

IT29.1 Investigation and comparison of techniques for tumbling rate assessment of massive LEO objects

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MEO rocket body

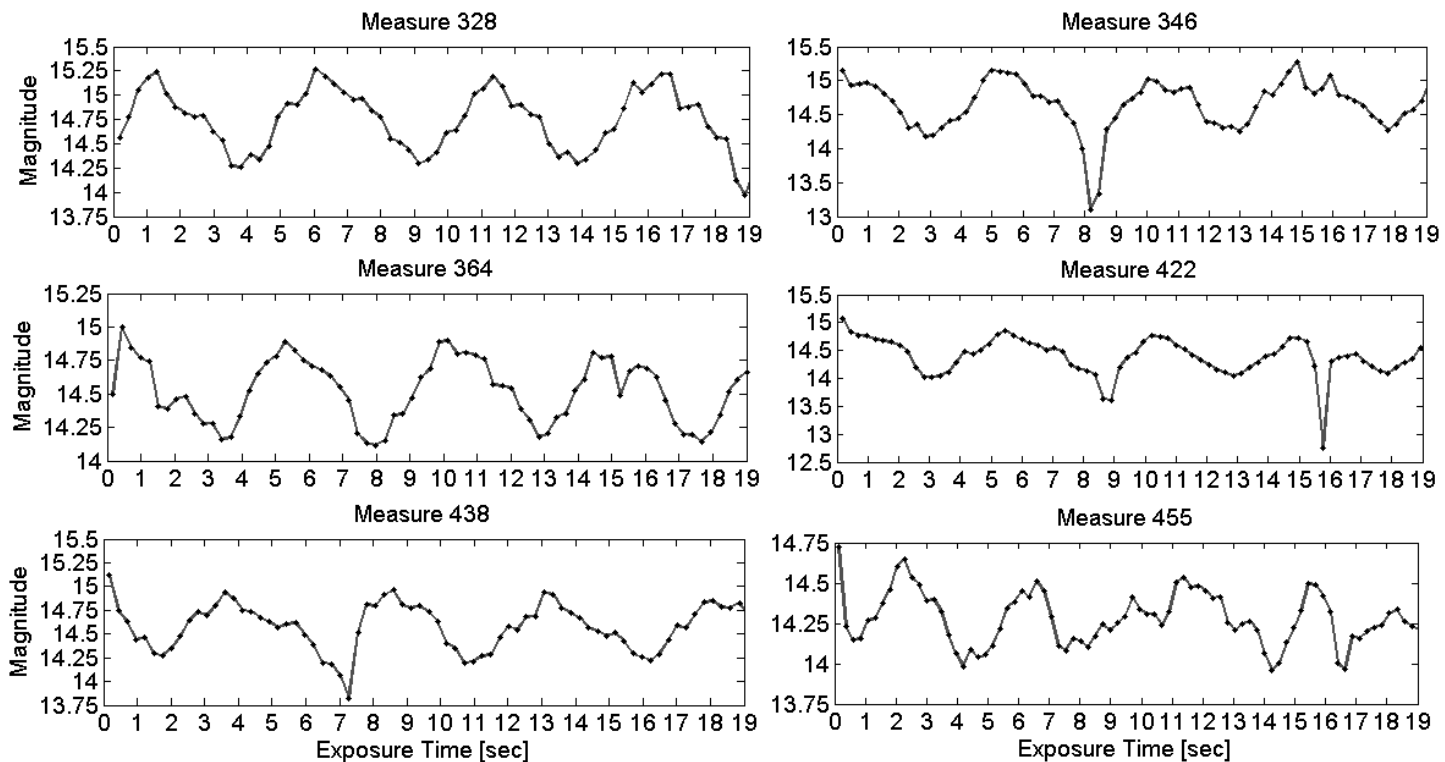
Sidereal tracking on

