Tau trigger performances on 13 TeV data

CMS Collaboration

Level-1 τ_h efficiency

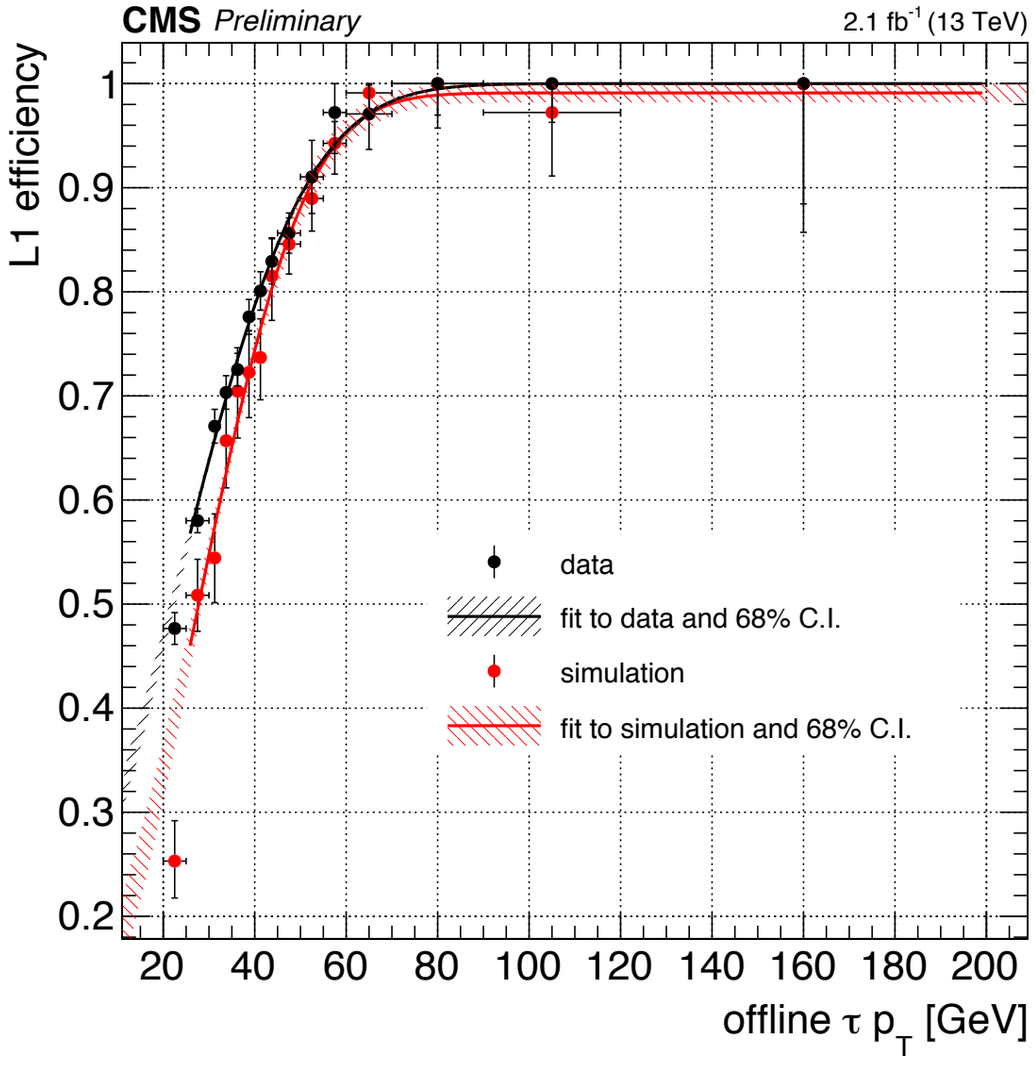

Figure 1a

Level-1 trigger efficiency for hadronically-decaying τ's used to seed the di-τ High Level Trigger for the H→ $\tau_h\tau_h$ analysis.

The efficiency is computed per single τ-leg through the tag-and-probe method, as a function of the offline-reconstructed tau transverse momentum. Hadronically-decaying τ's from the Z→$\tau_\mu\tau_h$ process are selected in events that fired the single μ HLT and fulfil the baseline H→ττ requirements of well identified and isolated $\mu\tau_h$ pairs and m(E_T^{miss}, μ) < 30 GeV.

Passed probe L1 τ's must geometrically match to selected offline τ's and must have transverse energy larger than 28 GeV. For E_T < 40 GeV, L1 τ's must satisfy an additional isolation requirement.

