PDV Detector Characterization and Testing

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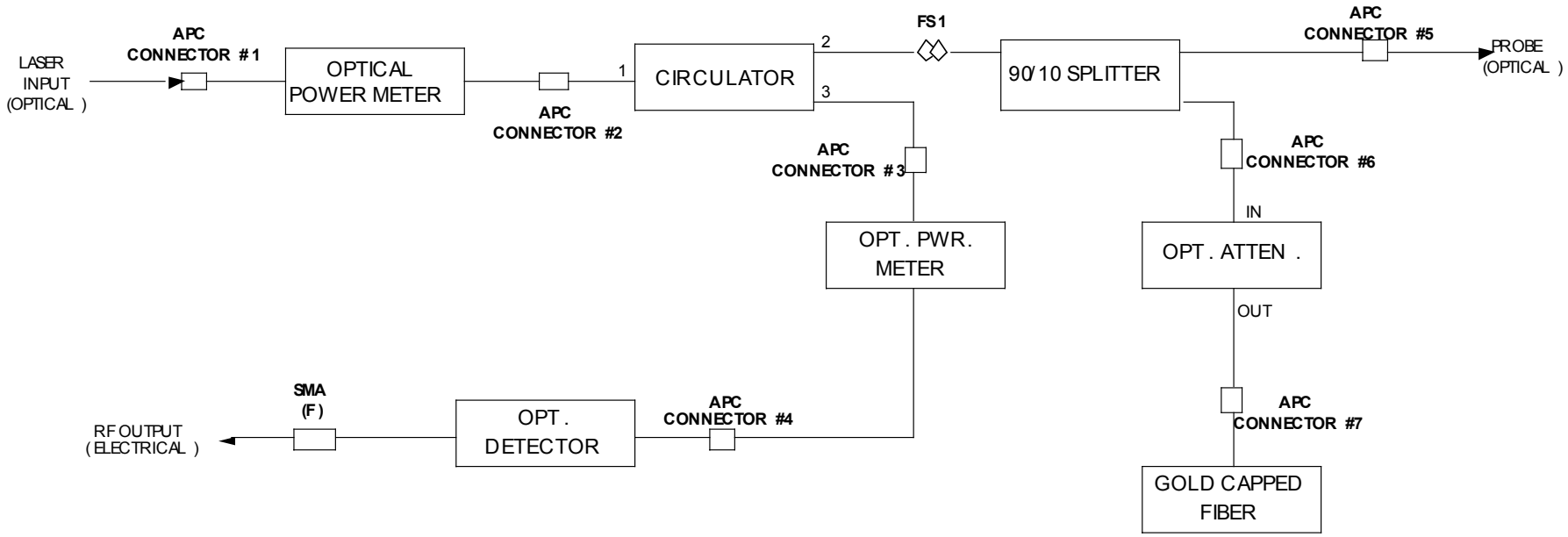
Introduction/Objective

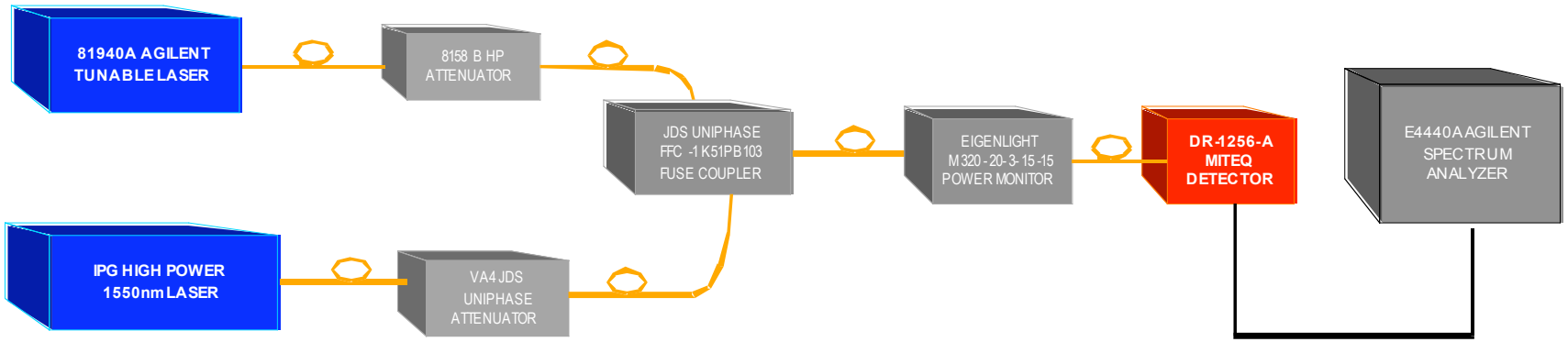
- Acknowledgments
  - Adam Iverson, Doug DeVore, Jason Young, John Hollabaugh, and David Esquibel (NSTec)
  - David Holtkamp (LANL)
- Objective
  - Establish a common test platform for evaluating detectors and report findings
- Work in progress

