ID	Task Name	% Comp.	Duration	People	Predecessors
1	**White Beam Conditioning (WBC)**	**78%**	**144.33 wks**		
2	**Beamline Shielding Walls (BSW)**	**95%**	**103.56 wks**		
3	BSW Concept design proposal	100%	2 wks	C. Broholm[5%],T. Pike	
4	BSW 3D design	100%	4 wks	T. Pike[25%],P. Hundertmark	3
5	BSW Detailed design	100%	10 wks	NCNR Mech. Engineering[10%],NCNR sub-contractor	4FS+2 wks
6	BSW Manufacturing	90%	18 wks	NCNR Mech. Engineering[5%],NCNR sub-contractor	5FS+2 wks
7	**Beam Tube Insert**	**100%**	**93.6 wks**		
8	BT Concept design proposal	100%	2 wks	C. Broholm[5%],T. Pike	
9	BT 3D design	100%	2 wks	T. Pike[25%],P. Hundertmark	8
10	BT Detailed design	100%	2 wks	NCNR Mech. Engineering	9
11	BT Manufacturing	100%	4 wks	NCNR Mech. Engineering[5%],NCNR sub-contractor	10FS+6 wks
12	**Shutter**	**91%**	**131.08 wks**		
13	Shutter Concept design proposal	100%	2 wks	C. Broholm[2%],NCNR sub-contractor,NCNR Management[10%]	
14	Shutter 3D design	100%	4 wks	P. Hundertmark,T. Pike[25%]	13
15	Shutter Dummy Detailed Design	100%	12.32 wks	Merrick Engineering	14FS+3 wks
16	Shutter Dummy Manufacturing	100%	2.79 wks	Merrick Engineering	15FS+3 wks
17	Shutter detailed design	100%	19.6 wks	Merrick Engineering	14FS+6 wks
18	Shutter Manufacturing	80%	9.27 wks	Merrick Engineering	17FS+1 wk
19	Shutter Assembly and testing	0%	3 wks	NCNR Mech. Techn.,NCNR Electr. Techn.[50%],NCNR Mech. Engineering[25%]	18FS+2 wks
20	**Cryo Filter Exchanger**	**20%**	**144.33 wks**		
21	CFX Concept design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
22	RFQ and contract negotiations	100%	2 wks	T. Pike[10%],JHU@NIST Sub contractor,Paul Homborg	21
23	Phase I	0%	5 wks	T. Pike[5%],CFX contract engineering	22FS+6 wks
24	Phase II	0%	6 wks	CFX contract engineering,T. Pike[5%]	23FS+1 wk
25	Phase III	0%	6 wks	CFX contract engineering,T. Pike[2%]	24FS+1 wk
26	Phase IV	0%	1 wk	CFX contract engineering	25FS+1 wk
27	CFX Acceptance testing at NCNR	0%	2 wks	T. Pike[2%],NCNR Cryo Techn.,NCNR Electr. Techn.[20%]	26
28	**Choke box**	**74%**	**111.28 wks**		
29	CB Concept design proposal	100%	1 wk	T. Pike	
30	CB 3D design	100%	12 wks	T. Pike[5%],NCNR Mech. Engineering	29
31	CB detailed design	95%	16 wks	NCNR Mech. Engineering	30
32	CB manufacturing	0%	8 wks	NCNR sub-contractor	31FS+6 wks
33	CB Installation	0%	1 wk	NCNR Mech. Engineering[10%],NCNR Mech. Techn.	32FS+2 wks
34	WBC Installation	90%	10 wks	NCNR Mech. Engineering[10%],NCNR Mech. Techn.,NCNR Electr. Techn.,T.	11FS+2 wks,224,6FS+1 wk,16FS+2 wks
35	Preliminary Beamline Complete	100%	0 wks		34
36	**Monochromator Cask (DFMC)**	**72%**	**139.83 wks**		
37	**Inline Collimator Exchanger**	**73%**	**135.44 wks**		
38	ICX Concept design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
39	ICX 3D design proposal	100%	2 wks	T. Pike[10%],P. Hundertmark	38
40	ICX Requirements review	100%	1 wk	Instr. Dev. Group[70%]	39
41	ICX Exchanger detailed 3D design	100%	32.05 wks	Instr. Dev. Group[60%],T. Pike[3%]	40
42	ICX Collimator design and manufacturing	50%	14.96 wks	JJ Xray[40%],Instr. Dev. Group[13%]	40,41
43	ICX Electrical system design	100%	16.05 wks	Instr. Dev. Group[80%]	40FS+10 wks
44	ICX Detailed mechanical design drafting	95%	16.8 wks	Instr. Dev. Group[80%]	41
45	ICX Mechanical manufacturing RFQ	60%	24.45 wks	Instr. Dev. Group[25%]	
46	ICX Mechanical manufacturing	20%	7.84 wks	IDG Mech. Eng. Contr.,JJ Xray,Instr. Dev. Group[15%]	45FS+6 wks
47	ICX Assembly and testing at JHU	0%	10.37 wks	T. Pike[2%],Instr. Dev. Group[80%]	46,42
48	**Variable Beam Aperture**	**69%**	**132.33 wks**		
49	VBA Concept design proposal	100%	3 wks	C. Broholm[5%],T. Pike	

