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Project Number: 16E086-1c

Prepared for:

IP Access Ltd

By

Compliance Engineering Ireland Ltd

Clonross Lane

Derrockstown

Dunshaughlin

Co. Meath

FCC Site Registration: 92592

FCC ID: QGGIPA248M

Date

15th June 2016

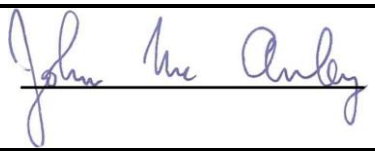
FCC EQUIPMENT AUTHORISATION

Test Report

EUT Description

Indoor Base Station.

Authorised :
John McAuley



TEST SUMMARY

The equipment complies with the requirements according to the following standards.

Description	FCC part15	Test Result
Conducted Emissions on the mains	15.207	Pass

Band 2

Description	FCC Part 24	FCC part 2	Test Result
Transmitter Carrier power	24.229 24.232a c d e	2.1046	Pass
Transmitter Occupied Bandwidth	24.238b	2.1049	Pass
Transmitter Conducted Emissions	24.238a ,b	2.1051	Pass
Transmitter Conducted Emissions at band edges	24.238a ,b	2.1051	Pass
Transmitter Radiated Spurious Emissions	24.238a ,b	2.1051	Pass
Transmitter Frequency Stability(Temperature/ Voltage Variation)	24.135a	2.1055	Pass
Frequency Plan	27.5h1	27.2b	Pass
Modulation Characteristics		2.1047	Pass

Band 4

Description	FCC Part 27	FCC part2	Test Result
Transmitter Carrier power	27.50 d	2.1046	Pass
Transmitter Occupied Bandwidth		2.1049	Pass
Transmitter Conducted Emissions	27.53 h1 h3	2.1051	Pass
Transmitter Conducted Emissions at band edges	27.53 h1 h3	2.1051	Pass
Transmitter Radiated Spurious Emissions	27.53 h1 h3	2.1053	Pass
Transmitter Frequency Stability(Temperature/ Voltage Variation)	27.54 .	2.1055	Pass
Frequency Plan	27.5h1	27.2b	Pass
Modulation Characteristics		2.1047	Pass

Band 17

Description	FCC Part 27	FCC part2	Test Result
Transmitter Carrier power	27.50 c	2.1046	Pass
Transmitter Occupied Bandwidth		2.1049	Pass
Transmitter Conducted Emissions	27.53 g	2.1051	Pass
Transmitter Conducted Emissions at band edges	27.53 g	2.1051	Pass
Transmitter Radiated Spurious Emissions	27.53 g	2.1053	Pass
Transmitter Frequency Stability(Temperature/ Voltage Variation)	27.54 .	2.1055	Pass
Frequency Plan	27.5b	27.2b	Pass
Modulation Characteristics		2.1047	Pass

Band 13

Description	FCC Part 27	FCC part2	Test Result
Transmitter Carrier power	27.50 b	2.1046	Pass
Transmitter Occupied Bandwidth		2.1049	Pass
Transmitter Conducted Emissions	27.53 c1,c5,f	2.1051	Pass
Transmitter Conducted Emissions at band edges	27.53 c1,c5,	2.1051	Pass
Transmitter Radiated Spurious Emissions	27.53 c1,c5,f	2.1053	Pass
Transmitter Frequency Stability(Temperature/ Voltage Variation)	27.54 .	2.1055	Pass
Frequency Plan	27.5b	27.2b	Pass
Modulation Characteristics		2.1047	Pass

Exhibit A – Technical Report

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1.0 EUT Description

The EUT is an indoor Base Station

Model:	248M , 278M
Type:	Indoor Base Station
FCC ID:	QGGIPA248M
Company:	IP Access Ltd
Contact	Costa Panayi
Address:	Cambourne Business Park, Cambourne, Cambs, UK, CB23 6DW
Phone:	+44 01954 713700
e-mail:	costa.panayi@ipaccess.com
Test Standards:	FCC part 27 and FCC part 24
Type of radio:	Stand-alone
Transmitter Type:	
Operating Frequency Range(s):	See Table 1
Number of Antenna ports	2 (identical antennas fitted to both ports)
Nominal Conducted Output power (per Antenna Port)	21dBm
Antenna gain (700-960MHz): **Antenna gain (1700-2700MHz):**	2.3dBi 4.7dBi
Antenna:	Integral (inside the case and not user accessible)
Nominal DC Supply :	DC 12 v from adapter
Oper. Temp Range:	0° C to +45° C
Test Methodology:	KDB 971168 D01 V02 r02 October 17th 2014 Measurement guidance for Certification of Licenced Digital Transmitters KDB 662911 D01 v02r01 Oct 31 2013 Emissions Testing of Transmitters with Multiple Outputs in the same band
EUT Serial num:	01 000 000 79

