

7.15 Budget Justification for the ATLAS Program

Preamble: This section provides the budget justifications for the ATLAS experiment and includes the PIs White, De, Brandt, Farbin, and Hadavand. A canonical cost of living adjustment rate of 3% is applied to all salaries in years two and three. The total budget for ATLAS for the three years is \$2,656,887.

The tasks carried out on-campus versus off-campus incur substantially different indirect rates 51.5% on-campus versus 26% off-campus.

1. Year 1

- **Senior Personnel:** Summer salary for PIs requested is \$97,222. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for 3.1 postdoctoral fellows is made using the base salary of \$54,000 per annum for a total of \$167,400. The fringe benefit rate is 30% of the request. Since it is anticipated to have 1 postdoctoral fellow on-campus and 2.1 off campus at CERN, the indirect rates for this cost are 51.5% and 26% respectively for the relevant portion of the cost.
- **Graduate Students:** A request for 4 graduate students support is made at the base rate of \$24,000 per annum for a total of \$96,000. The fringe benefit rate is 10% of the request. Since it is anticipated to have 2 graduate students on-campus and 2 off-campus at CERN, indirect rate for this cost 51.5% and 26% respectively.
- **Undergraduate Students:** A request of 3 undergraduate students support is made at the base rate of \$5,000 per annum for a total of \$15,000. They will be located on-campus therefore an indirect rate of 51.5% is applied to this rate.
- **Travel and Cost of Living Adjustment:** A total request of \$110,700 for travel and COLA support for postdoctoral fellow and graduate student is made. Of this amount, the travel support is \$49,500. An indirect rate for this cost of 26% off-campus is applied.
- **STEM Tuition:** Graduate student tuition support for one student is requested at the rate of \$9,140 per annum for a total of \$36,560. This cost does not incur indirect cost.
- **M&O:** A modest request for maintenance and operation cost of \$2,500 per PI is requested per annum for a total of \$12,500 to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$80,520 .
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$222,435 .
- **Grand Total for Year 1:** The grand total request for year 1 for ATLAS is \$840,348.

2. Year 2

- **Senior Personnel:** Summer salary for PIs requested is \$100,139. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for 3 postdoctoral fellows is made using the base salary of \$55,620 per annum for a total of \$172,422 . The fringe benefit rate is 30% of the request. Since it is anticipated to have 1 postdoctoral fellow on-campus and 2 off campus at CERN, the indirect rates for this cost are 26% off-campus and 51.5% on-campus for the relevant portion of the cost.
- **Graduate Students:** A request for 4 graduate students support is made at the base rate of \$24,720 per annum for a total of \$98,880. The fringe benefit rate is 10% of the request. Since it is anticipated to have 2 graduate students on-campus and 2 off-campus at CERN, indirect rate for this cost 51.5% and 26% respectively.
- **Undergraduate Students:** A request of 3 undergraduate students support is made at the base rate of \$5,000 per annum for a total of \$15,000. They will be located on-campus therefore an indirect rate of 51.5% is applied to this rate.

- **Travel and Cost of Living Adjustment:** A request of total of \$110,700 for travel and COLA support for postdoctoral fellow and graduate student is made. Of this amount, the travel support is \$49,500. An indirect rate for this cost of 26% off-campus is applied.
- **STEM Tuition:** Graduate student tuition support for one student is requested at the rate of \$9,140 per annum for a total of \$36,560. This cost does not incur indirect cost.
- **M&O:** A modest request for maintenance and operation cost of \$2,500 per PI is requested per annum for a total of \$12,500 to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$82,891.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$227,849.
- **Grand Total for Year 2:** The grand total request for year 2 for ATLAS is \$856,134.

3. Year 3

- **Senior Personnel:** Summer salary for PIs requested is \$103,143. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for 4 postdoctoral fellows is made using the base salary of \$57,289 per annum for a total of \$206,239. The fringe benefit rate is 30% of the request. Since it is anticipated to have 1 postdoctoral fellow on-campus and 3 off campus at CERN, the indirect rates for this cost are 26% off-campus and 51.5% on-campus for the relevant portion of the cost.
- **Graduate Students:** A request for 5 graduate students support is made at the base rate of \$25,462 per annum for a total of \$114,577. The fringe benefit rate is 10% of the request. Since it is anticipated to have 3 graduate students on-campus and 2 off-campus at CERN, indirect rate for this cost 51.5% and 26% respectively.
- **Undergraduate Students:** A request of 3 undergraduate students support is made at the base rate of \$5,000 per annum for a total of \$15,000. They will be located on-campus therefore an indirect rate of 51.5% is applied to this rate.
- **Travel and Cost of Living Adjustment:** A request of total of \$116,700 for travel and COLA support for postdoctoral fellow and graduate student is made. Of this amount, the travel support is \$49,500. An indirect rate for this cost of 26% off-campus is applied.
- **STEM Tuition:** Graduate student tuition support for one student is requested at the rate of \$9,140 per annum for a total of \$41,130. This cost does not incur indirect cost.
- **M&O:** A modest request for maintenance and operation cost of \$2,500 per PI is requested per annum for a total of \$12,500 to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$ 97,745.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$252,816.
- **Grand Total for Year 3:** The grand total request for year 3 for ATLAS is \$960,405.

