More Moore?

15 SEPTEMBER 2015

Symposium booklet

- To Infinity

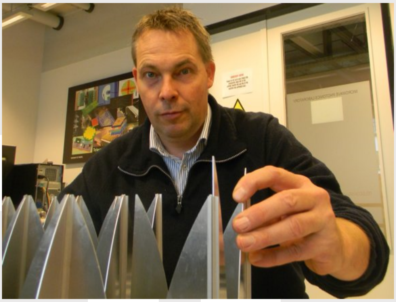
Introduction

Dear visitor,

It is our pleasure to welcome you at our lustrum symposium of the study association E.T.S.V. Scintilla. Our lustrum carries the theme to infinity, so the symposium committee named the symposium: More Moore. This universal law known among Electrical Engineers predicts that the number of transistors on a chip is doubling every 18 months. To carry the number of transistors onwards to infinity we have to be creative and innovative. During this symposium some of the most profound companies our little country knows share their developments in the field of Electrical Engineering with us. Are we still capable of keeping up with the never-ending trend of doubling transistors or will it become: no more Moore or more than Moore?
We as a symposium committee are very proud to provide you with a day you'll never forget and hope you will enjoy it as much as we do.

Max Vervoort
Chairman symposium committee 2015

Chairman



Mark Bentum was born in Smilde, The Netherlands, in 1967. He received the MSc degree in Electical Engineering (with honours) from the University of Twente, Enschede, The Netherlands, in August 1991. In December 1995 he received his Ph.D. degree for his thesis "Interactive Visualization of Volume Data" also from the University of Twente.
From December 1995 to June 1996 he was a research assistant at the University in the field of signal processing for mobile telecommunications and medical data processing. In June 1996 he joined the Netherlands Foundation for Research in Astronomy (ASTRON). He was in various positions at ASTRON. In 2005 he was involved in the eSMA project in Hawaii to correlate the Dutch JCMT mm-telescope with the Submillimeter Array (SMA) of Harvard University. From 2005 to 2008 he was responsible for the construction of the first software radio telescope in the world, LOFAR (Low Frequency Array).
In 2008 he became an Associate Professor in the Telecommunication Engineering Group at the University of Twente. He is now involved with research and education in mobile radio communications. His current research interests are short range radio communications, novel receiver technologies (eg. in the field of radio astronomy) and sensor networks.
He is a Member of the IEEE, NERG, KIVI and the Dutch Pattern Recognition Society and has acted as a reviewer for various conferences and journals.

Program

8.30 - 8:45	Entry and reception
8.45 - 9.00	Opening
9.00 - 9.45	Bruco
9:45 - 10.30	Nedap
11:00 - 11.45	ASML
12:00 - 12.45	Astron/IBM
12.45 - 14:00	Lunch and Information Market
14.00 - 14.45	NXP
14:45 - 15.30	Technolution
16.00 - 16.45	Dialog Semiconductor
16:45- 17:00	Conclusion
17.00 - 18:00	Drinks
18.00 -	Dinner

Information Market

During the lunchbreak there will be an information market with stands from following companies:

- NXP
- Arcadis
- Dialog Semiconductor

Bruco Integrated Circuits

Live streaming on Planes!

