

Study Committee B2

Overhead Lines

11145_2022

Correlation of the Surface Wettability and the Audible Noise Emission of Overhead Line Conductors

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Motivation

OHLs are an important part in power transmission system

Environmental regulations and public acceptance make expansion difficult

Noise emission during bad weather conditions

Reducing audible noise to increase public acceptance

Surface treatment on OHL conductors

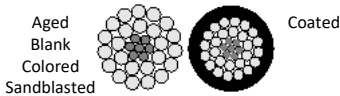
Close look on evaluation of hydrophilicity and correlation with noise emission

No detailed characterization of hydrophilicity of OHLs

Previous measurements show lower noise emission for hydrophilic (naturally aged) surfaces

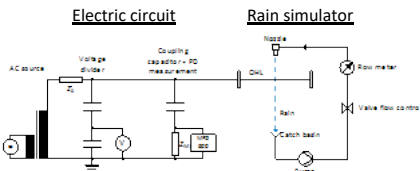
Materials

- Conductors differ in wettability due to different surface treatments
- Diameter of conductors: 22.4 mm



Methods

Noise emission measurement



Measurement of surface wettability

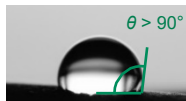
Static contact angle

- Single droplets on conductor surface
- 4 μ l droplets
- Measurements after 1, 3 and 10 min

Hydrophilic



Hydrophobic

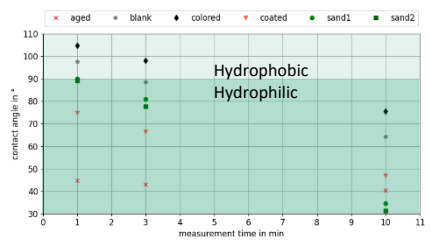


Completely wetted surface

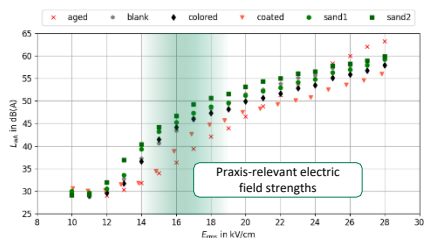
- Wetted on entire circumference
- Continuous wetting to simulate rain
- Measurements are taken without an applied electric field to isolate the wettability from deformation of droplets in electric field

Results

Static contact angle



Noise emission



Discussion

- static contact angle cannot reflect behavior of entire wetted surface
- contact angle of sandblasted conductors suggest hydrophilic behavior \rightarrow cannot be confirmed
- water film on surface leads to lower noise emission
- Not every surface treatment shows lower noise emission behavior

Conclusion

No correlation between static contact angle and noise emission

\Rightarrow Not useful to evaluate conductors according to their noise emission

Behavior of completely wetted surface correlates with noise emission:

\Rightarrow Should be focus for defining properties of conductor surface

\Rightarrow Conductors with a water film on the surface have lowest noise emission \rightarrow recommendation for the manufacturer

Up to now no possibility to standardize the evaluation method for conductor surfaces on the basis of the wettability \rightarrow more detailed measurements necessary