

Prüfbericht-Nr.: <i>Test Report No.:</i>	50149556 001	Auftrags-Nr.: <i>Order No.:</i>	144185176	Seite 1 von 19 <i>Page 1 of 19</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	25.05.2018		
Auftraggeber: <i>Client:</i>	Stadlbauer Marketing + Vertrieb G.m.b.H Rennbahn Allee 1, 5412 Puch, Salzburg, Austria				
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Wi-Fi Drone				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	370503025				
Auftrags-Inhalt: <i>Order content:</i>	FCC / IC Certification				
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C ANSI C63.10-2013 RSS-Gen Issue 5 RSS-247 Issue 2				
Wareneingangsdatum: <i>Date of receipt:</i>	31.05.2018				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000750455				
Prüfzeitraum: <i>Testing period:</i>	01.06.2018 - 19.06.2018				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland Hong Kong Ltd. Hong Kong Productivity Council				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Hong Kong Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:	kontrolliert von / reviewed by:				
					
03.08.2018	Mika Chan / Project Manager	03.08.2018	Sharon Li / Unit Senior Manager		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:		FCC ID: YFA370503025 IC: 12260A-370503025			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet	
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor
	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested	
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2412 - 2457 MHz
Type of modulation	Other type of spread spectrum
Number of channels	10
Channel separation	5 MHz
Type of antenna	Integral Wire Antenna
Antenna gain (dBi)	0 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	V _{nor} : 3.7 VDC
Independent Operation Modes	Transmitting

Product function and intended use

The equipment under test (EUT) is a remote control toy Wi-Fi Drone .

FCC ID: YFA370503025/ IC: 12260A-370503025

Models	Product description
370503025	Short Range Device - Wi-Fi Drone

Submitted documents

Circuit Diagram
 Block Diagram
 Technical Description
 User manual
 Label

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Test Operation and Test Software

Test operation should refer to test methodology.

- During test, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer (rfpower =9). The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- none

Test Methodology

Radiated Emission

The radiated emission measurements of the transmitter part were performed according to the procedures in ANSI C63.10-2013.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

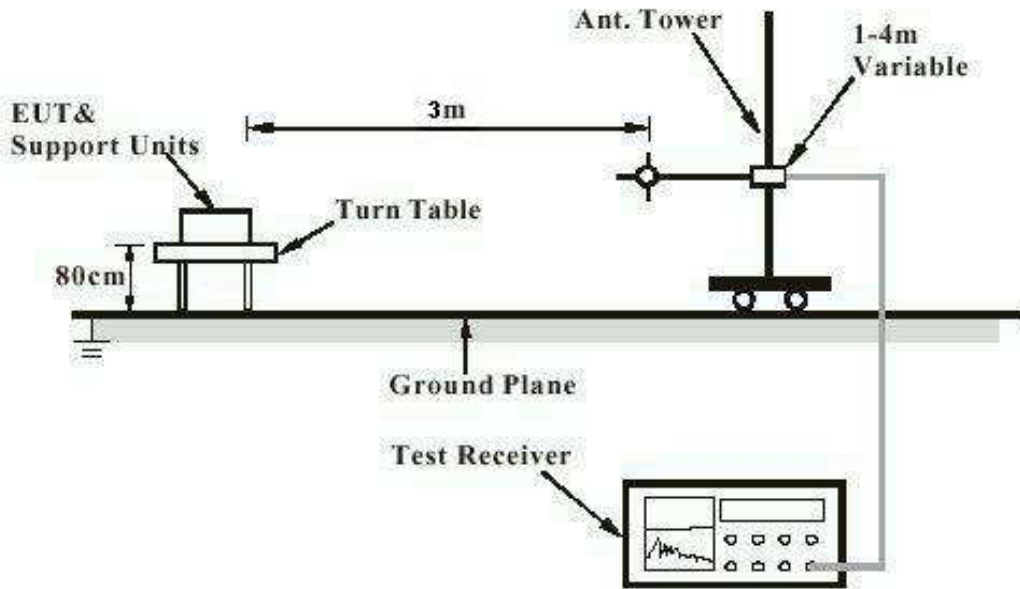
$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)

