

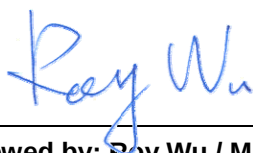
FCC Test Report

EQUIPMENT : EDA (Enterprise Digital Assistant)
BRAND NAME : Symbol
MODEL NAME : MC5590
FCC ID : H9PMC5590
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Transmission System (DTS)
APPLICANT : Symbol Technologies Inc

One Symbol Plaza Holtsville, NY 11742-1300 USA

The product sample received on Aug. 01, 2008 and completely tested on Sep. 05, 2008. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Roy Wu / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	A8.2(a)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)	A8.4	Power Output	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(d)	A8.5	Frequency Band Edges	$\leq 20\text{dBc}$	Pass	-
3.4	15.247(e)	A8.2(b)	Power Spectral Density	$\leq 8\text{dBm}$	Pass	-
3.5	15.207	Gen 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 16.9 dB at 0.462 MHz
3.6	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.23 dB at 44.58 MHz
3.7	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR880108A	Rev. 01	Initial issue of report	Oct. 13, 2008

1 General Description

1.1 Applicant

Symbol Technologies Inc

One Symbol Plaza Holtsville, NY 11742-1300 USA

1.2 Manufacturer

Symbol Technologies Inc

One Symbol Plaza Holtsville, NY 11742-1300 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	EDA (Enterprise Digital Assistant)
Brand Name	Symbol
Model Name	MC5590
Tx/Rx Frequency Range	802.11b/g : 2400 MHz ~ 2483.5 MHz 802.11a : 5725 MHz ~ 5850 MHz
Channel Spacing	802.11b/g : 5 MHz 802.11a : 20 MHz
Maximum Output Power to Antenna	<Main Antenna> : 802.11b : 16.33 dBm 802.11g : 17.33 dBm 802.11a : 16.13 dBm <Aux. Antenna> : 802.11b : 13.68 dBm 802.11g : 14.72 dBm 802.11a : 15.99 dBm
Antenna Type	<Main Antenna> : 802.11b/g : PIFA Antenna with gain 2.55 dBi 802.11a : PIFA Antenna with gain 2.94 dBi <Aux. Antenna> : 802.11b/g : PIFA Antenna with gain 2.27 dBi 802.11a : PIFA Antenna with gain 3.70 dBi
Type of Antenna Connector	N/A
Type of Modulation	DSSS / OFDM
EUT Stage	Identical Prototype

2nd component Source List

Component Model		
AC Adapter	Brand Name	MOTOROLA
	Model Name	EADP-16BBA
	Power Rating	I/P: 100-240Vac, 50-60Hz, 0.4A; O/P: 5.4Vdc, 2A
	DC Power Cord Type	1.94 meter shielded cable without ferrite core
Power Cable	AC Power Cord Type	1.57 meter without shielded cable without ferrite core
Battery 1	Brand Name	MOTOROLA
	Model Name	82-111094-01
	Power Rating	3.7Vdc, 3600mAh, 13.3wh
	Type	Li-ion
Battery 2	Brand Name	MOTOROLA
	Model Name	82-107172-01
	Power Rating	3.7Vdc, 2400mAh, 8.88wh
	Type	Li-ion
USB Cable	Part Number	25-108022-01R
	Signal Line Type	1.62 meter without shielded cable with ferrite core

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. For accessories equipped with this EUT, please refer to the appendix of the external photo.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C TEL: +886-3-3273456 / FAX: +886-3-3284978		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	CO05-HY	03CH07HY	TW1022/4086B-1

1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 (Measurement Guidelines of DTS)
- ♦ ANSI C63.4-2003
- ♦ IC RSS-210 Issue 7 Annex 8

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (DoC) which recorded in a separate test report.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DWL-7100AP	KA22003040 018-1	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	D400	E2K24GBRL	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Cellink	BTHS-6025-F	PQY-471087 4200357	N/A	N/A
4.	RS-232 Mouse	State	MS-303	FCC DoC	Unshielded, 1.2 m	N/A
5.	i-pod	Apple	A1199	FCC DoC	Unshielded, 1.2 m	N/A

2 Test Configuration of Equipment Under Test

2.1 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and recorded the RF power output in the following table:

802.11b <Main Ant. Port>

Channel	Frequency (MHz)	RF Power (dBm)			
		2.4GHz 802.11b Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	14.65	14.75	15.97	16.33
CH 06	2437 MHz	14.62	14.75	15.94	16.31
CH 11	2462 MHz	14.60	14.71	16.01	16.30

802.11b <Aux. Ant. Port>

Channel	Frequency (MHz)	RF Power (dBm)			
		2.4GHz 802.11b Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	-	-	-	13.63
CH 06	2437 MHz	-	-	-	13.68
CH 11	2462 MHz	-	-	-	13.57

802.11g <Main Ant. Port>

Channel	Frequency (MHz)	RF Power (dBm)							
		2.4GHz 802.11g Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	13.57	13.56	13.85	13.86	14.4	13.99	14.48	14.27
CH 06	2437 MHz	17.33	17.11	16.83	16.82	16.70	16.60	15.94	15.67
CH 11	2462 MHz	13.56	13.85	13.90	13.80	14.41	14.12	14.64	14.51

802.11g <Aux. Ant. Port>

Channel	Frequency (MHz)	RF Power (dBm)							
		2.4GHz 802.11g Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	11.44	-	-	-	-	-	-	-
CH 06	2437 MHz	14.72	-	-	-	-	-	-	-
CH 11	2462 MHz	11.42	-	-	-	-	-	-	-

802.11a <Main Ant. Port>

Channel	Frequency (MHz)	RF Power (dBm)							
		5GHz 802.11a Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH149	5745 MHz	15.73	15.67	15.48	15.58	14.38	14.46	12.22	12.05
CH157	5785 MHz	16.12	16.05	15.91	16.01	14.80	14.93	12.62	12.36
CH165	5825 MHz	16.13	16.08	15.99	16.09	14.71	14.88	12.61	12.45

802.11a <Aux. Ant. Port>

Channel	Frequency (MHz)	RF Power (dBm)							
		5GHz 802.11a Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH149	5745 MHz	15.50	-	-	-	-	-	-	-
CH157	5785 MHz	15.83	-	-	-	-	-	-	-
CH165	5825 MHz	15.99	-	-	-	-	-	-	-

Remark:

1. The 802.11b data rates were set in 11 Mbps, 802.11g data rates were set in 6 Mbps and 802.11a data rates were set in 6 Mbps for all the test cases, due to the highest RF output power.
2. The EUT is programmed to transmit signal continuously for all testing.

2.2 Test Mode

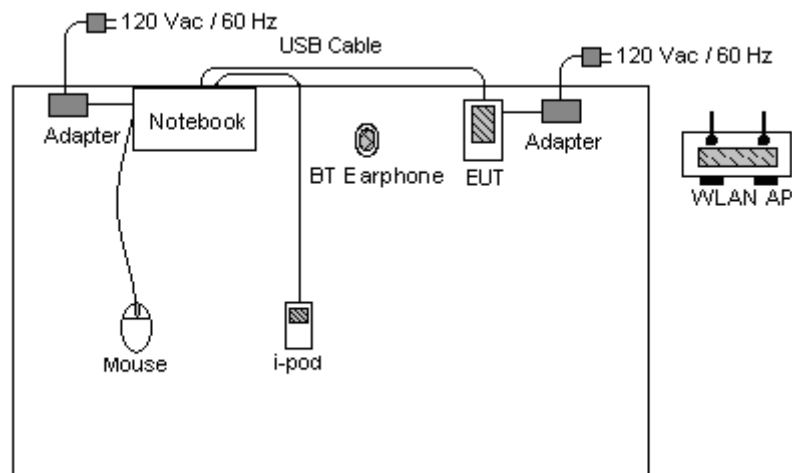
The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz), radiated emission (30 MHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests were conducted to determine the final configuration from all possible combinations. The following tables are showing the test modes as the worst cases and recorded in this report.

Test Cases			
Test Item	Modulation		
	802.11b	802.11g	802.11a Band III
Conducted TCs	■ Mode 1: CH01_2412 MHz ■ Mode 2: CH06_2437 MHz ■ Mode 3: CH11_2462 MHz	■ Mode 4: CH01_2412 MHz ■ Mode 5: CH06_2437 MHz ■ Mode 6: CH11_2462 MHz	■ Mode 7: CH149_5745 MHz ■ Mode 8: CH157_5785 MHz ■ Mode 9: CH165_5825 MHz
Radiated TCs	■ Mode 1: CH01_2412 MHz (2D Scanner) ■ Mode 2: CH06_2437 MHz (2D Scanner) ■ Mode 3: CH11_2462 MHz (2D Scanner) ■ Mode 4: CH11_2462 MHz (1D Scanner)	■ Mode 5 : CH01_2412MHz (2D Scanner) ■ Mode 6 : CH06_2437 MHz (2D Scanner) ■ Mode 7 : CH11_2462 MHz (2D Scanner)	■ Mode 8 : CH149_5745 MHz (2D Scanner) ■ Mode 9 : CH157_5785 MHz (2D Scanner) ■ Mode 10 : CH165_5825 MHz (2D Scanner) ■ Mode 11 : CH165_5825 MHz (1D Scanner)
AC Conducted Emission	Mode 1 : BT Link + WLAN (2.4G) Link + USB Charging Cable with AC power + USB Link + QWERTY key pad + Battery(3600mA) + 2D Scanner Mode 2 : BT Link + WLAN (5G) Link + USB Charging Cable with AC power + USB Link + QWERTY key pad + Battery(3600mA) + 2D Scanner Mode 3 : BT Link + WLAN (2.4G) Link + USB Charging Cable with AC power + USB Link + Numeric key pad + Battery(3600mA) + 1D Scanner Mode 4 : BT Link + WLAN (2.4G) Link + USB Charging Cable with AC power + USB Link + Numeric key pad + Battery(2400mA) + 1D Scanner Remark: The worst case of conducted emission is mode 3; only the test data of it was reported.		

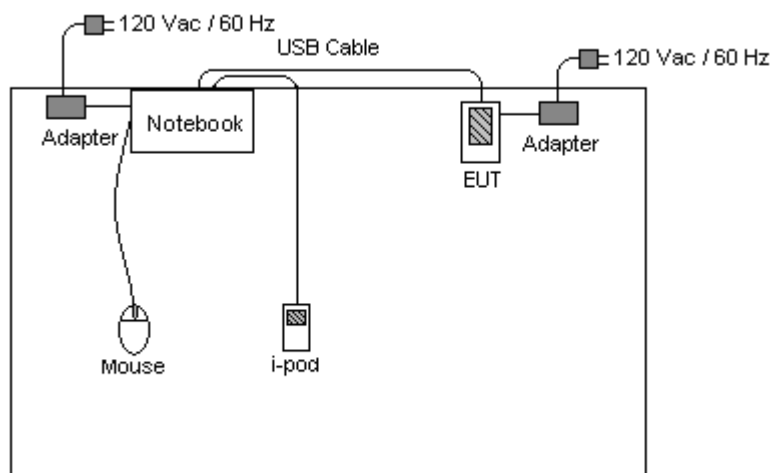
Remark: The output power of main antenna port was larger than aux. antenna port, so only main antenna used for all test items.

2.3 Connection Diagram of Test System

<Conducted Emission>



<Radiated Emission>





2.4 RF Utility

The programmed RF Utility "CEcTxRx", is installed in EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

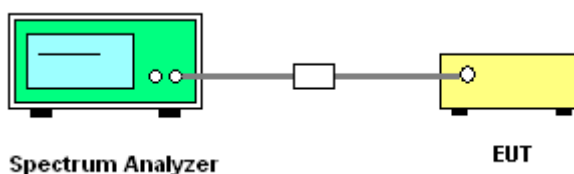
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz.
In order to make an accurate measurement, set the span greater than RBW. The 6 dB bandwidth must be greater than 500 kHz.
4. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Test Mode :	Mode 1, 2, 3	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	11.56	0.5	Pass
06	2437	11.52	0.5	Pass
11	2462	11.52	0.5	Pass

Test Mode :	Mode 4, 5, 6	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

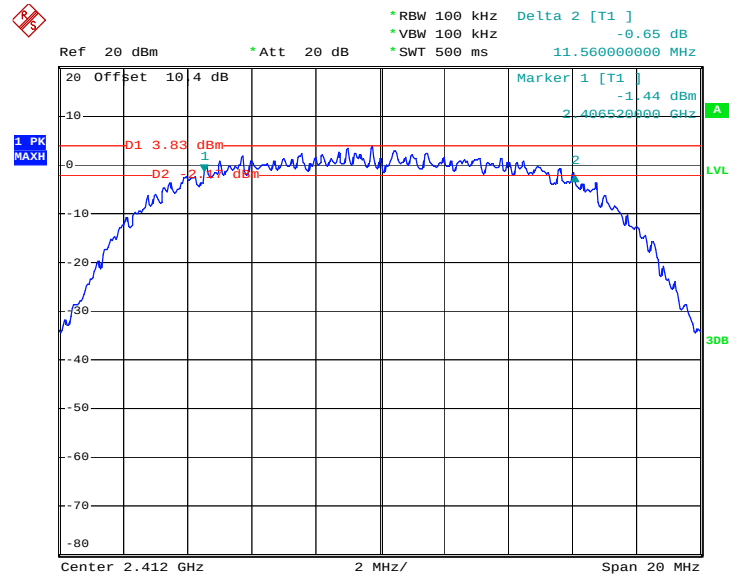
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
01	2412	16.32	0.5	Pass
06	2437	16.32	0.5	Pass
11	2462	16.32	0.5	Pass

Test Mode :	Mode 7, 8, 9	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
149	5745	16.36	0.5	Pass
157	5785	16.36	0.5	Pass
165	5825	16.36	0.5	Pass

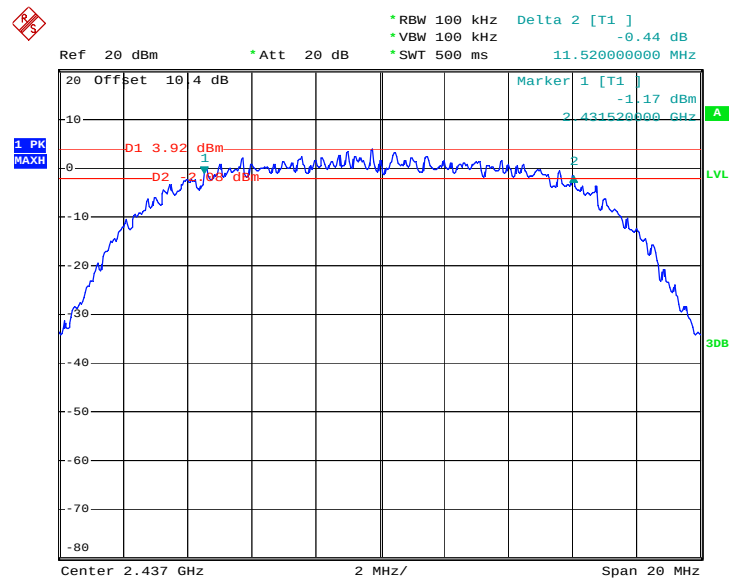
3.1.6 Test Result of 6dB Bandwidth Plots

Mode 1 : 6 dB Bandwidth Plot on 802.11b Channel 01



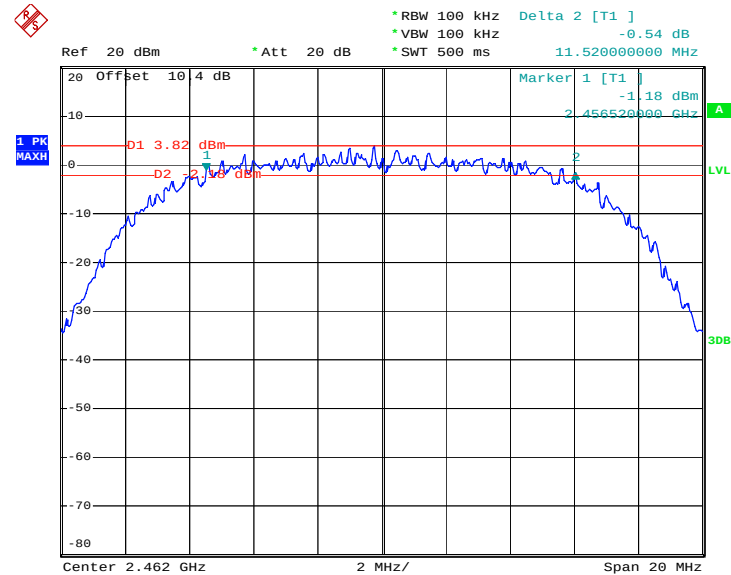
Date: 28.AUG.2008 06:28:52

Mode 2 : 6 dB Bandwidth Plot on 802.11b Channel 06



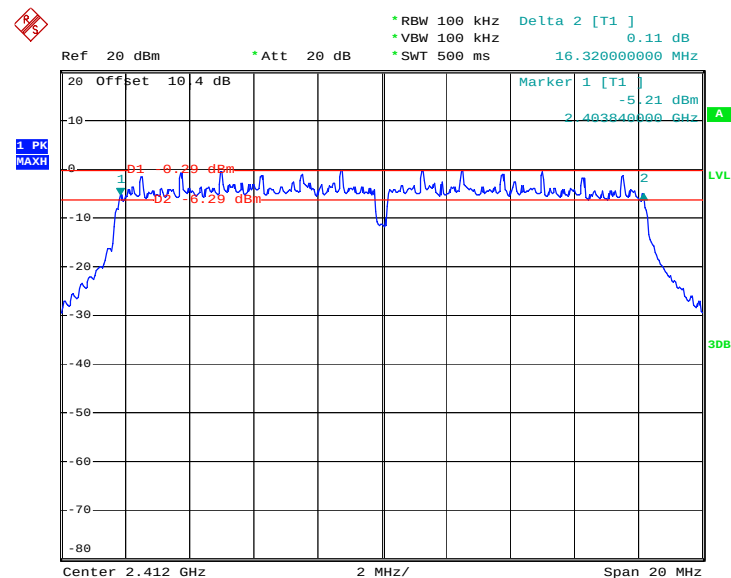
Date: 28.AUG.2008 07:01:18

Mode 3 : 6 dB Bandwidth Plot on 802.11b Channel 11



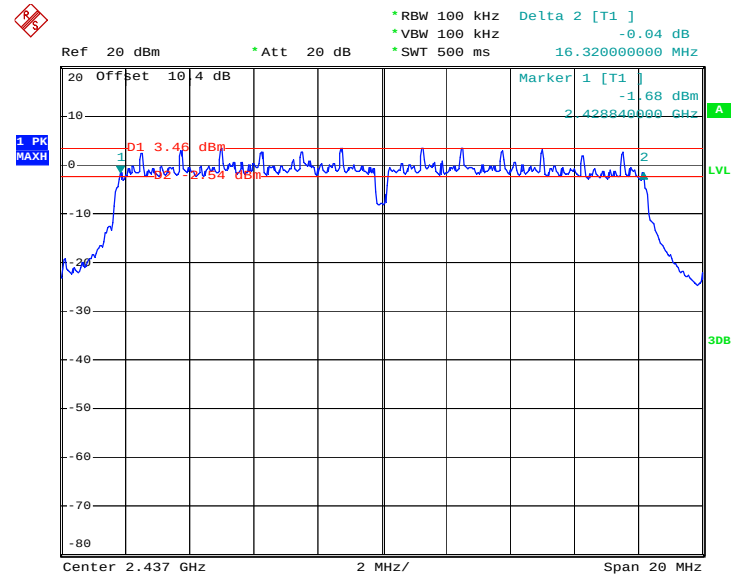
Date: 28.AUG.2008 07:02:18

Mode 4 : 6 dB Bandwidth Plot on 802.11g Channel 01



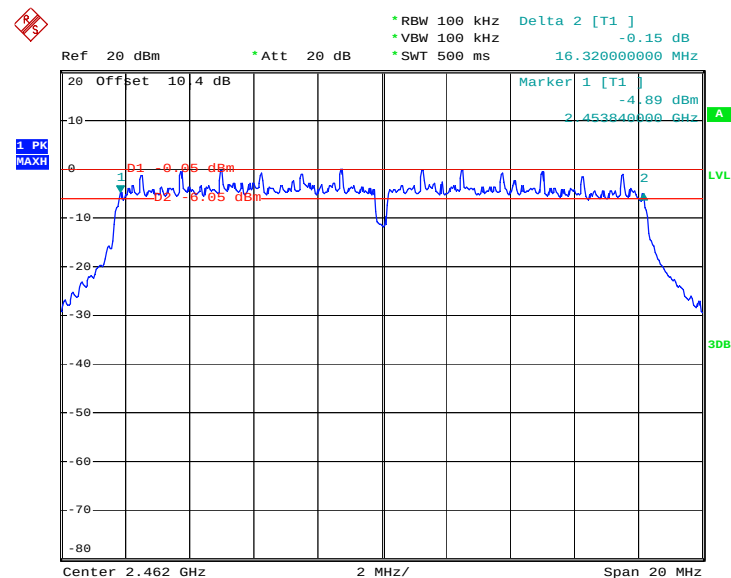
Date: 28.AUG.2008 06:39:11

Mode 5 : 6 dB Bandwidth Plot on 802.11g Channel 06

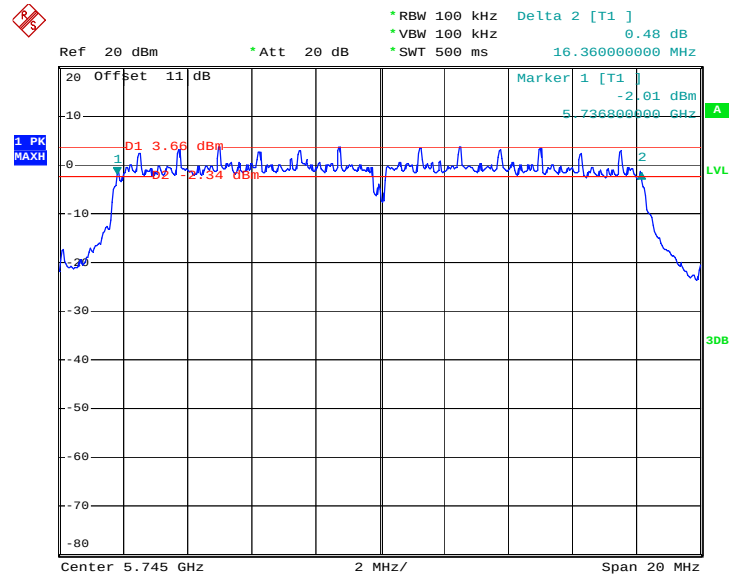


Date: 28.AUG.2008 07:00:30

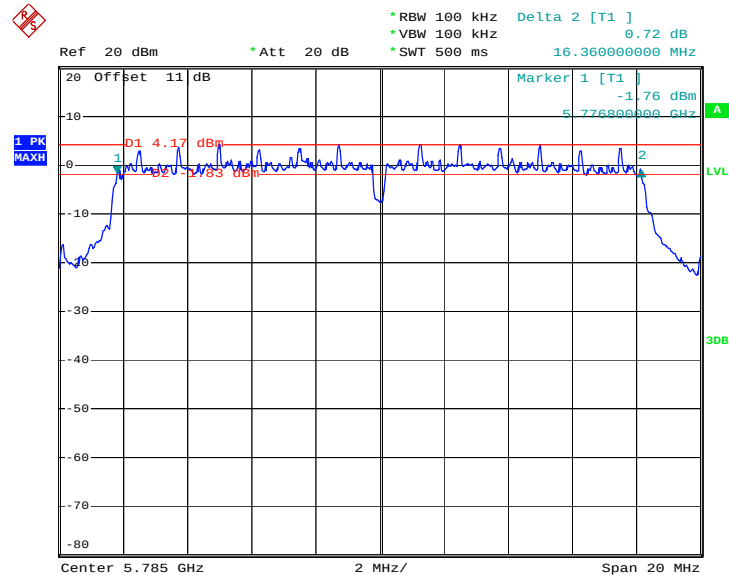
Mode 6 : 6 dB Bandwidth Plot on 802.11g Channel 11



Date: 28.AUG.2008 07:07:55

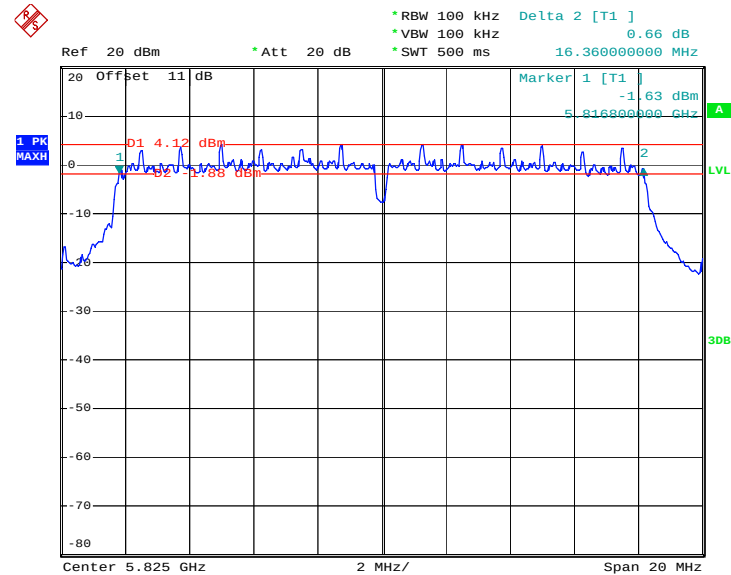
Mode 7: 6 dB Bandwidth Plot on 802.11a Channel 149


Date: 1.SEP.2008 21:36:01

Mode 8: 6 dB Bandwidth Plot on 802.11a Channel 157


Date: 1.SEP.2008 21:36:47

Mode 9: 6 dB Bandwidth Plot on 802.11a Channel 165



Date: 1.SEP.2008 21:46:00

3.2 Power Output Measurement

3.2.1 Limit of Power Output

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

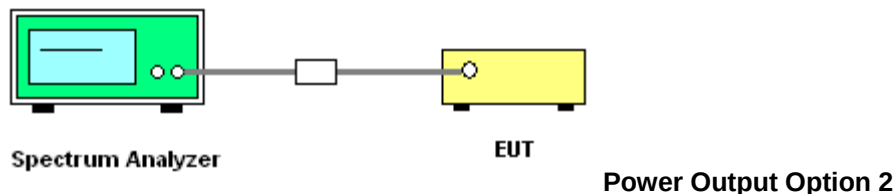
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Measure the power either by spectrum analyzer.

