

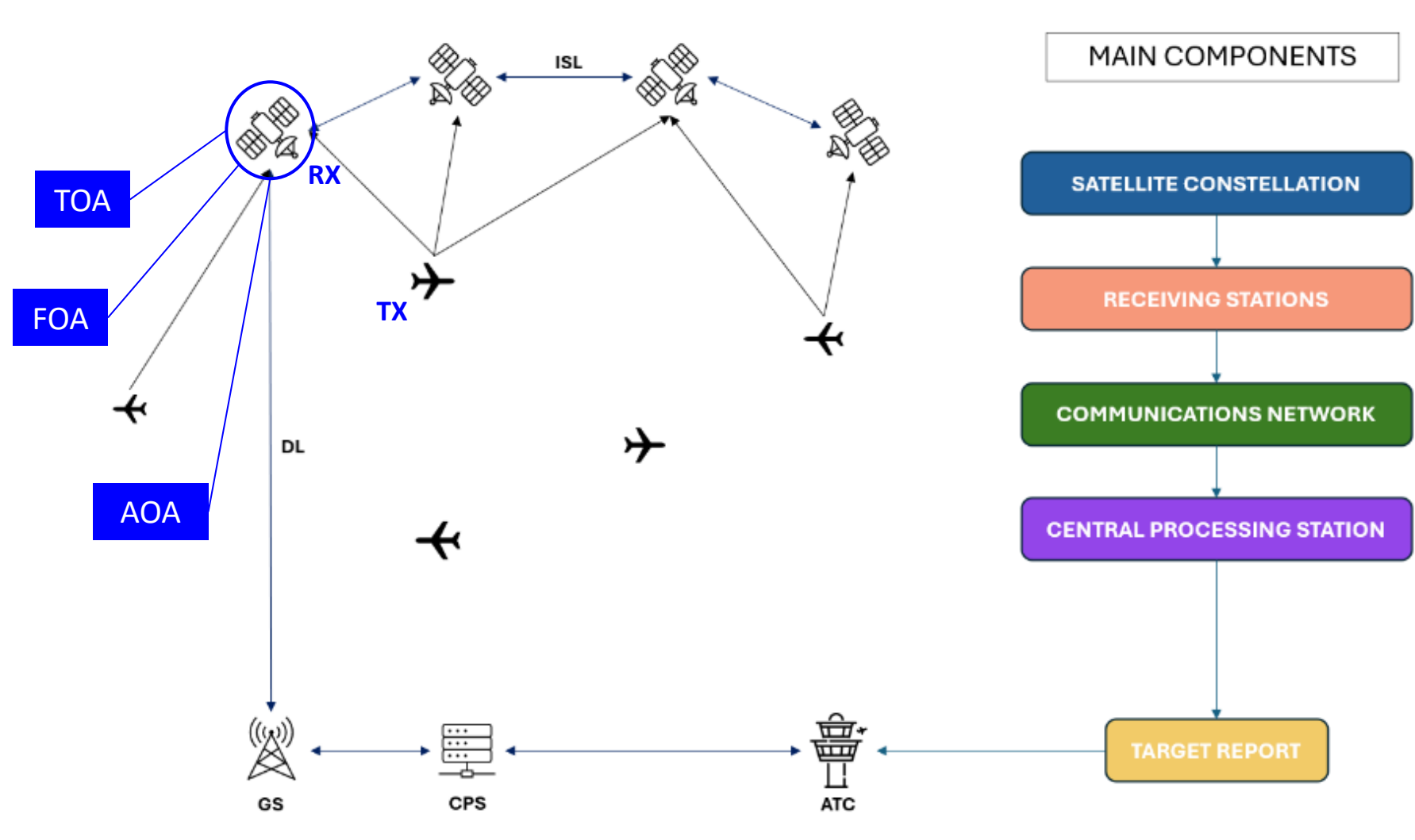
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Introduction

SATERA proposes satellite multilateration as backup/validation for ADS-B

- Aims, goals, expected outputs
- Design and validate a GNSS-independent ATC surveillance system.
 - Improve the air traffic capacity, security and safety over remote areas.
 - Consider multilateration based on **time**, **frequency**, **angle** measurements onboard LEO satellites.
 - Develop an integrity estimator for the ADS-B system.
 - Develop a **Performance Prediction Tool (PPT)** to evaluate the system in a given configuration.