Energy Frontier - International Linear Collider

Cumulative - 3 years

- **Senior Personnel:** One month summer salary for each year for White is requested at the current rate of \$127,386 per 9 month academic year, equivalent to \$14,154 per month. The total request for this item is 3 summer months at \$42,462. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Undergraduate Students:** Undergraduate students Andrew Myers and Ross McCoy (in Year 1, and other students in Years 2 and 3) will continue their present work on the SiD simulation and physics studies. Support for two undergraduates is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request for 3 years is \$30,000. The fringe benefit rate for an undergraduate student is 8.5%.
- **Travel:** A total of \$42,000 for 3 years is requested to support White's travel as SiD Spokesperson - 3 trips to Japan at \$3,000, 3 trips to Europe at \$3,000, both of these for regional LC meetings and SiD recruiting; 3 international conferences at \$3,000, 3 domestic conferences at \$2,500, and 3 domestic SiD Workshops at \$2,500.
- **M&O:** A limited amount for maintenance and operation cost of \$2,500 per annum is requested to support various costs. Total cost \$7,500. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total 3 year cost for the fringe benefits is \$15,675.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) and off-campus (26%) rates is \$56,973
- **Total for Year 1:** The total request for Years 1,2, and 3 ILC for White is \$188,396.

Energy Frontier - International Linear Collider Year 1

- **Senior Personnel:** One month summer salary for White is requested at the current rate of \$127,386 per 9 month academic year, equivalent to \$14,154 per month. The total request for this item is one summer month at \$14,154. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Undergraduate Students:** Undergraduate students Andrew Myers and Ross McCoy will continue their present work on the SiD simulation. Support for two undergraduates is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%.
- **Travel:** A total of \$14,000 is requested to support White's travel as SiD Spokesperson - 1 trip to Japan at \$3,000, 1 trip to Europe at \$3,000, both of these for regional LC meetings and SiD recruiting; 1 international conference at \$3,000, one domestic conference at \$2,500, and one domestic SiD Workshop at \$2,500.
- **M&O:** A limited amount for maintenance and operation cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$5,096.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) and off-campus (26%) rates is \$18,704
- **Total for Year 1:** The total request for Year 1 ILC for White is \$61,954.

Energy Frontier - International Linear Collider Year 2

- **Senior Personnel:** One month summer salary for White is requested at the current rate of \$131,208 per 9 month academic year, equivalent to \$14,579 per month. The total request for this item is two summer months at \$14,579. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Undergraduate Students:** Two undergraduate students will continue work on the SiD simulation and physics studies. Support for two undergraduates is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%.
- **Travel:** A total of \$14,000 is requested to support White's travel as SiD Spokesperson - 1 trip to Japan at \$3,000, 1 trip to Europe at \$3,000, both of these for regional LC meetings and SiD recruiting; 1 international conference at \$3,000, one domestic conference at \$2,500, and one domestic SiD Workshop at \$2,500.
- **M&O:** A limited amount for maintenance and operation cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$5,224.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) and off-campus (26%) rates is \$18,988
- **Total for Year 2:** The total request for Year 1 ILC for White is \$62,790.

Energy Frontier - International Linear Collider Year 3

- **Senior Personnel:** One month summer salary for White is requested at the current rate of \$135,144 per 9 month academic year, equivalent to \$15,016 per month. The total request for this item is two summer months at \$15,016. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Undergraduate Students:** Two undergraduate students will continue work on the SiD simulation and physics studies. Support for two undergraduates is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%.
- **Travel:** A total of \$14,000 is requested to support White's travel as SiD Spokesperson - 1 trip to Japan at \$3,000, 1 trip to Europe at \$3,000, both of these for regional LC meetings and SiD recruiting; 1 international conference at \$3,000, one domestic conference at \$2,500, and one domestic SiD Workshop at \$2,500.
- **M&O:** A limited amount for maintenance and operation cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$5,355.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) and off-campus (26%) rates is \$19,281
- **Total for Year 3:** The total request for year 1 ILC for White is \$63,652.

7.16 Intensity Frontier Program Budget Justification

Preamble: This section provides the budget justifications for PIs Yu and Asaadi for the intensity frontier. Detailed description for each of the items is given in year one. A canonical cost of living adjustment rate of 3% is applied to all salaries and STEM tuition in the subsequent years. Years two and three of the proposal contain fewer details as in year one, but instead reflect the base rate and where noted any significant changes in effort.

The tasks carried out on-campus versus off-campus incur substantially different indirect rates (51.5% on-campus versus 26% off-campus), therefore the requests are made with the specifications based on the personnel allocation plan specified in the Table 6.

PI Name	Category	ON/OFF Campus	Year 1	Year 2	Year 3
Jaehoon Yu	PI	ON	100%	100%	100%
	Postdoc	ON	50%	0%	0%
	Postdoc	OFF	100%	100%	100%
	GRA	ON	50%	50%	0%
	GRA	OFF	50%	50%	100%
	UG	ON	75%	55%	75%
	UG	OFF	25%	25%	25%
Jonathan Asaadi	PI	ON	100%	100%	100%
	Postdoc	ON	50%	0%	0%
	Postdoc	OFF	100%	100%	100%
	GRA	ON	50%	50%	0%
	GRA	OFF	50%	50%	100%
	UG	ON	75%	55%	75%
	UG	OFF	25%	25%	25%

Table 6: UTA Intensity Frontier Personnel Resource Allocation Plan

Since PI Asaadi has a component of research which appears in the Detector R&D section of this proposal, we include a Table 7 which shows the breakdown of percentage effort across the frontiers. A similar table appears in the Detector R&D section for completeness.

