

Test report

361381-2TRFWL

Date of issue: 2018-10-15

Applicant:

Mares Spa

Salita Bonsen, 4 – 16035 Rapallo (GE) – Italy

Product:

Dive computer

Model:

GENIUS

FCC ID:

2AIKSGENIUS

IC Registration number:

21499-GENIUS

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C**

Intentional radiators

◆ **RSS-210, Issue 9, August 2016, Section 4.3**

General field strength limits

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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

Company name:	Nemko Spa
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City:	Biassono
Province:	MB
Postal code:	20853
Country:	Italy
Telephone:	+39 039 220 12 01
Facsimile:	+39 039 220 12 21
Website:	www.nemko.com
Site number:	FCC: 481407; IC: 9109A-1 (10 m semi anechoic chamber)

Tested by (name, function and signature)	P. Barbieri	(project handler)	
Reviewed by (name, function and signature)	D. Guarnone	(verifier)	
Review date	2018-10-15		

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 contain in this report are within Nemko Spa's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name:	Mares Spa
Address:	Salita Bonsen 4
City:	Rapallo
Province/State:	GE
Postal/Zip code:	16035
Country:	Italy

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C	Intentional radiators
RSS-210, Issue 9, Section 4.3	General field strength limits

1.3 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
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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
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
\$15.207(a)	Conducted limits	Not tested
\$15.31(e)	Variation of power source	Pass ¹
\$15.203	Antenna requirement	Pass ²
\$15.209	Radiated emission limits; general requirements.	Pass

Notes: ¹ The EUT has been tested with the rechargeable battery pack full charged.

² The Antennas are located within the enclosure of EUT and not user accessible.

2.2 IC RSS-GEN, Issue 5, test results

Part	Test description	Verdict
6.7	Occupied bandwidth	Pass
6.11	Transmitter frequency stability	Not tested
7.3	Receiver spurious emissions limits (radiated)	Not applicable
7.4	Receiver spurious emissions limits (antenna conducted)	Not applicable
7.2	AC power lines conducted emission limits	Not tested

2.3 IC RSS-210, Issue 8, test results

Part	Test description	Verdict
4.3	General field strength limits	Pass
4.4	Transmitters with Wanted Emissions that are Within the General Field Strength Limits	Pass

Notes: EUT tested partially

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	2018-10-12
Nemko sample ID number	361381-1/1

3.2 EUT information

Product name	Dive computer
Model	GENIUS
Model variant	--
Serial number	361381-1/1 (Number assigned by Nemko Spa)

3.3 Technical information

Operating band	--
Operating frequency	46 kHz
Modulation type	AM
Occupied bandwidth (99 %)	8.36 kHz
Emission designator	8K36A1D
Power requirements	3.7 V DC from internal batteries
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The EUT is a Dive computer with a 46 kHz radio module power by an internal battery pack. It's provided with a color LCD display and four buttons. The battery pack is recharge by a dedicated AC/DC adapter not usable in the normal working of the EUT (only in recharging mode).

3.5 EUT exercise details

The firmware has been modified to put the EUT in continues transmission mode a max power.



3.6 EUT setup diagram

The EUT is a stand-alone device power by internal batteries.

Figure 3.6-1: Setup diagram

3.7 EUT sub assemblies

Table 3.7-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number
--	--	--	--

The EUT is composed by a single unit



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

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Temperature	18–33 °C
Relative humidity	30–60 %
Air pressure	980–1060 mbar

Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Thermohygrometer data loggers	Testo	175-H2	20012380/305	2016-12	2018-12
Thermohygrometer data loggers	Testo	175-H2	38203337/703	2016-12	2018-12
Barometer	MSR	MSR145B	330080	2018-04	2019-04

5.2 Power supply range

The EUT has been tested with the rechargeable battery pack full charged.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 3m, 10m Chamber	Antenna distance 1m, 3m, 10m (30÷200) MHz	5.0 dB	(1)
	Antenna distance 1m, 3m, 10m (0.2÷6) GHz	5.2 dB	(1)
	Antenna distance 1m, 3m (6÷18) GHz	5.8 dB	(1)
	Antenna distance 1m, 3m (18÷40) GHz	7.2 dB	(1)
Conducted Disturbance	9 kHz ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	9 kHz ÷ 30 MHz with current probe	2.9 dB	(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 has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202	2018-01	2019-01
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Loop antenna	R&S	HFH2-Z2	831 247/011	2017-10	2020-10
Antenna mast	R&S	HCM	836 529/05	NCR	NCR
Controller	R&S	HCC	836 620/7	NCR	NCR
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2018-09	2021-09
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 15.209(a) and RSS-210, 4.3 Radiated emissions limits

