Automatic Defect Review AFM for Hard Disk Media and Substrates

For more information:info@parkAFM.com www.parkAFM.com

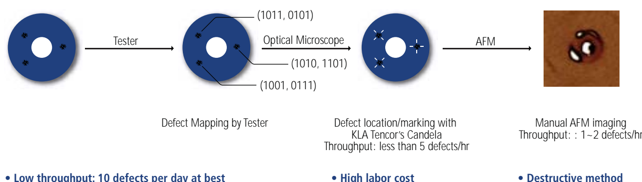
Nanotechnology Solutions Partner

Park Systems, Nanotechnology Solutions Partner for HDD Industry

Park Systems serves the hard disk drive (HDD) industry with automated nanotechnology measurement solutions including atomic force microscopes, software, and global service and support. Partnering with world leaders in HDD industry, Park Systems has been successfully delivering optimized solutions for the most challenging imaging and measurement needs in the industry.

The company's HDD-Optimize program is the state-of the-art nanotechnology solution service for the hard disk drive industry. Under the systematic approach of the program, Park Systems ensures rapid alignment and performance of the XE nanotechnology measurement platform with the specific requirement of its customers.

Limitations in Current Method of HDM Defect Review



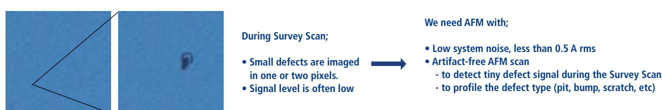
Defect Mapping by Tester

Defect location/marking with KLA Tencor's Candela Throughput: less than 5 defects/hr

Manual AFM imaging Throughput: : 1~2 defects/hr

- Low throughput: 10 defects per day at best
- High labor cost
- Destructive method

Challenges in Developing Automated Defect Review AFM



During Survey Scan;

- Small defects are imaged in one or two pixels.
- Signal level is often low

We need AFM with;

- Low system noise, less than 0.5 A rms
- Artifact-free AFM scan
  - to detect tiny defect signal during the Survey Scan
  - to profile the defect type (pit, bump, scratch, etc)

XE-HDM: Enabling Automated Defect Review of Hard Disk Media and Substrates

Continuing the company's impressive track record of developing optimized solutions, Park Systems introduces XE-HDM, an automatic defect review AFM which revolutionizes the way defects in HDD substrates and media are searched, scanned and analyzed. The new XE-HDM significantly increases throughput for the defect review process.

- Automated reference marker detection
- Automated stage mapping of XE-HDM
- Transfer KLA Tencor Candela defect map to XE-HDM
- Automated survey scan of defects mapped by Candela
- Automated zoom-in scan of specified defects
- Automated profiling of imaged defect types
- Automated analysis of imaged defects (in development)

Park Systems Inc. 3040 Olcott St. Santa Clara, CA 95054 Tel. +1-408-986-1110

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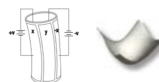
The Limitations of Conventional AFM

Scanner Bowing (Piezo tube is NOT an Orthogonal 3-D Actuator)

Flattening, software correction, is required

→ **Distorts or wipes out tiny defect signals during the Survey Scan**



Non-Contact Mode not Possible

Inevitable tip wear occurs when using contact or tapping mode

→ **Tip life is not long enough to complete "one" automated defect review run**

The Innovative XE Technology Overcomes the Challenges

Flat and Linear XY Scan (Decoupled XY and Z Scanners)

No Flattening is required, providing flat and linear XY scan

All defects can be detected during the Survey Scan without any artifacts

True Non-Contact Mode (High Force Z Scanner)

Significantly increased tip life (less tip wear and tear)

Consistent tip condition throughout multiple automatic runs

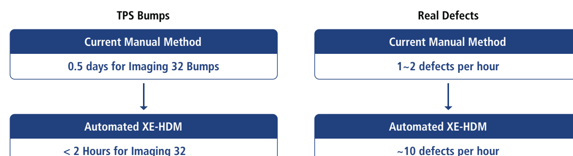
Result of Test Runs

	TPS Bumps	Real Defects
Current Manual Method	0.5 days for Imaging 32 Bumps	1~2 defects per hour
Automated XE-HDM	< 2 Hours for Imaging 32	~10 defects per hour

The test runs demonstrate **over 500 ~ 800 % gain in throughput**

The automation allows users to **manage several tools simultaneously**

Summary: Key Benefits of XE-HDM



- Automated Defect Review for hard disk media and substrates enabled
- Non-destructive method
- Significant increase in throughput (500~800%)
  - Over 95% success rate of finding & imaging defects
  - Throughput of approximately 10 defects per hour

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