

N.4: Technology transfer of 60 kW RF broadband dual directional coupler

Directional coupler is an indispensable measurement tool that provides a convenient and accurate means of signal sampling in high power Radio Frequency (RF) systems. It provides capability of separating travelling waves in forward and reverse direction, thus enabling precise measurement of power levels in both directions. There is a large requirement of such high-power directional couplers for ongoing as well as forthcoming DAE projects. This requirement for kW level of RF power, is mostly met by importing such couplers. Typically, a UHF 60 kW, solid state RF amplifier system requires around eight directional couplers. For fulfilling this requirement indigenously, an aperture coupled 60 kW CW directional coupler is designed. This coupler incorporates rectangular cross-sectional coaxial transmission lines without any moving parts. Specific profile of the metallic coupling aperture allows its operation over a wide bandwidth of 300 MHz to 700 MHz. The developed coupler has been successfully prototyped and deployed in multiple in 505.8 MHz and 650 MHz solid state RF amplifiers. After its prolonged time testing in Indus-2, this technology was transferred in July 2019 through Coordination Committee for Patents and Technology Transfer, RRCAT, and, Technology Transfer and Coordination Division (TTCD), BARC. It was licensed to M/s Minit Overseas Pvt. Ltd. Indore in Oct. 2019, in presence of Shri Debashis Das, Director, RRCAT, Dr. A. P. Tiwari, OS & Associate Director, KMG, BARC, Shri P. Shrivastava, Director, PAG, RRCAT, Shri M. R. Lad, Associate Director, PAG, RRCAT, Dr. Akhilesh Jain, Head, SSRFAS, RFSD, RRCAT and Dr. Amar Banerji, Head, TTCD, BARC.



Technology transfer event held at RRCAT Indore.

The developed coupler is a wideband, low loss (insertion loss < 0.05 dB) device which is indigenously, compact, manufacturing friendly and cost efficient as compared to imported unit.

*Reported by:
Alok Kumar Gupta (alok_gupta@rrcat.gov.in)*

N.5: COVID-19 work environment management at RRCAT

In view of the COVID-19 pandemic, certain adaptations in the work environment at RRCAT became necessary in order to prevent the spread of the novel Coronavirus. Ministry of Home Affairs (MHA), Ministry of Health and Family Welfare (MoHFW) and Indian Council of Medical Research (ICMR) issued several guidelines and advisory notes in-line with the directives of World Health Organisation (WHO) for controlling the pandemic in India. In the present pandemic condition, various measures have been taken to contain the spread of COVID-19 at RRCAT. For effectively implementing and enforcing the guidelines, Director, RRCAT constituted a COVID-19 Work Environment Management Committee (CWEMC). Based on the national guidelines, the committee formulated guidelines for the RRCAT, which were practical and effectively implementable. The following are the key measures implemented at RRCAT technical as well as residential area for avoiding the spread of the virus and associated risk to our employees and their family members.

Guidelines for work environment management: A comprehensive guideline addressing the modification in the work environment (within the framework of national and state/district directives) was made and released on RRCAT Infonet as well as RRCAT website. This helped the staff from various Divisions in the Centre to adapt their work environment to avoid the infection and virus spread. In the guideline, quarantine procedure for materials on receipt in stores at earmarked location is also laid down.

Implementation of social distancing and thermal screening at security gate: All pedestrians entering the gates have to maintain social distancing as per marking on the pathway near security gates. Also every person entering the RRCAT laboratory area has to undergo thermal screening with non-contact IR thermometer.

Area sanitization: A detailed scheme was worked out for the sanitization of common areas within RRCAT like entry lobby of various buildings, corridors, washrooms etc. and the same is being strictly implemented. Weekly sanitization of these areas with ~1 % Sodium Hypochlorite (NaOCl) is being carried out.

Hand sanitization: Hand sanitizer dispenser units were installed at the entry of each building. For this, around 50 foot-operated units were developed in-house and installed at 50 locations. In a few buildings, in-house developed sensor-based contactless hand sanitizer dispenser units were also installed.



Various types of hand sanitizer dispenser developed and installed at various buildings in RRCAT.

Medical management of COVID-19 situation: With a focus on medical management of COVID-19 cases, a document titled “COVID-19 Awareness, Precautions and Handling Procedures” was prepared by RRCAT medical centre (RMC) and made available on RRCAT Infonet. Reporting at RMC after travel from other cities is enforced as per the document.

Transit checkpoint and helpline: A transit checkpoint has been set up at RRCAT medical centre for patients with suspected symptoms of COVID-19, like cold, cough and/or fever. A 24x7 helpline has been setup in the Indus Accelerator Complex to guide staff suspected of COVID-19 symptoms. Thermal scanner, pulse oximeter and other PPEs have been procured and provided in the Centre.

Contactless washbasins: All washrooms are provided with hands free operated washbasin where foot-operated valves are procured and installed. Liquid soap dispensers/soap bars are provided at the washrooms.



IR sensor based and foot-operated wash basins.

Modifications in centralized air conditioning systems: Presently, once-through system in AHU has been implemented in official sitting rooms in Indus Complex and ADL. The fresh air intake of sitting rooms of other buildings

with centralized air conditioning facility have been increased from 10% to ~25% (maximum) and other parameters as per guidelines. As an additional precautionary measure, the Air Handling Units are being provided with UVC germicidal lamps in line with ASHRAE guidelines for HVAC applications.

Procurement of chemicals for sanitization and safety gadgets: Chemicals such as isopropyl alcohol (for hand sanitization), sodium hypochlorite (for area sanitization), face masks, face shields (for security personnel and other staff regularly dealing with outside agencies), hand gloves, thermal scanners (for use at security gates), dust bin (yellow coloured for disposal of mutilated/worn-out personal protective equipment like mask, etc.), have been procured. Also, procurement of UVC disinfection units for offices where a large number of files are handled has been initiated.

In-house sanitizer preparation and supply: Isopropyl alcohol (IPA) (70%) based hand-rub solution, sodium hypochlorite (1%) based solution for area disinfection and IPA based solution for equipment disinfection were prepared regularly by Chemical Treatment Lab (CTL) and distributed to all buildings through IRSU as per requirement.

Awareness programme: In order to make RRCAT staff and students aware about the precautionary measures to be adopted to prevent COVID-19 spread, a "COVID-19 corner" has been developed and made available on RRCAT Infonet. Relevant orders from the Government of India, DAE, district administration and RRCAT are made available on the "COVID-19 corner". For sensitizing the family members about the precautionary measures, display board highlighting *Do's and Don'ts* was fabricated and installed near RRCAT shopping centre.



Display board indicating Do's and Don'ts installed near Shopping Centre in RRCAT colony.

The above efforts and the cooperation received from family members of RRCAT employees have helped in avoiding the spread of COVID-19 in the RRCAT campus.

Reported by:
COVID-19 Work Environment Management Committee
(parchani@rrcat.gov.in)