Testing for Interference on DVL Systems

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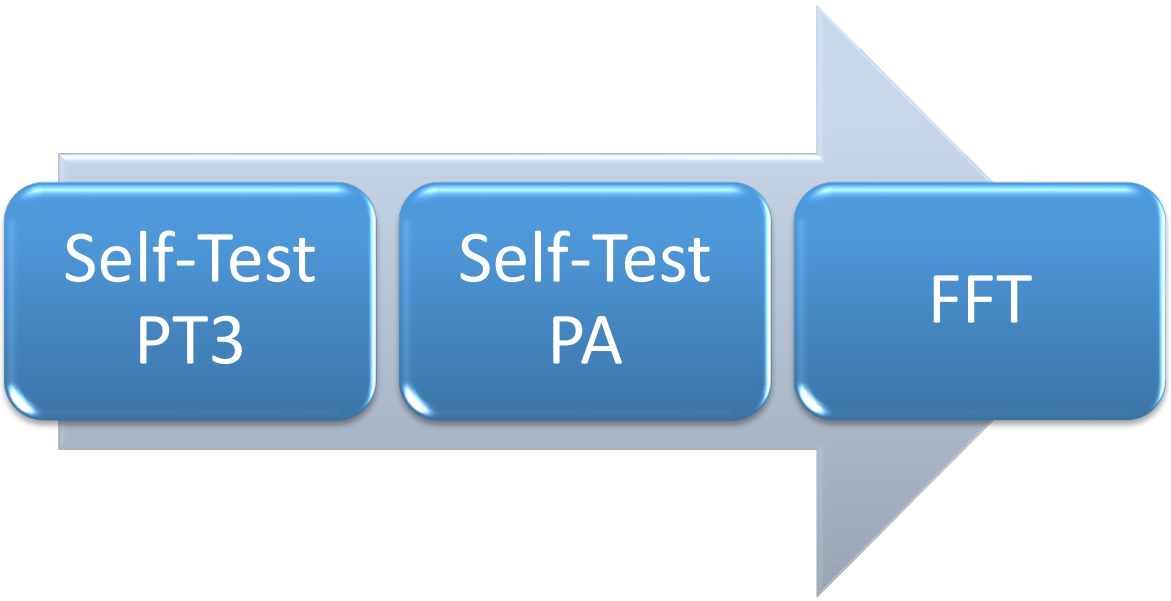


Introduction

Teledyne RD Instruments Doppler systems, Doppler Velocity Log and Doppler current profiler might have reduced performances when receiving an external signal. Interferences can be acoustic or electromagnetic (EMI interferences).

This topic is discussed in the DVL manuals, chapter 2 **Electrical integration considerations** and in the troubleshooting, section **Identifying EMI**.

This document will provide methods and tools to identify and detect EMI. In many cases, interferences come from surrounding instrument power supplies. Testing a DVL instrument on the bench will only verify its operational condition. It is important to test for interferences in environments as close as possible to the deployment conditions. DVL systems are designed to be mounted in a vehicle, and it is necessary to test the DVL on the vehicle with all surrounding instruments switched on.

This document applies to:

- Tasman and Pathfinder systems.
- Pioneer systems but using serial communication only.

For any question regarding to this document or DVL operations, please, contact Teledyne RD Instrument field service: rdifs@teledyne.com or rdiefs@Teledyne.com

System Set Up for EMI Testing

- **Minimum**: instrument face should be submerged in a plastic bucket of water, not touching the bottom or the sides of the bucket and placed close to the vehicle with all its electronic equipment turned on. DVL is using lab power supply.
- **Best**: instrument should be mounted in the vehicle, all vehicle electronic equipment turned on, and in enough water so that the DVL face is covered with water. DVL should be powered from the vehicle.

The PT3 and PA tests may fail in air and if so, are not relevant. Only a failure with the transducer at a minimum in contact with water is a relevant test.

PT3 Self-Test - Serial and Ethernet connections

A complete description of the PT3 test is provided in the DVL manual, Commands chapter, Performance and Testing Commands.

