Underwriters Laboratories Inc.

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Project: 12CA37638
File: MC16222
Report: 12CA37638-FCC
Date: July 30, 2012
Model: AMM190WTD

Electromagnetic Compatibility Test Report

For

LED Color Medical Monitor

ADVAN INT'L CORP
47817 Fremont Blvd. Fremont CA 94538 U.S.A.

Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance 47 CFR Part 15.107 (a) / 47 CFR Part 15.109 (a) Class B.				
Test #	Test Name Test Requirement/Specification	Compliant	Not Compliant	See Remark
1	AC Power line Conducted Emission Test	X	-	-
2	Radiated Emission Test	X	-	-
***Note:** No modifications were made to the EUT in order to achieve and maintain compliance to the standards described in this report.				

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed as a witness testing and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

The equipment under test has

☐ Met the technical requirements

☒ Met the technical requirements under the limited condition

☐ Not met the technical requirements

Tested by
Hongsuk Oh, WiSE Associate Project Engineer
UL Verification Services – 3014ASEO
UL Korea Ltd.
July 30, 2012

Reviewed by
Sung Hoon Baek, WiSE Senior Project Engineer
UL Verification Services – 3014ASEO
UL Korea Ltd.
July 30, 2012

Test Report Details

Test report No:	12CA37638-FCC
File No:	MC16222
Witnessed By:	UL Korea Ltd. 33rd FL. GFC Bldg. 737 Yeoksam-dong, Kangnam-ku, Seoul, 135-984, Korea
Test Site:	Digital EMC Co., Ltd 683-3, Yuban-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea The test facility was deemed to have the environment and capabilities necessary to perform the tests included in the test package.
Applicant:	ADVAN INT'L CORP 47817 Fremont Blvd. Fremont, CA 94538, U.S.A.
Manufacturer:	ADVAN INT'L CORP 47817 Fremont Blvd. Fremont, CA 94538, U.S.A.
Factory:	D&T Inc. Daedeok Valley, 59-9, Jang Dong, Yuseong Gu, Daejeon, Korea, 305-343
Applicant Contact:	Jun Ho Jang
Phone:	82-70-7842-8018
E-mail:	andyjang@advancorp.com
Product Type:	LED COLOR MEDICAL MONITOR
Model Number:	AMM190WTD
FCC ID:	QVXAMM190WTD
Trademark:	N/A
Product standards:	FCC Part 15 Subpart B
Test Procedure:	ANSI C63.4 : 2009
Sample Serial Number:	N/A
Sample Receive Date:	July 06, 2012
Testing Start Date:	July 10, 2012
Date Testing Complete:	July 27, 2012
Test Report Date:	July 30, 2012
Overall Results:	**Pass**

UL Korea Ltd. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports.

REPORT DIRECTORY

1. GENERAL PRODUCT DESCRIPTION

1.1 Report Revision History:

Revision Date	Description	Remarks
July 30, 2012	Added the part of LED panel as an alternative.	-

1.2 Equipment Description:

Description:
Auto - Scanning with digital control LED color medical monitor

1.3 Details of Equipment Under Test (EUT):

Equipment Configuration:				
No.	Product Type	Manufacturer	Model	Comments
1	LED Color Medical Monitor	ADVAN INT'L CORP.	AMM190WTD	N/A
2	ADAPTER	BridgePower Corp.	JMW1100KB1800F01	
3	DC Extension Cable	-	CB-1501047004	5 ft
4	DC Extension Cable	-	CB-1501047005	15 ft
5	DC Extension Cable	-	CB-1501047006	75 ft
6	DVI-D cable	-	-	1 EA
7	HD15 VGA cable	-	-	1 EA
8	Hospital-grade AC power cord	-	-	1 EA
9	Composite Video BNC Jack Cable	-	-	1 EA
10	Super Video Cable	-	-	1 EA

1.4 Technical Data:

Item	Description
LED Panel	19 LED Panel
Resolution	1680 x 1050 @ 60Hz
Pixel Pitch	0.24mm
Input Signal (Analog & Digital)	DVI, HD15, SD/HD-SDI 1 and 2 , Component Y/G, Pb/B, Pr/R, H/CS, VS, C-Video and S-Video
Display Size	16.1 x 10.1 (409.5mm x 255.94mm)
Power Source	Display Monitor: DC 18V 6.67A
	AC-Adapter: AC100~240V 50/60Hz, 1.4~0.6A

1.5 EUT Internal Operating Frequency

Frequency (MHz)	Description	Frequency (MHz)	Description
324.0 MHz	Memory Clock	27.000 MHz	System Clock
119.8 MHz	Display Clock	28.322 MHz	System Clock

1.6 Technical descriptions and documents:

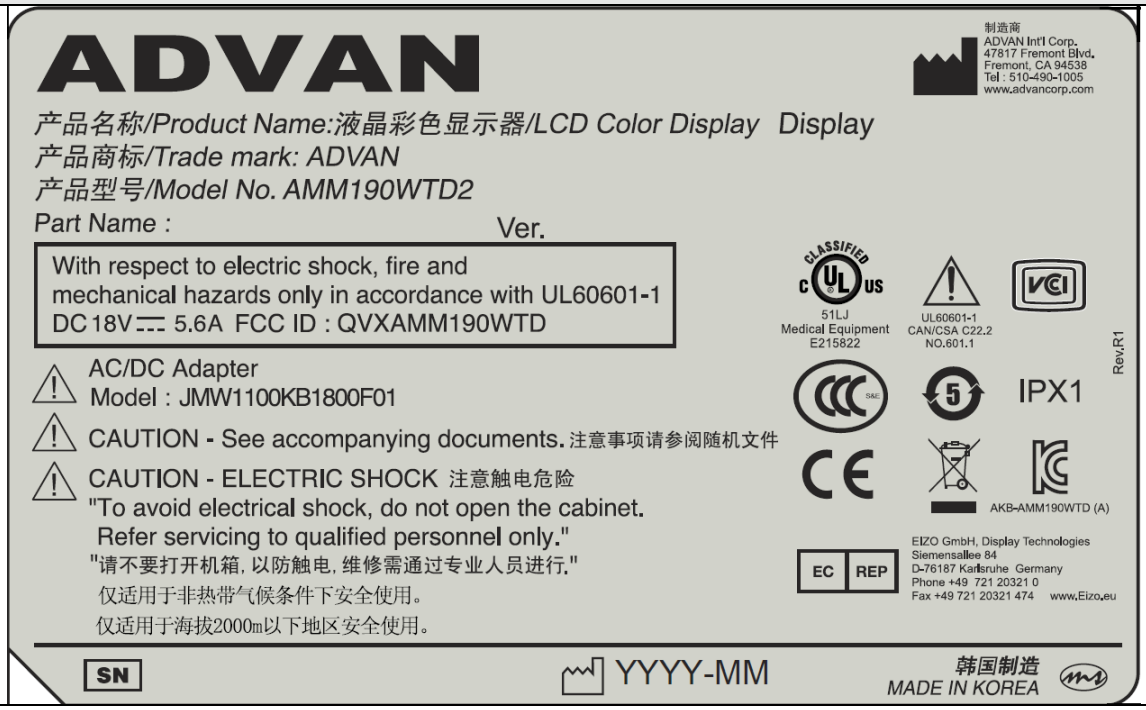
No.	Document Title and Description
1	AMM190WTD User Manual
***Note:** The manufacturer provided the following document.	

