Status of Preparation for Deuteron Database Run

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JEDI Collaboration meeting
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Goal: Provide a set of deuteron beam cross section and analyzing power angular distributions suitable for modeling various designs for an EDM polarimeter

Increase efficiency from 7×10^{-4} to 10^{-2}.
Explore higher energies and possible larger figure of merit (up to 270 MeV).
Explore sensitivity to tensor polarization (systematic errors? polarization monitor?
(This needs to replace EDDA as the working polarimeter for precursor
- new scheme with LYSO crystals and/or use of WASA Forward Detector.)

Learn how to make cuts to eliminate breakup background.
(Possibly remove breakup with absorbers.)

Plan:

Use WASA Forward Detector (keeping electronics, but with new FPGA trigger).

Work on sensitivity to tensor polarization at the Low Energy Polarimeter.

Beam Request: Two weeks of vector and tensor polarized deuteron beam.
WASA Forward Detector with new target box and targets.
Four running energies: 270*, 230, 200*, and 170 MeV

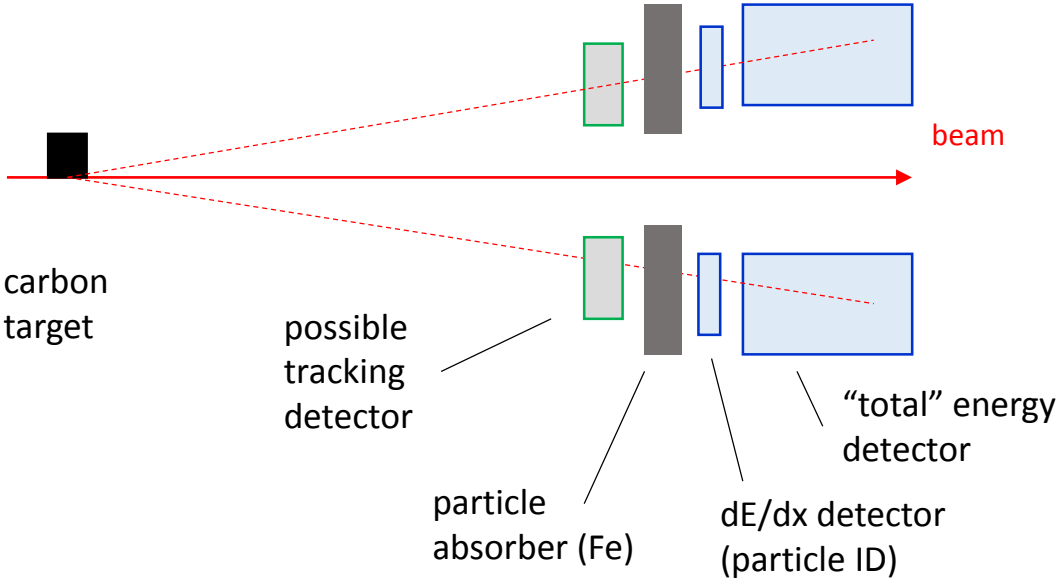
Polarimeter concepts

Thick carbon block target

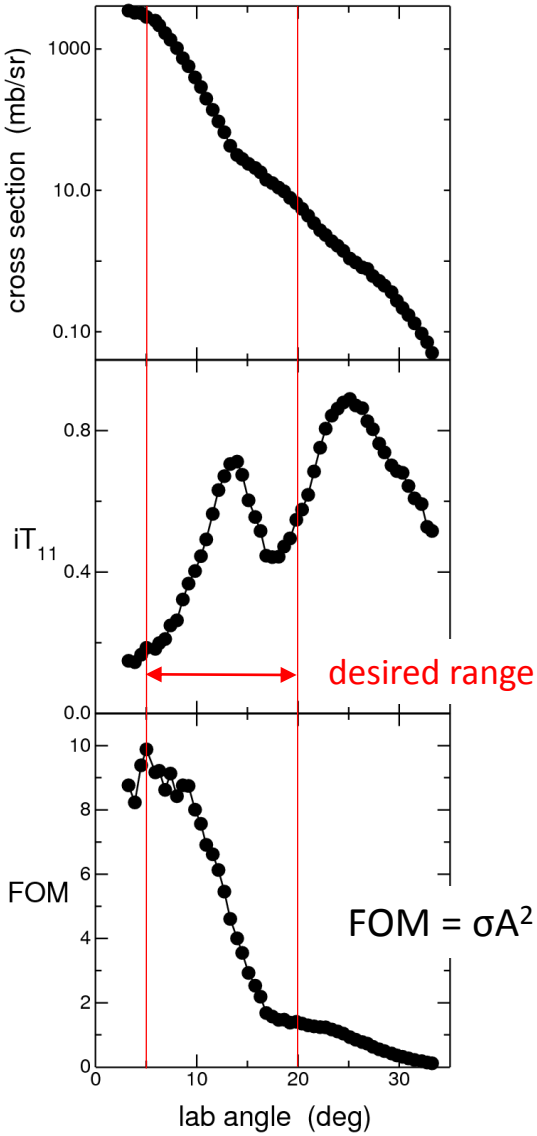
"extract" using ramping, white noise, or another target

