



Application Note

Features Pack 2 Pipe survey comparison using FlexMode

July 2011

Version 1.3

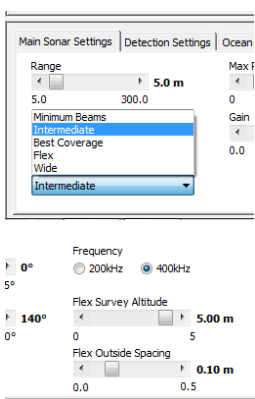
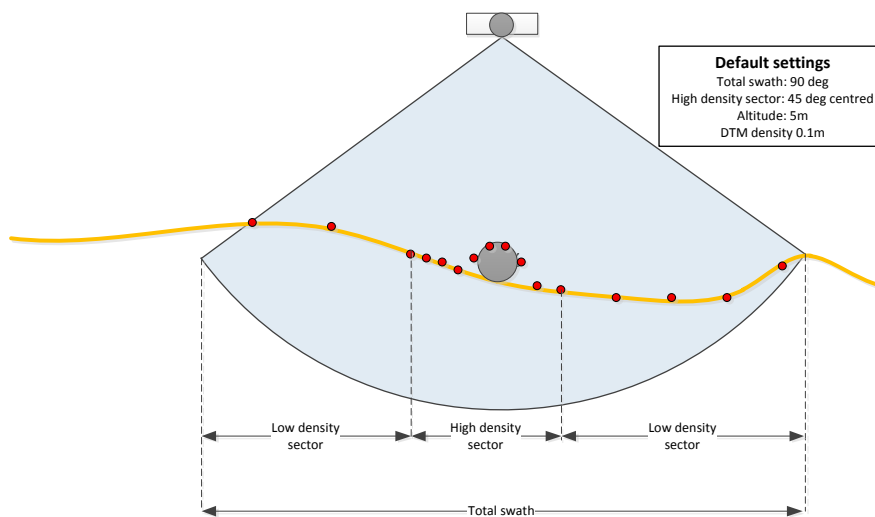


Introduction

FlexMode is a special operating selection in Features Pack 2 applicable to 7125 SV2, 7125-ROV2, 8125 hybrid and 7101 systems. Features Pack 2 brings a wide range of new features to these systems and FlexMode is an optional extra designed especially for pipeline and small object detection & inspection operations.

FlexMode description

FlexMode is a combination of equi-distant and equi-angle beam distribution optimised for pipeline work. A user-defined equi-distant set of soundings is generated across the swath and then all available beams are concentrated into a narrow equi-angle sector which may be steered to follow the pipe.



FlexMode is selected directly from the user interface and does not require a system restart. Once selected, the operator is provided with additional controls specifically for FlexMode.

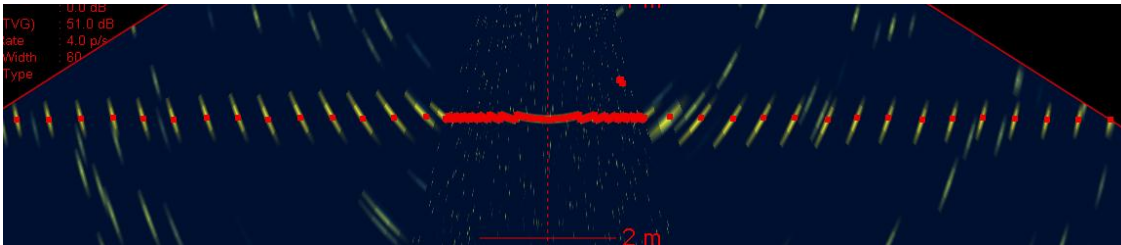
Survey Altitude: The operator defines the sonar altitude above the pipe. This value is presented in metres and is related to the range scale selected.

Outside spacing: This value is used along with the altitude value to calculate the beam distribution for the underlying equi-distant soundings.

