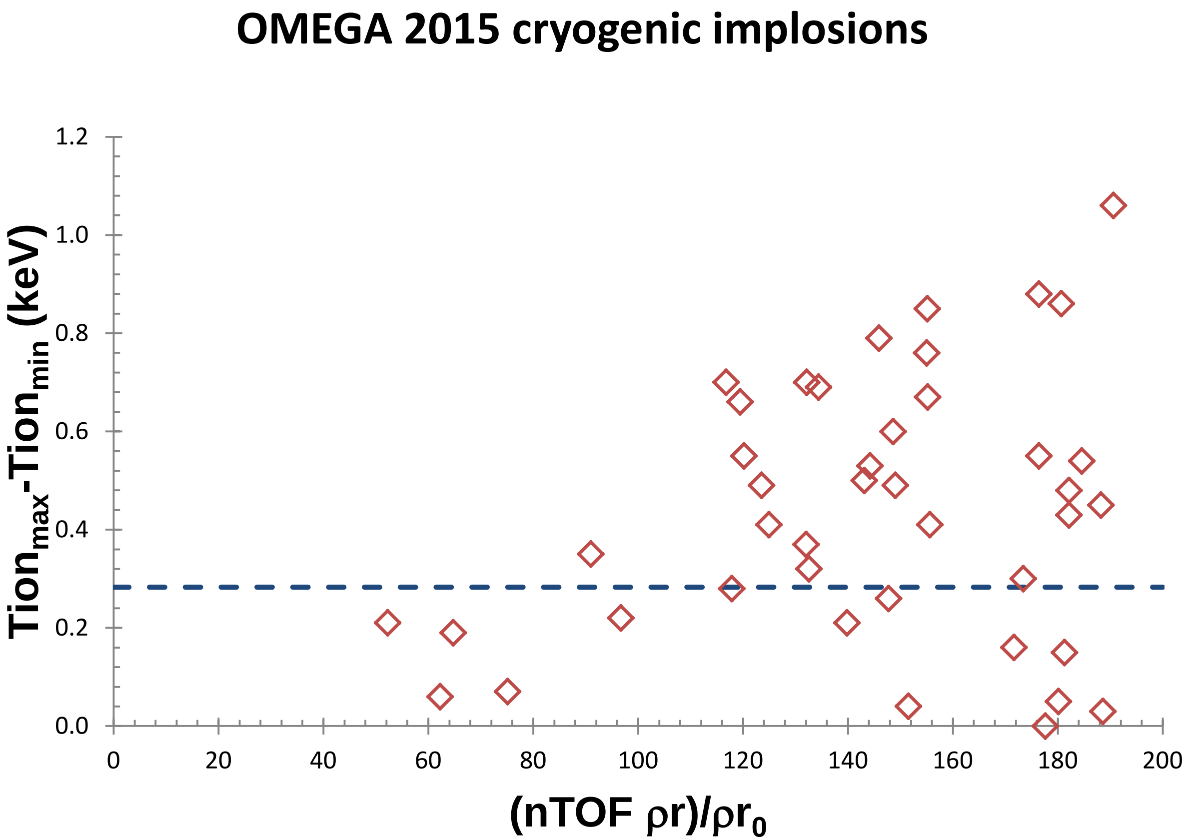
T_{ion} variations in OMEGA, 2015, cryogenic - implosions



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8 – 9 March 2016
NISP Workshop
Lawrence Livermore National Laboratory

T_{ion} variations in 2015 cryogenic implosions

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T_{ion} variations in 2015 cryogenic implosions

OMEGA T_{ion} variation along nTOF lines-of-sight

Comparison of OMEGA and NIF DT and DD yield and T_{ion}

T_{ion} variations in 2015 cryogenic implosions

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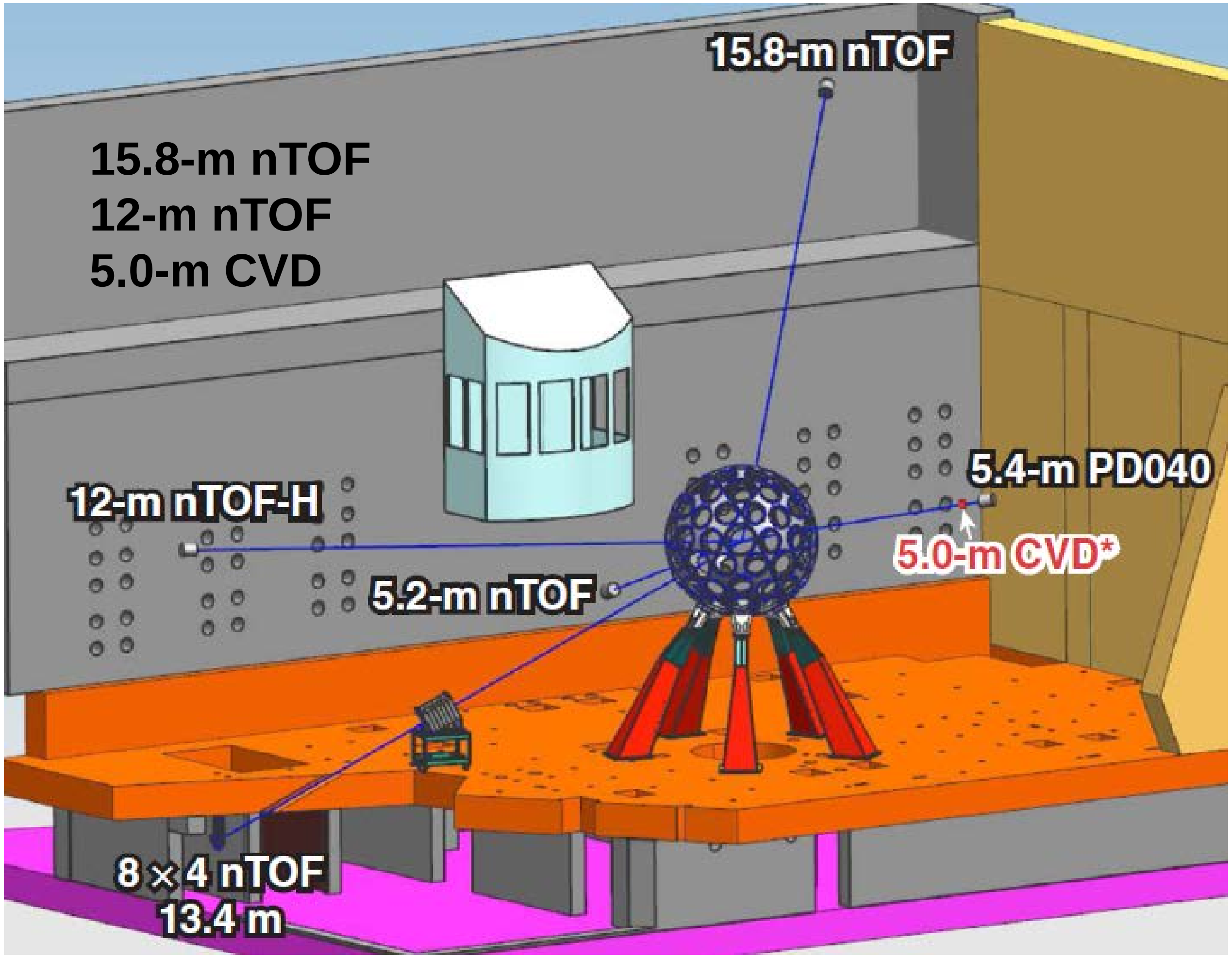
Comparison of OMEGA and NIF DT and DD yield and T_{ion}

