Electromagnetic Emission

F C C M E A S U R E M E N T R E P O R T

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	Digital Satellite Receiver
MODEL/TYPE NO	:	MERCURY-II
FCC ID	:	T44MERCURY-II
APPLICANT	:	FORTEC COMMUNICATION INC.
ADDRESS	:	2780 Skymark Ave. Unit 8, Mississauga, ON, Canada, L4W 5A7
		Attn.: Dobrin Trifonov / Manager
MANUFACTURER	:	DONGWON TELECOM CO., LTD.
ADDRESS	:	#724-2, Seungdu-ri, Congdo-eup, Anseong-si, Gyeonggi-do, Korea
FCC CLASSIFICATION	:	HID : TV interface device
FCC RULE PART(S)	:	FCC Part 15 Subpart B
FCC PROCEDURE	:	Certification
TRADE NAME	:	FORTEC STAR
TEST REPORT No.	:	ETLE060313.105
DATES OF TEST	:	March 13 - March 27, 2006
REPORT ISSUE DATE	:	March 28, 2006
TEST LABORATORY	:	ETL Inc. (FCC Registration Number: 95422)

This Digital Satellite Receiver, Model MERCURY-II has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL/EMC Test Laboratory and has been shown to complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B: TV interface device.
I attest to the accuracy of data. All measurement here in was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.
The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Chon Sik, Kim / Chief Engineer

ETL Inc.
#584 Sangwhal-ri, Kanam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea
Tel : 82-31-885-0072 Fax : 82-31-885-0074

Table of Contents

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

FCC MEASUREMENT REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

General Information

Applicant Name : FORTEC COMMUNICATION INC.

Address : 2780 Skymark Ave. Unit 8, Mississauga , ON, Canada , L4W 5A7

Attention : Dobrin Trifonov / Manager

- **EUT Type :** Digital Satellite Receiver
- **Model Number :** MERCURY-II
- **FCC Identifier :** T44MERCURY-II
- **S/N :** N/A
- **Freq. Range :** 61.25 MHz – 71.75 MHz
- **FCC Rule Part(s) :** Part 15 Subpart B
- **Test Procedure :** ANSI C63.4-2003
- **FCC Classification :** TV Interface Device
- **RF Channels :** Ch. 3 / Ch. 4
- **Dates of Tests :** March 13 - March 27, 2006
- **Place of Tests :** ETL Inc.
  584, Sangwhal-ri, Ganam-myeon, Yoju-gun,
  Gyounggi-do, Korea
  Tel : 82-31- 885-0072 Fax : 82-31- 885-0074
- **Test Report No. :** ETLE060313.105

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the shielded anechoic chamber room and open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myeon, Youju-gun, Gyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 and 10 m site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2003 and registered to the Federal Communications Commission(Registration Number : 95422).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions from the FORTEC COMMUNICATION INC. / Digital Satellite Receiver / Model : MERCURY-II

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test(EUT) is the FORTEC COMMUNICATION INC. / Digital Satellite Receiver / Model : MERCURY-II

2.2 General Specification

- Chassis Type : Metal
- List of Each OSC. Or X-Tal. Freq.(>=1MHz) : 27.00 MHz

1 TUNER

Input Connector	1 x F type with Loop through
Output Connector	1 x F type 75 Ohm, to connect an analog receiver
Frequency Range	950MHz to 2150 MHz
Input Impedance	75 Ohm
Signal Level	-25dBm ~ -65dBm
LNB Power & Polarization	Vertical +13.5V ~ +14.5V
	Horizontal +17.5V ~ +18.5V
22kHz Tone	Frequency 22KHz ± 20%
	Amplitude 0.6p-p ± 0.2Vp-p
Demodulation	QPSK
Input Symbol Rate	2-42Msps
FEC Decoder	Convolutional Code Rate
	1/2,2/3,3/4,5/6 and 7/8 with Constraint
	Length K=7