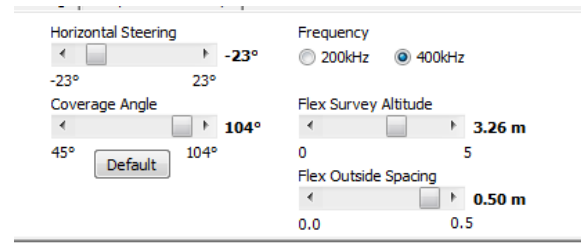
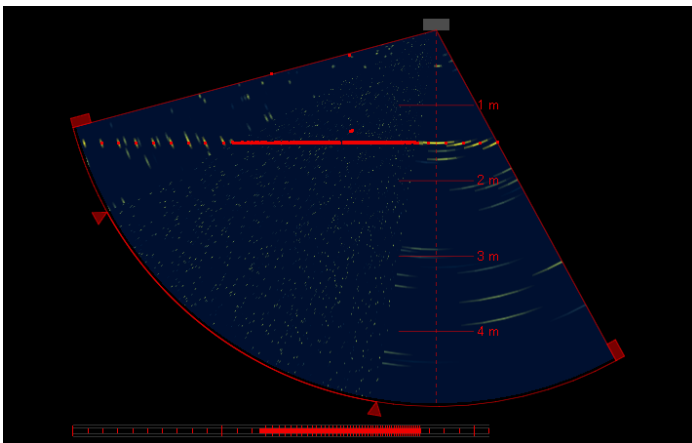


Once these values are selected the beam distribution is configured accordingly.

An example of the underlying equi-distant spacing may be seen below with the high density Equi-angle sector in the centre.



The operator may also select the overall sector size (angle), the high density sector size and also steering using either the slider bars or directly by using grippers on the wedge display.

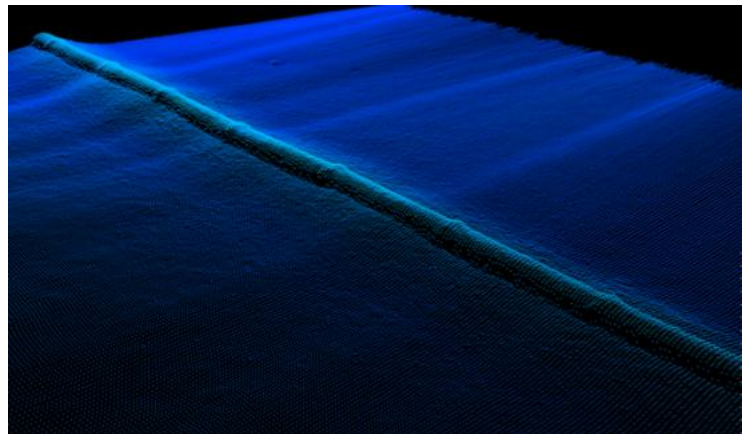
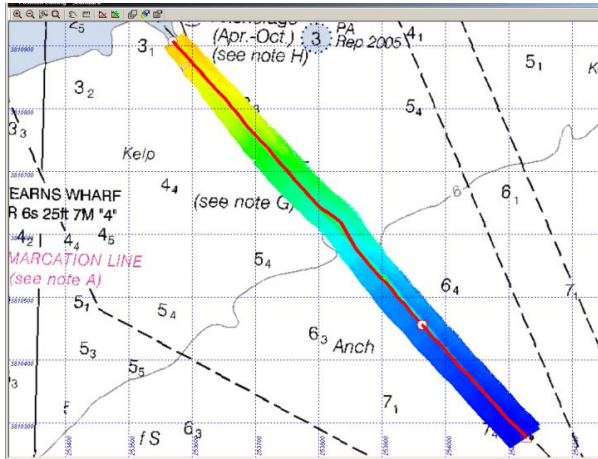


Wedge angle, steering and FlexMode parameters may be changed at any time without interrupting data collection.



Data examples

The following data was collected over a concrete 48" (1.2m) diameter pipe running offshore Santa Barbara for a distance of approximately 850m. Water depth varies between 5m & 22m. The pipe is built on a rock berm approximately 0.8m off mean sea bed and is protected by stone dump for the first 600m or so. Where the pipe is exposed, field joints every 21ft (6.6m) are clearly visible.



