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Search for the Standard Model Higgs boson in final states with photons or taus at the Tevatron

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Although the sensitivity to a low mass Standard Model Higgs boson at the Fermilab Tevatron is highest for channels
involving the $H \to b\bar{b}$ decay, other channels contribute significantly to the combined Higgs search. We report the results of searches for the Higgs boson in the diphoton final state using up to 8.5~fb^{-1} of integrated luminosity collected by the CDF and D0 detectors at $\sqrt{s} = 1.96$ TeV. Both gluon fusion and associated production processes are exploited. Whilst the branching ratio to the diphoton final state is small in the Standard Model, this channel contributes appreciably to the overall Higgs sensitivity at the Tevatron. Combined limits from the Tevatron experiment for this channel are presented and the result of these searches are also interpreted in fermiophobic models where the diphoton branching ratio is considerably larger. In addition we present the results of searches in final states with two taus and two jets. These final states are sensitive to a combination of associated production, gluon-gluon fusion and vector boson fusion production processes and further enhance the sensitivity to the Standard Model Higgs boson.

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