

N.3: Patents

N.3.1: US patent for high voltage DC power supply for high power radio frequency amplifiers

US patent US 10,027,122 B2 has been granted on 17.07.2018 for “High voltage DC power supply for high power radio frequency amplifiers”. The inventor is Shri Manmath Kumar Badapanda, Head, RF Power Supplies Laboratory, RF Systems Division, RRCAT.



Series connected DC-DC power modules of -36 kV, 24 A DC power supply.

The invention is based on indigenous development of a solid state modular -36 kV, 24 A DC power supply achieving full range 24 pulsed, 11 kV input system for biasing high power RF amplifier. It employs several soft switched DC-DC power modules, outputs of which are connected in series and suitably staggered, to realize the desired low ripple high voltage output. Active redundancy is incorporated in this power supply to improve the overall system reliability. The variation of the output voltage and current as well as the number of faulty modules of this power supply does not affect its input line harmonics, input power factor and output voltage ripple.

This power supply employs simpler control protection system as its control is on low voltage, even though both the input and output of this power supply are on high voltages. Input section of this power supply is completely independent of its output control section to achieve high input and output performances simultaneously. The requirement of input-side line filter for harmonics and power factor improvement as well as the output-side crowbar for protection of RF amplifiers, under any unfavorable conditions, is avoided.

This power supply achieves input current THD $\leq 6\%$, input voltage THD $\leq 0.8\%$, input power factor ≤ 0.97 , output voltage stability $\leq 0.4\%$, peak to peak output ripple $\leq 0.72\%$ and output stored energy ≤ 10 Joule. These features make the invention important, particularly for particle accelerator related applications.

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N.3.2: US patent for optical rare earth doped fiber long period grating based ionizing radiation dose sensor device

A US patent US 10,101,467 B2 has been granted on 16.10.2018 for “Optical rare earth doped fiber long period grating based ionizing radiation dose sensor device”. The inventors are: Sanjay Kher, Smita Chaubey, Jai Kishore and Srikant M. Oak of RRCAT.



Extendable arm design probe for remote dose measurement.

This invention relates to a sensor device consisting of long period gratings made of rare-earth doped double clad fiber, which is written by CO₂ laser irradiation while the fiber is held static. This sensor device, shown below, can be used for gamma dose measurement in the range of 150 Gy-2.5 kGy, extendable to 20 kGy. The measurements are real-time and can be done from remote locations.

The sensor device has high wavelength dip shift sensitivity of at least 2.8 nm/kGy, and its radiation-induced changes are near permanent. The gratings demonstrate negligible temperature sensitivity and the shifts recorded show negligible annealing at room temperature.

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