Presentation of the funded projects in 2010 for the « FUTURE NETWORKS AND SERVICES » Programme

« Future Networks and Services » programme

YEAR 2010

Project title	**ABSYS 2 - Advanced BST based SYStems: new RF designs**

Abstract

Nowadays, due to the rapid development of wireless communication systems, in particular, public telecommunication, such as, television, internet, mobile phones and global positioning systems (GPS), transceiver architectures demand constant miniaturization of millimeter wave and microwave devices , better integration , lower power consumption and low cost. For this reason, the next generation wireless communication systems turn toward multi-function modules by incorporating reconfigurable and tunable structures. This project aims to explore new ways in order to achieve a telecommunication system with size miniaturization and complex functionality. In this view, this project proposes to use nanotechnology to realize innovative microwave components using the ferroelectric titanate of barium and Strontium Ba1-xSrxTiO3 (BST). BST is a ferroelectric tunable material at room temperature and can be used to achieve multiple applications in circuit design and tunable devices. To achieve the goals of this project, simultaneous efforts in materials development, process technologies and device designs are required to obtain a high-quality Radio Frequency (RF) system with tunable, compact, highly integrated, reliable, temperature stable components, in addition to good power handling capabilities. To develop such innovative devices, it is necessary that engineers and researchers in advanced materials and micro-electronics work in conjunction with telecommunication industry. This project aims to achieve a new level of tunable BST technology for microwave components, such as tunable filters, antennas, and capacitors. Concerning the materials, our effort will concern the optimization of the electrodes, the structure and microstructure of the ferroelectric and the interfaces quality in the components. At a fundamental level, it is important to study the best technological conditions with respect to type of substrate, thickness of BST, and BST optimization to design the proposed components, namely filters, antennas and capacitors. In the design level, different structure topologies and design schemes should be studied to achieve maximum tunability with minimum size and power consumption. The work plan is based on technology optimization that is suitable for different microwave components including the fabrication of BST, the selection of technology and optimal design whose

	results will be used in the implementation of more complex structures and devices. In this project we target the presentation of new functionality and performance of BST based RF and microwave components with respect to miniaturization, multiple functionality and power handling capabilities.
Partners	• ICMCB - Institut de Chimie de la Matière Condensée de Bordeaux • LAAS - Laboratoire d'Analyse et d'Architecture des Systèmes • ST - STMicroelectronics
Coordinator	Séverine Payan– Institut de Chimie de la Matière Condensée de Bordeaux payan@icmcb-bordeaux.cnrs.fr
ANR funding	827843 €
Starting date and duration	12/30/2010- 36 months
Reference	ANR-10-VERS-0012
Cluster label	S2E2 (Sciences et Systèmes de l'Energie Electrique)

Project title	AMORCE - Compact antenna platforms for IP on the move satellite applications

Abstract

There is an increasing need for broadband wireless Satellite connection to Internet services in public transportations, like buses, aircrafts and high-speed trains. To offer such connections with a high quality of service, innovative, low-cost and compact antenna platforms must be invented and developed. Nowadays, it is possible to establish a radio link between a satellite and a mobile terminal, for instance for Internet connection of aircraft passengers, using nearly-omnidirectionnal antennas in L-band. In this case, due to the very narrow allocated frequency band, the data rate is extremely low. To offer broadband services for "IP on the move" applications, it is required to operate at higher frequencies, especially in Ku band (from 10.5 to 14.5 GHz) in linear polarisation, and later in Ka-band (in circular polarisation). As a consequence, directive antennas with high EIRP must be designed. In addition, the main beam direction of the antenna must coincide with the satellite positioning, whatever the location of the mobile is. For instance, to cover all Europe area, the corresponding antennas must be able to scan the beam over a 360° angular range in the horizontal plane, and between 20° and 60° angular range in the vertical plane. In addition, for double-deck high speed trains, there are a few centimetres available to accommodate the antenna platforms due to the height of the train cars and the tunnels. To conclude, there is no antenna solution today complying with the needs mentioned above. The ultimate objective of this collaborative project is to invent new concepts of antenna platforms for "IP on the move applications" where very thin, directive, low cost and beam steering antennas are needed. To this end, a consortium gathering 5 partners has been built. It consists of one end-user (Thales Alenia Space – expert in base stations and user terminals for satellite applications), two SMEs (Ixmotion – expert in advanced mechanical platforms for beam scanning antennas; Innovative Business Partners – expert in the analysis of mobile communication services), and two academic partners (Institut d'Electronique et de Télécommunications de Rennes, UMR CNRS 6164 – expert in antenna design; LabSTICC / Telecom Bretagne expert in power amplifications). This project is coordinated by IETR.

Partners	• IETR - Institut d'Electronique et de Télécommunications de Rennes (Université de Rennes 1) • TAS - Thales Alenia Space France • TELECOM BRETAGNE - INSTITUT TELECOM • IXMOTION - IXMOTION • IBP - Innovative Business Partners
Coordinator	– IETR - Institut d'Electronique et de Télécommunications de Rennes (Université de Rennes 1) ronan.sauleau@univ-rennes1.fr
ANR funding	810365 €
Starting date and duration	- 36 months
Reference	ANR-10-VERS-013
Cluster label	Images & Réseaux SYSTEM@TIC Paris région Aerospace Valley

Project title	CONNECT - Content-Oriented Networking: a New Experience for Content Transfer

