

DATE: 27 April 2010

I.T.L. (PRODUCT TESTING) LTD.
FCC Radio Test Report
for
Orpak Systems Ltd.

Equipment under test:

DataPass

1. DATAPASS AT OBD-II
2. DATAPASS AT J1708/FMS

Written by:



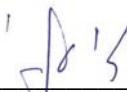
D. Shidowsky, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Measurement/Technical Report for Orpak Systems Ltd.

DataPass

1. DATAPASS AT OBD-II
2. DATAPASS AT J1708/FMS

FCC ID: W8F819507300

IC: 8264A-819507300

This report concerns: Original Grant: X
 Class I Change:
 Class II Change:

Equipment type: Digital Transmission System

Limits used:
47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
prepared by:
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1. General Information

1.1 Administrative Information

Manufacturer: Orpak Systems Ltd.

Manufacturer's Address: 31 Lechi St.
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Israel
Tel: +972-3-577-6868
Fax: +972-3-579-6310

Manufacturer's Representative: Rami Zamir

Equipment Under Test (E.U.T): DataPass

Equipment Model No.: 1. DATAPASS AT OBD-II
2. DATAPASS AT J1708/FMS

Equipment Part No.: 1. 800907300
2. 800907310

Date of Receipt of E.U.T: 13.12.09

Start of Test: 13.12.09

End of Test: 15.12.09

Test Laboratory Location: I.T.L (Product Testing) Ltd.
Kfar Bin Nun,
ISRAEL 99780

Test Specifications: FCC Part 15 Sub-part C

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.), Registration No. 90715.
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-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

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**

DataPass is a miniature unit that connects to the vehicle bus and captures data from the vehicle CPU/BUS. It then transmits this data to the nearest Wireless Gateway Terminal (WGT).

DataPass - connected directly to the vehicle bus harness and is used in heavy vehicles and trucks and supports most bus protocols common to those vehicles. DataPass unit supports the following vehicle protocols: J1708/J1587, FMS/J1939/CAN Bus, Odometer pulses, OBD II.

There are two types of DataPass.

1. 800907300 DATAPASS AT OBD-II
2. 800907310 DATAPASS AT J1708/FMS

The difference between the two types is the protocol used. The protocols are used to communicate with the vehicle's computer via cable. During the test a Vbis tester was used to simulate the vehicle computer.

DataPass is constructed from single electronic board:

819507300 PCB ASSY. DATAPASS AT BASIC

1.4 **Test Methodology**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 **Test Facility**

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 3, 2009).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 **Measurement Uncertainty**

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 **Justification**

The E.U.T. was tested connected to a Vbis tester. The Vbis tester simulated a vehicle computer.

2.2 **EUT Exercise Software**

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

2.3 **Special Accessories**

A Vbis tester was used to simulate a vehicle computer. In normal operation the E.U.T. is connected via cable to the vehicle computer.

2.4 **Equipment Modifications**

No modifications were needed in order to achieve compliance

2.5 **Configuration of Tested System**

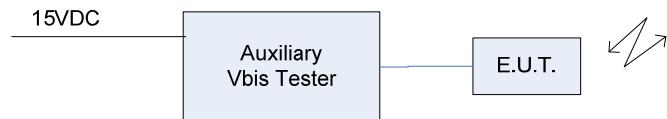


Figure 1. Configuration of Tested System

3. Test Setup Photo



Figure 2. Radiated Emission Test Setup

4. 6dB Minimum Bandwidth

4.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

4.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 2410 and 2475 MHz.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

