



DATE: 23 June 2016

I.T.L. (PRODUCT TESTING) LTD. FCC/IC Radio Test Report

For

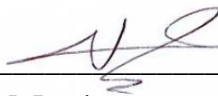
Orpak Systems Ltd.

Equipment under test:

Fuel Pump Nozzle Reader NNR Back

**NNR-T + Coil #7; NNR-B + Coil # 7*;
NNR-T + Coil #6*; NNR-B + Coil #6*;
NNR-T + Coil #5*; NNR-B + Coil #5*;
NNR-T + Coil #4*; NNR-B + Coil #4*;
NNR-T + Coil #3*; NNR-B + Coil #3*;
NNR-T + Coil #2*; NNR-B + Coil #2*;
NNR-T + Coil #1*; NNR-B + Coil #1***

*See customer's Declaration on page 5

Tested by: 
N. Levi

Approved by: 
D. Shidlow

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.



TABLE OF CONTENTS

1.	GENERAL INFORMATION	4
1.1	Administrative Information	4
1.2	List of Accreditations	6
1.3	Product Description	7
1.4	Test Methodology	7
1.5	Test Facility	7
1.6	Measurement Uncertainty	7
2.	SYSTEM TEST CONFIGURATION	8
2.1	Justification	8
2.2	EUT Exercise Software	8
2.3	Special Accessories	8
2.4	Equipment Modifications	9
2.5	Configuration of Tested System	9
3.	TEST SETUP PHOTOS	10
4.	FIELD STRENGTH OF FUNDAMENTAL (125 KHZ TRANSMITTER)	11
4.1	Test Specification	11
4.2	Test Procedure	11
4.3	Test Results	11
4.5	Test Instrumentation Used; Field Strength of Fundamental	14
5.	RADIATED EMISSION, 9 KHZ – 30 MHZ (125 KHZ TRANSMITTER)	15
5.1	Test Specification	15
5.2	Test Procedure	15
5.3	Test Results	15
5.4	Test Instrumentation Used; Radiated Measurements	17
5.5	Field Strength Calculation	17
6.	BANDWIDTH FOR 125 KHZ TRANSMITTER	18
6.1	Test Specification	18
6.2	Test Procedure	18
6.3	Test Results	18
6.4	Test Equipment Used; Bandwidth	21
7.	APPENDIX A - CORRECTION FACTORS	22
7.1	Correction factor for CABLE	22
7.2	Correction factors for ACTIVE LOOP ANTENNA	23



1. General Information

1.1 Administrative Information

Manufacturer: Orpak Systems Ltd.

Manufacturer's Address: 31 Lechi St.
P.O.B. 1461
Bnei-Brak, 51114
Israel
Tel: +972-3-577-6868
Fax: +972-3-579-6310

Manufacturer's Representative: Yair Elul

Equipment Under Test (E.U.T): Fuel Pump Nozzle Reader NNR Back

Equipment Model No.: NNR-T + Coil #7; NNR-B + Coil # 7*;
NNR-T + Coil #6*; NNR-B + Coil #6*;
NNR-T + Coil #5*; NNR-B + Coil #5*;
NNR-T + Coil #4*; NNR-B + Coil #4*;
NNR-T + Coil #3*; NNR-B + Coil #3*;
NNR-T + Coil #2*; NNR-B + Coil #2*;
NNR-T + Coil #1*; NNR-B + Coil #1*

Equipment Part No.: Not designated

Date of Receipt of E.U.T: 08.03.16

Start of Test: 08.03.16

End of Test: 22.03.16

Test Laboratory Location: I.T.L (Product Testing) Ltd.
1 Batsheva St.,
Lod
ISRAEL 7120101

Test Specifications: FCC Part 15, Subpart C
RSS-210 Issue 8, 2010
RSS Gen, Issue 4, 2014

*See customer's Declaration on following page.

