Visibility Service and Observation Locator: Planning future observations

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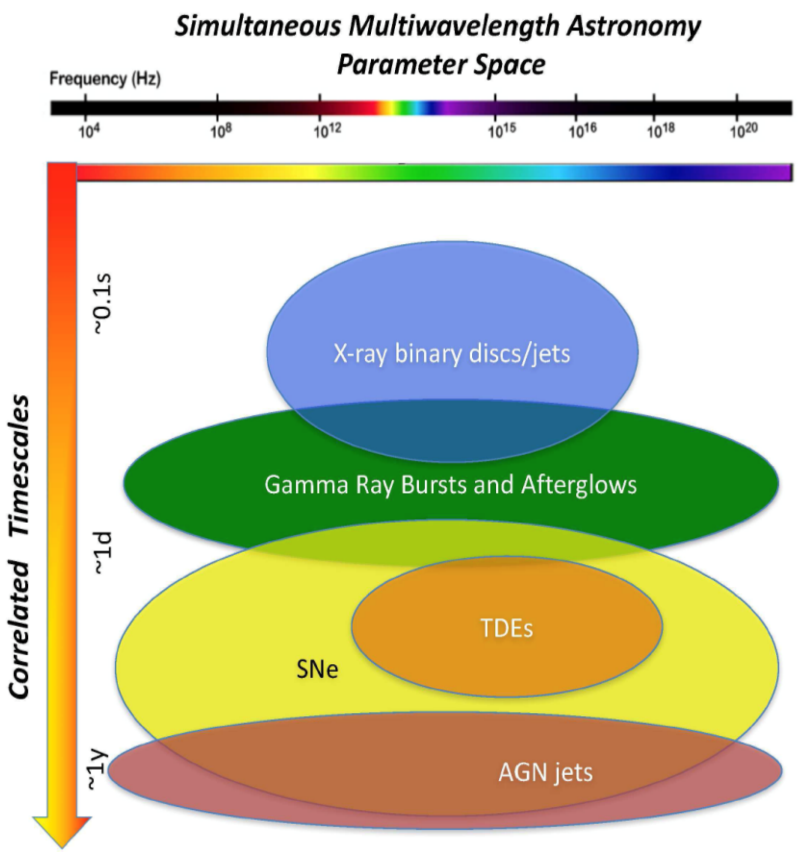
1 Quasar for ESA
2 TPZ-VEGA for ESA
3 ATG for ESA
4 ESA

Scientists Require Coordinated Multi-wavelength Observations

- Increasing interest to simultaneously observe the same target at different wavelengths. Example use cases:
  - X-ray binary ToOs
  - Gaia transients
  - Optical & radio transients
  - TDEs, GRBs
  - GW & neutrino follow-up

- Some observatory numbers:
  - **NuSTAR**: 30% of the observations are coordinated with other observatories.
  - **XMM-Newton**: ~12% coordinated observations (NuSTAR, HST, Chandra, VLT, Swift).
  - ***INTEGRAL**: ~10%* of the observations are coordinated with other observatories.
  - ***Chandra** has expanded the time available via joint programs.*



Middelton et al. 2017

Information is out there

All information needed to plan an observation (via AO or ToO) is currently in facilities own web pages.

Target Visibility Constraints

Observations info

BUT

Instrument characteristics

Short-term schedule

Long-term schedule

This information is usually shown in a web page statically and is only accessible trough forms that have to be manually filled in.

Visibility services

Isaac Newton Group of Telescopes

About ING ▼ Astronomy ▼ Developments ▼ Public Information ▼ Search:

Home > Astronomy > *Object Visibility*

Object Visibility – STARALT

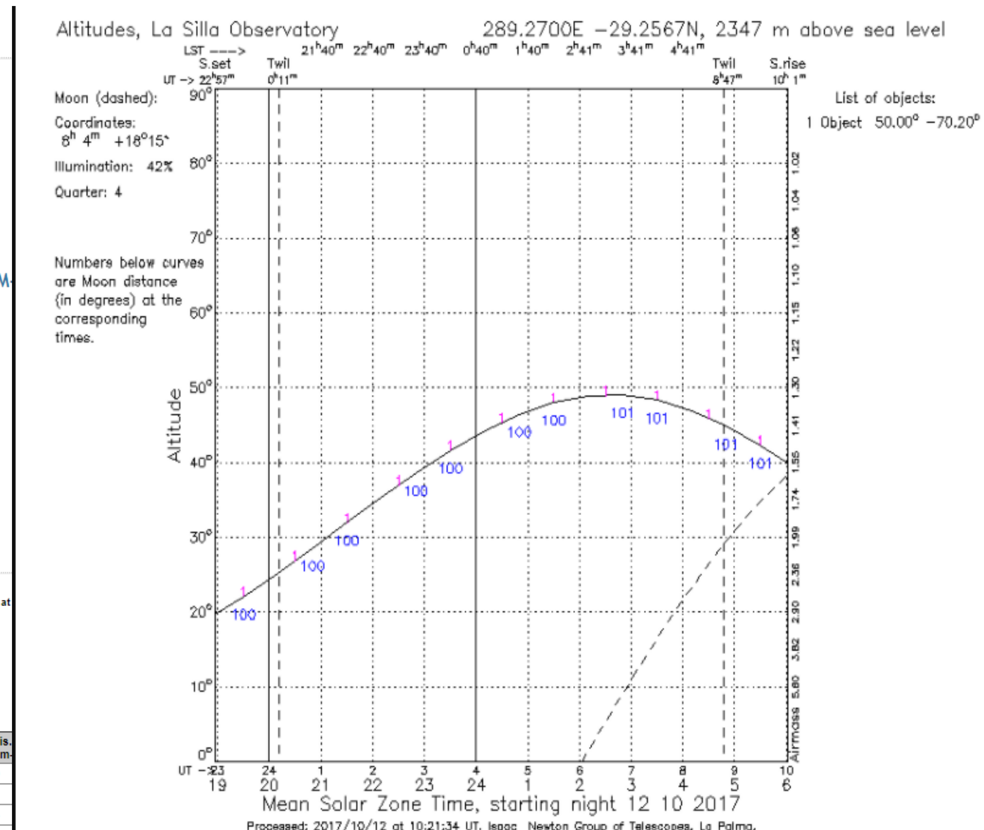
Staralt is a program that shows the observability of objects in various ways: either you can plot altitude against time for a particular night (**Staralt**), or plot the path of your objects across the sky for a particular night (**Startrack**), or plot how altitude changes over a year (**Starobs**), or get a table with the best observing date for each object (**Starmult**). For further information, click on the "help" button at the bottom of the page.

Mode	Staralt ▼
Night	12 ▼ October ▼ 2017 ▼ or date when the local night starts. *Staralt, Startrack only.*
Observatory	La Silla Observatory (Chile) ▼ Select one above or specify your own site with this format: `Longitude(°East) Latitude(°) Altitude(metres) UTC offset(hours)` Ex.: `289.2767 -30.2283 2725 -4`

Coordinates	Formats can be any of these:
	`name hh mm ss ±dd mm ss`
	`name hh:mm:ss ±dd:mm:ss`
	`name ddd.ddd dd.ddd`
	name must be a single word with no dots, avoid using single numbers. Every entry must be in the same format, do not use different formats with different entries. We recommmend a maximum of 100 targets per submission.
	`50.0 -70.2`

TY CHECKER

TS RETURNED BELOW.




```
   RA & dec:   5 23 34.5, -69 45 22, epoch 2000.0
Site long&lat:  +4 41 36.8 (h.m.s) West, -24 37 30 North

Shown: local eve. date, moon phase, hr ang and sec.z at
(2) natural center of night, and (3) morning twilight; t
nighttime hours during which object is at sec.z less tha
Night (and twilight) is defined by sun altitude < -18.0

 Date (eve) moon       eve           cent           morn
                   HA  sec.z     HA  sec.z      HA  se
2017 Nov 3    F   -6 52   3.1    -2 45   1.6    +1 21
2017 Nov 17   N   -5 44   2.4    -1 49   1.5    +2 07
```

Rev.	Visi start (yyyy-mm-dd hh:mm)	Visi Window Duration (s)	Vis. (yyyy-mm-					
3397	2018-06-28 02:58	27036	2018-06-28 10:29					
3398	2018-06-29 12:49	78126	2018-06-30 10:31					
3399	2018-07-01 12:42	78063	2018-07-02 10:23					
3400	2018-07-03 12:35	77939	2018-07-04 10:14					
3401	2018-07-05 12:29	77804	2018-07-06 10:06	75000	0.47	0.92	77.3	69.5
3402	2018-07-07 12:22	77715	2018-07-08 09:58	75000	0.47	0.92	78.8	68.5
3403	2018-07-09 12:15	78302	2018-07-10 10:00	75000	0.47	0.93	80.4	67.4
3404	2018-07-11 12:07	78348	2018-07-12 09:53	75000	0.47	0.93	82.0	66.3

SkyCalc provided by courtesy of John Thorstensen, Dartmouth College. John.Thorstensen@dartmouth.edu

Planned Observations Services

Integral Target and Scheduling Information

Schedule: All executed | Current revolution (1872) | Future schedule | Revolution 1872 to 1872 | Show... | show plot

Schedule for revolution 1872

(this list is also available in csv-format, click here to download)

Rev	Start time (UTC)	End time (UTC)	Exp. time (s)	Target	Ra (J2000)	Dec (J2000)	Pattern	PI	Proposal	Observation
1872	2017-10-10 13:29:15									01 / 0022
1872	2017-10-10 17:13:34									09 / 0011
1872	2017-10-11 08:16:46									21 / 0039
1872	2017-10-11 12:26:36									21 / 0038
1872	2017-10-11 13:27:21									21 / 0040
1872	2017-10-11 15:00:12									21 / 0040
1872	2017-10-11 18:41:00									29 / 0008
1872	2017-10-12 09:06:18									21 / 0041
1872	2017-10-12 13:16:06									21 / 0042

09-Oct-2017 18:48:29 --- Preliminary HST Observing Timeline Report for SMS: 172888A4 --- Page 1
SMS Start: 2017.288:22:10:00 (15-OCT-2017 22:10:00), End: 2017.296:00:00:00 (23-OCT-2017 00:00:00)