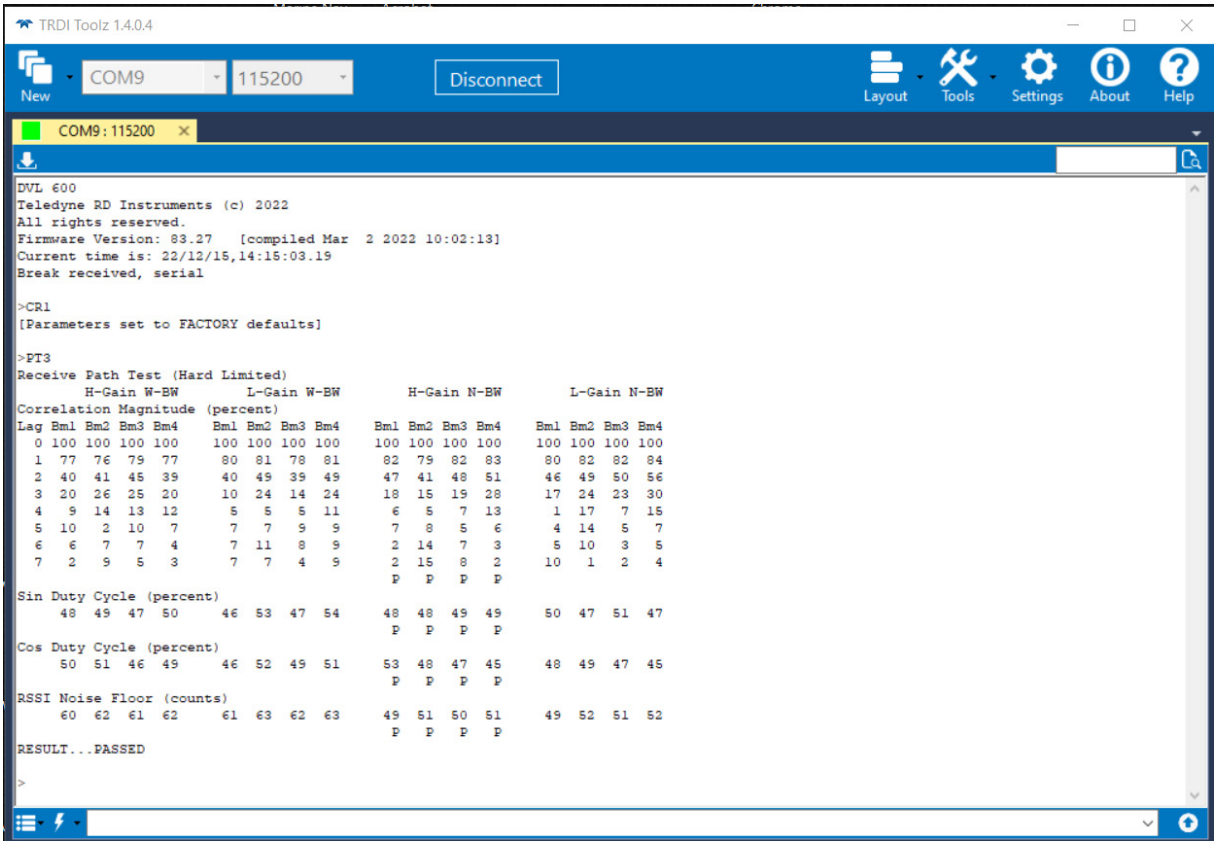
PT3 Serial Communication

Using *TRDI Toolz* or any terminal for serial communication.

Send a break by sending three “=” (===) to establish communications.

CR1 [Enter] to reset the system to factory defaults.

