Course Number N3202A/B
Scheduled, Dedicated
Using ADS Communication Systems Designer

Overview

Gain a comprehensive understanding of the ADS Communication Systems Designer (CSD) suite.

Course Overview

A medium paced review of communications system design techniques, for systems comprising of digital/DSP and RF/Analog sub-blocks. The path from requirements to system design specifications is shown, followed by individual sub-system design specifications. Different simulation techniques are used to aid in the design decisions, including optimization, budget analysis for transmitters and receivers, statistical design and yield analysis, digital filter synthesis, and BER measurement.

The class is hands-on oriented. Each student builds their own project, effectively using all the necessary features of ADS. The project developed during the training course is built from the ground up into a complete PI4DQPSK communications system: data source, modulator, transmitter, RF propagation channel model, receiver, demodulator. Simulations are performed on various sub-systems, to validate their performance prior to integration into the top-level system design.

What You Will Learn

- Review Basics
- Harmonic Balance
- Budget Analysis
- Circuit Envelope
- Optimization and Yield Analysis
- Ptolemy
- Numeric Modulator
- System Design Analysis
- BER Measurements

Specifications

Course Type

User Training

Audience

Technical staff who work in an RF, microwave, or communications design environment and want an in-depth understanding of designing communication systems with Agilent EEsof EDA's Advanced Design System.

Prerequisites

Course N3200A, N3201A, or equivalent experience using ADS.

Course Length

3 days

Course Format

The course combines lecture presentations with instructor-guided, hands-on lab sessions. The practical nature of these labs ensures effective use of the software in a real design situations.

Delivery Method

Scheduled (at Agilent training locations) or
Dedicated (at customer site)
To save you time and travel, many Agilent EEsof EDA courses can be delivered at your site. Agilent EEsof EDA will provide required equipment.

Detailed Course Agenda

Day One

- Lab 1–RF Transmitter
  A brief review of ADS basics is followed by a practical exercise in which a basic communications RF transmitter subsystem is constructed using system level behavioral components. Harmonic Balance simulation techniques are utilized to evaluate the spurious signal levels at the transmitter output. Filtering is applied to ensure that spurious signal levels satisfy the target specification.

- Lab 2–Budget Analysis
  Harmonic Balance techniques are utilized to perform budget analysis on the RF transmitter subsystem built in Lab 1. Key performance parameters for the transmitter such as gain compression contributions from each of the components are examined. A basic communications RF receiver subsystem is constructed using system level behavioral components. AC simulation techniques are applied to the receiver to assess the noise performance of the receiver. Budget analysis is used to review the noise contributions from each of the receiver components.

- Lab 3–ACPR Analysis
  Evaluating the performance of a communications subsystem operating in a digital system is of key importance. The Circuit Envelope simulator is used to evaluate the ACPR performance of the RF transmitter subsystem when operated with a PI4DQPSK modulated carrier. The example illustrates clearly the importance of specifying the transmit amplifier output power rating correctly in order that the ACPR specification for the RF transmitter subsystem is satisfied. Extensive use of Measurement Equations is made during this exercise.

Day Two

- Lab 4–Performance Optimization
  A review of the Optimization features available in ADS is provided. These techniques are then applied to the RF transmitter subsystem and the performance of the transmit amplifier is optimized to satisfy the target ACPR specification. Finally, the system level behavioral model of the transmit amplifier is replaced by a real amplifier design to illustrate the concept of introducing hierarchy within a design. The transmitter subsystem is then re-simulated and the ACPR performance is assessed.

- Lab 5–Yield Analysis
  A review of the yield analysis features available in ADS is provided. These techniques are applied to the RF receiver subsystem to assess the possible performance variations of both gain and noise figure.

- Lab 6–Ptolemy, QPSK System
  The fundamentals of Ptolemy are outlined and a QPSK system is used as a vehicle to illustrate some of these features. A QPSK modulator and demodulator are constructed and real time displays used to examine the constellation diagrams and eye diagrams.

Day Three

- Lab 7–Ptolemy, PI4DQPSK System
  The QPSK system design developed in Lab 6 is converted to a PI4DQPSK system. Sinks are used to store the I and Q symbols and post-processing is used in the data display window to generate both eye and constellation diagrams.

- Lab 8–Ptolemy, PI4DQPSK Numeric Modulator
  The timed modulator developed in the previous lab exercises is re-designed as a numeric DSP modulator. The design uses numeric circuit elements which process samples which have no associated timed parameters, special components are used to time stamp the samples in order for the samples to be processed by timed elements. EVM measurements are performed to establish an overall quantitative measure of the system performance. The DSP synthesis tool available in ADS is used to create a floating point design for a filter and the simulation results are compared with the behavioral Raised Cosine filter.

- Lab 9–Top Level Design/Simulation
  The top-level system design is created and analyzed in this lab exercise. The system design incorporates a DSP design as the modulator front end and the analog/RF transmitter design is embedded as a subcircuit. This illustrates the ability of ADS to provide a common integrated design environment for System, DSP and Microwave/RF Circuit designs. The system is simulated and measurements are made to verify satisfactory system performance against the original target specifications.

- Lab 10–Measuring BER
  A methodology for setting up BER measurements on the top-level system design is provided, the PI4DQPSK system design is simulated and BER performance examined.

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