# CEC AND ESA ACTIVITIES IN THE AREA OF GAAS AND RELATED III-V COMPOUNDS

A. MBaye*, G. Gatti**
* CEC, DG XIII-ESPRIT, Brussels, Belgium
** ESA/ESTEC, RF Systems Division, Noordwijk, The Netherlands

ABSTRACT

The Commission of European Communities (CEC) and the European Space Agency (ESA) have been involved for several years in activities related to the development and application of GaAs and related compounds devices. This paper highlights the main goal of the most recent projects.

## 1. CEC ACTIVITIES

Six projects on Compound Semiconductors are included in the current ESPRIT II (European Strategic Programme for Research and Development in Information Technology). These projects involve approximately 330 man years of effort between 1989 and 1993. Projects vary from two and half years to four years in duration and apart from one project, they all started in January 1990 [1], [2].

Each project has a well defined application pull. A project centred on advanced transistors for example, is pulled by the need of these transistors for high performance integrated circuits. A project centred on MMICs is pulled in its turn, by the need of these circuits for various system requirements. The projects can be examined from several angles. In this paper, we shall examine them by the frequency bands which they cover. This reflects to some extent the technology and devices being pursued by each project. Some projects are concerned with basic technologies, for example, the development of non-toxic precursors. These projects can be regarded as horizontal technology projects which would complement the more vertical projects with circuit and system pulls.

The projects are summarised in table 1, including the participants to each project.

Broadly speaking, the ESPRIT II programme on Compound Semiconductors is pivoted on two A-type projects each with over 100 man years of effort. These projects are COSMIC and AIMS. Although these projects also involve a substantial amount of horizontal activities in the areas of devices and technology, they are nevertheless very much systems driven where the target specifications and functionalities of the devices and circuits are defined from system studies. Between COSMIC and AIMS, the projects cover frequency bands between approximately 1 to 20 GHz and 20 to 30 GHz respectively.

These two A-type projects are complemented by two smaller B-type projects, MONOFAST and GIANTS. MONOFAST is concerned with technology and MMIC design technique focused at 44 GHz and GIANTS is concerned with the development of InGaAs based transistors where on of the aims is to demonstrate a low noise amplifier MMIC at 60 GHz. Another aim is to demonstrate optoelectronic integration on InP substrates.

their cooperation is excellent and this contributes to strongly support European Industry in competing at world level.

## 4.REFERENCES


1. G.Papageorgiou, III-V activities in ESPRIT, First International Workshop on MMICs for Space Applications, ESTEC, Noordwijk, 1990

2. J.Mun, A.Mbaye, ESPRIT II projects on compound semiconductors, ESSDERC 91, Montreux

4. G.Gatti, MMIC activities in ESA-ESTEC, SPIE Conference on MMICs for Sensors, Radar and Communications Systems, 1991, Orlando

5. G.Gatti, ESA solid state power amplifier activities, 1989 European Microwave Conference, Workshop on SSPAs, London, 1989

6. F.Jean, W.Walker, MMIC Reliability issues and ESA qualification plan, First International Workshop on MMICs for Space Applications, ESTEC, Noordwijk, 1990


| Project No. (ACRONYM) | Title | Participants |
|---|---|---|
| 5018 (COSMIC) | GaAs Monolithic Analogue Circuits for Microwave Communication Systems up to 23 GHz | Siemens (D), Marconi (UK), Telettra (I and E), Telefonica (E), FORTH (GR), Jansen (D), ArguMens (D), Univ. Madrid (E), Univ. Rome (I), PT Torino (I) |
| 5032 (AIMS) | Advanced Integrated Millimeter-wave Sub-assemblies | Thomson (F), Daimler Benz (D), Alcatel Espace (F), Univ. Lille (F), Electronik Centralen (DK) |
| 2035 (GIANTS)*<br>* started in 1989 | Advanced in InGaAs-based Devices for High-speed ICs | Marconi (UK), BNR-Europe (UK), Philips-LEP (F), Thomson (F), Picogiga (F), FORTH (GR), Farran Tech. (IRL), Univ. Lille (F), Univ. Madrid (E) |
| 5052 (MONOFAST) | Monolithic Integration Beyond 26.5 GHz | Univ. Glasgow (UK), Alcatel Espace (F), GaAs Code (UK), Univ. Cambridge (UK), Farran Tech. (IRL), NMRC (IRL) |
| 5031 (MORSE) | Metal Organic Research for Semiconductor Epitaxy | Thomson (Fr), CNET (F), RSRE (UK), FORTH (GR), Univ. Aachen (D), Univ. Stuttgart (D), Preussag (D), Riber (F), SMI (F), Univ. Padova (I) |
| 5003 (PLANET) | Multi-wafer PLANET MOVPE Reactor | Philips - LEP (F), Aixtron (D), Polyflow (B), Philips (NL), Telefonica (E), Univ. Poly. Madrid (E) |

