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wirelesseurope

APRIL 2004

ISSUE 32

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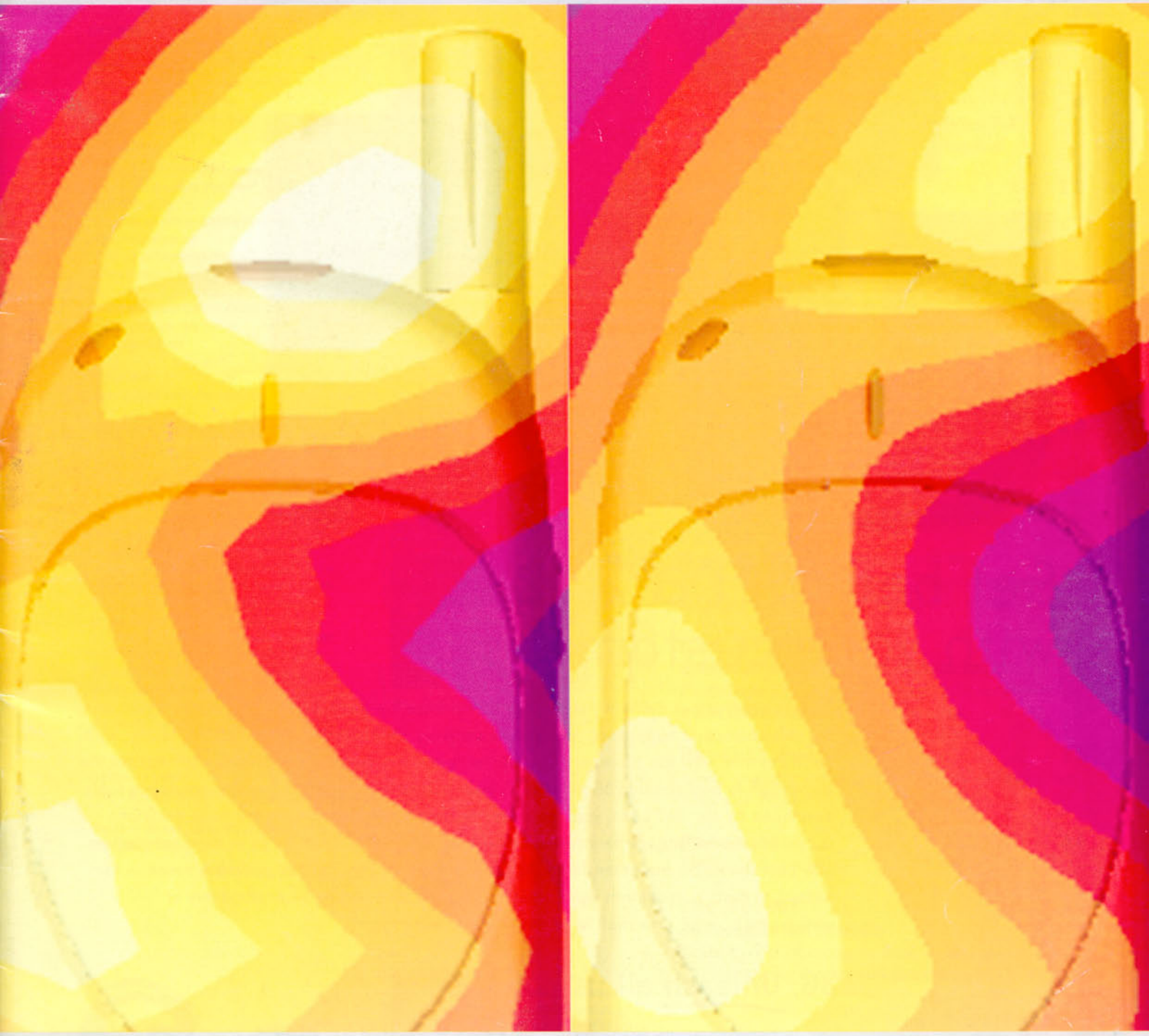
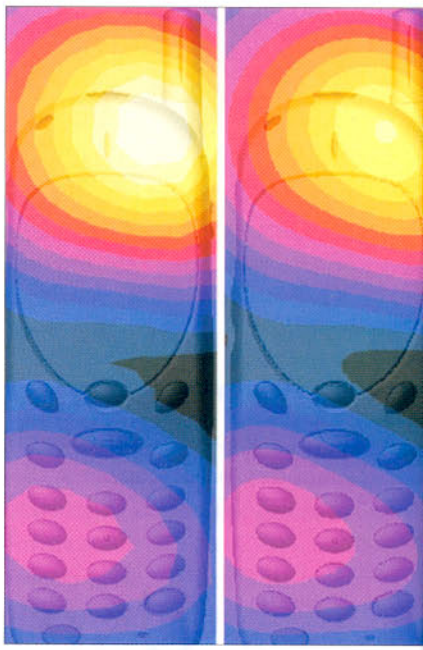


