WITHDRAWN TAS AUGUST 1994

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard for BASIC ENVIRONMENTAL TESTING PROCEDURES FOR ELECTROTECHNOLOGY

Part 3—BACKGROUND INFORMATION

SECTION 5. TEST Sa: SIMULATED SOLAR RADIATION

This standard shall be read in conjunction with AS 1099.1, General, and AS 1099.2Sa, Simulated Solar Radiation.

FOREWORD

This Section gives guidance of methods of achieving the simulated environment necessary to determine the effects of solar radiation by the test procedures set out in AS 1099.2Sa.

SECTION 5. GUIDANCE FOR TESTING WITH SIMULATED SOLAR RADIATION

5.1 SCOPE AND OBJECT. This Section describes methods of simulation designed to examine the effect of solar radiation on electrical and electronic equipment and components at the surface of the earth. The main characteristics of the environment to be simulated are the spectral energy distribution of the sun and the intensity of received energy as observed at the earth's surface in combination with controlled temperature conditions. However, it may be necessary to consider combinations of solar radiation, including sky radiation, with other environmental factors, e.g. temperature, humidity and air velocity.

The test methods prescribed are not intended to simulate worst-case conditions experienced from exposure to solar radiation in Australia. This Section is to be read in conjunction with AS 1099.2Sa.

5.2 IRRADIANCE AND SPECTRAL DISTRIBUTION OF TEST SOURCE.

5.2.1 General. The effect of radiation on the specimen(s) will depend on the level of irradiance and its spectral distribution.

5.2.2 Irradiance. The irradiance by the sun on a plane perpendicular to the incident radiation outside the earth's atmosphere at the mean earth-sun distance is known as the solar constant E_O.

The irradiance at the surface of the earth is influenced by the solar constant, the duration of exposure and the attenuation and scattering of radiation in the atmosphere. For test purposes, CIE Technical Committee No 2.2* has recommended the value of 1.120 kW/m² for the global (total) radiation at the surface of the earth from sun and sky, with the sun at zenith; value based on a solar constant E_O = 1.35 kW/m².

5.2.3 Spectral Distribution. The standard spectral distribution of the global radiation specified for this test, in accordance with the recommendations of the CIE, is given in Table 1 of AS 1099.2Sa. Where only the thermal effects of solar radiation are of interest, then the use of tungsten filament lamps may be permitted. However, it must be clearly understood that the spectral distribution of tungsten filament lamps differs markedly from that of natural solar radiation (see Fig. 5.1) and the irradiance shall be adjusted in accordance with Clause 5.2.4 below.

5.2.4 Irradiance to be Used with Other Spectral Distribution. If the source of radiation used for the test does not meet the standard spectral distribution given in Table 1, e.g. where tungsten filament lamps are used (permissible if the test is solely to assess thermal effects), the irradiance shall be adjusted so that the heating effect is the same as if the test specimen(s) were irradiated by the global radiation of sun and sky. Therefore, the absorbed radiation from the test source shall be the same as for the global radiation of sun and sky, i.e.:

$$E_{ex} = 1.120 \frac{\alpha_{es}}{\alpha_{ex}} \text{ kW/m}^2$$

where

E_{ex} = irradiance from the test source, in kilowatts per square metre

α_{ex} = absorption factor of the specimen for the radiation from the test source

α_{es} = absorption factor of the specimen for the global radiation of sun and sky.

(See also Appendix A.)

*CIE Publication 20 (TC 2.2) 1972, Recommendation for the Integrated Irradiance and the Spectral Distribution of Simulated Solar Radiation for Testing Purposes.