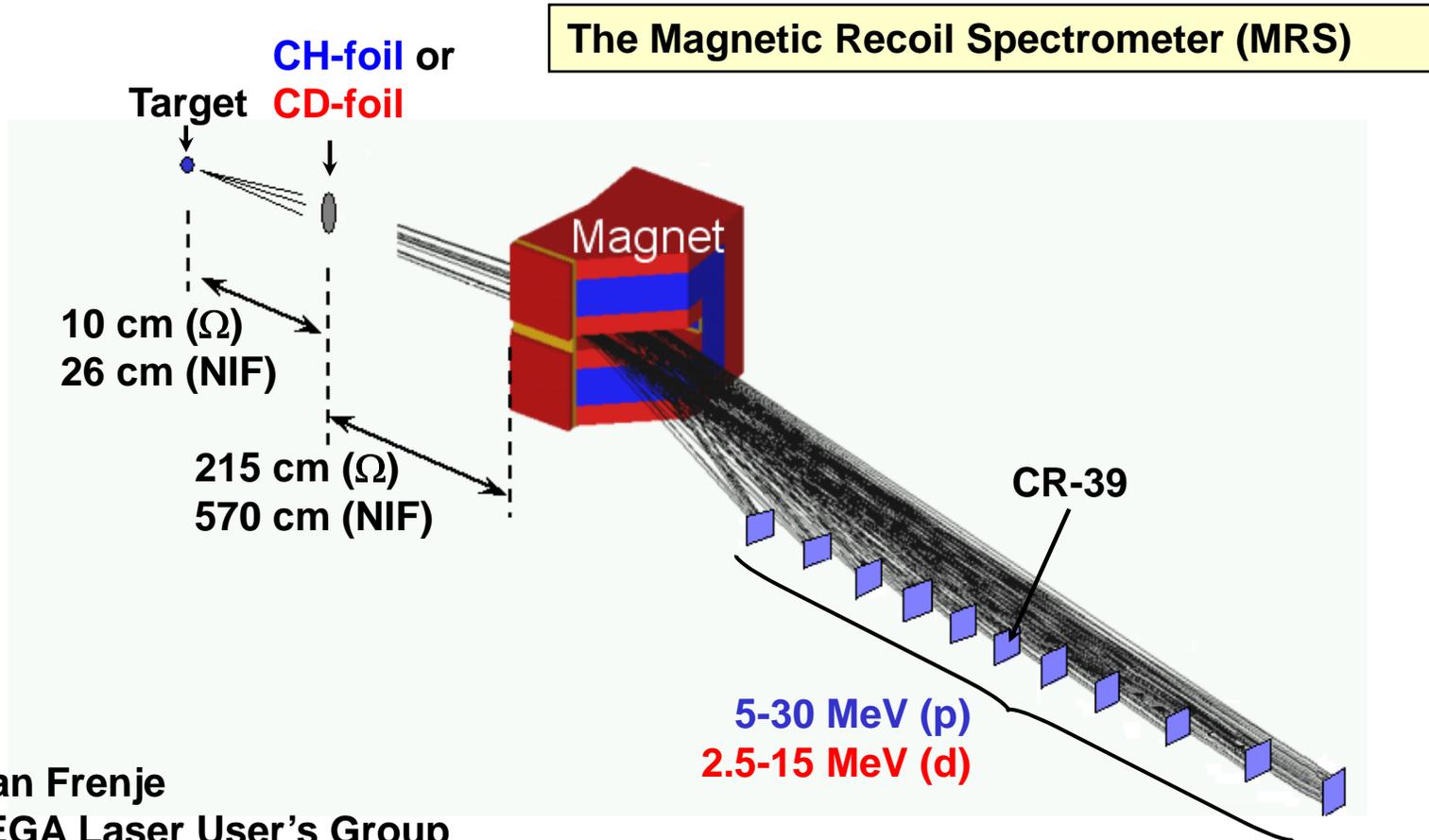


High-resolution neutron spectrometry at OMEGA and the NIF



Johan Frenje
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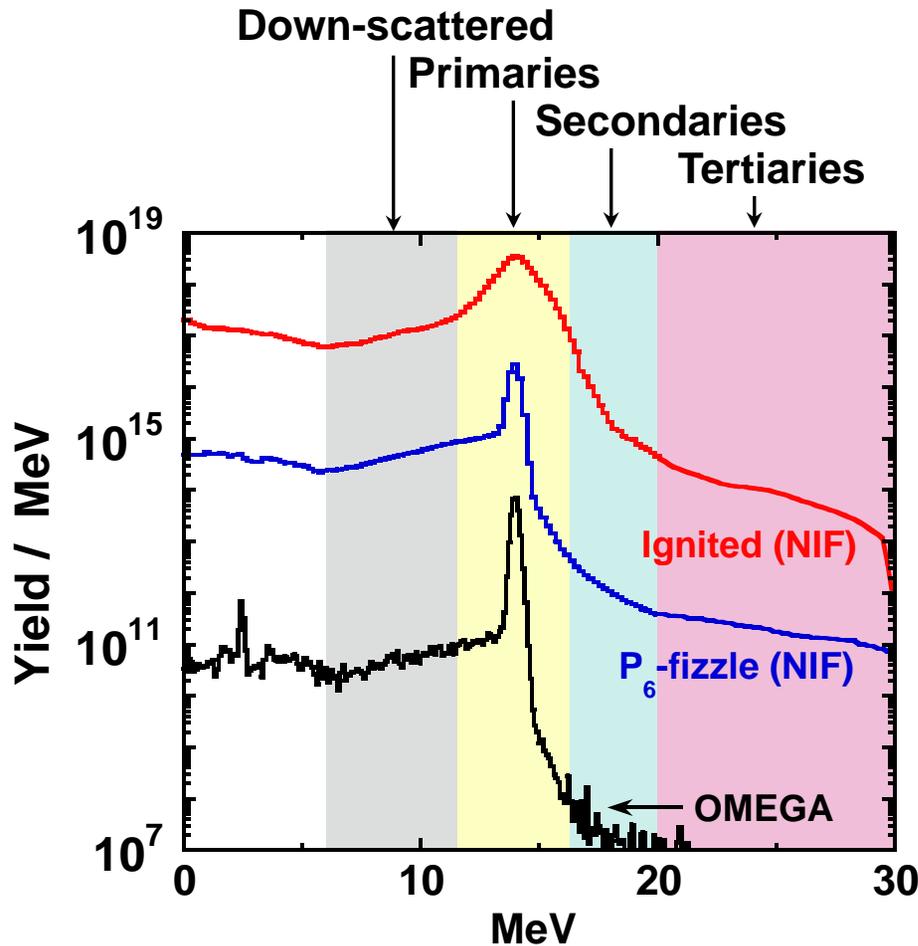
Summary

The first measurements of the down-scattered neutron spectrum have been performed with the MRS at OMEGA

- From the measured down-scattered neutron spectrum a ρR has been inferred for cryo-DT and warm-capsule implosions.
- The ρR values inferred from the down-scattered neutron data are consistent with ρR data obtained using other diagnostic techniques.
- We are currently developing another MRS on the NIF.
- The OMEGA data and simulations indicate that the MRS will accurately diagnose THD and DT implosions at the NIF.

Motivation for the MRS at OMEGA and the NIF

To provide information about ρR , T_i , T_e and Y_{1n} , which will be integral for assessing failure modes



From down-scattered (Y_{ds}):

- ρR ($\frac{Y_{ds}}{Y_{1n}} \propto \rho R$)

From primaries (Y_{1n}):

- Y_{1n}
- T_i ($T_i \propto \Delta E_D^2$)

