PDV in a Box

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PDV Workshop

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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

coherent solutions

complexity made simple.

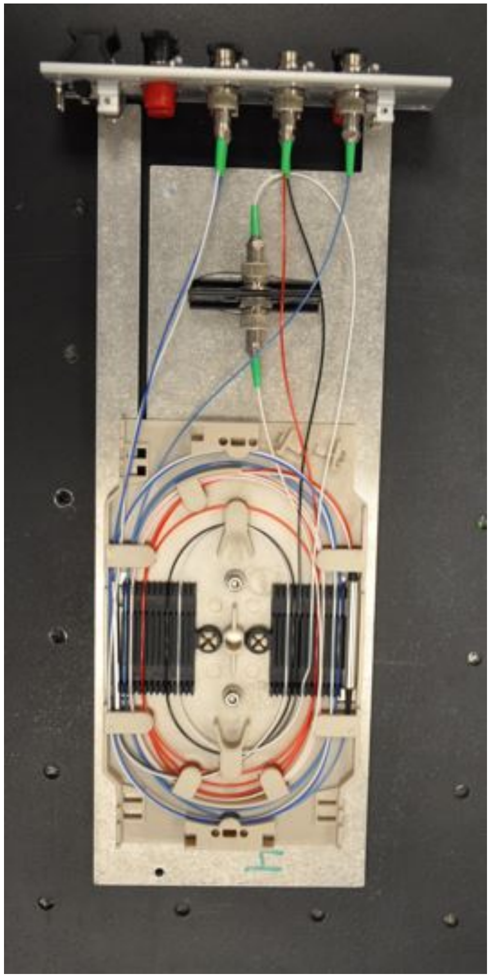
