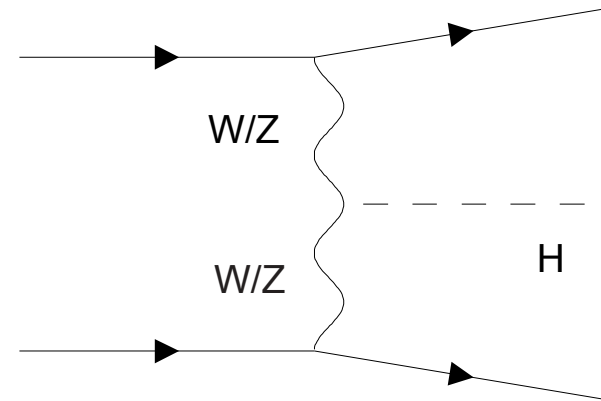




Topological Jet Triggers at Level-1



- CMS Level-1 trigger is sophisticated :
 - All objects available at final stage
 - Each object has E_t , η , ϕ
 - Can cut on any of these
 - Along with $\Delta\eta$, $\Delta\phi$ between two objects
- What use for jet triggers?
 - Diffractive physics
 - Weak boson fusion

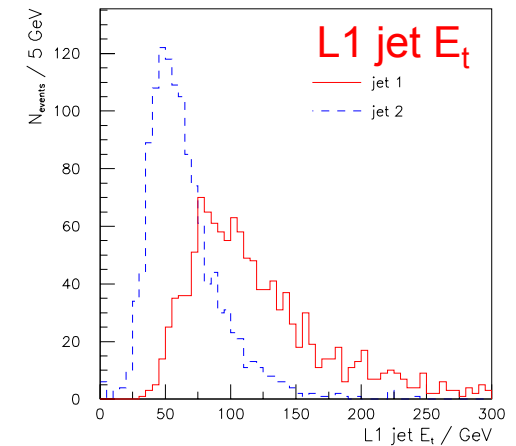
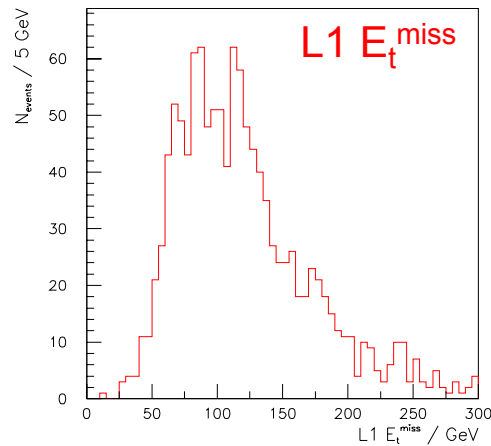
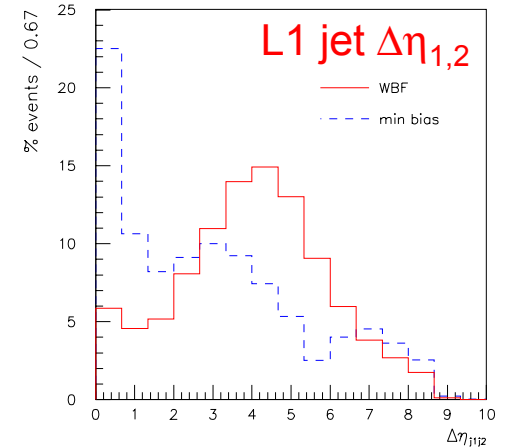
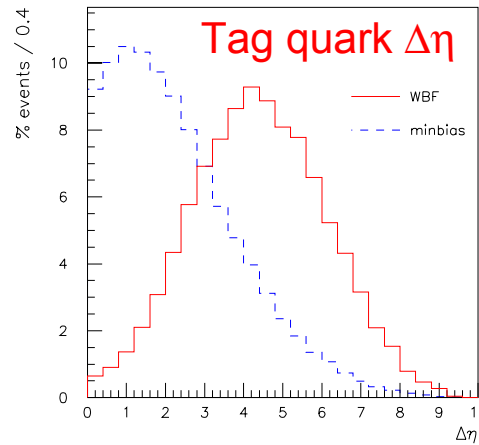