2 A/V & DATA IN / OUT

S-video Output	North American model only
RCA Output	CVBS, L, R Output(Yellow, White, Red Jack)with Volume Control
S/PDIF Output	RCA Output Black(Cinch) or Toslink Optical
Video Output	Y/Pb/Pr Output(Green, Blue, Red Jack) RCA
Date Interface	RS-232, Bit Rate:115200 baud Connector: 9-Pin D-Sub Male type

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3 MEMORY

Flash Memory	2 Mbytes
SDRAM	16 Mbytes

4 MPEG Transport Stream A/V Decoding

Transport Stream	MPEG-2 ISO/IEC 13818
	Transport Stream Specification
Profile & Level	MPEG-2 MP@ML
Input Data Rate	15Mbit/s Max
Video Resolution	720 x 480(NTSC)
Audio Decoding	MPEG-1 Audio Layer 1,2
Audio Mode	Stereo, Dual Channel, Joint Stereo, Mono
Sampling Rate	44.1 and 48KHz

5 RF-MODULATOR

RF-Connect	75 Ohm, IECI 169-2, Male/Female
Frequency	54MHz to 890MHz
Output Channel	CH3/4 for North America
TV Standard	NTSC
Audio Output	Mono with Volume Fuse
Preset Channel	CH 4(or TBD), Software changeable by Menu screen

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3. DESCRIPTION OF TESTS

3.1 AC Powerline Conducted Emissions Test

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurement were performed over the frequency range of 0.15 MHz to 30 MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within an bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1.0 m x 1.5 m x 0.8 m wooden table which is placed 40 cm away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the another LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical Satellite Receivers are shielded by braided tinned steel tubing with inner ϕ 1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. All interconnecting Satellite Receivers more than 1 m were shortened by non-inductive bundling(serprntine fashion) to a 1.0 m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the Spectrum Analyzer and Test Receiver to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the Test Receiver was set to 9 kHz. The EUT, support equipment, and interconnecting Satellite Receivers were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if appliSatellite Receiver, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3. DESCRIPTION OF TESTS

3.2 Radiated Emissions Test

Preliminary measurements were made at indoors 3 m semi EMC Compact Chamber using broadband antennas, broadband amplifier and spectrum analyzer to determine the emission frequencies producing the maximum EME.
Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1 000 MHz using biconilog antenna and above 1 000 MHz, linearly polarized double ridge horn antennas were used. Above 1 GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies which were selected as bottom, middle and top frequency in the operating band. Emission level from the EUT with various configurations were examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 3 m test range using biconilog antenna. The output from the antenna was connected, via a preselector or a preamplifier, to the input of the EMI Measuring Receiver or Spectrum analyzer(for above 1 GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120 kHz (1 MHz for measurement above 1 GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission The EUT, support equipment and interconnecting Satellite Receivers were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high non-metallic 1.0 m x 1.5 m table. The turntable containing the system was rotated and the antenna height was varied 1.0 m to 4.0 m and stopped at the azimuth or height producing the maximum emission.

Each emission was maximized by varying the mode of operating frequencies of the EUT. The worst case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20 dB/decade) as per section 15.31(f).

Photographs of the worst-case emission test setup can be seen in Appendix B.

