EMI – TEST REPORT

- FCC Part 15.225 & RSS-210 -

Type / Model Name	:	HF-mPCIe
Product Description	:	HF RFID module
Applicant	:	Maxsol GmbH
Address	:	Schulstrasse 2
		93495 Weiding
		GERMANY
Manufacturer	:	Maxsol GmbH
Address	:	Schulstrasse 2
		93495 Weiding
		GERMANY

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

Test Report No. :	**T42153-00-00JP**	21. February 2017 Date of issue

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12030-01-00

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (February, 2017)

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (February, 2017)

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

RSS-Gen Issue 4, Nov 2014	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 9, Aug 2016	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 Test results

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, 6.6	Occupied bandwidth	passed
15.225	RSS-210, B.6	Transmitter spectrum mask	passed

2.2 GENERAL REMARKS:

none

2.3 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 : 07 February 2017

Testing concluded on : 16 February 2017

Checked by:

Klaus Gegenfurtner 2017.02.23 09:45:37 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Jürgen Pessinger 2017.02.23 07:27:24 +01'00'

Jürgen Pessinger
Radio Team

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT

Refer to document T42153-00JP Attachment B

3.2 Power supply system utilised

Power supply voltage : 5V DC

3.3 Short description of the equipment under test (EUT)

The EuT is a RFID reader module. The module is intended to be integrated in embedded systems.

Number of tested samples: 1
Serial number: none

3.4 Operation frequency

The operating frequency is 13.56MHz.

3.5 Antenna

The EuT can be equipped with different antennas. The antennas are listed below:

Antenna_KEU V3.0
Antenna_KM1356

Detailed pictures of the antenna can be found in the document T42153-00JP Attachment B.

EUT operation mode:

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

- Cont. tag reading mode at 13.56 MHz

EUT configuration:

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

- RFID Tag Model : Supplied by client
- Laptop Model : Tecra A2, Toshiba CSA ID 01-01/01-05-005
- Power supply for Laptop Model : ADP-60RH A, Toshiba

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.

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%	± 2.5 x 10^{-7}
99% Occupied Bandwidth	Center frequency of EuT	95%	± 2.5 x 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	Center frequency of EuT	95%	± 3.53 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

4.1 Measurement protocol for FCC and IC

4.1.1 General information

4.1.1.1 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.

The Open Area test sites are listed Open Sites under the Canadian Test-Sites File-No:

IC 3009A-1 (OATS1) **and IC 3009A-3** (OATS3)

The anechoic chamber site is listed chamber under the Canadian Test-Sites File-No:

IC 3009A-2

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.1.1.2 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.

4.1.1.3 Details of test procedures

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.

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 SK1

5.1.2 Photo documentation of the test set-up

Refer to document T42153-00JP Attachment A

5.1.3 Applicable standard

FCC Part 15, Section 15.207 and RSS-Gen 8.8

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Limit according to FCC Part 15, Section 15.207(a) and RSS-Gen 8.8 Table 3:

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

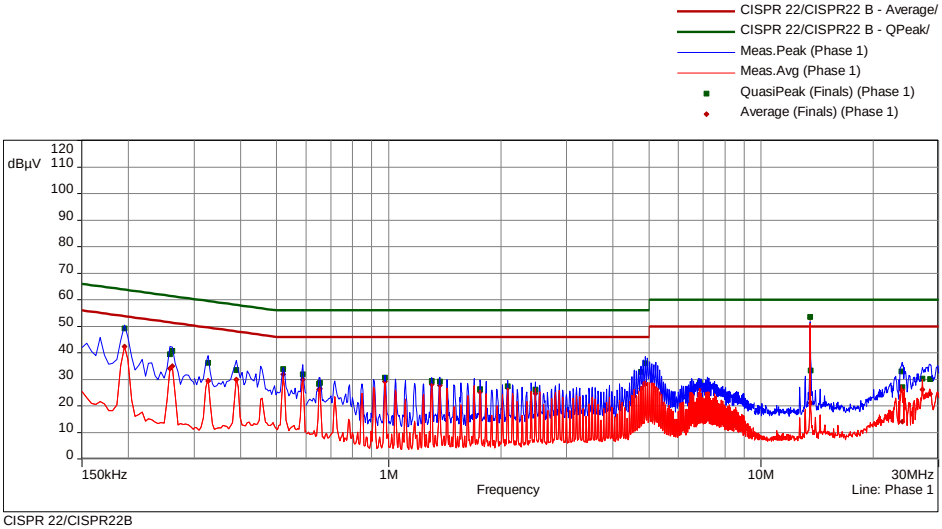
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED.**

Remarks: For detailed test result please refer to following test protocols

5.1.5 Test protocol

Test point	L1	Result: Passed
Operation mode:	RFID reading 13.56MHz, with TAG and Ant. KEU	
Remarks:	13.56MHz above the limit refer to test with 50 Ohm termination on antenna port	
Tested by:	Jürgen Pessinger	