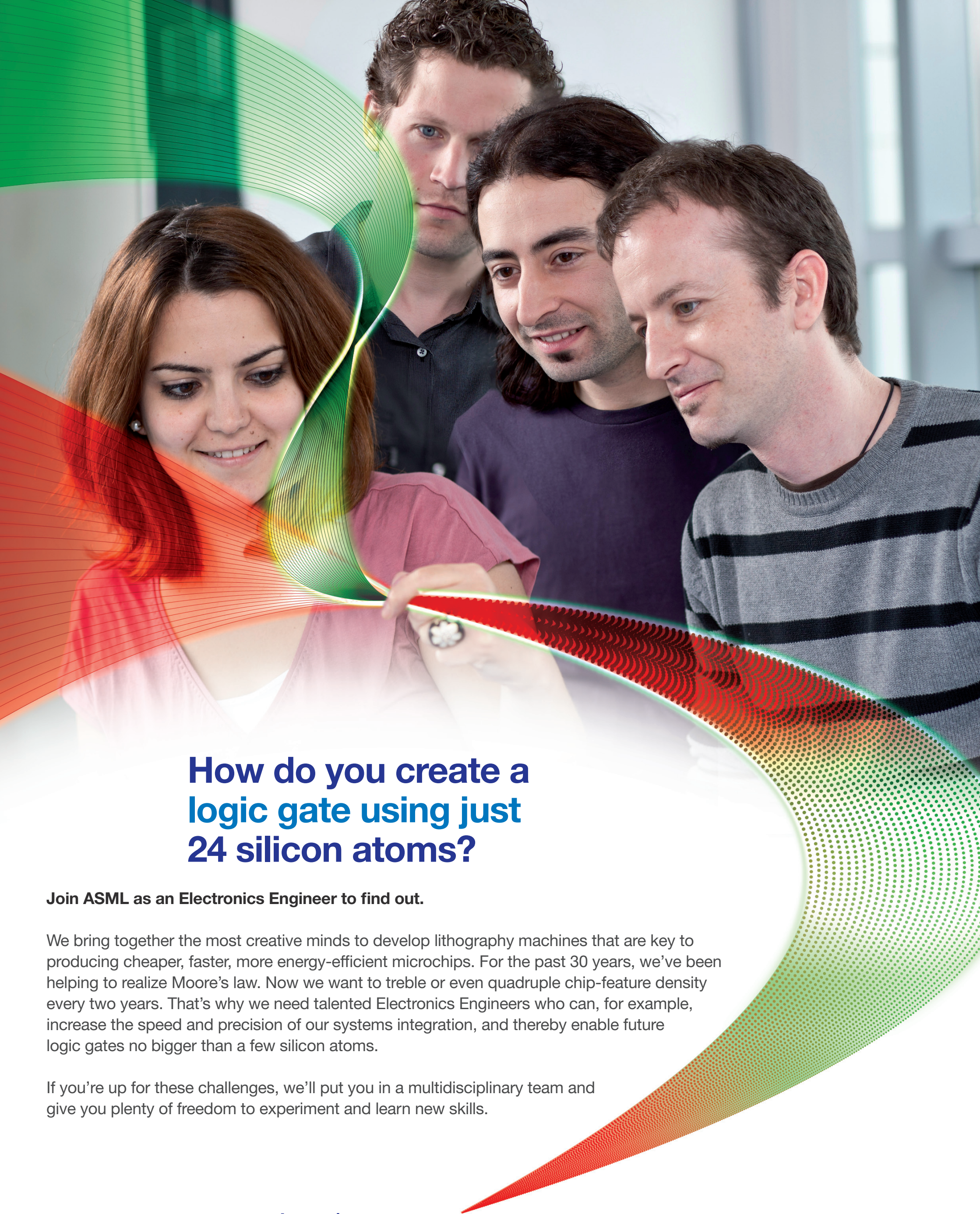
A highly integrated Ku-band (10.712.75 GHz) planar phased array receiver of 64 antenna elements is presented. It features instantaneous reception of the full Ku-band (2.05 GHz wide) in two orthogonal polarizations with wide scan angles by using time delay instead of phase shift. The receiver is part of a system for satellite broadcast TV reception on board of moving vehicles. Two SiGe radio frequency integrated circuits (RFICs) were developed, packaged in ceramic BGAs and assembled onto a 15-layer printed circuit board (PCB) which integrates the antenna elements. It sets a new standard in integration density. The receiver has extensive analog signal processing at intermediate frequency (IF)-level. A novel bipolar implementation for true time delay is proposed, with a continuous programmable delay range of 0...80 ps with less than 2.5 ps group-delay variation in 2 GHz bandwidth (BW). The wide BW calls for a constant group-delay implementation in the IF chain. The receiver (RFIC) consumes only 132 mW per channel. Each channel has 40 dB gain.

