

WG4 Discussion

Craig Group and Frederik Wauters

Focus questions for WG4:

Q1: Neutrino/Muon Physics: (Overlaps with WG1 and WG5)

- What overlaps exist to non-standard model neutrino interactions?
- How would these manifest in both the near term muon/precision measurements sector & in the neutrino sector?

Q2: Beam/Machine/Detector Design: (Overlaps with WG3)

- Are the ultimate sensitivities really exploited with current facilities?
- How can we improve experiments without increasing the beam power?
- What will be the ultimate sensitivity that we can reach even by increasing beam power, and what are its implications?
- Cooled muon beams w/ phase rotations? New methods?

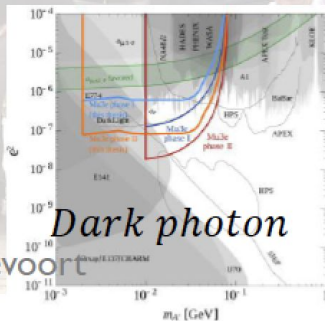
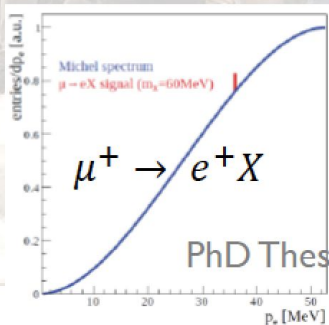
Q3: Program Planning: (Overlaps with WG3)

- How do you support the physics needs for both DC and pulsed (high sculpted) beam structures in the planning (and cost) of new facilities?
- How can muon physics benefit from future neutrino facilities?
- Could new ideas from muon physics developments turn out to be useful for future neutrino facilities?

Auxiliary Measurements? $\mu^- N(A, Z) \rightarrow e^+ N(A, Z - 2)$

+ beyond $\mu^+ \rightarrow e^+ e^+ e^-$ @ Mu3e?

@
Mu2e?

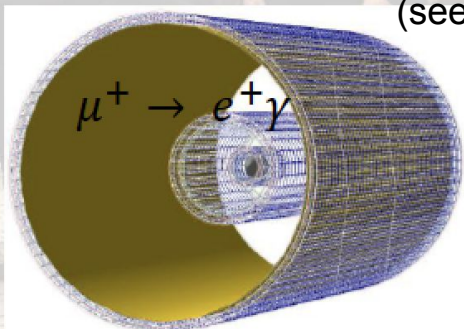


Frederik Wauters, NuFact2018

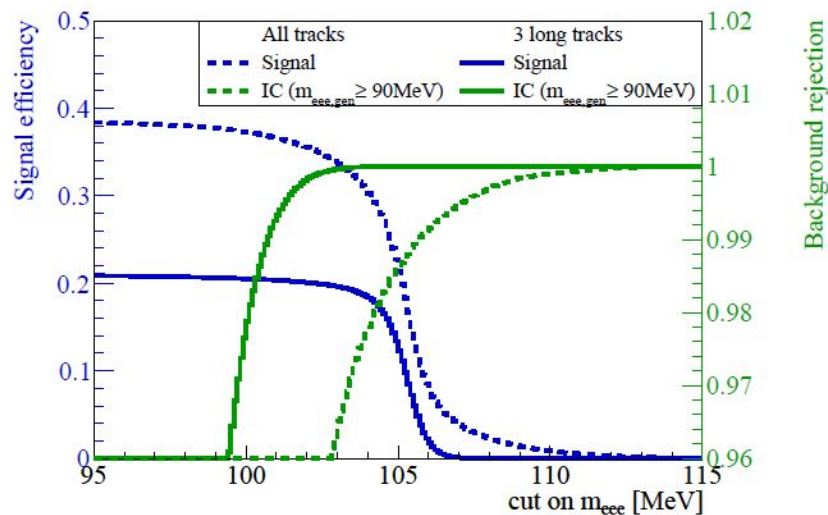
- Overall, among all physics processes, $\mu^- \rightarrow e^+$ conversion is the second most promising channel to search for the lepton number violation.
- Neutrinoless double beta decay has significantly better reach, however there could be scenarios under which the process of $\mu^- \rightarrow e^+$ conversion would be the most sensitive channel to search for the lepton number violation.
- Positron Energy $\sim 92.3 \text{ MeV}$ (DS optimized for 105 MeV)

(see backup slides F. Wauters)

Using
conversions
?



Mu3e: 300 days of running
 $N_{\mu} = 2.592 \cdot 10^{15}$ muon decays
0.44 background events from internal conversion
~8 combinatorial background events > 95 MeV
2-4 10^{-15} SES
5-8 10^{-15} upper limit



The longer-term future of muon facilities?

- JPARC, Fermilab, PSI
- Are there benefits from having a “central” muon facility with pulsed and DC beams?

Higher Intensities?

PRISM was discussed. Seems to be a serious option. Are there others? More for WG3?

From the experiment point of view:

Limits of DC experiments (MEGII digitizing at 5 Gs/s)

Scale/cost MEG & Mu3e < Mu2e & COMET

Limits of Pulsed beam experiments?

Physics motivated limits, is $10^{-15/16}$ the interesting region

Mu2e-II clear up

The cosmic ray background should of course scale with duty factor (table was misleading).

- Historically, we claimed a smaller value for the CR background (~ 0.05 events) back when we wrote the Snowmass note. We tripled that to 0.16 do to the increased duty factor.
- I changed it to match the current estimate because it seemed silly to quote something smaller for Mu2e-II

MEG-III ?

Angela had one slide regarding longer term upgrades. Can we hear more?