



# 12858 - A Geometric Distance to the Small Magellanic Cloud using the Expanding Supernova Remnant 1E 0102-7219

Cycle: 20, 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>
02	(1) SMC-SNR-1E	ACS/WFC	1	06-Nov-2012 21:00:56.0	yes

1 Total Orbits Used

## ABSTRACT

1E 0102-7219 is a highly symmetric, rapidly expanding, supernova remnant in the the Small Magellanic Cloud. We propose to use 1E~0102 to independently derive a geometric distance to the SMC. Scaling the transverse proper motions to match the line-of-sight radial motions directly gives the distance. Previous studies have reported measuring stellar proper motions in the SMC of  $1.1 \pm 0.2$  mas/yr (a precision of about 17%) for transverse velocities of stars in the SMC of only 300 km/s within a time a baseline of only 2 years. Given that our expansion velocities (peak-to-peak) are around 6,000 km/s (a factor of 20 larger) and that we will have a time baseline between ACS observations of at least 9 years (another factor of 4 larger) we estimate that our SNR proper motions will be measured to better than 1% precision. At this point assumptions in the modeling will dominate the systematics. 1E 0102 is one of the nearest extragalactic test cases for this method and it will be the archetype and testbed for investigating systematics and assessing the potential of this method for determining distances to additional galaxies at larger distances. We are simply requesting a single-orbit ACS observation using the F475W filter for comparison with an identical image taken 9 years ago.

**OBSERVING DESCRIPTION**

Single-orbit image of SMC SNR in the oxygen line. To be used for a proper motion study and distance determination.

**ADDITIONAL COMMENTS**

This is a high-precision proper motion study.

Having the chip oriented north-south as closely the same as the first epoch observation would be very advantageous.

The first-epoch observations were made with this same instrument on 2006-10-15.

Reference: MAST Dataset = J8R802010

<b>Visit</b>	<b>Proposal 12858, Visit 02</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/WFC Special Requirements: SCHED 100%; ORIENT 184.082306D TO 184.082306 D									
<b>Patterns</b>	<b>#</b>	<b>Primary Pattern</b>	<b>Secondary Pattern</b>	<b>Exposures</b>						
	(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(1)					
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>				
	(1)	SMC-SNR-1E	RA: 01 04 1.5300 (16.0063750d) Dec: -72 01 58.70 (-72.03297d) Equinox: J2000		V=18./-1.0	Reference Frame: ICRS				
<i>Comments: This is a high-precision proper motion study. Having the chip oriented as closely the same as the first epoch observation would be very advantageous. The first-epoch observations were made with this same instrument on 2006-10-15. Mast Dataset = J8R802010</i> September 24 through Nov 3, 2012 would allow for a 0 degree roll angle (N-S orientation)										
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>	<b>Orbit</b>
	1		(1) SMC-SNR-1E	ACS/WFC, ACCUM, WFC1-CTE	F475W		POS TARG -13,-5	Pattern 1, Exps 1-1 in Visit 02 (1)	511 Secs	[1]
									[=>(Pattern 1)]	
									[=>(Pattern 2)]	
									[=>(Pattern 3)]	
									[=>(Pattern 4)]	
<b>Orbit Structure</b>	<b>Orbit 1</b>					<b>Server Version: 20120802</b>				