Block diagram of the optical configuration in PDV system

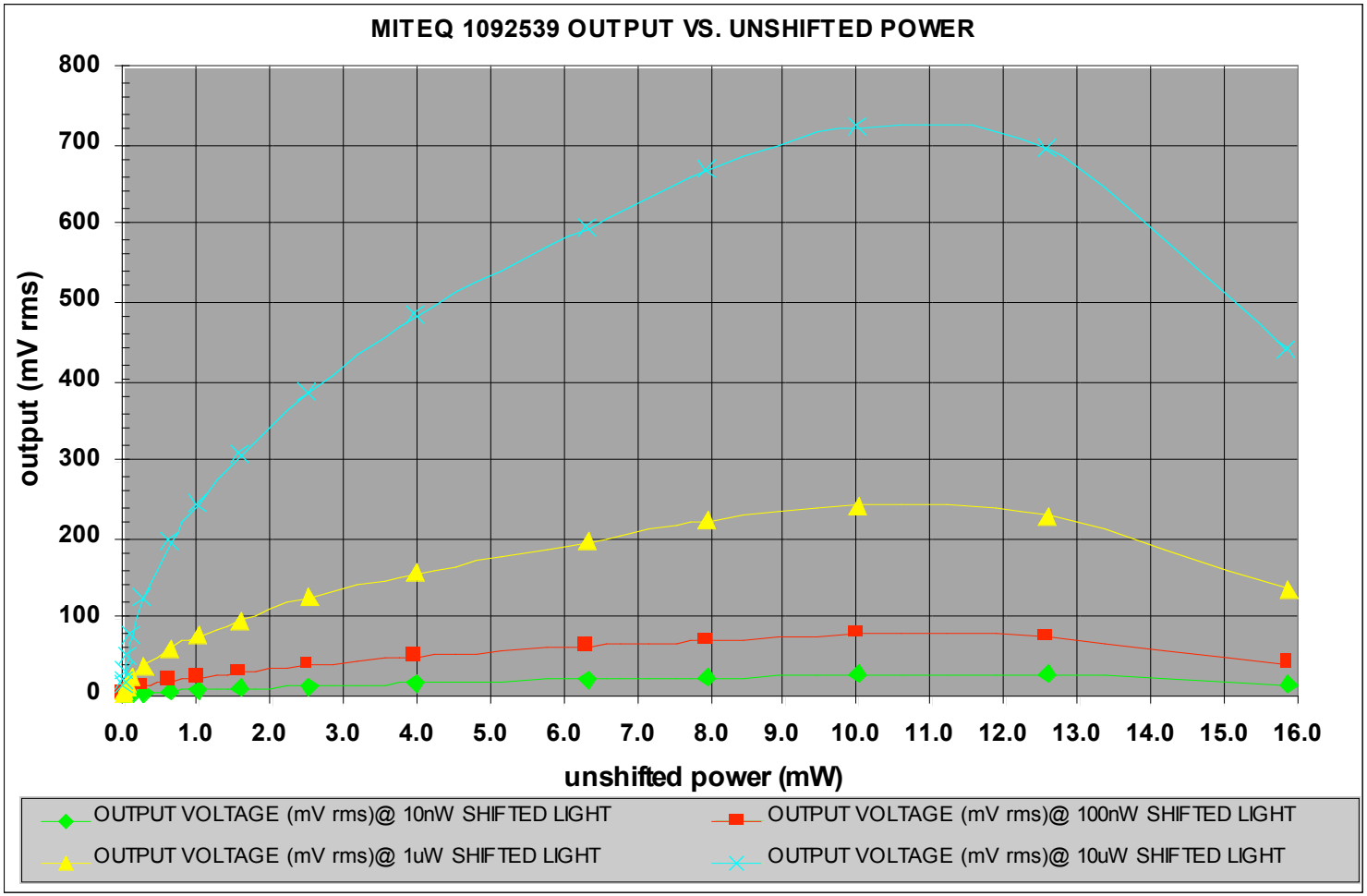


Test Setup

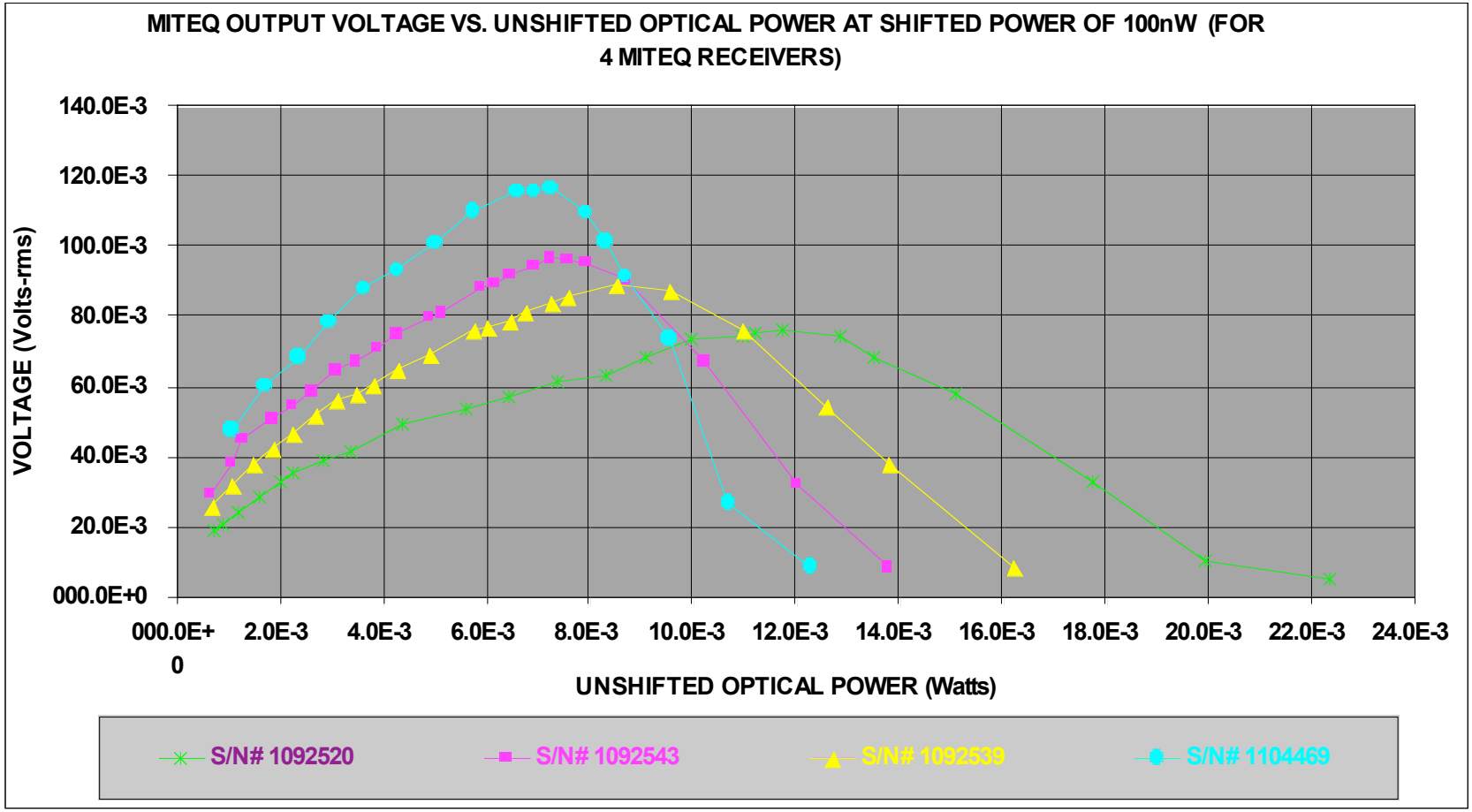
Polarization controller is needed to stabilize output level



