



SK TECH CO., LTD.

Page 1 of 15

## FCC-Certificate of Compliance

<b>Test Report No.:</b>	SKTFCE-060525-047		
<b>NVLAP CODE :</b>	200220-0		
<b>Applicant:</b>	CELLUON, INC.		
<b>Applicant Address:</b>	IT Venture Tower West 16F, 78 Garak-bondong, Songpa-Gu, Seoul, 138-803 South Korea		
<b>Manufacturer :</b>	CELLUON, INC.		
<b>Manufacturer Address:</b>	IT Venture Tower West 16F, 78 Garak-bondong, Songpa-Gu, Seoul, 138-803 South Korea		
<b>Product:</b>	PROJECTION KEYBOARD		
<b>FCC ID:</b>	TCLCL850	<b>Model No.:</b>	CL850
<b>Receipt No.:</b>	SKTEU06-0270	<b>Date of receipt:</b>	May. 08, 2006
<b>Date of Issue:</b>	May. 25, 2006		
<b>Testing location:</b>	SK TECH CO., LTD. 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea		
<b>Test Standards:</b>	ANSI C63.4 / 2003		
<b>Rule Parts:</b>	FCC part 15 Subpart B, CISPR 22		
<b>Equipment Class :</b>	Class B Digital Device Peripheral		
<b>Test Result:</b>	The above mentioned product has been tested and passed.		

Prepared by: S.Y.Ye

Tested by: S.H.Yoon/Engineer

Approved by: D.H.Kang  
/Manager & Chief Engineer

Signature Date

Signature Date

Signature Date

Other Aspects :

Abbreviations : · OK, Pass = passed · Fail = failed · N/A = not applicable

- ☞ •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 is based on a single evaluation of one sample of the above mentioned.
- This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.
- We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.

NVLAP Lab. Code: 200220-0


 》》 **Contents** 《《

Contents	2
List of Tables	2
List of Figures	2
1. General	3
2. Test Site	3
2.1 Location	3
2.2 List of Test and Measurement Instruments	4
2.3 Test Date	4
2.4 Test Environment	4
3. Description of the tested samples	5
3.1 Rating and Physical Characteristics	5
3.2 Submitted Documents	5
4. Measurement Conditions	6
4.1 Modes of Operation	6
4.2 List of Peripherals	6
4.3 Type of Used cables	7
4.4 Test Setup	8
4.5 Uncertainty	9
5. EMISSION Test	10
5.1 Conducted Emissions	10
5.2 Radiated Emissions	14

 》 **List of Tables**

Table 1	List of test and measurement Equipment	4
Table 2	Test Data, Conducted Disturbance	11
Table 3	Test Data, Radiated Emissions	15

 》 **List of Figures**

Figure 1	Spectral Diagram, LINE-PE	12
Figure 2	Spectral Diagram, NEUTRAL-PE	13



## 1. General

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. All measurements reported herein were performed by SK TECH Co., Ltd. and were made under Chief Engineer's supervision.

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

## 2. Test Site

SK TECH Co., Ltd.

### 2.1 Location

820-2, Wolmoon Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

The test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

This laboratory is recognized as a Conformity Assessment Body(CAB) for CAB's, Designation Number: **KR0007** by FCC, is accredited by NVLAP for NVLAP Lab. Code : **200220-0** and DATech for DAR-Registration No.:**DAT-P-076/97-01**.



## 2.2 List of Test and Measurement Instruments

Table 1 : List of Test and Measurement Equipment

- **Conducted Disturbance**

Kind of Equipment	Type	S/N	Calibrated until
EMI Receiver	ESHS10	835871/002	09.2006
Artificial Mains Network	ESH3-Z5	836679/018	08.2006

- **Radiated Disturbance**

Kind of Equipment	Type	S/N	Calibrated until
EMI Receiver	ESIB40	100277	02.2007
Amplifier	8447F	3113A05153	08.2006
Log Periodic Antenna	UHALP9107	1819	11.2006
Biconical Antenna	BBA9106	91031626	11.2006
Antenna Turntable Driver	5907	91X518	N/A
Antenna Turntable controller	5906	91X519	N/A

## 2.3 Test Date

Date of Application : May. 08, 2006

Date of Test : May. 09, 2006 ~ May. 19, 2006

## 2.4 Test Environment

See each test item's description.



