Jet Menu for rel.20.0.0/MC2015

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On behalf of the jet signature group
Trigger General Meeting
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Key

- Jet Algorithm:
  - **a4** = anti-kt jet finding algorithm with R parameter of 0.4
  - **a10** = anti-kt jet finding algorithm with R parameter of 1.0
- Input objects used for jet finding:
  - **tc** = TopoClusters reconstructed from calorimeter cells
  - **TT** = Level 1 TriggerTowers read out in HLT to allow fast but coarse full calo scan (a.k.a. Level 1.5)
- Calorimeter scan:
  - **PS** = partial calorimeter scan seeded by L1 RoI or L1.5
  - **FS** = full calorimeter scan (default)
- Pseudorapidity range:
  - **xxETAyy =** jets in interval xx < |η| < yy – default is **0eta32** (old central jets)
- Cluster Energy Scale correction:
  - **em** = no weights applied
  - **lcw** = local cluster weighting
- Jet Energy Scale correction:
  - **jes** = JES calibration factors without pileup subtraction
  - **sub** = pileup subtraction applied but no JES factors
  - **subjes** = both pileup subtraction and JES factors

- Some possible combinations:
  - **a4tcem** = jets built from EM-scale clusters with no jet level calibration
  - **a10tcemsubjes** = jets built from EM-scale clusters with pile-up subtraction and jet-level calibration
  - **a10TTem** = jets built from TriggerTowers with no jet level calibration
  - **a4tclcwsub** = jets built from LC-scale clusters with only a pile-up subtraction applied at the jet level
  - **a10tclcw_PS** = jets built from LC-scale clusters found in a SuperRoI seeded by all L1_Jx items

Inclusive single jet chains

Level 1 seed	Rate @ 0.5 & 2x10^{34}	HLT chain	Rate @ 0.5 & 2x10^{34}	Prescale@2x10^{34}	Clients
L1_RD0		j55_a4tcemsubjes	O(Hz)	?	bootstrap
		j60_a4tcemsubjes	O(Hz)	?	bootstrap
J12	0.95 / 3.8 MHz	j55_a4tcemsubjes	150 / 600 kHz	600,000 – 1 Hz	taus
J15	0.53 / 2.1 MHz	j60_a4tcemsubjes	100 / 400 kHz	400,000 – 1 Hz	taus, btag
J20	240 / 970 kHz	j85_a4tcemsubjes	21 / 85 kHz	85,000 – 1 Hz	taus, multi-j
		j85_a4tcemjes			
		j85_a4tclcwsubjes			
		j85_a4tclcwjes			
J25	130 / 510 kHz	j100_a4tcemsubjes	10 / 41 kHz	41,000 – 1 Hz	taus
J30	75 / 300 kHz	j110_a4tcemsubjes	6.5 / 26 kHz	26,000 – 1 Hz	LAr calib
J40	32 / 130 kHz	j150_a4tcemsubjes	1.6 / 6.5 kHz	6500 – 1 Hz	J+MET
J50	15 / 60 kHz	j175_a4tcemsubjes	0.75 / 3 kHz	3000 – 1 Hz	multijet
		j175_a4tcemjes			
		j175_a4tclcwsubjes			
		j175_a4tclcwjes			