ID	Task Name	% Comp.	Duration	People	Predecessors
50	VBA 3D design proposal	100%	1 wk	T. Pike[10%],P. Hundertmark	49
51	VBA Requirements review	100%	2 wks	Instr. Dev. Group[70%]	50
52	VBA Detailed 3D design	100%	46.48 wks	Instr. Dev. Group[65%],T. Pike[3%]	51
53	VBA Mechanical design drafting	98%	33.7 wks	Instr. Dev. Group[80%]	52
54	VBA Mechanical manufacturing RFQ	6%	35.28 wks	Instr. Dev. Group[25%]	53
55	VBA Mechanical manufacturing	85%	8 wks	Instr. Dev. Group[15%],IDG Mech. Eng. Contr.	
56	VBA Electrical system design	100%	2.75 wks	Instr. Dev. Group[80%]	52FS+10 wks
57	VBA Electrical system fabrication	100%	0.93 wks	Instr. Dev. Group[80%]	56
58	VBA Assembly and testing at JHU	15%	11 wks	T. Pike[2%],Instr. Dev. Group[80%]	
59	**Doubly Focusing Monochromator**	**82%**	**56.55 wks**		
60	Complete and test DFM software and electronics	90%	54.16 wks	Instr. Dev. Group[80%]	
61	DFM wiring	0%	4 wks		
62	Machine PG crystals	30%	2 wks	Instr. Dev. Group[25%]	
63	Mount PG crystals	20%	1 wk	Instr. Dev. Group[20%]	62
64	Calibration/Cycle	100%	7 days	Instr. Dev. Group	
65	Cable Takeup Rework	0%	2 wks		64
66	Pivot Rework if necessary	100%	10.21 wks	Instr. Dev. Group[98%]	65
67	**Monochromator Transport (DTS)**	**80%**	**132.41 wks**		
68	DTS Concept design proposal	100%	2 wks	T. Pike[1%]	
69	DTS 3D design proposal	100%	2 wks	P. Hundertmark[50%],T. Pike[10%],Instr. Dev. Group	68
70	DTS Requirements review	100%	1 wk	Instr. Dev. Group[70%]	69
71	DTS Detailed 3D design	100%	27.07 wks	Instr. Dev. Group[65%],T. Pike[3%]	70
72	DTS Mechanical design drafting	100%	16.24 wks	Instr. Dev. Group[80%]	71
73	DTS Mechanical manufacturing RFQ	100%	4.29 wks	Instr. Dev. Group[25%]	72
74	DTS Mechanical manufacturing	100%	18.08 wks	Instr. Dev. Group[15%],IDG Mech. Eng. Contr.	73
75	DTS Electrical system design	70%	13 wks	Instr. Dev. Group[80%]	71FS+10 wks
76	DTS Electical system fabrication	30%	0.75 wks	Instr. Dev. Group[80%]	75
77	DTS Assembly and testing at JHU	0%	15 wks	Instr. Dev. Group[80%],T. Pike[2%]	
78	**DFMC Liner**	**59%**	**133.81 wks**		
79	DFMC Concept design proposal	100%	2 wks	T. Pike[1%]	
80	DFMC 3D design proposal	100%	6 wks	P. Hundertmark[50%],T. Pike[10%],Instr. Dev. Group[80%]	79
81	DFMC Requirements review	100%	1 wk	Instr. Dev. Group	80
82	DFMC Detailed 3D design	85%	11.76 wks	Instr. Dev. Group[60%]	81
83	DFMC Mechanical design drafting	80%	4 wks	Instr. Dev. Group[80%]	
84	DFMC Mechanical manufacturing RFQ	40%	2 wks	Instr. Dev. Group[25%]	83
85	DFMC Manufacturing	0%	10 wks	Instr. Dev. Group[15%],IDG Mech. Eng. Contr.	
86	DFMC assembly and testing at JHU	0%	1 wk	Instr. Dev. Group[80%]	85
87	Shot/Wax Backfull at NCNR	0%	1 wk	Instr. Dev. Group	86
88	**DFMC Integration**	**66%**	**25.15 wks**		
89	Cask support structure design	100%	11.76 wks	Instr. Dev. Group[80%]	
90	Cask support structure fabrication	80%	3.2 wks	Instr. Dev. Group[15%],IDG Mech. Eng. Contr.	89
91	DTS integration	0%	1 wk	Instr. Dev. Group[200%]	
92	DFM Integration	0%	1.5 wks	Instr. Dev. Group[200%]	
93	VBA integration	0%	1.5 wks	Instr. Dev. Group[200%]	
94	ICX integration	0%	1 wk	Instr. Dev. Group[200%]	
95	Subsystem alignment	0%	1.6 wks	Instr. Dev. Group[200%]	
96	**DFMC Installation**	**0%**	**6.9 wks**		
97	Package for shipping	0%	1.7 wks	Instr. Dev. Group[200%]	95
98	DFMC transfer to NCNR	0%	0.2 wks	Instr. Dev. Group,NCNR Mech. Techn.[5%]	97

