European Organisation for Astronomical Research in the Southern Hemisphere
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APPLICATION FOR OBSERVING TIME **111.24UM**

IMPORTANT NOTICE

The local environments of stripped-envelope supernovae

ABSTRACT

The existence of stripped-envelope supernovae (SESNe) indicates that a considerable fraction of massive stars lose their outer layers of hydrogen (and even helium) before exploding as core-collapse SNe (CC SNe). The mechanism behind the envelope stripping, however, is unclear. Given the lack of direct observations of their progenitor stars, studies of their environments provide essential clues to the pre-SN evolution of these stars. We request MUSE observations of 62 SESN host galaxies, to significantly increase current samples and investigate the dependence of SN type on environment properties such as age and metallicity. In addition, we will for the first time correlate SN transient features - such as their light curve shapes - with environment properties. These observations will directly test model predictions on the explodability of massive stars with metallicity, and the dependence of SN type on environment parameters.

SCIENTIFIC KEYWORDS

stars: supernovae, galaxies: fundamental parameters, stars: evolution

RUNS

Run	Period	Instrument	Tel. Setup	Constraints	Mode	Type	Propr. Time	Time Constr.	Req. Time
111.24UM.001 • Run 1	111	MUSE	UT4	FLI: 100% • Turb.: 50% • pwv: 30.0mm • Sky: Variable, thin cirrus	SM	Normal	12m	×	69h00m

AWARDED AND FUTURE TIME REQUESTS

Time already awarded to this project

Instrument	Time	Comment
MUSE	99h	096.D-0296(A). SM. 72% completed. All data are reduced and analysed. Published and in prep. papers.
MUSE	99h	103.D-0440(A). SM. 82% completed. All data are reduced and analysed. Published and in prep. papers.

Future time requests to complete this project

- none -

Special Remarks

This project is a ‘filler’ program, with targets across the full RA and DEC range, that are observable in THN, bad seeing conditions, and during bright time. We understand that only part of the observations may be completed.

DESCRIPTION OF THE PROPOSED PROGRAMME

A- Scientific Rationale

Core-collapse supernovae (CCSNe) are luminous explosions associated with the end of the life of massive (≥ 8 M$_{\odot}$) stars. The study of these events has a deep impact in many fields of astronomy, as these explosions can be responsible for dramatic changes in the evolution of a galaxy, triggering or ceasing the formation of new stars. They are also the main formation channel of heavy elements, thus being a fundamental driver of chemical enrichment in galaxies.

CCSNe display a variety of observed properties in their observed light-curves (LCs) and spectra that are directly connected to the evolution of their progenitor stars and to explosion properties (e.g., explosion energy, ^{56}Ni mass). Type II SNe are characterized by broad hydrogen features during in their spectra, while Type Ib and Type Ic SNe are devoid of hydrogen, with the latter showing only a few traces of helium. Transition events also exist and are called Type IIb SNe; they are similar to Type II SNe at very early times but the hydrogen lines vanish during its later evolution. Type IIb/Ib/Ic SNe are called stripped-envelope SNe (SESNe), as the lack of hydrogen during their spectral evolution reflects the loss of the outermost layers of the progenitor star in pre-SN phases.

The mechanism behind the hydrogen-stripping in the pre-SN stages of SESNe, however, is a source of debate: two main scenarios propose the stripping from binary interactions (e.g., Yoon et al. 2010; Zenati et al. 2022) or strong winds and instabilities in single massive stars, such as Wolf-Rayet (WR) stars (e.g., Georgy et al. 2009; Dessart et al. 2020). In the lack of a substantial number of direct observations of their progenitor stars (only a few candidates have been identified so far; e.g., iPTF13bvn, Cao et al. 2013; SN 2013ge, Fox et al. 2022), indirect methods of constraining the masses and evolutionary states of these stars, such as local environment analysis and absolute/relative rates, are needed.

Previous studies of the environments of CCSNe showed that there are at most small differences between the local properties of SESNe and normal Type II SNe (e.g., Galbany et al. 2018). These results would support the scenario of less massive stars generating SESNe, where binary interactions would be the main mechanism behind hydrogen stripping. Most of these analyses, however, use a sample of SNe detected in targeted searches (i.e., detected by surveys that observe only bright galaxies), which lead to biases in the analyses of the environments. In fact, studies that used untargeted selections of SNe showed that SESNe occur in more metal-rich and star-forming environments than Type II SNe, and that Type Ic SNe environments have larger metallicities than Types Ib and IIb (e.g., Galbany et al. 2016, 2018).