Two to three nTOF detectors are used to report T_{ion} values

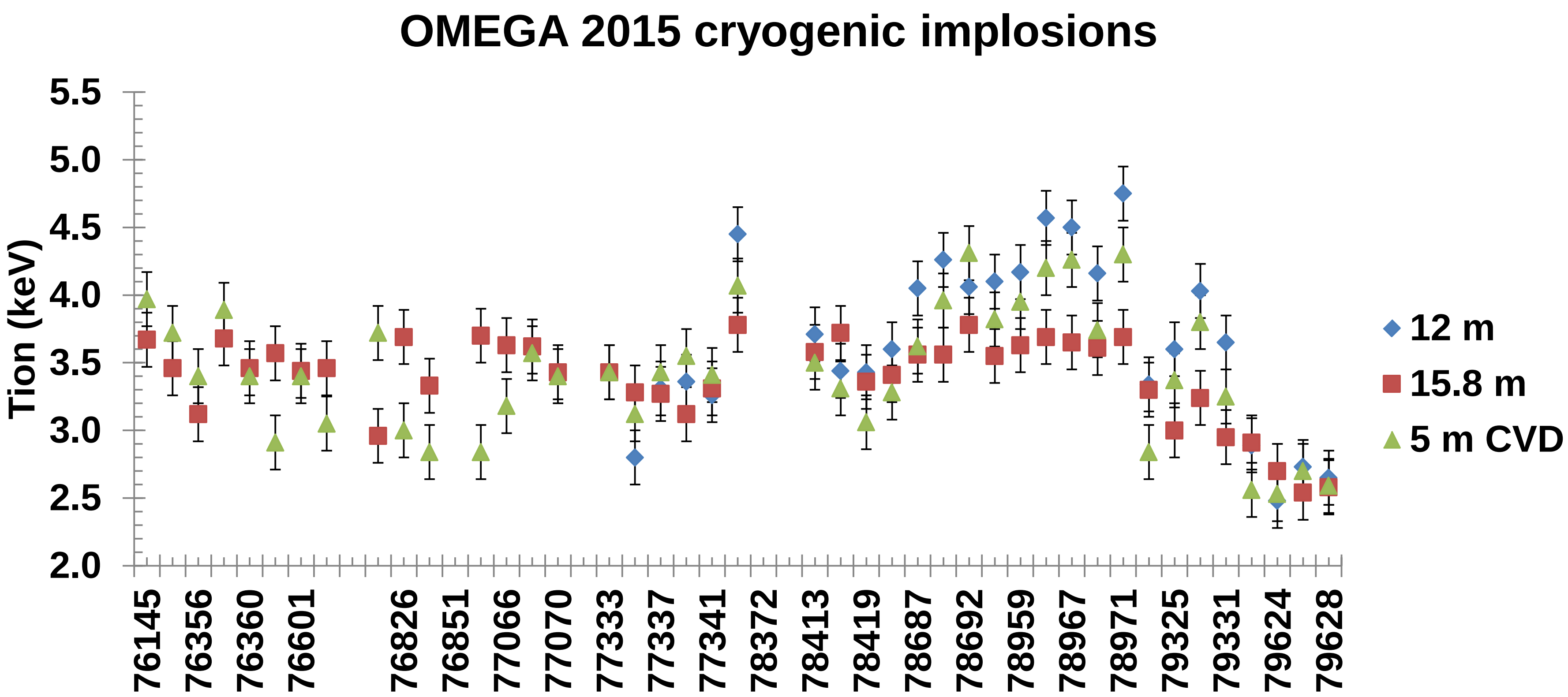


There were 11 cryogenic implosion days in 2015

- February 5^{th}
- March 17^{th}
- April 8^{th}
- April 28^{th}
- May 19^{th}
- June 17^{th}
- August 20^{th}
- September 15^{th}
- October 6^{th}
- November 3^{rd}
- December 8^{th}

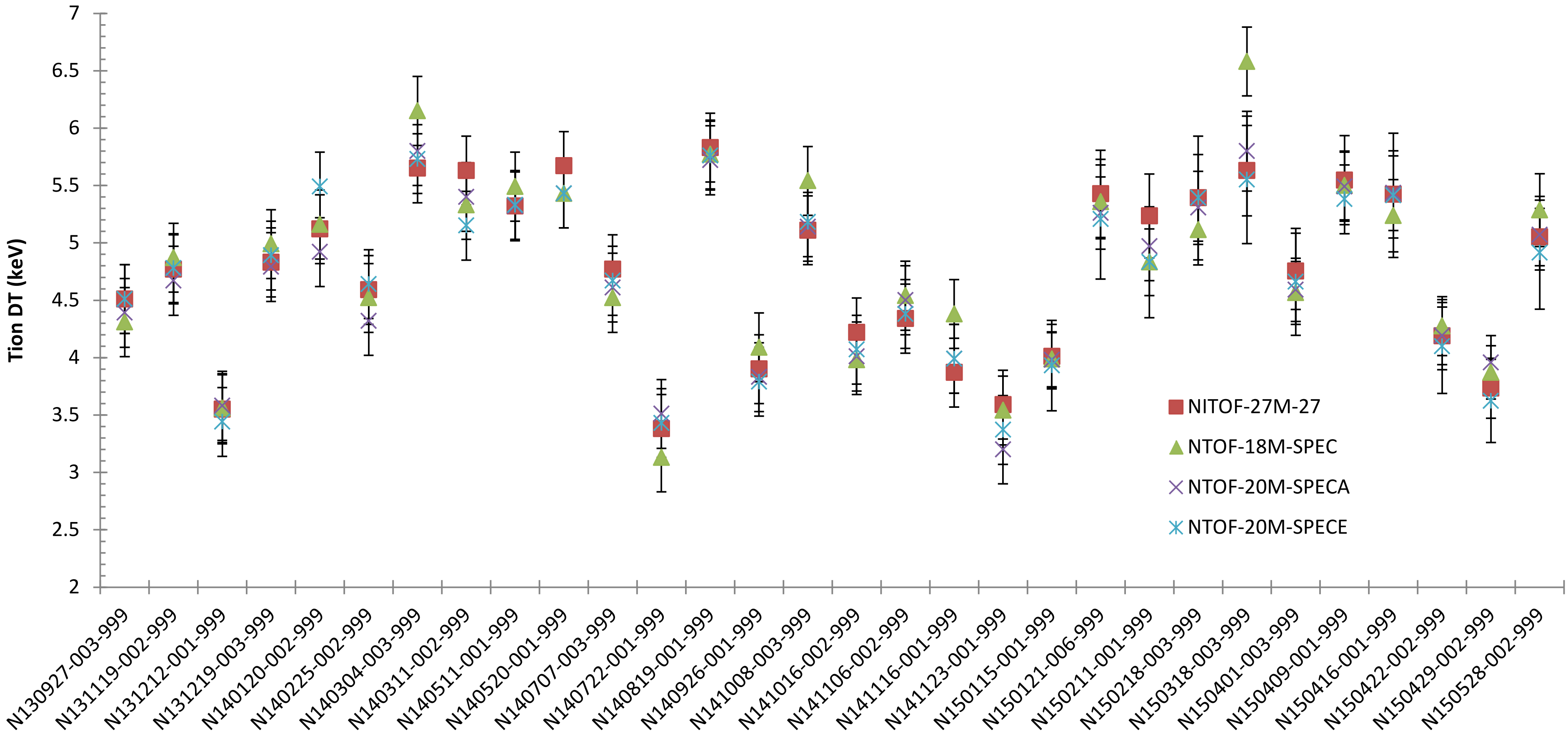
Black font indicates days when 12-m nTOF may have been nonlinear