Polarimeter features might include:
(whether WASA Forward Detector or new construction)

full azimuthal coverage



d+C elastic, 270 MeV



Y. Satou, PL B **549**, 307 (2002)

Polarimeter concepts

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Polarim
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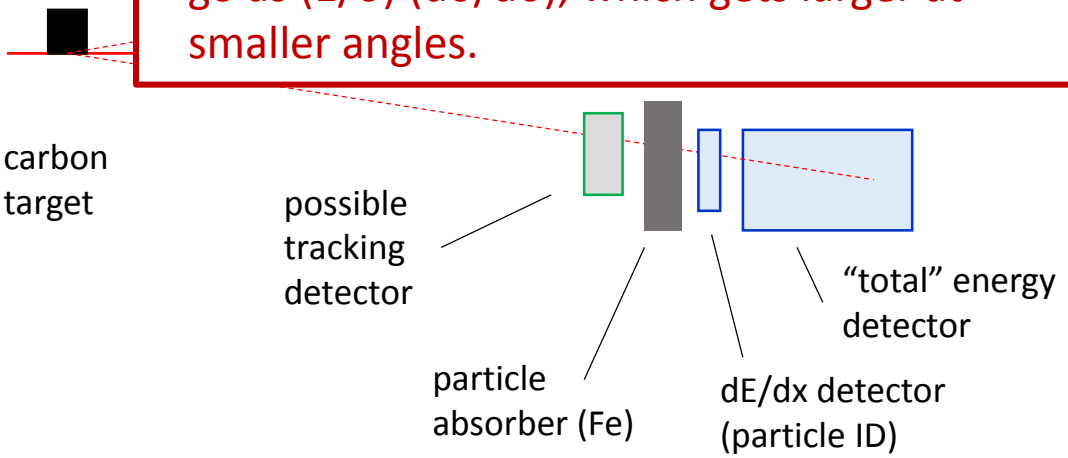
Present EDDA operating range ~ 9° - 13°.
To what extent can we profit from extending the range down to ~ 4° - 5°?
Analyzing power will be smaller.
Systematic errors from geometric factors go as (1/σ) (dσ/dθ), which gets larger at smaller angles.



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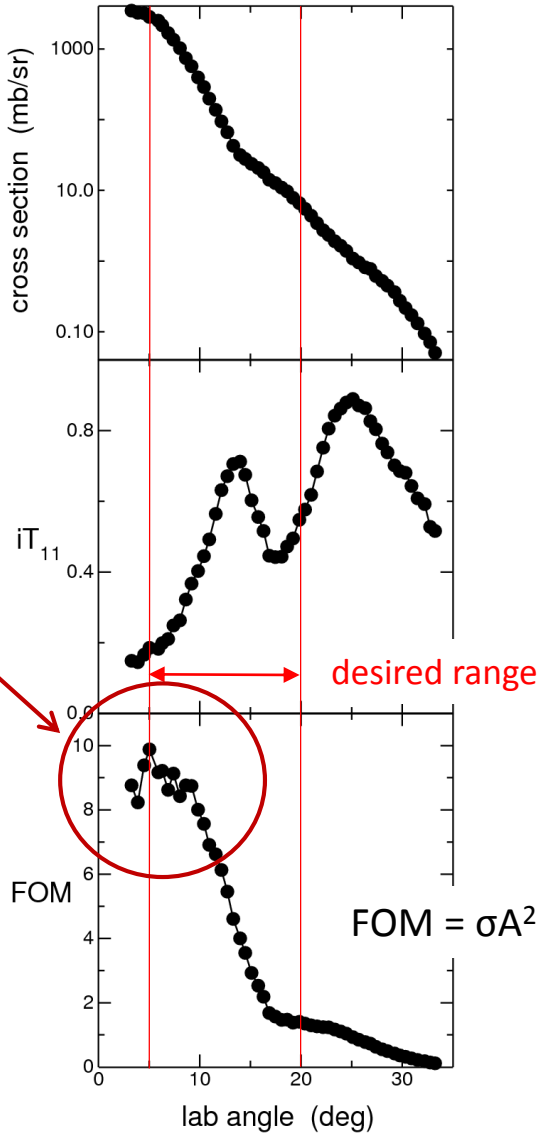

