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Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14041814 001**	**Seite 1 von 19** *Page 1 of 19*
Auftraggeber: *Client:*	**Binatone Electronics International Ltd.** **Floor 23A, 9 Des Voeux Road West, Sheung Wan** **Hong Kong**	
Gegenstand der Prüfung: *Test Item:*	**Digital Video Baby Monitor**	
Bezeichnung: *Identification:*	**MBP38SBU**	**Serien-Nr.:** *Serial No.:* **Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000271123-001**	**Eingangsdatum:** *Date of Receipt:* **03.02.2016**
Prüfort: *Testing Location:*	**TÜV Rheinland Hong Kong Ltd.** 8/F, First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong **Hong Kong Productivity Council** HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong	
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of test item at delivery:*	Test samples are not damaged and suitable for testing.	
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **RSS-247 Issue 1** **ANSI C63.10-2013**	
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.** 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong	

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
22.02.2016	Benny Lau Senior Project Manager		22.02.2016	Sharon Li Department Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges: Other Aspects
FCC ID: VLJ-MBP38SBU
IC: 4522A-MBP38SBU

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2402 - 2479 MHz
Type of modulation	GFSK
Number of channels	23
Channel separation	1 MHz
Type of antenna	Wire Antenna
Antenna gain (dBi)	0 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	Yes
Nominal voltage	100-240VAC
Independent Operation Modes	Transmitting

Product function and intended use

The equipment under test (EUT) is a 2.4 GHz digital video baby monitor – the Camera (Baby Unit). It is a wireless camera which transmits the captured image and sound to the corresponding monitor (Parent Unit). Moreover, it has a temperature sensor is to measure the ambient temperature. It is powered by AC-DC adaptor.

FCC ID: VLJ-MBP38SBU/ IC: 4522A-MBP38SBU

Models	Product description
MBP38SBU	Digital video baby monitor – the Camera (Baby Unit)

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Rating Label

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.
- Normal operation mode

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.
The corresponding Parent Unit is authorized under the certification procedure (FCC ID: VLJ-MBP38SPU).
Others digital function which is independent from the transmitter is authorized under verification procedure (refer to test report 14043055 001)

Remark

Nil

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 =1). 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

The product has been tested together with the following additional accessories:

- AC-DC adaptor Model: S006AKU0500100 Input: 100-240 VAC 50/60 Hz 200mA Output: 5.0VDC 1000mA) (Provided by the applicant)

Supporting equipment:
- MBP38S – Parent Unit (Provided by the applicant)

Countermeasures to achieve EMC Compliance

- A ferrite core is incoroprated at the connector end of the DC line of the AC-DC adapter (Provided by the applicant)

Test Methodology

Radiated Emission

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

The equipment under test (EUT) was placed at the middle of the 80 cm and 1.5m height turntable, and the turntable is 3 meters far from the 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:

