

CN433 Receiver Signal Processing for Future GNSS Signals - Introduction
September 22, 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. Olivier Julien, Ecole Nationale de l'Aviation Civile (ENAC)

Prerequisite: Some knowledge of mathematics and computer science will be useful. Additionally, knowledge of basic GNSS signal processing and receiver functions will help.

Intended Audience: Engineers, scientists and managers interested in the area of GNSS using GPS, Galileo, and/or other satellite navigation systems. The course will benefit to attendees interested in understanding typical GNSS receiver signal processing, architectures, and performances (acquisition and tracking) associated to future civil GNSS signals.

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 an excellent overview of future GNSS signal processing and the many aspects that affect GNSS receiver design and performance. The course starts with a reminder of future GNSS signal structures (with emphasis on GPS and Galileo), and then addresses the necessary features to consider for future GNSS signals acquisition and tracking. It also provides an evaluation of the future signals with respect to the current GPS C/A signal in terms of receiver performance and complexity.

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

Reminder on future transmitted civil GNSS signals:

- Introduction to Binary Offset Carrier (BOC) modulation, pilot channel and secondary code,
- Structure of future GPS and Galileo civil signals on L1/E1 and L5/E5 bands:
 - Components, modulations (BPSK, QPSK, MBOC, TMBOC, CBOC, ALTBOC) and spectral representation

The correlation operation:

- Correlator output model in the presence of thermal noise,
- GPS and Galileo main correlation functions

Acquisition of future GNSS signals:

- Review of acquisition performance criteria
- Joint data/pilot acquisition detectors,
- Impact of BOC-based modulations on acquisition performance, and
- Secondary code acquisition

Phase tracking architectures and performances of future GNSS signals:

- Use of the pilot channel for phase tracking, and
- Phase tracking performance using future GPS and Galileo signals

Code tracking architectures and performances of future GNSS signals:

- Use of the pilot and secondary code for code tracking,
- Investigation of basic BOC tracking (architecture, performance in thermal noise, tracking ambiguity problem), and
- Tracking of BOC-based signals and application to future GPS and Galileo signals: (architecture, performance in thermal noise, tracking ambiguity problem)

Course Outcomes: At the completion of this course, the attendee should have a solid understanding of the fundamentals of GNSS signal processing, including future GNSS signals, necessary within GNSS receivers of the future. The attendee should also have a clear view of the advantages and constraints brought by future GNSS signals on the receiver performance. For further information on GNSS receiver and signal processing, CN434 Receiver Signal Processing for Future GNSS Signals - Advanced is recommended.