Optical setup at 532nm: tests and first conclusions

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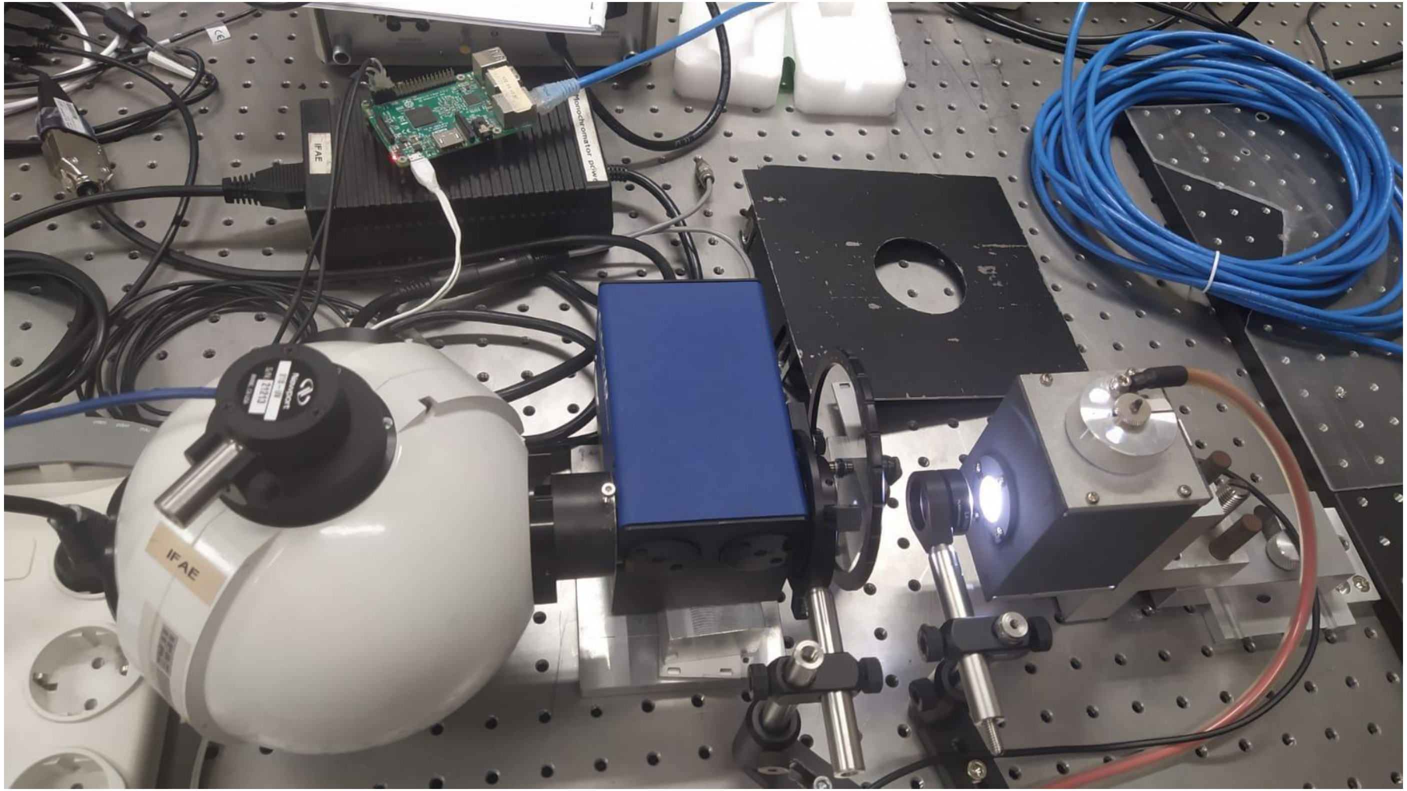
Set-up for 532nm

- Xenon lamp
- Collimation

- Filter
- Monochromator
- Integrating sphere
- PD_{NIST} calibrated
- PD Virgo (-2%)

- Raspberry PI (V)
- PM (W/cm2)