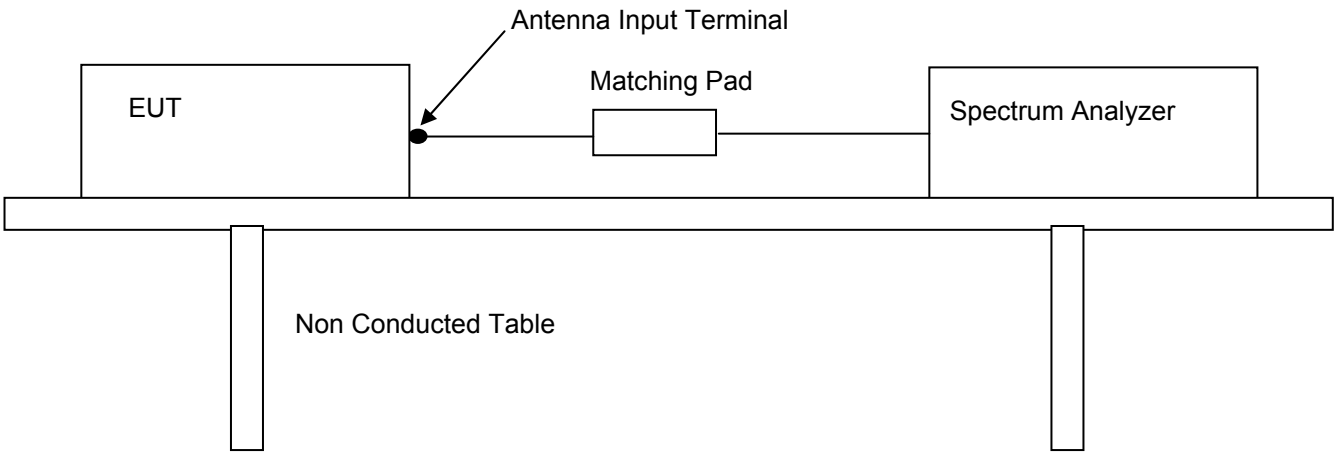
Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3. DESCRIPTION OF TESTS

3.3 Antenna-Conducted Power Measurements

Power on the receive antenna terminals was to be determined by measurement of the voltage present at these terminals. Antenna-conducted power measurements is performed with the EUT antenna terminals connected directly to a spectrum analyzer, if the antenna impedance matches the impedance of the measuring instrument. Otherwise, use an impedance-matching network to connect the measuring instrument to the antenna terminals of the EUT. Losses in decibels in any impedance-matching network used is added to the measured value in dBμV.

With the EUT tuned to one of the frequency over which device operates , measure both the frequency and voltage present at the antenna input terminals over the frequency range specified in the individual equipment requirements. Repeat this measurement with the receiver tuned to another frequency until the number of frequencies specified have been successively measured. Power on the receive antenna terminals is the ratio of V^2/R, where V is the loss-corrected voltage measured at the antenna terminals, and R is the impedance of the measuring instrument.



Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3. DESCRIPTION OF TESTS

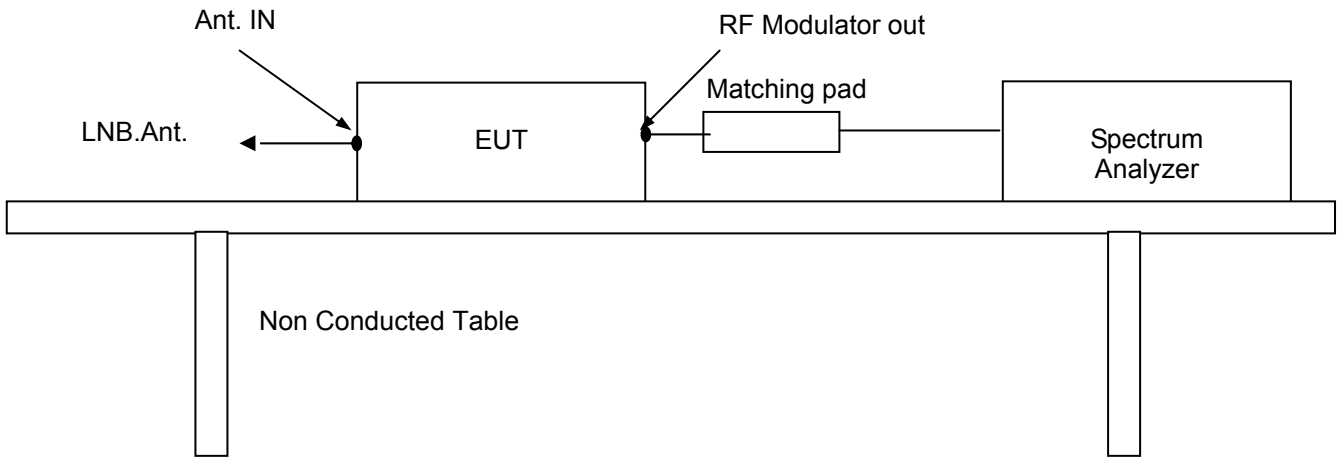
3.4 Output Signal Conducted Level Measurement

The output signal level is themaximum voltage level present ata the output terminals of the EUT on a particular frequency during mormal use of the device.

