

FACES AND PLACES

DESY

PETRA III starts up as a leading light source

On 16 November Germany's federal minister for education and research, Annette Schavan, and DESY's director, Helmut Dosch, took part in firing the starting shot at the inauguration of Hamburg's new synchrotron-radiation source, PETRA III. They were joined by Hamburg senator for science and research, Herlind Gundelach, and Jürgen Mlynek, president of the Helmholtz Association, of which DESY is a member.

PETRA III is the latest reincarnation of the PETRA electron-positron storage ring that ran from 1978 to 1986. As PETRA II it formed part of the injection chain for the HERA electron-positron-proton collider, until HERA shut down in 2007. Now, as PETRA III, it contains a completely new section, with wigglers and undulator magnets to provide the high-brilliance synchrotron radiation (*CERN Courier* September 2008 p19). The new facility demonstrated its potential in October by establishing a beam of a record-low horizontal emittance of 1 nm rad before final commissioning. The wigglers dampen the beam to guarantee the reduction of its transverse size.

PETRA III will open up new opportunities, especially in the field of structural biology, for example in the research of protein structures. The award of the 2009 Nobel Prize in Chemistry shows the importance of this



From left to right: Jürgen Mlynek, president of the Helmholtz Association; Herlind Gundelach, Hamburg's science senator; Annette Schavan, federal minister for education and research; and DESY director Helmut Dosch. Together, they pushed the start button at the inauguration of PETRA III. (Courtesy DESY.)

field of research: one of the laureates was Ada Yonath, who from 1986 to 2004 decoded the structure of ribosomes at PETRA III's predecessor at DESY, DORIS III.

The modernization of PETRA and the construction of the new experimental hall for PETRA III were funded jointly by the German government and the Free and Hanseatic City of Hamburg with €233 million, nearly €150 million of which came from special funds.

Following the rule for Helmholtz Association facilities, Hamburg has contributed 10% and the federal government 90% of the total. Within the framework of collective research, the federal ministry of education and research provided an additional €12.2 million for experiments in the current funding period to give scientists from German universities the opportunity for optimal exploitation of PETRA III for their research projects.

APPOINTMENT

Sharkov named as FAIR director designate

Boris Sharkov has been selected to be the scientific director of the future Facility for Antiproton and Ion Research (FAIR). He has also become the new leader of the FAIR Joint Core Team at GSI, taking over from Horst Wenninger on 1 September 2009. The team's goal is to create FAIR GmbH as soon as possible in 2010 and start construction of the new accelerator complex in Darmstadt.

Born in Moscow in 1950, Sharkov received his PhD for physics at the Moscow Engineering Physics Institute (MEPhI) in

1978. He has worked with CERN and GSI for many years and has been responsible for the collaboration between these institutes and the Russian Alikhanov Institute for Theoretical and Experimental Physics (ITEP-Moscow) and later also with the Institut de Physique Nucléaire d'Orsay. He was one of ITEP's directors for several years. Under his leadership the ITEP proton synchrotron was upgraded to the proton-heavy-ion accelerator complex, ITEP-TWAC.

Sharkov was a member of the GSI Experiment Commission from 2002 until 2007 and has been full professor at MEPhI since 2005. He has also been the Russian representative in the FAIR Scientific and Technical Issues Working Group since 2005 and director of the FAIR Russia Research Centre in Moscow since 2007.



Boris Sharkov is to be the scientific director of FAIR. (Courtesy GSI/Gaby Otto.)

SCHOOL

CERN Accelerator School goes to Darmstadt

The CERN Accelerator School (CAS), GSI and the Technische Universität Darmstadt (TU Darmstadt) jointly organized an intermediate-level course on “General Accelerator Physics” at the TU Darmstadt on 27 September – 9 October 2009.

The course followed established practice, with lectures on core topics in the mornings and specialized courses in the afternoons. The latter provided “hands-on” education and experience in three areas: RF measurement techniques; beam instrumentation and diagnostics; and optics design and correction. These proved to be highly successful, with participants choosing one course and following the topic throughout the school. Guided studies, tutorials, seminars and a poster session completed the programme. Participants appreciated a visit to GSI and the project for the future Facility for Antiproton and Ion Research (FAIR), as well as an optional visit to the superconducting linac, DALINAC, in Darmstadt. The school also included an



Participants at the CERN Accelerator School in Darmstadt. (Courtesy Sabrina Appel, TU Darmstadt.)

excursion by boat on the river Rhine from Mainz to Bacharach.