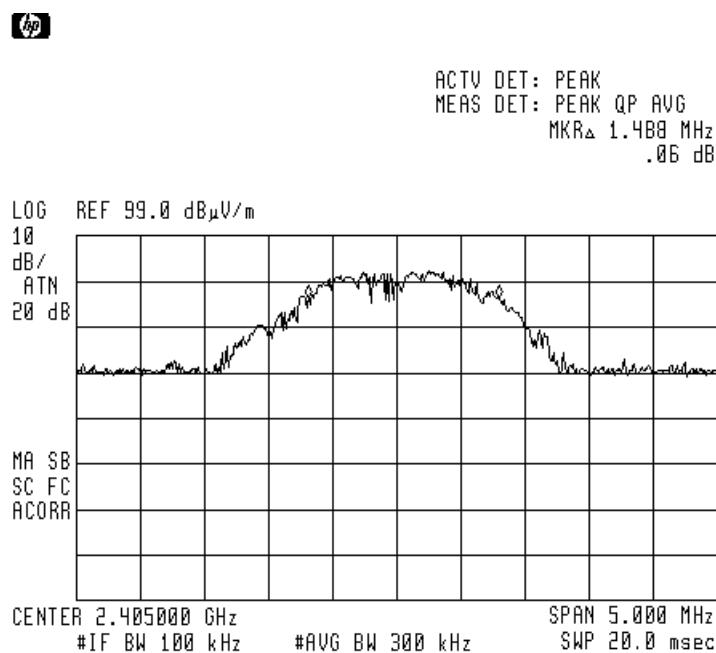


Figure 3. 2405 MHz

hp

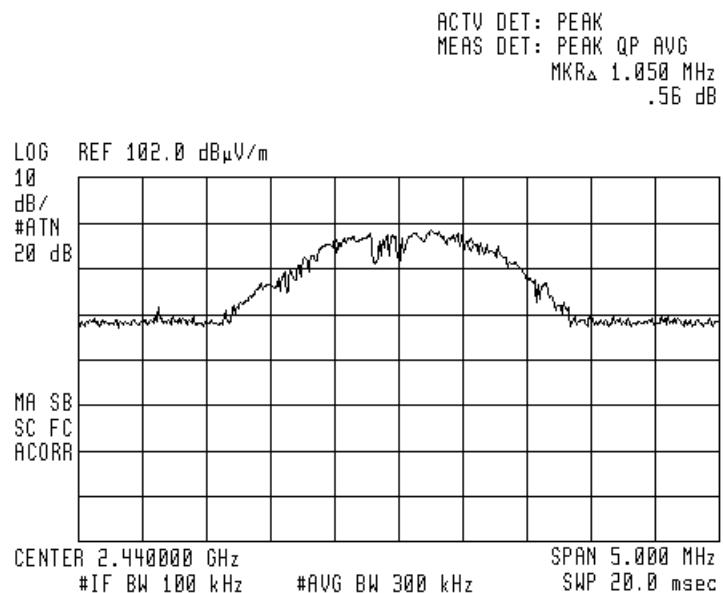


Figure 4. 2440 MHz

hp

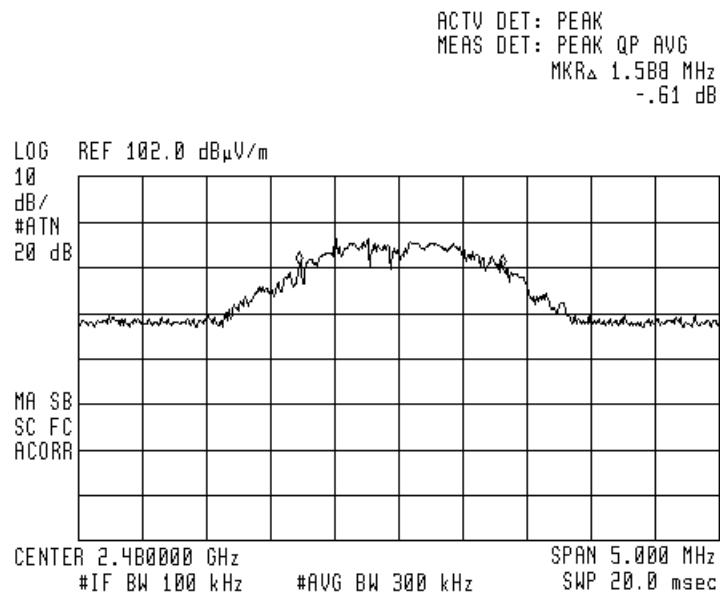


Figure 5. 2480 MHz

4.3 Test Results

E.U.T Description: DataPass

Model: 1. DATAPASS AT OBD-II 2. DATAPASS AT J1708/FMS

Serial Number: 1. 800907300 2. 800907310

| Operation Frequency (MHz) | Bandwidth Reading (MHz) | Specification (MHz) |
|---------------------------|-------------------------|---------------------|
| 2405.00 | 1.49 | >0.5 |
| 2440.00 | 1.05 | >0.5 |
| 2480.00 | 1.59 | >0.5 |

Figure 6 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 27.04.10

Typed/Printed Name: A. Sharabi

4.4 **Test Equipment Used.**

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|-------------------------|--------------|---------------|---------------|-------------------|--------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 year |
| RF Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 year |
| Antenna Log Periodic | A.H. Systems | SAS-200/511 | 253 | January 29, 2009 | 2 year |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

Figure 7 Test Equipment Used

5. 26dB Minimum Bandwidth

5.1 ***Test Specification***

F.C.C. Part 15, Subpart C: 15.247(a)(2)

5.2 ***Test procedure***

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 2410 and 2480 MHz. The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

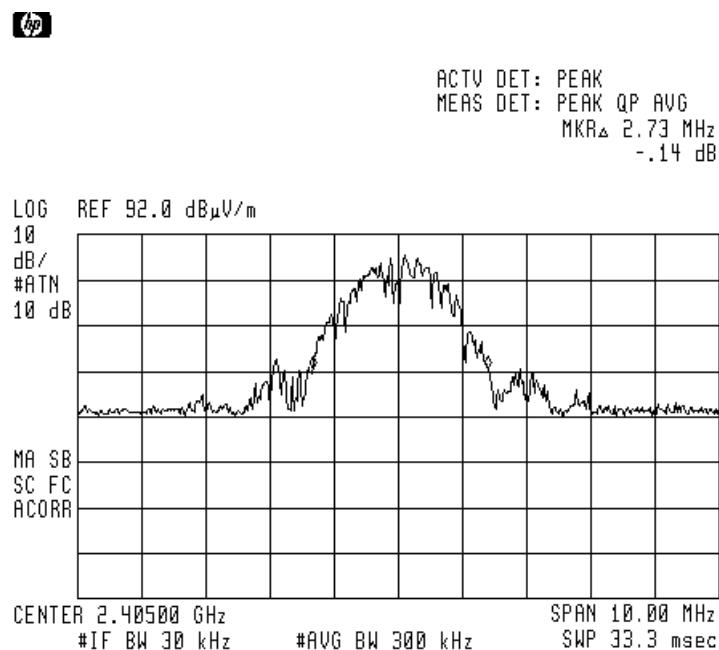


Figure 8. 2405 MHz

(hp)

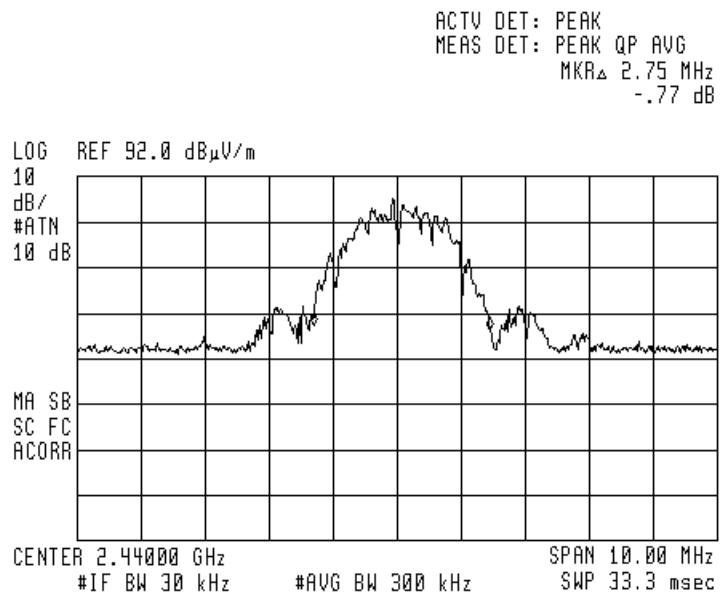


Figure 9. 2440 MHz

(hp)