Inclusive single jet chains

Level 1 seed	Rate @ 0.5 & 2x10^{34}	HLT chain	Rate @ 0.5 & 2x10^{34}	Prescale@2x10^{34}	Clients
J60	7.5 / 30 kHz	j200_a4tcemsubjes	0.4 / 1.6 kHz	1600 – 1 Hz	btag
J75	4 / 17 kHz	j260_a4tcemsubjes	140 / 400 Hz	400 – 1 Hz	btag, low Lumi
J85	2.5 / 10 kHz	j300_a4tcemsubjes	67 / 270Hz	200 – ≈1 Hz	multijet, medium Lumi
		j320_a4tcemsubjes	43 / 170 Hz	150 – ≈1 Hz	multijet, medium Lumi
J100	1.3 / 5 kHz	j360_a4tcemjes	22 / 90 Hz	100 – ≈1 Hz	unprescaled at 1x10^{32} or lower: aim for 1-2 points during year to change lowest unprescaled chain
		j380_a4tcemsubjes	16 / 65 Hz	50 – ≈1 Hz	
		j380_a4tcemjes			
		j380_a4tclcwsubjes			
		j380_a4tclcwjes			
		j400_a4tcemsubjes	9 / 35 Hz	unprescaled	Also re-think set of cross-check chains with different calibrations if needed
		j400_a4tcemjes			
		j400_a4tclcwsubjes			
		j400_a4tclcwjes			
J120	1.3 / 2.7 kHz	j460_a4tcemjes + cross-check chains	<1 / 2.8 Hz	unprescaled	High Lumi
J400	0 / 0 Hz	noAlg	5.5 Hz	unprescaled	Passthrough

Multi-jet and fat jet chains

Level 1 seed	@ 0.5 & 2x10^{34}	HLT chain	@ 0.5 & 2x10^{34}	Prescale@2x10^{34}	Clients
3J40	0.4 / 1.6 kHz	4j85_a4tcemsubjes	45 / 180 Hz	180 – 1 Hz	
3J50	0.3 / 1.0 kHz	4j100_a4tcemsubjes	12 / 50 Hz	unprescaled	SUSY, SM, top, jets
4J15	2.4 / 9.5 kHz	5j55_a4tcemsubjes	65 / 260 Hz	260 – 1 Hz	
4J20	0.5 / 1.9 kHz	5j60_a4tcemsubjes	40 / 170 Hz	170 – 1 Hz	
4J20	0.5 / 1.9 kHz	5j85_a4tcemsubjes	4 / 15 Hz	unprescaled	SUSY, SM, top, jets
		5j85_a4tcemjes			
		5j85_a4tclcwsubjes			
		5j85_a4tclcwjes			
5J15.0ETA24	0.1 / 0.3 kHz	6j45.0eta24_a4tcemsubjes	25 / 100 Hz	100 – 1 Hz	SUSY, SM (*)
5J15.0ETA24	0.1 / 0.3 kHz	6j50.0eta24_a4tcemsubjes	10 / 40 Hz	unprescaled	SUSY, SM (*)
5J15.0ETA24	0.1 / 0.3 kHz	6j55.0eta24_a4tcemsubjes	8 / 30 Hz	30 – 1 Hz	SUSY, SM (*)
HT150	3 / 12 kHz	j360_a10tcemsubjes	14 / 60 Hz	60 – 1 Hz	exotics, jets
HT190	1.2 / 5 kHz	j450_a10tcemsubjes	2 / 8 Hz	unprescaled	exotics, jets

(*) A new study from SUSY indicates that 6j chains can/should start from 4J20 to save bandwidth – need to understand if this is also ok for SM

Forward jet and HT chains

Level 1 seed	Rate @ 0.5 & 2x10^{34}	HLT chain	Rate @ 0.5 & 2x10^{34}	Prescale@2x10^{34}	Clients
J15.24ETA49	?	j60.24eta49	?	? – 1 Hz	egamma
J15.28ETA32	?	j60.28eta32	?	? – 1 Hz	SUSY, SM, top, jets
J20.28ETA32	?	j85.28eta32	?	? – 1 Hz	jets
J15.32ETA49	?	j60.32eta49	?	? – 1 Hz	jets
J20.32ETA49	?	j85.32eta49	?	? – 1 Hz	jets
J30.32ETA49	?	j110.32eta49	?	? – 1 Hz	jets
J50.32ETA49	?	j175.32eta49	0	unprescaled	Jets, SM
J75.32ETA49	?	j260.32eta49	0	unprescaled	SM
J100.32ETA49	?	j360.32eta49	0	unprescaled	SM

- Default R parameter and calibration is a4tcemsubjes
- Add cross-check chains (a4tcemjes, a4tclcwsubjes, a4tclcwjes) for:
  - j85.28eta32, j85.32eta49, j175.32eta49, j260.32eta49, j360.32eta49

