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|  <b>MOTOROLA SOLUTIONS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <br><b>CERTIFICATE 2518.05</b>                                                                                                                                                                                                                    |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                                                                                                                                                                                      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| <b>DECLARATION OF COMPLIANCE: MPE ASSESSMENT Part 1 of 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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| <b>Motorola Solutions<br/>EME Test Laboratory</b><br>Motorola Solutions Malaysia Sdn Bhd (Innoplex)<br>Plot 2A, Medan Bayan Lepas,<br>Mukim 12 SWD 11900 Bayan Lepas Penang, Malaysia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Date of Report:</b> 5/11/2017<br><b>Report Revision:</b> B                                                                                                                                                                                                                                                                       |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                   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| <table border="0"> <tr> <td style="vertical-align: top;"><b>Responsible Engineer:</b></td> <td>Saw Sun Hock (EME Engineer)</td> </tr> <tr> <td style="vertical-align: top;"><b>Report author:</b></td> <td>Saw Sun Hock (EME Engineer)</td> </tr> <tr> <td style="vertical-align: top;"><b>Date(s) Tested:</b></td> <td>3/8/2017-3/20/2017</td> </tr> <tr> <td style="vertical-align: top;"><b>Manufacturer:</b></td> <td>Futurecom Systems Group</td> </tr> <tr> <td style="vertical-align: top;"><b>Date submitted for test:</b></td> <td>01/13/2017</td> </tr> <tr> <td style="vertical-align: top;"><b>DUT Description:</b></td> <td>DVR 800 (806 - 870 MHz), Digital Vehicular Repeater<br/>Companion Mobile: APX8500 mobile All Bands (VHF, UHF, 7/800)</td> </tr> <tr> <td style="vertical-align: top;"><b>Test TX mode(s):</b></td> <td>CW</td> </tr> <tr> <td style="vertical-align: top;"><b>Max. Power output:</b></td> <td> <b>DVR:</b> 10W (100% duty cycle)<br/> <b>Companion Mobile:</b> 50% duty cycle, PTT with below maximum output power<br/>           60W (136-174 MHz), 54W (380-484 MHz), 48W (485-512 MHz), 30W (512-520 MHz),<br/>           36W (764-805 MHz), 42W (806-870 MHz); 10mW (Bluetooth); 2.5mW (Bluetooth LE);<br/>           63.1 mW (WLAN 802.11b), 20 mW (WLAN 802.11g/n)         </td> </tr> <tr> <td style="vertical-align: top;"><b>TX Frequency Bands:</b></td> <td> <b>DVR:</b> 806-825 MHz, 851-870 MHz<br/> <b>Companion Mobile:</b><br/>           136-174 MHz; 380-520 MHz; 764-805 MHz; 806-870 MHz; WLAN 2400-2483.5 MHz;<br/>           Bluetooth 2402-2480 MHz         </td> </tr> <tr> <td style="vertical-align: top;"><b>Signaling type:</b></td> <td>FM, TDMA, 802.11b/g/n (WLAN)</td> </tr> <tr> <td style="vertical-align: top;"><b>Model(s) Tested:</b></td> <td> <b>DVR:</b> MOBEXCOM DVRS 800 (DQPM DVRS8000P)<br/> <b>Companion Mobile:</b> M37TSS9PW1AN         </td> </tr> <tr> <td style="vertical-align: top;"><b>Model(s) Certified:</b></td> <td>MOBEXCOM DVRS 800 (DQPM DVRS8000P)</td> </tr> <tr> <td style="vertical-align: top;"><b>Serial Number(s):</b></td> <td>17010530 (DVR) , KLDORDDUC (Companion Mobile)</td> </tr> <tr> <td style="vertical-align: top;"><b>Classification:</b></td> <td>Occupational/Controlled Environment</td> </tr> <tr> <td style="vertical-align: top;"><b>FCC ID:</b></td> <td> <b>DVR:</b> LO6-DVRS800<br/>           806-824 MHz, 851-869 MHz<br/> <b>Companion Mobile:</b> AZ492FT7089<br/>           150.8-173.4 MHz, 406.1-512 MHz, 769-775 MHz, 799-824 MHz, 851-869 MHz,<br/>           2402-2480 MHz, 2412-2462 MHz<br/>           This report contains results that are immaterial for FCC equipment approval, which are clearly identified.         </td> </tr> <tr> <td style="vertical-align: top;"><b>IC:</b></td> <td> <b>DVR:</b> 2098B-DVRS800<br/> <b>Companion Mobile:</b> 109U-92FT7089<br/>           This report contains results that are immaterial for ISED Canada equipment approval, which are clearly identified.         </td> </tr> </table> <p>The MPE results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits. FCC rules require compliance for Passengers and Bystanders to the FCC General Population/Uncontrolled limits.</p> |                                                                                                                                                                                                                                                                                                                                     | <b>Responsible Engineer:</b> | Saw Sun Hock (EME Engineer) | <b>Report author:</b> | Saw Sun Hock (EME Engineer) | <b>Date(s) Tested:</b> | 3/8/2017-3/20/2017 | <b>Manufacturer:</b> | Futurecom Systems Group | <b>Date submitted for test:</b> | 01/13/2017 | <b>DUT Description:</b> | DVR 800 (806 - 870 MHz), Digital Vehicular Repeater<br>Companion Mobile: APX8500 mobile All Bands (VHF, UHF, 7/800) | <b>Test TX mode(s):</b> | CW | <b>Max. Power output:</b> | <b>DVR:</b> 10W (100% duty cycle)<br><b>Companion Mobile:</b> 50% duty cycle, PTT with below maximum output power<br>60W (136-174 MHz), 54W (380-484 MHz), 48W (485-512 MHz), 30W (512-520 MHz),<br>36W (764-805 MHz), 42W (806-870 MHz); 10mW (Bluetooth); 2.5mW (Bluetooth LE);<br>63.1 mW (WLAN 802.11b), 20 mW (WLAN 802.11g/n) | <b>TX Frequency Bands:</b> | <b>DVR:</b> 806-825 MHz, 851-870 MHz<br><b>Companion Mobile:</b><br>136-174 MHz; 380-520 MHz; 764-805 MHz; 806-870 MHz; WLAN 2400-2483.5 MHz;<br>Bluetooth 2402-2480 MHz | <b>Signaling type:</b> | FM, TDMA, 802.11b/g/n (WLAN) | <b>Model(s) Tested:</b> | <b>DVR:</b> MOBEXCOM DVRS 800 (DQPM DVRS8000P)<br><b>Companion Mobile:</b> M37TSS9PW1AN | <b>Model(s) Certified:</b> | MOBEXCOM DVRS 800 (DQPM DVRS8000P) | <b>Serial Number(s):</b> | 17010530 (DVR) , KLDORDDUC (Companion Mobile) | <b>Classification:</b> | Occupational/Controlled Environment | <b>FCC ID:</b> | <b>DVR:</b> LO6-DVRS800<br>806-824 MHz, 851-869 MHz<br><b>Companion Mobile:</b> AZ492FT7089<br>150.8-173.4 MHz, 406.1-512 MHz, 769-775 MHz, 799-824 MHz, 851-869 MHz,<br>2402-2480 MHz, 2412-2462 MHz<br>This report contains results that are immaterial for FCC equipment approval, which are clearly identified. | <b>IC:</b> | <b>DVR:</b> 2098B-DVRS800<br><b>Companion Mobile:</b> 109U-92FT7089<br>This report contains results that are immaterial for ISED Canada equipment approval, which are clearly identified. |
| <b>Responsible Engineer:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Saw Sun Hock (EME Engineer)                                                                                                                                                                                                                                                                                                         |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                   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| <b>Report author:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Saw Sun Hock (EME Engineer)                                                                                                                                                                                                                                                                                                         |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                   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| <b>Date(s) Tested:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| <b>Manufacturer:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| <b>Date submitted for test:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| <b>DUT Description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DVR 800 (806 - 870 MHz), Digital Vehicular Repeater<br>Companion Mobile: APX8500 mobile All Bands (VHF, UHF, 7/800)                                                                                                                                                                                                                 |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                                                                                                                                                                                                                                                                                                                     |                            |                                                                                                                                                                          |                        |                              |                         |                                                                                         |                            |                                    |                          |                                               |                        |                                     |                |                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                           |
| <b>Test TX mode(s):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <b>Max. Power output:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>DVR:</b> 10W (100% duty cycle)<br><b>Companion Mobile:</b> 50% duty cycle, PTT with below maximum output power<br>60W (136-174 MHz), 54W (380-484 MHz), 48W (485-512 MHz), 30W (512-520 MHz),<br>36W (764-805 MHz), 42W (806-870 MHz); 10mW (Bluetooth); 2.5mW (Bluetooth LE);<br>63.1 mW (WLAN 802.11b), 20 mW (WLAN 802.11g/n) |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                                                                                                                                                                                                                                                                                                                     |                            |                                                                                                                                                                          |                        |                              |                         |                                                                                         |                            |                                    |                          |                                               |                        |                                     |                |                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                           |
| <b>TX Frequency Bands:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>DVR:</b> 806-825 MHz, 851-870 MHz<br><b>Companion Mobile:</b><br>136-174 MHz; 380-520 MHz; 764-805 MHz; 806-870 MHz; WLAN 2400-2483.5 MHz;<br>Bluetooth 2402-2480 MHz                                                                                                                                                            |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                                                                                                                                                                                                                                                                                                                     |                            |                                                                                                                                                                          |                        |                              |                         |                                                                                         |                            |                                    |                          |                                               |                        |                                     |                |                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                           |
| <b>Signaling type:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| <b>Model(s) Tested:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>DVR:</b> MOBEXCOM DVRS 800 (DQPM DVRS8000P)<br><b>Companion Mobile:</b> M37TSS9PW1AN                                                                                                                                                                                                                                             |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                   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| <b>Model(s) Certified:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| <b>Serial Number(s):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 17010530 (DVR) , KLDORDDUC (Companion Mobile)                                                                                                                                                                                                                                                                                       |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                   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| <b>Classification:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| <b>FCC ID:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| <b>IC:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>DVR:</b> 2098B-DVRS800<br><b>Companion Mobile:</b> 109U-92FT7089<br>This report contains results that are immaterial for ISED Canada equipment approval, which are clearly identified.                                                                                                                                           |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                   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                                                                                                                                                                                                |            |                                                                                                                                                                                           |
| <p>Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 3.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola Solutions Inc. EME Laboratory. I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements.</p> <p>This reporting format is consistent with the suggested guidelines of the TIA TSB-159 April 2006</p> <p>The results and statements contained in this report pertain only to the device(s) evaluated herein.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                     |                              |                             |                       |                             |                        |                    |                      |                         |                                 |            |                         |                                                                                                                     |                         |    |                           |                                                                                                                                                                                                                                                                                                                                     |                            |                                                                                                                                                                          |                        |                              |                         |                                                                                         |                            |                                    |                          |                                               |                        |                                     |                |                                                                                                                                                                                                                                                                                                                     |            |                                                                                                                                                                                           |
| <div style="text-align: center;"> <br/> <b>Tiong Nguk Ing</b><br/> <b>Deputy Technical Manager</b><br/> <b>Approval Date:</b> 5/11/2017         </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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**Document Revision History**

| <b>Date</b> | <b>Revision</b> | <b>Comments</b>                                       |
|-------------|-----------------|-------------------------------------------------------|
| 4/16/2017   | A               | Initial release                                       |
| 5/11/2017   | B               | Change the ISED certification number from ISED to IC. |

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## 1.0 Introduction

This report details the test setup, test equipment and test results of Maximum Permissible Exposure (MPE) performed at Motorola Solutions' outside test site for DVR 800 (FCC ID: LO6-DVRS800) and Companion Mobile radio (FCC ID: AZ492FT7089).

