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Latest results on Level-1 and HLT Calo Tau trigger selections for A/H->2τ->2jet and H^+->$\tau\nu$

Sept 2002 CMS week. JetMet meeting

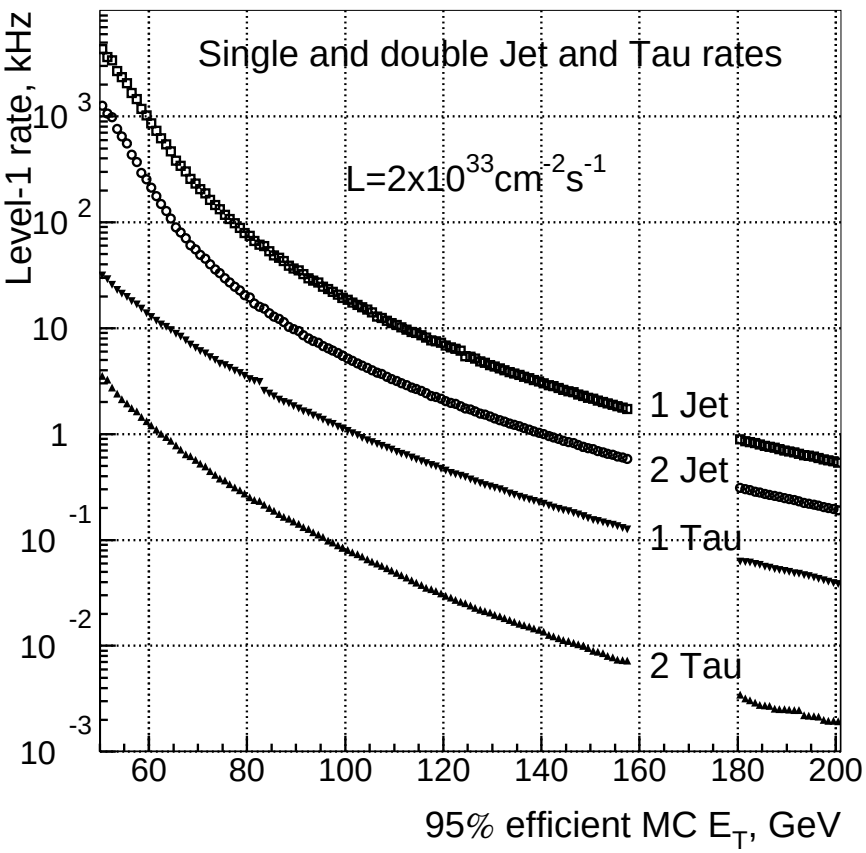
Level-1 Tau and Jet rates v.s. 95 % efficiency MC E_T for τ and qcd jets

