

PDV in a Box

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PDV Workshop

May 16, 2018



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Overview

- PDV systems are easy to build, unless you need:
 - Serviceability (accessible/replaceable parts)
 - Flexibility (leapfrog, multiplex, ...)
 - Scalability (>4 channels)
 - Unified computer control
- Traditional build approach is reaching its limits
 - Specific parts vanish or become scarce
 - Labor is expensive
- Is there a better way?
 - Modular systems
 - Easy to build and reconfigure

The “BladeMaster”

- 9-slot rack
 - Master power and **laser key lock**
 - Ethernet and USB control
- PDV systems can be built around blades (1-4 items per blade)
 - Lasers
 - Inline Attenuators
 - Power meters
 - O2E convertors
 - Polarization control
 - Switches
 - Passive Storage

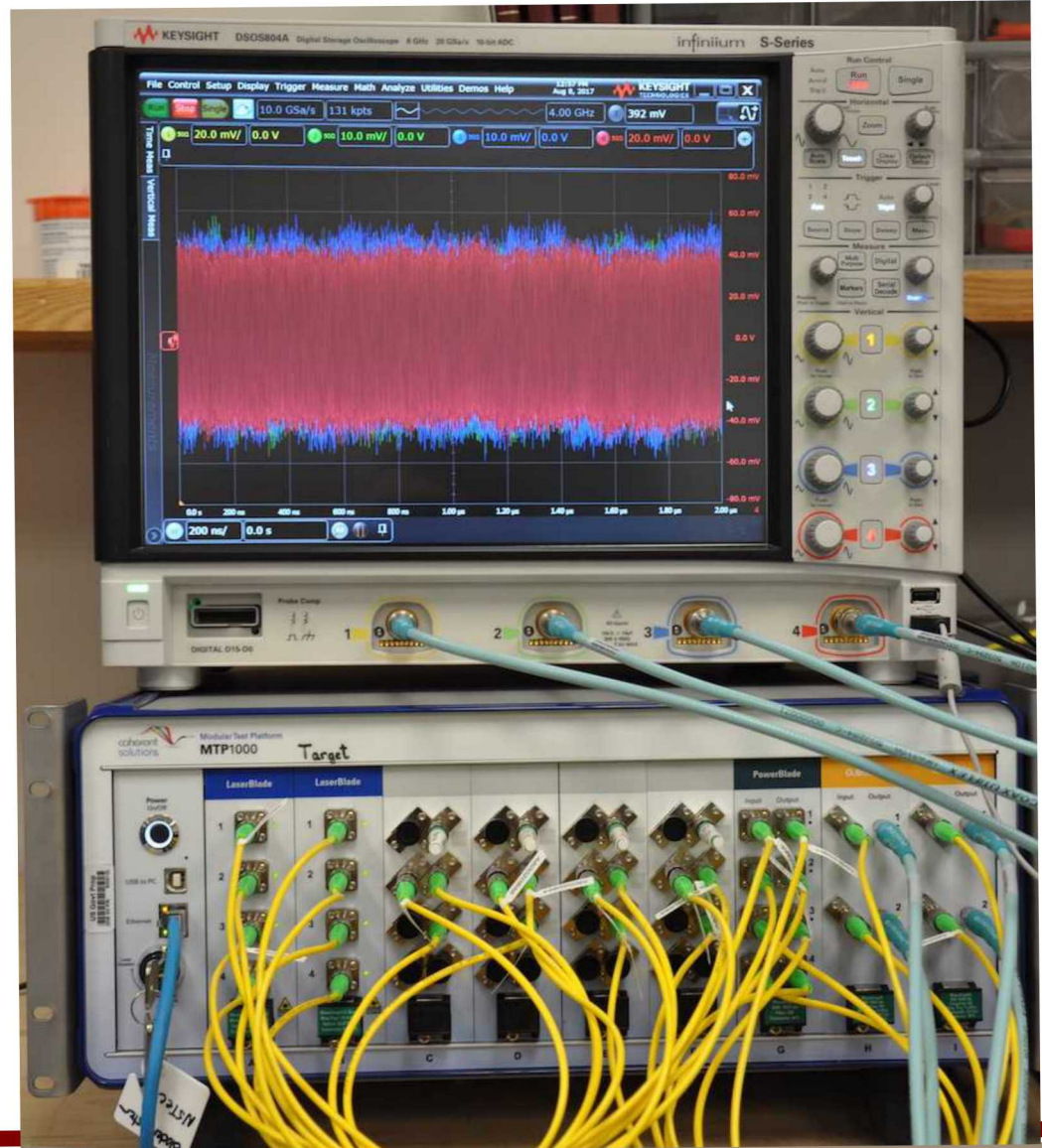
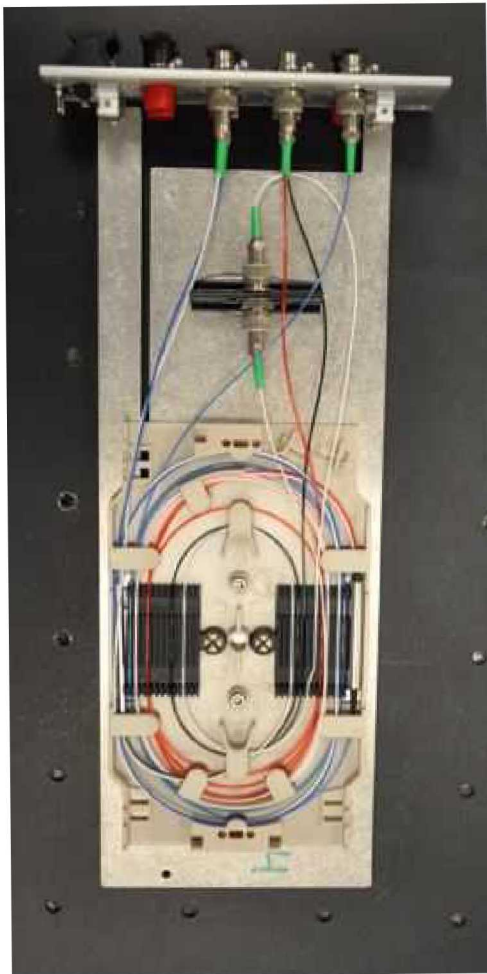


