

FCC ID: 2AATH-CC300RFIDA

EMI - TEST REPORT

- FCC Part 15.225 -

Test Report No. :	T37522-00-02JP	25. March 2014
		Date of issue

Type / Model Name : CC300

Product Description : Industrial HMI with RFID

Applicant : Kontron Europe GmbH

Address : Sudetenstr. 7

D-87600 Kaufbeuren

Manufacturer : Kontron Europe GmbH

Address : Sudetenstr. 7

D-87600 Kaufbeuren

Licence holder : Kontron Europe GmbH

Address : Sudetenstr. 7

D-87600 Kaufbeuren

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

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2013)

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
Part 15, Subpart A, Section 15.38	Incorporation by reference

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2013)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
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 15.215	Additional provisions to the general radiated emission limitations
Part 15, Subpart C, Section 15.225	Operation within the band 13.110 - 14.010 MHz

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement

2 SUMMARY

GENERAL REMARKS:

None

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 : 27 November 2013

Testing concluded on : 03 February 2014

Checked by:

Tested by:

Klaus Gegenfurtner

Jürgen Pessinger

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage : 24V DC

3.2 Short description of the equipment under test (EUT)

The EuT is operator panel (Human Machine Interface) designed for demanding industrial applications. The EuT incorporates a RFID reader for contactless identification of the user.

Number of tested samples: 1
Serial number: 341634001

EUT operation mode:

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

- tag reading mode at 13.56MHz

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

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

- RFID Tag Model : Supplied by client
- AC/DC Power Supply Model : FSP Group Inc, Model: FSP150-AAAN1

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 acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. 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.

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4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

General Standard information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.3 Conducted emission

Description of measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

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

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \cdot \log(\mu\text{V}); \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)}; \end{aligned}$$

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. 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 of a peak mode measurement appears to be less than 20 dB, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.4.4 Radiated emission (electrical field 30 MHz - 1 GHz)

Description of measurement

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

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turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from 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 meters horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters and the EUT is rotated 360 degrees.

The final level in dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (dB). The FCC or CISPR 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	Level	+	Factor	=	Level	-	CISPR Limit	=
Delta								
(MHz)	(dB μ V)		(dB)		(dB μ V/m)		(dB μ V/m)	(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	= -2.4

4.4.5 Radiated emission (electrical field 1 GHz - 40 GHz)

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from 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. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

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 SK4

5.1.2 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.3 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 2.8 dB at 0.1635 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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**.

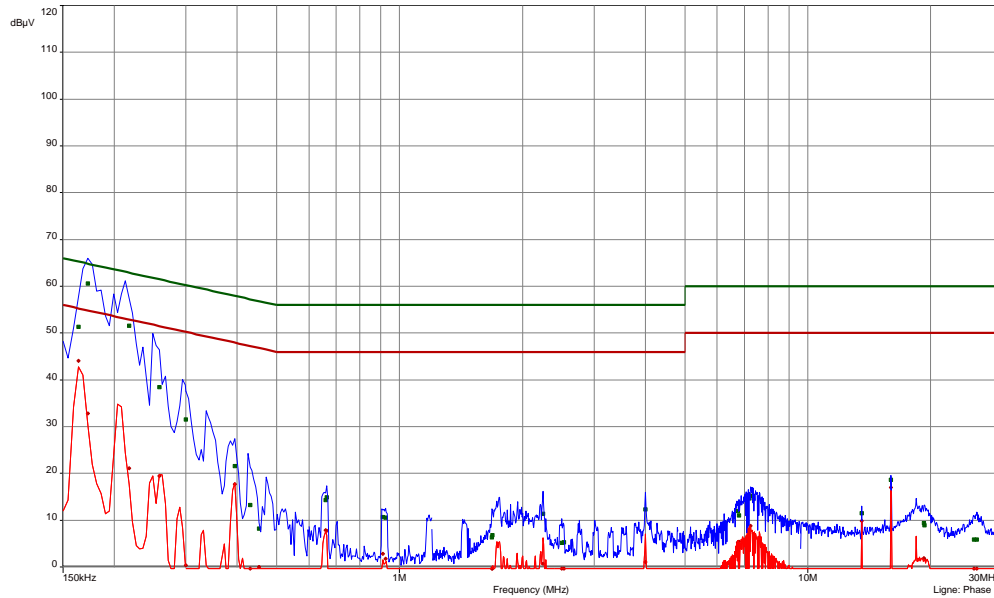
Remarks: For detailed test result please refer to following test protocols. The measurement was made at
AC input of the used AC/DC power supply.