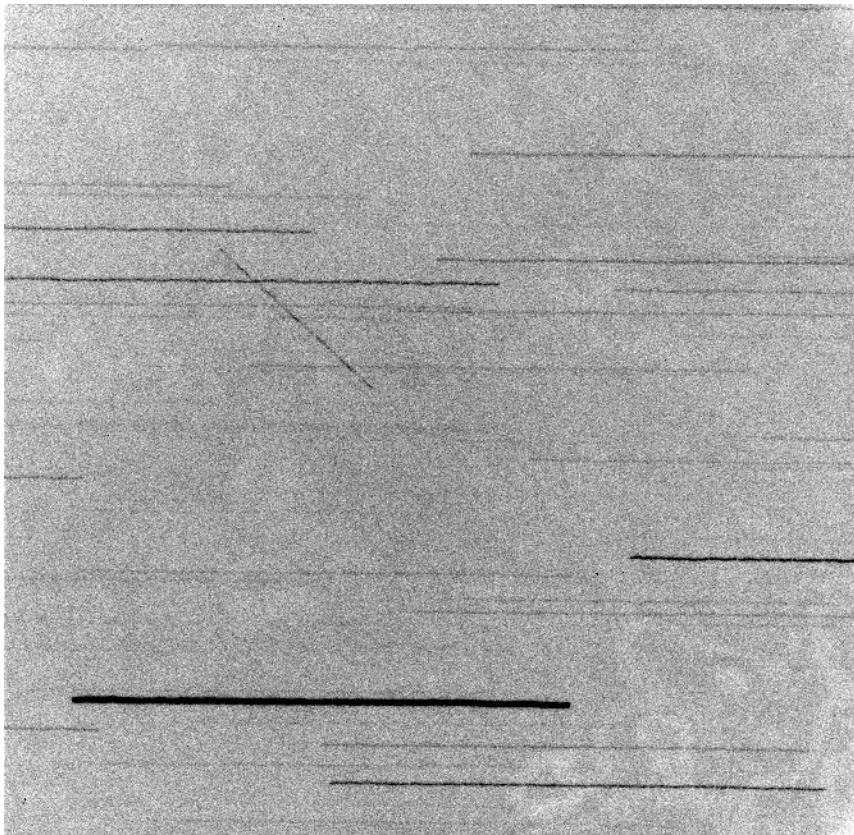
No filter

20 seconds exposures

Possibility to analyze different phase angles

Light Curve of SL-12 R/B (2) 37140





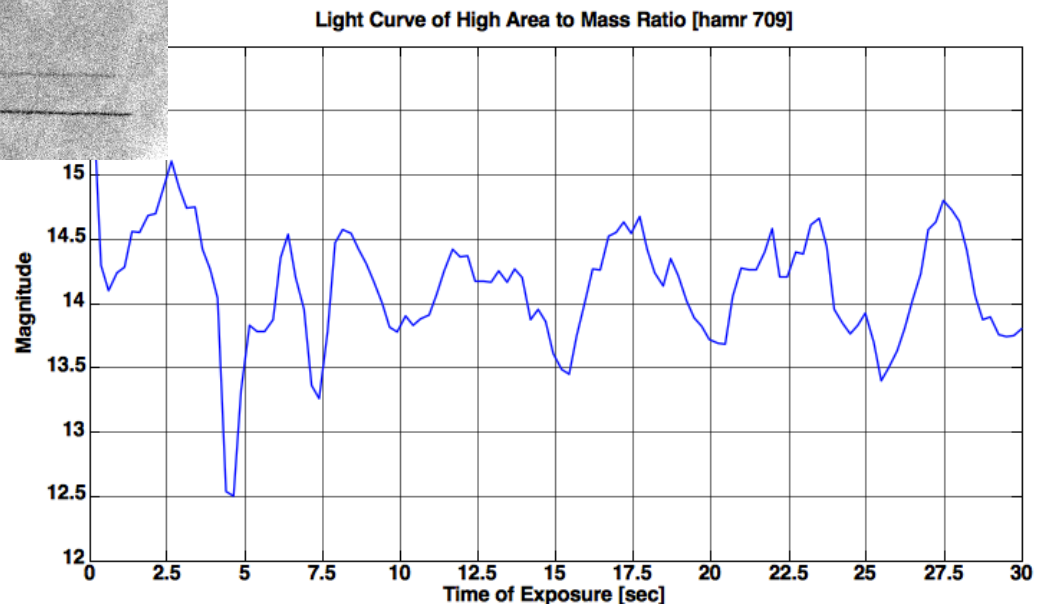
HAMR object

