An update on the hypothetical X17 particle

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Observation of Anomalous Internal Pair Creation in $^8$Be: A Possible Indication of a Light, Neutral Boson


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Electron-positron angular correlations were measured for the isovector magnetic dipole 17.6 MeV ($J^p = 1^+, T = 1$) state $\rightarrow$ ground state ($J^p = 0^+, T = 0$) and the isoscalar magnetic dipole 18.15 MeV ($J^p = 1^+, T = 0$) state $\rightarrow$ ground state transitions in $^8$Be. Significant enhancement relative to the internal pair creation was observed at large angles in the angular correlation for the isoscalar transition with a confidence level of > 5$\sigma$. This observation could possibly be due to nuclear reaction interference effects or might indicate that, in an intermediate step, a neutral isoscalar particle with a mass of $16.70 \pm 0.35$(stat) $\pm 0.5$(syst) MeV/c$^2$ and $J^p = 1^+$ was created.

The ATOMKI anomaly $\rightarrow$ signals for a new 17 MeV boson $\rightarrow$ gauge boson of a new fundamental force of nature
A New Particle is Being Born in ATOMKI that Could Make a Connection to Dark Matter

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feature article

A New Particle is Being Born in ATOMKI that Could Make a Connection to Dark Matter
Study of the $^8$Be M1 transitions

Excitation with the $^7$Li(p,γ)$^8$Be reaction

$^8$Be

$^8$Be

Ep = 1030 keV
Ep = 441 keV
$\text{e}^+\text{-e}^-\text{ energy-sum spectra and angular correlations}$

$^{8}\text{Be}$

$E_p=1.04\text{ MeV}$

$E_p=1.10\text{ MeV}$

Angular correlations measured from the decay of the $E_x=18.2\text{ MeV}$ resonance
Kinematical evidence for the X17 particle

Vector character of X17 is supported

Ejected with $L=1$ in $^8$Be

Previous experimental results

Consistent result with a new spectrometer
The following facts give us confidence about the reliability of the experimental results:

• Good agreement between the experimental and simulated acceptances,
• Good agreement between experimental and simulated IPCC values for $^{16}$O, $^{28}$Si, $^{8}$Be 17.6 MeV and 15.1 MeV transitions for large angular ranges,
• Consistent experimental results with 6, 5, and 2 telescopes,
• Good agreement between experimental and simulated IPCC values for asymmetric energy distributions of the $e^+e^-$ pairs,
Observation of the X17 anomaly in the decay of the Giant Dipole Resonance

Giant $E1$ resonances in $^8\text{Be}$ from the reaction $^7\text{Li}(p,\gamma)^8\text{Be}_1$

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(Received 21 January 1976)

TRK sum rule

$$\int_{E_1}^{E_3} \sigma(E) dE = \frac{60}{A} \frac{N \langle Z \rangle}{A} \text{MeV} \text{mb}$$
A new $e^+e^-$ spectrometer, their acceptance, $\gamma$-ray and energy-sum spectra
$e^+e^-$ angular correlations for the low-energy region, and for the GDR one
Fitting the $e^+e^-$ angular correlation for the GDR region
Thank you very much for your kind attention
To be continued...
Simulation for the X17 decay created in the $^7\text{Li}(p,\gamma)^8\text{Be}$ reaction at different proton bombarding energies ($\gamma_1$ transition)
γ-ray and $e^+e^-$ energy-sum spectra recorded at $E_p = 4$ MeV