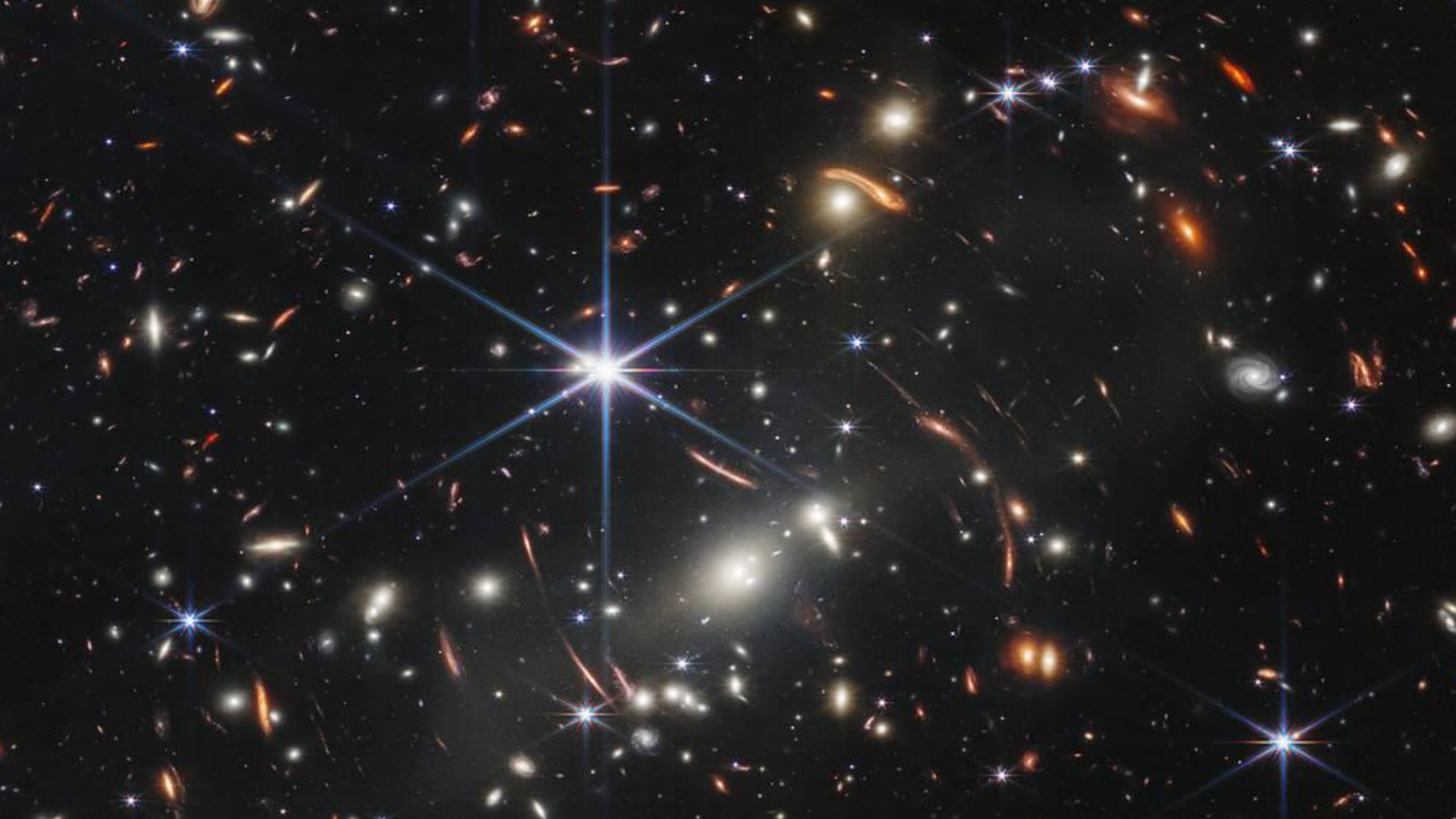
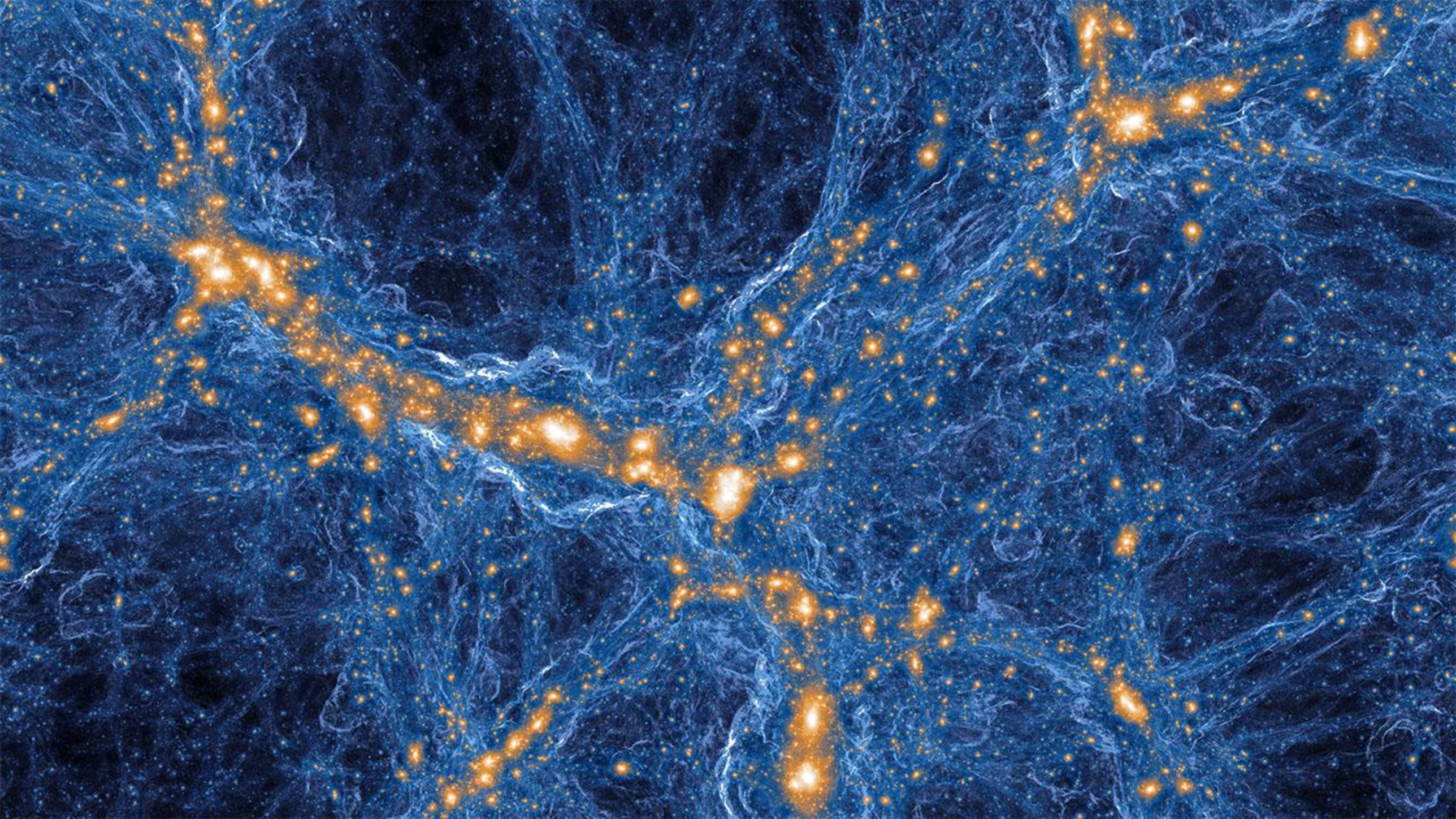
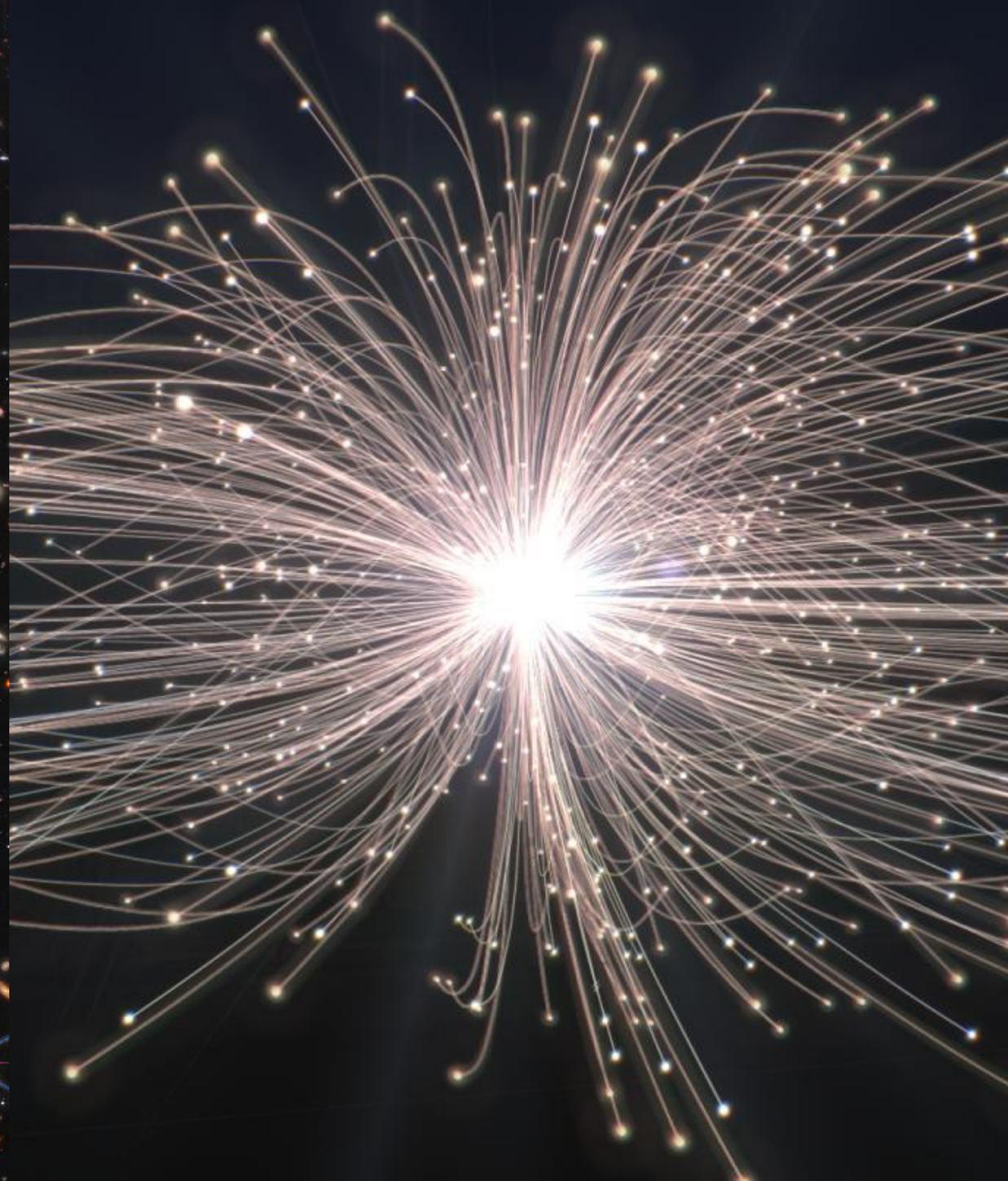
The Dark Side of Particle Physics

