

Faces & Places

APPOINTMENTS

Masanori Yamauchi to be director-general of KEK

Masanori Yamauchi has been selected to be the next director-general of KEK – the High Energy Accelerator Research Organization in Japan – with effect from 1 April. He will succeed Atsuto Suzuki, whose third term as director-general finishes at the end of March.

Masanori is currently director of the Institute of Particle and Nuclear Studies, KEK. After studying physics at the University of Tokyo, he gained his PhD in experimental particle physics for research at the PEP-4 experiment at SLAC, which saw the first major application of a time-projection chamber (TPC) in the study



Masanori Yamauchi. (Image credit: KEK.)

of e^+e^- collisions at the PEP storage ring (CERN Courier January/February 2004 p40). He worked subsequently for 10 years at KEK on the TRISTAN e^+e^- collider, before joining the Belle collaboration at the KEK B-Factory in 1994 as a founding member. He served as a co-spokesperson of Belle in the years 2003–2009, and since 2010 has been a member of the Belle II collaboration at SuperKEKB.

Masanori's appointment is for three years, with the possibility of being reappointed a maximum of twice, for the same period.

AWARDS

Vienna University of Technology honours Felicitas Pauss

On 30 October, the Vienna University of Technology awarded the degree *Doctor honoris causa* to Felicitas Pauss from ETH Zurich. The honour was bestowed in recognition of her outstanding contributions to the field of particle physics, in terms of her scientific achievements, her strong involvement in science policy making, her continuous support of the Austrian particle-physics community and her efforts to communicate the fascination of fundamental science to the general public.

In his *laudatio*, the dean of the Faculty of Physics, Gerald Badurek, highlighted among many scientific accomplishments her leading involvement in two

Felicitas Pauss, centre, at the award ceremony, together with the rector, Sabine Seidler, right, and the vice-rector, Adalbert Prechtel. (Image credit: Vienna University of Technology.)

Nobel-prize-winning discoveries, namely that of the W and Z bosons with the UA1 experiment and, more recently, the Higgs boson discovery at the LHC, where she played a pivotal role in the CMS experiment, in particular for the electromagnetic calorimeter. Her vision and policy-making skills are internationally renowned, and exemplified by the number of scientific and academic committees of which she has



been a member or chair. Most notably, as head of international relations at CERN, she was key in the ongoing development of the organization in the direction of a "world laboratory". She has also been commended as a role model, and for her engagement in transmitting her enthusiasm for being a scientist to the general public.



In a ceremony on 30 November, Bikash Sinha, right, was awarded the degree of DSc *Honoris Causa* by his alma mater, the University of Calcutta, in the presence of the chancellor, Keshari Nath Tripathi, centre, and vice-chancellor, Suranjan Das, left. With an interest in heavy-ion collisions, Sinha has been a leading figure in India's contributions to experiments at CERN's SPS, Brookhaven's RHIC and, finally, in ALICE at the LHC (CERN Courier April 2008 p38). As director of the Variable Energy Cyclotron Centre in Kolkata for 25 years, he oversaw the transition to a superconducting cyclotron. He was also director of the neighbouring Saha Institute of Nuclear Physics for 17 years. Founded in 1857, Calcutta University is the alma mater of Satyendra Nath Bose, who is remembered in the name "boson" for particles that obey Bose–Einstein statistics. (Image credit: Calcutta University.)

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CELEBRATION

Scientific Day honours Schopper's 90th

A Scientific Day took place at the Cyprus Institute in Nicosia on 24 October, to celebrate the 90th birthday of Herwig Schopper. Distinguished scientists from the international scientific community participated, together with eminent people from Cypriot society and government. The day paid tribute to Schopper's scientific achievements and also highlighted his talent for bringing people – and peoples – together.

After a welcome by Constantina Alexandrou, Costas Papanicolas started the series of talks by introducing the Cyprus Institute. Created with the vision to help transform Cyprus into a knowledge-based economy through research programmes and training in technology, it has become a key research and technology institute for Cyprus and the region. Papanicolas acknowledged and thanked Schopper for his involvement in the creation of the institute from the beginning – his roles as a founding trustee and chair of the Scientific Advisory Council were key to the development of the institute's high levels of scientific excellence.

