Mandatory checks to be done for UVIT observations

Version 1.2 (23 January 2018)

The main thrust of checking for safety of UVIT is to ensure (i) there is no bright source in the field which could trigger "Bright Object Detect (BOD)" in the hardware that would put all the detectors OFF, (ii) there is no ultra-bright source near the field which would scatter excessive radiation in the field and (iii) there is enough photon flux in the VIS detector to make tracking of spacecraft feasible. The list of things to be checked before proposing for UVIT observations are outlined below:

(I)) Choice of VIS filters

Run the VIS filter checking tool (http://uvit.iiap.res.in/Software/theia/) by choosing the prime instrument of your observation (from a scroll down menu) and entering the co-ordinates of your target in sexagesimal units. This is indicated in Fig. 1

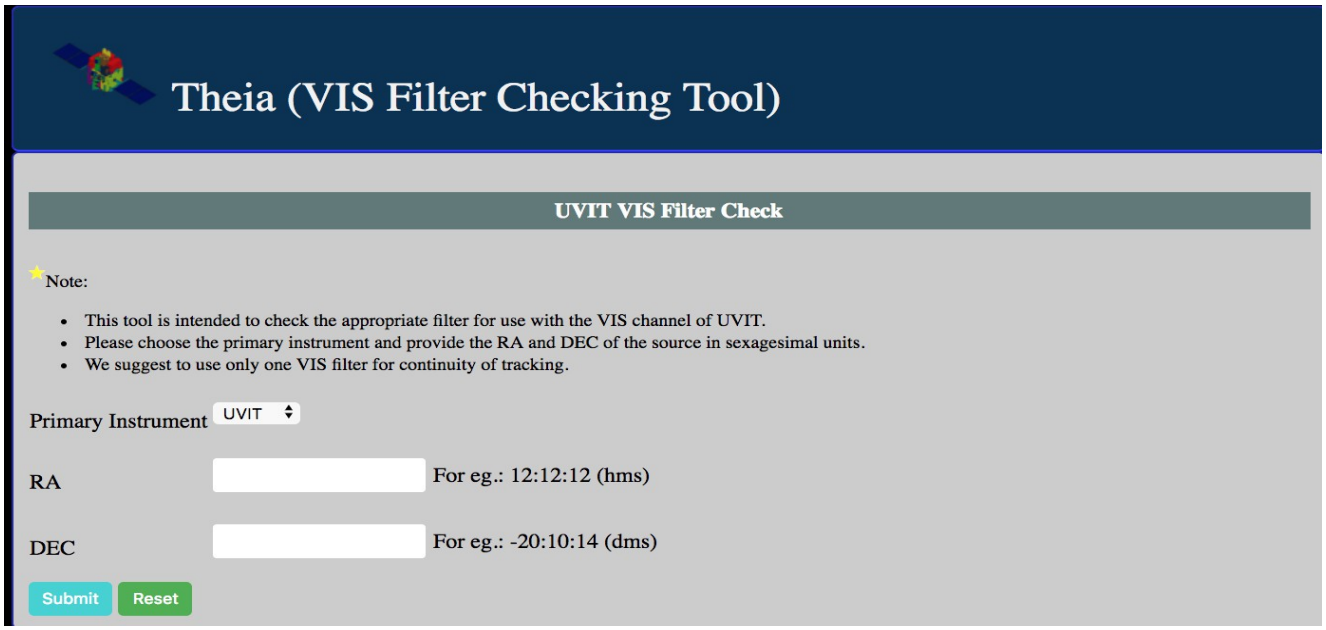


Figure 1: The VIS Filter check tool

On clicking submit, after choosing the prime instrument and the RA and DEC values, the tool picks the five brightest stars in the field of observation (depending on the chosen prime instrument) and displays the expected count rates in all the VIS filters of UVIT. An example is shown in Fig. 2. Choose the VIS filters such that none of the stars give > 4800 c/sec and attach the count rates obtained. Further, for good tracking of the aspect, there should be at least 2 stars within 12' radius of the target with count rates greater than 30 c/sec (for good S/N) and lesser than 1000 c/sec (to avoid saturation) in the chosen filter. These count rates should be attached. VIS channel is primarily used for tracking and no good photometry is possible.

