# Brunel University London

Peter Hobson & David Smith

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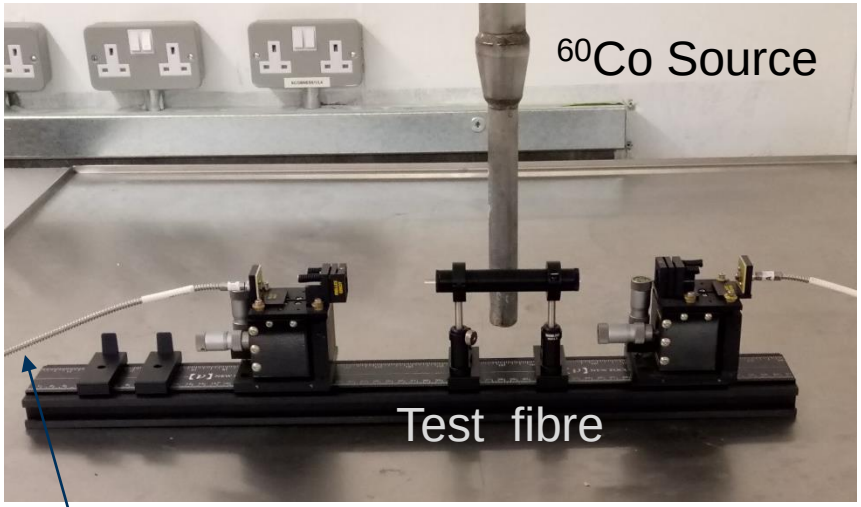
## Real-time measurements using a Fibre Bench with $^{60}$Co Source



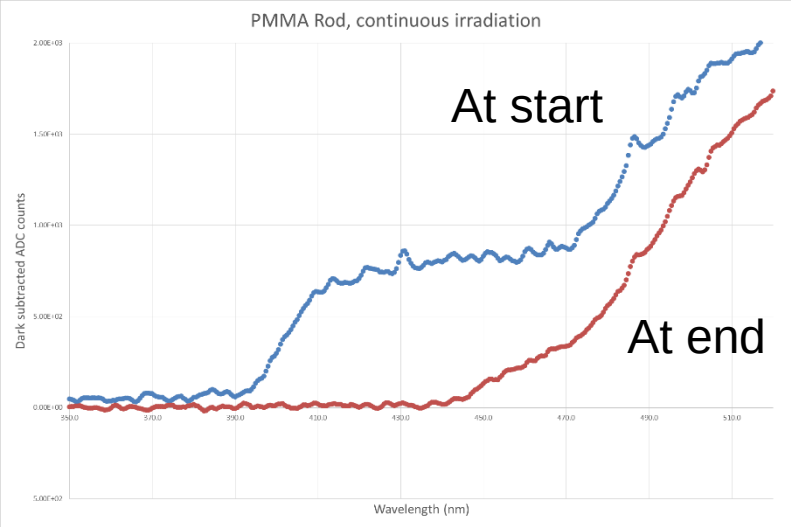

Evaluating data taken with the system which included some “calibration” runs connecting the light source via a 1 m fibre directly to the spectrometer shows a lack of repeatability when the silica fibre is removed/replaced. This poses a challenge for “in-run” calibration checks.

20 m long silica fibres to and from the light source and spectrometer which are located outside the room containing the radioactive source.

