What is included in the Cost Estimates for the ILC Detectors?

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CFS – Area System Workshop

SLAC – August 2-3, 2010

follow-up from Daresbury, July 2010

long existing info from RDR & LOIs

- I have not seen more recent updates from ILD or SiD (SiD_Umbilicals.xls)
  please tell me if I'm missing something important

- ***RDR estimates*** - I have spreadsheets from GLD, LDC, SiD, but not 4th
  RDR estimates were incomplete, had obvious holes…
  All assumed power and cooling would be available, specs SiD: 350 kW
  All included cost of LHe refrigeration plant and system for SC Magnets
  Nothing assumed for MDI, except SiD included beam pipe systems
  No platforms or motion devices included, except
    SiD had $ 1 M Detector Translation Sys & $ 0.25 M Detector Alignment Sys.
  No Pacmen or other shielding, mumblings about self-shielding
  CFS had *ZERO* Power and *ZERO* Cooling in their RDR estimate for IR

- ***LOI estimates*** – I do ***not*** have similar spreadsheets for ILD or SiD
  visually seeing these details shows whether something is missing
    between the intersections of CFS/MDI/Detectors
  both concentrate on parametric model of cost vs. size, weight, etc.

from Letters of Intent (LOIs)

- ***ILD –***

  LOI text mentions requirements of beam pipe, and "detector services": power, transformers, LHe compressor and storage plant on surface, but doesn't indicate where these are costed.

  Includes a CMS-like surface assembly and lowering of largest 3,500 t piece via temporary portal crane

  Estimate for push-pull platform is included under "integration", but all integration totals 1.7 M ILCU

- ***SiD –*** estimates in 2008 US $

  push-pull motion on rails grouted & locked to floor

  push-pull interchange time ~ 1 day!

  Is "self-shielding" but needs Pacmen

SiD assumes the following are provided, i.e. not in SiD estimate:

- IR Hall with finished surfaces, lighting, & HVAC
- Surface buildings, gantry cranes, hall cranes
- 480 VAC power, LCW, compressed air, internet
- External He compressor system, other LHe = SiD
- Data storage system and offline computing,
- QD0s and their cryogenic systems

SiD estimate includes costs for:

- LHe refrigeration sys – other than compressors
- Detector motion rails for push-pull and opening in both beam and garage are installed by SiD
- Beampipe

IRENG07 – September 20, 2007

IRENG07 Draft Utilities Requirements
20-Sep-07

Item	Description	Generic	GLD	GLDc	LDC	SiD	4th Type		
1	Hall SA End Temperature (Deg C)	21	21	21	21	21	21	69.8	F
2	Hall Stratified Temperature Rise (Deg C)	3	3	3	3	3	3	5.4	F
3	Hall Air Temperature Stability (+/- Deg C)	2	2	2	2	2	2	3.6	F
4	Hall Dew Point Temperature (Deg C)	13	13	13	13	13	13	55.4	F
5	Hall Maximum Relative Humidity (%)	60	60	60	60	60	60	60	%
6	Process Load to Hall Air per Detector (kW)	40	40	40	40	40	40	11.4	Ton
7	Process Detector Load to CHW per Detector (kW)	200	200	200	200	200	200	56.9	Ton
8	Process Load to Other CHW per Detector (kW)	100	100	100	100	100	100	28.4	Ton
9	Process Load to LCW per Detector (kW)	200	200	200	200	200	200	56.9	Ton
10	Hall Space Load to Air (W/Sq M - Dry Xfmrs, tools, pumps, lights, etc.) ???	40	40	40	40	40	40	3.72	w/sf
11	Ventilation (Numer of Persons in Hall - Add separate fan coil people heat load)	100	100	100	100	100	100	100	ea
12	Ventilation (Cu M/Hr)	4300	4300	4300	4300	4300	4300	2531	cfm
13	Hall Pressurization (Negative milliBars)	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.08	in WC
14	Hall Pressurization Stabilization (+/- milliBar - Bubblers or Chambers)	0.05	0.05	0.05	0.05	0.05	0.05	0.02	in WC
15	Shaft/Egress Pressurization (Positive milliBar)	0.2	0.2	0.2	0.2	0.2	0.2	0.08	in WC
16	Process CHW Supply Temperature (Deg C)	16	16	16	16	16	16	60.8	F
17	LCW Supply Temperature (Deg C)	16	16	16	16	16	16	60.8	F
18	LCW Make Up Source (Accelerator? Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
19	Hall ODH Purge (Y/N - Cu M/ Hr if Y)	No	No	No	No	No	No		
20	Hall Activated Air Purge (Y/N - Cu M /Hr if Y)	No	No	No	No	No	No		
21	Permanent Hall Smoke Purge (Y/N - If No use ventilation AHU at high-speed)	No	No	No	No	No	No		
22	Thermal Dimensional Stability Provided from Skids (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
23	Sub-Atmospheric Utility Water Systems Needed (Y/N)	No	No	No	No	No	No		
24	CHW Cooling for Magnets & Power Supplies (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
25	Non-Dessicant Dehumidification for Hall (Y/N - If Yes Hall surfaces are sealed)	Yes	Yes	Yes	Yes	Yes	Yes		
26	Ventilation Provided by Ground Level AHU's (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
27	Hall Air Load & Dehumidification Provided by Hall Fan-Coils (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
28	All Cooling to Hall Provided by Insulated CHW to HXs (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
29	Surface to Hall CHW Pressure Interruption Provided by HXs (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
30	Utility / Detector Interface at Hall Spiggots (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		
31	Compressed Air Supply Volume per Detector (Standard Cu M /Min)	200	200	200	200	200	200	7063	cfm
32	Compressed Air Supply Pressure (MegaPascals)	1	1	1	1	1	1	145	psi
33	Compressed Air Supply Oil-Free Plant at Ground Level (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes		