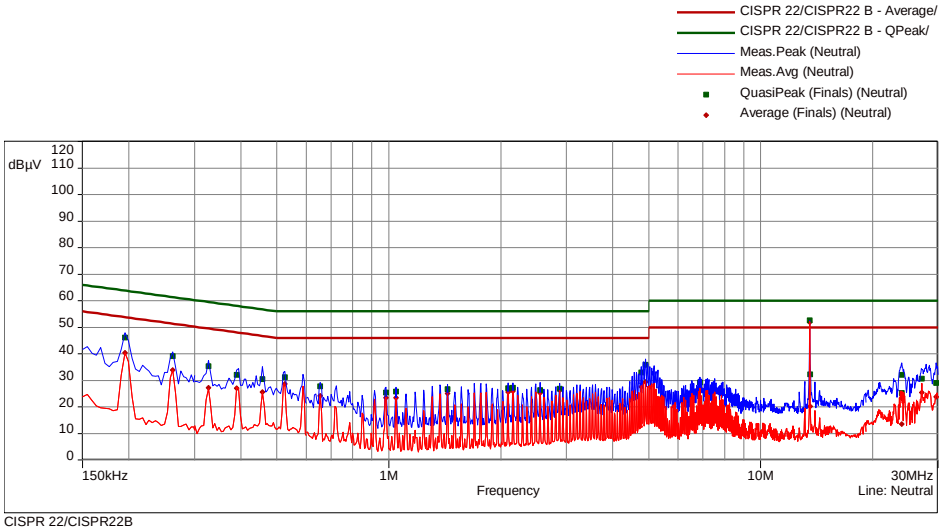


CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.195	49.27	14.56	63.82	42.29	11.53	53.82	Phase 1	10.22
0.258	39.52	21.98	61.50	34.08	17.42	51.50	Phase 1	10.22
0.2625	40.77	20.58	61.35	34.96	16.39	51.35	Phase 1	10.22
0.327	36.26	23.27	59.53	29.42	20.10	49.53	Phase 1	10.23
0.39	33.53	24.54	58.06	29.84	18.23	48.06	Phase 1	10.23
0.5205	33.98	22.02	56.00	31.92	14.08	46.00	Phase 1	10.24
0.588	31.91	24.09	56.00	29.89	16.11	46.00	Phase 1	10.24
0.6495	28.28	27.72	56.00	26.22	19.78	46.00	Phase 1	10.24
0.654	28.57	27.43	56.00	26.54	19.46	46.00	Phase 1	10.24
0.978	30.60	25.40	56.00	29.15	16.85	46.00	Phase 1	10.24
1.3035	29.44	26.56	56.00	28.05	17.95	46.00	Phase 1	10.25
1.371	29.29	26.71	56.00	27.67	18.33	46.00	Phase 1	10.25
1.758	26.31	29.69	56.00	25.18	20.82	46.00	Phase 1	10.26
2.0865	27.43	28.57	56.00	26.80	19.20	46.00	Phase 1	10.27
2.4765	26.19	29.81	56.00	24.71	21.29	46.00	Phase 1	10.29
4.758	32.74	23.26	56.00	26.53	19.47	46.00	Phase 1	10.40
4.89	36.11	19.89	56.00	28.11	17.89	46.00	Phase 1	10.41
6.8475	28.72	31.28	60.00	26.34	23.66	50.00	Phase 1	10.53
7.1715	27.60	32.40	60.00	24.06	25.94	50.00	Phase 1	10.56
13.56*	53.49	6.51	60.00	53.20	-3.20	50.00	Phase 1	11.03
13.587	33.34	26.66	60.00	21.04	28.96	50.00	Phase 1	11.04
23.8575	32.91	27.09	60.00	26.01	23.99	50.00	Phase 1	11.60
23.952	26.96	33.04	60.00	14.01	35.99	50.00	Phase 1	11.61
27.12	30.20	29.80	60.00	26.10	23.90	50.00	Phase 1	11.54
28.47	30.13	29.87	60.00	24.57	25.43	50.00	Phase 1	11.66

* fundamental frequency, retested with 50Ohm termination

Test point N Result: Passed
Operation mode: RFID reading 13.56MHz, with TAG and Ant. KEU
Remarks: 13.56MHz above the limit refer to test with 50 Ohm termination on antenna port
Tested by: Jürgen Pessinger

