

FCC ID: DO4-MPOSREADER

EMI - TEST REPORT

- FCC Part 15.247 -

Test Report No. : T37444-04-00HU

18. March 2015

Date of issue

Type / Model Name : RFID POS READER V2 (CPiD RFID 400 RDR)Product Description : UHF RFID Reader**Applicant** : Checkpoint SystemsAddress : Brentanostr. 27 – 29D-69434 Hirschhorn**Manufacturer** : BB Electronics Suzhou Co. Ltd.Address : Building E, 58 Yangdong Road, LoufengSuzhou Industrial Park, 215122 Suzhou, China**Licence holder** : Checkpoint SystemsAddress : Brentanostrs. 27 – 29D-69434 Hirschhorn**Test Result** according to the
standards listed in clause 1 test
standards:**POSITIVE**

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, 2014)

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 B - Unintentional Radiators (October, 2014)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions,
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2014)

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 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 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 C63.10: 2009	Testing Unlicensed Wireless Devices
ANSI C95.1:1992	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
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

The frequency range was scanned from 9 kHz to 10 GHz.

All emissions not reported in this test report were more than 10 dB below the specified limit.

The EuT is a frequency hopping system using 50 channels in the frequency band from 902 to 928 MHz.

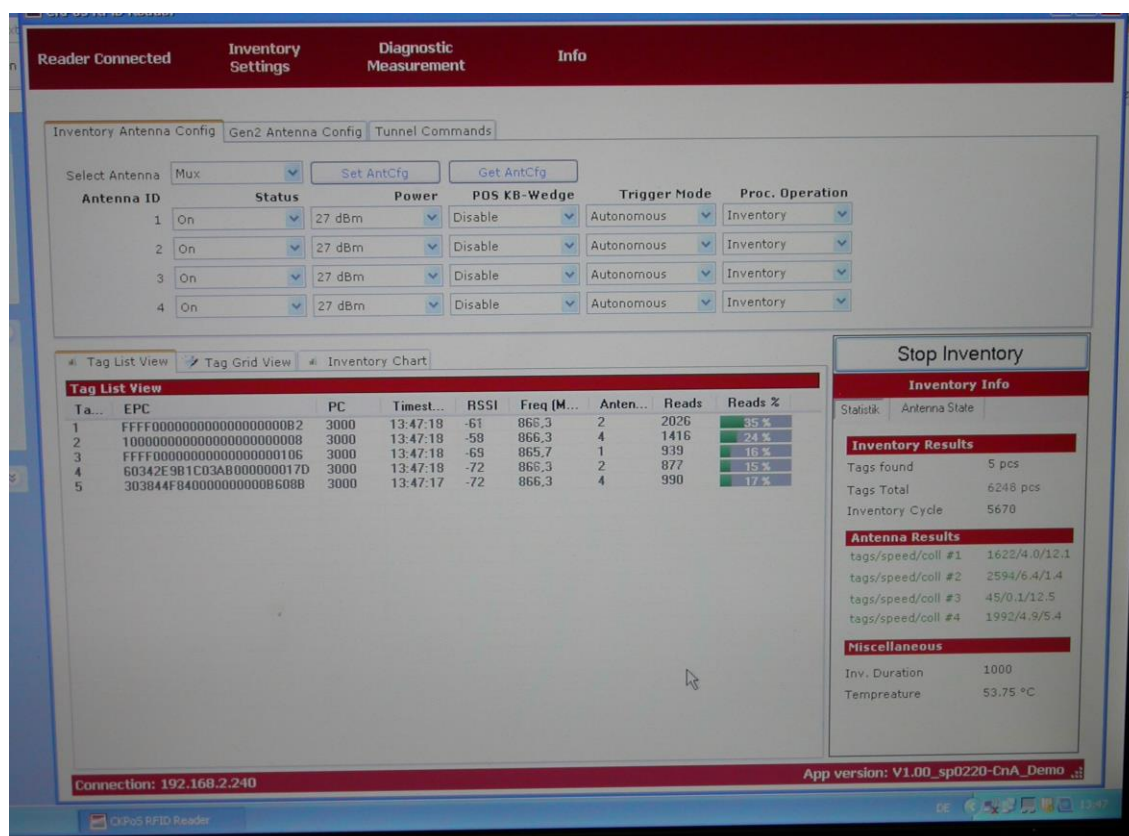
Following antennas are provided with the UHF Reader:

- PoS on Desk RFID only - Gain: < -10 dB
- PoS on Desk RFID + RF combined - Gain: < -10 dB
- PoS under Desk RFID only - Gain: < -10 dB
- PoS under Desk RFID + RF - Gain: < -10 dB
- PoS under Desk shielded RFID only - Gain: < -10 dB
- PoS on Desk Detacher RFID only - Gain: not applicable

For detailed information about the model and the antennas please refer to the user manual.

It is not possible to set the EuT only in receiving mode.

Screenshot of the supported test software:



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Declaration of the manufacturer:

RFID POS READER V2 Modification History

During development based on REV00 following modifications were done:

Modifications for REV R01 (released RN2644A)

- Introduction of cooling bracket
- CPU with 256kbyte RAM
- Documentation for Omnify

Modifications for REV R02 (not released)

- Layout Optimizations for Manufacturing at BB
- Swap from SPI1 to SPI0 for serial SRAM
- PTA11 CPU PIN connected to GND for hardware detection

Modifications for REV R03 (not released)

- Additional SPI Flash memory U21 PN 10048122
- Additional Capacitor C69 PN 7212833
- Additional Resistor R195 PN 7371337
- Additional Resistor R196 PN 7371337
- LED DS3-B connected to 12V from Power over Ethernet
- R57 modified from PN 7550507 to PN 7332883
- Additional Resistor R197 PN 7332883

Modifications for REV R04

- Additional Inductor L19 PN 10086744
- Additional Capacitor C70 PN 10038863
- Layout Modifications: adding L19 and C70, new position for C43, D5, C1
- Documentation for Omnify
- Modification label
- Addition to type reference "CPiD RFID 400 RDR"

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This test report covers partly testing from the spurious emissions with Rev03 of the UHF reader and the complete testing of the UHF Reader, Rev00, which was tested from 17. March 2014 up to 10. April 2014. For detailed information see test report T37444-01-00HU from CSA Group Bayern GmbH

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 : 08. December 2014

Testing concluded on : 08. December 2014

Checked by:

Tested by:

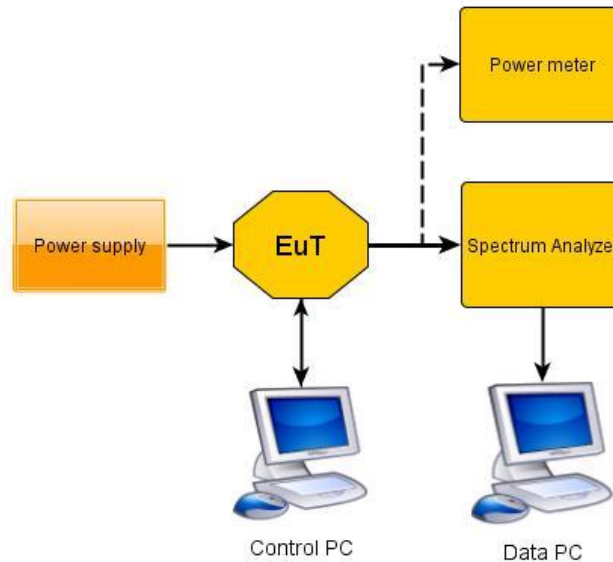
Klaus Gegenfurtner
Teamleader Radio

Markus Huber

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see Attachment A

3.2 Test setup



3.3 Power supply system utilised

Power supply voltage: : 100-240 V / 50-60 Hz / 1 ϕ , 12.0 V DC

3.4 Short description of the EUT

The EuT is a UHF RFID reader system. It can read active and passive Tags in the frequency range from 902 to 928 MHz.

Number of tested samples: 1
Serial number: Prototype

EUT operation mode:

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

- TAG reading mode supplying 27.0 dBm

- Standby mode

-

-

FCC ID: DO4-MPOSREADER**EUT configuration:**

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

- | | |
|---------------------------------------|--|
| - <u>Test software</u> | Model : <u>Supplied by manufacturer</u> |
| - <u>Lap Top</u> | Model : <u>CSA Group Bayern GmbH</u> |
| - <u>Antenna</u> | Model : <u>PoS on Desk RFID only</u> |
| - <u>Antenna</u> | Model : <u>PoS on Desk RFID + RF combined</u> |
| - <u>Antenna</u> | Model : <u>PoS under Desk RFID only</u> |
| - <u>Antenna</u> | Model : <u>PoS under Desk RFID + RF</u> |
| - <u>Antenna</u> | Model : <u>PoS under Desk shielded RFID only</u> |
| - <u>Antenna</u> | Model : <u>PoS on Desk Detacher RFID only</u> |
| - <u>Power supply</u> | Model : <u>EPSA 120100UE</u> |
| - <u>Test tags</u> | Model : <u>Supplied by Checkpoint</u> |
| - <u>Cisco Router – SF100D-08P V2</u> | |
| - <u>S/N DNI172904W9</u> | Model : <u>Supplied by Checkpoint</u> |
-
- customer specific cables
 - unscreened power cables

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.

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 C63.10: 2009, Testing Unlicensed Wireless Devices."

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.

4.4.1.2 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.

4.5 Determination of worst case measurement conditions

Pre measurements in the chamber shows that there are no differences regarding the spurious emissions in the frequency range from 9 kHz up to 1 GHz if the UHF Reader is powered via standard power supply or powered via switch (PoE). The spurious emissions test in the open area test site was performed with switch (PoE).

Also there are no differences at the spurious emissions from 1 GHz up to 10 GHz. These measurements, conducted and radiated where performed powered via standard power supply.

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 C

5.1.3 Applicable standard

According to FCC Part 15C, 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 limits in the following table.

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

5.1.4 Description of Measurement

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 μH (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 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.

To convert between dBμV and μV, the following conversions apply:

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

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz
Min. limit margin 2.66 dB at 0.3585 MHz

The requirements are **FULFILLED**.

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

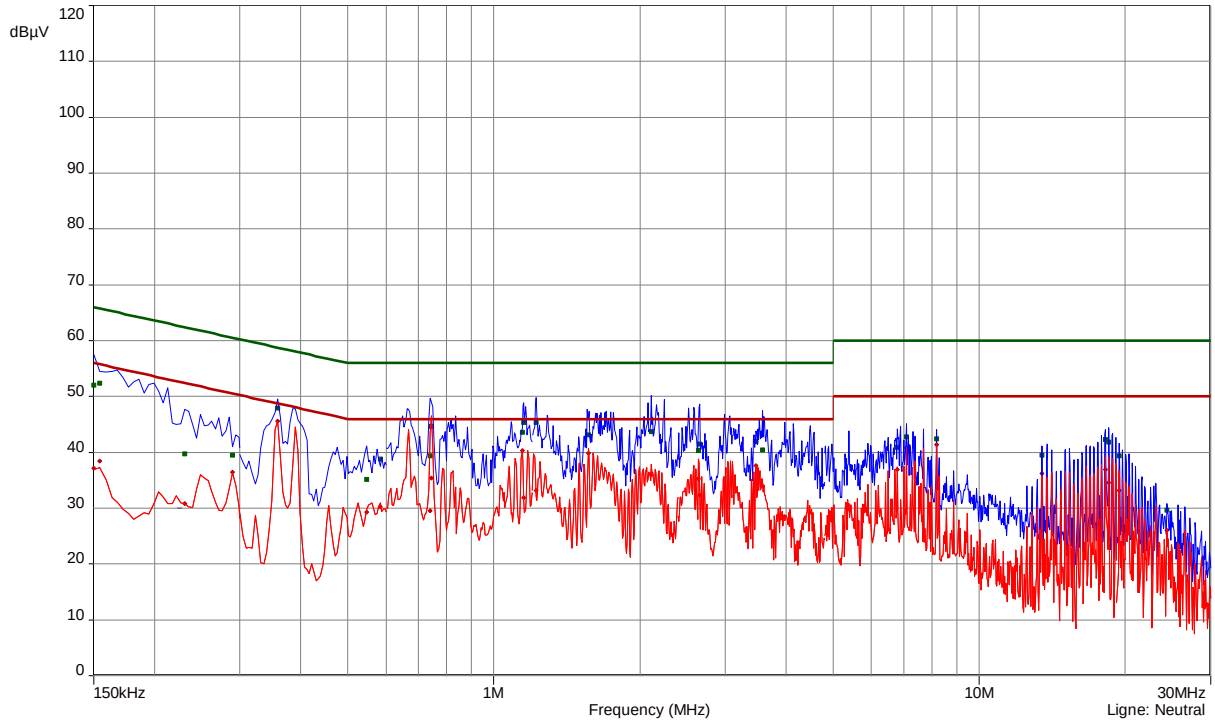
Test was performed from 17. March 2014 up to 10. April 2014.