Name and Yearly FTE for Senior Investigators with multiple HEP subprograms or Research Thrusts						
Proposal Project Period: 2017 - 2020						
Budget Period 2017-2018			Budget Period 2018-2019		Budget Period 2019-2020	
Name	Intensity Frontier	Detector R&D	Intensity Frontier	Detector R&D	Intensity Frontier	Detector R&D
Jonathan Asaadi	85%	15%	85%	15%	85%	15%

Table 7: Effort Table for Investigators with multiple HEP Subprograms in the Intensity Frontier

PI: Jaehoon Yu

1. Cumulative - 3 years

- **Senior Personnel:** Two months summer salary for Yu is requested at the current rate of \$121,607 per 9 month academic year, equivalent to \$13,512 per month for the first year and a canonical 3% cost of living adjustment is applied in subsequent years. The total request for this item is \$83,528. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%. Yu will lead the protoDUNE construction efforts, contribute to the SBND construction and installation, as well as leading analyses on ICARUS and sensitivity studies related to BSM physics for DUNE.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$54,000 per annum for the first year and a canonical 3% cost of living adjustment is applied in subsequent years. The total requested amount for this item is \$166,909. The fringe benefit rate is 30% of the request. Since it is anticipated to have the postdoctoral fellow 50% on campus and 50% off campus for tasks at CERN, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. Currently Dr. Animesh Chatterjee who has been with the group for 21 months is supported through this request. This researcher is expected to contribute to protoDUNE construction, installation, and data taking as well as analysis on the SBN
- **Graduate Students:** Support for one graduate student is requested at the base rate of \$24,000 per annum for the first year and a canonical 3% cost of living adjustment is applied in subsequent years. The total request for this item is \$74,182. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 50% on campus and 50% off campus for tasks at Fermilab, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. Yus student Garrett Brown is currently supported via teaching assistant support in the department. Yu is in the process of recruiting a couple of additional students strategically spaced in time. This student is expected to contribute to protoDUNE construction, installation, and data taking and will perform one of the cross-section analyses outlined in the proposal either on SBND or ICARUS.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project, such as systematic studies of beam line components for LBNF. A request for two undergraduate support is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$30,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students to spend 75% on campus and 25% off campus for tasks at Fermilab and at CERN during the summer, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. The undergraduate students currently in the group are R. Musser, E. Amador, M. Avilla, N. Smith and V. Cervantes.
- **Travel and Cost of Living Adjustment:** We request \$10,000 per year for travel, totalling \$30,000. In addition, COLA support for postdoctoral fellow and graduate student are requested at a total of \$46,350 subject under 26% off-campus indirect rate. Of this amount, the travel support \$15,000 is requested to be allocated to the funds at UTA and be subject to on-campus rate of 51.5% and \$15,000 be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. COLA is requested to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 for postdoc for Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.
- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140 per annum, totalling \$27,420. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum, totalling \$7,500 is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit for three year period is \$85,099.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%)

and off-campus (26%) described above is \$187,664.

- **Grand Total for Year 1:** The total request for Yu for the three year period is \$738,651.

2. Year 1

- **Senior Personnel:** Two months summer salary for Yu is requested at the current rate of \$121,607 per 9 month academic year, equivalent to \$13,512 per month. The total request for this item is \$27,024. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$54,000 per annum. The fringe benefit rate is 30% of the request. Since it is anticipated to have the postdoctoral fellow 50% on campus and 50% off campus for tasks at CERN, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. Currently Dr. Animesh Chatterjee who has been with the group for 21 months is supported through this request.
- **Graduate Students:** Support for one graduate student is requested at the base rate of \$24,000 per annum. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 50% on campus and 50% off campus for tasks at Fermilab, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. Yus student Garrett Brown is currently supported via teaching assistant support in the department. Yu is in the process of recruiting a couple of additional students strategically spaced in time.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project, such as systematic studies of beam line components for LBNF. A request for two undergraduate support is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students to spend 75% on campus and 25% off campus for tasks at Fermilab and at CERN during the summer, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. The undergraduate students currently in the group are R. Musser, E. Amador, M. Avilla, N. Smith and V. Cervantes.
- **Travel and Cost of Living Adjustment:** We request a total of \$17,950 for travel and COLA support for postdoctoral fellow and graduate student. Of this amount, the travel support \$5,000 is requested to be allocated to the funds at UTA and be subject to on-campus rate of 51.5%. Of the remaining \$12,950, we request \$5,000 to be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. The remaining \$7,950 is for COLA and is subject to off-campus rate of 26%. COLA request to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 for postdoc for Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.
- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140 per annum. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$27,557.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$66,351.
- **Grand Total for Year 1:** The grand total request for year one for Yu is \$238,522.

3. Year 2

- **Senior Personnel:** Two months summer salary for Yu is requested after applying a 3% canonical cost of living adjustment, at the rate of \$125,255 per 9 month academic year. The total request for this item is \$27,835. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$55,620 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit

rate is 30% of the request. Since it is anticipated to the postdoctoral fellow is 100% off campus for tasks 50% at Fermilab and 50% at CERN, the indirect rate for this cost is 26%.

- **Graduate Students:** Support for one graduate student is requested at the base rate of \$24,720 per annum after a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 50% on campus and 50% off campus for tasks at CERN, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost.
- **Undergraduate Students:** This request for two undergraduate support is at the base rate \$5,000. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. The proportion of undergraduates on and off campus tasks is the same as year 1, and the indirect cost is applied the same as that of year 1.
- **Travel and Cost of Living Adjustment:** We request a total of \$28,300 for travel and COLA support for postdoctoral fellow and graduate student. Of this amount, the travel support \$5,000 is requested to be allocated to the funds at UTA as in year 1. Of the remaining \$23,300, we request \$5,000 to be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. The remaining \$18,300 is for COLA and is subject to off-campus rate of 26%. COLA request to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 per month for postdoctoral fellow at Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.
It is worthwhile to note that this increase in travel cost request compared to year 1 is offset by the reduction in the indirect cost, thanks to taking advantage of the 26% off-campus rate.
- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140 per annum. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$28,358.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$61,488, reduced compared to year 1 due to the allocation of personnel to off-campus.
- **Grand Total for Year 2:** The total request for year two for Yu is \$247,962.