1.7 Detail information of Multi-listing model:

-	Model	Description	Comment
1	AMM190WTD2	Identical to AMM190WTD	No test
***Note:** The manufacturer has declared to all the multiple model names into the basic model without any further evaluation by UL.			

1.8 Equipment Marking Plate of Product:

Product Label



2. TEST CONDITION

2.1 Equipment Used During Test:

Use*	Product Type	Manufacturer	Model	Comments
EUT	LED Color Medical Monitor	ADVAN INT'L CORP.	AMM190WTD	-
EUT	ADAPTER	BridgePower Corp.	JMW1100KB1800F01	-
AE	PC	DELL	VOSTRO220	DVI, DSUB Source
AE	Mouse	MICROSOFT CORPORATION	1484	USB Mouse
AE	Keyboard	GP Electronics	GP-K4500	PS2
AE	Printer	BIGSlone	SRP-770	
AE	Adapter	BIGSlone	SRP-AD770	Connected with Printer
AE	HDMI to 3G SDI Scaler	Gefen	N/A	HD-SDI Source
AE	HDMI to 3G SDI Scaler Adapter	N/A	HK-H5-A05	Connected with HDMI to 3G SDI Scaler
***Note: EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, **SIM** - Simulator (Not Subjected to Test)				

2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
1	Mains	AC	1.8 m	Unshielded	Hospital-grade AC power cord
2	DVI In	I/O	1.8 m	Shielded	24 pin DVI-D
3	VGA In	I/O	1.8 m	Shielded	15 pin D-Sub
4	SDI In, Out	I/O	1.8 m	Shielded	BNC
5	S-Video In, Out	I/O	1.8 m	Shielded	S-Video
6	C-Video In, Out	I/O	1.8 m	Shielded	BNC
7	Component In, Out	I/O	1.8 m	Shielded	BNC
Note: *AC= AC Power Port, DC = DC Power Port, N/E = Non-Electrical, I/O= Signal Input or Output Port (Not Involved in Process Control), TP= Telecommunication Ports, * RS-232 port is used for service purpose only. No user interface port.					

2.3 Power Interface:

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Comments
Rated	100-240Vac	2.5A	-	50-60Hz	Rated of Power Supply
1	120Vac	-	-	60Hz	-

2.4 Test Operating Mode:

Mode #	Mode	Comments
1	DVI Mode	-
2	VGA Mode	Worst case condition
3	SDI In/Out Mode	Worst case condition
4	S-VIDEO In/Out Mode	-
5	C-Video In/Out Mode	-
6	Component In/Out Mode	-

*** Note:**
1. All the configuration described above has been investigated during the preliminary testing and selected two cases as worst-case condition for final measurements.
2. EUT have been performed under continuous displaying "H" Patten for configuration Modes of 1 to 2
3. EUT has been performed under continuous displaying "Color Bar" Patten for configuration Modes of 3 to 6.

2.5 Modes of Video Resolution:

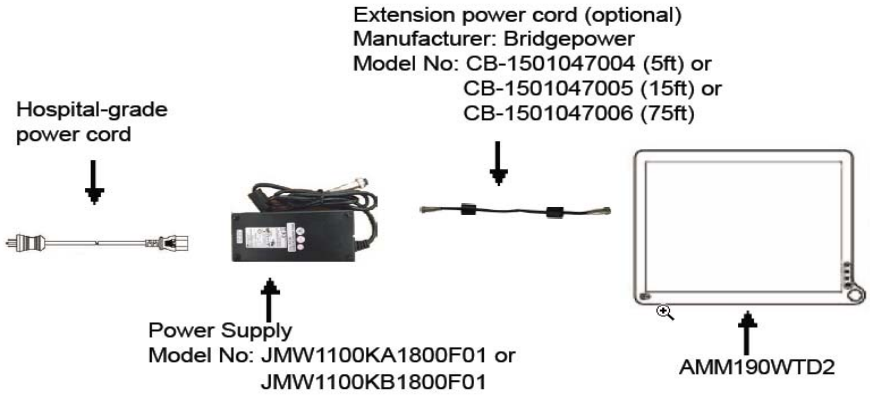
Mode #		Resolution	Comments
1	VGA Mode	800 * 600 @ 60Hz	-
2		1024 * 768 @ 60Hz	-
3		1680 * 1050 @ 60Hz	Worst case condition (Range of Brightness: 100, Range of contrast: 100 And range of backlight: 100.
4	SDI IN/OUT In/Out Mode	1080i	Worst case condition (Range of Brightness: 100, Range of contrast: 100 And range of backlight: 100.

*** Note:** Video resolution where it refers from above is representative worst case.

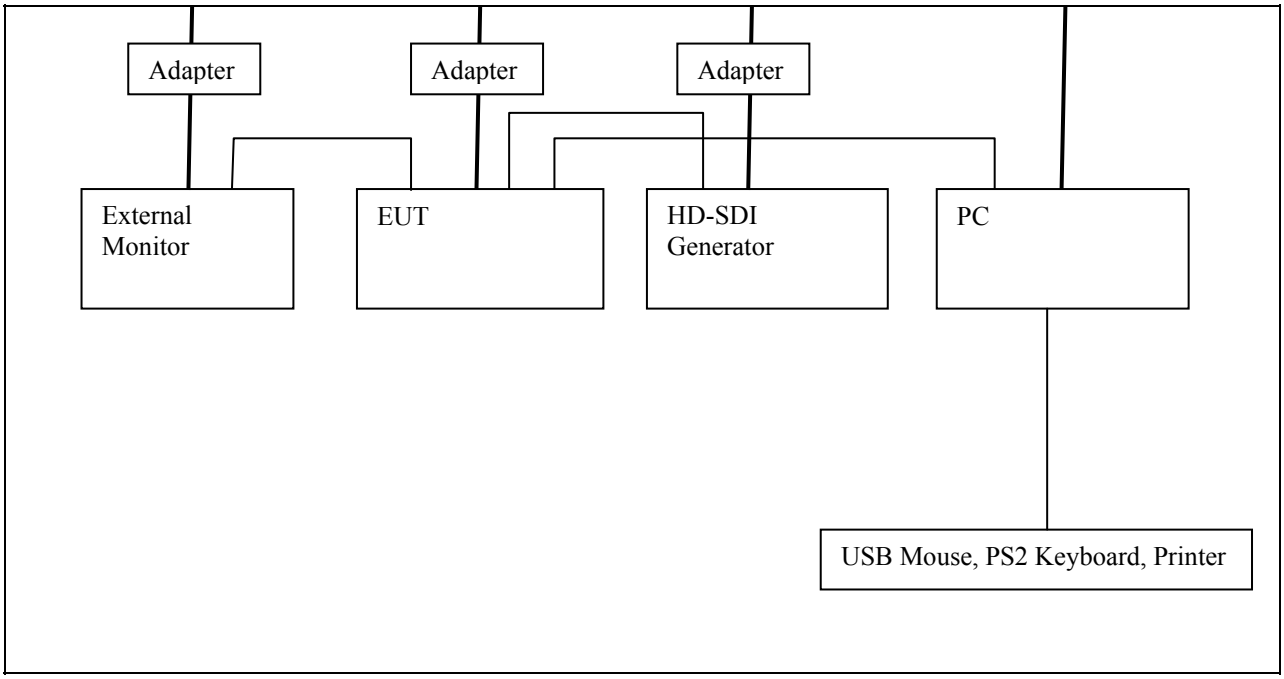
2.6 Used D.C. Extension Cable for Test:

No.	Cable Length	Preliminary Test	Comment
1	5ft	DVI, VGA, SDI, S-Video, C-Video, Component Mode.	-
2	15ft		-
3	75ft		Worst case condition

*** Note:** Radiated emission and conducted emission test were performed for all extension power cable during the preliminary testing and selected worst-case condition (75ft) for final measurements.



