Preface

This master thesis is the outcome of 16 months of research and development work on the ARGONTUBE project at the Laboratory for High Energy Physics and Albert Einstein Center for Fundamental Physics (LHEP-AEC) of the University of Bern. This project has been initiated specifically to evaluate certain aspects of the feasibility of large and massive, i.e. kiloton-scale, liquid argon time projection chambers (LArTPC) and to address the associated technological challenges. LArTPCs are a promising particle detector type offering the detection capabilities required amongst others by neutrino and astrophysics experiments.

For my master thesis, I have become fully involved into this fascinating project and have taken the opportunity to make my own contributions to the development of this particle detector technology. I have participated in five measurement campaigns where a large number of UV laser induced events as well as cosmic muon tracks have been acquired with a novel cryogenic read-out. These data allowed the extraction of interesting results, relevant for the ARGONTUBE project as well as for future large LArTPCs in general. In between the runs, I was involved in doing technical work, modified and prepared the detector and associated systems. I have gained experience in the fields of vacuum technique, cryogenics, electronics and programming.

Apart from a general introduction to the LArTPC technology, this master thesis reports on the ARGONTUBE detector upgrades that have been realized as well as the measurements and studies that have been carried out.

During my work on the ARGONTUBE project, I have been supported by a number of persons to whom I wish to express my sincere gratitude.

First of all, Prof. Dr. Antonio Ereditato who initiated this master thesis and allowed me to be part of such an interesting research project.

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