Ion temperature from DT peak shows variations between detectors of up to 1.1 keV

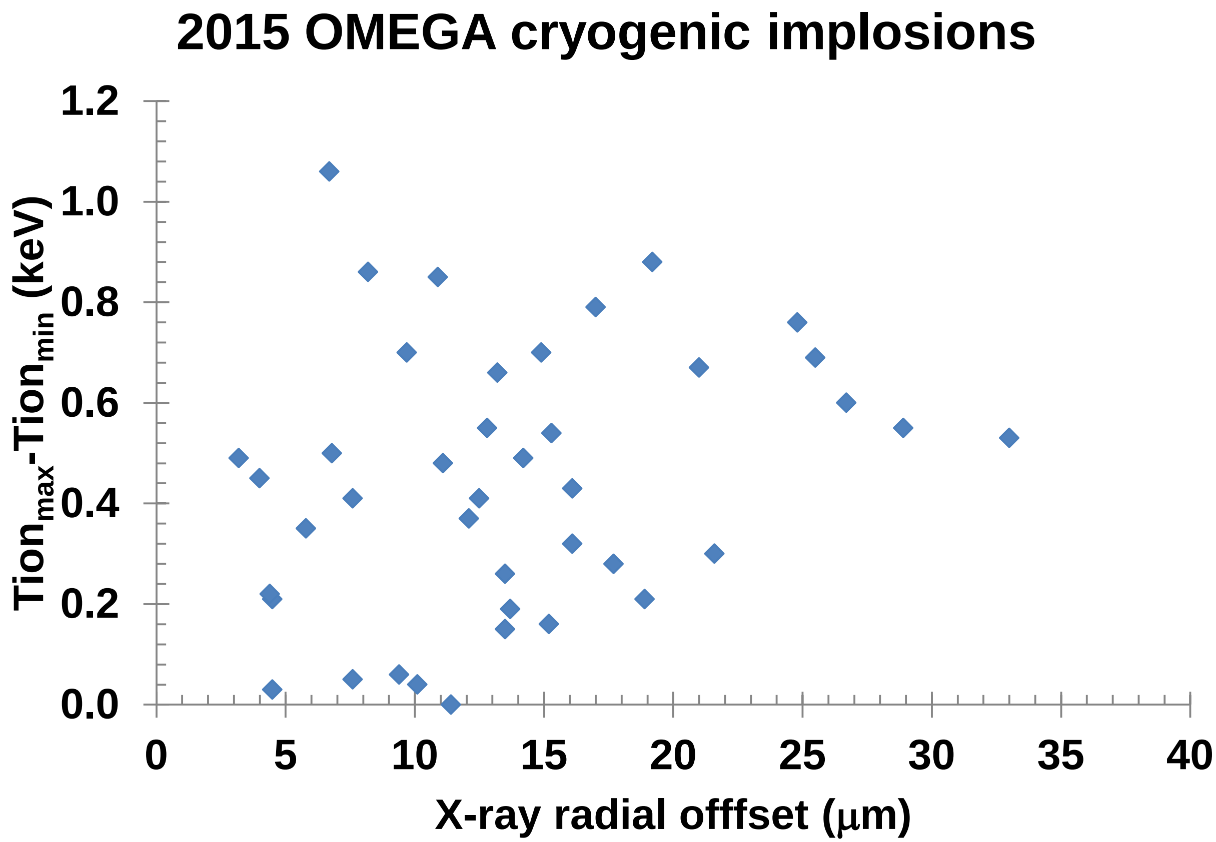


12-m nTOF-H excluded prior to May 2015 due to nonlinear signal

Ion temperature from DT peak shows little variations between detectors over the High Foot Campaign

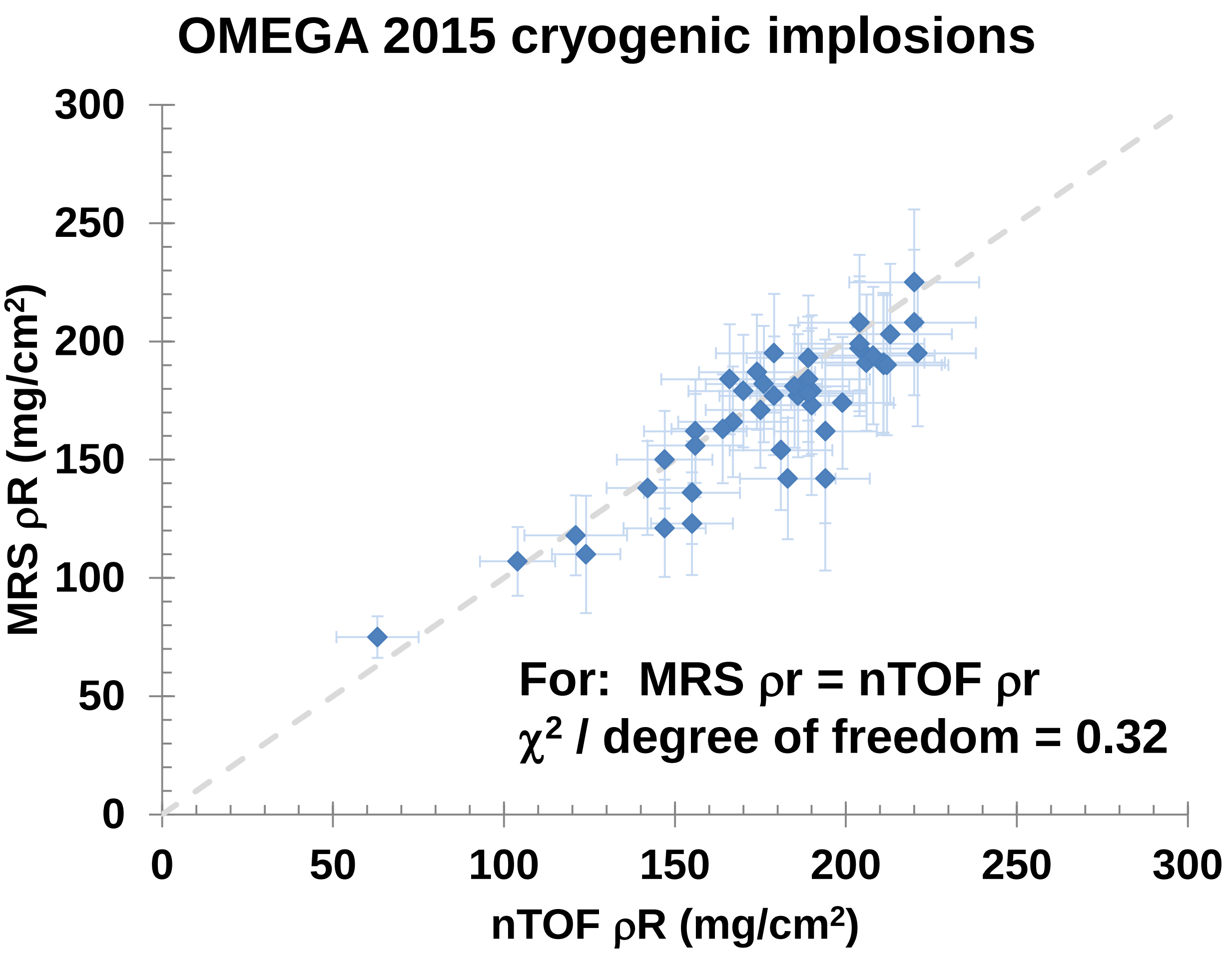


Difference between $Tion_{max}$ and $Tion_{min}$ is not correlated with X-ray radial offset

