

INTRODUCTION / BACKGROUND



- Current US Military guidance often cites 4 PSI peak overpressure as the limit for acute blast exposure
- 4 PSI threshold was based solely on pressure, not impulse, as no established cumulative (longitudinal) threshold existed (hearing injury threshold: 5 PSI)
- Low-level blast (below 4 PSI) can also lead to neurobehavioral effects due to repetitive exposures
- Cumulative blast impulse predicts worsening chronic neurobehavioral symptoms (McEvoy et al.)
- Cognitive slowing observed at 70 to 100 PSI-ms cumulative blast impulse (Carr et al.)

Objective: Equip RSOs with a real-time monitoring app for soldier blast exposure

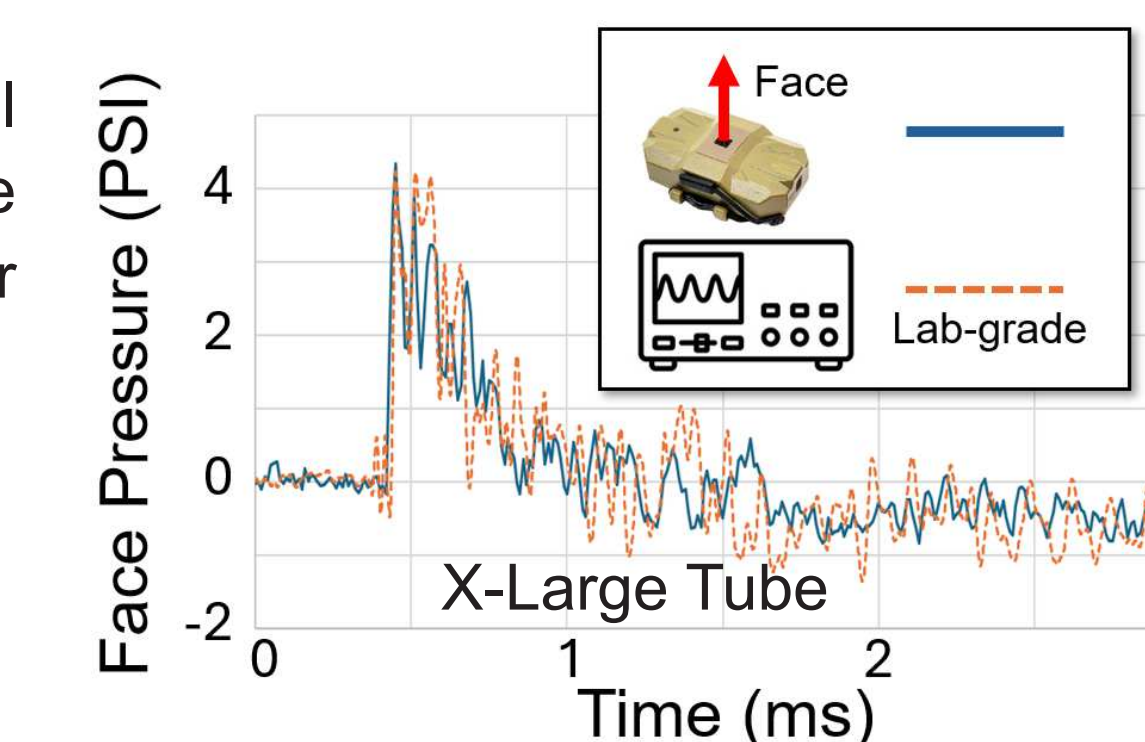
BLAST DOSIMETER

- Requirement to capture, export and assess injury potential from blast exposure in both operations and training



3 x pressure sensors in single device (0-100 PSI)
Synchronous time base (100 kHz)
Event duration: 15 to 90 ms (no dead time)
Pre-trigger to ensure peak is never missed