Level-1 τ_h energy response

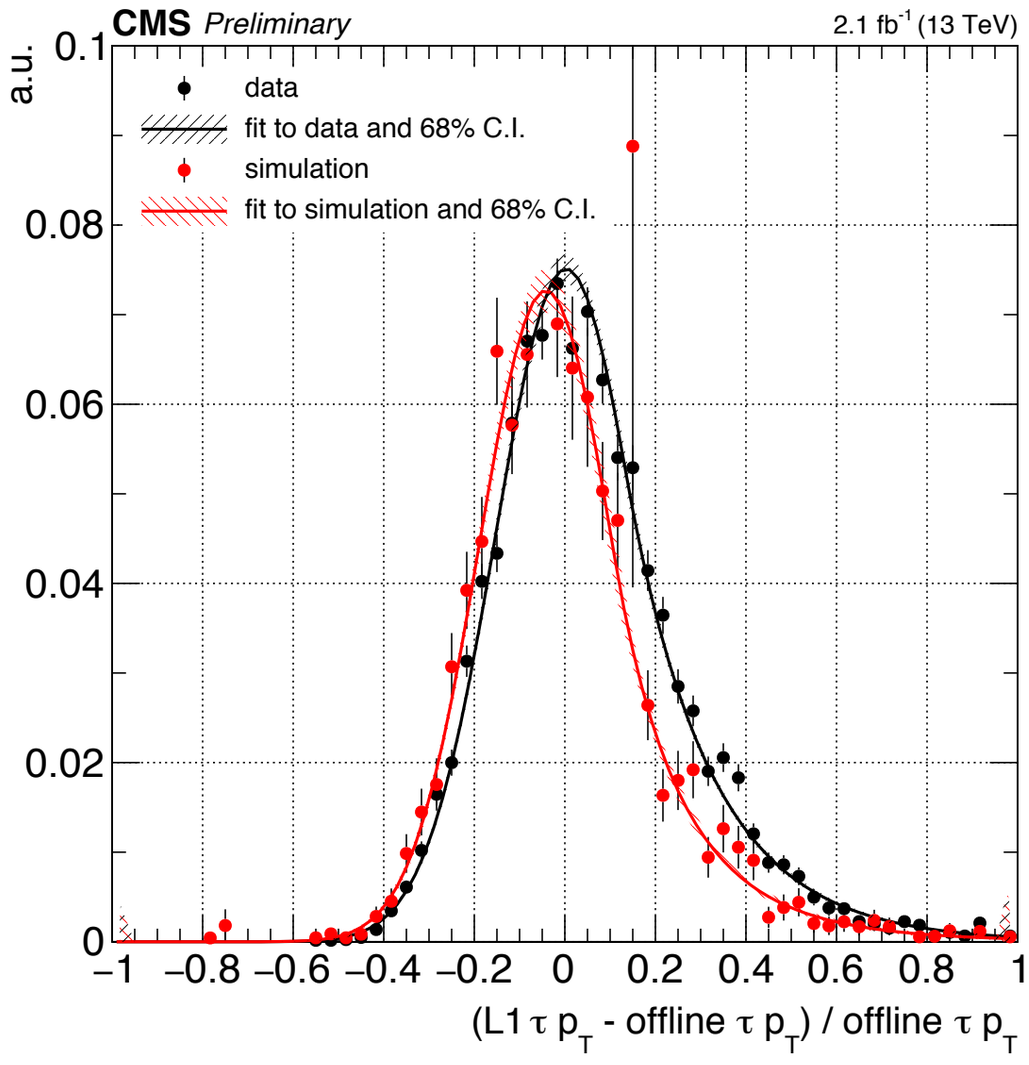

Figure 1b

Energy response for level-1 hadronically-decaying τ's used to seed the di-τ High Level Trigger for the H→ $\tau_h\tau_h$ analysis.

The L1 τ's here considered are geometrically matched to offline τ_h's which are selected in Z→$\tau_\mu\tau_h$ events that fired the single μ HLT and fulfil the baseline H→ττ requirements of well identified and isolated $\mu\tau_h$ pairs and m(E_T^{miss}, μ) < 30 GeV.