ID	Task Name	% Comp.	Duration	People	Predecessors
99	DFMC installation at NG0	0%	4 wks	Instr. Dev. Group[50%],NCNR Electr. Engineering,NCNR Mech.	98FS+1 wk,34FS+1 wk
100	**Monochromatic Beam Transport (MBT)**	**51%**	**150.56 wks**		
101	**Static MBT shielding**	**98%**	**118.26 wks**		
102	MBT shielding conceptual design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
103	MBT shielding 3D design	100%	3 wks	T. Pike[10%],P. Hundertmark	102
104	MBT shielding Detailed design	100%	6 wks	T. Pike[5%],P. Hundertmark[5%],NCNR sub-contractor	103
105	MBT shielding Manufacturing	95%	8.38 wks	P. Hundertmark[5%],NCNR sub-contractor	104FS+6 wks
106	**Supermirror Guide System (SMG)**	**43%**	**139.95 wks**		
107	SMG Concept design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
108	SMG 3D design	100%	4 wks	T. Pike[10%],P. Hundertmark	107
109	SMG Detailed design	85%	8 wks	T. Pike[10%],P. Hundertmark	108
110	SMG Manufacturing	0%	16 wks	NCNR sub-contractor	109FS+2 wks
111	SMG Assembly and testing	0%	1 wk	T. Pike[10%],P. Hundertmark[50%],NCNR Mech. Techn.,NCNR Electr. Techn.	110FS+1 wk
112	MBT main shielding Installation	0%	1 wk	T. Pike[5%],P. Hundertmark[50%],NCNR Mech. Engineering[25%],NCNR Mech.	101FS+2 wks,106FS+2 wks,34FS+2 wks
113	**Pre-Sample Optics (PSO)**	**33%**	**150.56 wks**		
114	Monitor	0%	4 wks	C. Broholm[2%],T. Pike[5%]	
115	**Attenuator exchanger**	**42%**	**129.07 wks**		
116	AEX Concept design proposal	90%	3 wks	C. Broholm[5%],T. Pike	
117	AEX 3D design	40%	3 wks	T. Pike[10%],P. Hundertmark	
118	AEX Detailed design	50%	3 wks	T. Pike[10%],JHU@NIST Sub contractor	117
119	AEX Manufacturing	0%	4 wks	P. Hundertmark[5%],JHU@NIST Sub contractor	118FS+6 wks
120	**Monochr. Variable Beam Aperture (MVBA)**	**37%**	**29.85 wks**		
121	MVBA Concept design proposal	90%	3 wks	C. Broholm[5%],T. Pike	
122	MVBA 3D design	40%	3 wks	T. Pike[10%],P. Hundertmark	121
123	MVBA Detailed design	50%	4 wks	T. Pike[10%],P. Hundertmark	122
124	MVBA Manufacturing	0%	6 wks	JHU@NIST Sub contractor	123FS+6 wks
125	PSO Integration and testing	0%	1 wk	C. Broholm[10%],P. Hundertmark[50%],NCNR Electr.	114FS+1 wk,115FS+1 wk,120FS+1 wk
126	PSO installation	0%	3 days	T. Pike[10%],NCNR Mech. Techn.[50%],NCNR Electr. Techn.[50%]	112FS+2 wks,125FS+2 wks
127	First Monochromatic Beam Out	0%	0 wks		112FS+2 wks,99FS+2 wks,193FS+1 wk,218FS+1 wk
128	**Sample Positioning (SPS)**	**73%**	**159.16 wks**		
129	SPS conceptual design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
130	SPS 3D design	90%	28.86 wks	T. Pike[10%],PAI design services	129
131	SPS Detailed design	84%	18.51 wks	T. Pike[5%],PAI design services	
132	SPS Manufacturing	0%	6 wks	T. Pike[5%],PAI design services	131FS+1 wk
133	SPS assembly and testing	0%	4 wks	T. Pike[10%],NCNR Mech. Techn.[50%],NCNR Electr. Techn.,PAI	132FS+2 wks
134	SPS installation at NG0 site	0%	1 wk	T. Pike[10%],NCNR Mech. Techn.[50%],NCNR Electr. Techn.	133FS+2 wks,212FS+2 wks,112FS+2 wks
135	**Neutron Detection System (NDS)**	**25%**	**166.67 wks**		
136	**Monochr. Cryo-Filter Exchanger (MCFX)**	**8%**	**46.25 wks**		
137	MCFX Concept design proposal	50%	10 wks	C. Broholm[5%],T. Pike,Paul Kopetka[30%]	
138	Development of RFQ documentation	0%	5 wks	C. Broholm[20%],T. Pike[10%],Paul Kopetka[20%]	137FF+1 wk
139	MCFX BeO procurement	0%	18 wks		146SF-4 wks
140	Vendor selection process	0%	5 wks	Paul Kopetka[10%],NIST purchasing	138
141	MCFX 3D design	0%	6 wks	NCNR sub-contractor	140
142	MCFX detailed design	0%	6 wks	NCNR sub-contractor	141FS+0.5 wks
143	MCFX Manufacturing	0%	8 wks	NCNR sub-contractor	142FS+0.5 wks
144	MCFX tests by vendor	0%	1 wk	NCNR sub-contractor	143FS+1 wk
145	MCFX packing and shipping to NCNR	0%	1 wk	NCNR sub-contractor	144FS+1 wk
146	Mount BeO filters in MCFX	0%	1 wk		145
147	MCFX cold test at NCNR	0%	1 wk		146

