2HDM+a, Dirac DM, $\sin\theta$ = 0.7, m_χ = 10 GeV, $g_{_{\gamma}}$ = 1, $m_{\!\scriptscriptstyle A}$ = $m_{\!\scriptscriptstyle H}$ = $m_{\!\scriptscriptstyle H\pm}$, $m_{\!\scriptscriptstyle a}$ = 250 GeV Limits at 95% CL ATLAS Observed $\sqrt{s} = 13 \text{ TeV}, 139 \text{ fb}^{-1}$ Expected 10 an eta $\Gamma/m > 20\%$ 400 500 600 700 800 900 1000 1100 1200 300 $m_{\scriptscriptstyle A}\,({\rm GeV})$

 $E_{\tau}^{\text{miss}} + h(b\overline{b})$, 139 fb⁻¹ JHEP 11 (2021) 209

 $E_{\rm T}^{\rm miss} + h(\tau \tau)$, 139 fb⁻¹ arXiv:2305.12938 $E_{\rm T}^{\rm miss} + Z(II)$, 139 fb⁻¹

PLB 829 (2022) 137066 $E_{\rm T}^{\rm miss} + tW$, 139 fb⁻¹ arXiv:2211.13138

 $tbH^{\pm}(tb)$, 139 fb⁻¹ JHEP 06 (2021) 145

arXiv:2211.01136 Combination

tttt, 139 fb⁻¹

 $E_{\mathrm{T}}^{\mathrm{miss}} + h(b\overline{b}), E_{\mathrm{T}}^{\mathrm{miss}} + Z(II), tbH^{\pm}(tb)$