



 <b>ESTECH Co., Ltd.</b> Rm 1015, World Venture Center II, 426-5 Gasan-dong, Guncheon-gu, Seoul, 158-803, Korea	   	<b>Electromagnetic Interference Test Report</b>
---	--	---

Test Report for FCC

FCC ID : STCEX-5201

Report Number		ESTF150712-010			
Applicant	Company name	Tellion, Inc			
	Address	8th Fl, Leader's tower 60-15 Gasan-dong, Geumcheon-gu, Seoul, 153-801, Korea			
	Telephone	82-2-2026-7003			
Product	Product name	VDSL			
	Model No.	EX-5201	Manufacturer	Tellion, Inc	
	Serial No.	NONE	Country of origin	KOREA	
Test date	2007-12-06		Date of issue	12-Dec-07	
Testing location	ESTECH. Co., Ltd. 97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea				
Standard	FCC PART 15 2006 , ANSI C 63.4 2003				
Test item	Conducted Emission	Class A	Class B	Test result	OK
	Radiated Emission	Class A	Class B	Test result	OK
Measurement facility registration number		94696			
Tested by	Engineer J.H.Kim  (Signature)				
Reviewed by	Engineering Manager J.M.Yang  (Signature)				
Abbreviation	OK, Pass = Passed, Fail = Failed, N/A = not applicable				
* Note - EX-5201 and VX-VEB165 are same product, only model name is different. - This test report is not permitted to copy partly without our permission - This test result is dependent on only equipment to be used - This test result based on a single evaluation of one sample of the above mentioned					

# Contents

- 1. Laboratory Information ..... 3
- 2. Description of EUT ..... 4
- 3. Test Standards ..... 5
- 4. Measurement condition ..... 6
- 5. Measurement of radiated emission ..... 8
  - 5.1 Measurement equipment ..... 8
  - 5.2 Environmental conditions ..... 8
  - 5.3 Test data ..... 9
- 6. Measurement of conducted emission ..... 10
  - 6.1 Measurement equipment ..... 10
  - 6.2 Environmental conditions ..... 10
  - 6.3 Test data ..... 11
- 7. Photographs of test setup ..... 12
- 8. Photographs of EUT ..... 14

## Appendix 1. Spectral diagram

## 1. Laboratory Information

### 1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report. ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

### 1.2 Test Lab.

Corporation Name : ESTECH Co. Ltd

Head Office : Rm 1015, World Venture Center II, 426-5, Gasan-dong, Geumcheon-gu, Seoul, Korea  
(Safety & Telecom. Test Lab)

EMC Test Lab : 58-1 Osan-Ri, GaNam-Myon, YeoJoo-Gun, KyungKi-Do, Korea  
97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea

### 1.3 Official Qualification(s)

MIC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC requirements

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

## 2. Description of EUT

### 2.1 Summary of Equipment Under Test

NONE : VDSL  
 Model Number : EX-5201  
 Serial Number : NONE  
 Manufacturer : Tellion, Inc  
 Country of origin : KOREA  
 Rating : INPUT: 120V 60Hz    OUTPUT:DC 5V ,2A  
 Receipt Date : 2007-12-04  
 Frequency list(s) : 25MHz, 25.33MHz

