



U.S. DEPARTMENT OF
ENERGY



Beamspot Stability & Mass Resolution

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HPS Collaboration Meeting

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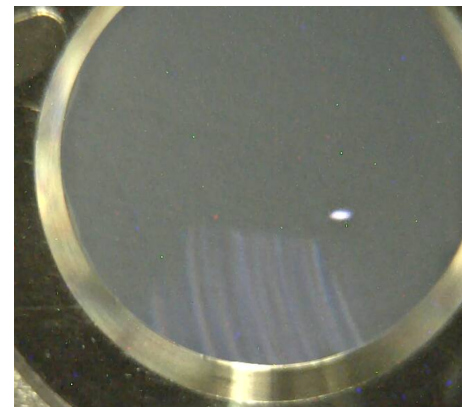
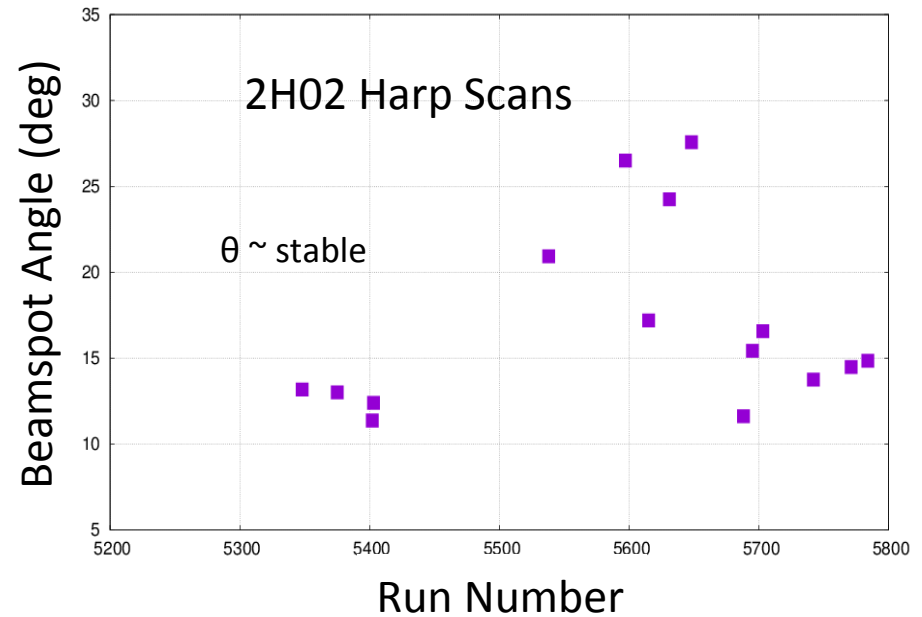
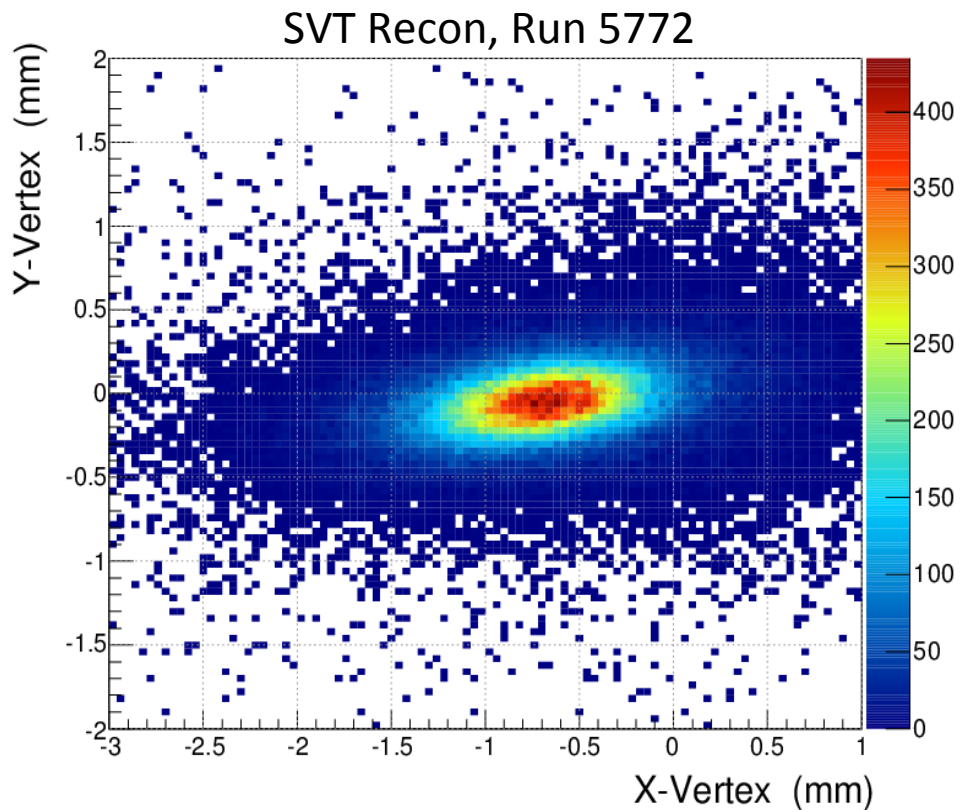
Beamspot(/Mass) Stability