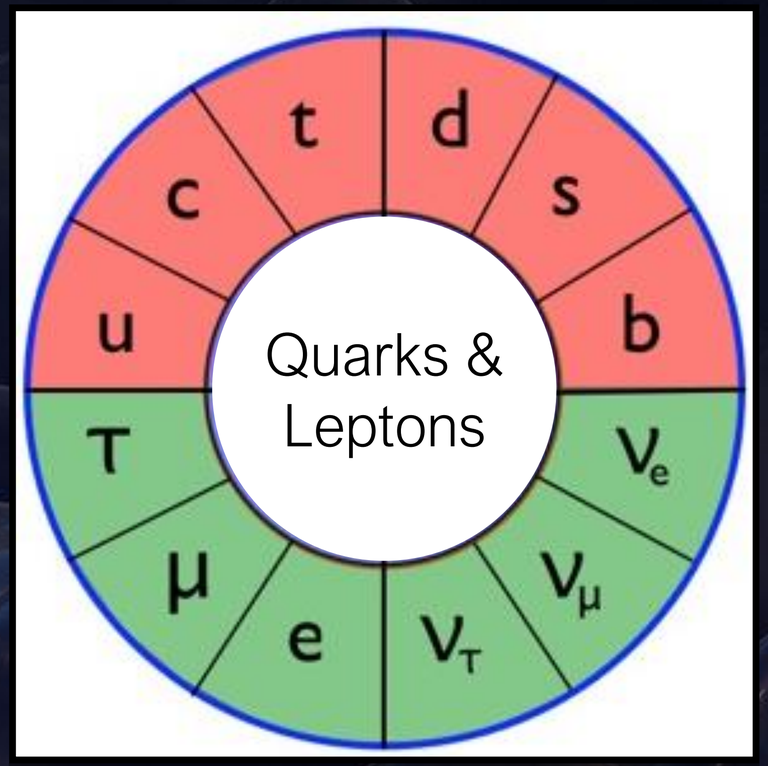
Monica Dunford, Heidelberg University

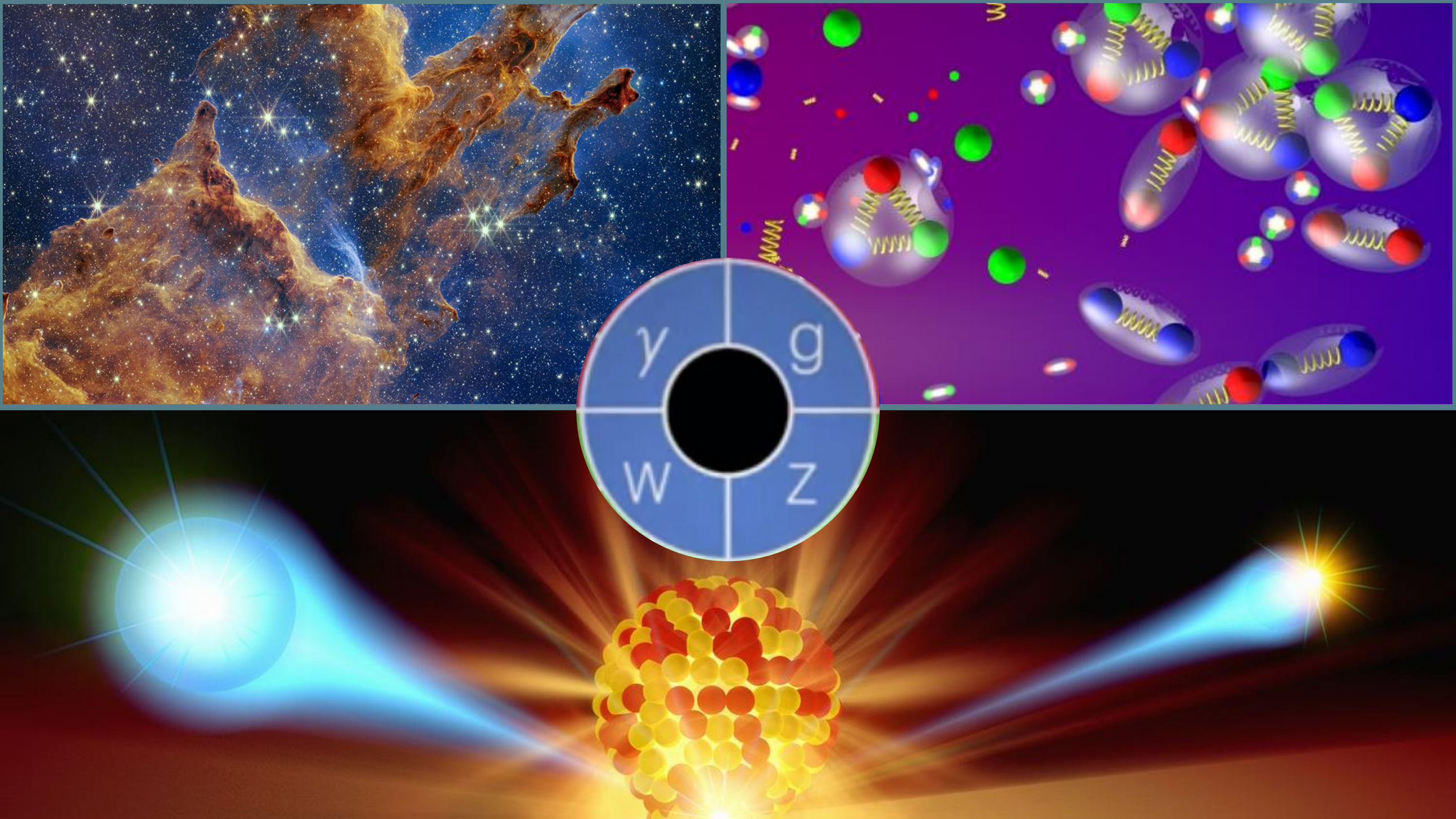


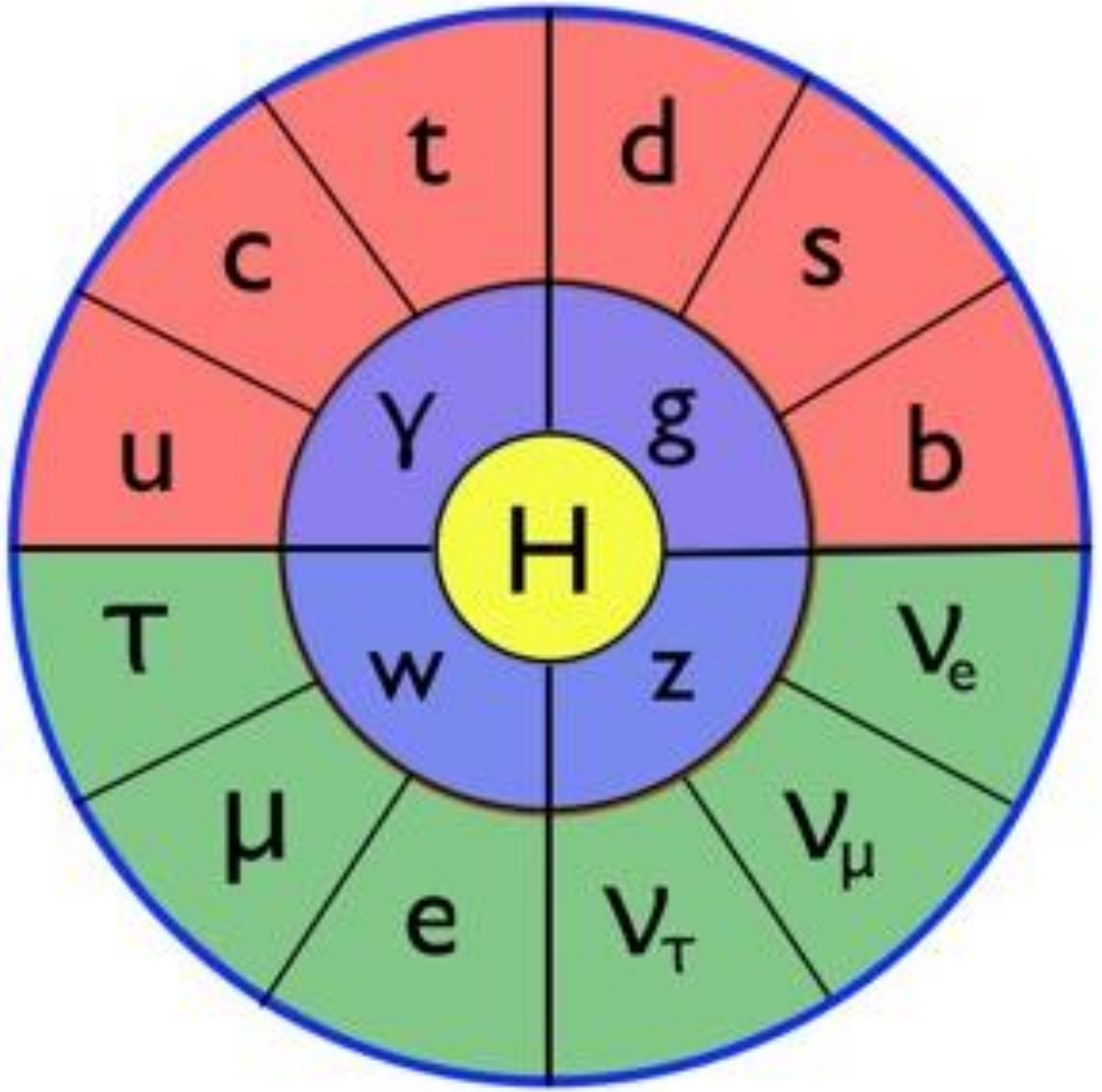




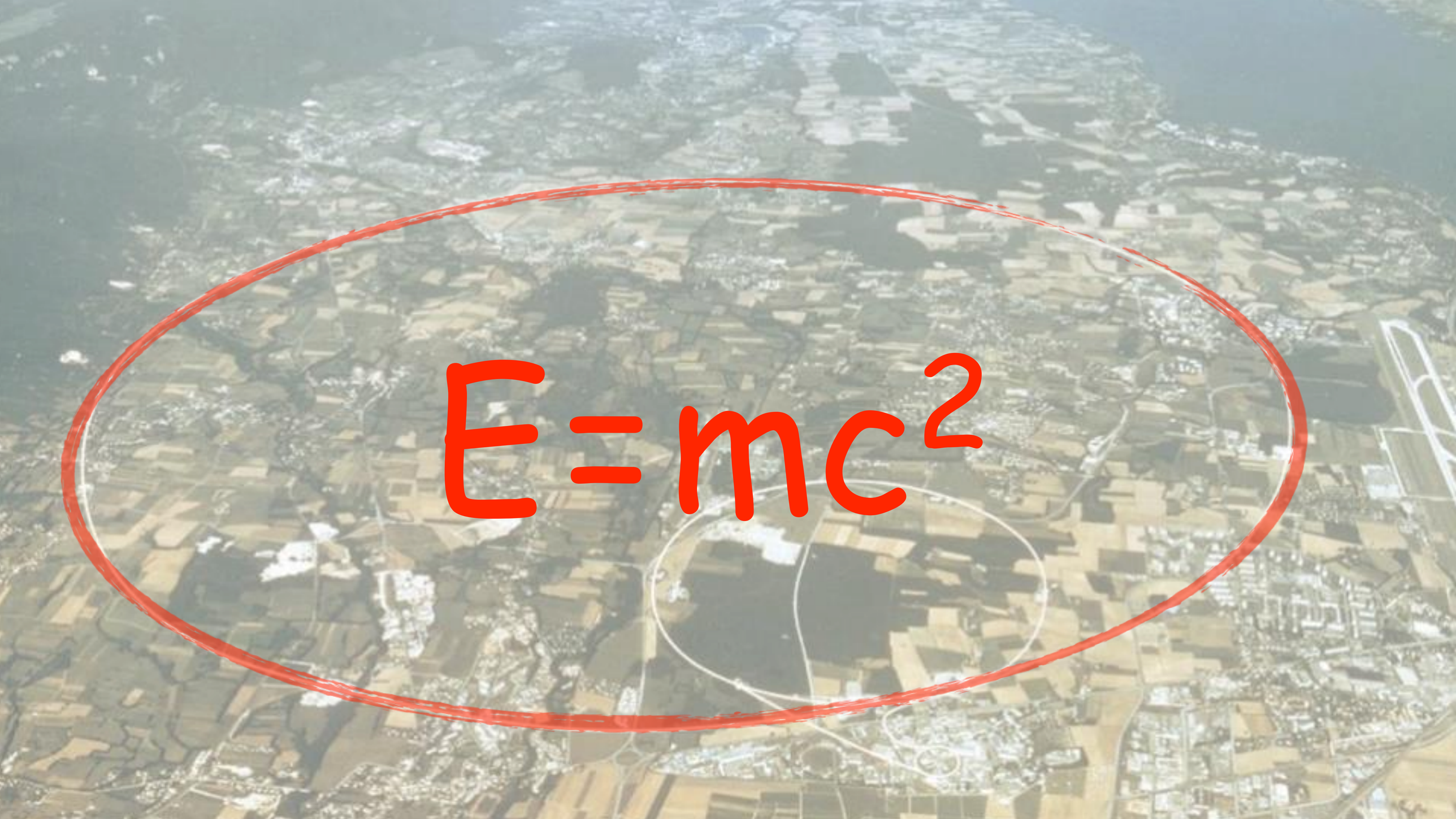
Hydrogen Atom

