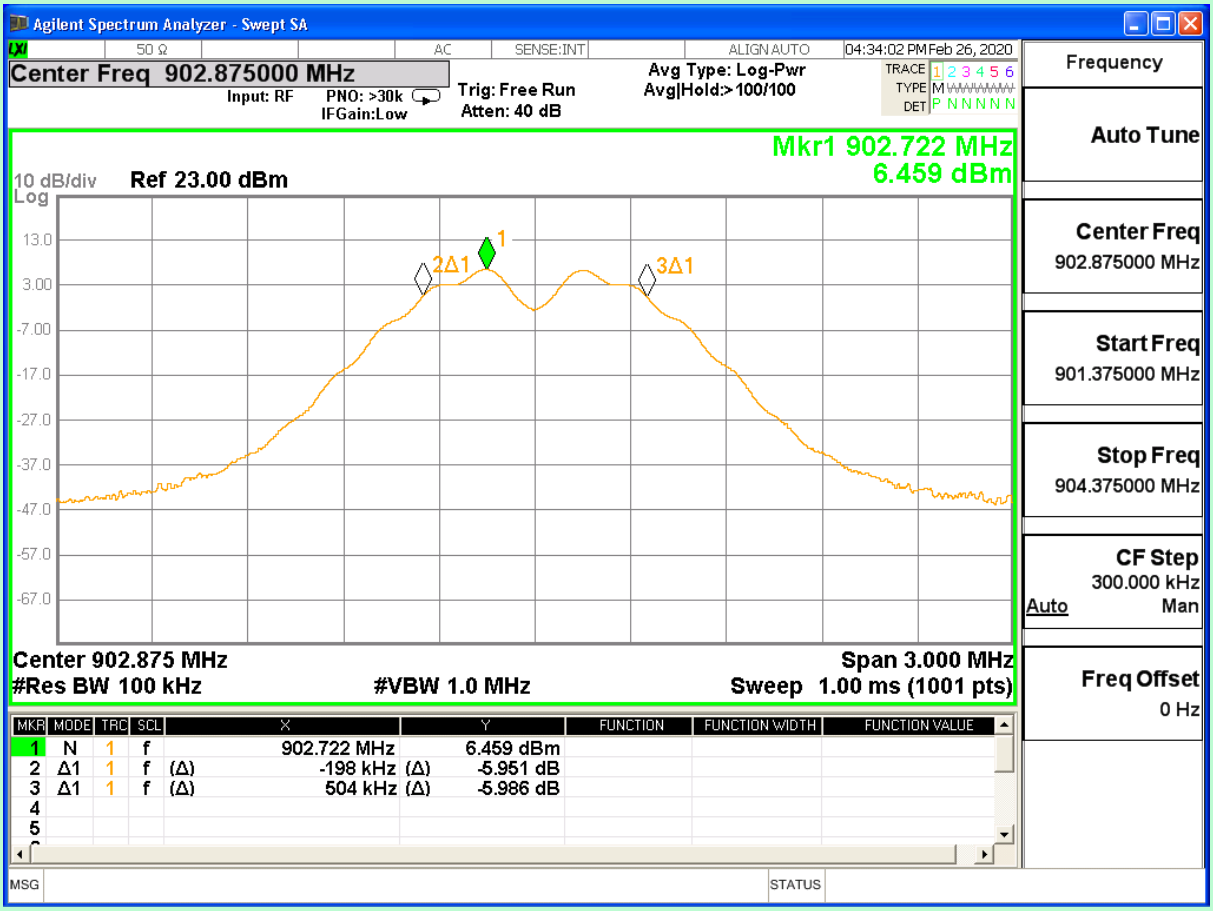
3 DTS CHANNELS

3.1 6dB BANDWIDTH			
EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	24.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	53.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	KDB 558074		
Comment	NA		
TEST DETAILS			
Method	Radiated ☐	Conducted ☒	
TEST PARAMETERS			
Antenna Height	NA	**Turntable Rotation**	NA
Equipment Class	NA	**Measurement Distance**	NA

TEST EQUIPMENT

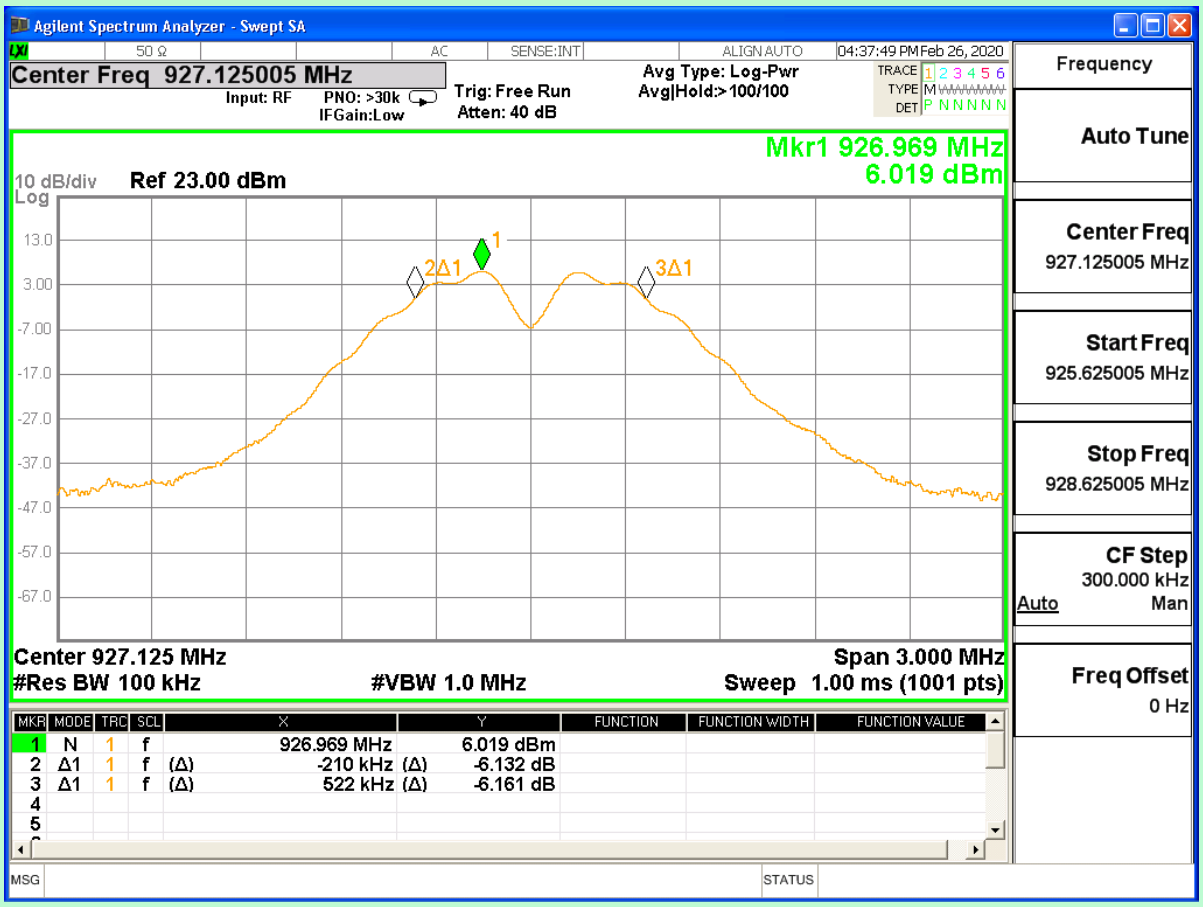
Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

TEST GRAPHS



Channel 1 (902.875MHz)

Channel 4(915.325MHz)



Channel 6 (927.125MHz)

TEST RESULT				
Channel	Frequency	Measured Bandwidth	Limit	Result
#	MHz	KHz	KHz	
1	902.875	702	>500	PASS
4	915.325	720	>500	PASS
6	927.125	732	>500	PASS

TEST SETUP PHOTOGRAPH
Refer Annexure -1 **Conducted RF Test setup**

3.2 PEAK OUTPUT POWER LEVEL

EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	KDB 558074		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

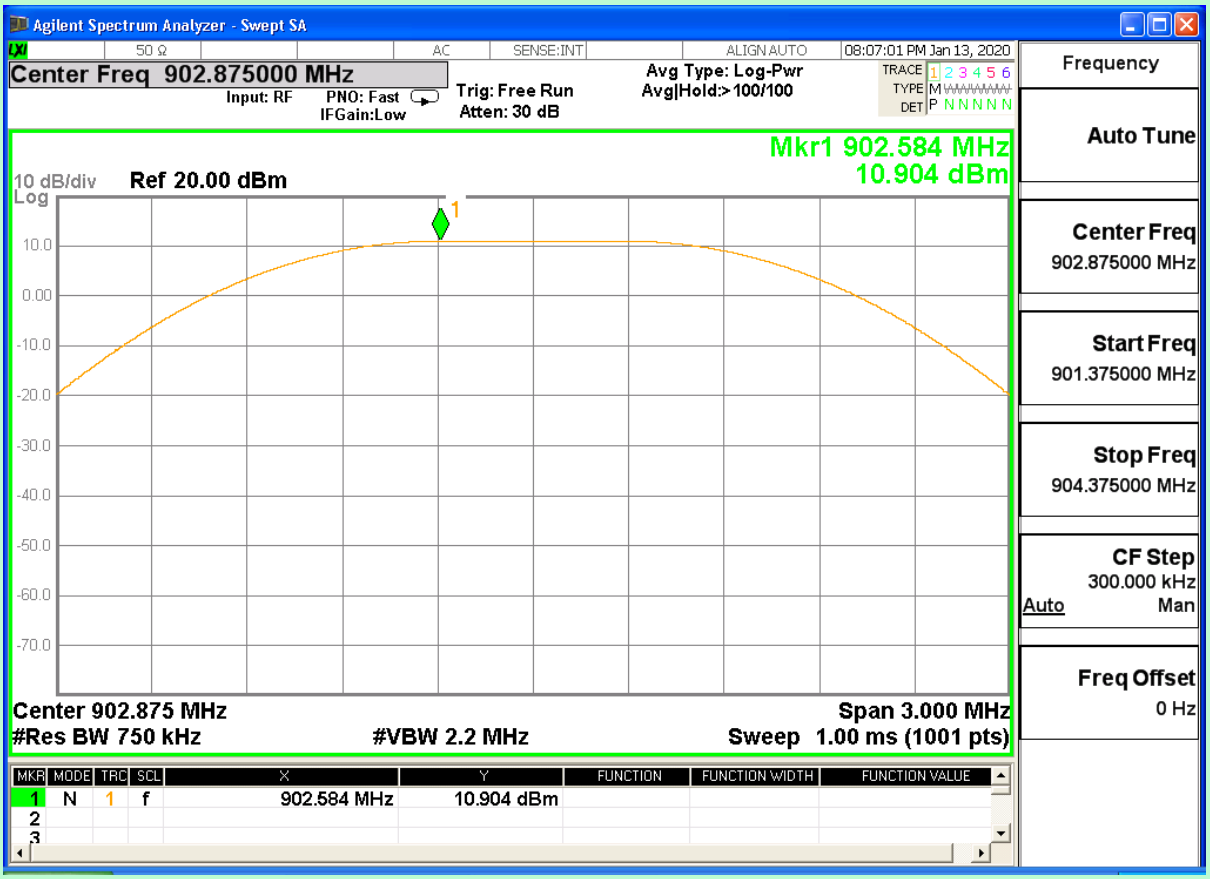
TEST PARAMETERS

Antenna Height	NA	**Turntable Rotation**	NA
Equipment Class	NA	**Measurement**	NA

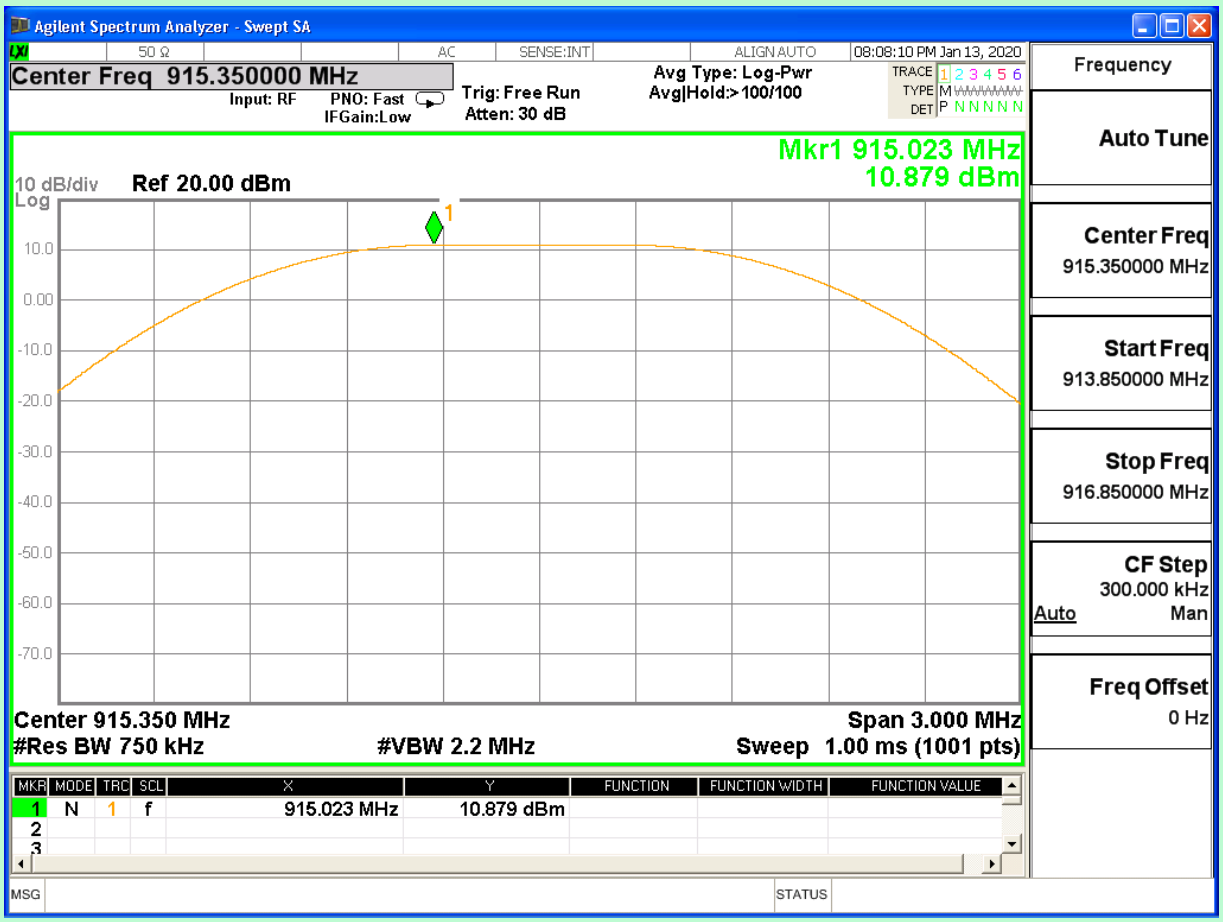
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

