



16654 - A wide, red-giant plus non-interacting black hole binary, or triple stellar system?

Cycle: 29, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

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) 2MASS-J05215658+4359220 NONE WAVE | STIS/CCD STIS/NUV-MAMA WFC3/UVIS | 3 | 08-Nov-2021 17:00:14.0 | yes |

3 Total Orbits Used

ABSTRACT

Black hole (BH) demographics in binaries is critical in view of recent results on massive stars binarity, and the proven multi-messenger detectability of compact objects mergers. Close systems are relatively simple to identify and study as the black hole accretes mass from an evolving companion, and develops an X-ray emitting accretion disk. However, identification and characterization of non-interacting BHs is elusive, but may represent a

significant unstudied population.

2MASS-J05215658+4359220 is the only candidate binary presumed to harbour a non-interacting stellar-mass black hole: it consists of a red giant and an optically undetected, compact companion of about 3.3 solar masses. In the scenarios proposed so far, based on a broad ensemble of data, the origin of near-UV flux detected by GALEX and Swift remains unexplained and may be the key to understanding the system.

We propose STIS UV spectroscopy and WFC3 multi-band imaging (including UV), that uniquely will reveal the origin of the NUV flux, and hence provide a decisive clue to the nature of the system. Compatible scenarios include the presence of a white dwarf (WD) or tight WD pair or a low-mass stellar close pair orbiting the red-giant primary at a larger separation, an accretion disk, or chromospheric/TZ line emission from the red giant. The HST UV data will uniquely allow us to conclusively discern the source of the UV emission, to detect a stellar companion (or pair) or accretion disk if present, derive physical parameters, characterize the entire system also refining the red-giant parameters, and to conclusively address the BH companion scenario postulated in recent literature.

OBSERVING DESCRIPTION

We spend three orbits on a red giant star which shows periodic RV variations but an unseen companion.

Two orbits will be mostly spent on STIS/MAMA NUV spectroscopy to reveal the nature of the unseen companion, and establish the nature of the NUV flux detected by GALEX (NUV=21.5 ABmag).

In one of the two STIS orbits, two short exposures with G430L (2900-5700Å) + G750L (5240-10265Å) will provide a high-quality, simultaneous spectrum of the red giant, to better characterize its stellar parameters and make an overall fit of the system SED from NUV to near-IR.

The observations will be executed according to the standard policy for standard star observations in order to achieve the best spectrophotometric precision and efficiency of observation. These procedures include, in addition to the choice of a photometric slit (52x0.5"), the suppression of the MAMA monthly offsets, the placement of the G750L fringe flat and wavecal in the occultation and the mixing of the very short CCD and long MAMA observations in the same orbit.

In the third orbit the target will be imaged with WFC3 in filters F218W, F275W, F336W, F475W, F606W. The filter choice is tuned to optimize derivation of physical parameters and extinction for a range of possible companions, based on simulations with our model grids. We only need to

image a small area around the target, therefore we use the UVIS2-M1K1C subarray option, significantly reducing buffer dumps, so that all exposures can easily be accommodated in one orbit. Exposures will be dithered, for mitigation of hot pixels and cosmetic defects in the array. Exposures in the red filter will be split in very short exposures (using CTE mitigation strategy) so to not saturate the primary RG.

EXPOSURE TIMES: The red giant is variable (Period about 83days), $V=12.78 - 12.88$ (from the main paper of Thompson et al. 2019), or $V=12.75$ to 12.90 from the smooth l.c. in Thompson+2019 Fig1.; the raw photometry l.c. (from Thompson supplement) spans from $V=12.7$ to almost 13, therefore I run ACQ and science-exposure simulations for $V=13$, then check that there is no saturation for $V=12.7$, for a conservative estimate.

