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Date
2011-06-07

Reference
PX03821-RA1 rev 1

Page
1 (2)

Rev.1: 2012-05-31

Hatteland Computer AS
Åmosen
N-5578 Nedre Vats
NORWAY

Equipment Authorization measurements on 906-927 MHz Transceiver Unit

FCC ID: Y62-ASAP-915-2

(9 appendices)

Rev.1, 2012-05-31: Added type number of the EUT. In Appendix 1 and 2 the modification of the antenna matching have been reviewed, different matching at antenna port 1 and 2. Wrong model number of AC/DC-adaptor of mini-ASIO in Appendix 2 and 5. The label in Appendix 9 has not the right type number.

Test object

Product name: Autostore ASAP

Model: ASAP 915 2.0

Type: AS-99174-915

Software: AS-99174-USA-radiotest-rev.1

Two different samples were used during the test:

Serial number: 2010030002 (unmodified) and 2010030004 (modified, see appendix 1)

See appendix 1 for which test object sample that been used for each sub test.

Summary

See Appendix 1 for general information and Appendix 9 for photos.

Emission measurements as specified below have been performed.

| Standard | Compliant | Appendix | Remarks |
|--|------------|----------|---------|
| FCC 47 CFR Part 15 C (07-10-08) | | | |
| 15.249 Operation within the band 902-928 MHz | Yes | | |
| IC RSS-210 Issue 8, June 2010 | Yes | | |
| 15.249 (a) / RSS-210 A2.9(a) Field strength of fundamental | Yes | 2 | Note 1 |
| 15.249 (d) (e) / RSS-210 A2.9(b) Radiated emission | Yes | 3 | |
| 15.215 (c) 20 dB bandwidth | Yes | 4 | |
| 15.207 / RSS-Gen 7.2.4 Conducted emission limits | Yes | 5 | |
| 2.1049 / RSS-Gen 4.6.1 Occupied bandwidth | Yes | 6 | |
| 2.1049 / RSS-210 A2.9(b) Band Edge | Yes | 7 | |
| RF Safety / RSS-102 2.5.1 SAR Evaluation | Yes | 8 | |

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REPORT

Date 2011-06-07 Reference PX03821-RA1 rev 1 Page 2 (2)

Rev.1: 2012-05-31

FCC ID: Y62-ASAP-915-2

Note: Above RSS items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

Note 1: To reduce the field strength of fundamental the EUT was modified, see appendix 2.

SP Technical Research Institute of Sweden
Electronics - EMC

Fredrik Isaksson
Technical Officer

Christer Karlsson
Technical Manager



Performance test and requirements

The tests were performed to verify that Hatteland Computer Autostore ASAP meets the electromagnetic compatibility requirements of FCC 47 CFR part 15 C.

Test facility

The used test site (SP 504 114) is compliant with the requirements of section 2.948 of the FCC rules and listed, registration number 96866, as a facility accepted for certification under parts 15 and 18. The site complies with RSS-Gen, Issue 2 and is accepted by Industry Canada for the performance of radiated measurements, file number: IC 3482A-2.

Test object

| | |
|-------------------------------|--|
| Transceiver: | Hatteland Computer Autostore ASAP |
| Antenna: | Dedicated, RF solutions, Flexi-4BA-916 |
| Antenna gain: | 0 dBi |
| Frequency range: | 906.0-927.0 MHz |
| Frequencies used during test: | 903.0 MHz 906.0 MHz 915.0 MHz 927.0 MHz |
| Modulation: | GFSK |
| Data rate: | 50 kbps |
| Supply voltage: | 24.0 V DC, via POE |

During the test the EUT was powered by a Mini ASIO test-box, P/N: AS-90176-A, S/N: 2009030010. The Mini ASIO test-box was then powered by an AC/DC-adaptor Powerbox, model: PUP120-14, out: 24 V DC, 5A.

The Mini ASIO test-box and the AC/DC-adaptor were placed outside the anechoic chamber during the test.

Operational test mode

The EUT was tested stand alone.

The test was performed with continuous transmission (100% duty cycle), if not otherwise stated, and with normal modulation.

In normal use the transmitted RF signal is continuously shifting between the two antennas, after each transmitting package, 2.6 ms, see the duty cycle calculations below. During the test the RF signal was shifted between the two antennas as in normal use.

Settings of the EUT was performed with an external computer, connected to the Mini ASIO test-box.

For duty cycle measurements see appendix 2.

At normal use the EUT has a duty cycle of 12.1 %.

With the setting C6 (duty cycle at normal use) the duty cycle was measured to $2.60/21.40 \text{ ms} = 0.121 = 12.1\%$.

The PRF was calculated to $\text{PRF} = 1/T = 1/21.40 \text{ ms} = 47 \text{ Hz}$, thus QP-detector was used without any correction for pulse desensitization.

Cabling during emission test:

| EUT port | Cable type | Termination / use |
|-------------------|---|-------------------------------------|
| Ethernet with POE | Shielded twisted pair, Cat 5e, 1.3 m length | Connected to the Mini ASIO test-box |

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP QD 10885". The measurement uncertainties can be found in the table below. The uncertainties are calculated with a coverage factor $k=2$ (95% level of confidence).

The measurement uncertainties can be found in the table below:

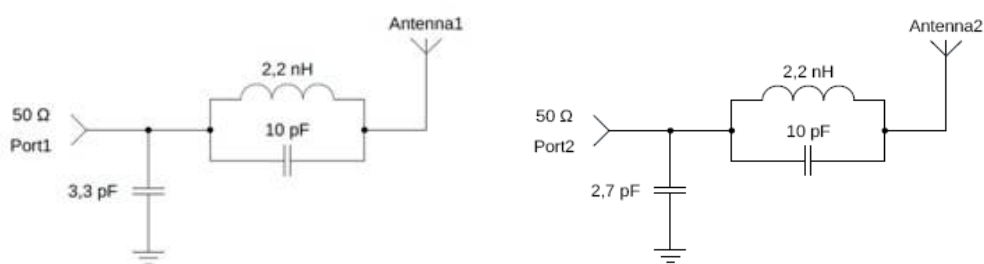
| Method | Uncertainty |
|----------------------------------|----------------------|
| Radiated emission, 30 – 1000 MHz | 4.8/5.6 dB (V/H-pol) |
| Radiated emission, 1 – 40 GHz | 2.6 dB |
| Conducted emission | 3.5 dB |

Reservation

The test results in this report apply only to the particular test object as declared in the report.

To reduce the field strength at the fundamental frequency below limit some modifications of the EUT (s/n: 2010030004) were made.

The impedances at the two antenna ports were mismatched. In order to improve the matching, the scheme below was implemented at the two antenna ports, there were different matching at the two antennas.



Some tests were performed at 903 MHz instead of 906 MHz.

With the power setting -2 dBm (P1) the field strength of the fundamental at 903 MHz was above the limit, thus the lowest frequency was changed from 903 to 906 MHz.

The changed frequency from 903 to 906 MHz was judged not to affect the 20 dB BW, AC conducted emission and Occupied bandwidth measurements, thus these tests were not performed again.



REPORT

FCC ID: Y62-ASAP-915-2

| Date | Reference | Page |
|------------|-------------------|-------|
| 2011-06-07 | PX03821-RA1 rev 1 | 3 (3) |

Rev.1: 2012-05-31

Appendix 1

Delivery of test object

The test objects was delivered: 2010-10-25 and 2010-11-01

Test participant

Geir Kõrge-Hårjuvet, Egesys OÜ

Test engineers

Fredrik Isaksson, SP

Martin Nilsson, SP

**Field strength of fundamental measurements according to FCC 47 CFR part 15.249 (a) / RSS-210 A2.9(a)**

| | | |
|--------------------|-----------------------------|------------------------|
| Date 2010-11-01 | Temperature 23 °C ± 3 °C | Humidity 37 % ± 5 % |
|--------------------|-----------------------------|------------------------|

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The modified sample was used during the test, serial number: 2010030004.

The EUT had the following settings during the test:

Power: - 2 dBm (command P1)

Duty cycle: 12.1% (command C6)

During the voltage variation test the duty cycle was 100%.

The radiated maximum peak radiated output power measurements were performed in the semi-anechoic chamber.

The fundamental was scanned with peak detector with the antenna height 1-4 m and the turntable was varied between 0-360 degrees for maximum response. The antenna distance during the measurements was 3.0 m.

Final measurement was performed with detector according to the FCC rules.

Test set-up photos during the tests can be found in Appendix 9.

| Measurement equipment | Calibration Due | SP number |
|--|-----------------|-----------|
| Semi anechoic chamber, Edison | 2011-12 | 504 114 |
| Spectrum analyzer R&S ESI 26 | 2011-08 | 503 885 |
| EMI measurement computer | - | - |
| Software: R&S EMC32, ver. 6.30.20 | - | 503 745 |
| Antenna Schaffner Bilog CBL6143 | 2013-04 | 504 079 |
| Multimeter Fluke 85 III | 2010-04 | 503 418 |
| Temperature and humidity meter Testo 625 | 2011-04 | 504 117 |

**Results**

Duty cycle measurements can be found in Appendix 2.1:

Diagram 1: Tx on at ASAP with normal duty cycle, setting C6

Diagram 2: Period time at ASAP with normal duty cycle, setting C6

Field strength of fundamental measurements:

RBW=120 kHz

| | | Max peak output power Quasi-peak detector | | |
|-------------------|-------------------------------|--|--|--|
| | | 906.0 MHz | 915.0 MHz | 927.0 MHz |
| | Antenna height | 1.00 m | 1.00 m | 1.00 m |
| | Azimuth | 330 deg | 330 deg | 330 deg |
| | Polarization | Horizontal | Horizontal | Horizontal |
| T_{nom} 23°C | V_{nom} 24.0 V DC | 93.6 dB μ V/m (=-1.6 dBm ERP) Note 1 | 92.1 dB μ V/m (=-3.1 dBm ERP) Note 1 | 90.8 dB μ V/m (=-4.4 dBm ERP) Note 1 |
| T_{nom} 23°C | V_{nom} 20.4 V DC Note 2 | 93.6 dB μ V/m (=-1.6 dBm ERP) Note 1 | 92.1 dB μ V/m (=-3.1 dBm ERP) Note 1 | 90.8 dB μ V/m (=-4.4 dBm ERP) Note 1 |
| T_{nom} 23°C | V_{nom} 27.6 V DC Note 2 | 93.6 dB μ V/m (=-1.6 dBm ERP) Note 1 | 92.1 dB μ V/m (=-3.1 dBm ERP) Note 1 | 90.8 dB μ V/m (=-4.4 dBm ERP) Note 1 |

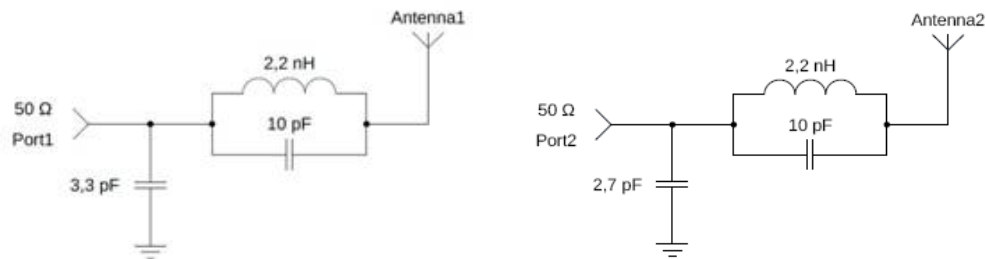
Note 1: The measurements were performed in field strength in dB μ V/m. The ERP level was then calculated by the formula $ERP = E(dB\mu V/m) - 90 + 20\log(d) - 10\log(30)$, (d=antenna dist, =3 m).

Note 2: According 47CFR 15.31(e), for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.
The 24 V DC voltage to the Mini ASIO test box was adjusted between 85% and 115% of the nominal 24 V DC.

Remark

To reduce the field strength at the fundamental frequency below limit some modifications of the EUT (s/n: 2010030004) were made.

The impedances at the two antenna ports were mismatched. In order to improve the matching, the scheme below was implemented at the two antenna ports, there were different matching at the two antennas.



Limits

According to 47CFR 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

According to RSS-210 A2.9(a), the field strength measured at 3 meter shall not exceed the following:

| Fundamental Frequency | Field strength of fundamental | Field strength of harmonics |
|-----------------------|-------------------------------|-----------------------------|
| 902-928 MHz | 50 mV/m = 94 dBμV/m | 500 μV/m = 54 dBμV/m |

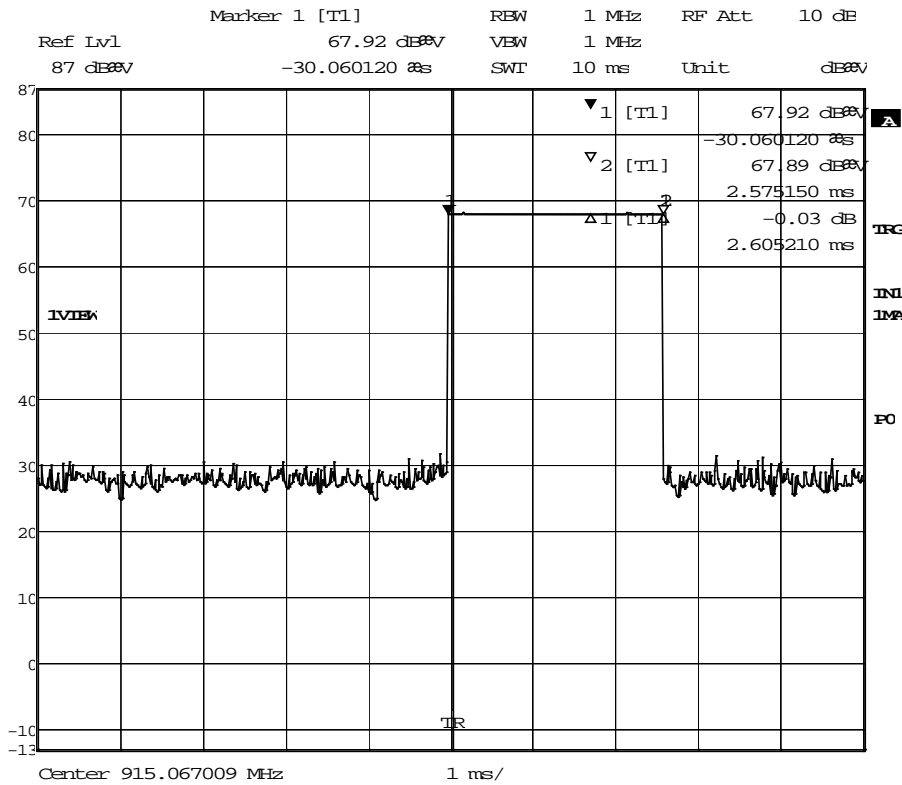
| | |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|



