

EMC TEST REPORT

Project No.	LBE20122291	Issue No.	1
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	416, Maetan 3-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	April 17, 2012	
EUT	Type of device	Class B personal computers and peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSHVE210L	
	Kind of product	Mobile Phone	
	Model No.	SHV-E210L	
	Variant Model No.	Refer to clause 3.5	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD. 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea TIANJIN SAMSUNG TELECOM TECHNOLOGY CO., LTD. 300385 China Tianjin No.9, WeiWu Rd., Micro Electronic Industrial Park, Xiqing Dist, Tianjin, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2003	
Test Period		April 17, 2012 ~ April 25, 2012	
Issue date		April 25, 2012	

Test result : Complied

The equipment under test has found to be compliant with the applied standards.
(Refer to the attached test result for more detail.)

Tested by : Jong-Sup Jeong



Reviewed by : Tae-Young Jang



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1. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result	Remarks
☒	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2003	Complied	Meets Class B Limit
☒	Radiated Disturbance		Complied	Meets Class B Limit

2. General Information

2.1 Test facility

The CS & Environment center is located on Samsung Electronics Co., Ltd. at 416, Maetan 3-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea.

All testing are performed in Semi-anechoic chambers conforming to the site attenuation Characteristics defined by ANSI C63.4, CISPR 22, 16-1 and 16-2. and Shielded rooms.

The CS & Environment center is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

3. Test Setup configuration

3.1 Test Peripherals

The cables used for these peripherals are either permanently attached by the peripheral manufacturer or coupled with an assigned cable as defined below.

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Description	Model No.	Serial No.	Manufacturer/ Trademark	FCC ID / DoC
Mobile Phone	SHV-E210L	-	SAMSUNG	A3LSHVE210L
Battery	EB-L1H2LLK	NAbC414AS/2-B	SAMSUNG	-
Headset	EHS64AVFWE	-	SAMSUNG	-
Data Cable	ECC1DU4BBE	-	SAMSUNG	-
microSD Card	2GB	-	SANDISK	-
Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
TV Monitor	UN22C4000	ZOBY31KZ700003F	SAMSUNG	DoC
Mouse	N3+Optical	K034729902	HP	DoC
Keyboard	SDM8500P	8M000131	SAMSUNG	DoC
Gigabit Switch 8	3CGSU08	AB/9XRQAC0024825	3COM	DoC
Power Supply	PW150	KA1203N03	AULT	DoC

3.2 EUT operating mode

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating Mode 1	USB Mode (Data Communication)
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3.3 Details of Sampling

Customer selected, single unit.

3.4 Used cable description

The EUT is configured, installed, arranged and operated in a manner consistent with typical applications. Interface cables/loads/devices are connected to at least one of each type of interface port of the EUT, and where practical, each cable shall be terminated in a device typical of actual usage. The type(s) of interconnecting cables to be used and the interface port (of the EUT) to which these were connected;

Connected cable	Length [m]	Shielded [Y/N]	Note
Data Cable	1.0	Yes	From EUT to Desk-Top Computer
Headset	1.3	No	For EUT
Power	1.8	No	For Desk-Top Computer
Power	1.8	No	For TV Monitor
Power	1.8	No	For Power Supply
Power	1.8	No	From Gigabit Switch 8 to Power Supply
LAN	1.5	No	From Desk-Top Computer to Gigabit Switch 8
LAN	1.5	No	From Desk-Top Computer to Local Area Network
RGB	1.8	Yes	From Desk-Top Computer to TV Monitor
PS/2	1.8	Yes	From Desk-Top Computer to Mouse
PS/2	1.8	Yes	From Desk-Top Computer to Keyboard

3.5 EUT Description

1. The following features describe EUT represented by this report:

Item	Specification	
Frequency Range	GSM1900	TX : 1 850 ~ 1 910 MHz RX : 1 930 ~ 1 990 MHz
Operating Temperature (°C)	-20 ~ +50	
Operating Humidity (%)	0 ~ 95	

2. The variant models

- None

3.6 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	1 400
USB 2.0	24

3.7 Test configuration and condition

The EUT was exercised during the testing by data read and write cycles repeated with internal storage devices. At the end of the test, the copied back data was compared with original.

The system was configured for testing in a typical fashion that a customer would normally use, and was tested while in an automated non-attendant mode.