- Tag quarks in final state,
 - forward distribution
 - useful for background reduction



Signal Characteristics

- Autumn 2001 production
- Luminosity - 2×10^{33}
- Signal data :
 - Invisible Higgs
 - $m_H = 120$ GeV
- Background :
 - Binned min-bias
 - $0 < p_t < 800$ GeV

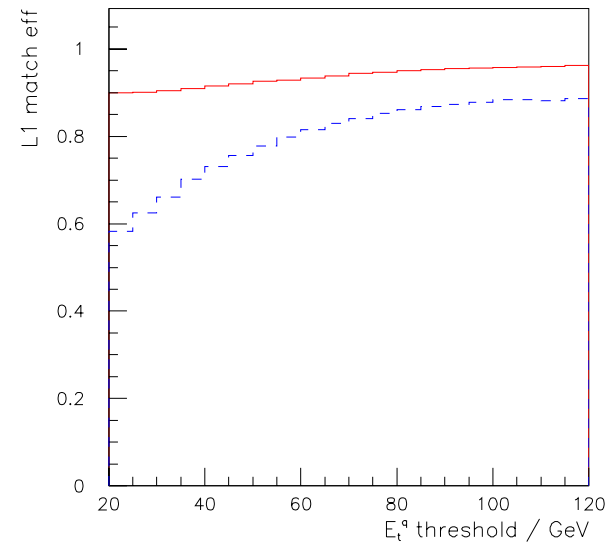
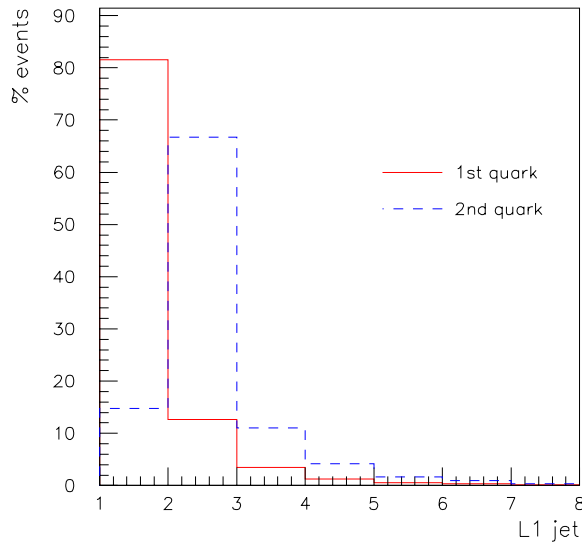




Tag Jet ID

- Consider 2 highest E_t L1 jets
 - from central, forward, tau
- ID efficiency
 - match to quarks using $\Delta R < 1$
 - (valid if no jets from Higgs)

