SatMaster Professional-Satellite Link Budget Training

15 – 19 February 2027
Boston, Massachusetts (USA)



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Introduction

The Satellite Link Budget Analysis and Design Course is a highly specialized training program that focuses on the essential aspects of satellite communications systems. The course provides an in-depth understanding of link budget analysis, a key component in the design, assessment, and optimization of satellite communication systems. Link budgets are crucial for evaluating satellite performance, accounting for various factors such as radio-wave propagation, satellite efficiency, terminal equipment, interference, and the physical aspects of fixed and mobile satellite systems.

Participants will gain hands-on experience using SatMaster, a widely recognized yet affordable PC-based software tool offered by Arrowe Technical Services. This course covers the principles and practical aspects of link budget calculation in satellite communication with a special focus on VSAT Very Small Aperture Terminals systems, interactive communications, and services across various frequency bands UHF, L, S, C, X, Ku, and Ka.

Over one week, attendees will develop the necessary skills for designing and analyzing satellite networks and ensuring high-quality satellite data transmission. This course is essential for professionals in the field of satellite communications, providing them with a solid foundation in satellite network design, and the hands-on ability to work with link budget analysis tools and techniques.

Course Objectives

By the end of this course, participants will:

- Understand the core principles of satellite link budget analysis and its practical applications in satellite communication systems.
- Gain hands-on experience in link budget calculation and design for various satellite communication systems, including VSAT.
- Master the use of SatMaster software to perform link budget calculations for both uplink and downlink transmissions.
- Learn how to design and optimize satellite networks for different types of transmission systems and data rates.
- Understand key considerations in satellite communication design, including frequency band selection, propagation effects, and power control strategies.
- Familiarize with advanced features such as adaptive power control, coding, modulation, and network design.



Course Outlines

Day 1: Principles and Main Components

- Types of transmission systems and satellite communication systems.
- Classification and characteristics of satellite systems.
- VSAT systems: What is VSAT and how does it function?
- Satellite frequency bands and their impact on transmission.
- Overview of VSAT Earth Station block diagram and network components.
- VSAT network topology and multiple access techniques.
- Important terms related to VSAT and satellite communications systems.

Day 2: Principles of Satellite Link Budget Calculations

- Standard ground rules for satellite link budget analysis.
- Frequency band selection and satellite footprints: EIRP, G/T, PFD, and SFD.
- Propagation considerations: Isotropic source, line of sight, and atmospheric effects rain, ionosphere.
- Satellite antenna characteristics: Radiation patterns, gain, and front-to-back ratio.
- Earth station power characteristics: HPA, uplink power control, and intermodulation.
- Modulation systems and error correction techniques.
- Bandwidth and roll-off factor considerations.
- Transmission equations and their relationship to the link budget.

Day 3: Principles of Satellite Link Budget Calculations Continued

- Continuing link budget calculations for satellite systems.
- Uplink/Downlink calculations.
- ASI Up / ASI Down calculations.
- Rain model considerations and the impact on satellite data transmission.
- Satellite and carrier configurations for different satellite network designs.

Day 4: Link Budget Calculation Considerations

- Basic design considerations for satellite communications systems.
- Link budget result fine-tuning using advanced SatMaster Pro tools.
- Key SatMaster calculators for:
    - Bandwidth.
    - Sun outages.
    - D:M:S to degrees conversion.
    - Noise figure to noise temperature conversion.
    - Beamwidth calculation.
- Detailed link design practice: Uplink/downlink and ASI calculations.
- Link budget calculation with emphasis on accuracy and reliability.



Day 5: Advanced Features in VSAT Systems

- Adaptive uplink power control techniques in VSAT systems.
- Adaptive coding and modulation strategies.
- CNC/Bandwidth cancellation and their impact on link budget considerations.
- Layer 2 networking, traffic shaping, and quality of service in satellite networks.
- General discussion on advanced satellite network design features.

Why Attend This Course? Wins & Losses!

- Hands-on experience in performing link budget analysis using SatMaster, a leading software in satellite communications.
- The ability to design and optimize satellite networks, including VSAT systems, with proficiency in link budget calculations for both uplink and downlink.
- Comprehensive understanding of satellite communication systems and how to apply link budget analysis in real-world scenarios.
- Practical knowledge of satellite data transmission techniques, adaptive power control, and error correction for efficient satellite network design.
- Valuable skills for telecommunications engineers, making you a sought-after professional in the satellite engineering and communications industry.

Conclusion

The Satellite Link Budget Analysis and Design Course offers in-depth training for professionals looking to advance their expertise in satellite communications systems, satellite network design, and link budget analysis. Through hands-on experience with SatMaster and comprehensive coverage of satellite data transmission techniques, participants will gain the skills needed to design and optimize robust satellite communication systems.

Whether you are a telecommunications engineer, a satellite communication professional, or an aspiring specialist in satellite link budget calculation, this course will equip you with the knowledge and practical experience to succeed in the rapidly evolving field of satellite communications. Join us today to enhance your career and deepen your understanding of satellite network design and link budget analysis.

