STUDY OF the SPECTRAL TRANSMISSION OF NICKEL PLASMA CREATED BY RADIATION ABLATION OF FINE FOILS UNDER THE ACTION OF the X-RAY RADIATION PULSE of A Z-PINCH [[1]](#footnote-1)\*)

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Current implosion in ultrahigh electric power generators makes it possible to obtain high-temperature dense plasma of Z-pinches, which is a source of powerful thermal radiation and is widely used in experiments in high energy density physics. To create a high-temperature plasma and study its spectral properties in the experiments carried out at the Angara-5-1 facility, a Z-pinch radiation pulse with a power of 5-10 TW with a duration of 7-10 ns is used, which is formed during the implosion of tungsten multiwire array. In this case, the Z-pinch radiation heats the target and turns it into hot plasma during half a pulse. In the second half of the pulse, the pinch radiation probes the target plasma to determine the spectral dependence of the transmittance of this plasma. An original scheme is proposed for measuring the radiation incident on the target, the transmitted radiation and the target's own radiation simultaneously in one experiment in the frame mode using a grazing incidence diffraction spectrograph. With the help of laser shadowing, the scheme allows one to obtain experimental data on the velocity of plasma motion on the irradiated and rear sides of the target, which reached 100 km/s. We studied targets made of thin Ni layers deposited on a Mylar film. An irradiation-induced multiple increase in the transmission coefficient of the target in the EUV range was observed in comparison with the transmission of the target in the solid state. Numerical simulation of heating, expansion, and own radiation of a target irradiated by a Z-pinch was carried out using a two-dimensional radiation gas-dynamic code RALEF-2D [1]. The RALEF code calculates the motion of a plasma in the framework of two-dimensional hydrodynamics, taking into account thermal conductivity and spectral transfer of thermal radiation. Radiation transfer is considered within the framework of a stationary transfer equation with spectral ranges of photons calculated using the THERMOS code, assuming the source function to be Planck. To describe the equations of state in the RALEF code, the FEOS model is used [2]. The dependence of the absorption spectrum of the plasma and the accompanying own radiation of the target on the power and shape of the incident pulse was also investigated. In the range of ~40-200 Å, the shape of the spectral dependence of the transmittance in the experiment and calculation is similar, but the value of the model plasma transmittance (~0.8-0.9) is greater than that obtained using a spectrograph and a multi-frame X-ray camera (~0.5-0.6).

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