



EMI – TEST REPORT

- FCC Part 15.225, RSS 210-

Type / Model Name : SIMATIC RF360H

Product Description : RFID Reader with external antenna - 6GT2803-1FA10

Applicant : ACD Elektronik GmbH

Address : Engelberg 2

88480 ACHSTETTEN, GERMANY

Manufacturer : ACD Elektronik GmbH

Address : Engelberg 2

88480 ACHSTETTEN, GERMANY

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : **80108680-01 Rev_0**

20. September 2022

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

FCC ID: O2FRF360H-E-ANT

IC ID: 9137A-RF360HEANT

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2021)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September 2021)

Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.225	Operation within the band 13.110 - 14.010 MHz

RSS Rules and Regulations

RSS-Gen Issue 5, March 2018 Amendment 1 (March 2019) Amendment 2 (February 2021)	General Requirements and Information for the Certification of Radiocommunication Equipment
RSS-210 Issue 10, December 2019 Amendment (April 2020)	Low Power Licence – Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

2.3 General remarks

All tests were carried out with the "ANT3" antenna.

This antenna had the maximum transmission power during the radio tests.

2.4 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.5 Equipment type

RFID device; operating frequency 13.56MHz

2.6 Power supply system utilised

Power supply voltage : Powered over hand held PC (V_{nom} 3.8 V DC)

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2.7 Short description of the equipment under test (EUT)

The Simatic RF360H with external antennas is a plug on module for reading HF-RFID tags which can be used for the upper plug mechanism of the M2smart.

Number of tested samples: 1
Serial number: 1996ND000013

Antenna variants:

ANT3 (6GT2398-1CD30-0AX0)

ANT3S (6GT2398-1CD50-0AX0)

ANT 8 (6GT2398-1CF00)

ANT 12 metal (6GT2398-1DC00)

ANT 18 metal (6GT2398-1DA00)

ANT 30 metal (6GT2398-1D00)

2.8 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- Continuous TAG reading @ 13.56 MHz

2.9 EUT configuration

The following peripheral devices and interface cables were connected during the measurements:

- Hand held PC	Model: M2SmartSE (SN: 193600000102)
- TAG (transponder)	Model: Siemens MDS D426 6GT2600-4AH00
- Antenna cable	Model: Siemens Cable 6GT2391-0AH30
- Antenna	Model: Siemens ANT3 – 6GT2398-1CD30-0AX0
- Charging cradle	Model: DS2Smart (SN: 192600000271)
- AC Adaptor	Model: Ktec P2719 - KSAS0361500240M2

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3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207	RSS Gen, 8.8	AC power line conducted emissions	passed
15.225	RSS-210, B.6	Field strength of fundamental	passed
15.209	RSS Gen, 8.9	Spurious emissions	passed
15.225	RSS-210, B.6	Frequency tolerance	passed
15.215	RSS-Gen, 6.7	Occupied bandwidth	passed
15.225	RSS-210, B.6	Transmitter spectrum mask	passed

3.1 General Remarks

The EuT was tested together with a handheld PC - M2SmartSE and a TAG - Siemens 6GT2600-4AH00 MDS D426MDS supplied by client.

3.2 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80108681-00	0	06 July 2022	Initial test report

The test report with the highest revision number replaces the previous test reports.

3.3 FINAL ASSESSMENT

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 14 January 2022

Testing concluded on : 02 May 2022

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Josef Knab
Radio Team

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15 - 35 ° C

Humidity: 30 - 60 %

Atmospheric pressure: 86 - 106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. 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.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EuT	95%	$\pm 2.5 \cdot 10^{-7}$
99% Occupied Bandwidth	Center frequency of EuT	95%	$\pm 2.5 \cdot 10^{-7}$
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

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4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

4.5 Measurement protocol for FCC and ISED

4.5.1 GENERAL INFORMATION

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011

ISED: DE0009

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

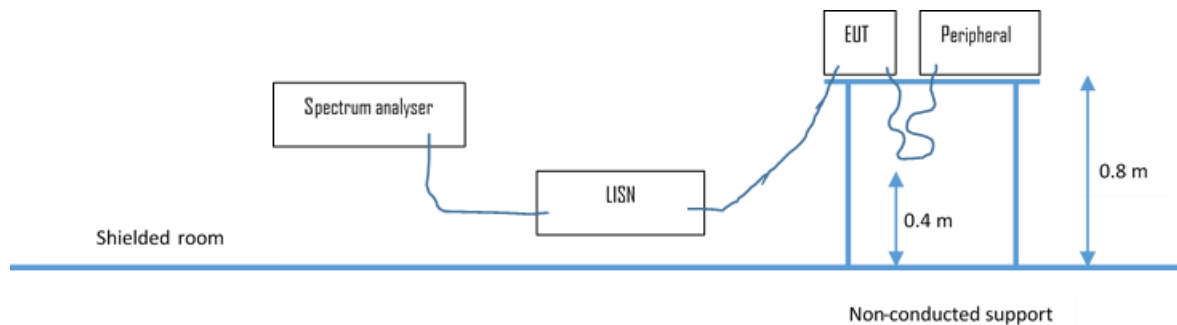
4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dB μ V, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

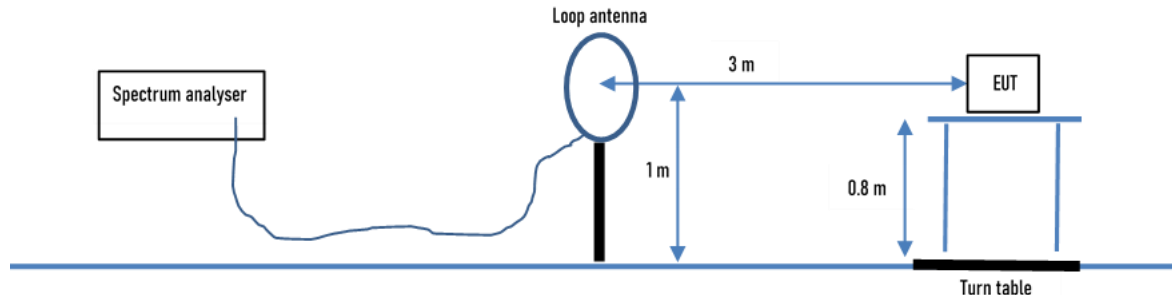
FCC ID: O2FRF360H-E-ANT

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4.5.3.2 Radiated emission

4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

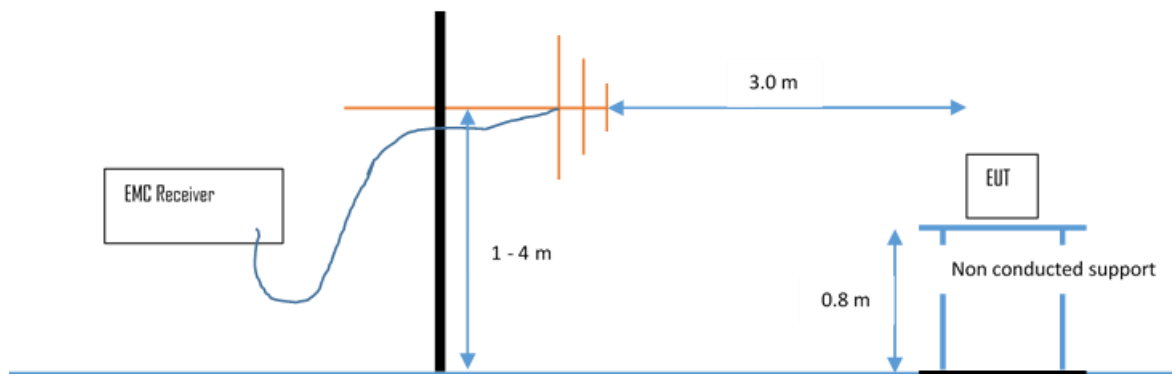
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Level (dBµV/m)	-	Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

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5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used, see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up

See attachment B to this report.

5.1.3 Applicable standard

FCC Part 15, Section 15.207.

5.1.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 5.7 dB at 0.19 MHz

Limit according to FCC Part 15, Section 15.207:

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

Remarks:

For detailed test result please refer to following test protocols

This test was performed in conjunction with the KDB 174176-D01 Q5.

