



Test report

407658-4TRFWL

Date of issue: 2020-11-04

Applicant:

Gimasi SA
Piazzale Roncàa, 4 – 6850 Mendrisio – Switzerland

Product:

TheNODE

Model:

TheNODE

Variants:

TheNODE IO, TheNODE LCD

FCC ID:

2AXU7-THENODE

IC:

26592-THENODE

Specifications:

- ◆ **FCC 47 CFR Part 24 Subpart E**
PERSONAL COMMUNICATIONS SERVICES – Broadband PCS
- ◆ **RSS-133, Issue 6, Amendment 1 (January 2018)**
2 GHz Personal Communications Services
- ◆ **RSS Gen, Issue 5 (April 2018), Amendment 1 (March 2019)**
General Requirements for Compliance of Radio Apparatus

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The test report merely corresponds to the tested sample.

The phase of sampling / collection of equipment under test is carried out by the customer.



Test location

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Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Spa ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Gimasi SA
Address	Piazzale Roncà, 4
City	Mendrisio
State	Switzerland
Postal/Zip code	6850

1.2 Test specifications

FCC 47 CFR Part 24 Subpart E	PERSONAL COMMUNICATIONS SERVICES – Broadband PCS
RSS-133, Issue 6, Amendment 1 (January 2018)	2 GHz Personal Communications Services
RSS Gen, Issue 5 (April 2018), Amendment 1 (March 2019)	General Requirements for Compliance of Radio Apparatus

1.3 Test methods

ANSI C63.26 v2015 KDB 971168 D01 v03r01	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services Power Meas License Digital Systems
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1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Exclusions

None

1.6 Test report revision history

Revision #	Details of changes made to test report
407658-4TRFWL	Original report issued

Section 2. Summary of test results

2.1 FCC Part 24E

RSS-133, Issue 6, Amendment 1 (January 2018)

RSS Gen, Issue 5 (April 2018), Amendment 1 (March 2019)

Part	Test method	Test description	Verdict
24.232 (c) RSS-133 §6.4	ANSI C63.26 § 5 KDB 971168 D01 v03r01 § 5.8	Effective Isotropic Radiated Power	Pass
24.238 (a) 2.1053 RSS-133 §6.5 RSS Gen	ANSI C63.26 § 5 KDB 971168 D01 v03r01 § 7	Radiated Spurious Emission	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	2020-10-22
Nemko sample ID number	4076580003

3.2 EUT information

Product name	TheNODE
Model	TheNODE
Model variant	TheNODE IO, TheNODE LCD
Serial number	864475040481649

3.3 Technical information

Frequency band	GSM1900	LTE Band 2
Frequency Min (MHz)	TX: 1850 / RX: 1930	TX: 1850 / RX: 1930
Frequency Max (MHz)	TX: 1910 / RX: 1990	TX: 1910 / RX: 1990
RF power EIRP (dBm)	29.3	22.7
Type of modulation	GMSK	QPSK
Transmitter spurious, Units @ distance	-23.9 dBm @ 3m	-40.3 dBm @ 3m
Power requirements	7 to 48 V DC	
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator. Antenna type: Antenova SR4L034L with 3.5 dBi gain	

3.4 Product description and theory of operation

The EUT is designed for tracking applications. It is available with 2G/NB1/M1 communication, GNSS module and accelerometer/gyroscope for wakeup and movement detection, as well as the standard temperature sensor. The EUT comes with a 1.17" 184x38 Monochrome LCD display and an RGB led. On the display working information and configuration data can be displayed. The power subsystem is based on a DC power port with a rechargeable 3350mAh battery.

The EUT use the Quectel BG95-M3 radio module separately approved.

3.5 EUT exercise details

TX mode forced by AT commands as following:

```
AT+QRFTESTMODE=1
AT+QRFTEST="GSM1900",661,"ON",0,3300
AT+QRFTEST="LTE BAND2",18900,"ON",100,1
```

3.6 EUT setup diagram



3.7 EUT sub assemblies

Description	Brand name	Model/Part number	Serial number
Radio module	Quectel	BG95-M3	--

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

In the laboratory, the following ambient conditions are respected for each test reported below:

Temperature	18 – 33 °C
Relative humidity	25 – 70 %
Air pressure	860 – 1060 mbar

The following instruments are used to monitor the environmental conditions:

Equipment	Manufacturer	Model no.	Asset no.	Cal date	Next cal.
Thermo-hygrometer data loggers	Testo	175-H2	20012380/305	01/2019	01/2021
Thermo-hygrometer data loggers	Testo	175-H2	38203337/703	01/2019	01/2021
Barometer	Castle	GPB 3300	072015	12/2019	12/2020

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

EUT	Type	Test	Range	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	0.009 MHz ÷ 30 MHz 30 MHz ÷ 18 GHz 18 MHz ÷ 40 GHz 40 MHz ÷ 140 GHz	1.1 dB 1.5 dB 3.0 dB 5.0 dB	(1) (1) (1) (1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.4 dB	(1)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz 18 GHz ÷ 40 GHz 40 GHz ÷ 220 GHz	3.0 dB 4.2 dB 6.0 dB	(1) (1) (1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter – Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
	Radiated	Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz 26.5 GHz ÷ 66 GHz 66 GHz ÷ 220 GHz	6.0 dB 8.0 dB 10 dB	(1) (1) (1)
		Effective radiated power transmitter	10 kHz ÷ 26.5 GHz 26.5 GHz ÷ 66 GHz 66 GHz ÷ 220 GHz	6.0 dB 8.0 dB 10 dB	(1) (1) (1)
Receiver	Radiated	Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz 26.5 GHz ÷ 66 GHz 66 GHz ÷ 220 GHz	6.0 dB 8.0 dB 10 dB	(1) (1) (1)
		Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz 18 GHz ÷ 40 GHz 40 GHz ÷ 220 GHz	3.0 dB 4.2 dB 6.0 dB	(1) (1) (1)

NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %

Section 7. Test equipment

7.1 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	08/2020	08/2021
EMI receiver (2 Hz ÷ 44 GHz)	Rohde & Schwarz	ESW44	101620	09/2020	09/2021
Spectrum Analyzer (2 Hz ÷ 43 GHz)	Rohde & Schwarz	FSW43	101767	07/2020	07/2021
Trilog Antenna (30 MHz ÷ 7 GHz)	Schwarzbeck	VULB 9162	9162-025	07/2018	07/2021
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	09/2018	09/2021
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718	9718-137	07/2020	07/2021
Horn antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	04/2020	04/2023
Preamplifier (18 ÷ 40 GHz)	Sage	STB-1834034030-KFKF-L1	18490-01	03/2020	03/2021
Controller	Maturo	FCU3.0	10041	NCR	NCR
Tilt antenna mast	Maturo	TAM4.0-E	10042	NCR	NCR
Turntable	Maturo	TT4.0-5T	2.527	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	09/2019	09/2021
Shielded room	Siemens	10m control room	1947	NCR	NCR

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 24.232 (c) – Effective Isotropic Radiated Power

RSS-133, Issue 6, Amendment 1 (January 2018), §6.4 - Transmitter Output Power and Equivalent Isotropically Radiated Power

8.1.1 Definitions and limits

FCC §24.232 (c)

Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

RSS-133, Issue 6, Amendment 1 (January 2018), §6.4

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

8.1.2 Test summary

Test date	From 2020-10-30 to 2020-11-02	Temperature	23 °C
Test engineer	P. Barbieri	Air pressure	55 %
Verdict	Pass	Relative humidity	1000 hPar

8.1.3 Observations, settings and special notes

Measurement performed with antenna eight from 1 to 4 m at 3 m distance from the EUT with a rotation of 360 °.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	≥ OBW
Video bandwidth:	≥ 3 x RBW
Detector mode:	RMS
Trace mode:	Power average

8.1.4 Test data

Mode	Channel	Frequency (MHz)	Polarization	EIRP (dBm)	Limit (dBm)	Margin (dB)
GSM 1900	Mid	1880	Horizontal	29.3	33.0	-3.7
LTE Band 2	18900	1880	Horizontal	22.7	33.0	-10.3

8.2 FCC 24.238 (a) – Radiated Spurious Emission

RSS-133, Issue 6, Amendment 1 (January 2018), §6.5 - Transmitter Unwanted Emissions

RSS Gen, Issue 5 (April 2018), Amendment 1 (March 2019)

8.2.1 Definitions and limits

FCC §24.238 (a)

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC §2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

RSS-133, Issue 6, Amendment 1 (January 2018), §6.5

Equipment shall comply with the limits in (i) and (ii) below.

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}P$ (watts).

After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}P$ (watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

8.2.2 Test summary

Test date	From 2020-10-30 to 2020-11-02	Temperature	23 °C
Test engineer	P. Barbieri	Air pressure	55 %
Verdict	Pass	Relative humidity	1000 hPar

8.2.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic. Radiated measurements were performed at a distance of 3 m. The spurious emissions limit is -13 dBm

Spectrum analyser settings for radiated measurements below 1 GHz:

