



CHALLENGES TO PERFORM STANDARDIZED DIELECTRIC TESTS OF UHV ARRANGEMENTS

L. AREVALO D.WU R.MONTAÑO
ABB HVDC - SWEDEN

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UHV requirements and limitations



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1. High voltage laboratories:

- Voltage levels AC, DC, Switching impulse and Lightning impulse
 - SI \cong 2700 kV
 - LI \cong 2500 kV
 - DC up to 1.6 Vnominal
- Measurement system calibrated: Reference measuring system limited worldwide
- Laboratory size: No flashovers or predischage phenomena from laboratory installation.

2. Test object size:

- Clearance distances available to test
- Connections inductance



High voltage equipment and measurement system



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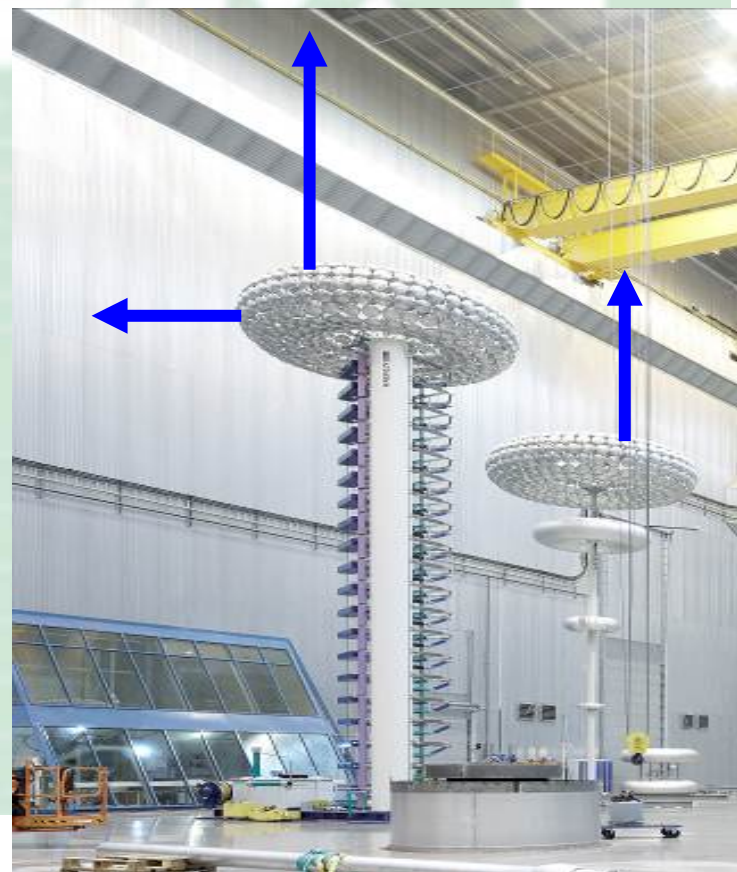


Undesirable breakdowns

- Clearance distance to surroundings
- Unevenness of top electrodes
- Under dimension of top electrodes
- DC field attracted particles and insects

Change of distribution of equipment

- Large test loops
- Recalibration of measurement dividers required
- Proximity effect

