

X-Ray Radiation experienced with Vacuum Capacitors

All high voltage devices operating higher than 10 kV produce X-rays. The radiation level increases as the voltage is increased.

For a vacuum capacitor of ceramic-metal construction the radiation becomes of concern once the peak voltages exceed 15 kV. It is therefore necessary to provide adequate shielding based on measurements and in accordance with the local laws covering X-ray radiation. Under normal circumstances the equipment manufacturer takes the necessary precautionary measures.

We have an entirely different picture when the capacitor is tested with a tester providing no shielding like the COMET HV-75 or similar old generation units. At the time these devices were designed, the laws covering permissible radiation levels were less stringent. For instance, it was deemed adequate to point out that these tests be performed by qualified, trained personnel only and that the distance between the test object to the test operator be at least 150 cm. Re-evaluating these old procedures with an end of life capacitor, having especially high leakage current, we were able to confirm that the procedures are safe if followed. The data obtained were 0.1 mR/hr (~ 1 μ Gy/hr). New standards known to us are:

American MIL 454F giving a max. reading of 2.0 mR/hr in 5 cm distance from outer surface of equipment.

American OSHA allows 2.4 mR/hr in 5 cm distance.

US National Council of Radiation Protection allows 5.7 mR/H in 5 cm distance.

We know that there are different standards in other countries. It is therefore strongly recommended that each user of a HV-tester follows the applicable local laws.

If one considers the fact that X-ray radiation is present with an AC test it will be worse under DC conditions. COMET has taken this into account when designing the new HV-tester, the HV 100-30 and HV 60-50. Not only is the design such that no high voltage lead or terminal can be touched during operating, but also adequate shielding is provided with respect to X-ray radiation during testing and spot-knocking operations.