### 2.2 General descriptions of EUT

Items	Specifications		
Standard	VDSL standards		<ul style="list-style-type: none"> <li>VDSL Automatic setting of line speed</li> <li>Automatic setting(10/100BASE-TX Auto-negotiation) of port parameter</li> </ul>
	<ul style="list-style-type: none"> <li>ETSI VDSL standard</li> <li>ITU ITU-T G.993.1</li> </ul>		
	IEEE		
	<ul style="list-style-type: none"> <li>IEEE 802.3 10BASE-TX</li> <li>IEEE 802.3u 100BASE-TX</li> </ul>	Connector	<ul style="list-style-type: none"> <li>Two RJ-11 connector (LINE, PHONE)</li> <li>ONE RJ-45 connector(LAN)</li> <li>Power Input JACK (DC 5V 2A)</li> </ul>
Interface	Ethernet Interface		
	<ul style="list-style-type: none"> <li>10/100BASE-TX(IEEE 802.3 Auto-negotiation)</li> <li>Connector : RJ-45</li> </ul>	LED	<ul style="list-style-type: none"> <li>POWER, LINK, DATA, LAN</li> </ul>
	VDSL interface		
	<ul style="list-style-type: none"> <li>Connector : RJ-11</li> </ul>		
VDSL	POTS interface	Environment	<ul style="list-style-type: none"> <li>Temperature : 0~50℃(in work), -40~70℃(in Keeping)</li> <li>Humidity : 5~90%</li> </ul>
	<ul style="list-style-type: none"> <li>Connector : RJ-11</li> </ul>		
	Modulation	Dimension	<ul style="list-style-type: none"> <li>Dimension :</li> </ul>
	<ul style="list-style-type: none"> <li>DMT</li> </ul>	And Weight	<ul style="list-style-type: none"> <li>Weight :</li> </ul>
	Transmission		
	<ul style="list-style-type: none"> <li>Full-duplex, Frequency Division Multiplexing(FDD)</li> </ul>		
	Data Rate	Power	<ul style="list-style-type: none"> <li>Input : 100~240VAC, 50~60Hz, DC 5V/2A</li> <li>Electric Power gauge : 10 Watt(MAX)</li> </ul>
	<ul style="list-style-type: none"> <li>Symmetrical : 100/100Mbps(MAX rate)</li> </ul>		
	Band Plan		
	<ul style="list-style-type: none"> <li>Plan 998</li> </ul>		
	PSD MASK		
	<ul style="list-style-type: none"> <li>ETSI, ANSI, ITU-T(G.993.1) VDSL Standards</li> </ul>		
	Upstream Power-Back-Off		
	<ul style="list-style-type: none"> <li>Support Upstream Power-back-off</li> </ul>		
	Loopback		
	<ul style="list-style-type: none"> <li>Support remote and local loopback for network connection test</li> </ul>		
	CPE Configurations		

### 2.3 Added requirement in the manual

To meet radiated emission, ferrite cores will be added to RJ45, RJ11  
 and DC power cable on every unit sold in the U.S

