# Purpose

## Facilitate identification of acoustic signals clashing hazard involved with LBL operation using array of multiple beacons in a CIF mode.

# OBJECTIVE

#### Provide guidance to the DP operator during the array preparation stage. Allow identification of possible clashing situations and provide a tool to mitigate the hazard. During the operation using LBL system in CIF (Common Interrogation Frequency) mode vessel’s hydroacoustic unit is sending and interrogation signal to all beacons at the same time. Beacons after receiving the interrogation signal will reply on their own IRF (Individual Reply Frequency). In this way, provided that replies at the vessel’s unit do not conflict in time, the transceiver can analyse multiple replies individually and without any ambiguity. As the travel time of the signal is a function of slant range and sound velocity in the water there is a possibility that the signal from two beacons will arrive at the vessel’s unit at the same time causing interference (signals clashing). o resolve that problem user can set a TAT (Turn-Around-Time) for each beacon. In simple words TAT is an amount of time that beacon will wait after receiving the interrogation signal before it send a reply signal.

# application

## This procedure applies to all Dynamically Positioned rigs equipped with LBL systems using CIF.

# Reference

## TATs Verification Report.

# Process

## On application start Main Window, opens as below.

## There are two paths to be followed upon start:

## When starting a new calculation / new well, manually fill all data;

## - To get the “Beacon’s Details” grid filled by a template, click “12xx” or “14xx” Radio Button (all data, including “Id” may then be filled/changed manually in the grid);

## Load data from \*.csv file – it is possible to save user’s work after the array is created into a \*.csv file which can be loaded in the future if any changes occur or adjustments are required.

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## When all required field are filled, click “Calculate”

## Application will then calculate values of Slant Range and Horizontal Distance for each beacon in use;

## The application will also create a graphic showing the relative horizontal distribution of the beacon’s array in relation to the vessel in both, Wellhead position and Safe Handling Zone position;

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## After initial calculation user can visually inspect the array and get a basic overview of the beacon’s layout.

## Next step is to verify if the TATs selected by the user are valid and will not create interference (clashing) between beacons. To do that click “Verify TATs” button.

## Application will now calculate travel time for each beacon for WH and SHZ position and compare it with other beacon’s TATs. If the time difference between any two beacons signals is smaller than 125 ms, “NOT OK” message will be shown on the “TAT Verification Grid. From the example below user can see that in SHZ position, BOP and 1401 beacon will have their travel times “closer” to each other than 125 ms. That situation may cause interference therefore signals from those two beacons may not be robust.

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## There is an additional help in “Verification Graph” tab that shows the situation graphically. The color lines shows how the travel times are changing while the vessel is moving between SHZ and WH positions. User can see that the lines are closer than 125 ms from each other.

## There is one more information that can be taken from the graph that is missing on the previous grid. User can see that the 1402 and BOP lines are crossing more or less in the half way between SHZ and WH. That means that at that point signals from both beacons will arrive at the vessel’s unit at the same time and will cause disturbance in LBL positioning quality.

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