	Scheduling Unit Begin UT	End UT	SU Id	Principal Investigat	Exp #	Target	Science Instrume	Mode	Apertures	Spectral Elements	Exposure Time(sec)	OB	AL	EX
2017.288	23:00:00	23:35:07	14835Z1	Lockwood	Z1-001	DARK	STIS/MA2	TIME-T	F28X50LP	MIRVIS	1300.00	Z1	01	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-001	WASP-69	COS/NUV	ACQ/SE	PSA	G230L	12.00	35	01	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-002	WASP-69	COS/NUV	ACQ/PE	PSA	G230L	12.00	35	02	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-003	WASP-69	COS/NUV	ACQ/PE	PSA	G230L	12.00	35	03	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-004	WASP-69	COS/FUV	TIME-T	PSA	G130M	1917.00	35	05	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-005	WASP-69	COS/FUV	TIME-T	PSA	G130M	2706.00	35	07	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-006	WASP-69	COS/FUV	TIME-T	PSA	G130M	2706.00	35	09	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-007	WASP-69	COS/FUV	TIME-T	PSA	G130M	2706.00	35	0B	01
2017.288	23:14:45	06:30:55	1476735	Sing	35-008	WASP-69	COS/FUV	TIME-T	PSA	G130M	2706.00	35	0D	01
2017.289	00:00:00	00:28:32	14819JF	Riley	JF-001	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	1100.00	JF	01	01
2017.289	00:00:00	00:28:32	14819JF	Riley	JF-002	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	60.00	JF	01	02
2017.289	00:00:00	00:28:32	14819JF	Riley	JF-003	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	60.00	JF	01	03
2017.289	00:00:00	00:46:10	145333B	Bourque	3B-001	DARK-NM	WFC3/UVI	ACCUM	UVIS	F373N	900.00	3B	01	01
2017.289	00:00:00	00:46:10	145333B	Bourque	3B-001	DARK-NM	WFC3/UVI	ACCUM	UVIS	F373N	900.00	3B	02	01
2017.289	00:39:46	01:08:18	14819JG	Riley	JG-001	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	1100.00	JG	01	01
2017.289	00:39:46	01:08:18	14819JG	Riley	JG-002	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	60.00	JG	01	02
2017.289	00:39:46	01:08:18	14819JG	Riley	JG-003	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	60.00	JG	01	03
2017.289	00:46:10	01:32:20	145333C	Bourque	3C-001	DARK-NM	WFC3/UVI	ACCUM	UVIS	F467M	900.00	3C	01	01
2017.289	00:46:10	01:32:20	145333C	Bourque	3C-001	DARK-NM	WFC3/UVI	ACCUM	UVIS	F467M	900.00	3C	02	01
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	01
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	02
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	03
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	04
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	05
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	06
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	07
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	08
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	09
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0A
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0B
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0C
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0D
2017.289	01:27:12	01:56:24	148219U	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0E
2017.289	01:27:12	01:56:24	148219U	Riley	9U-002	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0F
2017.289	01:27:12	01:56:24	148219U	Riley	9U-002	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0G
2017.289	01:27:12	01:56:24	148219U	Riley	9U-002	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U	01	0H
2017.289	01:40:00	02:09:22	14518F0	Golimowski	F0-001	BIAS	ACS/WFC	ACCUM	WFC	F502N F660N	0.00	F0	01	01
2017.289	01:40:00	02:09:22	14518F0	Golimowski	F0-002	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	1000.50	F0	01	02
2017.289	02:09:22	02:38:56	14518F1	Golimowski	F1-001	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	0.50	F1	01	01
2017.289	02:09:22	02:38:56	14518F1	Golimowski	F1-002	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	1000.50	F1	01	02

09-Oct-2017 18:48:29 --- Preliminary HST Observing Timeline Report for SMS: 172888A4 --- Page 2
SMS Start: 2017.288:22:10:00 (15-OCT-2017 22:10:00), End: 2017.296:00:00:00 (23-OCT-2017 00:00:00)

	Scheduling Unit Begin UT	End UT	SU Id	Principal Investigat	Exp #	Target	Science Instrume	Mode	Apertures	Spectral Elements	Exposure Time(sec)	OB	AL	EX
2017.289	02:38:56	03:08:18	14518F2	Golimowski	F2-001	BIAS	ACS/WFC	ACCUM	WFC	F502N F660N	0.00	F2	01	01
2017.289	02:38:56	03:08:18	14518F2	Golimowski	F2-002	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	1000.50	F2	01	02
2017.289	03:10:31	03:40:05	14518F3	Golimowski	F3-001	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	0.50	F3	01	01
2017.289	03:10:31	03:40:05	14518F3	Golimowski	F3-002	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	1000.50	F3	01	02
2017.289	03:46:00	04:48:35	14835Z2	Lockwood	Z2-001	DARK	STIS/MA2	TIME-T	F28X50LP	MIRVIS	1300.00	Z2	01	01
2017.289	03:49:34	05:01:49	1454639	Shanahan	39-001	TUNGSTEN	WFC3/UVI	ACCUM	UVIS1-M512-S	F645N	60.00	39	01	01
2017.289	03:49:34	05:01:49	1454639	Shanahan	39-002	TUNGSTEN	WFC3/UVI	ACCUM	UVIS	F814W	2.00	39	01	02
2017.289	03:49:34	05:01:49	1454639	Shanahan	39-003	TUNGSTEN	WFC3/UVI	ACCUM	UVIS	F438W	360.00	39	01	03
2017.289	03:49:34	05:01:49	1454639	Shanahan	39-004	TUNGSTEN	WFC3/UVI	ACCUM	UVIS	F438W	360.00	39	01	04