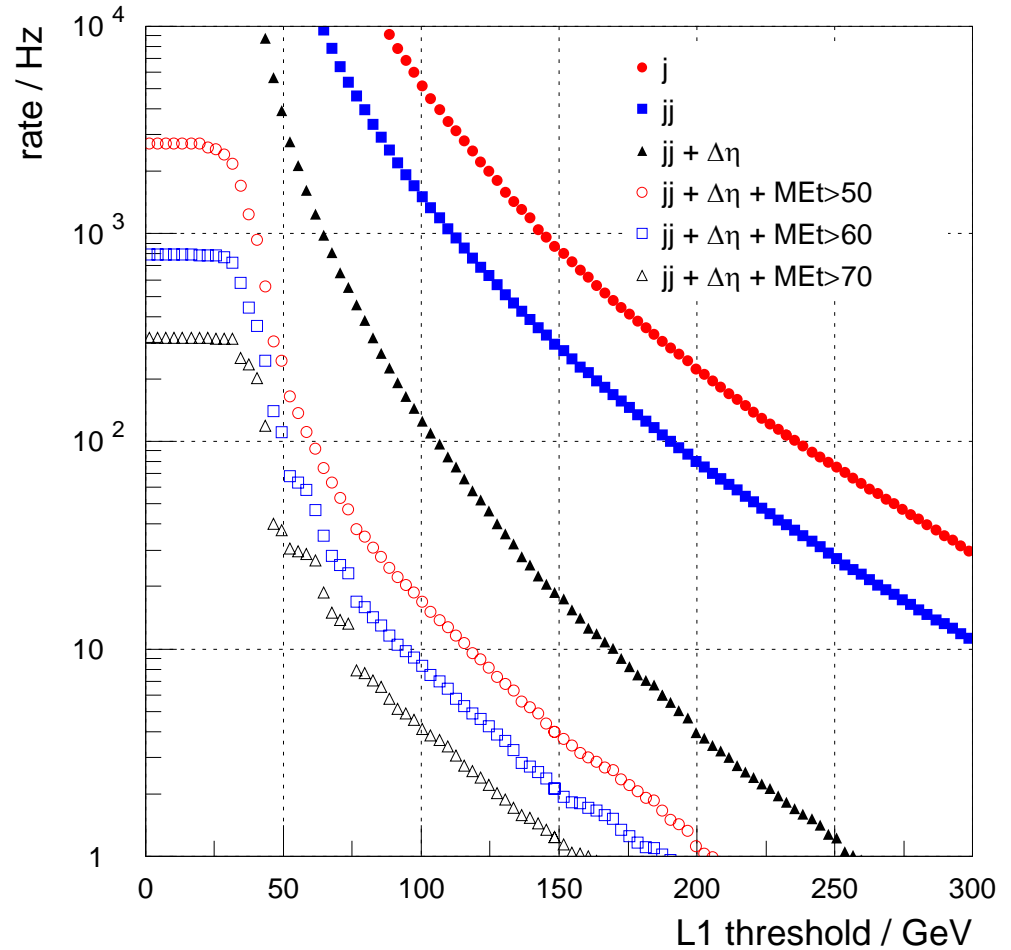
L1 jet(s)	Match Efficiency (%)
1	93
1 & 2	67
1 & 3	7
1 & 4	2
2 & 3	1





Trigger Rate

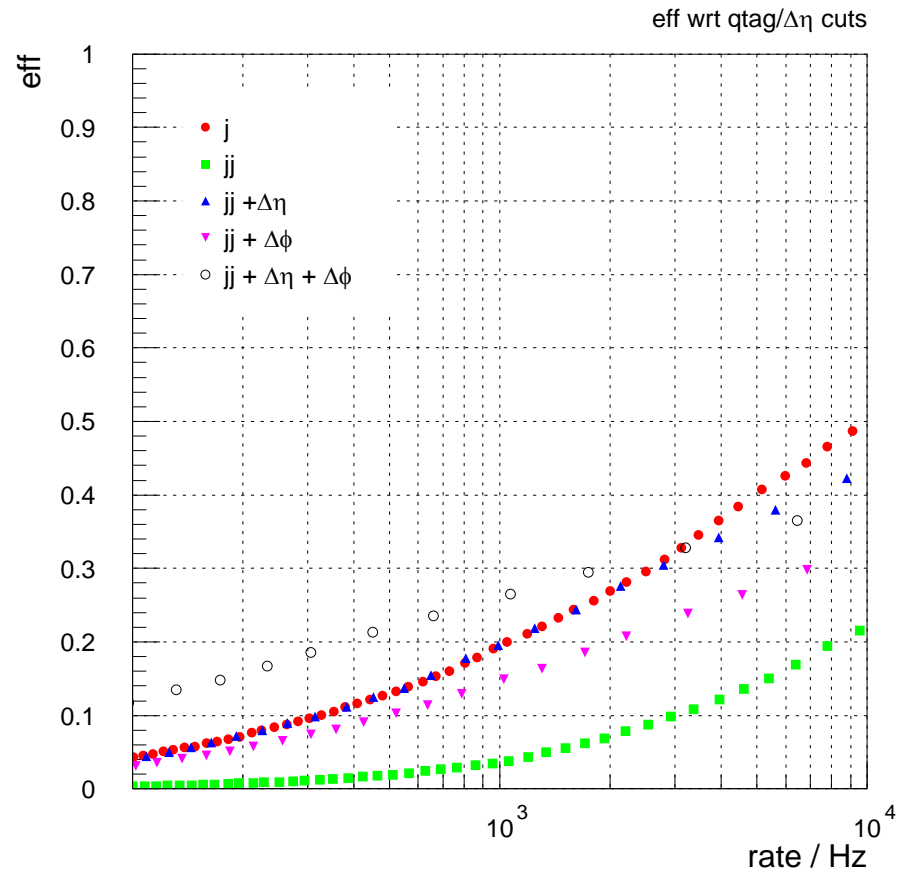
- E_t^{miss} cuts correspond to calibrated E_t^{miss} of
■ 78, 90, 101 GeV





