

Design and Testing of YAP:Ce Array for DAPPER

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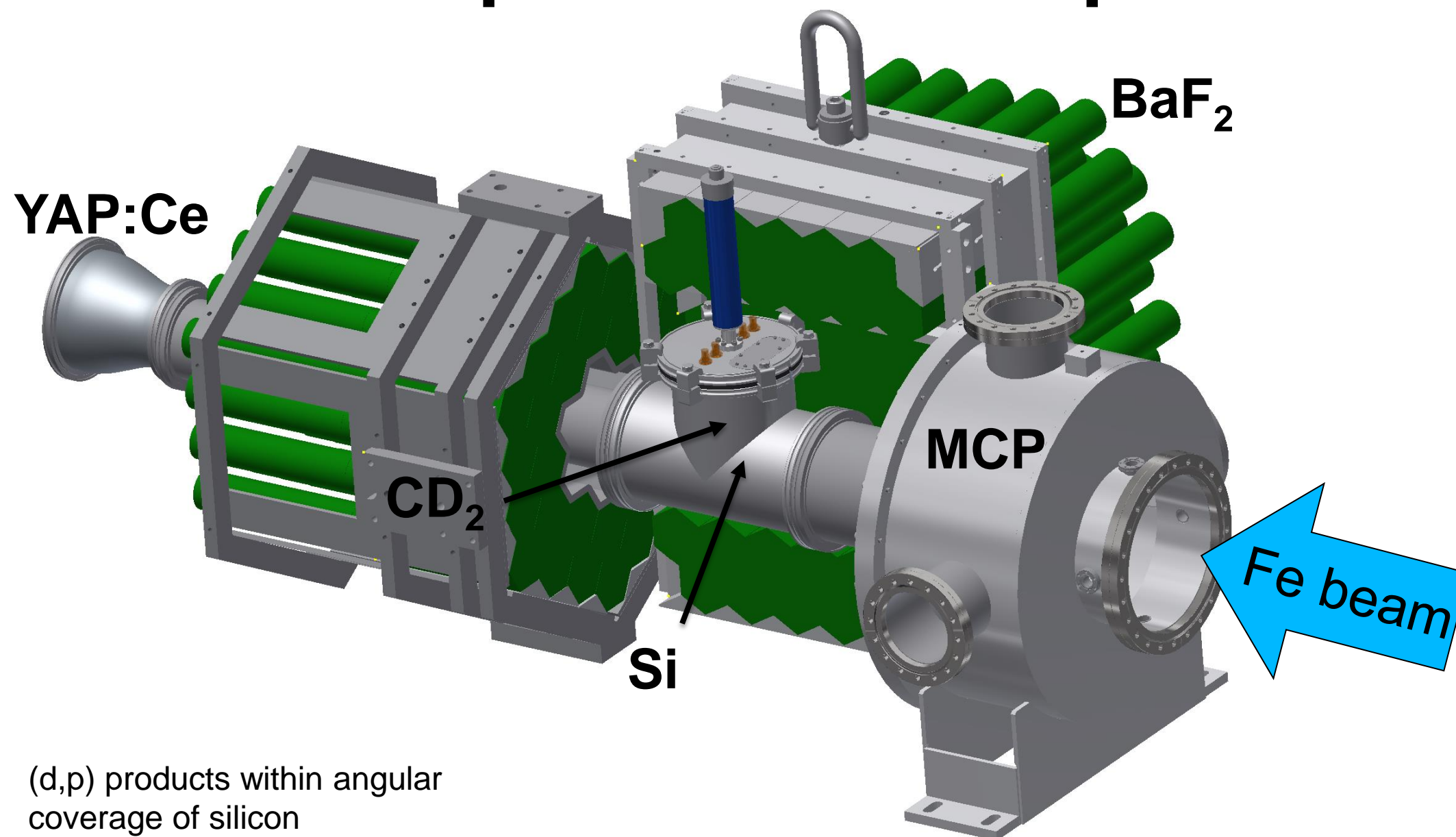
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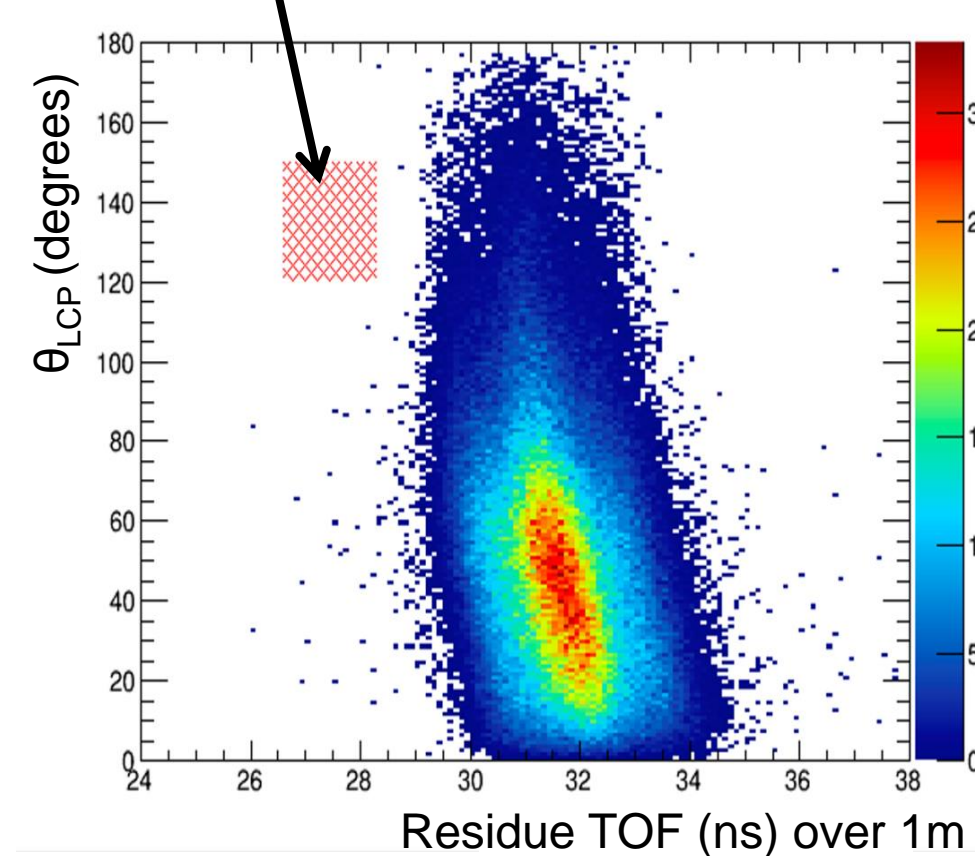
Introduction

