

Modelling parameters

Jos Vermeulen, 7 September 1999,
update from versions of 2 June and 6 July 1999

Changes of 6 July are indicated in *this style*,
of 7 September (SCT and pixel data volumes) in *this style*

Low luminosity menu, menu item rates in Hz (com-daq-99-010)

#1	MU6	<u>freq 23000</u>	#27	J180 + 5*J55	freq 2
#2	2*MU6	<u>freq 1000</u>	#28	2*J180 + 2*J55	freq 8
#3	MU6 + EM15I	freq 64	#29	2*J180 + 3*J55	freq 3
#4	MU6 + EM20I	freq 20	#30	TAU20 + XE30	<u>freq 1340</u>
#5	MU6 + 2*EM15I	freq 2.3	#31	2*TAU20 + XE30	freq 320
#6	MU6 + J180	freq 1.3	#32	3*TAU20 + XE30	freq 110
#7	MU6 + 3*J75	freq 2.8	#33	4*TAU20 + XE30	freq 4.0
#8	MU 6 + 4*J55	freq 2.8	#34	5*TAU20 + XE30	freq 2.0
#9	EM20I	<u>freq 11500</u>	#35	J50 + XE50	freq 148
#10	2*EM15I	<u>freq 1600</u>	#36	2*J50 + XE50	freq 31
#11	EM20I + 4*J55	freq 68	#37	3*J50 + XE50	freq 10
#12	2*EM15 + 4*J55	freq 180	#38	4*J50 + TAU20 + XE30	freq 16
#13	J180	freq 25	#39	4*J50 + 2*TAU20 + XE30	freq 7
#14	2*J180	freq 42	#40	4*J50 + 3*TAU20 + XE30	freq 7
#15	3*J180	freq 4	#41	5*J50 + TAU20 + XE30	freq 3
#15	3*J75	freq 107	#42	5*J50 + 2*TAU20 + XE30	freq 2
#17	4*J75	freq 10	#43	J50 + TAU20 + XE50	freq 100
#18	5*J75	freq 1	#44	2*J50 + TAU20 + XE50	freq 45
#19	4*J55	freq 131	#45	3*J50 + TAU20 + XE50	freq 45
#20	5*J55	freq 17	#46	4*J50 + TAU20 + XE50	freq 4
#21	6*J55	freq 3	#47	J50 + 2*TAU20 + XE50	freq 18
#22	J180 + 2*J75	freq 63	#48	2*J50 + 2*TAU20 + XE50	freq 8
#23	J180 + 3*J75	freq 15	#49	3*J50 + 2*TAU20 + XE50	freq 4
#24	J180 + 4*J75	freq 7	#50	4*J50 + 2*TAU20 + XE50	freq 2
#25	J180 + 3*J55	freq 28	#51	J50 + 3*TAU20 + XE50	freq 2
#26	J180 + 4*J55	freq 7	#52	2*J50 + 3*TAU20 + XE50	freq 1
			#53	3*J50 + 3*TAU20 + XE50	freq 2
			#54	4*J50 + 3*TAU20 + XE50	freq 2
			#55	5*J50 + 3*TAU20 + XE50	freq 1

Accept rate : 2kHz

Processing sequence for low luminosity menu

- Muon(s)**
1. confirm data muon detector, 75 % of RoIs accepted,
 2. confirm muon in tracker, 40 % of RoIs accepted,
 3. run TRT scan if at least one muon accepted in step 2, check for isolation in calorimeter, 4 % of RoIs accepted.

- Muon(s) + Em('s)**
1. confirm data muon detector for muon, 75 % of RoIs accepted, confirm data em calorimeter for em RoIs, 16.7 % of RoIs accepted,
 2. check tracker data for muon RoIs, 40 % of muon RoIs accepted, *check data from hadron calorimeter for em RoIs, 9 % of RoIs accepted*
 3. *check tracker data for em RoIs, 1 % of em RoIs accepted,*
 4. run TRT scan if muon accepted in step 2, check muon for isolation in calorimeter, 4 % of RoIs accepted,
 5. Pixel - SCT data analysis (analysis steered by TRT scan, all data requested by trigger processor) if TRT scan is run.

- Muon + Jet(s)**
1. confirm data muon detector, 75 % of RoIs accepted, confirm data calorimeters for jet RoIs, 100 % of RoIs accepted,
 2. confirm muon in tracker, 40 % of RoIs accepted,
 3. run TRT scan if at least one muon accepted in step 2, check for isolation in calorimeter, 4 % of RoIs accepted,
 4. Pixel - SCT data analysis (analysis steered by TRT scan, all data requested by trigger processor) if TRT scan is run.

Percentages : fraction of LVL2 input RoI rate, not of output rate of previous step

Processing sequence for low luminosity menu (cont'd)

- Em**
1. *confirm data em calorimeter, 16.7 % of RoIs accepted*
 2. *check data from hadron calorimeter, 9 % of RoIs accepted,*
 3. check tracker data, 1 % of RoIs accepted

- Em('s) + jet(s)**
1. *confirm data em calorimeter for em RoIs, 16.7 % of em RoIs accepted, confirm data calorimeters for jet RoIs, 100 % accepted*
 2. *check data from hadron calorimeter, 9 % of em RoIs accepted,*
 3. *check tracker data, 1 % of em RoIs accepted*

- Jet**
1. confirm data calorimeters, 100 % of RoIs accepted.

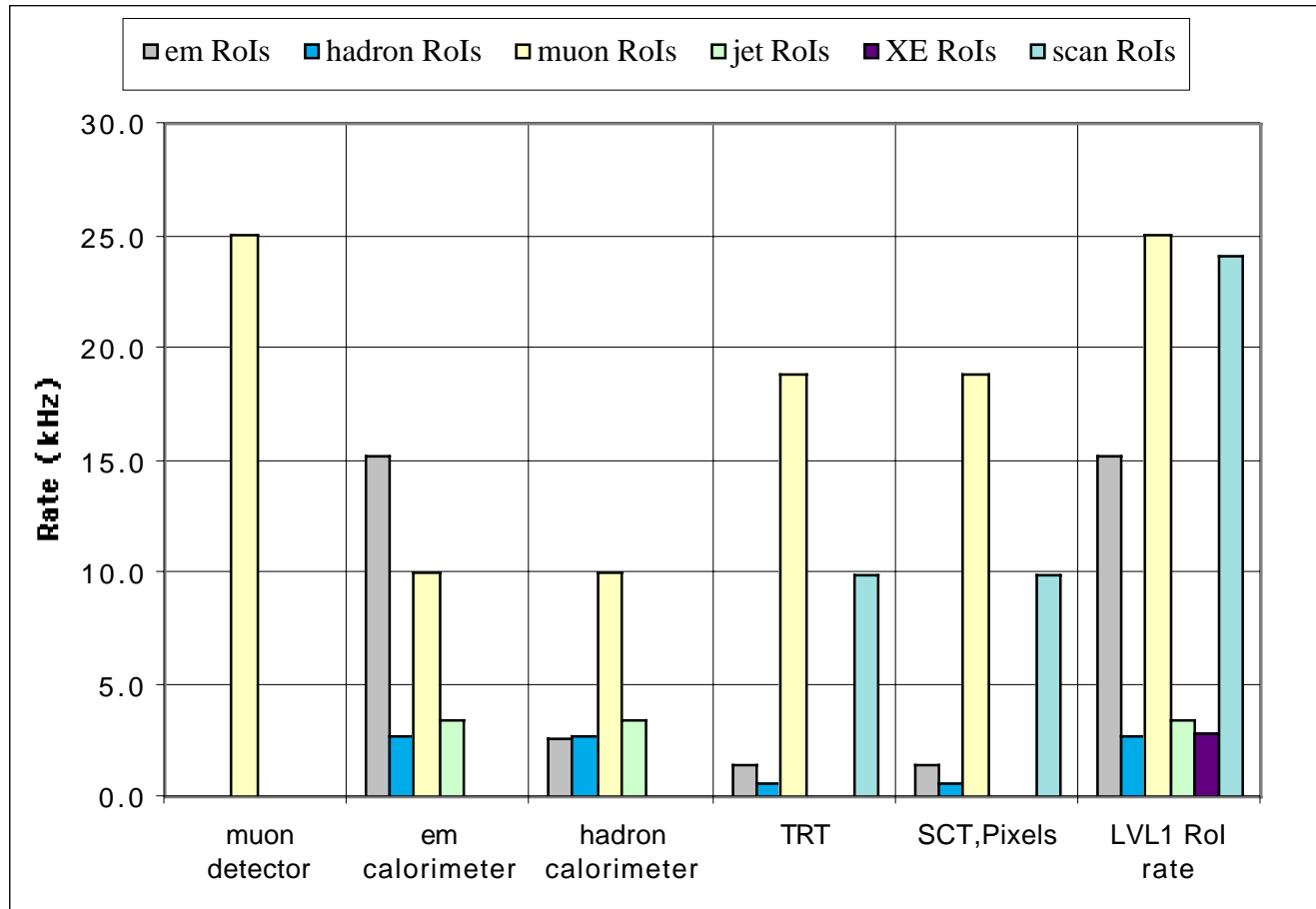
- Hadron(s) + XE**
1. confirm data calorimeters for taus, 20 % of RoIs accepted,
 2. check tracker data for taus, 8 % of RoIs accepted,
- No missing energy trigger.*

- Jet(s) + XE**
1. confirm jets in calorimeter,
- No missing energy trigger.*

- Hadron(s) + jet(s) + XE**
1. confirm data calorimeters for taus, 20 % of RoIs accepted
 2. check tracker data for taus as specified above, 8 % of RoIs accepted,
 3. all jets only if at least one tau is confirmed
- No missing energy trigger.*

Percentages : fraction of LVL2 input RoI rate, not of output rate of previous step

Low luminosity : total RoI rates



Average number of sequential steps = 1.81

High luminosity menu, menu item rates in Hz (com-daq-99-010)

#1	MU6	freq	<u>3900</u>	#22	TAU60 + XE60	freq	910	←
#2	2*MU20	freq	300	#23	2*TAU60 + XE60	freq	48	
#3	2*MU6	freq	<u>4000</u>	#24	3*TAU60 + XE60	freq	3	
#4	EM30I	freq	<u>24300</u>	#25	J100 + XE100	freq	166	
#5	2*EM20I	freq	<u>4900</u>	#26	2*J100 + XE100	freq	54	
#6	J290	freq	47	#27	3*J100 + XE100	freq	10	
#7	2*J290	freq	49	#28	4*J100 + XE100	freq	10	
#8	3*J290	freq	2	#29	4*J100 + TAU60 + XE60	freq	2	
#9	3*J130	freq	130	#30	4*J100 + 2*TAU60 + XE60	freq	2	
#10	4*J130	freq	8	#31	4*J100 + 3*TAU60 + XE60	freq	1.2	
#11	5*J130	freq	1	#32	5*J100 + TAU60 + XE60	freq	2.2	
#12	4*J90	freq	141	#33	5*J100 + 2*TAU60 + XE60	freq	2.2	
#13	5*J90	freq	15	#34	5*J100 + 3*TAU60 + XE60	freq	1.4	
#14	6 *J90	freq	5	#35	J100 + TAU60 + XE100	freq	142	
#15	J290 + 2*J130	freq	52	#36	2*J100 + TAU60 + XE100	freq	74	
#16	J290 + 3*J130	freq	8	#37	3*J100 + TAU60 + XE100	freq	10	
#17	J290 + 4*J130	freq	1	#38	4*J100 + TAU60 + XE100	freq	16	
#18	J290 + 3*J90	freq	27	#39	J100 + 2*TAU60 + XE100	freq	10	
#19	J290 + 4*J90	freq	5	#40	2*J100 + 2*TAU60 + XE100	freq	10	
#20	2*J290 + 2*J90	freq	9	#41	3*J100 + 2*TAU60 + XE100	freq	10	
#21	2*J290 + 3*J90	freq	1	#42	4*J100 + 2*TAU60 + XE100	freq	9	

Accept rate : 2kHz

Processing sequence for high luminosity menu

- Muon**
1. confirm data muon detector, 75 % of RoIs accepted,
 2. confirm muon in tracker, 40 % of RoIs accepted,
 3. check for isolation in calorimeter, 4 % of RoIs accepted.

- Em**
1. *confirm data em calorimeter, 16.7 % of RoIs accepted*
 2. *check data from hadron calorimeter, 9 % of RoIs accepted,*
 3. check tracker data, 1 % of RoIs accepted.

- Jet**
1. confirm data calorimeters, 100 % of RoIs accepted.

- Hadron**
1. confirm data calorimeters, 20 % of RoIs accepted,
 2. check tracker data, 8 % of RoIs accepted.

- Hadron(s) + XE**
1. confirm data calorimeters for hadron(s),
 2. check tracker data for hadron(s),
- No missing energy trigger..*

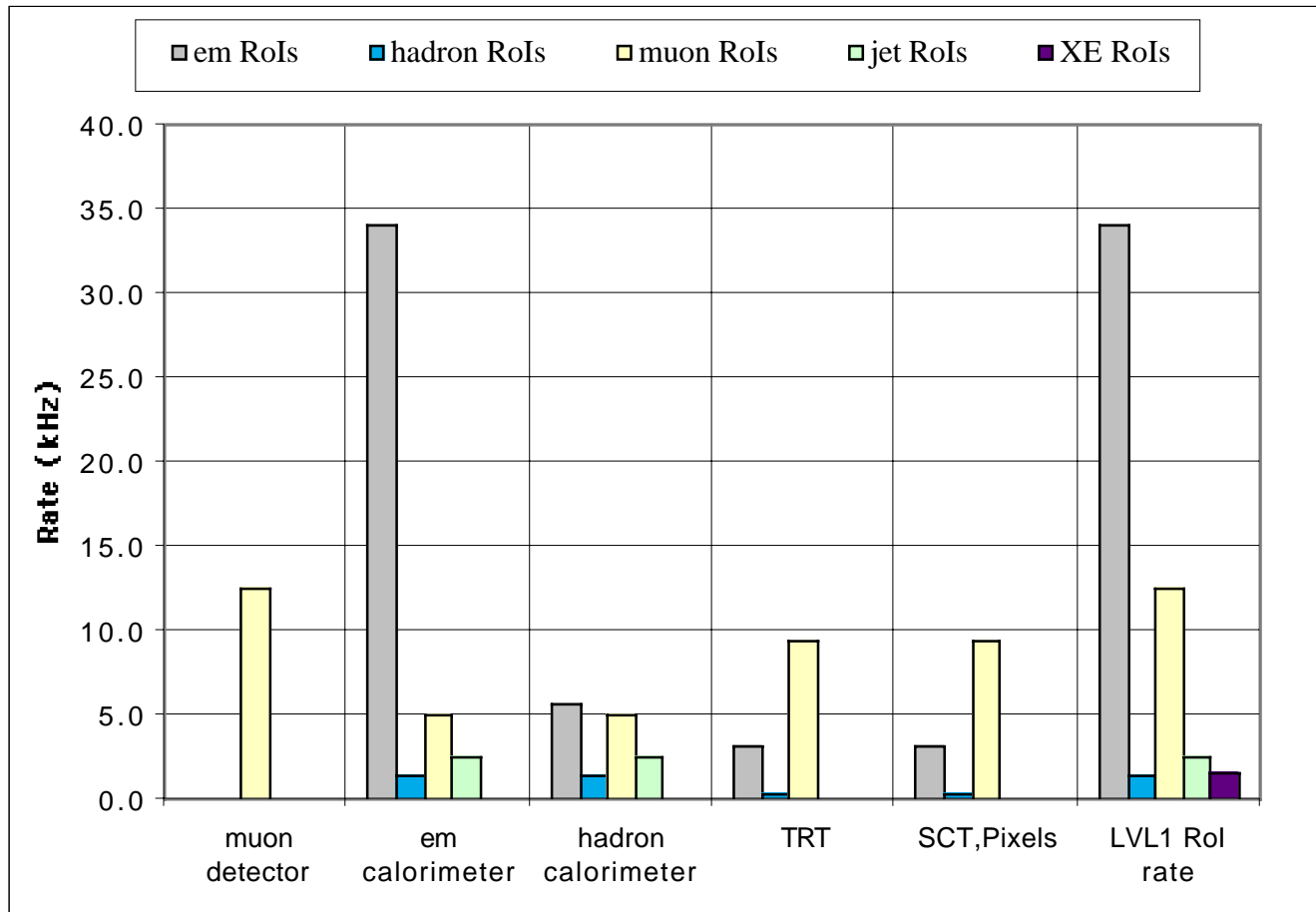
- Jet(s) + XE**
1. confirm jets in calorimeter, 100 % of RoIs accepted,
- No missing energy trigger.*

- Hadron(s) + jet(s) + XE**
1. confirm data calorimeters for taus,
 2. check tracker data for taus as specified above,
 3. all jets only if at least one tau is confirmed.

Percentages : fraction of LVL2 input RoI rate, not of output rate of previous step

No missing energy trigger.

High luminosity : total RoI rates



Average number of sequential steps = 1.51

RoI sizes used by the LVL2 system

Em RoIs

0.4 x 0.4 in calorimeters

(LVL1 RoI η min - 0.15 < η < LVL1 RoI η max + 0.15,
LVL1 RoI ϕ min - 0.15 < ϕ < LVL1 RoI ϕ max + 0.15)

0.2 x 0.2 in trackers

(LVL1 RoI η min - 0.05 < η < LVL1 RoI η max + 0.05,
LVL1 RoI ϕ min - 0.05 < ϕ < LVL1 RoI ϕ max + 0.05)

Tau RoIs

0.4 x 0.4 in calorimeters

(LVL1 RoI η min - 0.15 < η < LVL1 RoI η max + 0.15,
LVL1 RoI ϕ min - 0.15 < ϕ < LVL1 RoI ϕ max + 0.15)

0.2 x 0.2 in trackers

(LVL1 RoI η min - 0.05 < η < LVL1 RoI η max + 0.05,
LVL1 RoI ϕ min - 0.05 < ϕ < LVL1 RoI ϕ max + 0.05)

Jet RoIs

1.0 x 1.0 in calorimeters

(LVL1 RoI η min - 0.3 < η < LVL1 RoI η max + 0.3,
LVL1 RoI ϕ min - 0.3 < ϕ < LVL1 RoI ϕ max + 0.3)

Muon RoIs

0.3 x 0.16 - 0.26 in pixels and SCT

(LVL1 RoI η min - 0.1 < η < LVL1 RoI η max + 0.1,
LVL1 RoI ϕ min - 0.0667 < ϕ < LVL1 RoI ϕ max + 0.0667)

0.4 x 0.3 - 0.4 in TRT

(LVL1 RoI η min - 0.15 < η < LVL1 RoI η max + 0.15,
LVL1 RoI ϕ min - 0.133 < ϕ < LVL1 RoI ϕ max + 0.133)

0.4 x 0.3 - 0.4 in calorimeters

(LVL1 RoI η min - 0.15 < η < LVL1 RoI η max + 0.15,
LVL1 RoI ϕ min - 0.133 < ϕ < LVL1 RoI ϕ max + 0.133)

0.3 x 0.26 or 0.52 or 0.8 in muon spectrometer

(LVL1 RoI η min - 0.15 < η < LVL1 RoI η max + 0.15,
 ϕ range determined by lay-out spectrometer)

Number of ROBs, size of event fragments :

Pixels : *84 ROBs * 80* bytes (low luminosity), *800* bytes (high luminosity)

SCT : 92 ROBs * 250 bytes (low luminosity), *800* bytes (high luminosity)

TRT : 256 ROBs * 600 bytes (low luminosity), 800 bytes (high luminosity)

Em calorimeter : *760 ROBs * 1800 bytes* (was : 738 ROBs * 2000 bytes)

Hadron Calorimeter : *98 ROBs * 1800 bytes* (was 2000 bytes; for the tile calorimeter only 900 bytes can be used, here the maximum determined by the LAr hadron calorimeter is used)

μ -trigger : 48 ROBs * 380 bytes

μ -precision : 192 ROBs * 850 bytes

File with filenames

MuRoIs *MuRoIAreas-99.txt*

EmRoIs *EmRoIAreas.txt*

JetRoIs *JetRoIAreas.txt*

Specification of LVL1 RoI sizes

Pixel *Pixels-6-99.txt* MuRoIOverlap 0.1 0.0666666 EmRoIOverlap 0.05 0.05 JetRoIOverlap *0.3 0.3*

SCT *SCT-6-99.txt* MuRoIOverlap 0.1 0.0666666 EmRoIOverlap 0.05 0.05 JetRoIOverlap *0.3 0.3*

TRT *TRTMap-99.txt* MuRoIOverlap 0.15 0.1333333 EmRoIOverlap 0.05 0.05 JetRoIOverlap *0.3 0.3*

EmCal *EmcalMap-6-99.txt* MuRoIOverlap 0.15 0.1333333 EmRoIOverlap 0.15 0.15 JetRoIOverlap *0.3 0.3*

HadCal *HadCalMap-new-note-62.txt* MuRoIOverlap 0.15 0.1333333 EmRoIOverlap 0.15 0.15 JetRoIOverlap *0.3 0.3*

MuPrec *MuPrecMap-62-phi.txt* MuRoIOverlap 0.1 0.0

MuTrig *MuTrigMap-62.txt* MuRoIOverlap 0.1 0.0

Specification
of ROB maps
and of LVL2
RoI sizes

ROBsPerRoI
program

Average number of ROBIIns / ROBOuts
per RoI

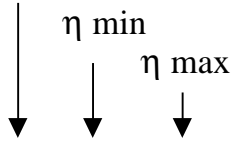
Look up table for computer model

LVL1 RoIs

em / tau RoIs

jet RoIs

Per ROI :
 $2\pi / \text{number in } \phi$



64	-2.4	-2.3	16	-3.2	-2.8
64	-2.3	-2.2	16	-2.8	-2.4
64	-2.2	-2.1	16	-2.4	-2.0
	.			.	
	.			.	
	.			.	
	.			.	
64	2.2	2.3	16	2.0	2.4
64	2.3	2.4	16	2.4	2.8
64	2.4	2.5	16	2.8	3.2

96	-2.4250	-2.3920	192	1.0346	1.0387
96	-2.3920	-2.3586	192	1.0387	1.0600
96	-2.3586	-2.3248	192	1.0600	1.0821
96	-2.3248	-2.2907	192	1.0821	1.1050
96	-2.2907	-2.2565	192	1.1050	1.1289
96	-2.2565	-2.2221	192	1.1289	1.1544
96	-2.2221	-2.1881	192	1.1544	1.1815
96	-2.1881	-2.1550	192	1.1815	1.2104
96	-2.1550	-2.1228	192	1.2104	1.2403
96	-2.1228	-2.0914	192	1.2403	1.2699
96	-2.0914	-2.0608	192	1.2699	1.2989
96	-2.0608	-2.0302	192	1.2989	1.3274
96	-2.0302	-1.9990	192	1.3274	1.3545
96	-1.9990	-1.9675	192	1.3545	1.3797
96	-1.9675	-1.9356	192	1.3797	1.4029
96	-1.9356	-1.9178	192	1.4029	1.4239
192	-1.9178	-1.8948	192	1.4239	1.4440
192	-1.8948	-1.8695	192	1.4440	1.4634
192	-1.8695	-1.8435	192	1.4634	1.4821
192	-1.8435	-1.8169	192	1.4821	1.5007
192	-1.8169	-1.7898	192	1.5007	1.5198
192	-1.7898	-1.7624	192	1.5198	1.5397
192	-1.7624	-1.7346	192	1.5397	1.5604
192	-1.7346	-1.7066	192	1.5604	1.5822
192	-1.7066	-1.6797	192	1.5822	1.6051
192	-1.6797	-1.6538	192	1.6051	1.6289
192	-1.6538	-1.6289	192	1.6289	1.6538
192	-1.6289	-1.6051	192	1.6538	1.6797
192	-1.6051	-1.5822	192	1.6797	1.7066
192	-1.5822	-1.5604	192	1.7066	1.7346
192	-1.5604	-1.5397	192	1.7346	1.7624
192	-1.5397	-1.5198	192	1.7624	1.7898
192	-1.5198	-1.5007	192	1.7898	1.8169
192	-1.5007	-1.4821	192	1.8169	1.8435
192	-1.4821	-1.4634	192	1.8435	1.8695
192	-1.4634	-1.4440	192	1.8695	1.8948
192	-1.4440	-1.4239	192	1.8948	1.9178
192	-1.4239	-1.4029	96	1.9178	1.9356
192	-1.4029	-1.3797	96	1.9356	1.9675
192	-1.3797	-1.3545	96	1.9675	1.9990
192	-1.3545	-1.3274	96	1.9990	2.0302
192	-1.3274	-1.2989	96	2.0302	2.0608
192	-1.2989	-1.2699	96	2.0608	2.0914
192	-1.2699	-1.2403	96	2.0914	2.1228
192	-1.2403	-1.2104	96	2.1228	2.1550
192	-1.2104	-1.1815	96	2.1550	2.1881
192	-1.1815	-1.1544	96	2.1881	2.2221
192	-1.1544	-1.1289	96	2.2221	2.2565
192	-1.1289	-1.1050	96	2.2565	2.2907
192	-1.1050	-1.0821	96	2.2907	2.3248
192	-1.0821	-1.0600	96	2.3248	2.3586
192	-1.0600	-1.0387	96	2.3586	2.3920
192	-1.0387	-1.0346	96	2.3920	2.4250

