Instructions for Kongsberg EM Multibeam Echosounder TX Channels Testing (SIS 4)

Multibeam Advisory Committee

2021 Jan 28

Warning

This procedure involves a telnet session into the TRU and, given the potential consequences in that environment, should be performed only by experienced operators of Kongsberg systems. The procedure below includes exporting the PU Parameters file ahead of the telnet session for restoration if necessary.

Purpose

Poor transmitter performance reduces the signal-to-noise ratio for seafloor soundings and water column data, limits swath width, and can significantly compromise mapping data quality in all sea states. Changes in performance may not be readily noticed during survey operations from year to year because of the typically slow pace of degradation, but may have serious net impacts on the resulting data products.

The general health of a Kongsberg multibeam transmitter can be monitored with a Built-In Self-Test (BIST) to measure proxies for impedance for each of the many individual elements (or 'channels') that make up the array. When monitored routinely (e.g., at least annually), the TX Channels BIST data can warn owners/operators of degrading transmit signal strength and help with planning service visits or replacement.

Multibeam performance assessment tools, including a BIST plotter for tracking TX and RX Channels data over time, are available at http://mac.unols.org/resources/assessment-tools. Detailed reports with TX Channels data from the UNOLS fleet are available on the MAC website at http://mac.unols.org/. Reports for similar testing aboard other vessels (not funded by NSF) are also available for reference.

Note that the TX Channels BIST outlined here is a proxy measurement taken through the transceiver. While this is useful for tracking general trends and identifying failed elements, it is worthwhile to have Kongsberg measure element impedance directly with special tools throughout the service life of the system.

Collect TX Channels BIST (SIS 4)

The routine suite of BISTs run at the start of every survey ('Run All BISTs') includes the TX Channels test but does not record the results in the output file. The steps outlined below will run the TX Channels test and record the results to a text file which can be examined with the BIST Plotter app. High impedance or low voltage is an indicator of element failure, some of which may be due to manufacturing defects and some of which may result from cycling of the elements through normal use.

1. **Ensure TRU is ON**
2. **Open SIS, scan for echosounders, and load the appropriate echosounder**
3. **Ensure pinging is stopped**
4. **Export PU Parameters file**

a. File Export PU Parameters Save to ...\sisdata\common\pu_param
b. Use a consistent file naming strategy including the date or cruise name

5. **Open the command prompt**
   a. Start type 'cmd' and hit ENTER

6. **Type 'telnet –f TX_channels_BIST_[date in YYYYMMDD].txt [TRU IP address]' and hit ENTER**
   a. **Typical TRU IP addresses:**
      i. **EM122 and EM302: 157.237.14.60**
      ii. **EM710: 157.237.2.71**

7. **Type 'bist' and hit ENTER**
   a. Note: disregard any interruptions of 'P40 – update parameter' and keep typing
   b. Next: keep track of which test has been requested/completed

8. **Type '30' (i.e., for TX channels slot 1-5) and hit ENTER**
   a. Do not touch any other keys
   b. Wait for the BIST to finish
   c. Continue only after the BIST menu pops up
   d. **Repeat a. through c. during each of the remaining tests**
   e. **The number of TX Channels tests available in the BIST menu will depend on the number of TX modules; ensure that all tests are run in order**

9. **Type '31' and hit ENTER (i.e., slot 6-10)**

10. **Type '32' and hit ENTER (i.e., slot 11-15)**

11. **Type '33' and hit ENTER (i.e., slot 16-20)**

12. **Type '34' and hit ENTER (i.e., slot 21-24)**

13. **If the BIST menu includes additional TX Channels tests (beyond test number '34' or slot 24), then complete those tests in order, as above, before continuing**