### 3. Description of the tested samples

The EUT is a PROJECTION KEYBOARD.

#### 3.1 Rating and Physical Characteristics

Type of EUT	Bluetooth Device
Type designation	PROJECTION KEYBOARD, Model CL850
FCC ID	FCC ID: TCLCL850 (During the tests, the EUT was not labeled with the FCC-label)
Power source	DC 3.7V Li-ion battery
Local Oscillator or X-Tal	48MHz, 16 MHz
Transmit Frequency	2402 ~ 2480 MHz (1MHz step, 79 channels)
Antenna Type	SMD Type Chip Antenna(Model AEC_CPK_001, Gain: 0.33 dBi)
Type of Modulation	FHSS (GFSK)
RF Output power	< 4 dBm
External Ports	<ul style="list-style-type: none"><li>- Mini-USB Port</li><li>- DC Charging Port</li><li>- AC/DC Adaptor</li></ul> <p>Manufacturer : PHIHONG Model : PSAA05A-050 Input : AC 100 – 240 V, 50-60 Hz, 0.2 A Output : DC 5 V, 1.0 A</p>

#### 3.2 Submitted Documents

N/A



## 4. Measurement Conditions

The power of EUT is supplied with AC/DC adaptor.

AC/DC Adaptor: Input-AC 100-240V, 50-60 Hz, 0.2A

Output-DC 5V, 1.0A

### 4.1 Modes of Operation

EUT is connected to Personal computer, using program, usb cable and EUT operated to the following mode during all tests.

-USB Mode

### 4.2 List of Peripherals

Equipment	Manufacturer	Model Name	Serial No.
PDA	ASU Stek Computer Inc	A620 Series	413AG000470
PDA Cradle	ASU Stek Computer Inc	A620/ CDL USP Cradle	413AG000470
Cradle Adaptor	HIPRO	HP-ACO1OL6E	5864801YMR8KQK
Adaptor (For EUT)	PHIHONG	PSAA05A-050	N/A
Keyboard(PS2)	LITE-ON TECHNOLOGY CORPORATION	SK-1688	C0509035687
Mouse(USB)	Logitech Inc	M-UV96	F93A90AN3SI3LSVT
LCD Monitor	LG	1510TFT Rev B	304KG04896
PC	Samsung Electronics	DM-V50	371F97BA100133V