Data compares well with laboratory-grade reference sensor

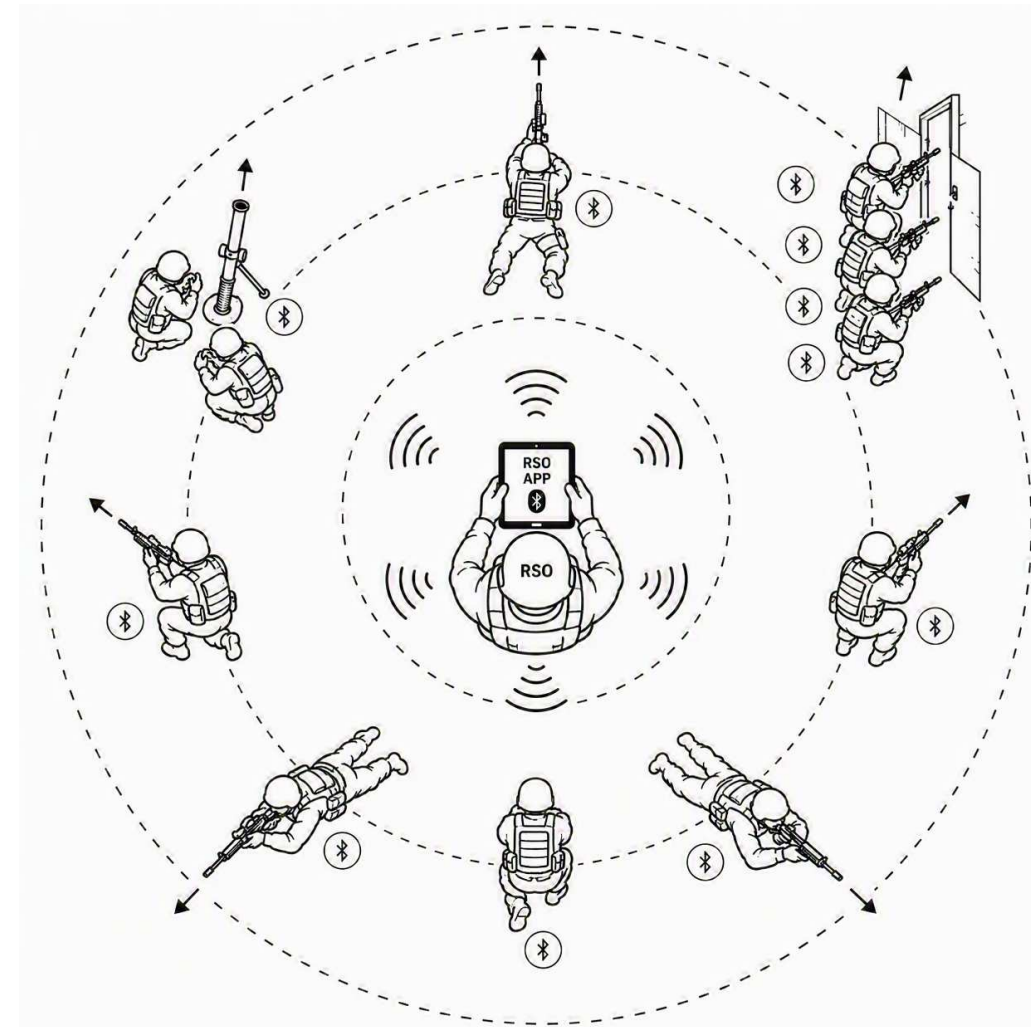


Event Data shared with RSO App:

- 3 x peak pressure values per event
- 3 x maximum impulse values
- Estimated side-on pressure/impulse obtained from Machine Learning
- Daily and weekly cumulative impulse value
- Call-sign, battery level, and memory

