



## 2896 - Confirming the Formation of a Black Hole

Cycle: 2, Proposal Category: GO

### INVESTIGATORS

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### OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	BH1miri	MIRI Imaging	(1) NGC6946-BH1

### ABSTRACT

LIGO is revolutionizing the discovery of stellar mass black holes, but it will almost certainly never observe a new black hole being formed from a star. It is possible to find forming black holes by searching for failed supernovae, where a black hole forms without a dramatic explosion. At present, there is one excellent candidate for a failed supernova: NGC 6946-BH1. This ~300,000 Lsun star has vanished in the optical and near-IR at the level of a few 1000 Lsun and in warm SST at the level of ~10,000 Lsun. This means that there can be no surviving star hidden by warm/hot dust ( $T_d > 400\text{K}$ ). It is, however, possible to hide it with colder dust. JWST MIRI observations at 5.6, 10 and 21 microns can test this possibility in a single short visit.

## **OBSERVING DESCRIPTION**

The objective is to constrain the mid-IR flux of a point source in NGC6946 using MIRI at 5.6 (F560W), 10 (F1000W) and 21 (F2100W) microns. The integration times were chosen so that a source with a band luminosity of  $\nu L_{\nu} = 3000 \text{ Lsun}$  could be detected with a signal-to-noise ratio of  $\sim 10$ . These will be combined with new HST F110W/F160W observations that are scheduled to be obtained in February 2023.

Any source with an interesting flux will not suffer from background confusion, so the data can all be obtained with standard dithering procedures to improve the PSF sampling and to minimize the consequences of detector artifacts etc. A high background was assumed to represent some contribution from the host galaxy. The BRIGHTSKY detector region was chosen to reduce overheads and to allow larger numbers of groups per integration without risk of saturation even if the source is bright.

Proposal 2896 - Targets - Confirming the Formation of a Black Hole

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	NGC6946-BH1	RA: 20 35 27.5600 (308.8648333d) Dec: +60 08 8.29 (60.13564d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Black holes] Extended=NO					

Proposal 2896 - Observation 1 - Confirming the Formation of a Black Hole

Wed Aug 30 17:00:08 GMT 2023

<b>Observation</b>	<p><b>Proposal 2896, Observation 1: BH1miri</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Imaging</p>										
<b>Diagnostics</b>	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>		<b>Miscellaneous</b>			
	(1)	NGC6946-BH1	RA: 20 35 27.5600 (308.8648333d) Dec: +60 08 8.29 (60.13564d) Equinox: J2000								
	<p><i>Comments:</i>  <i>Category=Star</i>  <i>Description=[Black holes]</i>  <i>Extended=NO</i></p>										
<b>Template</b>	<p><b>Subarray</b></p> <p>BRIGHTSKY</p>										
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>	<b>Starting Point</b>	<b>Number of Points</b>	<b>Points</b>	<b>Starting Set</b>	<b>Number of Sets</b>	<b>Optimized For</b>	<b>Direction</b>	<b>Pattern Size</b>	
	1	CYCLING	1	4		1	1			DEFAULT	
<b>Spectral Elements</b>	<b>#</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Dither</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F560W	FASTR1	25	1	1	Dither 1	4	4	86.528	
	2	F1000W	FASTR1	25	1	1	Dither 1	4	4	86.528	
	3	F2100W	FASTR1	50	3	1	Dither 1	4	12	526.09	