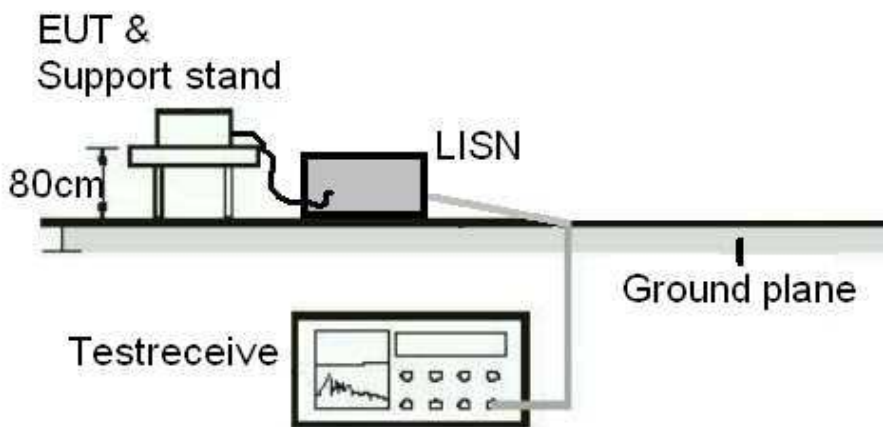
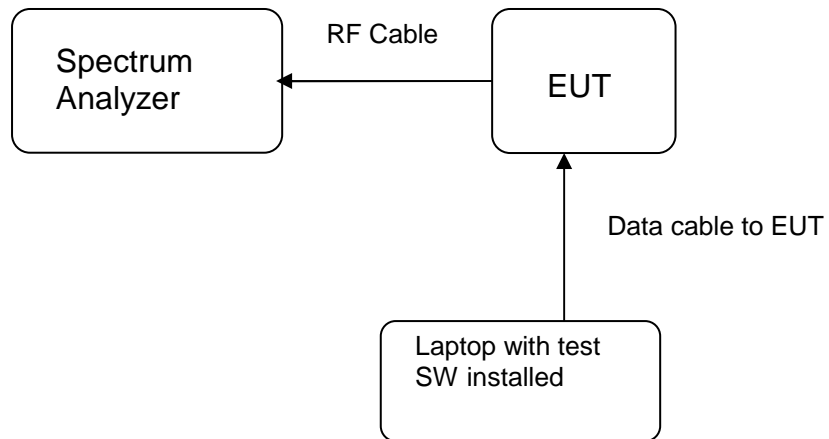


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



Test Facility

Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.

Address: 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong

Tel.: +852 2192 1000

Fax: +852 2192 1001

Email service-gc@tuv.com

Web: www.tuv.com

The test facility is recognized or accredited by the following organizations:

FCC

Type : Accredited Test Firm
Designation Number : HK0013
Test Firm Registration Number : 371735
Scope : Intentional Radiators

Industry Canada

The 10m Semi-anechoic chamber used by TÜV Rheinland Hong Kong Ltd at Hong Kong Productivity Council has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

Test Site Registration Number : 4780A-1

List of Test and Measurement Instruments

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	23-Apr-18	23-Apr-19
Test Receiver	R & S	ESU40	12-Jun-18	12-Jun-19
Bi-conical Antenna	R & S	HK116	21-Mar-18	21-Mar-20
Log Periodic Antenna	R & S	HL223	22-Mar-18	22-Mar-20
Cable with I-Joint Conector	Huber+Suhner	CNM-NMCMILX800-473	11-Dec-17	11-Dec-19
Active Loop Antenna	EMCO	6502	30-Oct-17	30-Oct-18
Semi-anechoic Chamber (SiteVSWR)	Frankonia	Nil	17-May-18	17-May-19
Double-Ridged Waveguide Horn	EMCO	3116	17-Jun-17	17-Jun-19
Double-Ridged Waveguide Horn	EMCO	3117	22-Jun-17	22-Jun-19
Cable with I-Joint Conector	Huber+Suhner	CNM-NMCMILX800-473	11-Dec-17	11-Dec-19
Microwave amplifer 0.5-26.5GHz, 25dB gain	HP	83017A	18-Jul-17	18-Jul-19
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	29-Jan-18	29-Jan-19
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30-Oct-17	30-Oct-19
High Frequency Cable	Pasternack	PE3VNA4001-3M	29-Jan-18	29-Jan-19
Horn Antenna	EMCO	3115	28-Mar-18	28-Mar-20

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	03-May-18	02-May-19

Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions measurements is ± 4.81 dB (9kHz to 30MHz) and ± 4.62 dB (30MHz to 200MHz) and ± 5.67 dB (200MHz to 1000MHz) and is ± 5.07 dB (1GHz to 8.2GHz) and ± 4.58 dB (8.2GHz to 12.4GHz) and ± 4.78 dB (12.4GHz to 18GHz)

The estimated combined standard uncertainty for antenna conducted emission is ± 2.1 dB

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for the level of confidence is approximately 95%.

Results FCC Part 15 – Subpart C / RSS-247 Issue 2

FCC 15.203 – Antenna Requirement 1		Pass
FCC Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	a) Antenna type:	Integral Wire antenna
	b) Manufacturer and model no:	N/A
	c) Peak Gain:	0 dBi
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		N/A
FCC Requirement:	An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.	
Results:	Only one integral antenna can be used.	
Verdict:	N/A	

RSS-Gen 6.3 – External Control		Pass
IC Requirement:	The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the limits prescribed in the applicable RSS.	
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.	
Verdict:	Pass	

RSS-Gen 8.3 – Antenna Requirement		Pass
IC Requirement:	When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device’s antenna shall be stated, based on measurement or on data from the antenna manufacturer.	
Results:	a) Antenna type:	Fixed Integral wire antenna
	b) Manufacturer	N/A
	c) model no	N/A
	d) Gain with reference to an isotropic radiator:	0 dBi
Verdict:	Pass	

FCC 15.207/ RSS-Gen 8.8 – Conducted Emission on AC Mains	N/A
There is no AC power input or output ports on the EUT.	