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5.1.6 Test protocol

Test point: L1
 Operation mode: Tag reading mode supplying 27.0 dBm
 Remarks: Powered via PoE

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.1545	1	52.59	13.16	65.75	37.54	18.21	55.75	Phase 1
0.222	1	41.24	21.5	62.74	31.89	20.85	52.74	Phase 1
0.2625	1	40.31	21.04	61.35	34.49	16.86	51.35	Phase 1
0.3585	2	48.07	10.69	58.76	45.51	3.25	48.76	Phase 1
0.579	2	35.47	20.53	56	30.51	15.49	46	Phase 1
0.5925	2	34.93	21.07	56	30.95	15.05	46	Phase 1
0.7125	3	40.48	15.52	56	36.22	9.78	46	Phase 1
0.8295	3	38.31	17.69	56	27.41	18.59	46	Phase 1
1.1445	3	43.36	12.64	56	41.24	4.76	46	Phase 1
1.158	3	44.34	11.66	56	30.06	15.94	46	Phase 1
1.569	4	43.46	12.54	56	39.89	6.11	46	Phase 1
1.695	4	43.65	12.35	56	36.89	9.11	46	Phase 1
1.758	4	40.18	15.82	56	35.07	10.93	46	Phase 1
2.1765	4	43.58	12.42	56	33.32	12.68	46	Phase 1
2.5845	5	44.16	11.84	56	35.01	10.99	46	Phase 1
3.039	5	41.93	14.07	56	38.28	7.72	46	Phase 1
3.4665	5	42.21	13.79	56	36.93	9.07	46	Phase 1

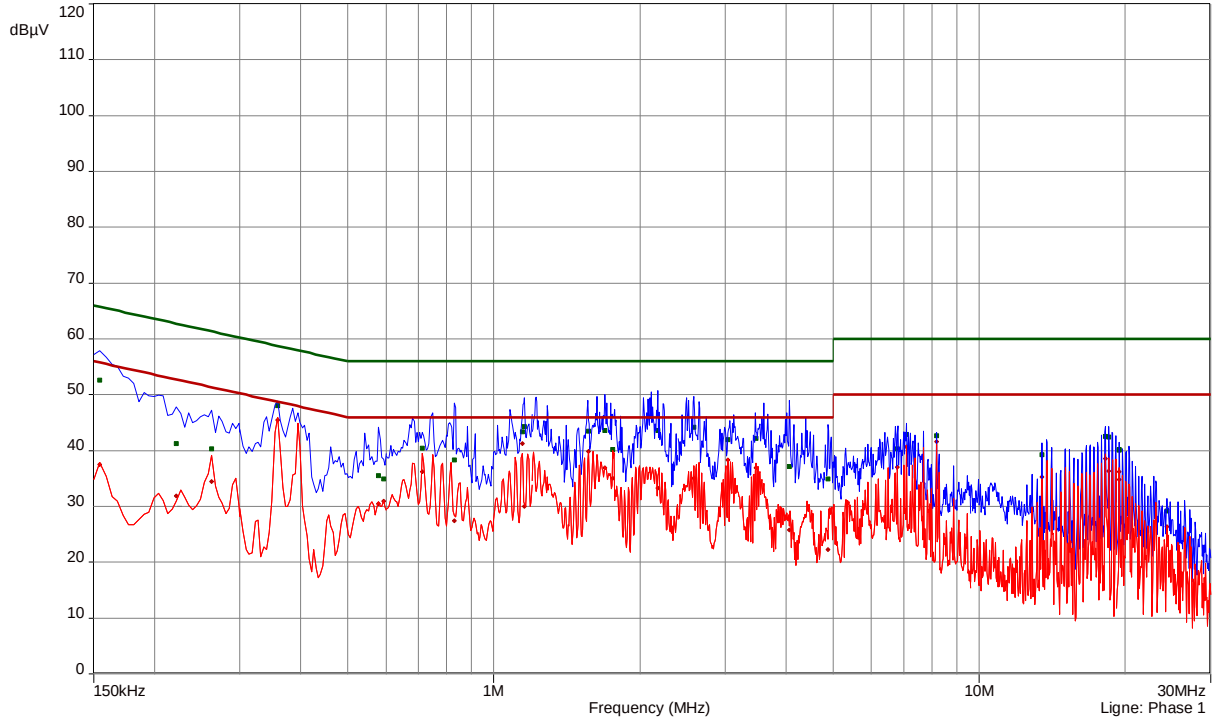
FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
4.065	5	37.19	18.81	56	25.76	20.24	46	Phase 1
4.8855	6	34.96	21.04	56	22.31	23.69	46	Phase 1
6.789	6	40.34	19.66	60	37.08	12.92	50	Phase 1
7.086	6	42.86	17.14	60	40.62	9.38	50	Phase 1
8.1705	6	42.65	17.35	60	41.62	8.38	50	Phase 1
13.479	7	39.31	20.69	60	35.33	14.67	50	Phase 1
18.1815	7	42.6	17.4	60	38.53	11.47	50	Phase 1
18.4875	7	42.44	17.56	60	36.35	13.65	50	Phase 1
19.434	8	40.24	19.76	60	34.86	15.14	50	Phase 1
19.4385	8	40.14	19.86	60	36.25	13.75	50	Phase 1
24.348	8	29.14	30.86	60	26.38	23.62	50	Phase 1

FCC ID: DO4-MPOSREADER

Test point: N
 Operation mode: Tag reading mode supplying 27.0 dBm
 Remarks: Powered via PoE

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.15	9	52.06	13.94	66	37.13	18.87	56	Neutral
0.1545	9	52.34	13.41	65.75	38.42	17.33	55.75	Neutral
0.231	9	39.69	22.72	62.41	30.88	21.53	52.41	Neutral
0.2895	9	39.51	21.03	60.54	36.45	14.09	50.54	Neutral
0.3585	10	47.91	10.85	58.76	45.62	3.14	48.76	Neutral
0.5475	10	35.19	20.81	56	29.32	16.68	46	Neutral
0.5835	10	38.77	17.23	56	30.24	15.76	46	Neutral
0.7395	11	39.4	16.6	56	29.51	16.49	46	Neutral
0.744	11	44.71	11.29	56	35.39	10.61	46	Neutral
1.1445	11	43.66	12.34	56	40.35	5.65	46	Neutral
1.1535	11	45.42	10.58	56	31.91	14.09	46	Neutral
1.2225	12	45.37	10.63	56	33.21	12.79	46	Neutral
1.569	12	43.1	12.9	56	39.91	6.09	46	Neutral
2.109	12	43.76	12.24	56	35.96	10.04	46	Neutral
2.643	13	40.35	15.65	56	35.28	10.72	46	Neutral
2.6565	13	41.44	14.56	56	32.32	13.68	46	Neutral
3.4665	13	41.91	14.09	56	37.66	8.34	46	Neutral
3.5745	13	40.46	15.54	56	33.97	12.03	46	Neutral
6.789	14	40.86	19.14	60	36.97	13.03	50	Neutral
7.086	14	42.78	17.22	60	40.81	9.19	50	Neutral

FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
8.1705	14	42.37	17.63	60	41.36	8.64	50	Neutral
13.479	15	39.51	20.49	60	36.21	13.79	50	Neutral
18.186	15	42.32	17.68	60	36.92	13.08	50	Neutral
18.4875	15	41.9	18.1	60	34.57	15.43	50	Neutral
19.4385	16	39.4	20.6	60	33.13	16.87	50	Neutral
24.348	16	29.66	30.34	60	26.06	23.94	50	Neutral

FCC ID: DO4-MPOSREADER

Test point

L1

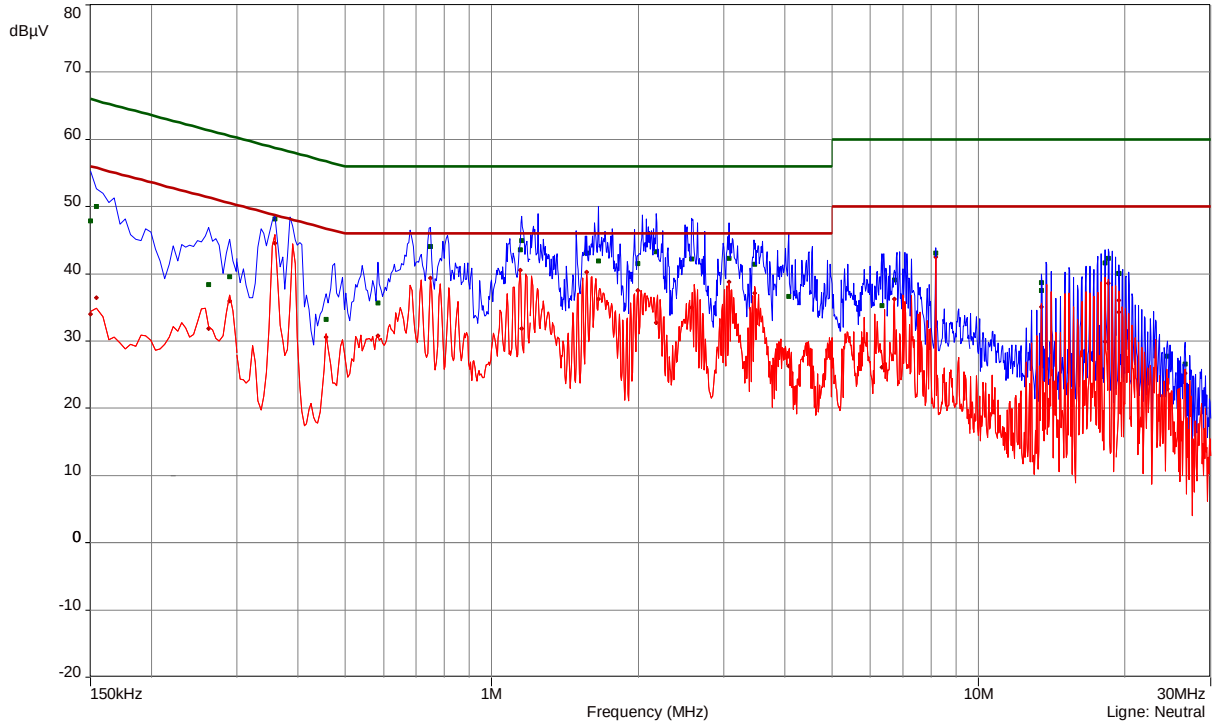
Result: Passed

Operation mode:

Standby mode

Remarks:

Powered via PoE



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.15	1	46.87	19.13	66	32.79	23.21	56	Phase 1
0.159	1	48.55	16.97	65.52	35.75	19.77	55.52	Phase 1
0.2175	1	38.41	24.5	62.91	29.63	23.28	52.91	Phase 1
0.294	1	40.53	19.88	60.41	36.45	13.96	50.41	Phase 1
0.3585	2	48.15	10.61	58.76	46.1	2.66	48.76	Phase 1
0.552	2	35.45	20.55	56	30.96	15.04	46	Phase 1
0.5835	2	35.29	20.71	56	30.66	15.34	46	Phase 1
0.744	3	43.43	12.57	56	35.05	10.95	46	Phase 1
0.7845	3	41.02	14.98	56	37.88	8.12	46	Phase 1
1.1535	3	44.48	11.52	56	31.73	14.27	46	Phase 1
1.176	3	43.34	12.66	56	40.26	5.74	46	Phase 1
1.6005	4	42.79	13.21	56	38.6	7.4	46	Phase 1
1.6635	4	42.69	13.31	56	36.97	9.03	46	Phase 1
1.992	4	40.3	15.7	56	35.5	10.5	46	Phase 1
2.1045	4	41.7	14.3	56	35.53	10.47	46	Phase 1
2.652	5	43.42	12.58	56	37.53	8.47	46	Phase 1
3.075	5	42.33	13.67	56	38.83	7.17	46	Phase 1
3.5025	5	41.73	14.27	56	37.02	8.98	46	Phase 1
4.4835	5	37.36	18.64	56	30.13	15.87	46	Phase 1