8.1.1 Definitions and limits

FCC:

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the Table 8.1-1 below.
- (c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
- (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

IC:

RSS-Gen includes the general field strength limits of unwanted emissions, where applicable, for transmitters and receivers operating in accordance with the provisions specified in this standard. Unwanted emissions of transmitters and receivers are permitted to fall within the restricted bands listed in RSS-Gen, and including the TV bands, but fundamental emissions are prohibited in the restricted bands. Whether or not their operation is addressed by published RSS standards, transmitters whose wanted and unwanted emissions are within the general field strength limits shown in RSS-Gen, they may operate in any of the frequency bands, other than the restricted bands listed in RSS-Gen and including the TV bands, and shall be certified under RSS-210. Under no conditions may the level of any unwanted emissions exceed the level of the fundamental emission. Note: Devices operating below 490 kHz in which all emissions are at least 40 dB below the limit listed in RSS-Gen (General Field Strength Limits for Transmitters at Frequencies below 30 MHz) are Category II devices and are subject to RSS-310.

Table 8.1-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	μV/m	dBμV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Table 8.1-2: IC restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677–5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5

MHz	MHz	MHz	GHz
12.29–12.293	322–335.4	4500–5150	Above 38.6

Note: Certain frequency bands listed in Table 8.1-2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

8.1.1 Definitions and limits, continued

Table 8.1-3: FCC restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.1.2 Test summary

Test date:	2018-10-12	Temperature:	24 °C
Test engineer:	P. Barbieri	Air pressure:	1020 mbar
Verdict:	Pass	Relative humidity:	50 %

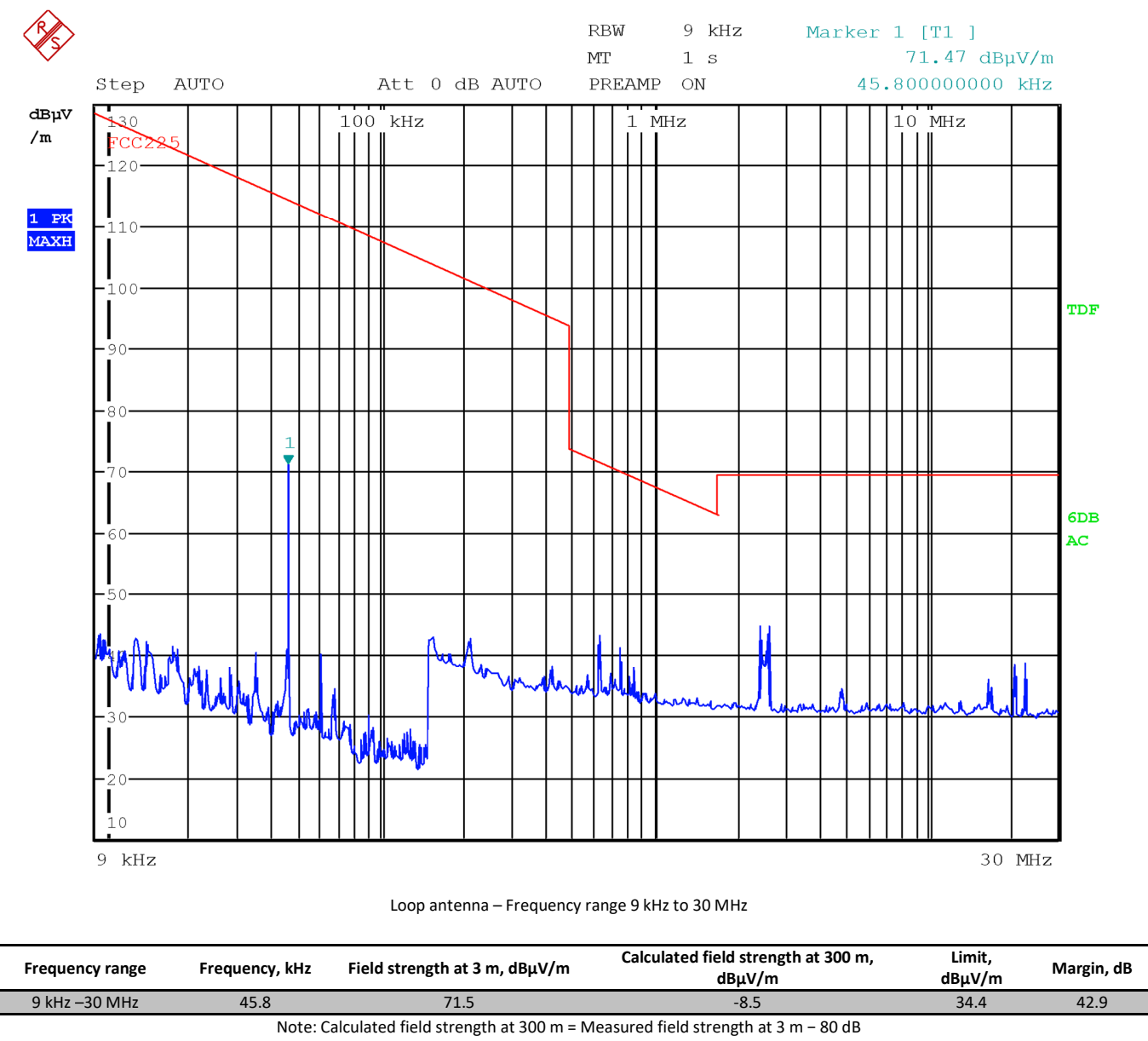
8.1.3 Observations, settings and special notes