Efficiency (WBF)

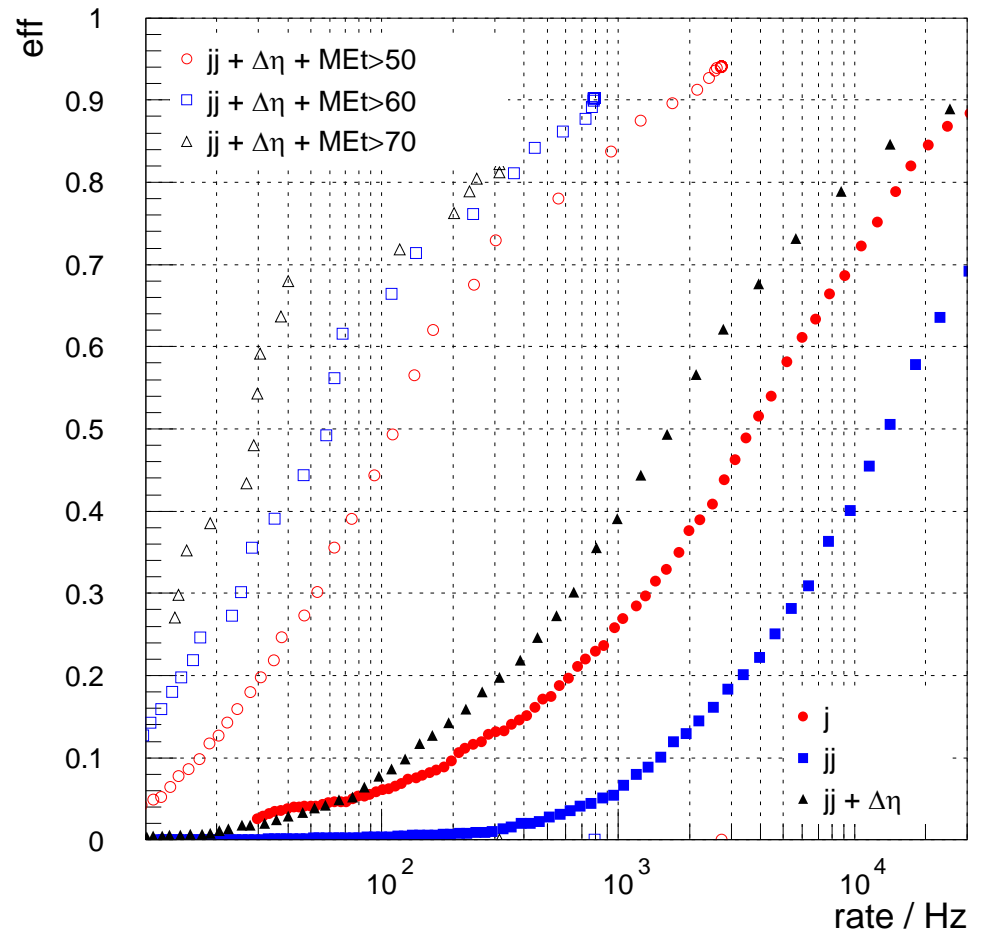
- Efficiency wrt to generator cuts
 - 2 quarks, $E_t > 20$ GeV, $|\eta| < 5$
 - $\Delta\eta_{qq} > 3.5$
- 'jj + $\Delta\eta$ ' offers no improvement over single jet trigger
- No improvement from adding 1st & 3rd L1 jet pair
 - (jj AND $\Delta\eta_{12} > 3.5$) OR
 - (jjj AND $\Delta\eta_{13} > 3.5$)





