



Beam Spec Advisory Group: Decay Pipe Extension

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Decay Pipe Extension:

(A) It's so – like – Wow.

(B) Whatever.





Decay Pipe Modifications

- 4 possibilities
- potential flux gains
- trade-offs for future flexibility
 - narrow band beams
 - off-axis beams
- comments on technical difficulty

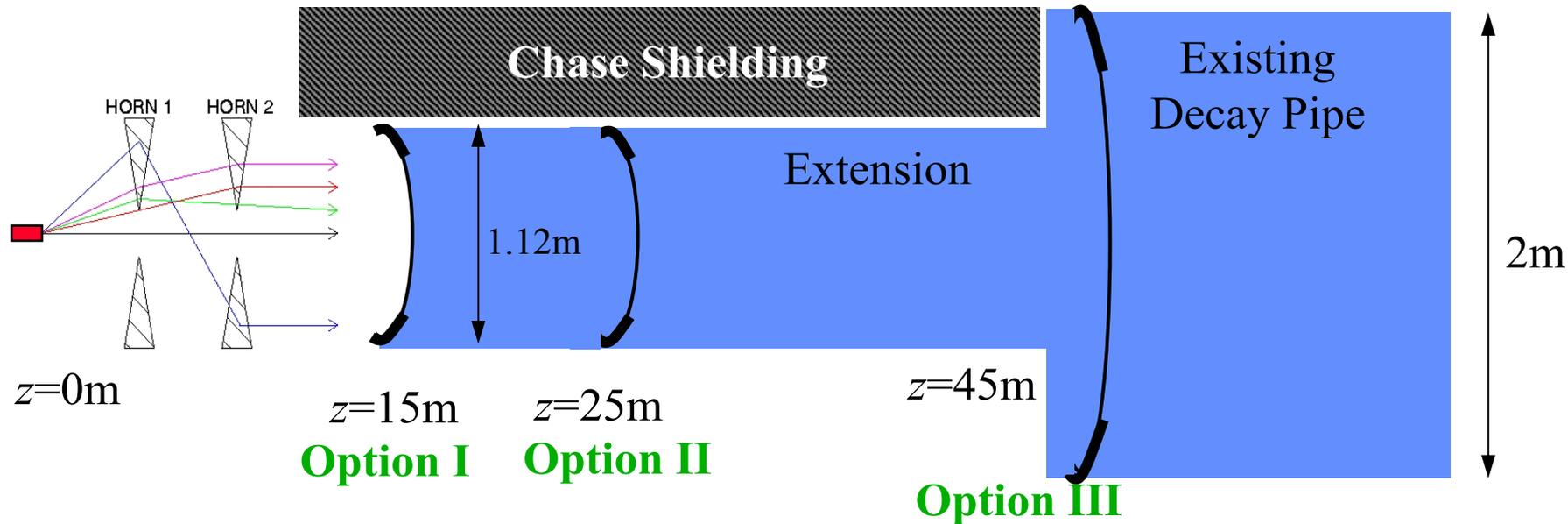
