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**ADR TESTING SERVICE  
EMC LABORATORY**

**EMC TEST REPORT**

**Test Report Number** – 25539-1NFC

The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Engineer, I hereby declare that the equipment tested as specified in this report conforms to the requirements indicated.

Signature:

A handwritten signature in black ink on a light-colored background, reading "Albert J. Patapack".

Name: Albert J. Patapack

Title: EMC Engineer

Date: September 27, 2013

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**Test Report Details**

Tests Performed By: ADR Testing Service  
Location Code: ADR LV  
Motorola Mobility LLC  
Product Safety and Compliance Group  
600 North US Hwy 45  
Libertyville, IL 60048  
PH (847) 523-6167 Fax (847) 523-4538  
FCC Registration Number: 316588  
Industry Canada Number: 1090-1

Tests Requested By: Motorola Mobility LLC  
600 North US Hwy 45  
Libertyville, IL 60048

Product Type: Cellular Phone

Signaling Capability: WCDMA 1900/850, GSM 1900/850, aGPS ,  
Bluetooth Class 2, Version 4.0 LE+EDR, NFC,  
802.11b/802.11g/802.11a/802.11n/802.11ac

FCC ID: IHDT56PA3

Serial Numbers: LXAA1W0037, LXAA1W0018

Testing Complete Date: April 25, 2013

**Applicable Standards**

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47:

  X   Part 15 Subpart C – Intentional Radiators

Applicable Standards: ANSI 63.4 2003, RSS-210 Issue 8, Part 15 Subpart C (15.225)

**Summary of Testing**

| Test # | Test Name   | Pass/Fail |
|--------|---|-----------|
| 1      | Field Strength of Spurious Emissions from Intentional Radiators | Pass      |
| 2      | AC Line Conducted Emissions                                     | Pass      |

| Test # | Test Name   | Margin with respect to the Limit |
|--------|---|----------------------------------|
| 1      | Field Strength of Spurious Emissions from Intentional Radiators | see results                      |
| 2      | AC Line Conducted Emissions                                     | see results                      |

The margin with respect to the limit is the minimum margin for all modes and bands.

**General and Special Conditions**

This product utilizes an internal battery that is not removable. When applicable, EMC testing was performed with the internal battery fully charged. Where a battery could not be used due to the need for a controlled variation of input voltage, an external power supply was utilized.

All testing was done in an indoor controlled environment. The temperature and the relative humidity were maintained within the ANSI C63.4 2003 Standard requirements during the entire duration of testing.

**Equipment and Cable Configurations**

The EUT was tested in a configuration as specified by ANSI C63.4 2003 Standard requirements.

**Equipment List**

| <b>Manufacturer</b> | <b>Equipment Type</b> | <b>Model No.</b> | <b>Serial Number</b> | <b>Calibration Due Date</b> |
|---------------------|-----------------------|------------------|----------------------|-----------------------------|
| Rohde & Schwarz     | Receiver              | ESU40            | 100286               | 5/15/2013                   |
| Agilent             | MXA Signal Analyzer   | N9020A           | US46470586           | 1/20/2014                   |
| Attenuator          | Weinschel             | AS-6             | 6675                 | NCR                         |
| Attenuator          | Weinschel             | AS-6             | 6677                 | NCR                         |
| ETS                 | LISN                  | 3810/2NM         | 00062907             | 8/7/2013                    |
| ETS                 | LISN                  | 3810/2NM         | 00062912             | 8/6/2013                    |
| ETS                 | Loop Antenna          | 6507             | 00049471             | 1/7/2014                    |
| Thermotron          | Environmental Chamber | S-4              | 31580                | 11/15/2013                  |

All test equipment was within their calibration date during the time of testing. When equipment went out of calibration during testing it was replaced using a similar piece of calibrated equipment. All these equipments are listed in the equipment list. All equipment is on a one-year calibration cycle.

