

Test Report Prepared By:

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MPBT Report No.: M34R2197(2459) Rev-1

Customer No.: PO#209

Report for

**FCC Part 1 Subpart I (1996)
FCC Part 15 Subpart B (1996)
FCC Part 22 Subpart H (1996)
FCC PART 2.1043 Changes in Certified Equipment (1998)**

**For Mobile Transmitter Amplifiers for
T.D.M.A. Cellular Radio-Telephone Service**

**Testing of the:
BST300 Cellular Booster
Addendum: 1.9 GHz PCS Passive Bypass Circuitry Modification**

Test Personnel: S. Drysdale, D. Zanette

Prepared for:

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360 Industrial Parkway South, Unit #1
Aurora, ON
L4G 3V7

Client Acceptance
Authorized Signatory

February 2, 2001
M34R2459 Rev-1

Dan Zanette
Lab Supervisor Electromagnetic Services
Electromagnetics Division
Authorized Signatory

MPB Technologies Inc.
N33R2459 Rev-1

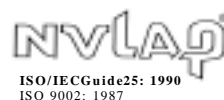


TABLE OF CONTENTS

1.0 INTRODUCTION

- 1.1 SCOPE
- 1.2 APPLICANT
- 1.3 APPLICABILITY
- 1.4 TEST SAMPLE DESCRIPTION
- 1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS
- 1.6 SCOPE OF TESTING
 - 1.6.1 VARIATIONS IN TEST METHODS
 - 1.6.2 TEST SAMPLE MODIFICATIONS

2.0 TEST CONCLUSION

- 2.1 EMISSIONS – AC PORT CONDUCTED
- 2.2 DIGITAL EMISSIONS, RADIATED
- 2.3 EFFECTIVE RADIATED POWER (ERP) LIMIT
- 2.4 EMISSION LIMITATIONS FOR CELLULAR – OCCUPIED BANDWIDTH
- 2.5 EMISSION LIMITATIONS FOR CELLULAR – OUT OF BAND
- 2.6 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

3.0 TEST FACILITY

- 3.1 LOCATION
- 3.2 GROUNDING PLANE
- 3.3 POWER
- 3.4 EMISSIONS PROFILE
- 3.5 TEST CONFIGURATION

4.0 TEST EQUIPMENT

- 4.1 RADIATED EMISSIONS
- 4.2 CONDUCTED EMISSIONS
- 4.3 EMI SPECTRUM ANALYZER AND RECEIVER
 - 4.3.1 Spectrum Analyzer
 - 4.3.2 Receiver

APPENDICES

- APPENDIX A:** SAMPLE DESCRIPTION
- APPENDIX B:** TEST REPORT DATA SHEETS & PLOTS
- APPENDIX C:** TEST EQUIPMENT REPORT
- APPENDIX D:** PHOTOGRAPHS
- APPENDIX E:** SUPPLEMENTARY DATA
- APPENDIX F:** 1.9 GHz PCS PASSIVE BY_PASS CIRCUITRY CHARACTERIZATION DATA PLOTS and PHOTOGRAPHS.

1.0 INTRODUCTION

1.1 SCOPE

The purpose of this report is to present the findings and results of compliance testing performed in accordance with FCC Part(s) 1, 15, 22 (1996).

1.2 APPLICANT

This test report has been prepared for MCT Inc.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the, which shall be referred to herein as the Equipment Under Test (**EUT**).

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by NVLAP or the Canadian or US governments.

If multiple units, the test samples provided for testing were intended for use together.

1.4 TEST SAMPLE DESCRIPTION

Product	Part Number	Serial Number	Power Requirements	Peripheral Equipment
(T.D.M.A.) BST300 Cellular Booster with 1.9 GHz PCS Passive By- pass Circuitry Modification	BST 300 (Sample BST300)	ACB10642	12 VDC	Signal Generator Spectrum Analyzer Cellular Phone

Tx Gain (dB): 22.0

Measured at: 849 MHz

Tx Maximum Power Output (dBm): 33.7 = 2.5 Watts

Band of operation Tx: 824-849 MHz

Measured at: 836.5 MHz

Rx Gain (dB): 19.0

Measured at: 869MHz

Band of operation Rx: 869 – 894 MHz

1.9 GHz PCS Passive By-pass circuitry (Gain 0 dB)

1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS

The EUT was setup and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

All testing, unless otherwise noted, was performed under the following environmental conditions:

Temperature: 17 to 23 °C
Humidity: 45 to 75 %
Barometric Pressure: 68 to 106 kPa

1.6 SCOPE OF TESTING

Tests were performed in accordance with FCC Parts 1,15,22 (1996).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above.

1.6.2 TEST SAMPLE MODIFICATIONS

No test sample modifications were made

2.0 TEST CONCLUSION

The EUT was subjected to the following tests. Compliance status is assessed as **PASS**, **FAIL**, or **MARGINAL PASS**

The following table summarizes the test results and details the tests performed in terms of the specification and class or level applied, the unique test sample identification, and the EUT modification state, the mode of operation, and configuration.

Test Case	Test Type	Specification	Class/Level	Criteria	Test Sample	Config	Engineering / Qualification	Result
2.1	AC Port Conducted Emissions	FCC Part 15, (Subpart B)	B	NA	Sample #642	Test	Qualification	PASS
2.2	Radiated Emissions (Field Strength Spurious)	FCC Part 15, (Subpart B)	B	NA	Sample #642	Test	Qualification	PASS
2.3	ERP	FCC Part 22 (Subpart H)	NA	NA	Sample #642	Test	Qualification	PASS
2.4	Emission Mask (OCC BW)	FCC Part 22 (Subpart H)	NA	NA	Sample #642	Test	Qualification	PASS
2.5	Emission Mask (Out of band/Spurious)	FCC Part 22 (Subpart H)	NA	NA	Sample #642	Test	Qualification	PASS
2.6	MPE	FCC Part 1.1310	B	NA	Sample #642	Test	Qualification	PASS
Appendix: F	1.9GHz PCS By Pass Characterization	FCC 2.1043	NA	NA	Sample #642	Test	Qualification	Data

STATEMENT OF COMPLIANCE
The client equipment referred to in this report was found to comply with the requirements of FCC regulations as summarized above.

