Thoughts on Lobes Program

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You are correct in using the EBA from the transducer sheet. But I think you can still use Lobe as usual even if the angle sensitivity is "wrong". The main function of Lobe is to compensate TS measurements for the beam pattern. If the angle sensitivity is wrong it will mean that the pysical location of the target will be wrong but the position on the beam pattern function will be correct.

Let us take as an example that we have a target physically located at 10 deg and that the 3 dB point for the beam pattern is physically at 10 deg. If we use Lobe to determine the beam pattern it will measure the target to be e.g. at 9 deg due to the inaccurate angle sensitivity but it will still find that the beam pattern is 3 dB down at this angle. When you then measure a target after calibration which is physically located at 10 deg it will again measure it to be at 9 deg but still compensate the correct 3 dB.

Thus I think the only implication is that the information on the physical location of the target may be inaccurate but the compensation will be correct.

This also means that I think you should also use the offset angles from Lobe. I am sorry if I have been unable to express it clearly but I will get back to this when I return from travel.

With Regards
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This is an interesting long running problem! I think I have been through this with five or six people and at least once publicly at the FAST WG. Jeff Condiotty has a good memory – nice guy. At that occasion I obtained agreement from the Simrad representative present that my view was correct.

IN MY OPION

It is not correct to use measurements from the 'lobe program' using EK500 (and I make the bold assumption the EK60) to estimate either beam width or equivalent beam angle. I am convinced you need an independent measure of physical angle as well. The only thing that lobe can do is to indicate if the angle measurements and the equivalent beam angle are incompatible.
The sounder is set up with an input parameter for mechanical angle that is used to tell the sounder how to interpret phase as an angle, and then to give the operator the off axis angle where the sounder thinks the target is located. In addition the sounder also has a parameter for the equivalent beam angle value which is set on the menue.

I will try to explain what the problem is. I will be a bit pedantic to try to take you through this. Imagine the transducer has an 8 degree beam (between 3dB points). The split beam sounder receives echoes on 4 quadrants. These 4 signals are combined in pairs to give 4 new signals with differing amplitude and phase that can be used in pairs to estimate the along and athwart ship angle of the single target (one pair of signals for each angle). Often the amplitude of each signal in a pair will be similar but the phases will be different. If the target is on the axis all the phases and all the amplitudes will be the same. The off axis angle given by the sounder will be zero. The integrator output from the combination of all 4 signals is a maximum

Now adjust the target off axis (but remember you do not measure the angle independently of the sounder) As the target moves off on one axis the pair of signals affected will change. The phase difference increases and the amplitude goes down a little. As the target reaches the 3dB point on the beam the phase between the signals is now $\pi/2$ (a quarter wave). The sounder integrator output is down by 3dB, the angle off axis is reported by the sounder as 4 degrees. The sounder gets the 4 degrees from the phase on the signal ($\pi/2$) using the mechanical angle scaling you have given the sounder. You use lobe and it measures signal 3dB down at 4 degrees. It calculates the beam width and says you have an 8 degree beam. You are happy.

Imagine now that somebody replaces your transducer with one half the size! (and twice as efficient to really fool you). You do your measurements again. On axis all signals in phase and you get a maximum value
Now adjust the target off axis (but remember you do not measure the angle independently of the sounder so you just move it) As the target moves off on one axis the pair of signals affected will change. The phase difference increases and the amplitude goes down a little. As the target reaches the 3dB point on the beam (the wider beam) the phase between the signals is again $\pi/2$ (a quarter wave). The sounder integrator output is down by 3dB, the angle off axis is reported by the sounder as 4 degrees. The sounder again gets the value of 4 degrees from the phase on the

signal ($\pi/2$) using the mechanical angle scaling you have given the sounder (you did not change the sounder setting for the new transducer). You use lobe and it measures signal 3dB down at 4 degrees. It calculates the beam width and says you have an 8 degree beam. You are happy, but you are wrong! OK In reality you might become suspicious of this situation because you would notice the difference in the movement of the ball.

The same problem would be occur if you had only 5% error in beam angle cause by changing transducer performance, or say 2 – 3% due to water temperature. Only this time you would never suspect it.

The problem is that there is no independent measure of angle against phase. Phase between the sections of the transducer is used explicitly to obtain angles and implicitly to form the main lobe of the beam. But the same phase is used for both, they are not independant. To check beam angles you need another independent measure of angle. Lobe does not have this independent measure of angle. Thus lobe can only tell you of inconsistency between sounder setting it cannot tell you of the real angles.