AAM, Sep 29 2017

OPTICAL METER STATUS
as of September 29 2017

THE CONCEPT

(Reminder)

As it was done in E-821, the magneto-optical crystal used for measuring magnetic field by registering rotation of polarization plane of light : $\Delta\varphi = Vc \cdot B \cdot l$

In our system a TGG crystal is in usage (Terbium Gallium Garnet $Tb_3Ga_5O_{12}$).

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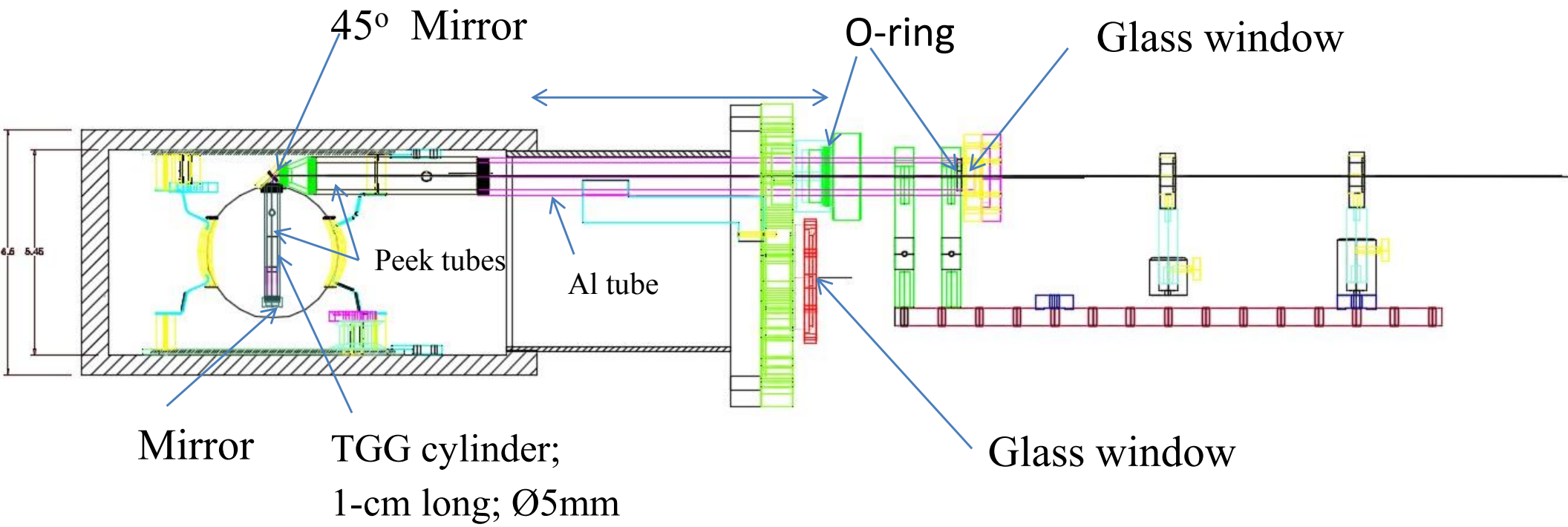
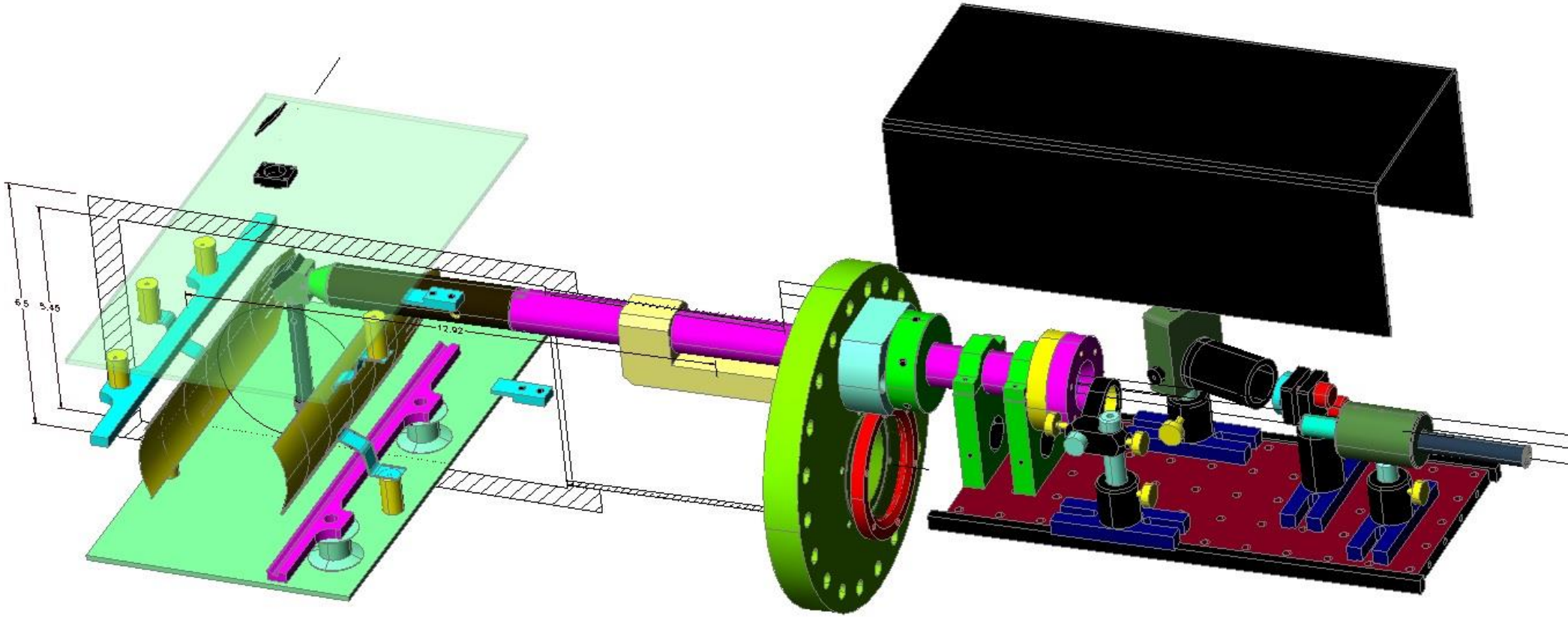
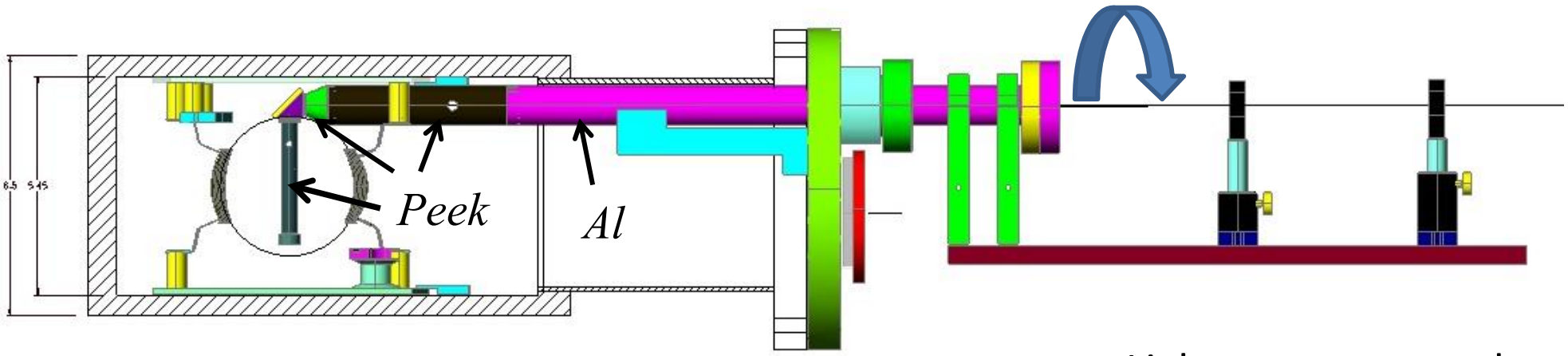


