The Rare and Forbidden: Testing Physics beyond the SM with the Mu3e

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Tau Workshop Amsterdam

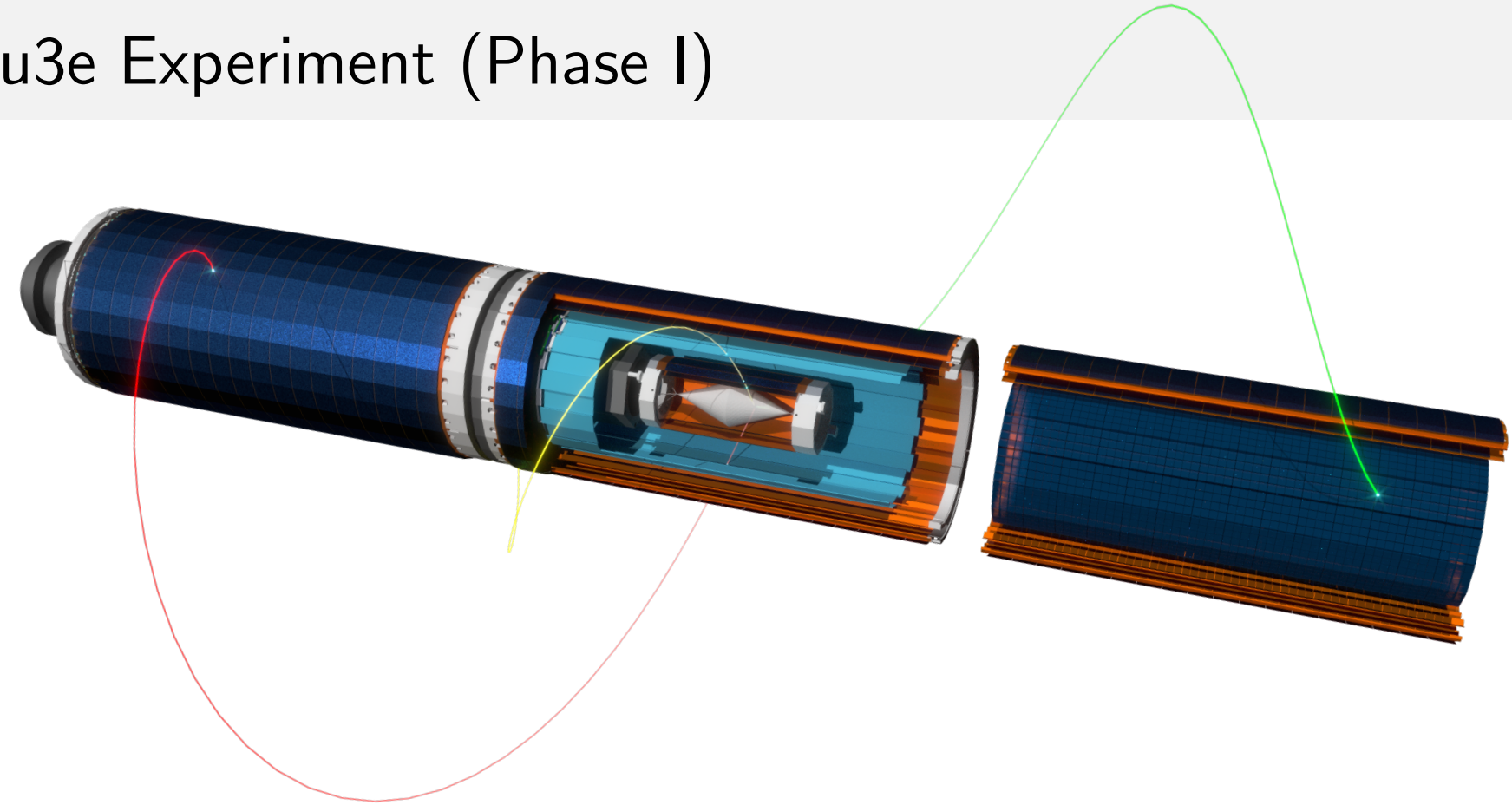
September 28, 2018

BEYOND STANDARD MODEL

UNIVERSITÄT HEIDELBERG ZUKUNFT SEIT 1386

Nikhef NWO

Mu3e Experiment (Phase I)