ABBREVIATIONS

CE – Conducted Emissions

N/T - Not Tested

E-Field - Electric Field

N/A - Not Applicable

H-Field - Magnetic Field

RE – Radiated Emissions

MEASUREMENT UNCERTAINTY

The following measurement uncertainty with 95% confidence level was calculated using the methods defined in NAMAS document NIS81: May 1994.

For Radiated E-Field Emissions

Frequency = $\pm 1 \times 10^{-3}$ MHz

Amplitude = ± 4.01 dB

For Conducted Emissions

Frequency = $\pm 1 \times 10^{-3}$ MHz

Amplitude = ± 3.25 dB

TEST SET UP

The photographs in Appendix D show the set up with maximized emission levels for each test.

2.1 EMISSIONS – AC PORT CONDUCTED

Test Summary	
Test Lab: MPB Technologies Inc. Ottawa Test Personnel: S. Drysdale Test Date: February 7, 2000	Product: BST300 Cellular Booster

Test Description										
Objectives/Criteria	Specifications									
<p>The Conducted E-Field emissions proliferated by a system or sub-system shall not exceed the limits for the specifications as stated.</p> <p>Emission levels should meet the requirements with a margin of 6 dB.</p> <p>The EUT was tested against Class B limits.</p>	<p>FCC PART 15: 1996</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Class A*</th> <th>Class B*</th> </tr> </thead> <tbody> <tr> <td>.45 – 1.705 MHz</td> <td>60</td> <td>48</td> </tr> <tr> <td>1.705 – 30 MHz</td> <td>69.5</td> <td>48</td> </tr> </tbody> </table> <p>*All limits are for Quasi-peak detection in dBµV. The detector bandwidth is 9 kHz.</p>	Frequency	Class A*	Class B*	.45 – 1.705 MHz	60	48	1.705 – 30 MHz	69.5	48
Frequency	Class A*	Class B*								
.45 – 1.705 MHz	60	48								
1.705 – 30 MHz	69.5	48								

Test Result: PASS
Comments: Refer to Test Report Data sheets for more detail.

**2.2 DIGITAL EMISSIONS, RADIATED
FIELD STRENGTH SPURIOUS**

Test Summary	
Test Lab: MPB Technologies Inc. Ottawa Test Personnel: S. Drysdale Test Date: March 2, 2000	Product: BST300 Cellular Booster

Test Description	
Objectives/Criteria	Specifications
<p>The Radiated E-Field emissions proliferated by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed the limits for the specifications as stated.</p> <p>Emission levels should meet the requirements with a margin of 6dB.</p> <p>The EUT was tested against Class B requirements</p>	FCC Part 15: 1996
	Frequency Class A* Class B*
	30 – 88 MHz 49.5 40.0
	88 – 216 MHz 54.0 43.5
	216 – 960 MHz 56.9 46.0
	> 960 MHz 60.0 54.0
	*All limits are @ 3m and are in dBµV/m.

Test Result: PASS
No spurious or digital emissions were detected. Refer to Test Report Data sheets for more detail.

2.3 EFFECTIVE RADIATED POWER (ERP) LIMIT

Test Summary	
Test Lab: MPB Technologies Inc. Ottawa Test Personnel: S. Drysdale Test Date: January 31, 2000	Product: BST300 Cellular Booster

Test Description	
Objectives/Criteria	Specifications
The ERP proliferated by a system or sub-system shall not exceed the limits for the specifications as stated.	FCC PART 22: 1996, Subpart H Section 22.913 Limit = 7 Watts Limit = 38.5 dBm Max Power = 33.7 dBm / 2.5 Watts

Test Result: PASS
Comments: Refer to Test Report Data sheets for more detail.

2.4 EMISSION LIMITATIONS FOR CELLULAR – OCCUPIED BANDWIDTH

Test Summary	
Test Lab: MPB Technologies Inc. Ottawa Test Personnel: S. Drysdale Test Date: February 21, 2000	Product: BST300 Cellular Booster

Test Description	
Objectives/Criteria	Specifications
<p>For an F3E/F3D emission mask, the mean power of emissions must be attenuated below that specified in mask (b), or mask (c). Measurement bandwidths are to be 300 Hz for any frequency removed from the carrier less than 45 kHz and 30 kHz for all else. For equipment which does not perform modulation and only amplifies the RF signal, pass/fail criteria shall be based on the following:</p> <p>a) The 20 dB bandwidth of the modulated carrier shall be the same (input signal vs. output signal).</p> <p>b) The difference of the amplitudes between the input signal and the output signal shall remain consistent (+/- 0.5 dB), for the 20 dB bandwidth of the modulated carrier.</p>	<p>FCC PART 22: 1996, Subpart H Section 22.917(b)/(c)</p> <p>Mask (b) $(f_c - 45 \text{ kHz})$ to $(f_c - 20 \text{ kHz})$, 26 dB $(f_c + 20 \text{ kHz})$ to $(f_c + 45 \text{ kHz})$, 26 dB 0 to $(f_c - 45 \text{ kHz})$, 60 <u>or</u> 43 + 10logP dB $(f_c + 45 \text{ kHz})$ to $(2 \times f_c)$, 60 <u>or</u> 43 + 10logP dB</p> <p>Mask (c) $(f_c - 20 \text{ kHz})$ to $(f_c - 12 \text{ kHz})$, $117\log(f_d/12)$ dB $(f_c + 12 \text{ kHz})$ to $(f_c + 20 \text{ kHz})$, $117\log(f_d/12)$ dB 0 to $(f_c - 20 \text{ kHz})$, $100\log(f_d/12)$ <u>or</u> 60 <u>or</u> 43 + 10logP dB $(f_c + 20 \text{ kHz})$ to $(2 \times f_c)$, $100\log(f_d/12)$ <u>or</u> 60 <u>or</u> 43 + 10logP dB</p> <p>Note: dB refers to attenuation from the mean power of the unmodulated carrier. f_c refers to frequency of the carrier f_d refers to displacement frequency from the carrier in kHz P refers to the mean power of unmodulated carrier wave.</p>