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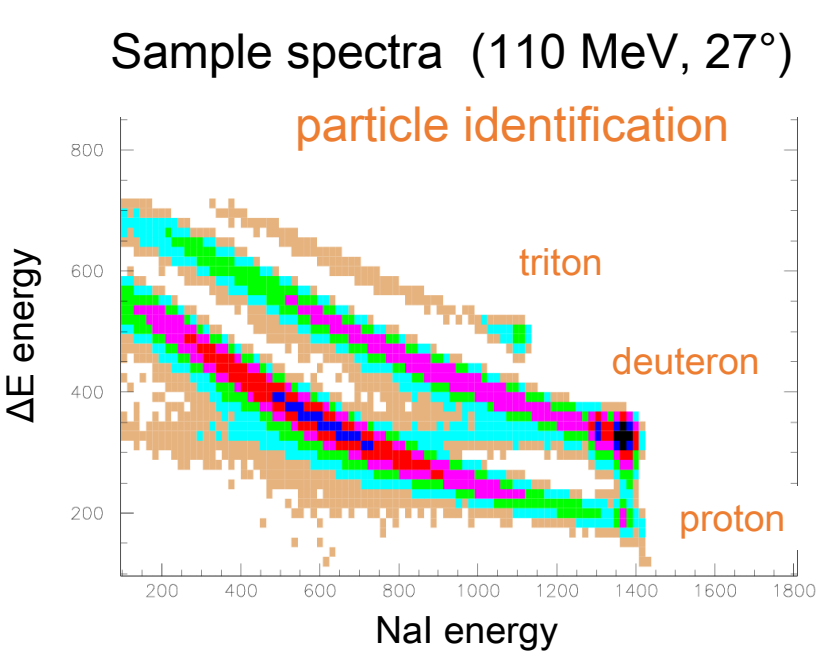
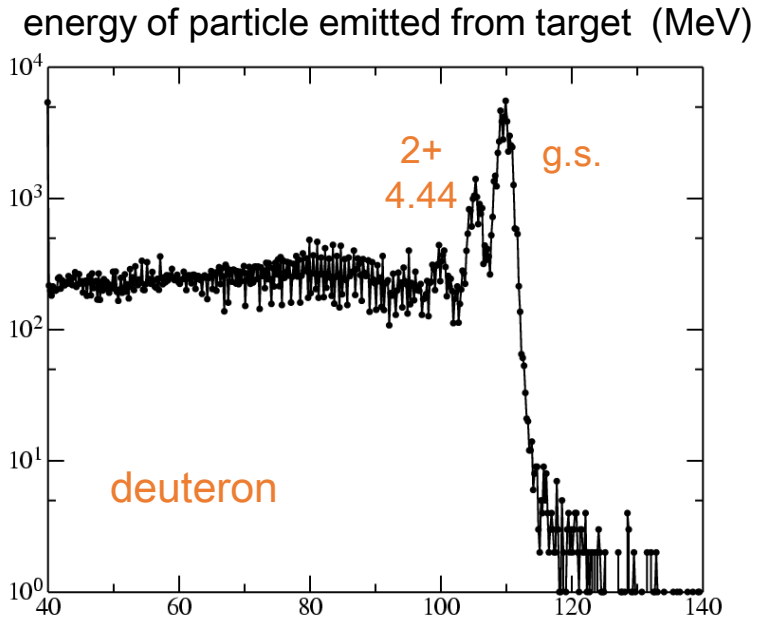
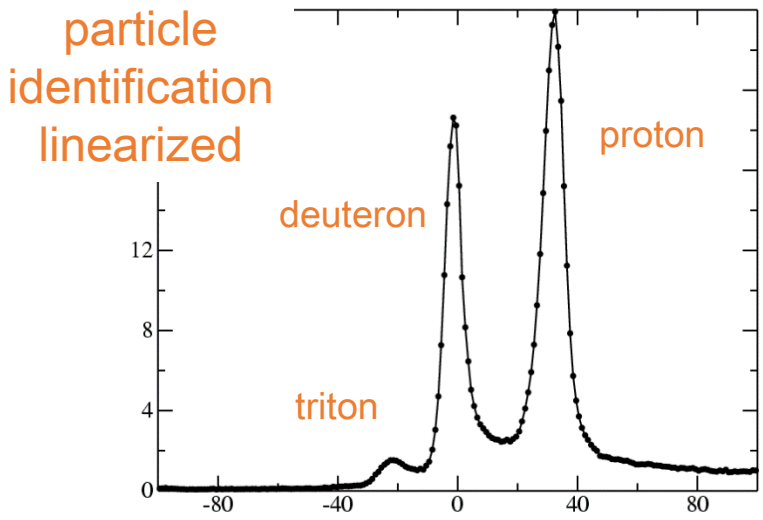
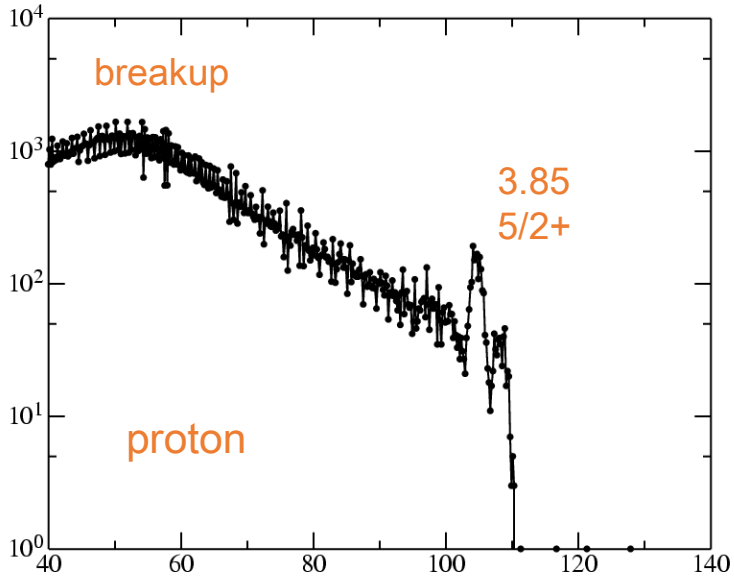
What would we include in a polarimeter signal?









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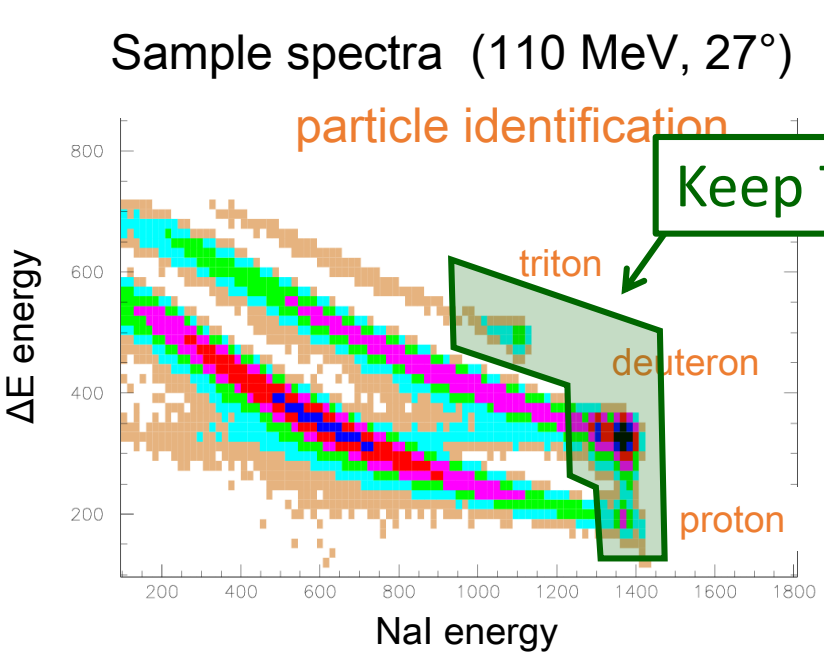

