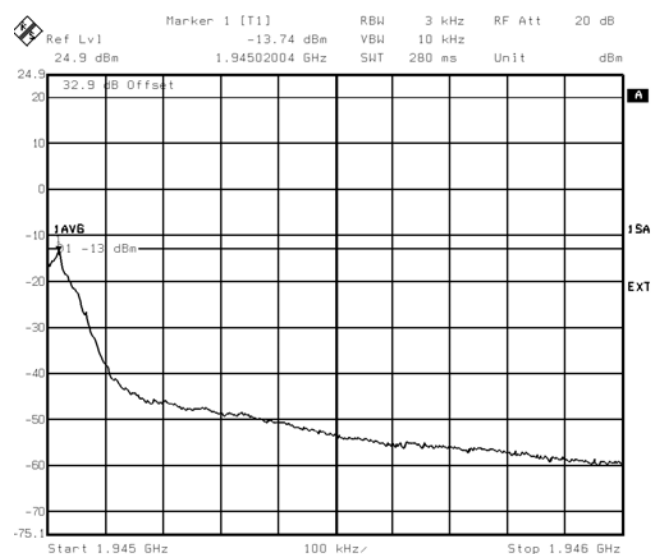


**+1 MHz adjacent band (Channel 585)**

**Pmax**



**Pmax-2dB**

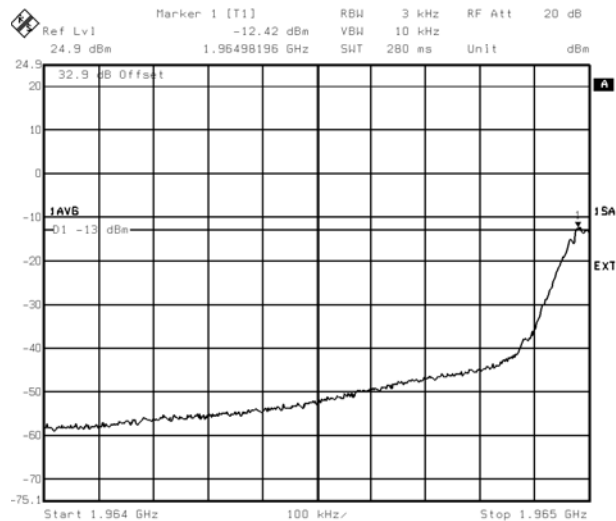


**Figure 13 :**

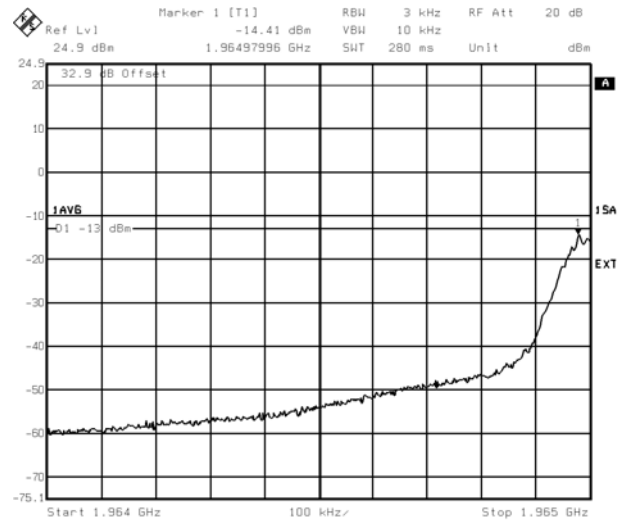
**GMSK modulation**

**-1 MHz adjacent band (Channel 687)**

**Pmax**

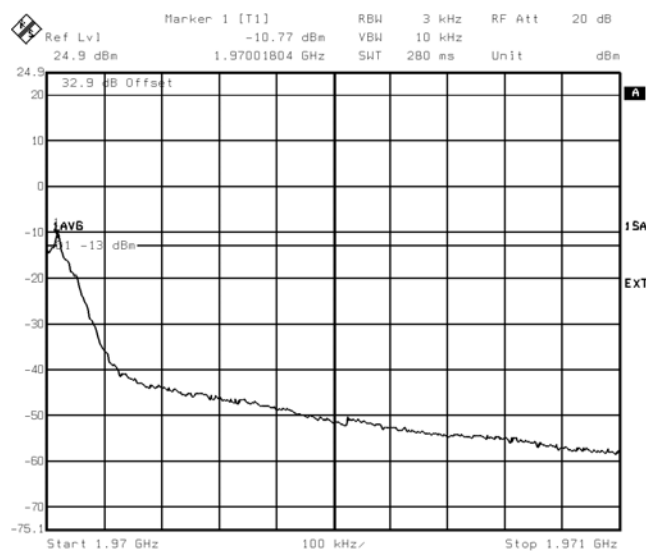


**Pmax-2dB**

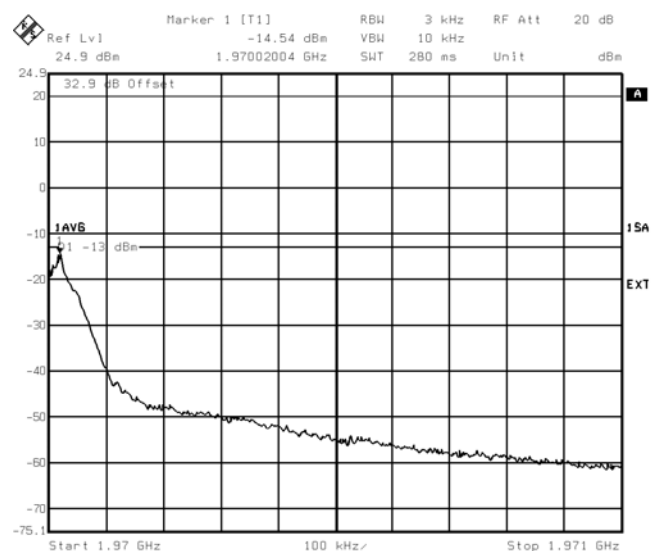


**+1 MHz adjacent band (Channel 710)**

**Pmax**



**Pmax-4dB**

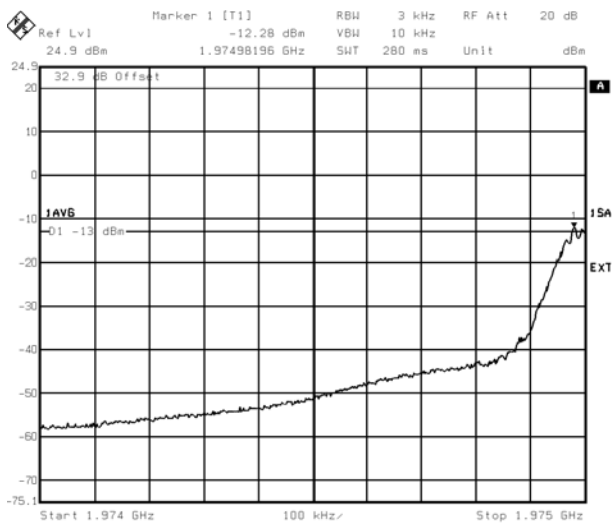


