

FCC Co-location Test Report

Equipment : 802.11abgn Bluetooth Mini PCIe module
Brand Name : Fukuda Denshi
Model No. : WPEA-251N(BT)
FCC ID : RFH-DS101WIFI
Standard : 47 CFR FCC Part 15
Applicant : IEI Integration Corp.
No. 29, Chung-Hsing Rd., Sijhih City,
New Taipei City 221, Taiwan (R.O.C.)
Manufacturer : SparkLAN Communications, Inc.
8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,
Taipei 11493, Taiwan

The product sample received on Jan. 06, 2017 and completely tested on Jan. 21, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown 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:


Phoenix Chen / Assistant Manager





Table of Contents

1	TEST CONFIGURATION OF EUT.....	4
1.1	The Worst Case Measurement Configuration	4
1.2	Testing Location Information	4
2	CO-LOCATION	5
2.1	Transmitter Radiated Unwanted Emissions	5
2.1.1	Transmitter Radiated Unwanted Emissions Limit	5
2.1.2	Measuring Instruments	5
2.1.3	Test Procedures	6
2.1.4	Test Setup	7
2.1.5	Transmitter Unwanted Emissions	7
3	TEST EQUIPMENT AND CALIBRATION DATA	8
APPENDIX A TEST RESULT OF UNWANTED EMISSIONS		

Revision History

[illegible]

1 Test Configuration of EUT

1.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	☐ EUT will be placed in fixed position.		
	☒ EUT will be placed in mobile position and operating multiple positions.		
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.		
Operating Mode	☒ 1. WLAN + BT		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT		V	

1.2 Testing Location Information

Testing Location				
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
Radiated	03CH09-HY	Terry	22.2°C / 51.8%	21/Jan/2017

Test site registered number [553509] with FCC.

2 CO-LOCATION

2.1 Transmitter Radiated Unwanted Emissions

2.1.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 30 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted Band Emissions Limit	
RF output power procedure	Limit (dB)
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

