1 Cost Estimates

1.1 Design, measurement and analysis

Cost estimates for labor to design the equipment, gather a complete set of beam measurements, and analyze the data are given in Tables 1 and 2

Table 1: Design, Data collection and Analysis

Item#	Description	Labor(FTE months)
1	Design of segmented time resolving flux detector	2(AccPhys)
2	Design of resonant microwave detector	2 (AccPhys)
3	Measurements and analysis of flux data	9 (AccPhys)
4	Measurements and analysis of resonant microwave data	9(AccPhys)
5	Analysis support	20 (undergrad)
	Labor for Design, beam measurements, and data analysis (FTE months)	22(AccPhys), 20(undergrad)

Table 2: Dedicated Storage Ring Operations

Item#		Machine Studies Time (hours)
1	Commissioning flux detector	8
2	Commissioning resonant microwave detector	8
3	Beam measurements with both systems	24
	Total dedicated storage ring time	40

Approximately 5 shifts (40 hours) of machine studies time would be needed to obtain data sets at 2.1 GeV and 5.3 GeV, with electron and positron beams, including detector commissioning. Data analysis would include the continued development of ECLOUD simulation software for comparison with the data as well as the continued development of the resonant microwave technique. Cornell is in a unique position to develop and verify ECLOUD simulations with direct beam experiments and is probably the only laboratory where the resonant microwave technique is being actively developed at this time. As shown in the table, it is expected that 1.5 full time equivalent (FTE) years of physicist/engineer time could be usefully directed at this effort during the year long grant period.

1.2 Construction and Installation

Cost estimates for the material and labor needed to construct the new magnet and detector are given in Table 3 and 4.

Table 3: Materials

Item#	Description	Qty	Unit Cost
	Beam-pipe Material:		
1	Oval Flange (DWG# 6046-038)	2	$50
2	Oval Al-SS Transition (DWG# 6046-038)	2	900
3	Aluminum Oval to Round Transition	2	20
4	Round Al-SS Transition (DWG# 6085-119)	2	500
5	Round Beam-pipe (DWG# 6085-206)	1	2,235
		Subtotal (Beam-pipe Material)	$5,175
	Detector Material:		
1	Detector Hole Plate	3	$1,200
2	Detector Cover	1	1,200
3	Detector PCB	5	688
4	Pickup Al-SS Housing	2	500
5	50 Ω SMA Feedthrough	6	255
6	SMA Feedthrough for Pickup	4	50
		Subtotal (Detector Material)	$10,970
	Magnet Material:		
1	Magnet: Iron Shims	8	$1k
2	Copper for Coils	1	$2k
2	Kapton Tape Insulation	1	$0.5k
2	Epoxy Potting	1	$0.5k
		Subtotal (Magnet Material)	$4k
		Total Material	$

Table 4: Labor

Item#	Description	Labor (hr)
1	Beam-pipe: Oval Flange	30
2	Beam-pipe: Oval Al-SS Transition	2
3	Beam-pipe: Oval-Round Al Transition	40
4	Detector: Small Parts Machining	16
5	Detector: Part Cleaning	8
6	Detector: Welding	16
7	Detector: Assembly and Testing	16
8	Detector: Vacuum Processing	24
9	Detector: Chamber Installation	16
10	Magnet: Machine Four Pole Faces (DWG#6041-158)	120
11	Magnet: Wind Four Coils (DWG#6041-156)	200
12	Magnet: Support Structure	40
13	Magnet: Assemble and Install	40
	Subtotal Labor for Beam-pipe, Detector and Magnet (hours)	468
	Labor Cost at $40.50/hr for Equip Tech V	