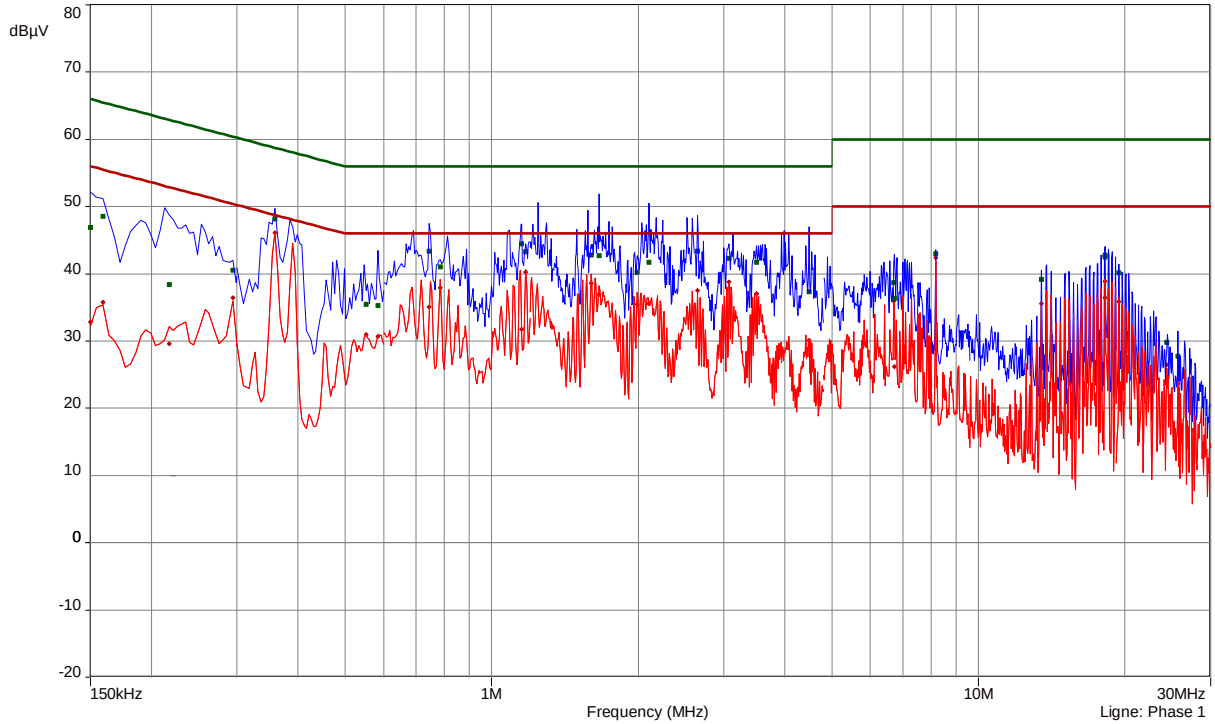
FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
4.4835	5	37.36	18.64	56	30.13	15.87	46	Phase 1
6.708	6	38.75	21.25	60	35.95	14.05	50	Phase 1
6.7305	6	36.39	23.61	60	26.23	23.77	50	Phase 1
8.1705	6	43.03	16.97	60	42.44	7.56	50	Phase 1
13.479	7	39.21	20.79	60	35.54	14.46	50	Phase 1
18.1815	7	42.78	17.22	60	38.93	11.07	50	Phase 1
18.186	7	42.46	17.54	60	36.46	13.54	50	Phase 1
19.434	8	40.14	19.86	60	35.83	14.17	50	Phase 1
24.348	8	29.78	30.22	60	26.51	23.49	50	Phase 1
25.6935	8	27.77	32.23	60	23.63	26.37	50	Phase 1

FCC ID: DO4-MPOSREADER

Test point N
Operation mode: Standby mode
Remarks: Powered via PoE

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.15	9	47.89	18.11	66	34.04	21.96	56	Neutral
0.1545	9	50.07	15.68	65.75	36.45	19.3	55.75	Neutral
0.2625	9	38.39	22.96	61.35	31.82	19.53	51.35	Neutral
0.2895	9	39.55	20.99	60.54	35.92	14.62	50.54	Neutral
0.3585	10	48.17	10.59	58.76	44.58	4.18	48.76	Neutral
0.4575	10	33.22	23.52	56.74	30.59	16.15	46.74	Neutral
0.5835	10	35.63	20.37	56	30.75	15.25	46	Neutral
0.7485	11	44.05	11.95	56	39.42	6.58	46	Neutral
1.1445	11	43.62	12.38	56	40.58	5.42	46	Neutral
1.1535	11	44.94	11.06	56	31.82	14.18	46	Neutral
1.569	12	43.12	12.88	56	40.22	5.78	46	Neutral
1.659	12	41.91	14.09	56	36.23	9.77	46	Neutral
1.9965	12	41.51	14.49	56	37.52	8.48	46	Neutral
2.1765	12	43.32	12.68	56	32.7	13.3	46	Neutral
2.5755	13	42.2	13.8	56	35.03	10.97	46	Neutral
3.075	13	42.31	13.69	56	38.77	7.23	46	Neutral
3.471	13	41.41	14.59	56	37.16	8.84	46	Neutral
4.074	13	36.61	19.39	56	26.31	19.69	46	Neutral

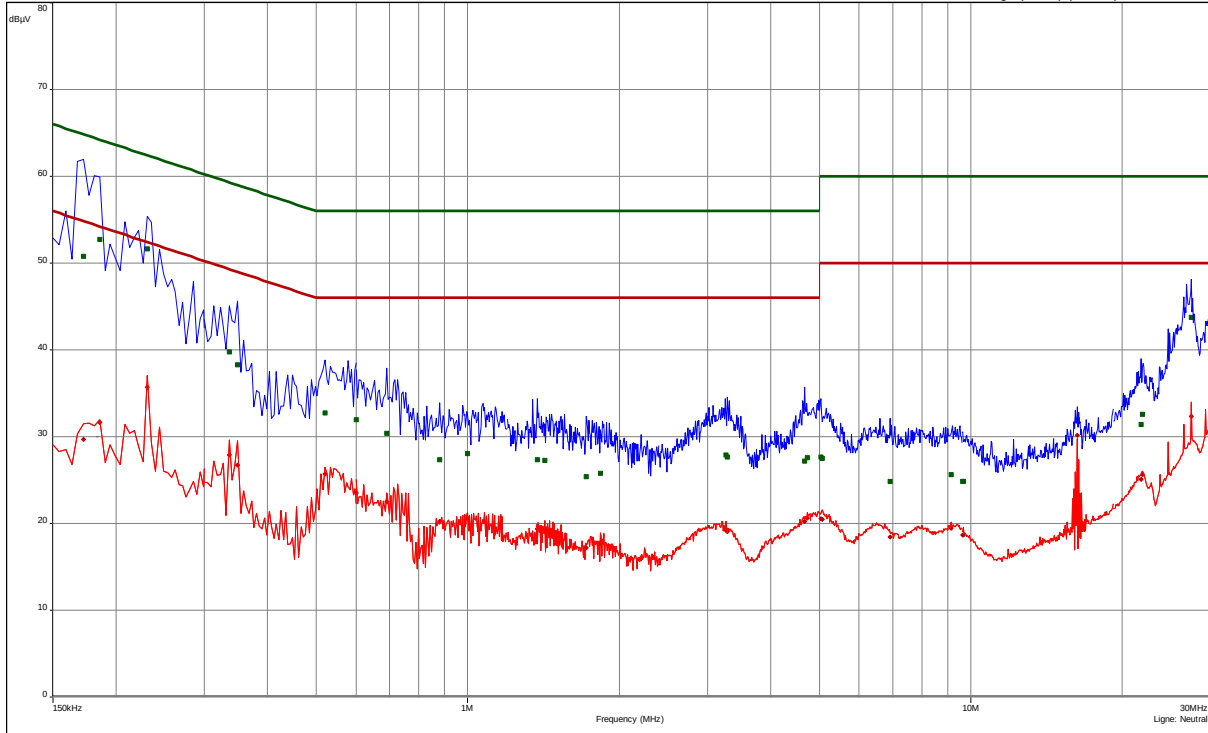
FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
6.33	14	35.27	24.73	60	26.07	23.93	50	Neutral
6.7125	14	39.13	20.87	60	36.24	13.76	50	Neutral
8.1705	14	43.13	16.87	60	42.51	7.49	50	Neutral
13.479	15	38.71	21.29	60	35.12	14.88	50	Neutral
13.488	15	37.53	22.47	60	28.76	21.24	50	Neutral
18.1995	15	41.64	18.36	60	29.95	20.05	50	Neutral
18.501	15	42.36	17.64	60	38.58	11.42	50	Neutral
19.443	16	40.1	19.9	60	34.34	15.66	50	Neutral
19.4475	16	40.06	19.94	60	36.09	13.91	50	Neutral
24.4695	16	27.78	32.22	60	22.89	27.11	50	Neutral
26.607	16	26.55	33.45	60	25.27	24.73	50	Neutral

FCC ID: DO4-MPOSREADER

Test point: L1
 Operation mode: Tag reading mode supplying 27.0 dBm
 Remarks: Powered via standard power supply

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.1545	9	50.92	14.83	65.75	27.9	27.85	55.75	Phase 1
0.1995	9	48.66	14.97	63.63	30.04	23.59	53.63	Phase 1
0.222	9	49.44	13.3	62.74	31.15	21.59	52.74	Phase 1
0.3135	10	37.55	22.33	59.88	23.33	26.55	49.88	Phase 1
0.318	10	38.52	21.24	59.76	23.77	25.99	49.76	Phase 1
0.5475	10	29.38	26.62	56	21.37	24.63	46	Phase 1
0.6	10	29.58	26.42	56	19.83	26.17	46	Phase 1
0.609	11	29.2	26.8	56	19.79	26.21	46	Phase 1
1.0545	11	27.29	28.71	56	18.91	27.09	46	Phase 1
1.086	11	27.29	28.71	56	19.29	26.71	46	Phase 1
1.452	12	27.2	28.8	56	19.43	26.57	46	Phase 1
1.479	12	27.58	28.42	56	19.56	26.44	46	Phase 1
1.776	12	26.87	29.13	56	18.74	27.26	46	Phase 1
1.812	12	26.46	29.54	56	18.48	27.52	46	Phase 1
3.2055	13	27.82	28.18	56	19.5	26.5	46	Phase 1
3.273	13	27.76	28.24	56	19.48	26.52	46	Phase 1
4.5735	13	26.55	29.45	56	19.45	26.55	46	Phase 1
4.785	13	27.82	28.18	56	20.3	25.7	46	Phase 1
4.818	14	27.72	28.28	56	20.44	25.56	46	Phase 1

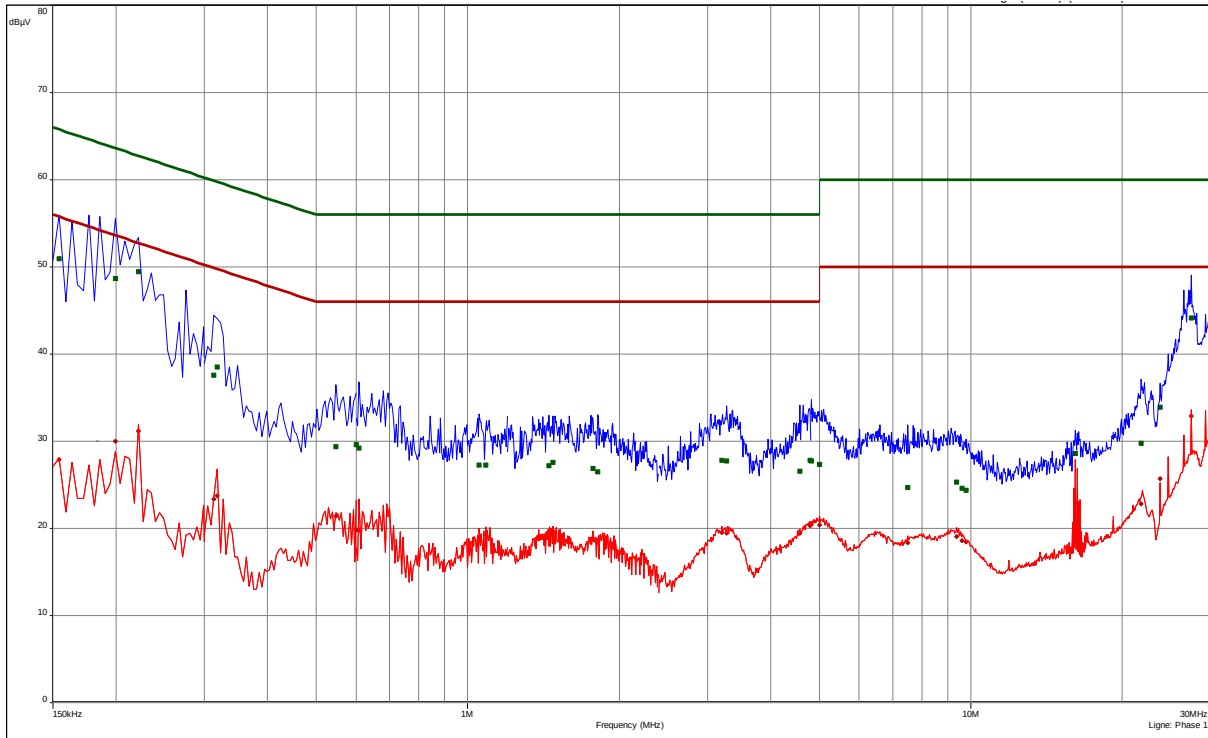
FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
4.818	14	27.72	28.28	56	20.44	25.56	46	Phase 1
4.998	14	27.37	28.63	56	20.43	25.57	46	Phase 1
7.5	14	24.68	35.32	60	18.35	31.65	50	Phase 1
9.3675	14	25.29	34.71	60	19.08	30.92	50	Phase 1
9.6045	15	24.6	35.4	60	18.58	31.42	50	Phase 1
9.771	15	24.4	35.6	60	18.43	31.57	50	Phase 1
16.1475	15	28.61	31.39	60	23.01	26.99	50	Phase 1
21.792	16	29.76	30.24	60	22.85	27.15	50	Phase 1
23.772	16	33.88	26.12	60	25.67	24.33	50	Phase 1
27.4305	16	44.11	15.89	60	32.88	17.12	50	Phase 1

