

Plastic Scintillators as In-Vivo Dosimeters: Angular Dependence of Response

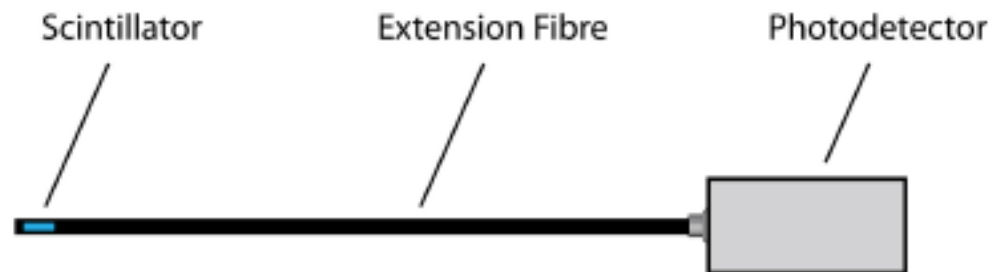
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Plastic scintillation dosimetry (PSD)

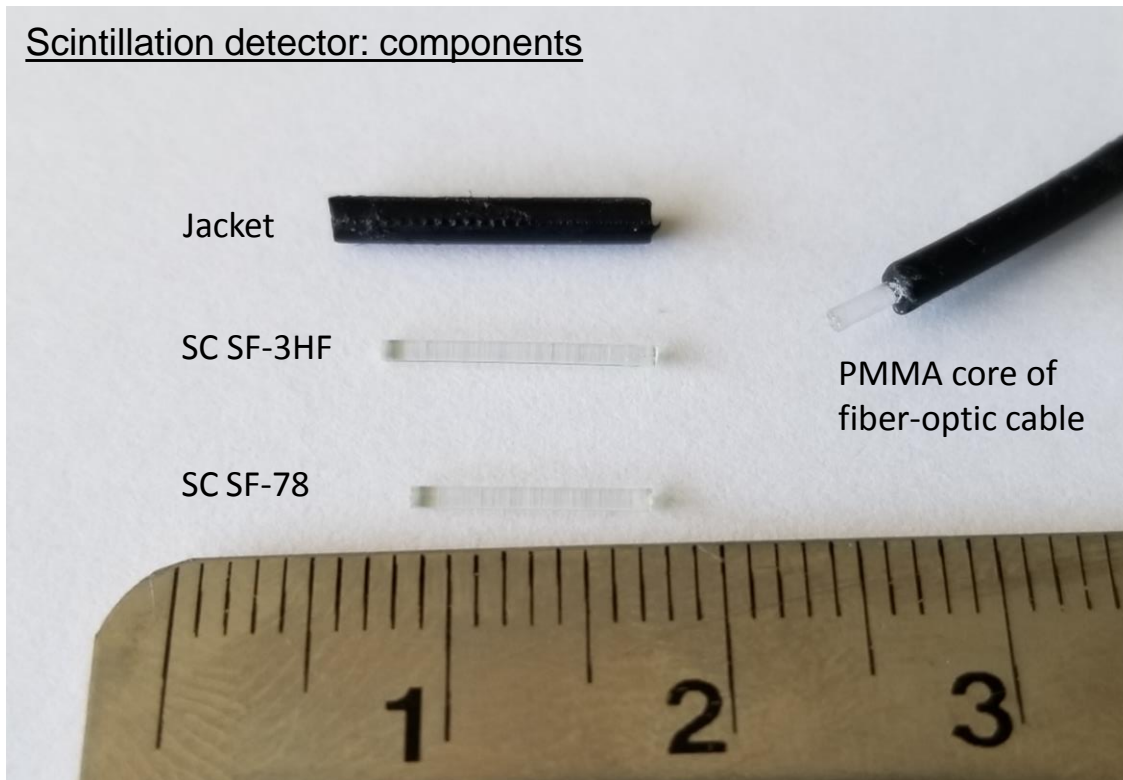
- Benefits of PSDs
 - Similar density to water
 - Less corrections
 - High temporal resolution
 - Linear response with dose