Edouard Brézin, chair of the board of trustees, covered Schopper's many achievements in world science, across a range of nuclear and particle physics, as well as other areas of advanced scientific research. Among his early research projects was the development of the first source of polarized protons. He also became interested and contributed significantly to the evidence of parity violation in β decays, and led one of the first experiments aimed at testing time-reversal symmetry. In addition, Schopper studied neutron–proton and neutron–nuclei total cross-sections, and invented the technique of hadron calorimetry to measure the energy and direction of neutrons. Later, he worked on the development of superconducting proton linacs and particle separators.

Schopper's days at DESY – from the 1970s to the future – were the topic for DESY's former director, Albrecht Wagner. He recalled significant milestones in



Herwig Schopper, sixth from left in the front row, together with the "Science Day" participants. (Image credit: Cyprus Institute.)

DESY's history since its founding in 1959, including the particle-physics programmes at the DESY, DORIS, PETRA and HERA machines. He also looked to the future with the European XFEL project – an X-ray laser laboratory for synchrotron radiation research that will continue the pioneering work at HASYLAB. The future at DESY also includes a hub for particle-physics co-ordination, support for LHC physics, enhanced Tier-2 capabilities in the Worldwide LHC Computing Grid, the International Linear Collider and the IceCube Neutrino Observatory. Schopper served as director of DESY during the years 1973–1980, and under his mandate the laboratory not only made outstanding discoveries, such as the gluon, but also prepared for new ones, for example B mixing. At the same time, DESY started to become a truly international laboratory, opening the door to collaboration with China.

Former director-general of CERN, Luciano Maiani, dealt with the directions of particle physics in the aftermath of the discovery of the Higgs boson. Somewhat paradoxically, the discovery has opened a

critical period for particle physics, with the first run of the LHC providing confirmation of the Standard Model but no sign of new physics. Maiani reviewed perspectives for new physics for the second LHC run at higher energies and at future higher-energy facilities, focusing on the physics of supersymmetry and searches for composite Higgs particles.

CERN's Emmanuel Tsismelis then described Schopper's years as the organization's director-general during 1981–1988. He also looked ahead to the high-energy frontier, in particular through the update of the European Strategy for Particle Physics in 2013. Among the elements underpinning the strategy is the importance of the European organizational model for particle physics. As director-general, Schopper promoted and strengthened this model through enlargement of CERN's member states to include Portugal and the return of Spain. Another important legacy for today – as the scale of facilities for particle physics results in increased globalization of the field – was tireless work that Schopper undertook in this respect to make the Large Electron–Positron

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(LEP) collider a reality. The history of LEP is indeed the history both of Schopper and of the groundwork for the LHC, with the size of the LEP tunnel being decided also in view of the future LHC.

More recently, Schopper has had a key role in the Synchrotron light for Experimental Science and Applications in the Middle East (SESAME) facility. This “third-generation” synchrotron light source – under construction in Allan, Jordan – is a co-operative venture by scientists and governments of the region. Set up on the model of CERN, it will be the region’s first international research centre. Khaled Toukan, SESAME’s director, underlined both Schopper’s key role in this important project as president of the SESAME Council in the years 2004–2008, and his unrelenting support of international scientific co-operation and the advancement of peace through scientific endeavour.

In closing, Schopper himself spoke about 70 years with physics, physicists and other people. He focused on biographical anecdotes and insights into how decisions are taken through personal experience in positions of leadership, and concluded by thanking everyone who had made the day so special and successful.

The day also included the 2014 Hubert Curien Memorial Lecture, given by Carlo Rubbia on the future of energy. He presented a broad look at the challenges facing current energy systems in the context of global warming, and spoke about innovative approaches to sustainability studies as well as specific research activities. In particular, he illustrated the potential of a methane-based society relying on innovative low-carbon technologies – such as methane cracking and the recovery of CO₂ for the production of methanol – to mitigate climate change.

