

Foreword

This book was written by a researcher who has been working actively in a field of detector technology originally introduced almost 40 years ago by a group of Russian physicists investigating electron emission from liquid argon. They were able to formulate the unique properties of a new detector technology that could be developed employing this effect. They called these detectors *emission detectors*, meaning detectors of ionizing radiation, in which ionization electrons could be extracted from a condensed matter detection medium into a rarefied gas phase in which the electron signal could be amplified. Such detectors are sometimes called *two-phase* or *dual-phase detectors*, but that does not truly reflect the basic principle of their operation, therefore probably the name *two-phase emission detectors* would be more accurate.

Researchers working in emission detector technology are concerned with effects associated with quasi-free electron transmission through bulk dielectrics and charge carrier penetration through the inter-phase boundary, purification technologies that provide long electron lifetimes, methods of amplification of electron signals in pure dielectrics, analogue and digital visualisation of ionization particle tracks with extremely low ionization yield in condensed matter.

First considered for accelerator experiments hunting for rare processes, such as short-ranged particles, neutral channels of antiproton-nucleon annihilations in heavy nuclei and abnormal low-ionizing particles as well as medical imaging, emission detectors seem to have found their niche in low-background experiments searching for cold dark matter and low-energy neutrino interactions. The further development of this interesting class of radiation detectors may enhance the arsenal

of modern experimental methods in other exciting fields like the neutrinoless double-beta decay search, solar neutrino physics and possibly in many new areas that cannot be satisfactorily served with existing detector technologies. In this sense, this monograph may be useful in providing readers with a solid foundation for development of the new instrumentation.

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