Overcoming this sample selection bias was the main motivation of previous approved proposals to observe SN host galaxies with MUSE, which selected only SNe discovered or detected by the ASAS-SN survey, an all-sky untargeted SN survey. The 120 observed galaxies that hosted CCSNe are being analyzed by established techniques of HII region segmentation, continuum fitting and emission line characterization to study the local environment of the different subtypes of CCSNe (Fig. 1). Current analyses (Fig. 2) show that there is a significant difference between the physical properties of the local environments of SESNe and Type II SNe, such as in metallicity, star-formation rate, and stellar age (as traced by Hα equivalent width). These results also show that Type Ic are associated with the highest metallicities, while Type IIb present have similar values to Type II SN (private communication). More observations of galaxies that hosted SESNe are needed to give these results a higher statistical significance.

B- Immediate Objective

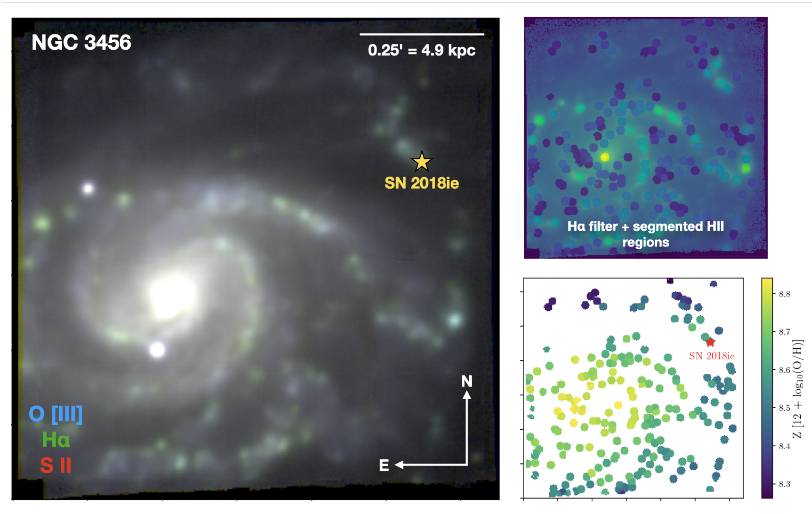
A total of 120 CCSN host galaxies were observed by MUSE as part of of previous approved proposals, of which 26 hosted SESNe. **We aim to increase this by a factor of 4 by observing 62 host galaxies of SESNe (14 Ic, 15 Ib, 21 IIb, 7 Ib/c, and 6 Ic-BL).** These targets include all galaxies that hosted SESNe detected by the ASAS-SN survey between 2013 and 2020, below a declination of $+30^{\circ}$, with no previous MUSE observations. We will use established techniques of stellar continuum fitting, HII regions segmentation and emission line characterization to derive physical parameters at a local and global scale within the galaxies. Specifically, our main goals are:

1) To complement previous observations of CCSNe host galaxies obtained with MUSE. We plan to use these observations to complement our ongoing analyses, to obtain results with a larger statistical significance of physical parameters such as star-formation rates, metallicity, and stellar population ages.

2) Look for correlations between the light curve properties of SESNe and their environments. Important physical parameters of the explosion can be derived from the observed LCs of SNe, such as the total ejecta mass, estimated from the LC width, and the ^{56}Ni mass, estimated from the peak absolute magnitude or late-time decline. Previous results show indications for a correlation between these parameters in Type II SNe and the physical properties of their local environments. Current analyses show that such correlations could also exist for SESNe, but the low number of events in the sample do not allows for strong conclusions.

3) Estimate the relative rates of SESNe as a function of local environment properties. The relative rates of the different subtypes of SESNe as a function of their local environment parameters or to the rate of Type II SNe can give a sense of the number of stars that loose their outer envelopes before exploding. The comparison of these results with the fractions of the different stellar types derived from physical models will help us constrain the mass range of SESN progenitors. We will correlate the relative rates of the different SESNe subtypes to current models, which predict that Type Ic SNe should be more common as metallicity increases (Aguilera-Dena et al. 2022). The number of galaxies expected to be observed during this program will provide enough confidence in the statistical analysis.