Scintillator with spectrometer setup

- 1 cm scintillator
- 40' optical fiber
- Exemplar plus spectrometer

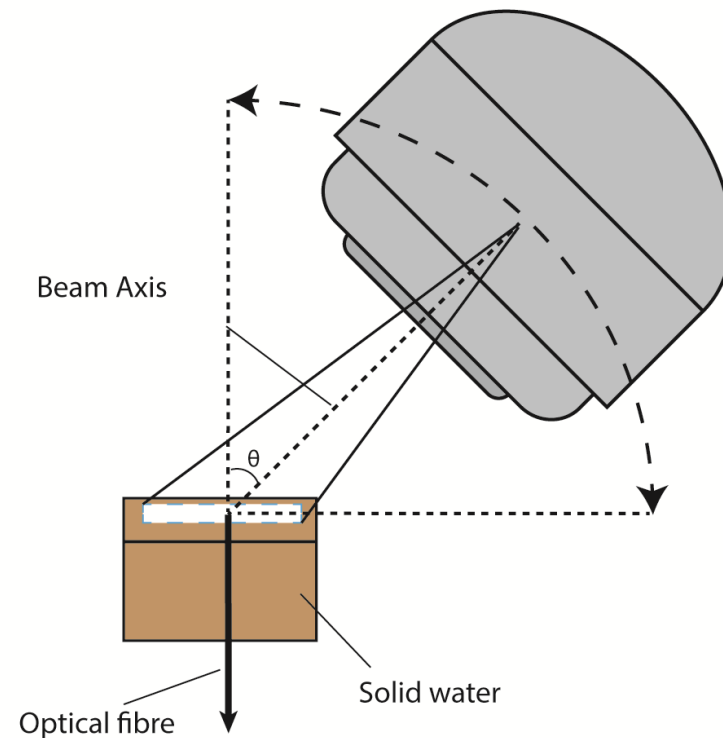
Scintillation detector: components



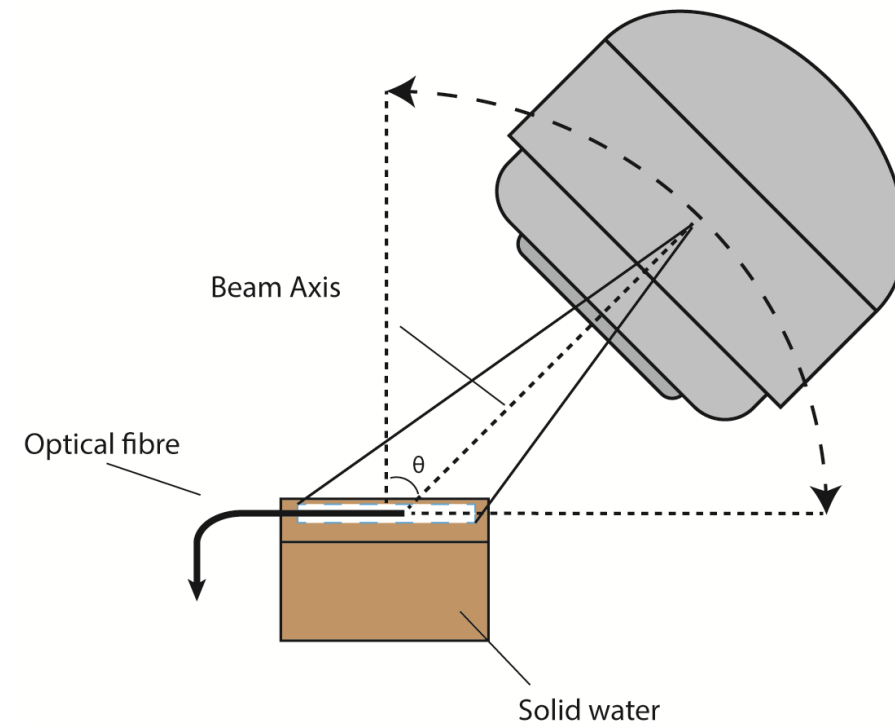
Validate spectral invariability of system signal

