*FCC PART 15 AND 18, SUBPART C*
*CLASS II PERMISSIVE CHANGE*
*TEST REPORT*

*for*

# EV BATTERY CHARGER

## Model: T-COMMON WM7200

Prepared for

GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES
3050 WEST LOMITA BOULEVARD
TORRANCE, CALIFORNIA 90509-2923

Prepared by: _____

KYLE FUJIMOTO

Approved by: _____

SCOTT McCUTCHAN

COMPATIBLE ELECTRONICS INC.
114 OLINDA DRIVE
BREA, CALIFORNIA 92823
(714) 579-0500

DATE: JUNE 20, 2000

| | REPORT BODY | APPENDICES | | | | TOTAL |
|---|---|---|---|---|---|---|
| | | ***A*** | ***B*** | ***C*** | ***D*** | |
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# GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

| | |
|---|---|
| Device Tested: | EV Battery Charger<br>Model: T-Common WM7200<br>S/N: T050003 |
| Modifications: | The EUT was not modified during the testing. |
| Manufacturer: | General Motors Advanced Technology Vehicles<br>3050 West Lomita Boulevard<br>Torrance, California 90509-2923 |
| Test Dates: | June 13 and 14, 2000 |
| Test Specifications: | EMI requirements<br>CFR Title 47, Subpart C, sections 15.205, 15.207, 15.209, 15.249, and 18.305 |
| Test Procedure: | ANSI C63.4: 1992 |
| Test Deviations: | The test procedure was not deviated from during the testing. |

# SUMMARY OF TEST RESULTS

| TEST | DESCRIPTION | RESULTS |
|---|---|---|
| 1 | Power Transfer Test -- Radiated Emissions 10 kHz to 400 MHz | Complies with the relevant requirements of FCC Title 47, Part 18, Subpart C, section 18.305 |
| 2 | Charger RF Communications – Transmitter Test – Fundamental and Harmonics 10 kHz to 9.3 GHz | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.249 |
| 3 | Charger RF Communications – Transmitter Test – Radiated Spurious Emissions 10 kHz – 1000 MHz | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart B |
| 4 | Charger RF Communications – Transmitter Test – Conducted Emissions 450 kHz – 30 MHz | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, Section 15.207 |
| 5 | Receiver Test – Radiated Emissions 10 kHz to 1000 MHz | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart B |

# 1. PURPOSE

This document is a qualification test report for a class II change based on the Electromagnetic Interference (EMI) tests performed on the EV Battery Charger Model: T-Common WM7200. Please see Appendix A for the changes made to the EV Battery Charger since the unit was previously granted by the FCC on October 20, 1998. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the EV Battery Charger Model: T-Common WM7200, referred to as the EUT hereafter, are within the specification limits defined by CFR Title 47, Part 15, Subpart B; sections 15.205, 15.207, 15.209, and 15.249 of Subpart C; and Title 47, Part 18, Subpart C.

# 2. ADMINISTRATIVE DATA

## 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

## 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

## 2.3 Cognizant Personnel

General Motors Advanced Technology Vehicles

| | |
|---|---|
| Stuart Moriwaki | MTS Systems, Systems Engineering |
| Michael E. Steele | Sr. Systems Engineer, Systems Engineering |

Compatible Electronics Inc.

| | |
|---|---|
| Kyle Fujimoto | Test Engineer |
| Scott McCutchan | Lab Manager |

## 2.4 Date Test Sample was Received

The test sample was received on June 13, 2000.

## 2.5 Disposition of the Test Sample

The test sample was returned to General Motors Advanced Technology Vehicles on June 14, 2000.

## 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

| | |
|---|---|
| RF | Radio Frequency |
| EMI | Electromagnetic Interference |
| EUT | Equipment Under Test |
| P/N | Part Number |
| S/N | Serial Number |
| HP | Hewlett Packard |
| ITE | Information Technology Equipment |
| CML | Corrected Meter Limit |
| LISN | Line Impedance Stabilization Network |

## 3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

| SPEC | TITLE |
|---|---|
| CFR Title 47, Part 15 Subpart C | FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators |
| ANSI C63.4 1992 | Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz |
| CFR Title 47, Part 15 Subpart B | FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators |
| FCC Title 47, Part 18 | FCC Rules – Industrial, Scientific, and Medical Equipment |

# 4. DESCRIPTION OF TEST CONFIGURATION

## 4.1 Description of Test Configuration – EMI

Specifics of the EUT and Peripherals Tested

**Radiated Emissions – 10 kHz to 400 MHz**
**Power Transfer Test**
**Part 18, Title 47, Subpart C**

The EV Battery Charger Model: WM7200 (EUT) was connected to the charge port via its charge paddle. The charge port was also hardwired to a resistive load box. During this test, the power transfer and RF communications were active. The accessories were powered on. During the initial scan, the EUT was tested at one amp current at the load, and at full power. The cables were moved to maximize the emissions. The final radiated data was taken at full power, which was the worst case scenario. The cables were bundled and routed as shown in the photographs in Appendix C.

Please see Appendix D for the data sheets.

**Radiated Emissions, Harmonics and Spurious – 10 kHz to 9.15 GHz**
**Charger RF Communications – Transfer and Receiver Test**
**Part 15, Title 47, Subpart C, section 15.249**

**Spurious Emissions**: The EV Battery Charger Model: WM7200 (EUT) was placed on the wooden table and tested in two orthogonal axis. The EUT was connected to the charge port via its charge paddle. The charge port was also hardwired to a resistive load box. During this test, the power transfer was disabled and the accessories were powered off. During the initial scan for spurious emissions, the EUT was tested with the RF communications transmitter active only and with the RF communications receiver active only. The cables were moved to maximize the emissions. The final spurious radiated data was taken with the RF communications transmitter active only in the Y axis, which was the worst case scenario. The cables were bundled and routed as shown in the photographs in Appendix C.

Please see Appendix D for the data sheets.

**Harmonics**: The EV Battery Charger Model: WM7200 (EUT) was placed on the wooden table and tested in two orthogonal axis. The EUT was connected to the charge port via its charge paddle. The charge port was also hardwired to a resistive load box. During this test, the power transfer was disabled and the accessories were powered off. The RF communications transmitter was active, continuously transmitting. The cables were moved to maximize the emissions. The final harmonics data was taken in the Y axis for this mode of operation, which was the worst case scenario. The cables were bundled and routed as shown in the photographs in Appendix C.

Please see Appendix D for the data sheets.

## Description of Test Configuration – EMI (con't)

### Conducted Emissions – 450 kHz to 30 MHz
### Charger RF Communications – Transmitter Test
### Part 15, Title 47, Subpart C, section 15.207

Specifics of the EUT and Peripherals Tested

The EV Battery Charger Model: WM7200 (EUT) was placed on the wooden table and tested in two orthogonal axis. The EUT was connected to the charge port via its charge paddle. The charge port was also hardwired to a resistive load box. During this test, the power transfer was disabled, leaving only the RF communications link active. The accessories were powered off. The cables were moved to maximize the emissions. The final conducted data was taken in the X axis for this mode of operation, which was the worst case scenario. The cables were bundled and routed as shown in the photographs in Appendix C.

Please see Appendix D for the data sheets.

### 4.1.1 Cable Construction and Termination

Cable 1 This is a 6 foot braid and foil shielded cable connecting the charge paddle to the EUT. It is hard wired at each end.

