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A Search for Lepton-Flavour-Violating $Z \rightarrow \tau \tau$ and $Z \rightarrow \mu \tau$ Decays with the ATLAS Experiment

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In the Standard Model (SM), lepton flavour is conserved in all interactions. Hence, any observation of lepton flavour violation (LFV) would be an unambiguous sign of physics beyond the SM (BSM), and LFV processes are predicted by numerous BSM models.

One way to search for LFV is in the decay of gauge bosons.

In the search presented here, the decay of the Z boson to an electron-tau or muon-tau pair is investigated using the full Run 2 pp collision data set at \sqrt{s} of 13 TeV recorded by the ATLAS experiment at the LHC.

The analysis exploits tau decays into hadrons and - for the first time in this channel in ATLAS - into leptons.

A key ingredient of the search is the usage of a neural net to differentiate between signal and background events in order to make optimum use of the data.

Combined with about 8 billion Z decays recorded by ATLAS in Run 2 of the LHC, the strongest constraints to date are set with $\text{Br}(Z \rightarrow \tau \tau) < 5.0 \times 10^{-6}$ and $\text{Br}(Z \rightarrow \mu \tau) < 6.5 \times 10^{-6}$ at 95% confidence level

- finally superseding the limits set by the LEP experiments more than two decades ago.

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