sidereal tracking off

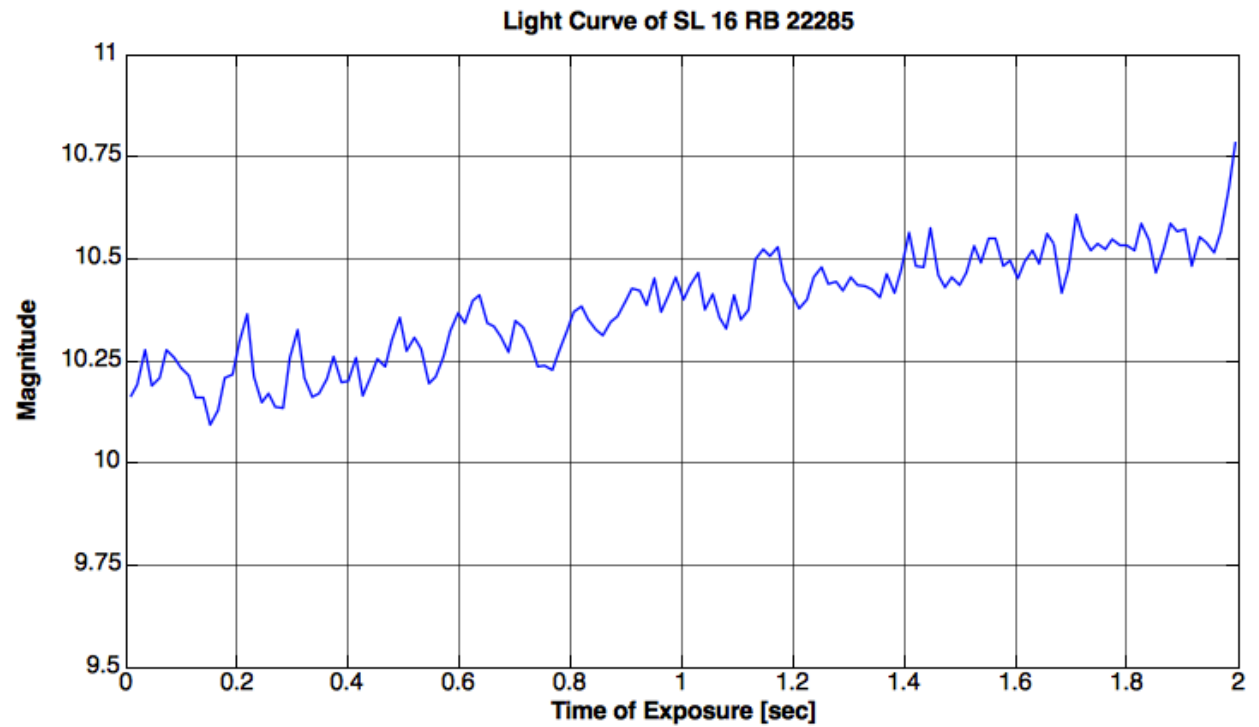
No filter

30 seconds exposure

Possible analyze different phase angles?



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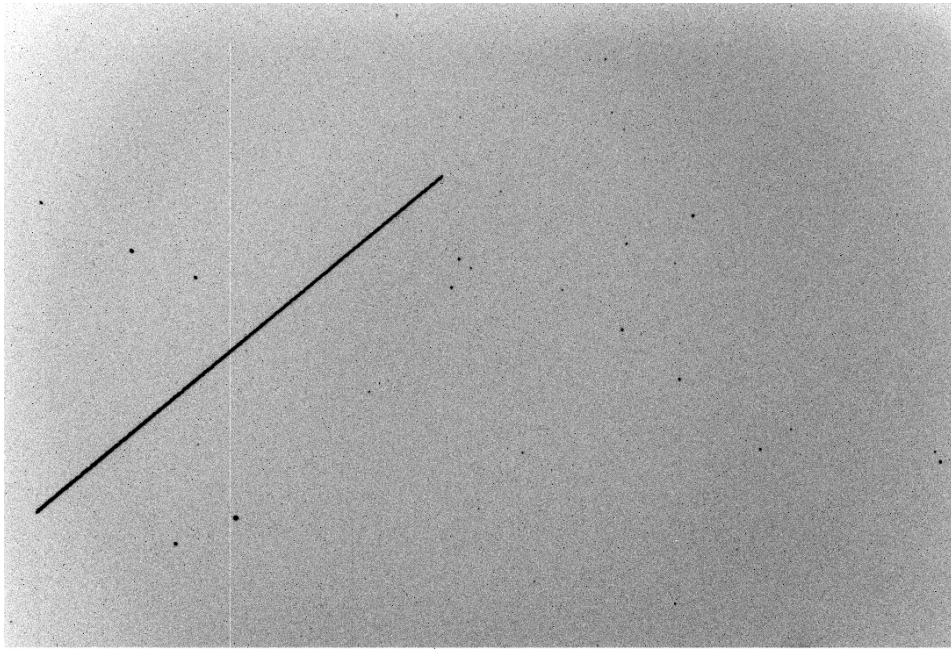