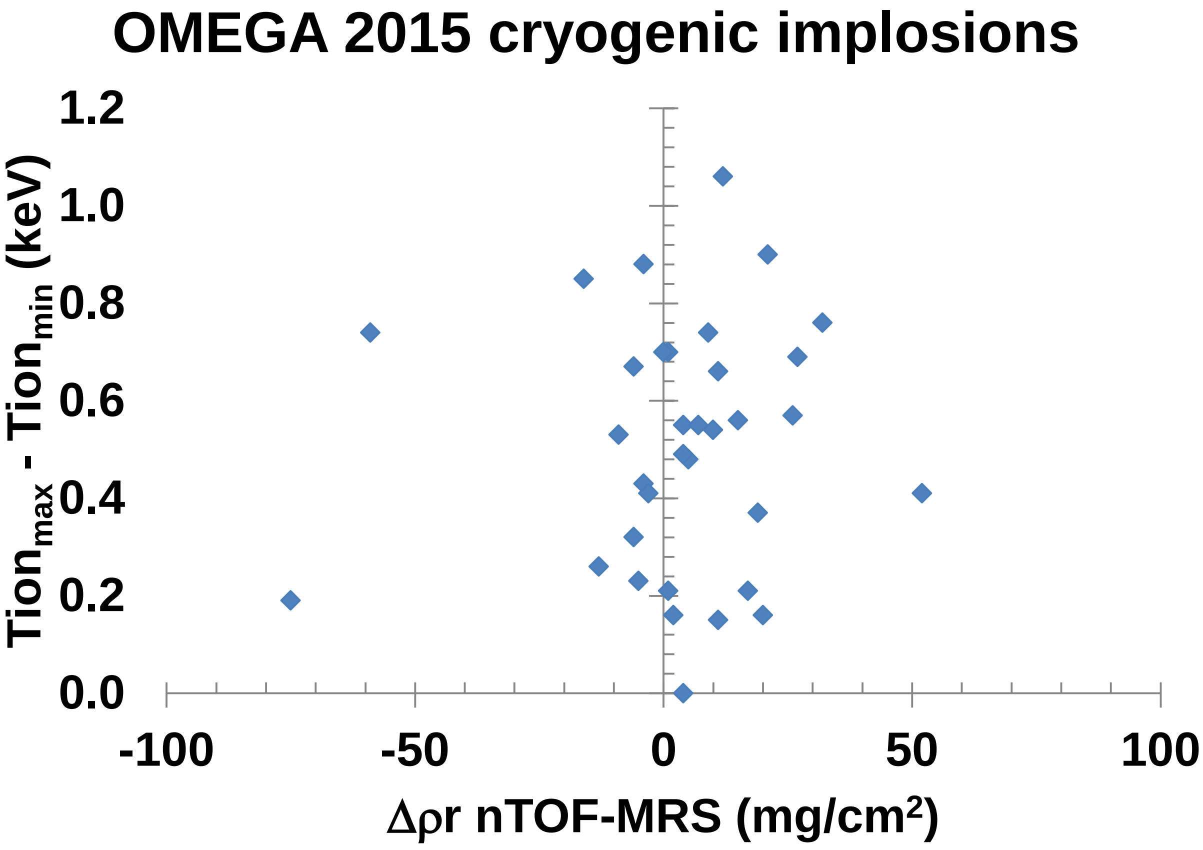


Same result found by V. Glebov when looking at HST offsets

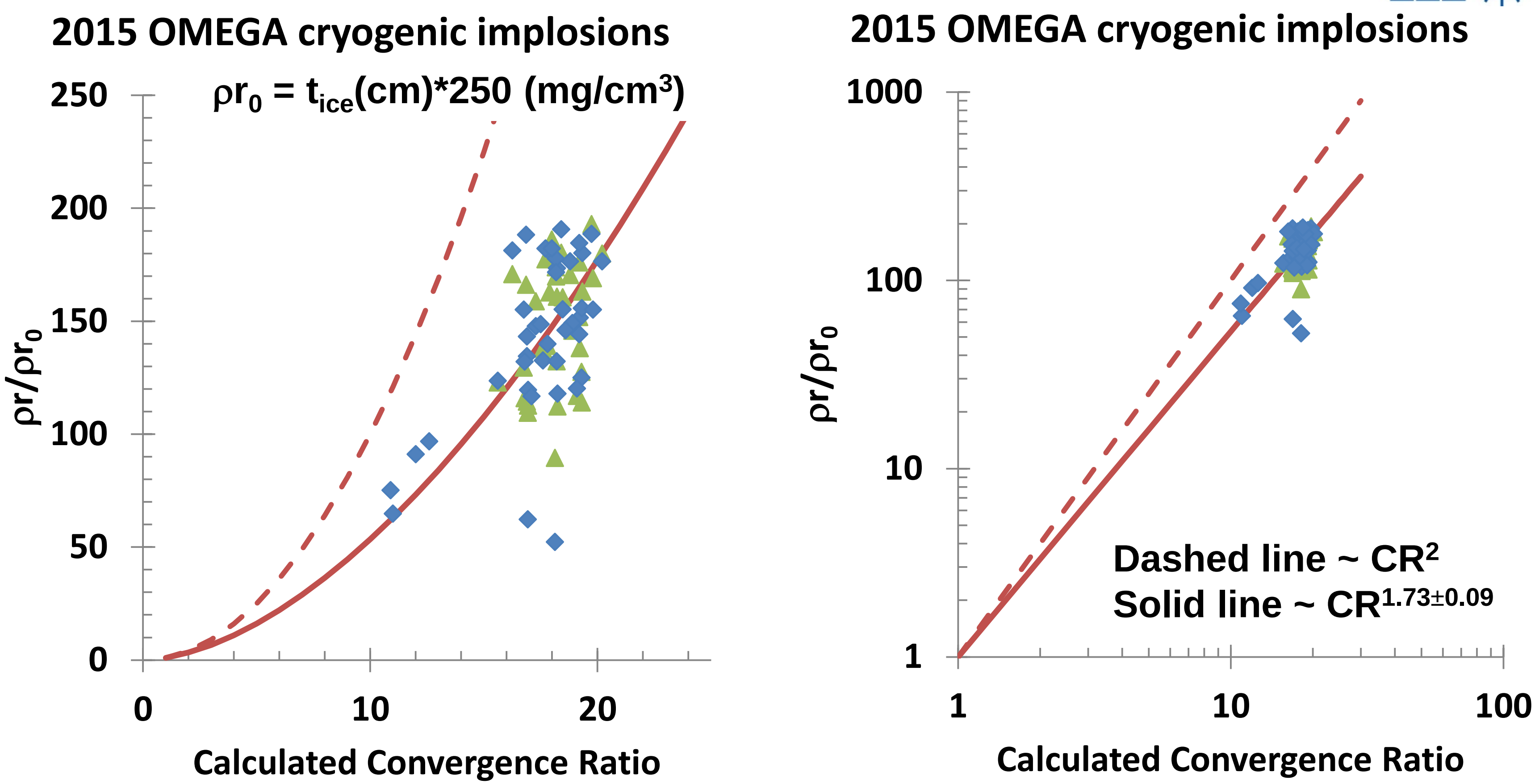
There is agreement between the MRS and nTOF measures of ρr for OMEGA cryogenic implosions