**Figure 14:**

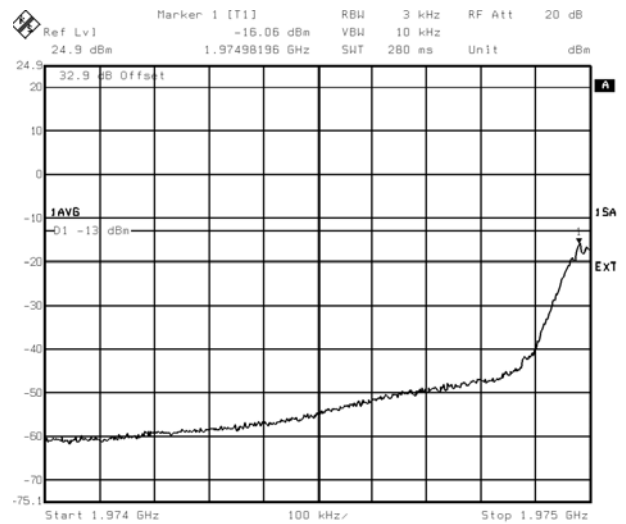
**GMSK modulation**

**-1 MHz adjacent band (Channel 737 )**

**Pmax**

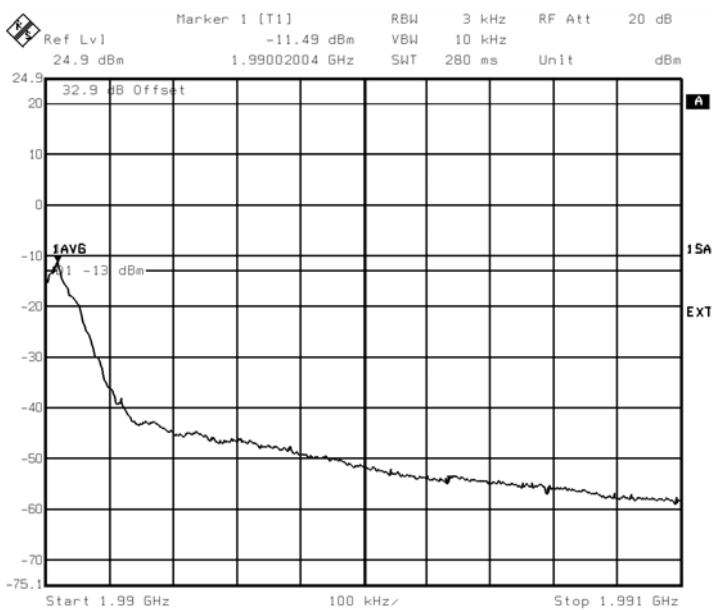


**Pmax-4dB**

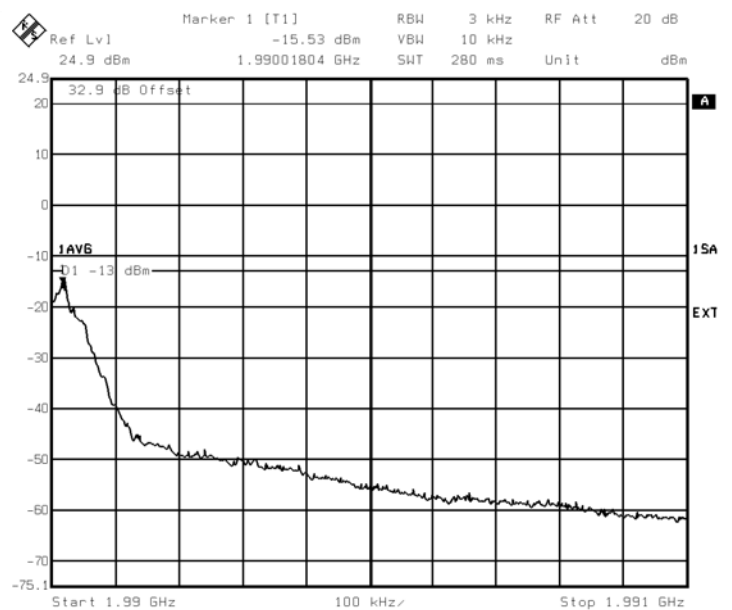


**+1 MHz adjacent band (Channel 810)**

**Pmax**

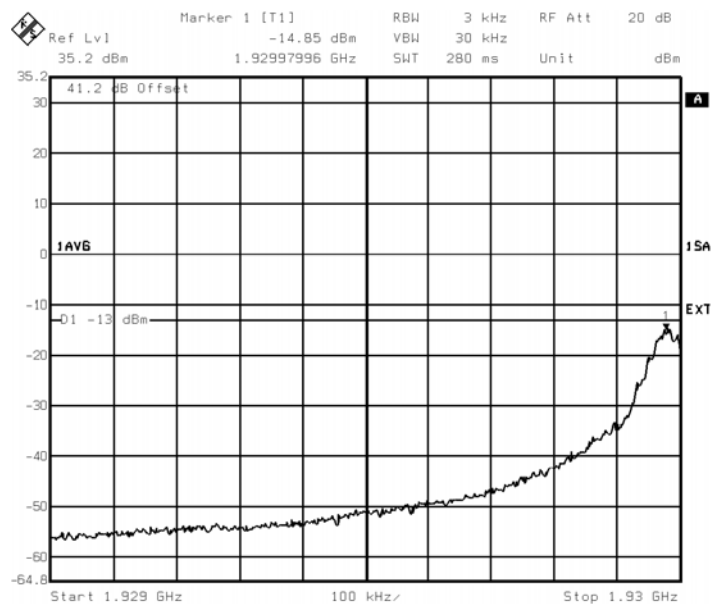


**Pmax-4dB**



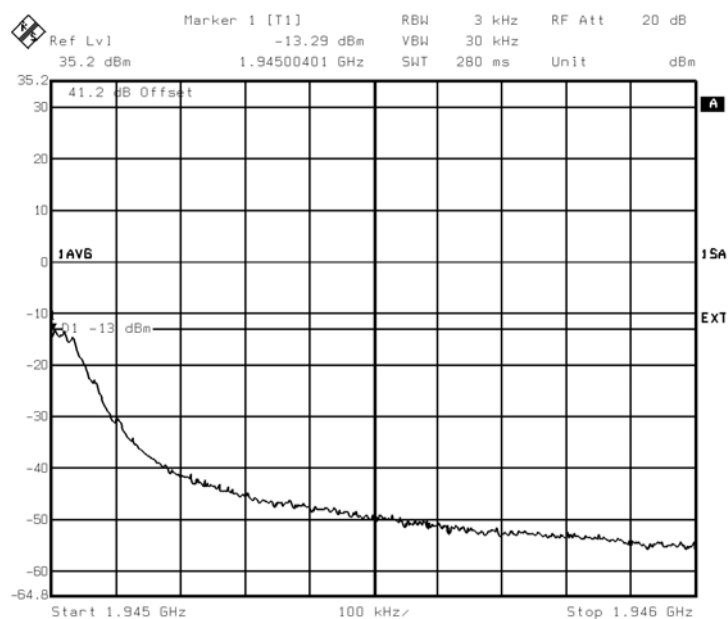