FCC ID: Y62-ASAP-915-2

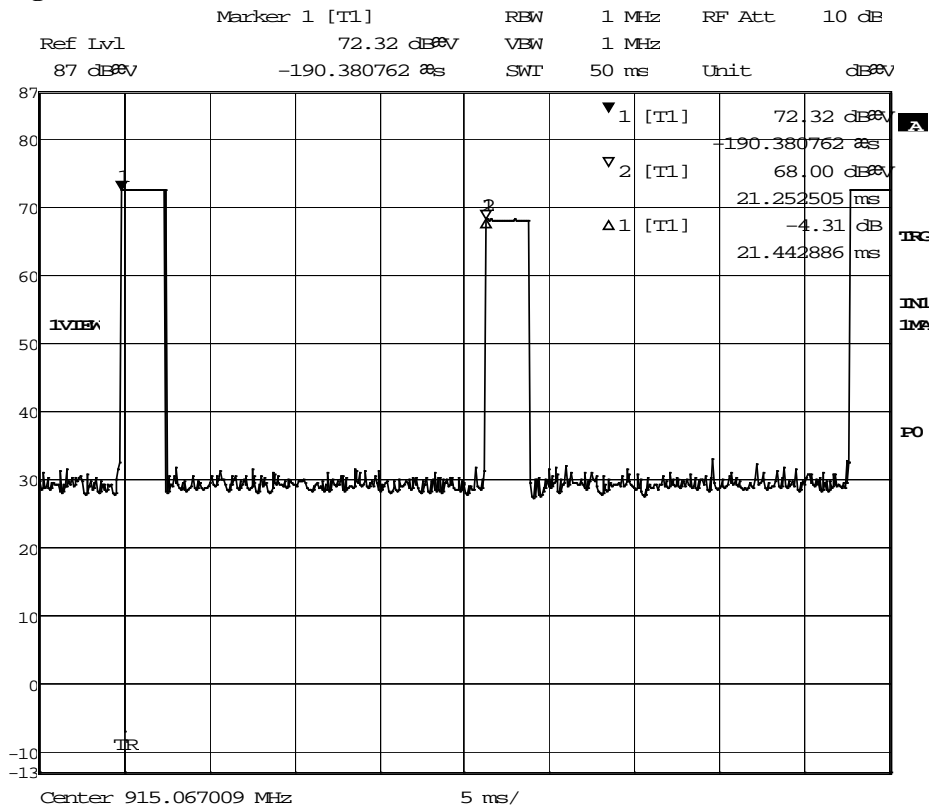
Appendix 2.1

Diagram 1



Date: 25.OCT.2010 10:37:52

Diagram 2



Date: 25.OCT.2010 10:36:58

Radiated emission measurements according to FCC 47 CFR part 15.249 (d) (e) / RSS 210-210 A2.9(b)

| | | |
|--------------------|-----------------------------|------------------------|
| Date 2010-11-01 | Temperature 23 °C ± 3 °C | Humidity 37 % ± 5 % |
|--------------------|-----------------------------|------------------------|

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The modified sample was used during the test, serial number: 2010030004.

The EUT had the following settings during the test:

Power: - 2 dBm (command P1)

Duty cycle: 100% (command C1)

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance was 3.0 m.

The measurement procedure is as follows:

1. A pre-measurement is performed with peak detector. The test object is measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m (above 1 GHz pre-measurement was only performed at 1.0 m due to the small EUT size).
2. If the emission is close or above the limit during the pre-measurement, the test object is scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response. Then the emission is measured with the quasi-peak detector on frequencies below 1 GHz and with the average detector above 1 GHz.

The measurement was first performed with peak detector.

The following RBW were used:

30 MHz-1 GHz: RBW=120 kHz

1-10 GHz: RBW=1 MHz

Test set-up photos during the tests can be found in Appendix 9.

| Measurement equipment | Calibration Due | SP number |
|--|-----------------|-----------|
| Semi anechoic chamber, Edison | 2011-12 | 504 114 |
| Spectrum analyzer R&S ESI 26 | 2011-08 | 503 885 |
| EMI measurement computer | - | - |
| Software: R&S EMC32, ver. 6.30.10 | - | 503 745 |
| Antenna Schaffner Bilog CBL6143 | 2013-04 | 504 079 |
| Horn antenna EMCO 3115 | 2011-02 | 501 548 |
| Preamplifier Miteq, 1 18 GHz | 2011-07 | 504 160 |
| High pass filter Wainwright WHKY | 2011-07 | 504 199 |
| Temperature and humidity meter Testo 625 | 2011-04 | 504 117 |

Results

The pre-measurement emission spectra can be found in Appendix 3.1:

Diagram 1: Radiated emission 30-1000 MHz, vertical and horizontal polarizations, ambient.

Diagram 2: Radiated emission 30-1000 MHz, 915.0 MHz, vertical and horizontal polarizations.

Diagram 3: Radiated emission 1-10 GHz, 915.0 MHz, vertical and horizontal polarizations.

The highest detected levels during the final measurement in the frequency range 30 MHz-10 GHz are listed in the tables below.

906.0 MHz

| Frequency (MHz) | QP level (dB μ V/m) | AV level (dB μ V/m) | Peak level (dB μ V/m) | Corr (dB) | Limit (dB μ V/m) | Height (m) | Azimuth (deg) | Polarization |
|-----------------|-------------------------|-------------------------|---------------------------|-----------|----------------------|------------|---------------|--------------|
| 226.426 | 23.1 | N/A | - | 13.1 | 46 (QP) | 1.38 | 319 | Horizontal |
| 453.023 | 33.5 | N/A | - | 18.3 | 46 (QP) | 1.26 | 270 | Vertical |
| 607.433 | 28.7 | N/A | - | 20.8 | 46 (QP) | 1.55 | 321 | Horizontal |
| 1359.054 | N/A | 36,5 | 40.3 | -20.9 | 53.9 (Av) | 1.00 | 175 | Vertical |

915.0 MHz

| Frequency (MHz) | QP level (dB μ V/m) | AV level (dB μ V/m) | Peak level (dB μ V/m) | Corr (dB) | Limit (dB μ V/m) | Height (m) | Azimuth (deg) | Polarization |
|-----------------|-------------------------|-------------------------|---------------------------|-----------|----------------------|------------|---------------|--------------|
| 35.468 | 19.5 | N/A | - | 19.3 | 40 (QP) | 1.15 | 90 | Vertical |
| 228.807 | 25.7 | N/A | - | 13.1 | 46 (QP) | 1.38 | 319 | Horizontal |
| 457.554 | 39.8 | N/A | - | 18.3 | 46 (QP) | 1.26 | 270 | Vertical |
| 686.279 | 31.1 | N/A | - | 21.1 | 46 (QP) | 1.55 | 321 | Horizontal |
| 1372.475 | N/A | 38.0 | 43.3 | -20.9 | 53.9 (Av) | 1.00 | 173 | Vertical |

927.0 MHz

| Frequency (MHz) | QP level (dB μ V/m) | AV level (dB μ V/m) | Peak level (dB μ V/m) | Corr (dB) | Limit (dB μ V/m) | Height (m) | Azimuth (deg) | Polarization |
|-----------------|-------------------------|-------------------------|---------------------------|-----------|----------------------|------------|---------------|--------------|
| 231.815 | 26.9 | N/A | - | 13.1 | 46 (QP) | 1.38 | 319 | Horizontal |
| 463.506 | 41.4 | N/A | - | 18.3 | 46 (QP) | 1.26 | 270 | Vertical |
| 695.219 | 31.6 | N/A | - | 21.2 | 46 (QP) | 1.55 | 321 | Horizontal |
| 1390.637 | N/A | 36.4 | 40.5 | -20.9 | 53.9 (Av) | 1.00 | 196 | Vertical |



Limits

According to 47CFR 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency | Field strength of harmonics |
|--------------------------|---------------------------------|
| 902-928 MHz | 500 μ V/m = 54 dB μ V/m |

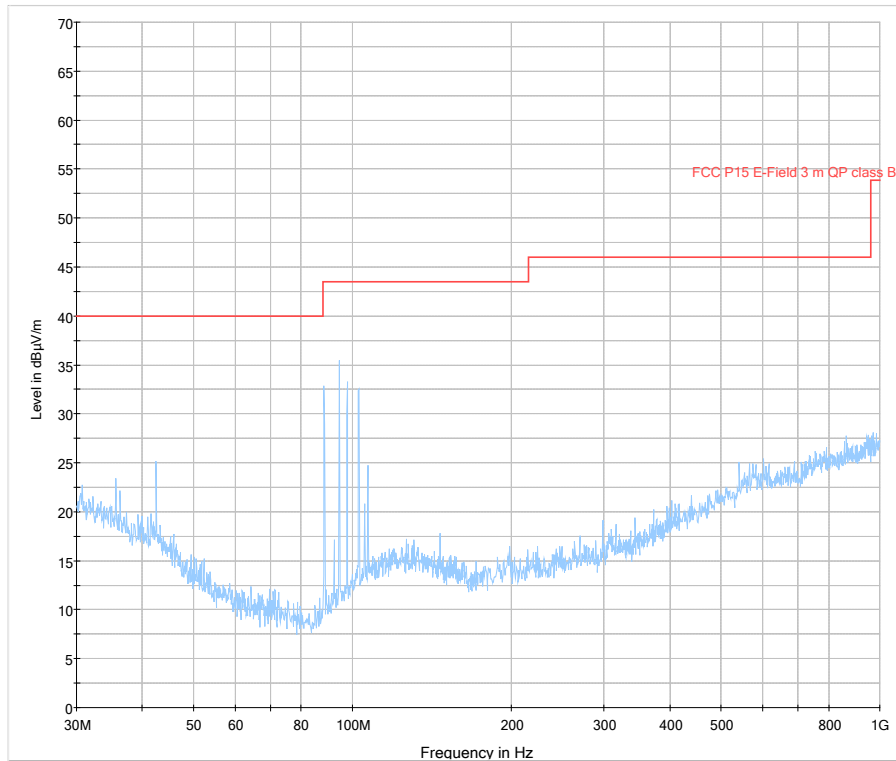
According to 47CFR 15.249(d), emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

According to 47CFR 15.249(e), the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

According to RSS-210 A2.9(b), emissions radiated the outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to table 2 limits, whichever is the less stringent.

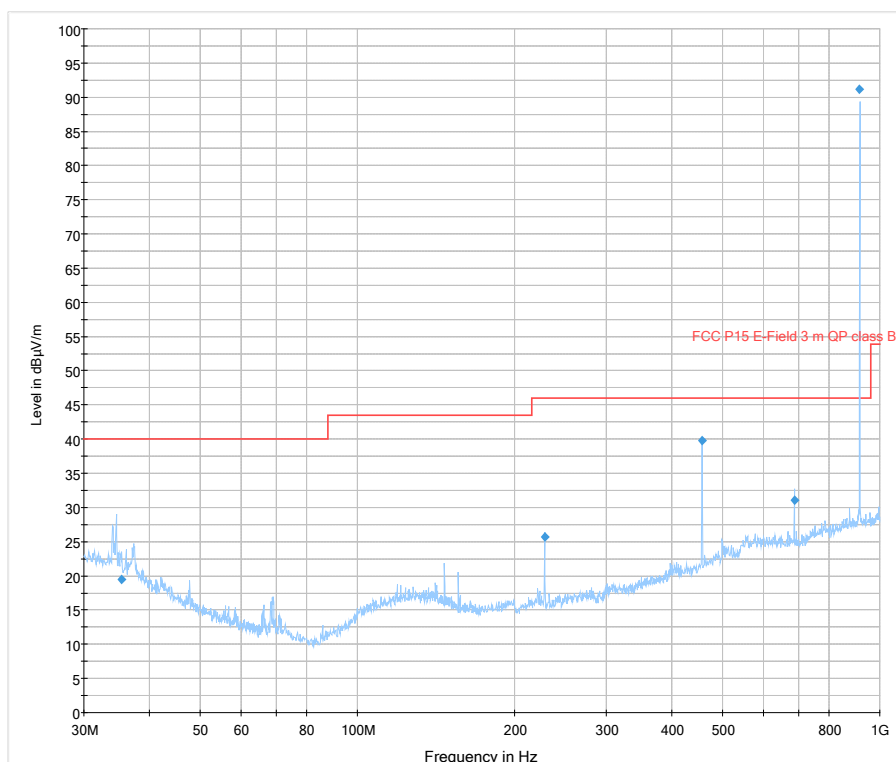
| | |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

Diagram 1



Note: The ambient measurement was performed with an unshielded Ethernet, thus the emission peaks at 100 MHz. The Ethernet cable was then exchanged to a shielded Ethernet cable, and was then used during all the measurements.

Diagram 2

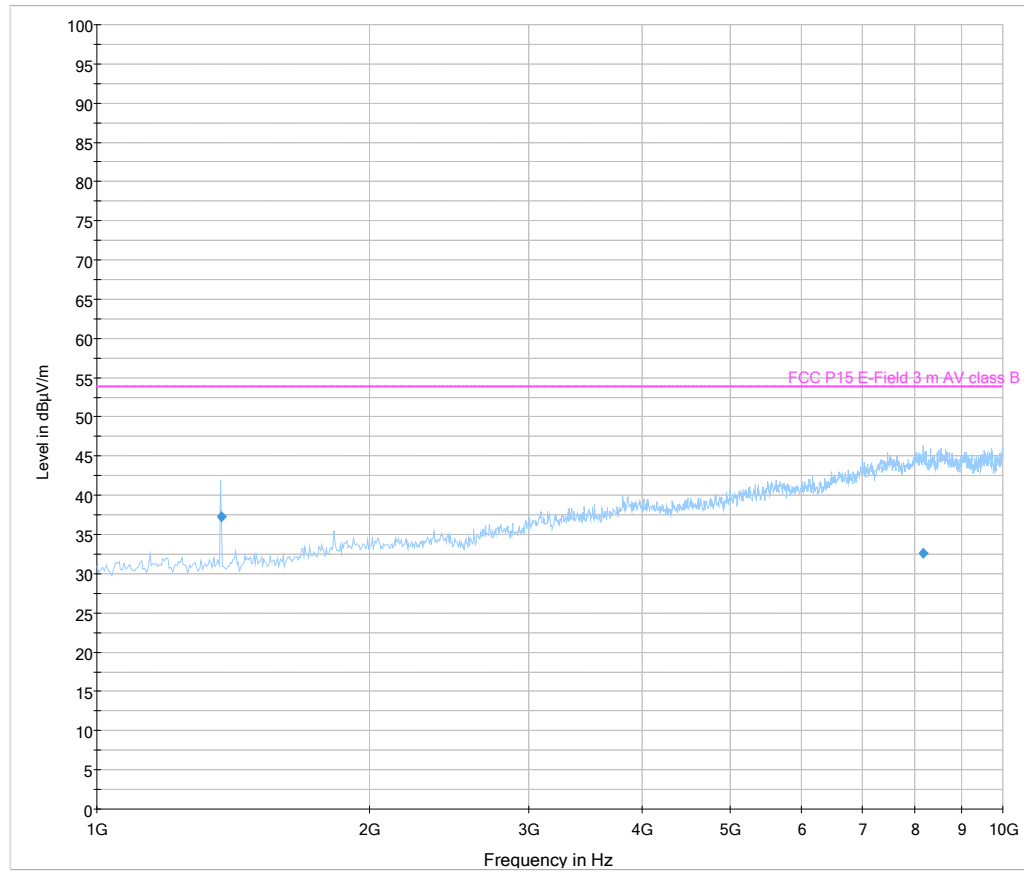




FCC ID: Y62-ASAP-915-2

Appendix 3.1

Diagram 3



20 dB bandwidth measurements according to FCC 47 CFR part 15.215 (c)

| | | |
|------------|--------------|------------|
| Date | Temperature | Humidity |
| 2010-10-25 | 23 °C ± 3 °C | 24 % ± 5 % |

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The unmodified sample was used during the test, serial number: 2010030002.

