Quality Assurance 'LUNA' Tool for Many Point Experiments

Martin Burk

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What is the problem?

- To many channels to little time to tune, setup, verify 128 channels or 256 channels.

- Need to check integrity of the entire fiber path with little or no disruption to any connections.

- Ability to characterize the fiber path for proper connections, return loss calculations, and indication of return power from the surface.

- Ability to check and verify for movement between the probe and surface during assembly, transport, and final installation

Hand Methods

- A Luna OBR 4600 is being used to take measurements of fiber connections, return losses, distance measurements.

- Using standard Luna software each measurement run must be hand initiated, measurements pulled from the front panel program, (picking peaks, regions of interest, power calculation, deltas, etc.), a very LABOR INTENSIVE process when doing many channels

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# Using the Luna OBR 4600 for Gap Measurements

- The Luna OBR 4600 is used for high resolution scans of an AOC probe to the a surface of interest.

- An AOC probe can have up 144 individual probe points

- To scan all 144 points, make measurements of distances and record is not practical to do by hand.

- An automated method has been developed using the Luna OBR, high count fiber optic switches, a software development kit (SDK) from Luna, and custom LabVIEW software to tie it altogether.
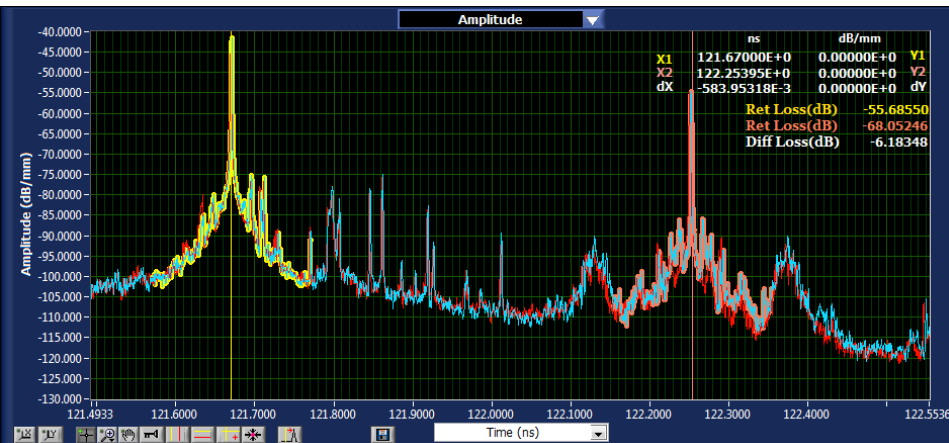
Standard Luna software and OBR 4600

Two separate scans of an AOC probe point with no changes to surface location.

Zoomed to the entry of the AOC probe and the return from the surface.