Jurjen Tangenberg received his B.E. degree in electronics engineering from Rens & Rens polytechnical school, Hilversum, The Netherlands, in 1995 and the M.S. degree in electronics engineering from the University of Twente, Enschede, The Netherlands, in 1998. In 1998, he joined Ericsson Eurolab Netherlands, Emmen, The Netherlands where he helped to develop the first single chip Bluetooth radio in RFCMOS. Since 2003 he works at Bruco Integrated Circuits as RFIC design engineer. His interests are in IC-technology and high-frequency circuit design of RX/TX radio parts.
Marc van der Vossen was born in 1980 in Lisserbroek, The Netherlands. He received his B.Eng degree from HTS Haarlem in 2004. He then joined Thales Netherlands where he worked on, among others, X-band TR modules and Ka-band solid state transmitters. In 2010 he started at Bruco Integrated Circuits as RF Application design engineer and is now working in analog and RFIC design.

Nedap
Rain RFID

There is currently a lot of buzz and hype around the Internet of Things. People build all kinds of crazy and cool applications that were impossible to imagine only a few years ago. However, if you look more closely, these are not things - those are actually devices! Imagine what would happen if you could connect real things (without power socket, battery or solar cells) to the internet? Like your beer bottles (real-time beer fridge inventory), your clothing (yep, laundry time) or your cat ()?
There is only one technology that enables this: RAIN RFID. Using extremely cheap ICs (100 times cheaper than Bluetooth Smart/LE) the technology still reads hundreds of tags per second over distances of more than ten meter. This explains why retailers are using this technology to track goods in their supply chain, hospitals to track equipment and the Batavierenrace to track runners. Some people are even connecting cameras or accelerometers to those chips, allowing wireless and battery-less sensors!

Danny Haak will explain the technology in the presentation, and will learn you on the real Internet of Things, being made possible by more Moore. Of course there will be a demo!



ASML

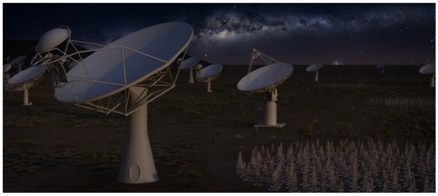
The key to Moore's Law: Lithography

The phenomenal growth of the semiconductor industry has been driven by Moores Law, named after Intel co-founder Gordon Moore. In 1965, Moore predicted that the number of components on a chip would double every 12 months; he later adjusted the period to two years. Moore's Law has inspired generations of engineers to push technology forward, as manufacturers strive to stay ahead of their competitors and fulfil the prediction.
As a company that makes the lithography machines to manufacture these chips, Moores Law also drives our business. In fact, the key to making transistors on a chip smaller is lithography.
For three decades, we have kept up with Moores Law by constantly improving the capabilities of our lithography machines, allowing our customers to make smaller, faster and more energy-efficient chips. To make this happen, we invest heavily in developing cutting-edge technology. We employ more than 5,000 engineers in research and development (R&D), with an annual budget of around €1 billion. Our major R&D sites are in the Netherlands (Veldhoven), at three locations in the United States (Wilton, Santa Clara and San Diego), in Taiwan (Linkou) and China (Shanghai). This R&D investment results in constant innovation, enabling our customers to develop chips for new devices and new applications, benefiting us all: from smartphones and wearable sensors, to tablets and car electronics.
At the heart of ASMLs product portfolio is the lithography system (scanner). To help our customers sustain Moores Law and shrink the size of transistors on a chip, we must continuously improve the capabilities of our systems to image smaller features with accuracy. The presentation will focus on the current technology and how ASML contributes to the continuation of Moore's Law with the next generation lithography systems, known as EUV.

dr.ir. Gerbert ten Brinke was born in Enter, The Netherlands, in 1979. After finishing Electronics, MTS Hengelo and receiving a BSc in Computer Technology, Saxion Enschede he started Electronics Engineering at the University of Twente where he received his MSc.In 2011 he received his Ph.D. degree for his thesis Automated Coronary Flow reserve Assessment Using Planar X-ray Angiography also from the University of Twente.
Since August 2010, Gerbert is working at ASML, Eindhoven. Two years as an embedded software designer for the NXT waferstage and currently as mechatronics design engineer as a member of the functions team. This team is responsible for the functional behavior of the waferstage in the scope of electronics, mechanics and software.

The SKA radio telescope computing challenges

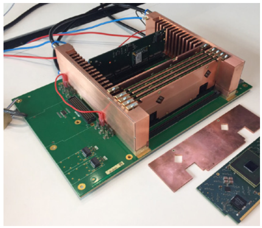
The Square Kilometre Array (SKA) is the next-generation radio telescope currently being designed by an international consortium.