3.2.4 Test Setup



3.2.5 Test Result of Power Output

Test Mode :	Mode 1, 2, 3	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

Channel	Frequency (MHz)	Measured Power Output (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	16.33	30	Pass
06	2437	16.31	30	Pass
11	2462	16.30	30	Pass

Test Mode :	Mode 4, 5, 6	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

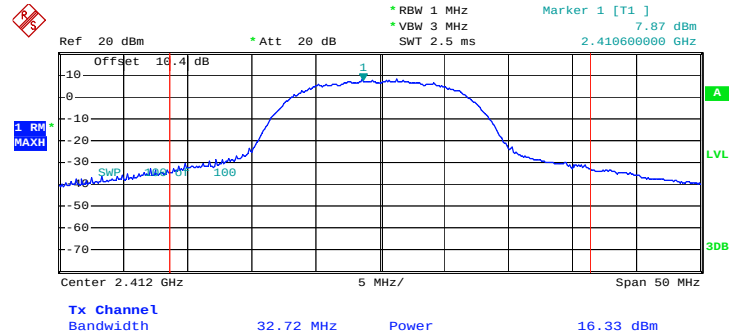
Channel	Frequency (MHz)	Measured Power Output (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	13.57	30	Pass
06	2437	17.33	30	Pass
11	2462	13.56	30	Pass

Test Mode :	Mode 7, 8, 9	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

Channel	Frequency (MHz)	Measured Power Output (dBm)	Max. Limits (dBm)	Pass/Fail
149	5745	15.73	30	Pass
157	5785	16.12	30	Pass
165	5825	16.13	30	Pass

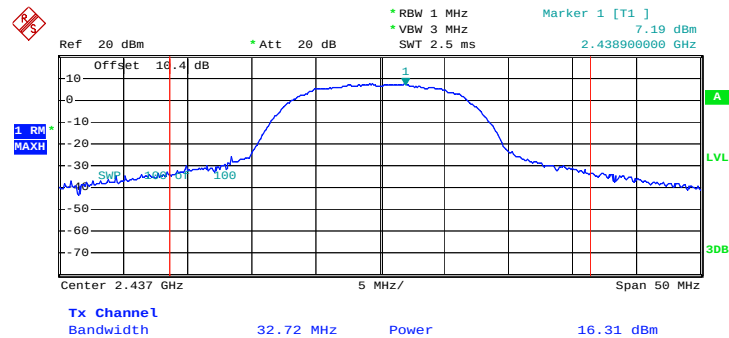
3.2.6 Test Result of Power Output Plots

Mode 1 : Channel Power Plot on 802.11b Channel 01



Date: 27.AUG.2008 01:02:26

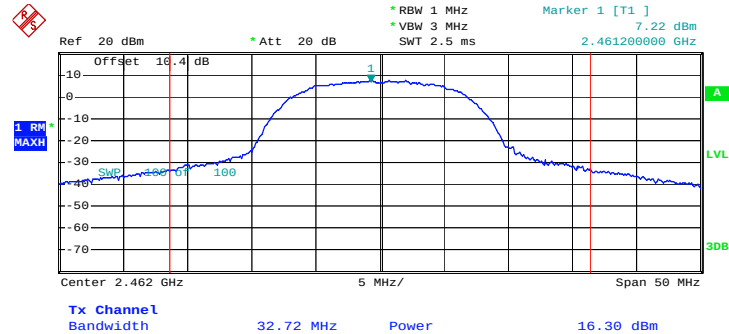
Mode 2 : Channel Power Plot on 802.11b Channel 06



Date: 27.AUG.2008 01:13:46

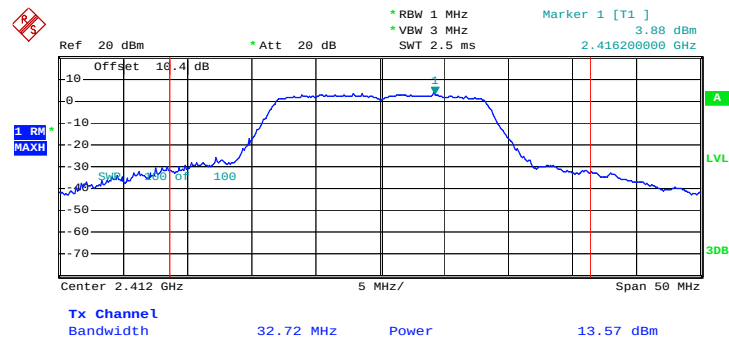


Mode 3 : Channel Power Plot on 802.11b Channel 11



Date: 27.AUG.2008 01:24:28

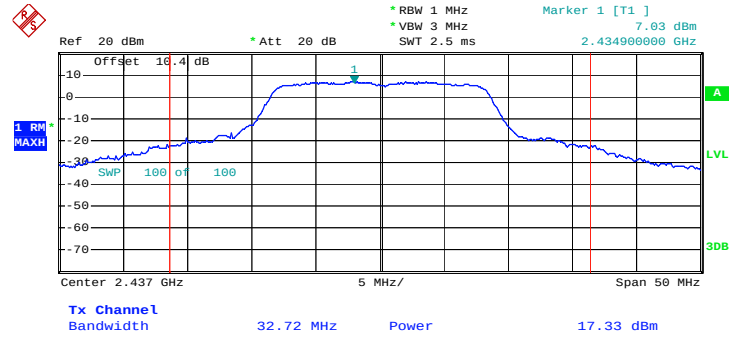
Mode 4 : Channel Power Plot on 802.11g Channel 01



Date: 27.AUG.2008 01:03:08

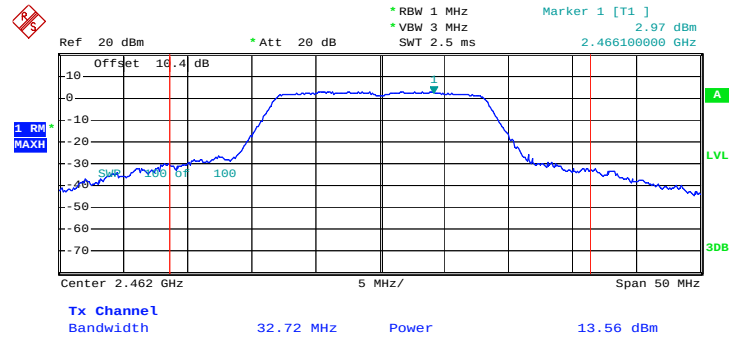


Mode 5 : Channel Power Plot on 802.11g Channel 06

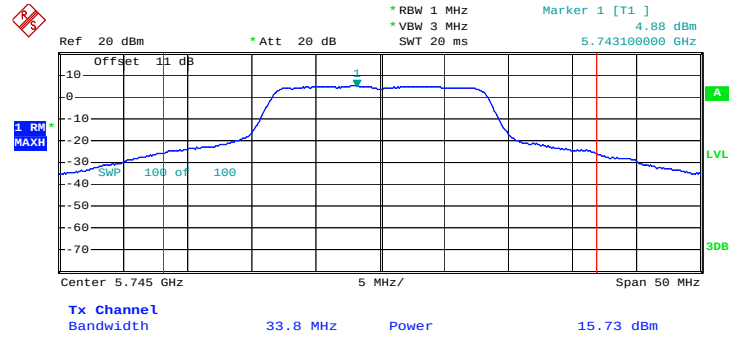


Date: 19.SEP.2008 16:08:53

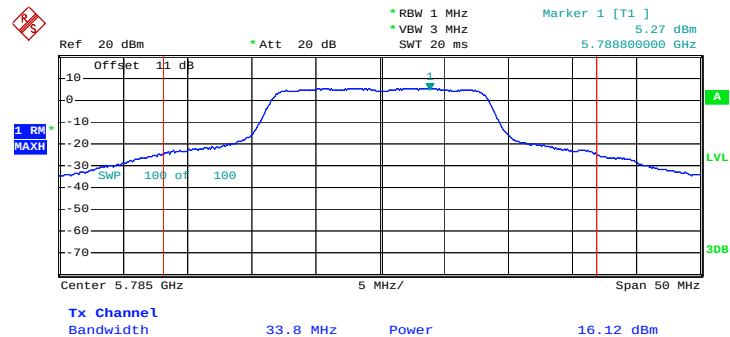
Mode 6 : Channel Power Plot on 802.11g Channel 11



Date: 27.AUG.2008 01:24:47

Mode 7 Channel Power Plot on 802.11a Channel 149


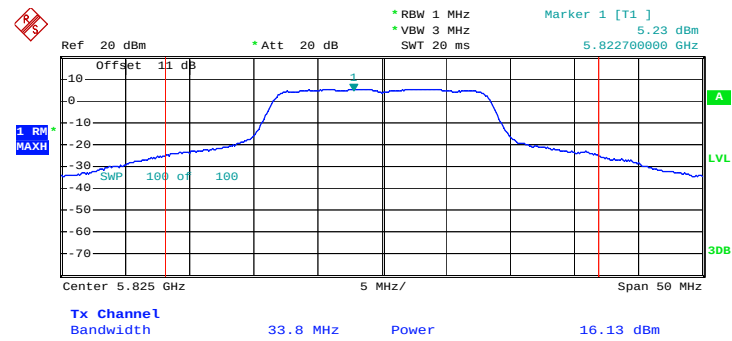
Date: 1.SEP.2008 21:08:39

Mode 8 : Channel Power Plot on 802.11a Channel 157


Date: 1.SEP.2008 21:05:53



Mode 9 : Channel Power Plot on 802.11a Channel 165



Date: 1.SEP.2008 20:55:08

3.3 Band Edges Measurement

3.3.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB.

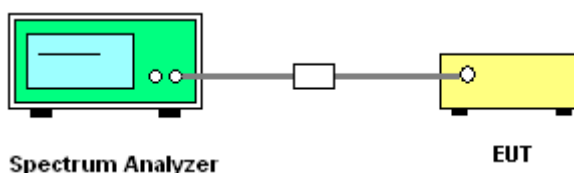
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Conducted emission test: Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. Band edge emissions must be at least 20 dB below the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the output power of this device was measured by power meter, the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Apply to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep=Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation as in FCC Section 15.35(b) and (c).

3.3.4 Test Setup



3.3.5 Test Result of Radiated Band Edges

EUT with 2D Scanner			
Test Mode :	Mode 1	Temperature :	22~24°C
Test Channel :	01	Relative Humidity :	50~52%
Test Engineer :	Elvis Chen		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.61	66.54	-7.46	74.00	64.44	32.32	5.46	35.68	100	0	Peak
2389.61	43.77	-10.23	54.00	41.67	32.32	5.46	35.68	130	5	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2389.42	64.68	-9.32	74.00	62.60	32.30	5.46	35.68	100	0	Peak
2389.42	41.28	-12.72	54.00	39.20	32.30	5.46	35.68	100	50	Average

EUT with 2D Scanner			
Test Mode :	Mode 3	Temperature :	22~24°C
Test Channel :	11	Relative Humidity :	50~52%
Test Engineer :	Elvis Chen		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	66.98	-7.02	74.00	64.99	32.30	5.38	35.70	100	0	Peak
2483.50	43.09	-10.91	54.00	41.10	32.30	5.38	35.70	187	1	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2380.00	63.3	-10.7	74.00	61.31	32.30	5.38	35.70	101	51	Peak
2380.00	41.64	-12.36	54.00	39.65	32.30	5.38	35.70	101	51	Average

EUT with 2D Scanner			
Test Mode :	Mode 5	Temperature :	22~24°C
Test Channel :	01	Relative Humidity :	50~52%
Test Engineer :	Elvis Chen		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2388.66	64.91	-9.09	74.00	62.81	32.32	5.46	35.68	100	0	Peak
2388.66	42.71	-11.29	54.00	40.61	32.32	5.46	35.68	135	8	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2388.85	61.91	-12.09	74.00	59.83	32.30	5.46	35.68	100	0	Peak
2388.85	41.71	-12.29	54.00	39.63	32.30	5.46	35.68	100	50	Average

EUT with 2D Scanner			
Test Mode :	Mode 7	Temperature :	22~24°C
Test Channel :	11	Relative Humidity :	50~52%
Test Engineer :	Elvis Chen		

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	45.85	-8.15	54.00	43.86	32.30	5.38	35.70	133	4	Average
2483.50	64.77	-9.23	74.00	62.78	32.30	5.38	35.70	100	0	Peak

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.25	44.72	-9.28	54.00	42.73	32.30	5.38	35.70	102	52	Average
2483.25	61.99	-12.01	74.00	60.00	32.30	5.38	35.70	100	0	Peak

EUT with 1D Scanner			
Test Mode :	Mode 4	Temperature :	22~24°C
Test Channel :	11	Relative Humidity :	50~52%
Test Engineer :	Elvis Chen		

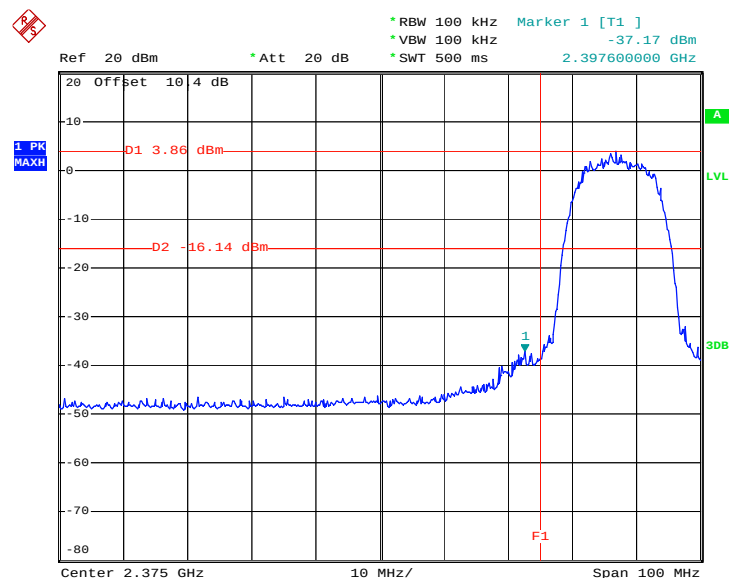
ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	63.85	-10.15	74.00	61.86	32.30	5.38	35.70	100	0	Peak
2483.50	38.08	-15.92	54.00	36.09	32.30	5.38	35.70	161	5	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	34.76	-19.24	54.00	32.77	32.30	5.38	35.70	100	58	Average
2483.50	58.18	-15.82	74.00	56.19	32.30	5.38	35.70	100	0	Peak

3.3.6 Test Result of Conducted Band Edges

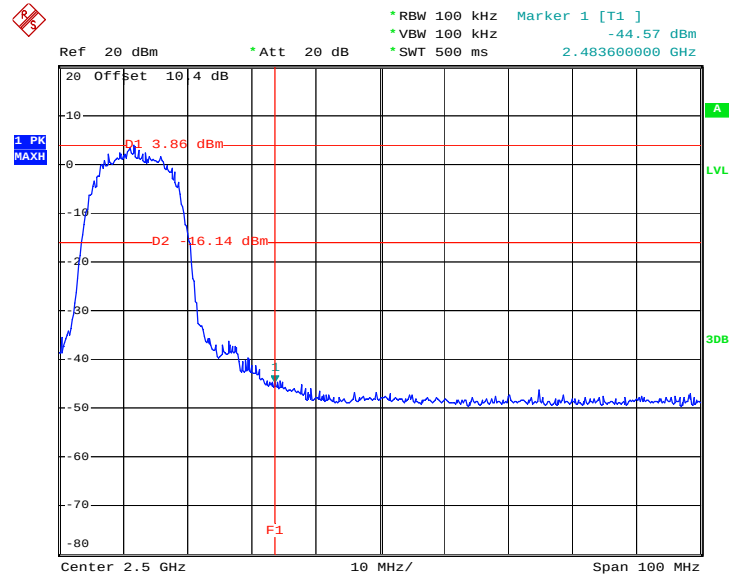
Test Mode :	Mode 1	Temperature :	25~26°C
Test Channel :	01	Relative Humidity :	52~53%
Test Engineer :	C.K.C. Cheng		

Low Band Edge Plot on 802.11b Channel 01



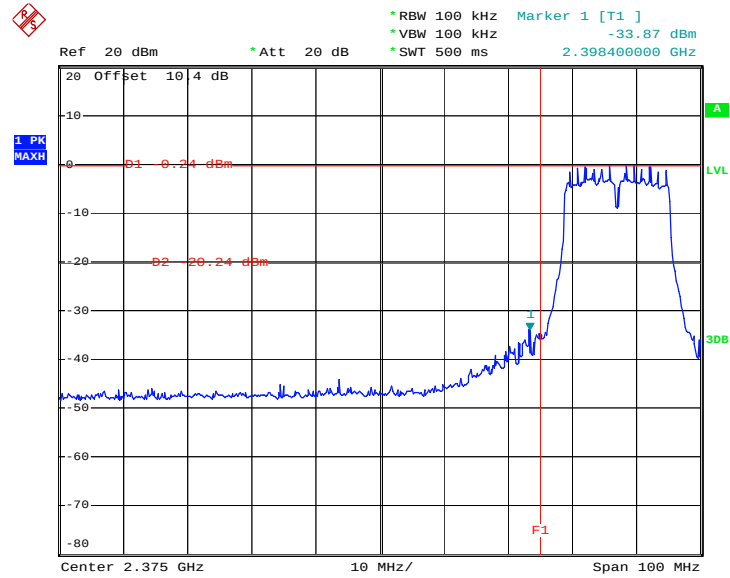
Date: 28.AUG.2008 06:54:15

Test Mode :	Mode 3	Temperature :	25~26°C
Test Channel :	11	Relative Humidity :	52~53%
Test Engineer :	C.K.C. Cheng		

High Band Edge Plot on 802.11b Channel 11


Date: 28.AUG.2008 07:11:01

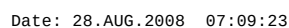
Test Mode :	Mode 4	Temperature :	25~26°C
Test Channel :	01	Relative Humidity :	52~53%
Test Engineer :	C.K.C. Cheng		

Low Band Edge Plot on 802.11g Channel 01


Date: 28.AUG.2008 06:59:13

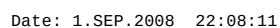


High Band Edge Plot on 802.11g Channel 11



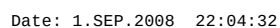


Low Band Edge Plot on 802.11a Channel 149





High Band Edge Plot on 802.11a Channel 165



3.4 Power Spectral Density Measurement

3.4.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

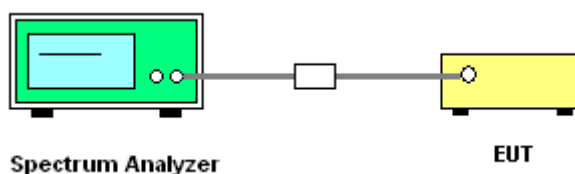
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The test follows FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Take the measured data from spectrum analyzer.

3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

Test Mode :	Mode 1, 2, 3	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

Channel	Frequency (MHz)	Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-9.88	8	Pass
06	2437	-9.71	8	Pass
11	2462	-9.94	8	Pass

Test Mode :	Mode 4, 5, 6	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

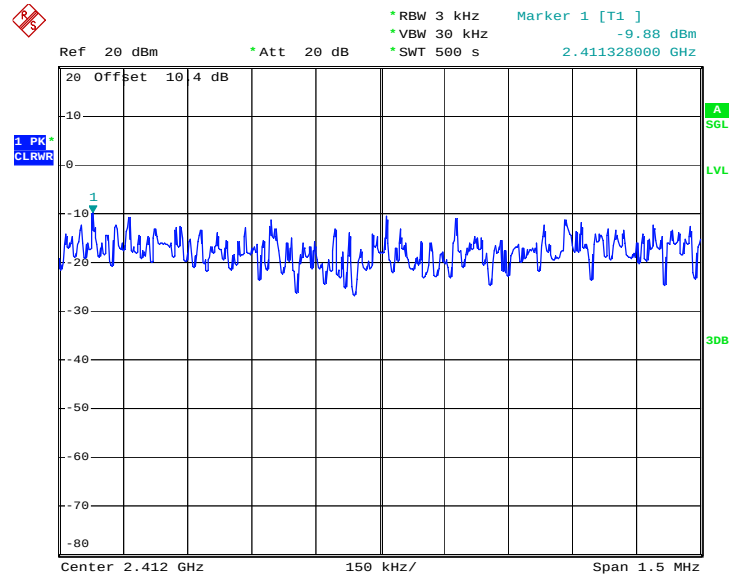
Channel	Frequency (MHz)	Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
01	2412	-16.89	8	Pass
06	2437	-13.50	8	Pass
11	2462	-16.89	8	Pass

Test Mode :	Mode 7, 8, 9	Temperature :	25~26℃
Test Engineer :	C.K.C. Cheng	Relative Humidity :	52~53%

Channel	Frequency (MHz)	Measured PSD (dBm)	Max. Limits (dBm)	Pass/Fail
149	5745	-10.98	8	Pass
157	5785	-12.58	8	Pass
165	5825	-12.48	8	Pass

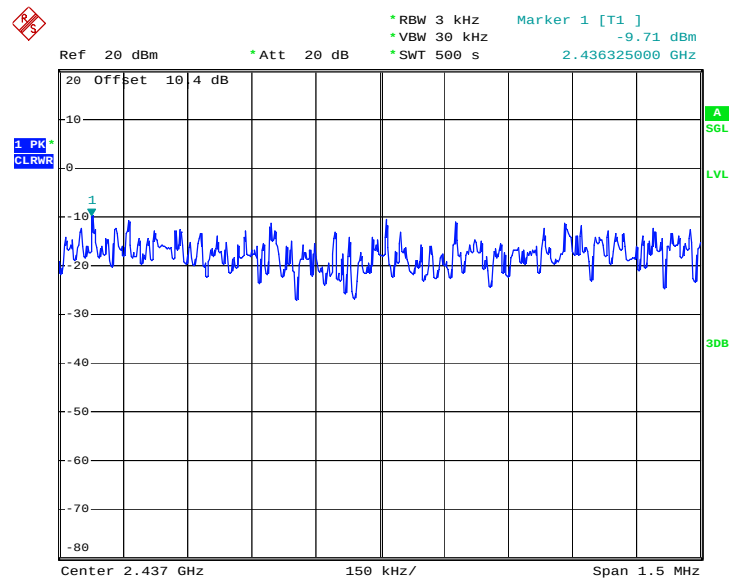
3.4.6 Test Result of Power Spectral Density Plots

Mode 1 : PSD Plot on 802.11b Channel 01



Date: 28.AUG.2008 08:14:53

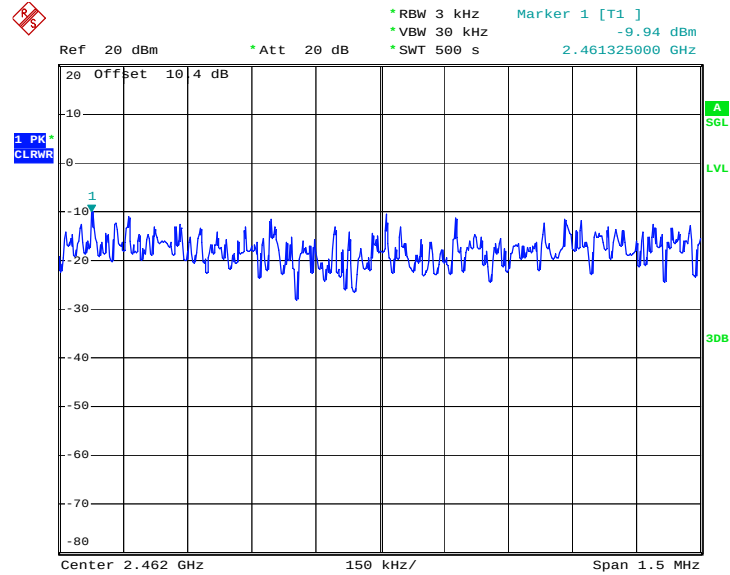
Mode 2 : PSD Plot on 802.11b Channel 06



Date: 28.AUG.2008 08:05:53

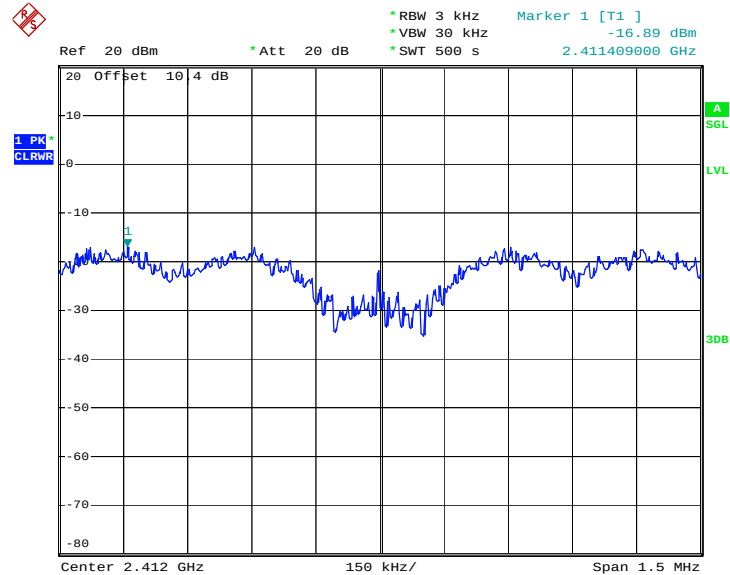


Mode 3 : PSD Plot on 802.11b Channel 11



Date: 28.AUG.2008 07:30:31

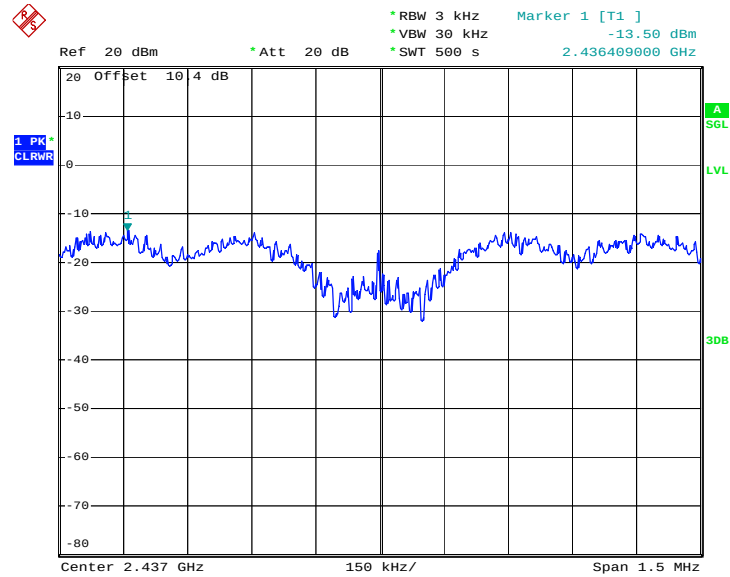
Mode 4 : PSD Plot on 802.11g Channel 01



Date: 28.AUG.2008 08:23:40

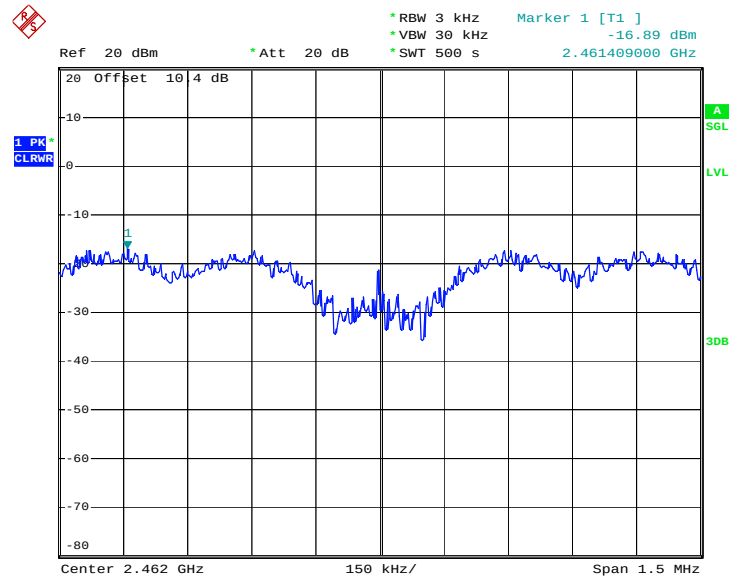


Mode 5 : PSD Plot on 802.11g Channel 06



Date: 28.AUG.2008 07:56:40

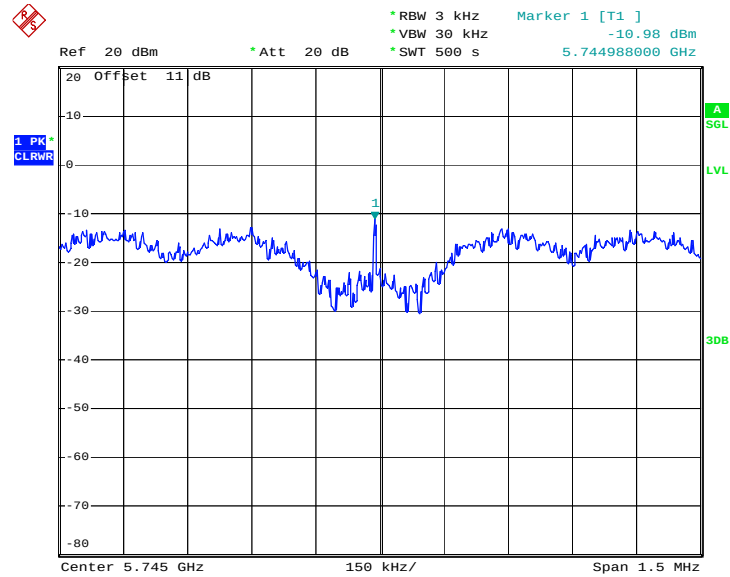
Mode 6 : PSD Plot on 802.11g Channel 11



Date: 28.AUG.2008 07:44:51

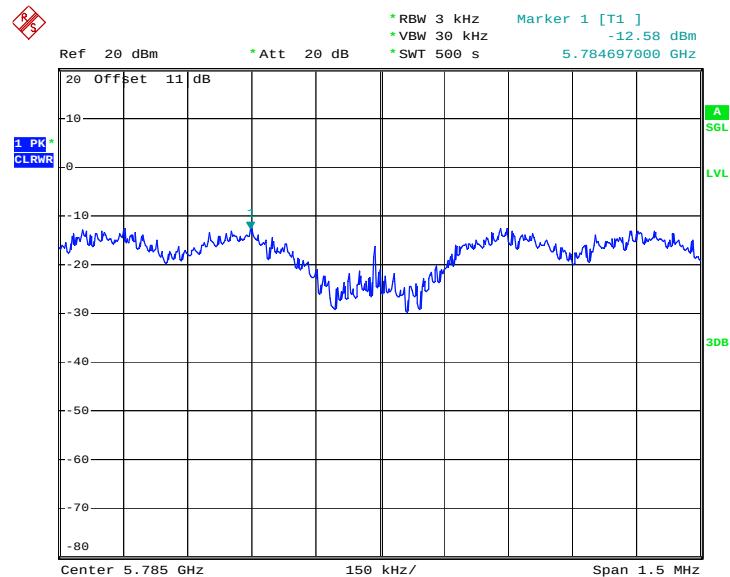


Mode 7 : PSD Plot on 802.11a Channel 149



Date: 1.SEP.2008 22:19:07

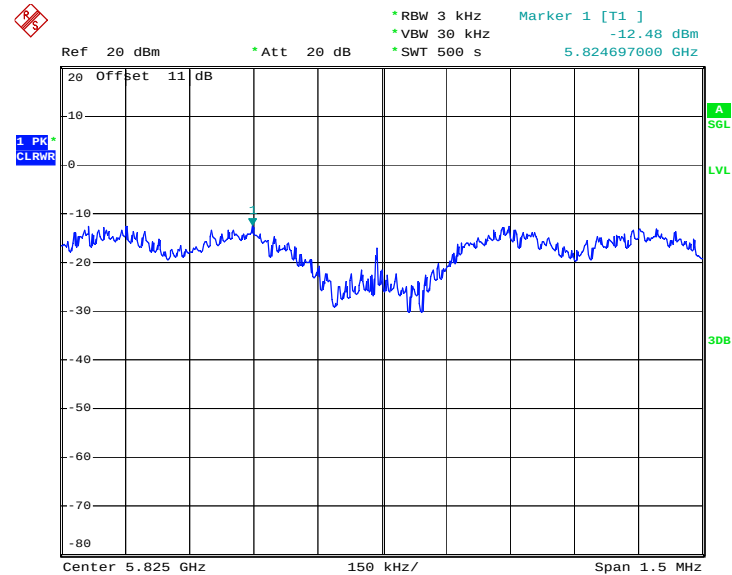
Mode 8 : PSD Plot on 802.11a Channel 157