The test was carried out in the charging cradle (this is not part of the tests

and was only used for the conducted emission measurement).

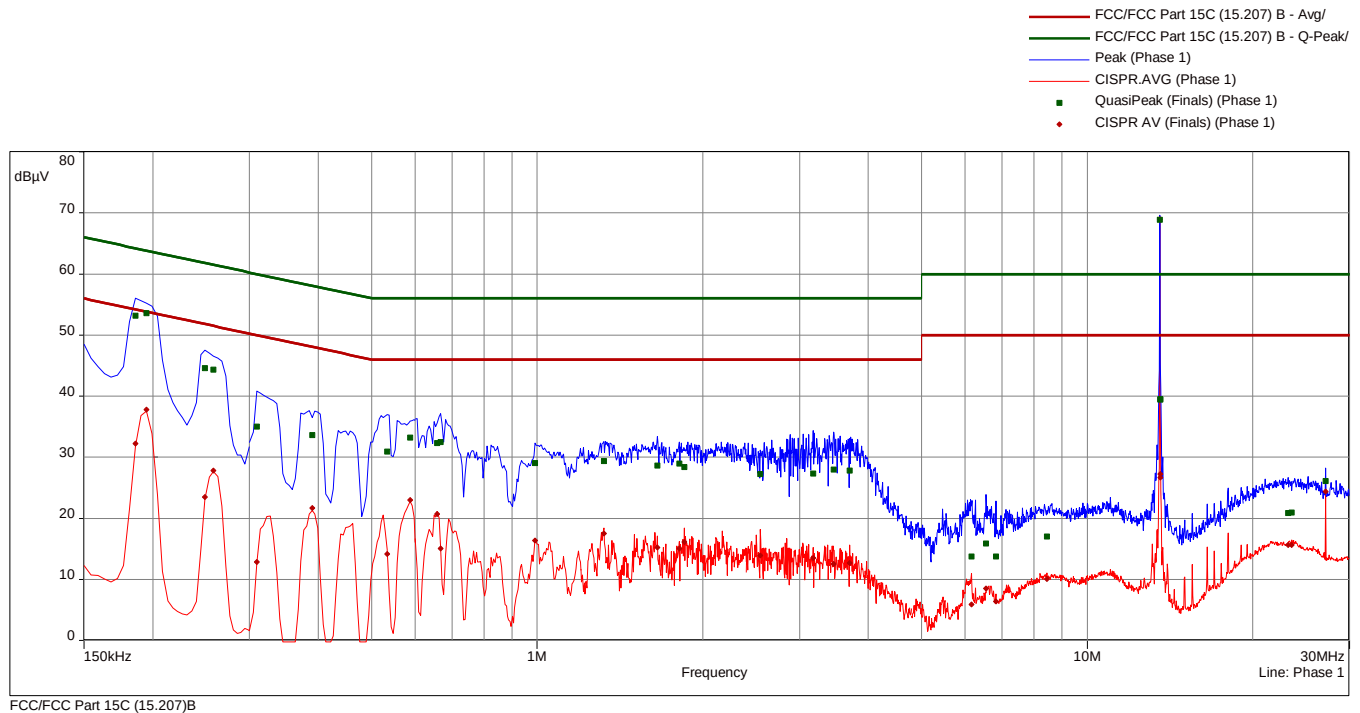
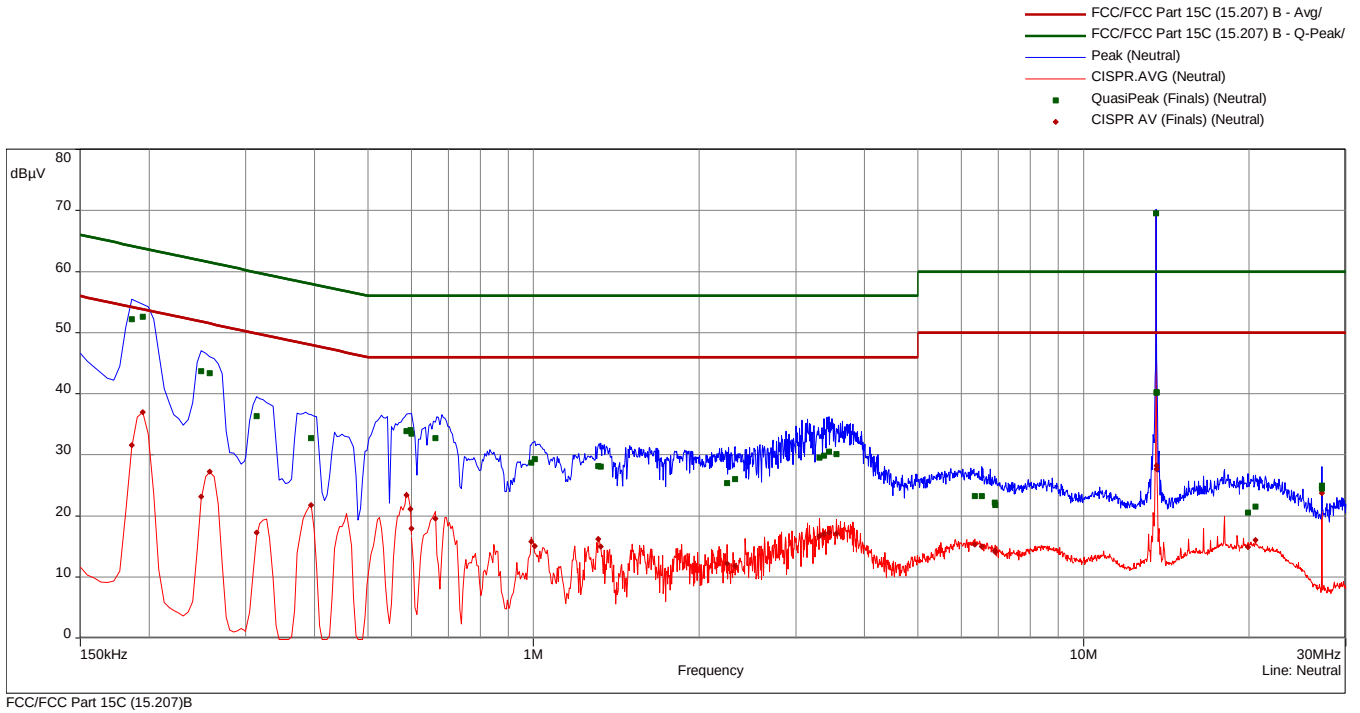
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5.1.6 Test protocol

Test point: L1 & N
Operation mode: Continuous TAG reading @ 13.56 MHz
Remarks: Original equipment
Tested by: KJ