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Page 7 of 15

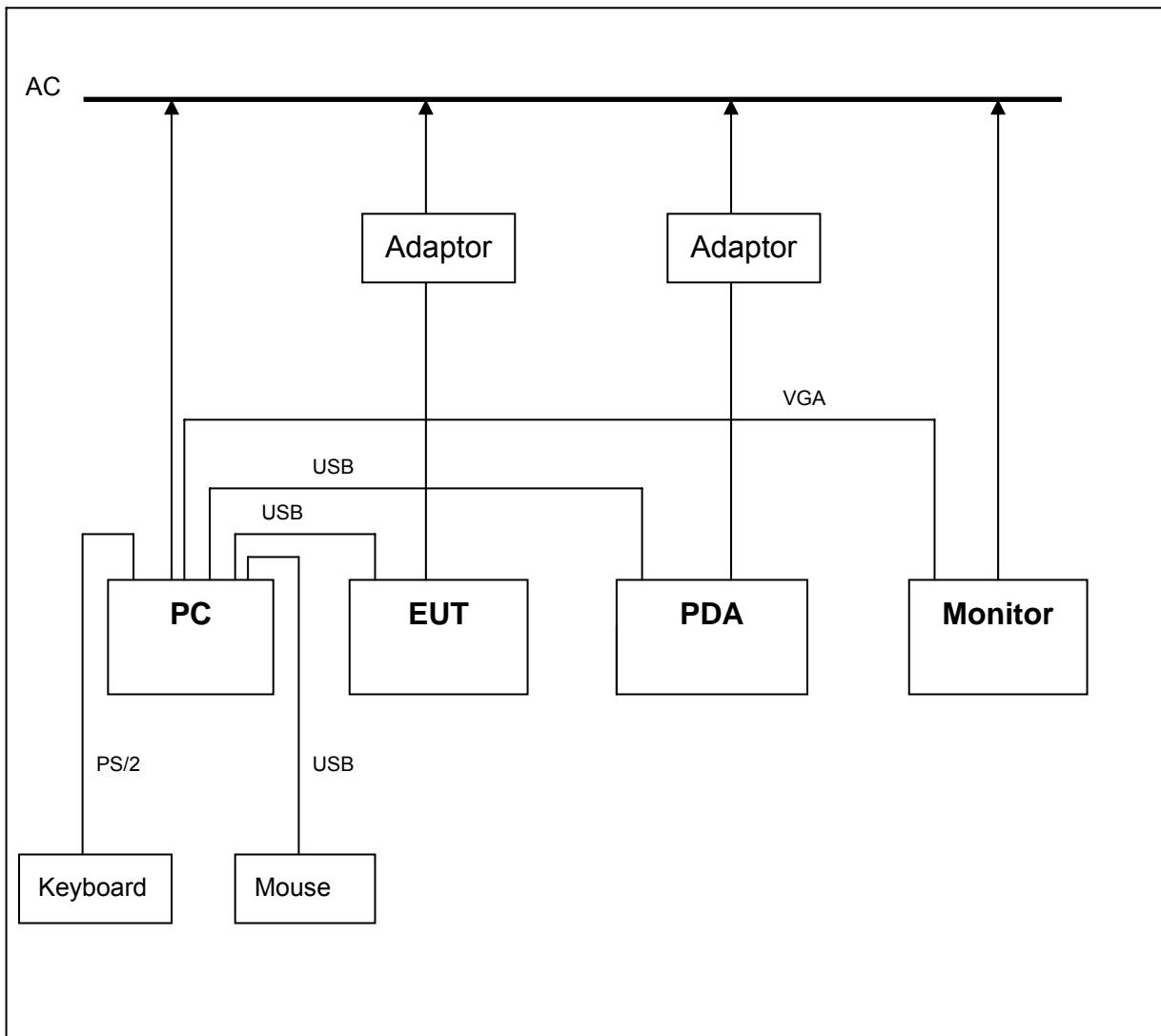
### 4.3 Type of Used Cables

Equipment	Manufacturer	M/N	S/N	Cables &connectors
Keyboard (For PC)	LITE-ON TECHNOLOGY CORPORATION	SK-1688	C0509035687	1.7m unshielded PS/2 cable
Mouse (For PC)	Logitech Inc	M-UV96	F93A90AN3SI3 LSVT	1.7m unshielded USB cable
EUT (For PC)	CELLUON, INC.	CL850	N/A	1.2m shielded USB cable
PDA (For PC)	ASU Stek Computer Inc	A620 Series	413AG000470	1.2m shielded USB cable
LCD Monitor (For PC)	LG	1510TFT Rev B	304KG04896	1.5m shielded VGA cable
EUT (For Adaptor)	CELLUON, INC.	CL850	N/A	1.5m shielded Power cable
PDA (For Adaptor)	ASU Stek Computer Inc	A620 Series	413AG000470	1.5m shielded Power cable
LCD Monitor (For Adaptor)	LG	1510TFT Rev B	304KG04896	1.5m shielded Power cable



## 4.4 Test Setup

The test setup photographs showed the external supply connections and interfaces.



[ System Block Diagram of Test Configuration ]