Power source for the EUT operating was supplied by CVCF made by the Pacific Power Source Corp.

- Test Voltage : AC 120 V, 60 Hz

3.8 Measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus: (According to CISPR 16-4 and UKAS Lab 34.)

3.8.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	AC Mains	± 3.03 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	± 4.61 dB
	Vertical	± 4.60 dB
Radiated Disturbance (1 GHz ~ 6 GHz)		± 4.09 dB

4. Results of individual test

4.1 Conducted disturbance

Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration. The EUT measured in accordance with the methods described in standards.

Limits for conducted disturbance at the mains ports

Frequency range Limits MHz	Resolution Bandwidth	Limits dB(μV)	
		Quasi-peak	Average
0,15 to 0,50	9 kHz	66 to 56	56 to 46
0,50 to 5	9 kHz	56	46
5 to 30	9 kHz	60	50

4.1.1 Test instrumentation

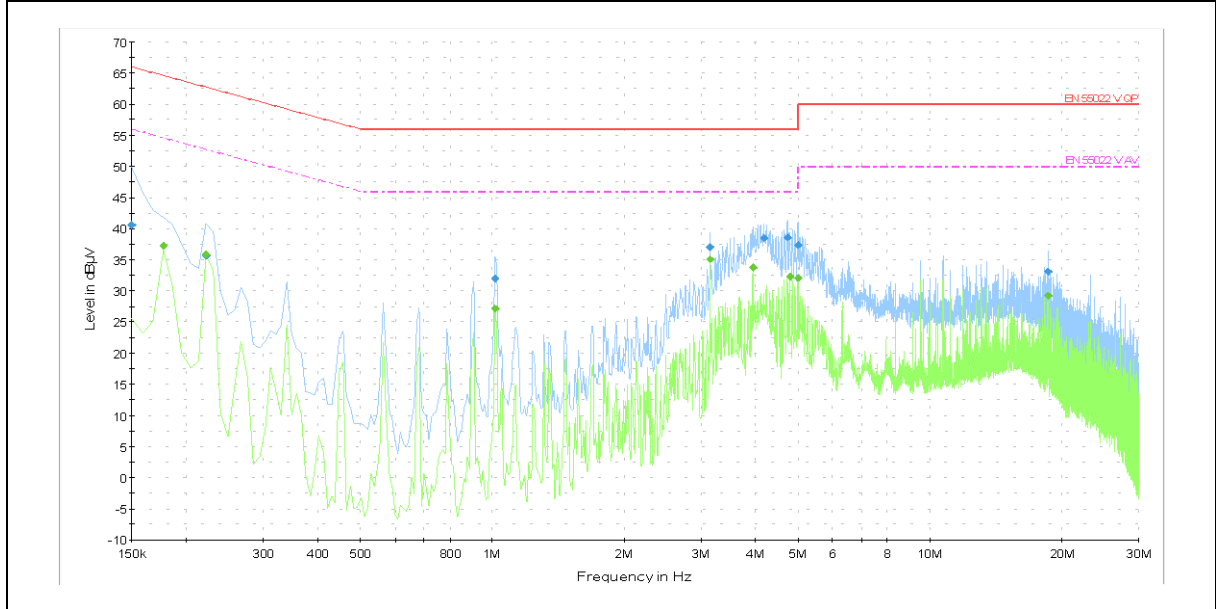
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E4I-093	Test Receiver	ESCI	R&S	100086	2011-11-11	12
E3I-050	LISN	ESH3-Z5	R&S	100263	2011-10-12	12
E3I-259	LISN	ENV216	R&S	101369	2011-10-11	12

4.1.2 Temperature and humidity condition

Test date	2012-04-17	Test engineer	Jong-Sup Jeong
Climate condition	Ambient temperature	23.7 °C	Limit (15.0 to 35.0) °C
	Relative humidity	43.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.4 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

4.1.3 Test results

- Operating Mode 1: AC Mains



Note 1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Quasi-peak final measurement results table:

Frequency (MHz)	Level (dBμV)	Corr. (dB)	Limit (dBμV)	Margin (dB)	Line
0.150	40.6	9.9	66.0	25.4	L1
0.222	35.6	10.0	62.7	27.1	L1
1.014	32.0	9.9	56.0	24.0	L1
3.147	37.1	9.7	56.0	18.9	N
4.182	38.4	9.8	56.0	17.6	N
4.722	38.6	9.8	56.0	17.4	L1
4.992	37.4	9.8	56.0	18.6	L1
18.618	33.1	10.0	60.0	26.9	N