Result: Passed



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freq	SR	QP	margin	limit	AV	margin	limit	line	RBW	Measure time	corr
MHz		dBμV	dB	dBμV	dBμV	dB	dBμV		Hz	sec	dB
0.186	1	53.19	-11.02	64.21	32.26	-21.96	54.21	Phase 1	9k	1.00	10.13
0.195	1	53.56	-10.26	63.82	37.76	-16.06	53.82	Phase 1	9k	1.00	10.13
0.249	1	44.61	-17.18	61.79	23.47	-28.32	51.79	Phase 1	9k	1.00	10.15
0.258	1	44.34	-17.15	61.50	27.83	-23.67	51.50	Phase 1	9k	1.00	10.15
0.309	2	35.06	-24.94	60.00	12.83	-37.17	50.00	Phase 1	9k	1.00	10.17
0.39	2	33.65	-24.41	58.06	21.65	-26.41	48.06	Phase 1	9k	1.00	10.18
0.534	2	30.91	-25.09	56.00	14.18	-31.82	46.00	Phase 1	9k	1.00	10.19
0.588	2	33.21	-22.79	56.00	22.98	-23.02	46.00	Phase 1	9k	1.00	10.20
0.6585	3	32.35	-23.65	56.00	20.73	-25.27	46.00	Phase 1	9k	1.00	10.22
0.6675	3	32.49	-23.51	56.00	15.08	-30.92	46.00	Phase 1	9k	1.00	10.22
0.9915	3	29.04	-26.96	56.00	16.37	-29.63	46.00	Phase 1	9k	1.00	10.24
1.3215	4	29.38	-26.62	56.00	17.48	-28.52	46.00	Phase 1	9k	1.00	10.29
1.6545	4	28.65	-27.35	56.00	15.22	-30.78	46.00	Phase 1	9k	1.00	10.32
1.812	4	28.99	-27.01	56.00	15.07	-30.93	46.00	Phase 1	9k	1.00	10.32
1.8525	4	28.40	-27.60	56.00	16.13	-29.87	46.00	Phase 1	9k	1.00	10.32
2.544	5	27.23	-28.77	56.00	13.91	-32.09	46.00	Phase 1	9k	1.00	10.38
3.1785	5	27.29	-28.71	56.00	13.48	-32.52	46.00	Phase 1	9k	1.00	10.42
3.462	5	27.98	-28.02	56.00	12.56	-33.44	46.00	Phase 1	9k	1.00	10.42
3.696	5	27.81	-28.19	56.00	12.66	-33.34	46.00	Phase 1	9k	1.00	10.44
6.168	6	13.75	-46.25	60.00	5.90	-44.10	50.00	Phase 1	9k	1.00	10.63
6.5415	6	15.91	-44.09	60.00	8.50	-41.50	50.00	Phase 1	9k	1.00	10.65
6.8295	6	13.75	-46.25	60.00	6.40	-43.60	50.00	Phase 1	9k	1.00	10.68
8.445	6	17.05	-42.95	60.00	10.09	-39.91	50.00	Phase 1	9k	1.00	10.77
13.56 *)	7	68.91	8.91	60.00	68.93	18.93	50.00	Phase 1	9k	1.00	11.18
13.5825	7	39.47	-20.53	60.00	27.28	-22.72	50.00	Phase 1	9k	1.00	11.18
13.587	7	39.52	-20.48	60.00	26.69	-23.31	50.00	Phase 1	9k	1.00	11.18
23.2005	8	20.86	-39.14	60.00	15.61	-34.39	50.00	Phase 1	9k	1.00	11.75
23.52	8	20.98	-39.02	60.00	15.67	-34.33	50.00	Phase 1	9k	1.00	11.77
27.1155	8	26.10	-33.90	60.00	24.36	-25.64	50.00	Phase 1	9k	1.00	11.86
0.186	9	52.19	-12.02	64.21	31.57	-22.65	54.21	Neutral	9k	1.00	10.15
0.195	9	52.62	-11.20	63.82	37.01	-16.81	53.82	Neutral	9k	1.00	10.15
0.249	9	43.66	-18.13	61.79	23.15	-28.64	51.79	Neutral	9k	1.00	10.16
0.258	9	43.36	-18.13	61.50	27.27	-24.22	51.50	Neutral	9k	1.00	10.16
0.3135	10	36.32	-23.56	59.88	17.26	-32.62	49.88	Neutral	9k	1.00	10.17
0.3945	10	32.72	-25.25	57.97	21.73	-26.23	47.97	Neutral	9k	1.00	10.18
0.588	10	33.90	-22.10	56.00	23.38	-22.62	46.00	Neutral	9k	1.00	10.20
0.597	10	34.04	-21.96	56.00	21.15	-24.85	46.00	Neutral	9k	1.00	10.20
0.6	11	33.46	-22.54	56.00	17.96	-28.04	46.00	Neutral	9k	1.00	10.20
0.663	11	32.71	-23.29	56.00	19.52	-26.48	46.00	Neutral	9k	1.00	10.22
0.9915	11	28.70	-27.30	56.00	15.79	-30.21	46.00	Neutral	9k	1.00	10.24
1.005	11	29.28	-26.72	56.00	15.02	-30.98	46.00	Neutral	9k	1.00	10.24
1.3125	12	28.14	-27.86	56.00	16.18	-29.82	46.00	Neutral	9k	1.00	10.29
1.326	12	28.03	-27.97	56.00	14.99	-31.01	46.00	Neutral	9k	1.00	10.29
2.2485	12	25.36	-30.64	56.00	12.20	-33.80	46.00	Neutral	9k	1.00	10.35
2.325	12	25.99	-30.01	56.00	11.82	-34.18	46.00	Neutral	9k	1.00	10.36
3.3135	13	29.51	-26.49	56.00	16.70	-29.30	46.00	Neutral	9k	1.00	10.41
3.372	13	29.86	-26.14	56.00	17.04	-28.96	46.00	Neutral	9k	1.00	10.41
3.4485	13	30.55	-25.45	56.00	17.27	-28.73	46.00	Neutral	9k	1.00	10.41
3.552	13	30.08	-25.92	56.00	17.09	-28.91	46.00	Neutral	9k	1.00	10.42
6.3435	14	23.23	-36.77	60.00	15.26	-34.74	50.00	Neutral	9k	1.00	10.62
6.528	14	23.22	-36.78	60.00	14.96	-35.04	50.00	Neutral	9k	1.00	10.63
6.8925	14	22.15	-37.85	60.00	14.35	-35.65	50.00	Neutral	9k	1.00	10.66
6.9195	14	21.80	-38.20	60.00	14.09	-35.91	50.00	Neutral	9k	1.00	10.66
13.56 *)	15	69.51	9.51	60.00	69.56	19.56	50.00	Neutral	9k	1.00	11.03
13.5825	15	40.13	-19.87	60.00	28.20	-21.80	50.00	Neutral	9k	1.00	11.03
13.587	15	40.22	-19.78	60.00	27.65	-22.35	50.00	Neutral	9k	1.00	11.03
19.92	16	20.57	-39.43	60.00	14.92	-35.08	50.00	Neutral	9k	1.00	11.39
20.5455	16	21.54	-38.46	60.00	16.03	-33.97	50.00	Neutral	9k	1.00	11.40
27.1155	16	24.92	-35.08	60.00	24.24	-25.76	50.00	Neutral	9k	1.00	11.35
27.12	16	24.46	-35.54	60.00	23.74	-26.26	50.00	Neutral	9k	1.00	11.35

*) Fundamental of the RFID transmitter, retested with 50 ohm termination.

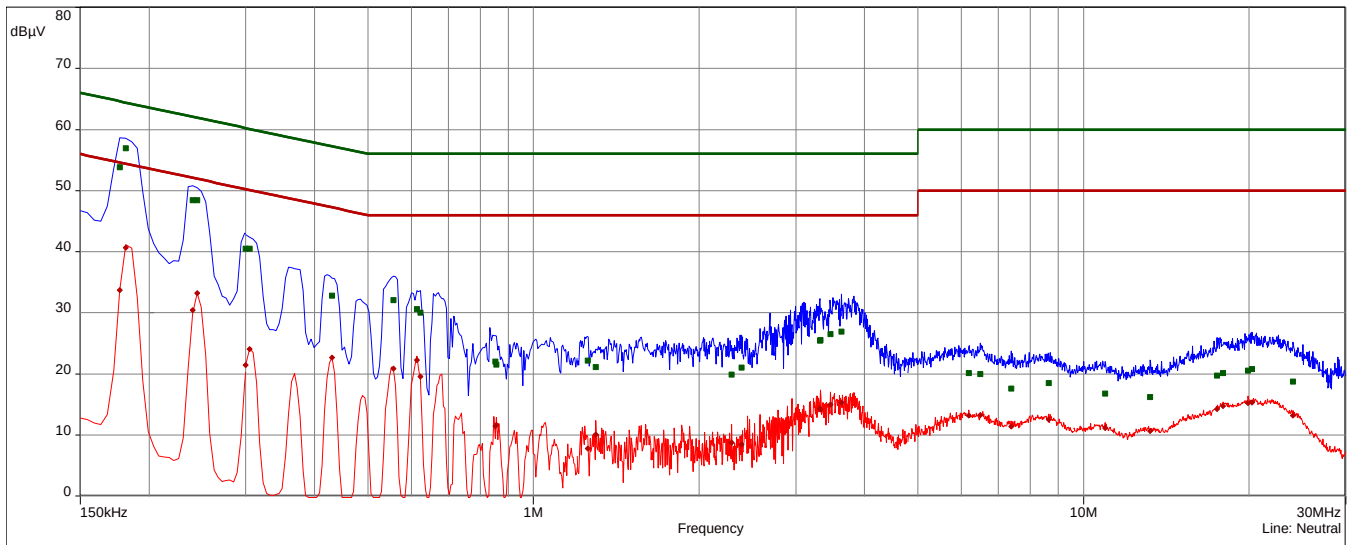
FCC ID: O2FRF360H-E-ANT

IC ID: 9137A-RF360HEANT

Test point L1 & N
 Operation mode: Continuous TAG reading @ 13.56 MHz
 Remarks: Modified equipment – RF-signal terminated into 50 ohms load (accd. to KDB 174176-D01)
 Tested by: KJ