**Figure 15:**

**-1 MHz adjacent band (Channel 512, Pmax)  
Diplexer only, 8PSK modulation**



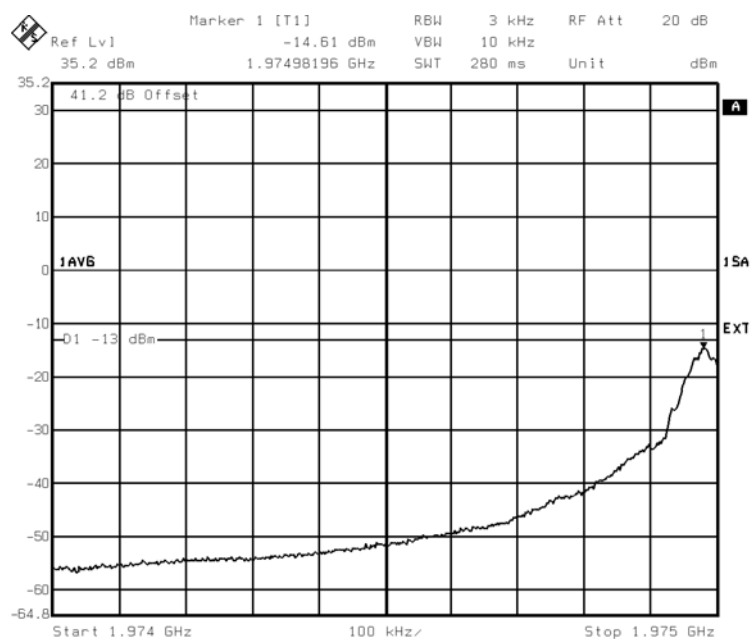
**+1 MHz adjacent band (Channel 585, Pmax),**

**Diplexer only, 8PSK modulation**



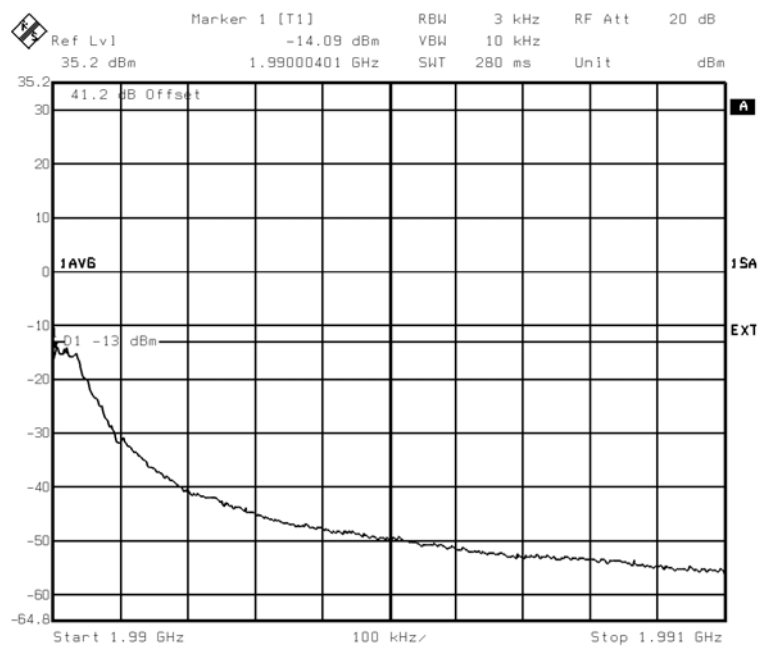
**Figure 16**

**-1 MHz adjacent band (Channel 737, Pmax)  
Diplexer only, 8PSK modulation**



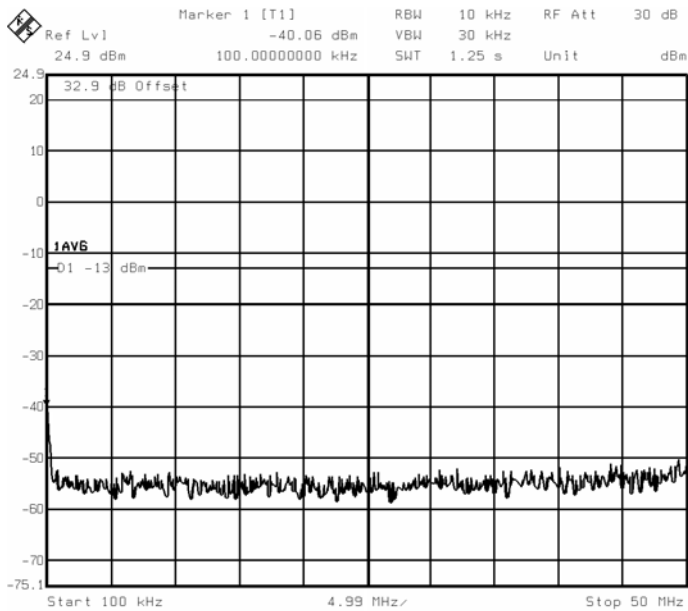
**+1 MHz adjacent band (Channel 810, Pmax),**