CERN Courier available online 1959–2015

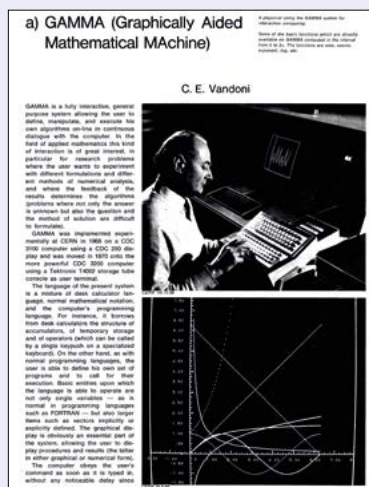
For more than half a century, *CERN Courier* – and until July 2005 the French edition, *Courrier CERN* – has kept its readers up to date about what happens at CERN and at many other places in the world of particle physics. At the end of the 1990s, it entered the digital age, appearing as an electronic journal on the website *cerncourier.com*, in parallel to the paper version distributed worldwide, and became available more recently as a digital PDF edition.

However, for readers without access to well-provisioned scientific libraries, it became more and more difficult to get access to the back issues of *CERN Courier*/*Courrier CERN*, but this has now changed. As of this year, the entire back catalogue is freely available to anyone with access to the internet. All of the issues have been digitized and the text made searchable. Furthermore, all of the pictures and plots have been extracted separately to facilitate the use of this material in conference presentations, on websites, etc. The rights for the reuse of any illustrations must be sought from the original copyright holder, which may not necessarily be CERN.

The old volumes offer remarkable reading. From the days when *CERN Courier* was still a “house magazine”, readers can find out about topics such as “What CERN is doing” (November 1959 p8), as well as recurrent issues such as “CERN staff and how we get them” (April 1960 p4). Even back then, however, the magazine contained news from other laboratories, as the first editor, Roger Anthoine, explained at the time of the magazine’s 50th anniversary (*CERN Courier* July/August 2009 p23). The first edition’s column on “Other people’s atoms” includes items on new linacs at 40 MeV for DESY and 40 GeV for Stanford (August 1959 p6). The latter of course became famous as the SLAC linac, and is still at the heart of the Linac Coherent Light Source (see p19 this issue).

So, readers, take a few minutes to enjoy past stories and return to the new digital collection as often as you like when looking for historical pieces of information.

● For the full collection, visit cds.cern.ch/collection/CERN%20Courier%20Issues?ln=en.



A search on “GAMMA” turns up this page – one of the topics for this issue’s Archive (p17). (Image credit: CERN.)

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Participants at the specialized school. (Image credit: Guillaume Jeanneret-Gris/CERN.)



SCHOOLS

CAS rides the plasma wake

The CERN Accelerator School (CAS) recently organized a specialized course on plasma-wake acceleration, which took place at CERN on 23–29 November.

Following a number of introductory lectures on laser and plasma physics, as well as an overview about conventional accelerators and their limitations, the course covered a large number of aspects in plasma-wake-acceleration schemes. These included creation of the plasma by high-power lasers or particle beams, description of the plasma-creation process in simulations, and characteristics of the accelerated particle beams and results from the latest achievements. Lectures about beam diagnostics, applications of plasma-accelerated beam and topical seminars completed the programme.

The course was attended by 109 students representing 26 nationalities, with most of the participants coming from European countries but also from the US, Israel, India, Korea, Russia and Ukraine. In addition to the academic programme, they also had the opportunity to take part in a typical Swiss-folklore evening and a CERN visit, both of which were appreciated highly by all who took part.

The following CAS courses are planned for 2015: Accelerators for Medical Applications, Vösendorf, 26 May–5 June; Advanced Accelerator Physics, Warsaw, 27 September–9 October; and Intensity Limitations in Particle Accelerators, CERN, 2–11 November.

● For more information, visit www.cern.ch/schools/CAS.

MEETING

The **Top at Twenty** workshop, dedicated to the celebration of 20 years since the discovery of the top quark in 1995, will take place at Fermilab on 9 April. Speakers from all experiments capable of studying the top quark – ATLAS, CMS, CDF and DZero – will present the most recent results of the top-quark studies based on Run II of the Tevatron and Run 1 of the LHC. Theoretical talks on how the top quark fits into the Standard Model and its potential extensions will be presented also. For more information, visit indico.fnal.gov/event/TopAtTwenty15.