Test Result: PASS
<p>Comments:</p> <p>Refer to Test Report Data sheets for more detail.</p>

2.5 EMISSION LIMITATIONS FOR CELLULAR – OUT OF BAND

Test Summary	
Test Lab: MPB Technologies Inc. Ottawa Test Personnel: S. Drysdale Test Date: February 21, 2000	Product: BST300 Cellular 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 or $43+10\log P$ dB.	FCC PART 22: 1996, Subpart H Section 22.917(e) $f_c - 10x f_c$ $43+10\log P$ dB Note: dB refers to attenuation from the mean power of the unmodulated carrier. f_c refers to frequency of the carrier f_d refers to displacement frequency from the carrier in kHz P refers to the mean power of the unmodulated carrier wave.

Test Result: PASS
Comments: $P \leq 2.5W$, Therefore $43 + \text{Log}P$ dB is 47dB. 47 dB down from unmodulated carrier is the limit for that frequency range of the mask. Refer to Test Report Data sheets for more detail.

2.6 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Test Summary	
Test Lab: MPB Technologies Inc. Ottawa Test Personnel: D. Zanette Test Date: February 4, 2000	Product: BST300 Cellular Booster

Test Description	
Objectives/Criteria	Specifications
For devices to be operated more than 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 Frequency mW/cm ² 0.3 – 1.34 (100) 1.24 – 30 (180/f ²) 30-300 0.2 300-1500 f/1500 1500-10000 1

Test Result: **PASS**

Comments:

Limit distance is at 8.8 inches from antenna.
Statement to be incorporated shall read as follows:

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.

The maximum permissible power output limit is at 8.8 inches from the antenna, this is equivalent to 0.557mW/cm². Max Output measured at 824 MHz was 0.194 mW/cm² at 12 inches. Refer to Test Report Data sheets for more detail.

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

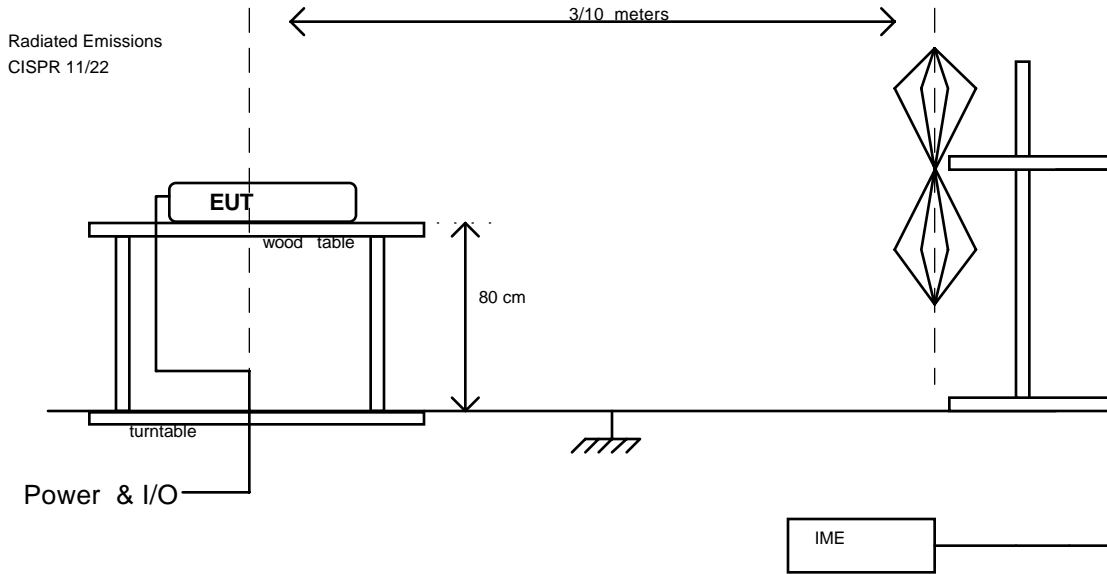
AC power was supplied via a CORCOM RFI feed through, 60-Ampere wall mounted filter. Bonding to hydro ground is via one inch grounding braid straps.

3.4 EMISSIONS PROFILE

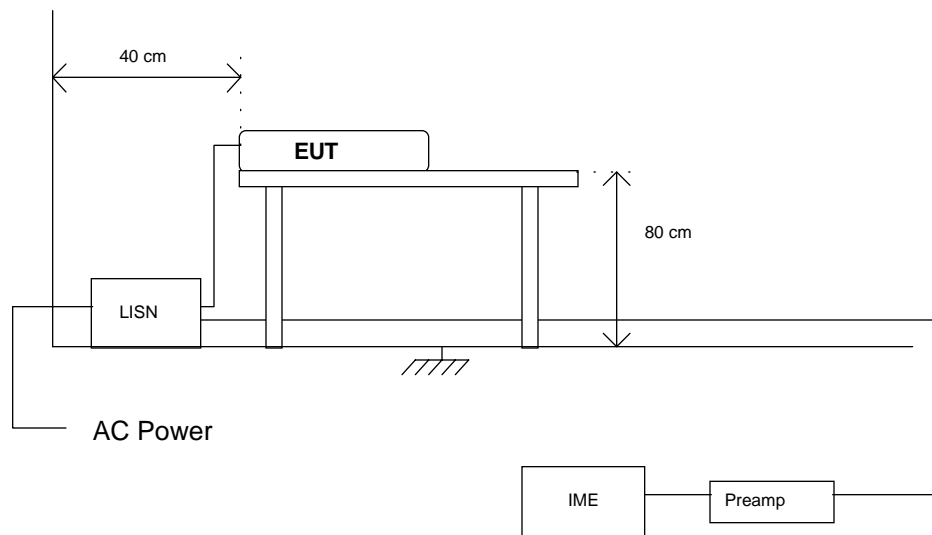
Conducted electromagnetic emission profiles were generated throughout the tests and are included in the Test Report Data sheets.

