

# Monte Carlo studies of $\eta \rightarrow 4\pi^0$ CP symmetry violating decay with WASA-at-COSY detector.

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In the Standard Model CP symmetry violation is described by the phase in the Cabibbo-Kobayashi-Maskawa quark-mixing matrix. Six quark flavours are grouped into three families. In the SM it is assumed that CP violation is related only to family-changing interactions. Therefore, studies of the family-conserving CP violation may lead us to New Physics that goes beyond the Standard Model. Such studies may be carried out with  $\eta$  meson decays into even number of pions [1].

The aim of presented investigation is to estimate the time of measurement for which the current branching ratio limit of  $\eta \rightarrow 4\pi^0 \rightarrow 8\gamma$  decay can be improved by means of the WASA-at-COSY detector. In order to estimate the time of measurement Monte Carlo simulations were performed and the responses of the WASA-at-COSY detector were simulated. Studies of the reaction with many gamma quanta in the exit channel required investigations of WASA-at-COSY calorimeter functioning. Tests of a cluster building algorithm with emphasis on merging and splitting of detected signals were done [2]. The result achieved will be presented.

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[1] B. M. K. Nefkens and J. W. Price, Phys. Scripta T99 (2002) 114 [arXiv:nuclex/0202008].

[2] T. Bednarski, *Feasibility study of measuring CP symmetry violation via  $\eta \rightarrow 4\pi$  decay using WASA-at-COSY detector*, Diploma Thesis, Jagiellonian University, Cracow, 2011 arXiv:1111.5240 [hep-ex].

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