**NIAC PHASE II BUDGET JUSTIFICATION**

|  |  |
| --- | --- |
| ***Table of Proposed Work Effort*** | |
| **Name** | **Effort** |
| PI: Christopher Walker | 8.33% |
| Co-I: Craig Kulesa | 8.33% |
| PM: Brian Duffy | 8.33% |
| Specialist: Abram Young | 16.67% |
| TBN: Graduate Research Assistant | 50% |

**Personnel**

**Christopher Walker (PI)** is a Professor in the Department of Astronomy at the University of Arizona. This budget includes 1 month of summer salary (8.33% effort) devoted to this project. Prof. Walker will lead the proposed effort, coordinate efforts between the Co-I institutions, and supervise the students working on the project.

**Craig Kulesa (Co-I)**: is currently an Associate Astronomer in Steward Observatory at the University of Arizona. Kulesa will contribute 1 month (8.33% effort) to this project. He will supervise the development of the Instrument Module.

**Brian Duffy (PM)** is currently a Project Manager in Steward Observatory at the University of Arizona. Duffy will contribute 1 month (8.33% effort) to this project, providing project management support. Management tasks are essential for the completion of the project objectives. These management tasks include but not restricted to: coordination with Steward Observatory management; local coordination of tasks and resources; documentation and planning generation; financial tracking; purchasing.

Abram Young (Specialist/Technical Research) is currently a Specialist, Technical/Research at the University of Arizona. Young will contribute 2 months (16.67% effort) to this project, providing technical expertise in the fabrication and testing of the Instrument Module.

**TBD (Graduate Research Assistant):** This student will contribute 4.5 mo/year (50% time during the academic year) to the project.

TBD (Undergraduate Student Assistant): This student will contribute 2.6 months/year (25 hours/wk x 20 weeks) to this project.

**Direct Labor:** We request funding for 1 months summer for PI Christopher Walker, Co-I Craig Kulesa, and Project Manager Brian Duffy, and 2 months for Specialist, Technical/Research Abram Young, including fringe benefits. We also request support for a graduate research student and an undergraduate research student for the life of the project, including fringe benefits.

**Operations, Fabricated Equipment:** In NIAC Phase II the UA will fabricate a prototype LBR Instrument Unit (IU). We request funds for costs associated with the fabrication of this instrument. We also request funding for research supplies and work-flow/data capture and telecommunications expenses required for the conduction of this investigation inclusive of the material costs of creating, replicating, backing up (archiving), distributing and presenting all project related documentation, memoranda, technical reports, analysis, summaries, etc. directly related to this project.

**Publication costs**: Funds are requested for 5 pages of publication in a peer-reviewed scientific journal.

**Travel:** We request support for travel. The only travel budgeted for the UA is the mandatory trips to the NIAC Symposium in 2014 and 2015. Travel costs include roundtrip airfare, lodging, per diem, and ground transportation.

**Indirect Costs:** Indirect costs are applied to all salaries, fringe benefits, materials and supplies, travel and other direct costs except capital equipment, 50% of graduate student fringe which is tuition remission, and all but the first $25,000 of each subcontract.

**Required Facilities and Equipment:** This work relies on the use of existing equipment and facilities at the University of Arizona.

**BUDGET DETAILS**

Here we propose for funding continued development of the Large Balloon Reflector (LBR) under the NIAC Phase II program. LBR will provide an unprecedented view of the Universe at THz frequencies.

This Budget Element explains the total cost the University of Arizona (UA) is expected to incur during the 1 year period of performance of this project (August 1, 2014 – July 31, 2015). The estimates include all labor costs, fabrication, research materials & services, publication costs, travel, and indirect (F&A) charges.

The UA budget will be one element in a larger budget to be submitted to the NASA ROSES-2014 NIAC Phase II Announcement of Opportunity (AO). The total project cost is approximately $500K. This proposal is being submitted as a *Multiple-Institution* proposal with the University of Arizona acting as the lead institution.

As instructed by the ROSES AO each of the Co-Investigator institutions will be requesting separate awards by independently submitting their institutional budgets and task statements. The Principal Investigator, Dr. Christopher Walker, is a UA faculty member.

The budget was calculated using 2014 dollars.

**DIRECT LABOR**

**Summary**

The labor hours applied to the research in the period specified is 2,109 labor hours. This is averages out to an average of 1.01 FTE per year for the period of performance (based on 2088 hr work year).