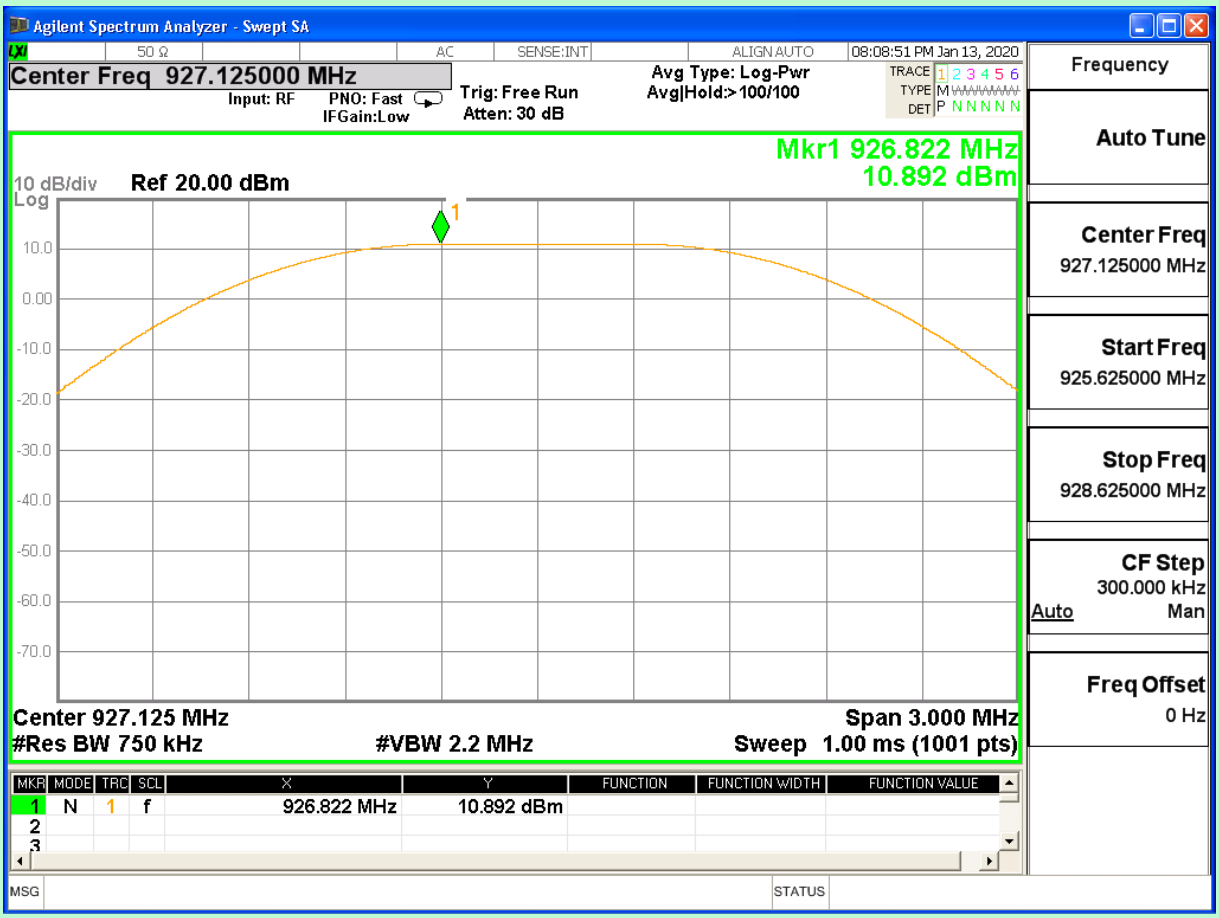
TEST GRAPHS



Antenna 1- Channel 1 (902.875MHz)



Antenna 1-Channel 4 (915.325MHz)



Antenna 1-Channel 6 (927.125MHz)

TEST RESULT

Channel	Frequency	Measured Power Level	Cable Loss	Transmitter Power Level	Limit	Result
#	MHz	dBm	dB	dBm	dBm	
Antenna 1						
1	902.875	10.90	0.8	11.70	≤30	PASS
4	915.325	10.87	0.8	11.67	≤30	PASS
6	927.125	10.89	0.8	11.69	≤30	PASS

Note: Transmitter Output Power = Measured Level (dBm) + Cable Loss (dB)

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

3.3 MAXIMUM POWER SPECTRAL DENSITY

EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	KDB 558074		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

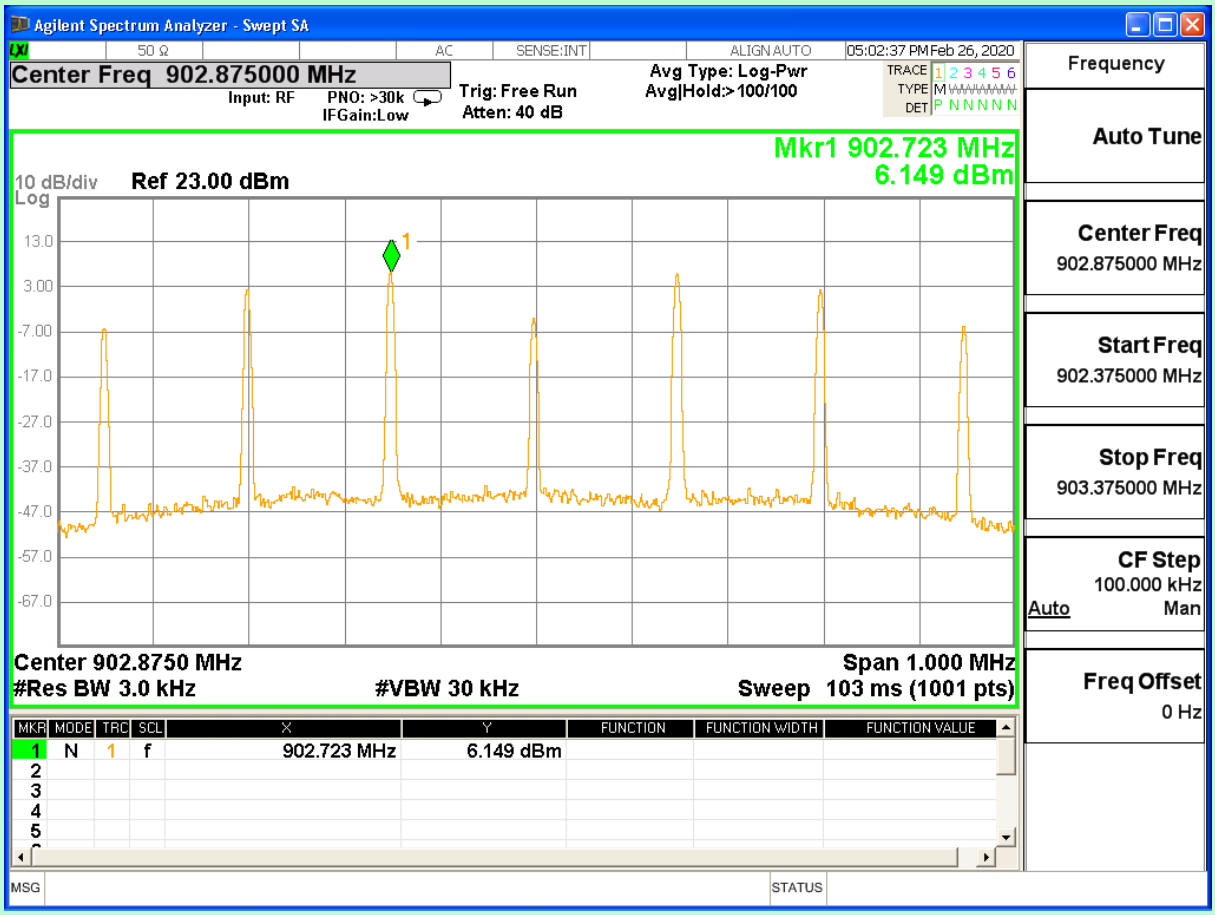
TEST PARAMETERS

Antenna Height	NA	**Turntable Rotation**	NA
Equipment Class	NA	**Measurement**	NA

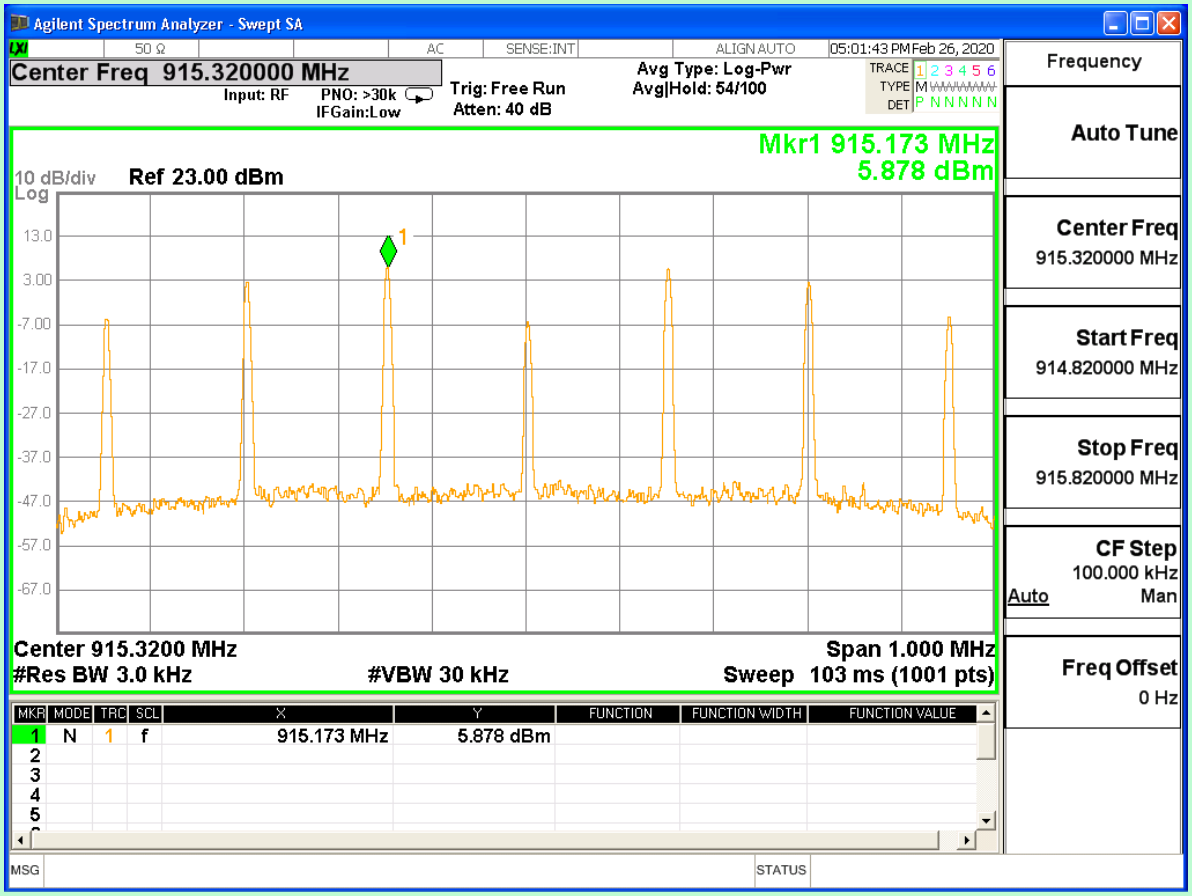
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

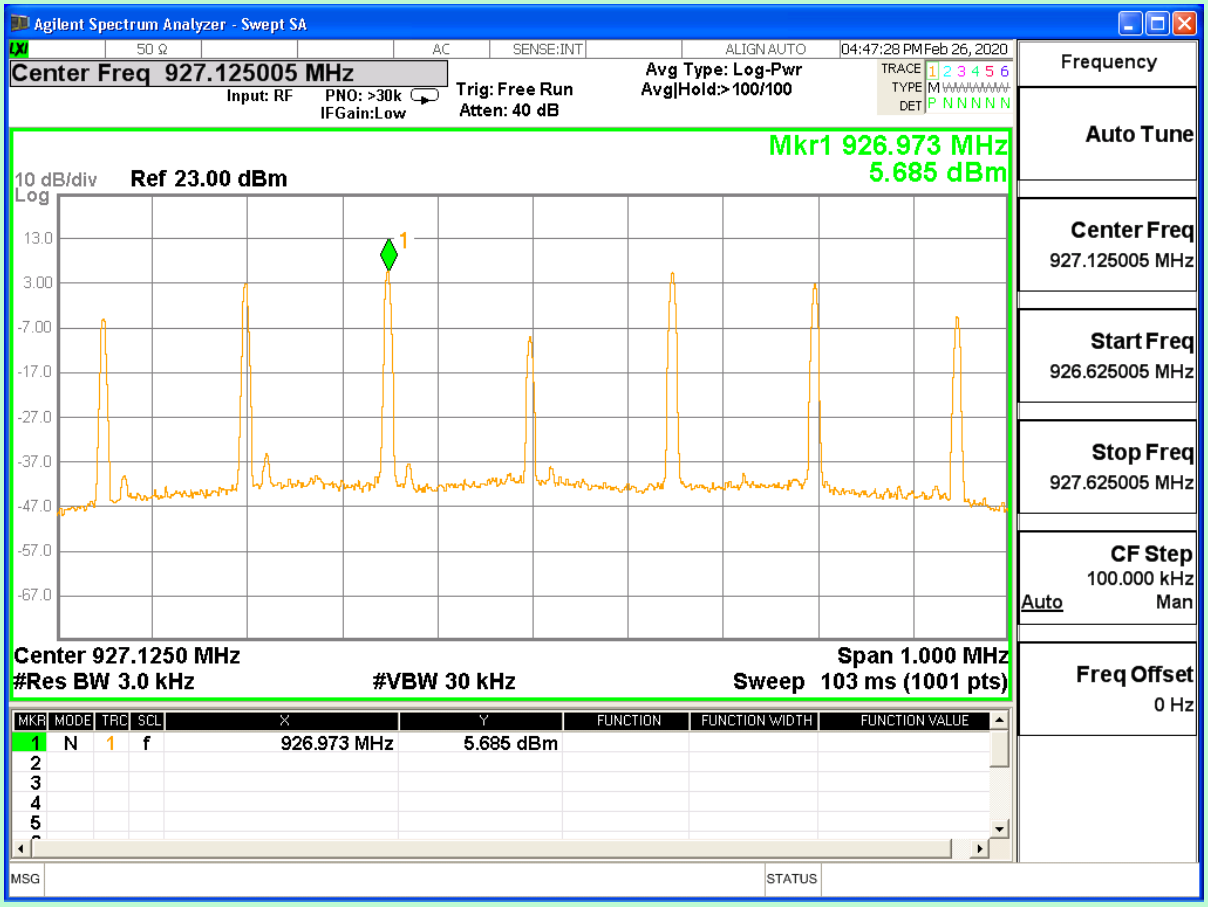
TEST GRAPHS



Channel 1 (902.875MHz)



Channel 4 (915.325MHz)



Channel 6 (927.125MHz)

TEST RESULT				
Channel #	Frequency MHz	Measured Level dBm/3KHz	Limit dBm/3KHz	Result
1	902.875	6.14	<8	Pass
4	915.325	5.87	<8	Pass
6	927.125	5.68	<8	Pass

TEST SETUP PHOTOGRAPH

Refer Annexure -1

Conducted RF Test setup

3.4 BAND EDGE COMPLIANCE

EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23.6°C
Test End Date	28-Feb-2020	**Humidity RH (%)**	51.9%RH
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage /	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std.	NA		
Applicable	FCC Part 15.247:2010		
Test Method	KDB 558074		
Comment	NA		