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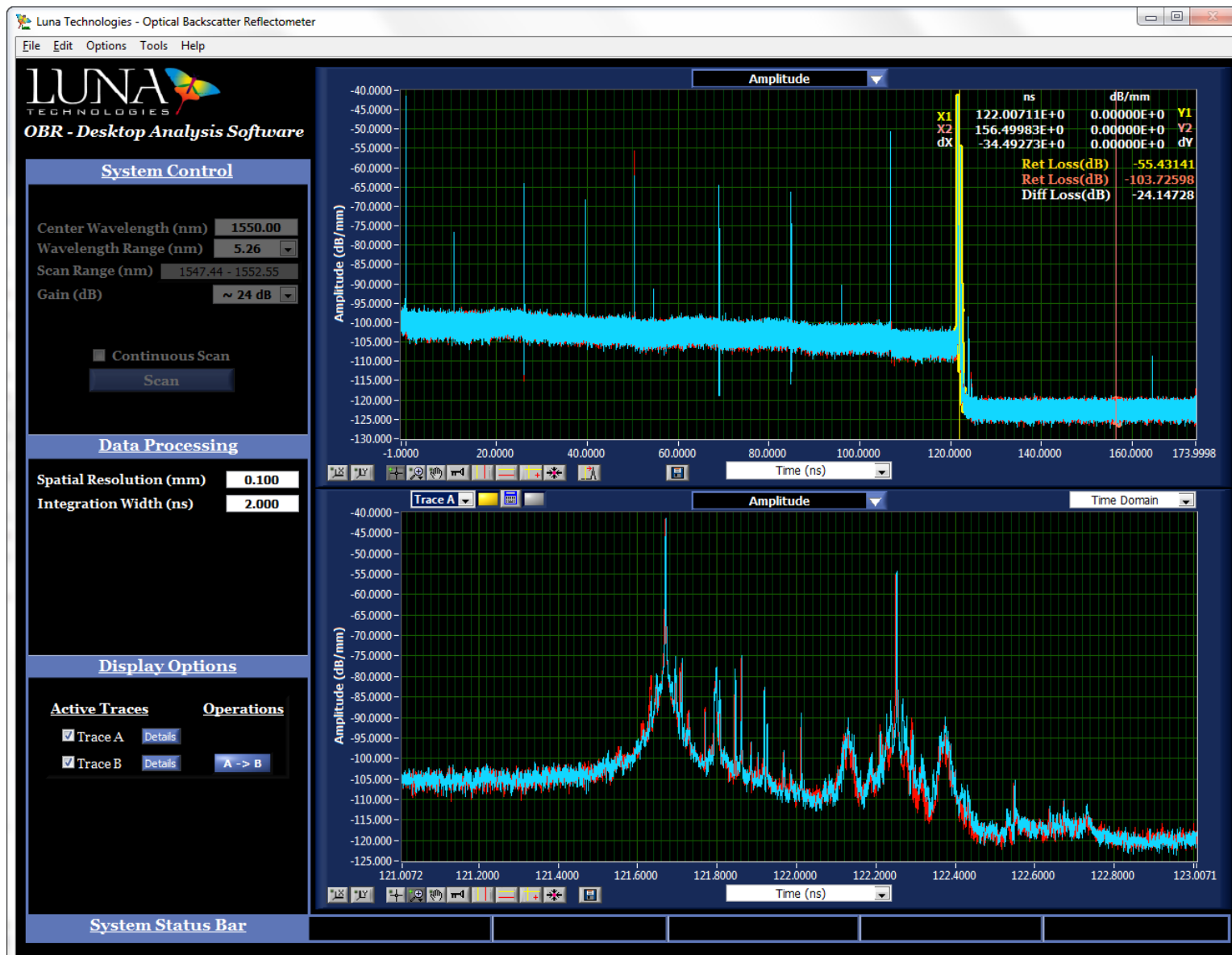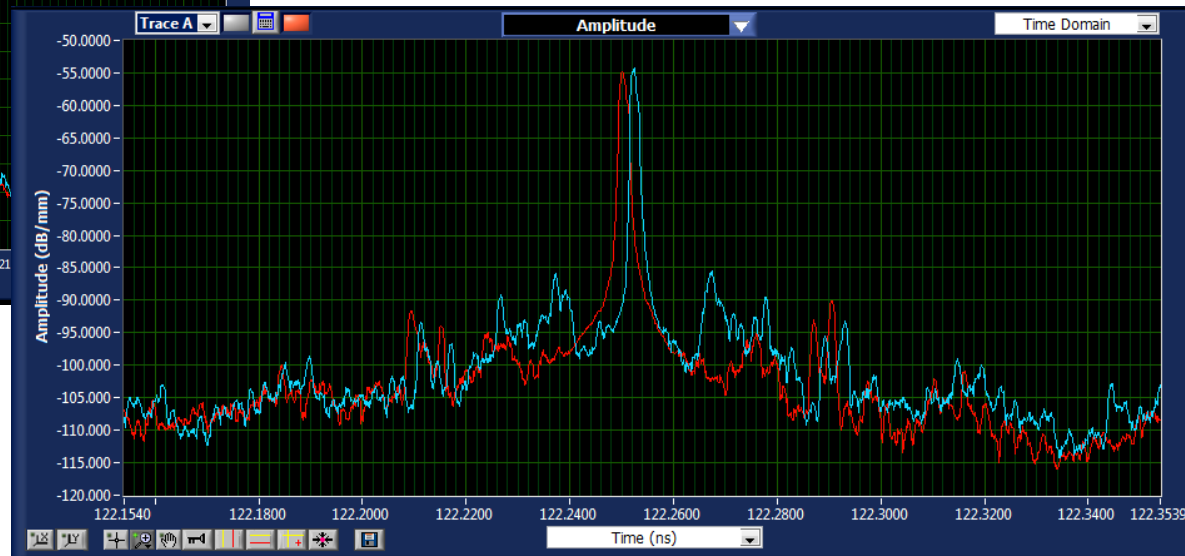
Compare two scans – unshifted probe/surface

Top Graph is zoomed to the AOC probe and surface return region.