No correlation is observed between Tion variation and nTOF and MRS ρr difference



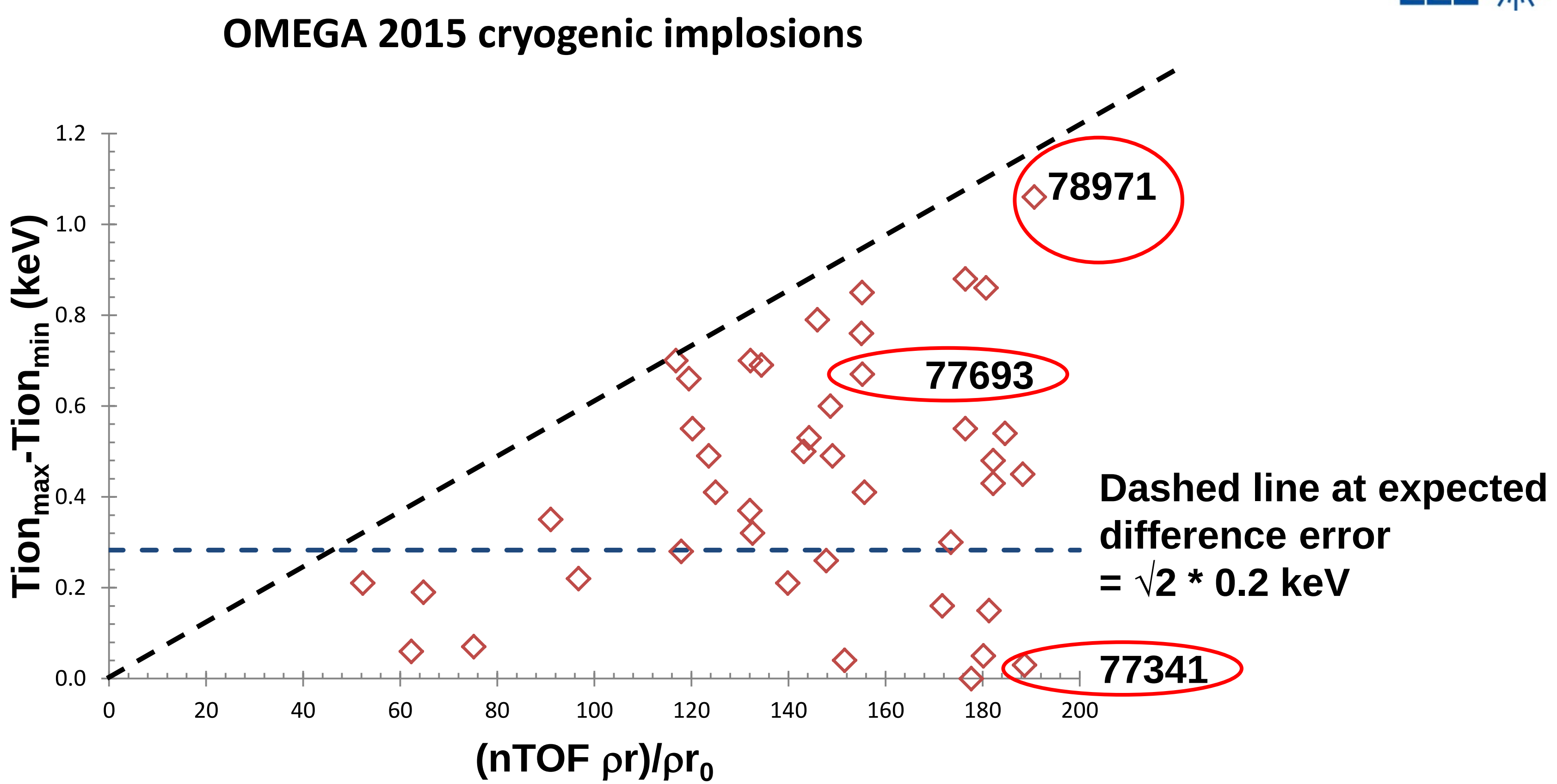
An experimental measure of the convergence ratio is the (final ρr)/(initial ρr)



◆ Blue diamonds nTOF data ▲ Green triangles MRS data

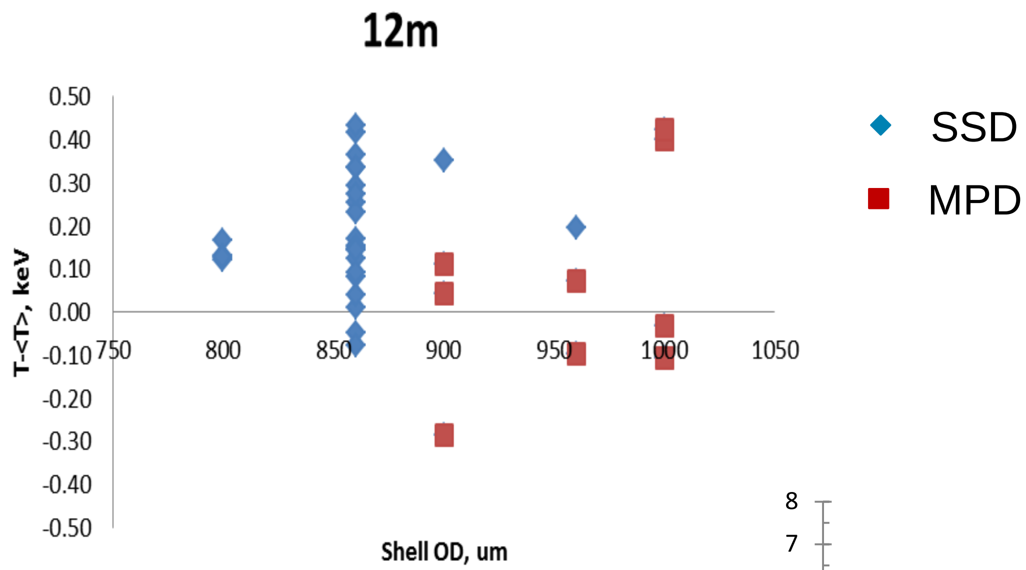
Neutron weighted ρr measured not peak ρr

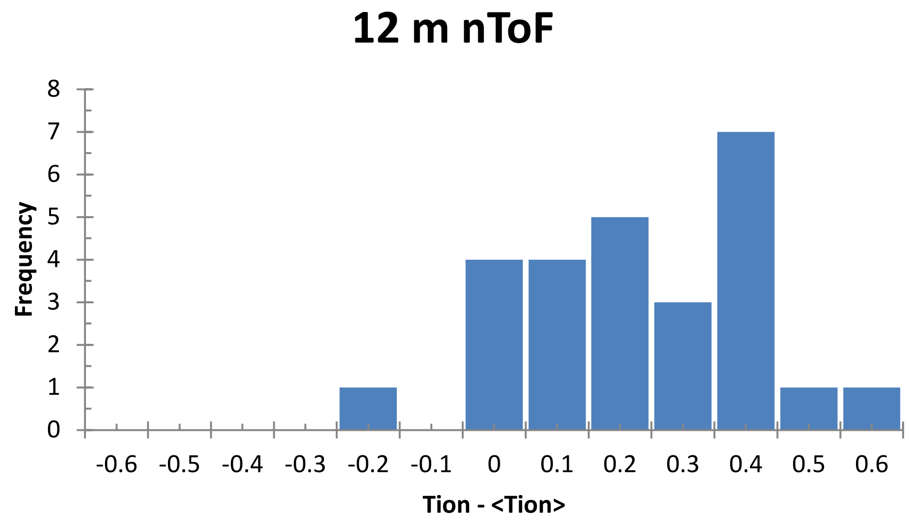
Difference between $Tion_{max}$ and $Tion_{min}$ is the largest for high convergence implosions



