



FCC LISTED,  
REGISTRATION NUMBER:  
720267  
ISED LISTED  
REGISTRATION NUMBER  
4621A-2

Test report No:

**NIE: 52341RRF.004**

## Partial Test report

### REFERENCE STANDARD: USA FCC Part 22 & Part 24 CANADA IC RSS-132, RSS-133

|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                |
|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Identificación del objeto ensayado.....:</b><br>Identification of item tested                | TELEMATICS CONTROL UNIT                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                |
| <b>Marca .....</b><br>Trademark                                                                 | LDL-TECHNOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
| <b>Modelo y/o referencia tipo .....</b><br>Model and /or type reference                         | 16102                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                |
| <b>Other identification of the product .....</b>                                                | FCC ID: T4516102<br>IC: 6450A-16102                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                |
| <b>Final HW version .....</b>                                                                   | 314-069-0090-B (NA)                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                |
| <b>Final SW version .....</b>                                                                   | 414069191012                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                |
| <b>Características .....</b><br>Features                                                        | Radiofrequency, low frequency, GNSS, GSM/UMTS, Bluetooth Low energy<br>CAN, LIN, RS232                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                |
| <b>Solicitante .....</b><br>Applicant                                                           | LDL-TECHNOLOGY<br>3 rue GIOTTO 31520 RAMONVILLE-SAINT-AGNE TOULOUSE (FRANCE)                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                |
| <b>Método de ensayo solicitado, norma.....:</b><br>Test method requested, standard              | USA FCC Part 22 10-1-15 Edition.<br>- FCC § 22.917 Radiated emissions<br>USA FCC Part 24 10-1-15 Edition.<br>- FCC § 24.238 Radiated emissions<br>CANADA IC RSS-132 Issue 3, Jan. 2013.<br>- 5.5 Transmitter Unwanted Emissions<br>CANADA IC RSS-133 Issue 6, Jan. 2013.<br>- 6.5 Transmitter Unwanted Emissions<br>Measurement Guidance 971168 D01 v02r02 for certification of Licensed Digital Transmitters.<br>ANSI/TIA-603-D (2010). |                                                                                                                                |
| <b>Resultado .....</b><br>Summary                                                               | IN COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                |
| <b>Aprobado por (nombre / cargo y firma) .....</b><br>Approved by (name / position & signature) | A. Llamas<br>RF Lab. Manager                                                                                                                                                                                                                                                                                                                                                                                                             | <b>ALEJANDRO LLAMAS RODRIGUEZ</b><br>Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ<br>Fecha: 2017.06.16 12:49:06 +02'00' |
| <b>Fecha de realización .....</b><br>Date of issue                                              | 2017-06-16                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>RODRIGUEZ</b>                                                                                                               |

|                                                           |          |
|-----------------------------------------------------------|----------|
| <b>Formato de informe No. ....:</b><br>Report template No | FDT08_19 |
|-----------------------------------------------------------|----------|

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## Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

DEKRA Testing and Certification is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: ISED 4621A-2.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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## General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

## Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification.internal document PODT000.

## Usage of samples

Samples undergoing test have been selected by: **the client**

Sample S/01 is composed of the following elements:

| Control N° | Description             | Model | Serial N° | Date of reception |
|------------|-------------------------|-------|-----------|-------------------|
| 52341C/005 | TELEMATICS CONTROL UNIT | 16102 | 8519E028  | 2017-04-06        |

Auxiliary elements used with the sample S/01:

| Control N° | Description | Model | Serial N° | Date of reception |
|------------|-------------|-------|-----------|-------------------|
| 52341C/012 | HARNESS     | ---   | ---       | 2014-04-06        |

1. Sample S/01 has undergone following test(s).

All tests indicated in appendixes A and B.

## Test sample description

The test sample consists of:

Radiofrequency, low frequency, GNSS, GSM/UMTS, Bluetooth Low energy  
CAN, LIN, RS232

## Identification of the client

LDL-TECHNOLOGY

3 rue GIOTTO 31520 RAMONVILLE-SAINT-AGNE TOULOUSE (FRANCE)

## Testing period

The performed test started on 2017-05-16 and finished on 2017-05-14.

The tests have been performed at DEKRA Testing and Certification.

## Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

|                               |                              |
|-------------------------------|------------------------------|
| Temperature                   | Min. = 15 °C<br>Max. = 35 °C |
| Relative humidity             | Min. = 20 %<br>Max. = 75 %   |
| Shielding effectiveness       | > 100 dB                     |
| Electric insulation           | > 10 kΩ                      |
| Reference resistance to earth | < 1 Ω                        |

In the semianechoic chamber, the following limits were not exceeded during the test.

|                                      |                                                                                             |
|--------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C                                                                |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %                                                                  |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar                                                         |
| <b>Shielding effectiveness</b>       | > 100 dB                                                                                    |
| <b>Electric insulation</b>           | > 10 kΩ                                                                                     |
| <b>Reference resistance to earth</b> | < 1 Ω                                                                                       |
| <b>Normal site attenuation (NSA)</b> | < ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz) |
| <b>Field homogeneity</b>             | More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).            |

## Remarks and comments

1. The tests have been performed by the technical personnel: Carlos Alberto Contreras.
2. Used instrumentation:

### Radiated Measurements

|     |                                                                  | Last Cal. date | Cal. due date |
|-----|------------------------------------------------------------------|----------------|---------------|
| 1.  | Semianechoic Absorber Lined Chamber ETS FACT3 200STP             | N.A.           | N.A.          |
| 2.  | BiconicalLog antenna ETS LINDGREN 3142E                          | 2015/06        | 2018/06       |
| 3.  | Multi Device Controller EMCO 2090                                | N.A.           | N.A.          |
| 4.  | Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D | 2016/11        | 2019/11       |
| 5.  | Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170           | 2017/03        | 2020/03       |
| 6.  | EMI Test Receiver R&S ESU 40                                     | 2016/03        | 2018/03       |
| 7.  | Spectrum analyser Rohde & Schwarz FSW50                          | 2015/12        | 2017/12       |
| 8.  | RF pre-amplifier 20 MHz-7 GHz PAM-0207                           | 2016/09        | 2017/09       |
| 9.  | RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M           | 2016/02        | 2018/02       |
| 10. | RF pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M          | 2015/12        | 2017/12       |
| 11. | Universal Radio communication Tester R&S CMW500                  | 2014/07        | 2017/07       |

3. GSM mode has not been tested to prove USA FCC Part 22 and Part 24 and Canada IC RSS-132 and RSS-133 compliance because the modulation scheme and the power maximum levels are the same as for GPRS mode.

Taking into account the above comments, testing in GSM mode is redundant for FCC Parts 22 and Part 24 and IC RSS-132 and RSS-133 as it is the same as GPRS mode. GPRS mode has been tested as indicated on the present test report.

