European Organisation for Astronomical Research in the Southern Hemisphere
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Cycle: P117
Type: Normal
Status: Submitted
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APPLICATION FOR OBSERVING TIME **117.29K1**

IMPORTANT NOTICE

Studying the host environments of sub-luminous Type Ia Supernovae using MUSE observations

ABSTRACT

SNe Ia are used as accurate cosmological distance indicators which has led to the discovery of the accelerated expansion of the Universe. However, the nature of their progenitors is still unclear. Constraining progenitors is important to both understand SNe Ia, but also to evaluate systematic effects which may limit the accuracy of SN Ia to distinguish cosmologies. In particular, this study aims to investigate how different environments influence the diversity of SNe Ia, particularly sub-luminous 91bg-like SNe Ia, which challenge the standard relations used in cosmology, to better understand their progenitors and explosion mechanisms. By utilizing the MUSE instrument on the VLT, we will map detailed properties of host galaxies, including stellar population age, metallicity, and extinction, focusing on observing 63 host galaxies from the Zwicky Transient Facility (ZTF) Data Release 2 (DR2), to enable a more precise understanding of the progenitors of sub-luminous SNe Ia.

SCIENTIFIC KEYWORDS

stars: supernovae, galaxies: elliptical and lenticular, cD

RUNS

Run	Period	Instrument	Tel. Setup	Constraints	Mode	Type	Propr. Time	Time Constr.	Req. Time
117.29K1.001 • Run 1	117	MUSE	UT4	FLI: 100% • Turb.: 50% • pwv: 30.0mm • Sky: Variable, thin cirrus	SM	Normal	12m	×	63h00m

AWARDED AND FUTURE TIME REQUESTS

Time already awarded to this project

Instrument	Time	Comment
MUSE	76h	Nineteen objects observed so far, just a few days left to obtain more data in P115
MUSE	80h	Data to be obtained in P116

Future time requests to complete this project

- none -

Special Remarks

This proposal has a large number of targets over a range of RA coordinates. Galaxies can be observed in sub-optimal conditions and thus this proposal could be scheduled as a bad-weather 'filler' programme.
Eighteen targets were observed from the time already awarded to this project in P115 and thus were removed in this proposal P117.

DESCRIPTION OF THE PROPOSED PROGRAMME

A- Scientific Rationale

Studies of the host galaxies of supernovae (SNe), can provide constraints on their progenitor properties, and help us understand specific transient features in relation to their environment. Type Ia SNe (SNe Ia) are found to explode in both early and late type galaxies, and their presence in the former constrains (at least a fraction of) their progenitors to be evolved systems. However, the exact range of ages from which progenitors explode, the delay time distribution, is not well constrained. Neither is its relation to progenitor metallicity. Indeed, a strong debate exists as to whether SNe Ia arise from accretion onto a single white dwarf (WD) star, or from the coalescence of two WDs. These questions are particularly pertinent given the use of SNe Ia in many other areas of astrophysics. Their use as primary high redshift distance indicators led to the discovery of the accelerated expansion of the Universe, while SNe Ia are the main iron producers in the Universe, hence driving chemical evolution of galaxies. The continued use of SNe Ia in these distinct fields demands a more precise understanding of their progenitors and explosions mechanisms.

