



CHAMELEON CHOPPER CALIBRATION

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Disclaimer: no chameleons were harmed in this experiment



<http://www.idontevenownatelevision.com/wp-content/uploads/2015/09/chameleon1.jpg>

Overview

- Background Information
 - CAST
 - Chameleons
- Experimental Setup
- The chameleon chopper
- Future plans

CAST Experiment

- CERN Axion Solar Telescope
- Dark Matter??
- Early 2000s
- prototype magnet for LHC
 - 10m long
 - 9 Tesla dipole magnetic field
- Equipped to detect X-rays
- First solar chameleon telescope

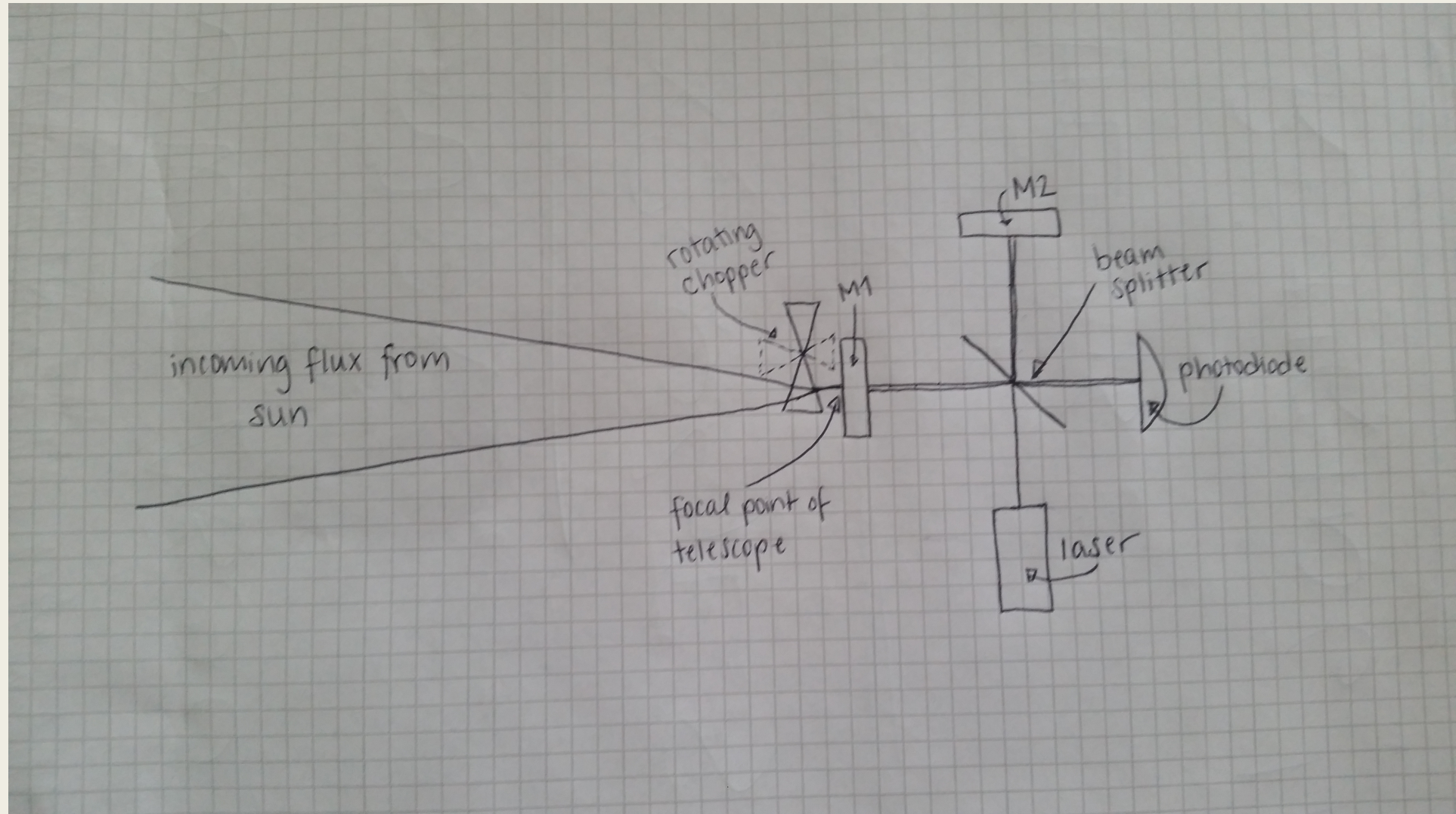


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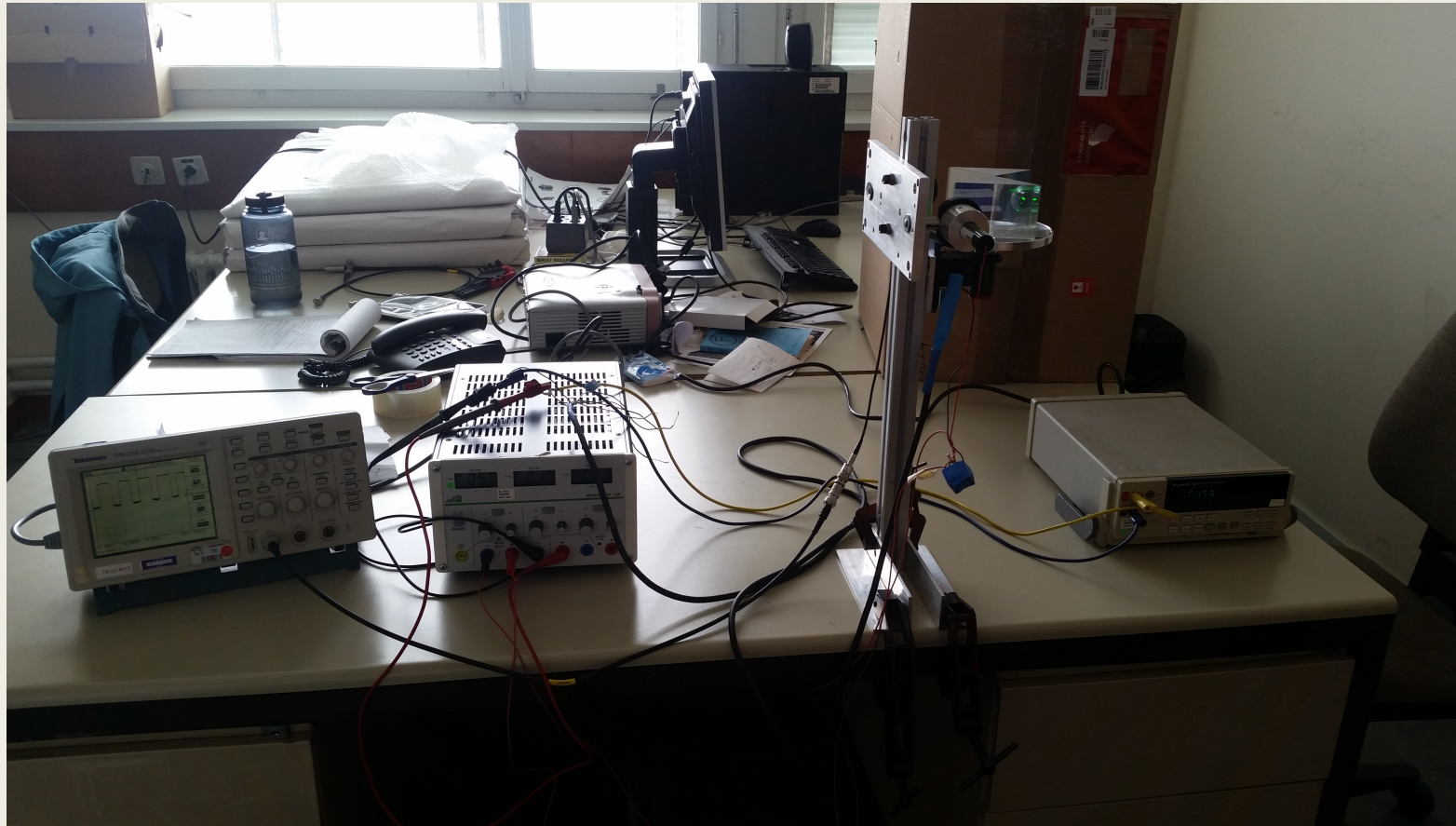
Chameleons

- Dark energy candidate
 - Fifth force?
- Produced by the Primakoff effect
- Variable mass depending on energy density
 - High density – low force, hence why we don't notice them on Earth
- Couple to matter more weakly than gravity
- Expected X-ray spectrum peaks at 600eV
- Very little is known