Artist's composition of the entire SKA1 array, with SKA dishes and MeerKAT dishes in Africa and low frequency aperture arrays and ASKAP dishes in Australia. Credit: SKA Organisation

The SKA sensitivity requirements will turn the SKA telescope into an exascale machine requiring the computational power of about a hundred million PCs and producing data rates exceeding the global internet traffic of today by far.

The ASTRON & IBM Center for Exascale Technology is a research centre, located in Dwingeloo, Drenthe on the Campus of ASTRON, the Netherlands Institute for Radio Astronomy. At this centre ASTRON and IBM jointly carry out fundamental research into technologies needed to develop the SKA radio telescope. These technologies include nano-photonics, accelerator technologies, 3D chips, new data storage techniques, but also novel algorithms.



The IBM-ASTRON 64-bit Microserver made its debut at CeBIT 2015 in Hannover, Germany.

ASTRON is the Netherlands Institute for Radio Astronomy. Its mission is to make discoveries in radio astronomy happen, via the development of novel and innovative technologies, the operation of world-class radio astronomy facilities, and the pursuit of fundamental astronomical research.

IBM Research is now in its 70th year, IBM Research continues to define the future of information technology with more than 3,000 researchers in 12 labs located across six continents. Scientists from IBM Research have produced six Nobel Laureates, 10 U.S. National Medals of Technology; five U.S. National Medals of Science, six Turing Awards, 19 inductees in the National Academy of Sciences and 14 inductees into the U.S. National Inventors Hall of Fame.

For more info visit:

- www.astron.nl
- www.dome-exascale.nl
- www.ibm.biz/skadome

Netherlands Institute for Radio Astronomy

ASTRON and IBM
The SKA radio telescope

The Square Kilometre Array (SKA) is the next-generation radio telescope currently in the design phase. It aims at becoming the world's largest radio telescope allowing scientists to map the universe at a time when the first stars and galaxies were forming. It will also investigate gravitational radiation by observing pulsating stars (pulsars), and it will conduct deep surveys helping to unravel the nature of dark energy. The flexibility of the SKA will also allow investigating new transient phenomena. The extreme sensitivity of the SKA telescope will be reached by deploying thousands of telescope dishes and antennas, by utilizing very wide bands of the radio spectrum, and by observing large instantaneous fields of view. These properties will turn the SKA telescope into an exascale machine requiring the computational power of about a hundred million PCs and producing data rates exceeding the global internet traffic of today by far. Not only the computing and data transport will be challenging, but also the energy bill accompanying it. In order to be able to face the computing and data transport challenges, the ASTRON-IBM project DOME was launched three years ago. In this project researchers are investigating (a) sustainable green supercomputing" - reducing the energy consumption of computer systems, (b) extreme streaming - real-time processing of gigantic data volumes, and (c) nano-photonics - optical technologies for superfast data transport. These technologies include nano-photonics, accelerator technologies, 3D chips, new data storage techniques, but also novel algorithms. The presentation will give an overview of the signal processing principles of the SKA telescope, followed by a description of the approaches and results of the DOME research.

Albert-Jan Boonstra is Scientific Director of the DOME Project and is Programme Manager Technical Research at ASTRON, the Netherlands Institute for Radio Astronomy in Dwingeloo. His scientific interests lie in the area of signal processing and scientific computing. In the nineties he coordinated the upgrade of the Westerbork Synthesis Radio Telescope (WSRT), after which he investigated temporal and spatial filtering techniques for suppressing radio interference at the WSRT. He conducted this research both at the R&D laboratories in Dwingeloo and at Delft University of Technology. Albert-Jan started his career at SRON Groningen where he conducted cryogenic optical and infrared test on the SWS spectrometer of the infrared astronomical satellite ISO. He also led several groups at ASTRON and headed the R&D dpt. a.i. Albert-Jan studied Applied Physics at the University of Groningen, and received his PhD at Delft University of Technology.

NXP

Moores Law at work in NXP

After a short introduction on NXP and its activities in the Netherlands, we will illustrate how Moores law is driving IC design innovation. Several examples are shown that demonstrate how design techniques are used to translate the semiconductor technology advancement into new applications, increased functionality and/or better performance.

