		R&D Test Report		Project: RDS-32
Laati / Issued TK	Testipaikka / Test location Turku	Testi päivä / Test date 10.08.2020	Päiväys / Date 04.03.2021	
Aihe / Subject <p style="text-align: center;">Maximum permissible exposure</p>				

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1 Purpose for the test

This test is done to evaluate device compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields of the WRM radio module.

2 Approval criteria

According to KDB publication for mobile and portable devices (KDB 447498) 4.3.1 a) SAR test exclusion can be calculated:

- $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [v_f(\text{GHz})] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity.

The calculation is used to see if further SAR testing is needed.

According to CFR § 2.1093 d) 2) exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

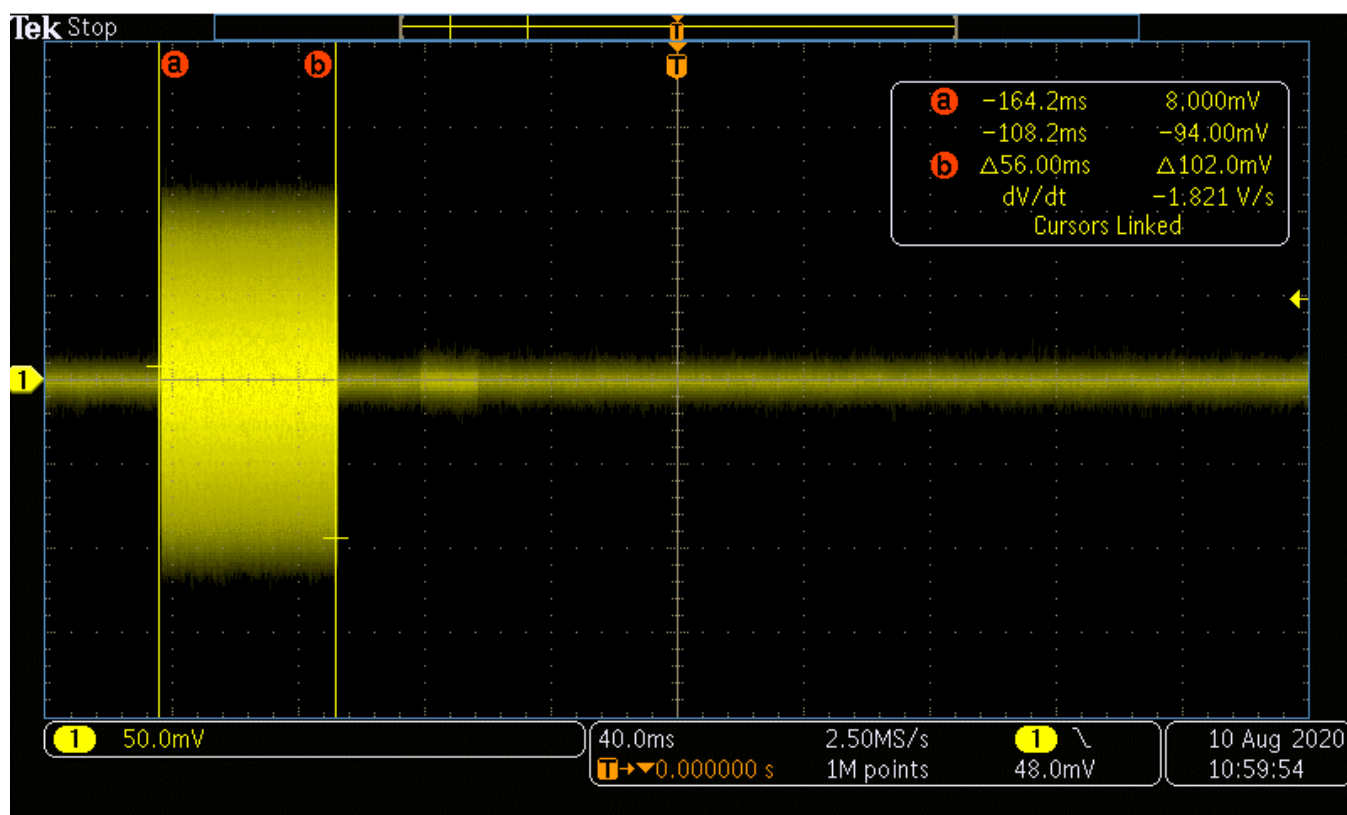
3 Test plan

WRM radio (FCC ID: MCQ-XB900HP) sends data with frequency hopping band of 902 MHz – 928 MHz. Data is sent in minimum interval of 2 seconds.