2.7 Test Configuration:



2.8 Result of Testing:

No	Test requirements	Standard	Results	Verdict
1	AC Power line Conducted Emission Test	47 CFR Part 15.107(a) / 47 CFR Part 15.109(a) Class B	Met limit Class B	**Complied**
2	Radiated Emission Test		Met limit Class B	**Complied**
*** Note:** This product has been tested in accordance with the measurement procedures specified 47 CFR Part 15.107 (a) / 47 CFR Part 15.109 (a) Class B at the Digital EMC Laboratory and the test results has been shown to be complied with the EMC requirements specified in the standard above.				

3. TEST CONDITION AND RESULTS

3.1 MAINS TERMINAL DISTURBANCE VOLTAGE TEST

TEST: Limits of mains terminal disturbance voltage					
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.				
Basic Standard	FCC Part 15				
Parameters recorded during the test	Laboratory Ambient Temperature	25 °C			
	Relative Humidity	46 %			
-	Frequency range on each side of line	Measurement Point			
Fully configured sample scanned over the following frequency range	150 kHz to 30 MHz	AC Input port of EUT			

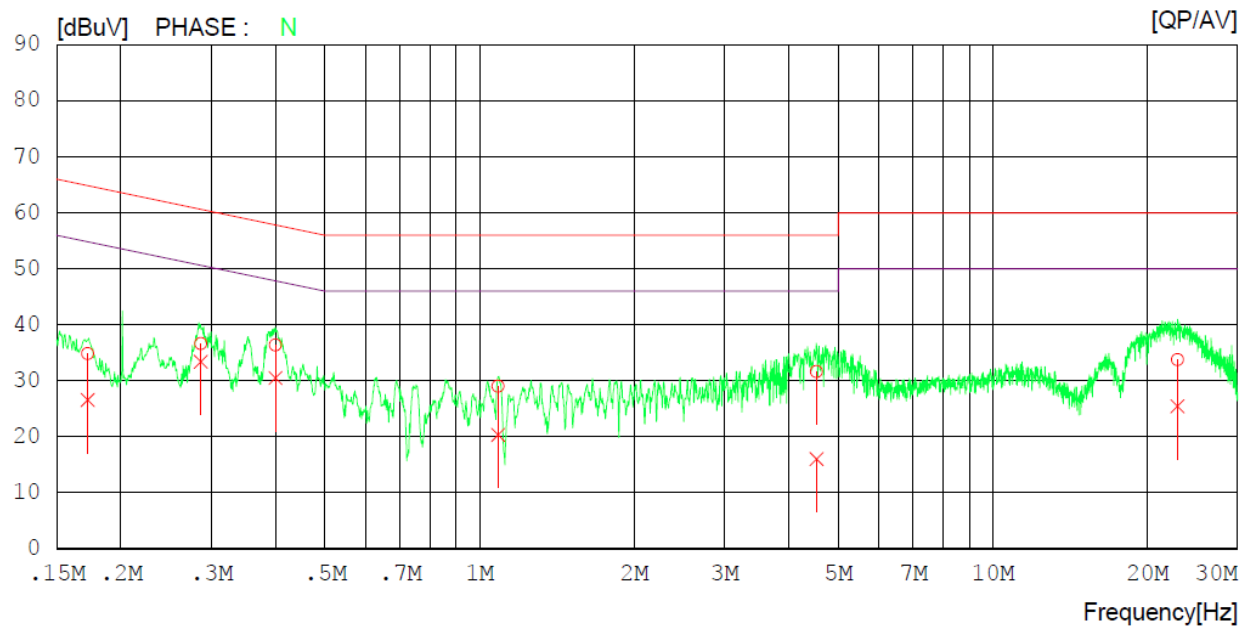
Limits - Class B				
Frequency (MHz)	Limit (dBμV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	66 to 56	**Pass**	56 to 46	**Pass**
0.50 to 5	56	**Pass**	46	**Pass**
5 to 30	60	**Pass**	50	**Pass**

EUT Configuration Settings:		
Power Interface Mode # (See Section 2.3)	EUT Operation Mode # (See 2.4)	EUT Configurations Mode # (See Section 2.7)
1	2, 3	1

Conducted Emissions Test Equipment used:					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESCI	100364	2012-03-06	2013-03-06
LISN (EUT)	R&S	ESH2-Z5	828739/006	2011-09-30	2012-09-30
LISN(Ancillary)	TTI	LISN1600	197204	2012-07-02	2013-07-02
50 Ohm terminator	TME	CT-01	N/A	2012-01-09	2013-01-09

