

Produkte
Products

Prüfbericht - Nr.: 14039660 001			Seite 1 von 22		
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Auftraggeber: <i>Client:</i>		Convergence Systems Limited 20/F, Chung Nam Building, 1 Lockhart Road Wan Chai, Hong Kong			
Gegenstand der Prüfung: <i>Test Item:</i>		ALL-IN-ONE BRIDGE/REG			
Bezeichnung: <i>Identification:</i>	CS3300	Serien-Nr.: <i>Serial No.:</i>	Engineering sample		
Wareneingangs-Nr.: <i>Receipt No.:</i>	A000202609-002	Eingangsdatum: <i>Date of Receipt:</i>	21.05.2015		
Prüfört: <i>Testing Location:</i>	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: <i>Condition of test item at delivery:</i>		Test samples are not damaged and suitable for testing.			
Prüfgrundlage: <i>Test Specification:</i>	FCC Part 15 Subpart C ANSI C63.4-2009				
Prüfergebnis: <i>Test Results:</i>	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .				
Prüflaboratorium: <i>Testing Laboratory:</i>	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:			
20.08.2015 Benny Lau Senior Project Manager		20.08.2015 Sharon Li Department 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 Aspects					
FCC ID: UB4CS3300WFBT					
Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet					
Abbreviations: P(ass) = passed F(ail) = failed 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. This test report 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 safety mark on this or similar products.					

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Product information

Manufacturers declarations

	WIFI Transceiver
Operating frequency range	2412 - 2462 MHz
Type of modulation	DSSS, OFDM, MCS0-7
Number of channels	11
Channel separation	5 MHz
Type of antenna	Integral Antenna
Antenna gain (dBi)	2 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	Yes
Nominal voltage	V _{nom} : 48 Vdc or 120 Vac
Independent Operation Modes	Transmitting mode

	Bluetooth Low Energy Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	40
Channel separation	2 MHz
Type of antenna	Wire Antenna
Antenna gain (dBi)	2 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	Yes
Nominal voltage	V _{nom} : 48 Vdc or 120 Vac
Independent Operation Modes	Transmitting mode

Product function and intended use

The equipment under test (EUT) is a Incontinence Sensing System All-In-One Bridging/Registration Subsystem which consists of a Wifi radio transceiver and a BT-LE radio transceiver. It connects to the wetness sensors model CS3180 by the Bluetooth radio and connects to WIFI Assess point by the WIFI radio. Its WIFI radio operating from 2412MHz to 2462MHz and supports 11 frequency channels and 20MHz bandwidth only. Its Bluetooth radio operating from 2402MHz to 2480MHz and supports 40 frequency channels. The WIFI radio uses integral antenna and the BT radio use external antenna with unique antenna connector (RP-SMA). This device could only be used in mobile or fix device which minimum separation distance between the radiator and the user or by-stander is 20cm as stated in the user manual. It is powered by AC-DC adaptor or POE.

FCC ID: UB4CS3300WFBT

Models	Product description
CS3300	Incontinence Sensing System All-In-One Bridging/Registration Subsystem

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Label

Independent Operation Modes

The basic operation modes are:

- WIFI transmit mode.
- BT-LE transmit mode.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitters.

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.

- Special software is provided by the grantee to set the device to operate in a fixed frequency channel and maximum RF output power level.
- Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Simultaneous transmission was investigated, no additional spurious emission was found from 9kHz to 25GHz.

Special Accessories and Auxiliary Equipment

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

- none

Supporting equipment:

- AC-DC adaptor model: Mean Well GSM18U12 (provided by applicant)
- POE adaptor model: D-Link DWL-P200 (provided by applicant)
- LAN cable with Ferrite bead connected to POE (provided by applicant)

Countermeasures to achieve EMC Compliance

- none

Test Methodology

Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-2009.

The equipment under test (EUT) was placed at the middle of the 80 cm 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.

List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	14-Apr-15	14-Apr-16
New Fully Anchoic 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-Feb-15	12-Feb-16
Bi-conical Antenna	R & S	HK116	22-Aug-13	22-Aug-15
Log Periodic Antenna	R & S	HL223	22-Aug-13	22-Aug-15
Coaxial cable	Harbour	LL335	10-Jun-14	10-Jun-16
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	17-Jul-14	17-Jul-16
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	28-Oct-13	28-Oct-15
Horn Antenna	EMCO	3115	07-Aug-13	07-Aug-15
Active Loop Antenna	EMCO	6502	17-May-15	17-May-16

