

$H \rightarrow \pi_\nu (\rightarrow b\bar{b}) \pi_\nu (\rightarrow b\bar{b})$  at 350 GeV

status update

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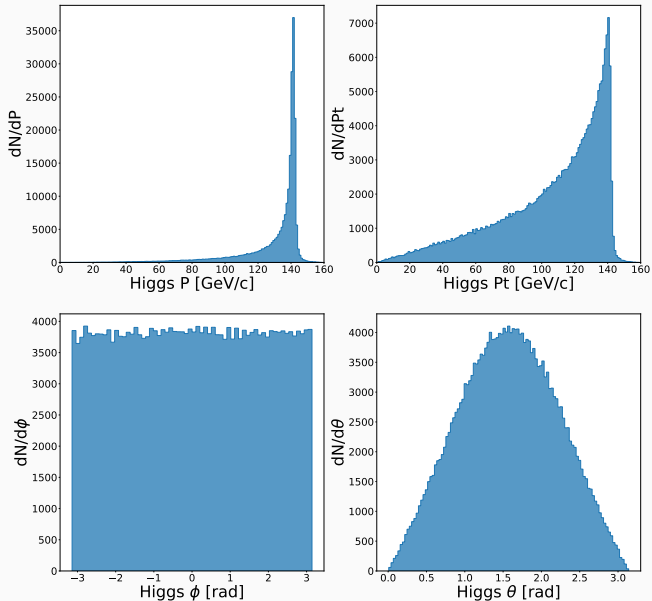
Mateusz Goncerz

- previous presentation
- we've added WWZ and  $t\bar{t}$  backgrounds as suggested
- no significant change in the final results
  - $t\bar{t}$  is suppressed by the reconstruction algorithm
  - both get separated very well by BDT

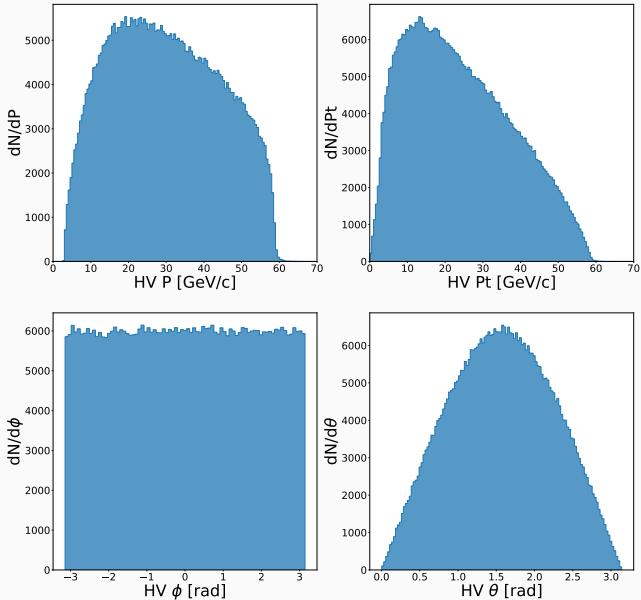
# samples

description	ID	$\sigma$ [fb]	# events	$\geq 2$ DV events [%]
25 GeV, 1 ps	10953	93.44	$\sim 240$ K	77
25 GeV, 10 ps	10944	93.44	$\sim 240$ K	93
25 GeV, 100 ps	10932	93.44	$\sim 240$ K	98
25 GeV, 300 ps	10962	93.44	$\sim 240$ K	96
35 GeV, 1 ps	10956	93.44	$\sim 240$ K	75
35 GeV, 10 ps	10947	93.44	$\sim 240$ K	92
35 GeV, 100 ps	10453	93.44	$\sim 240$ K	98
35 GeV, 300 ps	10965	93.44	$\sim 240$ K	98
50 GeV, 1 ps	10959	93.44	$\sim 240$ K	72
50 GeV, 10 ps	10950	93.44	$\sim 240$ K	89
50 GeV, 100 ps	10935	93.44	$\sim 240$ K	99
50 GeV, 300 ps	10968	93.44	$\sim 240$ K	99
qq	4698	24405.4	$\sim 2$ KK	12
qqqq	2871	5847	$\sim 1.44$ KK	8
qq $\nu\nu$	2862	324.6	$\sim 306$ K	12
WWZ (new)	1439	10	$\sim 40$ K	13
$t\bar{t}$ (new)	1369+1434	450	$\sim(21+220)$ K	2