FCC ID: DO4-MPOSREADER

Test point: N
 Operation mode: Tag reading mode supplying 27.0 dBm
 Remarks: Powered via standard power supply

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.1725	1	50.82	14.02	64.84	29.72	25.12	54.84	Neutral
0.186	1	52.76	11.45	64.21	31.62	22.59	54.21	Neutral
0.231	1	51.65	10.76	62.41	35.74	16.67	52.41	Neutral
0.336	2	39.78	19.52	59.3	27.88	21.42	49.3	Neutral
0.3495	2	38.26	20.71	58.97	26.72	22.25	48.97	Neutral
0.5205	2	32.71	23.29	56	25.67	20.33	46	Neutral
0.6	3	31.97	24.03	56	23.55	22.45	46	Neutral
0.69	3	30.4	25.6	56	22.49	23.51	46	Neutral
0.879	3	27.36	28.64	56	20.22	25.78	46	Neutral
1.0005	3	28.09	27.91	56	20.62	25.38	46	Neutral
1.3755	4	27.37	28.63	56	19.4	26.6	46	Neutral
1.425	4	27.28	28.72	56	19.3	26.7	46	Neutral
1.722	4	25.43	30.57	56	17.21	28.79	46	Neutral
1.8345	4	25.82	30.18	56	17.65	28.35	46	Neutral
3.264	5	27.88	28.12	56	19.23	26.77	46	Neutral
3.282	5	27.7	28.3	56	19.08	26.92	46	Neutral
4.668	5	27.2	28.8	56	20.25	25.75	46	Neutral
4.7355	5	27.57	28.43	56	20.61	25.39	46	Neutral

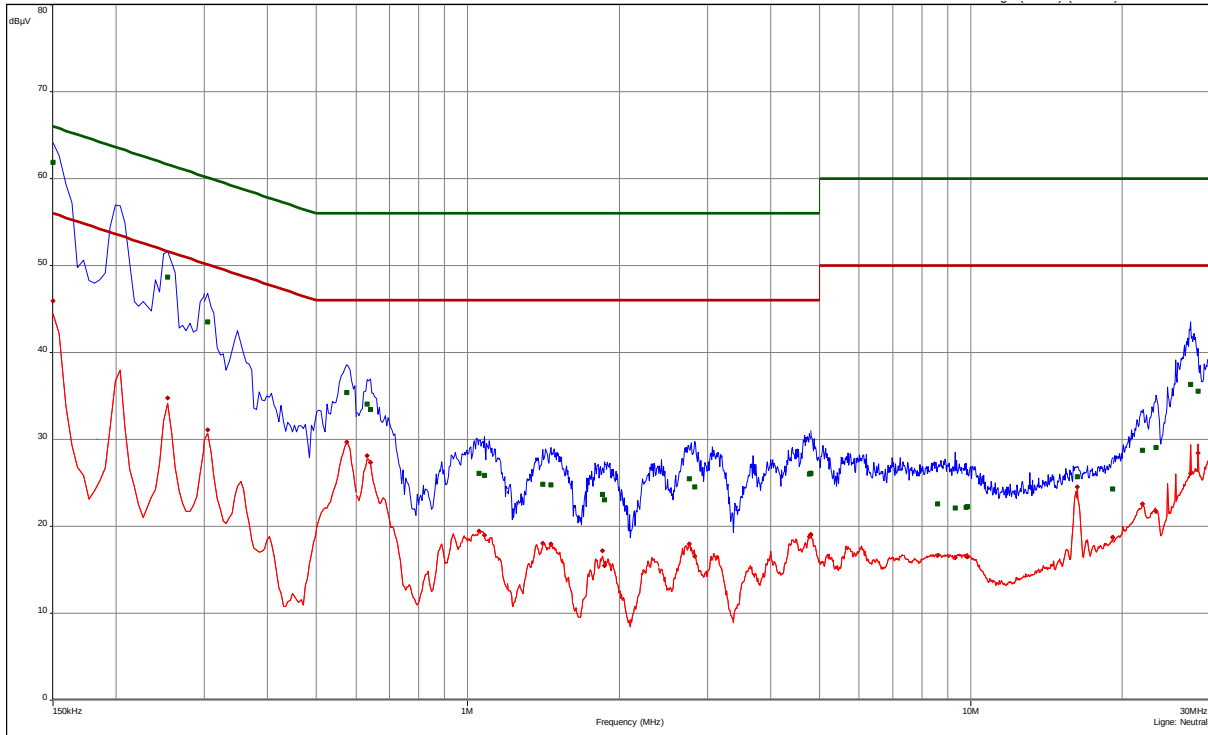
FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
4.7355	5	27.57	28.43	56	20.61	25.39	46	Neutral
5.034	6	27.69	32.31	60	20.58	29.42	50	Neutral
5.0655	6	27.52	32.48	60	20.51	29.49	50	Neutral
6.915	6	24.82	35.18	60	18.48	31.52	50	Neutral
9.138	6	25.61	34.39	60	19.48	30.52	50	Neutral
9.6225	7	24.86	35.14	60	18.64	31.36	50	Neutral
9.654	7	24.86	35.14	60	18.65	31.35	50	Neutral
16.2555	7	31.96	28.04	60	30.18	19.82	50	Neutral
21.774	8	31.45	28.55	60	25.06	24.94	50	Neutral
21.9405	8	32.61	27.39	60	25.63	24.37	50	Neutral
27.417	8	43.79	16.21	60	32.34	17.66	50	Neutral

FCC ID: DO4-MPOSREADER

Test point L1
 Operation mode: Standby mode
 Remarks: Powered via standard power supply

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.15	9	58.87	7.13	66	43.16	12.84	56	Phase 1
0.1545	9	57.4	8.35	65.75	41.43	14.32	55.75	Phase 1
0.249	9	44.2	17.59	61.79	28.35	23.44	51.79	Phase 1
0.2535	9	45.54	16.1	61.64	30.36	21.28	51.64	Phase 1
0.3045	10	40.05	20.07	60.12	26.41	23.71	50.12	Phase 1
0.57	10	31.91	24.09	56	24.5	21.5	46	Phase 1
0.5835	10	30.87	25.13	56	23.86	22.14	46	Phase 1
0.6315	11	32.45	23.55	56	25.96	20.04	46	Phase 1
0.636	11	32.15	23.85	56	25.53	20.47	46	Phase 1
1.059	11	25.79	30.21	56	18.93	27.07	46	Phase 1
1.0635	11	26.05	29.95	56	19.05	26.95	46	Phase 1
1.461	12	25.54	30.46	56	18.62	27.38	46	Phase 1
1.47	12	25.28	30.72	56	18.71	27.29	46	Phase 1
1.749	12	23.32	32.68	56	16.18	29.82	46	Phase 1
1.803	12	24.19	31.81	56	17.2	28.8	46	Phase 1
2.7645	13	24.77	31.23	56	17.06	28.94	46	Phase 1
3.1065	13	24.21	31.79	56	16.83	29.17	46	Phase 1

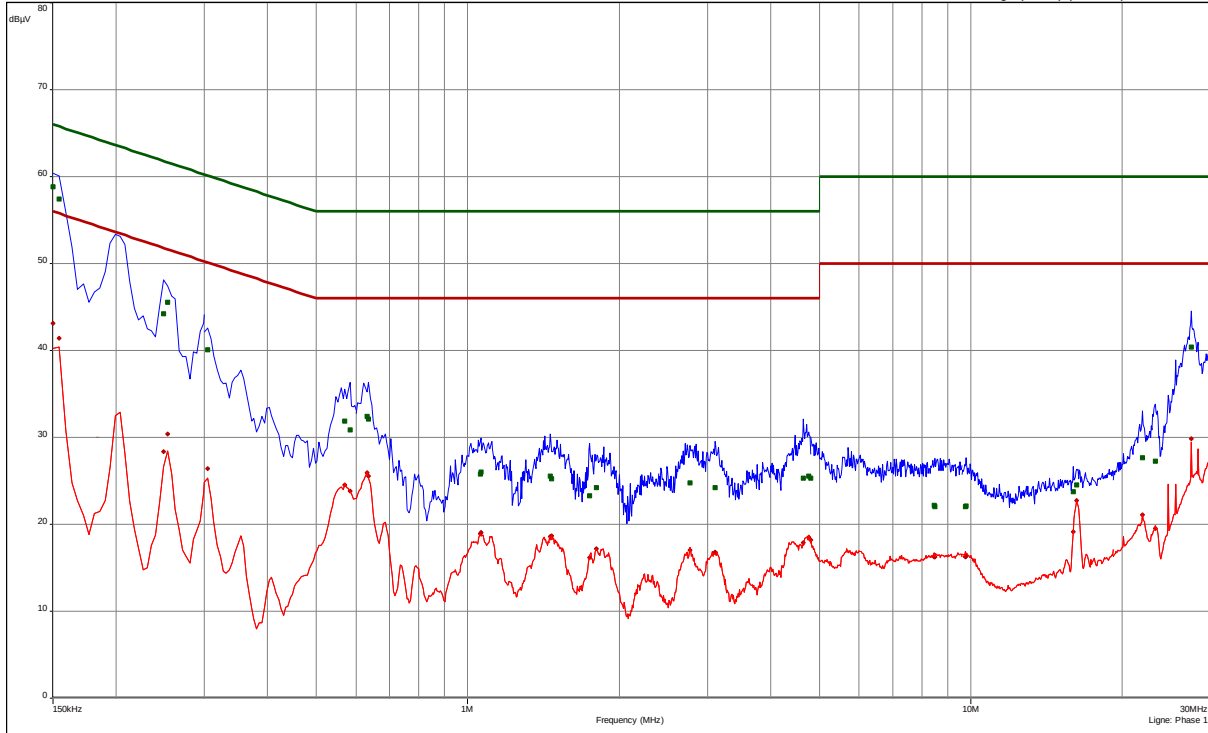
FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
4.6455	13	25.32	30.68	56	17.87	28.13	46	Phase 1
4.758	13	25.53	30.47	56	18.5	27.5	46	Phase 1
4.8	14	25.3	30.7	56	18.18	27.82	46	Phase 1
8.454	14	22.16	37.84	60	16.28	33.72	50	Phase 1
8.49	14	22.08	37.92	60	16.29	33.71	50	Phase 1
9.7395	15	22.06	37.94	60	16.29	33.71	50	Phase 1
9.798	15	22.08	37.92	60	16.34	33.66	50	Phase 1
15.999	15	23.73	36.27	60	19.13	30.87	50	Phase 1
16.2465	15	24.54	35.46	60	22.76	27.24	50	Phase 1
21.9045	16	27.68	32.32	60	21.13	28.87	50	Phase 1
23.286	16	27.29	32.71	60	19.54	30.46	50	Phase 1
27.381	16	40.42	19.58	60	29.85	20.15	50	Phase 1

FCC ID: DO4-MPOSREADER

Test point: N
 Operation mode: Standby mode
 Remarks: Powered via standard power supply

Result: Passed



freq MHz	SR	QP dB(μV)	margin dB	limit dB	AV dB(μV)	margin dB	limit dB	line
0.15	1	61.86	4.14	66	45.92	10.08	56	Neutral
0.2535	1	48.7	12.94	61.64	34.78	16.86	51.64	Neutral
0.3045	2	43.54	16.58	60.12	31.08	19.04	50.12	Neutral
0.5745	2	35.41	20.59	56	29.7	16.3	46	Neutral
0.6315	3	34.09	21.91	56	28.12	17.88	46	Neutral
0.6405	3	33.45	22.55	56	27.33	18.67	46	Neutral
1.0545	3	26.09	29.91	56	19.46	26.54	46	Neutral
1.0815	3	25.89	30.11	56	18.96	27.04	46	Neutral
1.4115	4	24.82	31.18	56	18.03	27.97	46	Neutral
1.4655	4	24.8	31.2	56	17.99	28.01	46	Neutral
1.8525	4	23.71	32.29	56	17.21	28.79	46	Neutral
1.8705	4	23.05	32.95	56	15.5	30.5	46	Neutral
2.76	5	25.44	30.56	56	17.94	28.06	46	Neutral
2.823	5	24.53	31.47	56	16.57	29.43	46	Neutral
4.7805	5	26.02	29.98	56	18.84	27.16	46	Neutral
4.8	5	26.1	29.9	56	19.06	26.94	46	Neutral
4.8	6	26.12	29.88	56	18.98	27.02	46	Neutral
8.598	6	22.55	37.45	60	16.64	33.36	50	Neutral

FCC ID: DO4-MPOSREADER

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
9.3	6	22.14	37.86	60	16.44	33.56	50	Neutral
9.7935	7	22.18	37.82	60	16.55	33.45	50	Neutral
9.852	7	22.26	37.74	60	16.5	33.5	50	Neutral
16.2915	7	25.71	34.29	60	24.54	25.46	50	Neutral
19.1535	7	24.27	35.73	60	18.79	31.21	50	Neutral
21.8955	8	28.76	31.24	60	22.58	27.42	50	Neutral
23.2995	8	29.07	30.93	60	21.71	28.29	50	Neutral
27.363	8	36.37	23.63	60	26.06	23.94	50	Neutral
28.281	8	35.56	24.44	60	28.44	21.56	50	Neutral

FCC ID: DO4-MPOSREADER

5.2 20 dB bandwidth

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

5.2.1 Description of the test location

Test location: Shielded Room S4

5.2.2 Photo documentation of the test set-up

See Attachment C

5.2.1 Applicable standard

According to FCC Part 15C, Section 15.247(a):

Frequency hopping systems shall have hopping carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.2.2 Description of Measurement

The bandwidth is measured at an amplitude level reduced from 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.

