

## The space charge characteristic in DC-XLPE cable after 400kV PQ test.

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In recent years, high voltage DC (HVDC) cross-linked polyethylene power cables have been developed and already been put into practical use. CIGRE TB 496 (former 219) is predominant test protocols in order to perform a long term pre-qualification (PQ) test and type test. J-Power Systems has already successfully conducted a 400kV type test and a PQ test in accordance with CIGRE TB496 on the complete cable system with accessories, under the polarity reversal conditions as reported in Jicable 2013 and highlighted in Fig 1 and Fig 2 below.

In the meantime, there are some technical discussions in users/manufacturers/technical committee of international standards if space charge accumulation would affect the deterioration of cable insulation in DC use and therefore residual space charge measurement might be useful to check the performance of DC-XLPE insulation as well as cable design. On the other hand, CIGRE 490 does not require any measurement of space charge in insulation.

Authors have many experiences in the measurement of space charge in cable insulation material. Space charge measurement, one of the evaluation methods, is a simple way to analyze space charge behavior, electric field distortion and space charge distribution in the insulator. In general HVDC cables require low accumulation of space charge, uniform electric fields and long-term stability of space charge distribution. To measure space charge, pulsed electroacoustic (PEA) method is applied.

In this paper, we describe the result of space charge measurement using PEA method on a full-size HVDC cable sample after the 400kV PQ test in order to attempt to evaluate any change or increase of space charge accumulation by polarity reversal operation after a long term test.



Fig. 1 View of 400kV PQ test

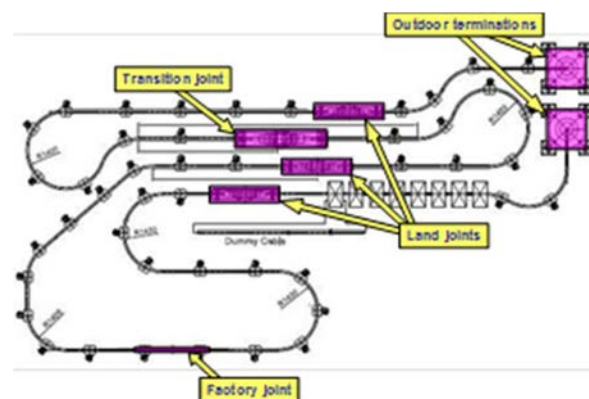


Fig. 2 Layout of 400kV PQ test