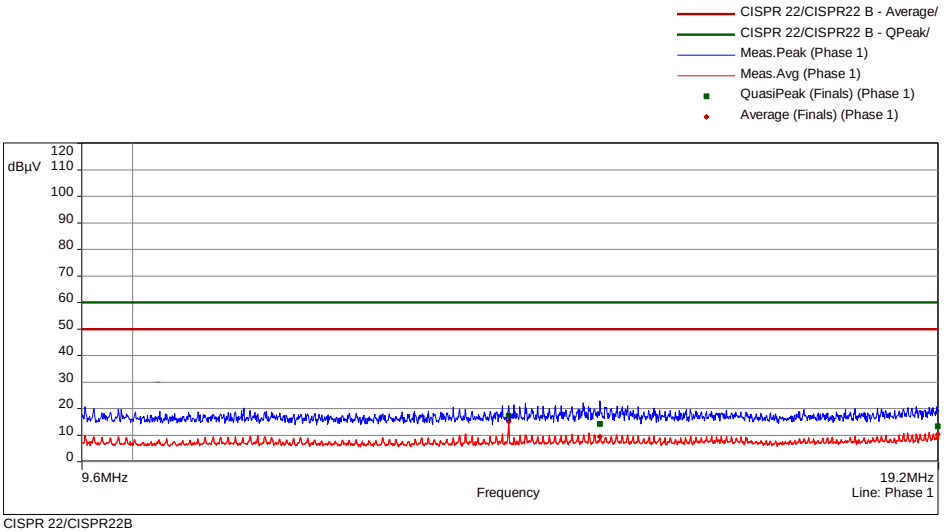


CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.195	46.11	17.71	63.82	40.42	13.40	53.82	Neutral	10.22
0.2625	39.08	22.27	61.35	33.85	17.50	51.35	Neutral	10.22
0.327	35.26	24.27	59.53	27.16	22.37	49.53	Neutral	10.23
0.39	32.03	26.03	58.06	27.06	21.00	48.06	Neutral	10.23
0.4575	30.54	26.20	56.74	25.63	21.11	46.74	Neutral	10.24
0.525	31.10	24.90	56.00	28.74	17.26	46.00	Neutral	10.24
0.654	27.76	28.24	56.00	24.17	21.83	46.00	Neutral	10.24
0.9825	25.40	30.60	56.00	23.50	22.50	46.00	Neutral	10.24
1.0455	25.77	30.23	56.00	23.52	22.48	46.00	Neutral	10.24
1.4385	26.66	29.34	56.00	25.09	20.91	46.00	Neutral	10.25
2.091	26.96	29.04	56.00	25.56	20.44	46.00	Neutral	10.27
2.1585	27.14	28.86	56.00	25.88	20.12	46.00	Neutral	10.28
2.5485	26.37	29.63	56.00	25.17	20.83	46.00	Neutral	10.30
2.877	26.86	29.14	56.00	26.24	19.76	46.00	Neutral	10.31
4.7715	32.96	23.04	56.00	27.50	18.50	46.00	Neutral	10.40
4.9035	35.87	20.13	56.00	29.37	16.63	46.00	Neutral	10.41
6.8655	29.20	30.80	60.00	27.06	22.94	50.00	Neutral	10.53
13.56	52.55	7.45	60.00	51.92	-1.92	50.00	Neutral	11.03
13.587	32.20	27.80	60.00	20.16	29.84	50.00	Neutral	11.04
23.9385	25.21	34.79	60.00	13.55	36.45	50.00	Neutral	11.61
23.9925	32.10	27.90	60.00	23.33	26.67	50.00	Neutral	11.61
27.12	30.61	29.39	60.00	25.50	24.50	50.00	Neutral	11.54
29.613	29.02	30.98	60.00	23.73	26.27	50.00	Neutral	11.76

* fundamental frequency, retested with 50Ohm termination

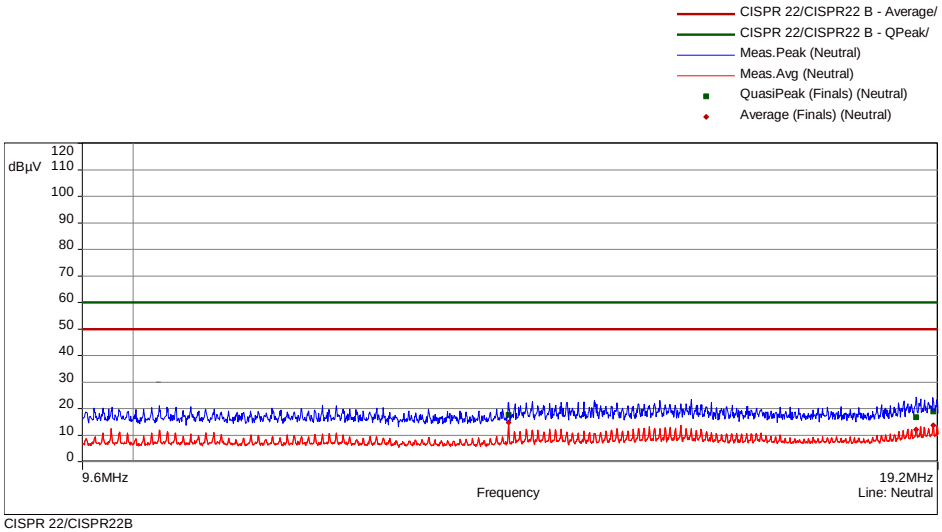
Test point L1 Result: Passed
Operation mode: RFID reading 13.56MHz, with 50 Ohm @ atenna port
Remarks: none
Tested by: Jürgen Pessinger



CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
13.56	17.26	42.74	60.00	15.08	34.92	50.00	Phase 1	11.03
14.5995	14.22	45.78	60.00	9.39	40.61	50.00	Phase 1	11.16
19.185	13.31	46.69	60.00	10.30	39.70	50.00	Phase 1	11.50