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5.1.5 Test protocol

Test point: L1
 Operation mode: tag reading mode at 13.56MHz
 Remarks: none

Result: PASS

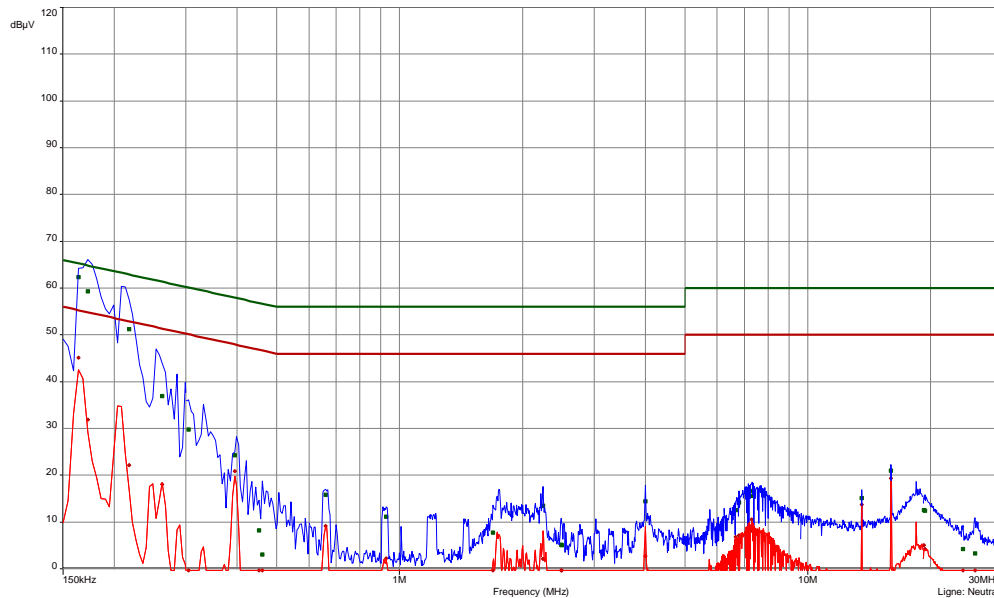


freq	QP	margin	limit	AV	margin	limit	line
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB	
0.1635	51.36	13.92	65.28	44.07	11.21	55.28	Phase 1
0.1725	60.6	4.24	64.84	32.85	21.99	54.84	Phase 1
0.2175	51.52	11.39	62.91	21.1	31.81	52.91	Phase 1
0.258	38.49	23	61.5	19.44	32.05	51.5	Phase 1
0.3	31.58	28.66	60.24	0.41	49.83	50.24	Phase 1
0.3945	21.62	36.35	57.97	17.68	30.29	47.97	Phase 1
0.4305	13.24	44	57.24	-6.93	54.17	47.24	Phase 1
0.453	8.24	48.58	56.82	0.01	46.81	46.82	Phase 1
0.6585	14.32	41.68	56	7.9	38.1	46	Phase 1
0.663	14.9	41.1	56	7.76	38.24	46	Phase 1
0.9105	10.65	45.35	56	2.83	43.17	46	Phase 1
0.924	10.52	45.48	56	1.72	44.28	46	Phase 1
1.686	6.38	49.62	56	-2.15	48.15	46	Phase 1
1.6905	6.82	49.18	56	-3.03	49.03	46	Phase 1
2.2485	11.36	44.64	56	0.71	45.29	46	Phase 1
2.4945	5.14	50.86	56	-4.51	50.51	46	Phase 1
2.526	5.24	50.76	56	-3.39	49.39	46	Phase 1
3.9975	12.29	43.71	56	1.02	44.98	46	Phase 1
6.735	11.95	48.05	60	5.31	44.69	50	Phase 1
6.7755	11.07	48.93	60	5.43	44.57	50	Phase 1
7.1895	14.71	45.29	60	7.23	42.77	50	Phase 1
7.23	15.21	44.79	60	8.76	41.24	50	Phase 1
13.56	11.54	48.46	60	9.84	40.16	50	Phase 1
15.999	18.63	41.37	60	16.97	33.03	50	Phase 1
19.2585	9.4	50.6	60	1.92	48.08	50	Phase 1
19.299	8.9	51.1	60	1.63	48.37	50	Phase 1
25.5	5.89	54.11	60	-0.43	50.43	50	Phase 1
25.95	5.89	54.11	60	-1.08	51.08	50	Phase 1

