

## Protected Guaranteed Time Observations - SOXS consortium

The following outlines the SOXS GTO target categories that can be triggered under the GTO program. The policies describing the implementation at the operation level are outlined in the NTT/SOXS Operation Policies document. Each object category has an allocated number of hours. The allocated hours are larger by a factor of 10% to account for variation in the rates of occurrence and to ensure the total GTO of 180N is delivered, but the GTO will be restricted to the agreed amount.

The sum of all the observing hours dedicated to the four programs below amounts to **1681.9hr**, the remaining 100.1hr to reach 180 nights per year (plus 10%) will be dedicated to a general classification program, to study and classify new sources and to fill the gaps in the observing schedule.

For known transients, we provide a list of objects and the GTO observations block the outburst and not the target itself.

Table 1: **SOXS GTO observations of Supernovae - Program: 116.297F**

| Object            | Science constraint                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time*          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Gap Transient     | Gap Transients $\text{yr}^{-1}$ which meet one or more of the following:<br>$m < 19$ & $-5 < M < -15$<br>Within Local Group and $M < -5$<br>$d < 50$ and Mpc $M < -15$<br>SN with precursors and failed SN candidates<br>Has a progenitor in pre-images<br>Visibility $> 7$ weeks or rising if recently emerged from solar conjunction                                                                                                                                   | <b>78.8hr</b>  |
| SN Ia             | Type Ia SNe that meet one or more of the criteria:<br>Type SN Ia with $d < 40$ Mpc<br>Any at $d < 15$ Mpc with very high-cadence<br>Nebular spectra with $\text{SNR} > 20$ (within the above)<br>Any SN2002ic-like events<br>Under-luminous or peculiar TN events (e.g. 02cx/02es like)<br>Single spectra of 30 SNe Ia to calibrate the Na I D EW-extinction relation                                                                                                    | <b>93.1hr</b>  |
| Core-Collapse SN  | Core-collapse SNe within $d < 20$ Mpc: photospheric to nebular phase<br>SNe with lines of velocity $v_{\text{FWHM}} < \text{few} \times 10^3 \text{ km/s}$ - $\sim 7$ spectra per target<br>Very luminous type II and Ibc SNe: $-20 < M_p < -19$ & $z < 0.05$<br>SN2022jli-like: lightcurve variability indicating binary progenitors ( $\gtrsim 3\sigma$ peak-to-peak)<br>Any CCSNe found within $< 2.5$ kpc from centre of LIRG (rare, expect $\sim 1\text{yr}^{-1}$ ) | <b>170.2hr</b> |
| Super-luminous SN | H-poor SLSN at redshifts $z < 0.1$<br>H-rich SLSN with broad lines at $z < 0.15$<br>iPTF14hls-like supernovae - very long-lived ( $\gtrsim 100$ d)                                                                                                                                                                                                                                                                                                                       | <b>59.1hr</b>  |
| Galactic SN       | Any SN within the Galaxy - high frequency observations                                                                                                                                                                                                                                                                                                                                                                                                                   |                |

\* The total requested time is **401.2hr**.

Table 2: **SOXS GTO on early observations of supernovae: shock breakout, cooling and Fast Blue Optical Transients - Program: 116.296F**

| Object                               | Constraints                                                                                                                                                                                                                                                                 | Time*          |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Early SN</b>                      | Rapid response to SNe that are discovered young, defined by:<br>Host galaxy within $d < 100$ Mpc and has a non-detection 2d before<br>For sources with $d < 20$ Mpc, infancy criteria relaxed to 7d before                                                                  | <b>320.1hr</b> |
| <b>FBOT</b>                          | Fast blue object transients - defined as below<br>$t_{\text{rise}} < 5$ d, $M < -19$ , $T_{\text{BB}} > 10,000$ K, $t_{\text{half}} \lesssim 7$ d<br>And/or has non-thermal x-ray and radio emission<br>Spectroscopic observation of FBOT Flares - as observed in AT2022tsd | <b>142.3hr</b> |
| <b>Luminous Fast Coolers</b>         | Transients that are luminous and fast cooling, defined by:<br>Host galaxy that implies $M < -20$ , plus rapid cooling (roughly $T \sim 1/t$ )                                                                                                                               | <b>17.8hr</b>  |
| <b>Fast extragalactic transients</b> | Rapid response to extragalactic fast declining sources:<br>Timescale above have maximum luminosity of $t_{\text{half}} \lesssim 5$ d<br>AT2018kzr-like (WD-BH merger): blue and fast declining                                                                              | <b>17.8hr</b>  |

\* The overall time request is **498.0hr**.

