

VO standards for Telescope Visibility and Observing Plans



INTEGRAL

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XMM-Newton

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Increasing Demand for Coordinated observations Evolution for XMM-Newton



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Basic Elements for Coordination:

+ Common Visibility

+ Respecting time-constrained observations

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Example: common XMM/NuSTAR Visibility/planning





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Example: common XMM/NuSTAR Visibility/planning



F	83055/01	· Mrk_359											:		<u>/27rev</u>	/s.
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All information needed to plan an observation (via AO or ToO) is currently in facilities own web pages.



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

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All information about Target Visibility Checks is there...

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Public	Science	User Portal						Contact	Site Map	Search		Go!
Science Use	ers Information > Observir	g with ESO Telescopes > Observing Tools and	Services >	Calendars and Calcul	lators > Observab	ility					12 Oct 20	17
Science U: Observing F	sers Information	Object Observability										
Future Facil	ities and Development	See also: Object Observability - Aim	asses - Da	ily Almanac - Sky	Calendar							
Observing v	ith ESO Telescopes	This tool provides object observabilit	v tablee bas	and on site object	t coordinates an	of observing perio	Times are (aiven for the locs	al time, including	daylight eaving times w	hen annlic:	able
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Telescope	Time Allocation	Select site, object coordinates and o	bserving pe	riod; then press C	Compute.							
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Phase 2 P	reparation			_								
Phase 3		Site: Paranal Observatory (VLT)	•									
Public Sur	veys	Dates (yyyy mm dd):										
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		SkyCalc provided by courtesy of Joh	n Thorstens	sen, Dartmouth C	college.John.The	orstensen@dartmo	outh.edu					
Visiting As	tronomers											
Science Sof	tware											
Data Handli	ng and Products											
Science Arc	hive Facility											

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Observatory		====	•=•=	e in ing New Heig		
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Science Users Information > Observi Science Users Information Observing Facilities Future Facilities and Development	ing with ESO Telescopes > Observing Tools and Services > Calendars and Calculators <u>Object Observability</u> See also: Object Observability - Airmasses - Daily Almanac - Sky Cal	s > Observability			12 Oot 2017	
Observing with ESO Telescopes Policies and Procedures Telescope Time Allocation Phase 1 Proposals	This tool provides object observability tables based on site, object cor Select site, object coordinates and observing period; then press Com More detailed information is provided is a separate document Notes f	ordinates and observing period. Times are spute . for Skycaic by John Thorstensen.	given for the local time, in	cluding daylight saving times	when applicable.	
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e also <u>Object Observability</u>)bservability for (aranal Observatory (VLT)	2 - Airmasses - Daily Almanac - Ephemerides 05 23 34.5 -69 45 22					
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2017 Nov 17

-5 44 2 4

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XMM-NEWTON MULTI-TARGET VISIBILITY CHECKER	omy		
YOU CAN LOOKUP SIMBAD OR NED AGAIN, OR RUN THE VISIBILITY CHECKER USING THE RESULTS RETURNED BELOW.	Go!		
SimBAD Lookup NED Lookup (eg: Abell 1750) SiMBAD Lookup NED Lookup Please note: there is a 30 second timeout should SIMBAD or NED not respond.	_		
	e.		
SIMBAD LOOKUP RESULTS:	_		
If you are happy with these results, complete the "Visibility Details" and Submit			
TARGET DETAILS			
Target Name IM31 Target name or identifier for output (eg. Abell 1750) RA 00:42:44.330 Decimal degrees or HH:MM:SS S (eg: 13.30.52.5) Dec + 41:16:07.50 Decimal degrees or DD:MM:SS S (eg: 0-150.27.0)			
VISIBILITY DETAILS			
Select either Revolution Range @ First Revolution 3369 default is ACI7 revolution range: 3369 to 3551 or Last Revolution 3551 or Prom Date Date Range From Date 01 May 2018 default is ACI7 range: 01 May 2018 - 30 Apr 2019 To Date 30 Apr 2019 Minimum visibility 5000 (minimum time the bin must be visible. Default is 5000 s)			
	Calendar T		
See also <u>Object Observability</u> - Airmasses - Daily Almanac - Ephemerides			
Observability for 05 23 34.5 -69 45 22			
Paranal Observatory (VLT)			
RA & dec: 5 23 34.5, -69 45 22, epoch 2000.0 Site long⪫: +4 41 36.8 (h.m.s) West, -24 37 30 North.			
Shown: local eve. date, moon phase, hr ang and sec.z at (1) eve. twilight, (2) natural center of night, and (3) morning twilight; then comes number of nighttime hours during which object is at sec.z less than 3, 2, and 1.5. Night (and twilight) is defined by sun altitude < -18.0 degrees.			
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Shifele provided by courtery of John Thorstenson Dartmouth College, John Thorstenson@dortmouth.colu			