DECLARATION

Date: June 23, 2016

I HEREBY DECLARE THE FOLLOWING REGARDING THE BELOW MODELS:


NNR-T + Coil #7; NNR-B + Coil #7;
 NNR-T + Coil #6; NNR-B + Coil #6;
 NNR-T + Coil #5; NNR-B + Coil #5;
 NNR-T + Coil #4; NNR-B + Coil #4;
 NNR-T + Coil #3; NNR-B + Coil #3;
 NNR-T + Coil #2; NNR-B + Coil #2;
 NNR-T + Coil #1; NNR-B + Coil #1

- 1. All the above models contain the identical 125.00 kHz radio transmitter which is found in the NNR Extra Large+Switch.**
- 2. All the above models contain the identical 2.4 GHz radio transmitter and have the same RF circuitry as the NNR Extra Large+ Switch.**
- 3. The difference between the above models and the NNR Extra Large + Switch is that the 125 kHz coil antenna has been changed and is now connected externally to the device.**
- 4. The NNR-T models are identical to the NNR-B models except for a mechanical switch and the 125kHz coil antenna that is assembled with each model.**
- 5. The differences between the 125kHz coil antennas are as follows:**

	Coil type	Coil Diameter	Housing type (according to the fueling nozzle)
1	COIL#1	35x58mm (Rectangular)	Rectangular
2	COIL#2	70mm	70mm
3	COIL#3	90mm	90mm WIGGINS
4	COIL#4	90mm	90mm OPW1290
5	COIL#5	90mm	90mm CT5000
6	COIL#6	90mm	90mm POSILOCK
7	COIL#7	80mm	WIGGINS

Please relate to them (from an EMC/RADIO point of view) as the same product.

Thank you.


 Yair Elul
 Engineering Manager
 OrPAK Systems LTD.



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T1877, G-245
5. Industry Canada (Canada), IC File No.: 46405-4025; Site Nos. IC 4025A-1, 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.



1.3 Product Description

The NNR Back is an add-on device designed to be installed on the dispenser's nozzle. It is a self-powered device that does not require any connections to any other existing components of the dispenser due to its wireless nature. The NNR has only mechanical interface to the nozzle without any wires or electronic interface to the nozzle, dispenser or any other station equipment.

The NNR reads (Frequency: 108 – 131 kHz) the vehicle information from the RFID FuelOpass and after that transmits (Frequency: 2.405-2.480 GHz) it to the WGT over wireless channel.

1.4 Test Methodology

Radiated testing was performed according to the procedures in RSS Gen, Issue 4, RSS 210, Issue 8, 2010 and ANSI C63.10: 2013. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is IL1005.

1.6 Measurement Uncertainty

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):
 ± 4.98 dB

2. System Test Configuration

2.1 Justification

The product was originally certified under FCC ID: W8F800960060 issued on 12/30/2015 and under IC: 8264A-800960000 issued on 12/24/2014.

There was no change to the 2.4 GHz transmitter/antenna.

The C2PC change to the original device is that the original LF 125 kHz antenna which had been located in the body of the E.U.T. has been replaced with 7 different coil antennas which are now connected externally.

A FCC C2PC is being requested based on this change.

An IC C2PC is also being requested to add the 14 models listed in Figure 1 below to the existing family certification based on the above change.

The E.U.T. transmits at Low (108.1 kHz), Mid (125.0 kHz) and High (131.1 kHz).

Exploratory radiated emission testing was performed to determine the worst case between the 14 models. According to the results below the worst case was NNR-T + COIL#7, on which full testing was performed.

Unit #	P/N	Description	Result [dBuV]		
			X	Y	Z
1	819260227	NNR-T + COIL#1	76.3	63.6	NA
2	819260220	NNR-B + COIL#1	76.5	76.4	NA
3	819260228	NNT-T + COIL#2	80.3	67.8	NA
4	819260221	NNR-B + COIL#2	81.3	67.8	NA
5	819260231	NNR-T + COIL#5	74.4	65.4	NA
6	819260224	NNR-B + COIL#5	81.6	71.7	NA
7	819260232	NNR-T + COIL#6	84.9	74.9	NA
8	819260225	NNR-B + COIL#6	81.8	70.2	NA
9	819260230	NNR-T + COIL#4	85.7	73	NA
10	819260223	NNR-B + COIL#4	83.4	69.4	NA
11	819260229	NNR-T + COIL#3	78.5	65	NA
12	819260222	NNR-B + COIL#3	82.4	72.3	NA
13	819260233	NNR-T + COIL#7	85.8	72.2	NA
14	819260226	NNR-B + COIL#7	85.3	70.5	NA

Figure 1. Screening Results

2.2 EUT Exercise Software

Commands were sent via hyper terminal to the WGT tester to operate the E.U.T.