Low eta

muon RoIs

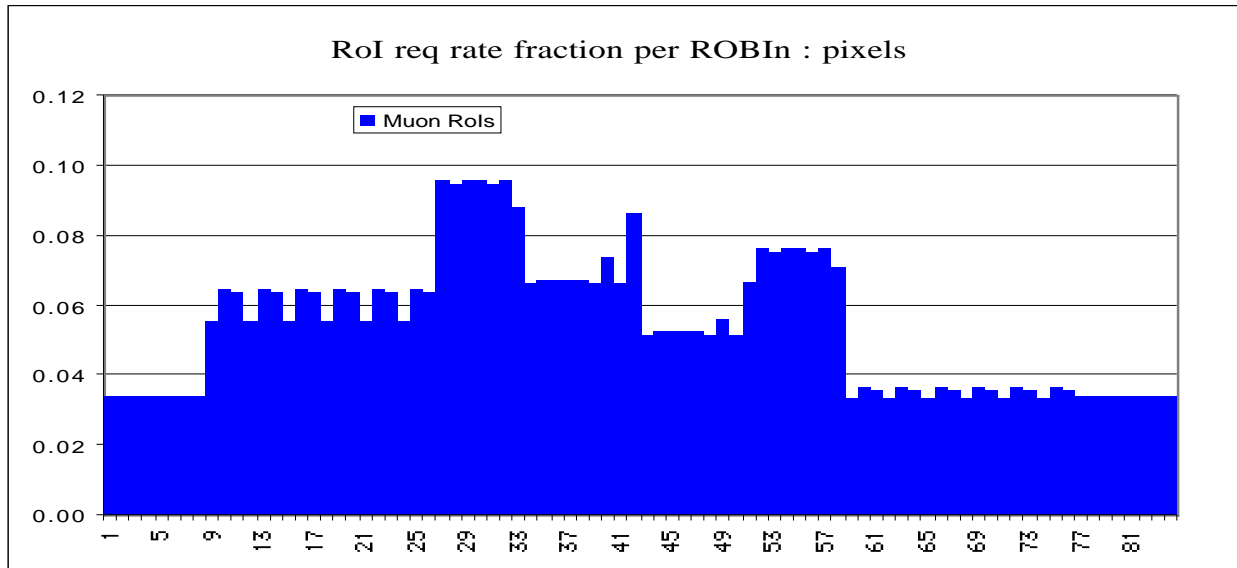
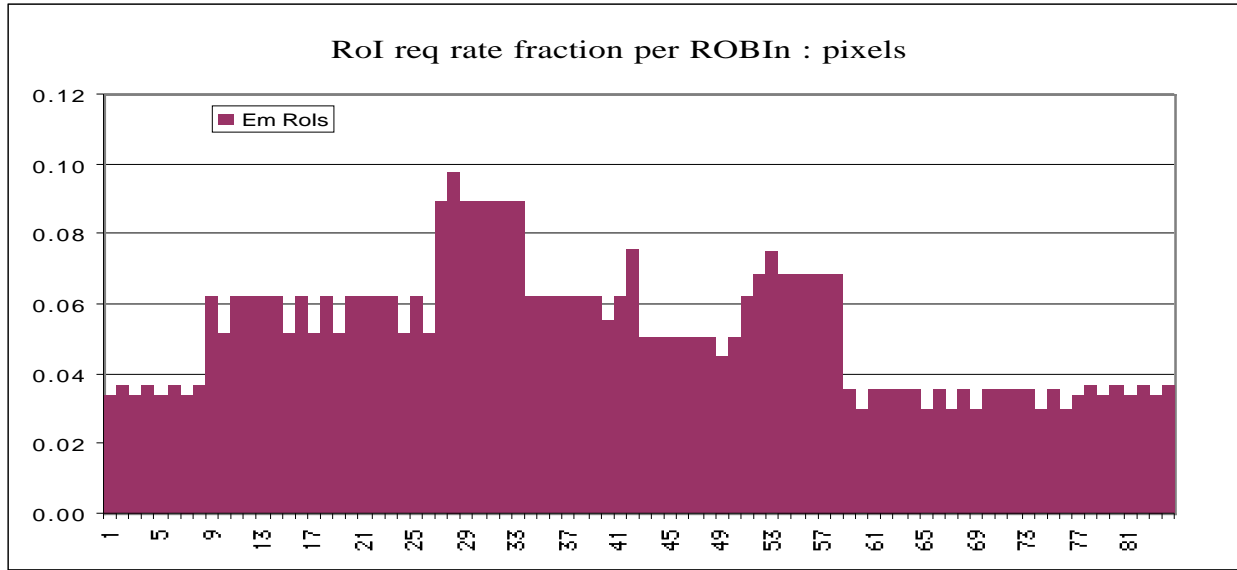
48	-1.0346	-0.9
48	-0.9	-0.8
48	-0.8	-0.7
48	-0.7	-0.6
	.	
	.	
	.	
	.	
	.	
	.	
48	0.7	0.8
48	0.8	0.9
48	0.9	1.0346

Pixels

ROB #	Low eta	High eta	Low phi	High phi	ROB #	Low eta	High eta	Low phi	High phi	ROB #	Low eta	High eta	Low phi	High phi
0	-2.69	-1.70	-0.04	1.00	28	-2.05	0.29	1.72	2.62	56	0.29	2.05	4.41	5.32
1	-2.69	-1.70	0.48	1.53	29	-2.05	0.29	2.62	3.52	57	0.29	2.05	5.31	6.21
2	-2.69	-1.70	1.53	2.57	30	-2.05	0.29	3.51	4.42	58	0.65	2.89	-0.17	0.19
3	-2.69	-1.70	2.05	3.10	31	-2.05	0.29	4.41	5.32	59	0.65	2.89	0.18	0.54
4	-2.69	-1.70	3.10	4.15	32	-2.05	0.29	5.31	6.21	60	0.65	2.89	0.52	0.89
5	-2.69	-1.70	3.62	4.67	33	-1.80	0.23	-0.06	0.62	61	0.65	2.89	0.87	1.24
6	-2.69	-1.70	4.67	5.72	34	-1.80	0.23	0.61	1.30	62	0.65	2.89	1.22	1.59
7	-2.69	-1.70	5.19	6.24	35	-1.80	0.23	1.29	1.97	63	0.65	2.89	1.57	1.94
8	-2.89	0.65	-0.17	0.19	36	-1.80	0.23	1.96	2.64	64	0.65	2.89	1.92	2.29
9	-2.89	0.65	0.18	0.54	37	-1.80	0.23	2.63	3.32	65	0.65	2.89	2.27	2.63
10	-2.89	0.65	0.52	0.89	38	-1.80	0.23	3.31	3.99	66	0.65	2.89	2.62	2.98
11	-2.89	0.65	0.87	1.24	39	-1.80	0.23	3.98	4.66	67	0.65	2.89	2.97	3.33
12	-2.89	0.65	1.22	1.59	40	-1.80	0.23	4.65	5.33	68	0.65	2.89	3.32	3.68
13	-2.89	0.65	1.57	1.94	41	-1.80	0.23	5.33	6.23	69	0.65	2.89	3.67	4.03
14	-2.89	0.65	1.92	2.29	42	0.23	1.80	-0.06	0.62	70	0.65	2.89	4.02	4.38
15	-2.89	0.65	2.27	2.63	43	0.23	1.80	0.61	1.30	71	0.65	2.89	4.36	4.73
16	-2.89	0.65	2.62	2.98	44	0.23	1.80	1.29	1.97	72	0.65	2.89	4.71	5.08
17	-2.89	0.65	2.97	3.33	45	0.23	1.80	1.96	2.64	73	0.65	2.89	5.06	5.43
18	-2.89	0.65	3.32	3.68	46	0.23	1.80	2.63	3.32	74	0.65	2.89	5.41	5.78
19	-2.89	0.65	3.67	4.03	47	0.23	1.80	3.31	3.99	75	0.65	2.89	5.76	6.13
20	-2.89	0.65	4.02	4.38	48	0.23	1.80	3.98	4.66	76	1.70	2.69	-0.04	1.00
21	-2.89	0.65	4.36	4.73	49	0.23	1.80	4.65	5.33	77	1.70	2.69	0.48	1.53
22	-2.89	0.65	4.71	5.08	50	0.23	1.80	5.33	6.23	78	1.70	2.69	1.53	2.57
23	-2.89	0.65	5.06	5.43	51	0.29	2.05	-0.08	0.83	79	1.70	2.69	2.05	3.10
24	-2.89	0.65	5.41	5.78	52	0.29	2.05	0.82	1.73	80	1.70	2.69	3.10	4.15
25	-2.89	0.65	5.76	6.13	53	0.29	2.05	1.72	2.62	81	1.70	2.69	3.62	4.67
26	-2.05	0.29	-0.08	0.83	54	0.29	2.05	2.62	3.52	82	1.70	2.69	4.67	5.72
27	-2.05	0.29	0.82	1.73	55	0.29	2.05	3.51	4.42	83	1.70	2.69	5.19	6.24

Note : in the previous version this table contained an error, the results presented were obtained with a correct table

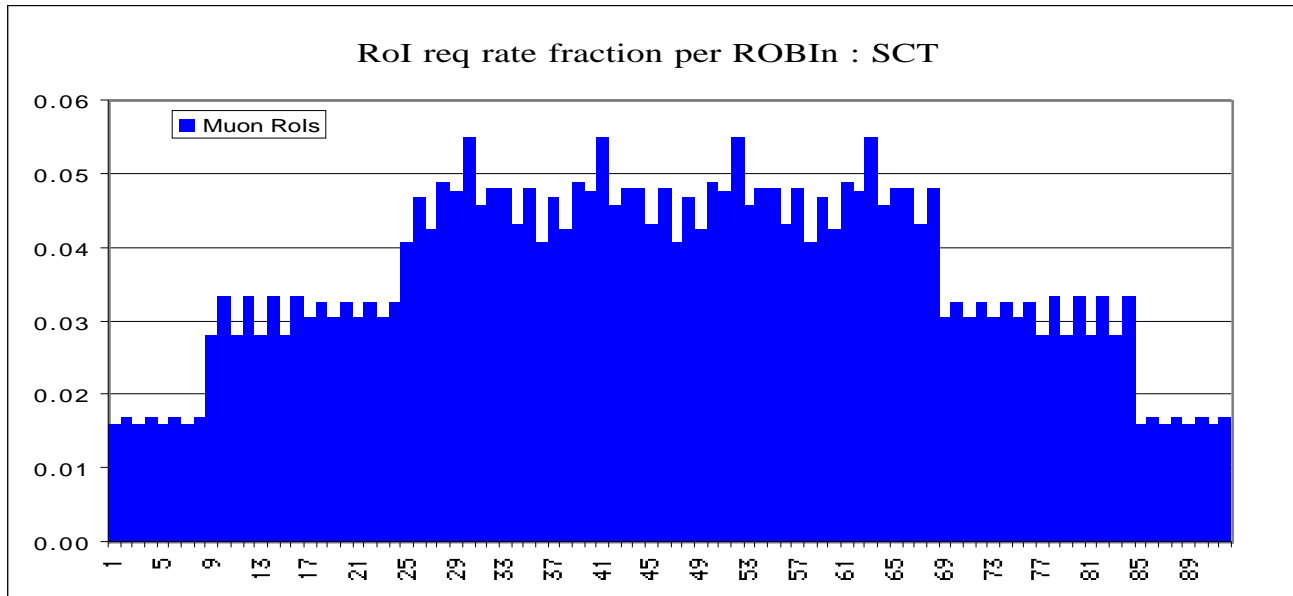
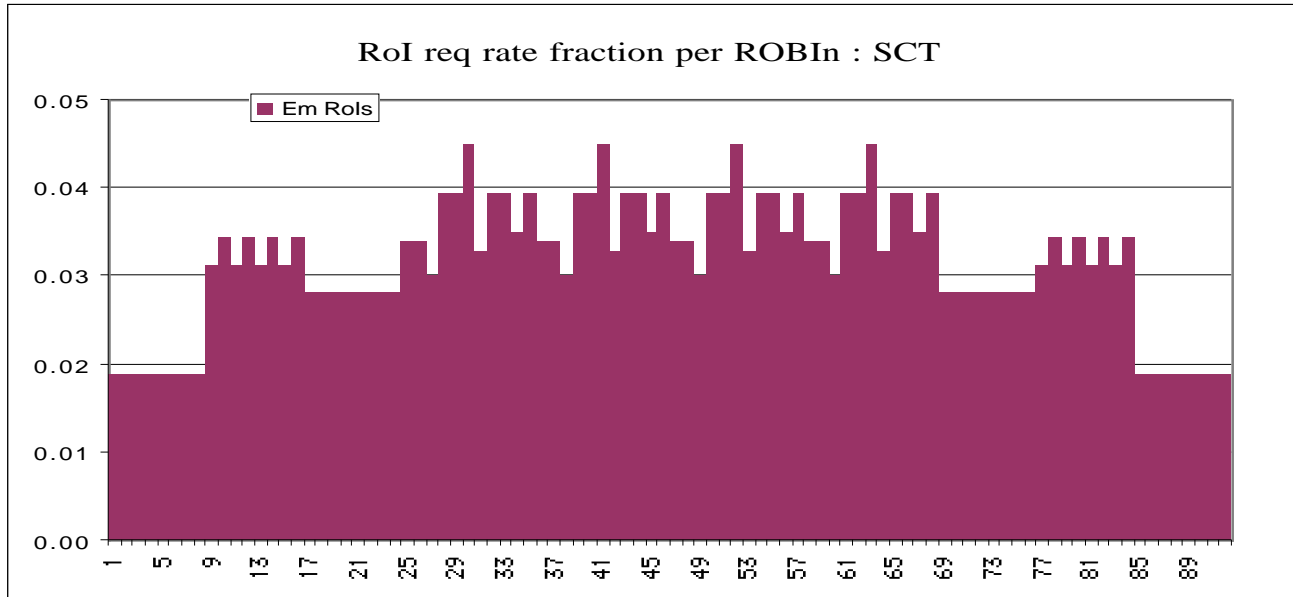
Pixels



SCT

ROB #	Eta min	Eta max	Phi min	Phi max	ROB #	Eta min	Eta max	Phi min	Phi max	ROB #	Eta min	Eta max	Phi min	Phi max
0	-2.57	-2.04	-0.08	0.71	31	-1.64	0.01	1.64	2.17	62	-0.01	1.64	4.25	4.82
1	-2.57	-2.04	0.66	1.51	32	-1.64	0.01	1.96	2.46	63	-0.01	1.29	4.51	5.05
2	-2.57	-2.04	1.49	2.28	33	-1.44	0.01	2.27	2.75	64	-0.01	1.64	4.79	5.31
3	-2.57	-2.04	2.24	3.08	34	-1.64	0.01	2.45	2.98	65	-0.01	1.64	5.10	5.60
4	-2.57	-2.04	3.06	3.85	35	-1.64	0.01	2.84	3.25	66	-0.01	1.44	5.41	5.90
5	-2.57	-2.04	3.81	4.65	36	-1.64	0.01	3.19	3.64	67	-0.01	1.64	5.59	6.12
6	-2.57	-2.04	4.63	5.42	37	-1.44	0.01	3.42	3.88	68	1.18	1.91	-0.08	0.71
7	-2.57	-2.04	5.38	6.22	38	-1.64	0.01	3.63	4.17	69	1.18	1.91	0.66	1.51
8	-2.42	-1.64	-0.08	0.71	39	-1.64	0.01	3.99	4.48	70	1.18	1.91	1.49	2.28
9	-2.42	-1.54	0.66	1.51	40	-1.64	0.01	4.25	4.82	71	1.18	1.91	2.24	3.08
10	-2.42	-1.64	1.49	2.28	41	-1.29	0.01	4.51	5.05	72	1.18	1.91	3.06	3.85
11	-2.42	-1.54	2.24	3.08	42	-1.64	0.01	4.79	5.31	73	1.18	1.91	3.81	4.65
12	-2.42	-1.64	3.06	3.85	43	-1.64	0.01	5.10	5.60	74	1.18	1.91	4.63	5.42
13	-2.42	-1.54	3.81	4.65	44	-1.44	0.01	5.41	5.90	75	1.18	1.91	5.38	6.22
14	-2.42	-1.64	4.63	5.42	45	-1.64	0.01	5.59	6.12	76	1.64	2.42	-0.08	0.71
15	-2.42	-1.54	5.38	6.22	46	-0.01	1.64	-0.30	0.11	77	1.54	2.42	0.66	1.51
16	-1.91	-1.18	-0.08	0.71	47	-0.01	1.64	0.05	0.50	78	1.64	2.42	1.49	2.28
17	-1.91	-1.18	0.66	1.51	48	-0.01	1.44	0.28	0.73	79	1.54	2.42	2.24	3.08
18	-1.91	-1.18	1.49	2.28	49	-0.01	1.64	0.49	1.03	80	1.64	2.42	3.06	3.85
19	-1.91	-1.18	2.24	3.08	50	-0.01	1.64	0.85	1.34	81	1.54	2.42	3.81	4.65
20	-1.91	-1.18	3.06	3.85	51	-0.01	1.64	1.11	1.68	82	1.64	2.42	4.63	5.42
21	-1.91	-1.18	3.81	4.65	52	-0.01	1.29	1.37	1.90	83	1.54	2.42	5.38	6.22
22	-1.91	-1.18	4.63	5.42	53	-0.01	1.64	1.64	2.17	84	2.04	2.57	-0.08	0.71
23	-1.91	-1.18	5.38	6.22	54	-0.01	1.64	1.96	2.46	85	2.04	2.57	0.66	1.51
24	-1.64	0.01	-0.30	0.11	55	-0.01	1.44	2.27	2.75	86	2.04	2.57	1.49	2.28
25	-1.64	0.01	0.05	0.50	56	-0.01	1.64	2.45	2.98	87	2.04	2.57	2.24	3.08
26	-1.44	0.01	0.28	0.73	57	-0.01	1.64	2.84	3.25	88	2.04	2.57	3.06	3.85
27	-1.64	0.01	0.49	1.03	58	-0.01	1.64	3.19	3.64	89	2.04	2.57	3.81	4.65
28	-1.64	0.01	0.85	1.34	59	-0.01	1.44	3.42	3.88	90	2.04	2.57	4.63	5.42
29	-1.64	0.01	1.11	1.68	60	-0.01	1.64	3.63	4.17	91	2.04	2.57	5.38	6.22
30	-1.29	0.01	1.37	1.90	61	-0.01	1.64	3.99	4.48					

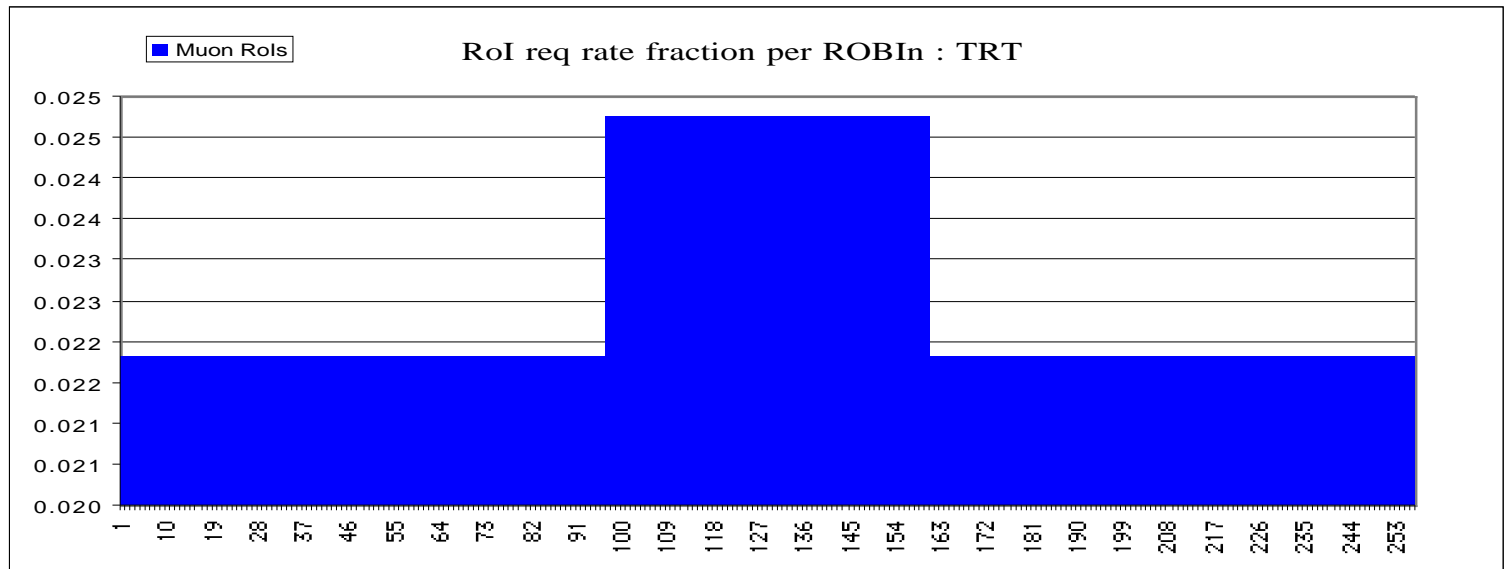
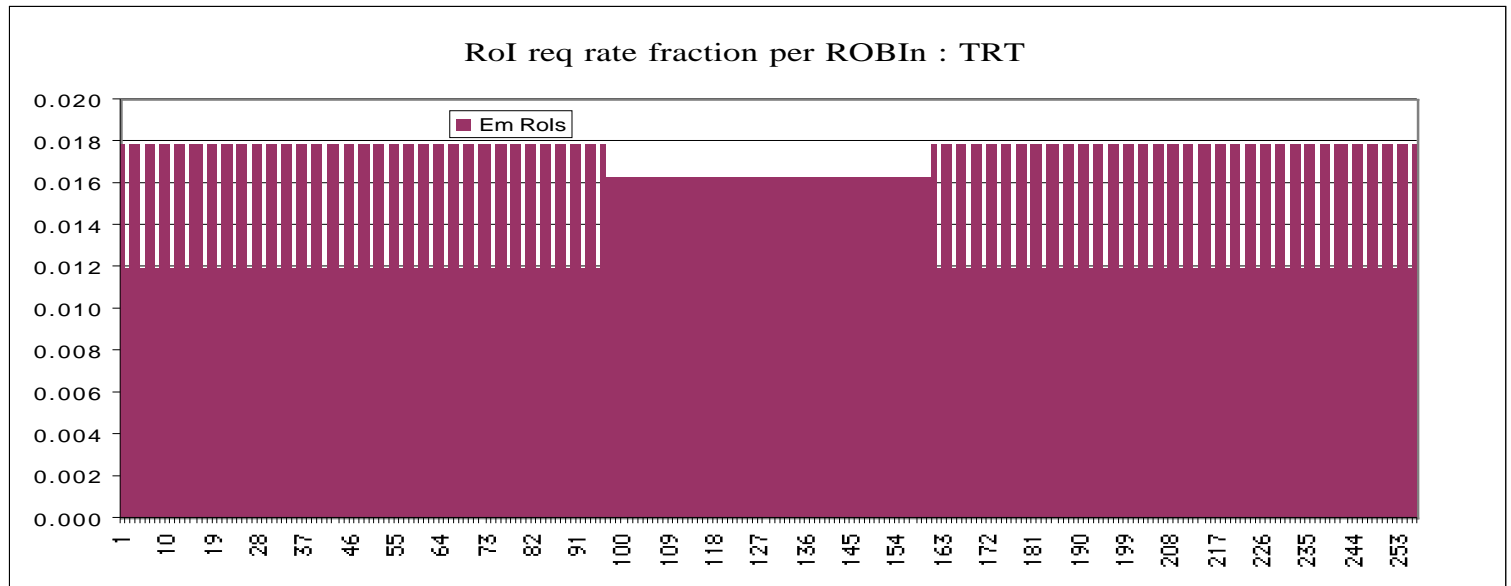
SCT



