# SmartPhantom Meeting

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# SmartPhantom Glue Material

- Ken's idea for the potting will be used where one side of the station will be a thin film material, with epoxy filling the rest of the space.

- Simulations performed investigating different film materials, thickness of the film, and thickness of the epoxy.

# Summary

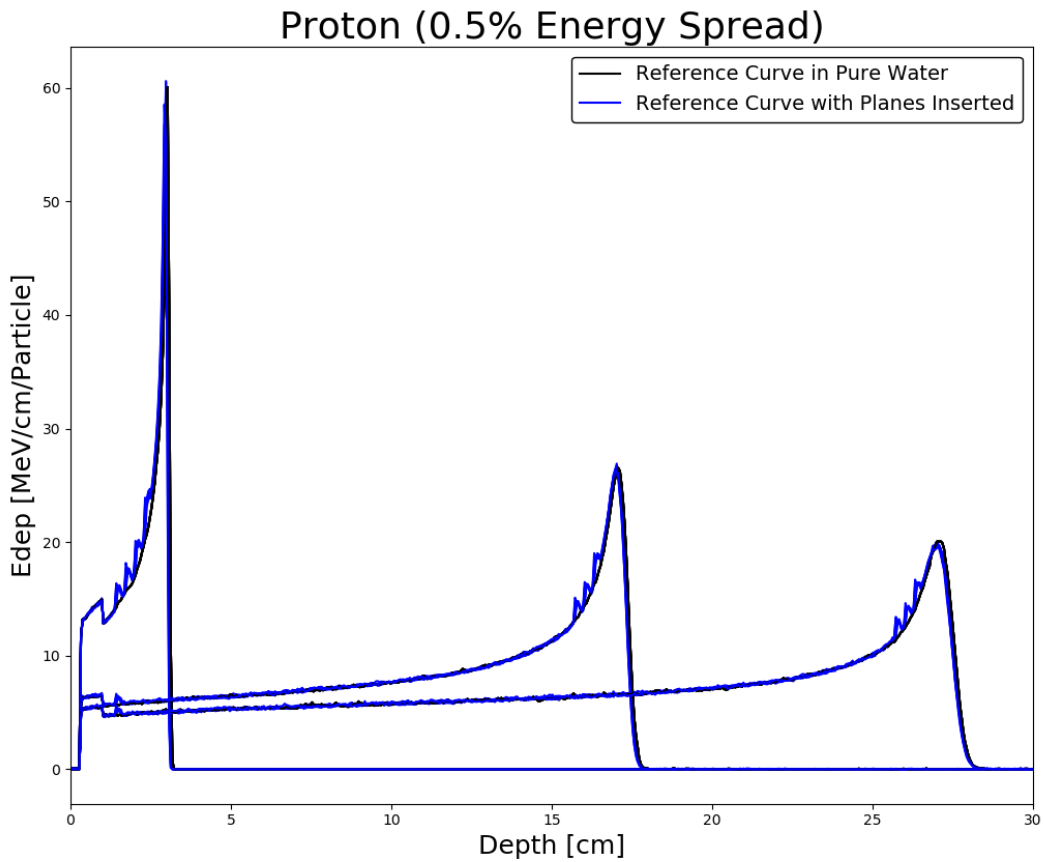
**Simulations for Proton**

- 3 materials for the film investigated:
  - Mylar, Kapton, and Kevlar.
- 6 different thickness of the film:
  - [50 Micron, 300 Microns]
- 4 different Epoxy extents:
  - [200 Micron, 500 Micron]

**My Conclusions**

- For particular film thickness there does not appear to be a major difference between the three different materials.
- Impact on energy deposition and depth of Bragg peak not hugely noticeable between the various combinations.
- The main difference is in the “bumps” of the curve, with thinner films and thinner epoxy being smaller.