5.2.3 Test result

Power setting 27.0 dBm:

Channel No.	-20 dB Bandwidth below peak (kHz)
CH 1 (902.25 MHz)	82.8
CH 26 (915.25 MHz)	81.6
CH 50 (927.25 MHz)	84.6

Bandwidth limit according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit -20 dB bandwidth (kHz)
902-928	≥ 50	< 250

The requirements are **FULFILLED**.

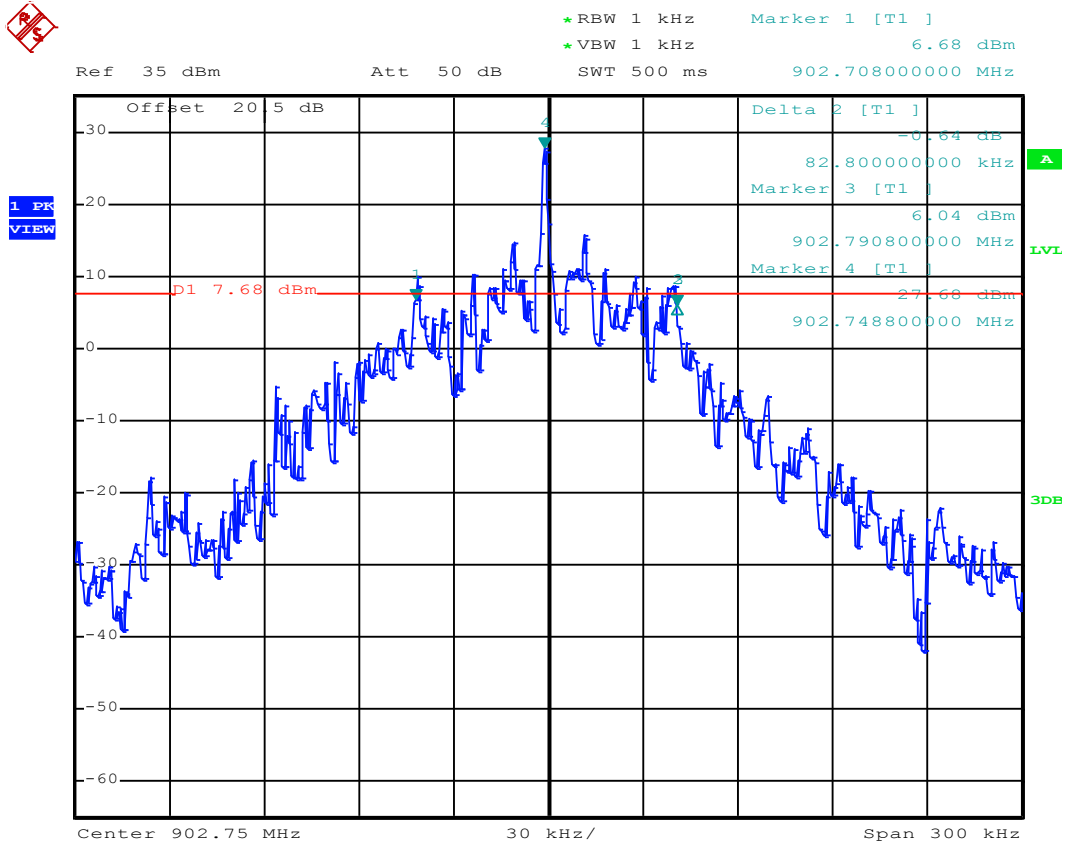
Remarks: For detailed test result please refer to following test protocol.

Test was performed from 17. March 2014 up to 10. April 2014.

FCC ID: DO4-MPOSREADER

5.2.4 Test protocol

Channel 1
902.25 MHz



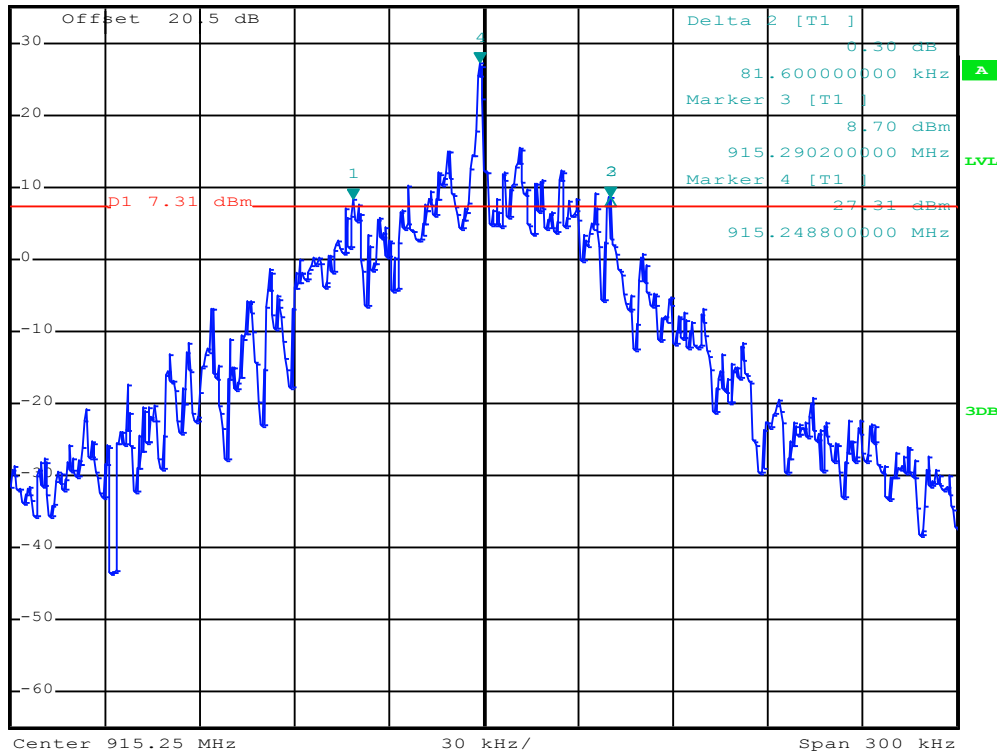
FCC ID: DO4-MPOSREADER

Channel 25
915.25 MHz



*RBW 1 kHz Marker 1 [T1]
*VBW 1 kHz 8.40 dBm
Ref 35 dBm Att 50 dB SWT 500 ms 915.208600000 MHz

1 PK
VIEW



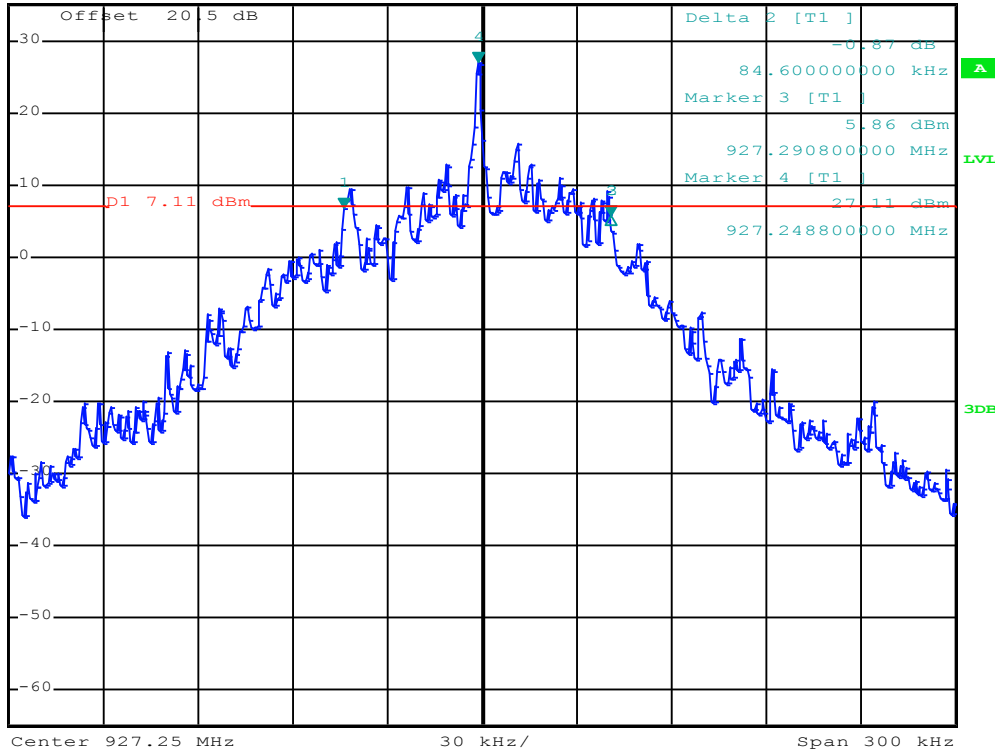
FCC ID: DO4-MPOSREADER

Channel 50
927.25 MHz



*RBW 1 kHz Marker 1 [T1]
*VBW 1 kHz 6.74 dBm
Ref 35 dBm Att 50 dB SWT 500 ms 927.206200000 MHz

1 PK
VIEW



FCC ID: DO4-MPOSREADER

5.3 Maximum peak conducted output power

For test instruments and accessories used see section 6 Part CPC 2.

5.3.1 Description of the test location

Test location: Shielded Room S4

5.3.2 Photo documentation of the test set-up

See Attachment C

5.3.3 Applicable standard

According to FCC Part 15C, Section 15.247(b)(2):

For frequency hopping systems operating in the 902-928 MHz band the maximum peak conducted output power shall not exceed the limit of 1 watt for systems employing at least 50 hopping channels.

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode using the assigned frequency.

Spectrum analyser settings:

RBW	100 kHz	Sweep time	5 ms (Auto)
VBW	100 kHz	Power Mode	Max. hold
Detector	Peak	Span	500 kHz

FCC ID: DO4-MPOSREADER

5.3.5 Test result

a.) Power setting 27.0 dBm

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Delta (dB)
1	902.25	27.11	30.0	-2.89
26	915.25	26.96	30.0	-3.04
50	927.25	26.87	30.0	-3.03

Note: Test cable loss and fixed attenuation of 20 dB are included in the analyzer reading (Offset).

Peak Power Limit according to FCC Part 15C, Section 15.247(b)(2):

Frequency (MHz)	Hopping channels	Hop. CH carrier frequ. separation	Peak Power Limit	
			(dBm)	(W)
902-928	≥ 50		30	1.0

The requirements are **FULFILLED**.

Remarks:

Test was performed from 17. March 2014 up to 10. April 2014.

FCC ID: DO4-MPOSREADER**5.4 Spurious RF conducted emissions**

For test instruments and accessories used see section 6 Part SEC1, SEC2 and SEC3.

5.4.1 Description of the test location

Test location: Shielded Room S4

5.4.2 Photo documentation of the test set-up

See Attachment C

5.4.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band 902 to 928 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.4.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode at the assigned frequency.

Spectrum analyzer settings:

RBW	100 kHz
VBW	300 kHz
Detector	Max. peak
Trace:	Max. hold
Sweep time	auto

FCC ID: DO4-MPOSREADER**5.4.5 Test result**

Power setting 27.0 dBm

Hopping frequency from 902.25 to 927.25 MHz, max. level 27.87 dBm			
Frequency (MHz)	Peak power * (dBm)	Limit (-20 dB) (dBm)	Delta (dB)
112.296	-36.95	7.87	-44.8
327.14	-57.57	7.87	-65.4
2170.0	-28.53	7.87	-36.4
4024.0	-55.86	7.87	-63.7
5446.0	-53.47	7.87	-61.3

* Fixed attenuation of 20 dB is included in the Peak power.

The requirements are **FULFILLED**.

Remarks: All spurious emissions falling in restricted bands have been measured radiated.

For detailed results please refer to following test protocols.

In the frequency range from 9 kHz to 30 MHz no emissions could be measured.

