Wire array initiation at 1MA z-pinch ZEBRA

G.S. SARKISOV, Ktech Corp, V.V. IVANOV, T.E. COWAN, UNR, S.E. ROSENTHAL, K.W. STRUVE, SNL, A. MOROZOV, A. HABOUB, A. ASTANOVITSKIY, B. LA GALLODEC, UNR — The initial stage of W and Al wire array explosions on the 1MA z-pinch installation ZEBRA was investigated. Data from breakdown light emission, B-dot and axial/peripheral V-dots were obtained. Observation of the resistive voltage and the moment of corona generation allow calculation of the condition of the wire core after breakdown. With a current prepulse of 300ns duration, we observed plasma formation at 200ns before the main current. At this moment a first light emission and V-dot signals was observed. During the next 5-10 ns fast plasma components arrive at the center of the wire array and shunt the axial V-dot. After shunting, the axial V-dot shows signals correlated to axial current. Analyzing mass-velocity ratios, we determined that for the Al wire array hydrogen plasma arrived first at the center with velocity 666km/s, followed by carbon plasma with velocity 200km/s and later, the aluminum plasma with velocity 130km/s. Hence, before the main current starts the internal volume of the array is filled by low-density plasma. The axial V-dot signal indicates that the main current initially flows though the entire wire array cross-section, but it is rapidly rejected to the periphery. During the compression stage we observed that the current again flows through the center of the wire array.

Gennady Sarkisov
Ktech Corp

Date submitted: 19 Jul 2006