EM Technical Note

Advanced Filters and Gains for EM 2040, EM 710, EM 302 and EM 122

KONGSBERG

EM Feature Explanation

## The what, the why, the how of EM Filters and Gains (Advanced)

This document is a continuation to the basic filters and gains addressed in a different EM Technical Note. There are many components that can affect or alter bottom detections in a multibeam echo sounder. Some of them are easier to remove than others. For instance, air bubbles close to the transducer and frequency interference are among the most difficult noise sources that a surveyor can encouter during a hydrographic survey. Kongsberg SIS software also provides an additional mammal protection function to help attenuate the impact of acoustic power to marine mammals.

Where are the Advanced EM Filtering options in SIS?

The **Filtering** function is located in *Filter and Gains* tab of the *Runtime Parameters* window in the *Kongsberg SIS* software.

The recommended 'advanced filters' settings are:
- **Slope**: On
- **Aeration**: Off
- **Sector Tracking**: On
- **Interference**: Off

Runtime Parameters > Filters and Gains
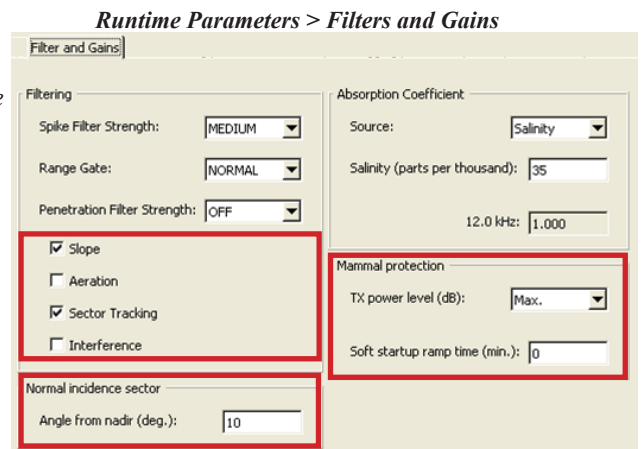

How it is done during multibeam data acquisition?

The bottom detection is performed in two passes in each ping. Filtering is performed after every pass.
- The first pass is done on all beams individually.
- The second pass is done only on beams which lack valid detection. However, the system then uses relaxed acceptance criteria within range windows derived from neighbouring beams with accepted detection.

It is always beneficial to eliminate erroneous measurements before post processing. In addition, if a false detection in a beam is eliminated in the first pass, a valid detection may be acquired in the second pass.

All the advanced filters are explained below.

Slope Filter
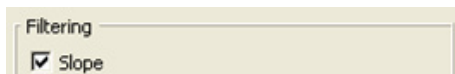
With this filter enabled, the system checks for bottom slopes that tilt inwards. These slant towards the vessel, and they are removed because the filter requires that the athwartships distance increases for every beam from the centre. Such detections are normally false, and after removal a new bottom detection is performed searching for a value with increased range. The slope filter should normally be enabled.

Drawing for Slope Filter

Advanced Filters and Gains for EM 2040, EM 710, EM 302 and EM 122
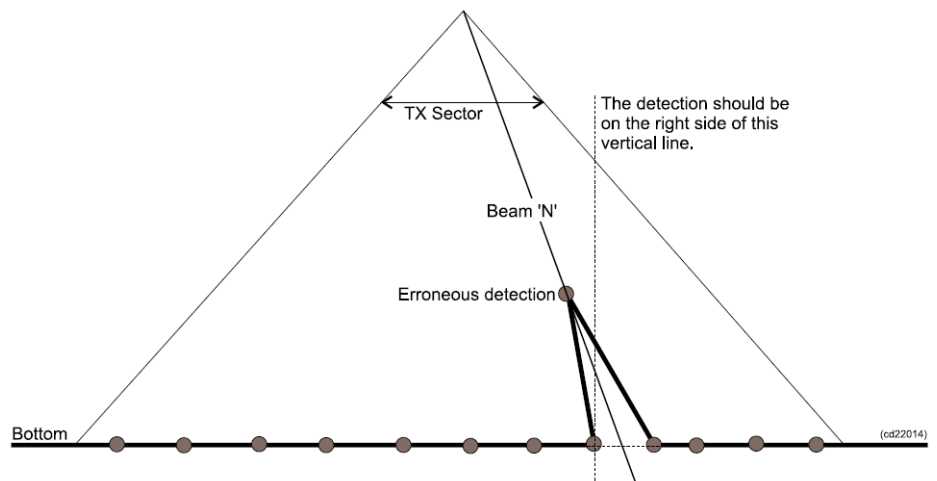
Aeration

If the transducer installation suffers from air bubbles close to the transducer, the system may have problems with bottom tracking. Activating this filter will force the system to keep tracking the same depth for a longer period. If you have aeration problems in areas with relatively constant depths, this filter will increase the performance of the system. However, if the bottom depth varies considerably, the filter may have an adverse effect. When enabled, the systems put more emphasis on previous pings when tracking the bottom. May improve performance and make the system more stable in conditions were air sweep downs frequently block the acoustic signal to/from the transducers

Sector Tracking

The transmitter operates with several pulses within each ping. Each pulse covers different sectors of the total swath. This setting will turn on an automatic gain compensation to avoid amplitude offsets between these sectors.

During normal operations, the Sector Tracking should be on.

However, if the survey specifications demand a fully calibrated system for sidescan image, this function should be turned off. This setting does not affect the depth measurements, only the backscatter strengths

Interference

If the vessel is equipped with other echo sounders or sonars operating on frequencies close to the echo sounder, you may experience interference.

The best solution is to synchronize the operation of the different systems. If synchronization is not possible, this filter may reduce interference problems. Tries to identify and remove interference from the data. Useful under noisy conditions (acoustic noise generated by waves, propeller, other acoustic systems etc.).

For best syncronization results between different sonars it is reccommended the use of a K-SYNC unit.

Normal Incidence Sector
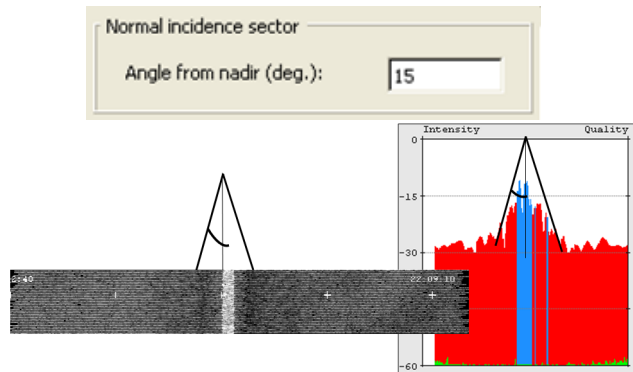
Angle from nadir [degrees]: Defines the angle at which the bottom backscatter can be assumed to not be affected by the strong reflections at normal incidence.
For seabed imaging, this angle may be adjusted to obtain a minimum of angle-dependent amplitude variations. (Light or dark stripes along the nadir beams.) The problem is that the optimum crossover angle varies with the bottom type, and may change within an area.
The bottom backscatter strengths in the beam intensity display are not affected by this setting.

Function for Mammal Protection

This functionality is implemented to reduce TX power level, as well as a delay period in which the output power level gradually will be increase from zero up to set maximum level.

TX power level (dB): Choose from 0 dB, -10 dB and -20 dB. Soft startup ramp time (min): This is a delay function, starting the transmission with low output power level, and increasing to max in a selected time (in minutes).

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