SUIT PROPOSER GUIDE

1. Introduction to SUIT

The Solar Ultraviolet Imaging Telescope (Tripathi et al. 2025, 2017) is one of the primary instruments on board Aditya-L1 mission (Seetha and Megala 2017; Tripathi et al. 2023). It observes the solar photosphere and chromosphere in the near and mid ultraviolet (UV) wavelength range of 200 – 400 nm, and provides full disk and partial disk images of the Sun (Sarkar et al. 2025).

Parameter	Value
Telescope design	f/24.8 off-axis Ritchey Chrétien
Wavelength range	200 nm – 400 nm.
Bandpass	8 Narrow-band, 3 Broad-band
Entrance aperture	146 mm
Detector	4096 × 4096, back-thinned, back-illuminated, UV-enhanced CCD
Plate scale	0.7′′/pixel at 12 µm pixel
Exposure times	0.1 to 1.4 s
Fastest cadence	6 sec in RoI mode

Table 1: SUIT instrument characteristics (Sarkar et al. 2025)

Science filter	Central wavelength (nm)	Bandpass (nm)	Science target
NB01	214.0	11.0	Continuum
NB02	276.6	0.4	Mg II k blue wing
NB03	279.6	0.4	Mg II k
NB04	280.3	0.4	Mg II h
NB05	283.2	0.4	Mg II h red wing
NB06	300.0	1.0	Continuum
NB07	388.0	1.0	CN Band
NB08	396.85	0.1	Ca II h
BB01	220.0	40.0	Herzberg continuum
BB02	277.0	58.0	Hartley band
BB03	340.0	40.0	Huggins band

Table 2: SUIT Science filter details and science targets (Sarkar et al. 2024).

2. SUIT Observation Modes

i. Synoptic Mode:

- Default mode of observation.
- Full resolution (4k X 4k) images are taken in all science filters every 2.5 hours.
- 2 x 2 binned full disk images in Mg II h (NB04) filter every 1.5 minutes.
- Predefined region of interest images taken in all narrowband (NB) filters. The cadence for each filter is ~64 s. The region of interest mode automatically tracks the solar feature being observed.

ii. Flare Mode:

- Partial disk view of the flaring region.
- Automatic exposure control and feature tracking with solar rotation.
- Overrides the default Synoptic Mode in the event of a flare.
- Fastest cadence of 6 seconds available for imaging in any one filter.
- The flare is detected using flare flags from SUIT, or from HEL1OS or SoLEXS instruments on Aditya-L1.

iii. Custom Mode:

- Tailored configurations beyond predefined modes, available through the proposal planning system.
- Custom filter selection. Custom cadence. Custom RoI.
- Limited only by payload data budget and operational constraints.