Figures



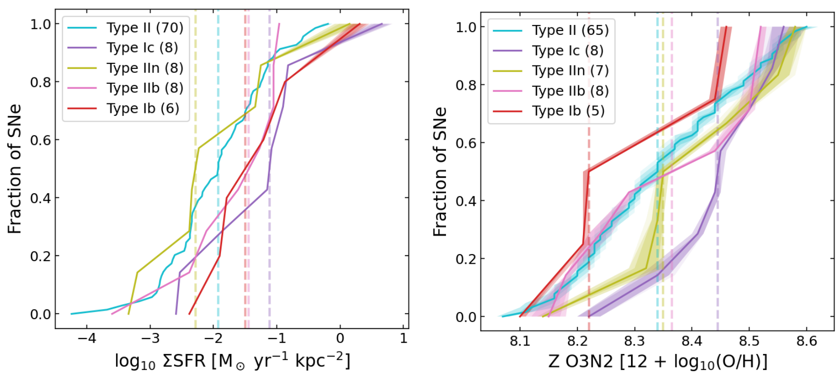


Fig. 1 (upper row): MUSE RGB image composition of the galaxy NGC 3456, which hosted the Type Ic SN 2018ie, where the O [III] emission is blue, Hα is green and S II is red. The top right panel shows the Hα image of the galaxy, with the circles indicating all the HII regions identified and analyzed to determine physical parameters by the code `IFUanalysis`. The bottom right panel reports the physical parameter map for the oxygen abundance of the segmented HII regions. Fig.2 (bottom row): the normalized cumulative distribution of the star formation rate surface density (ΣSFR) and oxygen abundance from the nearest HII region to each SN location.

References

1. Yoon, S. -C. , et al. (2010) "Type Ib/c Supernovae in Binary Systems. I. Evolution and Properties of the Progenitor Stars," APJ, 725, 940-954 – **2.** Zenati, Y., et al. (2022) "Evidence for Extended Hydrogen-Poor CSM in the Three-Peaked Light Curve of Stripped Envelope Ib Supernova," ArXiv e-prints, arXiv:2207.07146 – **3.** Georgy, C., et al. (2009) "The different progenitors of type Ib, Ic SNe, and of GRB,", 502, 611-622 – **4.** Dessart, L., et al. (2020) "Supernovae Ib and Ic from the explosion of helium stars," AAP, 642, A106 – **5.** Cao, Y., et al. (2013) "Discovery, Progenitor and Early Evolution of a Stripped Envelope Supernova iPTF13bvn," APJL, 775, L7 – **6.** Fox, O. D. , et al. (2022) "The Candidate Progenitor Companion Star of the Type Ib/c SN 2013ge," APJL, 929, L15 – **7.** Galbany, L. , et al. (2018) "PISCO: The PMAS/PPak Integral-field Supernova Hosts Compilation," APJ, 855, 107 – **8.** Galbany, L. , et al. (2016) "Nearby supernova host galaxies from the CALIFA survey. II. Supernova environmental metallicity," AAP, 591, A48 **9.** Aguilera-Dena, D. R., et al. (2022) "Stripped-envelope stars in different metallicity environments. II. Type I supernovae and compact remnants", arXiv, arXiv:2204.00025