Simulation leaders face the future

Cost and integration pro

Hamish Johnston speaks to leading personalities in the simulation industry about the impact of 3G, Asia and the move towards software integration.



Data showing measurements and simulations of a Motorola T250 mobile phone at 1800 MHz. From electric measurement and simulation. The simula

Design and simulation software continues to play a key role in the development of new technologies for cellular handsets and base stations. As the migration from 2G to 3G gathers pace, *Wireless Europe* convened a "round-table" of leading simulation-industry personalities to sound out their visions for the future.

The migration to 3G and the economic downturn have changed the way that the cellular industry approaches the design and simulation of new products. According to Ted Miracco, executive vice-president of Applied Wave Research (AWR), technological and economic pressures have shifted the industry's focus from reducing time-to-market to minimizing the overall cost of technology. While the telecoms downturn has encouraged the move to cost reduction, Miracco believes that designers are struggling to develop economically viable solutions to the significant technical challenges posed by 3G systems. "This is a completely different atmosphere from the late 1990s when engineers could buy anything because they needed to get the job done faster," he says.

Design challenges

While designers are under intense pressure to keep costs down, they must also grapple with more complex 3G technologies. Miracco observes that higher integration levels mean that handset makers can no longer design subsystems independently: "We see an opportunity to link RFIC [radio-frequency integrated circuits] development with RF module design."

Head of software development at Schmid and Partner (SPEAG), Nicolas Chavannes believes that mobile-phone designers are starting to see handsets as a complex system and not just as an RF device. SPEAG produces the SEMCAD 3D electromagnetic (EM) simulation system that is based on the finite-difference time-domain method. The software is used for antenna design and specific absorption rate (SAR) estimation. Chavannes says that simulations can no longer focus solely on the antenna, but must model the effects of the entire handset.

The need to integrate multiple antennas within a single terminal will be a key challenge, says Chavannes. These antennas work in different bands and as terminals get smaller the antennas will get closer to each other and to the user's body. Indeed, in the future mobile devices could be incorporated within clothing.

High integration levels mean that simulations must be able to deal with many different components. Chavannes believes that simulation packages must import and modify CAD data and handle 500 or more CAD subparts. The simulation must also be able to resolve structure down to length scales of 50 μm or less.

Martin Timm, senior application engineer at Computer Simulation Technology (CST), agrees that greater integration of components inside mobile phones is making 3D EM simulation vital to the design process. "Traditionally our software has been used for antenna design and SAR calculations, but we are now seeing an increasing need for signal-integrity analysis considerations," he says.

Sonnet Software's president and founder James Rautio believes that the accurate analysis of low-temperature co-fired ceramic structures is becoming crucial to the handset industry. "Working with EPCOS and Motorola, we have achieved consistent success on first fabrication. This required a holistic approach, working with designs and developing the analysis/optimization process for maximum efficiency," he says.

Heikki Rekonen, chief executive of APLAC, believes that not all handset-design challenges are electronic-related. He stresses that design and optimization processes often begin at the Internet-protocol or video-streaming levels, and the digital or RF engineer must ensure that their design meets these demands.

On the base-station side, Rekonen says that the designers of power amplifiers (PAs) need simulation techniques that can cope with the increasing integration of digital and analogue components within PAs. This integration is being done to implement new techniques, such as digital predistortion, which ensure that the PA is operating with the appropriate linearity.

Larry Dunleavy, president and co-founder of Modelithics, agrees that designers must be able to simulate the components that allow base-stations to operate at high power and efficiency levels while meeting tough linearity requirements. "We will soon be announcing a family of high-power LDMOS [laterally diffused metal-oxide semiconductor] transistor models that are compatible with multiple simulators," he says.