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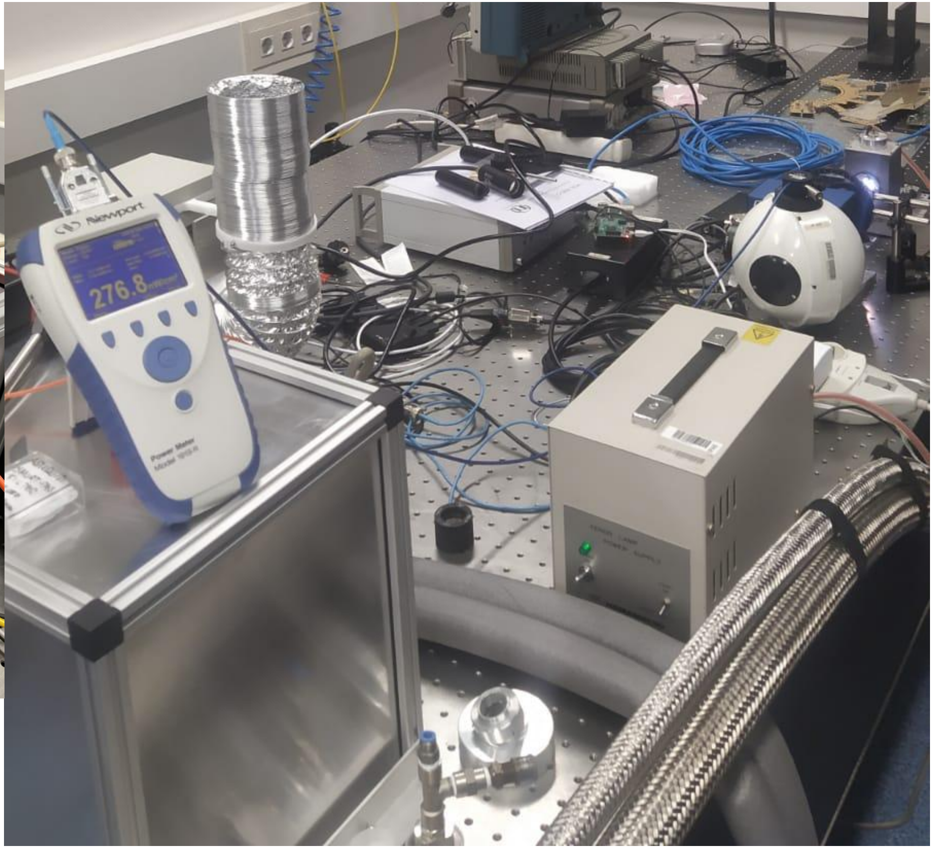
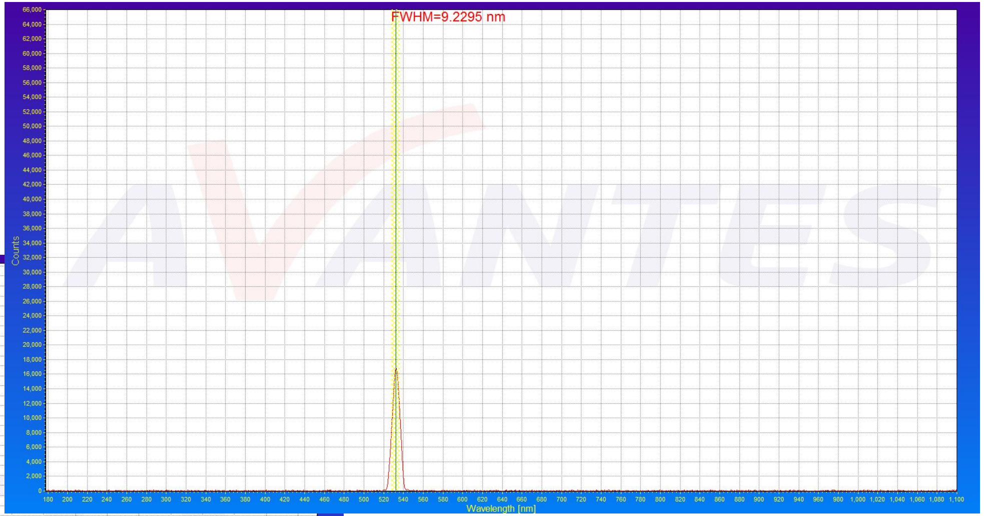
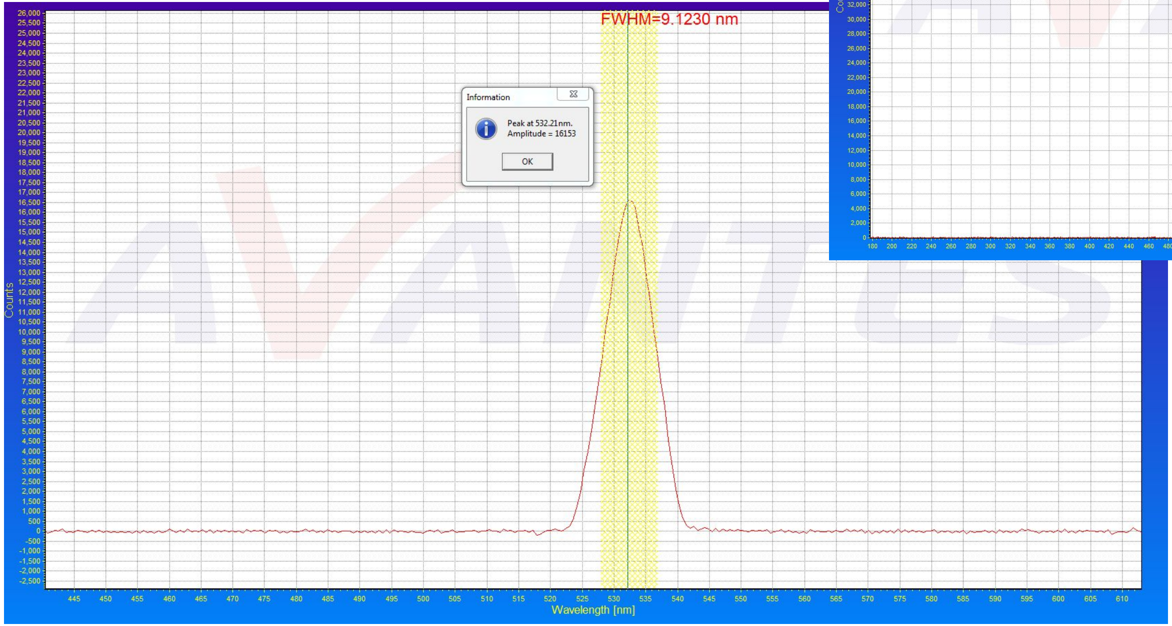