TARGETS

Name	RA	Dec	Coord	Runs	Comment
2014bt	21:43:11.13	-38:58:05.8	J2000	1	Ib/c
2014br	22:59:50.69	-61:33:22.2	J2000	1	Ib/c
PSN J11220840-3804001	11:22:08.40	-38:04:00.1	J2000	1	IIb
2014cq	09:23:29.55	-63:40:28.3	J2000	1	IIb
2014cp	02:25:30.46	-25:37:38.0	J2000	1	Ic-BL
OGLE-2014-SN-067	04:57:50.43	-74:00:39.9	J2000	1	Ic-BL
2014dp	08:19:37.98	-22:34:14.7	J2000	1	Ib
2014ds	08:11:16.45	+25:10:47.4	J2000	1	IIb
PSN J08181390+0445527	08:18:13.90	+04:45:52.7	J2000	1	Ib
MASTER OT J120451.50+265946.6	12:04:51.50	+26:59:46.6	J2000	1	Ib
ASASSN-15qz	01:25:36.09	-41:27:55.8	J2000	1	IIb
ASASSN-15um	05:40:05.19	-80:22:22.6	J2000	1	Ib/c
ASASSN-15uy	14:32:15.31	+26:19:32.0	J2000	1	IIb
PSN J20580766-5147074	20:58:07.66	-51:47:07.4	J2000	1	IIb
2015Y	09:02:37.87	+25:56:04.2	J2000	1	IIb
2015K	23:35:52.26	+23:36:52.1	J2000	1	Ic
PS15cjr	02:38:07.29	+01:23:29.2	J2000	1	IIb
MASTER OT J141023.42-431843.7	14:10:23.42	-43:18:43.7	J2000	1	Ib
ASASSN-16fp	21:59:04.14	+18:11:11.0	J2000	1	Ib/c-BL
PTSS-16ckr	08:33:18.30	+19:20:44.8	J2000	1	Ib
KAIT-16bx	22:09:14.28	+21:31:17.5	J2000	1	IIb
2016ajo	18:44:12.49	+24:09:29.7	J2000	1	Ib
2016jag	15:23:19.79	-04:09:19.5	J2000	1	Ib
2018ow	02:51:04.410	+09:06:44.32	J2000	1	IIb
2018dbg	14:17:58.860	+26:24:44.59	J2000	1	Ib/c
ASASSN-18dr	12:25:58.541	+04:28:26.30	J2000	1	Ic-BL
AT2018cqg	03:21:13.767	-57:13:31.26	J2000	1	Ibc
ASASSN-17ai	12:07:18.83	+16:50:26.02	J2000	1	Ib
ATLAS17cpj	10:38:12.92	+28:07:02.06	J2000	1	Ic
ATLAS17iif	20:21:47.44	-10:43:53.27	J2000	1	IIb
ATLAS17naq	07:10:41.07	+06:27:41.40	J2000	1	IIb
2017ixh	06:44:26.5	-63:42:40.00	J2000	1	Ib/c
SN 2017dcc V=16.3	12:49:04.879	-12:12:22.571	J2000	1	Ic
2020hvp	16:21:45.3	-02:17:21.3	J2000	1	Ib
2019yz	15:41:57.3	+00:42:39.42	J2000	1	Ic
2020fqv	12:36:33.2	+11:13:53.976	J2000	1	IIb
2020admc	11:54:06.0	-39:51:52.704	J2000	1	Ib
2018gsk	04:09:11.6	+08:38:51.828	J2000	1	Ic
2019bao	10:29:18.5	+06:07:21.828	J2000	1	IIb
2019rn	02:17:59.6	+14:32:00.42	J2000	1	IIb
2019pqo	15:41:30.3	+15:47:03.3	J2000	1	IIb
2020eai	04:59:08.0	+04:58:21.792	J2000	1	Ib
2020njz	02:01:51.0	-10:28:11.892	J2000	1	Ic

Name	RA	Dec	Coord	Runs	Comment
2018hyw	08:20:17.3	+20:52:32.196	J2000	1	IIb
2018eoe	22:24:24.3	+18:04:18.768	J2000	1	Ib
2018cew	23:52:24.1	+28:46:30.612	J2000	1	Ib
AT2018adg	13:25:31.2	-14:21:05.22	J2000	1	Ic
2018cbz	13:41:18.6	-04:20:46.536	J2000	1	Ic
2019vsi	13:45:54.9	+23:03:42.948	J2000	1	Ib
ASASSN-19sj	16:18:38.50	+21:58:23.27	J2000	1	IIb
ASASSN-18acl	02:33:34.32	-39:02:42.40	J2000	1	Ic
ASASSN-18dj	06:00:58.90	-17:59:33.04	J2000	1	Ic-BL
ASASSN-18ex	11:51:59.84	+09:42:11.20	J2000	1	Ic
ASASSN-18ga	10:29:51.63	+09:00:46.84	J2000	1	Ic
ASASSN-18hq	14:06:34.81	-32:34:44.08	J2000	1	IIb
ASASSN-18ji	09:31:23.03	+17:48:27.90	J2000	1	Ib/c
ASASSN-18ke	10:10:28.16	+02:13:48.76	J2000	1	IIb
ASASSN-18ky	14:14:18.42	+10:40:41.56	J2000	1	Ib
ASASSN-18ph	12:55:10.14	-05:34:07.79	J2000	1	Ic
ASASSN-18rt	00:45:58.57	-21:56:44.34	J2000	1	Ic
ASASSN-18ss	03:55:20.76	-56:45:14.62	J2000	1	IIb
ASASSN-18xg	02:13:45.04	+04:06:08.17	J2000	1	Ic