Beam Specifications Advisory Group

BSpAG





Possible Modifications to Decay Pipe

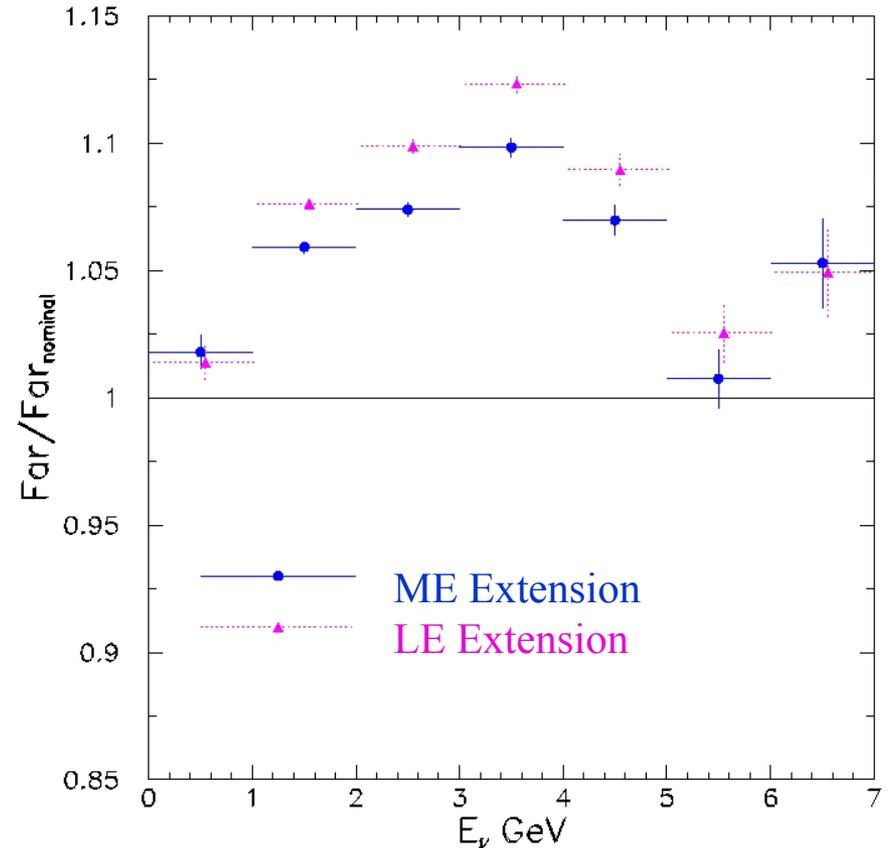
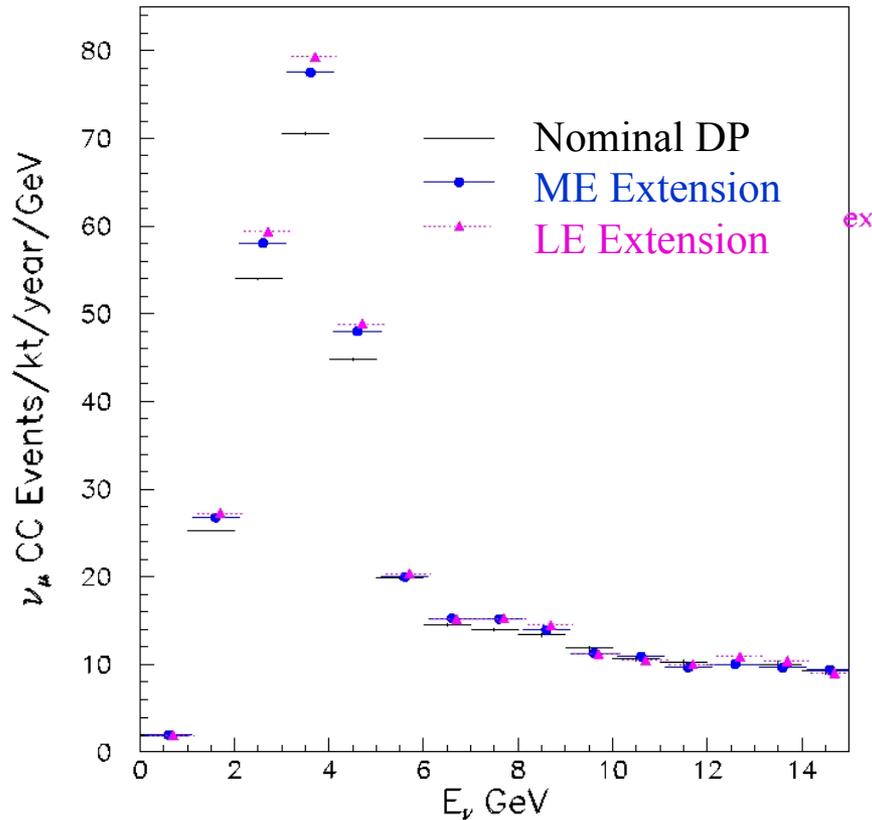


- Window, air in chase present 37% X_0 scattering for pions
- Smaller diameter of pion cloud at $z = 15\text{ m} \Rightarrow$ thin window.
- Could do thin window at $z = 45\text{ m}$, but not as thin.
- Extension requires raising ceiling of shielding