hbpix

esa

› Short Term Schedule

XMM-NEWTON SHORT-TERM SCHEDULE

2:00 UT (Current Rev = 3267)

RGS2 Dur. Ks	OM Dur. Ks	PI
18.2	18.0	Peter Boorman
11.0	10.8	Fabio Favata
45.0	37.3	Fred Jansen XMM-Newton MM
27.0	26.8	Guido Risaliti
13.0	12.9	Nathan Secrest
44.9	43.7	Patrick Kavanagh
44.0	42.8	Patrick Kavanagh
37.5	37.3	Guido

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Observing schedules

Short Range Observatory Schedule

Download

This is the confirmed schedule of NuSTAR observations. This sequence of observations has been uploaded to the spacecraft and will execute autonomously unless interrupted by a new schedule, Target of Opportunity, or instrument and spacecraft anomalies. This schedule will cover various time ranges depending on the exposure time goal of the observations, but will usually be for a period of at least one week.

The times reported here are the start and end of the on-target period (day of year UTC). The estimated exposure time takes into account Earth occultation and the SAA passage time where detector background is increased. The end time of the observation is the start of the slew to the next target. Please examine the NuSTAR As-Flown Timeline (AFT) for the log of past observations.

Table Header Explanations

obs_start	obs_end	sequenceID	Name	J2000_RA	J2000_Dec	Exp	Notes
2017:281:19:05:02	2017:283:00:30:00	90201021006	Kepler	262.671620	-21.491957	60.6	DDT
2017:283:01:11:23	2017:283:02:40:00	90311211001	Sol_17282_AR2683_POS11	195.15715	-6.38520	3.4	ToO
2017:283:02:40:32	2017:283:04:20:00	90311212001	Sol_17282_AR2683_POS12	195.21879	-6.41062	3.4	ToO
2017:283:04:20:32	2017:283:05:50:00	90311213001	Sol_17282_AR2683_POS13	195.28046	-6.43604	3.4	ToO
2017:283:06:55:11	2017:284:09:20:00	60376001002	2MASXJ19301380p3410495	292.557500	34.180500	55.3	Extragalactic Legacy Survey
2017:284:09:45:09	2017:284:20:35:00	60360008002	SDSSJ152132d21p391206d9	230.3874232	39.2007671	22.0	Extragalactic Legacy Survey
2017:284:21:10:03	2017:285:21:00:00	90301320002	NGC_6440	267.218083	-20.358944	49.5	ToO
2017:285:21:20:06	2017:286:08:20:00	30302020004	GRS_1915p105	288.79813	10.94578	21.9	(2/4) coordinated with XMM and VLT
2017:286:08:35:06	2017:286:19:30:00	60160701002	2MASXJ18560128p1538059	284.00210000	15.63200000	23.3	BAT AGN
2017:286:20:05:11	2017:287:15:05:00	60376007002	UGC06728	176.316800	79.681500	61.4	Extragalactic Legacy Survey
2017:287:15:50:11	2017:288:03:20:00	60368001002	NGC_1144	43.80083	-0.18361	22.0	
2017:288:04:05:09	2017:288:23:00:00	60301004002	ESO_103m35	279.58458	-65.4275	50.3	
2017:288:23:30:08	2017:290:05:45:00	30301026002	AX_J1841d0m0536	280.25179	-5.59625	59.7	phase constrained
2017:290:06:00:04	2017:290:17:00:00	60160670002	2E1739d1m1210	265.47600000	-12.19700000	23.5	BAT AGN
2017:290:17:15:01	2017:291:04:20:00	30363001002	GX_3p1	266.98333	-26.56361	21.8	

Long Range Observatory Schedule

Download

This is the latest NuSTAR long-term schedule. Observations have been sorted into one-week intervals, taking into account Sun, Moon, required exposure time, and other constraints. So the date is the Monday of the week in which the observation is scheduled to begin.

E.g. An observation with a date **2017-12-18** in this table is scheduled to have the observation ***starting*** sometime between **2017-12-18 0000Z** and **2017-12-25 0000Z**.

Currently the schedule is driven by the large number of observations coordinated with other observatories and the need to complete the NuSTAR Guest Observer programs. The exposure goal for targets allotted within one week may appear to fill more then the available NuSTAR exposure time in that week (average is 330 ks per week) but many observations start in one week and complete in the following week.

Targets of opportunity and any instrument or spacecraft anomalies may also cause the observing times of targets to shift. This long-term schedule is our present estimate of the future order of observations. Please be aware of the uncertainties.

