CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010) – UPDATED JUL 16 2010

LIST OF QUESTIONS (CFS mechanical / electrical)

MAIN FOCUS

1. What are the heat loads to be used per area system? *(page 3 to 9)*
2. What are the electrical power loads per area system? *(page 2, 4 to 9)*
3. Where are these loads? Approximate locations? *(page 4 to 9)*
4. How are they distributed? Assumed uniformly distributed? *(page 4 to 9)*
5. What are the SB2009 features we need to use?
   a) DR circumference 3.2Km or 6,4 Km
   b) DR low power or full power
   c) Service tunnel only in central region and none in other area
   d) Undulator in end of ML?
6. What portion of the BDS is the stringent temperature stability applicable? All of it? *(page 11 to 12)*
7. Does the loads in central region varies a lot? (critical to the BDS tight temperature stability)? *(page 11 to 12)*
8. Are the BDS components at constant load? *(page 11 to 12)*
9. When can we freeze the information/criteria?
10. Does the RF distribution in the ML (KCS) need to be changed? *(page 15)*
11. In KCS, what portion of the racks (power/heat) remain in the tunnel?
12. What are the demarcation points of responsibility for the electrical and process water?
13. What voltage regulation is required for proper operation?
14. Will the individual components contribute to poor overall power quality?
15. What is the criteria for ventilation? ODH purge, Activated Air purge? Smoke purge? *(page 10)*

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

TOTAL ELEC POWER LOAD

RDR							
Area System	RF Power	Conventional Power				Emerg Power	Total
		Conv	NC Magnets	Water Systems	Cryo		
e-sources	1.05	1.19	0.73	1.27	0.46	0.06	4.76
e+sources	4.11	7.32	8.9	1.27	0.46	0.21	22.27
DR	14	1.71	7.92	0.67	1.76	0.23	26.29
RTML	7.14	3.78	4.74	1.34	0	0.15	17.15
Main Linac	75.72	13.54	0.78	9.86	33.9	0.404	134.21
BDS	0	1.11	2.57	3.51	0.33	0.2	7.72
Dumps	0	3.83	0	0	0	0.12	3.95
IR	0	0	0	0	0	0	0
TOTALS	102.0	32.5	25.6	17.9	36.9	1.4	**216.3**

SB2009 (KlyCluster) Full Power -DRAFT FEB 2 2010							
Area System	RF Power	Conventional Power				Emerg Power	Total
		Conv	NC Magnets	Water Systems	Cryo		
e-sources	1.05	1.19	0.73	1.27	0.46	0.06	4.76
e+sources	3.08	5.49	6.68	0.95	0.46	0.16	16.82
DR	6.05	0.74	3.42	0.29	1.76	0.10	12.36
RTML	6.12	3.24	4.06	1.15	0	0.13	14.70
Main Linac	75.72	8.12	0.78	8.87	33	0.4	126.90
BDS	0	1.01	2.34	3.20	0.33	0.18	7.07
Dumps	0	3.83	0	0	0	0.12	3.95
IR	0	0	0	0	0	0	0
TOTALS	92.0	23.6	18.0	15.7	36.0	1.1	**187**

SB2009 (DRFS) Full Power -DRAFT FEB 2 2010							
Area System	RF Power	Conventional Power				Emerg Power	Total
		Conv	NC Magnets	Water Systems	Cryo		
e-sources	1.05	1.19	0.73	1.27	0.46	0.06	4.76
e+sources	3.08	5.49	6.68	0.95	0.46	0.16	16.82
DR	6.05	0.74	3.42	0.29	1.76	0.10	12.36
RTML	6.12	3.24	4.06	1.15	0	0.13	14.70
Main Linac	75.72	13.54	0.78	9.86	33.9	0.404	134.21
BDS	0	1.01	2.34	3.20	0.33	0.18	7.07
Dumps	0	3.83	0	0	0	0.12	3.95
IR							
TOTALS	92.0	29.0	18.0	16.7	36.9	1.2	**194**

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

TOTAL THERMAL LOAD

RDR 2006			
	LCW	Air/Chw	**Total**
e-sources	2.88	1.42	**4.3**
e+sources	17.48	5.33	**22.8**
DR	17.68	1.85	**19.5**
RTML	9.25	1.34	**10.6**
Main Linac	56	21.1	**77.1**
BDS	10.29	0.98	**11.3**
Dumps (wtr)	36	0	**36**
IR	0	0	**0**
	TOTAL		**182**

SB2009 (w KlyCluster)full power - DRAFT FEB 2 2010		
LCW	Air/Chw	**Total**
2.88	1.42	**4.3**
13.11	4.00	**17.1**
6.84	1.61	**8.4**
6.97	2.10	**9.1**
* 62.72	5.6	**68.3** *
9.65	0.62	**10.3**
36	0	**36**
0	0	**0**
TOTAL		**154**

SB2009 (DRFS)full power - DRAFT FEB 2 2010		
LCW	Air/Chw	**Total**
2.88	1.42	**4.3**
13.11	4.00	**17.1**
6.84	1.61	**8.4**
6.97	2.10	**9.1**
56	21.1	**77.1**
9.65	0.62	**10.3**
36	0	**36**
0	0	**0**
TOTAL		**162**

Jul 12, 2010 Discussion:
e + numbers will change based on updated table

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

DR (Damping Ring)