Cable 2 This is a 4 foot unshielded cable connecting the Resistive load box to the charge port. It has a D-9 pin metallic connector at the Resistive load box end and a 8 pin rectangular connection at the charge port end.

# 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

## 5.1 EUT and Accessory List

| EQUIPMENT | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | FCC ID |
|---|---|---|---|---|
| EV BATTERY CHARGER (EUT) | GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES | T-COMMON WM7200 | T050003 | NZM0603TR |
| CHARGE PORT | GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES | N/A | CP2009735017R | AB01025TR |
| LOAD STATION | GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES | N/A | N/A | N/A |

## 5.2 EMI Test Equipment

| EQUIPMENT TYPE | MANU-FACTURER | MODEL NUMBER | SERIAL NUMBER | CAL. DATE | CAL. DUE DATE |
|---|---|---|---|---|---|
| Spectrum Analyzer | Hewlett Packard | 8566B | 3638A08768 | Dec. 14, 1999 | Dec. 14, 2000 |
| Preamplifier | Com Power | PA-102 | 1017 | Jan. 11, 2000 | Jan. 11, 2001 |
| Quasi-Peak Adapter | Hewlett Packard | 85650A | 2811A01363 | Dec. 14, 1999 | Dec. 14, 2000 |
| RF Attenuator | Sertek | 412-10 | N/A | Nov. 22, 1999 | Nov. 22, 2000 |
| LISN | Com Power | LI-215 | 12075 | Nov. 13, 1999 | Nov. 13, 2000 |
| LISN | Com Power | LI-215 | 12078 | Nov. 13, 1999 | Nov. 13, 2000 |
| Biconical Antenna | Com Power | AB-100 | 1548 | Oct. 14, 1999 | Oct. 14, 2000 |
| Log Periodic Antenna | Com Power | AL-100 | 16039 | Oct. 14, 1999 | Oct. 14, 2000 |
| Antenna Mast | Com Power | AM-100 | N/A | N/A | N/A |
| Turntable | Com Power | TT-100 | N/A | N/A | N/A |
| Computer | Hewlett Packard | D5251A 888 | US74458128 | N/A | N/A |
| Printer | Hewlett Packard | C5886A | SG7CM1P090 | N/A | N/A |
| Monitor | Hewlett Packard | D5258A | DK74889705 | N/A | N/A |
| Microwave Preamplifier | Com-Power | PA-122 | 25195 | Jan. 13, 2000 | Jan. 13, 2001 |
| Horn Antenna | Antenna Research | DRG-118/A | 1053 | Dec. 8, 1995 | N/A |
| Loop Antenna | Com-Power | AL-130 | 25309 | May 25, 2000 | May 25, 2001 |

# 6. TEST SITE DESCRIPTION

## 6.1 Test Facility Description

Please refer to section 2.1 and 8.1.2 of this report for EMI test location.

## 6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was grounded only to the safety ground in its power cord.

# 7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

## 7.1 RF Emissions

### 7.1.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the HP software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix D.

**Test Results:**

The EUT complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.207 for conducted emissions.

### 7.1.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com Power Microwave Preamplifier Model: PA-122 was used for frequencies above 1 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps. The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets. The measurement bandwidths and transducers used for the radiated emissions test were:

| FREQUENCY RANGE | EFFECTIVE MEASUREMENT BANDWIDTH | TRANSDUCER |
|---|---|---|
| 10 kHz to 150 kHz | 200 Hz | Active Loop Antenna |
| 150 kHz to 30 MHz | 9 kHz | Active Loop Antenna |
| 30 MHz to 300 MHz | 120 kHz | Biconical Antenna |
| 300 MHz to 1 GHz | 120 kHz | Log Periodic Antenna |
| 1 GHz to 9.3 GHz | 1 MHz | Horn Antenna |

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data for all of Part 15. For Part 18, the EUT was tested at a 3 meter test distance from 30 MHz – 400 MHz and at 10 meters from 10 kHz – 30 MHz to obtain final test data.

## 8. CONCLUSIONS

The EV Battery Charger Model: T-Common WM7200 meets all of the specification limits defined by FCC Title 47, Part 15, Subpart B; section 15.205, 15.207, 15.209 and 15.249 of Subpart C; and Title 47, Part 18, Subpart C.

# APPENDIX A

## *CHANGES MADE FOR CLASS II TO THE EUT*

# *CHANGES MADE FOR CLASS II TO THE EUT*

Please see the next change for the list of changes made to the EUT for the Class II Permissive Change.

**List of Changes Made to the WM7200 p/n 27005276**

1. Output Cable Assembly
   - The output cable assembly has been changed to accommodate both IR and RF communications
2. Electrical Components
   - Transistors
     - BCX71KCT
     - BCX70KCT
   - Resistors
     - MCR18JZHFX5361
     - MCR18JZHFX4991
     - MCR18JZHFX4531
     - MCR18JZHFX4020
     - MCR18JZHFX3653
     - MCR18JZHFX3652
     - MCR18JZHFX3651
     - MCR18JZHFX3321
     - MCR18JZHFX3012
     - MCR18JZHFX3011
     - MCR18JZHFX2261
     - MCR18JZHFX2212
     - MCR18JZHFX2001
     - MCR18JZHFX10R0
     - MCR18JZHFX1001
     - MCR18JZHFX1000
   - Microcircuit
     - MC7805BT
   - Inductor
     - 28F04181SR
   - Diodes
     - MA3082CT
     - MA159ACT
   - Connector
     - 70553-0109
   - Capacitors
     - VJ1210Y105KXXAT
     - PCS4475CT
     - PCS2475CT
     - PCC471BCT
     - PCC333BCT
     - PCC332BCT
     - MCH315C104KP
     - MCH215A102JP
     - GRM40C0G820J050BL
     - GRM40G0G680J050BD