Abstract

CONNECT will contribute to the definition and evaluation of a new paradigm for the future Internet: a content-centric networking (CCN) architecture where, rather than interconnecting remote hosts like IP, the network directly manages the information objects that users wish to publish, retrieve and exchange. The project will build on existing CCN proposals in Europe and the US, adopting as a starting point the concept currently promoted by the Palo Alto Research Center (PARC) team led by Van Jacobson. In the PARC vision of CCN, content is divided into packet-size chunks identified by a unique name having a particular hierarchical structure. The name and content can be cryptographically encoded and signed, providing a range of security levels and generally ensuring content is verifiable, of known provenance and relevant to user requirements. Packets in CCN carry names rather than addresses and this has a fundamental impact on the way the network works. Security concerns are addressed at the content level, relaxing requirements on hosts and the network. Users no longer need a universally known address, greatly facilitating management of mobility and intermittent connectivity. Content is supplied under receiver control, limiting scope for denial of service attacks and similar abuse. Since chunks are self-certifying, they can be freely replicated, facilitating caching and thereby bringing significant bandwidth economies. CCN applies to both stored content and to content that is dynamically generated, as in a telephone conversation, for example. While the CCN paradigm has some clear advantages, the architecture is incompletely defined and it remains to thoroughly evaluate the technical and economic feasibility of the proposal. CONNECT will concentrate its efforts on three main design areas: traffic controls and resource sharing mechanisms for the core and access segments; a scalable naming, routing and forwarding framework; caching strategies in single nodes and over the network. The objective is to propose original mechanisms and protocols adapted to the CCN framework, to demonstrate their scalability and to evaluate their performance. In addition, CONNECT will consider how CCN can eventually come to replace IP as the basis of the Internet architecture. The considered approach is to study some typical use cases for which CCN has some clear advantages. A particular objective will be to verify that the enhanced security model of CCN indeed removes the problems that face IP and allows the development of some interesting new applications. Simulation and emulation tools will be developed to validate and test the mechanisms and protocols proposed by

CONNECT and to ensure seamless integration with open source CCN software produced elsewhere. The work is organized in 5 main tasks devoted respectively to Traffic Control and Resource Sharing, Routing and Naming, Caching Strategies and Bandwidth Memory Tradeoffs, Use Cases and Security, Experimentation and Disseminations. Project duration is 2 years. The expected outcome is a set of algorithms and protocols to realize the objectives of the technical tasks. Deliverables will be mainly in the form of reports but also include simulation and emulation platforms for experimentation.

Partners	• ALBLF - Alcatel Lucent Bell Labs France • TP - Télécom ParisTech • CRI Paris - Rocquencourt / EPI RAP - Centre de recherche INRIA Paris - Rocquencourt • INRIA Sophia Antipolis Méditerranée Planète - Institut National de Recherche en Informatique et Automatique • FT - France Telecom - Orange Labs • Lip6 - Université Pierre et Marie Curie - Lip6
Coordinator	Giovanna Carofiglio– Alcatel Lucent Bell Labs France giovanna.carofiglio@alcatel-lucent.com
ANR funding	1046457 €
Starting date and duration	12/13/2010- 24 months
Reference	ANR-10-VERS-001
Cluster label	SYSTEM@TIC Paris région SCS (Solutions Communicantes Sécurisées)

Project title	EXPRESSO - Lossy filters for multiradio front-ends. Application to future wireless home-networking communications

Abstract

The research project EXPRESSO aims to design lossy microwave filters for future wireless home-networks. With the increasing demand of new services, devices for mobile communications and home-networking integrate more and more standards, and therefore in order to maintain signal integrity of the various embedded systems, very narrow band filters using high quality factor (Q) resonators are highly required. Generally, the design and implementation of such filters require a compromise between, on one hand, the electrical performances (in term of insertion loss, bandwidth, and selectivity), and on the other hand, the cost, weight and volume. Indeed, filter performances depend straightly on resonator Q factor, the higher Q the better performances. However, high Q means also high cost and high volume which are far to be compatible with what mass market devices require. Consequently, other approaches should be found out for future radio communication systems which aim to exploit efficiently the spectrum resource (operating in more and more narrow bandwidths) and which will require low-cost and ultra-selective filters to this end. The alternate solution proposed in this project consists in using low-cost technologies required for mass production devices, while compensating the resulting filter insertion losses within the system. This solution, called "lossy filters", is considered as emerging and is not yet exploited in the context of home-networking. The idea is to distribute the losses within the filter structure in order to keep the electrical performances (in terms of in-band flatness and rejection steepness) and, since a counterpart is necessary, to increase the absolute level of losses. This approach remains possible if the system is able to compensate for the losses by re-designing the RF front-end architecture in this respect. The research project EXPRESSO contains 3 main lines: • The identification of suitable RF architectures for home-networking communication systems that will compensate for the amount of losses inherent to "lossy filters", • The development of appropriate method (and tool) for the synthesis of lossy filters within the particular context of low-cost technologies used in wireless home-networks, • The design and implementation of such filters including dissipative elements within the same drastic constraints. The research project EXPRESSO is a fundamental research program and is relevant to the topic #4: "components for communication". The research topics intend to bring out new solutions that will enable to exploit more effectively the frequency spectrum. In the future, such filters,

	considered as key-components in communication systems, will take a strategic role in the design of electronic equipments including multiple radios. Also, the efficient usage of spectral resources will contribute to the development of new services with better quality.
Partners	• XLIM - XLIM UMR 6172 • Télécom Bretagne - INSTITUT TELECOM/ Telecom Bretagne • Technicolor - Thomson R&D France
Coordinator	Stéphane Bila– XLIM UMR 6172 stephane.bila@xlim.fr
ANR funding	524784 €
Starting date and duration	12/1/2010- 30 months
Reference	ANR-10-VERS-009
Cluster label	ELOPSYS Images & Réseaux

