SMELLIE:
A Laser Calibration System for SNO+

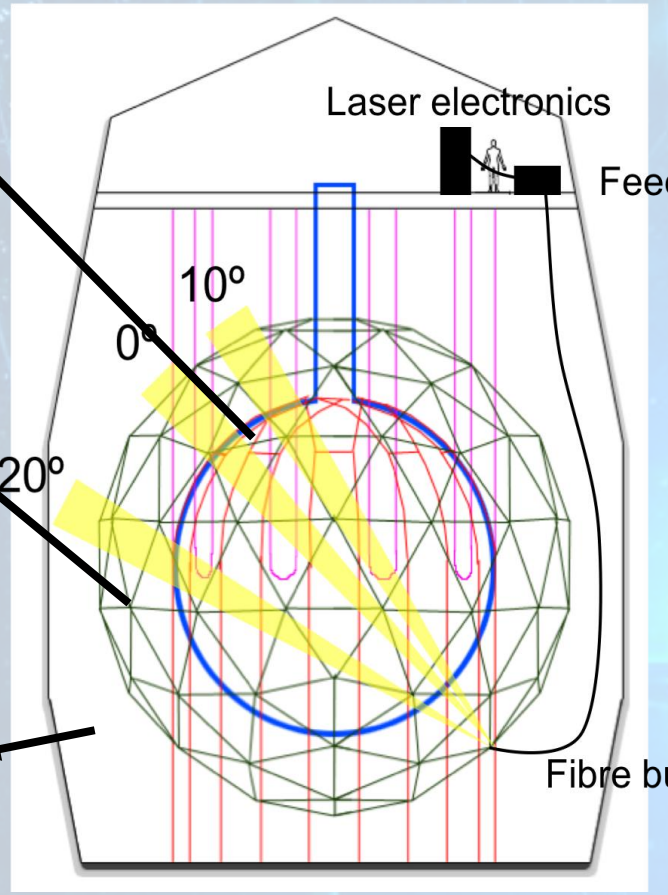
SMELLIE: **S**cattering **M**odule for the **E**mbedded **L**aser/**L**ED **L**ight **I**njection **E**ntity.

Designed to measure and characterise the scattering properties of the detection medium

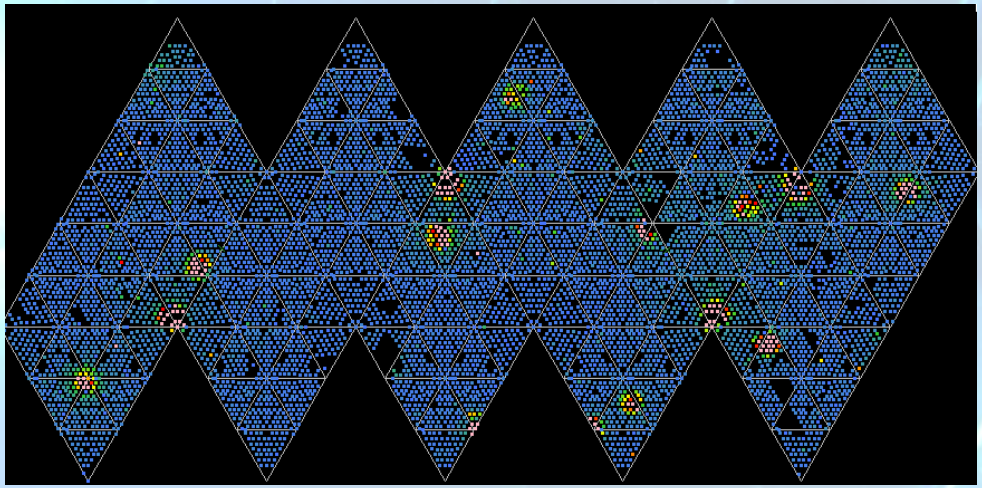
6m radius **a**crylic **v**essel (AV) filled with detector medium

8.9m radius **P**MT **sup**port structure (PSUP) with ~9300 PMTs mounted on it

Cavity filled with ~7000 tonnes **u**ltra-**p**ure **w**ater (UPW)



Hardware:
- 15 collimated optical fibres
- 5 injection points on PSUP
- 3 fibres at each
- 4 fixed wavelength lasers (375nm, 405nm, 440nm, 495nm)
- 1 supercontinuum laser (400 – 700nm)
- 1 **m**onitoring **P**MT **u**nit (MPU)
- Uses an **ext**ernal **a**synchronous (EXTA) trigger



