



Fundamentals of Microwaves, Components and Systems in Telemetry Flight Test Applications

One Day Short Course

Instructor: Mark McWhorter, V.P. of Sales & Marketing, Lumistar Inc.

Course Objectives

This short-course is designed to provide a fundamental overview of microwave theory, followed by a presentation of the design and application of various microwave and RF components. The course then takes the student through system level applications specific to the IRIG Telemetry "Flight Test" industry, and then closes with factors related to health and safety with equipment demonstrations..

Who Should Take this Course?

Entry Level Engineers, Technicians, Sales Staff, and Technical Management who desire to learn (or brush up on) a wide array of fundamental topics related to microwaves and high frequency topics specific to the Flight Test Industry

Course Content

After completing this course, students will be able to

- *Explain the basics of RF and Microwaves*
- *Describe the work of several historical figures in microwaves (optional)*
- *Understand the microwave frequency spectrum*
- *Understand RF propagation and transmission line principles*
- *Understand terms and acronyms such as dB, VSWR, G/T, wavelength, bandwidth, attenuation, noise, impedance matching, standing waves, S-parameters, return and transmission loss as applied to microwave theory*
- *Understand typical microwave unit conversions, such as dBm to watts*
- *Understand the essence of the Smith Chart (optional)*
- *Understand antenna basics*
- *Describe various types of microwave transmission lines*
- *Understand various components used in microwave receiving and transmitting systems, such as low noise amplifiers, mixers, attenuators, power combiners, directional couplers, PIN and Varactor diodes, microwave filters, variable phase shifters and attenuators and more*
- *Understand basic microwave TLM system design considerations*
- *Discuss modulation techniques such as AM, FM, and Phase Modulation*
- *Calculate microwave propagation losses and link budgets*
- *Understand system degradation due to non-ideal microwave components*
- *Understand natural and man-made obstructions to RF propagation, such as "multi-path".*
- *Understand health issues related to human exposure to microwaves*



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www.telemetry.org

Instructor's Biography: Mr. McWhorter has been involved in the design, development, production and marketing of a variety of microwave components and systems for over 30 years. He holds a BSEE Degree from the University of South Florida and has authored several papers on microwave components and system applications. Mr. McWhorter previously held the position of Technical Director at Honeywell Space Systems, Clearwater, FL where he was involved in the design, development, and mission operations of ground based mobile Range Safety and Telemetry Systems for launch vehicle flight test applications. Currently, he is VP of Sales and Marketing for Lumistar, Inc.

Suggested Class Size:

A class size of approx. 15-30 people is optimal. Other sizes can be obliged.

Material Resources:

Optional book for "independent study" is *Understanding Microwaves*, ISBN 0-471-57567-4 Allan Scott, 538 pages, Copyright 1993.

The course can be tailored to the specific needs of individual customers, including "hands-on" training with the customer's TLM antennas and receiving systems. Specific procedures for improving "system-readiness" are offered.

**For more information please call (727) 642-0939 or
E-mail to mmcwhorter@lumistar.net**

[Link to Mr. McWhorter's "Fundamentals of Aeronautical Telemetry Ground Stations" class:](#)

<https://lumi-star.com/uploads/TRAINING/FundamentalsAeronauticalTelemetryGroundStations.pdf>