- Spectral lines for ^{60}Fe have been detected in space [1], on the moon [2], and in the Earth's oceans [3].
- Important isotope in nucleosynthesis; branch point in the s-process
- DAPPER constructed to measure gamma ray strength functions; first with $^{57}\text{Fe}(d,p\gamma)^{58}\text{Fe}$
- YAP array as part of DAPPER will give TOF measurement and record beam rate

Experimental Setup



(d,p) products within angular coverage of silicon

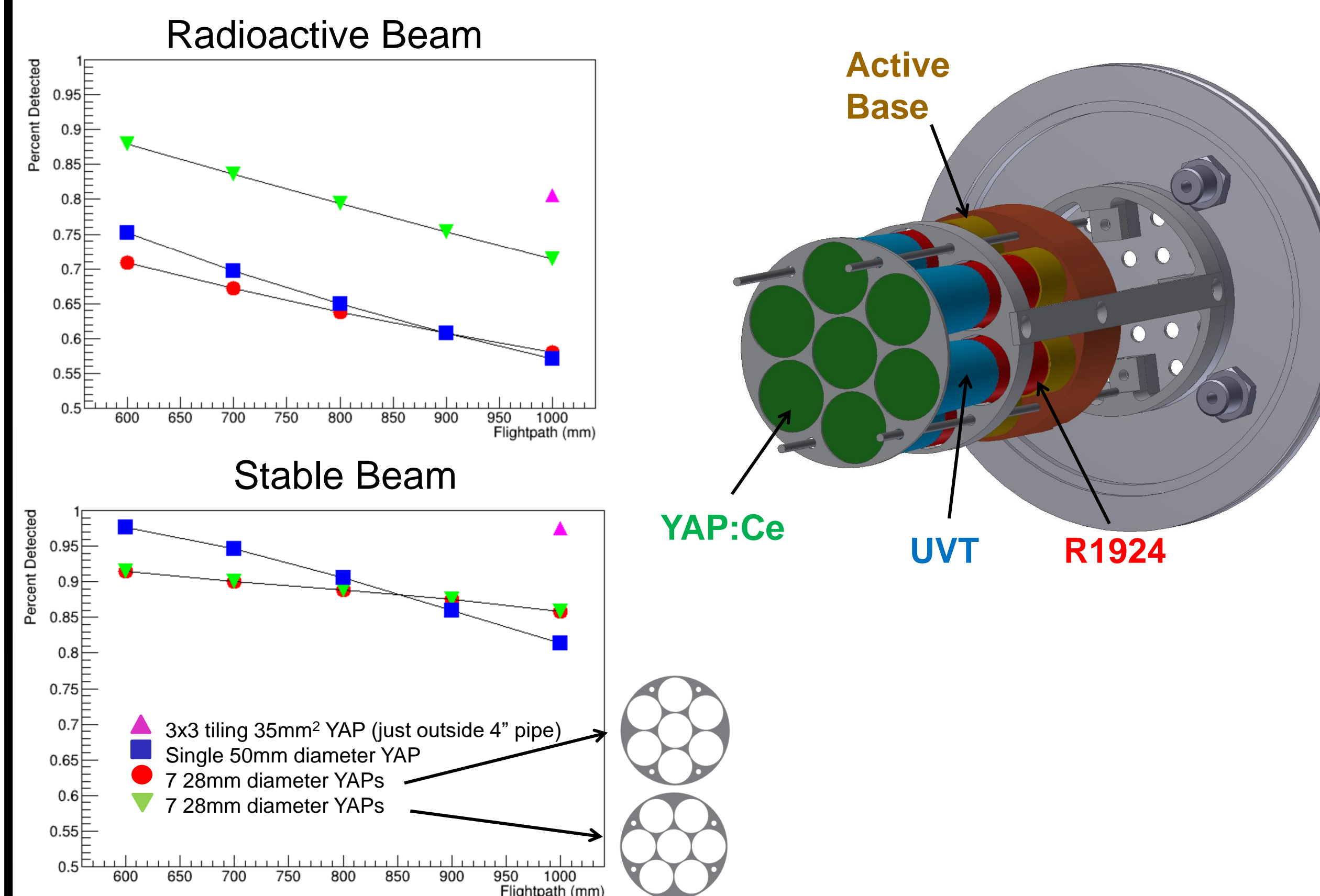


CAD drawing of final experimental setup

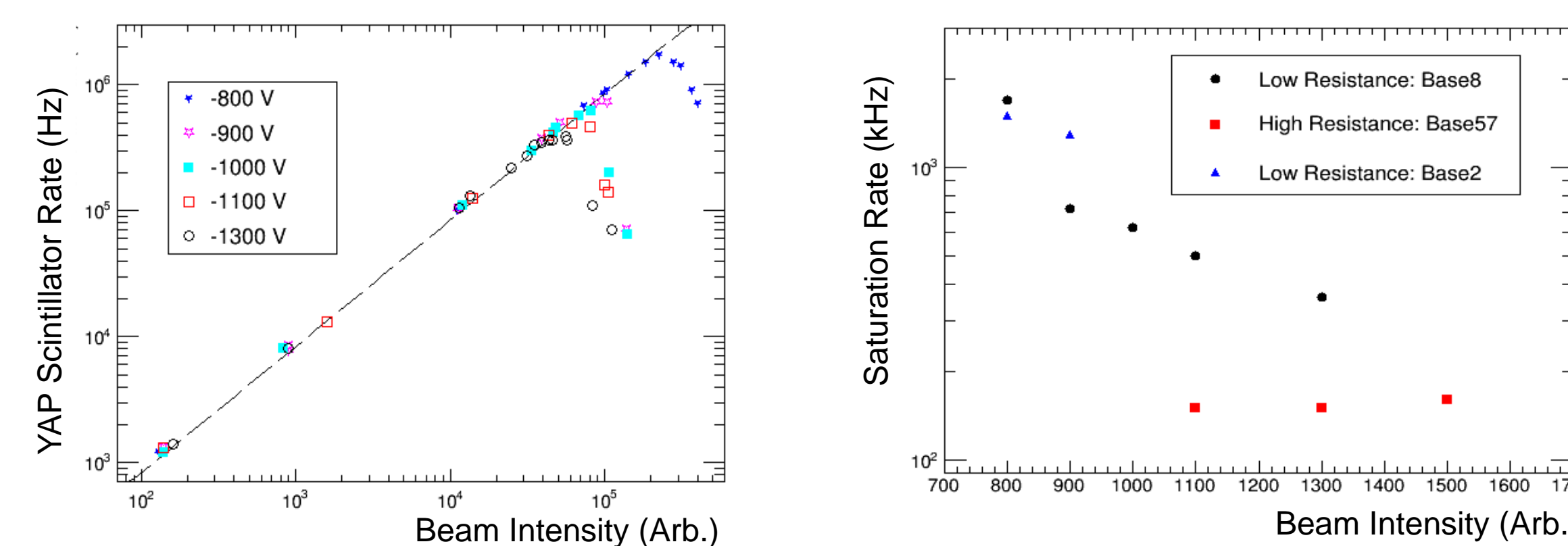
- Coincidence of Silicon/MCP and YAP give TOF
- Silicon rings give angular resolution
- BaF_2 packs for gamma ray detection

Simulation indicating time separation between carbon fusion product and (d,p) reaction product at angles of emitted LCPs.