The school was very successful, attracting 67 participants representing 21 nationalities. Feedback from the participants was extremely positive, and praised the expertise and enthusiasm of the lecturers as well as the high

standard and excellent quality of their lectures.

● The next CAS General Accelerator Physics course will be an introductory course and will take place in Varna, Bulgaria on 19 September – 1 October 2010. Information will soon be available on the CAS website, at www.cern.ch/schools/CAS.

AWARDS

The Nishina Memorial Prize is awarded for strings and gamma rays

Hiroshi Ooguri of the California Institute of Technology and the Institute for the Physics and Mathematics of the Universe (IPMU), and Hirokazu Tamura of Tohoku University have won the Nishina Memorial Prize for 2009.

The prize is awarded to young physicists for their achievements in the field of atomic and sub-atomic physics by the Nishina Memorial Foundation, established in 1955 to commemorate Yoshi Nishina. Ooguri receives his share for the study of topological string theory, while Tamura is rewarded for his work on hypernuclear gamma-ray spectroscopy.

Nishina originated the study of nuclear physics in Japan and trained many young Japanese scientists in the field.

VISITS



William Brinkman, director of the Office of Science in the US Department of Energy, centre left, visited CERN on 13 November. He toured the test hall for the LHC's superconducting magnets with (from left to right): **Felicitas Pauss**, CERN co-ordinator for external relations; **John Ellis**, CERN adviser for non-member states; **Jim Strait** from Fermilab and **Lucio Rossi**, deputy head of CERN's Technology Department. He also visited the CMS control room and the computing centre.

The Bulgarian minister of economy, energy and tourism, **Traicho Trajkov**, right, visited CERN on 1 December. He was welcomed by **Rolf Heuer**, CERN's director-general and toured the test hall for the LHC's superconducting magnets and the ATLAS visitors' centre.



CONFERENCE

Transylvania hosts extreme light

The first International Conference on Light at Extreme Intensities (LEI '09) took place in Brasov, Romania, on 16–21 October 2009, just as the news broke of a multicountry (Czech Republic, Hungary and Romania) commitment to spend €735 million on building up a new European infrastructure in this field of research by 2015. The meeting was organized by Dan Dumitras of the National Institute for Laser, Plasma and Radiation Physics (INFLPR), Bucharest, on behalf of the National Authority for Scientific Research, Romania, and the international consortium, the Extreme Light Infrastructure (ELI). It took place at the Transylvania University of Brasov and was chaired by Gérard Mourou from the Ecole Nationale Supérieure de Techniques Avancées and Ecole Polytechnique, who is also the co-ordinator of ELI.

LEI '09 addressed the new physics opportunities offered by high-intensity relativistic laser technology. Around 150 experts from Europe, the US, Russia,



Participants at LEI '09 in Brasov, Romania. (Courtesy Doru Dutu, INFLPR, Bucharest.)

Japan and Korea traded petawatt intensities for ultrarelativistic particle beams; single-cycle femtosecond light-pulses for problems of radiation reactions in electromagnetic theory; and multi-kilojoule

pulse energies for cracks in the QED vacuum structure. From attosecond photography to Mach's principle, the breadth of the scientific opportunities continues to amaze (*CERN Courier* March 2009 p21).

JINR

Dubna's member states agree on new plan in Astana

A regular session of the Committee of Plenipotentiaries of the governments of JINR member states took place in Astana, the capital of Kazakhstan, on 19–21 November 2009. This was the first time in the 54-year history of JINR that a regular session of this committee has met in one of the member states. Astana is the location of the interdisciplinary scientific research complex of the L. Gumilev Eurasian National University, which was established with the participation of JINR.

At the meeting, JINR's director Alexei Sissakian presented a report on the results of the previous seven-year plan and the main features of a new seven-year programme for JINR's development. He highlighted as major

achievements the start-up of the Intense Resonance Neutron Source, the synthesis of new long-lived superheavy elements, the development of the DRIBs cyclotron complex for heavy ions, the upgrading of the research reactor IBR-2M and the superconducting heavy-ion accelerator Nucoltr-m, which is to become the basis for the new superconducting collider NICA (p13). The institute also attained significant results in its network and computing infrastructure.

