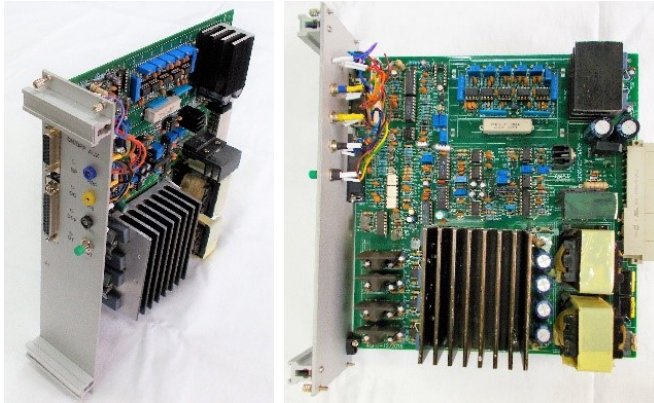


The power converter is developed on a single 6U double-sided PCB, complete with power circuit, control electronics and interface electronics for its remote operation. Further, a controlled electro-mechanical switch is provided at the output that facilitates the output polarity reversal.



*Photographs showing bipolar power converter on 6U printed circuit board. The on-board constant-temperature bath is removed to reveal the electronic circuit.*

The bipolar power converter is capable of delivering up to  $\pm 50$  V DC output voltage,  $\pm 15$  A DC output current, and 600 W output power ratings with minimum alterations. It operates with 60 V max DC input source. The power converter is also developed on a single 6U four-layer PCB, complete with power circuit, control electronics and interface electronics for its remote operation. It is capable of being operated in both the polarities of output voltage and current, with smooth zero cross-over.

Both the converters are equipped with precision current sensor, electronics and on-board constant-temperature bath that provides output current stability within  $\pm 100$  ppm of the full-scale current (for 8 hours after 1 hour of warm-up). Important signals are available on the front panel, facilitating in-situ diagnosis/monitoring of the operational status.

Since both types of power converters are based on single-board design, the manufacturing process is industry-friendly. Special manufacturing infrastructure / environment / processes are not required. Standard PCB production, assembly, coil winding and testing techniques are applicable. All components are normal through-hole component, and are readily available in Indian market.

The technology of unipolar power converter is transferred to M/s Electronics Corporation of India Limited, Hyderabad. Similarly, the technology of bipolar power converter is transferred to M/s Electronics Corporation of India Limited, Hyderabad and M/s Scientific Mes-Technik Private Limited, Indore.

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**N.6: 29<sup>th</sup> DAE-BRNS National Laser Symposium (NLS-29)**

The DAE-BRNS National Laser Symposium is held every year under the aegis of Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy (DAE). The symposium covers research and technological advances in areas of physics and technology of lasers; lasers in nuclear science and technology; laser materials, devices and components; nonlinear, quantum and atom optics; ultrafast lasers and applications; lasers in materials science; laser plasma interaction; lasers in industry and defense; laser spectroscopy and applications; lasers in chemistry, biology and medicine; laser and fiber based instrumentation; and electronics and instrumentation for lasers. The symposium is held every year at different locations in India so that the researchers and young students of different areas are exposed to modern and technological developments in lasers and related areas.



*Photograph of inaugural ceremony of NLS-29 on February 12, 2021 at SVVV, Indore. From left to right: Shri Praveen Agrawal, Secretary, NLS-29, Prof. Uttam Shrama, Co-convenor, NLS-29, Prof. U. Dhar, VC, SVVV, Indore, Shri S. V. Nakhe, Chairman, NLS-29, and President, ILA, Dr. S. R. Mishra, Convener, NLS-29, and Dr Nitu Kataria, Co-secretary, NLS-29.*

The 29<sup>th</sup> DAE-BRNS National Laser Symposium (NLS-29) was conducted in online mode during February 12 to 15, 2021 due to prevailing pandemic COVID-19 situation world-wide. The NLS-29 was organized in online mode by Raja Ramanna Centre for Advanced Technology (RRCAT), Indore and Shri Vaishnav Vidyapeeth Vishwavidyalaya (SVVV), Indore (for details please check [www.ila.org/NLS-29](http://www.ila.org/NLS-29)). The speakers and participants joined NLS-29 by online mode from their respective work/native place via internet facility, without any physical gathering of people at any place. The scientific program of NLS-29 consisted of 36 invited talks by leading experts, 15 theses presentations by Ph. D. scholars and 146 contributory research papers. Among invited speakers, 17 were from foreign and 19 were from India. The keynote address on “Photonics Gone Rogue” was delivered by Prof. Raman Kashyap, Canada Research Chair on Future Photonics Systems, Ecole Polytechnique de Montreal, Montreal, Canada during the Inauguration Function on 12<sup>th</sup> Feb. 2021.