- Mass and vertex resolution are needed for A' searches, and mass and vertex are closely correlated in reconstruction
- In both bump hunt and detached vertex searches an x/y beamspot constraint is used in tracking to optimize resolution
 - so beamspot should be stable over the run
 - else accounted for with run-dependent constraint
- Mass resolution is best by assuming prompt decay, allowing a target z -constraint in tracking
 - only valid for bump-hunt, not detached-vertex

Measure Beamspot Stability

- Available info:
 - BPMs
 - recorded every 2 seconds (in EVIO and MYA archive)
 - also in run database from EVIO (easy to correlate with run#)
 - Hall-B Harp Scans and SVT Wire Scans
 - archived in MYA
 - only use last in a series for analysis
 - SVT Tracks
 - unconstrained v0 & Moller candidates

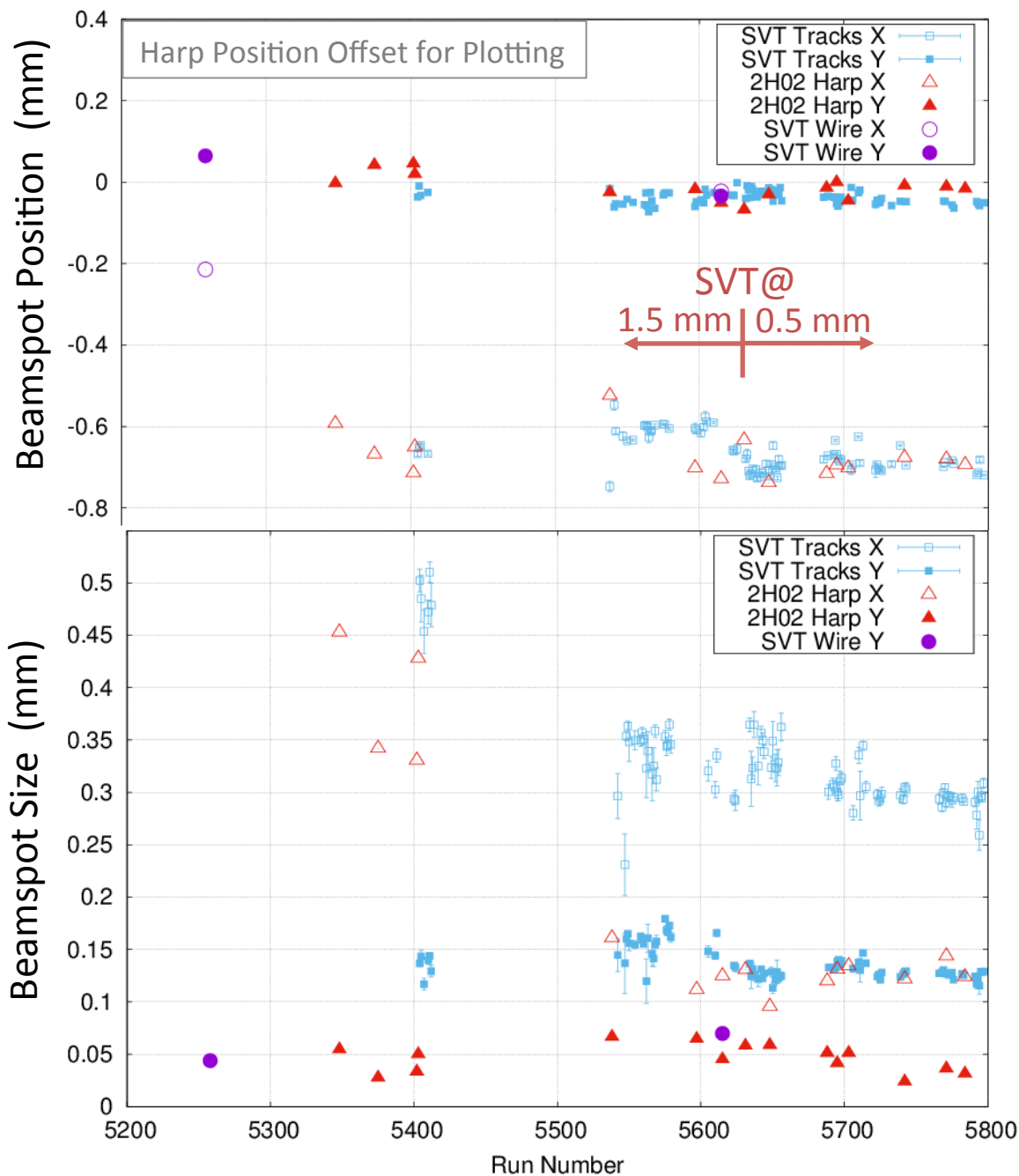
Beamspot: SVT, Harp, and Viewer



Beamspot Stability:

Harps and SVT Tracks

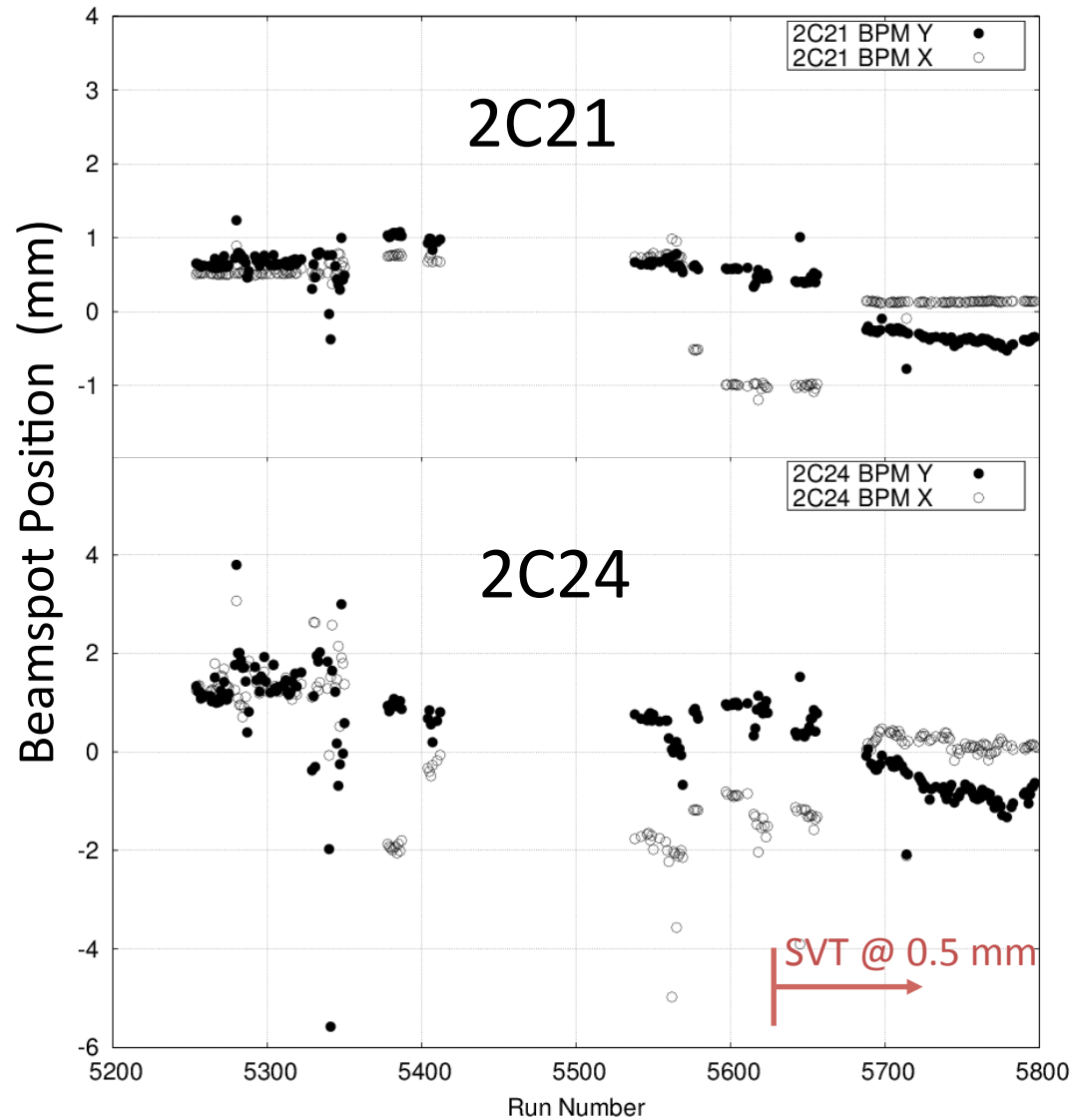
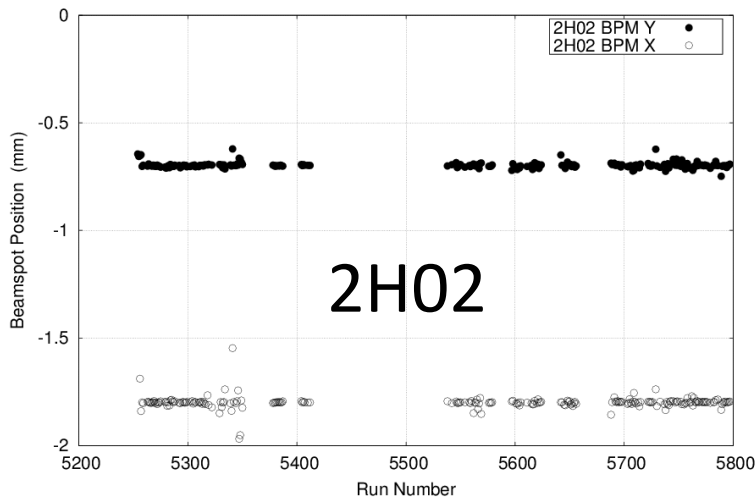
- SVT tracks shown are from pass2, unconstrained e-e- vertex
 - e+e- gives very similar result
- Clear reduction of beamspot size during the run (as M. Tiefenback mentioned yesterday)
 - tracks and harps
- pass3 gives similar conclusion on jumps/drifts
 - but problems with lots of 1.5 mm recon, so not shown
 - has SVT x-vertex shifted to within 50um from zero (!?)
- Tracking X-jump when SVT moved to 0.5mm



