SAR Analysis Report

(Based upon upper bound transmission duty factor)

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Contents

1. Product Description

Platypus is a CAT-1 LTE mobile medical alert (mPERS) pendant worn on a lanyard around the neck and hangs on the chest. With people fall detection, GPS, WiFi (Rx Only) and OTDOA location services the device frees users to live independently while having access to emergency help at the press of a button. Platypus is scheduled for certification on AT&T and Verizon networks. If the SOS button is pressed or a people fall is detected, across the U.S.

Platypus connects users to emergency care operators at a central station by two-way HD voice. In addition to low battery and power off reports, the device sends a daily status report to the IOT platform to assure dealers the device is functioning properly.

- Data Support LTE CAT 1 Data Uplink up to 5 Mbps/Downlink up to 10 Mbps
- Operating Bands LTE FDD B2, B4, B12, B66 for AT&T, LTE FDD B2, B4, B13, B66 for Verizon.
- The same antenna in AT&T and Verizon Sku
- Transmitter maximum Power: B2(23dbm), B4 (23dbm), B12(24dbm), B13 (24dbm), B66 (23dbm)
- HD Voice - VoIP
- Battery Capacity 3.7v @ 420mAh
- People fall detect proprietary algorithm acquires @ 416Hz
- Activity detect features include up and about reporting and trip reporting
- Home Fencing feature sends device event when user exits or enters the home
- Charging cradle included automatically powers on the device

2. Referenced FCC Guideline

The guideline followed is section 6.3 “Low transmission duty factor devices” of KDB 447498 D01 General RF Exposure Guidance v06. From this section, “When SAR evaluation is required to determine compliance, the duty factor established in the SAR analysis may be applied to scale the measured SAR. Voice-mode communication generally does not qualify for low duty factor considerations; however, exceptions may be considered for certain short (e.g., < 30 seconds) and infrequent transmissions.” This latter guidance matches the use of this emergency pendant that rarely transmits.

3. Network Connection Scenarios

3.1. Prior to activation

When shipped by the factory the device is in a shipping mode and does not make any network connection until it is placed on the charging cradle. If the device is worn in this mode there is no network connection.

3.2. Initial activation and charging cradle use

When the user unboxes the device, their first instruction is to plug in the included cradle and place the device on the cradle. After 18.33 seconds (FIG. 1) boot cycle the device turns on the cellular transceiver, registers to the network over 2.84 seconds (FIG. 2), opens a perpetual MQTT connection to an MQTT Broker at a cost of 300 bytes to open over 3.27 seconds (FIG. 3). The device cannot be worn in this mode so SAR does not apply.

3.3. Intermittent reporting

In normal use, the pendant is worn on a lanyard around the neck and hangs on the chest.

The device wakes up every 20 minutes to report its status. The transmission at this interval is very short, as follows:

When device trigger by cradle or RTC (Real- time clock), after 18.33 seconds (FIG. 1)boot cycle the device turns on the cellular transceiver, registers to the network over 2.84 seconds (FIG. 2), opens a data connection taking 3.07 seconds, sends and receives about 281 bytes to deliver a status report over 0.2 seconds (FIG. 3), closes the data connection within 29.44 seconds(FIG. 4), then stops all transmitters and powers down until the next real time clock wakeup.

