NEWSLETTER of the SID-MID EUROPE CHAPTER

S I D – M E

SOCIETY FOR INFORMATION DISPLAY

Nr. 7, June 1999

Ernst Lüder - Professor emeritus

About 350 guests attended the moving Farewell Colloquium organized Friday, April 23, 1999, by the University of Stuttgart to honour Ernst Lüder, one of its prominent faculty members and a leader in display technology, who reached the age of retirement.

Ernst Lüder has been attached to Stuttgart University as student of electrical engineering, research assistant, lecturer and as full professor. His early research work dealt with topological issues in networks and his first lectures were on Systems Theory and Stochastical Processes. From 1968 to 1971 he has worked for Bell Telephone Laboratories in Holmdel, USA, designing and optimizing miniaturized filters for telephone applications.

In 1971 Lüder took the Chair for Network- and Systems Theory. In his Institute he has worked on thin film circuits and filters, which paved the way to large area electronics for flat panel displays. Supported by the Federal Ministry for Research and Education and the local government of Baden-Württemberg, Ernst Lüder has built the Laboratory for Screen Technology, which was operational in 1990. In addition to his on-going research in the field of digital and analog signal processing, Lüder and his students have contributed to the science and technology of a-Si-, poly-Si and CdSe-TFTs and MIMs for direct view and projection displays, cholesteric and ferroelectric bistable displays and PDLCs.

His important contributions in both fields of engineering science were emphasized by two guest lecturers during the Colloquium. Prof. Mathis talked about 'Physical Aspects of the Theory of Electrical Networks' and drew a fascinating picture of the advances from the early days of Ohm and Kirchhoff to nanostructures and quantum computers. Malcolm Thompson, Palo Alto, USA, gave a lecture on 'The Present State of Technology and Business of Flat Panel Displays' which culminated in his 'holy grail of plastic knowledge appliance', the visionary ultimate integrated display for the knowledge age.

The last speaker of the Colloquium was Ernst Lüder himself, succesfully attempting to integrate his competences in both areas of engineering science with his presentation on 'Optical Signal Processing Using Display Components'. It was a great lecture with an impressive demonstration how spatial light modulation could be used in ultrafast signal processing. Ernst Lüder closed his lecture saying 'that among all the nice things I have encountered in my career it was the permanent dialog and interaction with bright young people to find optimal solutions which I liked best'.

The Colloquium started and ended with selected pieces of music, performed by members of Lüder's Institute who proved that they are not only perfect in signal processing and PDLCs but also with the violin, the cello and the piano.

Dietmar Theis

SID-Mid Europe Chapter meeting at Nokia, Espoo, Finland, March 25-26, 1999

The spring meeting of the SID-ME Chapter was held at Nokia Headquarters in Espoo, Finland and was dedicated to **Displays for Portable Terminals**.

About 72 people attended the meeting. The Nokia Headquarters are located in a building of architectonical beauty with a lot of glass, called the Nokia House. It was designed by the Finnish architect Pekka Helin. The inside, designed by Liris Ulin, is even more impressive, with it's high open space, in which veils like surfing sails are hanging, reminding me of the artist Panaramenko. It is the working place of more than 1000 people. The starting point in the total design was: 'Connecting People'.

The participants were welcomed by *J. Kimmel*, the organizer of the meeting, who gave a short introduction on Nokia. It is an international telecommunications group, employing about 38000 people worldwide. In 1997, the net sales were $9.8 billion. Nokia has a total of 36 R&D centers in 11 countries with more than 10000 employees.

Next, *D. Theis*, chair of the Chapter, thanked J. Kimmel for his personal effort in organizing the meeting and reminded the participants of EuroDisplay'99, which will be held from September 6-9 in Berlin.