## **Measurement Procedures and Data**

### **FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS**

#### **Measurement Procedure**

The equipment under test is placed inside the semi-anechoic chamber on a wooden table on the center of the turntable. Initially, for all radiated emissions from 9 kHz to 30 MHz, the turntable is rotated 45 degrees to obtain a maximum reading on the spectrum analyzer using the peak detector function. All final readings are then taken at the worst case EUT orientation. For all radiated emissions from 30 MHz to 1 GHz, the antenna mast is varied from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer using the peak detector function. Below 1000 MHz, the final radiated emissions are then measured using an EMI receiver employing a CISPR quasi-peak detector. This is repeated for both horizontal and vertical polarizations of the receive antenna.

The field strength of each radiated emission is calculated by correcting the EMI receiver level for cable loss, amplifier gain and antenna correction factors.

$$\text{Field Strength (dBuV/m)} = \text{EMI Receiver Level (dBuV)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)} + \text{Antenna Correction Factor (1/m)}$$

#### **Test Setup**

The EUT and the host equipment were setup according to the procedures in ANSI C63.4-2003. A software application was run on the phone which enables the phone to transmit at all the different modulations and data rates supported for NFC operation.

EUT was tested in all 3 orthogonal planes. The loop antenna was positioned in all 3 orthogonal axes.

Worst case results are reported.

**Measurement Results**

Radiated emissions were measured from 9 kHz to 30 MHz.

Notes: Worst Case emissions reported.

FCC Limits

| Frequency Range<br>MHz | Limit                    |
|------------------------|--------------------------|
| 13.410 – 13.553        | 90.47 dBuV/m @ 3 m       |
| 13.110 – 13.410        | 80.50 dBuV/m @ 3 m       |
| 13.710 – 14.010        | 80.50 dBuV/m             |
| 13.553 – 13.567        | 124 dBuV/m @ 3m          |
| 0.009 – 0.490          | 2400/F(kHz) uV/m @ 300 m |
| 0.490 – 1.705          | 24000/F(kHz) uV/m @ 30 m |
| 1.705 – 30.00          | 69.50 dBuV/m @ 3 m       |

| Frequency<br>MHz | QuasiPeak-<br>MaxHold<br>dBuV/m | Polarization | Corr.<br>dB | Comment |
|------------------|---------------------------------|--------------|-------------|---------|
| 13.110000        | 27.5                            | V            | 16.7        | Pass    |
| 13.150000        | 26.2                            | V            | 16.7        | Pass    |
| 13.202000        | 26.8                            | V            | 16.7        | Pass    |
| 13.250000        | 26.0                            | V            | 16.7        | Pass    |
| 13.302000        | 24.6                            | V            | 16.7        | Pass    |
| 13.350000        | 25.5                            | V            | 16.7        | Pass    |
| 13.402000        | 26.5                            | V            | 16.7        | Pass    |
| 13.450000        | 25.0                            | V            | 16.7        | Pass    |
| 13.502000        | 25.5                            | V            | 16.7        | Pass    |
| 13.530000        | 26.8                            | V            | 16.7        | Pass    |
| 13.534000        | 25.2                            | V            | 16.7        | Pass    |
| 13.538000        | 26.5                            | V            | 16.7        | Pass    |
| 13.542000        | 23.9                            | V            | 16.7        | Pass    |
| 13.546000        | 25.2                            | V            | 16.7        | Pass    |
| 13.550000        | 23.9                            | V            | 16.7        | Pass    |
| 13.554000        | 25.5                            | V            | 16.7        | Pass    |
| 13.558000        | 26.0                            | V            | 16.7        | Pass    |
| 13.562000        | 24.8                            | V            | 16.7        | Pass    |
| 13.566000        | 26.8                            | V            | 16.7        | Pass    |
| 13.570000        | 26.3                            | V            | 16.7        | Pass    |
| 13.574000        | 25.5                            | V            | 16.7        | Pass    |
| 13.578000        | 25.5                            | V            | 16.7        | Pass    |
| 13.582000        | 24.8                            | V            | 16.7        | Pass    |
| 13.586000        | 26.1                            | V            | 16.7        | Pass    |
| 13.590000        | 26.3                            | V            | 16.7        | Pass    |
| 13.594000        | 25.2                            | V            | 16.7        | Pass    |
| 13.598000        | 25.1                            | V            | 16.7        | Pass    |
| 13.602000        | 25.0                            | V            | 16.7        | Pass    |
| 13.650000        | 26.6                            | V            | 16.7        | Pass    |