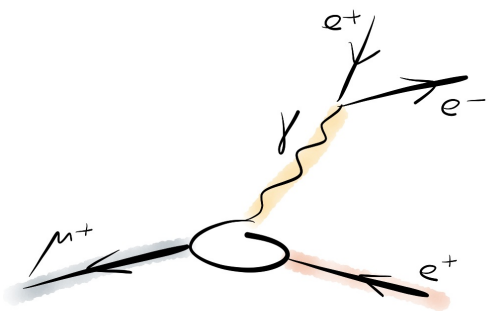


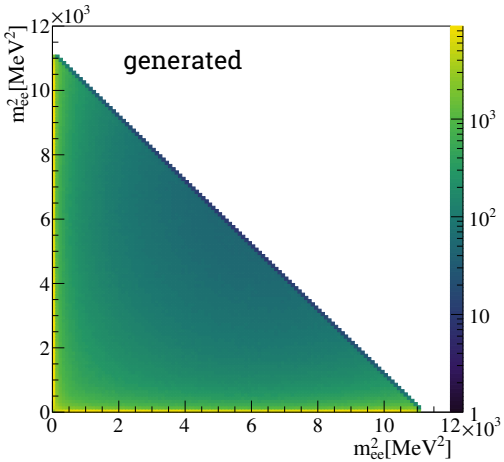
- Background-free search for $\mu \to eee$
- Observe some 10^{15} muon decays
- Precise tracking of e^+/e^- and large acceptance

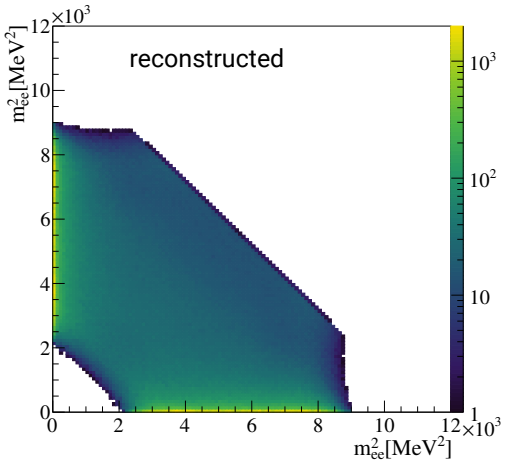
... more details in A. Bravar's talk

$\mu \to eee$ in Effective Theories

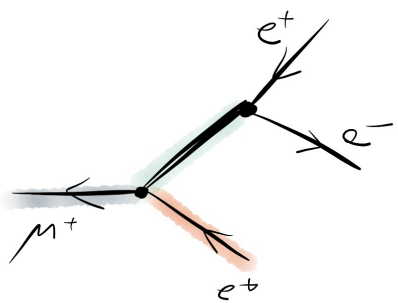
- Dipole operator: $\epsilon = 11\,\%$ $\Rightarrow$ BR $\geq 8.5 \cdot 10^{-15}$ at 90 % CL

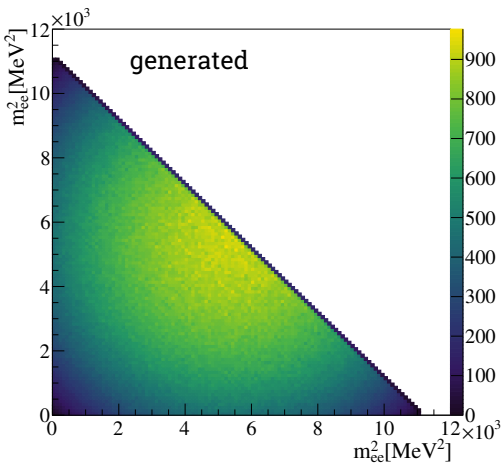


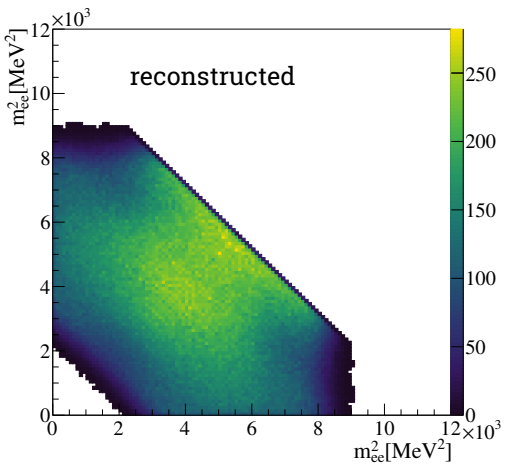




- Vector operator: $\epsilon = 17\,\%$ $\Rightarrow$ BR $\geq 4.6 \cdot 10^{-15}$ at 90 % CL