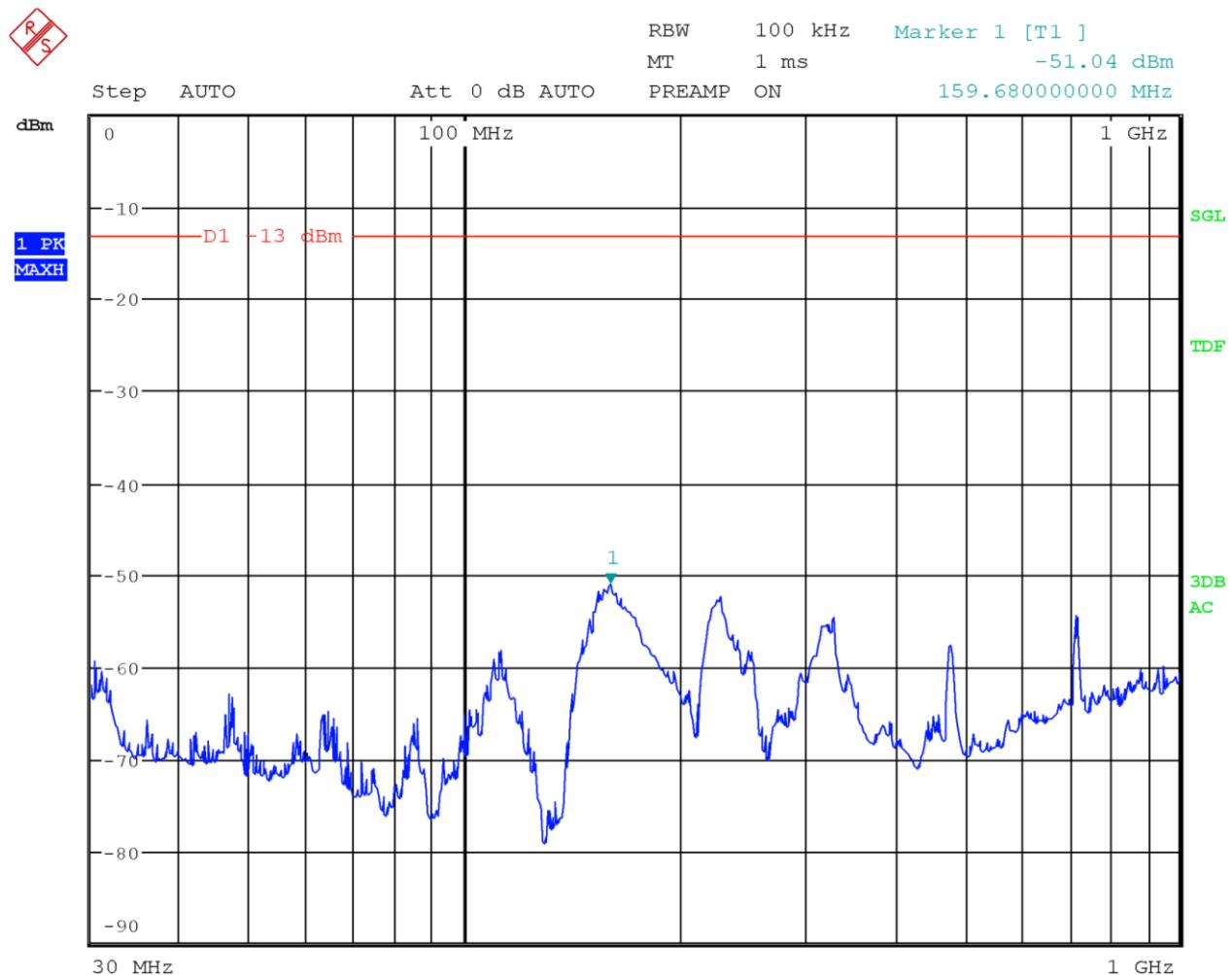
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for radiated measurements below 1 GHz:

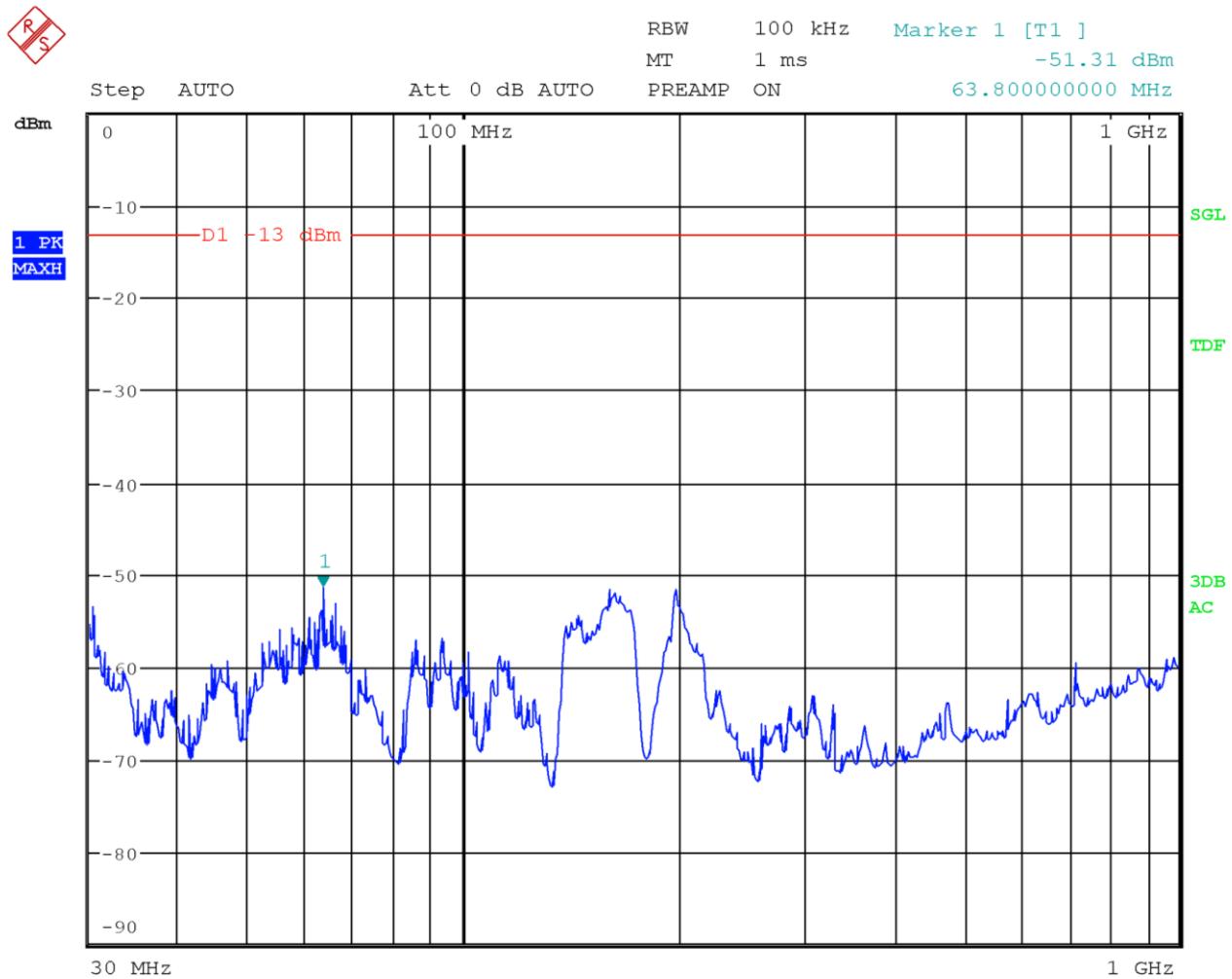
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Final measurement, if any, has been performed in power averaging mode

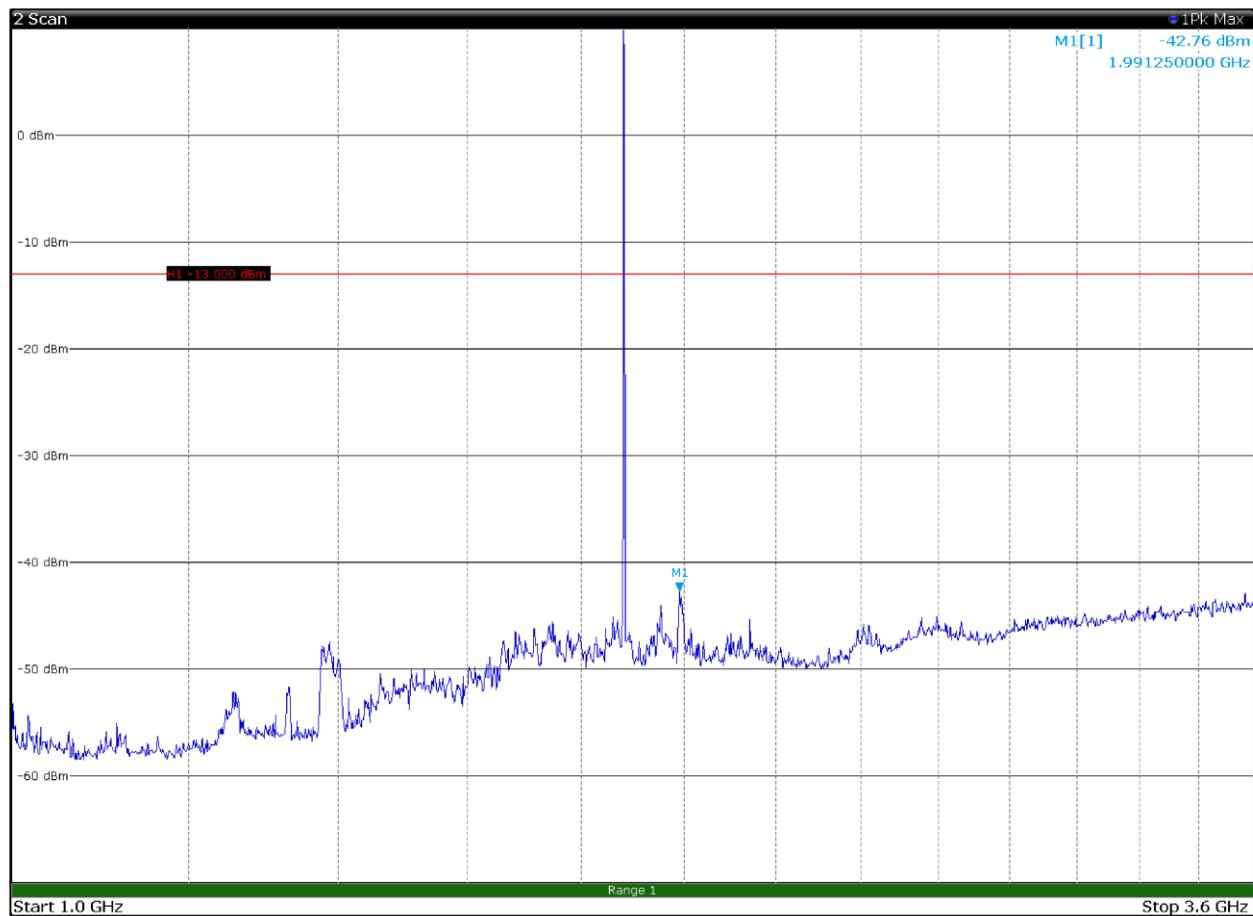
8.2.4 Test data



GSM 1900 – Frequency range 30 MHz to 1 GHz with antenna in horizontal polarization