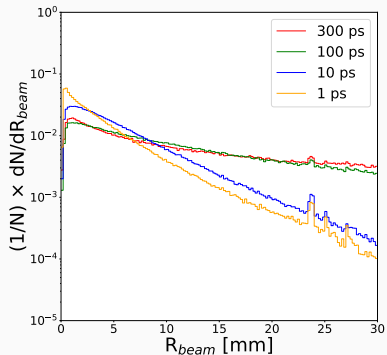
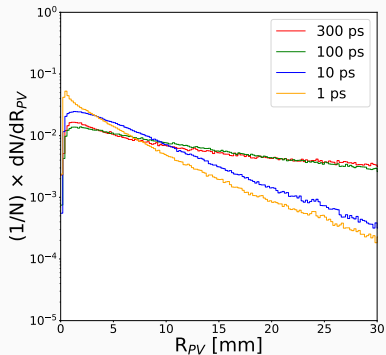
# Higgs



# Hidden Valley pions (35 GeV, 10 ps)



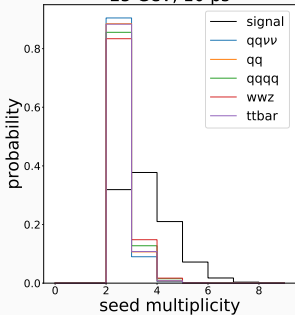
# displaced vertices (35 GeV)



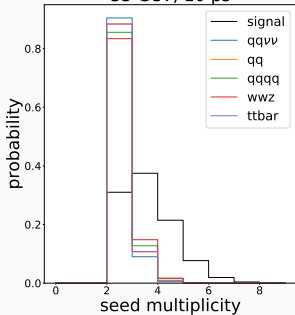
- training done using 35 GeV, 10 ps signal sample and  $qq\nu\nu$  background
- 50-50 split for training/testing
- BDT chosen for providing highest  $S/\sqrt{S+B}$  ratio for the most difficult background in testing samples (qqqq)
- number of events normalized to  $3 \text{ ab}^{-1}$  of collected data

# TMVA – variables

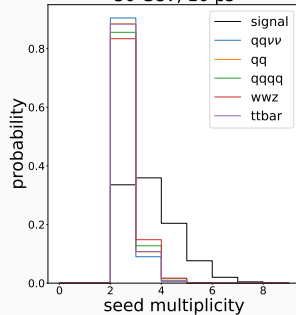
25 GeV, 10 ps



35 GeV, 10 ps

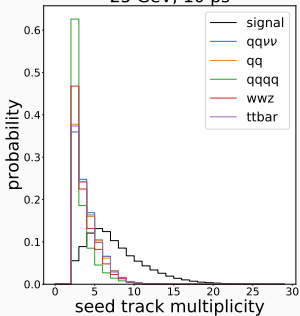


50 GeV, 10 ps

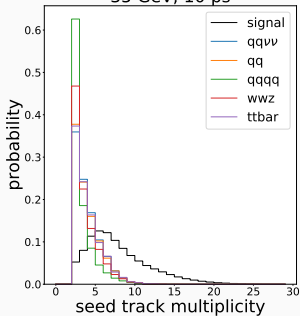




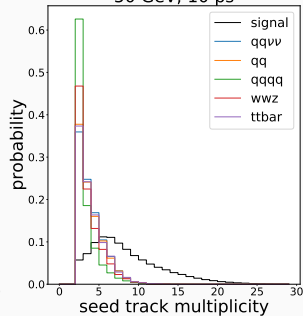
25 GeV, 10 ps

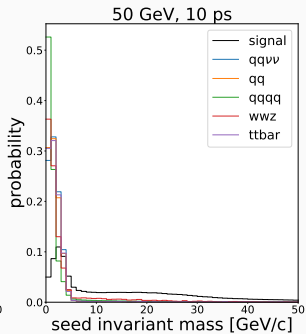
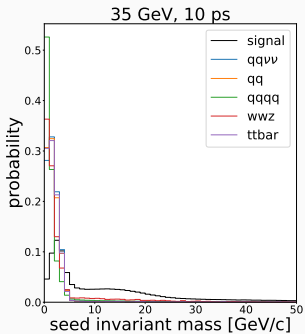
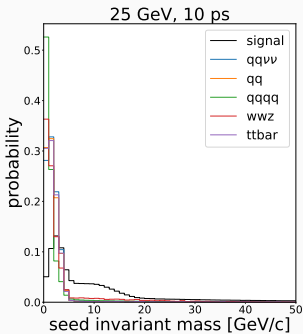