A series of surveys were carried out using a 7125-SV2 400 kHz multibeam echosounder running Features Pack 2 software, PDS2000 data acquisition and processing software. A POS MV 320 was used for attitude and position, data was post-processed in POSPAC before being imported into PDS2000. Sound velocity was recorded using a SVP70/SVP-14. Surveys were conducted from a 30ft aluminium survey vessel, Minotaur.





New beam modes have been introduced with FP2 replacing the old Equi-angle/equi-distant selections. These are:

Minimum beams

This mode replaces the equi-angle mode. 240 equi-angle beams are formed (140 in 200 kHz) to cover the 140° sector

Intermediate

This mode is a mix of Equi-angle and equi-distant and should be used for general purpose survey operations. 320 beams are used in 200 kHz and 512 at 400 kHz

Best coverage

In this mode, 512 equi-distant beams are formed to cover the sector.

Wide

In wide mode 512 Equi-angle beams are formed and the maximum sector is increased from 140° to 165°

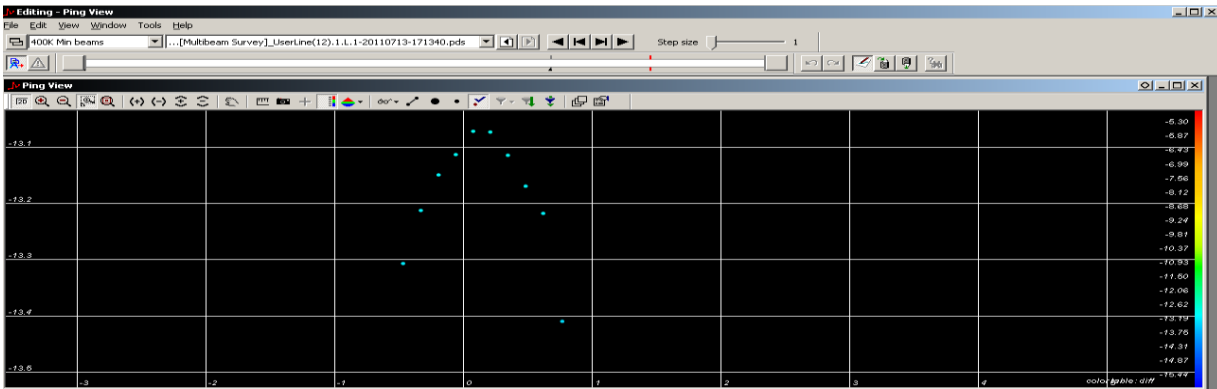
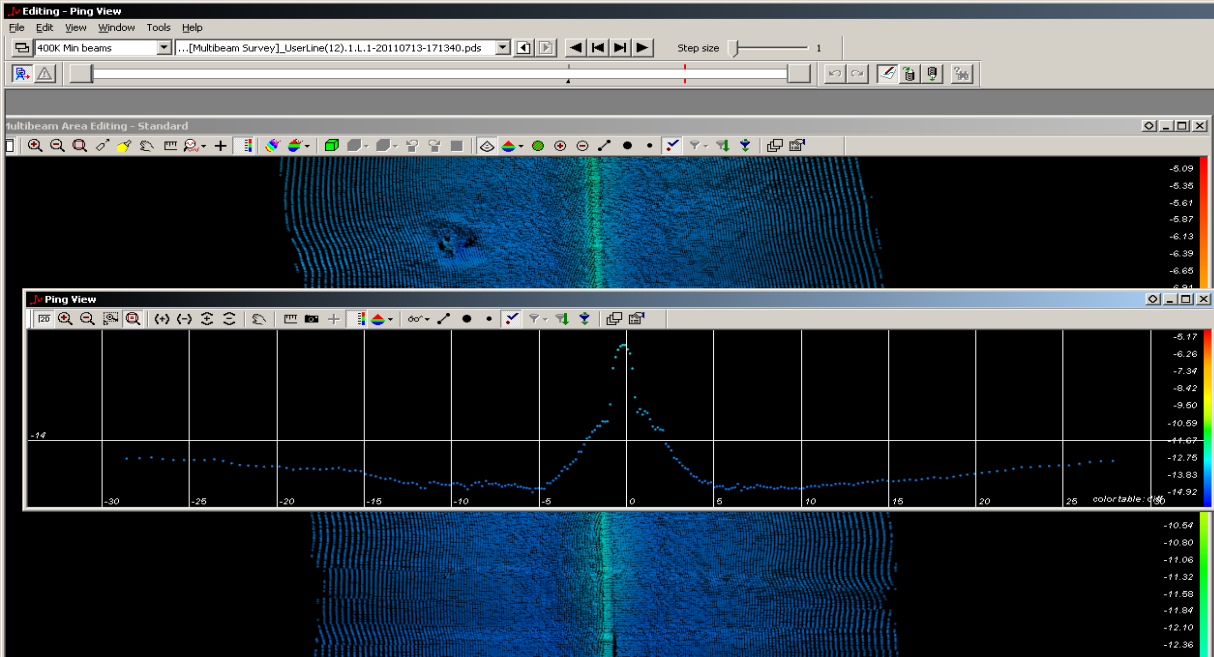
FlexMode

