



Subject: BroadBand™ ADCP Advantages

RDI's ADCPs use patented BroadBand™ technology. Broadband signaling is found everywhere in our daily lives: high-speed internet access, cable TV, FM stereo radio, 3G cell telephones, GPS positioning, and CD music recordings. Compared with older methods, these devices have significant advantages like better quality, clearer reception, and faster results. These advantages reflect improved performance that is due to broadband signaling providing **more information**. In this note, we consider the advantages available to users of RDI's BroadBand ADCPs that come from **broadband signaling**.

Quality Results

How does broader bandwidth signaling produce better quality results? Bandwidth is synonymous with sampling rate. So the signal bandwidth determines how many samples are taken per depth cell by a single acoustic transmission (*ping*).

Measuring more independent samples translates into more information per depth cell that creates a better data set. **More information** provides a better basis and more confidence for drawing conclusions and making important decisions.

BroadBand ADCPs make more measurements in the same depth interval or in the same distance along the path being traveled by a vehicle. How do these improved BroadBand ADCP data sets help you?

- ✓ *Sharper data quality:* You obtain better certainty of the measurement because the signal is clearer.
- ✓ *Better resolution in time or along the boat's path:* You don't have to wait as long to see the signal, so your time series or boat path have better definition
- ✓ *Better vertical resolution in velocity profile:* You can see more structure in how currents vary top-to-bottom, enabling more accurate estimates of shear

Better Performance

The improved informational content of the BroadBand ADCP signals can be used to suppress significantly the random noise in the velocity data.

Consider a velocity profile having an arbitrary yet specified cell size, data noise, and averaging time. Compared with alternative methods, BroadBand ADCPs permit

- ✓ *Longer measurement range:* low noise BroadBand data permits using lower frequency signals yet still achieve the required profile characteristics
- ✓ *Longer deployment duration:* low noise BroadBand data consumes less energy to achieve the required profile characteristics so deployments can last longer

New Applications

Considering applications, what else does the lower noise in BroadBand ADCP data enable?

- ✓ *New measurement capabilities,* such as the ADCP Wave Array, a high-resolution directional wave array.
- ✓ *Expanded operational range,* such as measuring sites with shallower depths

Superior Surveys

For making spatial surveys, how does BroadBand ADCP improve reliability of the results?

- ✓ Less bias in measurements of vehicle motion ... due to superior bottom tracking
- ✓ More definition in measurement record during high speed surveys--along boat path and through the water column
- ✓ Submerged vehicles can operate closer to the sea-bed ... due to superior bottom tracking
- ✓ Measure more of the water column and closer to boundaries ... due to smaller depth cells

Other Advantages

- ✓ Measurement noise can be controlled independently of averaging (either in time or in the vertical)
- ✓ Smaller bias arises in water velocity and bottom tracking measurements
- ✓ More effective data screening is possible because scatter of data is less; permits detection of smaller biases.

Patented Technology

In recent years, other manufacturers have entered the market but are prohibited by patent protection from offering BroadBand ADCP technology. As a result, they try to emulate some of the advantages of RDI's method. Unfortunately, these choices cannot be made without degrading the accuracy of other aspects of the complete measurement—notably operating at higher frequency to control noise in the data increases the susceptibility to bias in bottom tracking (see *Caveats* in Bottom Tracking Tip).