Level-1 Taus corrected with Level-1 Jet corrections

Low luminosity

E_T(95% MC τ-jet) = E_T(L1 Tau calibr) - 7.0

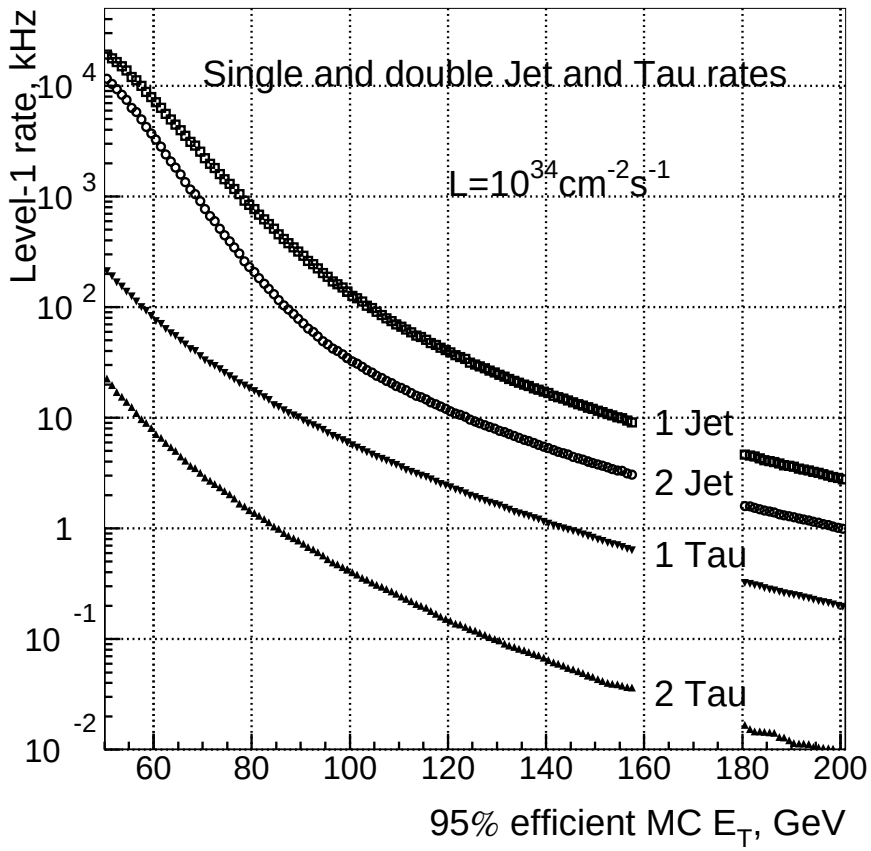
E_T(95% MC qcd-jet) = 1.18 E_T(L1 Jet calibr) + 17.2