| Frequency MHz | QuasiPeak-MaxHold dBµV/m | Polarization | Corr. dB | Comment |
|---------------|--------------------------|--------------|----------|---------|
| 13.702000     | 26.7                     | V            | 16.7     | Pass    |
| 13.750000     | 25.2                     | V            | 16.7     | Pass    |
| 13.802000     | 24.7                     | V            | 16.7     | Pass    |
| 13.850000     | 27.9                     | V            | 16.7     | Pass    |
| 13.902000     | 26.0                     | V            | 16.7     | Pass    |
| 13.950000     | 24.9                     | V            | 16.7     | Pass    |
| 14.002000     | 25.3                     | V            | 16.7     | Pass    |
| 14.006000     | 25.3                     | V            | 16.7     | Pass    |
| 14.010000     | 27.6                     | V            | 16.7     | Pass    |
| 14.014000     | 26.8                     | V            | 16.7     | Pass    |
| 14.018000     | 24.7                     | V            | 16.7     | Pass    |
| 27.122000     | 21.2                     | V            | 16.7     | Pass    |

| Frequency MHz | QuasiPeak-MaxHold dBµV/m | Polarization | Corr. dB | Comment |
|---------------|--------------------------|--------------|----------|---------|
| 13.110000     | 26.5                     | H            | 16.7     | Pass    |
| 13.150000     | 25.5                     | H            | 16.7     | Pass    |
| 13.202000     | 25.6                     | H            | 16.7     | Pass    |
| 13.250000     | 24.7                     | H            | 16.7     | Pass    |
| 13.302000     | 27.9                     | H            | 16.7     | Pass    |
| 13.350000     | 25.2                     | H            | 16.7     | Pass    |
| 13.402000     | 25.4                     | H            | 16.7     | Pass    |
| 13.450000     | 27.2                     | H            | 16.7     | Pass    |
| 13.502000     | 25.9                     | H            | 16.7     | Pass    |
| 13.550000     | 31.1                     | H            | 16.7     | Pass    |
| 13.550000     | 31.1                     | H            | 16.7     | Pass    |
| 13.554000     | 38.8                     | H            | 16.7     | Pass    |
| 13.558000     | 48.0                     | H            | 16.7     | Pass    |
| 13.562000     | 48.9                     | H            | 16.7     | Pass    |
| 13.566000     | 42.2                     | H            | 16.7     | Pass    |
| 13.570000     | 33.3                     | H            | 16.7     | Pass    |
| 13.574000     | 29.7                     | H            | 16.7     | Pass    |
| 13.578000     | 27.1                     | H            | 16.7     | Pass    |
| 13.582000     | 25.8                     | H            | 16.7     | Pass    |
| 13.586000     | 26.0                     | H            | 16.7     | Pass    |
| 13.590000     | 26.7                     | H            | 16.7     | Pass    |
| 13.594000     | 26.1                     | H            | 16.7     | Pass    |
| 13.598000     | 26.7                     | H            | 16.7     | Pass    |
| 13.602000     | 26.2                     | H            | 16.7     | Pass    |
| 13.606000     | 27.3                     | H            | 16.7     | Pass    |
| 13.610000     | 25.5                     | H            | 16.7     | Pass    |
| 13.622000     | 25.6                     | H            | 16.7     | Pass    |
| 13.638000     | 25.1                     | H            | 16.7     | Pass    |
| 13.650000     | 26.6                     | H            | 16.7     | Pass    |
| 13.702000     | 26.0                     | H            | 16.7     | Pass    |

| Frequency MHz | QuasiPeak-MaxHold dB $\mu$ V/m | Polarization | Corr. dB | Comment |
|---------------|--------------------------------|--------------|----------|---------|
| 13.750000     | 25.6                           | H            | 16.7     | Pass    |
| 13.802000     | 25.5                           | H            | 16.7     | Pass    |
| 13.850000     | 27.1                           | H            | 16.7     | Pass    |
| 13.902000     | 28.2                           | H            | 16.7     | Pass    |
| 13.950000     | 24.4                           | H            | 16.7     | Pass    |
| 13.998000     | 24.0                           | H            | 16.7     | Pass    |
| 14.002000     | 25.6                           | H            | 16.7     | Pass    |
| 14.006000     | 26.3                           | H            | 16.7     | Pass    |
| 14.010000     | 26.4                           | H            | 16.7     | Pass    |
| 14.014000     | 25.5                           | H            | 16.7     | Pass    |
| 14.018000     | 25.3                           | H            | 16.7     | Pass    |
| 27.122000     | 21.7                           | H            | 16.7     | Pass    |