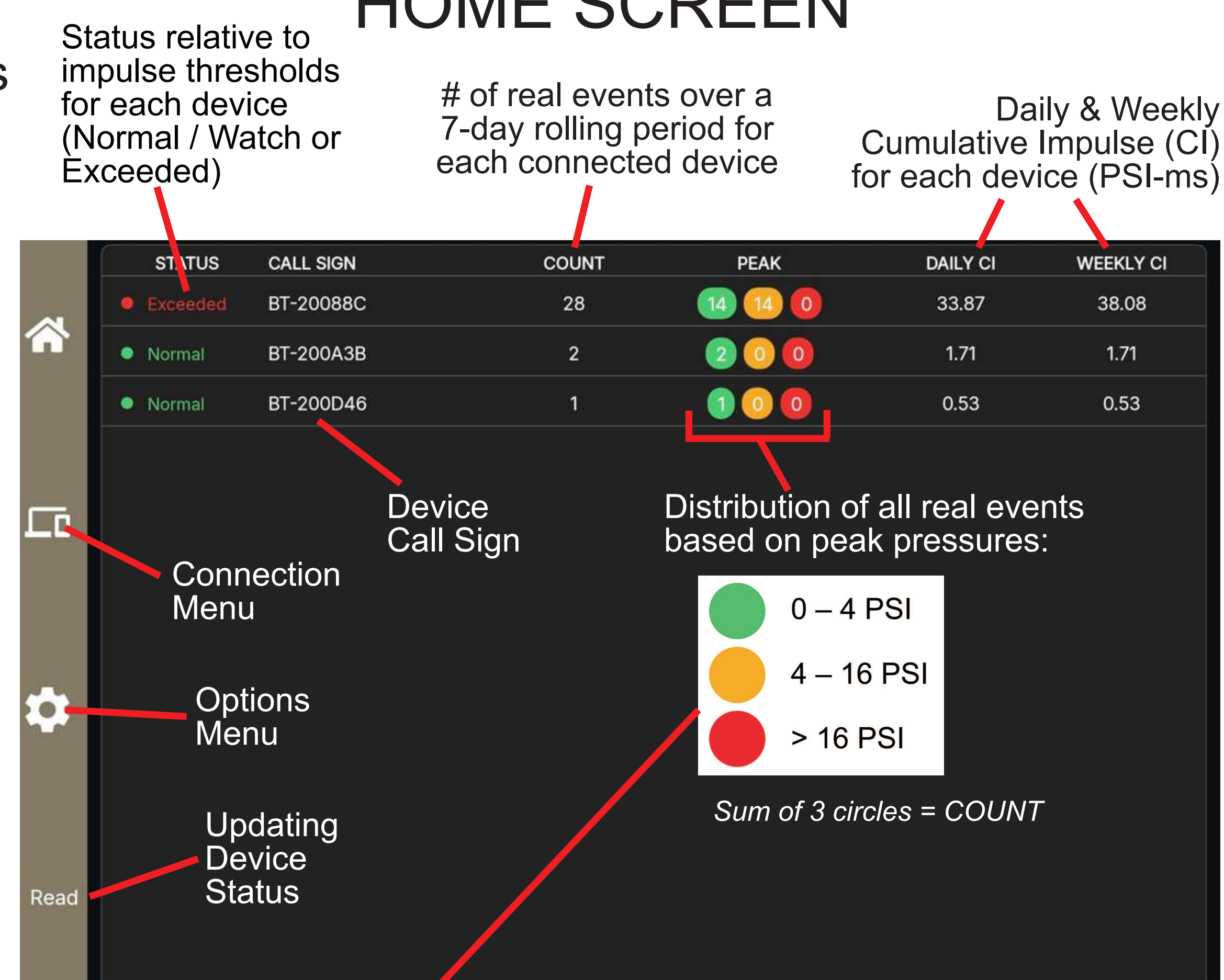
SMARTPHONE APPLICATION - RSO APP

App range: 15+ m (50 ft)
Connects to 20+ sensors



- Runs on Android tablets & Smartphones
- Uses Bluetooth
- Automatically scans devices at pre-determined intervals
- Sends notifications/warnings