High luminosity

E_T(95% MC τ-jet) = E_T(L1 Tau calibr) - 5.0

E_T(95% MC qcd-jet) = 1.17 E_T(L1 Jet calibr) + 19.8



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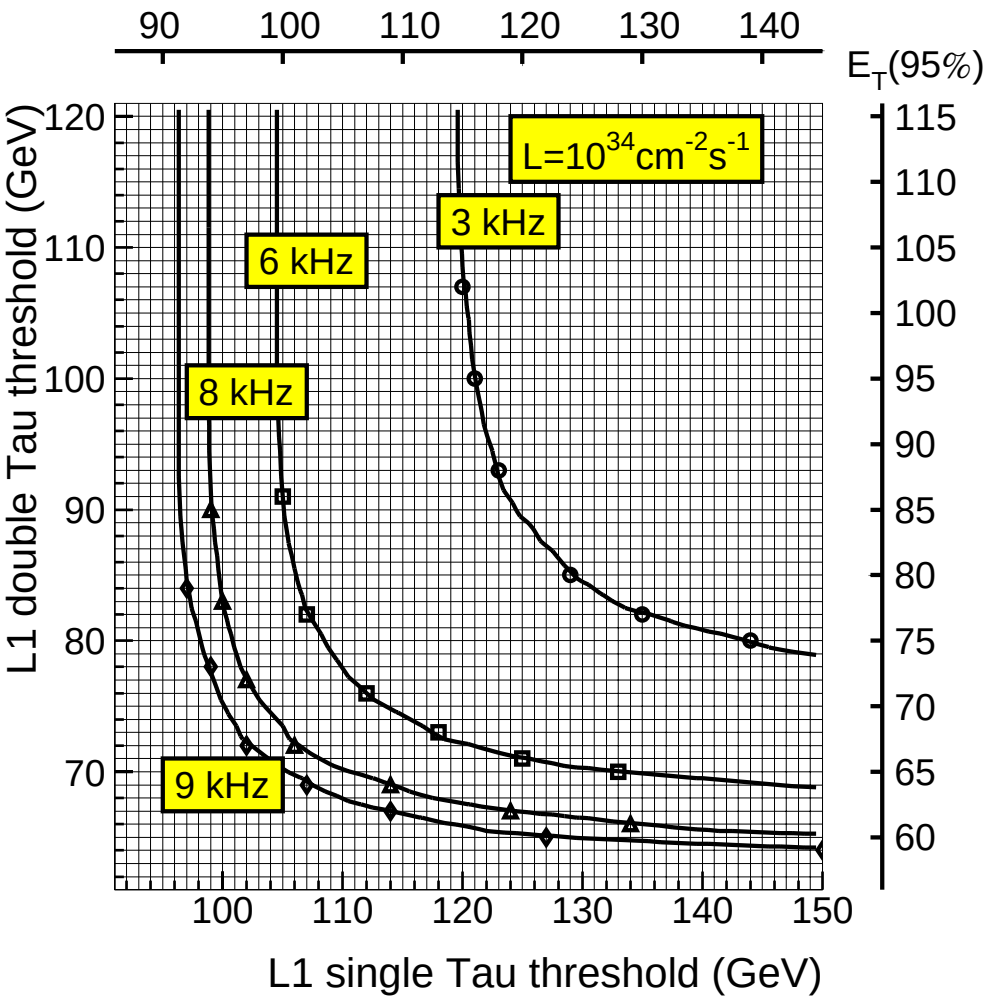
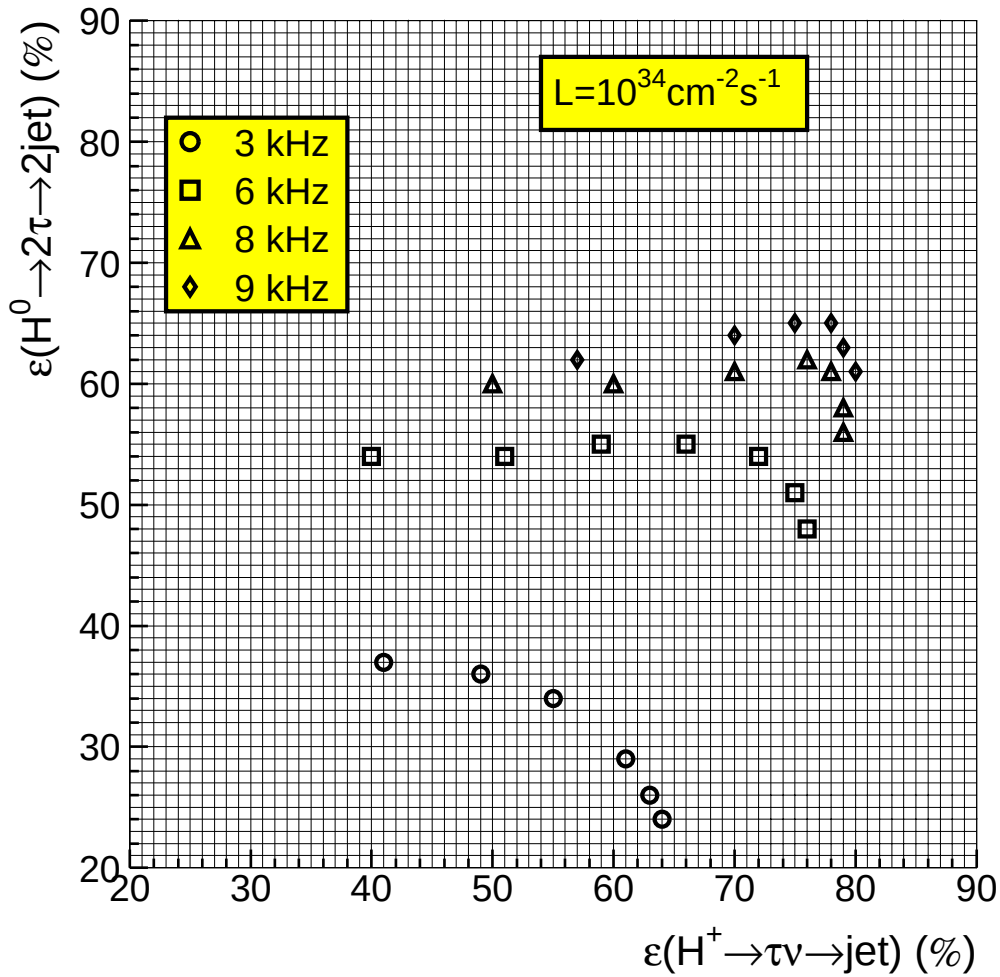
Optimization of Levl-1 1T v.s. 2T trigger thresholds at $L=10^{34}cm^{-2}s^{-1}$