Bottom Graph is the region of the AOC probe entry illustrating jitter between successive scans with no changes in the setup
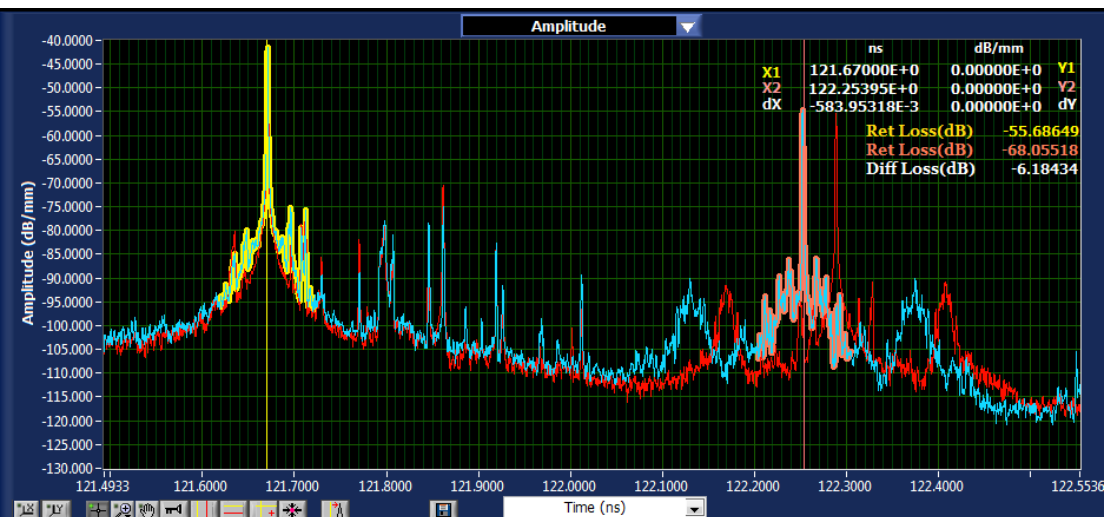
This graph again shows the jitter between two scans but at the probe surface.

