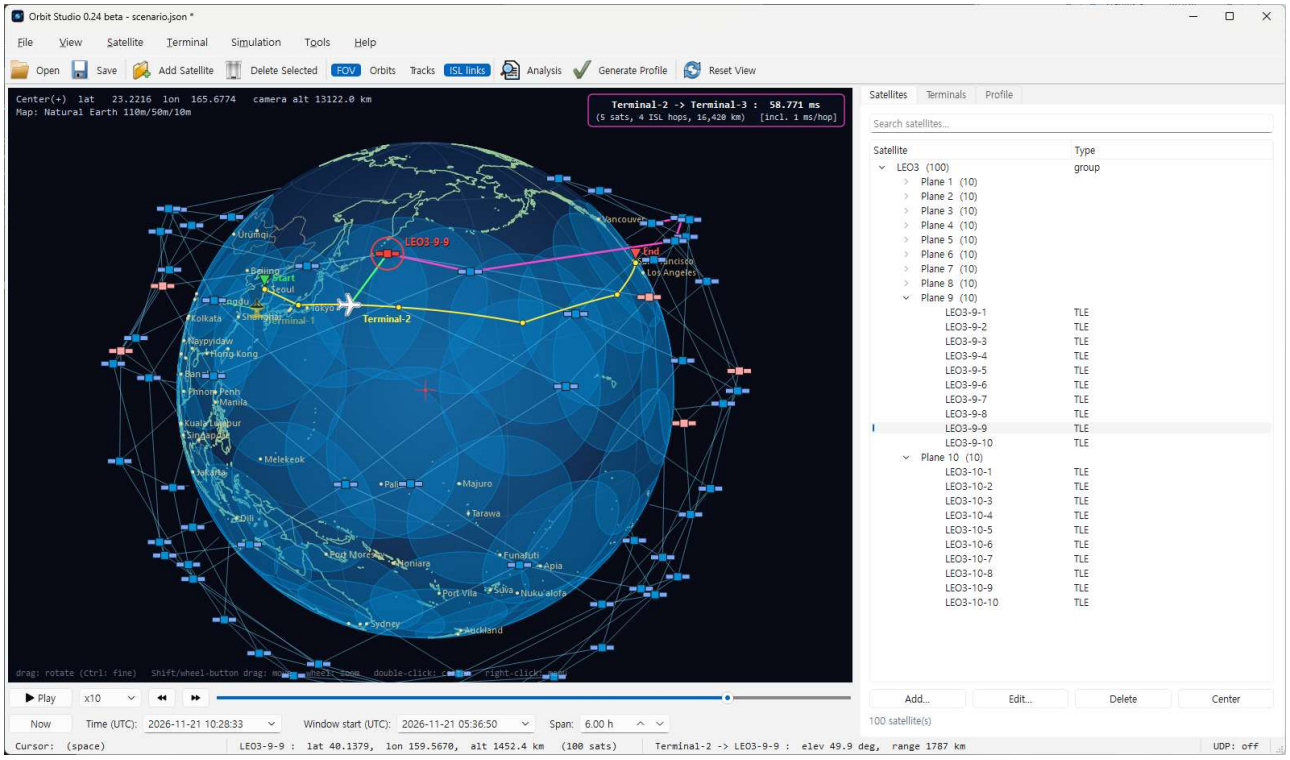
MANTISTECH · ORBIT STUDIO 0.24 BETA

Orbit Studio

Satellite channel profiles for the SCE-C4202 — from real orbits to the emulator

Profile Generator · 3D Globe · Service Analysis · ISL Routing · Radiation · UDP Output



Orbit Studio main window — 100-satellite constellation, ISL route and a moving aircraft on the 3D globe

01

Real orbital geometry

TLE/SGP4, Walker constellations and GEO with beams and 8-figure motion on the WGS84 Earth.

02

Emulator-ready CSV

Delay / FO / Gain files in the SCE-C4202 format, checked against the emulator limits.

03

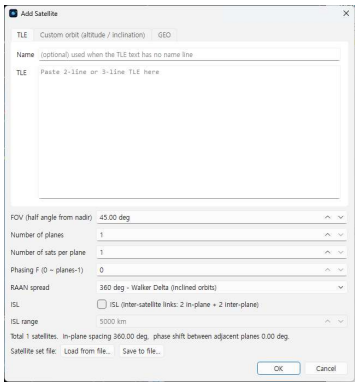
Analysis built in

24 h coverage, handovers, ISL routes and radiation dose in the same tool.