- Well-characterized signal components in arbitrary dose measurements

Inline setup

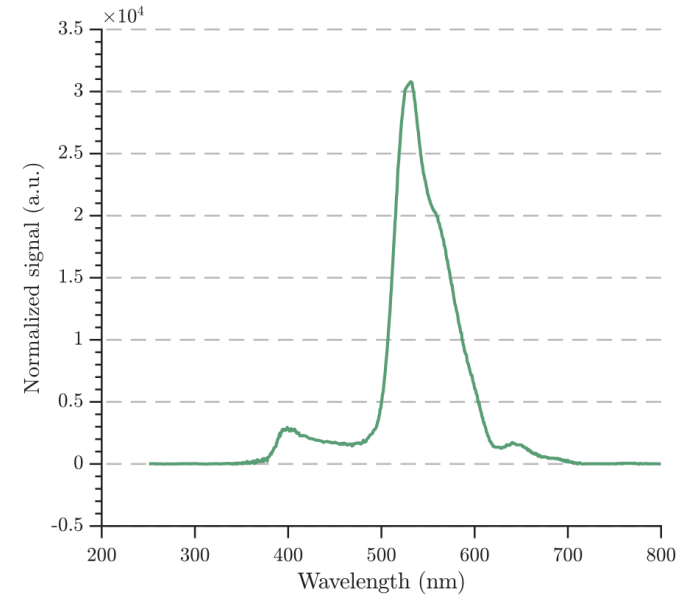
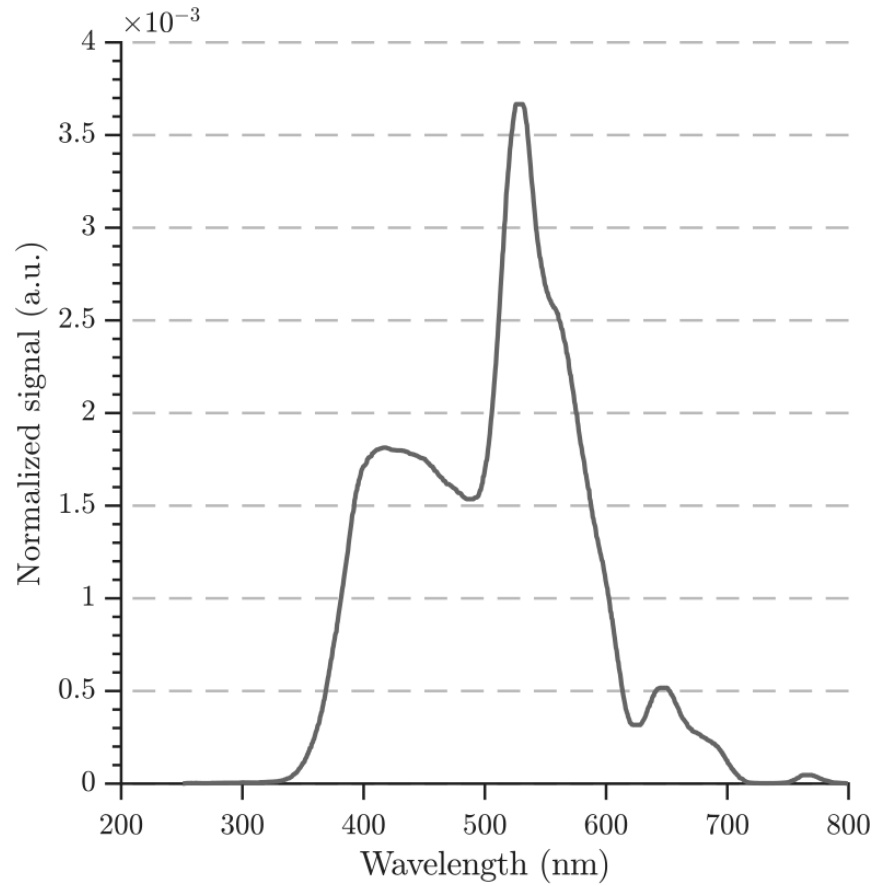


Crossline setup



Determination of scintillation signal

Total signal:
-Spectrometer signal

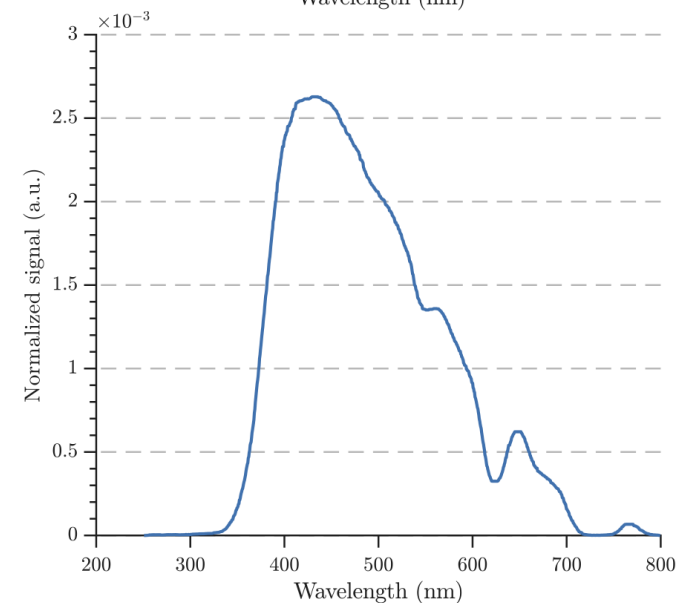


Scintillation:

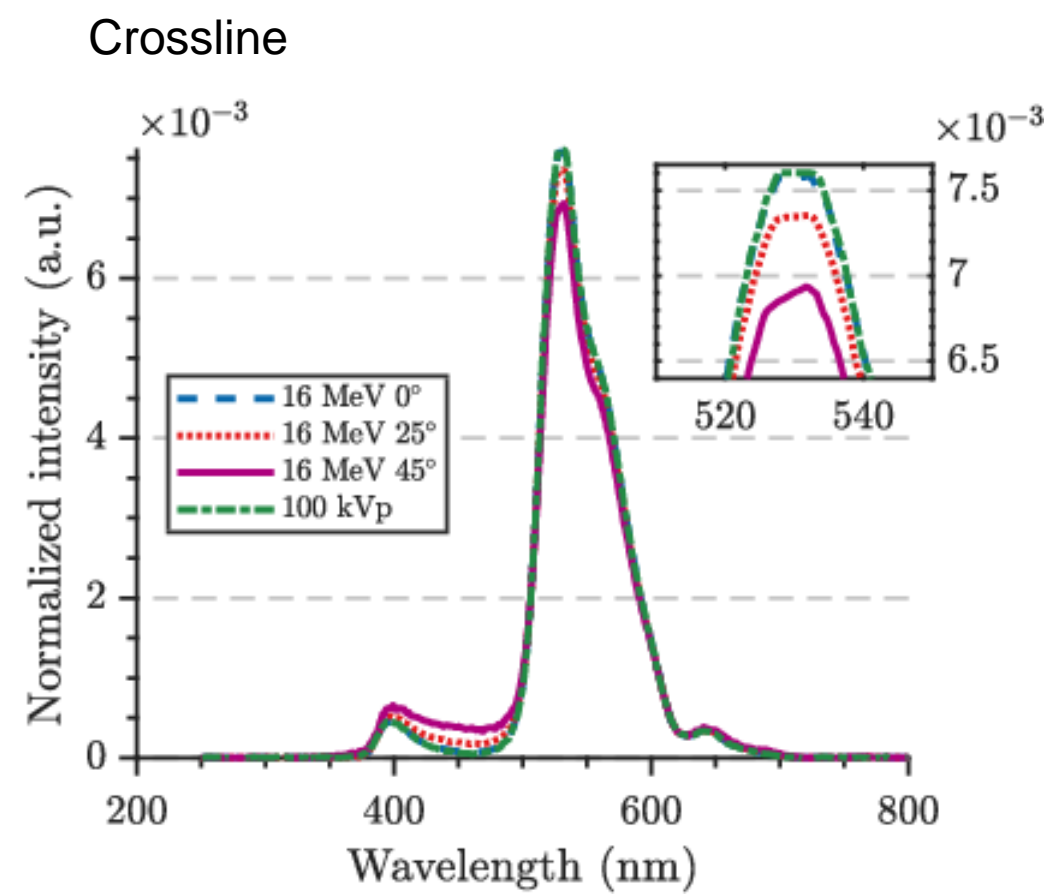
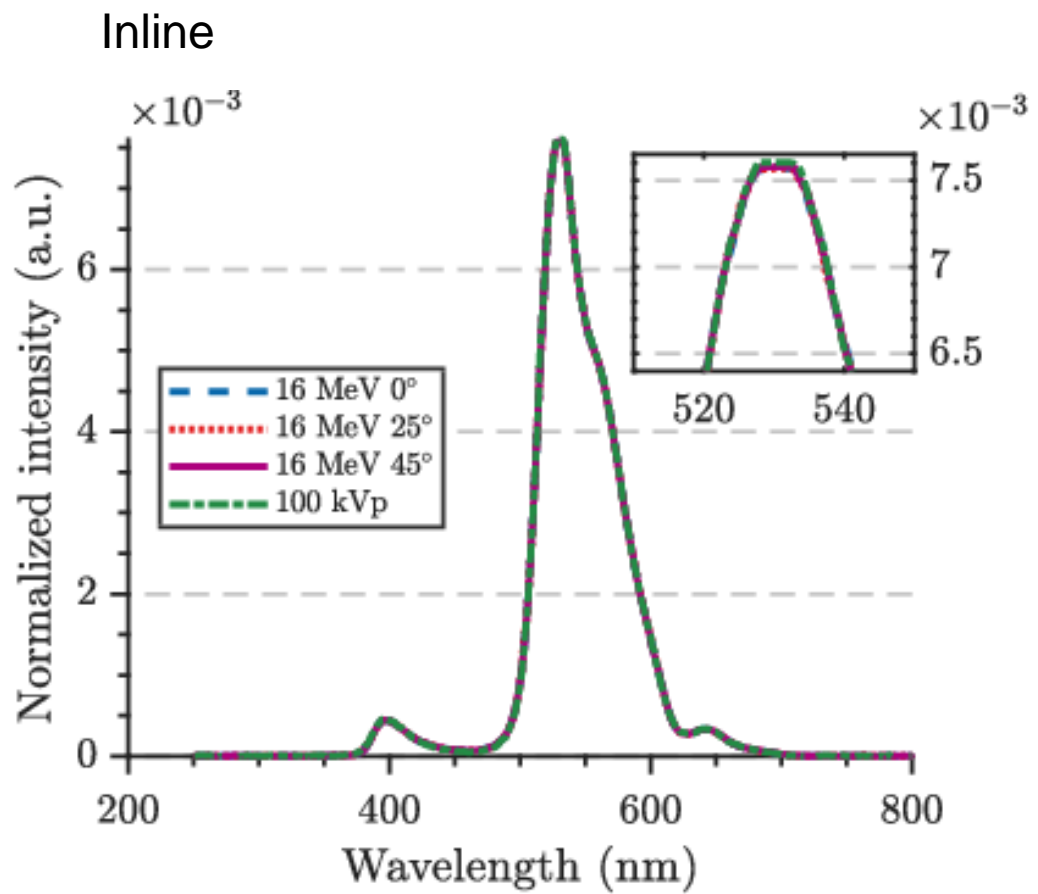
- Proportional to dose
- Acquired by subtracting Cerenkov