MTP1000 &
Modular Test Platform

Building a 4-channel PDV system

- MPT1000 crate: \$6300
- 2x Four-channel LaserBlades: \$13,600 each
 - Independent tuning over 5 THz (1527.605-1567.132)!
 - 35 mW output on each laser
 - Frequency stability < 25 seconds
- 4x TrayBlades: \$520 each
 - 8 FC/APC connections each (could fit two PDV channels)
- 1x PowerBlade: \$4450
 - VOABlade is a little more expensive, includes a power meter
- 2x O2EBlades: \$15,750 each
 - Two receivers per blade, 3dB @ 25GHz, about 900 V/W
- Shipping for the above items: \$1200
- **Total invoice: \$72,730**
- \$500-1000 in passive parts, a few hours of labor

First complete system

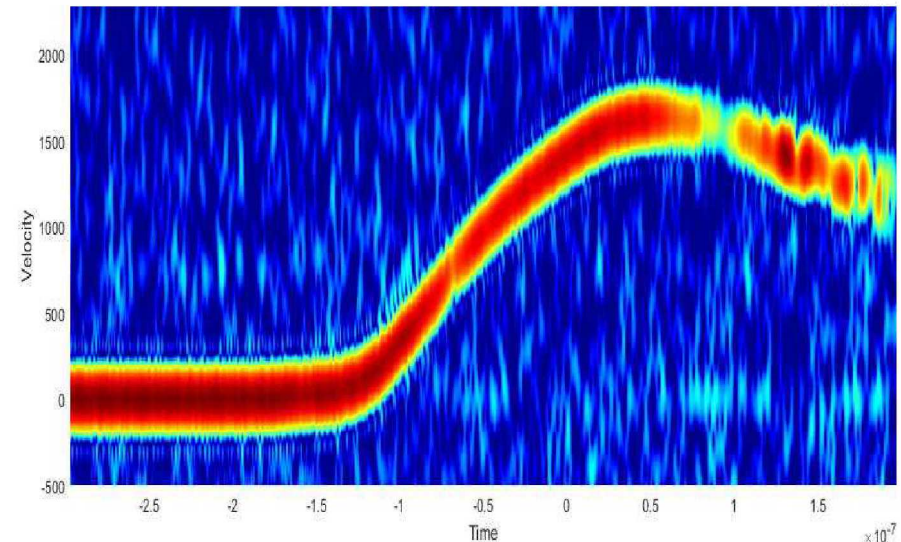


Testing

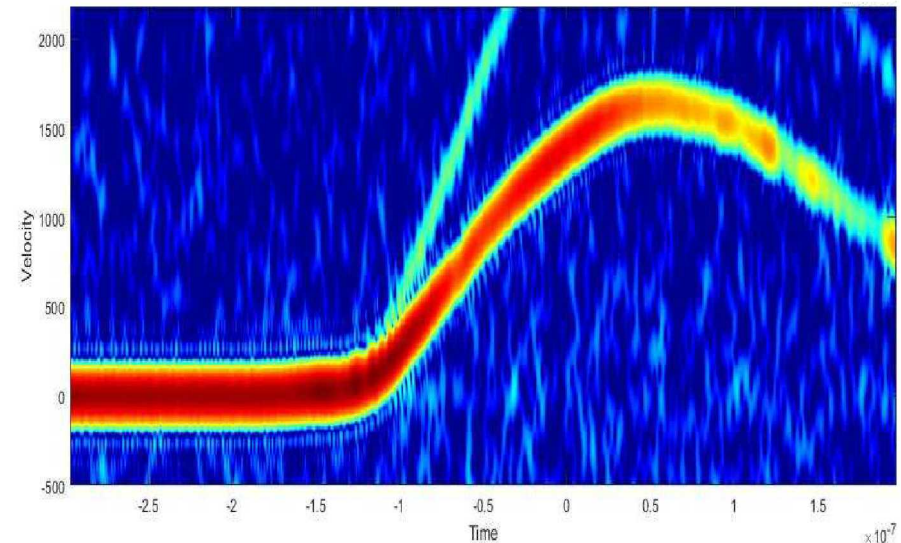
- LaserBlades tested on an existing PDV system
 - 12 GHz Miteq receivers
 - Similar spectrogram as separate probe with NKT lasers
 - Gained understanding of dither

- Dynamic Test using our BladeMaster
 - Existing PDV
 - 1 NP Photonics “Rock”
 - 1 NKT

Blade Master



Legacy PDV

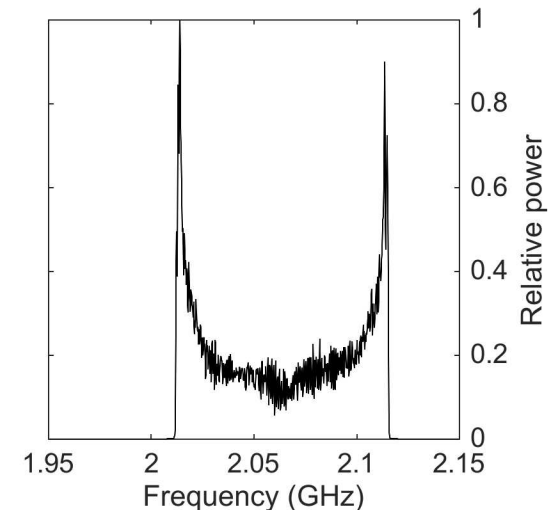
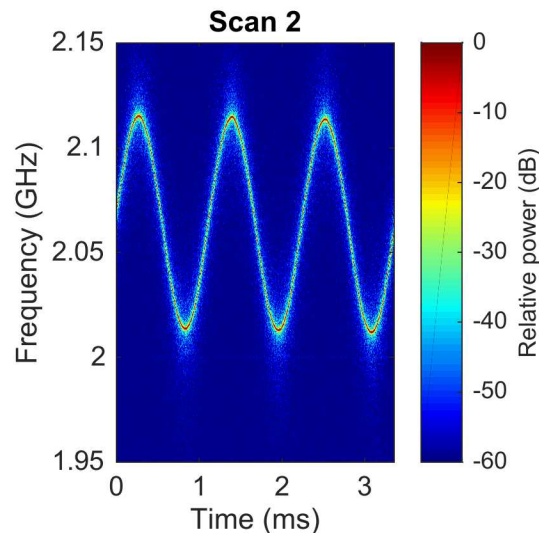
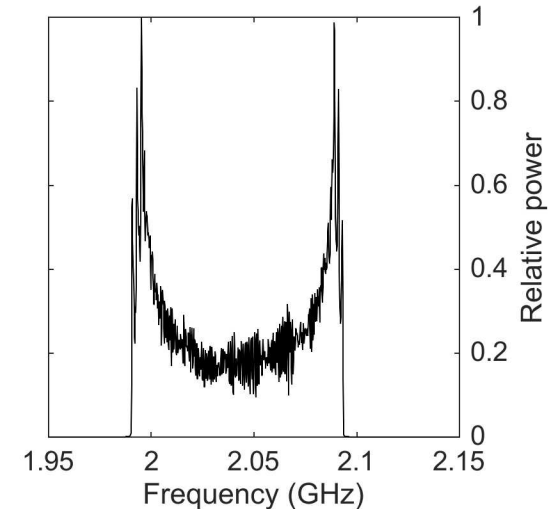
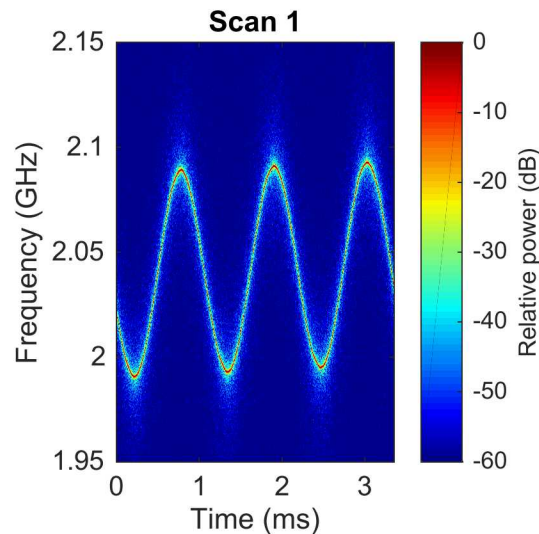


