



Contribution ID: 23

Type: Parallel Flash talk

## Radiative decays of charged leptons as constraints of leptonic unitarity

Friday, February 19, 2021 11:40 AM (5 minutes)

We calculate the rates of radiative  $\beta^- \rightarrow \alpha^- + \gamma$  decays for  $(\alpha, \beta) = (e, \mu), (e, \tau)$  and  $(\mu, \tau)$  by taking the {it unitary} gauge in the  $(3 + n)$  active-sterile neutrino mixing scheme, and make it clear that constraints on the unitarity of the  $3 \times 3$  Pontecorvo-Maki-Nakagawa-Sakata (PMNS) matrix  $U$  extracted from  $\beta^- \rightarrow \alpha^- + \gamma$  decays in the {it minimal unitarity violation} scheme differ from those obtained in the canonical seesaw mechanism with  $n$  heavy Majorana neutrinos by a factor  $5/3$ . In such a natural seesaw case we show that the rates of  $\beta^- \rightarrow \alpha^- + \gamma$  can be used to cleanly and strongly constrain the effective apex of a unitarity polygon, and compare its geometry with the geometry of its three sub-triangles formed by two vectors  $U_{\alpha i} U_{\beta i}^*$  and  $U_{\alpha j} U_{\beta j}^*$  (for  $i \neq j$ ) in the complex plane. We find that the areas of such sub-triangles can be described in terms of the Jarlskog-like invariants of CP violation  $\text{cal} J_{\alpha\beta}^{ij}$ , and their small differences signify slight unitarity violation of the PMNS matrix  $U$ .

### Collaboration name

**Primary authors:** ZHANG, Di (Institute of High Energy Physics, CAS); Prof. XING, Zhi-zhong

**Presenter:** ZHANG, Di (Institute of High Energy Physics, CAS)

**Session Classification:** Non Standard Interactions

**Track Classification:** Neutrino Theory and Cosmology