TECHNICAL REPORT

IEC TR 62064

First edition
1999-07

**Radio-frequency cables –
Relationship between surface transfer impedance and screening attenuation
(A background to the recommended limits contained in IEC 61196-1, clause 14)**

*Câblages pour fréquences radioélectriques –
Relation entre l'impédance de transfert en surface et l'affaiblissement d'écran*

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* See web site address on title page.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIO-FREQUENCY CABLES – RELATIONSHIP BETWEEN SURFACE TRANSFER IMPEDANCE AND SCREENING ATTENUATION

(A background to the recommended limits contained in IEC 61196-1, clause 14)

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IEC 62064, which is a technical report, has been prepared by subcommittee 46A: Coaxial cables, of IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, and accessories for communication and signalling.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
46A/330/CDV	46A/348/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

This document which is purely informative is not to be regarded as an International Standard.

A bilingual version of this technical report may be issued at a later date.

RADIO-FREQUENCY CABLES – RELATIONSHIP BETWEEN SURFACE TRANSFER IMPEDANCE AND SCREENING ATTENUATION
(A background to the recommended limits contained in IEC 61196-1, clause 14)

1 Scope

This technical report describes the valuable background material used during the revision of IEC 61196-1, clause 14, guidance for surface transfer impedance and screening attenuation limits for flexible r.f. cables.

In this report the relationship between surface transfer impedance (Z_T) and screening attenuation (a_s) is given, also measurements of Z_T and a_s are provided to show the correlation of mean scanning attenuation between 200 MHz and 500 MHz and Z_T at both 30 MHz and 300 MHz.

The sensitivity of a_s and the relative velocity difference between the inner and outer system is shown, also the need for the cable data sheet to show the a_s values in a standardized form – $\Delta v/v$ = 10 % and the characteristic impedance of the outer system is 150 Ω. It is also shown that a relative velocity difference change from 10 % to 40 % gives an improvement of 12 dB in screening attenuation.

2 General

At high frequencies when the surface transfer impedance Z_T and effective transfer impedance $Z_{TE_{n,f}} = \left| Z_F \pm Z_T \right|$, and increases 6 dB per octave, its relation to the screening attenuation a_s is frequency independent and can be written as (see also figure 1):

$$a_{s_{n,f}} = -20 \times \log_{10} \left| T_{n,f} \right| \quad (1)$$

$$= -20 \times \log_{10} \frac{Z_T}{\sqrt{Z_1 Z_2}\,\omega \left| \frac{l}{v_2} \pm \frac{l}{v_1} \right|} = -20 \times \log_{10} \frac{Z_T\, c_o}{\sqrt{Z_1 Z_2}\,\omega \left| \sqrt{\varepsilon_{r2}} \pm \sqrt{\varepsilon_{r1}} \right|} \quad (2)$$

and $$T_{n,f} = \frac{U_{2n,f} / \sqrt{Z_2}}{U_1 / \sqrt{Z_1}}$$

where

- l is the length of the cable under test;
- $T_{n,f}$ are the coupling transfer functions;
- 'n' for the near end and 'f' for the far end;
- Z_1 is the characteristic impedance of the cable;
- Z_2 is the impedance of the outer circuit;
- ε_{r1} is the cable dielectric permittivity;
- ε_{r2} is the permittivity of the outer circuit;
- c_o is the velocity of light in vacuum;
- v_1 is the propagation velocity of the inner circuit;