

Assessing TENS Waveform Integrity

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Objectives

- To measure the waveform characteristics that are delivered across a resistor up to a maximum current output for 2 TENS units.
- Compare the waveform characteristics delivered to waveforms advertised by the 2 units.

Design

- Stimulus output was recorded from two TENS units (TENS Unit 1: Compass Health Quattro 2.5, monopolar square wave; TENS Unit 2: InTENSity IF Combo II, biphasic square wave) through a 1kOhm resistor up to maximum current output (100 mA).

Results

- Current output of the two TENS units was significantly different than advertised.
- In the 1-10 mA range there was a mean difference in stimulus current output of 57.9% in TENS Unit 1 and 10.9% in TENS Unit 2.
- In the 1-90 mA range there was a mean difference in current output of 31.8% in TENS Unit 1 and 5.0% in TENS Unit 2, with both devices saturating at 70-80 mA.

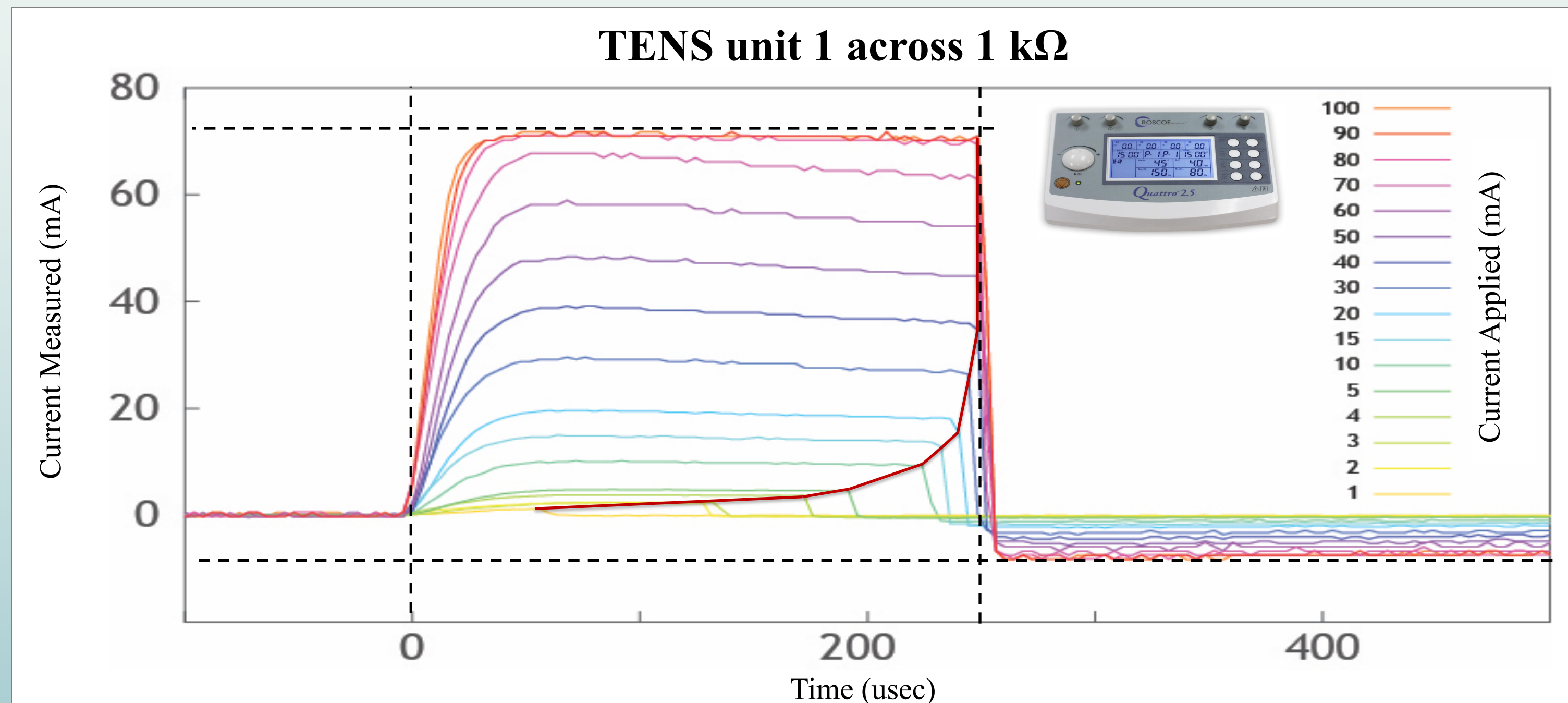


Fig. 1. Waveforms of current measured when range of currents are applied across 1 k Ω for Quattro unit.