## 2.0 FCC MPE Summary

**Table 1**

| DVR 800 (FCC ID: LO6-DVRS800)                  |                                               |                                     |                    |                                     |                    |
|------------------------------------------------|-----------------------------------------------|-------------------------------------|--------------------|-------------------------------------|--------------------|
| Trunk Mounted Antenna                          |                                               |                                     |                    |                                     |                    |
| Equipment Class                                | Frequency Band (MHz)                          | Passenger                           |                    | Bystander                           |                    |
|                                                |                                               | Power Density (mw/cm <sup>2</sup> ) | Highest % of Limit | Power Density (mw/cm <sup>2</sup> ) | Highest % of Limit |
| TNB                                            | 806-824 MHz; 851-869 MHz                      | 0.060                               | 11.1%              | 0.028                               | 4.9%               |
| Companion Mobile APX8500 (FCC ID: AZ492FT7089) |                                               |                                     |                    |                                     |                    |
| Roof Mounted Antenna                           |                                               |                                     |                    |                                     |                    |
| Equipment Class                                | Frequency Band (MHz)                          | Passenger                           |                    | Bystander                           |                    |
|                                                |                                               | Power Density (mw/cm <sup>2</sup> ) | Highest % of Limit | Power Density (mw/cm <sup>2</sup> ) | Highest % of Limit |
| TNB                                            | VHF (150.8 – 173.4 MHz)                       | 0.127                               | 63.5%              | 0.081                               | 40.4%              |
|                                                | UHF1 (406.1-470 MHz)                          | 0.056                               | 19.1%              | 0.042                               | 14.2%              |
|                                                | UHF2 (450-512 MHz)                            | 0.045                               | 13.6%              | 0.038                               | 11.1%              |
|                                                | 7/800 (769-775 MHz; 799-824 MHz; 851-869 MHz) | 0.027                               | 5.0%               | 0.033                               | 6.4%               |
| DTS                                            | WLAN (2412-2462 MHz)                          | 0.030                               | 3.01%              | 0.030                               | 3.01%              |
| Simultaneous Transmissions                     |                                               |                                     |                    |                                     |                    |
| Simultaneous Transmissions conditions          |                                               | Passenger                           |                    | Bystander                           |                    |
|                                                |                                               | Highest Combine % of limit          |                    | Highest Combine % of limit          |                    |
| DVR 800 + WLAN + VHF                           |                                               | 77.6%                               |                    | 44.4%                               |                    |
| DVR 800 + WLAN + UHF1                          |                                               | 33.2%                               |                    | 18.2%                               |                    |
| DVR 800 + WLAN + UHF2                          |                                               | 26.4%                               |                    | 15.1%                               |                    |
| DVR 800 + WLAN + 7/800                         |                                               | 19.1%                               |                    | 12.2%                               |                    |

### 3.0 Abbreviations / Definitions

CNR: Calibration Not Required  
CW: Continuous Wave  
DUT: Device Under Test  
EME: Electromagnetic Energy  
FHSS: Frequency Hopping Spread Spectrum  
FM: Frequency Modulation  
MPE: Maximum Permissible Exposure  
GPS: Global Positioning System  
LMR: Land Mobile Radio  
SAR: Specific Absorption Rate  
NA: Not Applicable  
BS: Bystander  
PB: Passenger Back seat  
PF: Passenger Front seat  
PTT: Push to Talk  
WLAN: Wireless Local Area Network  
TDMA: Time Division Multiple Access

### 4.0 Referenced Standards and Guidelines

This product is designed to comply with the following applicable national and international standards and guidelines.

- United States Federal Communications Commission, Code of Federal Regulations; Rule Part 47CFR § 1.1310, § 2.1091 (d) and § 2.1093 for RF Exposure, where applicable.
- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65 (Edition 97-01), FCC, Washington, D.C.: August 1997.
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1999
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992. Specific to FCC rules and regulations.
- Institute of Electrical and Electronics Engineers (IEEE) C95.3-2002
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2015), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- RSS-102 (Issue 5) – Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02

## 5.0 Power Density Limits

**Table 2 – Occupational / Controlled Exposure Limits**

| Frequency Range (MHz) | FCC OET Bulletin 65<br>mW/cm <sup>2</sup> | ICNIRP<br>W/m <sup>2</sup> | IEEE C95.1 1992/1999<br>mW/cm <sup>2</sup> | IEEE C95.1 2005<br>W/m <sup>2</sup> | RSS-102 Issue 5 2015<br>W/m <sup>2</sup> |
|-----------------------|-------------------------------------------|----------------------------|--------------------------------------------|-------------------------------------|------------------------------------------|
| 10 – 20               |                                           |                            |                                            |                                     | 10.0                                     |
| 20 – 48               |                                           |                            |                                            |                                     | $44.72 / f^{0.5}$                        |
| 30 – 300              | 1.0                                       |                            |                                            |                                     |                                          |
| 48 – 100              |                                           |                            |                                            |                                     | 6.455                                    |
| 10 – 400              |                                           | 10.0                       |                                            |                                     |                                          |
| 100 – 300             |                                           |                            | 1.0                                        | 10.0                                |                                          |
| 100 – 6,000           |                                           |                            |                                            |                                     | $0.6455 f^{0.5}$                         |
| 300 – 1,500           | $f/300$                                   |                            |                                            |                                     |                                          |
| 300 – 3,000           |                                           |                            | $f/300$                                    | $f/30$                              |                                          |
| 400 – 2,000           |                                           | $f/40$                     |                                            |                                     |                                          |
| 1,500 – 15,000        |                                           |                            |                                            |                                     |                                          |
| 1,500 – 100,000       | 5.0                                       |                            |                                            |                                     |                                          |
| 2,000 – 300,000       |                                           | 50.0                       |                                            |                                     |                                          |
| 3,000 – 300,000       |                                           |                            | 10.0                                       | 100.0                               |                                          |
| 6,000 – 15,000        |                                           |                            |                                            |                                     | 50.0                                     |
| 15000 – 150,000       |                                           |                            |                                            |                                     | 50.0                                     |
| 150000 – 300,000      |                                           |                            |                                            |                                     | $3.33 \times 10^{-4} f$                  |

**Table 3 – General Population / Uncontrolled Exposure Limits**

| Frequency Range (MHz) | FCC OET Bulletin 65<br>mW/cm <sup>2</sup> | ICNIRP<br>W/m <sup>2</sup> | IEEE C95.1 1992/1999<br>mW/cm <sup>2</sup> | IEEE C95.1 2005<br>W/m <sup>2</sup> | RSS-102 Issue 5 2015<br>W/m <sup>2</sup> |
|-----------------------|-------------------------------------------|----------------------------|--------------------------------------------|-------------------------------------|------------------------------------------|
| 10 – 20               |                                           |                            |                                            |                                     | 2.0                                      |
| 20 – 48               |                                           |                            |                                            |                                     | $8.944 / f^{0.5}$                        |
| 30 – 300              | 0.2                                       |                            |                                            |                                     |                                          |
| 48 – 300              |                                           |                            |                                            |                                     | 1.291                                    |
| 10 – 400              |                                           | 2.0                        |                                            |                                     |                                          |
| 100 – 300             |                                           |                            | 0.2                                        |                                     |                                          |
| 100 – 400             |                                           |                            |                                            | 2.0                                 |                                          |
| 300 – 1,500           | $f/1,500$                                 |                            |                                            |                                     |                                          |
| 300 – 6000            |                                           |                            |                                            |                                     | $0.02619 f^{0.6834}$                     |
| 400 – 2,000           |                                           | $f/200$                    |                                            | $f/200$                             |                                          |
| 300 – 15,000          |                                           |                            | $f/1,500$                                  |                                     |                                          |
| 1,500 – 15,000        |                                           |                            |                                            |                                     |                                          |

**Table 3 Continued – General Population / Uncontrolled Exposure Limits**

| Frequency Range (MHz) | FCC OET Bulletin 65 | ICNIRP           | IEEE C95.1 1992/1999 | IEEE C95.1 2005  | RSS-102 Issue 5 2015    |
|-----------------------|---------------------|------------------|----------------------|------------------|-------------------------|
|                       | mW/cm <sup>2</sup>  | W/m <sup>2</sup> | mW/cm <sup>2</sup>   | W/m <sup>2</sup> | W/m <sup>2</sup>        |
| 1,500 – 100,000       | 1.0                 |                  |                      |                  |                         |
| 2,000 – 100,000       |                     |                  |                      | 10.0             |                         |
| 2,000 – 300,000       |                     | 10.0             |                      |                  |                         |
| 6,000 – 15,000        |                     |                  |                      |                  | 10.0                    |
| 15,000 – 150,000      |                     |                  |                      |                  | 10.0                    |
| 150,000 – 300,000     |                     |                  |                      |                  | $6.67 \times 10^{-5} f$ |

## 6.0 N<sub>c</sub> Test Channels

The number of test channels is determined by using Equation 1 below. This equation is available in FCC's KDB 447498. The test channels are appropriately spaced across the antenna's frequency range.

### Equation 1 – Number of test channels

$$N_c = \text{Round} \{ [100(f_{\text{high}} - f_{\text{low}})/f_c]^{0.5} \times (f_c / 100)^{0.2} \}$$

where  $N_c$  is the number of test channels,  $f_{\text{high}}$  and  $f_{\text{low}}$  are the highest and lowest frequencies within the transmission band,  $f_c$  is the mid-band frequency, and frequencies are in MHz.

## 7.0 Measurement Equipment

**Table 4 – Equipment**

| Equipment Type  | Model #           | SN        | Calibration Date | Calibration Due Date |
|-----------------|-------------------|-----------|------------------|----------------------|
| Automobile      | Volvo 240-1988    | NA        | NA               | NA                   |
| Survey Meter    | ETS Model HI-2200 | 00086316  | 5/16/2016        | 5/16/2017            |
| Probe – E-Field | ETS Model E100    | 000153632 |                  |                      |
| Probe – H-Field | ETS Model H200    | 00206937  |                  |                      |

E-field measurements are in mW/cm<sup>2</sup>.

H field measurements are in A/m.



## 8.0 Measurement System Uncertainty Levels

**Table 5 – Uncertainty Budget for Near Field Probe Measurements**

|                                                       | <b>Tol.</b>  | <b>Prob.</b> |                | <b><math>u_i</math></b> |                         |
|-------------------------------------------------------|--------------|--------------|----------------|-------------------------|-------------------------|
|                                                       | <b>(± %)</b> | <b>Dist.</b> | <b>Divisor</b> | <b>(±%)</b>             | <b><math>v_i</math></b> |
| <b>Measurement System</b>                             |              |              |                |                         |                         |
| Probe Calibration                                     | 7.1          | N            | 1.00           | 7.1                     | ∞                       |
| Survey Meter Calibration                              | 0.0          | N            | 1.00           | 0.0                     | ¥                       |
| Hemispherical Isotropy                                | 8.0          | R            | 1.73           | 4.6                     | ∞                       |
| Linearity                                             | 5.0          | R            | 1.73           | 2.9                     | ∞                       |
| Pulse Response                                        | 1.0          | R            | 1.73           | 0.6                     | ∞                       |
| RF Ambient Noise                                      | 3.0          | R            | 1.73           | 1.7                     | ∞                       |
| RF Reflections                                        | 8.0          | R            | 1.73           | 4.6                     | ∞                       |
| Probe Positioning                                     | 10.0         | R            | 1.73           | 5.8                     | ∞                       |
| <b>Test sample Related</b>                            |              |              |                |                         |                         |
| Antenna Positioning                                   | 3.0          | N            | 1.00           | 3.0                     | ∞                       |
| Power drift                                           | 5.0          | R            | 1.73           | 2.9                     | ∞                       |
| Bystander measurement uncertainty                     | 4.8          | N            | 1.00           | 4.8                     | ∞                       |
| Passenger measurement uncertainty                     | 8.1          | N            | 1.00           | 8.1                     | ∞                       |
| <b>Combined Standard Uncertainty</b>                  |              | RSS          |                | 15.6                    | ∞                       |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL) |              | $k=2$        |                | 31                      |                         |

## 9.0 Product and System Description

MOBEXCOM DVR 800 (FCC ID: LO6-DVRS800) is Digital Vehicular Repeater (DVR) manufactured by Futurecom System Group. The DVR, in addition to standalone operation, is capable of interfacing to a companion mobile radio using serial data protocol for audio and control. The DVRS can operate in the following modes: OFF mode– DVRS repeat is not required; LOCAL mode–with portable-to-portable repeat and network monitoring capabilities; and SYSTEM mode – outbound calls received by mobile radio are repeated by DVRS. Inbound calls received by DVRS are repeated locally (portable-to-portable) as well as to the system users (by keying up the mobile radio).