What are SNe Ia progenitors? The fact that SNe Ia are discovered in all types of galaxies, including passive galaxies with no signs of star formation, points to old stars being the most probable progenitors (>100 Myr; Mannucci et al. 2006). At the same time, their uniform brightness suggests that their progenitor systems form a homogeneous family. The consensus is that a SN Ia results from a degenerate (held by electron degeneracy pressure) carbon-oxygen (C-O) white dwarf (WD) undergoing a thermonuclear runaway (Hoyle & Fowler 1960), and that SNe Ia originate from close binary systems. However, the nature of the system and the explosion mechanism is still under debate. Potential progenitor systems may either consist of two WDs, called a double degenerate (DD) system, or a single WD with a non-degenerate companion, called a single degenerate (SD) system. The connection of these progenitor scenarios and explosion mechanisms with SN Ia sub-types is still not well established. However, it is of utmost importance to clarify which progenitor configuration leads to SNe Ia with particular properties and at what rate for a number of fields including stellar evolution and SN cosmology. The presence of the peculiar over- and sub-luminous SNe Ia, and other heterogeneous objects that do not follow the empirical relations (Taubenberger et. al. 2017), may challenge the picture of all SNe Ia coming from the same family of progenitors. Unlike the over-luminous 91T-like SNe, which primarily occur in actively star-forming late-type galaxies, the sub-luminous 91bg-like SNe are predominantly observed in large elliptical or S0 galaxies that have a low star formation rate, typically only a few times $10^{-9} M_{\odot}\, yr^{-1}$ (Howell, 2001; Neill et al., 2009; González-Gaitán et al., 2011), and in particular, seem to break relations, such as color characteristics and evolution. One of the main peculiarities is the lack of a secondary maximum in the NIR light curves seen in normal SNe Ia, as well as deviations from the Phillips relation (Phillips et al., 1993), which affects their reliability as cosmic distance indicators. These sub-luminous objects are photometrically characterized as fainter at peak and having faster light curve rise and decline rates, putting them at the faint and fast extreme of the light curve width-luminosity relation (Δm_{15} >1.7 mag), where many characteristics of 91bg-like SNe, such as their colors and spectroscopic features, exhibit a stronger dependence on the decline rate $\Delta m_{15}(B)$ compared to those with lower decline rates. This applies to the peak luminosity, causing 91bg-like SNe to be dimmer than expected according to the Phillips relation for their respective $\Delta m_{15}(B)$ values (Garnavich et al., 2004; Taubenberger et al., 2008). This deviation from the width-luminosity relation made it widely accepted that this relation, used to standardize normal SNe Ia, breaks down for sub-luminous 91bg-like SNe Ia as useful cosmic distance indicators.

Environments of SNe Ia and their relevance to the progenitor properties. Environmental studies of SNe offer alternative means to photometeric analysis and spectroscopic modeling to constrain progenitor properties. Integrated host-galaxy properties such as mass, star-formation rate and metallicity show crucial independent evidence in the delay-time differences between thermonuclear SNe Ia and other types of SNe, as well as metallicity dependence on the production of exceptional SNe (e.g. Timmes et al. 2004; Bravo et al. 2010). As discussed above, light-curve correlations are used to calibrate SNe Ia as distance indicators. Luminous, slower declining SNe are more often found in star-forming galaxies (where the rate per unit mass is also higher than in ellipticals), suggesting that a characteristic of their progenitors may be influencing their diversity (e.g., Hamuy et al. 2000). These findings could be linked to the age and metallicity of the progenitors, both of which change over time, meaning that at different redshifts we observe different populations of SNe. Hubble diagrams are created by applying correlations between the absolute magnitude of SNe and their light-curve shapes or colors. Any deviations in these diagrams (given a certain cosmological model) also relate to the properties of the host galaxies (see e.g., Sullivan et al. 2010), making it crucial to understand these relationships. In a study by Anderson et al. (2015), they investigated the environments of SN Type Ia in star-forming galaxies. They found out that these SNe closely track the B-band light of their host galaxies, with "redder" SNe being found nearer to star-forming regions/within more central environments (see Fig. 1). This aligns with previous research (e.g., Rigault et al. 2013), which also highlights correlations between the environments of SNe Ia and their characteristics, including Hubble residuals. Here, we propose to study the environments of the host galaxies of 1991bg-like SN Ia, in order to provide more precise constraints on their progenitor properties of these sub-luminous objects, where the installation of MUSE at the VLT promises a spectral analysis over the full spatial extent of SNe Ia hosts in an efficient manner, enabling simultaneous analysis of e.g. stellar population age, metallicity, and line of sight extinction properties. Moreover, MUSE observations allows a detailed characterization of both the global and the local environment of these SNe Ia, as well as the ability to then map galaxy-wide SN Ia host properties, and analyze where within the overall distribution of, e.g., host metallicity the SN Ia environment falls (see e.g. Galbany et al. 2018).