TRT

Per ROB :
 $2\pi / \text{number in } \phi$

	$\eta \text{ min}$	$\eta \text{ max}$
↓	↓	↓
96	-2.4	-0.7
32	-1.1	0.0
32	0.0	1.1
96	0.7	2.4



Electromagnetic calorimeter

layer 0
(presampler)

Per ROB :

$2\pi / \text{number in } \phi$

	$\eta \text{ min}$		$\eta \text{ max}$
↓	↓		↓
4	-1.8		-1.6
4	-1.6		-1.5
16	-1.47		0.0
16	0.0		1.47
4	1.5		1.6
4	1.6		1.8

layer 1 (front)

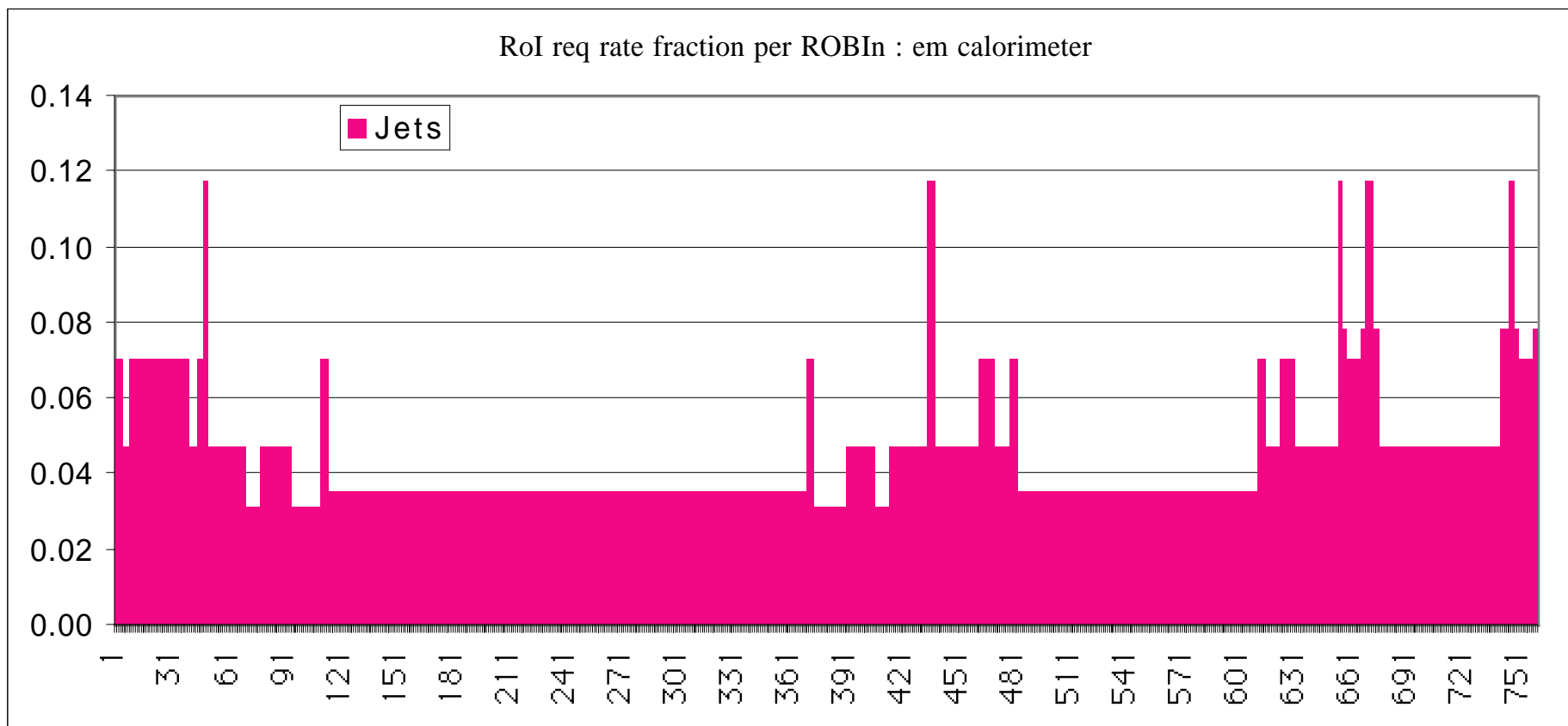
2	-3.2	-2.5
4	-2.5	-2.4
8	-2.4	-2.2
8	-2.2	-2.0
8	-2.0	-1.9
8	-1.9	-1.8
8	-1.8	-1.7
8	-1.7	-1.6
8	-1.6	-1.5
4	-1.5	-1.4
32	-1.47	-1.2
32	-1.2	-0.8
32	-0.8	-0.4
32	-0.4	0.0
32	0.0	0.4
32	0.4	0.8
32	0.8	1.2
32	1.2	1.47
4	1.4	1.5
8	1.5	1.6
8	1.6	1.7
8	1.7	1.8
8	1.8	1.9
8	1.9	2.0
8	2.0	2.2
8	2.2	2.4
4	2.4	2.5
2	2.5	3.2

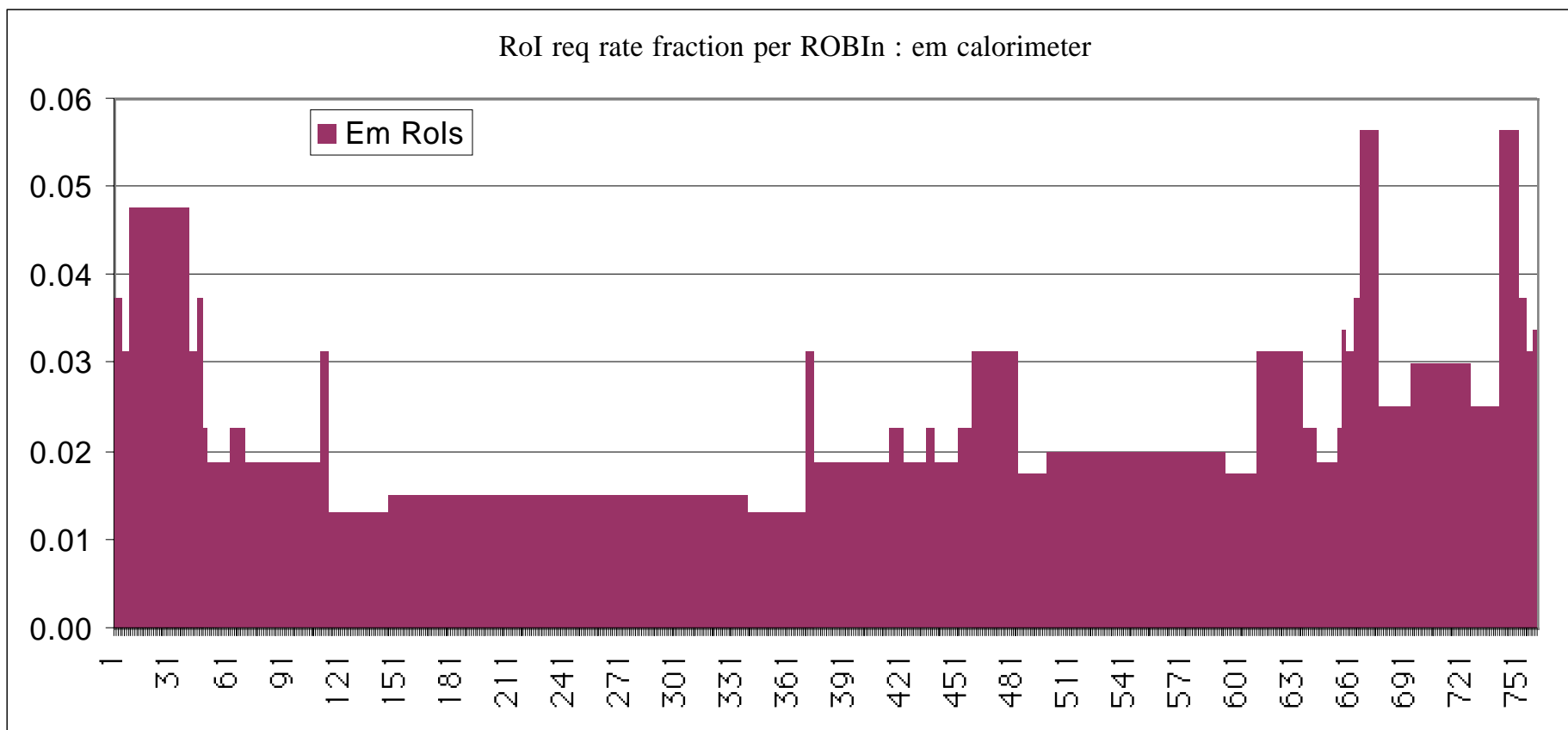
layer 2 (middle)

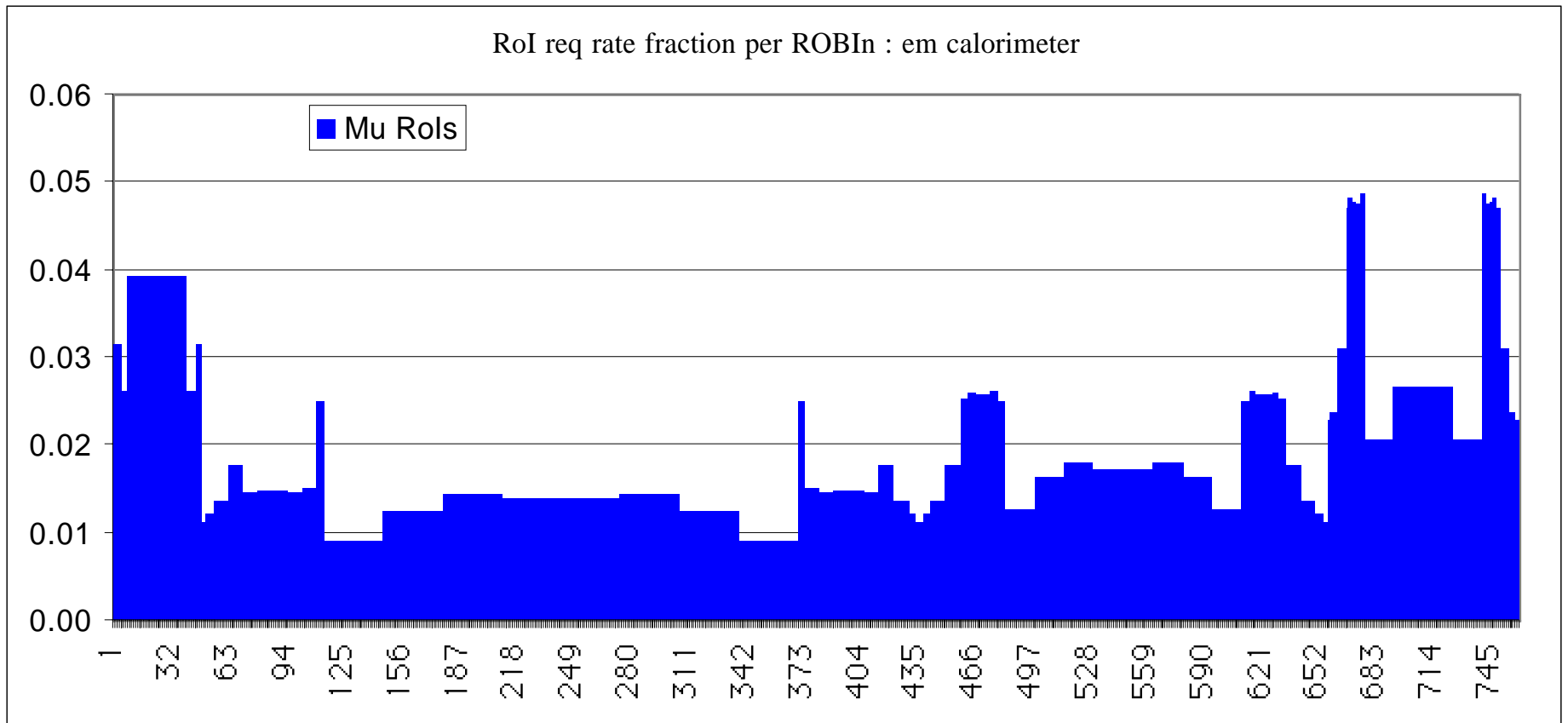
2	-3.2	-2.5
4	-2.5	-2.4
8	-2.4	-2.2
8	-2.2	-2.0
4	-2.0	-1.9
4	-1.9	-1.8
4	-1.8	-1.7
4	-1.7	-1.6
4	-1.6	-1.5
4	-1.5	-1.4
16	-1.47	-1.2
16	-1.2	-0.8
16	-0.8	-0.4
16	-0.4	0.0
16	0.0	0.4
16	0.4	0.8
16	0.8	1.2
16	1.2	1.47
4	1.4	1.5
4	1.5	1.6
4	1.6	1.7
4	1.7	1.8
4	1.8	1.9
4	1.9	2.0
8	2.0	2.2
8	2.2	2.4
4	2.4	2.5
2	2.5	3.2

layer 3

2	-2.5	-2.4
4	-2.4	-2.2
4	-2.2	-2.0
2	-2.0	-1.9
2	-1.9	-1.8
2	-1.8	-1.7
2	-1.7	-1.6
2	-1.6	-1.5
16	-1.4	-0.8
16	-0.8	0.0
16	0.0	0.8
16	0.8	1.4
2	1.5	1.6
2	1.6	1.7
2	1.7	1.8
2	1.8	1.9
2	1.9	2.0
4	2.0	2.2
4	2.2	2.4
2	2.4	2.5



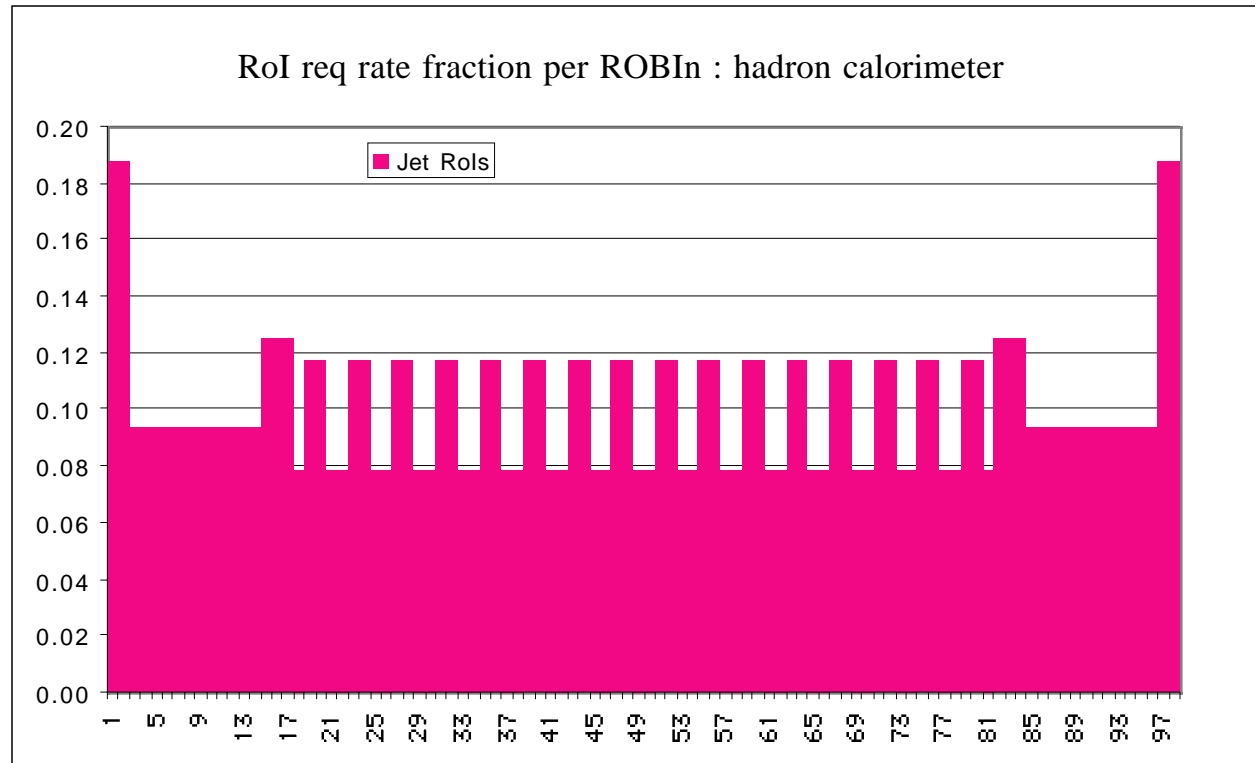




Hadron calorimeter

Per ROB :
 $2\pi / \text{number in } \phi$

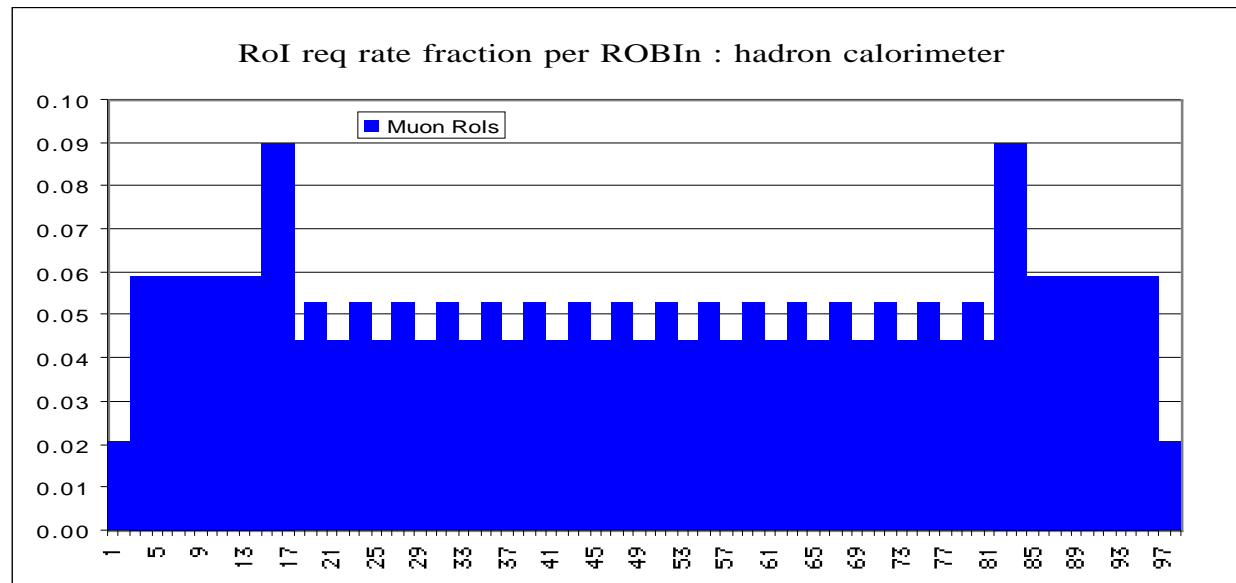
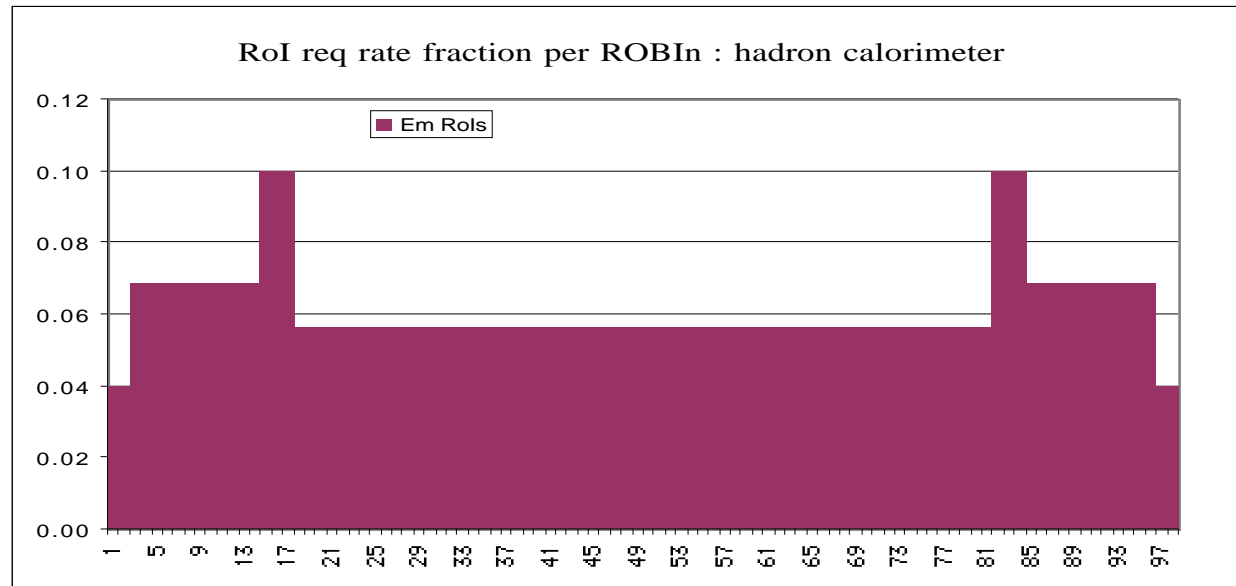
	$\eta \text{ min}$	$\eta \text{ max}$
1	-3.2	-2.5
1	-3.2	-2.5
4	-2.5	-1.6
4	-2.5	-1.6
4	-2.5	-1.6
1	-1.6	-1.5
1	-1.6	-1.5
1	-1.6	-1.5
64	-1.6	1.6
1	1.5	1.6
1	1.5	1.6
1	1.5	1.6
4	1.6	2.5
4	1.6	2.5
4	1.6	2.5
1	2.5	3.2
1	2.5	3.2



Hadron calorimeter

Per ROB :
 $2\pi / \text{number in } \phi$

	$\eta \text{ min}$	$\eta \text{ max}$
1	-3.2	-2.5
1	-3.2	-2.5
4	-2.5	-1.6
4	-2.5	-1.6
4	-2.5	-1.6
1	-1.6	-1.5
1	-1.6	-1.5
1	-1.6	-1.5
64	-1.6	1.6
1	1.5	1.6
1	1.5	1.6
1	1.5	1.6
4	1.6	2.5
4	1.6	2.5
4	1.6	2.5
1	2.5	3.2
1	2.5	3.2



