

CN425 GNSS Signals and Systems with emphasis on Galileo
September 21, 2009, 8:30 am-12:00 pm, CEU: 3.0
GNSS Solutions® Tutorials prior to ION GNSS 2009, September 21-22, 2009
Marriott Savannah Riverfront, Savannah, GA

Instructor: Dr. Tony Pratt, Orbstar Consultants

Prerequisite: Some knowledge of mathematics and computer science will be useful.

Intended Audience: Engineers, scientists, and managers interested in the area of GNSS for GPS, Galileo, Glonass, and other satellite navigation systems. Emphasis will be on signals and systems used in GNSS and in particular Galileo. The course provides a solid foundation for navigation signal formats and their characteristics.

Notes Provided: Slides presented will be professionally spiral bound, with clear plastic cover, including color to add clarity where needed.

Reference List: A reference list will be provided as part of the note package for completeness and to allow the interested attendee to obtain additional information.

Course Overview: This course provides a solid foundation of GNSS Signal formats and emphasizes the new signal and services for Galileo. Details on GNSS signal formats, spreading codes, and their characteristics are provided.

Course Content: The main topics to be covered by this course are:

GNSS System Overview:

Introduction to different GNSS Providers:

- GPS, Glonass, Galileo, Beidou, Compass, IRNSS, QZSS
- Signal Spectra in L1, L2, L5, E1, E5, E6 and related bands

Signal Characteristics

- Modulation types: CDMA, BPSK, BOC, AltBOC, MBOC, TMBOC, CBOC, FDMA
- Signal Spectra and signaling requirements,
- Signal Multiplexing - many services on a single carrier
 - Quadrature phase, Interplex, Modified Interplex, CASM, Majority Voting, Spatial summation; Phase Plane Plots
- Spreading Codes and signal reception by correlation or convolution
 - Gold codes, m-sequences, random sequences, primary, secondary codes

Power Requirements in Space

- Signal Power Budget, spreading loss
- Background noise, inter and intra system noise
- Iso-flux antenna, antenna patterns and gain, understanding circular and elliptic polarization

Navigation Message Structure

- GPS and Galileo
- Error detection, forward error correction, parity checking

- Ephemeris and Clock models

Course Outcomes: At the completion of this course, the attendee should have a solid understanding of the fundamentals of navigation signals and their characteristics used in GNSS. For further information on Galileo, CN426 GNSS Signal Performance with emphasis on Galileo is recommended.