Reference No: C7190/1

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Dear Mr Fisher,

This report contains calculation of maximum Possible Exposure for the Qubi3, Base version and E version.

Mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and generally to be used in such a way that a separation distance of 20cm is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limit. As the 20cm separation may not be achievable under normal operating conditions, an RF exposure calculation is used to demonstrate the minimum distance required to be less than the power density limit, as required under FCC rules.

47CFR1.1310 (e) (1) Table 1 Limits for General Population/Uncontrolled Exposure

Limits for power density:

Frequency Range (MHz)	Power density (mW/cm^2)
<0.3	no limit
0.3-1.34	100mW/cm^2
1.34-30	180/f^2

Where f is frequency in MHz.

The 125kHz variant is excluded from this test, since no limit is defined. At 13.56MHz the limit is:

Maximum power density = 180/13.56^2 = 0.979mW/cm^2

Power density (S) relates to Equivalent Isotropic Radiated power (EIRP) according to the following:

$$S = \frac{EIRP}{4\pi R}$$

Where,

R is the distance to the centre of radiation of the antenna (cm)

Rearranging,

$$R = \sqrt{\frac{EIRP}{S4\pi}}$$

EIRP is calculated from measurement of electric field strength,

$$EIRP = \frac{E^2 r^2}{30}$$

Where E is the measured electric field strength (V/m)
And r is the specification distance in m.

In this case:

Maximum electric field strength measured was 2.866dBμV/m = 1.39×10^{-6}V/m at a specification distance of 30m. (47CFR 15.209). The EIRP was therefore

$$5.8 \times 10^{-11} W = 5.8 \text{m} \times 10^{-8} \text{mW}$$

The distance r is therefore calculated from the above:

$$R = \sqrt{\frac{EIRP}{S4\pi}}$$

Using this formula R was calculated as 6.86×10^{-5}cm

Comparison with limit:

Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) (mW/cm²) 47CFR1.1310 Table 1	Distance (R) cm required to be less than (mW/cm²)
13.56	$5.8 \text{m} \times 10^{-8}$	0.979	6.86×10^{-5}

Conclusion:

The apparatus met the MPE emission requirements of the FCC Rules R<20cm.

Yours sincerely

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