Orbit Studio is developed by **MantisTech (Mantis Technology Co., Ltd.)** as the profile generator for the **SCE-C4202 Satellite Channel Emulator**. Place satellites and terminals, press **SAT Align** and **Generate**, and load the three CSV files into the emulator's Profile mode to reproduce a LEO pass, a GEO link or a moving platform on the bench.

Model any satellite scenario

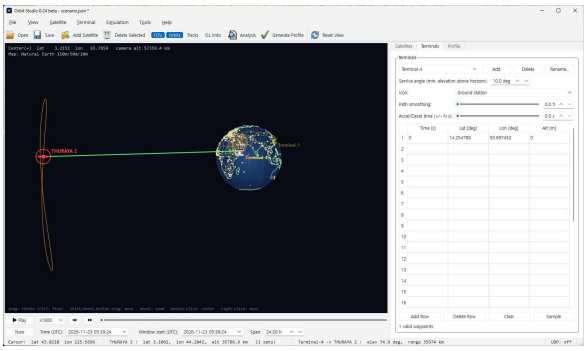
Satellites, beams and moving terminals on a live 3D globe



Add Satellite — TLE, Walker, GEO

Satellites & constellations

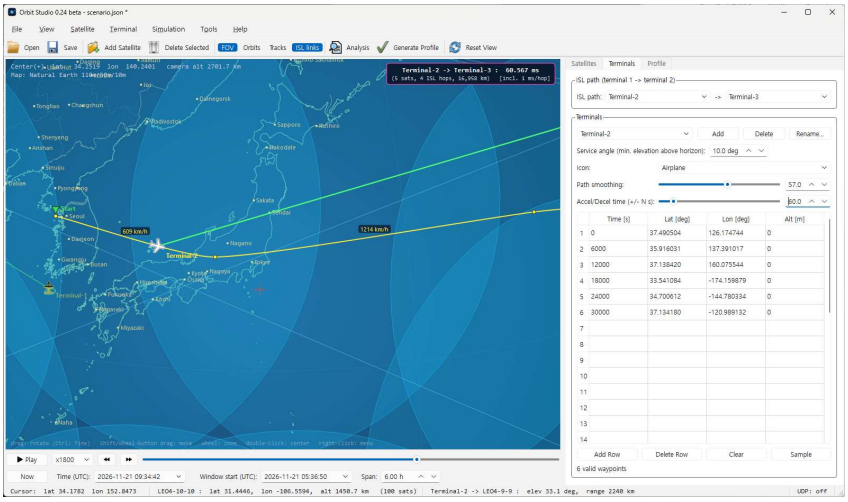
- TLE lists from CelesTrak or your own, propagated with SGP4
- Walker Delta / Star generator (planes, satellites per plane, phasing)
- Tree list by constellation and plane, multi-select editing



GEO (THURAYA 2 TLE) and its daily 8-figure track

GEO beams & 8-figure motion

- Multiple beams aimed by right-clicking the map
- Inclined GEO: daily 8-figure with delay and FO variation
- FOV half-angle cones and tilted beam footprints



Moving terminal with waypoint table and segment speed labels

Moving terminals

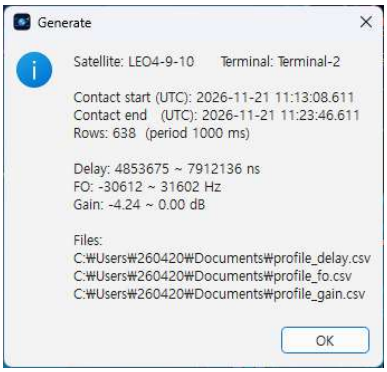
- Waypoints by table, Excel paste or right-click on the map
- Path smoothing and acceleration/deceleration keep the timing
- 12 icons — aircraft, drone, ship, vehicle, train, handheld …

Detailed 3D map

- Natural Earth coastlines, borders, provinces and cities with automatic detail
- Orbits, ground tracks, FOV, links and handover blinking
- Play from ×1 to ×1800, SAT Align to an overhead pass

Generate profiles. Analyze the link.