TEST DETAILS

Method	Radiated ☐	Conducted ☒

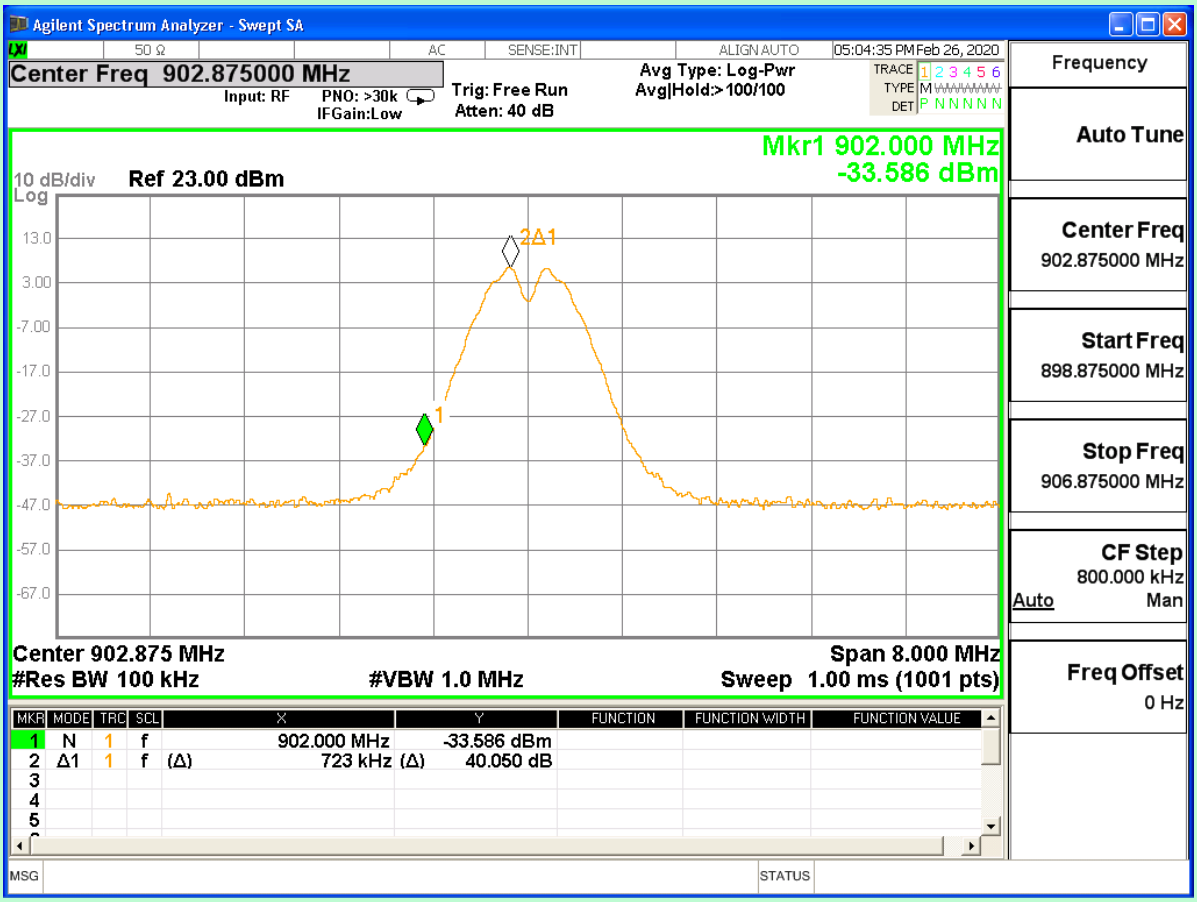
TEST PARAMETERS

Antenna Height	NA	**Turntable Rotation**	NA
Equipment Class	NA	**Measurement**	NA

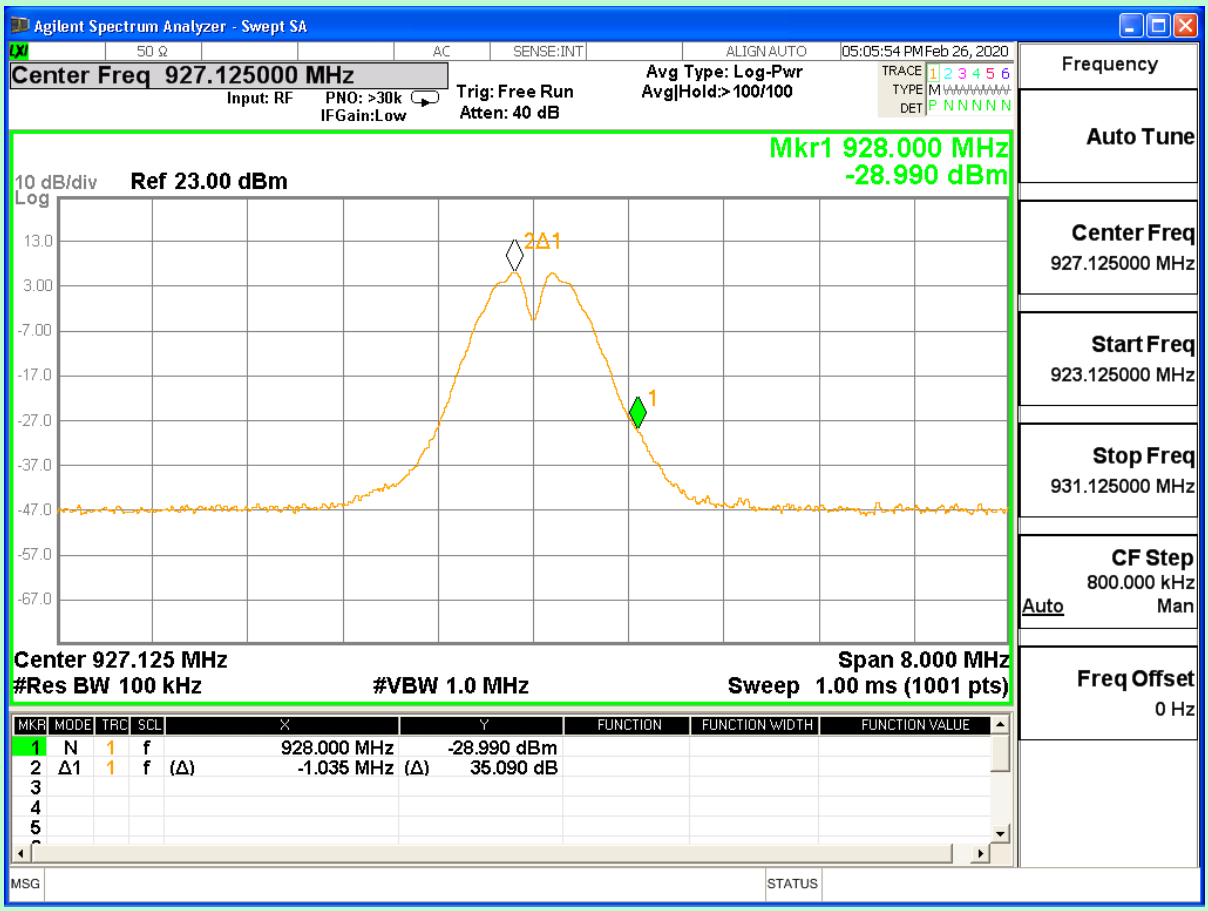
TEST EQUIPMENT

Y/N	Equipment	Make	Model	Serial Number	Cal Due Date
Y	Spectrum Analyzer	Agilent	N9010A	MY48031005	27-Feb-2021
Y	RF Cable	Huber- Suhner	SF104/2X11PC3542/500	NA	NA

TEST GRAPHS



Channel 1 (902.875MHz)



Channel 6 (927.125MHz)

TEST RESULT				
Channel	Frequency	Measured Level	Limit	Result
#	MHz	dBm/3KHz	dBm/3KHz	
1	902.875	40.05	>20	PASS
6	927.125	35.09	>20	PASS

TEST SETUP PHOTOGRAPH
Refer Annexure -1 **Conducted RF Test setup**

3.5 EFFECTIVE ISOTROPIC RADIATED POWER

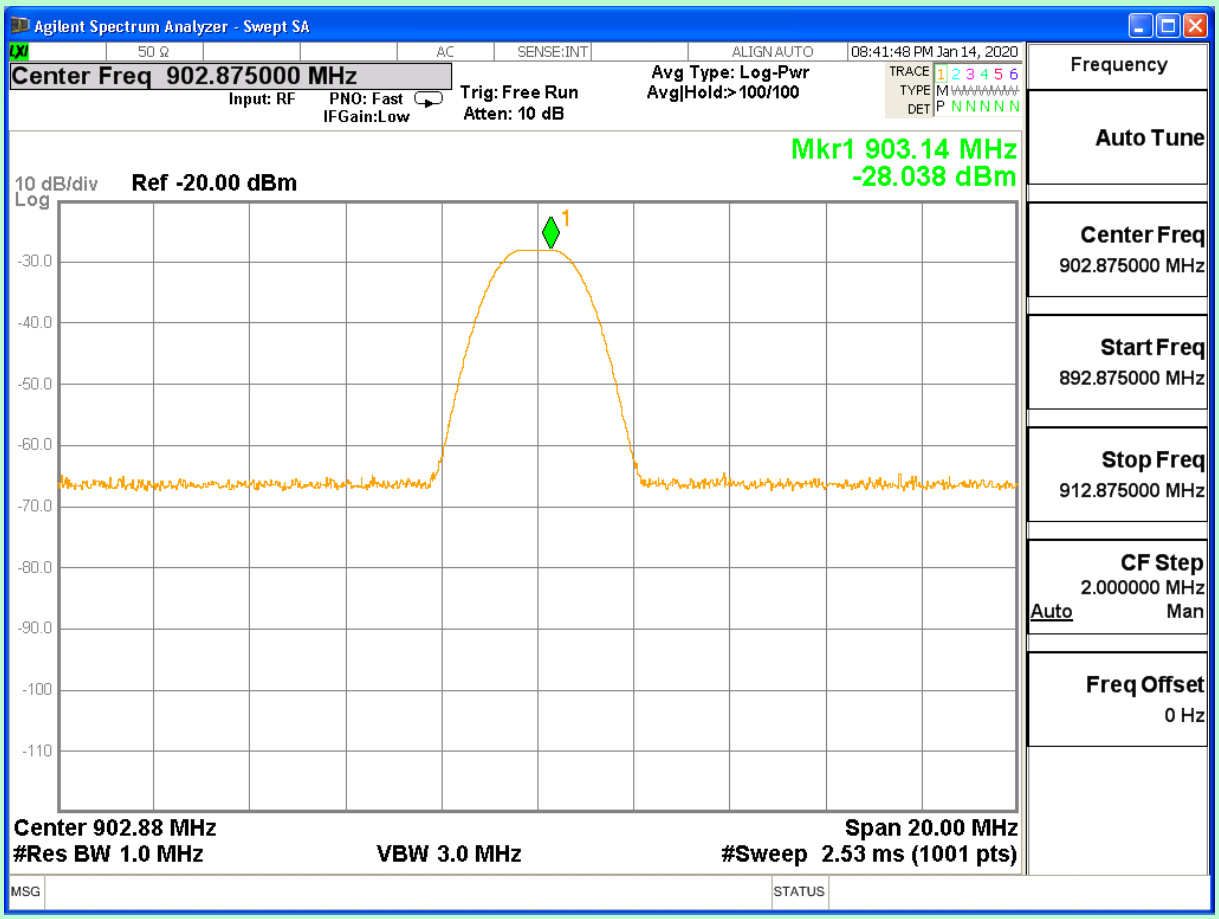
EUT Nomenclature	Wireless Photo Detector	**Test Request No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23 ± 2
Test End Date	28-Feb-2020	**Humidity RH (%)**	55 ± 3
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3V, 24mA		
Operating Mode	Refer Page 6 for Operating Mode Table		
Test configuration	Refer Page 6 for Test Configuration Table		
Deviation from Std	NA		
Applicable standard	FCC Part 15.247: 2010 & 15.209 :2010		
Test Method	KDB 412172		
Comment	NA		
TEST DETAILS			
Method	☒ Radiated	☐ Conducted	
TEST PARAMETERS			
Antenna Height	1m to 4m	**Turntable Rotation**	0° to 360°
Equipment Class	NA	**Measurement Distance**	3m

TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	EMI Test Receiver	R&S	ESU26	100525	7-Aug-20
Y	3m Semi Anechoic Chamber	ETS Lindgren	DKE 6X7 DBL.DR	1625	30-Jul-22
Y	Bilog Antenna	ETS Lindgren	HLP3003C	130525	5-Nov-21
Y	RF cable (9KHz to 18GHz)	Huber + Schuner	Sucoflex100	515518/126E	04-Oct-21

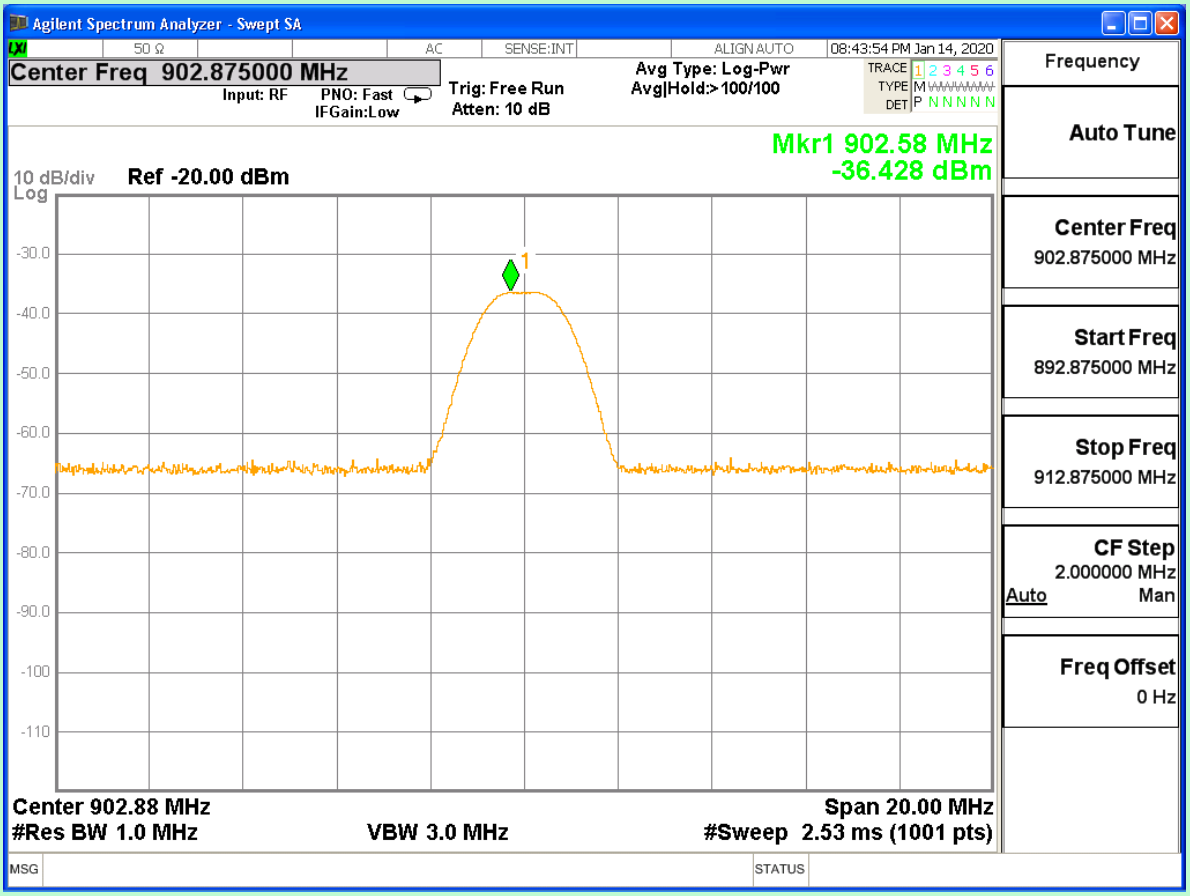
Note: Switch ON /OFF the Internal Preamplifier based on carrier level and or noise floor without overloading the receiver

TEST GRAPHS – EIRP



Antenna-1, Channel 1 (902.875MHz)