PT3 [Enter] to run the receive test to check for interferences.




```
DVL 600
Teledyne RD Instruments (c) 2022
All rights reserved.
Firmware Version: 83.27   [compiled Mar  2 2022 10:02:13]
Current time is: 22/12/15,14:15:03.19
Break received, serial

>CR1
[Parameters set to FACTORY defaults]

>PT3
Receive Path Test (Hard Limited)
        H-Gain W-BW        L-Gain W-BW        H-Gain N-BW        L-Gain N-BW
Correlation Magnitude (percent)
Lag Bm1 Bm2 Bm3 Bm4    Bm1 Bm2 Bm3 Bm4    Bm1 Bm2 Bm3 Bm4    Bm1 Bm2 Bm3 Bm4
  0 100 100 100 100    100 100 100 100    100 100 100 100    100 100 100 100
  1  77  76  79  77     80  81  78  81     82  79  82  83     80  82  82  84
  2  40  41  45  39     40  49  39  49     47  41  48  51     46  49  50  56
  3  20  26  25  20     10  24  14  24     18  15  19  28     17  24  23  30
  4   9  14  13  12      5   5   5  11      6   5   7  13      1  17   7  15
  5  10   2  10   7      7   7   9   9      7   8   5   6      4  14   5   7
  6   6   7   7   4      7  11   8   9      2  14   7   3      5  10   3   5
  7   2   9   5   3      7   7   4   9      2  15   8   2     10   1   2   4
                                            P   P   P   P
Sin Duty Cycle (percent)
     48  49  47  50     46  53  47  54     48  48  49  49     50  47  51  47
                                            P   P   P   P
Cos Duty Cycle (percent)
     50  51  46  49     46  52  49  51     53  48  47  45     48  49  47  45
                                            P   P   P   P
RSSI Noise Floor (counts)
     60  62  61  62     61  63  62  63     49  51  50  51     49  52  51  52
                                            P   P   P   P
RESULT...PASSED

>
```

Result should be “Passed”