Speaking about the specific features of the new seven-year plan, Sissakian pointed out that the main purpose of the strategic development of JINR is to take leading positions in three basic research directions. In high-energy heavy-ion physics, the highest priority belongs to the NICA/MPD project – one of JINR's large-scale projects – and to the involvement in external experiments and partnership programmes. These consist of 15 projects in collaboration with CERN, including three ambitious projects at the LHC, and collaborations with national laboratories in the US and Germany. These partnership

programmes also imply the involvement of these other centres in JINR's "home" projects in Dubna.

In low-energy heavy-ion physics, the important development stage deals with the project of the accelerator complex for radioactive beams, DRIBs-III. JINR expects to obtain a number of fundamental results in this area. Finally, IBR-2M, the pulsed reactor for fast neutrons with mean capacity of 2 MW, is the basic facility for research at JINR in neutron nuclear physics and condensed-matter physics using nuclear physics methods.

JINR's theorists are active in all three directions and there are educational programmes to promote science to young people. The institute also pays great attention to projects to upgrade the JINR network and computing infrastructure.

The session concluded with a discussion of the new seven-year plan for JINR's development and the financial plan for 2010. The committee approved the plan and agreed the budget for 2010.

ACCELERATORS

CLIC study workshop focuses on feasibility

The annual workshop for the Compact Linear Collider (CLIC) study was held at CERN on 12–16 October 2009. The study is preparing a conceptual design report (CDR), for the end of 2010, for an electron–positron linear collider in the multi-tera-electron-volt collision-energy range (*CERN Courier* September 2008 p15). Such a machine is complementary to that under study for the International Linear Collider (ILC) in the tera-electron-volt energy range, and would allow further exploration of the physics that might be revealed by the LHC. The CLIC accelerator study is a global collaboration with 34 participating institutes from around the world. Daniel Schulte chaired the workshop, which attracted more than 250 participants from 62 institutes in 21 countries.

After a welcome by CERN's director-general, Rolf Heuer, the leaders of the CLIC study (Jean-Pierre Delahaye), of the ILC Global Design Effort (Barry Barish) and of the newly formed Linear Collider Detector project (Lucie Linssen) gave an overview of the progress and plans, which were followed by more detailed presentations. The workshop continued in working groups focusing on physics and detector issues as well as on accelerator issues that might arise at CLIC. The closing session presented the conclusions of the working groups, followed by a summary of the workshop by Ken Peach, the newly elected chair of the CLIC Collaboration Board.

In preparing the CDR, the CLIC study has identified a number of feasibility issues that must be addressed to establish that the



Participants at the annual workshop of the CLIC study pose outside CERN's main building.

concept is viable, and has launched R&D to address them. These issues include the novel scheme of the two-beam acceleration, the production of high-intensity drive beam, the generation of a large amount of RF power at high frequency, the development of RF structures with high accelerating fields and of components that are vital to achieving high target luminosity. In addition, the detectors have to be adapted to the specific CLIC technology and the large beam-induced background that is inherently present at high electron–positron collision energies.

The status of the R&D on feasibility issues was consequently the focus of the workshop. Among the highlights presented was the recent demonstration of the full drive-beam generation scheme in the CLIC test facility (CTF3). Progress was also

reported in many other critical areas, such as in the understanding of the structure of RF breakdown – one of the main gradient limitations – and in emittance preservation.

The workshop benefited from the participation of a number of ILC experts. The CLIC and ILC studies are collaborating closely on technical issues with strong synergies, in preparation for the best possible facility adapted to the demands of physics based on discoveries at the LHC. This collaboration has already proved to be extremely beneficial for both studies and is still improving. Hence, the studies decided to unite their workshops later this year in the context of an ECFA Linear Collider Workshop covering CLIC and ILC accelerators and detectors to be held at CERN tentatively in September or October 2010.

LETTER

Natural logic

I would like to comment on Antonino Zichichi's "Viewpoint" on Intelligent Design (*CERN Courier* October 2009 p42).

Most scientists will not agree with the statement: "If a fundamental logic (of nature) exists then the author of this logic must exist too." Good science is, and can be, done by people of many different world views and/or religious beliefs. No one can claim that the present scientific knowledge "proves" his or her view with the implication that it

"disproves" all the others.