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Test point: N
 Operation mode: tag reading mode at 13.56MHz
 Remarks: none

Result: PASS



freq	QP	margin	limit	AV	margin	limit	line
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB	
0.1635	62.41	2.87	65.28	45.12	10.16	55.28	Neutral
0.1725	59.34	5.5	64.84	31.87	22.97	54.84	Neutral
0.2175	51.22	11.69	62.91	22.12	30.79	52.91	Neutral
0.2625	36.88	24.47	61.35	18.05	33.3	51.35	Neutral
0.3045	29.83	30.29	60.12	-0.45	50.57	50.12	Neutral
0.3945	24.32	33.65	57.97	20.86	27.11	47.97	Neutral
0.453	8.2	48.62	56.82	-0.61	47.43	46.82	Neutral
0.462	3.1	53.55	56.66	-7.37	54.02	46.66	Neutral
0.6585	15.88	40.12	56	9.12	36.88	46	Neutral
0.9285	11.14	44.86	56	2.22	43.78	46	Neutral
1.695	7.7	48.3	56	-1.82	47.82	46	Neutral
2.2485	13.44	42.56	56	2.13	43.87	46	Neutral
2.49	5.2	50.8	56	-3.72	49.72	46	Neutral
2.4945	5.1	50.9	56	-3.9	49.9	46	Neutral
3.9975	14.47	41.53	56	2.76	43.24	46	Neutral
6.654	12.54	47.46	60	6.82	43.18	50	Neutral
6.7755	14.19	45.81	60	7.2	42.8	50	Neutral
7.275	16.63	43.37	60	10.5	39.5	50	Neutral
7.311	15.63	44.37	60	8.04	41.96	50	Neutral
13.56	15.16	44.84	60	13.66	36.34	50	Neutral
15.999	20.97	39.03	60	19.35	30.65	50	Neutral
19.218	12.6	47.4	60	5.11	44.89	50	Neutral
19.3395	12.44	47.56	60	4.19	45.81	50	Neutral
24.006	4.28	55.72	60	-0.33	50.33	50	Neutral
25.6755	3.24	56.76	60	-5.52	55.52	50	Neutral

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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: OATS3

Test distance: 3 metres

5.2.2 Applicable standard

According to FCC Part 15, Section 15.225(a):

The field strength of any emission within the band 13.553 – 13.567 MHz shall not exceed the limit at 30 m.

5.2.3 Description of Measurement

The magnetic field strength from the EUT will be measured at an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the equipment under test will be in accordance to ANSI C63.4. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to FCC Part 15C, Section 15.31(f)(2). The final measurement will be performed with an EMI receiver set to quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used, according to FCC Part 15C, Section 15.209(d).

The resolution bandwidth during the measurement is as follows:

150 kHz – 30 MHz: RBW: 9 kHz

Example:

Frequency (MHz)	Level (dB μ V)	+ Corr. factor (dB/m)	=	Level dB(μ V/m)	-	Limit dB(μ V/m)	=	Delta (dB)
1.705	5	+ 20	=	25	-	30	=	-5

5.2.4 Test result

Measurement result at 3m measurement distance

Frequency (MHz)	Level (dB μ V)	Corr. factor (dB)	Corr. level dB(μ V/m)
13,56	26,4	20,0	46,4

Extrapolated values to a distance of 30m

Frequency (MHz)	Level (dB μ V)	Corr. factor (dB)	Corr. level dB(μ V/m)	Limit dB(μ V/m)	Delta (dB)
13,56	-13,6	20	6,4	84	-77,6

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

Frequency (MHz)	Field strength of fundamental wave		Measurement distance (metres)
	($\mu\text{V}/\text{m}$)	$\text{dB}(\mu\text{V}/\text{m})$	
13.553 - 13.567	15848	84	30

The requirements are **FULFILLED**.

Remarks: none

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5.3 Spurious emissions

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2**, **SER 3**.

5.3.1 Description of the test location

Test location: OATS3
 Test location: A2
 Test distance: 3 metres

5.3.2 Applicable standard

According to FCC Part 15C, Section 15.209:
 The emissions from intentional radiators shall not exceed the effective field strength limits.