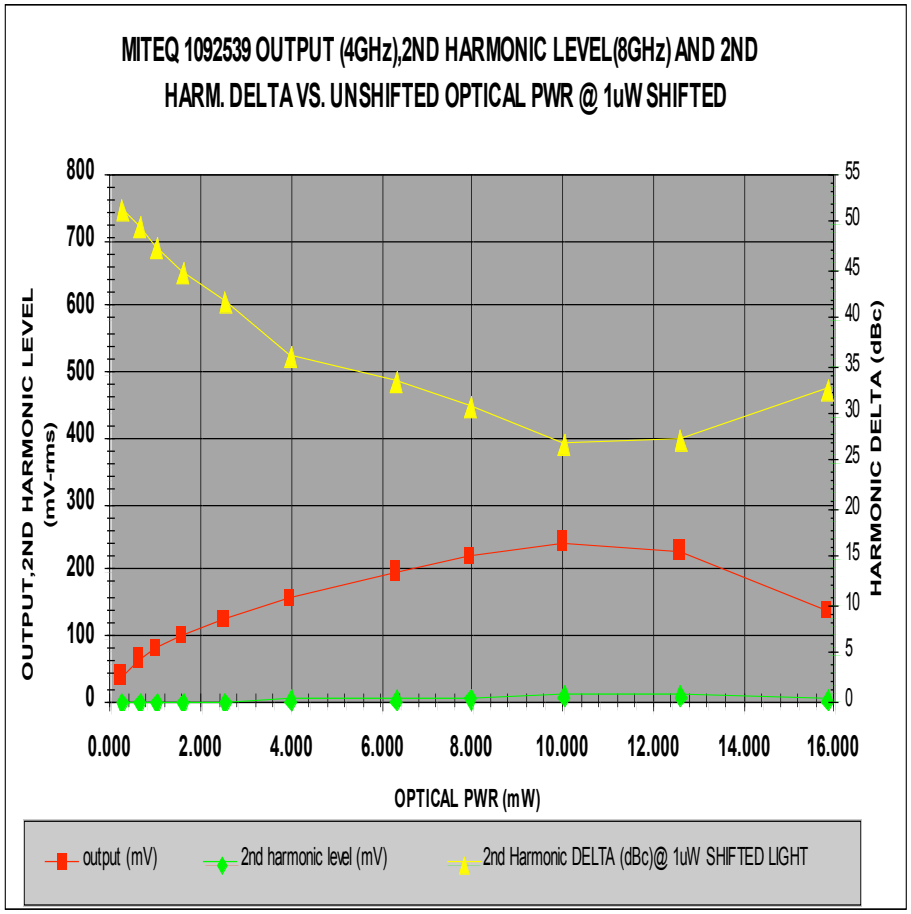
Miteq transfer function at 10 uW, 1 uW, 100 nW, and 1 nW