**Diplexer only, 8PSK modulation**

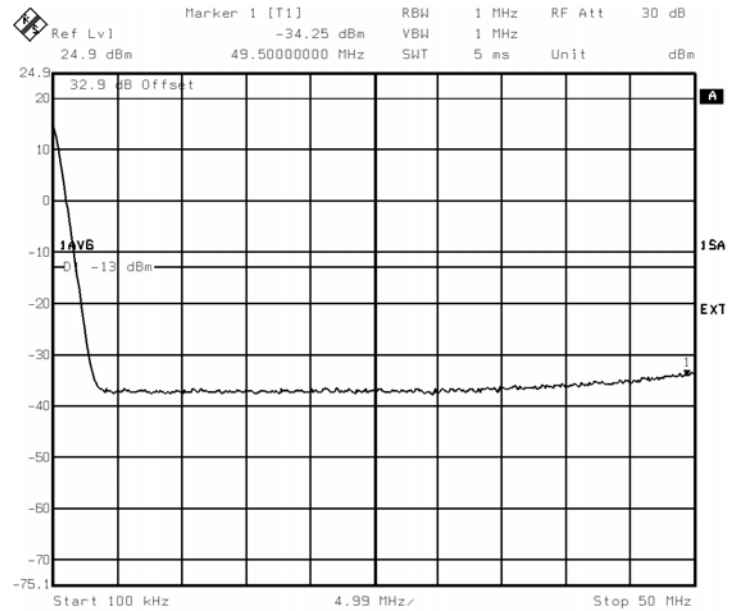


**Figure 17: Out of block emissions (Channel 810, Pmax) for GMSK modulation**

**100kHz–50 MHz**



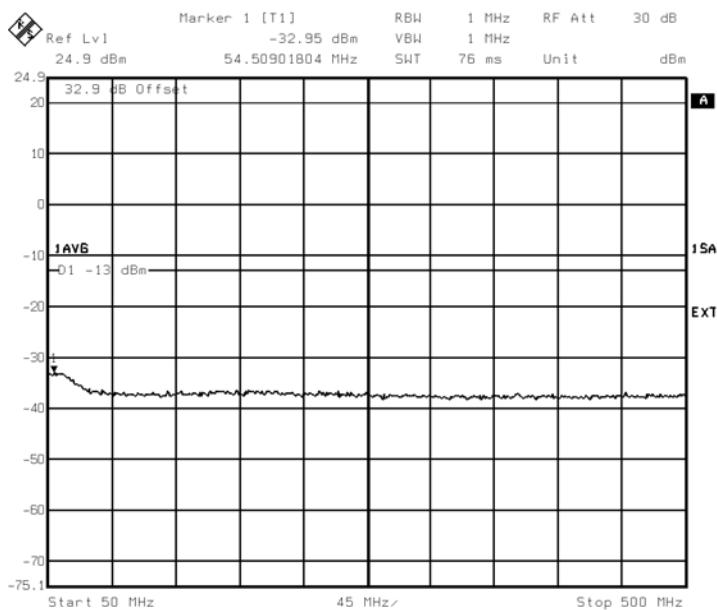
RBW = 10 kHz



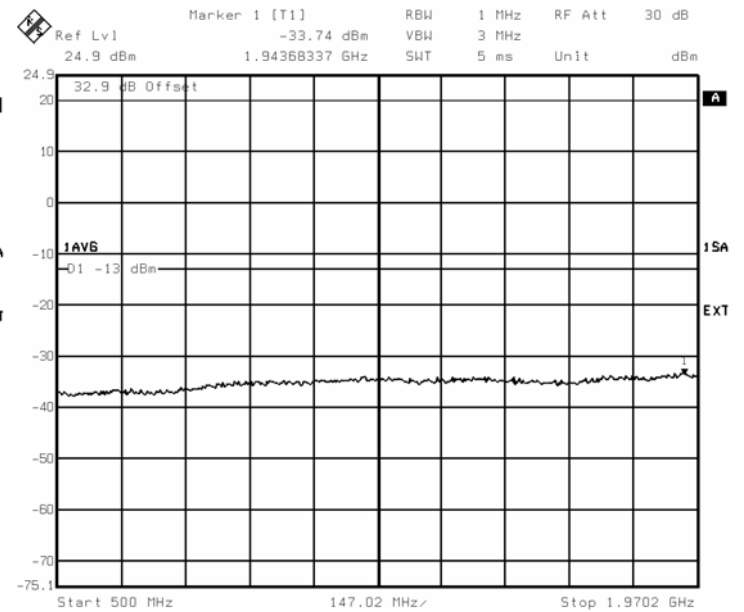
RBW = 1 MHz

*Note : spectrum lines at 100 kHz is internal DC spectrum line of Analyzer.*

**50 MHz–500MHz**

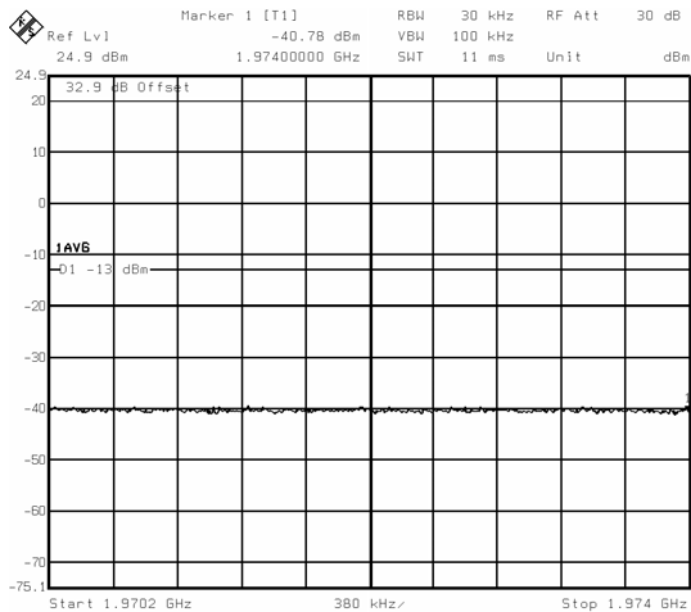


**500 MHz-1970.2 MHz**

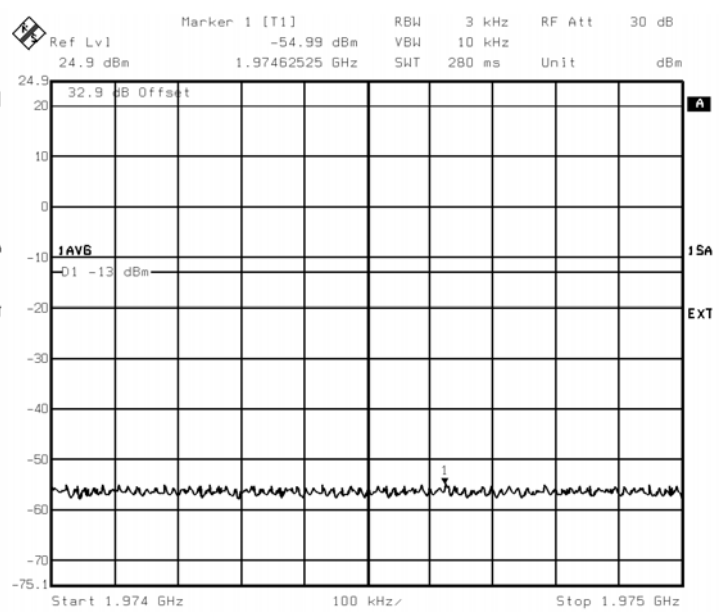


**Figure 18: Out of block emissions (Channel 810, Pmax)**

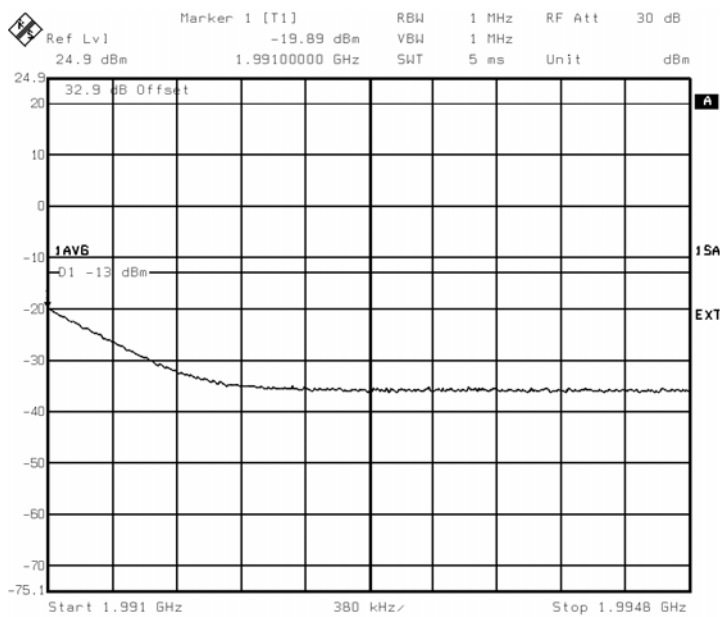