Big flange sealed by-Al gasket; Optical Windows sealed by O-rings;
Tube sealed by O-ring



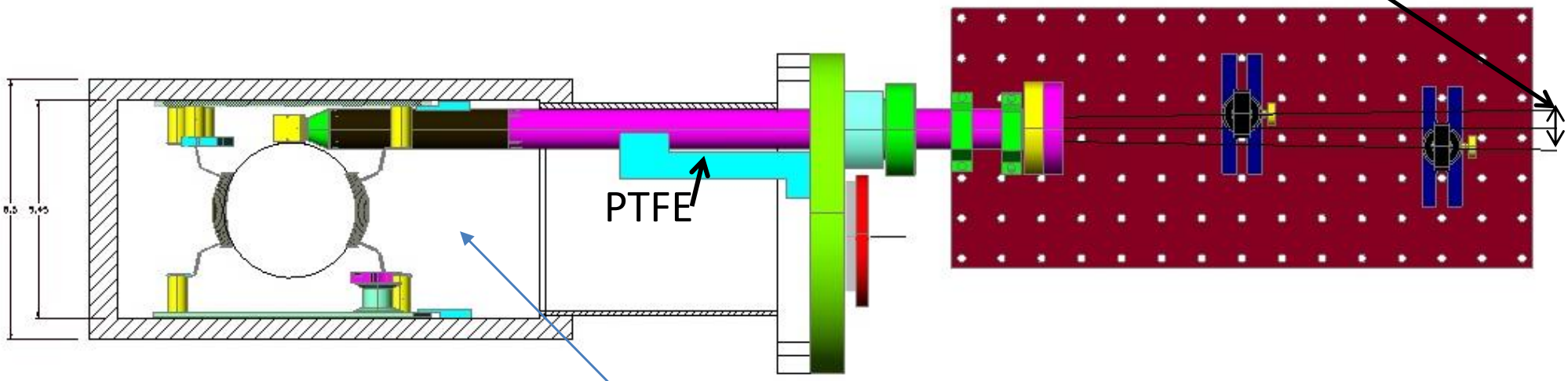
~26 simple parts; all are fabricated already.
Parts include solenoidal coil for calibration of TGG response

After manual rotation on 90° the probe is out of the NMR train shadow.

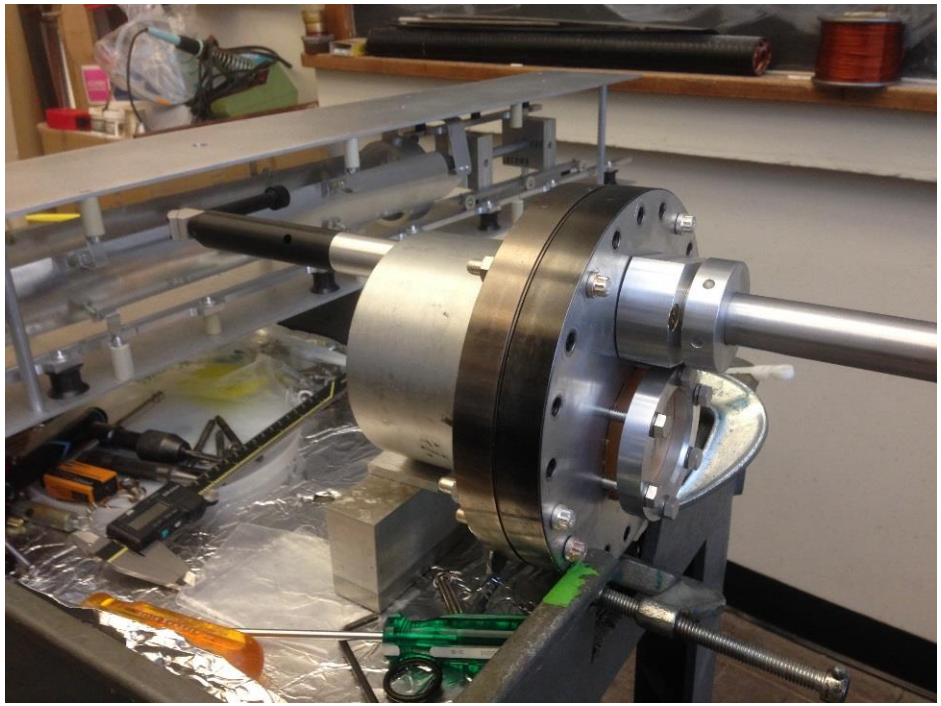


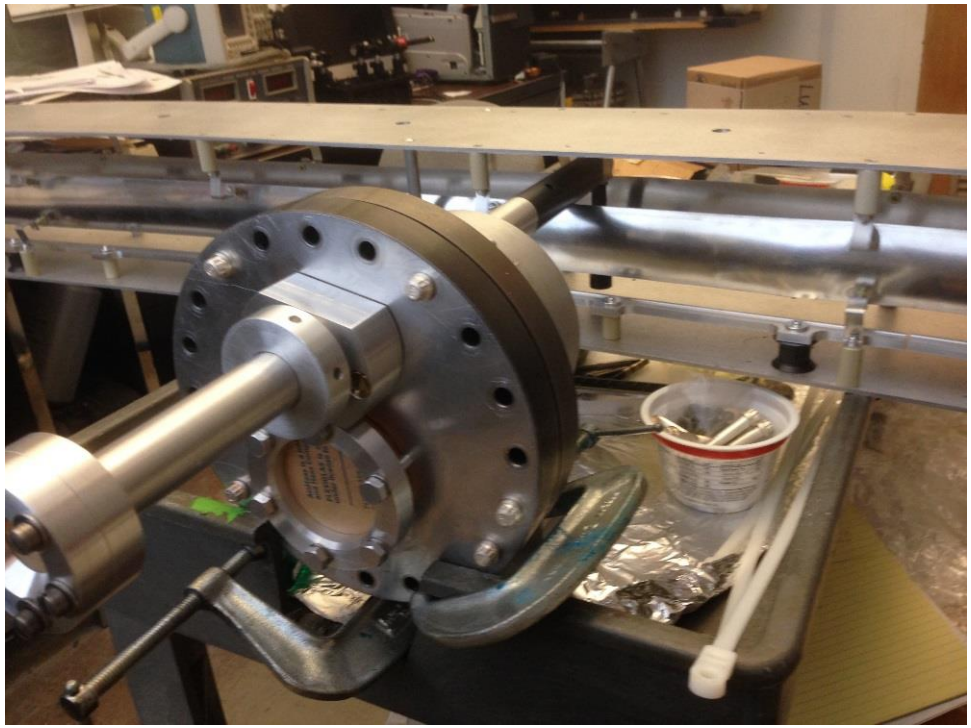
System could be moved transversely (in/out);