The signal level was measured by direct connection to the spectrum analyzer with 50/75 ohm matching transformer between the spectrum analyzer and the TV interface device. The RF output signal level measured was the highest RF level present at the output terminals during normal use of the device. Measurements were made of the levels of both the visual (61.25 MHz) and audio (65.75 MHz) carrier for each TV channel(3 and 4) on which the device operates. The Satellite Receiver was supported between the EUT and the measuring instrument in a straight horizontal line so it had at least 75 cm clearance from any conducting surface.

The EUT is provided with a typical signal consistent with normal operation. For each channel on which the EUT operates and in each mode in which the device operates, the video and audio carrier level is measured and recorded.

The voltage corresponding to the peak envelope power of the video modulated signal during maximum amplitude peaks across a resistance (R ohms) matching the rated output impedance of the device, must not exceed 692.8 $R^{1/2}$ μV for all other TV interface device. The voltage corresponding to peak envelope power of the audio modulated signal, if provided by the TV interface device, must not exceed 155$R^{1/2}$ μV for Satellite Receiver system terminal device of TV interface device used with a master antenna, and 77.5 $R^{1/2}$ μV for all other TV interface device. Losses in decibels in any impedance-matching network used is added to the measured value in dBμV. The EUT was configured in accordance with ANSI C63.4-2003 Section 12.2 as below configuration block diagram.



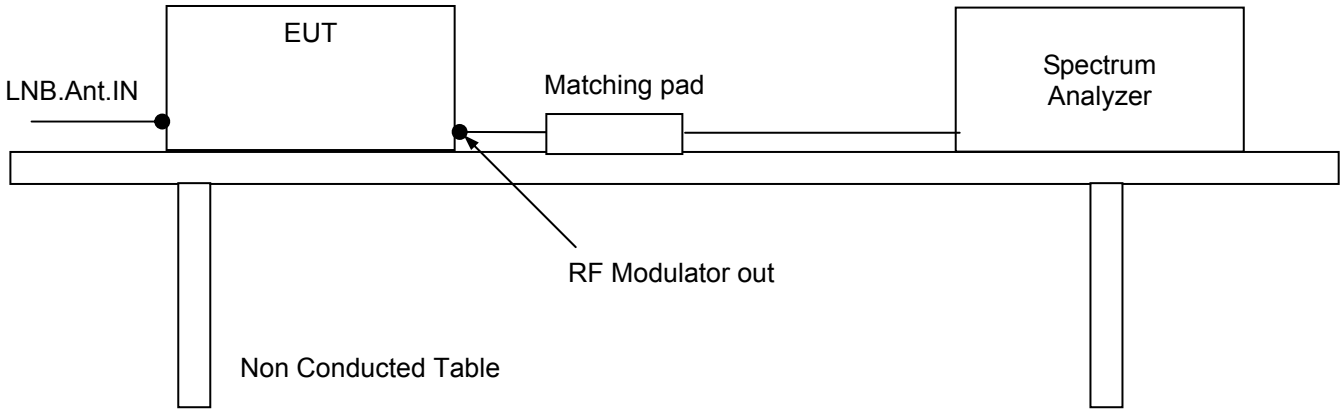
Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3. DESCRIPTION OF TESTS

3.5 Output Terminal Conducted Spurious Emission Measurement

The RF output signal was fed to the TV receiver via coaxial Satellite Receiver. Measurements were made by direct connection to the spectrum analyzer and TV interface device with 50/75 ohm matching transformer. The frequency range 30 MHz to 1 000 MHz was investigated for significant emission.

The maximum RMS voltage of any emission appearing on frequencies removed by more than 4.6 MHz below and 7.4 MHz above the video carrier frequency on which the TV interface device is operated must not exceed 692.8 $R^{1/2}$ μV for Satellite Receiver system terminal device or TV interface device used with a master antenna and 10.95 $R^{1/2}$ μV for all other TV interface device when terminated with a resistance (R ohms) matching the rated output impedance of the TV interface device. The EUT was configured in accordance with ANSI C63.4-2003 Section 12.2 as below configuration block diagram.



Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

3. DESCRIPTION OF TESTS

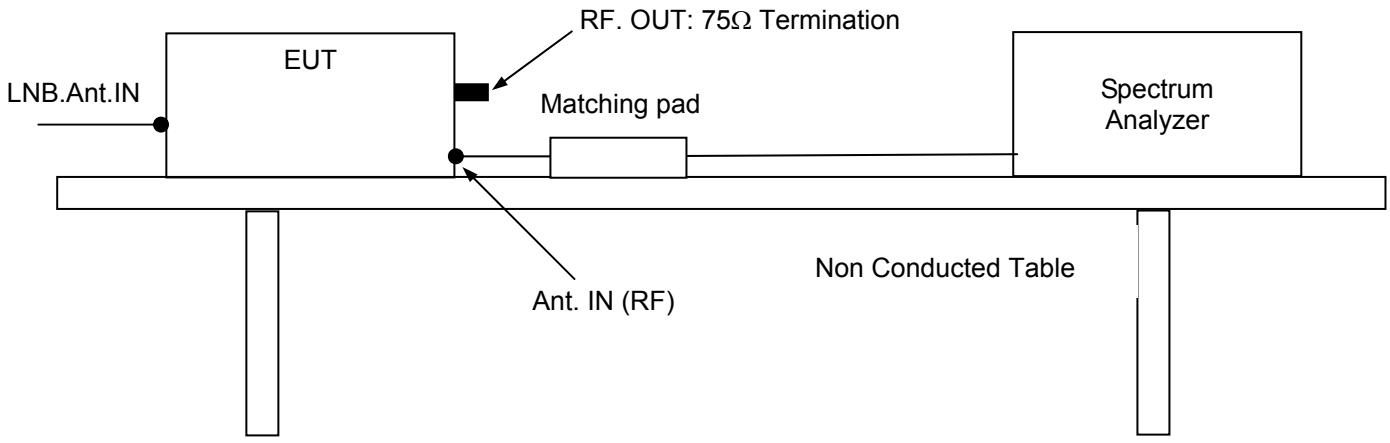
3.6 Antenna Transfer Switch Measurement

Isolation was measured for all positions of an antenna transfer switch on all output channels of the EUT. TV interface device transfer switch isolation is the difference the levels of a signal going into one antenna input port of the switch and that of the same signal coming out of another antenna terminal of transfer switch. The isolation of an antenna transfer switch equipped with coaxial connectorsis performed by measuring the maximum voltage of the visual carrier. Measurements were made of the maximum RMS voltage at the antenna input terminals of the switch for all positions of the transfer switch. The maximum voltage corresponds to the peak envelope power of the video signal during maximum amplitude peaks. In either position of the receiver transfer switch, the maximum voltage at the receiving antenna input terminals of the switch when terminated with a resistance (R ohms) matching the rated impedance of the antenna input of the switch, must not exceed $0.346\ R^{1/2}\ \mu V$.

The maximum voltage corresponds to the peak envelope power of the video modulated signal during maximum amplitude.

The EUT was configured in accordance with ANSI C63.4-2003 Section 12.2 as below configuration block diagram. and the EUT configuration can also be seen in Appendix B. Photographs of the test setup.

The unused RF input/output terminals are terminated in a proper impedance. The antenna input terminal is connected to the the input of preamplifier through the matching transformer coaxial Satellite Receiver. And the output of preamplifier is connected to the spectrum analyzer. Then, the signal level on the antenna input terminal is measured under the EUT condition produced the maximum signal level.



Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

4.2 EUT operation

The EUT was set to the normal receiving mode in a TV mode during all the testing in a manner similar to a typical use. For the EUT operation, the satellite live signal was fed to the EUT through the LNB input. During the preliminary testing, the worst case condition of the operating mode was ch.3

4.3 Support Equipment Used

Following peripheral devices and interface Satellite Receivers were connected during the measurement:

EUT- Digital Satellite Receiver

FCC ID	: T44MERCURY-II
Model Name	: MERCURY-II
Serial No.	: N/A
Manufacturer	: Dongwon Telecom Co., Ltd.
Power Supply Type	: Switching type
Data Cable	: 1.5 m Shielded RF Cable , 1.5m Shielded RCA Cable(2EA) 1.5m Shielded S-video Cable

Support Unit - TV

FCC ID	: N/A
Model Name	: DM TECH TV
Serial No.	: N/A
Manufacturer	: DM TECH
Power Supply Type	: Switching
Data Satellite Receiver	: refer to EUT connection

Support Unit - DVD Receiver

FCC ID	: N/A
Model Name	: DVR-530C
Serial No.	: N/A
Manufacturer	: Ellion Digital
Power Supply Type	: Switching
Data Satellite Receiver	: refer to EUT connection

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule Parts	Measurement Required	Result
15.107	Conducted Emission	Passed by 5.10 dB
15.109	Radiated Emission	Passed by 3.10 dB
15.111	Antenna Power Conduction Measurement	Passed by 7.10 dB
15.115(b)(1)(ii)	Output Signal Level Measurement	Passed by 2.92 dB
15.115(b)(2)(ii)	Output Terminal Conducted Spurious Emission Measurement	Passed by 6.36 dB
15.115(c)(1)(ii)	Transfer Switch Measurement	Passed

The data collected shows that the **FORTEC COMMUNICATION INC. / Digital Satellite Receiver / MERCURY-II** complies with Part 15 Subpart B Unintentional radiators and the TV Interface Device section(15.115) of the FCC Rules.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.2 Conducted Emission Test

EUT	Digital Satellite Receiver / MERCURY-II (SN:N/A)
Limit apply to	FCC Part 15 Subpart B Section 15.107
Test Date	March 17, 2006
Operating Condition	TV Mode (Channel 4)
Environment Condition	Humidity Level : 38 %R.H., Temperature : 20 ℃
Result	Passed by 5.10 dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarizations of hot and neutral line.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 9 kHz)

Frequency [MHz]	Result [dBμV]		Phase (*L/**N)	Limit [dBμV]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Q.Peak	Average
0.199	57.7	47.1	H	63.6	53.6	5.90	6.50
0.657	44.8	39.9	N	56.0	46.0	11.20	6.10
0.786	43.6	39.0	N			12.40	7.00
1.248	44.8	39.7	N			11.20	6.30
4.798	45.8	40.7	N			10.20	5.30
4.862	46.0	40.9	N			10.00	5.10

NOTES :

1. ** H : Live Line , **N :Neutral Line*
2. *Margin value = Result – Limit.*
3. *Channel 4 was the worst case operation mode*

Kug Kyoung Yoon
Test Engineer

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.3 Radiated Emission Test

EUT	Digital Satellite Receiver / MERCURY-II (SN:N/A)
Limit apply to	FCC Part 15 Subpart B Section 15.109
Test Date	March 20, 2006
Operating Condition	TV Mode (Channel 3)
Environment Condition	Humidity Level : 35 %R.H., Temperature : 8 ℃
Result	Passed by 3.10 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 120 kHz)
Measurement Distance : 3 m

Frequency [MHz]	Reading [dB μV]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB μV/m]	Limit [dB μV/m]	Margin [dB]
254.30	28.34	V	10.95	3.51	42.80	46.0	3.20
381.30	20.28	H	14.16	4.36	38.80	46.0	7.20
508.58	20.59	V	17.24	5.07	42.90	46.0	3.10
566.90	16.74	V	18.23	5.54	40.50	46.0	5.50
635.83	16.32	V	19.39	6.09	41.80	46.0	4.20
667.64	12.75	V	19.95	6.31	39.00	46.0	7.00

NOTES :

1. ** H : Horizontal polarization , ** V : Vertical polarization*
2. *Result = Reading + Antenna factor + Cable loss*
3. *Margin value = Limit - Result*
4. *Channel 3 was the worst case operation mode.*