BPMs, Run-Averaged

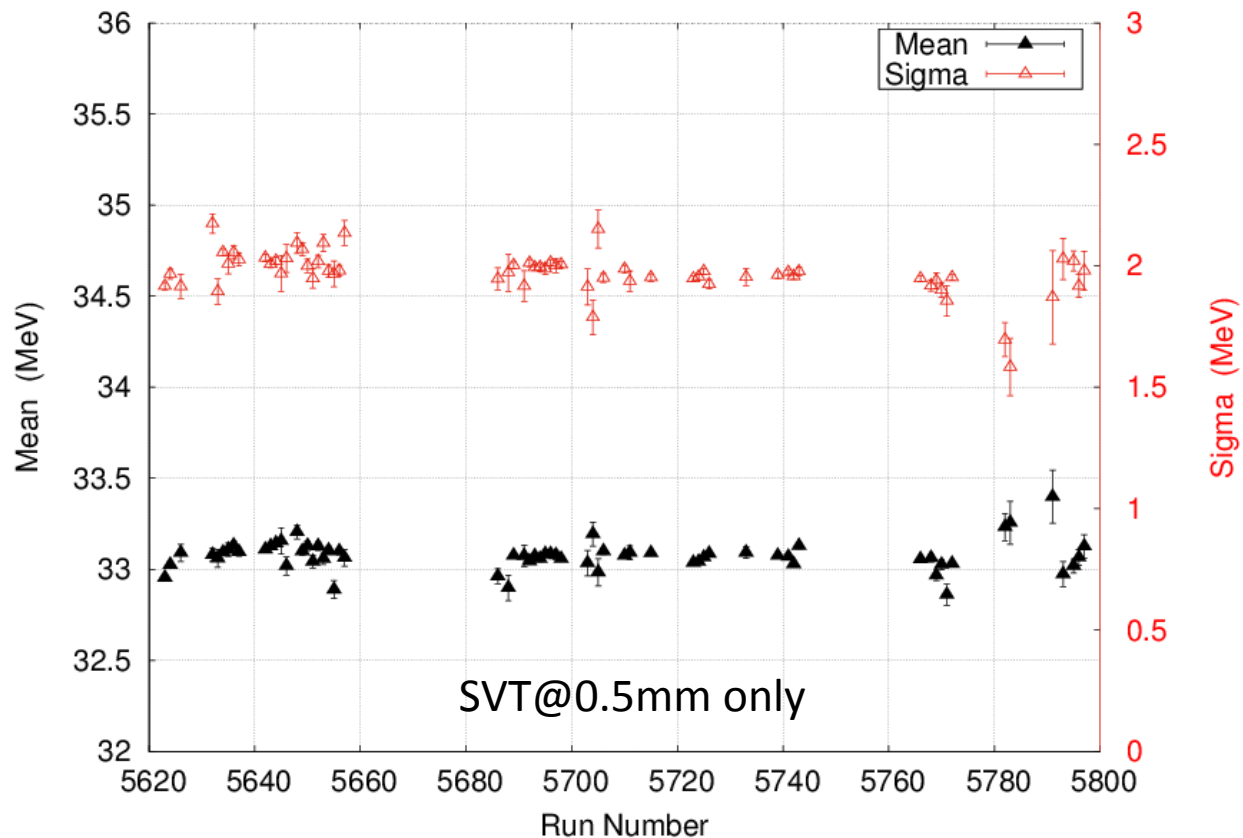
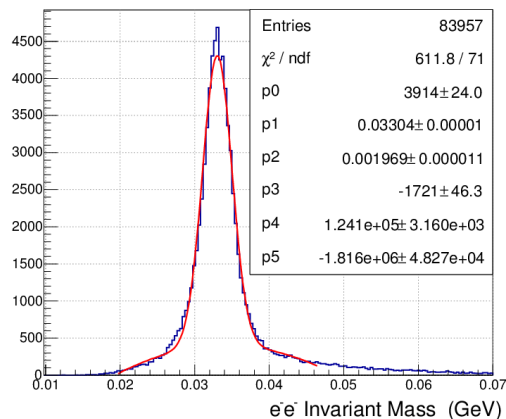
Upstream BPM jumps not correlated with Harps/SVT jumps @ 5620