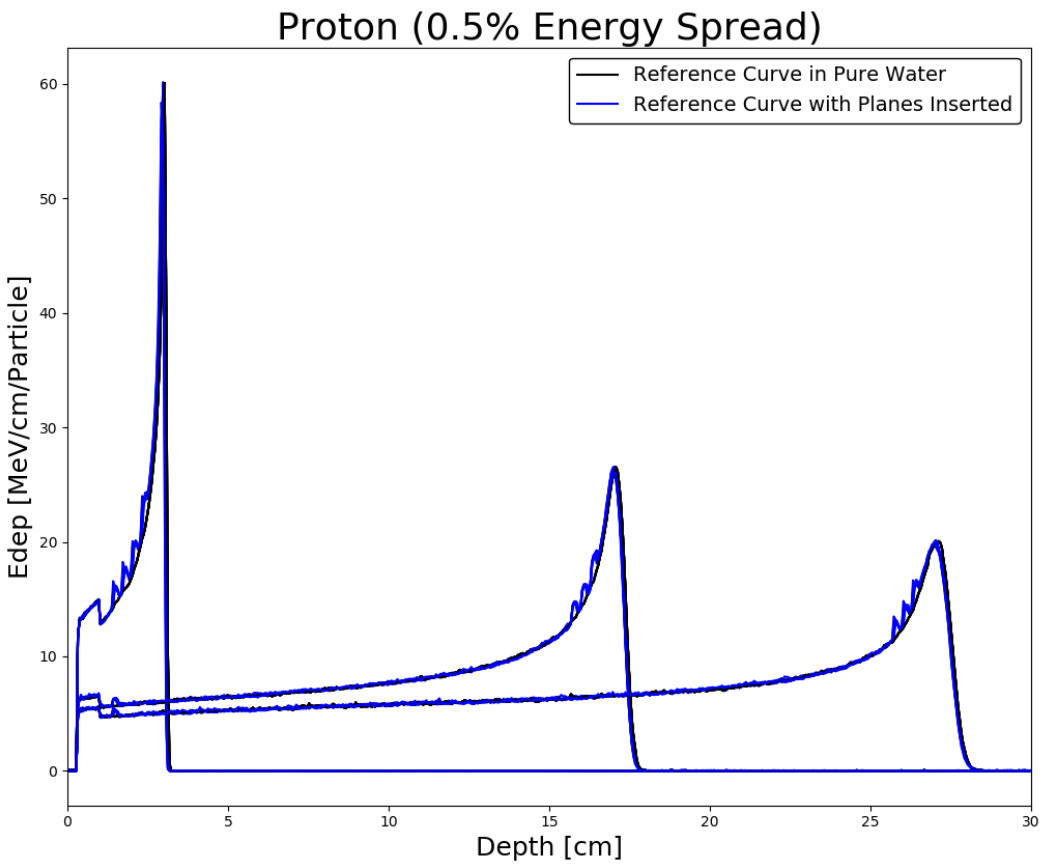
# Proton - Mylar Film - 0.2 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.20mm |
| Varying Film Material | Mylar |

| Mylar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.050 | -0.020 |
| 0.1 | -0.050 | -0.000 |
| 0.15 | -0.033 | -0.356 |
| 0.2 | -0.050 | -0.519 |
| 0.25 | -0.033 | -1.435 |
| 0.3 | -0.050 | -0.705 |

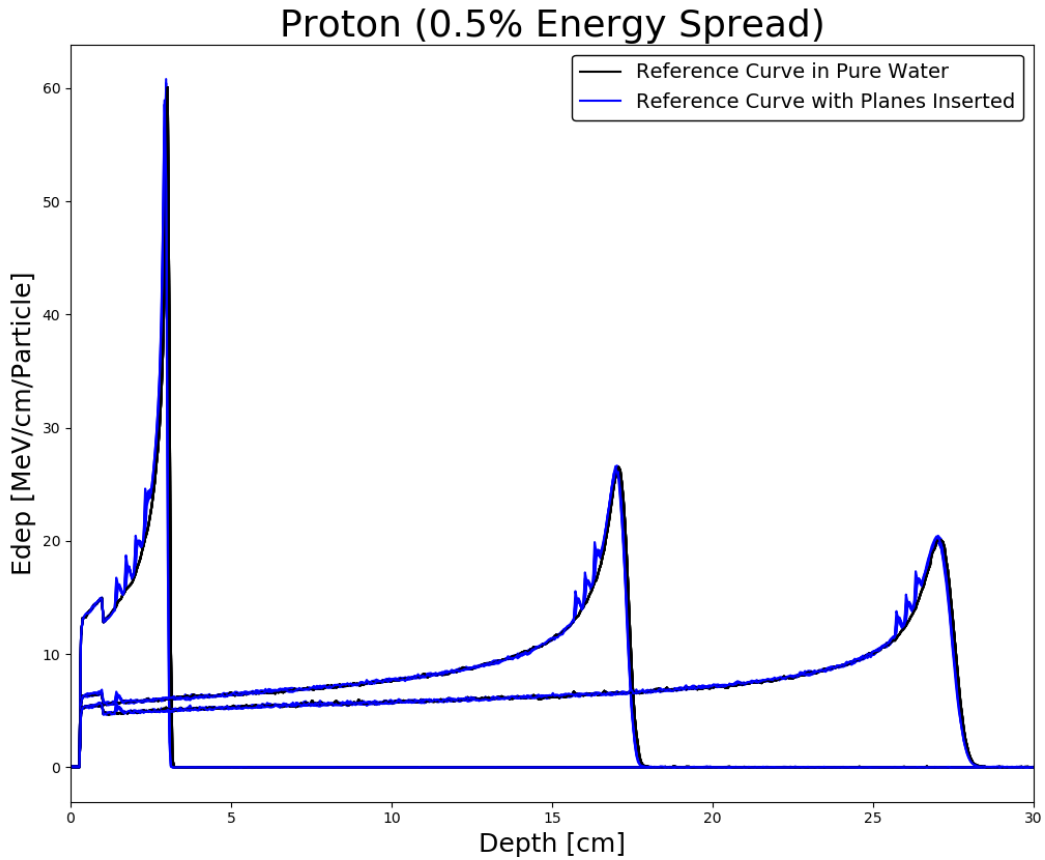
# Proton - Kapton Film - 0.2 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.20mm |
| Varying Film Material | Kapton |

| Kapton Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.033 | -0.170 |
| 0.1 | -0.017 | -0.118 |
| 0.15 | -0.033 | -0.160 |
| 0.2 | -0.033 | -0.460 |
| 0.25 | -0.083 | -1.022 |
| 0.3 | -0.050 | -0.721 |

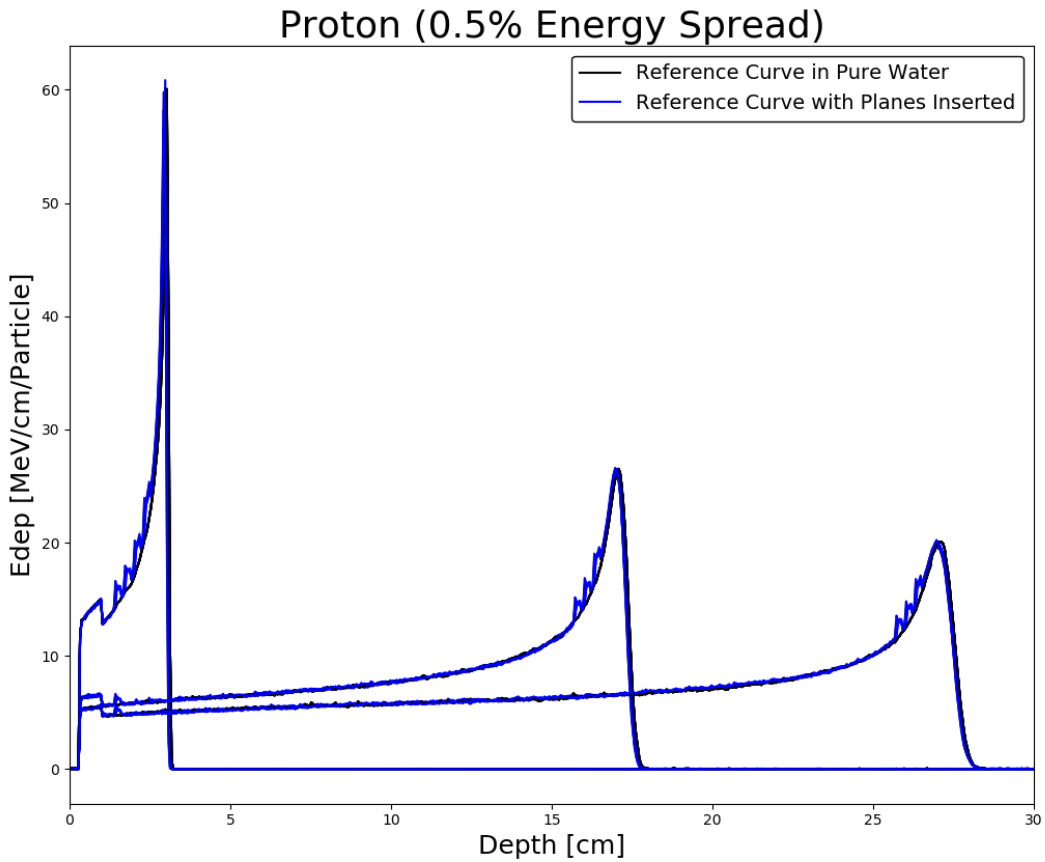
# Proton - Kevlar Film - 0.2 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.20mm |
| Varying Film Material | Kevlar |

| Kevlar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.033 | 0.319 |
| 0.1 | -0.033 | -0.062 |
| 0.15 | -0.033 | -0.369 |
| 0.2 | -0.033 | -0.607 |
| 0.25 | -0.067 | -0.640 |
| 0.3 | -0.083 | -0.342 |

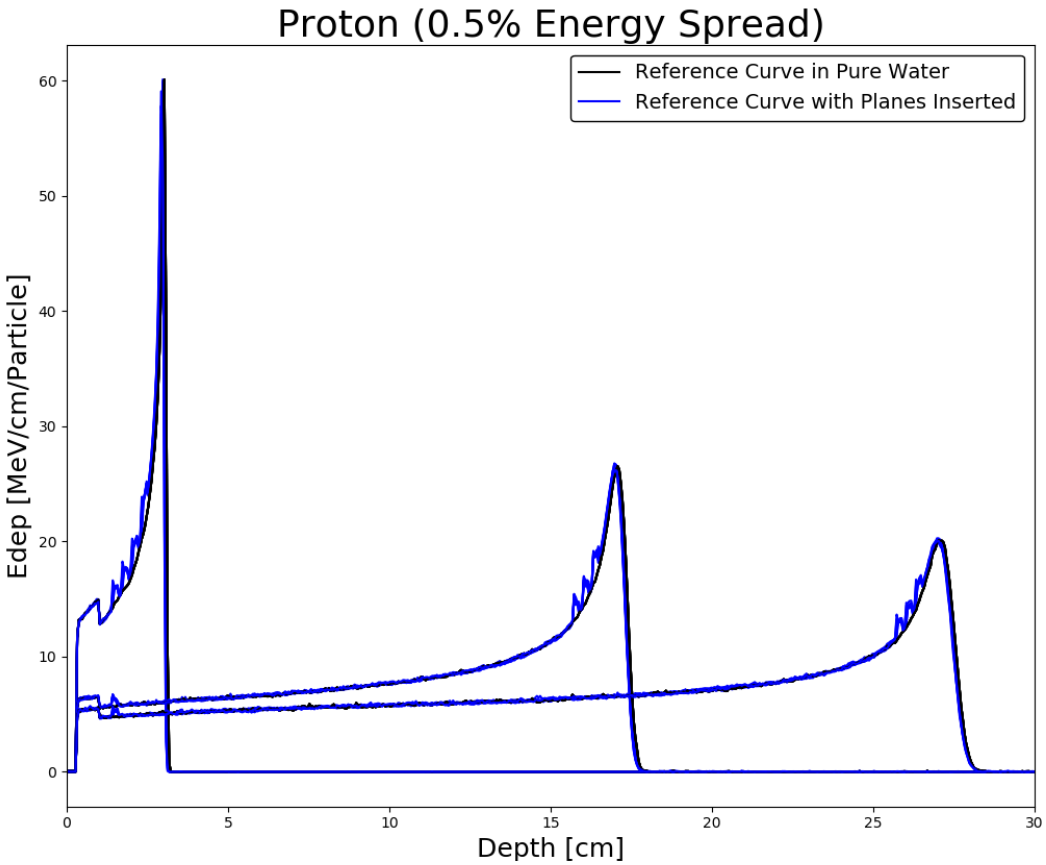
# Proton - Mylar Film - 0.3 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.30mm |
| Varying Film Material | Mylar |

| Mylar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.050 | 0.220 |
| 0.1 | -0.050 | -0.344 |
| 0.15 | -0.050 | -0.617 |
| 0.2 | -0.083 | -1.254 |
| 0.25 | -0.033 | -0.791 |
| 0.3 | -0.083 | -0.089 |

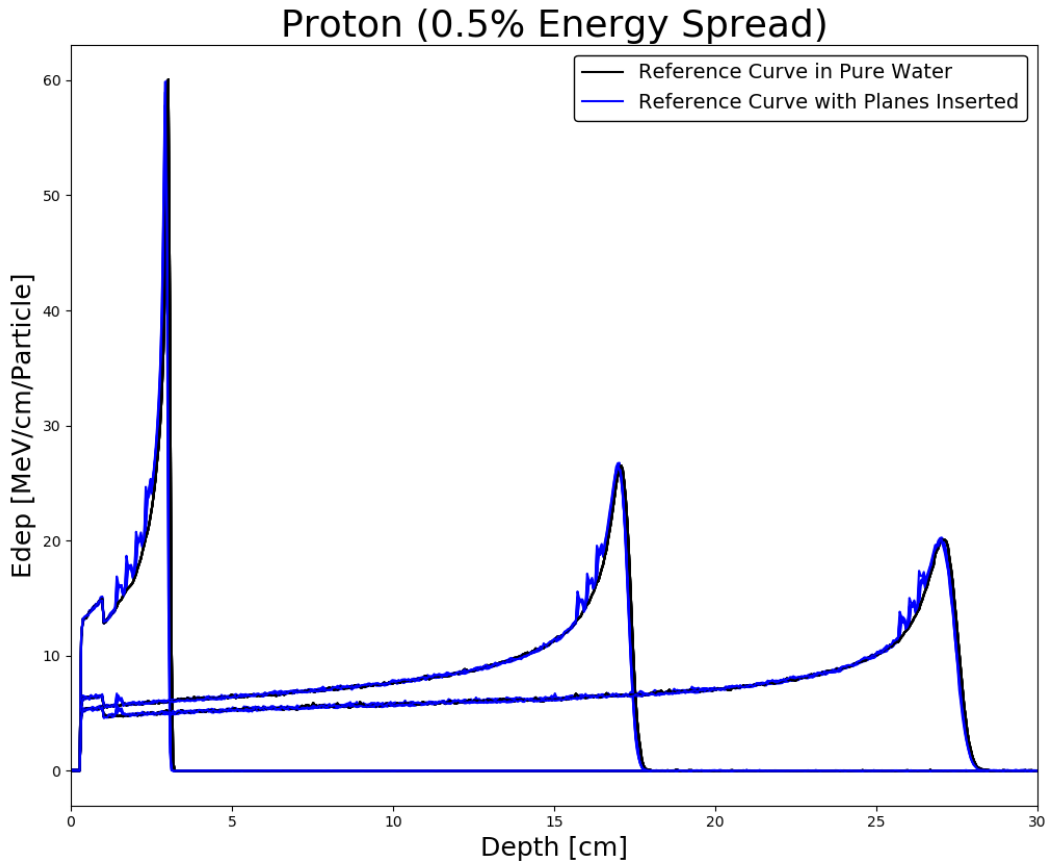
# Proton - Kapton Film - 0.3 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.30mm |
| Varying Film Material | Kapton |

| Kapton Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.067 | 0.143 |
| 0.1 | -0.017 | 0.003 |
| 0.15 | -0.050 | -0.418 |
| 0.2 | -0.050 | -0.795 |
| 0.25 | -0.083 | -0.862 |
| 0.3 | -0.050 | -0.463 |

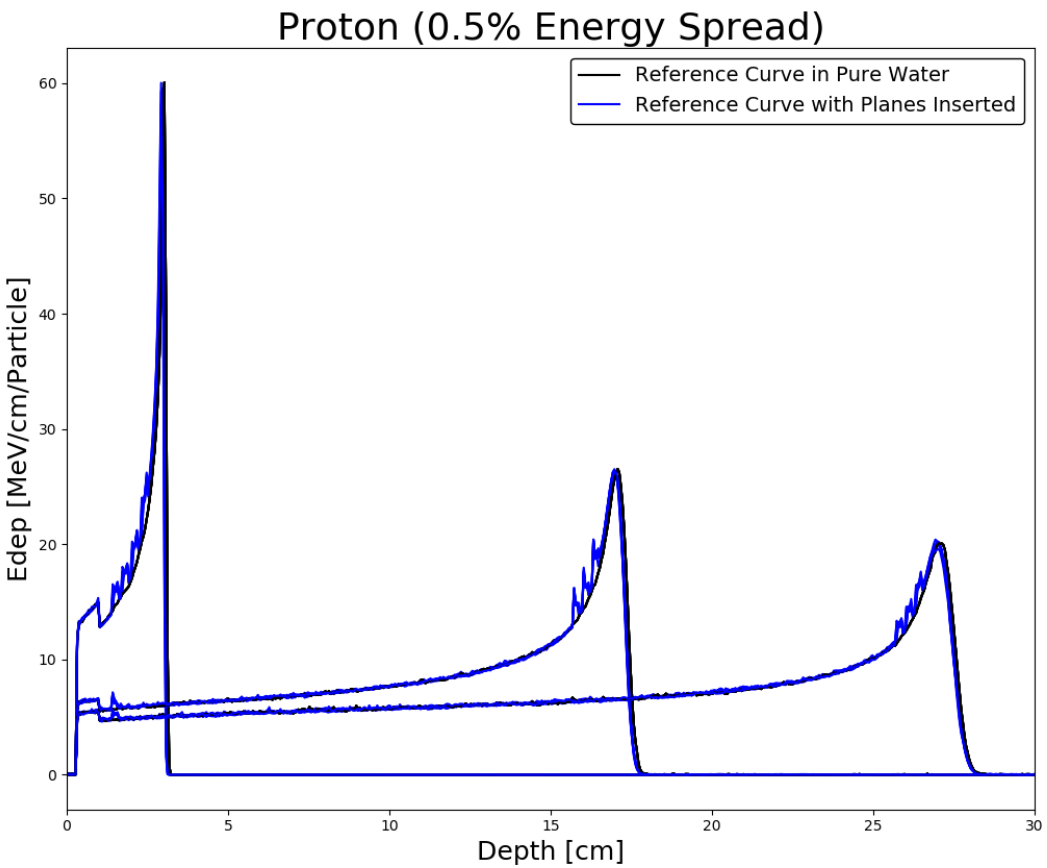
# Proton - Kevlar Film - 0.3 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.30mm |
| Varying Film Material | Kevlar |

| Kevlar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.017 | -0.032 |
| 0.1 | -0.033 | -0.081 |
| 0.15 | -0.033 | -0.680 |
| 0.2 | -0.033 | -0.786 |
| 0.25 | -0.067 | -0.340 |
| 0.3 | -0.067 | -0.100 |

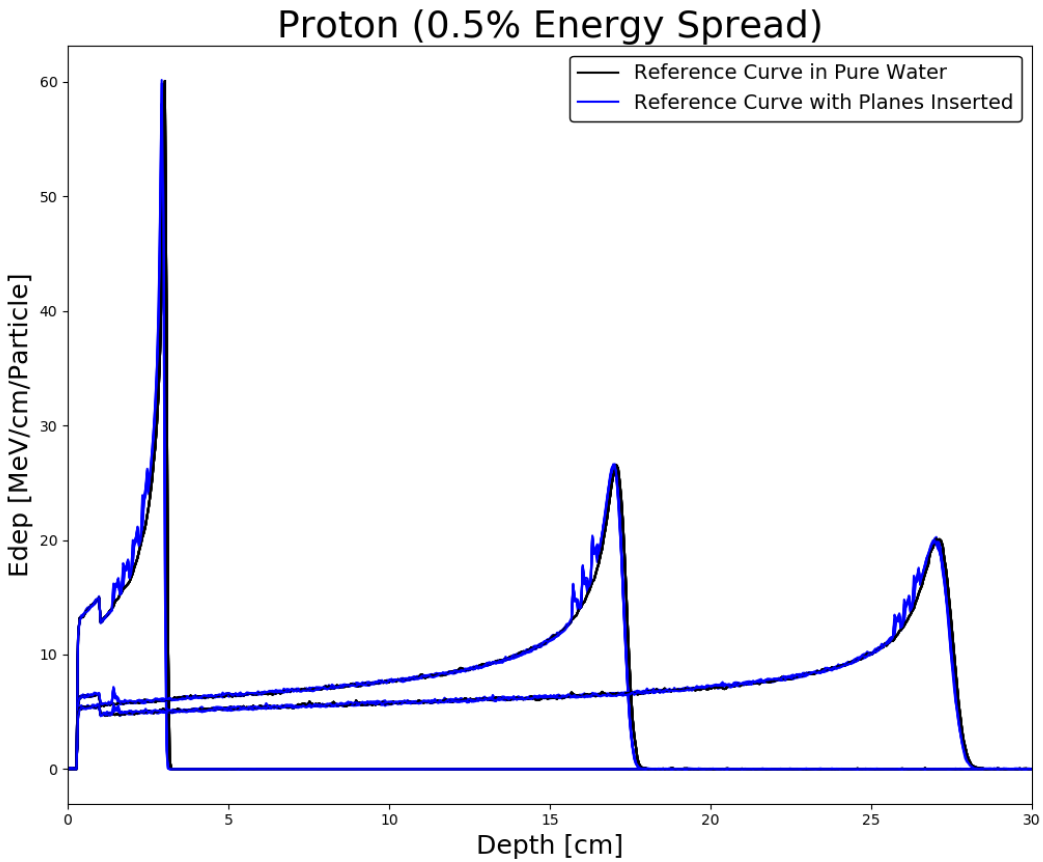
# Proton - Mylar Film - 0.4 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.40mm |
| Varying Film Material | Mylar |

| Mylar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.050 | -0.177 |
| 0.1 | -0.050 | -0.616 |
| 0.15 | -0.050 | -1.114 |
| 0.2 | -0.067 | -0.705 |
| 0.25 | -0.100 | -0.149 |
| 0.3 | -0.050 | -0.271 |

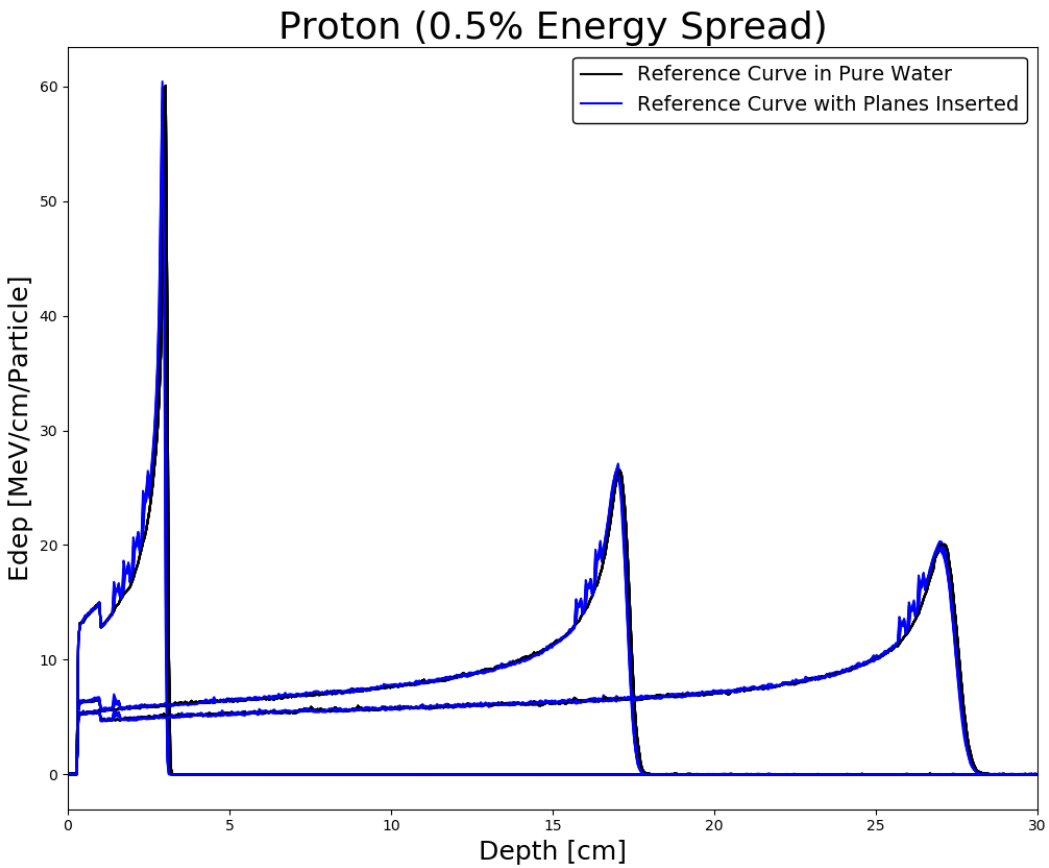
# Proton - Kapton Film - 0.4 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.40mm |
| Varying Film Material | Kapton |

| Kapton Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.050 | -0.219 |
| 0.1 | -0.067 | -0.562 |
| 0.15 | -0.050 | -0.929 |
| 0.2 | -0.067 | -0.576 |
| 0.25 | -0.083 | -0.226 |
| 0.3 | -0.083 | -0.021 |

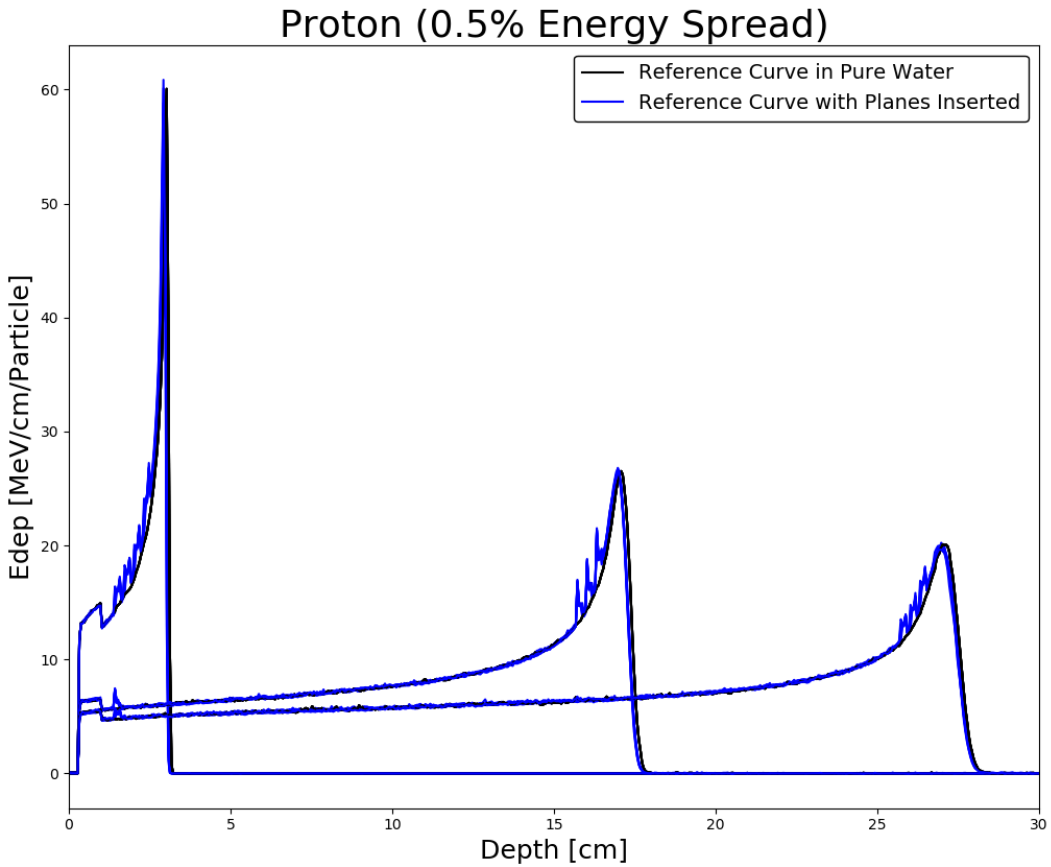
# Proton - Kevlar Film - 0.4 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.40mm |
| Varying Film Material | Kevlar |

| Kevlar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.033 | -0.063 |
| 0.1 | -0.067 | -0.560 |
| 0.15 | -0.067 | -0.752 |
| 0.2 | -0.100 | -0.664 |
| 0.25 | -0.083 | 0.038 |
| 0.3 | -0.083 | -0.184 |

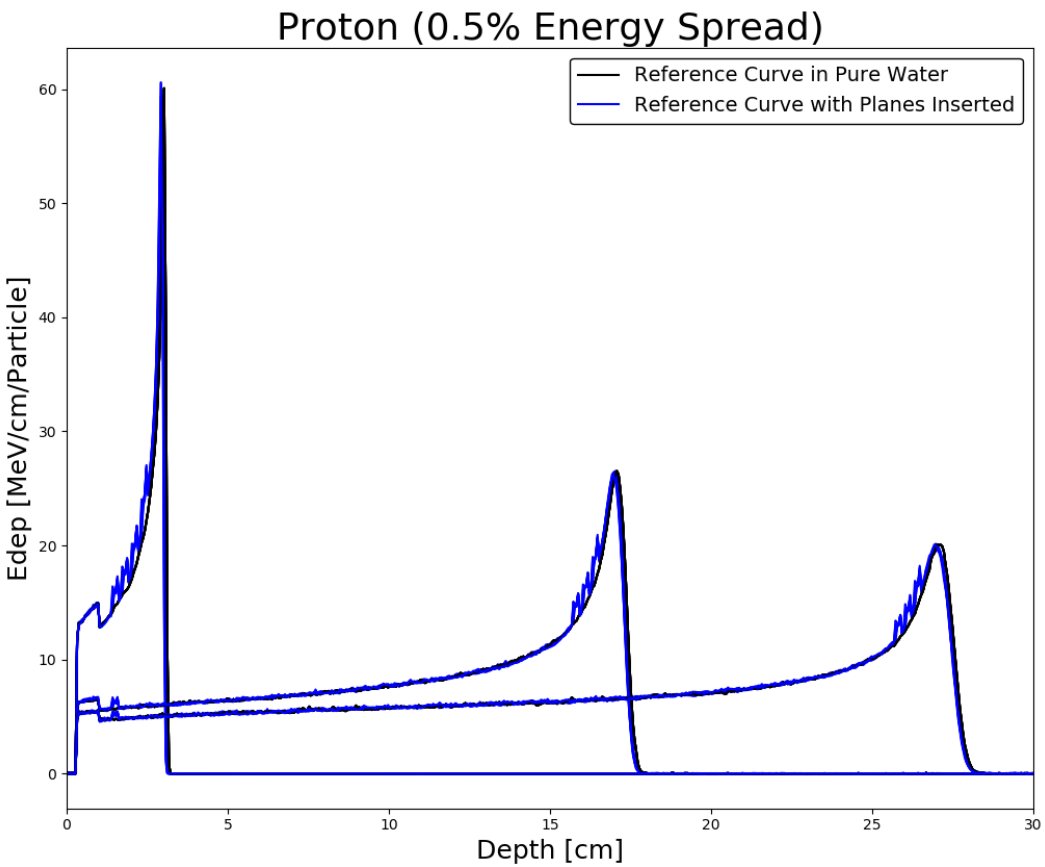
# Proton - Mylar Film - 0.5 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.50mm |
| Varying Film Material | Mylar |