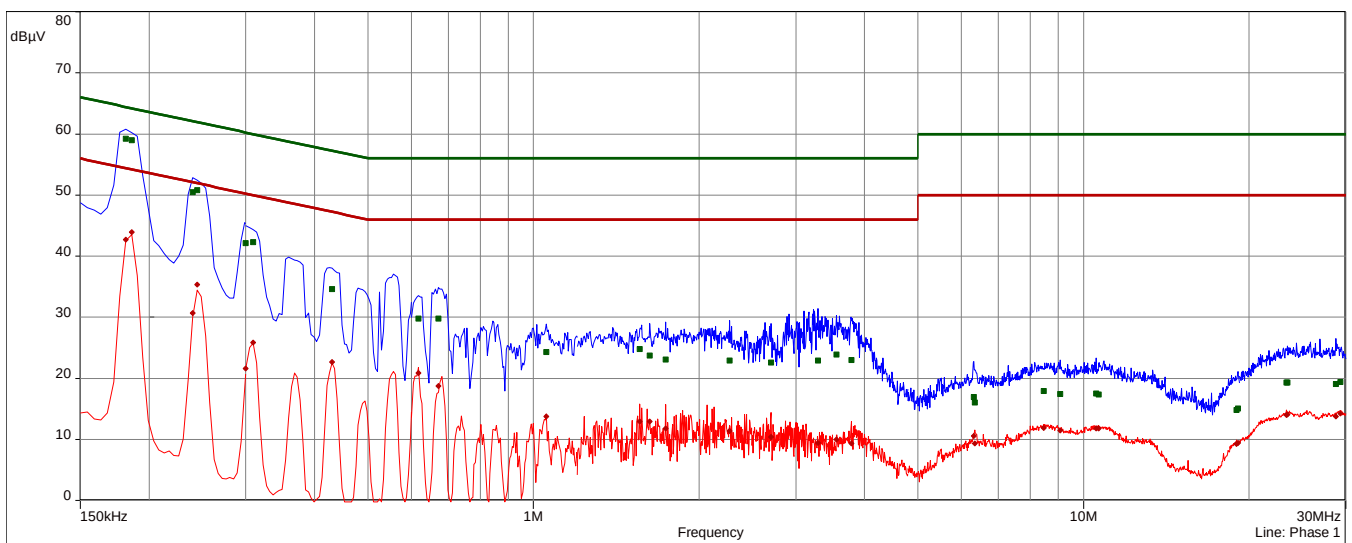
Result: Passed

— FCC/FCC Part 15C (15.207) B - Avg/
 — FCC/FCC Part 15C (15.207) B - Q-Peak/
 — Peak (Neutral)
 — CISPR.AVG (Neutral)
 ■ QuasiPeak (Finals) (Neutral)
 • CISPR AV (Finals) (Neutral)



FCC/FCC Part 15C (15.207)B

— FCC/FCC Part 15C (15.207) B - Avg/
 — FCC/FCC Part 15C (15.207) B - Q-Peak/
 — Peak (Phase 1)
 — CISPR.AVG (Phase 1)
 ■ QuasiPeak (Finals) (Phase 1)
 • CISPR AV (Finals) (Phase 1)



FCC/FCC Part 15C (15.207)B

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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freq	SR	QP	margin	limit	AV	margin	limit	line	RBW	Measure time	corr
MHz		dBμV	dB	dBμV	dBμV	dB	dBμV		Hz	sec	dB
0.1815	1	59.26	-5.16	64.42	42.69	-11.72	54.42	Phase 1	9k	1.00	10.13
0.186	1	58.97	-5.25	64.21	43.91	-10.30	54.21	Phase 1	9k	1.00	10.13
0.24	1	50.44	-11.66	62.10	30.66	-21.43	52.10	Phase 1	9k	1.00	10.15
0.2445	1	50.81	-11.13	61.94	35.32	-16.62	51.94	Phase 1	9k	1.00	10.15
0.3	2	42.10	-18.15	60.24	21.62	-28.62	50.24	Phase 1	9k	1.00	10.17
0.309	2	42.32	-17.68	60.00	25.87	-24.13	50.00	Phase 1	9k	1.00	10.17
0.4305	2	34.63	-22.61	57.24	22.65	-24.59	47.24	Phase 1	9k	1.00	10.19
0.618	3	29.75	-26.25	56.00	20.85	-25.15	46.00	Phase 1	9k	1.00	10.21
0.672	3	29.74	-26.26	56.00	18.75	-27.25	46.00	Phase 1	9k	1.00	10.22
1.0545	3	24.27	-31.73	56.00	13.72	-32.28	46.00	Phase 1	9k	1.00	10.25
1.56	4	24.78	-31.22	56.00	12.94	-33.06	46.00	Phase 1	9k	1.00	10.31
1.6275	4	23.71	-32.29	56.00	12.93	-33.07	46.00	Phase 1	9k	1.00	10.32
1.74	4	23.11	-32.89	56.00	11.79	-34.21	46.00	Phase 1	9k	1.00	10.32
2.2755	4	22.95	-33.05	56.00	11.36	-34.64	46.00	Phase 1	9k	1.00	10.35
2.706	5	22.60	-33.40	56.00	10.42	-35.58	46.00	Phase 1	9k	1.00	10.39
3.291	5	22.91	-33.09	56.00	9.43	-36.57	46.00	Phase 1	9k	1.00	10.42
3.5565	5	23.91	-32.09	56.00	9.95	-36.05	46.00	Phase 1	9k	1.00	10.42
3.786	5	22.96	-33.04	56.00	9.31	-36.69	46.00	Phase 1	9k	1.00	10.45
6.321	6	16.93	-43.07	60.00	10.55	-39.45	50.00	Phase 1	9k	1.00	10.64
6.3435	6	16.01	-43.99	60.00	9.37	-40.63	50.00	Phase 1	9k	1.00	10.64
8.472	6	17.92	-42.08	60.00	11.85	-38.15	50.00	Phase 1	9k	1.00	10.78
9.066	6	17.44	-42.56	60.00	11.47	-38.53	50.00	Phase 1	9k	1.00	10.80
10.5495	7	17.50	-42.50	60.00	11.76	-38.24	50.00	Phase 1	9k	1.00	10.90
10.653	7	17.36	-42.64	60.00	11.78	-38.22	50.00	Phase 1	9k	1.00	10.91
18.9645	7	14.85	-45.15	60.00	9.23	-40.77	50.00	Phase 1	9k	1.00	11.56
19.1085	7	15.02	-44.98	60.00	9.41	-40.59	50.00	Phase 1	9k	1.00	11.56
23.3715	8	19.29	-40.71	60.00	13.98	-36.02	50.00	Phase 1	9k	1.00	11.76
23.4795	8	19.28	-40.72	60.00	14.05	-35.95	50.00	Phase 1	9k	1.00	11.77
28.776	8	19.05	-40.95	60.00	13.75	-36.25	50.00	Phase 1	9k	1.00	11.88
29.289	8	19.36	-40.64	60.00	14.25	-35.75	50.00	Phase 1	9k	1.00	11.88
0.177	9	53.84	-10.78	64.63	33.72	-20.91	54.63	Neutral	9k	1.00	10.14
0.1815	9	56.92	-7.50	64.42	40.65	-13.77	54.42	Neutral	9k	1.00	10.14
0.24	9	48.44	-13.66	62.10	30.47	-21.63	52.10	Neutral	9k	1.00	10.16
0.2445	9	48.44	-13.50	61.94	33.19	-18.75	51.94	Neutral	9k	1.00	10.16
0.3	10	40.47	-19.77	60.24	21.41	-28.84	50.24	Neutral	9k	1.00	10.17
0.3045	10	40.46	-19.65	60.12	24.08	-26.04	50.12	Neutral	9k	1.00	10.17
0.4305	10	32.84	-24.41	57.24	22.67	-24.57	47.24	Neutral	9k	1.00	10.19
0.5565	10	32.05	-23.95	56.00	20.86	-25.14	46.00	Neutral	9k	1.00	10.20
0.6135	11	30.60	-25.40	56.00	22.25	-23.75	46.00	Neutral	9k	1.00	10.21
0.6225	11	30.02	-25.98	56.00	19.57	-26.43	46.00	Neutral	9k	1.00	10.21
0.852	11	22.05	-33.95	56.00	11.47	-34.53	46.00	Neutral	9k	1.00	10.23
0.8565	11	21.54	-34.46	56.00	11.63	-34.37	46.00	Neutral	9k	1.00	10.23
1.254	12	22.21	-33.79	56.00	7.80	-38.20	46.00	Neutral	9k	1.00	10.28
1.299	12	21.11	-34.89	56.00	10.08	-35.92	46.00	Neutral	9k	1.00	10.29
2.2935	12	19.90	-36.10	56.00	8.73	-37.27	46.00	Neutral	9k	1.00	10.36
2.388	12	21.04	-34.96	56.00	8.45	-37.55	46.00	Neutral	9k	1.00	10.37
3.318	13	25.43	-30.57	56.00	14.34	-31.66	46.00	Neutral	9k	1.00	10.41
3.3225	13	25.56	-30.44	56.00	14.13	-31.87	46.00	Neutral	9k	1.00	10.41
3.4665	13	26.49	-29.51	56.00	14.98	-31.02	46.00	Neutral	9k	1.00	10.41
3.6285	13	26.89	-29.11	56.00	15.34	-30.66	46.00	Neutral	9k	1.00	10.43
6.186	14	20.13	-39.87	60.00	13.16	-36.84	50.00	Neutral	9k	1.00	10.61
6.4875	14	19.94	-40.06	60.00	13.27	-36.73	50.00	Neutral	9k	1.00	10.63
7.3875	14	17.61	-42.39	60.00	11.36	-38.64	50.00	Neutral	9k	1.00	10.68
8.652	14	18.50	-41.50	60.00	12.52	-37.48	50.00	Neutral	9k	1.00	10.73
10.95	15	16.76	-43.24	60.00	11.10	-38.90	50.00	Neutral	9k	1.00	10.85
13.227	15	16.24	-43.76	60.00	10.65	-39.35	50.00	Neutral	9k	1.00	11.01
17.493	15	19.76	-40.24	60.00	14.28	-35.72	50.00	Neutral	9k	1.00	11.28
17.934	15	20.10	-39.90	60.00	14.72	-35.28	50.00	Neutral	9k	1.00	11.31
19.929	16	20.57	-39.43	60.00	15.25	-34.75	50.00	Neutral	9k	1.00	11.39
20.262	16	20.78	-39.22	60.00	15.28	-34.72	50.00	Neutral	9k	1.00	11.40
24.0195	16	18.70	-41.30	60.00	13.16	-36.84	50.00	Neutral	9k	1.00	11.41