Table 3: **SOXS GTO on extragalactic transients (excluding SNe) - Program: 116.2960**

| Object                 | Trigger. mag         | Constraints                                                    | Time*          |
|------------------------|----------------------|----------------------------------------------------------------|----------------|
| BL Lac                 | –                    | TeV flare                                                      |                |
| FSRQ                   | –                    | Flux 0.1-100 GeV, $> 1 \times 10^{-7}$ ph cm $^{-2}$ s $^{-1}$ | <b>30.5hr</b>  |
| (A/E)NT                | $M < -20$            | or $t_{\text{rise}} > 20$ d (nuclear)                          |                |
| TDE Candidate          | $r < 20$             | classify all sources that are blue, rising, nuclear            | <b>138.1hr</b> |
| TDE follow-up          |                      | confirmed TDE                                                  |                |
| Long GRB               | $r < 21$ or $H < 19$ | High energy trigger or afterglow - spectrum                    |                |
| Long GRB               | $r > 21$             | High energy trigger or afterglow - photometry                  |                |
| GRB-SN                 | $r < 21$ or $H < 19$ | High energy trigger or afterglow $z \lesssim 0.2$              |                |
| Short GRB              | $r < 21$ or $H < 19$ | High energy trigger or afterglow - spectrum                    |                |
| Short GRB              | $r > 21$             | High energy trigger or afterglow - photometry                  | <b>247.5hr</b> |
| (FXT)                  | $r < 21$ or $H < 19$ | High energy trigger or afterglow - spectrum                    |                |
| (FXT)                  | $r > 21$             | High energy trigger or afterglow - photometry                  |                |
| GW/Kilonova spectrum   | $r < 21$             | GW/Kilonova detection not connected to SGRB                    |                |
| GW/Kilonova photometry | $r < 24$             | GW/Kilonova detection not connected to SGRB                    | <b>52.0hr</b>  |
| HEN Neutrino           | $r < 21$             | Gold HEN & counterpart                                         |                |

\* **The overall time request is 468.1hr.**Table 4: **SOXS GTO observations of Galactic transients - Program: 116.2950**

| Object                        | Trigger. mag | Constraint                                                        | Time*         |
|-------------------------------|--------------|-------------------------------------------------------------------|---------------|
| NEO                           | $V < 20$     | Orbit $< 1.5''$ ( $3\sigma$ ) $D < 300$ m                         |               |
| Cometary body                 | $V < 20$     | Orbit $< 1.5''$ ( $3\sigma$ ) $r_{\text{init}} > 5$ au $q < 3$ au |               |
| FRT - Active Asteroid         | –            | Detection of eject/coma + comet trigger                           | <b>64.4hr</b> |
| FRT - Interstellar            | –            | $e > 1$ ( $3\sigma$ )                                             |               |
| 158 TESS cand. (see list)     | $V < 11$     | Two measurements in windows close to quadrature                   |               |
| 60 HJ transit                 | $V < 13$     | Two transits from a sample of HJs                                 | <b>64.6hr</b> |
| RR Lyr                        | $V < 18$     | Obs. during hump, bump and quiescent phases                       |               |
| Eruptive Young stars          | $V < 18.5$   | $mag_{\text{alert}} - mag_{\text{histo}} > 3\sigma$               | <b>46.6hr</b> |
| Dwarf Nova outburst           | $V < 18$     | DN outburst alert from optical surveys (sample of 12)             |               |
| Gal or extragal. Nova         | $V < 19$     | Nova outburst alert from optical surveys within 3 Mpc             |               |
| WZ Sge outburst               | $V < 19$     | Outburst alert from optical surveys of WZ Sge                     | <b>83.4hr</b> |
| White dwarfs                  | $V < 19$     | Irregular transits of planetary debris from LAST & Rubin          |               |
| Magnetar                      | $r < 21$     | High energy outburst or flare                                     |               |
| Swift J195509+261406-like     | $r < 21$     | High energy or optical flare                                      |               |
| Type II X-ray pulsar outburst | –            | $L_X > 5 \times 10^{37}$ erg s $^{-1}$                            | <b>55.6hr</b> |
| Transitional MSP              | –            | State change                                                      |               |
| NS-LMXB outburst              | $i < 20.5$   | Optical/quiescence ( $\Delta m > 1$ ) or X-ray alert              |               |
| BH-LMXB outburst              | $i < 20.5$   | Optical/quiescence ( $\Delta m > 1$ ) or X-ray alert              |               |

\* **Overall time 314.6hr.**