ToO = Target of Opportunity **DDT** = Directors Discretionary Time **N03** = NuSTAR GO cycle-3 **I15** = INTEGRAL GO cycle-15
X16 = XMM-Newton GO cycle-16 **C18** = Chandra GO cycle-18 **ELS/GLS** = Extragalactic/Galactic legacy surveys

Use Case: XMM-Newton – Integral

XMM-Newton

http://xmm.esac.esa.int/XMMVisCheck?
startDate=11-10-2017&
minduration=12.000&
coordinates=equatorial&
ra=192.063458&
dec=17.77394

INTEGRAL

http://integral.esac.esa.int//IntegralVisCheck?
startDate=11-10-2017&
minduration=12.000&
coordinates=equatorial&
ra=192.063458&
dec=17.77394

xmm.esac.esa.int/XMMVisCheck?ra=321&dec=34&minDuration=5000&startdate=20-Dec-2017&enddate=20-Dec-2018&coordinates=equatorial


```
[{"SolarA":"89.3","Rev":"3293","VisStar":"2017-12-01 10:19","AstroA":"241.2","VisEnd":"2017-12-03 01:12","StarPh":"0.12","Round":"130000","VisDur":"139962","EndPh":"0.93"},
{"SolarA":"87.9","Rev":"3294","VisStar":"2017-12-03 10:11","AstroA":"239.7","VisEnd":"2017-12-05 00:54","StarPh":"0.12","Round":"130000","VisDur":"139376","EndPh":"0.93"},
{"SolarA":"86.5","Rev":"3295","VisStar":"2017-12-05 10:05","AstroA":"238.2","VisEnd":"2017-12-07 00:47","StarPh":"0.12","Round":"130000","VisDur":"139318","EndPh":"0.93"},
{"SolarA":"85.1","Rev":"3296","VisStar":"2017-12-07 09:59","AstroA":"236.8","VisEnd":"2017-12-09 00:39","StarPh":"0.12","Round":"130000","VisDur":"139189","EndPh":"0.93"},
{"SolarA":"83.7","Rev":"3297","VisStar":"2017-12-09 09:53","AstroA":"235.3","VisEnd":"2017-12-11 00:31","StarPh":"0.12","Round":"130000","VisDur":"139045","EndPh":"0.93"},
{"SolarA":"82.3","Rev":"3298","VisStar":"2017-12-11 09:46","AstroA":"233.8","VisEnd":"2017-12-13 00:12","StarPh":"0.12","Round":"130000","VisDur":"138334","EndPh":"0.92"},
{"SolarA":"80.9","Rev":"3299","VisStar":"2017-12-13 09:39","AstroA":"232.3","VisEnd":"2017-12-15 00:03","StarPh":"0.12","Round":"130000","VisDur":"138278","EndPh":"0.92"},
{"SolarA":"79.5","Rev":"3300","VisStar":"2017-12-15 09:31","AstroA":"230.7","VisEnd":"2017-12-16 23:55","StarPh":"0.12","Round":"130000","VisDur":"138259","EndPh":"0.92"},
