Diffusion of the magnetic field in the explosion of flat conductors

Datsko I.M.[1,@], **Chaikovsky S.A.**[2], **Van'kevich V.A.**[1], **Labetskaya N.A.**[1] **and Oreshkin V.I.**[1]

[1] Institute of High Current Electronics of the Siberian Branch of the Russian Academy of Sciences, Akademichesky Avenue 2/3, Tomsk, 634055, None
[2] Institute of Electrophysics of the Ural Branch of the Russian Academy of Sciences, Amundsen 106, Ekaterinburg, 620016, None

[@] datsko@ovpe.hcei.tsc.ru

The formation, expansion of plasma and the passage of a wave nonlinear diffusion of a magnetic field on a terawatt generator MIG (2.5 MA, 100 ns) were studied during a nanosecond explosion of flat aluminum conductors with perforation in the form of round holes. The exit of the nonlinear magnetic field diffusion wave to the boundaries of the holes was studied by the glow of the formed plasma. The density of the substance in this plasma was estimated. Flat aluminum conductors with a thickness of 100 μm and a width of 5 mm were used in the experiments. The images obtained in the visible range showed that due to the amplification of the magnetic field on the end faces of the flat conductor, they explode and form plasma with the development of instabilities. In this case, there is practically no expansion of the conductor. In the holes, plasma is formed from the direction of the side edges and the hole expands in their direction. Along the conductor in the direction of current flow, the size of the hole remained unchanged until the maximum current. A luminous halo was recorded around the hole in the direction of the side edges. It indicates the meeting point of the incident and reflected pressure wave accompanying the field diffusion wave. The propagation velocity of the field diffusion wave in the flat conductor was measured. The wave under these conditions propagates at a speed of 50 km/sec. Based on X-ray images of flat loads the density of the substance in the plasma at the boundaries of the conductor and inside the holes was estimated.