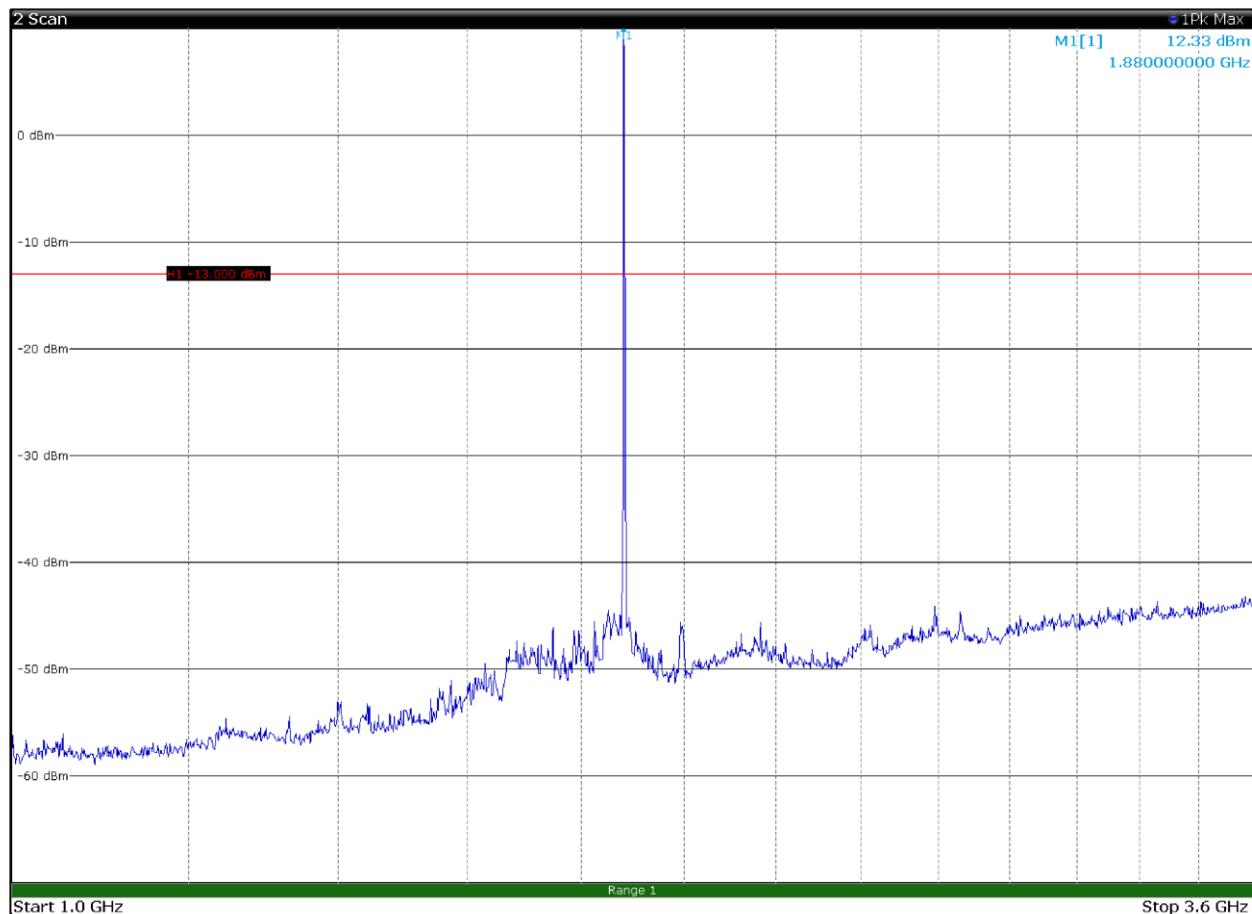


GSM 1900 – Frequency range 30 MHz to 1 GHz with antenna in vertical polarization



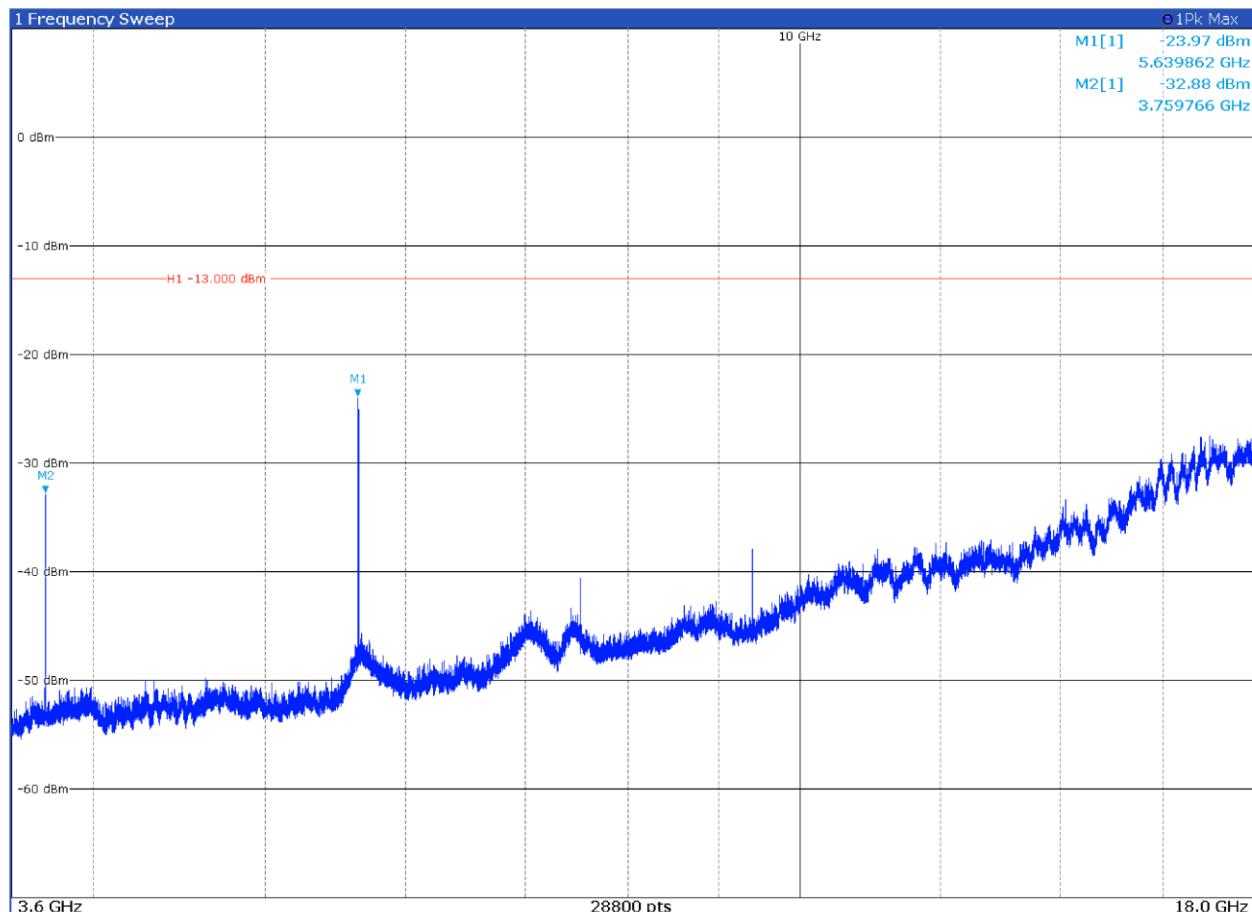
GSM 1900 – Frequency range 1 GHz to 3.6 GHz with antenna in horizontal polarization

Limit exceeded by the carrier



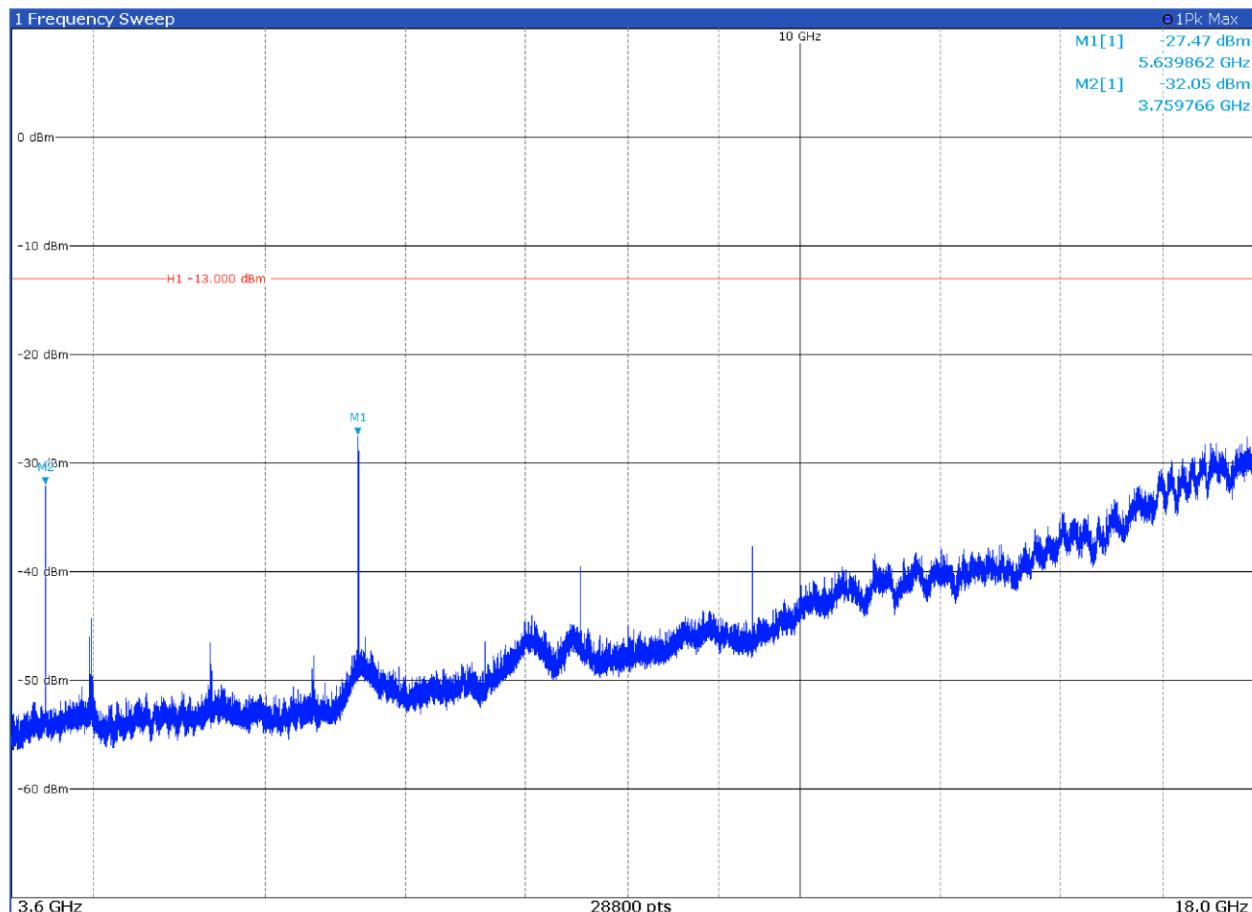
GSM 1900 – Frequency range 1 GHz to 3.6 GHz with antenna in vertical polarization