MTP1000 & **MTP**mini

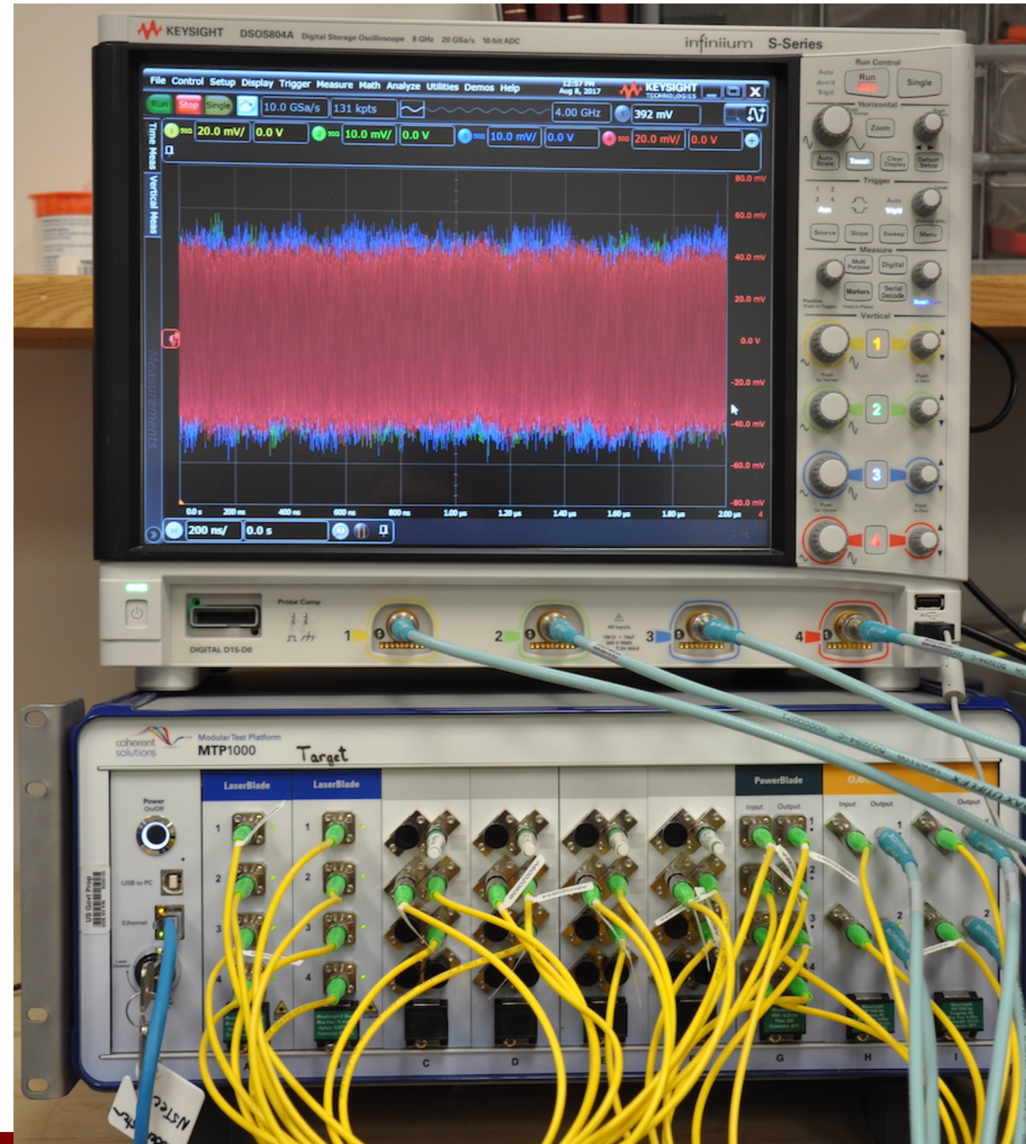
Modular Test Platform

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

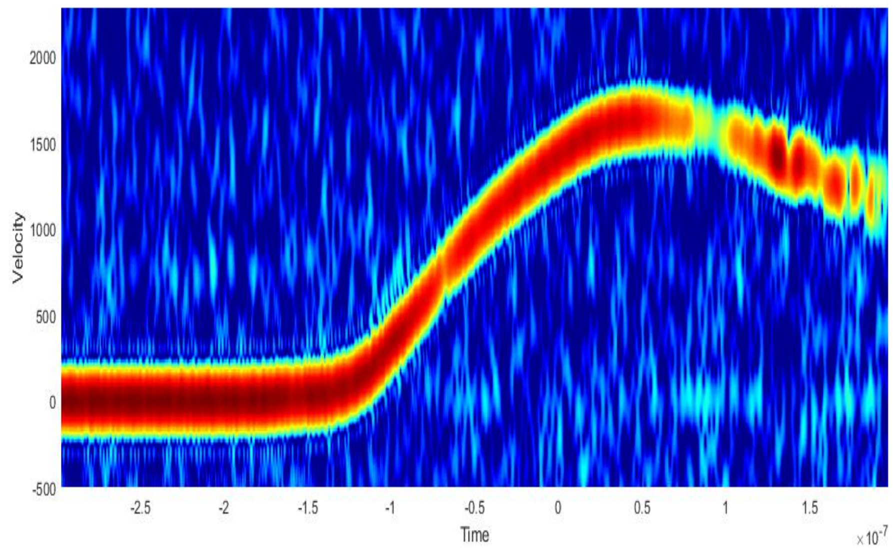




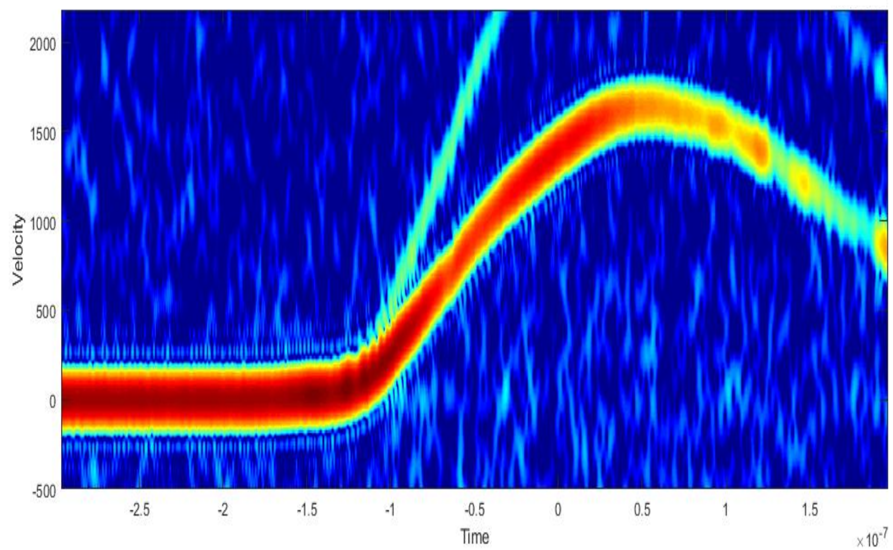
Testing

