Summary Session III:
Halo & Hiro Currents and Forces Discussion Topics

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Topics for Discussion

- **What are the outstanding issues associated with VDEs and axisymmetric halo currents?**

- **What is the difference between halo and Hiro axisymmetric and asymmetric currents?**

- **What determines the magnitude and direction of the currents and rotation of the instability?**

  – What determines the duration of asymmetric currents?

- **Is the large inter-machine and intra-machine variability understood?**

  – Does the variability provide clues regarding what can be done to decrease the forces associated with halo and Hiro currents?

- **If we cannot interpolate the JET sideways force results to AUG, what are the implications for the extrapolation to ITER?**

The physics of Hiro and Evans currents is different from the physics of halo currents and summarized in the Table.

	Hiro currents	Evans currents:	Halo currents:
1	Both result from magnetic flux conservation.		Derived from questionable use of equilibrium reconstruction. **No strong reason for existence.**
2	Driven by instability acting as current generator.	Driven by instability acting as voltage generator.	Assumed to be driven by a residual voltage outside the last closed magnetic surface.
3	Highly concentrated at the plasma edge.		Diffused in space with open field lines.
4	Big in amplitude, proportional to plasma deformation.		Limited by the ion saturation current.
5	Absolutely necessary to slow down the instability.	Force-free, little, if any, effect on stabilization.	Secondary, if any, effect on stabilization.
6	**Opposite to** I_{pl}.	Same direction as I_{pl}.	Same direction as I_{pl}.
7	Consistent with toroidal asymmetry in JET VDEs.		Ruled out as a reason of toroidal asymmetry.
8	The real plasma physics objects		**Most probably the result of misinterpretation**
		May 2012	
9	Consistent with EAST VDE measurements.	No indication of presence	No indication of presence