The EUT had the following settings during the test:

Power: - 2 dBm (command P1)

Duty cycle: 12.1% (command C6)

The radiated measurements were performed in the semi-anechoic chamber.

The fundamental was scanned with peak detector with the antenna height 1-4 m and the turntable was varied between 0-360 degrees for maximum response, see Appendix 2. The antenna distance during the measurements was 3.0 m.

Test set-up photos during the tests can be found in Appendix 9.

| Measurement equipment | Calibration Due | SP number |
|--|-----------------|-----------|
| Semi anechoic chamber, Edison | 2011-12 | 504 114 |
| Spectrum analyzer R&S ESI 26 | 2011-08 | 503 885 |
| EMI measurement computer | - | - |
| Software: R&S EMC32, ver. 6.30.10 | - | 503 745 |
| Antenna Schaffner Bilog CBL6143 | 2013-04 | 504 079 |
| Temperature and humidity meter Testo 625 | 2011-04 | 504 117 |

Measurement uncertainty: 2.6 %

Remark

The test was performed at 903 MHz instead of 906 MHz.

With the power setting -2 dBm (P1) the field strength of the fundamental at 903 MHz was above the limit, thus the lowest frequency was changed from 903 to 906 MHz.

The changed frequency from 903 to 906 MHz was judged not to affect the 20 dB BW measurement, thus the test was not performed again.



FCC ID: Y62-ASAP-915-2

Appendix 4

Results

The diagram can be found in the Appendix 4.1.

| | | |
|-----------|-----------|------------------------------|
| Diagram 1 | 903.0 MHz | 20 dB BW = 212.42 kHz |
| Diagram 2 | 915.0 MHz | 20 dB BW = 211.42 kHz |
| Diagram 3 | 927.0 MHz | 20 dB BW = 213.43 kHz |

Limits

According to 47CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

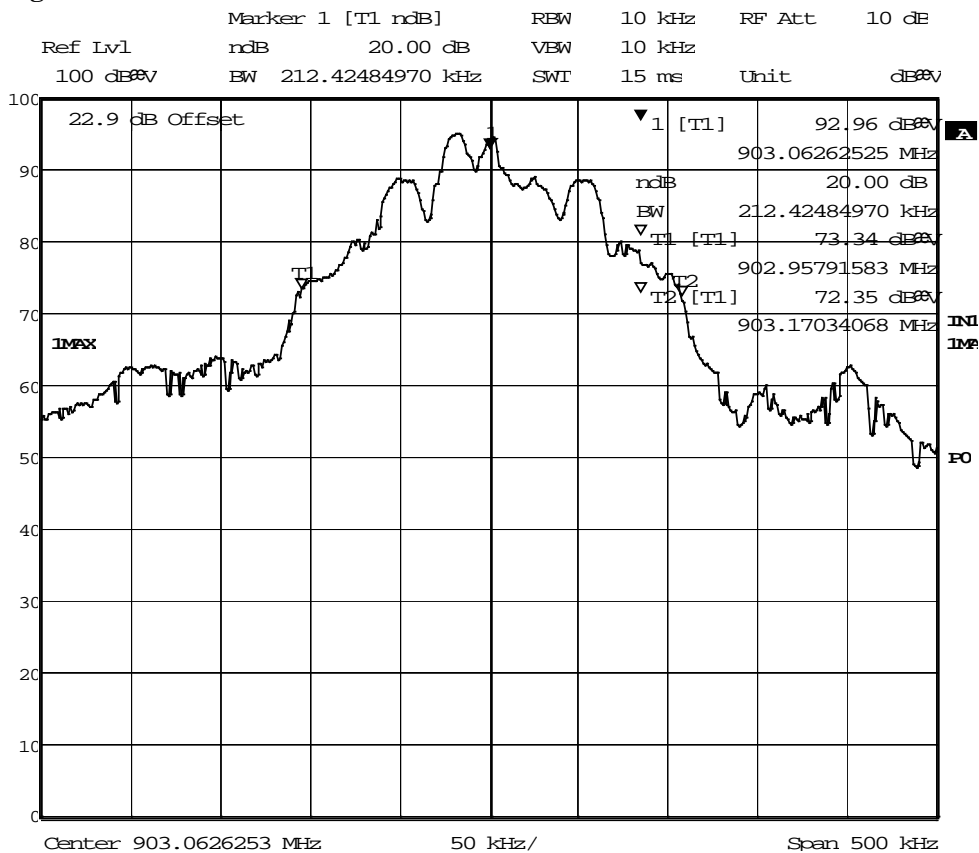
| | |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|



FCC ID: Y62-ASAP-915-2

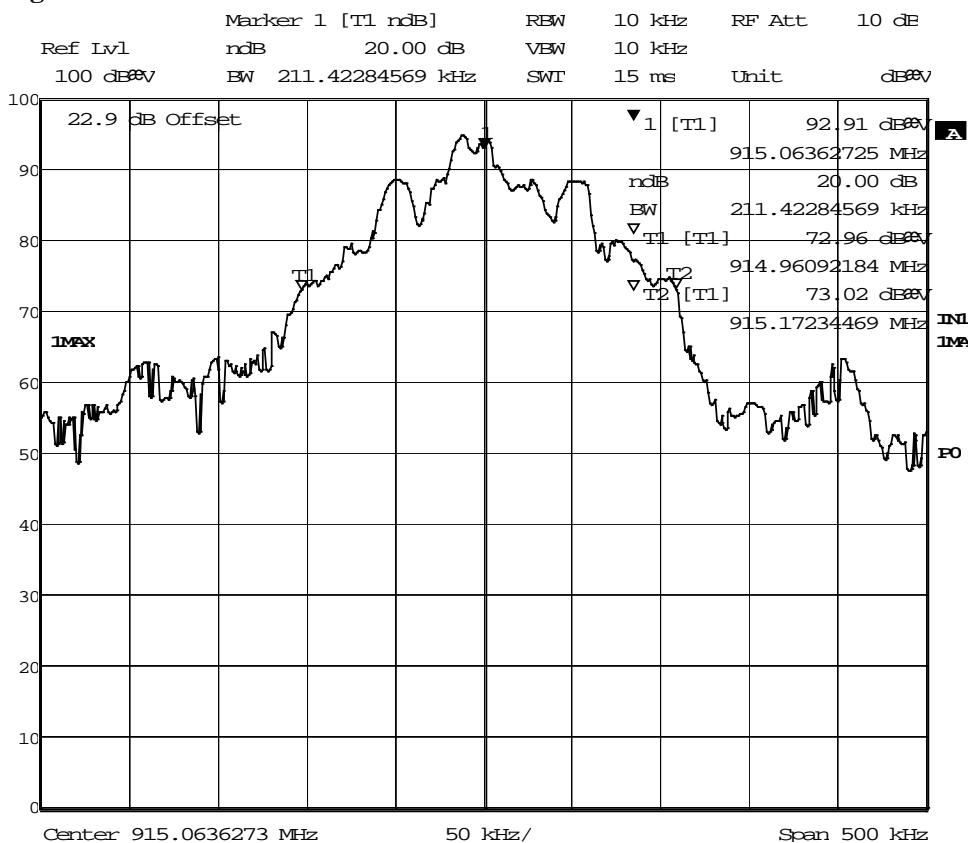
Appendix 4.1

Diagram 1



Date: 25.OCT.2010 16:30:41

Diagram 2



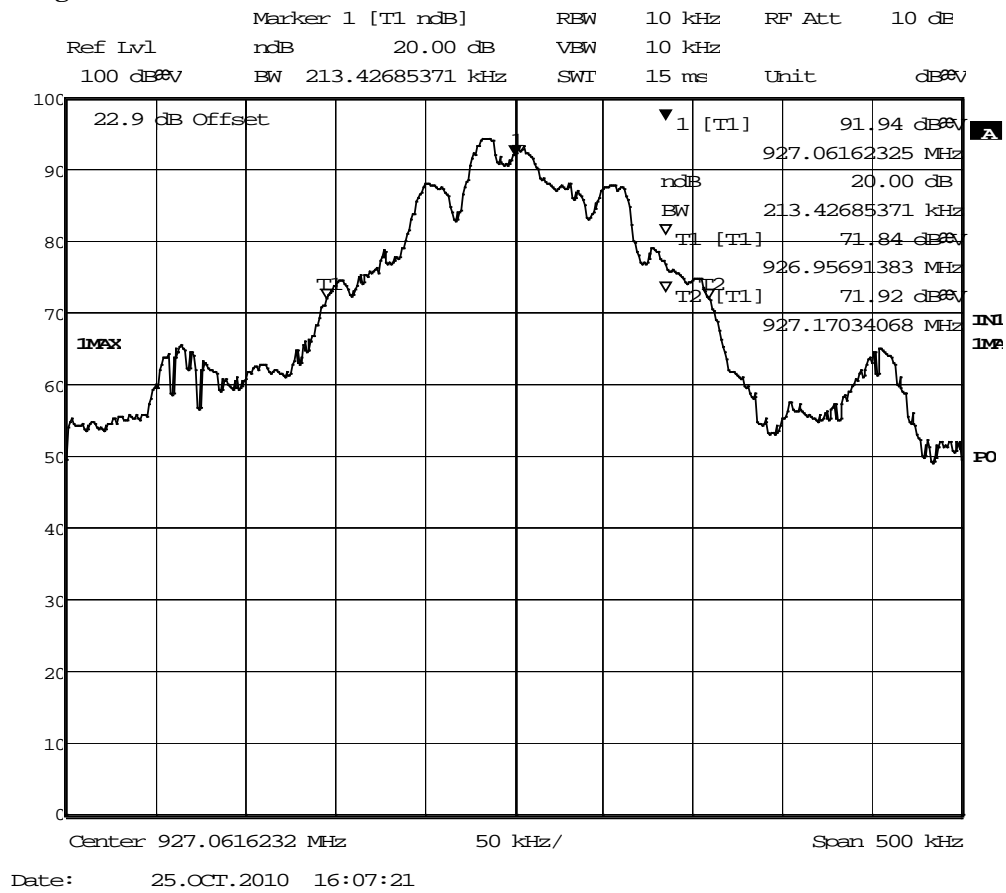
Date: 26.OCT.2010 08:15:28



FCC ID: Y62-ASAP-915-2

Appendix 4.1

Diagram 3



Conducted emission measurements according to FCC 47 CFR part 15.207, class B / RSS-Gen 7.2.2

| | | |
|--------------------|-----------------------------|------------------------|
| Date 2010-10-26 | Temperature 22 °C ± 3 °C | Humidity 24 % ± 5 % |
|--------------------|-----------------------------|------------------------|

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The unmodified sample was used during the test, serial number: 2010030002.

The EUT had the following settings during the test:

Power: - 2 dBm (command P1)

Duty cycle: 100% (command C1)

Measurements were performed on the 120 V AC/60 Hz, phase and neutral terminals, at the AC/DC adapter Powerbox, model: PUP120-14.

Test set-up photos during the tests can be found on page 2.

| Measurement equipment | Calibration Due | SP number |
|--|-----------------|-----------|
| Semi anechoic chamber, Edison | 2011-12 | 504 114 |
| Spectrum analyzer R&S ESI 26 | 2011-08 | 503 885 |
| EMI measurement computer | - | - |
| Software: R&S EMC32, ver. 6.30.10 | - | 503 745 |
| LISN Schwartzbeck NNLA20 | 2012-04 | 504 129 |
| Temperature and humidity meter Testo 625 | 2011-04 | 504 117 |

Remark

The test was performed at 903 MHz instead of 906 MHz.

With the power setting -2 dBm (P1) the field strength of the fundamental at 903 MHz was above the limit, thus the lowest frequency was changed from 903 to 906 MHz.

The changed frequency from 903 to 906 MHz was judged not to affect the AC conducted emission measurement, thus the test was not performed again.

Result

The conducted emission spectra can be found in Appendix 5.1:

| | |
|------------|---------------------------------------|
| Diagram 1: | 120 V AC, phase terminal, ambient |
| Diagram 2: | 120 V AC, phase terminal, 903.0 MHz |
| Diagram 3: | 120 V AC, neutral terminal, 903.0 MHz |
| Diagram 4: | 120 V AC, phase terminal, 915.0 MHz |
| Diagram 5: | 120 V AC, neutral terminal, 915.0 MHz |
| Diagram 6: | 120 V AC, phase terminal, 927.0 MHz |
| Diagram 7: | 120 V AC, neutral terminal, 927.0 MHz |

The limit lines indicated as Voltage on Mains in the diagrams are the same limit lines as of FCC part 15.