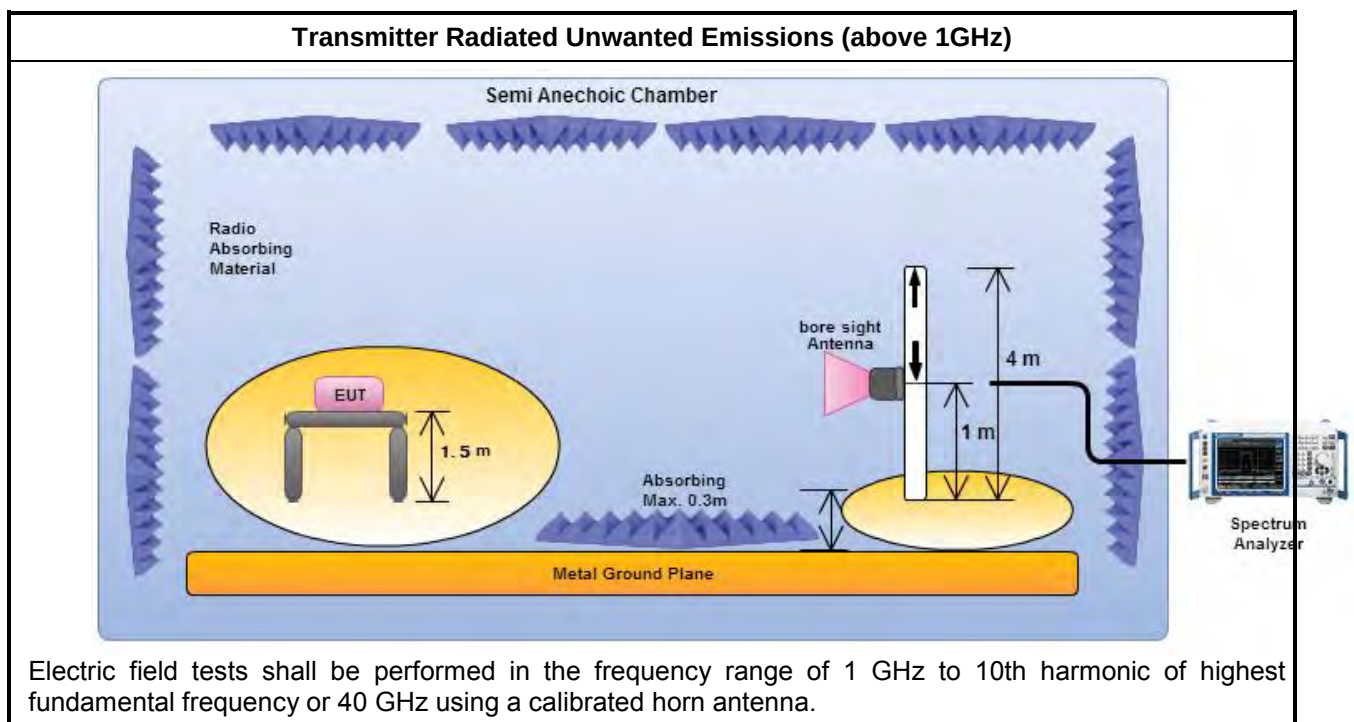
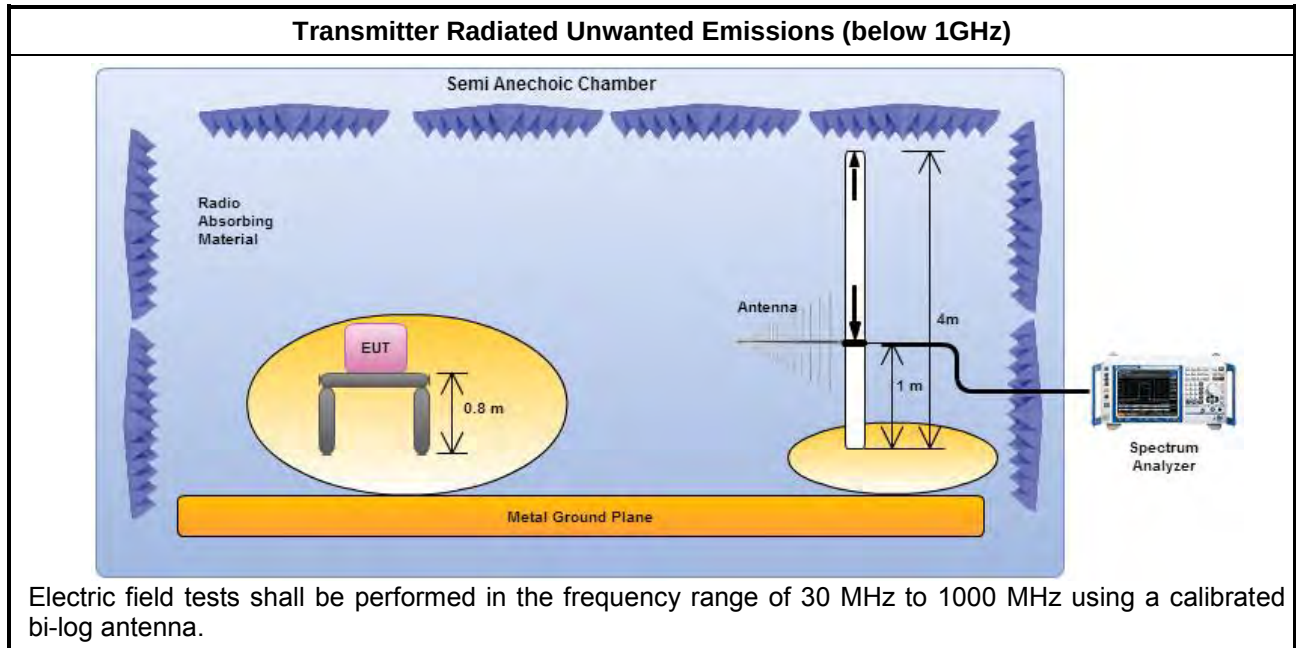
2.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

2.1.3 Test Procedures

Test Method	
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
☒	For the transmitter unwanted emissions shall be measured using following options below:
☒	Refer as KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
☒	Refer as KDB 558074, clause 12 for unwanted emissions into restricted bands.
☐	Refer as KDB 558074, clause 12.2.5.1 and 9.2.1 Option 1 (spectral trace averaging)
☐	Refer as KDB 558074, clause 12.2.5.2 and 9.2.1 Option 2 (slow sweep speed).
☒	Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). VBW $\geq 1/T$, where T is pulse time.
☐	Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
☒	Refer as KDB 558074, clause 12.2.4 and 9.1.1 measurement procedure peak limit.
☐	Refer as KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
☒	For radiated measurement, refer as KDB 558074, clause 12.1.
☐	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.
☐	For conducted and cabinet radiation measurement, refer as KDB 558074, clause 12.2.2.
☐	For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.
☐	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB

2.1.4 Test Setup



2.1.5 Transmitter Unwanted Emissions

Refer as Appendix A

3 Test Equipment and Calibration Data

Radiated

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz	28/Nov/2016	27/Nov/2017
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz~18GHz	16/Dec/2016	15/Dec/2017
Amplifier	HP	8447D	2944A08033	10kHz~1.3GHz	10/May/2016	09/May/2017
Amplifier	KEYSIGHT	83017A	MY53270197	1GHz~26.5GHz	29/Aug/2016	28/Aug/2017
Spectrum	R&S	FSV40	101513	9kHz~40GHz	16/Feb/2016	15/Feb/2017
Bilog Antenna	SCHAFFNER	CBL 6112D	2723	30MHz~1GHz	01/Oct/2016	30/Sep/2017
Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA 9120D 1531	1GHz~18GHz	22/Apr/2016	21/Apr/2017
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170154	18GHz~40GHz	29/Jan/2016	28/Jan/2017
Amplifier	MITEQ	JS44-18004000-3 3-8P	1840917	18GHz~40GHz	02/Jun/2015	01/Jun/2017
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	02/Feb/2015	01/Feb/2017
RF-Cable-high	SUHNER	SUHNER	CB222	1GHz~40GHz	28/Oct/2016	27/Oct/2017
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz~1GHz	27/Oct/2016	26/Oct/2017



Summary

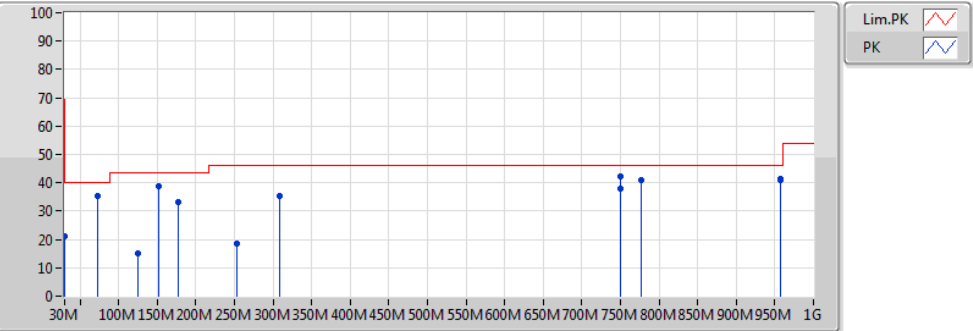
Mode	Result	Type	Freq(Hz)	Level	Limit	Margin(dB)	Factor(dB)	Dist(m)	Condition	Azimuth(°)	Height(m)	Comments
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	749.44M	42.25	46.00	-3.75	-6.28	3	Vertical	NaN	NaN	-



Result

Mode	Result	Type	Freq(Hz)	Level	Limit	Margin(dB)	Factor(dB)	Dist(m)	Condition	Azimuth(°)	Height(m)	Comments
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	30M	21.31	40.00	-18.69	-14.14	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	125.16M	15.29	43.50	-28.21	-18.33	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	253.32M	18.68	46.00	-27.32	-15.88	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	749.75M	37.97	46.00	-8.03	-6.28	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	957.12M	41.33	46.00	-4.67	-2.34	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	QP	776.92M	41.12	46.00	-4.88	-5.87	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	72.48M	35.19	40.00	-4.81	-24.21	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	151.72M	38.77	43.50	-4.73	-18.56	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	177.54M	33.21	43.50	-10.29	-20.20	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	309.26M	35.17	46.00	-10.83	-15.17	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	749.44M	42.25	46.00	-3.75	-6.28	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	957.12M	41.03	46.00	-4.97	-2.34	3	Vertical	NaN	NaN	-

Radiated-below 1GHz_Mode 1



Adapter Mode
ENT = A+B
EUT = Y axis

Type	Freq(Hz)	Level	Limit	Margin(dB)	Factor(dB)	Dist(m)	Condition	Azimuth(°)	Height(m)	Comments
PK	30M	21.31	40.00	-18.69	-14.14	3	Horizontal	NaN	NaN	-
PK	125.16M	15.29	43.50	-28.21	-18.33	3	Horizontal	NaN	NaN	-
PK	253.32M	18.68	46.00	-27.32	-15.88	3	Horizontal	NaN	NaN	-
PK	749.75M	37.97	46.00	-8.03	-6.28	3	Horizontal	NaN	NaN	-
PK	957.12M	41.33	46.00	-4.67	-2.34	3	Horizontal	NaN	NaN	-
QP	776.92M	41.12	46.00	-4.88	-5.87	3	Horizontal	NaN	NaN	-
PK	72.48M	35.19	40.00	-4.81	-24.21	3	Vertical	NaN	NaN	-
PK	151.72M	38.77	43.50	-4.73	-18.56	3	Vertical	NaN	NaN	-
PK	177.54M	33.21	43.50	-10.29	-20.20	3	Vertical	NaN	NaN	-
PK	309.26M	35.17	46.00	-10.83	-15.17	3	Vertical	NaN	NaN	-
PK	749.44M	42.25	46.00	-3.75	-6.28	3	Vertical	NaN	NaN	-
PK	957.12M	41.03	46.00	-4.97	-2.34	3	Vertical	NaN	NaN	-