FlexMode is optimised for pipe inspection operations. An operator configurable centre sector is formed using very high density equi-angle beams and an underlying set of equi-distant beams provides coverage across the entire sector.



Minimum beam mode

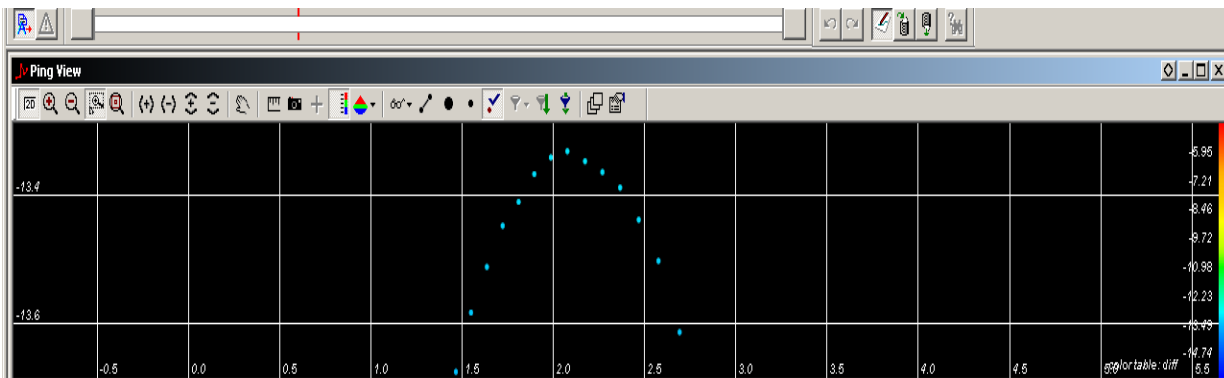
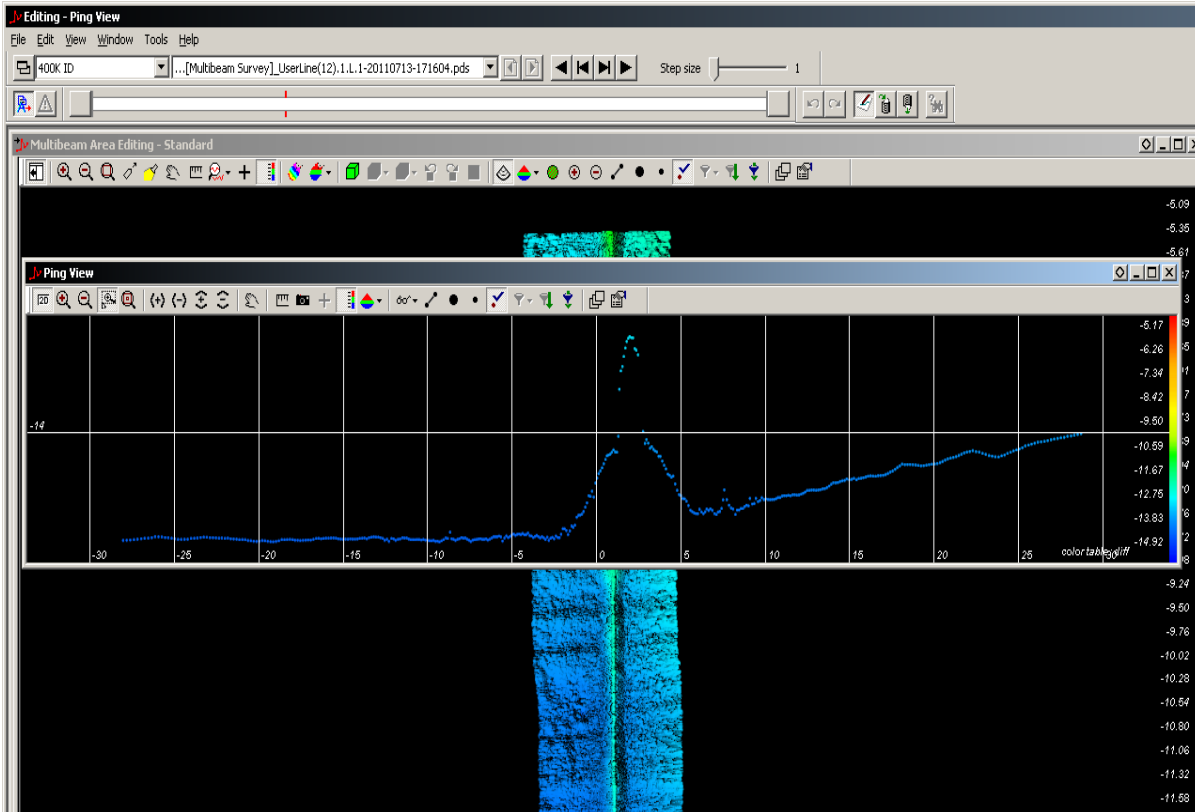
The first data example is using 400 KHz and minimum beam mode, producing 240 beams. The data density is such that approximately 9 hits are achieved on the pipe





