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1052—1988

ELECTROMAGNETIC INTERFERENCE—
MEASURING APPARATUS AND MEASUREMENT METHODS

This Australian Standard was prepared by Committee TE/3, Electromagnetic Interference. It was approved on behalf of the Council of the Standards Association of Australia on 16 November 1987 and published on 4 January 1988.

The following interests are represented on Committee TE/3:

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Ground planes or Ground Bed see CISPR 22
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AUSTRALIAN STANDARD

ELECTROMAGNETIC INTERFERENCE—
MEASURING APPARATUS AND MEASUREMENT METHODS

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PREFACE

This Standard was prepared by the Association's Committee on Electromagnetic Interference and supersedes AS 1052, Electromagnetic Interference Measuring Equipment, Part 1—1976, Equipment for the Frequency Range 10 kHz to 150 kHz, and Part 2—1976, Equipment for the Frequency Range 0.15 MHz to 1000 MHz.

It is identical with and has been reproduced from IEC/CISPR 16 (1987), Specification for Radio Interference Measuring Apparatus and Measurement Methods, except that the title is in Australia's nomenclature.

This Standard retains the generic AS number of AS 1052 since AS 1052, Part 1—1976 and Part 2—1976 are incorporated into legislation (N.S.W. Coal Mines Regulation Act). This Standard is designated AS 1052—1988.

Alignment of this Standard with the IEC/CISPR 16 allows a considerable expansion of the subject matter including measurement techniques from 9 kHz to 18 GHz, new material dealing with average measuring receivers for the measurement of narrow-band signals, ferrite clamps, current probes, radiation measurements in the microwave region and requirements for disturbance analysers for the measurement of discontinuous interference.

For the purposes of this Australian Standard, the text of the IEC/CISPR 16 should be modified as follows:

(a) *Terminology:* The words 'Australian Standard' should replace the words 'IEC Publication' wherever they appear.

(b) *Cross-references:* The references to IEC Publications should be replaced by references to Australian Standards as follows:

Reference to IEC Publication		*Appropriate Australian Standard*	
CISPR 11	Limits and methods of measurement of radio interference characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (excluding surgical diathermy apparatus)	AS 2064	Limits and methods of measurement of radio interference characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (excluding surgical diathermy apparatus)
CISPR 12	Limits and methods of measurement of radio interference characteristics of vehicles, motor boats and spark-ignited engine-driven devices		No Australian equivalent
CISPR 13	Limits and methods of measurement of radio interference characteristics of sound and television receivers	AS 1053	Limits and methods of measurement of radio interference characteristics of sound and television receivers
CISPR 14	Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus	AS 1044	Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus
CISPR 15	Limits and methods of measurement of radio interference characteristics of fluorescent lamps and luminaires		No Australian equivalent
CISPR 18-1	Radio interference characteristics of overhead power lines and high-voltage equipment	AS 2344	Limits of electromagnetic interference from overhead a.c. power lines

CISPR 20	Measurement of the immunity of sound and television broadcast receivers and associated equipment in the frequency range 1.5 MHz to 30 MHz by the current-injection method. Guidance on immunity requirements for the reduction of interference caused by radio transmitters in the frequency range 26 MHz to 30 MHz	No Australian equivalent
CISPR 22	Limits and methods of measurement of radio interference characteristics of information technology equipment	No Australian equivalent
IEC 96-1	Radio frequency cables—General requirements	No Australian equivalent

(c) *Page number references:* The text references apply to the IEC page numbers at the bottom left-hand corner of each page.

CONTENTS

SECTION FOUR – METHODS OF MEASUREMENT OF VARIOUS TYPES OF INTERFERENCE-PRODUCING DEVICES AND SYSTEMS

SECTION FIVE – RADIO INTERFERENCE MEASURING APPARATUS HAVING DETECTORS OTHER THAN QUASI-PEAK

SECTION SIX – AUDIO-FREQUENCY INTERFERENCE MEASUREMENTS

SECTION SEVEN – MEASUREMENT OF DISTURBANCES DUE TO SWITCHING OPERATIONS

SECTION EIGHT – MEASUREMENT OF THE SHIELDING EFFICIENCY OF COAXIAL CABLES HAVING ONE OR TWO BRAIDS IN THE METRIC WAVELENGTH RANGE

SECTION NINE – STATISTICAL CONSIDERATIONS IN THE DETERMINATION OF LIMITS OF RADIO INTERFERENCE

SECTION TEN – MEASUREMENT OF TOTAL RADIATED POWER FROM APPARATUS OPERATING IN THE MICROWAVE RANGE (REVERBERATING CHAMBER METHOD)

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

ELECTROMAGNETIC INTERFERENCE— MEASURING APPARATUS AND MEASURMENT METHODS

SECTION ZERO—INTRODUCTION AND SCOPE

INTRODUCTION

The initial objective of the C.I.S.P.R. method of voltage measurement was to provide, in the frequency range from 150 kHz to 1 605 kHz, an assessment of interference related to its effect on the reception of sound broadcasting. Much of the interference is impulsive in nature and its effect increases with increasing repetition rate in a way that has been shown to be approximated by a quasi-peak detector circuit with an appropriate set of time constants. Over the years, the quasi-peak technique has been extended in frequency to cover the range from 10 kHz to 1 GHz, and is applied for the protection of services other than radio broadcasting. Instruments using the quasi-peak detector still remain as the basic reference for determining compliance with C.I.S.P.R. limits.