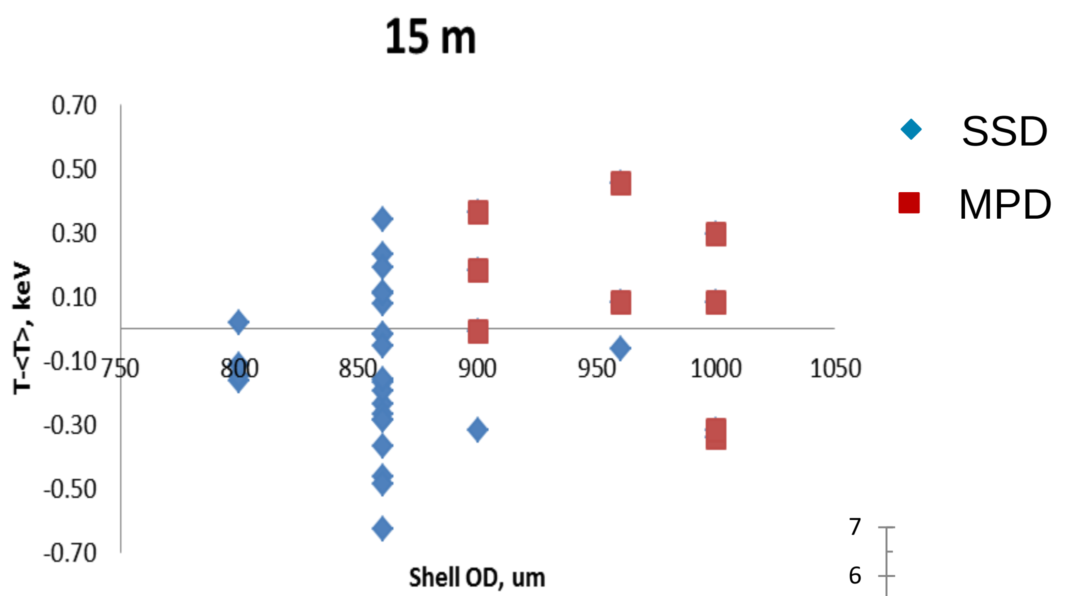
Fiche #

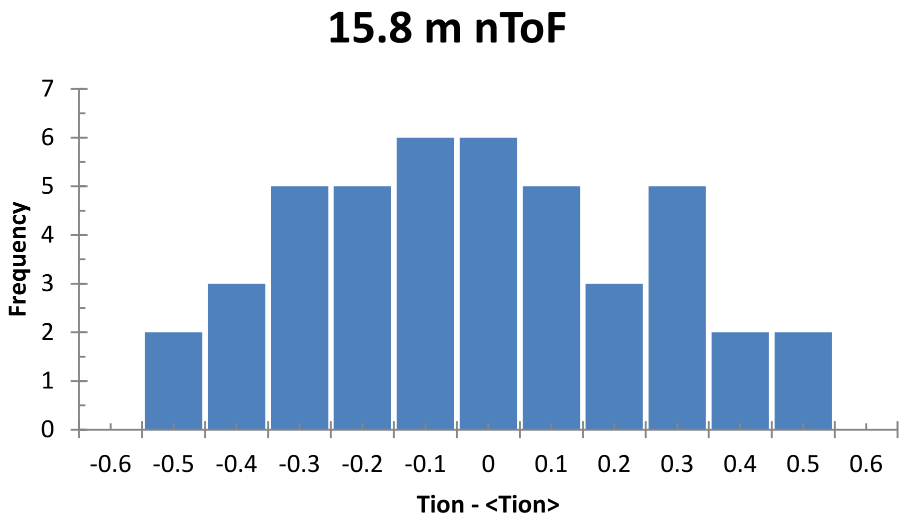
12 m nToF T_{ion} histogram shows a distribution with a positive offset



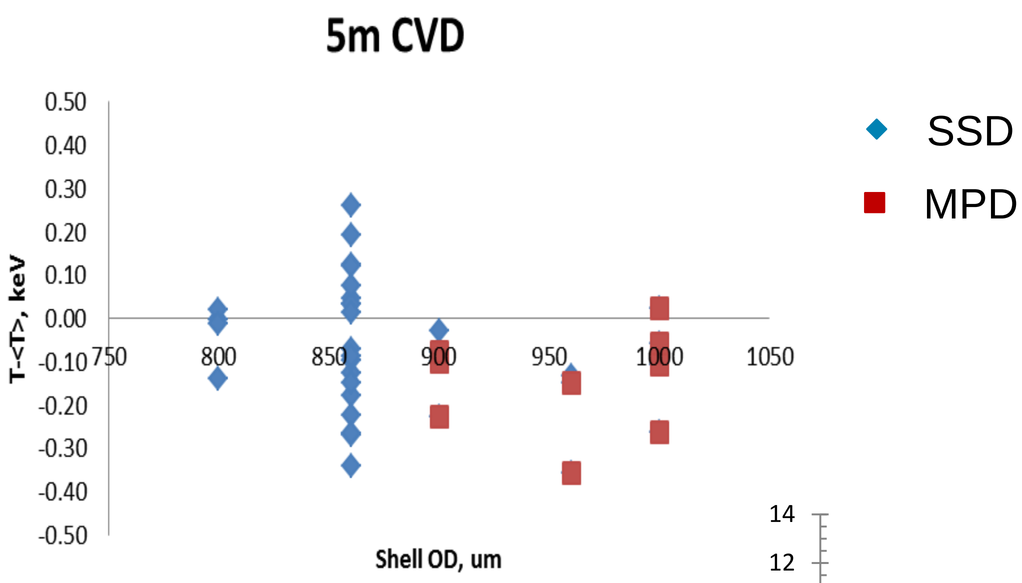


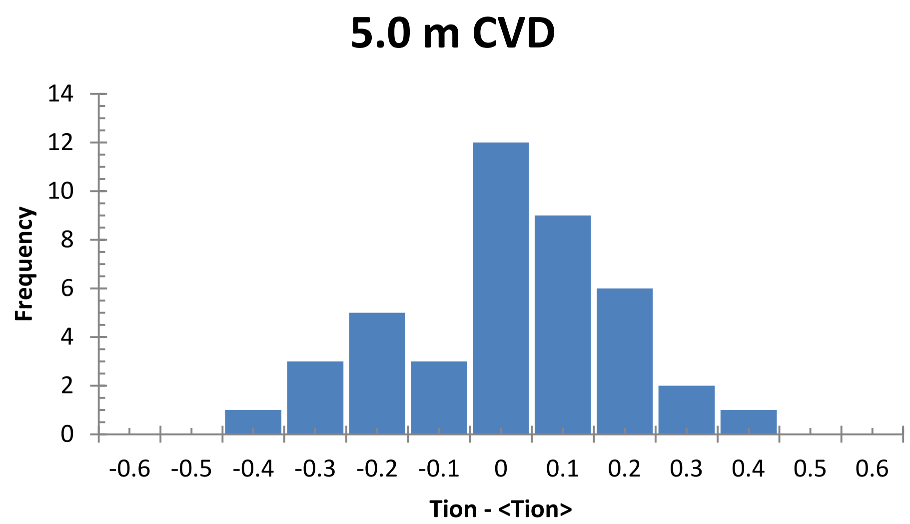
15.8 m nToF T_{ion} histogram shows a distribution consistent with a zero offset