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 μ 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 μ 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 μ V

4.3.2 Receiver

Transducer	Biconilog Antenna
Quasi-Peak Bandwidth	120 kHz
Measurement Window	20 dB μ V

Appendix A
CLIENT SAMPLE DESCRIPTION

New <input checked="" type="checkbox"/>		Repeat	
MPBT Personnel	Date	Project/Work Order	
S. Drysdale	Feb 15, 2000	M34R2197	

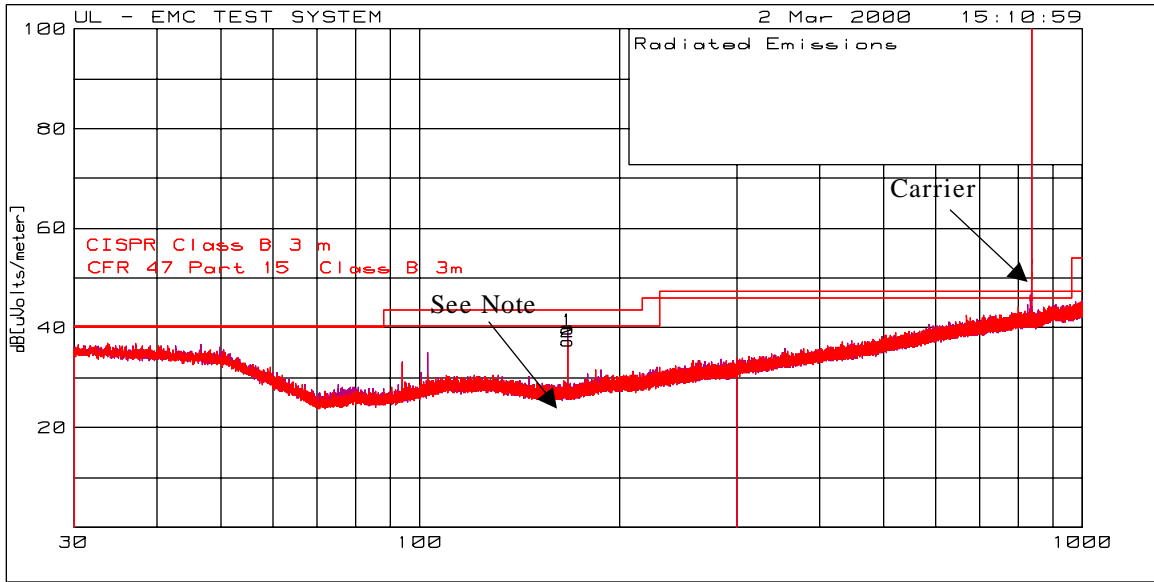
Contact	Tom Vagenas	M.C.T. INC.
Company		360 Industrial Parkway South, Unit #1
	M.C.T. INC.	Aurora, ON LAG 3V7
Client Code	M34	
		Phone: 416-726-3444 Fax: 905-726-4233

Product Application	Product Category	Product Type
Commercial <input checked="" type="checkbox"/>	Cellular	TDMA Amplifier
Product Name/Part No.	BST300 Cellular Booster	
Serial Number	ACB10642	
Power Requirements: AC/DC, Current	DC, 12 VDC	
Operational Frequency	NA	
Typical Installation Instructions or Configuration	DC Car with adapter or with supplied AC/DC converter.	
Ground EUT	No	
# Interconnecting Leads	2	
Modulation Type	N/A (Amp boosts incoming signal, for test purposes TDMA was used)	
Peripheral Equipment	Signal Generator/Cell Phone	
Cables	FME type Cable 50 ohm.	
Functional or Self-Test Duration	EUT is ready on power up.	
Brief Functional Description	The EUT is for boosting cellular signals in areas of weak reception.	
Other Remarks	Modified with 1.9 GHz Passive By Pass Circuitry	

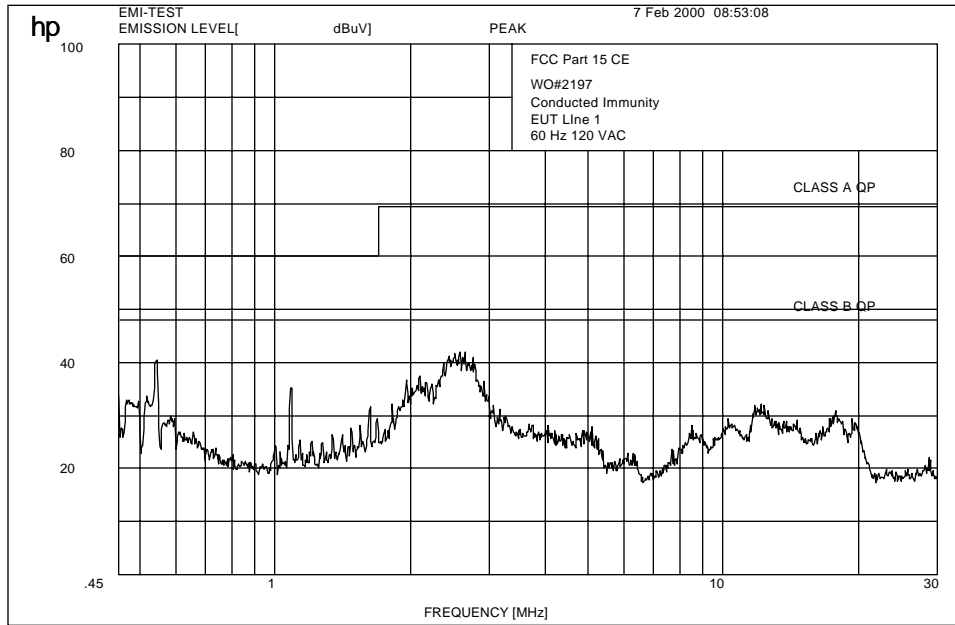
Prepared By:	Title:	Date:
S. Drysdale/ D.Zanette	EMC Technologist	February 15, 2000