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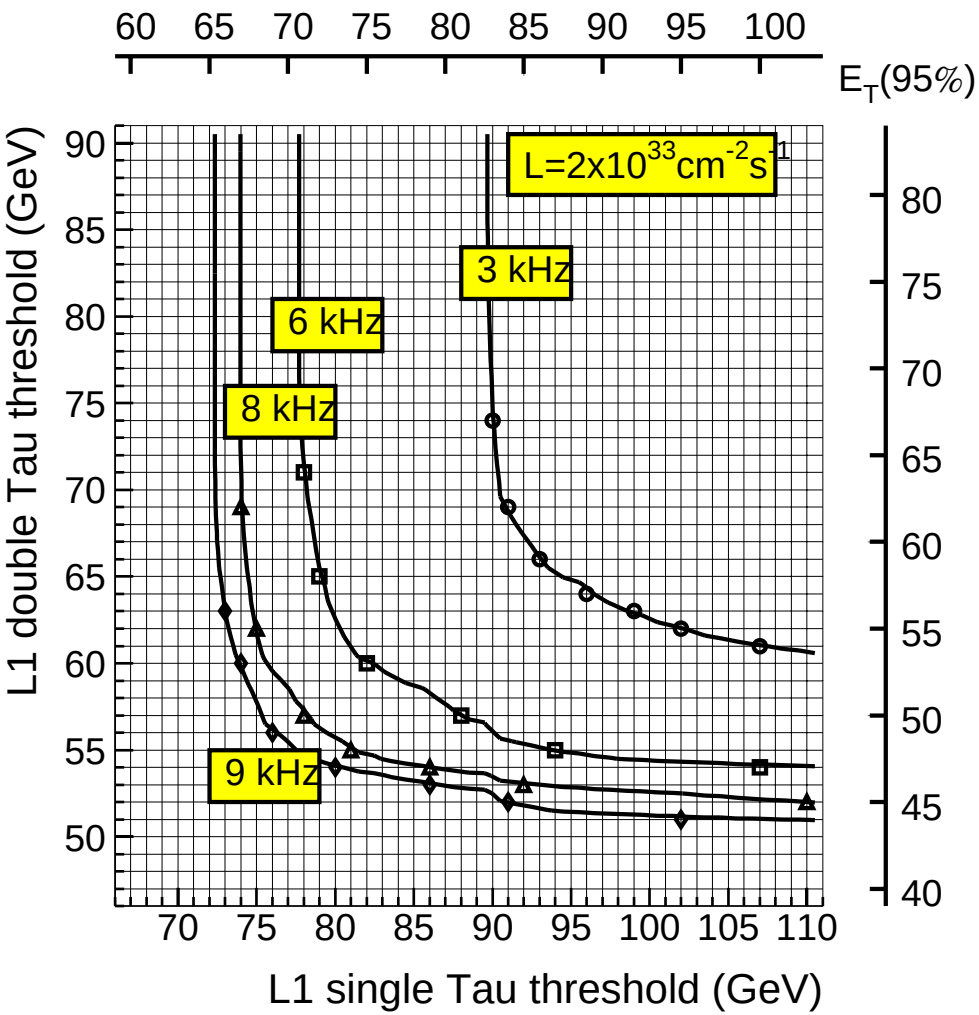
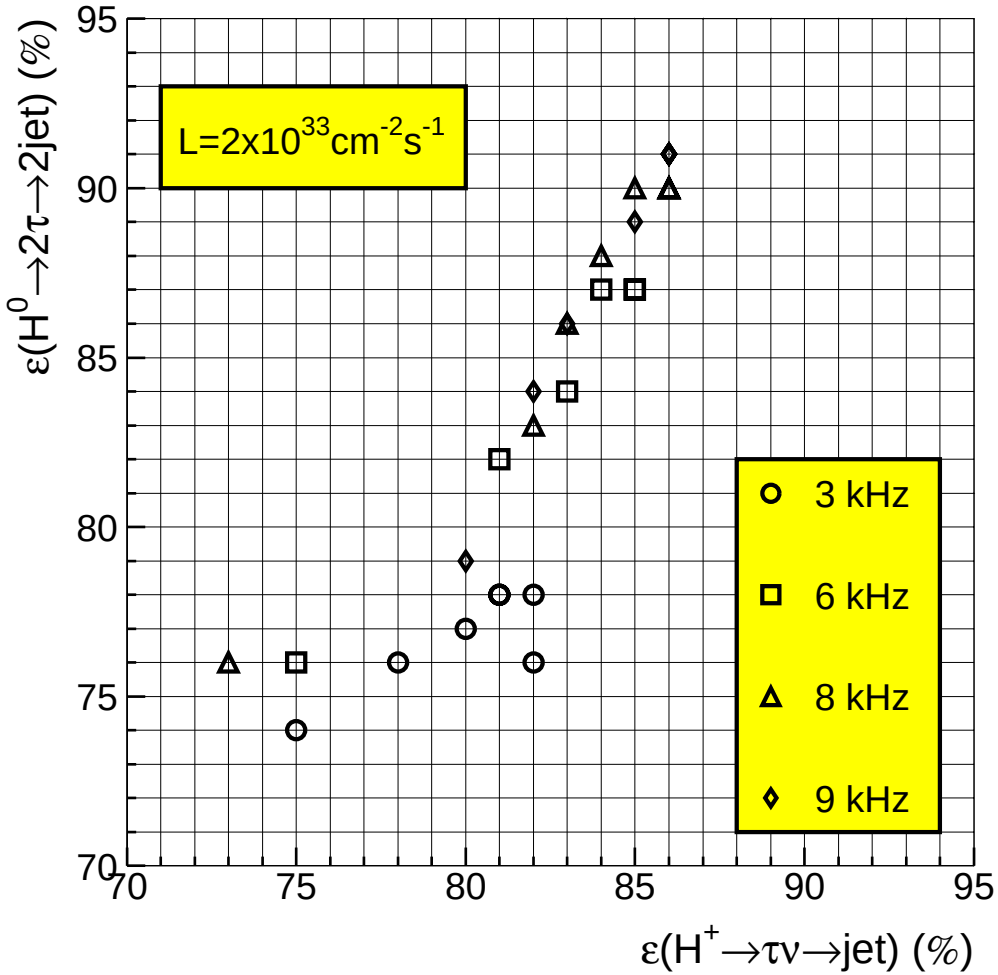
Optimization of Level-1 1T v.s. 2T trigger thresholds at $L=2x10^{33}cm^{-2}s^{-1}$