The first speaker of the **Plenary Session** was *H. Huomo*, Vice-President Research and Technology, Nokia Mobile Phones, who presented a paper about 3rd Generation Drivers. The 1st generation of mobile phones was analogue with a moderate voice capability, a circuit oriented data capability of 2.4 kbits/s and the design was driven by voice. The 2nd generation, driven by voice and data, had a digital modulation with a good voice capability and a circuit oriented data capability of 9.6 kbits/s. The 3rd generation is driven by data and voice, has a digital modulation with a wireline voice quality and is packet oriented, with a data rate of 144 kbits/s outdoors (2 Mbit/s indoors). It will start in 2001 in Japan. Important in future will be the arrival of colour pictures on phones. The fastest grow is in messages, which is simpler and faster than voice and, in combination with images, more attractive. The convergence of the contents voice, picture and data will lead to Personal Multimedia.

The next paper about Mobile Phones of Tomorrow was presented by *J. Luukkainen*, Nokia Mobile Phones. He showed the evolution in Mobile Phones, from hardly portable (5 kg) and expensive ($5000), of which 200 per day were made from 1984-1988, to the low-cost lightweight phones of today. He mentioned the key parameters for mobile displays, which are: size, resolution, total power consumption, environmental properties, readability, quality and cost, of which cost is of utmost importance. The future displays must fulfil the following requirements: high resolution, gray scales and colours, videospeed, small wasted areas, thin structure, ultra-low power consumption, operational and readable in a wide range of conditions, robust, lightweight, high quality and low cost. The interface should be simple and serial, fast with low EMI and perhaps common for all future mobile displays.

The following speaker was *J. Nijst*, Philips LCD Cells and Modules, who talked about Display Solutions for Mobile Terminals. He mentioned the different phone standards of the generations 1, 2, 2^+ and 3. For videophone he saw the 'telefax dilemma': you need one at the other side, and therefore it won't come fast. The present GSM phone will evolve into a smart phone, the present PDA will evolve into a smart phone by addition of telecom and multimedia functions. For the coming years a wide range of display technologies is required, like PMLCD, AMLCD and OLED/PLED. There will be an increasing information content on mobile devices.

After the lunch the elections for the SID-ME Chapter Committee took place. You will find information about these elections in the next article.

In the afternoon session **LCDs in Mobile Terminals**, *S. Doe*, Nokia Mobile Phones, discussed Mechanical and Environmental Considerations for LCDs in Mobile Terminals. He mentioned the mechanical requirements for mobile phones like the drop test (1.5 meter on concrete!), the random vibration and resonance search test. The LCD can have glass breakage and poor electrical connections. The environmental requirements for mobile phones are related to damp heat and dust and water ingress. The LCD is mainly sensitive to airborne contaminants. Moisture can degrade the LC material and the polarisers. Air can intrude into LCDs with plastic substrates. Most mobile phone use at present FSTN-LCDs. The mobile phone operating temperature is -30 °C to +70 °C. Temperature effects mainly affect the optical properties of the LC material, the polarisers and the retardation foil.

The next speaker was *M. Antila*, Nokia Mobile Phones, with a paper about Communicator Displays. A communicator display is preferably 1/2 VGA or VGA. For instance, the Nokia 9000 communicator display is a reflective FSTN-LCD with 640x200 pixels, 8 gray scales, 0.18mm square dot pitch and an area of 41 cm^2. The successor Nokia 9110 weights 252 g, which is 36% less, has a 37cm^2 display area, 16 gray scales and an EL backlight of 2 cd/m^2. In future the display will be of high quality and large in a small device, so that the display is larger than the case! For future communicator displays, he compared reflective/transflective B/W and colour LCDs, transmissive colour LCDs, LCDs without polarisers, multistable LCDs, Poly-LED displays and FEDs. Finally he mentioned the desired properties

of the ultimate communicator display, like video capability, very high resolution, perfect colours, thinness like paper, robustness and light weight like a sheet of titanium.

H. Wegener, Schott-Desag AG, presented Thin Glass Substrates for Mobile Applications. The general trends in mobile display applications are reduction of thickness, weight and parallax and introduction of new features like flexibility and colour. He discussed the float process, which is a high-speed process, suitable for thicknesses of 0.7 to 15 mm, but which gives a lower yield for thin glass. For thin glass of 0.03 to 2 mm, Schott-Desag has a special process, consisting of melting and down drawing. Both alkaline-free borosilicate glass AF45 and low-alkaline borosilicate glass D263 are available. AF45 is used in PALC and EL, D263 in mobile phones, pagers, PDAs and FEDs. The last slide showed an impressive 42" sheet of 50µm thickness for PALC.