30 MHz – 1000 MHz

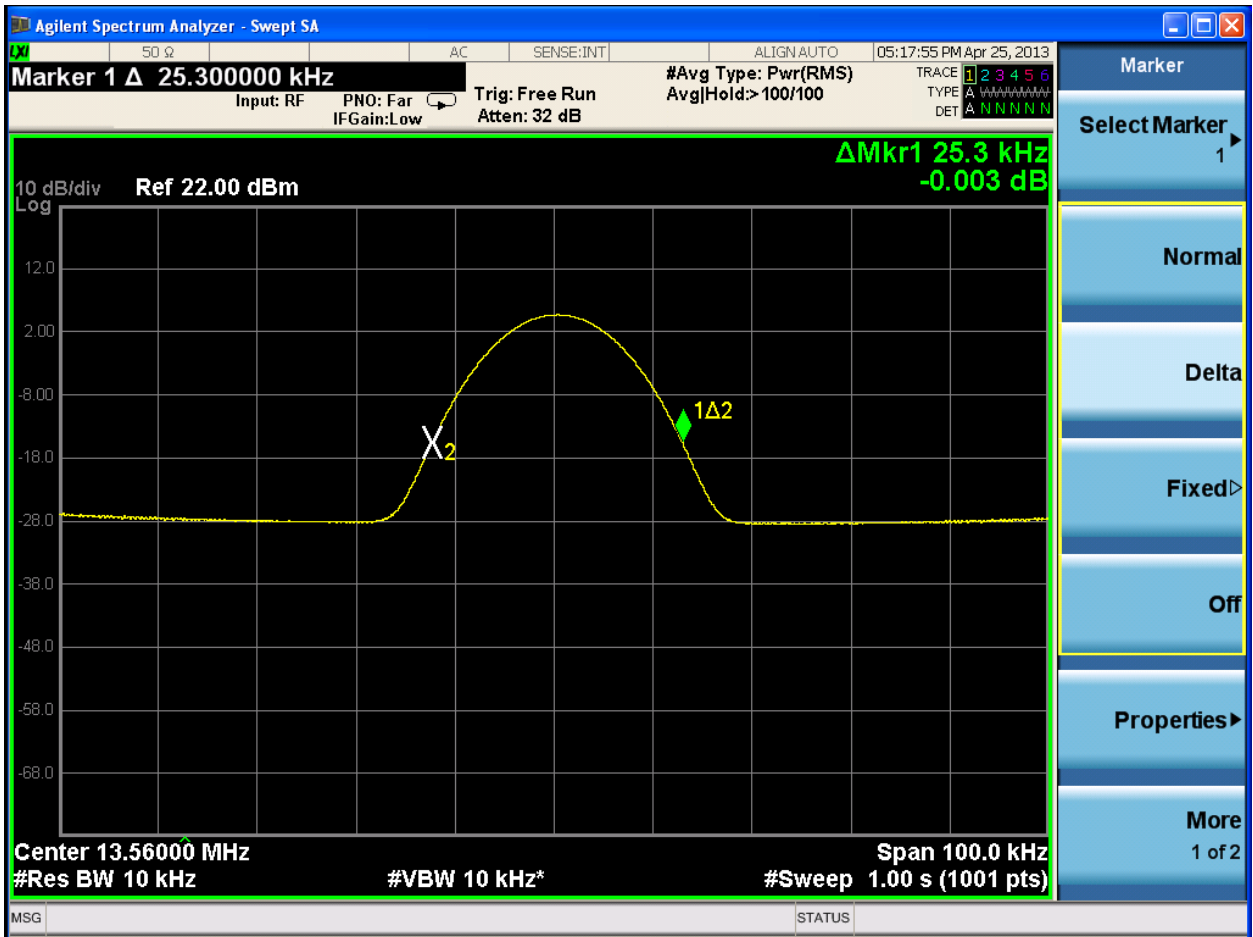
| Frequency MHz | Level dB $\mu$ V/m | Measured dB $\mu$ V | Transd dB | Cables dB | Limit dB $\mu$ V/m | Margin dB | Height cm | Angle deg | Pol. |
|---------------|--------------------|---------------------|-----------|-----------|--------------------|-----------|-----------|-----------|------|
| 690.28        | 28.34              | -1.93               | 21.9      | 8.4       | 46                 | 17.7      | 351       | 360       | HORI |
| 853.68        | 30.64              | -1.27               | 23.3      | 8.6       | 46                 | 15.4      | 120       | 139       | VERT |
| 946.84        | 31.53              | -1.22               | 24.0      | 8.8       | 46                 | 14.5      | 115       | 25        | VERT |