3. Instrument Configuration Interface in PRADAN

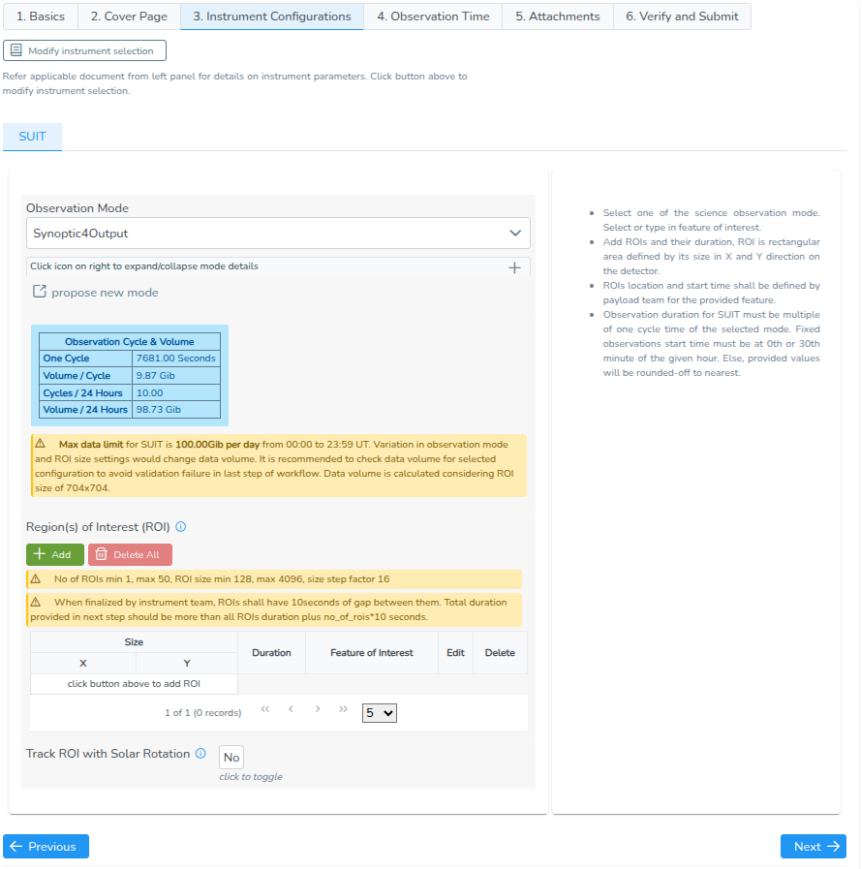

Fig.1: Instrument Configuration tab for SUIT: The observation mode and the RoI region size are selected here.

The user can select the program sequence (observation mode) and the Region of Interest (RoI) according to their scientific requirements. At least one RoI must be provided for program sequences that include RoI loops. The following points should be kept in mind when specifying the RoI:

- The region size is given in pixels (1 px = 0.7 arcsec).
- The minimum box size is **128 × 128**, and both dimensions must be divisible by 16. A size of **560 × 560** generally provides good coverage for typical observations, while the maximum allowable size is **704 × 704**.
- **Feature of Interest** is a dropdown menu used to select the region type. You may also enter a custom region name in the same field, such as *Active Region (NOAA14299)*.

4. Science Mode operation Program Sequences

These are the observation modes available for public use when planning observations through the PPS interface.

1. **Synoptic4Output:** This is the default program sequence, consisting of three types of loops. Binned images are captured every minute, full-frame images are taken approximately every 2.5 hours, and ROI images are acquired during the remaining time.

Normal RoI Loop	NB04 (280.3 nm), NB03 (279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB06 (300 nm), NB07 (388 nm), NB08 (396.85 nm), NB01 (214.0 nm), Extra-ROI in BB02 (242–300 nm), and every minute NB03-binned image.
Full Frame Loop	All eleven filter combinations with every minute 2x2 binned NB03 images.
Normal Flare Loop	All eleven filter combinations, with extra-RoI captured in NB03, to align the shutter position for 2x2 binned NB03 images.
Prominence Flare Loop	NB04 (280.3 nm), NB03 (279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB08 (396.85 nm), and Extra-RoI in NB03.

2. **2KCampaignAllDisk:** Two 2k × 2k images are obtained in filters: NB04 (280.3 nm), NB03 (279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB08 (396.85 nm), BB01(200-242), NB01 (214.0 nm), BB02 (242–300 nm) in an infinite cycle.

3. **FailSafe1400msExpTime:** This program sequence is intended for situations where the filter becomes stuck and no movement is possible. In this mode, only ROI and full-frame images can be captured using a single filter. This approach may be applicable to filters NB04, NB03, NB02, NB01, NB08, and possibly BB02. The exposure time can be adjusted by modifying the exposure settings associated with the NB08 filter.

4. **FailSafeNB3:** A synoptic mode with only the NB03 filter.

5. **IrradianceMode:** Similar to the Synoptic4Output mode, but with some changes in the filter selection.

Normal RoI Loop	Uses NB04 (280.3 nm), NB03 (279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB06 (300 nm), NB07 (388 nm), NB08 (396.85 nm), NB01 (214.0 nm), Extra-ROI in BB02 (242–300 nm), plus NB03-binned images.
Full Frame Loop	All eleven filter combinations with NB03-binned images.
Flare Irradiance Loop	Uses NB04 (280.3 nm), NB03 (279.6 nm), NB01 (214.0 nm), BB01 (200–242 nm), BB02 (242–300 nm), and BB03 (320–360 nm)

6. **Mg2Ca2ROI:** Similar to Synoptic mode, with changes in filter combinations

Normal RoI Loop	NB04(280.3 nm), NB03(279.6 nm), NB02(276.7 nm), NB05(283.2 nm), NB08(396.85 nm), and every minute NB03-binned image
Full Frame Loop	All eleven filter combinations with NB03-binned images.
Normal Flare Loop	All eleven filter combinations, with Extra RoI in NB03

7. **ROIVELC:** An infinite loop that cycles through all filters without any full-frame or flare loops. It observes a larger fixed ROI size and location, ignoring the vignette part, when the Sun is properly aligned for VELC.

