



15414 - Confirming Extreme Lyman Continuum Emission in a $z=3.27$ Star-Forming Galaxy

Cycle: 25, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) GS-MUSE-LYC ANY | ACS/WFC WFC3/UVIS | 2 | 08-Dec-2017 17:14:27.0 | yes |
| 02 | (1) GS-MUSE-LYC ANY | ACS/WFC WFC3/UVIS | 2 | 08-Dec-2017 17:14:29.0 | yes |

| <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> |
|--------------|------------------------------|-------------------------------------|--------------------|-------------------------------|-------------------------------|
| 03 | (1) GS-MUSE-LYC ANY | ACS/WFC WFC3/UVIS | 1 | 08-Dec-2017 17:14:30.0 | yes |

5 Total Orbits Used

ABSTRACT

Identifying the drivers of cosmic reionization ("Lyman Continuum (LyC)" leakers) is an open frontier in observational cosmology. Star-forming galaxies are leading candidates, provided their critical parameter " f_{esc} " (the fraction of ionizing photons escaping to the IGM) is found to exceed 10-20%. Since the opaque IGM precludes direct observations of f_{esc} at $z > 6$, extensive searches for low- z LyC leakers have been mounted. These sources, however, have proven notoriously elusive--only three have been found at $z > 0.5$. We propose to confirm LyC emission from a new, promising candidate (GS15601) at $z_{\text{spec}} = 3.2705 \pm 0.0007$, which would be the highest redshift and most extreme LyC leaker so far. GS15601 was detected in deep F336W WFC3/UVIS imaging in our HDUV survey which directly probes LyC emission at $z > 3$. Detailed simulations show that its high F336W LyC flux implies an extreme LyC output, a very high $f_{\text{esc}} > 50\%$, and an almost transparent IGM line of sight. Unfortunately, GS15601 was imaged by a detector region with poor charge transfer efficiency (CTE)--its flux is robustly recovered but S/N is lost. Given the potentially extraordinary physical situation in GS15601, and the systematic uncertainties introduced by CTE loss correction and cosmic ray cleaning, we seek independent confirmation of this high LyC flux measurement with a small amount of additional F336W data. If confirmed, GS15601 will give us the rare chance to study the physics of LyC escape and calibrate indirect methods of inferring f_{esc} from UV and optical lines--these indirect methods are our only hope of measuring f_{esc} at $z > 6$ with JWST and solving the puzzle of cosmic reionization.

OBSERVING DESCRIPTION

This program aims to obtain a robust F336W flux measurement for a $z = 3.27$ galaxy. The current flux we measure is significantly affected by charge transfer inefficiency. In this program we will place GS15601 close to the edge of the detector (15" from the UVIS2 pointing position), hence minimizing charge transfer and providing an independent, clean measurement. Additionally, we will flash the detector to the required 12 electron/pixel level before every exposure in order to produce a uniform image that can be appropriately CTE corrected over the full WFC3/UVIS field-of-view.

Pointing: we use the UVIS2 pointing position with an additional $y = -15''$ POSTARG offset in order to put the primary target close to the readout and minimize the CTE losses.

Orbit Structure: We propose the following structure: three visits, the first two have two orbits each (4 exposures) and the final visit has a single orbit (2 exposures).

Dithering: The two orbit visits use the standard 4point UVIS dither box, while the 1 orbit visit uses a two point linear dither. Between each visit, we apply a small POSTARG offset to step across the UVIS chip gap and improve the data quality.

Post-Flash:

We use an 8 electron post-flash background to reach the 12e- level at each readout to improve the CTE.

ACS Parallels:

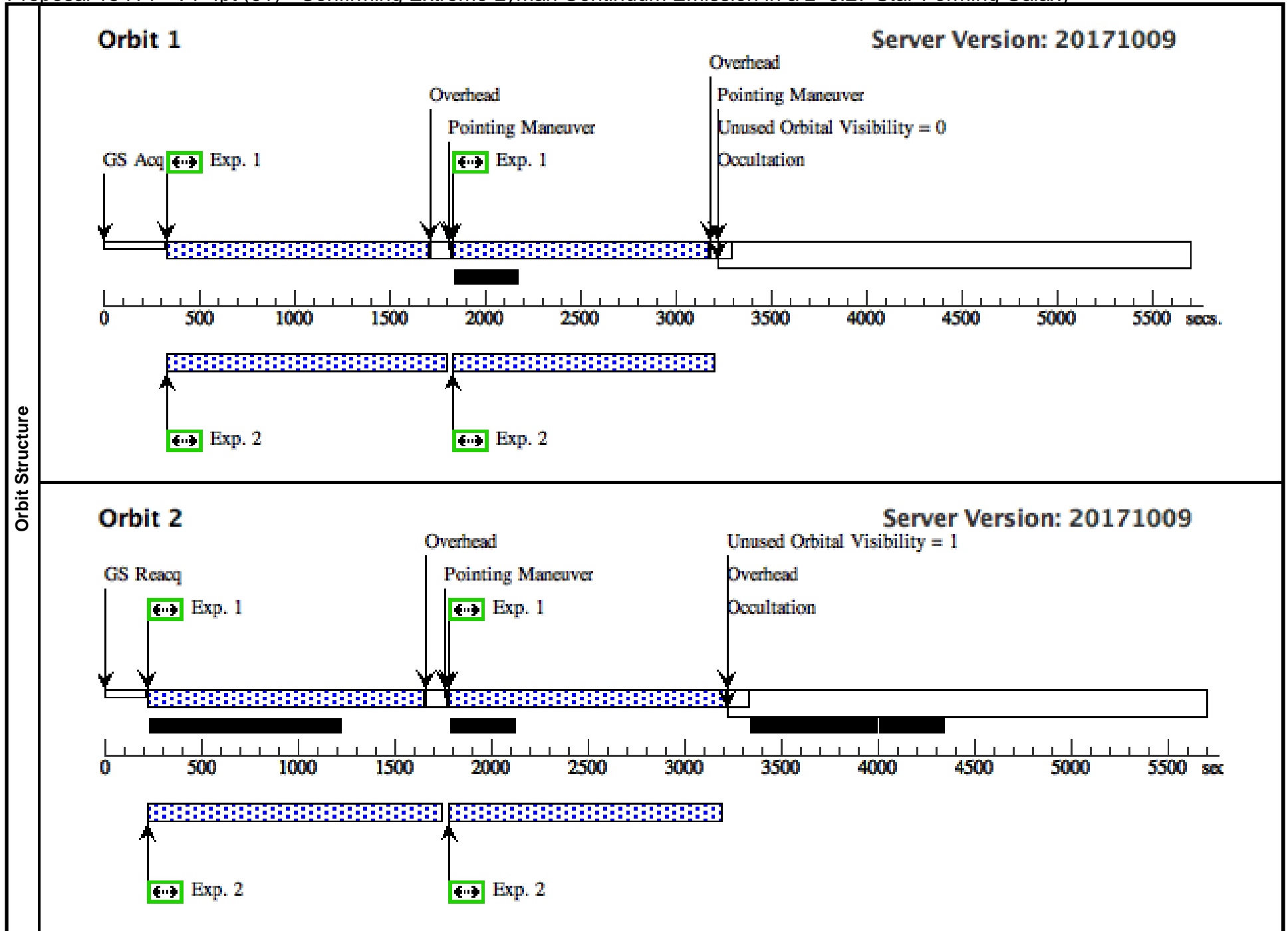
In parallel to our WFC3/UVIS exposures, we will take ACS/WFC3 parallel imaging in F435W.

Orients: No constraints are set on the orients of these observations, but ideally the visit should be scheduled close enough in time to have a similar orient for each.

Proposal 15414 - V1-4pt (01) - Confirming Extreme Lyman Continuum Emission in a z=3.27 Star-Forming Galaxy

