

# Feasibility studies of Dark Photon searches with the J-PET detector

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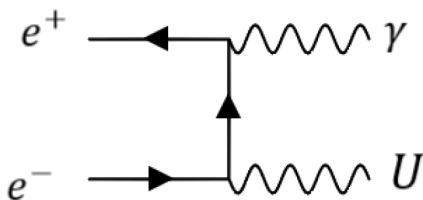
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# U boson

The U boson is a hypothetical particle proposed as a possible carrier of interaction forces between known particles and dark matter particles.

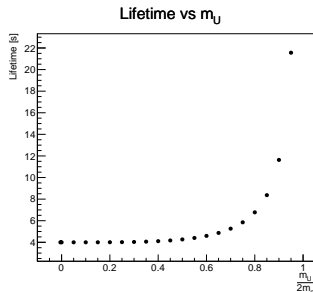
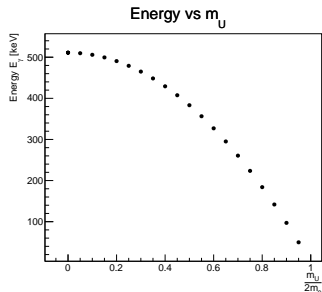
The U boson can be produced in positronium decays.

[P. Fayet and M. Mezard, Phys. Lett. 104B (1981) 3]



**Rysunek:** Diagrams showing a possible pathway for the production of the U boson in the annihilation of  $e^+e^- \rightarrow \gamma U$ .

# U boson in orthopositronium decay

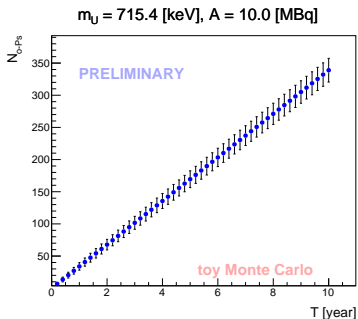
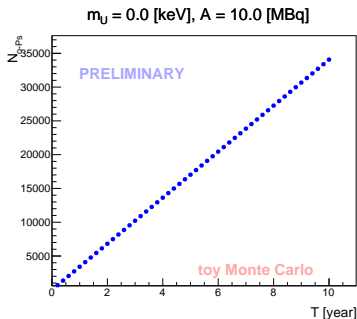


The energy of the photon emitted in the decay of  $o - Ps \rightarrow \gamma U$  (left) and the average lifetime of  $o - Ps \rightarrow \gamma U$  (right).

Average lifetime of o-Ps in vacuum: 142 ns

# Expected number of registered cases $o - Ps \rightarrow U\gamma$

$$N_{o-Ps \rightarrow U\gamma}(m_U) = \frac{dN}{dt} \cdot BR(m_U) \cdot T \cdot \varepsilon(m_U)$$



Rysunek: Number of decays  $o-Ps \rightarrow U\gamma$  during observation time  $T$ .