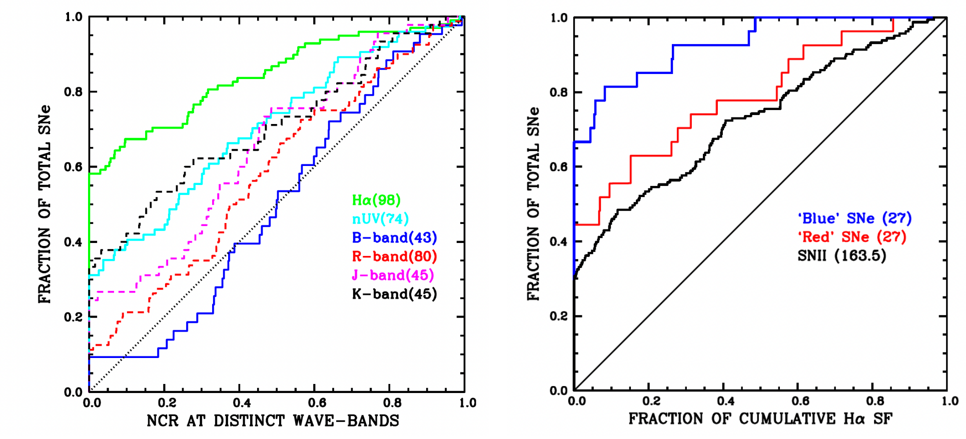

Fig. 1: multi-colour SN Ia host galaxy pixel statistics presenting cumulative distributions of SNe Ia to their host light as traced by different filters. The SN Ia population best traces the B-band light hinting at a relatively young age dominating the progenitor population. Right: pixel statistics of SN Ia with respect to Hα emission showing that 'redder' SNe more often occur close to star-forming regions. Our proposed observations will afford a much more detailed analysis of the host environments and overall host galaxies of 91bg-like SNe Ia than presented in the above plots, due to the IFU nature of MUSE.

B- Immediate Objective

We propose to obtain MUSE observations of 63 91bg-like SNe Ia host galaxies, for which detailed photometric and spectroscopic data is publicly available from the Zwicky Transient Facility (ZTF) data release 2 (DR2; Rigault et al. 2024). This sample is unbiased in terms of selection given that DR2 is complete up to the redshift of the SNe included in this proposal (z$\sim$0.06). This will allow an unprecedented study of how 91bg-like SNe Ia are linked to all the environments in which they explode. MUSE observations will provide both global host galaxy properties in addition to spectral information on the immediate environments of SNe. The power of an IFU instrument will allow us to analyse parent stellar populations in a manner that has not been previously possible. While previous studies have either estimated properties such as metallicity at specific SN locations or integrated over full galaxies, our proposed observations will allow a statistical analysis of where within the distribution of e.g. spaxel metallicities each SN lies. In the case of metallicity this will constrain whether there is a metallicity floor, below which nature does not produce these explosions (as predicted by Kobayashi et al. 1998). Extinction towards SNe Ia in the line of sight and its relation to intrinsic SN colour is also a key issue in SN Ia research (see discussion in e.g. Phillips et al. 2013). Host extinction maps will be produced using MUSE data, and comparing this to SN colour and spectral absorption features will be extremely revealing in determining the true source of SN colour diversity. The above are just two examples of the type of analysis possible with these data. Many more avenues of research will be possible to further elucidate the SN Ia progenitor problem. Using the following methods, our immediate goals of this proposal are:

1) Obtain the largest 1991bg-like SN Ia host galaxy Integral Field Spectroscopy (IFS) database yet produced.
2) Map key environmental parameters: stellar age (via through both stellar population modeling and equivalent width measurements), metallicity (via population modeling and line diagnostics), and extinction (via stellar synthesis and sodium absorption).
3) Compare host environments to SN light-curve and spectral properties to constrain progenitor diversity and refine SN Ia distance calibration techniques.