Compare two scans – shifted surface/probe
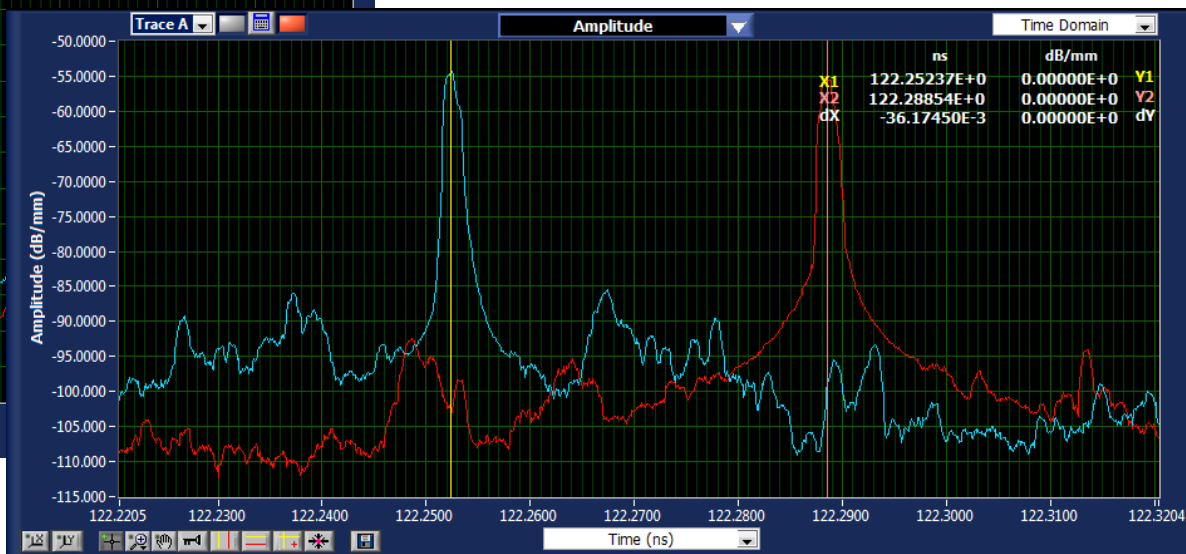

The original scan shown in blue is the same as the previous graphs, The scan in red shows the surface has shifted.

The graph below shows the probe to surface has shifted by about 36 ps.

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An automated method of scanning and measuring

- A method to quickly (relative to hand solutions) to take measurements without disconnecting, cleaning, and re-connecting, fibers for each probe.

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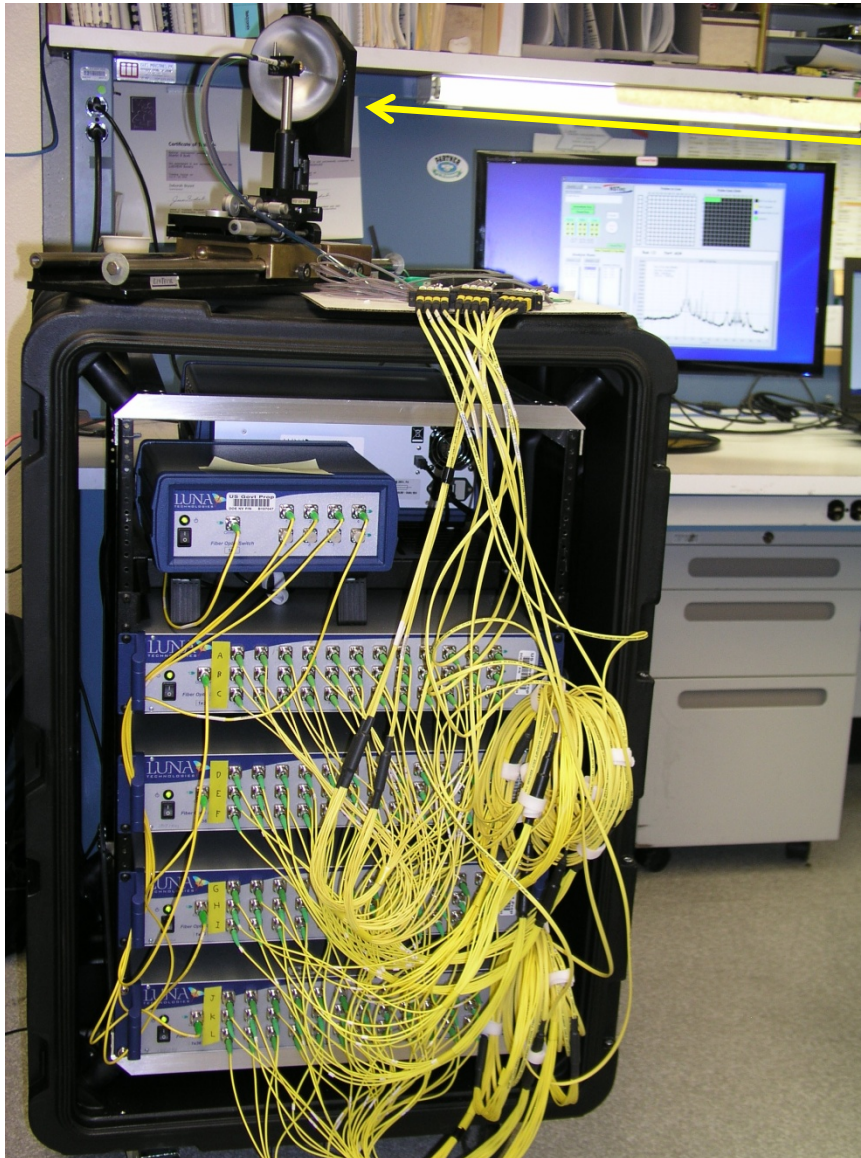*Managed and Operated by National Security Technologies, LLC*

