

## NEUTRON DETECTION AT JET USING ARTIFICIAL DIAMOND DETECTORS

**mario pillon**(1), marrizio angelone(1), danielle lattanzi(1), enrico milani(2), aldo tucciarone(2), gianluca verona-rinati(2), sergey popovichev(3), andrea murari(4)

1. Associazione EURATOM- ENEA sulla Fusione, Via Enrico Fermi 45, I-00044 Frascati (RM), Italy

2. Associazione EURATOM -Università di Roma "Tor Vergata", Dipartimento di Ingegneria Meccanica Via del Politecnico 1 I-00133 Rome Italy

3. Experimental Department, Euratom/UKAEA Fusion Association Culham Science Centre Abingdon UK JET-Culham Science Centre OX143DB Oxford UK

4. Consorzio RFX - Associazione EURATOM -ENEA sulla fusione Corso Stati Uniti 4 I-35127 Padova Italy

Three CVD diamond detectors are installed and operated at Joint European Torus, Culham laboratory. Diamond detectors are very promising detectors to be used in fusion environment due to their radiation hardness, gamma discrimination properties, fast response and spectroscopy properties. The aim of this work is to test and qualify artificial diamond detectors as neutron counters and spectrometers on a large fusion device.

Two of these detectors are polycrystalline CVD diamond films of thickness 30 mm and 40 mm respectively while the third detector is a monocrystalline CVD of 110 mm thickness.

The first polycrystalline diamond is covered with 4 mm of LiF 95 % enriched in  ${}^6\text{Li}$  and enclosed inside a polyethylene moderator cap. This detector is used with a standard electronic chain made with a charge preamplifier, shaping amplifier and threshold discriminator. It is used to measure the time-dependent total neutron yield produced by JET plasma and its signal is compared with JET fission chambers.

The second polycrystalline diamond is connected with a fast (1 GHz) preamplifier and a threshold discriminator via a long (about 100 m) double screened cable. This detector is used to detect the 14 MeV neutrons produced by triton burn-up using the reaction  ${}^{12}\text{C}(n,\alpha){}^9\text{Be}$  which occurs in diamond and a proper discriminator threshold. The response of this detector is fast and the electronic is far from the high radiation environment. Its signal is used in comparison with JET silicon diodes.

The third monocrystalline diamond is also connected using a standard electronic and is used to demonstrate the feasibility of 14 MeV neutron spectrometry at about 3% peak resolution taking advantage of the spectrometer properties of monocrystalline diamonds. The results obtained are presented in this work.