ID	Task Name	% Comp.	Duration	People	Predecessors
148	**Monochr. Collimator Exchanger (MCX)**	**32%**	**52 wks**		
149	MCX Concept design proposal	70%	27 wks	T. Pike[50%],C. Broholm[10%],P. Hundertmark[20%]	
150	MCX 3D design	20%	6 wks	T. Pike[10%],Paul Homborg	149
151	Procurement of MCX Collimators	0%	16 wks	P. Hundertmark[5%],T. Pike[5%],JHU@NIST Sub contractor,C. Broholm[10%]	154SF-2 wks
152	MCX Detailed design	0%	6 wks	T. Pike[10%],Paul Homborg	150
153	MCX Manufacturing	0%	7 wks	T. Pike[10%],JHU@NIST Sub contractor	152FS+4 wks
154	MCX Assembly and testing	0%	1 wk	NCNR Mech. Techn.,T. Pike[5%],NCNR Electr. Techn.	153FS+1 wk
155	**Double Crystal Analyzer (DXAL)**	**61%**	**142.28 wks**		
156	DAXL Concept design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
157	DAXL 3D design	100%	6 wks	T. Pike[10%]	156
158	DAXL Detailed design	100%	8 wks	T. Pike[10%],Exonics	157FS+2 wks
159	DAXL Manufacturing	21%	12.21 wks	T. Pike[5%],Exonics	158FS+6 wks
160	DAXL Assembly and testing	0%	3 wks	T. Pike[15%],NCNR Mech. Techn.,NCNR Electr. Techn.	159FS+2 wks
161	**Kidney Shielding (KS)**	**22%**	**153.93 wks**		
162	KS Concept design proposal	100%	3 wks	C. Broholm[5%],T. Pike	
163	KS 3D design	15%	31.17 wks	T. Pike	162
164	KS Detailed design	33%	27.65 wks	T. Pike,NCNR Electr. Engineering[20%]	
165	KS Manufacturing	0%	16 wks	NCNR Manufacturing contract	164FS+5 wks
166	Detectors and Electronics Acquisition	30%	11.95 wks	C. Broholm[2%],NCNR Electr. Engineering[5%]	
167	**Neutron Camera (NCA)**	**38%**	**104.15 wks**		
168	NCA Concept design proposal	100%	2 wks	C. Broholm,JHU Eng. Students	
169	NCA Detailed design completion	50%	2 wks	C. Broholm[40%],T. Pike[5%],Instr. Dev. Group	168FS+1 wk
170	NCA Completion Manufacturing	0%	3 wks	IDG Mech. Eng. Contr.,Instr. Dev. Group[5%]	169FS+4 wks
171	NCA re-assembly and testing	0%	1 wk	C. Broholm[50%],Instr. Dev. Group	170FS+1 wk
172	**NDS Actuation (NDSA)**	**29%**	**144.09 wks**		
