Contribution ID: **32** Type: **not specified**

# Effect of magnetic fields on $B^{-}\to l^{-}\bar{\nu}_{l}$ in two-Higgs doublet model

In this paper, we have studied $B^{-}\to l^{-}\bar{\nu}_{l}$ decay in the presence of magnetic field in two-Higgs doublet model (2HDM). The decay rate of the process is calculated both in the presence of magnetic field and in the absence of magnetic field in standard model (SM) and 2HDM. In the SM, the leptonic decay of charged B meson $B^{-}(p)\to l^{-}(k)\bar{}_{l}(q)$ [1,2] originate from charged-current interactions due to $W^{-}$ exchange between quark and lepton currents. Whereas, in the 2HDM, this is due to $H^{-}$ exchange between quark and lepton currents. Here, $l^{-}$ is charged lepton ($l = e, ,$ ) and$\bar{}_{l}$ is the corresponding neutrino. The *p*,*k* and *q* denote the momenta to the B meson, the lepton and the antineutrino respectively. We have found that the ratio of muonic and tau leptonic decay rate is independent of the magnetic field in both the SM and 2HDM, for $eB$ $m^{2}$, $(B)_{B\to\bar{}}/(B)_{B\to\bar{}} = (m^{2})/(m^{2})$ $3.6\times10^{-3}$. In the absence of magnetic fields, $(0)_{B\to\bar{}}/(0)_{B\to\bar{}}$ $4.5\times10^{-3}$. The ratio of decay rates of the decays $B\to\bar{}$ and $B\to\bar{}$ in the presence of magnetic fields is reduced by 20% than that in the absence of magnetic fields both in SM and 2HDM. The tau leptonic decay becomes more dominant than muonic decay at B both in SM and 2HDM. Further, it is found that ${}_{2HDM}(B=0) > {}_{SM}(B=0)$ and ${}_{2HDM}(B)/{}_{2HDM}(0) < {}_{SM}(B)/{}_{SM}(0)$.

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