New Trigger Effort at RHUL

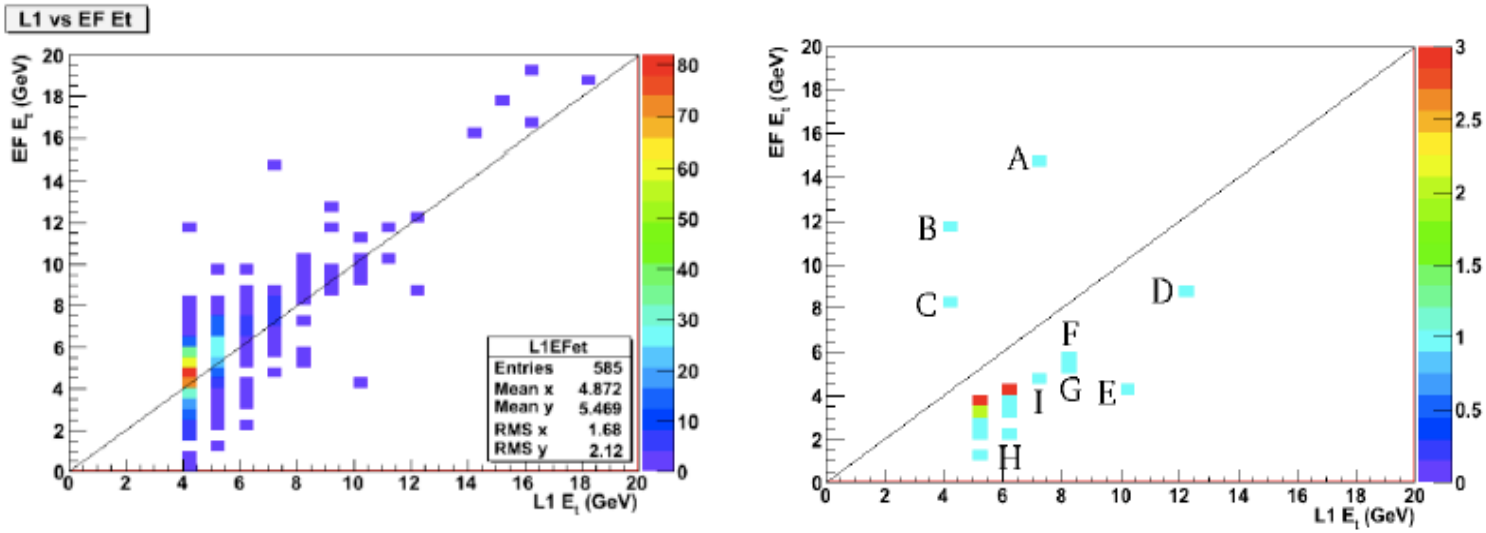
- Royal Holloway students have started to contribute to the trigger:
  - Daniel Hayden – e/gamma outliers in first data
  - Clive Edwards – Optimization of L2 electron candidates found by TrigElectronFex
  - Matthew Rose – HLT code cleanup

Dan Hayden

e/gamma Outliers with First Data

Looking for problematic e/gamma candidates in first beam data

- Take all Good Runs in the L1CaloEM stream for 900 GeV Run (Now re-doing with 7 TeV Data)
- Compare E_T reconstructed at the different Trigger Levels: L1 vs L2, L1 vs EF, and L2 vs EF
  - Work done together with Matthew Tamsett, who did L# vs Offline
- Investigate events > 3 sigma away from the mean of the pseudo resolution distribution e.g. (L1et - L2et)/ L2et
  - Group outliers into "families" of known problems when possible
  - Look for any events which cannot be explained!
- Work contributed to TrigEGamma COM Note:
  - https://svnweb.cern.ch/trac/atlasgrp/browser/Trigger/EgammaTrigger/2009CollisionNote/TrigEgamma2009CollisionNote.pdf



(a) all matches

(b) outliers

Figure 20: L1 vs EF resolution and outliers.

Outlier	Run	Event	Lumi	Eta|Phi (L1 ROI)	L1|L2|EF|OFF E_T (GeV)	Category
A	142193	894091	78	1.30|-2.36	7|6|14.9|14.8	f3
B	142165	1329234	201	1.40|0.49	4|8.7|11.8|17.9	Crack
C	142383	430598	265	2.30|-1.67	4|3.5|8.4|7	f3
D	142193	844664	75	-0.60|-0.29	12|7.7|8.6|9.8	L1 Summing
E	142165	366495	87	-0.50|-1.08	10|8|4|8	False EF Cluster
F	142171	111762	87	-0.30|0.79	8|5.6|5.5|6.8	Unknown
G	142193	115593	27	0.00|1.18	8|4.6|5.2|6	Unknown
H	142165	467735	134	-1.60|-0.29	6|5.4|2.3|5.7	False EF Cluster
I	142189	454010	729	0.90|1.28	7|5.8|4.7|7.2	False EF Cluster

Table 8: L1 vs. EF outlier details

Dan Hayden

Clive Edwards

L2 trig electron optimization

Problem

- L2 Trig electrons currently created using Fex algorithm from L2 EMClusters and TrigInDetTracks
- Creation of Trigelectrons done with dR matching of track and cluster
- Aim is to optimize way trig electrons are created
- i.e. Maintain/ improve current performance of identification of trig electrons while keeping fewer
- Reduce cpu processing time