Di-τ_h High Level Trigger efficiency

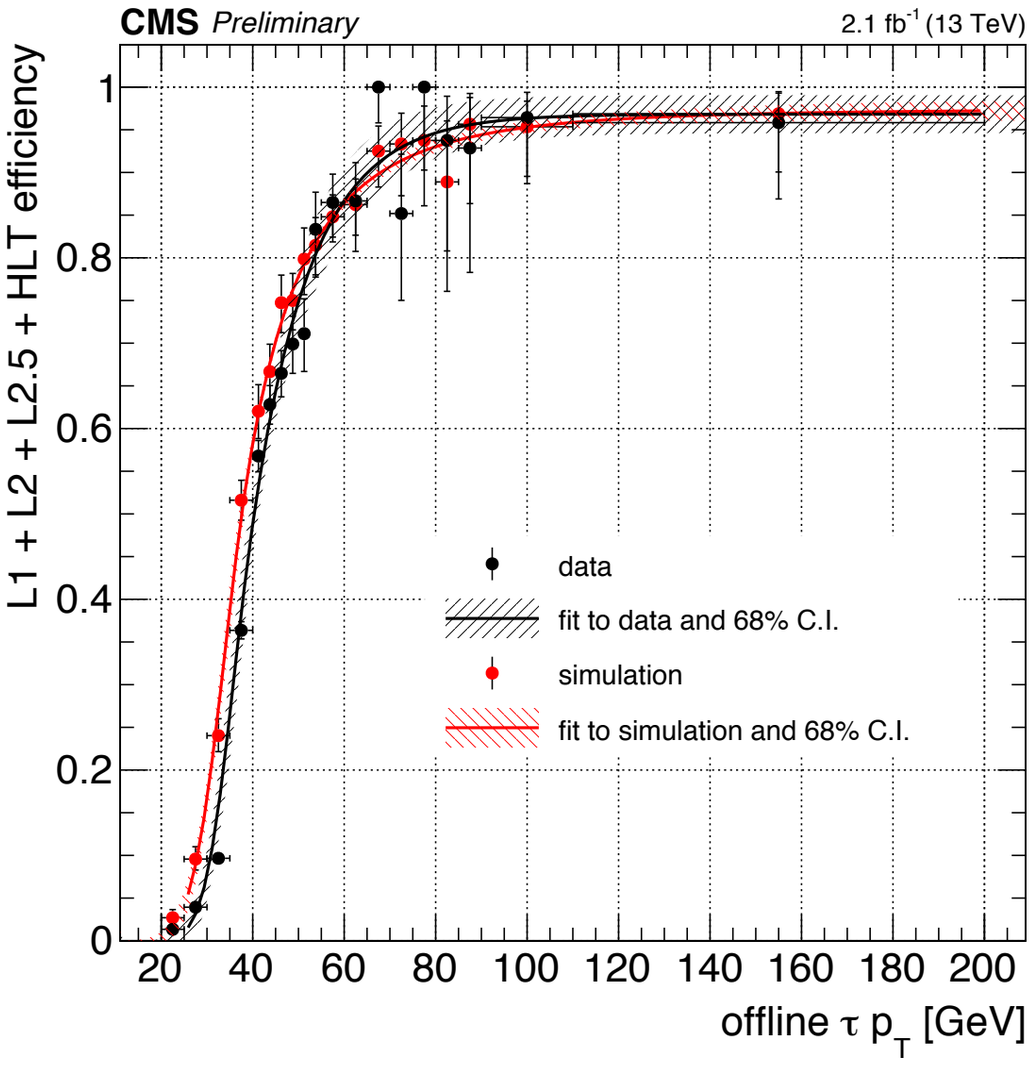

Figure 2

Combined L1 + L2 + L2.5 + High Level trigger efficiency of the di-τ_h (medium isolation, p_T > 35 GeV, seeded by di-τ Level-1) trigger for the H→ $\tau_h\tau_h$ analysis.

The efficiency is computed per single τ-leg through the tag-and-probe method, as a function of the offline-reconstructed tau transverse momentum. Hadronically-decaying τ's from the Z→$\tau_\mu\tau_h$ process are selected in events that fired the single μ HLT and fulfil the baseline H→$\tau\tau$ requirements of well identified and isolated $\mu\tau_h$ pairs and m(E_T^{miss}, μ) < 30 GeV.

Passed probe τ's are those that fired one leg of the di-τ_h HLT and geometrically match to selected offline τ's.

