

## 2.5 EMISSION LIMITATIONS FOR CELLULAR – OUT OF BAND

| Test Summary                                                                                     |                                                          |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Test Lab: MPB Technologies Inc. Ottawa<br>Test Personnel: D. BECK<br>Test Date: February 9, 2001 | Product: BST301 <i>iDEN</i> Motorola<br>Trunking Booster |

| Test Description                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objectives/Criteria                                                                                                                                                                                                   | Specifications                                                                                                                                                                                                                                                                                                                                                                                                          |
| On any frequency twice or more then twice the fundamental frequency, the mean power of emissions must be attenuated below the mean power of the unmodulated carrier by a minimum of 60 <u>or</u> $43 + 10 \log P$ dB. | <p>FCC PART 90: 1996, Subpart H<br/>Section 90.210</p> <p><math>f_c - 10 \times f_c \ 43 + 10 \log P</math> dB</p> <p>Note: dB refers to attenuation from the mean power of the unmodulated carrier.</p> <p><math>f_c</math> refers to frequency of the carrier</p> <p><math>f_d</math> refers to displacement frequency from the carrier in kHz</p> <p>P refers to the mean power of the unmodulated carrier wave.</p> |

| Test Result: <b>PASS</b>                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Comments: <math>P \leq 3.0W</math>, Therefore <math>43 + \log P</math> dB is 58.4dB. 58.4 dB down from unmodulated carrier is the limit for that frequency range of the mask.</p> <p>Refer to Test Report Data sheets for more detail.</p> |

**2.6 MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

| Test Summary                                                                                     |                                                          |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Test Lab: MPB Technologies Inc. Ottawa<br>Test Personnel: D. BECK<br>Test Date: February 7, 2001 | Product: BST301 <i>iDEN</i> Motorola<br>Trunking Booster |

| Test Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objectives/Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Specifications                                                                                                                                                                                                         |
| For devices to be operated more then 20 cm from the users body, the equipment shall not exceed that listed in the table based on an averaging time of 30 minutes and that the limit is for the general population/uncontrolled exposure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Power Density Requirements, FCC Part 1.1310<br><br>Frequency    mW/cm <sup>2</sup><br>0.3 – 1.34    (100)<br>1.24 – 30     (180/f <sup>2</sup> )<br>30-300        0.2<br><b>300-1500     f/1500</b><br>1500-10000    1 |
| Test Result: <b>PASS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                        |
| Comments:<br><br>Limit distance is at 8.8 inches from antenna.<br>Statement to be incorporated shall read as follows:<br><br>The glass mount antenna must be mounted in a location that will provide a minimum of 12 inches separation between it and vehicle occupants in order to meet the MPE (Maximum Permissible Exposure) limit and requirements in accordance with FCC CFR 47 Part 1.1301.<br><br>The maximum permissible power output limit is at 8.8 inches from the antenna, this is equivalent to 0.557mW/cm <sup>2</sup> . Max Output measured at 824 MHz was 0.194 mW/cm <sup>2</sup> at 12 inches. Refer to Test Report Data sheets for more detail.<br><br>All measurements were performed while the EUT was transmitting a CW signal which is deemed to be worst case. |                                                                                                                                                                                                                        |

### **3.0 TEST FACILITY**

#### **3.1 LOCATION**

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Kanata, Ontario, Canada.

#### **3.2 GROUNDING PLANE**

The EUT was located on a wooden table 80 cm above the ground plane. The EUT was grounded according to the Clients specifications.

#### **3.3 POWER**

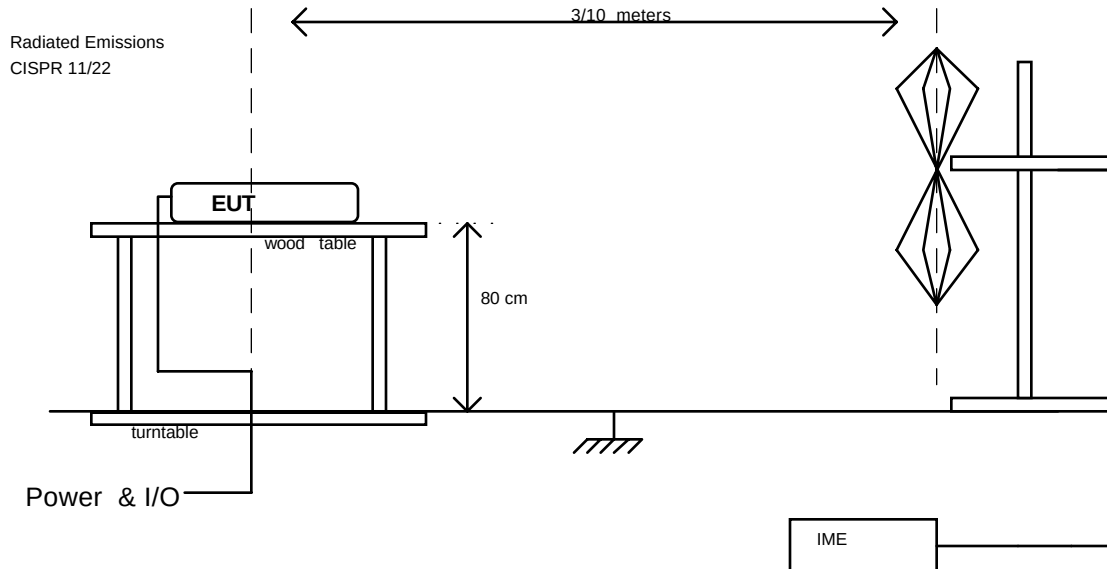
AC power was supplied via a CORCOM RFI feed through, 60-Ampere wall mounted filter. Bonding to hydro ground is via one inch grounding braid straps.

