RF Exposure Technical Brief

Supplementary to Teltest report 3585

Equipment:	TBCH1A Base Station Transceiver
IC identification	737A-TBCH1A
Rated transmit power:	50W
Frequency range:	400 → 440 MHz
Test standard:	RSS102 issue 4
Reference Standard:	IEEE C95.3 -2002

Contents

RSS102 Annex A - RF Technical Brief Cover Sheet

All Fields must be completed with the requested information or the following codes:
N/A for Not Applicable, N/P for Not Performed or N/V for Not Available.
Where applicable, check appropriate box.

1. COMPANY NUMBER: **737A**

2. MODEL NUMBER: **TBCH1A**

3. MANUFACTURER: **Tait Communications**

4. TYPE OF EVALUATION: **(d) RF Exposure Evaluation.)**

Note: The worst-case scenario (i.e. highest measured value obtained) shall be reported.

(a) SAR Evaluation: Device Used in the Vicinity of the Human Head
● Multiple transmitters: Yes □ No □
● Evaluated against exposure limits: General Public Use □ Controlled Use □
● Duty cycle used in evaluation: ____N/A_____%
● Standard used for evaluation: _____ N/A _____
● SAR value: ___ N/A ___W/kg Measured □ Computed □ Calculated □
(b) SAR Evaluation: Body-Worn Device and Body-Supported Device
● Multiple transmitters: Yes □ No □
● Evaluated against exposure limits: General Public Use □ Controlled Use □
● Duty cycle used in evaluation: ___ N/A ___%
● Standard used for evaluation: ____ N/A _____
● SAR value: __ N/A ____W/kg Measured □ Computed □ Calculated □
(c) SAR Evaluation: Limb-Worn Device
● Multiple transmitters: Yes □ No □
● Evaluated against exposure limits: General Public Use □ Controlled Use □
● Duty cycle used in evaluation: __ N/A ____%
● Standard used for evaluation: ____ N/A _____
● SAR value: __ N/A _____W/kg Measured □ Computed □ Calculated □

(d) RF Exposure Evaluation
● Evaluated against exposure limits: General Public Use ✓ Controlled Use

● Duty cycle used in evaluation: 100 %

● Standard used for evaluation: IEEE C95.3 -2002

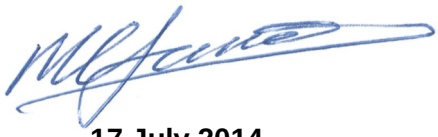
● Measurement distance: 3.6 m

● RF field strength value: 1.0 V/m □ A/m □ W/m2 ✓

Measured □ Computed □ Calculated ✓

RSS102 Annex B - Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in Annex A is correct; that the Technical Brief was prepared and the information contained therein is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed; and that the device meets the SAR and/or RF field strength limits of RSS-102.

Signature:	
Date:	**17 July 2014**
NAME:	**Mike James**
TITLE:	**Laboratory Technical Manager**
COMPANY:	**Teltest Laboratories** **Tait Communications**

Safe Distance calculations – Uncontrolled environment

Transmitter power : 50W
Antenna Type: Dual dipole array, Vertically polarised
Antenna Gain: 5.1dBi
Antenna Length: 1.2m
Calculation frequency: 400MHz

RF Field Strength limit for uncontrolled environments (RSS102 table 4.2) 300MHz to 1500MHz

Limit = f/150 Wm^2
= 400/150
=2.67 W/m^2

Near field Calculation

Equation 39 of IEEE C93.3-2002

$$S_{near} = \frac{P}{(2\,\pi\,d\,h)}$$

Rearranged to find d

$$d = \frac{P}{(2\,\pi\,S_{near}\,h)}$$

For 100W

$$d = \frac{50}{2\pi \times 2.67 \times 1.2}$$

$$= 2.49m$$

Fresnel region and far field calculation

Equation 37 of IEEE C93.3-2002

$$S_{far} = \frac{P\,G}{4\,\pi\,d^2}$$

Rearranged to find d

$$d = \sqrt{\frac{P\,G}{4\,\pi\,S_{far}}}$$

For 50W

$$d = \sqrt{\frac{50\ \times\ 3.24}{4\,\pi\ \times 2.67}}$$

$$= 2.20m$$

Far Field boundary calculation

The near field equation may be applied for several metres from the antenna, but may over predict the power density at longer distances. To determine which result should be used the crossover point where the predicted field strengths are the same is calculated.

$$S_{near} = S_{far}$$

$$\frac{P}{(2\,\pi\,d\,h)} = \frac{P\,G}{4\,\pi\,d^2}$$

Rearranged to find d

$$d = \frac{Gh}{2}$$

$$d = \frac{3.24\ \times 1.2}{2}$$

$$= \frac{3.24\ \times 1.2}{2}$$

$$= 1.94m$$

For a 1.2m antenna at 400MHz, the crossover point is 1.94m. Therefore the far-field calculation is appropriate and the minimum safe distance for the general public is 2.20m.

Minimum distance requirement stated in the user manual

For convenience the derived figure of 2.2m is rounded up to 3.6m giving the following for 50W

$$S = \frac{50\ \times 3.24}{4\,\pi\,3.6^2}$$

$$= 1.0\,W/m^2$$

Where: S=power density in W/m^2
P= net power output to the antenna (W)
d = radius of a cylinder around the antenna (m)
h = aperture height of antenna (m)
G = linear gain of antenna relative to an isotropic radiator (5.1dBi = 3.24 linear terms)
F = frequency (MHz)

References:

1. RSS102 issue 4 March 2010 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
2. IEEE Std C95.3-2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency

End