4. HSDPA modulation mode has not been tested to prove USA FCC Part 22 and Part 24 compliance because it is an improved mode of operation only for Downlink (UE reception), but using the normal WCDMA mode for UL (Up Link, UE transmission). Therefore HSDPA has no associated a Power class or modulation scheme different than WCDMA mode for the UL transmission.

Taking into account the above comments, testing in HSDPA modulation mode is redundant for FCC Part 22 and Part 24 as it is the same as WCDMA mode as long as UE transmission is concerned. WCDMA modulation mode has been tested as indicated on the present test report.

5. Test not requested. Only co-location radiated spurious emission test was requested.

## Testing verdicts

|                             |     |
|-----------------------------|-----|
| <b>Not applicable</b> ..... | N/A |
| <b>Pass</b> .....           | P   |
| <b>Fail</b> .....           | F   |
| <b>Not measured</b> .....   | N/M |

| FCC PART 22/IC RSS-132 PARAGRAPH                                          | VERDICT |   |   |                 |
|---------------------------------------------------------------------------|---------|---|---|-----------------|
|                                                                           | NA      | P | F | NM <sup>5</sup> |
| Clause 22.913/RSS-132 Clause 5.4: RF output power                         |         |   |   | NM <sup>5</sup> |
| Clause 2.1047/RSS-132 Clause 5.2: Modulation characteristics              |         |   |   | NM <sup>5</sup> |
| Clause 22.355/RSS-132 Clause 5.3: Frequency stability                     |         |   |   | NM <sup>5</sup> |
| Clause 2.1049: Occupied Bandwidth                                         |         |   |   | NM <sup>5</sup> |
| Clause 22.917/RSS-132 Clause 5.5: Spurious emissions at antenna terminals |         |   |   | NM <sup>5</sup> |
| Clause 22.917/RSS-132 Clause 5.5: Radiated emissions                      |         | P |   |                 |

5: see section "Remarks and comments".

| FCC PART 24/IC RSS-133 PARAGRAPH                                          | VERDICT |   |   |                 |
|---------------------------------------------------------------------------|---------|---|---|-----------------|
|                                                                           | NA      | P | F | NM <sup>5</sup> |
| Clause 24.232/RSS-133 Clause 6.4: RF output power                         |         |   |   | NM <sup>5</sup> |
| Clause 2.1047/RSS-133 Clause 6.2: Modulation characteristics              |         |   |   | NM <sup>5</sup> |
| Clause 24.235/RSS-133 Clause 6.3: Frequency stability                     |         |   |   | NM <sup>5</sup> |
| Clause 2.1049: Occupied Bandwidth                                         |         |   |   | NM <sup>5</sup> |
| Clause 24.238/RSS-133 Clause 6.5: Spurious emissions at antenna terminals |         |   |   | NM <sup>5</sup> |
| Clause 24.238/RSS-133 Clause 6.5: Radiated emissions                      |         | P |   |                 |

5: see section "Remarks and comments".

## Appendix A – Test result for FCC Part 22/IC RSS-132

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## TEST RESULTS FOR FCC PART 22 AND IC RSS-132

### TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 12/24 \text{ Vdc}$$

Type of power supply = DC voltage from external power supply.

### TEST FREQUENCIES:

GPRS AND EDGE MODULATION

Middle channel (190): 836.6 MHz

WCDMA AND HSUPA MODULATION

Middle channel (4182): 836.4 MHz

## Radiated emissions

### SPECIFICATION

FCC § 22.917

RSS-132. Clause 5.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

### METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method, in accordance with the ANSI/TIA-603-D: 2010.

The test was performed with the equipment transmitting in cellular mode, BT LE (modulation GFSK, which is the worst case), 433.92 MHz and LF 125 kHz (antenna 3, which is the worst case) radios simultaneously to check the impact of the co-location of all radio interfaces. The results and plots below show the worst results obtained in all modes.

#### Measurement Limit:

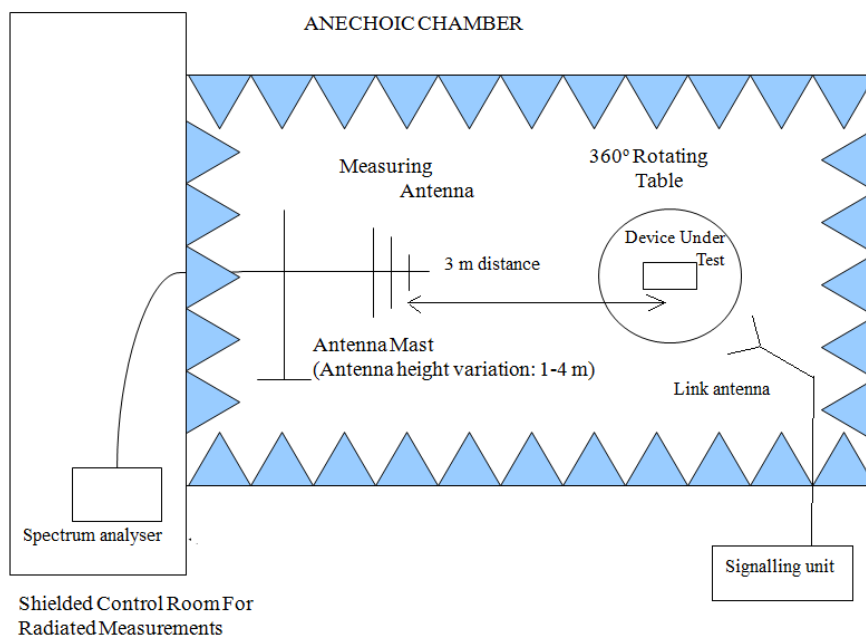
According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log (P_o)$  and the level in dBm relative  $P_o$  becomes:

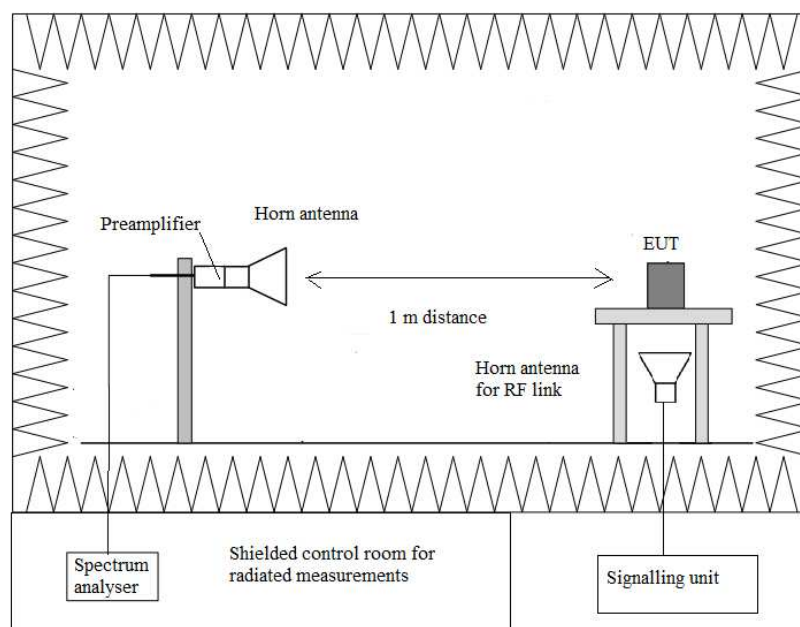
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

## TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



## RESULTS

### **GPRS AND EDGE MODULATION**

A preliminary scan determined the GPRS modulation as the worst case. The following tables and plots show the results for GPRS modulation.