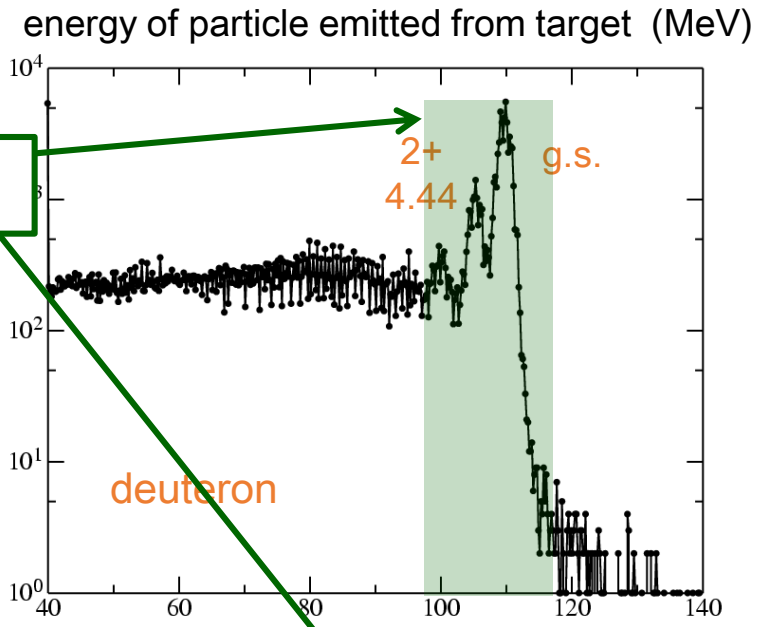

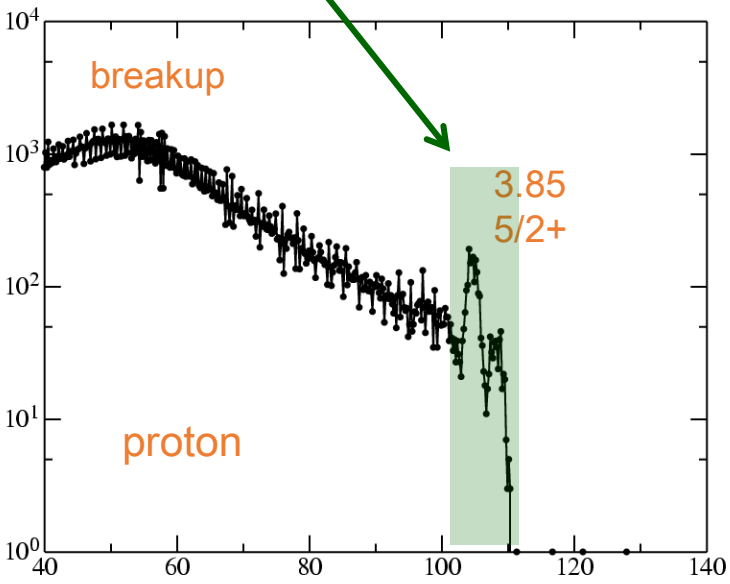

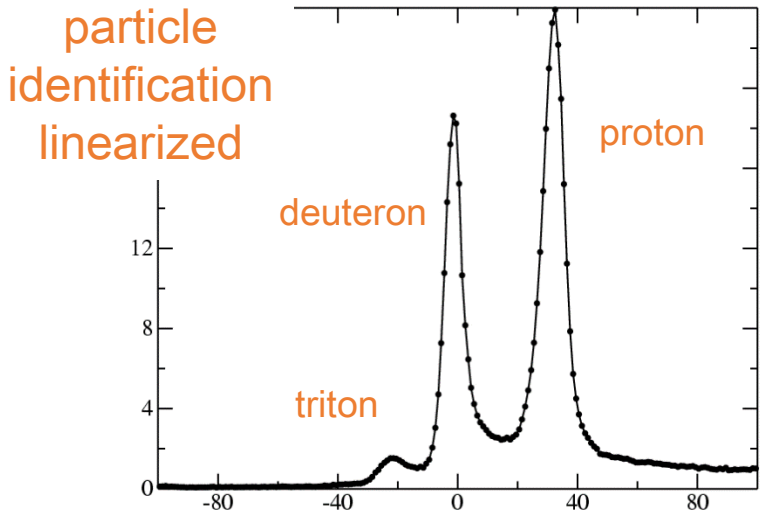

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