UPDATE TO ACCEPTANCE CALCULATIONS AND RESOLUTIONS

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INTRODUCTION

Further update to acceptance calculations, again using same latest beamline optics as at Manchester in 2005. (As before), most of the distributions come from a 120 GeV Higgs Mass EXHUME file of 10000 events. Different Higgs masses are simulated by scaling the proton momenta.

- **Table of mass resolution effects**
- **Effect of collimators**
- **220 m or 240 m?**

MASS RESOLUTION EFFECTS

As requested, here are the effects of the known smearings, individually and all together. The table quotes the Gaussian σ of the Root Gaussian fit to the mass histogram. Values in GeV. Black = IP1, Red = IP5.

Smearing effect	420 + 420	420 + 220	Comments
None	0.02 0.34	0.04 0.42	finite precision of present parametrisation
$\sigma(p_0)$ of beam	1.68 1.59	2.58 2.63	0.77 GeV
σ_x of beam spot	1.07 1.08	3.01 3.07	16.8 $/\sqrt{2}$ μm
$\sigma(x)$ of Si meas.	0.20 0.34	0.59 0.80	10 μm
$\sigma(dx/dz)$ of Si meas.	0.59 0.61	2.67 3.61	1 μrad
$\sigma(dx/dz)$ of Si meas.	1.04 1.03	4.81 6.35	2 μrad
All	2.1 1.94	5.0 5.6	(1 μrad
None, constrained	3.0 3.0	10.1 6.2	remove angle params.

Silicon planes 3mm and 5mm from beam at 220 m and 420 m respectively. No collimators yet.

MASS RESOLUTION EFFECTS

Could we usefully prune out the worst resolved events by cutting on the position of the tracks? Perhaps certain configurations are particularly bad. Look at (IP1) the effect of varying the silicon position. Apply all the smearings using 1 microradian angle error. Total number of events = 10k.

Silicon positions	Accepted 420+420/420+220	Resolution 420 + 220
3mm + 5mm	1592/1931	5.0
4mm + 5mm	1597/ 761	6.35
2mm + 5mm	1495/4070	3.3
3mm + 6mm	1599/1198	4.2
3mm + 8mm	1598/ 317	3.4
3mm + 10mm	1596/0	
3mm + 15mm	760/0	

The resolution of the 420+420 events was always about 2.0 GeV.

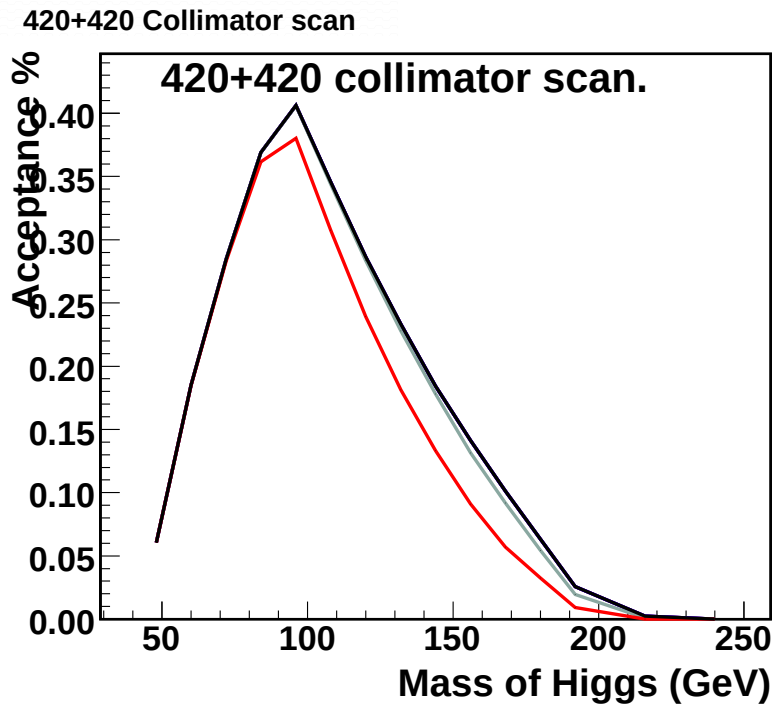
Going to 2mm silicon distance at 220 m is clearly very beneficial. . .