The Gain: Flux in LE Beam



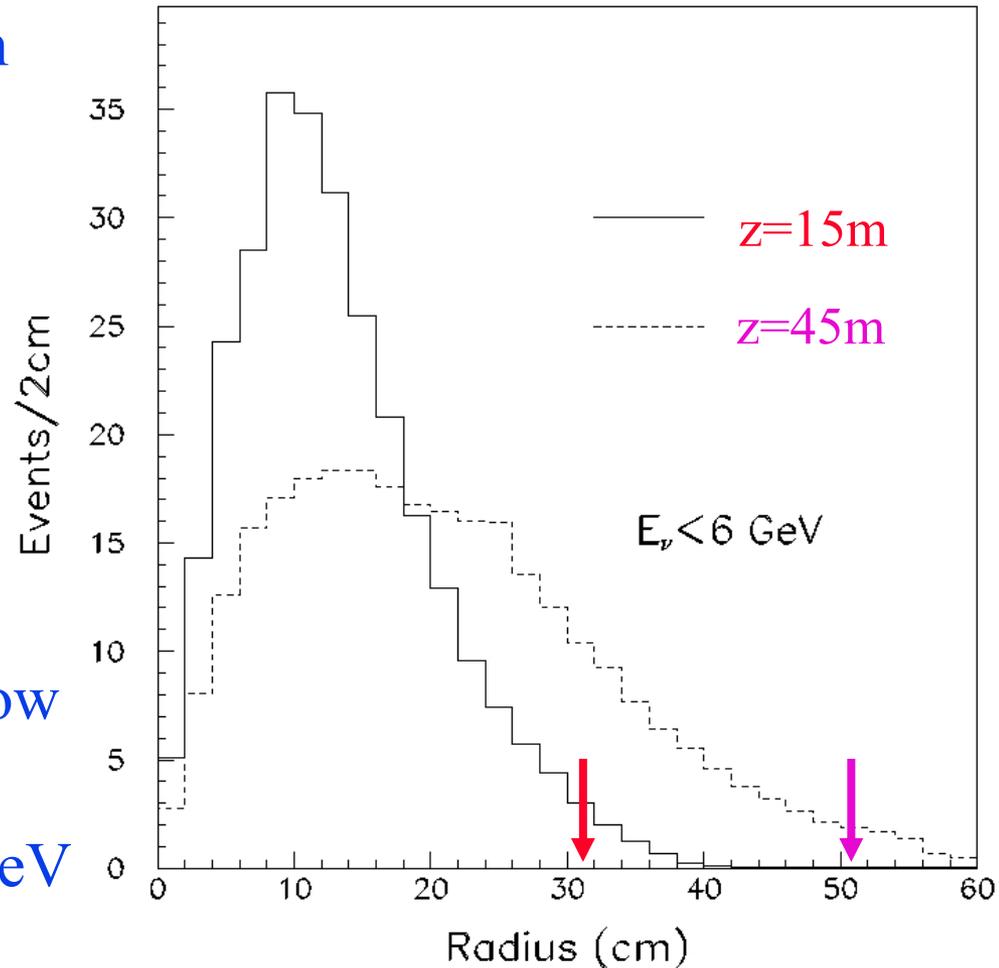
- Both Extensions 0.030" thick window, Nominal DP = 0.186"
- Flux gain is 7% (ME Ext.) and 10% (LE Ext.) for $E_\nu < 6$ GeV





Option III: Just a Thin Window

- For extension, 5% of the gain was thin central window 24''
- Option III: simply put thin central window on existing decay pipe.
- Has to be 1m diameter to contain 98% of pion cloud (soft π 's diverge)
- Slightly thicker central window than extension (.045'')
- Net gain: 4.5% in events $< 6\text{GeV}$





