MEXART: III. IPS sources & Observing strategy

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1 IPS sources

At the telescope operating frequency of 139.65 MHz, the angular size of the source that would scintillate as a point sources is about 2 arcsec. In case of extended sources, the compact components that are smaller than 2 arcsec will scintillate. The scintillation index, $m = \Delta S_{rms}/S_T$, where ΔS_{rms} is the scintillating flux and S_T is the total flux of the source. For sources detected at N σ level the lower limit to the scintillation index, m, is 1/N. For example, for a 5σ detection, scintillation index greater than 0.2 is measurable.

The scintillation index of a point source decreases as the elongation angle (ϵ), the angle subtended by the lines of sights to the source and the Sun from the observer, increases. The scintillation index, m, is related to ϵ as $m \propto sin(\epsilon)^{-1.75}$ (1995-1996 observations) as shown in figure 1. A lower limit on the scintillation index sets an upper limit on the elongation angle up to which scintillations can be measured. The lower-limit to the m and the corresponding upper-limit to ϵ are given in the table below for different detection limits.
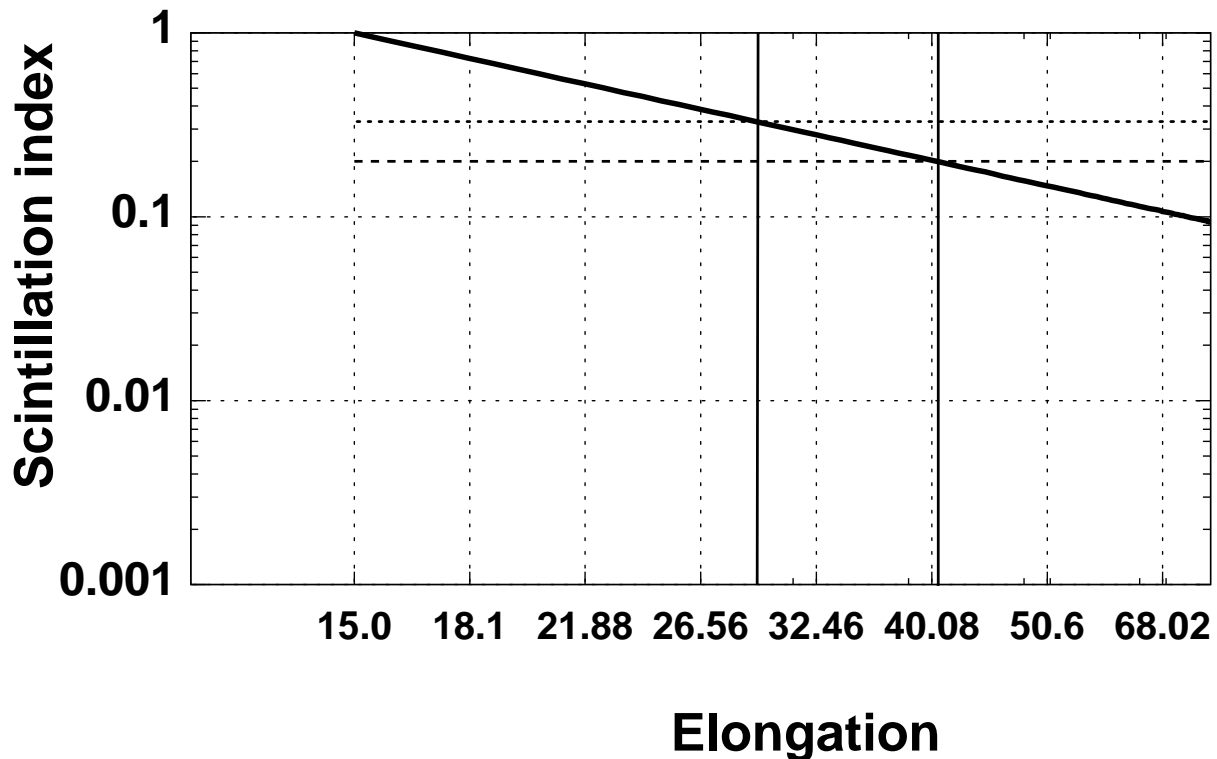

Figure 1: Variation of scintillation index with solar elongation.

Table 1: Table of IPS-zone and the number of sources.

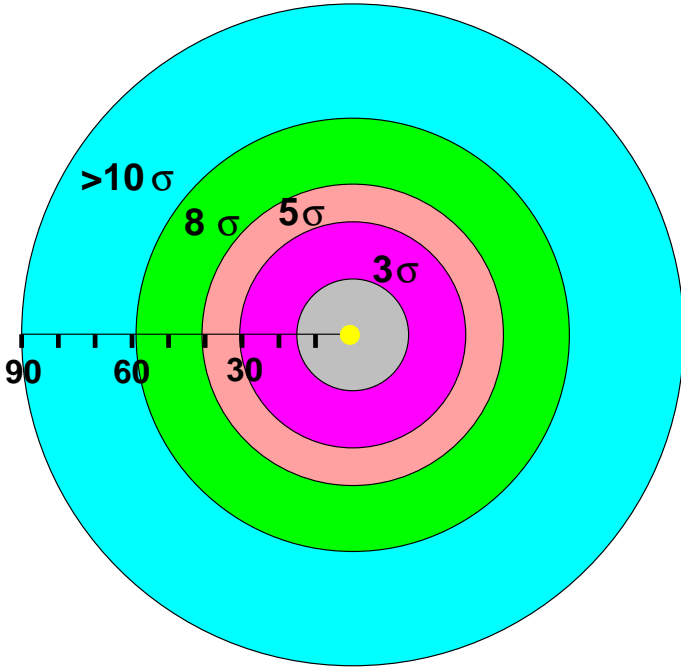| Observing limit	m-limit	ϵ-limit degree	Number of sources Total	Number of sources IPS-zone	Transit Time (Hour)
5.5 Jy (3σ)	0.33	29	990	50	3.87
9.1 Jy (5σ)	0.2	40	410	43	5.3
14.6 Jy (8σ)	0.125	58	235	56	7.7
18.2 Jy (10σ)	0.1	75	155	63	10.0

2 Observing strategy

Figure 2: Region of the sky with the detection/scintillation index limit

The region set by the ϵ limit above are shown in figure 2. For an integration time of 20 ms, the minimum detectable flux is 1.82 Jy. Assuming that most of the sources are close to the detection limit, the number of sources that would fall within each zone are given in the above table. This is calculated assuming that line of sights with elongation angles less than 15° are not observed due to strong scattering. Since the telescope is a transit instrument, the above elongation angles correspond to a transit time over which the observations are carried out. For a give source the ON source time is about 5mins. Assuming 10 mins of observing time for each source including the OFF source observations, the total data-time is about 8.3 hours for 3σ and 7.2 hours for 5σ detection. To acquire the data within the transit time of the IPS-zone 3 receivers are required for 3σ detection and 2 receivers are required for 5σ detection.