

SPECIAL ISSUE ON SPACE-CHARGE MEASUREMENT AND ITS PROPERTIES

PREFACE



The main theme of this special issue is research on space-charge measurement and its properties, especially measurement by the pulsed electroacoustic (PEA) method. Recently, many researchers have focused on the space-charge accumulation problem in insulating materials. One of the major reasons is the current movement of the so-called High Voltage Direct Current (HVDC) Project in Europe. To install a sustainable electric power source for infrastructures in Europe, many leading companies have been using long-distance cables with solid polymer insulating layers. However, while the insulating layer must show good performance under high DC stress, space charge accumulates and distorts the electric field in conventional solid polymeric materials, such as cross-linked polyethylene (XLPE) used in AC cables. Therefore, it is required to develop a good material free of space-charge accumulation even under high DC stress. To evaluate the space-charge accumulation in the developed material, the PEA method is a necessary technique. In fact, the reliability of a newly developed material for DC cables under high DC stress was confirmed using the PEA measurement system, and the material was used in the HVDC long-distance cable between Honshu and Hokkaido in Japan inaugurated in 2012. Of course, it is currently well run, and another plan for a transmission cable using this material between England and Belgium is expected to be completed within a few years. Actually, the transmission cable between Honshu and Hokkaido with a solid polymeric material was initially planned about 40 years ago. At that time, the plan failed because all test cables with the XLPE insulating layer broke during the HVDC test. Space-charge accumulation was considered to be the main reason for this failure. Since then, the space-charge problem has attracted the attention of many researchers in this field. However, there was no effective measurement technique to evaluate space-charge accumulation. Professor Takada took on the challenge of this problem, and he eventually developed the PEA measurement technique. The theme of an HVDC cable was his consistent motivation to develop the measurement technique. Therefore, the installation of the HVDC cable between Honshu and Hokkaido in 2012 was one of the fruits of his labor. It's an amazing success story spanning about 40 long years! Nowadays, the PEA method is recognized as a standard measurement technique of the space-charge distribution by many researchers, and its application has been extended into various fields. I believe that further tremendous achievements will be accomplished by researchers of many generations far into the future.

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