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ANALYTIC METHODS FOR CALCULATING COUPLING IMPEDANCES

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Abstract

These lecture notes describe a variety of analytic techniques to calculate the longitudinal and transverse impedances of obstacles in a beam pipe. They also treat the effort to shield these impedances from the beam by appropriate use of thin conducting layers.
Preface

This report contains the lecture notes used for a course entitled ‘Analytic Methods for Calculating Coupling Impedances’ which I gave at the US Particle Accelerator School at Tuscon, Arizona, in January 2000, at the invitation of S.Y. Lee, director of the School. These notes are being published as a CERN report in order to achieve a wider distribution to those who may be interested in the subject.

The contents represent the work on coupling impedance of my colleagues and I over the last 15 years. As mentioned in the Introduction, material is included on the shielding of impedance by wires and/or thin conducting layers, which has been and continues to be the focus of my present interest in the subject. This recent work has benefited from extended conversations and collaboration with Bruno Zotter at CERN, and Sergey Kurennoy of Los Alamos National Laboratory, and with assistance from Alexei Fedotov at BNL and Maura Williams at the University of Maryland.

I would like to acknowledge partial support from the US Department of Energy during the preparation of this report. I am also grateful to Francesco Ruggiero for the invitation to spend several weeks at CERN as well as for the encouragement to publish these lecture notes as a CERN report.

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