Target Notes

This dataset contains all galaxies that hosted SESNe detected by the ASAS-SN survey between 2013 and 2020, below a declination of 30 degrees, with no previous MUSE observations.

REMARKS & JUSTIFICATIONS

Lunar Phase and Constraints Justification

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

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.

Our proposed MUSE observations aim to detect and measure the strength of H II region emission lines throughout target galaxies, together with narrow absorption features in the galaxy continuum. To estimate exposure times, we assume a typical r-band surface brightness of 21 mag per arcsec^2 for faint HII regions (James et al. 2004). We then use the MUSE ETC to estimate our required exposure times. We assume an ‘Infinitely extended source’ and the HII region template (at a redshift of 0.05) together with an r-band surface brightness of 21 mag per arcsec^2. As a ‘filler’ proposal we assume observations to 7 days from new moon with an airmass of 1.4 and seeing 1.5″.

In order to remove the edges of each IFU on the detector (artifacts of the image slicer), it is best to combine observations with all four 90 degree angles. With 4×700 second exposures, the ETC gives a S/N of ~5 in the continuum, which translates to a S/N of more than 100 for all the emission lines we wish to detect (e.g., Hα, [Nii], [O iii], Hβ). This totals roughly 1 hr per pointing.

Most galaxies in our sample are covered by one MUSE pointing, with the exception of 7 targets (SN 2014cp, MASTER OT J141023.42-431843.7, ASASSN-18acl, SN 2020hvp, SN 2020fqv, SN 2019bao, and SN 2019rn) which require 2 MUSE pointings to cover the entire galaxy. We thus require 69 h to observe our sample of 62 host galaxies.

We have previously obtained MUSE data with very similar conditions/observing strategy to that outlined above, and these exposure times allowed us to make the necessary measurements. We have already published several papers based on these data (see publications section). Our team has experts on the reduction, analysis and interpretation of IFS galaxy observations, while IFS data and their analysis can sometimes prove somewhat daunting, our team provides all the required knowledge to fully exploit this rich data set. These data will remain in the archive as a legacy for future extragalactic studies

Telescope Justification

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

MUSE at the VLT is the only currently available IFU instrument that has a FoV of sufficient size to cover the majority of our targets, while at the same time providing high spatial resolution, and sensitivity, allowing targets to be observed in a relatively small amount of time.

We stress here that even in relatively bad seeing conditions we will still be able to unravel kinematic and population substructure in these galaxies over a large FoV. Indeed, even in bad seeing conditions these data will still be better able to probe SN environments and galaxy characteristics than any current or past IFU survey (SAURON, ATLAS3D, CALIFA, SAMI, MaNGA).

Observing Mode Justification

Please justify the choice of SM, VM or dVM.

Targets are observable throughout the semester, so service mode is required.

Calibration Request

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

Standard Calibration.

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.

We searched for duplications, and there are no IFU observations of these galaxies in the ESO or any other public archive.

GTO Target Duplication Justification

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

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.

The team has acquired and analysed the vast majority of VLT/MUSE observations of supernova host galaxies. We have tools in place to rapidly leverage the scientific yield of this combined data set. The AMUSING project has run for 11 previous semesters, and has already published >30 papers (for a complete list of publications check https://amusing-muse.github.io/publications/), with many other projects currently ongoing.

