Replicating the Oblique Constraints

- Replicating James' work on the obliques has yielded very similar results to his
- Figures 1 and 2 compare to his work on Overleaf, and Figure 3 compares to Figure 3 in 2003.03386

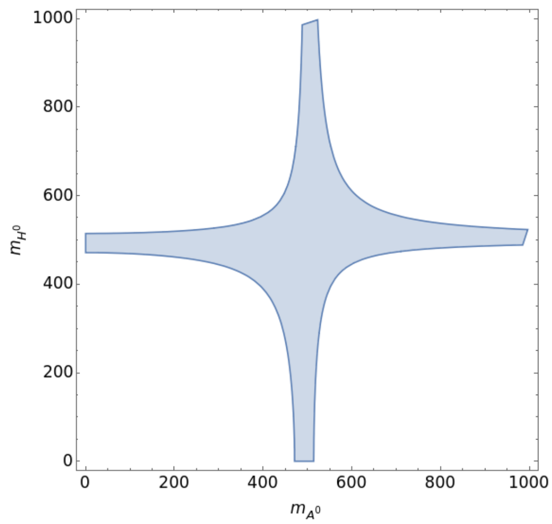

Figure 1: Cross-section in $m_{H^0} - m_{A^0}$ space for $m_{H^+} = 500\,\text{GeV}, \theta = \frac{\pi}{2}$, and assuming $U = 0$ at 95% CL

- Overall, we see the same results as James has discussed: that it is very closely set that at least one of the new scalar masses must be approximately equal to m_{H^+}
- The main difference appears to be that my regions in Figures 1 and 2 are a bit thicker than James', although I think this is down to error propagation – I'm don't think I've fully done my errors right yet so I'm going through that in case that resolves the slight discrepancies between plots

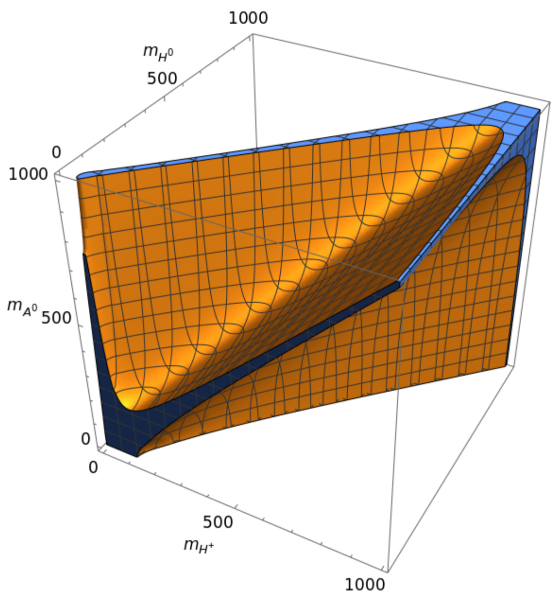

Figure 2: Full scan for $\theta = \frac{\pi}{2}$ and $U = 0$ at 95% CL

➤ I've managed to quite closely replicate the work of Figure 3 in 2003.03386 considering just T, seen in Figure 3 here

➤ We can see that again this favours the scalar masses lying fairly close to m_{H^+}, although there is more room for variation than above

➤ However, this is for $m_{H^+} = 110\,\text{GeV}$ which is smaller than the limits set by direct searches, so in Figure 4, I have tested this again for $m_{H^+} = 500\,\text{GeV}$

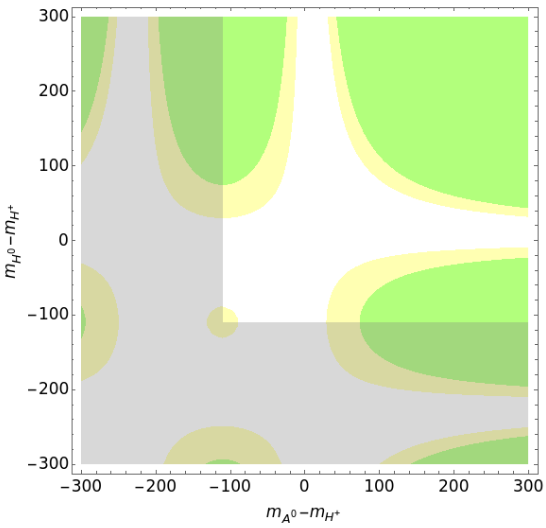

Figure 3: Scalar mass splittings excluded by T for $\theta = \frac{\pi}{2}$ and $m_{H^+} = 110\,\text{GeV}$ at 1σ (yellow) and 2σ (blue). The gray region indicates where is forbidden by requiring that $m_{H^0}, m_{A^0} > 0$.

➤ This essentially replicates Figure 1 without the additional constraints of S

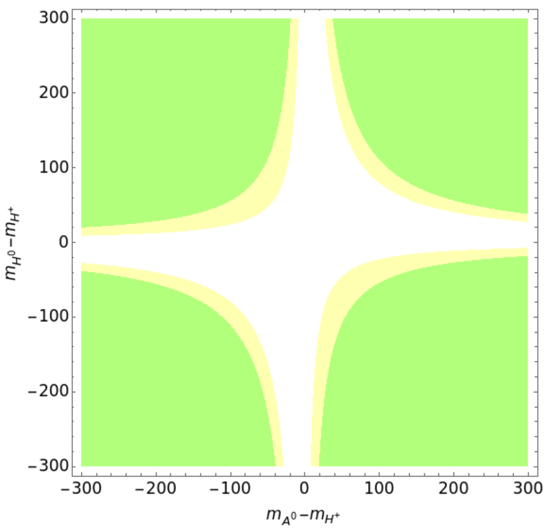

Figure 4: Scalar mass splittings excluded by T for $\theta = \frac{\pi}{2}$ and $m_{H^+} = 500\,\text{GeV}$ at 1σ (yellow) and 2σ (blue).