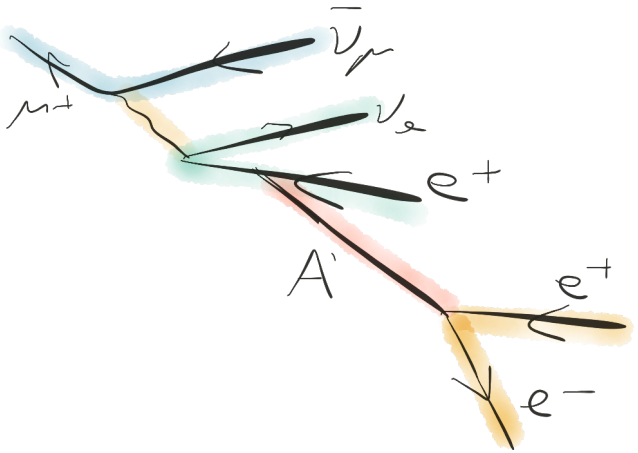


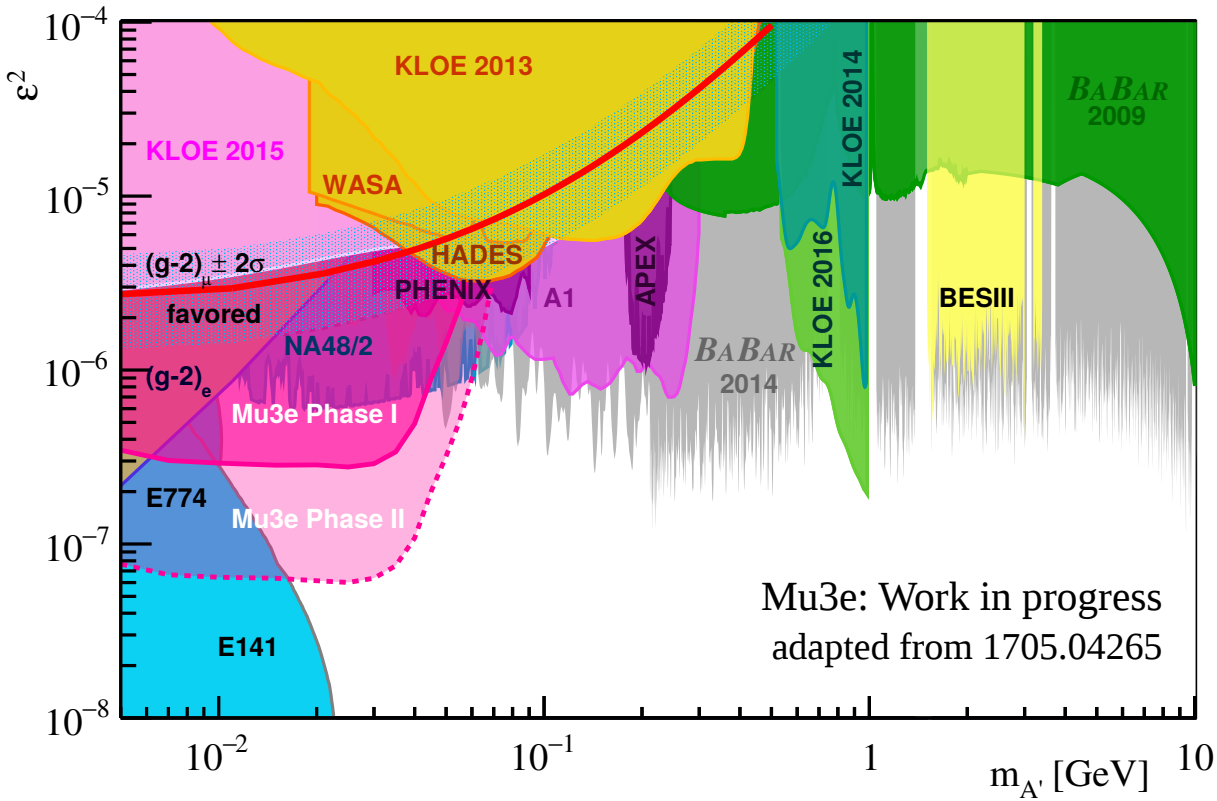




Dark Photon Searches

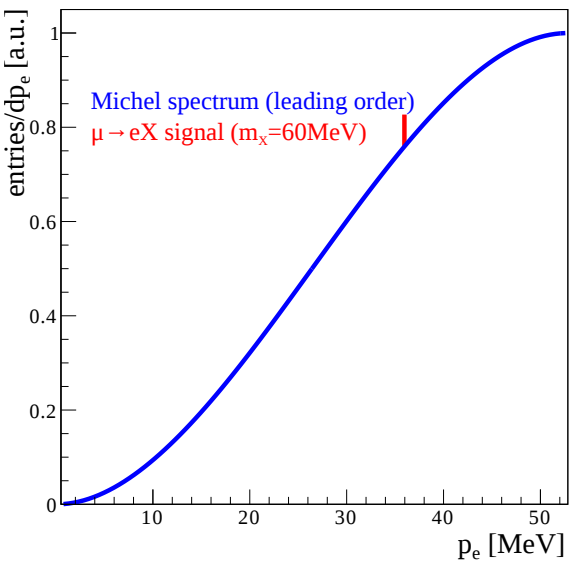
- e^+e^- resonances in $\mu \to eee\nu\nu$
- Same data set as for $\mu \to eee$ searches