**1970.2–1974 MHz**



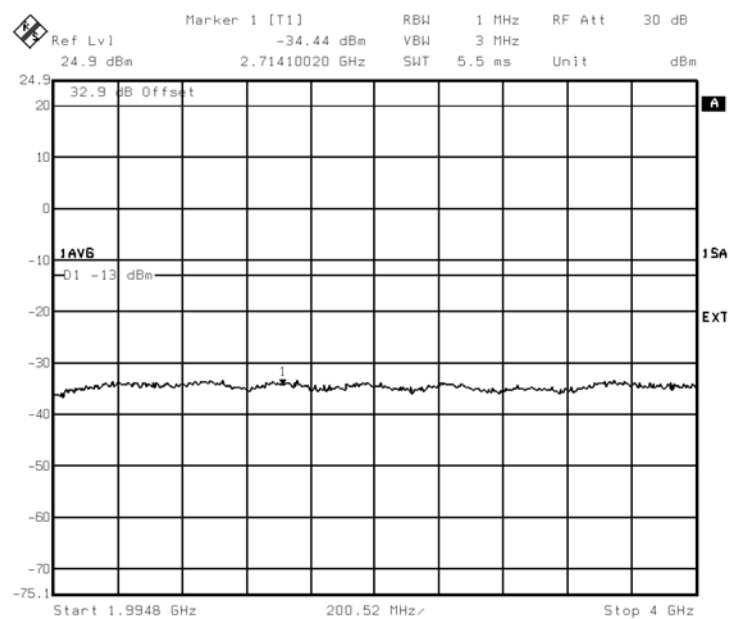
**1974 MHz-1975 MHz**



**1991 MHz-1994.8 MHz**

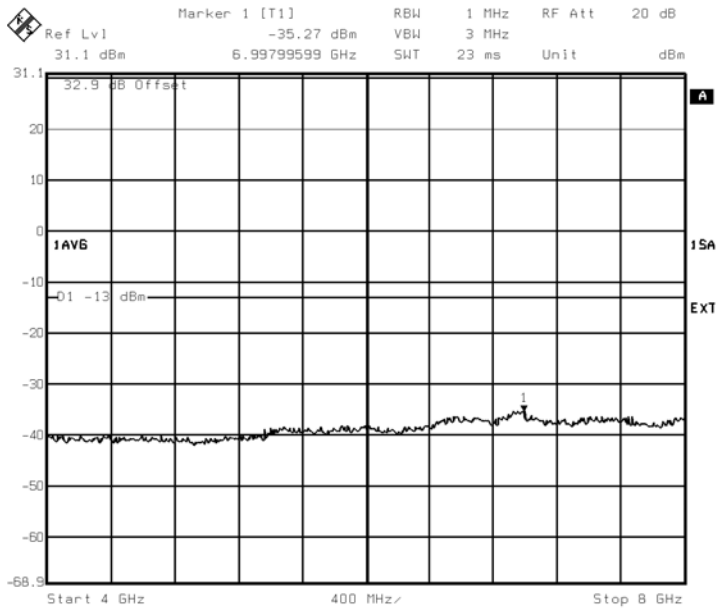


**1994.8 MHz-4 GHz**

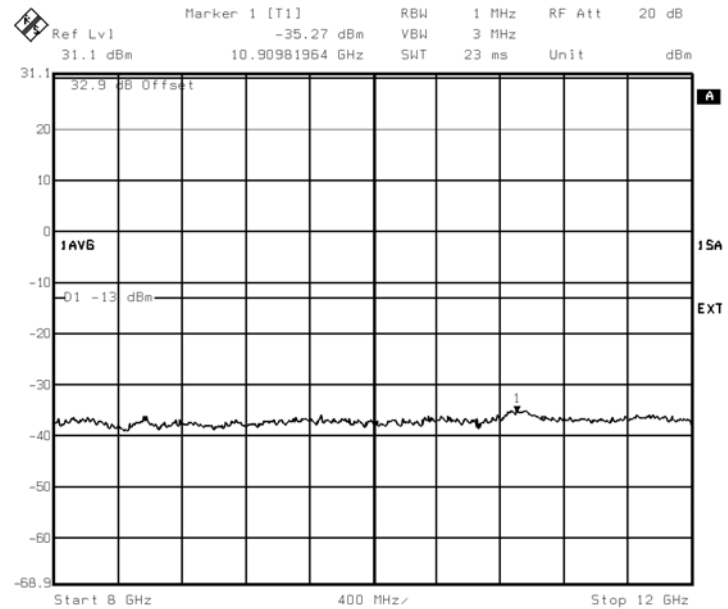


**Figure 19: Out of block emissions (Channel 810, Pmax)**

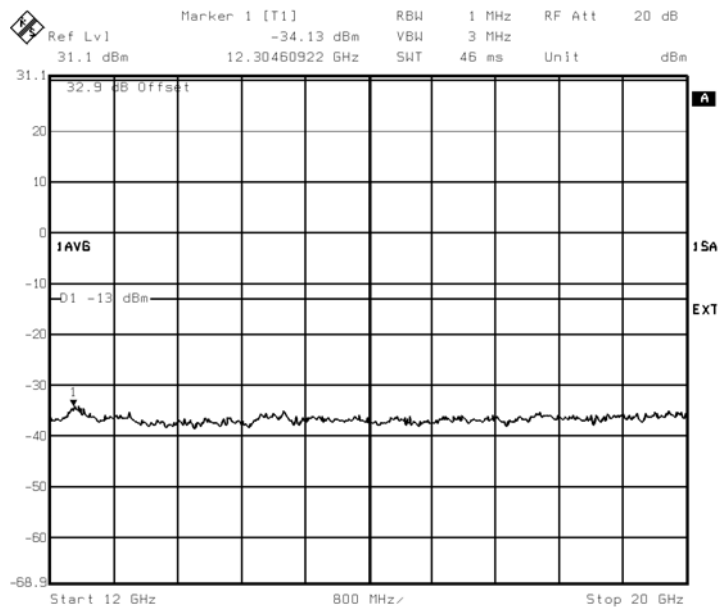
**4-8 GHz**



**8-12 GHz**



**12-20 GHz**



**Conclusion :**

▪ **GMSK modulation:**

The worst case is the Duplexer configuration and emission power has been done at PD max - 4dB = 40 dBm

