

### WH selection requirements

$p_T^{\tau_h} > 20 \text{ GeV}, |\eta^{\tau_h}| < 2.3, I^e < 0.1, I^\mu < 0.15, \text{b-veto}$

Channel	Trigger ( $p_T/\eta$ )	Lepton Selection: $p_T$ (GeV)	Lepton Selection: Iso.
$e\mu\tau_h$	$\mu(22/2.1)$ or $e(25/2.1)$	$p_T^e > 15$ or $26, p_T^\mu > 23$ or $15$	MVA $\tau_h$ (60% eff.)
$\mu\mu\tau_h$	$\mu(22/2.1)$	$p_T^\mu > 23, p_T^\mu > 15$	MVA $\tau_h$ (60% eff.)
$e\tau_h\tau_h$	$e(25/2.1)$	$p_T^e > 26$	MVA $\tau_h$ (55 or 65% eff.)
$\mu\tau_h\tau_h$	$\mu(22/2.1)$	$p_T^\mu > 23$	MVA $\tau_h$ (55 or 65% eff.)

### ZH selection requirements

Z boson reconstructed from opposite charge, same-flavor light leptons,  $60 < m_{\ell\ell} < 120 \text{ GeV}$

$\tau_h$  baseline requirements:  $p_T^{\tau_h} > 20, |\eta^{\tau_h}| < 2.3, \text{MVA } \tau_h$  (65% efficiency)

e baseline requirements:  $p_T^e > 10, |\eta^e| < 2.5, \text{MVA ID}$  (90% efficiency)

$\mu$  baseline requirements:  $p_T^\mu > 10, |\eta^\mu| < 2.4, \mu \text{ ID}$  (> 99% efficiency),  $I^\mu < 0.25$

Channel	Trigger ( $p_T/\eta$ )	Lepton Selection: $p_T$ (GeV)	Lepton Selection: Isolation
$ee\mu\tau_h$			$I^\mu < 0.15$
$eee\tau_h$	$e(23/2.5)$ & $e(12/2.5),$	$p_T^e > 24, \& p_T^e > 13,$	e ID (80% eff.), $I^e < 0.15$
$ee\tau_h\tau_h$	or $e(27/2.5)$	or $p_T^e > 28$	baseline selection
$eee\mu$			e ID (80% eff.), $I^e < 0.15, I^\mu < 0.15$
$\mu\mu\mu\tau_h$			$I^\mu < 0.15$
$\mu\mu e\tau_h$	$\mu(17/2.4)$ & $\mu(8/2.4),$	$p_T^\mu > 18, \& p_T^\mu > 10,$	e ID (80% eff.), $I^e < 0.15$
$\mu\mu\tau_h\tau_h$	or $\mu(24/2.4)$	or $p_T^\mu > 25$	baseline selection
$\mu\mu e\mu$			e ID (80% eff.), $I^e < 0.15, I^\mu < 0.15$