Cerenkov:

- Highest intensity at 45°
- Obtained from stem measurement

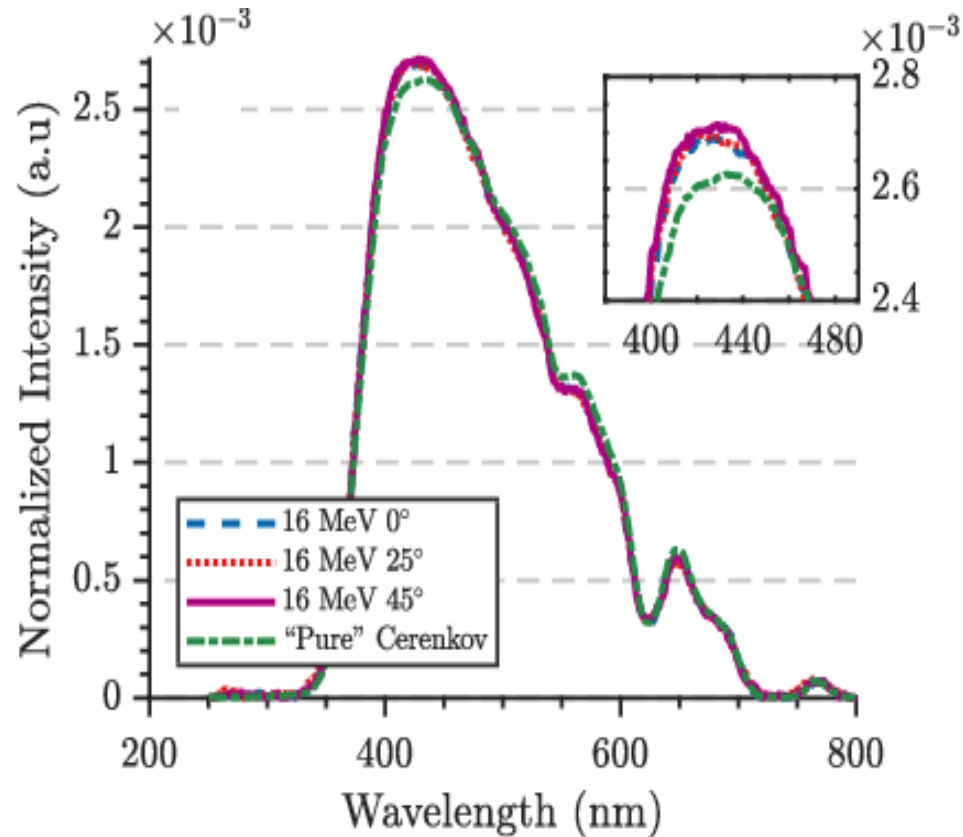