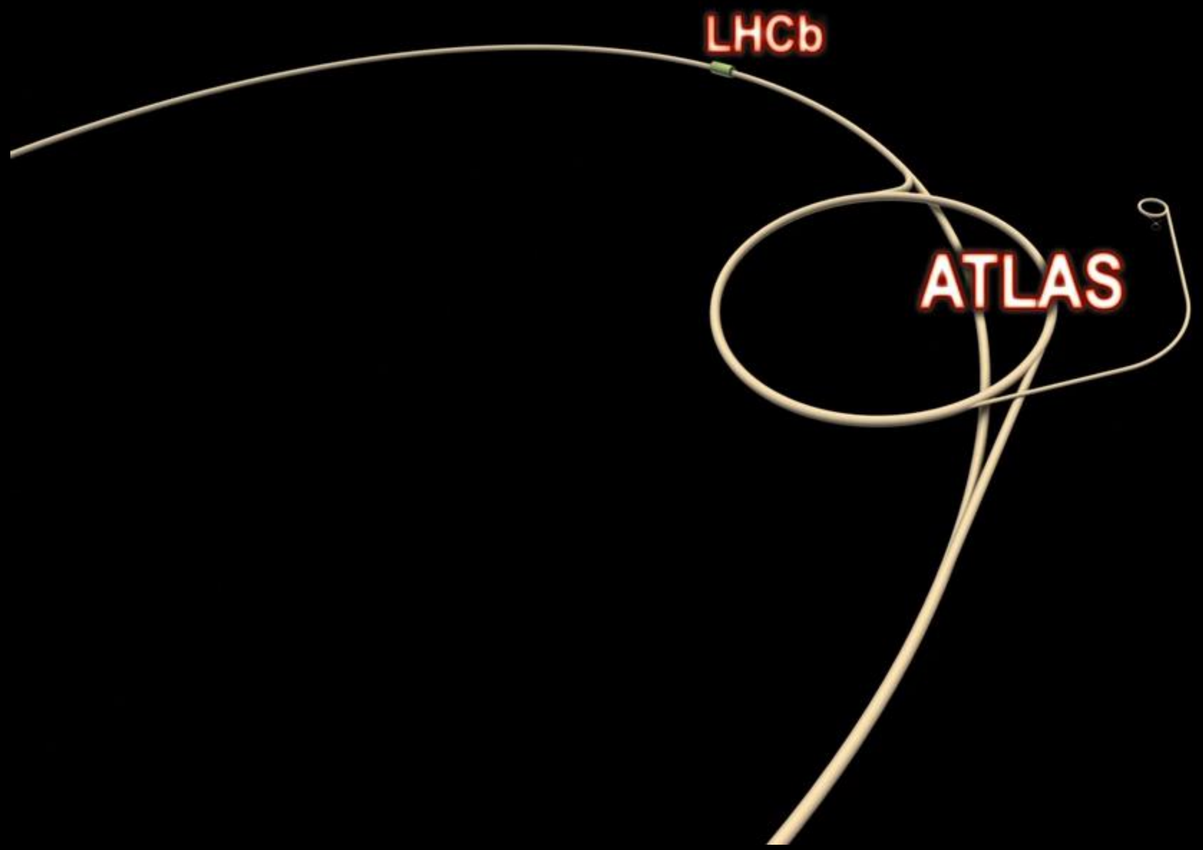



γ
g
W
Z


t
d
c
s
u
b
γ
g
H
τ
ν_e
w
z
μ
ν_μ
e
ν_τ


CMS
LHC
LHCb
ALICE
ATLAS


$E=mc^2$


LHCb
ATLAS

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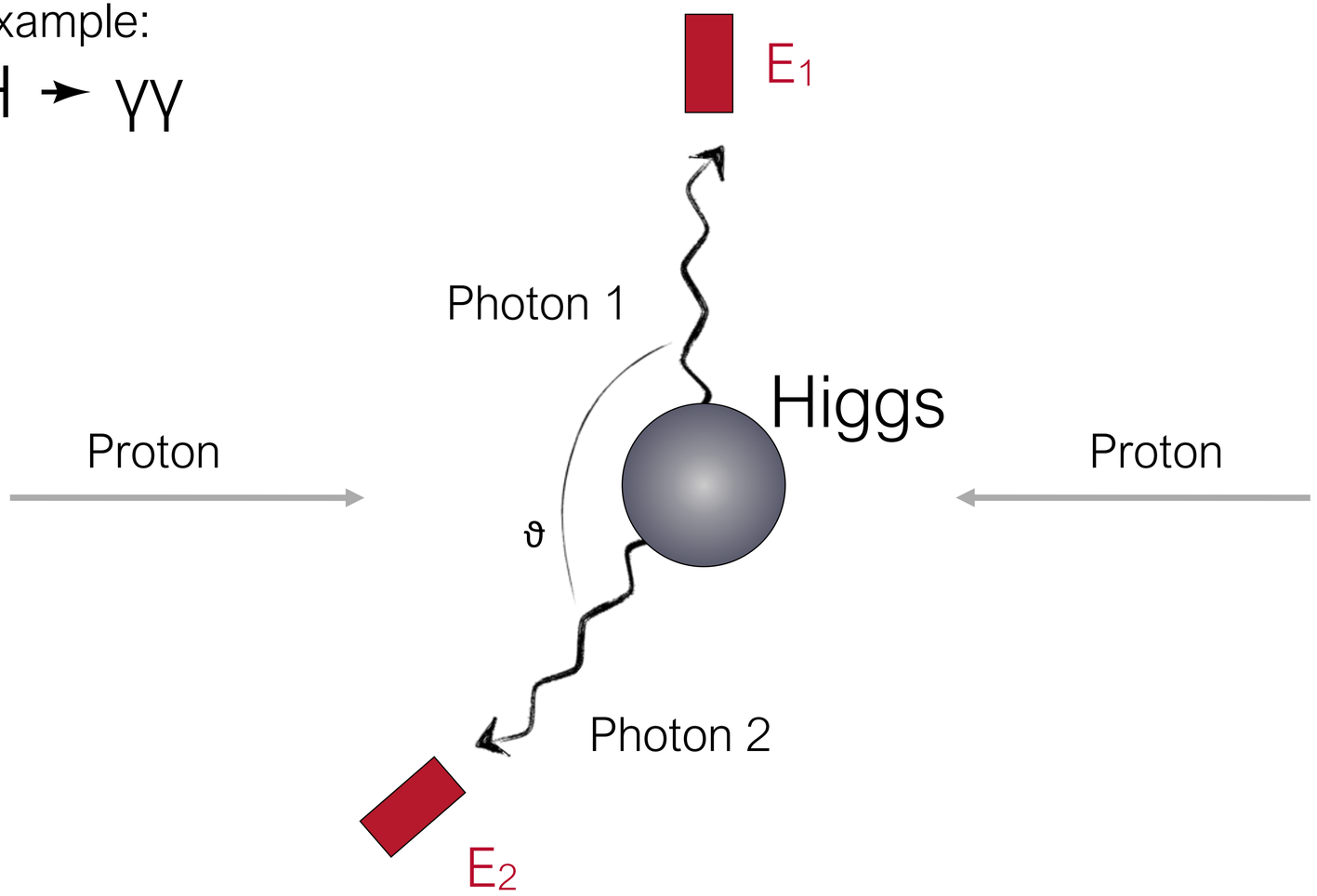
PARTICLE**FEVER**