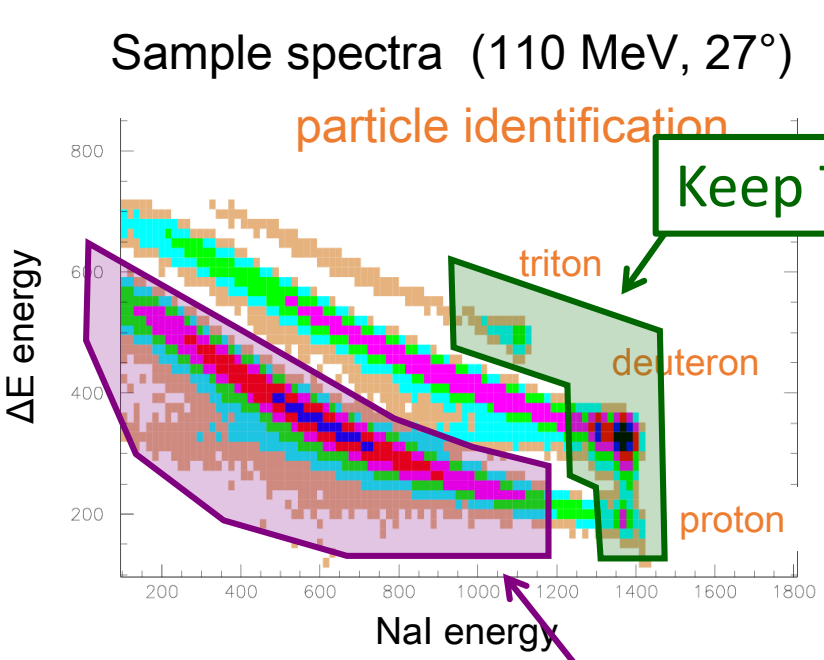
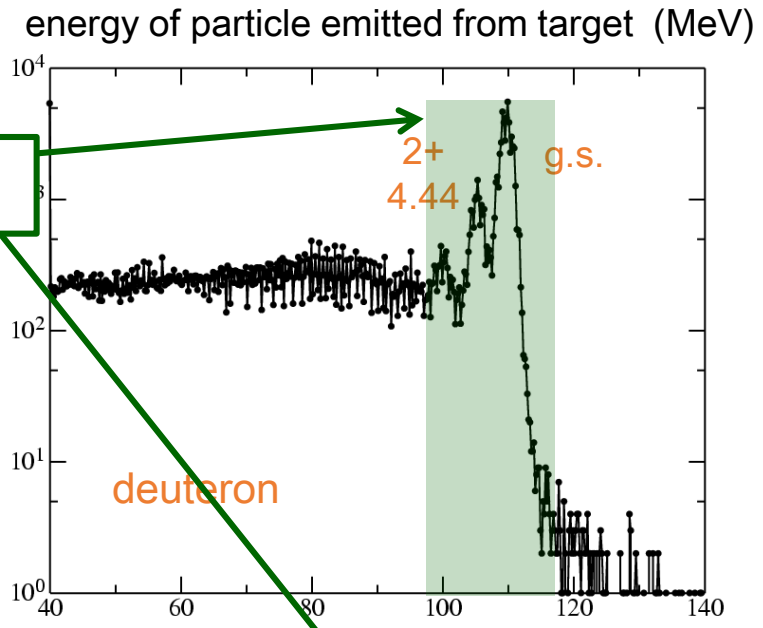
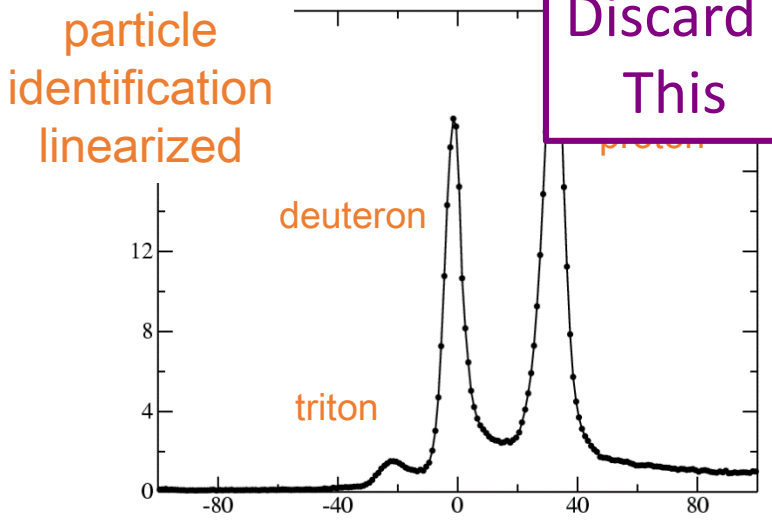
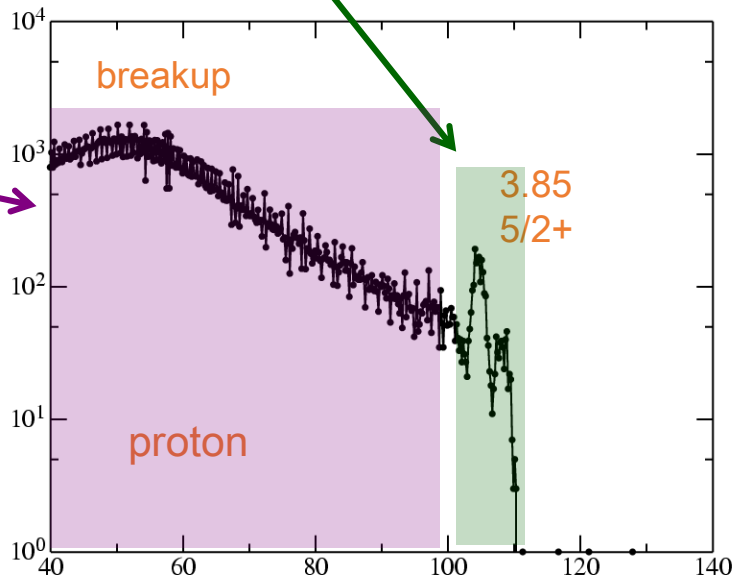