In order to comply with the emission limits in the 1 MHz bands immediately outside and adjacent to the frequency block, the absolute transmit power level of the block edge channels is set to **40 dBm** for GMSK modulation.

▪ **8PSK modulation:**

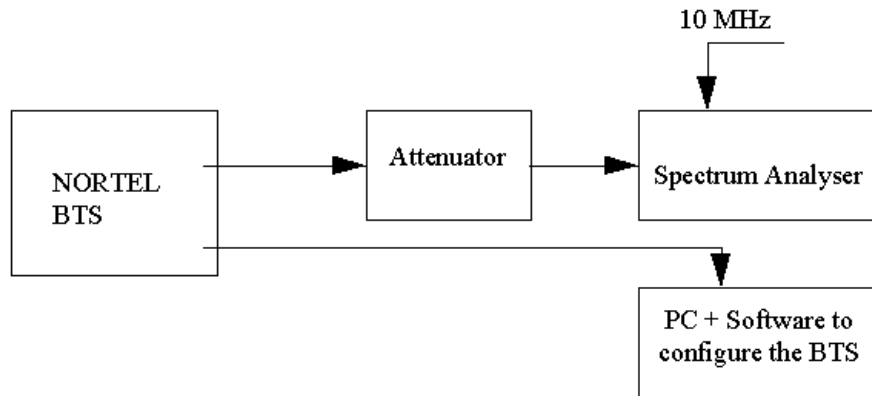
eDRX and eSCPA 1900 support 8 PSK modulation.

In the worst configuration (Duplexer) , **maximum emission power P=44 dBm** allows to be compliant with the spurious emission limits (-13 dBm) in the 1 MHz bands immediately outside and adjacent to the frequency block for 8PSK modulation.

## TEST PROCEDURE

The equipment was configured as shown in schematic2.

**Schematic2 : Test configuration for Spurious emissions at antenna terminals**



For adjacent channels emissions, the BTS nominal carrier frequency was adjusted to each block edge channel.

The transmitter was set to operate to maximum power in Tx activation mode GMSK no synchro.

Initially the transmitter was set to operate to maximum power. Then in case of out of limits, the power has been decreased by 2 or 4dB.

The BTS was configured to transmit at maximum power (static level 0) or a reduced power :

- for GMSK modulation, in mode GMSK no synchro
- for 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5 .

For these measurements, the resolution bandwidth of the spectrum analyzer was set to at least 1% of the emission bandwidth. In this case the emission bandwidth measured was near 300 kHz. Therefore, the resolution bandwidth was set to 3 kHz.

The spectrum analyzer had the following settings for adjacent band:

|                         |                                                             |
|-------------------------|-------------------------------------------------------------|
| Resolution bandwidth:   | 3 kHz                                                       |
| Video bandwidth:        | 10 kHz                                                      |
| Span :                  | 1 MHz                                                       |
| Reference Level Offset: | Corrected to take into account cables and attenuator losses |
| Sweep time:             | Coupled                                                     |
| Detector:               | Sample                                                      |
| Trace:                  | Average                                                     |
| Sweep count:            | 200                                                         |

For all other measurements the BTS carrier frequency was adjusted to Channel 190 in GSM850 and Channel 810 in PCS 1900.

The spectrum analyzer had the following settings for out of block emissions.

|                       |       |
|-----------------------|-------|
| Resolution bandwidth: | 1 MHz |
| Video bandwidth:      | 1 MHz |

The emissions were investigated up to the twentieth harmonic of the fundamental emission (20 GHz).

The measured level of the emissions was recorded and compared to the -13dBm limit.

## **5.6. TEST NAME: 2.1055 FREQUENCY STABILITY**

### **FCC REQUIREMENTS**

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### **TEST RESULTS GSM 850**

Table 11 shows the Frequency Stability for channel 190 (F=881.6 MHz) in BTS 12000 OUTDOOR configuration under extreme conditions.

**Table 11: Frequency Stability in BTS S12000 Outdoor configuration – Channel 190**

| Temperature<br>(°C) | Maximum Carrier Frequency<br>Deviation (Hz) |                                      |                                            |
|---------------------|---------------------------------------------|--------------------------------------|--------------------------------------------|
|                     | 85% Nominal<br>Supply voltage<br>195 V AC   | Nominal Supply<br>voltage<br>230V AC | 115% Nominal<br>Supply voltage<br>264 V AC |
| -30                 | 7.75                                        | 7.43                                 | -7.43                                      |
| -20                 | 11.69                                       | -11.56                               | 10.46                                      |
| -10                 | 10.85                                       | 9.81                                 | -11.24                                     |
| 0                   | 15.56                                       | 13.11                                | 12.53                                      |
| 10                  | -10.65                                      | 13.3                                 | -11.75                                     |
| 20                  | 8.33                                        | 13.04                                | 8.85                                       |
| 30                  | 11.69                                       | 10.65                                | -12.91                                     |
| 40                  | 14.98                                       | 11.69                                | -8.78                                      |
| 50                  | 10.2                                        | -10.53                               | 10.98                                      |

The maximum frequency deviation allowed is 45 Hz. The maximum deviation measured (15.56 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Table 12 shows the Frequency Stability for channel 190 (F=881.6 MHz) in BTS 12000 Indoor configuration under extreme conditions.

**Table 12: Frequency Stability in BTS S12000 Indoor configuration – Channel 190**

| Temperature<br>(°C) | Maximum Carrier Frequency<br>Deviation (Hz) |       |        |
|---------------------|---------------------------------------------|-------|--------|
|                     | Channel 190 @ DC supply voltage             |       |        |
|                     | 40V                                         | 48V   | 57V    |
| -5                  | 7.81                                        | 6.59  | 8.78   |
| 5                   | 12.46                                       | 10.98 | -12.20 |
| 15                  | 9.56                                        | 8.91  | -8.98  |
| 25                  | 8.98                                        | 10.65 | 10.01  |
| 35                  | 10.20                                       | 9.04  | 10.33  |
| 45                  | 10.07                                       | 8.01  | 9.17   |

The maximum frequency deviation allowed is 40 Hz. The maximum deviation measured (12.5Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

## TEST RESULTS PCS 1900

Table 13 shows the Frequency Stability for channel 661 (F=1960 MHz) in BTS 12000 OUTDOOR configuration under extreme conditions.