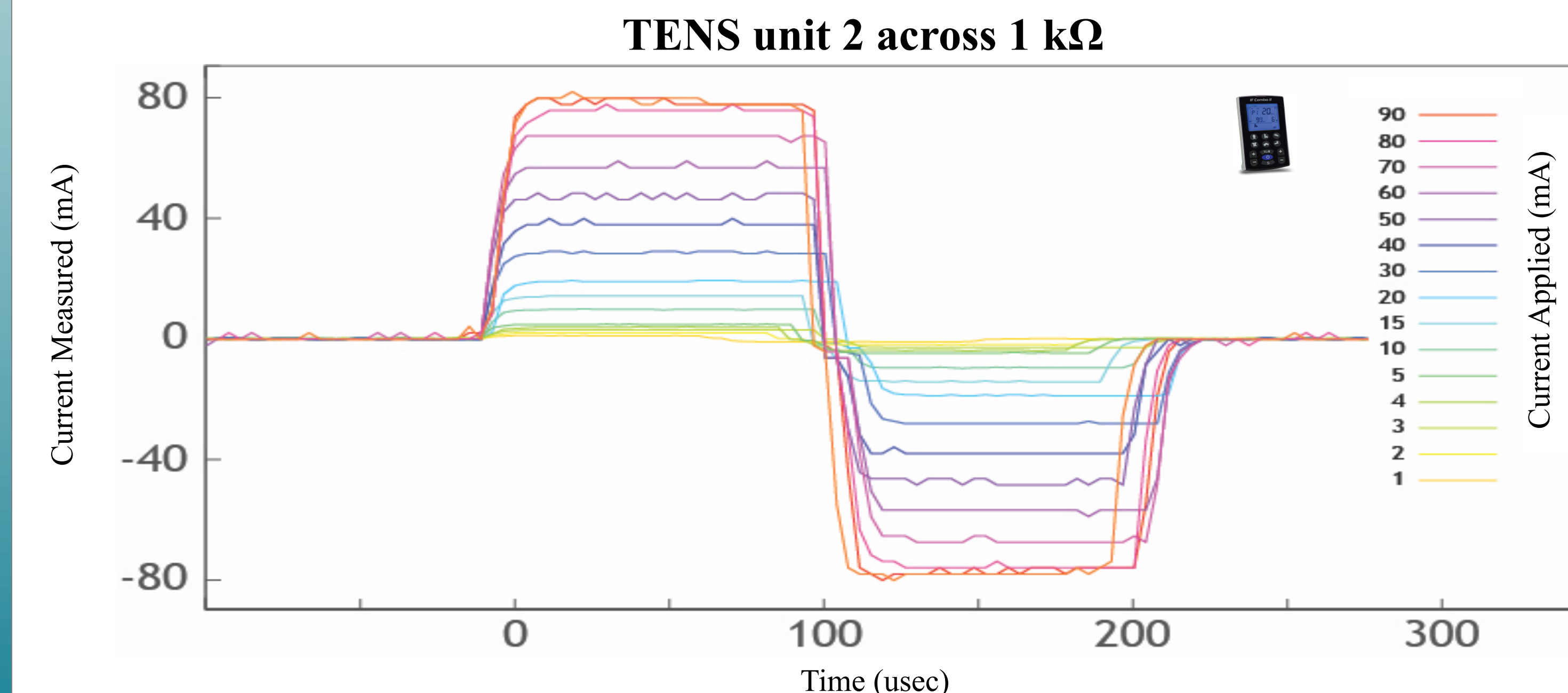


Fig. 2. Waveforms of current measured when range of current are applied across 1 k Ω for the InTENSity unit.

