Virtual Distinguished Lecturer Program
10 December 2024

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VPI VICEPRESIDENCIA DE INVESTIGACIÓN - UNAM

UNAM UNIVERSIDAD NACIONAL DE MOQUEGUA "Universitas Universitarum"

Conceptualization and Simulation of a 3U Nanosatellite

Ph.D. Ing. Avid Roman-Gonzalez

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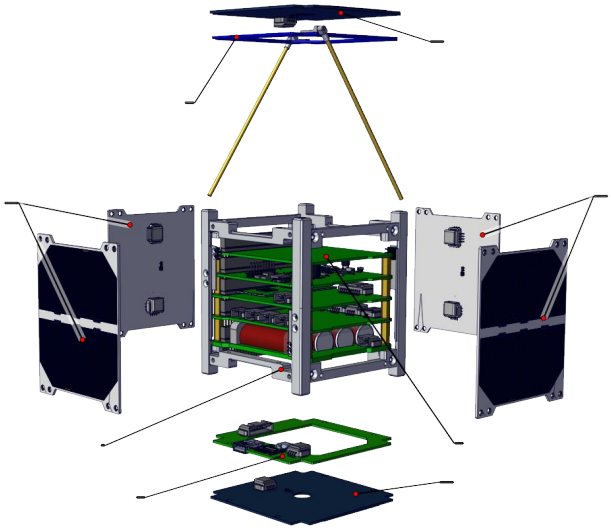
Context

- Small satellites are an excellent platform to enter the aerospace field.
- The use of commercial EEE components known as Space COTS can reduce the cost, time, and gap in space incursions.
- A critical stage is the simulation of the mission.
- For the educational purpose, one has low-cost and/or free access tools, which allow us to carry out simulations of the various aspects in a small satellite mission.



Mission Simulation

- Mission Geometry.
- Payload.
- Platform.
- Ground Segment.

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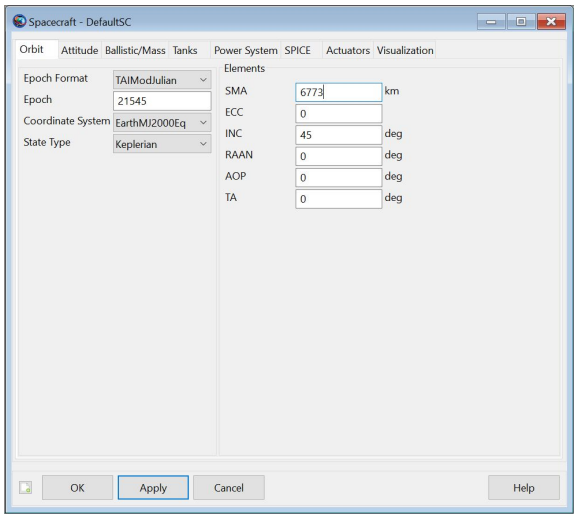
Mission Simulation

