

## Neutrinoless double electron capture stimulated by X-rays

The possibility of exposure of electromagnetic radiation on the nuclear processes is considered on an example of a neutrinoless double-electron capture –  $0\nu 2e$ . Expected lifetimes of the  $0\nu 2e$  capture are several orders of magnitude longer than those of the  $0\nu 2\beta$ -decay that strongly retards development of experiments, requiring many tons of the bulk target matter. Hence, any way of acceleration of the  $0\nu 2e$  would be of great interest. For cases of X-ray free electron lasers – X-ray FEL and/or inverse Compton X-ray sources it is shown that such a decay can be significantly enhanced due to tuning the system to the resonant conditions through an absorption and/or emission of a photon with the decay resonance defect energy  $\Delta$ . In this case the  $0\nu 2e$  decay rate  $\Gamma_{2eX}$  of nuclide  $Z$  grows linearly with field intensity –  $S/S_z$  – up to the X-ray flux power  $S_m \sim Z^6$ , while  $S_z \sim Z^6 (\Gamma/\Delta)^2$  with decay width  $\Gamma$  of a daughter atom. For a case of  $78\text{Kr} \rightarrow 78\text{Se} - 0\nu 2e$  capture we find  $S_z \sim 108.5 \text{ W cm}^{-2}$  and  $S_m \sim 1017.5 \text{ W cm}^{-2}$  which indicate a possibility of increasing decay rate to ten orders of magnitude or even larger.

### Section

Neutrino physics and nuclear astrophysics

**Primary author:** KONDRATYEV, Vladimir (BLTP JINR)

**Co-author:** Prof. KARPESHIN, F.

**Presenter:** KONDRATYEV, Vladimir (BLTP JINR)

**Session Classification:** Poster session