Luna Gap Measurement Layout
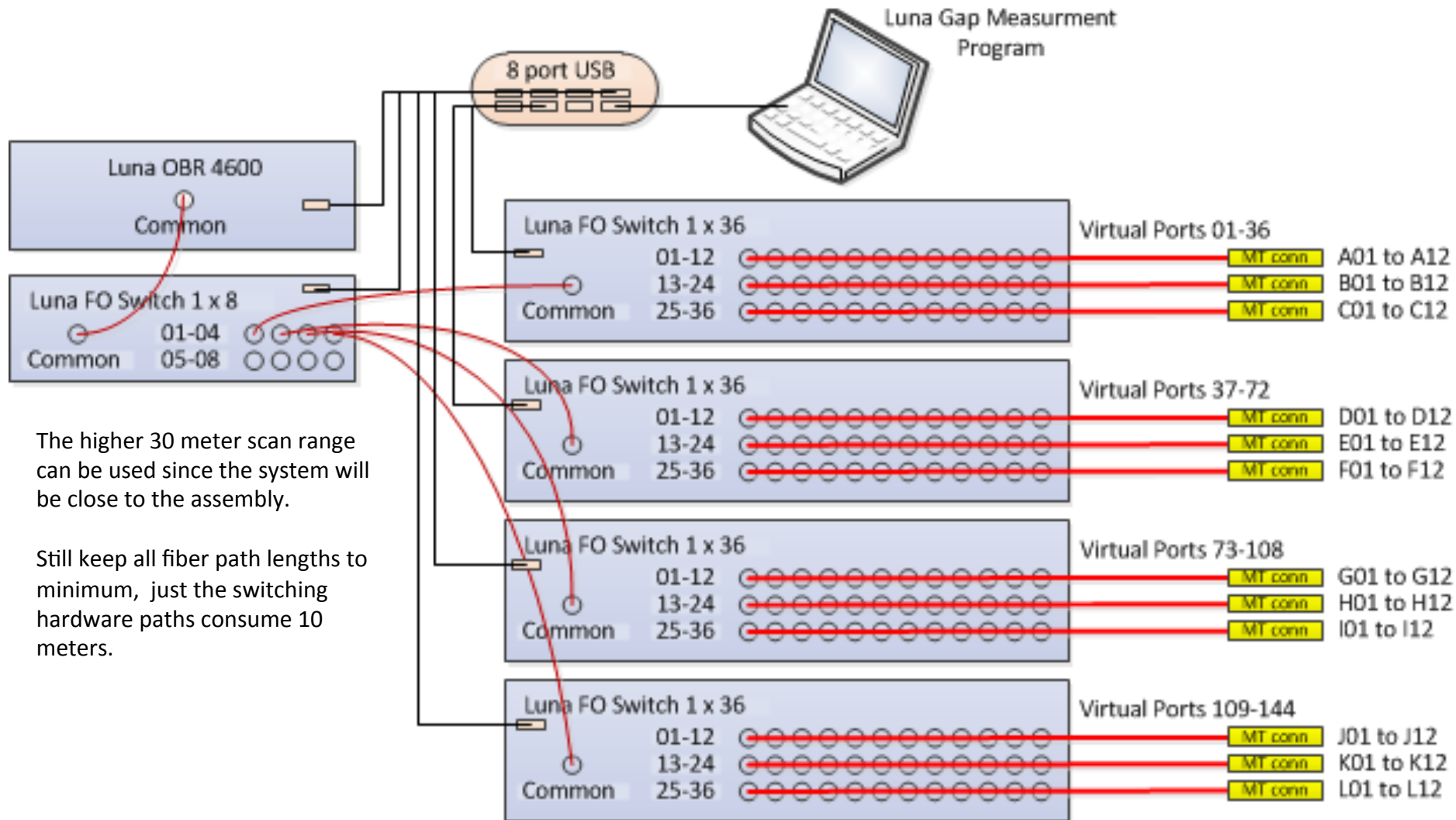
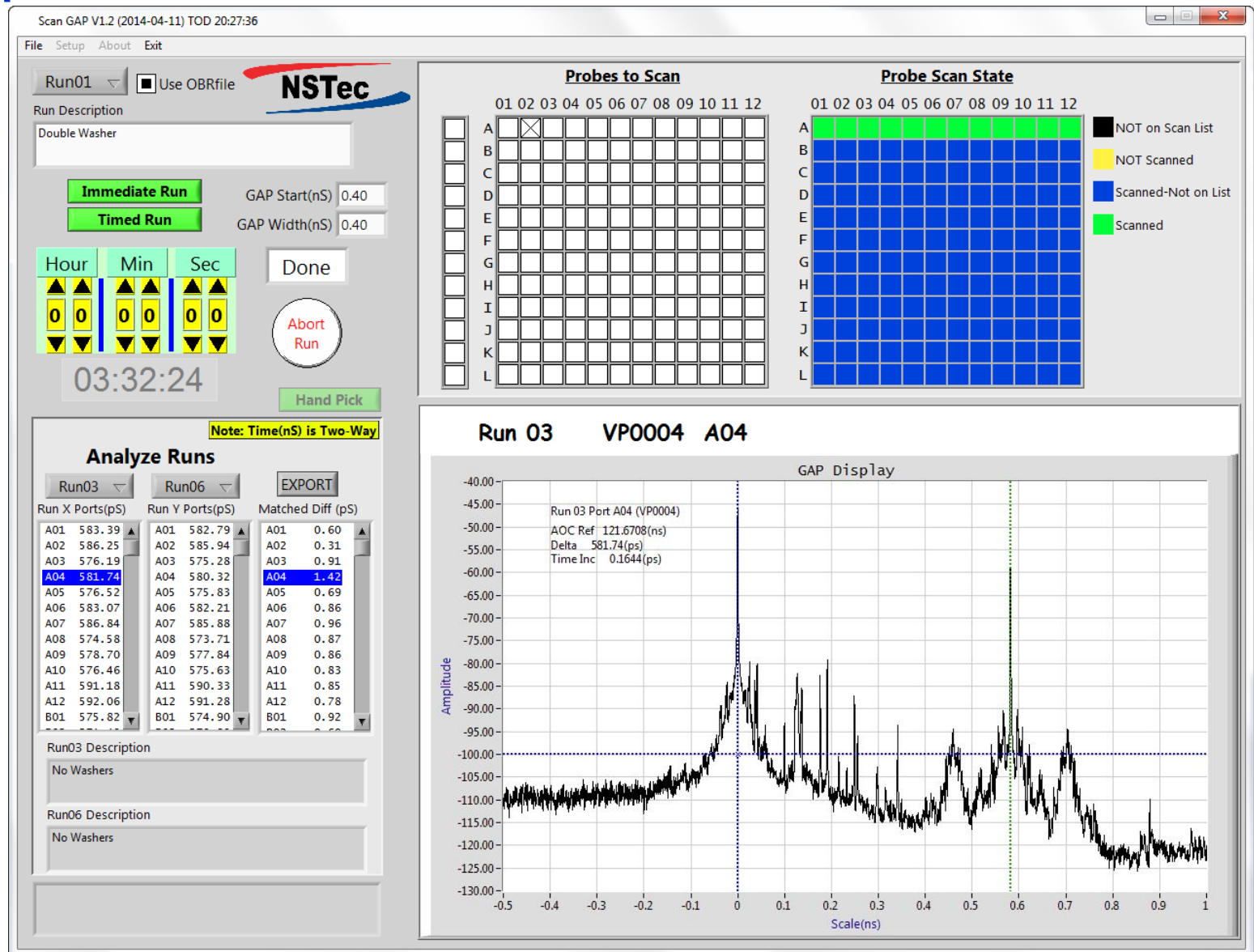The higher 30 meter scan range can be used since the system will be close to the assembly.

