Chapter 10

Cost and Schedule

10.1 Cost

Presented here is a cost estimate for the construction of the BRAHMS Experiment. This includes the mechanical construction of magnets and platforms, the building of detectors and electronics, as well as other utilities needed for the experiment. The budget is first presented as an overview, followed by more details on the subcomponents, given on the following pages.

The budget summarized in Table 10.1 is given in thousands of FY94 dollars (i.e. present day value). In broad terms 30% of the budget is for the large magnets, power supplies, and installation of all components, 50% for the detectors and the remaining 20% for data acquisition, triggers, and control systems. The budget assumes an overall contingency of 25%; a reasonable number in line with that of the other RHIC experiments, particularly considering that most components have little development involved. A more detailed budget is presented in tabular form at the end of this chapter. Several comments concerning this is given in the following paragraphs, while others have been addressed in previous chapters.

The costs of the magnets are based on the engineering and design work which has taken place. The coils are based on an estimate from a vendor. The facilities and integration includes the platforms which are presently preliminary but is based on recent experience from the AGS. As discussed in Chapter 4, it is proposed to rebuild (modify) the power supplies obtained from LBL surplus. The cost of trays, cables and installation of all mechanical structures, utilities and detectors is based on fairly extensive work, which also gave the basis for an installation schedule discussed later. These estimates

BRAHMS SPECTROMETER BUDGET

Magnets & Platforms		**471**	
Tracking		**774**	
PID		**1139**	
Daq and triggerring		**720**	
Global Detectors		**393**	
Facility & Infrastructure		**1118**	
			4616
Contingency	25%		**1154**
Total			**5769**

Table 10.1: Requested budget for BRAHMS, in thousands of FY94 dollars.

are considered quite conservative.

The cost of the drift chambers is based on very recent construction for AGS Experiment 866, both for the mechanical and for the electronics part. The cost of TPC electronics, which includes preamps, shapers and readout systems, was estimated at \$50/channel. This assumes that the detectors utilize with only minor modifications the integral electronics developed for NA49 and presently under development for STAR. As discussed earlier the front end electronics are well suited for our detector; only the read-out module following digitizing will have to be modified to handle an event rate of 200 per second.

The cost for the TOF system is based on current prices for the components used in E-802/E-866 based on a conventional design.

The global centrality detector is priced for the silicon detector option based on current incremental costs for silicon wafers and electronics using the PHOBOS design.

10.2 Schedule

At the present time a schedule for procurement, building of components, installation and testing has been outlined. This schedule will, for the larger components such as magnets, platforms etc., depend critically on the RHIC installation in the intersection region. All the major components must be installed before the area is enclosed and RHIC commissioning begins. After that time only smaller detectors, controls, and electronics can be installed. Assuming that the commissioning will start 1/2 year before RHIC turns on in FY99, magnets must be installed on platforms and tested during FY98. It is estimated that procurement, production and delivery of coils and steel for the larger magnets D1-D4 will take two years implying that this must begin in FY96. The final engineering and design should thus start in FY95 and be completed in early FY96.

The schedule for detector components, DAQ and control systems requires that they will also have to be installed by end of FY98 such that only the final testing is left before turn on. The construction of these items need not begin before FY96/97, although development of prototypes and design will have to take place during FY95/96 for detector components, electronics and DAQ.

The effects of time scheduling have been incorporated in a requested budget profile for BRAHMS. In this request we have incorporated the desire of RHIC that the smaller experiments be funded late, but it has to be stressed again that funding in FY96 is crucial to have the experiment ready at RHIC turn on.

The requested funding profile, divided into the various subsystems, is given in Table 10.2.

Sub-system	FY95	FY96	FY97	FY98	FY99
Magnets	31	180	260	0	0
Power Supplies	0	150	213	0	0
Installation..	0	0	298	427	30
Tracking	0	80	311	383	0
PID	0	200	400	539	0
Global Det.	0	0	180	213	0
DAQ and trigger	60	40	100	360	180
BRAHMS total	91	650	1762	1922	210
Tot incl cont.	113	813	2203	2402	263

Table 10.2: BRAHMS funding profile for subsystems in thousands of FY94 dollars, excluding contingency. The last row gives the total requested per year including contingency

Magnets total			**471**
D1		**50**	
Steel	25		
Coils	24.9		
D2		**98**	
Steel	58.4		
Coils	39.6		
D3		**210**	
Steel	122.6		
Coils	87		
D4		**28.1**	
Steel	28.1		
Coils-use existing	0		
D5		**55**	
Steel	28.5		
Coils	26.3		
Engineering & Design		**31**	
Facilities & Integration			**1118**
Platforms		**198**	
Pivot	9.4		
Front Platf.	44		
Back Platf.	49.4		
Midrap Platf.	30		
Design	65		
Power Supplies		**363**	
Modification of LBL supplies	150		
Trays,Cables	213		
Installation		**287**	
Detector stands,Air Cond,Racks.		**150**	
Control Systems		**80**	
Detector Shielding (Pb/Heavy Met)		**40**	

TRACKING **774**

M-TPC1					**120**
	field cage			15	
	Readout Chamber			25	
	HighVoltage,Gas..			20	
	electronics	1200	$50	60	
M-TPC2					**100**
	mechanical			15	
	Readout Chamber			20	
	HighVoltage,Gas..			20	
	electronics	900	$50	45	
T1					**116**
	field cage			15	
	Readout Chamber			30	
	High Voltage,Gas..			20	
	electronics	1024	$50	51	
T2					**87**
	field cage			15	
	Readout Chamber			20	
	High Voltage,Gas..			20	
	electronics	640	$50	32	
T3,T4,T5					**311**
	mechanical	62	4	248	
	electronics	1050	$60	63	
T6					40

PID Forward & Midrapidity **1139**

		channels	$/ch.		
TOF-midrapidity					**583**
	Tubes/electronics	450	1250	563	
	Engineering Design			20	
TOF-Forward					**170**
	H1	80	1250	100	
	H2	40	1250	50	

	Design,Eng.			20	
GasC-mid					**150**
	Electronics..	20	500	10	
	mechanical			120	
	Design,Eng.			20	
RICH					**183**
	4 tubes			88	
	Gas handling			25	
	Detector Box			20	
	Mirror			10	
	Design,Engineering			15	
	Readout Electronics			25	
Cherenkov (C1)					**53**
	mechanical,design			40	
	Gas handling			10	
	electronics	8	400	3.2	

Global Detectors **393**

Centrality					243
	Silicon wafers	54	3000	162	
	Electronics	3456	12	41	
	Control			20	
	Design+mechanical			20	
Beam Beam counter					150
	Tubes, Electronics...			110	
	Design,mechanical			35	

DAQ & Triggering **720**

	VME system	300
	Level I+ II trigger	300
	Workstations	120