

Current understanding of requirements and scope

Detector ASICs &/or Sensors Requirement	Spec
<p>No specific DAQ requirements because the interface to DAQ is handled through the FEEs. There are implicit requirements that the ASICs/Sensors are capable of streaming, and in particular these components must be capable of firing with:</p> <ul style="list-style-type: none"> <li>• No trigger (or) Trigger on repeating deterministic clock</li> <li>• No deadtime assuming normal operation</li> </ul>	

General DAQ side FEE requirements	Spec
Must provide and support configuration protocol for subcomponents (i2c)	
Must provide unique readable identifier via ID chip or other static mechanism	
Must support timing interface protocol including	BX clock on dedicated fiber @ 100MHz
	Average phase stability <5ps
	Phase repeatability between runs / power cycles <5ps
	Jitter < ?ps
	Accept DAQ defined timing protocol.
	Properly handle flow control commands, (data start/stop/trg)
	Tag data times relative to BX clock. Tagged times may be specified relative to a frame start but must use at least 24 bits. (.16 seconds) The frame duration can be different for different detectors.
	Accept without error formatting, beam information, and other user commands as defined by timing protocol
Must provide zero-suppression sufficient to reduce data volume under normal operating conditions to a pre-defined level by detector	Either <40Gb/sec per fiber or < 6.5Gb/sec per fiber
In conjunction with DAM board processing, must reduce data volume	< 80Gb/sec per DAM board

Fiber protocol between DAM / FEE	Spec
Must transmit clock to FEE with constant phase to BX	
	Average phase stability <5ps
	Phase repeatability between runs / power cycles <5ps
	Jitter < ?ps
	(two versions of specs depending on detector needs, one with dedicated fiber, one without?)
Must transmit configuration information	Support I2c protocol
Subcomponents requiring firmware must be programmable over fiber (to extent possible)	
Configurable parameters must be setable over fiber	
Must be able to reset components and/or cycle power over fiber	
Must transmit routing and beam information to FEE	
	Polarization Information
	Filled / unfilled bunch information
	Revtick to synchronize bunch identification
	Flow control including start, stop, trigger
	User defined commands
Data Link to DAM	
Throughput	Must adhere to pre-selected throughput requirements per fiber (likely either <40Gb/sec or <6.5Gb/sec)
Headers	Must provide DAQ defined packet headers sufficient to specify time of hits, and channel ids
Timing specification	Must tag all hits with time derived from BX clock. With a time window of at least 24 bits.

Timing System	Spec
Must transmit clock to DAM with constant phase to BX	
	Average phase stability <5ps
	Phase repeatability between runs / power cycles <5ps
	Jitter < ?ps
	64 bit BX counter
Must transmit all collider supplied BX information	
	Polarization Information
	Filled / unfilled bunch information
	Revtick to synchronize bunch identification
Must provide DAQ “user” control	
	Flow control including start, stop, trigger
	User defined commands
Must provide a potential trigger input and interface	Trigger Latency < N BX
	Trigger capabilities single bit? Specify scope of potential trigger?

Tracking Detector Specific Requirements	Spec
Tracking (out of date information: Jo?)	8-12 m <sup>2</sup> MAPS ITS-2 & ITS-3 sensors
3 layers silicon for vertex	ITS-3 curved silicon
2 layers silicon for sagitta	ITS-2 staves but ITS-3 improvements
4 layers silicon disks backward	
5 layers silicon disks forward	
3 layers of MPGD	
	(Super out of date information!)
MAPS	5GB/sec total throughput
	40-60B channels
	40-60k MAPS sensors
	400-600 data fibers (500 sensors / stave)?
MPGD	
	100k channels
	<10Gb/sec total zero-suppressed data volume
	Assume 512 channels per FEE (with 8 asics)
	200 FEEs / data fibers
	10Gb/sec -> .05Gb/sec per fiber
	Iraqi estimate -> 1.9Gb/sec per fiber
Use Reconstructed clocks to avoid fiber proliferation	

Calorimeters Specific Requirements	Spec
Forward ECAL (PbWO (+SiGlass))	3000 channels
Backward ECAL	(Not clear if needed)
Barrel ECAL	8000 channels
Imaging Barrel ECAL (If used)	10,000 Pb/SciFi
	50M channels Astropix "2 level data aggregation inside detector, 1 data link per stave Count of Staves?
Barrel HCAL (ECCE version)	3,000 channels
(Athena version)	26,600 channels (off detector electronics)
Forward pECAL (Athena Version)	25,000 channels (off detector electronics)
Forward FHCAL (Ecce Style)	60,000 channels
High granularity HCAL inset	8k channel
Except for the Imaging barrel all SiPM	~110k channels
	Assume 64 channels / FEE -> 1600 fibers
Use Reconstructed Clock to reduce fiber	

Far Forward Specific Requirements	Spec
B0	
3 MAPS layers	300M Pixel (3x20x20cm @ 20x20 um pitch. ~300 sensor)
1 AC-LGAD	150k (500x500um pitch assumed)
2RP and 2OffM	
4 x 500k AC-LGAD layers	8M total channels
ZDC	
Crystal	400 channels APD
32 x 2600 ch silican pad	11520 HGCROC as per ALICE FoCal-E pad layers
4 x 40,000ch silicon pixel	160k
2 boxes scintillator	72

Far Backward Specific Requirements	Spec
Low-Q tagger 1: 2 layers of (40x40cm) (500umx500um pitch)	1.3M
Low-Q Tagger 2: 2 layers of (30cmx20cm) (500umx500um pitch)	480k
(or smaller...)	
2 Calorimeters	700 Channels total

Cherenkov PID Specific Requirements	Spec
dRICH	300k channels
	Max dark current rate 1830 Gb/sec
	40Gb/sec fiber
	Dedicated Timing fiber for timing window application
	~310 fiber (assuming 64 channel FEB + 16 FEB x ROB) and 6.5Gb/sec fiber
	~24 DAM boards
pfRICH (if used) (assume 75% of dRICH)	225k
mRICH	?
DIRC	100k channels