T. Pessi is a graduate student working on supernova observations and his thesis will be in part based in using MUSE to study host galaxies of supernovae.
J. Prieto is an expert in supernovae observations and has also worked in host galaxy observations/analysis using MUSE. He is part of the ASAS-SN team.
J. P. Anderson has previously led the AMUSING proposals, and thus has significant experience of data and project organisation. He has expertise in supernova environment studies and how those studies can constrain progenitor scenarios.
L. Galbany is an expert in studying various supernovae and their host galaxies with integral field spectrograph (IFS) data. He has led and published several works from different campaigns on SNe and their host galaxies, and has expertise in the scheduling, reduction and analysis of VLT data.
J. Lyman is an expert in the study of various transient events and the analysis of SN environments with MUSE. He has developed the code IFUanalysis, which was used to analyze MUSE datacubes of several galaxies that hosted SNe and has been used in several publications of the field.
S. González-Gaitán is a SN Ia cosmology expert and has led several analyses in large SN surveys (SDSS, SNLS, DES).
H. Kuncarayakti has led MUSE core-collapse SN host galaxies projects (AMUSING, FOSSIL), and is an expert on analysing IFU data.
F. Förster is an expert in supernova observations and astroinformatics, having experience with large transient surveys (HiTS, DES). He is currently leading the ALeRCE project.
T. Holoien, B. Shappee, and K. Stanek are experts in the discovery and studies of different transient events, and have lead many important projects in the field. They are part of the ASAS-SN team.
S. F. Sanchez, F. F. Rosales-Ortega and J. Falcon-Barroso are experts in galaxy formation and evolution, particularly through the use of spectral synthesis with IFS data. They have lead and worked on many projects and publications with data obtained from large IFS galaxy surveys (SDSS, CALIFA, PINGS).
T. Kravtsov is a graduate student working on MUSE observations of SN host galaxies.

REPORT ON PREVIOUS USAGE OF ESO FACILITIES

Run	PI	Instrument	Time	Mode	Comment
0103.D-0440(A)	Joseph Anderson	MUSE	89.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey IX: supernova and tidal disruption event rates as a function of environment age and metallicity					
0103.D-0440(B)	Joseph Anderson	MUSE	10.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey IX: supernova and tidal disruption event rates as a function of environment age and metallicity					

Run	PI	Instrument	Time	Mode	Comment
0104.D-0503(A)	Joseph Anderson	MUSE	50.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey X: star formation in low-mass galaxies as traced by extra-galactic transients					
0104.D-0503(B)	Joseph Anderson	MUSE	49.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey X: star formation in low-mass galaxies as traced by extra-galactic transients					
099.D-0022(A)	Lluis Galbany	MUSE	99.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey V: Host galaxy dependences in the Near Infrared SN Ia Hubble diagram					
0100.D-0341(A)	Hanindyo Kuncarayakti	MUSE	84.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey VI: late-time nebular spectroscopy and environments of core-collapse supernovae					
0101.D-0748(B)	Hanindyo Kuncarayakti	MUSE	20.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey VII: Continuing the survey of nebular spectra and environments of core-collapse supernovae					
0101.D-0748(A)	Hanindyo Kuncarayakti	MUSE	79.0h	Service	Data reduced and analysed. Has contributed to the >30 papers published with AMUSING data thus far.
The All-weather MUse Supernova Integral field Nearby Galaxies (AMUSING) survey VII: Continuing the survey of nebular spectra and environments of core-collapse supernovae					
0110.D-0311(A)	Joseph Lyman	MUSE	1.0h	Service	Current semester, awaiting trigger
Superluminous supernova environments under the magnifying glass					
0110.D-0311(B)	Joseph Lyman	MUSE	1.0h	Service	Current semester, awaiting trigger
Superluminous supernova environments under the magnifying glass					
0109.D-0193(A)	Jose Prieto	MUSE	13.0h	Service	Only 3 h were completed so far.
The Extreme Host Galaxy Environments of Low-Luminosity Type Ia SNe with late-time H-alpha emission					
0109.D-0193(B)	Jose Prieto	MUSE	4.0h	Service	Only 3 h were completed so far.
The Extreme Host Galaxy Environments of Low-Luminosity Type Ia SNe with late-time H-alpha emission					