Figure 1. Graphical representation of conducted emissions, DSUB Mode

Hot Line



Neutral Line

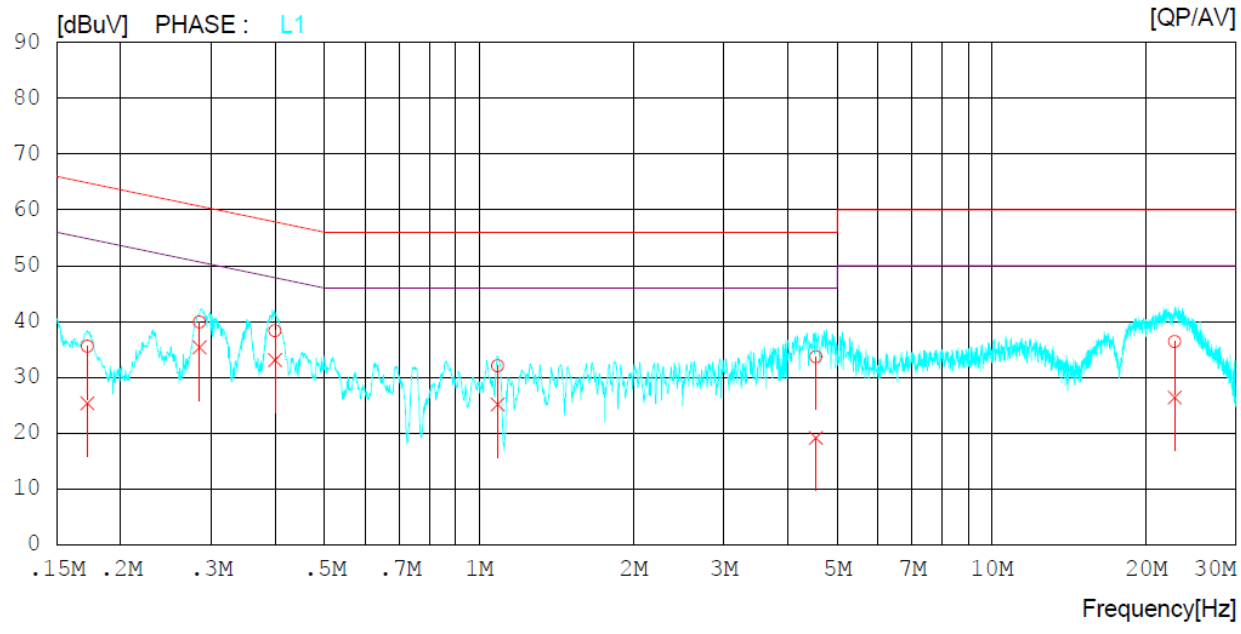
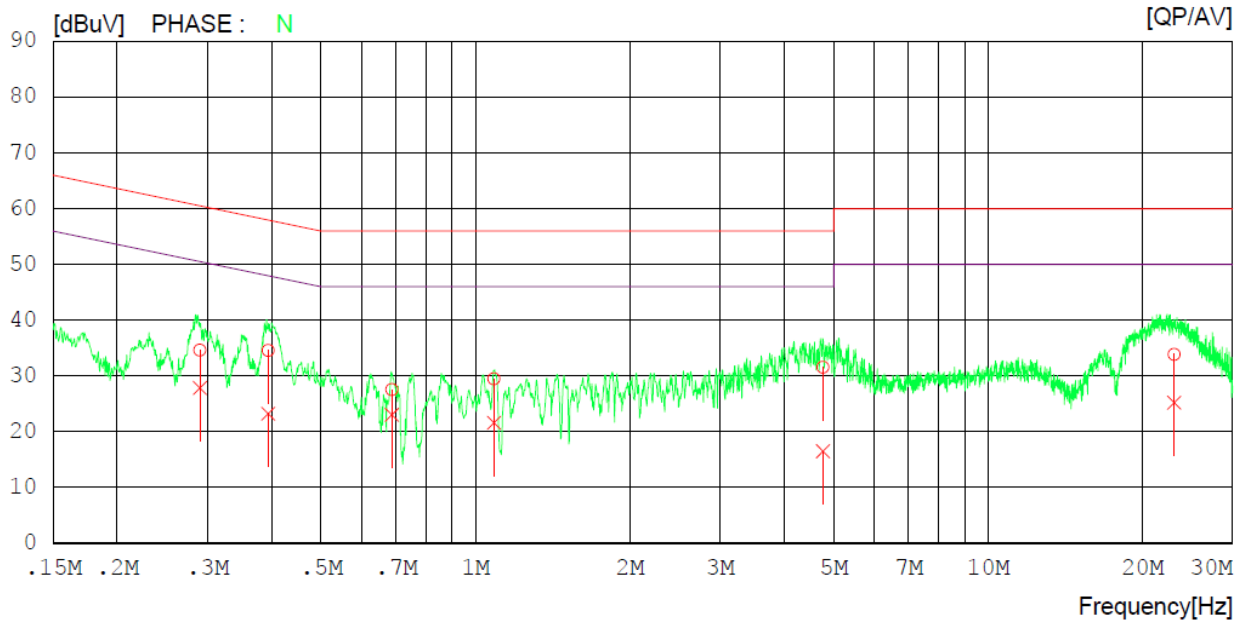


Table 1. Test data for conducted emission, DSUB Mode

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.17230	34.7	26.4	0.2	34.9	26.6	64.8	54.8	29.9	28.2	N
2	0.28624	36.5	33.2	0.2	36.7	33.4	60.6	50.6	23.9	17.2	N
3	0.40009	36.1	30.2	0.3	36.4	30.5	57.9	47.9	21.5	17.4	N
4	1.08650	28.7	20.0	0.3	29.0	20.3	56.0	46.0	27.0	25.7	N
5	4.53600	31.3	15.6	0.4	31.7	16.0	56.0	46.0	24.3	30.0	N
6	22.90500	32.5	24.1	1.3	33.8	25.4	60.0	50.0	26.2	24.6	N
7	0.17213	35.3	25.2	0.2	35.5	25.4	64.9	54.9	29.4	29.5	L1
8	0.28490	39.7	35.2	0.2	39.9	35.4	60.7	50.7	20.8	15.3	L1
9	0.40004	38.0	32.8	0.3	38.3	33.1	57.9	47.9	19.6	14.8	L1
10	1.08750	31.8	24.8	0.3	32.1	25.1	56.0	46.0	23.9	20.9	L1
11	4.54050	33.3	18.7	0.4	33.7	19.1	56.0	46.0	22.3	26.9	L1
12	22.75650	35.1	25.1	1.3	36.4	26.4	60.0	50.0	23.6	23.6	L1

Figure 2. Graphical representation of conducted emissions, HD-SDI Mode

Hot Line



Neutral Line

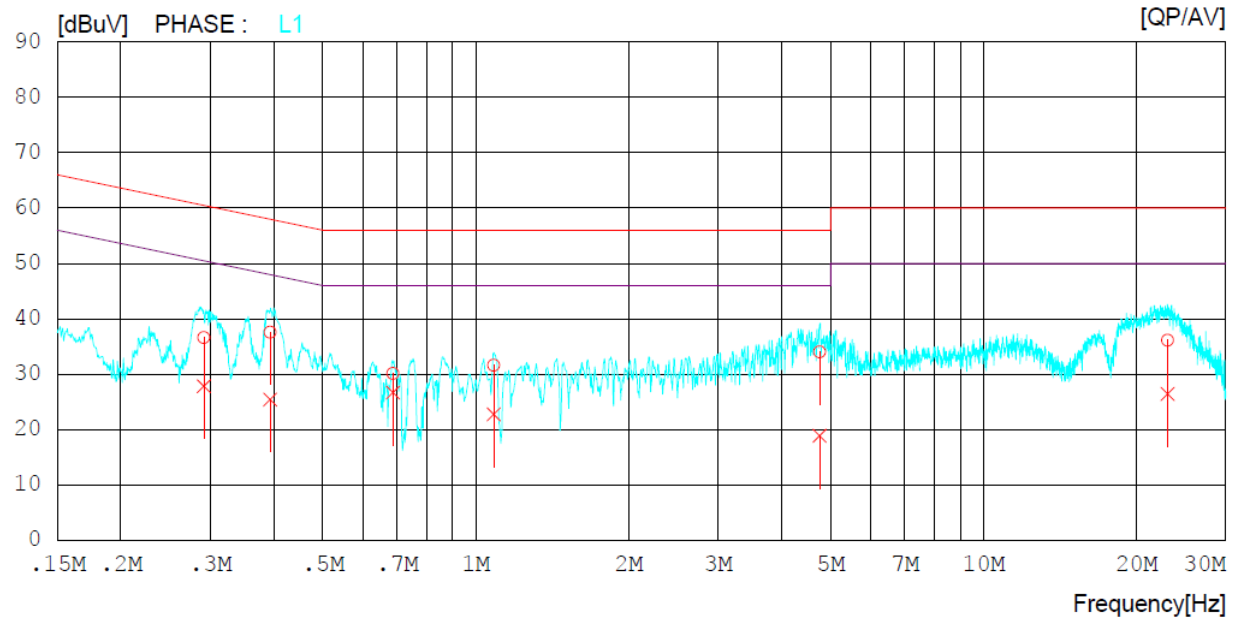


Table 2. Test data for conducted emission, HD-SDI Mode

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.28996	34.4	27.7	0.2	34.6	27.9	60.5	50.5	25.9	22.6	N
2	0.39398	34.3	22.9	0.3	34.6	23.2	58.0	48.0	23.4	24.8	N
3	0.68686	27.4	22.8	0.2	27.6	23.0	56.0	46.0	28.4	23.0	N
4	1.08700	29.2	21.3	0.3	29.5	21.6	56.0	46.0	26.5	24.4	N
5	4.76500	31.2	16.1	0.4	31.6	16.5	56.0	46.0	24.4	29.5	N
6	23.07500	32.6	23.9	1.3	33.9	25.2	60.0	50.0	26.1	24.8	N
7	0.29136	36.4	27.6	0.2	36.6	27.8	60.5	50.5	23.9	22.7	L1
8	0.39361	37.3	25.1	0.3	37.6	25.4	58.0	48.0	20.4	22.6	L1
9	0.68675	29.9	26.5	0.2	30.1	26.7	56.0	46.0	25.9	19.3	L1
10	1.08500	31.3	22.4	0.3	31.6	22.7	56.0	46.0	24.4	23.3	L1
11	4.75600	33.6	18.5	0.4	34.0	18.9	56.0	46.0	22.0	27.1	L1
12	23.05100	34.8	25.1	1.3	36.1	26.4	60.0	50.0	23.9	23.6	L1