**Table 13: Frequency Stability in BTS S12000 Outdoor configuration – Channel 661**

| Temperature<br>(°C) | Maximum Carrier Frequency<br>Deviation (Hz) |                                      |                                            |
|---------------------|---------------------------------------------|--------------------------------------|--------------------------------------------|
|                     | 85% Nominal<br>Supply voltage<br>195 V AC   | Nominal Supply<br>voltage<br>230V AC | 115% Nominal<br>Supply voltage<br>264 V AC |
| -30                 | 17.95                                       | 16.14                                | 18.02                                      |
| -20                 | 14.72                                       | -21.50                               | 19.24                                      |
| -10                 | 17.56                                       | -23.31                               | -23.70                                     |
| 0                   | -18.08                                      | 23.44                                | -19.24                                     |
| 10                  | 22.79                                       | 20.86                                | -19.63                                     |
| 20                  | 18.92                                       | -22.34                               | 16.14                                      |
| 30                  | 17.37                                       | 19.31                                | -25.18                                     |
| 40                  | 27.51                                       | 20.99                                | 23.34                                      |
| 50                  | 22.02                                       | -19.05                               | 22.86                                      |

The maximum frequency deviation allowed is 90 Hz.

The maximum deviation measured (-25.2 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The S12000 Outdoor BTS complies with the requirement.

Table 14 shows the Frequency Stability for channel 512 (F=1930.2 MHz) in BTS 12000 Indoor configuration under extreme conditions.

**Table 14: Frequency Stability in BTS S12000 Indoor configuration – Channel 512**

| Temperature<br>(°C) | Maximum Carrier Frequency<br>Deviation (Hz) |      |      |
|---------------------|---------------------------------------------|------|------|
|                     | Channel 512 @ DC supply voltage             |      |      |
|                     | -40V                                        | -48V | -57V |
| -5                  | 13.2                                        | 11.2 | 17.7 |
| 5                   | 22                                          | 22.6 | 21.4 |
| 15                  | 12.6                                        | 16.2 | 15.2 |
| 25                  | 15.3                                        | 12.7 | 15.1 |
| 35                  | 13                                          | 12.6 | 13.9 |
| 45                  | 13.9                                        | 15.6 | 16.5 |

The maximum frequency deviation allowed is 90 Hz.

The maximum deviation measured (22,6 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The S12000 Indoor BTS complies with the requirement.

## TEST PROCEDURE

Thermal tests have been performed with S12000 BTS .

The BTS S12000 must operate under the following external extreme temperatures:

- BTS S12000 Outdoor :                      - 30°C / + 50 °C
- BTS S12000 Indoor:                        - 5°C / + 45 °C

Frequency stability test is performed under following extreme conditions:

- for outdoor S12000 BTS
  - Temperature from -30°C to +50°C at intervals of 10 degrees.
  - With AC power supply variations: 195 VAC , 230 VAC, 264 VAC
- for Indoor S12000 BTS
  - Temperature from -5°C to +45°C at intervals of 10 degrees.
  - With DC power supply variations: -40V, -48V, -57V.

The BTS S12000 must operate under the following external extreme temperatures:

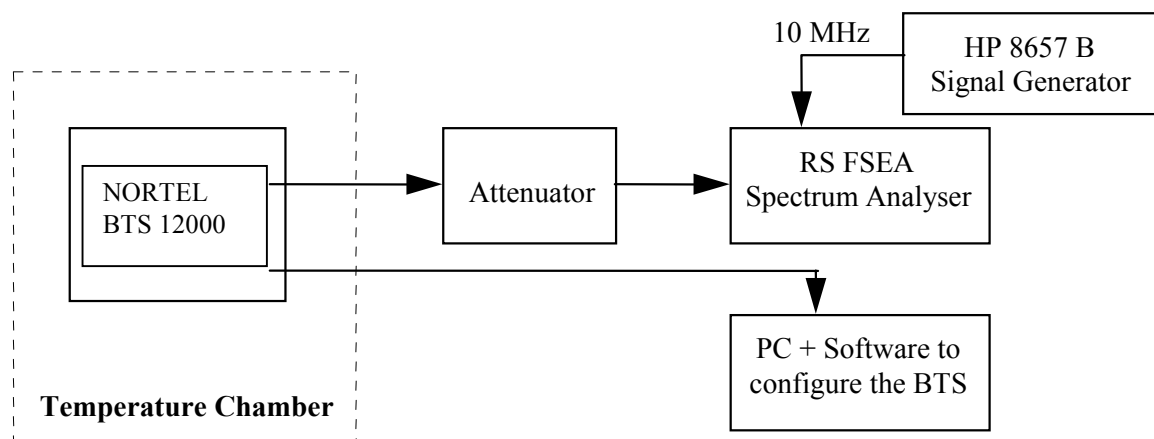
Frequency stability test is performed under following extreme conditions:

Modules (eDRX and eSCPA ) run with nominal power regulation at maximum power (30W) in GMSK modulation. The eDRX/eSCPA were configured to transmit at maximum power (Static level 0).

A period of at least one hour was allowed prior to measurement to ensure that all the components of the oscillator circuit was stabilized at each temperature.

The equipment was configured as shown in Schematic3.

**Schematic3: Test configuration for Frequency Stability**



## **6. MEASUREMENT EQUIPMENT LIST**

| <b>Equipment description</b> | <b>Manufacturer</b> | <b>Model</b> | <b>Serial No.</b> | <b>V/A date</b> |
|------------------------------|---------------------|--------------|-------------------|-----------------|
|                              |                     |              |                   |                 |
| Power Meter                  | Giga-tronics        | 8542C        | 515956            | 04/2003         |
| Programmable AC source       | Chroma              | Model 6590   | 57220073          | 04/2004         |
| Spectrum Analyser            | R&S                 | FSEA         | 509455            | 12/2003         |
| Spectrum Analyser            | R&S                 | FSEM         | 525495            | 07/2003         |
| Signal Generator             | R&S                 | SMT 03       | 509922            | 03/2003         |
| 30 dB attenuator 100 W       | Spinner             |              | 25483             |                 |
| 20 dB attenuator 80 W        | Radiall             |              | R417720118        |                 |