SPEAG's Chavannes believes that a key challenge is to develop software that can determine both the near-field performance of a base-station antenna and its performance in realistic operating environments. This currently requires a hybrid solution.

mote design innovation

aagnetic and electric fields in a plane 1 cm above
to right: magnetic measurement and simulation;
were performed using SEMCAD 1.8 from SPEAG.

The simulation industry's highlights for 2004

Wireless Europe asked the round-table what new technologies they look forward to releasing in the next 12 months.

- John Whitney of **Vector Fields** is looking forward to the release of Concerto 4, which will feature the full integration of finite-difference time-domain (FDTD) techniques. This will be followed by the addition of finite-element methods capability.
- **SPEAG**'s Nicolas Chavannes says that version 2.0 of SEMCAD will be released in mid-summer. It will have a range of new features to support the design of 3G and 4G devices.
- Ted Miracco says that **AWR** is excited about progressing its EM simulation technology in 2004, noting that by the end of this year designers will have access to eight different EM tools from the AWR user interface.
- Martin Timm says that version 5 of **CST**'s Microwave Studio will soon be available for 64-bit computing platforms. He adds that the company will continue with its drive to achieve the seamless integration of EM and circuit-simulation technologies.
- The addition of high-accuracy nonlinear diode and transistor libraries to **Modelithics**' product range, and the opportunity to work more closely with device and component suppliers, tops Larry Dunleavy's agenda for 2004.
- Heikki Rekonen looks forward to providing more efficient harmonic-balance simulation technology for the development of RFICs. **APLAC** will also be introducing several new technologies to improve the speed and memory efficiency of its software.
- James Rautio says that **Sonnet** has just completed a 10-year project to develop conformal-meshing techniques, which make it possible to simulate circuits that employ curving lines.

Two important trends in base-station design are the integration of the RF subsystems with the rest of the base station and device/thermal modelling, says AWR's Miracco. The firm is working to ensure that its RF tools can be integrated seamlessly with mainstream electronic design automation (EDA) tools. AWR is also adding device models that can handle thermal effects and is opening an interface to link the simulators with thermal analysis engines.

The importance of integration

Vector Fields' managing director John Whitney agrees that 3G is increasing the complexity of devices and the frequency and switching speeds at which they operate. "We may find that the problems that people want to address no longer fit comfortably in 32-bit [computer] architecture," he says. Whitney believes that success will come to firms with the "ability and commitment to offer a choice of simulation techniques in a single unified environment allied to efficient optimization tools with coupling to thermal analysis and other application-specific software".

Beyond the need to keep up with changes in technology, simulation vendors are also facing a changing market with much of the manufacture – and increasingly the design – of cellular equipment migrating eastward. Some in the industry – including APLAC's Rekonen – believe that while the design of digital electronics will move to Asia, the bulk of RF design activities will remain in Europe and North America.

Others – including Vector Fields' Whitney – believe that both manufacturing and R&D activities are migrating to Asia. "More of our business is coming from the east – India and China in particular are growing markets for our high-frequency and low-frequency EM software," he observes.

AWR's Miracco is also bullish on far-eastern markets: "In 2003, the Asia-Pacific [market] overtook Europe for the first time in our firm's history. We continue to see great potential in the Asian market, particularly in China, Korea and Taiwan."

SPEAG's Chavannes sees growing business opportunities with major Asian handset makers. While he believes eastward migration will provide opportunities for new entrants and smaller firms, he stresses that the initial opportunities will be for Asian companies that distribute western simulation products. Only as the Asian market matures will products developed by Asian companies begin to appear.

A key issue for the developers and users of simulation software is the development of standardized interfaces between packages from different suppliers. Proponents of a standardized approach argue that it will allow users to seamlessly mix-and-match software from different vendors and encourage smaller vendors of specialized software to join forces to create broader packages. However, critics of this approach caution that standardization will inevitably lead to a loss of the business and technological

advantages that proprietary systems bring.

CST's Martin Timm believes that open standards are the way forward. "CST is propagating this approach by building relationships with other "best-in-breed" software vendors," he says.

Sonnet has supported open interfaces for a decade and James Rautio believes that "openness is not just a nice frill – it is rapidly becoming necessary for survival". "Interfacing with clearly non-competitive tools is not enough," he declares, adding that vendors "must interface even with competitors if they want to survive, and this is actually starting to happen".

Open interfaces

Heikki Rekonen of APLAC believes that open interfaces and integration are inevitable because the technological challenges of the future "are far too difficult for any one company". Ted Miracco describes AWR as a "strong proponent of open simulation standards". AWR is working with eight software vendors to achieve integration through its EM Socket technology.

The development of sockets into simulation software will benefit companies like Modelithics, which supplies RF device models for multiple simulators. Larry Dunleavy explains that supporting multiple platforms "requires a good deal of reformatting for each [platform]".

In a perfect world, completely open software would be a great benefit to the end-user. However, John Whitney of Vector Fields warns that companies must be cautious when it comes to intellectual property. "The business model for software companies who rely on their [intellectual property] is not clear," he says.

Beyond the complex issues related to intellectual property, there are other barriers to truly open interfaces. Sonnet's Rautio sees the main challenge as "convincing framework vendors that the old ways do not work anymore and a truly open framework is in their best interest". He adds that the next challenge is actually creating the interfaces.

Legacy source code is another important barrier, according to AWR's Miracco: "It is difficult and can be unprofitable for [some] suppliers to invest in revamping their legacy systems, which were specifically engineered to be closed and proprietary."

SPEAG's Chavannes observes that open architectures put more pressure on simulation vendors because they must "keep up to date with the sometimes rapidly changing versions and all the different standards/formats of the external tools". He adds that if this energy were focused on the in-house design, the result would be a better-quality simulation tool.

While the impetus for change must ultimately be supported by the user community, AWR's Miracco believes that inertia is a key problem for the industry. "The biggest challenge we face in the market is apathy on the part of engineering teams that, although dissatisfied with the existing tools, are reluctant to take chances by trying anything new," he says. ■

Hamish Johnston is editor of Wireless Europe.

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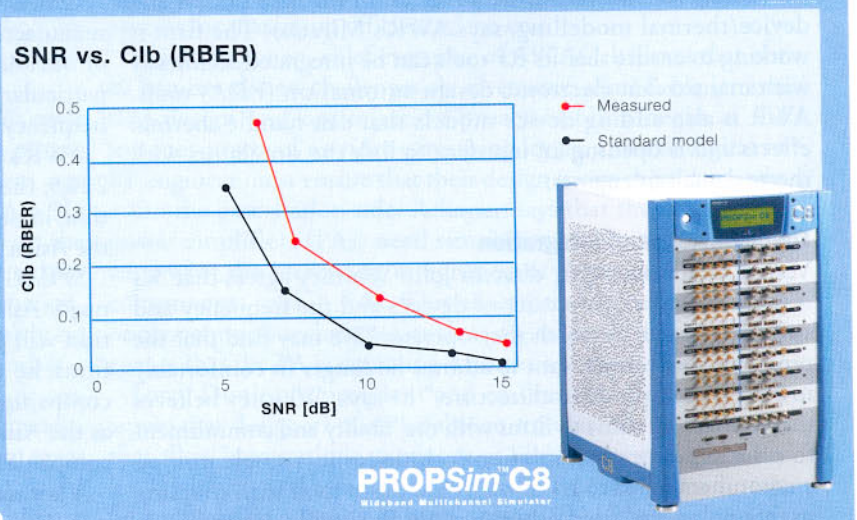

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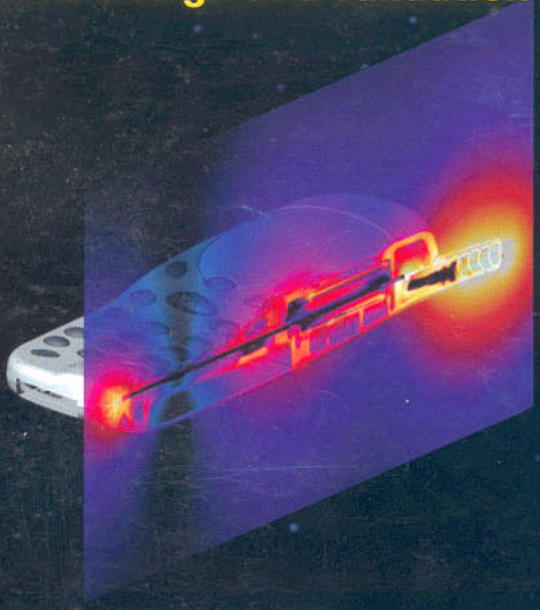

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