

## Assured Satellite Communications: High-Level Theory and Control/Game-Theoretical System Concepts

### Presented by

Khanh Pham

### Importance and timeliness

The aim of this tutorial is consisted of accomplishments that span many facets of control education and applications in satellite communications. As a direct result of working with academia, small business innovative researchers, and government laboratories Dr. Pham has served as the principal investigator, government technical advisor, and government contracting officer technical representative over his career, and through publications and noted research efforts with research and development partners, he has packaged and transferred knowledge on research and technology into classroom instructions, to engineers in industry, and to the tutorial for this conference. Details on these new and novel accomplishments are contained in the outline of the tutorial.

### Tutorial content

1. Part I: Setting the Stage
  - Systems, Scenarios, and Standards
  - Agility and Resiliency Challenges
2. Part II: Multi-Access Interference Menace and Automatic Gain Control Strike Back
  - Origin and Impact of Shared Satellite Transponders
  - Mitigation using Selective Sub-channel Gains
3. Part III: Flexible Satellite Communication (SATCOM) Terminals: A New Hope
  - Revisit of Demand Assigned Multiple Access
  - Intelligent Terminal Agents and Frameworks
4. Part IV: Resilient SATCOM without Satellite System Controllers
  - Motivation and Scenario
  - Resilient Synchronization of Clocks via a Game-Theoretical Approach
5. Part V: Conclusions

### Brief CV of the speaker

Khanh Pham is a senior aerospace engineer at the Air Force Research Laboratory-Space Vehicles Directorate at Kirtland Air Force Base, New Mexico, USA. He received his Bachelor and Master of Science Degrees in Electrical Engineering from the University of Nebraska-Lincoln in 1997 and 1998, and a Ph.D. in Electrical Engineering from the University of Notre Dame in 2004. Dr. Pham has been an Adjunct Research Assistant Professor at University of New Mexico / Electrical Engineering and Computer Science

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Department researching on stochastic controls and game theory. He is a Senior Member of Institute of Electrical and Electronics Engineers (IEEE), a Fellow of Society of Photo-Optical and Instrumentation Engineers (SPIE) and an Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA). Dr. Pham currently serves as a Technical Editor for Intelligent Systems of the IEEE Transactions on Aerospace and Electronics Systems. His research interests have focused on satellite cognitive radios, digital beamforming, distributed time synchronization; statistical optimal control and estimation; decision analysis of adversarial systems; fault-tolerant control; dynamic game decision optimization; security of cyber-physical systems; and control and coordination of large-scale dynamical systems, compiling 250+ scientific papers and book chapters. He currently holds 11 US patents.