Montauk Workshop

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1. Ultimate ionization cooling (including plasma lenses matching of final cooling sections) – "6-emittance" –

   – as the basis for comparison of other cooling options (optical stochastic; low energy; ...)

2. Emittance gym to reach highest luminosity, polarization degree, monochromaticity

   (keeping 6-emittance as small as was reached at cooling stage).

   (at any convenient energy!)

$$L_{\mu\mu\ ultimate} = \frac{N_\mu^2}{4\pi} \cdot \frac{\gamma_{coll}^2}{\varepsilon_{neq\,tran} \cdot \varepsilon_{neq\,long}} \cdot \frac{\Delta E_{max}}{E} \cdot N_{life}$$

↑ at collider

– high, but not practical.

$$L_{\mu\mu\,max} = \frac{N^2}{4\pi} \cdot \frac{\gamma_{coll}^{3/2}}{(\varepsilon_{neq\,6})^{1/2}\, \sigma_{long\,coll}^{1/2}} \left(\frac{\Delta E_{max}}{E}\right)^{1/2} N_{life}$$

But the last evaluation is valid till $\xi < 0.1$!

If ξ_{max} appears to be the main limitation for luminosity:

$$L_{\xi_{max}} = \frac{1}{r_M} \cdot \frac{N_M \cdot \gamma_{coll}}{\sigma_{long\,coll}} \cdot f_0 N_{life} \cdot \xi_{max}$$

— need for compens.

To reach this value, transv. emitt. should be not more than

$$\varepsilon_{n\,tran\,coll} = \frac{\gamma_M}{4\pi} \cdot \frac{N_M}{\xi_{MAX}}$$

3. Consequently – necessity to find the way to suppress beam-beam tune shift to reach ultimate luminosity – Lithium stream? seems OK, but needs more discuss

4. Transversal emittance growth due to multiple scattering in compensating lithium – small.

5. Background due to muons – lithium interaction – very serious problem. Needs proper "balancing".

6. Open median plane collider – to cope with decay loading of cryogenic and with decay background.

7. Above 5 TeV + 5 TeV muons live longer than repetition cycle = 1/15 sec. Hence, we need to switch to double-ring collider, or to separate beams in parasitic meeting points only, -- or to compensate beam-beam tune shifts!

8. Neutrino radiation for ultimate energy collider: the "easiest" solution vertically changing local angle of the collider -- slow and modest.