Project title	F-Lab - Federating computing resources

Abstract

As proposed by initiatives in Europe and worldwide, enabling an open, general-purpose, and sustainable large-scale shared experimental facility will foster the emergence of the Future Internet. There is an increasing demand among researchers and production system architects to federate testbed resources from multiple autonomous organizations into a seamless/ubiquitous resource pool, thereby giving users standard interfaces for accessing the widely distributed and diverse collection of resources they need to conduct their experiments. The F-Lab project builds on a leading prototype for such a facility: the OneLab federation of testbeds. OneLab pioneered the concept of testbed federation, providing a federation model that has been proven through a durable interconnection between its flagship testbed PlanetLab Europe (PLE) and the global PlanetLab infrastructure, mutualising over five hundred sites around the world. One key objective of F-Lab is to further develop an understanding of what it means for autonomous organizations operating heterogeneous testbeds to federate their computation, storage and network resources, including defining terminology, establishing universal design principles, and identifying candidate federation strategies. On the operational side, F-Lab will enhance OneLab with the contribution of the unique sensor network testbeds from SensLAB, and LTE based cellular systems. In doing so, F-Lab continues the expansion of OneLab's capabilities through federation with an established set of heterogeneous testbeds with high international visibility and value for users, developing the federation concept in the process, and playing a major role in the federation of national and international testbeds. F-Lab will also develop tools to conduct end-to-end experiments using the OneLab facility enriched with SensLAB and LTE. F-Lab is a "platform" type of project, fully compliant with the ANR VERSO call's definition of a platform (technically challenging, open, shared and sustainable). It already involves a large and vibrant community of researchers and users; it is open and its operation is sustainable. It helps to structure the community with strong connections at the international level and develops common best practices in testbed operation, management, and experiments. It is fully aligned with the call in the areas of Future Internet, sensor and cellular networks, federation of networks and testbeds. F-Lab is a unique opportunity for the French community to play a stronger role in the design of federation systems, a topic of growing interest; for the SensLAB testbed to reach an international visibility and use; and for pioneering testbeds on LTE technology.

Partners	• UPMC - LIP6- Université Pierre et Marie Curie • THC - THALES Communications S.A. • INRIA - Institut Nationale de Recherche en Informatique et en Automatique • A-LBLF - Alcatel-Lucent Bell Labs
Coordinator	Timur Friedman– LIP6- Université Pierre et Marie Curie Timur.Friedman@lip6.fr
ANR funding	1244713 €
Starting date and duration	11/1/2010- 36 months
Reference	ANR-10-VERS-002
Cluster label	SYSTEM@TIC Paris région SCS (Solutions Communicantes Sécurisées)

Project title	GENGHIS KhAN - AlInN/Gan Evaluation for low Noise - hiGH power, and Integrated circuitS in and above KA baNd

Abstract

The GENGHIS KhAN project proposes to develop new AlInN/GaN WGB technology for millimeter wave applications dedicated to satellite communications. In the RF business, GaN HEMT is now ready to challenge Si LDMOS and GaAs pHEMT in the telecommunication base stations market (3G, 4G, WiMAX...). With devices reaching 150W @ 6GHz under 48V bias, the GaN technology could be implemented within the 2 millions deployed mobile phone base stations and emerging WiMAX infrastructures. Nevertheless, developments are still on going to widen the market of WBG technologies toward high frequency. Researches and developments are ongoing from X-band (8 GHz) up to E band (90 GHz) in Europe (UMS, SELEX SI), Japan (FUJISTU, NEC, Matsushita Electric Industrial) and in the United States (TRIQUINT, RFMD, CREE, RAYTHEON, HRL, NORTHROP GRUMMAN…). This proposal is focused on the evaluation and development of a new generation of wide band gap (WBG) GaN technology for high frequency operation. This project will take advantage of the new lattice-matched AlInN/GaN heterostructure, which shows evidences of better frequency performances than other components. The main technologies, which can be used today for solid-state microwave power generation, are based on silicon (Si), gallium arsenide (GaAs), and AlGaN/GaN. Considering 10W output power target, the operation frequency cut-offs of those different technologies are roughly 4GHz, 10GHz and 18GHz respectively. The new AlInN/GaN heterostructure was pioneered by Europe through the EU programs "ULTRAGAN" (Future Emerging Technology STREP - FP6, c.f. http://www.ultragan.eu/) and "MORGAN" (NMP - IP - FP7, c.f. http://www.morganproject.eu/) , both projects being lead by Alcatel Thales III-V Lab. Those projects improved drastically the reputation of the European research in GaN for microelectronics, thanks to disruptive results, with the demonstrations of 10W/mm at 10GHz with power added efficiency (PAE) of 56%, 13W/mm at 3.5GHz with PAE up to 70%, and 4.3W/mm with 43% PAE at 18GHz. These PAE are impressive; they were not expected few years ago for nitrides. Moreover it was also demonstrated an incredible thermal stability never observed previously for any other transistor type with electrical operation at temperatures of 800°C for hundreds of hours.

Partners	• ATL - Alcatel Thales III-V Lab • UMS - United Monolithic Semiconductors • LAAS - Université de Toulouse / CNRS • ILV - Institut Lavoisier de Versailles • EGI - EGIDE • TCF - THALES Communications
Coordinator	– ATL - Alcatel Thales III-V Lab stephane.piotrowicz@3-5lab.fr
ANR funding	1269435 €
Starting date and duration	- 36 months
Reference	ANR-10-VERS-007
Cluster label	SYSTEM@TIC Paris région Aerospace Valley

Project title	LICoRNe - Leveraging Insurance for services providers cohabitation over Cognitive Radio Networks
Abstract	Efficient spectrum management and optimization are becoming the cornerstones for the deployment of our future mobile communications systems and, in this way, severely impact the incredible deployment of various mobile wireless technologies that would enable the instantiation of the 4G vision. As a direct result, cognitive radio networks are emerging as the new wireless standards that shall replace the traditional single frequency homogeneous environments. The concept of cognitive radios is based on using dynamically any available spectrum band for their communications. The LICoRNe project proposes to go beyond this emerging concept by investigating media transmission, services engineering, and management techniques over advanced cognitive radios. More specifically, the project aims to study what services can be offered to end users over a multi-hop cognitive radio network and how a dynamic and opportunistic optimization of cognitive radios shall be undergone to provide these services. Practically, one key challenge for the cognitive radio networking to overcome resides in ensuring the cohabitation over a dynamic environment of several types of networks having each different constraints to satisfy. Cognitive radio networks should transparently coexist with the already active users of the exploited licensed bands (often called primary radio users) that form the primary radio network. LICoRNe aims to study the interaction between these two networks from both a user and an operator point of view. Specifically, the objectives are in one hand to develop adequate techniques to protect primary users activity, and on the other hand to cohabit efficiently several secondary networks with different requirements over the residual spectrum. This cohabitation is considered to be successful only if concrete services can be enabled. To the best of our knowledge, no existing project has investigated the capabilities in terms of user applications over this same network scenario. In order to achieve the specified objectives, the LICoRNe project has to overcome the following scientific and technical challenges: 1.Develop and study realistic business models that allow cohabitation of networks and services over the same spectrum band dynamically. 2.Undergo PHY design through adapted distributed coordination schemes in an unstable and opportunistic multi-channel wireless network in order to maximize the physical capacity of the wireless network. 3.Exploit interference holes left over the spectrum opportunistically while mapping them to different service requirements for end users. 4.Develop and

