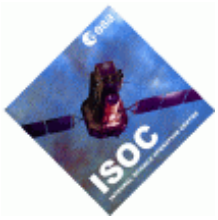
INTEGRAL

# Science Operations Centre

## Software User Manual




## Target Visibility Predictor SUM

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# 1 Purpose of the target visibility predictor

The **Target Visibility Predictor (TVP)** is available for INTEGRAL observers to determine when their source is visible to INTEGRAL. This is especially useful in determining whether INTEGRAL observations can be coordinated with other (space- or ground-based facilities) and in addition if phase-dependant observations, e.g. of binary systems, can be performed.

The TVP runs on a dedicated platform at the INTEGRAL Science Operations Centre at ESTEC, and is accessible via the usual web site:

**http://integral.esac.esa.int/isoc/operations/html/TVP.html.**

# 2 Viewing constraints

INTEGRAL celestial viewing constraints are defined by power and thermal constraints (Sun) and star tracker blinding constraints (Sun, Earth, Moon). The constraints used in this tool are that INTEGRAL cannot point to within $50^o$ of the sun, more than $130^o$ away from the sun, or within $15^o$ of the Earth limb, or within $10^o$ of the Moon limb.

Since the Earth and Lunar orbits can of course be predicted in advance, it is also possible to predict when any part of the celestial sphere is visible to INTEGRAL.

# 3 How visibility is calculated

Sky visibility has been calculated by dividing the sky into approximately rectangular cells of 10 x 10 degrees (‘skybins’). The visibility of each corner of a skybin is determined for every revolution in the INTEGRAL mission, whenever INTEGRAL is above the van Allen belts. If all four corners are simultaneously visible, that area of sky is deemed visible. The calculation is therefore (slightly) conservative. The results are stored in a ‘Data Base of Observable Bins’ (DBOB), which contains the open and close times for every skybin during the mission, and the resulting available duration. This ‘open interval’ never crosses revolution boundaries since science operations are not performed in the Van Allen belts around perigee. It is this DBOB, which lies behind the TVP.

# 4 How to use the TVP

## 4.1 Input

The TVP is called up by accessing the link mentioned above. The following input is needed from the observer:

*RA and Dec* (J2000 only!), in either of the formats shown on the web page.

*Dither pattern*. For hexagonal or 5x5 dither patterns, the TVP checks whether all points in the dither pattern are visible, not just the centre.

*Start and End date* for the period of interest to the observer. Defaults are start and end dates in the DBOB, which cover the interval to beyond the end of the AO-4 cycle - this will generate a long list! It is recommended to cover only the period of interest. Input should be in the format shown on the web page.

*Minimum Duration* in seconds. The TVP will only return visibility of bins open for longer than this value. In the DBOB, bins can be open for as short as one second! For example, if the bin is at the edge of the Earth or Moon constraint. However the scheduling system would never attempt to use such a bin. Also, INTEGRAL needs time to slew towards and away from a source. We suggest 20 000 seconds as a reasonable value.

The *longest* open duration a skybin can have is approximately 64 hours, the duration when INTEGRAL is continuously above the van Allen belts (currently, altitude 40 000 km ascending and 60 000 km descending). Thus we suggest that the minimum duration never be greater than 228000 sec, otherwise TVP would never find any skybins visible.

## 4.2 Output

The output of TVP is firstly, a summary of the input parameters, and then a time-ordered list of when the source (skybin) is visible, each line containing start time of visibility, end time of visibility (UT) and visibility duration (seconds). Gaps of eight hours between successive visibility periods are usually due to Van Allen belt transit; shorter gaps are due to Earth or Moon constraints, longer gaps to Sun/antisun constraints.