# Test with PMMA rod

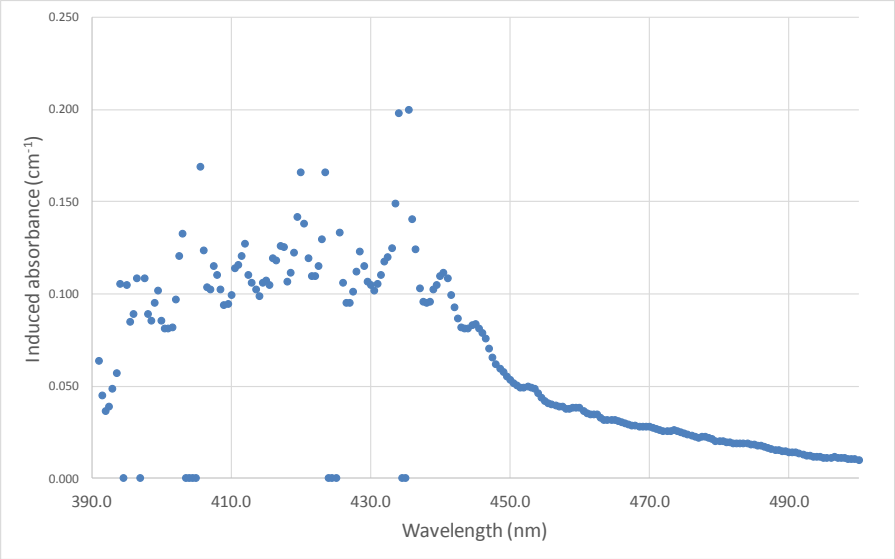


A 3 mm diameter rod, 150 mm long of standard PMMA (with a UV cut-off around 395 nm) was irradiated in the dark for 4 days to a total absorbed dose of ~ 10 kGy. D2 and W-halogen light sources used to measure transmission. An average of eight, 8 s exposures was used for signal and dark current.




Enlargement of data set in the region showing significant damage.

Spectrometer data up from 200 nm to 852 nm is simultaneously taken



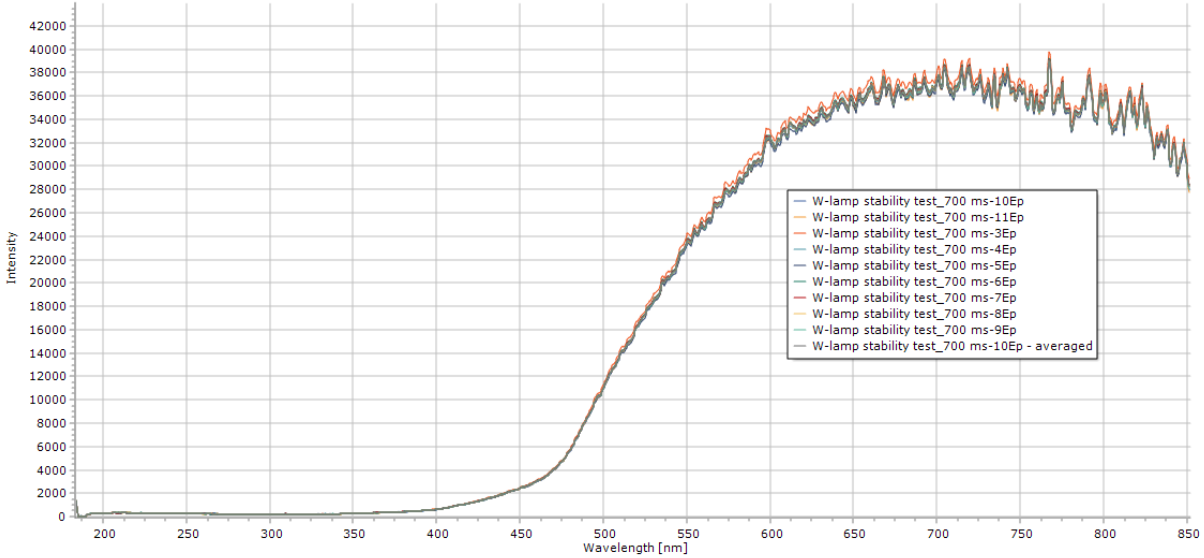

Induced absorbance per cm

Currently evaluating data on short (few minutes) and long (few hours) stability of the W and deuterium light sources. Spectrometer dark current is very stable over a period of days.