implement multi-criteria routing techniques to take into account instability, availability, learning capacities and diversity of cognitive radio environment. 5.Adapt and ensure adequate transport level for the different services to offer. 6.Build a feasible and dynamic management infrastructure. 7.Validate service cohabitation with representative scenarios over a test platform and a real-life implementation hosted at a network operator. In the LICoRNe project we envision to handle technical challenges listed above by following a gradual and collaborative methodology that will be based on the experience/competence and the complementarities of the consortium members. First, a theoretical study should be conducted and based on this study, new solutions will be developed. Obviously, the proposed solutions have enabling services for cognitive radio while preserving the communications of licensed radios as two main objectives to satisfy. Second, a more elaborated validation will be undergone through simulations and analytical models. Third, a laboratory platform deployment will be used to test scenarios for real services to end users while in the final phase, a real implementation over a service provider platform shall quantify the impact of our solutions on real licensed users.

Partners

- THALES - THALES Communications S.A.
- EURECOM - Eurecom
- UPMC - Université Pierre et Marie Curie – Paris 6 (Laboratoire d'Informatique de Paris 6)
- LaBRI - Laboratoire Bordelais de Recherche en Informatique
- OZONE - Ozone

Coordinator

– THALES - THALES Communications S.A.
herve.aiache@fr.thalesgroup.com

ANR funding

922643 €

Starting date and duration

- 36 months

Reference

ANR-10-VERS-005

Cluster label

Project title	LOW-IQ - Ultra Low Power Consumption Low Noise Cryogenics and Ambient MMIC for Space Telecommunications in Q-band

Abstract

The main objective of this proposal is to develop low noise receivers in Q-band. Targeted applications are space telecommunications, with potential applications such as: - Ambient temperature LNAs for Payload applications, where the HF performance, and in particular the noise figure are important - Cryogenic receivers for ground stations such as Gateways. The use of a cooled receiver circuit translates into an improved G/T, which in turn reduces the antenna size. For such applications, the reduction of electrical power consumption is also a key factor. The results of this project will have medium term applications in the areas described above, which implies a research project of industrial type. This is important since today there is a lack of high frequency low noise MMICs featuring low power consumption (LPC) for embedded space applications. In the longer term, other outcomes are expected such as: use of LPC MMIC for mobile, communications and autonomous applications for the ambient intelligence. Within the framework of this project, low noise integrated circuits will be developed at ambient and cryogenic temperatures, with specific LPC through the reduction of the supply voltage. Cryogenic MMIC LNAs operating from 37 to 40 GHz will be integrated into a cooling system, and establish an important technological advance. This project is strongly motivated by the lack of LPC technology for communication applications. Existing industrial technologies and roadmaps are currently focusing rather on high frequency performance and noise, whereas ultra LPC is not addressed, except in the United States. We intend to develop new technological devices, based on semiconductor materials with narrow bandgap, such as the usual InAlAs / InGaAs heterostructure and an alternative one: AlSb / InAs. These materials are of strong interest since they have very high electronic mobility that should compensate electrical performance degradation related to the reduction of the supply voltage. In France, the OMMIC Company proposes a 70 nm gate length HEMT technology, that while is state of the art; it might be not enough to develop the applications aimed in this project. In order to overcome this difficulty, two strategies are considered within the project: the development of shorter gate length HEMTs (50 nm) based on OMMIC's technological platform and to investigate a new academic HEMT technology based on antimonide material. These two alternative technologies will be used to realize integrated circuits (MMICs), to be inserted into cryogenic demonstrators. The most important points to be performed during the project are:

- The development of 50nm and 70 nm gate length InAlAs/InGaAs HEMT technology, and 70nm InAs HEMT (Sb-HEMT) - Investigation of the Potential of such technologies for LPC - MMIC LNA's realization in Q-band featuring a ten times power consumption reduction as compared to the current state of the art - Cryogenic Receivers' realization in Q band The activity proposed in this project is built up on combined strengths of four groups : - OMMIC, for its III-V manufacturing activity and associated packaging and qualification. - Thales Alenia Space, for the development of commercial product for space communications, and the activity of the design of integrated circuits. - Callisto Company, for marketing and design of cryogenic receiver system - IEMN, for antimonide HEMTs technology and high frequency characterizations, and its activity on the ultra low power The work program is articulated around 2 main phases: -Development of new technologies, and related electrical models extraction at ambient and cryogenic temperatures suitable for circuit design. During this phase, a cryogenic receiver covering 37-40GHz frequency range will be also designed, using technology 70nm gate length HEMTs OMMIC technology, acting as a reference -Development of low power consumption MMICs for future integration into the designed receiver.