Geometry

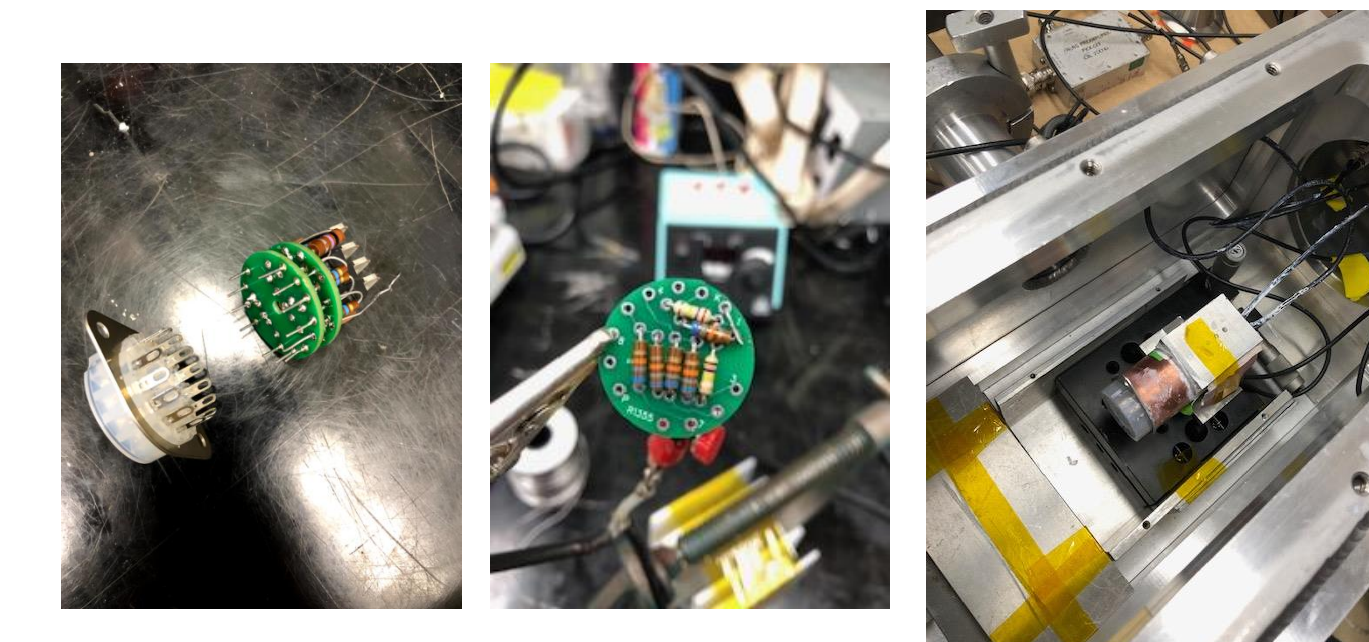
