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Analysis of Lightning-Induced Voltages on a Matched Experimental Overhead Line

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Abstract—This article presents an analysis of 64 lightning-induced voltage waveshapes recorded on a 2.7 km long, nonenergized experimental line located on the campus of the University of São Paulo, São Paulo, Brazil. The line had two conductors separated by 6 m crossarms; one was equipped with surge arresters, whereas the other was unprotected. The data presented in this article refer to the unprotected conductor, which was matched at both ends. Although, strictly speaking, all the recorded voltages were bipolar, they were classified into four categories and the parameters which characterize each type are presented and discussed. About 67.2% of the induced voltages were classified as unipolar (Type I) and, except for one case, all of them had positive polarity. About 20.3% of the voltages were classified as Type II, whose waveshape is composed of two semicycles, the first one of positive polarity. About 9.4% of the recorded voltages were classified as Type III, whose waveshape is also composed of two semicycles, but the first one which a much shorter duration and lower magnitude. Only 3.1% were classified as Type IV, whose waveshape has three semicycles and the peak value occurs in the third one, which has negative polarity and the longest duration. Index Terms—High power electromagnetics, lightning electromagnetic pulse, lightning induced effects and protection, lightning measurement and modeling