Still keep all fiber path lengths to minimum, just the switching hardware paths consume 10 meters.

Portable Rack-Mount 144 channel Luna scanning equipment.

AOC probe mounted with a test surface..

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Luna Gap Measurement Control Panel

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Features of Measuremnt Program

Setup for performing Path Analysis

- Use the Luna OBR 4600 with a 1 X n (n=128, 256) FO switching hardware with each switch output connected to a probe illuminator port of the NSTec MPDV.

- The probe send/receive port can be switched between the normal circulator path and the probe illuminator port.
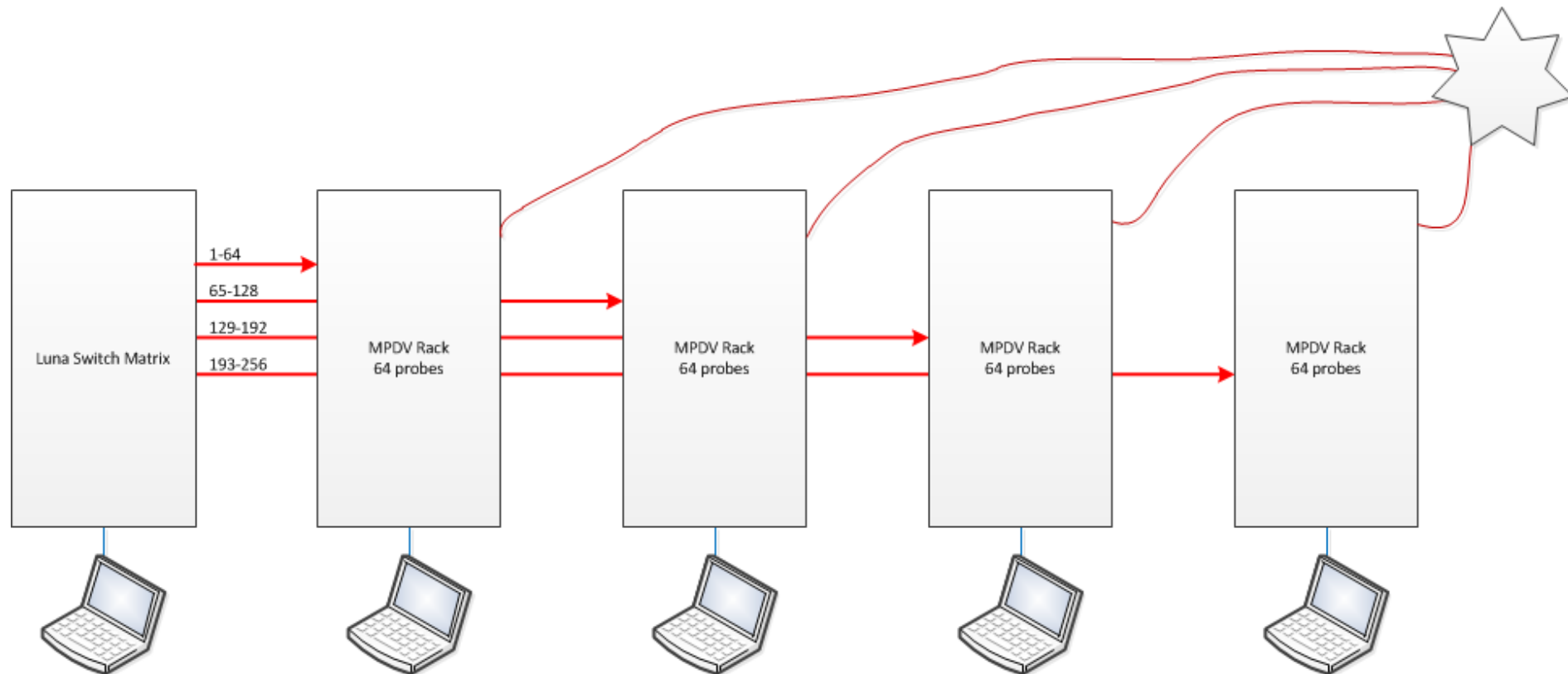
- The extended range scan must be used since the path will be greater than 30 meters, but should be enough resolution to gather all the information needed.

- A permanent installation of a Luna switching matrix can be connected to the MPDV probe illuminator ports. No connection or disconnection of fibers will be required to take measurements and do verification of the entire light path from the MPDV rack to the surface.