Option IV: Do Nothing

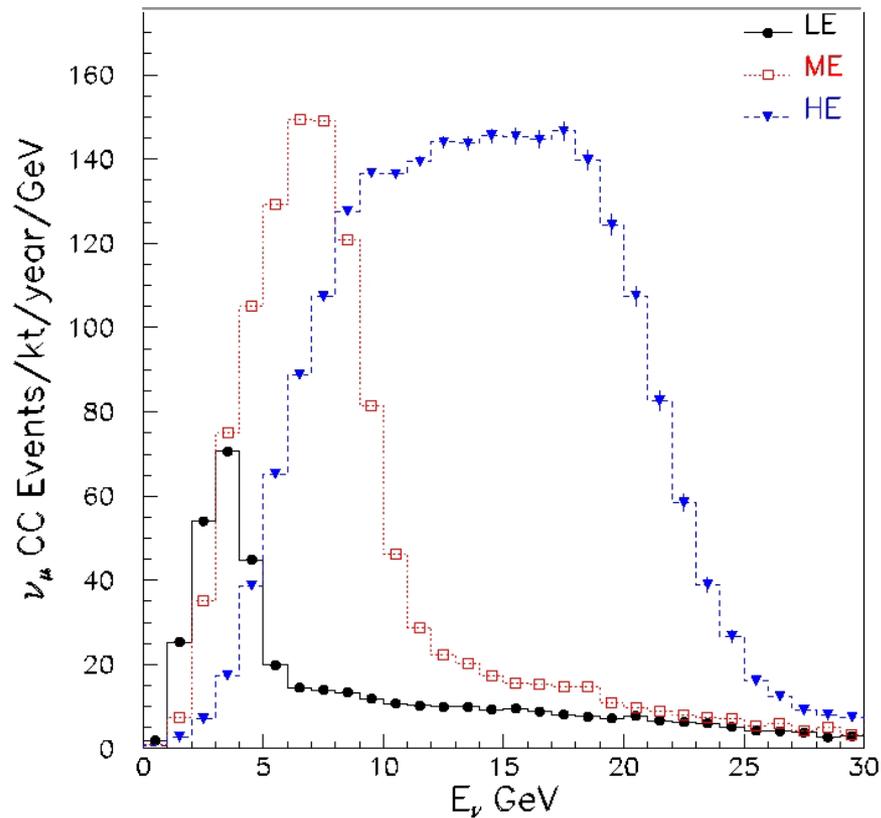
- Decide that all this effort is not worth 10% (or less) neutrino gain
- Decide that effort is distraction from more critical activity
- Live with .187" thick vacuum window
- Leave open possible future uses of target hall
 - » Narrow band beam
 - » Fully optimized off-axis beam



