16863 - CTE Evaluation of Resolved Objects

Cycle: 29, Proposal Category: CAL/WFC3

(Availability Mode: RESTRICTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Jay Anderson (PI) (Contact)	**Space Telescope Science Institute**	**jayander@stsci.edu**
Ms. Jennifer Mack (CoI)	Space Telescope Science Institute	mack@stsci.edu
Benjamin Kuhn (CoI)	Space Telescope Science Institute	bkuhn@stsci.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) MACSJ0417.5-1154	WFC3/UVIS	1	14-Dec-2021 16:00:11.0	yes

1 Total Orbits Used

ABSTRACT

The standard CTE calibration observations involve imaging starfields to assess photometric and astrometric losses as a function of observation date, number of parallel transfers, background, star brightness, etc. Like black holes, point sources "have no hair" --- they have no distinguishing characteristics. They can be characterized completely by the position and flux, and as such it is easy to come up with metrics for them and model how CTE impacts these metrics.

HST does indeed measure a lot of point sources, but it also measures a lot of resolved objects: galaxies, nebulae, stars with disks, double stars, etc. This 1-orbit program is an effort to examine the effect of CTE on resolved objects.

We will image a relatively dense galaxy field with WFC3/UVIS through the F606W filter. This filter was chosen since we can get the best S/N in the

quickest time. We chose a galaxy field that was observed early in the lifetime of WFC3/UVIS, so that we can compare present-day, CTE-impacted observations against observations that should be largely free of CTE losses in order to investigate how much CTE affects resolved objects.

The end-product of this program will be an ISR that describes how CTE affects various galaxy "metrics"... FWHM... integrated light.. position... etc. We will also provide an image that shows an array of galaxy rasters and will indicate how imperfect CTE shuffles the pixel-to-pixel flux around. This should help observers to better understand their data and proposers to better understand how best to plan their observations to ensure that what they want to measure can be measured.

This will also provide an interesting check on how well the pixel-based correction works on resolved objects, which should be easier to correct than stars, in that there is more self-shielding.

OBSERVING DESCRIPTION

We identified MACSJ0417.5-1154. It was observed through F606W within the first two years of UVIS operation. We looked for observations closer to launch, but much of early UVIS observations were focused on the UV, following up on what ACS had observed in the visible. So, there were not many F606W UVIS datasets. We wanted a dataset that had at least four dithered exposures, so we can make a well sampled image of the scene for follow up.

The original program was from GO-12009 (PI-von der Linden) and it took 9x596s dithered F606W exposures. The high-resolution stack of these images will provide the "truth" against which the new data will be compared.

We repeat the original observations as closely as possible---same pointing and roll angle. We take four 440s dithered exposures, using a dither pattern optimized for sub-pixel sampling (WFC3/ISR 2020-07). Finally we take one additional image shifted by a whole chip relative to the others. This way, we will get our own direct measure of CTE's impact.

Images are post-flashed with 5e. The archival images are ~600s and have a background of 22e, which is pretty much the currrent recommendation. The 440s exposures should have about 15e natural background, so our aim is to supplement this up to 20e.

Visit

Proposal 16863, One-Orbit Visit (01) Tue Dec 14 21:00:11 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 60.7D TO 60.9 D; BEFORE 01-MAR-2022:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MACSJ0417.5-1154	RA: 04 17 32.9905 (64.3874604d) Dec: -11 54 22.54 (-11.90626d) Equinox: J2000		V=20	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, RICH CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Dither#1	(1) MACSJ0417.5-1154	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	FLASH=5	POS TARG 0.000,0.000		440 Secs (440 Secs) *[==>]*	 ***[1]***
2	Dither#2	(1) MACSJ0417.5-1154	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	FLASH=5	POS TARG 0.1785,0.1908		440 Secs (440 Secs) *[==>]*	 ***[1]***
3	Dither#3	(1) MACSJ0417.5-1154	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	FLASH=5	POS TARG 0.3173,0.3591		440 Secs (440 Secs) *[==>]*	 ***[1]***
4	Dither#4	(1) MACSJ0417.5-1154	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	FLASH=5	POS TARG 0.4958,0.5101		440 Secs (440 Secs) *[==>]*	 ***[1]***
5	Full-chip Dither	(1) MACSJ0417.5-1154	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	FLASH=5	POS TARG 0.000,81.6		440 Secs (440 Secs) *[==>]*	 ***[1]***

Orbit Structure