Date: 1.SEP.2008 22:28:17



Mode 9 : PSD Plot on 802.11a Channel 165



Date: 1.SEP.2008 22:37:30

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

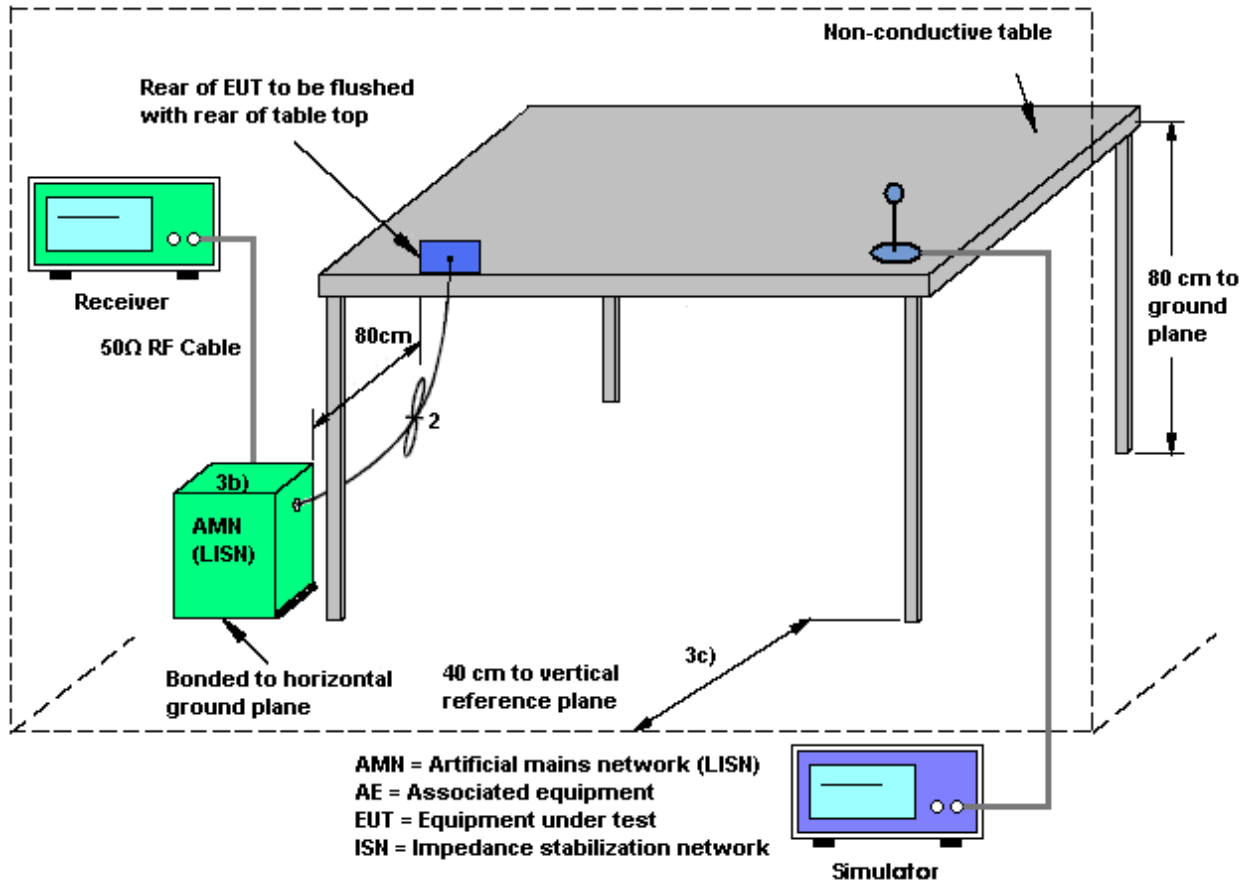
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

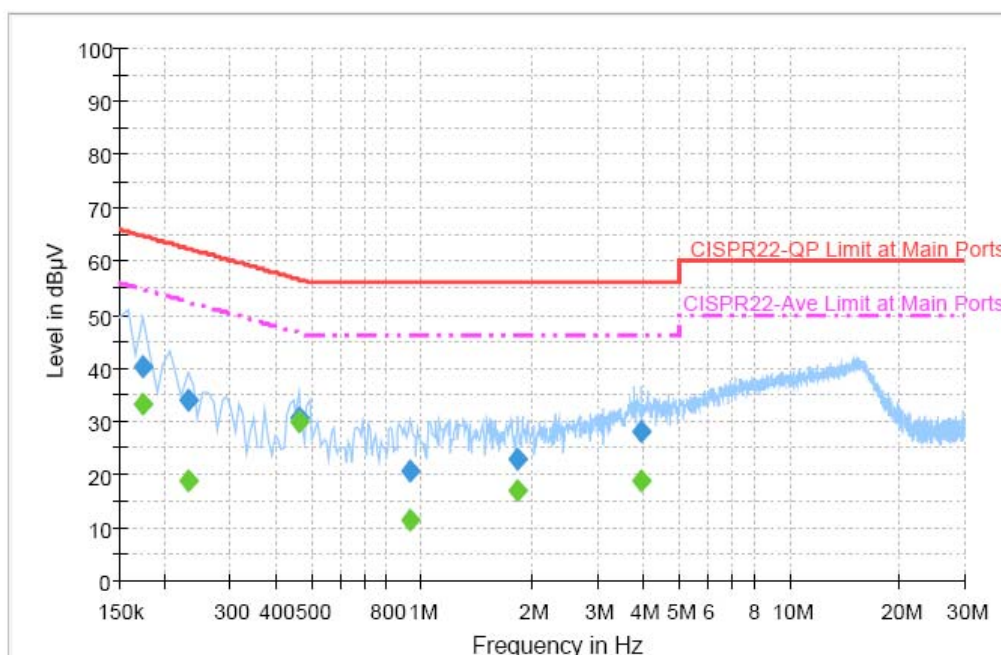
1. The testing follows the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Test Mode :	Mode 3	Temperature :	25~26°C
Test Engineer :	Cona Huang	Relative Humidity :	52~53%
		Phase :	Line
Function Type :	BT Link + WLAN (2.4G) Link + USB Charging Cable with AC power + USB Link + Numeric key pad + Battery(3600mA) + 1D Scanner		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result 1

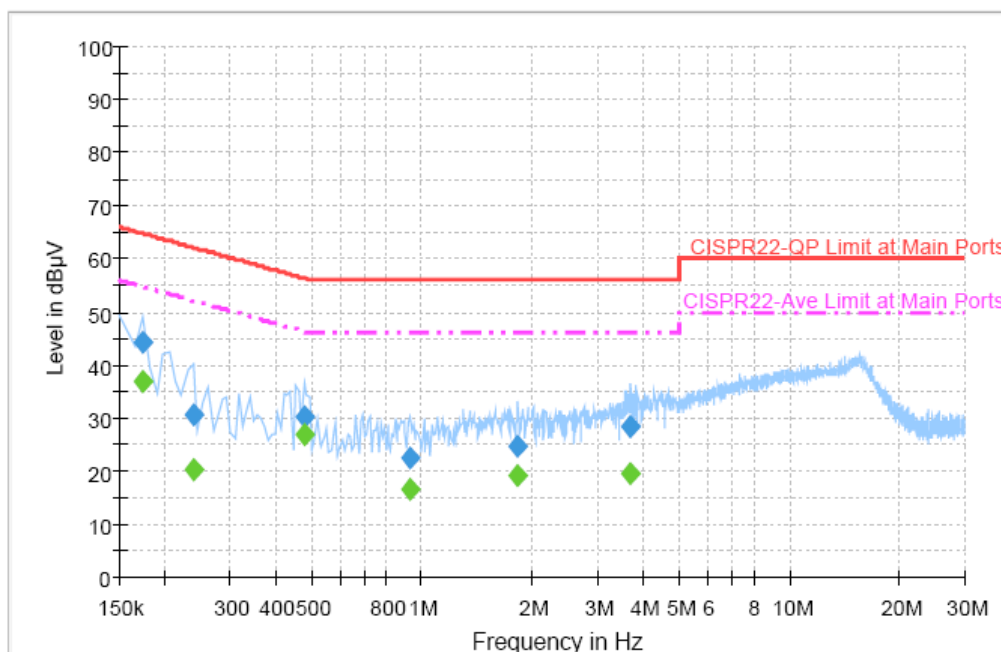
Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	40.4	Off	L1	19.3	24.4	64.8
0.230000	33.9	Off	L1	19.4	28.5	62.4
0.462000	30.6	Off	L1	19.3	26.1	56.7
0.926000	20.8	Off	L1	19.4	35.2	56.0
1.822000	22.9	Off	L1	19.5	33.1	56.0
3.934000	28.0	Off	L1	19.5	28.0	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	33.3	Off	L1	19.3	21.5	54.8
0.230000	18.7	Off	L1	19.4	33.7	52.4
0.462000	29.8	Off	L1	19.3	16.9	46.7
0.926000	11.4	Off	L1	19.4	34.6	46.0
1.822000	17.1	Off	L1	19.5	28.9	46.0
3.934000	19.0	Off	L1	19.5	27.0	46.0

Test Mode :	Mode 3	Temperature :	25~26°C
Test Engineer :	Cona Huang	Relative Humidity :	52~53%
		Phase :	Neutral
Function Type :	BT Link + WLAN (2.4G) Link + USB Charging Cable with AC power + USB Link + Numeric key pad + Battery(3600mA) + 1D Scanner		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

ENV216 Auto Test


Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	44.2	Off	N	19.3	20.6	64.8
0.238000	30.5	Off	N	19.4	31.7	62.2
0.478000	30.2	Off	N	19.4	26.2	56.4
0.926000	22.5	Off	N	19.4	33.5	56.0
1.822000	24.6	Off	N	19.5	31.4	56.0
3.702000	28.4	Off	N	19.6	27.6	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.174000	36.8	Off	N	19.3	18.0	54.8
0.238000	20.3	Off	N	19.4	31.9	52.2
0.478000	26.9	Off	N	19.4	19.5	46.4
0.926000	16.5	Off	N	19.4	29.5	46.0
1.822000	19.1	Off	N	19.5	26.9	46.0

3.6 Radiated Emission Measurement

3.6.1 Limit of Radiated Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

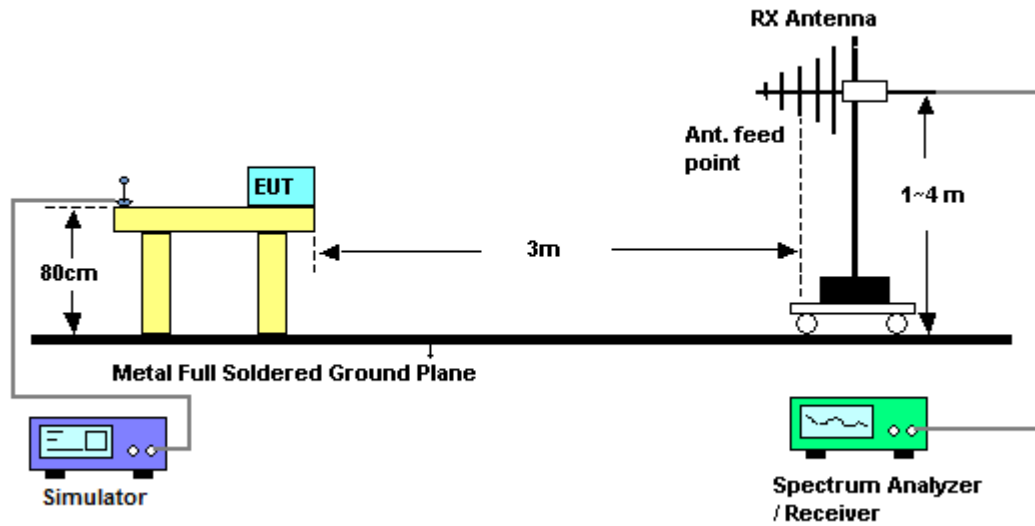
3.6.2 Measuring Instruments

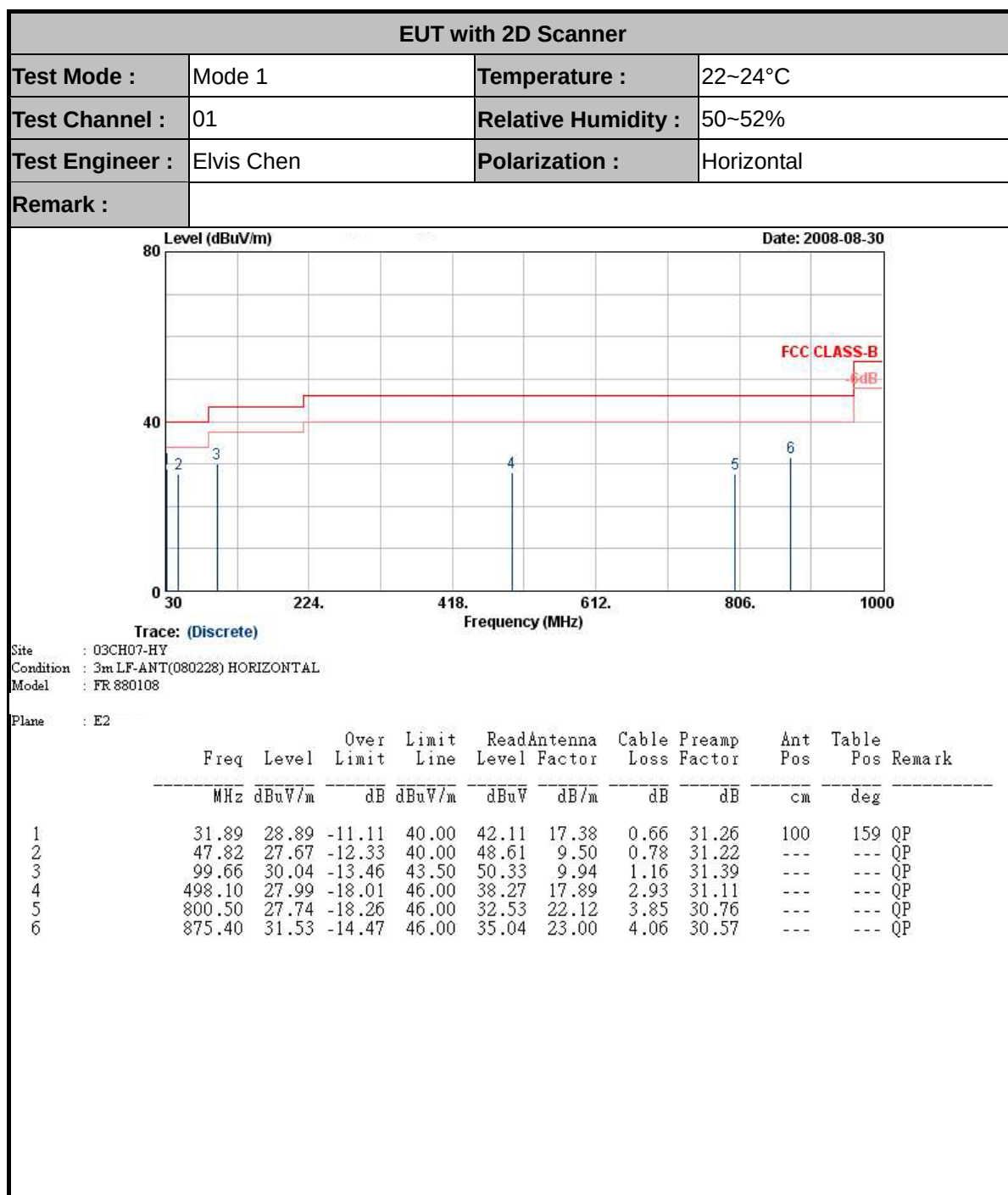
See list of measuring instruments of this test report.

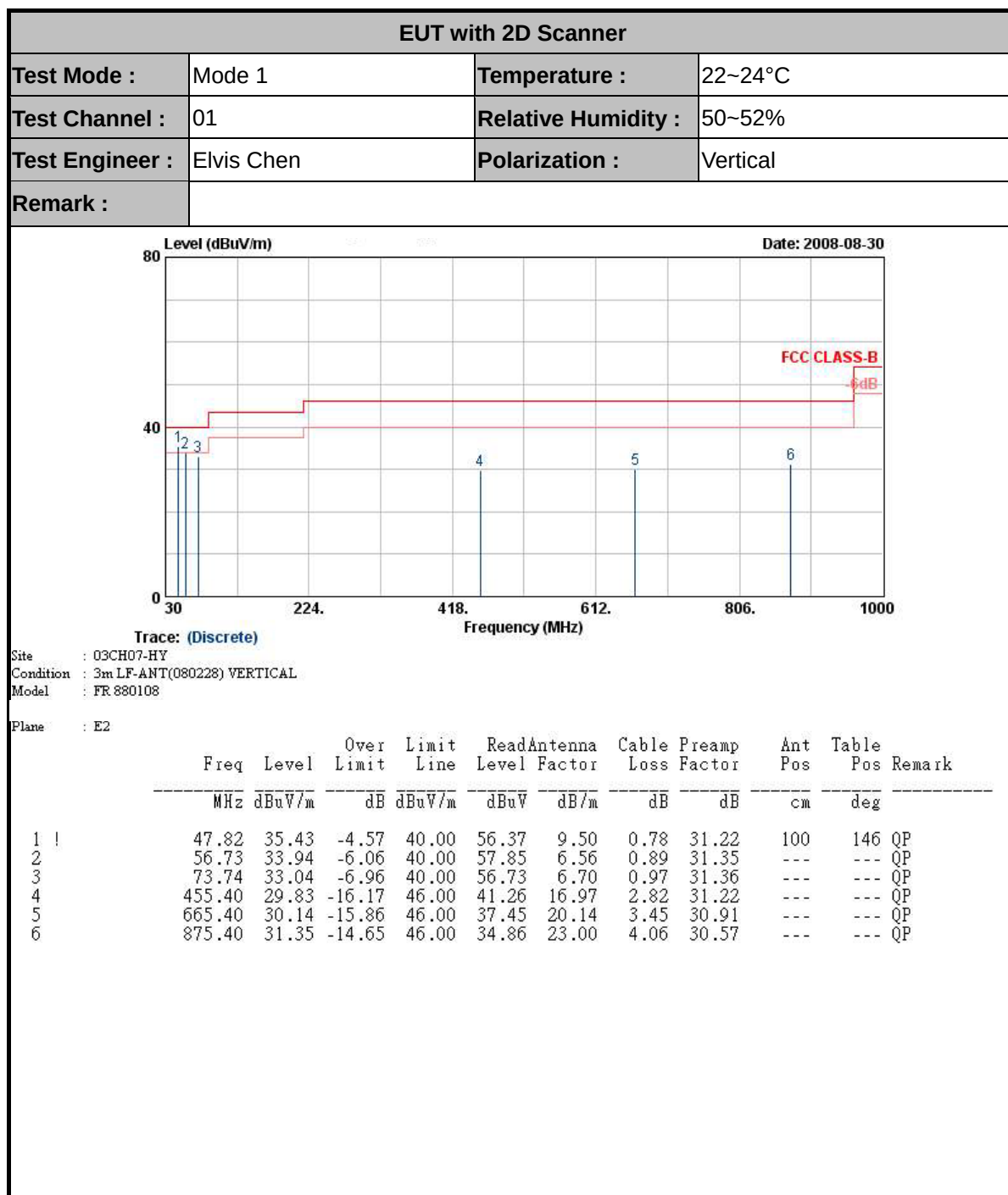
3.6.3 Test Procedures

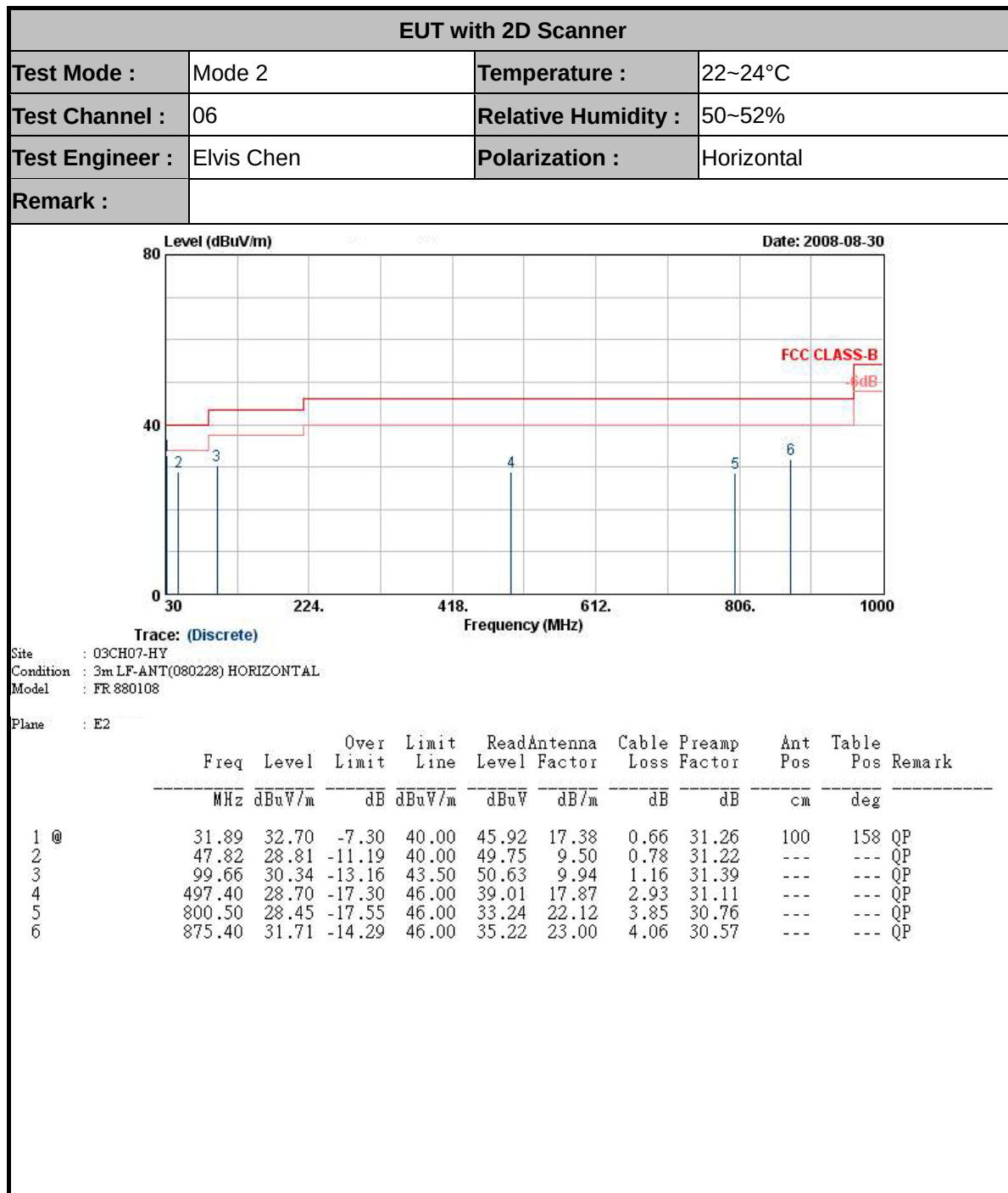
1. The testing follows the guidelines in FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
3. Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.

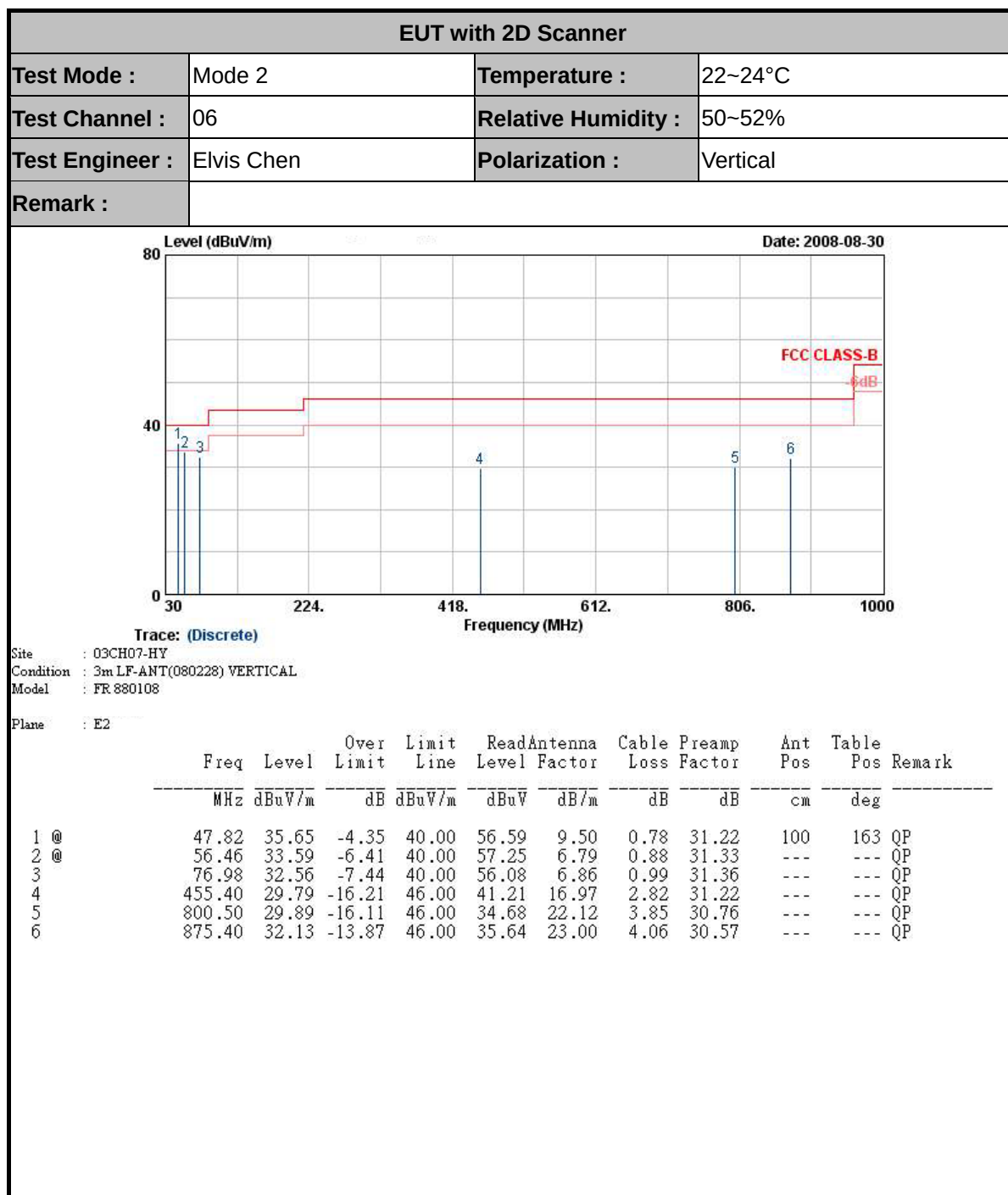
3.6.4 Test Setup

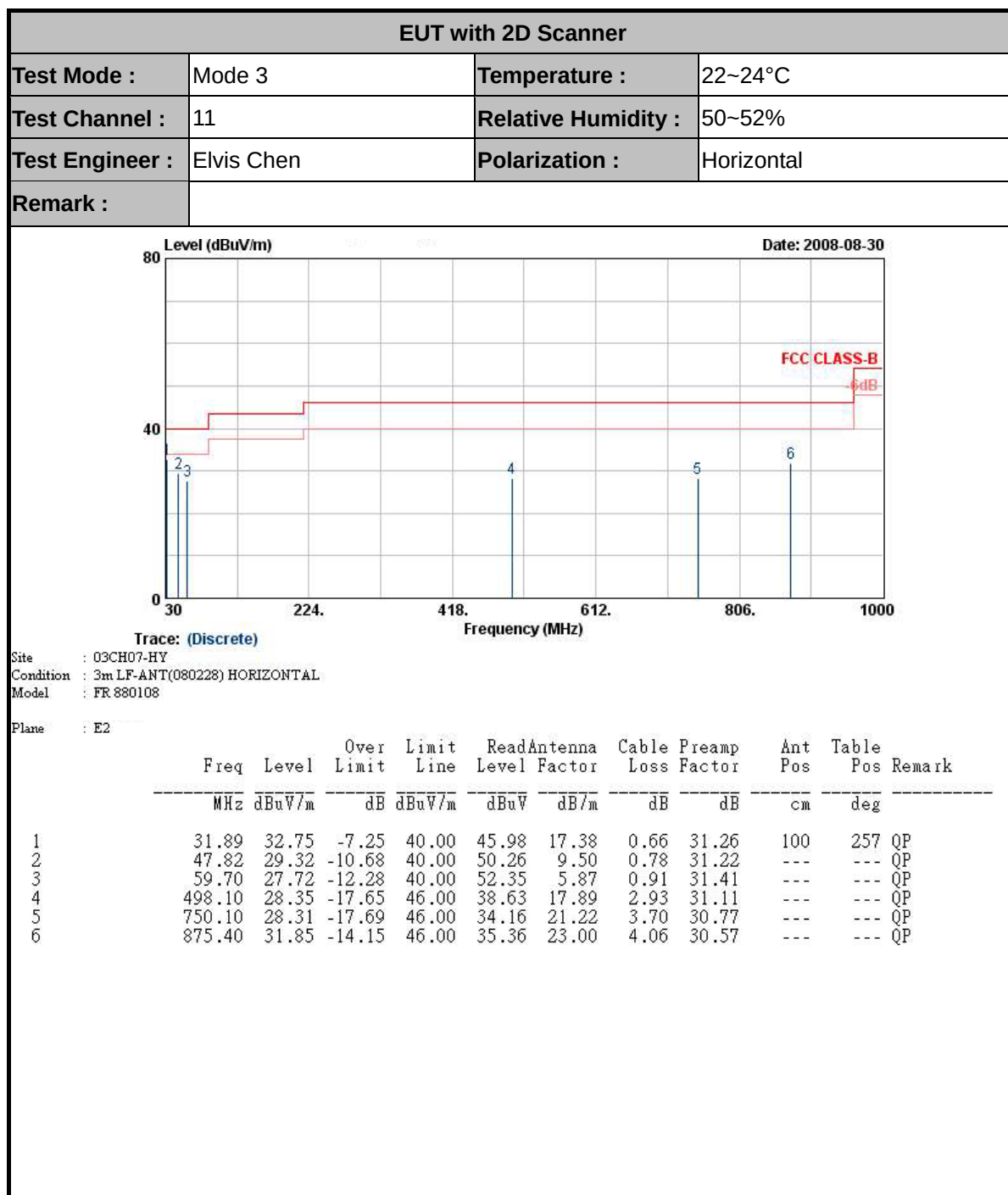


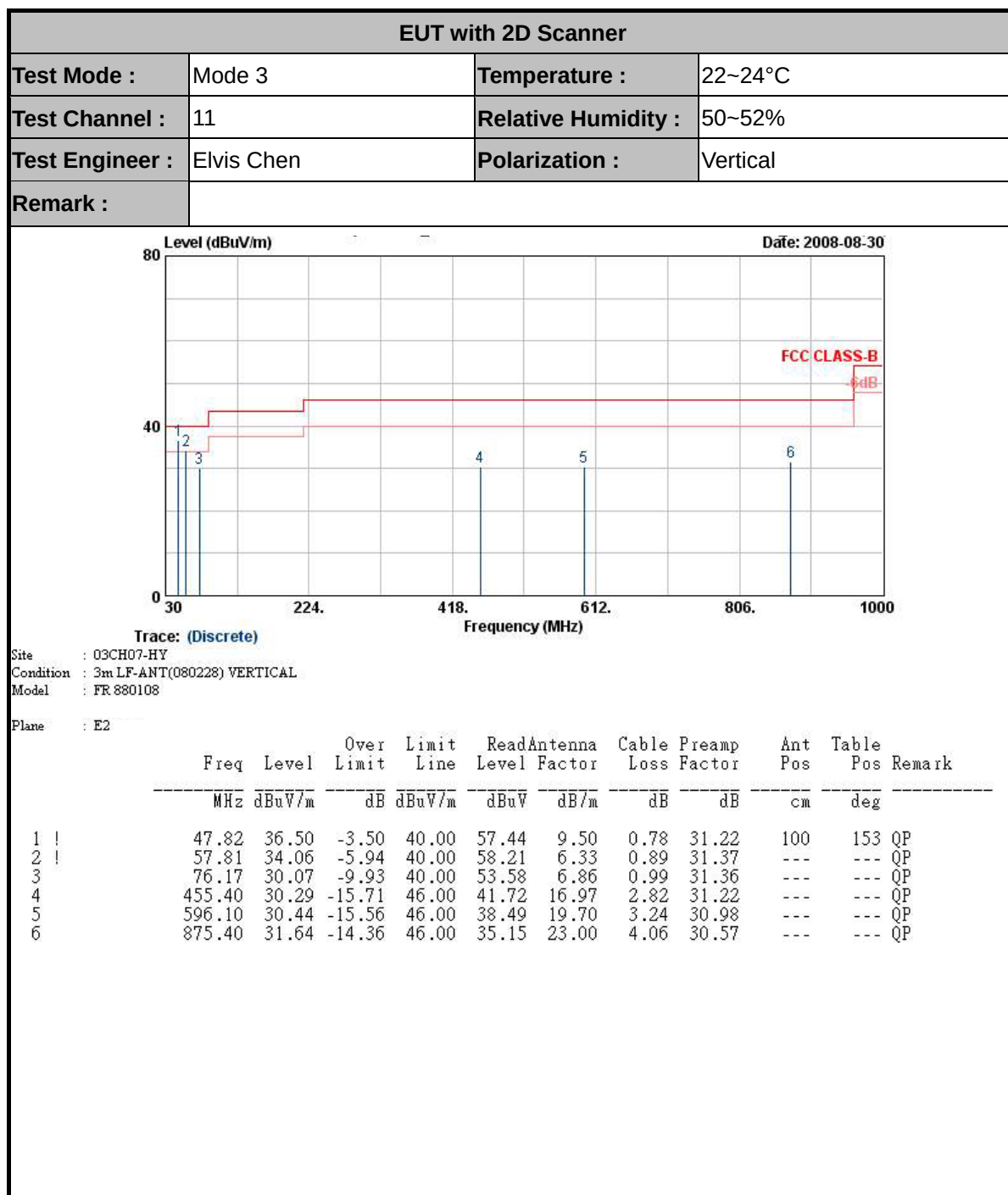
3.6.5 Test Result of Radiated Emission < 1GHz