Methodology

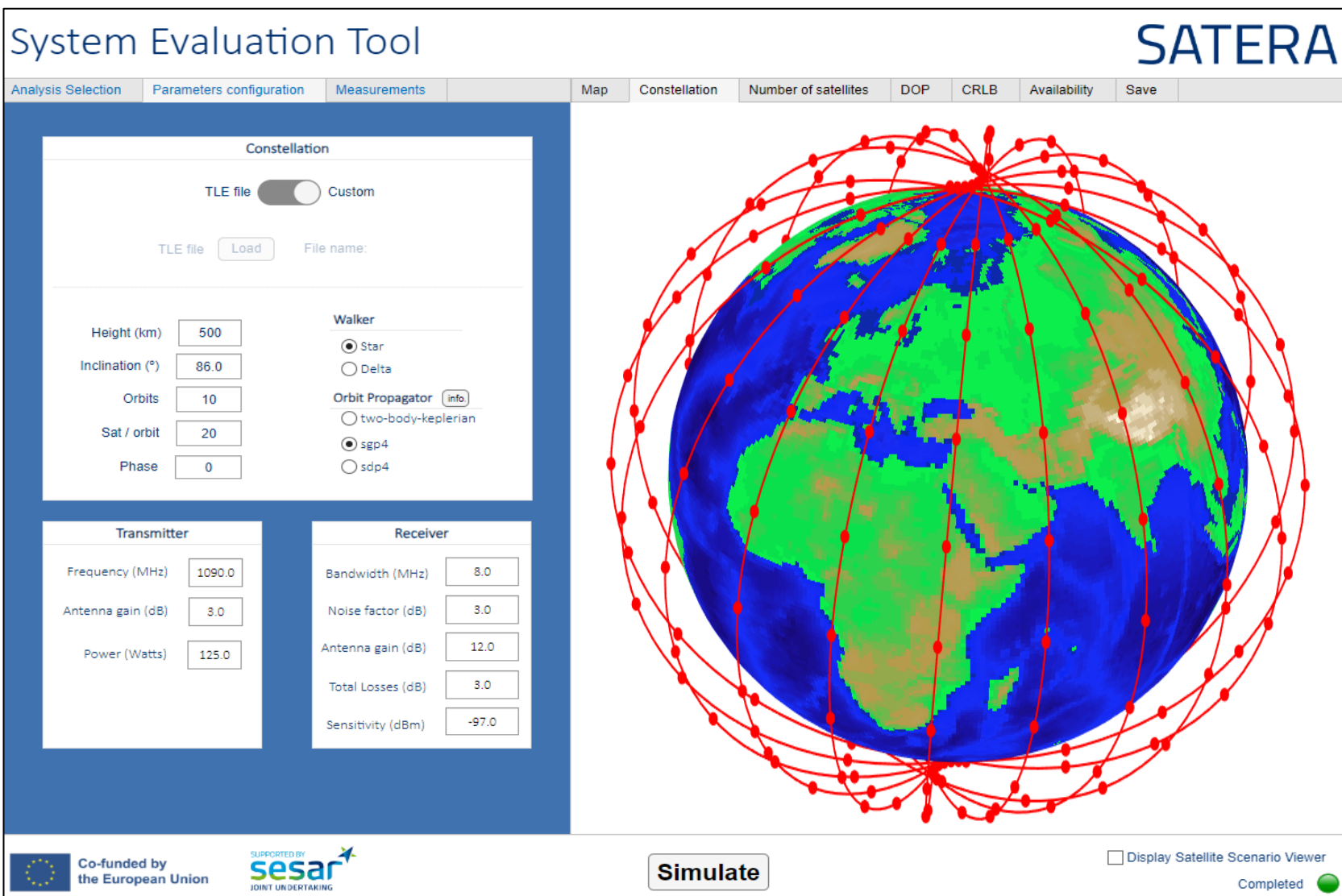
The PPT is developed in **MATLAB**

CRLB used as performance indicator (lower limit for positioning error covariance)