5.3.3 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The set up of the EUT will be in accordance to ANSI C63.4. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported. During the test, the EUT was set into continuous transmitting mode.

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
1000 MHz – 40 GHz	RBW:	1 MHz

Example:

Frequency (MHz)	Level (dB μ V)	+	Factor (dB)	=	Level dB(μ V/m)	-	Limit dB(μ V/m)	=	Delta (dB)
1.705	5	+	20	=	25	-	30	=	-5

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5.3.4 Test result

< 1GHz

Frequency (MHz)	Level AV (dBµV)	Level QP (dBµV)	Corr. factor (dB)	Corr. level AV dB(µV/m)	Corr. Level QP dB(µV/m)	Limit dB(µV/m)	Delta (dB)
40.670	--	13.4	14.7	--	28.1	40.0	-11.9
67.780	--	6.3	11.7	--	18.0	40.0	-22.0
78.022	--	6.8	10.9	--	17.7	40.0	-22.3
141.946	--	6.3	10.6	--	16.9	43.5	-26.6
168.247	--	9.1	11.4	--	20.5	43.5	-23.0

> 1GHz

Frequency (MHz)	Level AV (dBµV)	Level Pk (dBµV)	Corr. factor (dB)	Corr. level AV (dBµV/m)	Corr. Level Pk (dBµV/m)	Limit dB(µV/m)	Delta (dB)
1000	--	61.1	-19.8	--	41.3	54	-12.7
1036	--	61.1	-20.5	--	40.7	54	-13.3
1114	--	58.3	-20.3	--	38.1	54	-15.9
1354	--	59.1	-19.3	--	39.8	54	-14.2
1660	--	60.2	-19.8	--	40.4	54	-13.6
1996	--	58.6	-15.5	--	44.9	54	-9.1
3052	--	54.6	-12.2	--	42.4	54	-11.6

Limit according to FCC Part 15 Subpart 15.209(a):

Frequency (MHz)	Field strength of spurious emissions		Measurement distance
	(µV/m)	(dBµV/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

The requirements are **FULFILLED**.

Remarks: The measurement was performed in the frequency range 9kHz to 30000MHz.

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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 Applicable standard

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

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature range of -20 °C to $+50$ °C at normal supply voltage and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 °C. For battery operated equipment, the equipment shall be performed using a new battery.

5.4.3 Description of Measurement

The frequency tolerance is measured with the spectrum analyzer. The sweep points were set to maximum for higher the frequency resolution or the function "frequency counter" is used. The signal is unmodulated; the marker of the analyzer is set to maximum amplitude at normal temperature, the frequency was recorded. Then the maximum supply voltage is set and the marker of the analyzer is set to maximum amplitude. This procedure is done again for the minimum supply voltage. The EUT was now driven at normal supply voltage but in the climatic chamber to range the temperature from -20 °C to $+50$ °C in steps of 10 degrees. The drifting carrier is measured by setting the marker at the analyzer.

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5.4.4 Test result

Test conditions		Test result
		Frequency (MHz)
$T_{min} (-20)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55983
$T (-10)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55983
$T (0)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55984
$T (10)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55984
$T_{nom} (20)^{\circ}\text{C}$	$V_{min} (20,4 \text{ V})$	13,55984
$T_{nom} (20)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55984
$T_{nom} (20)^{\circ}\text{C}$	$V_{max} (27,6 \text{ V})$	13,55984
$T (30)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55982
$T (40)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55982
$T_{max} (50)^{\circ}\text{C}$	$V_{nom} (24,0 \text{ V})$	13,55982
Measurement uncertainty		$\pm 10 \text{ Hz}$

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

Highest frequency: $f_h = 13.55984 \text{ MHz}$
 Lowest frequency: $f_l = 13.55982 \text{ MHz}$

Negative tolerance: $f_l - f_c = -0.18 \text{ kHz} < - 1.356 \text{ kHz}$
 Positive tolerance: $f_h - f_c = -0.16 \text{ kHz} < + 1.356 \text{ kHz}$

Limit according to FCC Part 15, Section 15.225(e):
 The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01 \%$ of the operating frequency.

The requirements are **FULFILLED**.

Remarks: none

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5.5 20 dB 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 Applicable standard

According to FCC Part 15C, Section 15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in section 15.217 to 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed.

5.5.3 Description of Measurement

The bandwidth is measured at an amplitude level related to the reference level by a specified ratio of -20 dB. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. As alternative the bandwidth was measured with the function "n-dB down" of the spectrum analyzer and recorded. The measurement was performed conducted. The test signal may be modulated as intended.