4. Year 3

- **Senior Personnel:** Two months summer salary for Yu is requested after applying a 3% canonical cost of living adjustment, at the rate of \$129,013 per 9 month academic year. The total request for this item is \$28,670. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$57,289 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 30% of the request. Since it is anticipated to the postdoctoral fellow is 100% off campus for tasks 50% at Fermilab and 50% at CERN, the indirect rate for this cost is 26%.
- **Graduate Students:** Support for one graduate student is requested at the base rate of \$25,462 per annum after a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% off campus for tasks at Fermilab (50%) and at CERN (50%), the applied indirect is 26% off-campus rate.
- **Undergraduate Students:** This request for two undergraduate support is at the base rate \$5,305, after a 3% canonical cost of living adjustment. The total cost for this request is \$10,610. The fringe benefit rate for an undergraduate student is 8.5%. The proportion of undergraduates on and off campus tasks is the same as year 1, and the indirect cost is also applied the same as that of year 1.
- **Travel and Cost of Living Adjustment:** We request a total of \$30,100 for travel and COLA support for postdoctoral fellow and graduate student. Of this amount, the travel support \$5,000 is requested to be allocated to the funds at UTA as in year 1. Of the remaining \$25,100, we

request \$5,000 to be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. The remaining \$20,100 is for COLA and is subject to off-campus rate of 26%. COLA request to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 per month for postdoctoral fellow at Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.

It is worthwhile to note that this increase in travel cost request compared to year 1 is offset by the reduction in the indirect cost, thanks to taking advantage of the 26% off-campus rate.

- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$29,184.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$59,825, reduced compared to year 1 or 2 due to the greater allocation of personnel on off-campus.
- **Grand Total for Year 3:** The total request for year three is \$252,168.

7.16.1 PI: Jonathan Asaadi

1. Cumulative - 3 years

- **Senior Personnel:** Two months summer salary for Asaadi is requested at the current rate of \$84,460 per 9 month academic year, equivalent to \$7,038 per month for the first year and a canonical 3% cost of living adjustment is applied in subsequent years. The total request for this item is \$58,010. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%. Asaadi will lead the SBN construction efforts, installation, and operations effort as well as play a role in the installation and commissioning of the protoDUNE single phase detector. Asaadi will focus on neutrino cross-sections from MicroBooNE and SBND.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$54,000 per annum for the first year and a canonical 3% cost of living adjustment is applied in subsequent years. During year one of the proposal, the request is for one-half of the postdoc, with the anticipation that it will take some time to hire a new person. The total requested amount for this item is \$139,909. The fringe benefit rate is 30% of the request. Since it is anticipated to have the postdoctoral fellow 50% on campus and 50% off campus for tasks at CERN, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. This postdoctoral researcher is expected to play a critical role on MicroBooNE operations and SBND construction and installation. This person is expected to help spearhead the early data analysis on SBND.
- **Graduate Students:** Support for one graduate student is requested at the base rate of \$24,000 per annum for the first year and a canonical 3% cost of living adjustment is applied in subsequent years. The total request for this item is \$74,182. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 50% on campus and 50% off campus for tasks at Fermilab, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. Asaadi's student Zach Williams is currently supported via teaching assistant support in the department. Zach will lead the coherent pion cross-section on MicroBooNE as well as play a role in SBND cold electronics testing. Asaadi is in the process of recruiting additional students strategically spaced in time.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project. A request for two undergraduate support is made at the base rate \$5,000 per student, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$30,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students to spend 75% on campus and 25% off campus for tasks at Fermilab and at CERN during the summer, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. These students are expected to help with the operation and data taking of the cold electronics test stand as well as work on simulation associated with the cross-section analyses. The undergraduate students currently in the group are Ilker Parmaksiz and Nhan Pham.
- **Travel and Cost of Living Adjustment:** We request \$10,000 per year for travel, totalling \$30,000. In addition, COLA support for postdoctoral fellow and graduate student are requested at a total of \$49,800 subject under 26% off-campus indirect rate. Of this amount, the travel support \$15,000 is requested to be allocated to the funds at UTA and be subject to on-campus rate of 51.5% and \$15,000 be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. COLA is requested to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 for postdoc for Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.
- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140 per annum, totalling \$27,420. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum, totalling \$7,500 is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit for three year period is \$69,344.

- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$153,399.
- **Grand Total for Year 1:** The total request for Asaadi for the three year period is \$639,563.

2. Year 1

- **Senior Personnel:** Two months summer salary for Asaadi is requested at the current rate of \$84,460 per 9 month academic year, equivalent to \$7,038 per month. The total request for this item is \$18,768. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request of \$27,000 for half postdoctoral fellow is made using the base salary of \$54,000 per annum. This is because we anticipate that it will take about half a year to fill the position. The fringe benefit rate is 30% of the request. Since it is anticipated to have the postdoctoral fellow is going to be located at Fermilab (25%), the indirect rate for this cost is 26% off-campus for the relevant portion of the cost.
- **Graduate Students:** Support for one graduate student is requested at the base rate of \$24,000 per annum. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 50% on campus and 50% off campus for tasks at Fermilab, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. Asaadis student, Zach Williams, is currently supported via teaching assistant support in the department. Asaadi is in the process of recruiting an additional students strategically spaced in time.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project, LArTPC slow control component work utilizing arduino based micro-controllers. A request for two undergraduate support is requested at the base rate \$5,000, equivalent t to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students to spend 75% on campus and 25% off campus for tasks at Fermilab and at CERN during the summer, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost. The undergraduate students currently in the group are Ilker Parmaksiz and Nhan Pham.
- **Travel and Cost of Living Adjustment:** We request a total of \$21,400 for travel and COLA support for postdoctoral fellow and graduate student. Of this amount, the travel support \$5,000 is requested to be allocated to the funds at UTA and be subject to on-campus rate of 51.5%. Of the remaining \$16,400, we request \$5,000 to be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. The remaining \$11,400 is for COLA and is subject to off-campus rate of 26%. COLA request to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 per month for postdoctoral fellow at Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.
- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140 per annum. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$16,980.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$43,644.
- **Grand Total for Year 1:** The total request for year one is \$173,432.