Zichichi claims a "fundamental formal logic of nature" that "matter has to obey". According to the *Oxford Dictionary of English* the term "logic" signifies "reasoning according to strict principles of validity". I cannot see nature to reason in any way. Possibly the claim makes sense if it means a "formal structure of nature". Whether life and reason are part of such a formal structure is not proven. However, by an act of faith one can believe that the entire structure, formal or not,

has been "intelligently designed" and logically implemented by a supreme being. Or not.

So far, physics has contributed little to explain life and reason and it is unlikely that any reductionist approach will ever contribute much. On the other hand, and contrary to Zichichi's statement, the theory of evolution, to which Darwin contributed so much, is the best scientific theory we have for all of biology. Not to grant it the qualification "scientific" is shortsighted.

Peter Schmid, Salzburg.

OBITUARIES

Pavel Rehak 1945–2009

Pavel Rehak passed away on 4 November 2009, after a brief illness. He pioneered far-reaching new concepts in detectors and influenced many individuals and groups around the world.

Pavel obtained a first doctorate in natural sciences at the University of Prague in 1969. He left what was then Czechoslovakia shortly after and from 1969 until 1972 stayed at the Scuola Normale Superiore of Pisa, where he obtained his second doctoral degree, with Italo Mannelli as his thesis adviser. After a year at the University of Karlsruhe, Pavel went to CERN in 1973 to work with WJ Willis on experiments at the Intersecting Storage Rings as a research associate at Yale University. These experiments led, among other results, to the discovery of direct photon production in hadron interactions. In 1976 he became employed by Brookhaven National Laboratory and after moving there he put most of his effort into the development of innovative particle and photon detectors and their read-out electronics, while continuing to participate in physics experiments.

Although maintaining a prodigious output in other areas, Pavel's main interest since 1982 has been in semiconductor detectors. In October 1983 he and Emilio Gatti conceived of the idea of the silicon drift detector during one of Gatti's annual, month-long visits to Brookhaven. Their idea went against conventional thinking. All detector experts, when asked if a semiconductor position-sensitive detector based on electron drift over long distances (analogous to the well developed gaseous drift detectors) could develop in the negative: "How could you move electrons along a 100 μm thick sheet of silicon over several centimetres without losing them?"

The crucial step suggested by Pavel and Emilio was to realize that a large, very thin sheet of silicon (e.g. of n type with p^+ doping on each face) can be depleted of free carriers (electrons in this case) from a tiny n^+ contact (an anode about 100 μm in diameter) anywhere at the edge of the sheet. The remaining fixed positive charges create a parabolic potential distribution, with a maximum in the median plane of the sheet.



Pavel Rehak, pioneer of new concepts in semiconductor particle detectors. (Courtesy Margareta Rehak.)

Electrons created by an ionizing particle gather at this potential maximum and can be drifted along the sheet by applying an electric field in the desired drift direction to strip electrodes formed on the surfaces of the silicon sheet. From this basic concept, various geometrical configurations emerged. A large cylindrical drift detector 10 cm in diameter, with radial drift to read-out anodes around the periphery was developed for an experiment at CERN. A large drift-detector system has since been built for the STAR experiment at RHIC at Brookhaven, and the detector technology is one of those included in the ALICE experiment at the LHC.

The concept of depletion of large areas and charge collection over long distances by a small anode has made possible other types of devices. One is the fully depleted charge-coupled device, which has been developed as an efficient X-ray detector for astrophysics experiments at the Max-Planck Institute in Munich and is one of the principal detectors on the X-ray Multi Mirror Mission. Another application is in silicon detectors for X-ray spectrometry, now widespread in industry for trace-element analysis.

Pavel had a deep interest in physics, but most of his work was motivated by his belief that detector developments are among

the main forces responsible for progress in physics and other natural sciences. He was truly a renaissance physicist, in that he could delve deeply into various areas of physics. For the past decade he worked on developing new concepts for X-ray detectors for use with synchrotron radiation. During this time his collaboration with younger colleagues flourished, providing inspiration and leaving a deep imprint on everyone who worked with him. He was also a fellow of both the Institute of Electrical and Electronics Engineers and the American Physical Society.