## 4.5 Uncertainty

### 1) Radiated disturbances from 30 MHz to 1000 MHz at a distance of 3m and 10 m

Input quantity	Xi	Probability distribution function
Receiver reading	Vr	Rectangular $\sqrt{3}$
Attenuation: antenna-receiver	Lc	k=1
Amplifier Error	Ae	k=2
antenna factor	Lac	k=2
<b>Receiver corrections:</b>		
Sine wave voltage	dVsw	Rectangular $\sqrt{3}$
Pulse amplitude response	dVpa	Rectangular $\sqrt{3}$
Pulse repetition rate response	dVpr	Rectangular $\sqrt{3}$
Mismatch: antenna-receiver	dM	k=1
<b>Antenna corrections:</b>		
AF frequency interpolation	dAFF	Rectangular $\sqrt{3}$
AF height deviations	dAFh	Rectangular $\sqrt{3}$
Directivity difference	dAdir	3 m: Rectangular $\sqrt{3}$ , 10 m: Rectangular $\sqrt{3}$
Phase centre location	dAph	3 m: Rectangular $\sqrt{3}$ , 10 m: Rectangular $\sqrt{3}$
Cross-polarisation	dAcp	Rectangular $\sqrt{3}$
Balance	dAbal	Rectangular $\sqrt{3}$
<b>Site corrections:</b>		
Site imperfections	dSA	Rectangular $\sqrt{6}$
Separation distance	dd	3 m: Rectangular $\sqrt{3}$ , 10 m: Rectangular $\sqrt{3}$
Table height	dh	3 m: k=2, 10 m: k=2
Expanded Uncertainty		4.60(Vertical)/4.59(Horizontal) k=2 (Level of confidence)

Expanded Uncertainty

$$U = k * U_c(x_i) = 2 * 2.3 = 4.60 \text{dB}$$

The coverage factor k =2 yields approximately a 95% level of confidence.

### 2) Conducted disturbance from 150 KHz to 30 MHz using a 50 Ω/50 uH AMN

Input quantity	Xi	Probability distribution function
Receiver reading	Vr	Rectangular $\sqrt{3}$
Attenuation: AMN-receiver	Lc	k=1
AMN voltage division factor	Lamn	k=2
<b>Receiver corrections:</b>		
Sine wave voltage	dVsw	Rectangular $\sqrt{3}$
Pulse amplitude response	dVpa	Rectangular $\sqrt{3}$
Pulse repetition rate response	dVpr	Rectangular $\sqrt{3}$
Mismatch: AMN-receiver	dM	U-shape $\sqrt{2}$
AMN impedance	dZ	Triangular $\sqrt{6}$
Expanded Uncertainty		3.99 k=2 (Level of confidence)

Expanded uncertainty

$$U = k * U_c(x_i) = 2 * 1.96 = 3.92 \text{dB}$$

The coverage factor k =2 yields approximately a 95% level of confidence.



## 5. EMISSION Test

### 5.1 Conducted Emissions

**Result:** **PASS**

The line-conducted facility is located inside a 2.6M x 3.6M x 7.0M shielded enclosure.

The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 604-05. A 1 m x 1.5 m wooden table 80 cm high is placed 40 cm. away from the vertical wall and 1.5 m away from the side wall of the shielded room. ROHDE & SCHWARZ Model ESH3-Z5 (10 kHz-30 MHz) 50 ohm/50 uH Line-Impedance Stabilization Networks(LISNs) are bonded to the shielded room.

The EUT is powered from the ROHDE & SCHWARZ LISN and the support equipment is powered from the ROHDE & SCHWARZ LISN. Power to the LISNs are filtered by a high-current high-insertion loss Lindgren enclosures power line filters (100dB 14 kHz-10 GHz).

The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure.

All electrical cables are shielded by braided tinned copper zipper tubing with inner diameter of 1/2". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the ROHDE & SCHWARZ LISN.

All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter 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 to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150 kHz to 30 MHz with 100msec. sweep time.

The frequency producing the maximum level was reexamined using EMI/field Intensity Meter (ESHS 10) and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak mode.

The bandwidth of the receiver was set to 10 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.

Each emission was maximized by: switching power lines; varying the mode of operation or resolution;clock or data exchange speed; if applicable; whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in photograph of conducted test.

Each EME reported was calibrated using self-calibrating mode.

**Table 2: Test Data, Conducted Disturbance****<Quasi-Peak>**

Frequency (MHz)	Reading (dBuV)	Line	C/F (dB)	C/L (dB)	Actual (dBuV)	Limit (dBuV)	Margin (dB)
0.400	42.63	L	0.13	0.01	42.77	57.85	15.08
1.070	32.99	L	0.15	0.07	33.21	56.00	22.79
4.250	36.43	L	0.24	0.16	36.83	56.00	19.17
4.750	36.01	L	0.24	0.16	36.41	56.00	19.59
7.755	40.53	L	0.34	0.19	41.06	60.00	18.94
8.300	39.42	L	0.41	0.22	40.05	60.00	19.95