Limit exceeded by the carrier



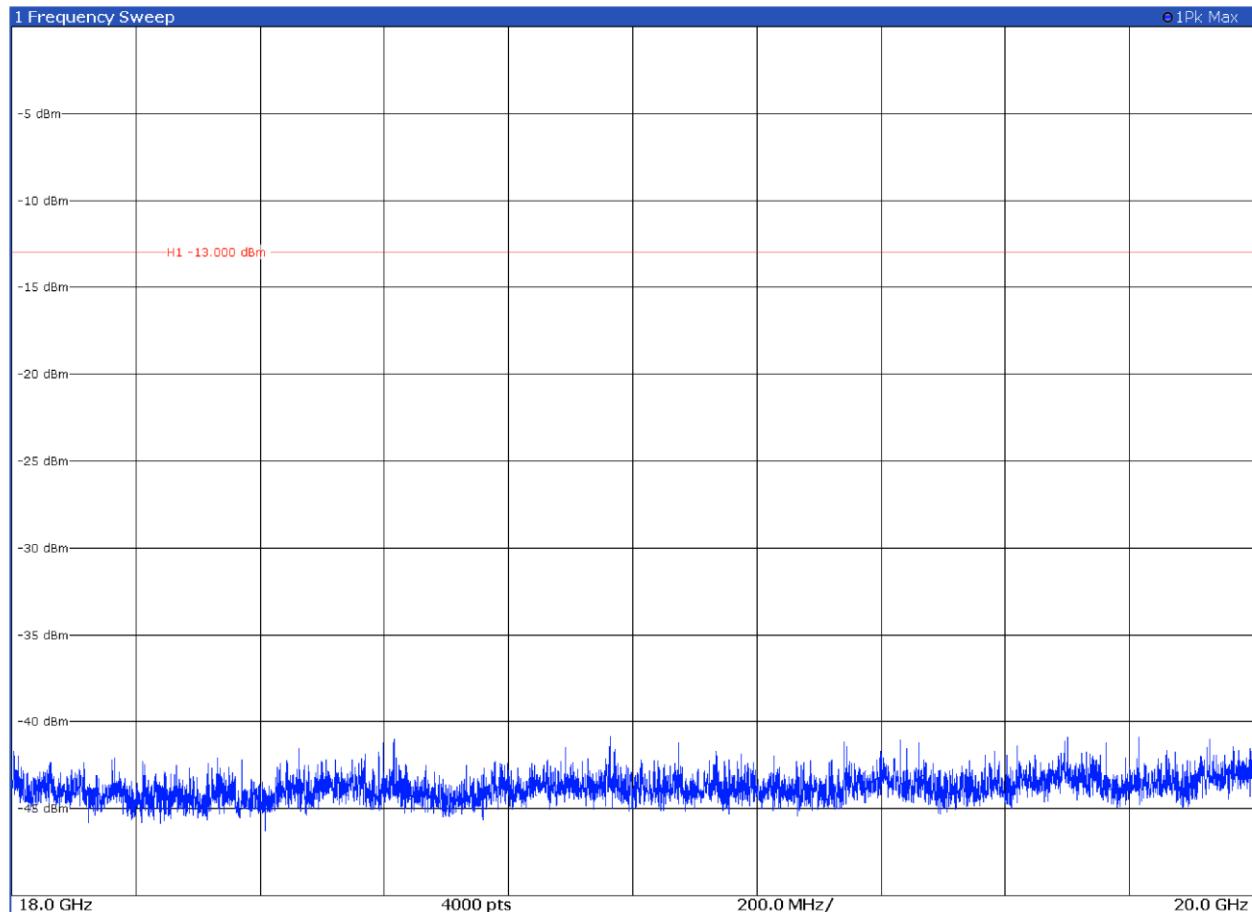
GSM 1900 – Frequency range 3.6 GHz to 18 GHz with antenna in horizontal polarization

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
3759.766	-32.8	-13.0	-19.8
5639.862	-23.9	-13.0	-10.9

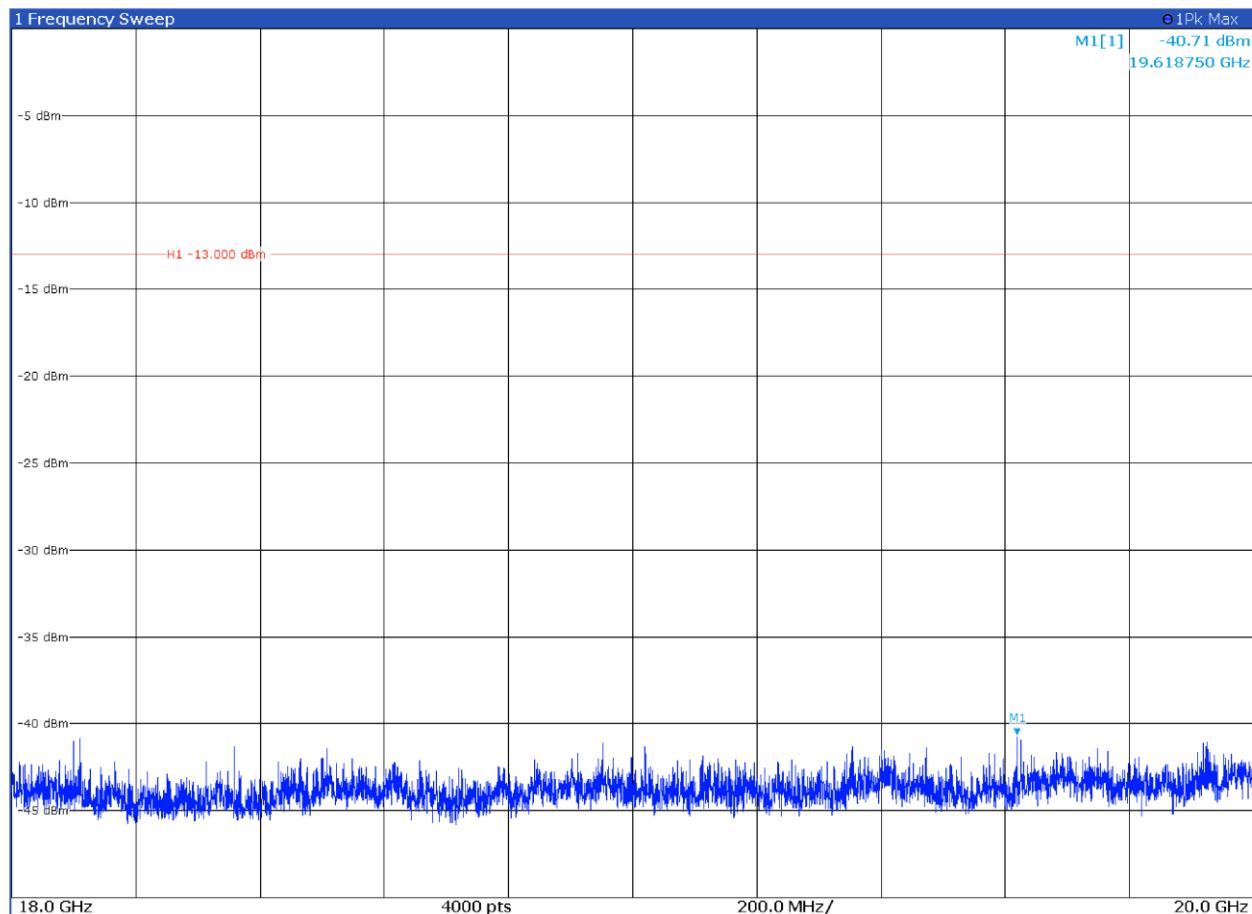


GSM 1900 – Frequency range 3.6 GHz to 18 GHz with antenna in vertical polarization

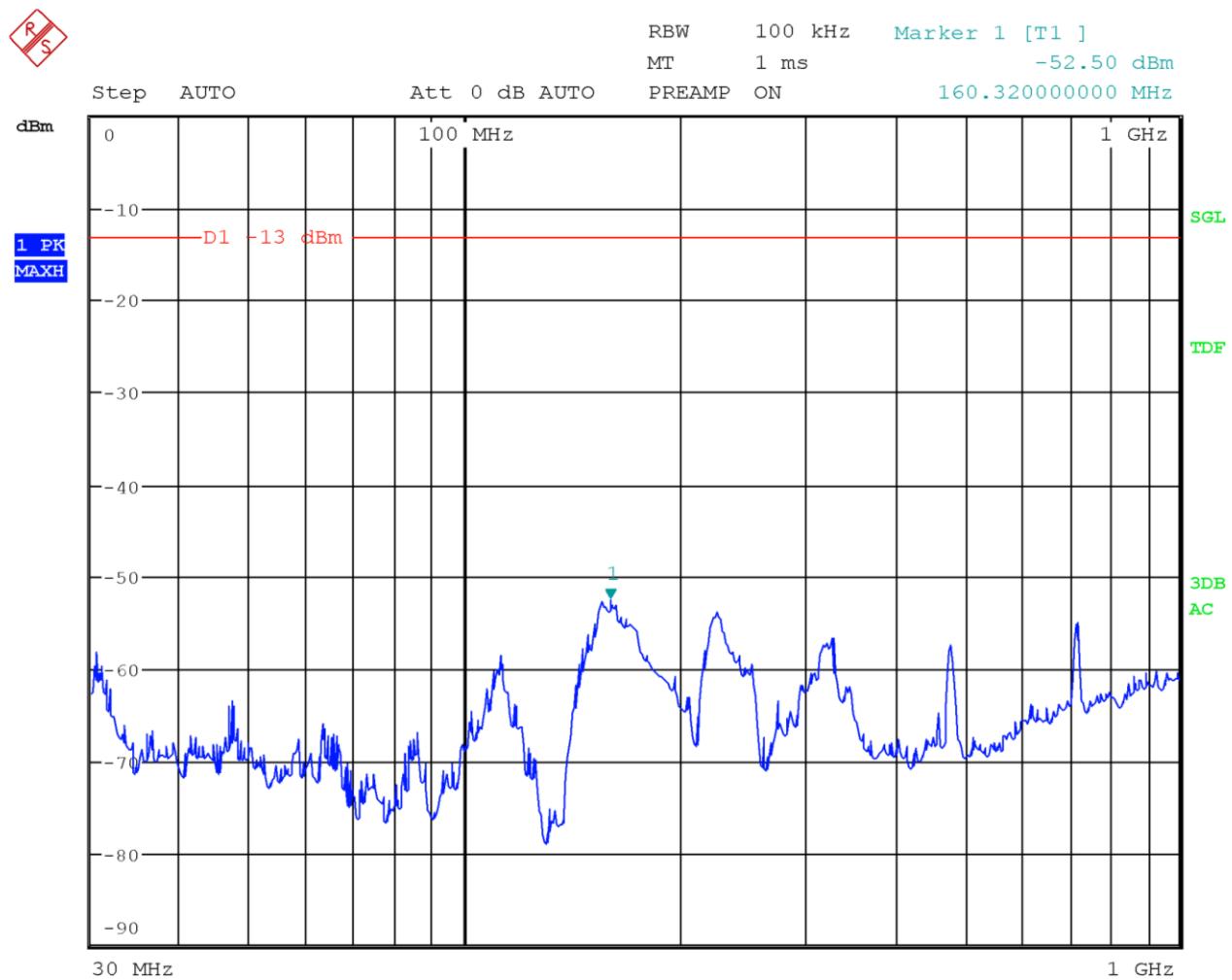
Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
3759.766	-32.1	-13.0	-19.1
5639.862	-27.5	-13.0	-14.5