2H02 not useful for this study (Orbit Locked)



Moller Mass Run-Dependence

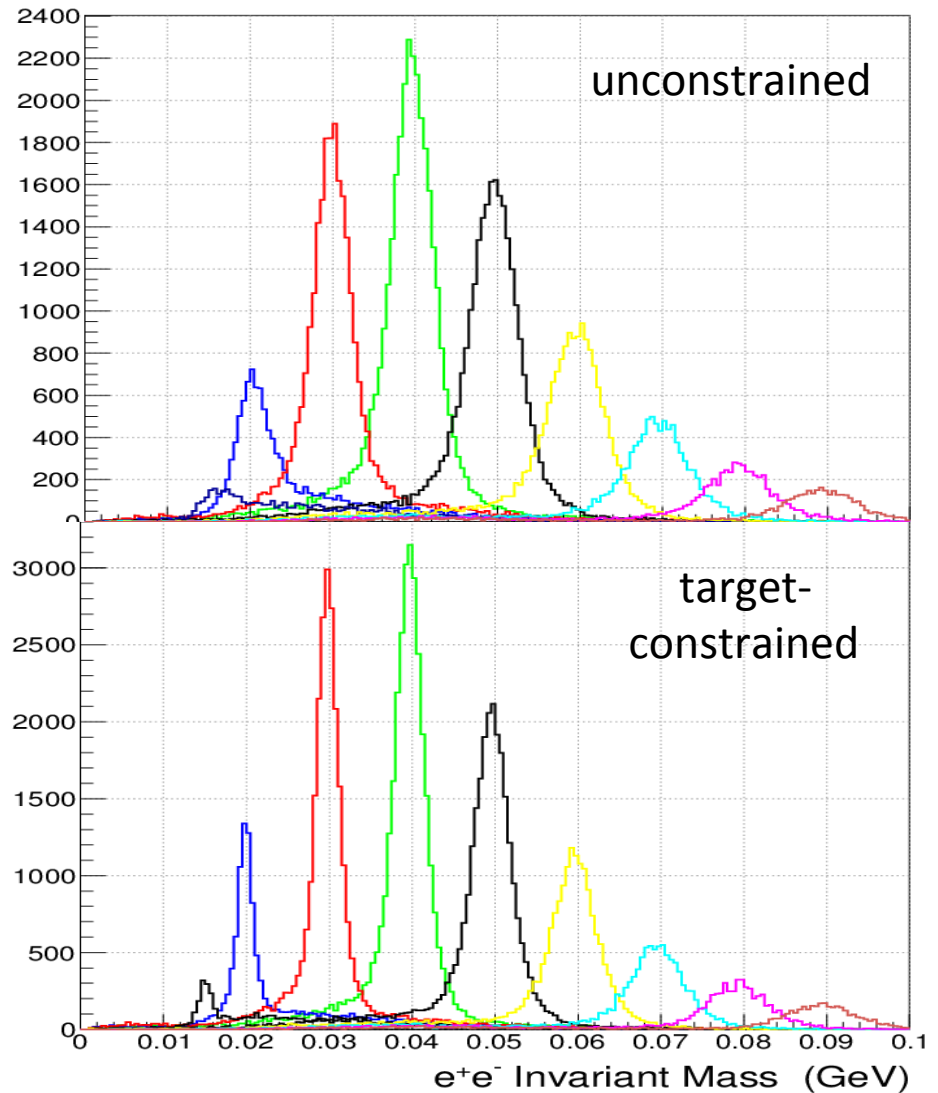
- Reconstructed Moller Mass with Beamspot Constraint
 - If beamspot stability is an issue, should see effect



$A' \rightarrow e^+e^-$ Mass Resolution, MC

Needed for bump-hunt signal extraction

- A' generated with
 - discrete masses
 - carrying full beam energy
 - along beam direction
 - (and isotropic e^+e^- decay in CM?)