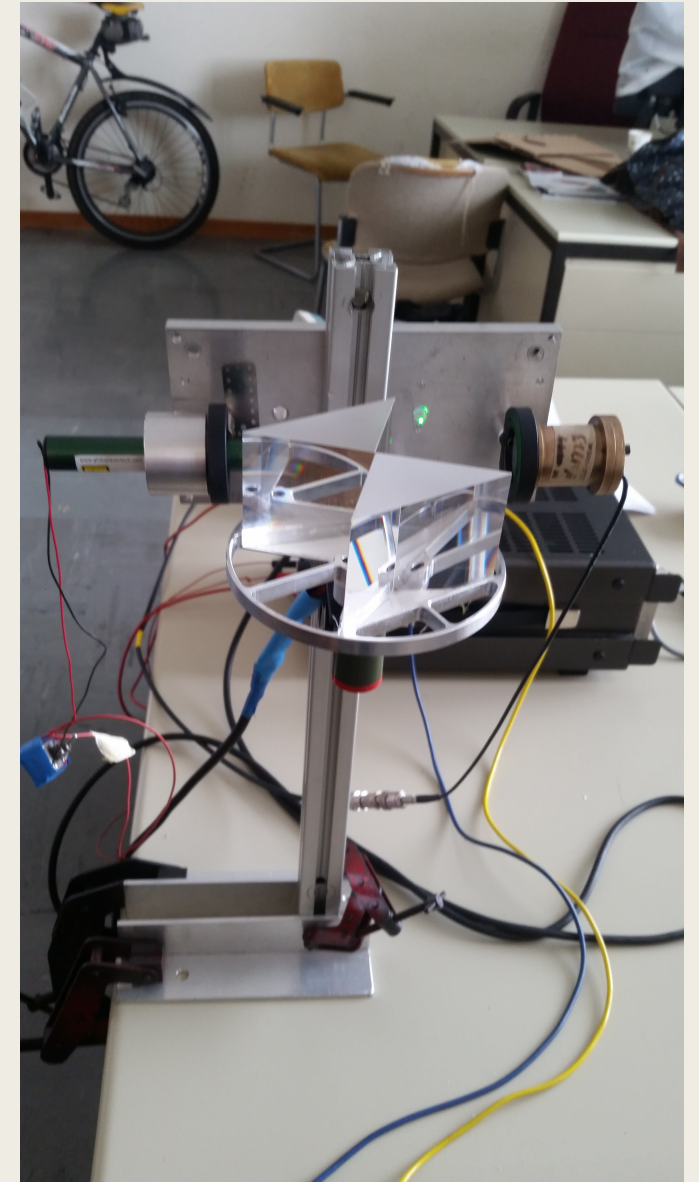
Hunting for chameleons



The chopper (my contribution)

