



## 13102 - Zooming in on the Starburst at the Core of the Phoenix Cluster

Cycle: 19, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

### INVESTIGATORS

| <i>Name</i>                                | <i>Institution</i>                           | <i>E-Mail</i>                 |
|--------------------------------------------|----------------------------------------------|-------------------------------|
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### 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) PHOENIX-A                | WFC3/UVIS                           | 1                  | 17-Aug-2012 21:11:38.0        | yes                           |
| 02           | (1) PHOENIX-A                | WFC3/UVIS                           | 1                  | 17-Aug-2012 21:11:47.0        | yes                           |

2 Total Orbits Used

### ABSTRACT

In a recently published letter to Nature, we report the discovery of the most X-ray luminous galaxy cluster in the known Universe, within which the intracluster medium is cooling at an unprecedented rate. In the core of this cluster, the brightest cluster galaxy is forming stars at an unmatched rate of 740 Msun/yr, which is highly unusual for this class of galaxy which are typically referred to as "red and dead". We suspect that the extreme cooling and star formation rates are intimately linked: the cooling intracluster gas is most likely providing fuel for the starburst. We request 2 orbits of near-UV and optical broadband WFC3-UVIS imaging in order to morphologically classify this starburst as a result of i) cooling, infalling gas (filamentary UV emission); ii) a recent merger (tidal tails with both UV and optical emission); or iii) a starburst- or AGN-driven wind (wide opening angle). These data will also allow us to determine the stellar populations of both the starburst and the underlying, older stellar populations, and will

provide a much sharper view of the central AGN, allowing us to more carefully extract the contribution to the extended UV emission from young stars. Our early results have already received substantial attention from the international press, and we expect that a dramatically improved picture of the heart of this cluster would stir up as much, if not more, interest from the public.

### **OBSERVING DESCRIPTION**

Straightforward broad-band imaging in 2x near-UV filters (F225W, F336W) and 3x optical filters (F475W, F625W, F814W). We use a 2-pt dither pattern, since our exposures are <1000s and we are concerned with maximizing S/N.

Since our target is relatively small, we opt to use a single quadrant (80"x80") in order to reduce read-out time.

# Proposal 13102 - Visit 01 - Zooming in on the Starburst at the Core of the Phoenix Cluster

|                 |                                          |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              |                          |
|-----------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------|--------------------------|-------------------|-----------------------|-------------------------------------|--------------------------------------------------|-----------|------------------------------|--------------------------|
| Visit           | Proposal 13102, Visit 01, implementation |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           | Sat Aug 18 01:11:54 GMT 2012 |                          |
|                 | Diagnostic Status: No Diagnostics        |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              |                          |
|                 | Scientific Instruments: WFC3/UVIS        |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              |                          |
|                 | Special Requirements: BEFORE 01-DEC-2012 |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              |                          |
| Patterns        | #                                        | Primary Pattern                                                                                                                                                                                                              |                                                                                      |                                  |                          | Secondary Pattern |                       |                                     |                                                  | Exposures |                              |                          |
|                 | (1)                                      | Pattern Type=WFC3-UVIS-DITHER-LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.145<br>Line Spacing=<br>Coordinate Frame=POS-TARG<br>Pattern Orientation=46.84<br>Angle Between Sides=<br>Center Pattern=false |                                                                                      |                                  |                          |                   |                       |                                     |                                                  | (1), (2)  |                              |                          |
| Fixed Targets   | #                                        | Name                                                                                                                                                                                                                         | Target Coordinates                                                                   |                                  | Targ. Coord. Corrections |                   | Fluxes                |                                     | Miscellaneous                                    |           |                              |                          |
|                 | (1)                                      | PHOENIX-A                                                                                                                                                                                                                    | RA: 23 44 43.9368 (356.1830700d)<br>Dec: -42 43 12.80 (-42.72022d)<br>Equinox: J2000 |                                  |                          |                   | V=17.3+/-0.3          |                                     | Reference Frame: ICRS                            |           |                              |                          |
| Exposures       | #                                        | Label                                                                                                                                                                                                                        | Target                                                                               | Config,Mode,Aperture             | Spectral Els.            | Opt. Params.      | Special Reqs.         | Groups                              | Exp. Time/[Actual Dur.]                          |           | Orbit                        |                          |
|                 | 1                                        |                                                                                                                                                                                                                              | (1) PHOENIX-A                                                                        | WFC3/UVIS, ACCUM, UVIS1-2K2A-SUB | F225W                    |                   | POS TARG 8.02,-12 .03 | Pattern 1, Exps 1-1 in Visit 01 (1) | 608 Secs<br>[==>(Pattern 1)]<br>[==>(Pattern 2)] |           | [1]                          |                          |
|                 | 2                                        |                                                                                                                                                                                                                              | (1) PHOENIX-A                                                                        | WFC3/UVIS, ACCUM, UVIS1-2K2A-SUB | F336W                    |                   | POS TARG 8.02,-12 .03 | Pattern 1, Exps 2-2 in Visit 01 (1) | 608 Secs<br>[==>(Pattern 1)]<br>[==>(Pattern 2)] |           | [1]                          |                          |
|                 |                                          |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              |                          |
| Orbit Structure | Orbit 1                                  |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              | Server Version: 20120802 |
|                 |                                          |                                                                                                                                                                                                                              |                                                                                      |                                  |                          |                   |                       |                                     |                                                  |           |                              |                          |