3.2 RADIATED DISTURBANCE

TEST: Limits for radiated disturbance					
Method	Frequency scans were conducted with a peak detector with horizontal and vertical polarization of the antenna. Measurements were done in the frequency range 30-1000 MHz. The main test was then conducted by measurements at each frequency found in the pretest. These measurements were done at an open area test site at 3m distances, with a quasi-peak detector. EUT was positioned on a wooden table 0.8m above the floor, at the edge of the turntable. Cables connected to EUT were fixed to cause maximum emission. A maximum emitting point for each frequency was found by turning EUT 0-360 degrees, and adjust the antenna height between 1-4m. A quasi-peak detector measurement was then done at the maximum emitting point. The measurements (above 1 GHz) were made 3 m distance test site. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna. The measurements were conducted with Average and Peak value.				
Basic Standards	FCC Part 15				
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C			
	Relative Humidity	55 %			
-	Frequency range	Measurement Point			
Fully configured sample scanned over the following frequency range	30 MHz – 1.0 GHz	3 meter measurement distance			
	1.0 GHz ~ 2.0 GHz	3 meter measurement distance			
Limits – Class B					
Frequency (MHz)	Limit (dBμV/m)				
	Quasi-Peak		**Results**		
30 to 88	40.00		**Pass**		
88 to 216	43.52		**Pass**		
216 to 960	46.02		**Pass**		
960 to 1000	53.97		**Pass**		
-	Average	Peak	-		
Above 1000	54	74	Pass		
EUT Configuration Settings:					
Power Interface Mode # (See Section 2.3)	EUT Operation Mode # (See 2.4)		EUT Configurations Mode # (See Section 2.7)		
1	2, 3		1		
Radiated Emissions Test Equipment:					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due

EMI Receiver	R/S	ESU	100014	2012-03-08	2013-03-08
Bilog Antenna	Schaffner	CBL6112D	22609	2010-12-21	2012-12-21
Amplifier	H/P	8447E	2945A02865	2012-01-09	2013-01-09
Horn antenna	Schaffner	BBHA9120A	556	2011-06-14	2013-06-14
Amplifier	TSJ	MLA-00108-B02-36	1518831	2012-01-09	2013-01-09

Figure 3. Graphical representation, 30 MHz to 1000 MHz

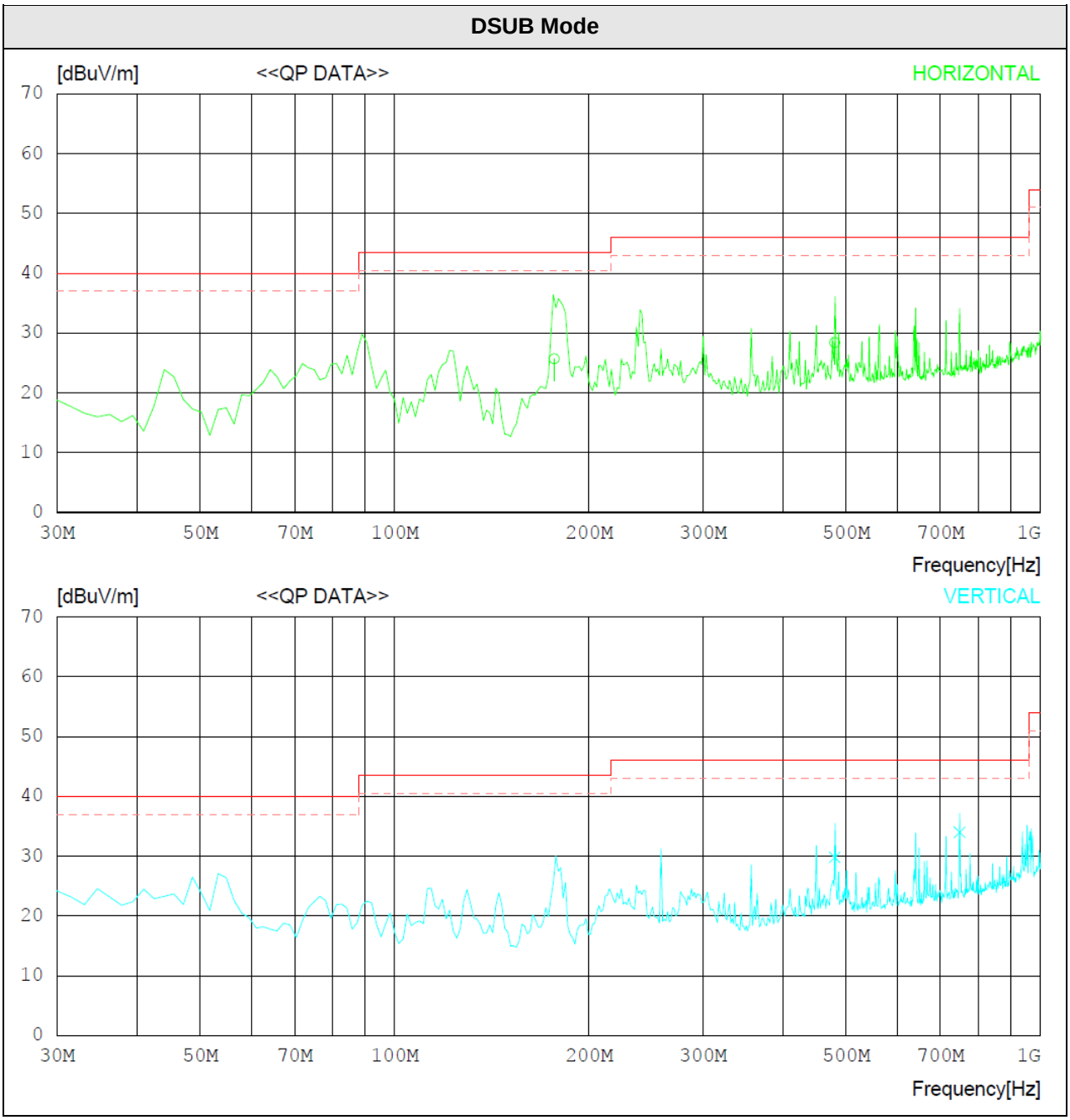


Table 3. Radiated emission Test data

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
--- Horizontal ------										
1	176.625	37.4	9.4	2.1	23.2	25.7	43.5	17.8	214	186
2	480.072	32.2	17.1	3.8	24.7	28.4	46.0	17.6	300	279
--- Vertical ------										
3	480.048	33.6	17.1	3.8	24.7	29.8	46.0	16.2	134	324
4	749.552	33.9	19.5	4.6	24.0	34.0	46.0	12.0	100	17