Spectrum analyzer settings:

RBW:	1 kHz	VBW:	1 kHz	Detector	Peak
Sweep time	auto				

5.5.4 Test result

Channel Frequency (MHz)	20 dB bandwidth (kHz)
13.56	2.9

Limit according to FCC Part 15C, Section 15.215(c):

Must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed.

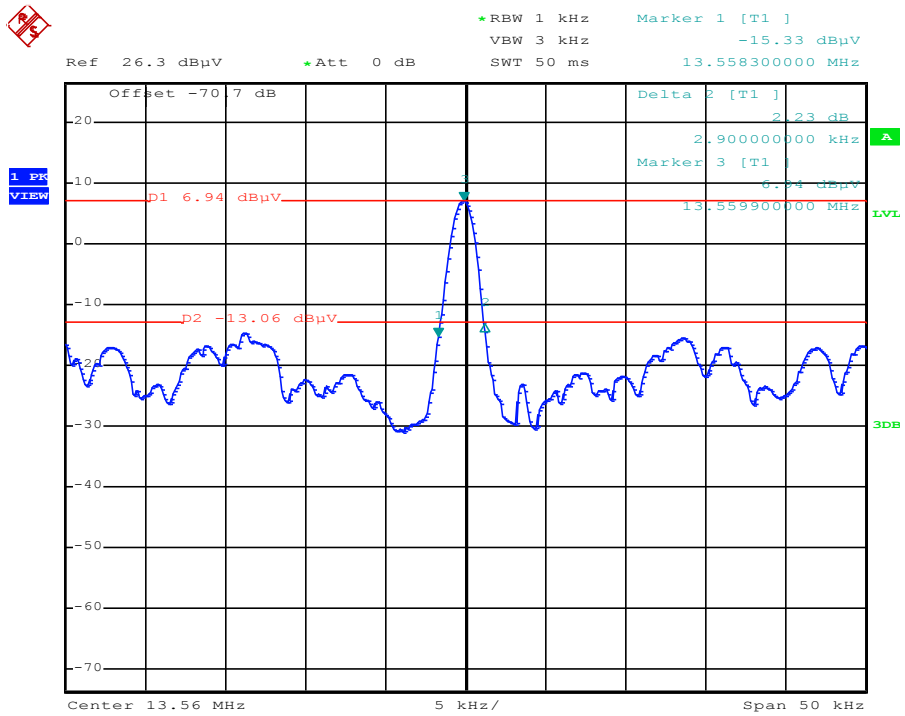
Frequency band (MHz)	Limit 20 dB bandwidth (kHz)
13.553 - 13.567	14.0

The requirements are

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

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5.5.5 Test protocol



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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: AREA4