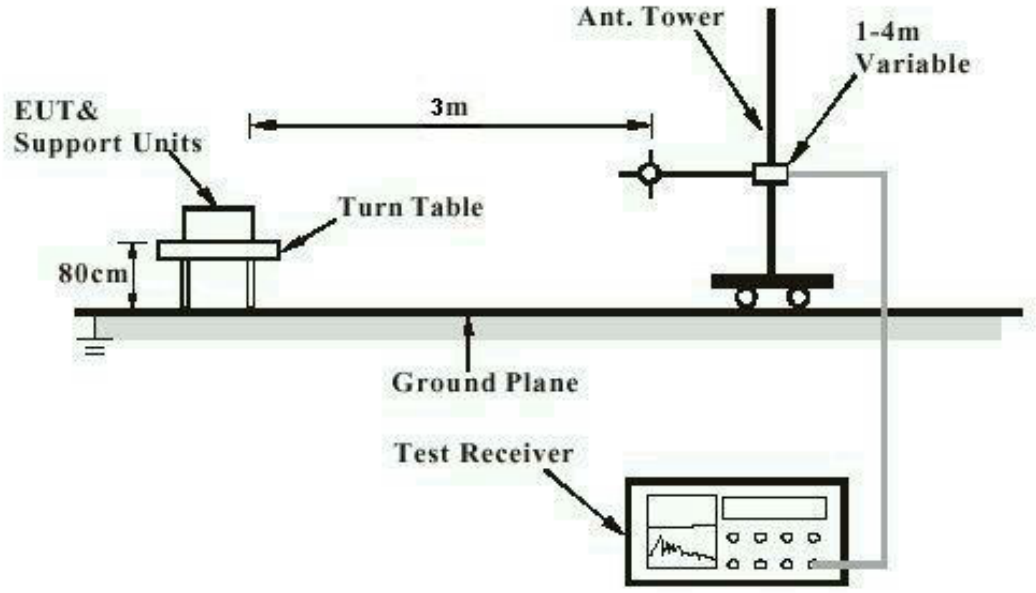
FS = R + AF + CF + FA – PA

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)

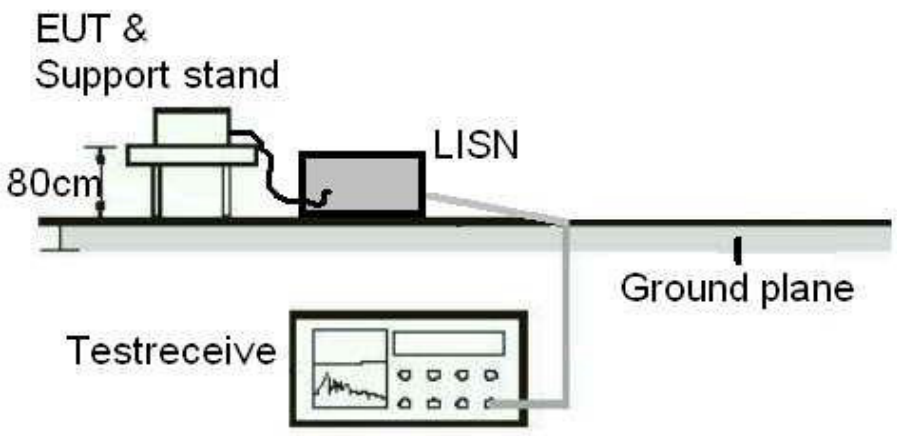
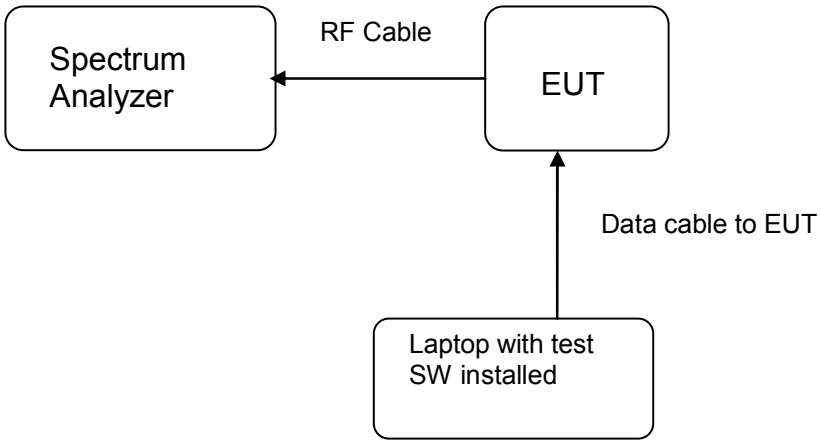


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC/ IC Registration number: 90656/ 4780A-1)

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	14-Apr-15	14-Apr-16
New Fully Ancheonic Chamber	TDK	N/A	15-Apr-15	15-Apr-16
Cable	Hubersuhner	SUCOFLEX 104	31-Mar-14	31-Mar-16
Test Receiver	R & S	ESU26	12-Aug-15	12-Aug-16
Bi-conical Antenna	R & S	HK116	1-Sep-15	1-Sep-17
Log Periodic Antenna	R & S	HL223	1-Sep-15	1-Sep-17
Coaxial cable	Harbour	LL335	10-Jun-14	10-Jun-16
Microwave amplifer 0.5-26.5GHz, 25dB gain	HP	83017A	17-Jul-14	17-Jul-16
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	28-Oct-15	28-Oct-17
Horn Antenna	EMCO	3115	26-Aug-15	26-Aug-17
Active Loop Antenna	EMCO	6502	17-May-15	17-May-16

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Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	12-Jan-15	12-Jan-2017