**Table B1: Annual Labor Breakdown**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | 2014 | 2015 | Total FTE |  |
| Faculty & Science | 0.1667 |  | 0.167 |  |
| Technical Personnel | 0.1667 |  | 0.167 |  |
| Management | 0.083 |  | 0.083 |  |
| Graduate Student | 0.25 | 0.25 | 0.50 |  |
| Undergraduate | 0.12 | 0.12 | 0.24 |  |
|  |  |  |  |  |  |

*Layout*

The UA budget uses calendar years (Jan-Dec) as the time ordinance and has been divided into the basic categories of: 1) Labor; 2) Travel; 4) Operations; 5) Indirect costs (F&A). The budget details start with the direct labor calculations for all participants that are to be directly compensated. The direct labor is calculated using the base hourly wages and the level of effort (number of hours) of each individual. The detailed budget includes the starting hourly wages (based upon April 2014 values). Year 1 direct labor is calculated using this wage. The grand total of the direct labor is the sum of all wages with the benefits.

**UA Academic and Summer Terms**

The Faculty and Student employee year is broken into the academic and the summer terms.

The academic term is 9 months, or 39 weeks in duration. The summer term is 3 months or 13 weeks in duration.

**UA Faculty and Student Academic and Summer Hours and Rates**

Faculty members are allowed a total of 464 hours of compensation during the summer term and 1600 hours during the Academic term. The faculty summer rate is calculated using 155 hours per month. The faculty hourly rate is calculated using the following formula: *Rate = (Academic Salary)\*.00072*.

Graduate students are allowed to work a total of 800 hours (89 hrs/month) during the academic term and 464 hours (155 hrs/month) during the summer term. The hourly rate is calculated using the formula: *Rate = (Academic Salary)\*.00072*.

**UA Appointed Personnel and Classified Staff Hours**

Appointed and Classified staff hourly rates are calculated using a 2088-hour work year or approximately a 174-hour work month.

**UA Project Management Support for this Project**

The project management effort will include detailed financial tracking as well as project requirements and goal tracking. The effort for these duties is over and above the typical departmental duties provided.

**Fringe Benefits Rates**

The benefits rates are listed in Table B2. The dollar value is calculated by multiplying the benefits rate to the wages earnings for the specified period.

**Table B2: Benefits Schedule**

|  |  |
| --- | --- |
| **Employee Type** | **July 2014 and beyond** |
| Faculty & Appointed Personnel | 28.6% |
| Classified Staff | 47.80% |
| Graduate Students | 63.3% (50% of which is IDC exempt) |
| Undergrad Student | 2.1% IDC |

Benefits $ = Hours x Hourly Rate x Benefit rate

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***PERSONNEL*** | **Annual** | **Labor** |  | **Year 1A** |  | **Year 1B** |  |
| *Senior Personnel* | **Salary** | **Rate** | **Hours** | **Subtotal** | **Hours** | **Subtotal** | **Total Year 1** |
| PI, Christopher Walker | $92,582 | $ 66.66 | 155 | $ 10,332 | - | $ - | **$ 10,332** |
| Co-PI, Craig Kulesa, Associate Astronomer | $58,131 | $ 27.84 | 174 | $ 4,844 | - | $ - | **$ 4,844** |
| ***Senior Personnel Subtotal*** |  |  | ***329*** | ***$ 15,176*** | ***-*** | $ - | ***$ 15,176*** |
| *Appointed Personnel* |  |  |  |  |  | $ - |  |
| Brian Duffy (PM) | $85,000 | $ 40.71 | 174 | $ 7,084 | - | $ - | **$ 7,084** |
| Abram Young, Specialist, Technical/Research | $72,800 | $ 34.87 | 348 | $ 12,135 | - | $ - | **$ 12,135** |
| ***Appointed Personnel Subtotal*** |  |  | ***522*** | ***$ 19,219*** | ***-*** | $ - | ***$ 19,219*** |
| *Undergraduate Student* |  |  |  |  |  |  |  |
| Undergraduate Student |  | $ 15.00 | 458 | $ 6,870 | 42 | $ 630 | **$ 7,500** |
| ***Undergraduate Student Subtotal*** |  |  | ***458*** | ***$ 6,870*** | ***42*** | ***$ 630*** | ***$ 7,500*** |
| *Graduate Students* |  |  |  |  |  |  |  |
| Graduate Research Assistant - AY (9-months) @ 50% FTE | $36,177 | $ 22.61 | 800 | $ 18,088 | - | $ - | **$ 18,088** |
| ***Graduate Students Subtotal*** |  |  | ***800*** | ***$ 18,088*** | ***-*** | $ - | ***$ 18,088*** |
| **LABOR SUBTOTAL** |  |  | **2,109** | **$ 59,353** | **42** | **$ 630** | **$ 59,983** |
| **FRINGE BENEFITS - Rates effective 7/1/14 and beyond** |  |  |  |  |  |  |  |
| Faculty and Appointed Personnel @ 28.6% |  |  |  | $ 9,837 |  | $ - | **$ 9,837** |
| Undergraduate Student @ 2.1% |  |  |  | $ 144 |  | $ 13 | **$ 157** |
| Graduate Students @ 63.3% (50% IDC exempt) |  |  |  | $ 11,450 |  | $ - | **$ 11,450** |
| **FRINGE BENEFITS SUBTOTAL** |  |  |  | **$ 21,431** |  | **$ 13** | **$ 21,444** |
| **PERSONNEL LABOR + FRINGE BENEFITS TOTAL** |  |  |  | **$ 80,784** |  | **$ 643** | **$ 81,427** |