The spectrum was searched from 9 kHz to the 1000 MHz (maximum internal frequency of the EUT less than 100 MHz)
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.

Frequency	RBW
9 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1000 MHz	100 kHz to 120 kHz
>1000 MHz	1 MHz

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

8.1.4 Test data

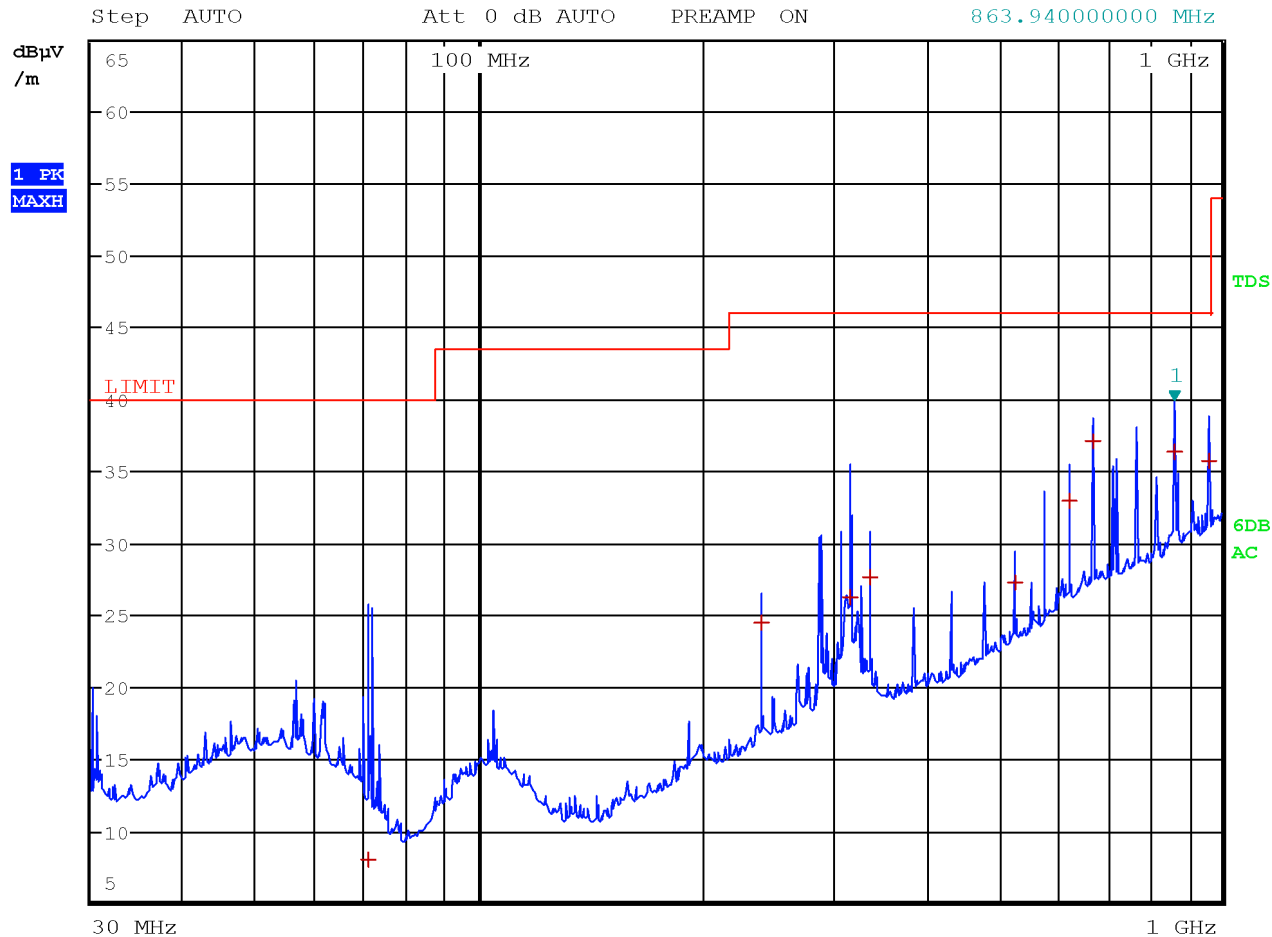


Section 8
Test name
Specification

Testing data
 FCC 15.209(a) and RSS-210, 4.3 Radiated emissions limits
 FCC Part 15 Subpart C and RSS-210



RBW 120 kHz Marker 1 [T1]
 MT 1 s 39.80 dBμV/m
 PREAMP ON 863.94000000 MHz



Antenna in horizontal – Frequency range 30 MHz to 1000 MHz

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
70.9800	8.0	40.0	-32.0	QP
240.0000	24.6	46.0	-21.4	QP
316.8300	26.2	46.0	-19.8	QP
336.0300	27.7	46.0	-18.3	QP
528.0000	27.3	46.0	-18.7	QP
624.0000	33.0	46.0	-13.0	QP
672.0300	37.1	46.0	-8.9	QP
863.9400	36.3	46.0	-9.7	QP
959.9700	35.8	46.0	-10.2	QP