**20dB BANDWIDTH**

**Measurement Procedure**

The 20dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

| Frequency | Occupied Bandwidth |
|-----------|--------------------|
| 13.56MHz  | 25.3kHz            |



**20dB Bandwidth Plot**

## **FREQUENCY STABILITY**

### **Measurement Procedure**

The equipment under test is placed in an environmental chamber. The antenna port of the Equipment Under Test is coupled to the input of the measurement equipment through a coupling antenna. A power supply is attached as the primary voltage supply.

Frequency measurements are made at the extremes of the temperature range  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  and at intervals of  $10^{\circ}\text{C}$  with the primary supply voltage set to the nominal battery operating voltage. A period of time sufficient to stabilize all components of the equipment is allowed at each frequency measurement. The maximum variation of frequency is measured.

At room temperature, the primary supply voltage is reduced to the battery operating endpoint of the equipment under test. The maximum variation of frequency is measured. A battery eliminator was used for the input supply voltage.

### **Measurement Results**

Worst case data attached

| Temperature                | Measured Frequency | Frequency Tolerance | Frequency Deviation | Voltage | Results |
|----------------------------|--------------------|---------------------|---------------------|---------|---------|
| Centigrade                 | MHz                | kHz                 | Hz                  | Volts   |         |
| -30                        | 13.560003          | ± 1.35              | 3                   | 3.8     | Pass    |
| -20                        | 13.560002          | ± 1.35              | 2                   | 3.8     | Pass    |
| -10                        | 13.560008          | ± 1.35              | 8                   | 3.8     | Pass    |
| 0                          | 13.560006          | ± 1.35              | 6                   | 3.8     | Pass    |
| 10                         | 13.560004          | ± 1.35              | 4                   | 3.8     | Pass    |
| 20                         | 13.560006          | ± 1.35              | 6                   | 3.8     | Pass    |
| 30                         | 13.560003          | ± 1.35              | 3                   | 3.8     | Pass    |
| 40                         | 13.560002          | ± 1.35              | 2                   | 3.8     | Pass    |
| 50                         | 13.560004          | ± 1.35              | 4                   | 3.8     | Pass    |
| 60                         | 13.560001          | ± 1.35              | 1                   | 3.8     | Pass    |
| Battery Operating Endpoint |                    |                     |                     |         |         |
| 20                         | 13.560009          | ± 1.35              | 9                   | 3.2     | Pass    |
| 20                         | 13.560012          | ± 1.35              | 12                  | 4.35    | Pass    |

**AC LINE CONDUCTED EMISSIONS****Measurement Procedure**

Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50  $\Omega$  LISN port, where permitted, terminated into a 50  $\Omega$  noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

All radio-noise voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN. Equipment shall be tested with power cords that are normally supplied using a LISN, the 50  $\Omega$  measuring port is terminated by a 50  $\Omega$  radio-noise meter or a 50  $\Omega$  resistive load. All other ports are terminated in 50  $\Omega$ .