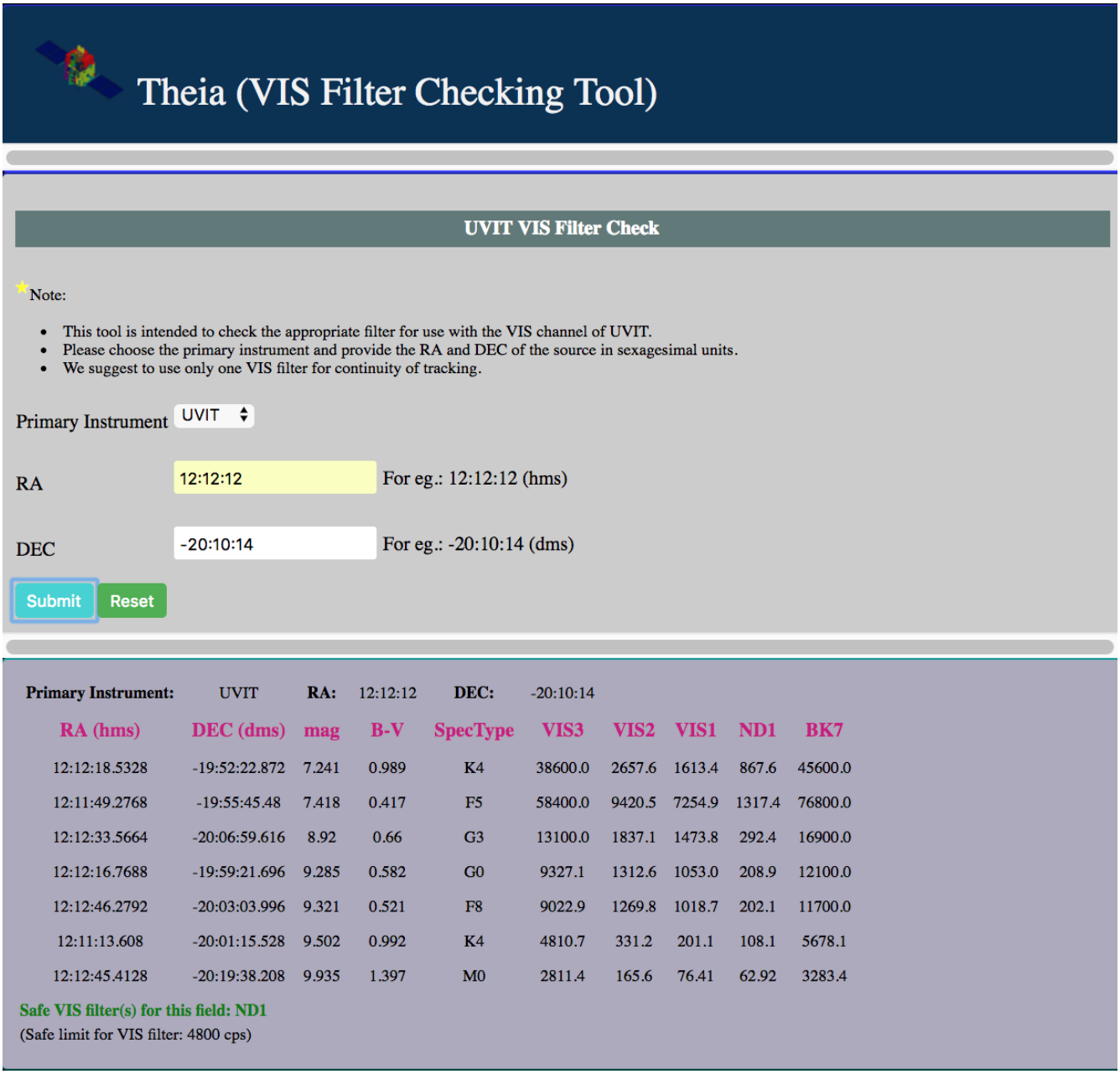


Figure 2: Output of the VIS filter check tool

(II) Choice of FUV/NUV filters

Decision on the choice of FUV/NUV filters depends on the availability of GALEX images at http://galex.stsci.edu/GalExView. There can be cases when (a) both FUV and NUV images are available in GALEX (b) only NUV images are available in GALEX and (c) no images are available in GAELX. To check for safe FUV and NUV filters, run the UV filter check tool available at (http://uvit.iiap.res.in/Software/gaia/) by choosing the prime instrument of your observation (from a scroll down menu) and entering the co-ordinates of your target in sexagesimal units. This is indicated in Fig. 3. This tool can be used only for fields wherein (i) GAELX image is available and (ii) if GALEX image is NOT available, the source must have galactic latitude beyond +/- 30 degree of the galactic plane. If the target of interest lies within +/- 30 degree of the galactic plane without GALEX

images, limited observations are possible. For such cases, please check the "AstroSat Proposers Guide" for details.