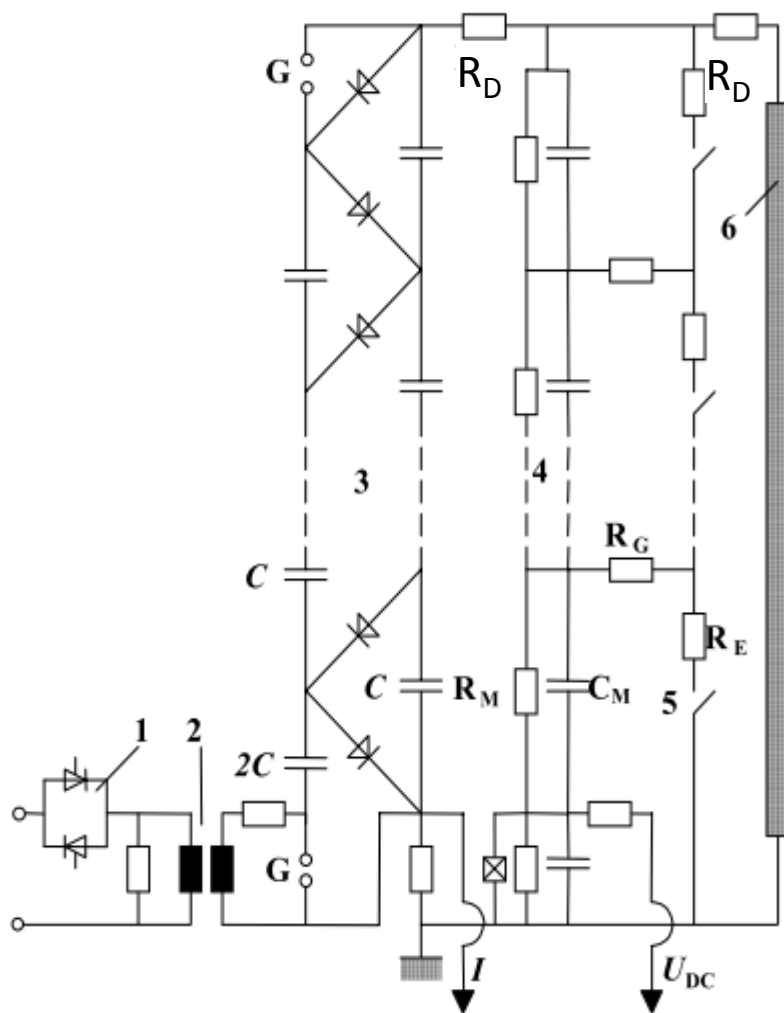




High voltage equipment and measurement system



DC Generator



R_D Damping resistor

- R_D protect the DC generator against transient overvoltage.
- R_D s are stressed and can be damaged in case of breakdown
- Reliability and repeatability of the test affected

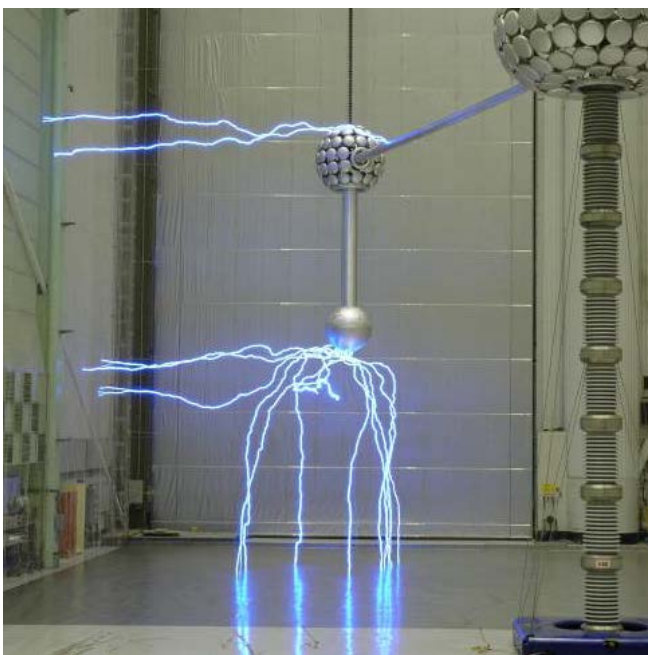


Testing methods Challenges



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- U_{50} – “up and down method” and “constant voltage test”. Automated methods.
- Continuity of the test affected by:
 - Proximity effect walls and test object
 - Undesirable discharges
 - Pre-discharges from generator and test object.
- Tests repeatability and reliability



Aids:

- Increase sample size
- Design smooth electrical connections
- Improve all points that can generate electrical stress

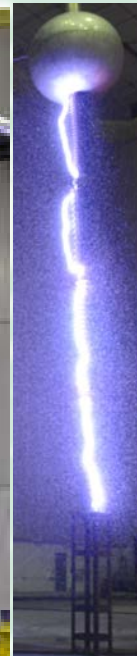
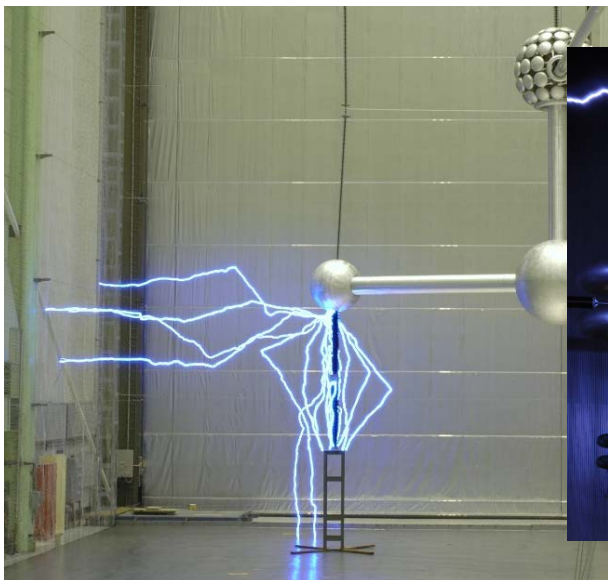


Testing methods



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- Cameras or video system to identify:
 - Starting point of the discharge
 - Ending point of the discharge
 - Pre-discharges
- How to warrant tests repeatability and reliability? E.g. Rain test





Conclusions



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- Testing methods of UHV arrangements and equipment are still under development.
- There are not standardized solutions yet.
- Improvements are required also from test equipment manufacturers
- Testing methods shall be re-evaluated:
 - Proximity effect
 - Breakdowns from other points
 - Higher intensity of water vertical and horizontal on rain test?
 - Calibration methods of measurement equipment



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QUESTIONS



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