

EMC TEST REPORT

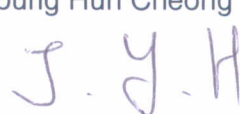
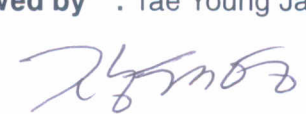
Project No.	LBE20153135	Issue No.	0
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	May 8, 2015	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMG531M	
	Kind of product	Mobile Phone	
	Model No.	SM-G531M/DS	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD. 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea SEDA-C(Samsung Electronica Da Amazonia Ltda. (Campinas)) CEP13097-105, R. Thomas Nilsen Junior, 150 Pq. Imperador, Campinas, SP, Brazil SEDA-M(Samsung Eletrônica da Amazônia Ltda (Manaus)) AV. DOS OITIS, 1460 - DISTRITO INDUSTRIAL CEP 69076-842 - MANAUS-AM	
Applied Standards		47 CFR Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		May 22, 2015 ~ May 29, 2015	
Issue date		June 3, 2015	
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 : Young Hun Cheong 		Reviewed by : Tae Young Jang 	
The test results in this report only apply to the tested sample. This report must not be reproduced, except in full, without written permission from CS & Environment center.			
 CS & Environment Center of Samsung Electronics Co., Ltd. (Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-so, 443-742, Republic of Korea			

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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	There are no revisions and this version is basic test report.

2. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result
☒	Conducted Disturbance (Mains port)	47 CFR Part 15, Subpart B / ANSI C63.4-2009 (Class B)	Complied
☒	Radiated Disturbance		Complied

3. General Information

3.1 Test facility

The CS & Environment center is located on Samsung Electronics Co., Ltd. at (Maetan dong) 129, Samsung-ro, 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.

4. Test Setup configuration

4.1 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:

Mark	Description	Model No.	Serial No.	Manufacturer / Trademark	FCC ID / DoC
A	Mobile Phone	SM-G531M/DS	R38G411Z64D	SAMSUNG	A3LSMG531M
B	Battery	EB-BG530CBB	AAbG506WS/2-B	SAMSUNG	-
C	Headset	EHS61ASFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU68WE	-	SAMSUNG	-
E	Micro SD Card	32GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD Monitor	U2713HMT	CN-0GK0KD-74445-332-106L	Dell	DoC
H	Mouse	M-SBF96	LZ949BG0D9Y	Logitech	DoC
I	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
J	Router	H3008	10070100009	EFM Networks	DoC
K	Power Supply	HB12B-050200SPA	HBK520201025	Shen Zhen	DoC

4.2 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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4.3 Details of Sampling

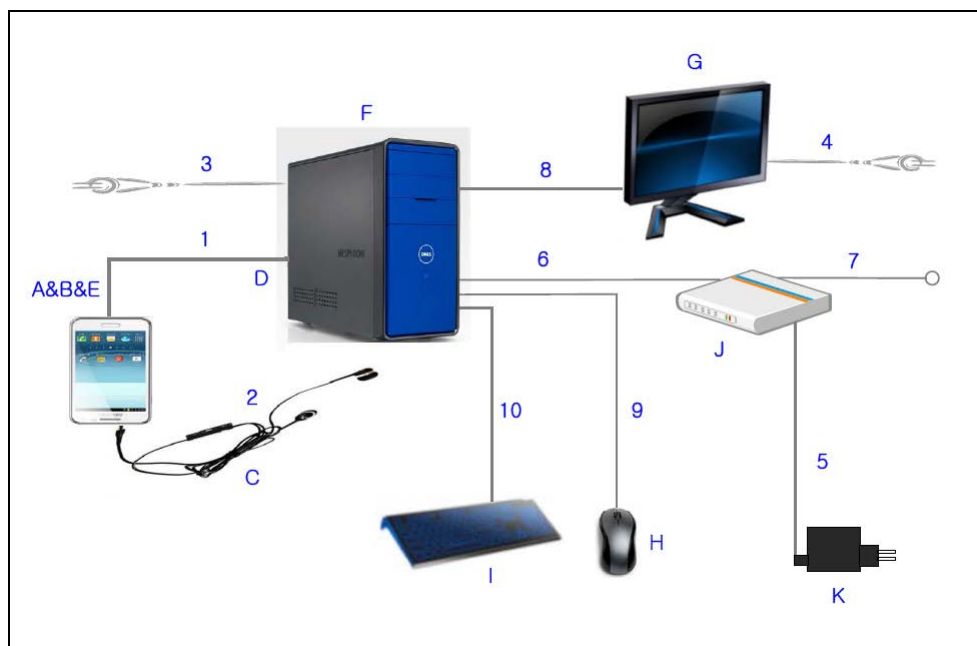
Customer selected, single unit.