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RA & dec: 5 23 34.569 45 22. epoch 2000.0	Rev.	Vis. Start (yyyy-mm-dd hh:mm)	Vis. Window Duration (s)	Vis. End (yyyy-mm-dd hh:mm)	Rounded Vis. (s)	Visibility Start Phase	Visibility End Phase	Solar Aspect Angle(°)	Mean Astronomical Position Angle(°)
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(2) natural center of night, and (3) morning twilight; t	3399	2018-07-01 12:42	78063	2018-07-02 10:23	75000	0.47	0.92	74.2	71.7
nighttime hours during which object is at sec.z less tha	3400	2018-07-03 12:35	77939	2018-07-04 10:14	75000	0.47	0.92	75.7	70.6
Night (and twilight) is defined by sun altitude < -18.0	3401	2018-07-05 12:29	77804	2018-07-06 10:06	75000	0.47	0.92	77.3	69.5
Date (eve) moon eve cent morn	3402	2018-07-07 12:22	77715	2018-07-08 09:58	75000	0.47	0.92	78.8	68.5
HA sec.z HA sec.z HA se	3403	2018-07-09 12:15	78302	2018-07-10 10:00	75000	0.47	0.93	80.4	67.4
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SkyCalc provided by courtesy of John Thorstensen, Dartmouth College. John Thorstensen@dartmouth.edu

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ALMA

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Integral Target and Scheduling Information