CHANNEL: MIDDLE

#### **Frequency range 30 MHz-1000 MHz.**

No spurious signals were found at less than 20 dB respect to the limit.

#### **Frequency range 1 GHz-10 GHz.**

No spurious signals were found at less than 20 dB respect to the limit.

### **WCDMA AND HSUPA MODULATION**

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for WCDMA modulation.

CHANNEL: MIDDLE

#### **Frequency range 30 MHz-1000 MHz.**

No spurious signals were found at less than 20 dB respect to the limit.

#### **Frequency range 1 GHz-10 GHz.**

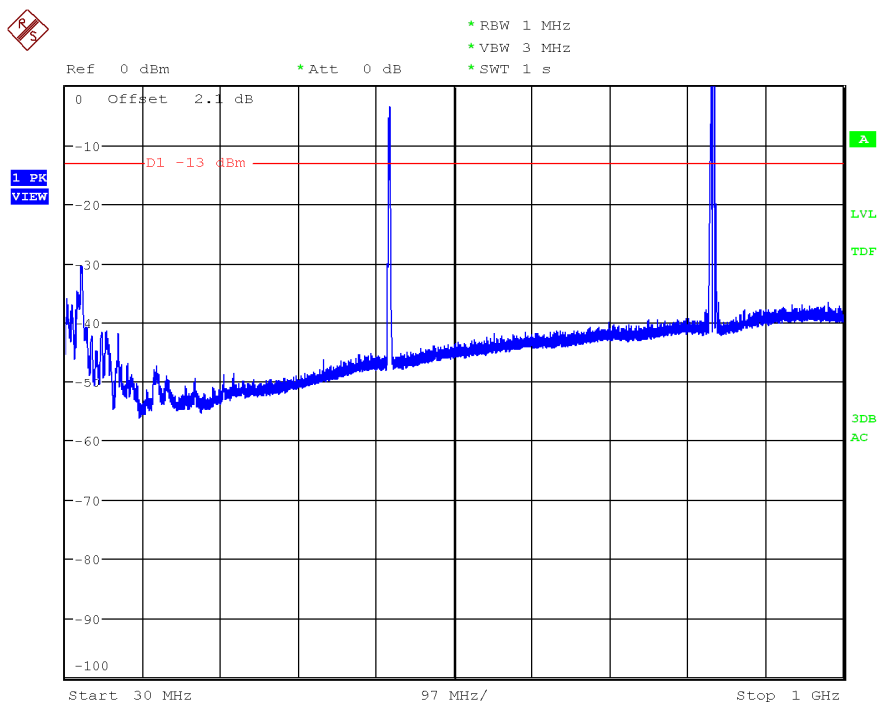
No spurious signals were found at less than 20 dB respect to the limit.

|                              |                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------|
| Measurement uncertainty (dB) | $<\pm 3.88$ for $f < 1\text{GHz}$<br>$<\pm 4.87$ for $f \geq 1\text{GHz}$ up to 10 GHz |
|------------------------------|----------------------------------------------------------------------------------------|

Verdict: PASS

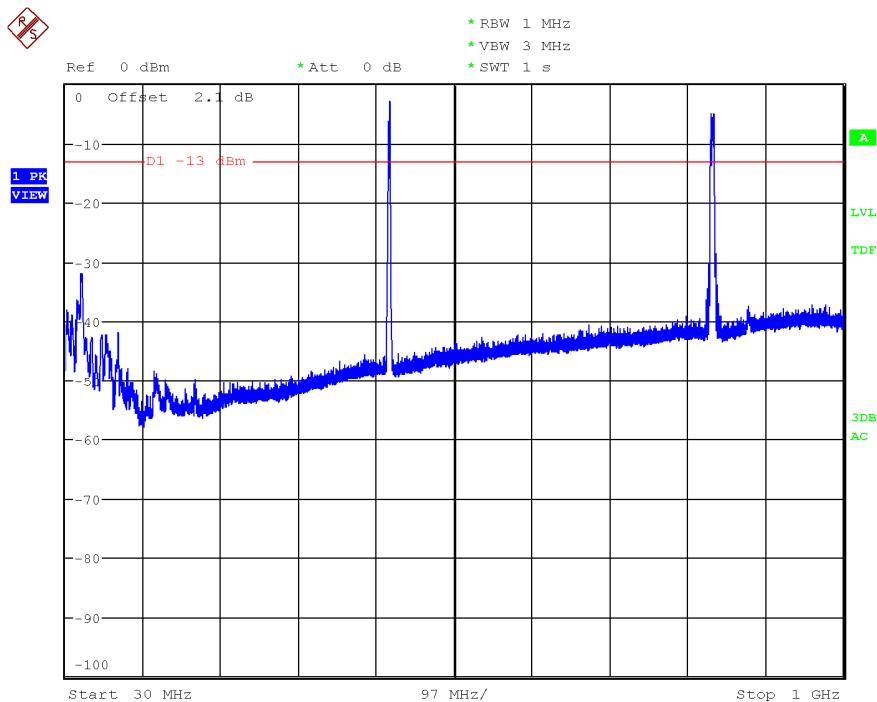
## FREQUENCY RANGE 30 MHz-1000 MHz.

### GPRS MODULATION



Note: The peaks above the limit are the carrier frequencies (433.92 MHz radio and GPRS 836.6 MHz).