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Working points of Level-1 1T or 2T trigger

rate, kHz	luminosity	1T threshold (95 %), GeV	2T threshold (95%), GeV	$\varepsilon(H^0 \to 2\tau)$ M_H=200 GeV	$\varepsilon(H^+ \to \tau\nu)$ M_H=200 GeV
3	low	93 (86)	66 (59)	0.78	0.81
	high	129(124)	85(80)	0.34	0.55
6	low	82(75)	60(53)	0.87	0.84
	high	112(107)	76(71)	0.54	0.72
8	low	78(71)	57(50)	0.90	0.85
	high	106(101)	72(67)	0.62	0.76
9	low	76(69)	56(49)	0.91	0.86
	high	102(97)	72(67)	0.65	0.78

Optimization of the signal efficiency as a function of the Calo Tau Trigger supression factor for the overal suppression factor of 10^3 for the full Calo+Pxl Trigger path.

low luminosity

optimization of L2 Calo Tau supression factor for HLT Calo+Pxl supression factor 1000									
L2 Calo Tau suppression factor S_{calo}	1	1.5	2.0	3.0	4.0	5.0	6.2	7.5	10
Cut off on em. isol., GeV	no cut	10.4	7.6	5.6	4.6	4.0	3.4	3.2	2.6
CPU (1 GHz) $T_{calo}+T_{Pxl} / S_{calo}$, ms	110	85	72	59	52	50	45	43	41
Calo+Pxl Tau id efficiency	0.35	0.37	0.40	0.41	0.40	0.39	0.37	0.36	0.35

high luminosity

optimization of L2 Calo Tau supression factor for HLT Calo+Pxl supression factor 1000									
L2 Calo Tau suppression factor S_{calo}	1	1.5	2.0	3.0	4.0	5.0	6.2	6.9	10
Cut off on em. isol., GeV	no cut	15.8	12.6	9.8	8.4	7.6	7.0	6.6	5.6
CPU (1 GHz) $T_{calo}+T_{Pxl} / S_{calo}$, ms	416	295	235	174	145	126	112	106	90
Calo+Pxl Tau id efficiency	0.25	0.27	0.28	0.33	0.31	0.29	0.27	0.26	0.23