In contemporary with integrating sphere:
PD Virgo data with the raspberry pi (V)
and PDNIST with powermeter (W/cm2)

Spectrometry @ 532 nm

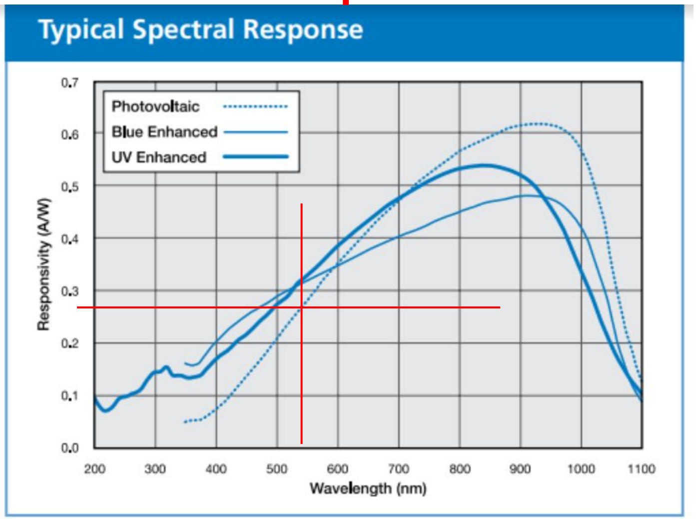




VIRGO PD: Setup @ 532 nm

Wavelength (nm)	Estimated Responsivity (A/W)*
532	0.253
1064	0.503

Quite near of the expected value for enhanced NIR photodiodes (dashed-curve)



* Link to data

Measurements of the offset: PD_{NIST} and PD virgo

- Offset (pedestal+environment) computed by closing the input hole of the lamp (from monochromator on).
- Measure taken with 5 min of Data Acquisition (stable laser)

- PD NIST Offset: Average 1.33 nW/cm2, std 0.03 nW/cm2
- PD Virgo:The offset measurements (with the lamp hole closed) show an average of 0.297 mV and a std of 0.246 mV