The next session **Backlights and Films** opened with a paper from *H. Cornelissen*, Philips Research Eindhoven, about Frontlights for Reflective LCDs. Compared to the 60% reflectivity in transflective LCDs, the reflectivity of reflective LCDs is improved to nearly 100%, while an in-cell mirror ensures the absence of parallax, so that a higher resolution may be obtained. However, an auxiliary illumination by means of a frontlight is required. He discussed various solutions of plastic sheets with micro-optical features. In his own design strongly asymmetrical grooves with varying pitch and a flat surface in the space between the grooves were used. The design was analysed with raytracing software and prototypes were made by precision diamond machining in PMMA sheets. The angular distribution of the light to the display and the stray light to the viewer were analysed with a conoscopic measurement set-up. The varying pitch turned out to be necessary to obtain a uniform exposure of the display.

E. Jostes, 3M, presented a paper on Transflective Films for Paperwhite Displays. The transflective films are based on a new thin-film multilayer construction, that allows for over 800 layers in a 130 micron film. By proper combination of the individual layers a broadband polarizer is designed, that is transmissive for one polarization axis and highly reflective for the other. Instead of crossed polarizers and >50% absorption loss, he suggested parallel polarizers, where the lower polarizer is the reflective one. The brightness in reflected mode nearly doubles in this way! Furthermore, the display colour turns from grey greenish to white and the graininess is replaced by a smoother appearance. In the transflective mode, contrast reversal occurs. This gives a quicker adaptation of the human eye. However, under certain intermediate lighting conditions the contrast may disappear. Therefore, a colour contrast is introduced to prevent this wash-out. The demonstrated reflective display was very bright and quite convincing.

In the session **Display Characterization**, *M. Lindfors*, Nokia Display Products, discussed Characterization of Mobile Phone Display Performance in Indoors and Outdoors Ambient Lighting Conditions, Applying ISO 9241-7. The question is whether ISO 9241-7, which is meant for monitors under office conditions (500 lux ambient light) is usable for mobile phone designers. He showed the typical diffuse illuminations and luminances in various conditions, like general space, indoor traffic areas, homes, outdoors daylight and offices. He then treated the ISO norm in brief. It was designed as a first practical method for anti-glare evaluation of monitors, and was based on ergonomics research by Kubota (Japan) and Kokoschka (Germany). Mobile phones are used in illumination levels of 1 to 100 000 lux, with glare sources of 125 to 100,000 cd/m^2. The main conclusion was that the basic concept of ISO 9241-7 is useful for mobile phone analysis and provides a tool for simulation of design alternatives.

The rest of the afternoon we visited Planar International in Espoo. *T. Bruhn*, Managing Director of Planar, Finland, gave an overview of the company. The factory was founded in 1983 and in 1990 became part of Planar. It is located in Finland, Oregon and Wisconsin. It is mainly manufacturing EL displays, but also supplies AMLCD, LCD, miniature and other displays. It has more than 950 employees, of which about 240 are located in Espoo. In 1998, the turnover was $129 million, compared to $14.4 million in 1990. The consolidated sales are for 79% in the USA and for 21% in Europe and Asia Pacific. The applications are in medical, business office, instrumentation, transportation and so on, of which transportation is fastest growing.

Next, *A. Pakkala*, Director, Global Product Engineering, gave an overview of the products. Originally, only EL displays were made. At the moment a wide range of displays and backlights are supplied. The Planar Difference is that these displays have a wide temperature range, a wide viewing angle, sunlight viewability, high reliability and extreme durability. In production are EL, LCD, CRT, backlights and miniature displays. R&D is done on EL, OLED, AMLCD components, FED and advanced phosphors. The key future product lines will concentrate on high-performance colour AMLCD, low-power reflective LCD, high-volume small graphic EL displays and systems with AMLCDs, passive LCDs and EL displays.

