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## Novel broad-mass search for new scalar particles in FCNC top quark decays using the full Run 2 data of the ATLAS detector

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No analysis in ATLAS or CMS has so far searched for FCNC decays of top quarks into a new scalar ( $X$ ) in a broad mass range probing branching ratios below  $10^{-3}$ . In the case of the Higgs boson, branching ratios  $t \rightarrow H + u/c$  are predicted within the SM to be of about  $O(10^{-17})/O(10^{-15})$ . Several beyond-SM theoretical models predict new particles and enhanced branching ratios. In particular, simple SM extensions involve the Froggatt-Nielsen mechanism, which introduces a scalar field with flavour charge, the so-called flavon, featuring flavour violating interactions. Using the full Run 2 data, ATLAS has performed a search for a scalar of a mass in the range between 20 and 160 GeV and decaying into a pair of bottom quarks. In order to distinguish signal from background, a feed-forward neural network that uses kinematic variables together with various invariant masses of pairs of  $b$ -jets is used in the fits for the various mass hypotheses. The method, strategy and preliminary results for both FCNC decays  $t \rightarrow cX$  and  $t \rightarrow uX$  will be presented.

### In-person participation

Yes

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**Session Classification:** Poster Session

**Track Classification:** Beyond the Standard Model