4.4 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:

No.	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Data Cable	1.0	Yes	From EUT to Desk-Top Computer
2	Headset	1.2	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD Monitor
5	Power	1.8	No	From Router to Power Supply
6	LAN	1.5	No	From Desk-Top Computer to Router
7	LAN	1.5	No	From Router to Local Area Network
8	RGB	1.8	Yes	From Desk-Top Computer to LCD Monitor
9	PS/2	1.8	Yes	From Desk-Top Computer to Mouse
10	PS/2	1.8	Yes	From Desk-Top Computer to Keyboard

4.5 Test arrangement



4.6 EUT Description

The EUT is a bar type Mobile Phone which can operate on GSM850/900/1800/1900, WCDMA FDD1/2/4/5/8, LTE FDD 1/2/3/4/5/7/17/28 bands and incorporates a camera, Bluetooth, Wi-Fi, FM radio, GPS and MP3/MP4 player.

4.6.2 The variant models

- SM-G531M

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	1 200

4.8 Test configuration and condition

- ☐ The EUT exercise program which is the samsung standardized emission test program for Windows was used during all EMC measurements were tested. This program was contained on the PC hard disk drive. Once loaded, the program sequentially exercises each system component in turn.
- ☒ 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 EUT was connected to the PC by using USB data cable to charge.
- ☐ 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

4.9 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.)

4.9.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	AC Mains	3.16 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.90 dB
	Vertical	4.66 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.45 dB
	Vertical	5.43 dB

5. Results of individual test

5.1 Conducted disturbance

The EUT was connected to the Desk-Top Computer which was powered from one LISN for the measurements. The support equipment power cables were connected to a second LISN.

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 of Class B ITE

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

NOTE 1 The lower limit shall apply at the transition frequency.
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.1.1 Test instrumentation

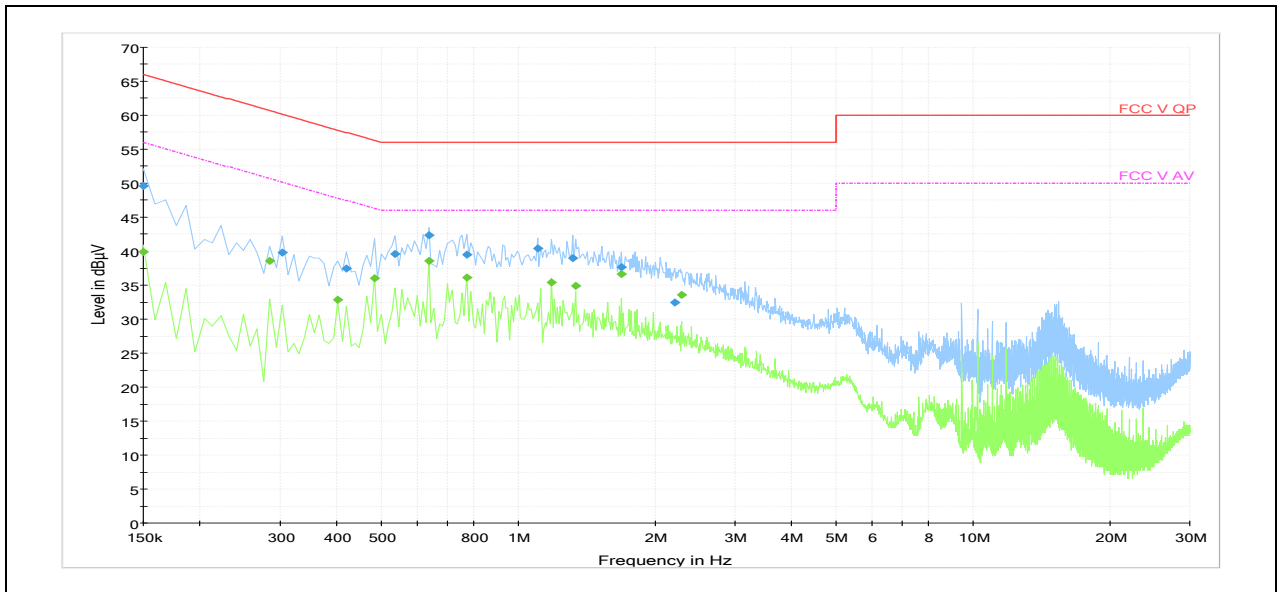
Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
				Date	Interval (Month)
EMI Test Receiver	ESIB-26	R&S	100291	2014-11-26	12
Two-Line V-Network	ENV216	R&S	101369	2014-11-17	12
Two-Line V-Network	ENV216	R&S	101366	2014-07-24	12

5.1.2 Temperature and humidity condition

Test date	2015-05-29	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	22.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	40.8 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.3 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

5.1.3 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.

