



Analysis Overview:

$$X \rightarrow Sh \rightarrow \gamma\gamma + 1/2L$$

Kaili Zhang, on behalf of ANA-HDBS-2021-23 team

IHEP

26/09/2022

- Int note: CDS:2779977
- Glance
- EB talk
 - First EB meeting in Feb. 2nd.
 - Second EB meeting in Sep. 26th
- EB committee:
- [D'ERAMO, Louis \(Northern Illinois\)](#)
- [MAZINI, Rachid \(Taipei AS\)](#)
- [SCHAARSCHMIDT, Jana \(Seattle Washington\)](#)



ATLAS Note
ANA-HDBS-2021-23-INT1
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Search for $X \rightarrow SH$ model in the final states of two photons and multiple leptons using 139 fb^{-1} of proton-proton collision data at $\sqrt{s} = 13 \text{ TeV}$ recorded with the ATLAS detector at the LHC

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This note presents a search for a new heavy scalar particle X decaying into a Standard Model Higgs boson and a singlet scalar particle S using 139 fb^{-1} of proton-proton collision data at the centre-of-mass energy of 13 TeV recorded with the ATLAS detector at LHC. The explored X mass range varies from 300 GeV to 1000 GeV , with the corresponding S mass range being from 170 GeV to 500 GeV . This search uses the event signature of two photons from the Higgs boson decay and one or two leptons (e or μ) coming from the process of $S \rightarrow WW/ZZ$. The observed (expected) upper limits at the 95% confidence level on the cross-section for $gg \rightarrow X \rightarrow Sh$ assuming the decay of S following the SM prediction is between $X \text{ fb}$ (167 fb) and $Y \text{ fb}$ (710 fb).

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Action Items from 2nd EB: all done.

- 20 mass points
 - SS tests
 - NP
 - Ranking, plots
 - Toy Limits
- Check different sideband data event threshold impact
- 2-D interpolation
- the comments from Jana on CDS are all replied.

Missing item:

- Theoretic uncertainty
 - Single Higgs
 - HH
 - SH