Note: In the proposal we had asked to cover the UV range using UVIS/NUV-MAMA prism, because from initial simulations we thought G230L would give insufficient S/N. However, we have now done more extensive ETC runs using the actual exposure times that can be accommodated in the orbits, and we find that G230L is much preferable, because the small loss in S/N wrt the prism can be compensated by some rebinning (in the spectral regions where this may be needed), which would yield comparable resolution to the prism spectrum, and - more important - there will be a critical gain in precision, since the G230L spectrum can be extracted (with routine scripts available to the proposers) with a few percent flux precision, while the prism may yield at best a 10% flux accuracy. In addition, since the origin of the NUV flux detected by GALEX is unknown (the objective of this proposal is to discover it), rebinning in some regions within the G230L range may not be necessary (depending on what source causes the GALEX NUV broad-band flux) and there we will gain both in flux accuracy and resolution by using G230L (avg dispersion 1.58Ang/pxl, $R=500-1010$ for G230L, vs 0.2-72Ang/px, $R=10-2500$ for prism). We simulated with ETC the S/N and spectrum obtained with either prism or G230L, assuming that the source of flux is the red giant primary, or an (unseen in the optical-IR) companion with T_{eff} about 15000K, and scaling the flux to the GALEX broad-band NUV. In these ETC run plots the gain with G230L can be appreciated in both cases:

For 2790sec exposure (orbit 2):

if the GALEX NUV flux is from the red giant: <https://etc.stsci.edu/etc/results/STIS.sp.1524275/> G230L

<https://etc.stsci.edu/etc/results/STIS.sp.1524366/> prism

if it were from a companion with a B5V-like SED: <https://etc.stsci.edu/etc/results/STIS.sp.1524276/> G230L

https://etc.stsci.edu/etc/plot_page/STIS.sp.1524364/ prism

Also, after we submitted the HST proposal, we have imaged with long exposures of the target with UVIT in two FUV bands. These data yielded an upper limit in FUV (about 23 mag in CaF2), which rules out the alternative possibility that the GALEX NUV detection comes from a hot white dwarf, and leaves open scenarios of a lower- T_{eff} WD or accretion disk, making the extension shortwards of the G230L range not necessary.

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Mon Nov 08 22:00:15 GMT 2021

| | | | | | | |
|---|---|--|--|---------------------------------|--|-----------------------|
| Visit | Proposal 16654, Visit 01, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/UVIS, STIS/NUV-MAMA, STIS/CCD Special Requirements: (none) | | | | | |
| | Diagnosics (Visit 01) Warning (Orbit Planner): MISSING FRINGE FLAT CALIBRATION (Exposure 11 (Pattern 1, Exps 11-15 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser (Exposure 12 (Pattern 1, Exps 11-15 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser (Exposure 13 (Pattern 1, Exps 11-15 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser (Exposure 14 (Pattern 1, Exps 11-15 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser (Exposure 15 (Pattern 1, Exps 11-15 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser | | | | | |
| Patterns | # | Primary Pattern | Secondary Pattern | Exposures | | |
| | (1) | 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 | | (11-15) | | |
| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
| | (1) | 2MASS- J05215658+4359220 | RA: 05 21 56.5909 (80.4857954d) Dec: +43 59 21.96 (43.98943d) Equinox: J2000 | Epoch of Position: 2015.5 | V=12.8 +/-0.1 GALEX NUV=21.5 AB mag, The bright optical companion (V =12.8) is a late-type giant, not emitting in UV | Reference Frame: ICRS |
| Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Then I updated it with : http://simbad.u-strasbg.fr/simbad/sim-id?Ident=2MASS+J05215658%2B4359220 ICRS coord. (ep=J2000) : 05 21 56.5909176121 +43 59 21.957588885 (Optical) [0.0482 0.0362 90] A Category=STAR Description=[K III-I] Extended=NO | | | | | | |