Test Results (Quasi-Peak and CAV)

Quasi-peak final measurement results table

Frequency [MHz]	Quasi-Peak [dBμV]	Line	Factor [dB]	Margin [dB]	Limit [dBμV]
0.150	49.6	N	9.9	16.5	66.0
0.420	37.4	N	9.9	20.0	57.4
0.537	39.6	N	9.9	16.4	56.0
0.636	42.4	N	9.9	13.6	56.0
0.771	39.5	L1	9.9	16.5	56.0
1.104	40.5	L1	9.8	15.5	56.0
1.320	39.0	N	9.8	17.0	56.0
1.689	37.7	L1	9.7	18.3	56.0

CAV final measurement results table

Frequency [MHz]	CAV [dBμV]	Line	Factor [dB]	Margin [dB]	Limit [dBμV]
0.285	38.6	N	9.7	12.1	50.7
0.402	32.9	L1	9.9	14.9	47.8
0.483	36.0	N	9.9	10.3	46.3
0.636	38.6	L1	9.9	7.4	46.0
0.771	36.1	N	9.9	9.9	46.0
1.185	35.4	N	9.8	10.6	46.0
1.338	34.9	N	9.8	11.1	46.0
1.689	36.6	L1	9.7	9.4	46.0

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

5.2 Radiated disturbance

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	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	120	300	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using quasi-peak detectors.

Peak/CISPR-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	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	1	3	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and CISPR-average detectors.

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

Frequency range Limits [MHz]	Field Strength		
	3 m [$\mu\text{V/m}$]	3 m [$\text{dB}(\mu\text{V/m})$]	10 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.

5.2.1 Test instrumentation

Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
				Date	Interval (Month)
Preamplifier	317	SONOMA	282424	2014-11-10	12
Preamplifier	317	SONOMA	282425	2014-11-10	12
Preamplifier	ESV-Z3	R&S	815111	2015-04-16	12
BILOG Antenna	CBL6112D	TESEQ	25513	2013-08-01	24
BILOG Antenna	CBL6112B	Schaffner	2804	2014-06-05	24
Horn Antenna	HF906	R&S	100028	2014-10-20	24
EMI Test Receiver	ESU	R&S	100482	2015-03-06	12
EMI Test Receiver	ESU-08	R&S	100481	2014-11-26	12
EMI Test Receiver	ESIB-26	R&S	100287	2014-06-05	12

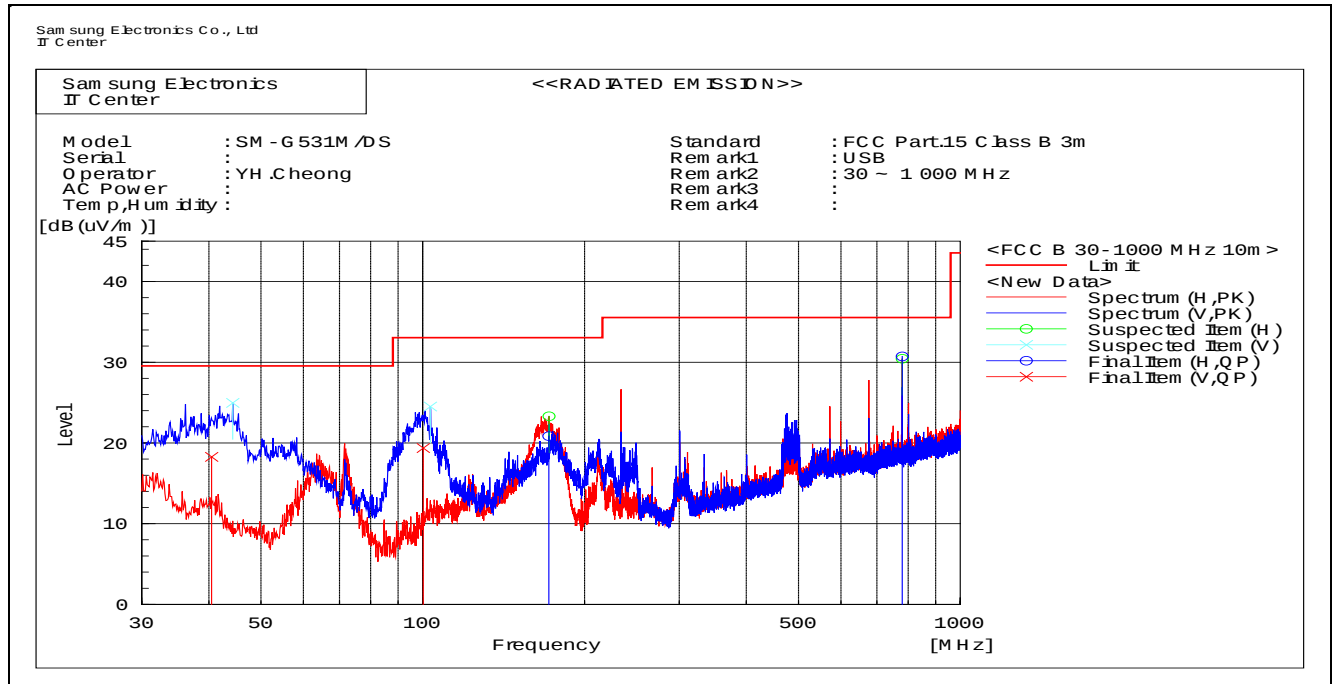
5.2.2 Temperature and humidity condition