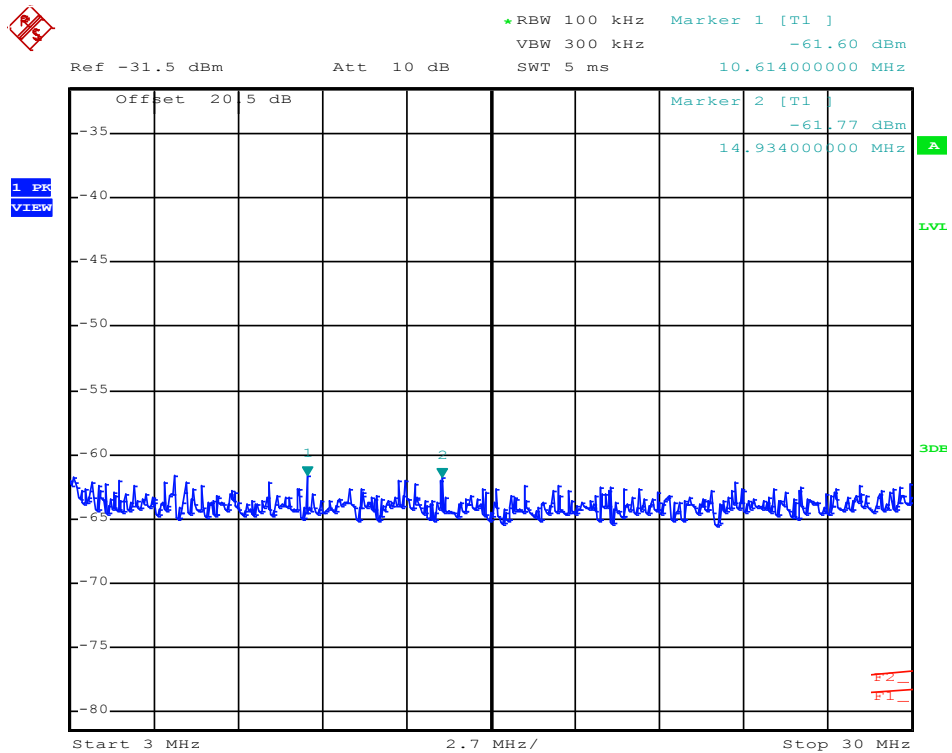
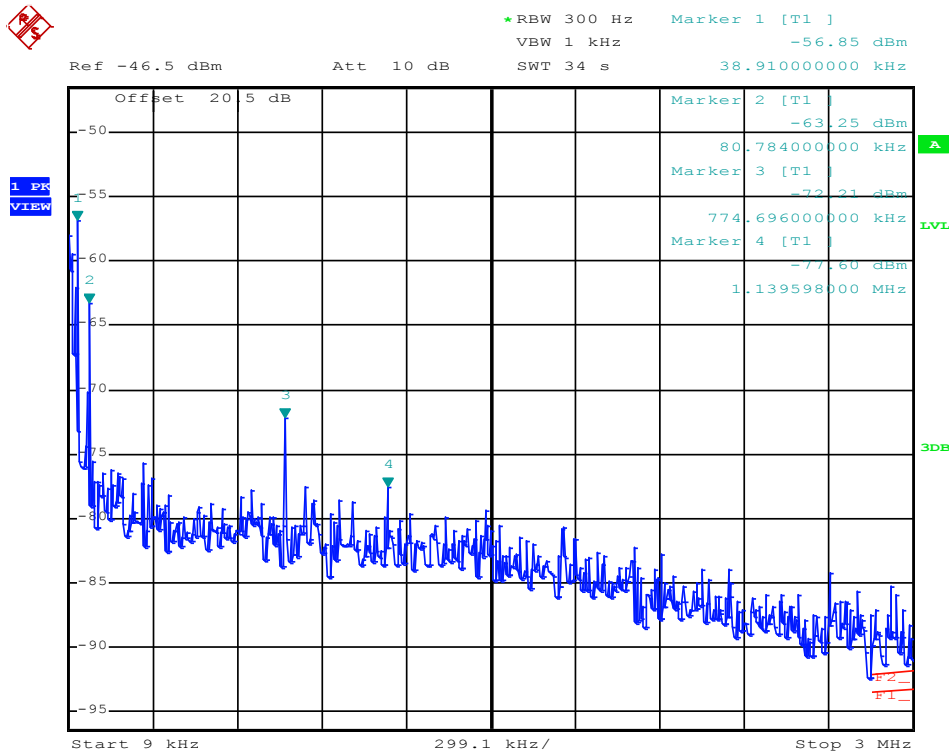
Test was performed in frequency hopping mode from 902.25 to 927.25 MHz.

This mode represents the worst case mode of the EuT.

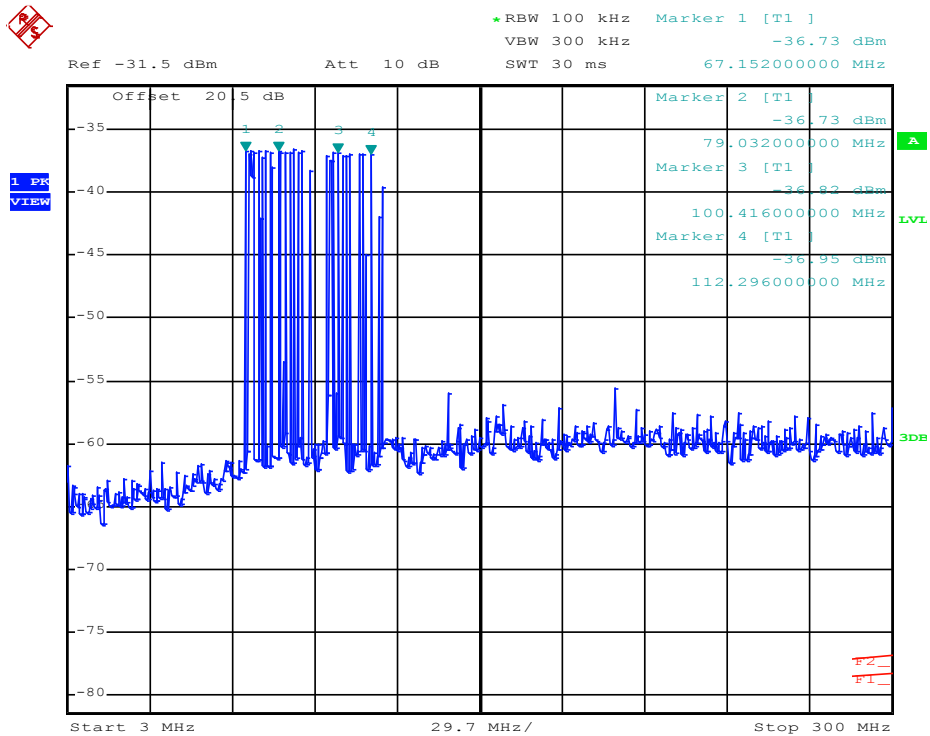
Test was performed from 17. March 2014 up to 10. April 2014.

FCC ID: DO4-MPOSREADER

Conducted RF emission from 9 kHz to 300 MHz

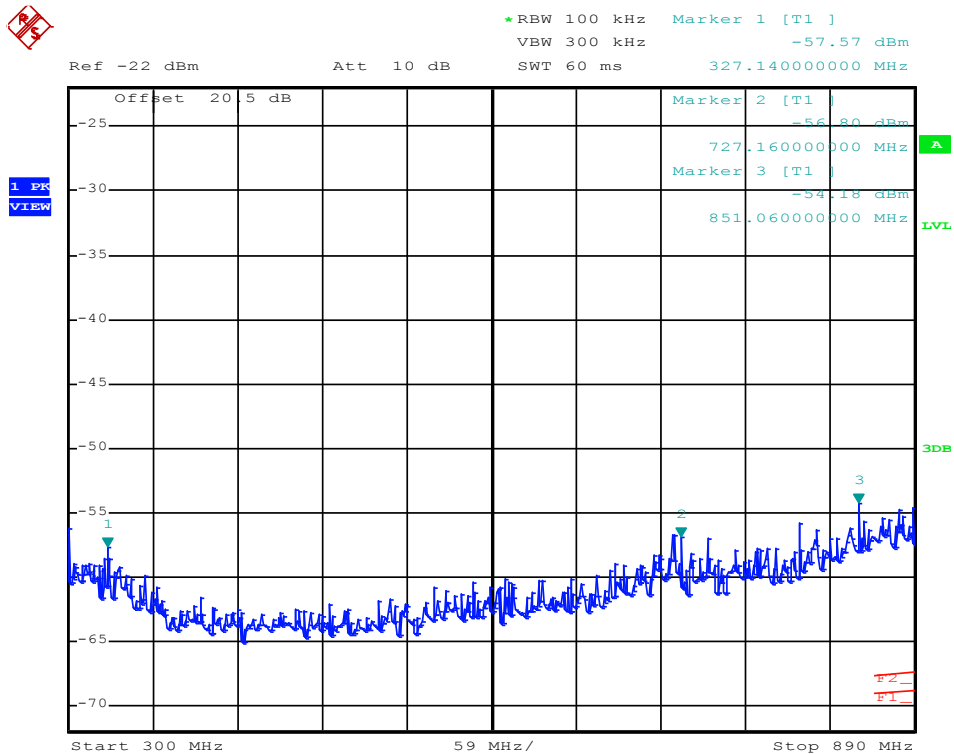


FCC ID: DO4-MPOSREADER



Note: Signal level no. 4 is located in restricted band.

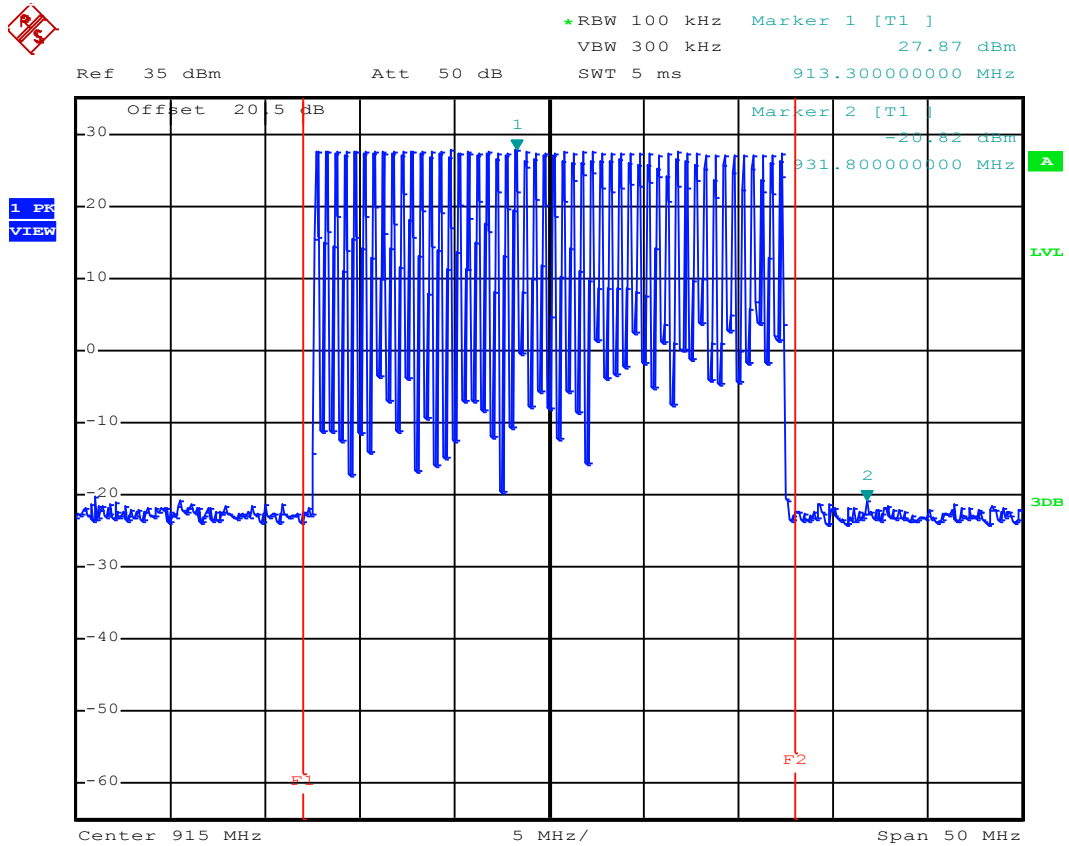
Conducted RF emission from 300 to 1000 MHz



Note: Signal level no. 1 is located in restricted band.