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

Schedule for revolution 1872

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

Rev	Start time (UTC)	Endtim		Ev	a time /	Target		Re	(12000)	Dee	(12000) Ba	ttorn DI			ronoral Ob	servation
1872	2017-10-10 13:29:15	09-Oct-2	017 18:48	129 -	Prel	iminary HS	r Obse	rving Time	line Rep	ort fo	r SMS 1 172	88884			Page 1	01/0022
1872	2017-10-10 17:13:34	1		SMS Start:	2017.288	:22:10:00 (15-007-	2017 22:10	00), End:	2017.2	96:00:00:00 (23-OCT-2017 (00:00:00)			09/0011
1872	2017-10-11 08:16:46															21/0039
1872	2017-10-11 12:26:36		Scheduli	ng Unit	en 14	Principal	Page 4	Taxaat	Science	Moule	houses	Spectral	Exposure	08 NT.		21/0038
1872	2017-10-11 13:27:21	2017.288	23:00:00	23:35:07	1483521	Lockwood	Z1-001	DARE	STIS/NA2	TIME-T	F28X50LP	MIRVIS	1300.00	Z1 01	01	21/0040
1972	2017-10-11 15:00:12	2017.288 2017.288	23:14:45 23:14:45	06:30:55	1476735	Sing	35-001	WASP-69 WASP-69	COS/NUV COS/NUV	ACQ/SE ACQ/PE	PSA	G230L G230L	12.00	35 01 35 02	01	21/0040
1072	2017-10-11 10:00:12	2017.288 2017.288	23:14:45 23:14:45	06:30:55	1476735 1476735	Sing	35-003 35-004	WASP-69 WASP-69	COS/NUV COS/FUV	ACQ/PE TIME-T	PSA	G230L G130M	12.00	35 03 35 05	01	21/0040
1872	2017-10-11 18:41:00	2017.288 2017.288	23:14:45 23:14:45	06:30:55	1476735 1476735	Sing	35-005	WASP-69 WASP-69	COS/FUV COS/FUV	TIME-T TIME-T	PSA	G130M G130M	2706.00 2706.00	35 07 35 09	01	2970008
1872	2017-10-12 09:06:18	2017.288	23:14:45	06:30:55	1476735	Sing	35-007	WASP-69 WASP-69	COS/FUV COS/FUV	TIME-T TIME-T	PSA	G130M G130M	2706.00	35 0B 35 0D	01	21/0041
1872	2017-10-12 13:16:06	2017.289 2017.289 2017.289	00100100	00128132	14819JF 14819JF	Riley	JF-001 JF-002	DARK	STIS/CCD STIS/CCD	ACCUM	F28X50LP F28X50LP	MIRVIS	60.00	JF 01	02	21/0042
		2017.289	00:00:00	00:46:10	14819JF 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 14819JG	Bourque	3B-001 JG-001	DARK-NM DARK	WFC3/UVI STIS/CCD	ACCUM	UVIS F28X50LP	F373N MIRVIS	900.00	3B 02 JG 01	01	
		2017.289	00:39:46	01:08:18	1481930	Riley	JG-002	DARK	STIS/CCD	ACCUM	F28X50LP	MIRVIS	60.00	JG 01	02	
		2017.289	00:39:46	01:08:18	14819JC 145333C	Riley	JG-003 3C-001	DARK-NM	STIS/CCD WFC3/UVI	ACCUM	F28X50LP UVIS	F467M	900.00	3C 01	03	
		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	1482190	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	02	
		2017.289	01:27:12	01:56:24	1482190	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U 01	03	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	04	
		2017.289	01:27:12	01:56:24	1482190	Riley	9U-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U 01	06	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	07	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	09	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-001	DIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	AO	
		2017.289	01:27:12	01:56:24	148219U	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	0C	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	OD	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-001	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	90 01	OF	
		2017.289	01+27+12	01:56:24	1482190	Riley	9U-002	BIAS	STIS/CCD	ACCUM	F28X50LP	MIRVIS	0.00	9U 01	00	
		2017.289	01:27:12	01:56:24	1482190	Riley	90-002	BIAS	STIS/CCD ACS/MEC	ACCUM	F28X50LP WFC	MIRVIS F502N	0.00	90 01 F0 01	01	
												F660N				
		2017.289	01:40:00	02:09:22	1451890	Golimowski	F0-002	DARK	ACS/WFC	ACCUM	WPC	F502N F660N	1000.50	F0 01	02	
		2017.289	02:09:22	02:38:56	1451851	Golimowski	F1-001	DARK	ACS/WFC	ACCUM	WPC	F502N F660N	0.50	F1 01	01	
		2017.289	02:09:22	02:38:56	14518F1	Golimowski	F1-002	DARK	ACS/WFC	ACCUM	WPC	F502N F660N	1000.50	F1 01	02	
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		09-086-2	017 10140	SMS Starts	2017.288	122:10:00 (15-007-	2017 22:10	100), Endi	2017.2	96:00:00:00 (23-OCT-2017 (00:00:00)		Page 2	
			Scheduli	ng Unit		Principal			Science			Spectral	Exposure			
			Begin UT	End UT	SU Id	Investigat	Exp #	Target	Instrume	Mode	Apertures	Elements	Time(sec)	OB AL	EX	
		2017.289	02:38:56	03:08:18	1451852	Golimowski	F2-001	BIAS	ACS/WFC	ACCUM	WPC	F502N F660N	0.00	F2 01	01	
		2017.289	02:38:56	03:08:18	1451852	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	1451873	Golimowski	F3-002	DARK	ACS/WFC	ACCUM	WFC	F502N F660N	1000.50	F3 01	02	
		2017.289	03:46:00	04:48:35	1483522	Shanahan	39-001	TUNGSTEN	NFC3/UVI	ACCUM	UVIS1-M512-S	F645N	1300.00	39 01	01	
		2017.289	03:49:34	05:01:49	1454639	Shanahan	39-002	TUNGSTEN	WFC3/UVI	ACCUM	UVIS	F014W	2.00	39 01	02	
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	Short Term S XMM-NE	Schedule EWTON SHO	DRT-TERM SCHEDULE								
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Short Range O	bservatory Schedu	ule Downlo	bad					C	ontinger	ncies c	f any type and
This is the confirmed autonomously unless various time ranges	s interrupted by a new sch depending on the exposur	ervations. This s nedule, Target o re time goal of t	sequence of observations has f Opportunity, or instrument the observations, but will usu	s been uploaded to th and spacecraft anon ally be for a period of	ne spacecraft an nalies. This sche of at least one w	d will ex dule wil eek.	l cover	in	can be	viewe	d after clearing
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next target. Please e Table Header Exp	examine the NuSTAR As-Fi	lown Timeline (A	AFT) for the log of past obser	rvations.				11	RGS2 Dur. Ks	OM Dur. Ks	Рі
obs_start	obs_end	sequenceID	Name	J2000_RA	J2000_Dec	Exp	Notes		_		Datas
2017:281:19:05:0	02 2017:283:00:30:00	90201021006	Kepler	262.671620	-21.491957	60.6	DDT	5	18.2	18.0	Boorman
2017:283:01:11:2	23 2017:283:02:40:00	90311211001	Sol_17282_AR2683_POS	11 195.15715	-6.38520	3.4	ToO)	11.0	10.8	Fabio
2017:283:02:40:3	32 2017:283:04:20:00	90311212001	Sol_17282_AR2683_POS	12 195.21879	-6.41062	3.4	ToO				Fred Jansen