## 7. EXHIBIT 2 : UPDATED EQUIPMENT LIST

| Description  | Hardware code | Comment |
|--------------|---------------|---------|
| Base Cabinet |               |         |
| CPCMI T1     | NTQA66AA      |         |
| CMCF         | NTQA66CB      |         |
| CBCF         | NTQA66GA      |         |

• **PCS1900 Radio Modules used with the 60W High Power Amplifier configuration**

| Radio Modules GSM 1900                                 |                      |                                     |
|--------------------------------------------------------|----------------------|-------------------------------------|
| GSM 1900 eDRX                                          | NTQA88PA             | EDRX PCS1900 (GMSK / 8PSK )         |
| GSM 1900 High Power Amplifier                          | NTQA50RA             | HePA ( 60 W GMSK / 45W 8PSK)        |
| GSM 1900 Duplexer                                      | NTQA51DA<br>NTQA51FA | Without TOS meter<br>With TOS meter |
| GSM1900 Tx Filter                                      | NTQA52CA<br>NTQA52CB | Without TOS meter<br>With TOS meter |
| GSM 1900 Two Ways Hybrid Duplexer (60W Power handling) | NTQA38KA<br>NTQA38LA | Without TOS meter<br>With TOS meter |
| GSM 1900 Four Ways Hybrid Duplexer                     | NTQA52BA<br>NTQA52BB | Without TOS meter<br>With TOS meter |
| GSM 1900 Splitter                                      | NTQA10AA             | Rx Splitter for Rx way only         |

**Power limitation to comply to Adjacent Band spurious at antenna connector :**

| Coupling configuration | System Power limitation                                           | System Power limitation                                           |
|------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|
|                        | GMSK modulation                                                   | 8 PSK modulation                                                  |
| Diplexer Tx Filter     | Power Limitation :<br>$P_{max} - 6 \text{ dB} = 40.5 \text{ dBm}$ | Power Limitation :<br>$P_{max} - 2 \text{ dB} = 43.8 \text{ dBm}$ |
| H2D                    | Power Limitation :<br>$P_{max} - 2 \text{ dB} = 41 \text{ dBm}$   | $P_{max} = 42 \text{ dBm}$                                        |
| H4D                    | $P_{max} = 40 \text{ dBm}$                                        | $P_{max} = 39 \text{ dBm}$                                        |

• **PCS1900 Radio Modules used with 30W Power Amplifier configuration**

| Description                        | Hardware code        | Comment                             |
|------------------------------------|----------------------|-------------------------------------|
| <b>Radio Modules GSM 1900</b>      |                      |                                     |
| GSM 1900 DRX                       | NTQA01DA             | DRX ND PCS1900 ( GMSK only)         |
| GSM 1900 Power Amplifier           | NTQA50DB             | PA GMSK 30W                         |
| GSM 1900 eDRX                      | NTQA88PA             | EDRX PCS1900 (GMSK / 8PSK )         |
| GSM 1900 Power Amplifier           | NTQA50GA             | eSCPA ( GMSK / 8PSK ) 30W           |
| GSM 1900 Diplexer                  | NTQA51DA<br>NTQA51FA | Without TOS meter<br>With TOS meter |
| GSM1900 Tx Filter                  | NTQA52CA<br>NTQA52CB | Without TOS meter<br>With TOS meter |
| GSM 1900 Two Ways Hybrid Duplexer  | NTQA51AA<br>NTQA51BA | Without TOS meter<br>With TOS meter |
| GSM 1900 Four Ways Hybrid Duplexer | NTQA52BA<br>NTQA52BB | Without TOS meter<br>With TOS meter |
| GSM 1900 Splitter                  | NTQA10AA             | Rx Splitter for Rx way only         |

**Power limitation to comply to Adjacent Band spurious at antenna connector :**

| Coupling configuration        | System Power limitation GMSK modulation                                            | System Power limitation 8 PSK modulation<br>( If 8PSK is supported by modules) |
|-------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Diplexer<br/>Tx Filter</b> | <b>Power Limitation :<br/><math>P_{max} - 4 \text{ dB} = 40 \text{ dBm}</math></b> | $P_{max} = 44 \text{ dBm}$                                                     |
| <b>H2D</b>                    | $P_{max} = 41 \text{ dBm}$                                                         | $P_{max} = 41 \text{ dBm}$                                                     |
| <b>H4D</b>                    | $P_{max} = 37 \text{ dBm}$                                                         | $P_{max} = 37 \text{ dBm}$                                                     |

• **GSM850 Radio Modules used with 30W Power Amplifier configuration**

| Description                                   | Hardware code        | Comment                             |
|-----------------------------------------------|----------------------|-------------------------------------|
| Radio Modules GSM 850                         |                      |                                     |
| GSM 850 DRX                                   | NTQA88HA             | eDRX                                |
| GSM 850 Splitter                              | NTQA88XA             |                                     |
| GSM 850 Power Amplifier                       | NTQA37AA             | eSCPA                               |
| Full Band coupling ( Tx Band 869-894 MHz )    |                      |                                     |
| GSM 850 Duplexer                              | NTQA38GA<br>NTQA38FA | Without TOS meter<br>With TOS meter |
| GSM 850 Tx Filter                             | NTQA39CA<br>NTQA39DA | Without TOS meter<br>With TOS meter |
| GSM 850 Two Ways Hybrid Duplexer              | NTQA38JA<br>NTQA38HA | Without TOS meter<br>With TOS meter |
| Part Band coupling ( Tx Band 869- 891.5 MHz ) |                      |                                     |
| GSM 850 Duplexer                              | NTQA38CA<br>NTQA38DA | Without TOS meter<br>With TOS meter |
| GSM 850 Tx Filter                             | NTQA39AA<br>NTQA39BA | Without TOS meter<br>With TOS meter |
| GSM 850 Two Ways Hybrid Duplexer              | NTQA38BA<br>NTQA38AA | Without TOS meter<br>With TOS meter |

**Power limitation to comply to Adjacent Band spurious at antenna connector :**

| Coupling configuration | System Power limitation<br>GMSK modulation                                     | System Power limitation<br>8 PSK modulation<br>( If 8PSK is supported by modules) |
|------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Diplexer<br>Tx Filter  | Power Limitation :<br>Pmax – 2 dB = 42 dBm<br>Except<br>ARFCN 238 , 241 : Pmax | Power Limitation :<br>Pmax – 2 dB = 42 dBm<br>Except<br>ARFCN 238 , 241 : Pmax    |
| H2D                    | Pmax = 41 dBm                                                                  | Pmax= 41 dBm                                                                      |

For Edge Channel ARFCN 128, 131, 133, 181, 183, 231, 233, 251, power has to be reduced by 2dB in order to meet spurious emission requirement.

**For Edge Channel ARFCN 238, 241, maximum power (44dBm) has allowed to meet spurious emission requirement.**

∞ End of DOCUMENT ∞