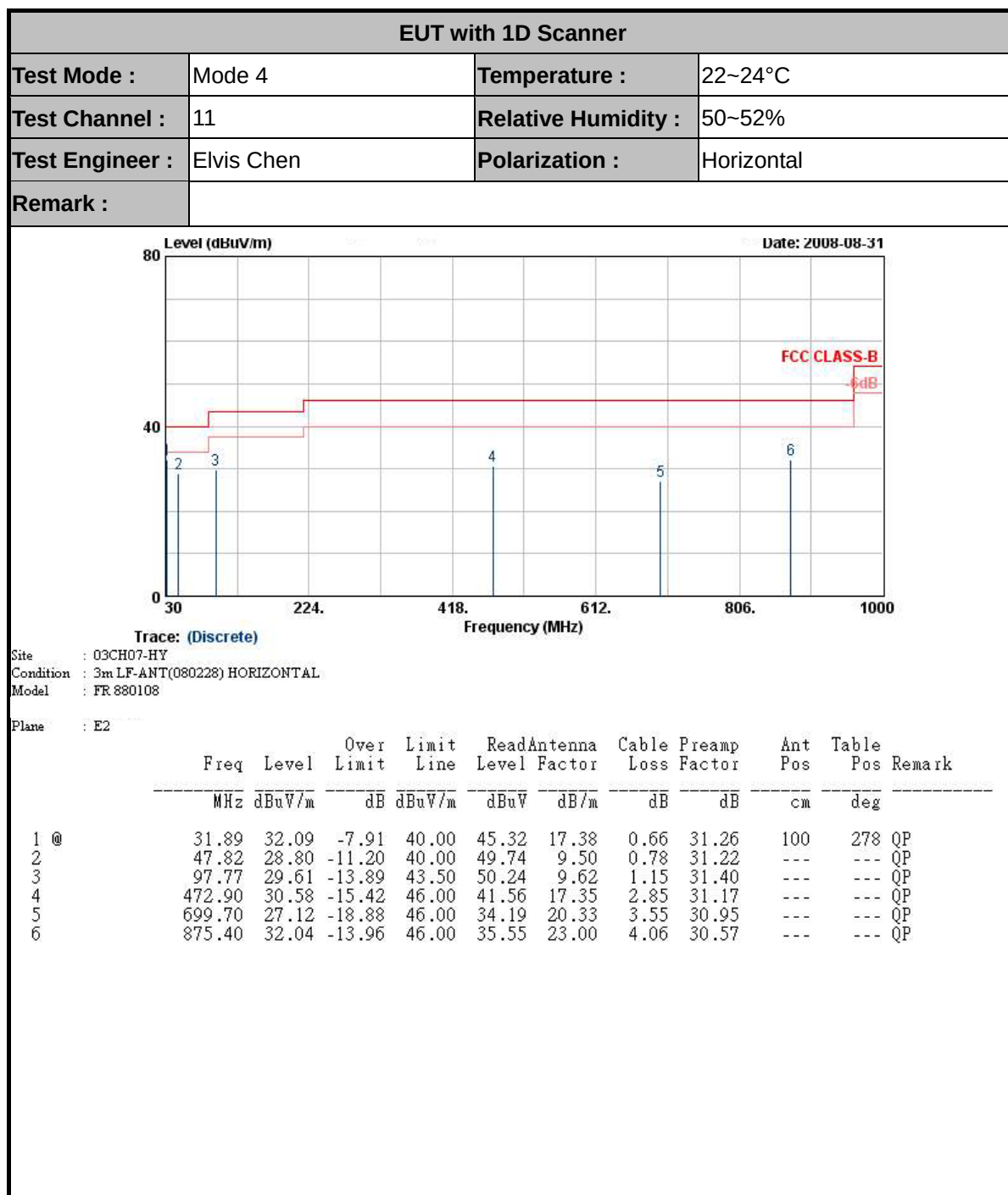


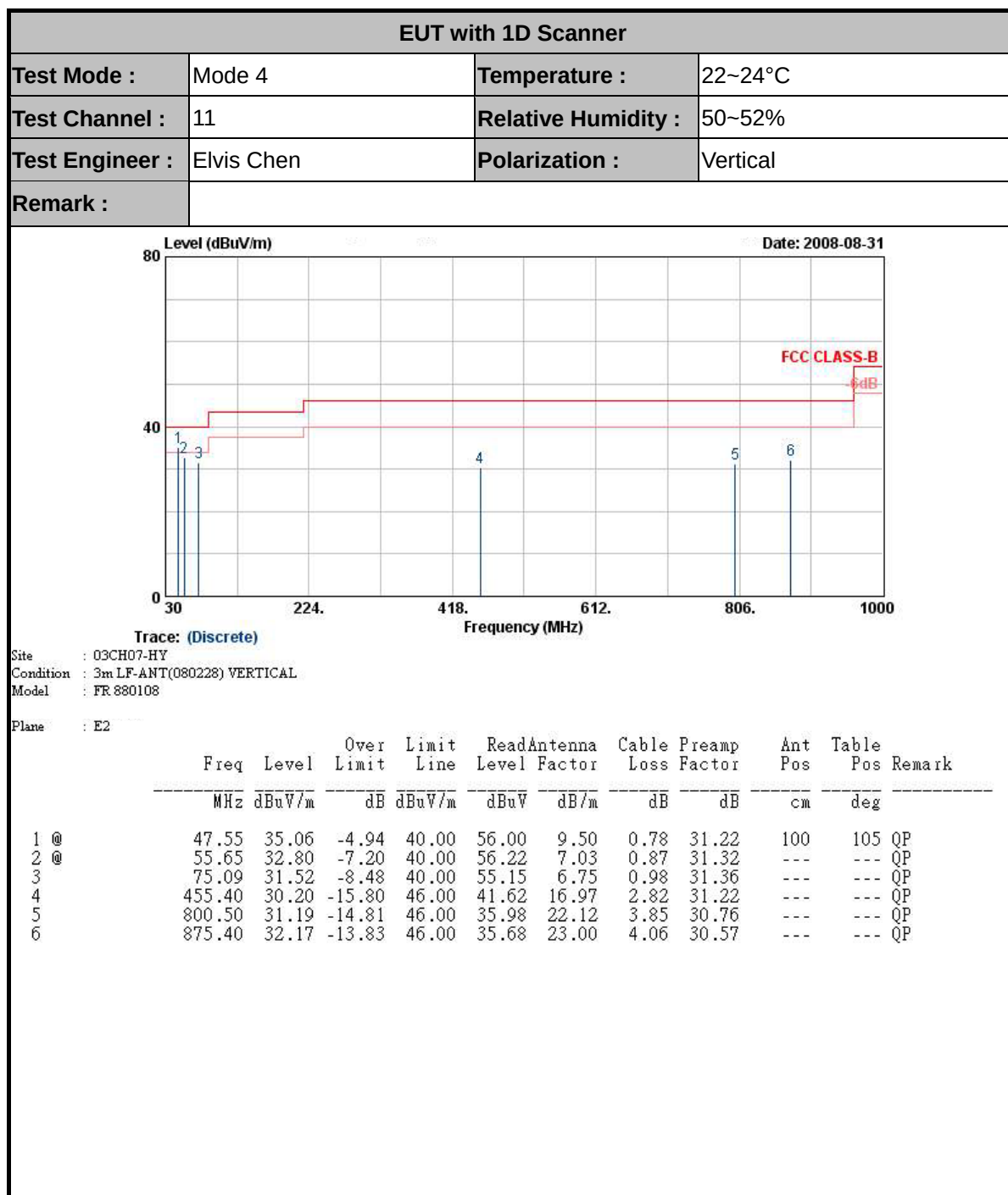


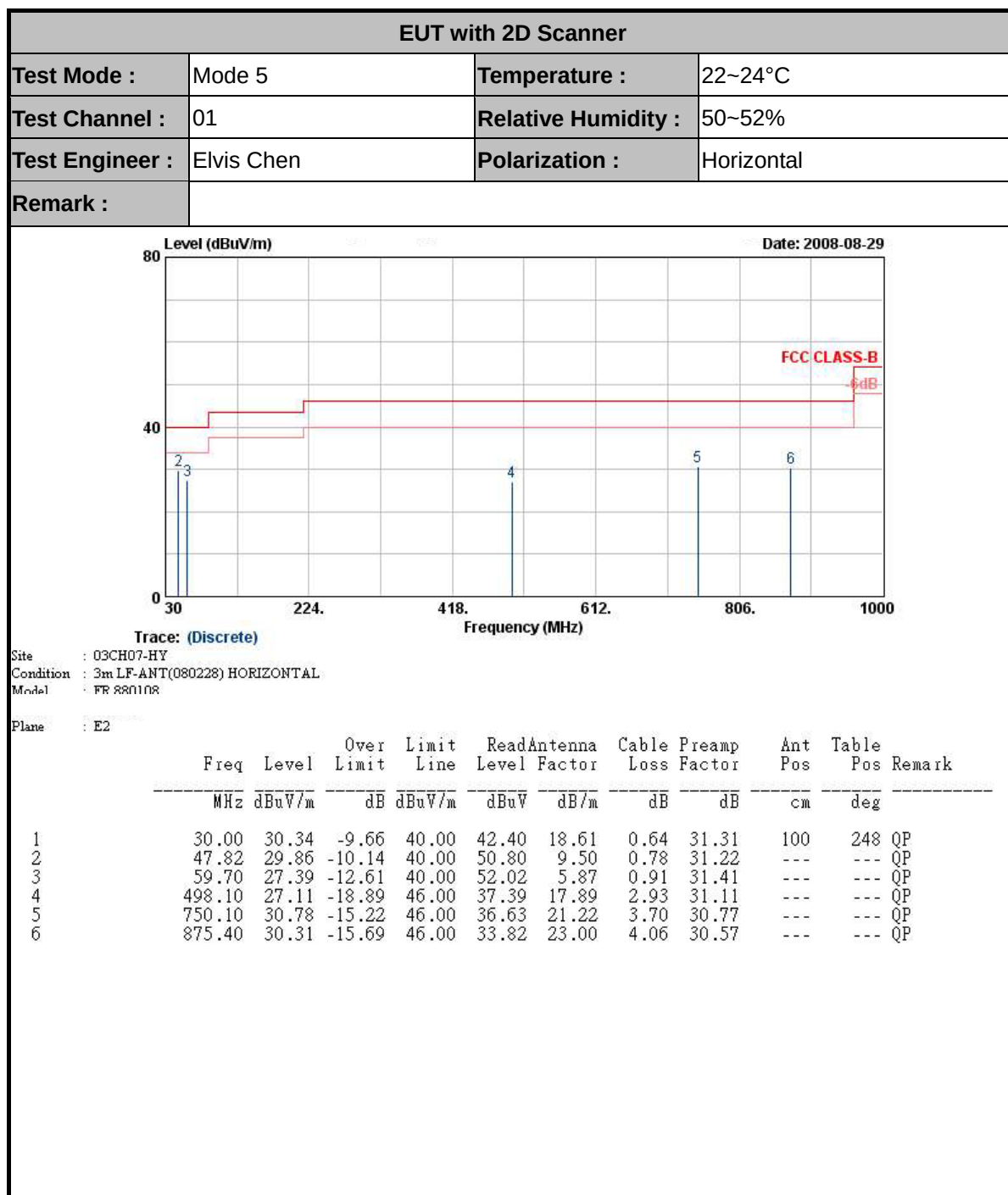


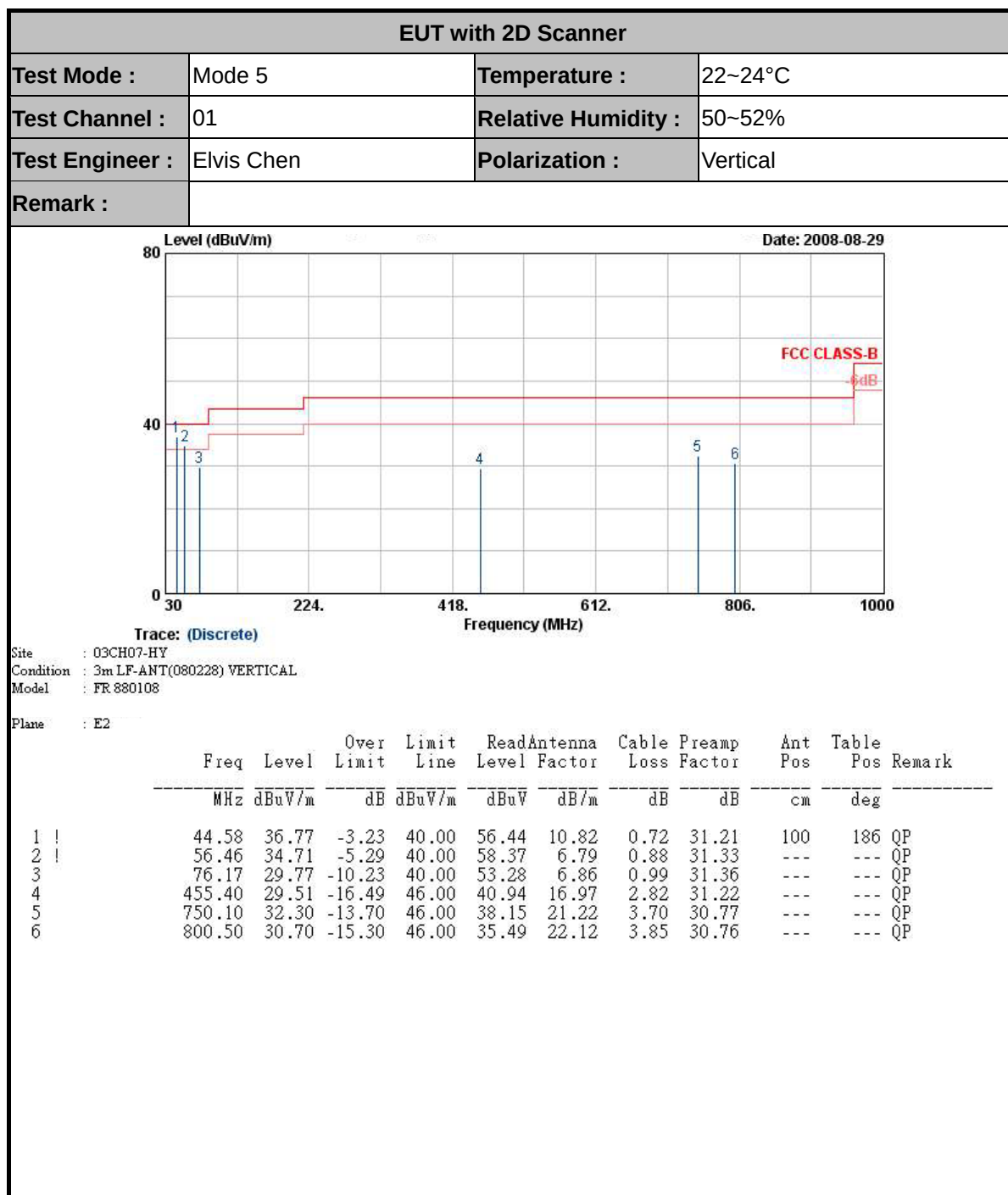


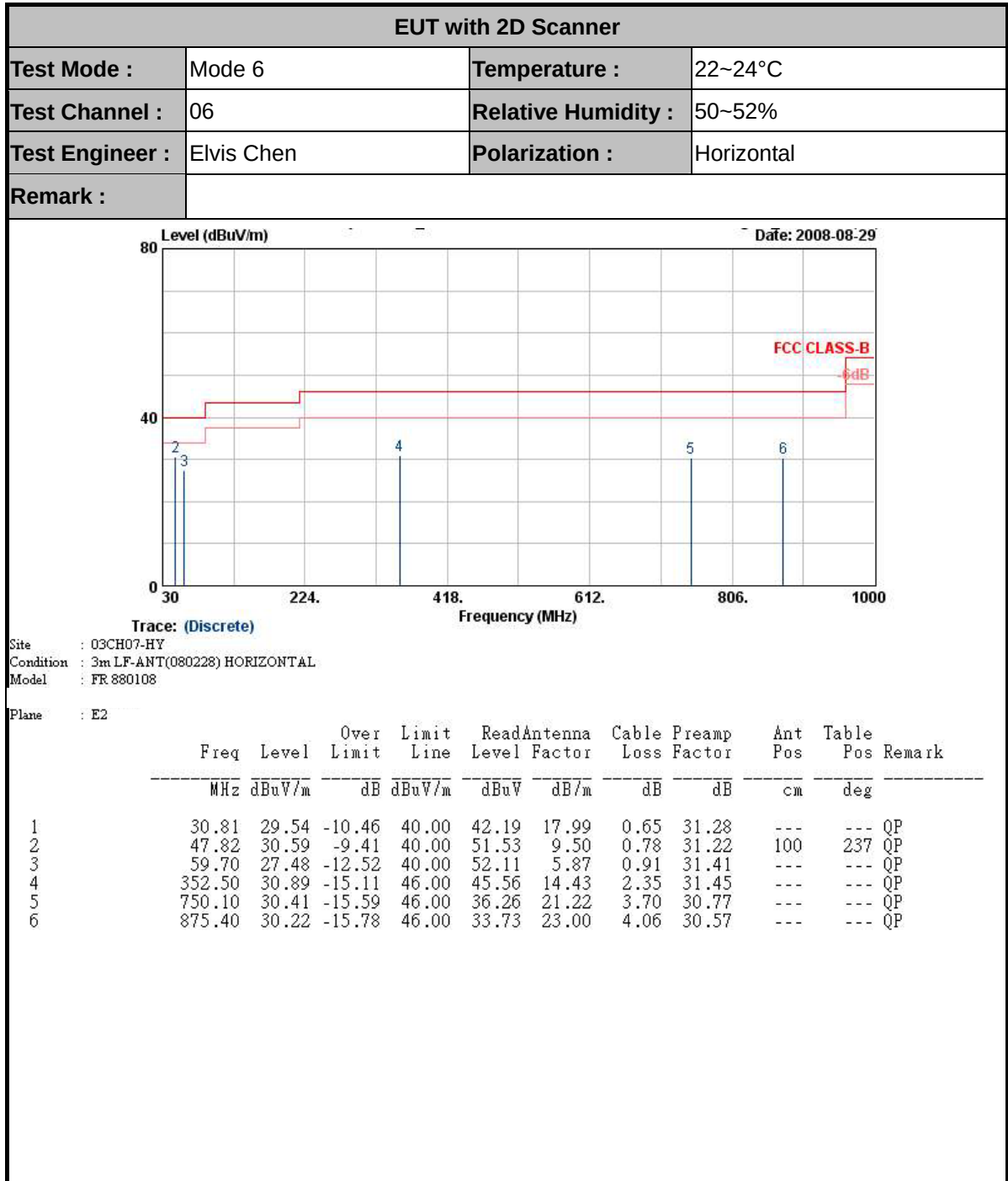


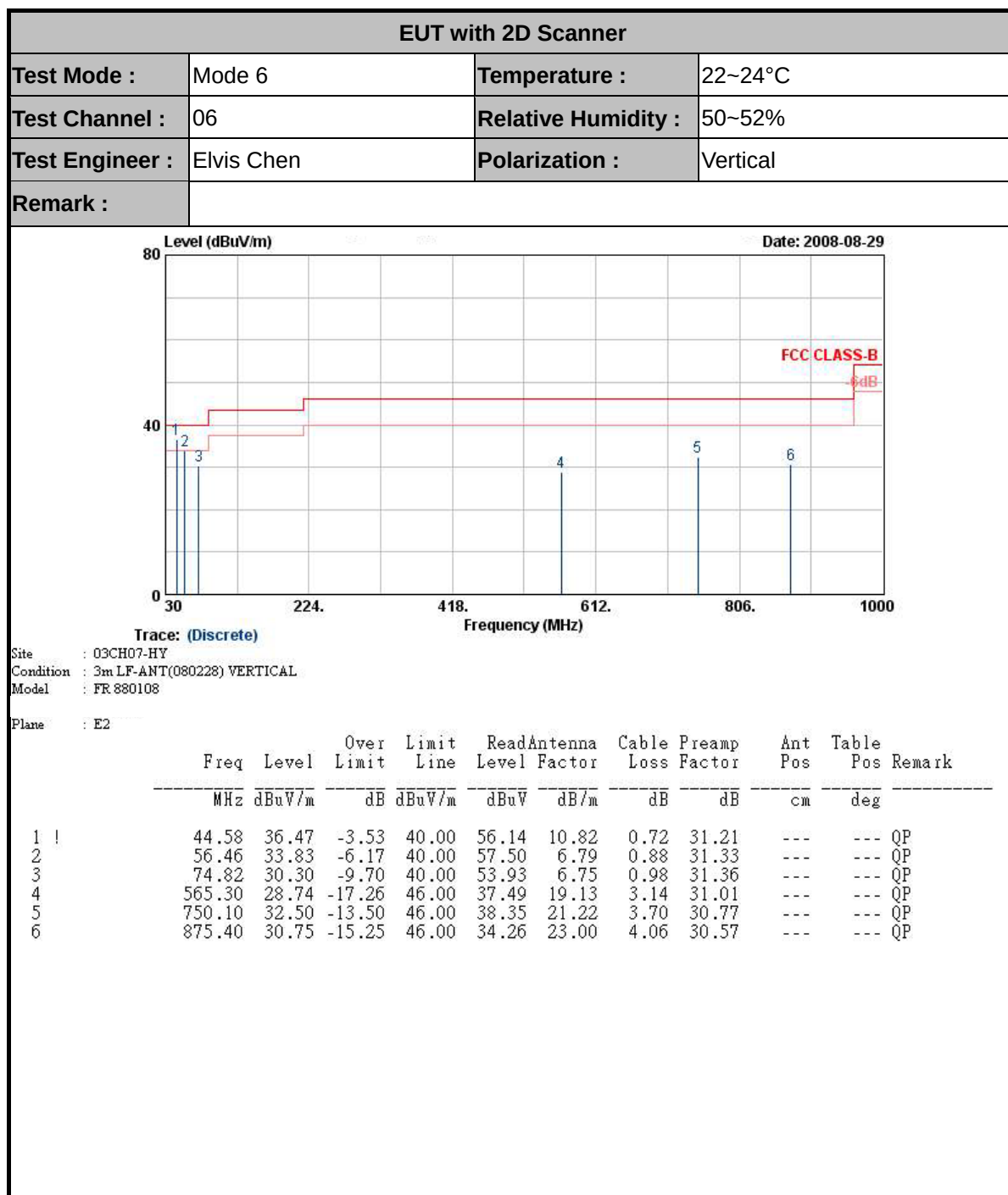


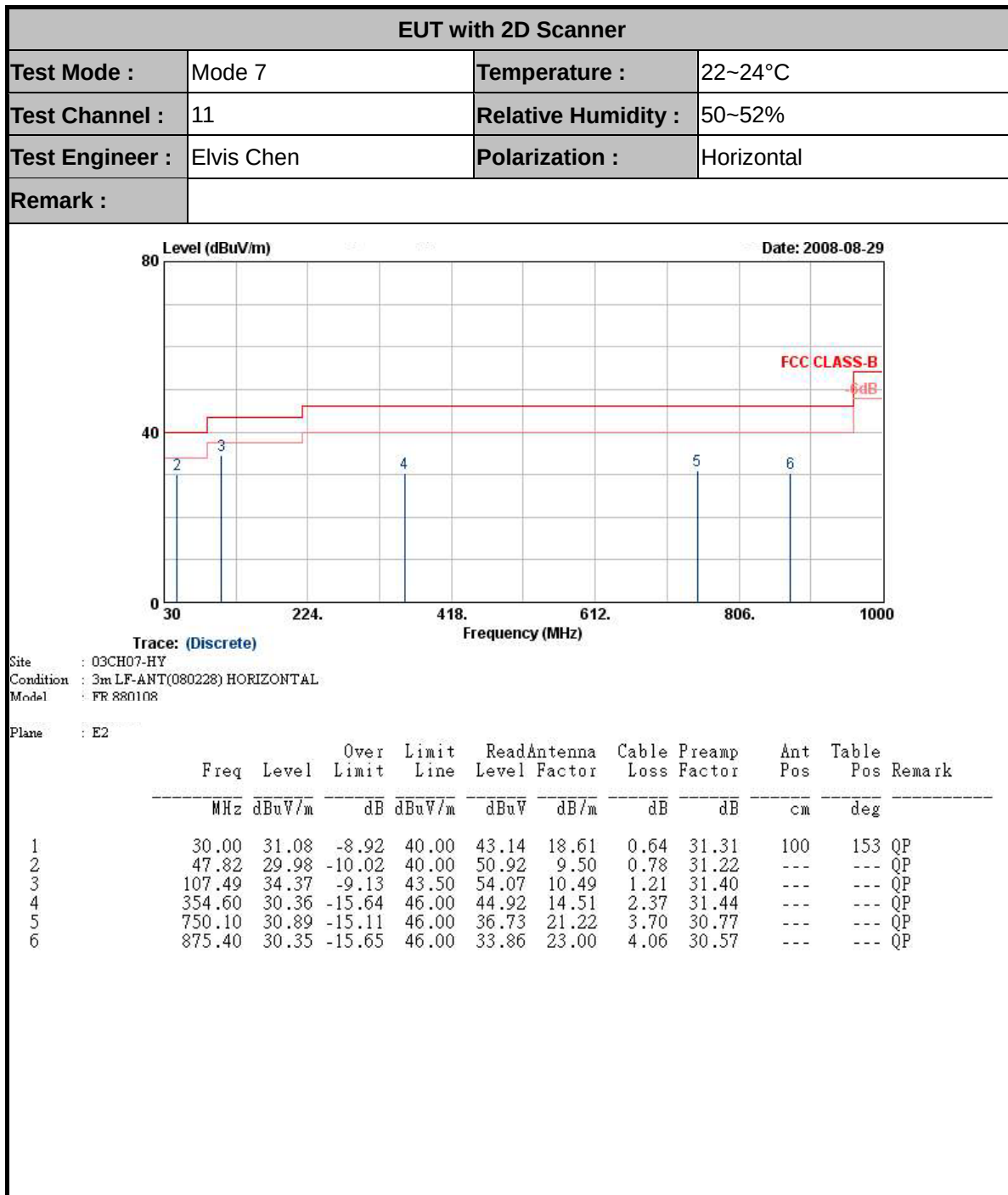