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS 1
Test distance: 3 metres

5.2.2 Photo documentation of the test set-up

See attachment B to this report.

5.2.3 Applicable standard

FCC Part 15, Section 15.225(a).

5.2.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10.

5.2.5 Test result

Antenna	Frequency (MHz)	Reading level QP (dBμV) @ 3m	D-factor (dB)	Extrapolate d level QP (dBμV) @ 30 m	Correction factor (dB/m)	Corrected level QP dB(μV/m)	Limit dB(μV/m)	Margin (dB)
ANT3	13.5587	52.6	-40.0	12.6	20.5	33.1	84.0	-50.9
ANT3S	13.5592	47.3	-40.0	7.3	20.5	27.8	84.0	-56.2
ANT 8	13.5592	31.0	-40.0	-9.0	20.5	11.5	84.0	-72.5
ANT 12 metal	13.5592	17.9	-40.0	-22.1	20.5	-1.6	84.0	-85.6
ANT 18 metal	13.5592	32.4	-40.0	-7.6	20.5	12.9	84.0	-71.1
ANT 30 metal	13.5592	37.1	-40.0	-2.9	20.5	17.6	84.0	-66.4

a) Result at a measurement distance of 3m

Antenna	Frequency (MHz)	Level (dBμV)	Ant. factor (dB 1/m)	Field strength dB(μV/m)
ANT3	13.5587	52.6	20.5	73.1
ANT3S	13.5592	47.3	20.5	67.8
ANT 8	13.5592	31.0	20.5	51.5
ANT 12 metal	13.5592	17.9	20.5	38.4
ANT 18 metal	13.5592	32.4	20.5	52.9
ANT 30 metal	13.5592	37.1	20.5	57.6

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b) Result extrapolated to a distance of 30 m

Antenna	Frequency (MHz)	Field strength dB(μ V/m) @3m	Extrapolation factor (dB)	Field strength dB(μ V/m) @30m	Limit dB(μ V/m)	Delta (dB)
ANT3	13.5587	73.1	-40.0	33.1	84.0	-50.9
ANT3S	13.5592	67.8	-40.0	27.8	84.0	-56.2
ANT 8	13.5592	51.5	-40.0	11.5	84.0	-72.5
ANT 12 metal	13.5592	38.4	-40.0	-1.6	84.0	-85.6
ANT 18 metal	13.5592	52.9	-40.0	12.9	84.0	-71.1
ANT 30 metal	13.5592	57.6	-40.0	17.6	84.0	-66.4

Limit according to FCC Part 15, Section 15.225(a):

Frequency (MHz)	Field strength of fundamental wave		Measurement distance (metres)
	(μ V/m)	dB(μ V/m)	
13.553 - 13.567	15848	84.0	30

The requirements are **FULFILLED**.

Remarks:

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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5.3 Spurious emissions

For test instruments and accessories used see section 6 Part SER 1, SER 2.

5.3.1 Description of the test location

Test location: OATS 1
Test distance: 3 metres

5.3.2 Photo documentation of the test set-up

See attachment B to this report.

5.3.3 Applicable standard

FCC Part 15, Section 15.209.

5.3.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

30 MHz – 1000 MHz: RBW: 120 kHz

Detector: QP (In frequency range 9-90 kHz and 110-490 kHz a linear average detector is used for iSED)

5.3.5 Test result < 30MHz

FCC

Antenna	Frequency (MHz)	Reading level QP (dBμV) @ 3m	D-factor (dB)	Extrapolate d level QP (dBμV) @ 30 m	Correction factor (dB/m)	Corrected level QP dB(μV/m)	Limit dB(μV/m)	Margin (dB)
ANT3	27.1174	3.4	-40.0	-36.6	20.5	-16.1	29.5	-45.6
ANT3S	27.1184	3.5	-40.0	-36.5	20.5	-16.0	29.5	-45.5
ANT 8	27.1184	3.5	-40.0	-36.5	20.5	-16.0	29.5	-45.5
ANT 12 metal	27.1184	3.4	-40.0	-36.6	20.5	-16.1	29.5	-45.6
ANT 18 metal	27.1184	3.5	-40.0	-36.5	20.5	-16.0	29.5	-45.5
ANT 30 metal	27.1184	3.5	-40.0	-36.5	20.5	-16.0	29.5	-45.5