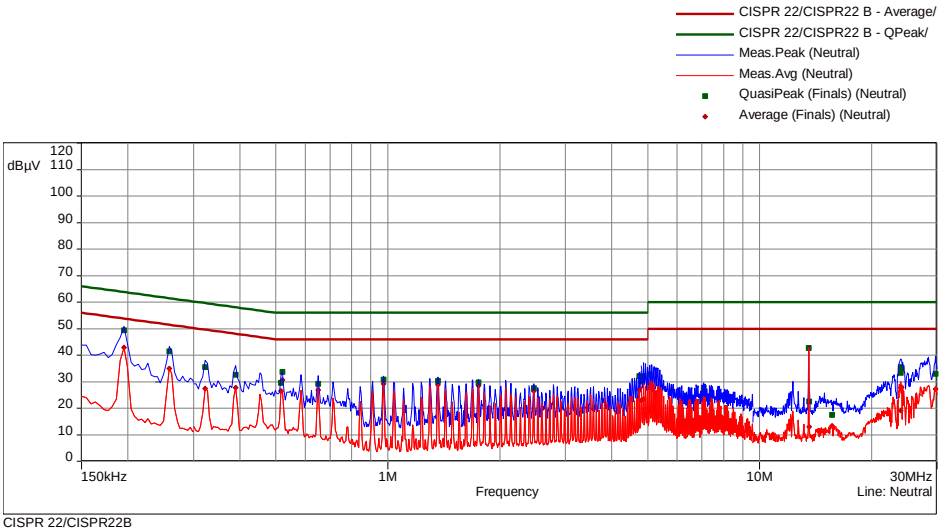
Test point N Result: Passed
Operation mode: RFID reading 13.56MHz, with 50 Ohm @ atenna port
Remarks: none
Tested by: Jürgen Pessinger



CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
13.56	17.73	42.27	60.00	14.72	35.28	50.00	Neutral	11.03
18.861	16.85	43.15	60.00	12.10	37.90	50.00	Neutral	11.46
19.1265	18.98	41.02	60.00	13.76	36.24	50.00	Neutral	11.49

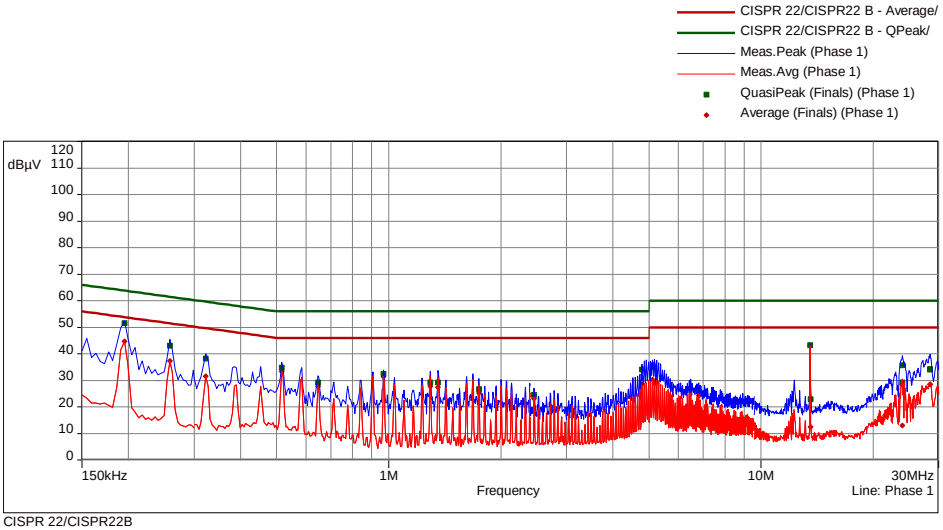
Test point N Result: Passed
Operation mode: RFID reading 13.56MHz, with TAG and Ant. KM1356
Remarks: none
Tested by: Jürgen Pessinger



CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.195	49.40	14.42	63.82	42.84	10.98	53.82	Neutral	10.22
0.258	41.40	20.09	61.50	34.93	16.56	51.50	Neutral	10.22
0.3225	35.54	24.10	59.64	27.47	22.17	49.64	Neutral	10.23
0.39	32.64	25.42	58.06	27.73	20.34	48.06	Neutral	10.23
0.516	29.54	26.46	56.00	26.48	19.52	46.00	Neutral	10.24
0.5205	33.72	22.28	56.00	30.72	15.28	46.00	Neutral	10.24
0.6495	29.26	26.74	56.00	26.93	19.07	46.00	Neutral	10.24
0.9735	30.91	25.09	56.00	29.23	16.77	46.00	Neutral	10.24
1.362	30.36	25.64	56.00	28.81	17.19	46.00	Neutral	10.25
1.7535	29.73	26.27	56.00	28.52	17.48	46.00	Neutral	10.26
2.4675	27.54	28.46	56.00	26.52	19.48	46.00	Neutral	10.29
4.74	32.01	23.99	56.00	27.06	18.94	46.00	Neutral	10.40
4.8	30.09	25.91	56.00	22.85	23.15	46.00	Neutral	10.40
4.8675	32.10	23.90	56.00	23.46	22.54	46.00	Neutral	10.41
5.0655	32.77	27.23	60.00	28.47	21.53	50.00	Neutral	10.42
7.077	26.15	33.85	60.00	22.59	27.41	50.00	Neutral	10.55
7.0815	27.69	32.31	60.00	25.55	24.45	50.00	Neutral	10.55
13.56	42.81	17.19	60.00	42.74	7.26	50.00	Neutral	11.03
13.587	22.59	37.41	60.00	13.02	36.98	50.00	Neutral	11.04
15.6615	17.42	42.58	60.00	13.33	36.67	50.00	Neutral	11.07
23.9655	33.30	26.70	60.00	19.14	30.86	50.00	Neutral	11.61
23.988	35.46	24.54	60.00	27.78	22.22	50.00	Neutral	11.61
24.1095	35.07	24.93	60.00	27.96	22.04	50.00	Neutral	11.62
29.7255	33.05	26.95	60.00	27.22	22.78	50.00	Neutral	11.77