Kug Kyoung Yoon
Test Engineer

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.4 Antenna Power Conduction Measurement

EUT	Digital Satellite Receiver / MERCURY-II (SN:N/A)
Limit apply to	FCC Part 15 Subpart B Section 15.111
Test Date	March 27, 2006
Operating Condition	LNB Tuner
Environment Condition	Humidity Level : 38 %R.H., Temperature : 20 ℃
Result	Passed by 7.10 dB

Antenna Power Conduction Test Data

Tuned Frequency [MHz]	Meter Reading [dBμV]	Correction Factor [dB]	Result [dBμV]	Limit [dBμV]	Margin [dB]
51.60	35.40	8.9	42.90	50.0	7.10
2995.03	32.80	9.5	42.30		7.70

NOTES :

1. *Result = Meter Reading + Correction Factor(Matching Loss + Cable loss)*
   Margin value = Limit – Result
2. *Measurements using the CISPR Quasi-peak mode in the the frequency range 30 MHz to 1 000 MHz and measurements using the CISPR peak mode in the the frequency range 1 000 MHz to 5 000 MHz .*
3. *The limits is 2.0 nanowatts in the frequency range 30 MHz to 5 000 MHz.*

Kug Kyoung Yoon
Test Engineer

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.5 Output Signal Level Measurement

EUT	Digital Satellite Receiver / MERCURY-II (SN:N/A)
Limit apply to	FCC Part15 Subpart B Section 15.115(b)(1)
Test Date	March 27, 2006
Operating Condition	TV Mode (Channel 3, 4)
Environment Condition	Humidity Level : 38 %R.H., Temperature : 20 ℃
Result	Passed by 2.92 dB

Output Signal Test Data

Test Channel	Emission Frequency [MHz]	Meter Reading [dB μV]	Correction Factor [dB]	Signal Level [dB μV]	Limit [dB μV]	Margin [dB]
3	61.25	58.69	7.5	66.19	69.5	3.31
	65.75	44.21	7.5	51.71	56.5	4.79
4	67.25	59.08	7.5	66.58	69.5	2.92
	71.75	43.72	7.5	51.22	56.5	5.28

NOTES :

1. *The correction factor consist of the insertion loss of the impedance matching transformer and the coaxial Satellite Receiver used for the test.*
2. *The spectrum was checked in each test mode and operation mode, and the maximum measured data were reported.*
3. *Signal Level = Meter Reading + Correction Factor(Matching Loss + Cable loss)*
   Margin value = Limit - Signal Level

Kug Kyoung Yoon
Test Engineer

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.6 Output Terminal Conducted Spurious Emission Measurement

EUT	Digital Satellite Receiver / MERCURY-II (SN:N/A)
Limit apply to	FCC Part15 Subpart B Section 15.115(b)(1)
Test Date	March 27, 2006
Operating Condition	TV Mode (Channel3, 4)
Environment Condition	Humidity Level : 38 %R.H., Temperature : 20 ℃
Result	Passed by 6.36 dB

Output Terminal Conducted Spurious Test Data

Test Channel	Emission Frequency [MHz]	Meter Reading [dB μV]	Correction Factor [dB]	Result [dB μV]	Limit [dB μV]	Margin [dB]
3	183.90	25.64	7.5	33.14	39.5	6.36
	512.00	14.79	7.7	22.49	39.5	17.01
	659.00	12.87	7.7	20.57	39.5	18.93
4	202.10	23.69	7.5	31.19	39.5	8.31
	500.00	17.43	7.7	25.13	39.5	14.37
	659.00	13.06	7.7	20.76	39.5	18.74

NOTES :

1. *The correction factor consist of the insertion loss of the impedance matching transformer, the coaxial Satellite Receiver used for the test.*
2. *The spectrum was checked in each test mode and operation mode, and the maximum measured data were reported.*
3. *Result = Meter Reading + Correction (Matching Loss+ Cable loss)*
   Margin value = Limit - Signal Level