Partners

- IEMN - Institut d'Electronique, de Microélectronique et de Nanoélectronique
- TAS - Thales Alenia Space France
- OMMIC - OMMIC
- CALLISTO - Callisto France

Coordinator

Sylvain Bollaert– Institut d'Electronique, de Microélectronique et de Nanoélectronique
sylvain.bollaert@iemn.univ-lille1.fr

ANR funding

799620 €

Starting date and duration

- 36 months

Reference

ANR-10-VERS-016

Cluster label

Project title	M3 - MOBILE-MULTIMEDIA

Abstract

Tomorrow's media landscape should be driven by the "native digital people", i.e. people deeply anchored in a digital world (computers, mobile phone, internet...). These users are intensive consumers of internet, including web radio listening, file downloading and sharing, discussions on social networks, linear web TV watching but also video on demand, on line games... The demand is really high nowadays to have access to all these services and applications whatever the receiver (desktop computer, laptop, mobile phone, PDA ...) in hands, and whatever the location, and the situation (fixed or mobile connexion to internet for instance). One of the components of this network of the future is broadcasting, enabling to address many users at the same time in a point-to-multipoint way (spectrum resources saving). In France, the current situation is that at least two broadcasting systems (or families) could be used to deliver multimedia services (e.g. to unload 3G spectrum with point-to-point mobile TV transmissions): the first one, DVB-H (Digital Video Broadcasting-Handheld) standardized by DVB Forum (Broadcasters-led group), chosen for "TMP (Télévision Mobile Personnelle)" delivery in France, and another one, iMB (integrated Mobile Broadcasting), standardized by 3GPP group (led by Mobile Operators and Vendors). These two different ecosystems, different in terms of key players, in terms of business models, in terms of spectrum, lead to a real issue in choosing and then deploying a broadcasting system. After analogue switch off in November 2011, a part of UHF spectrum should be re-allocated to mobile operators for multimedia applications. So in order to harmonize standards, to avoid market fragmentation and to encourage the take-off of broadcasting, M3 (Mobile Multi-Media) project will study in which extent next generation broadcasting 3GPP (E-MBMS Evolved Multimedia Broadcast and Multicast System and/or its advanced version) and DVB (DVB-NGH Next Generation Handheld) standards could be merged. This project will in a first step analyse broadcasting ecosystems, and then propose use cases for multimedia applications and enhancements of current business models in order to guarantee the success of future deployments. In a second step, the project will study the commonalities between 3GPP E-MBMS and future DVB-NGH standards not only at the physical layer, but also at higher layers (optimisation of the service convergence). A specific point will answer how an E-MBMS frame could be embedded in a DVB-T2 Future Extension Frame, likely to carry Next Generation Handheld system. Meanwhile weaknesses of current broadcasting systems will be studied and improvements will be proposed, especially in the following areas: multiple antennas schemes (MISO/MIMO), channel coding, constellation mapping

(application of rotated constellation to mobile broadcasting for instance), advanced modulation suitable for high mobility, reduction of Peak-to-Average-Power-Ratio... Specificities of satellite transmission will also be taken into account, in order to define a globally optimized system architecture. In a third step, selected solutions will be implemented on platforms to validate the possible synergies between both systems (for instance factorization of common modules, especially on receiver side, like OFDM demodulation for instance, or de-framing). Typically the broadcasting transmission of an E-MBMS signal in a DVB-T2 Future Extension Frame in future digital dividend spectrum should be a major result of the project. The performances of some implemented advanced technologies will also be derived not only in labs but also via real field tests. Major results of this project will be presented not only in conferences and journals, but contributions will also be proposed in both 3GPP and DVB standardization bodies to harmonize both standards.

Partners

- FT - France Telecom
- MERCE - Mistubishi Electric R&D Centre Europe
- INSA-IETR - Institut National des Sciences Appliquées de Rennes - Institut d'Electronique et des Télécommunications de Rennes
- TELECOM BRETAGNE - INSTITUT TELECOM
- TeamCast - TeamCast Technology SAS
- CNES - Centre National d'Etudes Spatiales
- DIBCOM - DiBcom

Coordinator – FT - France Telecom
christian.gallard@orange-ftgroup.com

ANR funding 1865171 €

Starting date and duration 10/1/2010- 36 months

Reference ANR-10-VERS-010

Cluster label Images & Réseaux

Project title	OCELOT - Prototype development of an all optical linear sampling based constellation oscilloscope

Abstract

The OCELOT project aims at developing the optical linear sampling of very high rate (> 100Gbps) optical signals with advanced modulation formats, especially in phase (x-PSK), in order to extract amplitude and phase information and display it in a constellation diagram. The main purpose of OCELOT is the transfer of this technology from a research industrial laboratory to a SME by realizing the prototype of a future product, which is planned to be launched on the very competitive constellation oscilloscope market. The two major obstacles identified in the project refer on one hand to the pulse laser source used for linear sampling, on the other hand to the acquisition and processing of the sampled and digitized signals, with display refreshment rate (> 1Hz) matching end users requirements about real time measurement and analysis. The laser source must provide short (< 1ps), stable (timing jitter < 200fs) pulses, with relatively low average power (> -3dBm) but also low pulse rate (40MHz-300MHz), in order to fit the economical requirement of simple implementation and reduced cost. This source, containing an amplifying quantum dot chip, will be developed in a specific task, with close collaboration of several partners of OCELOT project. The low economical cost is a hard requirement and will be considered as important as the pure technical purposes. After validation, the laser will be transferred to the SME APEX for its integration inside the constellation oscilloscope prototype. The digital acquisition board (CAN) will be designed with digital signal processing integrated circuits (DSP, FPGA) enabling the end display of the constellation diagram. A robust and fast algorithm must be designed, developed and implemented in FPGA, and transferred to APEX with the CAN for its integration in the prototype. Then, the prototype, integrating the laser pulse sources, the linear sampling modules, and the digital acquisition and processing boards, will be realized by APEX and validated with the very high rate and diverse format modulation sources developed by partner UR1-ENSSAT. The project will be promoted by presenting the prototype in important scientific and technical international conference exhibitions, in order to probe the market and attract future customers.