Level 1 seed	Rate @ 0.5 & 2x10^{34}	HLT chain	Rate @ 0.5 & 2x10^{34}	Prescale@2x10^{34}	Clients
HT190	1.2 / 5 kHz	ht1000	3.5/14 Hz (0 unique)	unprescaled	
HT150		Ht500(?)		prescaled	

Primary Jet Menu Items at low & high lumi

- $5x10^{33}$ menu: j360, fatjet360, 4j85, 5j60, 6j50.0ETA24, ht800
- $2x10^{34}$ menu: j400, fatjet450, 4j100, 5j85, 6j50.0ETA24, ht1000

- Default calibration: emsubjes
  - Plus cross check chains for specific thresholds
  - NOTE: cross check chains should be run with coherent prescale
- In each scenario, total jet menu rate adds up to around 100Hz

Chain Type	L1 Seed at $0.5x10^{34}$	HLT Item at $0.5x10^{34}$	L1 Seed at $2x10^{34}$	HLT Item at $2x10^{34}$
Single jet	J75	j360	j100	j400
Single fat jet	HT150	j360_a10	HT190	j450_a10
4 jets	3J40	4j85	3J50	4j100
5 jets	4J15	5j60	4J20	5j85
6 jets	5J15.0ETA24	6j50.0ETA24	5J15.0ETA24	6j50.0ETA24
HT trigger	HT190	ht800	HT190	ht1000

Isolated track triggers

- Needed for several measurements including calorimeter E/p studies
- Would like to include them in the trigger menu *now* even though studies have not yet begun
- Request similar “hadCalib” items as in Run I seeded from random triggers
  - HLT_hadCalib_trkXX_L1RDO
- For MC15, would like to have the same 9 GeV threshold in place.
- Hope to have threshold studies available soon for data.

Requests for the low-<mu> run

- Special bandwidth considerations needed for this run
  - Huge number of clients: lumi, physics, calo, tracker, reconstruction, etc.

- Needed provide data for jet-related studies
  - Forward jet triggers for eta intercalibration without pileup
  - Minbias triggers for material map studies
  - Isolated track triggers (HLT_hadCalib_trkXX_L1RD0) for E/p

To Do:

- From the discussion during the meeting:
  - Add in thresholds between j400 and j460
    - j420, j440?
  - Add in additional very low threshold triggers starting from random L1_RD0
    - j15, j20, j30, j45
  - Run cross-check chains in coherent-prescale mode
  - Finish tuning HLT ht chains

Bonus: rates with pileup correction

- Conditions:
  - L=2x10^{34}
  - 4j45 rate
  - No event weighting
- Only fixed **ρ=6** here
- ρ calculation works in private code so far
- **Top**: no areas subtraction
- **Bottom**: with ρ=6 area subtraction

Sample	Cross section	Filter eff	nevents	npass	rate
JZ0W	7.90E+07				
JZ1W	7.93E+07	3.11E-04	2800	18	3.17E+03
JZ2W	6.41E+04	5.39E-03	2900	18	4.29E+01
JZ3W	1.66E+03	1.90E-03	1700	7	2.60E-01
JZ4W	2.76E+01	1.49E-03	2100	26	1.02E-02
JZ5W	3.03E-01	5.51E-03	2400	52	7.23E-04
JZ6W	7.51E-03	1.52E-02	2600	83	7.29E-05
total rate (Hz)					3214.03

Sample	Cross section	Filter eff	nevents	npass	rate
JZ0W	7.90E+07				
JZ1W	7.93E+07	3.11E-04	1610	5	1.53E+03
JZ2W	6.41E+04	5.39E-03	1400	8	3.95E+01
JZ3W	1.66E+03	1.90E-03	1500	4	1.68E-01
JZ4W	2.76E+01	1.49E-03	1500	22	1.21E-02
JZ5W	3.03E-01	5.51E-03	1400	27	6.44E-04
JZ6W	7.51E-03	1.52E-02	300	9	6.85E-05
total rate (Hz)					1571.49