Average final measurement results table:

Frequency (MHz)	Level (dBμV)	Corr. (dB)	Limit (dBμV)	Margin (dB)	Line
0.177	37.2	10.2	54.6	17.4	N
0.222	35.8	10.0	52.7	16.9	L1
1.014	27.2	9.9	46.0	18.8	L1
3.147	35.1	9.7	46.0	10.9	N
3.939	33.7	9.8	46.0	12.3	N
4.785	32.3	9.8	46.0	13.7	L1
4.992	32.1	9.8	46.0	13.9	L1
18.636	29.2	9.8	50.0	20.8	L1

Note 2) Level (QP and/or AV) = Meter Reading (QP and/or AV) + Corr. (LISN Insertion Loss + Cable Loss)
 Margin (QP and/or AV) = Limit – Level (QP and/or AV)
 QP = Quasi-Peak, AV = Average

4.2 Radiated disturbance

Of those disturbances above ($L - 20\text{dB}$), where L is the limit level in logarithmic units, record at least the disturbance levels and the frequencies of the six highest disturbances.

The following data lists the significant emission frequencies, measured levels, correction factors (for antenna and cables), orientation of table, polarization and height of antenna, the corrected reading, the limit, and the amount of margin.

Peak measurements were made over the changeable frequency range 30 MHz to 1 GHz at a measurement distance of 10 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	RBW	VBW	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	120 kHz	300 kHz	Continuous

Measurements within 20 dB of the limit were then maximized by adjusting turntable position.

Final measurements were made using quasi-peak detectors.

Peak/Average measurements were made over the changeable frequency range 1 GHz to 40 GHz or 5th harmonics of the highest frequency in accordance with internal maximum operating frequency at a measurement distance of 3 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	RBW	VBW	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	1 MHz (PK / AV)	3 MHz (PK) 10 Hz (AV)	Continuous

Measurements within 20 dB of the limit were then maximized by adjusting turntable position.

Final measurements were made using peak and average detectors.

Limits for radiated disturbance of ITE at a measuring distance of 3 m and 10 m

Frequency range Limits [MHz]	Field Strength		
	$\mu\text{V/m}$	$\text{dB}(\mu\text{V/m})$	$\text{dB}(\mu\text{V/m})$
30 to 88	100	40.0	29.5
88 to 216	150	43.5	33.0
216 to 960	200	46.0	35.5
Above 960	500	54.0	43.5

Results checked manually; and points close to the limit line were re-measured.

4.2.1 Test instrumentation

EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-130	BILOG Antenna	CBL6112D	TESEQ	25513	2010-11-12	24
E3I-142	EMI Test Receiver	ESI-26	R&S	100019	2011-06-16	12
E3I-170	Horn Antenna	HF906	R&S	100028	2010-10-04	24
E3I-175	Preamplifier	310N	Sonoma	273121	2011-12-06	12
E3I-231	Horn Antenna	3115	ETS Lindgren	00101620	2012-01-12	24
E3I-257	EMI Test Receiver	ESU26	R&S	100364	2011-10-24	12