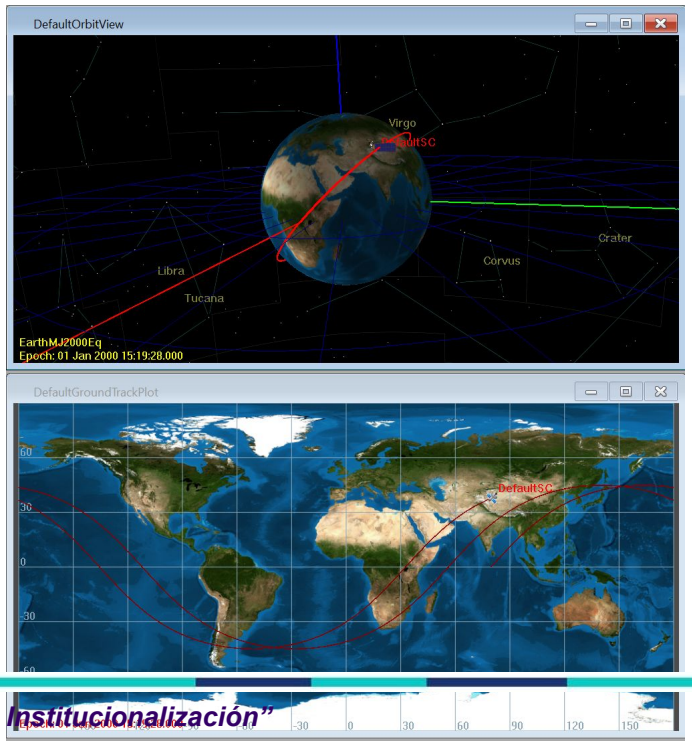
Mission Geometry

OPEN COSMOS

Mission Simulation

Mission Geometry





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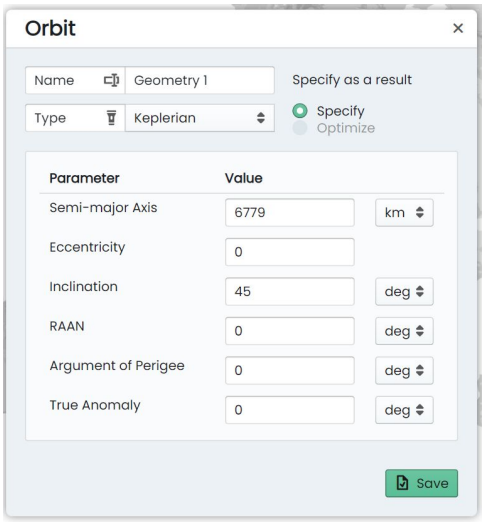
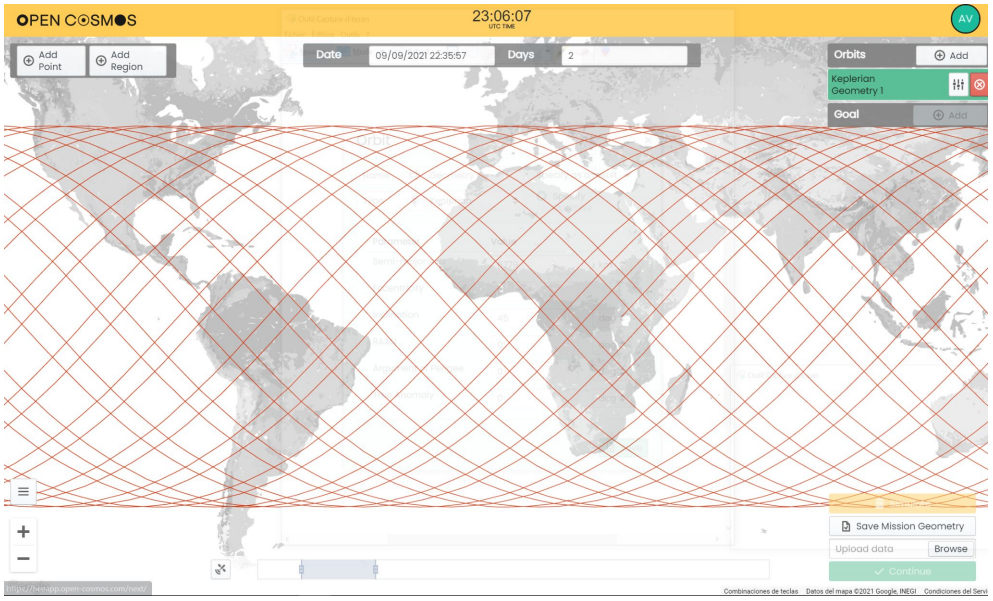
Mission Simulation





Mission Simulation

PayLoad

Type	Name	Mass [kg]	Volume [U]	Min Temp [°C]	Max Temp [°C]	Peak Power [W]	Selected
Optical	Sample - High Resolution Panchromatic Imager	8.00	8.44	-30	65	20.00	☐
Optical	Sample - Hyperspectral Imager with DPU	5.45	7.59	-15	50	1.50	☐
Optical	Sample - Compact Hyperspectral Imager	1.45	1.00	-45	80	5.00	☐
Optical	Sample - Visible Imager	0.25	0.51	-40	85	0.80	☑
Optical	Sample - RGB Imager	0.10	0.05	0	55	0.24	☐
Optical	Sample - IR Spectrometer	0.23	0.29	-25	55	0.38	☐
Communications	Sample - SDR with Dipole	0.33	0.24	-40	85	2.70	☐
Communications	Sample - SDR with Helical	0.45	0.30	-40	80	2.10	☐
Communications	Sample - IoT Receiver	0.50	1.25	-20	50	3.00	☐
Research	Sample - Biological Pressurized Vessel	0.90	2.00	-20	40	60.00	☐
Research	Sample - Biological Multi-experiment	0.90	2.00	-20	40	60.00	☐

