

**Title** Continued development of the HEAT telescope at Ridge A  
**Organization** The University of Arizona  
**PI, Co-PI** Craig A. Kulesa, Christopher K. Walker  
**Sponsor/Program** NSF AST - Advanced Technologies and Instrumentation  
**Performance Period** 10/1/2015 - 9/30/2018

	YEAR 1			YEAR 2			YEAR 3			3 YEAR TOTALS
	Year 1 Rate	Labor Hrs.	TOTAL YEAR 1	Year 2 Rate	Labor Hrs.	TOTAL YEAR 2	Year 3 Rate	Labor Hrs.	TOTAL YEAR 3	
<b>PERSONNEL</b>										
<b>Appointed Personnel</b>										
Kulesa, Craig - PI	\$ 27.84	696	\$ 19,377	\$ 28.76	1,044	\$ 30,024	\$ 29.71	1,044	\$ 31,015	\$ 80,416
Walker, Christopher - Co-I	\$ 66.66	80	\$ 5,333	\$ 68.86	160	\$ 11,018	\$ 71.13	160	\$ 11,381	\$ 27,732
Abram Young - systems lead	\$ 34.87	696	\$ 24,270	\$ 36.02	1,044	\$ 37,606	\$ 37.21	348	\$ 12,949	\$ 74,824
<b>Appointed Personnel Subtotal</b>		<b>1,472</b>	<b>\$ 48,979</b>		<b>2,248</b>	<b>\$ 78,647</b>		<b>1,552</b>	<b>\$ 55,345</b>	<b>\$ 182,971</b>
<b>Classified Staff Subtotal</b>										
Electrical Engineer (1 mo, Y2)	\$ 29.93	-	\$ -	\$ 30.92	160	\$ 4,947	\$ 31.94	-	\$ -	\$ 4,947
Mechanical Engineer (1 mo, Y2)	\$ 33.52	-	\$ -	\$ 34.63	160	\$ 5,540	\$ 35.77	-	\$ -	\$ 5,540
<b>Classified Staff Subtotal</b>		<b>-</b>	<b>\$ -</b>		<b>320</b>	<b>\$ 10,487</b>		<b>-</b>	<b>\$ -</b>	<b>\$ 10,487</b>
<b>Undergraduate Student</b>										
Undergrad (summer)	\$ 12.00	200	\$ 2,400	\$ 12.40	200	\$ 2,479	\$ 12.81	200	\$ 2,561	\$ 7,440
<b>Undergraduate Student Subtotal</b>		<b>200</b>	<b>\$ 2,400</b>		<b>200</b>	<b>\$ 2,479</b>		<b>200</b>	<b>\$ 2,561</b>	<b>\$ 7,440</b>
<b>Graduate Students</b>										
Graduate Research Assistant - AY (1 semester) @ 50% F	\$ 22.61	400	\$ 9,044	\$ 23.36	400	\$ 9,343	\$ 24.13	400	\$ 9,651	\$ 28,038
Graduate Research Assistant - summer (1.5-months) @ 1	\$ 26.05	232	\$ 6,043	\$ 26.91	232	\$ 6,242	\$ 27.79	232	\$ 6,448	\$ 18,734
<b>Graduate Students Subtotal</b>		<b>632</b>	<b>\$ 15,087</b>		<b>632</b>	<b>\$ 15,585</b>		<b>632</b>	<b>\$ 16,099</b>	<b>\$ 46,772</b>
<b>Labor Subtotal</b>		<b>2,304</b>	<b>\$ 66,466</b>		<b>3,400</b>	<b>\$ 107,199</b>		<b>2,384</b>	<b>\$ 74,005</b>	<b>\$ 247,670</b>
<b>FRINGE BENEFITS - Rates effective 7/1/13 and beyond</b>										
Faculty and Appointed Personnel @ 28.6%	\$ 48,979	\$ 14,008	\$ 62,987	\$ 78,647	\$ 22,493	\$ 101,140	\$ 55,345	\$ 15,829	\$ 67,174	\$ 168,314
Classified Staff @ 47.8%	\$ -	\$ -	\$ -	\$ 4,947	\$ 2,365	\$ 7,312	\$ -	\$ -	\$ -	\$ 2,365
Undergraduate Student @ 2.1%	\$ 2,400	\$ 50	\$ 2,450	\$ 2,479	\$ 52	\$ 2,531	\$ 2,561	\$ 54	\$ 2,615	\$ 7,538
Graduate Students @ 63.3% (50.0% IDC exempt)	\$ 15,087	\$ 9,550	\$ 24,637	\$ 15,585	\$ 9,865	\$ 25,450	\$ 16,099	\$ 10,191	\$ 26,290	\$ 51,740
<b>Fringe Benefits Subtotal</b>		<b>\$ 23,609</b>	<b>\$ 93,550</b>		<b>\$ 34,775</b>	<b>\$ 138,356</b>		<b>\$ 26,073</b>	<b>\$ 84,457</b>	<b>\$ 237,183</b>
<b>Personnel Labor + ERE Totals</b>			<b>\$ 90,075</b>			<b>\$ 141,974</b>			<b>\$ 100,079</b>	<b>\$ 332,127</b>
<b>OTHER DIRECT COSTS</b>										
<b>OPERATIONS</b>										