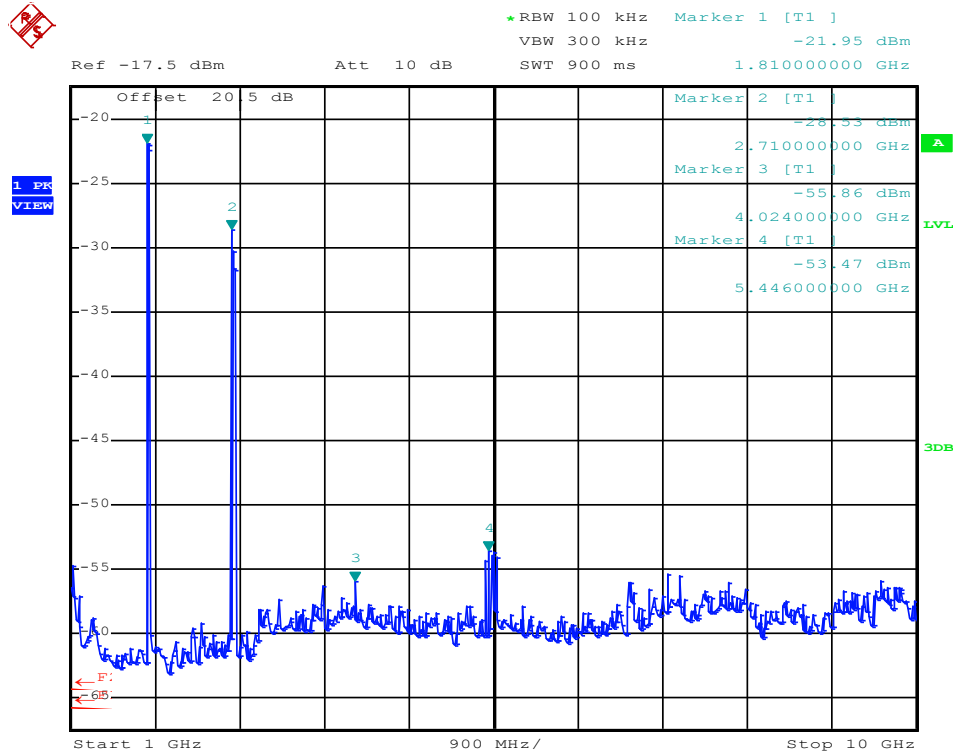
FCC ID: DO4-MPOSREADER

Conducted RF emission from 30 to 1000 MHz
(Band edge)



FCC ID: DO4-MPOSREADER

Conducted RF emission from 1 to 10 GHz



FCC ID: DO4-MPOSREADER

5.5 Spurious radiated emissions

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

5.5.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

Test location: Anechoic Chamber A1
Test distance: 3 metres

5.5.2 Photo documentation of the test set-up

See Attachment C

5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 902 to 928 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.5.4 Description of Measurement

Radiated spurious emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linear polarized antennas. The measurements are made with 120 kHz bandwidth and quasi-peak detection (200 Hz, 9 kHz up to 30 MHz). The EUT was placed on a 1.0 X 1.5 metres non-conducting table 80 centimetres above the ground plane. The setup of the equipment under test will be in accordance to ANSI C63.4. The antenna was positioned 3 metres horizontally from the EUT. To locate maximum emissions from the EUT the antenna is shifted in height from 1 to 4 metres, after the EUT is rotated 360 degrees. The measurement scan is made in horizontal and vertical polarization of the antenna.

For the radiated measurement up from 1 GHz to maximum frequency as specified in Section 15.33, a spectrum analyzer and appropriate linear polarized antennas are used. The EUT is placed on a 1.0 X 1.5 metres non-conducting table 80 centimetres above the ground plane. The setup of the EUT will be in accordance to ANSI C63.4. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions the EUT was rotated 360 degrees in the fully anechoic chamber. The measurement scan is made in horizontal and vertical polarization of the antenna. For testing above 1 GHz, if the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, 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.

FCC ID: DO4-MPOSREADER

5.5.5 Test result

5.5.5.1 Radiated emission test $f < 1$ GHz

Frequency [kHz]	L: QP [dB μ V]	L: AV [dB μ V]	Bandwidth [kHz]	Correct. [dB]	L: QP [dB μ V/m]	L: AV [dB μ V/m]	Limit [dB μ V/m]	Delta [dB]
536.8	24.1	19.7	9.0	20	44.1	39.7	73.0	-33.3
1073.6	23.4	18.0	9.0	20	43.4	38.0	67.0	-29.0
1342.0	21.6	15.9	9.0	20	41.6	35.9	65.0	-29.1

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.
Only ambient noises could be detected.

The table shows an extract of the critical values:

Frequency (MHz)	Reading Vert. (dB μ V)	Reading Hor. (dB μ V)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dB μ V/m)	Level Hor. (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
48,46		9,4		14,3		23,7	40,0	-16,3
85,00		17,7		11,2		28,9	40,0	-11,1
122,30	21,6	25,2	11,2	11,9	32,8	37,1	43,5	-6,4
141,40	6,7	8,9	10,0	10,7	16,7	19,6	43,5	-23,9
300,00	16,8	14,3	19,0	18,5	35,8	32,8	46,0	-10,2
500,00	14,1	15,6	24,9	24,7	39,0	40,3	46,0	-5,7
600,00	7,2	9,8	28,4	28,2	35,6	38,0	46,0	-8,0
700,00	5,6	6,2	29,8	29,2	35,4	35,4	46,0	-10,6
48,39	10,1		15,4		25,5		40,0	-14,5
59,98	5,4		13,8		19,2		40,0	-20,8
113,42	11,9		11,9		23,8		43,5	-19,7
150,00	6,8		10,4		17,2		43,5	-26,3
180,00	19,7		12,5		32,2		43,5	-11,3
200,00	6,9		13,8		20,7		43,5	-22,8
360,00	4,8		20,9		25,7		46,0	-20,3
400,00	14,9		22,1		37,0		46,0	-9,0

Remarks: Test was performed on 08. December 2014.

FCC ID: DO4-MPOSREADER

5.5.5.2 Radiated emission test f > 1GHz

Power setting 27.0 dBm

Frequency (GHz)	L: PK (dBμV)	L: AV (dBμV)	Bandwidth (kHz)	Correct. (dB)	L: PK dB(μV/m)	L: AV dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
2.170	70.0	60.4	1000	-12.1	57.9	48.3	54.0	-5.7
4.024	51.1	43.4	1000	2.3	53.4	45.7	54.0	-8.3
5.446	47.9	39.6	1000	4.7	52.6	44.3	54.0	-9.7

Remarks: Test was performed from 17. March 2014 up to 10. April 2014.

*) Average values were measured with spectrum analyzer by the following settings

RBW: 1 MHz

VBW: 10 Hz

Sweep: Auto

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(μV/m)	dB(μV/m)	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	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

FCC ID: DO4-MPOSREADER

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209: (Refer to section 5.5.5.1)

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

The requirements are **FULFILLED**.

Remarks: During the test the EUT was set into TX continuous mode with normal modulation.

The measurement was performed up to the 10th harmonic (10000 MHz).

During the test the EUT was powered via standard power supply.

Test was performed in frequency hopping mode from 902.25 to 927.25 MHz.

This mode represents the worst case mode of the EUT.

FCC ID: DO4-MPOSREADER

5.6 Hopping sequence

Requirement according to FCC Part 15C, Section 15.247(a):

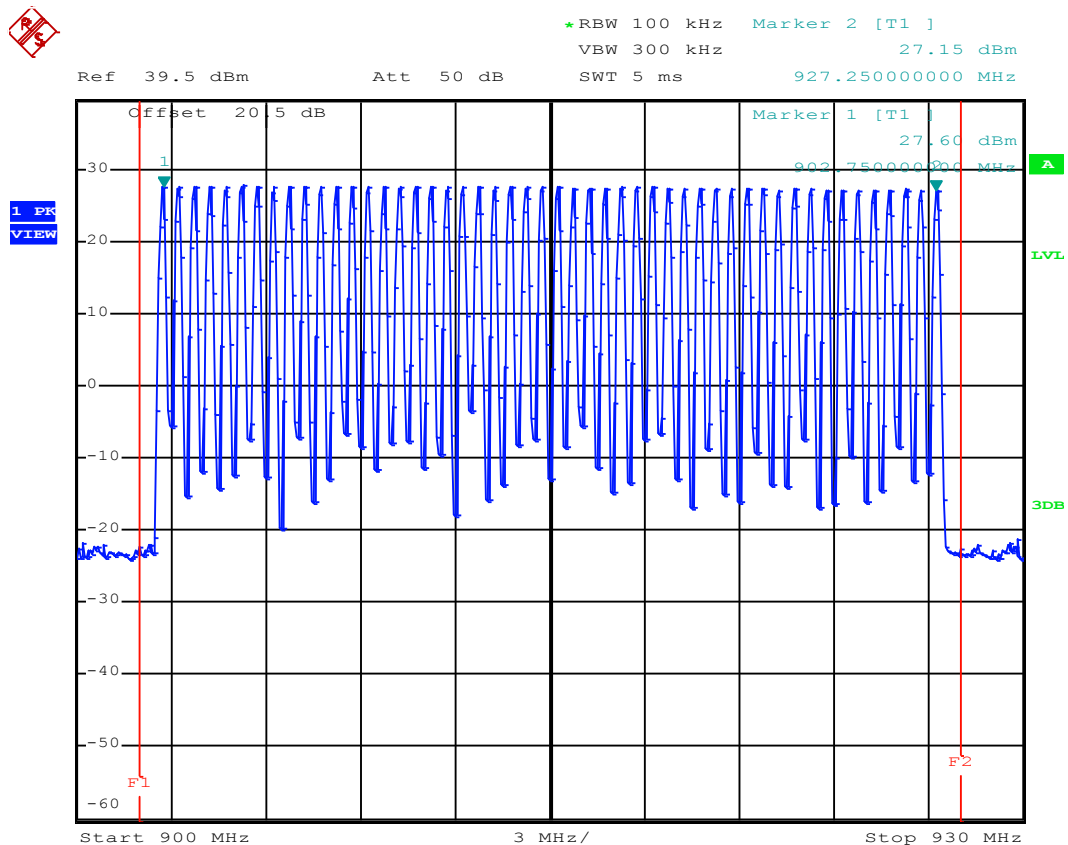
The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

Remarks: The channel is represented by a pseudo-random hopping sequence hopping through the 50 RF-channels.

For detailed information about the hopping sequence, please refer to "Theory of Operation Manual".

Test was performed from 17. March 2014 up to 10. April 2014.

5.6.1 Test protocol



FCC ID: DO4-MPOSREADER

5.7 Equal hopping frequency use

Requirement according to FCC Part 15C, Section 15.247(a):
Each frequency must be used equally on the average by each transmitter.

Remarks: The device fulfills the requirement according to FCC Part 15C, Section 15.247(a).
The manufacturer declares in the system manual that this function is controlled via software.
For detailed information about the hopping sequence, please refer to
"Theory of Operation Manual".

5.8 Receiver input bandwidth

Requirement according to FCC Part 15C, Section 15.247(a):
The system receivers shall have input bandwidth that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signal.

Remarks: The receiver bandwidth is equal to the transmitter bandwidth in the 50 hopping channel mode.
(Declared by the manufacturer.)
For detailed information about the hopping sequence, please refer to
"Theory of Operation Manual".

FCC ID: DO4-MPOSREADER

5.9 Dwell time

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

5.9.1 Description of the test location

Test location: Shielded Room S4

5.9.2 Photo documentation of the test set-up

See Attachment C

5.9.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(i):

Frequency hopping systems operating in the 902-928 MHz band: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

5.9.4 Description of Measurement

The measurement was done using a spectrum analyser in time domain function and able to store the maximum time of a period. This time period has been stored and added up the appropriate time intervals the hopping system has applied this channel.

5.9.5 Test result

Channel frequency (MHz)	Number of Bursts (in 1 time period)	Dwell time (ms)
914.75	1	376.8

Requirement according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	time of one period (s)	Limit dwell time, AV (ms)
902-928	≥ 50	20	< 400

The requirements are **FULFILLED**.

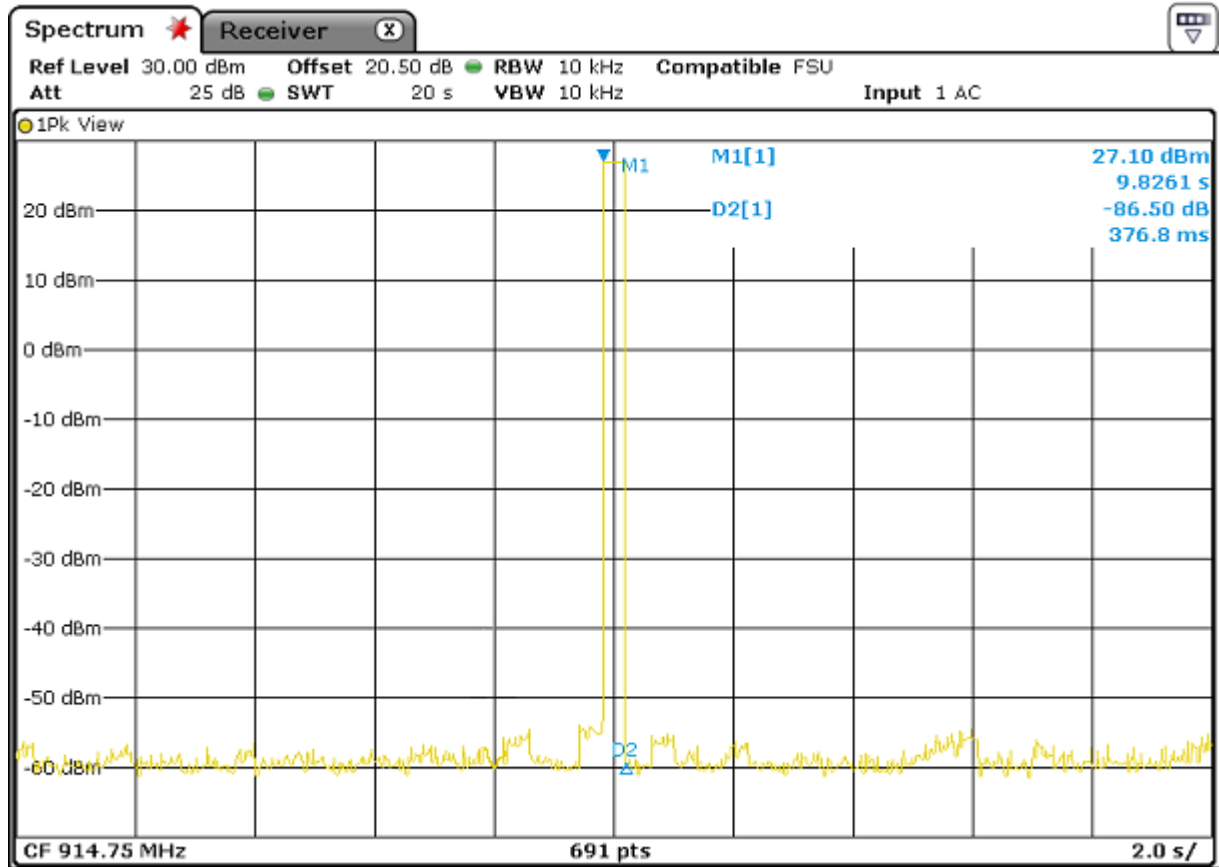
Remarks: For detailed test result please refer to following test protocol.