REPORT

FCC ID: Y62-ASAP-915-2

Date 2011-06-07 Reference PX03821-RA1 rev 1 Page 2 (3)

Rev: 2012-05-31
Appendix 5

Limits

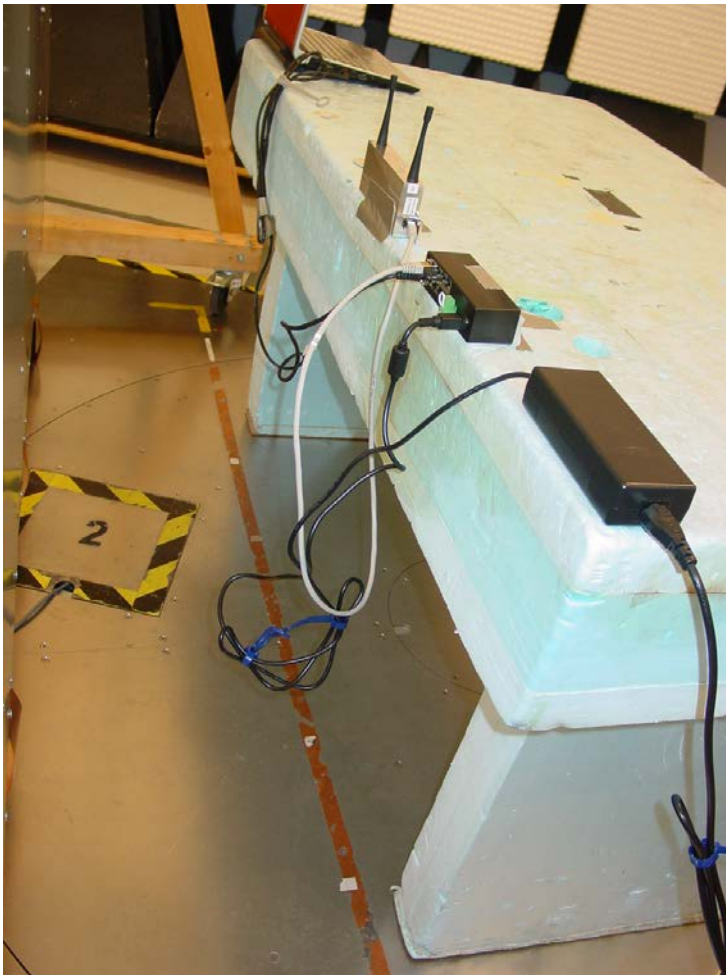
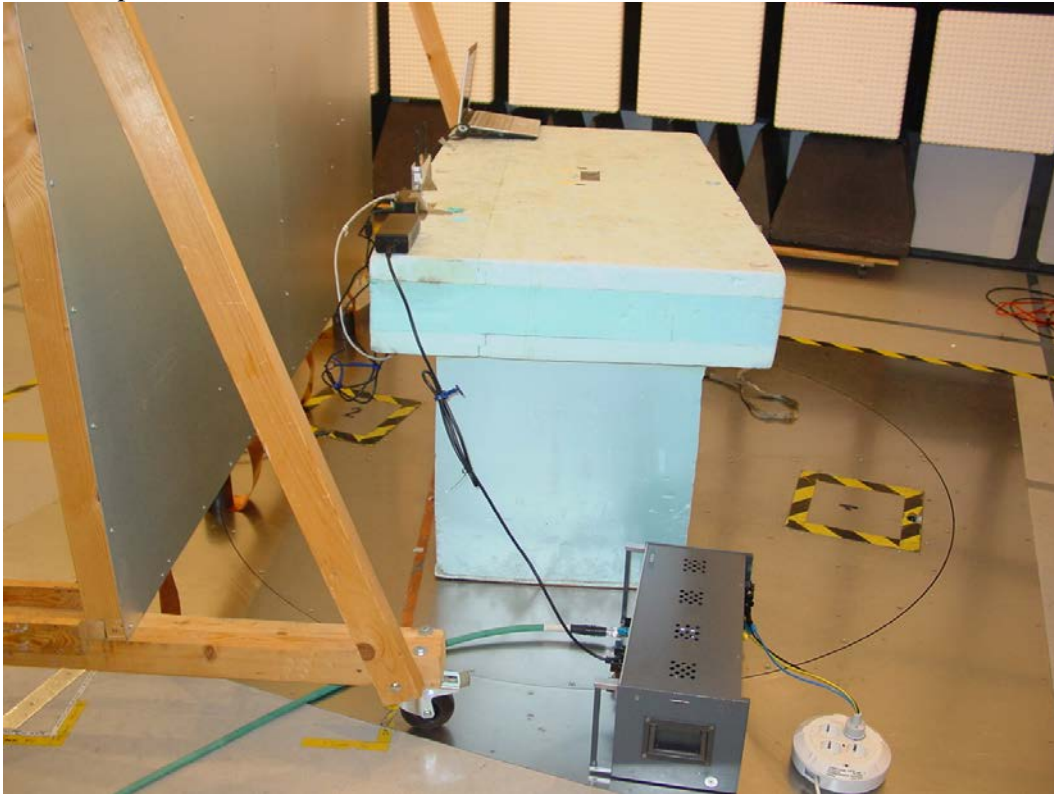
According to 47CFR 15.207 and according to RSS-Gen 7.2.2,

| Frequency (MHz) | Quasi-peak value (dB μ V) | Average value (dB μ V/m) |
|-----------------|-------------------------------|------------------------------|
| 0.15-0.5 | 66-56* | 56-46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*=Decreases with the logarithm of the frequency

| | |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

Test set-up:

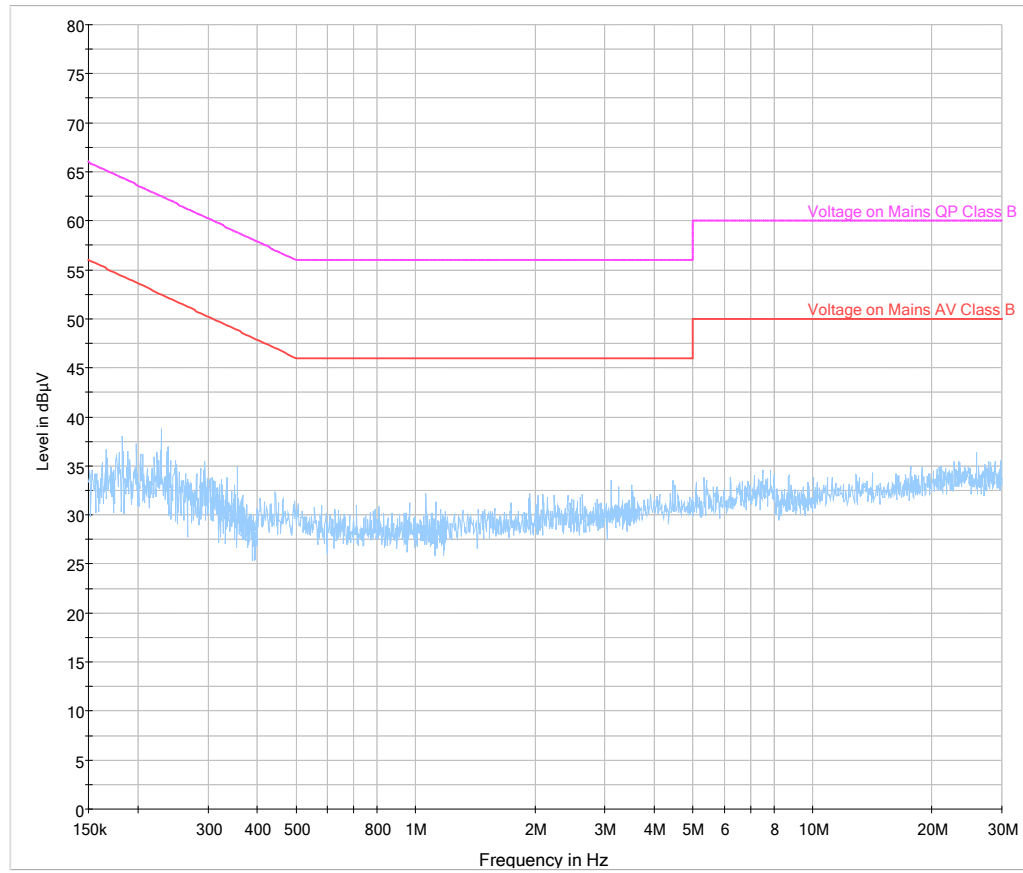




FCC ID: Y62-ASAP-915-2

Appendix 5.1

Diagram 1

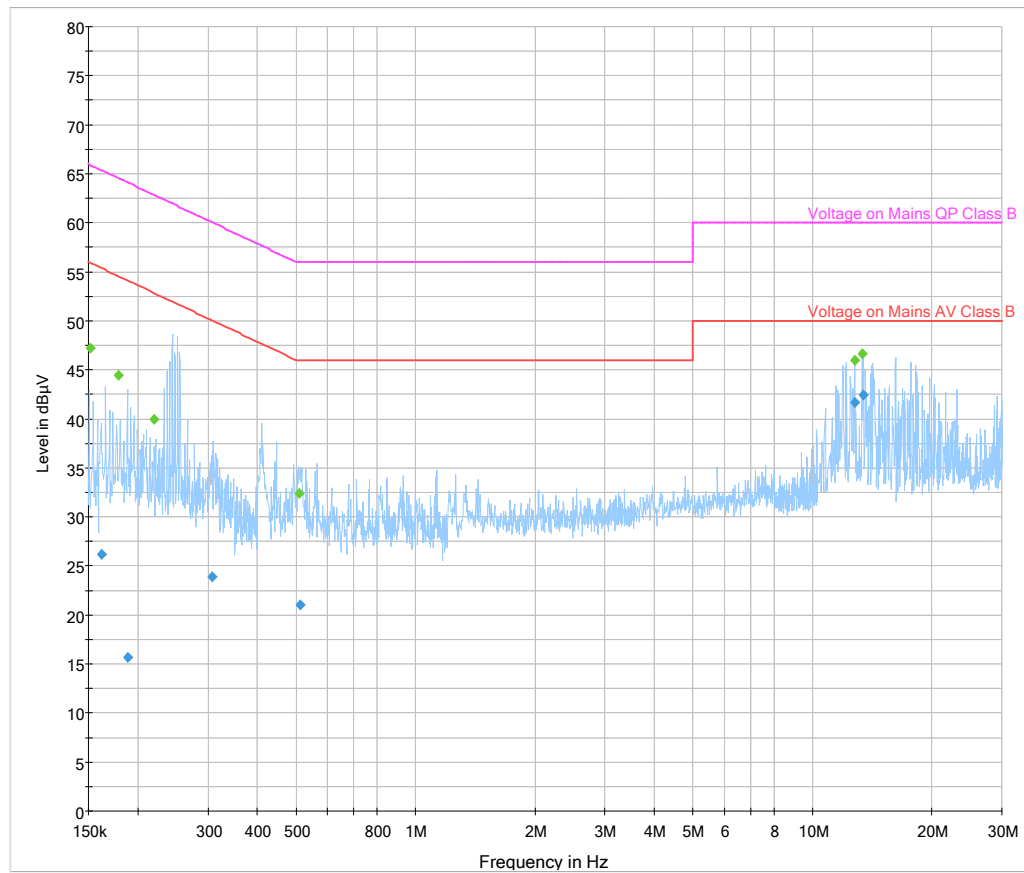




FCC ID: Y62-ASAP-915-2

Appendix 5.1

Diagram 2



Final Average

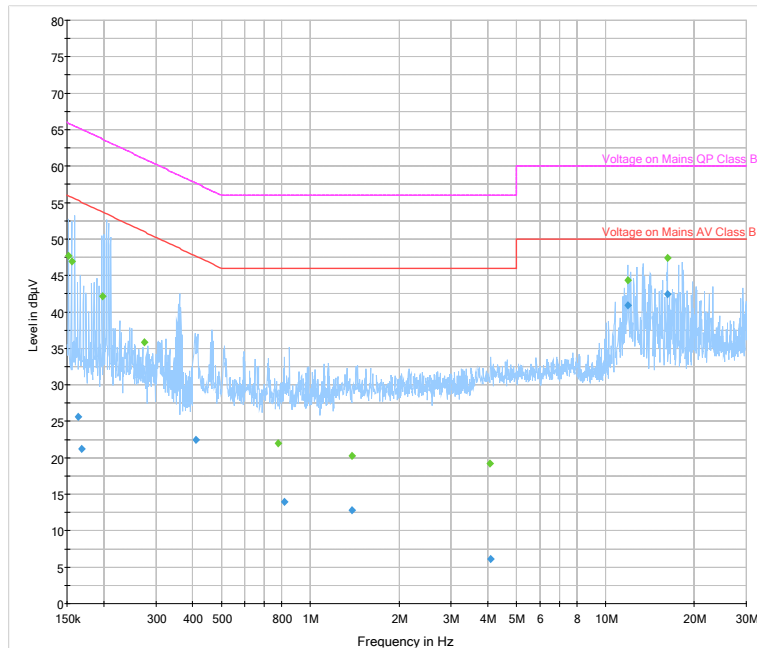
| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.162000 | 26.2 | 5000.000 | 9.000 | GND | L1 | 0.3 | 29.2 | 55.4 |
| 0.188188 | 15.7 | 5000.000 | 9.000 | GND | L1 | 0.3 | 38.4 | 54.1 |
| 0.307703 | 23.9 | 5000.000 | 9.000 | GND | L1 | 0.2 | 26.1 | 50.0 |
| 0.513130 | 21.0 | 5000.000 | 9.000 | GND | L1 | 0.2 | 25.0 | 46.0 |
| 12.747695 | 41.6 | 5000.000 | 9.000 | GND | L1 | 0.7 | 8.4 | 50.0 |
| 13.418838 | 42.4 | 5000.000 | 9.000 | GND | L1 | 0.7 | 7.6 | 50.0 |

Final QuasiPeak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.152000 | 47.2 | 5000.000 | 9.000 | GND | L1 | 0.3 | 18.7 | 65.9 |
| 0.178188 | 44.4 | 5000.000 | 9.000 | GND | L1 | 0.2 | 20.2 | 64.6 |
| 0.219703 | 39.9 | 5000.000 | 9.000 | GND | L1 | 0.2 | 22.9 | 62.8 |
| 0.509130 | 32.4 | 5000.000 | 9.000 | GND | L1 | 0.2 | 23.6 | 56.0 |
| 12.747695 | 45.9 | 5000.000 | 9.000 | GND | L1 | 0.7 | 14.1 | 60.0 |
| 13.358838 | 46.7 | 5000.000 | 9.000 | GND | L1 | 0.7 | 13.3 | 60.0 |