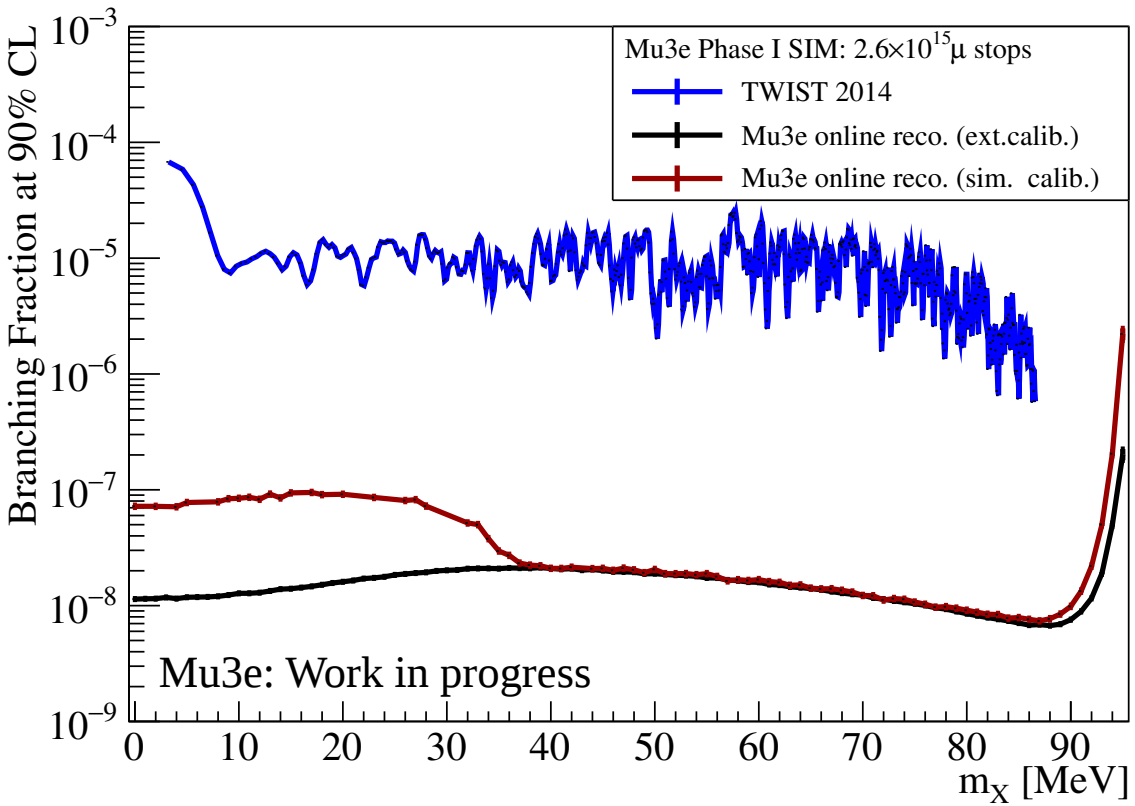




Familon Searches

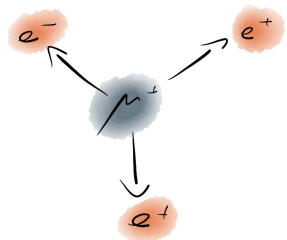
$\mu \to e X$: narrow peak on p_e spectrum



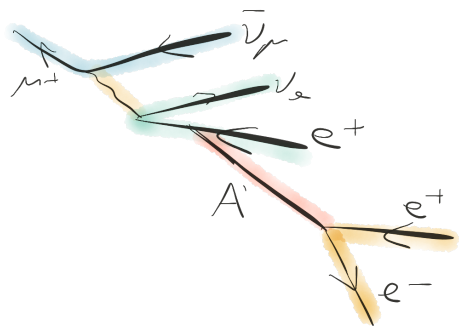


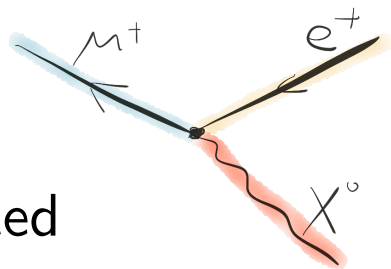
BSM Searches with Mu3e

- Characteristic decay distributions of $\mu \to eee$ can reveal type of BSM interaction (... in case of discovery)



- Can search for more than $\mu \to eee$
  - Dark photons in $\mu \to eee\nu\nu$
  - Familons in $\mu \to eX$





⇒ Significant improvements in all these channels expected


m3e