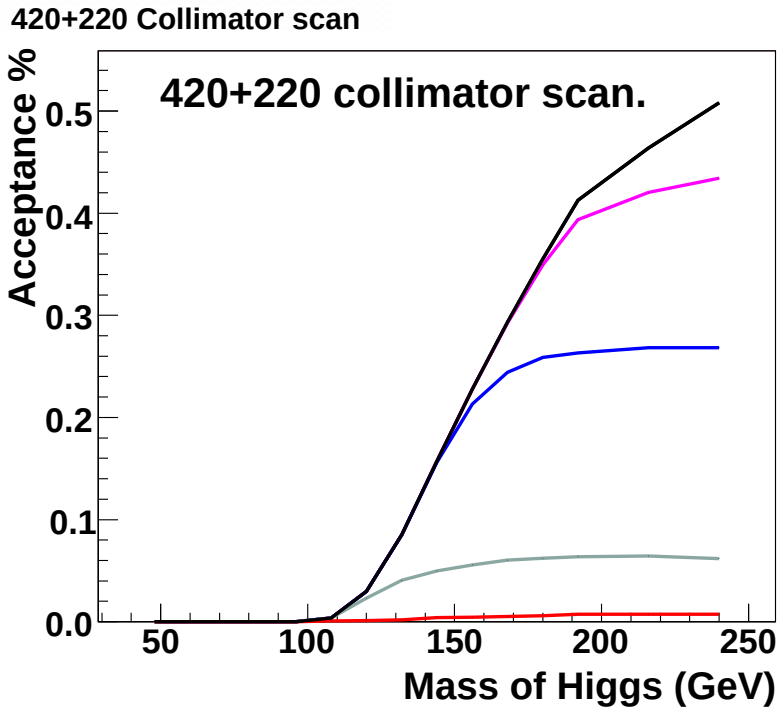
Otherwise, gains in 420+420 resolution come at a heavy statistical price.

COLLIMATORS

There are collimators at 149 m and at 184 m which may have to be fairly tightly closed, e.g. to ± 2 mm 10σ.

Look at the effect of these on acceptances as a function of Higgs mass.





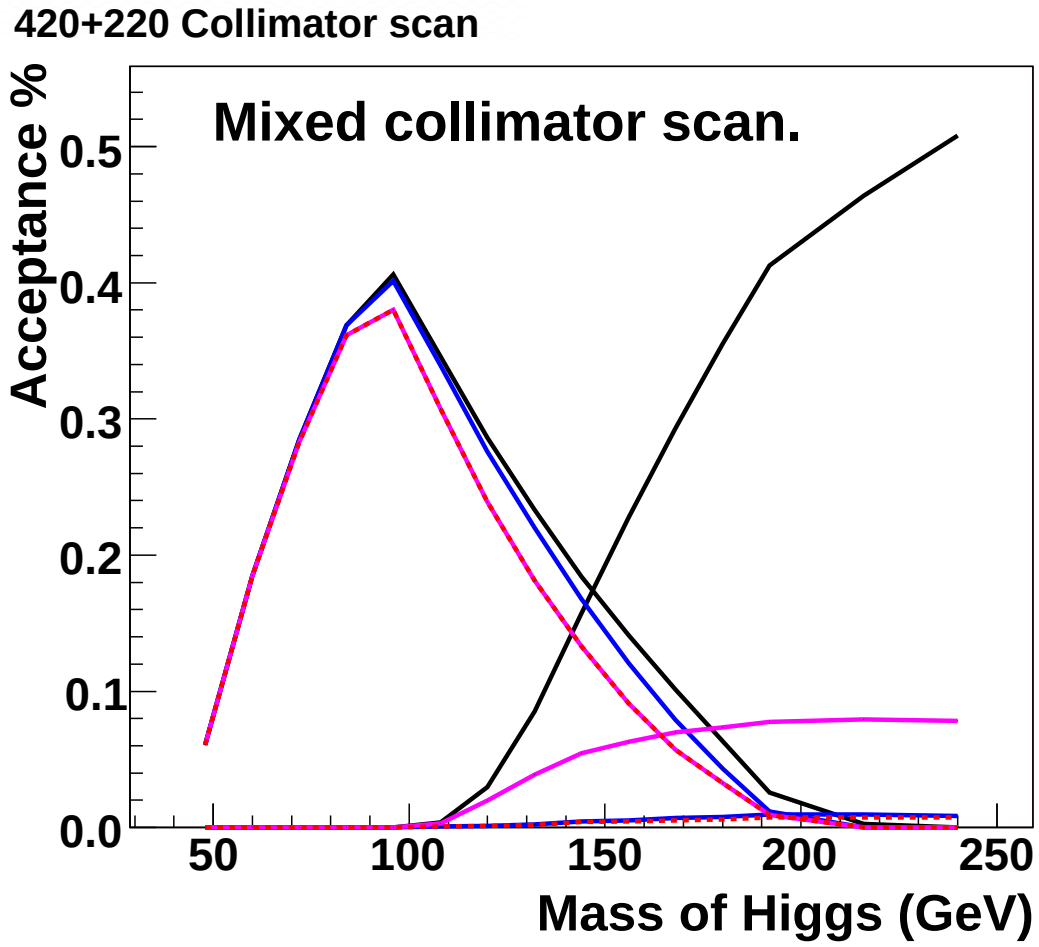
Both Coll. apertures set at (mm) = 10, 7.5, 5, 3, 2