Remco van de Beek received the M.Sc. degree in Electrical Engineering from the University of Twente in 1999. In 2004, he received the Ph.D. degree on the subject of High-speed low-jitter frequency multiplication in CMOS from the University of Twente. In 2004, he joined Philips Research Laboratories Eindhoven. In 2006, he moved to NXP Semiconductors, Research, and is currently in the Low Power Radio Solutions group which is part of the automotive business unit. In the past, Remco has worked on fast-hopping frequency synthesis for ultra-wideband and on front-ends for increased data rates in contactless smart cards and NFC.

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Technolution

A domain-specific language for electronics design: a paradigm shift

Ever since electronic circuits began to be designed, schematic drawings have been used to capture the design. But is a schematic drawing always the best way to do this? Is it possible to improve the electronics design process using alternative ways of design capture? How can the amount of effort required be reduced for example? And what paradigm shift needs to be introduced to achieve this? In conventional electronics design, schematics are the de facto standard. For analog parts of the design the reason is obvious a picture says more than a thousand words. However, in order to obtain the information required for PCB design, a lot of detail needs to be added. This detail is then either not visible, or the schematics become unreadable. When DDR SDRAM is connected to an FPGA, for example, a drawing requires almost a complete sheet; and drawing it requires a lot of effort. Moreover, the layout constraints remain hidden behind the sheets surface, even though these constraints are very important for PCB design. What is needed, therefore, is a solution that reduces the effort involved, while making hidden information visible. Technolution has devised just such a solution by introducing Hardware Design Language (HDL). This is a domain-specific language that defines circuits based on text. HDL allows DDR SDRAM, for instance, to be implemented in a few lines of text, while all information, including the layout constraints, remains visible at all times. By combining our HDL with schematic capture for analog parts of the design we have created the best of both worlds.

Gideon Zweijtzer is System Architect at Technolution B.V. After he successfully completed the study Electronic Engineering at Delft Technical University, Gideon started as an electronic designer at Technolution 16 years ago. Digital designs being his expertise, he brought the use of programmable logic, and FPGA design in particular, to a higher level within the company. He has always shown affinity with tools, methods and automation. In an attempt to use the good ideas of different design disciplines, in the last two years Gideon has been the driving force behind the design and development of HDL, the Hardware Description Language.

Dialog Semiconductor

From More-Moore to More-than-Moore: Enabling wearable devices to interact with the outside world using smart sensor fusion.

In 2014 Dialog Semiconductor introduced the worlds lowest power and smallest Bluetooth Smart System-on-a-Chip. This device combines analog, digital and radio frequency functionality on a single chip and is perfectly positioned to enable low power wearable applications. We will start with a short introduction to the company, the product and the market, and then focus on a particular function called sensor fusion that aims to provide a single stream of information with the best possible accuracy by combining multiple types of lower accuracy sensors. Sensor fusion is relevant to a wide range of wearable applications including context awareness, gesture recognition, health and fitness monitoring and personal navigation.

Drs. Wessel Lubberhuizen received his degree in Experimental Physics from Utrecht University in 1996. He started his career as systems engineer for Ericsson Eurolab Netherlands in Enschede, where he specialized in digital signal processing for radio receivers. Subsequently he was a consultant at Inspiro for numerous clients, including Astron, Peek Traffic, International Datacasting Corporation, ChampionChip, and Greenpeak Technologies. In 2008, he joined SiTel Semiconductor, which was acquired by Dialog Semiconductor in 2011. He currently holds a position as Member of Technical Staff. His interests are: Digital Signal Processing, Model-Based Design and Systems Architecture. He is author of several patents.

Committee

This symposium is organized by the symposium committee of E.T.S.V. Scintilla. E.T.S.V. Scintilla is the student association for electrical engineering. This student association is founded nearly 50 years ago, on September 9, 1965. Nowadays the association has about 450 members of which 350 study electrical engineering.

Bottom, from left to right:

- Roelof Grootjans
  Lead Graphic Designer
- Tobias Feijten
  CCP
- Martijn Schouten
  Logistics Manager
- Silvo Jeunink
  Treasurer

Top, from left to right:

- Jippe Rossen
  CCP
- Gertjan Eenink
  External Relations
- Max Vervoort
  Chairman
- Maurice Baveco
  Secretary


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