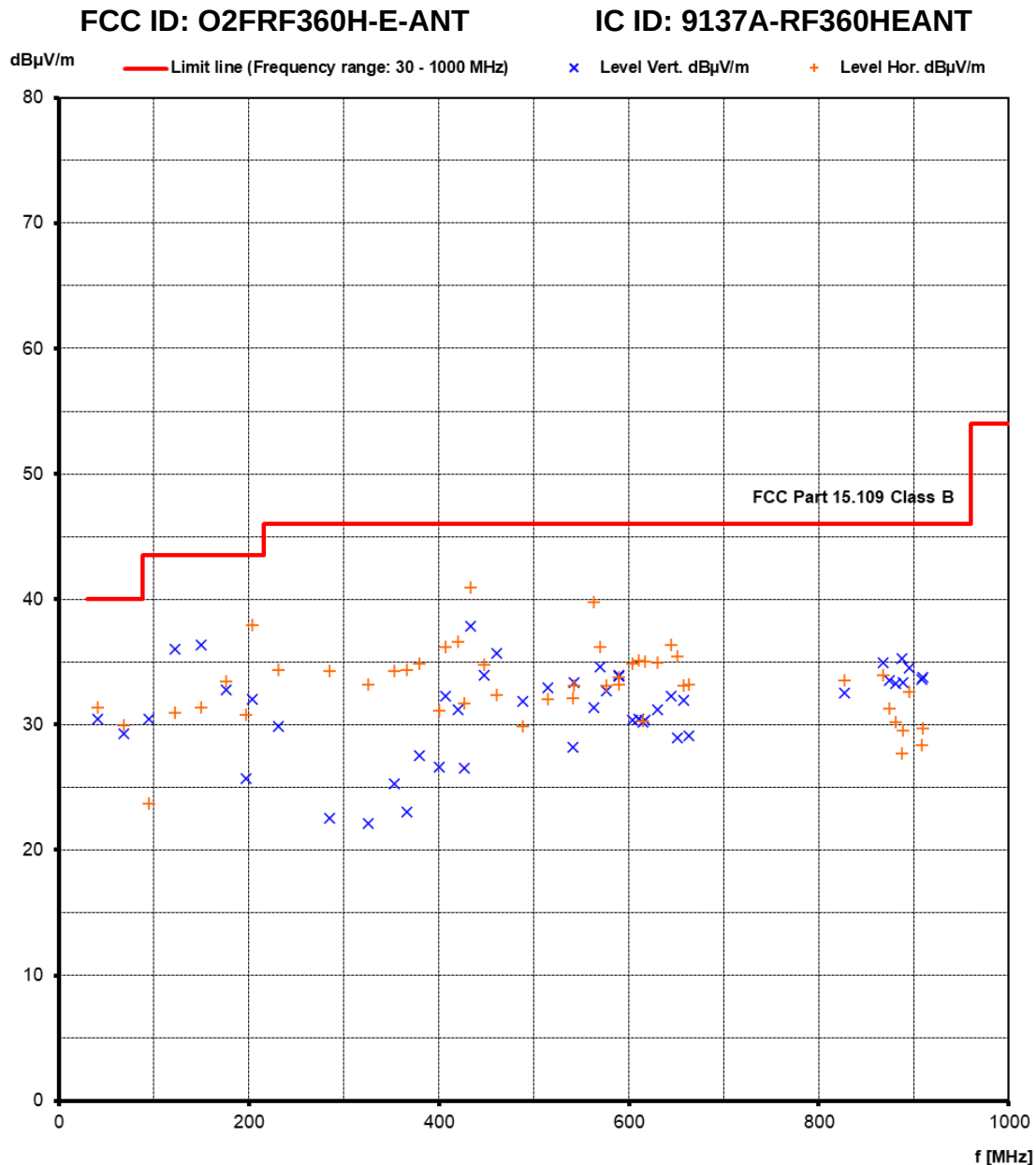
ISED

Antenna	Frequency (MHz)	Reading level QP (dBμA) @ 3m	D-factor (dB)	Extrapolate d level QP (dBμA) @ 30 m	Correction factor (dB/m)	Corrected level QP dB(μA/m)	Limit dB(μA/m)	Margin (dB)
ANT3	27.1174	-48.1	-40.0	-88.1	20.5	-67.6	-21.9	-45.7
ANT3S	27.1184	-48.0	-40.0	-88.0	20.5	-67.5	-21.9	-45.6
ANT 8	27.1184	-48.0	-40.0	-88.0	20.5	-67.5	-21.9	-45.6
ANT 12 metal	27.1184	-48.1	-40.0	-88.1	20.5	-67.6	-21.9	-45.7
ANT 18 metal	27.1184	-48.0	-40.0	-88.0	20.5	-67.5	-21.9	-45.6
ANT 30 metal	27.1184	-48.0	-40.0	-88.0	20.5	-67.5	-21.9	-45.6

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5.3.6 Test result 30 MHz < f < 1 GHz

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
40.68	13.5	13.3	16.9	18.1	30.4	31.4	40.0	-8.6
67.80	13.2	13.2	16.1	16.8	29.3	30.0	40.0	-10.0
94.91	16.3	10.5	14.2	13.2	30.5	23.7	43.5	-13.0
122.03	18.4	14.0	17.6	17.0	36.0	31.0	43.5	-7.5
149.15	16.8	12.6	19.5	18.8	36.3	31.4	43.5	-7.2
176.27	14.2	15.5	18.6	18.0	32.8	33.5	43.5	-10.0
196.60	8.5	14.2	17.2	16.5	25.7	30.7	43.5	-12.8
203.38	14.9	21.5	17.1	16.5	32.0	38.0	43.5	-5.5
230.50	11.8	16.6	18.0	17.8	29.8	34.4	46.0	-11.6
284.74	2.8	14.2	19.7	20.1	22.5	34.3	46.0	-11.7
325.41	1.2	11.8	20.9	21.4	22.1	33.2	46.0	-12.8
352.52	3.6	12.1	21.7	22.2	25.3	34.3	46.0	-11.7
366.08	0.9	11.8	22.1	22.6	23.0	34.4	46.0	-11.6
379.64	5.0	11.9	22.5	22.9	27.5	34.8	46.0	-11.2
399.98	3.5	7.6	23.1	23.5	26.6	31.1	46.0	-14.9
406.76	9.0	12.5	23.3	23.7	32.3	36.2	46.0	-9.8
420.32	7.6	12.6	23.6	24.0	31.2	36.6	46.0	-9.4
427.10	2.7	7.5	23.8	24.2	26.5	31.7	46.0	-14.3
433.88	13.9	16.6	24.0	24.3	37.9	40.9	46.0	-5.1
447.44	9.6	10.1	24.3	24.7	33.9	34.8	46.0	-11.2
461.00	11.0	7.3	24.7	25.0	35.7	32.3	46.0	-10.3
488.11	6.5	4.2	25.4	25.7	31.9	29.9	46.0	-14.1
515.23	6.9	5.7	26.1	26.4	33.0	32.1	46.0	-13.0
540.68	1.6	5.1	26.6	27.0	28.2	32.1	46.0	-13.9
542.35	6.7	6.1	26.7	27.0	33.4	33.1	46.0	-12.6
562.69	4.2	12.3	27.1	27.5	31.3	39.8	46.0	-6.2
569.47	7.3	8.5	27.3	27.7	34.6	36.2	46.0	-9.8
576.24	5.2	5.3	27.5	27.8	32.7	33.1	46.0	-12.9
589.80	6.1	5.6	27.8	28.2	33.9	33.8	46.0	-12.1
589.83	6.2	5.0	27.8	28.2	34.0	33.2	46.0	-12.0
603.36	2.3	6.4	28.1	28.5	30.4	34.9	46.0	-11.1
610.14	2.3	6.5	28.2	28.6	30.5	35.1	46.0	-10.9
614.41	2.0	1.6	28.2	28.6	30.2	30.2	46.0	-15.8
616.92	2.1	6.3	28.3	28.7	30.4	35.0	46.0	-11.0
630.48	2.7	6.0	28.5	28.9	31.2	34.9	46.0	-11.1
644.04	3.6	7.2	28.7	29.1	32.3	36.3	46.0	-9.7
650.82	0.2	6.2	28.8	29.3	29.0	35.5	46.0	-10.5
657.60	3.1	3.7	28.9	29.4	32.0	33.1	46.0	-12.9
663.56	0.2	3.7	29.0	29.5	29.2	33.2	46.0	-12.8
827.08	0.8	1.4	31.7	32.1	32.5	33.5	46.0	-12.5
867.76	2.7	1.2	32.2	32.7	34.9	33.9	46.0	-11.1
874.54	1.2	-1.5	32.3	32.8	33.5	31.3	46.0	-12.5
881.32	0.9	-2.7	32.4	32.9	33.3	30.2	46.0	-12.7
888.00	2.8	-5.3	32.5	33.0	35.3	27.7	46.0	-10.7
888.10	0.9	-3.5	32.5	33.0	33.4	29.5	46.0	-12.6
894.88	2.0	-0.5	32.5	33.1	34.5	32.6	46.0	-11.5
908.44	0.9	-4.9	32.7	33.3	33.6	28.4	46.0	-12.4
909.33	1.1	-3.6	32.7	33.3	33.8	29.7	46.0	-12.2

Note: The correction factor includes cable loss and antenna factor.