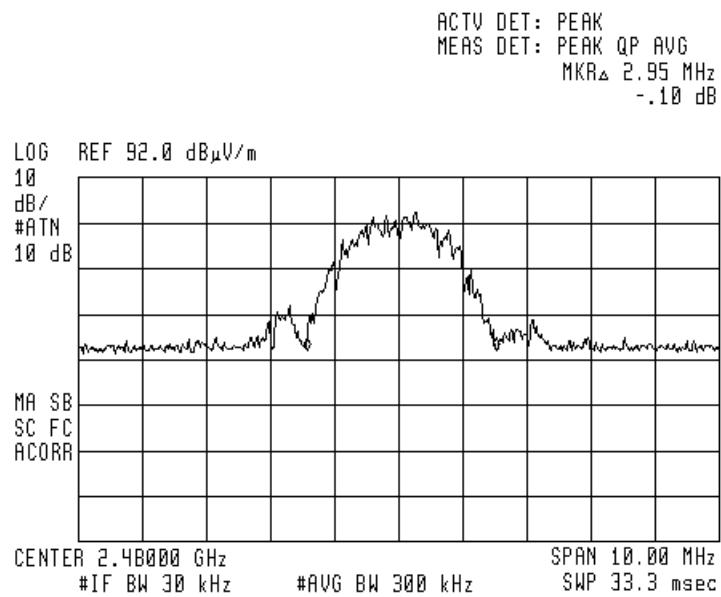


Figure 10. 2480 MHz

5.3 **Test Results**

E.U.T Description: DataPass

Model: 1. DATAPASS AT OBD-II 2. DATAPASS AT J1708/FMS

Serial Number: 1. 800907300 2. 800907310

| Operation Frequency (MHz) | Bandwidth Reading (MHz) |
|---------------------------|-------------------------|
| 2405.00 | 2.73 |
| 2440.00 | 2.75 |
| 2480.00 | 2.95 |

Figure 11 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 27.04.10

Typed/Printed Name: A. Sharabi

5.4 **Test Equipment Used.**

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|-------------------------|--------------|---------------|---------------|-------------------|--------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 year |
| RF Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 year |
| Antenna Log Periodic | A.H. Systems | SAS-200/511 | 253 | January 29, 2009 | 2 year |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

Figure 12 Test Equipment Used

6. Radiated Power Output

6.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(b)

6.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

The E.U.T. was tested at 2405, 2440, and 2480 MHz with QPSK modulation.

[hp]

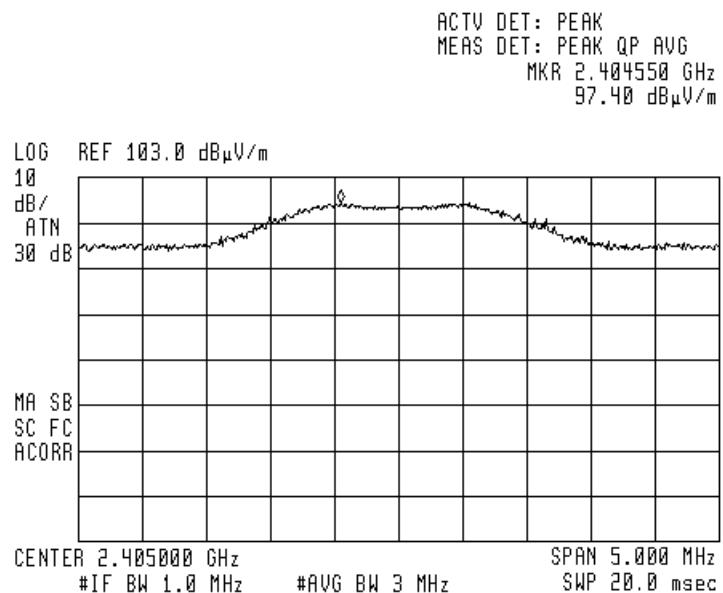


Figure 13 2405 MHz

[hp]

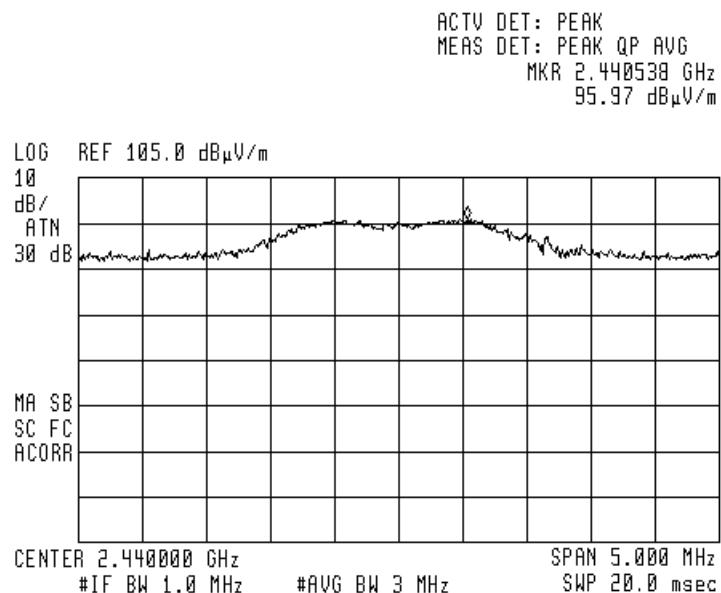


Figure 14 2440 MHz



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.480613 GHz
95.31 dB μ V/m

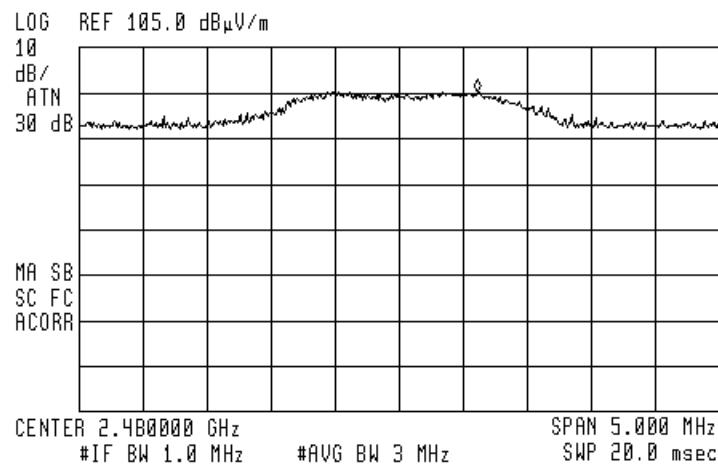


Figure 15 2480 MHz

6.3 Results Calculation

E.U.T. Description: DataPass

Model No.: 1. DATAPASS AT OBD-II 2. DATAPASS AT J1708/FMS

Serial Number: 1. 800907300 2. 800907310

Specification: F.C.C. Part 15, Subpart C Section 15.247(b)

| Frequency (MHz) | Pol | E (db μ V/m) | E (V/m) | Antenna Gain (dBi) | Antenna Distance (m) | Calculated Results (mW) | Limit (W) | Margin (mW) |
|--------------------|-----|---------------------|------------|--------------------------|----------------------------|-------------------------------|--------------|----------------|
| 2405.00 | V | 97.4 | 0.07 | 0 | 3 | 1.47 | 1 | -998.53 |
| 2440.00 | V | 95.97 | 0.06 | 0 | 3 | 1.08 | 1 | -998.92 |
| 2480.00 | V | 95.31 | 0.06 | 0 | 3 | 1.08 | 1 | -998.92 |

Figure 16 Test Results

JUDGEMENT: Passed by 998.53 mW

TEST PERSONNEL:

Tester Signature: A. Sharabi Date: 27.04.10

Typed/Printed Name: A. Sharabi

6.4 Test Equipment Used.

Radiated Maximum Power Output

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|-------------------------|--------------|---------------|---------------|-------------------|--------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 year |
| RF Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 year |
| Antenna Log Periodic | A.H. Systems | SAS-200/511 | 253 | January 29, 2009 | 2 year |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

7. Band Edge

[In Accordance with section 15.247(d)]

7.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2405 MHz, and 2480 MHz correspondingly.