Intermediate mode

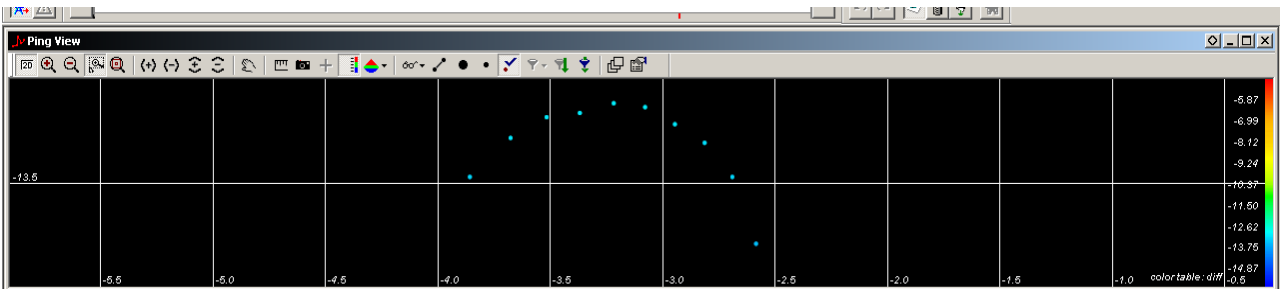
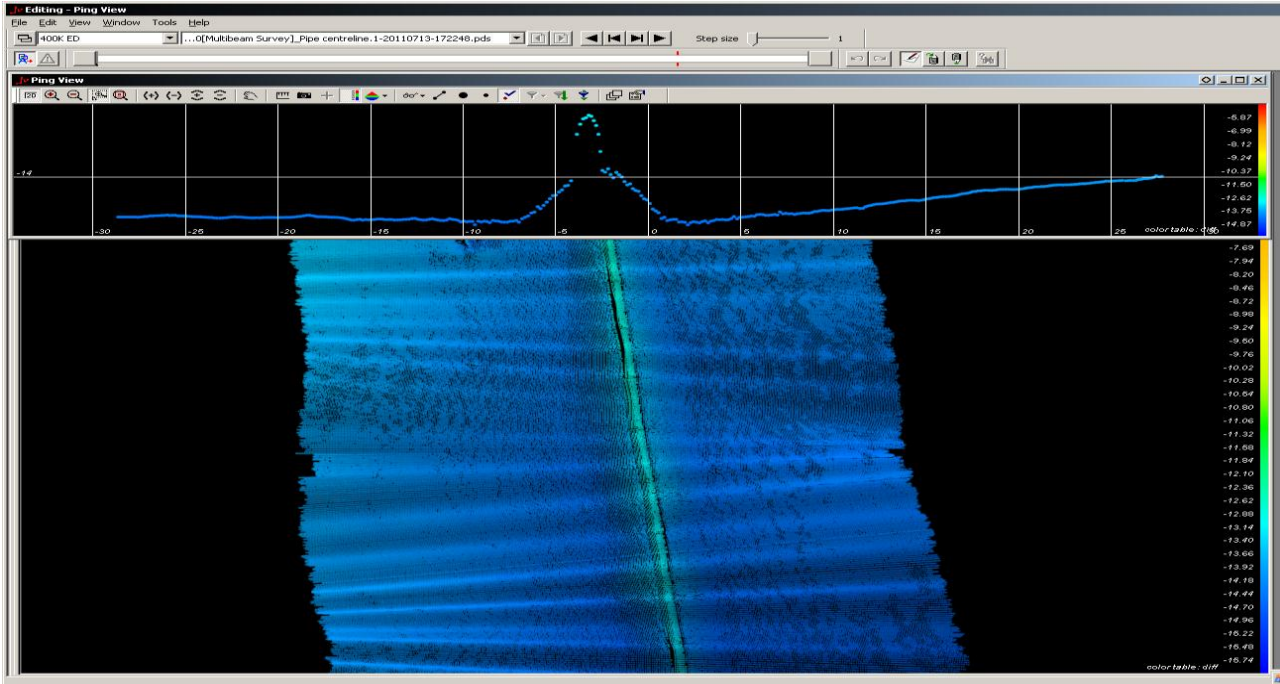
The second line uses Intermediate mode which generates 512 beams in a pattern between Equi-angle and Equi-distant. In this mode, around 10 hits are placed on the pipe





