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Subscriptions

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High Frequency Electronics, Vol. 3 No. 4, April 2004. Published ten times per year by Summit Technical Media, LLC, 7 Colby Court, Suite 4-436, Bedford, NH 03110. Subscriptions are free to qualified technical and management personnel involved in the design, manufacture and distribution of electronic equipment and systems at high frequencies. Send information requests by mail to the above address, by telephone to 603-472-8261, by fax to 603-471-0716, or by E-mail to editor@highfrequency-electronics.com

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A Look at Some Non-Traditional Applications

Gary Breed
Editorial Director



This issue includes three technical articles that cover topics beyond the classic “radio” uses of RF and microwave energy. Richard Brounley shows us how to use RF amplifiers in plasma and laser driver applications; Johnnie Hancock offers the first of a 3-part tutorial series on jitter; Shawn Stapleton and colleagues describe power amplifier linearization by manipulating the digital signal before it reaches the radio circuitry. These subjects may not be traditional,

but they are timely and very important to significant portions of the engineering community.

Industrial, scientific and medical uses of RF and microwave energy have been around for a long time, and continue to be an important sector of the overall marketplace. Sputtering, plasma and RF heating are used for a wide range of products, from microelectronics to automobiles. As author Brounley points out, these applications usually have load impedances that are a long way from $50 \pm j0$ ohms and may be variable as well. This application area requires a unique set of engineering techniques to understand matching to the loads, as well as the behavior of the amplifier as the load changes.

Then we move to high-speed digital circuits, and the error mechanism of jitter. In his article, Johnnie Hancock states the issue clearly—jitter is an issue related to the transmission of “ideal” digital 1s and 0s through an analog environment. The continuum of the analog domain introduces a degree of uncertainty rather than unambiguous logic states, requiring engineers to deal simultaneously with both digital and analog techniques.

Our article on linearization is another analog/digital combination. By manipulating the digital bit stream, the spectral content of the RF signal can be modified. If the function applied to the data results in the inverse of the analog distortion, the output signal will have lower distortion. In this case, the authors describe the use of another combination of techniques—software simulation and actual measurements—to evaluate the linearization results.

The range of topics represented in these articles illustrates once again the diversity of applications in RF, microwave, mm-wave and lightwave engineering. In many cases, these formerly separate areas are combined, requiring a wider range of skills than any one area of specialization.

This multi-disciplinary approach applies to other applications, too. High-frequency, high-efficiency DC power supplies require the combina-

tion of power electronics and RF skills; laser diode drivers and photodetector transimpedance amplifiers require knowledge of optical wavelength propagation, semiconductor device behavior and microwave circuit design; disk drive read/write systems need engineers who understand magnetics and electromagnetics, as well as mechanical design.

Businesses and individuals want greater capabilities to deal with their communications and information needs. Those needs are being met by more complex technology, often combining methods from different engineering realms

in new ways. I continue to be impressed by the creative ways that these solutions are being implemented, even if it taxes my own RF-centered skill set!

See us at the International Microwave Symposium

High Frequency Electronics will be in Fort Worth for the annual IEEE MTT-S conference and exhibition, June 6-11 in Fort Worth, TX. This event has emerged as the single most important technical and commercial gathering for the RF and microwave engineering community.

There are other important

events for the high frequency marketplace, but they focus on specific applications or finished products. The IMS has the most in-depth coverage of engineering design and development at the component, instrument and EDA tool level.

It is also the event with the biggest joint participation by industry and academia (including students). As many of you know, I am a big fan of in-person interaction among engineers, and I encourage all of our readers to consider attending. Information on the technical program and exhibition can be found at the IMS web site: <http://www.ims2004.org>

COMING IN THE MAY ISSUE:

Jitter Tutorial—Part 2: Instruments for Jitter Measurement

Understanding Pulsed I-V Measurements

'RFAL' Technique for Cancelling Distortion in Power Amplifiers

Product Coverage: Test Equipment and Power Devices