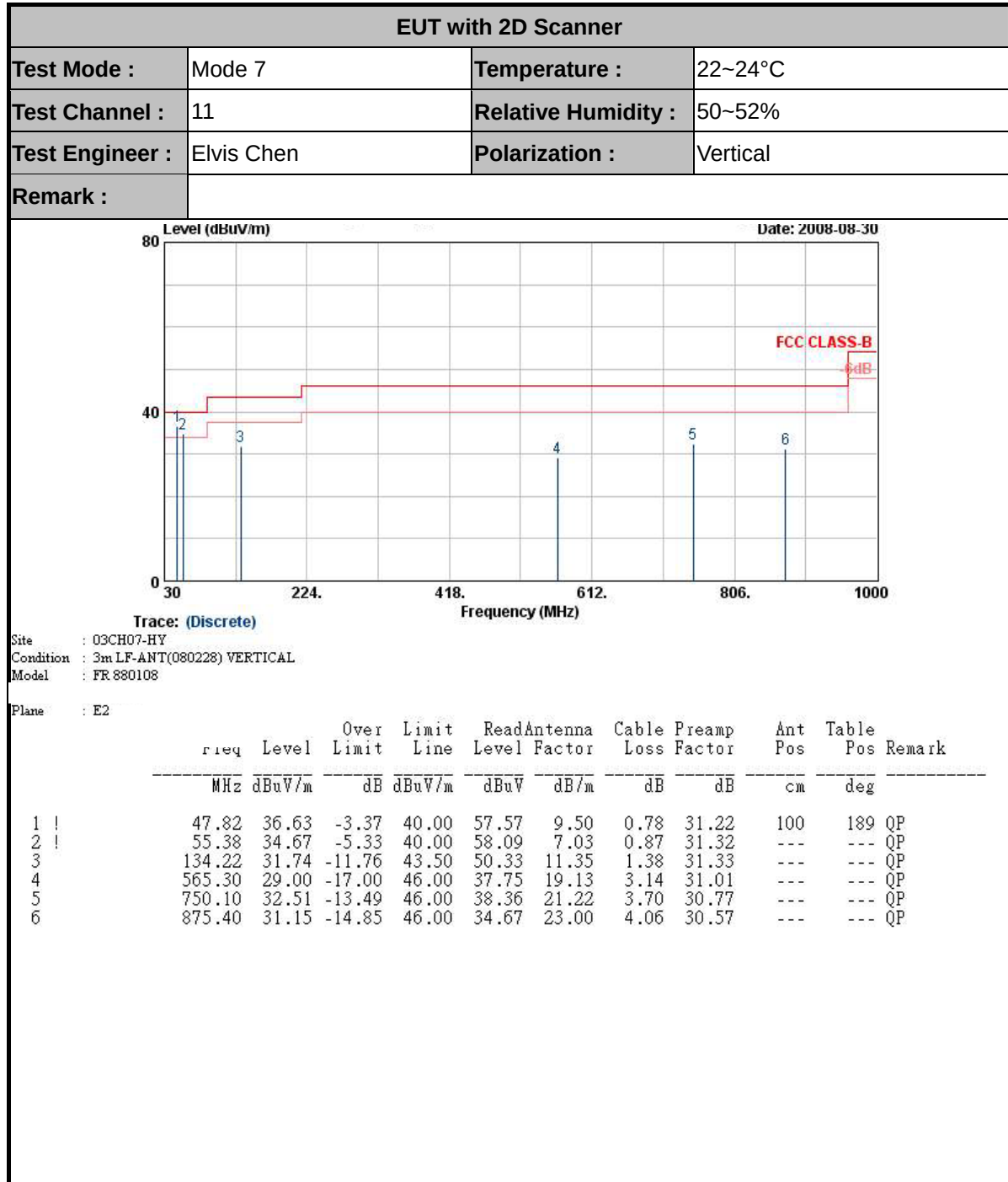


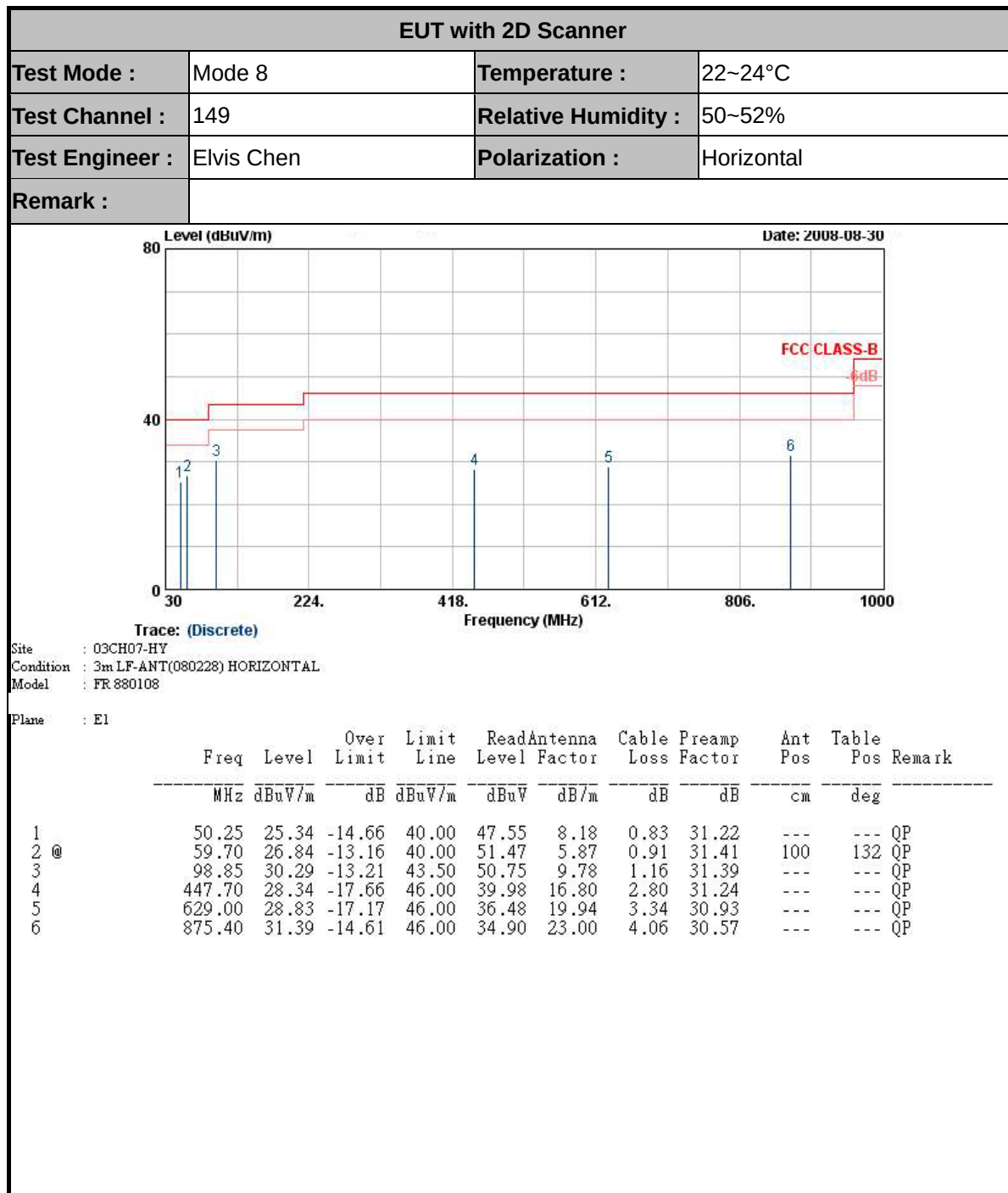


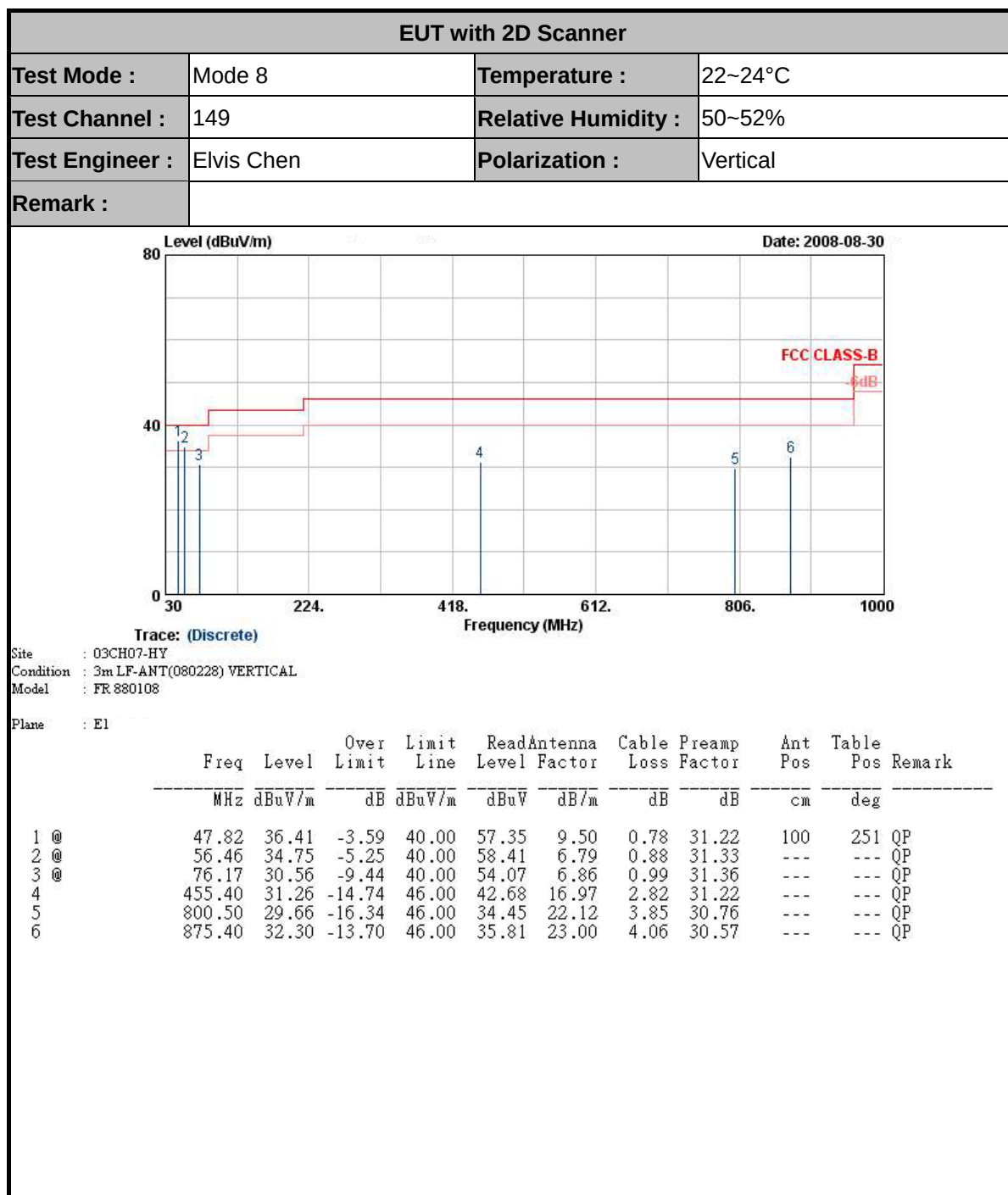


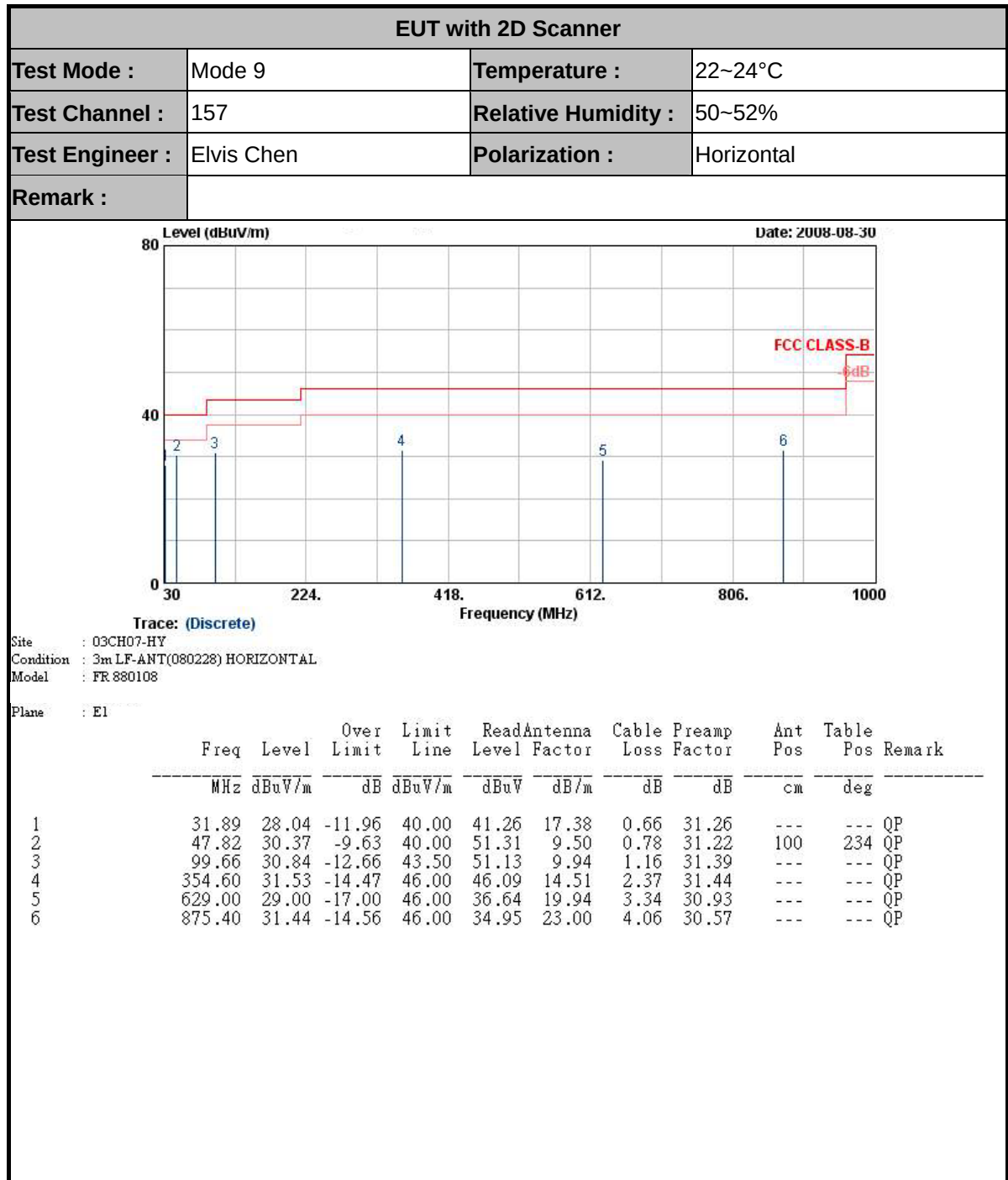


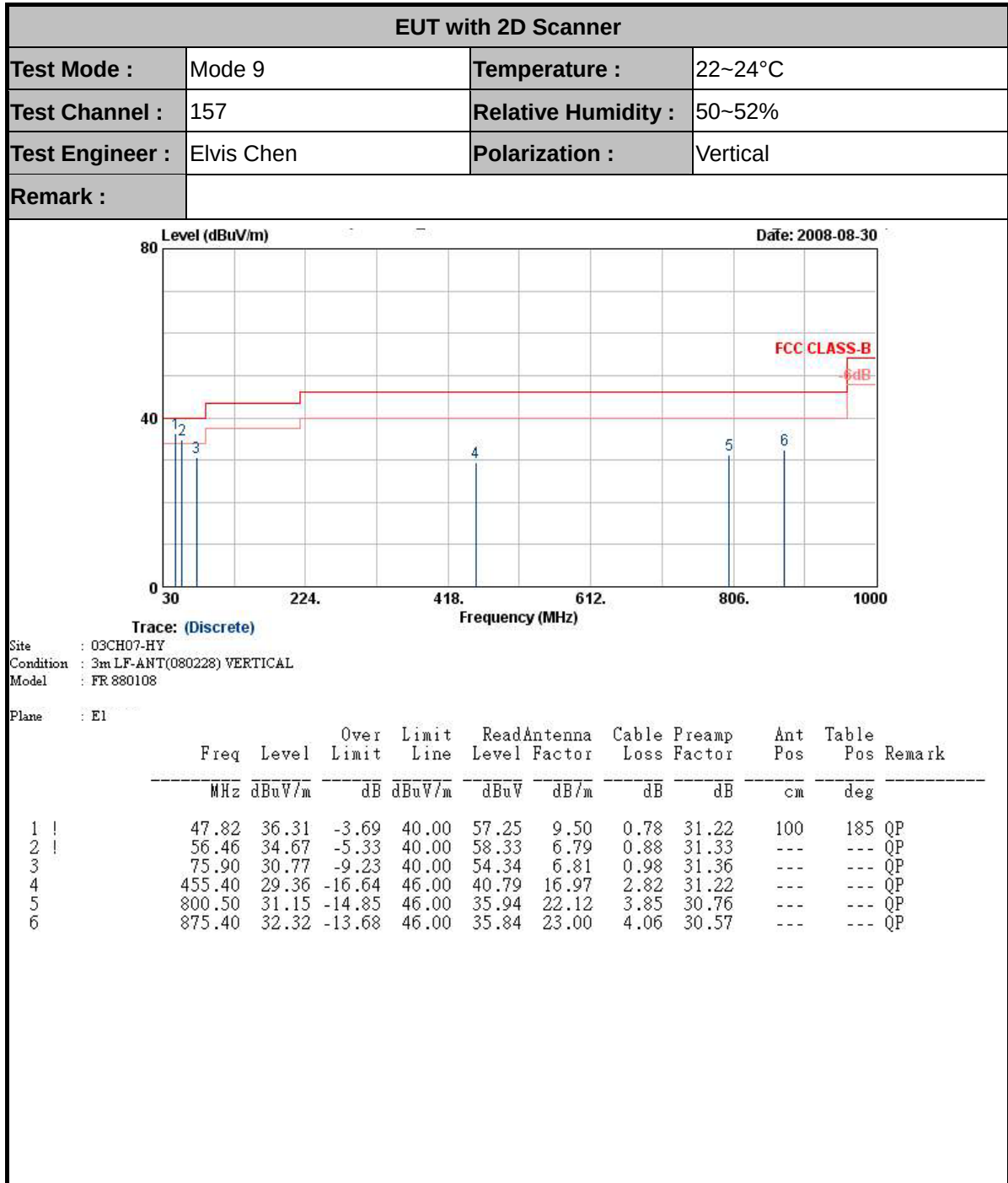


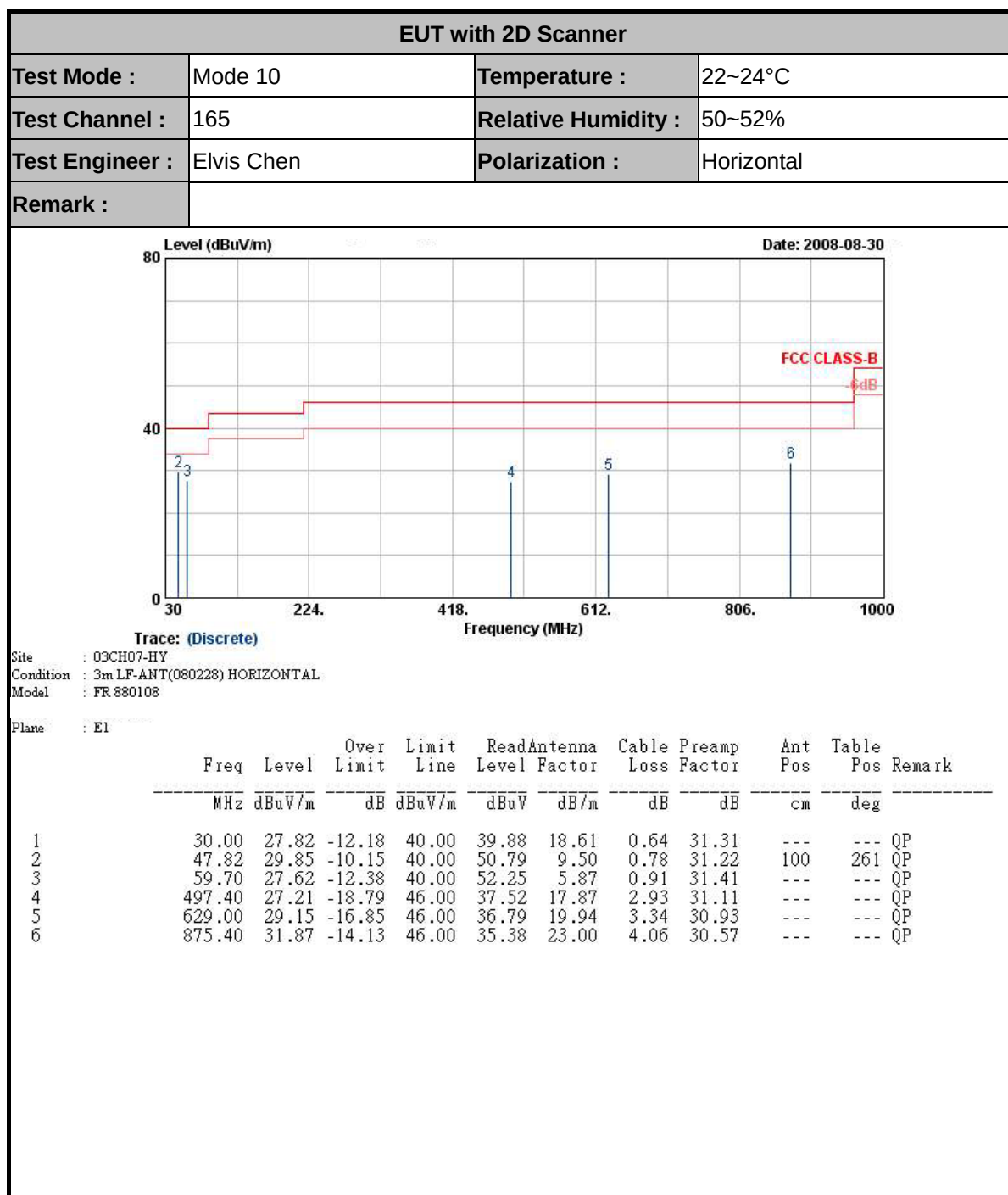


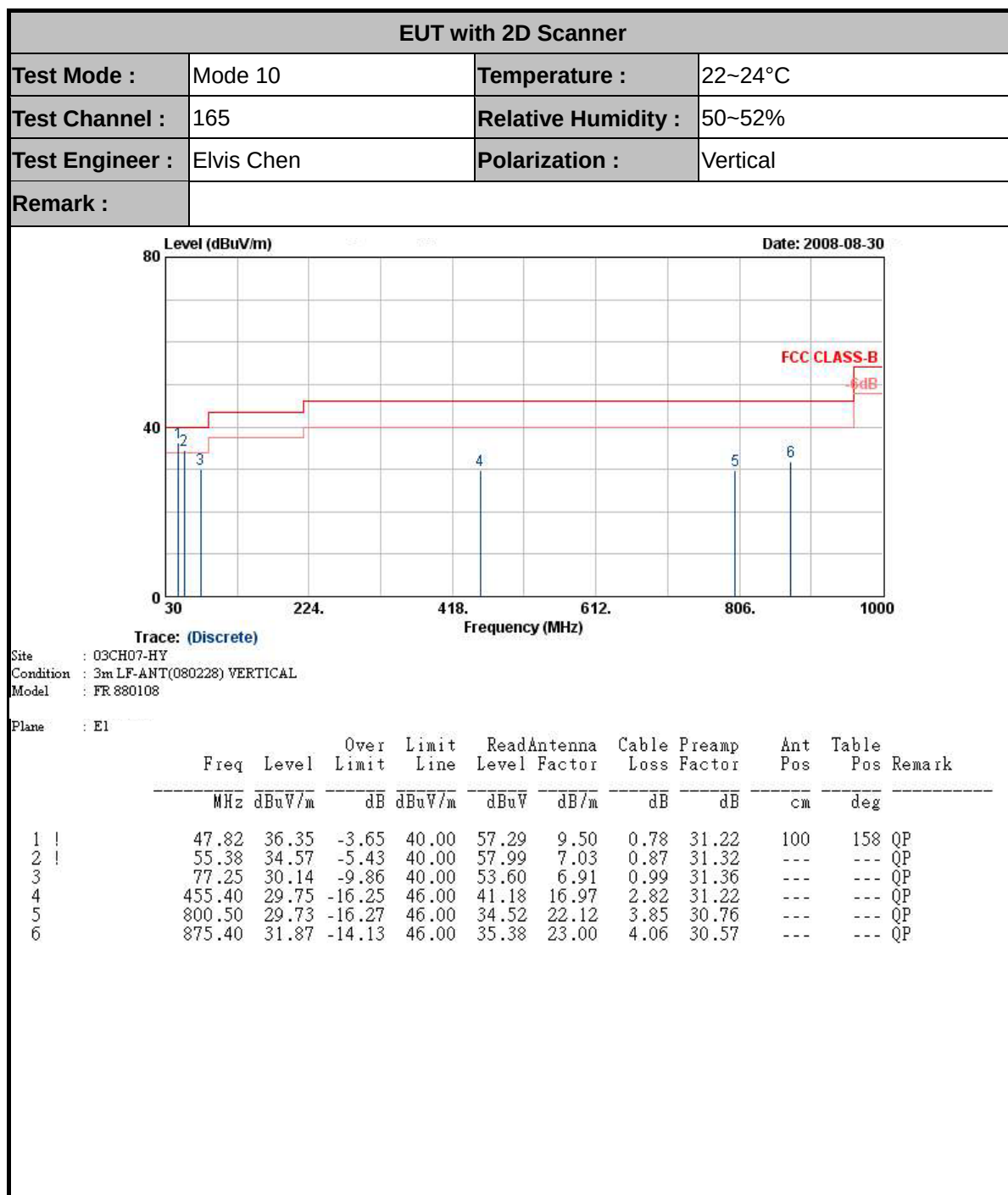


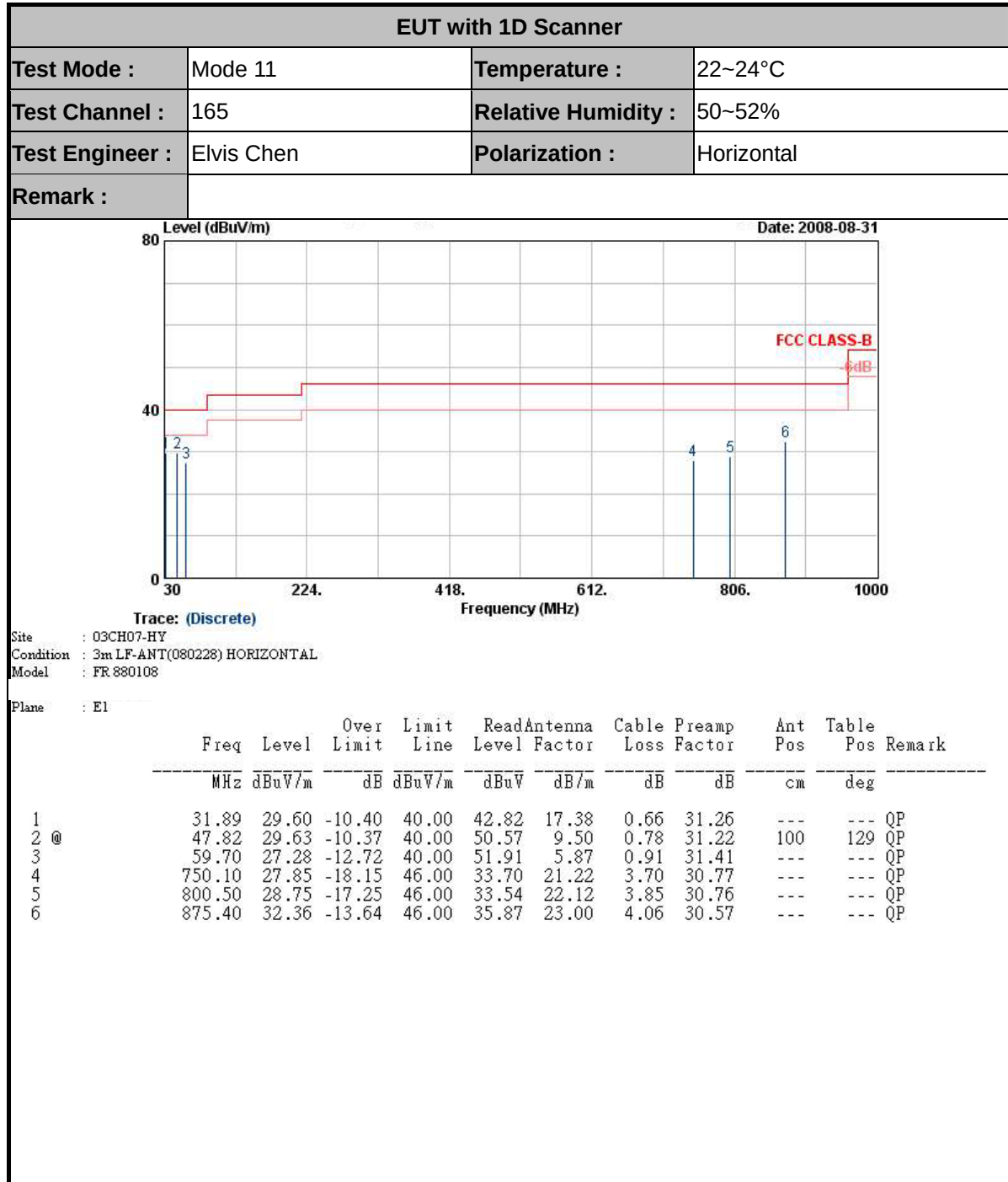