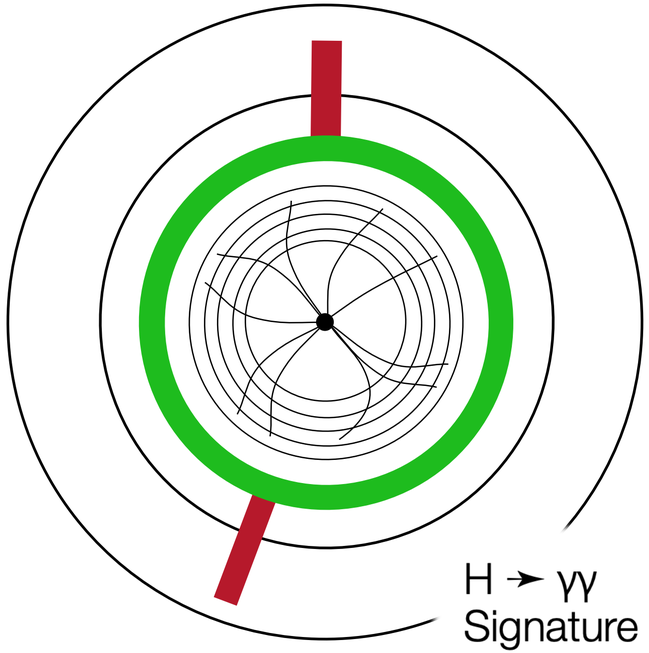
WITH ONE SWITCH, EVERYTHING CHANGES

Higgs Discovery

Example:

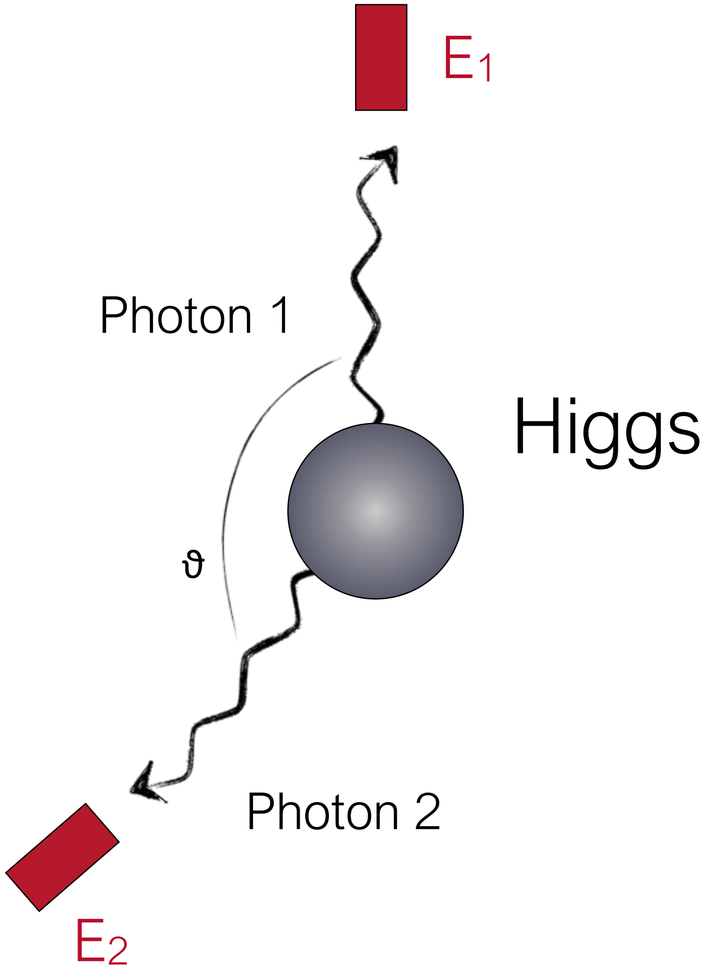
$H \rightarrow \gamma\gamma$

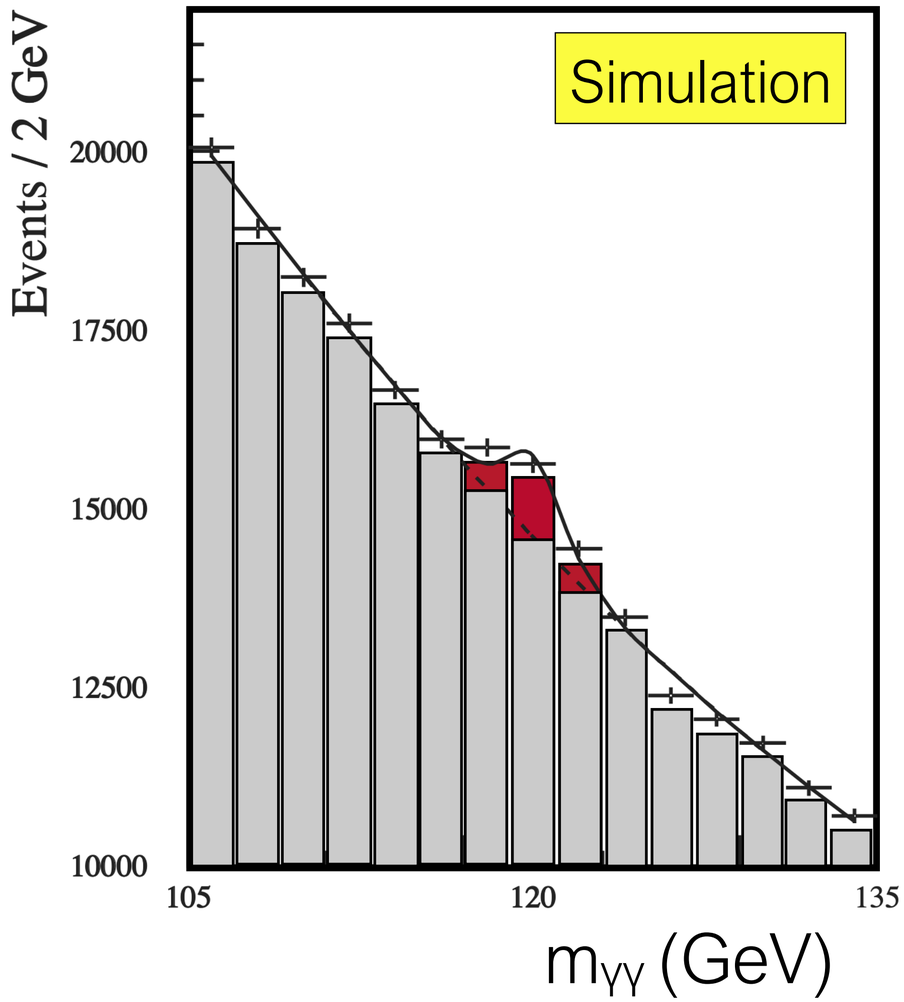


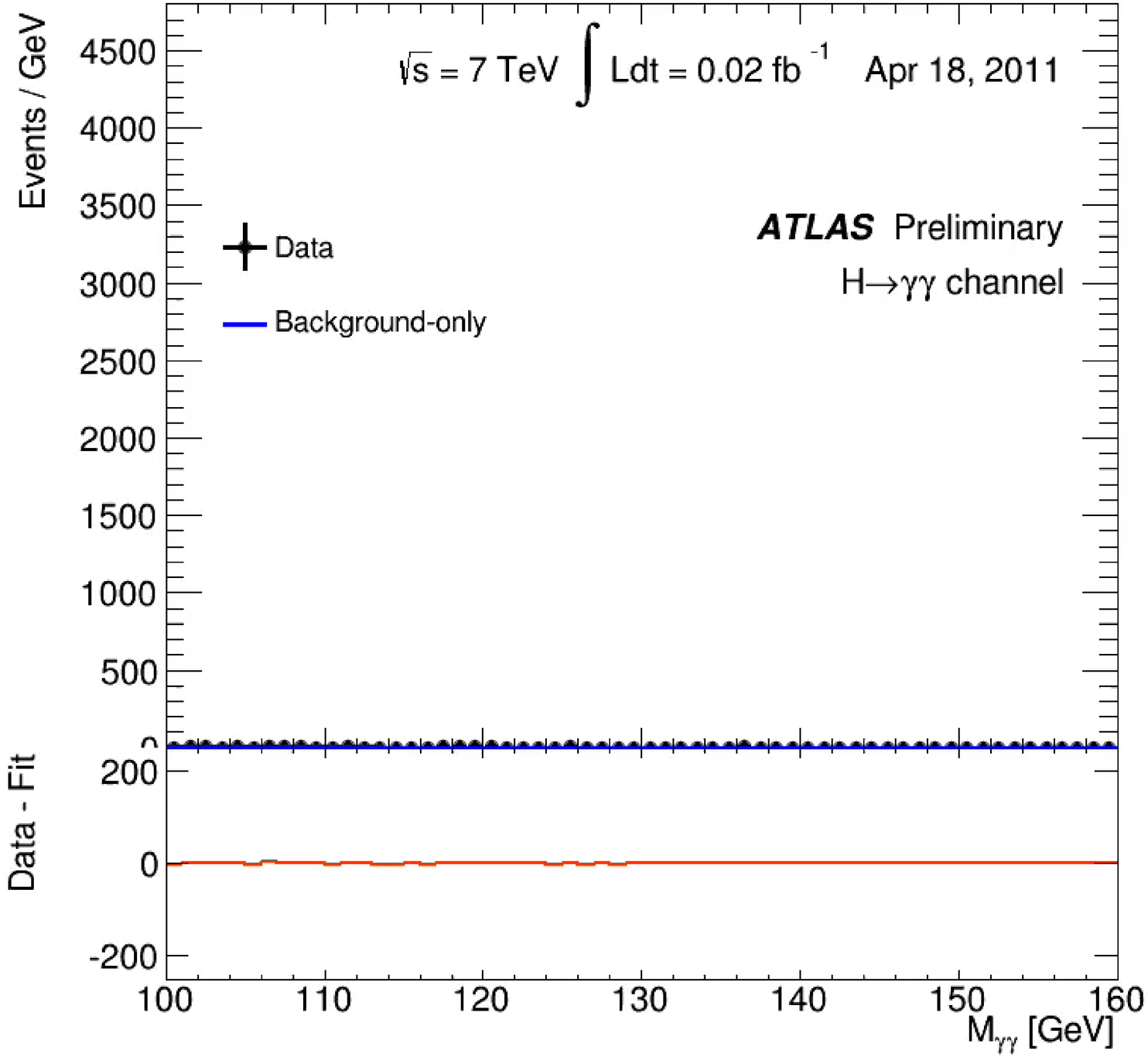