#### **3.4 EMISSIONS PROFILE**

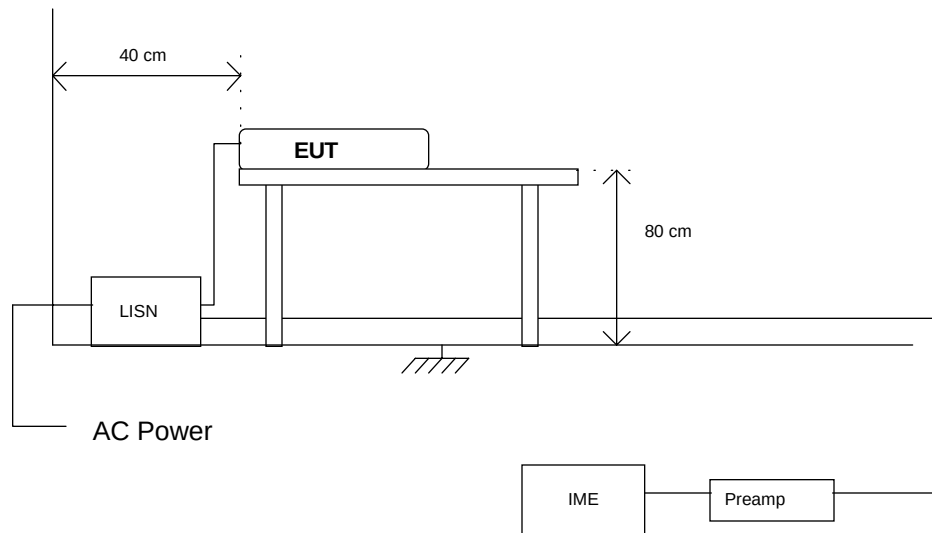
Conducted electromagnetic emission profiles were generated throughout the tests and are included in the Test Report Data sheets.

### 3.5 TEST CONFIGURATION

The following diagrams illustrate the configuration of the EUT test and measurement equipment used for CISPR Radiated and Conducted Emissions Testing.



Conducted Emissions CISPR 11 / 22



## 4.0 TEST EQUIPMENT

The following equipment was utilized for this procedure. All measurement devices are calibrated annually, traceable to NIST. Please refer to Appendix C for calibration data.

### 4.1 RADIATED EMISSIONS

- a) Spectrum Analyzer
- b) Receiver with CISPR Quasi-peak Adapter
- c) Power Isolation Transformers
- d) Biconilog antenna (25 MHz to 2 GHz)
- e) Antenna mast positioner, and controller
- f) Flush-mounted turntable, and controller

### 4.2 CONDUCTED EMISSIONS

- a) Spectrum Analyzer
- b) Line Impedance Stabilization Network, 50  $\mu$ H
- c) CISPR Quasi-peak Adapter
- d) Power Isolation Transformer
- e) Personal Computer and EMI/EMC Software

### 4.3 EMI SPECTRUM ANALYZER AND RECEIVER

#### 4.3.1 Spectrum Analyzer

##### Range 1 of 2

|                      |                   |
|----------------------|-------------------|
| Start Frequency      | 0.15 MHz          |
| Stop Frequency       | 30 MHz            |
| Transducer           | LISN per CISPR 16 |
| Quasi-Peak Bandwidth | 9 kHz             |
| Spectrum Analyzer BW | 10 kHz            |
| Video Bandwidth      | 100 kHz           |
| Reference Level      | 100 dB $\mu$ V    |

##### Range 2 of 2

|                      |                   |
|----------------------|-------------------|
| Start Frequency      | 30 MHz            |
| Stop Frequency       | 1000 MHz          |
| Transducer           | Biconilog Antenna |
| Quasi-Peak Bandwidth | 120 kHz           |
| Spectrum Analyzer BW | 120 kHz           |
| Video Bandwidth      | 1 MHz             |
| Reference Level      | 100 dB $\mu$ V    |