DR Heat and Power Load (Totals DR shown)

draft Jun 30 2010

CFS

for total (2) DR

					Load to water-LCW				Load to Air	Beam tunnel Temperature (F)	
	Total KW	rough location	Qty	Distribution Assumption	KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load		Notes
DR components											
Magnets	1628	tunnel			1556	95	20	1084	72		(07/22/09) reduce to 70% from RDR, Susana email 7/15/09, due to decrease in circumf to 3.2 KM
Cables	240	tunnel			240	95	N/A	N/A	0		
Power supplies	204	4 alcoves		equally distributed in 4 alcoves	0	95	N/A	N/A	204		
RF	2800	in 2 alcoves cavern		RF (base value)	2240	95	45	542	560		Located in 2 shaft cavern: Info from 07/14/09 meeting w Marc reduction 50% from RDR due to "low power option";
	70	beam tunnel		RF (peak overhead)	0	95	45	542	70	104	
Radiation (from RF)	3500	(mostly wigglers)		12% total radiation load in two arc; 88% of radiation load in two wiggler area; 1km straight section has stabke load	2800	95	N/A	N/A	700		
Racks	0	beam			0	95	N/A	N/A	0		
Dumps	0	beam			0	N/A	N/A	N/A	0		
	8442				**6836**				[illegible]		

Misc components											
AC Power Transformers											
Emergency Transformer											
Fancoils		beam									
Dehumidifer											
Water Pumps											
Lighting											
	0								[illegible]		

<u>Jul 12, 2010 Discussion:</u>
Mark and Susanna will update table to reflect
- 3.2Km Full Power
- 3.2 km 10Hz full power
- 6.4 Km 10 Hz full power

104F space is too High! (desire 25C?/77F?)

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

BDS

BDS Heat and Power Load

draft Jun 30 2010

CFS

	Total KW	rough location	Qty	Distribution Assumption	Load to water-LCW				Load to Air	Space Temperature (F)		Notes
					KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load	Beam Tunnel	Service Tunnel	
BDS components (excluding Major DUMPS)												
Magnets	2746	e-e+ common - beam tunnel		equally distributed	2746	95	20	937	0	104	104	Total KW From Paul Bellomo List May 9 2007
	5604	e-e+ 14 mr - beam tunnel		equally distributed	5604	95	20	1913	0			Total KW From Paul Bellomo List May 9 2007
Cables	186	e-e+ common - beam tunnel		equally distributed (assume 50% to beam tunnel and 50% to svc tunnel)	0	95	N/A	N/A	186			Total KW From Paul Bellomo List May 9 2007
	398	e-e+ 14 mr - beam tunnel		equally distributed (assume 50% to beam tunnel and 50% to svc tunnel)	0	95	N/A	N/A	398			Total KW From Paul Bellomo List May 9 2007
Power supplies	440	e-e+ common - service tunnel	27	equally distributed	168	95	12	96	272			Quantity from Paul Bellomo List May 9 2007
	900	e-e+ 14 mr - service tunnel	179	equally distributed?	552	95	12	314	348			Quantity from Paul Bellomo List May 9 2007
RF	0	beam	0	N/A	0	N/A	N/A	N/A	0			
Racks	0	beam	0	N/A	0	N/A	N/A	N/A	0			
Dumps	0	beam	0	N/A	0	N/A	N/A	N/A	0			There are (4) 18MW major dumps served by dedicated water plant
	10274											

Misc components (LATER)												
AC Power Transformers										104	104	
Emergency Transformer												
Fancoils		beam										
Dehumidifer												
Water Pumps												
Lighting												
	0				**0**							

<u>Jul 12, 2010 Discussion:</u>
Numbers are ok
Andrei and Deepa wiill define part of BDS that has less tight stability requirement
104F space is too high! (desire 25C?/77F?)

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

RTML

RTML Heat and Power Load (Totals RTML shown)

draft Jun 30 2010

CFS

for total (2) RTML

					Load to water-LCW				Load to Air	Beam tunnel Temperature	
	Total KW	rough location	Qty	Distribution Assumption	KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load		Notes
RTML components											
Magnets	3176	beam	4334	equally distributed in RTML area? & negligible in ML from DR area	3176	95	20	1084	0		Qty and KW from P.Bellomo 5/9/2007
Cables	942	beam		equally distributed?	0	95	N/A	N/A	942		KW from P.Bellomo 5/9/2007
Power supplies	618	??	3832	equally distributed?	8	95	N/A	N/A	610		P.Bellomo 5/9/2007
RF	3570	beam			3570	95	45	542	0	104F (40C)	Jul 14 2009 Nikolai & Marc (50% from RDR)
Racks	550	beam			0	95	N/A	N/A	550		Old Table Oct 2006
Dumps	220	beam		one location (in rtml)	220	95	56	27	0		{RDR showed 250 KW each AL ball dump with 30 gpm] Jul 14 2009 Nikolai & Marc (50% from RDR)
	0	beam		one location (near DT-LTR)	0	95	56	0	0		from dump list 2009 - not used?
	9076				**6974**				**2102**		

Misc components											
AC Power Transformers		??									
Emergency Transformer		cavern									
Fancoils		beam								104F (40C)	
Dehumidifer		beam									
Water Pumps		cavern									
Lighting		beam									
	0				**0**				**0**		

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

e+ SOURCE

e plus Heat and Power Load

draft Jun 30 2010 — *CFS*

					Load to water-LCW				Load to Air	Beam tunnel Temperature	
	Total KW	rough location	Qty	Distribution Assumption	KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load		Notes
e plus components											
Magnets	6933	beam	2170	equally distributed?	6933	95	20	2367	0		from Paul Bellomo 5/9/07 list
Cables	855.5	beam		equally distributed?	0	95	20	0	856		from Paul Bellomo 5/9/07 list
	855.5	svc tunl		equally distributed?	0	95	20	0	856		from Paul Bellomo 5/9/07 list
Power supplies	1161	??	3832	equally distributed?	872	95	20	298	289	104F (40C)	from Paul Bellomo 5/9/07 list
RF	0	beam			0	95	45	0	0		
Racks	0	beam			0	95	20	0	0		
Dumps	0	beam			0	95	56	0	0		
	0	beam			0	95	56	0	0		
Target Stations	0	beam	2		0	95	20	0	0		