This test report covers the RF exposure performance of the DVR FCC ID: LO6-DVRS800 interfaced with, and transmitting simultaneously with Companion Mobile radio FCC ID: AZ492FT7089. DVR operate in repeater; transmit with duty cycle up to 100%. A duty factor of 50% applies for companion mobile with PTT operating mode.

Table 6 below summarizes the bands, maximum duty cycles and maximum output powers.

**Table 6 – Bands, Duty Cycle and Maximum power**

| Devices                                                            | Bands (MHz)                          | Duty Cycle (%)                                              | Max power (W)                                             |
|--------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------|
| <b>DVR 800</b><br>(FCC ID:LO6-DVRS800)                             | 806-824 ; 851-869                    | 100% (Repeater)                                             | 10                                                        |
| <b>Companion Mobile APX8500 All bands</b><br>(FCC ID: AZ492FT7089) | 136-174 (VHF band)                   | 50% (PTT)                                                   | 60                                                        |
|                                                                    | 380-484; 485-512; 512-520 (UHF band) | 50% (PTT)                                                   | 54 ; 48 ; 30                                              |
|                                                                    | 764-805 ; 806-870 (7/800 band)       | 50% (PTT)                                                   | 36; 42                                                    |
|                                                                    | 2400 – 2483.5 (WLAN 802.11 b, g, n)  | 99.87% (802.11 b)<br>99.20% (802.11 g)<br>99.17% (802.11 n) | 0.0631 (802.11 b)<br>0.020 (802.11 g)<br>0.020 (802.11 n) |

Companion mobile can transmitting only one LMR band at once. Table 7 lists all the simultaneous transmission conditions.

**Table 7 – Simultaneous transmission conditions**

| Simultaneous transmission conditions | DVR 800                     | Companion Mobile APX8500 All bands (VHF, UHF, 7/800) |                      |                       |                       |                                        |
|--------------------------------------|-----------------------------|------------------------------------------------------|----------------------|-----------------------|-----------------------|----------------------------------------|
|                                      | 806-825 MHz;<br>851-870 MHz | WLAN<br>2.4 GHz                                      | VHF<br>[136-174 MHz] | UHF1<br>[380-470 MHz] | UHF2<br>[450-520 MHz] | 7/800<br>[764-805 MHz;<br>806-870 MHz] |
| DVR 800 + WLAN + VHF                 | x                           | x                                                    | x                    |                       |                       |                                        |
| DVR 800 + WLAN + UHF1                | x                           | x                                                    |                      | x                     |                       |                                        |
| DVR 800 + WLAN + UHF2                | x                           | x                                                    |                      |                       | x                     |                                        |
| DVR 800 + WLAN + 7/800               | x                           | x                                                    |                      |                       |                       | x                                      |

x: Simultaneous transmitting antennas

This device will be marketed to and used by employees solely for work-related operations, such as public safety agencies, e.g. police, fire and emergency medical. User training is the responsibility of these agencies which can be expected to employ the usage instructions, safety information and operational cautions set forth in the user's manual, instructional sessions or other means.

Accordingly this product is classified as Occupational/Controlled Exposure. However, in accordance with FCC requirements, the passengers inside the vehicle and the bystanders external to the vehicle are evaluated to the General Population/Uncontrolled Exposure Limits.

(Note that “Bystanders” as used herein are people other than operator)

## 10.0 Additional Options and Accessories

Not available.

## 11.0 Test Set-Up Description

Assessments were performed with DVR and companion mobile radio installed in the test vehicle, at the specified distances and test locations indicated in sections 12.0, 13.0 and Appendix A.

All antennas described in Table 8 were considered in order to develop the test plan for this product. Antennas were installed and tested per their appropriate mount locations (Roof / Trunk) and defined test channels. The DVR antenna mounted at center of the trunk, and the companion mobile antennas are mounted at the side of the roof (20 cm from the center of the roof).

The system was tested using a low-loss 16' Teflon RG58A/U cable attaching the radio to the transmit antenna. This cable is shorter and lower attenuation than the 17' RG58A/U cables supplied in the customer kits for connecting the radio to the transmit antenna. The cable used in the test setup also has lower attenuation over the test frequency range than the cable provided in the customer kits. The use of a shorter cable with lower attenuation in the test setup ensures that the test data is more conservative with regards to the actual installation. Cable losses are reported in Appendix A.

## 12.0 Method of Measurement for DVR with trunk mounted antenna(s)

### 12.1 External/Bystander vehicle MPE measurements

Initially the DVR antenna is located at the center of the trunk. Refer to Appendix A for antenna location and distance.

MPE measurements for bystander (BS) conditions are determined by taking the average of (10) measurements in a 2 m vertical line for each of the (5) bystander test locations indicated in Appendix A with 20 cm height increments, with the distance of 90cm from the test vehicle's body, as stated in the user manual. The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of persons other than the operator standing next to the vehicle.

### 12.2 Internal/Passenger vehicle MPE measurements

The DVR antenna is located toward the center of the trunk at a minimum 85 cm from backseat passenger. Refer to Appendix A for antenna location and distance.

MPE measurements for passenger front seat (PF) and backseat (PB) conditions are determined by taking the average of the (3) measurements (Head, Chest, and Lower Trunk) inside the vehicle for both the front and back seats.

The backseat is a bench seat and therefore each position (Head, Chest & Lower Trunk) were scanned across (horizontally) the seat starting from the middle of the seat to the edge of the seat stopping 20 cm from the vehicle door. Similar process was used in the front bucket seat.

The probe handle is oriented parallel (horizontal) to the ground and pointed towards the back of the vehicle. The probe handle is not oriented normal to the seat surface. The probe head (incorporating the field sensors) is scanned continuously (using the max-hold function available in the meter) along three test axes which are parallel to the seat angle (intended as the line determined by the intersection of the plane of the seat and the plane of the backrest) and are 20 cm from the seat surface. One test axis is at the Head height, another is at the Chest height, and another is at the Lower Trunk height. The maximum field level value recorded for each test axis is logged. The MPE is determined by averaging these three maximum values regardless of the geometrical location where they were observed. For instance, the locations of the three maxima may lie on different vertical (relative to ground) lines.

This approach leads to results that are representative of the exposure of vehicle occupants since it is based on an average across the body portions closest to the antenna for trunk mount positions, and is conservatively biased because the highest results for each test axis are combined, e.g. the highest head exposure could be in the middle of the seat while the highest lower trunk exposure could be closer to the door.

### **13.0 Method of Measurement Companion Mobile with roof mounted antenna(s)**

#### **Introduction**

The installation requirements for this radio indicate that in multiple single-band antenna configurations the antennas should be installed along a transverse line bisecting the roof, with one of the antennas in the center and the remaining two at 8" (20 cm) on each side. We tested all the antennas at one of the lateral positions (8" from the center along the mentioned bisecting line) in order to be closer to the edge of the roof. Additional measurements with antennas placed in the center of the roof are not needed because that placement would increase the distance to bystanders.

#### **13.1 External/Bystander vehicle MPE measurements**

Antenna is located at the side of the roof (20 cm from the center of the roof, along the width of the vehicle, driver side). Refer to Appendix A for antenna location and distance.

MPE measurements for bystander (BS) conditions are determined by taking the average of (10) measurements in a 2m vertical line for each of the (5) bystander test locations indicated in Appendix A with 20 cm height increments at the test distance of 90cm from the test vehicle body.

The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of persons other than the operator standing next to the vehicle.

### 13.2 Internal/Passenger vehicle MPE measurements

Antenna is located at the side of the roof (20 cm from the center of the roof, along the width of the vehicle, driver side). Refer to Appendix A for antenna location and distance. MPE measurements for passenger front seat (PF) and backseat (PB) conditions are determined by taking the average of the (3) measurements (Head, Chest, and Lower Trunk) inside the vehicle for both the front and back seats.

The backseat is a bench seat and therefore each position (Head, Chest & Lower Trunk) were scanned across (horizontally) the seat starting from the middle of the seat to the edge of the seat stopping 20 cm from the vehicle door. Similar process was used in the front bucket seat.

The probe handle is oriented parallel (horizontal) to the ground and pointed towards the back of the vehicle. The probe handle is not oriented normal to the seat surface. The probe head (incorporating the field sensors) is scanned continuously (using the max-hold function available in the meter) along three test axes which are parallel to the seat angle (intended as the line determined by the intersection of the plane of the seat and the plane of the backrest) and are 20 cm from the seat surface. One test axis is at the Head height, another is at the Chest height, and another is at the Lower Trunk height. The maximum field level value recorded for each test axis is logged. The MPE is determined by averaging these three maximum values regardless of the geometrical location where they were observed. For instance, the locations of the three maxima may lie on different vertical (relative to ground) lines.

This approach leads to results that are representative of the exposure of vehicle occupants since it is based on an average across the body portions closest to the antenna for both trunk and roof mount positions, and is conservatively biased because the highest results for each test axis are combined, e.g. the highest head exposure could be in the middle of the seat while the highest lower trunk exposure could be closer to the door.

## 14.0 MPE Calculations

The final MPE results for DVR and Companion Mobile are presented in section 16.0. These results are based on 50% duty cycle for Companion Mobile (PTT operation) and 100% duty cycle for DVR (repeater operation).

Below is an explanation of how the MPE results are calculated. Refer to Appendix I for DVR 800; Appendix J, K, L and M for Companion Mobile LMR bands VHF, UHF1, UHF2 and 7/800.

External to vehicle (Bystander) - 10 measurements are averaged over the body (*Avg\_over\_body*).  
Internal to vehicle (Passengers) - 3 measurements are averaged over the body (*Avg\_over\_body*).

The Average over Body test methodology is consistent with IEEE/ANSI C95.3-2002 guidelines.

Therefore;

### Equation 2 – Power Density Calculation (*Calc.\_P.D.*)

$$\text{Calc._P.D.} = (\text{Avg\_over\_body}) * (\text{probe\_frequency\_cal\_factor}) * (\text{duty\_cycle})$$

*Note 1: The highest “average” cal factors from the calibration certificates were selected for the applicable frequency range. Linear interpretation was used to determine “probe\_frequency\_cal\_factor” for the specific test frequencies.*

*Note 2: The E-field probe calibration certificate’s frequency cal factors were determined by measuring V/m. The survey meter’s results were measured in power density (mW/cm<sup>2</sup>) and therefore the “probe\_frequency\_cal\_factor” was squared in equation 2 to account for these results.*

*Note 3: The H-field probe calibration certificate’s frequency cal factors were determined by measuring A/m. The survey meter’s results were measured in A/m and therefore the “Avg\_over\_body” A/m results were converted to power density (mW/cm<sup>2</sup>) using the equation 3. H-field measurements are only applicable to frequencies below 300MHz.*

### Equation 3 – Converting A/m to mW/cm<sup>2</sup>

$$mW / cm^2 = (A/m)^2 * 37.699$$

### Equation 4 – Power Density Maximum Calculation

$$Max\_Calc.\_P.D. = P.D.\_calc * \frac{\text{max\_output\_power}}{\text{initial\_output\_power}}$$

*Note 4: For initial output power > max\_output\_power; max\_output\_power / initial output power = 1*

## 15.0 Antenna Summary

Table below summarizes the tested or evaluated antennas and their descriptions, mount location (roof/trunk), overlap of FCC bands, number of test channels per FCC KDB 447498 (FCC N<sub>c</sub>). This information was used to determine the test configurations presented in this report.