With this proposal we will obtain MUSE observations of 63 91bg-like host galaxies. The target list is formed from SNe which have been followed photometrically and spectroscopically and the data is publicly available, from which we will extract standard SN Ia parameters: light-curve morphology, colour, and spectral velocities. We select hosts which fall within the field of view (FOV) of MUSE in order to analyse their full spatial extent. With the existing sample includes over 400 "normal" SNe Ia observed with the MUSE instrument, this will allow us to directly compare the environment and implies progenitor properties of 91bg-like to 'normal' SN Ia explosions, and thus to infer how the environments and progenitor properties of 91bg-like SNe Ia differ from those of normal SNe Ia, helping to refine our understanding of the distinct characteristics of these subtypes.

References

Mannucci+06 MNRAS 370:773; Hoyle & Fowler+60 ApJ 132:565; Taubenberger17 hsn book 317; Howell01 ApJL 554:193; Neill+09 ApJ 707:1449; González-Gaitán+11 ApJ 727:107; Phillips93 ApJL 413:105; Garnavich+04 ApJ 613:1120; Taubenberger+08 MNRAS 385:75; Hamuy+00 AJ 120:1479; Sullivan+10 MNRAS 406:782; Anderson+15 PASA 32:19; Rigault+13 A&A 560:66; Galbany+18 ApJ 855:107; Rigault+24 arXiv:2409.04346; Kobayashi+98 ApJL 503:155; Phillips+13 ApJ 779:38;

TARGETS

Name	RA	Dec	Coord	Runs	Comment
ZTF18aahfgyz	11:41:08.0	+24:49:10.4	J2000	1	
ZTF18aahjaxz	12:53:49.4	+29:35:26.6	J2000	1	
ZTF18aaodnxt	13:28:04.1	+34:19:43.6	J2000	1	
ZTF18aaqfkqh	14:30:24.9	+11:55:57.2	J2000	1	
ZTF18aarcypa	11:09:50.2	+28:58:17.1	J2000	1	
ZTF18aasprui	16:14:33.806	+36:56:36.15	J2000	1	
B=21					
ZTF18aayiahw	13:59:14.0	+28:32:26.7	J2000	1	
ZTF18abbikrz	16:03:04.1	+19:10:56.3	J2000	1	
ZTF18abdmgab	16:43:36.6	+33:32:01.1	J2000	1	
ZTF18abixkdo	16:15:48.5	+19:39:25.5	J2000	1	
ZTF18abjrznx	14:45:09.7	+09:16:24.6	J2000	1	
ZTF18abklaoj	14:53:32.3	+03:04:13.8	J2000	1	
ZTF18abnzocn	02:44:07.114	+37:31:27.56	J2000	1	
B=21					
ZTF18acemhyb	07:56:34.1	+30:10:35.9	J2000	1	
ZTF18acslpba	02:44:08.2	-09:27:06.3	J2000	1	
ZTF18actasgb	04:20:41.3	-14:46:52.6	J2000	1	
ZTF18acybqhe	13:32:50.5	+07:18:38.9	J2000	1	
ZTF19aaafica	13:00:14.5	+27:57:24.6	J2000	1	
ZTF19aaaonuk	10:54:50.0	-07:22:51.6	J2000	1	
ZTF19aaejslw	14:57:27.8	+08:47:08.9	J2000	1	
ZTF19aaeopqn	13:18:59.7	+32:58:28.7	J2000	1	
ZTF19aaktdid	12:49:40.8	-12:20:53.2	J2000	1	
ZTF19aanhgqg	14:08:49.142	+35:36:51.30	J2000	1	
B=21					
ZTF19aanmclt	15:11:21.2	+11:23:38.8	J2000	1	
ZTF19aarnrbw	15:07:27.3	+03:12:15.1	J2000	1	
ZTF19aavmgtv	14:23:43.2	+28:20:52.0	J2000	1	
ZTF19aavvvrc	01:50:39.9	+33:05:09.5	J2000	1	
ZTF19abalrbb	18:13:22.2	+11:29:34.1	J2000	1	
ZTF19abfwdyt	11:48:43.7	+14:03:04.4	J2000	1	
ZTF19abggmim	14:19:30.4	+18:33:43.4	J2000	1	
ZTF19abhbjge	16:03:49.2	-06:35:44.2	J2000	1	
ZTF19abjpkdz	02:35:59.3	+10:26:31.1	J2000	1	
ZTF19abpbmli	16:07:25.7	+15:38:09.1	J2000	1	
ZTF19abpbqor	17:39:26.9	+31:14:36.2	J2000	1	
ZTF19abzlsbl	03:52:10.7	-08:30:22.9	J2000	1	
ZTF19abzprpk	01:00:30.6	+25:35:39.5	J2000	1	
ZTF19acazpyz	02:01:47.2	-01:20:27.5	J2000	1	
ZTF19acblzux	03:37:57.4	-05:00:02.6	J2000	1	
ZTF19acxngol	08:23:41.5	+21:26:04.2	J2000	1	
ZTF20aabqdbo	12:15:37.8	+27:01:27.7	J2000	1	
ZTF20aafqpum	03:06:06.5	+13:54:48.4	J2000	1	
ZTF20aagvvnr	10:49:57.1	+13:56:39.1	J2000	1	