μτh High Level Trigger efficiency

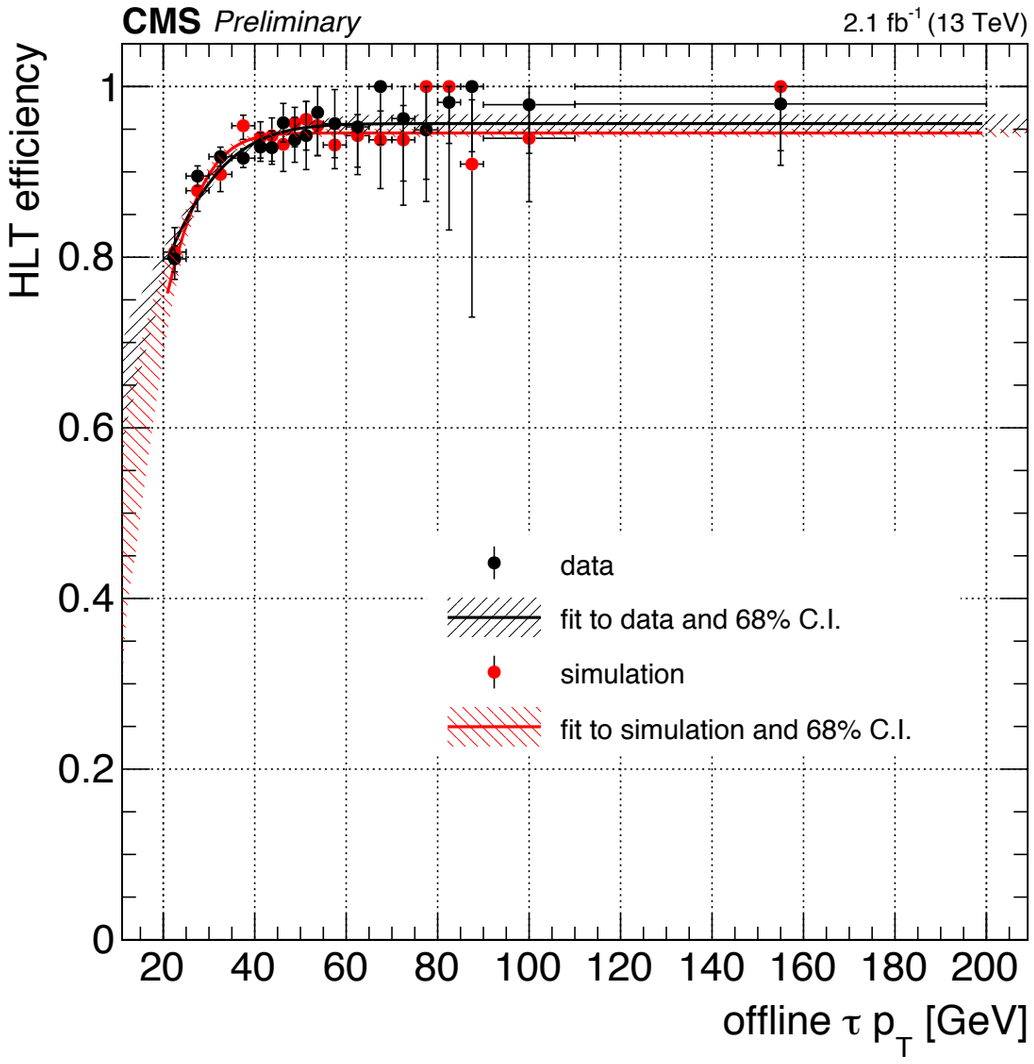

Figure 3

High Level Trigger efficiency of the τ leg of the μτh (loose isolation, p_T > 20 GeV, seeded by single-μ Level-1) trigger for the H→ τμτh analysis.

The efficiency is computed through the tag-and-probe method, as a function of the offline-reconstructed tau transverse momentum. Hadronically-decaying τ's from the Z→τμτh process are selected in events that fired the single μ HLT and fulfil the baseline H→ττ requirements of well identified and isolated μτh pairs and m(E_T^{miss}, μ) < 30 GeV.

Passed probe τ's are those that fired the μτh HLT and geometrically match to selected offline τ's.

