AES standard
for audio preservation and restoration —
Method for estimating life expectancy of magneto-optical (M-O) disks, based on effects of temperature and relative humidity

Abstract

This standard specifies test methods for estimating the storage life expectancy of information stored on magneto-optical media. Only the effects of temperature and relative humidity are considered. Byte error rate (BER) is the measured response and the end-of-life criterion. An Eyring model is developed from accelerated test results. Data are normalized to 25 °C and 50 % relative humidity and the life expectancy, percent compliance, and confidence intervals at these conditions are calculated.

Contents

Foreword

[This foreword is not a part of *AES standard for audio preservation and restoration — Method for estimating life expectancy of magneto-optical (M-O) disks, based on effects of temperature and relative humidity,* AES35-2000.]

This standard was prepared by the SC-03-03 Working Group on Optical Systems and Media of the SC-03 Subcommittee on the Preservation and Restoration of Audio Recording as part of project AES-X52 Life Expectancy of Magneto-Optical (M-O) Disks. The standard was developed as part of project AES-X80, Liaison with ANSI/PIMA IT9-5.

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1 General

1.1 Scope

This standard specifies test methods for estimating the storage life expectancy (LE) of information stored on rewritable and write once magneto-optical media. Only the effects of temperature and relative humidity (RH) are considered.

1.2 Purpose

The purpose of this standard is to establish a methodology for estimating the storage LE of information stored on magneto-optical disks. This methodology provides a technically and statistically sound procedure for obtaining and evaluating accelerated test data. The methodology deals only with the effects of temperature and humidity on the storage of media.

1.3 Summary

A sampling of eighty disks is baseline tested for byte error rate (BER) then divided into five groups according to a specified plan. Each group of disks is exposed to one of five combinations of temperature and relative humidity (stress). During the exposure, disks are periodically removed from the environmental test cell according to a set plan. These disks are then retested for BER. They are then returned to the cell for additional increments of exposure at the same stress. For each disk, the time to reach EOL (loss of any information or a BER of $5 - 10^{-4}$), is then determined or estimated. For each stress condition the resulting service life data are fitted to a log-normal distribution for that stress. The resulting five sets of parameters for lifetime, temperature, and relative humidity are regressed to fit an Eyring acceleration model. This model is then used to estimate the distribution of lifetimes for a standardized set of conditions.

1.4 Assumptions

It is the assumption of this standard that the failure mechanisms acting under the usage conditions are the same as those at the accelerated conditions. Also, it is assumed that the linearity of rate estimated over the accelerated and design conditions is valid. Finally, it is assumed that all failure mechanisms have been accounted for and appropriately modeled.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the indicated standards.

ISO/IEC 10089 (1991) *Information technology — 130 mm rewritable optical disk cartridge for information interchange*. Geneva, CH: International Electrotechnical Commission.

ISO/IEC 10090 (1992) *Information technology — 90 mm optical disk cartridge, rewritable and read only, for data interchange*. Geneva, CH: International Electrotechnical Commission.

ISO/IEC 11560 (1992) *Information technology — Information interchange on 130 mm optical disk cartridges using the magneto-optical effect, for write once, read multiple functionality*. Geneva, CH: International Electrotechnical Commission.

ISO/IEC 13549 (1994) *Information technology — 130 mm optical disk cartridges — Capacity: 1,3 Gbytes per cartridge — for data interchange*. Geneva, CH: International Electrotechnical Commission.

ISO/IEC 13963 (1993) *Data interchange on 90 mm optical disk cartridges, capacity: 230 megabytes per cartridge*. Geneva, CH: International Electrotechnical Commission.

ISO/IEC 14517 (1997-01) *Information technology — 130 mm optical disk cartridges — Capacity: 2,6 Gbytes per Cartridge — For information interchange*. Geneva, CH: International Electrotechnical Commission.

ISO/IEC 15041 (1997) *Information technology — Data interchange on 90 mm optical disk cartridges — Capacity: 640 Mbytes per cartridge*. Geneva, CH: International Electrotechnical Commission.

3 Definitions

3.1
baseline
condition representing the disk at time of manufacture

> NOTE   This is customarily the initial parameter measurement taken prior to any application of stress. The designation is usually $t = 0$ for stress time = 0 hours.

3.2
byte error rate
BER
number of bytes in error divided by number of bytes tested

> NOTE   For the purposes of this standard, the BER refers to the raw byte error rate, without benefit of any error correction or sector reallocation.

3.3
censored data
time at which a specimen is removed from life testing due to any reason other than having reached EOL

3.4
end of life
EOL
occurrence of any loss of information

3.5
information
signal or image recorded using the system

3.6
F(t)
probability that a random unit drawn from the population fails by time *t*, or fraction of all units in the population which fail by time *t*