Misc components											
AC Power Transformers		??									
Emergency Transformer		cavern									
Fancoils		beam									
Dehumidifer		beam									
Water Pumps		cavern									
Lighting		beam									
	0								**0**		

<u>Jul 12, 2010 Discussion:</u>
Norbert will update table, will total up components for cfs
All dumps watercooled

e- SOURCE

e- Source Heat and Power Load

draft Jun 30 2010

CFS

	Total KW-	rough location	Qty	Distribution Assumption	Load to water-LCW				Load to Air	Space		
					KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load	Beam Tunnel	Service Tunnel	Notes
e-source components												
Magnets	418	beam tunnel	163	equally distributed	418	95	20	143	0			Number from P.Bellomo 2007 List
Cables	110	beam tunnel		equally distributed	0	N/A	N/A	N/A	110			Number from P.Bellomo 2007 List
	110	service tunnel		equally distributed	0	N/A	N/A	N/A	110			Number from P.Bellomo 2007 List
Power Supplies	95	Cavern	142	(e- 5 GeV Dump)-one location	55	95	20	19	40			Number from P.Bellomo 2007 List
RF	306	service tunnel		(e- 12 MeV bunching)- one RF+1	260.1	95	45	39	46			From Clay 2006 - (1)+1 153KW RF
	612	service tunnel		(e-70 MeV Pre-Accel) - 2+2 RF	520.2	95	45	79	92			From Clay 2006- (2)+2 153KW RF
	1224	service tunnel		(e- 5.5 GeV Booster) = 7 +1RF;equally distributed in 245m of the SC beamlines	1040.4	95	45	158	184			From Clay 2006- (7)+1 153 KW RF
	306	service tunnel		(e- to DR Xfer line bends)-1+1RF	260.1	95	45	39	46			From Clay 2006- (1)+1 153 KW RF
Racks	128	Cavern		(e- Gun and Drive Laser)-one location	0	N/A	N/A	N/A	128	104F (40C)	85F (29 C)	From Clay 2006 - (16)-8KW racks
	80	service tunnel		(e- 12 MeV bunching)-equally distributed	0	N/A	N/A	N/A	80			From Clay 2006 - (10)-8KW racks
	128	service tunnel		(e-70 MeV Pre-Accel)	0	N/A	N/A	N/A	128			From Clay 2006 -(16) 8 KW racks
	8	beam tunnel		(e- Chicane)-equally distributed in 54m of the chicane	0	N/A	N/A	N/A	8			From Clay 2006-(1) 8KW rack
	448	service tunnel		(e- 5.5 GeV Booster)- equally distributed in 245m of the SC beamlines	0	N/A	N/A	N/A	448			From Clay 2006 -(56) 8KW racks
	8	Cavern		(e- 5 GeV Dump)- one location	0	N/A	N/A	N/A	8			From Clay 2006 -(1) 8 KW rack
	88	service tunnel		(e- 5 GeV Dump)- one location	0	N/A	N/A	N/A	88			From Clay 2006 -(11) 8 KW rack
Dumps (NC tune up dump) e-1	11	beam tunnel		(NC tune up dump) e-1 , one location	0	N/A	N/A	N/A	11			From 2009 SB2009 layout
	4079				**2554**				**1525**			

AC Power Transformers												
Emergency Transformer												
Fancoils (DX)		service tunnel										
Blowers												
Dehumidifer												
Water Pumps												
Lighting												
	0				**0**				**0**			

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

IR (Interaction Region / Detector)

IR Heat and Power Load

draft Jun 30 2010

CFS

				Load to water-LCW				Load to Air	Load to Chilled Water	Beam tunnel Temperature	
	Total KW	rough location	Qty	KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load	KW heat load		Notes
e plus components											
Detector	440			200	61			40	200		from IRENG Sep 2007
Other	100			0				0	100		
Cables	0									70F (21C)	
Power supplies	0	??									
RF	0										
Racks	0										
	540										

	Total KW	rough location	Qty	KW heat load	LCW supply temperature (F)	Delta T (F)	or Flow (gpm)	KW heat load	KW heat load		Notes
Misc components											
AC Power Transformers		??									
Emergency Transformer		cavern									
Fancoils		beam									
Dehumidifer		beam									
Water Pumps		cavern									
Lighting		beam									
	0			**0**				**0**			