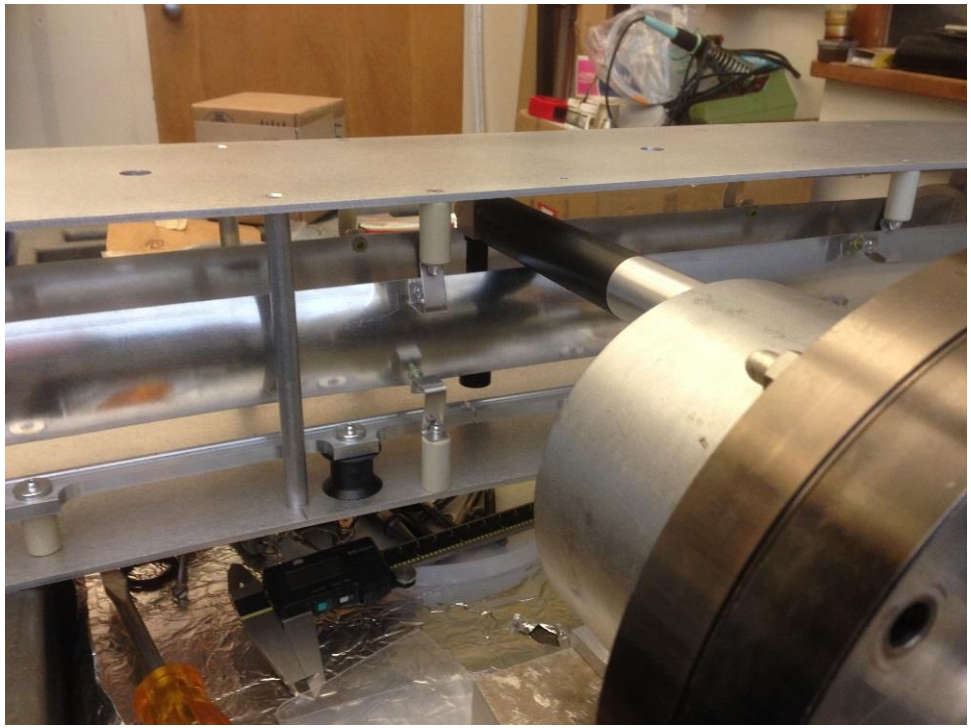
Light rays separated horizontally ~2degrees