LEO rocket body

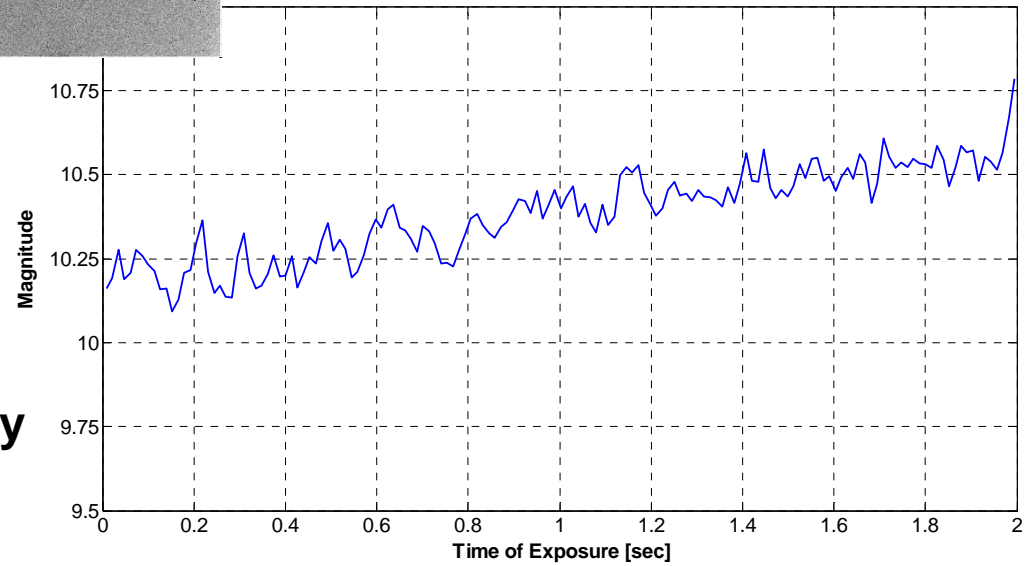
No filter

2 seconds exposures

of techniques for tumbling rate assessment of
massive LEO objects



Light Curve of SL 16 RB 22285

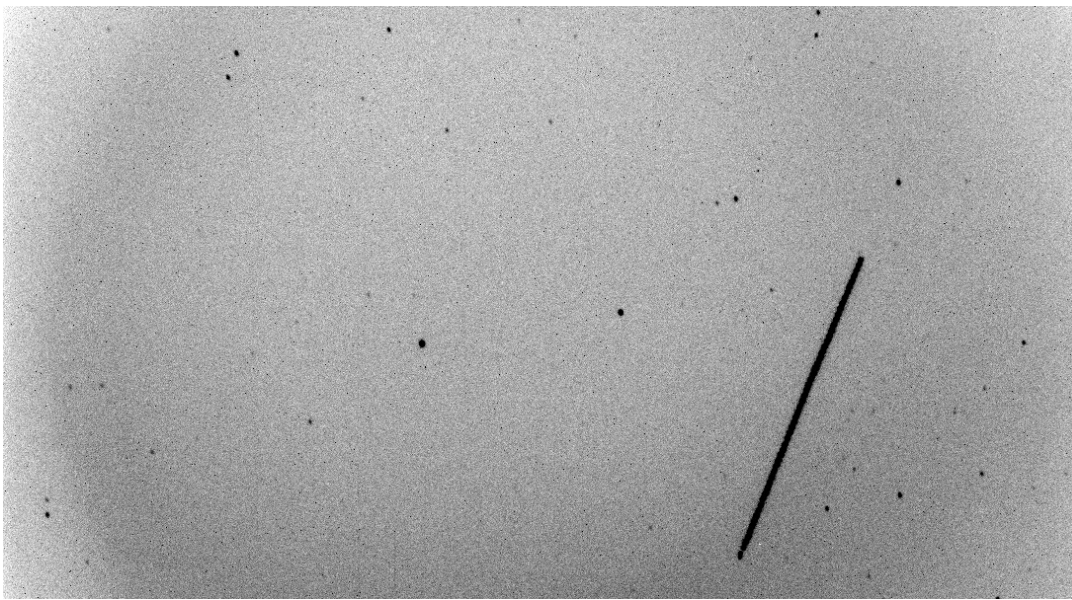


LEO rocket body

No filter

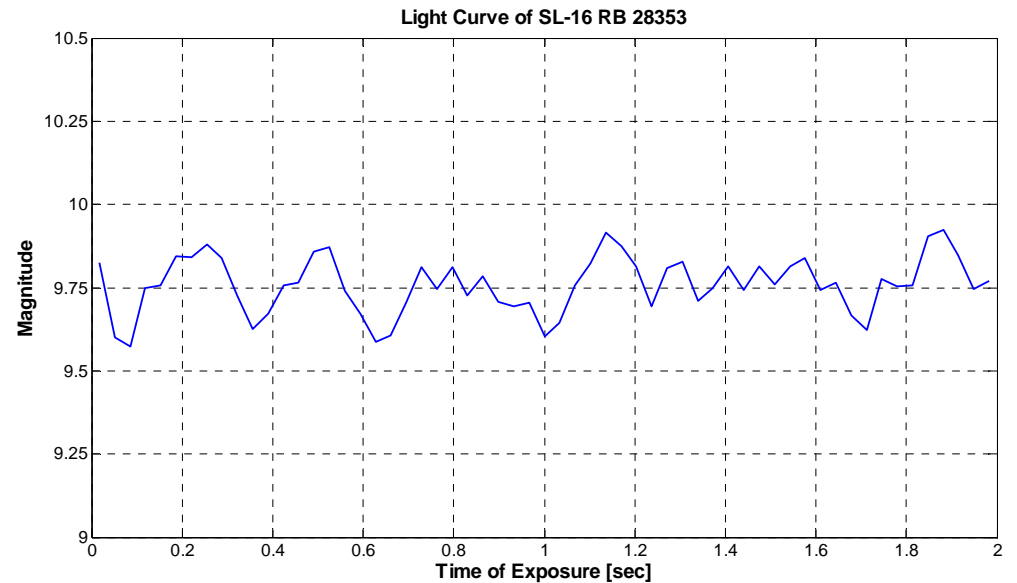
2 seconds exposures

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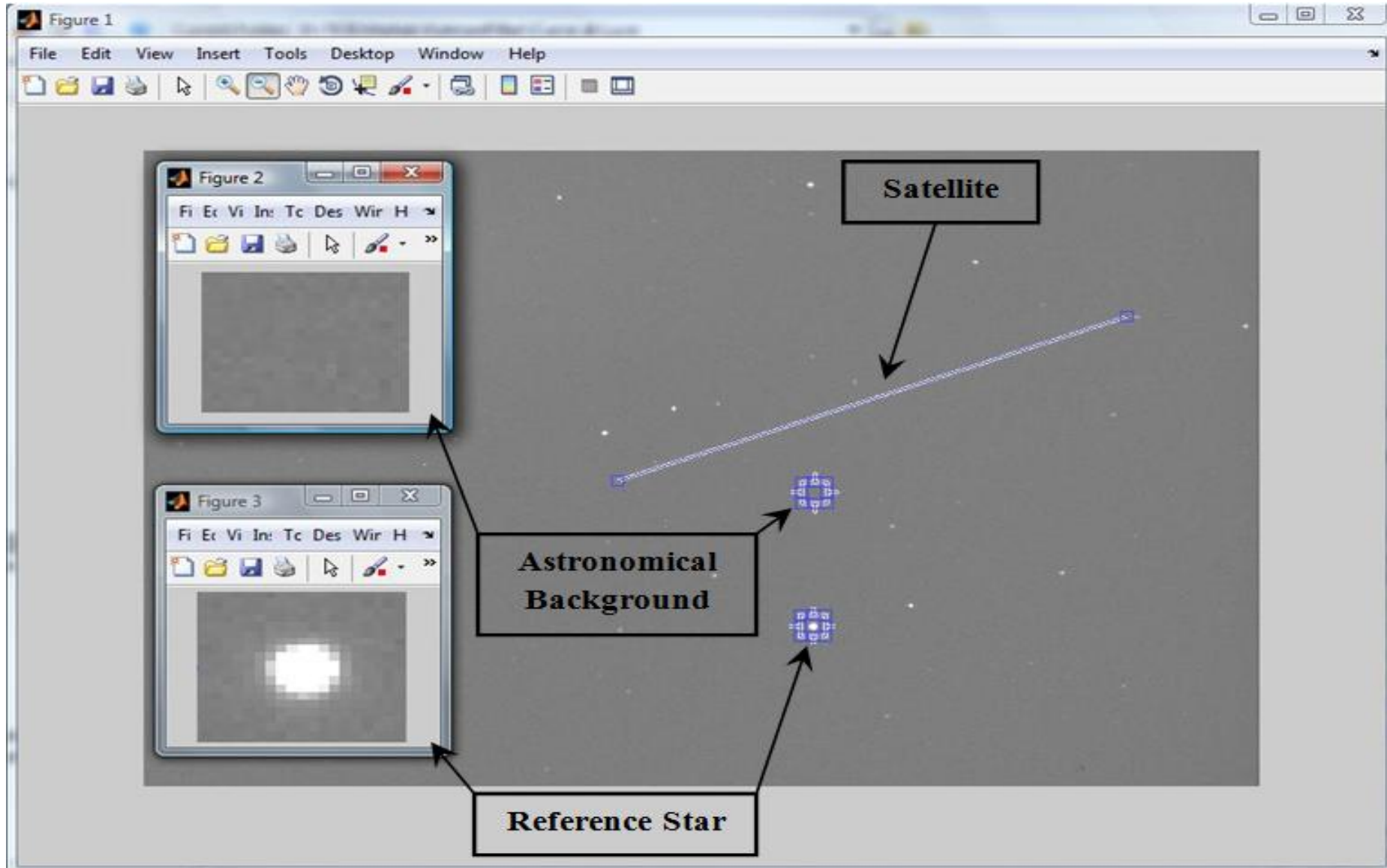
LEO rocket body

No filter
2 seconds exposures



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Light curve from images



Comparison among different objects/orbital regimes

	HAMR	MEO	LEO
Magnitude	Variable	Variable	High
Filters	Possible	Possible	Possible What meaning?
exposure	30 secs	30 secs	5 secs
Stripe analysis	All in the field	All in the field	Maybe not in the field (Use TLE for relative motion)
