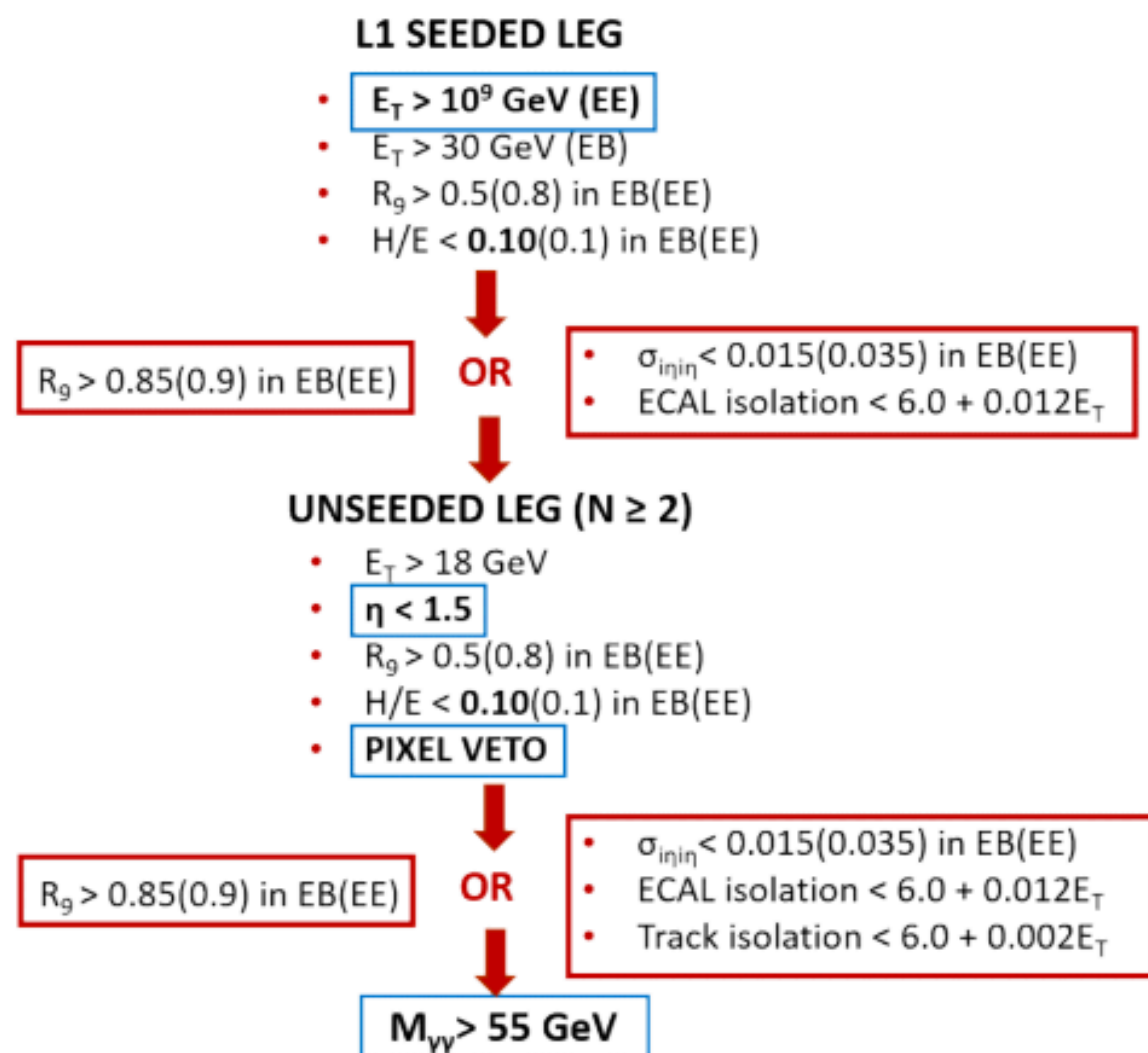


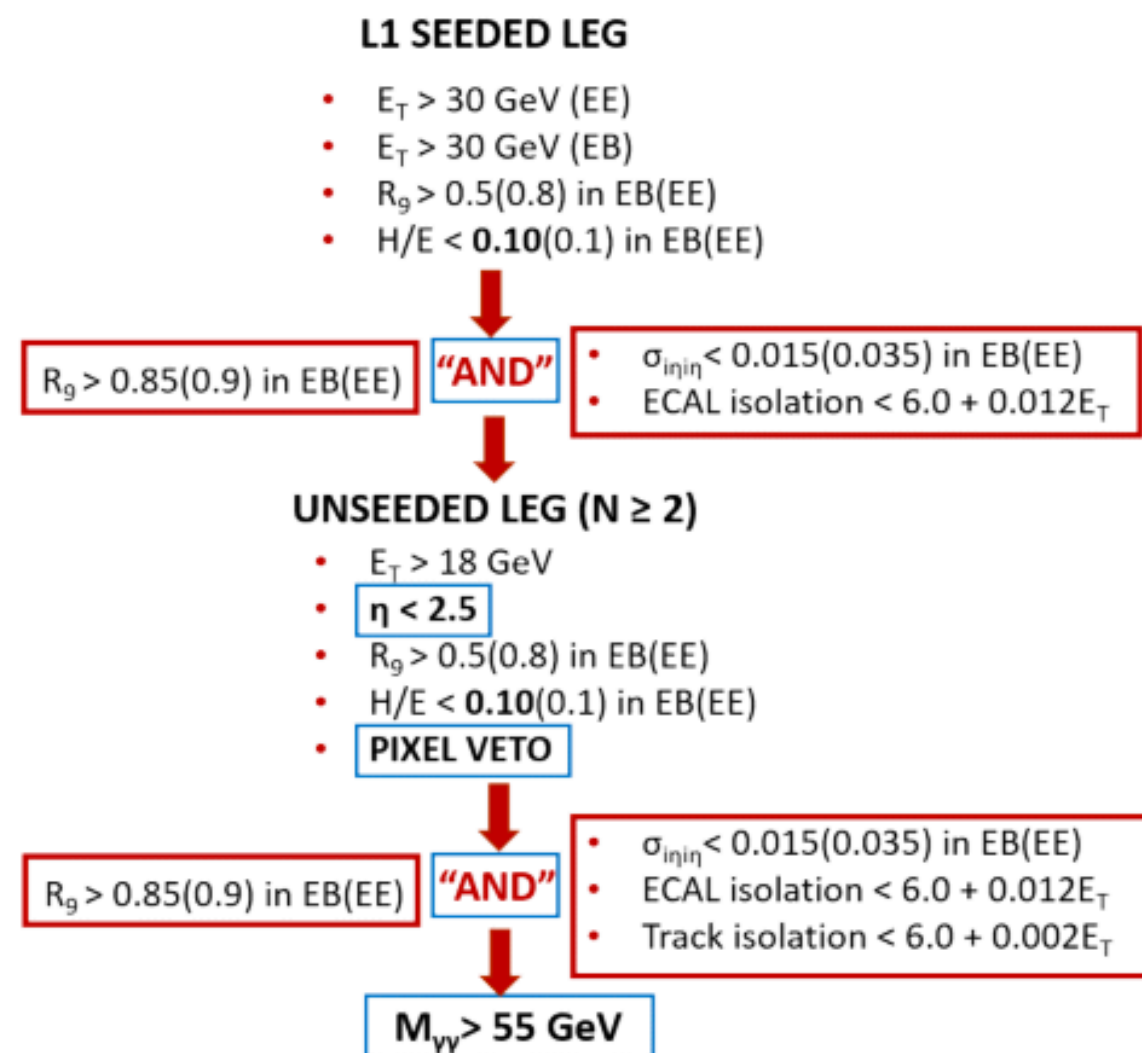
Pre-Selections

- Online selection identical to Low Mass $h \rightarrow \gamma\gamma$ search
 - HLT_Diphoton30EB_18EB_R9Id_OR_IsoCalId_AND_HE10p0_R9Id_DoublePixelVeto_Mass55_v7
 - HLT_Diphoton30PV_18PV_R9Id_AND_IsoCalId_AND_HE10p0_R9Id_DoublePixelVeto_Mass55_v7
- Events have to pass an OR of the two HLT paths
- Blue box means that the cut is different from standard $H \rightarrow gg$ analysis

“OR” PATH



“AND” PATH



Low Mass Pre-selections

➤ **Preselection:** to match the HLT and also with tighter cuts on H/E and $\sigma_{i\eta i\eta}$ to match the HLT of “single-fake” Zee (*HLT_Ele27_WPTight_Gsf_v**) for systematics on DCB parameters (μ, σ)

		R9 (5x5)	HoE	$\sigma_{i\eta i\eta}$ (5x5)	pfPhoIso	TrackerIso
Both photons in barrel	Barrel	> 0.5	< 0.07	< 0.0105	< 4 GeV	< 6 GeV
At least one in endcap	Barrel	> 0.85	< 0.07	< 0.0105	< 4 GeV	< 6 GeV
At least one in endcap	Endcap	> 0.9	< 0.035	< 0.0275	< 4 GeV	< 6 GeV

TWIKI

