MVA selection for $\tau \to 3\mu$

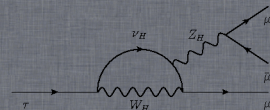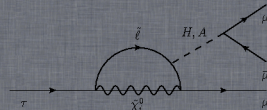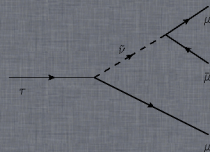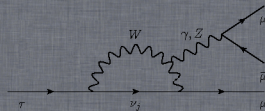## Marcin Chrząszcz[1,2]

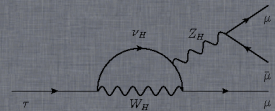[1] University of Zurich , [2] Institute of Nuclear Physics, Krakow,

January 6, 2014

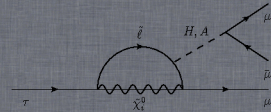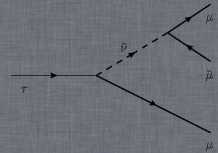Blending - THE END

Binning optimisation

η background

Plan
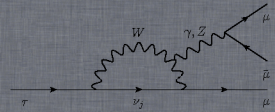
Where did we end last year

- We decided to use Blending technique with MatrixNet.
- Jon updated the mixing numbers $\rightarrow$ Need to retrain everything and hope things are status quo.
- People thanks to $B_s^0 \rightarrow \mu\mu$ will ask about mass correlation $\rightarrow$ Need to check to shut them up. Big big surprise.

Status quo

- I was to lazy to retrain all TMVA stuff.
- So just compared: GeoMVA(we have it for free), MN standalone, Blending.
- Again Blending wins.

ROC curve
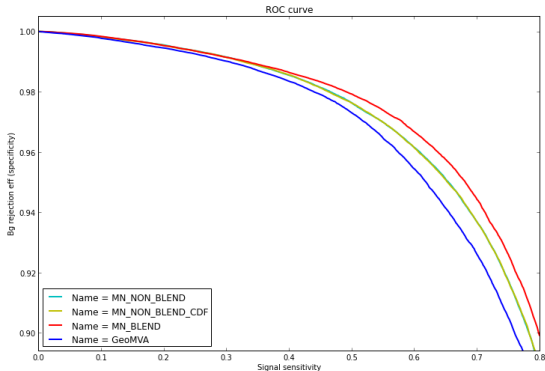
Status quo

- I was to lazy to retrain all TMVA stuff.
- So just compared: GeoMVA(we have it for free), MN standalone, Blending.
- Again Blending wins. → I am happy.

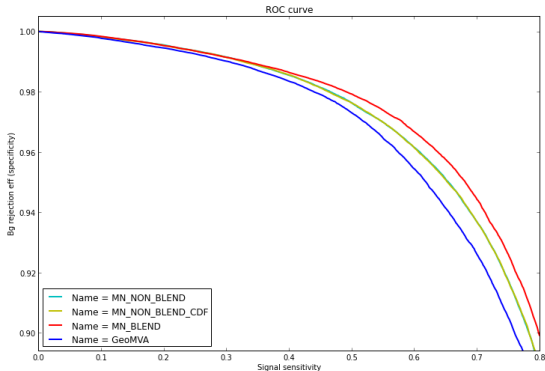# Status quo

- For sanity check I also have looked into 2011 data.
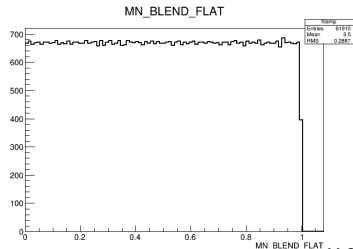- Result stays the same.
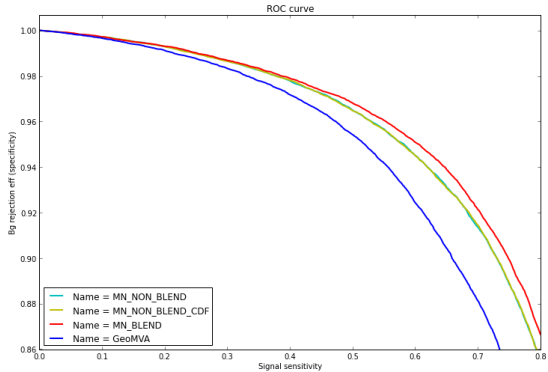
How does MN look like.

- So MN is Gradient BDT. (name in the ntuple: MN_BLEND)

- Applied transformation to make flat signal distribution. (name in the ntuple: MN_BLEND_FLAT).

