

Study on Optical Disk Testing Method in Kubo's Lab.¹⁾

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1. Intention of the study

1.1 Development and definition of measuring method of physical values prescribed in the International Standard.

1.2 Development and definition of reliability testing method.

1.3 Common test of disks manufactured or developed by many companies. One common testing system was used.

2. Work²⁾

2.1 Measuring method of laser spot size on rotating disk for prescribing recording laser power.

New method using a measuring glass disk coated thin metal film having right-angled triangle window was developed.⁷⁾ When the disk rotates in a drive with auto-focus servo, the two edges of the window cut the spot and light intensity transmitted through the window increases (or decreases) as the spot appears from (or is hidden by) the edge. We can obtain an intensity profile of the spot by differentiating the intensity change curve. Two diameters D_x, D_y of the elliptical spot are estimated from D_1, D_2 which are diameters obtained by two edges having different angle θ_1, θ_2 to the direction of the disk radius. D_x, D_y are estimated by the equation; $D_\theta^2 = D_x^2 \cos^2 \theta + D_y^2 \sin^2 \theta$ and observed $D_\theta = D_1, D_2$. $\theta_1 = 0, \theta_2 = 45^\circ$ are reasonable angles.

2.2 Reliability test method.

(a) Life test.³⁾

In order to discuss commonly about disk life, to define its measuring method is necessary.

It was studied by Japanese Standardization Committee and Kubo's Lab (Okino, etc). They estimate the life at 30°C from Arrhenius plot of life at acceleration test under high temperature (80°, 85° and 90°C) and humidity (85%). It is not yet the final definition.

(b) Dust test.⁴⁾

Method and testing system were developed. Rotating disks are exposed in thick dust in a dust chamber for hours. Then, reflectivity (measure of dust quantity) and error rate or jitter are measured. In the chamber, the dust is risen from a cup fixed on a voice coil of a speaker which is driven with noisy

electrical signal and its thickness is controlled. The dust is sold by Association of Powder Process Industry & Engineering in Japan. Influence by the dust is severe in write but very lenient in read. This work was done with the Standardization Committee initially and Dr. Ohta now.

2.3 Common test.²⁾

(A) Measurement of temperature dependence characteristics of ISO standard type MO disks manufactured by many companies.

It was confirmed that all disks had good signal in write and read at any temperature of operating environment. This work was done with the Standardization Committee.

(B) Common measurement of write/read characteristics for verifying a newly developed common characteristics book of phase-change disk.

This work was done with the phase-change optical disk workshop. They made a proposal document of the first International Standard of phase-change optical disk.

2.4 Others

2.4.1 Other testing items

2.4.2 Promoting and supporting activities

Committee member of following group;

Optical disk study group⁵⁾, Phase-change optical disk workshop⁶⁾, National standardization Committee ISOM, PCOS, EPCOS

- 1) These works were done in Kubo's Laboratory of Shizuoka Univ. and supported by government and many companies (Pulstec Industry Co., etc.).
- 2) T.Kubo, A.Ogawa, H.Senga, and M.Ishikawa: "Study on optical disk testing" Paper for 10th Phase-change Optical Recording Symposium (1998).
- 3) Y.Okino, T.Kubo, M.Okuda and S.Hasegawa: "Reliability test for phase-change optical recording media" Proc. SPIE **4085** pp108 (2000).
- 4) H.Senga, T.Kubo, T.Ohta, K.Watanabe, T.Shihara and T.Ishida: "Testing method of the Dust Influence on Thin Substrate DVD and the Results" Technical Digest of ISOM 2000 pp146 (2000).
- 5) The activities are recorded in the 100th meeting's memorial book written in Japanese (1998).
- 6) They published a book entitled "The Start and Progress of the Phase-change Optical Disk Workshop" which is written in Japanese and includes minutes written in English.

- 7) T.Kubo, A.Sugiura, T.Watanabe and J.Ohtsubo : J. Mag. Soc. Jpn. Vol.20 Suppl. No.S1 pp411 (1996)
A.Sugiura, T.Kubo, A.Ogawa, and T.Kaneko : Jpn. J. Appl. Phys. Vol.37 pp2206 (1998).