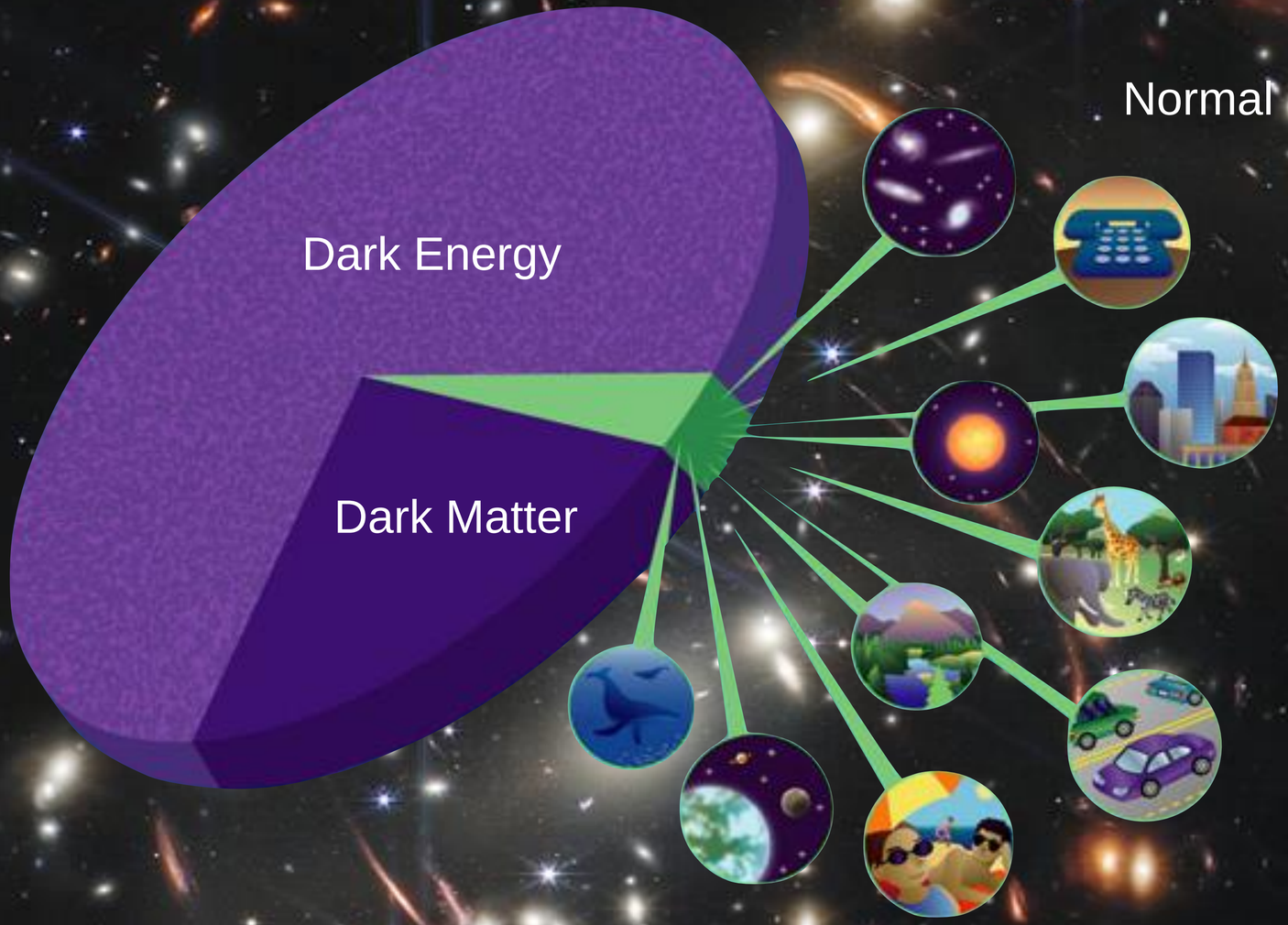
Invariant Mass:

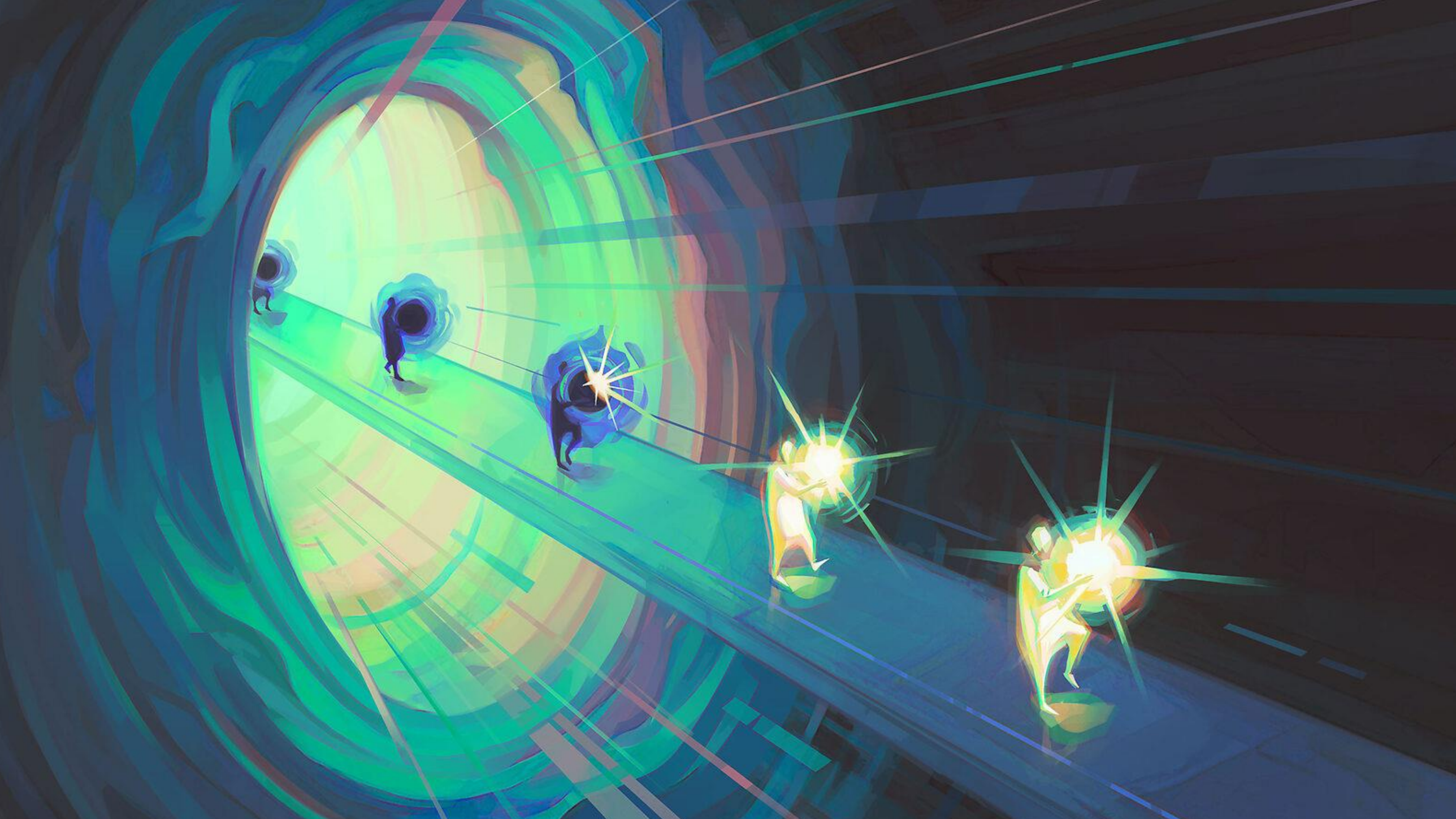
$$m_{\gamma\gamma}^2 = 2E_1E_2\,(1-\cos\vartheta)$$