AC Mains Conducted Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Test Receiver	R & S	ESR3	22-Oct-15	22-Oct-16
LISN	R & S	ENV216	05 Feb 15	19-Jan-17
EMC32	R & S	v9.12	N/A	N/A

Results FCC Part 15 – Subpart C/ RSS-247 Issue 1

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:	Antenna type:	Fixed Integral wire antenna
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		**Pass**
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: b) Manufacturer c) model no d) Gain with reference to an isotropic radiator:	Fixed Integral wire antenna N/A N/A 0 dBi
Verdict:	Pass	

FCC 15.207/ RSS-Gen 8.8 – Conducted Emission on AC Mains **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : TX mode
Port of testing : AC Mains input port of power supply
Detector : Quasi-peak and Average
RBW : 9 kHz
Supply voltage : 120Vac 60Hz
Temperature : 23ºC
Humidity : 50%

Requirement: 15.207(a)/ RSS-Gen 8.8

Results: Pass

Live measurement

Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	No peak found	---	---	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass

Neutral measurement

Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.384	41.5	36.2	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass

Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test Results plots refer to Appendix 1

FCC 15.247 (b)(1)/ RSS-247 5.4(2) – Peak Output Power **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 3 MHz / 10 MHz
Supply voltage : 120VAC
Temperature : 23ºC
Humidity : 50%

FCC/ IC Requirement :

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts.

Results: For test protocols please refer to Appendix 1. For RF exposure information please refer to Appendix 6.

Frequency (MHz)	Maximum peak output power (dBm)	Limit (W/dBm)	Verdict
2402	13.94	0.125 / 21.0	Pass
2440	13.11	0.125 / 21.0	Pass
2479	12.84	0.125 / 21.0	Pass

FCC 15.247 (a)/ RSS-247 5.1(1) – 20 dB Bandwidth

FCC/ IC Requirement : None

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 30 kHz / 100 kHz
Supply voltage : 120VAC
Temperature : 23ºC
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.

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	2401.000	2403.100	2.10
2440	2438.990	2441.100	2.11
2479	2477.990	2480.100	2.11

RSS-Gen 6.6 – Occupied Bandwidth

FCC/ IC Requirement : None

Test Specification : RSS-Gen
Mode of operation : Tx mode
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 120VAC
Temperature : 23ºC
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.

Frequency (MHz)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)
2402	2400.930	2403.150	2.22
2440	2438.930	2441.180	2.25
2479	2477.920	2480.200	2.28

FCC 15.247(a)(1)/ RSS-247 5.1(2) – Carrier Frequency Separation **Pass**

FCC/ IC Requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode (hopping on)
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 120VAC
Temperature : 23ºC
Humidity : 50%

Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

The centre frequencies of the hopping channels are separated by more than the 2/3*20dB bandwidth. For test Results plots refer to Appendix 1.

Verdict: Pass

FCC 15.247 (a)(1)(iii)/ RSS-247 5.1(4) – Number of hopping channels	Pass

FCC/ IC Requirement:

Frequency hopping systems operating in the 2400MHz-2483.5MHz bands shall use at least 15 hopping frequencies.

Test Specification	:	ANSI C63.10 – 2013
Mode of operation	:	Tx mode (hopping on)
Port of testing	:	Temporary antenna port
Detector	:	Peak
RBW/VBW	:	300 kHz / 1 MHz
Supply voltage	:	120VAC
Temperature	:	23ºC
Humidity	:	50%

Results: The total number of hopping frequencies is more than 15. For test Results plots refer to Appendix 1.

Verdict: Pass

FCC 15.247 (a)(1)(iii)/ RSS-247 5.1(4) – Time of Occupancy (Dwell Time)	Pass

FCC/ IC Requirement:

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Specification	:	ANSI C63.10 – 2013
Mode of operation	:	Tx mode (hopping on)
Port of testing	:	Temporary antenna port
Detector	:	Peak
RBW/VBW	:	1 MHz / 1 MHz
Supply voltage	:	120VAC
Temperature	:	23ºC
Humidity	:	50%

Results: Time period calculation = 0.4 x 23 = 9.2s

Dwell time = 68 x 2 x 2.34 x 10^{-3} = 0.318 s
<= 0.4 s

For test protocols please refer to Appendix 1.

