Tutorial A1: DVB-S2/RCS: Propagation and physical Layer
Part 2: DVB-S2/RCS: surfing over long waveforms
Adapting coding and modulation to achieve near-Shannon limit performance

Prof. Giovanni E. Corazza
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This tutorial will show how both the DVB-S2 and the DVB-RCS standards have learned the fundamental Shannon lesson of letting the waveform length go to infinity, by coding very long blocks with low-density parity check matrices or with concatenated convolutional codes. These codes are coupled to some resilient modulation schemes to achieve near Shannon-limit performance in dynamic channel conditions, through an adaptive selection of the best protection mode. Specific topics that will be addressed in the tutorial include the following:

DVB-S2

- Motivation for DVB-S2
- DVB-S2 Applications
- Adaptive Coding and Modulation (ACM) principles
- Shannon bound for M-ary modulations
- DVB-S2: Tx Block Diagram
- FEC encoding
    - Low-density parity-check codes
    - Message Passing
    - Sum-product algorithm: the most likely path
- Modulation Schemes
- ACM Performance: AWGN + Non-linearities
- Extensions to the mobile channel

DVB-RCS

- DVB-RCS Services and Applications
- DVB-RCS Burst Formats
- Channel Coding and Modulation
- DVB-RCS Turbo Code Option
- Turbo Decoder
- Turbo Code Performance: AWGN Channel
- Extensions to the mobile channel

GIOVANNI E. CORAZZA - CURRICULUM VITAE

Giovanni Corazza was born in Trieste (Italy) in 1964. He received the Dr. Ing. degree (summa cum laude) in Electronic Engineering in 1988 from the University of Bologna (Bologna, Italy), and a Ph.D. in 1995 from the University of Rome "Tor Vergata" (Roma, Italy). He is currently a Full Professor at the Department of Electronics, Computer Science, and Systems (DEIS) of the University of Bologna. He is responsible for the area of Wireless Communications inside the Advanced Research Centre for Electronic Systems (ARCES) of the University of Bologna. In the years 2000-2003, he held the Chair for Telecommunications inside the Faculty of Engineering. He is the Chairman of the Advanced Satellite Mobile Systems Task Force (ASMS-TF), a European forum on satellite communications with more than 60 industrial partners, under the auspices of the European Commission and of the European Space Agency.

In the years 1989–1990 he was with the Canadian aerospace company COM DEV (Ontario), where he worked on the development of microwave and millimeter-wave components and subsystems. In the years 1991–1998 he was with the Department of Electronic Engineering at the University of Rome "Tor Vergata", as a Research Associate. In November 1998 he joined DEIS–University of Bologna. During 1995 he visited ESA/ESTEC (Noordwjik, NL) as a Research Fellow. During 1996 he was a Visiting Scientist at the Communications Sciences Institute, University of Southern California (Los Angeles, CA). The same Institute invited him as a Visiting Professor to hold a graduate course on Spread Spectrum Systems in the fall of the year 2000. During the summer of 1999 he was a Principal Engineer at Qualcomm (San Diego, CA).

Prof. Corazza has research interests in the areas of communication and information theory, wireless communications systems (including cellular, satellite, and fixed systems), spread-spectrum techniques with emphasis on CDMA, synchronization and parameter estimation, MAC layer protocols, multicast protocols. He is author or co-author of more than 120 papers published in International Journals and Conference Proceedings. Since 1997, he joined the Editorial Board of the IEEE Transactions on Communications as Associate Editor for Spread Spectrum. He received the Marconi International Fellowship Young Scientist Award in 1995. He was co-recipient of the Best Paper Award at the IEEE Fifth International Symposium on Spread Spectrum Techniques & Applications, ISSSTA'98, Sept. 2-4, 1998, (Sun City, South Africa), and of the Best Paper Award at the IEEE International Conference on Telecommunications 2001, ICT2001, 4-7 June 2001, (Bucharest, Romania). He was co-recipient of the 2002 IEEE VTS Best System Paper Award for the paper entitled "Wide-Band CDMA for the UMTS/IMT-2000 Satellite Component", published on IEEE Transactions on Vehicular Technologies in March 2002. He holds a patent on "Closed Loop Resource Allocation", devoted to resource management for high data rate wireless networks. He chaired sessions and was member of the Technical Committee of several conferences, Chairman of the ASMS2004 Conference and of the upcoming IEEE ISSSTA 2008 Conference.