Next, different displays were shown, like colour EL with a white phosphor and colour filter, see-through EL panels, miniature EL panels, AMLCD and state-of-the-art organic EL displays from Pioneer (car radio) and Uniax. Then, a tour through the factory was made, to watch some of the processes.

In the evening we had a marvellous diner in Restaurant La Tour. These social happenings are as important as the sessions to get to know the people of European display businesses. Everybody was obviously enjoying the pleasant company and the splendid dinner with choice of wines!

On the second day the first session was about **New Technologies**. The first paper Virtual Displays as Accessories was presented by *T. Levola*, Nokia Research Center. He discussed the problem that mobile phones are getting smaller, while their displays are becoming larger. The resolution of present displays is far too low for video, still images or browsing the web. SVGA should be good enough, but VGA on a direct-view display in a phone is already beyond the resolution of the eye. The conclusion is that a display is needed which is larger than the phone itself! The solution is to create a virtual image of a miniature display with the aid of optics. The monocular, biocular and binocular approaches were discussed, the viewing comfort, the desired field of view (FOV) and the resolution. Different display solutions were mentioned, of which AMLCD is most suited, especially LC on a silicon chip (LCOS). This will be the dominant display panel. The frame rate should be >85 Hz, the FOV ~30 deg. An increased information transfer rate is required, as it takes 25 minutes to load one SVGA picture with 9600 bits per second!

J. Kaario, Nokia Research Center, presented the paper Wearable Computing and Displays. Examples of wearable computers are PDAs, intelligent watches, GPS devices and mobile phones. They should be comfortable, discreet, quick to access and fashionable. The display options are handheld, head mounted, small (wristwatch) and peek-into-a-hole (virtual display, but not head mounted). He then discussed the head-mounted displays. Different areas can be distinguished on the display. In the middle is the focus area (~1° of vision), which is the part of the user vision area, where the user sees sharply. The user interface area surrounds the user completely. User tracking via sensors and GPS is used to determine the user's position. The benefits of the virtual display are, that a very large size can easily be made. However, there remains still a lot to do. Social acceptance is another issue.

Next, *A. Pakkala*, Planar International, presented New EL Technologies. He gave a short overview of the company, which is market leader in EL technology. Inorganic Thin-Film Electroluminescent (TFEL) displays are based on a simple, compact and reliable solid-state structure. The displays are used in industrial, medical, instrumentation and transportation applications. Main manufacturers are Planar, Sharp (Japan) and recently Denso (Japan). The advantages are the excellent appearance and viewing angle, as the display is emissive. It has a high contrast and fast response time over a wide temperature range. The disadvantages are the higher power, compared to an LCD without backlight, the high voltage drivers and the fact that full colour is not yet proven. He then discussed Organic Light-Emitting Diode (OLED) displays, either based on small molecules or polymers, which are investigated by several companies. Their advantage is the low voltage and the possibility of full colour. In future, flexible plastic substrates will be a possibility. However, the technology, the life time and the high-temperature behaviour are still unproven. He ended with miniature Active-Matrix TFEL displays, which are comparable with LCOS. A full colour prototype with wite phosphor and RGB colour filters has been made. His conclusion was that LCDs will continue to dominate portable applications, that emissive displays will find acceptance because of superior viewing characteristics and that there will be an increasing use of miniature displays.

J. Saarinen, Heptagon Oy, presented a paper on Diffractive Optics for Displays. Heptagon Oy was founded in 1993, as a spin-off of the University of Technology. They specialize in micro optics with diffractive components. These diffractive elements are based on surface modulation or index modulation in sheets. The master fabrication is done by direct writing, replication is achieved by hot embossing, UV casting or replica molding. Applications are in colour filtering, controlled light propagation and polarization, antireflective coatings, flat diffractive lenses, uniform backlighting and 3D displays.

In the last session **Addressing and Power Considerations**, *A. Henzen*, Philips LCD Cells & Modules, explained the Multiple-Row Addressing (MRA) technique. The standard way of driving is the Improved Alt & Pleshko Technique (IAPT). This gives the maximum number of multiplexible rows with a low supply voltage. However, using fast LC materials 'frame response' occurs, which is relaxation of the molecules during the frame time, leading to flicker and a lower contrast. By driving more rows simultaneously with orthogonal signals, several selection pulses, evenly distributed over the frame time, ensure a good behaviour with fast LC materials, i.e. less flicker and no frame response. At the same time, the supply voltage can be lower than in the case of IAPT.