Dither issues

- Frequency locking system uses dither
 - Uncorrelated within/between blades
 - ± 100 MHz at 888 Hz

- Long FFTs don't get narrower
 - Min/max states last longer, resulting in a "Batman" profile

- Long, slow drift on top of the dither



Is dither a problem?

- Experiment duration
 - How long since motion began?
 - Worst case assumes maximum chirp, which is also the least likely result
- Workarounds
 - Explicitly monitor reference frequency
 - Analyze the extended baseline and subtract this frequency
 - Store 1-2 ms of data prior to motion and project the reference forward in time
- Is it worth putting up with dither?
 - Convenience and cost of the LaserBlades
 - Extreme tuning range (50 ITU channels!)
 - Avoid crosstalk between adjacent and overlapping probes

Experiment duration	Frequency error
0.1 us	0.06 MHz
1 us	0.6 MHz
10 us	6 MHz
100 us	60 MHz
1 ms	200 MHz
10 ms	~200 MHz

1 MHz is 0.775 m/s

Summary

- There is a lot to like about the Blade Master...
 - Everything but the digitizer in one unit
 - Common communication interface and safety system
 - Minimal labor costs
 - Design flexibility with easy blade replacement
- ... it's generally price competitive
 - Lasers are less expensive
 - Power monitors and switches are reasonable
 - Detectors are pricey, bandwidth higher than most users need
- Lasers have some limitations
 - Modest power (without external amplification)
 - Dither may be an issue for some applications
- Some interesting things in the pipeline...

Coming soon

► DopplerBlade

- Everything but the Laser and Receiver

► PXIe blades

- TrayBlade
- VOABlade
- SwitchBlade
- O2EBlade
- DopplerBlade
- LaserBlades

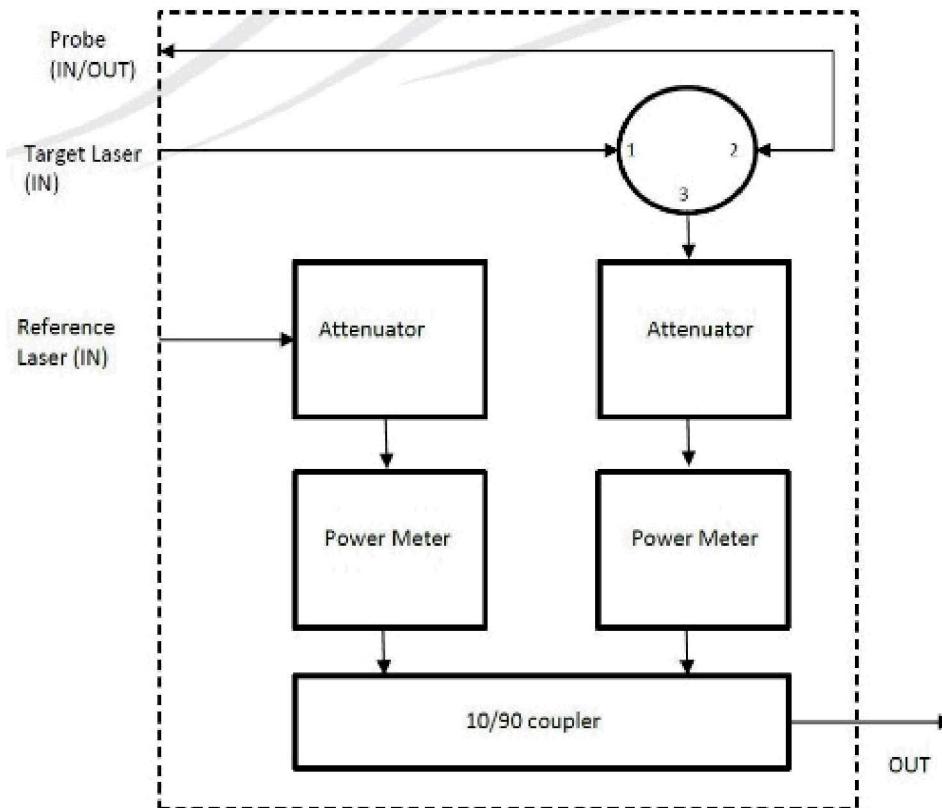


Fig 4 : Doppler Module schematic



Extra slides

Complete System One-Line

NSTEC

