Low energy ν-beam for EUROSB

Marcos Dracos, *Nikos Vassilopoulos*
IPHC Strasbourg, IN2P3/CNRS

- Aim is to use the low energy μ-beam to produce ν s with with $<E_\nu>$ = 300 MeV in order to measure their cross section

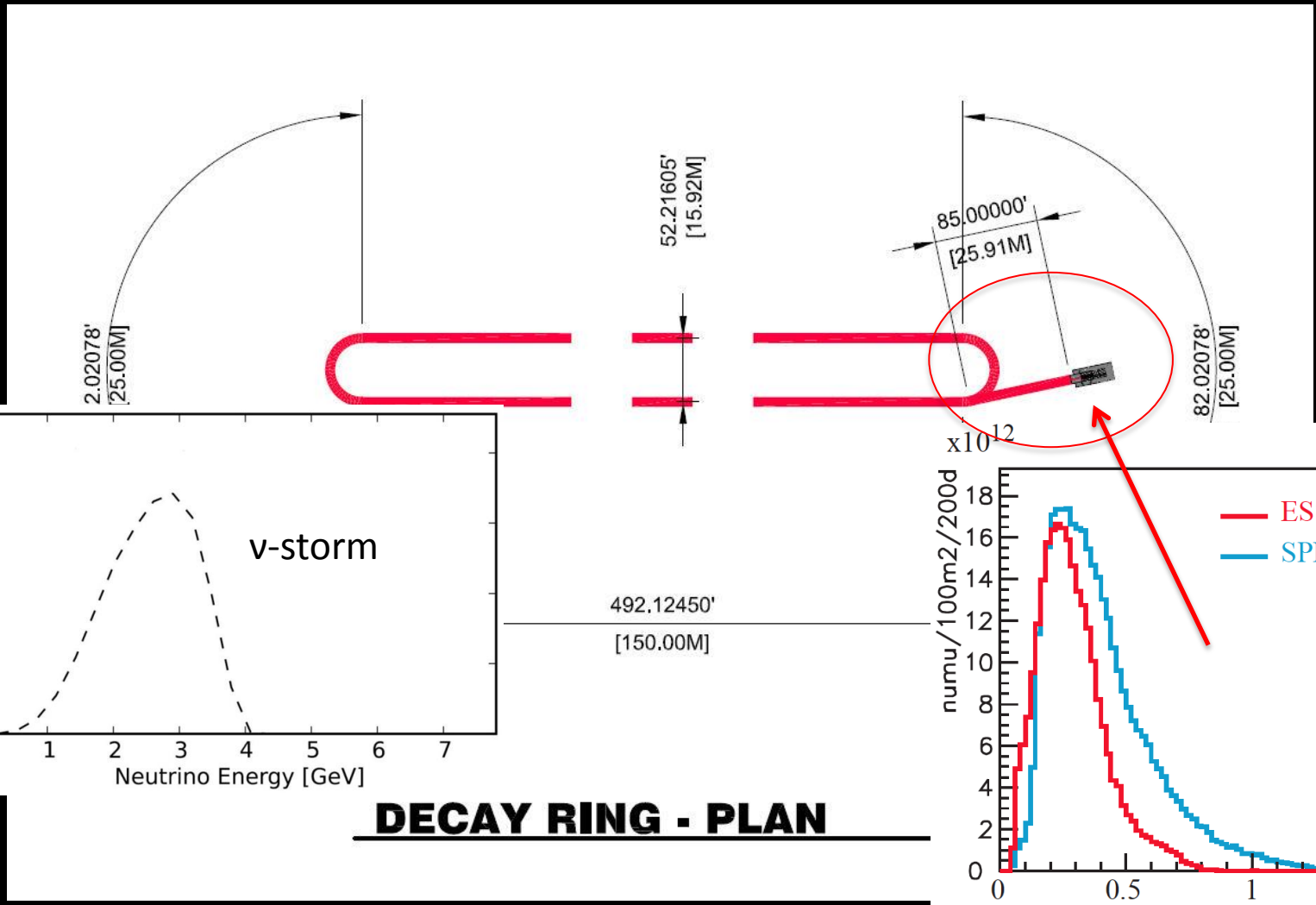
- Study a target-horn system optimized for 5 GeV/c focusing (initiated by Sergei's talk on 18/3/2013 meeting + ν-storm papers)
- Also look at the 0 - 2 GeV/c π^+- production-focusing