Keep This



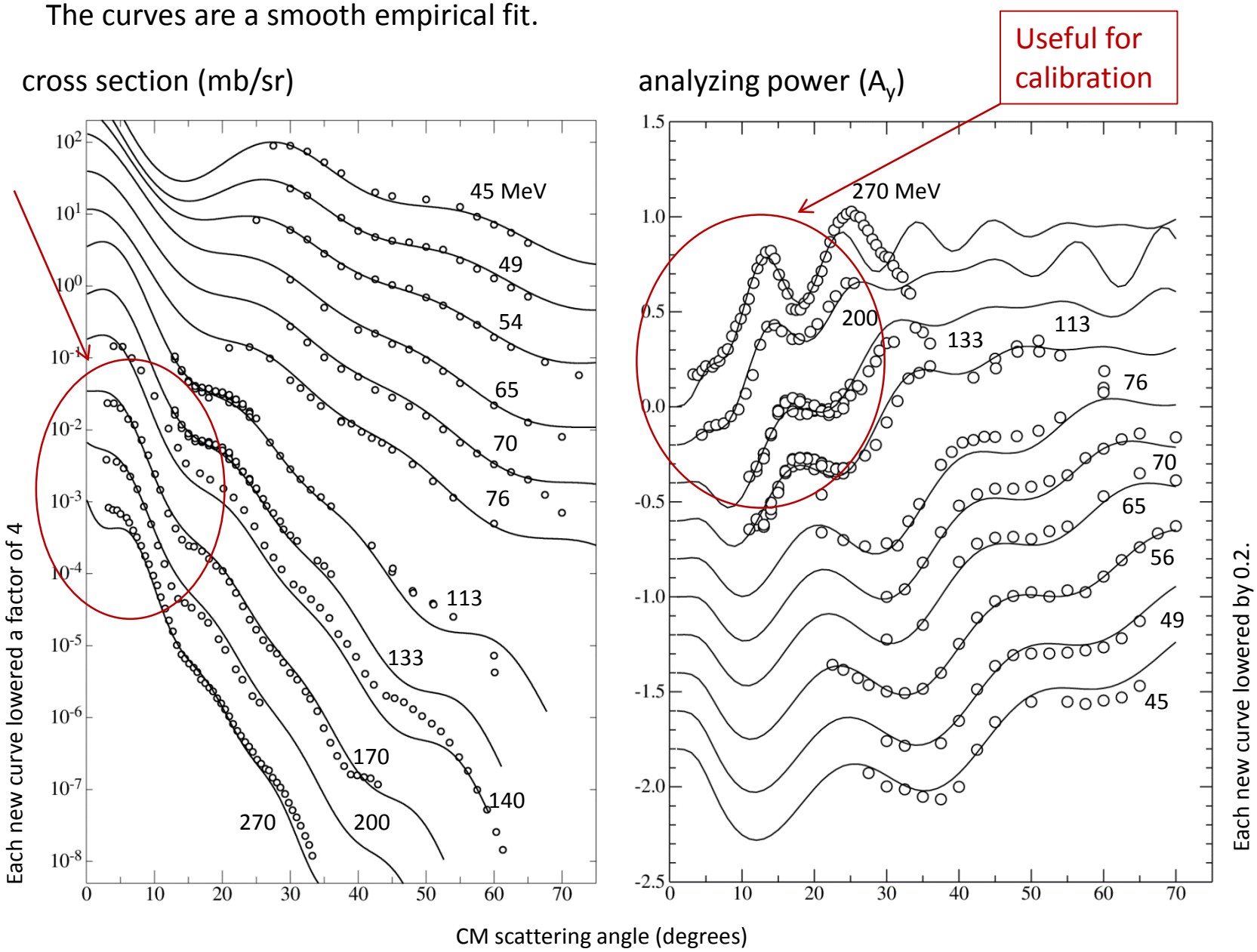
Discard This



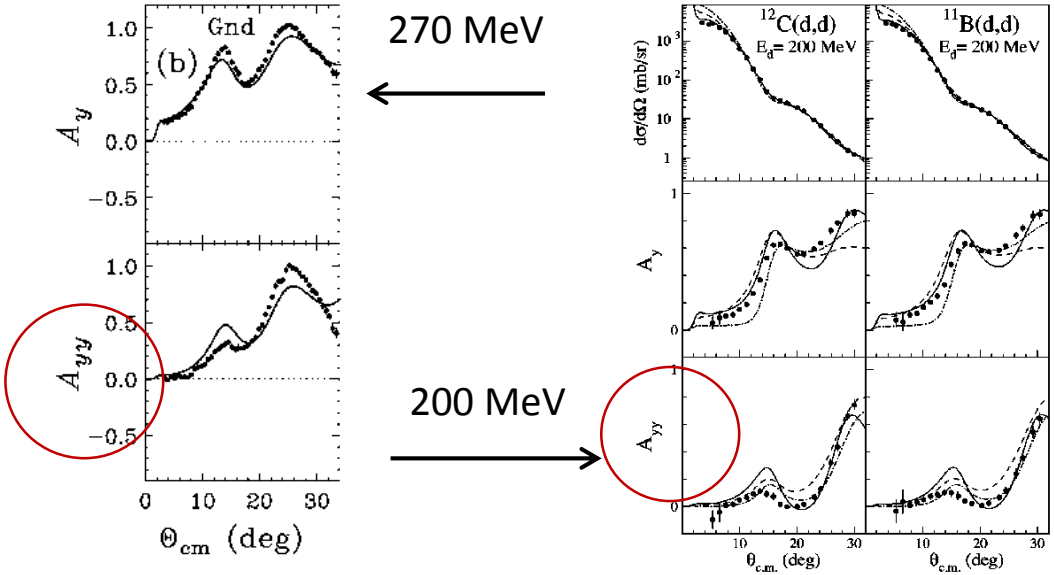


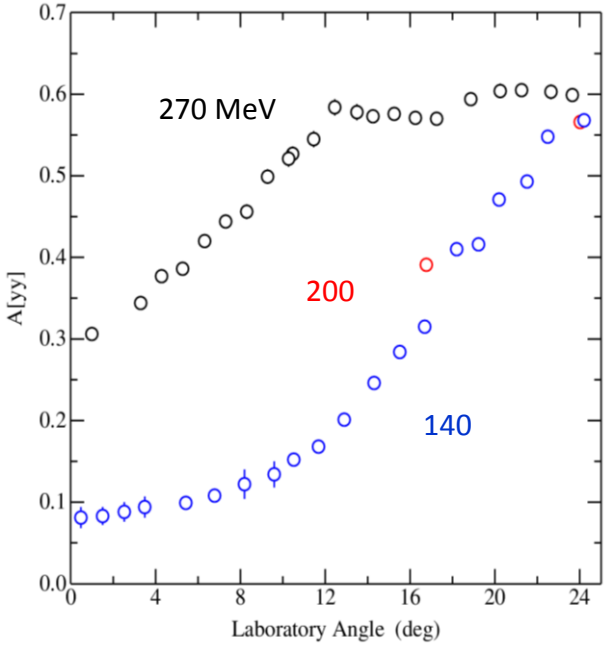
We have some elastic scattering data available (but not much else):

The curves are a smooth empirical fit.



Tensor analyzing powers are also available.