The E.U.T. was tested in 2 operating channels and frequencies (11 (2.405 GHz); 26 (2.480 GHz)).

The E.U.T. was tested at 2405 and 2480 MHz with QPSK modulation.

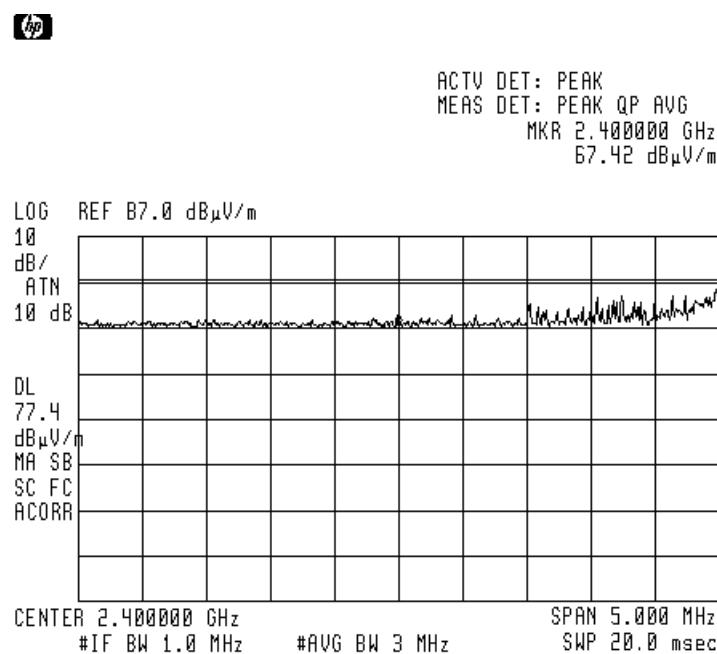


Figure 17 — 2405 MHz

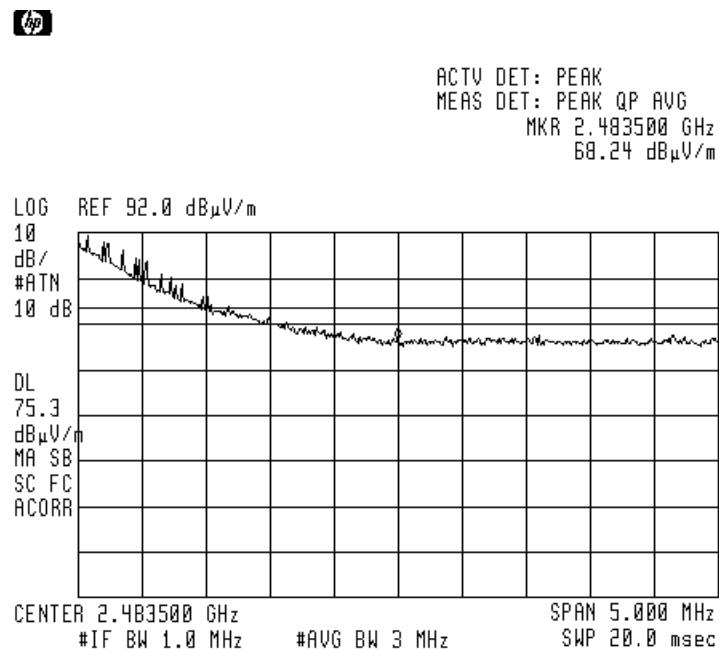


Figure 18 — 2480 MHz

7.2 Results table

E.U.T. Description: DataPass

Model No.: 1. DATAPASS AT OBD-II 2. DATAPASS AT J1708/FMS

Serial Number: 1. 800907300 2. 800907310

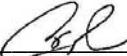
Specification: F.C.C. Part 15, Subpart C (15.247 (d))

| Operation Frequency (MHz) | Band Edge Frequency (MHz) | Spectrum Level (dBuV/m) | Specification (dBc) |
|---------------------------|---------------------------|-------------------------|---------------------|
| 2405.00 | 2400.00 | 67.42 | 20 |
| 2480.00 | 2483.50 | 68.24 | 20 |

Figure 19 Band Edge

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 27.04.10

Typed/Printed Name: A. Sharabi

7.3 **Test Equipment Used.**

Band edge Spectrum

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|-------------------------|--------------|---------------|---------------|-------------------|--------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 year |
| RF Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 year |
| Antenna Log Periodic | A.H. Systems | SAS-200/511 | 253 | January 29, 2009 | 2 year |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

Figure 20 Test Equipment Used

8. Radiated Emission, 9 kHz – 30 MHz

8.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of kHz. This frequency was measured using a peak detector.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz; 26 (2.480 GHz)).

8.3 Measured Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all three channels were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 27.04.10

Typed/Printed Name: A. Sharabi

8.4 Test Instrumentation Used, Radiated Measurements

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|-------------------------|--------------|---------------|---------------|-------------------|--------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 year |
| RF Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 year |
| Active Loop Antenna | EMCO | 6502 | 9506-2950 | October 19, 2009 | 1 year |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

8.5 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: $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

9. Radiated Emission 30 – 25000 MHz

9.1 ***Test Specification***

30 MHz-25000 MHz, F.C.C., Part 15, Subpart C

9.2 ***Test Procedure***

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground..

The frequency range 30 MHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz; 26 (2.480 GHz)).

9.3 **Test Data**

JUDGEMENT: Passed by 4.2 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The results for all three operation channels were the same.

The signals in the band 30 MHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

For the operation channel 11 (2.405 GHz), the margin between the emission level and the specification limit is 6.5 dB in the worst case at the frequency of 4810.00 MHz, horizontal polarization.

For the operation channel 18 (2.440 GHz), the margin between the emission level and the specification limit is 6.5 dB in the worst case at the frequency of 4880.00 MHz, horizontal polarization.

For the operation channel 26 (2.480 GHz), the margin between the emission level and the specification limit is 4.2 dB in the worst case at the frequency of 4960.00 MHz, horizontal polarization.