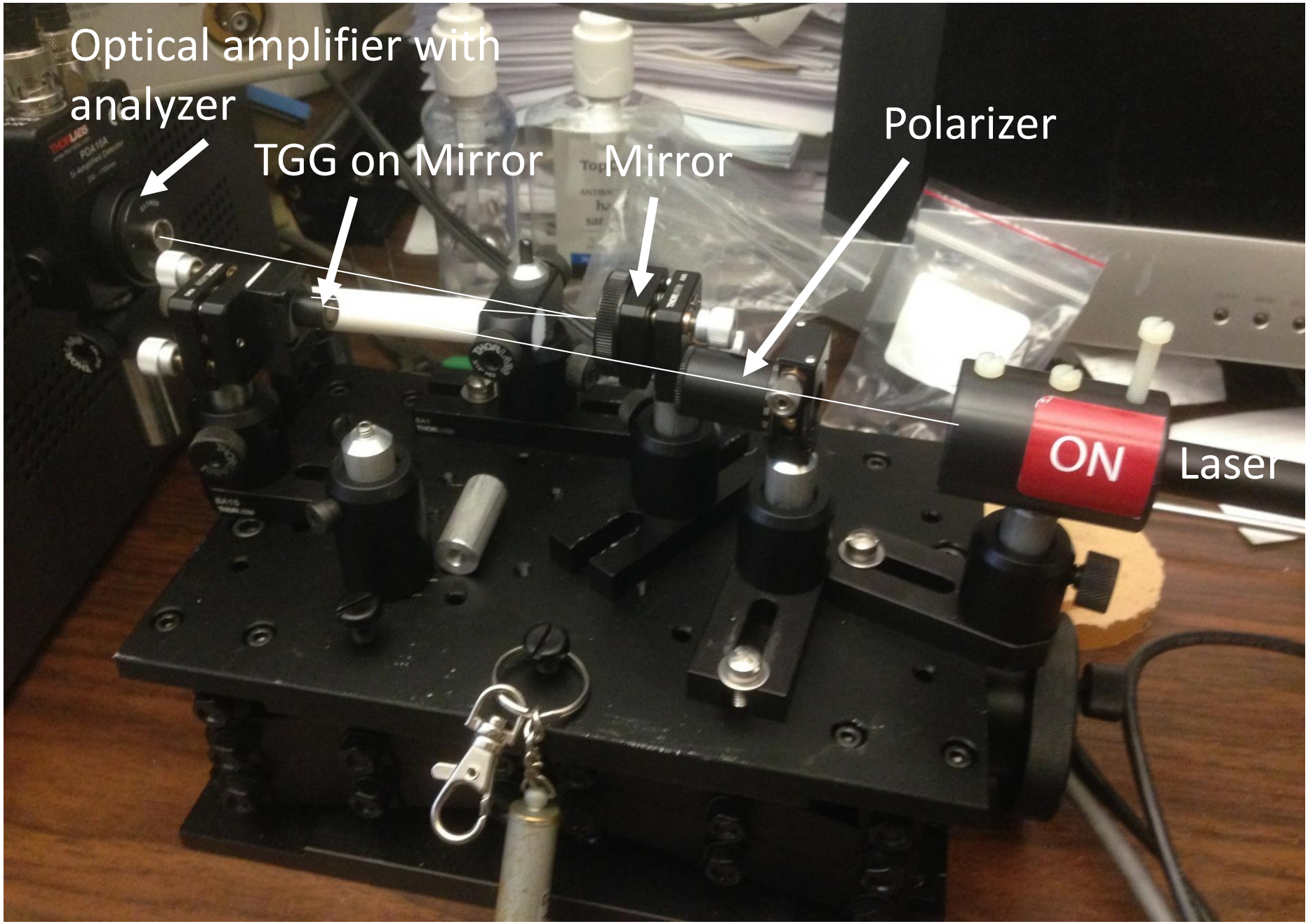


The crystal holder could be allocated at external position to the kicker plate.

