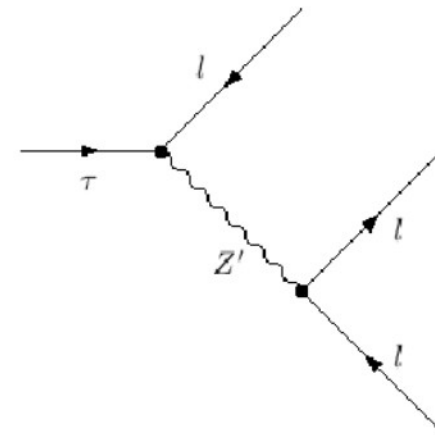


# CLFV

- Coupling vertex with charged leptons of different flavour.
- Search for Charged LFV “of” taus and “with” taus by ATLAS and CMS.
- Charged LFV “of” taus.
- Searches focusing on  $\tau \rightarrow 3\mu$  search



Results	$\tau \rightarrow 3\mu$ 90% CL Limits
ATLAS Eur. Phys. J. C (2016) 76:232	$3.76 \times 10^{-7}$ ( $W \rightarrow \tau\nu$ , 8 TeV)
CMS JHEP 01 (2021) 163	$8.0 \times 10^{-8}$ ( $W \rightarrow \tau\nu$ and hadrons, 13 TeV)

# HL-LHC Projections

- ATLAS Projections for HL-LHC
- Ref: [ATL-PHYS-PUB-2018-032](#)

$W \rightarrow \tau\nu$

Scenario	$\mathcal{A} \times \epsilon$ [%]	$N_{\text{bkg}}^{\text{exp}}$	90% CL UL on BR( $\tau \rightarrow 3\mu$ ) [ $10^{-9}$ ]
Run 1 result	2.31	0.19	276
Non-improved	2.31	50.71	13.52
Intermediate	5.01	50.71	6.23
Improved	5.01	40.06	5.36

Increased acceptance (trigger, reco)  
Better S/B separation

## Hadrons

Scenario	$\mathcal{A} \times \epsilon$ [%]	$N_{\text{bkg}}^{\text{exp}}$	90% CL UL on BR( $\tau \rightarrow 3\mu$ ) [ $10^{-9}$ ]
High background	0.88	507.05	6.40
Medium background	0.88	152.12	2.31
Low background	0.88	50.71	1.03

- Charged LFV “with” taus, decays of heavy resonances.
  - My personal selection, more searches are performed at LHC.

13 TeV Results	$H \rightarrow \mu\tau$ 95% CL Limits	$H \rightarrow e\tau$ 95% CL Limits	$Z \rightarrow \mu\tau$ 95% CL Limits	$Z \rightarrow e\tau$ 95% CL Limits
ATLAS	0.28% (36 fb <sup>-1</sup> , <a href="#">link</a> )	0.47% (36 fb <sup>-1</sup> , <a href="#">link</a> )	$6.5 \times 10^{-6}$ (137 fb <sup>-1</sup> , <a href="#">link</a> )	$5.0 \times 10^{-6}$ (137 fb <sup>-1</sup> , <a href="#">link</a> )
CMS	0.15% (137 fb <sup>-1</sup> , <a href="#">link</a> )	0.22% (137 fb <sup>-1</sup> , <a href="#">link</a> )	-	-

- No recent projections on these searches → Good candidates for Snowmass document!