Pavel led an active life. A competitive swimmer in his youth, he pursued this activity with his characteristic tenacity to the end. He was also an avid cyclist and was always eager to take friends sailing. Having participated in the events of 1968 in Central Europe, he closely followed international politics. He maintained fluency in seven languages and had an appreciation for fine arts. Most of all he was generous, honest and caring.

Pavel will be deeply missed by his colleagues and remembered for all that he did and who he was. He is survived by his wife, Margareta, his daughter, Ludmila, and his son Pavel Ludwig. *Veljko Radeka, Brookhaven National Laboratory.*

Vladimir Teplyakov 1925–2009

Vladimir Alexandrovich Teplyakov, one of the leading scientists of the Institute for High Energy Physics (IHEP) in Protvino and a well known accelerator physicist, passed away on 10 December 2009.

Teplyakov was born on 6 November 1925 in Tambov in Russia. After being drafted into the Red Army and taking part in the battles of the Second World War, he graduated from the Polytechnic Institute and, in the 1950s, started his career at the Moscow-based Institute for Chemical Physics of the National Academy of Sciences. There he was involved in feasibility studies for a high-current proton linear accelerator to be used for applied purposes in the context of an electronuclear programme. His scientific interests were focused on issues of beam dynamics, the design of accelerating structures and high-power RF engineering.

In 1966 Teplyakov moved to IHEP where he was in charge of commissioning and running a 100 MeV Alvarez drift-tube linac, the I-100. Under his supervision, this machine served smoothly for 20 years as an injector to IHEP's 70 GeV proton synchrotron, the U-70, which was the world's largest machine of this kind at the time of its starting up.

Teplyakov and Ilya Kapchinsky of the



Vladimir Teplyakov. (Courtesy IHEP.)

Institute for Theoretical and Experimental Physics Moscow made a major breakthrough in the field when they put forward the concept of the radio-frequency quadrupole (RFQ)

linear accelerator in 1969. This development is widely recognized as an important contribution to linac engineering. To mark the invention, Teplyakov and Kapchinsky were awarded both the Lenin Prize of the former USSR and the US Particle Accelerator School Prize for Achievement in Accelerator Physics and Technology in 1988.

Over the following years, Teplyakov contributed greatly to extending RFQ focusing to higher beam energies by developing various RFQ drift-tube structures and RF cavities to drive them. These efforts were not in vain, and in 1985 URAL-30 – the world's only 30 MeV linear accelerator based wholly on the RFQ – was commissioned and put into operation. It is still being employed as an injector to the fast-cycling 1.5 GeV booster synchrotron in the upgraded injector chain of IHEP's U-70 proton synchrotron.

In 2006 Teplyakov received the Achievement Prize of the European Physical Society Accelerator Group, "for the invention of RFQ in collaboration with I M Kapchinsky. RFQ revolutionized the technique for accelerating low-energy ion beams".

We share our sorrow with his relatives and convey our deepest condolences.
His colleagues and friends.

Tsvetan Dimitrov Vylov 1941–2009

Tsvetan Dimitrov Vylov passed away on 13 December, after a severe and abrupt illness.

A Bulgarian, Vylov spent all of his scientific career at JINR in Dubna where he started work in 1968 as a junior researcher, having graduated from the physics department of Leningrad State University. He participated in and later led research in a range of scientific methods in the precision spectrometry of nuclear radiation at the JINR Laboratory of Nuclear Problems. The methods and spectrometers that he developed were used for fundamental studies of the properties of light nuclei (such as deuteron binding energy, proton and electron mass) and of processes of radioactive decay of rare-earth nuclides and actinoids. The results of



Tsvetan Dimitrov Vylov. (Courtesy JINR.)

these studies were published as an atlas of radioactive-nuclide radiation spectra.

Vylov was the founder of a new line of research at JINR, namely, non-accelerator neutrino physics, and was one of the main organizers of the Non Accelerator Nuclear Physics (NANP) international collaboration. Under his guidance, experiments were conducted on neutrino helicity measurements, the role of the natural width and shape of electron lines in measurements of the antineutrino mass, and to investigate the potential for measuring neutrino mass from the electron capture of certain nuclei. He also initiated experimental studies to search for double neutrinoless beta-decay with an unconventional telescope of high-purity semiconductor germanium

detectors. In recent years, he participated in research with reactor antineutrinos and in the development of the new-generation SuperNEMO facility for the studies of double neutrinoless beta-decay with record sensitivity.