Add Custom Payload | Continue

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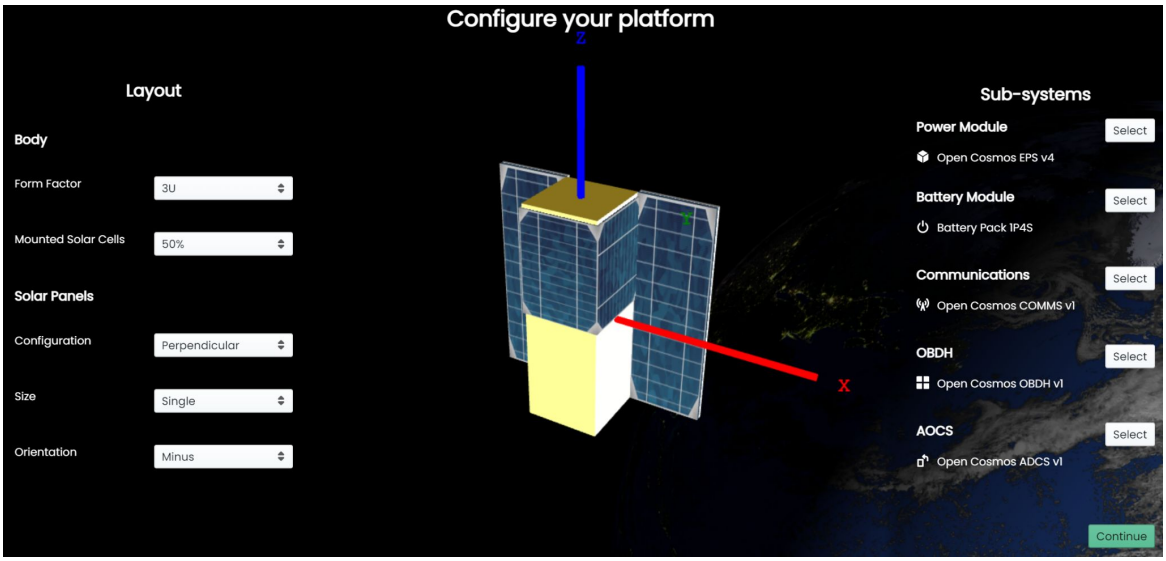
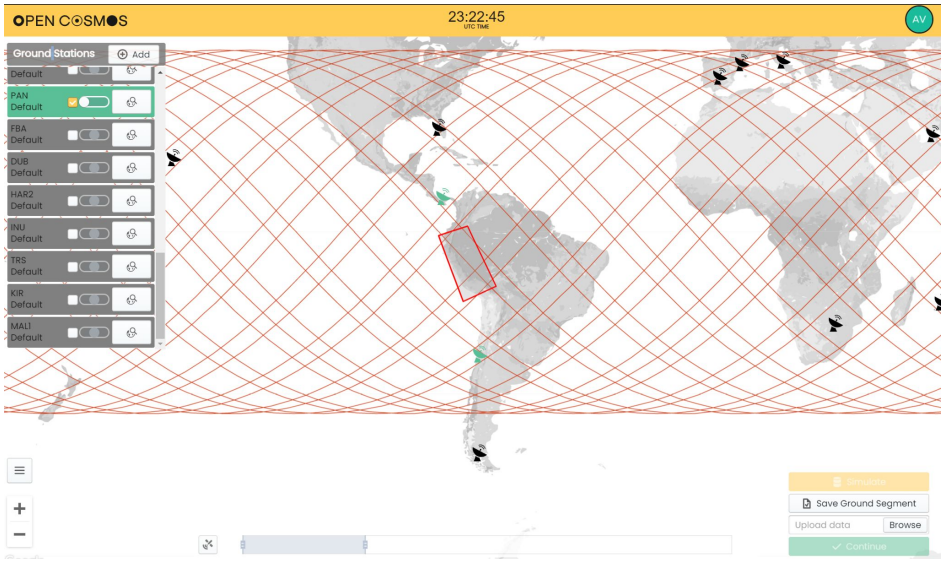
Mission Simulation