M. Kitamura, Asahi Glass Co. Ltd, discussed Low Voltage Operated MLA-LCDs for Mobile Phone. They developed Multiple Line Addressing (MLA) STN-LCDs for mobile phones. It resulted in a 3V driver for 1/33 duty ratio and a 5V driver for 1/65 duty ratio with reduced power consumption in a low-voltage IC process. The lower voltages of MLA leads to a smaller number of boosters in the capacitive uptransforming of the battery voltage in case of 1/65 duty ratio, and no boosters at all in the 3V driver for 1/33 duty ratio. Because of MLA, crosstalk was eliminated and frame response suppressed. Compared to conventional driving, the driving voltage went down with 40% and the power consumption with 50%.

All together, this was a very valuable and fruitful meeting with a lot of interesting papers. The members of the Chapter Committee want to express their thanks to Jyrki Kimmel, who organized the meeting in a perfect way, including a nicely designed Digest of papers that we could collect at the start of the meeting!

Financial report and elections for the SID-ME Chapter Committee

In the meeting at Nokia the treasurer F. Rochow gave his financial report over the period 01-12-'97 to 31-12-'98. The total income was DM 9238.38, the total expenditure amounted to DM 8735.35. The expenditure for mailings was DM 6488.10. The rebate from the SID USA (for the period of 1994-1997) was DM 2697.38.

There have been discussions with B. Needham, Regional Vice-President Europe, and the French Chapter to come to a common fee for Europe. The French Chapter proposed to set the contribution to 50 or 55 Euro. However, looking at the costs, especially for the mailings, the treasurer wants to fix the contribution for the moment at 60 Euro.

The report of the treasurer was checked by two members and approved by the meeting.

To save costs, H. Cornelissen suggested to stop the mailing of the Newsletter and send it per e-mail, for instance as a .pdf file, to all members, with exception of those, who have indicated that they want to receive it by normal mail.

The Chapter Committee supports this idea. Therefore, if you like to receive the next Newsletters in this electronic way, please send your e-mail address to our secretary Prof. A. van Calster, e-mail: vancalster@elis.rug.ac.be ! If you do not react, you will continue to receive the Newsletters via normal mailing.

We should remind you that the Newsletter can already be found on the SID website www.sid.org.

Next, the elections for the Chapter Committee took place. As there were no other candidates, the members of the Committee, whom you will find below, were elected again for the coming year.

The Chapter Committee proposed to add Prof. Dr.-Ing E. Lüder and Lic.Tech. J. Kimmel to the list of additional members of the Committee, which proposal was approved by the meeting.

Chapter Committee

Dr.-Ing. D. Theis (chair),
Siemens AG, ZT MuK, Otto-Hahn-Ring 6,
D-81730 Munich, Germany,
Tel.: +49 89 636 405 50, Fax: +49 89 636 405 54,
E-mail: dietmar.theis@mchp.siemens.de

Dr.Ir. K.E. Kuijk (vice-chair),
Philips Research, Prof. Holstlaan 4, 5656 AA,
Eindhoven, The Netherlands,
Tel.: +31 40 274 46 36, Fax: +31 40 274 43 35,
E-mail: kuijk@natlab.research.philips.com

Prof.Dr. A. van Calster (secretary),
University of Gent, St.-Pietersnieuwstraat 41,
B-9000 Gent, Belgium,
Tel.: +32 9 264 33 90, Fax: +32 9 264 35 94,
E-mail: vancalster@elis.rug.ac.be

Dipl.Ing. F.Rochow (treasurer),
LMT Lichtmesstechnik GmbH, Helmholtzstrasse 9,
D-10587 Berlin, Germany,
Tel.: +49 30 393 40 28, Fax: +49 30 391 80 01,
E-mail: rochow@lmt-berlin.de