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AC Mains Conducted Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Test Receiver	R & S	ESR3	12 Sep 14	12-Sep-15
LISN	R & S	ENV216	05 Feb 15	05-Feb-16
EMC32	R & S	v9.12	N/A	N/A

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	12-Jan-16	12-Jan-17
Power meter	Dijkstra Advice, Research & EMC Instruments B.V.	RPR3006W	11-Jun-14	09-July-16

Results FCC Part 15 Subpart C – WIFI portion

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: b) Manufacturer and model no: c) Peak Gain:	Fixed Integral antenna N/A 2 dBi
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		N/A
FCC Requirement: A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. Except as described otherwise in this section, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized. 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. An intentional radiator may be authorized with multiple antenna types.		
Results:	Only one integral antenna can be used.	
Verdict:	N/A	

FCC 15.207 – Conducted Emission on AC Mains						Pass
Test Specification : ANSI C63.4 – 2009 Mode of operation : TX mode of 802.11b, 802.11g, 802.11n Port of testing : AC Mains input port of power supply Detector : Quasi-peak and Average RBW : 9 kHz Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50%						
Requirement:		15.207(a)				
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	0.441	41.6	40.6	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	0.463	44.2	43.7	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. Only the worst-case is reported. 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 (a)(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.			
IC Requirement: The minimum -6 dB bandwidth shall be at least 500 kHz.			
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 8.1 Option 1 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100KHz/ 300KHz Supply voltage : 120Vac 60Hz 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	2407.480	2416.04	8.56
2437	2432.480	2441.04	8.56
2462	2457.480	2466.04	8.56
802.11g			
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (MHz)
2412	2404.440	2419.60	15.16
2437	2429.200	2444.60	15.40
2462	2454.480	2469.60	15.12
802.11n			

Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (MHz)
2412	2403.480	2419.60	16.12
2437	2429.240	2444.60	15.36
2462	2454.440	2469.57	15.13

FCC 15.247(b)(3) – 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 : KDB 558074 D01 DTS Measurement Guidance v03r02 section 9.2

Mode of operation : TX mode

Port of testing : Temporary antenna port

Detector : Peak

Supply voltage : 120Vac 60Hz

Temperature : 23°C

Humidity : 50%

802.11b

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2412	17.5	1.1	18.6	1 / 30.0	Pass
2437	17.3	1.1	18.4	1 / 30.0	Pass
2462	17.5	1.1	18.6	1 / 30.0	Pass

802.11g

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2412	19.0	1.1	20.1	1 / 30.0	Pass
2437	19.4	1.1	20.5	1 / 30.0	Pass
2462	19.7	1.1	20.8	1 / 30.0	Pass

802.11n

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2412	17.8	1.1	18.9	1 / 30.0	Pass
2437	18.0	1.1	19.1	1 / 30.0	Pass
2462	18.3	1.1	19.4	1 / 30.0	Pass

FCC 15.247(e) – 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 : KDB 558074 D01 DTS Measurement Guidance v03r02 section 10.2 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : ≥ 100 KHz / $\geq 3 \times$ RBW span : $\geq 1.5 \times$ DTS BW Supply voltage : 120Vac 60Hz 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	4.06	8.0	Pass
2437	4.73	8.0	Pass
2462	4.62	8.0	Pass
802.11g			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2412	2.26	8.0	Pass
2437	2.21	8.0	Pass
2462	2.24	8.0	Pass
802.11n			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2412	1.89	8.0	Pass
2437	1.08	8.0	Pass
2462	0.88	8.0	Pass

FCC 15.247(d) – Spurious Conducted Emissions					Pass
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 11.1 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 120Vac 60Hz 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	2398.000	-33.42	8.68	-42.1	Pass
2437	No peak found	---	8.01	---	Pass
2462	No peak found	---	8.37	---	Pass
802.11g					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	2399.920	-34.43	2.26	-36.69	Pass
2437	No peak found	---	2.21	---	Pass
2462	No peak found	---	2.24	---	Pass
802.11n					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	2399.920	-36.35	1.89	-38.24	Pass
2437	No peak found	---	1.08	---	Pass
2462	No peak found	---	0.88	---	Pass

FCC 15.247(d) or 15.205 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification : ANSI C63.4 – 2009 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 60Hz 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.		
Mode: 802.11b 2412MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	56.62	74.0 / PK
2390.000	44.31	54.0 / AV
Mode: 802.11b 2412MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	57.81	74.0 / PK
2390.000	45.99	54.0 / AV
Mode: 802.11b 2437MHz 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: 802.11b 2437MHz 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: 802.11b 2462MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	54.07	74.0 / PK
2483.500	43.55	54.0 / AV