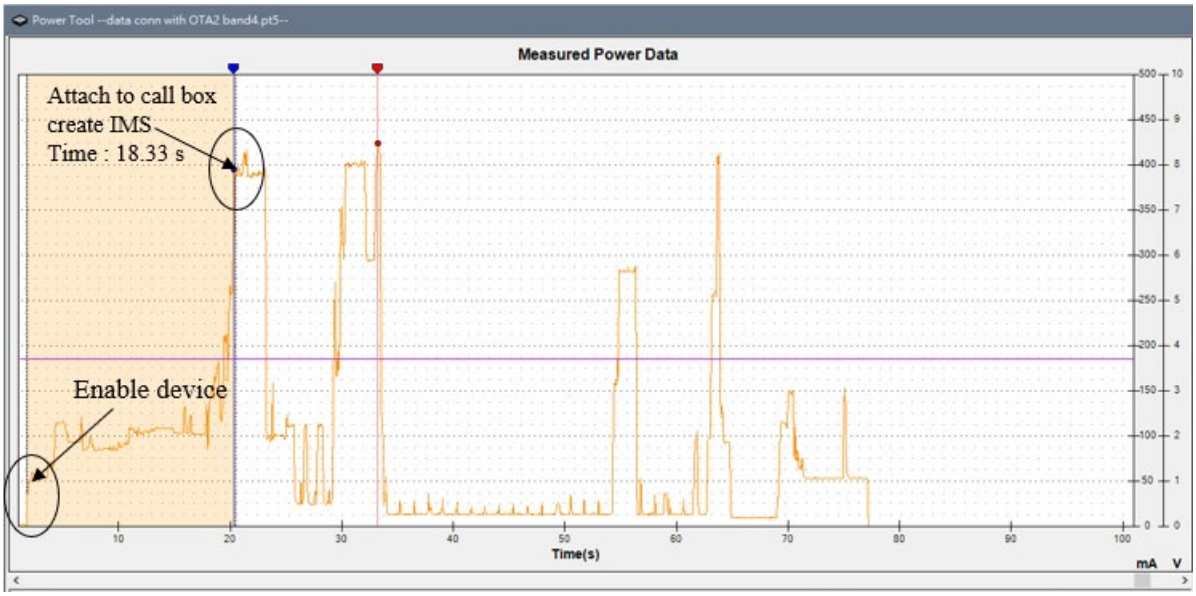

FIG. 1. Device boot cycle

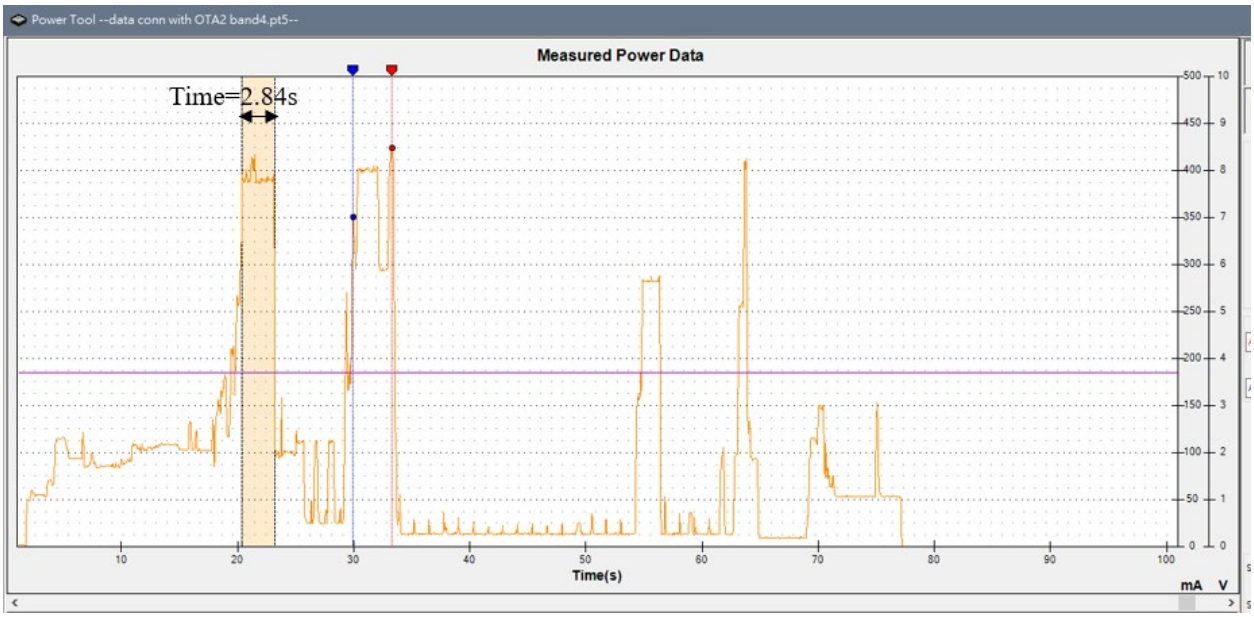

FIG. 2 Device registers to the network

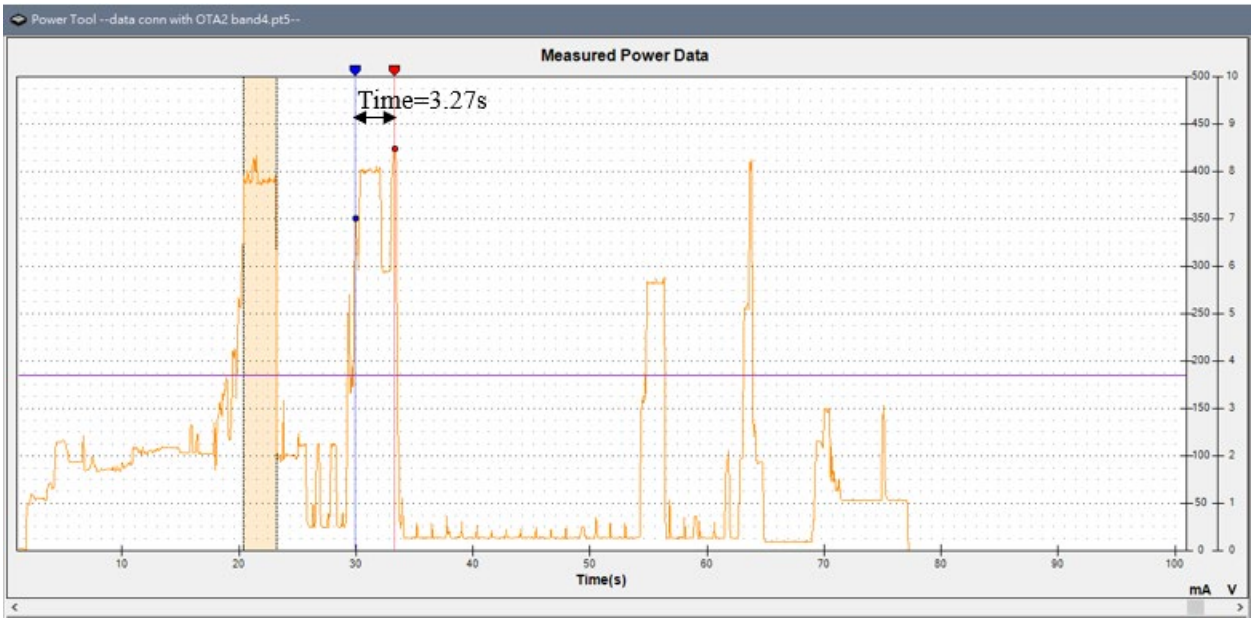

FIG. 3 Device sent out data

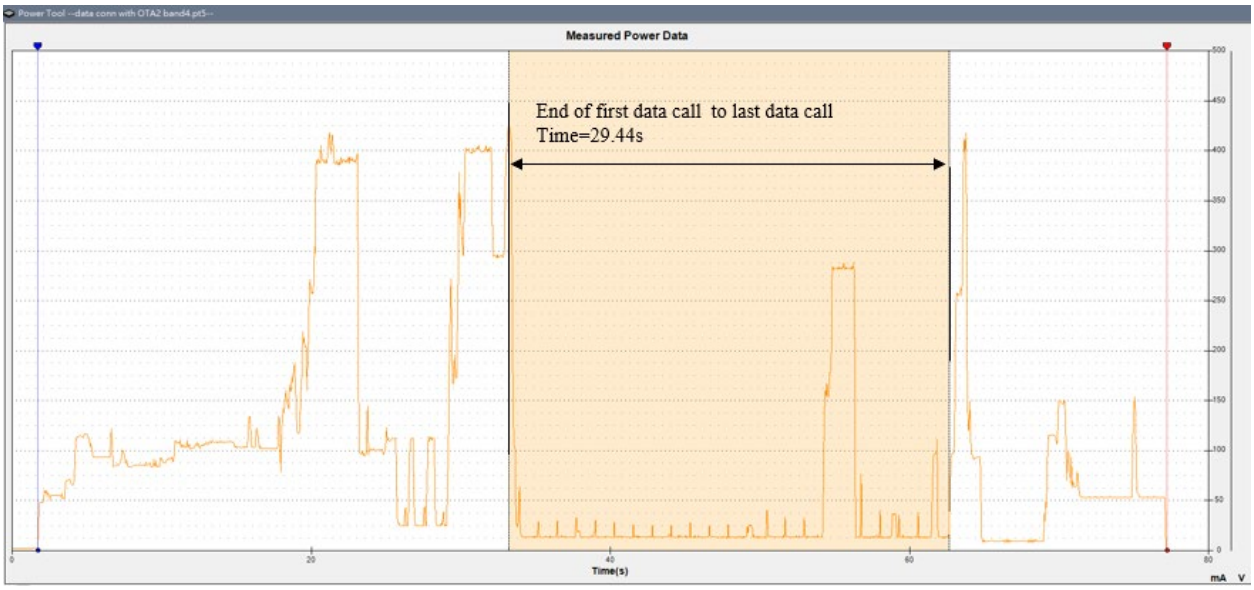

FIG. 4 Device close data connection and power down

3.4.SOS Alert

The device accepts a button press to trigger the SOS Alert when the user needs emergency dispatch. The process for SOS alert includes making a 2-way VoIP call to the emergency operator, and sending a location message by MQTT.

4. User using VoIP Scenario

When using the device, pressing the SOS button to activate the VoIP call. After a short delay, the user will hear a voice message and then tones or ringing to successfully reaches to the alert service provider. The device has integrated microphones and speakers for communication. The user should hold the device near to the mouth for speaking as below picture.