Kug Kyoung Yoon
Test Engineer

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

5. TEST RESULTS

5.7 Antenna Transfer Switch Measurement

EUT	Digital Satellite Receiver / MERCURY-II (SN:N/A)
Limit apply to	FCC Part15 Subpart B Section 15.115(b)(1)
Test Date	March 27, 2006
Operating Condition	TV Mode (Channel 3, 4)
Environment Condition	Humidity Level : 38 %R.H., Temperature : 20 ℃
Result	Passed

Antenna Transfer Switch Test Data

Test Channel	Emission Frequency [MHz]	Meter Reading [dB μV]	Correction Factor [dB]	Result [dB μV]	Limit [dB μV]	Margin [dB]
3	61.25	During this test, no signal dectect.			9.5	-
4	67.25				9.5	-

NOTES :

1. *No emission was observed during the test. The spectrum was checked in each test mode and operation mode Transfer switch isolation measurements were made on the Channel 3 or 4 video output frequency of 61.25 or 67.25MHz and both positions of the transfer switch were checked for compliance.*
2. *To clarify the emissions emanated from ANT. intput terminal on the EUT, RF pre-amplifier was used. The gain of pre-amplifier at each frequency measured from the EUT was obtained after sufficient warm-up for stabilization of gain. The correction factor consist of the insertion loss of the impedance matching transformer, the coaxial Satellite Receiver used for the test and the gain of pre-amplifier.*
3. *Result = Meter Reading + Correction Factor(Matching Loss + Cable loss)*
   Margin value = Limit - Result
4. *Spectrum analyzer setting : Frequency Span 1MHz, Resolution bandwidth 100 kHz, Video bandwidth 300 kHz, Detector function Peak mode.*

Kug Kyoung Yoon
Test Engineer

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss Factor.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Loss

dB(μV/m) = 20 $\log_{10}$ (μV /m) : Equation 1
dBμV = dBm + 107 : Equation 2

Example : @508.58 MHz

Class B Limit = 46.00 dBuV/m

Reading = 20.59 dBuV

Antenna Factor + Cable Loss = 22.31 dB/m

Total = 42.90 dBuV/m

Margin = 46.00 – 42.90 = 3.10

= 3.10 dB below Limit

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074

7. List of Test Equipments used for Measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Due Date
☒	Spectrum Analyzer	7401A	H.P	US38440057	06.04.07
☒	Spectrum Analyzer	R3261A	Advantest	21720033	06.10.17
☒	Receiver	ESVS 10	R & S	835165/001	06.04.07
☒	Spectrum Analyzer	7405A	H.P	US41160290	06.10.18
☒	TEST Receiver	ESPI	Rohde & Schwarz	100478	06.10.18
☒	LISN	3825/2	EMCO	9006-1669	06.04.06
☐	LISN	3825/2	EMCO	9208-1995	06.04.07
☒	LISN	3816/2	EMCO	1001	06.10.18
☐	LogBicon Antenna	VULB9160	Schwarz Beck	3082	06.07.19
☒	LogBicon Antenna	VULB9165	Schwarz Beck	2023	06.07.05
☐	Dipole Antenna	VHAP	Schwarz Beck	964	06.06.24
☐	Dipole Antenna	VHAP	Schwarz Beck	965	06.07.05
☐	Dipole Antenna	UHAP	Schwarz Beck	949	06.06.24
☐	Dipole Antenna	UHAP	Schwarz Beck	950	06.07.05
☒	Turn-Table	DETT-03	Daeil EMC	-	N/A
☒	Antenna Master	DEAM-03	Daeil EMC	-	N/A
☐	Plotter	7440A	H.P	2725A 75722	N/A
☒	Chamber	DTEC01	DAETONG	-	N/A
☒	RAM	Rohde & Schwarz	Matching Pad	836964 / 009	06.10.18

End of test Report

Head Office : # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788
EMC Lab : #584 Sangwhal-ri, Ganam-myeon, Yoju-gun, Gyounggi-do, 469-885, Korea Tel:82-31-885-0072, Fax:82-31-885-0074