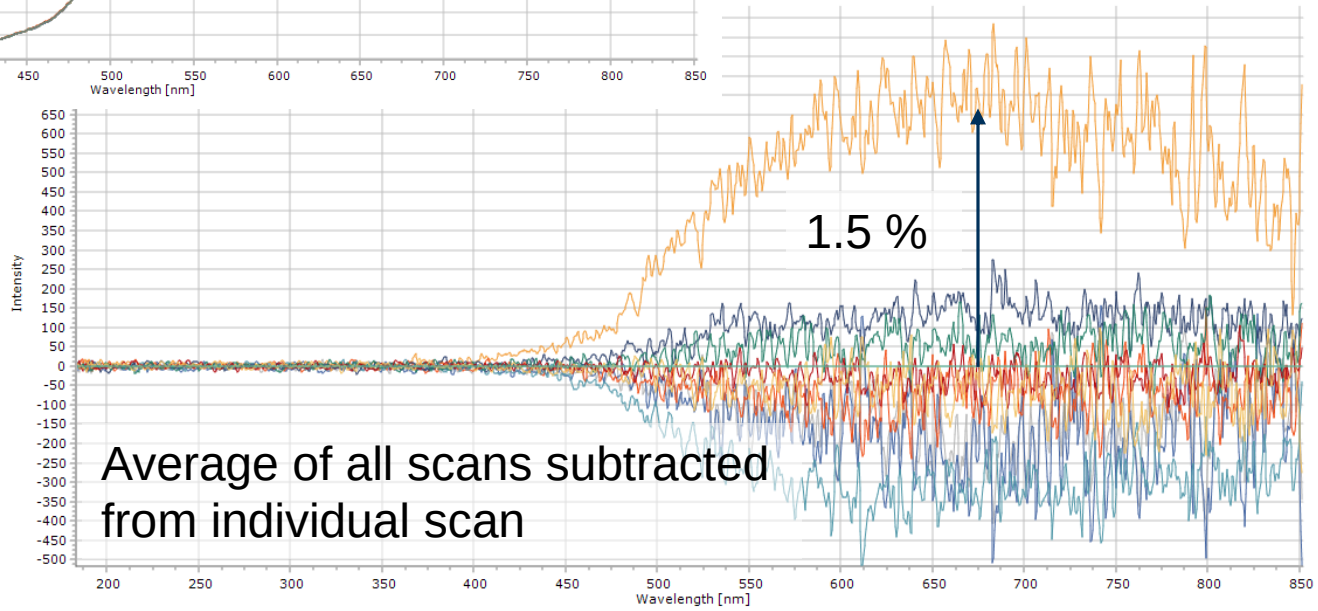
# Deuterium and tungsten light stability



We use a commercial combined source from StellarNet (SL5). We are evaluating the reproducibility of this combined source.




120 s between data scans.



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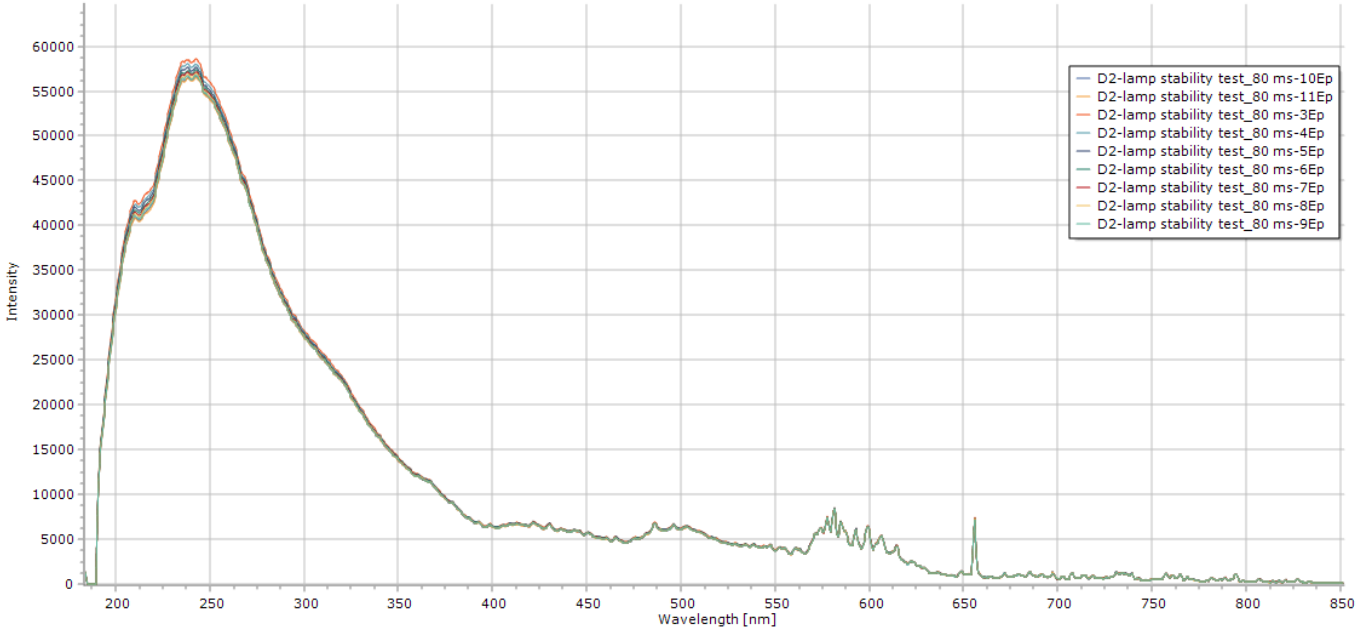