Mode: 802.11b 2462MHz TX			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2483.500	54.14	74.0 / PK			
2483.500	43.00	54.0 / AV			
Mode: 802.11g 2412MHz TX			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2390.000	68.28	74.0 / PK			
2390.000	47.44	54.0 / AV			
Mode: 802.11g 2412MHz TX			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2390.000	71.35	74.0 / PK			
2390.000	50.48	54.0 / AV			
Mode: 802.11g 2437MHz 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: 802.11g 2437MHz 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: 802.11g 2462MHz TX			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2483.500	67.40	74.0 / PK			
2483.500	48.43	54.0 / AV			
Mode: 802.11g 2462MHz TX			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2483.500	67.89	74.0 / PK			
2483.500	48.36	54.0 / AV			
Mode: 802.11n 2412MHz TX			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2390.000	67.33	74.0 / PK			
2390.000	46.29	54.0 / AV			
Mode: 802.11n 2412MHz TX			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m			
2390.000	69.04	74.0 / PK			
2390.000	49.83	54.0 / AV			

Mode: 802.11n 2437MHz 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: 802.11n 2437MHz 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: 802.11n 2462MHz TX		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	69.39	74.0 / PK	
2483.500	48.46	54.0 / AV	
Mode: 802.11n 2462MHz TX		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	65.65	74.0 / PK	
2483.500	47.93	54.0 / AV	

Results FCC Part 15 Subpart C – BT-LE portion

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: External antenna with unique antenna connector (RP-SMA) b) Manufacturer and model no: N/A c) Peak Gain: 2 dBi	
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		Pass
FCC Requirement:	A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. Except as described otherwise in this section, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized. 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. An intentional radiator may be authorized with multiple antenna types.	
Results:	Only the tested antenna is authorized with the EUT as a complete system. No other antenna will be marketed and used with the EUT.	
Verdict:	Pass	

FCC 15.207 – Conducted Emission on AC Mains						Pass
Test Specification : ANSI C63.4 – 2009 Mode of operation : Bluetooth 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 : 23°C Humidity : 50%						
Requirement:		15.207(a)				
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	1.552	41.9	40.1	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	No peak found	---	---	66 - 56	56 - 46	Pass
> 0,5 - 5	1.55	42.2	40.4	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 (a)(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 : KDB 558074 D01 DTS Measurement Guidance v03r02 section 8.1 Option 1 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100KHz/ 300KHz Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50%				
Results: For test protocols please refer to Appendix 1.				
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (kHz)	
2402	2401.600	2402.280	680	
2440	2439.590	2440.280	690	
2480	2479.580	2480.270	690	

FCC 15.247(b)(3) – 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 : KDB 558074 D01 DTS Measurement Guidance v03r02 section 9.1.1 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak Supply voltage : 3.7 Vdc Temperature : 23°C Humidity : 50%				
Results: For test protocols please refer to Appendix 1.				

Frequency (MHz)	Measured Output Power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	-5.31	1.1	-4.21	1 / 30.0	Pass
2440	-6.02	1.1	-4.92	1 / 30.0	Pass
2480	-6.35	1.1	-5.25	1 / 30.0	Pass

FCC 15.247(e) – 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 : KDB 558074 D01 DTS Measurement Guidance v03r02 section 10.2 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : ≥ 100 KHz / $\geq 3 \times$ RBW span : $\geq 1.5 \times$ DTS BW Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50%				
Results: For test protocols please refer to Appendix 1.				
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict	
2402	-4.35	8.0	Pass	
2440	-5.11	8.0	Pass	
2480	-5.68	8.0	Pass	

FCC 15.247(d) – Spurious Conducted Emissions					Pass
Test Specification : KDB 558074 D01 DTS Measurement Guidance v03r02 section 11.1 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 120Vac 60Hz 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.					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	2399.180	-40.65	-6.81	-47.46	Pass
2440	No peak found	---	-6.46	---	Pass
2480	2485.720	-45.90	-5.98	-51.88	Pass

FCC 15.247(d) or 15.205 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification : ANSI C63.4 – 2009 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 60Hz 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 section15.205(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.		
Mode: 2402MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	51.61	74.0 / PK
2390.000	40.84	54.0 / AV
Mode: 2402 MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	46.90	74.0 / PK
2390.000	34.90	54.0 / AV
Mode: 2440 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: 2440 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: 2480MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	55.19	74.0 / PK
2483.500	48.26	54.0 / AV

Mode: 2480 MHz TX		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	47.90	74.0 / PK	
2483.500	39.22	54.0 / AV	