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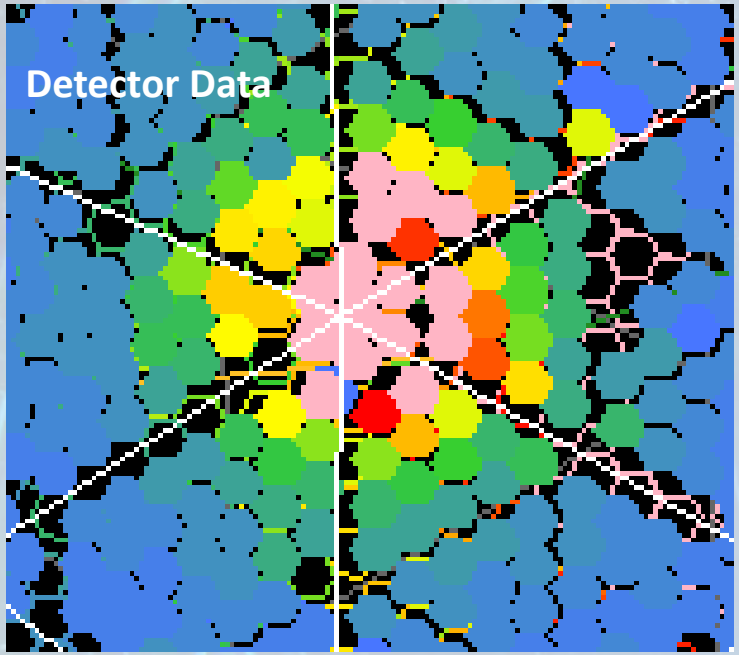
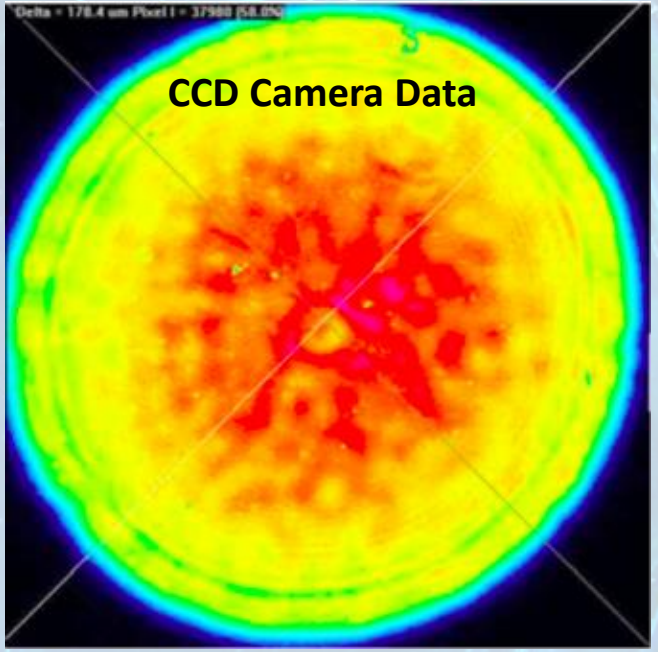
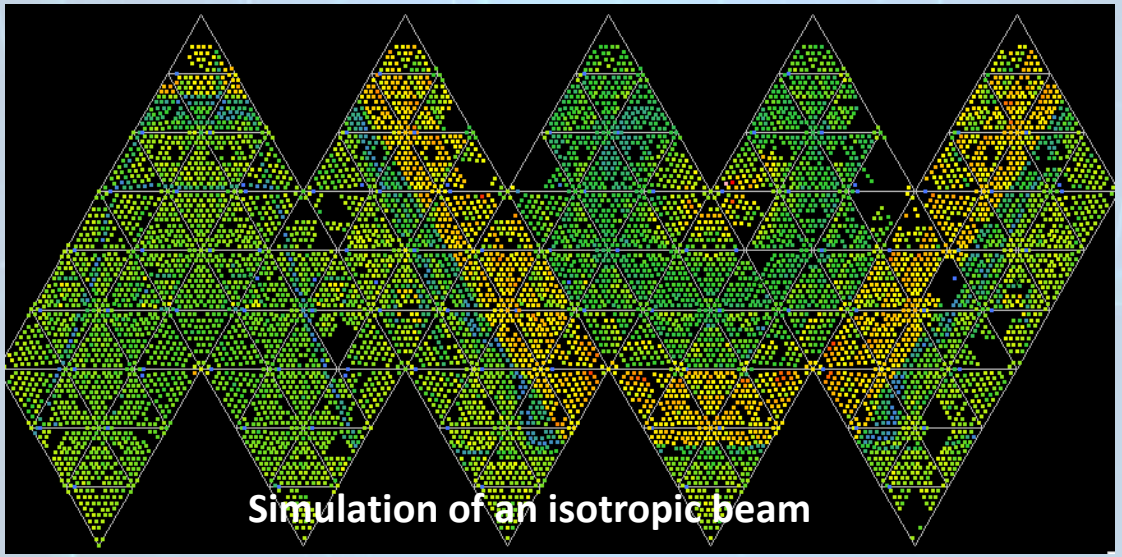


Beam Profiling

- Necessary to characterise scattering with SMELLIE
- Only possible with water data due to long attenuation length and no-re-emission
- A lot of detector effects distort the profile we see: shadowing, PMT efficiencies, solid angle, etc.
- Rather than manually correct for each effect -> correct by **M**onte **C**arlo (MC)





Simulate a beam with is isotropic in azimuthal angle and isotropic in polar angle out to $^{\pi}/_{2}$.

Take ratios of multi-hit corrected **p**hoto**e**lectrons (p.e.) for each PMT of data to MC. Simulating this ratio should account for all simulated detector effects and accurately recreate our beam.