173	NDSA Concept design proposal	100%	1 wk	C. Broholm[5%],T. Pike	
174	NDSA 3D design	100%	2 wks	T. Pike,Paul Homborg	173
175	NDSA Detailed design	100%	3 wks	T. Pike[10%],Paul Homborg	174
176	RFQ for detector system support	0%	2 wks	P. Hundertmark[20%],T. Pike[10%],NCNR Mech. Engineering[10%]	
177	NDSA Manufacturing	0%	8 wks	T. Pike[5%],NCNR Manufacturing contract	175FS+6 wks,176FF+6 wks
178	NDSA Assembly and testing	0%	5 wks	T. Pike[10%],C. Broholm[10%],NCNR Mech. Techn.,NCNR Electr. Techn.[50%]	177FS+2 wks
179	NDS assembly and testing	0%	10 wks	T. Pike[5%],NCNR Mech. Techn.,NCNR Electr. Techn.[50%],NCNR Cryo	155FF+2 wks,161FF+2 wks,172FS+2 wks
180	NDS installation at NG0 site	0%	6 wks	NCNR Mech. Techn.,NCNR Electr. Techn.,NCNR Cryo Techn.[10%]	212FS+1 wk,179FS+1 wk,136FF+3 wks,148FF+3 wks
181	**Get Lost Pipe (GLP)**	**54%**	**139.07 wks**		
182	**Shielding Walls (GLPS)**	**37%**	**133.07 wks**		
183	GLPS Concept design proposal	100%	1 wk	C. Broholm[2%],T. Pike	
184	GLPS 3D design	90%	2 wks	P. Hundertmark,T. Pike[25%]	183
185	GLPS detailed design	70%	4 wks	NCNR Mech. Engineering	184
186	GLPS Manufacturing	0%	8 wks	NCNR Mech. Engineering[5%],NCNR sub-contractor	185FS+4 wks
187	**GLP Helium Liner (GLPH)**	**84%**	**119.95 wks**		
188	GLPH Concept design proposal	100%	1 wk	C. Broholm[2%],T. Pike	
189	GLPH 3D design	100%	1 wk	P. Hundertmark,T. Pike[25%]	188
190	GLPH detailed design	100%	3 wks	NCNR Mech. Engineering	189
191	GLPH Manufacturing	85%	6 wks	NCNR sub-contractor	190FS+6 wks
192	GLPH Assembly and testing	0%	1 wk	NCNR Mech. Techn.,NCNR Electr. Techn.,NCNR Mech. Engineering[10%]	191FS+3 wks
193	GLP Installation at NG0 site	0%	2 wks	NCNR Mech. Techn.,NCNR Mech. Engineering[10%],NCNR Electr. Techn.[20%]	186FS+4 wks,34FS+4 wks
194	**Cross Cutting Tasks (CCT)**	**8%**	**160.16 wks**		
195	**Site preparation for Experiments**	**4%**	**39.01 wks**		
196	City Planning	15%	8 wks		