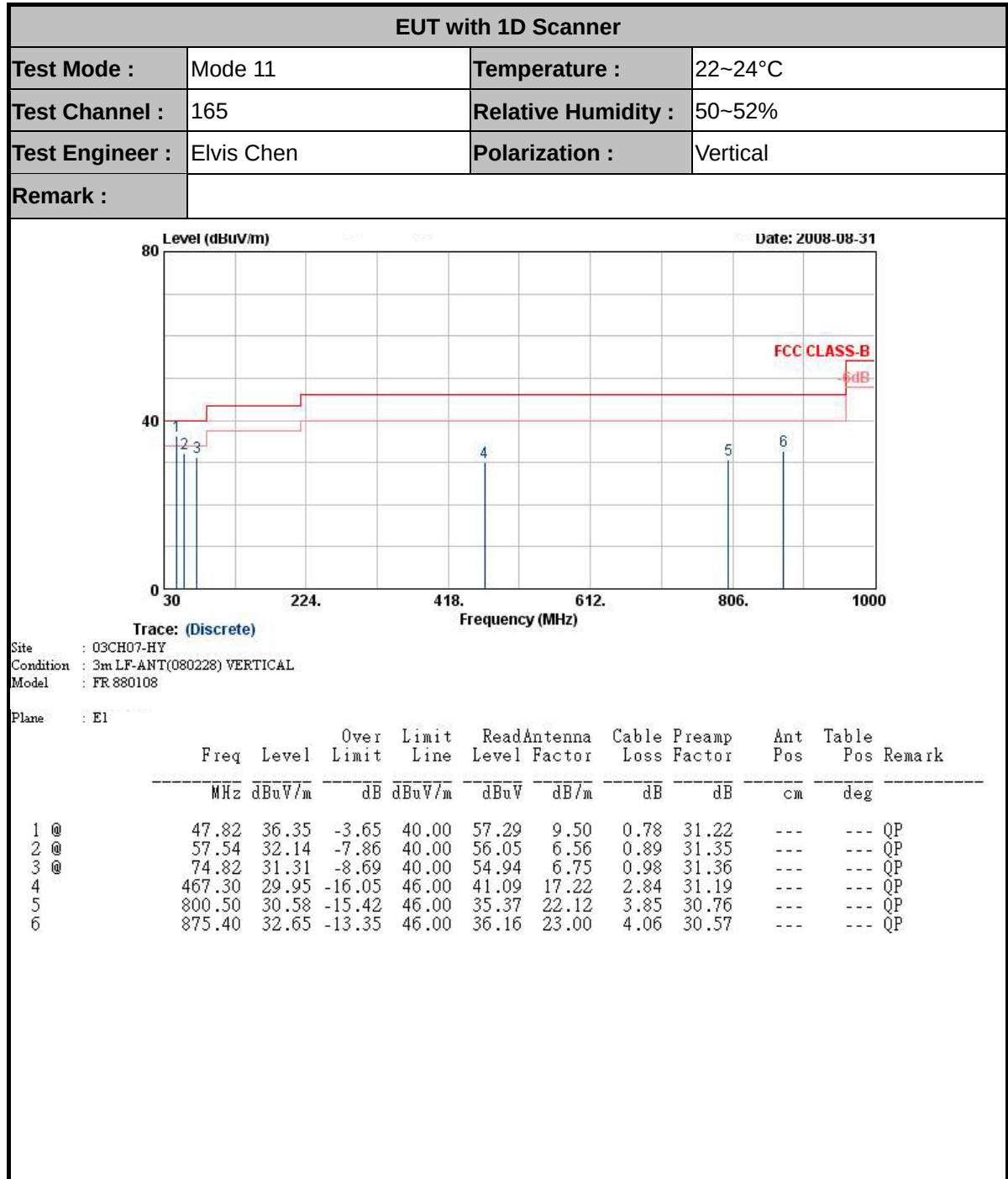




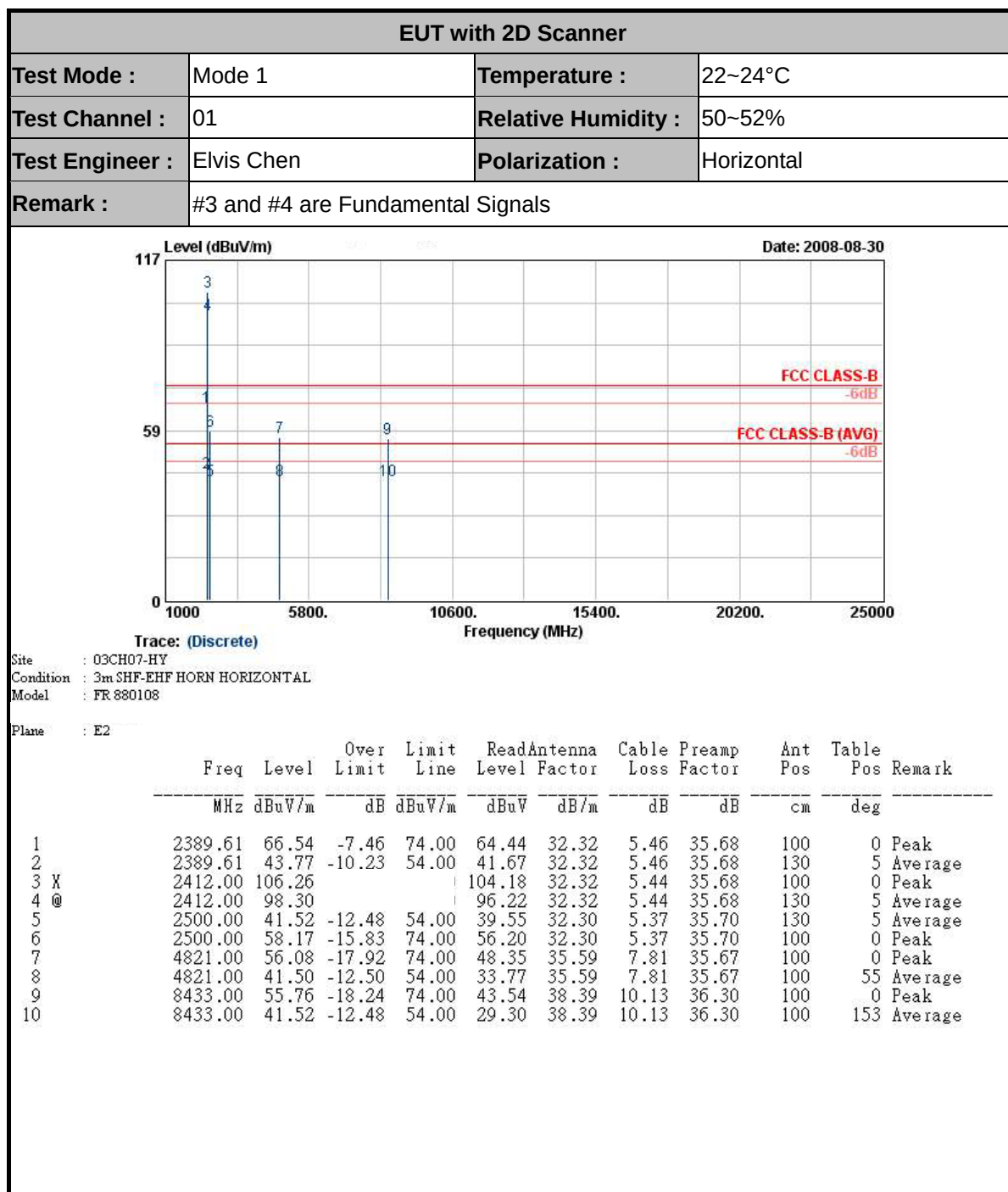


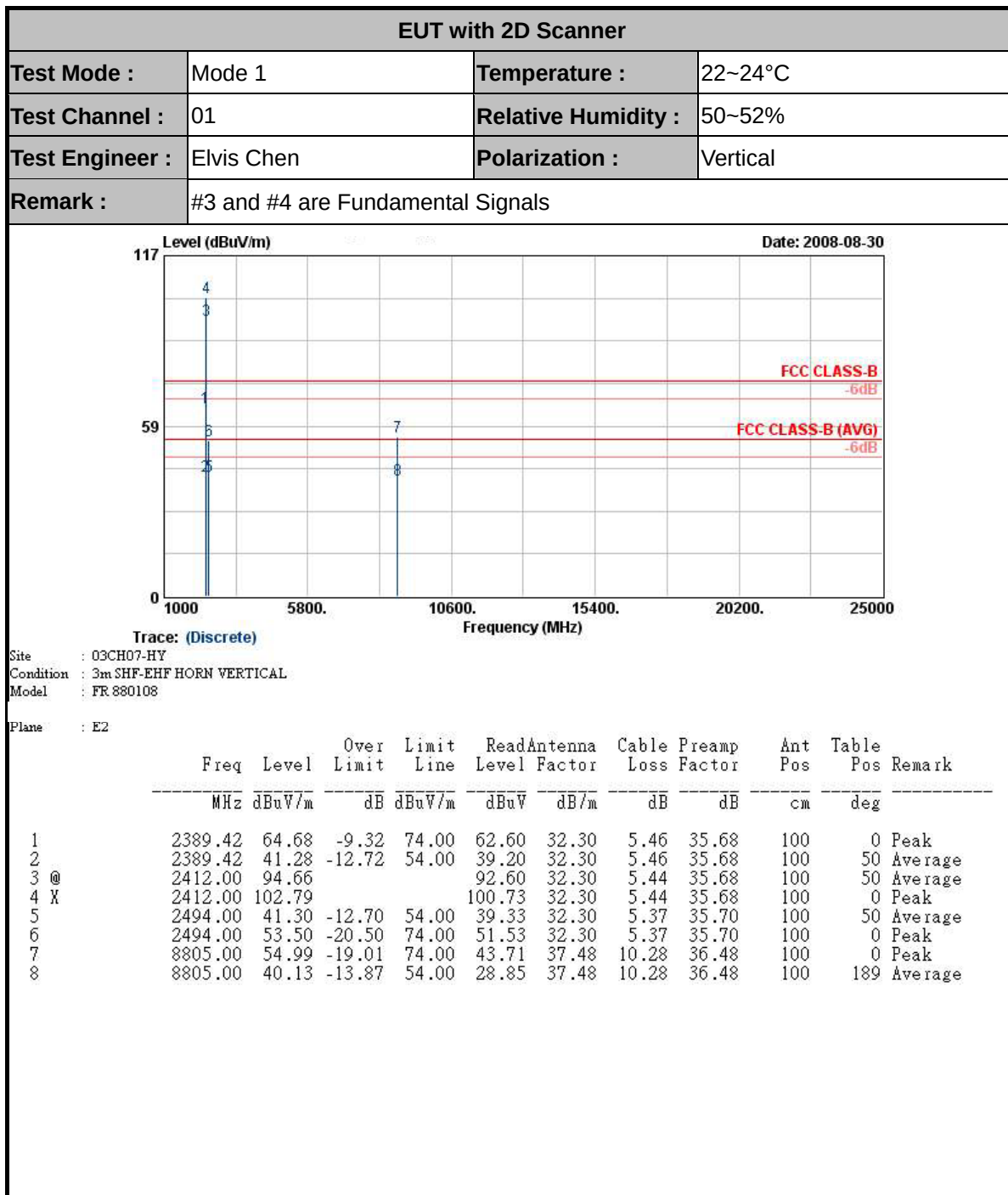


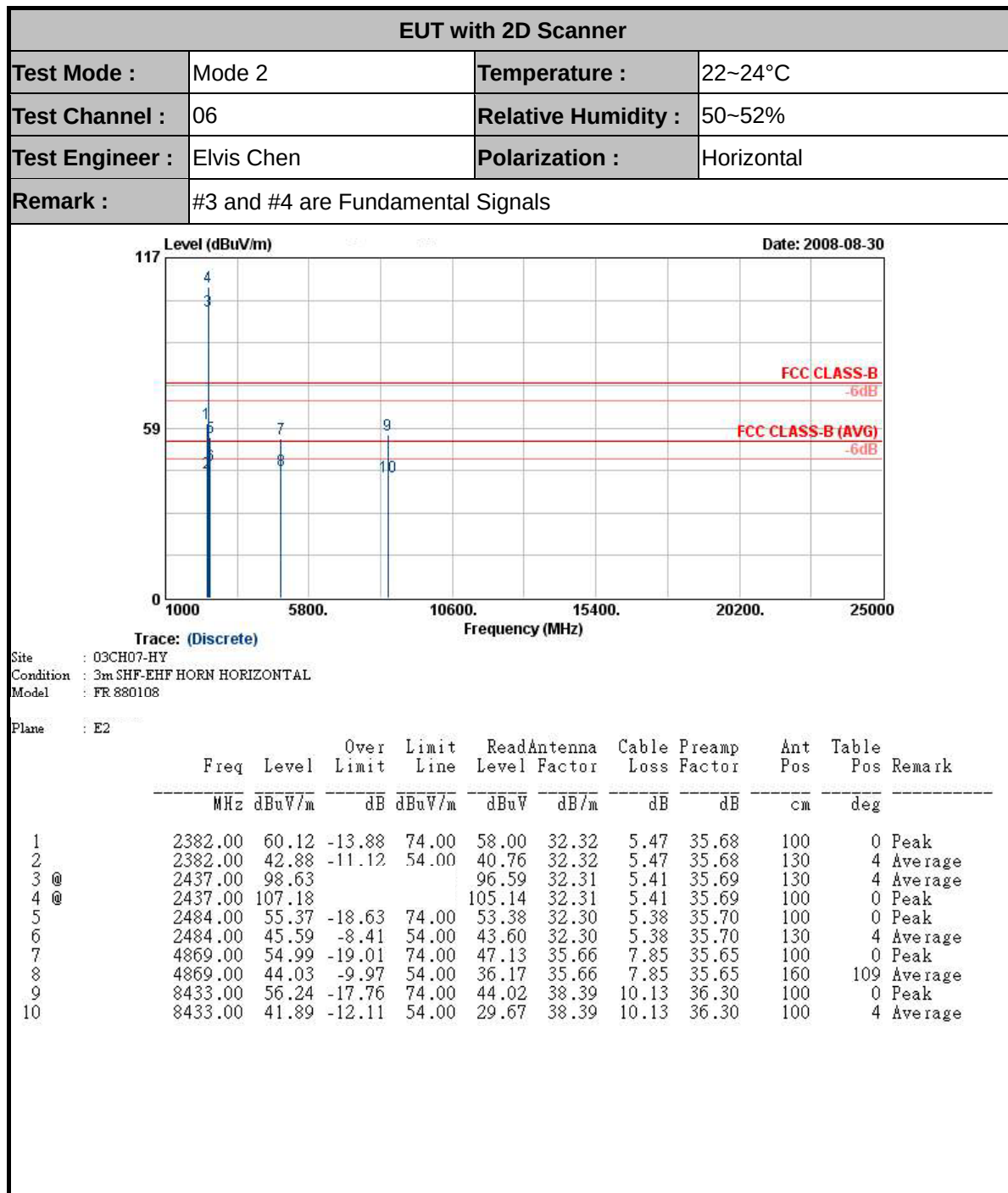


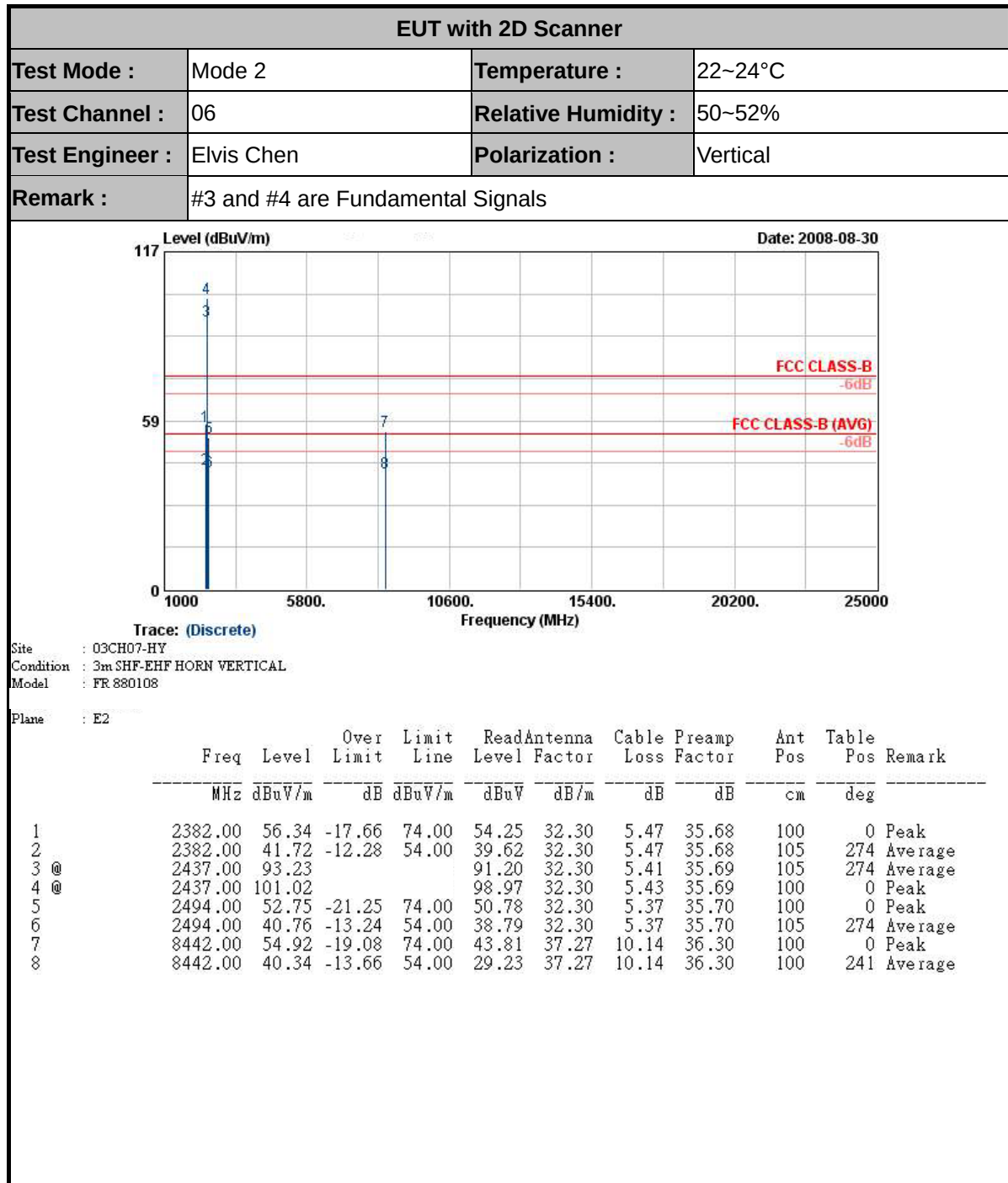


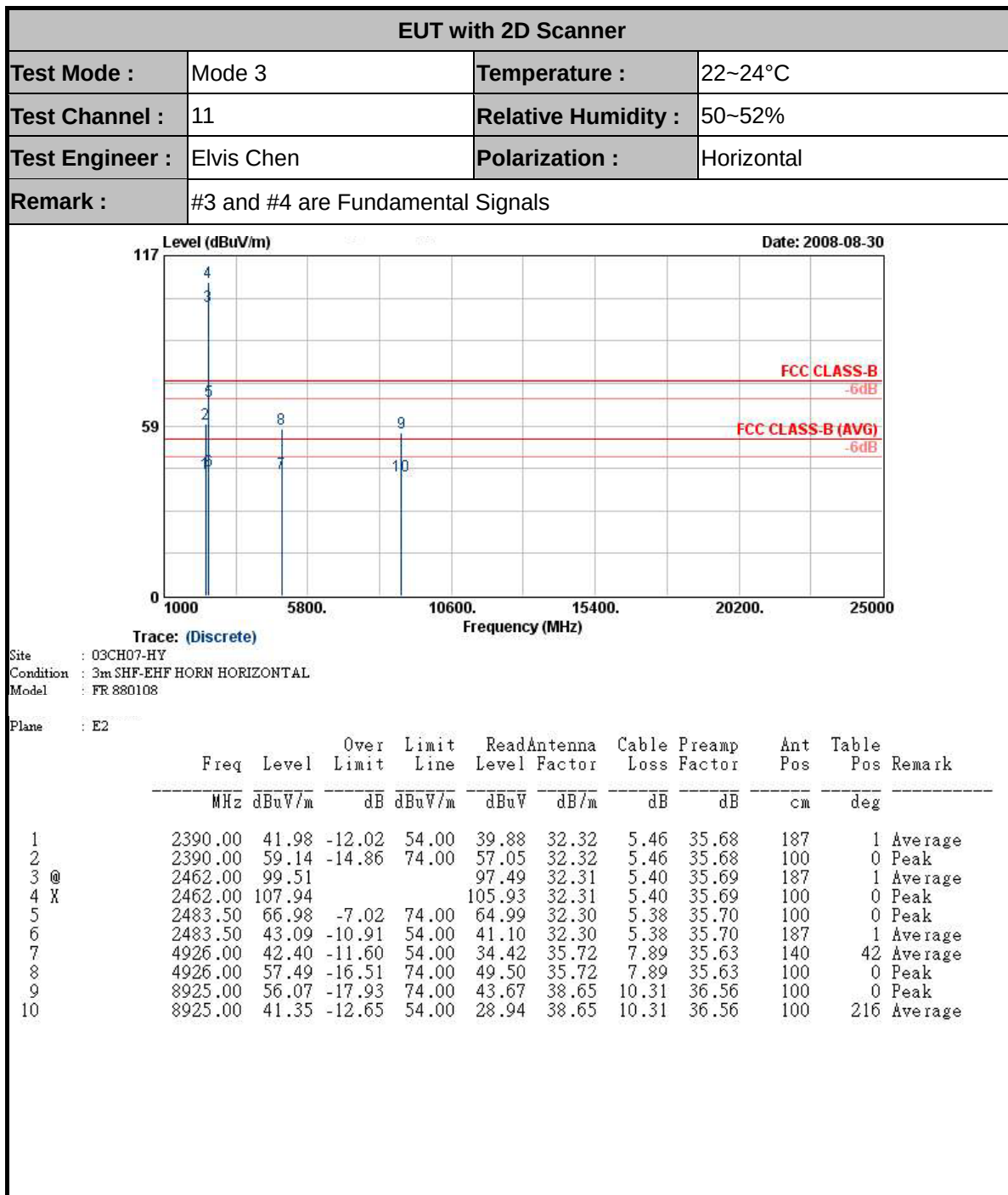
3.6.6 Test Result of Radiated Emission $\geq 1\text{GHz}$