Electron veto: No Pixel Seed (PSV) instead of conversion-safe (CSV) used in std. analysis

Same loose photon **ID MVA > -0.9** as the std analysis

$pT_{\text{leading } \gamma} > 30 \text{ GeV}$, $pT_{\text{subleading } \gamma} > 18 \text{ GeV}$, and both $|\eta| < 2.5$ but not in EB-EE gap

$m_{\gamma\gamma} > 55 \text{ GeV}$

Higgs->4 Gamma Pre-selections

• Pre-Selection

- Loose Photon ID > -0.9
- Trigger strategy on MC based on offline selection similar to online
- Different kind of photon pairs being considered according to their η and R9 values

Offline Trigger like requirements

Category		R9	H/E	$\sigma_{i\eta i\eta}$	Pho Iso	Trk Iso
Both photons in EB		> 0.85	< 0.08	-	-	-
		> 0.5 && < 0.85	< 0.08	< 0.015	4 GeV	6 GeV
At least one Photon in EE	Second photon in EB	> 0.85	< 0.08	< 0.015	4 GeV	6 GeV
	Second Photon in EE	> 0.9	< 0.08	< 0.035	4 GeV	6 GeV

- $m_{\gamma\gamma} > 55 \text{ GeV}$, $P_T \text{ lead } \gamma > 30 \text{ GeV}$, $P_T \text{ sub-lead } \gamma > 18 \text{ GeV}$, Pixel Veto applied