On clicking "submit" after choosing the prime instrument (from the scroll down menu) and after entering the RA and DEC values, the tool displays the expected count rates in the NUV and FUV filters of UVIT. This is done for the five brightest objects in the field as detected by GALEX in both FUV and NUV. The GALEX images (the size will depend on the chosen prime instrument) along with the detected objects (marked in red) as well as two tables, one for NUV and the other for FUV will be given in the output. If GALEX images are not there only two tables will be printed as the output based on the objects detected from TD1 catalog (http://heasarc.gsfc.nasa.gov/db-perl/W3Browse/w3table.pl?tablehead=name%3Dtd1&Action=More+Options). An example is shown in Fig. 4. Choose that filters that give count rates less than 1500 in both NUV and FUV. This tool takes about 3 minutes to run, as it has to download the FUV and NUV images if available as well as the FUV and NUV catalog from the GALEX web server.

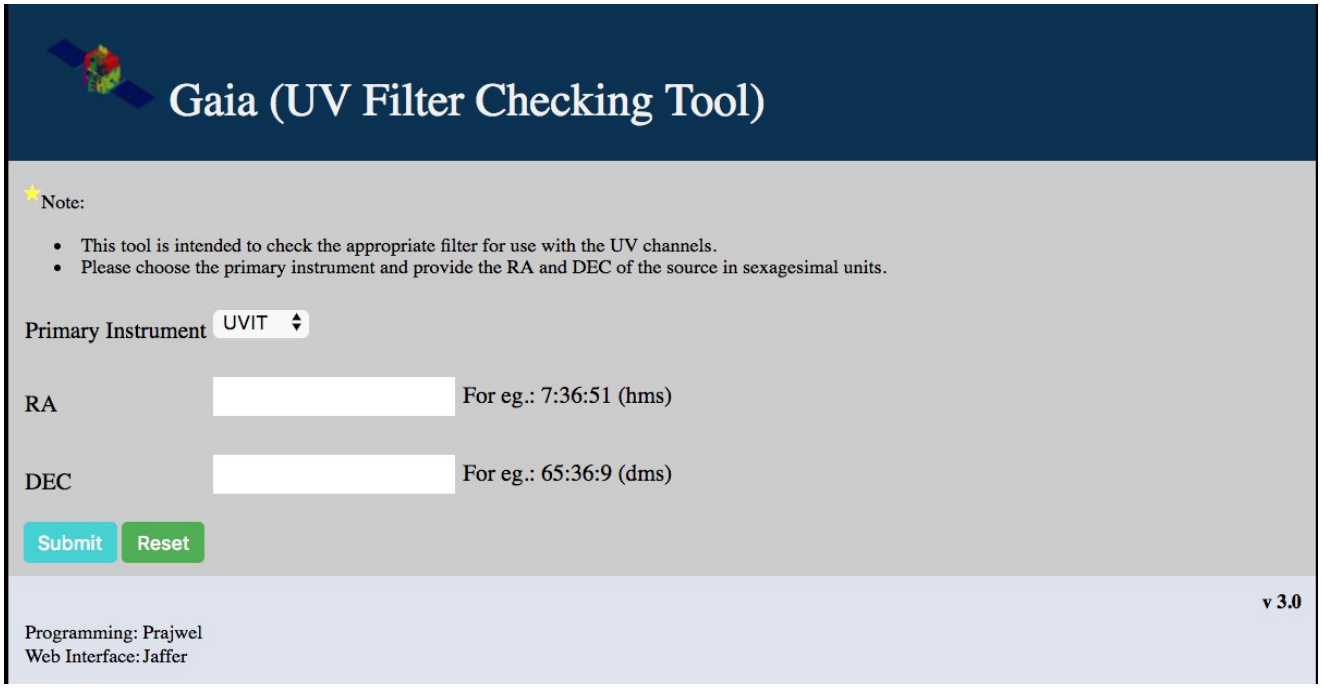


Figure 3: The UV filter check tool

Gaia (UV Filter Checking Tool)

*Note:

- This tool is intended to check the appropriate filter for use with the UV channels.
- Please choose the primary instrument and provide the RA and DEC of the source in sexagesimal units.

