PLASMA FORMATION INTENSITY OF CYLINDRICAL ARRAYS FROM WIRES AND FIBERS OF VARIOUS SUBSTANCES [[1]](#footnote-1)\*)

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Mitrofanov K.N., Aleksandrov V.V., Grabovskii E.V., Gritsuk A.N., Lauhin Yan N., Frolov I.N.

Troitsk Institute for Innovation and Fusion Research, Troitsk, Moscow, Russia

According to the model of a heterogeneous liner [1,2], the intensity of plasma formation  [μg/(cm2⋅ns)], necessary to maintain a stationary radial outflow of plasma from a plasma formation region with a fixed external boundary, is expressed as follows

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In the presented model, it is assumed that plasma flows into vacuum and the rate of plasma formation depends on only one parameter. This can be either a global magnetic field, or a current flowing in a narrow cylindrical layer (in region of plasma formation), or a magnetic field on inner surface of plasma source, where a magnetic field becomes equal to 1/ from an external a magnetic field. All these parameters (quantities) are unambiguously related to each other while such stationary plasma formation is taking place, therefore, one can be replaced by another, and only the coefficient *Km* in front of (*I*/*R*0)μ will change.

However, this model has one significant drawback. It is believed that all wires in array are the same and a plasma formation on them ends instantly along their length. Within framework of this model, it isn't possible to explain, found in experiments on the Angara-5-1 facility [3], not an instantaneous drop in the value →0 at final stage of wire array implosion, when total current in system *I*(*t*) still continues to increase, and velocity of plasma formation in this case decreases over a finite time. It was found that at some point in time proportionality ~*I*μ(*t*) is violated.

In the present paper, a new approach to determining a value  as a main quantitative characteristic of process of prolonged plasma formation in wire (or fiber) arrays is proposed. A method is presented, using which, it is possible to experimentally determine time dependence of  at an initial stage of plasma formation and at its final stage, when →0. Indeed, by measuring the current *Ip*(*t*) by a magnetic probe located inside wire array near wires surface, one can find a current *Is*(*t*) flowing in plasma formation region, as the difference between total current *I*(*t*) through liner and a current *Ip*(*t*). The temporal dependence *Is*(*t*) thus determined turned out to be nonmonotonic, and the value ~*Is*μ(*t*) decreases at final stage of wire array implosion. The plasma formation intensity of arrays made of wires and fibers of various substances (Al, Cu, Mo, W, Bi, kapron) was determined.

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References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/It/ru/CS-Mitrofanov.docx) [↑](#footnote-ref-1)