- 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

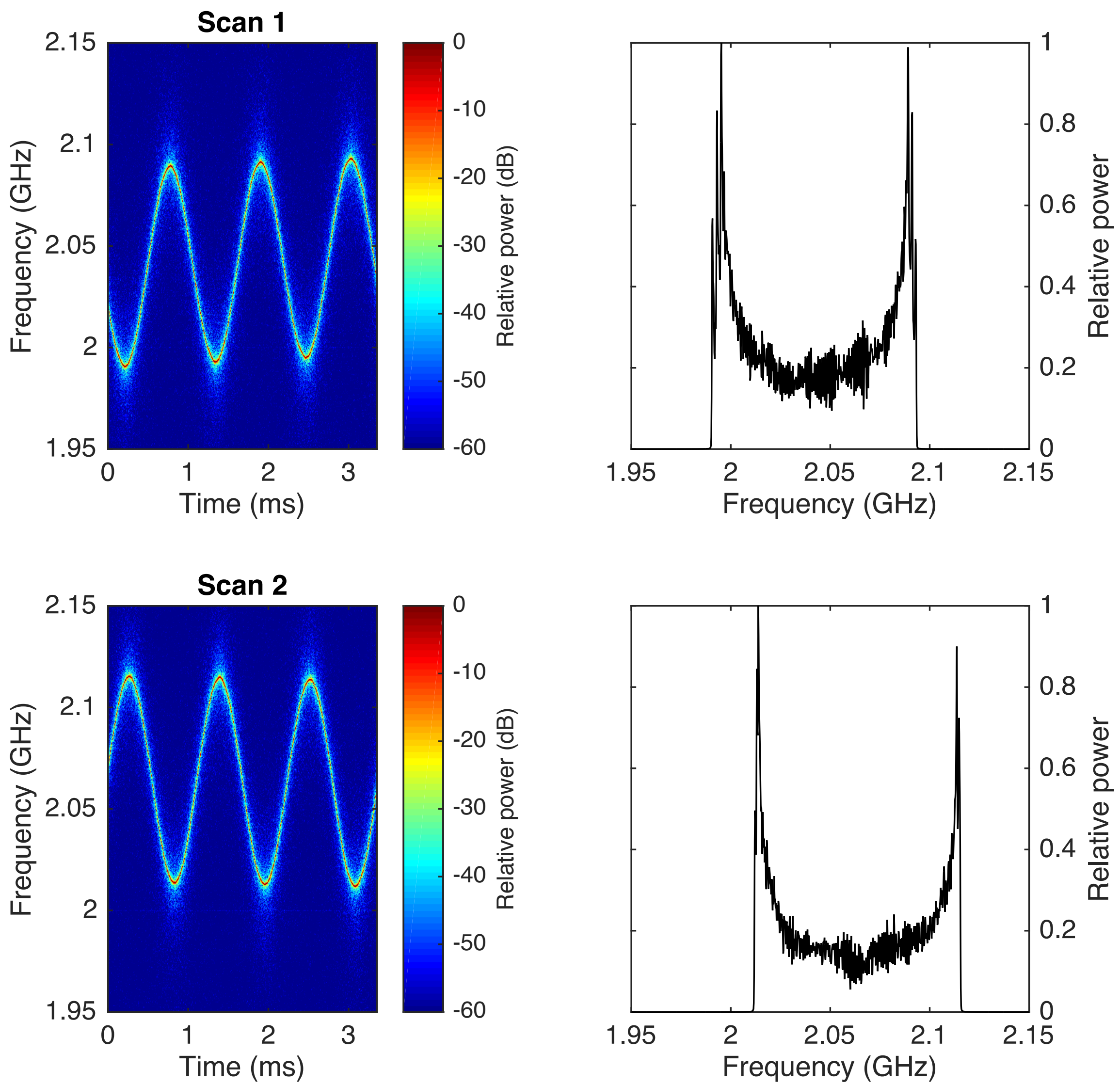


Legacy PDV



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

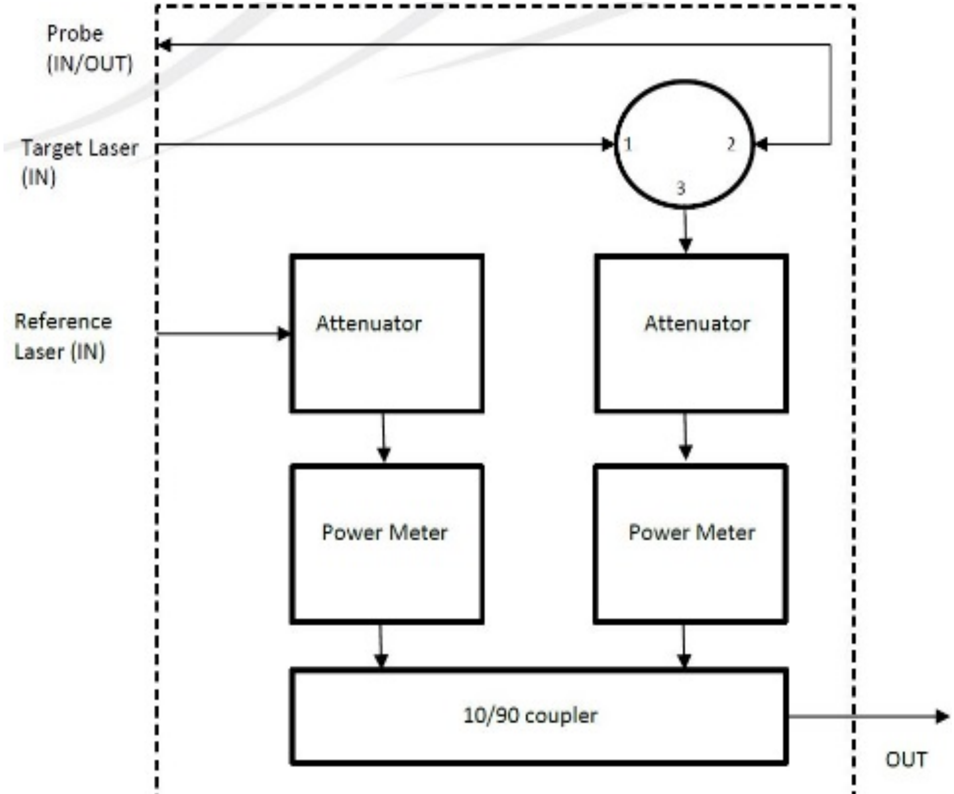


Fig 4 : Doppler Module schematic

Extra slides

Complete System One-Line