HOME SCREEN



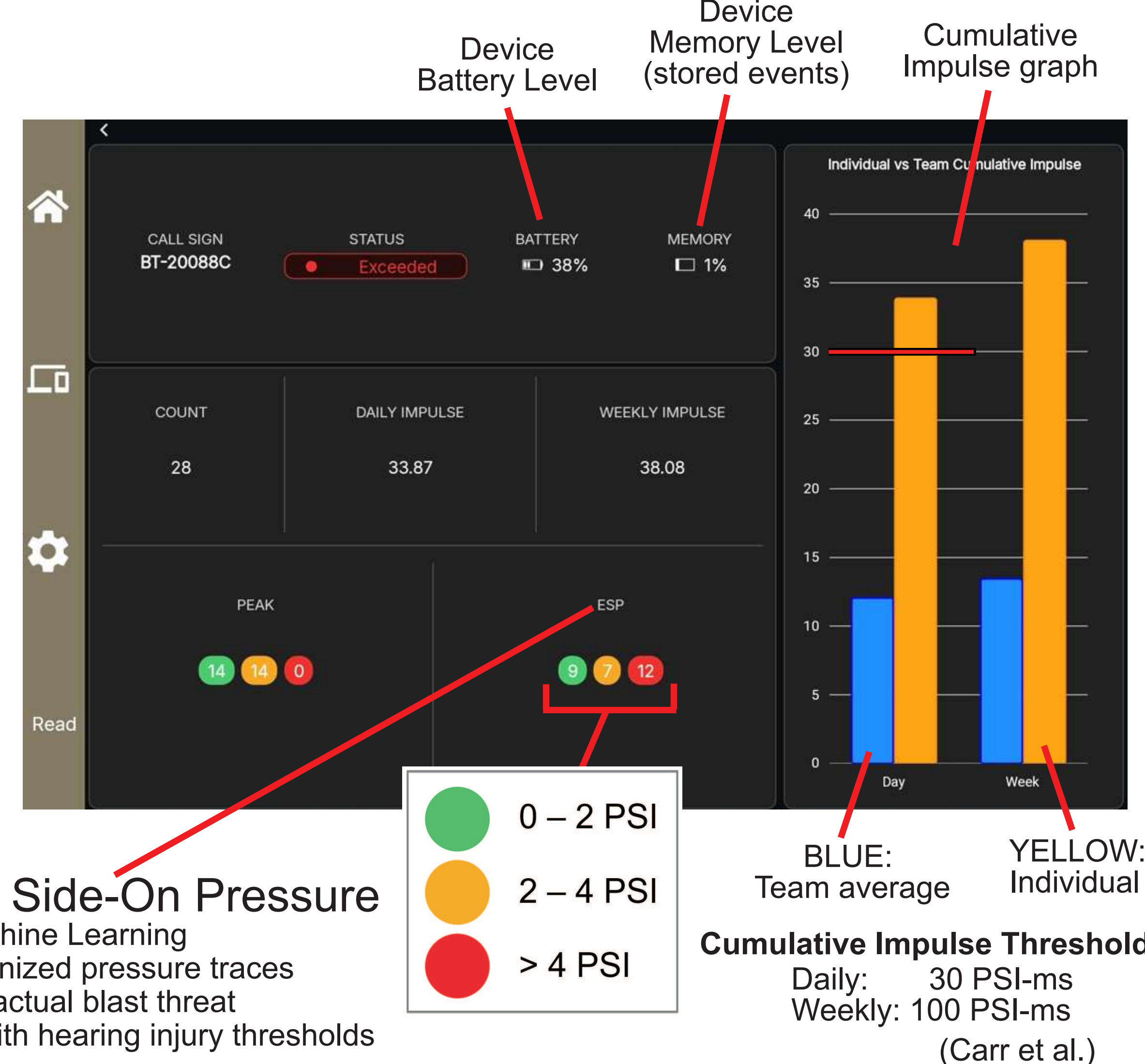
Max peak from the 3 pressure sensors could be a reflected (face-on) pressure, substantially higher than the incident (side-on) pressure over which the 4 PSI threshold is based



ESP: Estimated Side-On Pressure
Calculated through Machine Learning
Based on the 3 synchronized pressure traces
More representative of actual blast threat
Can directly compare with hearing injury thresholds

EVENT DETAILS SCREEN

(when specific event selected from the Main Screen)



CONCLUSION

- Pressure-only limits insufficient for blast risk
- Cumulative impulse: superior injury risk predictor
- Repeated low-level blasts can cause subclinical but meaningful deficits
- Dual tracking (pressure+impulse) enables:
 - Early risk identification
 - Improved Force Health protection
- The RSO App enables real-time, team-wide blast exposure operational picture, without analysis of complex pressure traces
- Supports development of evidence-based exposure limits