TEST PERSONNEL:

Tester Signature:  Date: 27.04.10

Typed/Printed Name: A. Sharabi

Radiated Emission

E.U.T Description: DataPass
 Type: 1. DATAPASS AT OBD-II
 2. DATAPASS AT J1708/FMS
 Part Number: 1. 800907300
 2. 800907310

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Peak

| Operation Frequency (MHz) | Freq. (MHz) | Polarity (H/V) | Peak Reading (dB μ V/m) | Peak Specification (dB μ V/m) | Peak Margin (dB) |
|------------------------------|----------------|-------------------|--------------------------------|--------------------------------------|---------------------|
| 2405.00 | 2390.00 | H | 51.5 | 74.0 | -22.5 |
| 2405.00 | 2390.00 | V | 52.3 | 74.0 | -21.7 |
| 2405.00 | 4810.00 | H | 67.5 | 74.0 | -6.5 |
| 2405.00 | 4810.00 | V | 61.0 | 74.0 | -13.0 |
| 2440.00 | 4880.00 | H | 67.5 | 74.0 | -6.5 |
| 2440.00 | 4880.00 | V | 61.3 | 74.0 | -12.7 |
| 2480.00 | 4960.00 | H | 69.8 | 74.0 | -4.2 |
| 2480.00 | 4960.00 | V | 61.3 | 74.0 | -12.7 |

**Figure 21. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Peak**

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.

“Peak Reading” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission

E.U.T Description DataPass
 Type 1. DATAPASS AT OBD-II
 2. DATAPASS AT J1708/FMS
 Part Number: 1. 800907300
 2. 800907310

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
 Test Distance: 3 meters Detector: Average

| Operation Frequency (MHz) | Freq. (MHz) | Polarity (H/V) | Average Reading (dB μ V/m) | Average Specification (dB μ V/m) | Average Margin (dB) |
|------------------------------|----------------|-------------------|-----------------------------------|-----------------------------------------|------------------------|
| 2405.00 | 2390.00 | H | 39.3 | 54.0 | -14.7 |
| 2405.00 | 2390.00 | V | 38.9 | 54.0 | -15.1 |
| 2405.00 | 4810.00 | H | 41.2 | 54.0 | -12.8 |
| 2405.00 | 4810.00 | V | 39.8 | 54.0 | -14.2 |
| 2440.00 | 4880.00 | H | 41.4 | 54.0 | -12.6 |
| 2440.00 | 4880.00 | V | 39.8 | 54.0 | -14.2 |
| 2480.00 | 4960.00 | H | 41.5 | 54.0 | -12.5 |
| 2480.00 | 4960.00 | V | 39.7 | 54.0 | -14.3 |

**Figure 22. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Average**

Notes:

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.

“Average Reading” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

9.4 Test Instrumentation Used, Radiated Measurements

| Instrument | Manufacturer | Model | Serial No. | Last Calibration Date | Period |
|--------------------------------------|-----------------|-----------------------|------------|-----------------------|---------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 Year |
| RF Filter Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 Year |
| Antenna Biconical | ARA | BCD 235/B | 1041 | March 25, 2009 | 1 Year |
| Antenna Log Periodic | ARA | LPD-2010/A | 1038 | March 6, 2009 | 1 Year |
| Antenna Log Periodic | A.H. Systems | SAS-200/511 | 253 | January 29, 2009 | 2 Years |
| Double Ridged Waveguide Horn Antenna | EMCO | 3115 | 29845 | March 16, 2008 | 2 Years |
| Horn Antenna | ARA | SWH-28 | 1008 | December 23, 2008 | 2 Years |
| Horn Antenna | Narda | V637 | 0410 | December 23, 2008 | 2 Years |
| Low Noise Amplifier | DBS MICROWAVE | LNA-DBS-0411N313 | 013 | January 7, 2009 | 1 Year |
| Low Noise Amplifier | Sophia Wireless | LNA 28-B | 232 | January 9, 2009 | 1 Year |
| Low Noise Amplifier | MK Milliwave | MKT6-3000 4000-30-13P | A0399 | January 15, 2009 | 1 Year |
| Spectrum Analyzer | HP | 8592L | 3826A01204 | March 17, 2009 | 1 Year |
| Spectrum Analyzer | HP | 8546E | 3442A00275 | December 15, 2009 | 1 Year |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

9.5 **Field Strength Calculation 30 MHz – 1000 MHz**

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

$$[\text{dB}\mu\text{v}/\text{m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

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.

10. Radiated Power Spectral Density

[In accordance with section 15.247(e)]

10.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (11 (2.405 GHz); 18 (2.440 GHz); 26 (2.480 GHz)).

Then the EMI receiver was set to 3 kHz resolution BW, span of 300.0 kHz, and sweep time of 100 seconds. The spectrum peaks were located at each of the 3 operating frequencies.

Radiated peak output power levels were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [\text{W}]$$