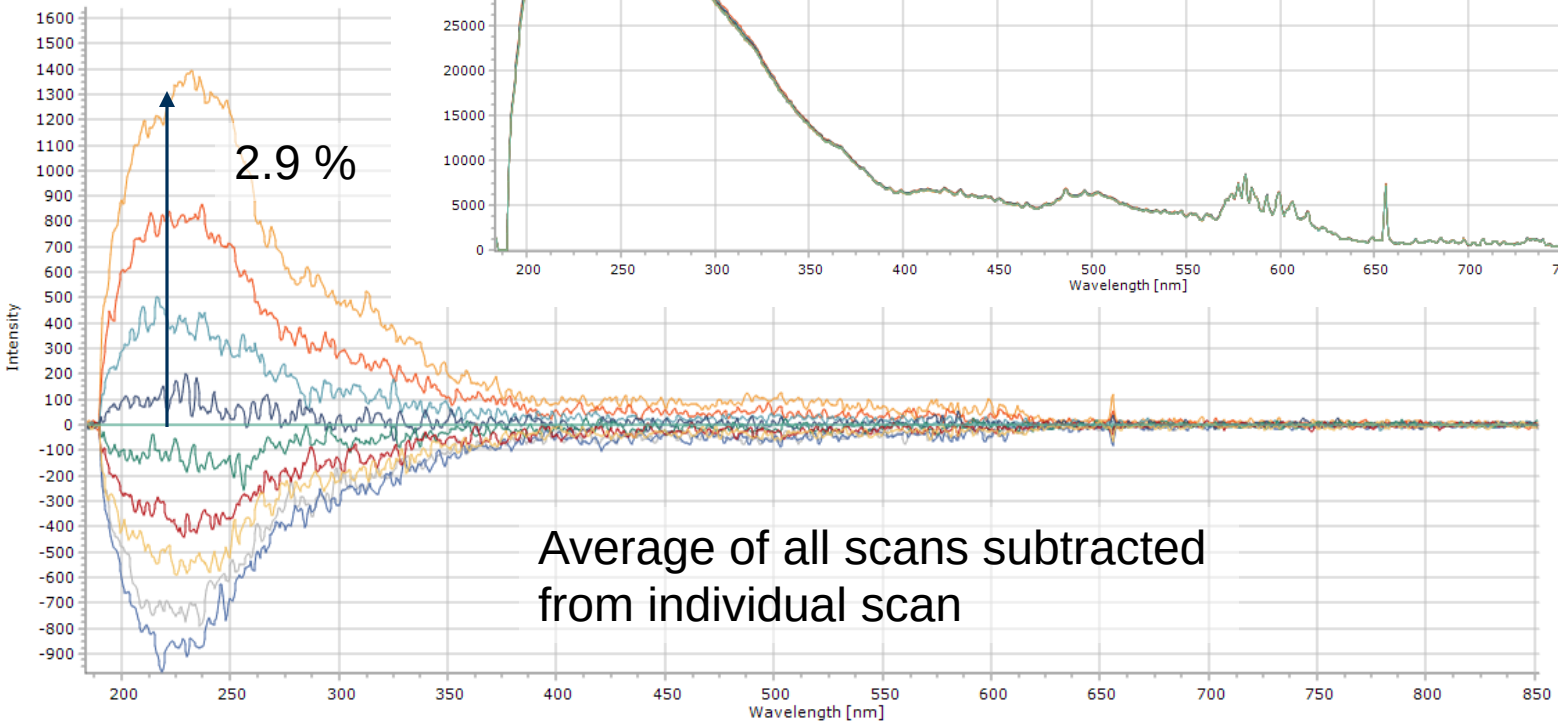


Average of all scans subtracted from individual scan

# Issues



- Major issues with accessing the $^{60}$Co source connected with the radiation safety monitoring system. We have lost more than four months. Only became available again last week!
- Still trying to understand light source stability as a function of time from switch on (5 minutes is our standard protocol) and over much longer periods between sequences of On-Off-On over periods of days.
- Developing a standard protocol and analysis framework in the light of a better understanding of these effects.

# Plans for the future



- Return to irradiation of materials to generate a good data-base and to test our protocol.
- Evaluate our system with fluorescent fibres; can we determine changes in QE as well as absorption effects?
- Design and possibly implement a totally achromatic illumination system using mirrors rather and then quartz singlet f# = 2 optics whose coupling efficiency varies with focus onto the fibre ends (and thus is also potentially thermally sensitive).
- Submit a paper for journal publication.