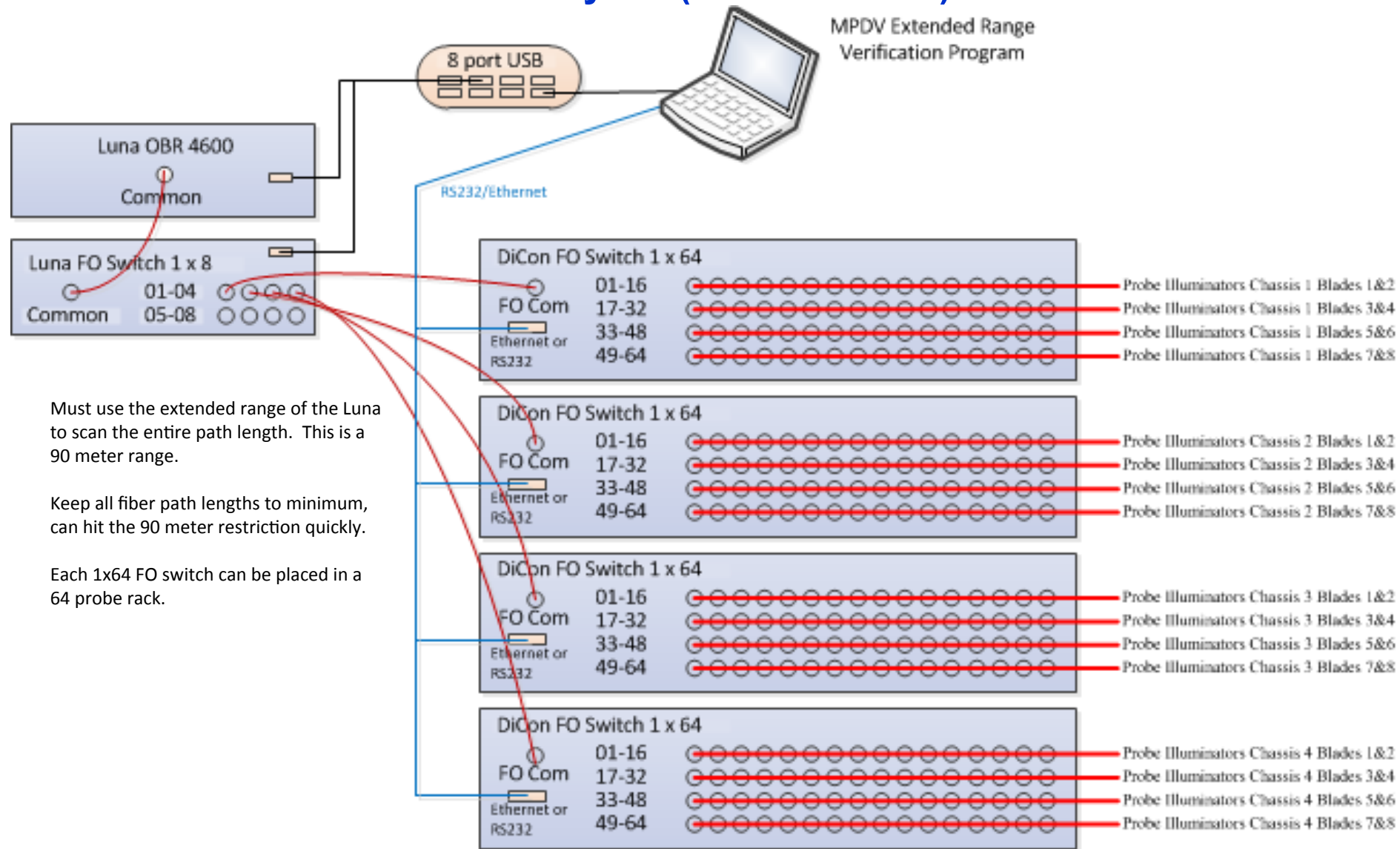**National Security Technologies** LLC
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Luna Probe Verification

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Luna Probe Verification Layout (256 channels)

Must use the extended range of the Luna to scan the entire path length. This is a 90 meter range.

Keep all fiber path lengths to minimum, can hit the 90 meter restriction quickly.

Each 1x64 FO switch can be placed in a 64 probe rack.

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Luna Probe Verification Issues

- Lots of information to gather, analyze, and archive.

- Will require software to automate the procedure of finding all regions of interest, do reflection, power loss, etc., measurements.

- Do we need a database server to tie all of the systems together for a central repository of data and common analysis?