** Indicates further reflection warranted*

SiD_Umbilicals.xls (from 2007)

Sent by Phil Burrows after Daresbury Workshop

I had some follow-up e-mails with Marty Breidenbach

SID Umbilicals received July2010

Analysis of actual connections to the detector; does not include hall HVAC, lighting, cranes, etc.

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	Nominal Power (KW)	DT©	Chilled Water (lpm)	LCW (lpm)	He 4K (g/s)	LN (l/hr)	480 3ph utility (kw)	480 3 ph Uninteruptable (kW)	Optical Fibers (72 fiber cables)	Instrument Air 125 PSI, SCFM
Model A										
Liquid He 4K is supplied to Sid by Flex line. Power supply and services for solenoid and QD0's are carried with detector.										
Solenoid Power	200	10		76			250			
Solenoid Cryogenic System (include cold to warm leads, valves)	1				9			1		10
Solenoid Protection System (Dump Breaker, Current transductor)	2							2		
Solenoid Dump Resistor (Pressurized Water Bath)				175						
Solenoid Leads (power supply to current leads)	15	10		23						
Solenoid Vacuum System	6						5	1		
Solenoid & He liquifier Control & Monitoring System (on detector)	10						5	5		
QD0										
VXD	5	1	76				5			100
Trkr	1	1	15				1		2	100
EMCal	5	2	38				5			
Hcal	1	2	8				1			
Muon	0.1	2	1				0.1			
							0			
DAQ	50	10	76				50		2	
HV etc	20	10	30				15	5		
							0			
Lighting	5						5			
							0			
Transport	100	20		76			100			
Totals			244	350			442.1	14		210
SID facilities off Detector										
He Compressors	1280				150		1280			
He Liquifier (1000 w @ 4K refrigeration)	1		12		11	410	1			50
LHe Storage Dewar	1						1			
LHe Vacuum System	2						2			
He Liquifier Adsorber Regeneration	25						25			3
He Liquifier & Solenoid Control & Monitoring	15						5	10		

questions or comments?

- Each detector assumes QD0s are attached to detectors and move with them. This means we need 4 QD0s (we do have these 4 in the RDR estimate).

  Maybe 6 QD0s and shield walls if run beam w/o experiments

- How is LHe cooling provided to QF1s, Crab Cavities, and Traveling Focus?

- Nick Walker reported that Karsten Buesser (ILD) acknowledges need to present requirements and specifications to CFS, but did not state timescale

- Need to provide & verify requirements & specifications and also agree on ***whose responsibilities*** to provide, so CFS can provide designs & cost impacts

discussion – page 1

- Marty B. requests also standby power (within 10 minutes) such as diesel generator on surface
- SiD request includes 14 KW uninterruptible PS for > 10 minutes
- Is there standby power everywhere? For whole complex where needed, not just IR hall?
- How can we do beam commissioning with detectors out? Shielding ~ 2 – 2.5 meters

  what beam components and instrumentation are needed for commissions?
- Are PACMEN specified and who provides?

discussion – page 2

- Marty says beam commissioning could be possible with detector installed but require B-field to be on and vertex detector removed
- Rail = narrow steel plate for Hillman rollers
- Either both detectors have platforms or neither
  Could be two platforms with different heights
  SiD would need platform 1.6 m thicker than ILD
  ILD fears that will not be sufficiently internally rigid without a common platform
- What is tolerance on motion of QF1 and QD0?

discussion – page 3

- What information does ILD need for CFS design and ground properties to do vibration studies? Are there any differences in vibrations between QF1 (supported independent of detectors) and QD0 + detectors? Does this impact siting criteria? Even if you understand ground motion (e.g. Shiltsev DB) what about transfer up to components.
- Posted Shiltsev vibration document on Indico – need to name it for easy reference
- Marty – needs tie-downs points (rock-bolts?) to prevent motion of detector during earthquakes would also help to pre-tension the floor

discussion – page 4

- What are the questions for October in Geneva? electrical power, cooling, moving detector, vibration, etc. Need someone to take lead on each question, either from CFS or from detector groups

RDR Est. for GDE Cryogenics near IR

- From Tom Peterson – August 2, 2010, see:
  BDScryo-8Dec06.doc BDS-cryo-11Oct07.ppt
- Included complete LHe system for:
  - Crab cavities (2 on each side of IR)
  - QF1 quadrupole packages (1 on each side of IR)
  - QD0 quad packages (movable, 1 on each side of IR)
  - Tail-folding octupoles (cryocooler, 1 on ea side of IR)
- Did ***not*** include:
  - Traveling focus quads (TDR – post-RDR addition)
  - Second (or 3rd) pair of QD0 quad packs for 2 detectors
  - Refrigerator for SC Solenoids, ***NO compressors/storage***
- Will have to decide ***responsibilities*** & incl. in est.