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New multi-channel scaler for photon counting applications

The MCS-CT3 is a new multi-channel scaler/counter-timer from ET Enterprises Ltd which can be interfaced with a PC or Laptop via a USB port to operate as a cost-effective, high performance pulse counting instrument. When used with a compatible amplifier/discriminator, such as the ET Enterprises AD8, and a suitable detector, it becomes a wide-dynamic-range photon counting system.

Operation and data retrieval are controlled by a PC using Windows XP, or later, operating systems and the open-source software supplied with the MCS-CT3. A LabVIEW virtual instrument program option is also supplied.

Power for the MCS-CT3 is supplied via the PC USB cable and can also power an AD8 amplifier/discriminator for photon counting applications. This socket can even be used to power an ET Enterprises HVBase/photomultiplier combination with the HV level also being controlled by the MCS-CT3.

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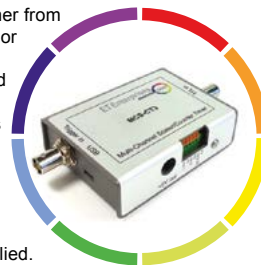
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OBITUARIES

Lowell Bollinger 1923–2014

Lowell Bollinger, a pioneer in nuclear-physics research, died on 25 September at the age of 91.

Bollinger was brought up in India and educated at Oberlin College, where he received his BA in 1943, before working as a physicist at the Aircraft Engine Research Laboratory until 1946. After World War II he attended Cornell, where he received his PhD in 1951, his thesis being on one of the earliest underground cosmic-ray measurements, observing muons 600-m deep in a salt mine.

He joined the Physics Division at Argonne National Laboratory in 1951, and during his long distinguished career played an important role in many areas of nuclear and accelerator physics. Developing a fast chopper at the CP5 reactor, he did definitive work on the properties of neutron resonances and their capture widths. He also pioneered γ -ray spectroscopy, establishing systematics in the decay of neutron resonances and the characteristics of γ -ray cascades in the de-excitation of compound nuclei.

In 1963, Bollinger became director of the Physics Division, serving for more than a decade. During this time he built up a strong contingent of research staff focused on nuclear physics – indeed, Argonne remains a major centre in nuclear physics to this day. When he stepped down as director of the division, it was to lead a small group exploring the possible applications of superconductivity to the acceleration of beams of nuclei. The result was the first successful use of superconducting



Lowell Bollinger. (Image credit: ANL.)

radiofrequency (SRF) technology for the acceleration of sub-relativistic particles aimed at investigations of nuclear structure.

The extremely high “Q” of a superconducting resonator made phase and frequency control a challenge. One of the major accomplishments of Bollinger’s group was development of the combined use of a slow frequency-tuning system and a fast reactance system, to stabilize against vibrations and achieve the synchronization of the RF fields necessary for precisely controlled acceleration. Another achievement was to develop a multi-stage harmonic buncher to shape the time profile of a DC beam to match the acceleration window of the linac. Bollinger’s hands-on involvement in all aspects of the development, including setting up the

required cryogenic system, was crucial. Under his leadership, first a prototype and then a fully funded, successful accelerator – ATLAS – were constructed. ATLAS has since evolved in its capabilities to become a major international user facility for nuclear-structure research.

The pioneering work of Bollinger, Ken Shepard, and their co-workers was followed by a number of other nuclear-physics facilities using SRF for accelerating sub-relativistic particles – at Florida State, Kansas State, Stony Brook, the University of Washington, and TRIUMF in North America, as well as in Europe, Asia and Australia. This demonstration of using SRF technology for accelerating sub-relativistic particles continues to have a major influence on research facilities. It is being applied currently in the Facility for Rare Isotope Beams, a major new facility for nuclear physics under construction at Michigan State University, and a number of similar projects worldwide. It is also the basis of the high-intensity linac injector project at Fermilab.

In recognition of Bollinger’s achievements, the American Physical Society awarded him the 1986 Tom W Bonner Prize for “his contributions to and leadership in the development of the superconducting linear accelerator for the production of high-quality ion beams, a new technology that broadens the base for nuclear structure research”.