Additional members of the SID-ME Chapter Committee

Dr.-Ing. M.E. Becker,
autronic-Melchers GmbH, An der Rossweid 18,
D-76229 Karlsruhe, Germany,
Tel.: +49 721 962 64 44, Fax: +49 721 962 64 85,
E-mail: autronic-melchers@t-online.de
Dr. Th. Geelhaar,
E. Merck, Frankfurter Strasse 250,
D-64271 Darmstadt, Germany,
Tel.: +49 6151 72 67 56, Fax: +49 6151 72 31 35.
Dr. C.J. Gerritsma,
Jennerlaan 36, 5644 NL Eindhoven, The Netherlands,
Tel/Fax: +31 40 212 30 68.
Lic. Tech. J. Kimmel,
Nokia Research Center,
P.O. Box 100, (Sinitaival 6) FIN-33721 Tampere, Finland,
Tel.: +358 3 272 5484, Mobile: +358 40 580 8967,
Fax: +358 3 272 5322,
E-mail: jyrki.kimmel@research.nokia.com
Prof.Dr.-Ing. E. Lüder,
University of Stuttgart, Pfaffenwaldring 47, D-70550
Stuttgart-Vaihingen, Germany,
Tel.: +49 711 68 57 330 or +49 711 68 57 332,
Fax: +49 711 685 7311,
E-mail: ernst.lueder@ins.uni-stuttgart.de
Prof.Dr. P. Maltese,
University La Sapienza, Via Marmorata 169,
I-00153 Roma, Italy,
Tel.: +39 644 585 428, Fax: +39 647 42 647.
Dr. M. Schadt,
Rolic Research Ltd, Gewerbestrasse 18,
CH-4123 Allschwil, Switzerland,
Tel.: +41 61 487 22 22, Fax: +41 61 487 22 88,
E-mail: martin.schadt@rolic.com

European officers of the SID:

Ms. B. Needham,
Regional Vice-President Europe,
Screen Technology Ltd., Unit D5, Button End, Harston, Cambridge, CB2 5NX, UK,
Tel.: +44 1223 875511, Fax: +44 1223 870955,
E-mail: BNeedham@screentech.co.uk
Dr.-Ing. D. Theis,
Director, Mid-Europe Chapter, Siemens AG, ZT MuK,
Otto-Hahn-Ring 6, D-81730 Munich, Germany,
Tel.: +49 89 636 405 50, Fax: +49 89 636 405 54,
E-mail: dietmar.theis@mchp.siemens.de

Change of SID payment

We would like to ask you to pay your SID contribution in the coming years not to our treasurer, but to the SID in the USA via the invoice, which you receive yearly.
The reason for this change of policy is, that it has turned out that the banks are keeping a considerable amount of money at each payment in Euro. For instance, with every payment of contribution from The Netherlands to Germany, an amount of 12.50 Euro is subtracted for the bank's services. Furthermore, as the staff of the administration of the SID headquarters in the USA is completely changed and is at present a very effective and well-functioning organisation, the reason for direct payment to our treasurer has disappeared.

Calendar

September 6-9, 1999

EuroDisplay'99	Berlin,	Germany

Sept.28-Oct.1, 1999

Display Workshop,	Grenoble, SID-France/Le Club Visu	France

Next meeting of the SID-ME Chapter

Because of EuroDisplay'99, which will take place from September 6 - 9 in Berlin, the October meeting of the SID-ME Chapter will be skipped. Therefore, the next meeting of the Chapter will be in March 2000. The meeting place still remains to be decided.

Copy

If you want to place an article in the Newsletter, which is interesting for the European display society, please send it to:
K.E. Kuijk, fax: +31 40 274 43 35
E-mail: kuijk@natlab.research.philips.com
(preferably as plain text, **not** as a Word or Wordperfect file.)
If you are a member of the SID-ME Chapter but you do not receive a copy of the Newsletter, please contact the secretary:
A. van Calster, Fax: +32 9 264 35 94,
E-mail: vancalster@elis.rug.ac.be

The Newsletter can also be found on the website of the SID under successively:
www.sid.org, Chapters & Meetings, Mid-Europe.