Muon precision

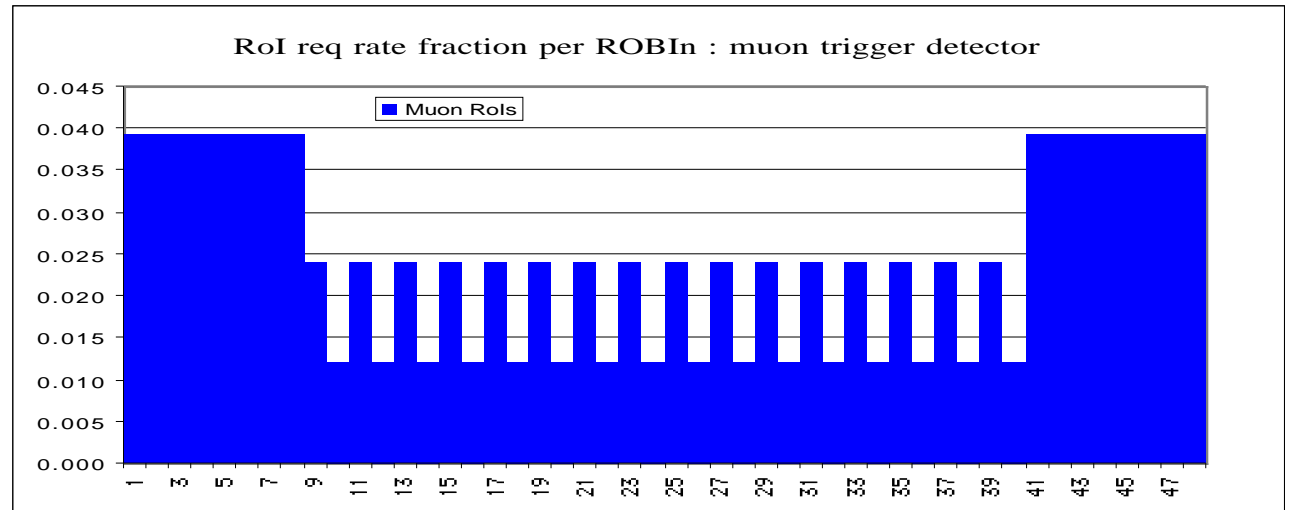
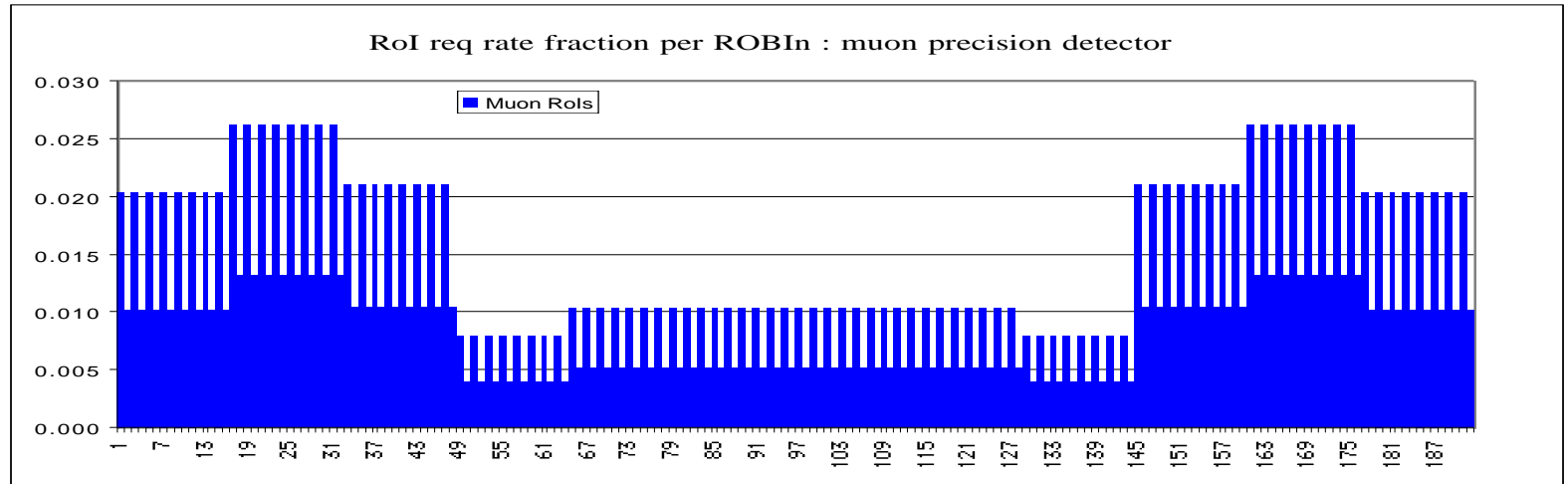
Per ROB :
 $2\pi / \text{number in } \phi$

η min η max

16	-2.7	-1.36	21PhiDivision
16	-2.7	-1.05	21PhiDivision
16	-2.0	-1.05	21PhiDivision
16	-1.05	-0.8	21PhiDivision
16	-0.8	-0.4	21PhiDivision
16	-0.4	0.0	21PhiDivision
16	0.0	0.4	21PhiDivision
16	0.4	0.8	21PhiDivision
16	0.8	1.05	21PhiDivision
16	1.05	2.0	21PhiDivision
16	1.05	2.7	21PhiDivision
16	1.36	2.7	21PhiDivision

Muon trigger

8	-2.5	-1.0	EvenPhiDivision
16	-1.2	0.0	21PhiDivision
16	0.0	1.2	21PhiDivision
8	1.0	2.5	EvenPhiDivision



Paper model

Jos Vermeulen, 2 June 1999, updated on 6 July and 7 September 1999

New version (3.2) of Excel spreadsheet,
support for pixels and analysis of jets in tracker added

Tables for 1 - 128 ROBins per ROBOut included
(generated with RoBsPerRoI program)

Lower and upper limits of rates calculated

Model of DAQ-1 Read-Out Crate with
VME and PVIC bus included, *parameters updated*

Many graphs : all graphs shown are taken from the spreadsheet

Present results

No analysis of jets in tracker

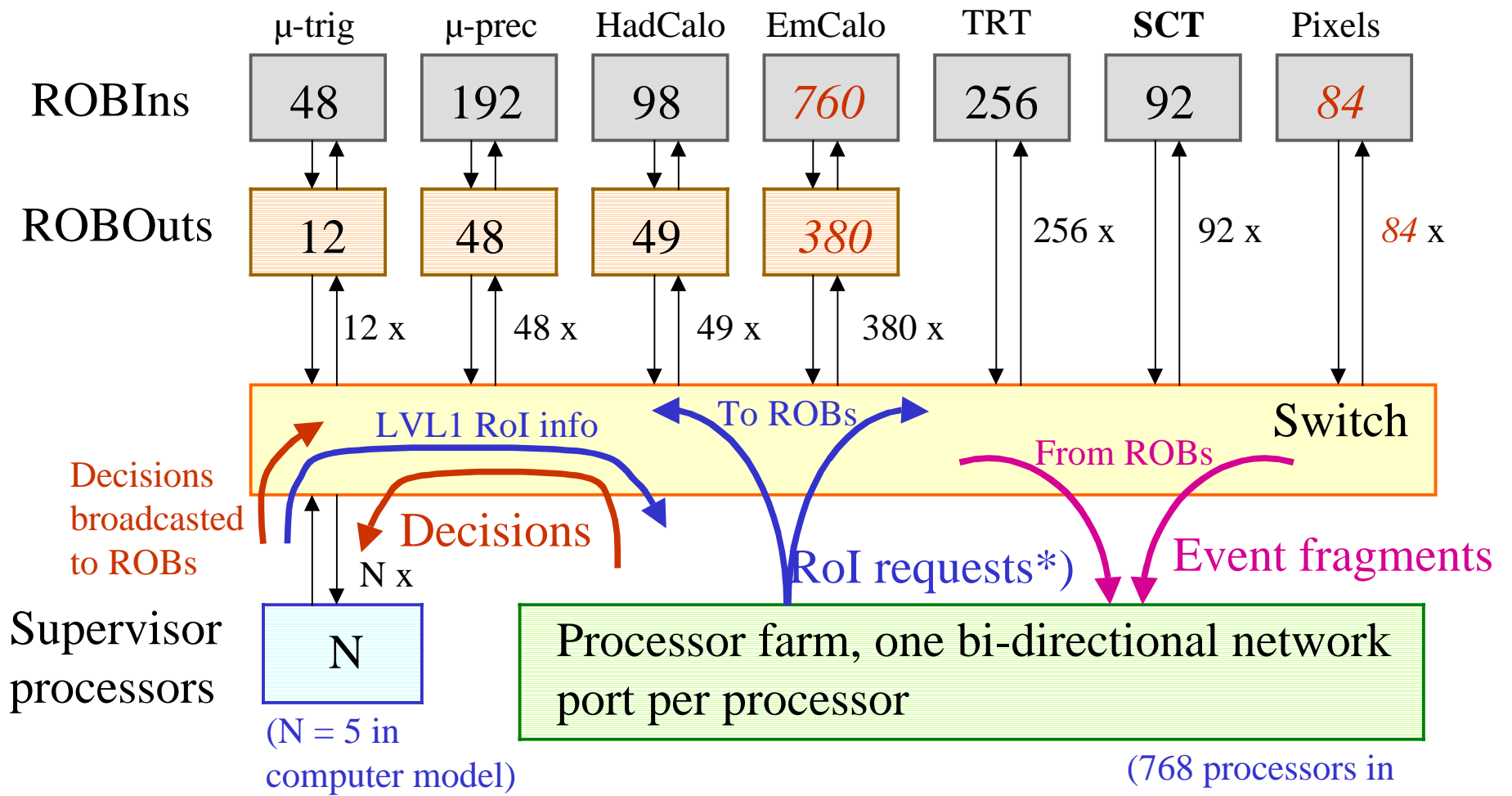
TRT scan leads to requesting all data
from SCT and pixels

Processing parameters and process models as
agreed on in January meeting and as documented
in MWD

Accept decisions combined with reject decisions
in blocks of 20 decisions multicasted to all ROBINs

TRT, SCT and pixel scan and missing energy
RoI requests multicasted

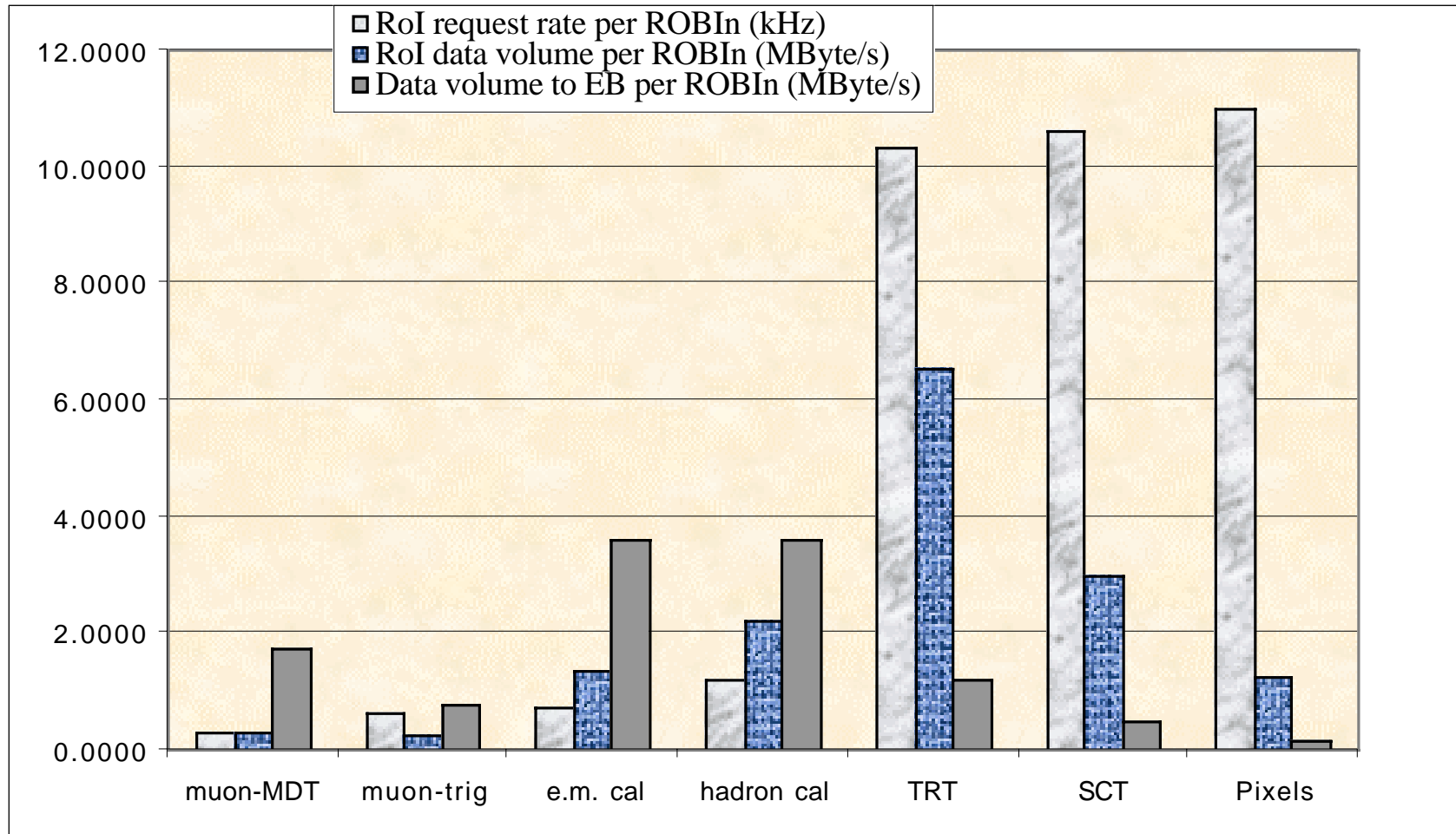
NB : No missing energy trigger



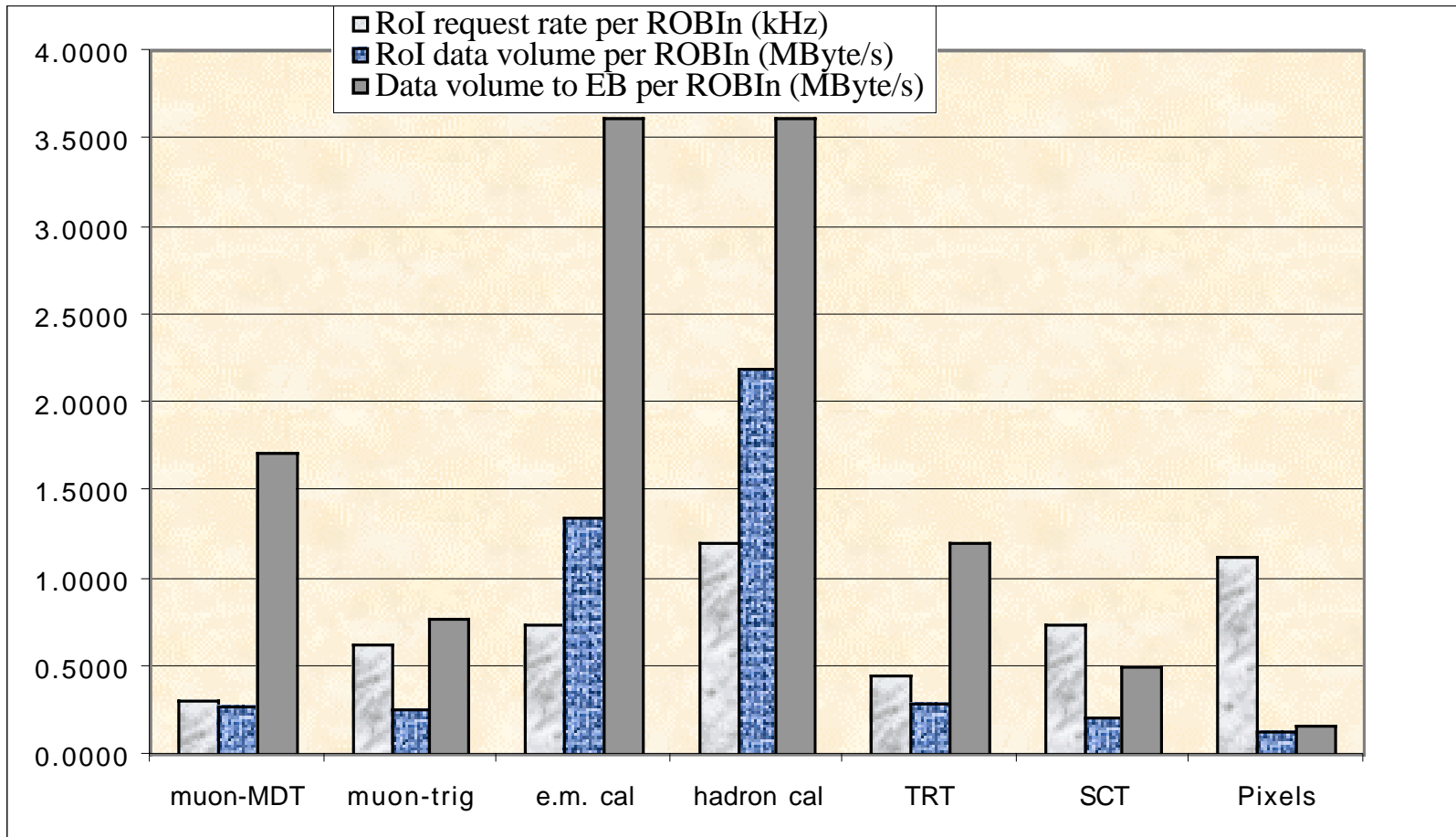
Event building into 512 processors added in computer model (direct connection of each ROBIN to EB)

*) Scan and Emiss RoI requests are multi-casted

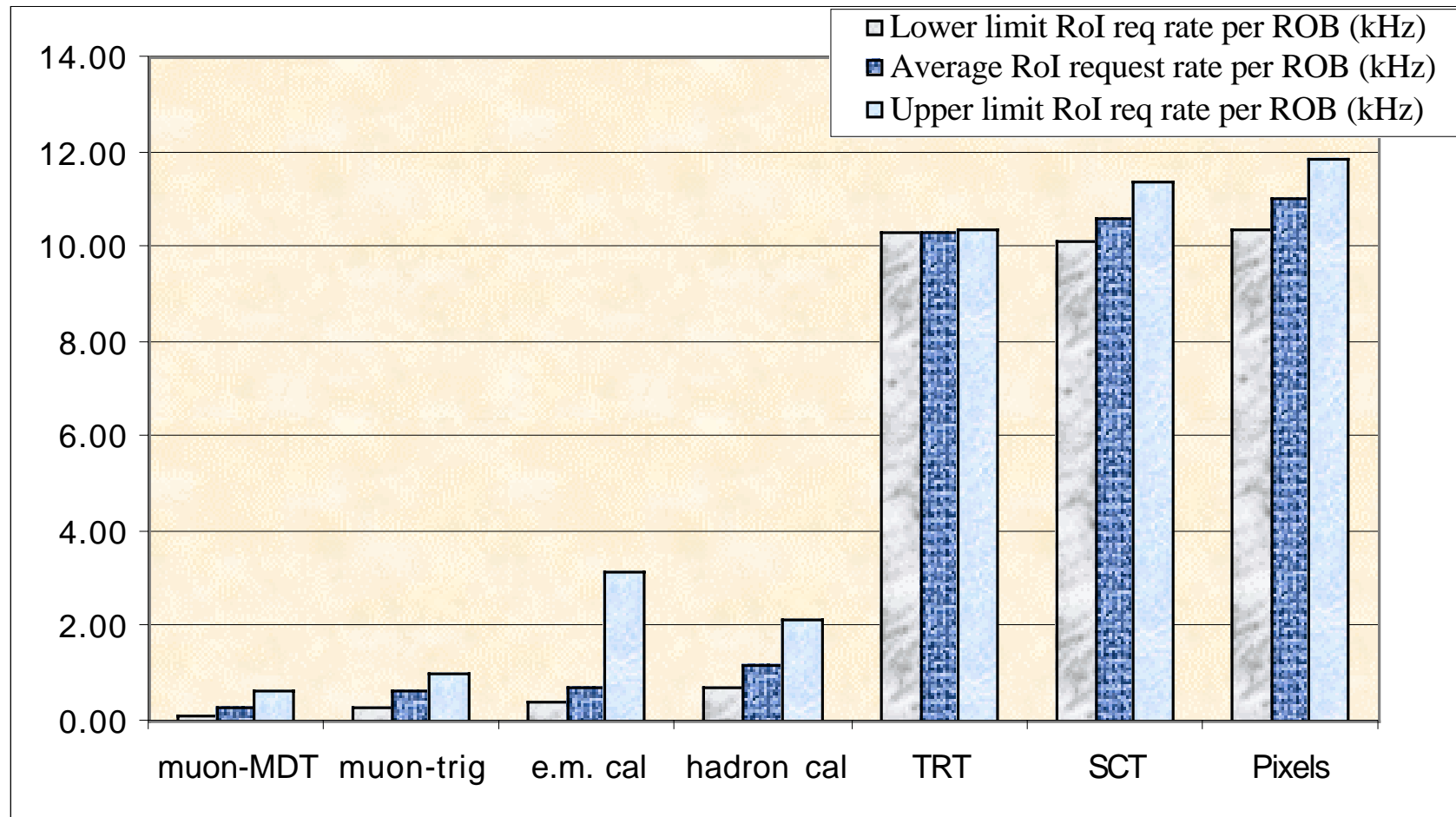
Low luminosity with B-physics trigger



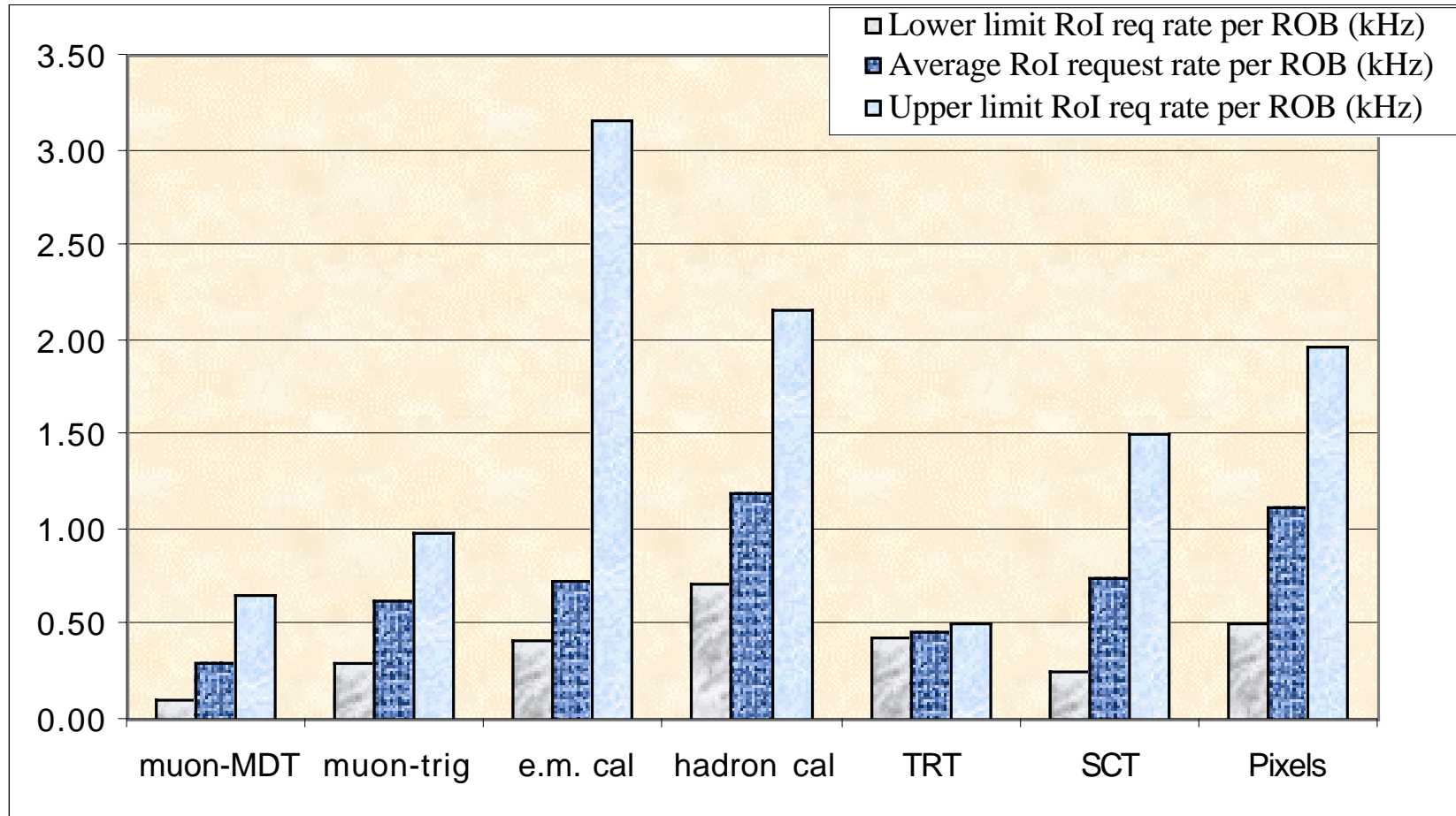
Low luminosity without B-physics trigger