Test was performed from 17. March 2014 up to 10. April 2014.

FCC ID: DO4-MPOSREADER

5.9.6 Test protocol

Time of occupancy (Dwell time)



FCC ID: DO4-MPOSREADER**5.10 Channel separation**

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

5.10.1 Description of the test location

Test location: Shielded Room S4

5.10.2 Photo documentation of the test set-up

See Attachment C

5.10.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.10.4 Description of Measurement

This measurement was done by using a spectrum analyser. The Span of the analyzer was set wide enough to capture 2 frequencies. The result of the channel separation was compared with the 20 dB bandwidth and recorded.

5.10.5 Test result

Channel 1 (MHz)	Channel 2 (MHz)	Channel separation (kHz)
902.25	902.75	500

FCC ID: DO4-MPOSREADER

Limit according to FCC Part 15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit channel separation (kHz)
All systems		> 25 kHz or 20 dB bandwidth, whichever is greater
2400-2483.5	≥ 15	

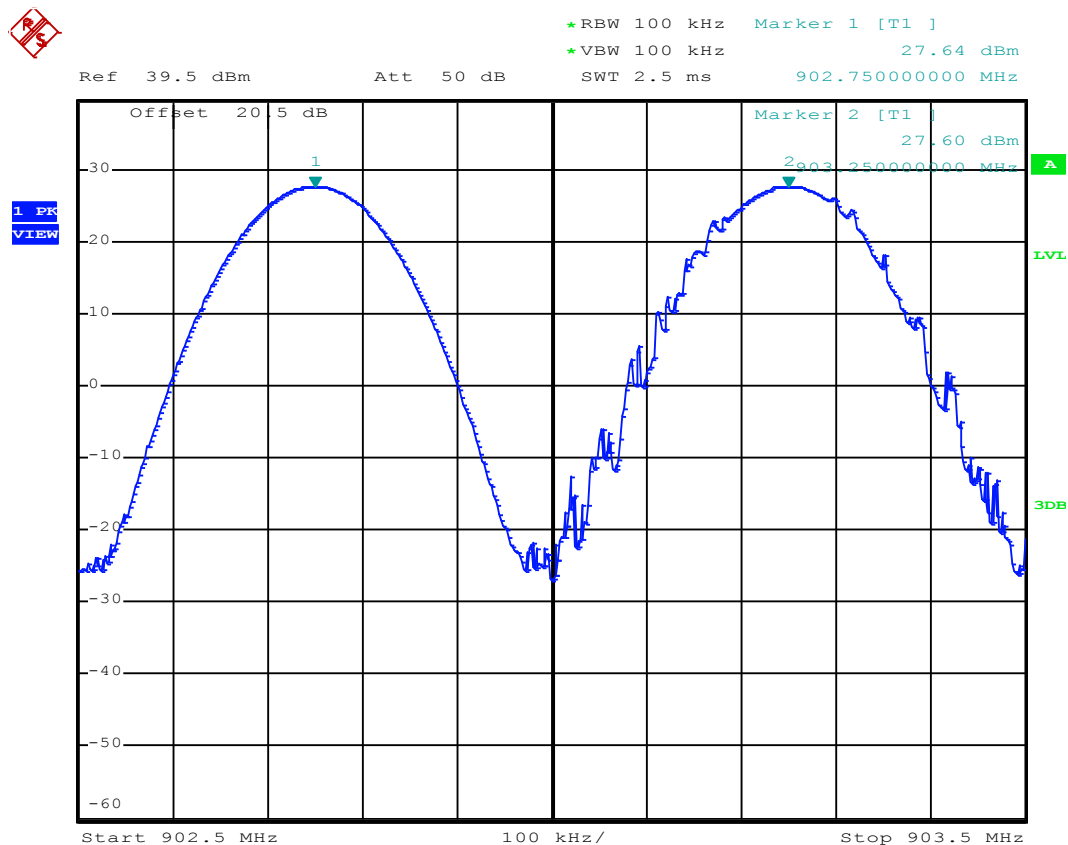
The requirements are **FULFILLED**.

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

Test was performed from 17. March 2014 up to 10. April 2014.

5.10.6 Test protocol

Channel separation



FCC ID: DO4-MPOSREADER**5.11 Quantity of hopping channels**

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

5.11.1 Description of the test location

Test location: Shielded Room S4

5.11.2 Photo documentation of the test set-up

See Attachment C

5.11.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(1)(i):

For frequency hopping systems operating in the 902-928 MHz band: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

5.11.4 Description of Measurement

This measurement was done by using a spectrum analyser. The EuT was transmitting at its maximum data rate. The Span of the analyzer was set wide enough to capture the frequency band from 902-928 MHz.

5.11.5 Test result

Hopping channel frequency range	Quantity of hopping channels value	Quantity of hopping channels minimum limit
902-928 MHz	50	50

FCC ID: DO4-MPOSREADER

Limit according to FCC Part 15C, Section 15.247(1):

Frequency range (MHz)	LIMIT (Quantity of Hopping Channels)			
	20dB Bandwidth < 250kHz	20dB Bandwidth > 250kHz	20dB Bandwidth < 1 MHz	20dB Bandwidth > 1MHz
902 - 928	50	25	---	---

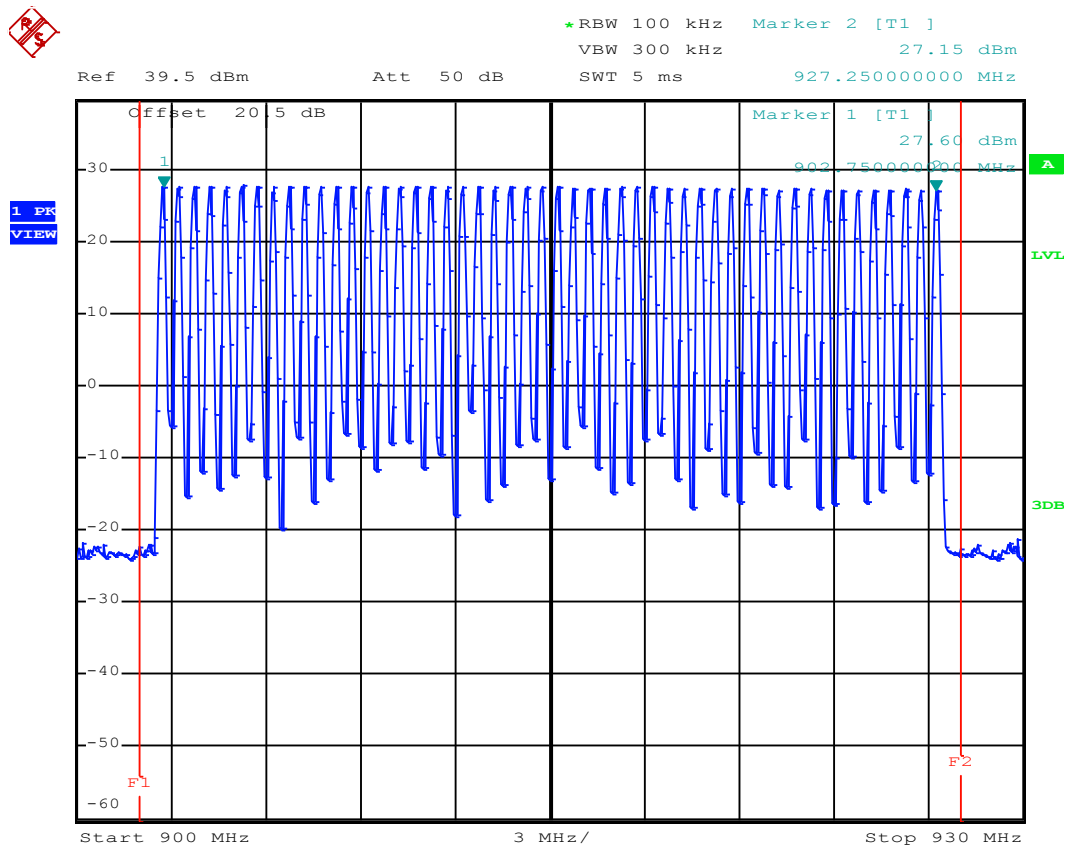
The requirements are **FULFILLED**.

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

Test was performed from 17. March 2014 up to 10. April 2014.

5.11.6 Test protocol

Quantity of hopping channel



FCC ID: DO4-MPOSREADER**5.12 Antenna application - Detailed photos see Attachment A****5.12.1 Applicable standard**

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has reverse SMA plugs to connect the defined antennas supplied by the manufacturer.

All supplied antennas meet the requirements of part 15.203 and 15.204.

5.12.2 Antenna requirements

According to FCC Part 15C, Section 15.247 (b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Following antennas are provided with the UHF Reader:

- PoS on Desk RFID only - Gain: < -10 dB
- PoS on Desk RFID + RF combined - Gain: < -10 dB
- PoS under Desk RFID only - Gain: < -10 dB
- PoS under Desk RFID + RF - Gain: < -10 dB
- PoS under Desk shielded RFID only - Gain: < -10 dB
- PoS on Desk Detacher RFID only - Gain: not applicable

FCC ID: DO4-MPOSREADER**5.13 Maximum permissible exposure (MPE) – See Attachment B**

For test instruments and accessories used see section 6 Part **CPC 2**.

5.13.1 Description of the test location

Test location: None

5.13.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.13.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, the MPE can be calculated in a defined distance away from the product.

Friis transmission formula:
$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

Remarks: For detailed test result please refer Attachment B.

Test was performed from 17. March 2014 up to 10. April 2014.

FCC ID: DO4-MPOSREADER

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Beginning of Testing: 08. December 2014

End of Testing: 08. December 2014

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	17/07/2015	17/07/2014		
	ESH 2 - Z 5	02-02/20-05-004	18/10/2015	18/10/2014	09/08/2015	09/02/2015
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	19/11/2015	19/11/2014	19/05/2015	19/11/2014
	SP 103 /3.5-60	02-02/50-05-182				
CPC 2	FSP 30	02-02/11-05-001	20/10/2015	20/10/2014		
	Inmet 18N50W-20 dB	02-02/50-10-001				
DC	FSP 30	02-02/11-05-001	20/10/2015	20/10/2014		
	Inmet 18N50W-20 dB	02-02/50-10-001				
MB	FSP 30	02-02/11-05-001	20/10/2015	20/10/2014		
	WHJS 1000-10EE	02-02/50-05-070				
	Inmet 18N50W-20 dB	02-02/50-10-001				
SER 1	FMZB 1516	01-02/24-01-018			19/01/2016	19/01/2015
	ESR 7	02-02/03-13-001	03/06/2015	03/06/2014		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	03/07/2015	03/07/2014		
	VULB 9168	02-02/24-05-005	08/04/2015	08/04/2014	04/03/2015	04/09/2014
	S10162-B	02-02/50-05-032				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	FSP 40	02-02/11-11-001	02/10/2015	02/10/2014		
	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	07/05/2015	07/05/2014		
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				

FCC ID: DO4-MPOSREADER

Beginning of Testing: 17. March 2014
End of Testing: 03. April 2014

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	16/07/2014	16/07/2013		
	ESH 2 - Z 5	02-02/20-05-004	18/10/2015	18/10/2013	28/08/2014	28/02/2014
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155			10/04/2014	10/10/2013
	SP 103 /3.5-60	02-02/50-05-182				
CPC 2	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	Inmet 18N50W-20 dB	02-02/50-10-001				
DC	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	Inmet 18N50W-20 dB	02-02/50-10-001				
MB	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	Inmet 18N50W-20 dB	02-02/50-10-001				
SEC 1-3	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	WHJS 1000-10EE	02-02/50-05-070				
	Inmet 18N50W-20 dB	02-02/50-10-001				
SER 1	FMZB 1516	01-02/24-01-018			13/02/2015	13/02/2014
	ESR 7	02-02/03-13-001	21/05/2014	21/05/2013		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	28/06/2014	28/06/2013		
	VULB 9168	02-02/24-05-005	11/04/2014	11/04/2013	06/09/2014	06/03/2014
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	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		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				