07/24/00

# APPENDIX B

# *MODIFICATIONS TO THE EUT*

# MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart C specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

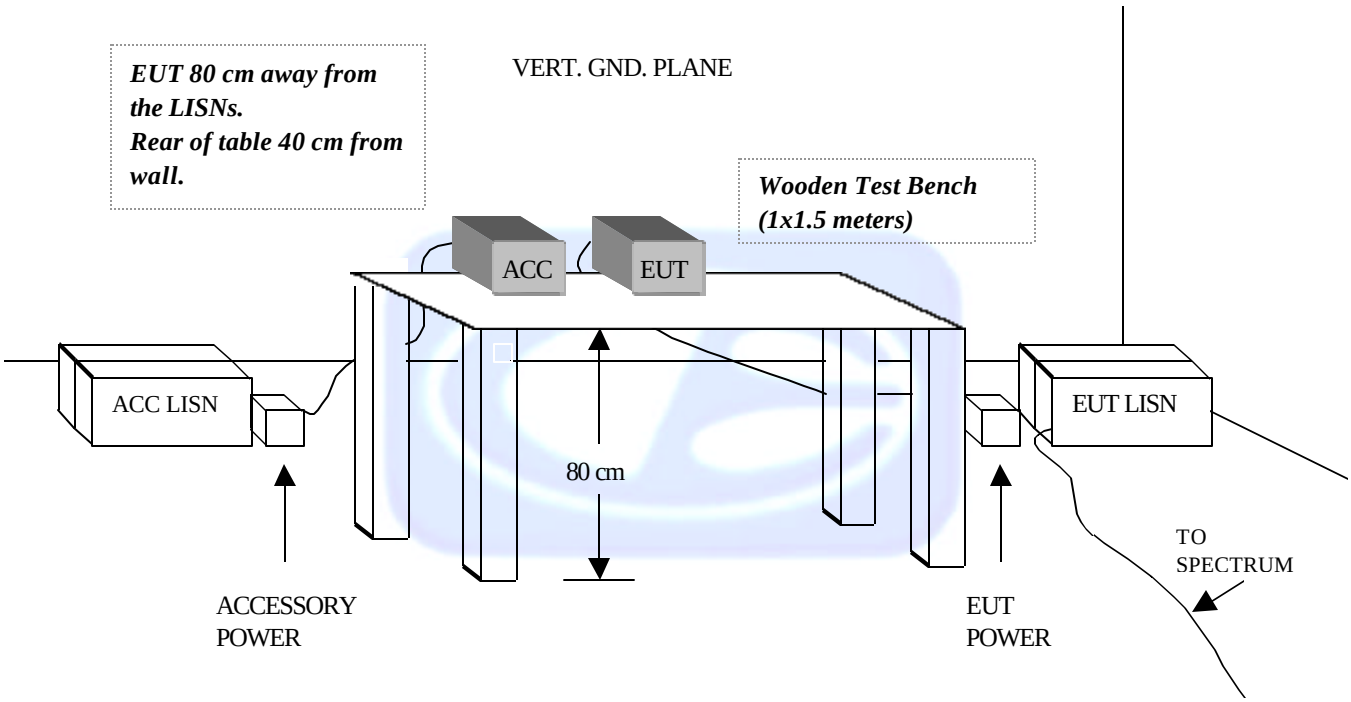
Modifications:

No modifications were made to the EUT during the testing.

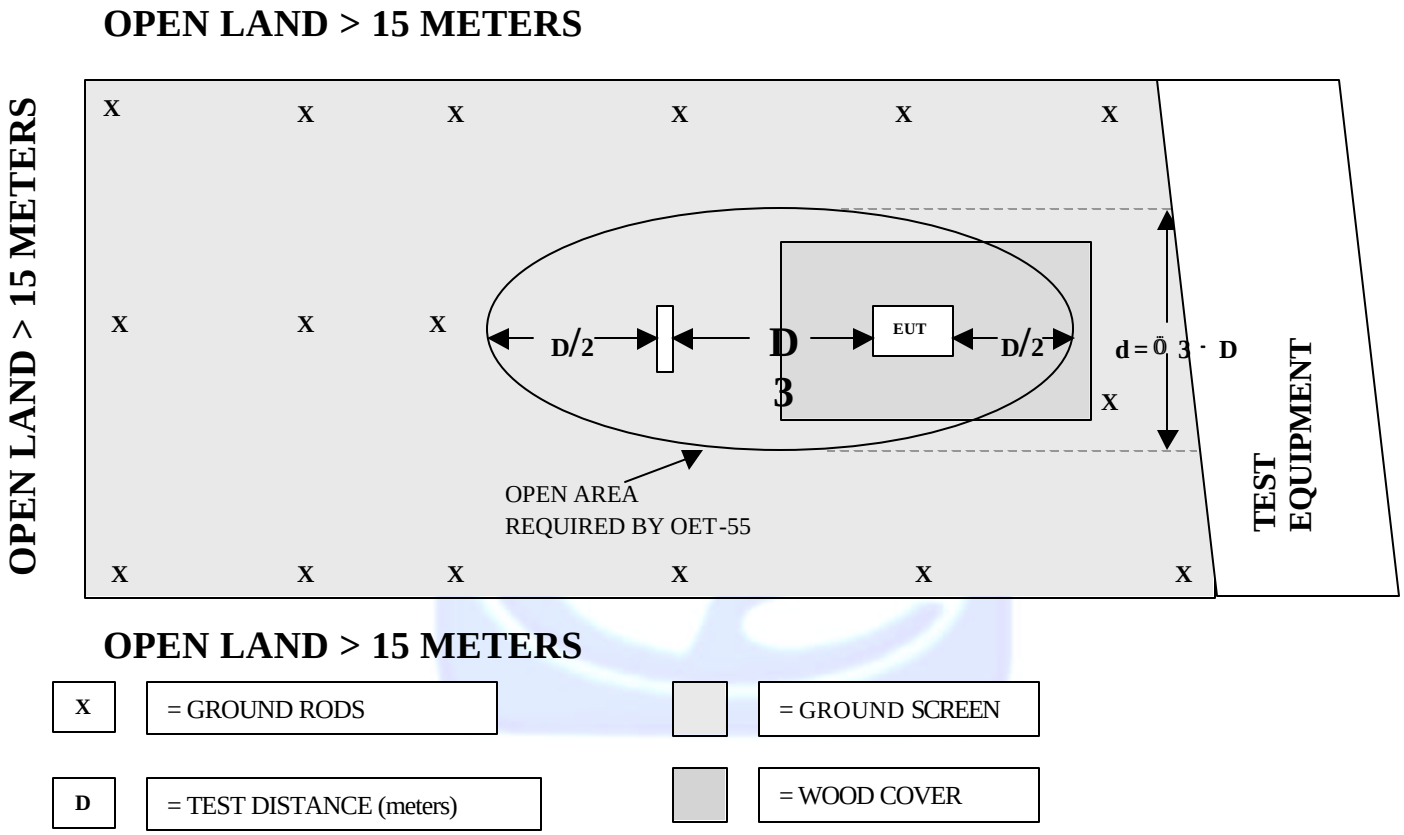
# APPENDIX C

## *DIAGRAMS, CHARTS AND PHOTOS*

# *FIGURE 1: CONDUCTED EMISSIONS TEST SETUP*



# *FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE*



**FRONT VIEW**

GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES
EV BATTERY CHARGER
Model: T-COMMON WM7200
FCC SUBPART C - RADIATED EMISSIONS – 6-13-00 AND 6-14-00