3. Year 2

- **Senior Personnel:** Two months summer salary for Asaadi is requested after applying a 3% canonical cost of living adjustment, at the rate of \$86,994 per 9 month academic year. The total request for this item is \$19,331. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$55,620 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit

rate is 30% of the request. Since it is anticipated to the postdoctoral fellow is 100% off campus for tasks 50% at Fermilab and 50% at CERN, the indirect rate for this cost is 26%.

- **Graduate Students:** Support for one graduate student is requested at the base rate of \$24,720 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 50% on campus and 50% off campus for tasks at CERN, the indirect rate for this cost is 51.5% on-campus and 26% off-campus for the relevant portion of the cost.
- **Undergraduate Students:** This request for two undergraduate support is at the base rate \$5,000. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. The proportion of undergraduates on and off campus tasks is the same as year 1, and the indirect cost is also applied the same as that of year one.
- **Travel and Cost of Living Adjustment:** We request a total of \$28,300 for travel and COLA support for postdoctoral fellow and graduate student. Of this amount, the travel support \$5,000 is requested to be allocated to the funds at UTA as in year 1. Of the remaining \$23,300, we request \$5,000 to be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA. The remaining \$18,300 is for COLA and is subject to off-campus rate of 26%. COLA request to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 per month for postdoctoral fellow at Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.
It is worthwhile to note that this increase in travel cost request compared to year 1 is offset by the reduction in the indirect cost, thanks to taking advantage of the 26% off-campus rate.
- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$25,807.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$55,795, reduced compared to year 1 due to the allocation of personnel to off-campus.
- **Grand Total for Year 2:** The total request for year two for Asaadi is \$231,214.

4. Year 3

- **Senior Personnel:** Two months summer salary for Asaadi is requested after applying a 3% canonical cost of living adjustment, at the rate of \$89,604 per 9 month academic year. The total request for this item is \$19,911. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** A request for one postdoctoral fellow is made using the base salary of \$57,289 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 30% of the request. Since it is anticipated to the postdoctoral fellow is 100% off campus for tasks 50% at Fermilab and 50% at CERN, the indirect rate for this cost is 26%.
- **Graduate Students:** Support for one graduate student is requested at the base rate of \$25,462 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% off campus for tasks at Fermilab (50%) and at CERN (50%), the applied indirect is 26% off-campus rate.
- **Undergraduate Students:** This request for two undergraduate support is at the base rate \$5,000. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. The proportion of undergraduates on and off campus tasks is the same as year 1, and the indirect cost is also applied the same as that of year 1.
- **Travel and Cost of Living Adjustment:** We request a total of \$30,100 for travel and COLA support for postdoctoral fellow and graduate student. Of this amount, the travel support \$5,000 is requested to be allocated to the funds at UTA as in year 1. Of the remaining \$25,100, we request \$5,000 to be placed in our groups LSA at Fermilab to minimize the indirect cost at UTA.

The remaining \$20,100 is for COLA and is subject to off-campus rate of 26%. COLA request to defray the cost differentials between Arlington, TX and Fermilab or CERN is computed based on \$300 per month for graduate students and \$450 per month for postdoctoral fellow at Fermilab. The rate for CERN is higher at \$1,000 per month for students and \$1,600 per month for postdoctoral fellow. These COLA rates are consistent with that of Energy Frontier program to ensure the fair treatment of the group personnel.

It is worthwhile to note that this increase in travel cost request compared to year one is offset by the reduction in the indirect cost, thanks to taking advantage of the 26% off-campus rate.

- **STEM Tuition:** Graduate student tuition support for one student is request at the rate of \$9,140. This cost does not incur indirect cost.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$26,556.
- **Total Indirect:** The total indirect cost computed using the proportion of the on-campus (51.5%) and off-campus (26%) described above is \$53,961.
- **Grand Total for Year 3:** The total request for year three is \$234,918.

7.17 Detector R&D Program Budget Justification

Preamble: This section provides the budget justifications for PIs Brandt, Nygren, Asaadi, and Jones related to the Detector R&D proposal. Detailed description for each of the items is given in Year 1. A canonical cost of living adjustment rate of 3% is applied to all salaries in the subsequent years. Therefore, Year 2 and Year 3 of the budget justification does not contain as much details as year 1 and instead the base rates and significant changes for each item and total amount are listed. Only PI Brandt is seeking any salary support from the Detector R&D activities, Nygren, Asaadi, and Jones are seeking support for personnel and M&S.

The personnel requested for these projects are: one month summer salary and half-time postdoc for PI Brandt; a half-time graduate student for PI Asaadi; a half-time graduate student for PI Jones; support for two undergraduates for PI Nygren. All tasks are carried out on campus, and thus incur an indirect rate of 51.5%.