From 1984 Vylov led a big international team in the JINR department of nuclear spectroscopy and from 1988 he was director

of the Laboratory of Nuclear Problems. He served as vice-director of JINR from 1992 to 2005. He paid much attention to widening and strengthening the co-operation of the institute with scientific centres in JINR member states and other countries. His numerous students successfully work today in various scientific research centres around the world.

With Vylov's passing we have lost a profoundly educated physicist who had an acute sense of responsibility and immense commitment. We will remember his rare amiability and winning personality that brought him the highest renown among his colleagues and friends.
JINR directorate.

MEETINGS

The **7th International Workshop on Heavy Quarkonium** 2010 will take place at Fermilab on 18–21 May. Working groups will cover spectroscopy, decays, production, Standard Model measurements, quarkonium in media and physics beyond the Standard Model. For more details, see <http://conferences.fnal.gov/QWG2010/> or contact Cynthia

Sazama, Conference Office, Fermilab; fax +1 630-840-8589; or e-mail sazama@fnal.gov.

The **5th CERN–Fermilab Hadron Collider Physics Summer School** will take place at Fermilab on 16–27 August. The target audience for the school is young postdocs and advanced graduate students with a

strong interest in hadron-collider physics. Theorists and experimentalists alike are encouraged to apply. Applications and references should be received no later than 14 February. For more information, contact Cynthia Sazama, fax +1 630 840 4102; e-mail sazama@fnal.gov; or see <http://projects.fnal.gov/hcps/hcps10/>.

NEW PRODUCTS

BNC has developed a new front-end utility, PB-5 WinControl, which controls up to 8 of its PB-5 NIM Pulser pulse generators at the same time to synchronize or test multiple systems. Written with a simple GUI, the status of multiple units may be viewed in the same application window. The software is compatible with user scripts. For more details, e-mail robert.corsetti@berkeleynucleonics.com or see www.berkeleynucleonics.com/.

HiTek Power has added an RS232 controlled model to the XRG70 series of high-voltage power supplies for high-performance X-ray applications. The XRG70-703 RS232 has an output range of 0–70 kV at 0–1 mA and a maximum power output of 70 W. The unit incorporates a 5.5 VDC, 3.5 A grounded-filament power supply. The RS232 interface offers a variety of functions. For more details, contact Michelle Quiggan, tel: +44 1903 712400, or e-mail: sales.uk@hitekpower.com or see www.hitekpower.com.

MKS Instruments Inc has introduced web-enabled residual gas analysers with

Ethernet connectivity for remote access, Microvision 2 and e-Vision 2. The enhanced technology allows web-based access for faster data acquisition with a wider dynamic measurement range. With improved I/O capacities, the systems feature improved stability, accuracy and speed, enabling more accurate alarm decisions with fewer false positives. For more details, tel: +1 978 645 5538; or see www.mksinst.com.

SmartQuantum has launched an ultra-low-noise infrared single photon detector, covering the wavelength region 900–1700 nm. The SQLightSensor includes a Geiger-mode InGaAs avalanche photodiode and a thermoelectricity cooler that ensure detection efficiency up to 25%, a very low dark count (5×10^{-6} per ns gate), a high-speed trigger up to 10 MHz and low jitter. For more details, contact Jerome Prieur, e-mail: photonics@smartquantum.com or see www.smartquantum.com.

Southern Scientific has designed and built the Radhound, a general-purpose digital

radiation monitor. For use with Geiger and scintillation probes, the compact instrument provides measurements of alpha, beta and gamma contamination. It has a digital LCD display with backlight and optional RS232 or IR ports for external communication. Other features include configurable alarm levels and a source-finding facility and rechargeable lithium battery with 12 hours of operation. The primarily standalone unit can also be built into other systems. For more details, see www.ssl.gb.com.

XP Power has released the HPU1K5 1500 W AC/DC power-supply series aimed at bulk power applications within a compact enclosure. Three models with single outputs cover output voltages of +12, +24 or +48 VDC, with input range of 85–264 VAC. Output power is up to 1500 W with high line-input. XP Power also produces the LCL range of low-cost AC/DC power supplies, with 150, 300 and 500 W models and outputs of +12, +13.5, +15, +24, +27 or +48 VDC. For more details, contact Steve Head, e-mail shead@xppower.com; or see www.xppower.com.



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