PROJECT PROFILE

T305: Wireless integrated test equipment (WireLITE)

PROCESS EQUIPMENT

Partners:

NPTest
Probe Technology
Rohde & Schwarz
STMicroelectronics

Project leader:

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Key project dates:

Start: May 2002
End: June 2005

Countries involved:

France
Germany
Italy

Europe has a global lead in radio frequency (RF) IC manufacture – an increasingly important ability with the trend to complete system-on-chip (SoC) designs for mobile phones, portable multimedia terminals and other wireless applications. The MEDEA+ WireLITE project aims to provide chipmakers with a complete means of testing both digital and analogue parts of RF SoCs. The early availability of European designed and manufactured high performance test equipment will provide European chipmakers with a substantial advantage. WireLITE will develop a mass production oriented solution for the worldwide semiconductor manufacturing community, as well as an efficient engineering development and debug tool.

The MEDEA+ T305 WireLITE project intends to strengthen the competitiveness of the industry that fabricates the basic building blocks, namely defect-free radio frequency (RF) integrated circuits for applications in the field of consumer and communications equipment. By this leveraging effect, these industries will also gain from the developments in WireLITE and end users will benefit by receiving products of high quality and reliability at the right price.

Consortium partners are addressing the technology and market challenges on the basis of the high level of integration achieved both at the RF instrumentation level and at the tester platform level, novel measurement and calibration techniques, and a specially designed RF probing system.

IC companies and foundries – and through them, the whole microelectronics industry – will gain access to a means of improving the quality of their products while keeping their costs at the lowest possible level. The benefits will be passed on to consumers by way of high-performance low-cost information technology devices.

With the benefit of the latest process and design enhancements, current CMOS technology makes it possible to deploy complex system-on-chip (SoC) devices with embedded RF front-ends, baseband and a digital core. It will soon be possible to mass-produce those devices at low cost for applications such as second and third generation (2G and 3G) mobile phones, wireless local area networks (WLAN) based on standards such as Bluetooth and WiFi, and set-top boxes.

High volumes required

As a result of the capabilities of the technology, the forecast for the next few years indicates that high volumes of ICs will be required for a wide variety of wireless applications. For example, forecasts indicate a demand for some 600 million devices for Bluetooth-enabled equipment and a slightly higher number of devices for mobile phones by 2005. All this poses a major problem for testing. RF solutions in the telecommunications market – such as surface acoustical wave (SAW) filters – require more and more complex multi-port modules. And vector network analysers (VNAs) have to address fast balanced multi-port measurements with the highest accuracy and speed.

Current VNA equipment addresses classical S parameter measurements with loose capa-

bilities for the testing of non-linear devices such as frequency converters, differential inputs/outputs (I/Os) – including active semiconductor devices – and multi-port systems.

In general, dynamic range and accuracy are compromised when flexibility is added, as with external multi-port test sets. None of the currently available instruments provide the throughput, reliability and scalability mandatory in an automatic test equipment (ATE) environment.

SoC testers now available on the market do not provide the capabilities required to address customer needs on a single platform for design and process characterisation in terms of laboratory class and complex RF measurements. And they are unsuitable for high volume manufacturing in terms of cost, throughput and reliability.

Current probing techniques used for RF testing are mostly based on membranes, an extremely expensive solution. So testing is generally performed either by means of cantilever cards – under degraded conditions because of the 10 to 15mm probe lengths – or on packaged devices.

Instruments and methodologies

WireLITE is intended to provide the semiconductor and electronics industries with tools for the measurement and testing of chips operating in the RF range (i.e. 2.5 to 5.4 GHz). The facilities include: a new generation of VNA RF measuring instruments; an ATE platform, suitable in cost and performance both for engineering and for high-volume manufacturing; methodologies for RF measurement on ATE; and a probing system for RF class testing at wafer level.

The RF equipment and the ATE platform are being designed to work together and will promote an open standard for test and measurement activities. RF measurement methodologies will be developed for wide reusability – that is they will be virtually platform independent. The probing system will achieve RF-class performance while keeping the costs reasonable and offering a level of ruggedness that is compatible with high-volume manufacture.

RF instruments resulting from this project will provide innovations in ultra broadband performance from low frequencies up to microwave range; a full parallel testing concept at all ports; parallel use of different detectors to extract various results from a single measurement and a scalable number of RF ports.

The resulting test system from this project will provide innovations such as a 'tester per port' architecture, full modularity and scalability, calibration without undocking, and a unique environment both for characterisation and for volume manufacture.

A network of five R&D teams representing instrument manufacturers, research institutes and chipmakers is involved in the MEDEA+ T305 project, working in close co-operation. This requires the exchange of ideas and is resulting in improved knowledge of each other's fields, as well as providing valuable communication between engineers from three European countries.

Benefits in volume production

WireLITE is developing tools and new generations of VNA and ATE for semiconductor manufacturers, capable of handling engineering qualification and mass production of RF devices. This will help chipmakers reduce the time to market of new products as well as increasing the quality and manufacturing profitability of their products.

These benefits will be returned to RF IC users among the general public as consumers of electronic equipment such as mobile phones and a vast range of domestic equipment.

Through the development of suitable test equipment, this project is supporting European efforts in developing components for high-speed electrical wireless networks, broadband service platforms for wireless office and home environment, and SoC requirements in design methodologies and tools. Overall, the final outcome of the project – a European RF testing system – will benefit IC manufacturers operating in various wireless arenas.

The main outcome of the WireLITE research work will be the availability of RF instrumentation and ATE in line with upcoming demands for accuracy, speed, reliability and excellent cost/performance. There will be an indirect impact through the wider use of RF-enabled equipment such as the third generation of mobile phones, wireless LANs, GPS and much more. WireLITE will help fuel those deployments.

The involvement of the research community will enable the dissemination of certain aspects of the calibration routine strategy – which can help move a step forward in metrology.

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