Partners	• APEX Technologies • III-V Lab - Alcatel Thales III-V Lab • UR1-ENSSAT - Université de Rennes 1 - ENSSAT • TP - Télécom ParisTech
Coordinator	APEX Technologies tony.da.silva@apex-t.com
ANR funding	967377 €
Starting date and duration	- 36 months
Reference	ANR-10-VERS-015
Cluster label	SYSTEM@TIC Paris région Images & Réseaux

Project title	PIMI : Personal Information Management through Internet
Abstract	The future Internet will bring a growing number of networked applications (services), devices and individual data (including private ones) to end-users (citizens, consumers, employees). The important challenges are the organization of their access, and the guarantee of trust and privacy. The objectives of the PIMI project (Personal Information Management through Internet) are the definition of a model-based design environment and a deployment platform for Personal Information Management System (PIMS). The future PIMS must provide the end-user personal data access with services that are relevant to his needs. In order to take mobility into account, the PIMS will be accessed both by mobile devices (smartphone) and Internet-connected Personal Computers. With the increasing number of e-services and associated data being accessible through Internet, the number and complexity of PIMS will augment dramatically in the near future. This will require strong research investment in a number of topics, all contributing to the expected usability and accessibility of Individual Information Spaces for the end-user: - Electronic trust and reputation of the services - Secured private data transfer between PIMS and between services - Ergonomic Human Computer Interface including mobile ones - Service composition and re-composition based on end-users requirements (life events), on e-service trust and runtime feedback - Quality of Service / Quality of Experience self adaptation - Advanced algorithms to monitor the PIMS, the private data and service accesses.
Partners	• GENIGRAPH - GENIGRAPH • INRIA - Institut National de Recherche en Informatique et Automatique • LRI - Laboratoire de Recherche en Informatique • IT - Institut Telecom • Montimage - Montimage • IRIT - Institut de Recherche en Informatique de Toulouse
Coordinator	Olivier Nicolas– GENIGRAPH onicolas@e-citiz.com
ANR funding	1068628 €
Starting date and duration	11/15/2010- 36 months
Reference	ANR-10-VERS-0014
Cluster label	SYSTEM@TIC Paris région

Project title	ProSe - Security protocols : formal model, computational model, and implementations

Abstract

There is nowadays a huge quantity of information that flows through untrusted channels. And this will still increase dramatically in the future. Mobile sensor networks are deployed everywhere and control more and more social activites: car driving, health care, traffic control, ... Mobile and ad hoc networks, iphone and more generally mobile terminals are increasingly used in everyday life. Chips are used to store sensitive data and are supposed to secure critical transactions: they are embedded in electronic passports, cash cards, ... Securing the communications is therefore an important challenge. The research community in computer and information sciences has deployed a lot of efforts in trying to secure the communications. There is also a lot of efforts, in trying to increase our confidence by providing with ``security proofs''. Such proofs require a formal model for the protocols, for the security properties and for the attacker capabilities. Until 2001, different research communities worked independently, using different formal models. This includes for instance a logical (or symbolic) model and analysis, whose successes can be illustrated by the numerous man-in-the-middle attacks that have been found on security protocols. A second approach is computational, inheriting from complexity theory; it assumes for instance that the attacker is any randomized polynomial time Turing machine. This is the favorite model of cryptographers. A third approach is more pragmatic and tries to prove/find attacks on actual implementations of the protocols (this has been more successful in finding attacks than in proving protocols secure). The main goal of the ProSe project is to provide with security proofs at several levels: symbolic, computational, and implementation. In a nutshell, the aim of the project is to develop automatic protocol verification tools in the symbolic model, in the computational model, and in an implementation model. We will rely on the partner's experience in the areas of symbolic security proofs and their relationships with computational proofs.

Partners

- INRIA Paris-Rocquencourt - Institut National de Recherche en Informatique et en Automatique, centre de recherche Paris-Rocquencourt
- LSV - Laboratoire Spécification et Vérification
- LORIA - Laboratoire Lorrain de Recherche en Informatique et ses Applications
- VERIMAG – VERIMAG

Coordinator	Bruno Blanchet– Institut National de Recherche en Informatique et en Automatique, centre de recherche Paris-Rocquencourt blanchet@di.ens.fr
ANR funding	434576 €
Starting date and duration	12/13/2010- 48 months
Reference	ANR-10-VERS-004
Cluster label	

Project title	ReAGaN - REalibility Analysis of GaN technologies. Development of an innovative methodology for physical and electrical analysis at the device scale

Abstract

Telecom infrastructures are based on various standards using different modulation schemes (PSK, QPSK…..) characterized by a Peak to Average signal Ratio (PAR) which can reach 10.5dB for W-CDMA modulation. The expected 4G standards (Evolved UMTS and WiMax) are operating OFDM multiplexing technology which presents the advantage to be robust but leads to increase the PAR in parallel. Combining stronger electric performances requirement (linearity and RF power) and the economical constraint of the zero defect, it is evident that the reliability of power amplifier appears to be a crucial aspect. UMS, main industrial actor in the field of microwave electronic components and circuits, intends to industrialize GaN based power component covering such telecom applications. Wide band gap technologies represent the corner stone for the next generation of telecommunication systems and such development is critical to maintain independence and industrial competitiveness in Europe. The technological process maturity is a key factor to reach reliability requirement. This explains why the purpose of this project is the development of a specific and dedicated methodology for characterization and physical analysis of GaN technologies. The ReaGaN project clearly aims at supporting the industrialization of GaN technologies. This requires a deeper understanding of the physical mechanisms taking place in GaN devices as well as the investigation of material properties and their evolution during the process as they determines the resulting performances of the amplifier. To reach this end, new analysis techniques dedicated to Wide Band Gap semiconductor technologies have still to be improved or developed. These analytical techniques include electrical diagnostics as well as physical and structural characterization techniques. In particular, it is expected that the correlation of the results given by electrical and physical techniques proposed and used in this project will lead to the identification, characterisation and localization of nano-structural defects and physical mechanisms taking place in GaN technologies and potentially responsible for degradation. During this project, devices issued from the evaluation and qualification of UMS processes will be analyzed in significant details. UMS is currently developing two GaN technologies built on SiC substrate for high thermal properties: Power bar GH50, and Monolithic Microwave Integrated Circuit (MMIC) GH25 technologies based on 0.5µm and 0.25µm gate length transistor respectively. During this project, specific devices or

structures will be procured to the consortium partners to investigate particular processing options of the technology (eg gate module, passivation, epistructure …). The life tests of the devices will be performed in the frame of UMS internal projects. The comparative analysis of different processing steps will provide important and pertinent information to support the step-up of the GH25 and GH50 technologies from one generation to the next one. The complementarities between techniques will be demonstrated as a proof of the existing interaction between electrical transport properties, light characteristic and material structural properties. This project involves three academic partners (IMS UMR CNRS, LAAS UPR CNRS, LEPMI UMR CNRS) and three companies (UMS, TRT, SERMA). The project duration isof three years.