Efficiency (inv Higgs)

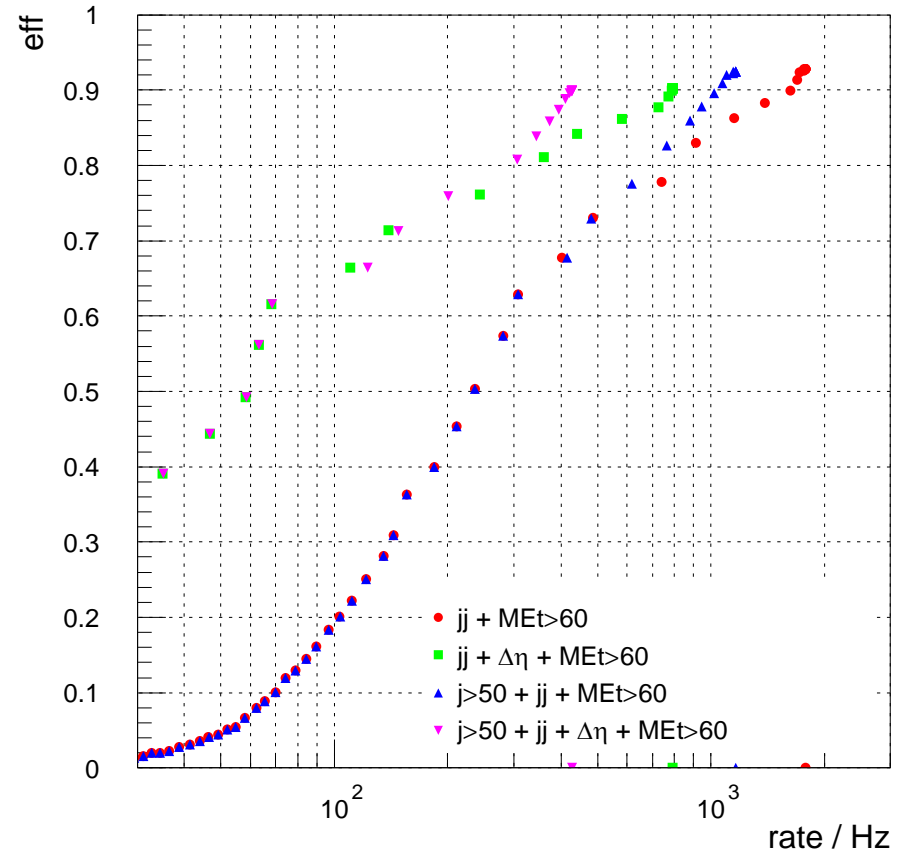
- Efficiency wrt offline cuts on generator quantities :
 - 2 jets, $E_t > 40$ GeV, $|\eta| < 5$
 - $E_t^{\text{miss}} > 100$ GeV
 - $\Delta\eta_{jj} > 4.4$
 - $\Delta\phi_{jj} < 1$
- $jj > 33 + \Delta\eta + E_t^{\text{miss}} > 60$
 - 86.2 (89.6) % efficiency
 - 725 Hz rate





Asymmetric di-jet cut

- 1st tag quark E_t distribution starts at ~ 50 GeV (as measured by L1)
- Plot shows 'jj + E_t^{miss} ' triggers including 1st jet $E_t > 50$ GeV
- Small reduction in rate at high efficiency





Summary

Trigger	Threshold(s) (GeV)	Rate (Hz)	Ind Eff (%)	Tot Eff (%)
$j + E_t^{\text{miss}} (*)$	60, 60	800	88.9	89.1
$jj + E_t^{\text{miss}}$	36, 70	605	82.2	85.0
$jj + \Delta\eta + E_t^{\text{miss}}$	33, 60	725	86.2	89.6
$jj + \Delta\eta + E_t^{\text{miss}}$	50, 30, 60	410	87.4	90.4

* as TDR

- Thresholds above set for $\sim 90\%$ total efficiency
 - including j , jj , τ , $\tau\tau$, E_t^{miss} triggers as TDR