2.3 Special Accessories

No accessories were used.

2.4 **Equipment Modifications**

No modifications were needed in order to achieve compliance.

2.5 **Configuration of Tested System**

108.1 kHz, 125.0 kHz, 131.1 kHz

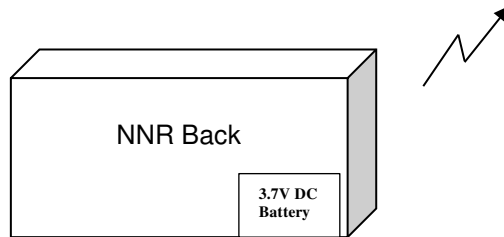


Figure 2. Configuration of Tested System

3. Test Setup Photos



Figure 1. Fundamental and Radiated Emission Test Setup

4. Field Strength of Fundamental (125 kHz Transmitter)

4.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.209
RSS Gen, Issue 4, November 2014, Clause 8.9
RSS 210 Issue 8 Clause 2.5

4.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. was placed in a chamber on a table, 1.5 meters above the ground. The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

4.3 Test Results

Frequency (kHz)	Reading (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
108.1	84.4	106.1	-21.7
125.0	83.7	105.6	-21.9
131.1	84.2	105.2	-21.0

Figure 3. Field Strength of Fundamental 125 KHz Transmitter Test Results

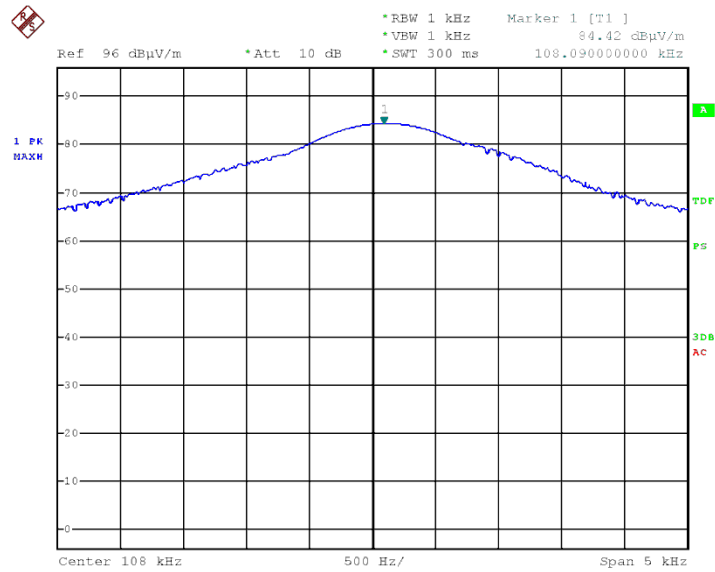
The EUT met the FCC Part 15, Subpart C, Section 15.209, RSS 210 Issue 8 Clause 2.5 and RSS Gen, Issue 4, Clause 8.9 requirements.

JUDGEMENT: Passed by 21.0dB

The details of the highest emissions are given in *Figure 4* to *Figure 6*.

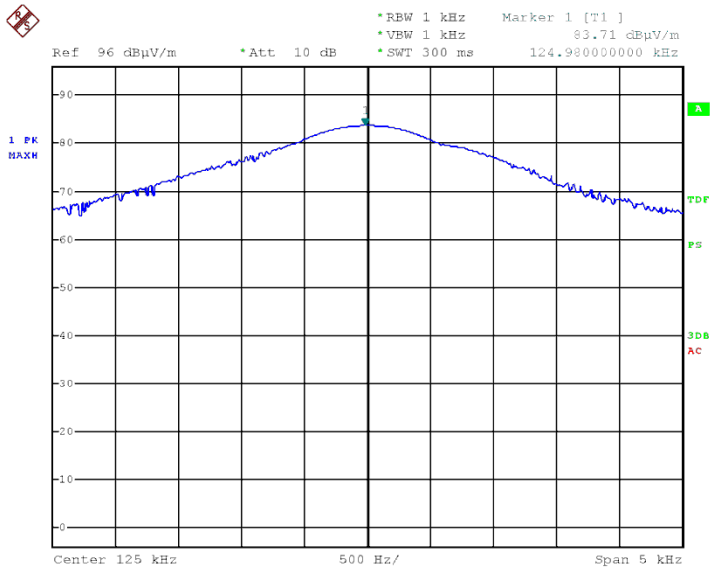
Field Strength of Fundamental

E.U.T Description Fuel Pump Nozzle Reader
NRR Back
Model Number NNR-T + Coil #7
Part Number: Not designated



