

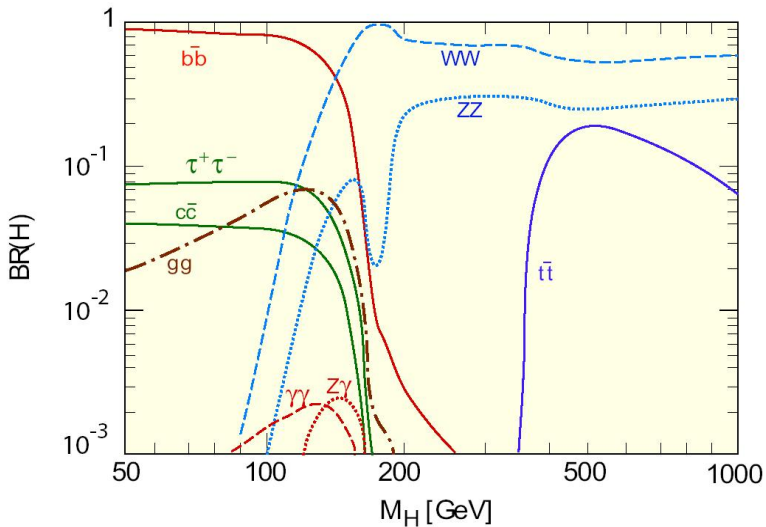
Rare Hadronic Decays of Higgs

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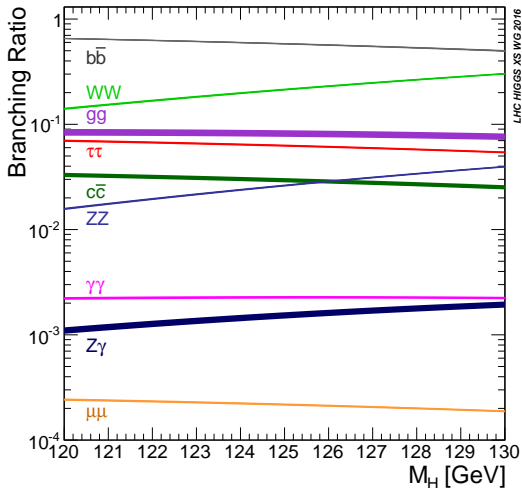
Branching Fractions of Higgs in SM

Before 125 GeV Scalar Discovery



Branching Fractions of Higgs in SM

After 125 GeV Scalar Discovery with identification 125 GeV Scalar = SM Higgs



Branching Fractions in SM

$$\frac{\text{BR}_{h \rightarrow \phi \gamma}}{\text{BR}_{h \rightarrow b \bar{b}}} = \frac{\kappa_\gamma [(3.0 \pm 0.13)\kappa_\gamma - 0.78R_s] \cdot 10^{-6}}{0.57R_b^2},$$

$$\frac{\text{BR}_{h \rightarrow \rho \gamma}}{\text{BR}_{h \rightarrow b \bar{b}}} = \frac{\kappa_\gamma [(1.9 \pm 0.15)\kappa_\gamma - 0.24R_u - 0.12R_d] \cdot 10^{-5}}{0.57R_b^2},$$

$$\frac{\text{BR}_{h \rightarrow \omega \gamma}}{\text{BR}_{h \rightarrow b \bar{b}}} = \frac{\kappa_\gamma [(1.6 \pm 0.17)\kappa_\gamma - 0.59R_u - 0.29R_d] \cdot 10^{-6}}{0.57R_b^2},$$

State	m_{V_i} [GeV]	f_{V_i} [MeV]	$\mathcal{B}(h \rightarrow ZV_i)$	$\Delta[d\Gamma(h \rightarrow Z\ell\ell)/dm_{34}]$ [1 GeV bin]
$J/\psi(1S)$	3.10	405	1.7×10^{-6}	2.6%
$J/\psi(2S)$	3.69	290	8.6×10^{-7}	0.2%
$\Upsilon(1S)$	9.46	680	1.6×10^{-5}	3.1%
$\Upsilon(2S)$	10.02	485	8.2×10^{-6}	1.2%
$\Upsilon(3S)$	10.36	420	6.2×10^{-6}	0.9%

Table 1: List of narrow $c\bar{c}$ and $b\bar{b}$ narrow resonances giving rise to sizable modifications of the $d\Gamma(h \rightarrow Z\ell\ell)/dq^2$ spectrum. In the last column we report the relative modification of the spectrum assuming the following m_{34} bin: $[m_{V_i} - \Delta/2, m_{V_i} + \Delta/2]$, with $\Delta = 1$ GeV.

$$\text{BR}_{\text{SM}}(H \rightarrow J/\psi \gamma) = (2.46_{-0.25}^{+0.26}) \times 10^{-6},$$

$$\text{BR}_{\text{SM}}(H \rightarrow \Upsilon(1S) \gamma) = (1.41_{-1.14}^{+2.03}) \times 10^{-8}.$$

Search for Higgs and Z Boson Decays to $J/\psi\gamma$ and $\Upsilon(nS)\gamma$ with the ATLAS Detector

The ATLAS Collaboration

Abstract

A search for the decays of the Higgs and Z bosons to $J/\psi\gamma$ and $\Upsilon(nS)\gamma$ ($n = 1, 2, 3$) is performed with pp collision data samples corresponding to integrated luminosities of up to 20.3 fb^{-1} collected at $\sqrt{s} = 8 \text{ TeV}$ with the ATLAS detector at the CERN Large Hadron Collider. No significant excess of events is observed above expected backgrounds and 95% CL upper limits are placed on the branching fractions. In the $J/\psi\gamma$ final state the limits are 1.5×10^{-3} and 2.6×10^{-6} for the Higgs and Z boson decays, respectively, while in the $\Upsilon(1S, 2S, 3S)\gamma$ final states the limits are $(1.3, 1.9, 1.3) \times 10^{-3}$ and $(3.4, 6.5, 5.4) \times 10^{-6}$, respectively.

Figure: Phys.Rev.Lett. 114 (2015) no.12, 121801, arXiv:1501.03276 [hep-ex]

Gracias