Measurements of the setup@532nm

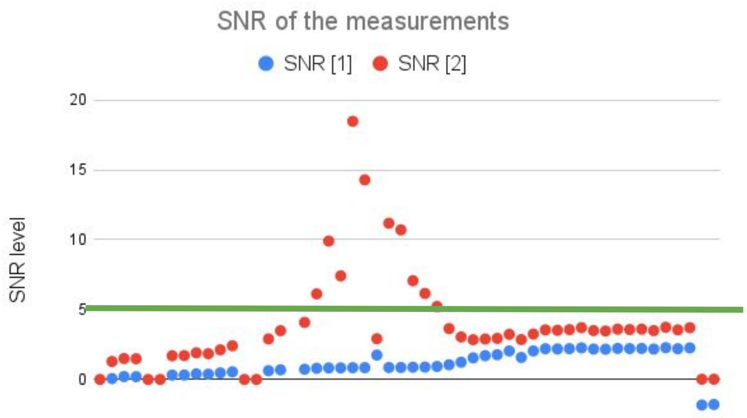
- First measurements show that Xenon lamp flux is too low to cover the whole PD Virgo's dynamical range (0.3-0.8) mV
- We vary the filter wheel spanning a range of 4.16-280.5 nW/cm2 as seen by the PD_{NIST}+powermeter
- Each measure taken with a 60 ms sampling rate and for 1 min
  - Moving average in case of the PM
  - Used labview for PD VIRGO

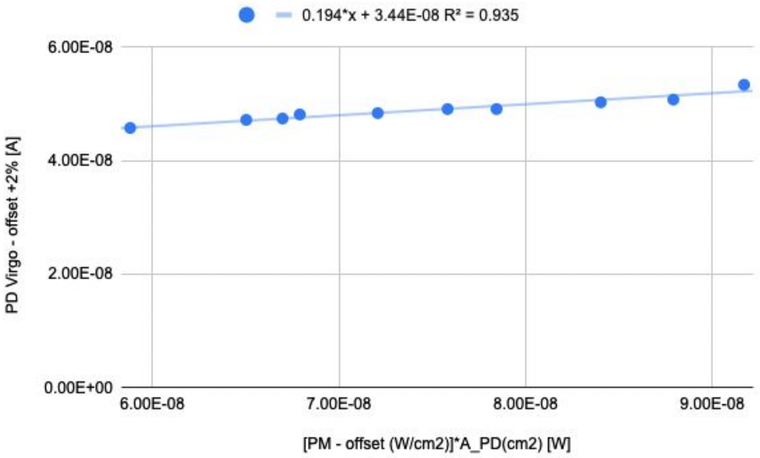
[link to full dataset]

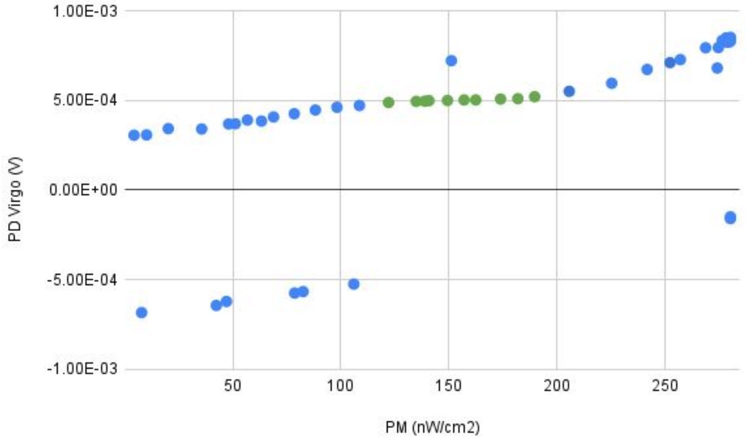
Results of the setup@532nm

- SNR as [1] n sigmas away: we are **not able to go beyond 3 sigmas** with the current setup (max 2.26 sigmas)
- SNR as [2]: we are also noise-dominated.

$$SNR = \frac{x - \mu_{pedestal}}{\sigma_{pedestal}} \quad [1] \qquad SNR = \frac{x}{\sigma_x} \quad [2]$$







Conclusions from the setup@532nm

- We propose a simpler setup, valid for both 532nm and 1064nm
- A new green laser is needed
- Avoid integrating sphere, use rails or BS
- The optimal condition is to use a black box