Diagram 3



Final Average

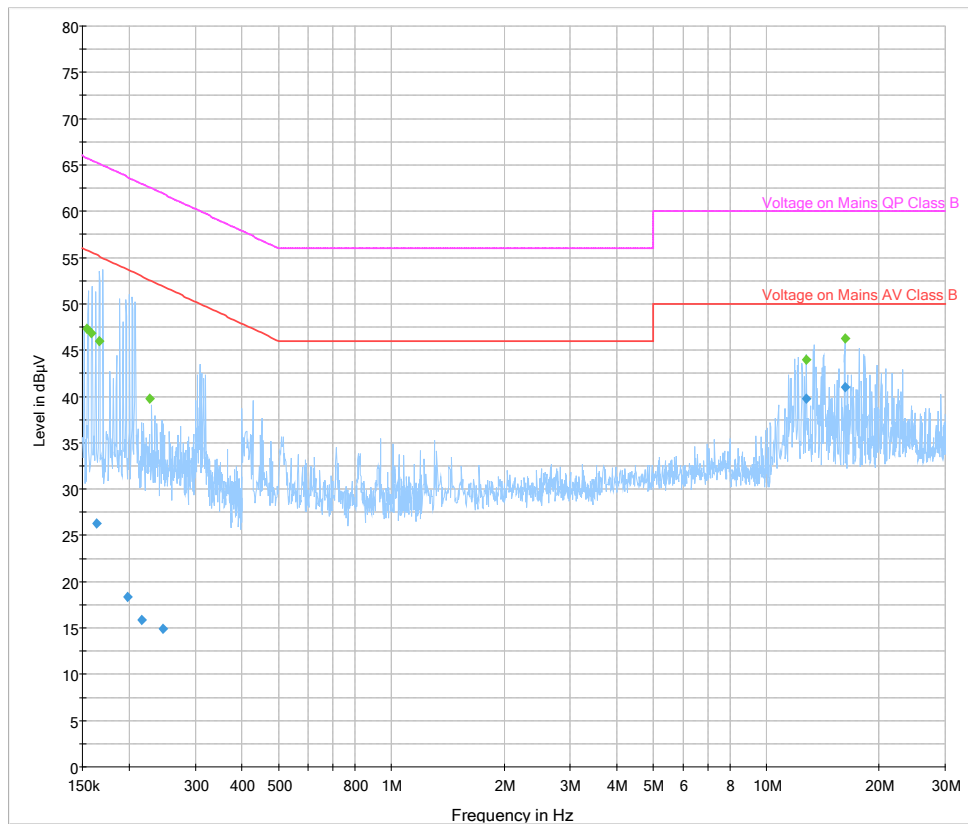
| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.164000 | 25.6 | 5000.000 | 9.000 | GND | N | 0.1 | 29.7 | 55.3 |
| 0.168000 | 21.2 | 5000.000 | 9.000 | GND | N | 0.1 | 33.9 | 55.1 |
| 0.410922 | 22.5 | 5000.000 | 9.000 | GND | N | 0.1 | 25.1 | 47.6 |
| 0.816501 | 14.0 | 5000.000 | 9.000 | GND | N | 0.1 | 32.0 | 46.0 |
| 1.388100 | 12.8 | 5000.000 | 9.000 | GND | N | 0.1 | 33.2 | 46.0 |
| 4.075367 | 6.2 | 5000.000 | 9.000 | GND | N | 0.2 | 39.8 | 46.0 |
| 11.893158 | 40.9 | 5000.000 | 9.000 | GND | N | 0.6 | 9.1 | 50.0 |
| 16.227844 | 42.4 | 5000.000 | 9.000 | GND | N | 0.8 | 7.6 | 50.0 |

Final QuasiPeak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.152000 | 47.7 | 5000.000 | 9.000 | GND | N | 0.1 | 18.2 | 65.9 |
| 0.156000 | 46.9 | 5000.000 | 9.000 | GND | N | 0.1 | 18.8 | 65.7 |
| 0.198000 | 42.1 | 5000.000 | 9.000 | GND | N | 0.1 | 21.6 | 63.7 |
| 0.274922 | 35.8 | 5000.000 | 9.000 | GND | N | 0.1 | 25.2 | 61.0 |
| 0.778501 | 21.9 | 5000.000 | 9.000 | GND | N | 0.1 | 34.1 | 56.0 |
| 1.386100 | 20.3 | 5000.000 | 9.000 | GND | N | 0.1 | 35.7 | 56.0 |
| 4.063367 | 19.2 | 5000.000 | 9.000 | GND | N | 0.2 | 36.8 | 56.0 |
| 11.891158 | 44.3 | 5000.000 | 9.000 | GND | N | 0.6 | 15.7 | 60.0 |
| 16.227844 | 47.4 | 5000.000 | 9.000 | GND | N | 0.8 | 12.6 | 60.0 |



Diagram 4



Final Average

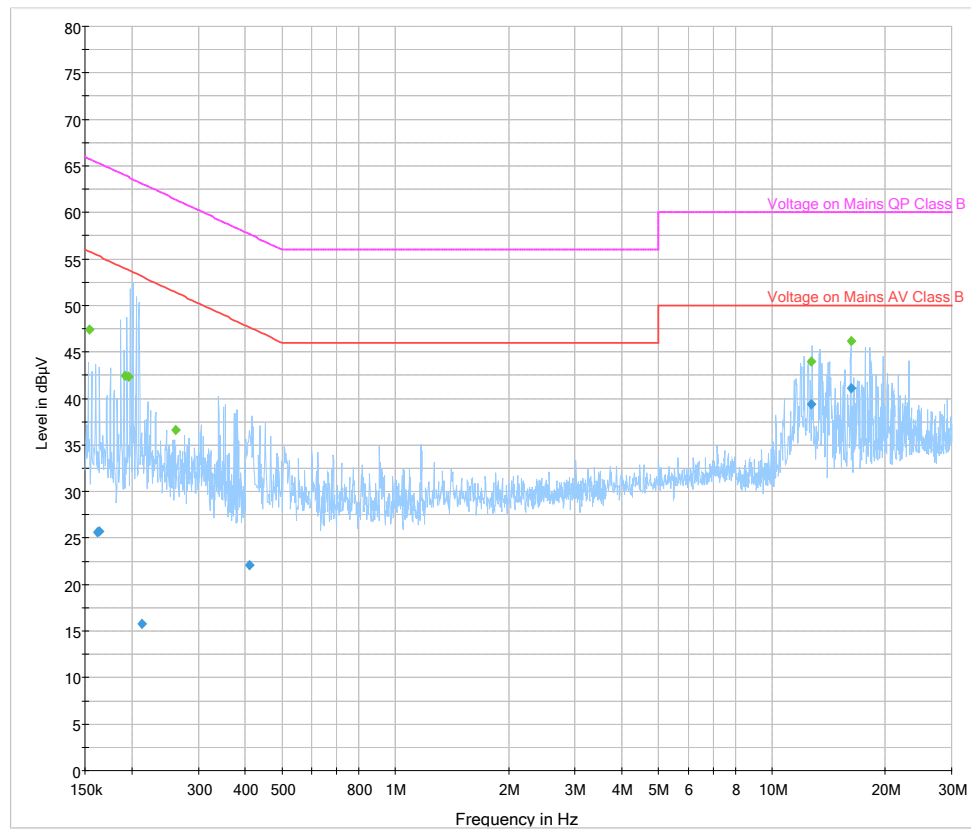
| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.164000 | 26.3 | 5000.000 | 9.000 | GND | L1 | 0.3 | 29.0 | 55.3 |
| 0.198000 | 18.4 | 5000.000 | 9.000 | GND | L1 | 0.2 | 35.3 | 53.7 |
| 0.216000 | 15.8 | 5000.000 | 9.000 | GND | L1 | 0.2 | 37.2 | 53.0 |
| 0.246317 | 14.9 | 5000.000 | 9.000 | GND | L1 | 0.2 | 37.0 | 51.9 |
| 12.747695 | 39.8 | 5000.000 | 9.000 | GND | L1 | 0.7 | 10.2 | 50.0 |
| 16.229844 | 41.0 | 5000.000 | 9.000 | GND | L1 | 0.9 | 9.0 | 50.0 |

Final QuasiPeak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.154000 | 47.3 | 5000.000 | 9.000 | GND | L1 | 0.3 | 18.5 | 65.8 |
| 0.158000 | 46.8 | 5000.000 | 9.000 | GND | L1 | 0.3 | 18.8 | 65.6 |
| 0.166000 | 46.0 | 5000.000 | 9.000 | GND | L1 | 0.3 | 19.2 | 65.2 |
| 0.226317 | 39.7 | 5000.000 | 9.000 | GND | L1 | 0.2 | 22.9 | 62.6 |
| 12.809695 | 44.0 | 5000.000 | 9.000 | GND | L1 | 0.7 | 16.0 | 60.0 |
| 16.227844 | 46.3 | 5000.000 | 9.000 | GND | L1 | 0.9 | 13.7 | 60.0 |



Diagram 5



Final Average

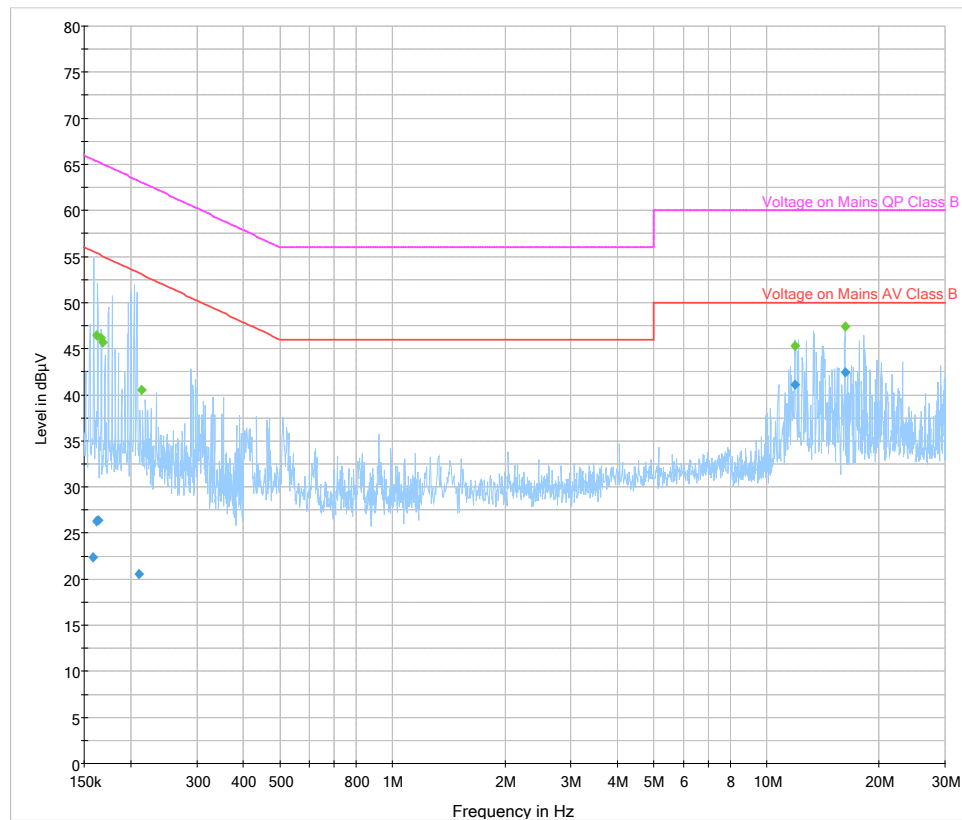
| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.162000 | 25.6 | 5000.000 | 9.000 | GND | N | 0.1 | 29.8 | 55.4 |
| 0.164000 | 25.7 | 5000.000 | 9.000 | GND | N | 0.1 | 29.6 | 55.3 |
| 0.212000 | 15.8 | 5000.000 | 9.000 | GND | N | 0.1 | 37.3 | 53.1 |
| 0.409379 | 22.1 | 5000.000 | 9.000 | GND | N | 0.1 | 25.6 | 47.7 |
| 12.747174 | 39.4 | 5000.000 | 9.000 | GND | N | 0.6 | 10.6 | 50.0 |
| 16.229844 | 41.1 | 5000.000 | 9.000 | GND | N | 0.8 | 8.9 | 50.0 |

Final QuasiPeak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.154000 | 47.4 | 5000.000 | 9.000 | GND | N | 0.1 | 18.4 | 65.8 |
| 0.192000 | 42.4 | 5000.000 | 9.000 | GND | N | 0.1 | 21.5 | 63.9 |
| 0.196000 | 42.3 | 5000.000 | 9.000 | GND | N | 0.1 | 21.5 | 63.8 |
| 0.261379 | 36.6 | 5000.000 | 9.000 | GND | N | 0.1 | 24.8 | 61.4 |
| 12.747174 | 44.0 | 5000.000 | 9.000 | GND | N | 0.6 | 16.0 | 60.0 |
| 16.229844 | 46.2 | 5000.000 | 9.000 | GND | N | 0.8 | 13.8 | 60.0 |



Diagram 6



Final Average

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.158000 | 22.3 | 5000.000 | 9.000 | GND | L1 | 0.3 | 33.3 | 55.6 |
| 0.162000 | 26.3 | 5000.000 | 9.000 | GND | L1 | 0.3 | 29.1 | 55.4 |
| 0.164000 | 26.4 | 5000.000 | 9.000 | GND | L1 | 0.3 | 28.9 | 55.3 |
| 0.209780 | 20.6 | 5000.000 | 9.000 | GND | L1 | 0.2 | 32.6 | 53.2 |
| 11.893158 | 41.1 | 5000.000 | 9.000 | GND | L1 | 0.6 | 8.9 | 50.0 |
| 16.227844 | 42.4 | 5000.000 | 9.000 | GND | L1 | 0.9 | 7.6 | 50.0 |