**Table 8 – Antennas**

| Antenna No.             | Antenna Model | Frequency Range (MHz) | Physical Length (cm) | Gain (dBi) | Remarks  | Mount Location (Roof/Trunk) | Overlap FCC Bands (MHz)                 | FCC N <sub>c</sub> |
|-------------------------|---------------|-----------------------|----------------------|------------|----------|-----------------------------|-----------------------------------------|--------------------|
| <b>DVR 800</b>          |               |                       |                      |            |          |                             |                                         |                    |
| 1                       | HAF4016A      | 764-870               | 9                    | 2.15       | 1/4 wave | Trunk                       | 806-824;<br>851-869                     | 6                  |
| <b>Companion Mobile</b> |               |                       |                      |            |          |                             |                                         |                    |
| 2                       | AN000131A01   | 136-870               | 55.7                 | 2.15       | 1/4 wave | Roof                        | 150.8-173.4 (VHF)                       | 4                  |
|                         |               |                       |                      |            |          | Roof                        | 406.1- 470 (UHF1)                       | 5                  |
|                         |               |                       |                      |            |          | Roof                        | 450-512 (UHF2)                          | 5                  |
|                         |               |                       |                      |            |          | Roof                        | 769-775;<br>799-824;<br>851-869 (7/800) | 7                  |
| 3                       | PMAN5100A     | 2400-2500             | Glass mount          | 6          |          |                             | 2412-2462                               | 3                  |

## 16.0 Test Results Summary

### 16.1 MPE Test Results Summary for DVR and Companion Mobile (LMR)

Refer to the following appendices for MPE test results for each test configuration: antenna location, test positions (BS1-Bystander test location #1, BS2-Bystander test location #2, BS3-Bystander test location #3, BS4-Bystander test location #4, BS5-Bystander test location #5, PB-Passenger Backseat, PF-Passenger Front seat), E/H field measurements, antenna model & freq. range, maximum output power, initial power, TX frequency, max calculated power density results, applicable FCC/ ISED Canada specification limits and % of the applicable specification limits.

- Appendix D for DVR 800
- Appendix E, F, G and H for Companion Mobile

Table 9 summarized the highest maximum calculated power density and highest % of the applicable specification limit for each standalone transmitters (DVR, Companion Mobile).

Table 9

| Test Positions             | DVR 800                                |                       | Companion Mobile APX8500               |                       |                                        |                       |                                        |                       |                                        |                       |
|----------------------------|----------------------------------------|-----------------------|----------------------------------------|-----------------------|----------------------------------------|-----------------------|----------------------------------------|-----------------------|----------------------------------------|-----------------------|
|                            | 806-825 MHz;<br>851-870 MHz            |                       | VHF (136-174 MHz)                      |                       | UHF1 (380-470 MHz)                     |                       | UHF2 (450-520 MHz)                     |                       | 7/800 (764-870 MHz)                    |                       |
|                            | Power Density<br>(mw/cm <sup>2</sup> ) | Highest % of<br>Limit | Power Density<br>(mw/cm <sup>2</sup> ) | Highest % of<br>Limit | Power Density<br>(mw/cm <sup>2</sup> ) | Highest % of<br>Limit | Power Density<br>(mw/cm <sup>2</sup> ) | Highest % of<br>Limit | Power Density<br>(mw/cm <sup>2</sup> ) | Highest % of<br>Limit |
| FCC US                     |                                        |                       |                                        |                       |                                        |                       |                                        |                       |                                        |                       |
| Passenger, Front Seat (PF) | 0.034                                  | 5.8%                  | 0.063                                  | 31.4%                 | 0.008                                  | 2.5%                  | 0.045                                  | 13.6%                 | 0.008                                  | 1.5%                  |
| Passenger, Back Seat (PB)  | 0.060                                  | 11.1%                 | 0.127                                  | 63.5%                 | 0.056                                  | 19.1%                 | 0.037                                  | 12.3%                 | 0.027                                  | 5.0%                  |
| Bystander #1 (BS-1)        | 0.006                                  | 1.0%                  | 0.081                                  | 40.4%                 | 0.042                                  | 14.2%                 | 0.038                                  | 11.1%                 | 0.033                                  | 6.4%                  |
| Bystander #2 (BS-2)        | 0.016                                  | 2.9%                  | 0.075                                  | 37.3%                 | 0.023                                  | 8.0%                  | 0.031                                  | 9.0%                  | 0.033                                  | 6.3%                  |
| Bystander #3 (BS-3)        | 0.016                                  | 3.0%                  | 0.052                                  | 26.0%                 | 0.019                                  | 6.4%                  | 0.021                                  | 6.6%                  | 0.021                                  | 4.0%                  |
| Bystander #4 (BS-4)        | 0.028                                  | 4.9%                  | 0.049                                  | 24.7%                 | 0.007                                  | 2.7%                  | 0.011                                  | 3.2%                  | 0.014                                  | 2.6%                  |
| Bystander #5 (BS-5)        | 0.016                                  | 3.0%                  | 0.034                                  | 16.8%                 | 0.005                                  | 1.7%                  | 0.007                                  | 2.1%                  | 0.007                                  | 1.5%                  |
| ISED Canada                |                                        |                       |                                        |                       |                                        |                       |                                        |                       |                                        |                       |
| Passenger, Front Seat (PF) | 0.034                                  | 12.7%                 | 0.063                                  | 48.6%                 | 0.008                                  | 4.5%                  | 0.008                                  | 4.5%                  | 0.008                                  | 3.3%                  |
| Passenger, Back Seat (PB)  | 0.060                                  | 23.5%                 | 0.128                                  | 99.3%                 | 0.044                                  | 27.7%                 | 0.037                                  | 21.7%                 | 0.027                                  | 10.6%                 |
| Bystander #1 (BS-1)        | 0.006                                  | 2.2%                  | 0.081                                  | 63.1%                 | 0.029                                  | 17.9%                 | 0.030                                  | 17.4%                 | 0.033                                  | 13.3%                 |
| Bystander #2 (BS-2)        | 0.016                                  | 6.1%                  | 0.075                                  | 57.8%                 | 0.021                                  | 11.9%                 | 0.021                                  | 11.9%                 | 0.033                                  | 13.3%                 |
| Bystander #3 (BS-3)        | 0.016                                  | 6.4%                  | 0.064                                  | 49.3%                 | 0.018                                  | 10.5%                 | 0.018                                  | 10.5%                 | 0.021                                  | 8.3%                  |
| Bystander #4 (BS-4)        | 0.028                                  | 10.5%                 | 0.049                                  | 38.3%                 | 0.007                                  | 4.5%                  | 0.007                                  | 3.9%                  | 0.014                                  | 5.6%                  |
| Bystander #5 (BS-5)        | 0.016                                  | 6.4%                  | 0.034                                  | 26.0%                 | 0.004                                  | 2.0%                  | 0.004                                  | 2.0%                  | 0.008                                  | 3.3%                  |

## 16.2 MPE Test Results for Companion Mobile (WLAN)

Maximum power for WLAN = 63.02 mW (63.1 mW \*99.87 % duty cycle)

MPE calculation was use to determine power density for these transmitters due to lower power. According to FCC's OET Bulletin 65 Edition 97-01 Section 2, calculations can be made to predict RF field strength and power density levels around typical RF sources. Equation (5) is generally accurate in far-field of an antenna.

### Equation 5 – Power Density Calculation

$$S = \frac{P_t G}{4\pi d^2 L} F$$

Equation (5) accounts for the maximum duty cycle of the signal, and the factor, F, to provide a worst-case prediction of power density per FCC OET Bulletin 65, Edition 97-01 1997.

Where:

- S = power density (mW/cm<sup>2</sup>)
- P<sub>t</sub> = maximum output power scaled by the maximum duty cycle of the signal
- G = power gain of the antenna in the direction of interest relative to an isotropic radiator (dBi)
- d = distance from antenna (cm), *20 cm for more conservative estimation.*
- L = cable loss (dB), *2.2 dB with 17' PFP240 cable (attenuation 12.9 dB/100ft)*
- F = Enhancement factor

Table 10 summarized the MPE calculation for WLAN.

**Table 10**

| Antenna # | Max Power (W) | Duty Cycle (%) | Tx Frequency (MHz) | Antenna Gain (dBi) | Cable Loss, L (dB) | Dist., d (cm) | Enhance Factor, F | Max Calc. MPE (mW/cm <sup>2</sup> ) | MPE Spec Limit (mW/cm <sup>2</sup> ) |                     |            |                      |
|-----------|---------------|----------------|--------------------|--------------------|--------------------|---------------|-------------------|-------------------------------------|--------------------------------------|---------------------|------------|----------------------|
|           |               |                |                    |                    |                    |               |                   |                                     | FCC                                  | % To FCC Spec Limit | ISED limit | % To ISED Spec Limit |
|           |               |                |                    |                    |                    |               |                   |                                     |                                      |                     |            |                      |
| PMAN5100A | 0.063         | 99.87%         | 2412.0             | 6.00               | 2.20               | 20            | 1.00              | 0.03                                | 1.00                                 | 3.01                | 0.54       | 5.60                 |
| PMAN5100A | 0.063         | 99.87%         | 2437.0             | 6.00               | 2.20               | 20            | 1.00              | 0.03                                | 1.00                                 | 3.01                | 0.54       | 5.57                 |
| PMAN5100A | 0.063         | 99.87%         | 2462.0             | 6.00               | 2.20               | 20            | 1.00              | 0.03                                | 1.00                                 | 3.01                | 0.54       | 5.53                 |
|           |               |                |                    |                    |                    |               |                   |                                     |                                      |                     |            |                      |



### 16.3 Simultaneous Transmission

DVR will transmit simultaneously with Companion mobile; refer to Table 7 for all simultaneous transmission conditions.

The combine MPE results for DVR and Companion Mobile were calculated base on the percent of MPE limit for each applicable test channels according to the formula below. This is due to the signals emitted by each individual transmitter are statistically uncorrelated; the collective compliance of the transmitters is determined by summing the individual ratios between actual measured power density (S) and maximum allowed MPE exposure. Compliance is achieved if the total exposure (T) is less than one.

Formula:

$$T = \frac{S_1}{MPE_1} + \frac{S_2}{MPE_2} + \dots < 1$$

The highest combined power density percentage of the applicable specification limits are indicating in table 11.

