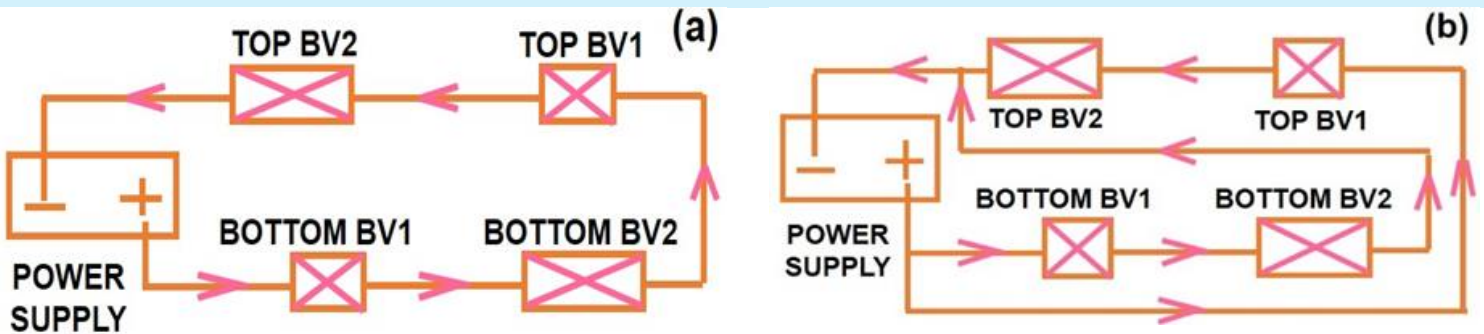


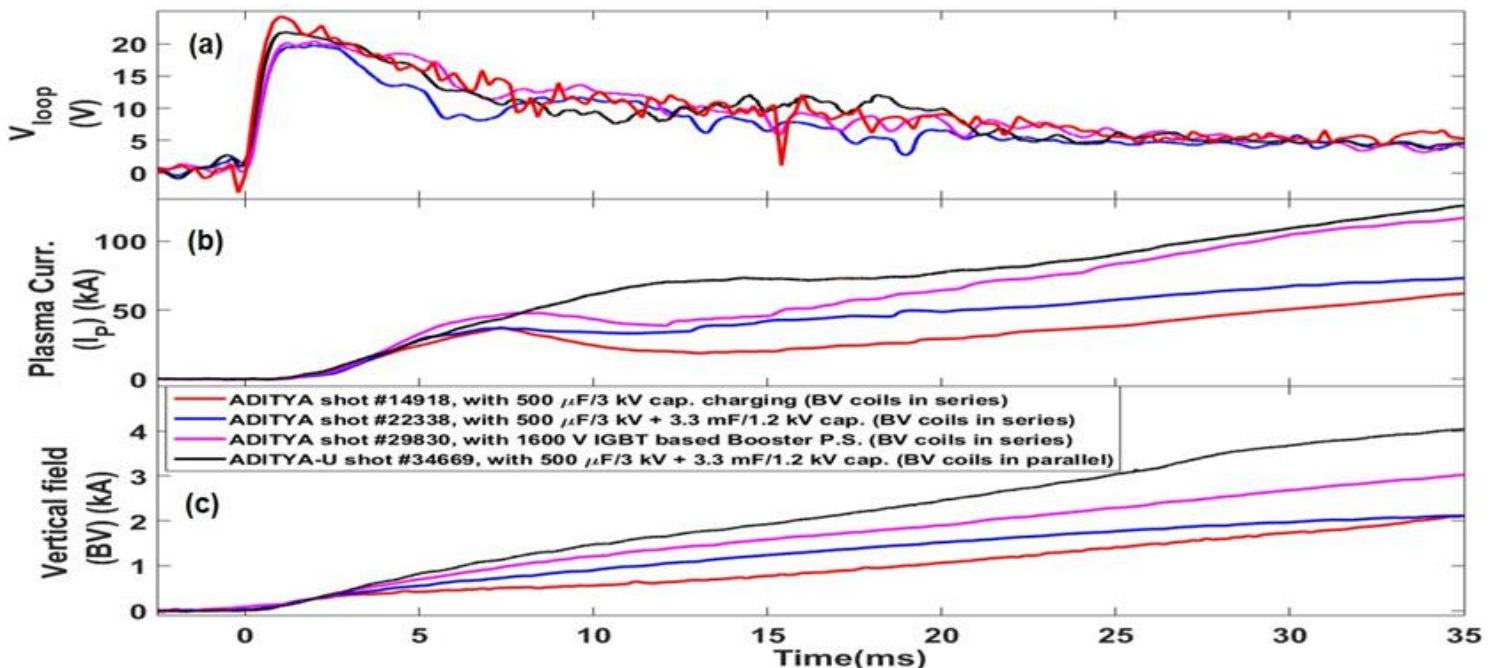


ADITYA-U Plasma Operation With Parallel Configuration Of BV Coils

In a tokamak, the equilibrium of toroidal plasma current column is mainly provided by means of an externally applied vertical magnetic field (BV). ADITYA-U tokamak has two pairs of vertical field coils (namely BV1 & BV2) placed outside the top and bottom of the vacuum vessel equidistant from the horizontal mid-plane in the high and low toroidal magnetic field side provide the require vertical magnetic field (equilibrium field). The require BV in ADITYA-U for plasma current (I_p) of ~ 250 kA is of the order of ~ 1000 Gauss is supplied by the available VF power supply, a 12 pulse converter based system having 2250 V/ 12.5 kA. The major straight vertical field is provided by a set of BV₂ coils and the curvature in the vertical field lines are provided by set of BV₁ coils. The direction of the vertical field is such that as to reduce the net field in the inboard side and enhance it on the outboard side. Usually, these all four BV coils are connected in series to provide vertical field and hence offer a large value of inductance (L) as well as resistance (R). Because of this large L and R, the response time for the coil is slow. Which cannot support the higher I_p ramp-rate due to high L/R time constant of the coils. This causes problems in the initial phase, when plasma current rise is very fast, as well as in the flat-top phase