{"SolarA":"78.1","Rev":"3301","VisStar":"2017-12-17 09:23","AstroA":"229.2","VisEnd":"2017-12-18 23:47","StarPh":"0.12","Round":"130000","VisDur":"138228","EndPh":"0.92"},
{"SolarA":"76.7","Rev":"3302","VisStar":"2017-12-19 09:17","AstroA":"227.7","VisEnd":"2017-12-20 23:29","StarPh":"0.12","Round":"130000","VisDur":"137542","EndPh":"0.92"},
{"SolarA":"75.4","Rev":"3303","VisStar":"2017-12-21 09:12","AstroA":"226.1","VisEnd":"2017-12-22 23:21","StarPh":"0.12","Round":"130000","VisDur":"137392","EndPh":"0.92"},
{"SolarA":"74.0","Rev":"3304","VisStar":"2017-12-23 09:06","AstroA":"224.5","VisEnd":"2017-12-24 23:03","StarPh":"0.12","Round":"130000","VisDur":"136627","EndPh":"0.92"},
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```
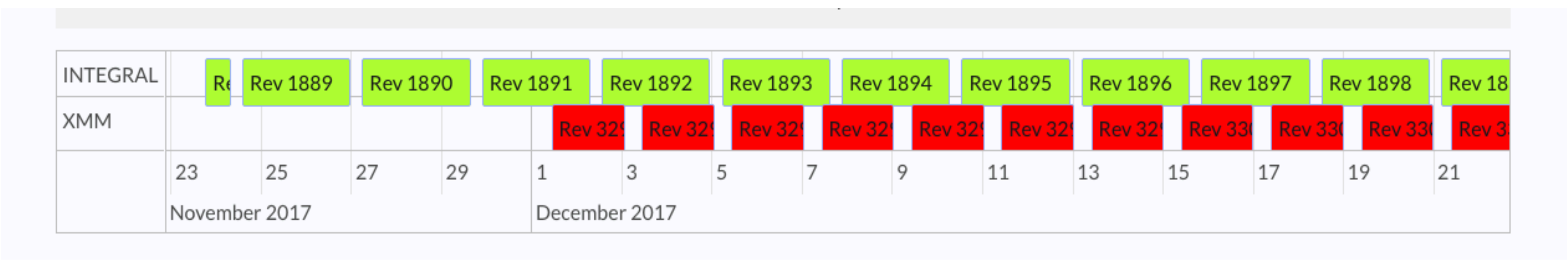
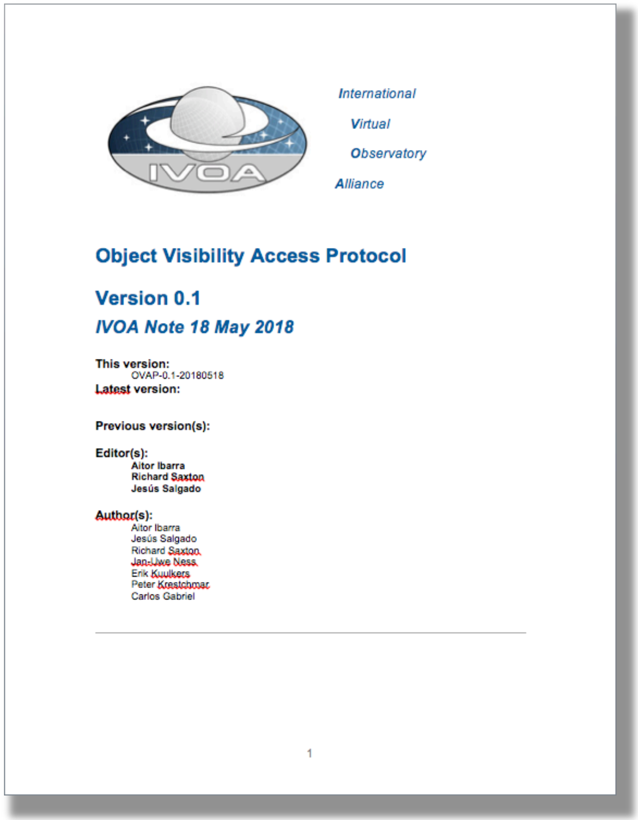




Two protocols



International
Virtual
Observatory
Alliance

Object Visibility Access Protocol

Version 0.1

IVOA Note 18 May 2018

This version:
OVAP-0.1-20180518
Latest version:

Previous version(s):

Editor(s):
Aitor Ibarra
Richard Saxton
Jesús Salgado

Author(s):
Aitor Ibarra
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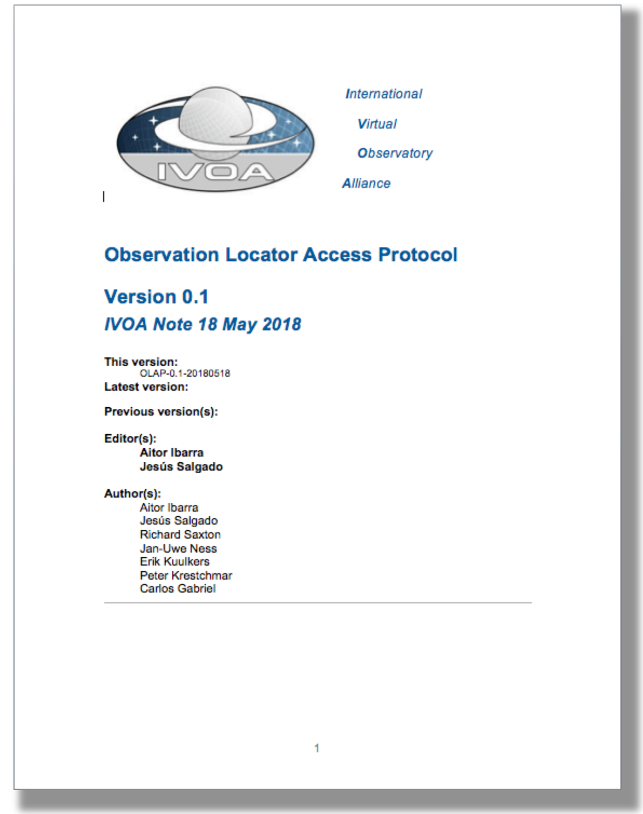
Richard Saxton
Jan-Uwe Ness
Erik Kuulkers
Peter Krestchmar
Carlos Gabriel

1



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Observation Locator Access Protocol

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OVAP IVOA Note

OLAP IVOA Note

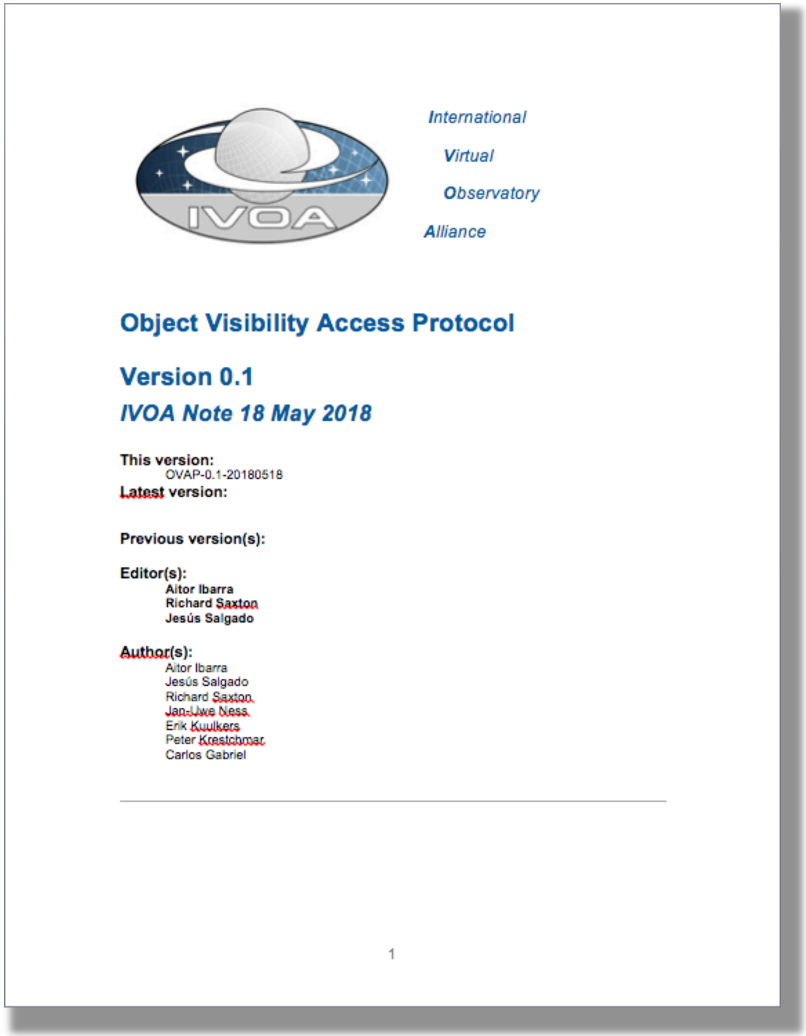
SOVAP (?)

PlanObsTAP (?)

Object Visibility Access Protocol

1. Simple Access Protocol
2. Easy to implement for the different observatories
3. Already available in a non-standard way in many cases
4. Based on "parameter=value" approach
5. VOTable response

6. Analyzed to be done as a TAP protocol but it was not so easy to implement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OVAP protocol: Input parameters

Compulsory:

1. **RA**: Right Ascension - Equatorial J2000
2. **DEC**: Declination – Equatorial J2000
3. **START_TIME**: Time period start time - UTC Time (IVOA format) or MJD
4. **END_TIME**: Time period end time - UTC Time (IVOA format) or MJD

