



Background

Demands for stable and safe electricity are increasing due to the recent development of the information society and diversification of electric power sources, such as dispersed power systems. To meet such demands, evaluation methods of electromagnetic environments are being developed. The research subjects include: radiated emission in the frequency region of wireless LAN, instantaneous voltage drop, and biological effect of magnetic field, in addition to established countermeasures for corona interference caused by ultra high voltage (UHV) transmission lines.

Principal results

(1) Reduction of corona interference of UHV transmission lines

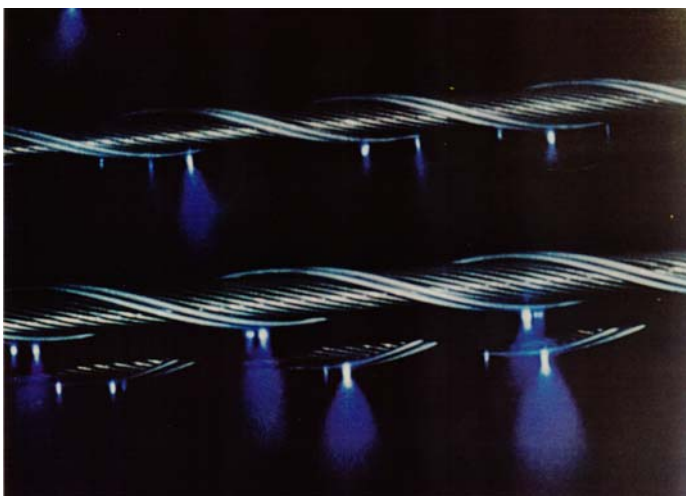
Optimal design reduced the necessary number of conductors of UHV conductor bundle by 20% based on experiments using a corona cage at Shiobara Testing Yard and a UHV testing line at Akagi Research Center. Recently, a novel method to effectively reduce corona discharges by reforming surface of conductor by oxidized titanium is being studied.

(2) Establishment of evaluation method of radiated emissions

An evaluation method of radiated emission by dispersed power systems was established through experiments using a facility for evaluation of radiated emission at Akagi research center. The results are referenced in the action of revision of the Radio Law by Ministry of Internal Affairs and Communications.

(3) Research on biological effects of power frequency magnetic fields

Methods for measurements, calculation and mitigation of magnetic fields generated by power facilities have been developed. In addition, a simple evaluation method of induced currents caused by human exposure to magnetic field is being developed.



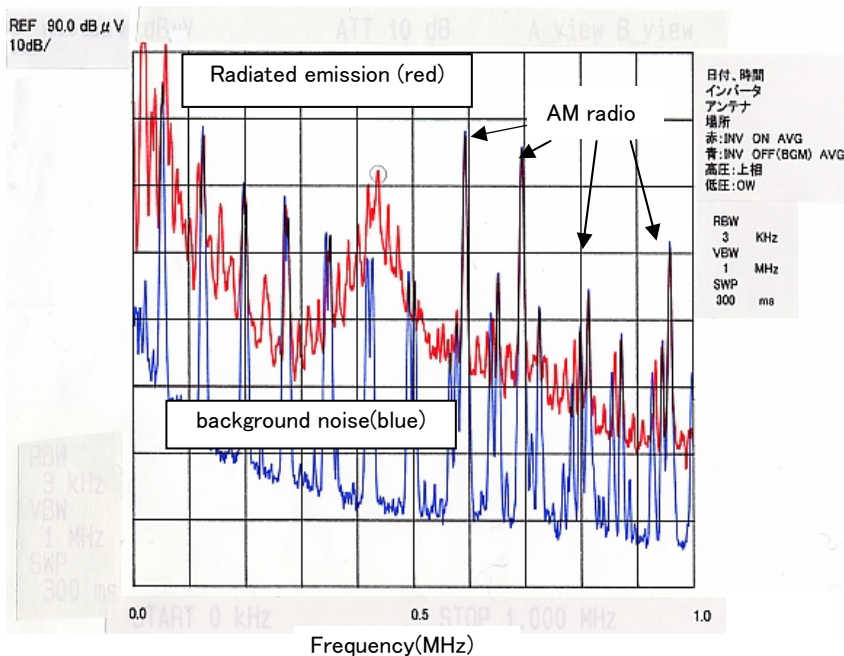
Corona discharges on conductor surface



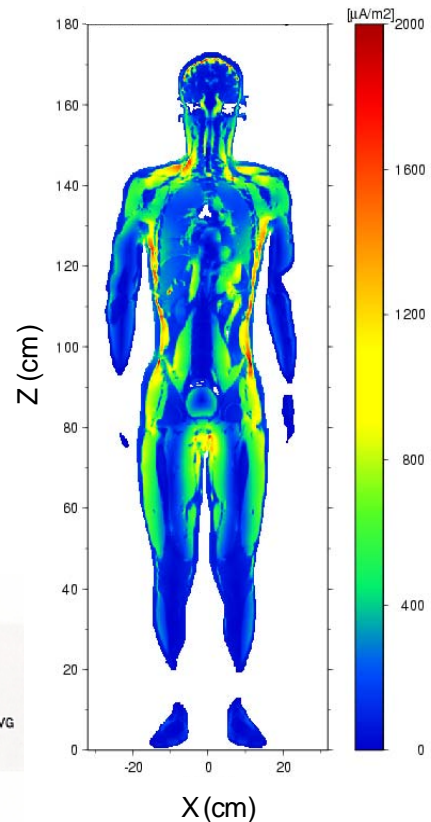
Corona cage at Shiobara Testing Yard



Facility for evaluation of radiated emission
(Example of utilities interconnection)



Radiated emission generated by inverter circuit



Current distribution in Japanese human model induced by exposure to magnetic field.

The model contains 8 million voxels with 2 mm resolution, and simulates 50 tissues.

The figure shows the case for coronal exposure to uniform magnetic field (0.1 mT, 50 Hz).

Future Developments

Evaluation methods of electromagnetic environment are being developed for electric power facilities to be acceptable in the civil society.

- (1) Low-corona conductor will be developed by surface modification, and its applicability for practical use will be evaluated.
- (2) Interference of the radiated emissions to electronic devices and telecommunication systems will be clarified by experiments, and the estimation method of the interference will be developed.
- (3) Contribution to government Ministries and utilities will be made with obtained knowledge.