Primary Instrument: UVIT

RA: 7:36:51 — For eg.: 7:36:51 (hms)

DEC: 65:36:9 — For eg.: 65:36:9 (dms)

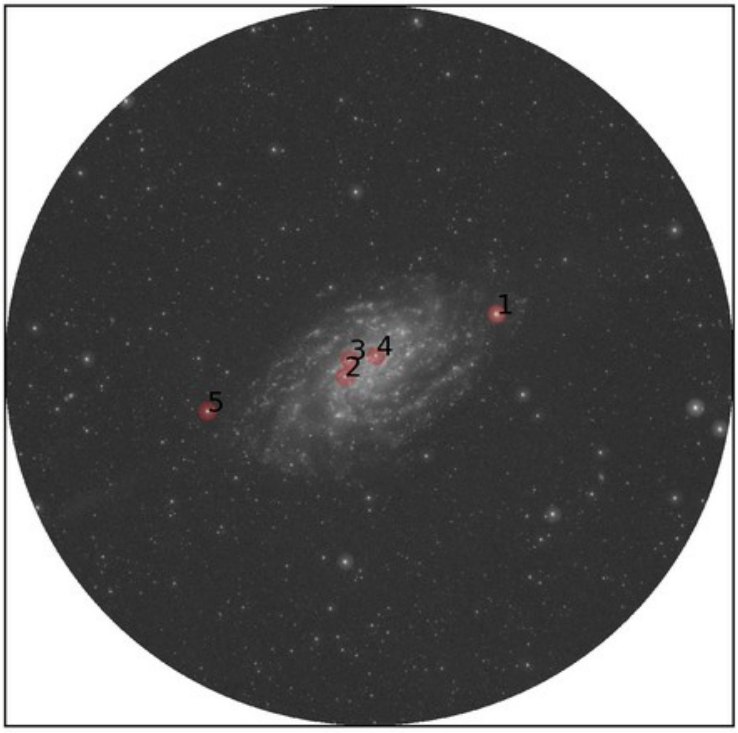
Submit | Reset

Your input conditions:

Primary Instrument: UVIT **RA:** 7:36:51 **DEC:** 65:36:9

NUV

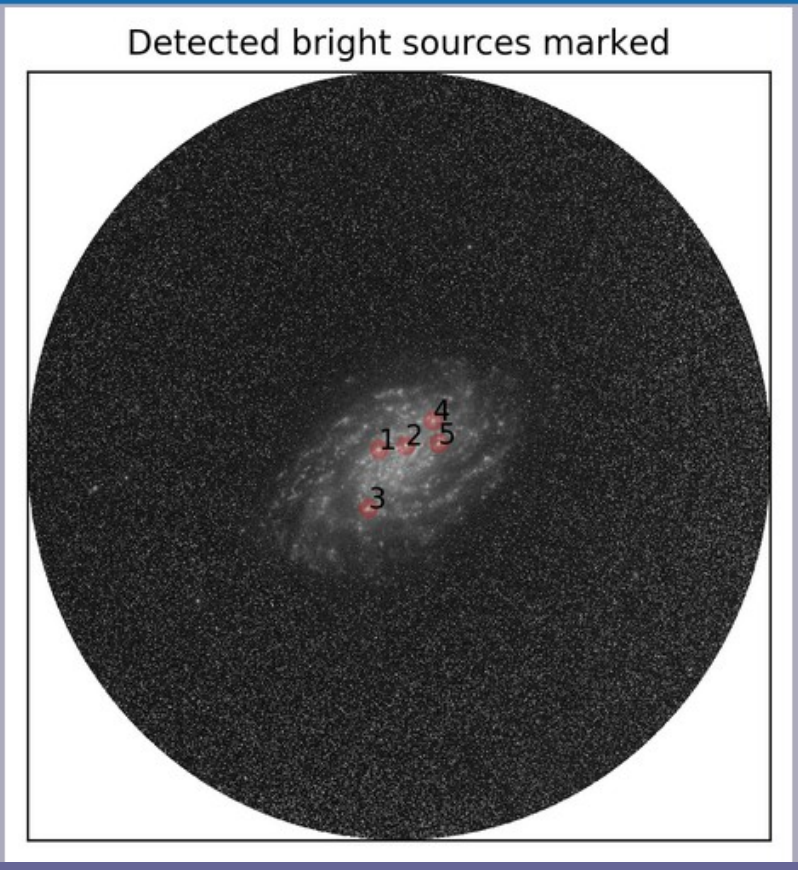
Detected bright sources marked



Sl No.	RA (hms)	DEC (dms)	Mag	Mag_corrected	Silica	B4	B13	B15	N2
1	07:35:09.252	+65:40:24.9134	12.92	12.37	1126.64	247.86	304.19	83.37	61.96
2	07:37:10.3192	+65:35:13.5785	14.15	13.91	273.93	60.26	73.96	20.27	15.07
3	07:37:06.8612	+65:36:38.3198	14.19	13.96	261.81	57.60	70.69	19.37	14.40
4	07:36:45.5335	+65:36:58.4304	14.26	14.04	242.38	53.32	65.44	17.94	13.33
5	07:38:59.53	+65:32:18.9528	14.46	14.27	196.52	43.24	53.06	14.54	10.81

Safe filters in NUV: ['Silica', 'NUV-grating', 'NUV-B4', 'NUV-B13', 'NUV-B15', 'NUV-N2']

FUV



Sl No.	RA (hms)	DEC (dms)	Mag	Mag_corrected	CaF2	BaF2	Sapphire	Silica
1	07:37:06.8612	+65:36:38.3198	14.42	14.22	39.86	33.88	25.11	8.77
2	07:36:45.5335	+65:36:58.4304	14.57	14.38	34.29	29.15	21.60	7.54
3	07:37:14.8649	+65:32:01.5647	14.74	14.57	28.93	24.59	18.22	6.36
4	07:36:24.1705	+65:38:54.1446	14.76	14.59	28.40	24.14	17.89	6.25
5	07:36:19.9596	+65:37:07.2444	14.94	14.78	23.68	20.13	14.92	5.21

Safe filters in FUV: ['CaF2', 'FUV-grating', 'BaF2', 'Sapphire', 'Silica']

v 3.0

Programming: Prajwel
Web Interface: Jaffer

Figure 4: The output of UV filter check tool

(III) Check for scattered light

Check is also required for the scattered light from any ultra bright source outside the field up to a radius of 5 deg. We note that scattered radiation from any planet at a radius > 5 degree is within acceptable limits for all the VIS/NUV/FUV filters. In photon counting mode, the count-rate for any planet or very bright star if it were in the field and observed with the chosen filter should be lesser than that given in Table 1

(IV) Choice of Gratings:

For observations with grating, the following is recommended. NUV grating can be used when the count-rate in NUV Silica is less than 1133. Similarly, FUV gratings can be used when the count-rate in FUV CaF2 is less than 892. This is valid when the full window of 512 x 512 pixels is used. To decide on the grating, please check the output obtained from the run of the UV filter check tool (Figure 4).

Table 1: Allowable count-rates for bright stars/planets located at various distances from the field center

Angle	Counts
20'< Source < 30'	10^4 c/sec
0.5 deg < source < 1.0 deg	10^6 c/sec
Source at > 1 deg	10^6 *exp((α – 1)/0.834) c/sec; alpha is the angle in degree

1. **Proposers requiring observations for sources that are within +/- 30 degree of the galactic latitude and with no GALEX images are requested to refer to the "AstroSat Proposers Guide" for more details on the possibilities of observing such fields.**
2. **A table indicative of the magnitude limit (from GALEX catalog) of any object in the field of observation for each filters in NUV and FUV channels is given below. For example if a field has an object brighter than 12.7 mag in GALEX NUV, the field is not observable in the NUV Silica filter of UVIT. Similarly, for other filters.**

Filter	Magnitude limit
NUV-Channel	NUV magnitude from GALEX catalog
Silica	12.70
B4	11.62
B13	11.76
B15	10.98
N2	10.82
FUV-Channel	FUV magnitude from GALEX catalog
CaF2	11.72
BaF2	11.63
Sapphire	11.48
Silica	11.04