Date: 8.MAR.2016 10:23:54

Figure 4. Field Strength of Fundamental, Low, Detector: Peak

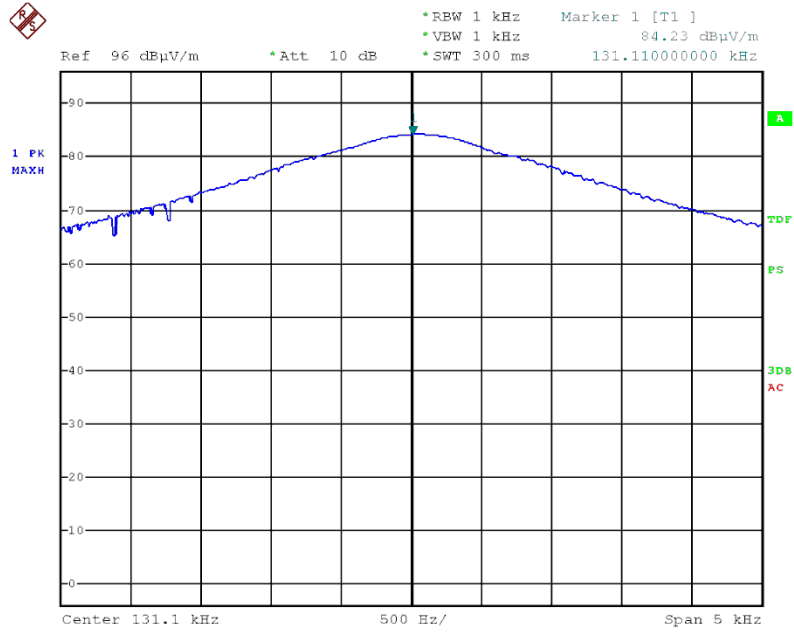


Date: 8.MAR.2016 10:07:36

Figure 5. Field Strength of Fundamental, Mid, Detector: Peak

Field Strength of Fundamental

E.U.T Description Fuel Pump Nozzle Reader
NRR Back
Model Number NNR-T + Coil #7
Part Number: Not designated



Date: 8.MAR.2016 10:31:28

Figure 6. Field Strength of Fundamental, High, Detector: Peak



4.4 Test Instrumentation Used; Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	9506-2950	November 5, 2015	November 30, 2016
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 7. Test Equipment Used

5. Radiated Emission, 9 kHz – 30 MHz (125 kHz Transmitter)

5.1 Test Specification

FCC, Part 15, Subpart C, Section 209

RSS 210, Issue 8, Clause 2.5

RSS Gen, Issue 4, Clause 8.9

5.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

The measurement was performed inside the shielded room at a distance of 3 meters, using peak detection mode and loop antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was placed on a remote-controlled turntable on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 2.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1.5 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of 108.1 kHz, 125.0 kHz and 131.1 kHz. These frequencies were measured using a peak detector.

5.3 Test Results

JUDGEMENT: Passed by 16.7 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209, RSS 210, Issue 8, Clause 2.5 and RSS Gen, Issue 4, Clause 8.9 specification.

See additional information in *Figure 8*.

