Formation and termination of runaway beams in tokamak disruptions and implications for ITER

- Inter-machine comparison of the termination phase of disruptions with current plateau formation in JET, DIII-D and FTU: Conversion of magnetic energy into runaway kinetic energy during disruption termination is found to increase for slow terminations and to decrease with the plasma resistive time after the disruption, increasing substantially for large RE plateau currents and long enough terminations due to RE avalanche

- Modelling of runaway beam formation and termination for selected ITER disruption scenarios with Ar and Ne injection:

  for the shortest CQs compatible with acceptable mechanical forces in ITER, collisions of the REs with impurity ions lead to very low RE production and low energy conversion during termination

  for long CQs, RE beams up to ~ 10 MA can be generated and, if the runaway loss time during termination is slow enough (τ_{diff} > 1 ms), the energy deposited by the REs onto the PFCs, W_{run}, can increase up to a few hundreds of MJs, mainly due to RE avalanche

  mixed Ar+D or Ne+D injection is found to be effective in controlling the formation of the RE current as well as the energy deposited by the REs during current termination