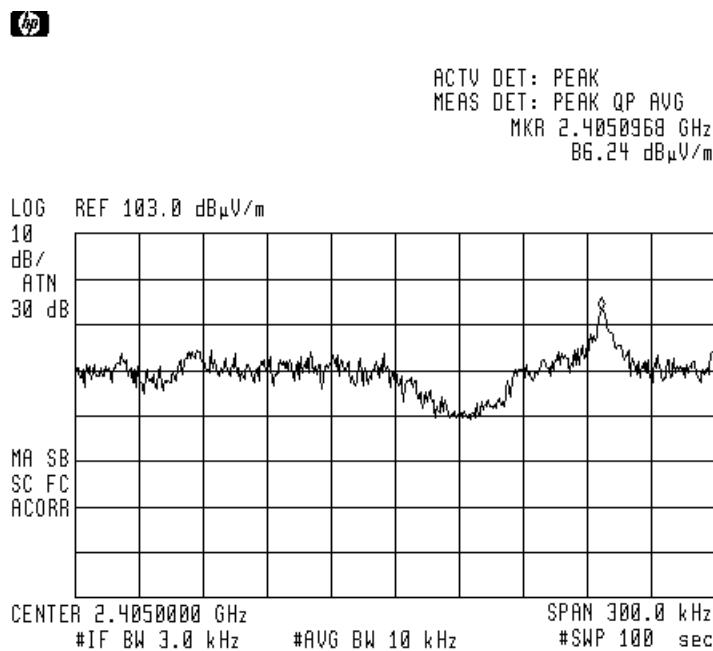


Figure 23 — 2405 MHz

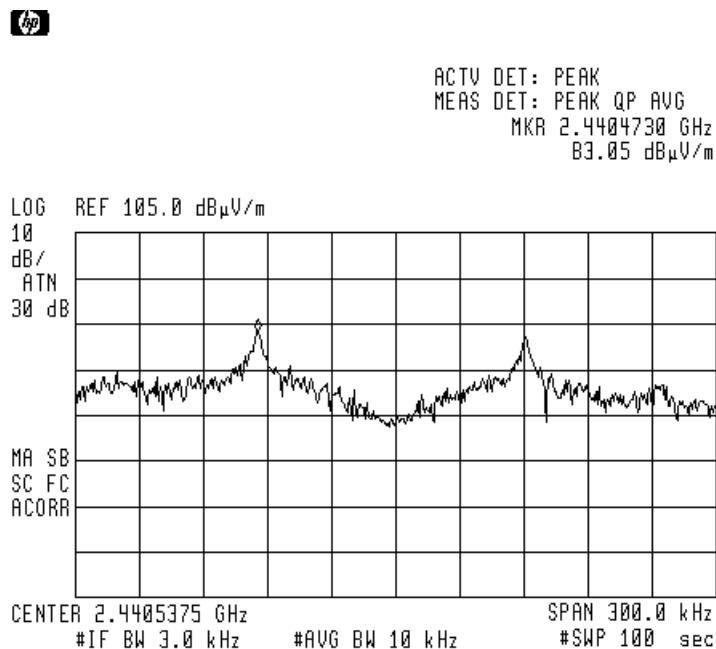


Figure 24 — 2440 MHz

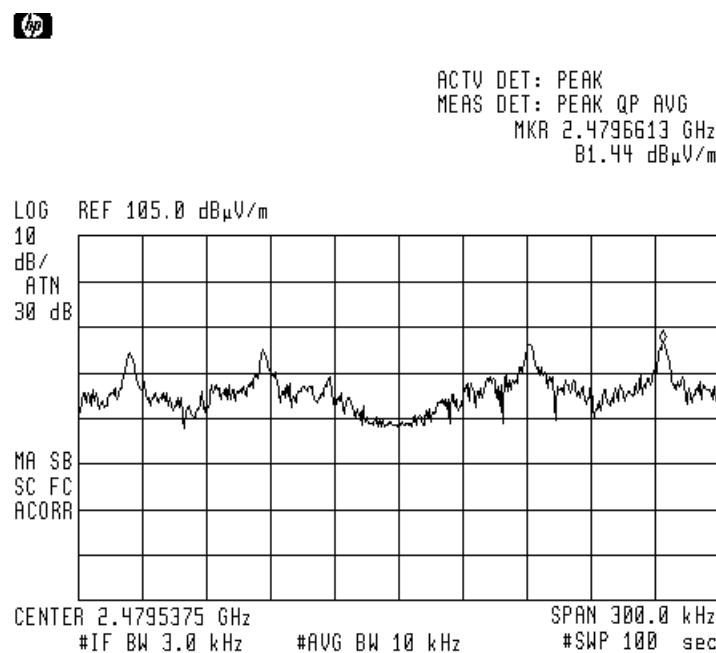


Figure 25 — 2480 MHz

10.2 Results table

E.U.T. Description: DataPass

Model No.: 1. DATAPASS AT OBD-II 2. DATAPASS AT J1708/FMS

Serial Number: 1. 800907300 2. 800907310

Specification: F.C.C. Part 15, Subpart C (15.247(e))

| Frequency (MHz) | E (db μ V/m) | Spectral Density Result (V/m) | Antenna Gain (dBi) | Antenna Distance (m) | Calculated Results (mW) | Spec. (mW) | Margin (mW) |
|--------------------|---------------------|-------------------------------------|--------------------------|----------------------------|-------------------------------|---------------|----------------|
| 2405 | 86.24 | 0.02 | 0 | 3 | 0.12 | 6.3 | -6.18 |
| 2440 | 83.05 | 0.01 | 0 | 3 | 0.03 | 6.3 | -6.27 |
| 2480 | 81.44 | 0.01 | 0 | 3 | 0.03 | 6.3 | -6.27 |

Figure 26 Test Results

JUDGEMENT: Passed by 6.18 mW

TEST PERSONNEL:

Tester Signature: 

Date: 27.04.10

Typed/Printed Name: A. Sharabi

10.3 Test Equipment Used.

Transmitted Power Density

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|-------------------------|--------------|---------------|---------------|-------------------|---------|
| EMI Receiver | HP | 85422E | 3906A00276 | November 10, 2009 | 1 year |
| RF Section | HP | 85420E | 3705A00248 | November 10, 2009 | 1 year |
| Antenna Log Periodic | A.H. Systems | SAS-200/511 | 253 | January 29, 2009 | 2 years |
| Antenna Mast | ARA | AAM-4A | 1001 | N/A | N/A |
| Turntable | ARA | ART-1001/4 | 1001 | N/A | N/A |
| Mast & Table Controller | ARA | ACU-2/5 | 1001 | N/A | N/A |
| Printer | HP | LaserJet 2200 | JPKGC19982 | N/A | N/A |

Figure 27 Test Equipment Used

11. Antenna Gain/Information

The antenna gain is 0 dBi simulated.

12. R.F Exposure/Safety

The typical placement of the E.U.T. is in a vehicle. The typical distance between the E.U.T. and the user in the worst case application, is 0.2 m.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2440 MHz is: $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 1.47 mw Peak

G_T- Antenna Gain, 0 dBi = 1 (Numeric)

R- Distance from Transmitter using 1 m worst case

(c) The peak power density is :

$$S_p = \frac{1.47 \times 1}{4\pi(20)^2} = 0.3 \times 10^{-3} \frac{mW}{cm^2}$$

13.