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

**REAR VIEW**

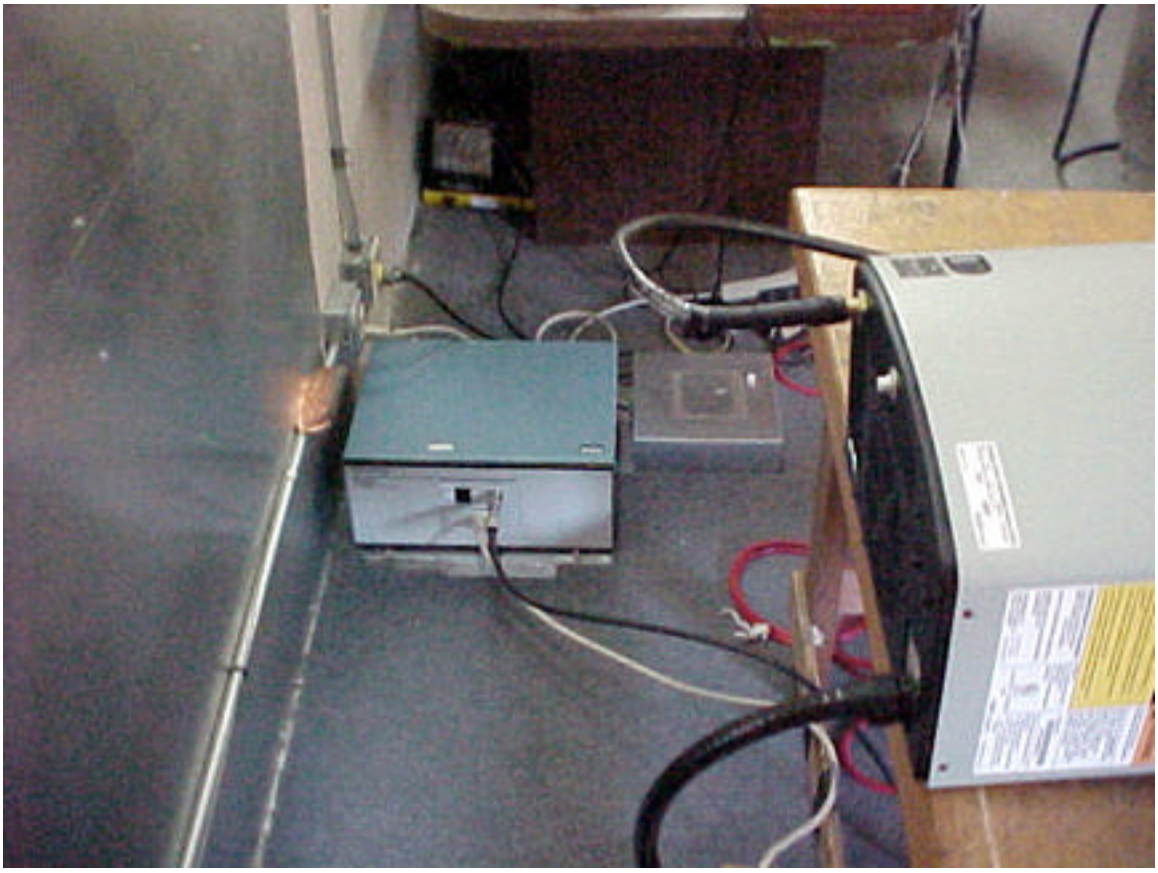
GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES
EV BATTERY CHARGER
Model: T-COMMON WM7200
FCC SUBPART C - RADIATED EMISSIONS – 6-13-00 AND 6-14-00

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

**FRONT VIEW**

GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES
EV BATTERY CHARGER
Model: T-COMMON WM7200
FCC SUBPART C - CONDUCTED EMISSIONS – 6-14-00

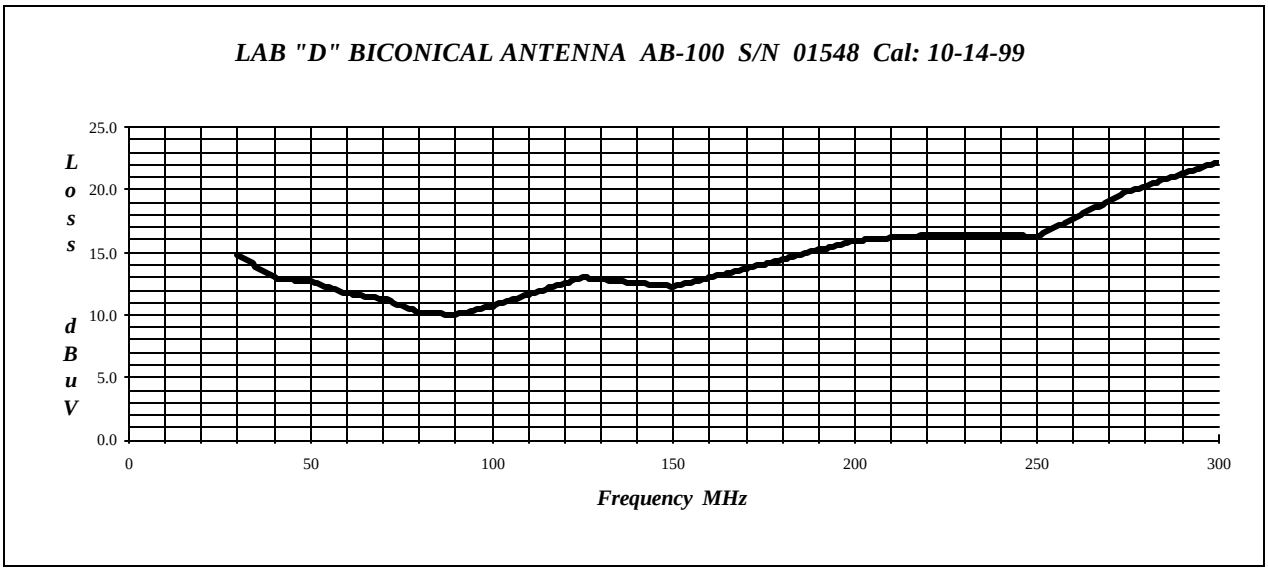
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