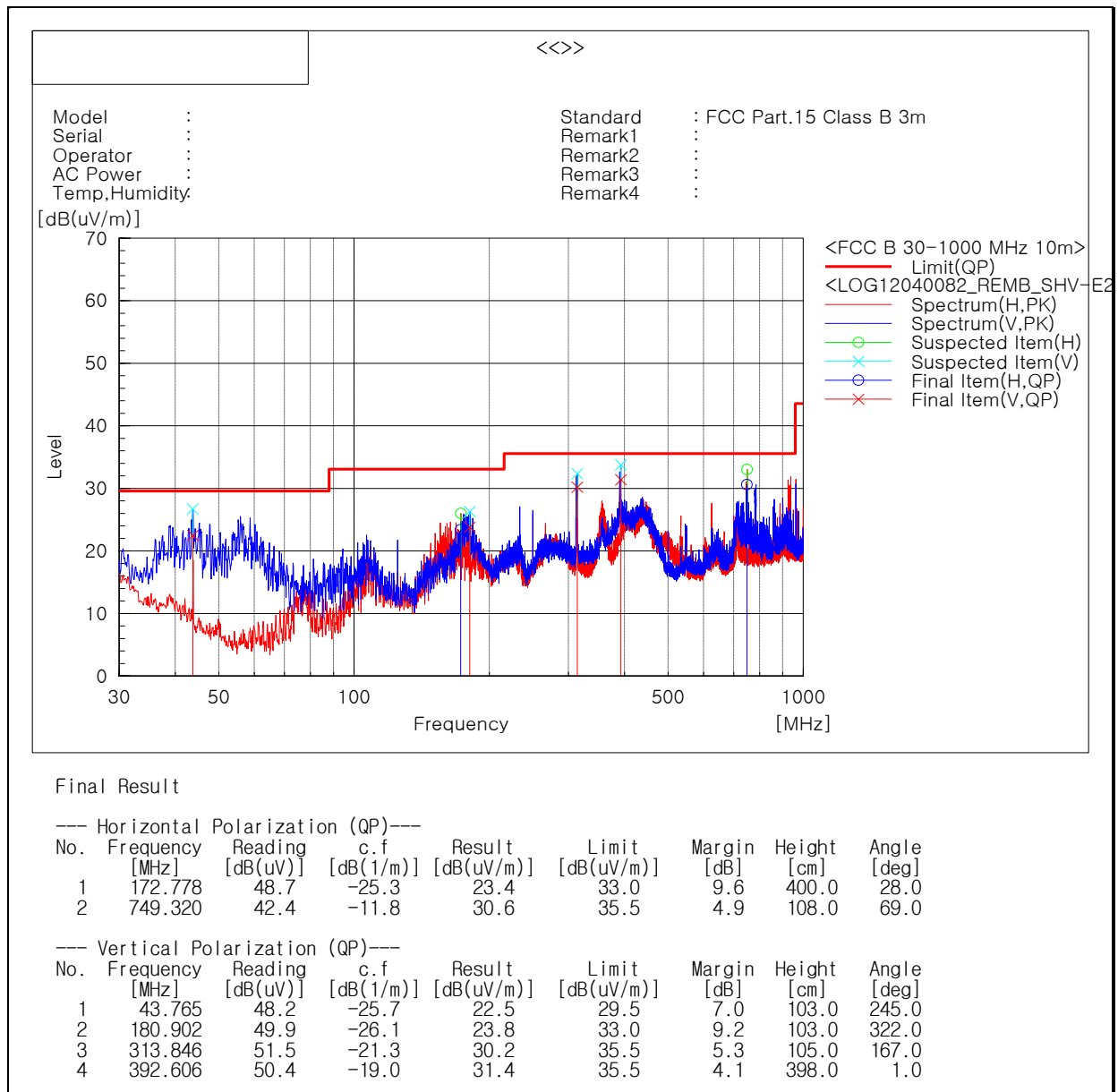
4.2.2 Temperature and humidity condition

Test date	2012-04-18 / 2012-04-25	Test engineer	Jong-Sup Jeong
Climate condition	Ambient temperature	23.2 °C / 23.9 °C	Limit (15.0 to 35.0) °C
	Relative humidity	37.0 % R.H. / 44.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.9 kPa / 101.1 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4 / SAC7)		

4.2.3 Test results

□ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



Note) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 10 m, Antenna Height : 1 to 4 meters