APPENDIX B - CORRECTION FACTORS

13.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

| FREQUENCY (MHz) | CORRECTION FACTOR (dB) | FREQUENCY (MHz) | CORRECTION FACTOR (dB) |
|--------------------|------------------------------|--------------------|------------------------------|
| 10.0 | 0.3 | 1200.0 | 7.3 |
| 20.0 | 0.6 | 1400.0 | 7.8 |
| 30.0 | 0.8 | 1600.0 | 8.4 |
| 40.0 | 0.9 | 1800.0 | 9.1 |
| 50.0 | 1.1 | 2000.0 | 9.9 |
| 60.0 | 1.2 | 2300.0 | 11.2 |
| 70.0 | 1.3 | 2600.0 | 12.2 |
| 80.0 | 1.4 | 2900.0 | 13.0 |
| 90.0 | 1.6 | | |
| 100.0 | 1.7 | | |
| 150.0 | 2.0 | | |
| 200.0 | 2.3 | | |
| 250.0 | 2.7 | | |
| 300.0 | 3.1 | | |
| 350.0 | 3.4 | | |
| 400.0 | 3.7 | | |
| 450.0 | 4.0 | | |
| 500.0 | 4.3 | | |
| 600.0 | 4.7 | | |
| 700.0 | 5.3 | | |
| 800.0 | 5.9 | | |
| 900.0 | 6.3 | | |
| 1000.0 | 6.7 | | |

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

13.2 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

| FREQUENCY (GHz) | CORRECTION FACTOR (dB) |
|-----------------|------------------------|
| 1.0 | 1.2 |
| 2.0 | 1.6 |
| 3.0 | 2.0 |
| 4.0 | 2.4 |
| 5.0 | 3.0 |
| 6.0 | 3.4 |
| 7.0 | 3.8 |
| 8.0 | 4.2 |
| 9.0 | 4.6 |
| 10.0 | 5.0 |
| 12.0 | 5.8 |

NOTES:

1. The cable type is RG-8.
2. The overall length of the cable is 10 meters.

13.3 Correction factors for CABLE

from spectrum analyzer
to test antenna above 2.9 GHz

| FREQUENCY (GHz) | CORRECTION FACTOR (dB) | FREQUENCY (GHz) | CORRECTION FACTOR (dB) |
|--------------------|------------------------------|--------------------|------------------------------|
| 1.0 | 1.9 | 14.0 | 9.1 |
| 2.0 | 2.7 | 15.0 | 9.5 |
| 3.0 | 3.5 | 16.0 | 9.9 |
| 4.0 | 4.2 | 17.0 | 10.2 |
| 5.0 | 4.9 | 18.0 | 10.4 |
| 6.0 | 5.5 | 19.0 | 10.7 |
| 7.0 | 6.0 | 20.0 | 10.9 |
| 8.0 | 6.5 | 21.0 | 11.2 |
| 9.0 | 7.0 | 22.0 | 11.6 |
| 10.0 | 7.5 | 23.0 | 11.9 |
| 11.0 | 7.9 | 24.0 | 12.3 |
| 12.0 | 8.3 | 25.0 | 12.6 |
| 13.0 | 8.7 | 26.0 | 13.0 |

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

13.4 Correction factors for CABLE

from EMI receiver
to test antenna
at 10 meter range.

| FREQUENCY (MHz) | CORRECTION FACTOR (dB) | FREQUENCY (MHz) | CORRECTION FACTOR (dB) |
|--------------------|------------------------------|--------------------|------------------------------|
| 10.0 | 0.3 | 1200.0 | 9.8 |
| 20.0 | 0.8 | 1400.0 | 10.0 |
| 30.0 | 0.9 | 1600.0 | 11.3 |
| 40.0 | 1.2 | 1800.0 | 12.2 |
| 50.0 | 1.4 | 2000.0 | 13.1 |
| 60.0 | 1.6 | 2300.0 | 14.5 |
| 70.0 | 1.8 | 2600.0 | 15.9 |
| 80.0 | 1.9 | 2900.0 | 16.4 |
| 90.0 | 2.0 | | |
| 100.0 | 2.1 | | |
| 150.0 | 2.6 | | |
| 200.0 | 3.2 | | |
| 250.0 | 3.8 | | |
| 300.0 | 4.2 | | |
| 350.0 | 4.6 | | |
| 400.0 | 5.1 | | |
| 450.0 | 5.3 | | |
| 500.0 | 5.6 | | |
| 600.0 | 6.3 | | |
| 700.0 | 7.0 | | |
| 800.0 | 7.6 | | |
| 900.0 | 8.0 | | |
| 1000.0 | 8.7 | | |

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 34 meters.
3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

12.6 Correction factors for LOG PERIODIC ANTENNA
Type LPD 2010/A
at 3 and 10 meter ranges.

| Distance of 3 meters | | Distance of 10 meters | |
|-----------------------------|----------------------|------------------------------|----------------------|
| FREQUENCY (MHz) | AFE (dB/m) | FREQUENCY (MHz) | AFE (dB/m) |
| 200.0 | 9.1 | 200.0 | 9.0 |
| 250.0 | 10.2 | 250.0 | 10.1 |
| 300.0 | 12.5 | 300.0 | 11.8 |
| 400.0 | 15.4 | 400.0 | 15.3 |
| 500.0 | 16.1 | 500.0 | 15.6 |
| 600.0 | 19.2 | 600.0 | 18.7 |
| 700.0 | 19.4 | 700.0 | 19.1 |
| 800.0 | 19.9 | 800.0 | 20.2 |
| 900.0 | 21.2 | 900.0 | 21.1 |
| 1000.0 | 23.5 | 1000.0 | 23.2 |

NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".

13.5 Correction factors for LOG PERIODIC ANTENNA
Type SAS-200/511
at 3 meter range.

| FREQUENCY (GHz) | ANTENNA FACTOR (dB) |
|--------------------|---------------------------|
| 1.0 | 24.9 |
| 1.5 | 27.8 |
| 2.0 | 29.9 |
| 2.5 | 31.2 |
| 3.0 | 32.8 |
| 3.5 | 33.6 |
| 4.0 | 34.3 |
| 4.5 | 35.2 |
| 5.0 | 36.2 |
| 5.5 | 36.7 |
| 6.0 | 37.2 |
| 6.5 | 38.1 |

| FREQUENCY (GHz) | ANTENNA FACTOR (dB) |
|--------------------|---------------------------|
| 7.0 | 38.6 |
| 7.5 | 39.2 |
| 8.0 | 39.9 |
| 8.5 | 40.4 |
| 9.0 | 40.8 |
| 9.5 | 41.1 |
| 10.0 | 41.7 |
| 10.5 | 42.4 |
| 11.0 | 42.5 |
| 11.5 | 43.1 |
| 12.0 | 43.4 |
| 12.5 | 44.4 |
| 13.0 | 44.6 |

NOTES:

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

13.6 Correction factors for BICONICAL ANTENNA

Type BCD-235/B,
 at 3 meter range

| FREQUENCY (MHz) | AFE (dB/m) |
|--------------------|---------------|
| 20.0 | 19.4 |
| 30.0 | 14.8 |
| 40.0 | 11.9 |
| 50.0 | 10.2 |
| 60.0 | 9.1 |
| 70.0 | 8.5 |
| 80.0 | 8.9 |
| 90.0 | 9.6 |
| 100.0 | 10.3 |
| 110.0 | 11.0 |
| 120.0 | 11.5 |
| 130.0 | 11.7 |
| 140.0 | 12.1 |
| 150.0 | 12.6 |
| 160.0 | 12.8 |
| 170.0 | 13.0 |
| 180.0 | 13.5 |
| 190.0 | 14.0 |
| 200.0 | 14.8 |
| 210.0 | 15.3 |
| 220.0 | 15.8 |
| 230.0 | 16.2 |
| 240.0 | 16.6 |
| 250.0 | 17.6 |
| 260.0 | 18.2 |
| 270.0 | 18.4 |
| 280.0 | 18.7 |
| 290.0 | 19.2 |
| 300.0 | 19.9 |
| 310 | 20.7 |
| 320 | 21.9 |
| 330 | 23.4 |
| 340 | 25.1 |
| 350 | 27.0 |

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

13.7 Correction factors for BICONICAL ANTENNA

Type BCD-235/B,
10 meter range

| FREQUENCY (MHz) | AFE (dB/m) |
|--------------------|---------------|
| 30.0 | 12.1 |
| 40.0 | 10.6 |
| 50.0 | 10.6 |
| 60.0 | 8.9 |
| 70.0 | 8.5 |
| 80.0 | 9.6 |
| 90.0 | 9.4 |
| 100.0 | 9.6 |
| 110.0 | 10.3 |
| 120.0 | 10.7 |
| 130.0 | 12.6 |
| 140.0 | 12.7 |
| 150.0 | 12.7 |
| 160.0 | 13.8 |
| 170.0 | 13.7 |
| 180.0 | 14.9 |
| 190.0 | 13.4 |
| 200.0 | 13.1 |
| 210.0 | 14.0 |
| 220.0 | 14.5 |
| 230.0 | 15.8 |
| 240.0 | 16.0 |
| 250.0 | 16.6 |
| 260.0 | 16.7 |
| 270.0 | 18.3 |
| 280.0 | 18.5 |
| 290.0 | 19.3 |
| 300.0 | 20.9 |

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

13.8 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

| FREQUENCY (GHz) | ANTENNA FACTOR (dB 1/m) | ANTENN A Gain (dBi) | FREQUENCY (GHz) | ANTENNA FACTOR (dB 1/m) | ANTENNA Gain (dBi) |
|--------------------|-------------------------------|---------------------------|--------------------|-------------------------------|--------------------------|
| 1.0 | 24.8 | 5.4 | 10.0 | 38.8 | 11.4 |
| 1.5 | 26.1 | 7.6 | 10.5 | 38.9 | 11.8 |
| 2.0 | 28.6 | 7.7 | 11.0 | 39.0 | 12.1 |
| 2.5 | 29.8 | 8.4 | 11.5 | 39.6 | 11.8 |
| 3.0 | 31.4 | 8.4 | 12.0 | 39.8 | 12.0 |
| 3.5 | 32.4 | 8.7 | 12.5 | 39.6 | 12.5 |
| 4.0 | 33.7 | 8.6 | 13.0 | 40.0 | 12.5 |
| 4.5 | 33.4 | 9.9 | 13.5 | 39.8 | 13.0 |
| 5.0 | 34.5 | 9.7 | 14.0 | 40.2 | 13.0 |
| 5.5 | 35.1 | 9.9 | 14.5 | 40.6 | 12.9 |
| 6.0 | 35.4 | 10.4 | 15.0 | 41.3 | 12.4 |
| 6.5 | 35.6 | 10.8 | 15.5 | 39.5 | 14.6 |
| 7.0 | 36.2 | 10.9 | 16.0 | 38.8 | 15.5 |
| 7.5 | 37.3 | 10.4 | 16.5 | 40.0 | 14.6 |
| 8.0 | 37.7 | 10.6 | 17.0 | 41.4 | 13.4 |
| 8.5 | 38.3 | 10.5 | 17.5 | 44.8 | 10.3 |
| 9.0 | 38.5 | 10.8 | 18.0 | 47.2 | 8.1 |
| 9.5 | 38.7 | 11.1 | | | |

13.9 Correction factors for

Horn Antenna

**Model: SWH-28
at 1 meter range.**

| FREQUENCY (GHz) | AFE (dB /m) | Gain (dB1) |
|---------------------------|-----------------------|----------------------|
| 18.0 | 40.3 | 16.1 |
| 19.0 | 40.3 | 16.3 |
| 20.0 | 40.3 | 16.1 |
| 21.0 | 40.3 | 16.3 |
| 22.0 | 40.4 | 16.8 |
| 23.0 | 40.5 | 16.4 |
| 24.0 | 40.5 | 16.6 |
| 25.0 | 40.5 | 16.7 |
| 26.0 | 40.6 | 16.4 |

13.10 Correction factors for

**Horn Antenna
Model: V637**

| FREQUENCY (GHz) | AFE (dB /m) | Gain (dB1) |
|--------------------|----------------|---------------|
| 26.0 | 43.6 | 14.9 |
| 27.0 | 43.7 | 15.1 |
| 28.0 | 43.8 | 15.3 |
| 29.0 | 43.9 | 15.5 |
| 30.0 | 43.9 | 15.8 |
| 31.0 | 44.0 | 16.0 |
| 32.0 | 44.1 | 16.2 |
| 33.0 | 44.1 | 16.4 |
| 34.0 | 44.1 | 16.7 |
| 35.0 | 44.2 | 16.9 |
| 36.0 | 44.2 | 17.1 |
| 37.0 | 44.2 | 17.4 |
| 38.0 | 44.2 | 17.6 |
| 39.0 | 44.2 | 17.8 |
| 40.0 | 44.2 | 18.0 |

13.11 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 |

14. Comparison Industry Canada Requirements With FCC

DataPass

M/N : 1. DATAPASS AT OBD-II 2. DATAPASS AT J1708/FMS
IC: 8264A-819507300 FCC ID: W8F819507300

| Test | FCC | IC |
|---------------------------------------------------|--------------|-----------------------------|
| Radiated Power Output | 15.247(b) | RSS 210 Issue 7 A8.4(4) |
| 6dB BW | 15.247(a)2 | RSS 210 Issue 7 A8.2a |
| Power density | 15.247(e) | RSS 210 Issue 7 A8.2b |
| Spurious radiated emission in the restricted band | 15.205(c) | RSS 210 Issue 7 2.7(Table2) |
| Band edge spectrum | 15.247(d) | RSS 210 Issue 7 A8.5 |
| RF Exposure Limits | 1.1307(b)(1) | RSS 102 4.4 |