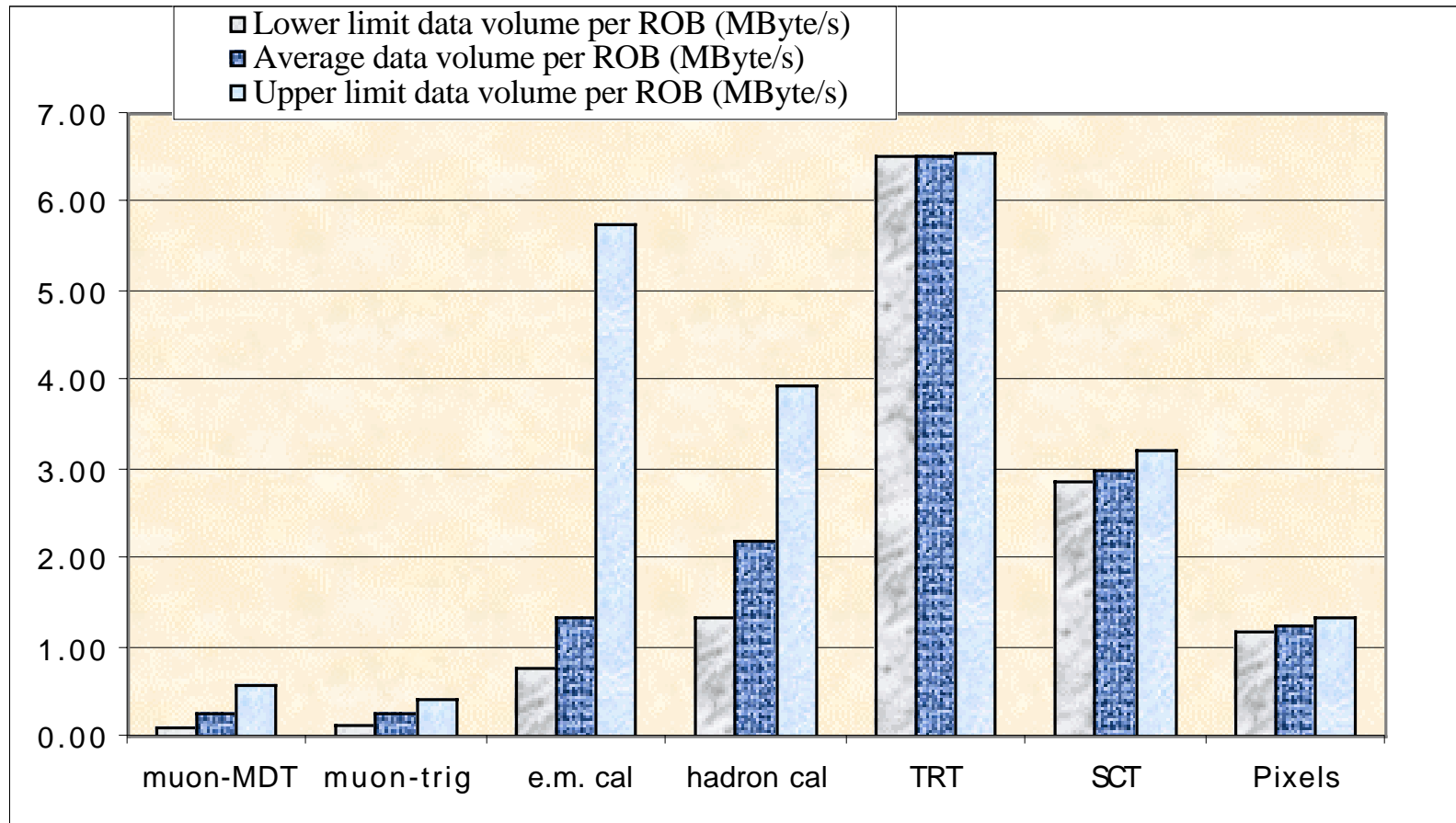
Low luminosity with B-physics trigger



Low luminosity without B-physics trigger

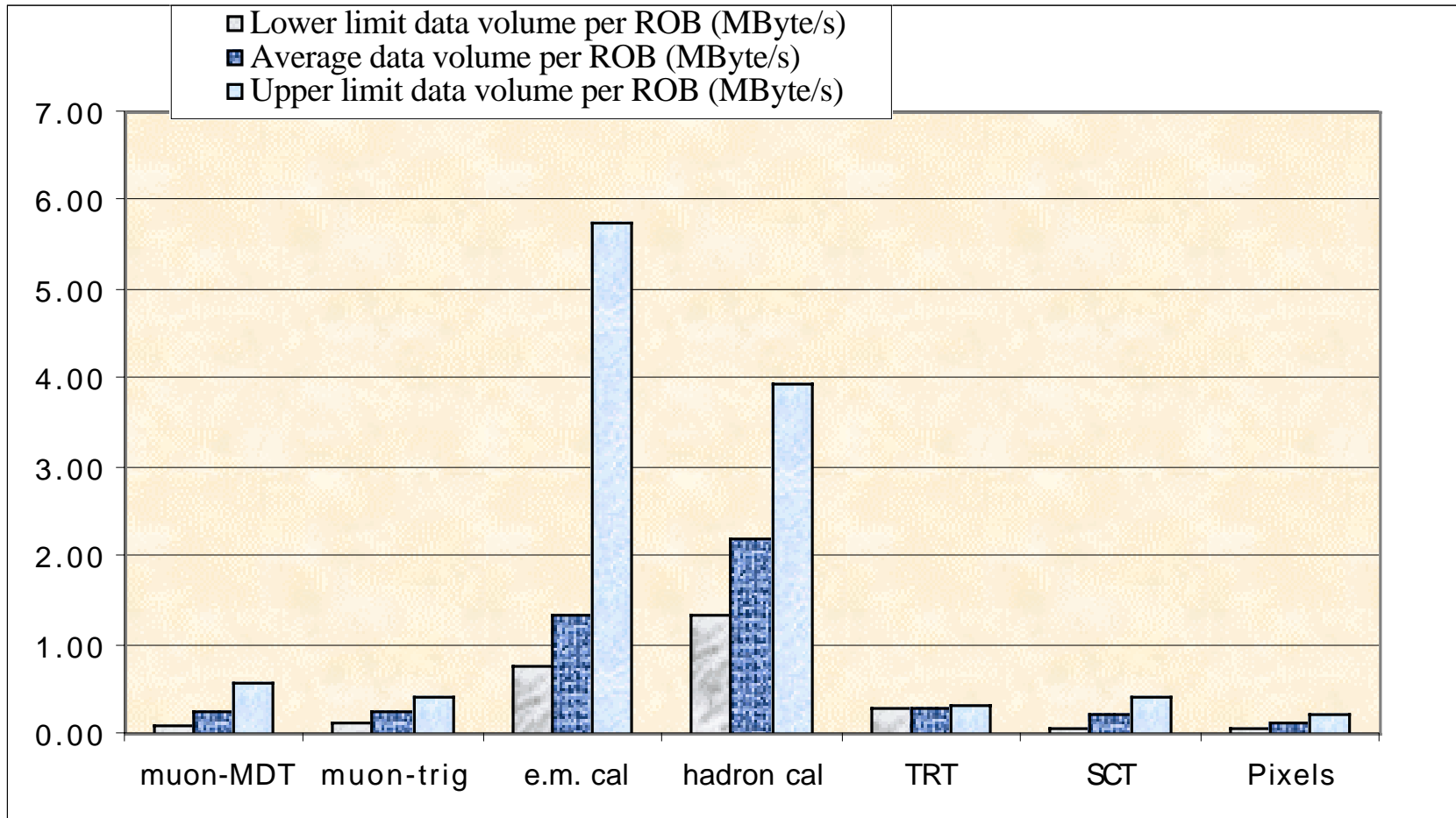


Low luminosity with B-physics trigger

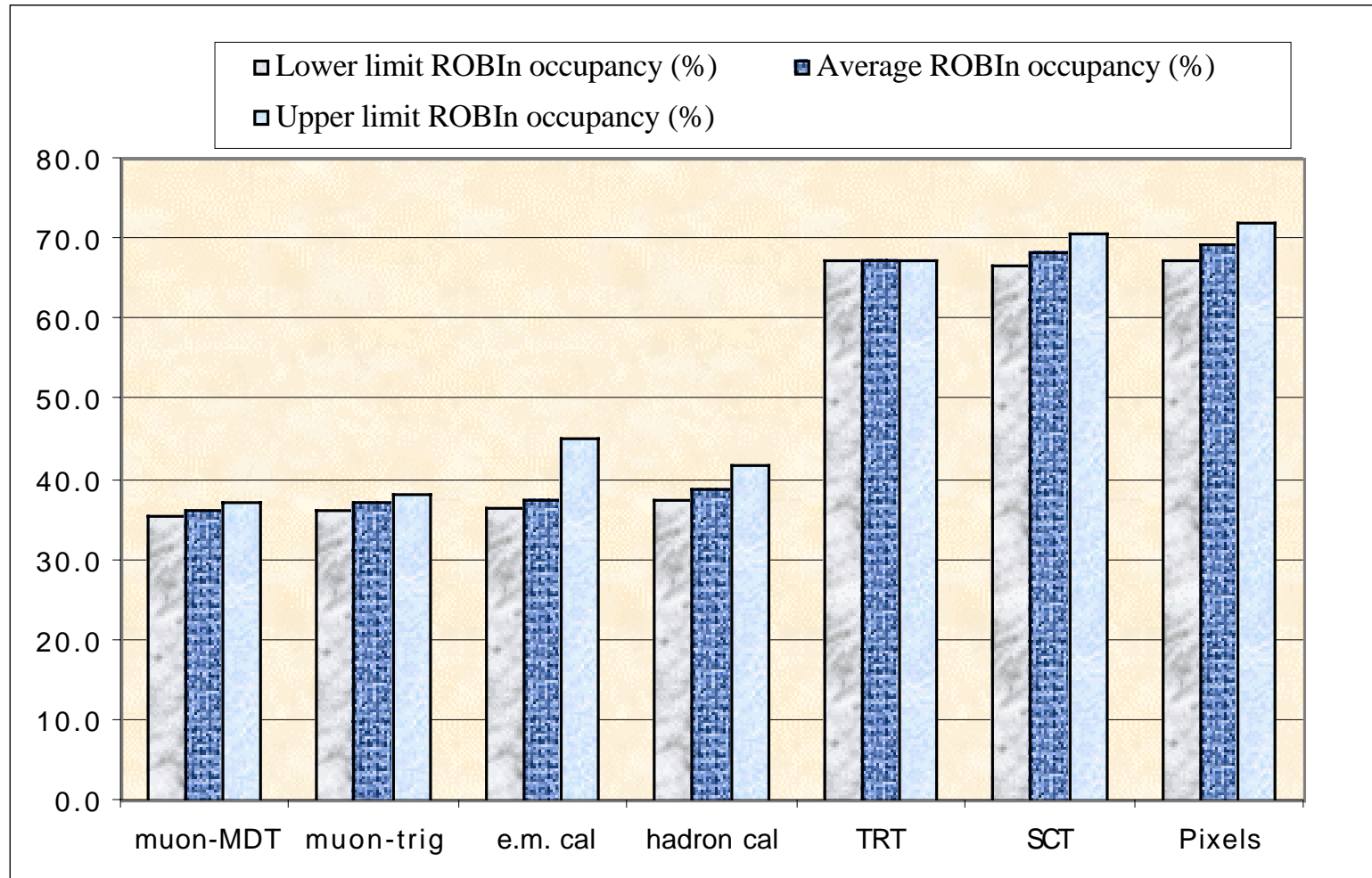


Raw data volume event fragments : Pixels : **80**, SCT : **250**, TRT : 600,
EmCalo : **1800**, HadCalo : **1800**, μ -trig : 380, μ -precision : 850 bytes

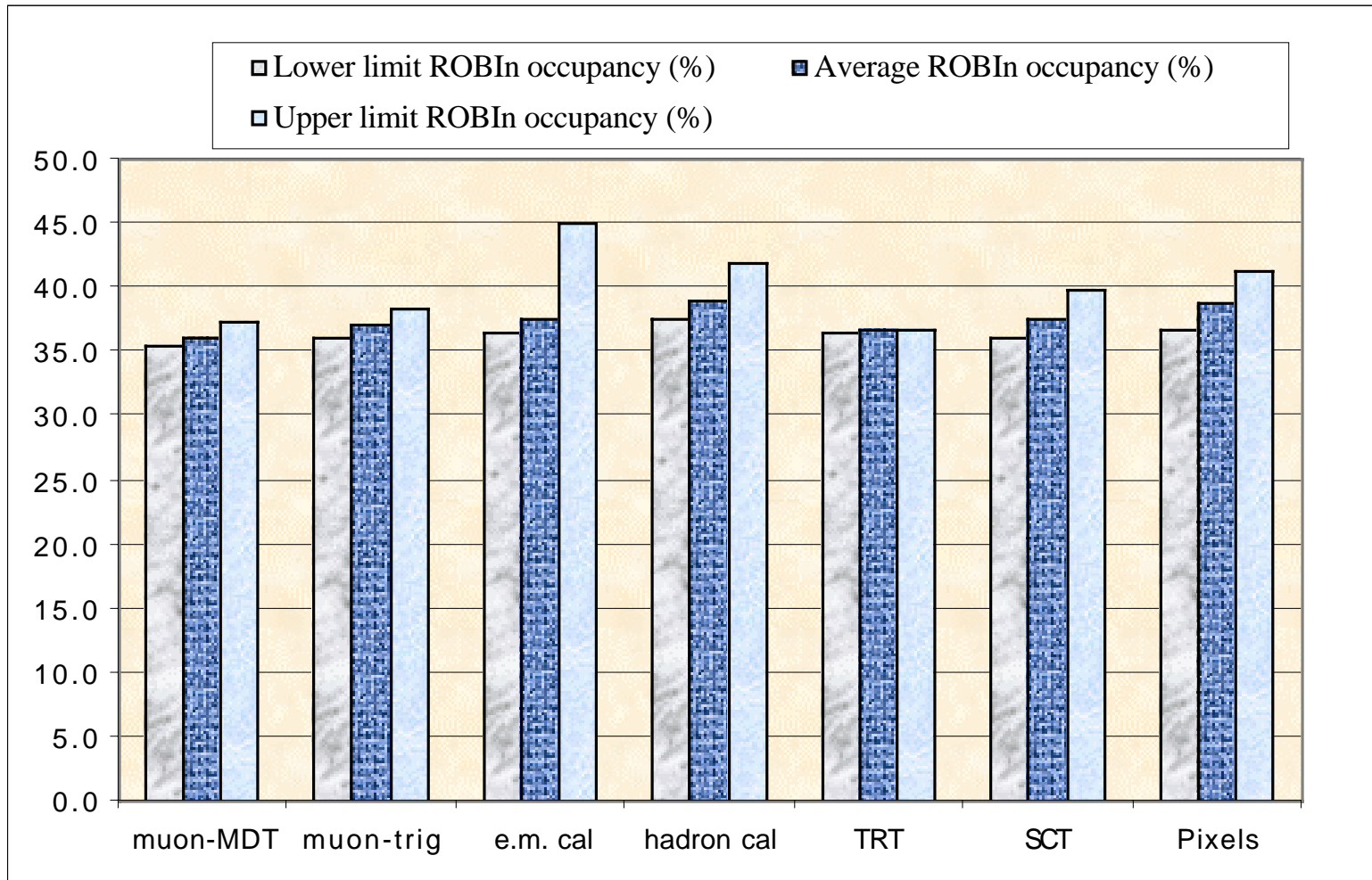
Low luminosity without B-physics trigger



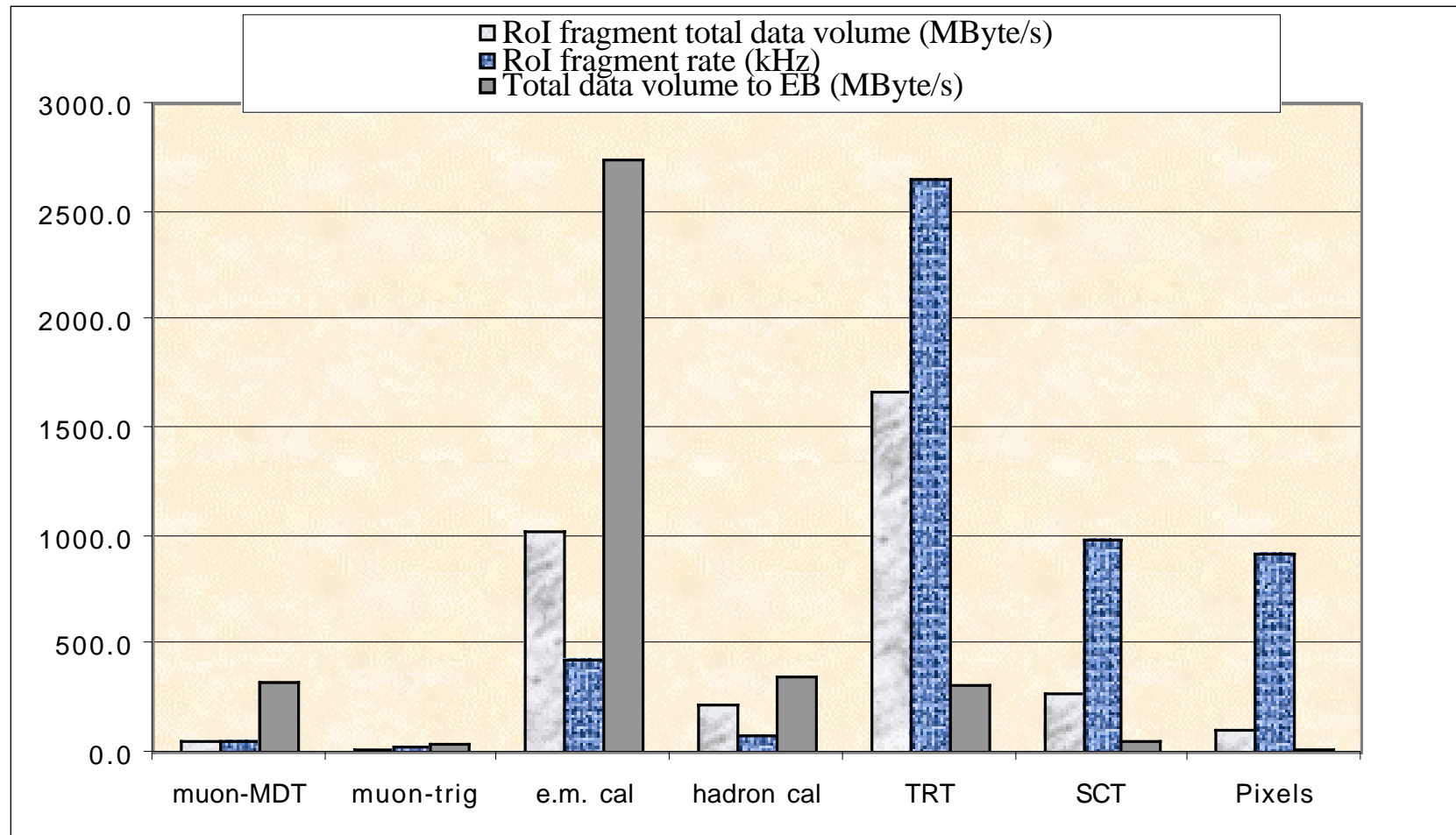
Low luminosity with B-physics trigger



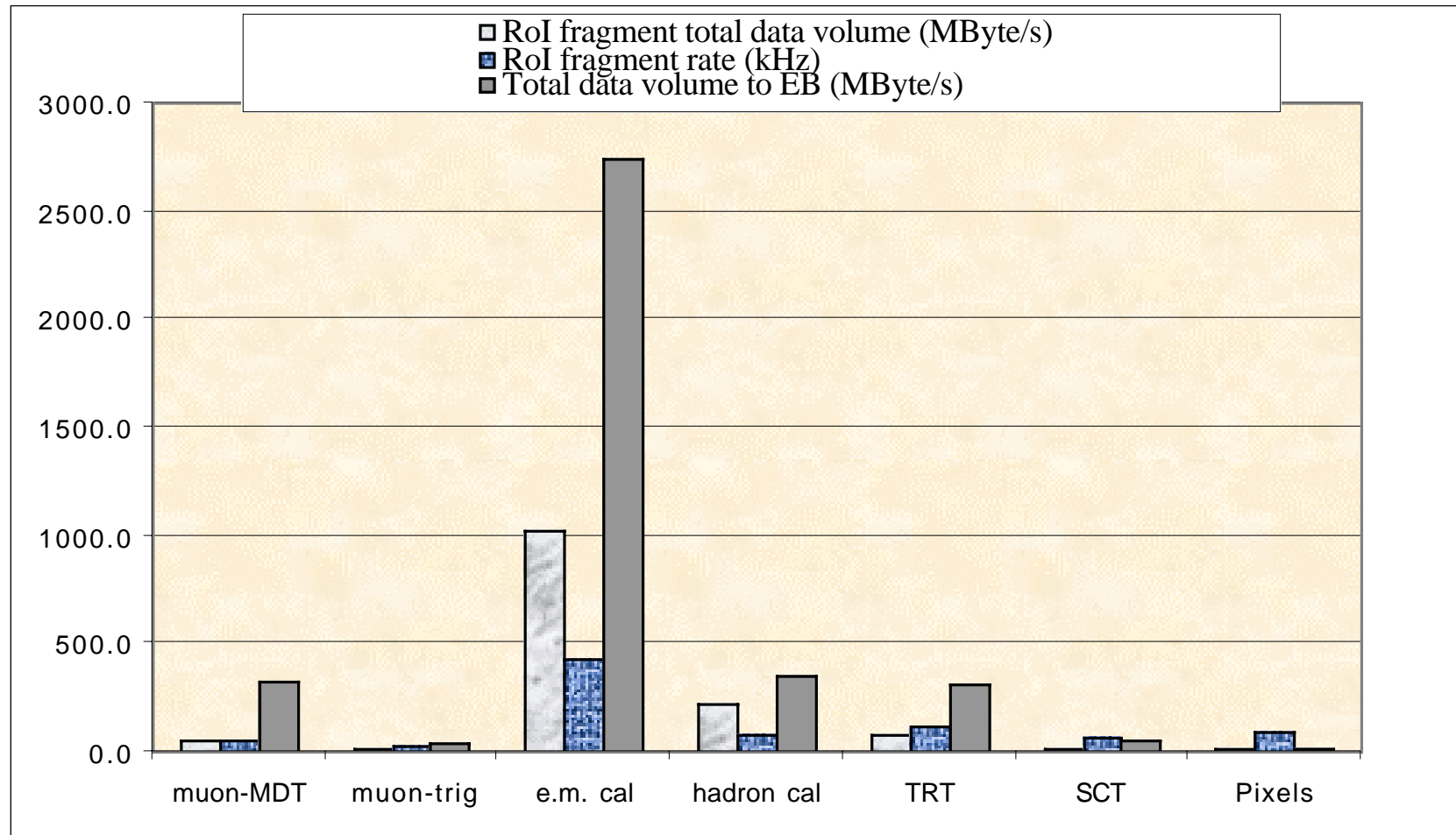
Low luminosity without B-physics trigger