Appendix B

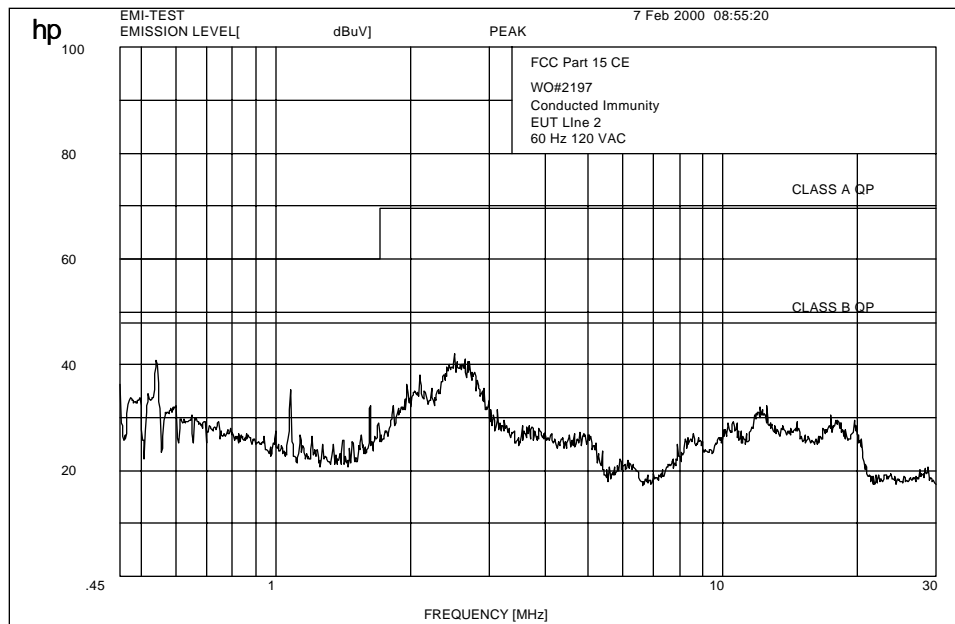
TEST REPORT DATA SHEETS and PLOTS



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



Line 1



Line 2

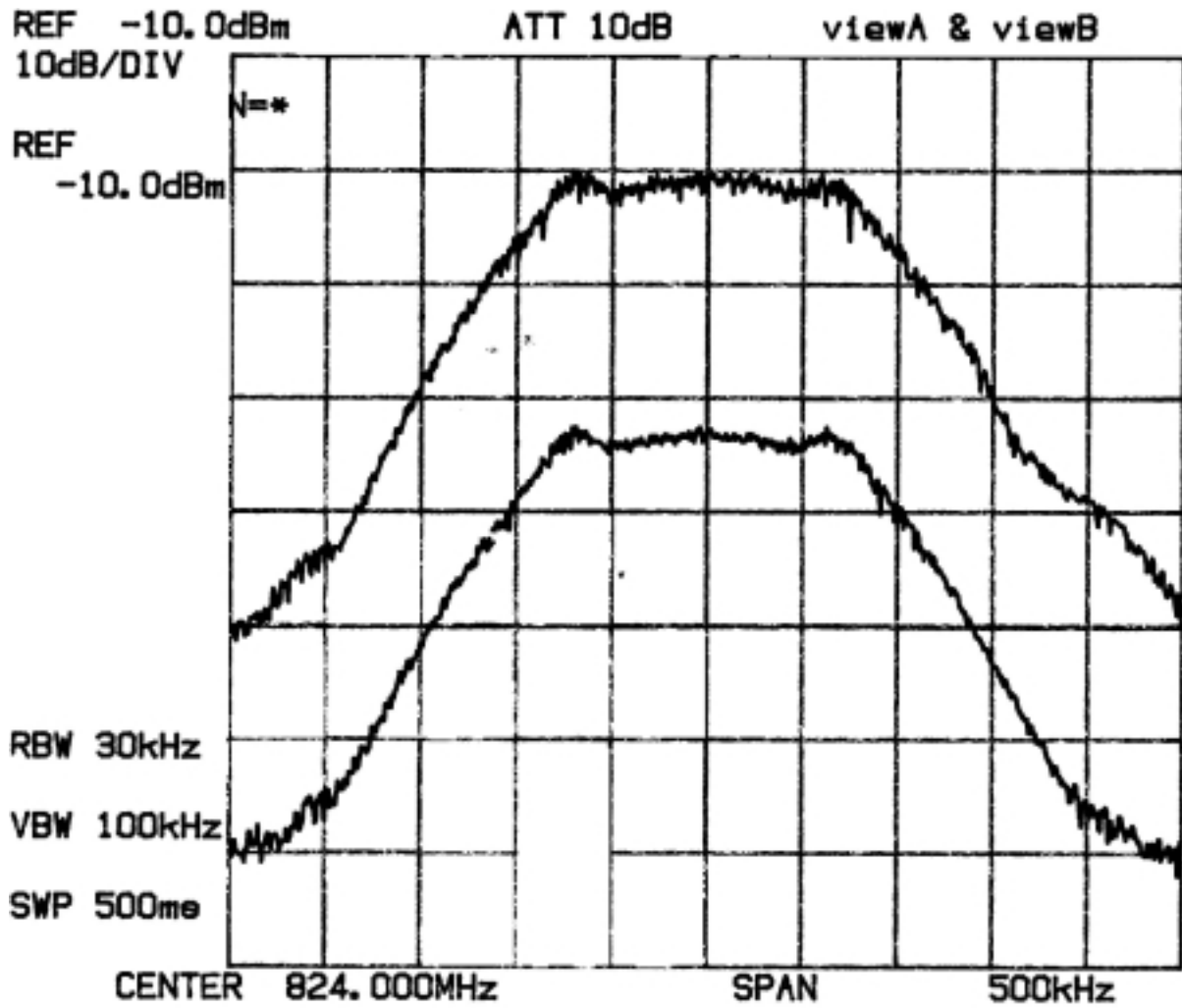
The EUT complies with conducted emission requirements.