Figure 4. Graphical representation, 1 GHz to 6 GHz_PEAK

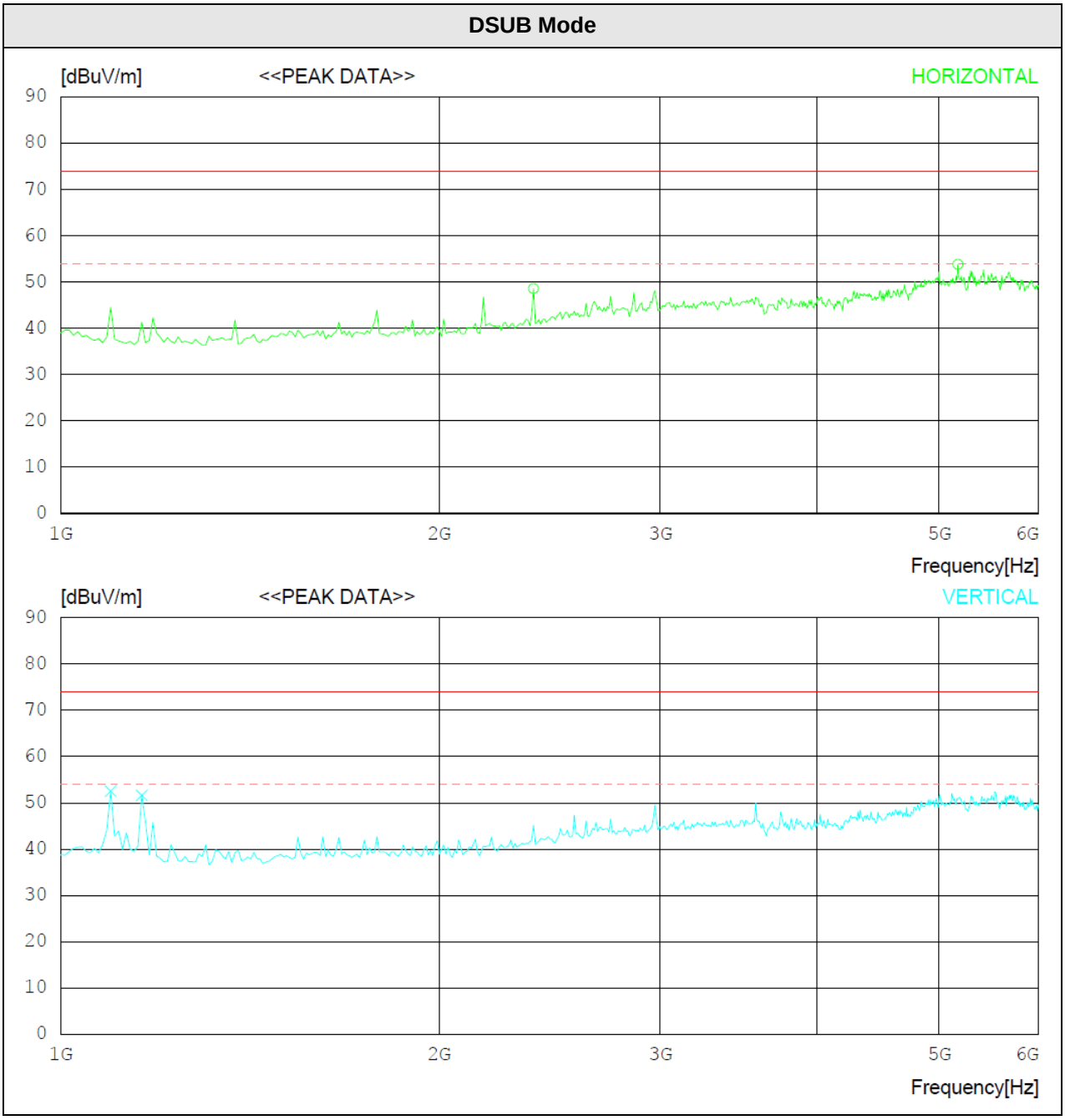


Table 4. Radiated emission Test data

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
--- Horizontal ------										
1	2378.210	54.5	26.7	9.3	41.9	48.6	74.0	25.4	100	1
2	5174.693	47.1	33.4	15.2	41.9	53.8	74.0	20.2	100	294
--- Vertical ------										
3	1096.154	64.2	24.0	6.1	41.8	52.5	74.0	21.5	100	203
4	1160.256	63.1	24.1	6.3	41.9	51.6	74.0	22.4	100	350