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

OTHER CRITERIA

6/30/2010, Updated JUL 16 2010

	Description	RTML	ML DRFS	ML KCS	e- source (central region)	e+ source (central region)	BDS (central region)	DR	Major Dump
						CFS Wkshp Jul 12&13 2010	CFS Wkshp Jul 12&13 2010	CFS Wkshp Jul 12&13 2010	*RDR*
1	Max Space/Air Temperature in Beam Tunnel (Deg C) (Deg F)	40 / 104	40 / 104	40 / 104	29.5 / 85	29.5 / 85	29.5 / 85	29.5 / 85	no reqmnt
2	Max Space/Air Temperature in ServiceTunnel (Deg C) (Deg F)	no svc tunel	no svc tunel	no svc tunel	(29.5) 85			no svc tunel	no reqmnt
3	Max Space/Air Temperature in Cavern/Alcove (Deg C) (Deg F)	no reqmnt	no reqmnt	no reqmnt	no reqmnt			no reqmnt	no reqmnt
4	Air Temperature Stability in Beam Tunnel (+/- Deg C) (+/- Deg F)	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	0.5 / 0.9	0.1 / 0.18	no reqmnt
5	Dew Point Temperature (Deg C)	no reqmnt	no reqmnt	no reqmnt	no reqmnt			no reqmnt	no reqmnt
6	Maximum Relative Humidity (%)	60	60	60	60	60	60	60	no reqmnt
7	Minimum Relative Humidity (%)	none	none	none	none	none	none	none	none
8	Process Heat Load to Air (kW) (Ton)	See individual Heat/Power load tables							(4) 18MW dumps; water plant sized for 36 MW
9	Process Load to CHW (kW) (Ton)								
10	Process Load to LCW (kW) (Ton)								
11	Ventilation (Numer of Persons in space)	none	none	none	none	none	none	none	none
12	Ventilation (Cu M/Hr) (cfm)								no reqmnt
13	Space Pressurization (Negative milliBars) (inch W.C)	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	TBD	no reqmnt	no reqmnt
14	Space Pressurization Stabilization (+/- milliBar)	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	TBD	no reqmnt	no reqmnt
15	Shaft/Egress Pressurization (Positive milliBar)	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt
16	LCW Supply Temperature (Deg C) (Deg F)	35 / 95	35 / 95	35 / 95	16 / 61	16 / 61	16 / 61	16 / 61	35 / 95
17	LCW Supply Temperature Stability (+/- Deg C) (+/- Deg F)	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	0.5 / 0.9	no reqmnt	no reqmnt
18	LCW delta T (Deg C delta) (Deg F delta)	11 / 19.8	?? for RF ?? overall	25C (45F) for RF 18C (33F) overall	17 / 31	17 / 31	17 / 31	17 / 31	30 / 54
19	LCW Pressure ripple in the frequency band (1-1000Hz)	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	TBD	no reqmnt	no reqmnt
20	LCW Pipe vibration impact	no reqmnt	no reqmnt	no reqmnt	no reqmnt	no reqmnt	TBD	no reqmnt	no reqmnt
21	ODH Purge (Y/N - Cu M/ Hr if Y)								No
22	Activated Air Purge (Y/N - Cu M /Hr if Y)				no reqmnt				No
23	CHW Cooling for Magnets & Power Supplies (Y/N)	No	No	No	YES	YES	YES	YES	No
24	Dessicant Dehumidification	No	No	No	No	No	No	No	No
25	Any power quality reqmnt (clean / dirty power?)						N/A		
26	Can you maintain min power factor?						N/A		
27	Voltage Regulation						N/A		
28	Utiltity (water system) interface								
29	Utiltity (electrical) interface								

Jul 12, 2010 Discussion:
104F space temperature was too high

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

IR from IRENG07

IRENG07 Draft Utilities Requirements

20-Sep-07

Item	Description	Generic	ILD			SiD	4th Type		
			GLD	GLDc	LDC				
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		