Mathematical models for:

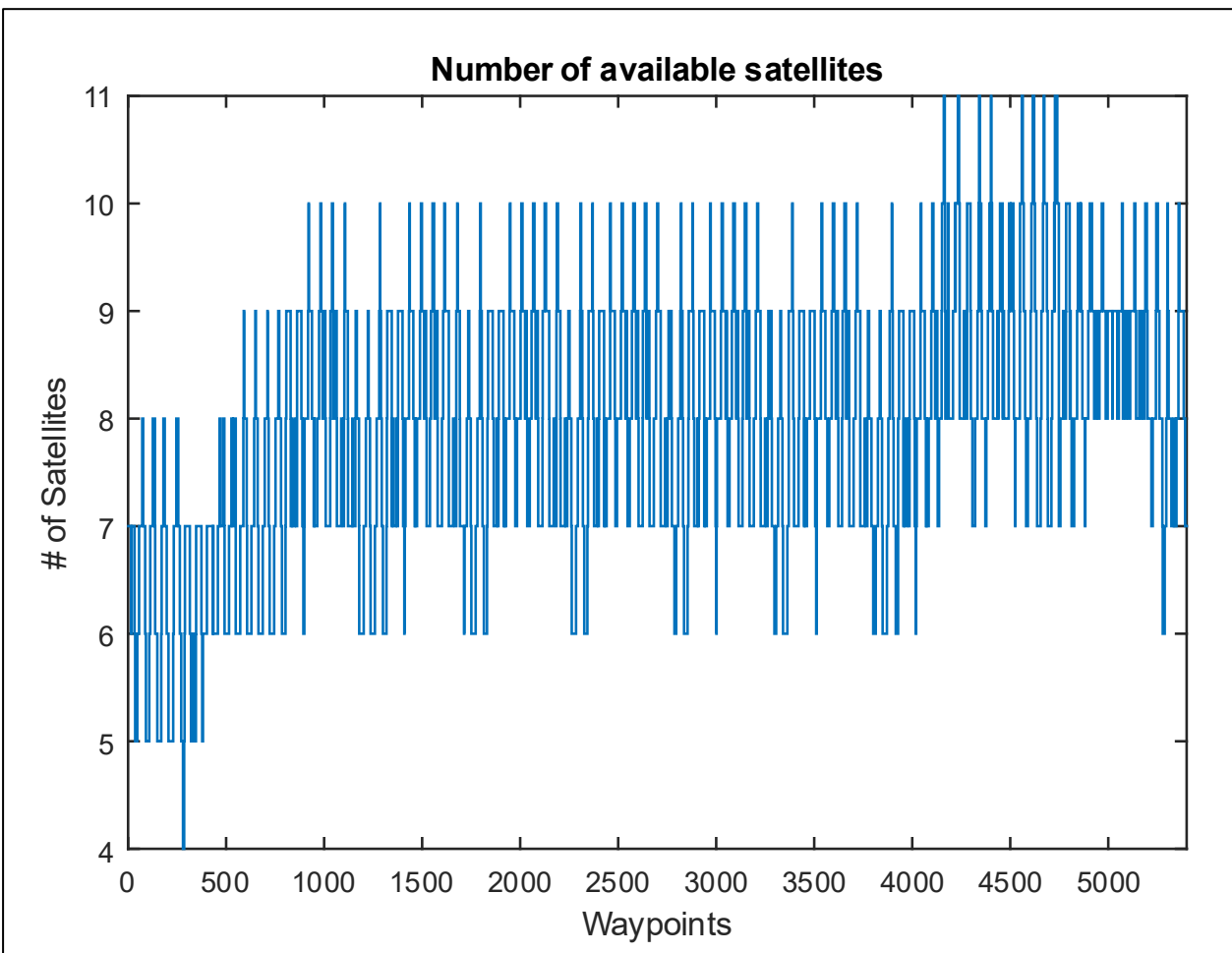
- TOA, FOA, AOA CRLB
- TOA, FOA, AOA measurement errors
- LEO satellites constellation
- Link budget analysis