Figure 5. Graphical representation, 1 GHz to 6 GHz_AV

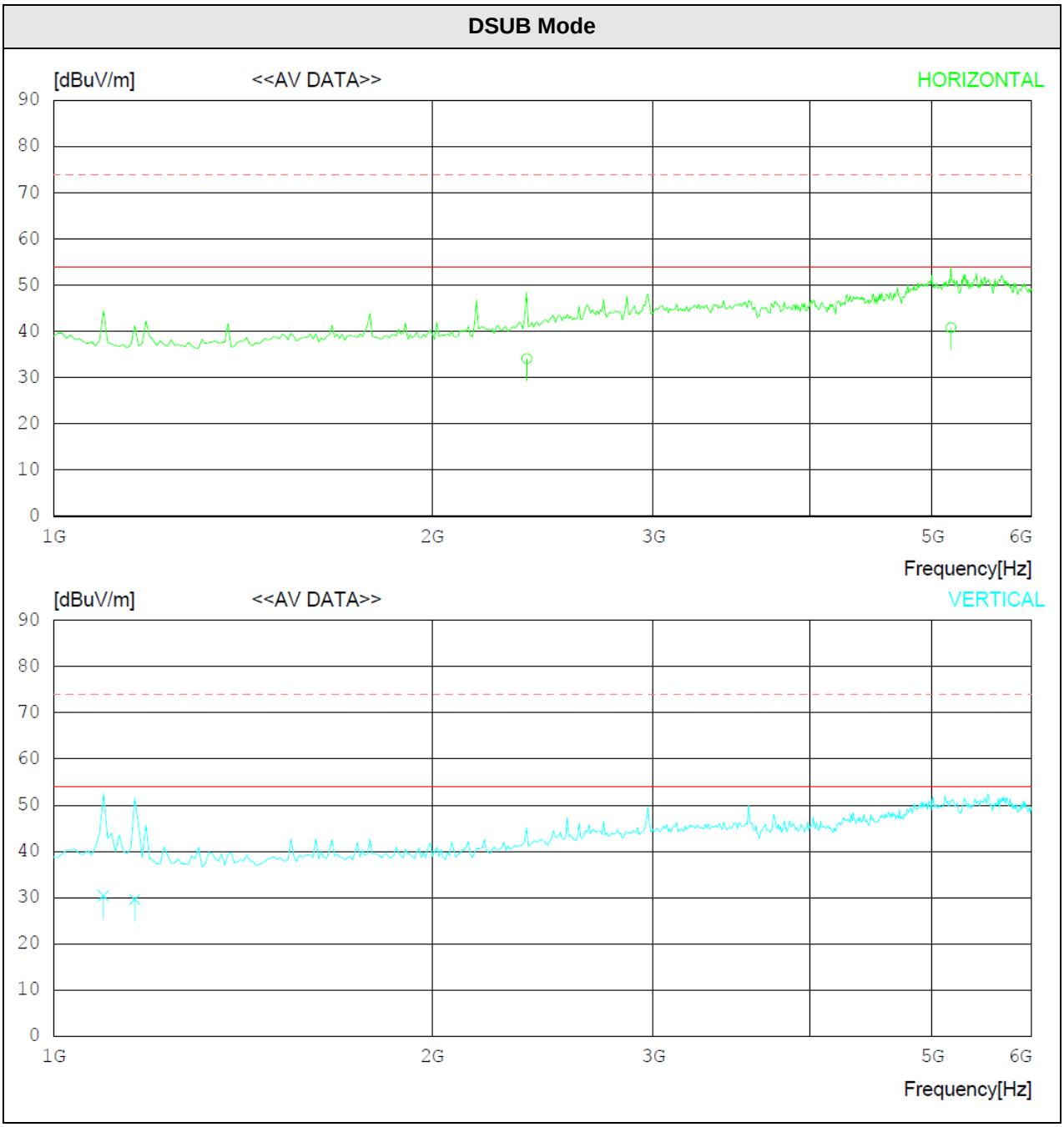


Table 5. Radiated emission Test data

No.	FREQ [MHz]	READING AV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
---- Horizontal ------										
1	2380.124	39.9	26.8	9.3	41.9	34.1	54.0	19.9	100	17
2	5174.647	34.1	33.4	15.2	41.9	40.8	54.0	13.2	100	294
---- Vertical ------										
3	1095.451	42.1	24.0	6.1	41.8	30.4	54.0	23.6	100	221
4	1160.438	41.1	24.1	6.3	41.9	29.6	54.0	24.4	100	329

Figure 6. Graphical representation, 30 MHz to 1000 MHz

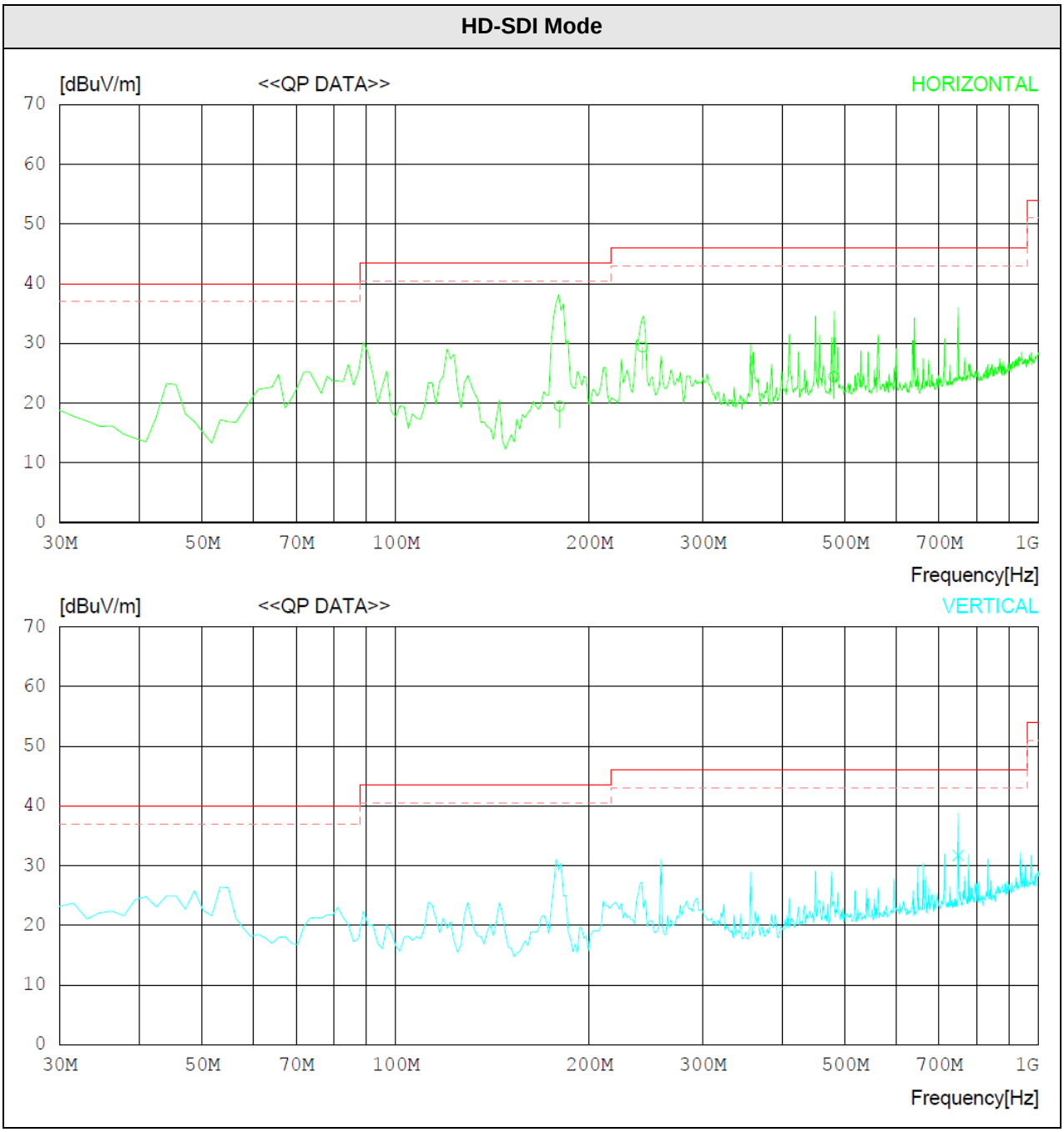


Table 6. Radiated emission Test data

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
--- Horizontal ------										
1	179.769	31.2	9.3	2.2	23.2	19.5	43.5	24.0	146	324
2	242.168	38.7	11.8	2.5	23.6	29.4	46.0	16.6	100	76
3	480.096	28.2	17.1	3.8	24.7	24.4	46.0	21.6	230	358
--- Vertical ------										
4	749.552	31.6	19.5	4.6	24.0	31.7	46.0	14.3	100	225