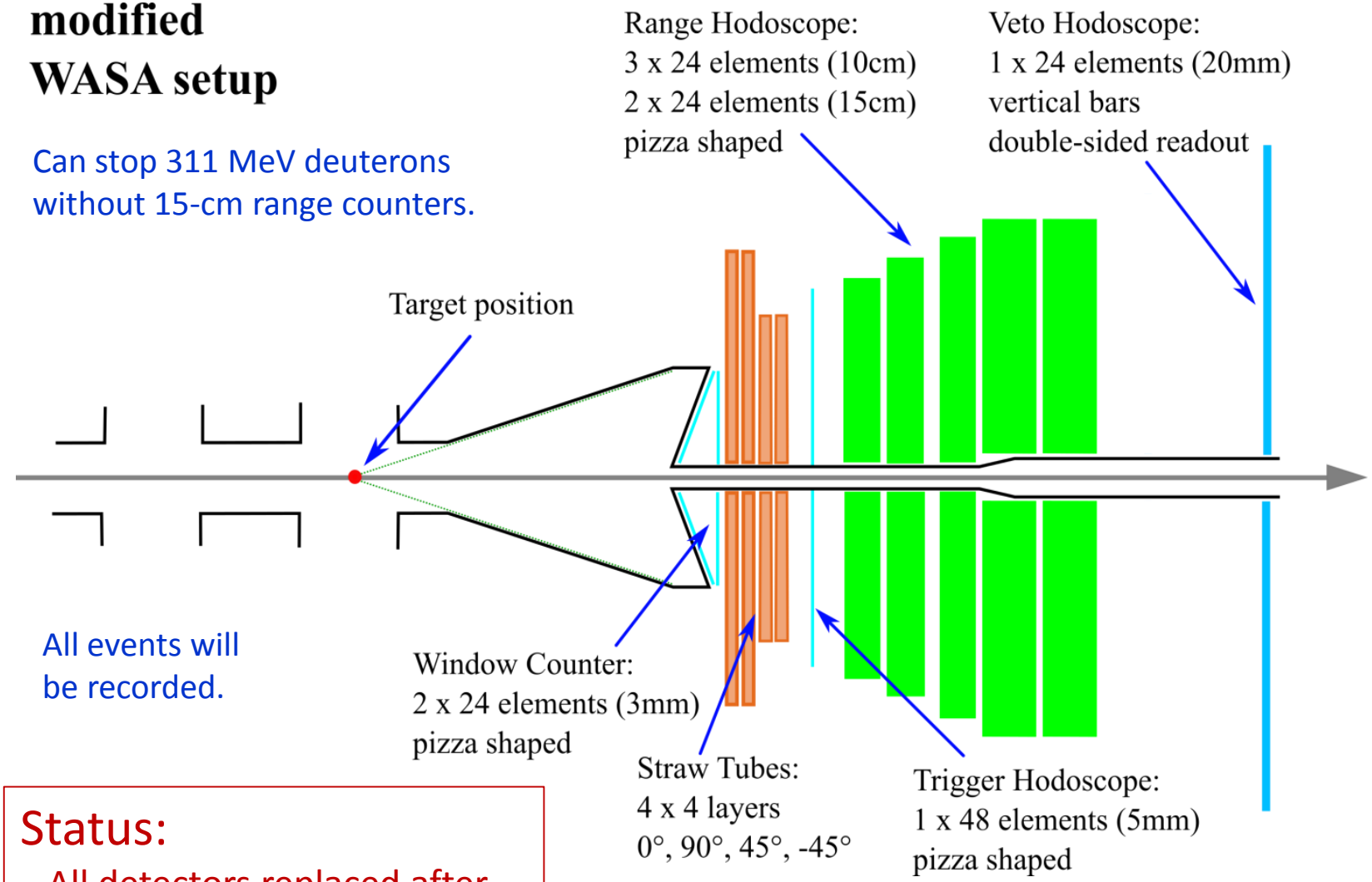


The forward-going proton from d+p elastic scattering (CH_2 target) also provides some known values for A_{yy}.

The plan is to use the Forward Detector from WASA

modified WASA setup

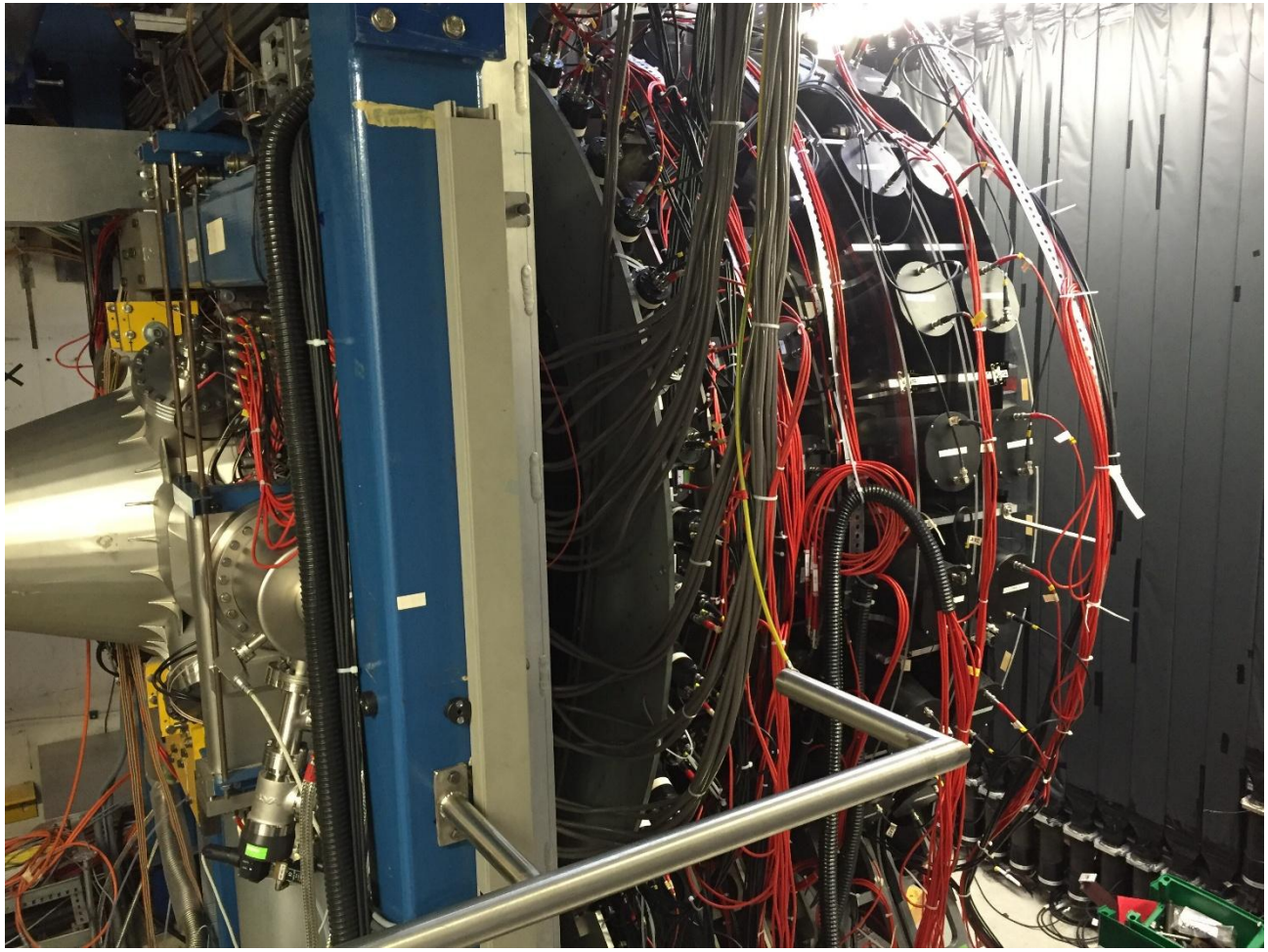
Can stop 311 MeV deuterons without 15-cm range counters.