τ_h + E_T^{miss} High Level Trigger efficiency - τ_h leg

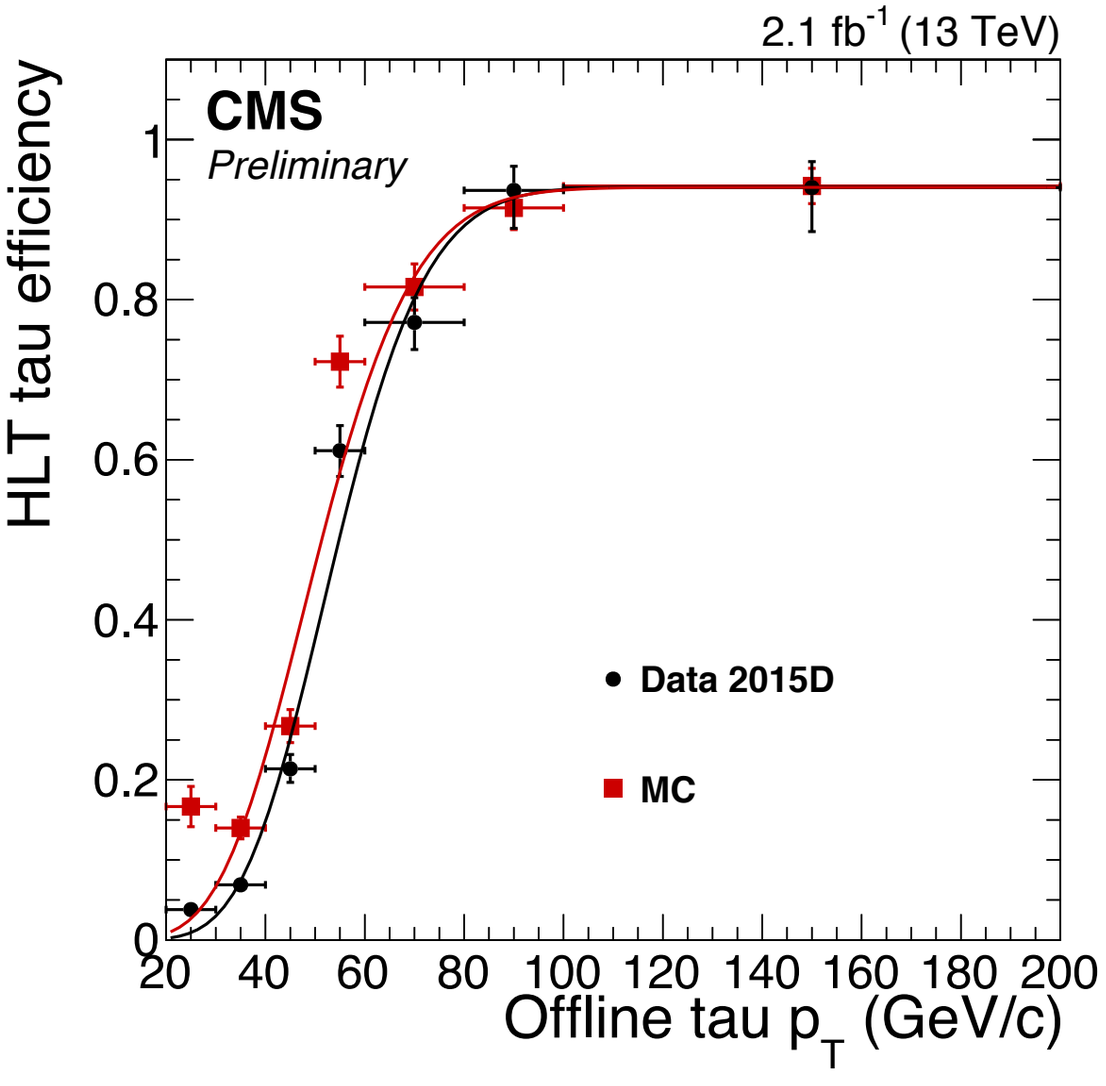

Figure 4a

High Level Trigger efficiency of the τ_h leg of the τ_h + E_T^{miss} (medium isolation, p_T > 50 GeV, seeded by E_T^{miss} Level-1) trigger for the $H^{\pm} \rightarrow \tau_h \nu_\tau$ analysis.

The efficiency is computed through the tag-and-probe method, as a function of the offline-reconstructed tau transverse momentum. Hadronically-decaying τ's from the $Z \rightarrow \tau_\mu \tau_h$ process are selected in events that fired the μ + E_T^{miss} service HLT and for which the τ_h fulfils identification and isolation requirements equivalent to those used in the $H^{\pm} \rightarrow \tau_h \nu_\tau$ analysis.

Passed probe τ's are those that fired the μ + τ_h + E_T^{miss} service HLT and geometrically match to selected offline τ's.

