# Satellite Link Budget Calculation with SatMaster Pro

30 November – 4 December 2026
Casablanca (Morocco)



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A satellite link budget is the calculation that adds every gain and subtracts every loss between a transmitting earth station, the satellite and a receiving terminal to show whether the signal arrives with enough margin. This one-week course is for satellite communications engineers and technicians who want to do that calculation in the SatMaster Pro software, and it ends with a documented digital VSAT link budget file built in the tool.

## Introduction

Three references sit behind the calculations. DVB-S2, the second-generation digital video broadcasting standard for satellite, defines the modulation and coding options entered for each carrier. ITU-R P.618, the radiocommunication recommendation on Earth-space propagation, provides the rain attenuation method used for availability. SatMaster Pro, a Windows link budget application, is the tool used throughout. The level is practitioner and tool-centred rather than expert theory: delegates set up GEO and non-GEO links, run calculations band by band and learn to read each output screen, mostly at the computer in guided exercises.

## Course Objectives

- Define each line of a link budget and locate where SatMaster Pro calculates or asks for it.
- Distinguish the DAH and Crane rain models and select one for a given band and availability target.
- Compare SCPC and MCPC uplink arrangements and set transponder back-off values to suit each.
- Apply DVB-S2 modulation and coding choices to reach a required throughput on VSAT, television and mobile terminal links.
- Interpret carrier-to-interference results and decide when spread spectrum or flux density limits are needed.

## Target Audience

- Earth station and teleport engineers who decide antenna size and amplifier power for a new carrier.
- VSAT network technicians who judge whether a remote site will meet its availability target.
- Satellite capacity planners who decide how much transponder bandwidth and power to lease.
- Broadcast transmission engineers who choose modulation and coding for television contribution links.
- Radio frequency engineers moving into satellite work who need to decide which inputs a link calculation requires.



## Course Outline

### Day 1: Link Budget Terms and the SatMaster Pro Interface

- Link Budget Structure: Transmit Power, Gains, Losses and Resulting Carrier-to-Noise Ratio
- C Band vs Ku Band vs Ka Band: Rain Sensitivity, Antenna Size and Capacity
- Frequency Band Overview: UHF, L, S and X Band Uses in Satellite Services
- EIRP, G/T and SFD: Satellite Parameters Read From Published Footprint Maps
- SatMaster Pro Interface: Project Files, Satellite Database and Earth Station Entries

### Day 2: Propagation, Rain and Modulation Settings

- Troposphere vs Ionosphere Effects: Gaseous Absorption Against Scintillation and Faraday Rotation
- DAH vs Crane Rain Model: Two Methods for Predicting Rain Attenuation
- ITU-R P.618: The Recommendation Behind Rain Fade and Availability Calculations
- Modulation Schemes: QPSK, 8PSK and 16QAM Thresholds Entered in SatMaster Pro
- Forward Error Correction: LDPC and BCH Coding Rates Defined Under DVB-S2

### Day 3: One-Way Links and Earth Station Setup

- One-Way DVB-S2 Link Budget: Building a Digital Downlink Calculation Step by Step
- Earth Station Components: HPA, LNB, Feed and Antenna in the Signal Chain
- Beamwidth vs Antenna Gain: Dish Diameter Trade-Offs Shown in Tool Entries
- Polarisation and Aperture Efficiency: Linear, Circular and Efficiency Settings Entered
- GEO vs Non-GEO Geometry: Elevation, Slant Range and Doppler Inputs Compared

### Day 4: Uplink, Transponder Loading and Optimisation

- SCPC vs MCPC Uplink: Single and Multiple Carriers per Transponder Compared
- Transponder Loading: Input Back-Off, Output Back-Off and Shared Power Calculations
- Bandwidth-Limited vs Power-Limited Links: Spotting Which Resource Runs Out First
- Availability and Throughput Targets: Margins That Hold Service Through Fade Events
- Leased Capacity Reduction: Lower Bandwidth Through Modulation and Coding Choices

### Day 5: Interference Checks and the VSAT Link Budget

- C/I vs C/N: Interference Ratio Against Thermal Noise in Total Link Quality
- Interference Sources: Adjacent Satellite, Cross-Polar and Terrestrial Signals Identified in Results
- Spread Spectrum and Power Flux Density Limits: Mitigation Settings for Small Antennas
- VSAT and Mobile Terminal Case Studies: Television Broadcast and Enterprise Data Links
- Digital VSAT Link Budget File: Uplink, Downlink, Availability and C/I Documented



## Skills You Will Gain

- Carrier-to-noise calculation
- Rain fade prediction
- Footprint map reading
- Input and output back-off setting
- Slant range and elevation geometry
- Interference ratio assessment
- SatMaster Pro project setup

## Why Attend This Course

- From spreadsheet link calculations built by hand to repeatable SatMaster Pro project files.
- From picking a dish size by habit to sizing it from beamwidth, gain and margin results.
- From treating a link as either working or failing to reading which resource, bandwidth or power, limits it.
- From separate uplink and downlink notes to a documented digital VSAT link budget file covering availability and interference.

## Conclusion

Calculating a satellite link is a matter of tracing power from amplifier to receiver and checking that what is left exceeds the demodulator threshold for the time required. The course makes clear the differences between rain models, between SCPC and MCPC loading, and between noise and interference limits. It suits engineers and technicians who prefer to learn by building links in software and need a working tool method, rather than an expert-level theory course.

## Course FAQs

### What is a satellite link budget calculation?

It is an accounting of transmit power, antenna gains, path and rain losses and noise that shows whether the received carrier exceeds the threshold for the chosen modulation and coding, and by how much margin.

### What is the difference between C/I and C/N in a satellite link budget?

C/N compares the carrier with thermal noise from the receiver and sky. C/I compares it with unwanted signals from adjacent satellites, cross-polar carriers or terrestrial sources. Both combine into the total link quality.

### Which standards does a satellite link budget course with SatMaster Pro follow?

Carrier settings follow DVB-S2 modulation and coding, rain attenuation follows the ITU-R P.618 method with the Crane model as an alternative, and every calculation is run in SatMaster Pro.



## Is a SatMaster Pro satellite link budget course right for a VSAT technician?

Yes, for a technician who commissions remote terminals and needs to check antenna size, power and availability before installation, using a software tool rather than manual formulas.

## What does a delegate produce in a satellite link budget course with SatMaster Pro?

Each delegate builds a digital VSAT link budget file in SatMaster Pro covering uplink, downlink, rain availability and carrier-to-interference, with the assumptions behind each entry recorded.