- Beam: protons E = 60 GeV, $\sigma_x = \sigma_y = 0.1$ cm
- Target: graphite, L = 95 cm, r = 0.3 cm, d = 1.81 gr/cm^2

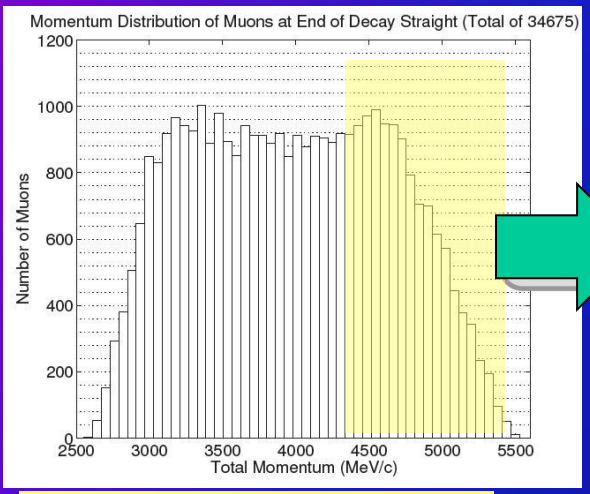
- Horn, Aluminum thickness = 0.3 cm, 5 GeV/c focusing, (horn shape as NIM A 383 (1996) 277-290, CNRS Technical Report)

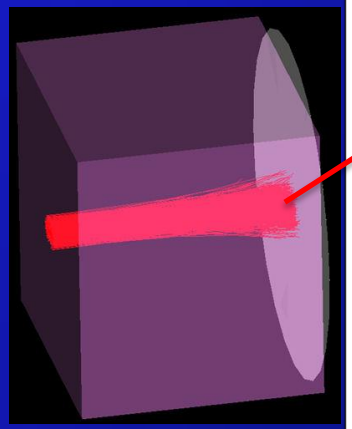
- MC: FLUKA 2011.2.17/latest + Flair interface