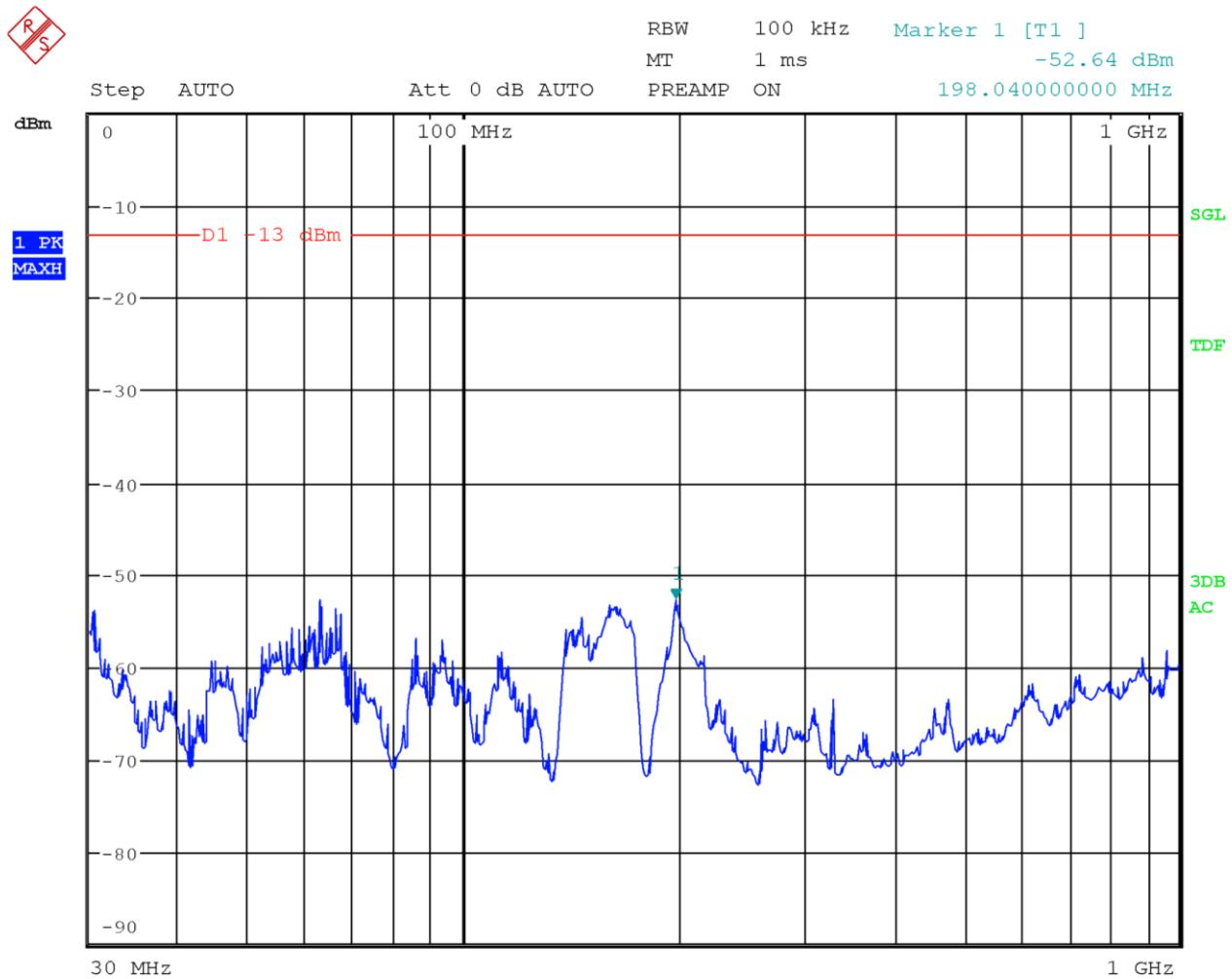
GSM 1900 – Frequency range 18 GHz to 20 GHz with antenna in horizontal polarization



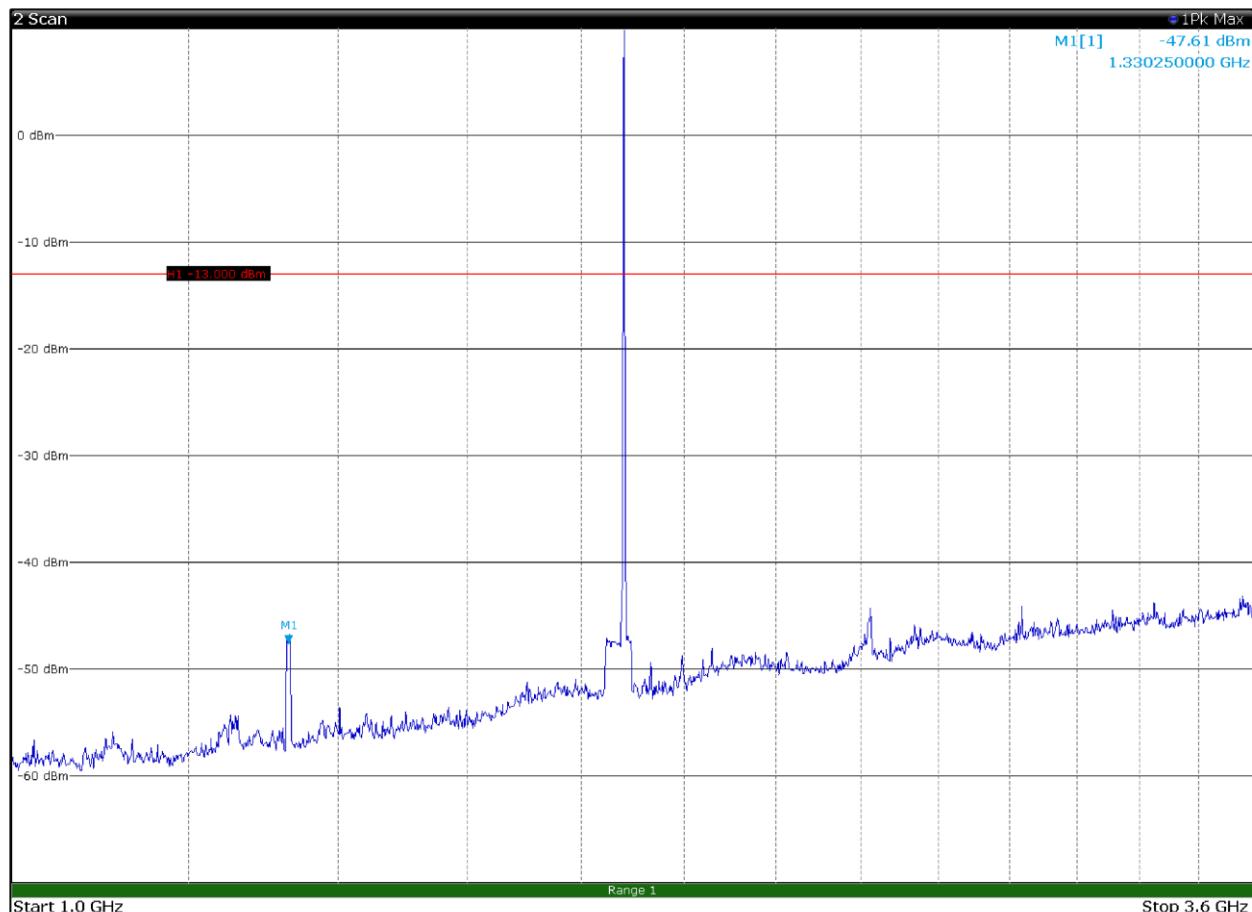
GSM 1900 – Frequency range 18 GHz to 20 GHz with antenna in vertical polarization



LTE Band 2 – Frequency range 30 MHz to 1 GHz with antenna in horizontal polarization