### 3. Test Standards

#### **Test Standard : FCC PART 15 (2007)**

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

#### **Test Method : ANSI C 63.4 (2003)**

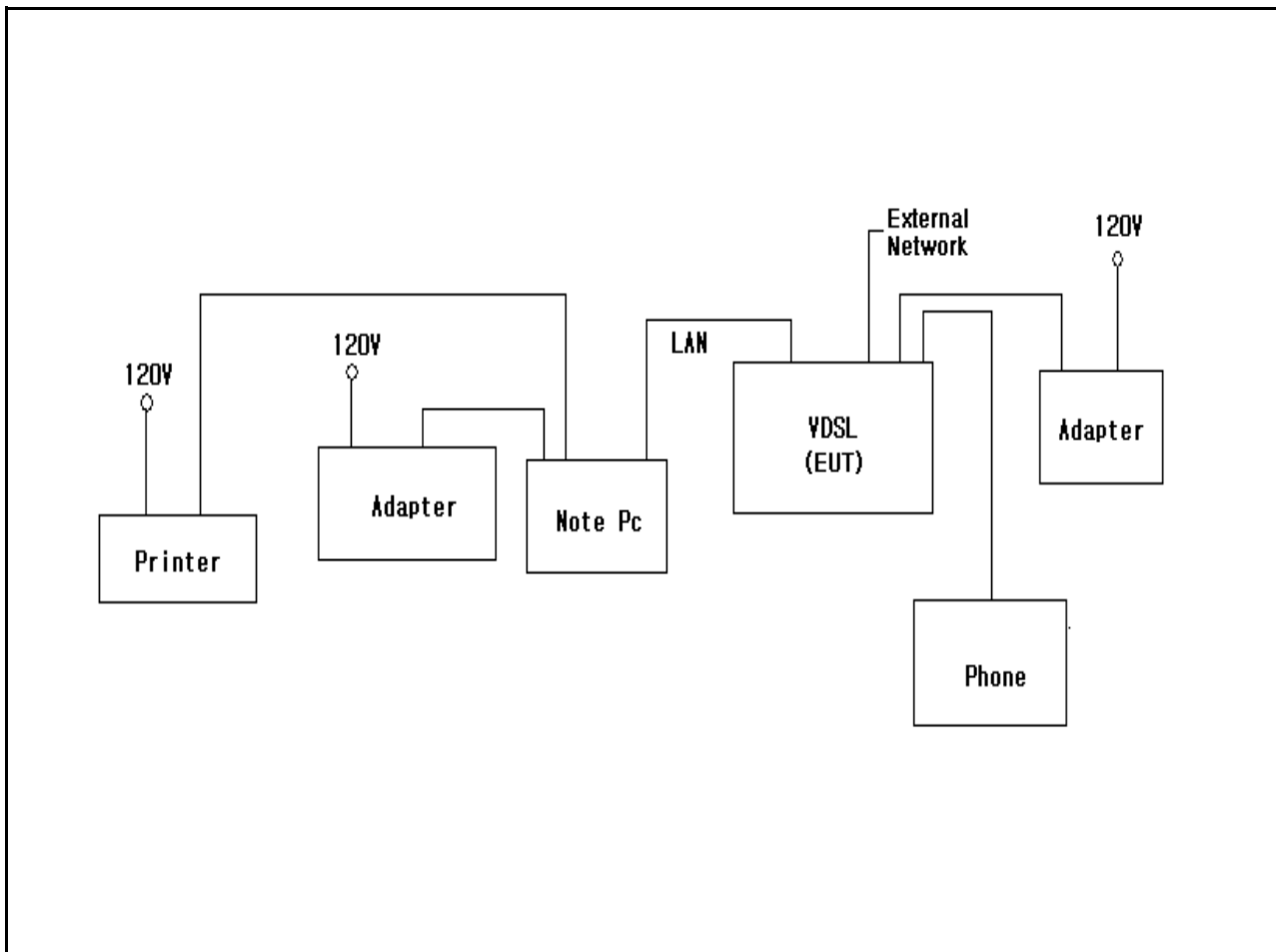
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

## 4. Measurement Condition

### 4.1 EUT Operation.

- \* The EUT was in the following operation mode during all testing
- \* The operational conditions of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission
- \* Using ping command between external Network, Transmission and Receiving test at between external Network

### 4.2 Configuration and Peripherals



#### 4.4 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
VDSL	EX - 5201	NONE	Tellion, Inc	EUT
NOTE PC	HSTNN - 105C	CNU7281VY5	HEWLETT - PACKARD	
PRINTER	MJC - 5750	NA34BFFP313402V	SAMSUNG ELECTRONICS(SHANGHAI)DI GITAL PRINTING CO.,LTD	
TELEPHONE	SP - FZ14	KKAN529272	SAMSUNG	
ADAPTER	PPP009L	PA - 1650 - 02HC	HEWLETT - PACKARD	
ADAPTER	PA8040WB	0703016518	Bestec Electronics (Dongguan) Co.,Ltd.	
ADAPTER	SYS1298 - 1305 - V02	G071108121180	CPC	

#### 4.5 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
VDSL	TEL - LINE	External Network	TEL - LINE	20	N	with Ferrite core
VDSL	TEL - LINE	Phone	TEL - LINE	2	N	
VDSL	LAN	Note Pc	LAN	2	N	with Ferrite core
VDSL	Power	Adapter	-	2	N	with Ferrite core
Note Pc	USB	Printer	USB	2	Y	
Note Pc	Power	Adapter	-	2	N	
Printer	Power	Adapter	-	2	N	

## 5. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC Part 15 (2007). The test setup was made according to ANSI C 63.4 (2003) on an open test site, which allows a 3m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test set-up.