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 -20112

Luropean Space Agency European Space Agency

) 45.0 37.3 XMM-Newton MM

Risaliti

Secrest Patrick

Kavanao

Patrick Kayanagh 5 37.5 37.3 Guido

27.0 26.8

13.0 12.9

44.9 43.7

44.0 42.8















Object Visibility Simple Access Protocol



1. Initial note modified to create ObjVisSAP v0.5 WD

http://www.ivoa.net/Gocuments/ObjVisSAP/

Properties:

- S*AP protocol different implementation at different observatories (adaptation)
- 3. Based on "parameter=value" approach
- 4. Basic interface:
 - a. Coordinates
 - b. Time Range

	International
	Virtual
	Observatory
IVOA	Alliance
Object Visibility Sim	ple Access Protocol
Version 0.2	
IVOA Working Draft 23	July 2018
This version: Ob/VisSAP-0.2-20180713 Latest version:	
Previous version(s):	
Working Group: http://www.ivoa.net/twiki/bin/view/7/4	DA/woaDAL
Editor(s): Aitor Ibarra Richard Saxton Jesús Salgado	
Author(s): Ater Ibana Jesús Salgado Jan-Uwe Ness Mathias Ehle Carlos Gabriel Peler Ketschman	
Era Kuutwrs Bruto Merin Emilio Salazar Cela Sanchez Richard Saxton TBC: Representatives of a large multi-obse	nutory collaboration

CLS+2

ObsLocTAP: Observation Locator Table Access Protocol



 Initial note modified to create ObsLocTAP v0.5 WD

http://www.ivoa.net/documents/ObsLocTAP/

Properties:

- 2. TAP protocol Similar to ObsTAP
- 3. Data Model contains:
 - a. Observation Characterization
 - b. Axes:
 - Spatial Coverage
 - Spectral Coverage
 - Polarization
 - c. Observatory provenance



Slide 23

c++

Standard VO Protocols



- Initial definition by ESAC team, then discussed with about 60 supporting partners (observatory operators, platform operators, institutions, scientists etc.)
 - Workshop held on 21st September 2018 in ESAC
- Consolidated protocol descriptions presented to Virtual Observatory
 - Positive response, certification only a matter of time
- INTEGRAL has provided a prototype used here to demonstrate how it works:

Use Case:

I have a target and want to know how long I have to wait until it can be observed by multiple observatories

Demonstration for INTEGRAL



Example URL Query:

GRS 1915+105 right now RA=288.8, DEC≠10.95

cURL -s "http:intergral.esa.int/isocweb/tvp.html?startDate=26-04-2019&endDate=26-05-2019&duration=12,600&action=predict&ra=288.8&dec=10.95&format=json"

cURL -s "http:intergral.esa.int/isocweb/tvp.html?startDate=26-04-2019&endDate=26-05-2019& duration=12.600&action=predict&ra=288.8&dec=10.95&format=json"

