

A note on LASER station selection for IRNSS-1A

IRNSS-1A was launched on 1st July 2013 successfully. The objective of this note is to select number of stations (max-3 stns) and their locations for the continuous tracking of IRNSS-1A s/c. This continuously tracked data from those stations will help in estimating the IRNSS-1A orbit to accuracy better than 5m.

Visibility study

For this analysis we considered the following 4 stations with mask angle of 15deg (Based on real measurements minimum elevation observed)

1. YARL (Yarragadi)
2. GRSM (Grasse)/MATM(Matera)
3. CHAL (Changchu)



Figure 1: Visibility circle when the satellite at 27deg S latitude

The above figure shows the visibility circle when the s/c is at 27deg south latitude, one station YRAL is visible at this instant of time.

The following figure shows the visibility circle when the s/c is at equator (at 55deg Equatorial crossing), from the figure it is clear that the s/c is visible to all the stations except for CHAL station.

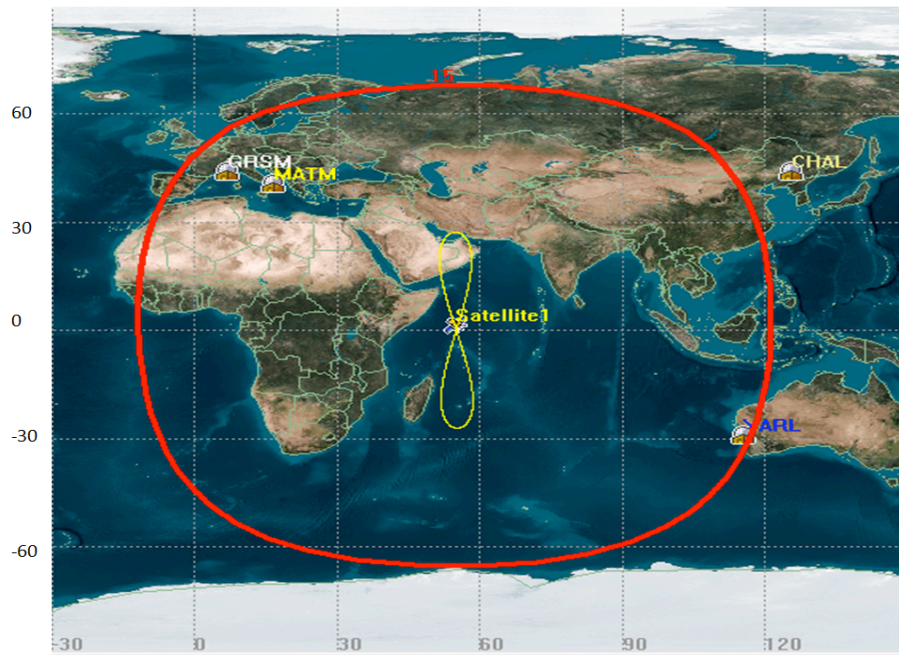


Figure 2: Visibility circle when the satellite at Equator

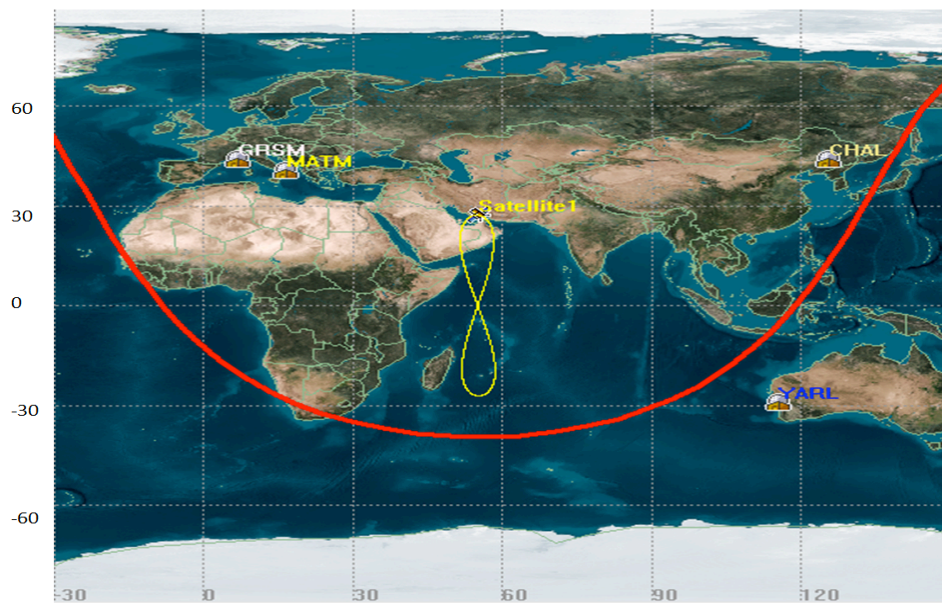


Figure 3: Visibility circle when the satellite at 27deg N latitude

The following figure shows the visibility circle when the s/c is at 27deg north latitude, from the figure it is clear that the s/c is visible to all the stations except for YARL station.

Summary

The following table depicts the duration of time the s/c visible to the respective stations over a period of 24hrs with mask angle of 15deg.

S.No	Station	Visibility Duration
1	YARL (Australia)	~12.5 hrs.
2	CHAL (China)	~ 7 hrs.
3	MATM (Europe)	~17 hrs.
4	GRSM (Europe)	~14 hrs.

Table 1: Table showing duration of time IRNSS-1A s/c visible to respective stations

From the above analysis it is observed that none of the stations has continuous visibility for 24hrs. Hence we are proposing MATM, CHAL and YARL for the continuous tracking of the IRNSS-1A spacecraft.