Name and Yearly FTE for Senior Investigators with
multiple HEP subprograms or Research Thrusts

Proposal Project Period: 2017 - 2020						
Name	Budget Period 2017-2018		Budget Period 2018-2019		Budget Period 2019-2020	
	Intensity Frontier	Detector R&D	Intensity Frontier	Detector R&D	Intensity Frontier	Detector R&D
Jonathan Asaadi	85%	15%	85%	15%	85%	15%
Name	Energy Frontier	Detector R&D	Energy Frontier	Detector R&D	Energy Frontier	Detector R&D
Andrew Brandt	50%	50%	50%	50%	50%	50%

Table 8: Effort Table for Investigators with multiple HEP Subprograms

7.17.1 PI: Andrew Brandt

Cumulative - 3 years

- **Senior Personnel:** As discussed in the text and the yearly justification. Prof Brandt will oversee the development of the lifetime techniques, the construction of the test stand, interface with Photonis and LAPPD, and make sure the results are disseminated. One month summer salary for Brandt is requested at the current rate of \$110,646 per 9 month academic year, equivalent to \$12,294 per month with a 3% canonical cost of living adjustment in year two and three. The total request for this item over all three years is \$38,000. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** The post-doc will be in charge of procedures and daily operations as discussed below and in text. A request for one-half of a postdoctoral fellow in year one and two of this project is made using the base salary of \$54,000 per with a 3% canonical cost of living adjustment in year two. The total request for this item over all three years is 54,810. The fringe benefit rate is 30% of the request. Since this postdoctoral fellow will be based on campus the indirect rate for this cost is 51.5% for the relevant portion of the cost.
- **Graduate Students:** No support for a graduate student is sought in this proposal.
- **Undergraduate Students:** A request for support of two undergraduates in year three is made at the base rate \$5,000 equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is over all three years \$10,000. The fringe benefit rate for an undergraduate student is 8.5% with the indirect rate for this cost is 51.5% on-campus.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this proposal.
- **STEM Tuition:** No STEM tuition is sought in this proposal.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum in all three years is requested to support various costs. The total request for this item over all three years is \$7,500. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit over all three years \$28,693.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is over all three years is \$71,586.
- **Total for all years:** The total request for all three years for Brandt is \$210,589.

1. Year 1

- **Senior Personnel:** Prof. Brandt will be leading the MCP-PMT lifetime effort. He will meet regularly with students (supported locally) and post-doc, plan strategies, interface with Photonis and LAPPD as needed. The emphasis this year is on the lifetime method and pretesting, interpreting results. One month summer salary for Brandt is requested at the current rate of \$110,646 per 9 month academic year, equivalent to \$12,294 per month. The total request for this item is \$12,294. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** The post-doc will oversee daily operations and implement the accelerated lifetime testing plan. A request for one-half of a postdoctoral fellow is made using the base salary of \$54,000 per annum. The fringe benefit rate is 30% of the request. Since this postdoctoral fellow will be based on campus the indirect rate for this cost is 51.5% for the relevant portion of the cost.
- **Graduate Students:** No support for a graduate student is sought in this year.
- **Undergraduate Students:** No support for undergraduates is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** No STEM tuition is sought in this year.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$11,788.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$27,595.
- **Grand Total for Year 1:** The grand total request for year 1 for Brandt is \$81,177.

2. Year 2

- **Senior Personnel:** Prof. Brandt will be leading the MCP-PMT lifetime effort. He will meet regularly with students (supported locally) and post-doc, plan strategies, interface with Photonis and LAPPD as needed. The emphasis this year is on the lifetime measurements and LAPPD results. One month summer salary for Brandt is requested after applying a 3% canonical cost of living adjustment, at the rate of \$113,967 per 9 month academic year. The total request for this item is \$12,663. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.
- **Postdoctoral Researcher:** The post-doc will oversee daily operations and implement the LAPPD lifetime tests. He will work on a NIM paper with Prof. Brandt. A request for one-half of a postdoctoral fellow is made using the base salary of \$55,620 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 30% of the request. Since this postdoctoral fellow will be based on campus the indirect rate for this cost is 51.5% for the relevant portion of the cost.
- **Graduate Students:** No support for a graduate student is sought in this year.
- **Undergraduate Students:** No support for undergraduates is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** No STEM tuition is sought in this year.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$12,142.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$28,384.
- **Grand Total for Year 2:** The grand total request for year 2 for Brandt is \$83,499.

3. Year 3

- **Senior Personnel:** Prof. Brandt will be leading the MCP-PMT lifetime effort. He will meet regularly with undergraduate students supported by this grant. The post-doc is not needed, since the setup should be quite mature at this point. He will plan strategies, interface with Photonis and LAPPD as needed. The emphasis this year is on finishing the lifetime measurements and publishing results. One month summer salary for Brandt is requested after applying a 3% canonical cost of living adjustment, at the rate of \$117,387 per 9 month academic year. The

total request for this item is \$13,043. The fringe benefit rate is 30% of the request. The indirect rate for this item is the agreed on-campus rate of 51.5%.

- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** No support for a graduate student is sought in this year.
- **Undergraduate Students:** The students will do the daily operations, and finish the lifetime testing. This request for support of two undergraduates at the base rate \$5,000 equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5% with the indirect rate for this cost is 51.5% on-campus.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** No STEM tuition is sought in this year.
- **M&S:** A modest maintenance and services cost of \$2,500 per annum is requested to support various costs. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$4,763.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$15,607.
- **Grand Total for Year 3:** The grand total request for year 3 for Brandt is \$45,913.

7.17.2 PI: David Nygren

Cumulative - 3 years

- **Senior Personnel:** No salary for Nygren is sought in this proposal.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is sought in this proposal
- **Graduate Students:** No support for a graduate student is sought in this proposal.
- **Undergraduate Students:** A request for support of two undergraduates in all three years is made at the base rate \$5,000 equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is over all three years \$30,000. The fringe benefit rate for an undergraduate student is 8.5% with the indirect rate for this cost is 51.5% on-campus.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this proposal.
- **STEM Tuition:** No STEM tuition is sought in this proposal.
- **M&S:** No maintenance and services cost is requested in this proposal
- **Total Fringe Benefit:** The total cost for the fringe benefit over all three years \$2,550.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is over all three years is \$20,085.
- **Total for all years:** The total request for all three years for Nygren is \$52,635.