The voice communication of device is when the user needs emergency dispatch and then pressing the SOS button to get emergency assistance, due to the size of the device is small that there are limitation of the microphone and speaker performance, therefore in normal use, the user should hold the device close to the mouth to be able to talk to the microphone and hear clear sound from speaker for emergency call use. The devices is resting on the chest of the user for voice communication is not expected operations, due to human body may block the voice output and receive, and couldn’t pick up good voice quality.

5. For the LTE Data mode scenario

In normal use, the pendant is worn on a lanyard around the neck and hangs on the chest. The device wakes up every 24 hours to report its status by LTE data mode transmission.

6. LTE Data Transmission Analysis

This section shows the time-based LTE transmission plots for registration, data connection, socket open, 281-byte data message transmission, about 30-second in paging and socket close.

Calculations for Upper Bound Transmission Duty Factor:

Device boot cycle T1	Attach base station T2	Device enter Idle T3	Open data Socket T4	Transmission data T5	Device in paging T6	Device power Down T7
18.33 s	2.84 s	6.27 s	3.07 s	0.2s	29.44 s	15.3

Total transaction time in = T1+T2+T3+T4+T5+T6+T7 = 75.45 sec

Radio activity time = T2+T4+T5 = 6.11 sec

Ratio of Radio activity time to Total transaction time

(Duty Factor) = (T2+T4+T5) / (T1+T2+T3+T4+T5+T6+T7) = 0.081

7. RF Exposure conditions

Head Exposure condition

Since the device has integrated microphones and speakers for voice communication, in normal use, the device may next to mouth for voice communication; therefore head SAR evaluation is required.

Head Test Plan:

Front and bottom side of the device at 10 mm from a flat phantom filled with head tissue- equivalent medium.

Body Worn exposure condition

Since the devices that are designed to operate on the body of users using lanyards, therefore the device must be tested for SAR compliance using a conservative minimum test separation distance ≤ 5 mm to support compliance.

Body Test Plan:

Six surfaces of the device at 0 mm separation distance

8. Low transmission duty factor consideration

Voice-mode communication generally does not qualify for low duty factor considerations; therefore head SAR evaluation is not apply for low duty factor.

SAR Exclusion Threshold: KDB 447498 Section 4.3.1

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ⩽ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR.

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ⩽ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is

< 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

For this device, the body worn test separation distance is 0mm, head test separation is 15 mm, therefore 5mm and 15 mm is used in the equation. For each of the technologies the maximum output power (nominal power plus tune-up tolerance), corrected for low duty cycle calculated in this document, is used in the equation above to determine if SAR is excluded (value is 3.0 or less) or required (value exceeds 3.0). The table on the following page shows the results.

Head

Band	Freq. (MHz)	Output power		Separation distance (mm) Note 2	Threshold Value Note 3
		dBm Note 1	mW Note 1		
LTE Band 2	1900	23	199.53	15	18.54 Measure
LTE Band 4	1750	23	199.53	15	17.6 Measure
LTE Band 12	750	24	251.19	15	14.50 Measure
LTE Band 13	750	24	251.19	15	14.50 Measure
LTE Band 66	1780	23	199.53	15	17.6 Measure

Note 1: Maximum output power including tune-up/manufacturing tolerances.

Note 2: The device has integrated microphones and speakers for voice communication, in normal use, the device may next to mouth for voice communication, therefore 15 mm separation distance consider for Head SAR evaluation.

Note 3: To exclude the device from SAR testing the threshold value must be less than 3.0.

Body

Band	Freq. (MHz)	Duty Cycle Note 1	Output power			Separation distance (mm) Note 4	Threshold Value Note 5
			dBm Note 2	mW Note 2	mW Note 3		
LTE Band 2	1900	8%	23	199.53	15.96	5	5.03 Measure
LTE Band 4	1750	8%	23	199.53	15.96	5	5.03 Measure
LTE Band 12	750	8%	24	251.19	20.09	5	3.48 Measure
LTE Band 13	750	8%	24	251.19	20.09	5	3.48 Measure
LTE Band 66	1780	8%	23	199.53	15.96	5	5.03 Measure

Note 1: duty factor calculated in this document.

Note 2: Maximum output power including tune-up/manufacturing tolerances.

Note 3: Maximum power adjusted for duty cycle (see note 1) and rounded to closest mW as per KDB 447498 procedures.

Note 4: When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Note 5: To exclude the device from SAR testing the threshold value must be less than 3.0.

9. Conclusion

Voice-mode communication generally does not qualify for low duty factor considerations; therefore head SAR evaluation is not apply for low duty factor, and Head SAR testing is required for all of frequency bands.

Body Worn SAR testing is required for all of frequency bands and wireless technology, the duty factor established in the SAR analysis will be applied to scale the measured SAR to determine SAR compliance.