### 5.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESVS10	Rohde & Schwarz	838562/002	2008. 1. 23
LogBicon Antenna	VULB 9160	Schwarzbeck	3142	2008. 5. 07
Amplifier	8447F	HP	2805A02972	2008. 6. 26
PREAMPLIFIER	8449B	HP	3008A00581	2008. 5. 06
Spectrum Analyzer	R3261C	ADVANTEST	61720116	2008. 4. 20
Horn Antenna	BBHA 9120D	Schwarzbeck	9210-D469	2008. 7. 24

### 5.2 Environmental Condition

Test Place : Open site(3m)  
 Temperature (°C) : 7  
 Humidity (%) : 39 %



### 5.3 Test data

Test Date : 6-Dec-07

Measurement Distance:

3 m

Frequency (MHz)	Reading (dB $\mu$ V)	Position (V/H)	Height (m)	Correction Factor		Quasi-peak Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB $\mu$ V/m)	Result (dB $\mu$ V/m)	Margin (dB)
47.82	23.00	V	1.0	12.39	1.1	40.0	36.49	-3.51
70.69	18.40	V	1.0	9.73	1.3	40.0	29.44	-10.56
111.56	20.00	V	1.0	10.40	1.6	43.5	32.04	-11.46
125.02	19.20	V	1.0	11.56	1.7	43.5	32.49	-11.01
141.32	25.80	V	1.0	12.74	1.8	43.5	40.38	-3.12
191.76	25.40	V	1.0	10.29	2.2	43.5	37.87	-5.63
211.90	22.40	H	1.6	10.06	2.3	43.5	34.78	-8.72
216.02	23.10	V	1.0	10.22	2.4	46.0	35.68	-10.32
256.35	13.00	V	2.0	11.72	2.6	46.0	27.37	-18.63
282.63	26.70	V	1.0	12.56	2.8	46.0	42.07	-3.93
317.96	24.50	H	1.0	13.51	3.1	46.0	41.10	-4.90
353.30	21.00	V	1.0	14.30	3.3	46.0	38.64	-7.37
423.96	22.90	V	1.5	15.97	3.8	46.0	42.64	-3.36
443.88	18.00	H	1.0	16.48	3.9	46.0	38.36	-7.64
472.52	16.30	V	1.0	16.91	4.1	46.0	37.26	-8.74
500.00	12.20	H	1.0	17.18	4.2	46.0	33.62	-12.38
500.56	6.90	H	1.0	17.19	4.2	46.0	28.34	-17.66
565.26	15.80	H	1.0	18.70	4.6	46.0	39.05	-6.95
847.83	13.50	H	1.0	22.89	6.2	46.0	42.56	-3.44
989.15	13.00	V	1.0	24.41	6.9	54.0	44.32	-9.68
1668.70	38.85	H	1.0	24.74	-31.8	54.0	31.76	-22.24
1996.80	33.20	V	1.0	25.87	-31.3	54.0	27.76	-26.24
Remark		*To Radiated emission meet, measured with Ferrite core at tel-line,DC power in and Lan port. *CL = Cable Loss - Amplifier Gain(In case of above1000Mhz) *CL = Cable Loss(In case of below1000Mhz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection at frequency above 1GHz.						

## 6. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 to 30 MHz was measured in accordance to FCC Part 15 (2007). The test setup was made according to ANSI C 63.4 (2003) in a shielded. The EUT was placed on a non-conductive table at least 80 above the ground plan. A grounded vertical reference plane was positioned in a distance of 40cm from the EUT. The distance from the EUT to other metal surfaces was at least 0.8m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0m.. The test receiver with Quasi Peak detector complies with CISPR 16.