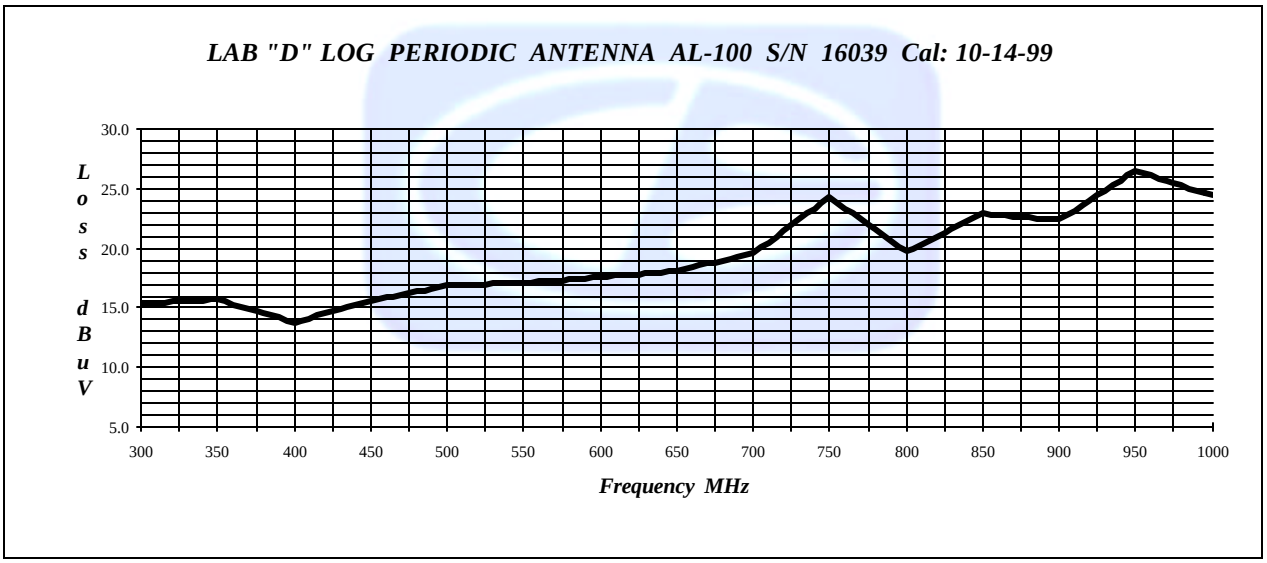


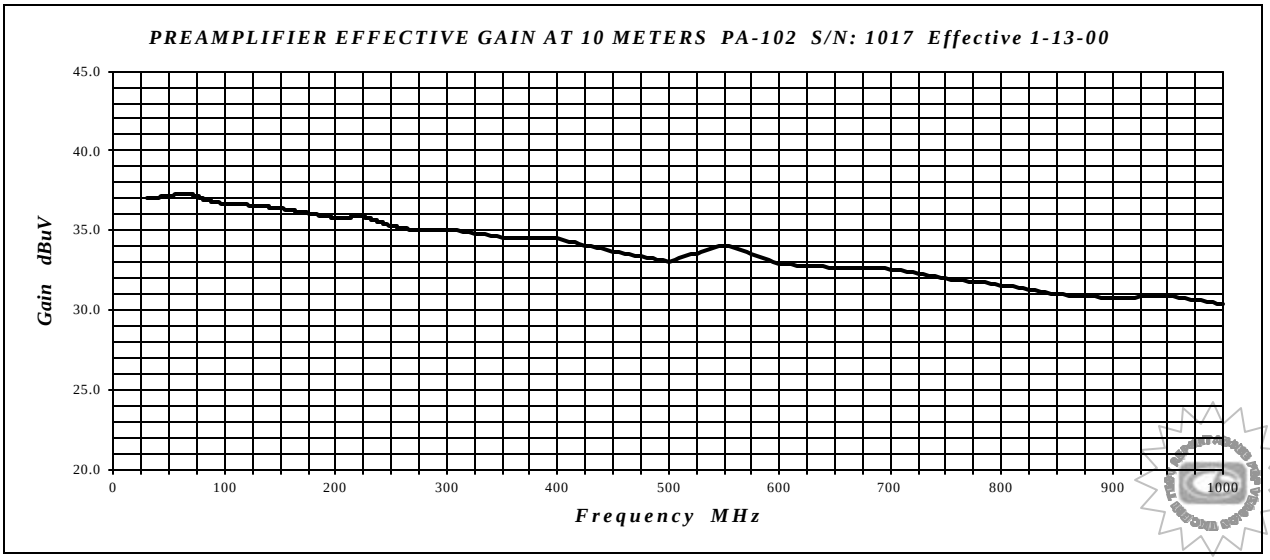
**REAR VIEW**

GENERAL MOTORS ADVANCED TECHNOLOGY VEHICLES
EV BATTERY CHARGER
Model: T-COMMON WM7200
FCC SUBPART C - CONDUCTED EMISSIONS – 6-14-00

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS


LAB "D" BICONICAL ANTENNA AB-100 S/N 01548 Cal: 10-14-99
Loss dBuV
25.0
20.0
15.0
10.0
5.0
0.0
0
50
100
150
200
250
300
Frequency MHz


LAB "D" LOG PERIODIC ANTENNA AL-100 S/N 16039 Cal: 10-14-99
Loss dBuV
30.0
25.0
20.0
15.0
10.0
5.0
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
Frequency MHz


PREAMPLIFIER EFFECTIVE GAIN AT 10 METERS PA-102 S/N: 1017 Effective 1-13-00
Gain dBuV
45.0
40.0
35.0
30.0
25.0
20.0
0
100
200
300
400
500
600
700
800
900
1000
Frequency MHz

# COM-POWER PA-122

# MICROWAVE PREAMPLIFIER

## S/N: 25195

## CALIBRATION DATE: JANUARY 13, 2000

| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 1.0 | 34.4 | 9.0 | 30.7 |
| 1.1 | 34.1 | 9.5 | 31.5 |
| 1.2 | 34.2 | 10.0 | 31.0 |
| 1.3 | 34.1 | 10.5 | 31.4 |
| 1.4 | 33.9 | 11.0 | 30.7 |
| 1.5 | 33.8 | 11.5 | 29.5 |
| 1.6 | 33.0 | 12.0 | 27.8 |
| 1.7 | 33.3 | 12.5 | 31.4 |
| 1.8 | 33.3 | 13.0 | 31.0 |
| 1.9 | 31.9 | 13.5 | 31.0 |
| 2.0 | 32.7 | 14.0 | 31.5 |
| 2.5 | 31.8 | 14.5 | 30.2 |
| 3.0 | 31.7 | 15.0 | 29.2 |
| 3.5 | 31.9 | 15.5 | 30.1 |
| 4.0 | 31.0 | 16.0 | 29.0 |
| 4.5 | 31.4 | 16.5 | 27.8 |
| 5.0 | 31.1 | 17.0 | 30.8 |
| 5.5 | 31.0 | 17.5 | 31.5 |
| 6.0 | 32.0 | 18.0 | 30.8 |
| 6.5 | 31.6 | | |
| 7.0 | 32.3 | | |
| 7.5 | 32.9 | | |
| 8.0 | 32.1 | | |
| 8.5 | 31.6 | | |

ANTENNA RESEARCH ASSOCIATES, INC.
11317 Frederick Avenue, Beltsville, MD 20705

# E-FIELD ANTENNA FACTOR CALIBRATION

**E(dB V/m) = Vo(dB V) + AFE(dB/m)**

**Model number : DRG-118/A**

| Frequency GHz | AFE dB/m | Gain dBi |
|---|---|---|
| 1 | 22.3 | 8.0 |
| 2 | 26.7 | 9.5 |
| 3 | 29.7 | 10.1 |
| 4 | 29.5 | 12.8 |
| 5 | 32.3 | 12.0 |
| 6 | 32.4 | 13.4 |
| 7 | 36.1 | 11.0 |
| 8 | 37.4 | 10.9 |
| 9 | 36.8 | 12.5 |
| 10 | 39.5 | 10.7 |
| 11 | 39.6 | 11.5 |
| 12 | 39.8 | 12.0 |
| 13 | 39.7 | 12.8 |
| 14 | 41.8 | 11.3 |
| 15 | 41.9 | 11.9 |
| 16 | 38.1 | 16.3 |
| 17 | 41.0 | 13.9 |
| 18 | 46.5 | 8.9 |

Serial number : 1053
Job number : 96-092
Remarks : 3 meter calibration
Standards : LPD-118/A, TE-1000

Temperature : 72° F
Humidity : 56 %
Traceability : A01887
Date : December 08, 1995

*Calibrated By*

# Com-Power Corporation

(949) 587-9800

**Antenna Calibration**

| | |
|---|---|
| Antenna Type: | Loop Antenna |
| Model: | AL-130 |
| Serial Number: | 25309 |
| Calibration Date: | 05/25/00 |

| Frequency MHz | Magnetic (dB/m) | Electric dB/m |
|---|---|---|
| | | |
| 0.009 | -41.0 | 10.5 |
| 0.01 | -41.0 | 10.5 |
| 0.02 | -41.9 | 9.6 |
| 0.05 | -41.9 | 9.6 |
| 0.075 | -41.8 | 9.7 |
| 0.1 | -42.2 | 9.3 |
| 0.15 | -42.2 | 9.3 |
| 0.25 | -40.7 | 10.8 |
| 0.5 | -42.1 | 9.4 |
| 0.75 | -40.9 | 10.6 |
| 1 | -41.3 | 10.2 |
| 2 | -40.8 | 10.7 |
| 3 | -41.1 | 10.4 |
| 4 | -41.2 | 10.3 |
| 5 | -40.7 | 10.8 |
| 10 | -40.6 | 10.9 |
| 15 | -42.0 | 9.5 |
| 20 | -42.0 | 9.5 |
| 25 | -42.9 | 8.6 |
| 30 | -42.3 | 9.2 |

| | |
|---|---|
| Trans. Antenna Height | 2 meter |
| Receiving Antenna Height | 2 meter |