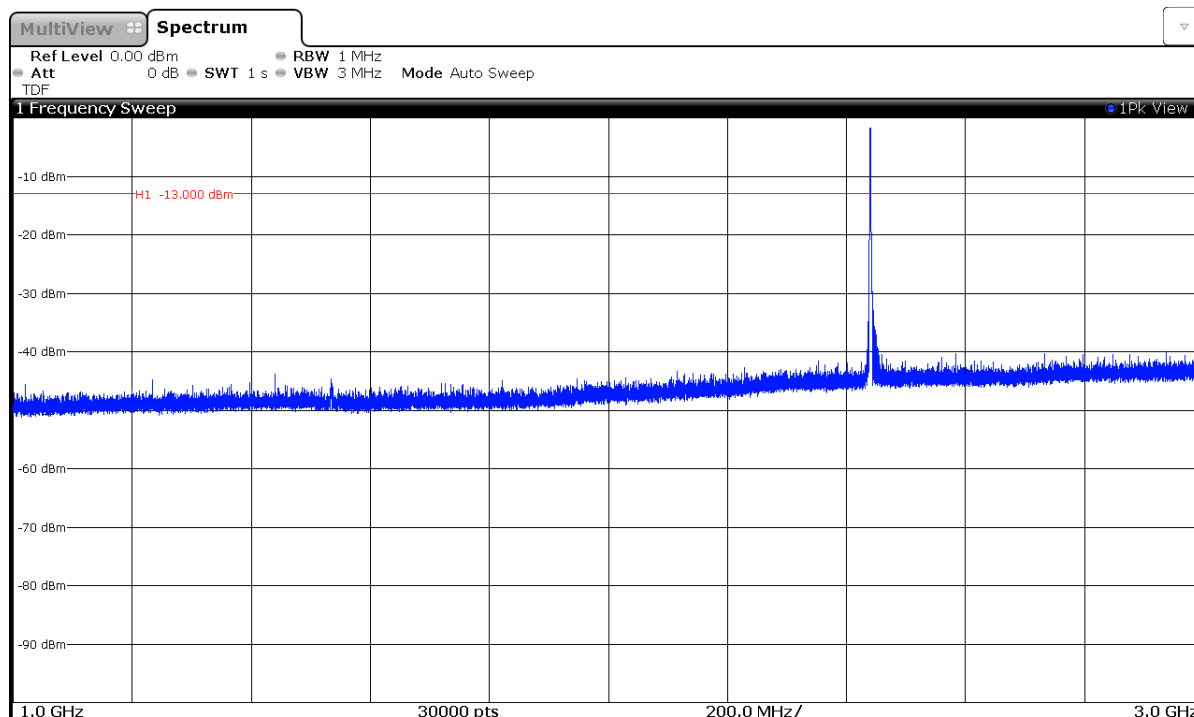
### WCDMA MODULATION



Note: The peaks above the limit are the carrier frequencies (433.92 MHz radio and WCDMA 836.4 MHz).

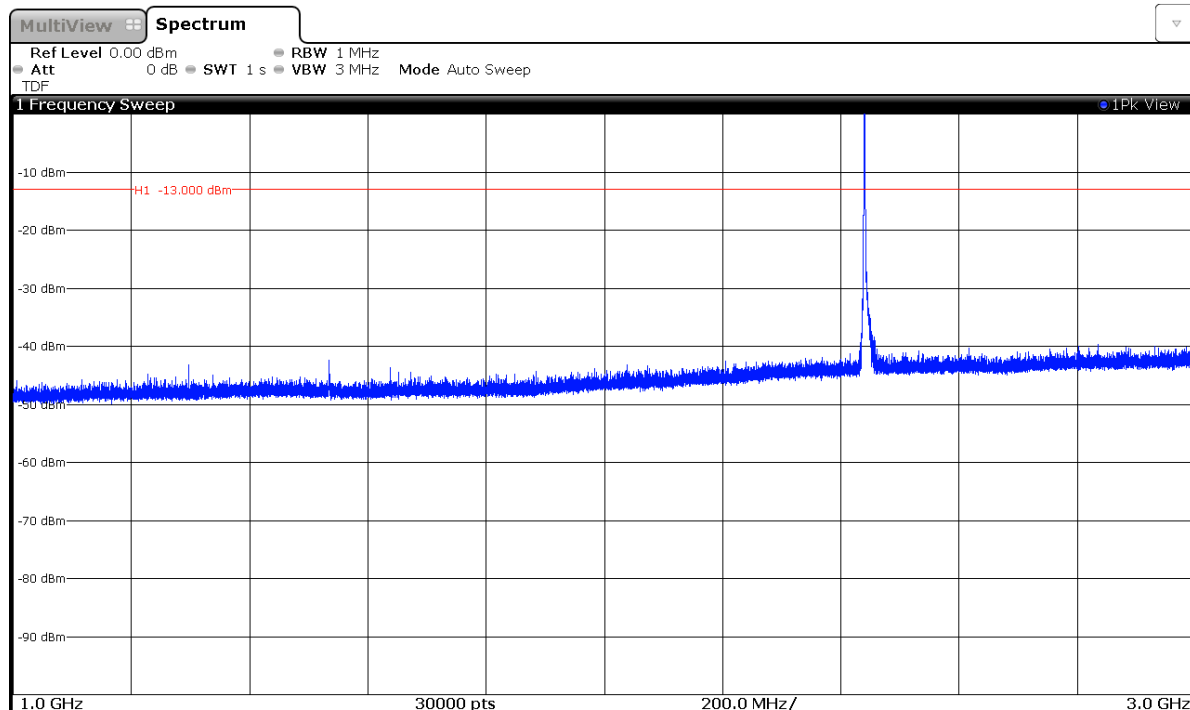
## FREQUENCY RANGE 1 GHz to 3 GHz.

### GPRS MODULATION



Note: The peak above the limit is the Bluetooth LE carrier frequency (2440 GHz).