### 6.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
LISN	ESH3-Z5	Rohde & Schwarz	838979/010	2008. 2. 28
LISN	NNLA8120A	Schwarzbeck	8120161	2008. 2. 28
TEST Receiver	ESPI7	Rohde & Schwarz	100185	2008. 8. 27
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	-

### 6.2 Environmental Condition

Test Place : Shield Room  
 Temperature (°C) : 16  
 Humidity (%) : 33 %

## 6.3 Test data

Test Date : 6-Dec-07

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB $\mu$ V)	Reading (dB $\mu$ V)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Reading (dB $\mu$ V)	Result (dB)
0.15	0.17	0.0	N	65.78	52.55	52.76	55.78	45.19	45.40
0.16	0.17	0.0	H	65.67	50.50	50.71	55.67	45.00	45.21
0.17	0.16	0.0	N	64.86	37.38	37.58	54.86	20.26	20.46
0.31	0.12	0.1	H	60.02	43.34	43.51	50.02	41.51	41.68
0.38	0.13	0.1	H	58.32	42.17	42.37	48.32	38.79	38.99
0.39	0.00	0.0	N	58.17	42.49	42.49	48.17	39.21	39.21
0.53	0.15	0.1	H	56.00	41.09	41.34	46.00	36.25	36.50
0.61	0.15	0.1	N	56.00	43.61	43.87	46.00	38.22	38.48
0.84	0.18	0.1	N	56.00	42.36	42.67	46.00	34.73	35.04
1.38	0.27	0.2	H	56.00	40.40	40.86	46.00	31.42	31.88
1.39	0.27	0.2	N	56.00	40.19	40.65	46.00	31.85	32.31
1.50	0.27	0.2	N	56.00	39.42	39.89	46.00	31.55	32.02
6.48	0.44	0.6	N	60.00	23.26	24.26	50.00	17.41	18.41
8.28	0.54	0.6	H	60.00	22.53	23.72	50.00	17.68	18.87
14.81	0.82	1.0	N	60.00	26.63	28.42	50.00	22.34	24.13
15.62	0.84	1.0	H	60.00	27.11	28.95	50.00	21.77	23.61
15.64	0.00	0.0	N	60.00	27.40	27.40	50.00	22.25	22.25
23.13	0.93	1.2	N	60.00	26.41	28.59	50.00	22.01	24.19
Remark	H : Hot Line, N : Neutral Line *To Radiated emission meet, measured with Ferrite core at tel-line,DC power in and Lan port.								

## 7. Photographs of test setup

### 7.1 Setup for Radiated Test : 30 ~ 2000 MHz

[ Front ]