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| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|--------------------------------|---------------------------------|-------------------------------------|-----------------|--------------|---------------|--------|---|-------|
| 1 | STIS ACQ | (1) 2MASS-J052156 58+4359220 | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 1.5 Secs (1.5 Secs) [==>] | [1] |
| <p><i>Comments: The red giant is variable with a P=83days, V=12.78 -- 12.88 from the main paper of Thompson et al. 2019: V=12.75 to 12.90 from the smooth l.c. in Fig1.; the raw photometry l.c.(from Thompson supplement) spans from V= 12.7 to almost 13, therefore I run ACQ simulations for V=13 and check that there is no saturation for V=12.7.</i></p> <p><i>for V=13, K0III Castelli 4750 logg2.0 , EBV=0.44 applied before normalization;</i></p> <p><i>filter F28x50LP : https://etc.stsci.edu/etc/results/STIS.ta.1523807/ V=13 Requested Signal/Noise Ratio = 80.000 gives: Time = 0.0843 seconds gives: Time to Saturation (for a single exposure) = 4.10 seconds WARNING MESSAGE: Result of the calculation 0.0843291 is less than the minimum exposure time for this detector (0.1)</i></p> <p><i>V=12.7 https://etc.stsci.edu/etc/results/STIS.ta.1523810/ Requested Signal/Noise Ratio = 80.000 gives: Time = 0.0640 seconds gives: Time to Saturation (for a single exposure) = 3.11 seconds WARNING MESSAGE: Result of the calculation 0.06397 is less than the minimum exposure time for this detector (0.1)</i></p> | | | | | | | | | |
| 2 | G230L Wav e | (1) 2MASS-J052156 58+4359220 | STIS/NUV-MAMA, ACCUM, 31X0.05NDC | G230L 2376 A | | | | [==>] | [1] |
| 3 | G230L (STIS.sp.15 24271) | (1) 2MASS-J052156 58+4359220 | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | WAVECAL=NO | | | 727 Secs (727 Secs) [==>] | [1] |
| <p><i>Comments: For STIS/MAMA we used the GALEX NUV =21.5ABmag in the ETC for normalization For STIS/MAMA we used the GALEX NUV =21.5ABmag in the ETC for normalization</i></p> <p><i>If all the GALEX NUV flux were coming from the red giant: https://etc.stsci.edu/etc/results/STIS.sp.1524271/ if the source of the UV GALEX flux were a B1V-like companion: https://etc.stsci.edu/etc/plot_page/STIS.sp.1524268/ (STIS.sp.1523567 was for MAMA/NUV prism, as in the proposal)</i></p> <p><i>This exposure will be combined with the longer exposure in the second orbit</i></p> | | | | | | | | | |
| 4 | G430L | (1) 2MASS-J052156 58+4359220 | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | CR-SPLIT=3 | | | 600 Secs (600 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] | [1] |
| <p><i>Comments: For the red giant, we used in the ETC a model K0III Castelli 4750 logg2.0 , ebv=0.44, aperture: 52x0.5</i></p> <p><i>V=13 S/N=200 https://etc.stsci.edu/etc/results/STIS.sp.1524529/ Requested Signal/Noise Ratio = 200.000 at wavelength 4451.00 (per resolution element) gives: Time = 871.1998 seconds gives: Time to Saturation (for a single exposure) = 1,384.13 seconds WARNING MESSAGE: "Electrons per pixel due to background (12) is less than the recommended threshold of 20 electrons to avoid poor charge transfer efficiency (CTE). We suggest you consider CTE mitigation strategies described in the STIS Instrument Handbook."</i></p> <p><i>V=12.7 S/N=200 https://etc.stsci.edu/etc/results/STIS.sp.1524534/ Requested Signal/Noise Ratio = 200.000 at wavelength 4451.00 (per resolution element) gives: Time = 659.6185 seconds gives: Time to Saturation (for a single exposure) = 1,050.27 seconds</i></p> | | | | | | | | | |
| 5 | G430L WA VE | WAVE | STIS/CCD, ACCUM, 52X0.1 | G430L 4300 A | | | | [==>] | [1] |