#### 4.3.2 Receiver

|                      |                   |
|----------------------|-------------------|
| Transducer           | Biconilog Antenna |
| Quasi-Peak Bandwidth | 120 kHz           |
| Measurement Window   | 20 dB $\mu$ V     |

## Appendix A

### CLIENT SAMPLE DESCRIPTION

|                |             |                    |
|----------------|-------------|--------------------|
|                | New ✓       | Repeat             |
| MPBT Personnel | Date        | Project/Work Order |
| D. BECK        | Feb 7, 2001 | M34R2460           |

|                    |             |                                       |
|--------------------|-------------|---------------------------------------|
| <b>Contact</b>     | Tom Vagenas | M.C.T. INC.                           |
| <b>Company</b>     |             | 360 Industrial Parkway South, Unit #1 |
|                    | M.C.T. INC. | Aurora, ON                            |
|                    |             | L4G 3V7                               |
| <b>Client Code</b> | M34         |                                       |
|                    |             | Phone: 416-726-3444 Fax: 905-726-4233 |

| Product Application                                               | Product Category                                                      | Product Type        |
|-------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------|
| Commercial ✓                                                      | Cellular                                                              | Trunking<br>Booster |
| <b>Product Name/Part No.</b>                                      | BST301 <i>iDEN</i> Motorola Trunking Booster                          |                     |
| <b>Serial Number</b>                                              |                                                                       |                     |
| <b>Power Requirements:<br/>AC/DC, Current</b>                     | DC, 12 VDC                                                            |                     |
| <b>Operational Frequency</b>                                      | NA                                                                    |                     |
| <b>Typical Installation<br/>Instructions or<br/>Configuration</b> | DC Car with adapter or with supplied AC/DC converter.                 |                     |
| <b>Ground EUT</b>                                                 | No                                                                    |                     |
| <b># Interconnecting Leads</b>                                    | 2                                                                     |                     |
| <b>Modulation Type</b>                                            | N/A (Amp boosts incoming signal, for test purposes TDMA PDC was used) |                     |
| <b>Peripheral Equipment</b>                                       | Signal Generator/Cell Phone                                           |                     |
| <b>Cables</b>                                                     | FME type Cable 50 ohm.                                                |                     |
| <b>Functional or Self-Test<br/>Duration</b>                       | EUT is ready on power up.                                             |                     |
| <b>Brief Functional<br/>Description</b>                           | The EUT is for boosting cellular signals in areas of weak reception.  |                     |
|                                                                   |                                                                       |                     |
| <b>Other Remarks</b>                                              |                                                                       |                     |

|              |  |                  |                  |
|--------------|--|------------------|------------------|
| Prepared By: |  | Title:           | Date:            |
| D. Beck      |  | EMC Technologist | February 7, 2000 |

## **Appendix B**

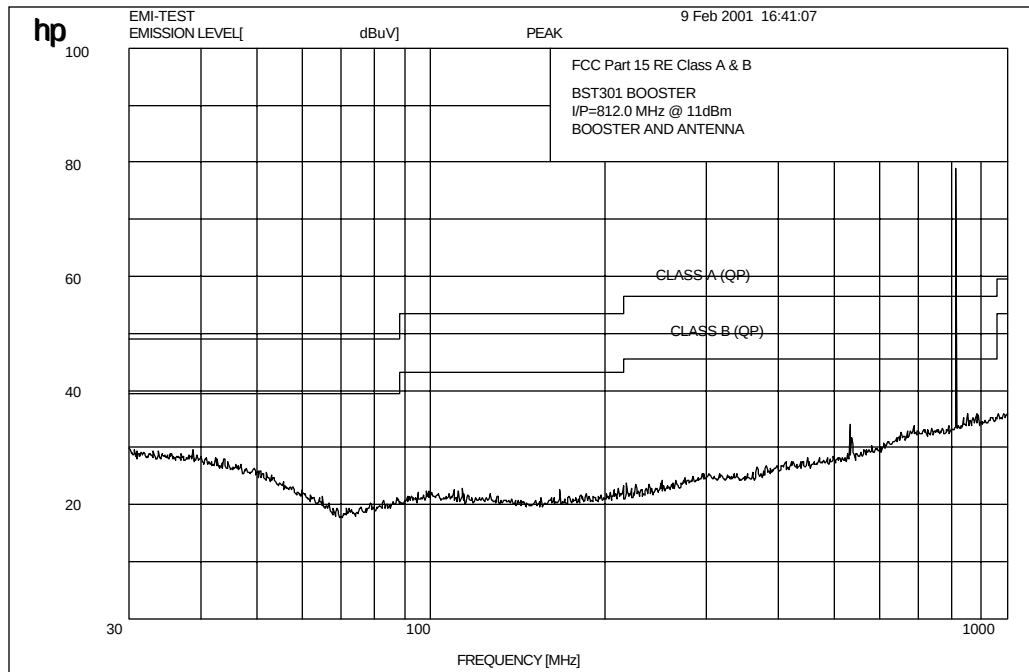
### **TEST REPORT DATA SHEETS and PLOTS**