Verdict: Pass

FCC 15.247 (a) – Hopping Sequence	Pass
FCC Requirement:	The system radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.
As stated in the technical description, the EUT is controlled by microchip to generate Pseudorandom Frequency Hopping Sequence base on CCITT16 and distributed it over 23 hopping channels. The sequential hops are randomly distributed in both direction and magnitude of change in the hop set	

FCC 15.247 (a) – Equal Hopping Frequency Use	Pass
FCC Requirement:	Each of the transmitter's hopping channels is used equally on average. The system radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.
As stated in the technical description, a single data frame is transmitted on each frequency location before skipping to the next hopping frequency in the list. So each hopping channels is used equally on average in long term.	

FCC 15.247 (a) – Receiver Input Bandwidth	Pass
FCC Requirement:	The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.
As stated in the technical description, both receiver and transmitter are set to same bandwidth of 2MHz	

FCC 15.247 (a) – Receiver Hopping Capability	Pass
FCC Requirement:	The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.
Both transmitter and receiver will share the same device ID so the same sequence is generated for the communication. Moreover, the microchip has a clock recovery mechanism to synchronize the timing between the transmitter and receiver. With the same hopping sequence and timing, the receiver can shift frequencies in synchronization with the transmitted signals.	

FCC 15.247 (d)/ RSS-247 5.5 – Spurious Conducted Emissions	Pass

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 120VAC
Temperature : 23 ºC
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 packet types.

There is no peak found outside any 100kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1.

Operating frequency (MHz)	Spurious frequency (MHz)	Delta (dB)	Verdict
2402	2400	32.71	Pass
2440	7320	42.83	Pass
2479	2483.5	43.09	Pass

FCC 15.205/ RSS-Gen – Radiated Emissions in Restricted Frequency Bands **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : TX mode
Port of testing : Enclosure
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 120VAC
Temperature : 23ºC
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 section15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).

IC Requirement: Spurious emissions from licence-exempt transmitters shall comply with the field strength limits shown in RSS-Gen table 5. Unwanted emissions falling into restricted bands of Table 3 shall comply with the limits specified in RSS-Gen. Unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

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.

Mode: 2402MHz TX Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
160.031	39.3	43.5 / QP
224.043	44.6	46.0 / QP
2390.000	51.90	74.0 / PK
2390.000	25.52	54.0 / AV
4803.930	57.42	74.0 / PK
4803.930	31.04	54.0 / AV
9608.000	65.93	74.0 / PK
9608.000	40.55	54.0 / AV

Mode: 2402 MHz TX Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
160.031	31.60	43.5 / QP
368.071	44.90	46.0 / QP
9608.000	65.90	74.0 / PK
9608.000	39.52	54.0 / AV

Mode: 2440 MHz TX Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m

138.691	34.90	43.5 / QP
208.038	44.80	46.0 / QP
4880.000	58.39	74.0 / PK
4880.000	32.01	54.0 / AV
9760.000	66.78	74.0 / PK
9760.000	40.40	54.0 / AV
Mode: 2440 MHz TX	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
464.090	44.70	46.0 / QP
4880.000	54.14	74.0 / PK
4880.000	27.76	54.0 / AV
9760.000	64.05	74.0 / PK
9760.000	37.67	54.0 / AV
Mode: 2479 MHz TX	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
216.041	44.90	46.0 / QP
432.084	45.40	46.0 / QP
2483.500	70.52	74.0 / PK
2483.500	44.14	54.0 / AV
4958.000	59.62	74.0 / PK
4958.000	33.24	54.0 / AV
9916.000	67.25	74.0 / PK
9916.000	40.87	54.0 / AV
12392.115	67.52	74.0 / PK
12392.115	41.14	54.0 / AV
Mode: 2479 MHz TX	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
264.051	44.20	46.0 / QP
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

Remark: Average value is determined from the worst case duty cycle correction factor.

FCC 15.35 (c) / RSS-GEN 6.10 – Worst Case Duty Factor		
ON time of a pulse	2.4 ms	See Appendix 1
Number of pulse found in 100ms	2	See Appendix 1
Duty cycle factor = 20 x log ((on time of 1 pulse x no. of pulse in 100ms) / 100ms) = -26.38 dB		