● *His friends and former colleagues at Argonne.*

Anselm Citron 1923–2014

Anselm Citron, one of CERN’s pioneers and an enthusiastic scholar and internationally renowned researcher, passed away on 8 December at the age of 91.

He contributed considerably to establishing the research programme of the Institut für Experimentelle Kernphysik (IEKP) at Karlsruhe University – now the Karlsruhe Institute of Technology (KIT) – where he continued to take an active part in matters until shortly before he died. His scientific achievements lie in fundamental and seminal work in the area of accelerator technology, which in many cases still finds applications

today, and in his contributions to physics with exotic atoms and hadrons, including the intriguing observation of a glueball candidate. He was a member of the renowned German Academy of Sciences Leopoldina.

Citron was born on 27 March 1923 in Stettin (then in Germany, today Szczecin in Poland). In 1934 his family moved to Freiburg, where he went to high school, until, to escape the persecution of people with Jewish roots, he was sent to the Netherlands. He obtained his matriculation in Zutphen, followed by a short period at a technical high school. He was then transferred to the

Eastern Front during the last stages of the Second World War, and returned in 1945 to Freiburg. There, he studied physics at the institute of Wolfgang Gentner, obtaining his PhD for investigations of large air showers in the mountains of the Schwarzwald. In 1952 he married Renate Lais, and together they raised five daughters.

After obtaining his PhD, Citron started as a postdoc at Cavendish Laboratory, Cambridge, in 1952, to take part in research on accelerator physics. A year later, he went to the newly founded CERN as one of the first 12 staff physicists. There he contributed

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to the construction of the 28 GeV Proton Synchrotron (PS), where he was responsible for the high-frequency power system and beam shielding. After this, he moved to work on the CERN Synchrocyclotron (SC), where he constructed the first muon channel with strong focusing.

In 1964, Citron was sent to Brookhaven National Laboratory to work in the machine division. Several offers of professorships in Marburg, Munich and Karlsruhe ensued, and he decided to go to Karlsruhe University in 1965, joining and expanding the IEKP founded by Herwig Schopper. Citron had a professorial chair in Karlsruhe until 1991, and at the same time was director of one of the three institutes for nuclear physics. Together, the institutions under Citron had a staff of 280. After restructuring, IEKP and the Institut für Kernphysik continue to exist at the recently founded KIT, focusing on elementary particle physics and astroparticle physics.

During his tenure, Citron's research projects included the following highlights: the development of high-frequency superconducting cavities, which are still being used in contemporary accelerators; studies at the light-ion accelerator KALIF at Karlsruhe; the development of a 1 MW gyrotron for plasma heating inside fusion reactors; and the development of electron cooling at the Low Energy Antiproton Ring (LEAR) at CERN.



Anselm Citron, front, looks at a quadrupole for the muon beam at the SC with, left to right, Bengt Hedin, Marinus van Gulik and Pierre Lapostolle. (Image credit: CERN-GE-6104308.)

In parallel, he initiated research efforts at international laboratories, CERN and PSI, with noteworthy highlights including: precise measurements with muonic, pionic and antiprotonic atoms; pion-induced reactions with light nuclei at CERN and PSI; meson spectroscopy with antiprotons with the Crystal Barrel experiment at LEAR, for which the crystal calorimeter was constructed in Karlsruhe; and observation of the $f_0(1500)$, a glueball candidate.

Citron was also a dedicated teacher. He supervised many PhD and habilitation theses. As dean of the Physics Faculty, he laid the foundation for the contemporary research profile in Karlsruhe. He was particularly dedicated to the needs of junior

staff members, which was also evident in his strong engagement with students supported by the Deutsche Studienstiftung (an elite student programme).

We remember Anselm Citron dearly, as a highly esteemed colleague who was greatly appreciating and respected. Not only an internationally renowned scientist who paved the way in modern particle-physics research, he was also a valuable mentor to the members of the IEKP. He acted as an example for many of his colleagues, particularly in his enduring engagement on behalf of the persecuted.

Our memory of him will always remain.