| TEST REPORT DATA                       |                                              |                    |                  |                     |
|----------------------------------------|----------------------------------------------|--------------------|------------------|---------------------|
| Customer No: PO# 208                   |                                              | MPBT No.: M34R2460 |                  | Test Date: 7-Feb-01 |
| TEST COMP./PART:                       | TEST DESCRIPTION: RADIATED EMISSIONS CLASS B |                    | TEST CRITERIA:   |                     |
| MIL-SPECS./STDS.:                      | CISPR 22, FCC PART 15 SUBPART B              |                    | QUAL: ✓<br>ENG.: |                     |
| FACILITY: <b>MPB TECHNOLOGIES INC.</b> | TEST ENGINEER: D. BECK                       |                    | INTERNAL:        |                     |
| QA PERSONNEL:                          | OTHER:<br>TEMP.: 21 C HUMIDITY: 35 %         |                    |                  |                     |
| TEST PROCEDURES                        | DETAILS/DEVIATIONS: QUASI-PEAK LIMITS        | PASS               | FAIL             | INIT                |
|                                        |                                              |                    |                  |                     |
|                                        |                                              |                    |                  |                     |
|                                        |                                              |                    |                  |                     |
|                                        |                                              |                    |                  |                     |
|                                        |                                              |                    |                  |                     |
|                                        |                                              |                    |                  |                     |
| FCC PART 15                            | 30 MHz - 88 MHz, 40 dBμV/m                   | ✓                  |                  | D.B                 |
| SUBPART B                              | 88 MHz - 216 MHz, 43.5 dBμV/m                | ✓                  |                  | D.B                 |
|                                        | 216 MHz – 960 MHz, 46.0 dBμV/m               | ✓                  |                  | D.B                 |
|                                        | > 960 MHz, 54.0 dBμV/m                       | ✓                  |                  | D.B                 |
|                                        |                                              |                    |                  |                     |
|                                        |                                              |                    |                  |                     |
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|                                        |                                              |                    |                  |                     |
| MPBT: D.BECK                           | CUSTOMER: M.C.T. INC.                        | 1 OF 6             |                  |                     |

NOTE: This emission was below noise floor when a ferrite bead was applied to output of the signal generator outside of the shielded room.



| TEST REPORT DATA                       |                                                           |                    |                             |      |
|----------------------------------------|-----------------------------------------------------------|--------------------|-----------------------------|------|
| Customer No 208                        |                                                           | MPBT No.: M34r2460 | Test Date: February 7, 2000 |      |
| TEST COMP./PART:                       | TEST DESCRIPTION : CONDUCTED EMISSIONS CLASS B            |                    | TEST CRITERIA:              |      |
| MIL-SPECS./STDS.:                      | FCC PART 15 SUBPART B                                     |                    | QUAL ✓<br>ENG.:             |      |
| FACILITY: <b>MPB TECHNOLOGIES INC.</b> | TEST ENGINEER: D. BECK                                    |                    | INTERNAL:                   |      |
| QA PERSONNEL:                          | OTHER:<br>TEMP.: 21 C                      HUMIDITY: 45 % |                    |                             |      |
| TEST PROCEDURES                        | DETAILS/DEVIATIONS: QUASI-PEAK LIMITS                     | PASS               | FAIL                        | INIT |
|                                        |                                                           |                    |                             |      |
| FCC PART 15                            | Quasi-Peak 450 kHz - 30 MHz, 48 dBμV                      | ✓                  |                             | D.B  |
| CLASS B                                |                                                           |                    |                             |      |
|                                        | Note: If the Quasi-Peak reading exceeds 48 dBμV,          |                    |                             |      |
|                                        | an average measurement is performed. If the Quasi-Peak    |                    |                             |      |
|                                        | measurement is more then 6dB higher then the average      |                    |                             |      |
|                                        | measurement, the Quasi-Peak measurement is reduced by     |                    |                             |      |
|                                        | 13 dB.                                                    |                    |                             |      |
|                                        |                                                           |                    |                             |      |
|                                        |                                                           |                    |                             |      |
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|                                        |                                                           |                    |                             |      |
|                                        |                                                           |                    |                             |      |
| MPBT: D. BECK                          | CUSTOMER: M.C.T. INC.                                     | 2 OF 6             |                             |      |



### Radiated Emissions

#### BST301 Trunking Booster Sample 1758