Limit according to FCC Part 15 Subpart 15.209(a)

Frequency (MHz)	Field strength of spurious emissions		Measurement distance
	(µV/m)	dB(µV/m)	(metres)
0.009 - 0.490	2400/F(kHz)	--	300
0.490 - 1.705	24000/F (kHz)	--	30
1.705 - 30.0	30	29.5	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

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Limit according to RSS-Gen clause 8.9

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(μ A/m)	dB(μ A/m)	
0.009 - 0.490	6.37/F(kHz)	--	300 (Note 1)
0.490 - 1.705	63.7/F (kHz)	--	30
1.705 - 30.0	0.08	-22	30
Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(μ V/m)	dB(μ V/m)	
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

The requirements are **FULFILLED**.

Remarks: Measurement has been performed up to 1000 MHz.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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5.4 Frequency tolerance

For test instruments and accessories used see section 6 Part FE.

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up

See attachment B to this report.

5.4.3 Applicable standard

According to FCC Part 15, Section 15.225(e).

5.4.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10.

5.4.5 Test result

Test conditions		Test result	Tolerance	Limit
		Frequency (MHz)	(kHz)	(kHz)
$T_{min} (-20)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5588658	1.134	± 1.356
$T (-10)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5588408	1.159	± 1.356
$T (0)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5588158	1.184	± 1.356
$T (10)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5587783	1.222	± 1.356
$T_{nom} (20)^{\circ}C$	$V_{min} (2.2 V DC)$	13.5587658	1.234	± 1.356
	$V_{nom} (3.8 V DC)$	13.5587658	1.234	± 1.356
	$V_{max} (4.35 V DC)$	13.5587658	1.234	± 1.356
$T (30)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5587408	1.259	± 1.356
$T (40)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5587408	1.259	± 1.356
$T_{max} (50)^{\circ}C$	$V_{nom} (3.8 V DC)$	13.5587533	1.247	± 1.356

Limit Calculation:

Carrier frequency: $f_c = 13.56 \text{ MHz}$

Max. tolerance: $\pm 0.01 \% \text{ of } 13.56 \text{ MHz} = \pm 1.356 \text{ kHz}$

Limit according to FCC Part 15, Section 15.225(e) and RSS-210 clause B.6(b):

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01 \%$ of the operating frequency.

The requirements are **FULFILLED**.

Remarks: The cut-off voltage is 2.1 V.

FCC ID: O2FRF360H-E-ANT

IC ID: 9137A-RF360HEANT

5.5 Bandwidth

For test instruments and accessories used see section 6 Part MB.

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up

See attachment B to this report.

5.5.3 Applicable standard

According to FCC Part 15, Section 15.215(c).

5.5.4 Test result

Measured Bandwidth	result (kHz)	Limit (kHz)
20dB	2.63	--
99%	91.04	--

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

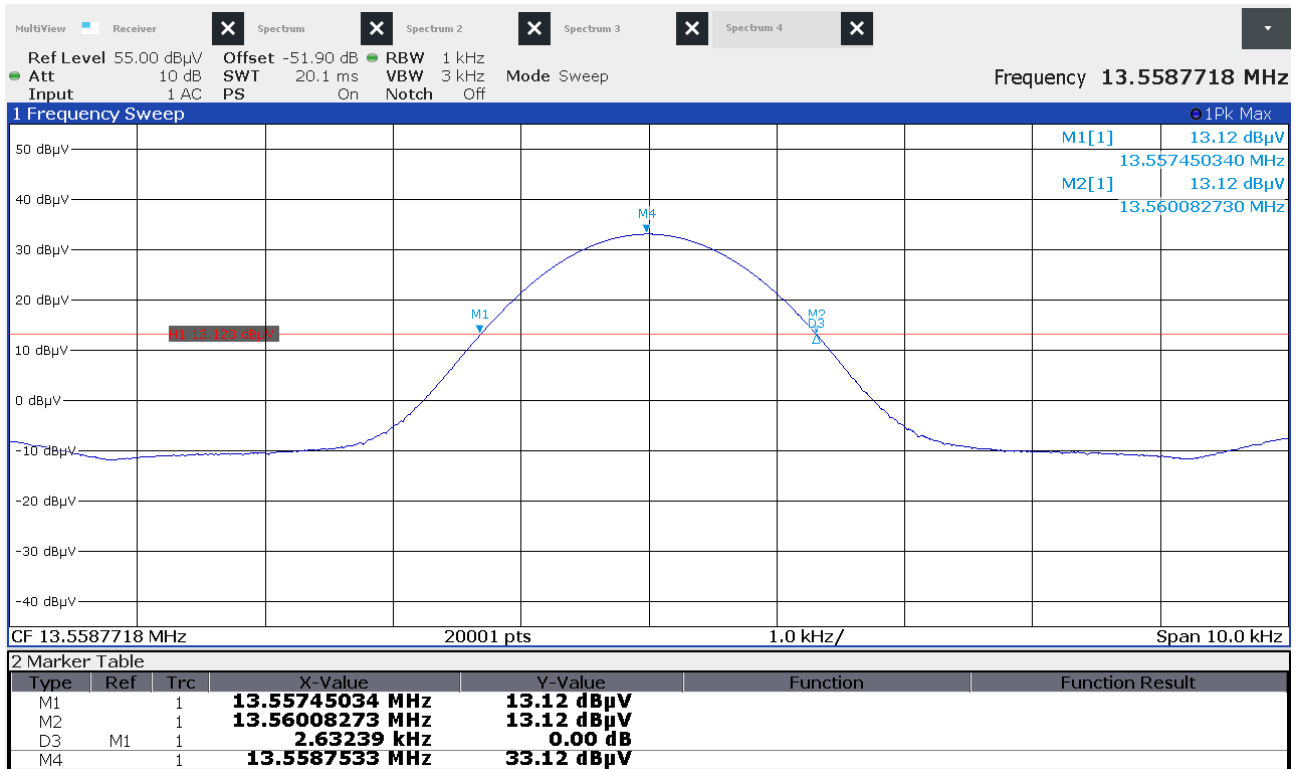
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: O2FRF360H-E-ANT

