**Introduction**

The IFMIF-EVEDA Accelerator Prototype will be a 9MeV, 125mA CW deuteron accelerator to validate the technical options for the IFMIF accelerator design. The Radiofrequency Quadrupole (RFQ), buncher cavities and Superconducting Radiofrequency Linac (SRF Linac) require continuous wave RF power at 175 MHz with an accuracy of ±1% in amplitude and ±1° in phase. Also the IFMIF/EVEDA RF Power System is to work under pulsed mode operation (during the accelerator commissioning). The IFMIF/EVEDA RF Power System is composed of 18 RF power generators feeding the eight RFQ couplers (200kW), the two buncher cavities (105kW) and the eight superconducting half wave resonators of the SRF Linac (105kW). The main components of each RF power chain are the Low Level Radio Frequency system (LLRF), three amplification stages and a circuit with its load. For obvious standardization and scale economies reasons, the same topology has been chosen for the 18 RF power chains: all of them use the same main components which can be individually tuned to provide different RF output powers up to 200kW.

**Main Description**

The RF Power System combines all three components of which that will be integrated in the Accelerator Prototype Building in Rokkasho (Japan). These three groups are:
- RF Modules (2 RF Amplifying Chains per module)
- RF Final Amplifier Anode Power Supplies (composed by Breaker, Transformer and 400kW HVPS)
- Auxiliaries for the installation at Rokkasho (RF Local Control System, Coaxial Transmission Lines, Water/Air Cooling System)

The first amplifying stage of the RF chain have been designed and manufactured by Europen de Telecommunications S.A. (France) and it is based on solid state technology. The second amplifying stage of the RF chain is being manufactured by Thales Electron Devices (France) and it is based on the TH1528C cavity or the H56 tetrode. The last amplifying stage is based on the TH781 tetrode manufactured by Thales Electron Devices (France). The RF Final Amplifier cavity and auxiliaries have been designed and are being manufactured by Iba Group (Belgium). The circulators are being manufactured by AFT Microwave GmbH (Germany) and the circuit loads are being manufactured by Spinnerr GmbH (Germany).

**RF Module**

The RF Module original concept is to assemble two complete amplifying chains in a unique module. This approach allows the reduction of the time needed for the installation at Rokkasho (RF Modules will be shipped fully assembled) and ease the commissioning and maintenance operations in the Accelerator Building (RF Modules can be extracted partially or totally from their operating position). For the future IFMIF plant this design will reduce the accelerator MTR by having spare RF modules, leading to a better availability of the whole facility.

- The RF Module Control System is based on a Samic St PLC which will monitor and control all physical parameters and operation sequences within each RF Module.
- The Tetrodes Protection System has to protect the driver and final amplifier tubes from damage caused by excessive voltages or current peaks caused by arcs between electrodes. This system has to protect tubes in any operation mode and independently of the RF Module Control System. The main components of this system are the following:
  - Screen grid protection circuit
  - Control grid protection circuit
  - Anode protection circuit

**RF Power System Main Performances**

- Frequency, 175 MHz
- Output Power: 200kW
- Load: 500Ω
- Output Voltage, 6.8kV
- Input Power: 15kW
- Cooling System: Water/Air
- Efficiency, 90%
- Overall Dimensions: 765mm x 2160mm x 2300mm
- Mass: 1000kg

**Current Status**

- The first 200kW RF chain ("the Prototype RF Chain") is being integrated and installed in Madrid and will be extensively tested during the following months in order to demonstrate its full capabilities. It is foreseen to achieve full output power in January 2013. The Prototype RF Chain will be permanently available during the complete duration of the project at the Spain Test Platform and it will be also used for the testing and conditioning of the SRF Linac cavities.
- The final design of the buncher cavities require less RF power than originally expected (16kW maximum). So it was decided to change the vacuum tube amplifiers by solid state amplifiers for the RF chains of the MEBT cavities. Ciemat is designing a very innovative solution to achieve a high efficiency and high scalability to prove the feasibility to use an RF Power System for the final IFMIF accelerators fully based on solid state technology.

- The Genesys power supplies family from TDK-Lambda with an output power range from 750W to 15kW have been chosen practically for all the required power supplies to be installed inside the RF Module. The exception is the TH-561 anode power supply, whose power level requirement exceeds the Genesys range. In this case, the ALE 203/503 family from the high voltage products division of TDK-Lambda have been chosen.
- The RF Final Amplifier Anode Power Supply is the only one that will be installed outside the module due to the size.
- The RF Water Cooling System will be installed in a shelter due to the lack of space (3 parallel pumps, expansion tank, deionizing circuit, filters, ...)