Test point L1 Result: Passed
Operation mode: RFID reading 13.56MHz, with TAG and Ant. KM1356
Remarks: none
Tested by: Jürgen Pessinger



CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.195	51.54	12.28	63.82	44.71	9.11	53.82	Phase 1	10.22
0.258	43.11	18.38	61.50	37.36	14.13	51.50	Phase 1	10.22
0.3225	38.20	21.44	59.64	31.46	18.18	49.64	Phase 1	10.23
0.516	34.86	21.14	56.00	33.34	12.66	46.00	Phase 1	10.24
0.645	29.15	26.85	56.00	27.83	18.17	46.00	Phase 1	10.24
0.969	32.41	23.59	56.00	31.31	14.69	46.00	Phase 1	10.24
1.2945	29.22	26.78	56.00	27.78	18.22	46.00	Phase 1	10.25
1.3575	29.18	26.82	56.00	27.46	18.54	46.00	Phase 1	10.25
1.749	26.68	29.32	56.00	25.20	20.80	46.00	Phase 1	10.26
2.4585	24.60	31.40	56.00	23.02	22.98	46.00	Phase 1	10.29
4.7895	34.13	21.87	56.00	28.47	17.53	46.00	Phase 1	10.40
5.115	35.64	24.36	60.00	30.29	19.71	50.00	Phase 1	10.42
5.178	35.01	24.99	60.00	28.81	21.19	50.00	Phase 1	10.42
6.798	26.95	33.05	60.00	24.21	25.79	50.00	Phase 1	10.53
13.56	43.23	16.77	60.00	43.14	6.86	50.00	Phase 1	11.03
13.587	22.87	37.13	60.00	12.43	37.57	50.00	Phase 1	11.04
23.9475	29.20	30.80	60.00	12.95	37.05	50.00	Phase 1	11.61
23.988	35.64	24.36	60.00	28.22	21.78	50.00	Phase 1	11.61
28.4475	34.34	25.66	60.00	28.50	21.50	50.00	Phase 1	11.65
28.4565	34.10	25.90	60.00	28.40	21.60	50.00	Phase 1	11.65

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: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up

Refer to document T42153-00JP Attachment A

5.2.3 Applicable standard

FCC Part 15, Section 15.225 and RSS-210 B.6

5.2.4 Test result

a) Result at a measurement distance of 3m

Antenna	Frequency (MHz)	Level (dBµV)	Ant. factor (dB 1/m)	Field strength dB(µV/m)
KEU	13.56	34.3	20.5	54.8
KM1356	13.56	38.0	20.5	58.5

b) Result extrapolated to a distance of 30 m

Antenna	Frequency (MHz)	Level (dBµV)	Ant. factor (dB 1/m)	Field strength dB(µV/m)	Limit dB(µV/m)	Delta (dB)
KEU	13.56	-5.7	20.5	14.8	84.0	-69.2
KM1356	13.56	-2.0	20.5	18.5	84.0	-65.5

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

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

The requirements are **FULFILLED.**

Remarks: none

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: OATS1
Test distance: 3 metres

5.3.2 Photo documentation of the test set-up

Refer to document T42153-00JP Attachment A

5.3.3 Applicable standard

FCC Part 15, Section 15.209 and RSS-Gen 8.9

Instrument settings:

9 kHz – 150 kHz	RBW:	200 Hz
150 kHz - 30 MHz	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 4 GHz	RBW:	1 MHz

5.3.1 Test result f < 30 MHz

Note: In the frequency range 9 kHz to 30 MHz the measurement results from 3m distance are extrapolated (D factor) to the specified distance.

Antenna KEU

Frequency (MHz)	Reading level QP (dBµV) @ 3m	D-factor (dB)	Extrapolated level QP (dBµV) @ specified distance	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Limit dB(µV/m)	Margin (dB)
27.12	2.5	40	-37.5	20.5	-17.0	29.5	46.5

Antenna KM1356

Frequency (MHz)	Reading level QP (dBµV) @ 3m	D-factor (dB)	Extrapolated level QP (dBµV) @ specified distance	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Limit dB(µV/m)	Margin (dB)
27.12	3.9	40	-36.1	20.5	-15.6	29.5	45.1

5.3.2 Test result 30 MHz - 1 GHz

Antenna KEU

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)
40,67	21,1	8,2	14,7	13,5	35,8	21,7	40,0	-4,2
54,24	7,0	0,3	15,0	14,0	22,0	14,3	40,0	-18,0
67,80	8,4	2,8	14,2	13,4	22,6	16,2	40,0	-17,4
149,16	8,3	4,6	13,9	14,7	22,2	19,3	46,0	-23,8
271,20	8,9	13,4	15,1	15,0	24,0	28,4	46,0	-17,6

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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)
40,67	24,7	9,8	14,7	13,5	39,4	23,3	40,0	-0,6
54,24	8,0	6,1	15,0	14,0	23,0	20,1	40,0	-17,0
67,80	9,2	6,3	14,2	13,4	23,4	19,7	40,0	-16,6
203,40	12,7	7,3	11,4	12,1	24,1	19,4	46,0	-21,9

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

Limit according to FCC Part 15, Section 15.209(a) and RSS-Gen 8.9 Tables 4 and 5:

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(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

The requirements are **FULFILLED.**

Remarks: Measurement has been performed up to 1000MHz.