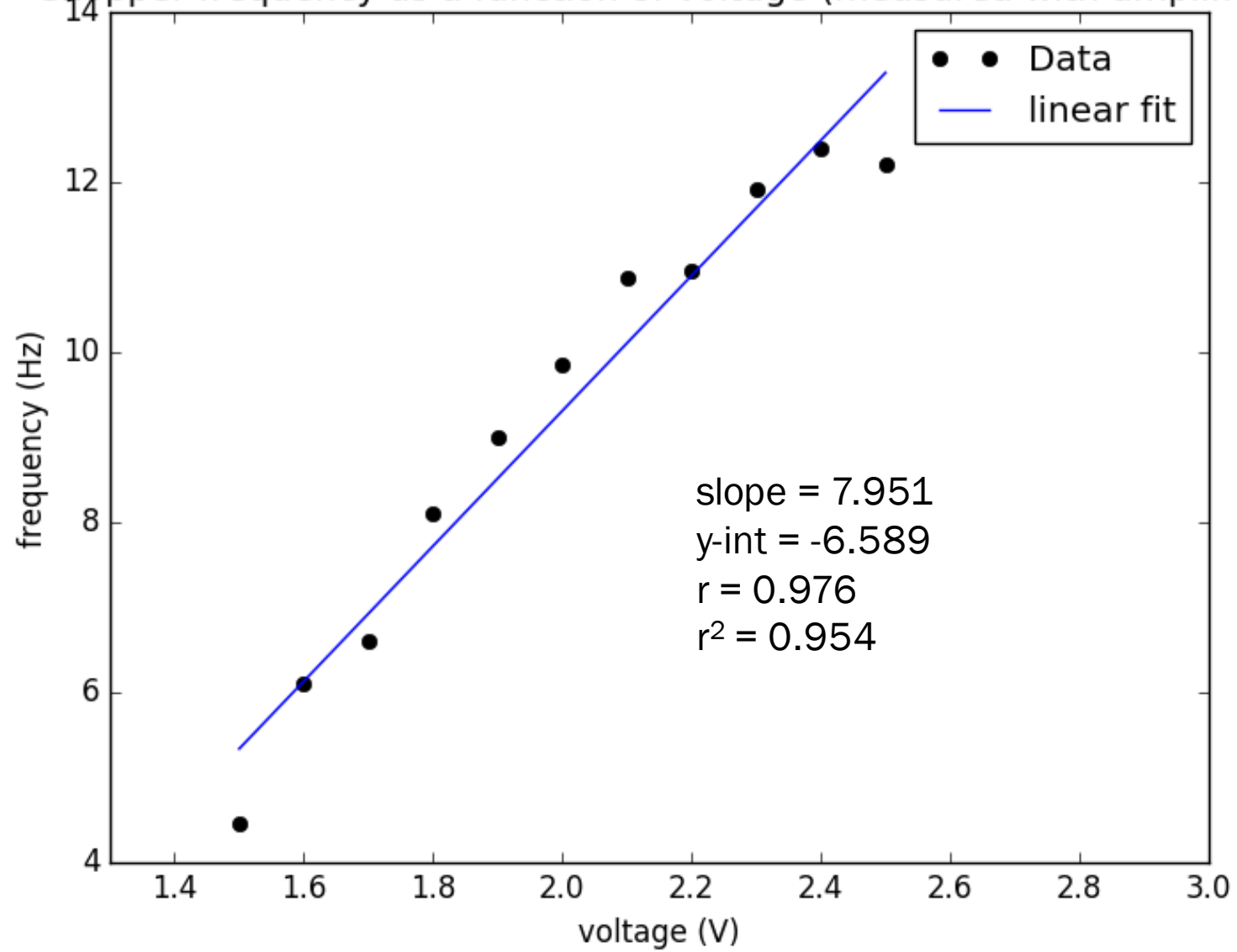


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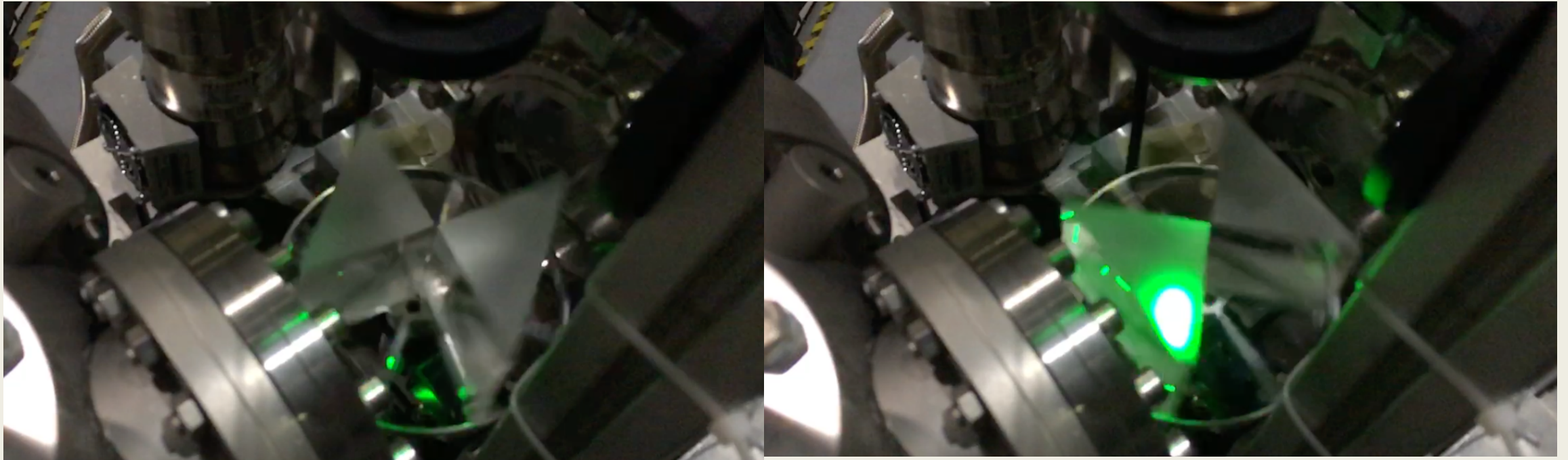
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Chopper frequency as a function of voltage (measured with amplifier)