Partners	• IMS - Laboratoire IMS, UMR 5218, Université Bordeaux 1, IPB • UMS - United Monolithic Semiconductors • LAAS - LAAS, UPR CNRS • TRT-LATPI - THALES Research and Technologies • SERMA - SERMA Technologies • LEPMI - LEPMI, UMR 5631
Coordinator	Nathalie Labat– Laboratoire IMS, UMR 5218, Université Bordeaux 1, IPB nathalie.labat@ims-bordeaux.fr
ANR funding	648954 €
Starting date and duration	12/13/2010- 36 months
Reference	ANR-10-VERS-006
Cluster label	Aerospace Valley MINALOGIC

Project title	RESCUE - Mobile Coordinated Substitution Network

Abstract

Access and metropolitan networks are much more limited in capacity than core networks. While the latter operate in over-provisioning mode, access and metropolitan networks may experience high overload due to evolution of the traffic or failures. In wired networks, some failures (but not all) are handled by rerouting the traffic through a backup network already in place. In developed countries, backup networks are adopted wherever possible (note that this is generally not the case for the links between end users and their local DSLAM). Such a redundant strategy may not be possible in emerging countries because of cost issues. When dedicated backup networks are not available, some operators use their 3G infrastructure to recover some specific failures; although such an alternative helps avoid full network outage, it is a costly solution. Furthermore, availability of 3G coverage is still mainly concentrated in metropolitan zones. When no backup networks are available, it would be interesting to deploy, for a limited time corresponding to the period of the problem (i.e., failure or traffic overload), a *substitution network* to help the base network keep providing services to users. In the RESCUE project, we will *investigate both the underlying mechanisms and the deployment of a substitution network composed of a fleet of dirigible wireless mobile routers*. Unlike many projects and other scientific works that consider mobility as a drawback, in RESCUE we use the controlled mobility of the substitution network to help the base network reduce contention or to create an alternative network in case of failure. The advantages of an on-the-fly substitution network are manifold: 1) Reusability and cost reduction. Substitution resources are only used when needed compared to a permanent backup network which may be not used very often. Furthermore, substitution nodes can be redeployed at different parts on the network at different times. 2) Deployability. Substitution network may help some parts of the base network where there is no redundancy. It is important to underline that deploying substitution networks is not orthogonal to having traditional backup networks. Instead, it should be seen as complementary. 3) Adaptability. The topology of the substitution network may be adapted to the context, i.e. to the environment as to the on-going traffic so that an efficient delivery service may be provided. Note that a fundamental aspect of the project is the *decision* strategy, as deploying a substitution network has some counterpart cost. By decision, we mean the judgment concerning the right time a substitution should be deployed (or undeployed when the system estimates that the

substitution network is no further needed). To this end, the RESCUE project addresses both the *theoretical* and the *practical* aspects of the deployment of a substitution network. From a theoretical point of view, we will propose a two-tiered architecture including the base network and the substitution network. This architecture will describe the deployment procedures of the mobile routing devices, the communication stack, the protocols, and the services. The design of this architecture will take into account some constraints such as quality of service and energy consumption (since mobile devices are autonomous), as we want the substitution network to provide more than a best effort service. From a practical point of view, we will provide a proof of concept, the architecture linked to this concept, and the necessary tools (e.g., traffic monitoring, protocols) to validate the concept and mechanisms of on-the-fly substitution networks. At last but not least, we will validate the proposed system both in laboratory testbeds and in a real-usage scenario.

Partners

- INRIA - Institut National de Recherche en Informatique et Automatique
- UPMC - Université Pierre et Marie CURIE
- LAAS - Laboratoire d'Automatique et d'Analyse des Systèmes
- FT - France Telecom
- ENSL - Ecole Normale Supérieure de Lyon / Laboratoire LIP

Coordinator

Tahiry Razafindralambo– Institut National de Recherche en Informatique et Automatique
tahiry.razafindralambo@univ-lille1.fr

ANR funding

796000 €

Starting date and duration

12/1/2010- 36 months

Reference

ANR-10-VERS-003

Cluster label

Project title	TRIMARAN - Time-Reversal MIMO OFDM Green communicAtions based on MicRo-structured ANtenna

