BSM physics at IsoDAR

Gwyneth Allwright, Andre de Gouvea, Patrick Huber, Yoni Kahn,
Nick Rodd, Mark Ross-Lonergan, Yotam Soreq, Jesse Thaler

Producing new states is hard

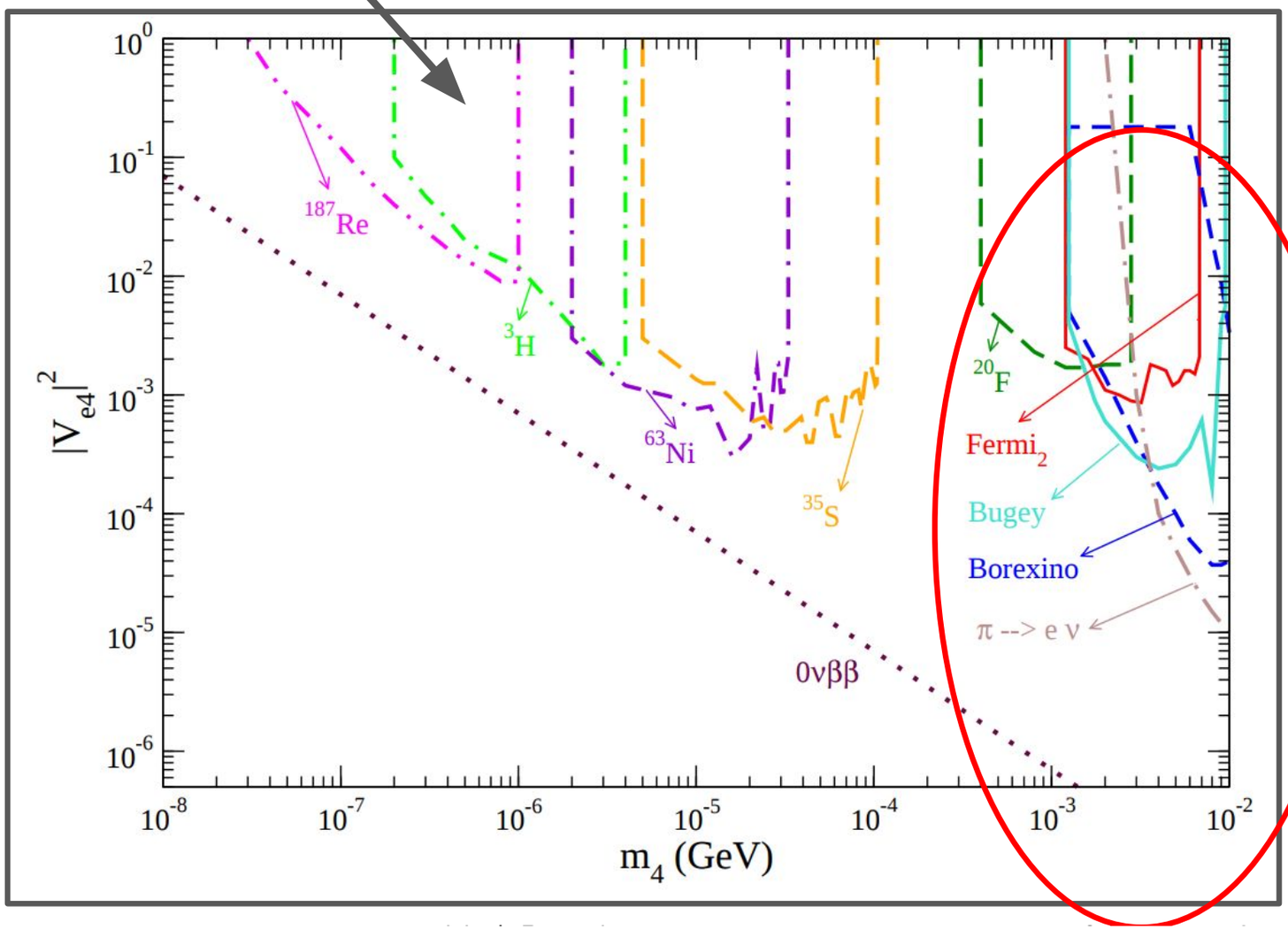
- 60 MeV protons are nonrelativistic
- No mesons produced
- Photons ~< 1 MeV
- Neutrons are thermal, can't produce any excited nuclear states