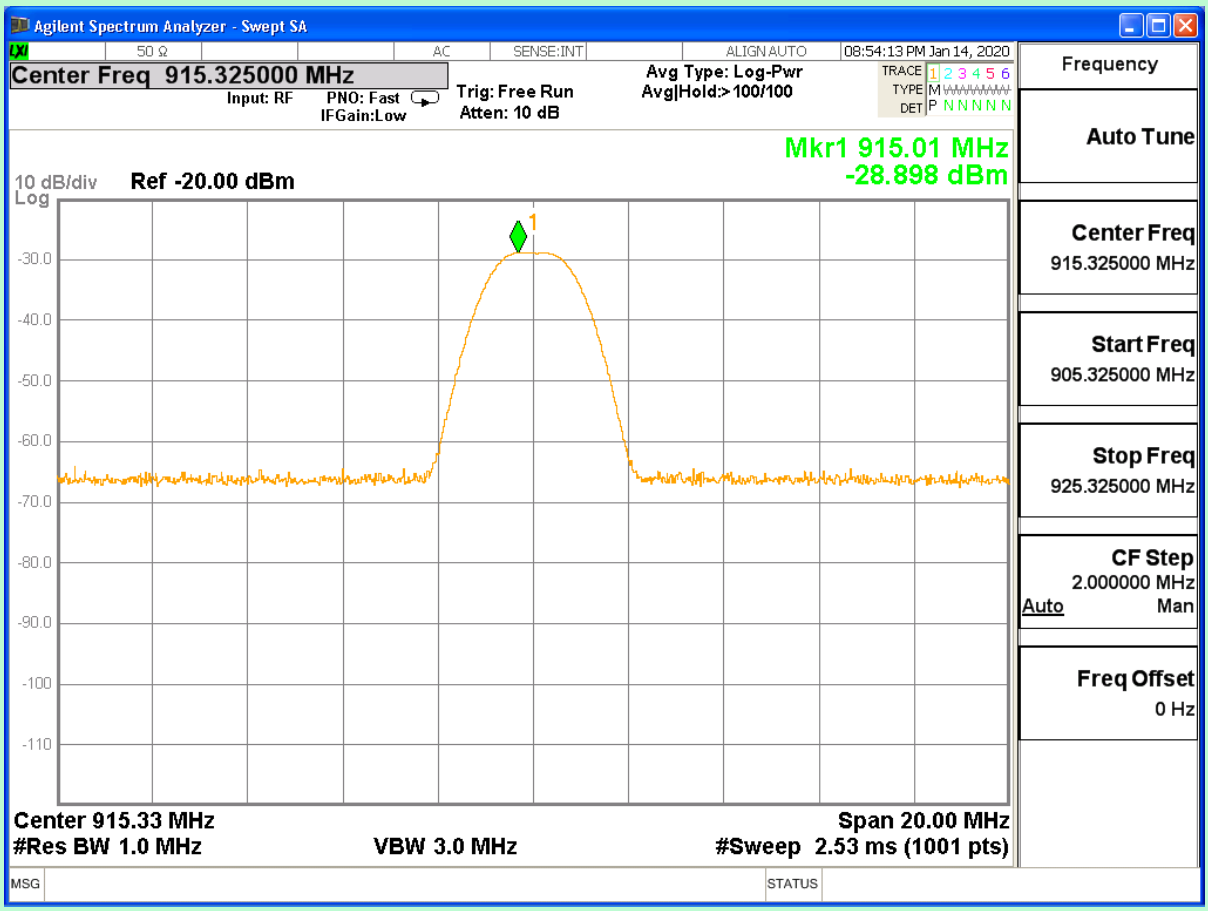
Note : Peak Graph - Horizontal polarization



Antenna-1, Channel 1 (902.875MHz)

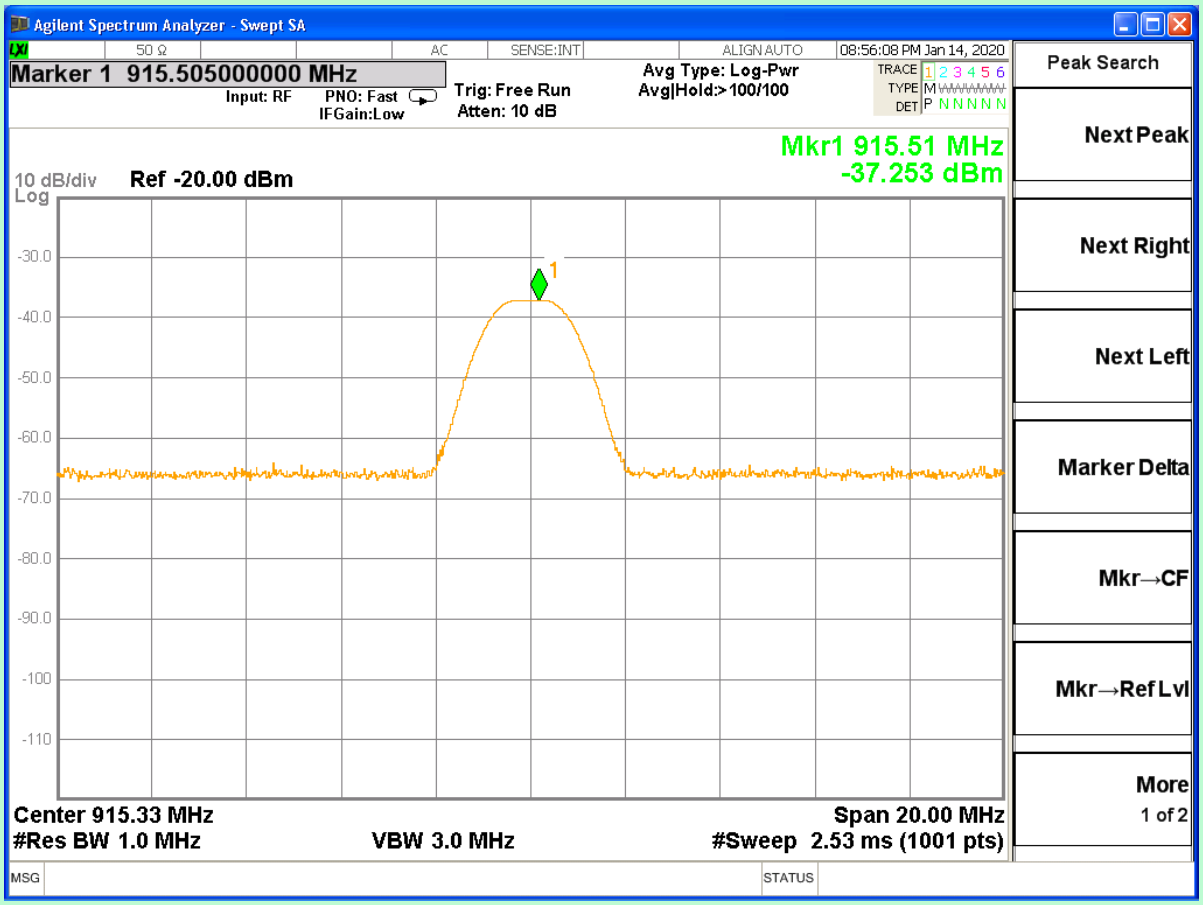
Note : Peak Graph - Vertical polarization

TEST GRAPHS – EIRP



Antenna-1, Channel 4 (915.325MHz)

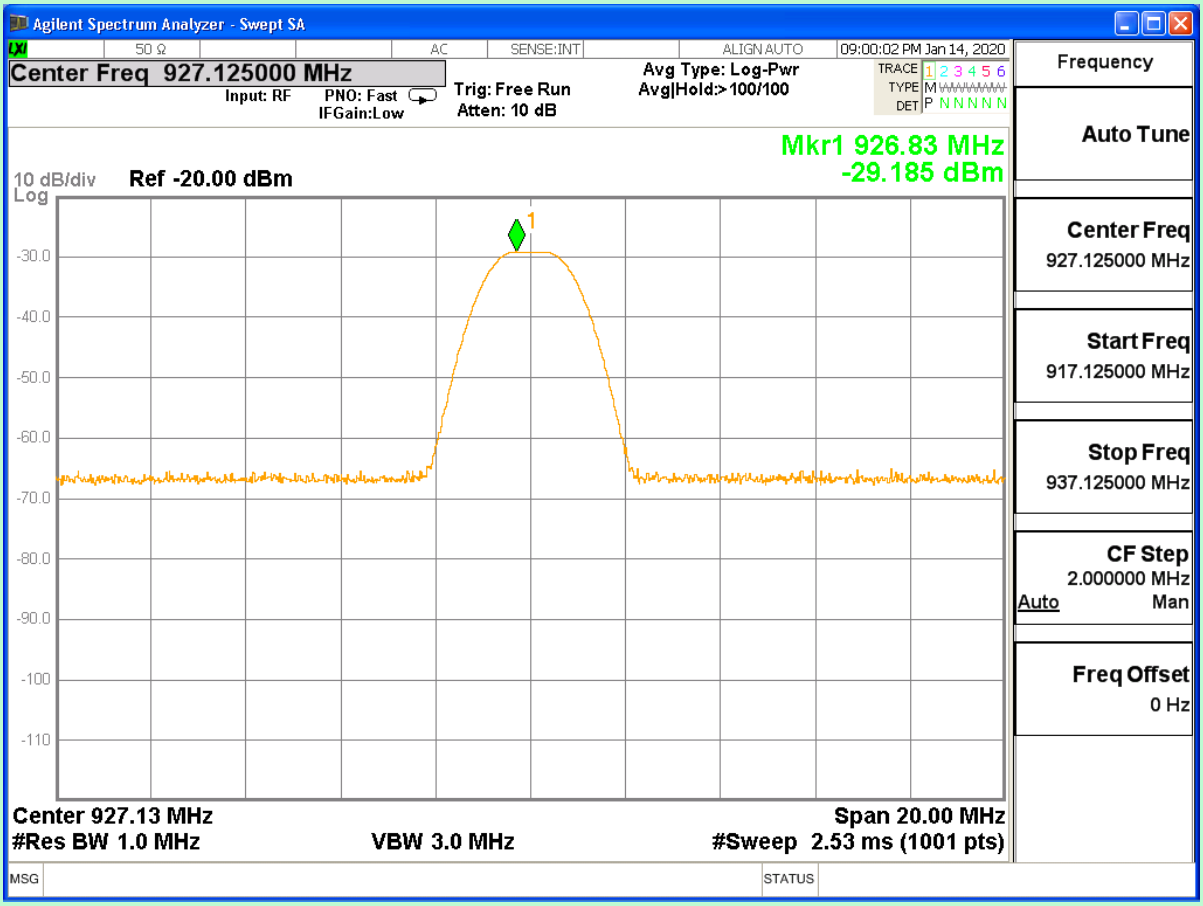
Note : Peak Graph - Horizontal polarization



Antenna-1, Channel 4 (915.325MHz)

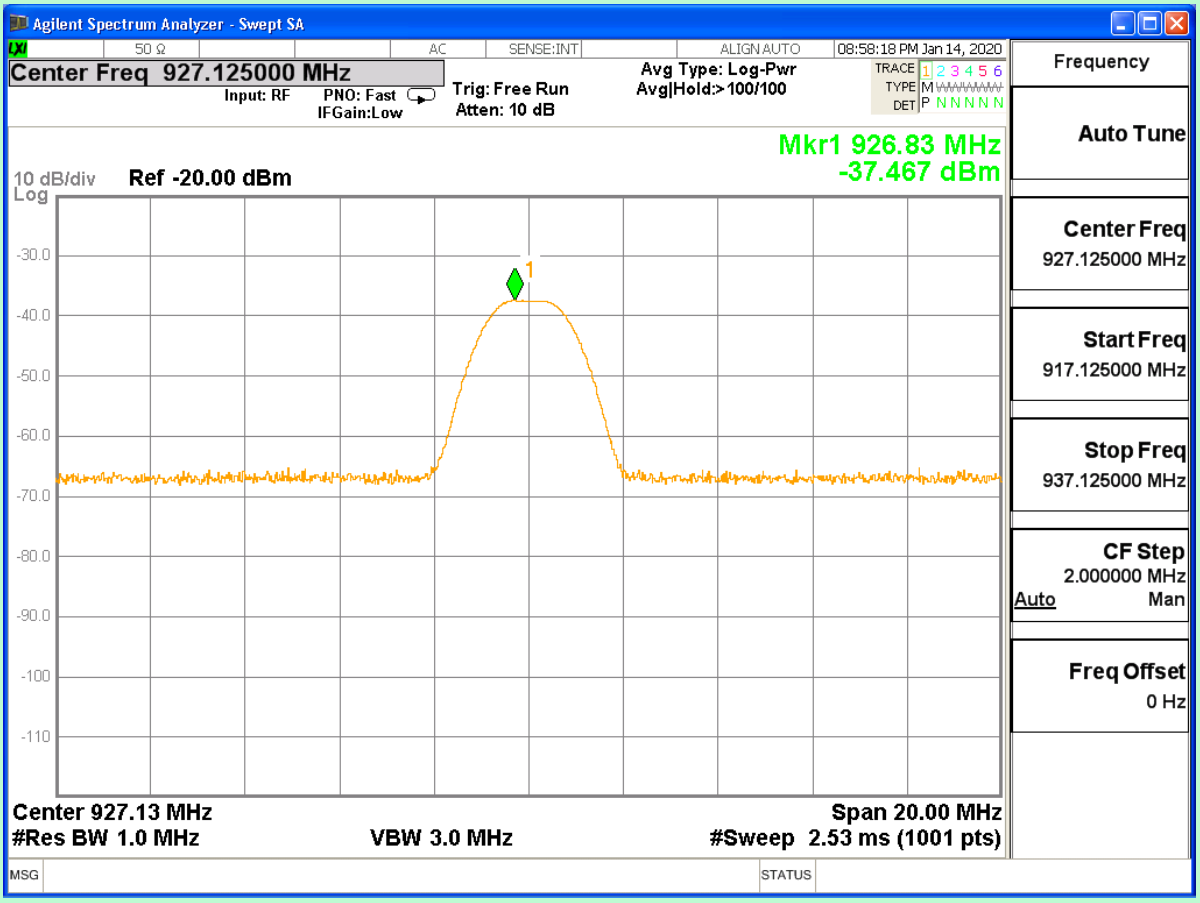
Note : Peak Graph - Vertical polarization

TEST GRAPHS – EIRP



Antenna-1, Channel 6 (927.125MHz)

Note : Peak Graph - Horizontal polarization



Antenna-1, Channel 6 (927.125MHz)

Note : Peak Graph - Vertical polarization

TEST RESULT – EIRP										
Channel	Channel Freq	Rx Antenna Height	Rx Ant Pol	Measured Level	Cable Loss	External Att	Path loss @ 3m	Rx Antenna Gain	Calculated Rx Power	Calculated EIRP
#	MHz	cm	H/V	dBm	dB	dB	dB	dBi	dBm	dBm
Antenna – 1 (DTS Mode)										
CH-1	902.875	150	H	-28.03	2.91	6	41.21	6.3	-25.42	15.79
CH-1	902.875	100	V	-36.42	2.91	6	41.21	6.3	-33.81	7.4
CH-4	915.325	150	H	-28.89	2.91	6	41.21	6.3	-26.28	14.93
CH-4	915.325	160	V	-37.25	2.91	6	41.21	6.3	-34.64	6.57
CH-6	927.125	180	H	-29.18	2.91	6	41.21	6.3	-26.57	14.64
CH-6	927.125	160	V	-37.46	2.91	6	41.21	6.3	-34.85	6.36

Note :
Effective Isotropic Radiated Power (dBm)= Pr(dBm) +Lp(dB)
Pr = Pmeas(dBm)-Gr(dBi)+Lc(dB)+Latt(dB)
Lp =20Log F+20LogD-27.5
Where:
Pr =Calculated Received Power Level(dBm)
Lp= Free Space Path Loss(dB)
Pmeas= Measured Power Level(dBm)
Gr = Receiver Antenna Gain(dBi)
Lc = Cable Loss (dB)
Latt= External Attenuator(dB)
F = Frequency (MHz)
D= Distance (m)