Exposures

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|--|---|---|-----------------|------------------------------------|---|--|-----|
| 6 | G750L 58+4359220 | (1) 2MASS-J052156 STIS/CCD, ACCUM, 52X0.5 | G750L 7751 A | CR-SPLIT=3 | | 300. Secs (300 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] | [1] |
| <p>Comments: V=13. https://etc.stsci.edu/etc/results/STIS.sp.1524556/ Requested Signal/Noise Ratio = 200.000 at wavelength 7000.00 (per resolution element) gives: Time = 145.2628 seconds gives: Time to Saturation (for a single exposure) = 503.31 seconds</p> <p>V=12.7 https://etc.stsci.edu/etc/results/STIS.sp.1524555/ Requested Signal/Noise Ratio = 200.000 at wavelength 7000.00 (per resolution element) gives: Time = 110.1575 seconds gives: Time to Saturation (for a single exposure) = 381.84 seconds</p> | | | | | | | |
| 7 | G750L WA VE | STIS/CCD, ACCUM, 52X0.1 | G750L 7751 A | | | [==>] | [1] |
| 8 | G750L fring e | NONE STIS/CCD, ACCUM, 0.3X0.09 | G750L 7751 A | LAMP=TUNGSTE N; GAIN=4 | | 120 Secs X 2 (240 Secs) [==>(Copy 1)] [==>(Copy 2)] | [1] |
| 9 | G230L Wav e | WAVE STIS/NUV-MAMA, ACCUM, 31X0.05NDC | G230L 2376 A | | | [==>] | [1] |
| 10 | G230L orbit 2 (STIS.sp.15 24275) | (1) 2MASS-J052156 58+4359220 STIS/NUV-MAMA, TIME-TAG, 52X0.5 | G230L 2376 A | BUFFER-TIME=68 0; WAVECAL=NO | | 2790 Secs (2790 Secs) [==>] | [2] |
| <p>Comments: For STIS/MAMA we used the GALEX NUV =21.5ABmag in the ETC for normalization if all of the GALEX NUV flux is from the red giant: https://etc.stsci.edu/etc/results/STIS.sp.1524275/ if it were from a companion with a B5V-like SED: https://etc.stsci.edu/etc/results/STIS.sp.1524276/</p> | | | | | | | |
| 11 | (1) 2MASS-J052156 58+4359220 | WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB | F606W | FLASH=12 | Pattern 1, Exps 11-1 5 in Visit 01 (1) | 0.5 Secs (1 Secs) [==>(Pattern 1)] [==>(Pattern 2)] | [3] |
| <p>Comments: F606W : V=13 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524029/ Requested Signal/Noise Ratio = 80.000 gives: Time = 0.0384 seconds gives: Time to Saturation (for a single exposure) = 1.75 seconds gives: Optimum SNR = 89.7245</p> <p>V=12.7 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524030/ Requested Signal/Noise Ratio = 80.000 gives: Time = 0.0291 seconds gives: Time to Saturation (for a single exposure) = 1.33 seconds gives: Optimum SNR = 89.7244</p> <p>WARNING MESSAGE: Result of the calculation 0.0291425 is less than the minimum exposure time for this detector (0.5)</p> <p>WARNING MESSAGE: "Electrons per pixel due to background (0.0016) is less than the recommended threshold of 20 electrons to avoid poor charge transfer efficiency (CTE). We suggest you consider CTE mitigation strategies described in Section 6.9 of the WFC3 Instrument Handbook. Updates are provided on the WFC3 webpages."</p> <p>AUGUST 10 2021 : checking BCKG with exposure time=0.5sec: https://etc.stsci.edu/etc/results/WFC3UVIS.im.1532208/ for V=12.7 Exposure time (seconds) = 0.5000 gives: SNR = 347.0119 gives: Time to Saturation (for a single exposure) = 1.33 seconds gives: Optimum SNR = 375.2628 WARNING MESSAGE: "Electrons per pixel due to background (0.028) is less than the recommended threshold of 20 electrons</p> | | | | | | | |