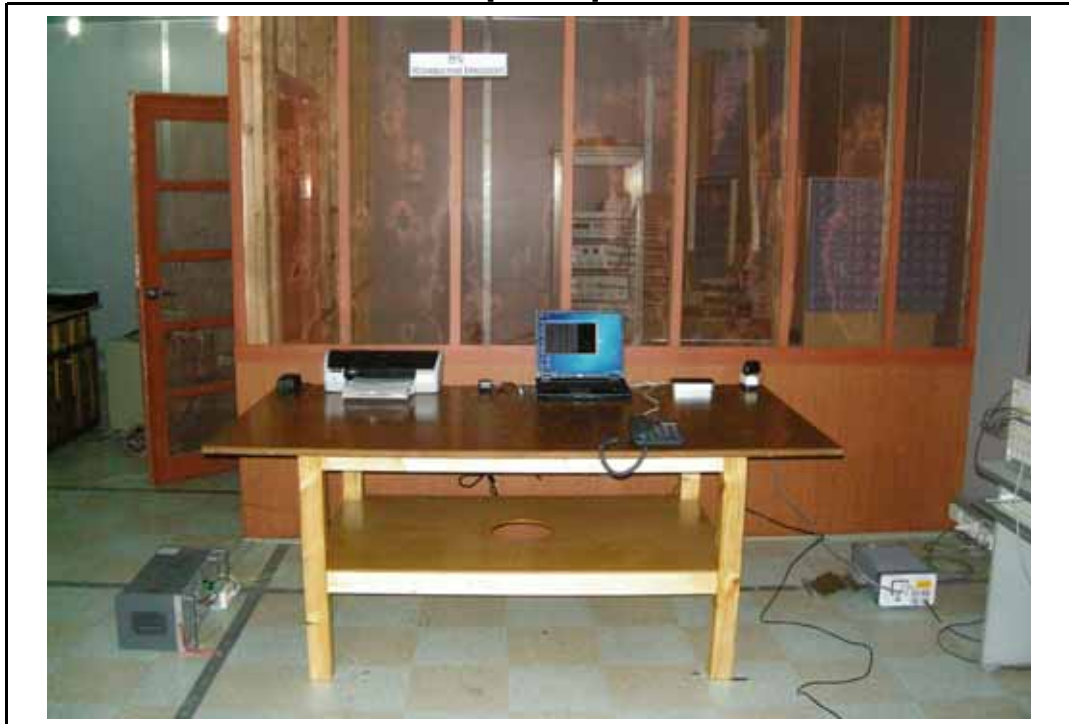
[ Rear ]



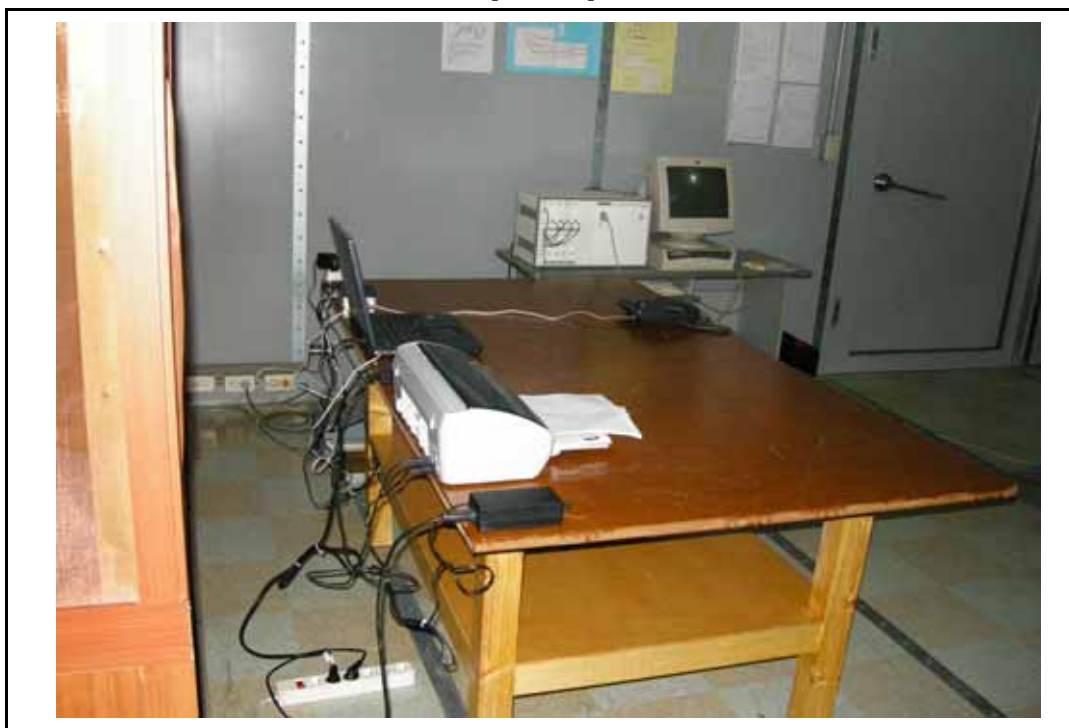


## 7.2 Setup for Conducted Test : 0.15 ~ 30 MHz

[ Front ]