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

SiD

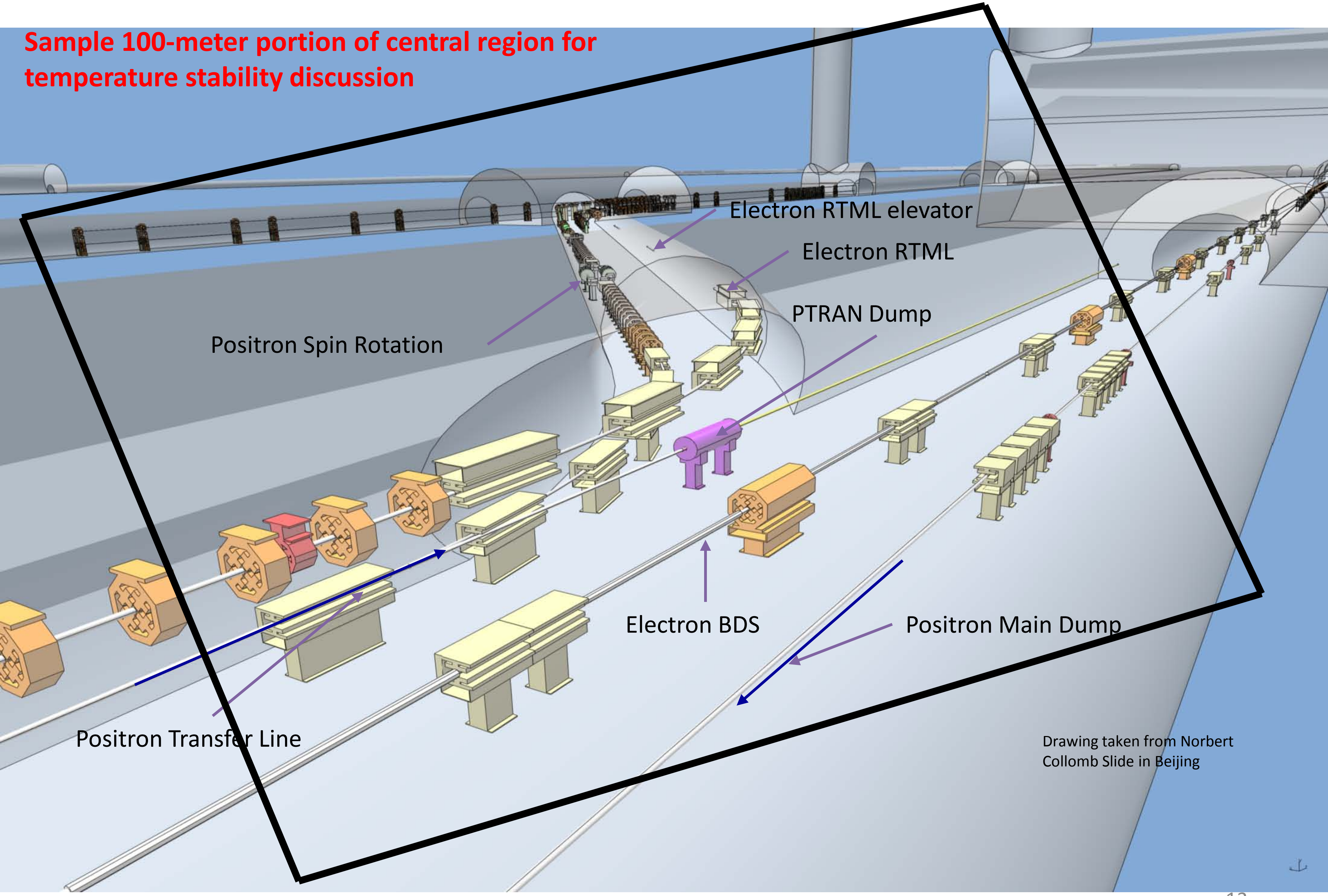
SiD Umbilicals JUL 13 2010

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

	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
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			
DAQ	50	10	76				50		2	
HV etc	20	10	30				15	5		
Lighting	5						5			
Transport	100	20		76			100			
Totals	**421**		**244**	**350**			**442**	**14**		**210**

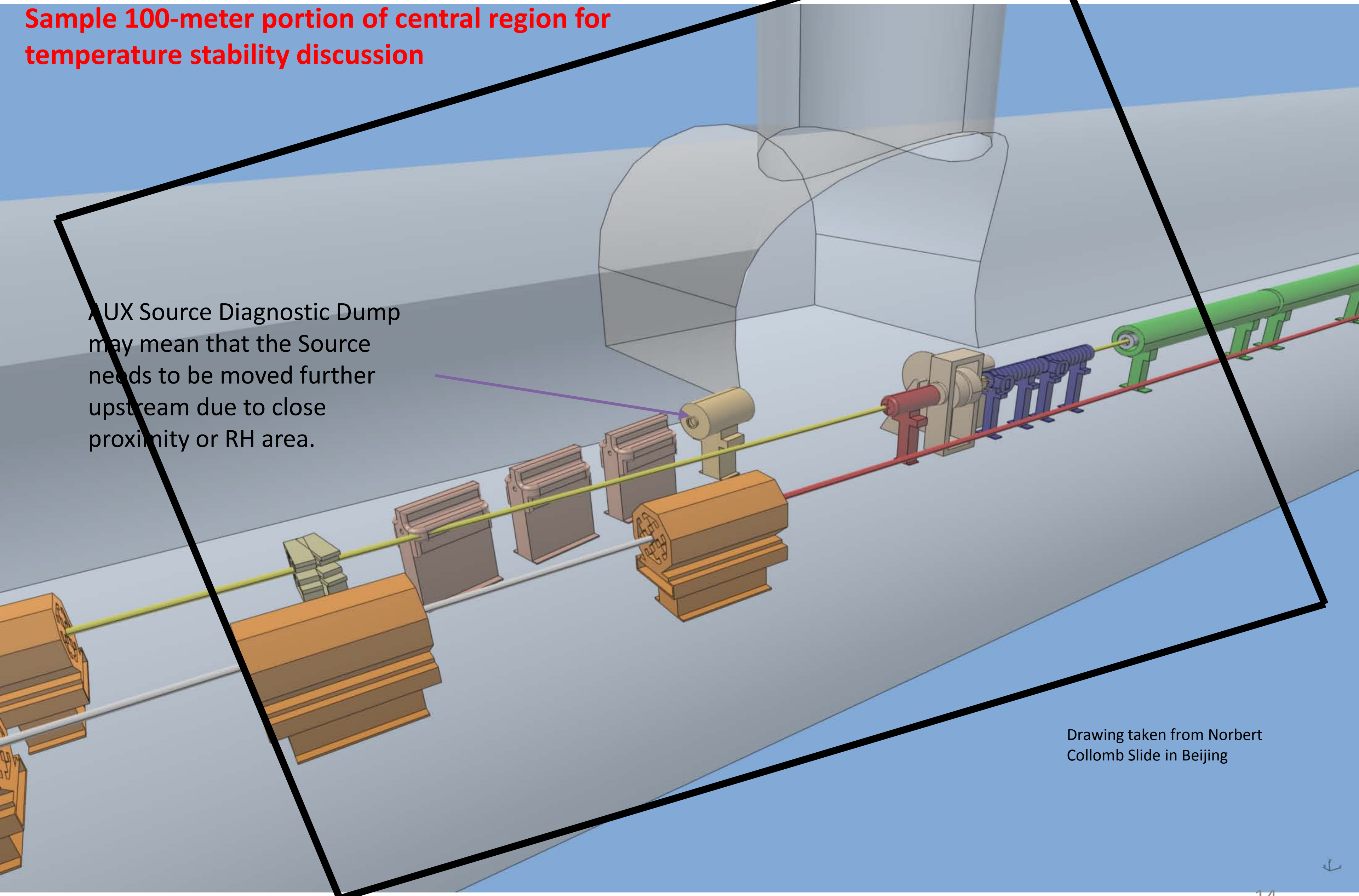
SiD facilities off Detector										
He Compressors	1280				150		1280			
He Liquifier (1000 w @ 4K refrigeration)	1		12		11	410	1			50
LHe Storage Dewar	1						1			
LHe Vacuum System	2						2			
He Liquifier Adsorber Regeneration	25						25			3
He Liquifier & Solenoid Control & Monitoring	15						5	10		
Totals	**1324**									

