9. COLLABORATION WITH THE ASSOCIATION EURATOM/CEA

This project will have four research lines, where the following activities are planned:

- *Microwave reflectometry*

- Studies of Doppler effects on standard as well as on dedicated Doppler reflectometry taking into account time variation of plasma turbulence;
- Further modelling of density fluctuations footprints aiming at quantifying the level of turbulence from the reflectometry response.

- *ITER-like PAM LHCD antenna for TORE SUPRA*

- Testing of the multijunctions and antenna will be conducted in Cadarache, and electromagnetic coupling codes will be improved with more realistic geometry.

- *Turbulence studies*

- Studies of infinite-dimensional Hamiltonian systems (with or without small dissipative perturbations) with particular emphasis in the long-term prediction of such systems and strategies for the control of their turbulent;
- Analysis by infinite-dimensional Hamiltonian techniques of the gyrokinetic equation resulting from the kinetic equation that explains the average over the particles motion along the magnetic field lines. Of particular importance are the long-term prediction of the solutions and the establishment of barriers to the microturbulent drifting;
- Application of the above mentioned techniques to the Vlasov-Maxwell equation. Here some potentially promising techniques include not only its treatment as an infinite-dimensional Hamiltonian system but also the evolution of the densities (Perron-Frobenius equation) as well as the exploration of its infinite-dimensional Lie group symmetries;
- Exploration of the possibility of adapting the (non-commutative) tomographic techniques to plasma diagnostics.

- *Real-time MSE diagnostic*

- Improvement of the software of the real-time MSE diagnostics of JET and TORE SUPRA;
- Improvement of MHD and equilibrium codes based on the real-time MSE results.