Budget Justification

As described in the proposal, we are requesting funds to construct the Outer Veto detector for the Double Chooz Experiment. The request also includes funds to support undergraduate participation in the construction, testing, and data analysis for the experiment. The budget request has four components:

1. Module Construction
2. Electronics
3. Detector Shipping and Installation
4. Education and Outreach

Table 1, taken from the Project Description, summarizes the proposed budget for the project, including a 30% contingency on the first three items. Detailed budget tables and justification of costs are given in the project description (see Sections 4.1, 4.2, 4.4, and 5.3). Here, we show modified versions of the budget tables (without item counts and unit costs) that indicate how funds will be distributed over the 3-year grant period. This spending profile will allow us to install the far detector outer veto in the summer of 2008 and the near detector outer veto in the fall of 2009.

Table 1: Proposed 3-year budget. We have assigned a 30% contingency, budgeted mainly in Year 3, to all items except education and outreach.

Category	Request in thousands of dollars			
	Year 1	Year 2	Year 3	Total
Module Construction	399.2	517.4	134.0	1050.6
Electronics	308.9	235.1	53.1	597.1
Shipping and Installation	0	43.7	53.7	97.4
Contingency (on above items)	109	100	300	509
Education and Outreach	47.5	10.3	10.3	68.1
Total	864.6	906.5	551.1	2322.1

Table 2 shows the yearly budget for module construction. Infrastructure for module construction must be purchased at the start of the project. Materials for the modules must be purchased during the first two budget years. Labor peaks during the second year went the modules for the near site will be constructed (recall that 5/8 of the modules are deployed at the near site). The support structure is needed prior to installation at the Chooz site.

Table 3 shows the yearly budget for electronics and DAQ. Several items that must be purchased in single orders (e.g., the MAROC2 custom integrated circuits) are included in the first budget year. Engineering to design the system also occurs mainly during the first year. Otherwise, the annual budget is adjusted to meet the detector installation schedule.

Table 4 shows the budget for shipping and detector installation. The second year costs correspond to shipping and installing the far detector (3/8 of the total modules); the third year costs correspond to shipping and installing the near detector (5/8 of the total modules).

Table 5 shows the budget for education and outreach (E&O). The PMT testing station, described in the project description, is needed at the start of the project. Two Barnard undergraduate students will work on the project during the first year. There will be one student during each of the following years.

Table 2: Proposed budget for scintillator module mechanical construction by year. See Project Description (Table 5 and accompanying text) for a justification of costs for each item. A 30% contingency will be added to the total module construction estimate.

Category	Request in thousands of dollars			
	Year 1	Year 2	Year 3	Total
Coextruded plastic scintillator	100	155	0	255
Wavelength shifting fiber	110	110	0	220
Additional materials for module assembly	50	78	0	128
Module Assembly and Testing Fixtures				
Storage racks	10	0	0	10
Scintillator cutting station	10	0	0	10
Assembly tables	16	0	0	16
Vacuum pumps and bags for gluing	10	0	0	10
Support structure with sliding rails				
for 8 module detector planes	0	36	60	96
Mechanical engineering	28.8	9.6	9.6	48
Technicians (construction)	37	74	37	148
Undergraduates (construction and testing)	27.4	54.8	27.4	109.6
Total	399.2	517.4	134.0	1050.6

Table 3: Proposed budget for readout electronics and DAQ. See Project Description (Table 6 and accompanying text) for a justification of costs for each item. A 30% contingency will be added to the total electronics and DAQ estimate.

Category	Request in thousands of dollars			
	Year 1	Year 2	Year 3	Total
Hamamatsu M64s	123.8	123.7	0	247.5
Frontend:				
Frontend cards	4.8	0	0	4.8
MAROC2 ASIC	60	0	0	60
FPGA	4.5	4.5	0	9
DC LV to HV	1.9	1.9		3.8
Low Voltage Supplies	9	0	11	20
Cables (10 per frontend card)	9	0	14.1	23.1
Clock distribution system	10	20	10	40
VME crates	10	20	10	40
VME control cards	5	15	0	20
VME receiver cards	5	20	0	25
Engineering	54	18	0	72
Technician	12	12	8	32
Total	308.9	235.1	53.1	597.1

Table 4: Proposed budget for shipping and detector installation. See Project Description (Table 7 and accompanying text) for a justification of costs for each item. A 30% contingency will be added to the total shipping and installation estimate.

Category	Request in thousands of dollars			
	Year 1	Year 2	Year 3	Total
Shipping	0	20	30	50
Technicians	0	23.7	23.7	47.4
Total	0	43.7	43.7	97.4

Table 5: Proposed budget for education and outreach (E&O). See Project Description (Table 8 and accompanying text) for a justification of costs for each item. All items in this table are for Barnard College. The quoted costs for travel and undergraduate salaries include 53.5% overhead. Undergraduate salaries during the summer also include 7.4% fringe benefits.

Category	Request in thousands of dollars			
	Year 1	Year 2	Year 3	Total
PMT testing station	22	0	0	22
Undergraduates	17.5	8.8	8.8	35.1
Travel	3	1.5	1.5	6
Computing	5	0	0	5
Total	47.5	10.3	10.3	68.1