Output in JSON Format

-

Demonstration for INTEGRAL

jness-Lenovo-G50-80:*> curl -s "http://integral.esa.int/isocweb/tvp.html?startDate=26-04-2019&&endDate=26-05-2019& duration=12.600&action=predict&ra=288.8&dec=10.95&format=ison" | sed '/^\$/d {"RA":"288.8", "RAHMS": "19:15:12.00", "DEC":"10.95", "DECHMS": "+10:57:00.0", "START_DATE": 2019-04-26", "END_DATE":"2019-05-26", "DITHER_PATTERN":"Raster", "MINUMUM DURATION":"12.6". "TOTAL_DURATION":"1417164", "INTERVALS": {"revolution" : "2083", "start": "2019-04-24 14:07:48 GMT", "end": "2019-04-26 18:25:00 GMT" ."duration": "188232"} {"revolution" : "2084", "start": "2019-04-27 05:56:36 GMT", "end": "2019-04-29 10:14:40 GMT" ."duration": "188284"} {"revolution" : "2085". "start": "2019-04-29 21:45:43 GMT". "end": "2019-05-02 02:05:08 GMT" ."duration": "188365"} {"revolution" : "2086". "start": "2019-05-02 13:35:23 GMT". "end": "2019-05-04 17:56:04 GMT" ."duration": "188441"} {"revolution" : "2087", "start": "2019-05-05 05:25:42 GMT", "end": "2019-05-07 09:46:48 GMT" ,"duration": "188466"} {"revolution" : "2088", "start": "2019-05-07 21:16:20 GMT", "end": "2019-05-10 01:36:28 GMT" ."duration": "188408"} {"revolution" : "2089", "start": "2019-05-10 13:06:24 GMT", "end": "2019-05-12 17:25:02 GMT" ."duration": "188318"} {"revolution" : "2090". "start": "2019-05-13 04:55:13 GMT". "end": "2019-05-14 08:19:23 GMT" ,"duration": "98650"}



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```
#1/bin/bash
                                Demonstration for INTEGRAL
out=`mktemp tempXXXXXX` II exit 1
trap "rm -f $out*" 0 1 2 3 5
ra=$1
if test x = x: then
                                                                 Bash script
  echo Need to provide coordinates in decimal units
  exit 1
                                                                     Take RA/Dec as input
else
  dec=$2
fi
                                                                       Display visibility intervals
root="http://integral.esa.int/isocweb/tvp.html"
                                                                          from today to 30 days in future
dstart=$(date +%d-%m-%Y) ←
dend=$(date -d "+30 days" +%d-%m-%Y) <-
#dstart="08-02-2019"
echo "${root}?startDate=${dstart}&duration=12.600&action=predict&endDate=${dend}&coordinates=equatorial&ra=$ra&dec=${dec}&format=.ison"
curl -s "${root}?startDate=${dstart}&duration=12.600&action=predict&endDate=${dend}&coordinates=equatorial&ra=$ra&dec=${dec}&format=;son" > $out.;son
less $out.json | jq '.INTERVALS[].revolution' | cut -d'"' -f2 > $out.rev
less $out.json | jq '.INTERVALS[].start' | cut -d'"' -f2 > $out.start
less $out.json | jg '.INTERVALS[].end' | cut -d'"' -f2 > $out.end
n=$(wc -l $out.rev | cut -d' ' -f1)
d=$(date +%u-%m-%d)
d=$dstart
echo "Visibility from Today ($d) to ${dend}"
for ((i=1: i<n: i++)): do
   a=$(sed -n "${i},${i} p" $out.rev)
   b=$(sed -n "${i},${i} p" $out.start)
   c=$(sed -n "${i},${i} p" $out.end)
   echo " $a $b $c"
done.
```

European Space Agency

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```
#1/bin/bash
                               Demonstration for INTEGRAL
out=`mktemp tempXXXXXX` II exit 1
trap "rm -f $out*" 0 1 2 3 5
na=$1
if test x = x: then
                                                                Bash script
  echo Need to provide coordinates in decimal units
  exit 1
                                                                    Take RA/Dec as input
else
  dec=$2
                                                                     Display visibility intervals
fi
root="http://integral.esa.int/isocweb/tvp.html"
                                                                         from today to 30 days in future
dstart=$(date +%d-%m-%Y) ←
dend=$(date -d "+30 days" +%d-%m-%Y) <-
#dstart="08-02-2019"
echo "${root}?startDate=${dstart}&duration=12.600&action=predict&endDate=${dend}&coordinates=equatorial&ra=$ra&dec=${dec}&format=.ison"
curl -s "${root}?startDate=${dstart}&duration=12.600&action=predict&endDate=${dend}&coordinates=equatorial&ra=$ra&dec=${dec}&format=;son" > $out.;son
less $out.json | jq '.INTERVALS[].revolution' | cut -d'"' -f2 > $out.rev
less $out.json | jq '.INTERVALS[].start' | cut -d'"' -f2 > $out.start
less $out.json | jg '.INTERVALS[].end' | cut -d'"' -f2 > $out.end
                                                               > ./too.sh 288.8 10.95
n=$(wc -l $out.rev | cut -d' ' -f1)
                                                                 Visibility from Today (26-04-2019) to 26-05-2019
d=$(date +%u-%m-%d)
                                                                2083
                                                                        2019-04-24 14:07:48 GMT
                                                                                                    2019-04-26 18:25:00 GMT
d=$dstart
                                                                        2019-04-27 05:56:36 GMT
                                                                                                   2019-04-29 10:14:40 GMT
                                                                2084
echo "Visibility from Today ($d) to ${dend}"
                                                                                                   2019-05-02 02:05:08 GMT
                                                                       2019-04-29 21:45:43 GMT
                                                                2085
for ((i=1; i<n; i++)); do
                                                                2086
                                                                        2019-05-02 13:35:23 GMT
                                                                                                    2019-05-04 17:56:04 GMT
   a=$(sed -n "${i},${i} p" $out.rev)
   b=$(sed -n "${i},${i} p" $out.start)
                                                                        2019-05-05 05:25:42 GMT
                                                                2087
                                                                                                    2019-05-07 09:46:48 GMT
   c=$(sed -n "${i},${i} p" $out.end)
                                                                2088
                                                                        2019-05-07 21:16:20 GMT
                                                                                                    2019-05-10 01:36:28 GMT
   echo "$a $b $c'
                                                                2089
                                                                        2019-05-10 13:06:24 GMT
                                                                                                    2019-05-12 17:25:02 GMT
done.
```