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)



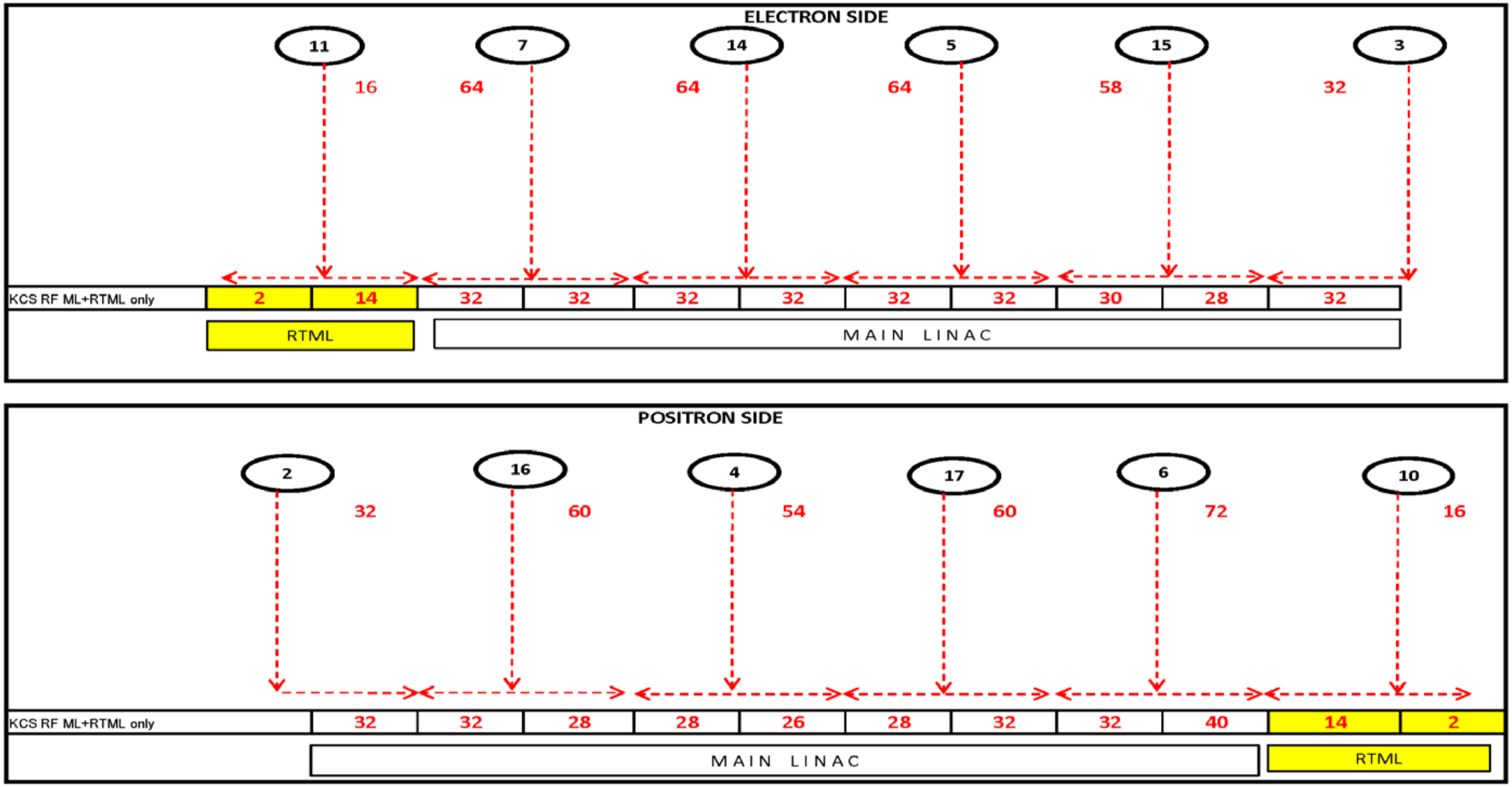
CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

Sample 100-meter portion of central region for temperature stability discussion



CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

KCS RF DISTRIBUTION What's the correct number of RF (between shafts)?



CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

KLY CLUSTER SCHEME, MAIN LINAC "Power, Water & Air Heat Load" per RF D R A F T MAY 12 2010 CF