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|---|--|--------------------------------------|-------|-------------------------|---|---------------------|--|-----|
| 12 | (1) 2MASS-J052156 58+4359220 | WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB | F475W | FLASH=12 | Pattern 1, Exps 11-1 5 in Visit 01 (1) | 0.7 Secs (1.4 Secs) | [=>(Pattern 1)] [=>(Pattern 2)] | [3] |
| <p>Comments: F606W : V=13 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524029/ Requested Signal/Noise Ratio = 80.000 gives: Time = 0.0384 seconds gives: Time to Saturation (for a single exposure) = 1.75 seconds gives: Optimum SNR = 89.7245</p> <p>V=12.7 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524030/ Requested Signal/Noise Ratio = 80.000 gives: Time = 0.0291 seconds gives: Time to Saturation (for a single exposure) = 1.33 seconds gives: Optimum SNR = 89.7244 WARNING MESSAGE: Result of the calculation 0.0291425 is less than the minimum exposure time for this detector (0.5) WARNING MESSAGE: "Electrons per pixel due to background (0.0016) is less than the recommended threshold of 20 electrons to avoid poor charge transfer efficiency (CTE). We suggest you consider CTE mitigation strategies described in Section 6.9 of the WFC3 Instrument Handbook. Updates are provided on the WFC3 webpages."</p> <p>AUGUST 10 2021: for exp.time =0.7, V=12.7 : https://etc.stsci.edu/etc/results/WFC3UVIS.im.1532209/ Exposure time (seconds) = 0.7000 gives: SNR = 218.1151 gives: Time to Saturation (for a single exposure) = 4.44 seconds gives: Optimum SNR = 236.8344 WARNING MESSAGE: "Electrons per pixel due to background (0.02) is less than the recommended threshold of 20 electrons</p> | | | | | | | | |
| 13 | (WFC3UVI (1) 2MASS-J052156 S.im.152403 58+4359220 7) | WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB | F336W | CR-SPLIT=2; FLASH=12 | Pattern 1, Exps 11-1 5 in Visit 01 (1) | 10. Secs (20 Secs) | [=>(Pattern 1, Split 1)] [=>(Pattern 1, Split 2)] [=>(Pattern 2, Split 1)] [=>(Pattern 2, Split 2)] | [3] |
| <p>Comments: V=13 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524036/ Requested Signal/Noise Ratio = 80.000 gives: Time = 7.6590 seconds gives: Time to Saturation (for a single exposure) = 350.52 seconds gives: Optimum SNR = 91.1004</p> <p>V=12.7 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524037/ BCKG countrate =0.397 c/s Total counts= 2.31 w/o flash (circle with radius 0.2 arcsec) Requested Signal/Noise Ratio = 80.000 gives: Time = 5.8094 seconds gives: Time to Saturation (for a single exposure) = 265.90 seconds gives: Optimum SNR = 91.0974 Exposure time calculation HAD WARNINGS. WARNING MESSAGE: "Electrons per pixel due to background (0.029) is less than the recommended threshold of 20 electrons to avoid poor charge transfer efficiency (CTE). We suggest you consider CTE mitigation strategies ...</p> <p>AUGUST 10 2021: V=12.7 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1532210/ Exposure time (seconds) = 10.0000 gives: SNR = 107.0793 gives: Time to Saturation (for a single exposure) = 265.90 seconds gives: Optimum SNR = 120.0181 WARNING MESSAGE: "Electrons per pixel due to background (0.049) is less than the recommended threshold of 20 electrons</p> | | | | | | | | |