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 (Climatic Chamber)

5.4.2 Photo documentation of the test set-up

Refer to document T42153-00JP Attachment A

5.4.3 Applicable standard

FCC Part 15, Section 15.225 and RSS-210 B.6

5.4.4 Test result

Test conditions		Test result
		Frequency (MHz)
T_{min} (-20)°C	V_{nom} (V)	13,560040
T (-10)°C	V_{nom} (V)	13,560030
T (0)°C	V_{nom} (V)	13,560012
T (10)°C	V_{nom} (V)	13,560006
T_{nom} (20)°C	V_{min} (V)	13,559998
	V_{nom} (V)	13,559998
	V_{max} (V)	13,560000
T (30)°C	V_{nom} (V)	13,559992
T (40)°C	V_{nom} (V)	13,559982
T_{max} (50)°C	V_{nom} (V)	13,559976

Carrier frequency: f_c = 13.56 MHz
Max. tolerance: ± 0.01 % of 13.56 MHz = ± 1.356 kHz

Highest frequency: f_h =13.560040 MHz
Lowest frequency: f_l =13.559976 MHz

Negative tolerance: $f_l - f_c$ = -0.001 kHz > - 1.356 kHz
Positive tolerance: $f_h - f_c$ = 0.040 kHz < + 1.356 kHz

Limit according to FCC Part 15, Section 15.225(e) and RSS-210 A2.6
Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

The requirements are **FULFILLED.**

Remarks: Test performed on HF-mPCIe with antenna KM1356.

5.5 Occupied Bandwidth

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

5.5.1 Description of the test location

Test location: Shielded Room S6

5.5.2 Photo documentation of the test set-up

Refer to document T42153-00JP Attachment A

5.5.3 Applicable standard

FCC Part 15, Section 15.215 and RSS-Gen, 6.6

5.5.4 Test result

Antenna KEU

Measured Bandwidth	result (kHz)	Limit (kHz)
20dB	0.031	--
99%	0.025	--

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Measured Bandwidth	result (kHz)	Limit (kHz)
20dB	0.031	--
99%	0.027	--