Table 11- Highest Combine MPE % of limits

| Test Positions             | DVR 800                     | Companion Mobile APX8500  |                           |                           |                           |                           | Simultaneous Transmission         |                 |                                   |           |                                   |           |                                   |           |
|----------------------------|-----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-----------------------------------|-----------------|-----------------------------------|-----------|-----------------------------------|-----------|-----------------------------------|-----------|
|                            | 806-825 MHz;<br>851-870 MHz | WLAN<br>(2.4 GHz)         | VHF<br>(136-174 MHz)      | UHF1<br>(380-470 MHz)     | UHF2<br>(450-520 MHz)     | 7/800<br>(764-870 MHz)    | DVR5 + WLAN+LMR_VHF               |                 | DVR5 + WLAN+LMR_UHF1              |           | DVR5 + WLAN+LMR_UHF2              |           | DVR5 + WLAN+LMR_7800              |           |
|                            | [1]<br>Highest % of Limit   | [2]<br>Highest % of Limit | [3]<br>Highest % of Limit | [4]<br>Highest % of Limit | [5]<br>Highest % of Limit | [6]<br>Highest % of Limit | [1]+[2]+[3]<br>Combine % of Limit | Table No.       | [1]+[2]+[4]<br>Combine % of Limit | Table No. | [1]+[2]+[5]<br>Combine % of Limit | Table No. | [1]+[2]+[6]<br>Combine % of Limit | Table No. |
| FCC US                     |                             |                           |                           |                           |                           |                           |                                   |                 |                                   |           |                                   |           |                                   |           |
| Passenger, Front Seat (PF) | 5.8%                        | 3.01%                     | 31.4%                     | 2.5%                      | 13.6%                     | 1.5%                      | 40.2%                             |                 | 11.3%                             |           | 22.4%                             |           | 10.3%                             |           |
| Passenger, Back Seat (PB)  | 11.1%                       | 3.01%                     | 63.5%                     | 19.1%                     | 12.3%                     | 5.0%                      | 77.6%                             |                 | 33.2%                             |           | 26.4%                             |           | 19.1%                             |           |
| Bystander #1 (BS-1)        | 1.0%                        | 3.01%                     | 40.4%                     | 14.2%                     | 11.1%                     | 6.4%                      | 44.4%                             |                 | 18.2%                             |           | 15.1%                             |           | 10.4%                             |           |
| Bystander #2 (BS-2)        | 2.9%                        | 3.01%                     | 37.3%                     | 8.0%                      | 9.0%                      | 6.3%                      | 43.2%                             |                 | 13.9%                             |           | 14.9%                             |           | 12.2%                             |           |
| Bystander #3 (BS-3)        | 3.0%                        | 3.01%                     | 26.0%                     | 6.4%                      | 6.6%                      | 4.0%                      | 32.0%                             |                 | 12.4%                             |           | 12.6%                             |           | 10.0%                             |           |
| Bystander #4 (BS-4)        | 4.9%                        | 3.01%                     | 24.7%                     | 2.7%                      | 3.2%                      | 2.6%                      | 32.6%                             |                 | 10.6%                             |           | 11.1%                             |           | 10.5%                             |           |
| Bystander #5 (BS-5)        | 3.0%                        | 3.01%                     | 16.8%                     | 1.7%                      | 2.1%                      | 1.5%                      | 22.8%                             |                 | 7.7%                              |           | 8.1%                              |           | 7.5%                              |           |
| ISED Canada                |                             |                           |                           |                           |                           |                           |                                   |                 |                                   |           |                                   |           |                                   |           |
| Passenger, Front Seat (PF) | 12.7%                       | 5.60%                     | 48.6%                     | 4.5%                      | 4.5%                      | 3.3%                      | 66.9%                             |                 | 22.8%                             |           | 22.8%                             |           | 21.6%                             |           |
| Passenger, Back Seat (PB)  | 23.5%                       | 5.60%                     | 99.3%                     | 27.7%                     | 21.7%                     | 10.6%                     | <b>128.4%</b>                     | <b>Table 12</b> | 56.8%                             |           | 50.8%                             |           | 39.7%                             |           |
| Bystander #1 (BS-1)        | 2.2%                        | 5.60%                     | 63.1%                     | 17.9%                     | 17.4%                     | 13.3%                     | 70.9%                             |                 | 25.7%                             |           | 25.2%                             |           | 21.1%                             |           |
| Bystander #2 (BS-2)        | 6.1%                        | 5.60%                     | 57.8%                     | 11.9%                     | 11.9%                     | 13.3%                     | 69.5%                             |                 | 23.6%                             |           | 23.6%                             |           | 25.0%                             |           |
| Bystander #3 (BS-3)        | 6.4%                        | 5.60%                     | 49.3%                     | 10.5%                     | 10.5%                     | 8.3%                      | 61.3%                             |                 | 22.5%                             |           | 22.5%                             |           | 20.3%                             |           |
| Bystander #4 (BS-4)        | 10.5%                       | 5.60%                     | 38.3%                     | 4.5%                      | 3.9%                      | 5.6%                      | 54.4%                             |                 | 20.6%                             |           | 20.0%                             |           | 21.7%                             |           |
| Bystander #5 (BS-5)        | 6.4%                        | 5.60%                     | 26.0%                     | 2.0%                      | 2.0%                      | 3.3%                      | 38.0%                             |                 | 14.0%                             |           | 14.0%                             |           | 15.3%                             |           |

Note: Refer to indicated table no. for result in bold to determine configurations that require SAR simulations.

Table 12 (a) – Combined MPE % of ISED Canada limit (Passenger, Back Seat)

|                                                     |           |                                           |                   |                    | [1]<br>DVR 800 Antenna (Trunk Mounted) |          |          |          |          |          |
|-----------------------------------------------------|-----------|-------------------------------------------|-------------------|--------------------|----------------------------------------|----------|----------|----------|----------|----------|
|                                                     |           |                                           |                   |                    | E Field                                |          |          |          |          |          |
|                                                     |           |                                           |                   |                    | HAF4016A, 1/4 Wave (764-870MHz)        |          |          |          |          |          |
|                                                     |           |                                           |                   |                    | 806.0000                               | 815.0000 | 824.0000 | 851.0000 | 860.0000 | 869.0000 |
| [2]+[3]<br>Companion<br>Mobile<br>(roof<br>Mounted) | E/H Field | Companion<br>Mobile Antenna               | LMR Freq<br>(MHz) | % of ISED<br>Limit | 21.9                                   | 23.5     | 18.6     | 17.0     | 14.7     | 8.7      |
|                                                     | E Field   | AN000131A01,<br>1/4 wave (136-<br>870MHz) | 146.0000          | 104.9              | *126.8                                 | *128.4   | *123.5   | *121.9   | *119.6   | *113.6   |
|                                                     |           |                                           | 150.8000          | 89.3               | *111.2                                 | *112.8   | *107.9   | *106.3   | *104     | 98.0     |
|                                                     |           |                                           | 158.0125          | 104.0              | *125.9                                 | *127.5   | *122.6   | *121     | *118.7   | *112.7   |
|                                                     |           |                                           | 165.0125          | 62.2               | 84.1                                   | 85.7     | 80.8     | 79.2     | 76.9     | 70.9     |
|                                                     |           |                                           | 173.0125          | 41.7               | 63.6                                   | 65.2     | 60.3     | 58.7     | 56.4     | 50.4     |
|                                                     | H Field   | AN000131A01,<br>1/4 wave (136-<br>870MHz) | 146.0000          | 83.3               | #105.2                                 | #106.8   | #101.9   | #100.3   | 98.0     | 92.0     |
|                                                     |           |                                           | 150.8000          | 95.2               | #117.1                                 | #118.7   | #113.8   | #112.2   | #109.9   | *103.9   |
|                                                     |           |                                           | 158.0125          | 101.2              | #123.1                                 | #124.7   | #119.8   | #118.2   | #115.9   | #109.9   |
|                                                     |           |                                           | 165.0125          | 50.0               | 71.9                                   | 73.5     | 68.6     | 67.0     | 64.7     | 58.7     |
|                                                     |           |                                           | 173.0125          | 21.7               | 43.6                                   | 45.2     | 40.3     | 38.7     | 36.4     | 30.4     |

Notes:

\* Configurations require SAR simulations.

# Same SAR simulation configurations as E Field.

Table 12 (b) – Combined Simulated 1-g SAR for ISED Canada limit (Passenger, Back Seat)

|                                                     |                                           |                   |                                        | [1]                             |          |          |          |          |          |          |
|-----------------------------------------------------|-------------------------------------------|-------------------|----------------------------------------|---------------------------------|----------|----------|----------|----------|----------|----------|
|                                                     |                                           |                   |                                        | DVR 800 Antenna (Trunk Mounted) |          |          |          |          |          |          |
|                                                     |                                           |                   |                                        | HAF4016A, 1/4 Wave (764-870MHz) |          |          |          |          |          |          |
|                                                     |                                           |                   |                                        | DVR Freq (MHz)                  | 806.0000 | 815.0000 | 824.0000 | 851.0000 | 860.0000 | 869.0000 |
| [2]+[3]<br>Companion<br>Mobile<br>(roof<br>Mounted) | Companion<br>Mobile Antenna               | LMR Freq<br>(MHz) | 1-g SAR <sub>PB_center</sub><br>(W/kg) | 0.15                            | 0.09     | 0.11     | 0.12     | 0.12     | 0.15     |          |
|                                                     | AN000131A01,<br>1/4 wave (136-<br>870MHz) | 146.0000          | 0.34                                   | 0.488                           | 0.43     | 0.45     | 0.46     | 0.46     | 0.494    |          |
|                                                     |                                           | 150.8000          | 0.31                                   | 0.46                            | 0.40     | 0.42     | 0.43     | 0.43     | 0.46     |          |
|                                                     |                                           | 158.0125          | 0.16                                   | 0.31                            | 0.25     | 0.27     | 0.28     | 0.28     | 0.31     |          |
|                                                     |                                           | 165.0125          |                                        |                                 |          |          |          |          |          |          |
|                                                     |                                           | 173.0125          |                                        |                                 |          |          |          |          |          |          |
|                                                     |                                           |                   |                                        |                                 |          |          |          |          |          |          |
|                                                     | Companion<br>Mobile Antenna               | LMR Freq<br>(MHz) | 1-g SAR <sub>PB_side</sub><br>(W/kg)   | 0.12                            | 0.14     | 0.12     | 0.13     | 0.13     | 0.17     |          |
|                                                     | AN000131A01,<br>1/4 wave (136-<br>870MHz) | 146.0000          | 0.60                                   | 0.72                            | 0.74     | 0.72     | 0.73     | 0.73     | 0.77     |          |
|                                                     |                                           | 150.8000          | 0.52                                   | 0.64                            | 0.66     | 0.64     | 0.65     | 0.65     | 0.69     |          |
|                                                     |                                           | 158.0125          | 0.28                                   | 0.40                            | 0.42     | 0.40     | 0.41     | 0.41     | 0.45     |          |
|                                                     |                                           | 165.0125          |                                        |                                 |          |          |          |          |          |          |
| 173.0125                                            |                                           |                   |                                        |                                 |          |          |          |          |          |          |

## 17.0 Conclusion

The assessment for DVR and Companion mobile were performed with an output power range as indicate in section 16.1 and WLAN MPE calculation in section 16.2. The maximum allowable output power is equal to the upper limit of the final test factory transmit power specification listed in Table 6. The highest power density results for DVR and Companion Mobile scaled to maximum allowable power output are indicated in Table 13 (FCC US) and Table 14 (ISED Canada) for internal/passenger of to the vehicle, and external/bystander to the vehicle.

These MPE results herein demonstrate compliance to FCC, ISED Canada Occupation/Controlled Exposure limit. However, FCC rules required compliance for Passengers and Bystanders to FCC General Population / Uncontrolled limits. Maximum Combined MPE percentage in bold exceed General Population / Uncontrolled limit.