```
http://xmmvischeck.esac.esa.int/ovap/vischek?
RA=10.68&DEC=41.27&
START_TIME=2018-02-22T23:00:00.0Z&
END_TIME=2018-03-20T23:00:00.0Z
```

Optional:

1. **MIN_VIS**: Minimum visibility check - Double between 0-1 (min/max)
2. **MAX_VIS**: Maximum visibility check - Double between 0-1 (min/max)

OVAP protocol: Output

1. **Visibility period start:**

UTC Time (IVOA format) or MJD
(utype=”**ovdm:Visibility.startVisibility.value**”)

1. **Visibility period end:**

UTC Time (IVOA format) or MJD
(utype=”**ovdm:Visibility.endVisibility.value**”)

1. **Visibility period duration:**

seconds
(utype=”**ovdm:Visibility.duration.value**”)


```
<?xml version="1.0" encoding="UTF-8"?>
<VOTABLE xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="xmlns:http://www.ivoa.net/xml/VOTable/VOTable-1.1.xsd"
xmlns:ssldm ="http://www.ivoa.net/xml/ObjectViibilityDM/ObjectVisibilityDM-v1.0.xsd"
version="1.0">
<RESOURCE type="results">
<DESCRIPTION>European Space Astronomy Centre. XMM-Newton SOC – Object Visibility
Access Protocol (OVAP)</DESCRIPTION>
<INFO name="QUERY_STATUS" value="OK"/>
<INFO name="SERVICE_PROTOCOL" value="1.0">OVAP</INFO>
<INFO name="REQUEST" value="queryData"/>
<INFO name="RA" value="10.68"/>
<INFO name="DEC" value="41.27"/>
<INFO name="START_TIME" value="2018-02-22T23:00:00.0Z "/>
<INFO name="END_TIME" value="2018-07-22T23:00:00.0Z "/>

<TABLE>
<FIELD ucd="ovdm.startVisibility" name="START_VISIBILITY"
utype="ovdm:visibility.startVisibility.value" datatype="char" arraysize="*"/>
<FIELD ucd="ovdm.endVisibility" name="END_VISIBILITY"
utype="ovdm:visibility.endVisibility.value" datatype="char" arraysize="*"/>
<FIELD ucd="ovdm.duration" name="DURATION" utype="ovdm:visibility.duration.value"
datatype="double"/>
<DATA>
<TABLEDATA>

<TR>
<TD>2018-06-28T02:58:00.0Z</TD>
<TD>2018-06-28T10:29:00.0Z</TD>
<TD>27036</TD>
</TR>

<TR>
<TD>2018-06-29T12:49:00.0Z</TD>
<TD>2018-06-30T10:31:00.0Z</TD>
<TD>78126</TD>
</TR>

..... more lines data......