There was a session of two special evening talks by internationally renowned scientists: (1) “The beginnings of gravitational wave astronomy: current state and future” by Prof. Rainer Weiss (Physics Noble Laureate 2017), MIT, USA, and (2) “Plasmonic Technologies for Alloyed Hybrid Meta-surfaces” by Prof. Martin Olivier, Swiss Federal Institute of Technology, Lausanne (EPFL), Switzerland. These talks were highly appreciated by the participants. During NLS-29, there was a separate session for the industry presentation in which information about laser and related products was presented by different vendors.



*Prof. Rainer Weiss (Physics Noble Laureate for 2017) delivering his special evening talk during NLS-29. In the inset: Prof. Somak Raychaudhury, Director, IUCAA, Pune, conducting this session.*

It is a matter of great pride and honor that Dr. G. Sathesh Reddy, Secretary, Department of Defence R&D and Chairman, Defence Research and Development Organisation (DRDO), Govt. of India, was the Chief Guest at the inaugural function of NLS-29 on 12<sup>th</sup> Feb, 2021. His gracious online presence and motivating address to the participants and delegates added value to the Symposium. During the inauguration of NLS-29, Shri Debashis Das, Director, RRCAT, Indore and Shri Purushottamdas Pasari, Chancellor, SVVV, Indore, were special guests who addressed the participants and delegates in online mode. On this occasion of inauguration, Shri S. V. Nakhe, President, ILA, presented the ILA perspective of the NLS event. The function was presided by Prof. U. Dhar, Vice Chancellor, SVVV, Indore, who presented his views on symposium and new education policy in his address to participants. During the inaugural session, Chief Guest released e-proceedings of NLS-29 and inaugurated the Exhibition Gallery from vendors of lasers and related products, in online mode. More than 10 industries and vendors displayed their products related information in the exhibition.

Indian Laser Association plays an active role in various ways in planning the NLS. Over the years, the short tutorial courses organized by ILA on laser related advanced topics, preceding the NLS, have become quite popular among the young researchers. This year, just before the NLS-29, on 10<sup>th</sup> and 11<sup>th</sup>

February 2021, two short courses were offered by ILA. These are: (1) “LASER - A Versatile Tool for Research and Technology Development” (Course Co-ordinators: Dr Suprajya Thakur and Dr. Manvendra Kumar, SVVV, Indore) and (2) “Quantum Metrology” (Course Co-ordinators: Dr Sendhil Raja and Dr. Vibhuti Bhushan Tiwari, RRCAT, Indore). Many young researchers from various parts of country attended these courses, which will be beneficial to their future growth.

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### **N.7: Industrial and radiation safety in RRCAT**

*Industrial safety:* Fire & Safety Cell of RRCAT puts efforts to ensure that safe working environment prevails in the Centre. It also instructs the individuals to adhere to the safe work practices and complies with all administrative checks and controls. To meet these objectives, various safety measures are being continuously followed, which includes safety inspections at various levels. The objectives of these inspections are to analyze and eliminate the associated job hazards, which may become reason for the potential accidents. Internal Safety Inspection Committees for Accelerator and Laser Labs, Safety Review Sub-committees for EAG, PAG, LGB, MSG and TDSG and Apex Safety Committee (ASC) of RRCAT are regularly monitoring, reviewing and ensuring implementation of various safety related measures. Internal safety inspection committees are regularly visiting various laboratories and buildings of RRCAT. Committees observe the industrial safety aspects and gives recommendations to improve safety, wherever necessary. These safety inspections are carried out in the presence of Building Safety Officer (BSO) and deputy BSO of the respective buildings, and the reports are submitted to ASC.

The Internal Safety Inspection Committee for Accelerator ensured that radiation fields and other hazardous factors in accessible areas were within the relevant regulatory stipulated limits; no one remained trapped or was present inside the areas with high radiation fields during operation while the primary particle beam was switched on; there was protection against noxious fumes and gases that might be formed during the accelerator beam operation or in radiation processing of materials; an efficient fire protection system was in place; safety was adequately taken care of against all other conventional and industrial hazards, and non-ionizing radiation, which might arise from operation in various subsystems in the facility. The fire protection system was checked to ensure that it was working efficiently and there was adequate protection against noxious fumes and gases. Similarly, Internal Safety Inspection Team for Laser, ensured that everyone using laser were aware of the risks, for example, watches and other jewelries that might enter the optical plane were not allowed in the laboratory; all non-optical objects that were close to the optical plane had a matt finish in order to prevent specular reflections; adequate eye protection was provided to everyone in the room if there was a significant risk