Low luminosity with B-physics trigger



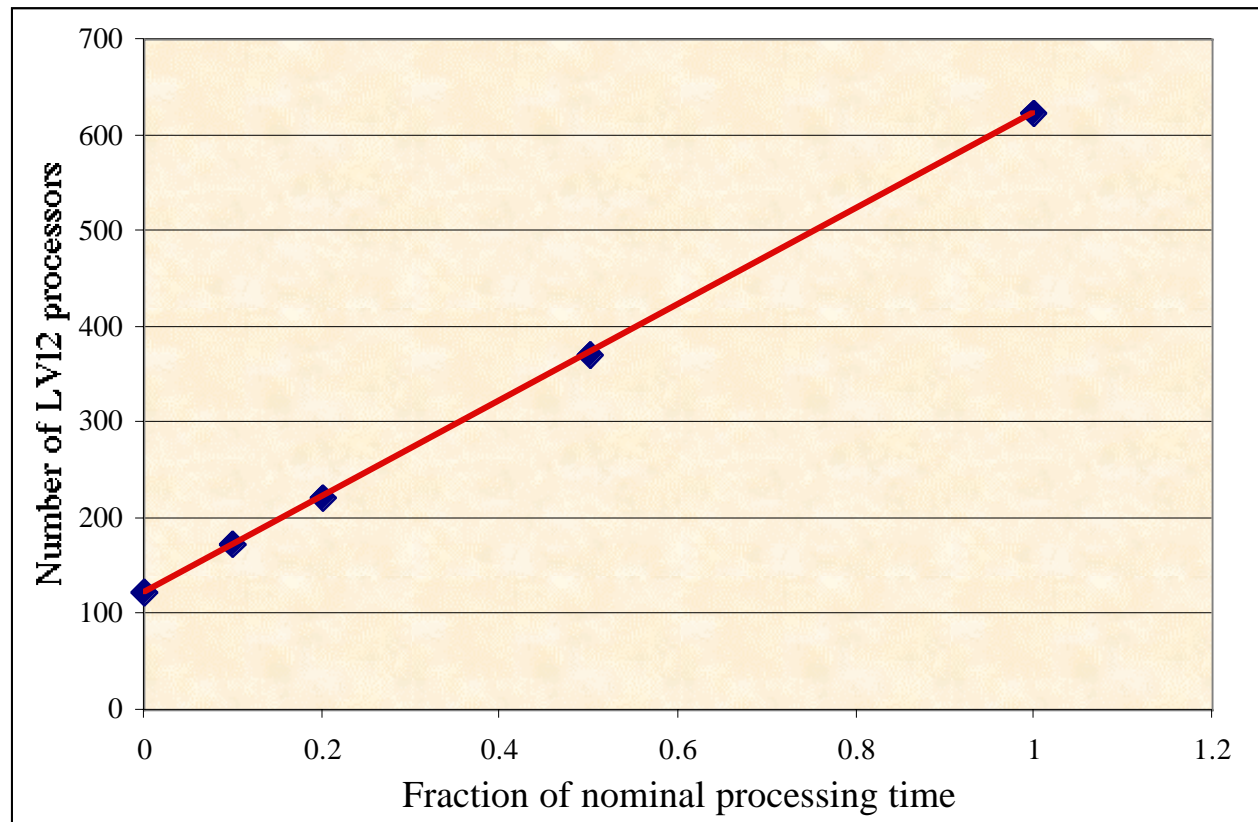
Low luminosity without B-physics trigger



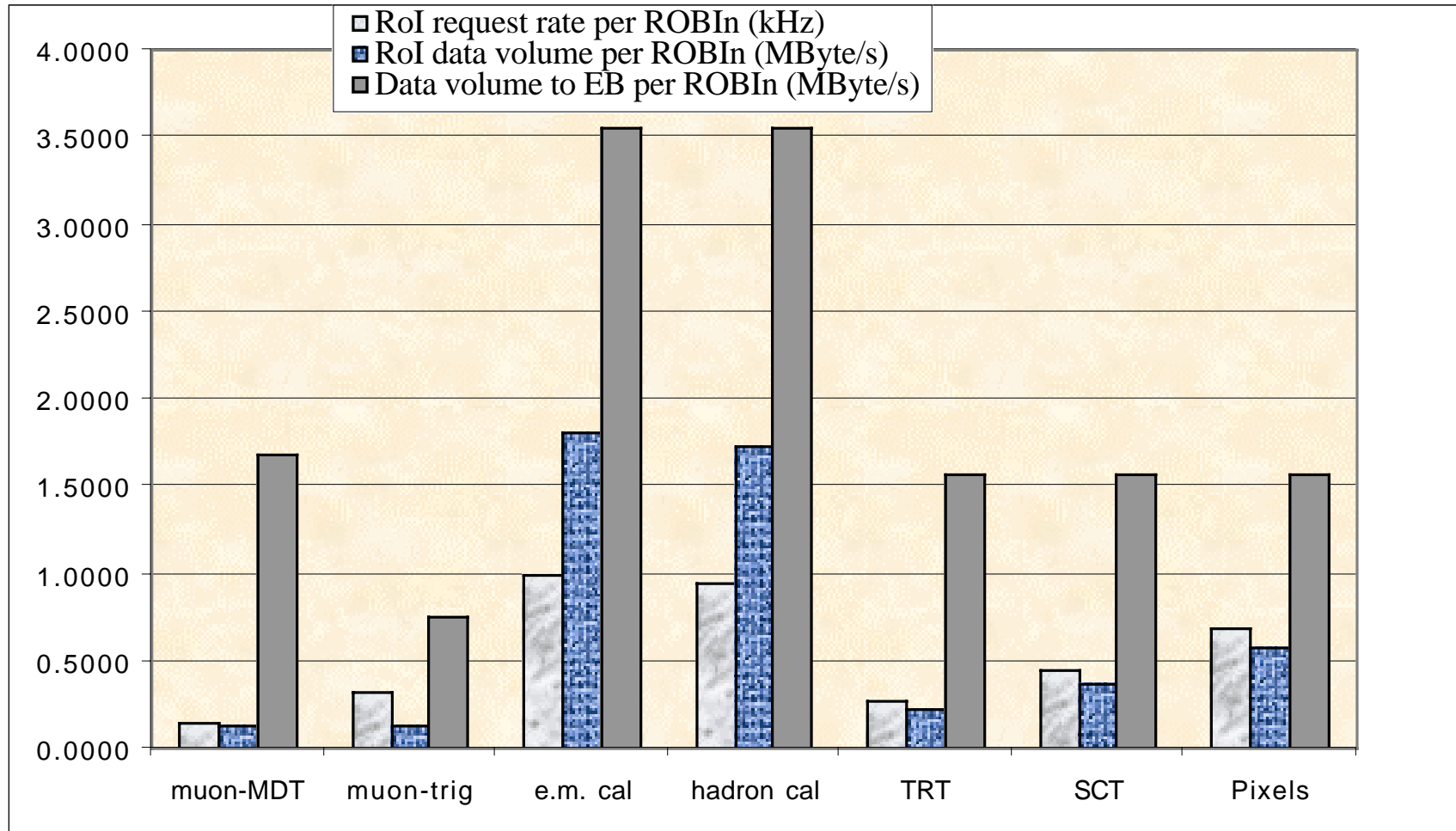
Low luminosity with scan	mu-prec	mu-trig	e.m. cal	hadron cal
Number of ROBINs per ROBOut	4	4	2	2
Volume RoI fragments per ROBOut (MByte/s)	1.06	1.04	2.69	4.37
Total occupancy ROBOut (%)	17.52	24.22	15.82	21.29

Low luminosity with scan	mu-prec	mu-trig	e.m. cal	hadron cal
Number of ROBINs per ROBOut	12	12	6	6
Volume RoI fragments per ROBOut (MByte/s)	3.19	3.12	8.06	13.12
Total occupancy ROBOut (%)	48.55	67.85	40.70	53.54

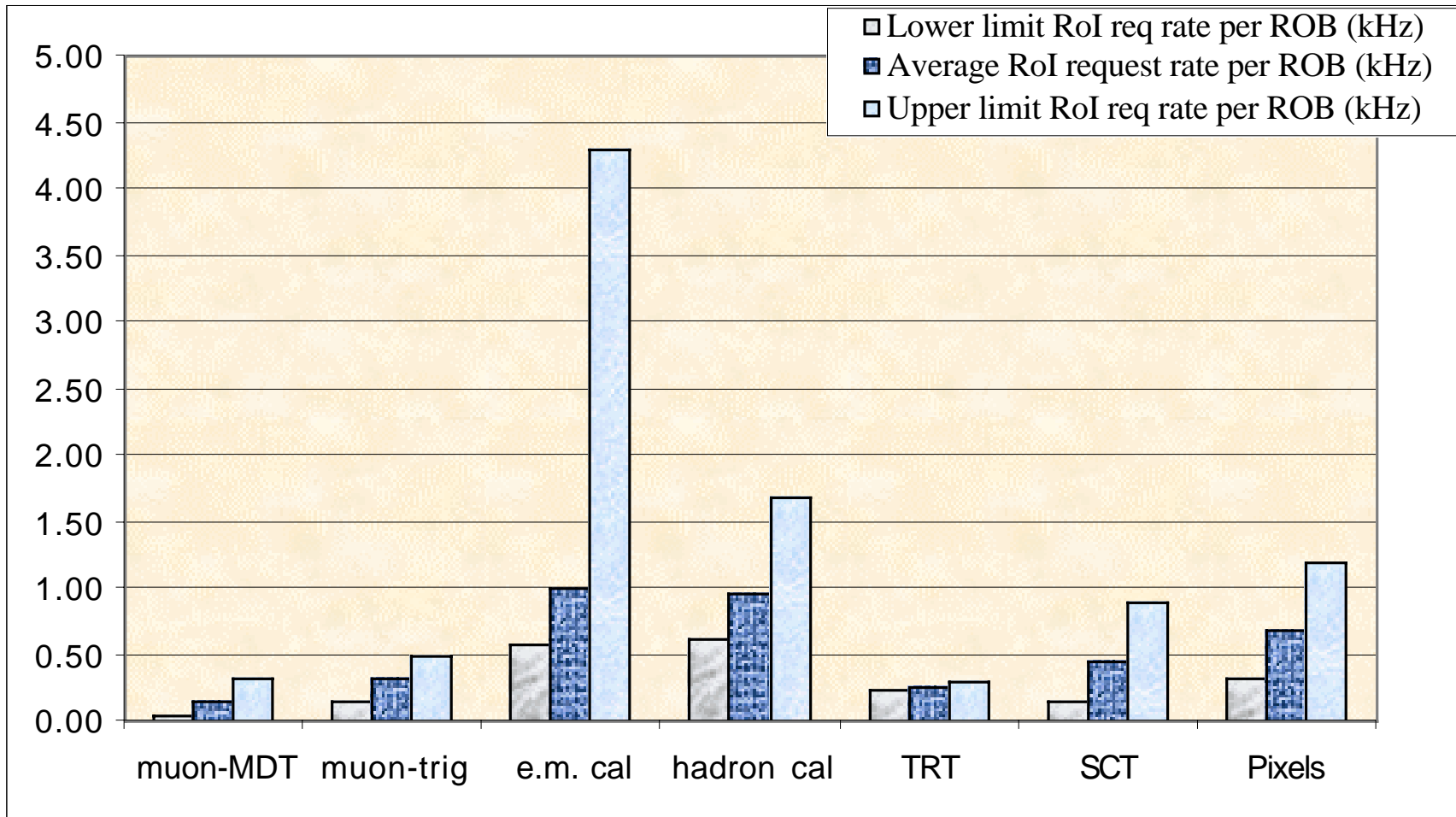
Low luminosity	with scan	with scan	with scan	with scan	with scan	no scan
Execution time scan (nominal = 100 %)	100%	50%	20%	10%	0%	
Minimum number of processors	624	370	222	173	123	56
Data volume per processor in (MByte/s)	5.37	9.05	15.09	19.36	27.23	25.03
Fragment rate per processor in (kHz)	8.24	13.90	23.16	29.72	41.80	15.62
Minimum number of supervisor processors	2	2	2	2	2	2



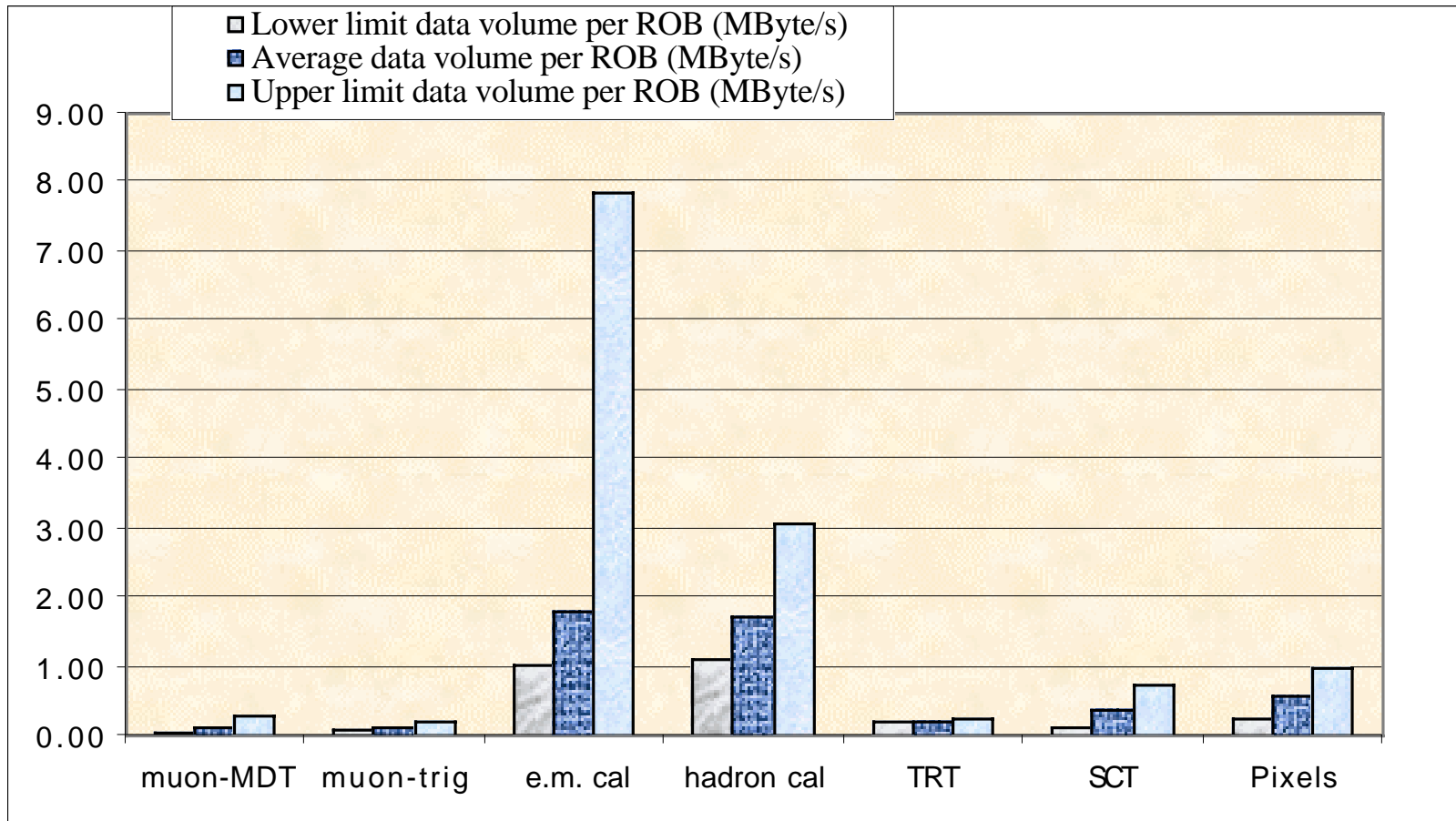
High luminosity



High luminosity

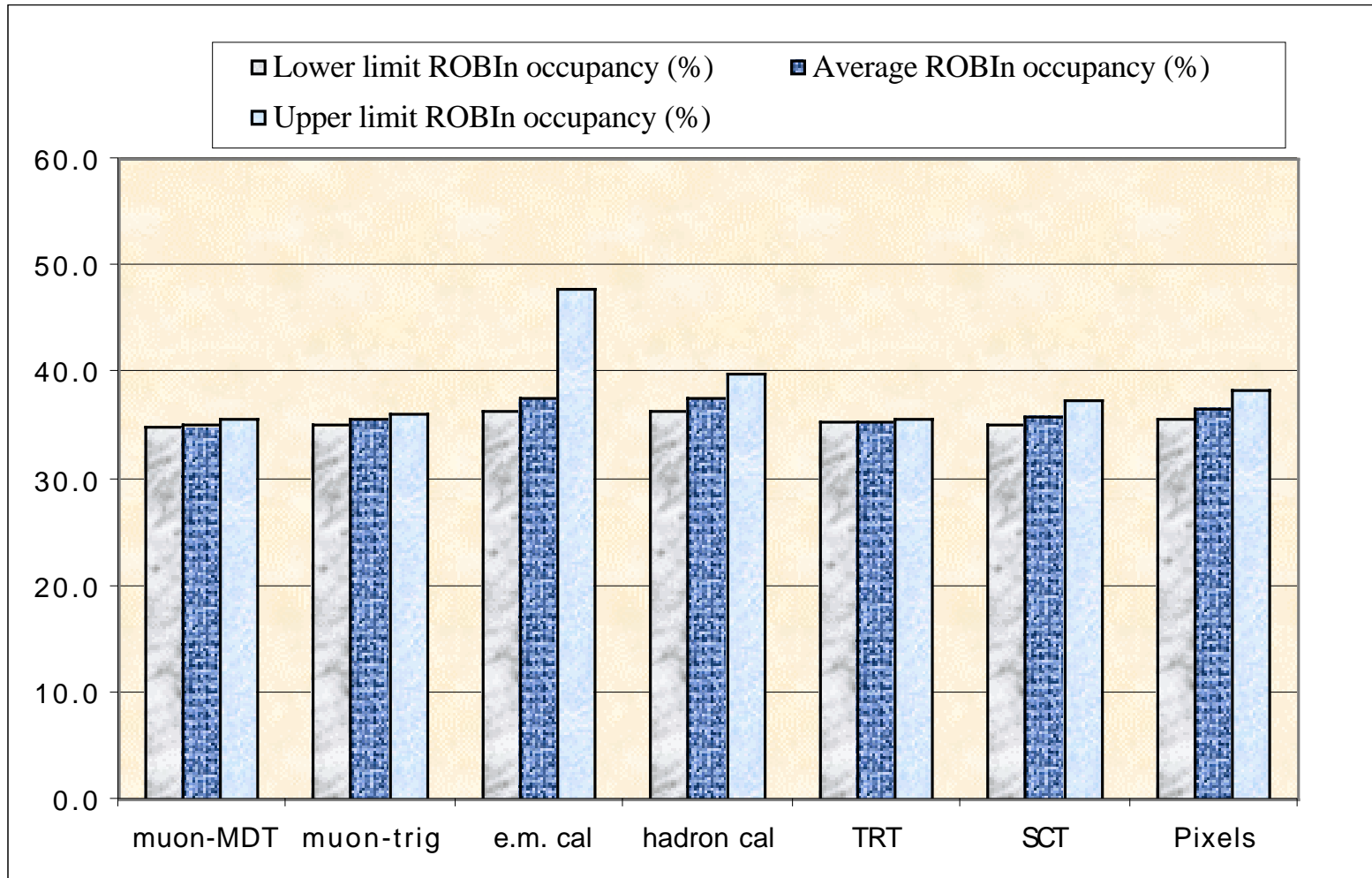


High luminosity

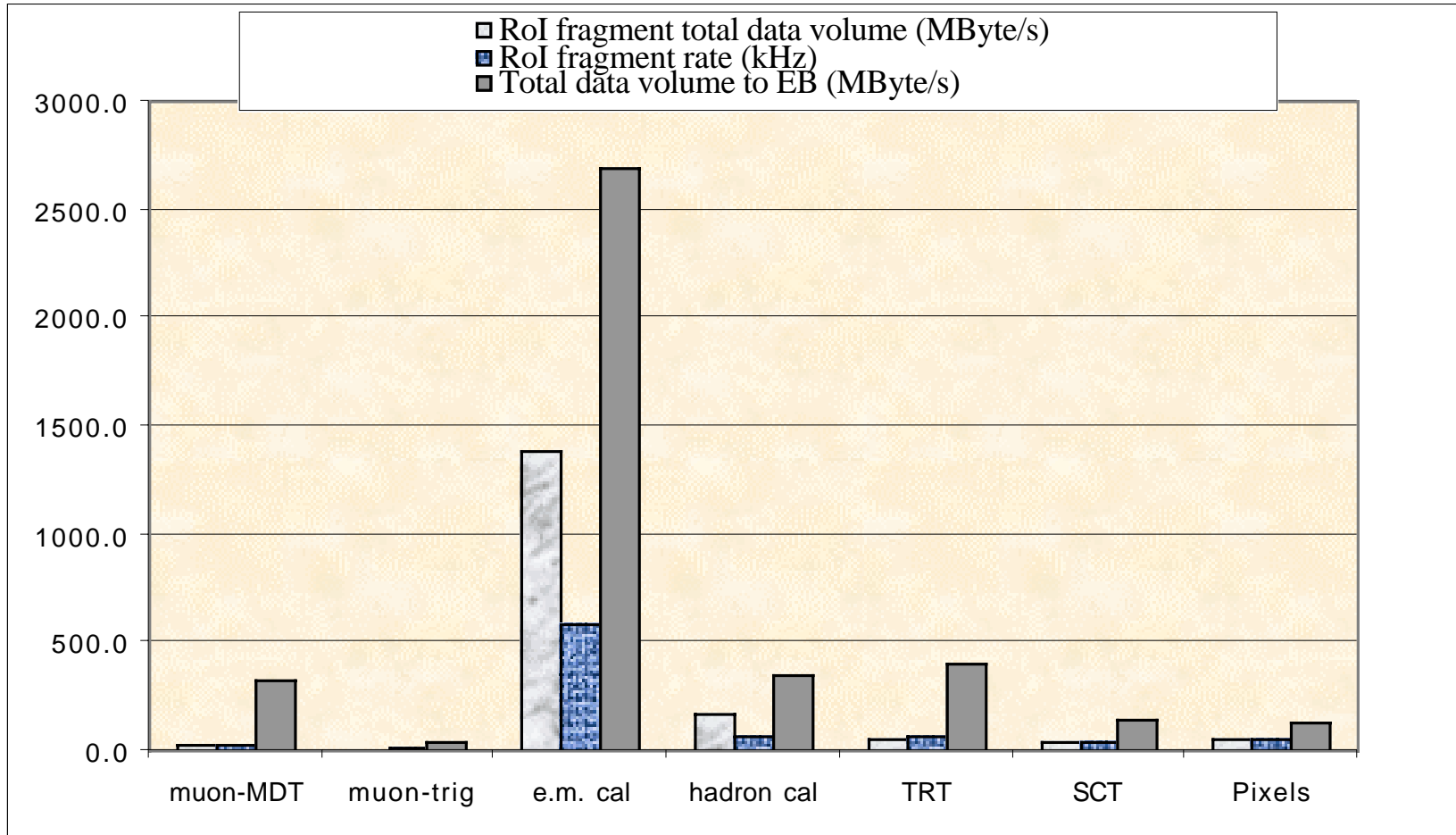


Raw data volume event fragments : Pixels : *800*, SCT : *800*, TRT : *800*,
EmCalo : *1800*, HadCalo : *1800*, μ -trig : 380, μ -precision : 850 bytes

High luminosity



High luminosity



High luminosity	mu-prec	mu-trig	e.m. cal	hadron cal
Number of ROBINs per ROBOut	4	4	2	2
Volume RoI fragments per ROBOut (MByte/s)	0.53	0.52	3.63	3.47
Total occupancy ROBOut (%)	13.58	16.91	19.19	18.01

High luminosity	
Minimum number of processors	55
Data volume per processor in (MByte/s)	31.24
Fragment rate per processor in (kHz)	15.57
Minimum number of supervisor processors	2

High luminosity	mu-prec	mu-trig	e.m. cal	hadron cal
Number of ROBINs per ROBOut	12	12	6	6
Volume RoI fragments per ROBOut (MByte/s)	1.59	1.55	10.88	10.41
Total occupancy ROBOut (%)	36.79	46.40	49.87	45.06