Platform



Mission Simulation

Ground Segment



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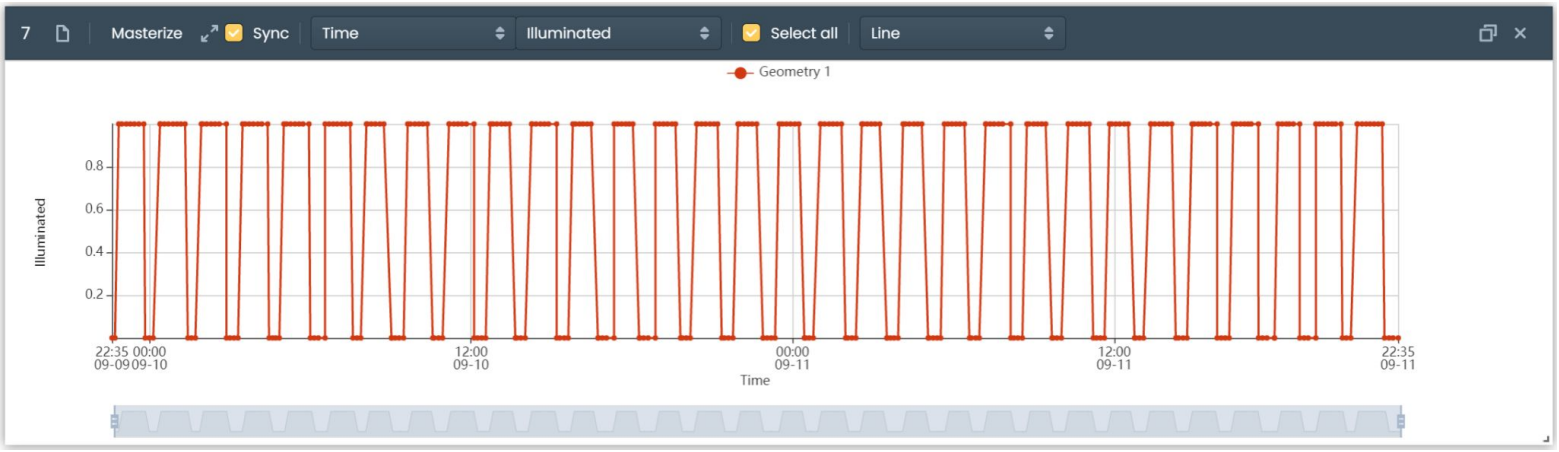
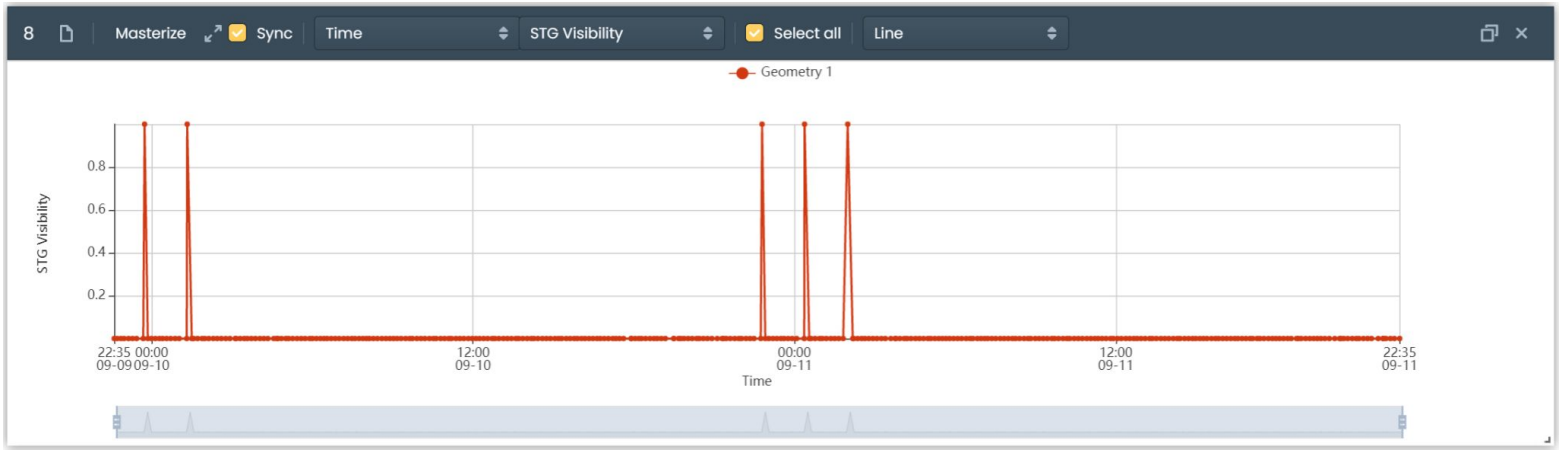
Results



