SBS A_{LL} Data Volume & Computing Resources

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SBS A_{LL} Experimental Readiness Review
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Event Size Estimate

SBS A_LL: Event size details

					From Eric's latest "with shielding" simulations 5/13/22				
Detector	Type	# modules	chan/module u/x	chan/module v/y	Occupancy u/x (%)	Occupancy v/y (%)	Samples per chan	Total active chan/event	Data size (kB)
BB GEM 1	UVA uv	1	3840	3840	37%	43%	6	3072	37
BB GEM 2	UVA uv	1	3840	3840	56%	63%	6	4570	55
BB GEM 3	UVA uv	1	3840	3840	45%	53%	6	3763	45
BB GEM 5	UVA uv	1	3840	3840	63%	70%	6	5107	61
BB GEM 5	UVA xy	4	1280	1536	25%	21%	6	2570	31
SBS GEM 1	INFN xy	3	1280	1024	22%	19%	6	1428	17
SBS GEM 2	INFN xy	3	1280	1024	25%	21%	6	1605	19
SBS GEM 3	UVA xy	4	1280	1536	28%	23%	6	2847	34
SBS GEM 4	UVA xy	4	1280	1536	30%	25%	6	3072	37
SBS GEM 5	UVA xy	4	1280	1536	33%	28%	6	3410	41
SBS GEM 6	UVA xy	4	1280	1536	35%	30%	6	3635	44
SBS GEM 7	UVA xy	4	1280	1536	35%	30%	6	3635	44
SBS GEM 8	UVA xy	4	1280	1536	35%	30%	6	3635	44
SBS HCAL		1	288		100%		40	288	23
BB Shower		1	243		100%		25	243	12
GRINCH/other		1	750		100%		1	750	6
							Total event size estimate		550

NB: Not all SBS GEM layers may be needed (under discussion) → event size may be smaller

Computing Resources Estimate

Estimated data taking time (wall time)	hours	196
Accelerator uptime		50%
Event rate	kHz	4.5
Event size	kB	550
Raw events	10^6	1588
Beam-on raw data rate	MB/s	2475
Average raw data rate to tape	MB/s	1238
Raw data to tape	**TB**	**873**
Raw data skimming reduction factor		5
Simulated events per raw event		10%
Simulation time per event per core	ms	500
Time to analyze one event per core	ms	150
Number of passes though data		3
Production data reduction factor		20
Simulation CPU requirement	k-core-hours	22
Production CPU requirement	k-core-hours	198
Total CPU for current experiment	**k-core-hours**	**221**
Simulation percentage		10%
Skimmed raw data to tape	TB	175
Simulated data to tape	TB	87
Production data to tape	TB	131
Total data to tape (raw+sim+production)	**TB**	**1266**

Notes
Core = AMD EPYC 7502 2.5 GHz
Raw data does not include duplicates (backups)

- Trigger rate (4.5 kHz) is limited by DAQ frontend readout speed. Will adjust beam current and/or trigger thresholds to set.
- Considering first-pass event skimming to reduce raw data volume for subsequent analyses.
- Simulation requirements are rough estimates. Simulations will be run as needed and are not expected to be crucial for analysis.
- "Time to analyze one event per core" derived from experience with last fall's SBS-GMn run.

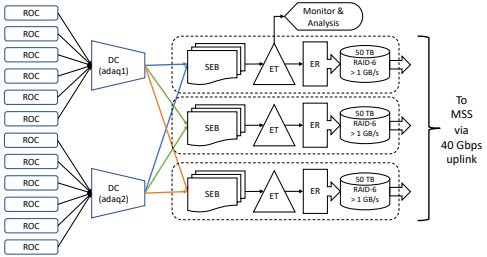
SBS DAQ & Online Computing

- New high-performance event builder hosts, demonstrated $\approx$ **1 GB/s** to disk per node.
- Planning to use CODA3's scalable event stream parallelization to achieve up to $\approx$ **3 GB/s.**

- Online replay on aonlX systems (128 threads). Planning to procure additional nodes this summer for 2–3$\times$ higher throughput
- GMn has developed scripts for launching massive parallel online analysis ($\mathcal{O}(100)$ jobs).
- GMn was typically able to keep up with incoming data.

New CODA Event Builder Machines

Full SBS DAQ Configuration



Summary

- Main challenges: high raw data rate & volume.
  - Hall A DAQ expected to support up to 3 GB/s to disk based on experience with GMn
  - Average rate to MSS/tape expected below 1.5 GB/s.
  - Total tape volume requirement $\approx$ 1.25 PB (without raw data duplicates).
- Farm CPU requirements are modest. Entire data set can be processed in a single day, using only a fraction of the farm ($\approx$ 2800 cores).
  - Bottleneck will be restoring raw data from tape.
- Disk requirements (1st pass): 60 TB `/cache` + 50 TB `/volatile`.
  - Considering first-pass event skimming to reduce input data set size and speed up subsequent analysis passes.