Abstract

OFDM-MIMO systems are efficient for wireless communications in terms of throughput versus transmit power. Many algorithms have been developed in the physical layer and joint MAC-PHY layers, for both TDD and FDD, in order to achieve the MIMO capacity under maximum transmit power constraint. MIMO-OFDM techniques are theoretically scalable with the number of antennas and the number of sub-carriers. However, in practice, expected performance is not met due to complexity constraints and implementation impairments. MIMO-OFDM receivers performance prediction is highly complex for large number of antennas and sub-carriers, dispersive channels, and large multi-user or multi-stream interference. Low complexity but unreliable PHY layer performance predictions leads to suboptimal link adaptation and scheduling by MAC layer. The system lacks of robustness. Among all MISO beamforming techniques, time reversal (aka matched filtering transmission) appears to be one of the most robust techniques. It is less complex at the transmitter than Zero-Forcing Beamforming (a.k.a inverse filtering) and yet, it leads to a decreasing receiver complexity. Its achieved space-time focusing quality increases in highly scattering environments. Applied alone, time reversal is optimum in the low SINR region (high multi-user interference or low receive power). Combined with coded OFDM and STBC, it meets coded classical beamforming (based on the determination of the unique eigen vector of the MISO channel) performance with lower complexity. Combined with spatial multiplexing, and micro-structured antennas, it achieves MIMO multi-stream communications by sub-wavelength focusing. Combining OFDM-MIMO, Time Reversal and micro-structured antennas is still to be done. The aim of this project is to achieve high throughput and high system robustness, in wireless networks, under a maximum transmit power consumption constraint, with large bandwidth and very large numbers of antennas over small terminals and access points, in indoor and indoor-outdoor environments which are highly scattering, and taking into account radio conditions variations due users low speed or due to changing environment. The project proposes a joint design of OFDM-MIMO and space-time focusing with micro-structured antennas. Focusing quality will be controlled for a better robustness of the receiver performance against implementation impairments and multi-path propagation. Innovative algorithms based on time reversal and space-time focusing techniques will be proposed and evaluated by link

and system level simulations. New metrics to measure robustness and human exposure, in addition to traditional metrics, will be defined. Finally, the most important challenge of this project is to produce an experimental prototype which will provide a proof-of-concept of data transmission with a maximum bandwidth of 40MHz, OFDM-MIMO, time reversal, and NTxNR micro-structured antennas. The prototype will include up to NT=8 transmit antennas and up to NR=4 receive antennas.

Partners

- FT - France Telecom
- TCF - THALES Communication France
- Institut Langevin - Institut Langevin - ondes et Images
- TRCom - Time reversal communications
- IETR - IETR INSA de Rennes
- Telecom Bretagne - INSTITUT TELECOM

Coordinator

– FT - France Telecom
rodolphe.legouable@orange-ftgroup.com

ANR funding

1108744 €

Starting date and duration

- 36 months

Reference

ANR-10-VERS-008

Cluster label

Images & Réseaux
SYSTEM@TIC Paris région

Project title	UltraWIDE - Ultra-Wideband Integrated amplifying Device for Enhanced WDM optical systems

Abstract

The project UltraWIDE addresses the issue of increasing the total capacity of wavelength division multiplexing (WDM) systems through a disruptive approach that intends to widen the amplification bandwidth of WDM optical systems. Nowdays, optical fiber communication systems based on WDM widely use erbium doped fibers amplifiers (EDFA), which have a bandwidth limited to approximately 32 nm. The project aims at developing and validating in a system environment a novel optical amplifier with 100nm-large optical bandwidth, so as to leverage the increase of capacity in optical systems by a factor of three. In the late-90's, a solution for doubling the optical amplifier bandwidth beyond the conventional C-Band (1530nm-1562nm) was proposed by operating another EDFAs across the L band (1570nm-1602nm) in parallel. This solution was never successful on the market because of its higher complexity, which raised its cost to more than twice the cost of single C-band amplifier. However, the need for larger optical bandwidths is greater than ever. Project UltraWIDE is therefore timely. It relies on a novel optical amplifier with three times the bandwidth of state-of-art (C-band) amplifier in a single integrated device, which represents a tremendous scientific and technical challenge. The device incorporates two high-performance optical amplifiers (SOA) imbedded in an innovative integrated structure. Although SOAs have been extensively investigated, they have not been compliant with efficient WDM transmission yet, for the following reasons: (1) the SOAs developed so far have limited output saturation power (max 17dBm at an injection current of 500mA), especially when designed to be polarization insensitive (2) the SOAs developed so far have higher noise figures (~7-8dB) than that of EDFAs (5-6dB) (3) the SOAs developed so far generate cross-talk between WDM channels, whenever the output power is comparable with the saturation power In UltraWIDE, we rely on an original, polarization-diversity, integrated structure which is used to make a compact and wideband SOA-based amplification device. This structure is expected to alleviate the first two drawbacks. In that respect, the novel optical amplifier has to exhibit comparable performance to that of EDFAs such as such high gains (>20dB), high saturation powers (~25dBm), and satisfactory noise figures (<7dB). Another important goal of UltraWIDE is to propose and validate original WDM system configurations and node architectures through numerical simulations and experiments (optical power distribution across the WDM multiplex, dispersion mapping, modulation formats,

primarily). Even though SOAs have not been able to compete with EDFAs for more than 15 years for WDM amplification, the recent revolutions in system technologies (e.g. FEC and thus nominal operation at higher bit-error-rates, massive expansion of phase shift keying, introduction of coherent detection and powerful signal processing, suppression of in-line dispersion compensation…) make the third drawback (SOA non linear crosstalk) much less critical. In UltraWide, we propose to demonstrate the transmission of 100Gbit/s channels spanning over 100nm bandwidth, over 1000km distance, i.e. more than a hundredfold improvement from the best demonstrated capacityxdistance product of SOA based transmission systems. The 6 members of the consortium have complementary skills and expertises to achieve the target. ALU has a strong knowledge of WDM systems and their recent evolutions to draw clear directions, ATL will design specific wide band single polarization SOA with the support of SUP, Kylia will use its free space know how to realize polarization diversity structure. IT will define best operating conditions for advanced SOA in future WDM systems. ENIB will characterize SOA and develop model, while ALU will experimentally demonstrate the added value of 100nm wide band SOA in next generation WDM systems.

Partners

- ALU - Alcatel-Lucent Bell Labs France
- ATL - Alcatel Thales III-V Lab
- KYL - Kylia
- IT-TSP - Institut TELECOM/ Telecom SudParis
- SUP - SUPELEC
- ENIB - Ecole Nationale d'Ingénieurs de Brest

Coordinator

– ALU - Alcatel-Lucent Bell Labs France
jeremie.renaudier@alcatel-lucent.com

ANR funding

1150715 €

Starting date and duration

12/1/2010- 36 months

Reference

ANR-10-VERS-011

Cluster label

SYSTEM@TIC Paris région
Images & Réseaux