Section 8

Test name

Specification

Testing data

FCC 15.209(a) and RSS-210, 4.3 Radiated emissions limits

FCC Part 15 Subpart C and RSS-210



RBW 120 kHz

MT 1 s

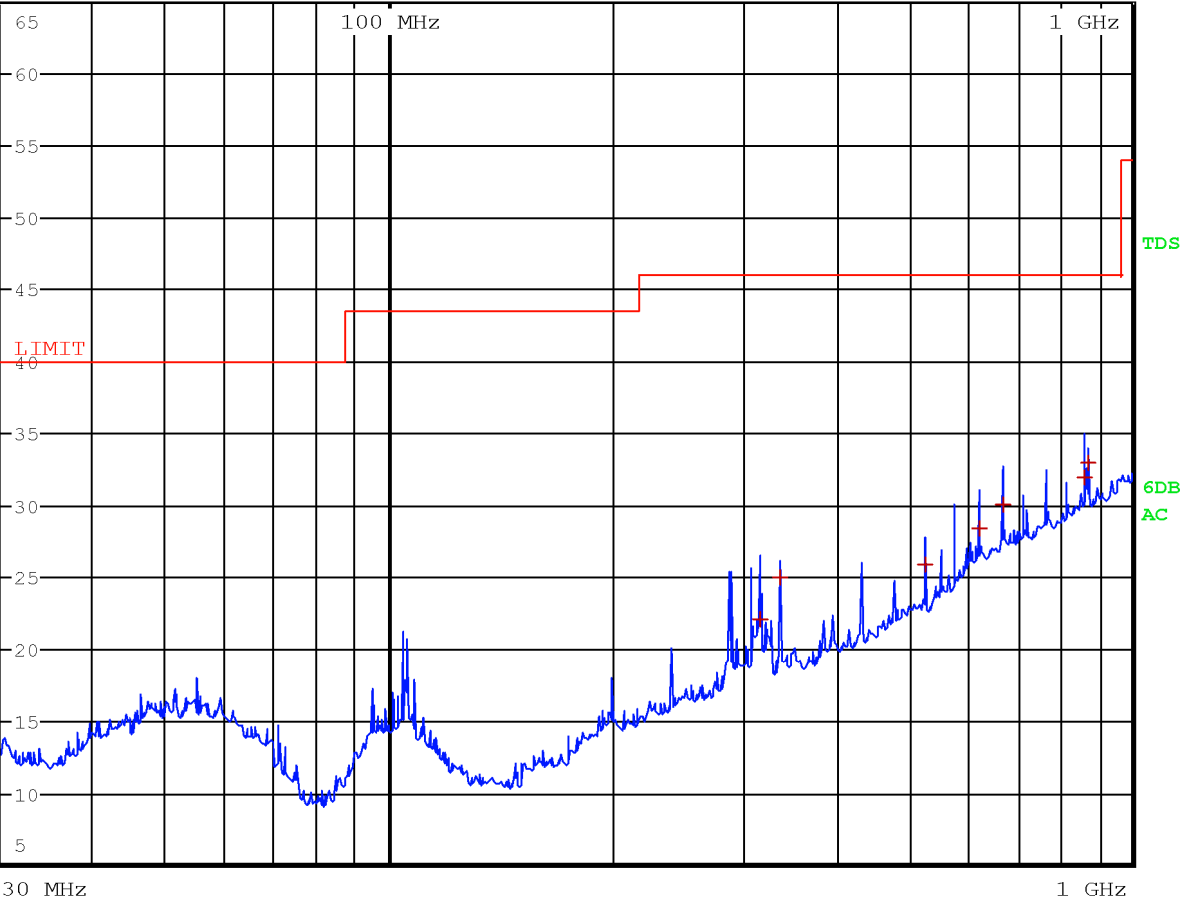
Step AUTO

Att 0 dB AUTO

PREAMP ON

dBμV
/m

1 PK
MAXH



Antenna in vertical – Frequency range 30 MHz to 1000 MHz

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
316.8300	22.2	46.0	-23.8	QP
336.0000	25.0	46.0	-21.0	QP
528.0300	25.9	46.0	-20.1	QP
624.0600	28.4	46.0	-17.6	QP
672.0000	30.1	46.0	-15.9	QP
863.9700	31.9	46.0	-14.1	QP
871.5600	33.0	46.0	-13.0	QP

8.2 RSS-Gen 6.7 Occupied bandwidth

8.2.1 Definitions and limits

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

8.2.2 Test summary

Test date:	2018-10-12	Temperature:	24 °C
Test engineer:	P. Barbieri	Air pressure:	1020 mbar
Verdict:	Pass	Relative humidity:	50 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth:	≥1 % of span
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