Final QuasiPeak

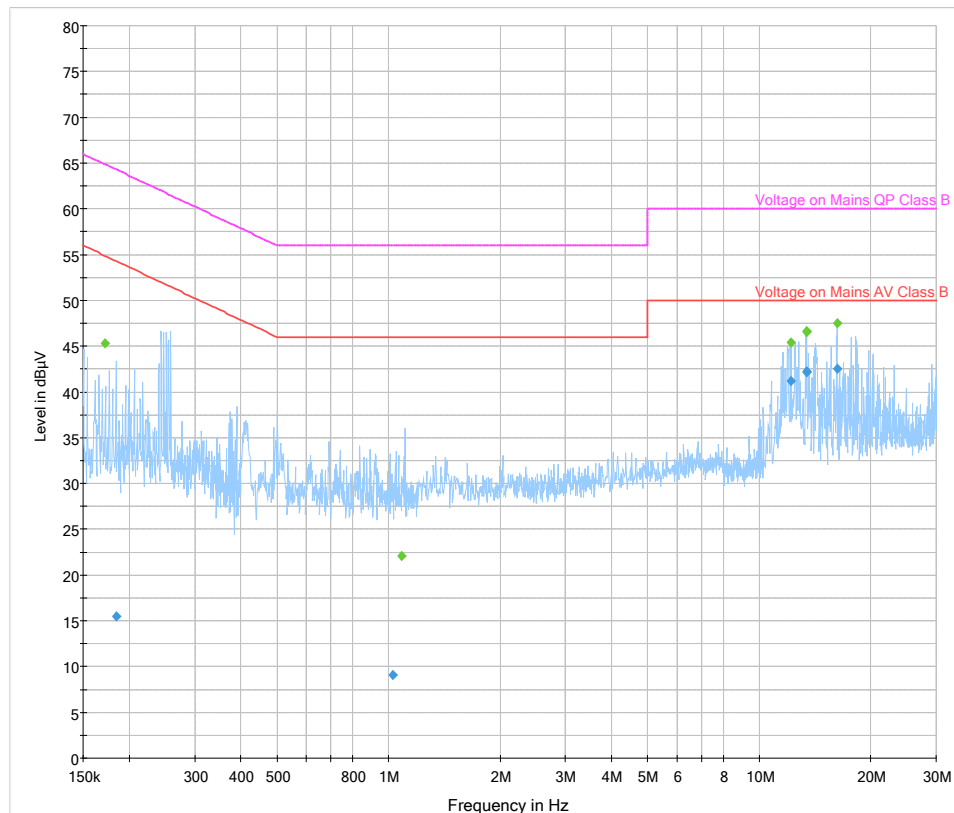
| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.162000 | 46.4 | 5000.000 | 9.000 | GND | L1 | 0.3 | 19.0 | 65.4 |
| 0.166000 | 46.1 | 5000.000 | 9.000 | GND | L1 | 0.3 | 19.1 | 65.2 |
| 0.168000 | 45.7 | 5000.000 | 9.000 | GND | L1 | 0.2 | 19.4 | 65.1 |
| 0.213780 | 40.5 | 5000.000 | 9.000 | GND | L1 | 0.2 | 22.6 | 63.1 |
| 11.893158 | 45.3 | 5000.000 | 9.000 | GND | L1 | 0.6 | 14.7 | 60.0 |
| 16.227844 | 47.4 | 5000.000 | 9.000 | GND | L1 | 0.9 | 12.6 | 60.0 |



FCC ID: Y62-ASAP-915-2

Appendix 5.1

Diagram 7



Final Average

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.184216 | 15.4 | 5000.000 | 9.000 | GND | N | 0.1 | 38.9 | 54.3 |
| 1.029014 | 9.1 | 5000.000 | 9.000 | GND | N | 0.1 | 36.9 | 46.0 |
| 12.196990 | 41.2 | 5000.000 | 9.000 | GND | N | 0.6 | 8.8 | 50.0 |
| 13.418838 | 42.3 | 5000.000 | 9.000 | GND | N | 0.6 | 7.7 | 50.0 |
| 13.419880 | 42.2 | 5000.000 | 9.000 | GND | N | 0.6 | 7.8 | 50.0 |
| 16.227844 | 42.5 | 5000.000 | 9.000 | GND | N | 0.8 | 7.5 | 50.0 |

Final QuasiPeak

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.172216 | 45.3 | 5000.000 | 9.000 | GND | N | 0.1 | 19.6 | 64.9 |
| 1.085014 | 22.1 | 5000.000 | 9.000 | GND | N | 0.1 | 33.9 | 56.0 |
| 12.198990 | 45.4 | 5000.000 | 9.000 | GND | N | 0.6 | 14.6 | 60.0 |
| 13.418838 | 46.5 | 5000.000 | 9.000 | GND | N | 0.6 | 13.5 | 60.0 |
| 13.419880 | 46.6 | 5000.000 | 9.000 | GND | N | 0.6 | 13.4 | 60.0 |
| 16.227844 | 47.5 | 5000.000 | 9.000 | GND | N | 0.8 | 12.5 | 60.0 |

Occupied bandwidth measurements according to 47CFR 2.1049 / RSS-Gen 7.2.2

| | | |
|--------------------|-----------------------------|------------------------|
| Date 2010-10-25 | Temperature 23 °C ± 3 °C | Humidity 24 % ± 5 % |
|--------------------|-----------------------------|------------------------|

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The unmodified sample was used during the test, serial number: 2010030002.

The EUT had the following settings during the test:

Power: - 2 dBm (command P1)

Duty cycle: 12.1% (command C6)

The radiated measurements were performed in the semi-anechoic chamber.

The fundamental was scanned with peak detector with the antenna height 1-4 m and the turntable was varied between 0-360 degrees for maximum response, see Appendix 2. The antenna distance during the measurements was 3.0 m.

Test set-up photos during the tests can be found in Appendix 8.

| Measurement equipment | Calibration Due | SP number |
|--|-----------------|-----------|
| Semi anechoic chamber, Edison | 2011-12 | 504 114 |
| Spectrum analyzer R&S ESI 26 | 2011-08 | 503 885 |
| EMI measurement computer | - | - |
| Software: R&S EMC32, ver. 6.30.10 | - | 503 745 |
| Antenna Schaffner Bilog CBL6143 | 2013-04 | 504 079 |
| Temperature and humidity meter Testo 625 | 2011-04 | 504 117 |

Measurement uncertainty: 2.6 %

Remark

The test was performed at 903 MHz instead of 906 MHz.

With the power setting -2 dBm (P1) the field strength of the fundamental at 903 MHz was above the limit, thus the lowest frequency was changed from 903 to 906 MHz.

The changed frequency from 903 to 906 MHz was judged not to affect the Occupied bandwidth measurement, thus the test was not performed again.

Results

The diagram can be found in Appendix 6.1.

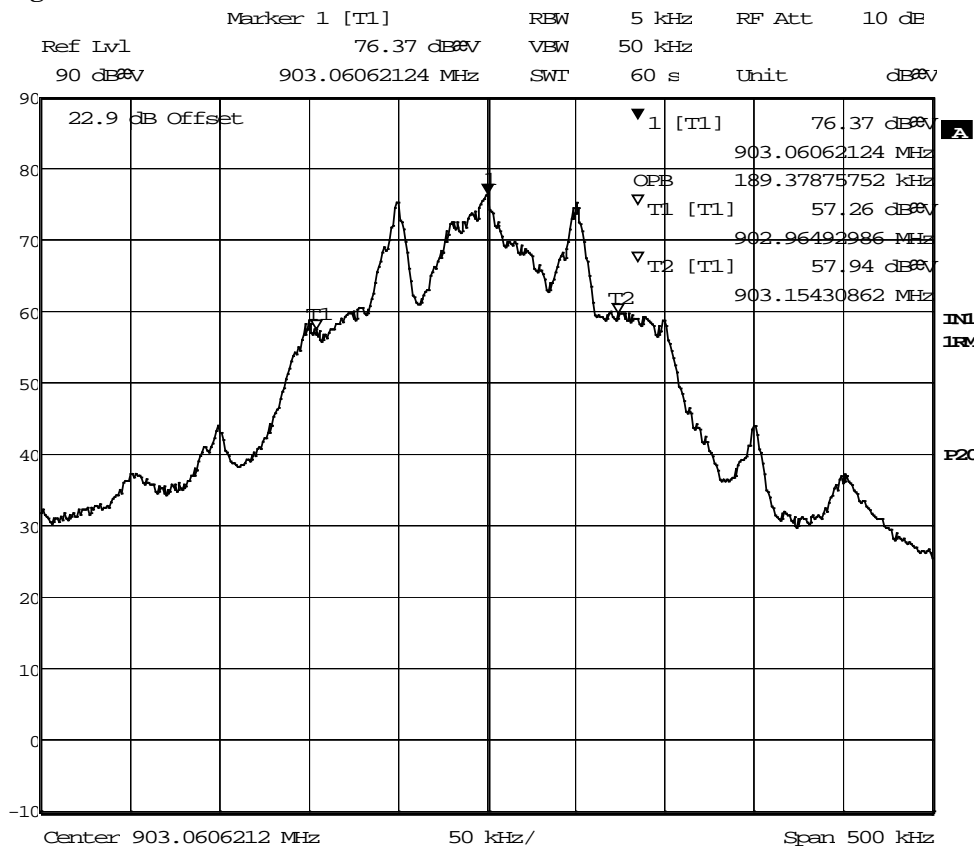
| | | |
|-----------|-----------|-------------------------------|
| Diagram 1 | 903.0 MHz | OBW = 189.38 kHz (99%) |
| Diagram 2 | 915.0 MHz | OBW = 187.37 kHz (99%) |
| Diagram 2 | 927.0 MHz | OBW = 182.36 kHz (99%) |



FCC ID: Y62-ASAP-915-2

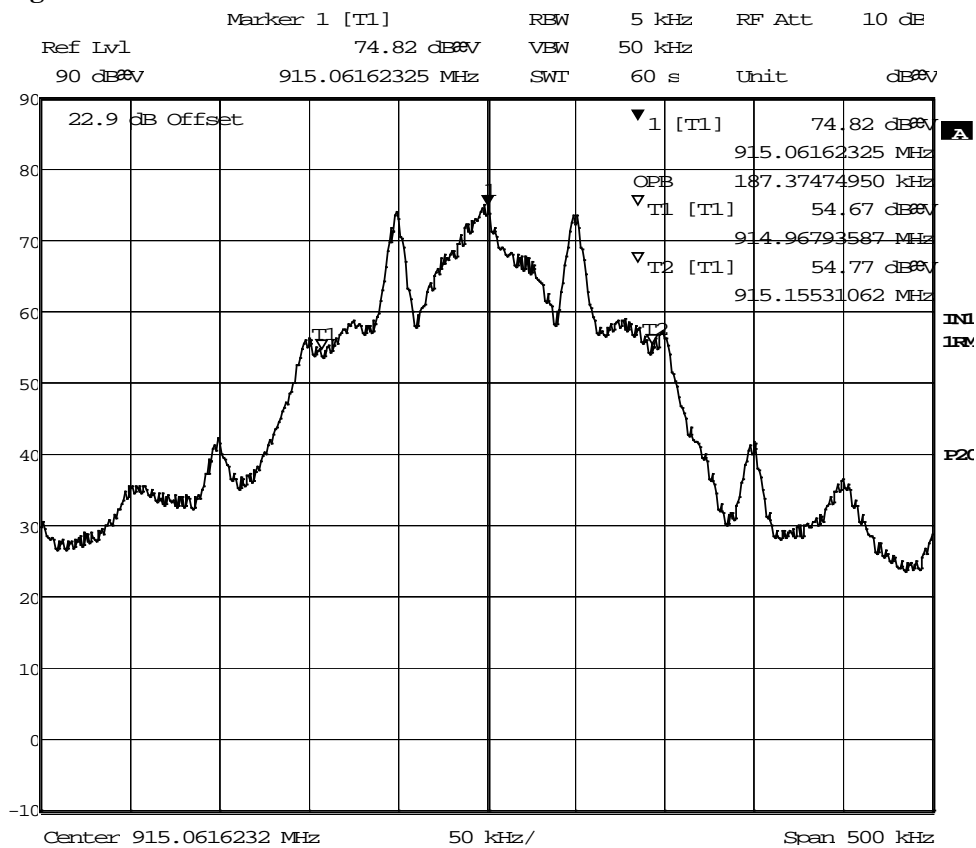
Appendix 6.1

Diagram 1



Date: 25.OCT.2010 16:33:31

Diagram 2



Date: 26.OCT.2010 08:10:31



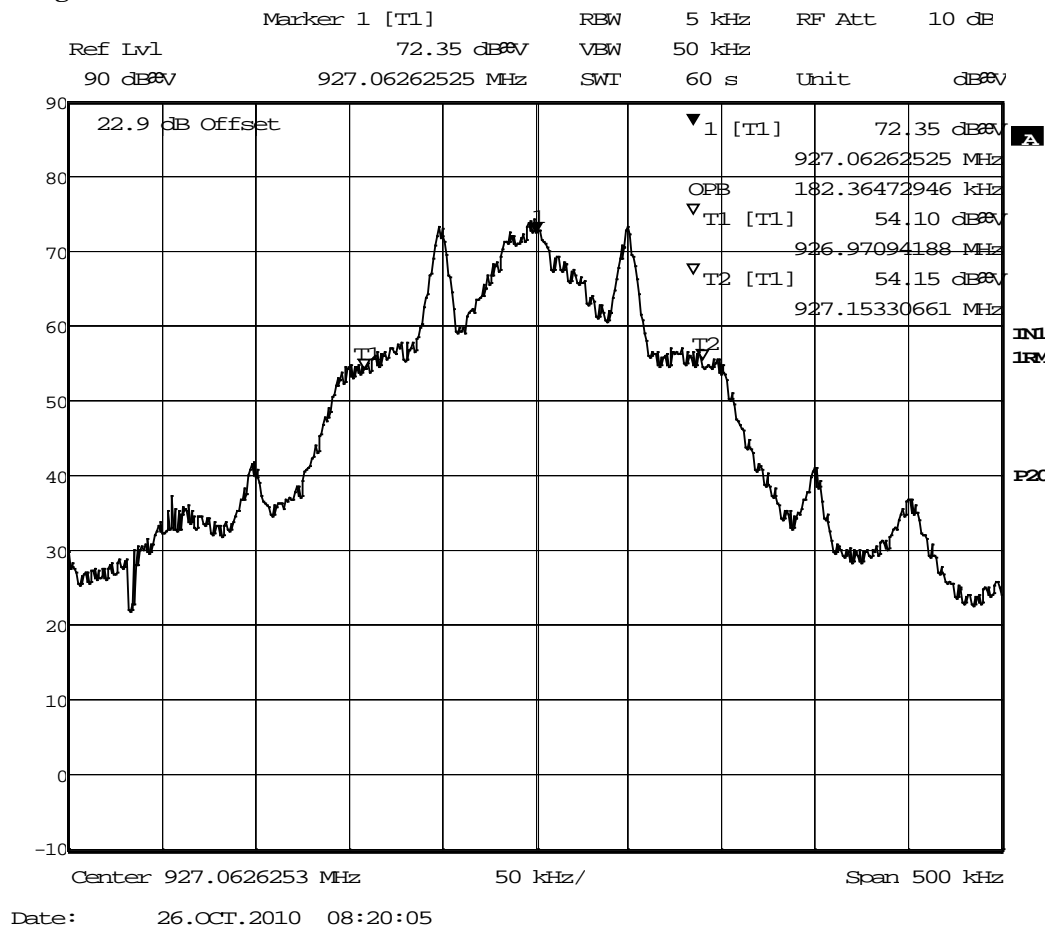
REPORT

Date 2011-06-07 Reference PX03821-RA1 rev 1 2 (2) Page

FCC ID: Y62-ASAP-915-2

Appendix 6.1

Diagram 3



Band edge measurements according to 47CFR 2.1049 / RSS-210 A2.9(b)

| | | |
|------------|--------------|------------|
| Date | Temperature | Humidity |
| 2010-11-01 | 23 °C ± 3 °C | 37 % ± 5 % |

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

Both the unmodified sample, serial number: 2010030002 and the modified sample, serial number: 2010030004 were used during the test.