1. Year 1

- **Senior Personnel:** No summer salary for Nygren is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** No support for a graduate student is sought in this year.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project, running various tests, assembly and construction, and data collection. A request for two undergraduate support is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students on campus, the indirect rate for this cost is 51.5% . The undergraduate students currently in the group are I. Safa, and N. Davachi.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** No STEM tuition is sought in this year.
- **M&S:** No maintenance and services cost is requested in this year.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$850.
- **Total Indirect:** The total indirect cost using the on-campus rate (51.5%) is \$6,695.
- **Grand Total for Year 1:** The grand total request for year 1 for Nygren is \$17,545.

2. Year 2

- **Senior Personnel:** No summer salary for Nygren is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** No support for a graduate student is sought in this year.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project, running various tests, assembly and construction, and data collection. A request for two undergraduate support is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students on campus, the indirect rate for this cost is 51.5% . The undergraduate students currently in the group are I. Safa, and N. Davachi.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** No STEM tuition is sought in this year.
- **M&S:** No maintenance and services cost is requested in this year.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$850.
- **Total Indirect:** The total indirect cost using the on-campus rate (51.5%) is \$6,695.
- **Grand Total for Year 1:** The grand total request for year 2 for Nygren is \$17,545.

3. Year 3

- **Senior Personnel:** No summer salary for Nygren is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** No support for a graduate student is sought in this year.
- **Undergraduate Students:** Undergraduate students contribute to well defined tasks for the project, running various tests, assembly and construction, and data collection. A request for two undergraduate support is requested at the base rate \$5,000, equivalent to \$12.5 per hour, 10 hours a week for 40 weeks per year. The total cost for this request is \$10,000. The fringe benefit rate for an undergraduate student is 8.5%. Since it is anticipated to have undergraduate students on campus, the indirect rate for this cost is 51.5% . The undergraduate students currently in the group are I. Safa, and N. Davachi.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** No STEM tuition is sought in this year.
- **M&S:** No maintenance and services cost is requested in this year.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$850.
- **Total Indirect:** The total indirect cost using the on-campus rate (51.5%) is \$6,695.
- **Grand Total for Year 1:** The grand total request for year 3 for Nygren is \$17,545.

7.17.3 PI: Jonathan Asaadi

Cumulative - 3 years

- **Senior Personnel:** No salary for Asaadi is requested in this proposal.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request in this proposal
- **Graduate Students:** Support for one-half a graduate student is requested at the base rate of \$24,000 per annum in all three years of this proposal with a 3% canonical cost of living adjustment in year two and three. The total cost for this request over all three years is \$37,091. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5% . Asaadis student, Hunter Sullivan, is currently supported via teaching assistant support in the department and will be seeking outside support for the other half.
- **Undergraduate Students:** No support for a undergraduate student is sought in this proposal.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this proposal.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum (\$4,570 for half support). The total cost for this item in all three years is \$13,710. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$6,000 per annum is requested in all three years to support the running of the cryogenic argon facility. This request will pay for approximately 30 operating days of argon as well as filter material and supplies in each year. The total cost for this item over all three years is \$18,000. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit over all three years \$3,709.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is over all three years is \$30,282.
- **Total for all years:** The total request for all three years for Asaadi is \$102,792.

1. Year 1

- **Senior Personnel:** No summer salary for Asaadi is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** Support for one-half a graduate student is requested at the base rate of \$24,000 per annum. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5% . Asaadis student, Hunter Sullivan, is currently supported via teaching assistant support in the department and will be seeking outside support for the other one-half.
- **Undergraduate Students:** No support for a undergraduate student is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum, coming to \$4,570 for year 1. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$6,000 per annum is requested to support the running of the cryogenic argon facility. This request will pay for approximately 30 operating days of argon as well as filter material and supplies. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$1,200.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$9,888.
- **Grand Total for Year 1:** The grand total request for year 1 for Asaadi is \$33,658.

2. Year 2

- **Senior Personnel:** No summer salary for Asaadi is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** Support for one-half a graduate student is requested at the base rate of \$24,720 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5%.
- **Undergraduate Students:** No support for a undergraduate student is sought in this year.

- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum, coming to \$4,570 for year 2. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$6,000 per annum is requested to support the running of the cryogenic argon facility. This request will pay for approximately 30 operating days of argon as well as filter material and supplies. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$1,236.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$10,092.
- **Grand Total for Year 1:** The grand total request for year 2 for Asaadi is \$34,258.

3. Year 3

- **Senior Personnel:** No summer salary for Asaadi is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** Support for one-half graduate student is requested at the base rate of \$25,462 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5%.
- **Undergraduate Students:** No support for a undergraduate student is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum, coming to \$4,570 for year 3. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$6,000 per annum is requested to support the running of the cryogenic argon facility. This request will pay for approximately 30 operating days of argon as well as filter material and supplies. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$1,273.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$10,302.
- **Grand Total for Year 3:** The grand total request for year 3 for Asaadi is \$34,867.

7.17.4 PI: Benjamin Jones

Cumulative - 3 years

- **Senior Personnel:** No salary for Jones is requested in this proposal.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request in this proposal
- **Graduate Students:** Support for one-half a graduate student is requested at the base rate of \$24,000 per annum in all three years of this proposal with a 3% canonical cost of living adjustment in year two and three. The total cost for this request over all three years is \$37,091. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5% . Jones's student, still to be named, is currently supported via teaching assistant support in the department and will be seeking outside support for the other half.
- **Undergraduate Students:** No support for a undergraduate student is sought in this proposal.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this proposal.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum (\$4,570 for half support). The total cost for this item in all three years is \$13,710. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$10,000 in year one and two of this proposal and \$5,000 in year three is requested. This resource will support plate materials and associated machining, a supply of purified xeonon and argon gas, the necessary flours, solvents, and chemistry supplies for testing, and SiPM board development along with associated cables and connectors. The total cost for this item over all three years is \$25,000. This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit over all three years \$3,709.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is over all three years is \$33,887.
- **Total for all years:** The total request for all three years for Asaadi is \$113,397.