3.6 SPURIOUS RADIATED EMISSIONS

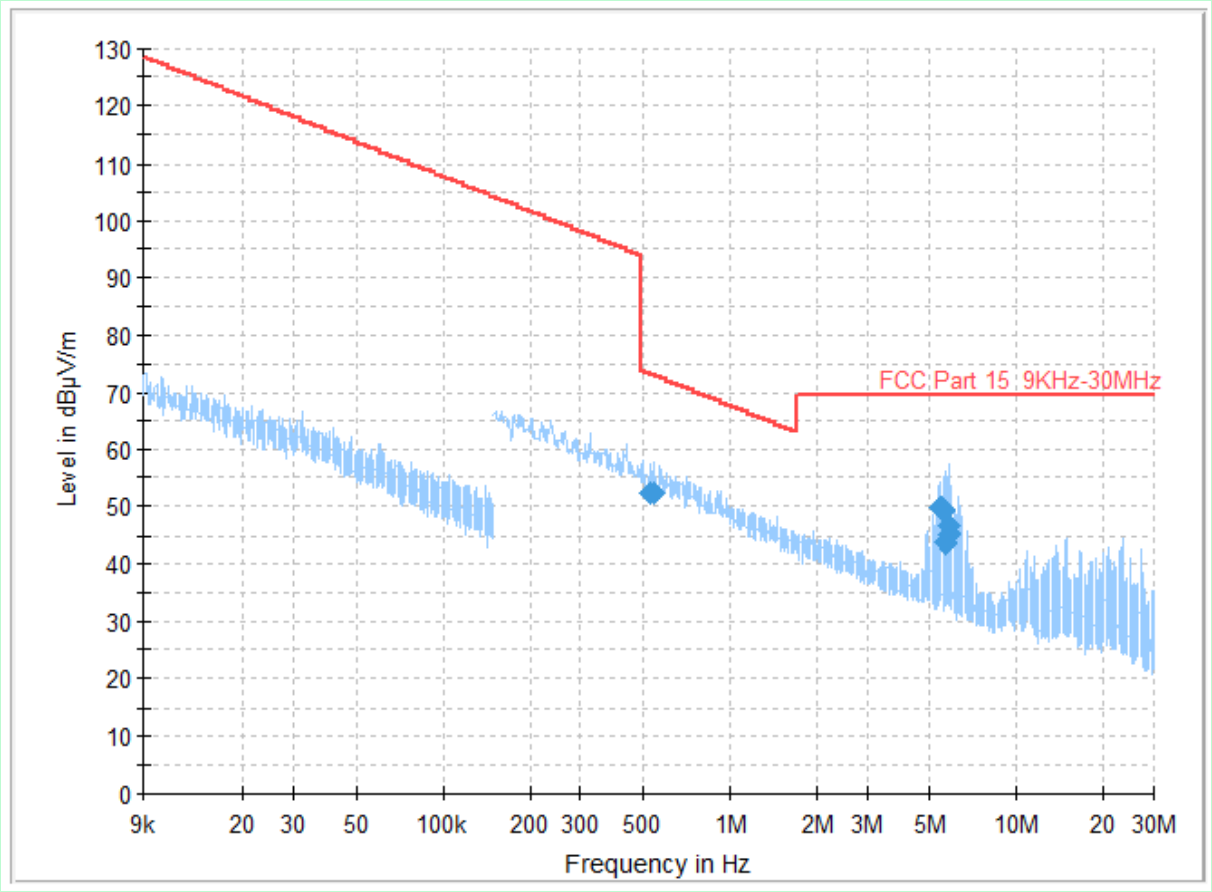
EUT Nomenclature	Wireless Photo Detector	**Test Report No.**	EMC0420-1
Model No.	FWD-200P	**Serial No.**	138
Test Start Date	14-Dec-2019	**Temperature (˚C)**	23 ± 2
Test End Date	28-Feb-2020	**Humidity RH (%)**	55 ± 3
Tested By	Shaithanya C	**Pressure (mbar)**	NR
Input Voltage / Freq	3.3V, 24mA		
Operating Mode	Refer Page 6 Operating Modes Table		
Test configuration	Refer Page 6 Test Configuration Table		
Deviation from Std	NA		
Comment	NA		
TEST FREQUENCY RANGE			
Start Frequency	9KHz	**Stop Frequency**	10GHz
MAXIMUM OPERATING FREQUENCY			
902MHz to 928MHz			
TEST PARAMETERS			
Antenna Height	1m to 4m	**Turntable Rotation**	0° to 360°
Applicable standard	FCC Part 15.209	**Test Method**	KDB 558074
Equipment Class	NA	**Measurement Distance**	3m

TEST EQUIPMENT

Y/N	Equipment	Make	Model	Sl. No.	Cal Due Date
Y	EMI Test Receiver	R&S	ESU26	100229	7-Aug-20
Y	3m Semi Anechoic Chamber	ETS Lindgren	DKE 6X7 DBL.DR	1625	30-Jul-22
Y	Double Ridge Guide Horn Antenna	ETS Lindgren	3117	64055	1-Nov-21
Y	Bilog Antenna	ETS Lindgren	HLP3003C	130525	5-Nov-21
Y	Loop Antenna	ETS Lindgren	6507	103694	15-Nov-21
Y	RF cable (9KHz to 18GHz)	Huber + Schuner	Sucoflex100	515518/126E	04-Oct-21
Y	Signal Conditioning unit	R&S	SCU-18	10178	5-Jun-20
Y	High Pass Filter	Wainwright	WHKX1.5/15G-12ST	1	24-Feb-21
Y	EMC32 Software	R&S	8.30.0	820-OT101248	NA

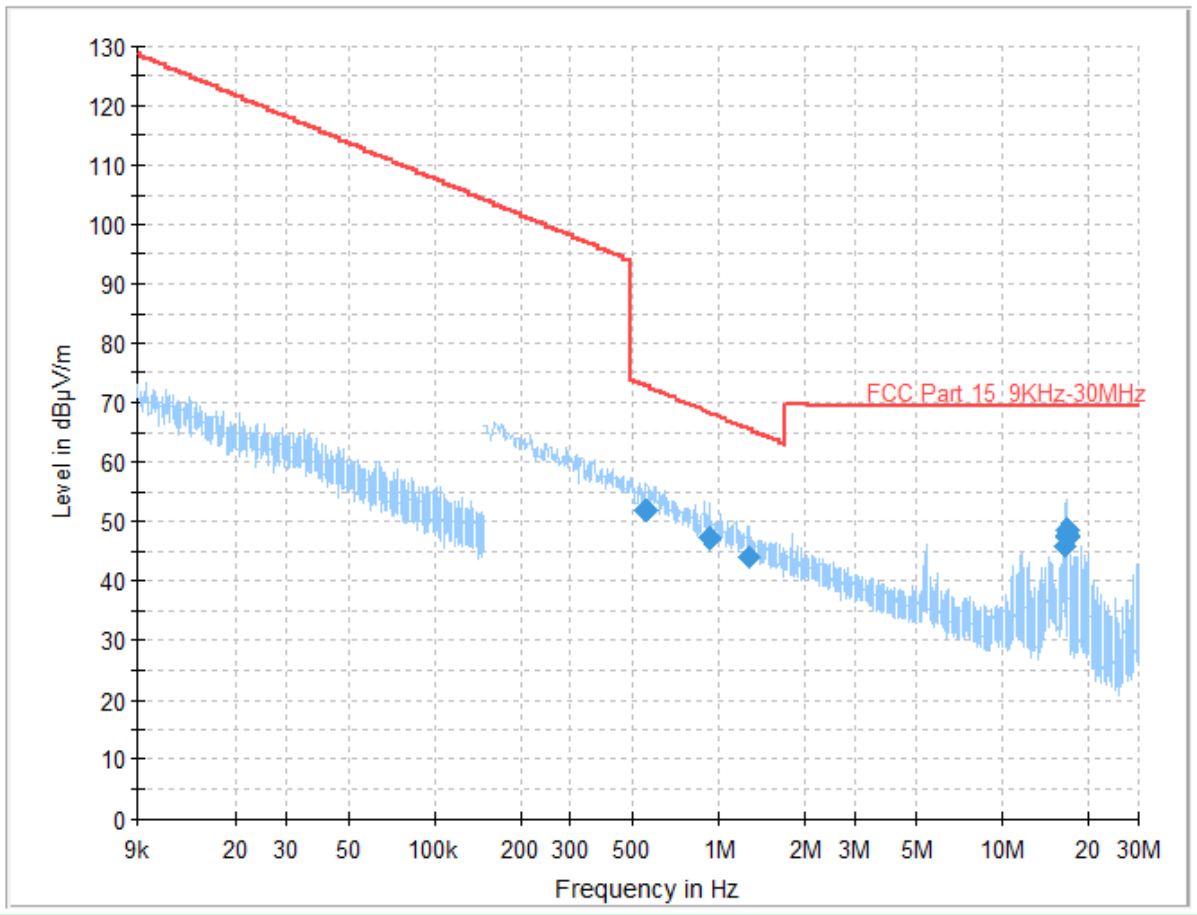
Note: Switch ON /OFF the Internal Preamplifier based on carrier level and or noise floor without overloading the receiver