Calo Tau Trigger preselection reduces CPU / Level-1 event

low luminosity : efficiency and CPU for suppr. 10^3

High Level Trigger path	HLT efficiency		CPU, msec
	M_H=200 GeV	M_H=500 GeV	
Calo+ Pxl Tau Trigger	0.42	0.41	59
Trk Tau Trigger	0.43	0.49	290
Calo+Trk Tau Trigger	0.45	0.49	130

high luminosity : efficiency and CPU for suppr. 10^3

High Level Trigger path	HLT efficiency		CPU, msec
	M_H=200 GeV	M_H=500 GeV	
Calo+ Pxl Tau Trigger	0.33	0.36	174
Trk Tau Trigger	0.35	0.42	~1000
Calo+Trk Tau Trigger	0.40	0.45	390

The loss of efficiency of Calo+Pxl Tau Trigger can be fully compensated at Level-1 if accept 6 kHz Tau rate instead of 3 kHz reserved for Tau's. Faster HLT algorithm can accept bigger Level-1 rate for the same amount of CPU's.

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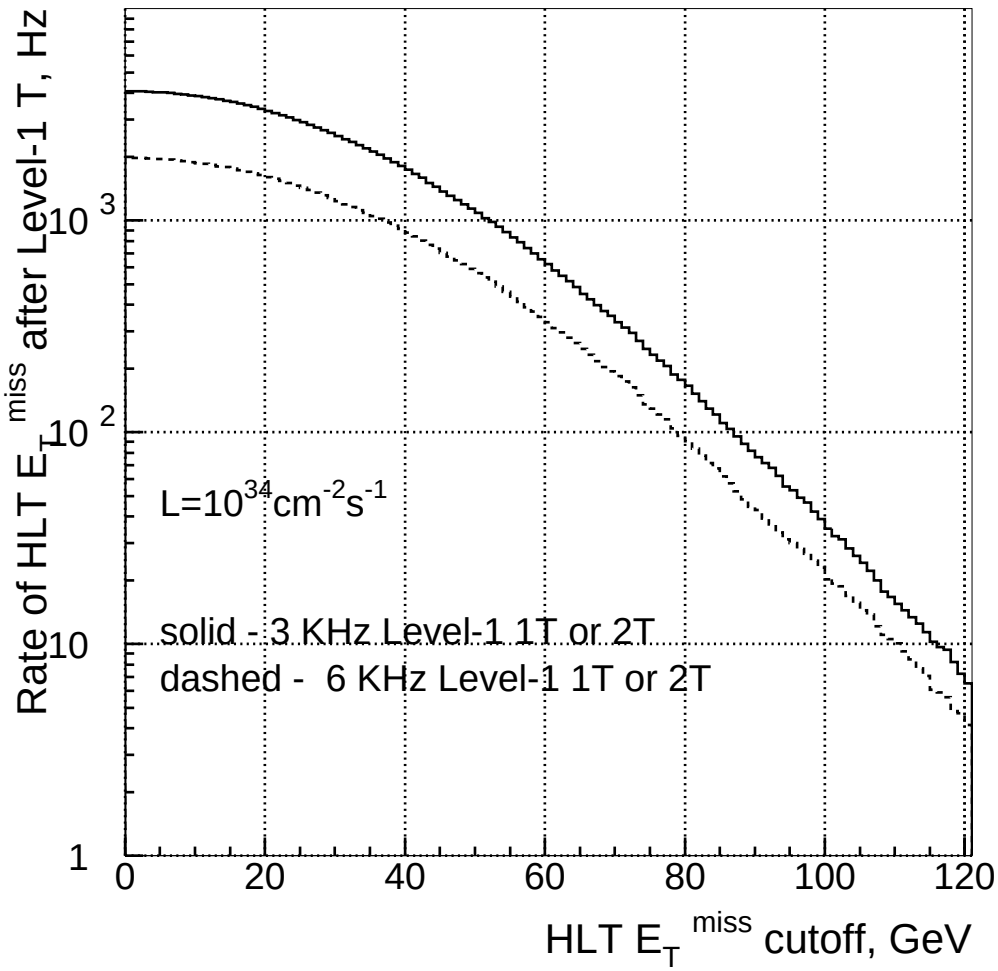
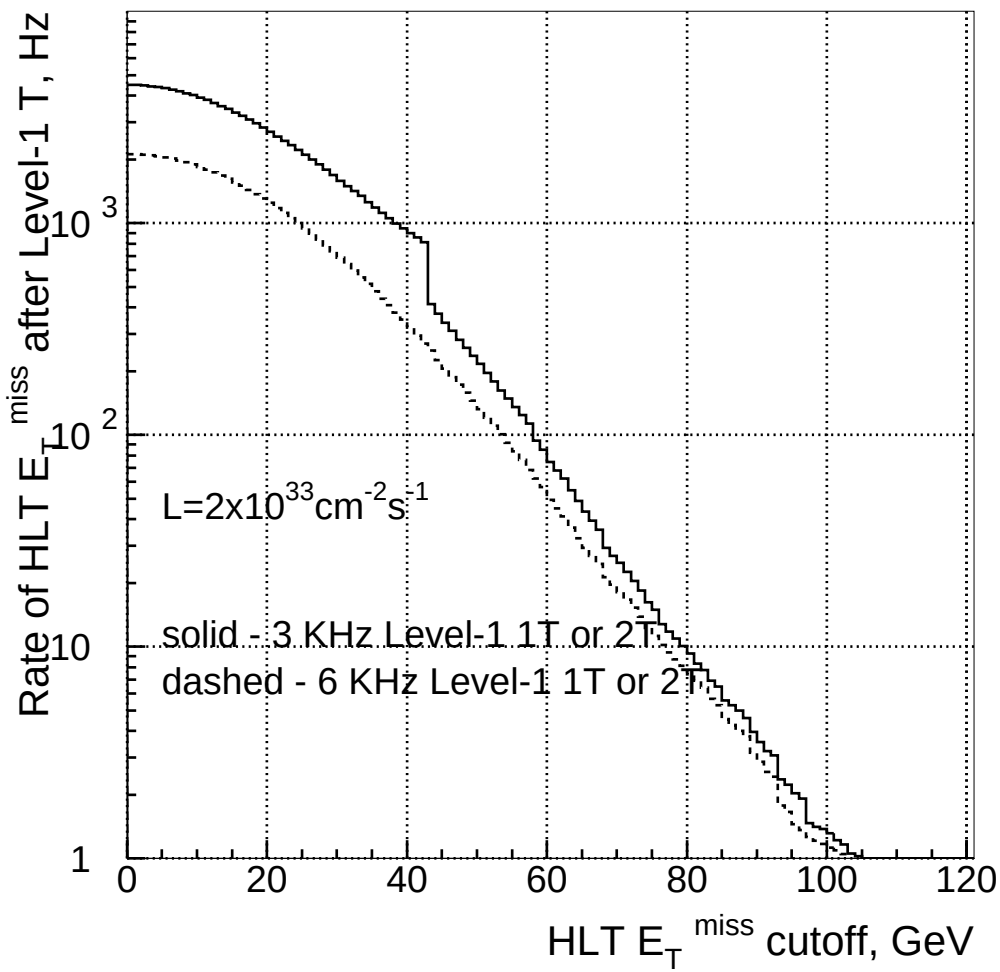
$H^+ \to \tau\nu$: strategy at Calo + Trk HLT

off-line cut : E_T^{miss} > 100 GeV. Let's do it at HLT for Level-1 1T stream





and apply then HLT Tracker Tau selection with rejection factor ~ 30