[ Rear ]



8. Photographs of EUT

[ Front ]

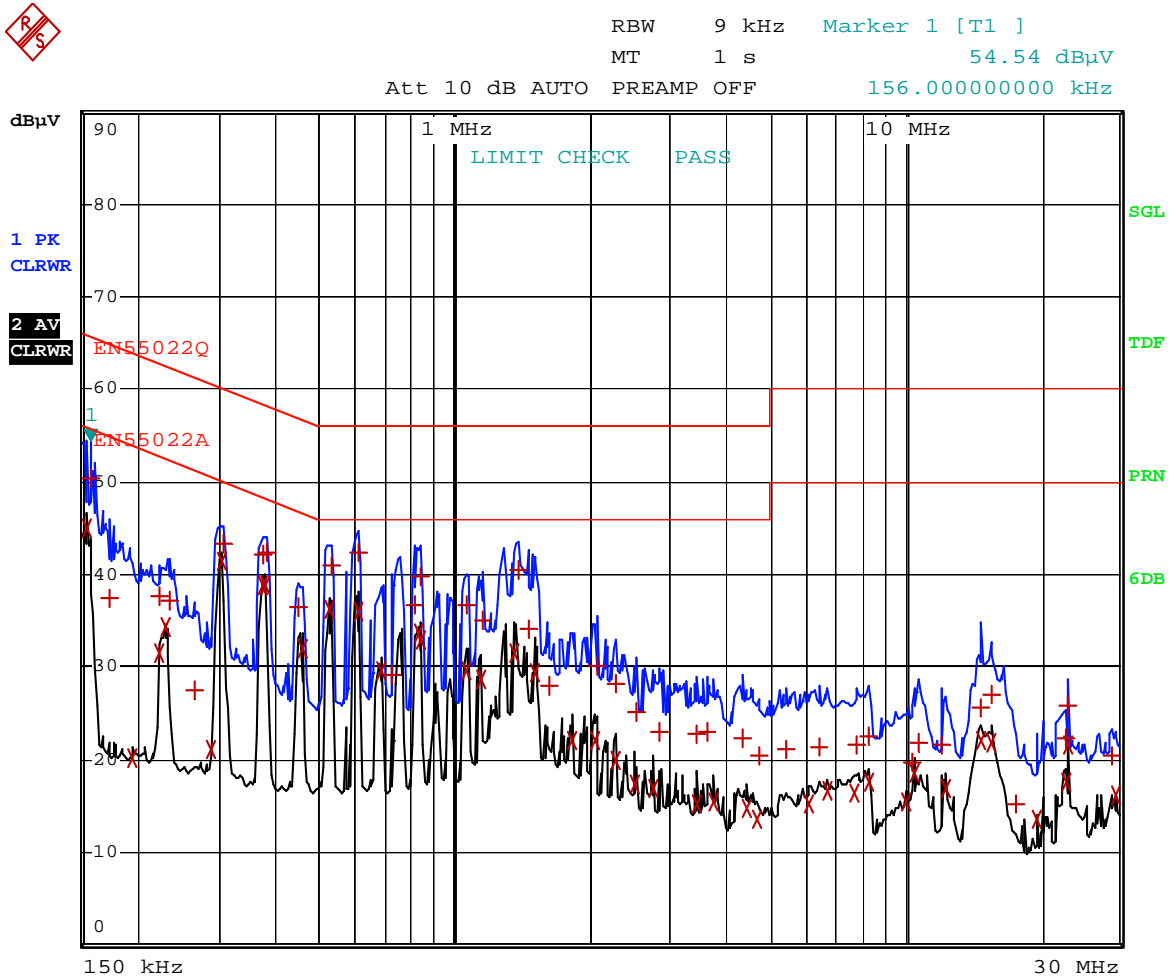


[ Rear ]



