

temperature, vibration, strain, chemical, etc. The unique salient proportions of fabricating the FBG sensors using RRCAT facility are: specialized custom-built sensors, independence from foreign source, and cost-effective solution.

During last few months, the demand for 100 number of customized FBGs has been received from M/s Lab to Market Innovations Private Limited (L2M), Bengaluru for a project pertaining to advanced safety systems of Indian railways. The required specifications of the FBGs are grating length of 5 mm, reflectivity of more than 80%, FWHM between 0.4 to 0.6 nm, Bragg wavelengths of 1534 nm, 1537 nm, 1540 nm, 1543 nm, 1546 nm, 1549 nm, 1554 nm and 1559 nm. These sensors are being used by L2M for appropriate wheel impact load detection (WILD) system, which are attached to the railway track to measure strain caused by the movement of wheels over the sensor zone. The information gathered from these sensors are being used to build systems for estimated load on the axle, axle count and quality of wheel.

Utilization of RRCAT fabricated FBG is an ongoing process and the demands received from ISRO and IITs/NITs are under processing for sensor development and validation.

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N.3: Design and development of 650 MHz, 40 kW solid state RF amplifier and its shipment to Fermilab, USA

As a part of its R&D phase deliverables to Fermilab, USA (FNAL) for use in PIP II (Proton Improvement Plan II), design and development of 40 kW solid state RF amplifier at 650 MHz was taken up at RRCAT under the framework of Indian Institution Fermilab collaboration. Last year, 36 kW/650 MHz, solid state RF amplifier developed at RRCAT was sent to FNAL and after its successful installation, testing and joint acceptance, this new development was carried out with modified design requirements from Fermilab. The 40 kW RF amplifier is modular in design using 64 way combining/dividing architecture using 2 kW RF power amplifying modules as basic RF power units, having four RF amplifier slices of 500 W each on a common cold plate. Various RF components developed and used in this 40 kW amplifier includes; 34 RF power modules, 66 RF directional sensors, 2 sets of 64-port radial dividers and combiners, 2 phase shifters, one two-port high power combiner, 2 high power line sections, and 3 high power directional couplers. All of these RF components were developed indigenously and most of them were mass produced in local industry after their suitable technology transfer as per DAE norms. After rigorous testing of 40 kW RF amplifier, for different RF parameters such as RF power, gain, wall-plug efficiency, linearity, bandwidth, group-delay, pulse characteristics, spectral purity, etc., it was shipped to FNAL in Dec. 2021.



Photographs of the 40 kW, 650 MHz solid state RF amplifier (left) and snapshot of the measured RF power during rugged testing at RRCAT with 50 Ohms RF load (right).

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N.4: Trade Apprenticeship Scheme at RRCAT

RRCAT has initiated a Trade Apprenticeship Scheme at RRCAT (TASAR) under National Apprenticeship Promotion Scheme (NAPS). This scheme is successfully training ITI passed students by providing them access to the modern engineering infrastructure under the guidance of experienced and knowledgeable engineers and technicians. This scheme is helping the organization by providing semi-skilled technical manpower.

Encouraged by success of the program in technical field, apprenticeship in non-technical trade has also been introduced this year with first batch consisting of nine apprentices in stenographer and secretarial assistant trade. Their one year apprenticeship commenced on 1st September 2021 at IRPSU, Administration and Accounts Division.



Apprentice being trained at Accounts Division.

Fourth batch of apprentices in technical trades was also started from 1st October 2021. Although the selection process of the apprentices was completed in March 2020, the training could not be started on scheduled time due to pandemic.