E1
Photon 1
Higgs
ϑ
Photon 2
E2

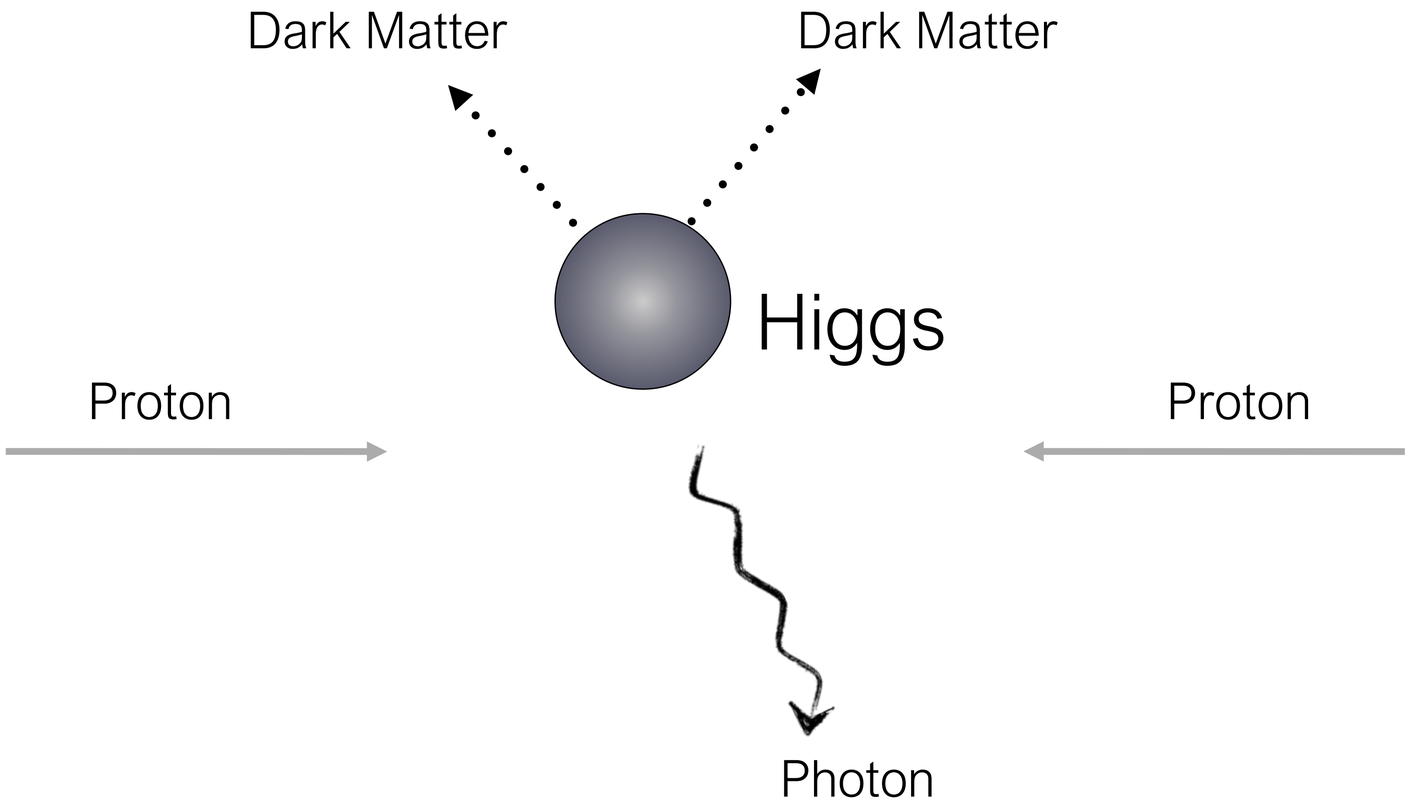

Simulation
Events / 2 GeV
20000
17500
15000
12500
10000
105
120
135
mγγ (GeV)

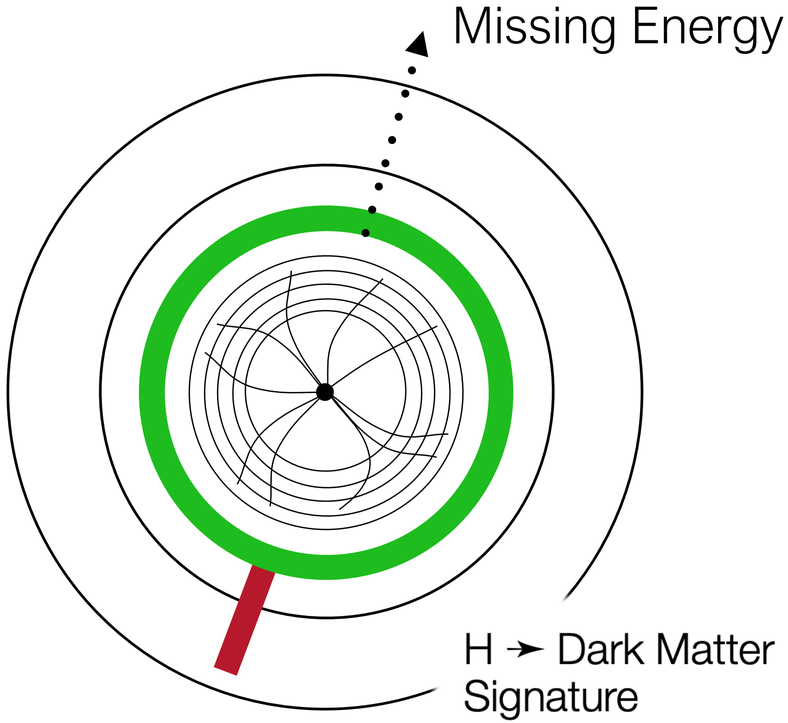

√s = 7 TeV ∫ Ldt = 0.02 fb -1 Apr 18, 2011
ATLAS Preliminary
H→γγ channel
Data
Background-only
Events / GeV
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Data - Fit
200
0
-200
100
110
120
130
140
150
160
Mγγ [GeV]