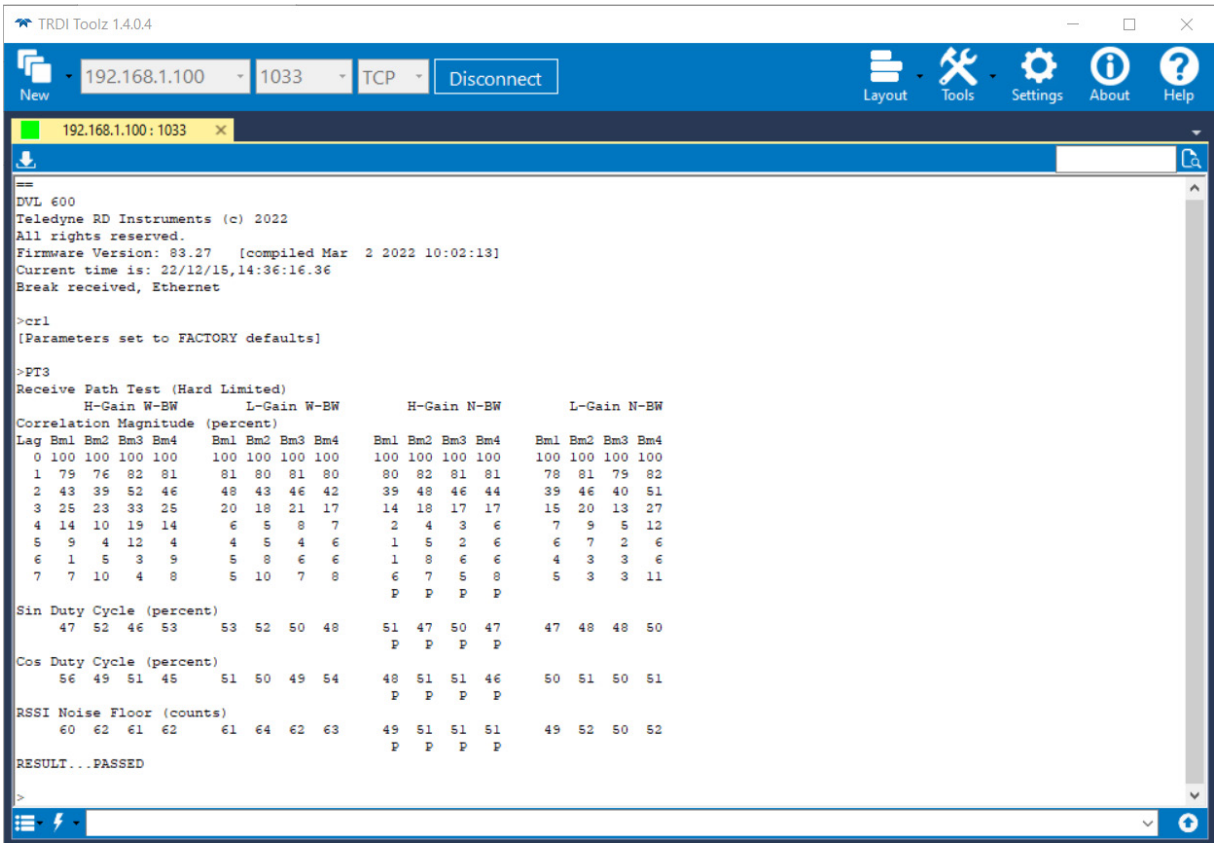
PT3 Ethernet Communication

Using TRDI Toolz or any terminal for Ethernet communication.

Send a break by sending three “=” (===) to establish communication.

CR1 [Enter] to reset the system to factory defaults.

PT3 [Enter] to run the receive test to check for interferences.



Result should be “Passed”

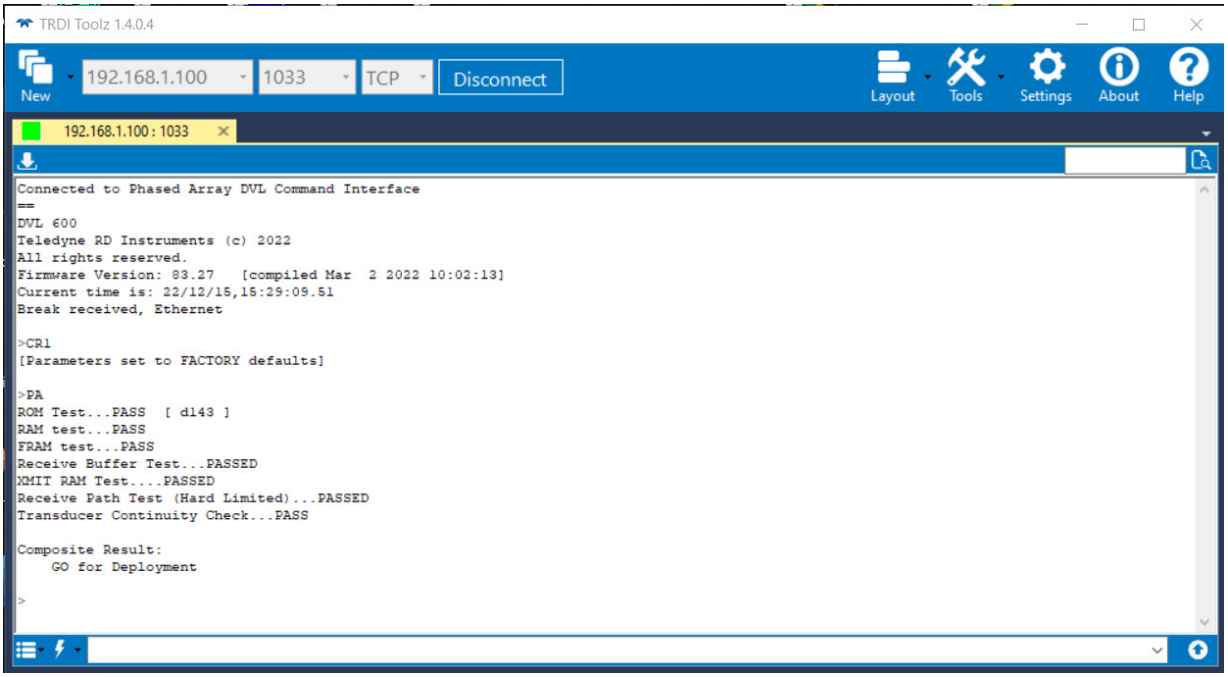
DVL PA Self-Test

The DVL Self-test can be performed via serial or Ethernet Terminal. The PA command will provide a complete quick test of the system.

Send a break by sending three “=” (===) to establish communication.

CR1 [Enter] to reset the system to factory defaults.

PA [Enter] to run the receive test to check for interferences.