8.2.4 Test data

Table 8.2-1: 99 % bandwidth results

Modulation	99 % bandwidth, MHz
AM	8.36 kHz

8.2.4 Test data, continued

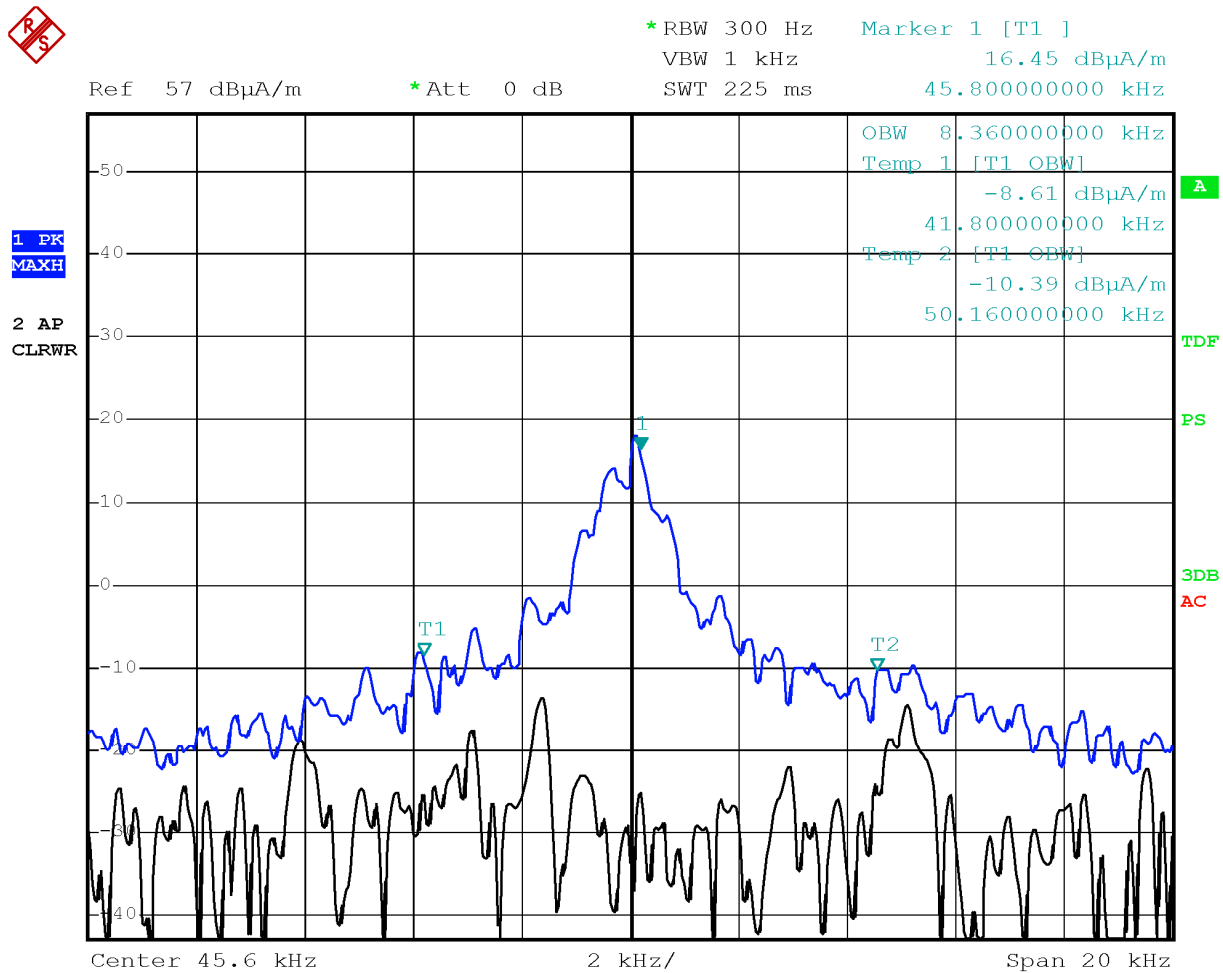
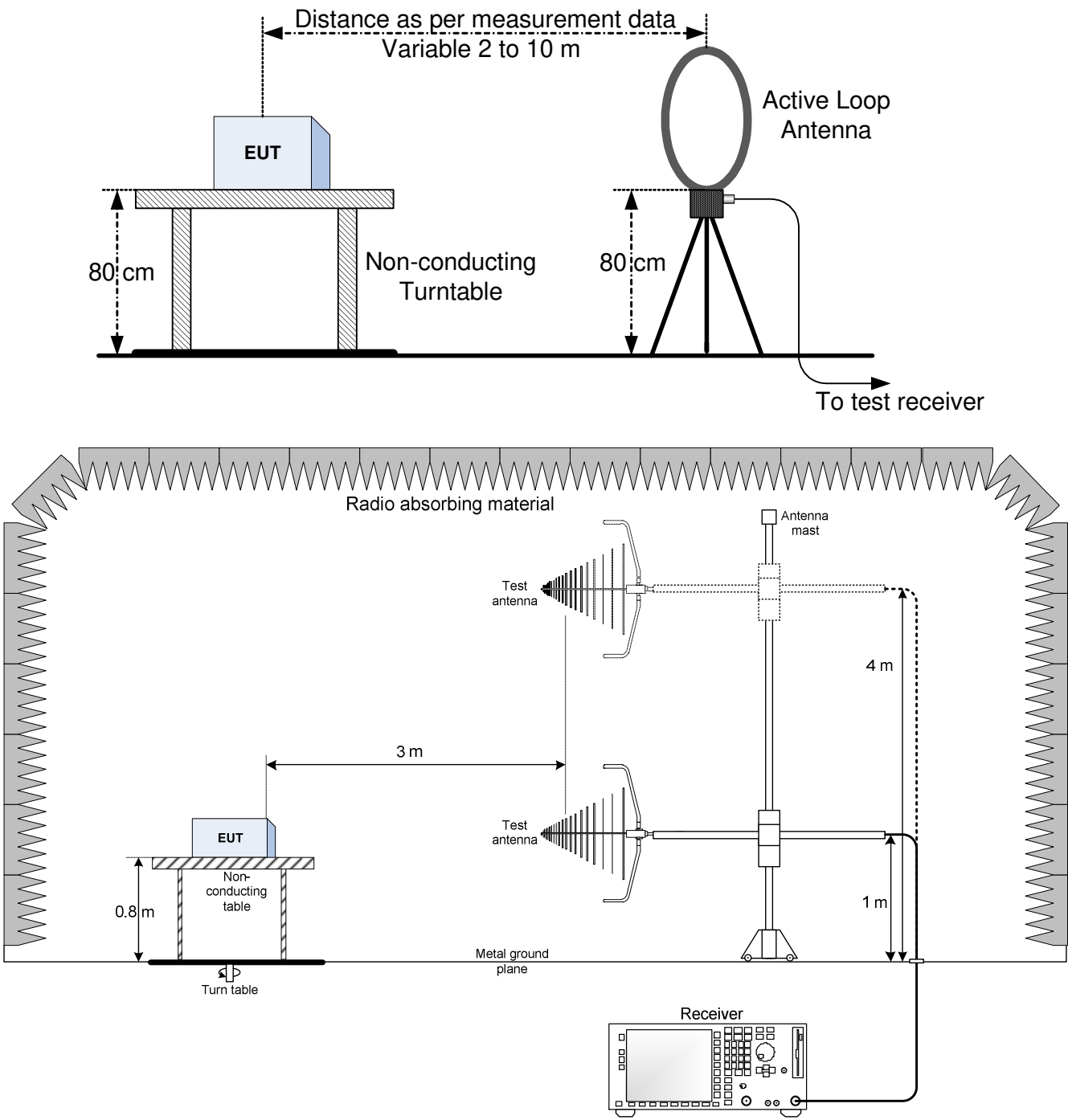


