



**NATIONAL COMMUNICATIONS STUDIES AND RESEARCH INSTITUTE  
INSTITUT NATIONAL D'ETUDES ET DES RECHERCHES DES  
TELECOMMUNICATIONS**



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**KNOW-HOW, INNOVATION AND  
EXPERTISE IN COMMUNICATIONS**

***MISSION***

*INSCC mission is to promote technologies, systems and services in the field of communications - support for the development of the Information Society in Romania.*

## **AREAS OF ACTIVITY**

### **Radiocommunications**

- ✓ *Analysis of conditions and strategies for implementation of radiocommunication services in Romania.*
- ✓ *Analysis of the objectives and development of new broadband wireless services and applications, including services security.*
- ✓ *Flexible utilization of radioresources and frequency spectrum.*

### **Communications Systems for Electronic Services**

- ✓ *Analysis of conditions for implementation of electronic services in Romania,*
- ✓ *Analysis of ways to use of technology and communication networks that support for the development of teleassistance services,*
- ✓ *The development of experimental models teleassistance platforms.*

### **Optical Communications**

- ✓ *Integrating Communications Technologies into a Public and Personal Electronic Services Enabling Platform in Accordance with e-Romania Strategy*

### **Communications Systems Security**

- ✓ *Analysis and modeling the access systems reliability for broadband communications security*
- ✓ *Biometric identification solutions for communications networks security improvement*
- ✓ *Solutions to security risks minimization in wireless networks*

### **Technical assistance, test and evaluation**

- ✓ *INSCC performs research-development, tests and evaluations, offers technical assistance and consultancy in all the areas of communications.*
- ✓ *INSCC has implemented the system of quality management in compliance with standard ISO 9001:2000, with the number 534, certified by SRAC/IQNET.*
- ✓ *INSCC have organized a Testing Laboratory for Communications, which acts in compliance with the standard SR EN ISO/CEI 17025.*

## **MISSION, DIRECTIONS, OBJECTIVES AND MAIN PROJECTS**

National Communications Research Institute – I.N.S.C.C. Bucharest, was established according to regulation of Government Ordinance Nr.57/2002, approved by Law Nr.324/2003, by Government Decision Nr.1234/1996, as the National Institute for Research and Development.

### **1. Mission**

National Institute of studies and research for Communications (INSCC Bucharest), is the only national institute for research, development, and innovation, in Romania, in the field of communications.

INSCC mission is to promote technologies, systems and services in the field of communications - support for the development of the Information Society in Romania.

INSCC has been providing quality communications R&D projects to customers through highly qualified scientific research team.

INSCC has been committed to Excellency R&D activities with academic and university communities.

INSCC has been researching and engineering a wide range of wireless technologies, RF systems, and landed broadband networks. Last but not least, photonic communications has emerged to complete a more and more technology-crowded communications land.

INSCC is undertaking communication services that help people to live better within the ambient. We discover technologies. We engineer systems. We make people believe in future

### **2. Directions and research objectives**

- ✓ Studies and research on advanced communications technologies and applications;
- ✓ Applied research and technological development-oriented issues / specific task;
- ✓ Diagnosis and prospective studies, participation in national development strategies;
- ✓ Hybrid solutions and new network architectures for broadband access to electronic Communications services;
- ✓ Impact of new wireless techniques and technologies on the structure and evolution of National Table of Frequency Bands Assignment;
- ✓ Increase security of communication networks and the use of biometric identification technologies;
- ✓ Analysis and reliability modeling of the access systems for broadband Communications security;
- ✓ The use of satellites for mobile communications networks;
- ✓ Integration of communications technologies to develop platform for electronic services at home;
- ✓ New algorithms for adaptive/smart antennas in Communications systems 3G and post 3G;
- ✓ Integrated wireless platforms of local access for broadband and mobility, with self-organization of resources;
- ✓ Free space optical communication an solitons systems.

Elaboration of solutions and concepts regarding communication technologies and services, new or improved, and INSCC participation to the objectives achievement of National strategic Documents for the development of Information Society, in accordance with the Digital Agenda for Europe in 2020, mainly:

- ✓ Romania Digital Strategy – e-Strategy for Information Society;
- ✓ E-Inclusion strategy;
- ✓ Telecommunications strategy;
- ✓ Radio spectrum strategy;
- ✓ Government development strategy of broadband electronic communications in Romania;
- ✓ Strategy for transition from analogue terrestrial to digital television and digital multimedia services nationwide deployed.

### **3. Main projects**

#### ***3.1 Complex system on NGN support for teleassistance of the elderly, at home, - TELEASIS***

The experimental platform architecture TELEASIS has specifically been designed to meet social, technical and economic users' stringent requirements. TELEASIS ensure a support for to medical and social personnel to provide the teleassistance with installation and use reasonable cost. The development of a telecare component, within an assistance service, leads to optimum performance for the service, meaning to offer customized services, depending on certain conditions and concrete requirements - offered by the telecare side, afferent costs optimized through focused involvement of the medical personnel or social assistance, through optimized treatment for some chronic illness, as well as increasing the nursing at home. Secondly, it may meet the demands of elder persons to live in their own home and not at home for elderly, furthering the continuation of the active period by involving this in daily activities of selfcaring, under distant assistance, as well as improvement of the customized management of the assisted person lifestyle.

