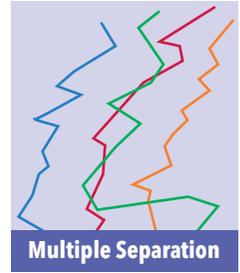
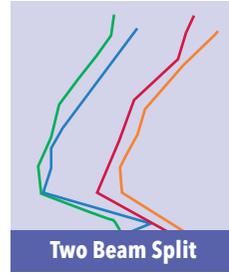
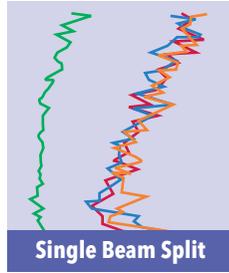
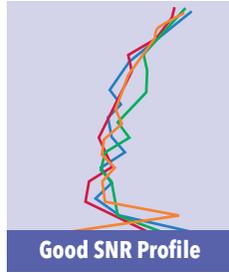


BEAM SEPARATION in ADPs and ADCPs



► Various examples of beam separation including one example of good beam SNR. (For illustration only.)



Brittany Jenner, Application Engineer at SonTek, a Xylem brand

WHAT IS BEAM SEPARATION?

Monostatic acoustic transducers used on acoustic Doppler current profilers (ADPs or ADCPs) are used in pairs and groups to resolve multi-directional water velocity and sometimes track position. It is critical that the acoustic signal from these groups of beams show the same acoustic decay at the same decibel (dB) level.

Beam separation is defined by the difference in dB among the beams, **if any one beam differs by more than 10 dB, this beam is considered to be separated** from the others.

OK, WHAT'S THE BIG DEAL?

If multiple transducers are being used, won't the others resolve velocity and track position? This is a valid question and in certain circumstances, this may be true.

However, for moving boat or discharge applications, where water velocity in 3D must be computed along with position, it is essential that all beams are functioning properly and profiling under similar conditions. Each beam of an ADP is used to compute one component of 3D velocity.

When one beam is malfunctioning or separating, this will directly impact the velocity and possibly position data, and thus discharge.

WHAT CAN YOU DO TO IDENTIFY, TEST, AND RESOLVE BEAM SEPARATION?

Beam separation will directly impact the accuracy of an ADP's calculated velocity and position data. No post-processing steps will correct beam separation. For this reason, **it is crucial that operators can identify and work to correct beam separation in the field during data collection.**

Identifying beam separation is easy and has been made even easier by the addition of real-time QC alerts in recent software updates. Beam separation can be seen in the SNR (Signal to Noise Ratio) profile. **Some site conditions that cause beam separation are:**

- High flows in shallow, mountain streams where turbulent water causes excessive tilt
- Boat mounted applications where the wake may cause cavitation around the ADP
- Measuring from a bridge, cableway, etc. that causes an angle on the line, pulling the bow up and exposing transducer(s)
- Debris or surface plumes moving downstream that block the acoustic beams

To test for beam separation, follow these steps:

Stop or complete the measurement by finishing a transect or the averaging period for that station:

- If one or more beams were intermittently displaying separation, lower the ADP further into the water.
- If the separation persists or is consistently seen on one (or more) beams, rotate the ADP 90 - 180 degrees.

Proceed with the next measurement step while watching the SNR profile. If a different beam separates, try the following:

- Place the ADP further below the surface or wipe the beams with your hand or cloth.
- Check the tilt values if working from a bridge, cableway, etc., a counter-weight on the towline can help lower the bow.

If the same beam is separated, then your instrument will require service. Please contact SonTek Technical Support for instructions.

Make sure to document any new position or rotate the ADP back to its original configuration, if proceeding with the measurement.



Contact the SonTek technical team: support@sontek.com
For customer support services: SonTek.com/Total-Care