# APPENDIX D

# *DATA SHEETS*

# *RADIATED DATA SHEETS FOR THE POWER TRANSFER TESTS*

# RADIATED EMISSIONS

COMPANY NAME: GM Advanced Tech. Vehicle DATE: 6-14-00

EUT: EV Battery Charger EUT S/N:

EUT MODEL: T-Common WM2000 LOCATION: ☒ BREA ☐ SILVERADO ☐ AGOURA

SPECIFICATION: FCC 15.249 & FCC 15.205 CLASS: TEST DISTANCE: 10m LAB: D

ANTENNA: ☒ LOOP ☐ BICONICAL ☐ LOG ☐ HORN POLARIZATION: ☒ VERT ☐ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: Mike Christensen

NOTES:

| Frequency (MHz) | Peak Reading (dBuV) | Quasi-Peak (dBuV) | Antenna Height (meters) | Azimuth (degrees) | Antenna Factor (dB) | Effective Gain (dB) | * Corrected Reading (dBuV) | Delta ** (dB) | Spec Limit (dBuV) |
|---|---|---|---|---|---|---|---|---|---|
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| | | | No | emissions | | | | | |
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* CORRECTED READING = METER READING + ANTENNA FACTOR - EFFECTIVE GAIN

** DELTA = CORRECTED READING - SPECIFICATION LIMIT

# RADIATED EMISSIONS

**COMPANY NAME:** GM Advanced Tech. Vehicle **DATE:** 6-14-00

**EUT:** EV Battery Charger **EUT S/N:**

**EUT MODEL:** T-Common WM7200 **LOCATION:** ☒ BREA ☐ SILVERADO ☐ AGOURA

**SPECIFICATION:** FCC 15.249 / FCC 18.305 **CLASS:** **TEST DISTANCE:** 10m **LAB:** D

**ANTENNA:** ☒ LOOP ☐ BICONICAL ☐ LOG ☐ HORN **POLARIZATION:** ☐ VERT ☒ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT **ENGINEER:** Mike Christensen

NOTES:

| Frequency (MHz) | Peak Reading (dBuV) | Quasi-Peak (dBuV) | Antenna Height (meters) | Azimuth (degrees) | Antenna Factor (dB) | Effective Gain (dB) | * Corrected Reading (dBuV) | Delta ** (dB) | Spec Limit (dBuV) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | No Emissions | | | | | | |
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*** CORRECTED READING** = METER READING + ANTENNA FACTOR - EFFECTIVE GAIN

**** DELTA** = CORRECTED READING - SPECIFICATION LIMIT

# *RADIATED DATA SHEETS FOR THE TRANSMITTER*

RP-1

# RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

| | | | |
|---|---|---|---|
| COMPANY | GMATV | DATE | 6/13/00 |
| EUT | EV BATTERY CHARGER | DUTY CYCLE | 6% |
| MODEL | T-COMMON WM7200 | PEAK TO AVG | -24.44 dB |
| S/N | N/A | TEST DIST. | 3 METERS |
| TEST ENGINEER | MICHAEL CHRISTENSEN | LAB | D |

| Frequency MHz | Peak Reading (dBuV) | Average (A) or Quasi-Peak (QP) | Antenna Polar. (V or H) | Antenna Height (meters) | EUT Azimuth (degrees) | EUT Axis (X,Y,Z) | EUT Tx Channel | Antenna Factor (dB) | Cable Loss (dB) | Amplifier Gain (dB) | *Correcte Reading (dBuV/m) | Delta ** (dB) | Spec Limit (dBuV/m | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 915.0700 | 79.1 | 76.9 Q | H | 1.0 | 0 | | | 23.7 | 4.6 | 37.6 | 67.6 | -26.4 | 94.0 | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 915.0700 | 77.6 | 75.2 Q | V | 1.0 | 0 | | | 23.7 | 4.6 | 37.6 | 65.9 | -28.1 | 94.0 | |
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* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING



COMPATIBLE ELECTRONICS

# RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

| | | | |
|---|---|---|---|
| COMPANY | GMATV | DATE | 6/13/00 |
| EUT | EV BATTERY CHARGER | DUTY CYCLE | 6% |
| MODEL | T-COMMON WM7200 | PEAK TO AVG | -24.44 dB |
| S/N | N/A | TEST DIST. | 3 METERS |
| TEST ENGINEER | MICHAEL CHRISTENSEN | LAB | D |

| Frequency MHz | Peak Reading (dBuV) | Average (A) or Quasi-Peak (QP) | Antenna Polar. (V or H) | Antenna Height (meters) | EUT Azimuth (degrees) | EUT Axis (X,Y,Z) | EUT Tx Channel | Antenna Factor (dB) | Cable Loss (dB) | Amplifier Gain (dB) | *Correcte Reading (dBuV/m) | Delta ** (dB) | Spec Limit (dBuV/m | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2745.0000 | 44.1 | 19.7 A | H | 2.0 | 0 | | | 28.4 | 4.5 | 31.8 | 20.8 | -33.2 | 54.0 | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 2745.0000 | 47.2 | 22.8 A | V | 1.0 | 90 | | | 28.4 | 4.5 | 31.8 | 23.9 | -30.1 | 54.0 | |
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* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

RP-1

# RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

| | | | |
|---|---|---|---|
| COMPANY | GMATV | DATE | 6/13/00 |
| EUT | EV BATTERY CHARGER | DUTY CYCLE | 6% |
| MODEL | T-COMMON WM7200 | PEAK TO AVG | -24.44 dB |
| S/N | N/A | TEST DIST. | 3 METERS |
| TEST ENGINEER | MICHAEL CHRISTENSEN | LAB | D |

| Frequency MHz | Peak Reading (dBuV) | Average (A) or Quasi-Peak (QP) | Antenna Polar. (V or H) | Antenna Height (meters) | EUT Azimuth (degrees) | EUT Axis (X,Y,Z) | EUT Tx Channel | Antenna Factor (dB) | Cable Loss (dB) | Amplifier Gain (dB) | *Correcte Reading (dBuV/m) | Delta ** (dB) | Spec Limit (dBuV/m | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3660.0000 | 44.4 | 20.0 A | H | 2.0 | 0 | | | 29.6 | 5.0 | 31.9 | 22.7 | -31.3 | 54.0 | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 3660.0000 | 45.1 | 20.7 A | V | 1.0 | 90 | | | 29.6 | 5.0 | 31.9 | 23.4 | -30.6 | 54.0 | |
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* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

NO HARMONICS NOR EMISSIONS FOUND BEYOND THE 4TH HARMONIC



COMPATIBLE ELECTRONICS

COMPATIBLE ELECTRONICS



Test location: Compatible Electronics
Customer : GM ADVANCED TECH. VEHICLE
Manufacturer : GM ADVANCED TECH. VEHICLE
EUT name : EV BATTERY CHARGER
Specification: Fcc_B Test distance: 3.0 mtrs
Distance correction factor(20*log(test/spec)) :
Test Mode :
Qualification Test
Test Engineer: Michael Christensen