Components	Quantity	Average Heat Load (KW)	Heat Load to LCW Water (KW)	Max Allowable Temperature (c)	Supply Temp (C)	Delta Temperature (C delta)	Water Flow (l/min)	Maximum Allowable Pressure (Bar)	Typical (water) pressure drop Bar	Acceptable Temp Variation delta C	Heat Load to Chilled Water (KW)	Heat Load to Air (KW)	Source
COMPONENTS IN THE SURFACE (listed as per RF)													
			To Low Conductivity Water								to CHW	To AIR	
RF Components													
RF Charging Supply 34.5 Kv AC-8KV DC		4.0	2.8		40	40	*1.17*	18	5	10	NA	1.2	* CJensen email 2-27-06 183 kVa 0.84pf oil ps xfmr **Shigeki Apr 18 2006 ** Clay 5-25-06 LLRF meeting ** Sep 18 move all to LCW per Marc Ross ** Move load to Dirty Water per RCassell Oct 20 2006, **Nov 22 2006 Keith Jobe Wag on load to Air **Nov 27 2006 C
Switching power supply 4kV 50kW		7.5	4.5		35	*8.50*	7.6	13	5	10	NA	3.0	** Move load to Dirty Water per Rcassell Oct 20 2006 LCW for now **Nov 22 2006 Keith Jobe wag on load to air **Chris Jensen Post meeting notes 11 16 06 **Nov 27 2006 C. adolphsen Email ** Rcassell email Oct 3 2007 **Oct 25 2007 fix delta T
Modulator		7.5	4.5		35	*3.23*	20	10	5	n/a	NA	3.0	* Shigeki Fukuda Email 3-1-06 **Shigeki Apr 18 2006**Nov 22 2006 Keith Jobe wag on load to air** 11-27-06 C. Adolphsen Email **12-1-06 Email from Chris Jensen ****supply temp, water flow, press drop from Chris Jensen mtg 10-24-07
Pulse Transformer		1.0	0.7	60	35	*0.50*	20		1	n/a	NA	0.3	**Shigeki Apr 18 2006** Nov 22 2006 Keith Jobe wag on load to air**11-27-06 C.Adolphsen Email****supply temp, water flow, press drop from Chris Jensen mtg 10-24-07
Klystron Socket Tank / Gun		1.0	0.8	60	35	*1.15*	10	15	1	n/a	NA	0.2	**Shigeki Apr 18 2006** Marc& Keith -remove load to air/chilled - transfer all load to water**Nov 22 2006 Keith Jobe wag on load to air**11-27-06 C. adolphsen Email**supply temp, water flow, press drop from Chris Jensen mtg 10-24-07
Klystron Focusing Coil (Solenoid)		4.0	5.5	80	55	*8*	10	15	1	n/a	NA	0.4	* Shigeki Fukuda Email 4-05-06 **Nov 22 2006 Keith Jobe wag on load to air** 11-27-06 C. Adolphsen Email *Shigeki Oct 18 2007
Klystron Collector		47.2	45.8	87	38 (inlet temp 25 to 63)	18	37	15	0.3	n/a	NA	1.4	* Shigeki Fukuda Email 3-1-06 **Nov 22 2006 Keith Jobe wag on load to air** 11-27-06 C. Adolphsen Email* Shigeki Oct 18 2007
Klystron Body & Windows			4.2	40	25 to 40C	*6*	10	15	4.5	+ - 2.5 C	NA		* Shigeki Fukuda Email 3-1-06** Keith Jobe added stability Oct 20 2006 * * HLRF 11/16 /06 meeting** 11-27-06 C. Adolphsen Email*Shigeki Oct 18 2007 **Oct 25 2007 fix Supply temp *Shigeki Email Oct 26 2007
RF Pipe in Shaft			**1.0**			**12**							***C. Adolphsen Email Jul 21 2008, placeholder 60 KW at 21.6 F delta T per shaft equate to about 1KW per RF**
Relay Racks (Instrument Racks)		9.0	0	N/A	N/A	N/A		N/A	N/A	None	**9.0**	0.0	* Shigeki Fukuda Email 3-30-06 **Shigeki Apr 18 2006 (chilled water) ***Rlarsen email** RayLarsen Email 9-15-06 except reduced by 40% per Marc * Ray HLRF Meeting 11/16/06**11-27-06 C. Adolphsen Email; ***Aug 14 2008 J.Cawardine-minimal 1KW per rack placeholder only (10% of previous rack load in tunnel, the rest in surface)**
Subtotal Surface RF unit Only (for 1 RF)			69.8								9.0	9.5	
COMPONENTS IN THE TUNNEL (listed as per RF)													
NON-RF Components													
AC Pwr Transformer 34.5-.48 kV	1 per 4 RF		0							None	0	3.13	Assumed 500KVA xfmr every 4 RF (2.5% heat load to air)
Emergency Transformers	1 per 4 RF												assume none?
Lighting			0								0	0.00	ignored
Fancoils (Heat Pump)												0.25	Assume ? HP Pump
Dehumidifiers													?
Secondary Water Pumps			0							None	0	0.25	Assume ? HP Pump
RF Components													
Relay Racks (Instrument Racks)	1/36 m		0	N/A	N/A	N/A		N/A	N/A	None	1.0	0.0	* Shigeki Fukuda Email 3-30-06 **Shigeki Apr 18 2006 (chilled water) ***Rlarsen email** RayLarsen Email 9-15-06 except reduced by 40% per Marc * Ray HLRF Meeting 11/16/06**11-27-06 C. Adolphsen Email; **Aug 14 2008 J.Cawardine-minimal 1KW per rack placeholder only (10% of previous rack load in tunnel, the rest in surface)**
RF Pipe	1/36 m		**4**			**12**							*C. Adolphsen Email Jul 21 2008, placeholder 4 KW at 21.6 F delta T (12 Delta C)
Loads and Circulators	26/36 m		**38**		**20**					+ - 2.5 C	0	0.0	**Shigeki Email Apr 28 2006** HLRF 11/16/06 meeting update from 24.3 to 29.8 KW** 11-27-06 C. Adolphsen Email **C. Nantista Oct 1 2007 ** Oct 24 2007 Flow, Supply Temp per Oleg, NO Press drop *Chris Nantista Oct 26 2007 8 liter per min per load, 10 bar press, no press drop, but 30 C for circulator? ***C. Adolphsen Email Jul 21 2008, placeholder 38 KW at 36 F delta T (20 delta C)**
	24/36 m									+ - 2.5 C		0.0	
Subtotal Tunnel RF& NonRF unit Only (for 1 RF)			42								1.0	0	
			112								**10**	**9.5**	

CFS WORSKHOP @ DARESBURY (Jul 12/13 2010) and SLAC (Aug 2/3 2010)

DRFS SCHEME, MAIN LINAC "Power, Water & Air Heat Load" Per 2 RF D R A F T MAY 12 2010 CFS