- This is a work in progress and ideas and methods are still in development.
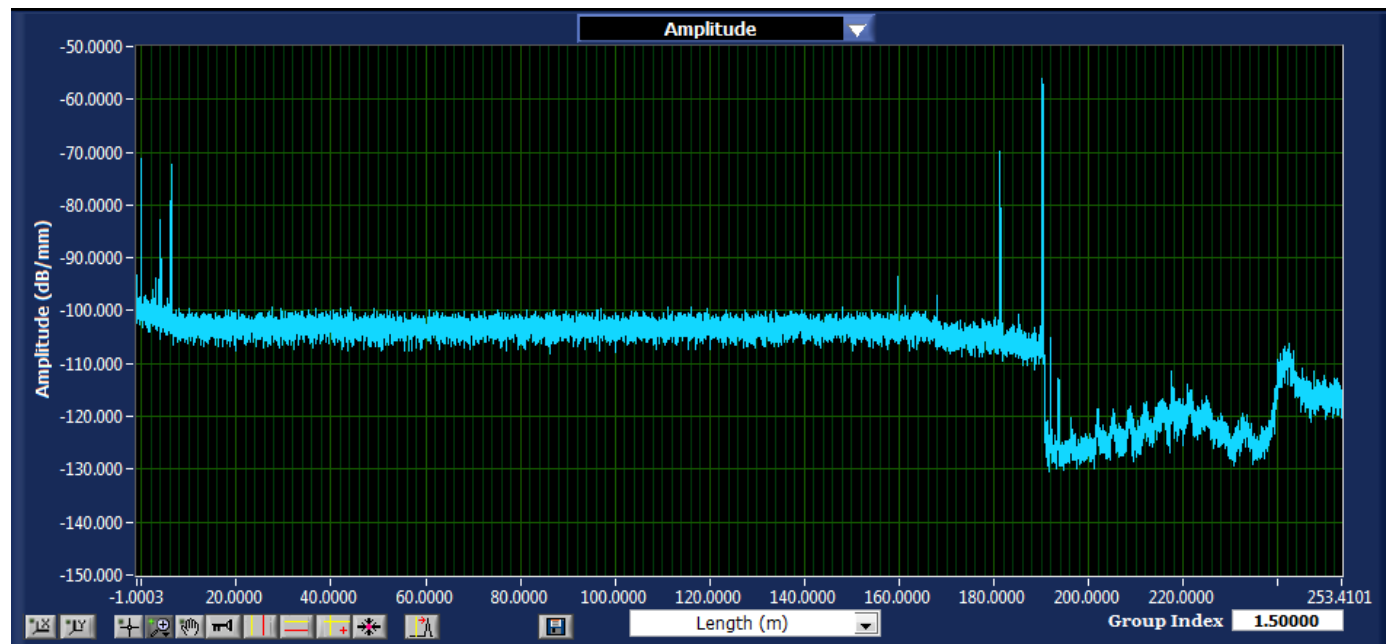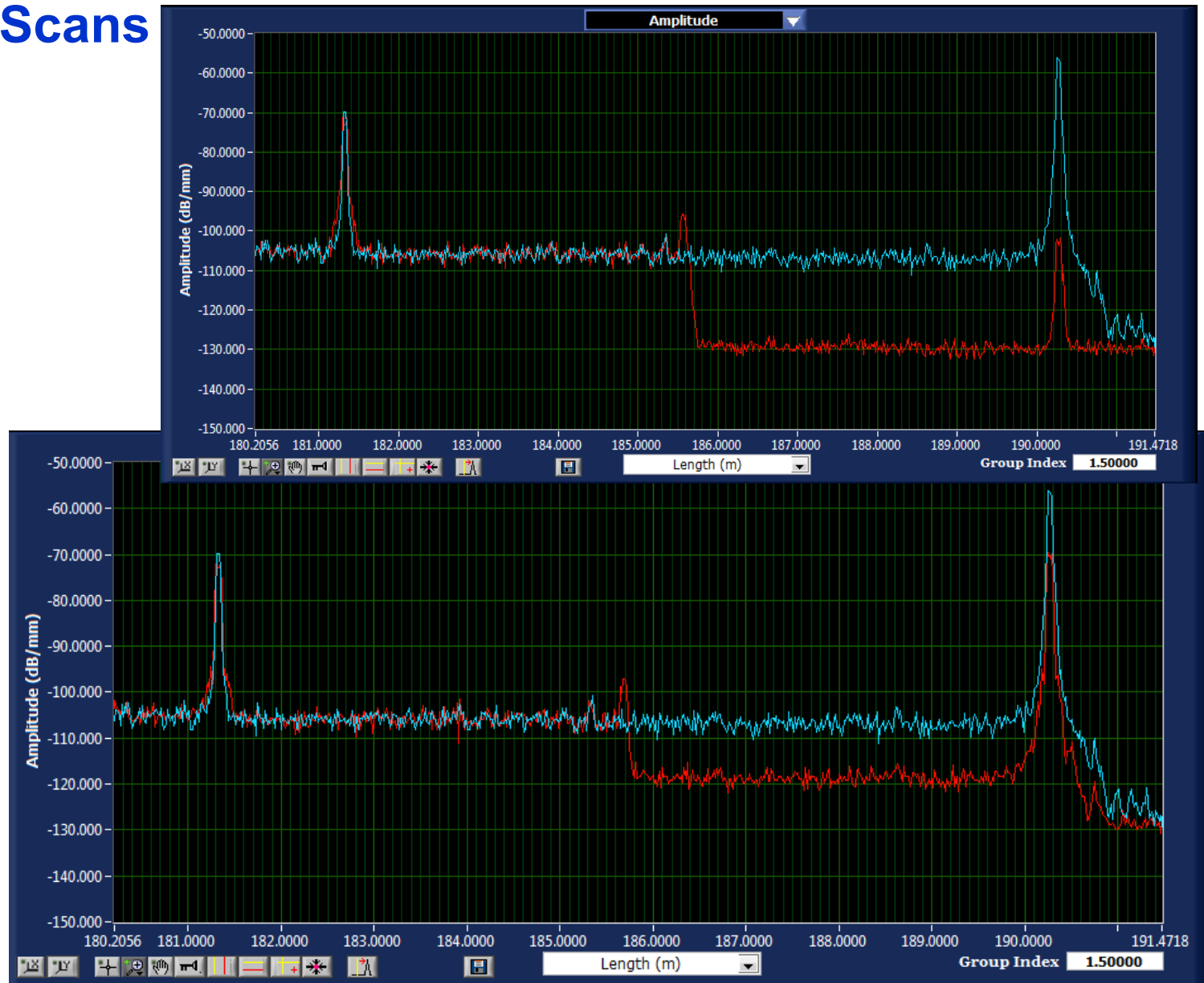
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Sample Scans

Auto-tuning (the Holy Grail)

- What information can be gathered from the extended Luna scans to feed back to the MPDV controller?

- Don't have enough information or experience to answer exactly how auto-tuning will be done, although all of the hooks exists or will be available. This will take some development planning and effort.

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