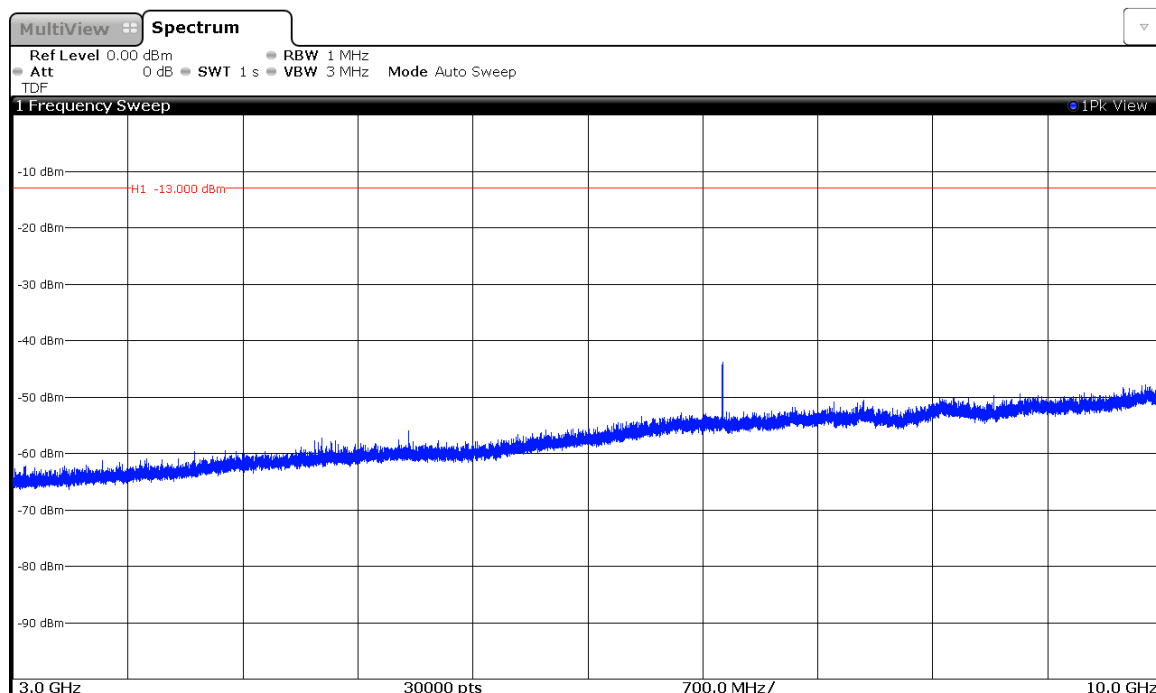
### WCDMA MODULATION



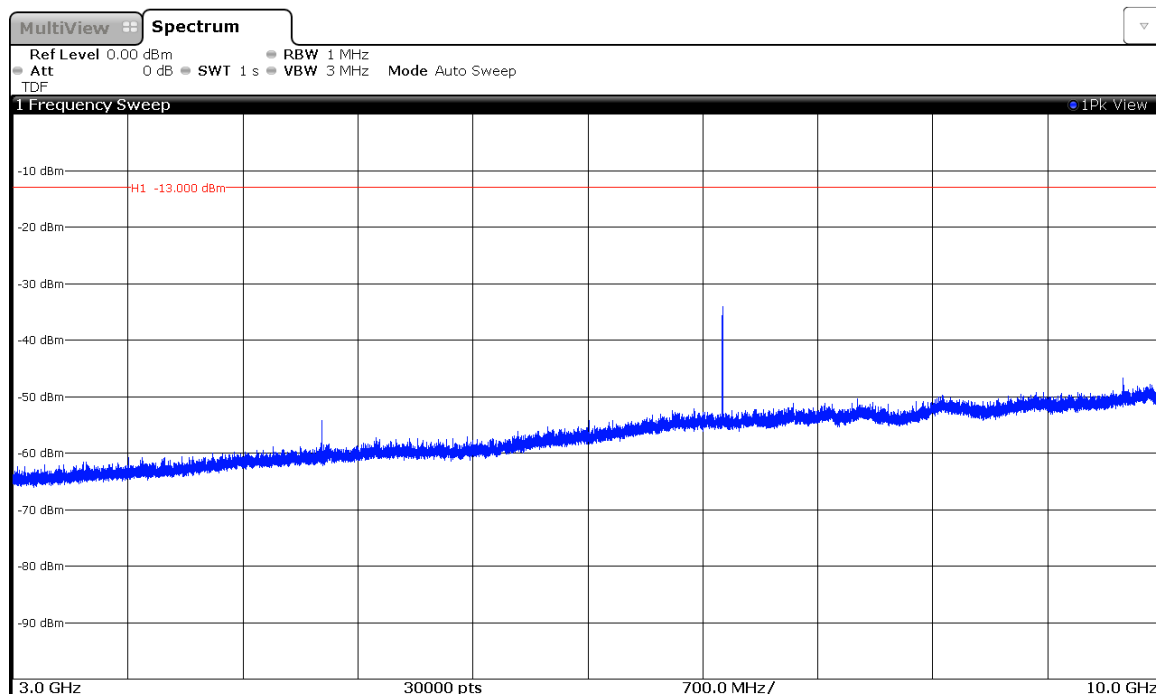
Note: The peak above the limit is the Bluetooth LE carrier frequency (2440 GHz).

## FREQUENCY RANGE 3 GHz to 10 GHz.

### GPRS MODULATION



### WCDMA MODULATION



## Appendix B – Test result for FCC Part 24/IC RSS-133

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## TEST RESULTS FOR FCC PART 24 AND IC RSS-133

### TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 12/24 \text{ Vdc}$$

Type of power supply = DC voltage from external power supply.

### TEST FREQUENCIES:

#### GPRS AND EDGE MODULATION

Middle channel (662): 1880.2 MHz

#### WCDMA AND HSUPA MODULATION

Middle channel (9400): 1880.0 MHz

## Radiated emissions

### SPECIFICATION

FCC §2.1046 and 24.238

RSS-133. Clause 6.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

### METHOD

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method, in accordance with the ANSI/TIA/EIA-603-D.

The test was performed with the equipment transmitting in cellular mode, BT LE (modulation GFSK, which is the worst case), 433.92 MHz and LF 125 kHz (antenna 3, which is the worst case) radios simultaneously to check the impact of the co-location of all radio interfaces. The results and plots below show the worst results obtained in all modes.

#### Measurement Limit:

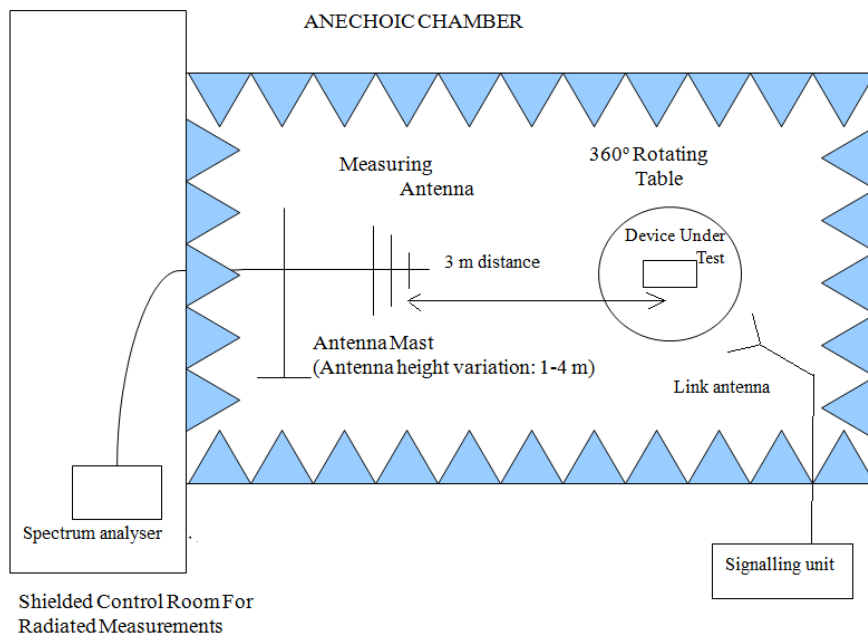
According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log (P_o)$  and the level in dBm relative  $P_o$  becomes:

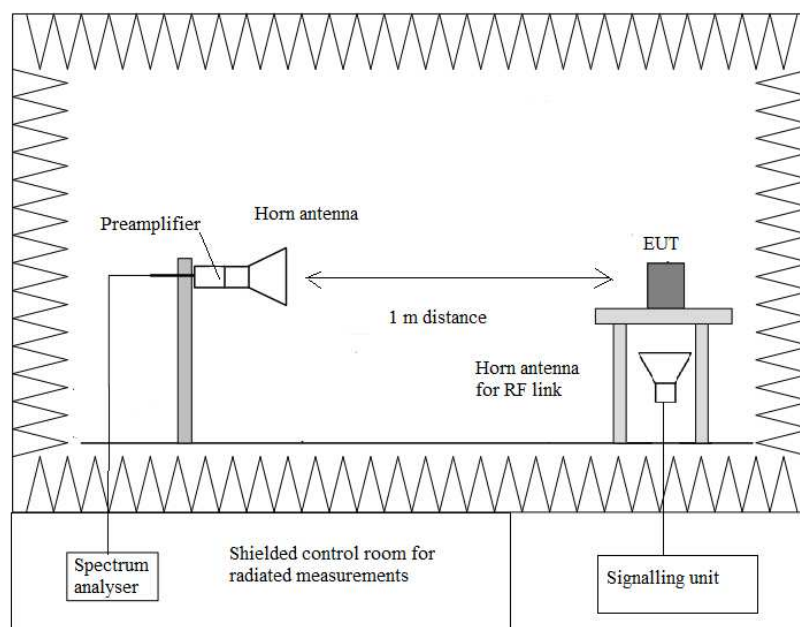
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

## TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



## RESULTS

### **GPRS AND EDGE MODULATION**

A preliminary scan determined the GPRS modulation as the worst case. The following tables and plots show the results for GPRS modulation.

CHANNEL: MIDDLE

#### **Frequency range 30 MHz-1000 MHz.**

No spurious signals were found at less than 20 dB respect to the limit.

#### **Frequency range 1 GHz-20 GHz.**

No spurious signals were found at less than 20 dB respect to the limit.

### **WCDMA AND HSUPA MODULATION**

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for WCDMA modulation.

CHANNEL: MIDDLE

#### **Frequency range 30 MHz-1000 MHz.**

No spurious signals were found at less than 20 dB respect to the limit.

#### **Frequency range 1 GHz-20 GHz.**

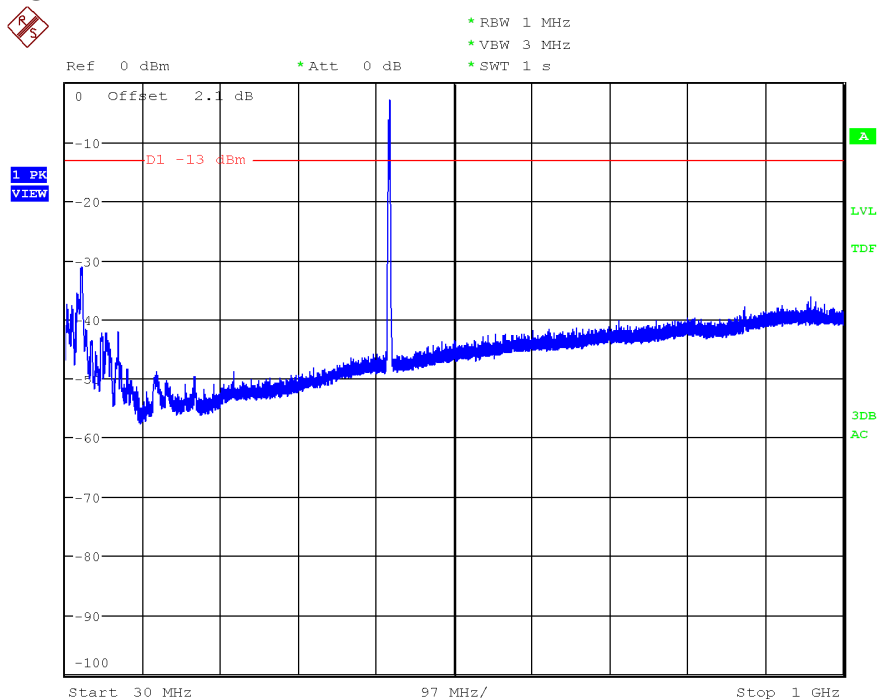
No spurious signals were found at less than 20 dB respect to the limit.

|                              |                                                                                                                               |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Measurement uncertainty (dB) | <±3.88 for $f < 1\text{GHz}$<br><±4.87 for $f \geq 1\text{GHz}$ up to 18 GHz<br><±3.99 for $f \geq 18\text{GHz}$ up to 20 GHz |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------|

Verdict: PASS

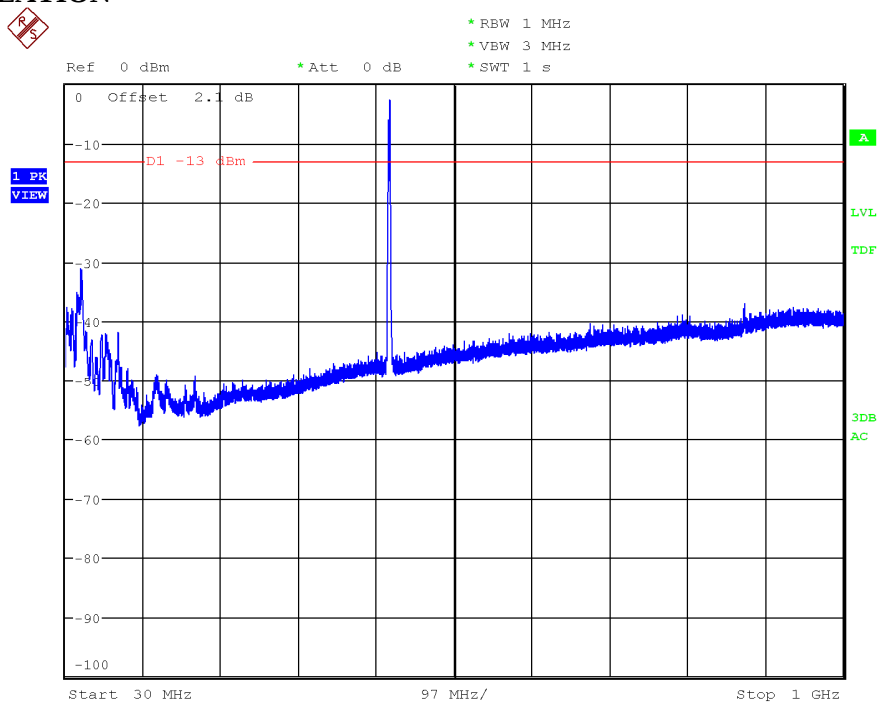
## FREQUENCY RANGE 30 MHz-1000 MHz.

### GPRS MODULATION



Note: The peak above the limit is the 433.92 MHz radio carrier frequency.