TEST REPORT DATA				
Customer No: 1129		MPBT No.: M34R2197	Test Date: January 31, 2000	
TEST COMP./PART: SAMPLE 642	TEST DESCRIPTION: E.R.P LIMIT		TEST CRITERIA:	
MIL-SPECS./STDS.:	FCC PART 22, SUBPART H SECTION 22.913		QUAL ✓ ENG.:	
FACILITY: MPB TECHNOLOGIES INC.	TEST ENGINEER: S. DRYSDALE		INTERNAL:	
QA PERSONNEL:	OTHER: TEMP.: 21 C HUMIDITY: 35 %			
TEST PROCEDURES	DETAILS/DEVIATIONS	PASS	FAIL	INIT
	The ERP proliferated by a system or sub-system shall not exceed the limits for the specifications as stated.			
	7Watts	✓		S.D.
	The maximum power output(s) measured shall be within + 2dB to 0dB of the manufacturer's rating(s) of RF Power output.	✓		S.D.
MPBT: S.D.	CUSTOMER: M.C.T. INC.	2 OF 6		

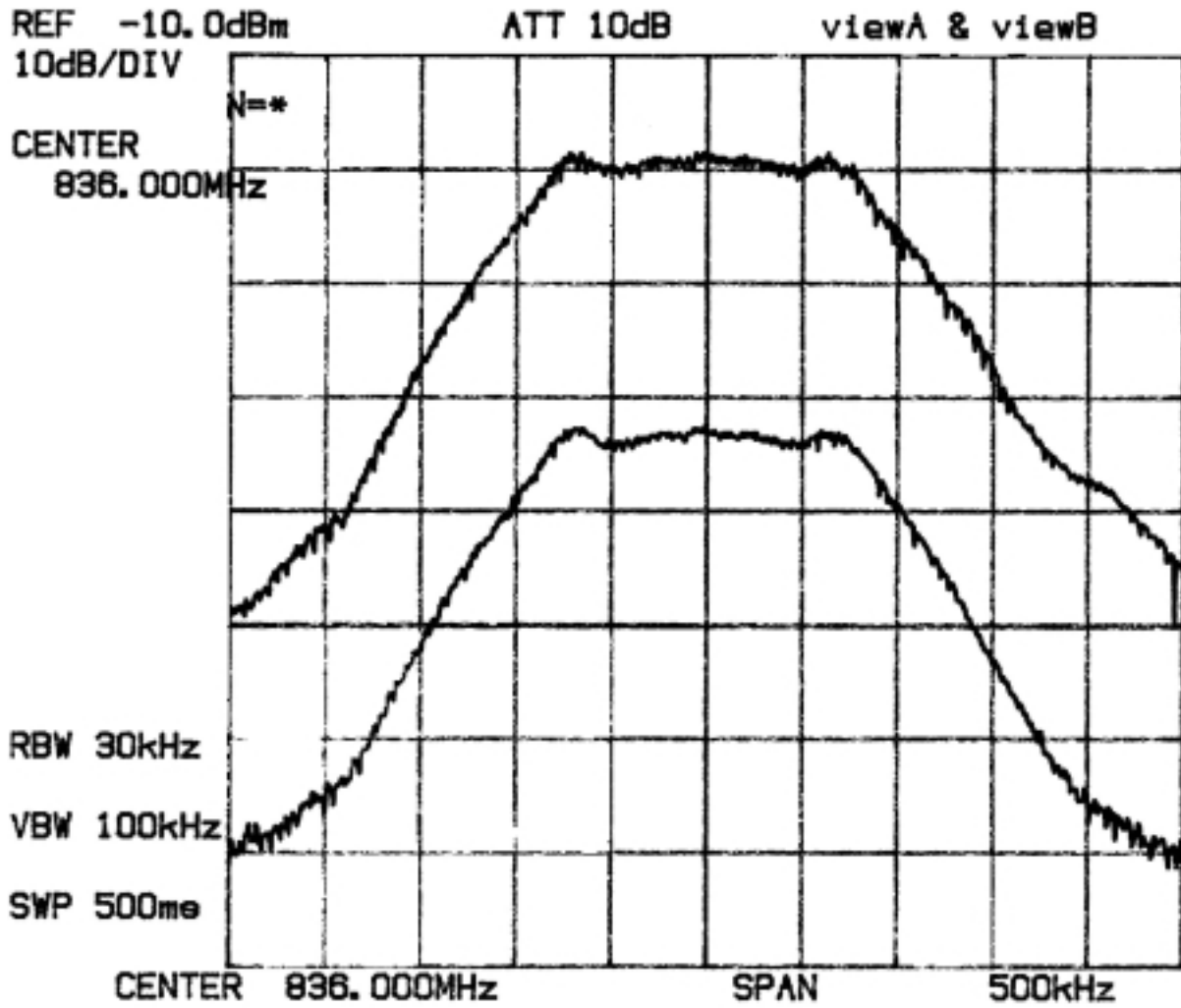
Sample #642	Signal Gen	Spec A	Losses*	Calculated	Gain
Frequency	RF Out (dBm)	Reading	(dB)	Out (dBm)	(dB)
		(dBm)			
824	10	-18.8	52.3	33.5	23.5
836.5	10	-18.6	52.3	33.7	23.7
849	10	-20.3	52.3	32	22
869	-13	-46.3	52.3	6	19
881.5	-13	-44.6	52.3	7.7	20.7
894	-13	-45.2	52.3	7.1	20.1
Note: *Losses Include Cable1 (0.9), Cable2 (0.9), Coupler (50), Cable3 (0.5)					
= 52.3					
Signal Gen RF Out taken at 1dB compression point					