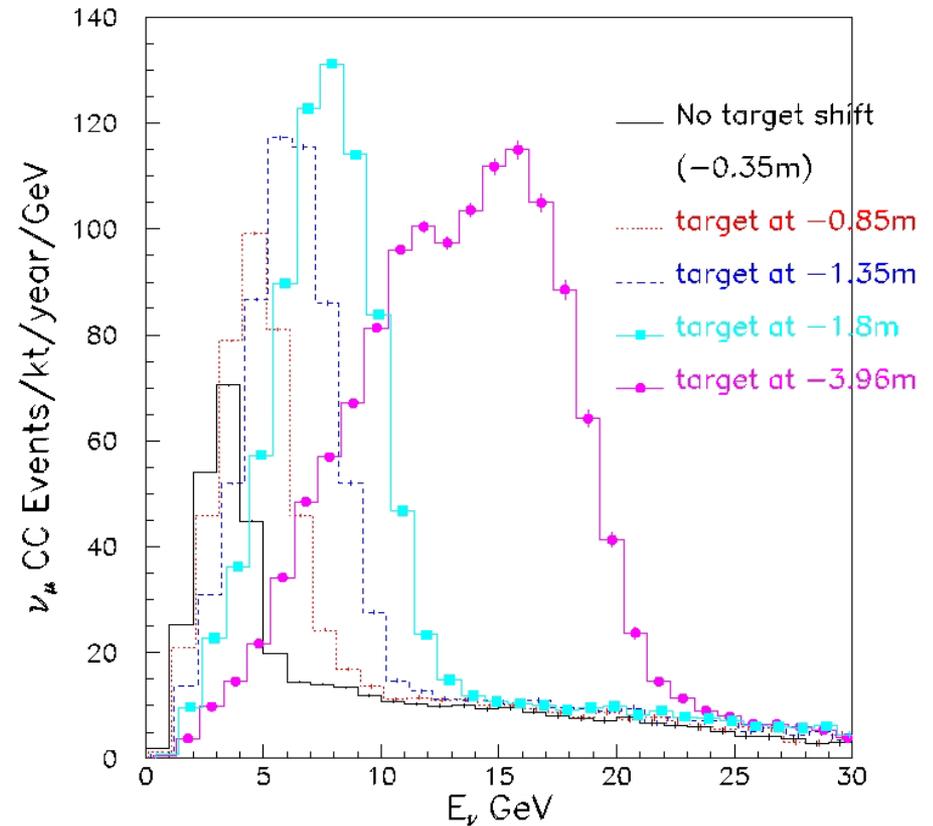


Trade-Off: Only Semi-beams in Future

Fully-Optimized Beam



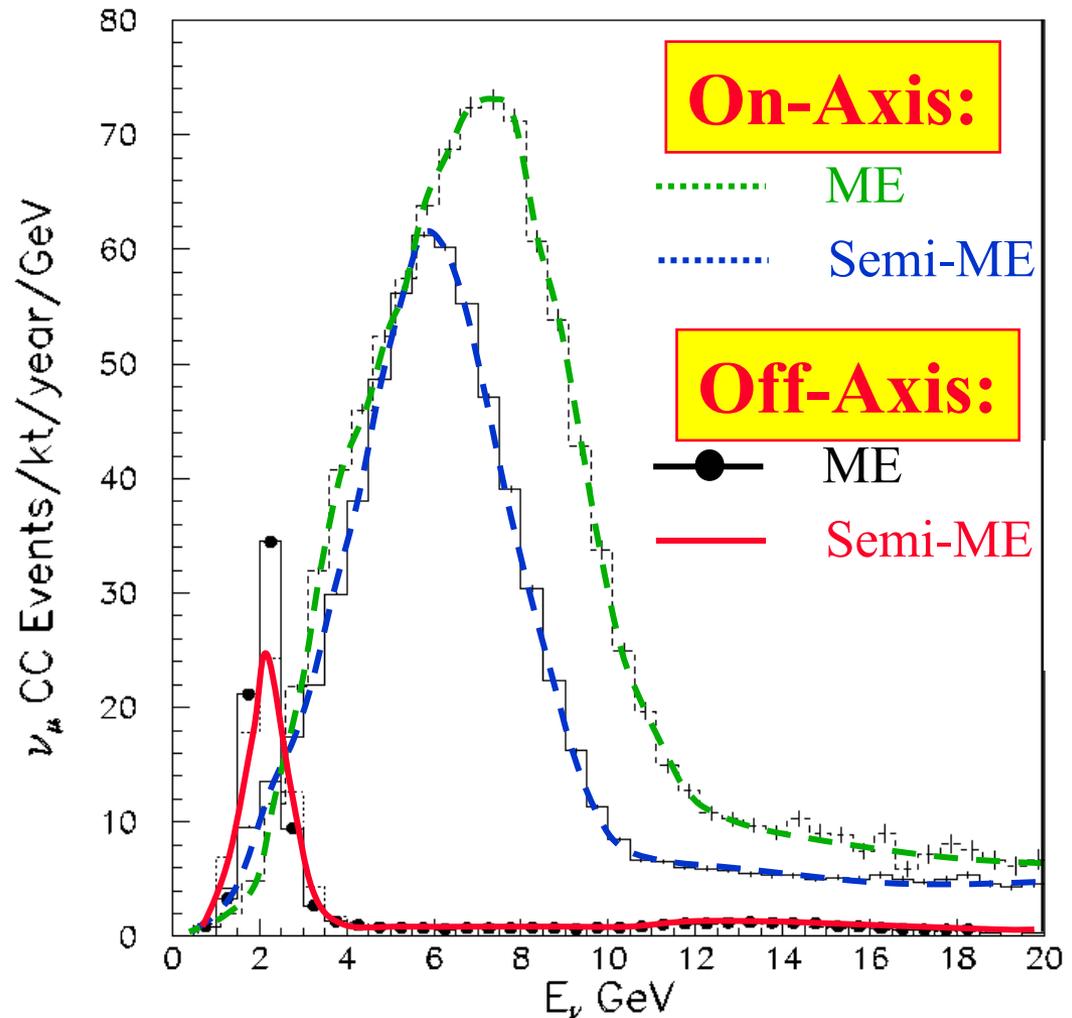
Moving just the Target





Trade-Off III: Off-axis

- Off-axis beams perhaps best performed in ME position (peak 2 GeV).
- If build LE Extension, would have to do a semi-ME beam off-axis as a compromise.
- No loss of future off-axis if do Options II - IV