Results



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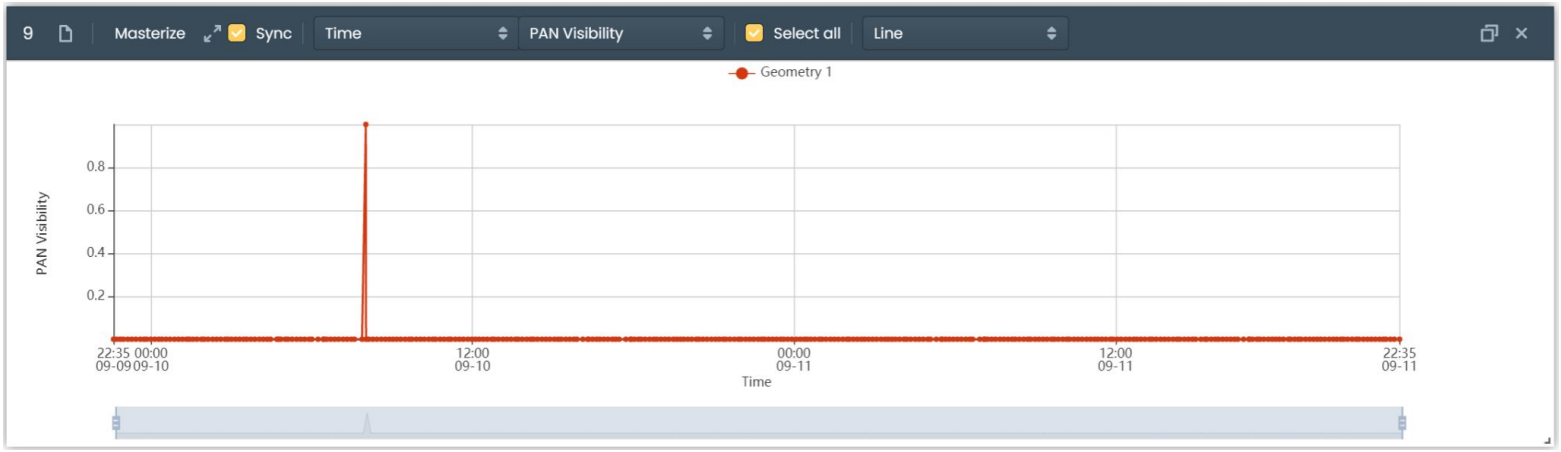
Results



Final Remarks

- According to the simulation, one can observe that there is more significant contact time with the Santiago ground station than Panama ground station under the established parameters.
- It is good to have these simulation tool options that allow the training of professionals with knowledge in the aerospace field, especially in developing countries.
- These tools are used in the final cycle of the electronic engineering undergraduate program of some universities in Peru, with outstanding results.

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