The maximum and minimum values of flavor-changing neutral currents (FCNC) are studied based on the effective approach of our approach. The allowed regions of the $tqZ$ couplings are within $|f_{tqZ}^{1/2}| \lesssim 10^{-3}$ and $|f_{tqZ}^{1/2}| \lesssim 10^{-2}$.

- The allowed regions of $tqZ$ couplings are within $|f_{tqZ}^{1/2}| \lesssim 10^{-3}$ and $|f_{tqZ}^{1/2}| \lesssim 10^{-2}$.
- The $tqZ$ couplings are more strongly restricted than the $tcZ$ couplings.
- Both the real and imaginary parts of $f_{tcZ}^{1/2}$ and $f_{tcZ}^{1/2}$ in each of the $tqZ$ and $tcZ$ couplings have the same minimum and maximum limits, respectively.
- The allowed regions are expected to be narrowed by about 30% if the assumed branch fractions are realized at the HL-LHC with 3000fb$^{-1}$ luminosity.

### References
- Z. Hioki, K. Ohkuma and A. Uejima, Work in progress

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