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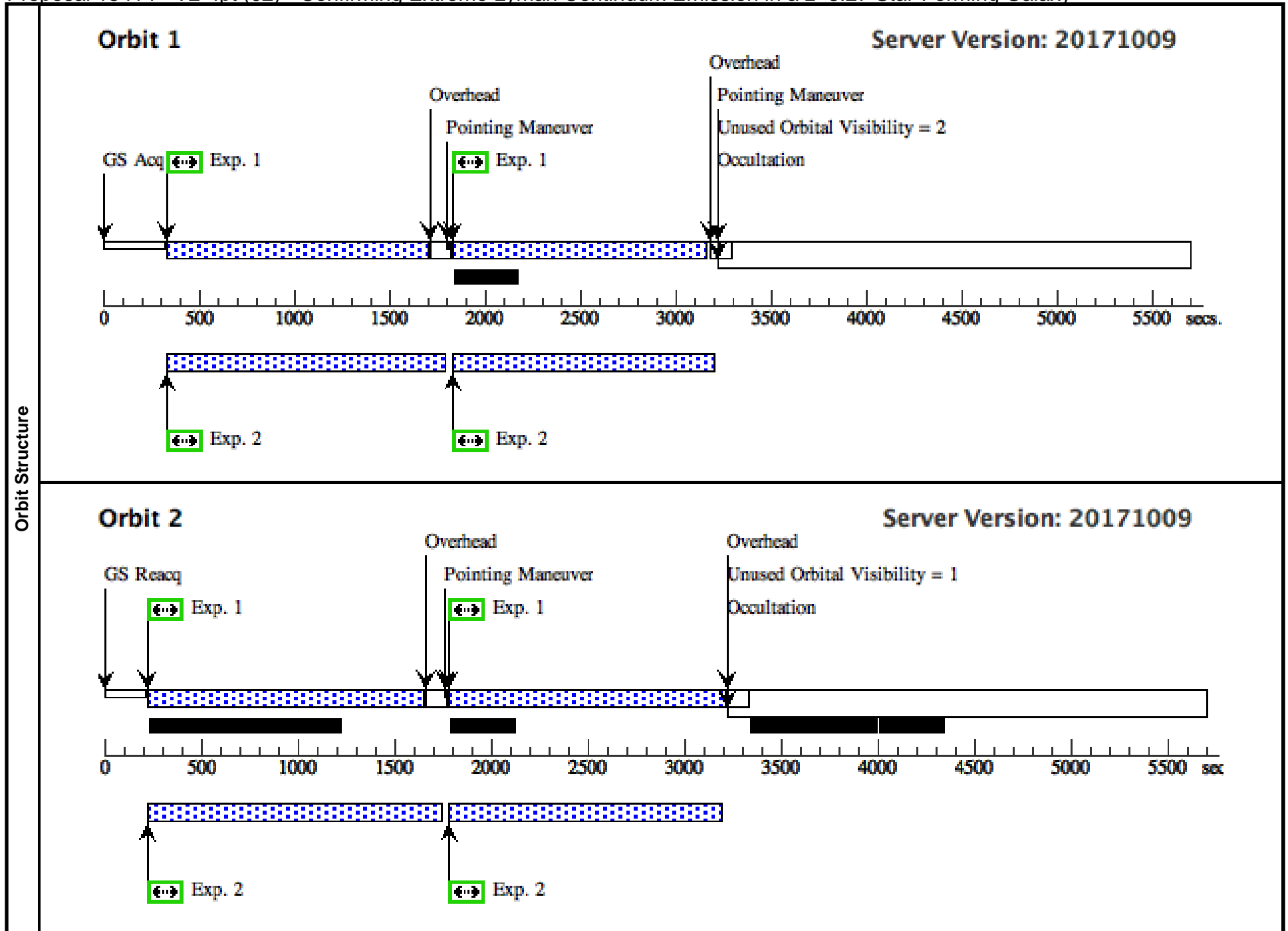
| Visit | Proposal 15414, V1-4pt (01), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: ORIENT 5D TO 345 D | | | | | | | | | | |
|---------------|--|-------------|--|---|--------------------------|--------------|-------------------|--|---|------------|-------|
| | Patterns | # | Primary Pattern | | | | Secondary Pattern | | | Exposures | |
| | | (1) | Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112 | Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false | | | | | | (1-2) | |
| Fixed Targets | # | Name | Target Coordinates | | Targ. Coord. Corrections | | Fluxes | | Miscellaneous | | |
| | (1) | GS-MUSE-LYC | RA: 03 32 23.8000 (53.0991667d) Dec: -27 50 21.10 (-27.83919d) Equinox: J2000 | | | | V=26 | | Reference Frame: ICRS | | |
| | <i>Comments:</i> Category=GALAXY Description=[STARBURST] | | | | | | | | | | |
| Exposures | # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | | Orbit |
| | 1 | | (1) GS-MUSE-LYC | WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE | F336W | FLASH=8 | POS TARG 0,0 | Pattern 1, Exps 1-2 in V1-4pt (01) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in V1-4pt (01) | 1338 Secs (5532 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>1428.0 Secs (Pattern 3)] [==>1428.0 Secs (Pattern 4)] | [1] [2] | |
| | 2 | ANY | | ACS/WFC, ACCUM, WFC | F435W | | | Pattern 1, Exps 1-2 in V1-4pt (01) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in V1-4pt (01) | 1250 Secs (5200 Secs) [==>1260.0 Secs (Pattern 1)] [==>(Pattern 2)] [==>1400.0 Secs (Pattern 3)] [==>1290.0 Secs (Pattern 4)] | [1] [2] | |



