

# INFLUENCE OF GAS PRESSURE ON INTENSITY OF THE PYROELECTRIC X-RAY SOURCES

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The idea of using pyroelectric crystals for *X*-ray generation was raised by J.D. Brownridge [1]. Changing the temperature of the pyroelectric crystal of about one hundred degrees results in the formation of the uncompensated electrical charges on the surfaces sufficient to generate the electric field with a potential of a few tens of keV. These fields cause ionization of residual gas atoms and create beams of accelerated electrons and ions. The interaction of accelerated electrons with the crystal and the target leads to the generation of *X*-ray bremsstrahlung and *X*-ray characteristic radiation.

The pyroelectric devices can also be used to generate neutrons [2, 3]. Nuclear fusion reaction  $D + D = He3 + n$  has been implemented in a device in which pyroelectric crystal of lithium tantalate and deuterated target were placed in a deuterium gas. Currently pyroelectric devices are considered as promising mobile sources of *X*-rays and neutron radiation having small dimensions and low power.

This paper is devoted to the choice of gas and to the study the effect of pressure on the *X*-ray radiation intensity. Experiments were carried out in a vacuum chamber in which a pyroelectric crystal of lithium niobate  $NbLiO_3$  and a copper foil as a target (thickness of 15 micrometers) were placed. The crystal temperature was measured by a copper-constantan thermocouple. *X*-ray intensity was measured during heating-cooling cycles in the temperature range  $25^{\circ}C - 125^{\circ}C - 25^{\circ}C$ . The gases air, helium, nitrogen and argon were investigated.

In the report the experimental data on the optimal gas pressure corresponding to the maximum intensity of *X*-rays will be presented. A qualitative model of the processes in pyroelectric sources will be considered.

1. J.D.Brownridge, S.Raboy // *J. of Appl. Phys.* 1999. V.86. P.641.

2. B.Naranjo *et al.* // *Nature.* 2005. V.434. P.1115.

3. J.Geuther *et al.* // *Phys. Rev. Lett.* 2006. V.96. 054803.