Date : 6/14/2000
Time : 9.15
Model: T-COMMON WM7200
Lab: D
: 0.00

| Pol | Freq MHz | Rdng dBuV | Cable loss dB | Ant factor dB | Amp gain dB | Cor'd rdg = R dBuV | limit = L dBuV/m | Delta R-L dB |
|---|---|---|---|---|---|---|---|---|
| 1V | 334.17 | 43.30 | 2.50 | 15.59 | 38.60 | 22.80 | 46.00 | -23.20 |
| 2V | 429.10 | 37.40 | 2.76 | 14.83 | 38.31 | 16.68 | 46.00 | -29.32 |
| 3V | 452.20 | 39.10 | 2.81 | 15.66 | 38.09 | 19.48 | 46.00 | -26.52 |
| 4H | 452.06 | 38.90 | 2.81 | 15.65 | 38.09 | 19.27 | 46.00 | -26.73 |
| 5H | 348.15 | 39.40 | 2.59 | 15.67 | 38.60 | 19.06 | 46.00 | -26.94 |
| 6H | 43.35 | 55.50 | 0.83 | 12.87 | 38.63 | 30.57 | 40.00 | -9.43 |
| 7H | 110.83 | 60.90 | 1.34 | 11.72 | 38.69 | 35.28 | 43.50 | -8.22 |
| 8V | 41.93 | 58.60 | 0.82 | 12.91 | 38.62 | 33.71 | 40.00 | -6.29 |
| 9V | 74.61 | 46.30 | 1.00 | 10.82 | 38.85 | 19.27 | 40.00 | -20.73 |
| 10V | 113.23 | 54.50 | 1.35 | 11.94 | 38.71 | 29.09 | 43.50 | -14.41 |

# *CONDUCTED EMISSIONS*
# *DATA SHEETS FOR THE EUT*

COMPATIBLE ELECTRONICS

6/14/2000 11:20:44

GM ADVANCED TECH. VEHICLE
EV BATTERY CHARGER
MODEL: T-COMMON WM7200
FCC C - BLACK LEAD
TEST ENGINEER : MICHAEL CHRISTENSEN

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30 highest peaks above -50.00 dB of CLASS B limit line
Peak criteria : 1.00 dB, Curve : Peak

| Peak# | Freq(MHz) | Amp(dBuV) | Limit(dB) | Delta(dB) |
|---|---|---|---|---|
| 1 | 0.649 | 43.90 | 48.00 | -4.10 |
| 2 | 0.494 | 40.30 | 48.00 | -7.70 |
| 3 | 0.474 | 39.60 | 48.00 | -8.40 |
| 4 | 0.478 | 39.50 | 48.00 | -8.50 |
| 5 | 0.524 | 39.30 | 48.00 | -8.70 |
| 6 | 0.462 | 39.10 | 48.00 | -8.90 |
| 7 | 0.507 | 39.10 | 48.00 | -8.90 |
| 8 | 0.551 | 39.10 | 48.00 | -8.90 |
| 9 | 0.489 | 38.80 | 48.00 | -9.20 |
| 10 | 0.556 | 38.80 | 48.00 | -9.20 |
| 11 | 0.577 | 38.40 | 48.00 | -9.60 |
| 12 | 0.597 | 38.40 | 48.00 | -9.60 |
| 13 | 0.546 | 38.30 | 48.00 | -9.70 |
| 14 | 0.584 | 38.20 | 48.00 | -9.80 |
| 15 | 0.800 | 38.20 | 48.00 | -9.80 |
| 16 | 0.617 | 38.10 | 48.00 | -9.90 |
| 17 | 0.697 | 38.00 | 48.00 | -10.00 |
| 18 | 0.630 | 37.70 | 48.00 | -10.30 |
| 19 | 0.674 | 37.60 | 48.00 | -10.40 |
| 20 | 0.751 | 37.30 | 48.00 | -10.70 |
| 21 | 25.157 | 37.17 | 48.00 | -10.83 |
| 22 | 23.130 | 37.10 | 48.00 | -10.90 |
| 23 | 0.768 | 37.10 | 48.00 | -10.90 |
| 24 | 1.115 | 36.80 | 48.00 | -11.20 |
| 25 | 0.867 | 36.70 | 48.00 | -11.30 |
| 26 | 0.979 | 36.70 | 48.00 | -11.30 |
| 27 | 6.702 | 36.55 | 48.00 | -11.45 |
| 28 | 0.835 | 36.50 | 48.00 | -11.50 |
| 29 | 0.967 | 36.50 | 48.00 | -11.50 |
| 30 | 18.759 | 36.50 | 48.00 | -11.50 |

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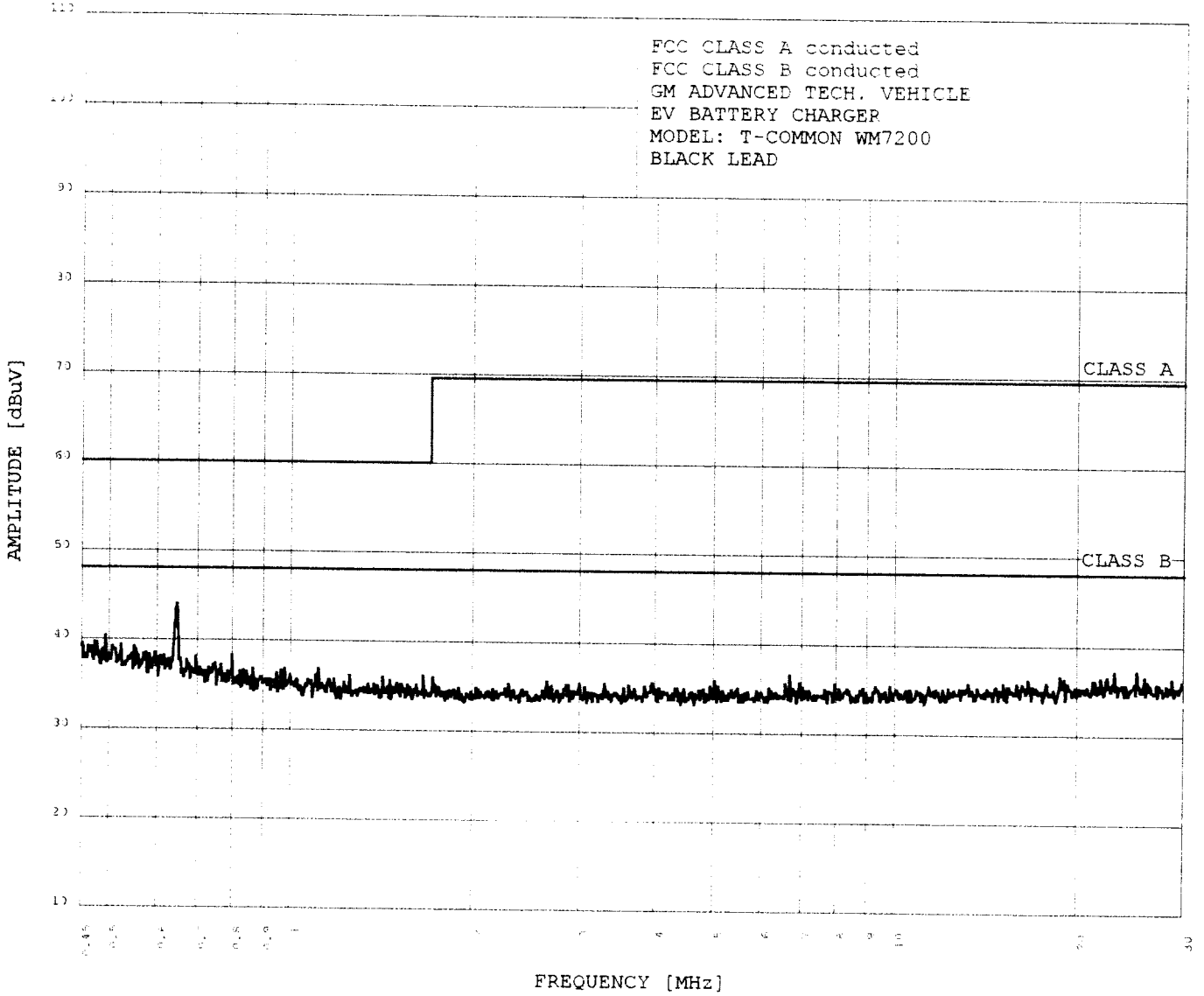
EMISSION LEVEL [dBuV] PEAK
Graph for Peak