Summary

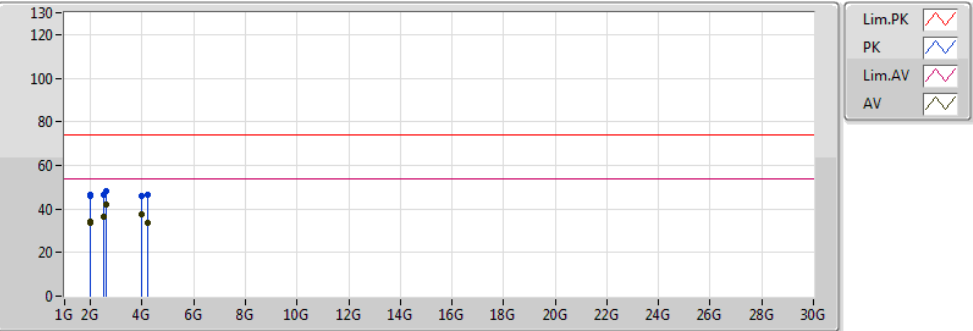
Mode	Result	Type	Freq(Hz)	Level	Limit	Margin(dB)	Factor(dB)	Dist(m)	Condition	Azimuth(°)	Height(m)	Comments
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	2.621G	42.16	54.00	-11.84	-3.22	3	Horizontal	NaN	NaN	-



Result

Mode	Result	Type	Freq(Hz)	Level	Limit	Margin(dB)	Factor(dB)	Dist(m)	Condition	Azimuth(°)	Height(m)	Comments
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	2G	33.68	54.00	-20.32	-5.21	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	2.621G	42.16	54.00	-11.84	-3.22	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	4.231G	33.68	54.00	-20.32	1.29	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	2G	46.39	74.00	-27.61	-5.21	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	2.621G	48.36	74.00	-25.64	-3.22	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	4.231G	46.29	74.00	-27.71	1.29	3	Horizontal	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	2G	34.21	54.00	-19.79	-5.21	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	2.52G	36.24	54.00	-17.76	-3.52	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	AV	4G	37.49	54.00	-16.51	0.72	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	2G	46.12	74.00	-27.88	-5.21	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	2.52G	46.48	74.00	-27.52	-3.52	3	Vertical	NaN	NaN	-
Mode 1.Normal,AC110/60Hz,EUT Y,L1-6	Pass	PK	4G	46.02	74.00	-27.98	0.72	3	Vertical	NaN	NaN	-

Radiated-above 1GHz_Mode 1



Adapter Mode
ENT = A+B
EUT = Y axis

EUT :
Model :

Type	Freq(Hz)	Level	Limit	Margin(dB)	Factor(dB)	Dist(m)	Condition	Azimuth(°)	Height(m)	Comments
AV	2G	33.68	54.00	-20.32	-5.21	3	Horizontal	NaN	NaN	-
AV	2.621G	42.16	54.00	-11.84	-3.22	3	Horizontal	NaN	NaN	-
AV	4.231G	33.68	54.00	-20.32	1.29	3	Horizontal	NaN	NaN	-
PK	2G	46.39	74.00	-27.61	-5.21	3	Horizontal	NaN	NaN	-
PK	2.621G	48.36	74.00	-25.64	-3.22	3	Horizontal	NaN	NaN	-
PK	4.231G	46.29	74.00	-27.71	1.29	3	Horizontal	NaN	NaN	-
AV	2G	34.21	54.00	-19.79	-5.21	3	Vertical	NaN	NaN	-
AV	2.52G	36.24	54.00	-17.76	-3.52	3	Vertical	NaN	NaN	-
AV	4G	37.49	54.00	-16.51	0.72	3	Vertical	NaN	NaN	-
PK	2G	46.12	74.00	-27.88	-5.21	3	Vertical	NaN	NaN	-
PK	2.52G	46.48	74.00	-27.52	-3.52	3	Vertical	NaN	NaN	-
PK	4G	46.02	74.00	-27.98	0.72	3	Vertical	NaN	NaN	-