The EUT had the following settings during the test:

Power: - 2 dBm (command P1)

Duty cycle: 12.1% (command C6)

The radiated maximum peak radiated output power measurements were performed in the semi-anechoic chamber.

The measurement was scanned with peak detector with the antenna height 1-4 m and the turntable was varied between 0-360 degrees for maximum response, see Appendix 2. The antenna distance during the measurements was 3.0 m.

Test set-up photos during the tests can be found in Appendix 9.

| Measurement equipment | Calibration Due | SP number |
|--|-----------------|-----------|
| Semi anechoic chamber, Edison | 2011-12 | 504 114 |
| Spectrum analyzer R&S ESI 26 | 2011-08 | 503 885 |
| EMI measurement computer | - | - |
| Software: R&S EMC32, ver. 6.30.10 | - | 503 745 |
| Antenna Schaffner Bilog CBL6143 | 2013-04 | 504 079 |
| Temperature and humidity meter Testo 625 | 2011-04 | 504 117 |



FCC ID: Y62-ASAP-915-2

Appendix 7

Results

Operation band 902-928 MHz

The pre-measurement diagrams with peak detector can be found in Appendix 7.1.

Diagram 1 906.0 MHz s/n: 2010030004
Diagram 2 927.0 MHz s/n: 2010030004

Final measurements with QP detector:

906.0 MHz QP level at band edge at 902 MHz: **31.9 dB μ V/m**
s/n: 2010030004
(Fundamental power = 93.6 dB μ V/m)

927.0 MHz QP level at band edge at 928 MHz: **42.8 dB μ V/m**
s/n: 2010030002
(Fundamental power = 93.1 dB μ V/m)

Limits

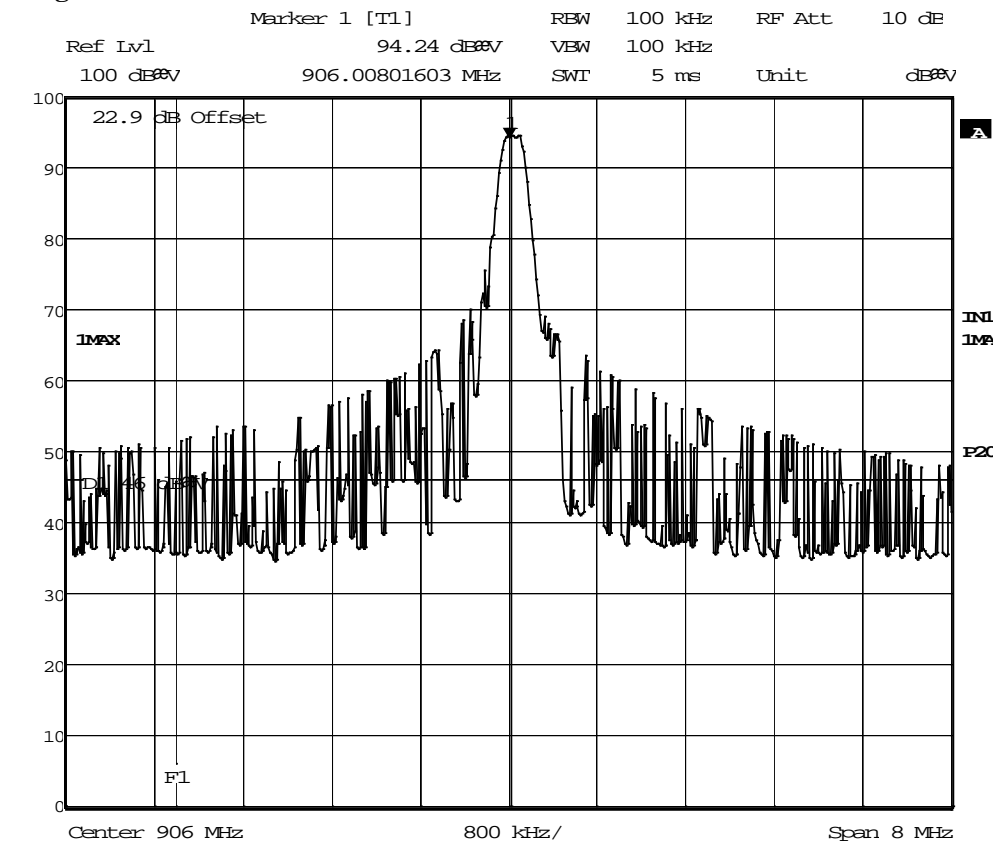
According to 47CFR 15.249(d), emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

According to RSS-210 A2.9(b), emissions radiated the outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to table 2 limits, whichever is the less stringent.

| | |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

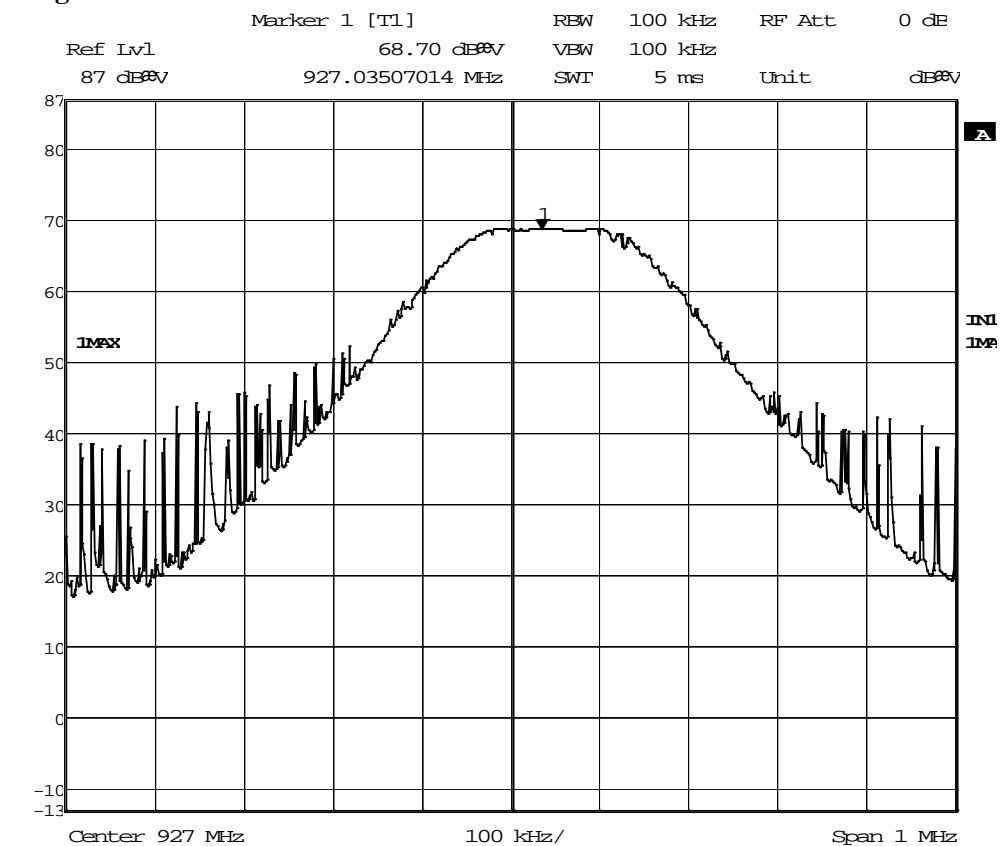


Diagram 1



Date: 1.NOV.2010 13:32:14

Diagram 2



Date: 1.NOV.2010 10:57:48

RF exposure evaluation: Mobile equipment / RSS-102 2.5.1

| | | |
|--------------------|-----------------------------|------------------------|
| Date 2010-11-01 | Temperature 23 °C ± 3 °C | Humidity 37 % ± 5 % |
|--------------------|-----------------------------|------------------------|

Procedure

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

Results

The following formula was used to calculate the RF exposure,

$$P_d = P_{out} \times G / (4 \times \pi \times r^2_{cm})$$

where,

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

r = distance between observation and center of the radiator in cm

From the peak EUT RF output power, the minimum mobile separation distance, $r=20$ cm, as well as the gain of the used antenna, the RF power density can be obtained.

The maximum radiated peak output power from appendix 2 was used for calculation of MPE.

| Antenna Gain (dBi) | Antenna Gain (numeric) | ERP Peak output power (dBm) | Peak output power (mW) | Power density, P_d [S] (mW/cm ²) | Limit of power density (mW/cm ²) |
|--------------------|------------------------|-----------------------------|------------------------|--|--|
| Note 1 | Note 1 | -1.6 | 0.692 | 0.00014 | 1.0 |

Note 1: The antenna gain is not used in the MPE calculation as the ERP value (including the antenna) is used.

Limits

(A) Limits for Occupational/Controlled Exposure

| Frequency range (MHz) | Electric field strength [E] (V/m) | Magnetic field strength [H] (A/m) | Power density [S] (mW/cm ²) | Averaging time E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|---|---|
| 0.3-3.0 | 614 | 1.63 | (100)* | 6 |
| 3.0-30 | 1842/f | 4.89/f | (900/f)* | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | F/300 | 6 |
| 1500-100,000 | | | 5 | 6 |

(B) Limits for General Population/Uncontrolled Exposure

| Frequency range (MHz) | Electric field strength [E] (V/m) | Magnetic field strength [H] (A/m) | Power density [S] (mW/cm ²) | Averaging time E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|---|---|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | F/1500 | 30 |
| 1500-100,000 | | | 1.0 | 30 |

Note: f=frequency in MHz, *Plane-wave equivalent power density

According to RSS-102 2.5.1, SAR evaluation is required if the separation distance between the user and the radiating element of the device is less than or equal to 20 cm, except when the device operates as follows:

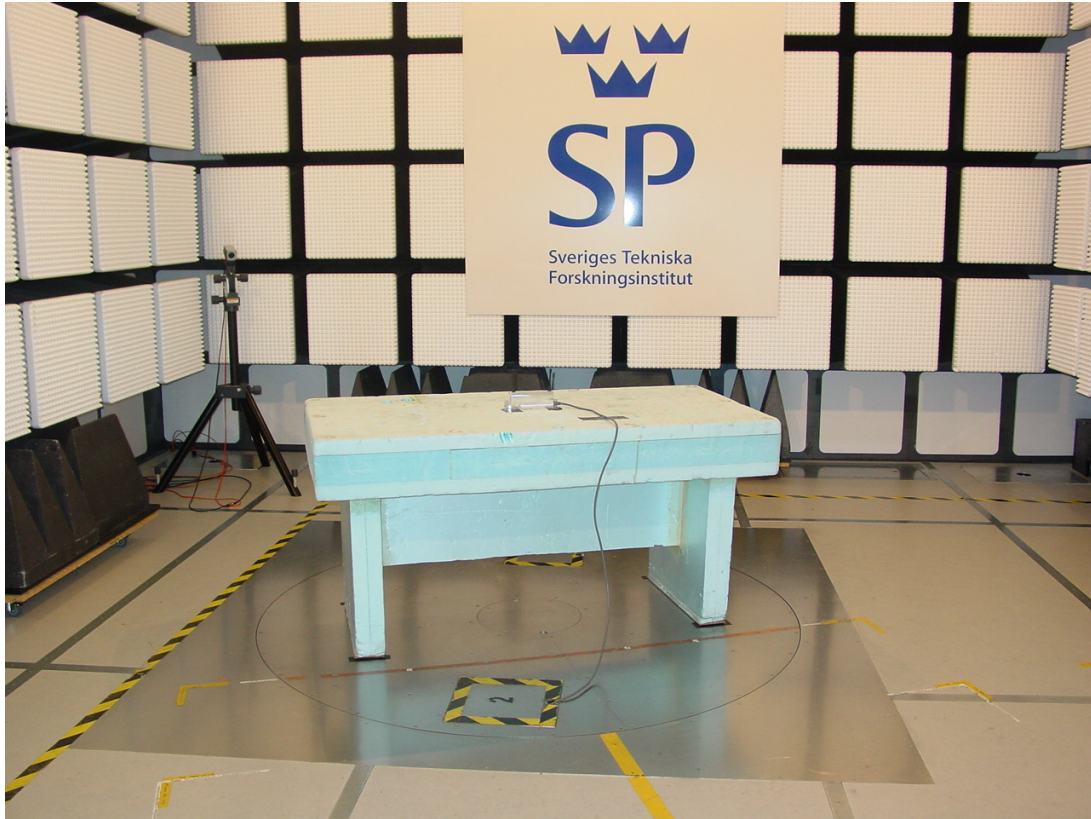
- From 3 kHz up to 1 GHz inclusively, and with output power (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p) source-base, time-averaged output power) that is less than or equal to 200 mW for general use and 1000 mW for controlled use.

| | |
|-----------|-----|
| Complies? | Yes |
|-----------|-----|

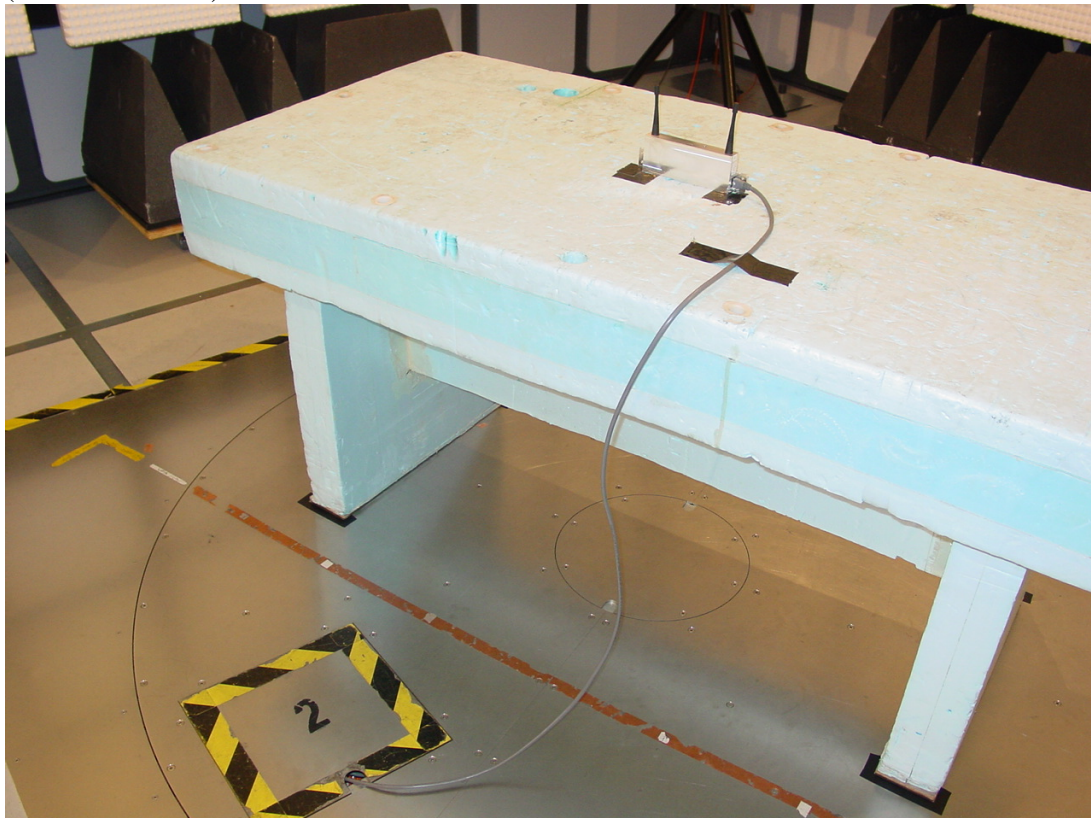
Photos

The test set-up during all the radiated tests can be seen in the pictures below.