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. López-Cobá, C., Sánchez, S. F., Anderson, J. P., et al. (2020) "The AMUSING++ Nearby Galaxy Compilation. I. Full Sample Characterization and Galactic-scale Outflow Selection," AJ, 159, 167 - 2020AJ....159..167L

3. Tucker, M. A., Shappee, B. J., Hinkle, J. T., et al. (2021) "An AMUSING look at the host of the periodic nuclear transient ASASSN-14ko reveals a second AGN," MNRAS, 506, 6014-6028 - 2021MNRAS.506.6014T

4. Irani, I., Prentice, S. J., Schulze, S., et al. (2022) "Less Than 1% of Core-collapse Supernovae in the Local Universe Occur in Elliptical Galaxies," ApJ, 927, 10 - 2022ApJ...927...10I

5. Galbany, L., Smith, M., Duarte Puertas, S., et al. (2022) "Aperture-corrected spectroscopic type Ia supernova host galaxy properties," A&A, 659, A89 - 2022A&A...659A..89G

6. Holoien, T. W.-S., Berger, V. L., Hinkle, J. T., et al. (2022) "Examining the Properties of Low-Luminosity Hosts of Type Ia Supernovae from ASAS-SN," arXiv, arXiv:2207.07657 - 2022arXiv220707657H

7. Lopez-Coba, C, Sanchez, S. F. Lin, L., et al., (2022) "Exploring stellar and ionized gas non--circular motions in barred galaxies with MUSE", arXiv, arXiv2207.07906 - 2022arXiv220707906L
8. Lugo-Aranda, A. Z., Sánchez, S. F., Espinosa-Ponce, (2022) "PYHIIEXTRACTOR: a tool to detect and extract physical properties of HâII regions from integral field spectroscopic data", RAS Techniques and Instruments - C.2022RASTI...1....3L
9. Dessart, L., John Hillier, D., & Kuncarayakti, H. (2022) "Helium stars exploding in circumstellar material and the origin of Type Ibn supernovae," A&A, 658, A130 - 2022A&A...658A.130D
10. Brennan, S. J., Fraser, M., Johansson, J., et al. (2022) "Progenitor, environment, and modelling of the interacting transient AT 2016jbu (Gaia16cfr)," MNRAS, 513, 5666-5685 - 2022MNRAS.513.5666B

INVESTIGATORS

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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 111.24UM.001 • Run 1 • P111 • MUSE • SM — Tel. Time: 69h00m

FLI: 100% • Turb.: 50% • pwv: 30.0mm • Sky: Variable, thin cirrus • Airmass: 2.8

Target • 2014br • 22:59:50.69 • -61:33:22.2 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2014bt • 21:43:11.13 • -38:58:05.8 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • PSN J11220840-3804001 • 11:22:08.40 • -38:04:00.1 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2014cq • 09:23:29.55 • -63:40:28.3 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2014cp • 02:25:30.46 • -25:37:38.0 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • OGLE-2014-SN-067 • 04:57:50.43 • -74:00:39.9 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2014dp • 08:19:37.98 • -22:34:14.7 — Tel. Time: 02h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 8 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 7200s		Signal/Noise: 0.0

Target • 2014ds • 08:11:16.45 • +25:10:47.4 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • PSN J08181390+0445527 • 08:18:13.90 • +04:45:52.7 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • MASTER OT J120451.50+265946.6 • 12:04:51.50 • +26:59:46.6 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-15qz • 01:25:36.09 • -41:27:55.8 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-15um • 05:40:05.19 • -80:22:22.6 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-15uy • 14:32:15.31 • +26:19:32.0 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • PSN J20580766-5147074 • 20:58:07.66 • -51:47:07.4 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2015Y • 09:02:37.87 • +25:56:04.2 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2015K • 23:35:52.26 • +23:36:52.1 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s

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

Target • PS15cjr • 02:38:07.29 • +01:23:29.2 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • MASTER OT J141023.42-431843.7 • 14:10:23.42 • -43:18:43.7 — Tel. Time: 02h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 8 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 7200s		Signal/Noise: 0.0