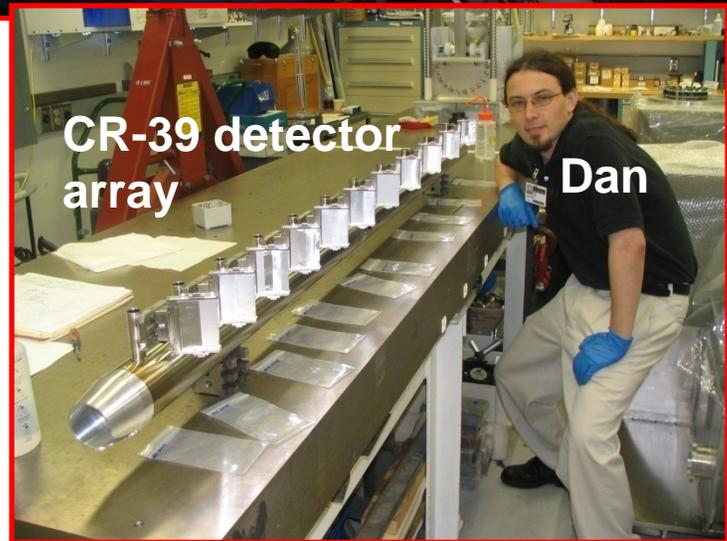
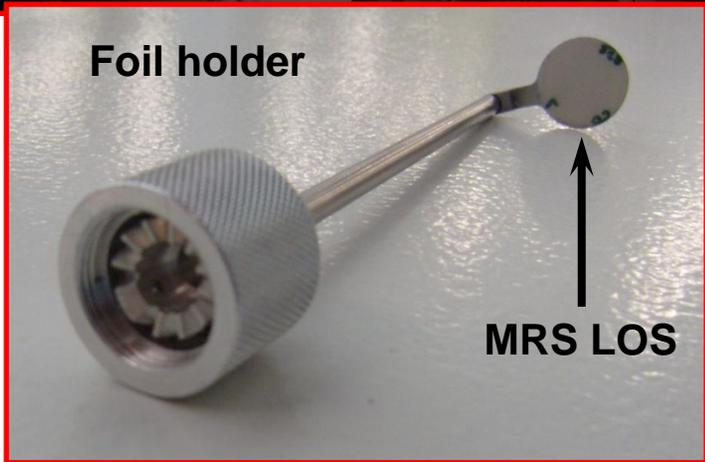
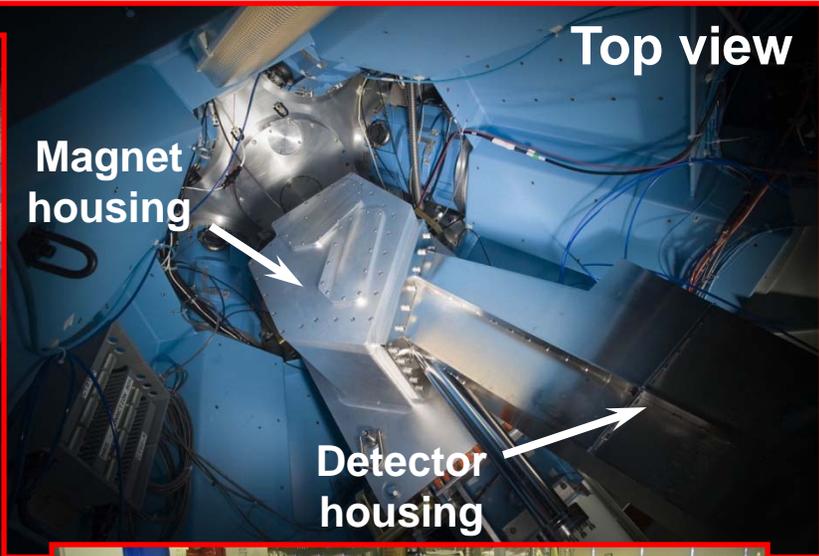
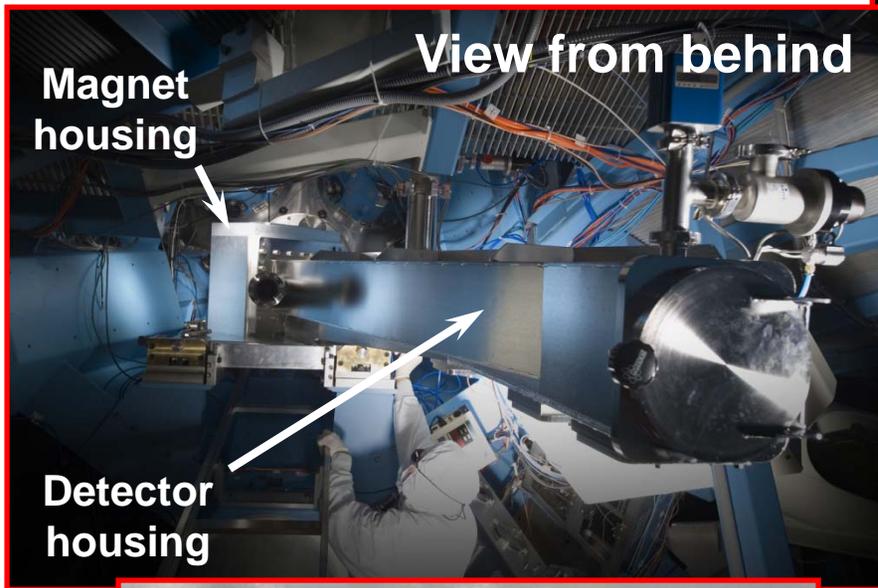
From Secondaries (Y_{2n}):