τ_h + E_T^{miss} HLT efficiency - E_T^{miss} leg

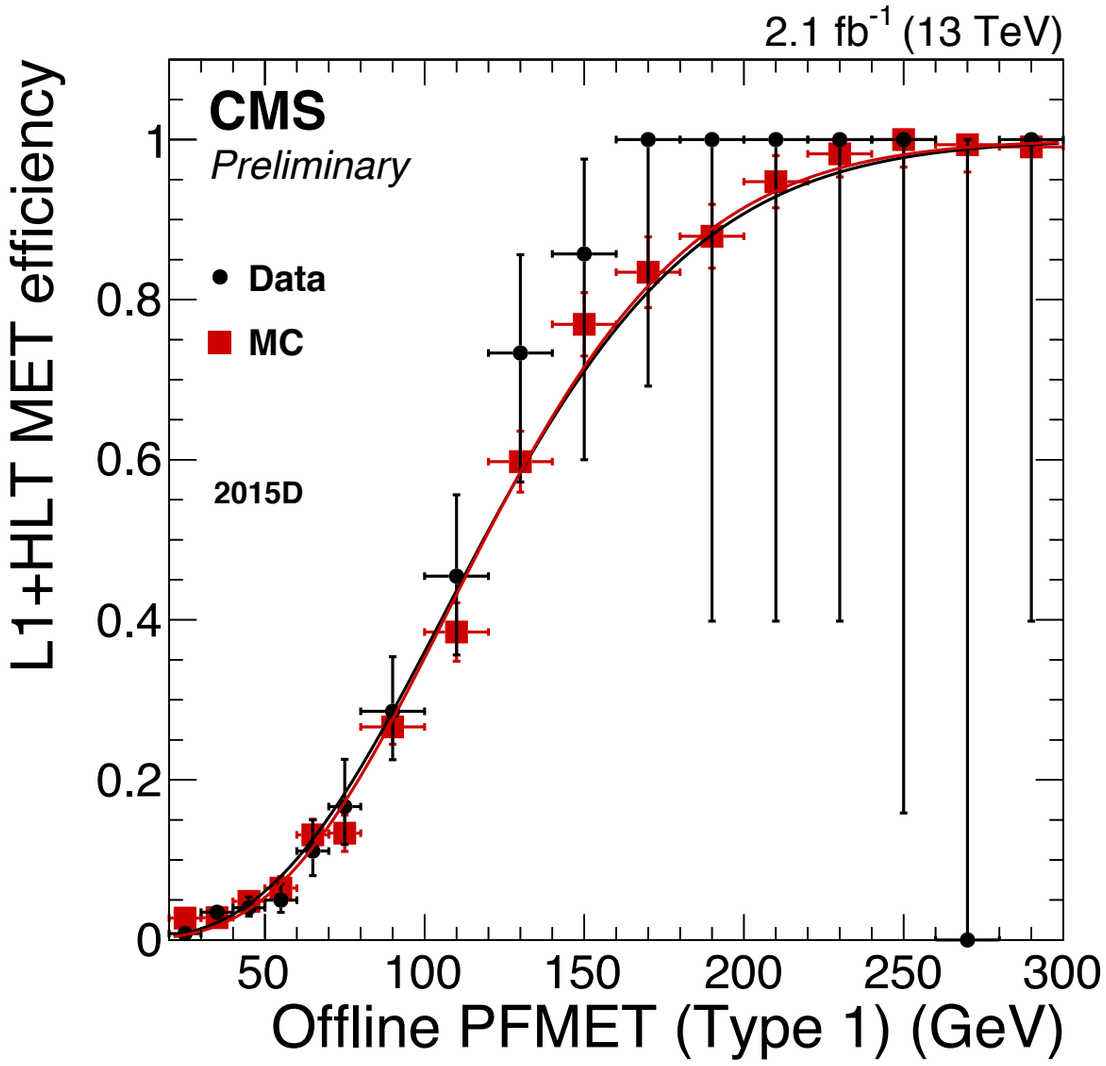

Figure 4b

High Level Trigger efficiency of the E_T^{miss} leg of the τ_h + E_T^{miss} (E_T^{miss} > 80 GeV, seeded by E_T^{miss} Level-1) trigger for the $H^{\pm} \rightarrow \tau_h \nu_\tau$ analysis.

The efficiency is computed through the tag-and-probe method, as a function of the offline Particle Flow based E_T^{miss}, in ttbar-enriched events selected by the single τ_h service HLT and fulfil the $H^{\pm} \rightarrow \tau_h \nu_\tau$ analysis requirements (presence of one b-tagged jet and absence of further leptons other than the τ)

Passed probe events are those that fired the τ_h + E_T^{miss} HLT.