

# SONRAS – Sound Registration and Analyzing System



## Overview

The *Sonar Registration and Analyzing System (SONRAS™)* is a complete system for receiving, storing and analyzing underwater sound.

The system consists of two main parts:

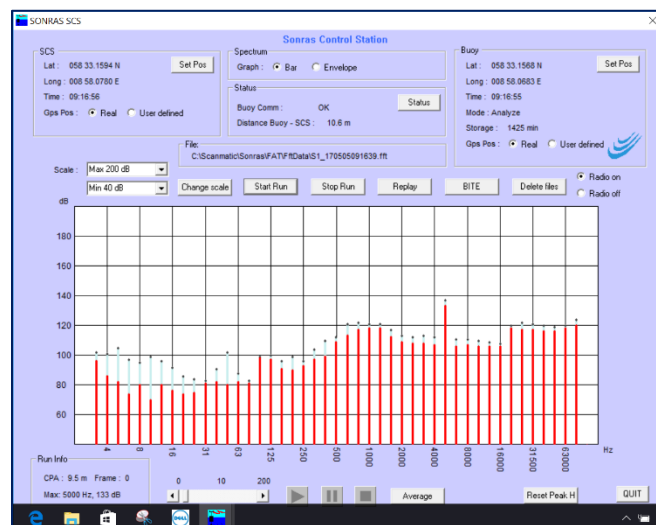
1. A GPS positioned, battery operated buoy, containing all necessary electronics for amplifying signals from the hydrophone, A/D converting, storing, analyzing in frequency bands and transmitting data to the SONRAS Control Station (SCS).
2. A PC-based, GPS positioned SONRAS Control Station (SCS) on board the ship or offshore installation for control of buoys settings and presentation of received data.

## Features:

- Sensitive sound recording
- Control and monitoring of data collection
- Real-time analog “voice” transmission
- Post processing of raw data

## Applications

- Mapping of noise signature for ships and marine installations
  - Mine sweepers - to ensure safety distance
  - Fishing vessels - during search and catch operation
  - Seabed installations – to detect malfunction
- Biologic noise in the ocean including mammal sound
- Determination of Shock wave sources.



SONRAS SCS GUI

## Operation

In operation the SONRAS buoy performs the following tasks:

- Read and report the GPS positions.
- Signals received from the hydrophone are continuously sampled (42 Ks/sec) for storing and analyzes in the frequency band from 3 Hz to 20 kHz.
- The frequency band from 20 kHz to 100 kHz is analyzed in numerical filters.
- The SCS is updated every 1.5 sec with 1/3 octave band data in the full frequency range 3Hz to 100kHz
- In mode for shock wave or splash down source positioning, events are time tagged to GPS time with accuracy better than 1 msec.
- Audio signal (“listen in”) is obtained by sending the analogue signal over a VHF radio link (frequency range approx. 100 Hz to 3 kHz).
- Both the data stored in the buoy and the data transmitted to SCS by radio is encrypted.

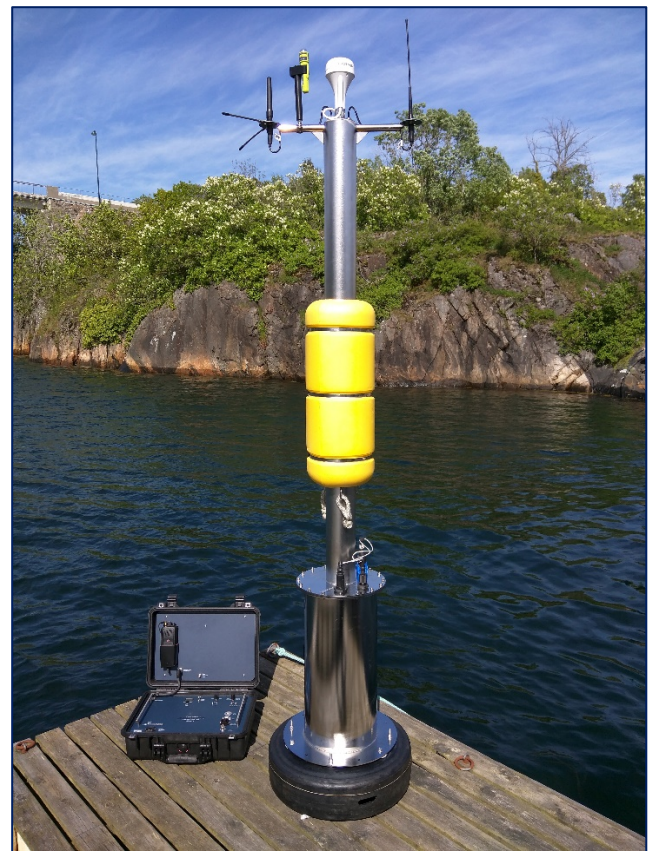
## SONRAS Control Station

The SCS has 4 modes of operation:

1. Control and monitoring the of data collection. During this operation, noise data analyzed to 1/3 octave band is displayed every 1.5 sec, reduced to true spectrum levels. The analogue sound can be listened to by activating the VHF radio.
2. Replay of received processed data together with the recorded analogue signals.
3. Positioning of events. The SCS can receive time-tagged events from several buoys for positioning of sound source.
4. Post-processing of raw data from the buoy. The signals sampled and stored in the buoy can be retrieved from the buoy by Ethernet connection after the measurement mission is finished and the buoy is recovered. This enables new FFT analyzes in the band from 3 Hz to 20 kHz now also with narrow band analyzes (resolution 1.5 Hz)

## Specifications

SONRAS	
Sea state	Full spec of accuracy when drifting in Sea State 0 to 2. Reduced low frequency accuracy below 10 Hz in sea state 3.
Signal registration accuracy	Frequency range: 3 Hz – 100 kHz Sound level accuracy: 3 Hz – 100 kHz, $\pm 3$ dB Sound level accuracy: 10 Hz – 10 kHz, $\pm 1.5$ dB (critical band)
Data collection	Analysis below 16 kHz: 44,1 kHz Analysis 16 kHz – 100 kHz: 220 kHz
Communication	UHF data communication. VHF real-time analog voice transmission.
Operating distance	Up to 5 km radio range (line of sight) for data communication. Up to 2 km for analog transmission.
Hydrophone depth	Floating mode: 40 m Anchored mode: 1 m above seafloor.
Battery capacity	8 hours 24 hours position transmission (GPS and radio)
Total weight of buoy	40 kg



SONRAS buoy and SCS