8. **SingleFilterBinnedNB3ROI:** Program sequence that takes binned and ROI images in a single filter, NB3. Flare loops are absent in this sequence.

9. **SingleShutterBinnedNB3NB4**: Program sequence that takes binned images in NB3 and NB4 filters. The shutter position remains the same for the filters. Flare loops are absent in this sequence.

10. SophiFDCa2: Similar to Synoptic mode, with a special loop in the full disk for certain filters.

Special full disk loop	BB01 (200 - 242 nm), BB02 (242 - 300 nm), BB03 (320 - 360 nm), NB03-binned image (No external-flare trigger monitoring)
Full frame loop	All eleven filter combinations with NB3-binned images.
Normal flare loop	All eleven filters.
Prominence flare loop	NB04 (280.3 nm), NB03 (279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB08 (396.85 nm), Extra-RoI in NB03

11. Synoptic4Output2x2K: Similar to Synoptic mode, with a special loop in the full disk for certain filters.

Normal RoI Loop:	NB04(280.3 nm), NB03(279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB06 (300 nm), NB07 (388 nm), NB08 (396.85 nm), NB01 (214.0 nm), Extra-ROI in BB02(242-300 nm), NB03-binned image.
Full frame loop:	2k binned images for NB04(280.3 nm), NB03(279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm),NB08 (396.85 nm), NB01 (214.0 nm), BB01(200 - 242 nm), BB02(242 - 300 nm), with NB03 2k images and Extra-ROI in NB04 for flare detection.
Normal flare loop:	All eleven filters. Extra-ROI in NB03.
Prominence flare loop:	NB04(280.3 nm), NB03(279.6 nm), NB02(276.7 nm), NB05(283.2 nm), NB08(396.85 nm),Extra-ROI in NB03

12. SynopticROIMode: Similar to Synoptic mode, but without a full-frame loop.

Normal RoI Loop:	NB04(280.3 nm), NB03(279.6 nm), NB02 (276.7 nm), NB05 (283.2 nm), NB06 (300 nm), NB07 (388 nm), NB08 (396.85 nm),

	NB01 (214.0 nm), Extra-ROI in BB02(242-300 nm), NB03-binned image
Full frame loop:	Absent
Normal flare loop:	All eleven filters. Extra-ROI in NB03
Prominence flare loop:	NB04(280.3 nm), NB03(279.6 nm), NB02(276.7 nm), NB05(283.2 nm), NB08(396.85 nm),Extra-ROI in NB03

13. SynopticSR: Similar to Synoptic mode, with changes in filter combinations in the normal ROI loop and the Full frame loop.

Normal RoI Loop:	NB07(388 nm), NB08(396.85 nm), NB01(214.0 nm), BB01(200-242 nm),BB02(242-300 nm), BB03(320-360 nm), Extra-ROI in NB04,NB03-binned image.
Full frame loop:	NB07(388 nm), NB08(396.85 nm), NB01(214.0 nm), BB01(200-242 nm), BB02(242-300 nm), BB03(320-360 nm), NB03-binned image
Normal flare loop:	All eleven filters. Extra-ROI in NB03
Prominence flare loop:	NB04(280.3 nm), NB03(279.6 nm), NB02(276.7 nm), NB05(283.2 nm), NB08(396.85 nm),Extra-ROI in NB03.

14. WaveROI: Similar to Synoptic mode, with changes in filter combinations in the normal ROI loop.

Normal RoI Loop:	NB04(280.3 nm), NB02(276.7 nm), NB06(300 nm), NB07(388 nm),NB08(396.85 nm), NB03-binned image.
Full frame loop:	NB07(388 nm), NB08(396.85 nm), NB01(214.0 nm), BB01(200-242 nm), BB02(242-300 nm), BB03(320-360 nm), NB03-binned image

Normal flare loop:	All eleven filters. Extra-ROI in NB03
Prominence flare loop:	NB04(280.3 nm), NB03(279.6 nm), NB02(276.7 nm), NB05(283.2 nm), NB08(396.85 nm),Extra-ROI in NB03.

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