The EUT complies with maximum power output requirements.

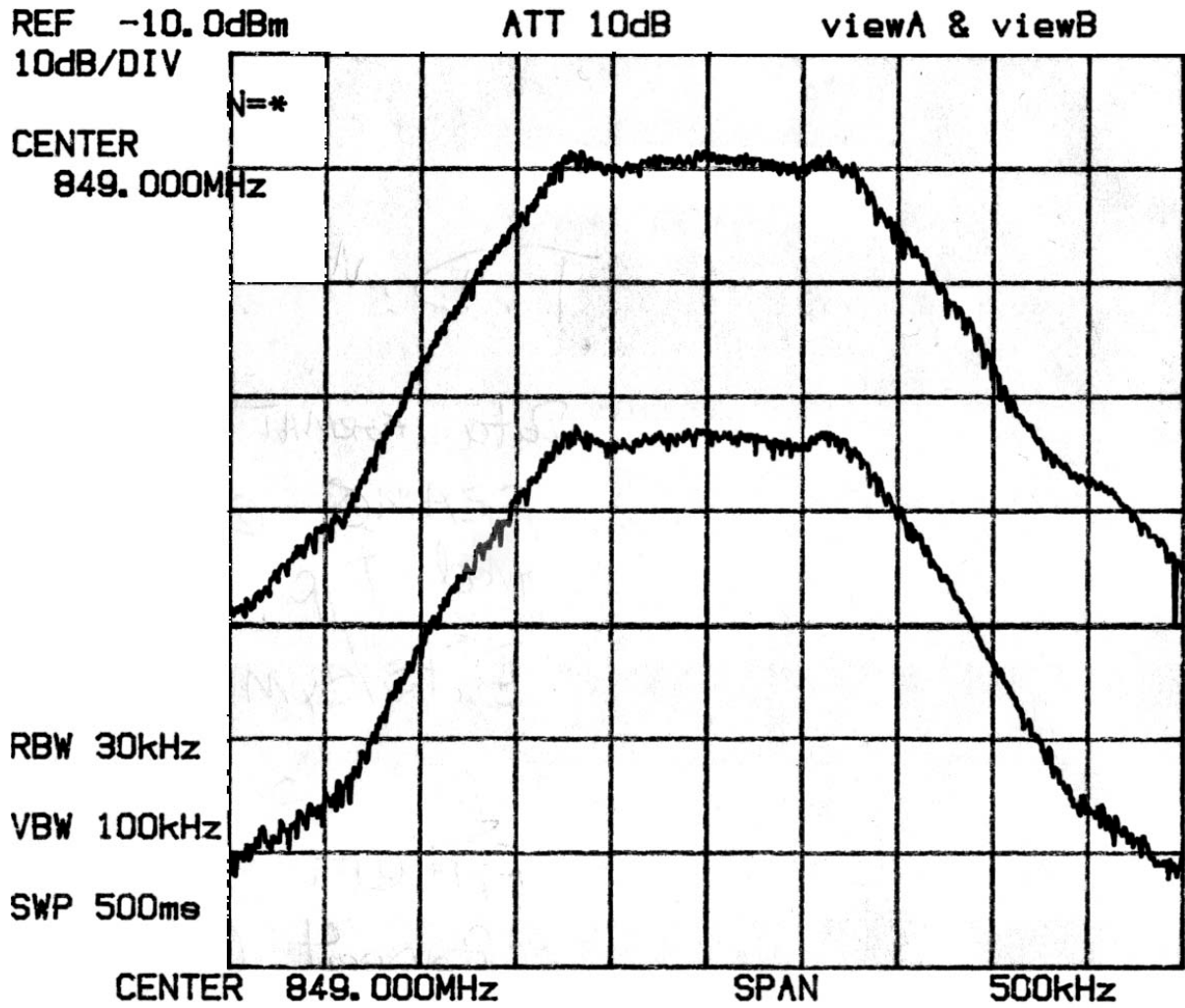
TEST REPORT DATA						
Customer No: 1129		MPBT No.: M342197		Test Date: Feb 1, 2000		
TEST COMP./PART: SAMPLE 642	TEST DESCRIPTION: EMISSION LIMITATIONS FOR CELLULAR – OCCUPIED BANDWIDTH			TEST CRITERIA:		
MIL-SPECS./STDS.:	FCC PART 22 SUBPART H, SECTION 22.917			QUAL: ✓ ENG.:		
FACILITY: MPB TECHNOLOGIES INC.	TEST ENGINEER: S. DRYSDALE			INTERNAL:		
QA PERSONNEL:	OTHER: TEMP.: 21 C HUMIDITY: 20 %					
TEST PROCEDURES	DETAILS/DEVIATIONS			PASS	FAIL	INIT
	The EUT must meet the specifications of either (b) or (c)					
Mask (b)	(f _c – 45 kHz) to (f _c – 20 kHz), 26 dB					
	(f _c + 20 kHz) to (f _c + 45 kHz), 26 dB					
	0 to (f _c – 45 kHz) , 60 <u>or</u> 43 + 10logP dB					
	(f _c + 45 kHz) to (2 x f _c), 60 <u>or</u> 43 + 10logP dB					
Mask (c)	(f _c – 20 kHz) to (f _c – 12 kHz), 117log(f _d /12)dB					
	(f _c + 12 kHz) to (f _c + 20 kHz), 117log(f _d /12) dB					
	0 to (f _c – 20 kHz), 100log(f _d /12) <u>or</u> 60 <u>or</u> 43 + 10logP dB					
	(f _c + 20 kHz) to (2 x f _c), 100log(f _d /12) <u>or</u> 60 <u>or</u> 43+10logP dB					
	Note: dB refers to attenuation from the mean power of					
	the unmodulated carrier					
	OR					
	For equipment which does not perform modulation and only					
	amplifies the RF signal, pass/fail criteria shall be based on the					
	following:					
	a) The 20 dB bandwidth of the modulated carrier shall be the same (input signal vs. output signal).			✓		S.D.
	b) The difference of the amplitudes between the input signal and the output signal shall remain consistent (+/- 0.5 dB), for the 20 dB bandwidth of the modulated carrier.			✓		S.D.
MPBT: S. DRYSDALE	CUSTOMER: M.C.T. INC.					