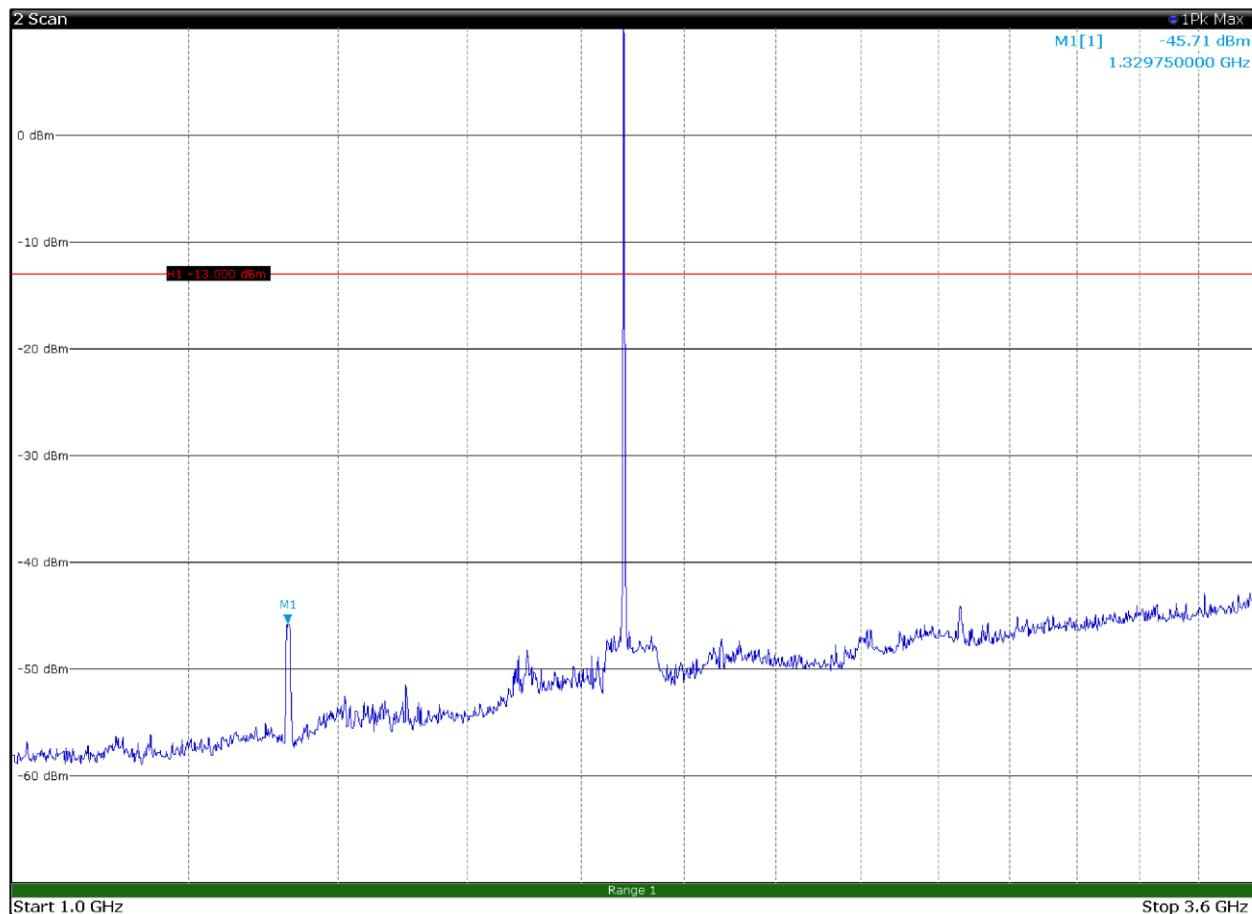


LTE Band 2 – Frequency range 30 MHz to 1 GHz with antenna in vertical polarization



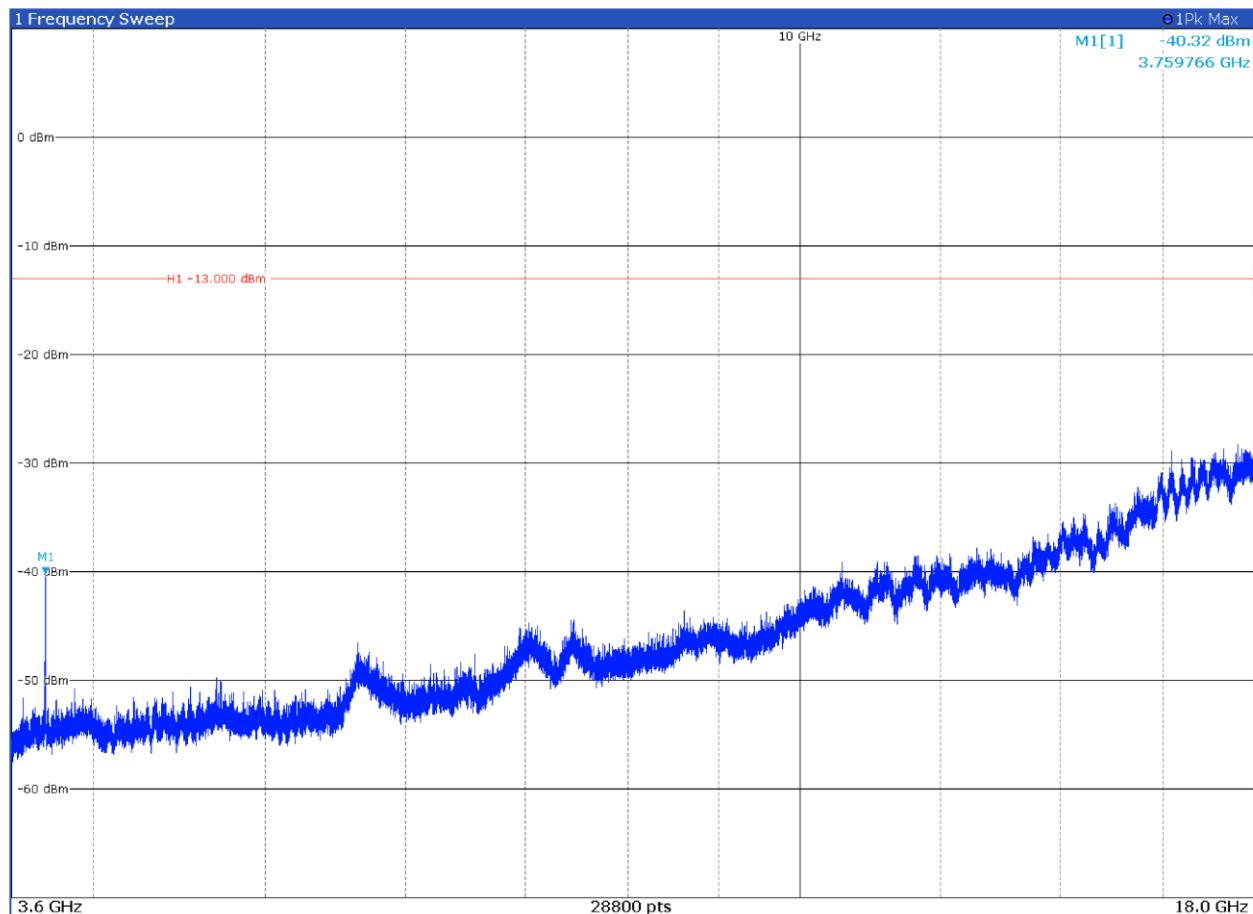
LTE Band 2 – Frequency range 1 GHz to 3.6 GHz with antenna in horizontal polarization

Limit exceeded by the carrier

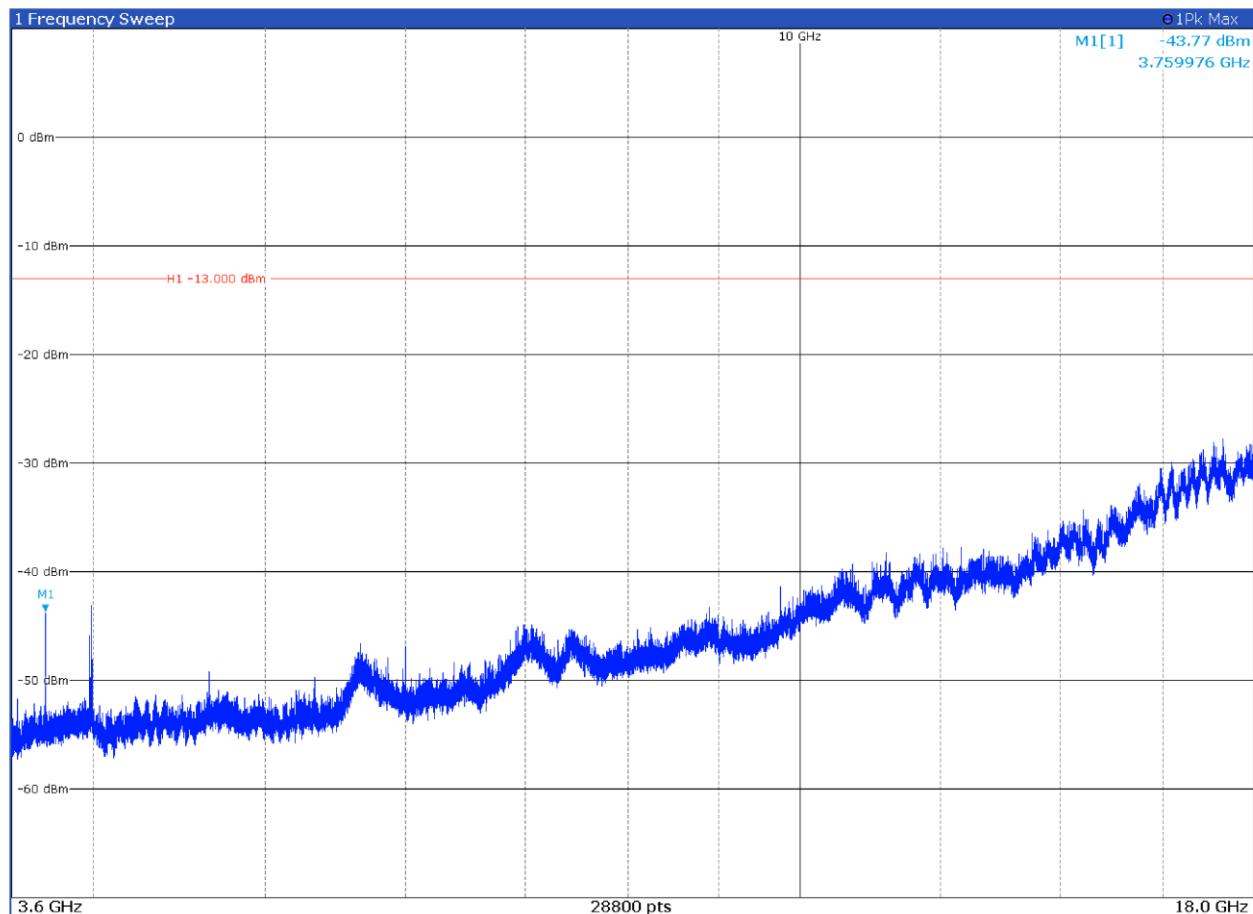


LTE Band 2 – Frequency range 1 GHz to 3.6 GHz with antenna in vertical polarization