Figure 7. Graphical representation, 1 GHz to 6 GHz_PEAK

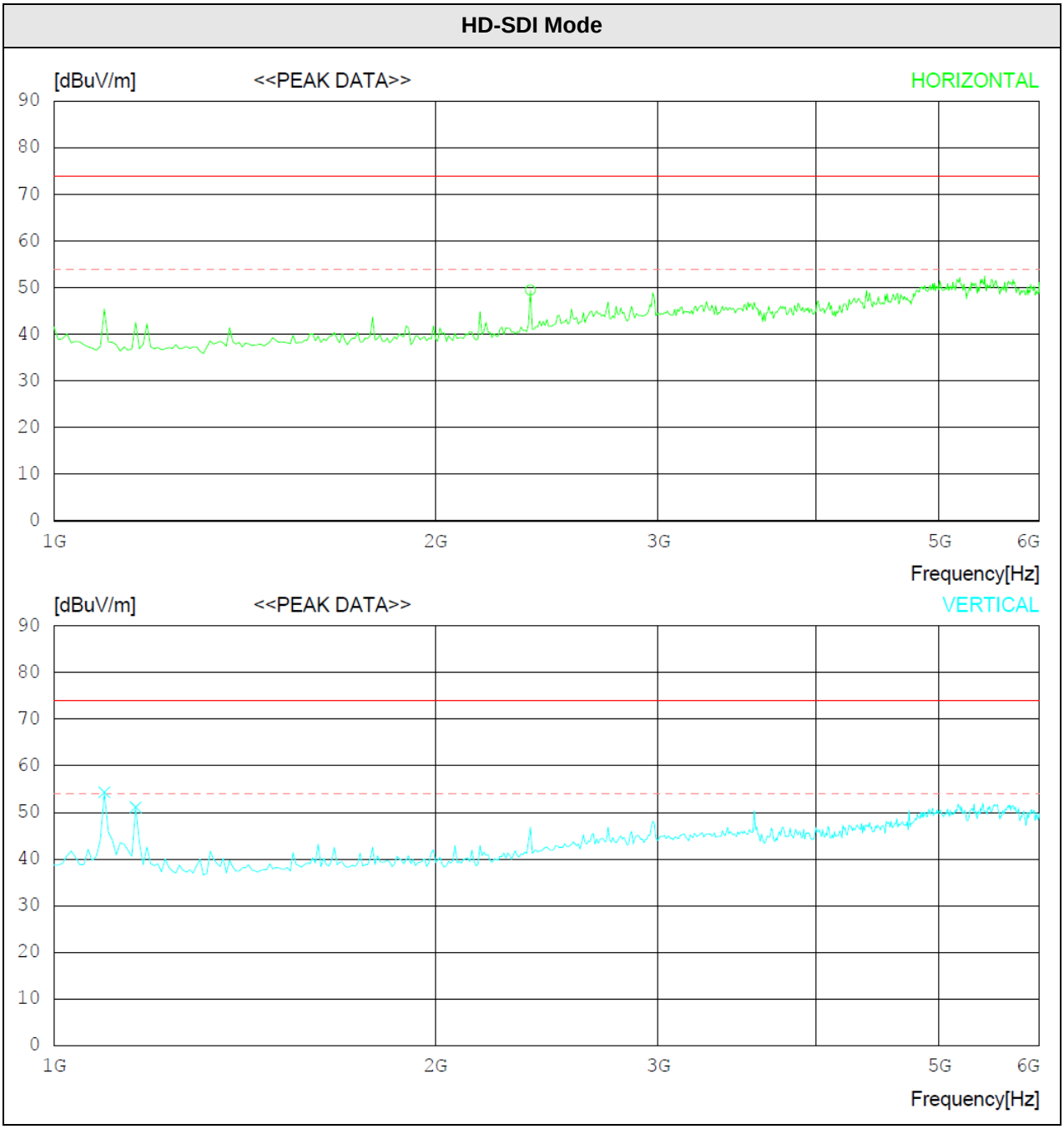


Table 7. Radiated emission Test data

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
--- Horizontal ------										
1	2378.210	55.4	26.7	9.3	41.9	49.5	74.0	24.5	100	206
--- Vertical ------										
2	1096.154	66.0	24.0	6.1	41.8	54.3	74.0	19.7	100	1
3	1160.256	62.6	24.1	6.3	41.9	51.1	74.0	22.9	100	11

Figure 8. Graphical representation, 1 GHz to 6 GHz_AV

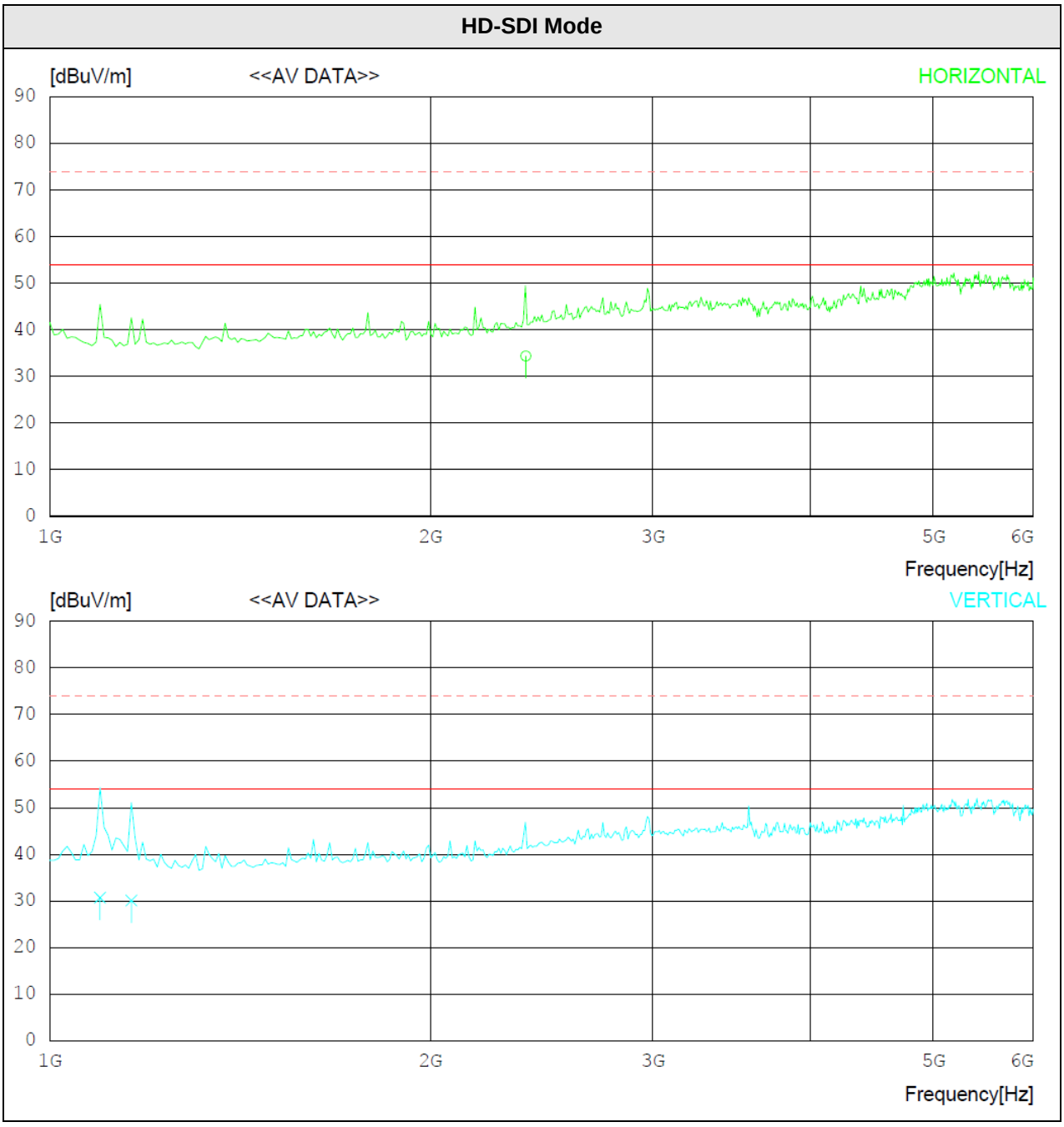


Table 8. Radiated emission Test data

No.	FREQ [MHz]	READING AV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
--- Horizontal ------										
1	2380.412	40.2	26.8	9.3	41.9	34.4	54.0	19.6	100	206
--- Vertical ------										
2	1095.970	42.4	24.0	6.1	41.8	30.7	54.0	23.3	100	78
3	1160.421	41.6	24.1	6.3	41.9	30.1	54.0	23.9	100	142