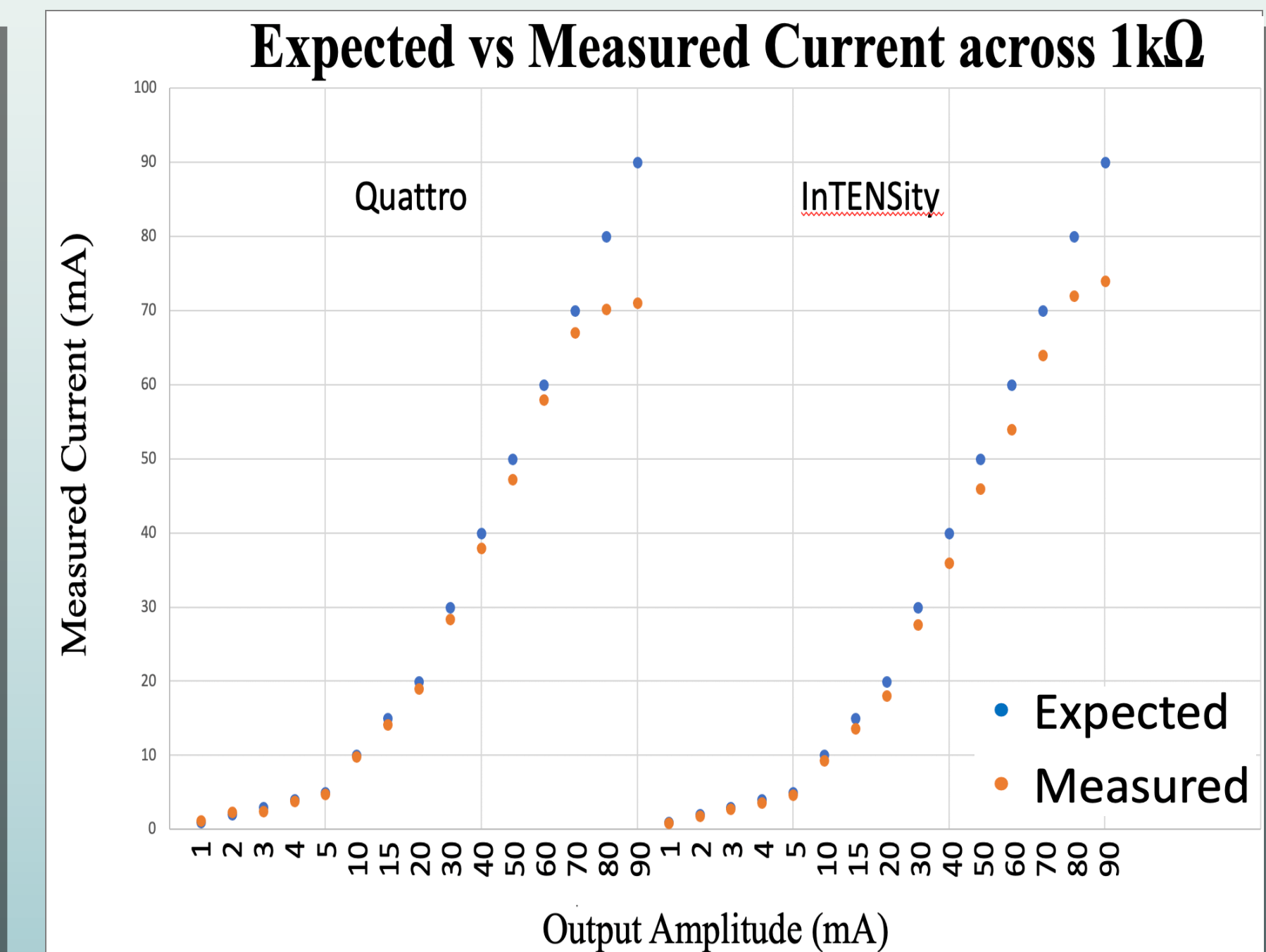


Fig. 3. Waveforms of current measured when range of currents are applied across 1 k Ω for Quattro and InTENSity unit.

Conclusion

- While TENS is an attractive and accessible non-invasive pain management option, efficacy is questionable; potentially due to variability in TENS waveform output.
- This study revealed that TENS unit waveform output can be different than advertised by device manufacturers.
- In future studies, obtaining accurate data from stimulus waveforms delivered to tissue could minimize study inconsistencies caused by manufacturer data.