# Appendix 1. Spectral diagram

\*HOT



Comment: EX-5201\_HOT

Date: 6.DEC.2007 03:53:36

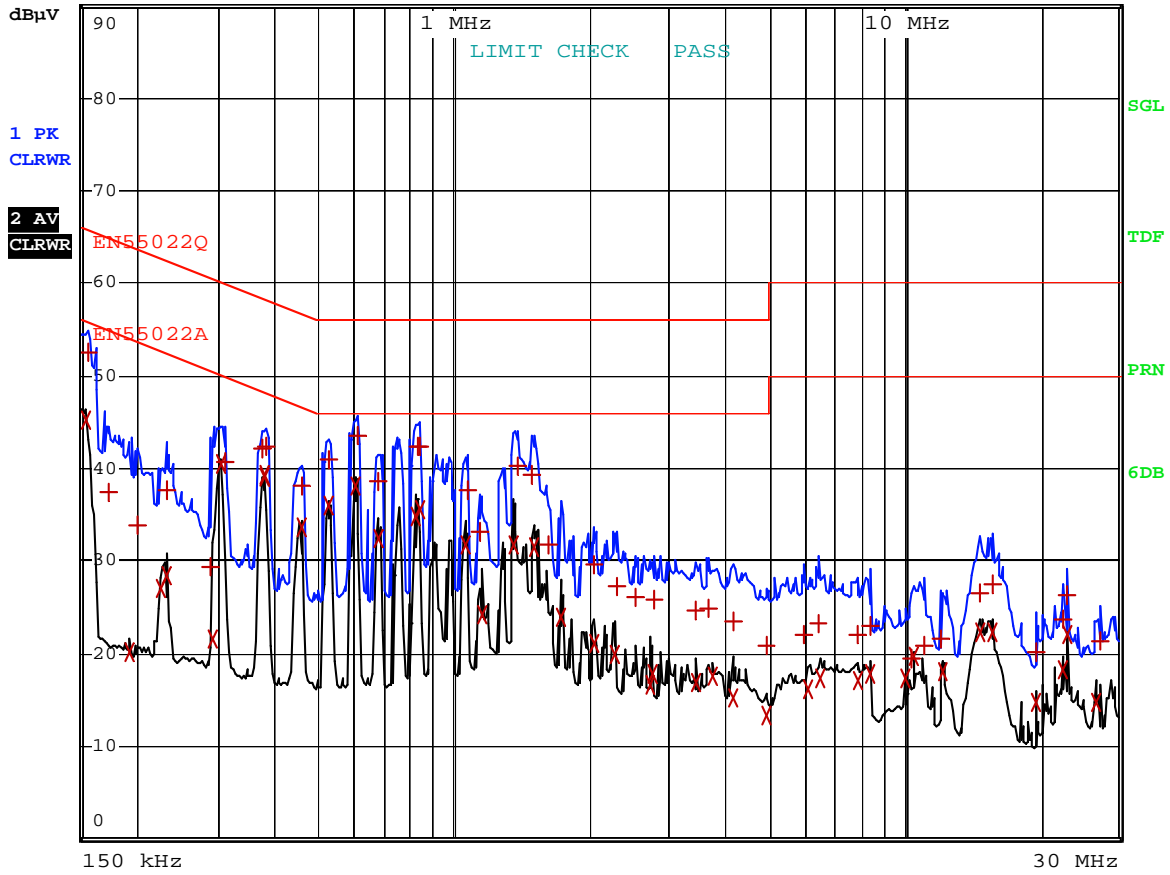
\*NEUTRAL



RBW 9 kHz

MT 1 s

Att 10 dB AUTO PREAMP OFF



Comment: EX-5201\_NEUTRAL

Date: 6.DEC.2007 03:48:12