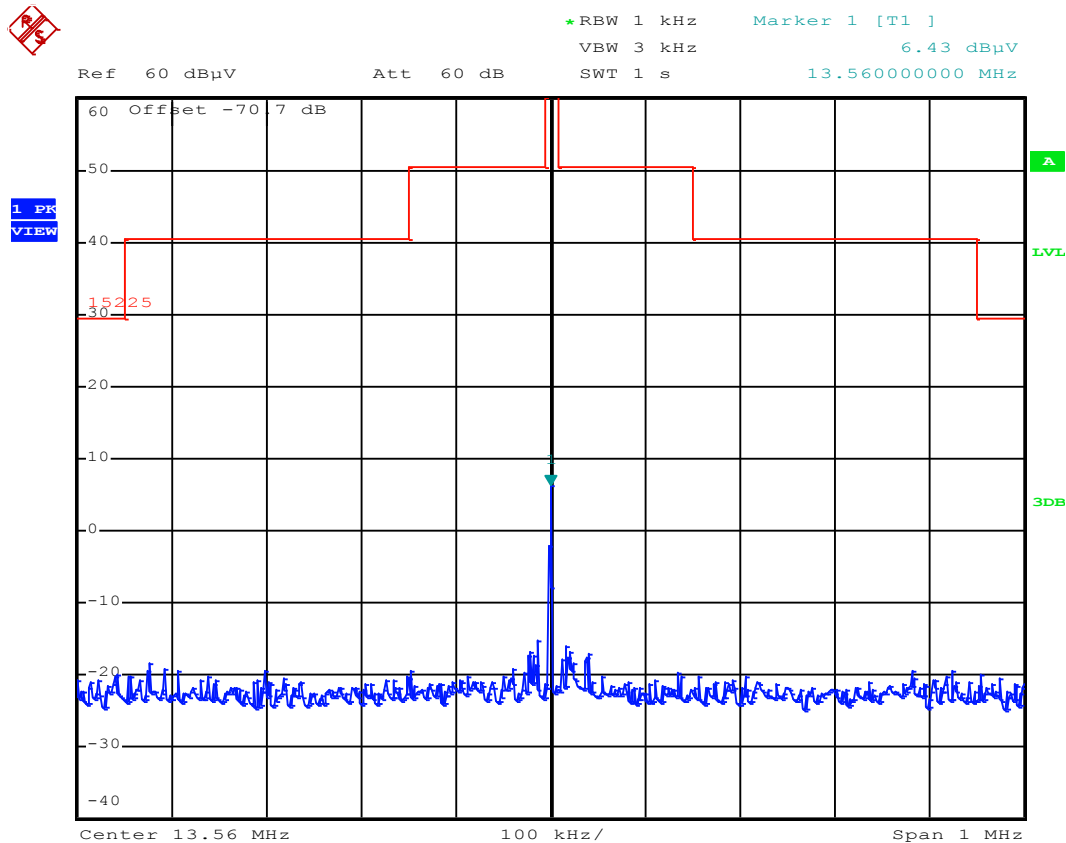
5.6.2 Applicable standard

According to FCC Part 15C, Section 15.225 (a-d):
The field strength of any emission shall not exceed the defined limits.

5.6.3 Description of Measurement

The spectrum mask is measured using a spectrum analyser. The profile of the spectrum mask is displayed on analyser and has to be adjusted to the reference level given as maximum output power at 30m measurement distance according to subclause 5.2.5. The test signal may be modulated as intended.

5.6.4 Test result



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

The absolute levels of RF power at any frequency shall not exceed the limits defined in the following table:

Frequency band (MHz)	Emission level limit at 30 m ($\mu\text{V}/\text{m}$)	Emission level limit at 30 m (dB $\mu\text{V}/\text{m}$)
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

The requirements are **FULFILLED**.

Remarks: none

FCC ID: 2AATH-CC300RFIDA
6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESH 3	01-02/03-01-005	16/01/2015	16/01/2014		
	ESH2-Z5	01-02/20-01-001	28/01/2015	28/01/2014	28/07/2014	28/01/2014
	ESH 3 - Z 2	01-02/50-02-020	15/01/2015	15/01/2014		
	BNC-3000-N	01-02/50-07-008				
	N-5000-N	01-02/50-07-009				
	emitel ESW V31	01-02/68-09-002				
CPR 1	ESCS 30	01-02/03-04-003	26/02/2014	26/02/2013		
	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	N-40000-N	01-02/50-05-043				
	N-30000-N	01-02/50-05-044				
	emitel ESW V31	01-02/68-09-002				
FE	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
	METRA HIT World	02-02/32-10-001	05/08/2014	05/08/2013		
	WK-340/40	02-02/45-05-001	31/05/2014	31/05/2013	26/02/2014	26/08/2013
	6543A	02-02/50-05-157				
MB	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
	METRA HIT World	02-02/32-10-001	05/08/2014	05/08/2013		
	WK-340/40	02-02/45-05-001	31/05/2014	31/05/2013	26/02/2014	26/08/2013
	6543A	02-02/50-05-157				
SER 1	ESCS 30	01-02/03-04-003	26/02/2014	26/02/2013		
	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	N-40000-N	01-02/50-05-043				
	N-30000-N	01-02/50-05-044				
	emitel ESW V31	01-02/68-09-002				
SER 2	ESVP	01-02/03-01-002	18/03/2014	18/03/2013		
	HM 5012	01-02/11-01-001				
	N-40000-N	01-02/50-05-043				
	N-30000-N	01-02/50-05-044				
	emitel ESW V31	01-02/68-09-002				
SER 3	VULB 9168	02-02/24-05-005	11/04/2014	11/04/2013	04/03/2014	04/09/2013
	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	JS4-18004000-30-5A	02-02/17-05-017				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	04/04/2014	04/04/2013		
	BBHA 9170	02-02/24-05-014				
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
KMS102-0,2 m	02-02/50-11-020					
SF104/11N/11N/1500MM	02-02/50-13-015					