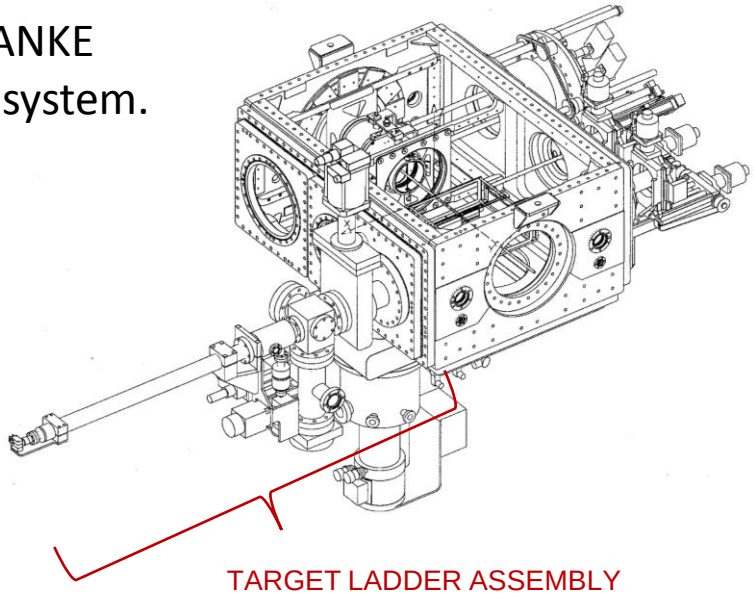
Status:

All detectors replaced after removal of WASA ball detector.

Status of the detector after working on it this summer

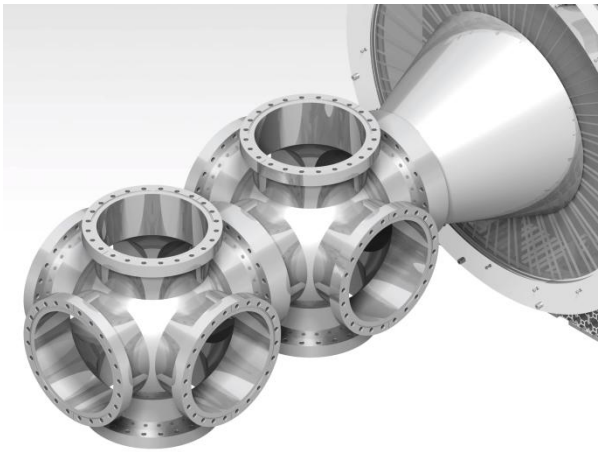


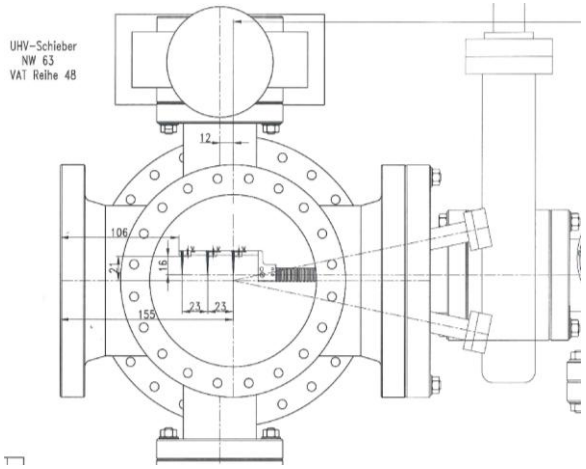
From ANKE
target system.



TARGET LADDER ASSEMBLY

New target box





BEAM LINE VIEW OF CONICAL TARGETS

Needle targets
(C, CH_2, etc.)
available

2 d+p elastic scattering, coincident particle detection

This may be done with the same angle for d and p on either side of the beam, or with differences of 10° or 20°.

Kinematics:

angle difference	0°	10°	20°	
proton angle	30.01°	38.56°	45.90°	
deuteron angle	30.01°	28.56°	25.90°	
proton energy	50.33	40.85	32.21	MeV
deuteron energy	25.67	35.16	43.79	MeV
CM angle	119.11°	101.91°	87.22°	

Glockle data

markers for angles 20°, 10°, 0°

Average these two energies.