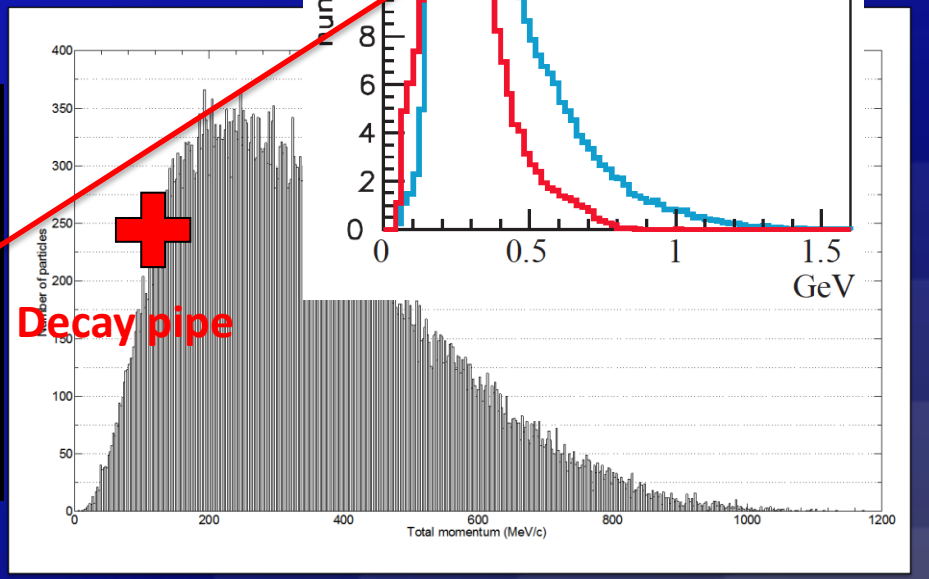
Lower ν-energies for ESS & SPL SBs



Low Energy μ beam





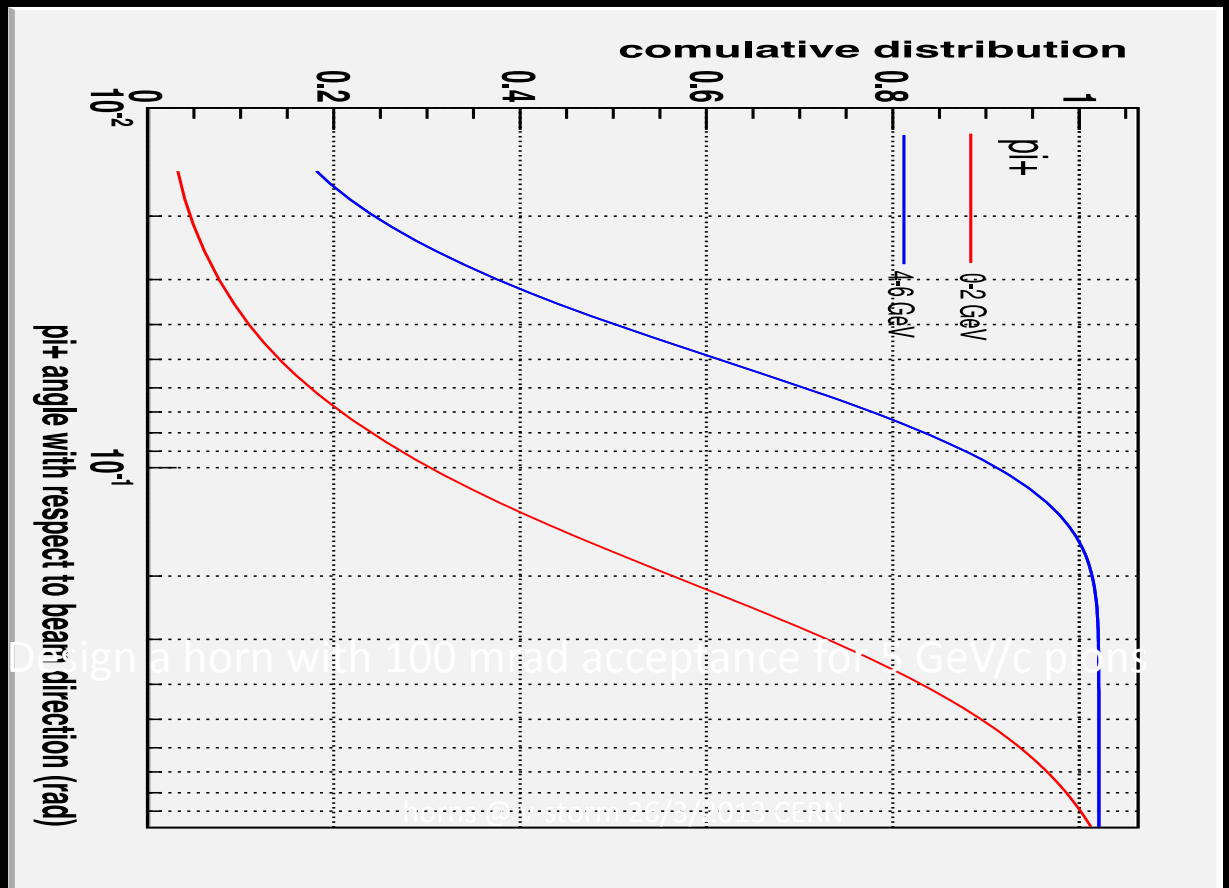


At end of straight we have a lot of πs, but also a lot of μs with 4.5 < P(GeV/c) < 5.5