Detectors - Quasi Peak and Average Detector

**Test Setup**

The EUT and the host equipment were setup according to the procedures in ANSI C63.4-2003. A software application was run on the phone which enables the phone to transmit at all modulation and data rates supported for NFC operation.

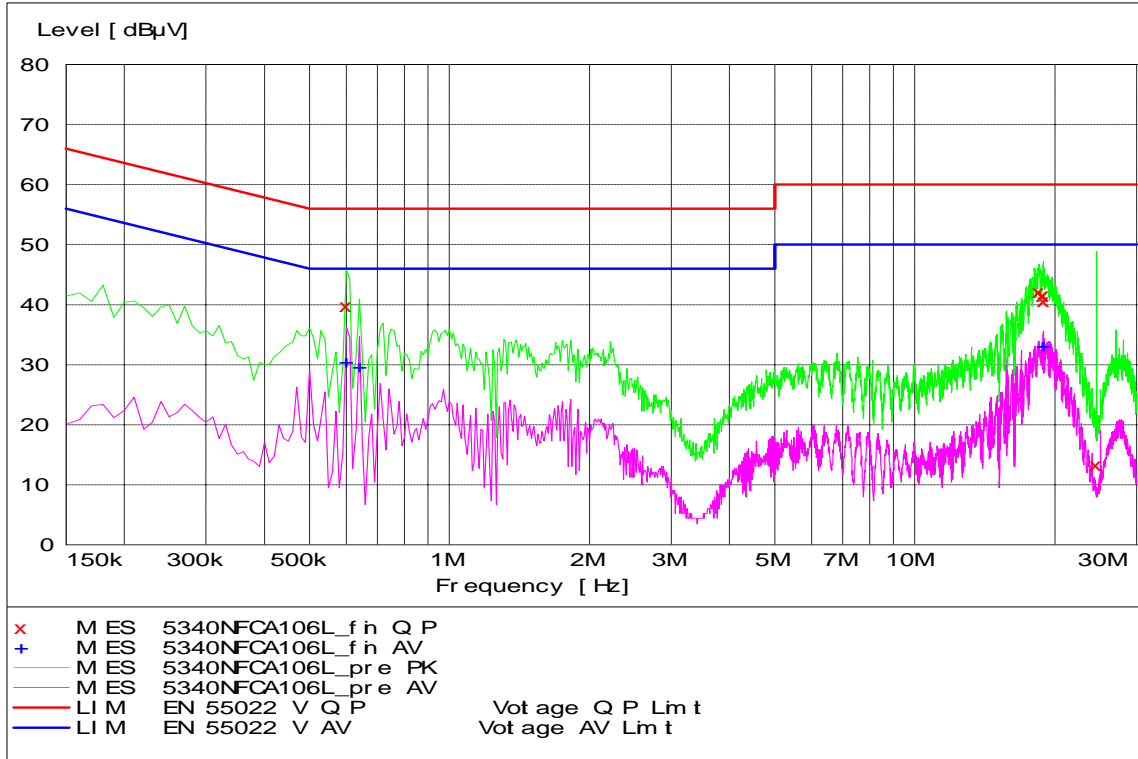
Testing was done with NFC function turned ON in the phone.