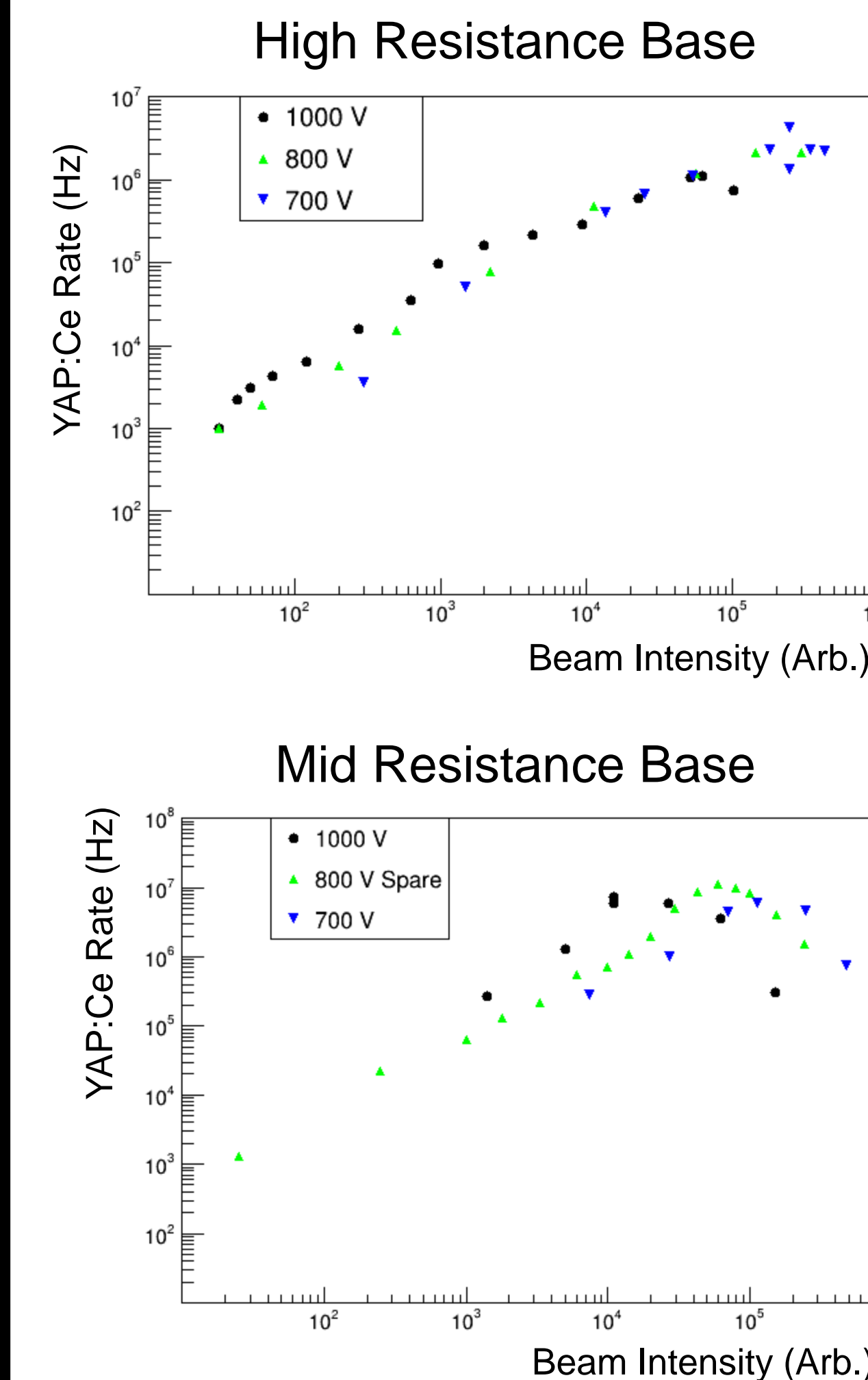