It is recommended to perform the PA system self-test before and after each deployment.

FFT

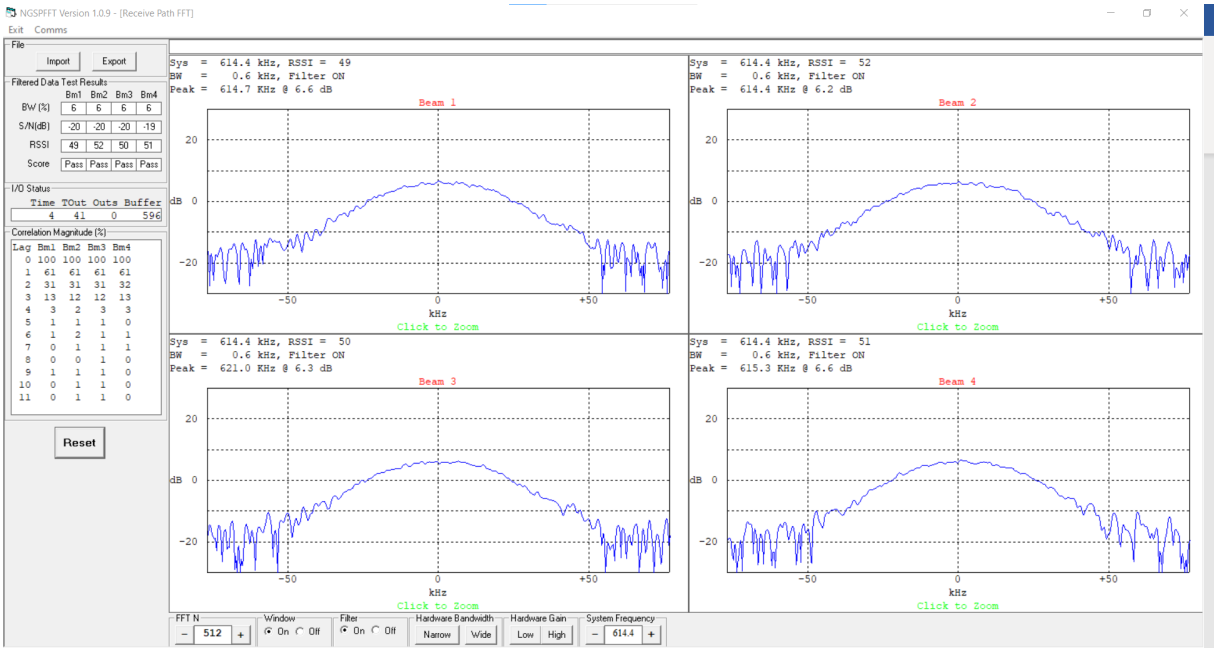
Use the FFT plots to check for interference.

Testing with NGSPFFT (requires direct serial communication at 155,200 B/sec)

This software must be requested from TRDI Field Service.

NGSPFFT uses Serial connection only. Instrument should be set up with 115,200 Baud serial com.

- Start **NGSPFFT.exe** version 1.0.9
- Select com port
- Select system frequency
- Set Hardware gain to **High**
- Set hardware **bandwidth** to **Narrow**
- **Filter** to **On**
- SET **Windows** to **ON**
- FFT N to **512**



There should be no peak in the center part of the plot.

Noise level should be around 6 dB.

Testing with Teledyne NavUI software (Ethernet communication)

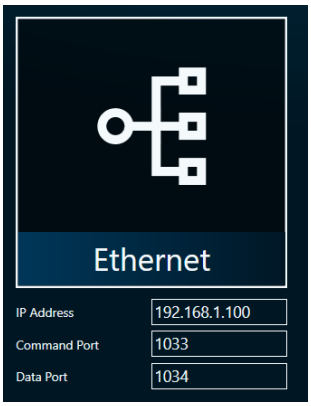
NavUI uses Ethernet connection only. NavUI is available for download on the TRDI Software Portal: https://tm-portal.force.com/TMsoftwareportal

Start NavUI.

