



ALPhA Summer Week 5 Presentation

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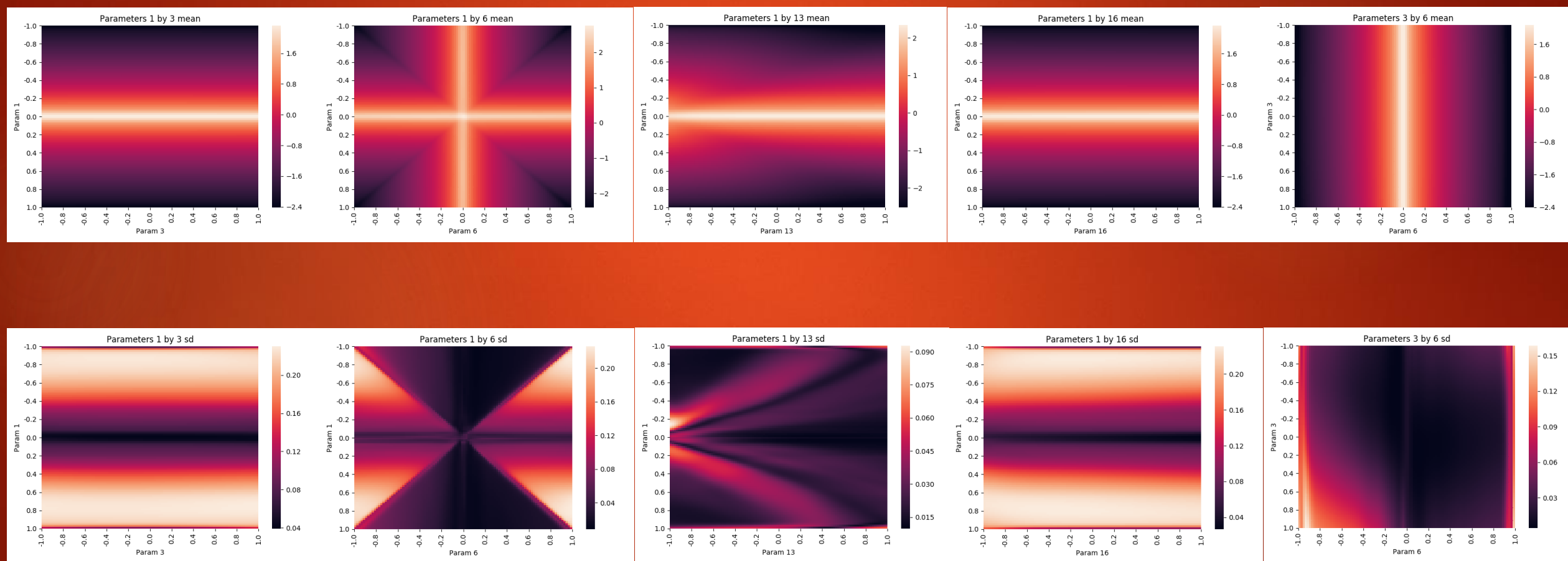
JULY 1, 2019