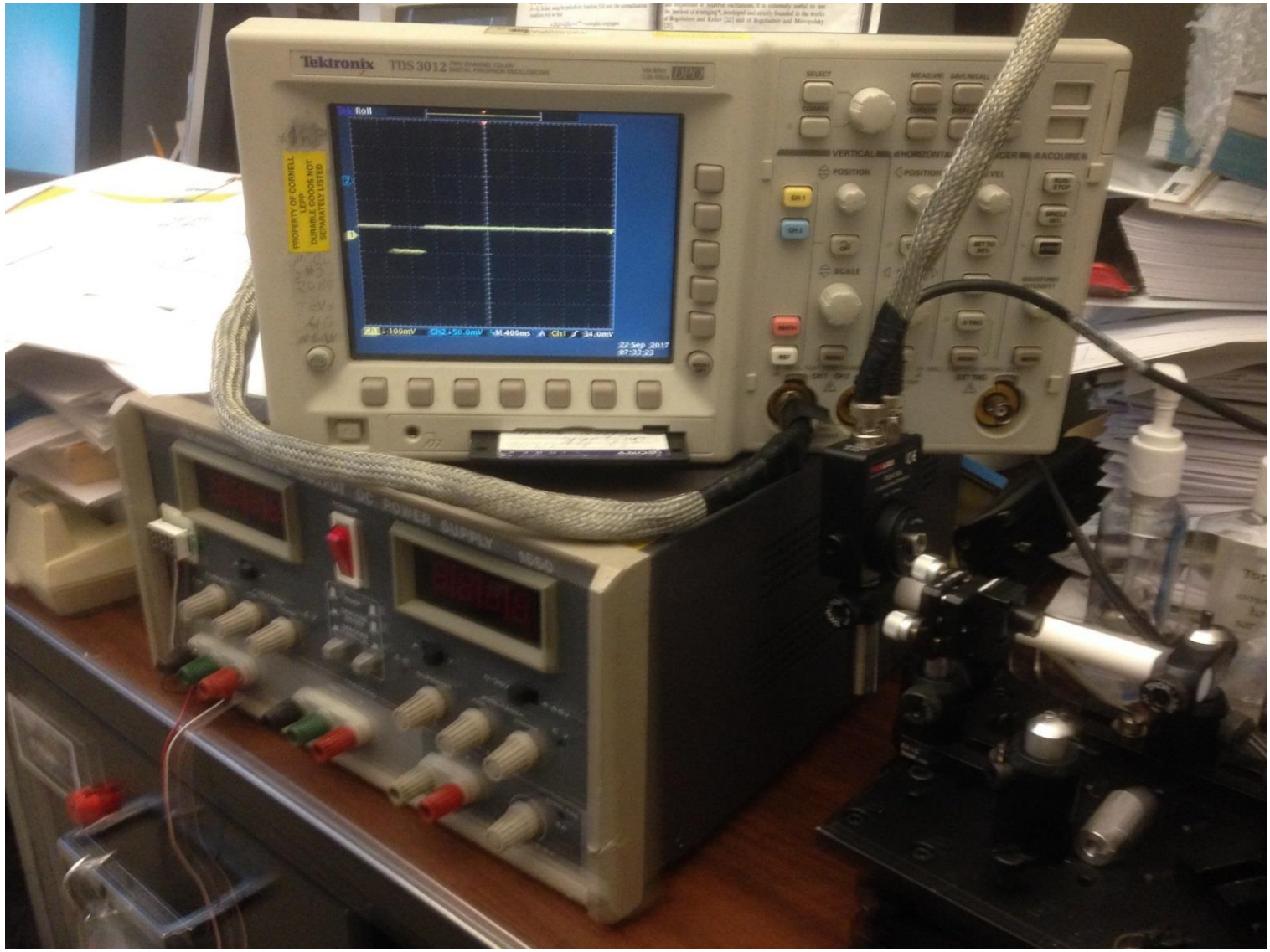




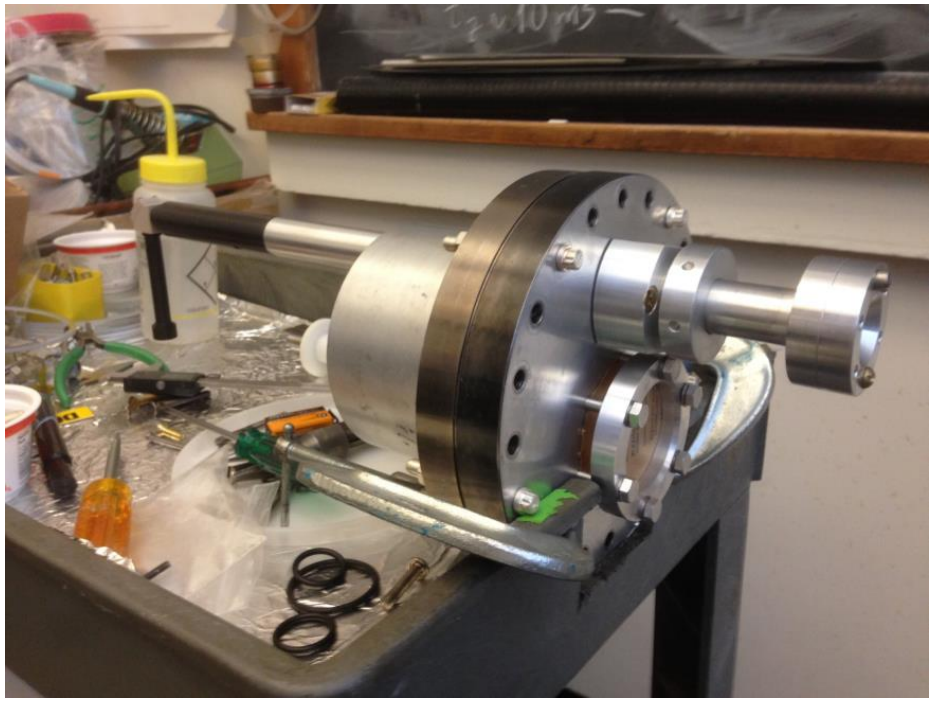


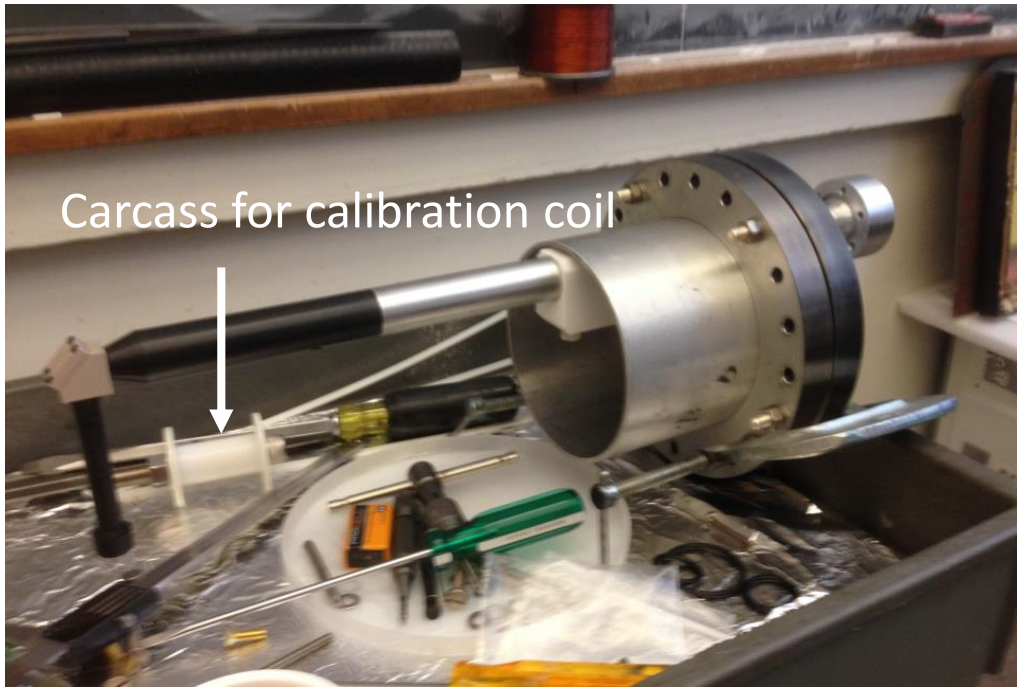


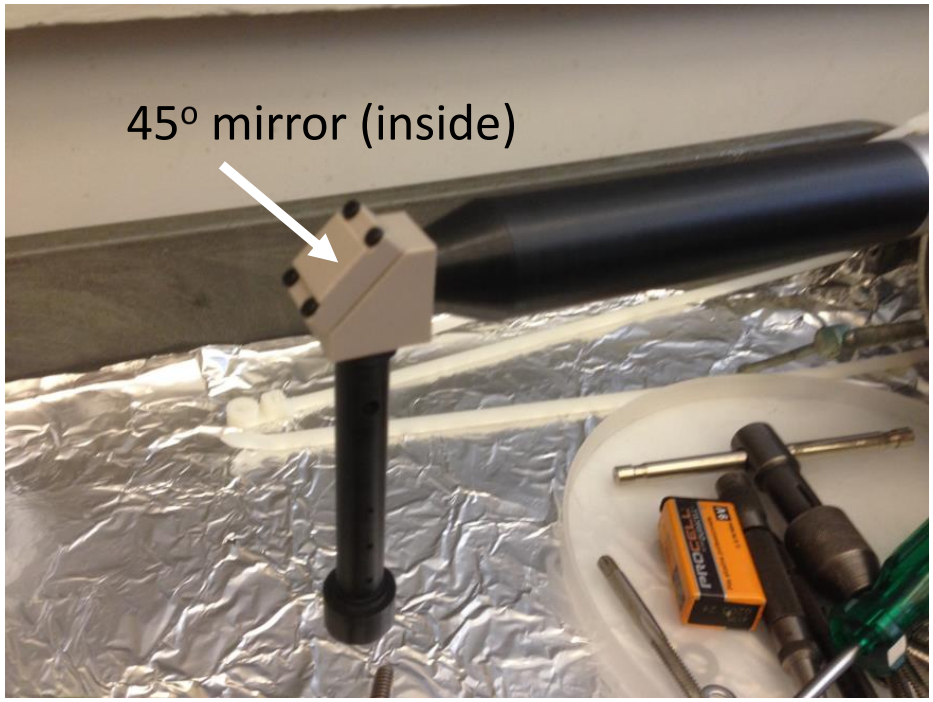
Prototype of meter; assembled for checking the level of signal with 10mW laser (650±5 nm)



Laser ON/OFF; Max signal from amplifier ~500mV;
System reacts on field of permanent magnet; electromagnet is under fabrication




Carcass for calibration coil


45º mirror (inside)

To be able measure residual field ~ 1 ppm (i.e. 10^{-6}x14kG≈0.14G), the optical meter system should be able to register ~0.01 mV (10μV) signal change.