- T_e ($\frac{Y_{2n}}{Y_{1n}} \propto T_e^3$)

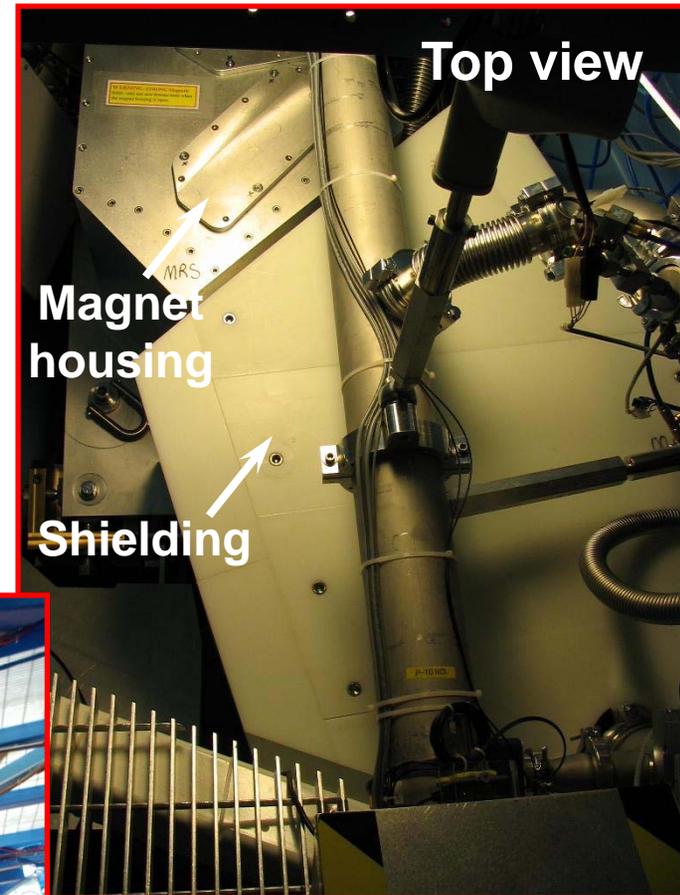
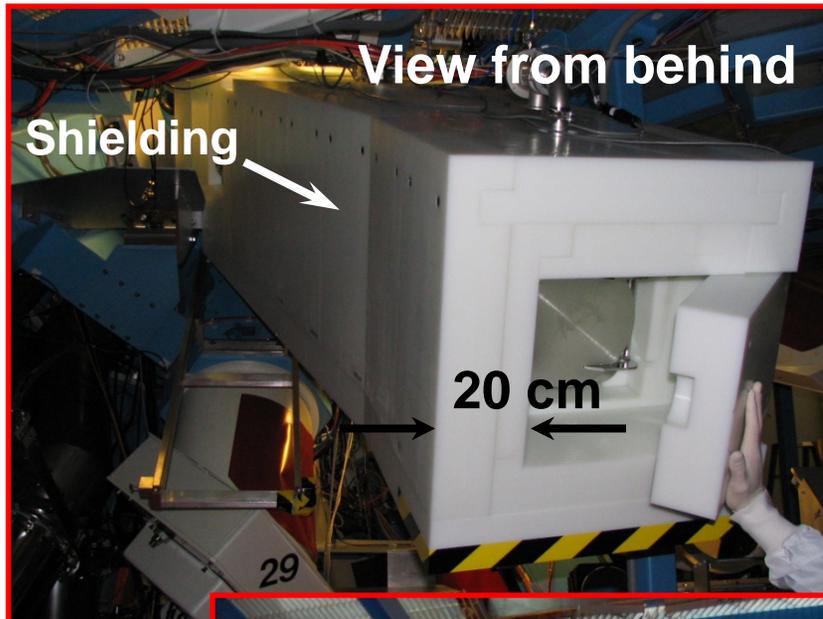
From Tertiaries (Y_{3n}):