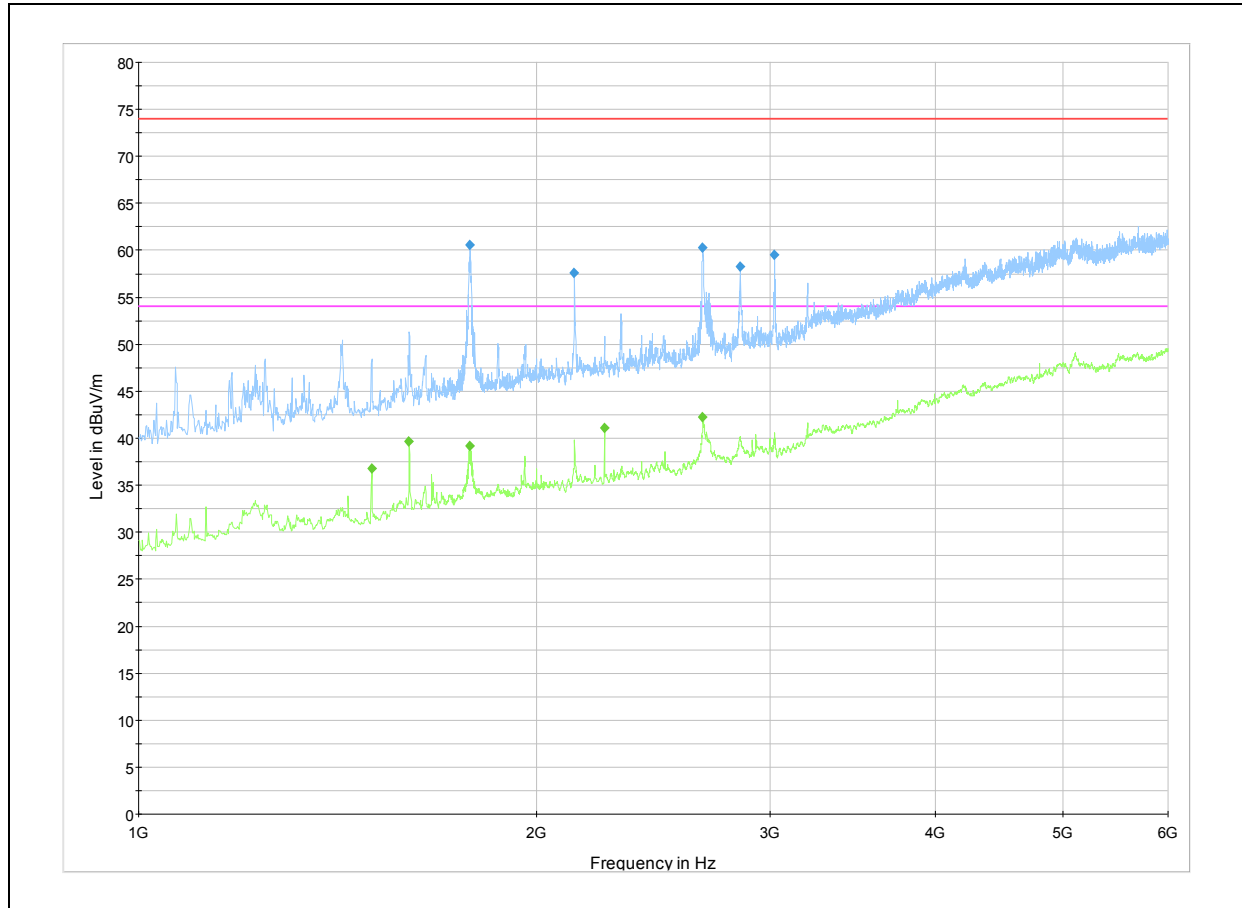
Level (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)

Margin (QP) = Limit - Level (QP)

QP = Quasi-Peak

☐ Operating Mode 1

- Frequency range: 1 000 ~ 6 000 MHz


MEASUREMENT RESULT (Peak):

Frequency MHz	Level dBuV/m	Polarisation	Azimuth deg	Corr. dB	Margin dB	Limit dBuV/m
1 779.960	60.5	V	45	3.0	13.5	74.0
2 136.273	57.6	V	45	5.2	16.4	74.0
2 669.339	60.3	H	45	7.7	13.7	74.0
2 848.697	58.2	V	0	9.0	15.8	74.0
3 026.052	59.4	V	180	9.1	14.6	74.0

MEASUREMENT RESULT (Average):

Frequency MHz	Level dBuV/m	Polarisation	Azimuth deg	Corr. dB	Margin dB	Limit dBuV/m
1 500.802	36.8	V	45	1.6	17.2	54.0
1 601.804	39.6	V	315	2.2	14.4	54.0
1 781.764	39.1	V	45	3.0	14.9	54.0
2 249.499	41.1	V	45	5.6	12.9	54.0
2 669.339	42.3	H	45	7.7	11.7	54.0

Note 1) There were no emissions from 6 GHz to 7 GHz.

Note 2) Receiving antenna polarization : Horizontal (H), Vertical (V)

Test Distance : 3 m, Antenna Height : 1 to 4 meters

Level (PK and/or AV) = Reading (PK and/or AV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)

Margin (PK and/or AV) = Limit – Level (PK and/or AV)

PK = Peak, AV = Average