Operating Band	Operating Band	Uplink	Downlink	Channel bandwidths	Modulations
		MHz	MHz	MHz	
2	PCS	1850– 1910	1930 – 1990	5, 10, 15, 20	QPSK, 16QAM, 64QAM
4	AWS	1710– 1755	2110 – 2155	5, 10, 15, 20	QPSK, 16QAM, 64QAM
13	LTE Upper Band	777– 787	746 – 756	5, 10	QPSK, 16QAM, 64QAM
17	LTE Lower band	704– 716	734 – 746	5, 10	QPSK, 16QAM, 64QAM

Table 1

Note the manufacturer declares that the models 248M and 278M are identical from a product test perspective.

All tests were carried out on model 248M

The EUT was powered from 12V DC adapter Manufacturer Phihong Model PSAA30R-120

There are 2 antenna ports which are not user accessible (located inside the case) to which identical antennas from Ethertronics Ltd PN 1002089 are fitted.

EUT Operation

Operating Conditions during Test:

The EUT is a base station for indoor use only, powered from a 12V dc mains adapter.

This report is a summary of the tests for all bands
Detailed reports for the individual bands

Ref report 16E086-2b for Band2
Ref report 16E086-3b for Band4
Ref report 16E086-4b for Band13
Ref report 16E086-5b for Band17

The EUT was powered from 12V DC adapter
Manufacturer Phihong Model PSAA30R-120

Channel bandwidths and modulations were programmed from a laptop via LAN cable.
All tests were performed at max power from the EUT.

1.1 Modifications
No modifications were required in order to pass the test specifications.

1.2 Date of Test
The tests were carried out on one sample of the EUT on the 15th, 30th May and 1st, 13th 14th ,16th June 2016

1.4 Electromagnetic Emissions Testing
. The guidelines of CISPR 16-4 were used for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of Compliance Engineering Ireland Ltd.'s policy for EMC Measurement Uncertainty is available on request.
RF Requirements:

1.4.1 Measurement Uncertainty
The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was ±3.5 dB.
The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was ±5.3 dB (from 30 to 100 MHz), ±4.7 dB (from 100 to 300 MHz), ±3.9 dB (from 300 to 1000 MHz) and ±3.8 dB (from 1 GHz to 40 GHz).

2.0 Emissions Measurements Procedures

2.1 Conducted Emissions Measurements Antenna Ports

The EUT antenna port was connected to the analyser through a 10dB attenuator while the other antenna port was terminated in 50 ohm termination.

2.1.1 Output power:

The Analyser was operated in LTE mode and tuned to the frequency of operation under test. The EUT was connected via low loss cable and 10 dB attenuator.
The power measurement uses an RMS detector.
Both Antenna ports were tested for output power.

2.1.2 Occupied Bandwidth

The Occupied Bandwidth for Band 2 and Band 4 were tested using the relative measurement procedure in KDB 971168 section 4.1.
The Occupied Bandwidth for Band 13 and Band 17 were tested using the power bandwidth (99%) procedure in KDB 971168 section 4.2

2.1.3 Spurious Emissions

The Spurious emission for Band2 and Band 4 were tested using an RBW of 1M across the full band
The Spurious emission for Band13 and Band 17 were tested using an RBW of 100K below 1GHz and 1MHz above 1GHz

2.1.4 Band Edge Emissions

The Spurious emission at band edges for Band2 and Band 4 were tested using an RBW of >=1% of the occupied bandwidth in the 1MHz window around the band edge.
The Spurious emission at the band edges for Band13 and Band 17 were tested using an RBW of 30K in the 100K window around the band edges

2.1.5 Peak to Average Ratio

The CCDF procedure was used to measure the peak to average ratio as per KDB971168 section 5.7.1

2.1.6 Frequency Stability under Temperature variations

The EUT was placed in a temperature chamber and was connected to an external power supply. The EUT RF output was connected to a spectrum analyser.
The Spectrum analyser was set to measure the required frequency with the appropriate resolution. The temperature chamber temp was set to -30deg C and after a stabilisation period of approx 30 minutes the frequency was recorded. The frequency was recorded at 10degC steps until a temperature of 50 Deg C was reached.

Frequency stability under voltage variations

The Temperature chamber was set to 20 Deg C.

The input mains voltage was set to nominal and the frequency recorded.

With the input voltage varied at the extreme voltage variation (-/+ 15%) the maximum frequency change was recorded.