Maximum rate and volume of data to be sent
to LVL2 per ROBIN

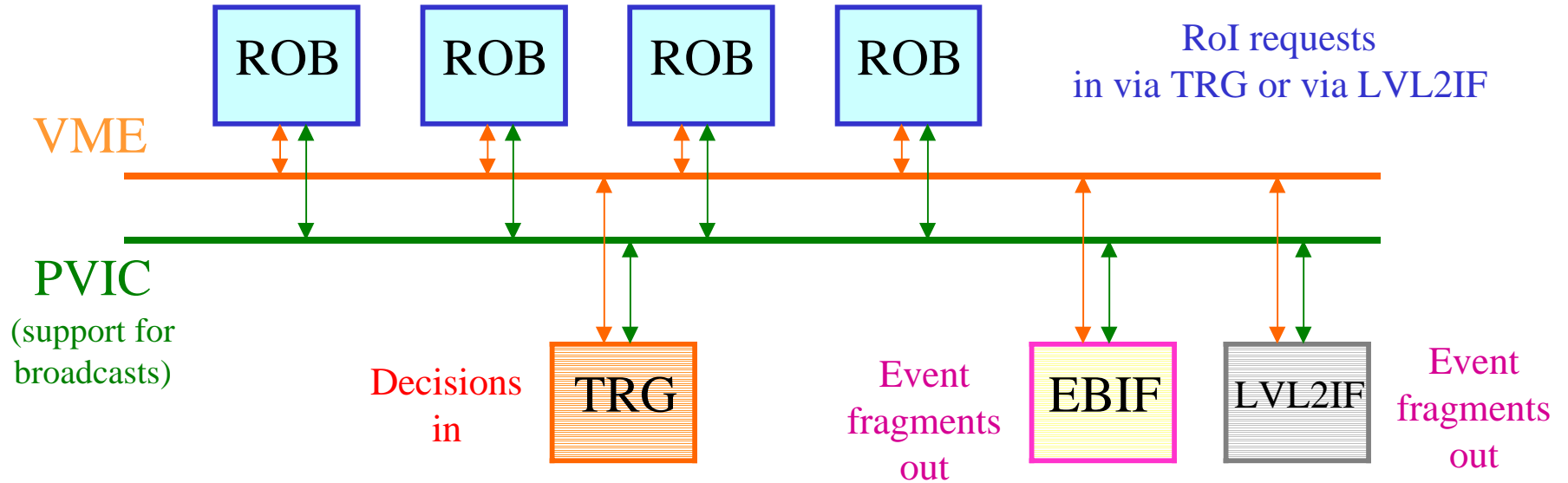
Low luminosity : *12 kHz (pixels) / 6.6 MByte/s (TRT)*
(was 18.6 MByte/s for SCT)

Without B-physics trigger :

3.2 kHz / 5.8 MByte/s (em calorimeter)

High luminosity : *4.3 kHz / 7.9 MByte/s (em calorimeter)*

Read Out Crate Model

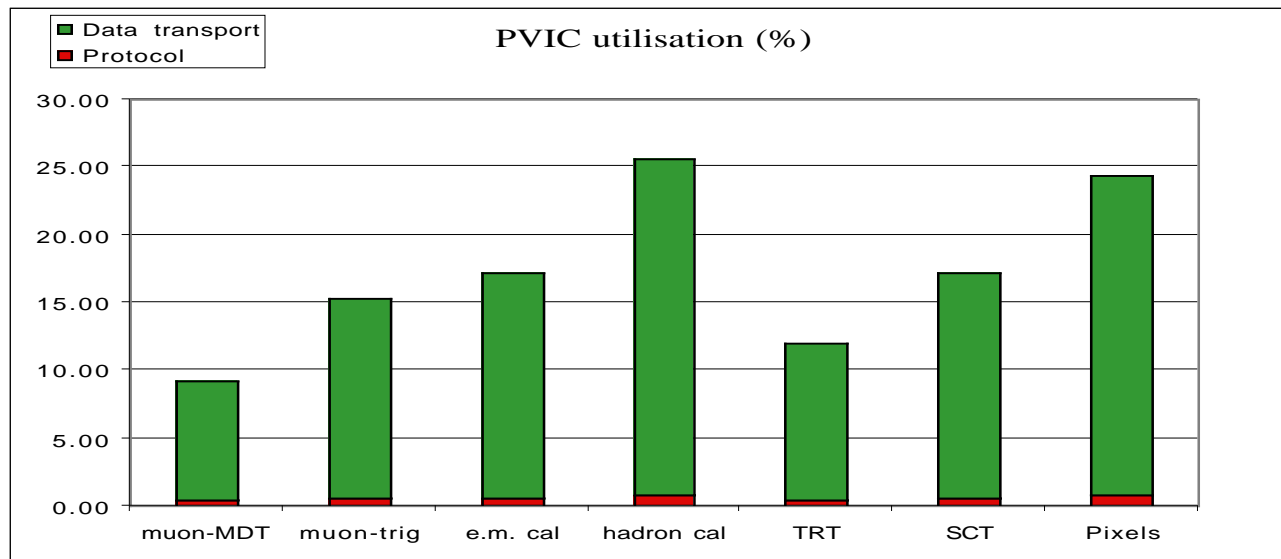
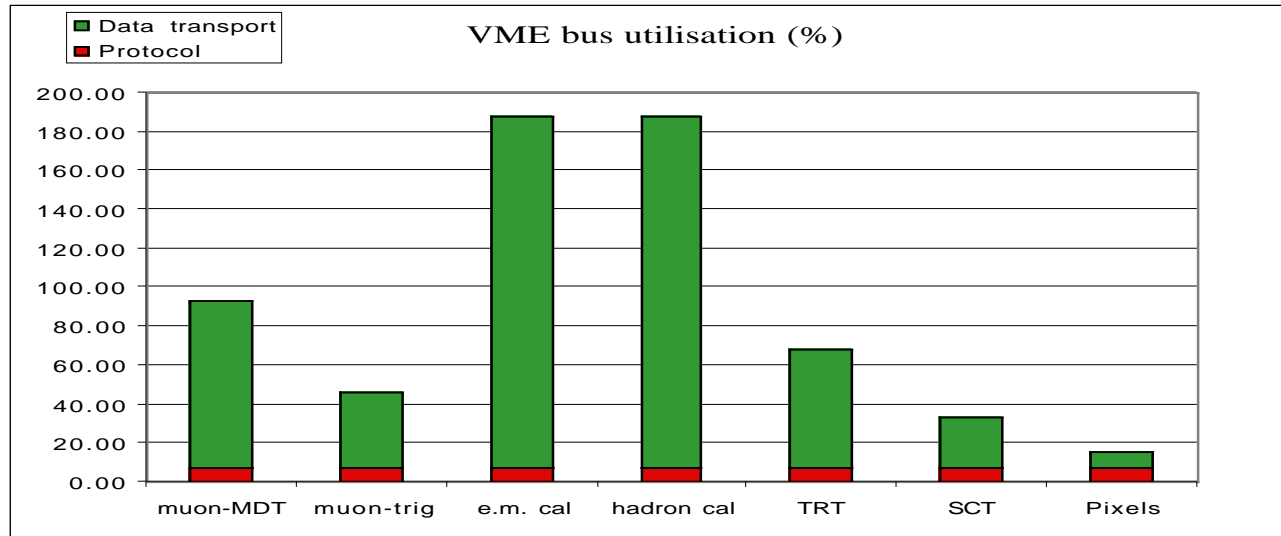


	muon-MDT	muon-trig	e.m. cal	hadron cal	TRT	SCT	Pixels
Number of ROBs per crate	16	16	16	16	16	16	16
TRG :RoI req's (only LVL2 RoI requests broadcasted if possible) via:	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC
TRG : Blocked reject decions via :	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC
TRG : Unblocked accept decisions via :	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC
LVL2 i/f : Event data in via :	Local *)	Local *)	Local *)	Local *)	Local *)	Local*)	Local*)
LVL2 i/f : RoI requests out via :	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC
EBIF : Event data in via :	VME	VME	VME	VME	VME	VME	VME
EBIF : Discards out via :	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC	PVIC
ROBs write event data to LVL2 I/F (in stead of reading from ROBs)	No	No	No	No	No	No	No
ROBs write event data to EBIF (in stead of EBIF reading from ROBs)	No	No	No	No	No	No	No

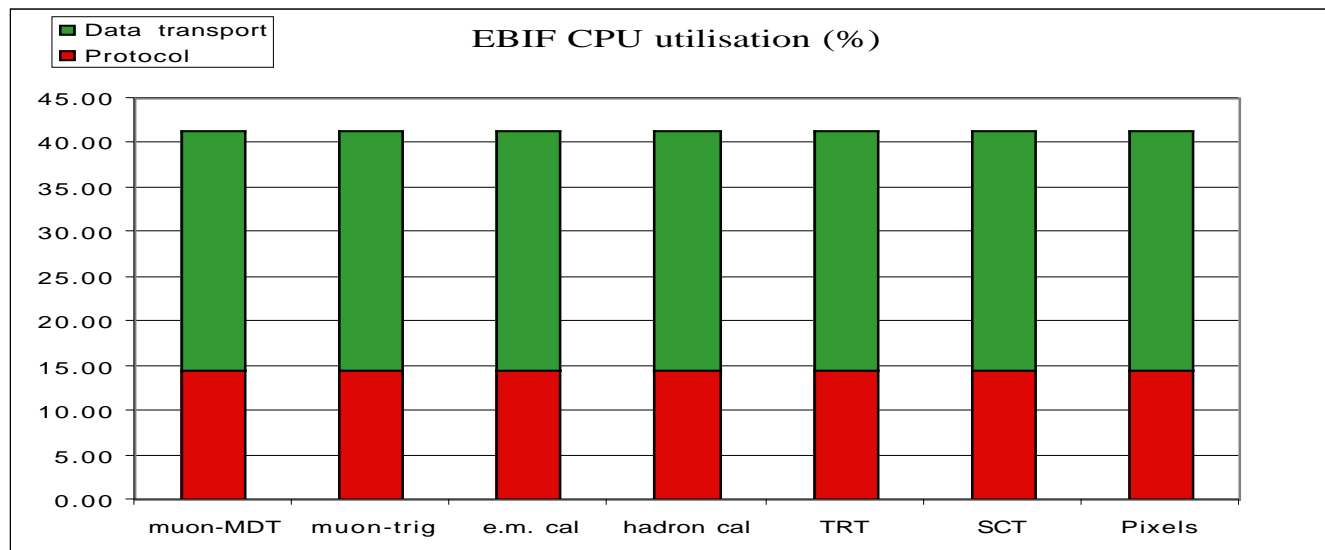
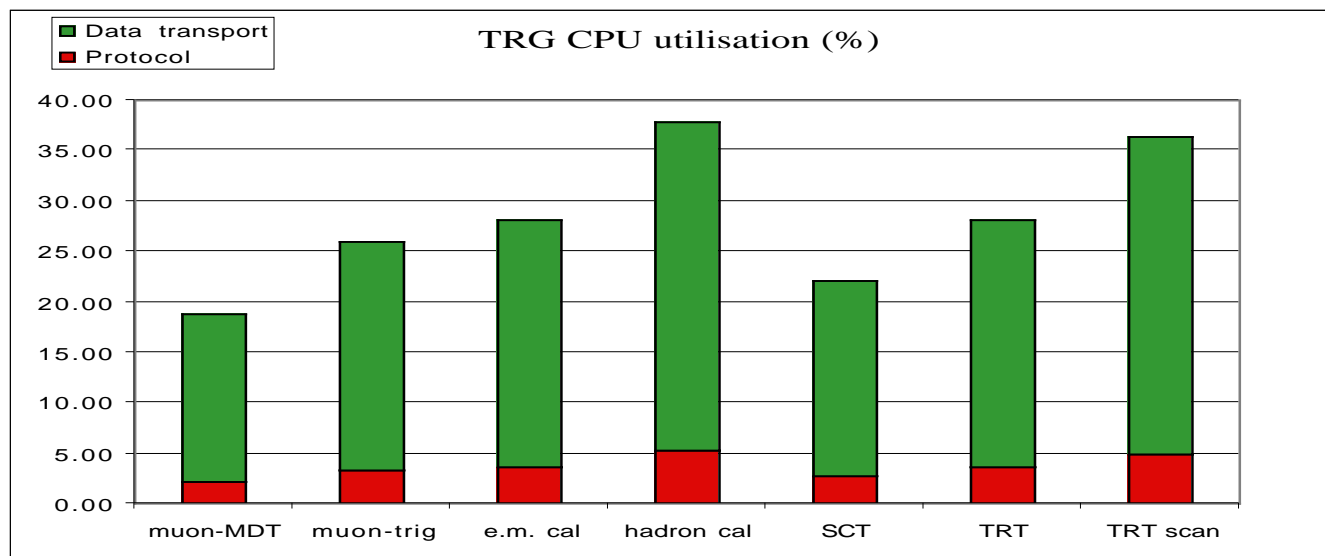
*) event data for LVL2 system is assumed to be sent via local interfaces connected to ROBs 47

VME : CPU protocol overhead (μs)	4.4	4.4	4.4	4.4	4.4	4.4	4.4
VME : Bus utilization protocol (μs)	2.4	2.4	2.4	2.4	2.4	2.4	2.4
VME : # of msgs for protocol	2.0	2.0	2.0	2.0	2.0	2.0	2.0
VME : # of bytes / protocol msg	4.0	4.0	4.0	4.0	4.0	4.0	4.0
PVIC : CPU protocol overhead (μs)	2.1	2.1	2.1	2.1	2.1	2.1	2.1
PVIC : Bus utilization protocol (μs)	0.30	0.30	0.30	0.30	0.30	0.30	0.30
PVIC : # of msgs for protocol	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PVIC : # of bytes / protocol msg	4.0	4.0	4.0	4.0	4.0	4.0	4.0
VME - no DMA : CPU overhead for 1 transfer (μs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VME - no DMA : CPU utilization per 4 bytes read (μs)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
VME - no DMA : CPU utilization per 4 bytes write (μs)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
VME - no DMA : Bus utilization per 4 bytes read (μs)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
VME - no DMA : Bus utilization per 4 bytes write (μs)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
VME - DMA : CPU overhead for 1 transfer (μs)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
VME - DMA : broadcast : additional CPU overhead per destination (μs)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VME - DMA : CPU utilization per 4 bytes read (μs)	0.125	0.125	0.125	0.125	0.125	0.125	0.125
VME - DMA : CPU utilization per 4 bytes write (μs)	0.125	0.125	0.125	0.125	0.125	0.125	0.125
VME - DMA : Bus utilization per 4 bytes read (μs)	0.125	0.125	0.125	0.125	0.125	0.125	0.125
VME - DMA : Bus utilization per 4 bytes write (μs)	0.125	0.125	0.125	0.125	0.125	0.125	0.125
PVIC - no DMA : CPU overhead for 1 transfer (μs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PVIC - no DMA : CPU utilization per 4 bytes read (μs)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PVIC - no DMA : CPU utilization per 4 bytes write (μs)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
PVIC - no DMA : Bus utilization per 4 bytes read (μs)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
PVIC - no DMA : Bus utilization per 4 bytes write (μs)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
PVIC - DMA : CPU overhead for 1 transfer (μs)	8.0	8.0	8.0	8.0	8.0	8.0	8.0
PVIC - DMA : broadcast : additional CPU overhead per destination (μs)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PVIC - DMA : CPU utilization per 4 bytes read (μs)	0.065	0.065	0.065	0.065	0.065	0.065	0.065
PVIC - DMA : CPU utilization per 4 bytes write (μs)	0.065	0.065	0.065	0.065	0.065	0.065	0.065
PVIC - DMA : Bus utilization per 4 bytes read (μs)	0.065	0.065	0.065	0.065	0.065	0.065	0.065
PVIC - DMA : Bus utilization per 4 bytes write (μs)	0.065	0.065	0.065	0.065	0.065	0.065	0.065

Low luminosity



Low luminosity



ROBIn processing times (μs)

DecisionBlockHandlingTime	55.5555
IndexingTime	5.0
Processing time per RoI	11.111

FEX processing times (μs)

LocalPixelSCTEmRoI	277.775
LocalPixelSCTMuRoI	277.775
LocalPixelSCTScanRoI	2222.22
LocalTRTMuRoI	327.775
LocalTRTEmRoI	172.22
LocalCalMuRoI	55.555
LocalCalEmRoI	55.555 for hadrons
LocalCalJetRoI	55.555
LocalCalEMissRoI	55.555
LocalMuonMuRoI	55.555
LocalTRTScanRoI	2777.75

Task switching time : 10 μs

*Em RoIs : 44.444 μs for emcal data,
11.111 μs for hadron cal data
(for 16,667 % of em RoIs)*

Processing times other processes in farm (μs)

RoIFormulateProcessTime	11.11111
DecisionProcessTime	5.555
MergeSpeed	80 MByte/s
Global	55.55
RequestPixSCTScanEarly	
ScanRequestMulticast EMissRequestMulticast	

Computer model

Jos Vermeulen, 2 June 1999, updated on 6 July and 7 September 1999

Status : generic model of full pilot project system implemented and debugged, together with paper model (!)

Comparison with paper model OK, for both low and high luminosity

Diagnostics added : max. queue sizes, min. and max. occupancies, etc. .

Support for ports and switches working with packets added (in the form of simple ATM ports and switches)

Event building added

*Results : both low and high luminosity :
nominal LVL1 rate (~40 kHz) can be handled*

Example diagnostics (low luminosity,nominal LVL1 rate)

Pixels ROBIN proc 43.399408 OS 25.979174 sum 69.378582 (min 38.121654 max 72.016512)
r-out 10.986313 v-out 1.230467
Ports - RoIR i 340692 b 74350 m 11 LVL2-out i 288190 b 0 m 0 EB-out i 52598 b 0 m 0
Buffers - Events total **3200** max **3524** RoIRs t 3.00 m 33 passed 288193 stored 221092
Buffers - Range in event Ids **24614** max **32625**
Buffers - LVL2Fragments total 0.00 max 0 passed 288190 stored 0 EFFragments t 0.00 m 6 p 52598 s 19012
Switch port <- LVL2PortOut i 288190 b 0 m 0 Switch port -> RoIPortIn i 340692 b 14240 m 5
Switch port <- EFPortOut i 52598 b 0 m 0

Model C proc 72.047740 OS 8.193733 sum 80.241473 rcvlink 29.051241
r-in 6.741335 r-out 1.228661 v-in 4.357468 v-out 0.029279
Model C proc min 38.121654 max 90.442690
Time fraction : RoIRInput 0.000000 FEXInput 0.000000 RoIFormulate 0.143752 FEX 71.614463
global 0.289525 out 0.000000 RoIROut 0.000000
of schedules per LVL1A : RoIInput 0.999943 FEXinput 127.955801 RoIFormulate 2.474854 FEX 2.988088
of schedules per LVL1A : global 1.805135 out 23.503197 RoIROut 0.000000
s / s EM_ROI Pix-SCT 0.558755 TRT 0.388411 cal 8.462728
s / s JET_ROI Pix-SCT 0.000000 TRT 0.000000 cal 3.627823
s / s MU_ROI Pix-SCT 5.563737 TRT 7.022176 cal 4.898126 mu 2.185835
s / s EMISS_ROI cal 0.000000
s / s TRTSCAN_ROI TRT 293.974154
s / s PIXELSCTSCAN_ROI Pix-SCT 223.317327
Ports - InPort i 176837 b 41972 m 55 OutPort i 32229 b 0 m 0
Buffers - fragments in total 305 max 0 FEX results t 0 m 9 roirFormulatorInBuffer t 1.24 m 33 passed 2479 stored 543
Buffers - theGlobalOutBuffer total 0.15 max 66 passed 32230 stored 27469
Switch port -> InPort i 176867 b 171824 m 631 Switch port <- OutPort i 32229 b 0 m 0
Steward sum 0.000000 RoIProcessor 6.423712 OS 24.465090 sum 30.888802

Low luminosity, 40148 Hz (nominal) LVL1 rate used in computer model,
1,050,000 events

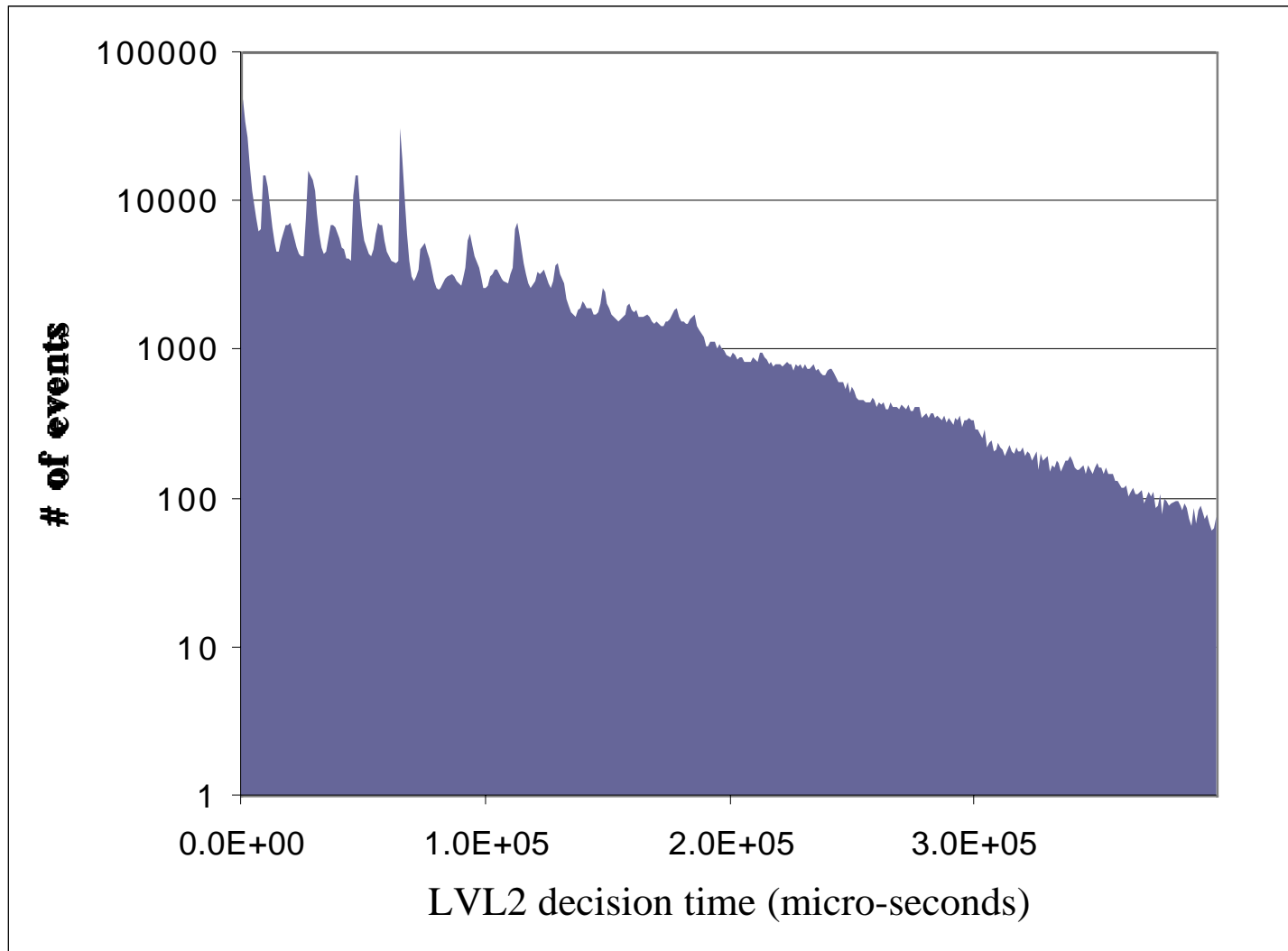
Paper model	mu-MDT	muon-trig	e.m. cal	hadron cal	TRT	SCT	Pixels
RoI request rate per ROBIN (kHz)	0.301	0.630	0.733	1.194	10.332	10.615	11.000
Total average (Mbyte/s)	0.266	0.260	1.343	2.187	6.530	2.993	1.232
Average ROBIN occupancy (%)	36.178	37.202	37.522	38.955	67.385	68.266	69.462

Computer model	mu-MDT	muon-trig	e.m. cal	hadron cal	TRT	SCT	Pixels
RoI request rate per ROBIN (kHz)	0.301	0.631	0.732	1.192	10.329	10.602	10.986
Total average (Mbyte/s)	0.266	0.260	1.341	2.184	6.528	2.990	1.230
Average ROBIN occupancy (%)	36.135	37.161	37.476	38.908	67.335	68.184	69.379