Spectral variability with angle

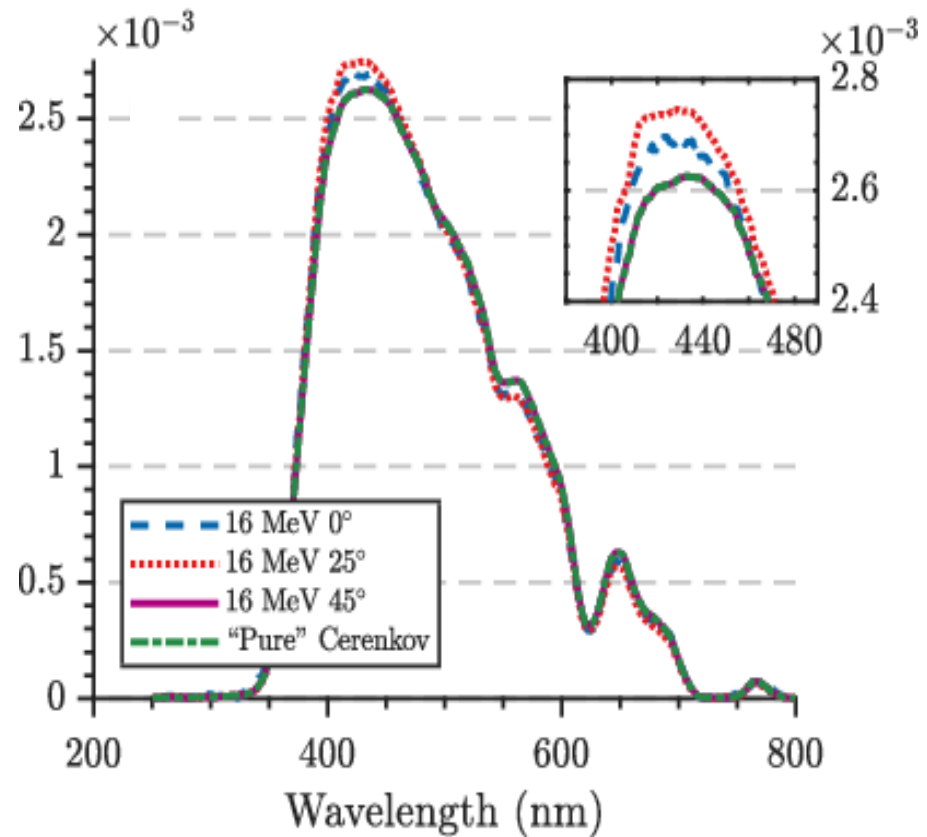


Spectral variability of stem signal