FCC 15.247 (a)(2) / RSS-247 5.2 – 6dB Bandwidth Measurement	Pass		
FCC Requirement: Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.			
Test Specification : ANSI C63.10 – 2013 Test date : 19.06.2018 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1			
802.11b			
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (MHz)
2412	2407.04	2416.68	9.64
2432	2427.04	2436.60	9.56
2457	2452.04	2461.72	9.68
802.11g			
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (MHz)
2412	2403.88	2420.40	16.52
2432	2423.88	2440.40	16.52
2457	2448.88	2465.44	16.56

RSS-Gen 6.6 – Occupied Bandwidth			Pass
FCC/ IC Requirement : N/A			
Test Specification : RSS-Gen Test date : 19.06.2018 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%			
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1.			
802.11b			
Frequency (MHz)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)
2412	2405.34	2418.72	13.38
2432	2425.28	2438.72	13.44
2457	2450.28	2463.72	13.44
802.11g			
Frequency (MHz)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)
2412	2403.78	2420.52	16.74
2432	2423.78	2440.52	16.74
2457	2448.84	2465.52	16.68

FCC 15.247(b)(3) / RSS-247 5.4 – Maximum Peak Conducted Output Power		Pass	
FCC Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)			
Test Specification : ANSI C63.10 – 2013 Test date : 19.06.2018 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1			
802.11b			
Frequency (MHz)	Measured Output Power (dBm)	Limit (W/dBm)	Verdict
2412	-15.88	1 / 30.0	Pass
2432	-17.70	1 / 30.0	Pass
2457	-20.14	1 / 30.0	Pass
802.11g			
Frequency (MHz)	Measured Output Power (dBm)	Limit (W/dBm)	Verdict
2412	-21.43	1 / 30.0	Pass
2432	-20.37	1 / 30.0	Pass
2457	-21.42	1 / 30.0	Pass

FCC 15.247(e) / RSS-247 5.2 – Power Spectral Density		Pass	
FCC Requirement: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.			
Test Specification : ANSI C63.10 – 2013 Test date : 19.06.2018 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1.			
802.11b			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2412	-17.51	8.0	Pass
2432	-20.00	8.0	Pass
2457	-21.48	8.0	Pass

802.11g			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2412	-24.93	8.0	Pass
2432	-24.40	8.0	Pass
2457	-25.36	8.0	Pass

FCC 15.247(d) / RSS-247 5.5 – Spurious Conducted Emissions	Pass
Test Specification : ANSI C63.10 – 2013 Test date : 19.06.2018 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%	
FCC Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.	
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Only the worst cases is shown below. For test protocols refer to Appendix 1	

802.11b					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	2398.60	-56.62	-17.30	-39.32	Pass
2432	2548.00	-59.03	-19.56	-39.47	Pass
2457	2124.00	-59.98	-21.20	-38.78	Pass

802.11g					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	2397.10	-55.51	-24.25	-31.26	Pass
2432	1724.00	-56.85	-23.95	-32.90	Pass
2457	1876.00	-60.04	-26.02	-34.02	Pass

FCC 15.205/ RSS-Gen 8.9 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification : ANSI C63.10 – 2013 Test Specification : 04.06.2018 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%		
FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).		
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.		
802.11b		
Mode: 2412MHz TX		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	46.4	74.0 / PK
2390.000	32.5	54.0 / AV
4816.923	51.4	74.0 / PK
4816.923	37.9	54.0 / AV
Mode: 2412 MHz TX		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	48.7	74.0 / PK
2390.000	32.5	54.0 / AV
4824.000	51.7	74.0 / PK
4824.000	37.7	54.0 / AV
Mode: 2432 MHz TX		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4865.000	51.6	74.0 / PK
4865.000	37.5	54.0 / AV
Mode: 2432 MHz TX		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4864.903	51.2	74.0 / PK
4864.903	37.6	54.0 / AV
Mode: 2457MHz TX		Vertical Polarization
Freq	Level	Limit/ Detector

MHz	dBuV/m	dBuV/m
2483.500	45.9	74.0 / PK
2483.500	32.2	54.0 / AV
4914.500	51.4	74.0 / PK
4914.500	37.7	54.0 / AV
Mode: 2457 MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	44.8	74.0 / PK
2483.500	32.1	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
802.11g		
Mode: 2412MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	46.9	74.0 / PK
2390.000	33.2	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2412 MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	45.1	74.0 / PK
2390.000	32.1	54.0 / AV
4817.500	50.9	74.0 / PK
4817.500	37.4	54.0 / AV
Mode: 2432 MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2432 MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2457MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	45.6	74.0 / PK
2483.500	32.1	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Mode: 2457 MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	44.9	74.0 / PK

2483.500	32.1	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV