

Plan for a Multi-Foil Solid Target  
Hall D SRC/CT Experiment  
E12-19-003

We propose a slight modification to the experiment's multi-foil target. We intend to replace four of the eight carbon foils with iron foils. Iron will provide a valuable additional data point, and the experiment will still retain adequate luminosity on carbon.

The thickness of the original carbon target (1.9 cm) was limited by the expected electromagnetic backgrounds. With this in mind, we have chosen a total iron thickness to maintain the target's electron density. The relevant parameters are in the table below.

Material	e <sup>-</sup> density [cm <sup>-3</sup> ]
Carbon	6.65 E23
Iron	2.20 E24

The original target's electron density budget is  $1.9 \text{ cm} \times 6.65 \text{ E23 e}^-/\text{cm}^3 = 1.26\text{E24 e}^-/\text{cm}^2$ .

We intend to replace 35% of our carbon target's electron density budget with iron. The total thicknesses of the two materials are:

- Carbon:  $0.65 \times 1.9\text{cm} = 1.235 \text{ cm}$
- Iron:  $0.35 \times 1.26\text{E24 e}^-/\text{cm}^2 / 2.20 \text{ E24 e}^-/\text{cm}^3 = 0.200 \text{ cm}$

We intend to divide these total thicknesses over 4 foils per material, interleaved on a multi-foil target to match the detector acceptance as closely as possible to that when running the 30 cm cryogenic liquid target. The four carbon foils would each be 0.309 cm thick. The four iron foils would each be 0.050 cm thick. An illustration of the intended multi-foil target is shown below.