**SUBCONTRACTS**

No subcontracts included in this proposal.

**DIRECT FUNDING**

As approved by the NIAC Program Manager, each of the Co-Investigator institutions will be requesting separate awards by independently submitting their institutional budgets and task statements. We attach these as part of our budget justification.

**EQUIPMENT**

No Capital Equipment is planned for purchase by the UA in NIAC Phase II.

**FABRICATED EQUIPMENT**

In NIAC Phase II the UA will fabricate a prototype LBR Instrument Unit (IU). The costs associated with the IU are listed in Table B.3.

**Table B3: NIAC Phase II Fabricated Equipment: Instrument Unit (IU)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item Name** | **Quantity** | **Price/unit** | **Total price** |
| Stepper drivers | 50 | 7 | 350 |
| Steppers (retail) | 50 | 75 | 3750 |
| Silicone/urethane/latex | 4 | 100 | 400 |
| Custom electronics board | 5 | 20 | 100 |
| Misc electronics components | 5 | 20 | 100 |
| Mold machining | 1 | 1000 | 1000 |
| Structural sheet goods | 10 | 10 | 100 |
| Stepper controller | 6 | 20 | 120 |
| Raspberry pi | 1 | 40 | 40 |
| Reflector material | 1 | 200 | 200 |
| Instrument Computer | 2 | 1000 | 2000 |
| Mount Machining |  |  | 5000 |
|  |  | **Total** | **13,160** |

**TRAVEL**

The only travel budgeted for the UA is the mandatory trips to the NIAC Symposium in 2014 and 2015. The cost estimate for the basic trip is described in detail in Table B4.

**Table B4: Travel**

|  |  |
| --- | --- |
| **Travel** | **2014 (1), 2015 (1)** |
| *Destination* | *2- NIAC Meetings* |
| Airfare | 2 x 450 |
| Lodging | 2 x315 |
| Per diem | 2 x 168 |
| Ground transport | 2 x 300 |
| **Per person totals** | **$2,466** |

**SUPPLIES, MATERIALS, & OPS**

*Research Supplies and Services*

All supplies described in this budget are charged at the indirect rates described below. We request funding for shipping **($500)**, research supplies and work-flow/data capture **($3000**), and telecommunication expenses **($150)** required for the conduction of this investigation inclusive of the material costs of creating, replicating, backing up (archiving), distributing and presenting all project related documentation, memoranda, technical reports, analysis, summaries, etc. under PI Christopher Walker’s responsibility . These costs were estimated based on historical usage for projects of this size and scope of work.

*Publication Fees*

The main product of the scientific investigation is the publication of journal papers. Estimates for publication fees have been included within the budget. The calculations are based upon the following assumptions: 1) Publication of four UA authored journal paper is expected (these papers are independent of Co-Institutions publications efforts); 2) Journal papers will be approximately 10 pages in length; 3) Journal page fees were estimated from the *Astrophysical Journal Letters* charges ($150 per page, 2007 dollars), for a total of **$750.**

**INDIRECT COSTS**

University indirect costs (Facilities & Administrative) apply to the subtotal of: 1) Direct Labor (including benefits); 2) Travel; 3) Supplies and materials (including equipment items costing under $5000). The University of Arizona defines capital equipment as equipment items costing $5000 or above.

*Indirect Cost Rates*

The following table describes the University’s indirect rates for the period of performance of this proposal.

Table B6: UA Indirect Cost Schedule

|  |  |
| --- | --- |
| **On-Campus Research Rates** | |
| 7/1/14 - 6/30/15 | 52.50% |
| 7/1/15 - 6/30/16 | 53% |
| 7/1/16 - 6/30/17 | 53.5% |

The total estimated indirect charges for this period of the program is **$48,521**

BUDGET PREPARATION

The UA Cost Element summary was

Large Balloon Reflector (LBR): NIAC Phase II

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