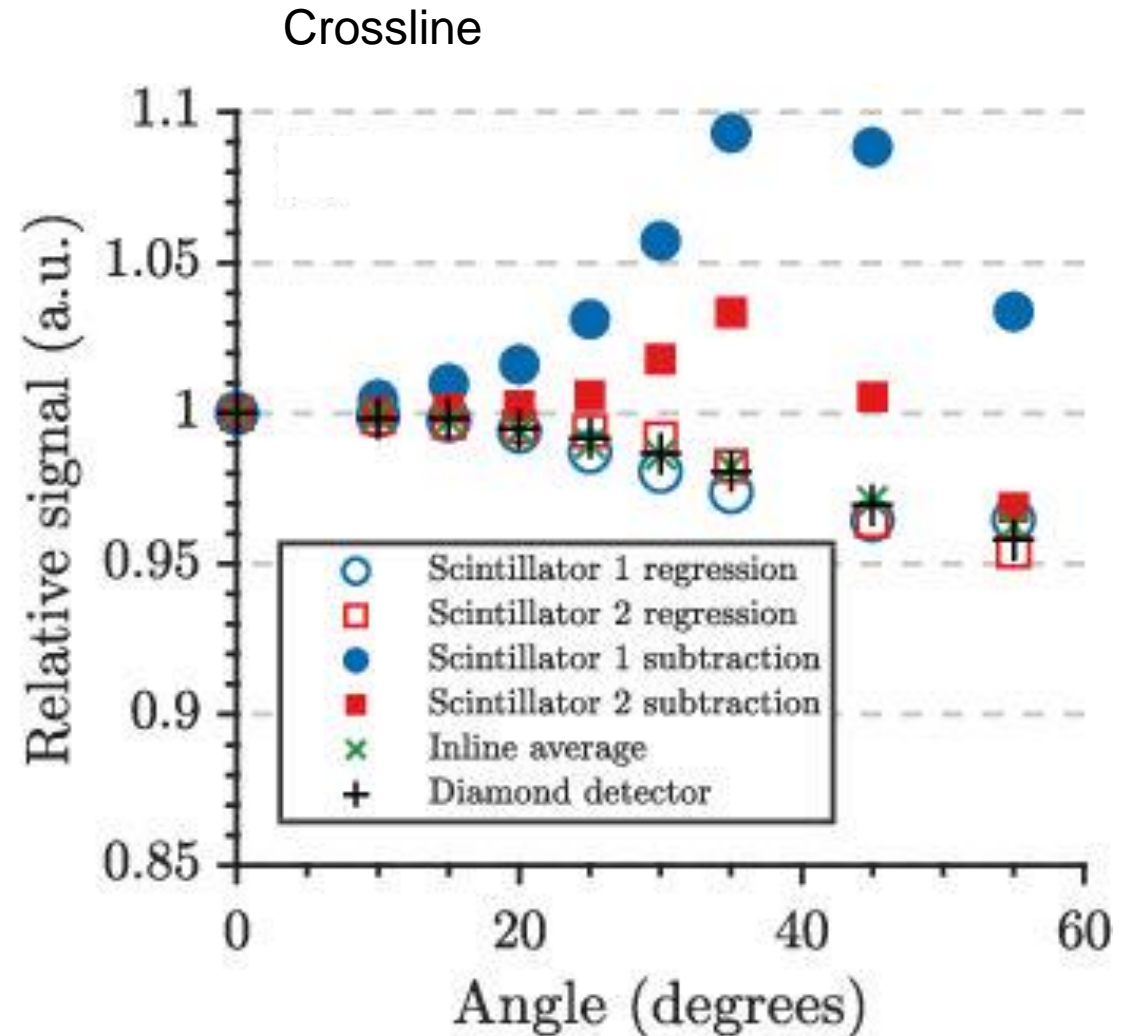
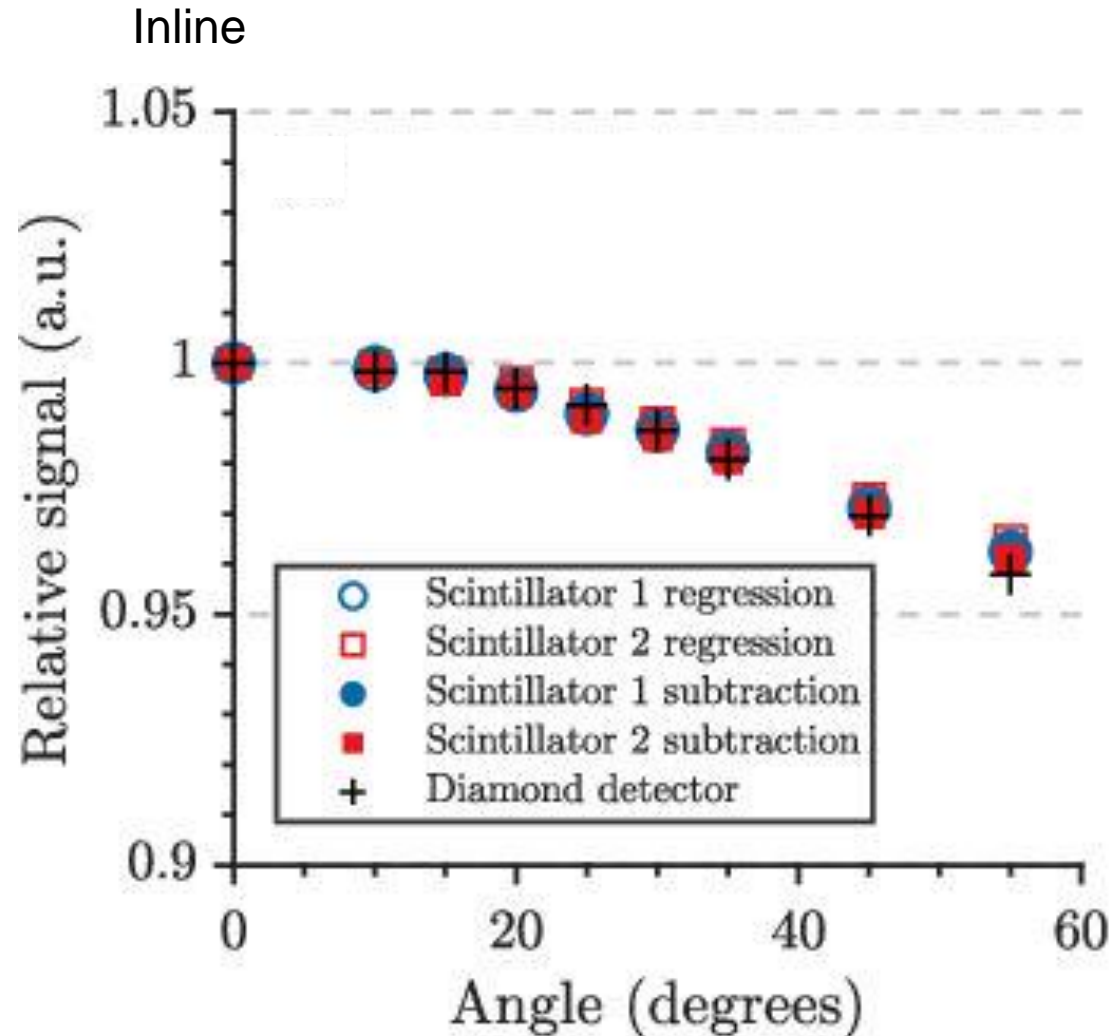
Inline