Dark Energy
Dark Matter
Normal Matter



Connecting to Dark Matter

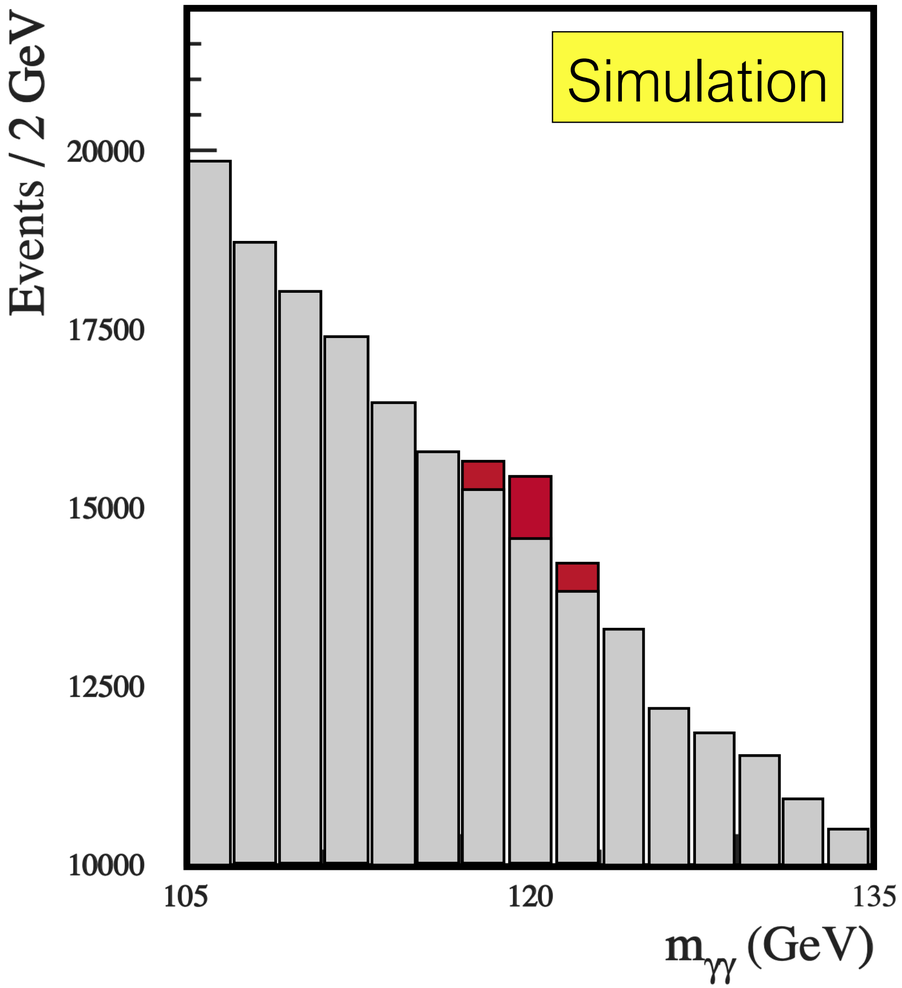




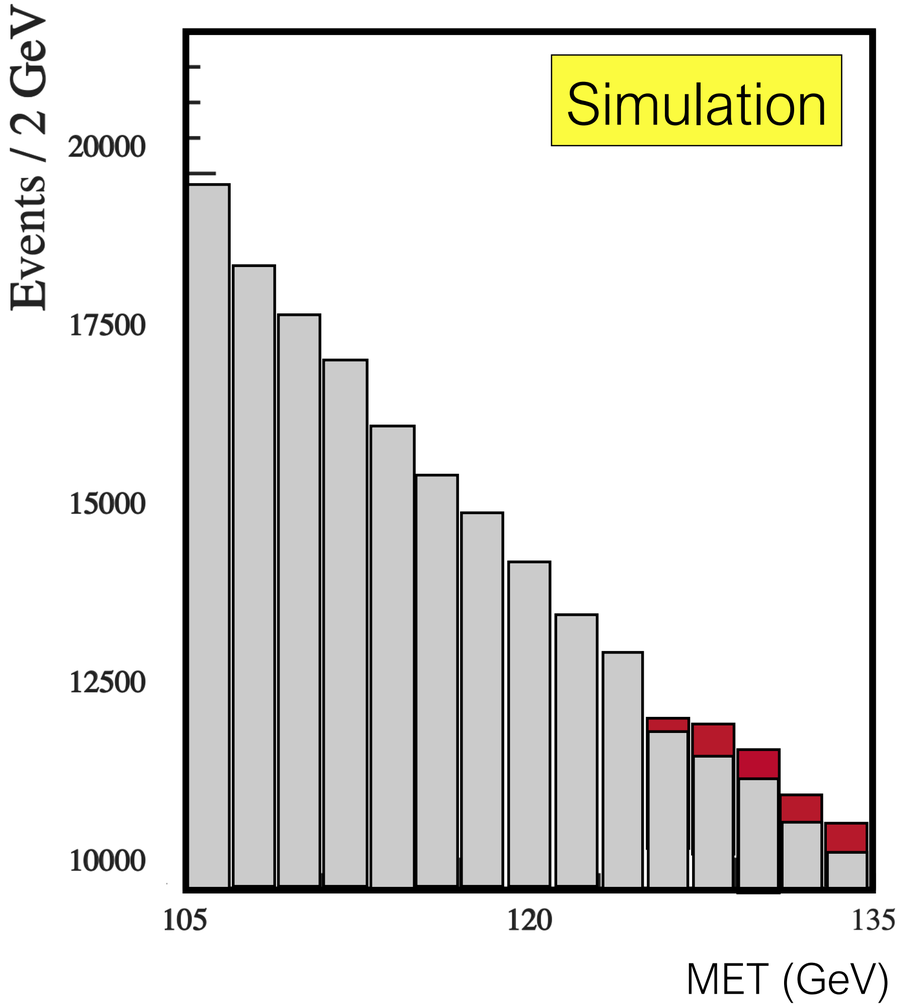
[Sketch]

Higgs

To Photons

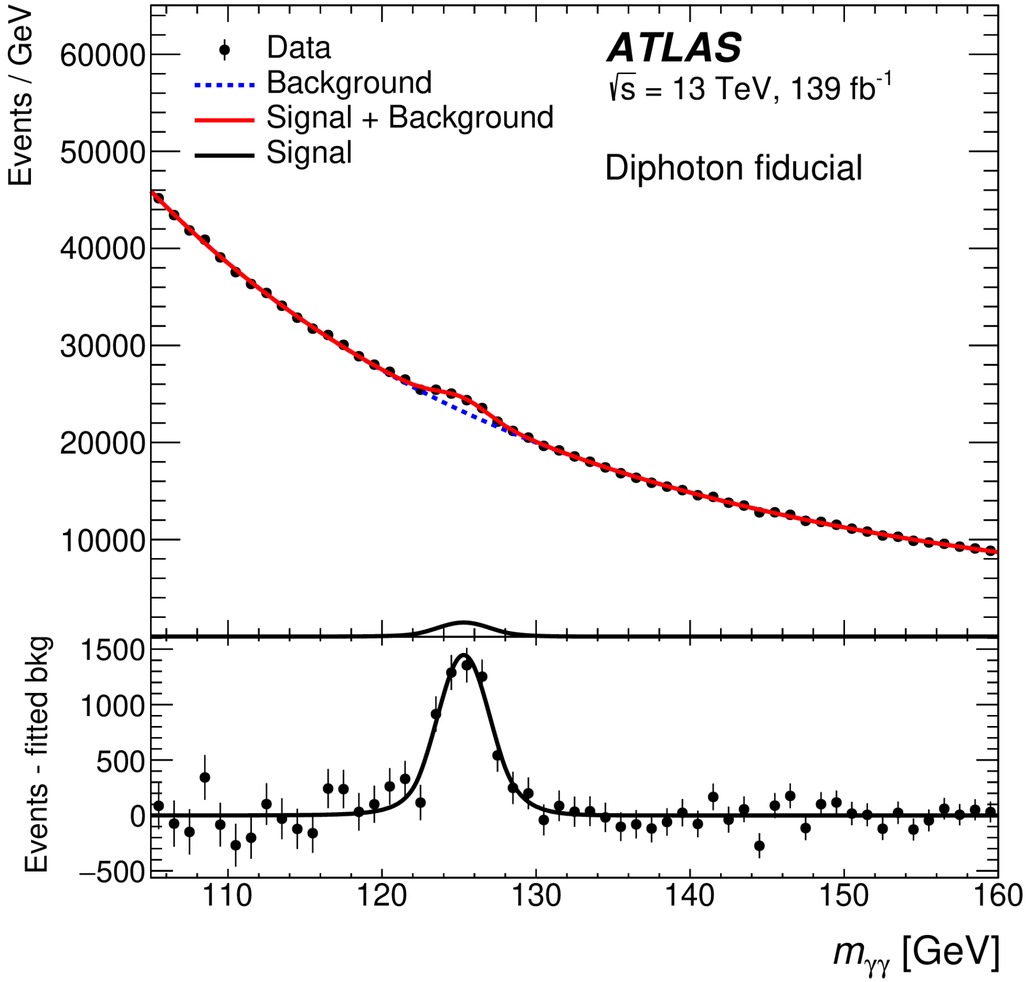


To Dark Matter



Higgs

To Photons



To Dark Matter