1. Year 1

- **Senior Personnel:** No summer salary for Jones is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** Support for one-half a graduate student is requested at the base rate of \$24,000 per annum. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5% . Jones student, still to be named, will be supported half from other sources.
- **Undergraduate Students:** No support for a undergraduate student is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum, coming to \$4,570 for year 1. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$10,000 in year one is requested. This resource will support the plate materials and associated machining (\$2,000), the necessary flours, solvents, and chemistry supplies (\$2,000), SiPM board development along with associated cables and connectors (\$2,500), the mechanical mounting and frame machining (\$2,500) as well as a supply of gas argon for preliminary tests (\$1,000). This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$1,200.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$11,948.
- **Grand Total for Year 1:** The grand total request for year 1 for Jones is \$39,718.

2. Year 2

- **Senior Personnel:** No summer salary for Jones is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** Support for one-half a graduate student is requested at the base rate of \$24,720 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit

rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5%.

- **Undergraduate Students:** No support for a undergraduate student is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum, coming to \$4,570 for year 2. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$10,000 in year two is requested. This resource will support further plate materials and associated machining (\$2,000), a supply of purified xenon gas (\$5,000), as well as a supply of gas argon for preliminary tests (\$1,000) the necessary flours, solvents, and chemistry supplies for continued testing (\$2,000). This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$1,236.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$12,152.
- **Grand Total for Year 1:** The grand total request for year 1 for Jones is \$40,318.

3. Year 3

- **Senior Personnel:** No summer salary for Jones is requested during this year.
- **Postdoctoral Researcher:** No support for a postdoctoral researcher is request for this year.
- **Graduate Students:** Support for one-half graduate student is requested at the base rate of \$25,462 per annum after applying a 3% canonical cost of living adjustment. The fringe benefit rate is 10% of the request. Since it is anticipated to have the graduate student 100% on campus, the indirect rate for this cost is 51.5%.
- **Undergraduate Students:** No support for a undergraduate student is sought in this year.
- **Travel and Cost of Living Adjustment:** No COLA or travel is sought in this year.
- **STEM Tuition:** Graduate student tuition support for one-half student is request at the rate of \$9,140 per annum, coming to \$4,570 for year 3. This cost does not incur indirect cost.
- **M&S:** A maintenance and services cost of \$5,000 in year three is requested to support the final tests assoiciated with the detector development. This request will pay for a supply of xenon gas (\$5,000). This request is subject to on-campus indirect rate of 51.5%.
- **Total Fringe Benefit:** The total cost for the fringe benefit is \$1,273.
- **Total Indirect:** The total indirect cost computed using the on-campus (51.5%) rate is \$9,787.
- **Grand Total for Year 3:** The grand total request for year 3 for Jones is \$33,361.

Please note: Currently we have Usai, Heelan, Chatterjee, and Griffiths as postdocs. Some or all may change during this grant period - therefore we use average postdoc salaries in the budget, and names TBD. For GRA's we currently have Akafzade, Darmora, and Bullock. Some or all may change during this grant period - therefore we use average GRA salaries in the budget. Finally, for undergraduates, the names are also subject to change throughout the grant period and we have used the average support. - The Base Salary column contains yearly rates, the Months column contains the integrated total over three years. - The Requested Salary contains the integrated request over three years, with a 3% per year inflation factor. - The Requested Fringe is calculated on the Requested Salary at the rate of 30% for postdocs, 10% for GRA's, and 8.5% for Undergraduates. - The Total Requested Cost is the sum of Requested Salary and Requested Fringe.

Name	Title	Base Salary	Person months	Requested Salary	Fringe Benefits	Total Cost
TBD	EF PD	\$54,000	36	\$166,909	\$50,073	\$216,981
TBD	EF PD	\$59,400	18	\$91,800	\$27,540	\$119,340
TBD	EF PD	\$59,400	18	\$91,800	\$27,540	\$119,340
TBD	EF PD	\$54,000	36	\$166,909	\$50,073	\$216,981
TBD	IF PD	\$54,000	36	\$166,909	\$50,073	\$216,981
TBD	IF PD	\$54,000	30	\$139,909	\$41,973	\$181,881
TBD	Det RD PD	\$54,000	12	\$54,810	\$16,443	\$71,253
TBD	EF GRA	\$24,000	24	\$49,822	\$4,982	\$54,804
TBD	EF GRA	\$24,000	36	\$74,182	\$7,418	\$81,600
TBD	EF GRA	\$24,000	18	\$37,091	\$3,709	\$40,800
TBD	EF GRA	\$24,000	24	\$49,822	\$4,982	\$54,804
TBD	EF GRA	\$24,000	24	\$49,822	\$4,982	\$54,804
TBD	IF GRA	\$24,000	24	\$49,822	\$4,982	\$54,804
TBD	IF GRA	\$24,000	24	\$49,822	\$4,982	\$54,804
TBD	Det RD GRA	\$24,000	18	\$37,091	\$3,709	\$40,800
TBD	Det RD GRA	\$24,000	18	\$37,091	\$3,709	\$40,800
TBD	EF UG	\$5,000	72	\$30,000	\$2550	\$32,550
TBD	EF UG	\$5,000	36	\$15,000	\$1,275	\$16,275
TBD	IF UG	\$5,000	72	\$30,000	\$2550	\$32,550
TBD	IF UG	\$5,000	72	\$30,000	\$2550	\$32,550
TBD	Det RD UG	\$5,000	72	\$30,000	\$2550	\$32,550

Table 1: Name, Title, Person-months, and Requested Support for all personnel.