6/14/2000 11:20:44



COMPATIBLE ELECTRONICS

6/14/2000 11:07:58

GM ADVANCED TECH. VEHICLE
EV BATTERY CHARGER
MODEL: T-COMMON WM7200
FCC C - WHITE LEAD
TEST ENGINEER : MICHAEL CHRISTENSEN

---

30 highest peaks above -50.00 dB of CLASS B limit line
Peak criteria : 1.00 dB, Curve : Peak

| Peak# | Freq(MHz) | Amp(dBuV) | Limit(dB) | Delta(dB) |
|---|---|---|---|---|
| 1 | 0.643 | 43.57 | 48.00 | -4.43 |
| 2 | 0.513 | 41.38 | 48.00 | -6.62 |
| 3 | 0.487 | 41.19 | 48.00 | -6.81 |
| 4 | 0.452 | 40.59 | 48.00 | -7.41 |
| 5 | 0.458 | 40.29 | 48.00 | -7.71 |
| 6 | 0.528 | 40.08 | 48.00 | -7.92 |
| 7 | 0.482 | 39.79 | 48.00 | -8.21 |
| 8 | 0.502 | 39.78 | 48.00 | -8.22 |
| 9 | 0.492 | 39.59 | 48.00 | -8.41 |
| 10 | 0.517 | 39.38 | 48.00 | -8.62 |
| 11 | 0.553 | 38.68 | 48.00 | -9.32 |
| 12 | 0.584 | 38.58 | 48.00 | -9.42 |
| 13 | 0.597 | 38.58 | 48.00 | -9.42 |
| 14 | 0.677 | 38.37 | 48.00 | -9.63 |
| 15 | 0.660 | 38.27 | 48.00 | -9.73 |
| 16 | 0.666 | 38.27 | 48.00 | -9.73 |
| 17 | 0.745 | 38.17 | 48.00 | -9.83 |
| 18 | 0.560 | 38.08 | 48.00 | -9.92 |
| 19 | 0.630 | 38.07 | 48.00 | -9.93 |
| 20 | 21.439 | 38.07 | 48.00 | -9.93 |
| 21 | 0.739 | 37.67 | 48.00 | -10.33 |
| 22 | 0.721 | 37.67 | 48.00 | -10.33 |
| 23 | 0.927 | 37.48 | 48.00 | -10.52 |
| 24 | 0.828 | 37.27 | 48.00 | -10.73 |
| 25 | 0.904 | 37.18 | 48.00 | -10.82 |
| 26 | 0.691 | 37.17 | 48.00 | -10.83 |
| 27 | 26.916 | 37.08 | 48.00 | -10.92 |
| 28 | 0.860 | 37.08 | 48.00 | -10.92 |
| 29 | 0.839 | 37.07 | 48.00 | -10.93 |
| 30 | 0.996 | 36.98 | 48.00 | -11.02 |

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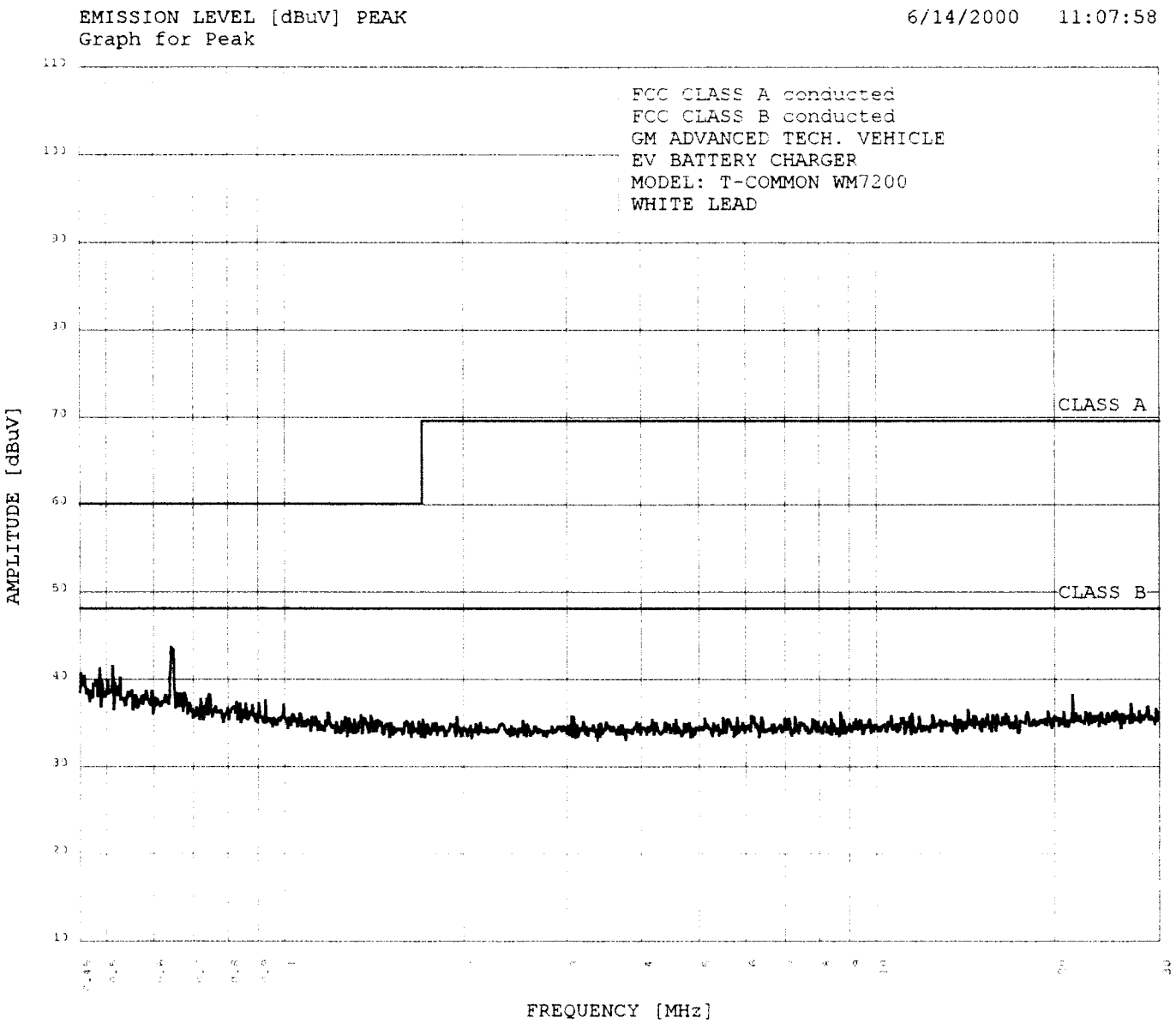


COMPATIBLE ELECTRONICS