

Limits on the anomalous $HZ\gamma$ vertex arising from the process $e^+e^- \rightarrow \tau^+\tau^-\gamma$

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We study the sensitivity for testing the anomalous triple coupling $HZ\gamma$ via the process $e^+e^- \rightarrow \tau^+\tau^-\gamma$ at high energy linear colliders. Using as an input the data obtained by the L3 Collaboration for the reaction $e^+e^- \rightarrow \tau^+\tau^-\gamma$, we get limits on the anomalous $HZ\gamma$ vertex of the order 10^{-2} , which are better by an order of magnitude than the bounds obtained from the known limits on the partial decay widths of the Z boson, but still an order of magnitude above the SM prediction.

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1. Results and Conclusions

The sensitivity to the $HZ\gamma$ vertex has been studied in processes like $e^-\gamma \rightarrow e^-H$ and $e^+e^- \rightarrow H\gamma$, rare Z and H decays, pp collisions via the basic interaction $qq \rightarrow qqH$ and the annihilation process $e^+e^- \rightarrow HZ$. It has been found that the latter reaction with polarized beams may lead to the best sensitivity to the $HZ\gamma$ vertex while an anomalous $HZ\gamma$ may enhance partial Higgs decays widths by several orders of magnitude that would lead to measurable effects in Higgs signals at the LHC.

The general aim of the present paper is to obtain limits on the $HZ\gamma$ vertex coming from the reaction $e^+e^- \rightarrow \tau^+\tau^-\gamma$ [2]. The limits on $h_1^{Z\gamma}$ and $h_2^{Z\gamma}$ for several values of M_H are included in Table 1. While we plot the total cross section in Fig. 1 as a function of the Higgs boson mass M_H .

M_H	$h_1^{Z\gamma}$	$h_2^{Z\gamma}$
115 GeV	[-0.042, 0.042]	[-0.045, 0.045]
130 GeV	[-0.047, 0.047]	[-0.081, 0.081]
150 GeV	[-0.14, 0.14]	[-0.25, 0.25]
190 GeV	[-0.37, 0.37]	[-0.742, 0.742]

Table 1: Sensitivities achievable at the 95% C.L. for the $h_{1,2}^{Z\gamma}$ vertices in the process $e^+e^- \rightarrow \tau^+\tau^-\gamma$ with a luminosity of 100 pb^{-1} . We have applied the cuts used by L3 for the photon angle and energy [1].

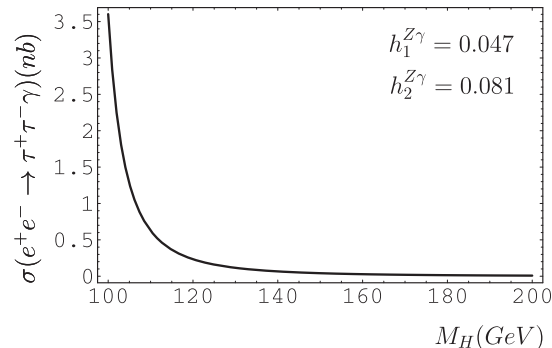


Figure 1: Cross-section of the process $e^+e^- \rightarrow \tau^+\tau^-\gamma$ as a function of M_H with $h_1^{Z\gamma} = 0.047$ and $h_2^{Z\gamma} = 0.081$.

In conclusion, we study the sensitivity for the anomalous triple coupling $HZ\gamma$ via the process $e^+e^- \rightarrow \tau^+\tau^-\gamma$ at high energy physics linear colliders. We get limits on the anomalous $HZ\gamma$ vertex of the order 10^{-2} , which are better by an order of magnitude than the bounds obtained from the known limits on the partial decay widths of the Z boson, but still an order of magnitude above the SM prediction.

References

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