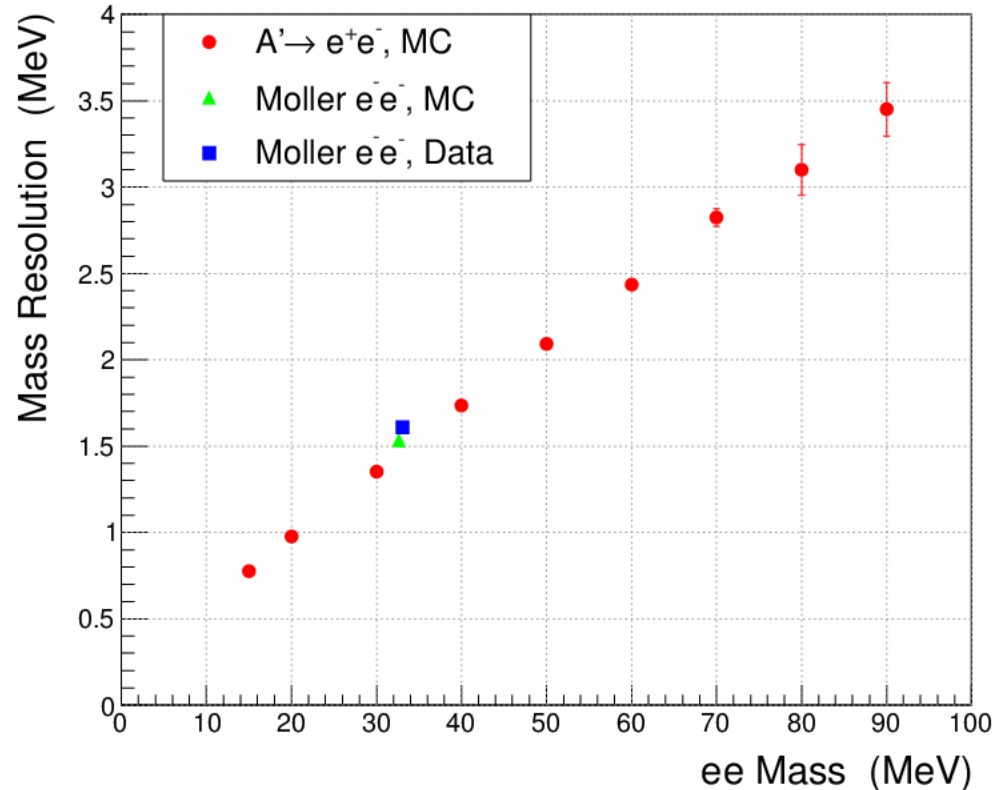
ee Mass Resolution

e^+e^- mass resolution from MC is very close to e^-e^- Moller resolution in both MC and data (Moller data fit in narrow range on peak).

→ can use reconstructed Moller mass as an e^+e^- proxy for some studies (e.g. stability)

Linear dependence on mass (~ opening angle)

Need to look at dependence on track angles (lab/CM), what else?



Outlook

- Can consider beam position sufficiently stable during SVT@0.5mm runs
 - don't need run-dependent constraint
 - choose unconstrained x/y-vertex with size from harps for tracking constraint (?)
 - beamspot-constrained Moller mass agrees
- Work to be done with pass3
 - big shift in x-vertex relative to pass2 expected (+700 um)?
 - need to rereconstruct 1.5 mm (?)
- Investigate mass-resolution kinematic dependencies