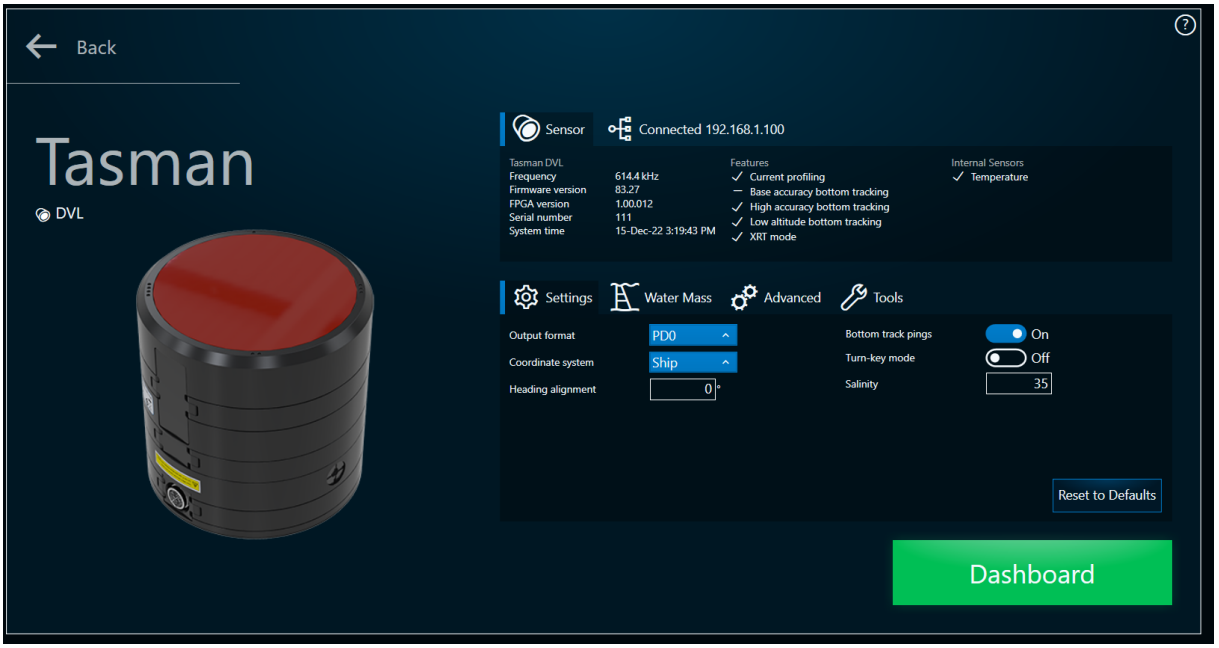
Click on **Acquire**.

Select **DVL**.

Select the IP and ports.