Name	RA	Dec	Coord	Runs	Comment
ZTF20aahaxjl	07:34:43.7	+18:02:33.1	J2000	1	
ZTF20aaivjce	02:55:47.8	+15:06:01.2	J2000	1	
ZTF20aamkyyx	12:36:36.6	+08:35:15.4	J2000	1	
ZTF20aanvpzo	14:57:30.2	+08:23:23.7	J2000	1	
ZTF20aattotq	14:28:32.0	+27:24:29.9	J2000	1	
ZTF20aatzwgk	16:01:06.3	+19:27:00.7	J2000	1	
ZTF20abjapav	16:07:23.3	+13:53:33.7	J2000	1	
ZTF20abmddts	01:25:44.2	+02:26:10.4	J2000	1	
ZTF20abrjmgi	13:10:37.783	+36:37:43.67	J2000	1	
B=21					
ZTF20abzettb	04:07:24.1	+30:17:19.4	J2000	1	
ZTF20acgyulx	17:04:56.0	+21:00:26.7	J2000	1	
ZTF20acmuzkw	06:24:38.0	-23:43:59.0	J2000	1	
ZTF20acnznol	10:27:11.7	+10:01:29.6	J2000	1	
ZTF20acuoacn	08:15:24.5	-06:57:27.7	J2000	1	
ZTF20acuosvy	12:28:50.3	-01:56:39.0	J2000	1	
ZTF20acvbrbv	01:36:24.5	+22:02:59.3	J2000	1	
ZTF20acwpbgv	08:46:21.2	-12:39:21.6	J2000	1	
ZTF20acwqndp	11:31:00.9	+27:14:34.2	J2000	1	
ZTF20acwvluw	09:41:14.1	+26:05:18.9	J2000	1	
ZTF22aahhywm	15:10:43.883	-11:36:01.442	J2000	1	
B=21					
ZTF22absmrdt	12:26:48.846	08:26:55.320	J2000	1	
B=21					

Target Notes

The FoV of MUSE will be exploited to maximally cover the SN explosion site and host galaxy at large.

REMARKS & JUSTIFICATIONS

Lunar Phase and Constraints Justification

Please justify here the requested lunar phase and other observing constraints. [Anonymised]

Our targets can be observed in any lunar phase as this project is a ‘filler’ program.