The frequency band shall be measured to determine the duration of data being sent and calculate the minimum distance in a worst case scenario.

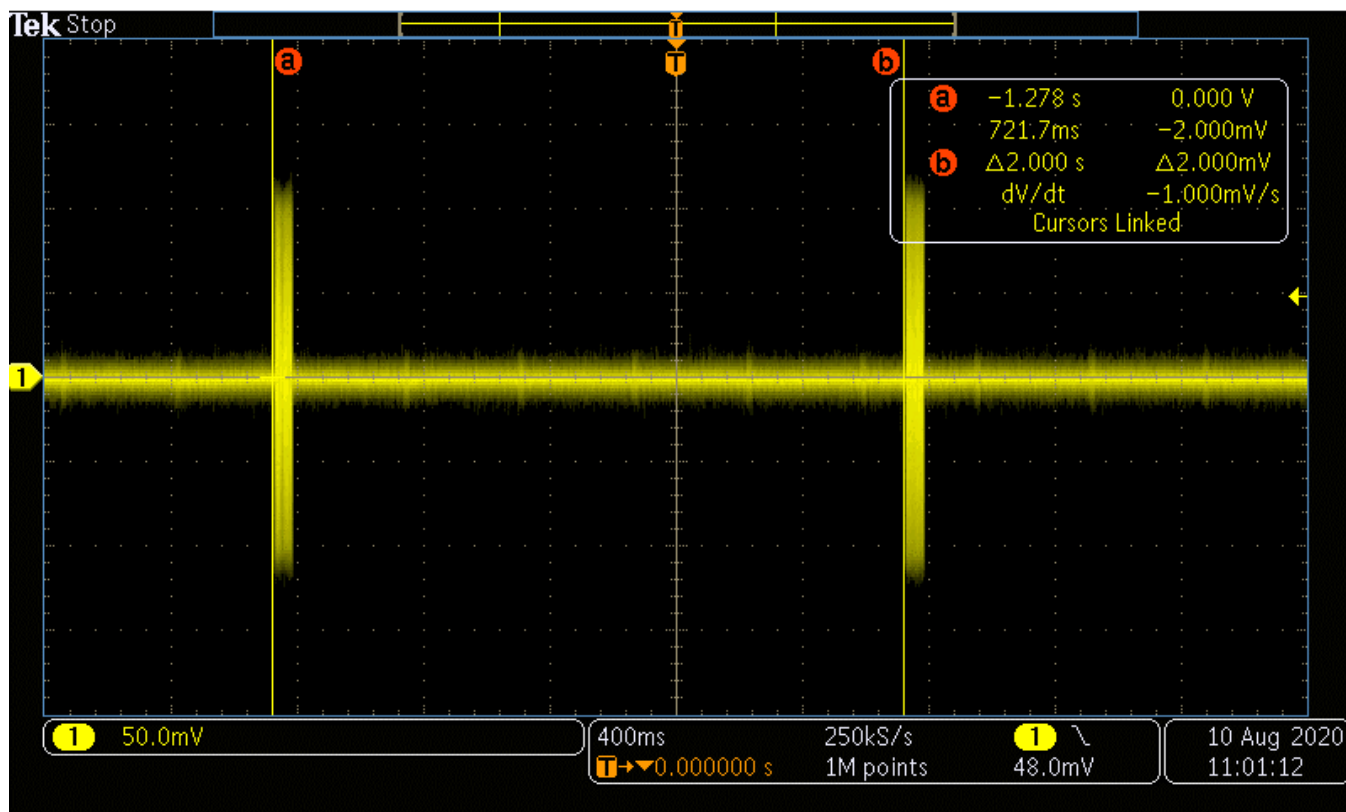
4 Test results

The device was set to send data in 2 second interval and the duration of the data stream measured (see Figure 1 and 2).



MDO3052 - 11:08:23 10.8.2020

Figure 1 The duration of data stream



MDO3052 - 11:09:40 10.8.2020

Figure 2 Time between two data streams

The minimum distance was calculated over 30 minutes data sent every 2 seconds for 56 ms with the previously measured power of 298 mW:

- Number of messages sent over 30 minutes: $\frac{1800s}{2s} = 900$ messages
- Total time sending messages over 30 minutes: $900 * 0,056s = 50,4 s$
- Average power over 30 minutes: $\frac{50,4s}{1800s} * 298mW = 8,344mW$
- Minimum separation distance with lowest frequency: $\frac{8,344mW}{3/\sqrt{0,902GHz}} = 2,64mm$
- Minimum separation distance with highest frequency: $\frac{8,344mW}{3/\sqrt{0,928GHz}} = 2,68mm$

The frame thickness was measured from 3d model (see Figure 3) to be at minimum 3,2 mm.