Therefore, the platform is aiming to provide the elderly people with medical and social decent home assistance while living the everyday live undisturbed. Last but not least, the system is allowing users to fully benefit from friendly/familiar electronic technologies, for example TV-based teleassistance.

*Research project have had an important contribution on:*

- ✓ the development of telemedicine, teleassistance at home, and the development of ambient intelligent environment fields;
- ✓ the technologies used to implement electronic services such as teleassistance, namely: wireless networking, access network to Internet, technologies for personal area networks for implementation of teleassistance devices with Bluetooth, ZigBee, or NFC technology;
- ✓ teleassistance network models with their hardware and software components.

#### ***3.2 Wireless integrated platform of broadband access and mobility for local, self-organizing resources – PABMAR***

The project aims at delivering a platform for studying and determining solutions for broadband wireless access with user mobility. Currently technologies provide wireless networking solutions, used individually or interconnected. For the development of local access networks we use Wi-Fi, WiMAX (local), Bluetooth, WiBro, etc., which can be combined with cellular solutions: CDMA, UMTS, WiMAX, etc. Local area networks are interconnected through backbone networks, for which it's made the assumption that have the necessary resources for carrying broadband multimedia services, requested by users. It is necessary to consider different forms of mobile networks, of local access, including residential networks for hot-spot areas, and especially for areas with sparse population.

The architecture proposed to be made based on Wi-Fi standards to define reusable components is based on optimization and control mechanisms and aims to increase the performance of a communication network. Generic access interfaces provide transparent access to the network parameters and the radio parameters, with beneficial effect on portability. Distributed coordination and control mechanisms and policies drive the primary functions performe other cognitive radio network.

#### ***3.3 The Access systems reliability analysis and modeling for broadband communications security:***

The research project has enriched the scientific knowledge concerning:

- ✓ the state-of-the art in communications and data security technologies, with special focus on broadband networks;
- ✓ the modern biometric identification technologies with application on communications security;
- ✓ the relationships between security and reliability for the communications infrastructures;
- ✓ novel and high performance multimodal biometric solutions for authentication;

- ✓ defining and applying cost evaluation models for the security solutions cost/performance ratio optimization;
  - ✓ designing equipment and network reliability-based security models to improve the communications infrastructures security
- The results has contributed to:*
- ✓ define a comprehensive framework on security issues (terms and concepts) within the documents of the Ministry of Communications and Information Society –MCSI;
  - ✓ technical support for communications policies and broadband strategies;
  - ✓ releasing of regulations and legal provisions in order to support providing the secured and reliable electronic communications services;
  - ✓ support for innovative security solutions releasing on the communications market, in order to ensure end-user data and communications infrastructure protection.

### ***3.4 Statistical Hypotesis on Impulse Noise within Broadband Links***

The project is providing methods to recognize and measure the impulse noise corrupting the fast traffic from broadband links. Impulse noise statistical time models are developed in order to describe the amplitude, event length and inter-arrival time. The bi-dimensional statistics of the impulse noise assesses the effects on orthogonal signals. A bivariate Weibull model for the amplitude impulse noise and a bivariate Gauss statistics for the additive white Gauss noise are determining the total noise distribution for the DMT modulation with N carriers. The bit errors rates (BER) of both the Weibull model and the Gauss statistics, irrespectively, are compared. It is concluded that the multi-carrier quadrature amplitude modulation (MC-QAM) produces a better BER than the single-carrier QAM (SC-QAM).

Spectral and power distribution models are designed as well.

The project is delivering new signal coding schemes to immunize the broadband traffic against the impulse noise aggressions. New solutions for allocating bits within the DMT (Discret-Multi Tone) frame are presented if FEC (Forward Error Correction) coding and subtone constellation restrictions are taken into account.

The new impulse noise time and frequency models are able to improve BER (Bit-Error Rate) and latency performances of the broadband networks.

### ***3.5 Soliton-based Optical Communications Systems***

The project is investigating processes, characteristics, requests and performances of a fiber optics soliton-based transmission.

A steady solution of the NSE (Non-linear Schroedinger Equation) is approached in order to produce picosecond solitons which are able to travel the information bits along the fiber.

Solitons instabilities are in-depth researched so as an efficient dispersion-based solitons management in long-haul fiber connections is provided.

The fiber losses lead to broadening of solitons in a high-speed communication channel. To overcome the fiber losses, amplification schemes are used to periodically boost the soliton energy at its input level after the soliton has travelled a certain distance. The soliton then readjusts its parameters to their input values.

Soliton interactions, acoustic effects, and polarization mode dispersion can lead to a non-Gaussian statistics. However, the soliton interaction is the dominant effect for high bit rate systems. The noise-induced timing jitter and the techniques developed for reducing it (optical filtering, synchronous modulation, etc.) are of practical implications in optical communication systems design.

The project develops an analytical model of the arrival time statistics, which relies on a pseudorandom pulse sequence. The model takes into account the effects of the amplified spontaneous emission noise in each amplifier stage as well.