- ρR ($\frac{Y_{3n}}{Y_{1n}} \propto \rho R$)

The 1st phase of the MRS installation on OMEGA was complete in late 2007

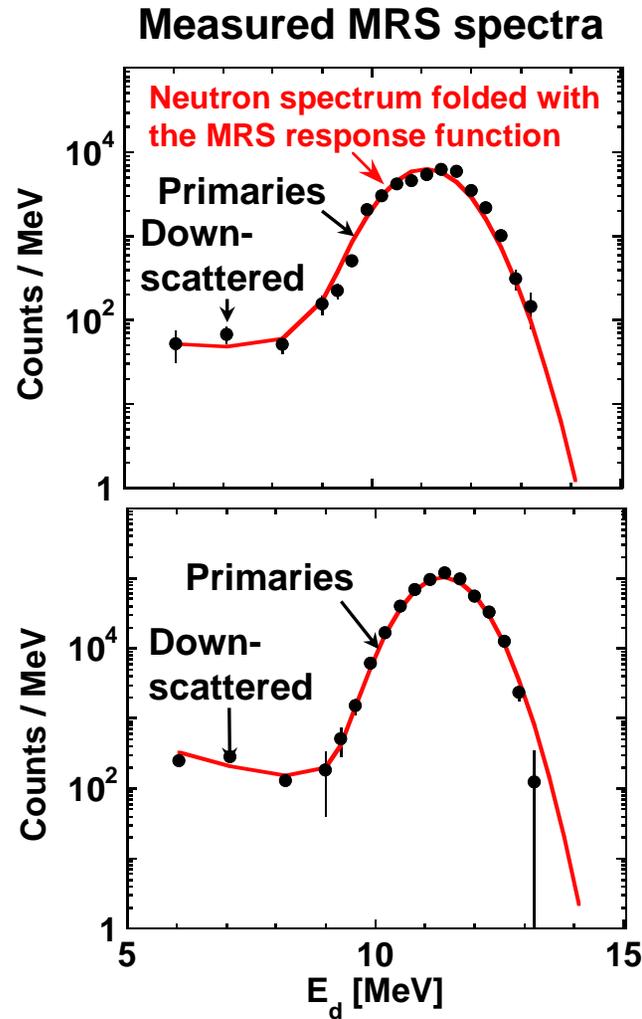


Polyethylene shielding was installed in spring 2008 for the down scattered neutron measurements