● *Helmut Koch, Thomas Müller, Herwig Schopper, IEKP.*

Hans Hofer 1934–2014

Hans Hofer, emeritus professor at ETH Zurich and experimental particle physicist of international renown, passed away on 28 September.

Born on 17 October 1934 in Zurich, Hofer studied physics at the University of Bern, where he obtained a PhD in 1965 under the supervision of George Sudarshan. After a stay at the University of Chicago, where he collaborated with Valentine Telegdi, and his return to the University of Bern, in 1973 he was appointed associate professor of experimental high-energy physics at the Federal Institute of Technology (ETH) in Zurich, and promoted to full professor in 1981. He was chair of the physics department for several years, as well as head of the former laboratories of nuclear and high-energy physics, in the case of the latter until his retirement in 2001.

Hofer's main research interests were in the fields of nuclear and particle physics. His dynamic personality and his engagement earned him an excellent reputation, both at



Hans Hofer. (Image credit: Rita Vonesch.)

the national and international level. Under his leadership, his group contributed to the construction of the MARK J detector at PETRA, DESY, and then took a leading role in the L3 experiment at CERN's

Large Electron–Positron collider. He also made important contributions to the Alpha Magnetic Spectrometer (AMS) experiment, particularly to the magnet and system integration. In addition, he played a pivotal role in implementing the electromagnetic crystal calorimeter and the superconducting-magnet system of the CMS experiment at the LHC, as well as the superconducting cables for the ATLAS experiment.

His excellent leadership qualities and diplomatic skills were essential to many of these achievements, and helped in the formation of international collaborations including physicists and engineers from Eastern Europe and China. Besides the successful implementation of many projects, Hofer's total devotion to particle physics is reflected in a publication list comprising more than 400 journal articles, and recognition through many awards, honorary titles and visiting professorships.

● *His ETH colleagues.*

Valery Zagrebaev 1950–2015

Valery Ivanovich Zagrebaev, deputy director of the Flerov Laboratory of Nuclear Reactions (FLNR) at the Joint Institute for Nuclear Research (JINR), passed away suddenly on 17 January, aged 64.

Valery Zagrebaev graduated with a degree in physics from Leningrad State University, where he subsequently defended his PhD and habilitation theses. He then began his academic career in the Department of Theoretical Physics at Chuvash State University, where he worked for more than 25 years, holding positions as an assistant, then associate professor and, finally, professor. In 1997, he was appointed as a senior researcher at JINR FLNR. Two years later, he founded and became head of the laboratory group of theoretical and computational physics, and in 2007 he became the deputy director of JINR FLNR, a position that he held up to his death. During his career, he published more than 190 scientific articles in top journals, both in Russia and abroad, and was awarded JINR prizes in 1997, 2002 and 2007, in recognition of his outstanding scientific achievements.

With academic interests interwoven intricately with research in nuclear-reaction dynamics at low and intermediate energies, Zagrebaev is known for his fundamental work in various fields of nuclear physics that played a key role in establishing and



Valery Zagrebaev. (Image credit: JINR.)

developing many areas of further research. For example, his calculations served as a basis for a series of experiments carried out in leading laboratories worldwide. He also initiated the development of a unique network of knowledge on low-energy nuclear physics, which continues to expand today. A co-discoverer of the superheavy elements with atomic numbers 113, 114, 115, 116 and 118, synthesized during the past few years at JINR FLNR, most recently in 2011 he initiated and led work on the development of a state-of-the-art set-up for the selective laser ionization and

separation of nuclear-reaction products. He is also recognized internationally for his expertise in heavy-ion physics, and made important contributions to the development of quasi-classical approaches for the description of a range of phenomena occurring in heavy-ion collisions.

Zagrebaev paid great attention to the training of academic staff and was involved in academic work for many years. Graduates defended PhD and habilitation theses under his guidance. In 2003, the Department of Nuclear Physics at Dubna State University was established under his leadership and with his direct involvement. The department's graduates have a range of employment opportunities, and are rated by employers as highly skilled and proficient. This is also reflected by the large majority of the graduates who went on to work successfully at JINR laboratories.