Radiated Emission 9 kHz – 30 MHz, (125 kHz Transmitter)

E.U.T Description Fuel Pump Nozzle Reader
 NNR Back

Model Number NNR-T + Coil #7

Part Number: Not designated

Specification: FCC, Subpart C, Part 15.209
RSS 210 Issue 8 Clause 2.5; RSS Gen, Issue 4, Clause 8.9

Antenna Polarization: Horizontal/Vertical Frequency range: 9 kHz to 30.0 MHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 108.1 kHz, 125.0 kHz, 131.1kHz

Operation Frequency (kHz)	Frequency (kHz)	Peak Reading (dBμV/m)	Specification (dBμV/m)	Margin (dB)
108.1	324.4	64.2	97.4	-33.2
108.1	536.0	56.3	73.0	-16.7
125.0	374.5	62.7	96.1	-33.4
125.0	626.0	53.3	71.6	-18.3
131.1	393.5	57.3	95.7	-38.4
131.1	655.7	49.6	71.2	-21.6

Figure 8. Radiated Emission

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.



5.4 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	9506-2950	November 5, 2015	November 30, 2016
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 9. Test Equipment Used

5.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

- FS: Field Strength [dB μ v/m]
- RA: Receiver Amplitude [dB μ v]
- AF: Receiving Antenna Correction Factor [dB/m]
- CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB μ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB μ V

No external pre-amplifiers are used.

6. Bandwidth for 125 kHz Transmitter

6.1 Test Specification

RSS-Gen Issue 4, Section 6.6, November 2014
FCC, Subpart C, Part 2.1049

6.2 Test Procedure

The transmitter unit was operated with normal modulation. The spectrum analyzer was set to 1 kHz resolution BW and center frequency of the transmitter fundamental. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 26dBc (99%) points.

The EUT was set up as shown in *Figure 2*, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on the modulation envelope. The E.U.T was tested in 3 operating frequencies: 108.1 kHz, 125.0 kHz and 131.1 kHz.

