Everything you wanted to know about packing fraction,
but were afraid to ask

Packing fraction

$$ND3rate = offset + slope \times p.f.$$

p.f. = 0: empty target, i.e. offset = empty rate

$rate0 = empty + slope \times pf0$, i.e.
$slope = (rate0 - empty)/pf0$

specific case pf0 = 0.5 (carbon substitute)

$$pf = 0.5(ND3 - empty)/(carbon - empty)$$

or

$$pf = (ND3 - empty)/(montecarlo - empty)$$

Montecarlo and data rates

- HMS-I, wet carbon: 632 ± 2 vs 618
- HMS-I, dry carbon: 382 ± 0.5 vs 374
- HMS-II, dry carbon 700 ± 3 vs 707
- HMS-III, empty 530 ± 7 vs 547
  or 545 vs 547
- HMS-III, thin carbon 740 ± 0.5 vs 770
- HMS-III, thick carbon 1196 ± 10 vs 1268 or 1249 ± 2 vs 1268

Ingredients of inclusive montecarlo:

- QFS (claimed accuracy: 15%)
- spectrometer model (bad edges of momentum acceptance, effect size about 10%, material dependent)
- radiative effects

Is 5% target accuracy realistic?

top: 58.4 ± 1.1, 58.3 ± 0.14, 56.0 ± 0.3
53.4 ± 1.2, 55.6 ± 1.1

bottom: 60.6 ± 1.1, 59.5 ± 0.64, 57.7 ± 0.45
52.7 ± 2.2, 55.0 ± 1.0

from data: top: 55.6, 53.6
bottom: 54.9 53.1