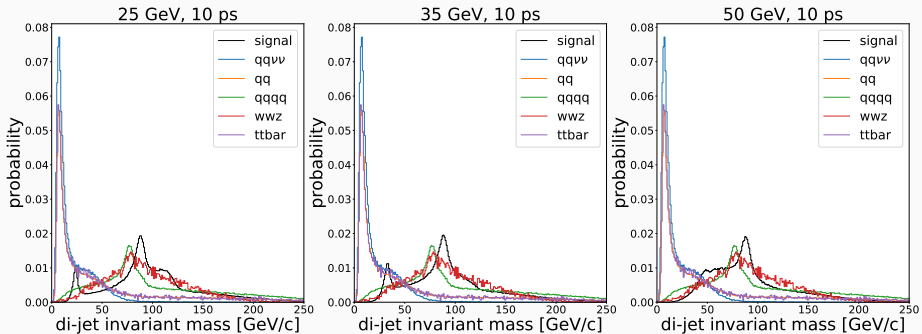
35 GeV, 10 ps

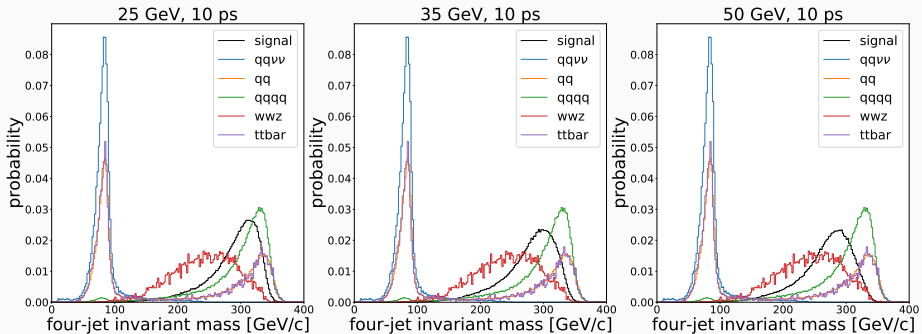


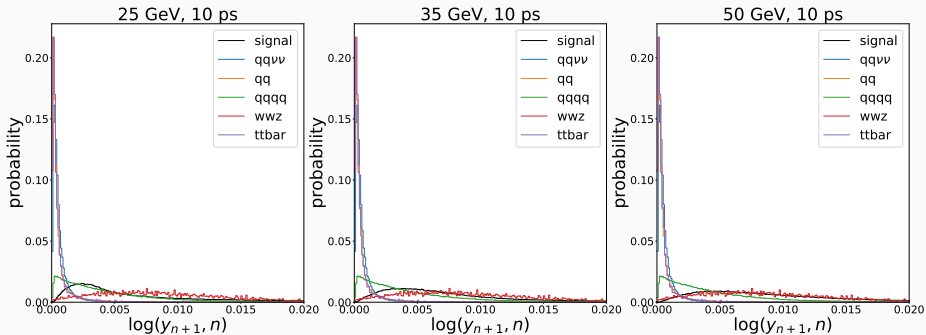
50 GeV, 10 ps

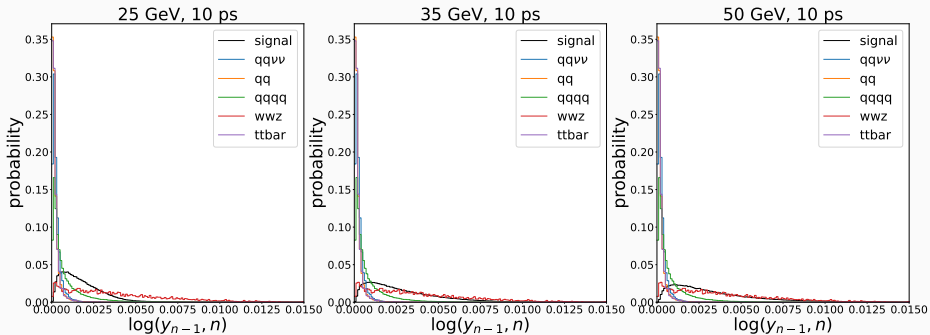




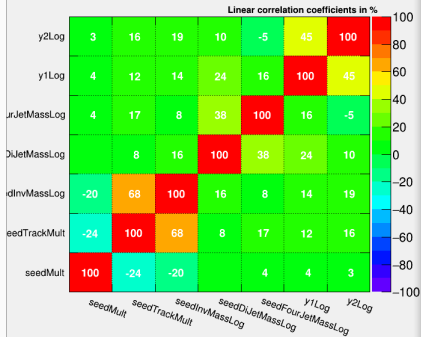




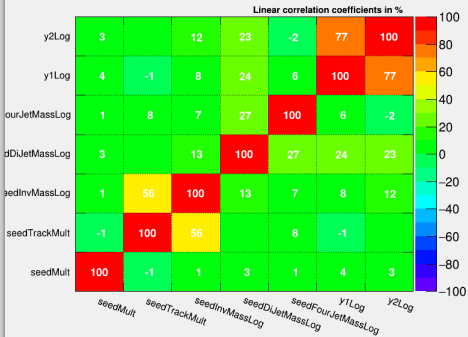




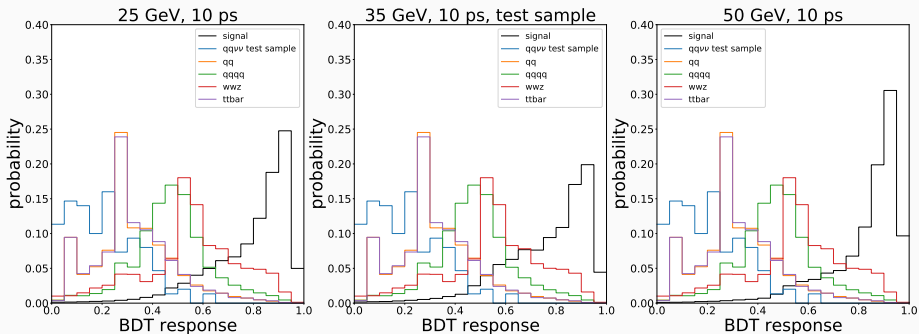
### Correlation Matrix (signal)



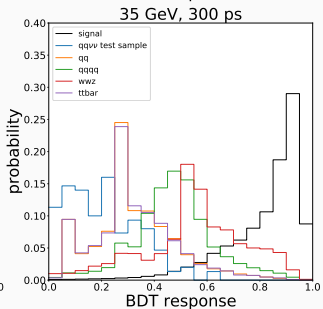
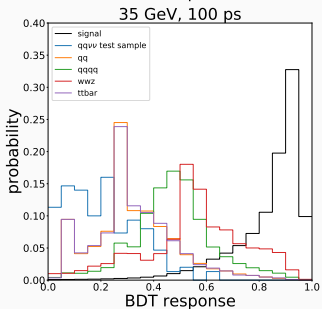
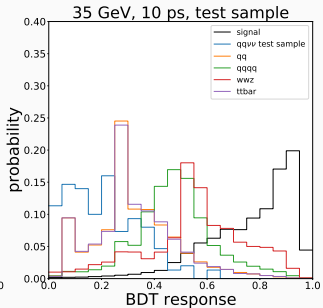