ID	Task Name	% Comp.	Duration	People	Predecessors
197	**Mezzanine**	**0%**	**30.01 wks**		
198	Mezzanine conceptual design	0%	4 wks	T. Pike[25%],C. Broholm[5%],P. Hundertmark[25%]	196FS+1 wk
199	Mezzanine 3D design	0%	4 wks	NCNR Mech. Engineering	198FS+1 wk
200	Mezzanine detailed design	0%	2 wks	NCNR Mech. Engineering	199FS+1 wk
201	Mezzanine manufacturing	0%	6 wks	NCNR sub-contractor	200FS+1 wk
202	Mezzanine installation	0%	4 wks	NCNR Mech. Engineering[10%],NCNR Mech. Techn.	196FS+2 wks,224,217,201FS+1 wk
203	Instrument control station	0%	6 wks		196FS+2 wks
204	**Central Instrument Control Hardware (CICH)**	**0%**	**20 wks**		
205	Choose and order CICH	0%	2 wks	NCNR Electr. Engineering,C. Broholm[5%],T. Pike[5%]	
206	Delivery of CICH	0%	12 wks		205
207	Configure for use on MACS	0%	4 wks	NCNR Electr. Engineering,C. Broholm[5%],T. Pike[5%]	206FS+2 wks
208	**Instrument Software**	**0%**	**32.48 wks**		
209	Software for controle of MACS	0%	24 wks	MACS Post doctor[25%],NCNR Comp. Engineering[25%]	
210	Software for analysis of MACS data	0%	24 wks	MACS Post doctor[25%],NCNR DAVE group[25%]	
211	Deployment and testing on MACS hardware	0%	6 wks	NCNR Electr. Engineering[50%],NCNR Electr. Techn.,MACS Post doctor[50%]	204FS+2 wks,209FS+2 wks,210FS+2 wks
212	**Dance floor (DF)**	**36%**	**156.16 wks**		
213	DF Concept design proposal	100%	4 wks	NCNR Mech. Engineering	
214	DF 3D design	100%	0.4 wks	P. Hundertmark,T. Pike[25%]	213
215	DF detailed design	81%	3.21 wks	NCNR Mech. Engineering	214
216	DF Manufacturing	0%	8 wks	NCNR Mech. Engineering[5%],NCNR sub-contractor	215FS+6 wks
217	DF installation and testing	0%	4 wks	NCNR Mech. Techn.,NCNR Electr. Engineering[10%]	216FS+2 wks,224FS+2 wks
218	**Helium purging system (HPS)**	**8%**	**139.9 wks**		
219	HPS Concept design proposal	80%	1 wk	NCNR Mech. Engineering	
220	HPS 3D design	0%	1 wk	NCNR Mech. Engineering	219
221	HPS detailed design	0%	2 wks	NCNR Mech. Engineering	220
222	HPS acquisition and manufacturing	0%	4 wks	NCNR Manufacturing contract	221FS+6 wks
223	HPS Installation	0%	2 wks	NCNR Mech. Techn.,NCNR Electr. Techn.,NCNR Mech. Engineering[50%]	222FS+2 wks
224	removal of present equipment	70%	2 wks	NCNR Mech. Engineering[25%],NCNR Mech. Techn.[200%],NCNR Electr.	
225	Ready for Commisioning	0%	0 wks		194FS+5 wks,1FS+5 wks,36FS+5 wks,100FS+5 wks,128FS+5 wks,126FS+5 wks,181FS+5 wks,180
226	MACS Commisioning	0%	28 wks	C. Broholm[50%],MACS Post doctor	225
227	Ready for CHRNS Users	0%	0 wks		226FS+2 wks