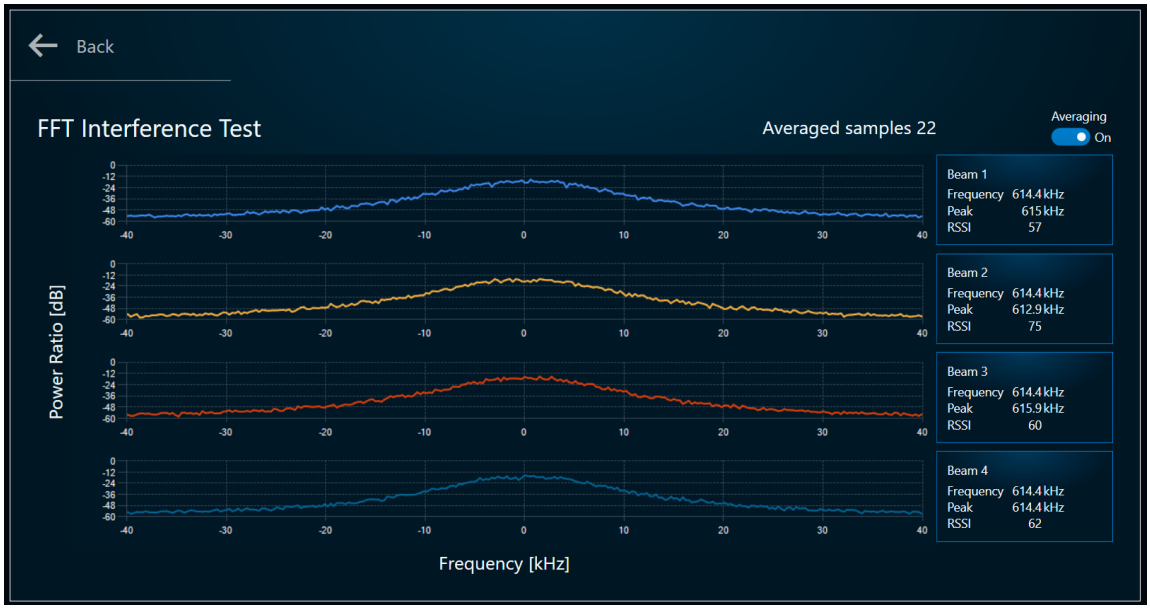


Click **Connect.**



Go to **Tools** and then **Interference test**.

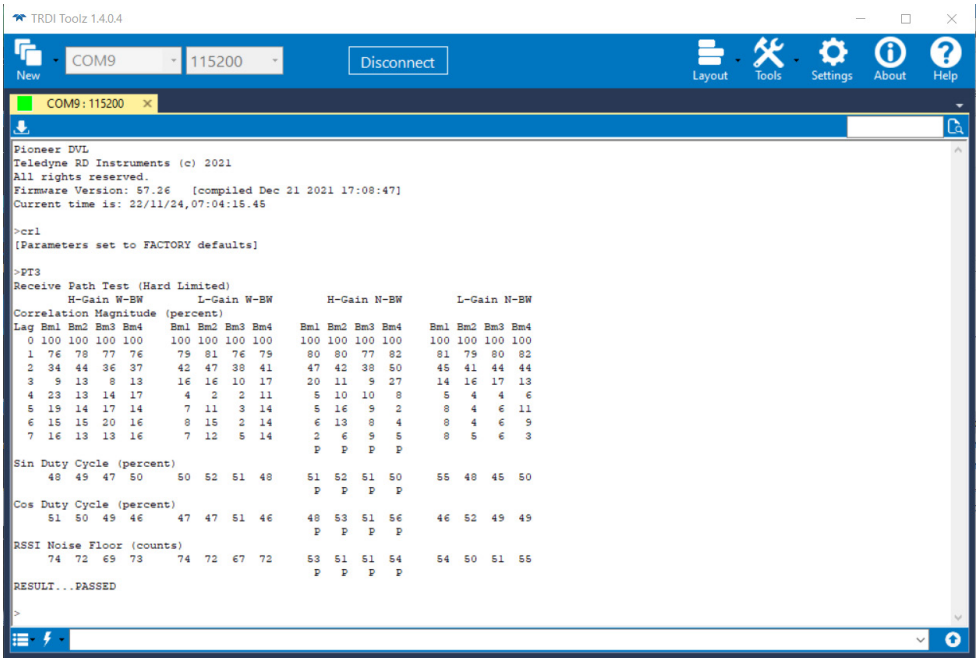
Switch **Averaging** ON**.**



After collecting about 20 samples, the FFT plots will display. There should be no peak in the center part of the plot.