Table 1: Current ESPRIT II projects on Compound Semiconductors and their participants. The prime contractors are underlined.

| | | | | |
|---|---|---|---|---|
| 8762/90 | Ku-band Beam Forming Network | MBB (D), GEC MMT (UK) | 1992 | FSS |
| 8861/90 | Ku-band Beam Forming Network | Alcatel (F), PML (F) | 1993 | FSS |
| 6756/86 | Ku-band 1 W Solid State Power Amplifier | GEC-MMT (UK) | 1993 | FSS |
| 9368/91 | Development of Standard MMICs | BAE (UK), PML (F) | 1993 | General |
| 9369/91 | Development of Standard MMICs | Alcatel (F), GEC MMT (UK) | 1994 | General |
| 9496/91 | Study of Si and GaAs ICs at L-band | VTT (SF) | 1993 | MSS |
| 103453-90 | Study on HBTs for Space Applications | University Darmstadt (D) | 1991 | General |
| 8059/88 | Reliability Evaluation GEC MMT F20 Process | GEC-MMT (UK) | 1991 | General |
| 9514/91 | Reliability Evaluation PML D07A Process | PML (F) | 1992 | General |
| 104535-90 | Reliability Evaluation Telettra Power MESFET Process | Telettra, TOP-REL (I) | 1993 | General |
| 7397/87 | S-band 30 W Solid State Power Amplifier | FIAR (I) | 1991 | DRS, Columbus, Hermes |
| 9030/90 | Ku-band Linear Solid State Power Amplifier | MBB (D) | 1993 | FSS |
| 8286/89 | K-band 5 W Solid State Power Amplifier | Siemens Telecomunicazioni (I) | 1992 | DRS, IOL |
| 8126/88 | Ka-band 0.5 W Solid State Power Amplifier | Siemens Telecomunicazioni (I) | 1991 | FSS |
| 7338/87 | Ku-band Linearizers for TWTAs and SSPAs | ANT (D) | 1991 | FSS |
| 9273/90 | S-band 300 W Solid State Power Amplifier | Dateno (F) | 1992 | TT&C |
| 8489/89 | Memory-less Biasing Schemes | Hirschmann (A) | 1991 | General |
| Artemis Ph.B.2.2 | S-band Low Noise Amplifier and Filter | Siemens Telecomunicazioni (I) | 1992 | DRS |
| 9596/91 | 60 GHz Low Noise Amplifier | VTT (SF) | 1993 | ISL |
| 8877/90 | 60 GHz Down-converter | Siemens Telecomunicazioni (I) | 1993 | ISL |
| 8295/89 | C-Band T/R Module for Advanced SAR | Alcatel (F) | 1992 | SAR |
| 7808/90 | Study on Active Filters | Univ.Limoges (F) | 1991 | General |
| 9406/91 | Study on Active Filters | King's College (UK) | 1992 | General |
| 8138/88 | Tunable Frequency Converter | Alcatel Bell (B) | 1992 | DRS |
| 8974/90 | Frequency Synthetizer and Mixer | FIAR, Siemens Telecomunicazioni (I) | 1992 | DRS |
| 9245/90 | Local Oscillators for mm-wave Radiometers | ANT (D) | 1992 | Radiometer |
| 9251/90 | Local Oscillator for mm-waves Radiometers | Elektronik Centralen (DK) | 1992 | Radiometer |

Table 3: continued