Time Justification

Please describe here a detailed computation of the necessary time to execute the observations, including time-critical aspects if any. Parameters used in the ETC should be mentioned so the computation can be reproduced. [Anonymised]

Our observing procedure is driven by that performed in other supernova host galaxy studies with MUSE, which will be our comparison samples for this study. Our main aims are related to detecting and characterizing the stellar continuum, which thus drive our exposure time requirements. MUSE observations of nearby galaxies, including supernova hosts, have shown that, with 1 hour OBs, good SNR (>15) in the stellar continuum can be achieved to provide the necessary environmental diagnostics. This is possible even in comparatively faint regions by employing adaptive spatial binning techniques and we will employ established techniques to maximally recover a balance between spatial resolution and required SNR. We set here a similar strategy for all galaxies, always using OBs of 4 exposures of 620s (1 OB of 1 hour), following MUSE guidelines to rotate and dither between each in order to combat detector artifacts. Allowing for overheads, this gives 63 hours total request.

Most fields are sparse enough to use on target observations for sky-subtraction, for those with larger hosts (on-sky) we will reserve 10% of exposing time for dedicated sky-subtraction observations in nearby sparse regions - this will be for the more nearby hosts and so not compromising our SNR targets significantly. With MUSE ETC Version P117, we set turbulence category 50%, airmass to 2.5 and Moon illumination to 1.0 and WFM using non-AO. We first use a passive galaxy template at $z = 0.04$ (typical of our sample) at $R = 21$ mag/arcsec2. In the pessimistic case of an infinitely extended source, this gives a SNR in the continuum of ~15 for each spatial element we can resolve (i.e. coadding spatial pixels). This will allow us to properly subtract a continuum model of the stellar population. Again, an adaptive spatial binning will allow us to probe lower luminosity regions at a required SNR for our analyses - i.e. primarily measuring equivalent width (characteristic ages).

Telescope Justification

Please justify why the telescope requested is the best choice for this programme. [Anonymised]

To analyse the explosion sites and host galaxies of these supernovae we require statially-resolved characterisation of the stellar continuum. Only MUSE is capable of providing these data with a good spatial resolution and FoV. Large existing samples of transient host galaxy studies from MUSE data exist and serve an excellent baseline from which to comparison our results.

Observing Mode Justification

Please justify the choice of SM, VM or DVM. [Anonymised]

For MUSE users only: please be reminded that the AO WFM mode is more efficient and suitable than non-AO WFM mode for most science cases.

We ask for service mode observations since our objects can be observed at any opportune time over long time windows, but they are not all well observable at the same time to fit inside a single observing run.

Calibration Request

If you need any special calibration not included in the instrument calibration plan, please specify it here. [Anonymised]

n/a

Duplication with ESO Science Archive

If observations of the same target(s) using the same instrument(s) already exist in the ESO archive, please justify why this programme requests further observations. [Anonymised]

n/a

GTO Target Duplication Justification

If an instrument GTO team aims at the same target(s), please justify why this programme requests further observations. [Anonymised]

n/a

Background and Expertise

Short description of the background, expertise and roles of the various team members in the context of the science case discussed in the proposal. For small teams the applicants may wish to provide a sentence for the qualifications of each member, while for larger teams (e.g. in Large Programmes), only the leading roles need to be specified. [Non-anonymised]

This data will be part of Alburai PhD thesis.

The team are experts in the observation and theoretical understanding of astrophysical transients, including core-collapse and thermonuclear SNe. They have published extensively on MUSE data of the environments of various transient types and are experts in stellar population measurements.

Galbany & Anderson have extensive experience with using MUSE data to study the host galaxies and environments for various transient types. They have worked on literature samples of stripped-envelope supernovae.

REPORT ON PREVIOUS USAGE OF ESO FACILITIES

Run	PI	Instrument	Time	Mode	Comment
115.28DB.001	Alaa Alburai	MUSE	76.0h	Service	Nineteen targets observed.
Studying the host environments of sub-luminous Type Ia Supernovae using MUSE observations					
116.28SK.001	Alaa Alburai	MUSE	80.0h	Service	Data not acquired yet.
Studying the host environments of sub-luminous Type Ia Supernovae using MUSE observations					
113.26AP.001	Lluis Galbany	KMOS	3.0h	Service	Data obtained and reduced. Analysis ongoing
The evolution of of type Ia supernova host galaxy metallicity at high-z with the Dark Energy Survey					
114.26ZM.001	Lluis Galbany	MUSE	12.0h	Service	More than 40 papers publihed.
Constraining the fates of very massive stars: Environments of newly discovered peculiar core-collapse supernovae					