After 3.48m Fe, we have ≈ 10^{10} μ/pulse in 100 < P(MeV/c) < 300

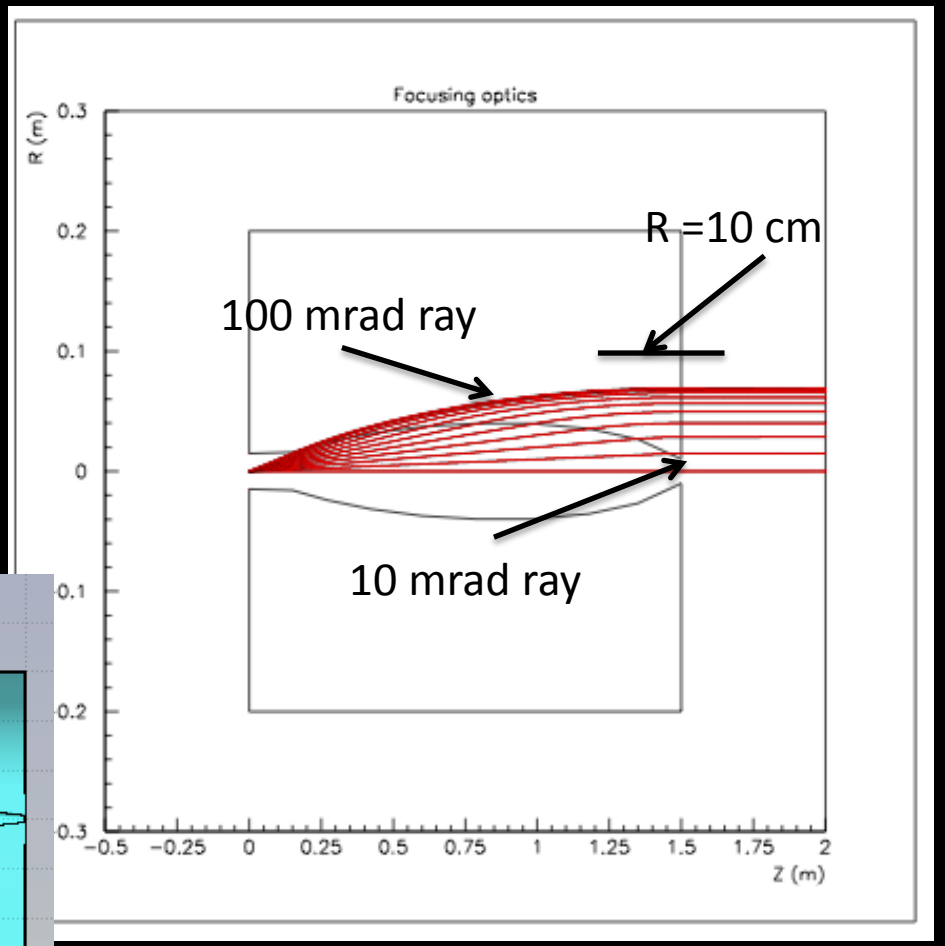
5 GeV/c π^+ angular distribution at target