TDMA @ 824 / Sig IN vs. Sig OUT

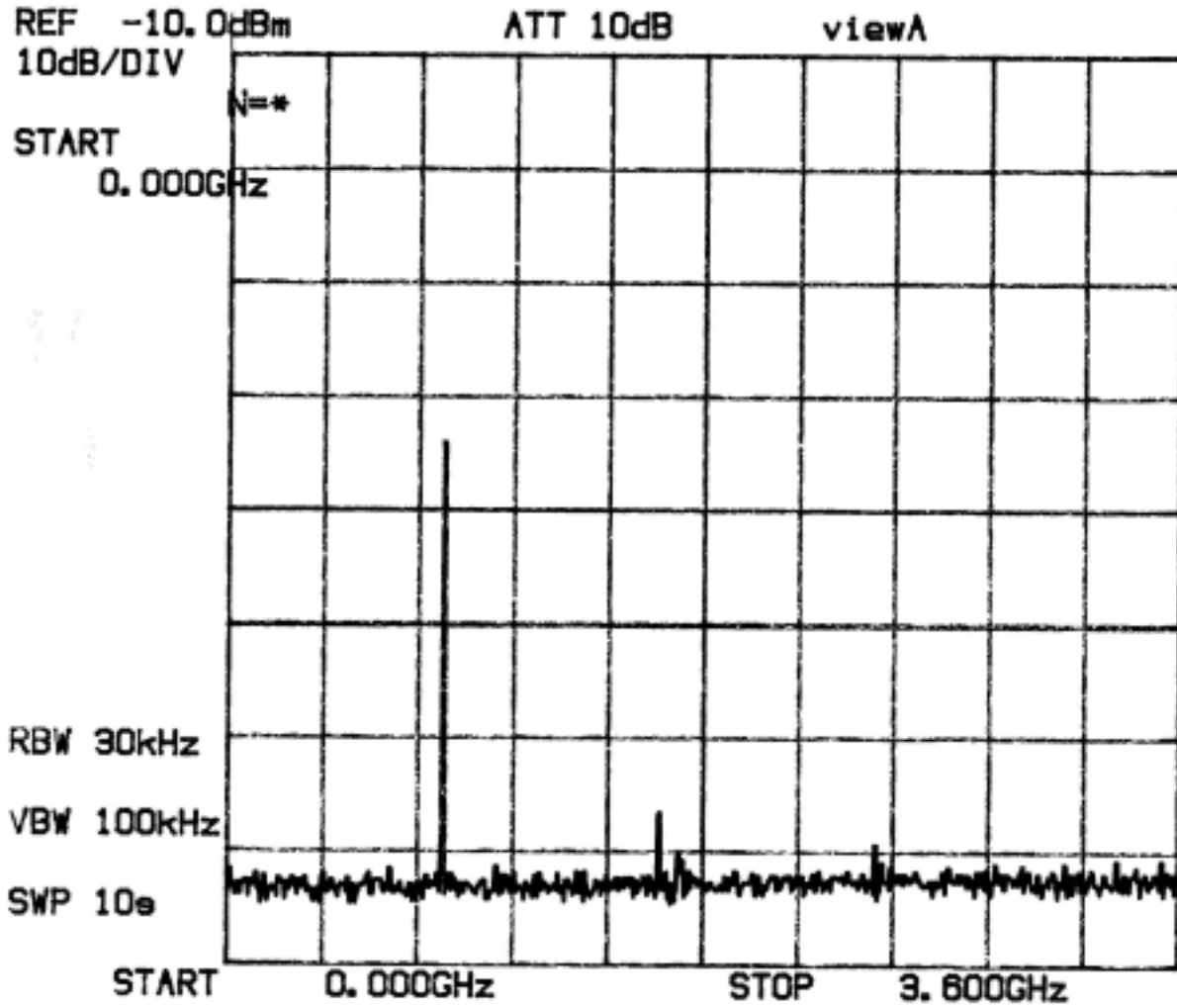


TDMA @ 836 / Sig IN vs. Sig OUT



TDMA @ 849 / Sig IN vs. Sig OUT

The EUT complies with emission limitations for cellular (out of band).



824 MHz - TDMA 0-3.6 SPURIOUS (WITHOUT AMP)