RECENT PI/CoIs PUBLICATIONS MOST RELEVANT TO THE SUBJECT OF THIS PROPOSAL

1. Lyman, J. D., Galbany, L., Sánchez, S. F., et al. (2020) "Studying the environment of AT 2018cow with MUSE," MNRAS, 495, 992-999 - 2020MNRAS.495..992L

2. Stritzinger, M. D., Taddia, F., Holmbo, S., et al. (2020) "The Carnegie Supernova Project II. Early observations and progenitor constraints of the Type Ib supernova LSQ13abf," A&A, 634, A21 - 2020A&A...634A..21S

3. Castrillo, A., Ascasibar, Y., Galbany, L., et al. (2021) "The delay time distribution of supernovae from integral-field spectroscopy of nearby galaxies," MNRAS, 501, 3122-3136 - 2021MNRAS.501.3122C

4. Galbany, L., de Jaeger, T., Riess, A., et al. (2022) "An updated measurement of the Hubble constant from near-infrared observations of Type Ia supernovae," arXiv, arXiv:2209.02546 - 2022arXiv220902546G

5. Solar, M., Michałowski, M. J., Nadolny, J., et al. (2024) "Binary progenitor systems for Type Ic supernovae," NatCo, 15, 7667 -

2024NatCo..15.7667S

6. Pérez, I., Verley, S., Sánchez-Menguiano, L., et al. (2024) "CAVITY, Calar Alto Void Integral-field Treasury surveY and project extension," A&A, 689, A213 - 2024A&A...689A.213P

7. González-Gaitán, S., Gutiérrez, C. P., Anderson, J. P., et al. (2024) "Narrow absorption lines from intervening material in supernovae. I. Measurements and temporal evolution," A&A, 687, A108 - 2024A&A...687A.108G

8. González-Díaz, R., Rosales-Ortega, F. F., Galbany, L., et al. (2024) "Bidimensional Exploration of the warm-Temperature Ionised gaS (BETIS). I. Showcase sample and first results," A&A, 687, A20 - 2024A&A...687A..20G

9. Kopsacheili, M., Jiménez-Palau, C., Galbany, L., et al. (2024) "Supernova remnant properties and luminosity functions in NGC 7793 using MUSE IFS," MNRAS, 530, 1078-1117 - 2024MNRAS.530.1078K

10. Sánchez, S. F., Barrera-Ballesteros, J. K., Galbany, L., et al. (2024) "The Calar Alto Legacy Integral Field Area Survey: Spatial Resolved Properties," RMxAA, 60, 41-67 - 2024RMxAA..60...41S

INVESTIGATORS

Alaa Alburai, Institute of Space Sciences ICE-CSIC, Spain (PI)
Lluis Galbany, Institute of Space Sciences ICE-CSIC, Spain (Delegated PI)
Joseph Anderson, ESO Chile, ESO

OBSERVATIONS

In the table below, the repeat factor is applied to the complete observation on that target, including its overhead.

✔ The PI acknowledged that all the telescope times listed below include overheads.