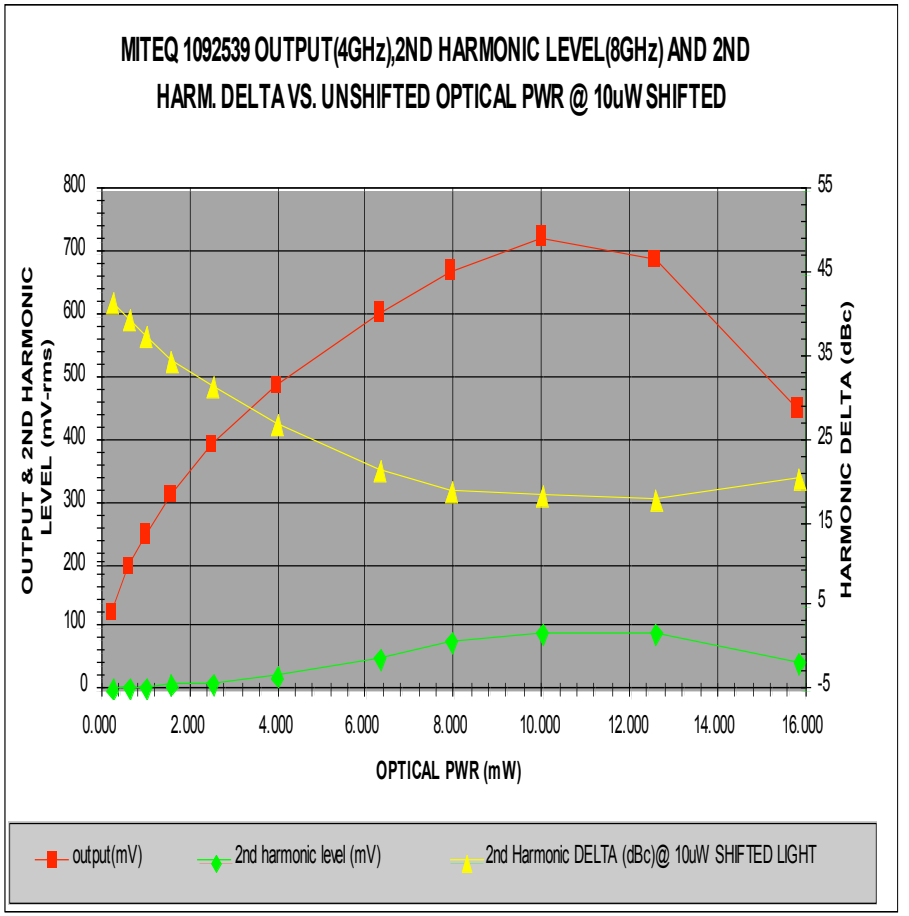


Transfer function for 4 different Miteq receivers

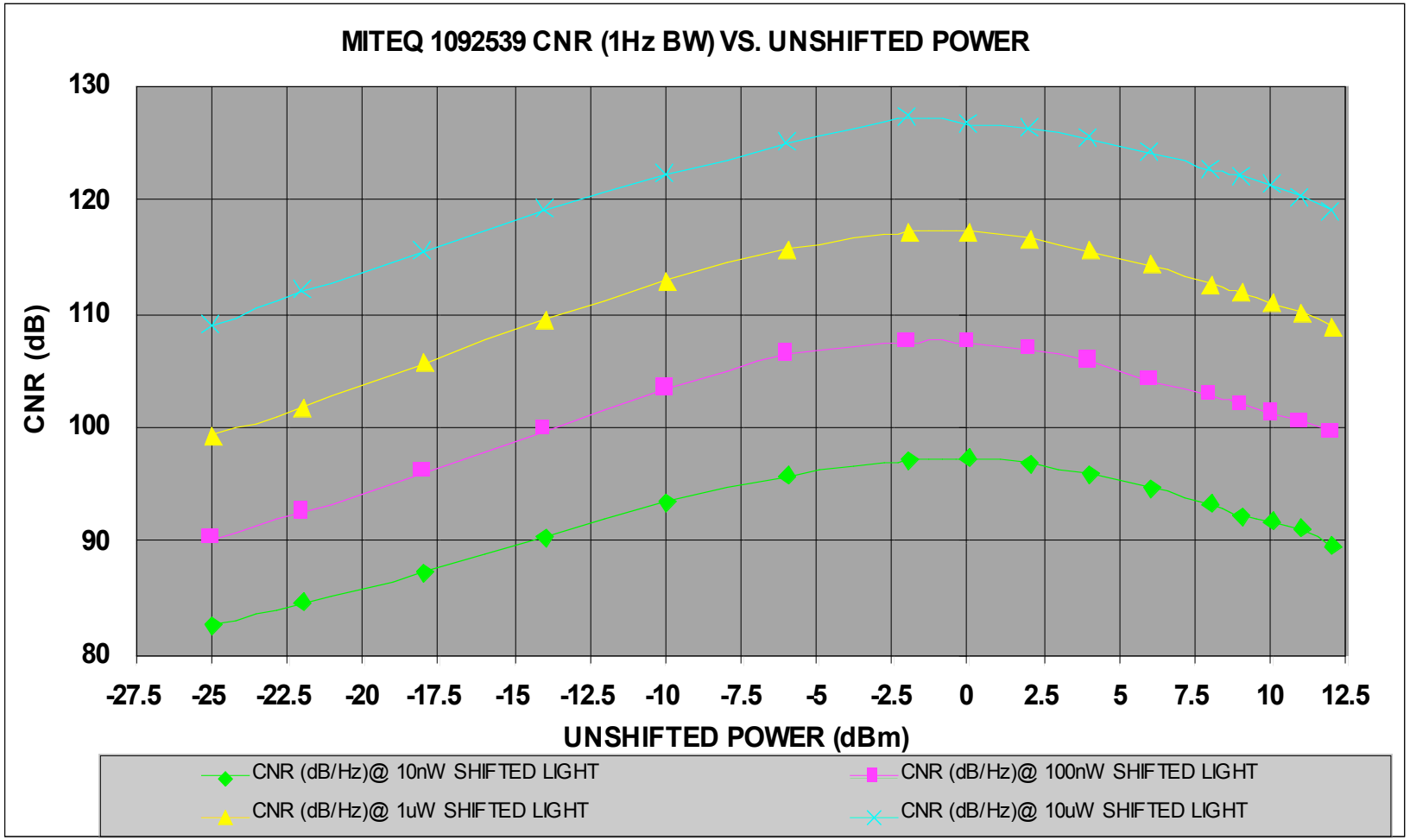


Harmonic content at 1 uW and 10 uW

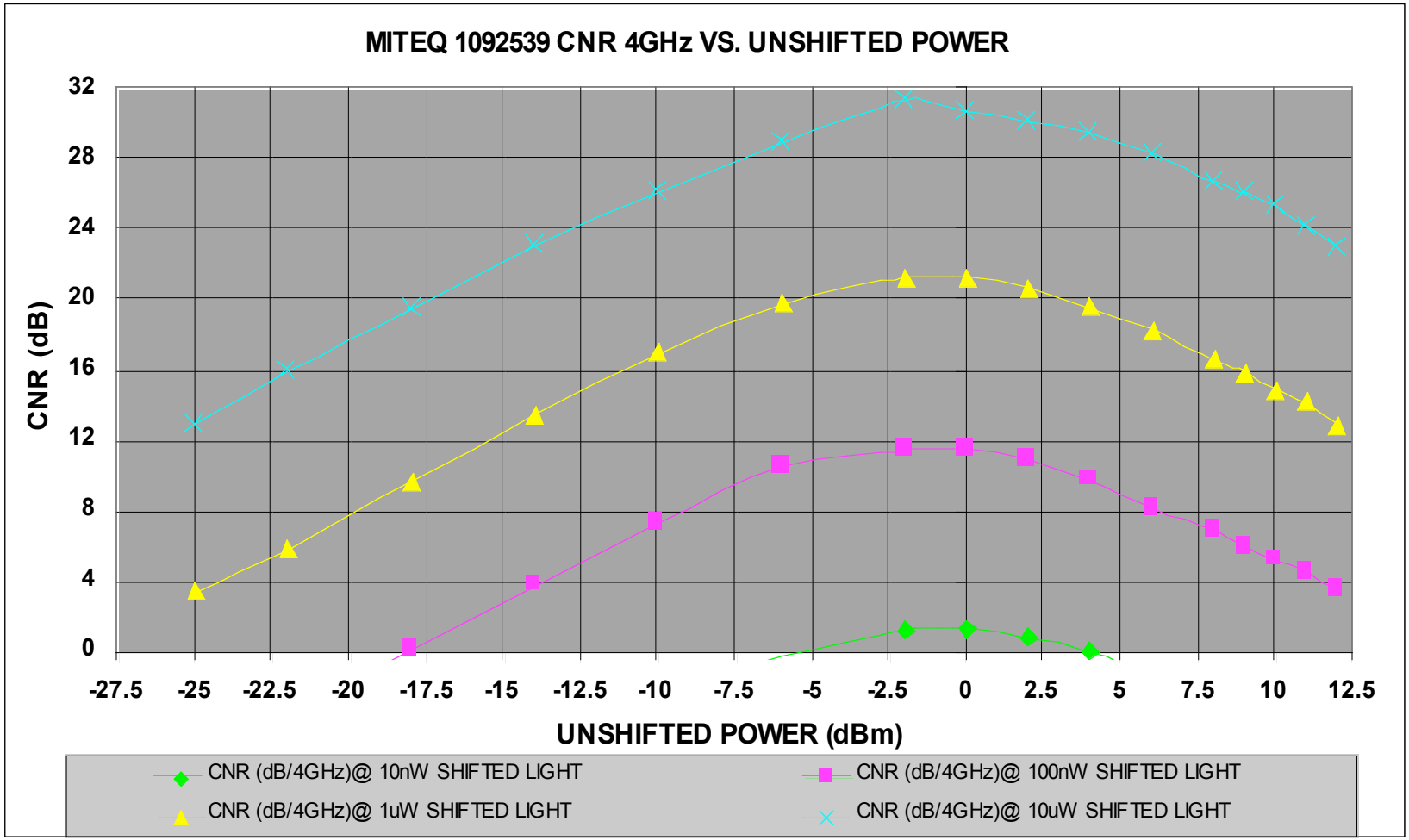