Target • ASASSN-16fp • 21:59:04.14 • +18:11:11.0 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • PTSS-16ckr • 08:33:18.30 • +19:20:44.8 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • KAIT-16bx • 22:09:14.28 • +21:31:17.5 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2016ajo • 18:44:12.49 • +24:09:29.7 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2016jag • 15:23:19.79 • -04:09:19.5 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2018ow • 02:51:04.410 • +09:06:44.32 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2018dbg • 14:17:58.860 • +26:24:44.59 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18dr • 12:25:58.541 • +04:28:26.30 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • AT2018cqg • 03:21:13.767 • -57:13:31.26 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s

Repeat: 4 x | Telescope Overheads: 360 s | Instrument Overheads: 0 s
Total Tel. Time: 3600s | | Signal/Noise: 0.0

Target • ASASSN-17ai • 12:07:18.83 • +16:50:26.02 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ATLAS17cpj • 10:38:12.92 • +28:07:02.06 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ATLAS17iif • 20:21:47.44 • -10:43:53.27 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ATLAS17naq • 07:10:41.07 • +06:27:41.40 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2017ixh • 06:44:26.5 • -63:42:40.00 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • SN 2017dcc • 12:49:04.879 • -12:12:22.571 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2020hvp • 16:21:45.3 • -02:17:21.3 — Tel. Time: 02h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 8 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 7200s		Signal/Noise: 0.0

Target • 2019yz • 15:41:57.3 • +00:42:39.42 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2020fqv • 12:36:33.2 • +11:13:53.976 — Tel. Time: 02h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 8 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 7200s		Signal/Noise: 0.0

Target • 2020admc • 11:54:06.0 • -39:51:52.704 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • 2018gsk • 04:09:11.6 • +08:38:51.828 — Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation

Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2019bao • 10:29:18.5 • +06:07:21.828 — Tel. Time: 02h00m

OS 1
Tel. Time: 900 s
Repeat: 8 x
Total Tel. Time: 7200s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2019rn • 02:17:59.6 • +14:32:00.42 — Tel. Time: 02h00m

OS 1
Tel. Time: 900 s
Repeat: 8 x
Total Tel. Time: 7200s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2019pqo • 15:41:30.3 • +15:47:03.3 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2020eai • 04:59:08.0 • +04:58:21.792 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2020njz • 02:01:51.0 • -10:28:11.892 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2018hyw • 08:20:17.3 • +20:52:32.196 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2018eoe • 22:24:24.3 • +18:04:18.768 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2018cew • 23:52:24.1 • +28:46:30.612 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • AT2018adg • 13:25:31.2 • -14:21:05.22 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2018cbz • 13:41:18.6 • -04:20:46.536 — Tel. Time: 01h00m

OS 1
Tel. Time: 900 s
Repeat: 4 x
Total Tel. Time: 3600s

WFM-NOAO
Instrument Mode: WFM-NOAO-N
Telescope Overheads: 360 s

Observation
Integration Time: 0 s
Instrument Overheads: 0 s
Signal/Noise: 0.0

Target • 2019vsi • 13:45:54.9 • +23:03:42.948 — Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-19sj • 16:18:38.50 • +21:58:23.27 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18acl • 02:33:34.32 • -39:02:42.40 Tel. Time: 02h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 8 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 7200s		Signal/Noise: 0.0

Target • ASASSN-18dj • 06:00:58.90 • -17:59:33.04 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ex • 11:51:59.84 • +09:42:11.20 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ga • 10:29:51.63 • +09:00:46.84 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18hq • 14:06:34.81 • -32:34:44.08 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ji • 09:31:23.03 • +17:48:27.90 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ke • 10:10:28.16 • +02:13:48.76 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ky • 14:14:18.42 • +10:40:41.56 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ph • 12:55:10.14 • -05:34:07.79 Tel. Time: 01h00m

OS 1	**WFM-NOAO**	**Observation**
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18rt • 00:45:58.57 • -21:56:44.34 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18ss • 03:55:20.76 • -56:45:14.62 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0

Target • ASASSN-18xg • 02:13:45.04 • +04:06:08.17 Tel. Time: 01h00m

OS 1	WFM-NOAO	Observation
Tel. Time: 900 s	Instrument Mode: WFM-NOAO-N	Integration Time: 0 s
Repeat: 4 x	Telescope Overheads: 360 s	Instrument Overheads: 0 s
Total Tel. Time: 3600s		Signal/Noise: 0.0