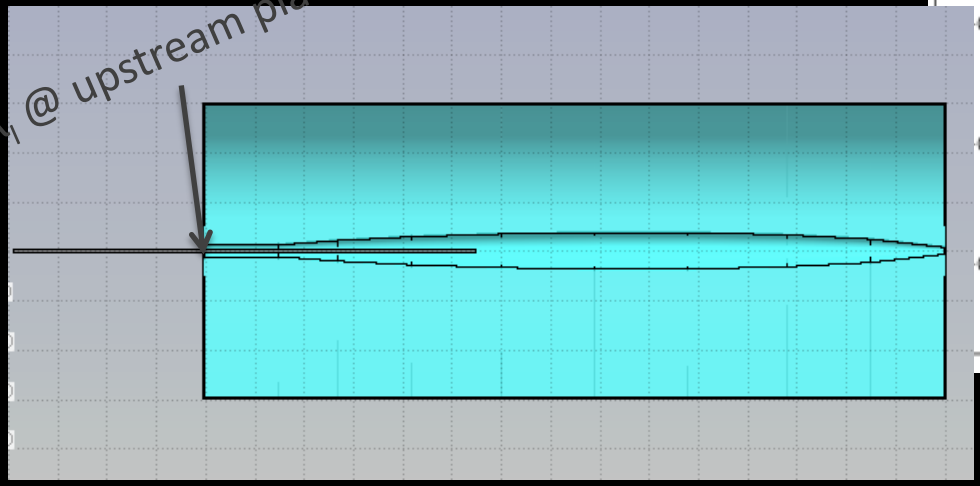
90 % of π^+ @ 100 mrad



Design a horn with 100 mrad acceptance for 5 GeV/c pions

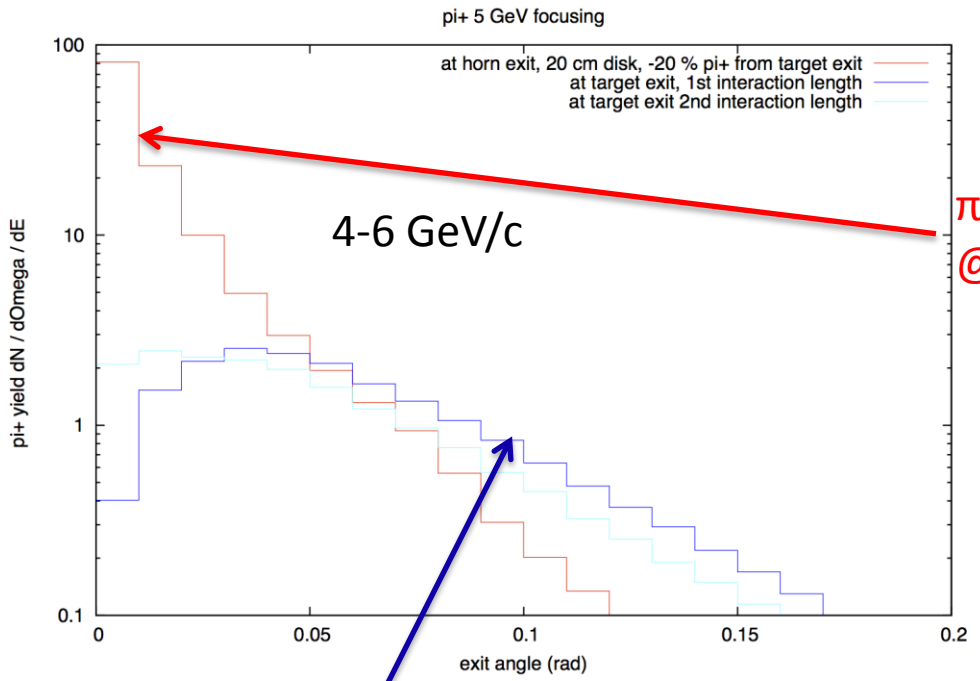
Horn 5 GeV/c, 100 mrad focusing





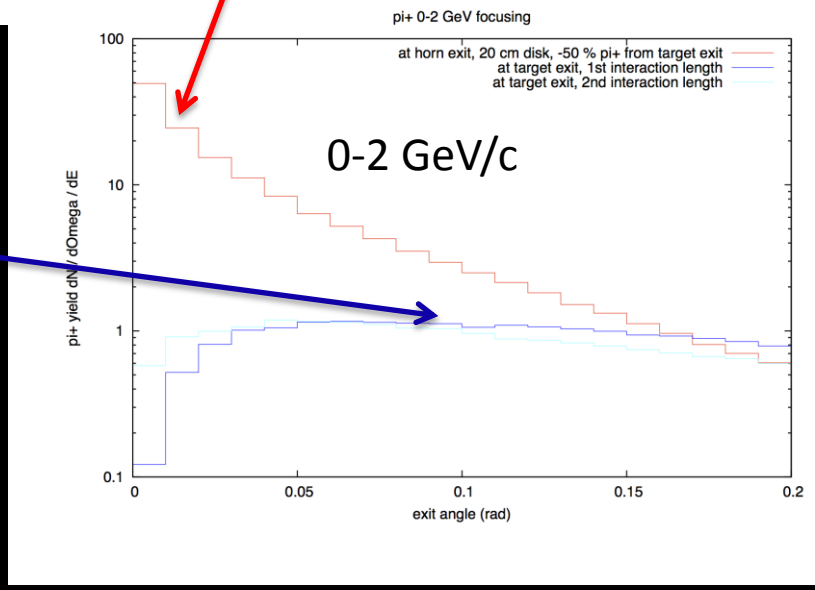
L = 1.5 m, R_{neck} = 1.5 cm, R_{out} > 10 cm,
aluminum thickness = 0.3 cm,
100 mrad acceptance @ 5 GeV

Horn II



π^+ yield vs theta with respect to beam-axis @ horn's exit @ r < 20cm

π^+ yield vs theta @ target's exit



Results/further thoughts

π^+ per proton at horn's exit

0 - 2 GeV/c r < 20 cm	5 ± 0.5 GeV/c r < 20 cm	4 - 6 GeV/c
0.89	0.11	0.21

After focusing

- most of 5 GeV π^+ have less than 20 mrad angle with respect to the beam-axis while wider angle for 0-2 GeV/C

Could we use the low energy μ-beam modified to our needs for the low ν-energy SBs with $<E_\nu>$ = 300 MeV ? Now an idea … Studies are needed…

Thanks

π^+ spectra at target exit