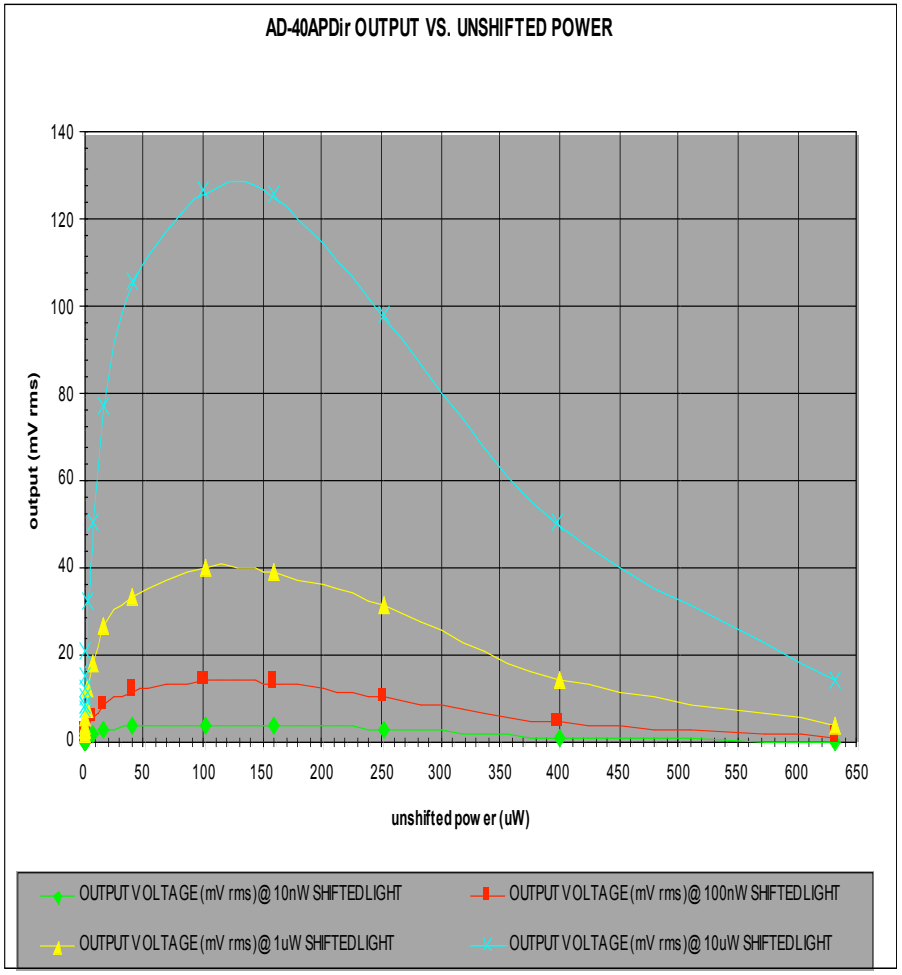
Signal-to-noise ratio in 1-Hz bandwidths

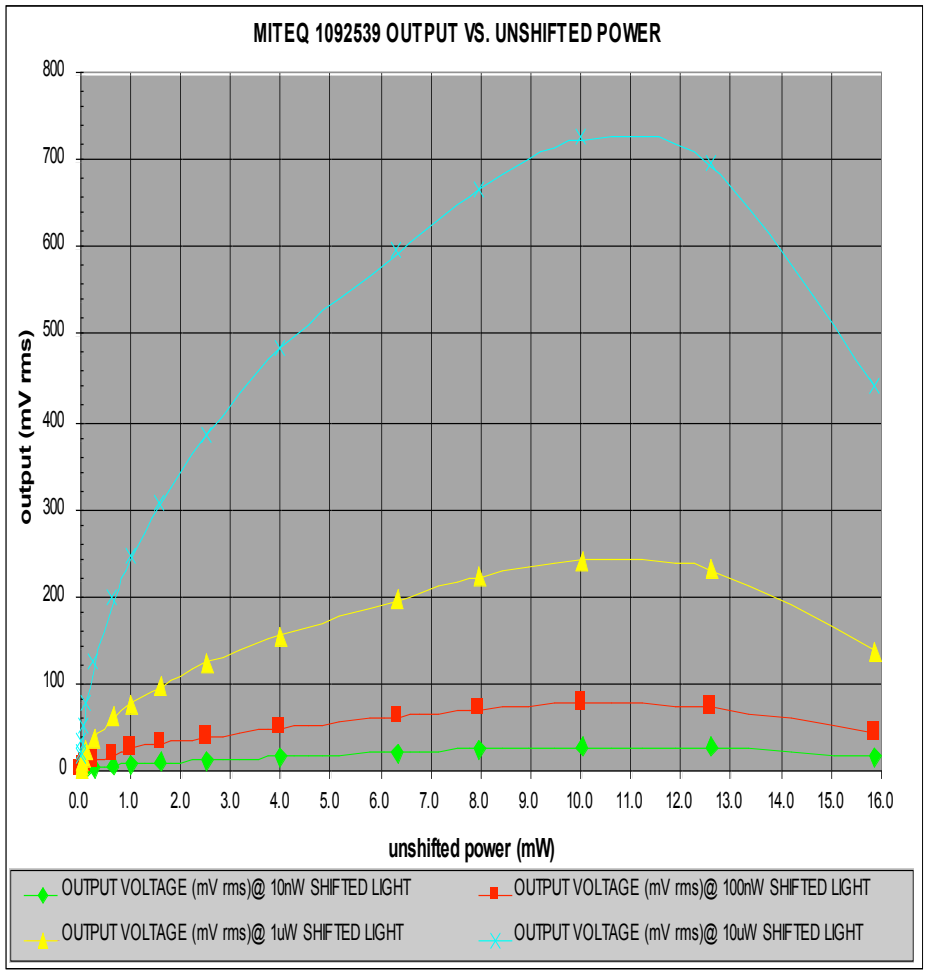


Signal-to-noise ratio in 4-GHz bandwidths [conversion factor from 1 Hz = 10 log (4 GHz)]