FOV	Better large for ephemeris uncertainties	Also small	Need large
tracking	yes	yes	No for standard telescopes
Different phase angles	difficult	yes	no

Practical considerations

	LEO
Magnitude	High
Filters	Possible What meaning?
exposure	5 secs
Stripe analysis	Maybe not in the field (Use TLE for relative motion)
FOV	Need large
tracking	No for standard telescopes
Different phase angles	no

Possible to use small aperture telescopes (high magnitude , large FOV)

Filters could be used in order to highlight different responses for objects with particular shapes or different reflecting parts

Exposure is not important (better long to get the object avoiding timing errors (stripe analysis using ephemeris data)

Tracking not necessary, sidereal tracking useful for calibration

Different phase angle analysis could be useful but long time stability of tumbling rate should be considered first

Request to WG1 Member

Is the topic ready to be transformed in an AI? Which could be the aim of the AI?

- Large experience from some delegations working separately on the topic
- Light curve definition and calibration techniques (calibrated magnitude) is an issue?
- AI participants could concentrate on the same objects in the same period (1 or 2 months) for calibrating measures
- Radar and optical participants could observe the same target
- Aim of the AI could be to achieve continuous brightness data of the same objects over a long period.
- Aim could be achieving data on light curve of many LEO objects to achieve statistical dataset
- This achievement could be only reached by sharing data and using facilities from different participants