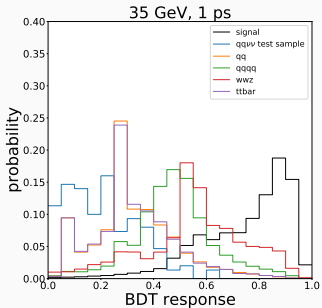
### Correlation Matrix (background)



# TMVA – BDT response

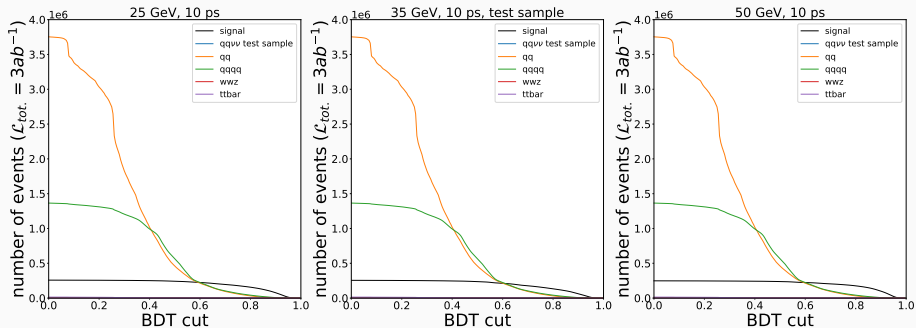


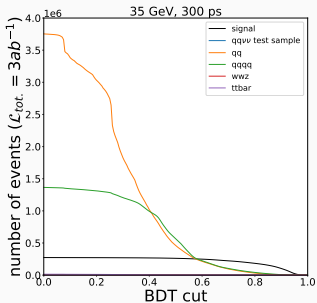
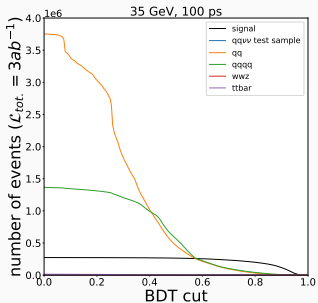
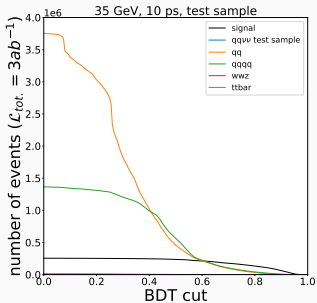
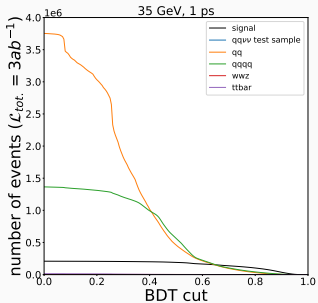




# TMVA – number of events

- order of  $1 \times 10^6$  for signal at  $\sqrt{s} = 3$  TeV





- order of 900 for worst background for signal at  $\sqrt{s} = 3$  TeV