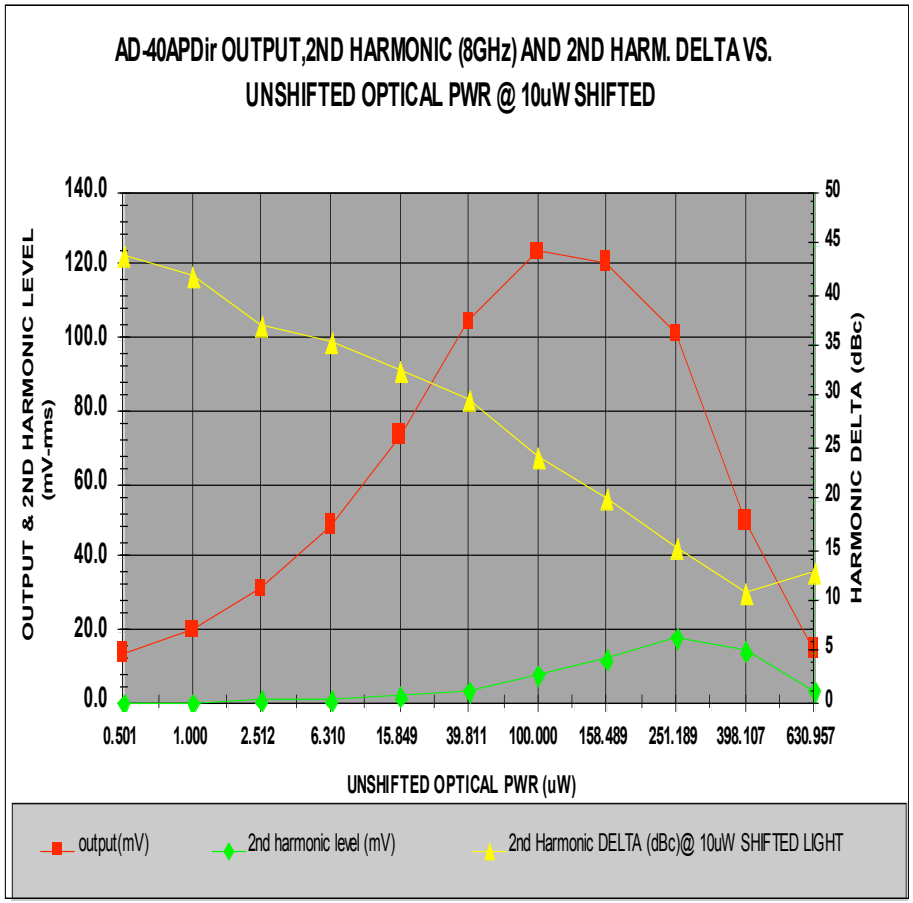


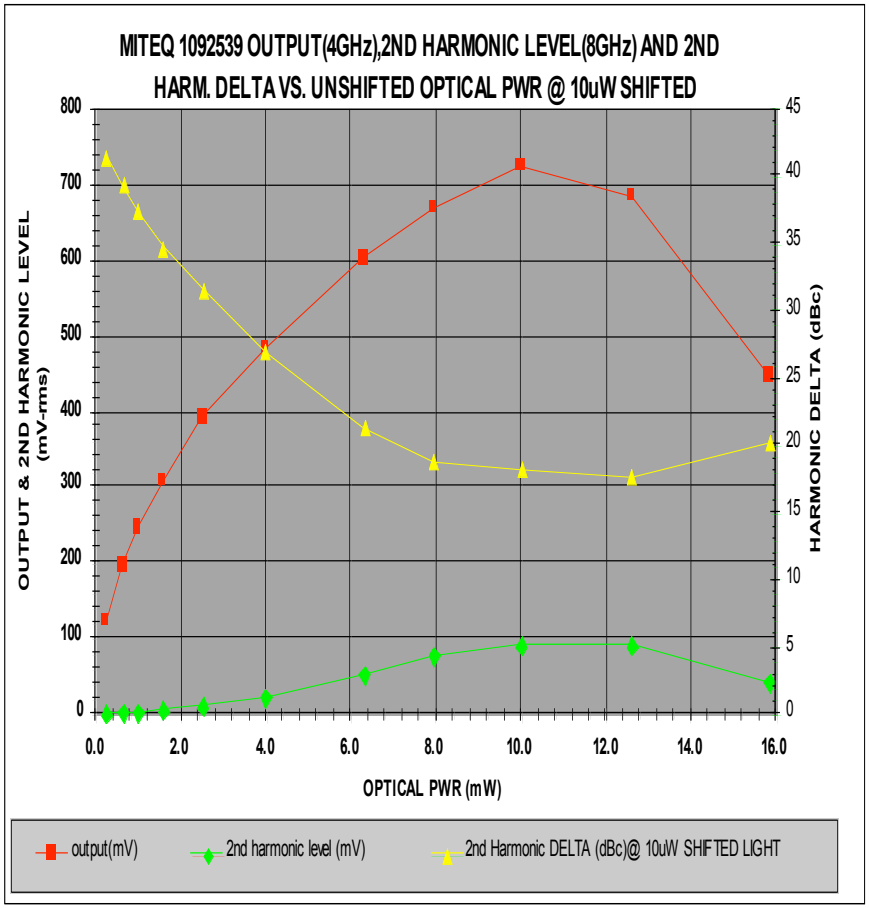
APD and Miteq transfer functions



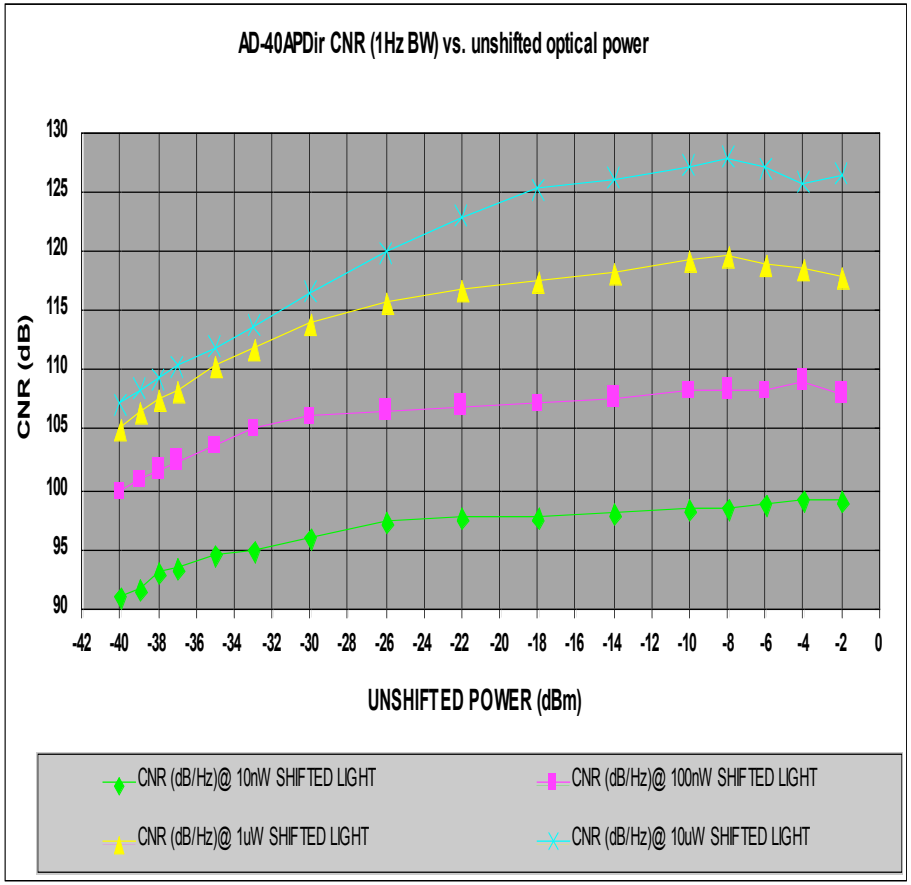


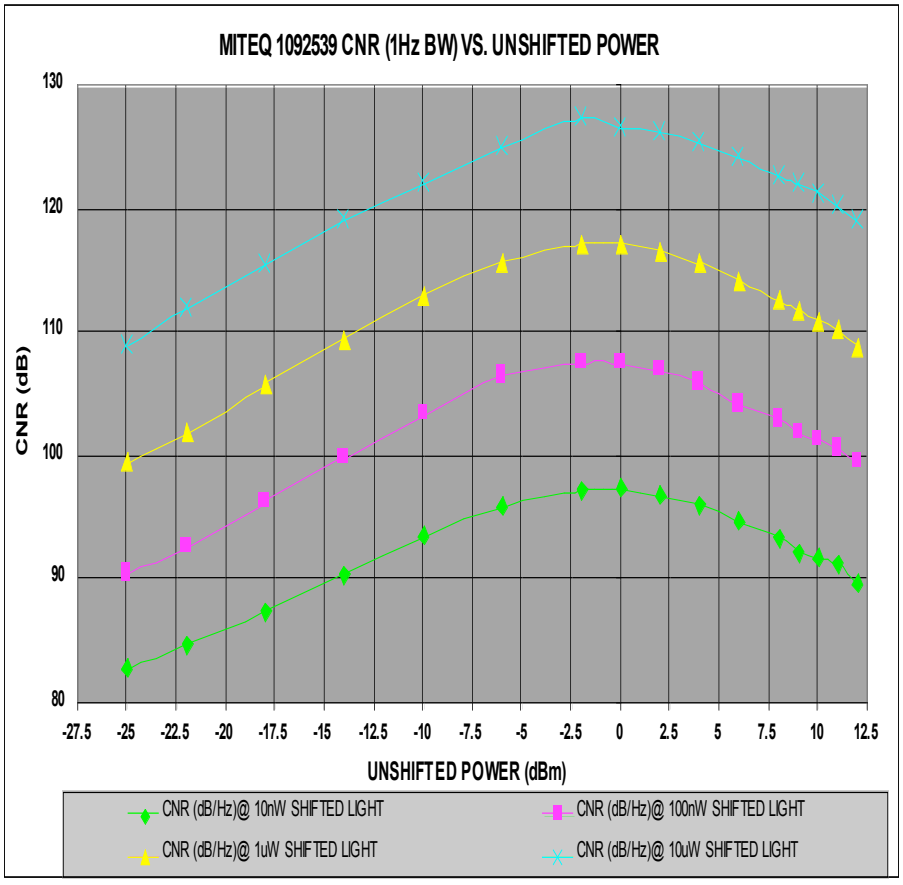
APD and Miteq harmonic distortion





APD and Miteq SNR

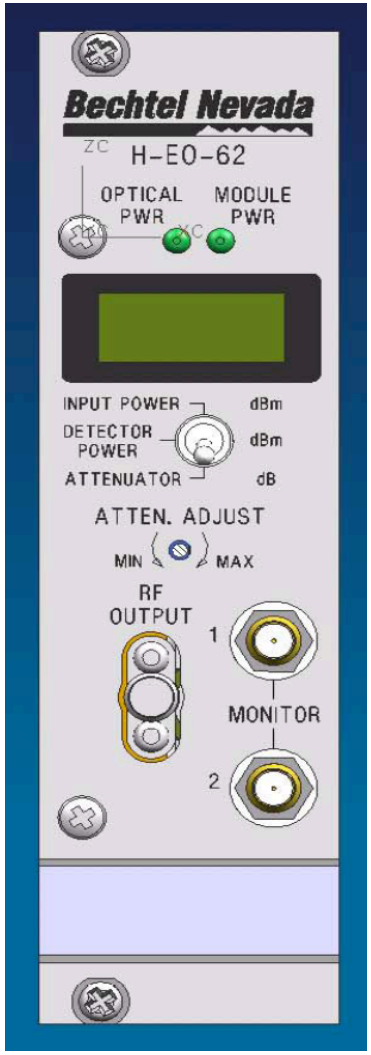




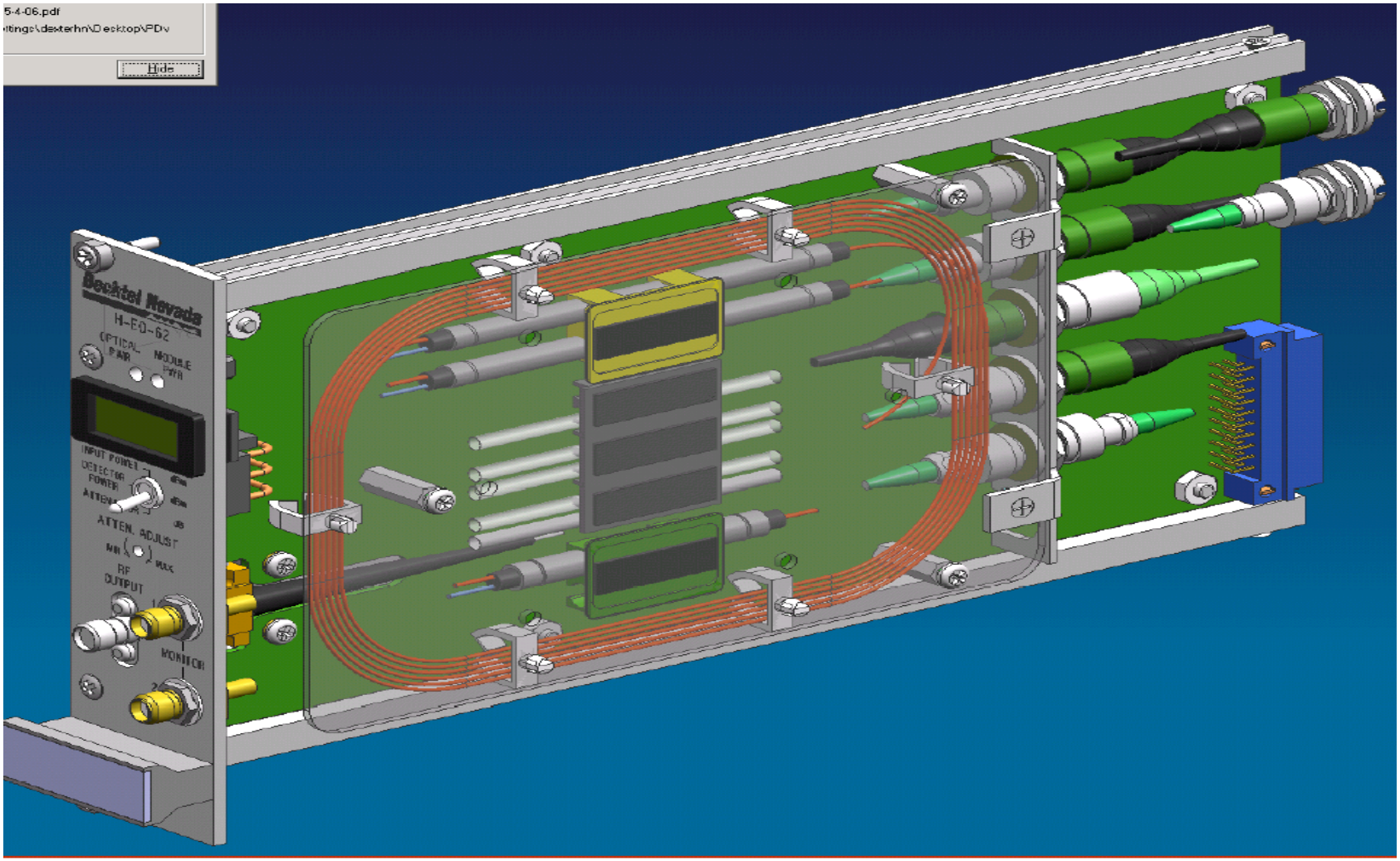
Conclusions

- Each Miteq DR-125G-A detector has a specific input optical power level to produce