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Project Number: 16E086-7a

Prepared for:

IP Access Ltd

By

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Clonross Lane

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FCC Site Registration: 92592

FCC ID: QGGIPA248M

Date

20th July 2016

FCC EQUIPMENT AUTHORISATION

Test Report

EUT Description

Indoor Base Station.

**Authorised :
John McAuley**

A handwritten signature in blue ink, appearing to read 'John McAuley', written over a horizontal line.

1.0 Summary

This report covers all Bands for calculating max antenna gain for compliance with Maximum Permissible Exposure

Appendix 1 shows the calculations for max antenna gains for Bands 2 ,4 ,13 ,17 in relation to meeting MPE limits.

Allowing for a conservative max out power 24dBm + 1dBm

Max Antenna Gain for Band 2 =12dBi

Max Antenna Gain for Band 4 =12dBi

Max Antenna Gain for Band 13 =11dBi

Max Antenna Gain for Band 17 =11dBi

Also no issues for output power in any band with these max antenna gains.

Appendix 1

Calculation for Maximum Antenna Gain

1.1 MPE Band 2 with max antenna gain

$$S = \frac{PG}{4\pi R^2}$$

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Conducted Output Power	24.11	dBm
Antenna Gain	12.9	dBi
Tune up factor	0	dB
Time Averaging Factor	0	dB
EIRP Peak	37.0	dBm
EIRP Peak	5023	mW
Prediction distance:	20	cm
Prediction frequency:	1990	MHz
MPE limit for Uncontrolled/General Population exposure at prediction frequency:	1.00	mW/cm ²
Power density at prediction frequency:	0.999380	mW/cm ²
Power density at prediction frequency:	9.993796	W/m ²
Test Result	Pass	

The Conducted output power is the max combined output power from both ports transmitting simultaneously. This was calculated by converting the output powers from both ports to mW , adding the mW powers and then converting back to dBm. This was carried out for all output powers and the max was selected.

dBm to mW conversion => $10^{(\text{power dBm}/10)}$ mW

mW –to dBm conversion => $10 \cdot \log(\text{power mW})$ dBm

TX1	TX2	TX1	TX2	Sum	Sum
dBm	dBm	mW	mW	mW	dBm
21.16	21.04	130.62	127.057	257.67	24.11

1.2 MPE Band 4 with max antenna gain

$$S = \frac{PG}{4\pi R^2}$$

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Conducted Output Power	24.22	dBm
Antenna Gain	12.7	dBi
Tune up factor	0	dB
Time Averaging Factor	0	dB
EIRP Peak	36.9	dBm
EIRP Peak	4920	mW
Prediction distance:	20	cm
Prediction frequency:	2155	MHz
MPE limit for Uncontrolled/General Population exposure at prediction frequency:	1.00	mW/cm ²
Power density at prediction frequency:	0.978882	mW/cm ²
Power density at prediction frequency:	9.788825	W/m ²
Test Result	Pass	

The Conducted output power is the max combined output power from both ports transmitting simultaneously. This was calculated by converting the output powers from both ports to mW , adding the mW powers and then converting back to dBm. This was carried out for all output powers and the max was selected.

dBm to mW conversion => $10^{(\text{power dBm}/10)}$ mW

mW –to dBm conversion => $10 \cdot \log(\text{power mW})$ dBm

TX1	TX2	TX1	TX2	Sum	Sum
dBm	dBm	mW	mW	mW	dBm
21.28	21.14	134.28	130.02	264.29	24.22

1.3 MPE Band 13 with max antenna gain

$$S = \frac{PG}{4\pi R^2}$$

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Conducted Output Power	24.27	dBm
Antenna Gain	11.8	dBi
Tune up factor	0	dB
Time Averaging Factor	0	dB
ERP Peak	33.9	dBm
ERP Peak	2466	mW
Prediction distance:	20	cm
Prediction frequency:	756	MHz
MPE limit for Uncontrolled/General Population exposure at prediction frequency:	0.50	mW/cm ²
Power density at prediction frequency:	0.490603	mW/cm ²
Power density at prediction frequency:	4.906031	W/m ²
Test Result	Pass	

The Conducted output power is the max combined output power from both ports transmitting simultaneously. This was calculated by converting the output powers from both ports to mW , adding the mW powers and then converting back to dBm. This was carried out for all output powers and the max was selected.

dBm to mW conversion => 10^{^(power dBm/10)} mW

mW –to dBm conversion => 10*log(power mW) dBm

TX1	TX2	TX1	TX2	Sum	Sum
dBm	dBm	mW	mW	mW	dBm
21.28	21.24	134.28	133.05	267.32	24.27

2.4 MPE Band 17 with max antenna gain

$$S = \frac{PG}{4\pi R^2}$$

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Conducted Output Power	24.3	dBm
Antenna Gain	11.8	dBi
Tune up factor	0	dB
Time Averaging Factor	0	dB
ERP Peak	34.0	dBm
ERP Peak	2483	mW
Prediction distance:	20	cm
Prediction frequency:	746	MHz
MPE limit for Uncontrolled/General Population exposure at prediction frequency:	0.50	mW/cm ²
Power density at prediction frequency:	0.494003	mW/cm ²
Power density at prediction frequency:	4.940030	W/m ²
Test Result	Pass	

The Conducted output power is the max combined output power from both ports transmitting simultaneously. This was calculated by converting the output powers from both ports to mW , adding the mW powers and then converting back to dBm. This was carried out for all output powers and the max was selected.

dBm to mW conversion => 10^{^(power dBm/10)} mW

mW –to dBm conversion => 10*log(power mW) dBm

TX1	TX2	TX1	TX2	Sum	Sum
dBm	dBm	mW	mW	mW	dBm
21.56	21	143.22	125.89	269.11	24.30

End of Report