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



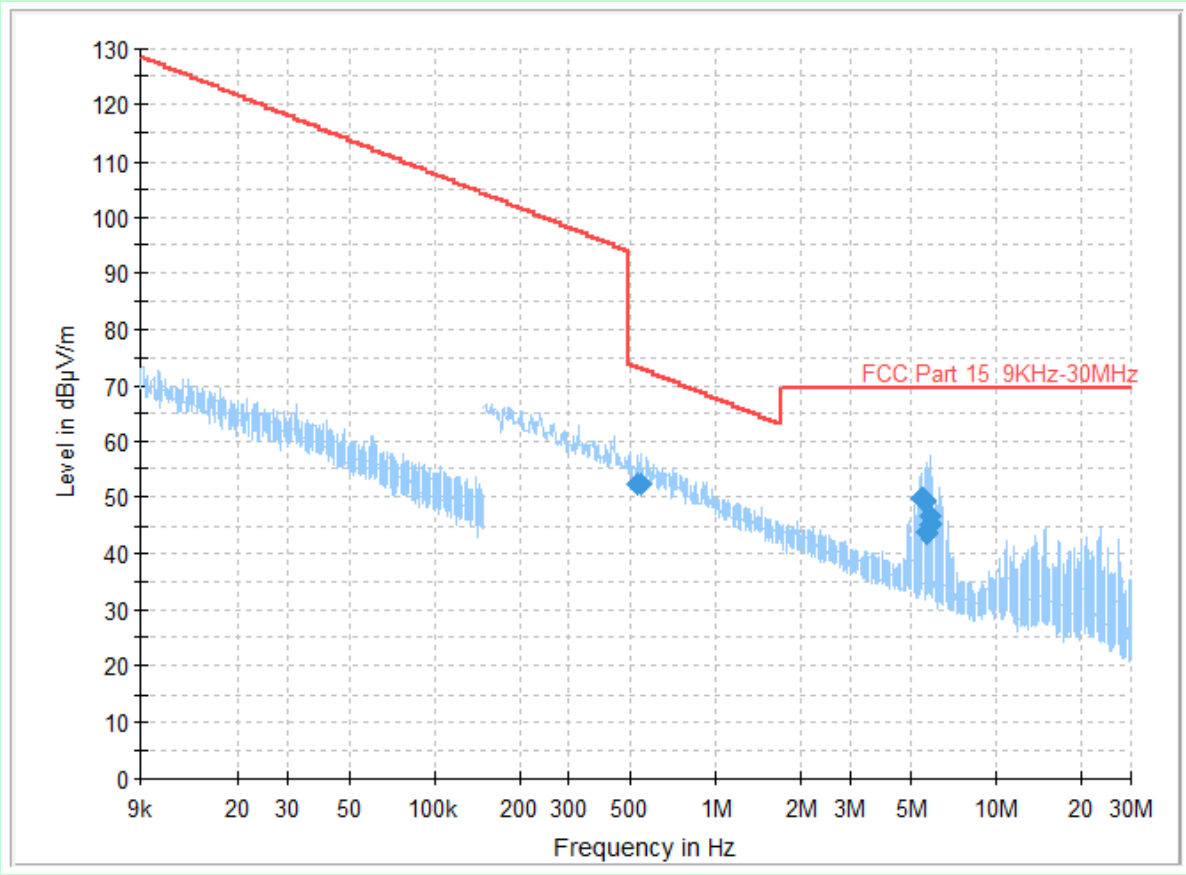
Channel 1 (902.875MHz) – Parallel

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



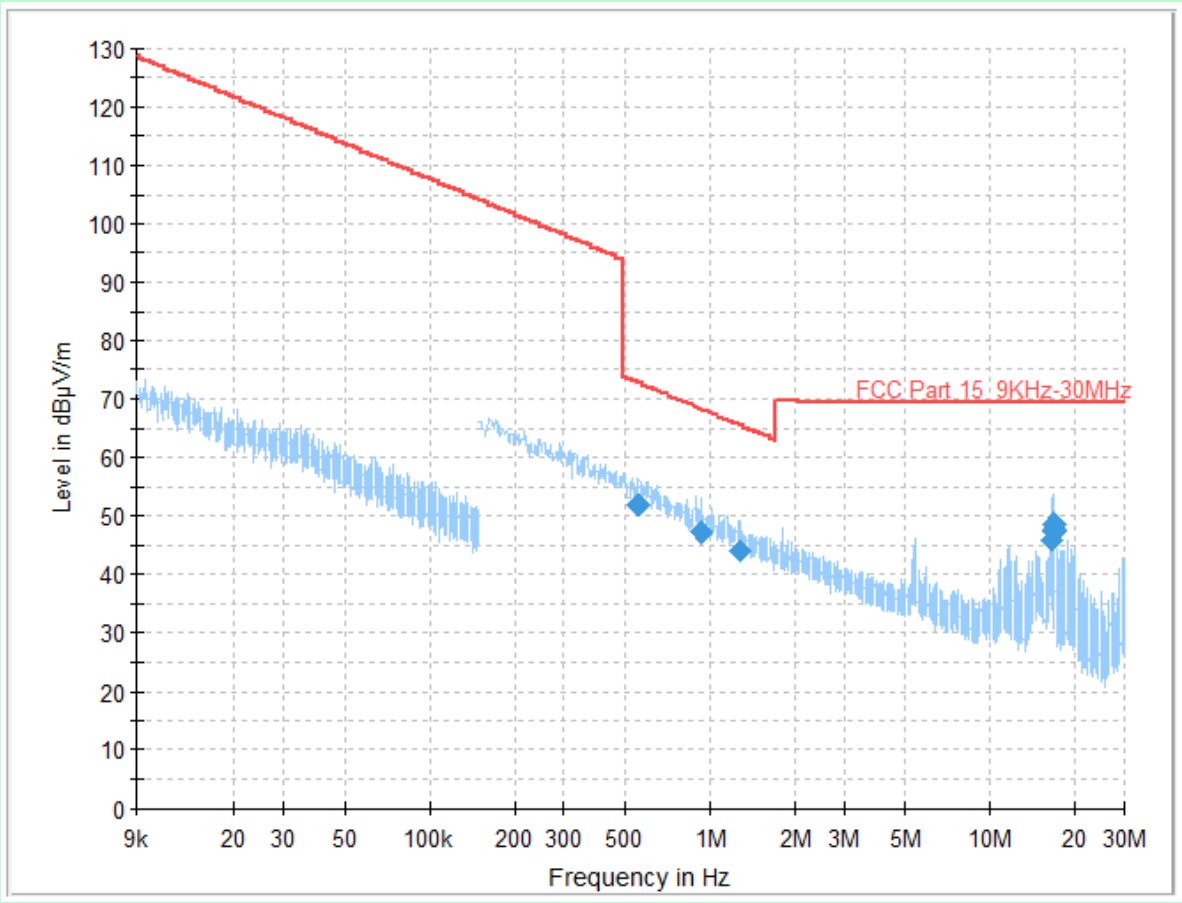
Channel 1 (902.875MHz) – Perpendicular

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



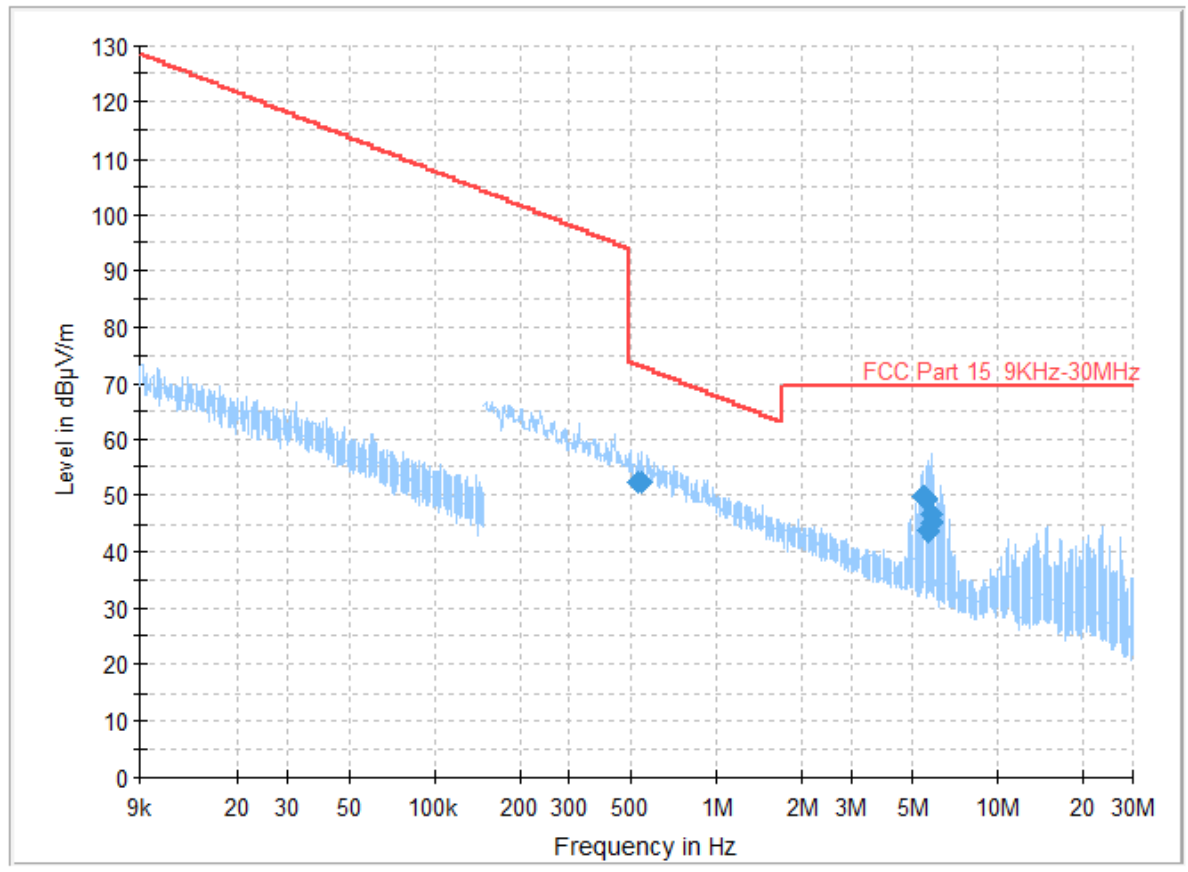
Channel 4 (915.325MHz) – Parallel

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



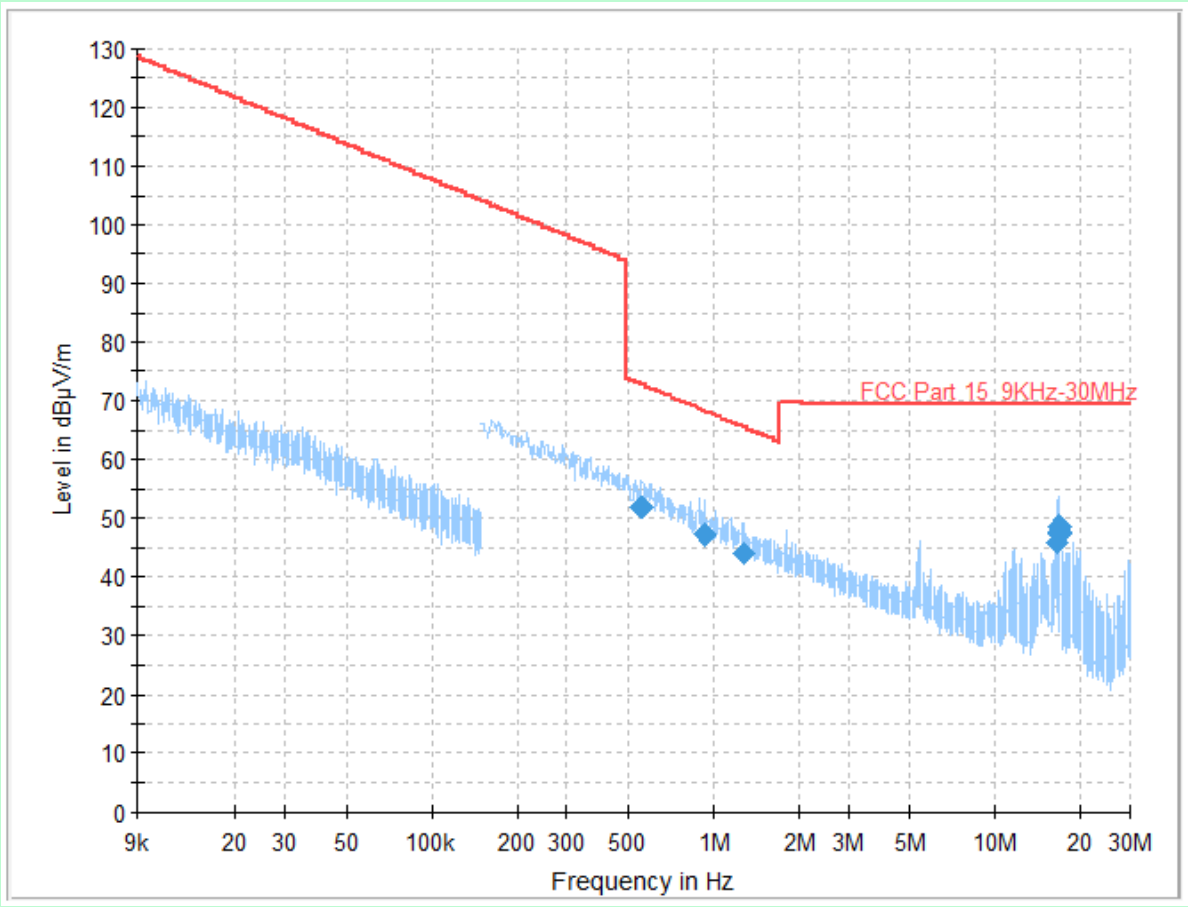
Channel 4 (915.325MHz) – Perpendicular

TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



Channel 6 (927.125MHz) – Parallel

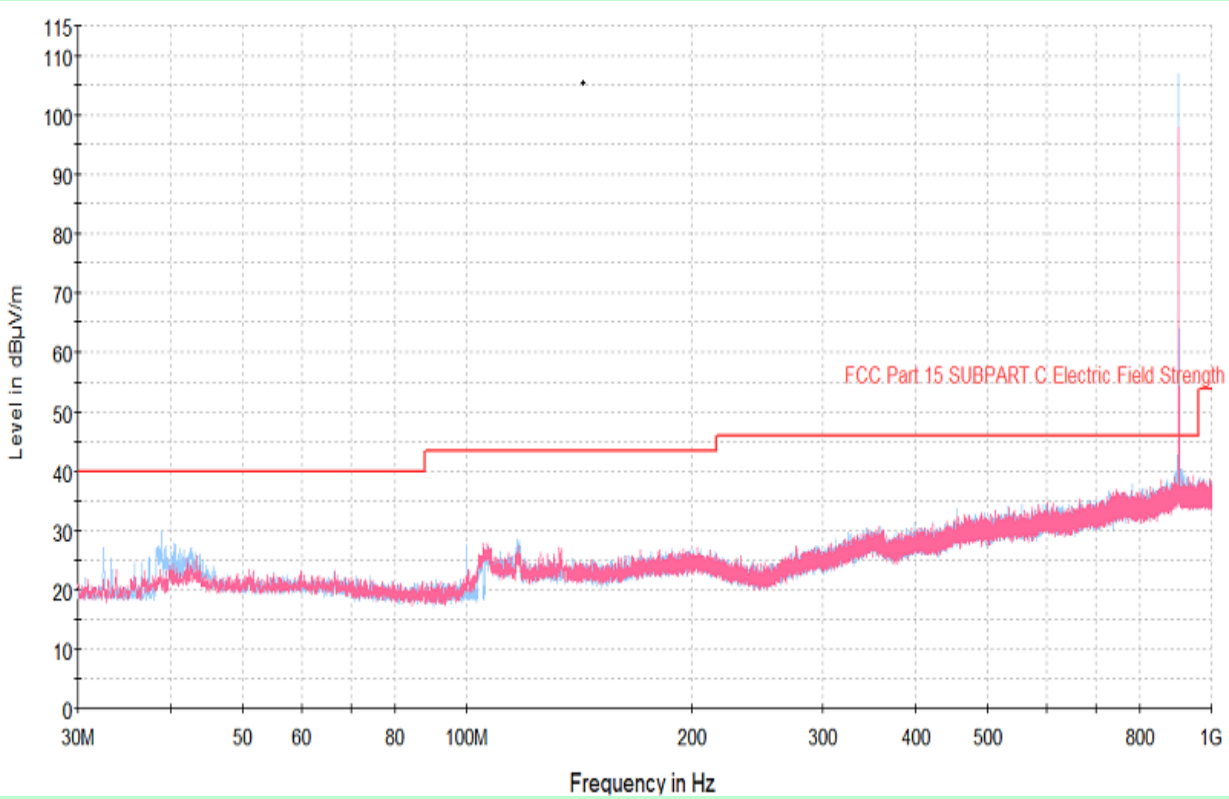
TEST GRAPHS – 9 KHz to 30 MHz (Antenna 1)



Channel 6 (927.125MHz) – Perpendicular

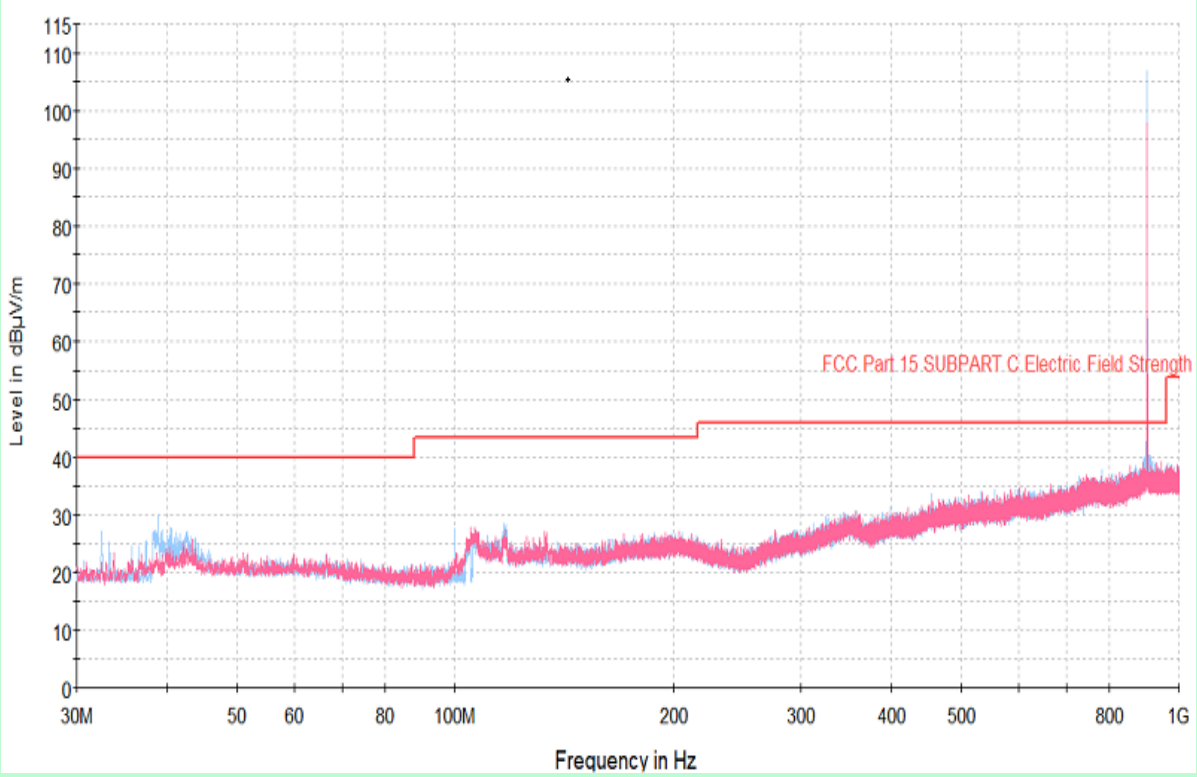
TEST RESULT – 9 KHz to 30 MHz									
Channel	Channel Frequency	Measured Spurious	Quasi Peak	Height	Ant Pol	Azimuth	Margin	Limit @ 3m Distance	Results
#	MHz	MHz	dBµV/m	cm	Parallel / Perpendicular	deg	dB	dBµV/m	
No emissions detected that are a product of the transmitter. Emissions shown in the plot are related to the chamber ambient									
NOTE: Measured Field Strength –dBuV/m (9 KHz to 1 GHz) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)									

TEST GRAPHS – 30MHz to 1GHz (Antenna 1)



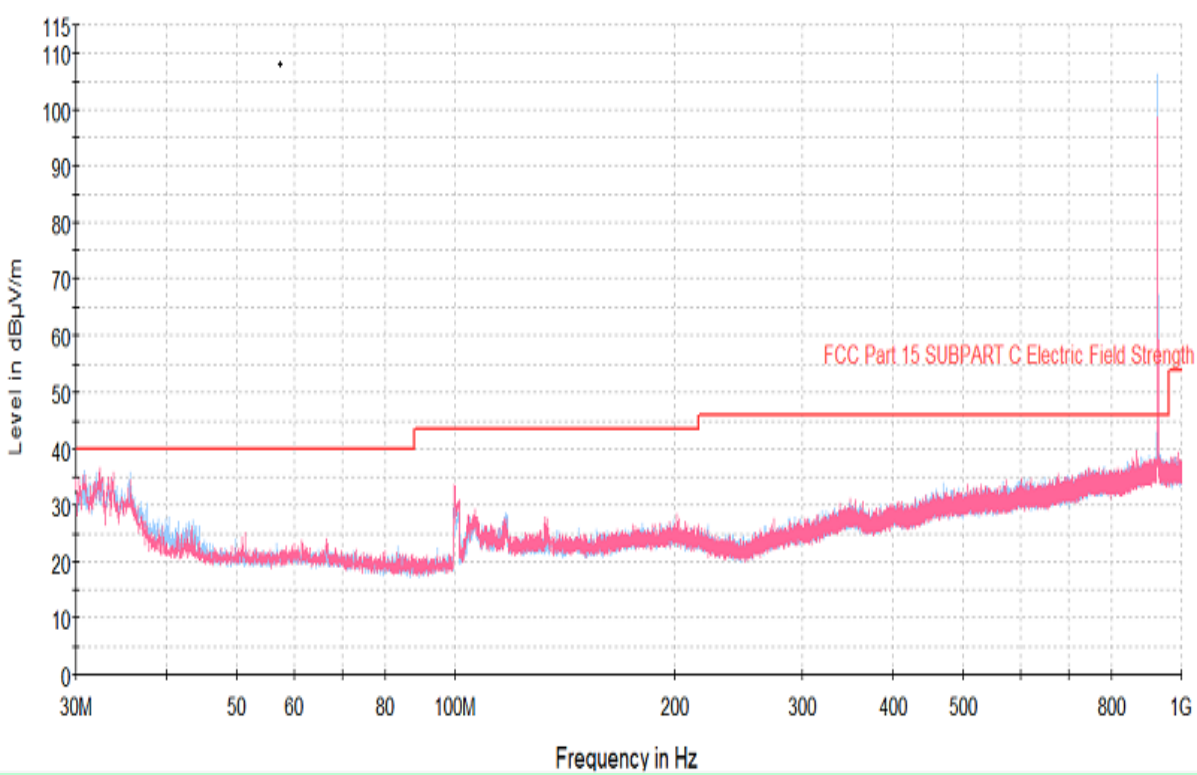
Channel 1 (902.875MHz) – Antenna 1

TEST GRAPHS – 30MHz to 1GHz (Antenna 1)