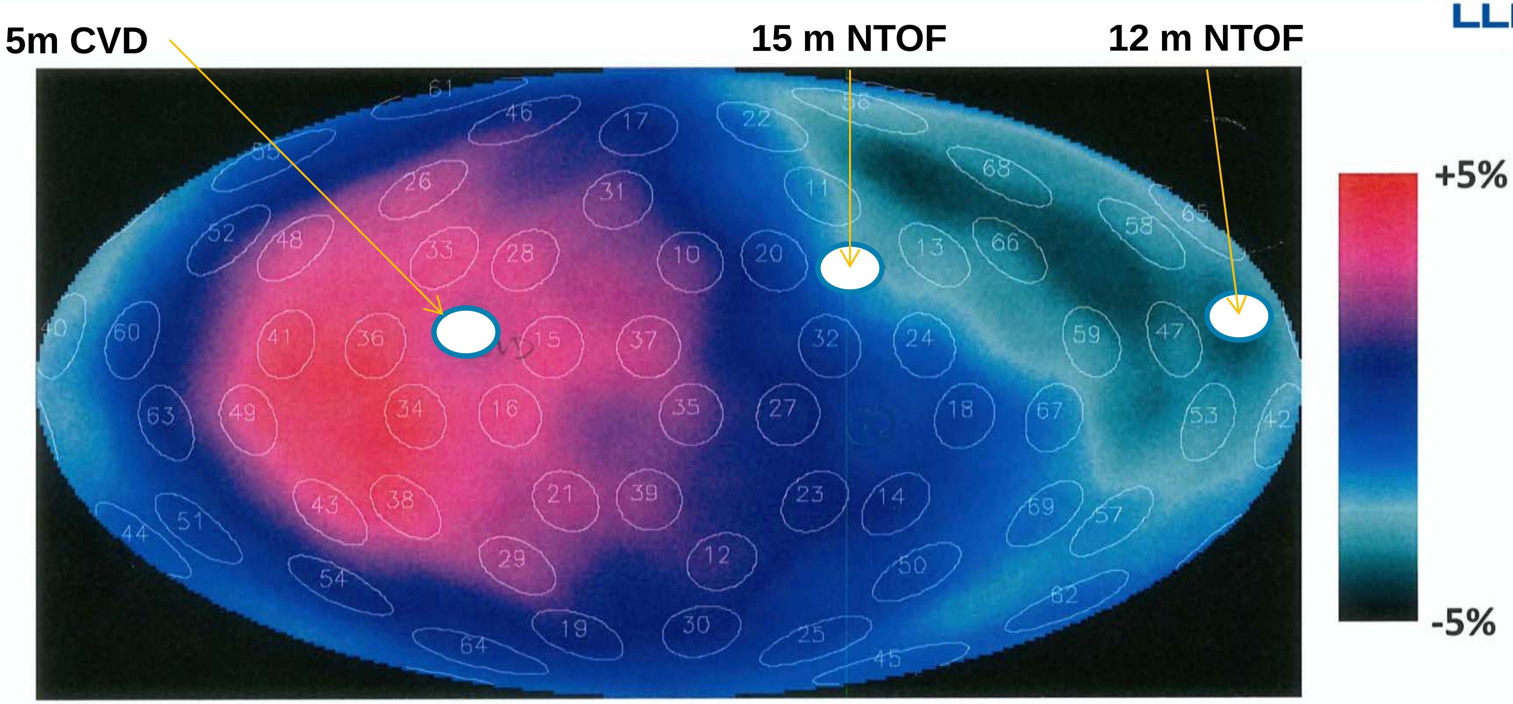


5.0 m CVD T_{ion} histogram shows a distribution consistent with a zero offset





Energy on target for Shot 77693 shows a P2 distribution



SG5 peak on target variation with varying beam areas
energies from shot 77693, σ_{uv} = 4.4%
for an 865 μm diam target
ptov = 8.7%, σ = 2.2%

r0(ave) = 377 μm
n(ave) = 4.19

F. J. Marshall
K. Silverstein
7 July 2015

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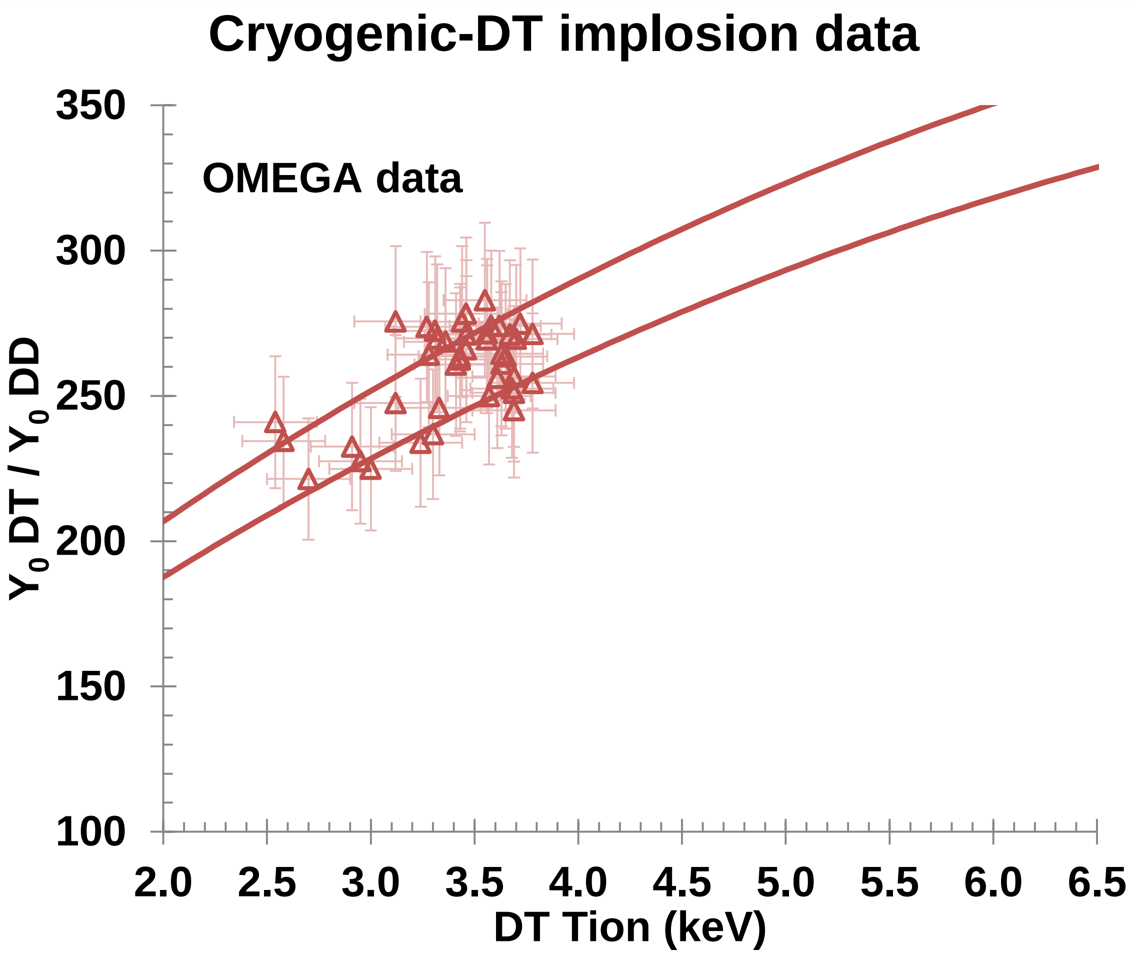
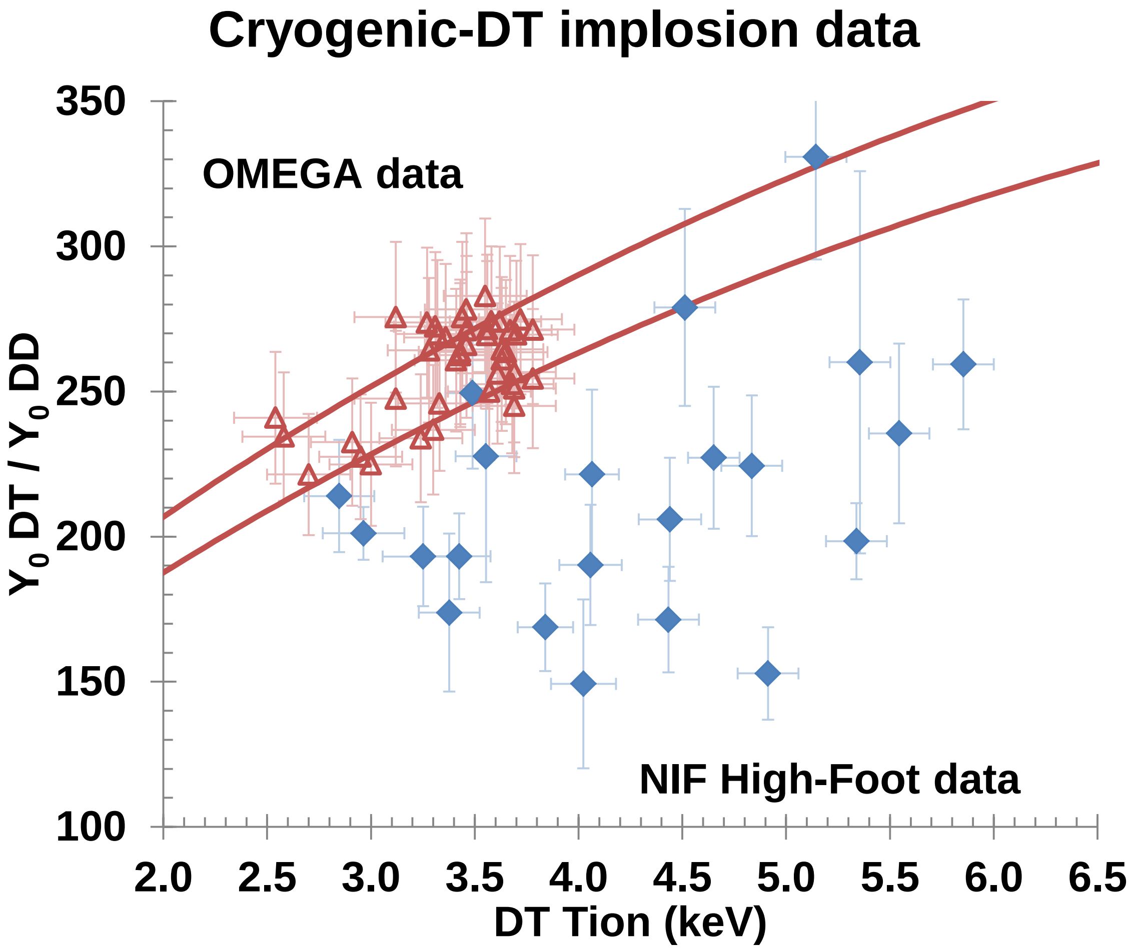
Comparison of OMEGA and NIF DT and DD yield and T_{ion}