Standard ideas (beam dump, Atomki, etc) are difficult below pion threshold

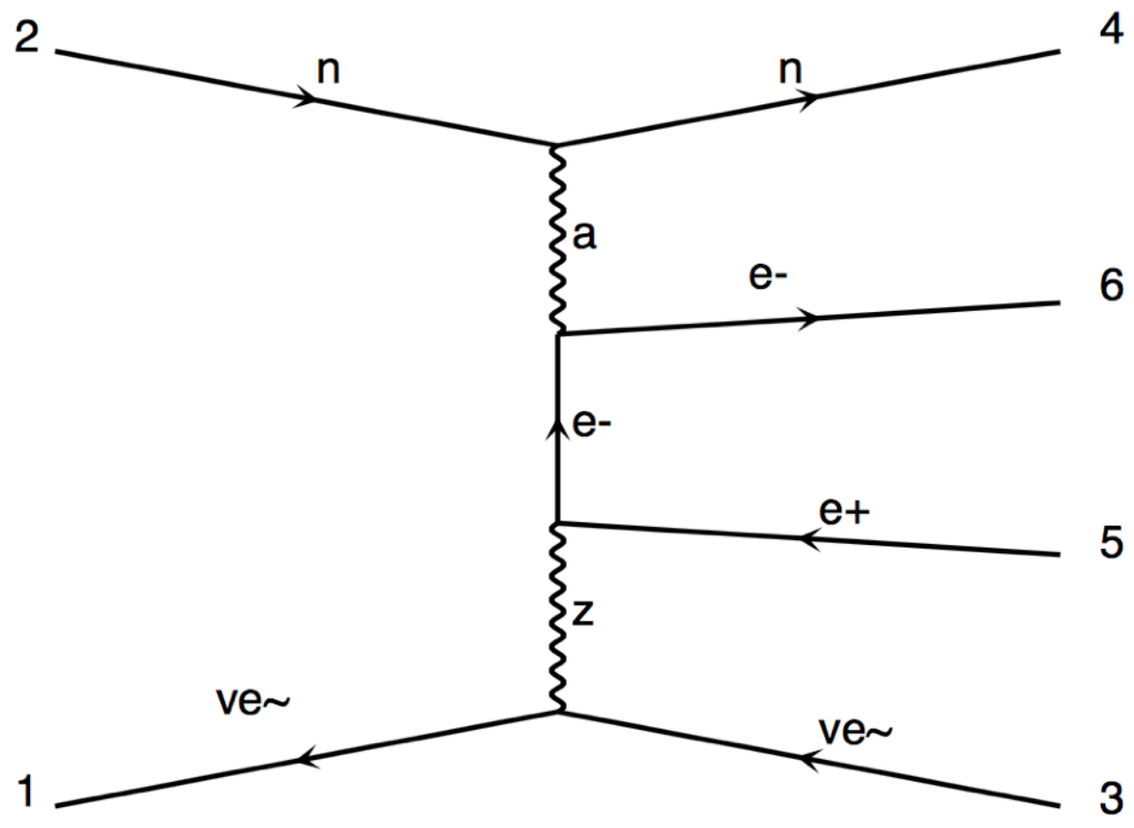
Idea #1: MeV sterile neutrinos

Most beta-decay experiments are much lower energy, therefore lower mass sterile probed

IsoDAR doesn't have access to the beta spectrum of Li^8, but could look for direct products of the sterile decays in the 1MeV->10 MeV region



Idea #2: electron trident production



(1406.2332)

Replace Z by Z': if IsoDAR can measure SM cross section, BSM cross section can be an order of magnitude larger

Idea #3: Neutrons shining through walls

$$\mathcal{L} \supset \frac{1}{\Lambda^2} u^c d^c d^c \chi$$

- New RH fermion with B = +1, mass mixing with neutron
- Must decay before BBN but live long enough to make it to detector; plenty of room in parameter space
- Signal is downstream decay in detector (ordinary beta decay)
- Could be related to asymmetric dark matter (1401.7664,1507.08295)

IsoDARk?