Abstracts

Measurement of Shielding Effectiveness of Microwave-Protective Suits

A.W. Guy, C.-K. Chou, J.A. McDougall and C. Sorensen. "Measurement of Shielding Effectiveness of Microwave-Protective Suits." 1987 Transactions on Microwave Theory and Techniques 35.11 (Nov. 1987 [T-MTT]): 984-994.

With more restrictive exposure standards and greater public concern about safety from nonionizing radiation, protective clothing to shield workers from dangerous levels of electromagnetic radiation has become imminently important. Tests were conducted of the shielding effectiveness of a number of microwave suits. Fabric attenuations at 10 selected locations on the suit were measured by the waveguide-transmission-loss method to evaluate the material, and relative field strengths at the surface of a full-sized phantom man model exposed to 2450-MHz free-field radiation fields with and without the suit were measured to evaluate the entire suit. The ratio of the incident power required to produce the same output from a diode E-field sensor placed against the synthetic tissue of the model exposed with and without the suit was used as a measure of attenuation. The waveguide measurements are important for a comparative evaluation of the different fabrics, and the free-field measurements are important for evaluating the fabric as well as the suit design and configuration in shielding effectiveness. The Navy suit provided the best performance in terms of shielding effectiveness, with attenuation varying from 34.5 to 48.7 dB, but its flammability constitutes a safety hazard. The Wave Guarde suit was second best, with attenuation varying from 13.2 to 35 dB. The Milliken (20.3-33.7 dB attenuation) and Invascreen (18.7-24.5 dB attenuation) suits provide acceptable protection for E-field polarization parallel to the long axis of the body, but poor protection (2.0-19.2 dB for the former and 0.4-21.1 dB for the latter) for E-field polarization perpendicular to the body. Localized high-power-density exposures of up to 1000 mW/cm² for 1 h from a waveguide aperture did not cause material damage to any of the suit fabrics. The Milliken was the most fire retardant, but its shielding performance was the poorest, owing to the large number of openings at the pockets, cuffs, sleeves, and collar. The Invascreen suit is well designed to eliminate the problem, but the shieldlng of the fabric is less effective.

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