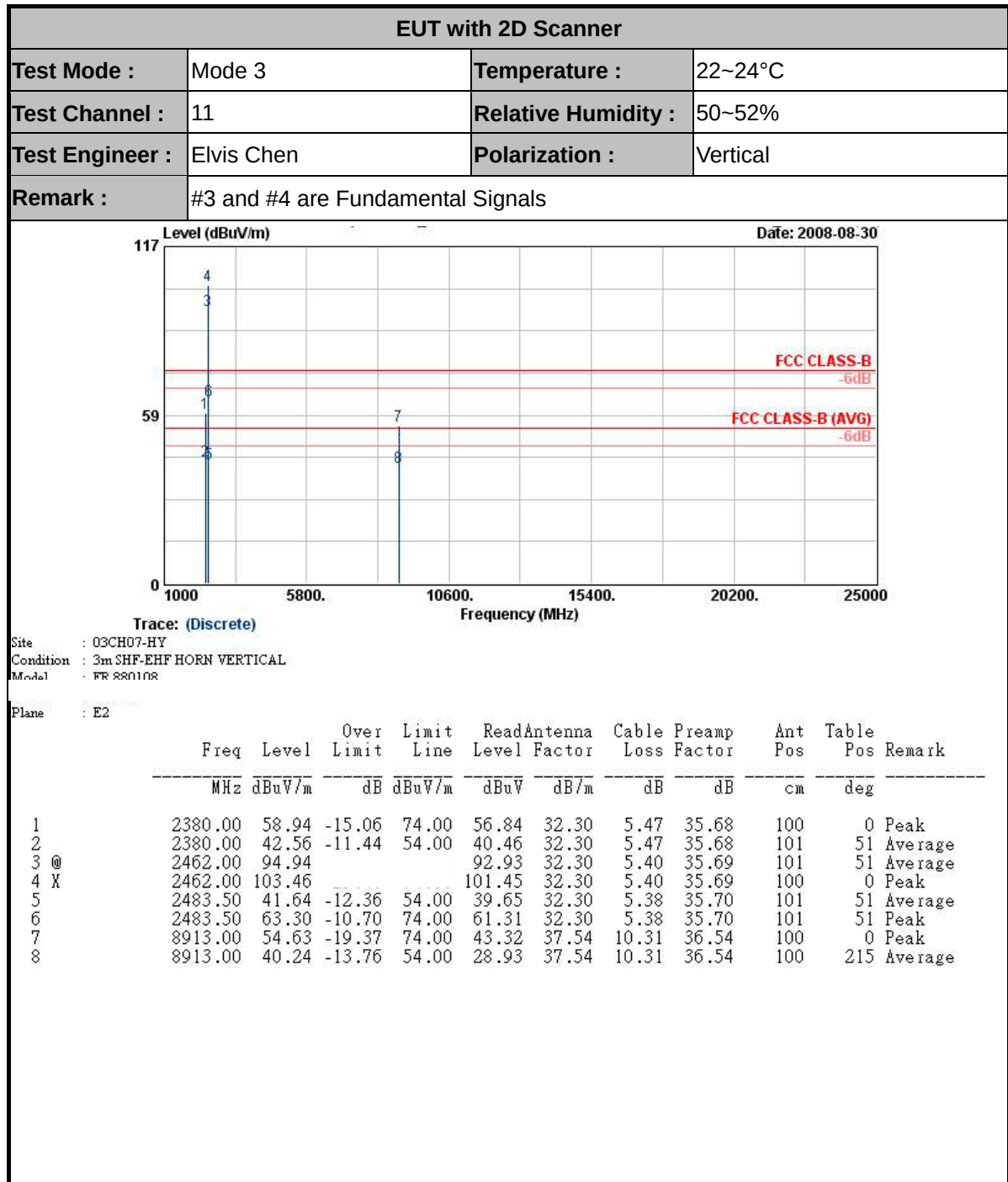


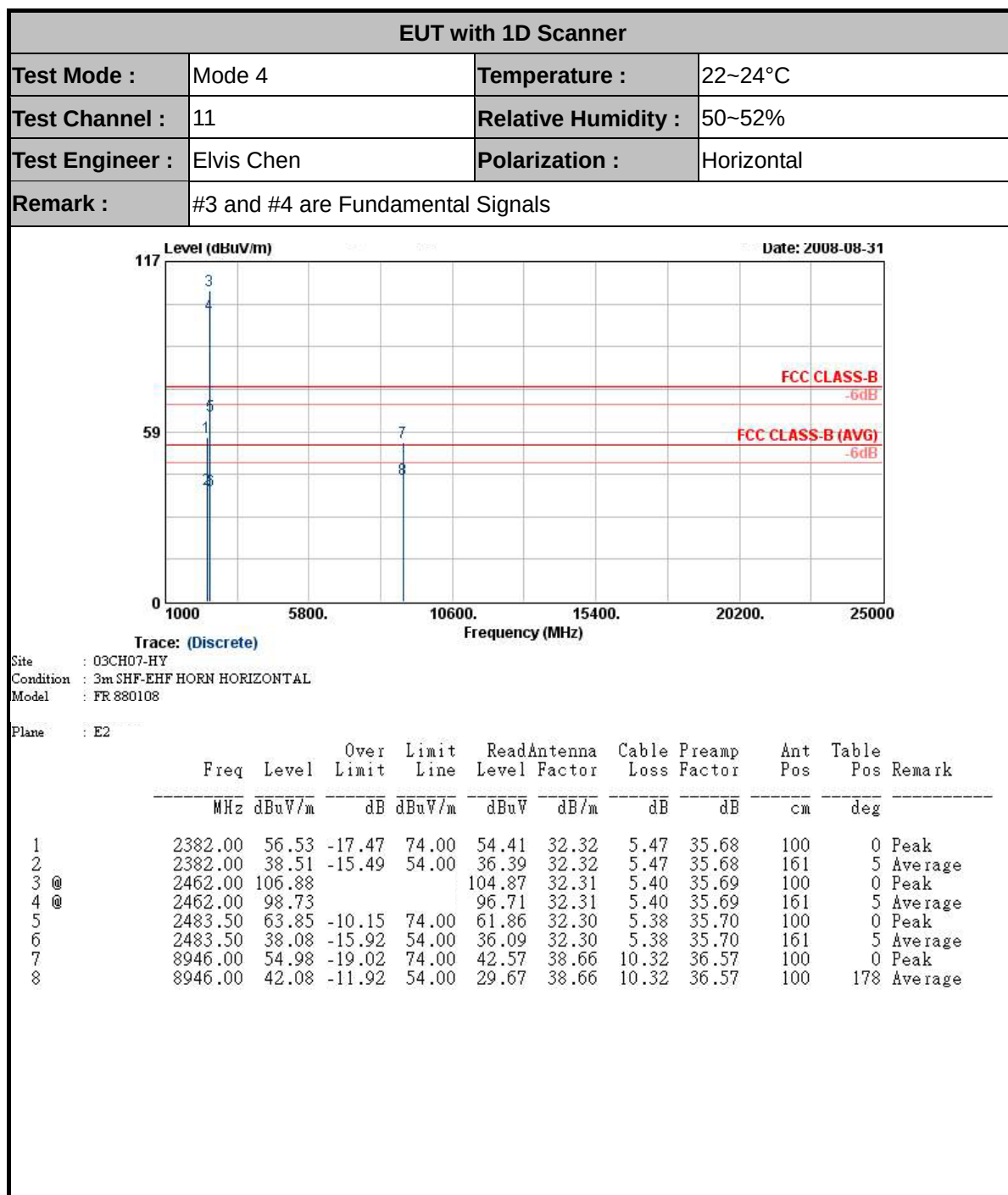


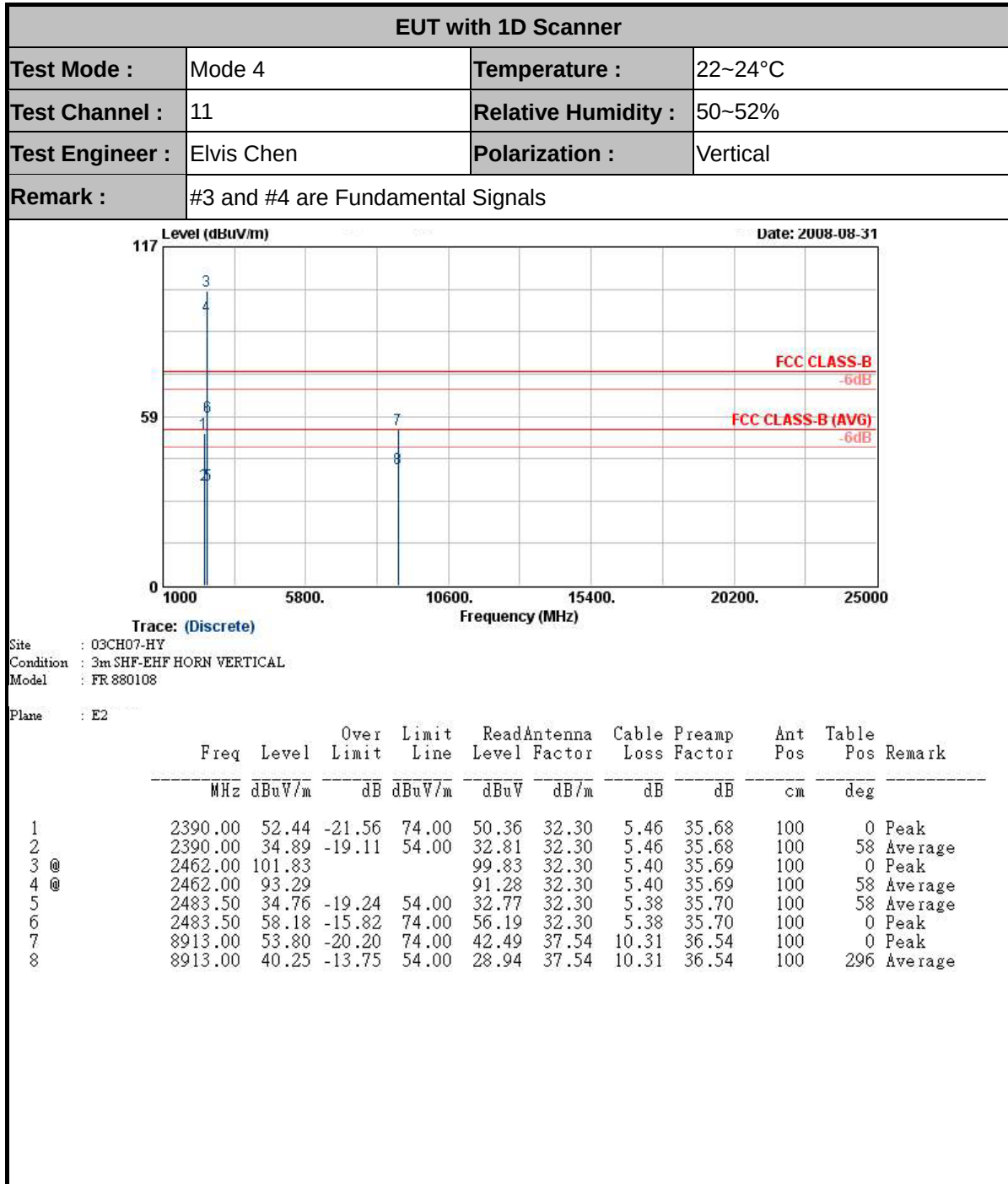


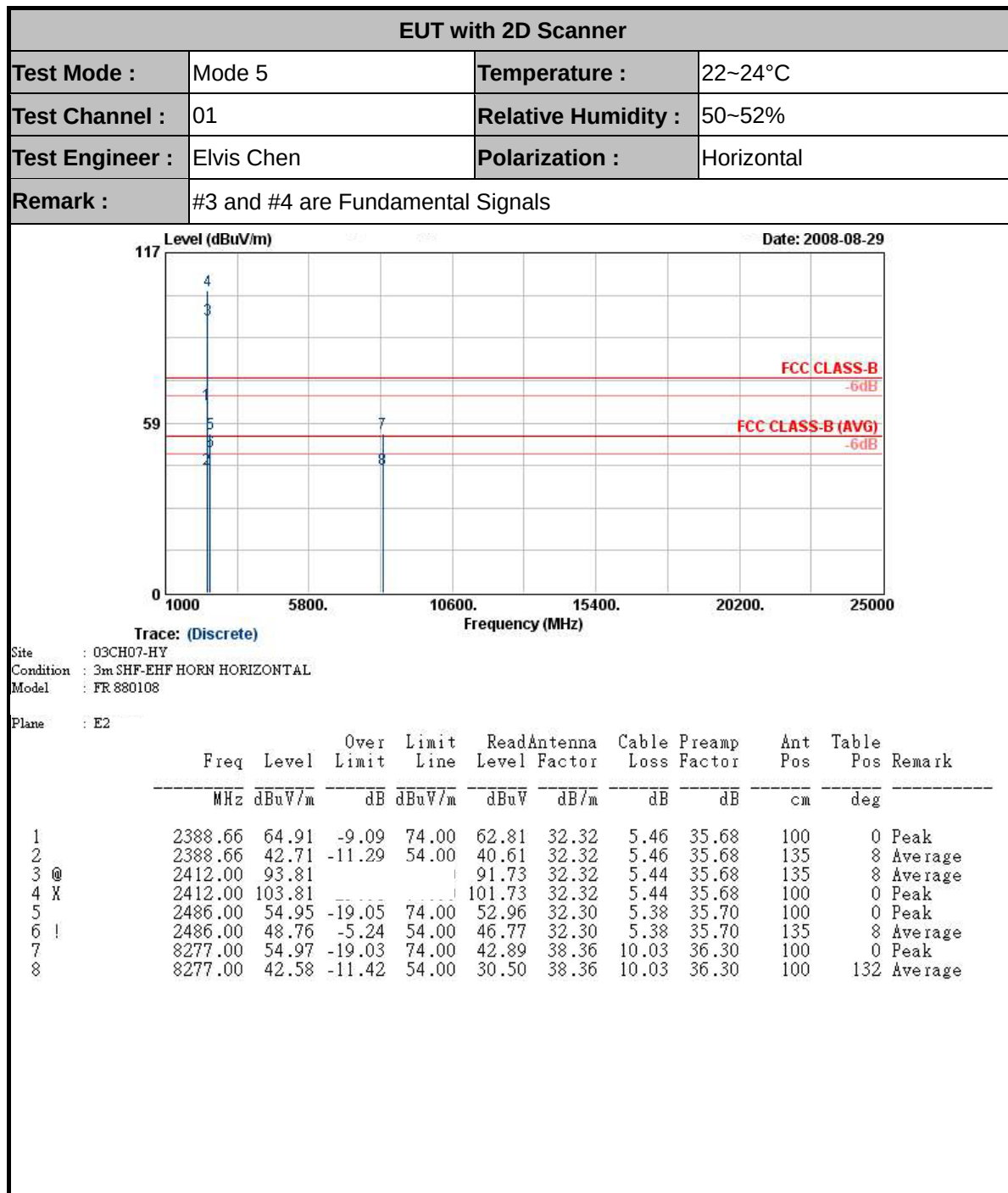


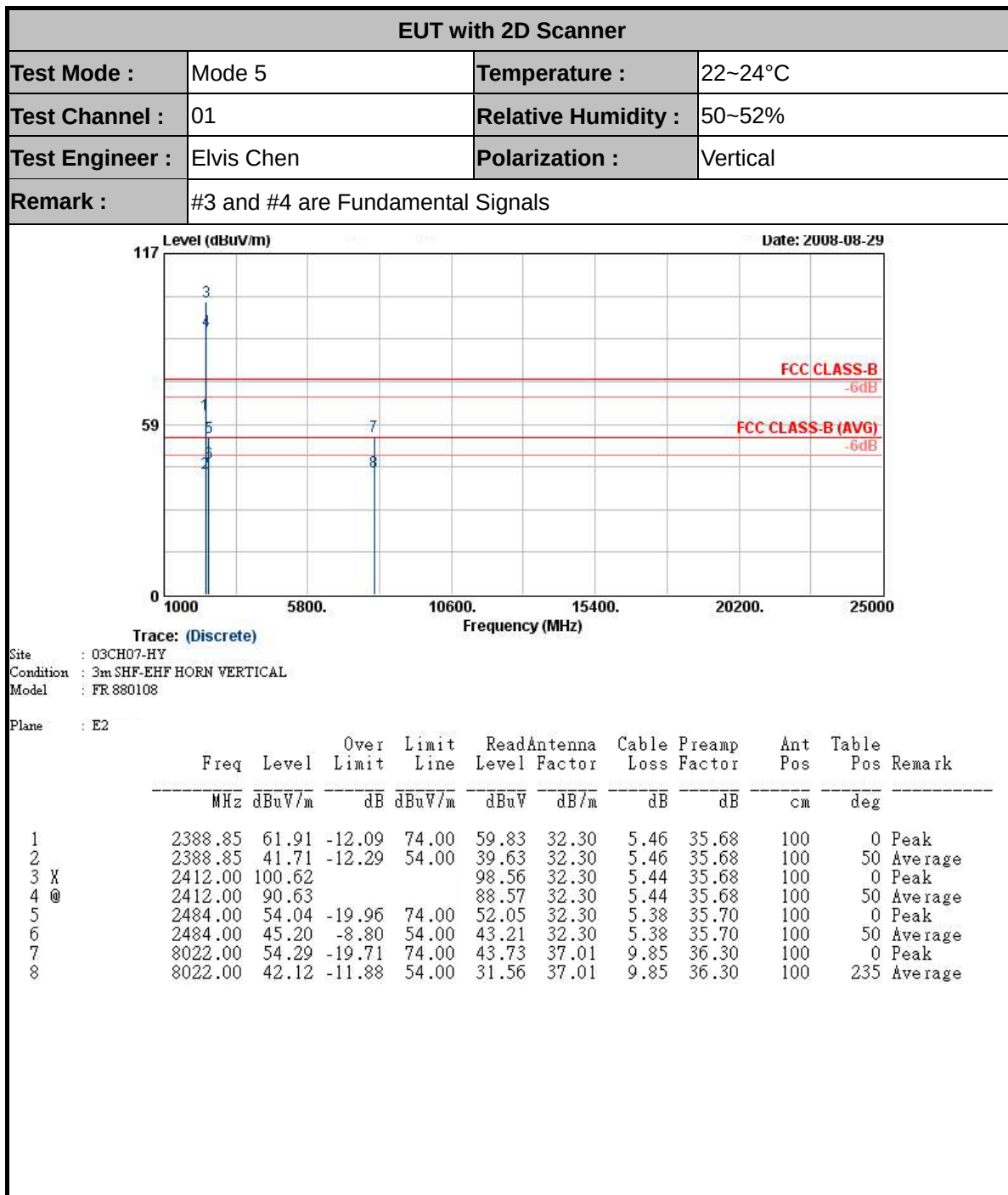


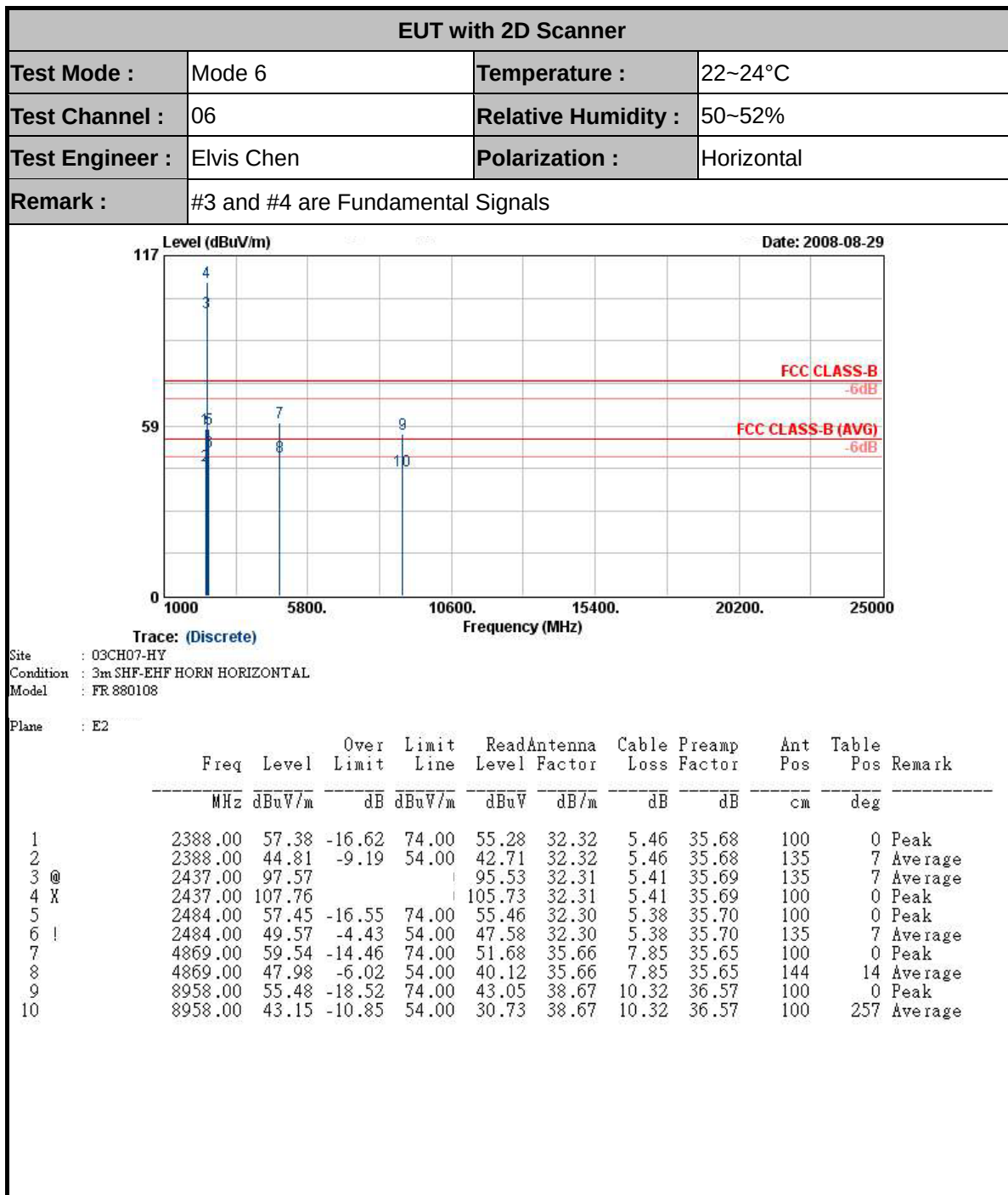


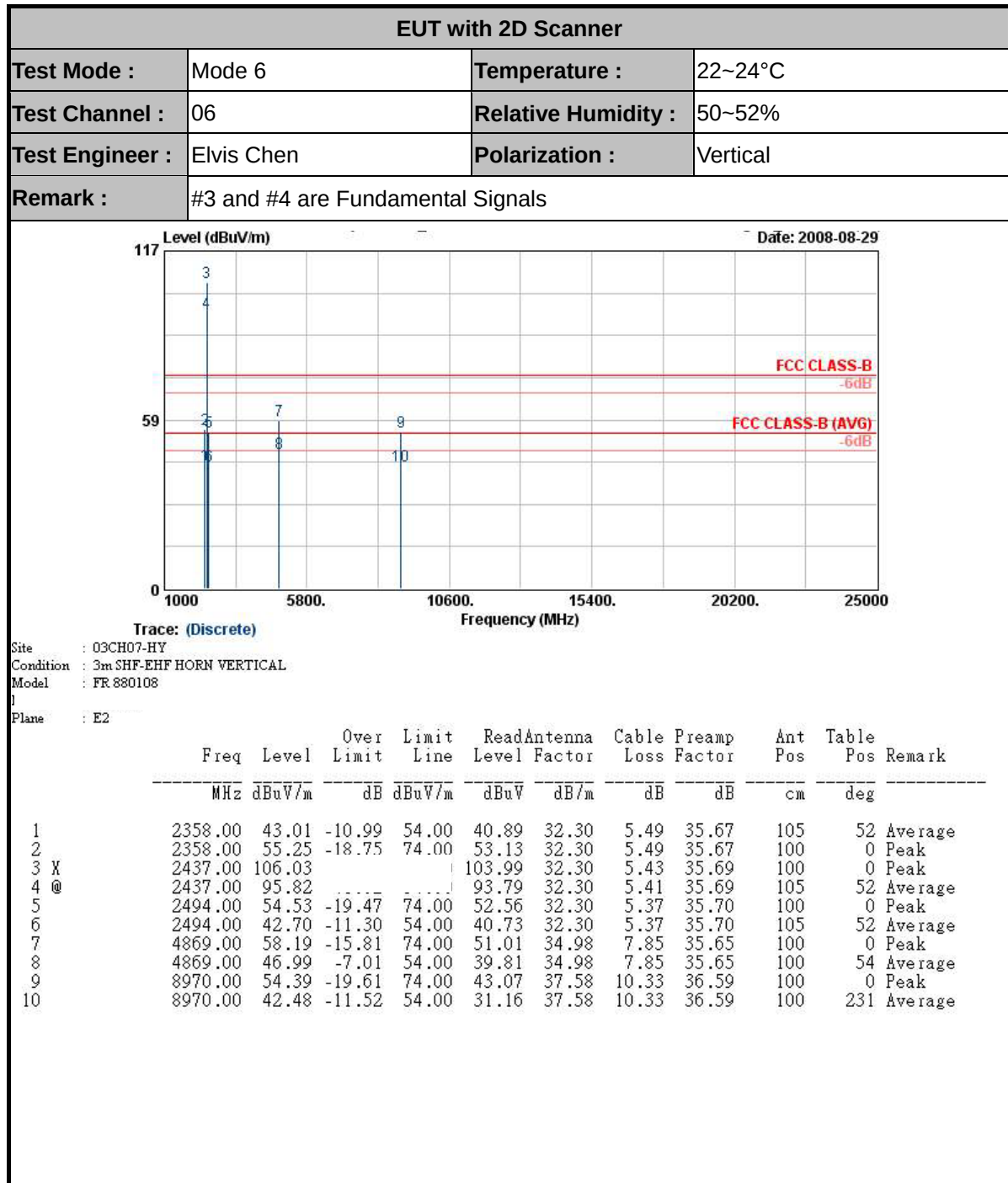


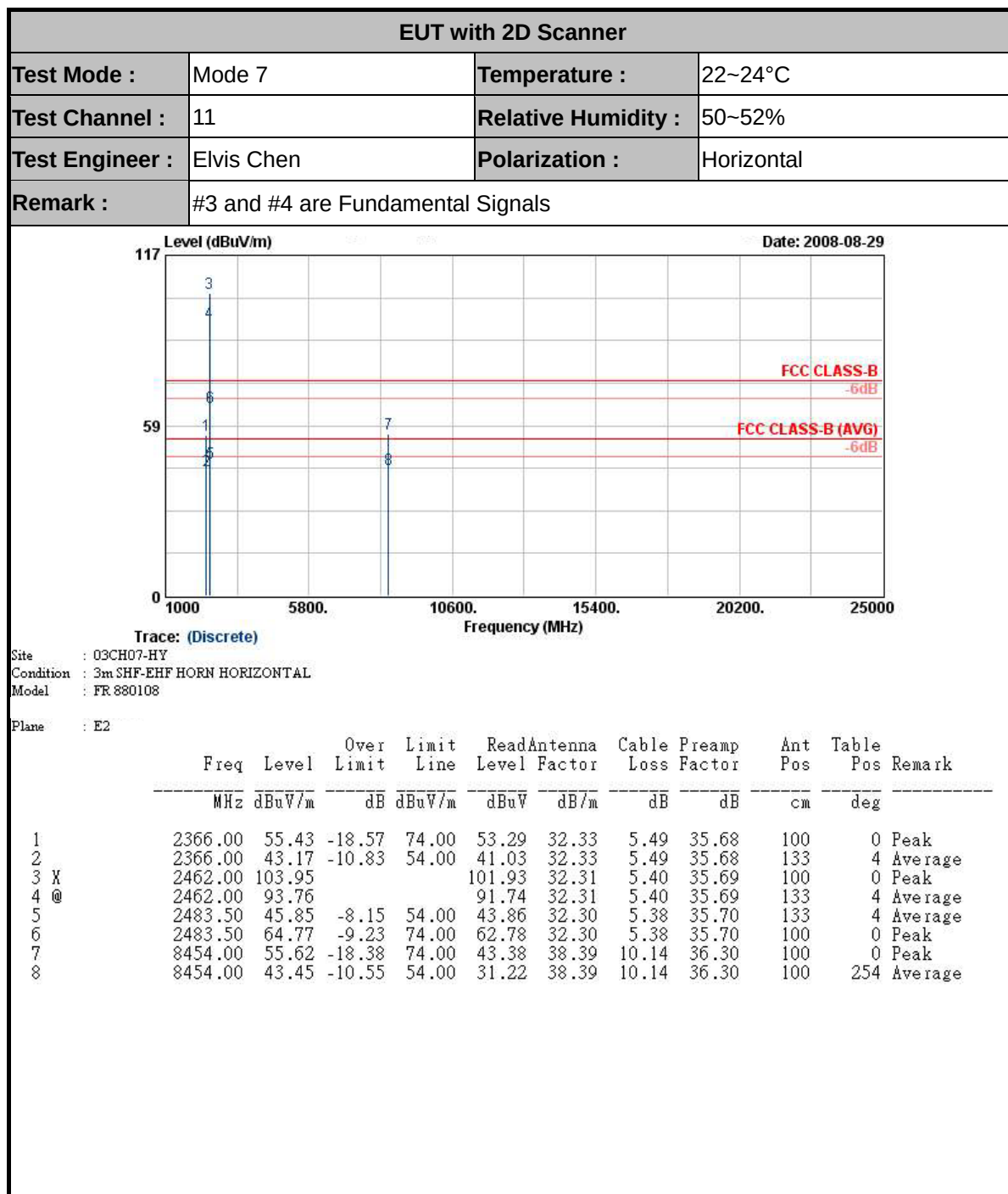


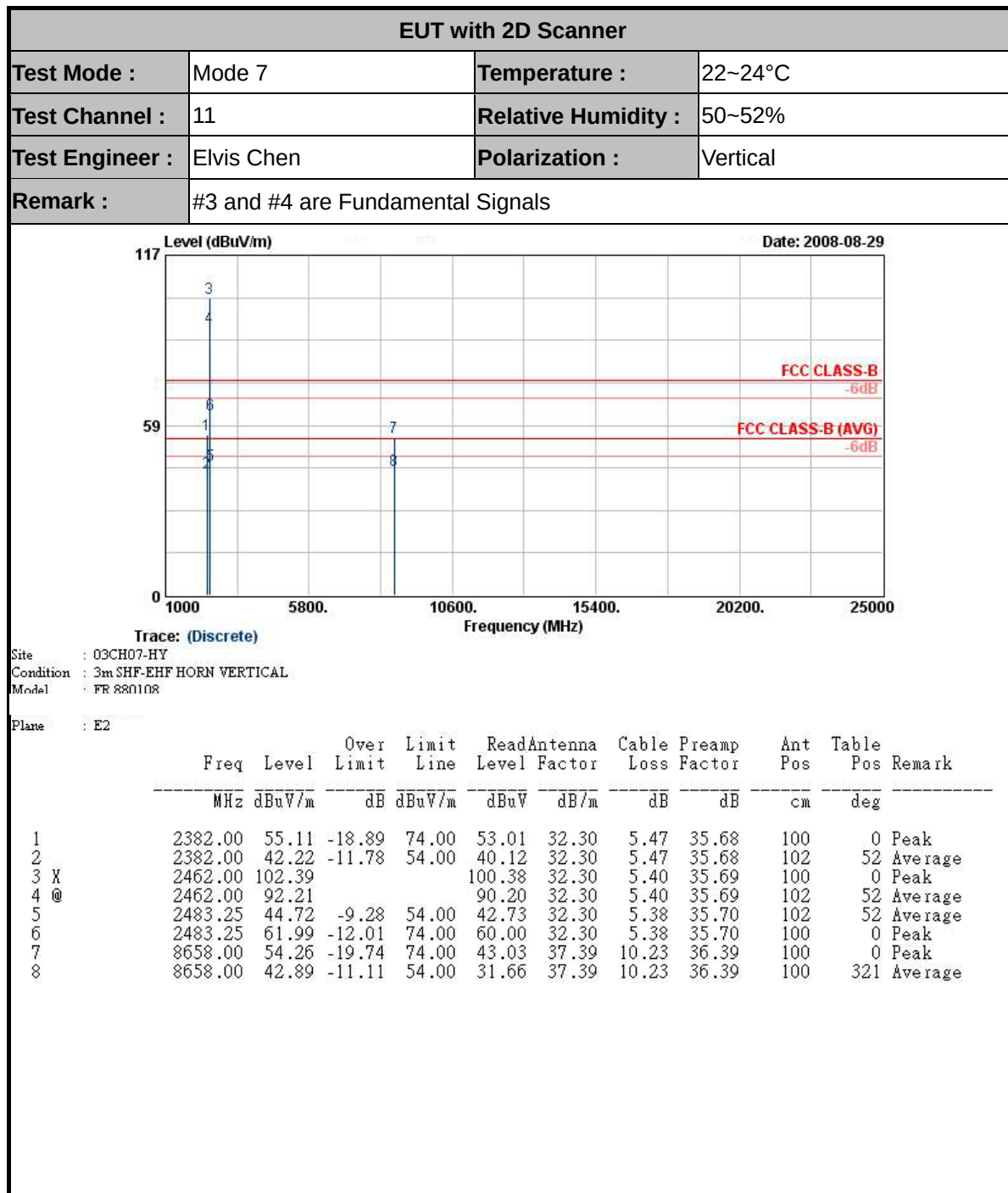


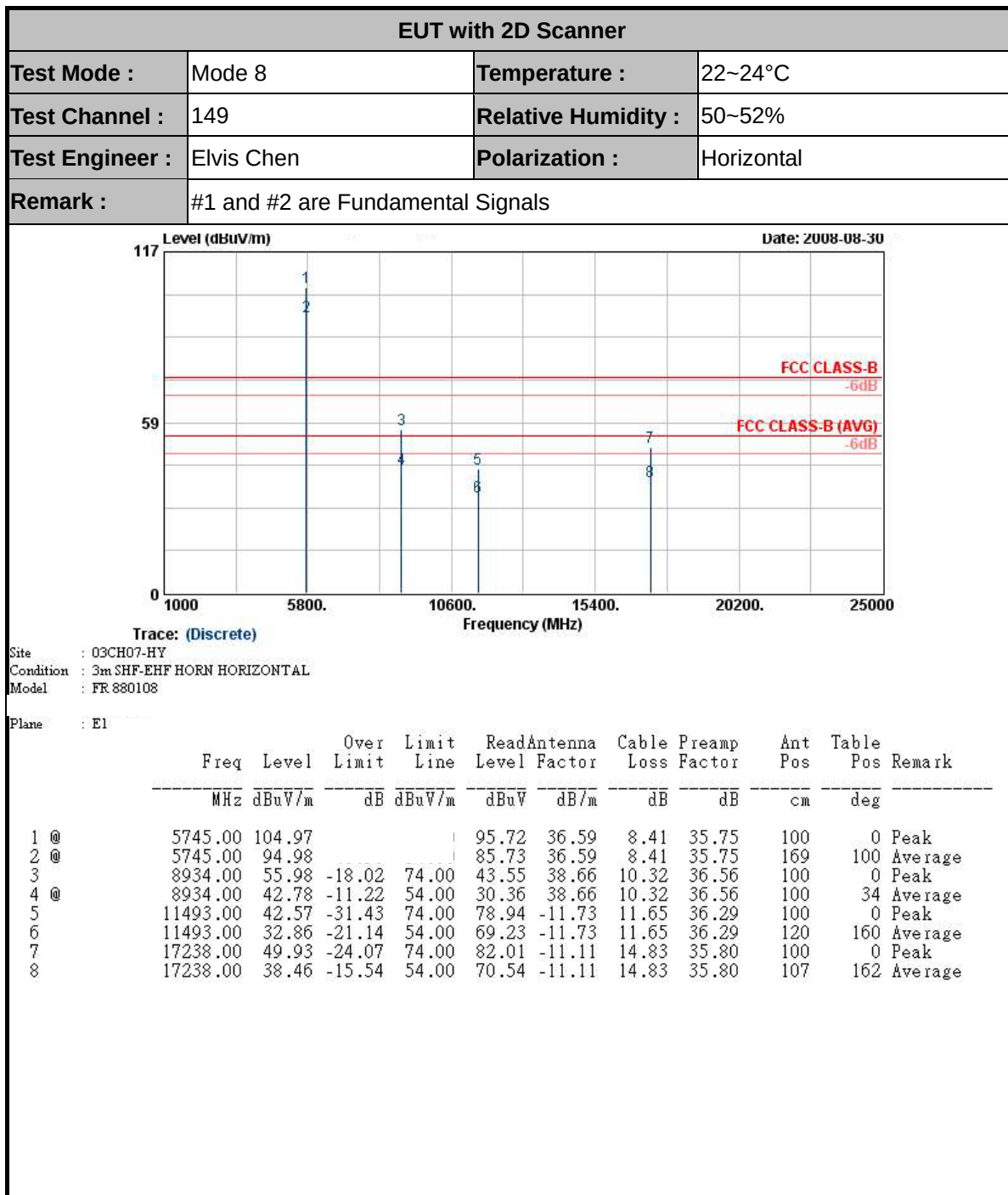


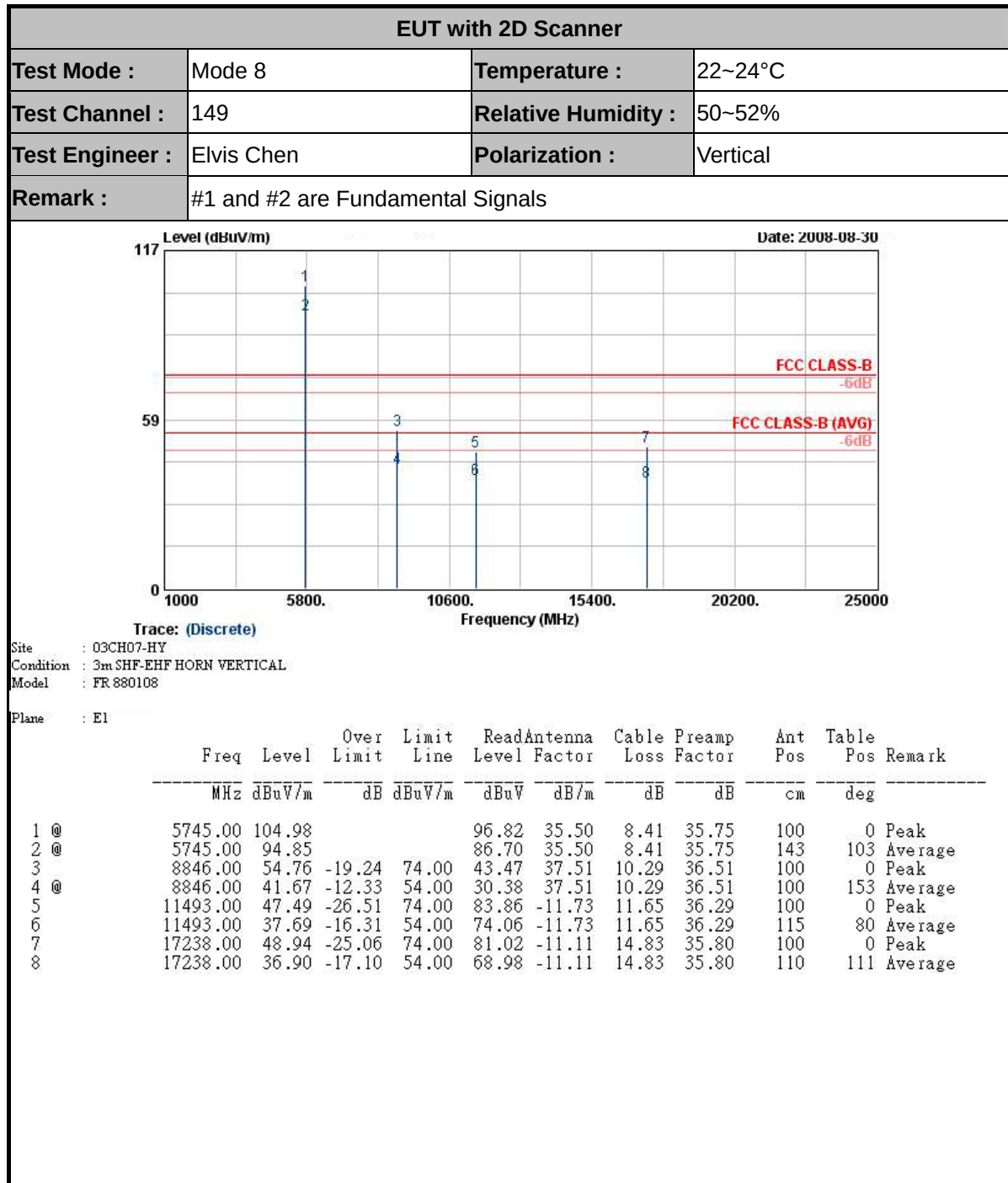


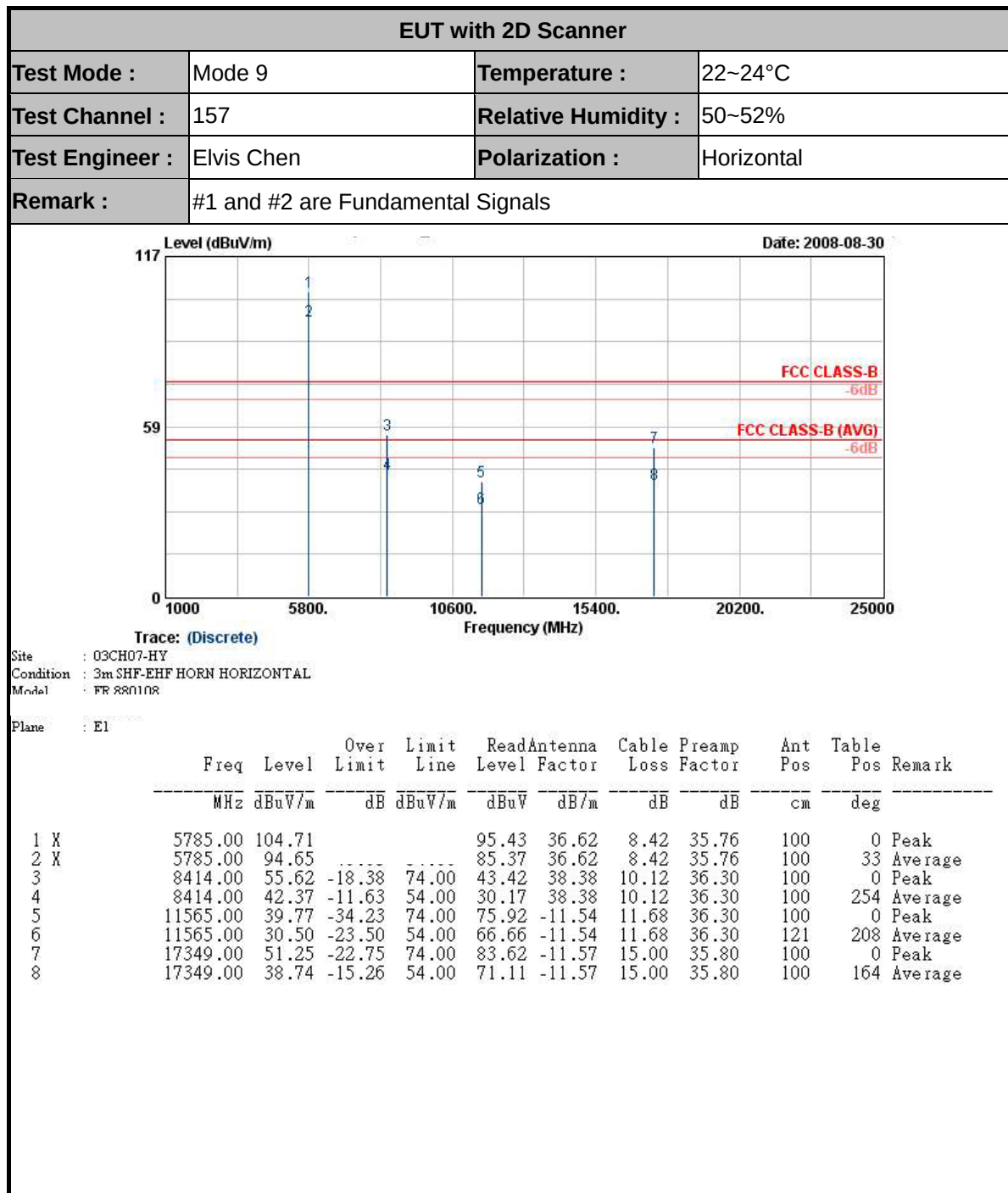


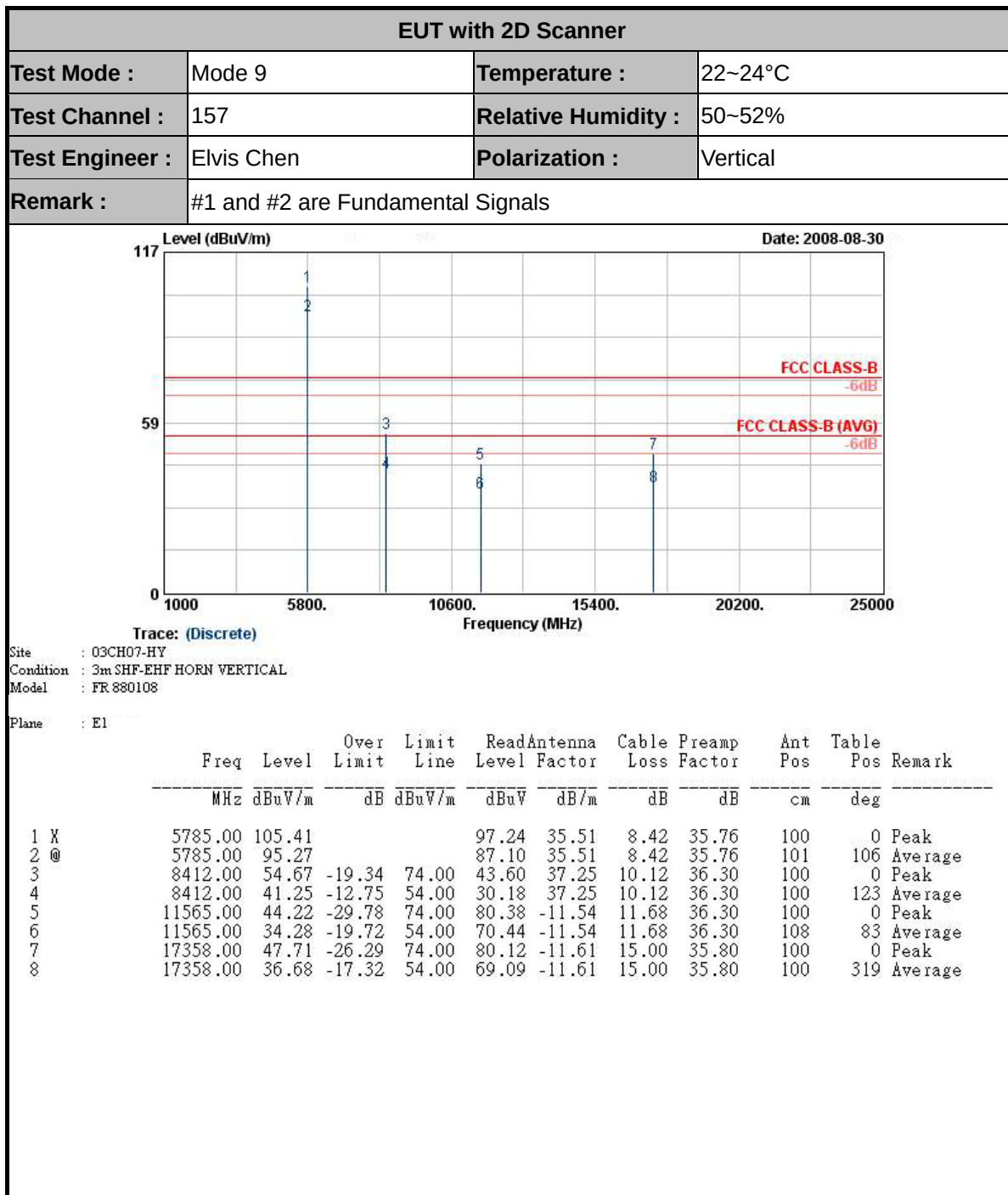


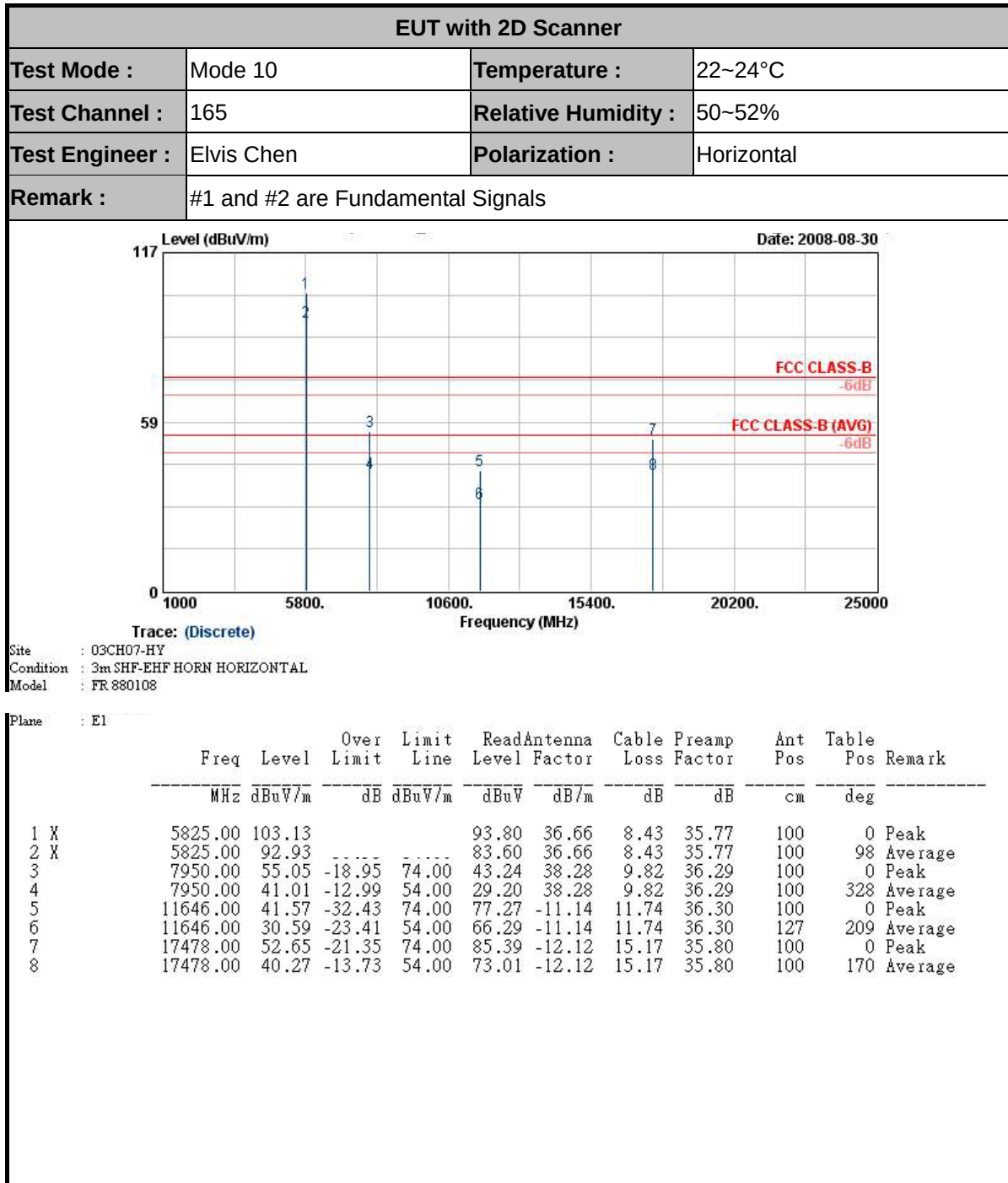


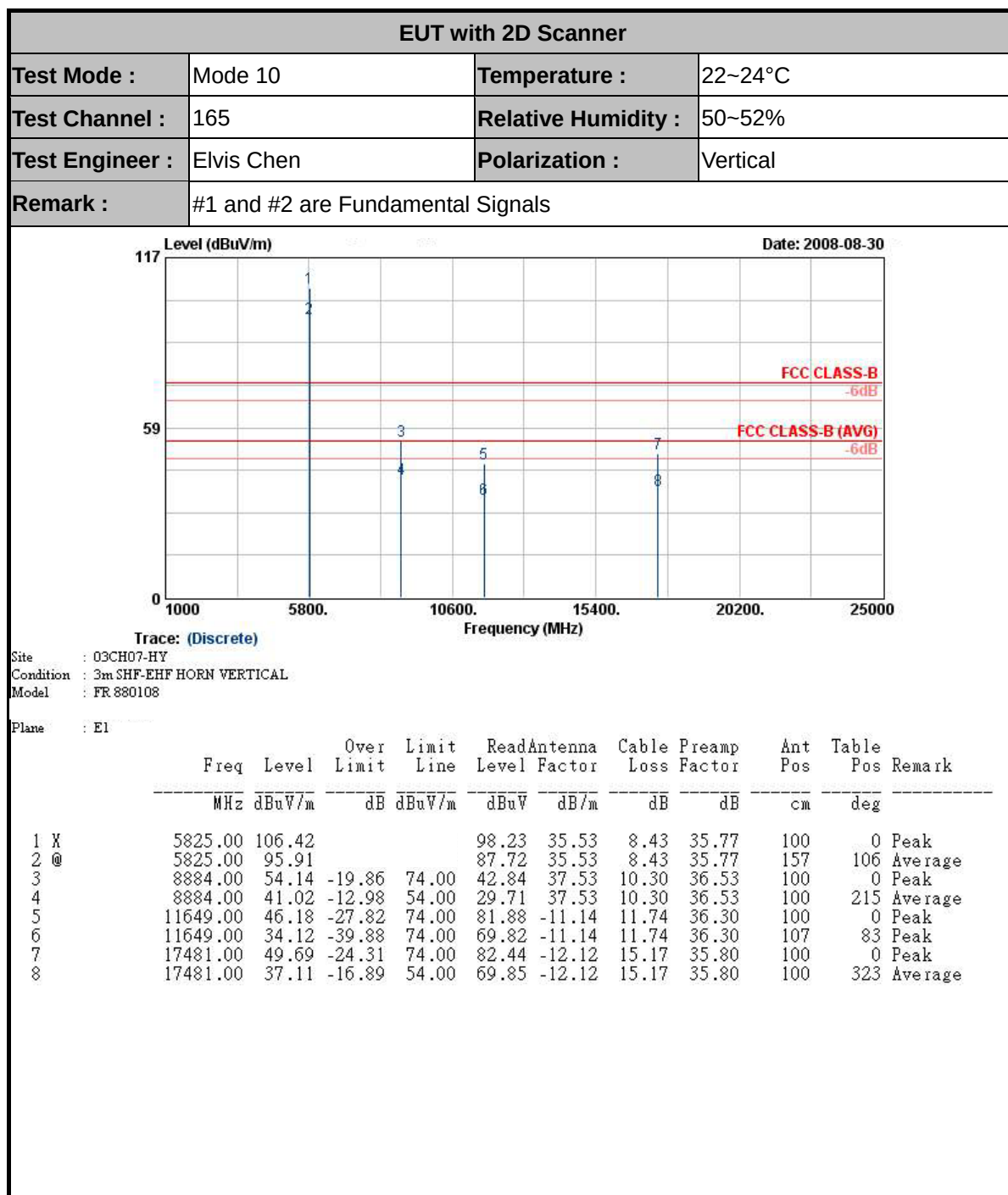


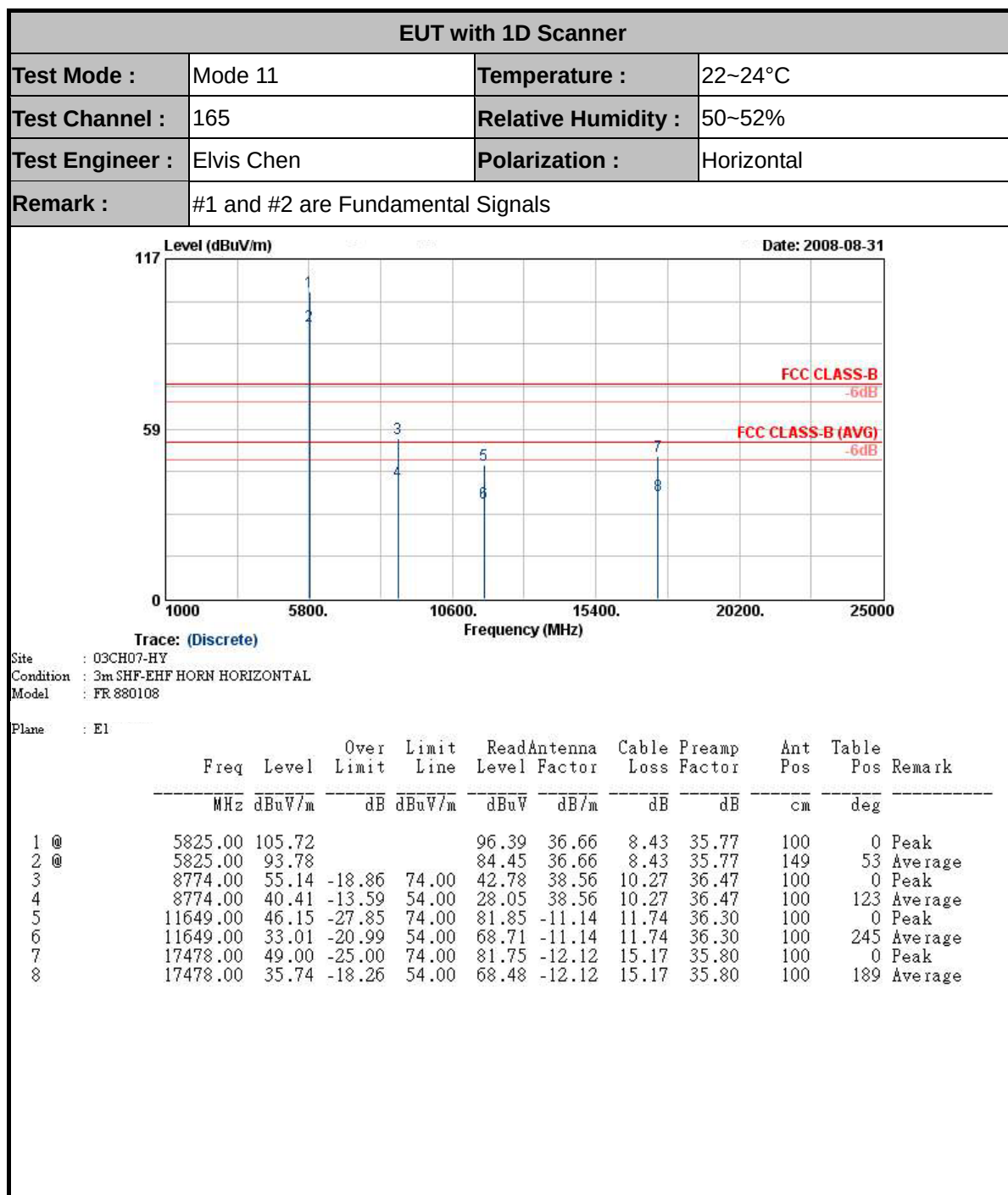


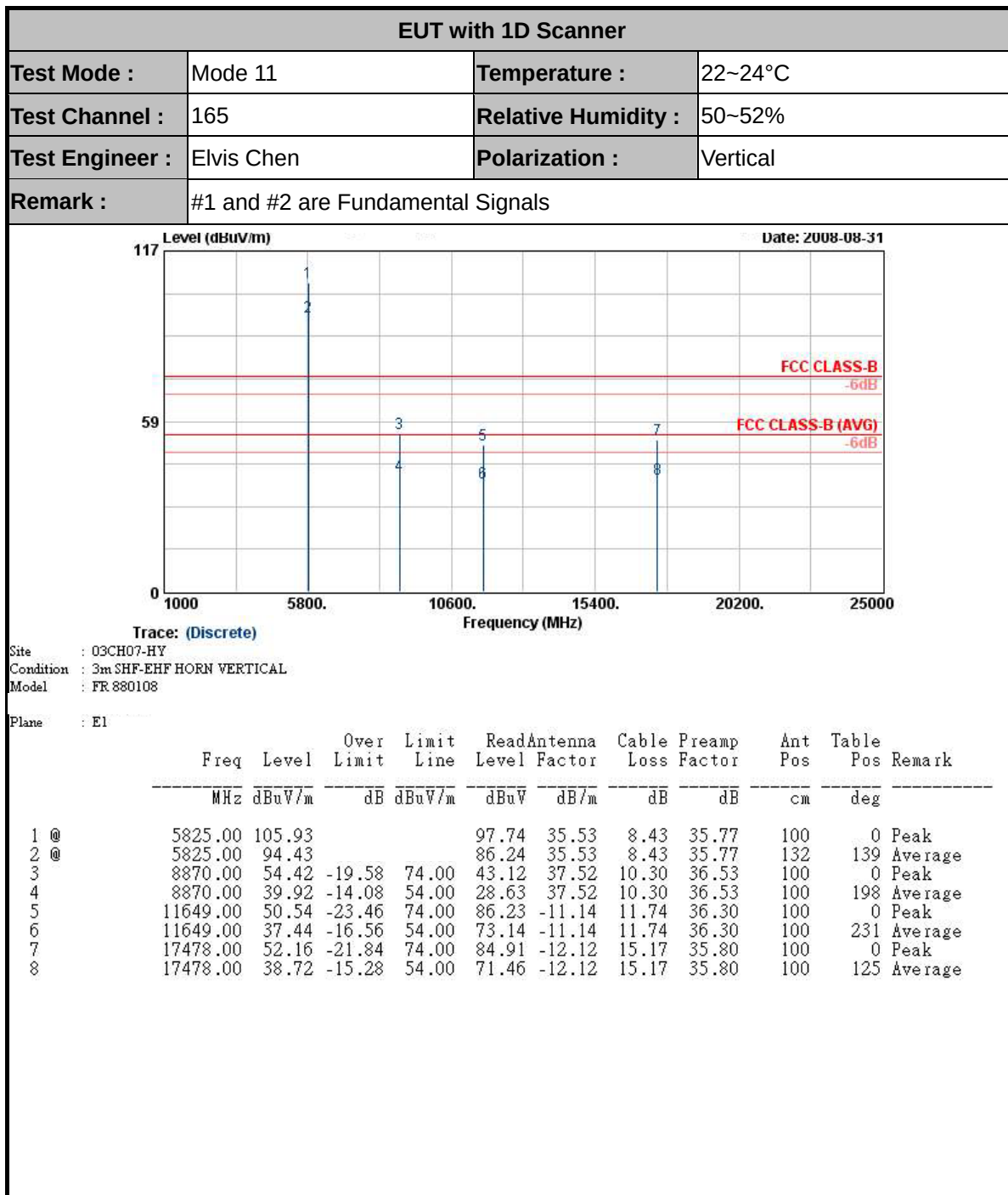












3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.7.2 Antenna Connected Construction

The antennas type used in this product is PIFA antenna without connector and it is considered to meet antenna requirement.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum	R&S	FSP40	100055	9KHz~40GHz	Jun. 26, 2008	Jun. 25, 2009	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Feb. 21, 2008	Feb. 20, 2009	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	N/A	Feb. 21, 2008	Feb. 20, 2009	Conducted (TH02-HY)
Thermal Chamber	TEN BILLION	TTH-D35P	TBN-930701	N/A	Aug. 01, 2008	Jul. 31, 2009	Conducted (TH02-HY)
EMI Receiver	R&S	ESCS 30	100356	9kHz – 2.75GHz	Aug. 01, 2008	Jul. 31, 2009	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9kHz – 30MHz	Dec. 06, 2007	Dec. 05, 2008	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9kHz – 30MHz	Dec. 06, 2007	Dec. 05, 2008	Conduction (CO05-HY)
DC- LISN	R&S	ESH3-26	1000485	0.1MHz-200MHz	Feb. 04, 2008	Feb. 03, 2009	Conduction (CO05-HY)
DC- LISN	R&S	ESH3-26	1000484	0.1MHz-200MHz	Feb. 04, 2008	Feb. 03, 2009	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz-1GHz	Dec. 01, 2007	Nov. 30, 2008	Radiation (03CH07-HY)
Spectrum Analyzer	R & S	FSP	101067	9KHz~30GHz	Dec. 05, 2007	Dec. 04, 2008	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1G~18GHz	Aug. 13, 2008	Aug. 12, 2009	Radiation (03CH07-HY)
PreAmplifier	Agilent	8449B	3008A02362	1G~26.5GHz	Dec. 22, 2007	Dec. 21, 2008	Radiation (03CH07-HY)
PreAmplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Mar. 31, 2008	Mar.30, 2009	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	66584	1G~18GHz	Aug. 06, 2008	Aug. 05, 2009	Radiation (03CH07-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.10	Normal(k=2)	0.05
Cable loss	0.10	Normal(k=2)	0.05
AMN insertion loss	2.50	Rectangular	0.63
Receiver Spec	1.50	Rectangular	0.43
Site imperfection	1.39	Rectangular	0.80
Mismatch	+0.34/-0.35	U-shape	0.24
Combined standard uncertainty Uc(y)	1.13		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	2.26		

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.41	Normal(k=2)	0.21
Antenna factor calibration	0.83	Normal(k=2)	0.42
Cable loss calibration	0.25	Normal(k=2)	0.13
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14
RCV/SPA specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site imperfection	1.43	Rectangular	0.83
Mismatch	+0.39/-0.41	U-shaped	0.28
Combined standard uncertainty Uc(y)	1.27		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	2.54		

Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of x_i		$u(x_i)$	C_i	$C_i * u(x_i)$
	dB	Probability Distribution			
Receiver reading	±0.10	Normal(k=1)	0.10	1	0.10
Antenna factor calibration	±1.70	Normal(k=2)	0.85	1	0.85
Cable loss calibration	±0.50	Normal(k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20 \log(1 - \Gamma_1 * \Gamma_2)$	+0.34/-0.35	U-shaped	0.244	1	0.244
Combined standard uncertainty $U_c(y)$	2.36				
Measuring uncertainty for a level of confidence of 95% $U = 2U_c(y)$	4.72				

6 Certification of TAF Accreditation


Certificate No. : L1190-070110
財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that
Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	: ISO/IEC 17025:2005
Accreditation Number	: 1190
Originally Accredited	: December 15, 2003
Effective Period	: January 10, 2007 to January 09, 2010
Accredited Scope	: Testing Field, see described in the Appendix
Specific Accreditation Program	: Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory


Jay-San Chen
President, Taiwan Accreditation Foundation
Date : January 10, 2007

PI, total 9 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when used without the Appendix.



Appendix A. Photographs of EUT

Please refer to Sporton report number EP880108 as below.