GUI →



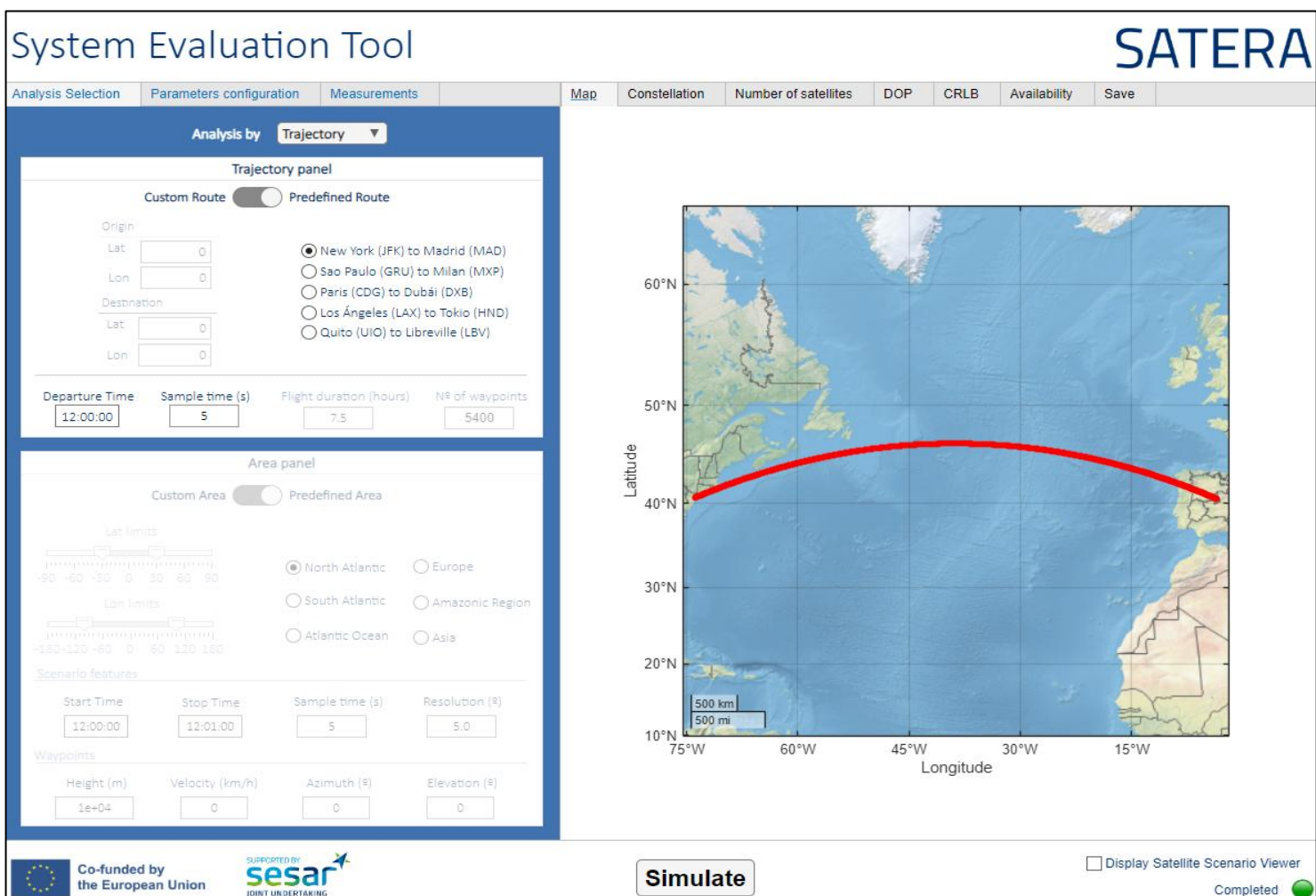
PPT Examples and Results

Visible satellites over given trajectory

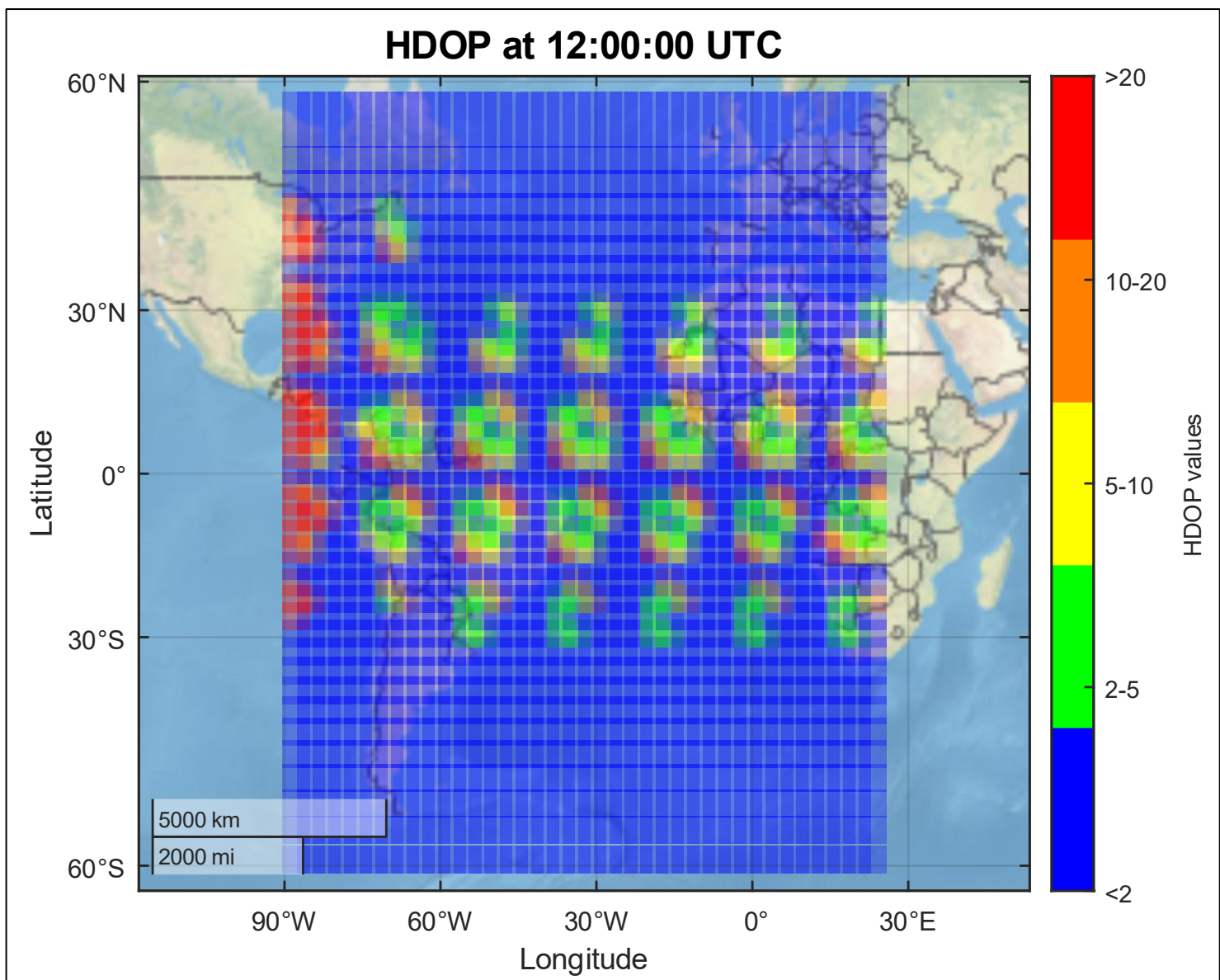


It is possible to increase the number of waypoints (trajectory) or decrease the cell width (area) for more granularity