# Proposal 13102 - Visit 02 - Zooming in on the Starburst at the Core of the Phoenix Cluster

|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         |                         |       |
|---------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------|--------------------------|-------------------|--------------------------|-----------------------------------------|-------------------------|-------|
| Visit         | <b>Proposal 13102, Visit 02, implementation</b> <span style="float: right;">Sat Aug 18 01:11:55 GMT 2012</span>           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         |                         |       |
|               | <b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFC3/UVIS<br>Special Requirements: BEFORE 01-DEC-2012 |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         |                         |       |
| Patterns      | #                                                                                                                         | Primary Pattern                                                                                                                                                                                                                  |                                                                                      |                                     |                          | Secondary Pattern |                          |                                         | Exposures               |       |
|               | (1)                                                                                                                       | Pattern Type=WFC3-UVIS-DITHER-<br>LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.145<br>Line Spacing=<br>Coordinate Frame=POS-TARG<br>Pattern Orientation=46.84<br>Angle Between Sides=<br>Center Pattern=false |                                                                                      |                                     |                          |                   |                          |                                         | (1), (2), (3)           |       |
| Fixed Targets | #                                                                                                                         | Name                                                                                                                                                                                                                             | Target Coordinates                                                                   |                                     | Targ. Coord. Corrections |                   | Fluxes                   |                                         | Miscellaneous           |       |
|               | (1)                                                                                                                       | PHOENIX-A                                                                                                                                                                                                                        | RA: 23 44 43.9368 (356.1830700d)<br>Dec: -42 43 12.80 (-42.72022d)<br>Equinox: J2000 |                                     |                          |                   | V=17.3+/-0.3             |                                         | Reference Frame: ICRS   |       |
| Exposures     | #                                                                                                                         | Label                                                                                                                                                                                                                            | Target                                                                               | Config,Mode,Aperture                | Spectral Els.            | Opt. Params.      | Special Reqs.            | Groups                                  | Exp. Time/[Actual Dur.] | Orbit |
|               | 1                                                                                                                         |                                                                                                                                                                                                                                  | (1) PHOENIX-A                                                                        | WFC3/UVIS, ACCUM,<br>UVIS1-2K2A-SUB | F475W                    |                   | POS TARG 8.02,-12<br>.03 | Pattern 1, Exps 1-1 i<br>n Visit 02 (1) | 344 Secs                |       |
|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         | [==>(Pattern 1)]        | [1]   |
|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         | [==>(Pattern 2)]        |       |
|               | 2                                                                                                                         |                                                                                                                                                                                                                                  | (1) PHOENIX-A                                                                        | WFC3/UVIS, ACCUM,<br>UVIS1-2K2A-SUB | F625W                    |                   | POS TARG 8.02,-12<br>.03 | Pattern 1, Exps 2-2 i<br>n Visit 02 (1) | 344 Secs                |       |
|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         | [==>(Pattern 1)]        | [1]   |
|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         | [==>(Pattern 2)]        |       |
|               | 3                                                                                                                         |                                                                                                                                                                                                                                  | (1) PHOENIX-A                                                                        | WFC3/UVIS, ACCUM,<br>UVIS1-2K2A-SUB | F814W                    |                   | POS TARG 8.02,-12<br>.03 | Pattern 1, Exps 3-3 i<br>n Visit 02 (1) | 344 Secs                |       |
|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         | [==>(Pattern 1)]        | [1]   |
|               |                                                                                                                           |                                                                                                                                                                                                                                  |                                                                                      |                                     |                          |                   |                          |                                         | [==>(Pattern 2)]        |       |

