Markt-Mengele Method for Computing Maximum Peak Subconductor Surface Electric Field Intensity

Apply this method when the transmission line has identical a-b-c phase bundles. Each phase bundle has N symmetric subconductors of radius r. The phase bundle has radius A that passes through all N subconductors.

1. Treat each phase bundle as a single equivalent conductor with equivalent radius

$$r_{eq} = \left[NrA^{N-1} \right]^{1/N}$$

2. Find the C(N by N) matrix, including ground wires, using average conductor heights above ground. Kron reduce C(N by N) to C(3 by 3). Select the phase bundle that will have the greatest peak line charge q_{lpeak} during a 60 Hz cycle by successively placing (Vmax) on one phase, (–Vmax/2) on the other two phases, and computing q_{lpeak}. Usually, the phase with the largest diagonal term in C(3 by 3) has the greatest q_{lpeak}.

3. Assuming equal charge division on the phase bundle identified in Step 2, ignore equivalent line charge displacement, and calculate the average peak subconductor surface electric field intensity using

$$E_{avg.peak} = \frac{q_{lpeak}}{N} \bullet \frac{1}{2\pi\varepsilon_o r}$$

4. Take into account equivalent line charge displacement, and calculate the maximum peak subconductor surface electric field intensity using

$$E_{\max.peak} = E_{avg.peak}\left[1 + (N-1)\frac{r}{A} \right]$$