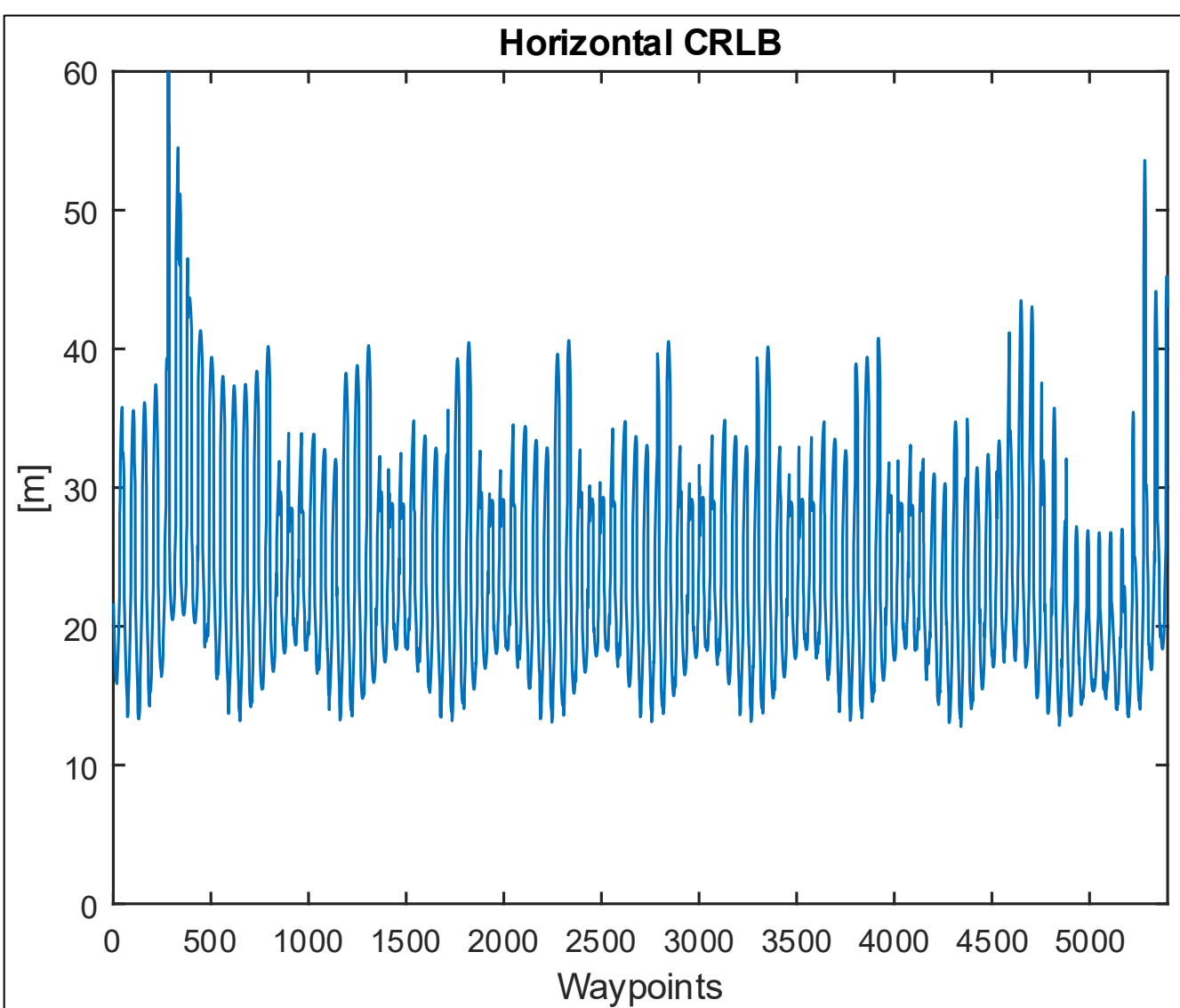
Trajectory setup



(Horizontal) Dilution of Precision over area



CRLB over given trajectory



Availability: 100.00%

In SATERA the overall availability is computed on horizontal error

The DOP is characterised by regular patterns due to the constellation

Conclusions

The PPT is a critical component in the iterative process of the SATERA system validation and improvement

The PPT is a useful tool that can be used to design and configure the parameters of any similar system

The PPT can check the performance of a space-based multilateration system out of the box by configuring the following: **satellite constellation** – **link budget** – **measurement types (TOA, FOA, AOA)** – **measurement errors** – **trajectory**

The software is modular and can be easily adapted to similar use cases (i.e.: ground-based) or be enhanced with new features