Other things We Looked At:

- The extension is identically equivalent to moving the horns and the target *en masse* downstream to the decay pipe
 - » Causes groundwater problems (MARS studies).
- The extension requires raising ceiling of chase by ~ 1 ft.
 - » No change in ground water from this
- Could we just put the extension off beam axis?
 - » Wouldn't have to raise ceiling
 - » But doesn't help flux (walls in the way of the beam)





Summary:

Option	Flux Gain 0-6 GeV (%)	Technical Difficulty	Future Flexibility Lost
I (LE Extension)	10	Raise chase ceiling, air cooling of target hall	NBB, Off-axis beam
II (ME Extension)	7	“	NBB
III (Nominal Pipe, thin window)	4.5	Design of double thickness window	None
IV (Nothing)	0	None	None





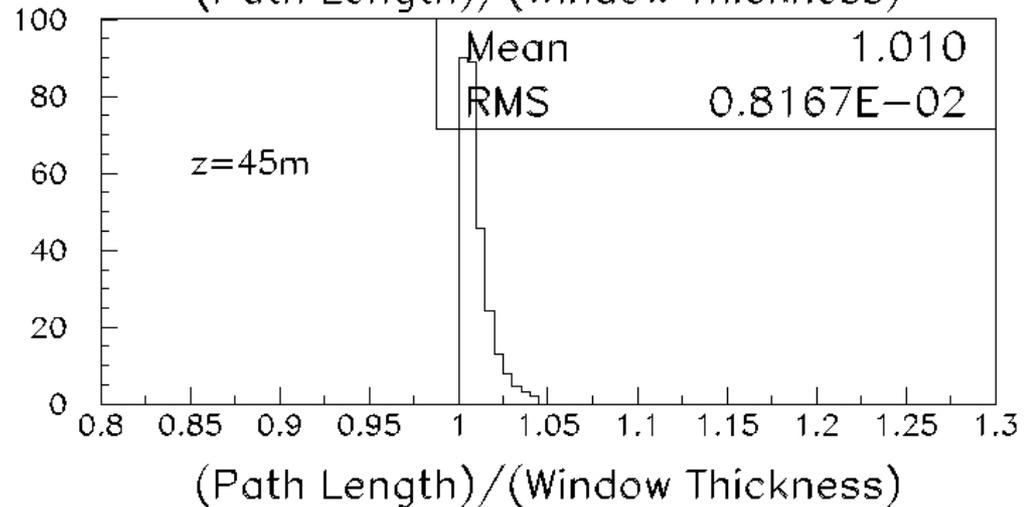
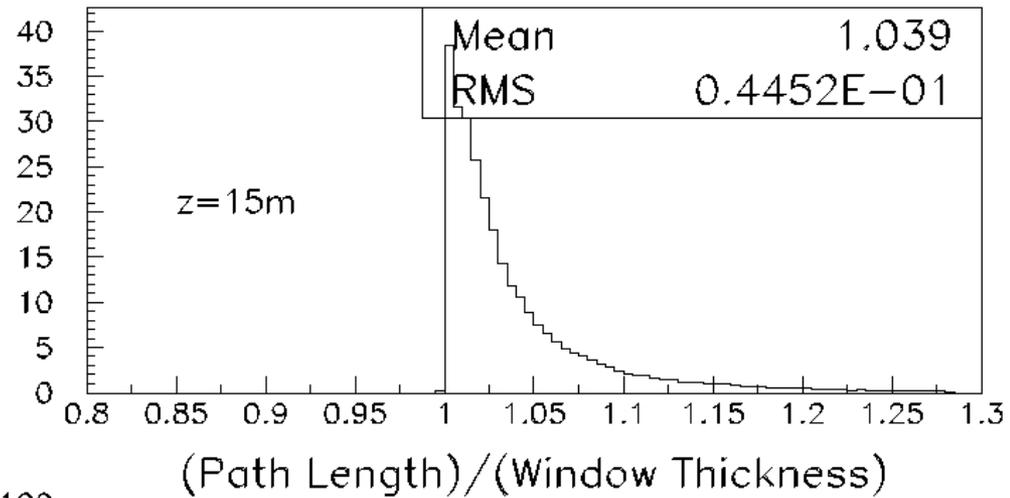
Back-Up slides





