Proposal for *Chandra* Observations **Cycle 10**

Cover Page

Principal Investigator Mr. Kenneth Cavagnolo		
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Institute Michigan State University		
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State / Province MI	**Zip / Postal Code** 48912	**Country** USA
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E-Mail Address: cavagnolo@pa.msu.edu		

Proposal Title The Hyperluminous Infrared Galaxy IRAS 09104+4109: An Extreme Brightest Cluster Galaxy			
Subject Category CLUSTERS OF GALAXIES			
Proposal Type GO	**Linked Proposal** N	**Distr. Medium** WWW ONLY	**Proprietary Rights** S
Total Requested Time 75.00	**Number of Targets** 1		**Proposed Budget**

Joint Proposal?	
HST Orbits	**HST Instruments:**
XMM Time	**RXTE Time:**
NOAO Nights?	**NOAO Telescope/Instruments:**
NRAO Hours	**NRAO Telescopes**

Abstract

We propose a detailed study of the hyperluminous infrared BCG IRAS 09104+4109. This BCG is in the rich cluster MACS J0913.7+4056, and likely hosts a ‘‘changing-look’’ AGN and the highest redshift AGN blown bubbles known to date. The environment of the BCG is best described as extreme, with cannibalized companion galaxies, the most powerful radio source of any IRAS object, and an AGN which has established a new beaming direction in the last 70 kyrs. Understanding the relationship of the BCG, AGN, and ICM in this peculiar and unique object will aide in developing better models for coupling together galaxy formation, AGN feedback, and large scale cluster environment. IRAS 09104+4109 is an ideal test case of a very short-lived but highly active stage of cluster and central galaxy formation.

Proposal Number 10800519 Date: 2008-03-20 Admin. use only

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General Form

PI	Mr. Kenneth Cavagnolo
Proposal Title	The Hyperluminous Infrared Galaxy IRAS 09104+4109: An Extreme Brightest Cluster Galaxy

Co-Investigator(s)

First Name Last Name	E-Mail Institute	Country
Megan Donahue	donahue@pa.msu.edu Michigan State University	USA
Mark Voit	voit@pa.msu.edu Michigan State University	USA
Ming Sun	sunm@pa.msu.edu Michigan State University	USA

Are there additional Co-Is listed in the science justification? N

Is the first Co-I doing observing, rather than the PI? N **Telephone:**

Institute Endorsement

Name of Administrator	Katherine Cook
Administrative Authority	Senior Contracts and Grants Administrator
Administrative Institute	Michigan State University
Admin Signature:	**Date:**
PI Signature:	**Date:**

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Target Summary

PI Mr. Kenneth Cavagnolo

Proposal Title
The Hyperluminous Infrared Galaxy IRAS 09104+4109: An Extreme Brightest Cluster Galaxy

Tar No	Target Name / Solar System Object / Grid Name / Target Description (keywords)	(J2000) R.A. Dec.	Offsets Y Detector Z Detector SIM Trans	Optical Monitor V-Mag	Observ. Time (ksec)	Detector Grating HRC Timing	(c/s) Count Rate 1st Order Total Fld.	Time-Constr? Ext.Src?	Grid #Points MaxDist.
1	IRAS 09104+4109 NONE IR-LUMINOUS GALAXIES; INTRACLUSTER MEDIUM	09 13 45.5 +40 56 29.0		N	75.0000	ACIS-I NONE N	0.538000	P Y	N

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ACIS Parameters (Required, Pileup, Telemetry Parameters)

PI Mr. Kenneth Cavagnolo

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Tar No.	Exposure Mode / Telemetry. Format	CCDs On I0 S0	I1 S1	I2 S2	I3 S3	S4	S5	Most Eff. CCD Time	Subarray Type	StartRow	No.Rows	Alternating Exposures Y/N	Nbr. Rows Exp.Time	Energy Filter Y/N	Lower Thresh. Range	Spectra Max Count	Mult. Lines
1	TE		Y	Y	Y	Y		Y	NONE			N		N		40000.00	Y
	VF	N	N	Y	Y	N	N										

ACIS Parameters (Custom:Telemetry Overflow Parameters)

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	Spatial Windows											
Tar No	Or-der	Chip	Type	Start Row	Start Col	Width	Height	Lower Threshold	Enery Range	Sample Rate	Additional Spatial Windows

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Target Constraints

PI	Mr. Kenneth Cavagnolo
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	Window Constraint			**Roll Constraints**				**Phase Dependent Observations**			
Tar No	Flag	Start Time	Stop Time	Flag	180?	Angle (degrees)	Tolerance (degrees)	Flag	Epoch(MJD) Period(days)	Min.Phase Min.Error	Max.Phase Max.Error
1	N			N	N			N			
	N			N	N						
	N			N	N						
	N			N	N						

	Monitoring Observations					**Group Observations**			**Un-interrupt?**	**Coordinated**		**Add. Constraints**
Tar No	Flag	No.	Geometric Factor	Interval (days)	Tolerance (%)	Flag	Group ID	Interval (days)		Flag	Interval (days)	
1	N	1	1.000			N			P	N		N

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TOO Details

PI	Mr. Kenneth Cavagnolo
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Tar No	Trig-ger?	Alternates Group Name	Nbr. Req.	Response Window Type (days)	Start	Stop	Prob-ability	Initial Alloc.	**Followup Observations** Order	Obs. Time	Interval (days)	Tolerance (%)	Obs.Params specified by Target No.
									1				
									2				
									3				
									4				
									5				
									6				
									7				
									8				

TOO Trigger Criteria

TOO Followup Instructions

If this TOO is a resubmission of a proposal approved in the previous Cycle, should this TOO be canceled if the previous Cycle TOO is triggered?

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Target Remarks

PI	Mr. Kenneth Cavagnolo
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Tar No	Remarks Coordinated Observation: Observatories