</TABLEDATA>
</DATA>
</TABLE>
</RESOURCE>
</VOTABLE>
```

OLAP – Observation Locator Access Protocol

1. Retrieve information of planned observations
2. Protocol based on TAP
3. Allow the discovery of planned observations
4. Based on discovery of planned observation periods (not in data discovery)
5. Non-applicable ObsDataSet elements have been removed as there is not data associated yet
6. Some new fields added to support planning and to make the distinction between performed and scheduled
7. Some metadata is private for some observatories but it is important to reserve these time blocks into the schedule
8. Compulsory metadata should be, only, the start and end times (in this case of the scheduled time)

Observation Locator Data Model

Column Name	*Unit*	*Type*	*Description*
t_planning	d	double	Planning time in MJD
target_name	unitless	String	Astronomical object observed, if any
obs_id	unitless	String	Observation ID
obs_collection	unitless	String	Name of the data collection
s_ra	deg	double	Central right ascension, ICRS
s_dec	deg	double	Central declination, ICRS
s_fov	deg	double	Diameter (bounds) of the covered region
s_resolution	arcsec	double	Spatial resolution of data as FWHM
t_min	d	double	Start time in MJD
t_max	d	double	Stop time in MJD
t_exptime	s	double	Total exposure time
t_resolution	s	double	Temporal resolution FWHM
em_min	m	double	Start in spectral coordinates
em_max	m	double	Stop in spectral coordinates
em_res_power	unitless	double	Spectral resolving power
o_ucd	unitless	String	UCD of observable (e.g. phot.flux.density, phot.count, etc.)
pol_states	unitless	String	List of polarization states or NULL if not applicable
pol_xel	unitless	integer	Number of polarization samples
facility_name	unitless	String	Name of the facility used for this observation
instrument_name	unitless	String	Name of the instrument used for this observation
obs_release_date	unitless	date	Observation release date (ISO 8601)
t_plan_exptime	s	double	Planned exposure time
category	unitless	String	Observation category (fixed, coordinated, etc…)
priority	unitless	enum integer	Priority level {0, 1, 2}

Data Model new elements

1. **t_planning** time when the plan has been generated (to support more optimal queries to the system)
2. **obs_release_date** Time when this observation has entered into the plan
3. **t_plan_exptime** Planned time and executed time can be different due to different reasons (e.g. problems with the observation or instrumental configuration overheads)
4. **Category** Values are “fixed” or “coordinated” (can be reused from other IVOA DMs?)
5. **Priority** Value are 0, 1, 2. It helps to understand the priority of the planned observation providing also the possible chance of changing

OLAP Use Case I

Discovery of observations planned for a certain observatory

1. The observatory receives observatory proposals by the scientists
2. Proposals are ranked
3. Proposals are inserted into the observation planning system
4. Observation planners schedule short-medium plan trying to maximize the relevance of a certain observation period (e.g. per night or orbit revolution) and taking into account the constrains of the observatory (e.g. visibility of the object, geometrical constrains like the Sun or the Earth for space based observatories, etc)
5. In case of unexpected events like, e.g. targets of opportunity, scheduled plan could be replaced by another one modifying the short or medium plans.

```
SELECT * FROM ivoa.ObsCore WHERE
t_min < 58700 AND
t_max  > 58500
```

OLAP Use Case II

Follow-up of Target of Opportunities

1. Two types of ToOs in astronomy:
   a. Unpredictable ToOs: Astronomical events that require immediate or almost immediate observations and that, generally, require also coordination between different observatories.
   b. Predictable ToOs: These astronomical events are related (not always) to known transient phenomena or due to coordinated observations of targets special interest.
2. For the first type, short-term plan can be affected in a very short time scale as per triggering of follow-up observations of a certain astronomical event.

```
SELECT * FROM ivoa.ObsCore WHERE
t_planning  >   <saved_copy_time>                AND
t_max       <   <maximum_time_requested>   AND
1=INTERSECTS(s_fov,
 CIRCLE('ICRS', <TOO_ra> , <TOO_dec>, <RADIUS>))
```

Looking for partners

1. ESA groups already involved
    a. XMM-Newton Science Operations Centre
    b. INTEGRAL Science Operations Centre
    c. ESDC – ESAC Science Data Centre

2. Teams Contacted
    a. NuStar (Caltech)
    b. CfA (Chandra)
    c. ESO
    d. Astron (ASTERICS)

3. Plan to create a multi-project prototype as a reference implementation (XMM-Newton, INTEGRAL, others (?))

Summary

1. Two technical notes in process
    a. Visibility protocol
    b. Planned observation access
2. Interest from observatories on this kind of services
3. Some relevant use cases already identified
4. Not existing standards for this.
    a. IVOA will help on that
5. XMM-SOC members in contact with other institutions to produce prototypes
6. Working prototype for next ADASS/Interop

Thanks!