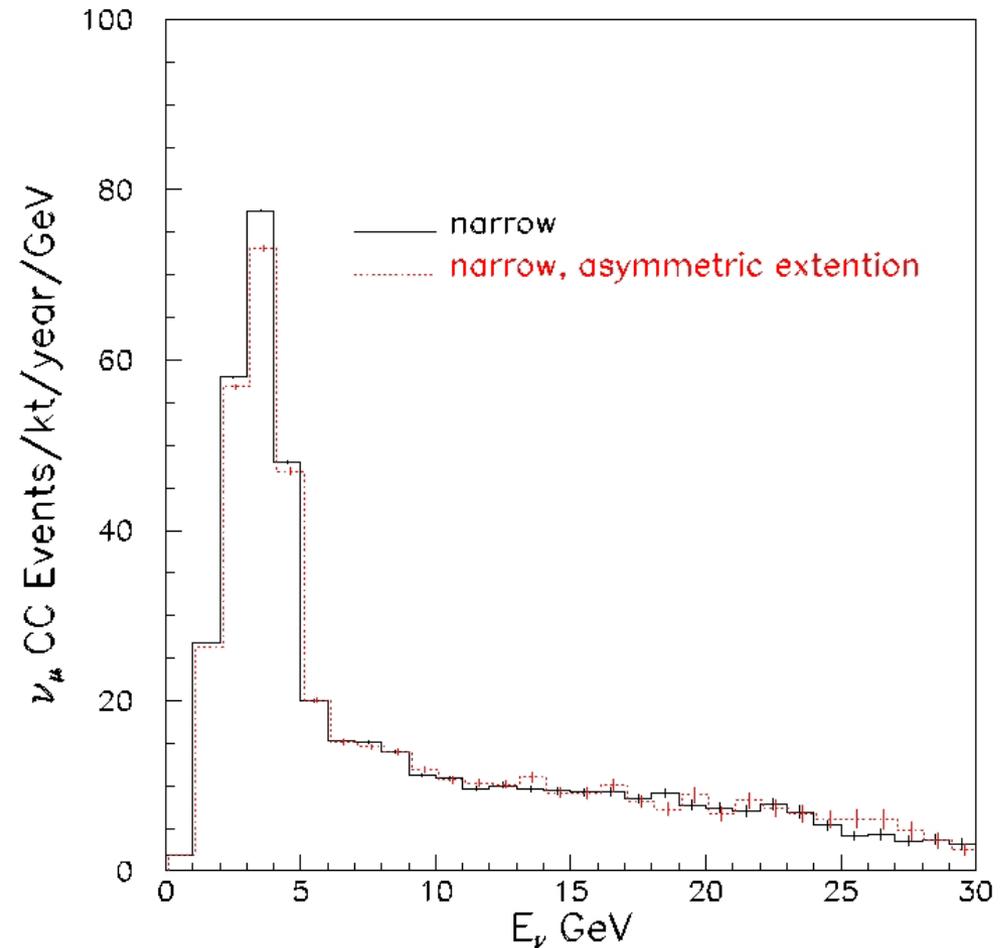
Slight Complication: Window Curvature

- Recall windows have 2:1 curvature.
- Large solid angle of extension window makes effective window thickness larger than 0.030”
- Less of effect at nominal window.





Asymmetric Extension





Comment on Window

- Our window was too thin for 44" diameter pipe
- Pion cloud after horn 2 is actually even narrower (broadens by 40m)
- Could make composite window with 'thin spot' in center