Summary

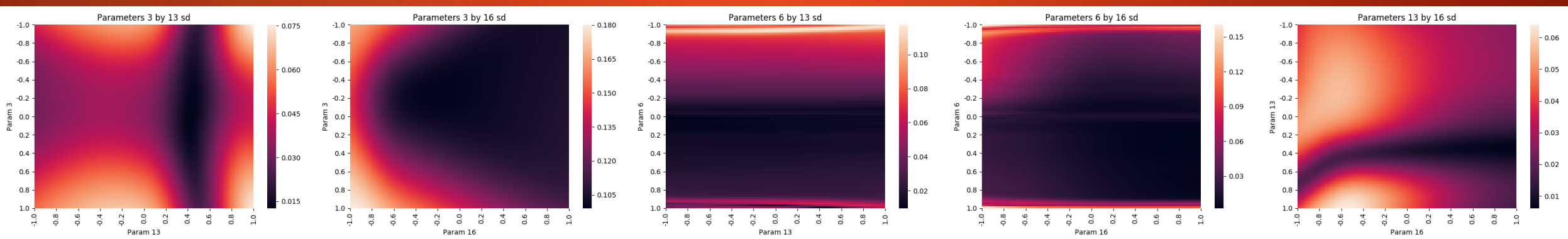
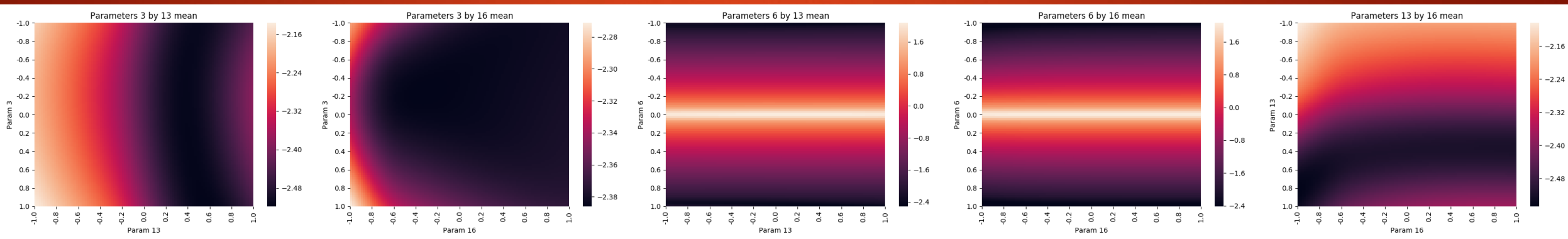
- ▶ Generated heatmaps of cross sections as a function of two variables
- ▶ Got Softsusy up and running
 - ▶ 2/3 of parameter combinations create tachyons, meaning a negative mass squared
 - ▶ These are not allowed
- ▶ Trained a neural network to predict whether a specific parameter combination creates tachyons
 - ▶ Examined impact of each parameter on tachyon creation

Most important variables for cross section:

wino, higgsino, A_t , M_{tR} , M_{q1L}



Most important variable (cont.)



Tachyons

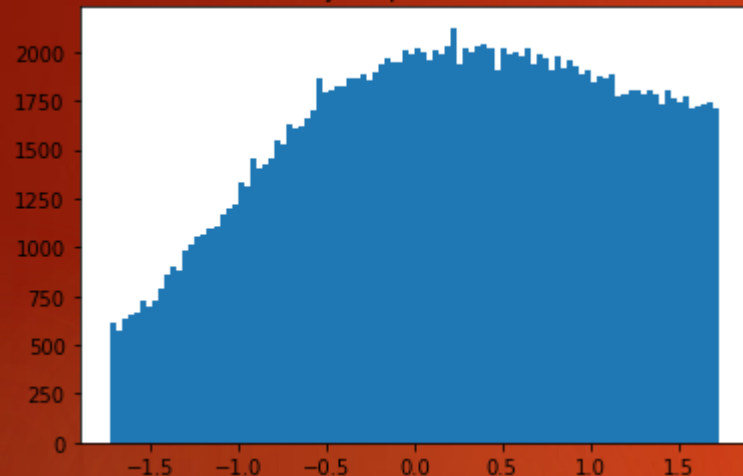
- ▶ Around 2/3 of parameter combinations fed into softsusy give tachyons, or particles with negative squared mass
 - ▶ These are not allowed, so they give an easy way to remove a lot of parameter combinations
- ▶ Trained a normal neural network as a classifier

Metric	Value
Precision	0.964
Recall	0.973
F1	0.969

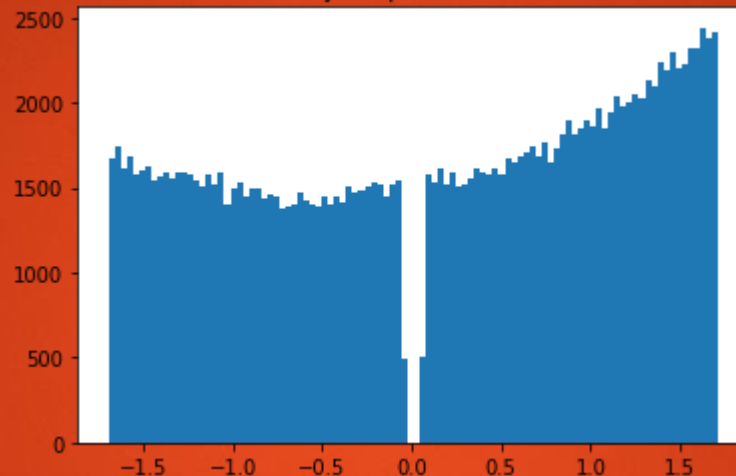
	Not a tachyon	Tachyon
Tachyons not predicted	30,662	2,432
Tachyon predicted	1,758	65,148