**Measurement Results**

Worst case data attached

## Measurement results

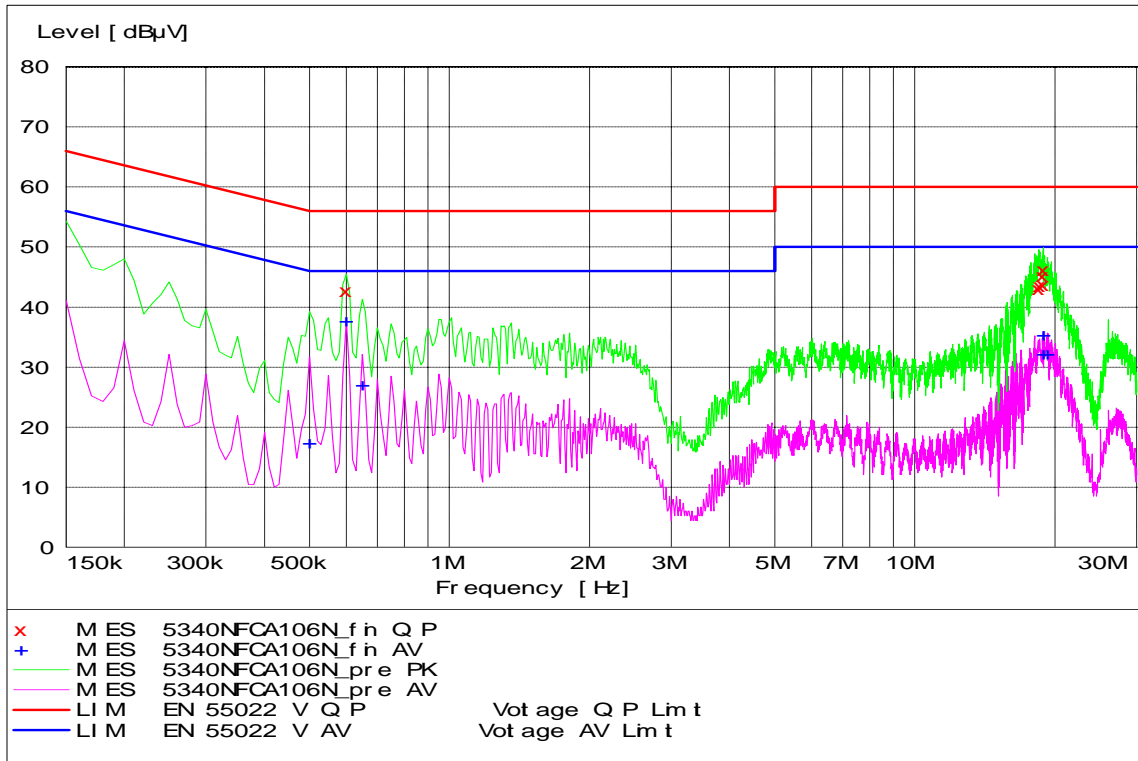
### Tx Mode - Line Coupling



| Frequency MHz | QuasiPeak dBuV | Correction dB | Limit dBuV | Margin dB |
|---------------|----------------|---------------|------------|-----------|
| 0.60          | 39.9           | 10            | 56         | 16.1      |
| 18.48         | 42.2           | 10            | 60         | 17.8      |
| 18.85         | 41.6           | 10            | 60         | 18.4      |
| 18.92         | 41.7           | 10            | 60         | 18.3      |
| 18.96         | 40.8           | 10            | 60         | 19.2      |
| 24.56         | 13.4           | 10            | 60         | 46.6      |

| Frequency MHz | Average dBuV | Correction dB | Limit dBuV | Margin dB |
|---------------|--------------|---------------|------------|-----------|
| 0.6           | 30.5         | 10            | 46         | 15.5      |
| 0.64          | 29.7         | 10            | 46         | 16.3      |
| 18.89         | 33.2         | 10            | 50         | 16.8      |

**Tx Mode - Neutral Coupling**



| Frequency MHz | QuasiPeak dBuV | Correction dB | Limit dBuV | Margin dB |
|---------------|----------------|---------------|------------|-----------|
| 0.60          | 42.8           | 10            | 56         | 13.2      |
| 18.51         | 43.1           | 10            | 60         | 16.9      |
| 18.61         | 43.6           | 10            | 60         | 16.4      |
| 18.85         | 45.2           | 10            | 60         | 14.8      |
| 18.89         | 46.2           | 10            | 60         | 13.8      |
| 18.94         | 43.8           | 10            | 60         | 16.2      |

| Frequency MHz | Average dBuV | Correction dB | Limit dBuV | Margin dB |
|---------------|--------------|---------------|------------|-----------|
| 0.50          | 17.5         | 10            | 46         | 28.5      |
| 0.60          | 37.7         | 10            | 46         | 8.3       |
| 0.65          | 27.1         | 10            | 46         | 18.9      |
| 18.89         | 35.4         | 10            | 50         | 14.6      |
| 18.94         | 32.2         | 10            | 50         | 17.8      |
| 19.27         | 32.3         | 10            | 50         | 17.7      |

**End of Test Report**