**<Average>**

Frequency (MHz)	Reading (dBuV)	Line	C/F (dB)	C/L (dB)	Actual (dBuV)	Limit (dBuV)	Margin (dB)
0.400	32.32	L	0.13	0.04	32.49	47.85	15.36
1.070	23.43	L	0.15	0.07	23.65	46.00	22.35
4.250	27.66	L	0.24	0.16	28.06	46.00	17.94
4.750	27.30	L	0.24	0.16	27.70	46.00	18.30
7.755	31.29	L	0.34	0.19	31.82	50.00	18.18
8.300	30.80	L	0.41	0.32	31.53	50.00	18.47

**► NOTE**

\* C/F = Correction Factor

\* C/L = Cable Loss

\* LINE : L = Line-PE, N = Neutral-PE

\* Margin Calculation

Margin(Q.P) = Limit - Actual

[Actual(Q.P)= Reading(Q.P) + C/F + C/L]

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Page 12 of 15

**Figure 1: Spectral Diagram, LINE – PE**

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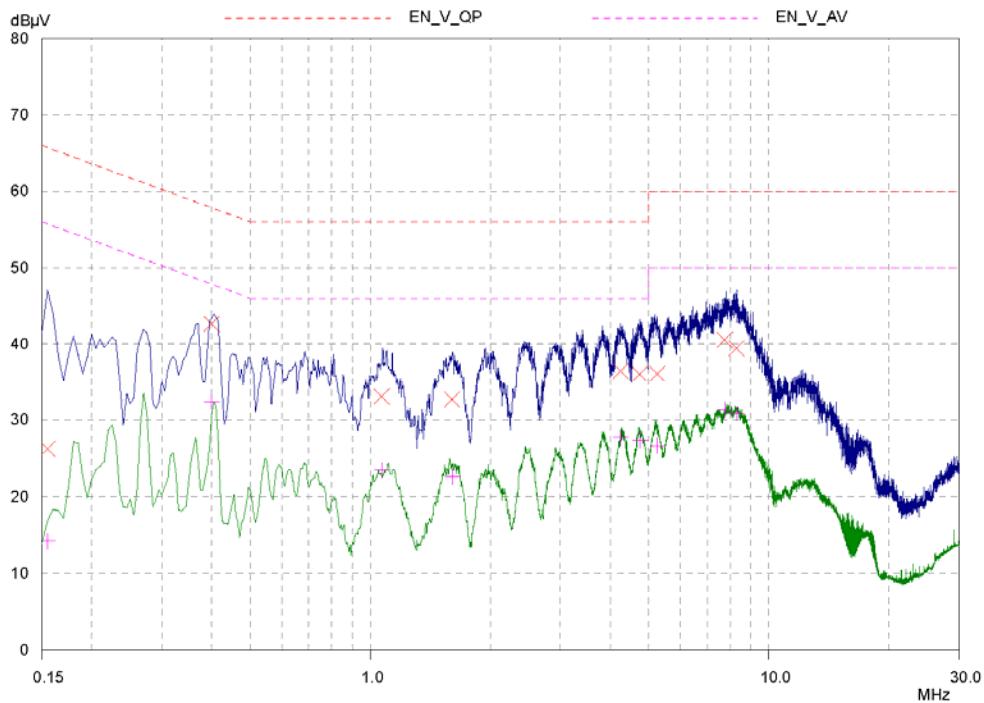
09 May 2006 14:53

**CONDUCTED DISTURBANCE**

EUT: CL850  
Manuf:  
Op Cond:  
Operator:  
Test Spec: FCC part 15 Subpart B  
Comment: LINE-PE

Scan Settings		(1 Range)			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge		
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB		

Final Measurement: Detectors: X QP / + AV  
Meas Time: 1sec  
Peaks: 8  
Acc Margin: 35 dB