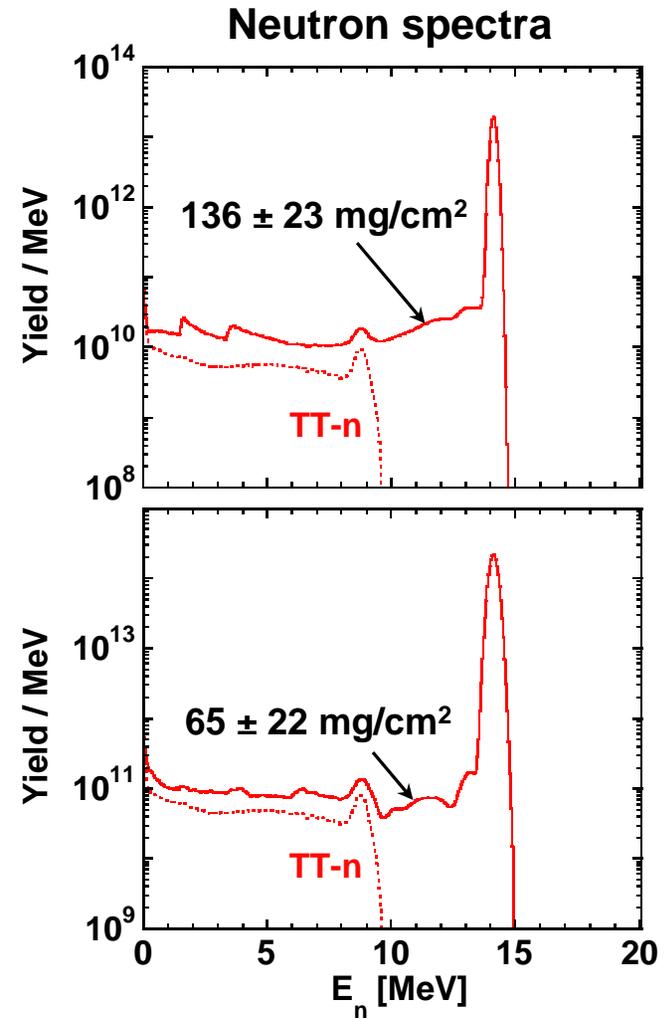


The first down scattered neutron measurements were performed with the MRS in late 2008

Shot 53066
DT Cryo
 $Y_{1n} = 5.8 \times 10^{12}$

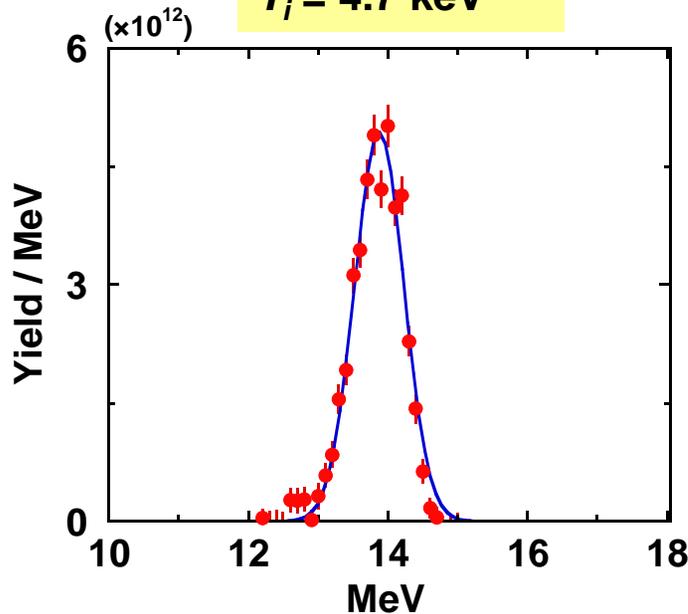


Shots 51316-20
DT(15)CH[15]
 $Y_{1n} = 9.5 \times 10^{13}$

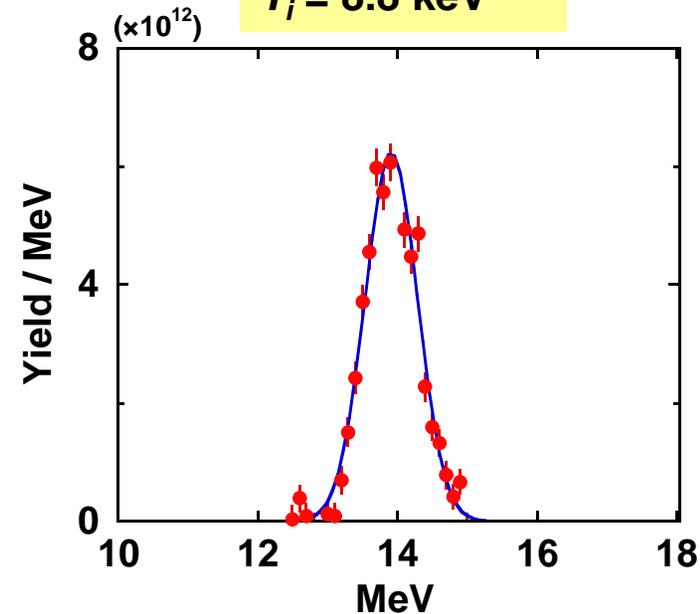


High-resolution measurements of the primary-neutron spectrum have been performed with the MRS