Test date	2015-05-22 ~ 2015-05-27	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	21.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	40.8 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3 Test results

□ Operating Mode 1

- Frequencies below 1 GHz



Frequency [MHz]	(P) ¹⁾	Reading QP ²⁾ [dB(μV)]	Factor ³⁾ [dB(1/m)]	Level QP ⁴⁾ [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP ⁵⁾ [dB]	Height [cm]	Angle [deg]
40.480	V	42.1	-23.8	18.3	29.5	11.2	103.0	322.0
100.252	V	44.6	-25.2	19.4	33.0	13.6	133.0	44.0
171.681	H	46.0	-25.2	20.8	33.0	12.2	396.0	201.0
780.010	H	41.7	-11.0	30.7	35.5	4.8	376.0	154.0

Note1) Receiving antenna polarization : Horizontal, Vertical

Note2) Test Distance : 10 m, Antenna Height : 1 to 4 meters

Note3) (P) : Abbreviation of Antenna Polarity

Note4) Reading QP : Received raw Quasi-peak signal

Note5) Factor = Antenna factor + Cable loss – Amplifier gain

Note6) Level QP = Reading QP + Factor, Real signal Quasi-peak level

Note7) Margin QP = Limit – Level QP

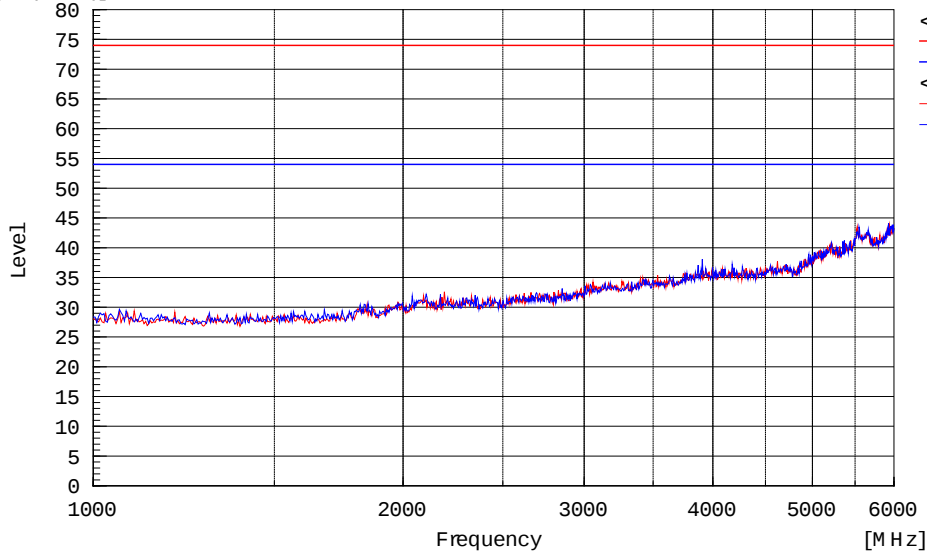
QP : Abbreviation of Quasi-peak

- Frequencies above 1 GHzSam sung Electronics Co., Ltd
IT CenterSam sung Electronics
IT Center

<<RADIATED EMISSION>>

Model : SM -G531M /DS
Serial :
Operator : YH .Cheong
AC Power :
Temp, Hum idity :Standard : FCC C lass B GHz 3m
Rem ark1 : USB
Rem ark2 : 1 ~ 6 GHz
Rem ark3 :
Rem ark4 :

[dB (uV/m)]

<FCC B GHz 3m>
Limit(PK)
Limit(AV)
<re_1~6GHz_USB_150526>
Spectrum (H,PK)
Spectrum (V,PK)