

## Contribution submission to the conference Heidelberg 2022

### **Search for light pseudoscalar boson pairs produced from decays of the 125 GeV Higgs boson in final states with tau leptons — ●LAKSHMI PRAMOD — DESY**

An extended Higgs sector is well-motivated in several Beyond the Standard Model theories. A vast set of models containing two Higgs doublets plus one additional Higgs singlet complex field (2HD+1S) are consistent with SM measurements, constraints from searches for additional Higgs bosons and supersymmetry, as well as with the measured properties of the H(125) boson. The Higgs sector of the 2HD+1S models contains seven physical states: three CP-even, two CP-odd and two charged bosons. In the context of these models, the H(125) boson can decay into a pair of light pseudoscalar bosons ( $a_1$ ), which can subsequently decay to pairs of Standard Model particles. There exist scenarios where  $a_1$  can have an enhanced decay rate to a pair of  $\tau$  leptons. A search for a pair of light bosons,  $a_1$ , produced from decays of 125 GeV Higgs boson, each decaying to a pair of  $\tau$  leptons will be presented. The search is based on proton-proton collision data collected by the CMS experiment during Run 2 at a centre of mass energy of 13 TeV, corresponding to an integrated luminosity of  $138 \text{ fb}^{-1}$ . Model-independent upper limits at 95% confidence level on the 125 GeV Higgs boson production cross-section times the branching fraction into the studied final state, relative to the SM H(125) production cross-section, are set. Model-specific upper bounds obtained as constraints on the parameter space of the different benchmark scenarios within the 2HDM+S will also be presented.

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