

Acoustic Startle Responses: A Brief Description

The acoustic startle reflex is an unconscious ‘flinch’ like response that can be elicited through the use of sudden pulsed sound bursts (Koch & Schnitzler, 1997). Götz & Janik (2011) demonstrated that activation of the startle reflex in Grey Seals elicited a different behavioural response than non-startling sounds of similar intensity. When exposed to sounds with a sound pressure level (SPL) 93dB above hearing threshold, the seals habituated to sounds with a long rise time (100ms from onset of sound to reaching its maximum intensity) but showed increased sensitization when the sound had a short rise time (5ms), eventually avoiding the area, even when it meant avoiding easily accessible food. Additionally (Götz & Janik, 2015) observed no difference in the behaviour of other species such as Harbour porpoises in the presence of Acoustic Startle Devices.

Characterization of the sound profiles of Ace Aquatec acoustic devices show that they produce sounds with short rise times known to elicit startle responses. The extended duration of this signal also shows that they cannot be considered to be impulse (see Figures below).

Introduction of advanced triggering systems has reduced the duty cycle of Ace Aquatec devices so that they average around 5%. Recent sound measurements made from commercially available Ace Aquatec acoustic devices confirm that the newest generation technology continues to produce sounds consistent with eliciting acoustic startle responses in seals.

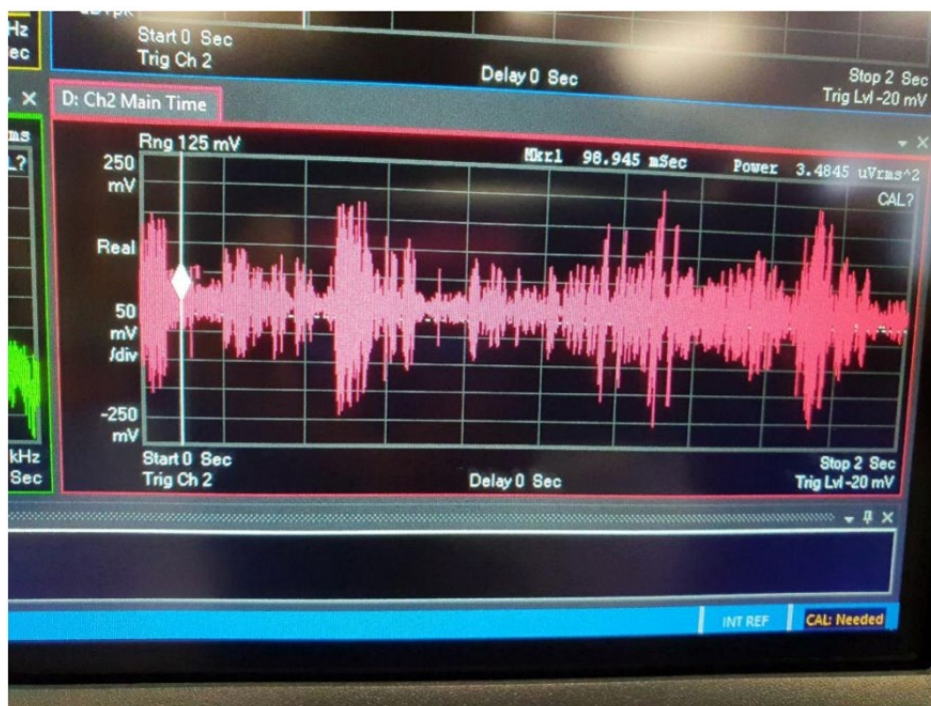


Figure 1: Time domain trace of ASR waveform showing amplitude modulation triggered at -20mV.

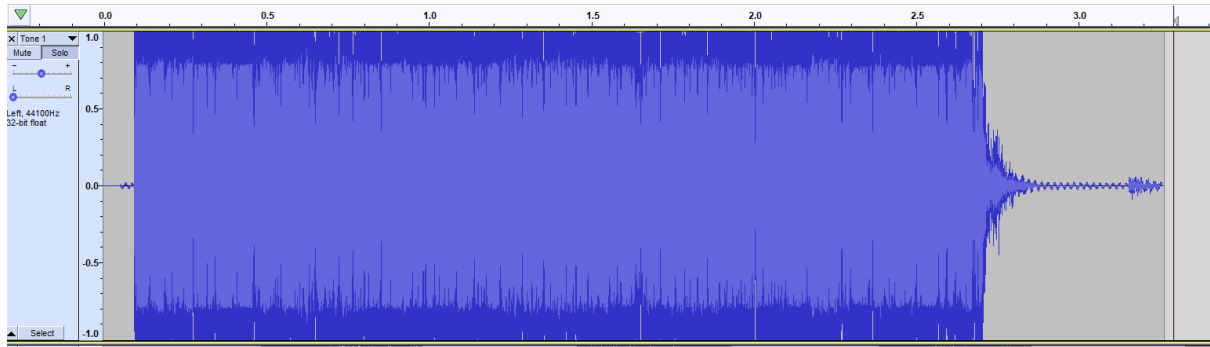


Figure 2: Time history of the highest power setting on the RT1.

References

- Koch, M., & Schnitzler, H. U. (1997). The acoustic startle response in rats - Circuits mediating evocation, inhibition and potentiation. *Behavioural Brain Research*, *89*, 35–49. [https://doi.org/10.1016/S0166-4328\(97\)02296-1](https://doi.org/10.1016/S0166-4328(97)02296-1)
- Götz, T., & Janik, V. M. (2011). Repeated elicitation of the acoustic startle reflex leads to sensitisation in subsequent avoidance behaviour and induces fear conditioning. *BMC Neuroscience*, *12*(April). <https://doi.org/10.1186/1471-2202-12-30>
- Götz, T., & Janik, V. M. (2015). Target-specific acoustic predator deterrence in the marine environment. *Animal Conservation*, *18*(1), 102–111. <https://doi.org/10.1111/acv.12141>