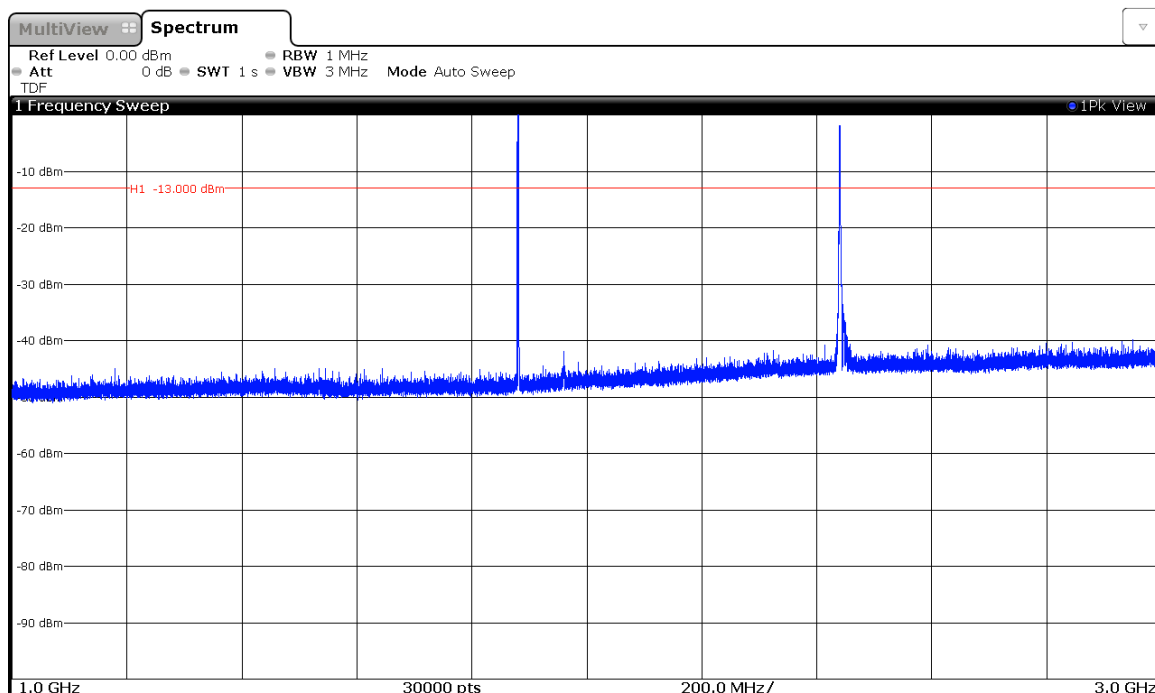
### WCDMA MODULATION



Note: The peak above the limit is the 433.92 MHz radio carrier frequency.

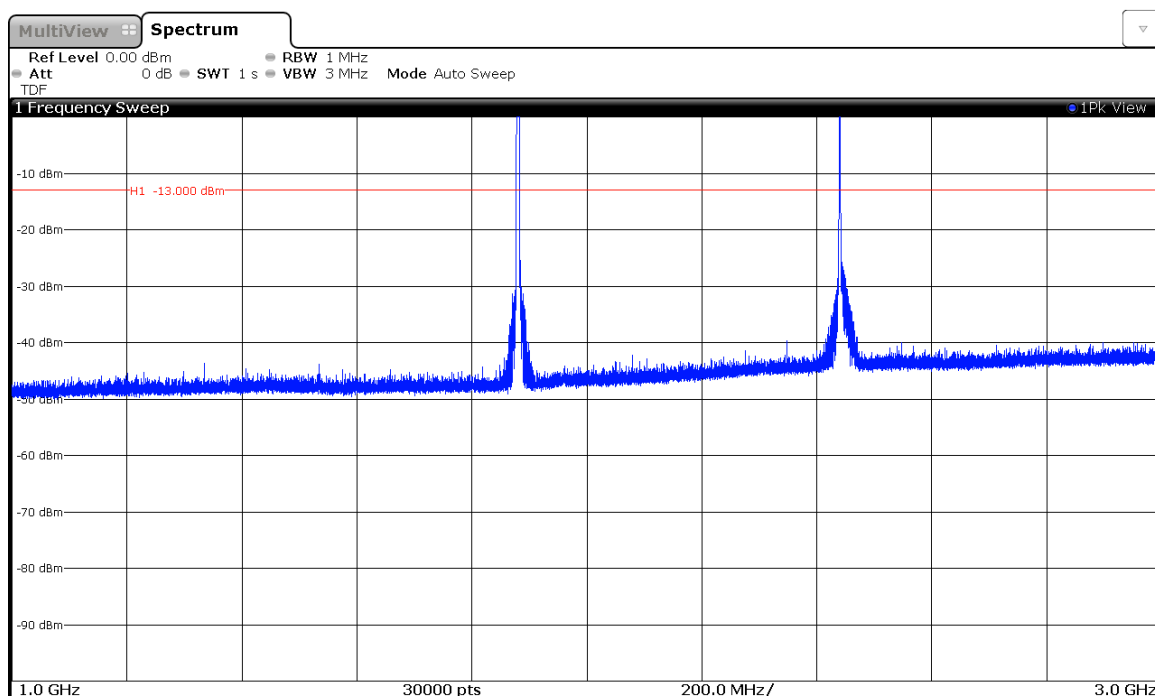
## FREQUENCY RANGE 1 GHz to 3 GHz.

### GPRS MODULATION



Note: The peaks above the limit are the carrier frequencies (Bluetooth LE 2440 MHz and GPRS 1880.2 MHz).