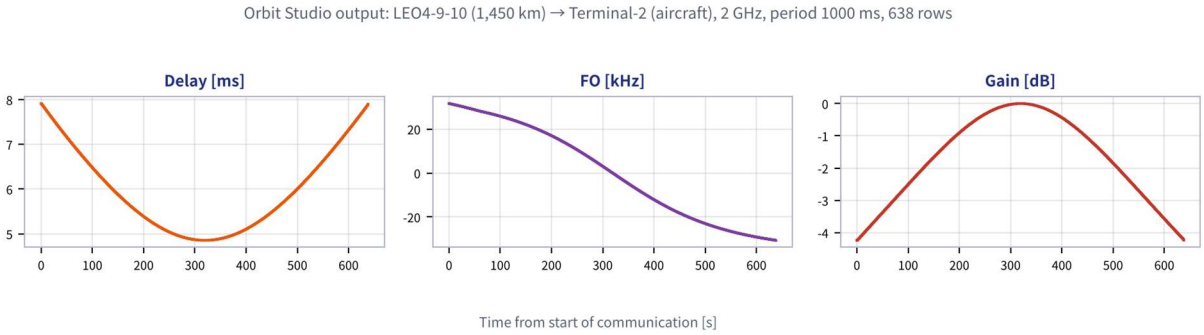
One-click SCE-C4202 profiles and 24-hour service analysis



Generate result — contact, rows and value ranges

SCE-C4202 profile generation

- `_delay`, `_fo`, `_gain` CSV in the emulator template (UTF-8 BOM, CRLF)
- Starts at acquisition, ends at loss of signal; GEO by duration
- Checks 8000 rows, 1 ms period and ±100 ns / ±100 kHz / ±10 dB per ms
- No accumulated rounding error: 1 ns, 1 Hz, 0.01 dB



Actual output: 1,450 km LEO to an aircraft, 2 GHz — delay 4.85–7.91 ms, FO -30.6…+31.6 kHz, gain -4.24–0 dB, 638 rows



Analysis — per-terminal graphs, handovers and summary table

Service analysis

24 h per terminal: satellites in view, path loss, elevation, azimuth, Doppler and rate, delay, off-axis angle, crossing/dropout handovers. Export to CSV.

ISL routing

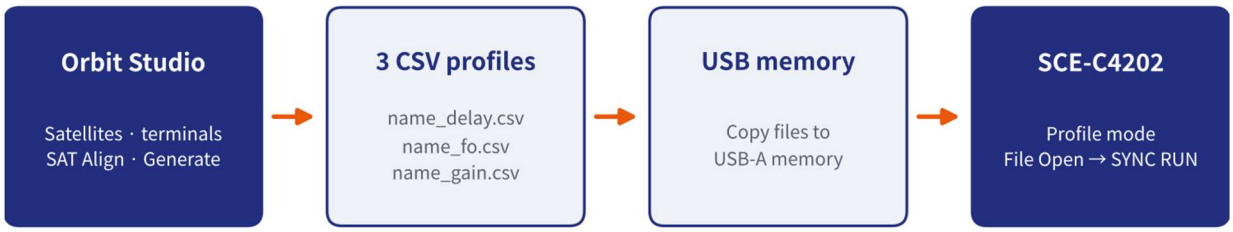
Minimum-delay route between two terminals through inter-satellite links, with per-hop delay and route-change statistics.

Radiation (TID)

AE8/AP8 dose behind 1–10 mm Al for the mission, solar min/max; IRENE (AE9/AP9) input export.

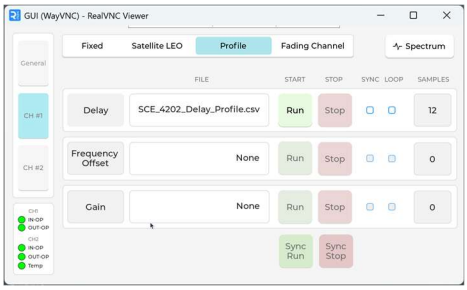
Built for the SCE-C4202

From Orbit Studio to the emulator in four steps





SCE-C4202 channel emulator



SCE-C4202 Profile tab — SYNC RUN of the three files

Specifications

Item	Orbit Studio 0.24 beta
Target	SCE-C4202 Profile mode
Outputs	Delay [ns], FO [Hz], Gain [dB] CSV
Period / rows	≥ 1 ms / ≤ 8000 rows
Orbits	TLE (SGP4), custom, Walker, GEO
Frame	WGS84, UTC
Link	One-way satellite ↔ terminal
Search	720 h, edges to 0.05 s
Network	UDP 100–1000 ms, broadcast / multicast / unicast
OS	Windows 10/11 64-bit, single installer (.exe)

Accuracy at a glance

Output resolution 1 ns / 1 Hz / 0.01 dB. With a fresh TLE, the dominant error is the orbit itself (about 1 km at epoch ≈ 3 µs delay; a few Hz to tens of Hz FO at 2 GHz). Gain is the relative free-space loss only; ionosphere, troposphere and antenna patterns are not modelled. See the User Manual, chapter 14.

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