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

Ethan Avila Ruiz, MSc\textsuperscript{1}, Thalat Monajemi, PhD\textsuperscript{1,2}

\textsuperscript{1}Department of Physics and Atmospheric Science, Dalhousie University
\textsuperscript{2}Department of Radiation Oncology, Dalhousie University
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

- Jacket
- SC SF-3HF
- SC SF-78
- PMMA core of fiber-optic cable
Validate spectral invariability of system signal

- Well-characterized signal components in arbitrary dose measurements
Determination of scintillation signal

Scintillation:
- Proportional to dose
- Acquired by subtracting Cerenkov

Cerenkov:
- Highest intensity at 45°
- Obtained from stem measurement
Spectral variability with angle

**Inline**

- Normalized intensity (a.u.)
- Wavelength (nm)

**Crossline**

- Normalized intensity (a.u.)
- Wavelength (nm)
Spectral variability of stem signal
Relative dose affected by variability
Effect is reduced with depth

Inline

Crossline

![Graphs showing relative signal vs. angle for different conditions.](image-url)
Summary

• Surface dosimetry requires a cautious approach

• Subtraction correction does not account for Cerenkov in scintillator

• Spectral correction more robust under all measurement conditions