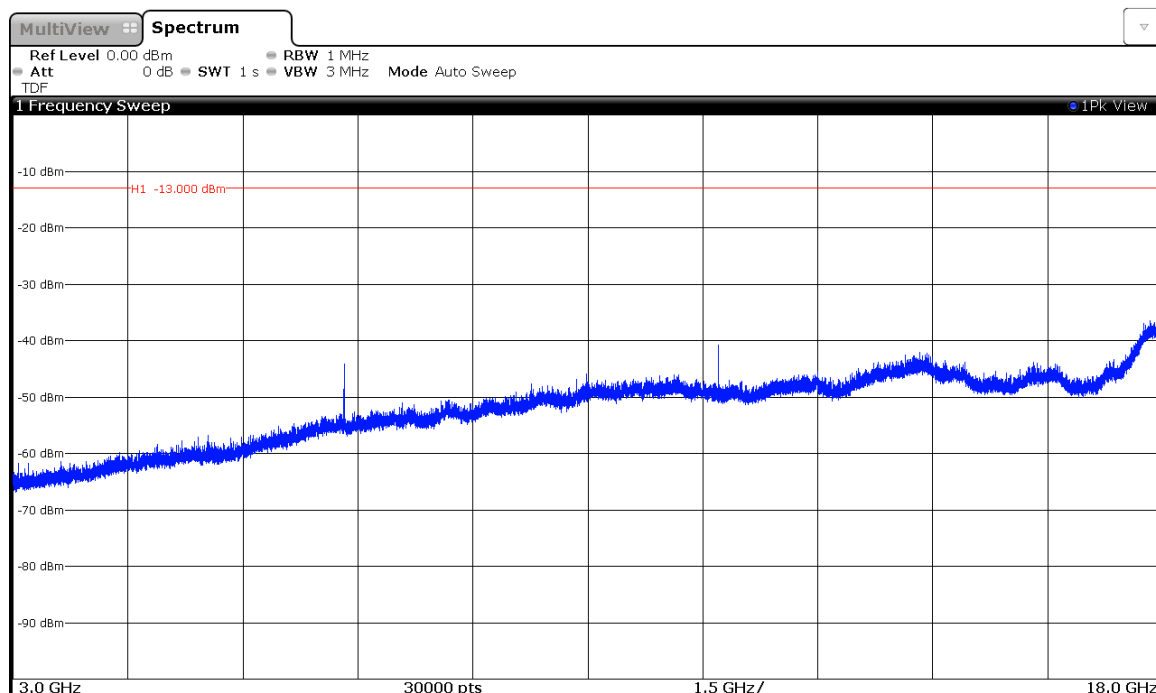
### WCDMA MODULATION



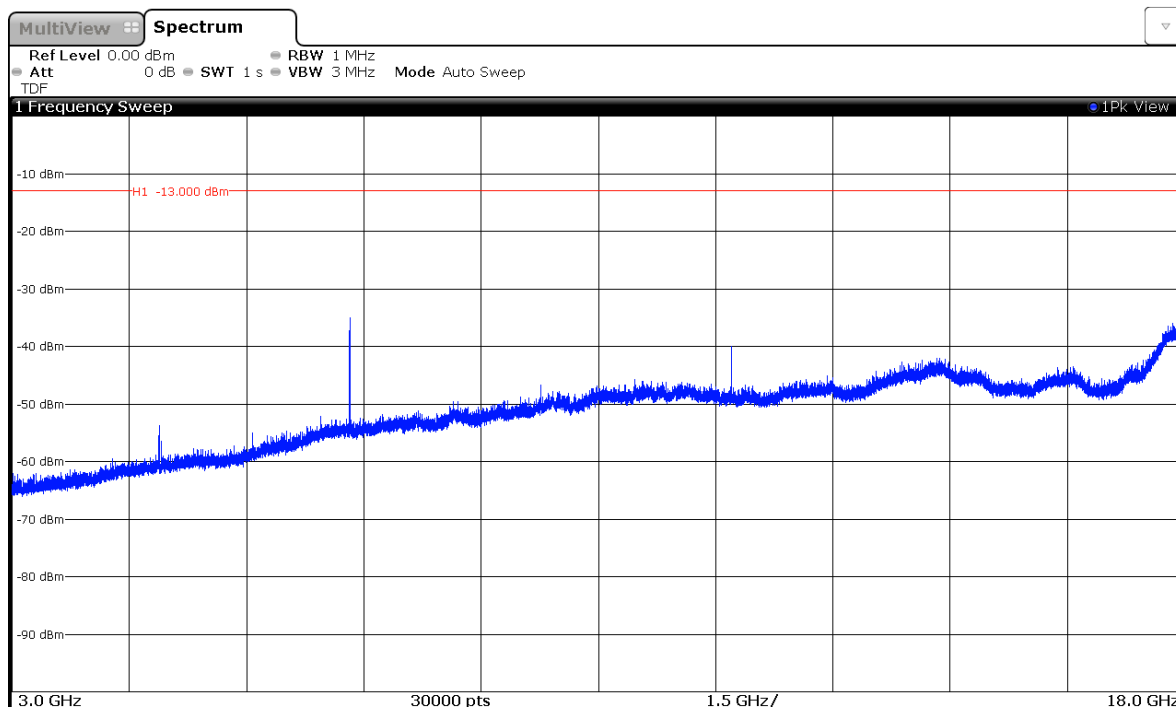
Note: The peaks above the limit are the carrier frequencies (Bluetooth LE 2440 MHz and GPRS 1880.2 MHz).

## FREQUENCY RANGE 3 GHz to 18 GHz.

### GPRS MODULATION

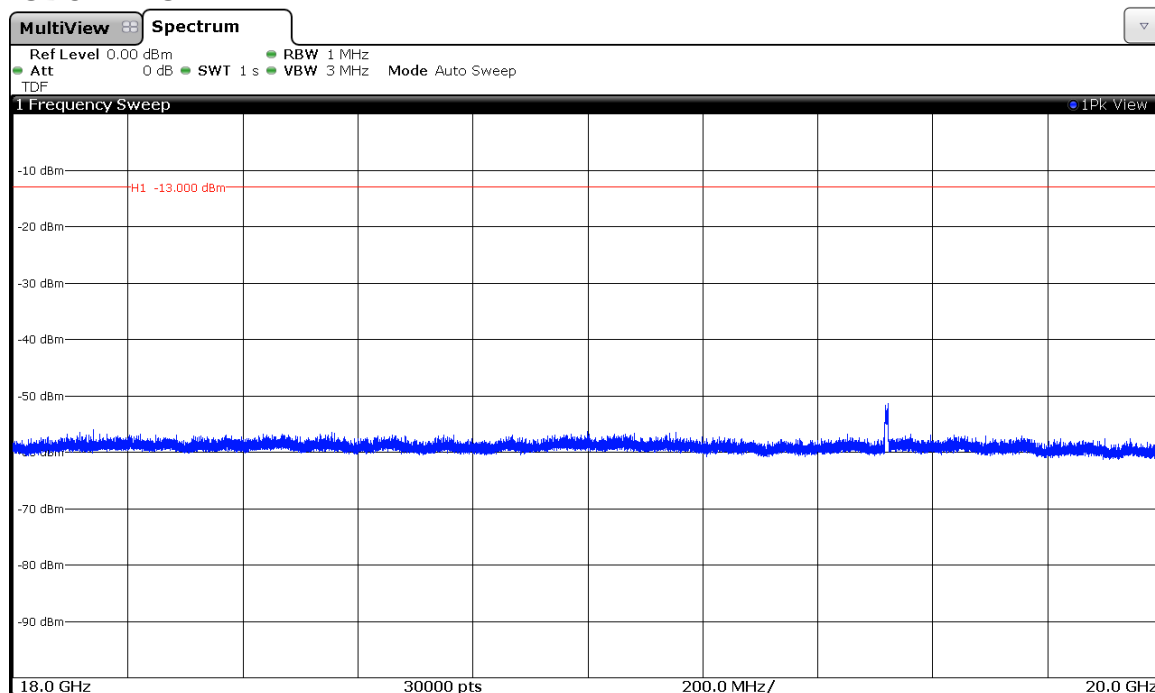


### WCDMA MODULATION



## FREQUENCY RANGE 18 GHz TO 20 GHz.

### GPRS MODULATION



### WCDMA MODULATION