Crossline

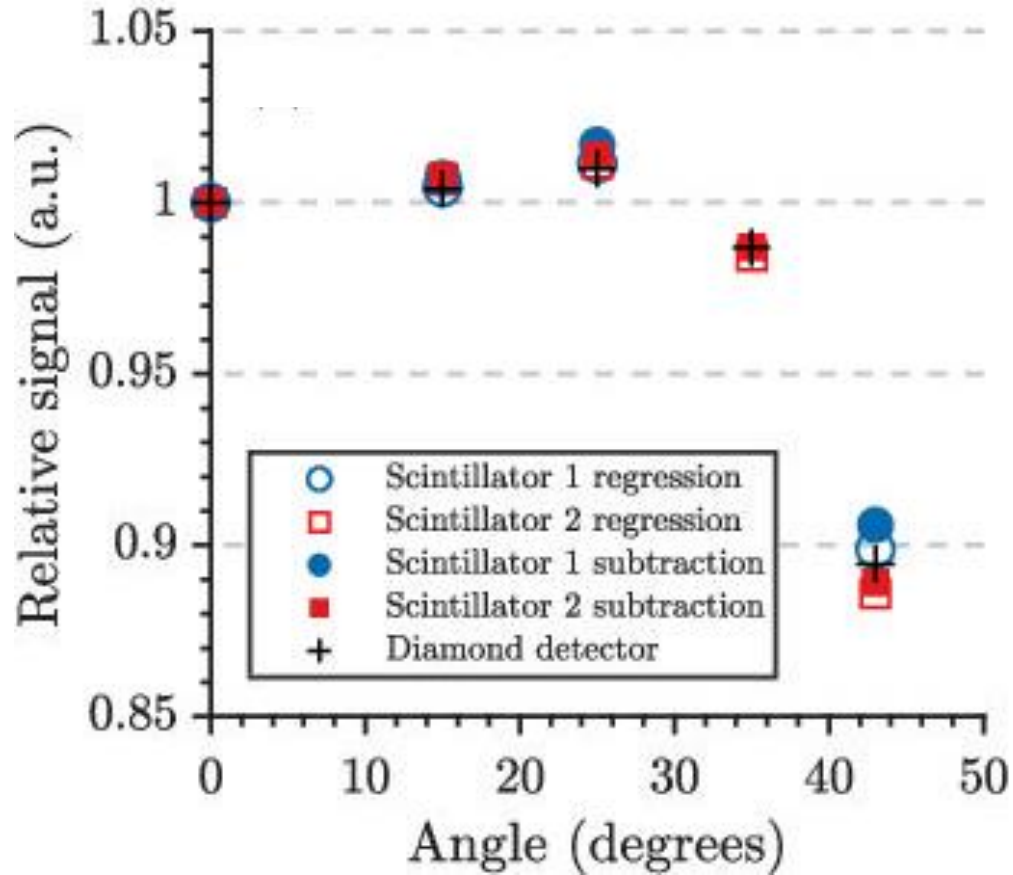


Relative dose affected by variability

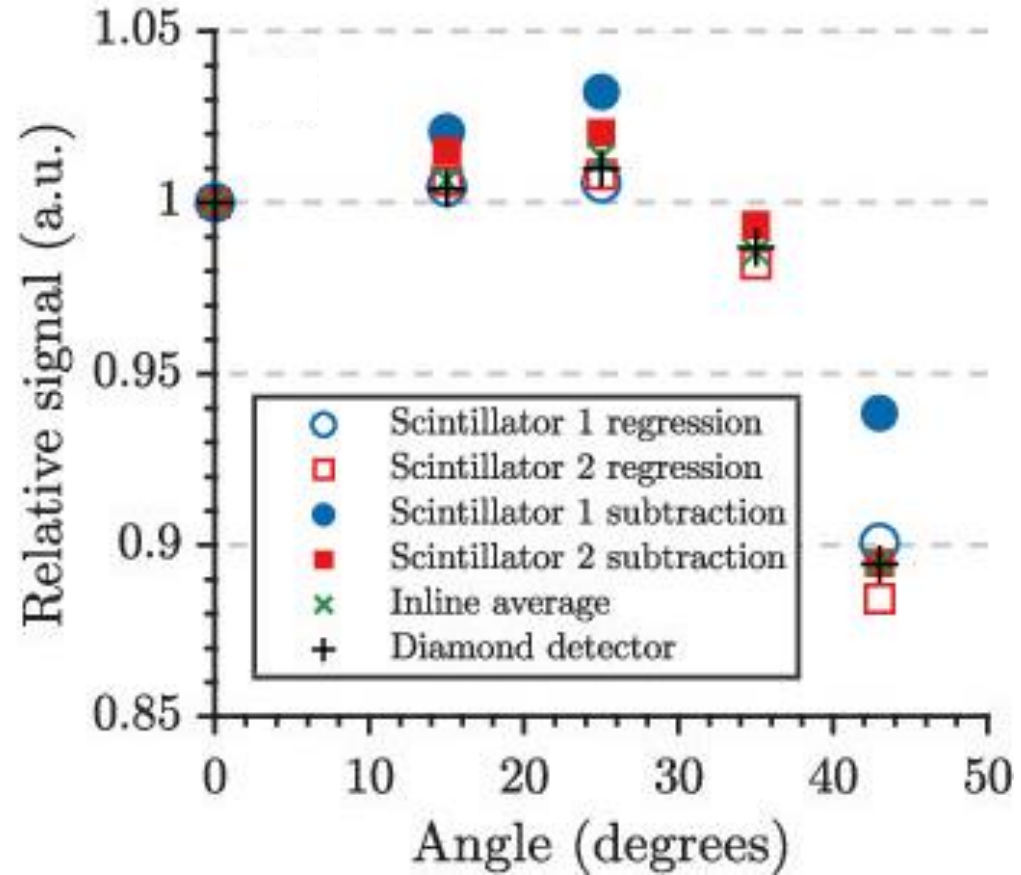


Effect is reduced with depth

Inline



Crossline



- Surface dosimetry requires a cautious approach
- Subtraction correction does not account for Cerenkov in scintillator
- Spectral correction more robust under all measurement conditions