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Estimation of Frequency of Lightning Strokes to Distribution Lines Based on An Observation of Lightning Channels

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Abstract

Outages on 6.6-kV overhead distribution lines mainly occur due to direct lightning strokes in Japan. Thus, the lightning protection is important against the outages. Several evaluation methods of lightning performance of distribution lines have been proposed in [1], [2], [3], and [4]. However, it was reported that lightning outage rate calculated using the method proposed in [4] was several times larger than the actual lightning outage rate. One of the causes may be that the frequency of lightning strokes to distribution lines used in the calculation deviates from actual conditions, particularly in winter.

In order to find out the actual frequency of lightning strokes to distribution lines, an observation of lightning channels using lightning-video cameras has been carried out since 2016 in Hokuriku region, Japan. The video camera can capture lightning channels with a high probability compared with the lightning-still camera we have used [5]. If a lightning channel is recorded by two or more video cameras located at different points, it is possible to locate a lightning stroke point by direction finding method.

In our presentation, first, we present the observation results of lightning channels captured by the video cameras from November 2016 to October 2017. The observation results are compared with the location data of lightning location system (LLS). Then, we estimate the location error with the video cameras. Secondly, based on the location error, the frequency of lightning strokes to the distribution lines is calculated from observation data.

References

[1] A. Asakawa, S. Yokoyama, M. Sakae, “Development of An Analytical Method for the Flashover Rate Due to Lightinin on Power Distribution Lines in Consideration of Cost Performance” 25th International Conference on Lightning Protection, 2000

[2] IEEE Working Group on the lightning performance of distribution lines, “Guide for Improving the Lightning Performance of Electric Power Overhead Distribution Lines”, IEEE Std 1410, 2004

[3] GIGLE-CIRED Joint Working Group C4.4.02, ”Protection of Medium Voltage and Low Voltage Networks against Lightning. Part II: Lightning Protection of Medium Voltage Networks”, CIGRE Technical Brochure, No. 441, 2010

[4] Electric Technology Research Association: “Quantitative Evaluation of Deterioration Environment for Power Distribution Equipment”, Electric Technology Research Association, Vol.69, No.3, 2012 (in Japanese)

[5] K. Shinjo, T. Wakai, H. Sugimoto, M. Ishi, “Seasonal Dependent of The Configuration of Lightning Channels”, 9th International Symposium on High Voltage Engineering, 1995