2.2 Radiated Emissions Measurements

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

2.3.1 General

Radiated emission below 1GHz were performed in a semi anechoic chamber. with a resolution bandwidth of 1MHz and an RMS detector.
The EUT

The EUT was placed on a test table 0.8m high a motorised turntable which allowed 360 degrees rotation at a measurement distance of 3 metres from the test antenna. The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters
Significant peaks from the EUT were then recorded to determine margin to the limits.
The EUT was replaced by a substitution antenna which was powered from a signal generator. The input level to the antenna was adjusted from the generator until the level on the receiver matched the recorded level for the frequency under examination. The Test antenna was again raised and lowered in order to maximise the level.

Emissions above 1GHz were measured using a horn antenna with resolution bandwidth of 1MHz and video bandwidth of 10 MHz at a measurement distance of 3 metres with EUT on a motorised turntable which allowed 360 degrees rotation.

Significant peaks from the EUT were then recorded to determine margin to the limits.

Radiated Emissions measurements were carried out with both antennas fitted.

Radiated Test procedure below 1GHz

The EUT was placed on a test table in the position closest to normal use as declared by the manufacturer

The test antenna was initially orientated for vertical polarization

The test antenna was raised and lowered through the specified range of height until a maximum signal level was detected by the measuring receiver

The EUT was rotated through 360 degrees until the maximum signal was detected on the measuring receiver.

The test antenna was again raised and lowered through the specified range of height and the result was maximised as detected by the measurement receiver.

The maximum signal level detected by the receiver was noted

The EUT was replaced by a substitution antenna orientated for vertical polarization.

The substitution antenna was connected to a signal generator.

The test antenna was raised and lowered through the specified range of height to ensure the maximum signal level is received

The input signal level to the substitution antenna was adjusted to the level that produced a level detected by the measuring receiver that was equal to the level noted while the EUT transmitter radiated power was measured

The measurement was repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

The result of the effective radiated power is the larger of the 2 levels recorded at the input to the substitution antenna corrected for the gain of the substitution antenna if necessary.

Radiated Test procedure above 1GHz

The EUT was placed on a test table in the position closest to normal use as declared by the manufacturer

The test antenna was initially orientated for vertical polarization.

The test antenna was raised and lowered through the specified range of height until a maximum signal level was detected by the measuring receiver

The EUT was rotated through 360 degrees until the maximum signal was detected on the measuring receiver.

The test antenna was again raised and lowered through the specified range of height and the result was maximised as detected by the measurement receiver.

The maximum signal level detected by the receiver was noted

The EUT was replaced by a substitution antenna orientated for vertical polarization.

The substitution antenna was connected to a signal generator.

The test antenna was raised and lowered through the specified range of height to ensure the maximum signal level is received

The input signal level to the substitution antenna was adjusted to the level that produced a level detected by the measuring receiver that was equal to the level noted while the EUT transmitter radiated power was measured

The measurement was repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

The result of the effective radiated power is the larger of the 2 levels recorded at the input to the substitution antenna corrected for the gain of the substitution antenna if necessary.

3.4 Frequency Stability Conducted

Mains 100%

Antenna port	Frequency	Temperature	Frequency Error	Frequency Error
	MHz	° C	Hz	ppm
1	2150	-30	12.35	0.006
2	2150	-30	12.53	0.006
1	2150	0	-7.1	0.003
1	2150	10	-6.41	0.003
1	2150	20	-6.53	0.003
1	2150	30	-5.46	0.003
1	2150	40	-8.76	0.004
1	2150	45	-11.45	0.005
2	2150	45	-14.84	0.007
1	2150	50	-15.32	0.007
2	2150	50	-12.80	0.006

20 Deg C

Antenna port	Frequency	Mains	Frequency Error	Frequency Error
	MHz		Hz	ppm
1	2150	85%	1.52	0.001
2	2150	85%	4.77	0.002
1	2150	115%	3.22	0.001
2	2150	115%	1.82	0.001

Limit +/- 1ppm

Test Result Pass

4 List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	19/09/2016
Spectrum Analyser 30Hz-40GHz	Rohde& Schwarz	FSP40	100053	850	09/11/2018
Test Receiver 3.6GHz	Rohde& Schwarz	ESR	1316.3003k03-101625-s	869	06/06/2017
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	11/08/2017
Anechoic Chamber	CEI	SAR 10M	845	845	23/09/2016
Antenna Horn	EMCO	3115	9905-5809	655	03/11/2017
Antenna Horn	AH Systems	SAS-200/571	373	839	20/11/2017
Fully Anechoic Chamber	CEI	FAR 3M	906	906	22/03/2018
Antenna Horn Standard Gain 18-26.5GHz	A-info	LB-42-25-C-KF	J2021091103028	877	12/09/2016
Antenna Log Periodic	Chase	UPA6108	1072	609	06/10/2018
LTE Spectrum Analyser	Rohde& Schwarz	UPA6108	FSV4		13/08/2017

End of Report