| Mylar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.083 | -0.454 |
| 0.1 | -0.083 | -0.948 |
| 0.15 | -0.067 | -0.959 |
| 0.2 | -0.083 | -0.586 |
| 0.25 | -0.100 | 0.077 |
| 0.3 | -0.050 | 0.209 |

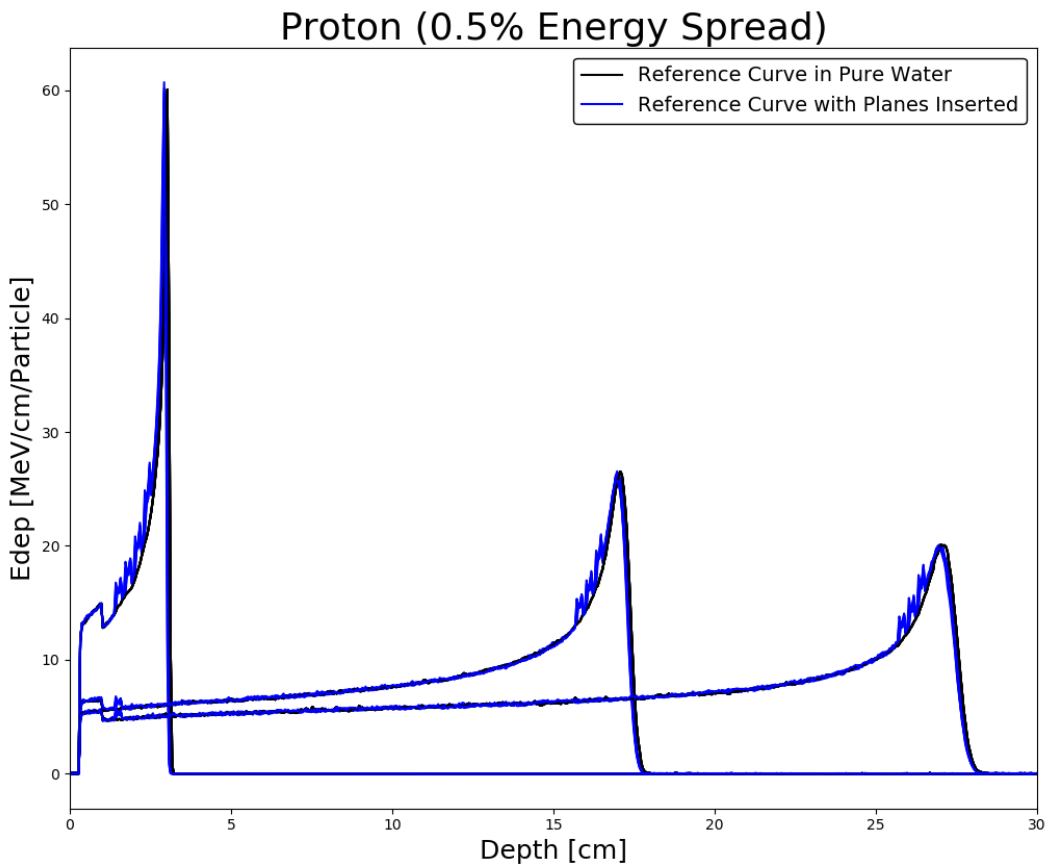
# Proton - Kapton Film - 0.5 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.50mm |
| Varying Film Material | Kapton |

| Kapton Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.050 | -0.513 |
| 0.1 | -0.067 | -1.071 |
| 0.15 | -0.083 | -0.846 |
| 0.2 | -0.050 | -0.504 |
| 0.25 | -0.083 | 0.032 |
| 0.3 | -0.083 | 0.022 |

# Proton - Kevlar Film - 0.5 mm Epoxy Extent




| | |
|---|---|
| Epoxy Thickness | 0.50mm |
| Varying Film Material | Kevlar |

| Kevlar Thickness [mm] | Average Delta Depth [cm] | Average Delta Edep [MeV/cm/Particle] |
|---|---|---|
| 0.05 | -0.050 | -0.737 |
| 0.1 | -0.117 | -0.865 |
| 0.15 | -0.050 | -0.505 |
| 0.2 | -0.067 | -0.133 |
| 0.25 | -0.083 | -0.089 |
| 0.3 | -0.083 | -0.331 |