**Table 13 – Maximum MPE RF Exposure Summary (FCC US)**

| <b>DVR 800 (FCC ID: LO6-DVRS800)</b>                  |                                               |                                          |                           |                                          |                           |
|-------------------------------------------------------|-----------------------------------------------|------------------------------------------|---------------------------|------------------------------------------|---------------------------|
| <b>Trunk Mounted Antenna</b>                          |                                               |                                          |                           |                                          |                           |
| <b>Equipment Class</b>                                | <b>Frequency Band (MHz)</b>                   | <b>Passenger</b>                         |                           | <b>Bystander</b>                         |                           |
|                                                       |                                               | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> |
| TNB                                                   | 806-824 MHz; 851-869 MHz                      | 0.060                                    | 11.1%                     | 0.028                                    | 4.9%                      |
| <b>Companion Mobile APX8500 (FCC ID: AZ492FT7089)</b> |                                               |                                          |                           |                                          |                           |
| <b>Roof Mounted Antenna</b>                           |                                               |                                          |                           |                                          |                           |
| <b>Equipment Class</b>                                | <b>Frequency Band (MHz)</b>                   | <b>Passenger</b>                         |                           | <b>Bystander</b>                         |                           |
|                                                       |                                               | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> |
| TNB                                                   | VHF (150.8 – 173.4 MHz)                       | 0.127                                    | 63.5%                     | 0.081                                    | 40.4%                     |
|                                                       | UHF1 (406.1-470 MHz)                          | 0.056                                    | 19.1%                     | 0.042                                    | 14.2%                     |
|                                                       | UHF2 (450-512 MHz)                            | 0.045                                    | 13.6%                     | 0.038                                    | 11.1%                     |
|                                                       | 7/800 (769-775 MHz; 799-824 MHz; 851-869 MHz) | 0.027                                    | 5.0%                      | 0.033                                    | 6.4%                      |
| DTS                                                   | WLAN (2412-2462 MHz)                          | 0.030                                    | 3.01%                     | 0.030                                    | 3.01%                     |
| <b>Simultaneous Transmissions</b>                     |                                               |                                          |                           |                                          |                           |
| <b>Simultaneous Transmissions conditions</b>          |                                               | <b>Passenger</b>                         |                           | <b>Bystander</b>                         |                           |
|                                                       |                                               | <b>Highest Combine % of limit</b>        |                           | <b>Highest Combine % of limit</b>        |                           |
| DVR 800 + WLAN + VHF                                  |                                               | 77.6%                                    |                           | 44.4%                                    |                           |
| DVR 800 + WLAN + UHF1                                 |                                               | 33.2%                                    |                           | 18.2%                                    |                           |
| DVR 800 + WLAN + UHF2                                 |                                               | 26.4%                                    |                           | 15.1%                                    |                           |
| DVR 800 + WLAN + 7/800                                |                                               | 19.1%                                    |                           | 12.2%                                    |                           |

**Table 14 – Maximum MPE RF Exposure Summary (ISED Canada)**

| <b>DVR 800 (IC:2098B-DVRS800 )</b>                  |                                          |                           |                                          |                           |
|-----------------------------------------------------|------------------------------------------|---------------------------|------------------------------------------|---------------------------|
| <b>Trunk Mounted Antenna</b>                        |                                          |                           |                                          |                           |
| <b>Frequency Band (MHz)</b>                         | <b>Passenger</b>                         |                           | <b>Bystander</b>                         |                           |
|                                                     | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> |
| 806-824 MHz; 851-869 MHz                            | 0.060                                    | 23.5%                     | 0.028                                    | 10.5%                     |
| <b>Companion Mobile APX8500 (IC: 109U-92FT7089)</b> |                                          |                           |                                          |                           |
| <b>Roof Mounted Antenna</b>                         |                                          |                           |                                          |                           |
| <b>Frequency Band (MHz)</b>                         | <b>Passenger</b>                         |                           | <b>Bystander</b>                         |                           |
|                                                     | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> | <b>Power Density (mw/cm<sup>2</sup>)</b> | <b>Highest % of Limit</b> |
| VHF (138-174 MHz)                                   | 0.128                                    | 99.3%                     | 0.081                                    | 63.1%                     |
| UHF1 (406.1-430 MHz ; 450-470 MHz)                  | 0.044                                    | 27.7%                     | 0.029                                    | 17.9%                     |
| UHF2 (450-470 MHz)                                  | 0.037                                    | 21.7%                     | 0.030                                    | 17.4%                     |
| 7/800 (769-775 MHz; 799-824 MHz;851-869 MHz )       | 0.027                                    | 10.6%                     | 0.033                                    | 13.3%                     |
| WLAN (2412-2462 MHz)                                | 0.030                                    | 5.60%                     | 0.030                                    | 5.60%                     |
| <b>Simultaneous Transmissions</b>                   |                                          |                           |                                          |                           |
| <b>Simultaneous Transmissions conditions</b>        | <b>Passenger</b>                         |                           | <b>Bystander</b>                         |                           |
|                                                     | <b>Highest Combine % of</b>              |                           | <b>Highest Combine % of</b>              |                           |
| DVR 800 + WLAN + VHF                                | <b>128.4%</b>                            |                           | 70.9%                                    |                           |
| DVR 800 + WLAN + UHF1                               | 56.8%                                    |                           | 25.7%                                    |                           |
| DVR 800 + WLAN + UHF2                               | 50.8%                                    |                           | 25.2%                                    |                           |
| DVR 800 + WLAN + 7/800                              | 39.7%                                    |                           | 25.0%                                    |                           |

Note: Result in bold required SAR simulation.

Although MPE is a convenient method of demonstrating RF Exposure requirements, SAR is recognized as the “basic restriction”. For those configurations indicate with “\*” in Table 12 (a), compliance to the General Population / Uncontrolled SAR 1g limit of 1.6 W/kg is demonstrated through SAR computational analysis.

The computational results show that this DVR 800 device, when used with Companion Mobile radio APX8500 and specified antennas, exhibit a maximum combine SAR are indicated in the Table 15.

**Table 15**

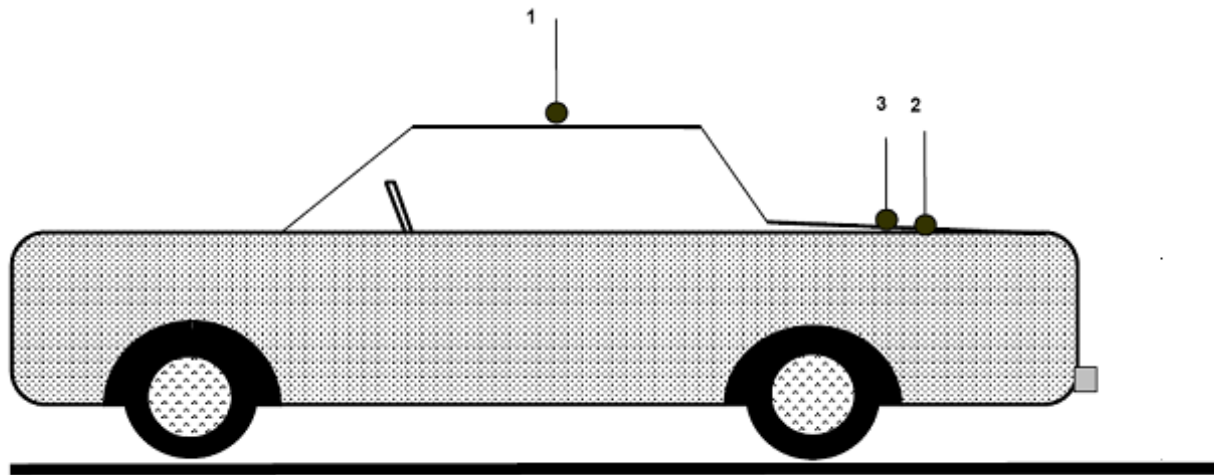
| <b>Designator</b> | <b>Frequency Band (MHz)</b> |                         | <b>Exposure Conditions</b> | <b>Combined SAR (W/kg)</b> |           |
|-------------------|-----------------------------|-------------------------|----------------------------|----------------------------|-----------|
|                   | <b>DVR 800</b>              | <b>Companion Mobile</b> |                            | <b>1-g</b>                 | <b>WB</b> |
| ISED Canada       | 806-824; 851-869            | 138 - 174               | Passenger Back             | 0.77                       | 0.018     |

## **18.0 User Instructions Considerations**

In order to facilitate the task of professional users, the Safety Manual for this radio requires that bystanders be kept at least 3 ft (90 cm) from the vehicle body during radio use.

## **Appendix A - Antenna Locations, Test Distances, and Cable Losses**

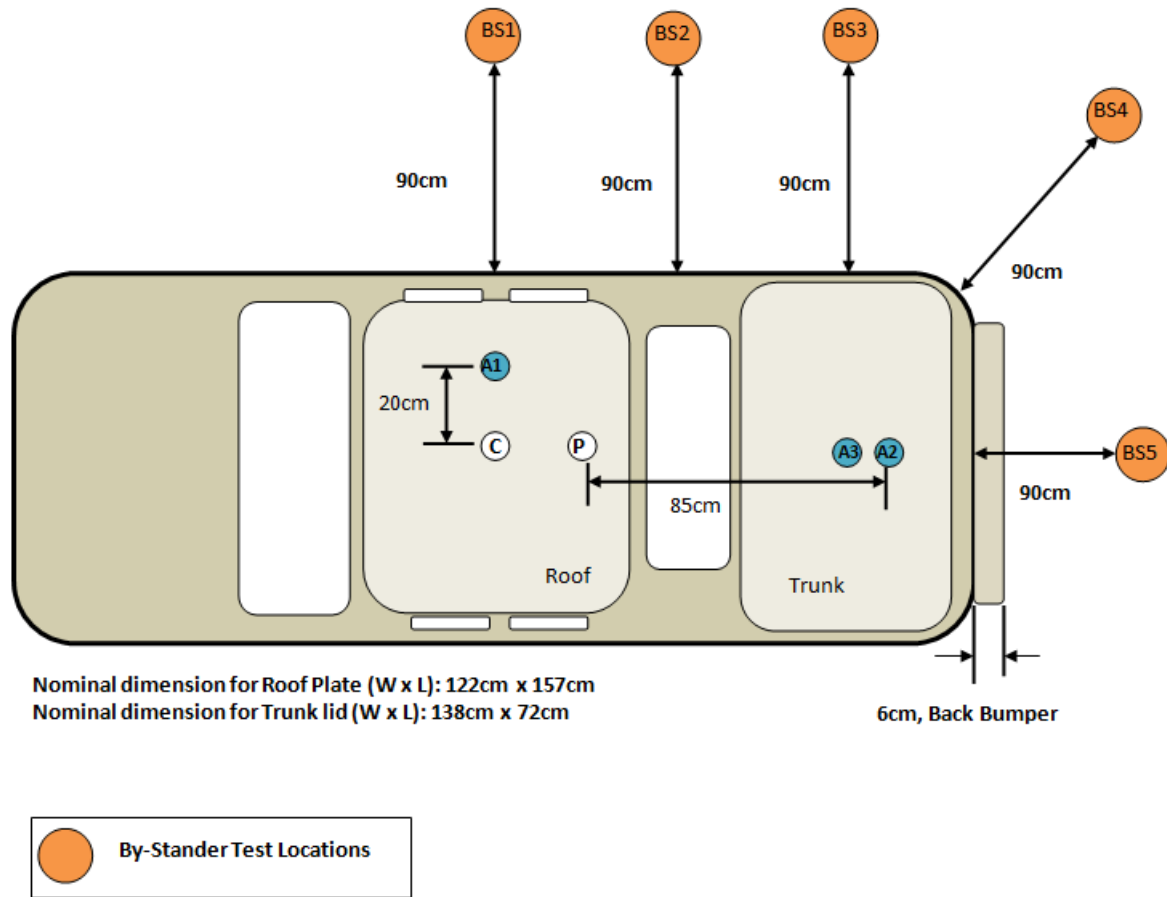
## Antenna locations



1. Roof (20cm from center)
2. Trunk (85cm from back of the back seat)
3. Trunk (center)



## Bystander Antenna mounting and test locations



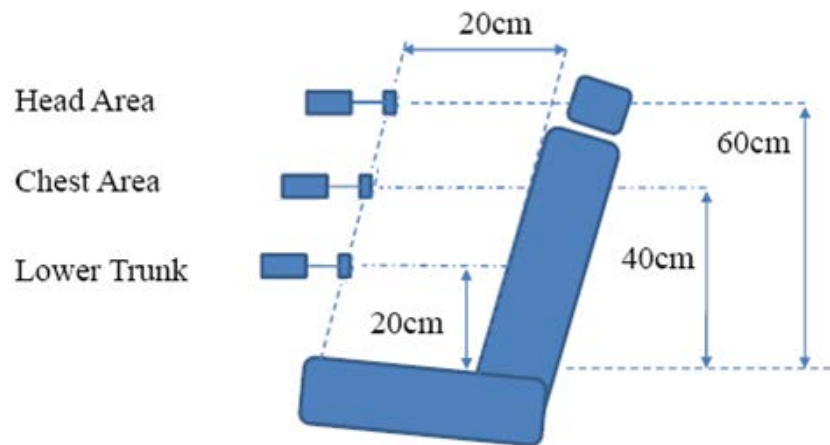
### Note:

- 1.) Antenna location A1: APX mobile radio roof antenna mounting locations for passenger and bystander testing
- 2.) Antenna location A2: DVR trunk antenna mounting locations for passenger back testing
- 3.) Antenna location A3: DVR trunk antenna mounting locations for bystander testing
- 4.) Bystander location BS2: Center point of the bystander test location BS1 and test location BS3
- 5.) Bystander location BS (1-5): 90cm away from the vehicle body. Apply for both roof and trunk testing
- 6.) Total distance between trunk mount antenna and rear passenger is 85cm

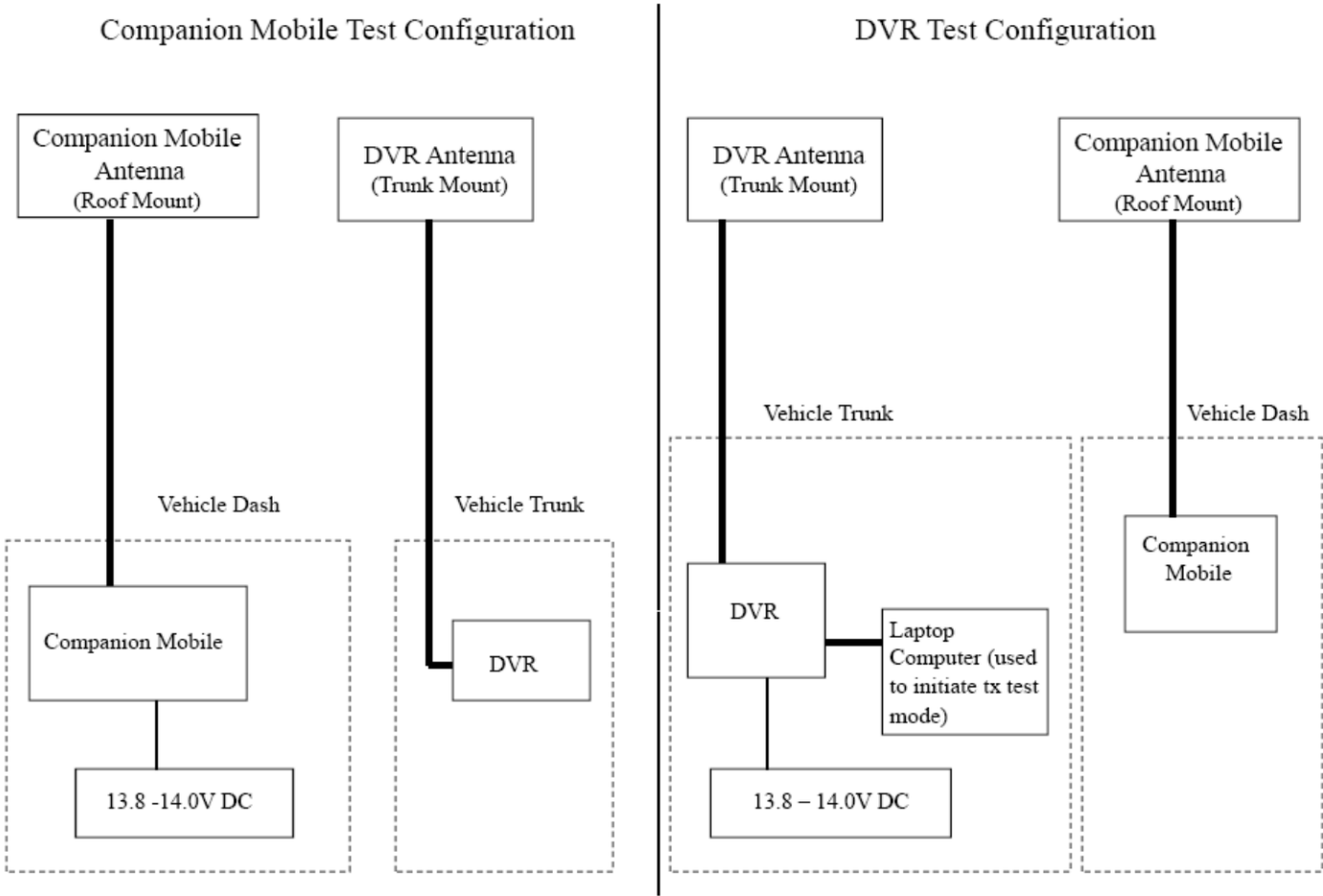
Seat scan areas  
(Applicable to both front and back seats)

Meter - Probe

 Probe diameter is 5.5cm



MPE Test Configuration



## Cable Losses

### **Test Cable**

#### Teflon RG58A/U Loss Per 100 Feet

160 MHz - 5 dB

450 MHz - 9 dB

1 GHz - 13.8 dB

### **Customer Cable**

#### RG-58A/U Loss Per 100 Feet

136 MHz – 5.5 dB

450 MHz – 9.6 dB

900 MHz – 13.9 dB

#### PFP 240 Loss Per 100 Feet (For BT/WLAN)

2500 MHz - 12.9 dB

**Appendix B - Probe Calibration Certificates****Service Test Report**

QAF 1126, 03/11

Report ID: 114201



An ESCO Technologies Company

1301 Arrow Point Drive  
Cedar Park, Texas 78613  
(512) 531-6400

Tracking # 800035042

**Equipment Check**Attested by GC Date: 16-May-16  
www.ets-lindgren.com**Certificate of Test Conformance**

Page 1 of 1

**Reference:** S 000035042**Customer:** Keysight Cal Lab C/O Motorola Solutions - 8000 West Sunrise Blvd. Plantation, FL.  
33322

The instrument listed below has been tested and verified to Internal Quality Standards. Test data is Not Applicable. Equipment used during instrument testing is controlled by laboratory compliance with ISO/IEC 17025-2005 and ANSI/NCSL Z540-1-1994 using ETS-Lindgren Quality Management System internal procedures.

**Manufacturer** ETS-Lindgren**Instrument Type** RF Survey Meter**Model** HI-2200**Serial Number/ID** 00086316**Status In**

In Tolerance

**Date Completed**

16-May-16

**Status Out**

Compliant with Internal Quality Standards

**Remarks**

Functional test performed with customer's probe S/N 00153632.

I would like to take this opportunity to express our appreciation for using ETS-Lindgren for your EMI test equipment services and I am looking forward to continued business with your organization. Please feel free to contact our offices at (512) 531-6400, if you have any questions regarding this report.

Sincerely,

George Cisneros

Calibration Supervisor

**Date Attested:** 16-May-16



Cert ID: 114197

**Certificate of Calibration Conformance**

Page 1 of 3

The instrument identified below has been individually calibrated in compliance with the following standard(s):

IEEE 1309 - 2013, Institute of Electrical and Electronics Engineers, Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas from 9 kHz to 40 GHz

Environment: Laboratory MTE is maintained in a temperature controlled environment with ambient conditions from 18 to 28 C, relative humidity less than 90%. The instrument under test has been calibrated in a suitable environment using an EMC TEM Cell 5101C, GTEM! 5305 and an RF Shielded EMC Chamber which is conducive to maintaining accurate and reliable measurement quality.

|                    |                                |                  |                                                                                        |
|--------------------|--------------------------------|------------------|----------------------------------------------------------------------------------------|
| Manufacturer:      | ETS-Lindgren                   | Operating Range: | 100kHz - 5GHz                                                                          |
| Model Number:      | E100                           | Instrument Type: | Isotropic Probe > 1 GHz                                                                |
| Serial Number/ ID: | 00153632                       | Date Code:       |                                                                                        |
| Tracking Number:   | S 000035042                    | Alternate ID:    |                                                                                        |
| Date Completed:    | 16-May-16                      | Customer:        | Keysight Cal Lab C/O Motorola Solutions - 8000 West Sunrise Blvd, Plantation, FL 33322 |
| Test Type:         | Standard Field, Field Strength |                  |                                                                                        |

Calibration Uncertainty: Std Field Method 100kHz - 6 GHz, +/-0.7 dB, Isotropy +/- 0.86  
k=2, (95% Confidence Level)

Test Remarks: Probe received in tolerance thus before and after data are the same.

Calibration Traceability: All Measuring and Test Equipment (MTE) identified below are traceable to the SI units through the National Institute for Standards and Technology (NIST) or other recognized National Metrology Institute. Calibration Laboratory and Quality System controls are compliant with ISO/IEC 17025-2005 and ANSI/NCSL Z540-1-1994.

**Standards and Equipment Used:**

Make / Model / Name / S/N / Recall Date

|                 |             |                       |            |           |
|-----------------|-------------|-----------------------|------------|-----------|
| HP              | 8648C       | Signal Generator      | 3836U02236 | 25-Feb-17 |
| Marconi         | 2024        | Signal Generator      | 112343/043 | 02-Feb-17 |
| Hewlett Packard | E4422B      | Signal Generator      | US40050591 | 22-Jul-16 |
| Rohde & Schwarz | SMB 100A    | Signal Generator      | 101558     | 17-Aug-16 |
| Keysight        | E9304A      | Power Sensor          | MY56100005 | 18-Mar-17 |
| Agilent         | E9304A      | Power Sensor          | MY41499013 | 01-Mar-17 |
| Agilent         | E9304A      | Power Sensor          | MY41499012 | 17-Jun-16 |
| Agilent         | E4419B      | Power Meter           | MY40510693 | 22-Jan-17 |
| Agilent         | E4419B      | Power Meter           | GB40202754 | 22-Oct-16 |
| Agilent         | U2004A      | USB Power Sensor      | MY50000280 | 08-Oct-16 |
| Rohde & Schwarz | 857.8008.02 | Power Meter NRVD      | 100451     | 17-Jul-16 |
| Hewlett Packard | 83650L      | Synthesized Sweep Gen | 3844A00422 | 21-Jan-17 |
| Rohde & Schwarz | NRV-Z55     | Thermal Power Sensor  | 100037     | 16-Jul-16 |
| Rohde & Schwarz | NRV-Z55     | Thermal Power Sensor  | 100362     | 14-Nov-16 |
| Rohde & Schwarz | NRV-Z55     | Thermal Power Sensor  | 100363     | 18-Aug-16 |
| Rohde & Schwarz | NRP-Z91     | Power Sensor          | 100733     | 16-Jul-16 |
| Rohde & Schwarz | NRP-Z91     | Power Sensor          | 100732     | 16-Jul-16 |