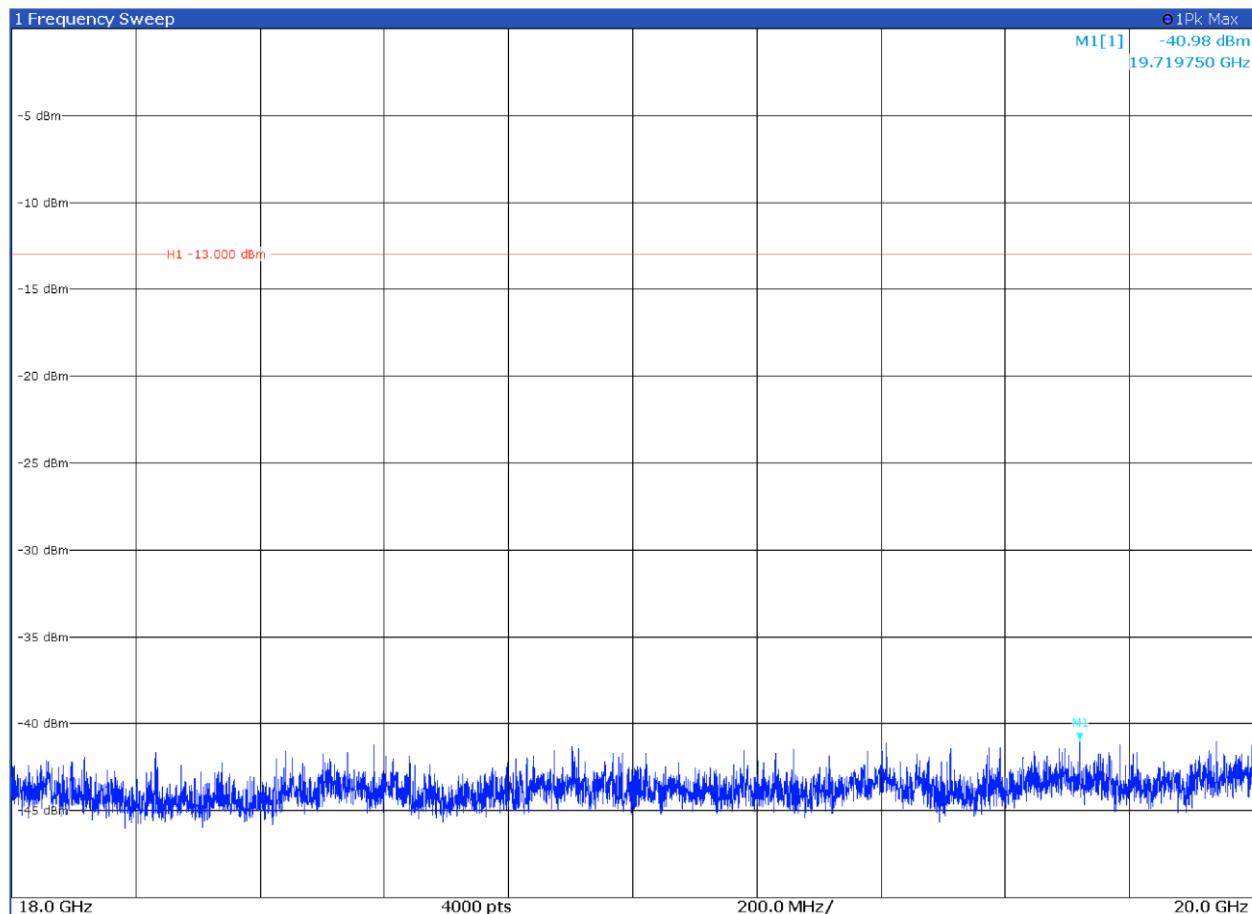
Limit exceeded by the carrier



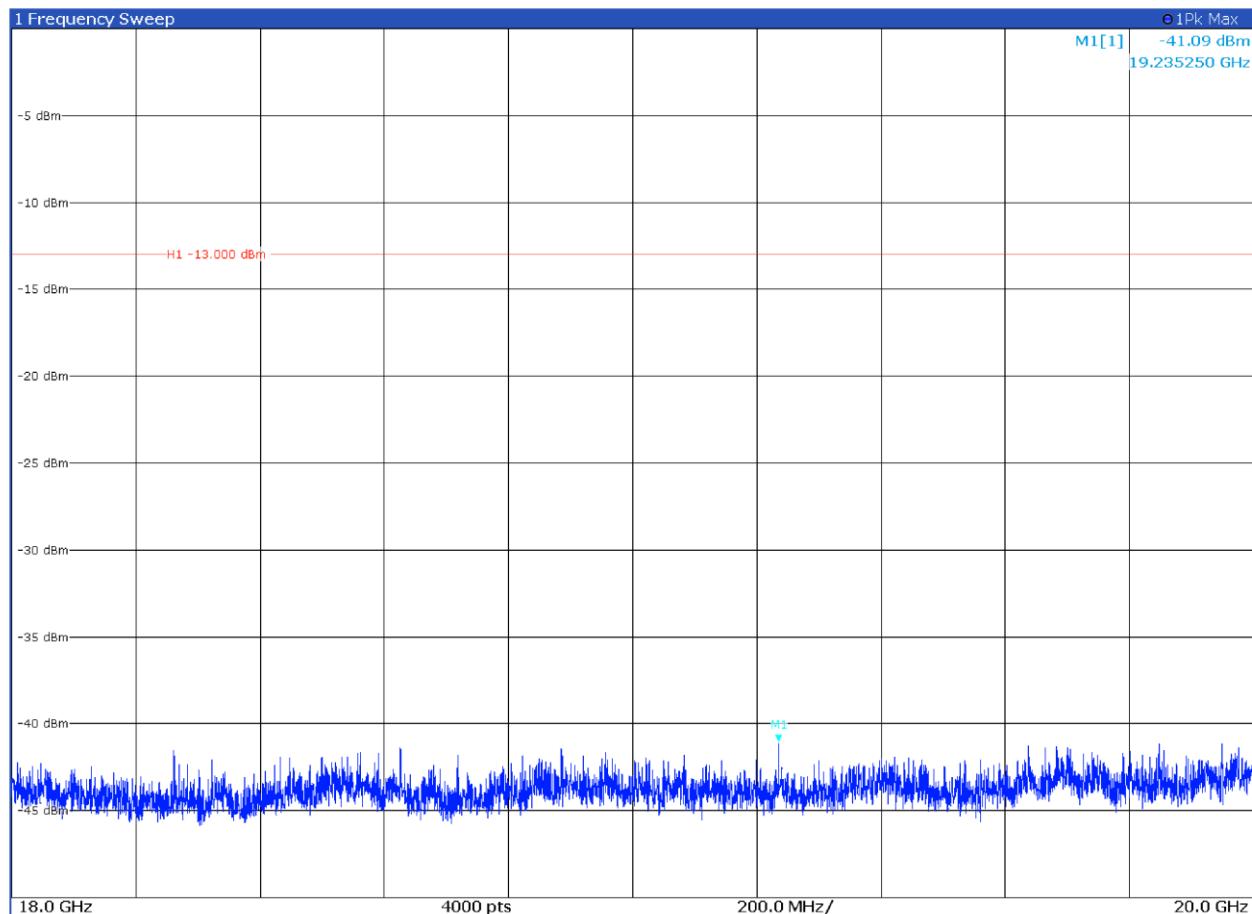
LTE Band 2 – Frequency range 3.6 GHz to 18 GHz with antenna in horizontal polarization



LTE Band 2 – Frequency range 3.6 GHz to 18 GHz with antenna in vertical polarization



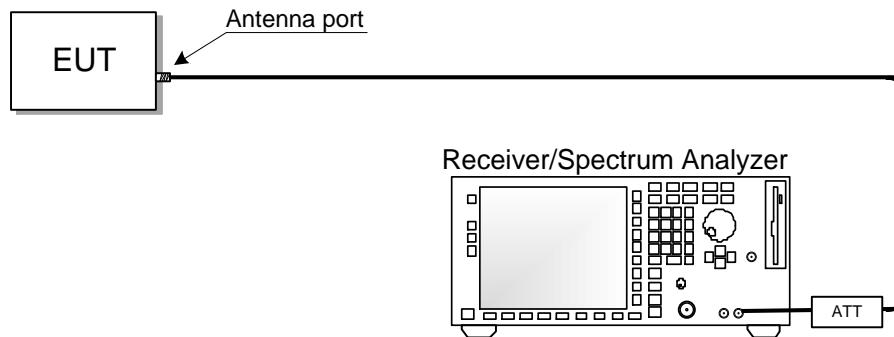
LTE Band 2 – Frequency range 18 GHz to 20 GHz with antenna in horizontal polarization



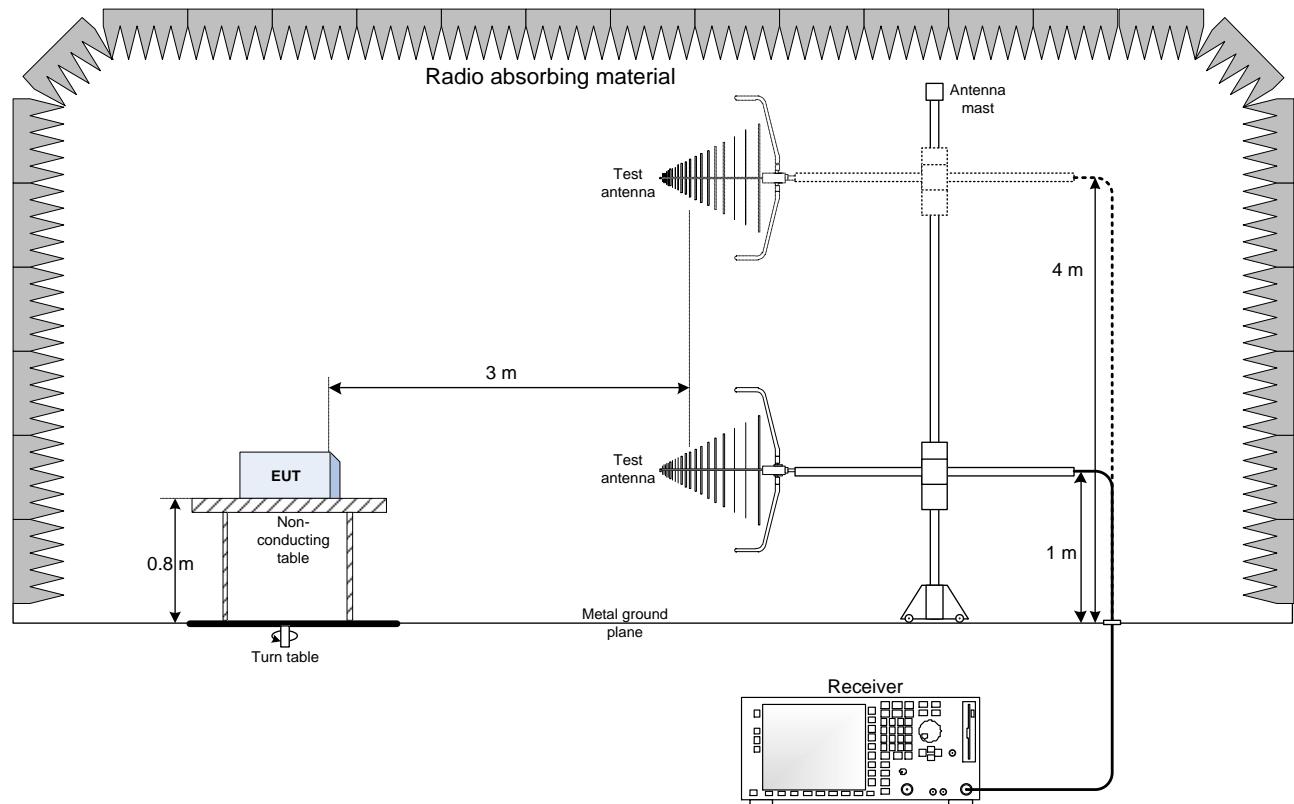
LTE Band 2 – Frequency range 18 GHz to 20 GHz with antenna in vertical polarization