Channel 4 (915.325MHz) – Antenna 1

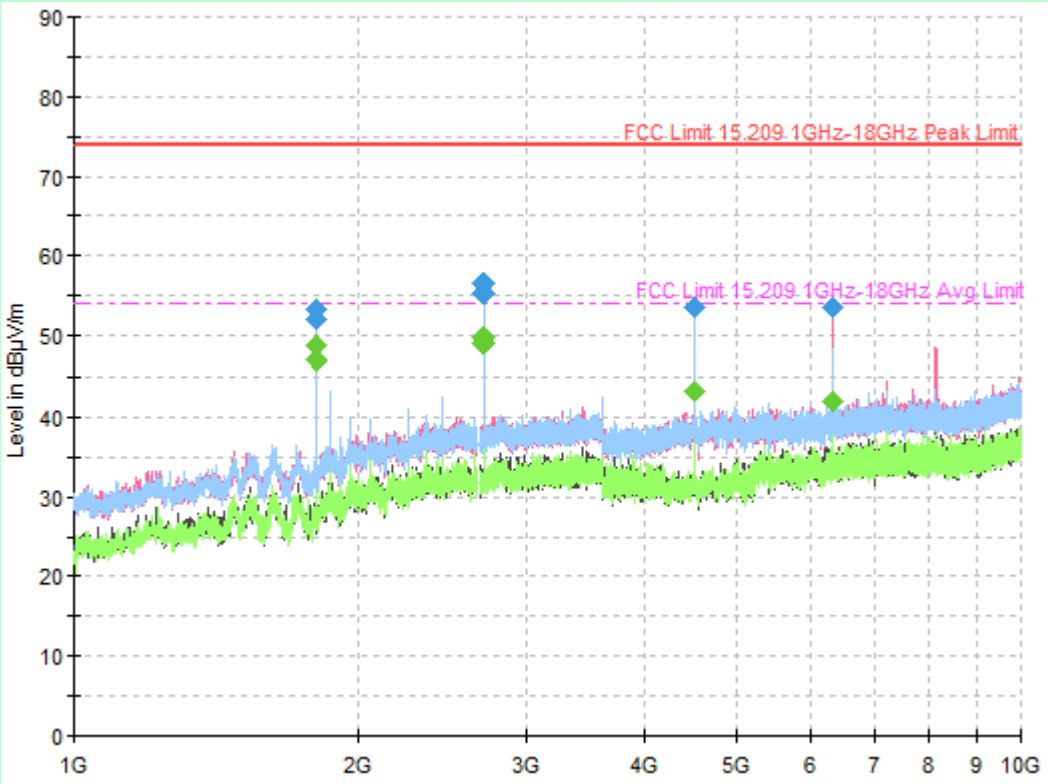
TEST GRAPHS – 30MHz to 1GHz (Antenna 1)



Channel 6 (927.125MHz) – Antenna 1

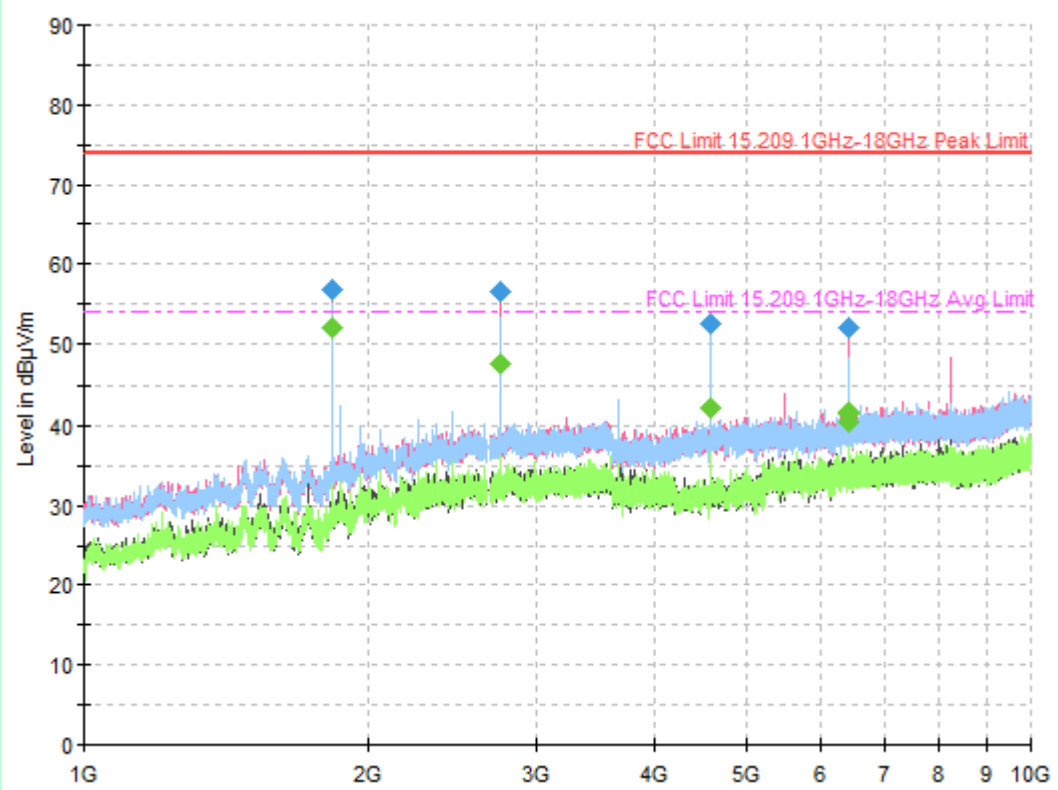
TEST RESULT – 30 MHz to 1 GHz								
Channel	Measured Spurious	Quasi Peak	Height	Ant Pol	Azimuth	Margin	Limit @ 3m Distance	Results
#	MHz	dBµV/m	Cm	H / V	deg	dB	dBµV/m	
Antenna – 1								
CH-1	340.01	27.41	100	V	35	18.59	46	Pass
CH-1	355.14	27.69	100	H	199	18.31	46	Pass
CH-1	364.26	27.42	100	V	187	18.58	46	Pass
CH-1	509.95	31.38	100	H	327	14.62	46	Pass
CH-1	512.09	31.43	400	H	61	14.57	46	Pass
CH-1	519.65	31.57	200	V	146	14.43	46	Pass
CH-1	683.39	34.98	200	H	356	11.02	46	Pass
CH-1	688.04	35.08	400	H	21	10.92	46	Pass
CH-1	838.39	37.39	300	V	91	8.61	46	Pass
CH-1	839.95	37.38	100	V	229	8.62	46	Pass
CH-1	841.69	37.51	200	H	80	8.49	46	Pass
CH-1	902.74	106.89	100	H	6	-	-	Intended Frequency
CH-4	519.07	31.52	200	V	299	14.48	46	Pass
CH-4	523.34	31.63	400	V	94	14.37	46	Pass
CH-4	693.48	35.21	200	H	158	10.79	46	Pass
CH-4	695.03	35.27	100	H	191	10.73	46	Pass
CH-4	696.97	35.32	300	H	220	10.68	46	Pass
CH-4	797.27	36.56	400	H	74	9.44	46	Pass
CH-4	840.53	37.42	400	H	202	8.58	46	Pass
CH-4	847.71	37.53	300	V	133	8.47	46	Pass
CH-4	915.22	106.74	100	H	275	-	-	Intended Frequency
CH-6	506.85	31.3	100	V	227	14.7	46	Pass
CH-6	517.32	31.5	400	H	171	14.5	46	Pass
CH-6	522.76	31.62	400	H	189	14.38	46	Pass
CH-6	675.82	34.74	100	H	169	11.26	46	Pass
CH-6	691.54	35.16	100	V	337	10.84	46	Pass
CH-6	839.36	37.36	400	V	67	8.64	46	Pass
CH-6	843.63	37.53	100	H	228	8.47	46	Pass
CH-6	847.12	37.59	100	H	151	8.41	46	Pass
CH-6	926.99	106.34	100	H	97	-	-	Intended Frequency
NOTE: Measured Field Strength –dBuV/m (9 KHz to 1 GHz) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)								

TEST GRAPHS – 1GHz to 10GHz (Antenna 1)



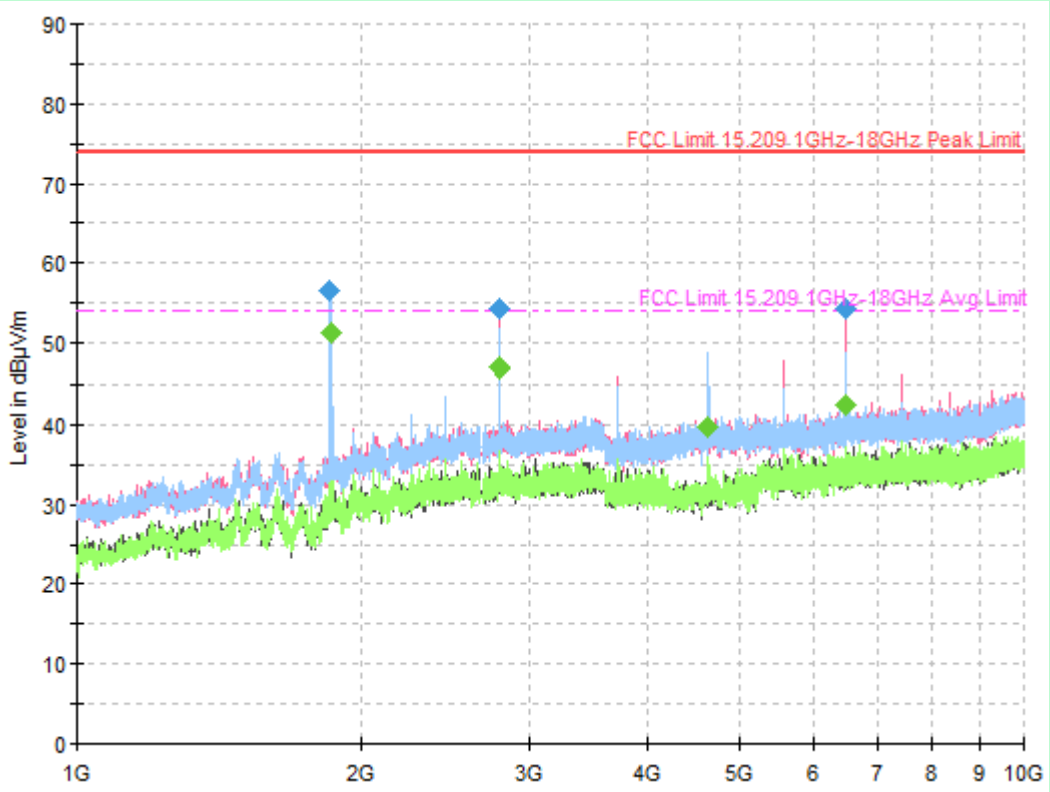
Channel 1 (902.875MHz) – Antenna 1

TEST GRAPHS – 1GHz to 10GHz (Antenna 1)



Channel 4 (915.325MHz) – Antenna 1

TEST GRAPHS – 1GHz to 10GHz (Antenna 1)



Channel 6 (927.125MHz) – Antenna 1

TEST RESULT – 1 GHz to 10 GHz						RESTRICTED BAND – PEAK		
Channel	Frequency	Measured Field Strength	Height	Ant Pol	Azimuth	Margin	Limit	Result
#	(MHz)	(dBµV/m)	(cm)	H / V	(deg)	(dB)	(dBµV/m)	
Antenna – 1								
CH-1	2707.43	55.34	300	V	15	18.66	74	PASS
CH-1	2709.04	56.52	300	V	359	17.48	74	PASS
CH-1	4515.79	53.52	400	H	317	20.48	74	PASS
CH-4	2745.04	56.55	300	V	300	17.45	74	PASS
CH-4	4574.93	52.53	400	H	228	21.47	74	PASS
CH-6	2782.00	54.22	300	V	196	19.78	74	PASS

Note :

Measured Field Strength (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)

TEST RESULT – 1 GHz to 10 GHz					RESTRICTED BAND – AVERAGE			
Channel	Frequency	Measured Average	Height	Ant Pol	Azimuth	Margin	Limit	Result
#	(MHz)	(dBµV/m)	(cm)	H / V	(deg)	(dB)	(dBµV/m)	
Antenna – 1								
CH-1	2707.75	48.92	300	V	359	5.08	54	PASS
CH-1	2709.04	49.76	300	V	359	4.24	54	PASS
CH-1	4515.46	43.33	400	H	317	10.67	54	PASS
CH-4	2745.04	47.42	300	V	300	6.58	54	PASS
CH-4	4575.57	42.32	400	H	233	11.68	54	PASS
CH-6	2780.71	46.9	300	V	191	7.1	54	PASS
CH-6	4636.96	39.74	300	H	133	14.26	54	PASS

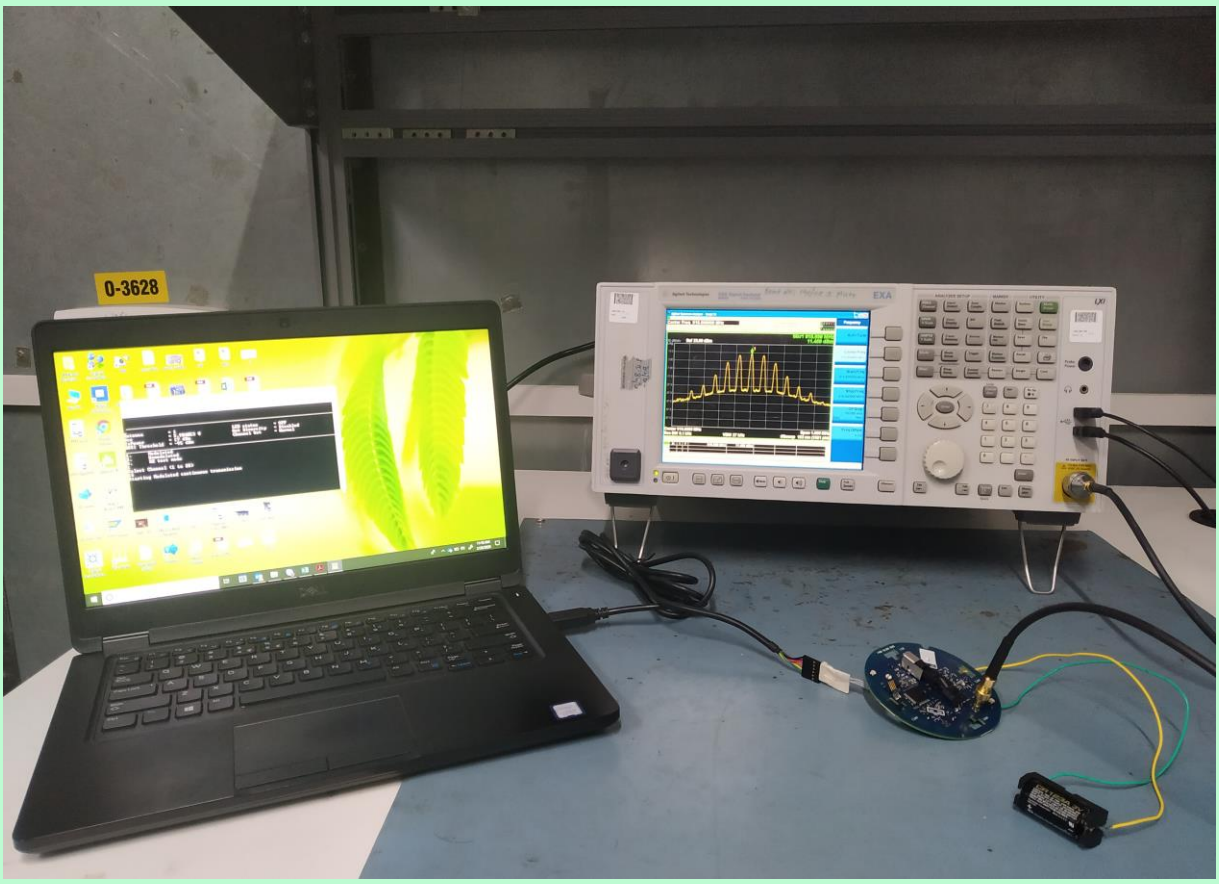
Note :

Measured Field Strength (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)

TEST RESULT – 1 GHz to 10 GHz								NON- RESTRICTED BAND - PEAK	
Channel	Measured Fundamental	Spurious Emission	Measured Harmonic	Height	Ant Pol	Azimuth	Limit [Fundamental – 20 dB]	Margin	Results
#	dBµV/m	MHz	dBµV/m	cm	H / V	deg	dBuV/m	dB	
Antenna – 1									
CH-1	106.89	1804.85	51.93	300	V	0	86.89	34.96	PASS
CH-1	106.89	1806.14	53.38	400	V	359	86.89	33.51	PASS
CH-1	106.89	6318.03	53.43	300	V	303	86.89	33.46	PASS
CH-4	106.74	1830.89	56.82	400	V	277	86.74	29.92	PASS
CH-4	106.74	6408.67	52.05	300	V	228	86.74	34.69	PASS
CH-6	106.34	1853.39	56.6	400	V	201	86.34	29.74	PASS
CH-6	106.34	6492.25	54.3	300	V	138	86.34	32.04	PASS
Note :									
Measured Harmonic Field Strength (dBuV/m) = Receiver Readings (dBuV) + Antenna Factor (dB/m) + Cable loss (dB) + Filter Insertion loss - Pre amplifier Gain (dB)									