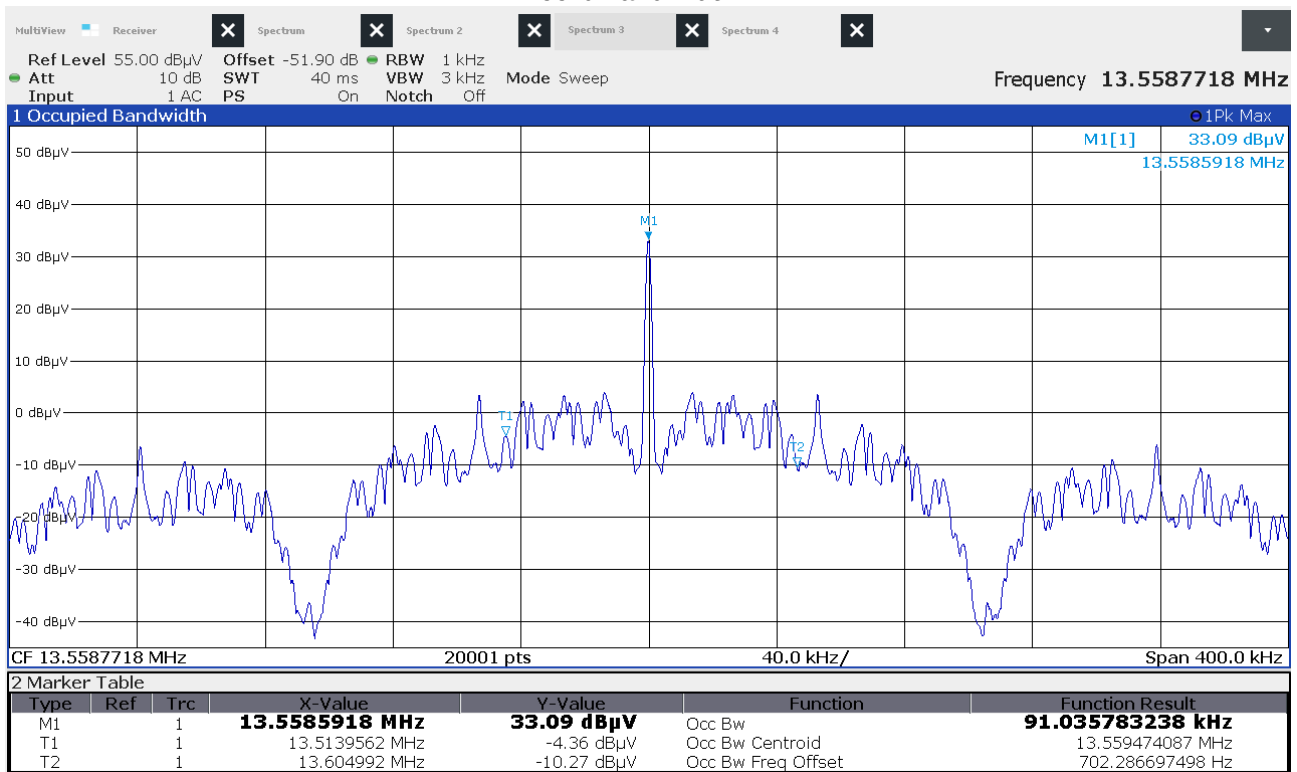
IC ID: 9137A-RF360HEANT

5.5.5 Test protocol

20 dB bandwidth



99% Bandwidth



FCC ID: O2FRF360H-E-ANT

IC ID: 9137A-RF360HEANT

5.6 Transmitter spectrum mask

For test instruments and accessories used see section 6 Part MB.

5.6.1 Description of the test location

Test location: NONE

5.6.2 Photo documentation of the test set-up

See attachment B to this report.

5.6.3 Applicable standard

According to FCC Part 15, Section 15.225 (a-d).

5.6.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10.

5.6.5 Test result

Limits according to FCC Part 15, Section 15.225(a-d)

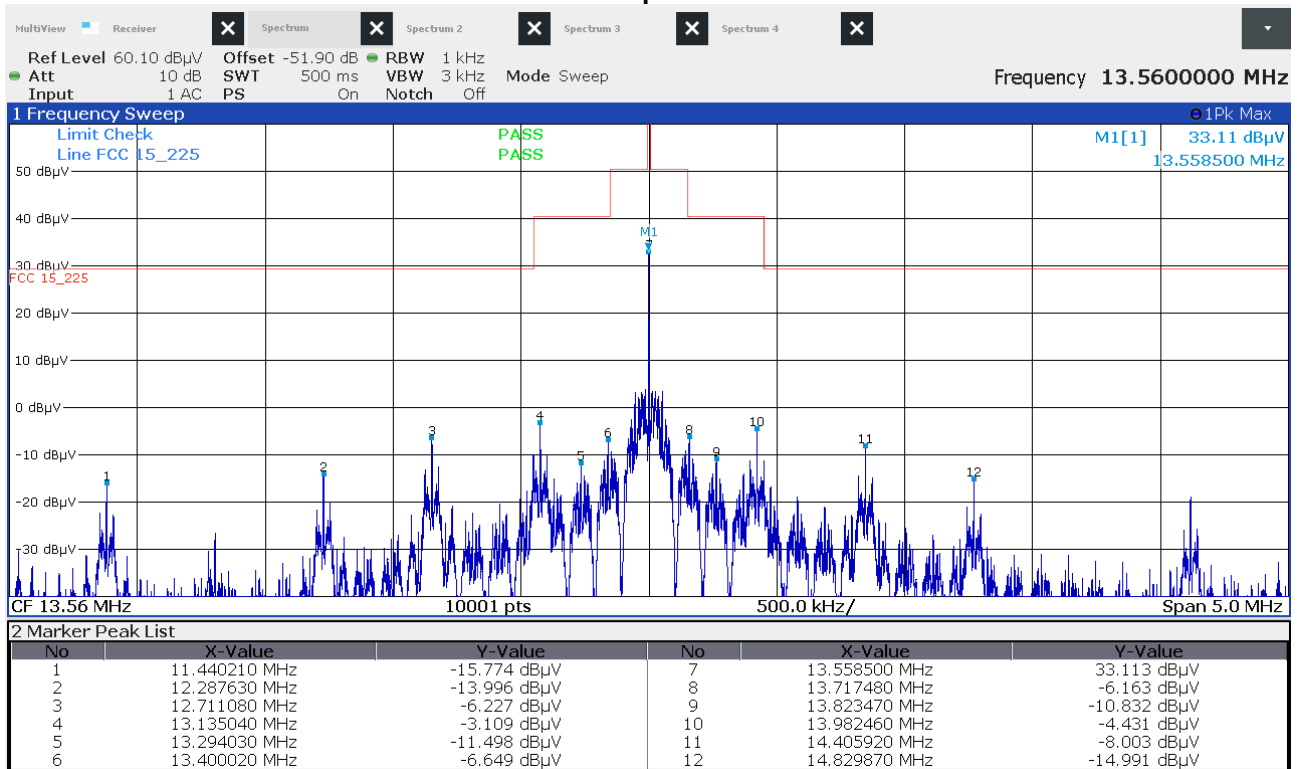
Frequency band (MHz)	Emission level limit at 30 m ($\mu\text{V/m}$)	Emission level limit at 30 m (dB $\mu\text{V/m}$)
13.110 – 13.410	106	40.5
13.410 - 13.553	334	50.5
13.553 - 13.567	15.848	84.0
13.567 – 13.710	334	50.5
13.710 – 14.010	106	40.5
outside of 13.110 – 14.010	30	29.5

Limits according to RSS-210 clause B.6 (i-iv)

Frequency band (MHz)	Emission level limit at 30 m ($\mu\text{V/m}$)	Emission level limit at 30 m (dB $\mu\text{V/m}$)
13.110 – 13.410	106	40.5
13.410 - 13.553	334	50.5
13.553 - 13.567	15.848	84.0
13.567 – 13.710	334	50.5
13.710 – 14.010	106	40.5
Frequency band (MHz)	Emission level limit at 30 m ($\mu\text{A/m}$)	Emission level limit at 30 m (dB $\mu\text{A/m}$)
outside of 13.110 – 14.010	0.08	-22

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

FCC ID: O2FRF360H-E-ANT
IC ID: 9137A-RF360HEANT
5.6.6 Test protocol
Transmitter spectrum mask


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: O2FRF360H-E-ANT

IC ID: 9137A-RF360HEANT

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.
All listed measuring devices were calibrated at the time of use.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.21.0.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	17/06/2023	17/06/2022		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2022	31/10/2019	22/09/2022	22/03/2022
	EMV D 30000/PAS	02-02/30-05-006	21/08/2023	21/08/2020	05/08/2022	05/08/2021
	MTS310	02-02/30-08-002	09/02/2024	09/02/2022	12/07/2022	12/04/2022
	N-4000-BNC	02-02/50-05-138				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	08/09/2022	08/03/2022
CPR 1	ESR 7	02-02/03-17-001	29/07/2022	29/07/2021		
	HFH 2 - Z 2	02-02/24-05-020	01/06/2025	01/06/2022	01/06/2023	01/06/2022
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
FE	FSW43	02-02/11-21-001	16/05/2023	16/05/2022		
	HZ-10	02-02/24-05-012	15/12/2022	15/12/2021		
	WK-340/40	02-02/45-05-001	05/08/2022	05/08/2021		
MB	FSW43	02-02/11-21-001	16/05/2023	16/05/2022		
	HZ-10	02-02/24-05-012	15/12/2022	15/12/2021		
SER 1	ESR 7	02-02/03-17-001	29/07/2022	29/07/2021		
	HFH 2 - Z 2	02-02/24-05-020	01/06/2025	01/06/2022	01/06/2023	01/06/2022
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESR 7	02-02/03-17-001	29/07/2022	29/07/2021		
	VULB 9168	02-02/24-05-005	20/12/2022	20/12/2021	07/07/2022	07/07/2021
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
	50F-003 N 3 dB	02-02/50-21-010				

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.