a maximum output level. These values are not the same from unit to unit.
- The Miteq DR-125G-A detector has a linear range up to approximately 1 mW input optical power.
- The optimum optical input level for output voltage is not the same for optimum carrier-to-noise ratio (CNR); therefore, a trade off between output level and CNR will be necessary.
- To take full advantage of CNR performance, use a detector with only enough bandwidth needed for the diagnostic.
- APD detectors can have as much as 10 to 15 dB improved CNR than PIN detectors for the same input optical power, but a post-amplifier will be needed to produce similar output voltage.

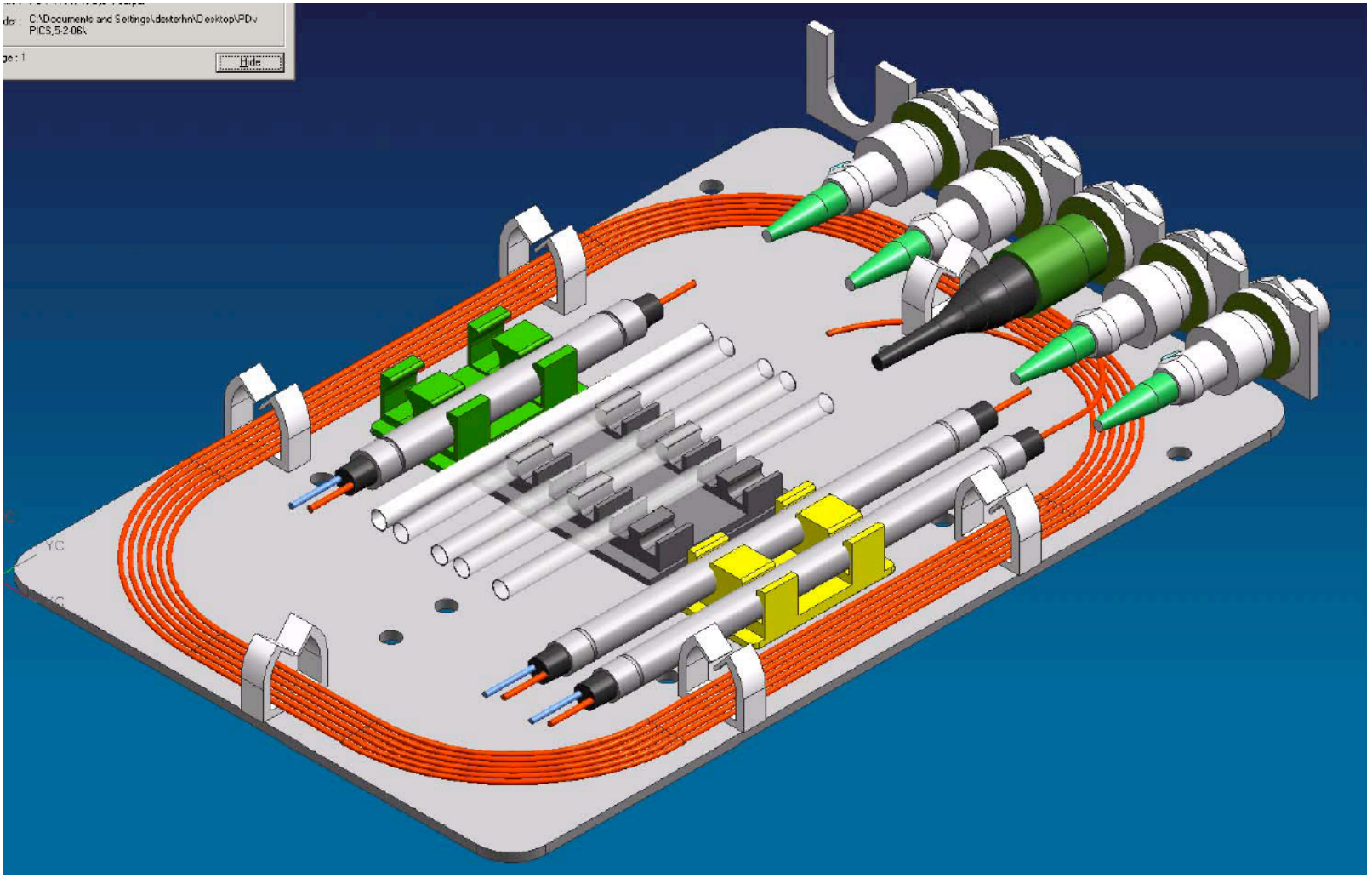
New package, front panel



New package, internal assembly



New package, fiber tray



Questions & Contact Information

- Questions?

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