The 420+420 acceptances are affected a little, the 420+220 a lot.

No beam or IP smearings were applied. These would make things worse.

COLLIMATORS

Try to investigate the effects of the collimators separately.

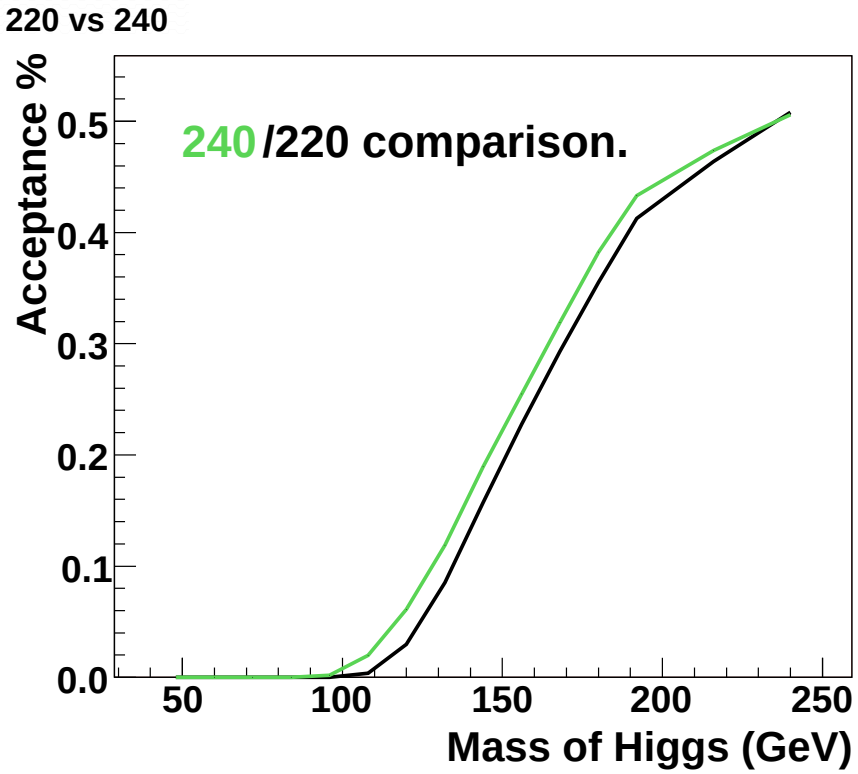


Coll. apertures (mm) = 10+10, 2+7.5, 7.5+2, 2+2

Both collimators have an effect, which is no doubt why they are there!

240 m or 220 m ?

What happens if we move the first plane from 220m to 240 m?



It helps a little bit.

CONCLUSIONS

- **Mass resolutions are bad for 420+220 when smearings are taken into account. This we saw before.**
- **The collimators have a potentially awful effect on 420+220**
- **It helps a small amount to move to 240 m.**