Instrument/facility/data archive maintenance and repairs		\$ 10,000	\$ 10,000		\$ 10,000	\$ 10,000		\$ 500	\$ 500	\$ 20,500
Electronics upgrades to accommodate new receivers		\$ 5,000	\$ 5,000		\$ 2,500	\$ 2,500		-	-	\$ 7,500
Conference Registration (2/year)		\$ 450	\$ 450		\$ 465	\$ 465		\$ 480	\$ 480	\$ 1,395
Publication costs charges (3 papers x 8 pages x \$110 in each year)		\$ 2,640	\$ 2,640		\$ 2,727	\$ 2,727		\$ 2,817	\$ 2,817	\$ 8,184
Shipping costs to Antarctica and back		\$ 3,000	\$ 3,000		\$ 3,000	\$ 3,000		\$ 1,500	\$ 1,500	\$ 7,500
<b>TRAVEL</b>		<b>\$ 3,400</b>	<b>\$ 3,400</b>		<b>\$ 3,512</b>	<b>\$ 3,512</b>		<b>\$ 3,628</b>	<b>\$ 3,628</b>	<b>\$ 10,540</b>
<i>2 persons: domestic conference, annual Antarctic deployment</i>										
		Domestic	International		Domestic	International		Domestic	International	
Airfare (\$400 roundtrip)	\$	800	\$ -	\$	826	\$ -	\$	854	\$ -	
Lodging (\$100/night x 4 nights)	\$	800	\$ 800	\$	826	\$ 826	\$	854	\$ 854	
Per diem (\$50/day x 5 days)	\$	500	\$ 500	\$	517	\$ 517	\$	534	\$ 534	
<b>Total per trip</b>	\$	<b>2,100</b>	<b>\$ 1,300</b>	\$	<b>2,169</b>	<b>\$ 1,343</b>	\$	<b>2,241</b>	<b>\$ 1,387</b>	
<b>CAPITAL EQUIPMENT</b>		<b>\$ 148,171</b>	<b>\$ 148,171</b>		<b>\$ 155,000</b>	<b>\$ 155,000</b>		<b>\$ -</b>	<b>\$ -</b>	<b>\$ 303,171</b>
4K dual closed-cycle cryostat, 1 per telescope		\$ 45,000	\$ 45,000		\$ 45,000	\$ 45,000		-	-	\$ 135,000
1.5 THz LO source, Virginia Diodes Inc		-	\$ 80,000		\$ 80,000	\$ 80,000		-	-	\$ 160,000
Two HEB mixers, SRON (25k EUR to USD)		\$ 31,671	\$ 31,671		-	-		-	-	\$ 63,342
ROACH2 FFT spectrometer plus 10Gbit ethernet & ADC boards		\$ 7,500	\$ 7,500		-	-		-	-	\$ 15,000
PLATO-R annual replacement modules		\$ 30,000	\$ 30,000		\$ 30,000	\$ 30,000		-	-	\$ 90,000
Diamond-turned THz mirrors for existing 2nd telescope		\$ 34,000	\$ 34,000		-	-		-	-	\$ 68,000
<b>Total Other Direct Costs</b>		<b>\$ 172,661</b>	<b>\$ 172,661</b>		<b>\$ 177,204</b>	<b>\$ 177,204</b>		<b>\$ 8,925</b>	<b>\$ 8,925</b>	<b>\$ 358,791</b>
<b>TOTAL DIRECT COSTS</b>		<b>\$ 262,736</b>	<b>\$ 262,736</b>		<b>\$ 319,178</b>	<b>\$ 319,178</b>		<b>\$ 109,004</b>	<b>\$ 109,004</b>	<b>\$ 690,918</b>
<b>INDIRECT COSTS - 52.5%, effective 7/1/14</b>										
<b>53.0%, effective 7/1/15</b>										
<b>53.5%, effective 7/1/16</b>										
MTDC BASE = Total Direct Costs (TDC) less capital equipment, less Tuition Remission (50.0% of Graduate Student fringe), and on first \$25K of EACH subcontract										
Flat spending profile puts 75% of MTDC of Y1 under UA FY2015 rates, 25% of Y1 under UA FY2016 rates. Similar for Y2. Y3 falls under UA FY2017 rates only.										
		MTDC Base	IDC		MTDC Base	IDC		MTDC Base	IDC	
Base (on salaries, operations, travel)	\$	107,021	\$ 56,855	\$	156,385	\$ 83,666	\$	100,954	\$ 54,011	
<b>Total Indirect Costs</b>		<b>\$ 56,855</b>	<b>\$ 56,855</b>		<b>\$ 83,666</b>	<b>\$ 83,666</b>		<b>\$ 54,011</b>	<b>\$ 54,011</b>	<b>\$ 194,532</b>
<b>TOTAL PROJECT COSTS</b>		<b>\$ 319,591</b>	<b>\$ 319,591</b>		<b>\$ 402,844</b>	<b>\$ 402,844</b>		<b>\$ 163,015</b>	<b>\$ 163,015</b>	<b>\$ 885,450</b>

**YEAR 1**

Destination	# People	# Days	Airfare		Per Diem
			\$ Each	\$ Total	\$ Each *
Domestic - We	0	0	265	0	182
Domestic - Ea	0	0	410	0	262
Domestic - Mi	0	0	449	0	137
International	0	0	1897	0	535

**YEAR 2**

Destination	# People	# Days	Airfare		Per Diem
			\$ Each	\$ Total	\$ Each *
Domestic - We	0	0	274	0	188
Domestic - Ea	0	0	424	0	271
Domestic - Mi	0	0	464	0	142
International	0	0	1960	0	553

**YEAR 3**

Destination	# People	# Days	Airfare		Per Diem
			\$ Each	\$ Total	\$ Each *
Domestic - We	0	0	283	0	194
Domestic - Ea	0	0	438	0	280
Domestic - Mi	0	0	479	0	147
International	0	0	2025	0	571

\$ Total	Car Rental		Subtotal	# Trips	Grand Total
	\$ Per Day *	\$ Total			
0	105	0	0	0	0
0	85	0	0	0	0
0	57	0	0	0	0
0	105	0	0	0	0
					0

\$ Total	Car Rental		Subtotal	# Trips	Grand Total
	\$ Per Day *	\$ Total			
0	108	0	0	0	0
0	88	0	0	0	0
0	59	0	0	0	0
0	108	0	0	0	0
					0

\$ Total	Car Rental		Subtotal	# Trips	Grand Total
	\$ Per Day *	\$ Total			
0	112	0	0	0	0
0	91	0	0	0	0
0	61	0	0	0	0
0	112	0	0	0	0
					0