Rate Testing



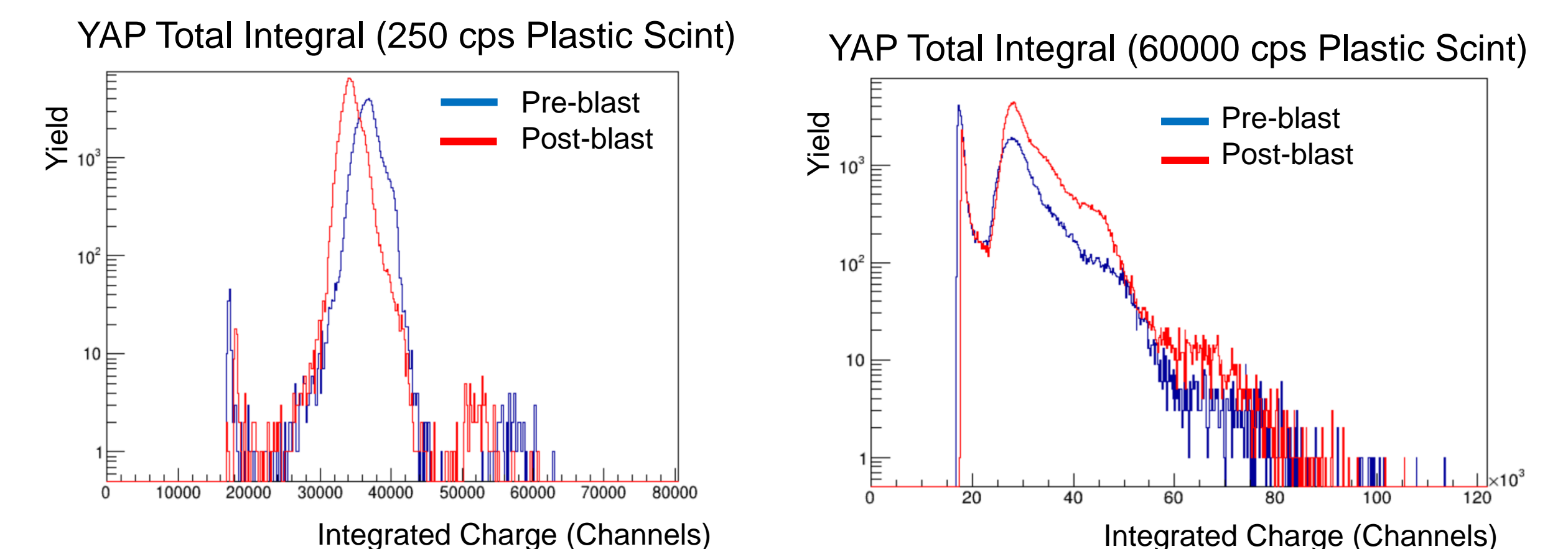
- Beam test of ^{84}Kr at 7.5 MeV/u was used to test rate saturation on a YAP coupled to a Hamamatsu 1355 PMT
- Top Left:** Saturation rate as a function of cathode voltage for various active bases
- Top Right:** Rate on YAP scintillator as a function of the rate on plastic scintillators

Testing Active Bases



- Beam test of ^{63}Cu at 7.5 MeV/u
- Left Picture:** Base with 1924 socket
- Middle Picture:** Resistor board for base
- Right Picture:** Completed base in testing chamber
- Upper Figure:** YAP:Ce rate as a function of plastic scintillator rate for high resistance base
- Lower Figure:** YAP:Ce rate as a function of plastic scintillator for a mid resistance base

Damage Test



- Beam blast: 10 minutes 2.4E9 pps ^{63}Cu
- Equivalent to 4 days of 5E6 pps ^{57}Fe
- Rise time mostly unaffected within electronics resolution

Acknowledgements

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