Figure 8.2-1: 99 % bandwidth

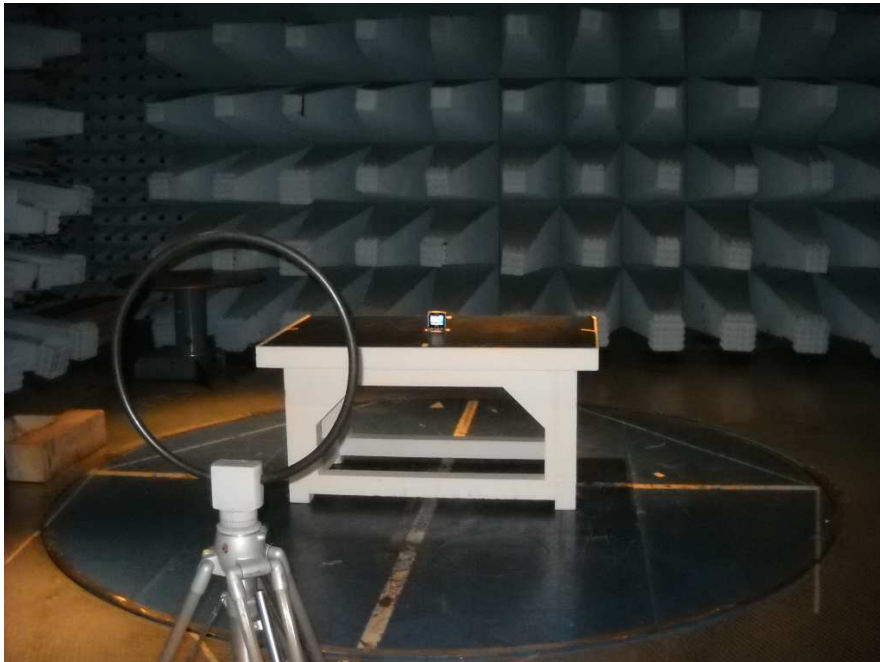
Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up



Section 10. Photos

10.1 Photos of the test set-up



10.2 Photos of the EUT



End of report