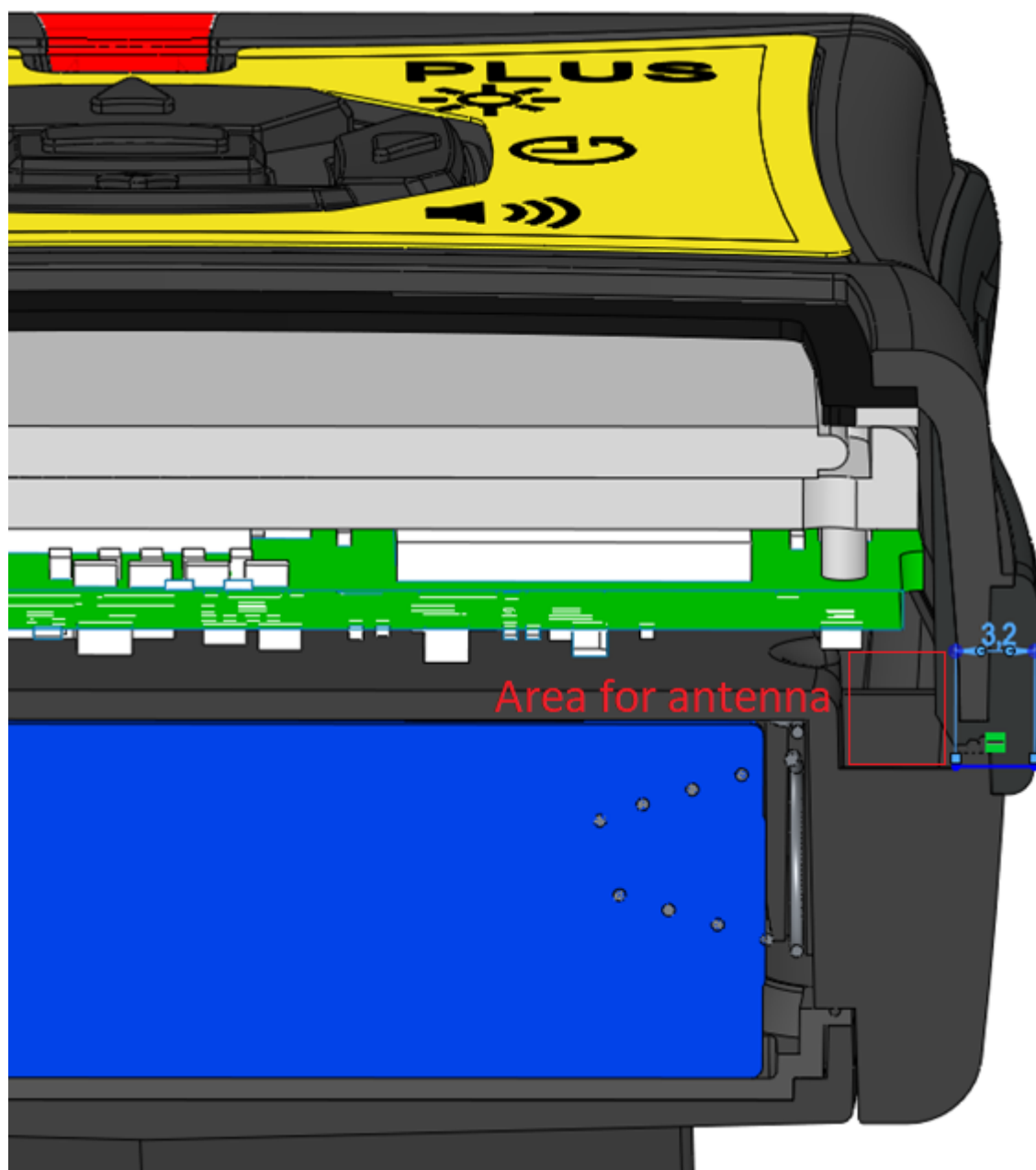


Figure 3 Frame thickness and area for antenna

5 Conclusions

According to the calculations the average exposure over 30 minutes does not require SAR testing as long as the antenna is 2,68 mm away from the user. The frame thickness is more than the minimum separation distance at the area where the antenna is positioned.