

SPECTROSCOPIC TEMPERATURE DETERMINATION IN THE "BOGEN" AND
"EIERUHR" EXPERIMENTS

by

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Abstract

As a result of the applied magnetic field and the related reduction of the heat transfer, large temperature gradients are present both in the arc experiments and in the "Eieruhr" experiments. Hence the population density of the ground state of both the neutral and the single ionized helium atoms decreases rapidly in the direction from the boundary towards the axis of the plasma column. Thus line radiation caused by transitions to the ground level is emitted by optically thick layers at the boundaries whereas it is emitted by optically thin layers in the plasma zone. It is investigated how the determination of the temperature is affected under these conditions. Three cases are considered: 1. temperature determination based on the relative intensities of two lines corresponding to different ionization states, 2. determination of the temperature based on the relative intensities of the line and continuum radiation, and 3. determination of the temperature based on the continuum intensity and the density of free electrons. Experimental results are presented.