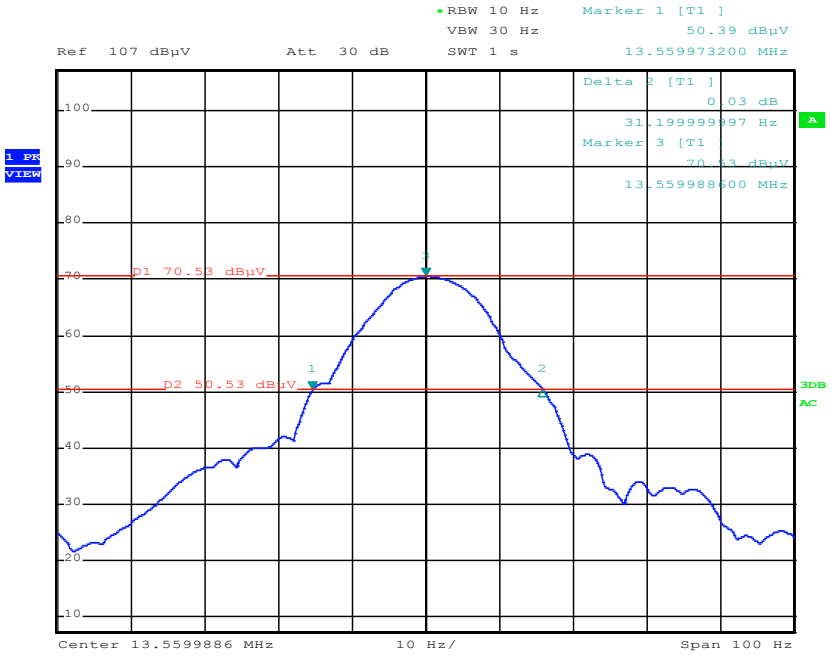
The requirements are **FULFILLED.**

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

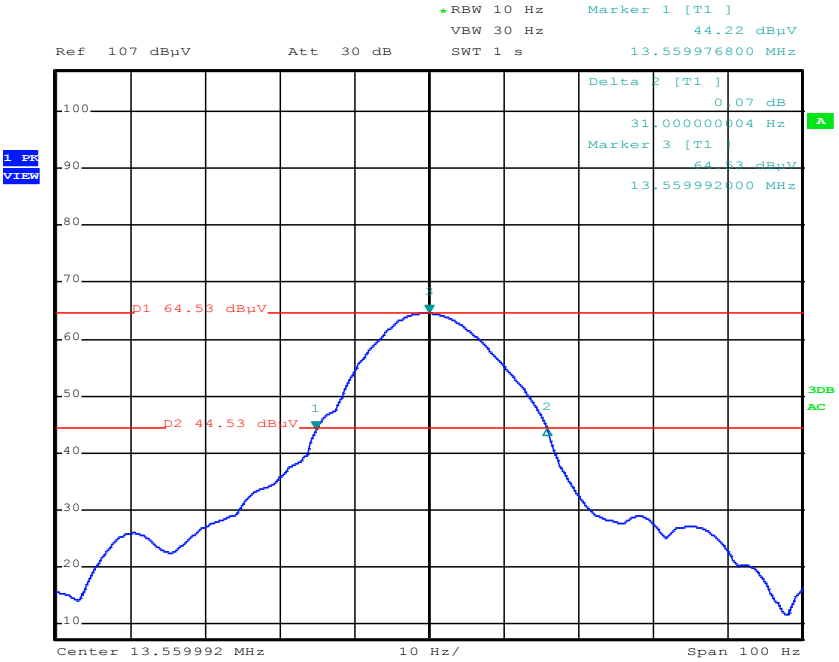
5.5.5 Test protocol

20dB Bandwidth

Antenna KEU

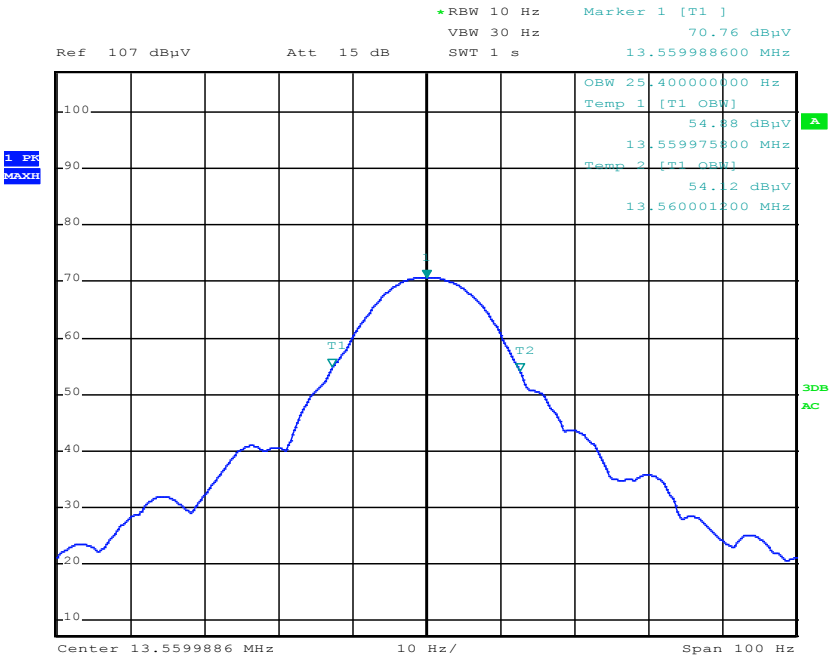


Antenna KM1356

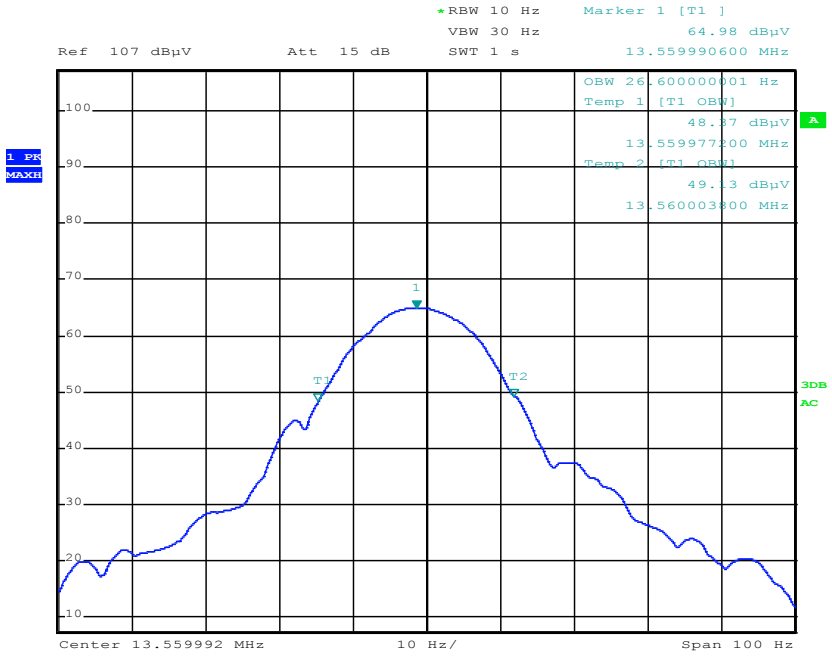


99% Bandwidth

Antenna KEU



Antenna KM1356



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 Photo documentation of the test set-up