Example of tests performed on a Pioneer 300kHz

Pioneer PT3 Receive Test



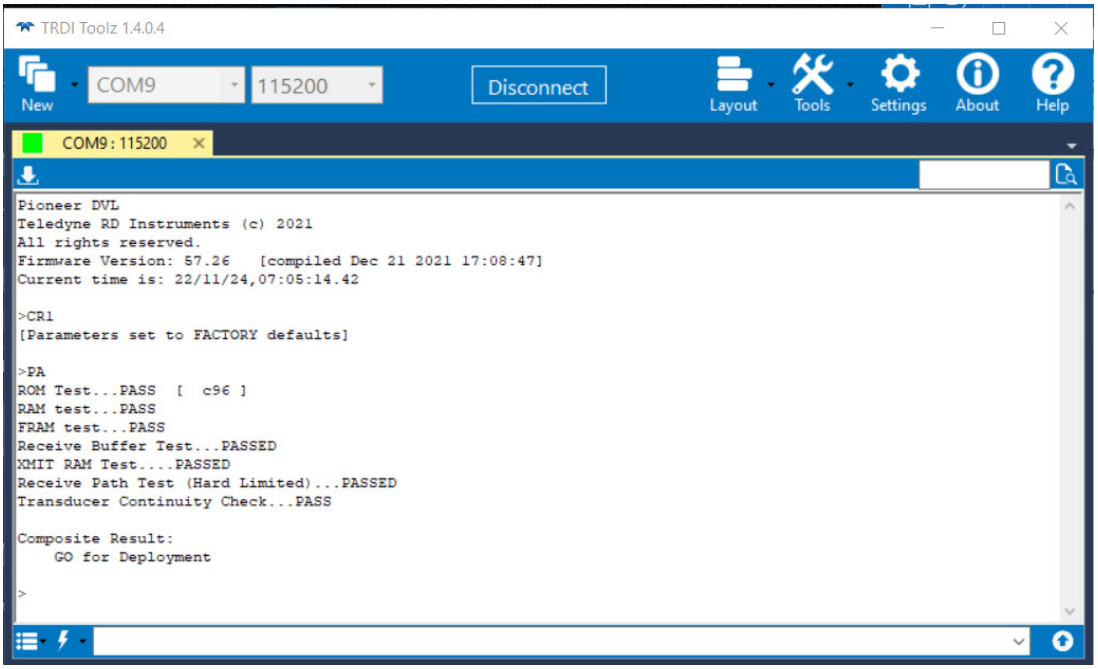

```
Pioneer DVL
Teledyne RD Instruments (c) 2021
All rights reserved.
Firmware Version: 57.26   [compiled Dec 21 2021 17:08:47]
Current time is: 22/11/24,07:04:15.45

>cr1
[Parameters set to FACTORY defaults]

>PT3
Receive Path Test (Hard Limited)
        H-Gain W-BW         L-Gain W-BW         H-Gain N-BW         L-Gain N-BW
Correlation Magnitude (percent)
Lag Bm1 Bm2 Bm3 Bm4     Bm1 Bm2 Bm3 Bm4     Bm1 Bm2 Bm3 Bm4     Bm1 Bm2 Bm3 Bm4
  0 100 100 100 100     100 100 100 100     100 100 100 100     100 100 100 100
  1  76  78  77  76      79  81  76  79      80  80  77  82      81  79  80  82
  2  34  44  36  37      42  47  38  41      47  42  38  50      45  41  44  44
  3   9  13   8  13      16  16  10  17      20  11   9  27      14  16  17  13
  4  23  13  14  17       4   2   2  11       5  10  10   8       5   4   4   6
  5  19  14  17  14       7  11   3  14       5  16   9   2       8   4   6  11
  6  15  15  20  16       8  15   2  14       6  13   8   4       8   4   6   9
  7  16  13  13  16       7  12   5  14       2   6   9   5       8   5   6   3
                                              P   P   P   P
Sin Duty Cycle (percent)
     48  49  47  50      50  52  51  48      51  52  51  50      55  48  45  50
                                              P   P   P   P
Cos Duty Cycle (percent)
     51  50  49  46      47  47  51  46      48  53  51  56      46  52  49  49
                                              P   P   P   P
RSSI Noise Floor (counts)
     74  72  69  73      74  72  67  72      53  51  51  54      54  50  51  55
                                              P   P   P   P
RESULT...PASSED

>
```

Pioneer PA Self-Test




```
Pioneer DVL
Teledyne RD Instruments (c) 2021
All rights reserved.
Firmware Version: 57.26   [compiled Dec 21 2021 17:08:47]
Current time is: 22/11/24,07:05:14.42

>CR1
[Parameters set to FACTORY defaults]

>PA
ROM Test...PASS  [  c96 ]
RAM test...PASS
FRAM test...PASS
Receive Buffer Test...PASSED
XMIT RAM Test....PASSED
Receive Path Test (Hard Limited)...PASSED
Transducer Continuity Check...PASS

Composite Result:
    GO for Deployment

>
```

Pioneer FFT Test with NGSPFFT 1.0.9