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|---|---------------------------------|--------------------------------------|-------|-------------------------|---|----------------------|--|-----|
| 14 | (1) 2MASS-J052156 58+4359220 | WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB | F218W | CR-SPLIT=3; FLASH=12 | Pattern 1, Exps 11-1 5 in Visit 01 (1) | 264. Secs (528 Secs) | [=>(Pattern 1, Split 1)] [=>(Pattern 1, Split 2)] [=>(Pattern 1, Split 3)] [=>(Pattern 2, Split 1)] [=>(Pattern 2, Split 2)] [=>(Pattern 2, Split 3)] | [3] |
| <p><i>Comments: using GALEX NUV=21.5 ABmag :</i> <i>For 2790sec exposure (orbit 2):</i> <i>if the GALEX NUV flux is from the red giant: https://etc.stsci.edu/etc/results/STIS.sp.1524275/ G230L</i> <i>https://etc.stsci.edu/etc/results/STIS.sp.1524366/ prism</i> <i>if it were from a companion with a B5V-like SED: https://etc.stsci.edu/etc/results/STIS.sp.1524276/ G230L</i> <i>https://etc.stsci.edu/etc/plot_page/STIS.sp.1524364/ prism</i></p> <p><i>AUGUST 10 2021: V=12.7 for 300sec (I must set CRsplit=3)</i> <i>Exposure time (seconds) = 300.0000</i> <i>gives: SNR = 18.1840</i> <i>gives: Time to Saturation (for a single exposure) = 129,773.03 seconds</i> <i>gives: Optimum SNR = 25.9562</i> <i>WARNING MESSAGE: "Electrons per pixel due to background (0.87) is less than the recommended threshold of 20 electrons</i></p> <p><i>for exp. time 360sec https://etc.stsci.edu/etc/results/WFC3UVIS.im.1532211/</i> <i>Exposure time (seconds) = 360.0000</i> <i>gives: SNR = 20.7758</i> <i>gives: Time to Saturation (for a single exposure) = 129,773.03 seconds (so I used CRsplit=3 of 360sec)</i> <i>gives: Optimum SNR = 28.8298</i> <i>WARNING MESSAGE: "Electrons per pixel due to background (1) is less than the recommended threshold of 20 electrons to avoid</i></p> <p><i>AUG.10 2021: V=12.7 exp=264 https://etc.stsci.edu/etc/results/WFC3UVIS.im.1532216/ I used CRSPIT=3 to be safe</i> <i>Exposure time (seconds) = 267.0000</i> <i>gives: SNR = 16.6632</i> <i>gives: Time to Saturation (for a single exposure) = 129,773.03 seconds</i> <i>gives: Optimum SNR = 24.2429</i> <i>WARNING MESSAGE: "Electrons per pixel due to background (0.78) is less than the recommended threshold of 20 electrons to...</i></p> | | | | | | | | |

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|--|---------------------------------|--------------------------------------|-------|-------------------------|---|--|-----|
| 15 | (1) 2MASS-J052156 58+4359220 | WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB | F275W | FLASH=12; CR-SPLIT=2 | Pattern 1, Exps 11-1 5 in Visit 01 (1) | 230. Secs (460 Secs) [==>(Pattern 1, Split 1)] [==>(Pattern 1, Split 2)] [==>(Pattern 2, Split 1)] [==>(Pattern 2, Split 2)] | [3] |
| <p><i>Comments: using GALEX NUV=21.5 ABmag : for the red giant (input: Castelli-Kurucz Models K0III 4750 2.0) : https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524122/ Requested Signal/Noise Ratio = 80.000 - BCKG total counts=21.3 , countrate = 0.341 w/o postflash gives: Time = 61.9197 seconds gives: Time to Saturation (for a single exposure) = 2,882.74 seconds gives: Optimum SNR = 91.5070 Exposure time calculation HAD WARNINGS. WARNING MESSAGE: "Electrons per pixel due to background (0.26) is less than the recommended threshold of 20 electrons to avoid poor charge transfer efficiency (CTE). We suggest you consider CTE mitigation strategies described in Section 6.9 of the WFC3 Instrument Handbook. Updates are provided on the WFC3 webpages." WARNING MESSAGE: This observation has a significant filter leak where 6.6 percent of the signal comes from outside the prescribed filter bandpass.</i></p> <p><i>If the NUV-emitting companion were a B5V (Teff=15kK) : https://etc.stsci.edu/etc/results/WFC3UVIS.im.1524124/ Requested Signal/Noise Ratio = 80.000 gives: Time = 375.9904 seconds gives: Time to Saturation (for a single exposure) = 18,391.47 seconds gives: Optimum SNR = 92.8594</i></p> <p><i>If the NUV-emitting companion were a B1V (Teff=30kK) - like spectrum Requested Signal/Noise Ratio = 80.000 gives: Time = 428.7019 seconds gives: Time to Saturation (for a single exposure) = 20,982.11 seconds gives: Optimum SNR = 92.9710</i></p> <p><i>AUG 10 2021: for the RG V=12.7 exp.=230sec https://etc.stsci.edu/etc/results/WFC3UVIS.im.1532213/ Exposure time (seconds) = 230.0000 gives: SNR = 87.1431 gives: Time to Saturation (for a single exposure) = 9,095.19 seconds gives: Optimum SNR = 99.3563 WARNING MESSAGE: "Electrons per pixel due to background (0.97) is less than the recommended threshold of 20 electrons to...</i></p> | | | | | | | |