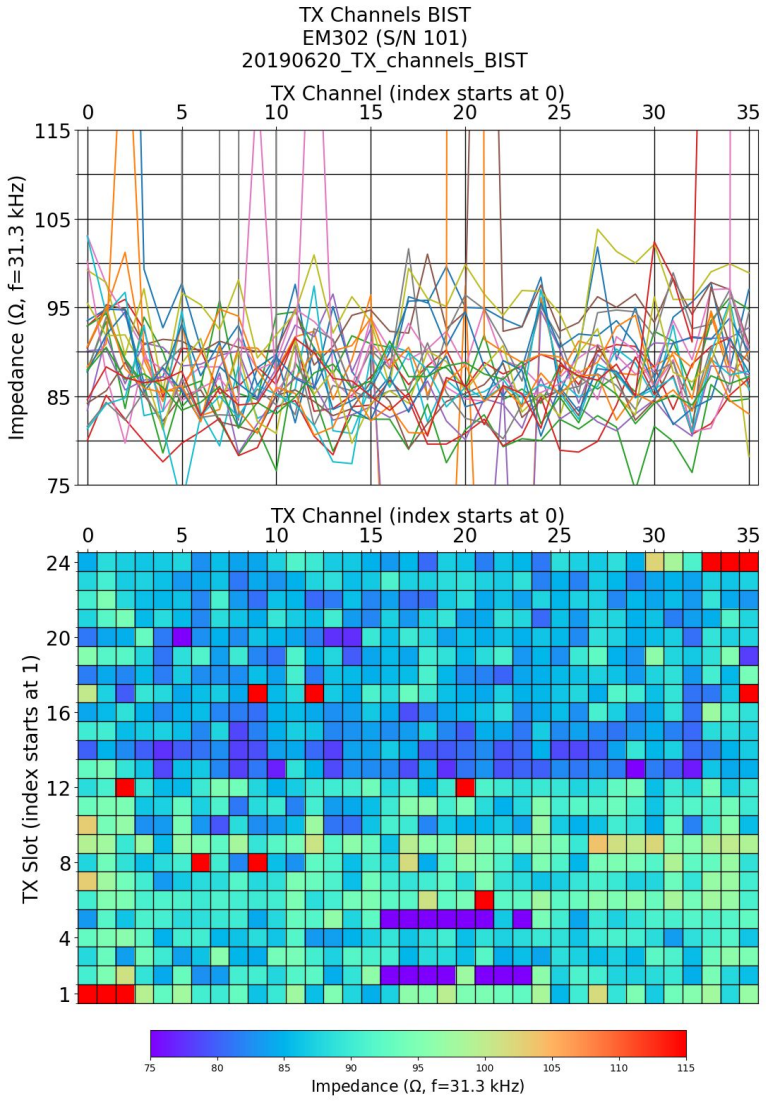
14. **Type '-1' and hit ENTER to quit**

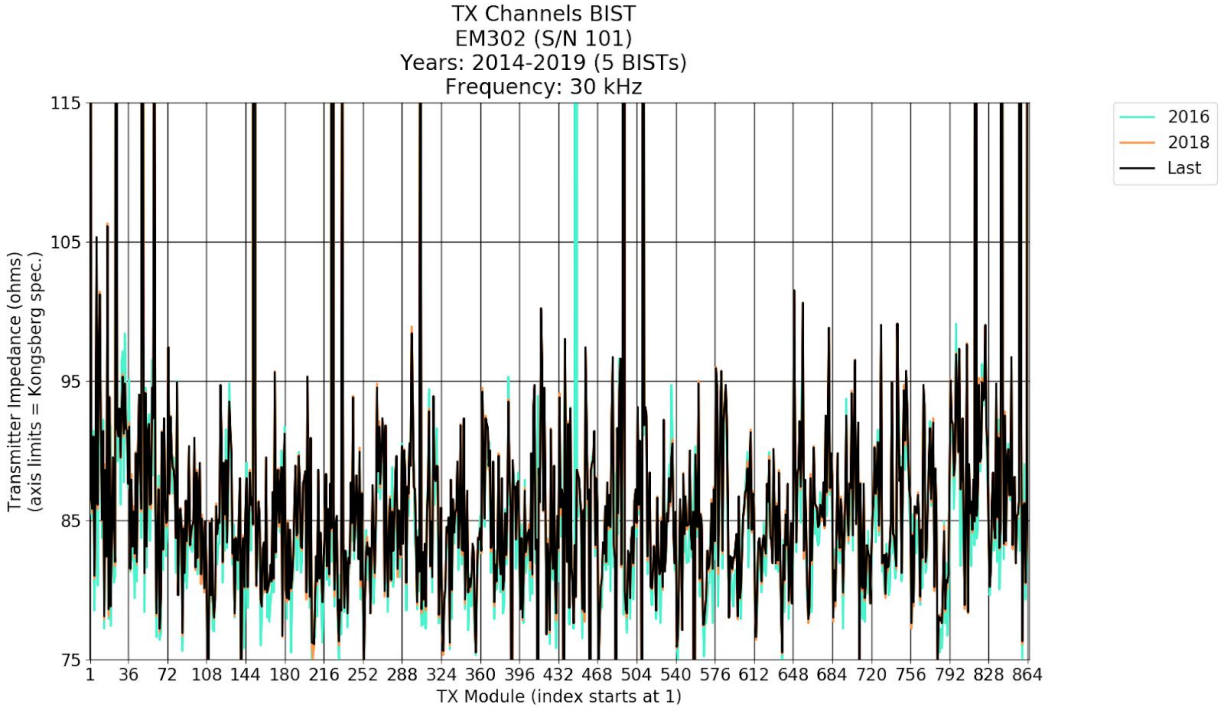
15. **Close the command prompt or type 'exit' and hit ENTER**

16. **Move the output text file from C: to a suitable BIST directory (e.g., *...\sisdata\common\bist)***

Review the BIST Output

The BIST Plotter application available at http://mac.unols.org/resources/assessment-tools can be used to plot this TX Channels BIST as well as a history of any TX Channels data collected previously for this system. Example plots for a single test and history of tests (2014-19) for one system are shown below. These plots illustrate increasing numbers of element failures over time, despite consistent average impedance trends for the 'good' elements. (This TX array was replaced after 11 years in service.)


TX Channels BIST
EM302 (S/N 101)
20190620_TX_channels_BIST
TX Channel (index starts at 0)
Impedance (Ω, f=31.3 kHz)
TX Channel (index starts at 0)
TX Slot (index starts at 1)
Impedance (Ω, f=31.3 kHz)


TX Channels BIST
EM302 (S/N 101)
Years: 2014-2019 (5 BISTs)
Frequency: 30 kHz
2016
2018
Last
Transmitter Impedance (ohms)
(axis limits = Kongsberg spec.)
TX Module (index starts at 1)