Other measures can be useful in specific instances: included are the average, r.m.s. and peak measures. All of these are described in this publication. The quasi-peak detector is the most extensively used in the protection of broadcasting services. Its characteristics are best described in terms of its response to short, constant amplitude, pulses of adjustable level and whose repetition frequency may be varied from that of an isolated pulse to a high value. Following the usual practice, this response is expressed in terms of the r.m.s. value of the unmodulated sine-wave voltage (or field) injected at the input of the measuring apparatus under the same condition as for the pulses, and which produces the same indication on the measuring apparatus.

(CISPR 16 page 13)

The measuring apparatus (usually of the superheterodyne type) has the following general characteristics:

— solely manual control of sensitivity,
— a defined overall bandwidth.

The apparatus is intended to measure the interference signal which may be conducted into the supply mains or radiated from the interference-producing device. In the general case when the device is connected to the supply mains, use is made of a special circuit known as the artificial mains network. The function of this network is, on the one hand, to isolate, at radio frequencies, the interfering device from the supply mains, and on the other, to provide a defined impedance across the terminals of the device. For measuring the interference power emitted by an appliance through its supply mains cord an absorbing clamp is used at frequencies above 30 MHz.

For the measurement of radiated interference, the measuring apparatus is connected to a suitable aerial. The response of the apparatus is expressed in terms of the r.m.s. value of the electric or magnetic component of the field which will give the same indication on the measuring apparatus.

The present instrument specification prescribes only those characteristics imposed by the principles of the method of measurement and refers primarily to the superheterodyne type of apparatus. Either a superheterodyne or tuned r.f. type of apparatus may, however, be used. Other characteristics which are subject to the conditions of use, such as the frequency coverage and the range of voltage or field levels, are left to individual choice.

Notes 1. — It is recommended that a conventional detector and audio-frequency amplifier (preferably gain control) be included in the measuring apparatus for aural monitoring of the interference to be measured.

2. — It is also recommended that a signal source be included so that the gain of the measuring apparatus may be set to the value used during the initial calibration.

The broadcasting services in the higher frequency ranges covered by this publication are very varied in nature and both aural and visual presentations are employed. Thus, it appears that while an apparatus similar to that used in the lower frequency ranges might be developed for each type of transmission to be considered, a universal measuring apparatus would hardly be possible.

For this reason, the tendency, which over the years is more and more marked, has been to subordinate agreement between subjective effect and objective measurement to the exigencies of the facility of making good measurements, is strongly emphasized in this publication.

The fundamental characteristics of the measuring apparatus over the higher frequency ranges have therefore been chosen in such a way as to obtain a compromise between the conditions appropriate to the frequencies under consideration and the measuring requirements, as well as maintaining a similarity to the lower frequency specification as regards the behaviour of the response to repeated pulses.

Cognizance has also been taken of the number of measuring apparatus in use which have fundamental characteristics approximating those chosen.

Further study will be necessary to establish the correlation between measurements made with apparatus complying with this specification and the different classes of subjective effect. They will assist in determining tolerable limits of interference voltages, currents, power and fields.

Scope

This publication stipulates performance requirements for radio interference measuring apparatus, including the associated artificial mains network.

The requirements of this publication shall be complied with at all frequencies and for all levels of radio-interference voltages, currents, power or field strengths within the range of the measuring apparatus.

The publication is divided into sections, as follows:

Section One: Measuring apparatus.
Section Two: Conduction measurements of radio interference.
Section Three: Radiation measurements of radio interference.
Section Four: Method of measurement of various types of interference-producing devices and systems.
Section Five: Radio interference measuring apparatus having detectors other than quasi-peak.
Section Six: Audio-frequency interference measurements.
Section Seven: Measurement of disturbances due to switching operations.
Section Eight: Measurement of the shielding efficiency of coaxial cables having one or two braids in the metric wavelength range.
Section Nine: Statistical considerations in the determination of limits of radio interference.
Section Ten: Measurement of total radiated power from apparatus in the microwave range (reverberating chamber method).

The appendices to this publication give additional information on the fundamental characteristics on which the requirements are based, information of general interest on propagation of interference from industrial equipment and the reproduction of the parts of C.I.S.P.R. Publication 1 about interference from power lines.

Sections Two and Three lay down only general requirements for the measurement of conduction and radiation characteristics of radio interference. Section Four lays down only general requirements applicable to the measurement of interference produced by various types of interference-producing devices and systems. Detailed requirements for the measurement of radio interference produced by specific types of devices are stipulated in other C.I.S.P.R. publications, as follows:

C.I.S.P.R. 11 (1975): Limits and methods of measurement of radio interference characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (excluding surgical diathermy apparatus).
C.I.S.P.R. 12 (1985): Limits and methods of measurement of radio interference characteristics of vehicles, motor boats and spark-ignited engine-driven devices.
C.I.S.P.R. 13 (1975): Limits and methods of measurement of radio interference characteristics of sound and television receivers.