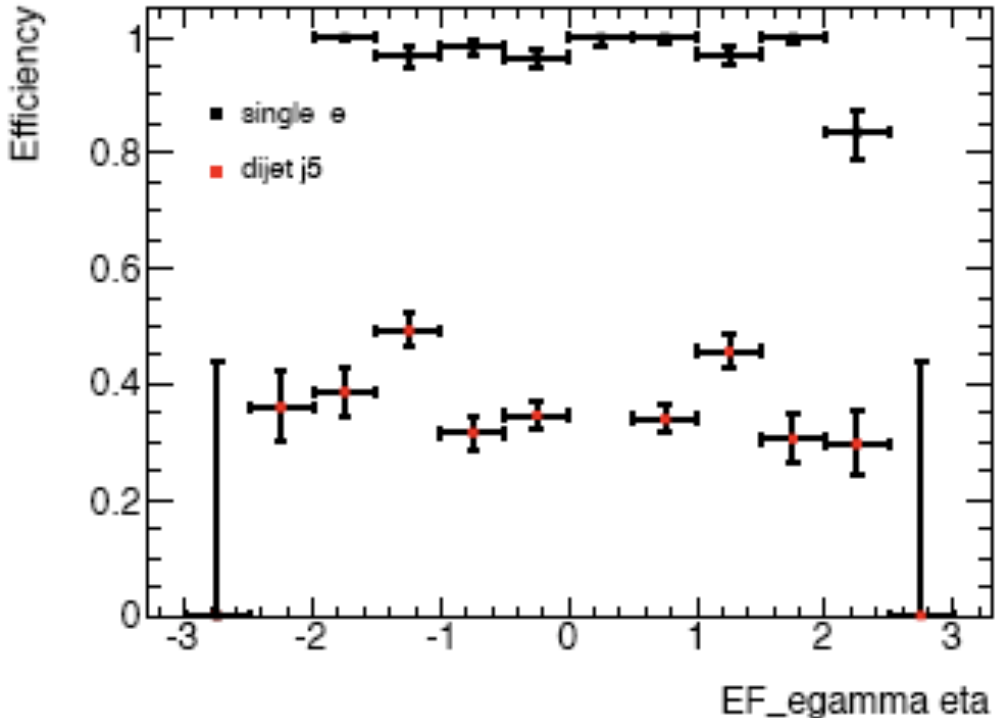
Current Performance

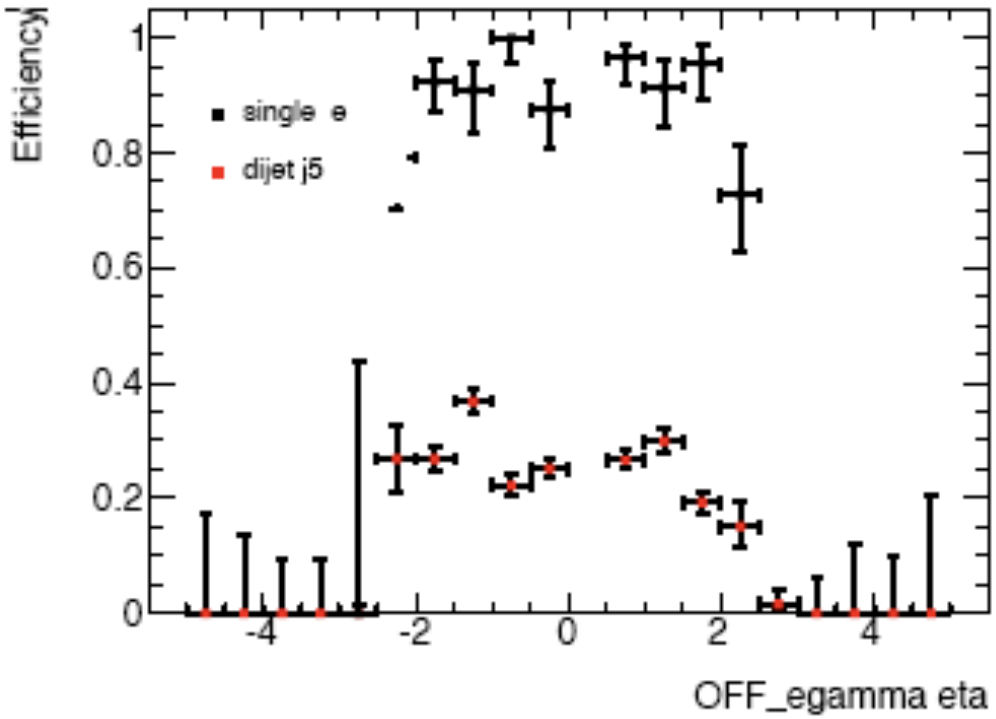
- Look at E10medium as example
- Calculate deta and dphi between each trigelectron compared to all event filter(EF) and offline(OFF) electrons
- require deta and dphi < 0.1 to have match
- If have $>=1$ trigelectron satisfying this, plot corresponding EF(OFF) electron pT, eta
- Plot in bins of eta and pT ratio of number of trigelectrons matched to EF(OFF) / total number of EF(OFF)

Clive Edwards

Initial results

- Very much “work in progress”
- Currently finding the best way to measure performance
- Must compare TrigElectrons to electron candidates found at both EF and offline
- Must be able to maintain/improve trigger efficiency and rate while improving purity of TrigElectrons built by FEX





Matt Rose

Trigger Software Cleanup

- Trigger code needs to cope with strict constraints of execution time, memory allocation and memory leaking
- Matt's task is to improve the trigger code according to the rules described in:
  - https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerCodingGuidelines
- Applying the guidelines retrospectively to trigger code, thus:
  - Ensuring that it builds without errors or warnings on all platforms
  - Improving general coding practice in order to make the code build faster
  - Aim for code to crash less often, run more efficiently and report errors in a clearer way
- The work has started and is ongoing