1 White Beam Conditioning (WBC)
Provide a fully installed white beam conditioning system. The WBC provides the interface beween the NG0 beam tube, the monochromating system, the monochromatic beam transport system and the get lost pipe and beam dump. This project is the responsibility of the NCNR engineering group.

2 Beamline Shielding Walls (BSW)
Provision of beam line shielding walls surrounding the shutter, CFX, and ICX.

7 Beam Tube Insert
This is the insert that goes into the beam tube within the biological shielding. WBS 1.1 provides a complete insert and any tools that are necessary to insert and later extract it from the biological shielding.

12 Shutter
Provide a fully tested shutter assembly ready for installation within the shielding. This is a stand along unit that includes all electronic controle systems for actuating the shutter and reporting the conditions to the instrument controle computer and to users.

20 Cryo Filter Exchanger
Provide a fully tested cryo-filter exchanger that is ready for installation in the WBC shielding. All actuation and status reporting systems are included in this project for the simplest possible interface with the rest of MACS. This project will be the reponsibiity of JHU@NIST who plans to contract with a cryogenic supplier for most of the work.

23 Phase I
Top Level concept models
Analysis of Cryogenic Performance
Tally of individual fabrication part & assembly drawings
Explanation of fabrication techniques
Projected performance of all proposed assemblies
Project Schedule to the accuracy of a week preferably in MS project format

24 Phase II
Individual fabrication part & assembly drawings complying with ANSI Y14.5
Materials selection
Paint and finish selection
Electrical, and pneumatic system design to industry standard and ready for manufacturing

25 Phase III
Digital images of the CFX system
Vacuum, thermal, and mechanical test results that demonstrate performance to specifications
Regular and preventive maintenance schedules
Delivery, inspection and installation procedures

26 Phase IV
Delivery of CFX to NCNR

28 Choke box
Provide an aperture that fits into the WBC shielding. The choke is basically a simple aperture in the shielding. However, it can be replaced by other devices at a later stage if needed. The choke can be extracted vertically.

29 CB Concept design proposal
Need to confirm thickness and material composition (Broholm) to achieve 100% completion.

32 CB manufacturing
Fabrication will involve shops or BOA followed by filling at NCNR

34 WBC Installation
The WBC installation goes from a conditioned NG0 area (all previous items removed) to a fully operational WBC system that is safe for occupants of C-100. This means that in case the mating parts of the shielding are not ready the WBC installation shall provide temporary shielding in their place.

Comment from D. Pierce July 2004: Phase 1 will be performed in Fall 04, completion in early January (worst case)

need to confirm thickness/composition of beam dump (Broholm), completion will take 10 days
following receipt of this information

35 Preliminary Beamline Complete
MACS beam line has been built up to the point that further development of it does not require an extended shutdown of the reactor. Further service occurs in regular shutdowns.

37 Inline Collimator Exchanger
Provide a fully tested radial collimation system for installation in the DFM Cask. Includes all actuation systems so that the device can reaily be connected to standard utilities and to the instrument controle computer from where actuation is initiated and monitored.

48 Variable Beam Aperture
Provide a fully tested variable aperture for the white beam. Includes all actuation systems so the device readily interfaces with the rest of the DFM cask.

59 Doubly Focusing Monochromator
The famous doubly focusing monochromator fully tested and with its own controle system in a rack that will be mounted outside the shielding, possible on top of it. This item includes provision of all rotation and translation stages so that WBS 2.3 can be mounted directly onto the main monochromator translation stage.

8/30/03 The main device has been complete for a while. Lacking is still completion of the software for controle of the device and mounting the PG.

67 Monochromator Transport (DTS)
Fully tested and functional DFM main translation stage ready for installation in the DFM cask. Note that installation will just have a dummy drive axis tha that the DTS external drive mechanism can hook on to.

78 DFMC Liner
Encompases all parts of the DFM cask needed to hold the internal devices in alignment and to provide mechanical and electrical connectivity. Also includes the helium containment but not the actual helium supply system which is part of the overall MACS system integration.

88 DFMC Integration
Packing, shipping, and transit of the DFM cask and all the content to the NCNR.

98 DFMC transfer to NCNR
Packing, shipping, and transit of the DFM cask and all the content to the NCNR.

99 DFMC installation at NG0
The WBC and the monochromatic beam transport system will be fully installed before the DFMC installation. This item includes connecting to or preparing to connect to tilities that are part of the MACS site.

