

Safe Working Distance tests, 2110 19-40189 iss. A

Background:

As a requirement of approval for use, many countries require minimum safe working distances to be provided for radiating equipment, such as FCC's 1.1310 of chapter 47 (OET Bulletin 65), Australia's AS2772.1, Canada's RSS-102, etc.

A blanket minimum of 20cm from the radiating element ensures the 2110 transceiver is considered a "Mobile Radio" which has simpler measurement criteria than "Portable Radio" (<20cm). All radiating elements therefore have a warning label "Safe working distance: 0.2 metre" as a minimum. Long wire antennas will have these labels fitted.

Whip antennas, and similar electrically short antennas have high voltages present on the radiating element, increasing the exposure risk.

"Push-to-talk" mobile radios have less stringent exposure restrictions, however an evaluation of the exposure risk still needs to be performed.

Setup:

- 2110 Serial # 028 with 2.4 metre collapsible whip antenna
- full power (25W PEP)
- 5.875 MHz USB
 - o Codan frequency
 - o gives about the worst exposure readings from other measurements (ref Appendix A)
- Nardalert XT RF exposure meter model D8862
 - o ICNIRP 1998 Occupational ($\equiv$ AS2772.1 1998) calibration
 - o Measures power, calibrated for full V/m or A/m at 100%
 - o Holds maximum of a series of 10 second or 30 second averages

Measurements:

50% duty cycle CW (absolute worst operational situation):

- Nardalert placed at various distances, set to 30 second average
- PTT 5 seconds ON, 5 second OFF for averaging period of the meter, with 1kHz modulating tone at each distance

Results:

Distance	Nardalert peak reading (% relative to ICNIRP 1998 recommendations)
0.7m	50%
0.6m	100%
0.55m	100%
0.5m	100%
0.45m	100%
0.4m	200%



Measurement setup (ruler was removed for test)



Measurement setup

Continuous speech:

- Nardalert placed at 0.6 metres, 0.4 metres and 0.35 metres.
- PTT held continuous with read text at each distance

Results:

Distance	Nardalert reading (% relative to ICNIRP 1998 recommendations)
0.6m	<10%
0.4m	50%
0.35m	100%

100% CW, calibration check:

- Nardalert moved until instantaneous reading just “100 %” and “200%”

Results:

Distance	Nardalert reading (%)
0.85m	Just 100%
0.62m	Just 200%

Conclusions:

- Worst frequency/antenna combination measured was 2.4m antenna at 5.875 MHz, which gave about 600mm Safe Working Distance (SWD) at CW with 50% duty cycle.
- Average power reduction gives a *close to* proportional square law reduction in SWD (ie half power ≈ 0.7 SWD). Speech produces an average power of about 25% of PEP. Normal speech SWD is therefore approx. 300mm for Speech with 50% duty cycle.
- Assuming absolute worst case radiation is 50% duty cycle of CW, we can measure the SWD to be approx. the “just 200%” distance measured with the Nardalert XT and 1kHz tone CW. Other antenna/frequency combinations can be tested using this criteria.

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