To-do: - better measurement of PD virgo pedestal with current setup

PD char with green light - proposal 1

Brainstorming on the set-up: various possibilities but none was perfectly suited to do 532nm and 1064nm tests (e.g. problem of the fiber that is ok for 532nm but attenuates 1064nm, etc)

If we need to do a proper characterization campaign, we need a setup that is **easy to manage** (XY table) and that is **almost identical** to 1064nm case

Problem: **most of our set-up is thought for 1064nm (collimator, fiber, filters)**

- Proposal: common set-up that is compatible with 1064nm and 532nm with a *switch* of the input source
- What is needed:
  - Multi-modal fibers
  - Laser@532nm + support
  - Broadband filters to attenuate the laser (current ones are only useful at 1064 nm (NIR))

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Problem: **most of our set-up is thought for 1064nm (collimator, fiber, filters)**

- Proposal: common set-up that is compatible with 1064nm and 532nm with a *switch* of the input source *and* of the PDs (4 set of measurements)
- What is needed:
  - Multi-modal fibers
  - Laser@532nm + support
  - Eventually filters to attenuate the laser
  - **Rails** for the change of the PDs (**BS** or even **integrating sphere** for 1064nm ?)

- Next step: WE NEED TO SIT DOWN AND DISCUSS

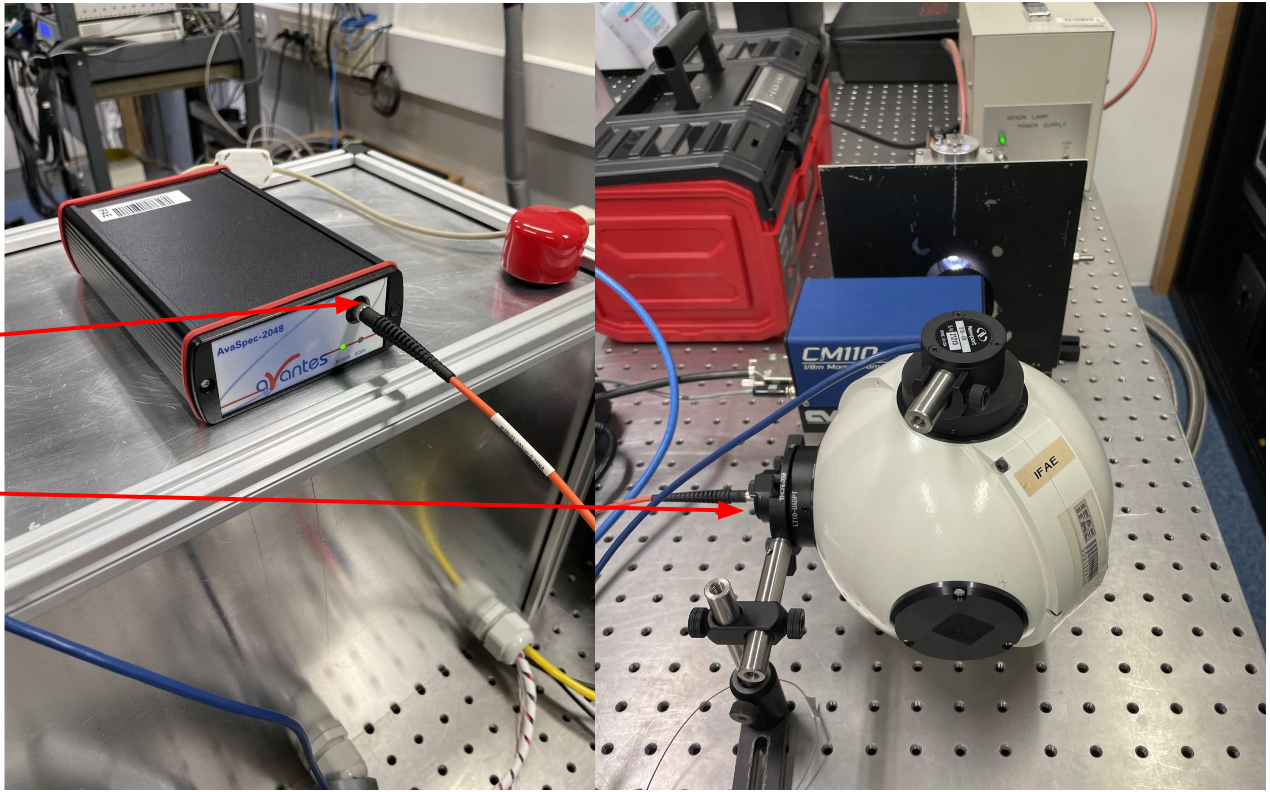
Back-up

Set-up for 532nm

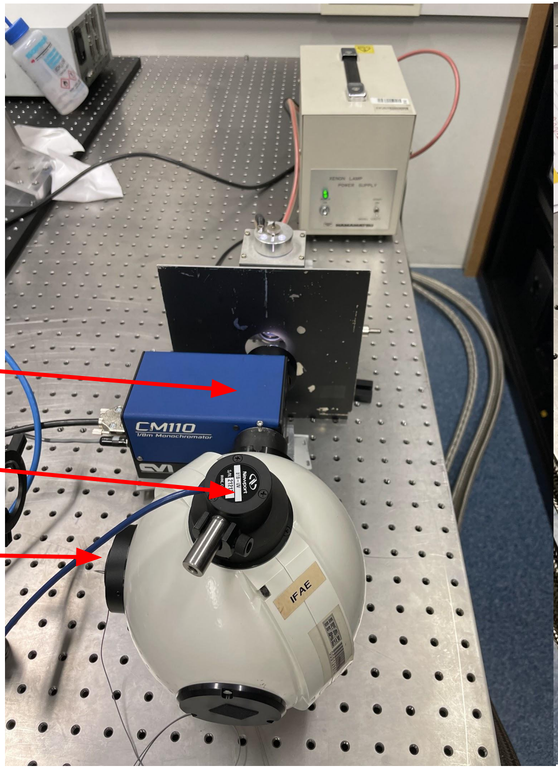
- Xenon lamp
- Filter
- Monochromator
- Integrating sphere

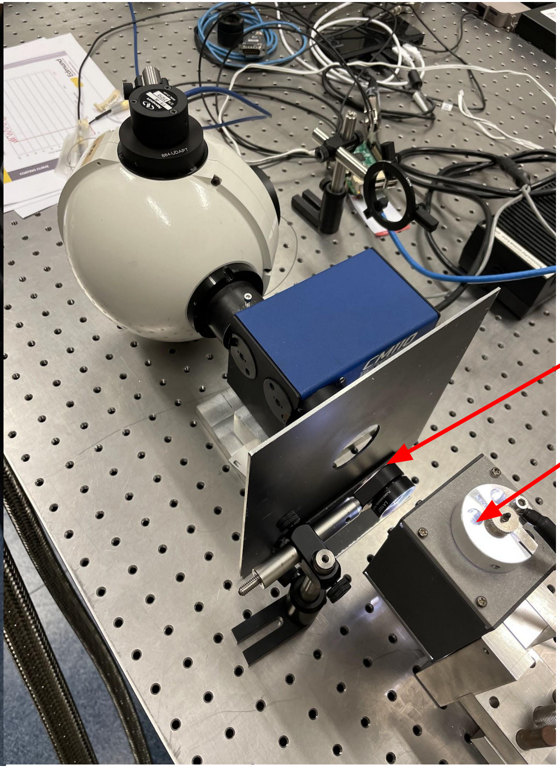
SPECTROMETER
INPUT

INTEGRATION
SPHERE OUTPUT



VIRGO PD: Setup @ 532 nm





First results for 1064nm

What you do you expect to present on this slide? which results?-> Results for the first setup, the one already mounted on the optical bench

- Sources of noises you have investigated in terms of NEP (a short recap)

Problems left

- Change of the resistance to check the NEP PD Virgo (ADC limitations)

New setup to cover BOTH: 532 nm and 1064 nm

Replace:

- Collimator: ~200€ of the input source? Which one?
- Multi-modal optical fiber: ~300€
- Filters: ~100€
- New laser: output power regulated and FC connector: ~3000€

Links and details of each component ?

PD char with green light - proposal 1

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  - Broadband filters to attenuate the laser (current ones are monomodal) (not sure about this?)

- What is already there
  - Beam Splitter
  - Lenses of former 1064nm setup
  - Lenses for the collimation (instead of collimator)
  - What else?

PD characterization campaign with green light

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