while trying plasma current feedback on BV current with the help of these BV coils. Hence to support the high ramp rate of the plasma current, the only possibility of getting faster response from these BV coils is to reduce overall inductance and resistance of the coil assembly. To achieve this requirement, we have connected top and bottom sets of BV coils in parallel configuration in such a way that the overall symmetry of the machine was not disturbed.



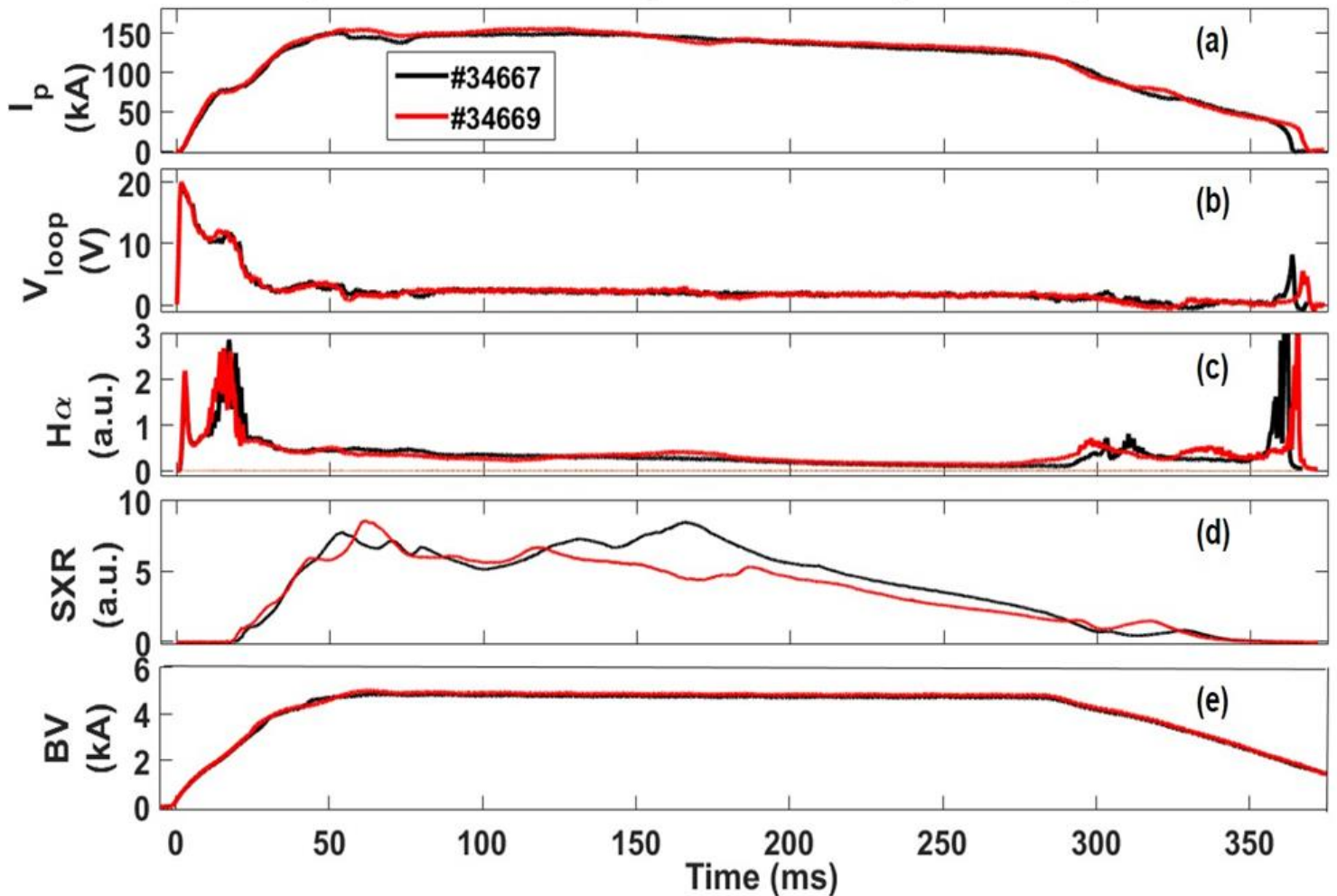
Schematic diagram for BV coils (a) Series configuration and (b) Parallel configuration.



Time evolution of ADITYA /ADITYA-U discharges parameters (a) loop voltage (V) (b) plasma current (kA) and (c) BV current (kA) shows the effect of various shapes of BV current in accordance with plasma performance.

The time evolution of the ADITYA/ADITYA-U plasma parameters represents the effect of various shapes of BV current in accordance with the plasma performance. The highest ramp-rate of I_p and BV current was observed with a parallel configuration of BV coils. Also, for the first time, with the parallel configuration of BV coils, consistent discharges with $I_p \sim 170$ kA, duration (t) ~ 370 ms, and flattop duration > 200 ms have been obtained.

Plasma Pulse length enhancement with Negative convertor in parallel configuration of BV coils



Plasma pulse length enhancement with negative convertor in BV parallel mode operation.

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