COMPONENTS IN THE SURFACE (listed as per RF)			To Low Conductivity Water										to CHW	to AIR		
Components	Quantity	Average Heat Load (KW)	Heat Load to LCW Water (KW)	Max Allowable Temperature (C)	Supply Temp (variation) (C)	Supply Temp (C)	Delta Temperature (C delta)	Water Flow (l/min)	Maximum Allowable Pressure (Bar)	Typical (water) pressure drop Bar	Acceptable Temp Variation delta C	DIMENSIONS	Heat Load to Chilled Water	Heat Load to Air (KW)	Max Space Temp (C)	Source
RF Components																
--- High Voltage Circuit Breaker (6.6 kV) ---	1/76 m															S. Fukuda 9-4-09
DC Power Supply, 6.6 kV (In), 60 kV, 4 A (Out), 250 kW, 90% eff. Rack 1	1/76 m	25	15	50									0	10		S. Fukuda 9-4-09
DC Power Supply, 6.6 kV (In), 60 kV, 4 A (Out), 250 kW, 90% eff. (Backup) Rack 2	1/76 m															S. Fukuda 9-4-09
Modulating Anode **Modulator**, 6.6 kV (Shunt 1.0 A, then 6 kW heat load) Rack 3	1/76 m	6.00	3.60	50									0	2.4		S. Fukuda 9-4-09
Modulating Anode **Modulator**, 6.6 kV (Shunt 1.0 A, then 6 kW heat load), (Back-up) Rack 4	1/76 m															S. Fukuda 9-4-09
--- AC Transformer to Low Voltage (400/200/100 V) ---	1/152 m															
Heater P/S, 200V,36A, 7.2kW Rack 3	1/76 m	1		50									1	0		S. Fukuda 9-4-09
Heater P/S (Back-up) Rack 4	1/76 m															S. Fukuda 9-4-09
Pulse Transformer	None															S. Fukuda 9-4-09
Klystron Socket Tank / Gun 0.3 kW X 26	26/76 m	7.80	6.24	60									0	1.56		S. Fukuda 9-4-09
Klystron Focusing x 26 (Permanent Magnet)	26/76 m	0														S. Fukuda 9-4-09
Klystron Collector 4.5 kW X 26	26/76 m	117	113.49	87									0	3.51		S. Fukuda 9-4-09
Klystron Body & Windows	26/76 m	7.52	5.51	40									0			S. Fukuda 9-4-09
LLRF+Amp +Int, 200V,2.5A /5 modules Rack 5	1/76 m	0.35		50									0.35	0		S. Fukuda 9-4-09
LLRF+Amp +Int, 200V,2.5A /5 modules Rack 6	1/76 m	0.35		50									0.35	0		S. Fukuda 9-4-09
LLRF+Amp +Int, 200V,1.5A /3 modules Rack 7	1/76 m	0.21		50									0.21	0	85 F (a)	S. Fukuda 9-4-09
(LLRF+Amp +Int, 200V,1.5A /3 modules, for full power op.) Rack 7	1/76 m	0.21		50									0.21	0.21		S. Fukuda 9-4-10
(LLRF+Amp +Int, 200V,2.5A /5 modules, for full power op.) Rack 8	1/76 m	0.35		50									0.35	0.7		
(LLRF+Amp +Int, 200V,2.5A /5 modules, for full power op.) Rack 9	1/76 m	0.35		50									0.35	1.05		
(Other Racks) Timing , 200V,0.5kW Rack 10	1/76 m	0.50		50									0.50	0		H. Hayano 9-8-09
(Other Racks) Timing , 200V,0.5kW Rack 11	1/76 m	0.50		50									0.50	0		
(Other Racks) Cavity , 200V,3 kW Rack 12	1/76 m	2.05		50									2.05	0		H. Hayano 9-8-09
(Other Racks) Cavity , 200V,3 kW Rack 13	1/76 m	2.05		50									2.05	0		
(Other Racks) Cryogenics, 200V, 2.1 kW Rack 14	1/76 m	2.10		50									2.10	0		H. Hayano 9-8-09
(Other Racks) Cryogenics, 200V, 2.1 kW Rack 15	1/76 m	2.10		50									2.10	0		
(Other Racks) BPM & Mag, 200V, 5 kW Rack 16	1/76 m	5.00		50									5.00	0		H. Hayano 9-8-09
(Other Racks) BPM & Mag, 200V, 5 kW Rack 17	1/76 m	5.00		50									5.00	0		
(RF) Attenuator	None															S. Fukuda 9-4-09
(RF) Waveguides in service tunnel	None															S. Fukuda 9-4-09
(RF) Waveguides in penetration	None															S. Fukuda 9-4-09
(RF) Waveguides in beam tunnel	26/76 m	1.60	0										0	1.60		S. Fukuda 9-4-09
(RF) Circulator with load	**None**															S. Fukuda 9-4-09
(RF) RF Loads	**26/76 m**	45.60	44.23											1.37		S. Fukuda 9-4-09
(Other Loads) Pulse motor for input coupler/tuner	(26+26)/76 m	0												0		H. Hayano 9-8-09
(Other Loads) Vacuum Pumps	(2+2)/76 m	1.26												1.26		H. Hayano 9-8-09
(Other Loads) Emergency Transformer																
(Other Loads) Lighting																
(Other Loads) Fancoils																
(Other Loads) Dehumidifiers																
(Other Loads) Water Pumps																
Subtotal RF unit Only (for 2 RF)		233.9	188.1										22.1	23.7		
[FOR REFERENCE] Subtotal RF unit Only (for 1 RF)		*117*	*94*										*11.1*	*11.83*		