Best Coverage mode

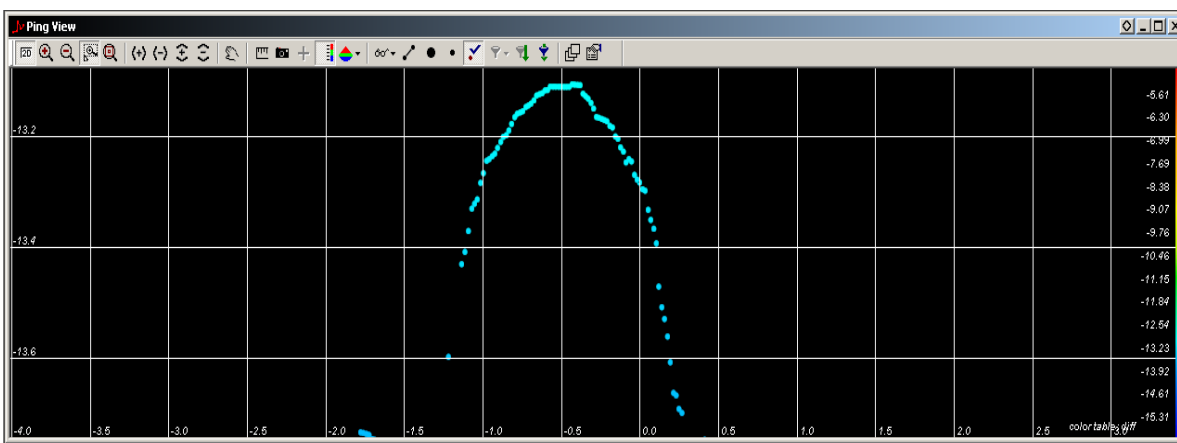
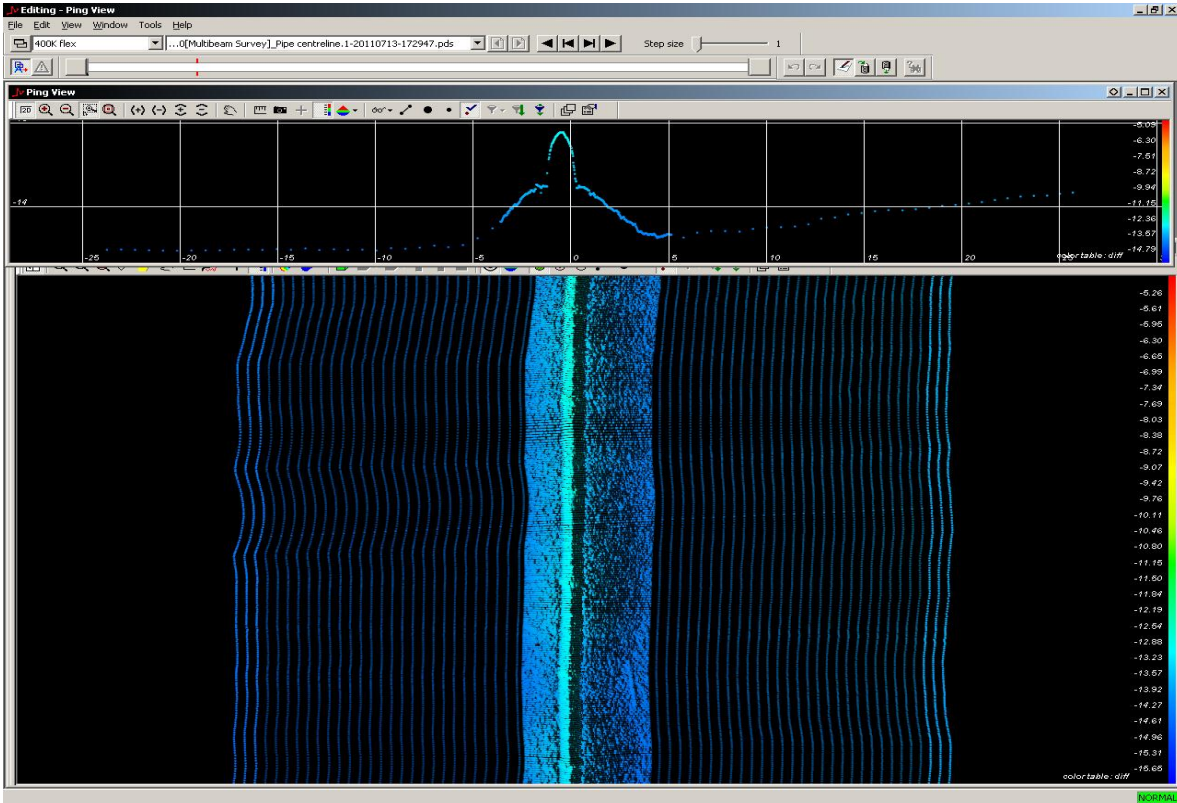
Best coverage mode creates 512 beams equally spaced and in this mode we see around 10 hits on the pipe but notice the increased density right across the swath.





FlexMode

FlexMode is intended specifically for pipe survey operations and here we see extremely high density in the centre section and lower, equal distant soundings over the remainder of the swath. In this mode approximately 100 hits are placed on the pipe.





Conclusion

FlexMode provides an extremely high sounding density over an operator defined area and underlying wide coverage using equi-distant soundings.

The operator is able to define the following parameters:

- Overall sector width & steering angle
- High density sector width & steering angle
- Equi-distant sounding spacing

This mode provides the highest possible density to aid in detection & tracking of small diameter pipes.