OMEGA yield ratio data are close to the Bosch and Hale reactivity with the measured D:T fractions

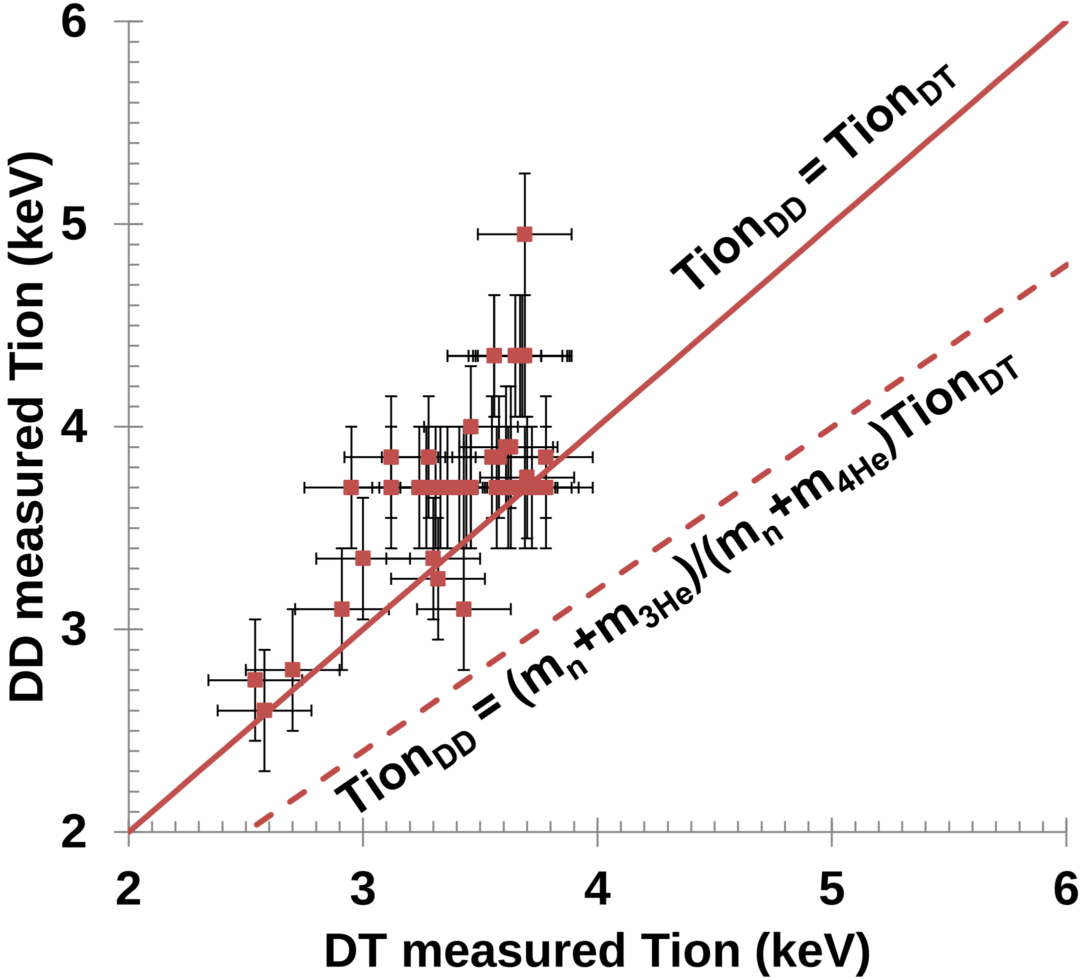


NIF High-Foot yield ratio data are more scattered than OMEGA yield ratio data



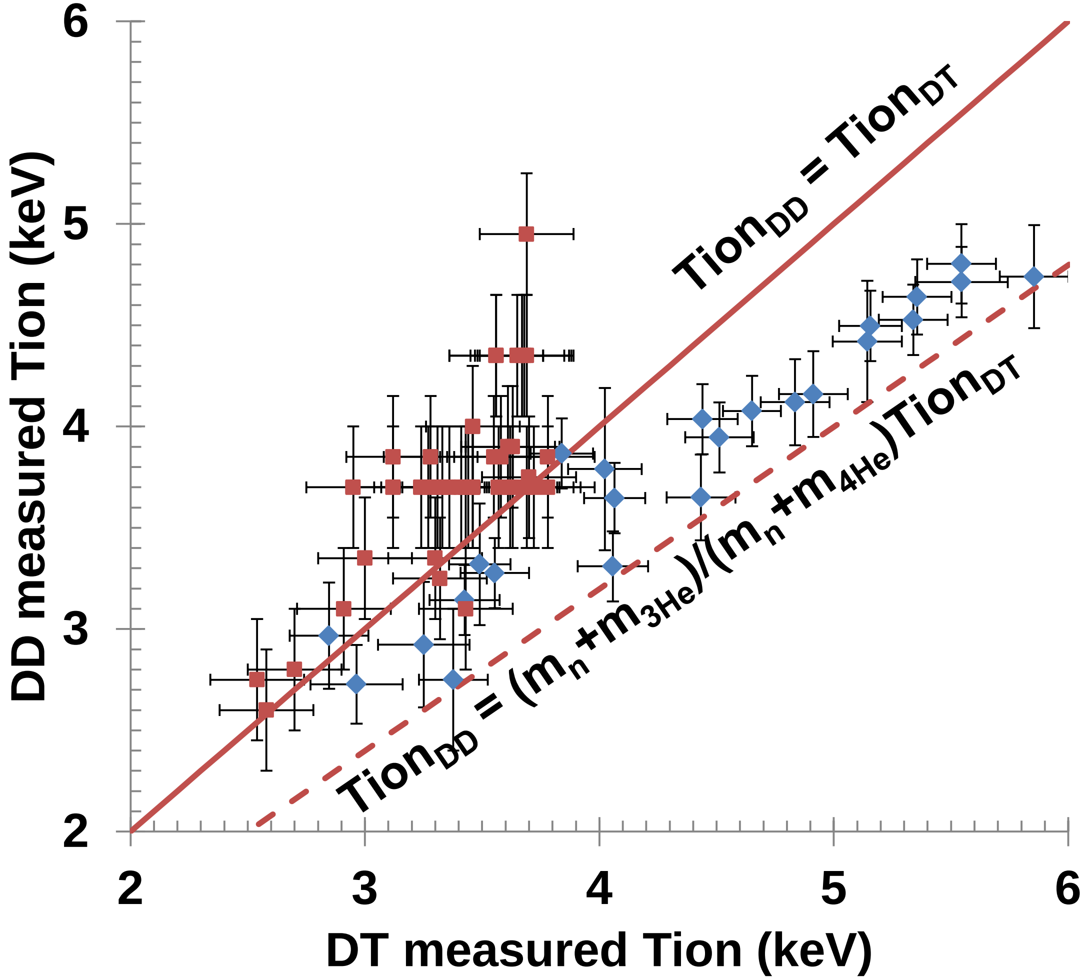
NIF ρr ~ 4x OMEGA ρr; Significant ablator remaining in NIF implosions

Detector averaged T_{ion} can be used to study the differences between DD data and DT data



Coline-of-sight DD and DT T_{ion} measurement Summer 2016

OMEGA T_{ion} DD versus T_{ion} DT data are very different than the NIF data



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