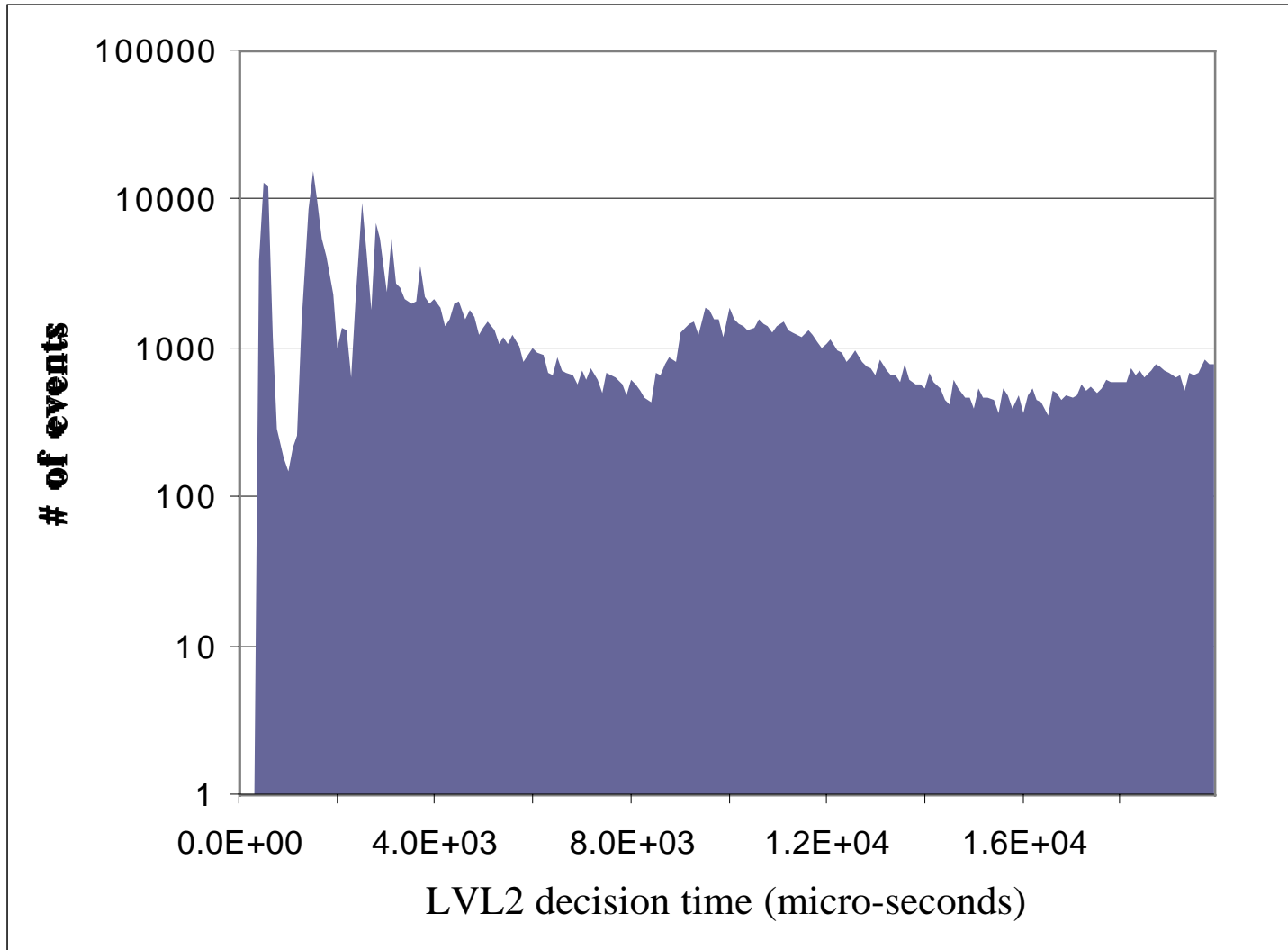
Paper / computer model - 1	mu-MDT	muon-trig	e.m. cal	hadron cal	TRT	SCT	Pixels
RoI request rate per ROBIN	0.0001	-0.0007	0.0016	0.0013	0.0003	0.0012	0.0012
Total average	0.0001	-0.0007	0.0016	0.0013	0.0003	0.0012	0.0012
Average ROBIN occupancy	0.0012	0.0011	0.0012	0.0012	0.0008	0.0012	0.0012

768 farm processors	
Farm processor occupancy: paper model (%)	80.251
Farm processor occupancy: computer model (%)	80.241
Paper / computer model - 1	0.0001

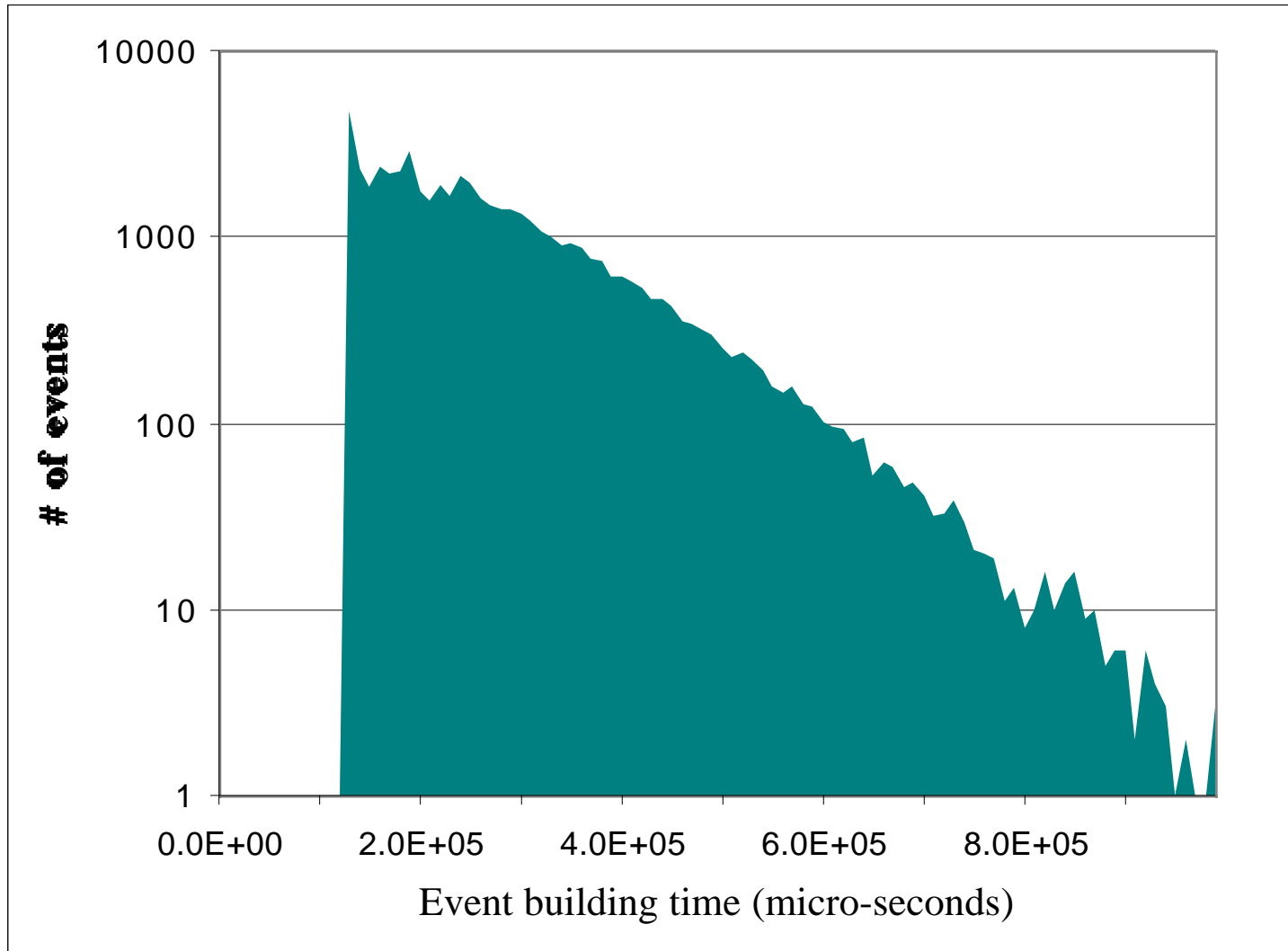
Low luminosity, 40.148 kHz LVL1 rate , 1,050,000 triggers



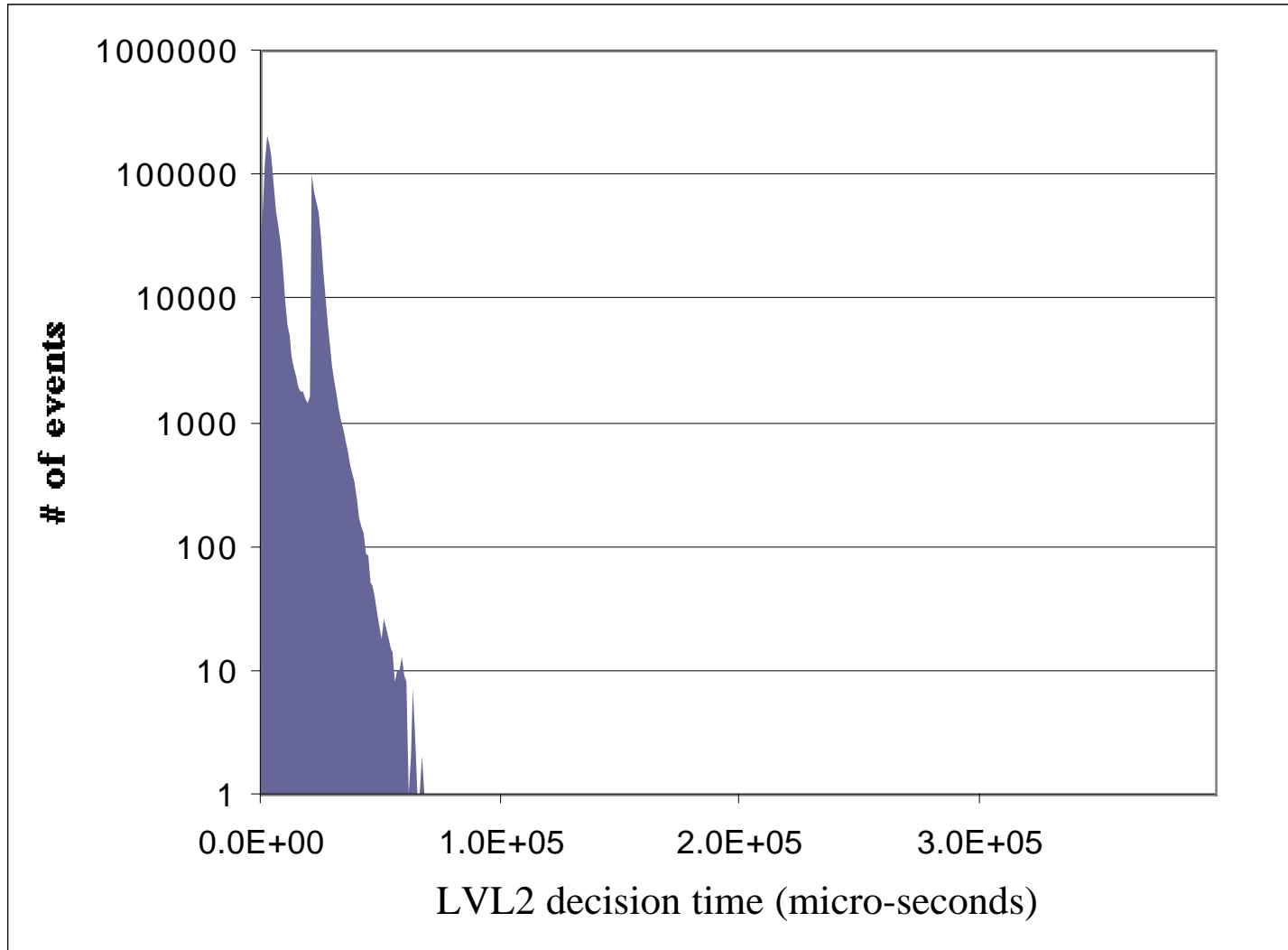
Low luminosity, 40.148 kHz LVL1 rate , 1,050,000 triggers



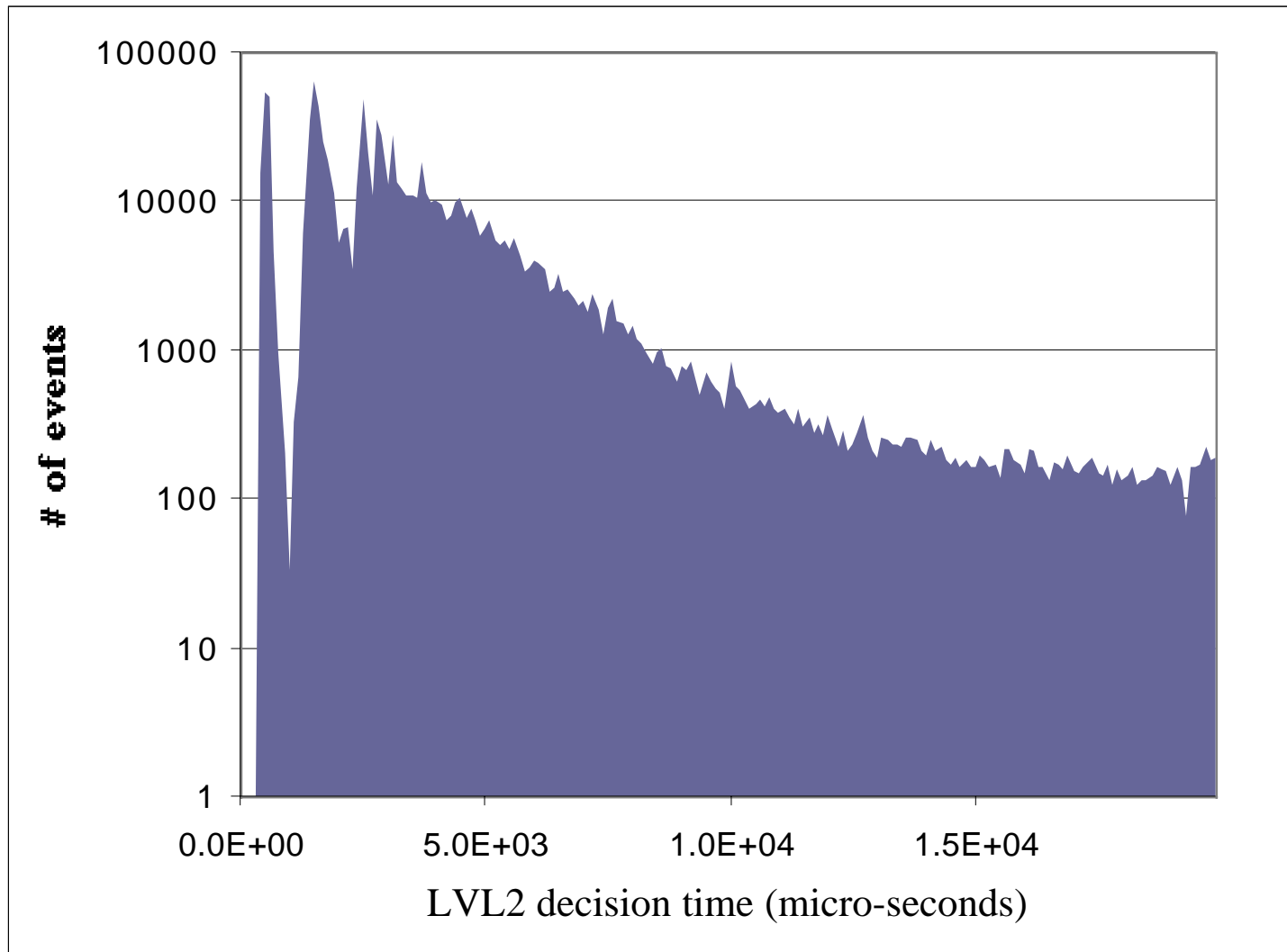
Low luminosity, 40.148 kHz LVL1 rate , 1,050,000 triggers



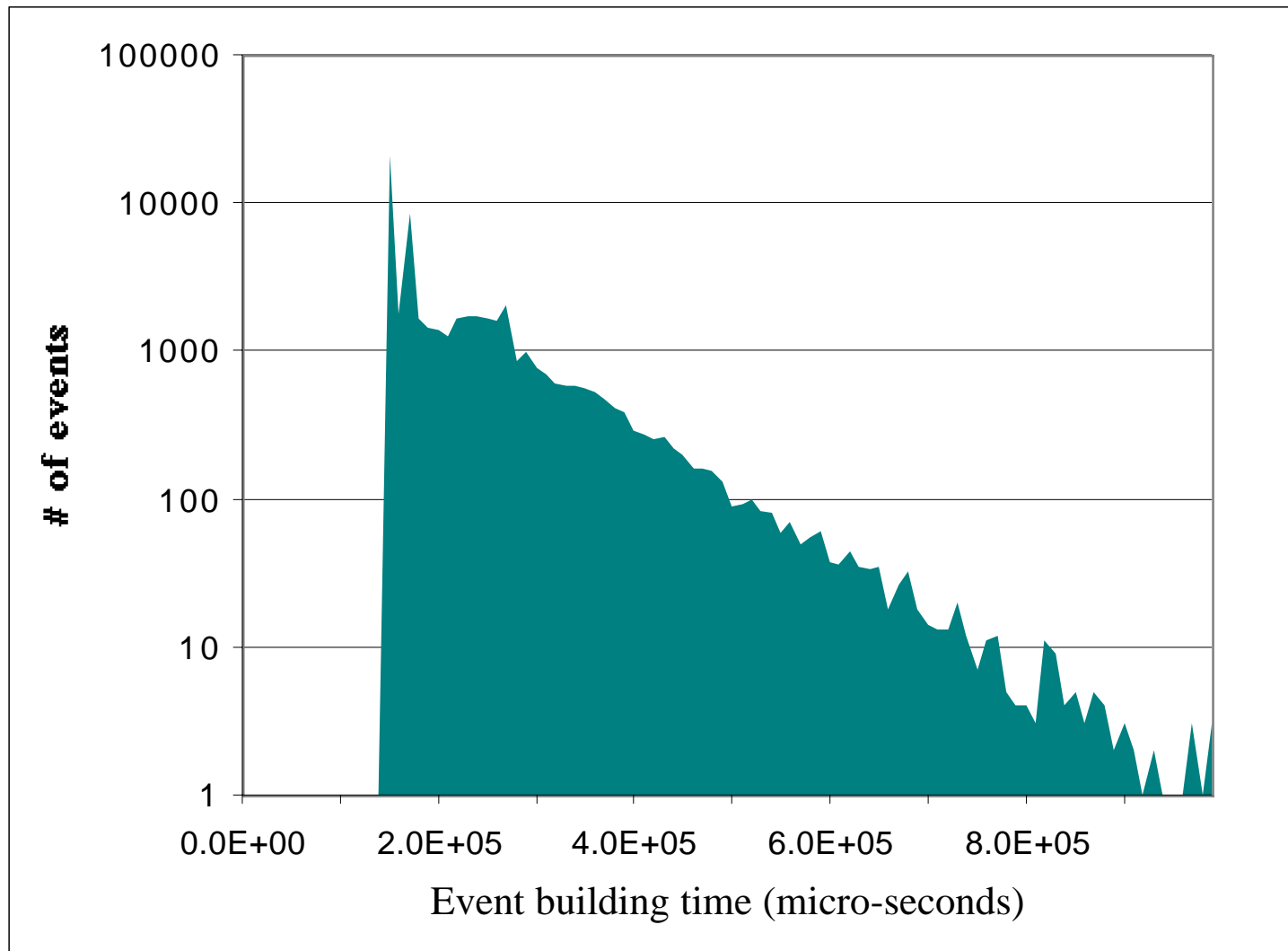
Low luminosity, 40.148 kHz LVL1 rate , 1,175,338 triggers, scan 10 x faster



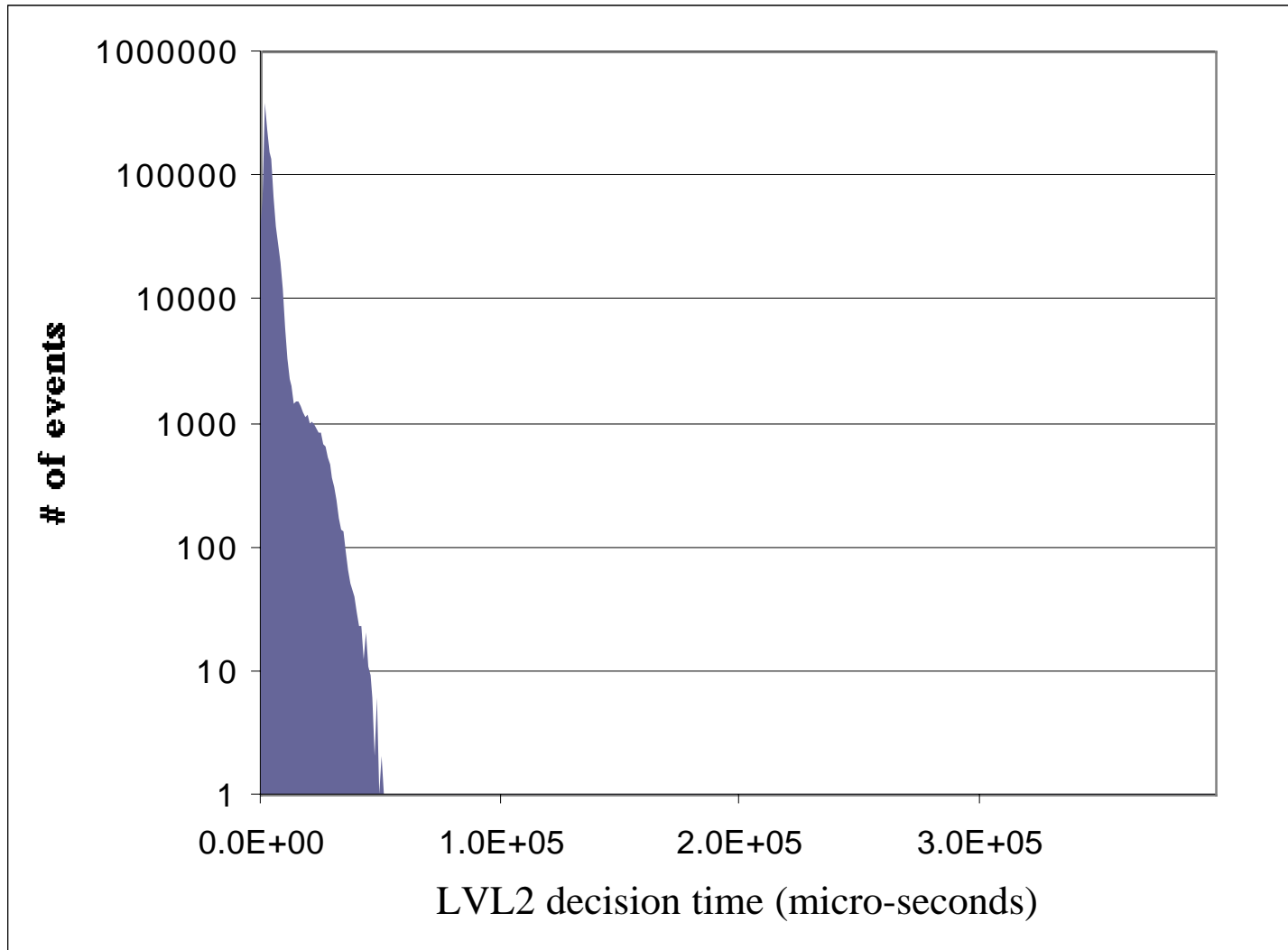
Low luminosity, 40.148 kHz LVL1 rate , 1,175,338 triggers, scan 10 x faster



Low luminosity, 40.148 kHz LVL1 rate , 1,175,338 triggers, scan 10 x faster



High luminosity, 39.394 kHz LVL1 rate, 1,175,186 triggers



High luminosity, 39.394 kHz LVL1 rate, 1,175,186 triggers