Proposal 15414 - V2-4pt (02) - Confirming Extreme Lyman Continuum Emission in a z=3.27 Star-Forming Galaxy

Fri Dec 08 22:14:31 GMT 2017

| Visit | Proposal 15414, V2-4pt (02), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: SAME ORIENT AS 01 | | | | | | | | | |
|---------------|---|-------------|--|---|---------------|-----------------------|----------------------|--|---|------------|
| | Patterns | # | Primary Pattern | | | Secondary Pattern | | | Exposures | |
| | | (1) | Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112 | Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false | | | | | (1-2) | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous | | | | |
| | (1) | GS-MUSE-LYC | RA: 03 32 23.8000 (53.0991667d) Dec: -27 50 21.10 (-27.83919d) Equinox: J2000 | | V=26 | Reference Frame: ICRS | | | | |
| | <i>Comments:</i> Category=GALAXY Description=[STARBURST] | | | | | | | | | |
| Exposures | # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
| | 1 | | (1) GS-MUSE-LYC | WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE | F336W | FLASH=8 | POS TARG -0.42,-2.02 | Pattern 1, Exps 1-2 in V2-4pt (02) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in V2-4pt (02) | 1300 Secs (5528 Secs) [==>1336.0 Secs (Pattern 1)] [==>1336.0 Secs (Pattern 2)] [==>1428.0 Secs (Pattern 3)] [==>1428.0 Secs (Pattern 4)] | [1] [2] |
| 2 | | ANY | | ACS/WFC, ACCUM, WFC | F435W | | | Pattern 1, Exps 1-2 in V2-4pt (02) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in V2-4pt (02) | 1250 Secs (5196 Secs) [==>1256.0 Secs (Pattern 1)] [==>(Pattern 2)] [==>1400.0 Secs (Pattern 3)] [==>1290.0 Secs (Pattern 4)] | [1] [2] |



Proposal 15414 - V3-2pt (03) - Confirming Extreme Lyman Continuum Emission in a z=3.27 Star-Forming Galaxy

Fri Dec 08 22:14:31 GMT 2017

| | | | | | | | | | | | |
|--|---|--|---|--|---------------------------------|---------------------|--------------------------|--|---|------------------|--------------|
| Visit | Proposal 15414, V3-2pt (03), implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: SAME ORIENT AS 01 | | | | | | | | | | |
| | Patterns | # | Primary Pattern | | | | Secondary Pattern | | | Exposures | |
| (2) | | Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing= | | Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false | | | | | (1-2) | | |
| Fixed Targets | # | Name | Target Coordinates | | Targ. Coord. Corrections | | Fluxes | Miscellaneous | | | |
| | (1) | GS-MUSE-LYC | RA: 03 32 23.8000 (53.0991667d) Dec: -27 50 21.10 (-27.83919d) Equinox: J2000 | | | | V=26 | Reference Frame: ICRS | | | |
| <i>Comments:</i> Category=GALAXY Description=[STARBURST] | | | | | | | | | | | |
| Exposures | # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | | Orbit |
| | 1 | | (1) GS-MUSE-LYC | WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE | F336W | FLASH=8 | POS TARG -0.21,-1.01 | Pattern 2, Exps 1-2 in V3-2pt (03) (2) Prime + Parallel Group 1-2 in Pattern 2, Exps 1-2 in V3-2pt (03) | 1300 Secs (2672 Secs) [==>1336.0 Secs (Pattern 1)] [==>1336.0 Secs (Pattern 2)] | | [1] |
| | 2 | ANY | | ACS/WFC, ACCUM, WFC | F435W | | | Pattern 2, Exps 1-2 in V3-2pt (03) (2) Prime + Parallel Group 1-2 in Pattern 2, Exps 1-2 in V3-2pt (03) | 1250 Secs (2506 Secs) [==>1256.0 Secs (Pattern 1)] [==>(Pattern 2)] | | [1] |