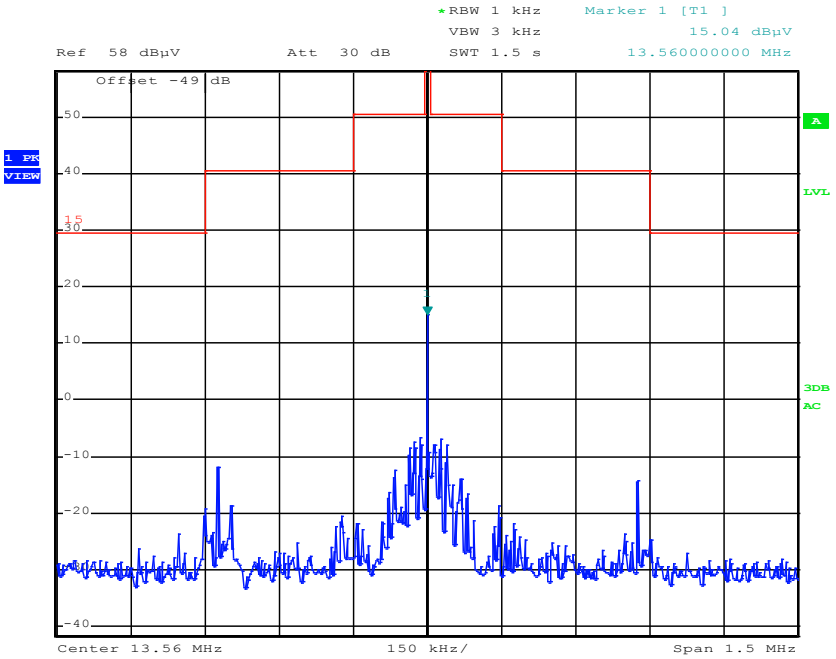
Refer to document T42153-00JP Attachment A

5.6.3 Applicable standard

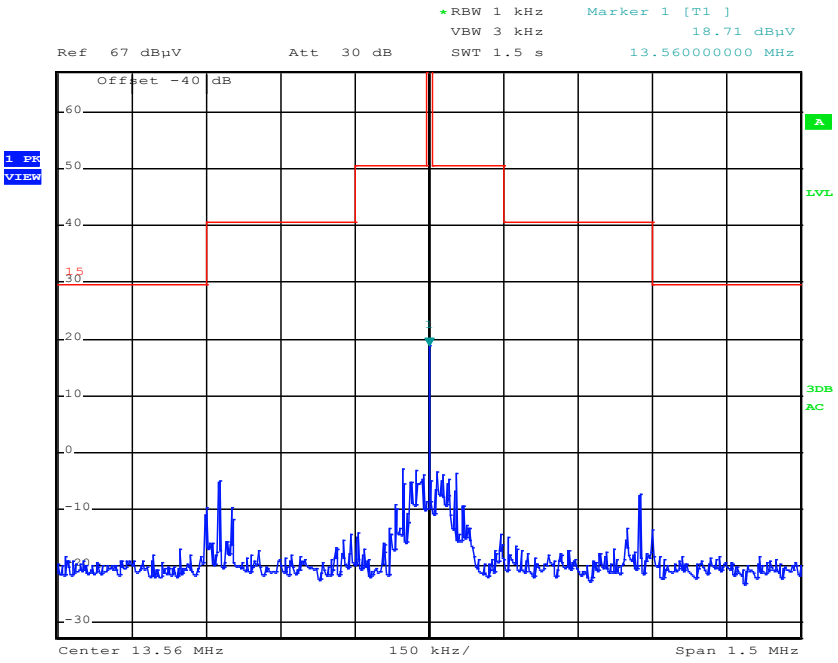
FCC Part 15, Section 15.225 and RSS-210 A2.6

5.6.4 Test result

Antenna KEU



Antenna KM1356



Limit according to FCC Part 15, Section 15.225(a) and RSS-210 A2.6:

Frequency band (MHz)	Emission level limit at 30 m (µV/m)	Emission level limit at 30 m (dBµV/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

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	ESR 7	01-02/03-13-002	17/03/2017	17/03/2016		
	ESH 2 - Z 5	01-02/20-01-001	31/01/2020	31/01/2017	31/07/2017	31/01/2017
	ESH 3 - Z 5	01-02/20-04-005				
	ESH 3 - Z 2	01-02/50-02-020	23/01/2020	23/01/2017	23/07/2017	23/01/2017
	BNC-3000-N	01-02/50-07-008				
	N-5000-N	01-02/50-07-009				
CPR 1	ESCI	02-02/03-05-004	12/09/2017	12/09/2016		
	HFH 2 - Z 2	02-02/24-15-001	23/03/2017	23/03/2016	23/09/2016	23/03/2016
	INA 265 A / CAS 3025	02-02/50-05-028	13/04/2017	13/04/2016		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
FE	ESCI	02-02/03-05-004	12/09/2017	12/09/2016		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
	WK-340/40	02-02/45-05-001	23/06/2017	23/06/2016		
	6543A	02-02/50-05-157				
MB	ESCI	02-02/03-05-004	12/09/2017	12/09/2016		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
	WK-340/40	02-02/45-05-001	23/06/2017	23/06/2016		
	6543A	02-02/50-05-157				
SER 1	ESCI	02-02/03-05-004	12/09/2017	12/09/2016		
	HFH 2 - Z 2	02-02/24-15-001	23/03/2017	23/03/2016	23/09/2016	23/03/2016
	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	ESVS 30	02-02/03-05-003	08/07/2017	08/07/2016		
	VULB 9168	02-02/24-05-005	20/04/2017	20/04/2016	01/03/2017	01/09/2016
	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				