Section 9. Block diagrams of test set-ups

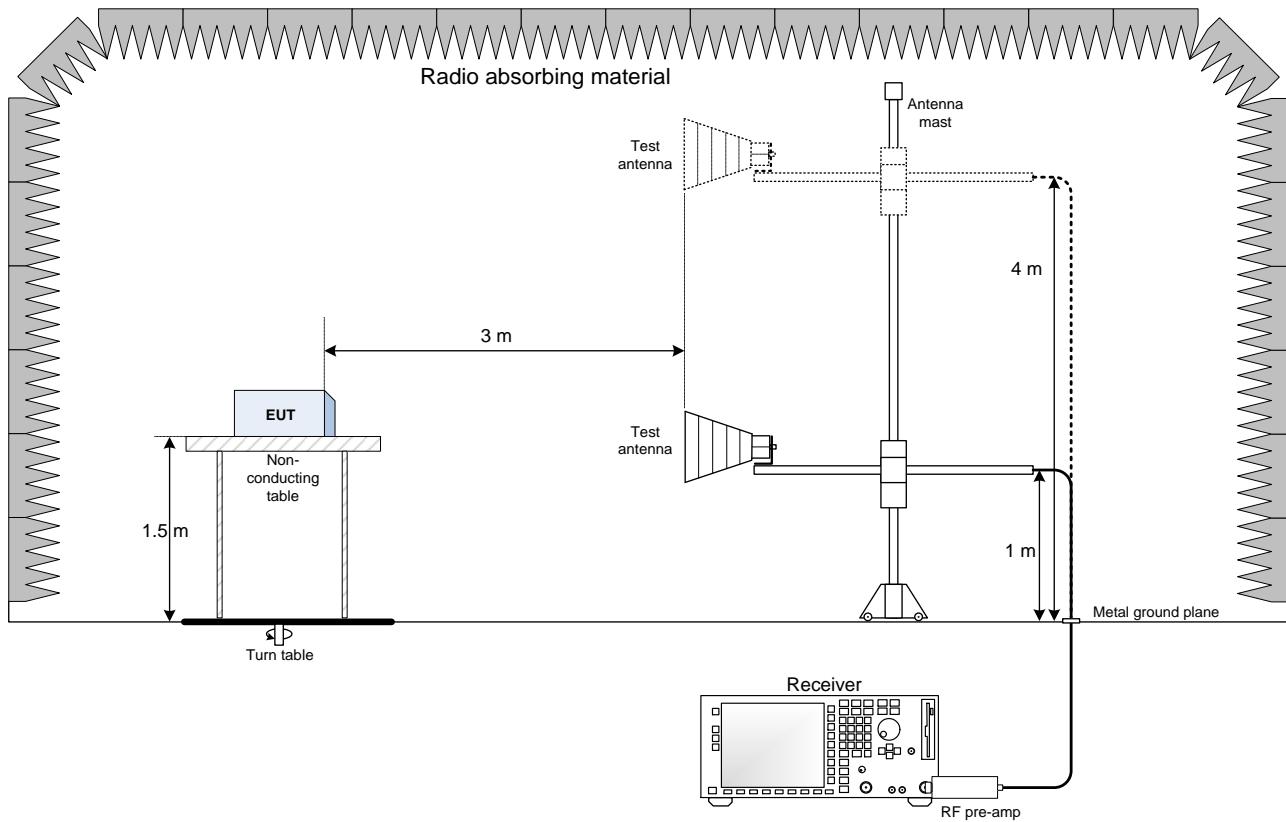
9.1 Antenna port set-up



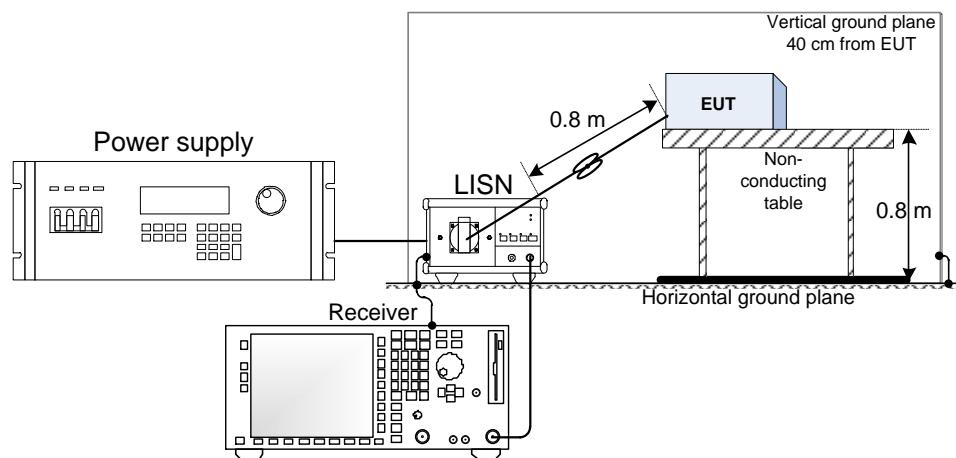
9.2 Radiated emissions set-up for frequencies below 1 GHz



9.3 Radiated emissions set-up for frequencies above 1 GHz



9.4 Conducted emissions set-up

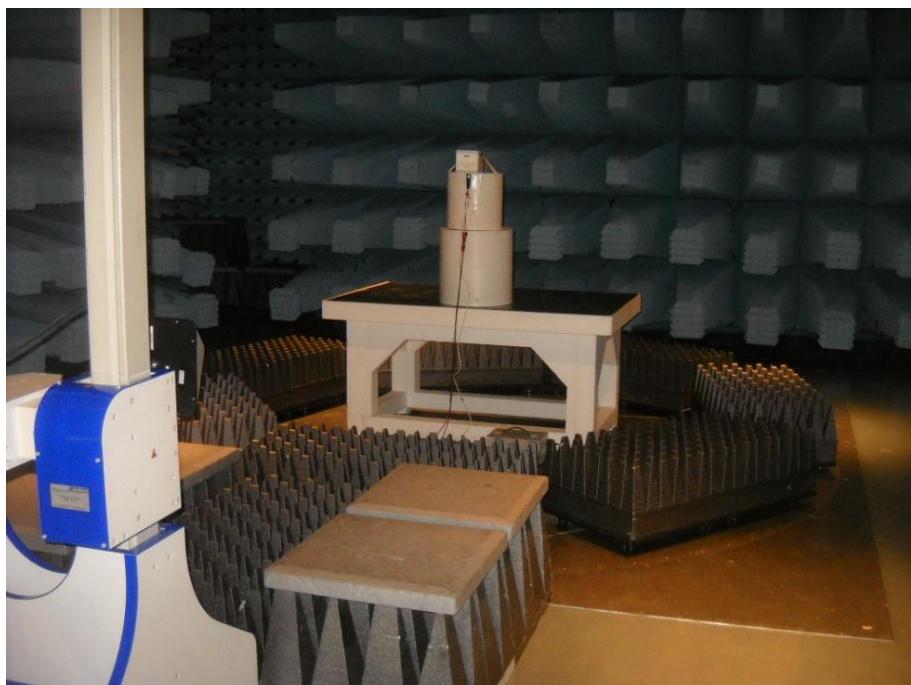


Section 10. Photos

10.1 Photos of the test set-up

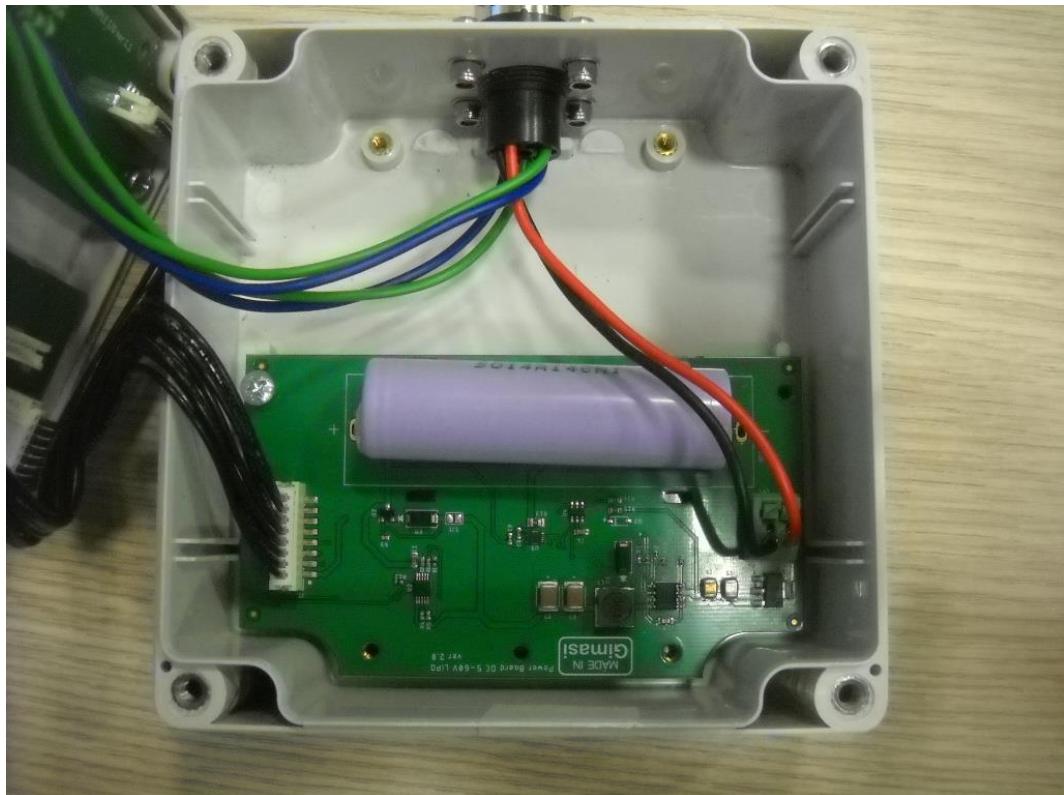


Radiated emission test below 1 GHz



Radiated emission test above 1 GHz

10.2 Photos of the EUT



(End of report)