

# STM – Sonar Transponder Module

Transforming an Autonomous Underwater Vehicle (AUV) to a Sonar Training Target



The STM is a module that receives and analyzes audio signals from sonars and generates an echo or emits pre-stored audio signals.

It is integrated as part of an AUV and is interfaced with the AUV's navigation and mission planning software.

The resulting Sonar Training Target (STT) provides advanced, flexible and highly realistic anti-submarine warfare (ASW) training for sonar operators.

Following a major hardware and software upgrade in 2019, the STM is more capable than ever and the low frequency edition, STM-LF, is available.

## Applications:

- Complex ASW training exercises for e.g. frigates and helicopters
- Quickly deployable target for sonar operator training
- Anti-torpedo training
- Anti-surface training for submarines
- Sonar testing

## Features:

- Modes for both Active and Passive sonar training
- Advanced echo repeater with flexible configuration of target characteristics
- Signal/noise generator and audio playback of any wave-file
- Broad frequency range
- Low frequency options
- Can be integrated with any AUV, also small and man portable ones
- Fully integrated into the AUV's user interface and mission planning
- State-of-the-art electronics
- Expands capability of existing assets
- Proven system by NATO navies



STM Module

Example of delivered STM. Image courtesy: Teledyne

## Operation:

The STM has two main types of operation, **Active Mode** and **Passive Mode**:

In **Active Mode**, the STM is used as a target for an active sonar system. It functions as an *Echo Repeater* which receives and analyses a sonar pulse and transmits an echo response. The echo response is modified by advanced techniques to simulate realistic targets. Available techniques are amongst other Time Delay (simulates distance to target), Highlights (simulates realistic target size, details and aspect angle), Doppler (simulates speed of target). These techniques are all configurable by the user in a flexible interface to enable the creation of very specific responses from e.g. one specific submarine or torpedo. The STM can also operate as a *Store Repeater*, where a pre-programmed response is executed when a sonar pulse is received (e.g. playback of pre-recorded audio file or change of behavior).

In **Passive Mode**, the STM emits noise or signals pre-programmed by use of the signal/noise generator or from any audio wave-file. This can either be transmitted continuously (*Noise Passive*) or at predefined intervals (*Pulse Passive*). Examples of relevant signal/noise signatures are submarine propeller noise, torpedo attacks and surface vessel noise.

The STM-LF is capable of simultaneous transmission of signal/noise while performing Echo Repeat, for increased realism.

## Technical data:

### STM (standard edition):

#### Frequency range and Source levels @ 24Vdc power supply

- Main frequency range: 3 – 50 kHz
- 7 – 45 kHz: 177 ± 3 dB re 1µPa@1m, with peaks ≥ 180 dB re 1µPa@1m
- 5 – 50 kHz: 166 ± 3 dB re 1µPa@1m
- 4 kHz: 163 ± 3 dB re 1µPa@1m
- 3 kHz: 155 ± 3 dB re 1µPa@1m
- Higher output source levels may be achieved by using higher supply voltage

#### Target functionality

- Pulse length: 10 ms – 15 s
- Pulse delay: < 40 ms – 60 s
- Doppler: ± 90 kts
- Compatible waveforms: Any (CW, LFM, HFM, etc.)
- Target characteristics: Highly flexible, 10+ highlights
- Noise/signal generation: Playback of any wave file, flexible signal/noise generator

#### Signal processing

- Powerful DSP (real-time Digital Signal Processor)
- Digital filter settings
- Digital hydrophone
- High sampling speed and resolution
- Many interfaces for communication and data storage
- Linux OS
- Highly customizable for adding new functionality and customer driven adaptations

#### Power requirements

- Minimum 24 VDC power supply. Higher voltage is better with respect to output source levels
- Peak power and consumption depend on configuration and duty cycle. Please consult Scanmatic

#### Size

- Fits within an 8-inch AUV
- Weight of Scanmatic delivered components: approx. 3 kg
  - Housing module typically provided by AUV manufacturer

#### Operational depth

- 2000 m, AUV depended

### STM – LF (low frequency edition):

#### Frequency range and Source levels @ 24Vdc power supply

- Main frequency range: 900 – 20 kHz
  - Different frequency range available on request (e.g. < 500 Hz, depending on AUV size)
- Power output > 170 dB re 1µPa@1m over the entire main frequency range, with peaks ≥180 dB re 1µPa@1m
- Higher output source levels may be achieved by using higher supply voltage

#### Target functionality

- Same as standard version
- Combined active and passive mode (Echo Repeater while simultaneous transmitting signal/noise)
- Aspect angle dependent highlights
  - Direction of incoming sonar pulse found by use of two hydrophones on AUV

#### Signal processing

- Same as standard version
- Possibility of broad band signal transmission, with up to 8 simultaneous transducer channels with separate filters for frequency adaptations

#### Power requirements

- Minimum 24 VDC power supply. Higher voltage is better with respect to output source levels
- Peak power and consumption depend on configuration and duty cycle. Please consult Scanmatic

#### Size

- Fits within a 12-inch AUV
- Weight of Scanmatic delivered components: approx. 15 kg
  - Housing module typically provided by AUV manufacturer

#### Operational depth

- 10 - 400 m (May be increased for other frequency configurations)

#### Other

- Export restrictions applies. Please consult Scanmatic.
- Custom versions with e.g. lower or higher frequencies are offered on request