

High speed
communications
systems



A104: System-on-Chip Solutions for Advanced UMTS Base-stations (SCUBA)

Technology platform ensures future-safe and efficient mobile phone systems

Third and fourth generation mobile phone networks needed a time-efficient development environment for multi-standard/multi-carrier equipment. SCUBA successfully defined and realised intellectual property (IP) blocks and prototype components for precisely that. By focusing on innovative concepts for advanced multi-carrier Universal Mobile Telephone Service (UMTS) base stations and related access networks, this MEDEA+ project created a universal technology platform for the development of future-safe, cost-efficient communication systems. This will boost European leadership in a major global market.

More than a billion customers should be using UMTS to access multimedia services within five years, according to the UMTS Forum. Such services are expected to create a turnover of some €100 billion a year. Providers of UMTS infrastructure are therefore in a good position to market their products. Initial equipment did not have multi-carrier functionality but, as demand for higher capacities grows, the results of the MEDEA+ A104 SCUBA project offer an innovative solution based on multi-carrier base stations. This will enable European companies to gain major global market share.

Development of third and fourth generation mobile phone networks is driven by the need for a high performance communication system suited to all types of transmission – voice, data, video, etc. The SCUBA project was established to enable four companies – Alcatel SEL, Atmel, Italtel and ChipIdea – to collaborate in creating a suitable development environment.

The whole project was co-ordinated by Alcatel, which initiated this project primarily to enhance its knowledge of the requirements of base-station design and manufacture. The result is a large step forward in progress towards international market leadership position in the short term.

The synergy between the project partners provided an ideal basis on which to co-oper-

ate and to create a mutually beneficial working relationship. The fact the partners had no competitive interests meant that they were able to collaborate freely in the exchange of ideas and technologies.

Focus on two areas

The MEDEA+ project focused on two specific areas:

1. Design of new highly integrated components for the analogue and digital parts of the transmitter and receiver of UMTS base stations; and
2. Improvements to service-edge routers in base-station access networks.

As demands for bandwidth increase, so linearity of UMTS base-station front-ends becomes more critical. One of the first targets of SCUBA was to develop a range of new components to provide this increased linearity. Until now, base-station architecture has primarily been structured on discrete components; the aim of the project was to obtain a much higher degree of integration, mainly using silicon-germanium-based application-specific integrated circuits (ASICs).

This work was entrusted to semiconductor partner Atmel. The net result was a significant increase in power amplifier efficiency from 13% to 22% – the highest level so far



recorded in documentation on the subject. An integrated front-end has been developed that is much more compact and more cost-effective than ever achieved previously. While the new concept requires two analogue-to-digital converters (ADCs) rather than one as in current approaches, fewer radio (RF) and intermediate (IF) frequency components, such as filters, are necessary. A cost estimation shows even now costs of the new integrated receiver would be below those of traditional concepts. And expected decreases in ADC prices will strengthen the cost advantage of the new principle.

Production benefits

As the leader of the SCUBA project, Alcatel stands to benefit mostly from its ability to pursue the technology through to final production of UMTS base stations, likely to be achieved in 2005.

Close collaboration with partners who share a mutual and complementary interest in the growth of their respective contributions to a rapidly growing market segment is evidently a key factor to strengthening European leadership in this business sector.

Atmel now has a highly-integrated chipset design available for the open market. The company already has pre-production chipsets and the same 2005 production target as Alcatel. This will enable the company to approach other base-station manufacturers and offer them innovative products.

ChipIdea, a small design company in Portugal, will benefit directly from involvement in this project, due mainly to exposure to the trends and future requirements of the mobile telecommunications market. The company is principally con-

cerned with developing ADCs, and there is an ever-growing demand for such technology in both mobile phone networks and consumer electronics in general.

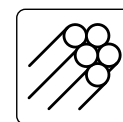
Italtel, as a developer and builder of public switching routers, has also been busy with development of routers that are connected to UMTS base stations. However, its production target date is somewhat more relaxed due to its position in the supply chain. Involvement in SCUBA is nevertheless of benefit in terms of its ability to market edge routers as part of base-station equipment.

Exploiting complementary skills

The success of the project has been largely due to the complementary technology skills of each of the partners. MEDEA+ was instrumental in several aspects of the establishment of ground rules, identification of suitable partners and helped in interfacing with public authorities in the various countries.

Excellent collaboration between the partners led to the development of new components and equipment that are now expected to be released in 2005, so establishing these European companies in leadership positions in their relevant sectors. This will also improve employment opportunities in Europe.

Links have been established to MEDEA+ projects focusing on complementary aspects – such as UniAccess, UniLan and 4G-Radio – thus creating as much as possible mutual benefit from European co-operation. The MEDEA+ aim of boosting the application of new technologies by developing innovative, low cost functional elements for base stations, and their linkage to the worldwide telecommunications network, has therefore been achieved.



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Partners

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Atmel
ChipIdea
Italtel

Project leader

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Key project dates

Start: September 2001
End: June 2004

Countries involved

Germany
Italy
Portugal



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MEDEA+ focuses on enabling technologies for the Information Society and aims to make Europe a leader in system innovation on silicon for the e-economy.