M.Chrząszcz 2013
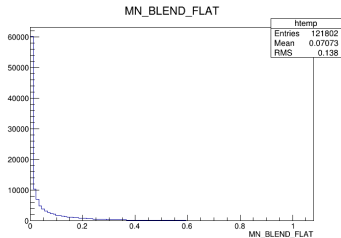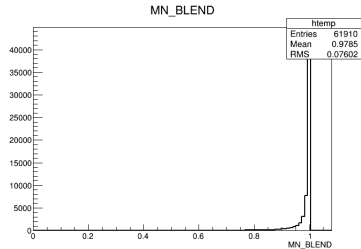
Mass correlation - Sit down, this is hardcore

- So lets check the correlation for my blending using MN.

- Correlation is flat and arround 3.5%. Everything seems to be ok.

- Now the scary part. I checked this for GeoMVA.

Correlation mass for /local/userdata/shelf/notebook/tau3mumu/ntuples_3-01/blend/for_Marcin/: corr_bg_abs = -2.2%, corr_bg = 2.2%
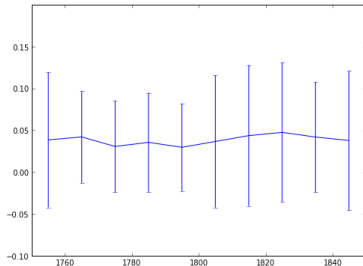
Mass correlation - Sit down, this is hardcore

- I saw 30% correlation in our previous GEOMVA!

- Before I got a heart attack I had thought: Making clarifies flat has to change the correlation value. So GeoMVA was transformed to be flat, for 1:1 comaprison.

- Never the less 15% in GeoMVA remains ;(

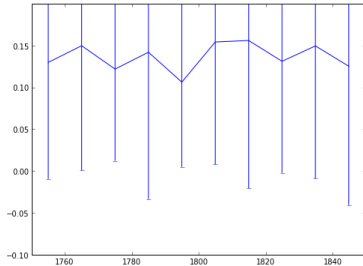Correlation mass for /local/userdata/shelf/notebook/tau3mumu/ntuples_3-01/blend/for_Marcin/: corr_bg_abs = -0.9%, corr_bg = 0.9%

MVA conclusions

- Blending is the best performing MVA.
- Mass correlation is reasonable low.
- GeoMVa mystery: Different RECO might have something to do with what we saw. It also could explain why GeoMVA is so efficient now(correlation might make the bck level artificially lower) ← this idea was after midnight and 3 pines of beer so I might now change my mind.

Binning

- Performed binning optimisation(with old trigger strategy and old classifier(before Jons updates)).
- All this will be updated of coz with Pauls new results + new clarifies.
- For 2012 for binning with eta veto:
  PID: 0 0.10 0.42 0.75 0.81 0.86 1.00
  BLEND_FLAT: 0. 0.05 0.38 0.63 0.71 0.82 1.00

M.Chrząszcz 2013
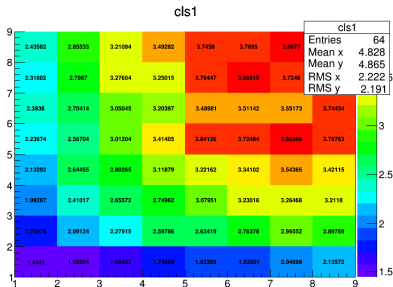
Binning - details

- Binning uses CLs method, not enough time to play with other FOM.
- Optimisation requires at least 8 events in the bin.
- Minimum bin size is 0.06.
- The sieve is 0.01
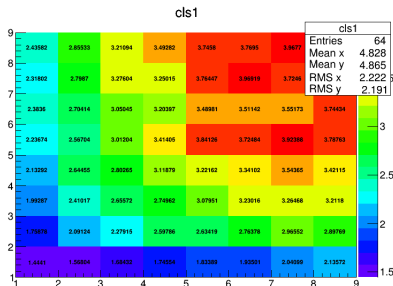
Binning - details

- Did all the fits to η bck.
- Fits are far more stable then last year.
- Will try to make a single fit to all bins to reduce the systematics.
- All fits are here: LINK
- I was lazy and didn't want to latex thing that will change...
- The same with fits with η veto....
- MC/Data comparison doing Splot: LINK

The Plan

1. If we want to move with this for Moriond we would need to have a limit soon.
2. I would propose the attemnt to have on next week a preliminary limit.
3. What we need:

- $D_s \to \phi\pi$. Done for 2011 and 2012. Will appear today on my page.
- New binning: 6 hours of computing one scenario$\to$ tmr will have it.
- Fits(with η veto: Wed).
- Calibration: Paul?
- Limit(lets aim 2011+2012). I have script from Diego with the combination for $B_s^0 \to \mu\mu$.
- But it is never easy to run those things(2-3 days).
- Lets try to make an effort?