

Course 323:

GPS Interference & Jamming Issues for Civil & Military Users: Principles, Problems, & Mitigation Techniques

Chateau Sonesta Hotel
New Orleans, Louisiana
January 12-13, 2006

Course notes now in full color!

Courses

Quotes:

"Clearly the material presented will prove useful on the job. The anti-jam details both in-depth and practical."

*Michael S. Bielawski
Raytheon*

"I will use this information in my work with antenna characterization. These courses were very interesting and provided practical methods for evaluating GPS receivers in test & evaluation."

*W. Mark Henderson
NAWCWD*

"Excellent level. Good use of real world examples."

*Name Withheld
RAAF*

"My job is to simulate the flight at remotely piloted vehicle to targets. Navigation errors (using a coupled INS/GPS) are of utmost importance. This course, along with the last 2 courses I've taken, will allow me to do analysis of RFI effects this job intelligently. Will help me find the right fidelity for my simulation effort."

*Frederick Kiefer
Bogdon Associates*

"I will use this information in the evaluation of system resistance to jamming on UK military helicopters. The most useful session for me was 'Threat Scenarios' and 'Adaptive Arrays' because my work includes reduction of threats to platforms and protective measures."

*M. R. Alexander
Qinetiq*

"Both Mr. Scott and Mr. Ward were excellent instructors. Both have years of experience in analyzing the effects of RFI and how these problems can be mitigated through clever signal processing and antenna design."

*Curtis Hay
Spirent Federal Systems*

Course 323 critique quotes by military and civil attendees:

"The course saved me hours of research, substantiated a design concept, and verified some key parameters and concepts."

"This material will be of great help to me in specifying GPS receiver requirements for my applications."

"The best sessions for me were the threat overview and unintentional RFI - the concepts were very well presented."

"This practical information will help me

About This Course

Radio frequency interference (RFI) and jamming are of increasing concern to both military and civil users as GPS and GNSS implementations proceed. This course addresses these concerns by reviewing and analyzing interference and jamming threats and their effects on equipment operation. The instructors address a variety of equipment analysis and design techniques which can be used to mitigate the effects found in adverse environments. One half-day addresses various aspects of GPS integrity and presents an aviation case study.

This course is very popular as an on-site course, usually with minor modifications to suit the customer's applications.

Mon. & Tues.

We recommend that you take Course 122: GPS Fundamentals and Enhancements, as this knowledge is assumed in Course 323.

Option

	Thursday	Friday
	<i>Mr. Logan Scott LS Consulting</i>	<i>Mr. Phillip Ward Navward GPS Consulting</i>
8:30	Threat Overview and Unintentional RF Interference Signal waveforms, power levels Nominal receiver architectures Impact of RF interference [Continuous Wave (CW), noise, pulses] Scope of problem: required C/N ₀ ; emission levels of environmental sources	Overview of Antijam Design Techniques I Jamming and spoofing detection techniques in a GPS receiver Front-end filtering techniques
9:45	Jamming and Spoofing Threats (Part I) Jamming and spoofing objectives Receiver performance, break points, countermeasures Effects of broad band noise, pulsed noise, CW and Gold code jammers	Overview of Antijam Design Techniques II Enhanced GPS tracking techniques, including aiding Narrowband and wideband RFI mitigation techniques Antenna design enhancements
11:00	Jamming and Spoofing Threats (Part II) The role of the internet in advancing the threat Civilian vs. military spoofing Spoofing techniques: GPS signal, differential link, & code contamination Methods for hardening the civil infrastructure against spoofing.	Analysis of RFI Effects I Analysis of unjammed GPS signal power Analysis of jamming effects Computation of jamming to signal ratio (J/S)
12:00	<i>Lunch is on your own</i>	
1:30	Case Studies: (subject to change) Terrorist and Military Scenarios Terrorist jamming attack on civil aviation Cruise missile attack scenario L5 and M-Code vulnerability Galileo vulnerability	Analysis of RFI Effects II Analysis of GPS receiver tracking loop thresholds Vector tracking and inertial integration for improved jamming resistance RF interference signal levels
2:45	GPS Interference in Aviation Characterizing interference The Mesa Arizona Accidental Jamming Incident LAAS and WAAS Sample CW and wideband interference test results Protecting the data link for LAAS Quantifying the effect of interference Sample test results	Analysis of RFI Effects III Receiver J/S performance - analysis example Computing range to jammer given antenna gain, jammer type and power
4:00	Land Mobile & Maritime Systems Receiver configurations Broadband effects C/N ₀ measurements Documented interference examples The Moss Landing EMI incident	GPS Receiver Vulnerabilities/Mitigation Approaches Comparison of precorrelation and postcorrelation A/D conversion of GPS receivers C/A code vulnerability to CW RFI Narrow correlator vulnerability to RFI DGPS data link vulnerability to RFI Codeless and semi-codeless GPS receivers' vulnerability to RFI Natural factors that reduce RFI
5:00	Summary of Solutions RAIM/FDI and threat signatures IDN and Snaptrack™ External aiding Antenna nulling Multiple antenna phase differences Data and code authentication	

Fee: \$1325
1.2 CEUs

Prerequisites

- *Course 122* or an understanding of GPS principles.
- Familiarity with GPS receiver engineering terms and receiver operations.

Course notes now in full color!

Materials You Will Keep

- A notebook with copies of all presentation materials.
- Navtech's CD-ROM containing a variety of GPS references.



Instructors:



Mr. Logan Scott



Mr. Phillip Ward



To register, or for more information, call Navtech at 1-800-NAV-0885 or 703-256-8900, or fax to 703-256-8988, or e-mail to courses@navtechgps.com. For updated information, go to: www.navtechGPS.com.