ELECTRONIC UPGRADES ON THE SECOND GENERATION OF AN AUTONOMOUS AND PORTABLE CETACEAN AUDITORY SCREENING SYSTEM

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Abstract - While noise is now considered a marine hazard that can directly affect cetaceans and induce a stranding, no clinical approach has yet introduced the detection of a possible hearing loss at a stranding site as a necessary practice. Here we present the second generation of an autonomous and portable auditory screening system for cetacean clinical and research purposes. This system is composed by two independent and autonomous modules that build a more versatile, lighter and interference isolated system. The improvement relies on the isolation between modules and their independency on many situations. The system is separated in two modules. The first one contains the low voltage biopotential amplification system and the acustic signal transmiter . The second module will activate only when needed for some frequencies and levels driving high voltage to the transducers thus avoiding interferences with the first module containing the low voltage amplifications system. The tool has been successfully tested for research purposes in captive dolphins and calibrated for a stranding site diagnoses operation.

Keywords – Auditory Evoked Potentials, cetacean, auditory screening

I. INTRODUCTION

Acoustic trauma and other noise related lesions have now been added to the list of potential causes of cetacean stranding [1][2]. A first generation of an Auditory Evoked Potentials autonomous acquisition unit was developed to help decision taking by testing on site the hearing functionality of stranded animals [3]. The evolution of that first generation system is presented featuring higher transducing capabilities while minimizing noise interferences, size and weight. The system is separated in two modules: a low voltage and a high voltage unit (Fig 2). The main module, the Low Voltage Unit features extra security that eliminates the presence of high voltages in the system that could generate hazards to patient/user from power leaking. It also includes a Transducer Signal Amplifier, designed for capacitive loads that ensures enough current driving capacity while it shows a strict stability, overheading the limitations given by the NI-6062E card with a 48V and 240mA driving power. The attenuator is integrated in the system allowing an accurate attenuation of the output level followed by a transient filtering system to avoid high level clicks at start-up. This is of extreme importance as pulse due to manual changes in the system configuration could cause injuries or stress to the diagnosed animal. Visual and electronic feedback of the voltage drived to the transducer is monitored through the data acquisition card (PCMCIA format) and visually displayed in an analog indicator allowing a fine calculation of the levels emitted through the software interface and providing analog visual information to the user. The electrode connectors feature full IP67 protection with no electromagnetic discontinuity in the case cover avoiding possible interferences due to shield discontinuities. The electrodes are gold plated, embedded in a suction cup with mechanical protection against sudden pulls out or swim away behaviors that often happen in captive animals. The system is thought to be improved though: it has therefore been designed in a modular way that allows an easy replacement of the integrated boards in case of failure or a need of upgrading.

The secondary High Voltage Unit features a switching power supply providing noise leakage minimization via physical separation of the two units. This system is ready to work only in case it is needed (Fig 2.), when high levels are required, e.g. in the case an animal presents a severe hearing loss at a certain frequency band. The use of different transducers, depending on their sensitivity in the high frequency band, minimizes the need of frequently requesting this high voltage unit.

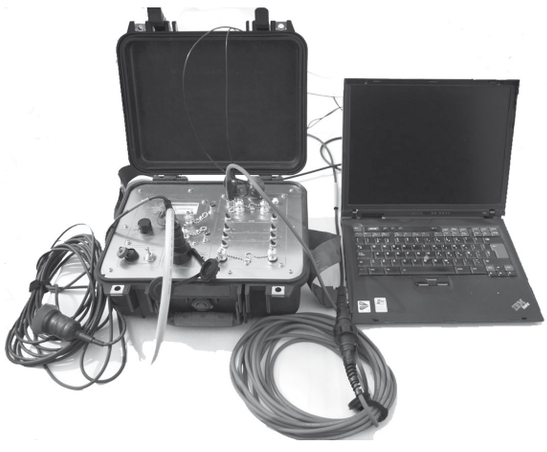

Fig.1 Complete assembly of the low voltage system

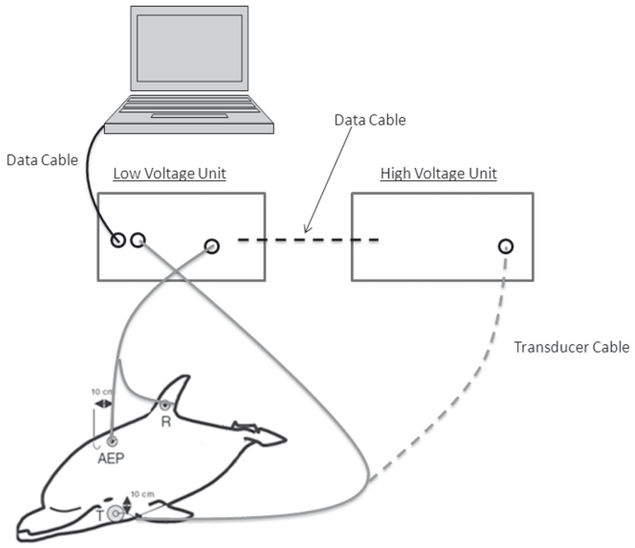

Fig.2 Complete system. Dashed lines indicate the connections between the modules when the High voltage unit is needed

II. CONCLUSION:

This portable system is more stable, independent and noise isolated than its previous first version. It's small size and small weight allows an easy carriage and maneuver.

III. ACKNOWLEDGEMENT

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