Shots 53593-4
DT(15)CH[15]
 $Y_{1n} = 4.3 \times 10^{13}$
 $T_i = 4.7$ keV

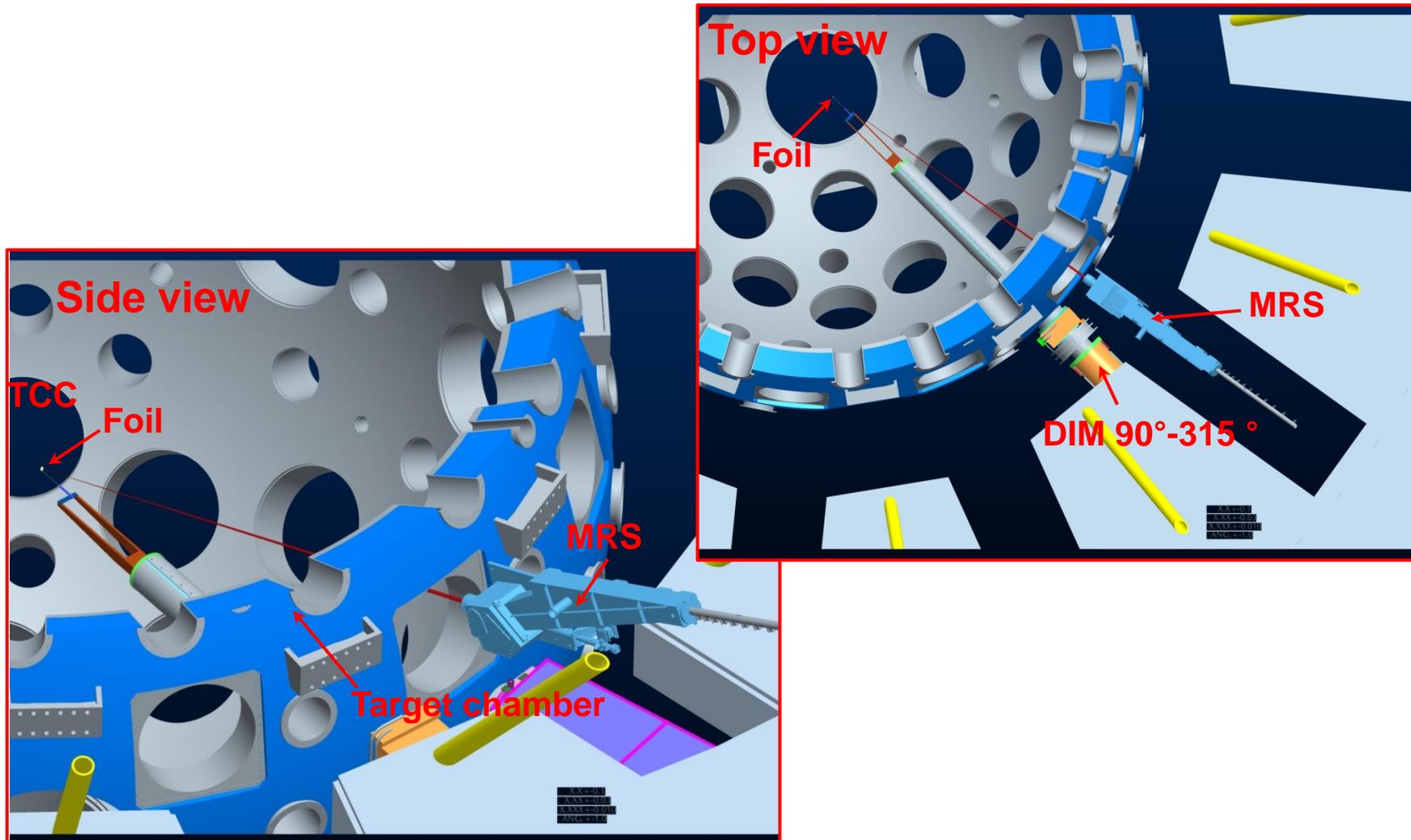


Shot 53595
DT(10)SiO₂[5]
 $Y_{1n} = 5.6 \times 10^{13}$
 $T_i = 8.8$ keV

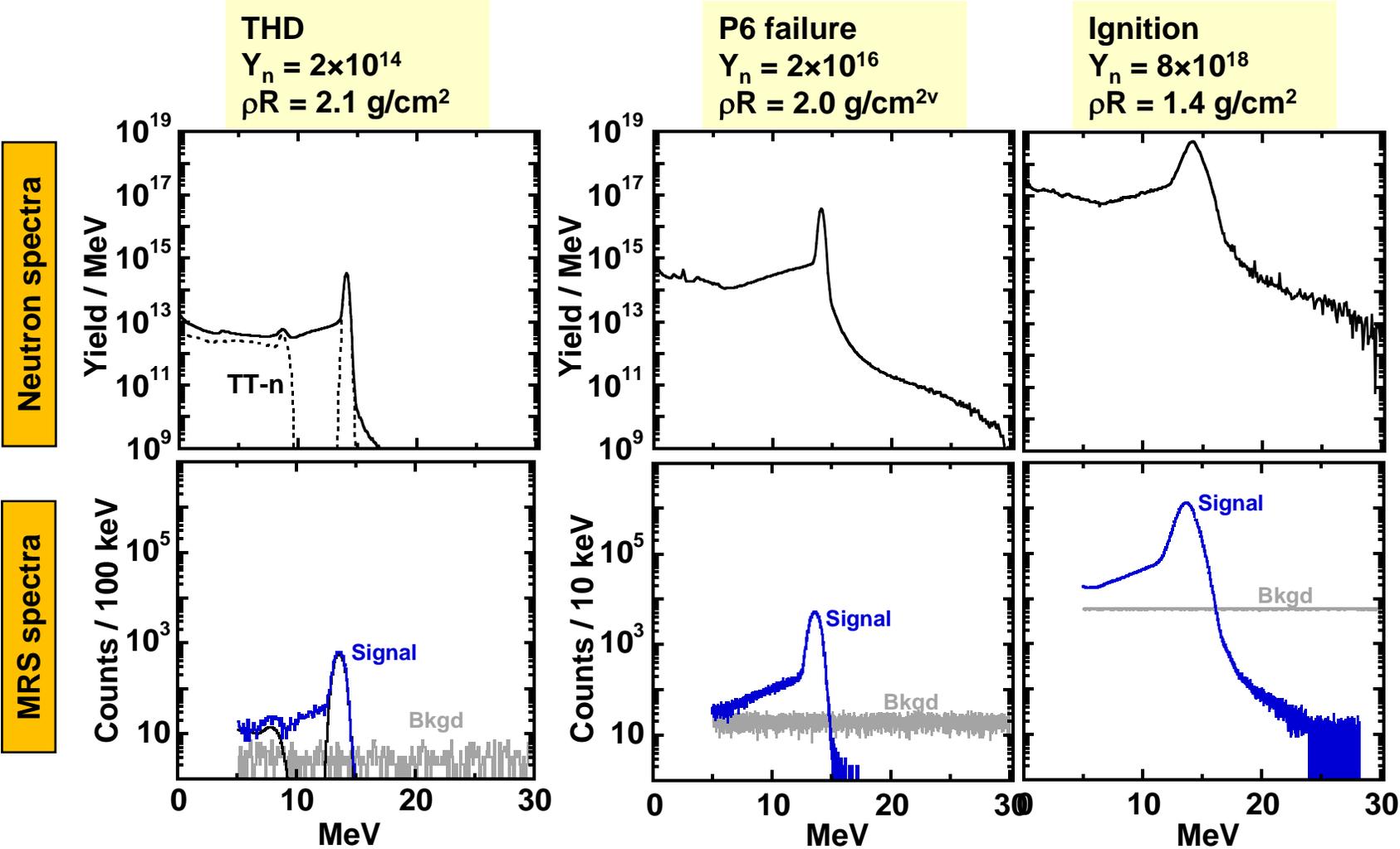


Preliminary analysis indicates that the width of the spectra provides a T_i consistent with the nTOF-determined value

An MRS is currently being developed on the NIF for diagnosing THD and DT implosions



OMEGA data and simulations indicate that the MRS will accurately diagnose THD and DT implosions at the NIF



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