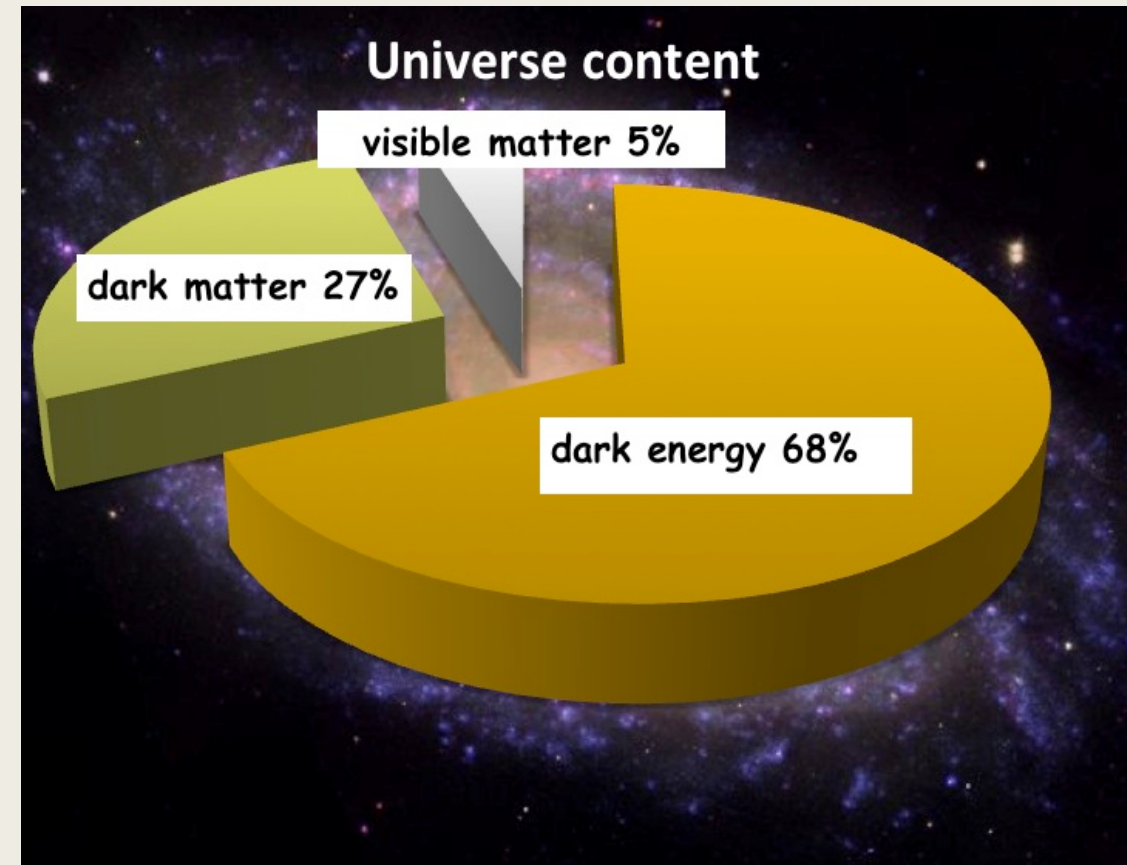
Mounted on the beamline!

- [Slow-motion video](#) of the chopper on the beamline



Future work

- Improve motor system
 - Current motor is too weak to rotate prism at higher frequencies
- Continue taking data
- Shed some light on dark matter and dark energy



<http://www.quantumdiaries.org/wp-content/uploads/2013/06/disk-dark-matter.jpg>

References

- CAST Collaboration (V. Anastassopoulos, et. al.) Search for chameleons with CAST. Phys.Lett. B749 (2015) 172-180
- K. Barth, et. al. CAST constraints on the axion-electron coupling. JCAP05 (2013) 010.

Questions?