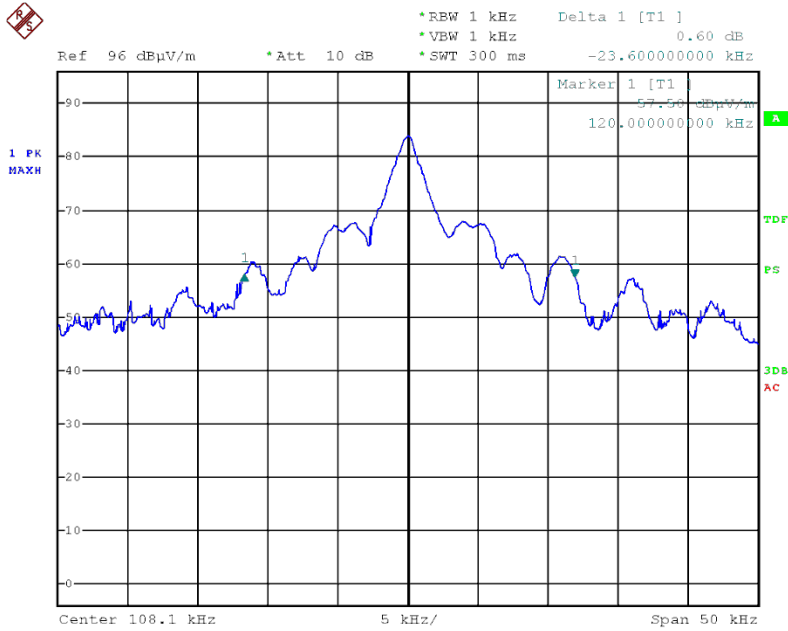
6.3 Test Results

FREQUENCY (kHz)	READING (kHz)
108.1	23.6
125.0	26.3
131.1	27.4

Figure 10. Bandwidth Test Results

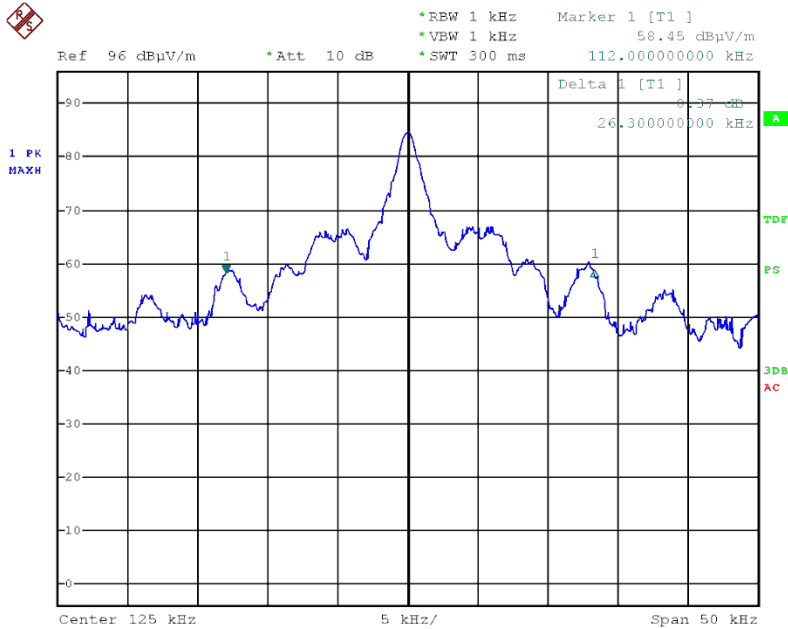
JUDGEMENT: Passed

See additional information in *Figure 11* to *Figure 13*.



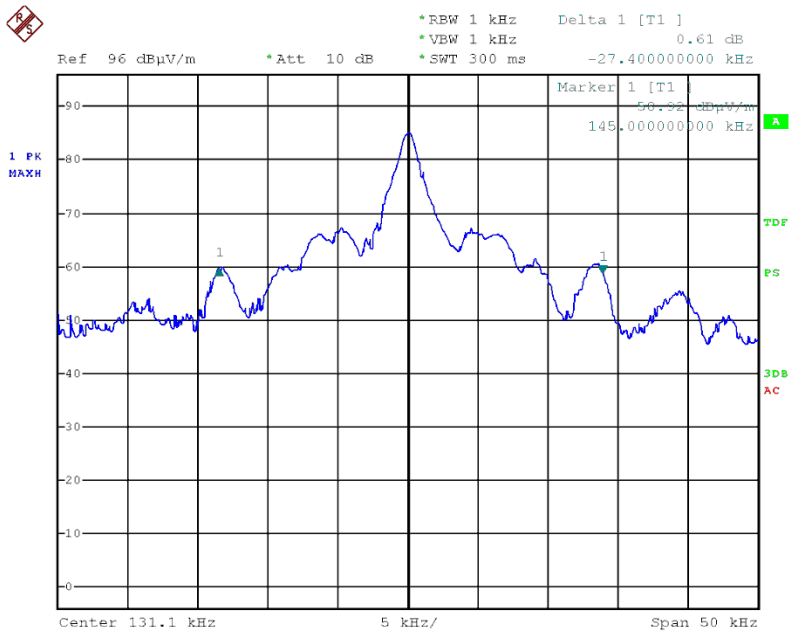
Date: 8.MAR.2016 13:44:26

Figure 11 Bandwidth – Low Frequency



Date: 8.MAR.2016 13:51:59

Figure 12 Bandwidth – Mid Frequency



Date: 8.MAR.2016 14:17:24

Figure 13 Bandwidth – High Frequency



6.4 Test Equipment Used; Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	9506-2950	November 5, 2015	November 30, 2016
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 14 Test Equipment Used

7. APPENDIX A - CORRECTION FACTORS

7.1 Correction factor for CABLE

**from EMI receiver
to test antenna
at 3 meter range.**

Frequency (MHz)	Cable Loss (dB)
0.010	0.4
0.015	0.2
0.020	0.2
0.030	0.3
0.050	0.3
0.075	0.3
0.100	0.2
0.150	0.2
0.200	0.3
0.500	0.4
1.00	0.4
1.50	0.5
2.00	0.5
5.00	0.6
10.00	0.8
15.00	0.9
20.00	0.8

Frequency (MHz)	Cable Loss (dB)
50.00	1.2
100.00	0.7
150.00	2.1
200.00	2.3
300.00	2.9
500.00	3.8
750.00	4.8
1000.00	5.4
1500.00	6.7
2000.00	9.0
2500.00	9.4
3000.00	9.9
3500.00	10.2
4000.00	11.2
4500.00	12.1
5000.00	13.1
5500.00	13.5
6000.00	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long
2. The cable is manufactured by Huber + Suhner



7.2 Correction factors for ACTIVE LOOP ANTENNA
Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2