100 Monochromatic Beam Transport (MBT)
Shiding surrounding the monochromating system and the beam delivery system from monochromator to sample. Includes installation starting from a completed WBC installation.

101 Static MBT shielding
The static part of the MBT shielding. This is everything but the supermirror guide drum from the floor to the roof around the monochromator.

106 Supermirror Guide System (SMG)
The rotating part of the MBT shielding system. Includes the actual variable supermirror guide. This is a complete functional system that can be controlled from the instrument controle computer. This item also includes the actuation system for affectuating and registering the rotation of the super-mirror guide drum.

113 Pre-Sample Optics (PSO)
Provides the fully functioning beam optics package between the supermirror guide and the sample. All actuation is included with the simplest possible interface to the controle computer.

127 First Monochromatic Beam Out
Will be able to open the beam for the first time and stear a monochromatic beam to the sample position. At this point we will make a monochromatic flux measurement.

128 Sample Positioning (SPS)
Provides the full stack of sample positioning equipment including parts needed to affectuate the combined motion of this object. All actuation hardware is included to that this item can readiy be connected to the instrument controle computer.

133 SPS assembly and testing
The sample positioning system will be assembled and tested in the high bay area so that when it arrives there we wil lknow that everything fits and works.

135 Neutron Detection System (NDS)
Provision of everything that is needed to detect neutron that are scattered from or transmitted through the sample. Full installation is also included. each sub-project is assembled and tested independently before integration and installation in C-100.

136 Monochr. Cryo-Filter Exchanger (MCFX)
Provision of exchangeable filtering capabilities for the instrument fully interfaced wih the instrument controle computer. The system will be cryogenically tested before integration wih the rest of the

neutron detection system.

148 Monochr. Collimator Exchanger (MCX)
Provision of collimation exchange system for 20 channels. Actuation systems unique to the device are included with the simplest possible interface with the instrument controle hardware.

155 Double Crystal Analyzer (DXAL)
Provision of 20 double crystal analyzer with all unique actuation electronics included. The devices interface with the instrument controle computer. They will be fully tested prior to assembling in the combined detection system.

9/2/03 The PG for the analyzer system is now being produced by Advanced Ceramics. WBS 5.3 includes mounting of these crystals.

161 Kidney Shielding (KS)
This subproject provides the bulk shielding of the detection system for NG0.

167 Neutron Camera (NCA)
A neutron camera is provided for use during sample alignment. A prototype has been built by engineering students at JHU. More work is however, needed to enhance sensitivity and to make the device easier to use on MACS.

172 NDS Actuation (NDSA)
Provides everything that is needed to rotate the detection system around the sample table initiated through commands from the instrument controle computer. This includes aripads but not the dance floor. Provision of the latter is included as part of the site prepration.

181 Get Lost Pipe (GLP)
Provision of fully installed systems for dealing with the beam that is not reflected to the sample. This means beam stop and all shielding around it. There is also a helium filled flight path to reduce airscattering and activation of the intense reactor beam that remains after the monochromator.

182 Shielding Walls (GLPS)
Provision of fully installed shielding walls surrounding the past monochromator flight path and the beam stop.

186 GLPS Manufacturing
out to BOA, expect delivery late August, early September

187 GLP Helium Liner (GLPH)
Provision of fully installed helium flight path for the post monochromator beam. This does not include the helium supply system, which is considered a cross cutting task because it feeds several helium systems in MACS.

194 Cross Cutting Tasks (CCT)
This group of tasks cross the boundaries between MACS sub-projects. They are characterized by intricate interfaces of various sorts.

204 Central Instrument Control Hardware (CICH)
Provision of all hardware for centralized electronic controle systems. Most of this will be in the form of purchases of standard equipment. Wen possible standardized NCNR solutions will be used.

208 Instrument Software
Provision of software systems that provide an efficient interface for a wide range of users and experiments. Most of these systems are standard packages provided by NCNR. The tasks accounted for here are associated with tailoring these systems to MACS as needed.

212 Dance floor (DF)
MACS moves on airpads accross an innovative new type of dance floor developed at NIST. This sub-project covers the floor in C-100 where needed with this dance floor.

218 Helium purging system (HPS)
Provision of fully installed helium purging system that brings helium to the part of the instrument that have a helium filled flight path. Includes monitoring systems that report the status to the instrument control computer.