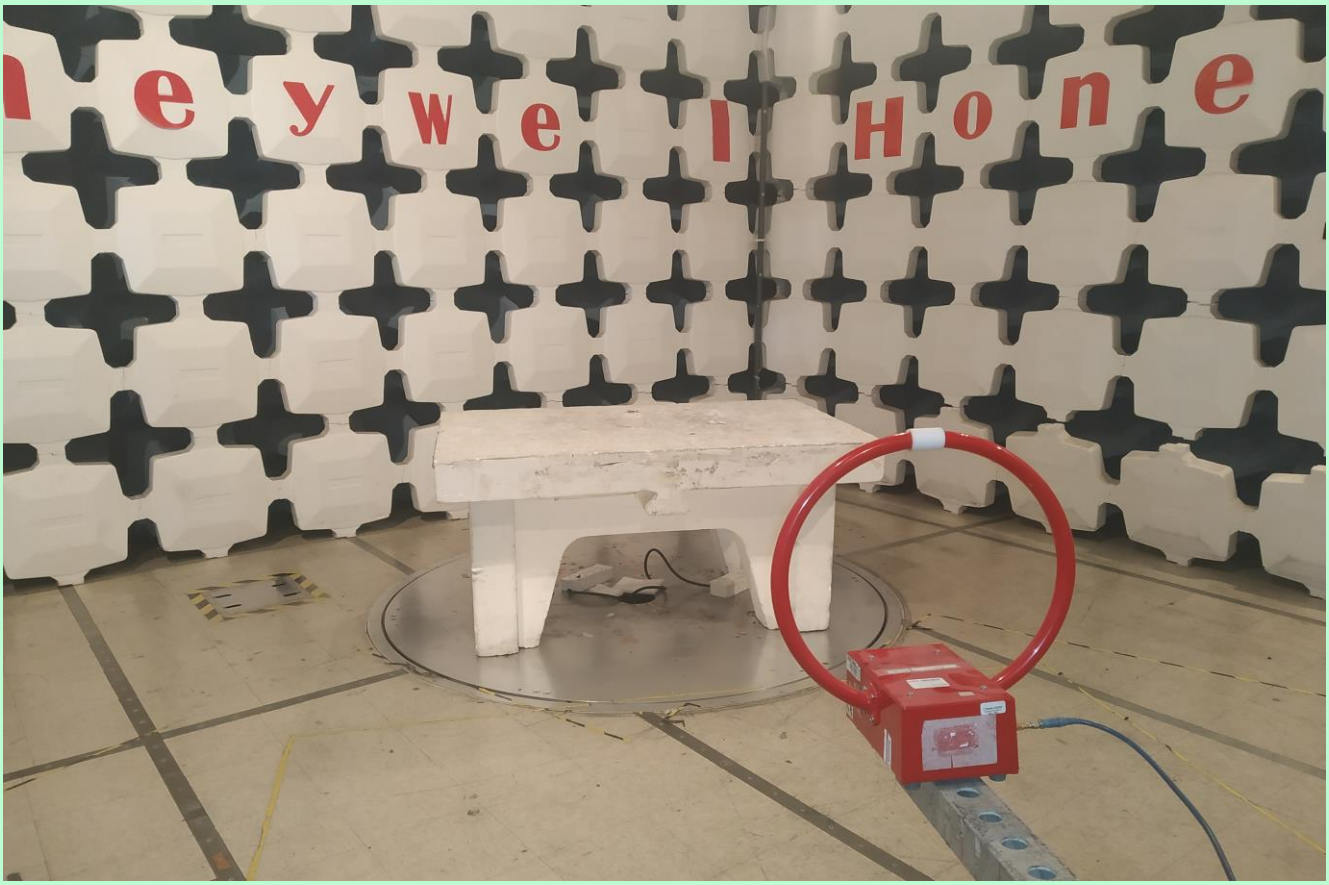
Annexure – 1

CONDUCTED RF TEST SETUP



Conducted RF test setup

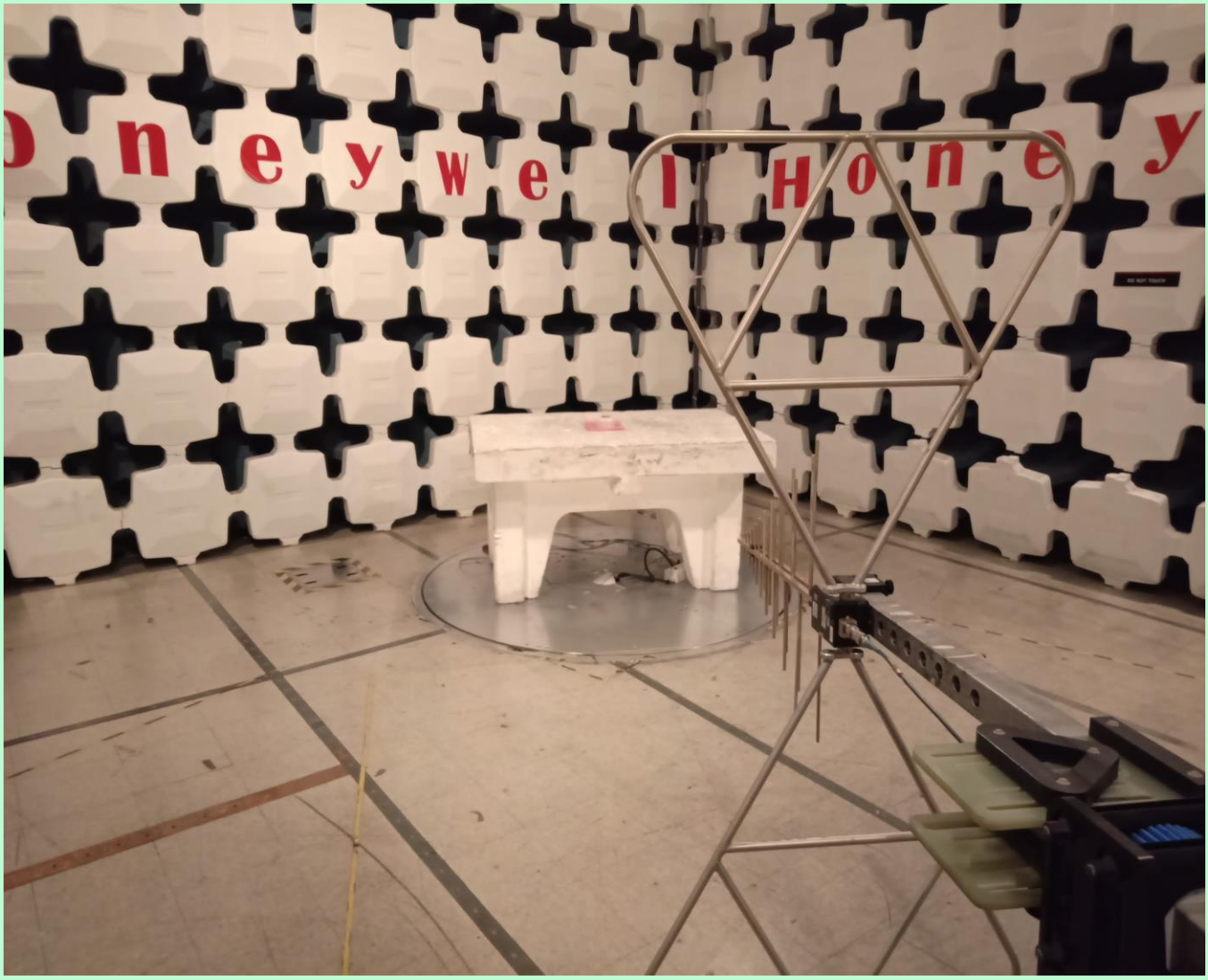
RADIATED EMISSION SETUP



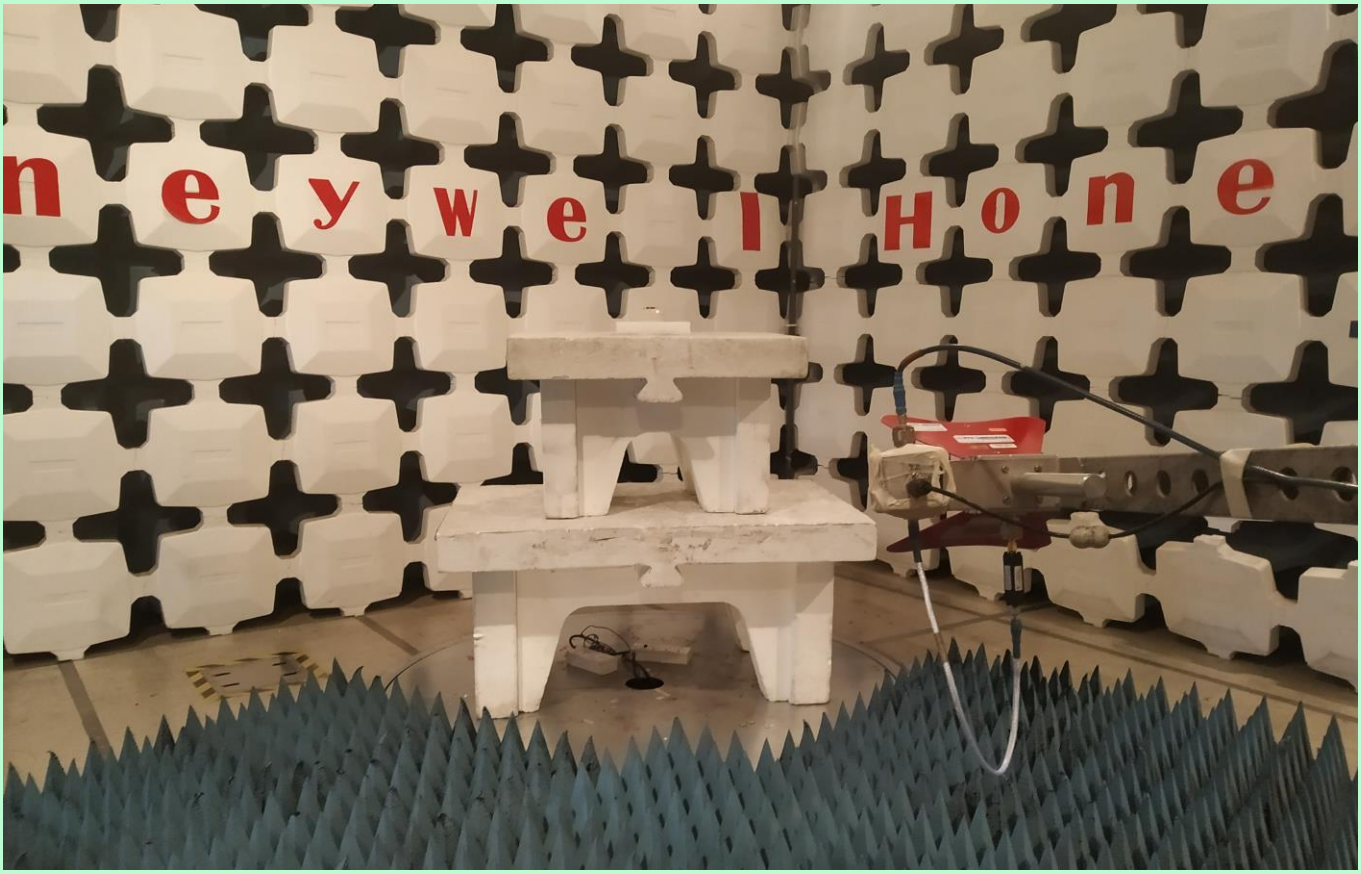
Radiated Emission Setup – 9 KHz to 30 MHz [Parallel]

Radiated Emission Setup – 9 KHz to 30 MHz [Perpendicular]

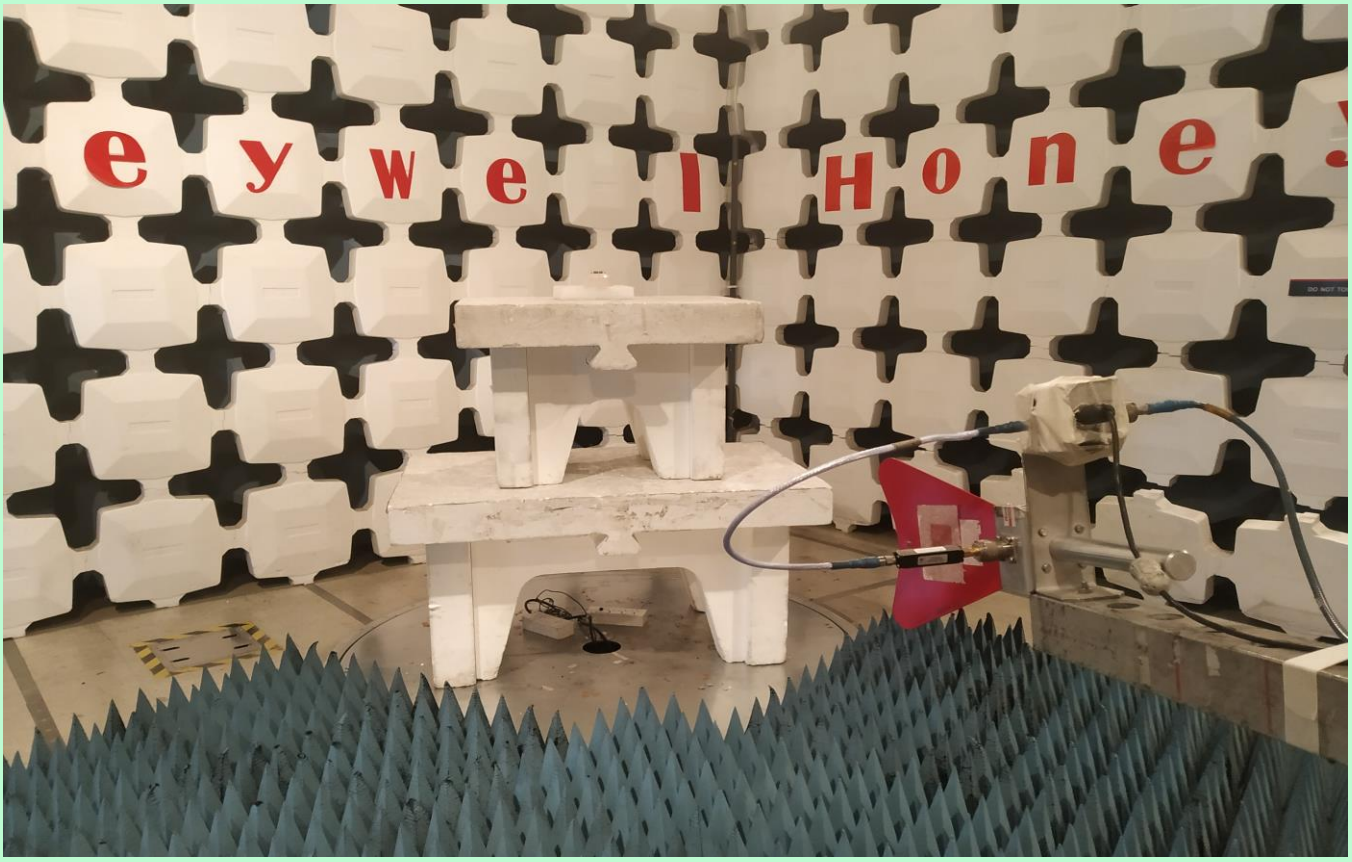
Radiated Emission Setup –30 MHz to 1 GHz [Horizontal Polarization]



Radiated Emission Setup –30 MHz to 1 GHz [Vertical Polarization]



Radiated Emission Setup –1 GHz to 10 GHz [Vertical Polarization]



Radiated Emission Setup –1 GHz to 10 GHz [Horizontal Polarization]