**Condition of Instrument**

Upon Receipt:

In Tolerance to Internal Quality Standards

On Release:

In Tolerance to Internal Quality Standards

Calibration Completed By  
Francisco D Maldonado, Calibration Technician

Attested and Issued on 16-May-16  
George Cisneros, Calibration Supervisor

This document provides traceability of measurements to recognized national standards using controlled processes at the ETS-Lindgren Calibration Laboratory. Uncertainties listed are derived from the methods described by NIST Tech Note 1297. This certificate and report may not be reproduced, except in full, without the written approval of ETS-Lindgren Calibration Laboratory in accordance with ISO/IEC 17025-2005 and ANSI/NCSL Z540-1-1994. The results in this document relate only to the item(s) listed and should not be considered representative of a population unless otherwise noted. QAF 1127 (03/11)

# CALIBRATION REPORT

## Electric Field Sensor

| Model   | S/N      |
|---------|----------|
| E100    | 00153632 |
| HI-2200 | 00086316 |

Date: 16 May 2016

☐ New Instrument  
☐ Other  
☐ Out of Tolerance  
☒ Within Tolerance

## Frequency Response

| Frequency Response | MHz   | Nominal Field<br>V/m | Cal Factor*<br>(Applied/Indicated) | Deviation<br>dB |
|--------------------|-------|----------------------|------------------------------------|-----------------|
| 1                  | 0.1   | 20                   | 1.30                               | -2.26           |
| 2                  | 0.5   | 20                   | 1.08                               | -0.64           |
| 3                  | 1     | 20                   | 1.08                               | -0.64           |
| 4                  | 3     | 20                   | 1.01                               | -0.12           |
| 5                  | 15    | 20                   | 1.00                               | -0.02           |
| 6                  | 27.12 | 20                   | 1.00                               | -0.04           |
| 7                  | 100   | 20                   | 1.02                               | -0.15           |
| 8                  | 200   | 20                   | 1.00                               | 0.03            |
| 9                  | 1     | 20                   | 1.08                               | -0.64           |
| 10                 | 15    | 20                   | 1.00                               | -0.02           |
| 11                 | 30    | 20                   | 1.00                               | -0.04           |
| 12                 | 75    | 20                   | 1.01                               | -0.11           |
| 13                 | 100   | 20                   | 1.02                               | -0.15           |
| 14                 | 150   | 20                   | 1.01                               | -0.06           |
| 15                 | 200   | 20                   | 1.00                               | 0.03            |
| 16                 | 250   | 20                   | 0.99                               | 0.12            |
| 17                 | 300   | 20                   | 0.99                               | 0.10            |
| 18                 | 400   | 20                   | 0.99                               | 0.08            |
| 19                 | 500   | 20                   | 1.03                               | -0.25           |
| 20                 | 600   | 20                   | 1.04                               | -0.36           |
| 21                 | 700   | 20                   | 1.07                               | -0.55           |
| 22                 | 800   | 20                   | 1.08                               | -0.69           |
| 23                 | 900   | 20                   | 1.03                               | -0.24           |
| 24                 | 1000  | 20                   | 0.99                               | 0.13            |
| 25                 | 2000  | 20                   | 1.05                               | -0.40           |
| 26                 | 2450  | 20                   | 1.08                               | -0.69           |
| 27                 | 3000  | 20                   | 1.06                               | -0.54           |
| 28                 | 3500  | 20                   | 1.01                               | -0.12           |
| 29                 | 4000  | 20                   | 1.03                               | -0.24           |
| 30                 | 5000  | 20                   | 1.32                               | -2.41           |
| 31                 | 5500  | 20                   | 1.45                               | -3.25           |
| 32                 | 6000  | 20                   | 1.41                               | -3.00           |

\* Corrected electric field values (V/m) can be obtained by multiplying the Cal Factor with the indicated E field readings.

## Linearity

maximum linearity deviation is 0.34 dB

(measurements taken from 0.3 V/m to 800 V/m at 27.12 MHz)

## Test Conditions

Calibration performed at ambient room temperature: 23 ±3°C



### PROBE ROTATIONAL RESPONSE

Model E100  
S/N 00153632  
Report S000035042  
Date Date of Calibration 16 May 2016  
Time 01:40:27 PM  
Isotropy \* + 0.270 dB/ -0.270 dB

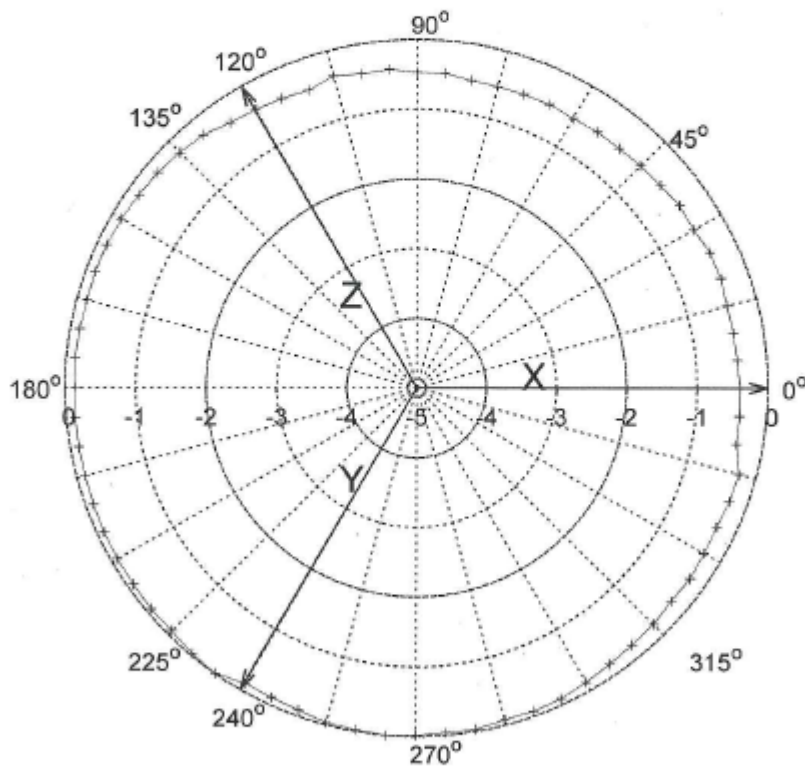


Figure 1: Probe Isotropic Response Chart.

Isotropic response is measured in a 20 V/m field at 400 MHz

\*Isotropy is the maximum deviation from the geometric mean as defined by IEEE 1309-2013.





Cert I.D.: 114199

**Certificate of Calibration Conformance**

Page 1 of 2

The instrument identified below has been individually calibrated in compliance with the following standard(s):  
 IEEE 1309 - 2013, Institute of Electrical and Electronics Engineers, Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas from 9 kHz to 40 GHz

Environment: Laboratory MTE is maintained in a temperature controlled environment with ambient conditions from 18 to 28 C, relative humidity less than 90%. The instrument under test has been calibrated in a suitable environment using an EMC TEM Cell 5101C, GTEM! 5305 and an RF Shielded EMC Chamber which is conducive to maintaining accurate and reliable measurement quality.

|                                 |                                |                         |                                    |
|---------------------------------|--------------------------------|-------------------------|------------------------------------|
| <b>Manufacturer:</b>            | ETS-Lindgren                   | <b>Operating Range:</b> | 5-300MHz / 30mA/m-10A/m            |
| <b>Model Number:</b>            | H200                           | <b>Instrument Type:</b> | Isotropic Magnetic Field Probe (2) |
| <b>Serial Number / ID:</b>      | 00206937                       |                         |                                    |
| <b>Date Completed:</b>          | 16-May-16                      |                         |                                    |
| <b>Test Type:</b>               | Standard Field, Field Strength |                         |                                    |
| <b>Calibration Uncertainty:</b> | Direct Field Method            | 1.15dB                  |                                    |

k=2, (95% Confidence Level)

**Test Remarks:**

Calibration Traceability: All Measuring and Test Equipment (MTE) identified below are traceable to the SI units through the National Institute for Standards and Technology (NIST) or other recognized National Metrology Institute. Calibration Laboratory and Quality System controls are compliant with ISO/IEC 17025-2005 and ANSI/NCCL Z540-1-1994.

| Standards and Equipment Used: Make / Model / Name / S/N / Recall Date |          |                  |            |           | Condition of Instrument On Release:        |
|-----------------------------------------------------------------------|----------|------------------|------------|-----------|--------------------------------------------|
| HP                                                                    | 8648C    | Signal Generator | 3836U02236 | 25-Feb-17 | In Tolerance to Internal Quality Standards |
| Marconi                                                               | 2024     | Signal Generator | 112343/043 | 02-Feb-17 |                                            |
| Hewlett Packard                                                       | E4422B   | Signal Generator | US40050591 | 22-Jul-16 |                                            |
| Rohde & Schwarz                                                       | SMB 100A | Signal Generator | 101558     | 17-Aug-16 |                                            |
| Keysight                                                              | E9304A   | Power Sensor     | MY56100005 | 18-Mar-17 |                                            |
| Agilent                                                               | E9304A   | Power Sensor     | MY41499013 | 01-Mar-17 |                                            |
| Agilent                                                               | E9304A   | Power Sensor     | MY41499012 | 17-Jun-16 |                                            |
| Agilent                                                               | E4419B   | Power Meter      | MY40510693 | 22-Jan-17 |                                            |
| Agilent                                                               | E4419B   | Power Meter      | GB40202754 | 22-Oct-16 |                                            |
| Agilent                                                               | U2004A   | USB Power Sensor | MY50000280 | 08-Oct-16 |                                            |

Calibration Completed By  
 Francisco D Maldonado, Calibration Technician

Attested and Issued on 16-May-16  
 George Cisneros, Calibration Supervisor

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## CALIBRATION REPORT

### Magnetic Field Sensor

| Model   | S/N      |
|---------|----------|
| H200    | 00206937 |
| HI-2200 | 00086316 |

Date: 16 May 2016

☒ New Instrument☐ Other☐ Out of Tolerance☐ Within Tolerance

### Frequency Response

| Frequency<br>Response | MHz | Nominal<br>Field<br>A/m | Cal Factor*<br>(Applied/Indicated) | Deviation<br>dB |
|-----------------------|-----|-------------------------|------------------------------------|-----------------|
| 1                     | 10  | 30                      | 1.07                               | -0.58           |
| 2                     | 15  | 30                      | 1.05                               | -0.42           |
| 3                     | 30  | 30                      | 1.01                               | -0.09           |
| 4                     | 50  | 30                      | 0.99                               | 0.05            |
| 5                     | 75  | 30                      | 0.96                               | 0.33            |
| 6                     | 100 | 30                      | 0.90                               | 0.94            |
| 7                     | 150 | 30                      | 0.87                               | 1.18            |
| 8                     | 175 | 30                      | 0.84                               | 1.53            |
| 9                     | 200 | 30                      | 0.80                               | 1.94            |
| 10                    | 250 | 30                      | 0.70                               | 3.12            |
| 11                    | 300 | 30                      | 0.56                               | 5.09            |

\* Corrected magnetic field values (A/m) can be obtained by multiplying the Cal Factor with the indicated H field readings.

### Linearity

maximum linearity deviation is 0.06 dB

(measurements taken from 30 mA/m to 9 A/m at 27.12 MHz)

### Test Conditions

Calibration performed at ambient room temperature: 23 ±3°C

The above sensor was calibrated to factory specifications. This calibration is performed per IEEE 1309 standard. All equipment used are traceable to US National Institute of Standards and Technology (NIST).

## **Appendix C - Photos of Assessed Antennas**

DVR



**Antenna kit number**  
HAF4016A

### Companion Mobile



**All bands Antenna kit number**  
AN000131A01