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Page 13 of 15

**Figure 2: Spectral Diagram, NEUTRAL – PE**

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CONDUCTED DISTURBANCE

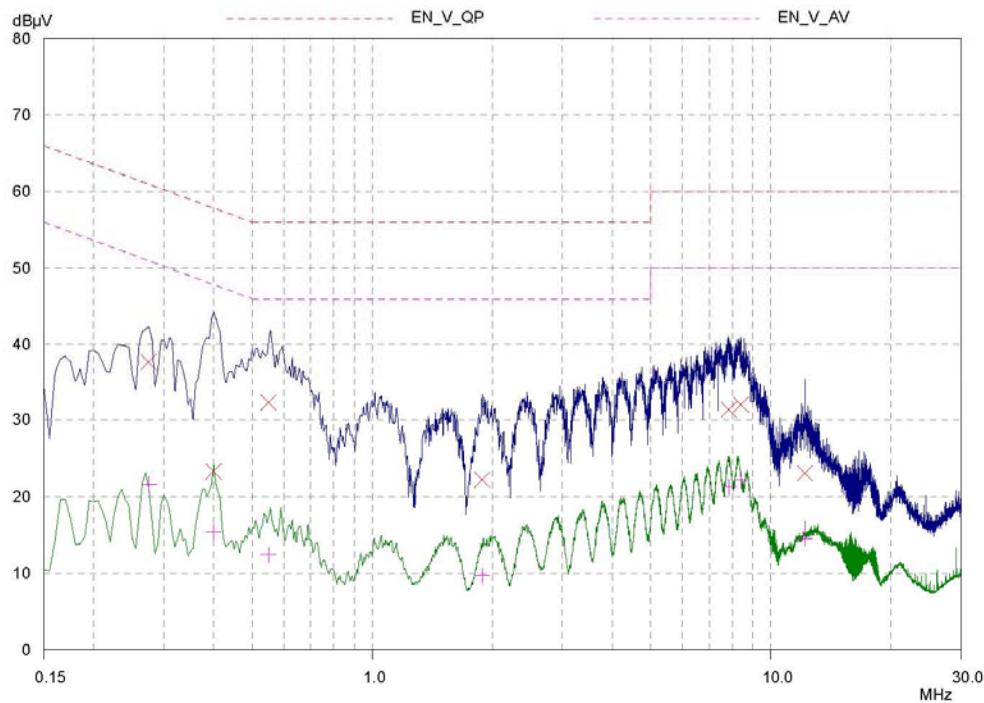
09 May 2006 15:11

EUT: CL850  
Manuf:  
Op Cond:  
Operator:  
Test Spec: FCC part 15 Subpart B  
Comment: NEUTRAL-PE

Result File: 1.dat : New Measurement

Scan Settings (1 Range)		Receiver Settings						
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	20msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV  
Meas Time: 1sec  
Peaks: 8  
Acc Margin: 35 dB





## 5.2 Radiated Emissions

**Result :****PASS**

Preliminary measurements were made indoors at 3 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME.

Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found.

The spectrum was scanned from 30 to 300 MHz using biconical antenna and from 300 to 1000 MHz using log-periodic antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using SCHWARZBECK dipole antennas.

The test equipment was placed on a wooden table situated on a 4x4 meter area adjacent to the measurement area. Turntable was to protect from weather in the dome that made with FRP.

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 pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter(ESVS 10) and Quasi-Peak Adapter.

The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100 kHz or 1 MHz depending on the frequency or type of signal.

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non- metallic 1 x 1.5 meter table.

The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed, and/or support equipment, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in photograph of radiated emission test.

Each EME reported was calibrated using self-calibrating mode.



Table 3 : Test Data, Radiated Emissions

Frequency [MHz]	Pol.	Height [m]	Real Reading	Correction Factor		T-Fact [dB]	Data [dBuV/m]	Limits [dBuV/m]	Margin [dB]
				Antenna	Cable				
335.99	H	1.0	20.2	16.8	1.6	18.4	38.6	46.0	7.4
384.02	H	1.0	15.8	17.9	1.7	19.6	35.4	46.0	10.6
432.02	H	1.0	22.3	17.6	1.8	19.4	41.7	46.0	4.3
528.02	H	1.0	15.4	19.5	2.0	21.5	36.9	46.0	9.1
576.01	V	1.0	21.9	20.6	2.1	22.7	44.6	46.0	1.4

Table. Radiated Measurements at 3-meters.

#### NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emission are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR Quasi-Peak mode.
5. H = Horizontal, V = Vertical Polarization
6. Data = Real Reading + T - Fact(Antenna+Cable)
7. Margin = Limits - Data