30-1000 MHz (s/n: 2010030004):



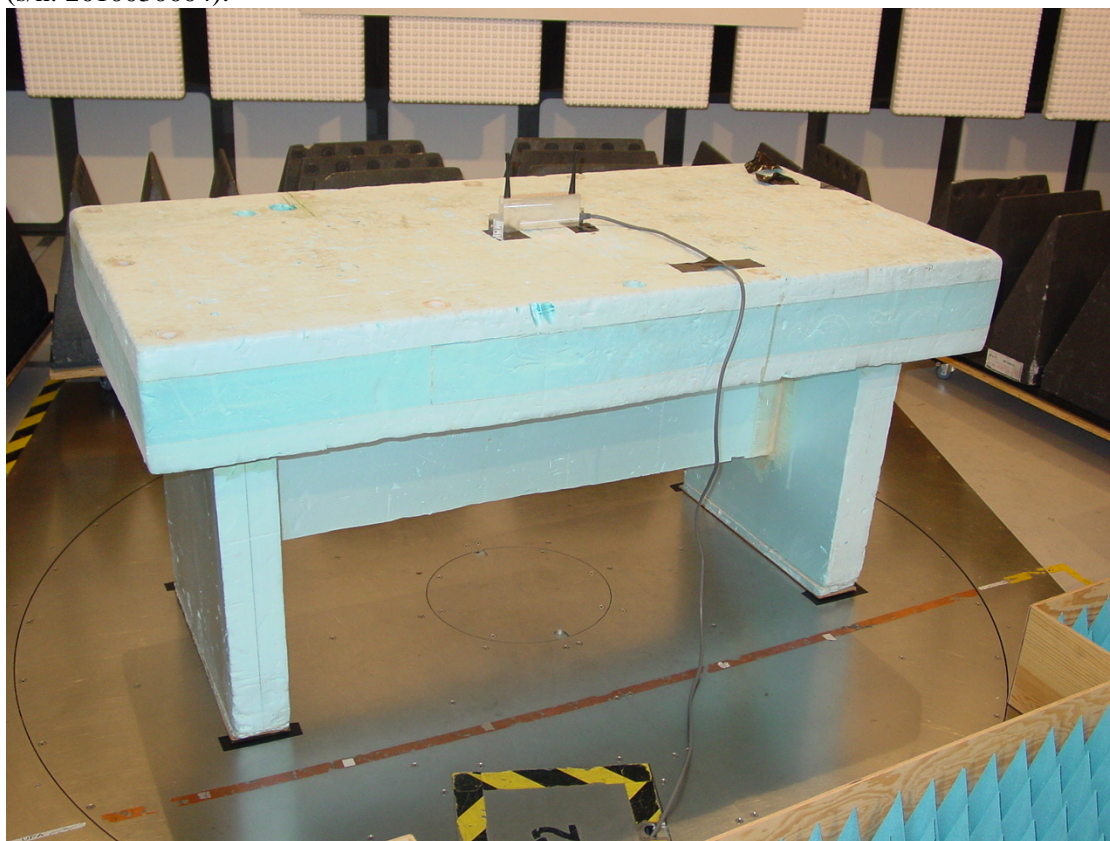
(s/n: 2010030004):



1-10 GHz (s/n: 2010030004):



(s/n: 2010030004):

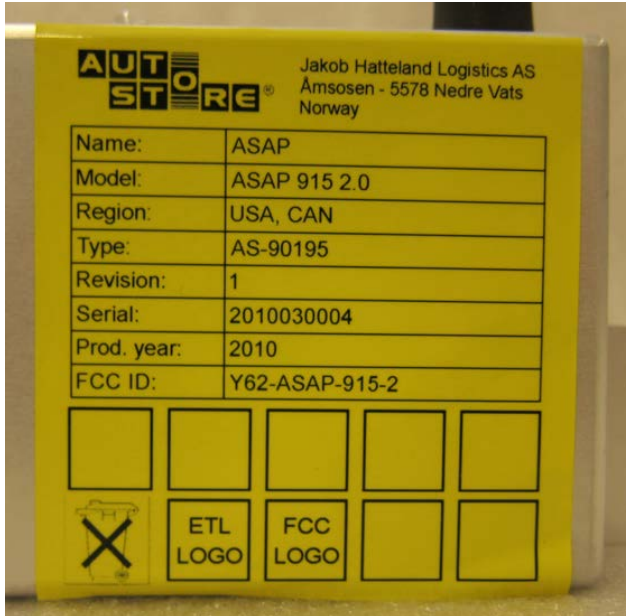


FCC ID: Y62-ASAP-915-2

EUT

Identity

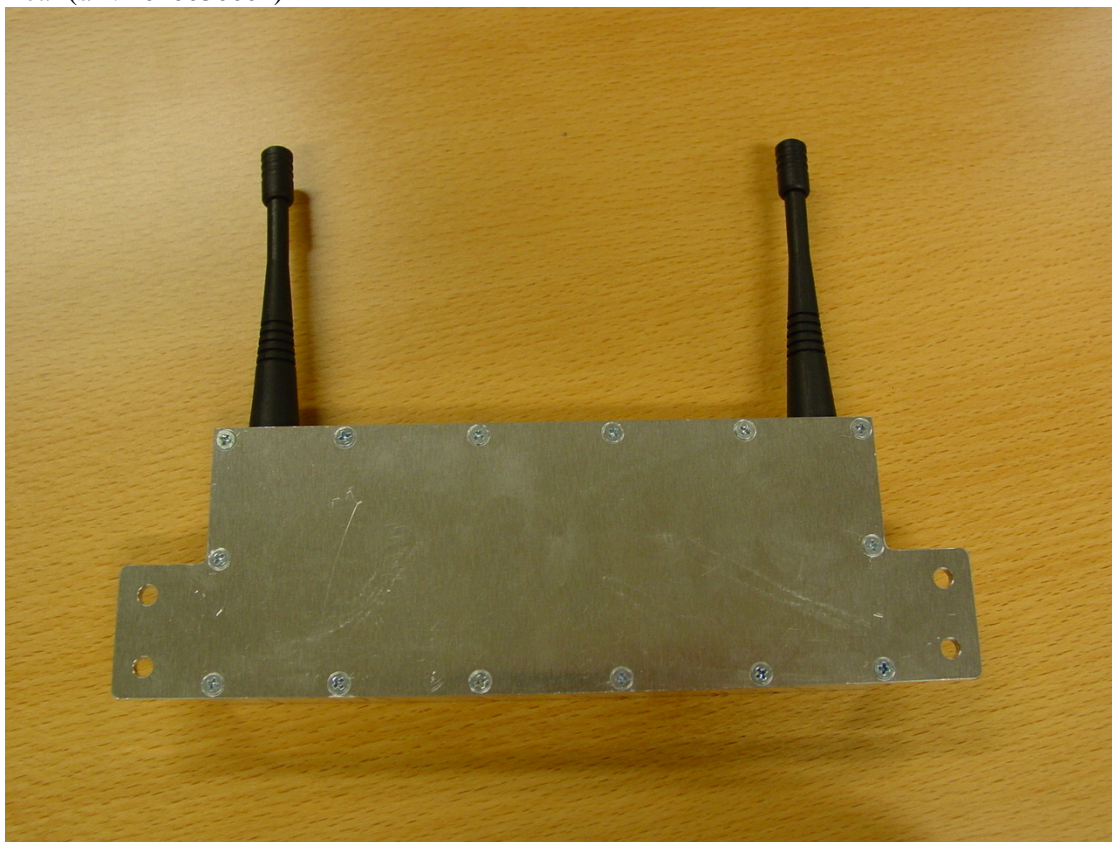
Note: the label below has not the right type number. The correct type number shall be AS-99174.



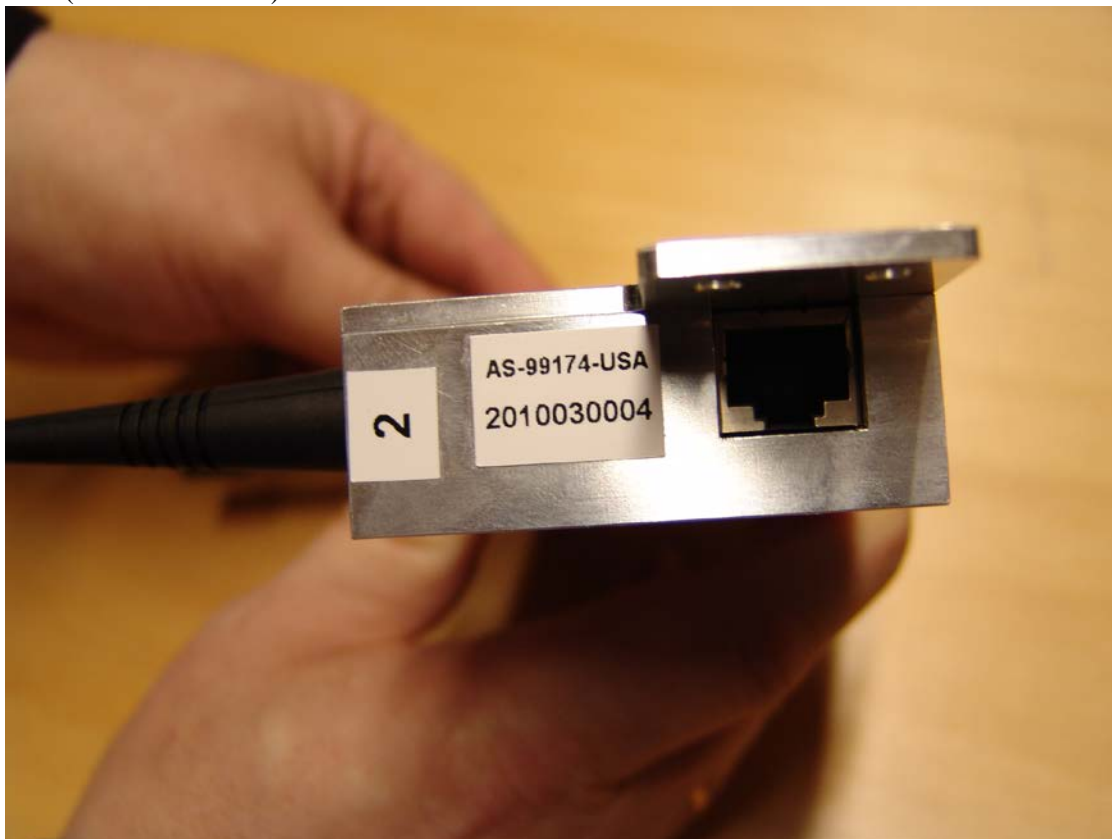
Front (s/n: 2010030004)



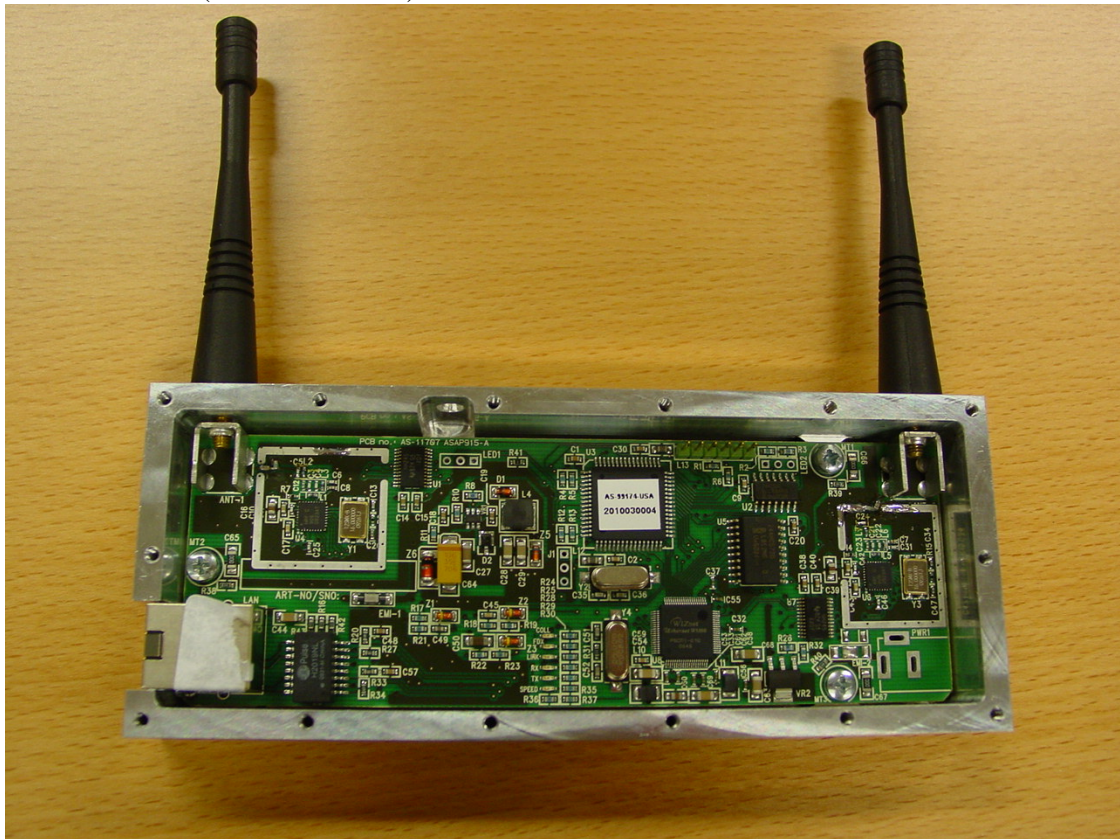
Rear (s/n: 2010030004)



Side (s/n: 2010030004)



Inside overview (s/n: 2010030004)



Inside close-up (s/n: 2010030004)