This will require better quality analyzer/polarizer and more likely more powerful laser. The system could easily accommodate these.

Registration of such small variation on a background noise will require statistical accumulation of signal, as it was done at Cornell.

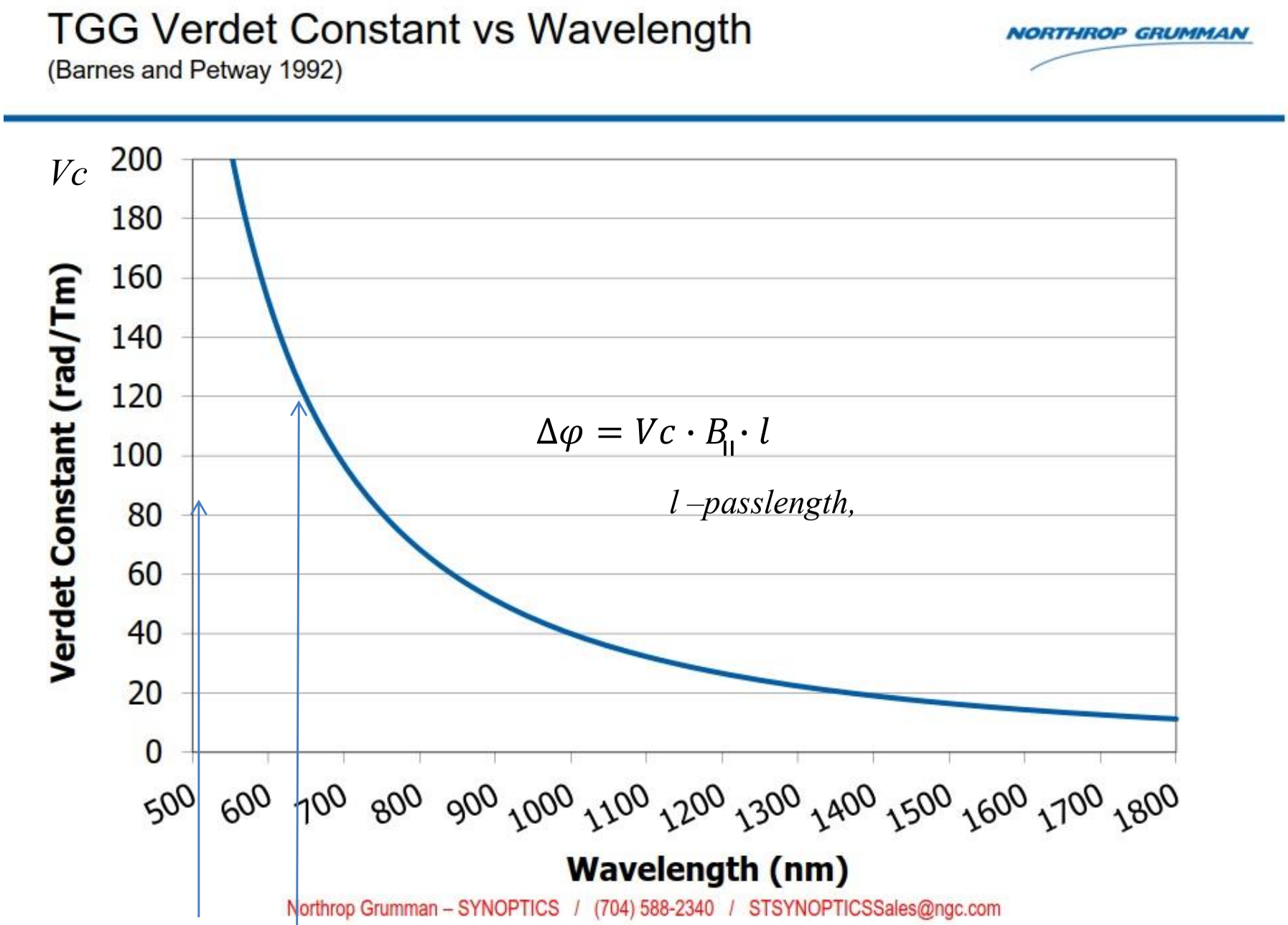
Shape of main pulse will be registered with existing polarizer/analyzer/laser however.

Second week of October the system will be ready for FERMILAB tests.

THE END

Terbium Gallium Garnet $Tb_3Ga_5O_{12}$

For the reference…



Green light (510nm)

Red light (650nm)