Parameter distribution without tachyons

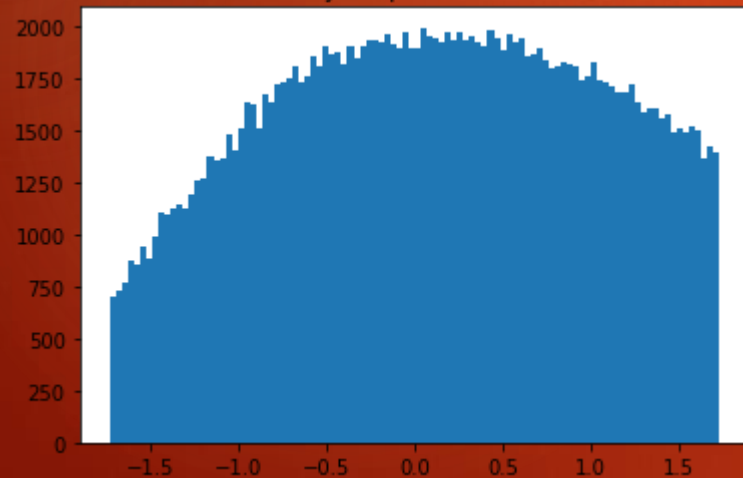
noTachyons param number 2



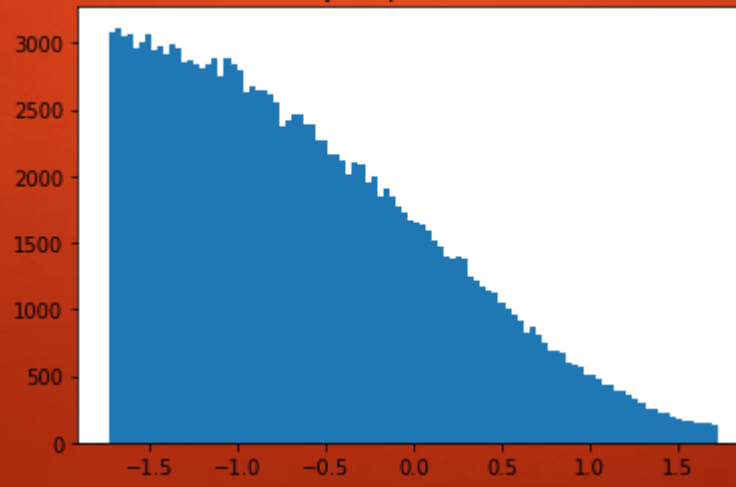
noTachyons param number 6



noTachyons param number 3

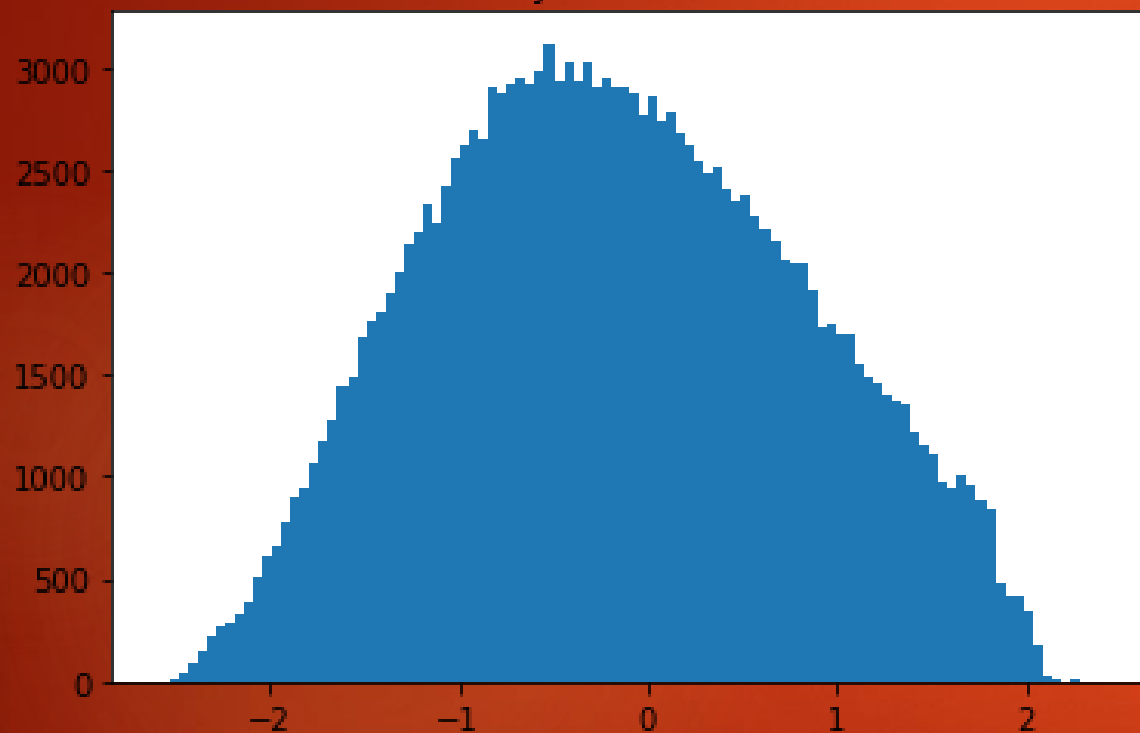


noTachyons param number 8

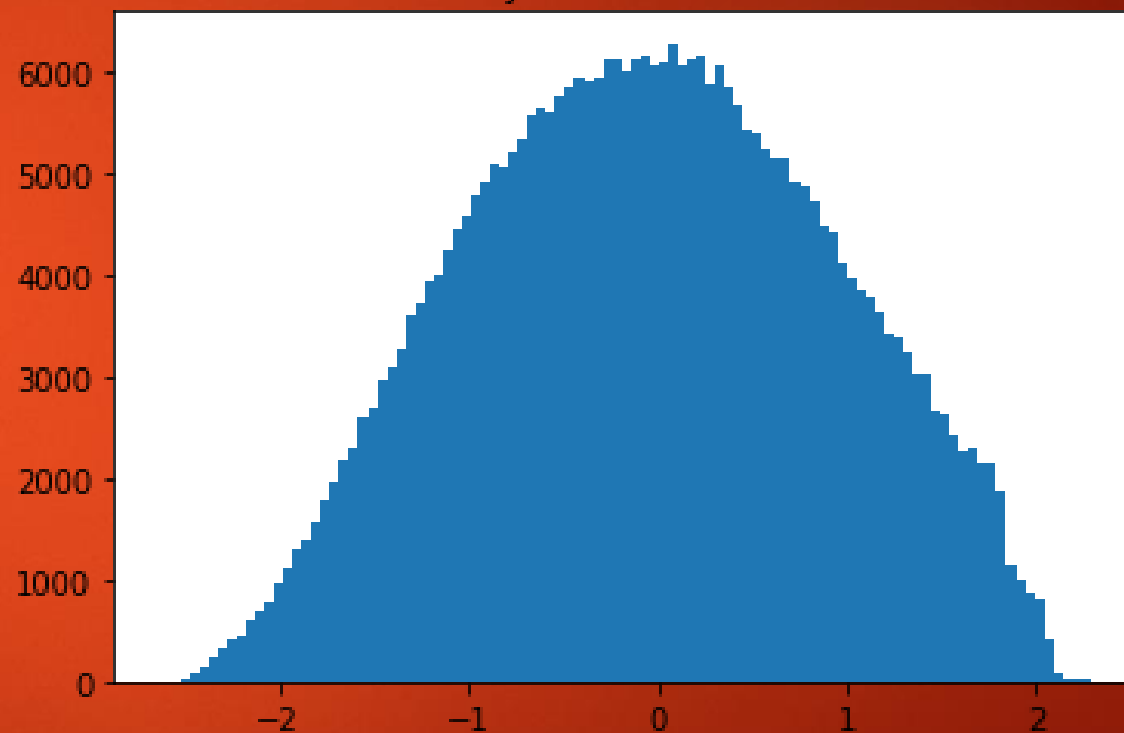


Cross Section Distribution

no tachyon crossSections



tachyon crossSections



Goals for next week

- ▶ Examine impact of removing tachyons on heatmaps
- ▶ Generate mass data from softsusy and train neural networks on it
 - ▶ Possible network ideas are for the lightest super symmetric particle, the lightest neutral higgs mass, or just all of the masses