

LINEAR MODE COUPLING AND MICROWAVE POLARIZATION DIAGNOSTICS OF PLASMA CURRENT SHEETS

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The problem of linear coupling of extraordinary (X) and ordinary (O) modes in a plasma current sheet with a weak transverse component of magnetic field is solved analytically. According to the pioneering paper [1], both known effects of linear mode coupling in the transverse magnetic field and in the zero magnetic field are possible in this case. Two pairs of the coupling regions of these types may be present in the current sheet. Their mutual action on the polarization of microwave radiation is described in detail. The most important result is the possibility of the unchanging sense of the circular polarization for the radiation propagating through a well-formed current sheet in a broad angular range of incident rays.

Conditions of effective X-, O-mode coupling are indicated allowing for the microwave polarization diagnostics of various current sheets. We show that the corresponding polarization observations may give valuable data on the inhomogeneity and strength of the main and transverse components of magnetic field in the dominating coupling region inside the sheet. The theory developed is applied to the calculations of the polarization features of probe microwave radiation passed through typical current sheets in the ionosphere (magnetosphere) of the Earth as well as in the solar corona and laboratory plasma.

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REFERENCES

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