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Example: common XMM/NuSTAR Visibility/planning



F	83055/01	· Mrk_359 ;		<u>15/27revs.</u>
	83039/01	PDS_456		20/28revs.
Γ	82439/01	HR7355		19/29 revs.
	83054/01	Ark_564		23/31 revs.
		2FHL_J2146d6m1345	_	23/32revs.
	83040/01	1RXS_J170849d0m40091		23/32revs.
F	83044/01	VV114		16/33revs.
F	82378/01		-	22/33revs
F	82083/01	PYS_11131m1231		19/34 cove
\vdash	_ 02003/01			
F	83048/02			24/J/revs.
┢	82408/01			18/3/revs
\vdash	83047/01	PG_ <u>1402p261</u>		18/ <u>38revs.</u>
F	82403/01	1034p396		29/40revs
	82137/01	HESS_J0632p057	——————————————————————————————————————	31/45revs.
L	83043/01	NGC_4051		<u>36/47revs.</u>
	83053/01	Her_X1		43/62revs.
Γ	83048/01	APM_08279p5255		46/69revs.
Γ	83051/01			63/92revs
F	80409/01	NGC 59D7: ULX observed in 3217 3218 322D 3222 3223		72/110revs
	83049/01			80/122revs
F	83050/02			83/144covp
┢	63050/02		r	63/144/evs
\vdash	83050/01			83/144revs
┝	83050/03	SDSS103315d71p5252		<u>114/163revs</u> .
	02 03		00 07 04 05	
-	02 03		02 03 04 05	06 07 08
		2019		

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1+1

Summary



- Increasing demand for multi-mission coordinations
- Challenges:
 - Diverse formats of hard constraints (visibility)
 - => Needed to find common slots
 - Diverse formats of observing plans
 - => Needed to find common slots with lowest scientific impact
- Solutions:

Standard of visibility and observing information

=> machine readable, interface with optimization routines (clients)

Status



- Implementation status:
 - INTEGRAL: public test version (see examples)
 - GAIA: Implemented ObjVisSAP (access to scanning laws)
 - Chandra: Implemented both services (testing phase)
- Applications:
 - ASTERICS: Working on Multimessenger Platform
 - Visualization of Observing Plans and visibility in Sky.esa.int

Always happy to welcome new collaborators!

You can help us to convince observing facilities to implement VO services