Industrial applications of Plasma Focus radiation
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Applications of a small-chamber Plasma Focus used as portable radiation generator is presented. The device was designed to maximize the fluence. The mean neutron yield was $3 \times 10^8$ neutrons of 2.45 MeV per shot, corresponding to a $10^6$ neutrons/cm$^2$ fluence on the external surface of the chamber. A technique to detect the presence of water in the neighborhood of a compact Plasma Focus is presented. The measuring system is composed by two neutron detectors operated simultaneously on every shot. The first detector is used to register the PF neutron yield in each shot; whereas the other one was designed for detecting neutrons scattered by the blanket. The results indicate that the system is able to detect water contents of few percents in volume. The correlation of the counts recorded by the detectors located at different positions was mapped with the water distribution around the neutron source. The complete detecting system is very simple and inexpensive. Among many other potential applications, the technique is specially suited for soil humidity prospections. X rays radiation emitted by the compact Plasma Focus operated in Deuterium has been used for introspective radiographic imaging of metallic objects. The samples were located about 1 m away from the PF chamber wall. High-sensitivity, fast-response commercial radiographic film was used as x-ray detector. A set of experimental images is presented demonstrating a very high penetration power of the x-ray beam. Among many other applications, the presented technique is specially suited for introspective visualization of pieces manufactured on metal. Radiographic projections of a stainless steel BNC elbow taken at 8 different angles were processed to reconstruct transversal cuts of the piece. A computer technique for 3 D reconstructions was combined with radiographic images of objects X-rayed with a compact plasma focus. The technique is able to automatically determine the position of the rotation axis, reconstruct the 3D-attenuation map, and display inner cuts. The system was demonstrated in introspective tomographic imaging of a stainless steel BNC elbow.