SMELLIE: A Laser Calibration System for SNO+

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

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 monitoring PMT unit (MPU)
- Uses an external asynchronous (EXTA) trigger

6m radius acrylic vessel (AV) filled with detector medium

8.9m radius PMT support structure (PSUP) with ~9300 PMTs mounted on it

Cavity filled with ~7000 tonnes ultra-pure water (UPW)

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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 Monte Carlo (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 photoelectrons (p.e.) for each PMT of data to MC. Simulating this ratio should account for all simulated detector effects and accurately recreate our beam.