Run 117.29K1.001 • Run 1 • P117 • MUSE • SM — Tel. Time: 63h00m

FLI: 100% • Turb.: 50% • pwv: 30.0mm • Sky: Variable, thin cirrus • Airmass: 2.5

Target • ZTF18aaodnxt • 13:28:04.1 • +34:19:43.6 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18abdmgab • 16:43:36.6 • +33:32:01.1 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aavvvrc • 01:50:39.9 • +33:05:09.5 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aaeopqn • 13:18:59.7 • +32:58:28.7 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20abzettb • 04:07:24.1 • +30:17:19.4 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18aahjaxz • 12:53:49.4 • +29:35:26.6 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18aarcypa • 11:09:50.2 • +28:58:17.1 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aaafica • 13:00:14.5 • +27:57:24.6 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aattotq • 14:28:32.0 • +27:24:29.9 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aabqdbo • 12:15:37.8 • +27:01:27.7 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acwvluw • 09:41:14.1 • +26:05:18.9 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abzprpk • 01:00:30.6 • +25:35:39.5 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18aahfgyz • 11:41:08.0 • +24:49:10.4 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acvbrbv • 01:36:24.5 • +22:02:59.3 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19acxngol • 08:23:41.5 • +21:26:04.2 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18abixkdo • 16:15:48.5 • +19:39:25.5 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aatzwgk • 16:01:06.3 • +19:27:00.7 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s

Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abggmim • 14:19:30.4 • +18:33:43.4 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aahaxjl • 07:34:43.7 • +18:02:33.1 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aaivjce • 02:55:47.8 • +15:06:01.2 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abfwdyt • 11:48:43.7 • +14:03:04.4 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aafqpum • 03:06:06.5 • +13:54:48.4 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20abjapav • 16:07:23.3 • +13:53:33.7 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18aaqfkqh • 14:30:24.9 • +11:55:57.2 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abalrbb • 18:13:22.2 • +11:29:34.1 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aanmclt • 15:11:21.2 • +11:23:38.8 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abjpkdz • 02:35:59.3 • +10:26:31.1 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acnznol • 10:27:11.7 • +10:01:29.6 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s

Repeat: 1 x | Telescope Overheads: 360 s | Instrument Overheads: 0 s
Total Tel. Time: 3600s | | Signal/Noise: 0.0

Target • ZTF18abjrznx • 14:45:09.7 • +09:16:24.6 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aaejslw • 14:57:27.8 • +08:47:08.9 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18acybqhe • 13:32:50.5 • +07:18:38.9 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aarnrbw • 15:07:27.3 • +03:12:15.1 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18abklaoj • 14:53:32.3 • +03:04:13.8 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20abmddts • 01:25:44.2 • +02:26:10.4 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19acazpyz • 02:01:47.2 • -01:20:27.5 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acuosvy • 12:28:50.3 • -01:56:39.0 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19acblzux • 03:37:57.4 • -05:00:02.6 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abhbjge • 16:03:49.2 • -06:35:44.2 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acuoacn • 08:15:24.5 • -06:57:27.7 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation

Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aaaonuk • 10:54:50.0 • -07:22:51.6 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abzlsbl • 03:52:10.7 • -08:30:22.9 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aaktdid • 12:49:40.8 • -12:20:53.2 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acwpbgv • 08:46:21.2 • -12:39:21.6 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acmuzkw • 06:24:38.0 • -23:43:59.0 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abpbqor • 17:39:26.9 • +31:14:36.2 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18acemhyb • 07:56:34.1 • +30:10:35.9 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18aayiahw • 13:59:14.0 • +28:32:26.7 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aavmgtv • 14:23:43.2 • +28:20:52.0 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acwqndp • 11:31:00.9 • +27:14:34.2 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20acgyulx • 17:04:56.0 • +21:00:26.7 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18abbikrz • 16:03:04.1 • +19:10:56.3 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19abpbmli • 16:07:25.7 • +15:38:09.1 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aagvvnr • 10:49:57.1 • +13:56:39.1 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aamkyyx • 12:36:36.6 • +08:35:15.4 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20aanvpzo • 14:57:30.2 • +08:23:23.7 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18acslpba • 02:44:08.2 • -09:27:06.3 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18actasgb • 04:20:41.3 • -14:46:52.6 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF19aanhgqg • 14:08:49.142 • +35:36:51.30 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF20abrjmgi • 13:10:37.783 • +36:37:43.67 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18aasprui • 16:14:33.806 • +36:56:36.15 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF18abnzocn • 02:44:07.114 • +37:31:27.56 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF22aahhywm • 15:10:43.883 • -11:36:01.442 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ZTF22absmrdt • 12:26:48.846 • 08:26:55.320 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 3600 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 1 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0