



## 12012 - Binary Formation in the Sparse Galactic Globular Cluster NGC 3201

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

| <i>Name</i>                         | <i>Institution</i>                | <i>E-Mail</i>                 |
|-------------------------------------|-----------------------------------|-------------------------------|
| <b>Dr. Gregory R. Sivakoff (PI)</b> | <b>The University of Virginia</b> | <b>gsivakoff@virginia.edu</b> |
| Dr. Ryan Lynch (CoI)                | The University of Virginia        | rsl4v@virginia.edu            |
| Dr. Craig Heinke (CoI)              | University of Alberta             | cheinke@phys.ualberta.ca      |
| Dr. Natasha Ivanova (CoI)           | University of Alberta             | nata.astro@gmail.com          |
| Dr. Scott M. Ransom (CoI)           | Associated Universities, Inc.     | sransom@nrao.edu              |
| Dr. Craig L. Sarazin (CoI)          | The University of Virginia        | sarazin@virginia.edu          |

### VISITS

| <i>Visit</i> | <i>Targets used in Visit</i> | <i>Configurations used in Visit</i> | <i>Orbits Used</i> | <i>Last Orbit Planner Run</i> | <i>OP Current with Visit?</i> |
|--------------|------------------------------|-------------------------------------|--------------------|-------------------------------|-------------------------------|
| 01           | (1) NGC-3201                 | ACS/WFC                             | 1                  | 23-Oct-2009 21:50:34.0        | yes                           |

1 Total Orbits Used

### ABSTRACT

Bright X-ray sources in globular clusters, X-ray binaries, cataclysmic variables, active binaries, and millisecond pulsars, are all binary systems or thought to be the products of such systems. Studies of X-ray sources in GCs thus probe binary formation. Most past observations have concentrated on dense GCs; these systems show clear evidence for strong dynamical formation of binaries; however, sparse clusters seem to fall off this pattern. Potential explanations include, among others, primordial binary formation and a misunderstanding of the dynamical state of some GCs. We propose

an 85 ks ACIS-S observation of NGC~3201, the nearest sparse GC unobserved by Chandra to test these explanations. We request 1 orbit of HST to discriminate CVs from ABs, and 1 hour of GBT time to search for MSPs.

### **OBSERVING DESCRIPTION**

We request a single orbit of F435W (B) imaging with HST to provide B-V colors. We choose ACS for its high sensitivity. The orbit is packed with one short exposure to avoid saturation for giant stars below the red clump, four long exposures using a box dither designed to avoid saturation for stars below the main sequence turnover. We also add a second 405 F606W exposure (to double the existing data). We will reach approximately 8 magnitudes below the main sequence in B. This will match the depth in F606W for typical CV spectra (~A0), and would reach deep enough to identify the majority of CVs seen in 47 Tuc. Thus, these HST observations will significantly increase the utility of our proposed Chandra observations by allowing us to differentiate CVs from chromospherically active binaries.

### **ADDITIONAL COMMENTS**

If possible, we request an orientation and position that matches close to Datasets J9L946010/J9L946020 to maximize coverage when making color magnitude diagrams.

Proposal 12012 - Visit 01 - Binary Formation in the Sparse Galactic Globular Cluster NGC 3201

Sat Oct 24 01:50:38 GMT 2009

| Visit         | <b>Proposal 12012, Visit 01</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: ACS/WFC<br>Special Requirements: (none) |                     |  |   |               |                       |               |  |                         |       |
|---------------|--|---------------------|--|---|---------------|-----------------------|---------------|--|-------------------------|-------|
|               | Patterns   | #                   | Primary Pattern  |   |               | Secondary Pattern     |               |  | Exposures               |       |
|               |  | (1)                 | Pattern Type=ACS-WFC-DITHER-BOX<br>Purpose=DITHER<br>Number Of Points=4<br>Point Spacing=0.265<br>Line Spacing=0.187 | Coordinate Frame=POS-TARG<br>Pattern Orientation=20.67<br>Angle Between Sides=69.05<br>Center Pattern=false |               |                       |               |  | (2)                     |       |
| Fixed Targets | #  | Name                | Target Coordinates   | Targ. Coord. Corrections  | Fluxes        | Miscellaneous         |               |  |                         |       |
|               | (1)  | NGC-3201            | RA: 10 17 36.7600 (154.4031667d)<br>Dec: -46 24 40.40 (-46.41122d)<br>Equinox: J2000                                 |   | V=8.24        | Reference Frame: ICRS |               |  |                         |       |
|               | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>                                       |                     |  |   |               |                       |               |  |                         |       |
| Exposures     | #  | Label               | Target   | Config,Mode,Aperture  | Spectral Els. | Opt. Params.          | Special Reqs. | Groups   | Exp. Time/[Actual Dur.] | Orbit |
|               | 1  |                     | (1) NGC-3201   | ACS/WFC, ACCUM, WFC   | F435W         |                       |               |  | 30 Secs                 |       |
|               |  |                     |  |   |               |                       |               |  | [==>]                   | [1]   |
|               | 2  | Long Box D<br>ither | (1) NGC-3201   | ACS/WFC, ACCUM, WFC   | F435W         |                       |               | Pattern 1, Exps 2-2 (1)  | 360 Secs                |       |
|               |  |                     |  |   |               |                       |               | [==>(Pattern 1)]<br>[==>(Pattern 2)]<br>[==>(Pattern 3)]<br>[==>(Pattern 4)] | [1]                     |       |
| 3             |  | (1) NGC-3201        | ACS/WFC, ACCUM, WFC  | F606W   |               |                       |               | 405 Secs   |                         |       |
|               |  |                     |  |   |               |                       |               | [==>]  | [1]                     |       |