A many-sided man of great depth who contributed enormously to the development of fundamental science, Zagrebaev was more than an outstanding scientist. We are mourning the loss of a good friend, great academician and wonderful colleague, who gave freely of his time, advice and expertise. He will stay in our hearts forever, and will be remembered as an extremely thoughtful scientist and dedicated mentor.

● *His colleagues, friends, students, and the FLNR staff.*

NEW PRODUCTS

FLIR Systems is offering the A6700sc for science-grade thermal imaging. Featuring a highly sensitive 640 × 512 pixel resolution InSb detector, the A6700sc produces temperature-calibrated IR imagery. Designed for electronics inspections, medical thermography, manufacturing monitoring, and non-destructive testing, the camera is ideal for high-speed thermal events and fast-moving targets. For further information, tel +32 3665 5100, e-mail research@flir.com or visit <http://flir.com/cs/emea/en/view/?id=63708>.

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MKS Instruments, Inc. has introduced the 902B Absolute Piezo vacuum transducer, which integrates a MEMS-based piezo sensor with a sealed, stainless-steel 316 diaphragm and integrated electronics to provide seamless, gas-independent vacuum-pressure measurement between 0.1 and 1000 torr. It features up to three setpoint relays, a high bakeout temperature of 100 °C, and a reduced process cycle time. For more details, see www.mksinst.com/news/NewsDetail.aspx?id=525.

Narda Safety Test Solutions has developed a new generation of RF analysers, the NRA RX. These 19" rack-mount devices analyse RF

signals up to 6 GHz in the frequency and time domains. They can yield spectra comprised of up to 600,000 frequency points with time resolutions as fine as around 30 ns. The demodulation function makes it possible to hear FM, AM, USB, LSB and CW signals using external headphones. For more details, e-mail info.narda-de@L-3com.com or visit www.narda-sts.com.

XP Power has announced the GSP500 series of 500 W AC–DC power supplies. Occupying a 4 × 6" footprint, these single-output forced-air-cooled units can continuously deliver the full output power across a temperature range of –40 to +50 °C, and up to 70 °C with derating. The supply requires just 12 CFM of forced air cooling, and can also provide an output power of up to 180 W with convection cooling only. For further information, visit www.xppower.com/EN/100714/GSP500-Series.

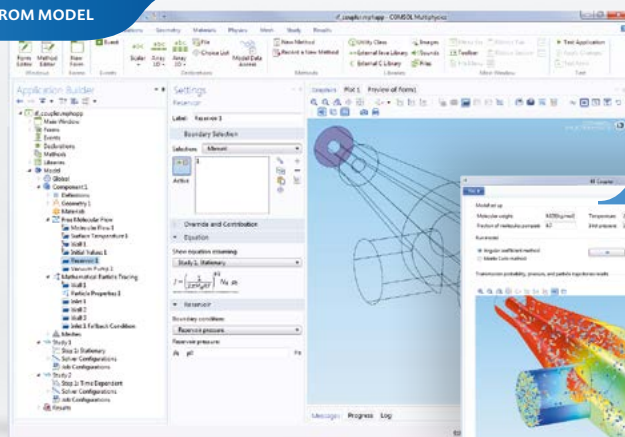
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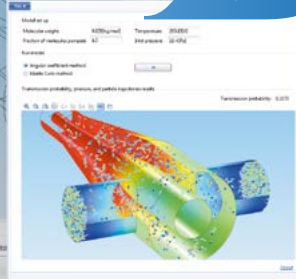
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MDC Vacuum components

Custom fabrications

MDC is equipped to build custom vacuum components of virtually any complexity. **Vacuum vessels can be built to your exact specifications** from a rough hand-sketch, detailed engineering drawings or anything in-between.

Burst disks

MDC's BDA-Series **ASME UD Certified** Burst Disks are designed as a safety device to protect vacuum systems against over pressurization.

Breaks and envelopes

Breaks and Envelopes in nominal tube sizes ranging from 3 to 200 mm are available on standard catalogue assemblies. Custom break assemblies up to 280 mm in diameter and 1200 mm in length are available upon request. MDC now offer custom break assemblies with **operating temperatures of 900°C** as well as high temperature material alternatives.



For more information please visit our website:
www.mdcvacuum.co.uk

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