

## Polar Kerr System

### Magnetic characterization of perpendicular media



The Polar Kerr system quickly determines the uniformity of the perpendicular recording layer immediately after deposition, an important factor in the yield of disk drives. By using full automation, the Polar Kerr system does not come into contact with the media being characterized and minimizes cost of ownership. The sensitivity and stability of the tool, combined with its ability to measure at both very high and very low magnetic fields, make it a powerful tool for PMR development and production monitoring.

### BENEFITS

- Non-destructive, non-contact double-sided mapping of the magnetic properties of perpendicular media.
- Rapid process feedback enhances control of the deposition process, measuring  $H_c$ ,  $H_n$ ,  $S$ ,  $S^*$  and other key properties of the recording layer.
- High-throughput production tool with automated cassette handling.
- Disk Heat option allows temperature-dependent measurements.
- User-selectable laser wavelengths available (red, violet).

### MAGNETIC CHARACTERIZATION

The Polar Kerr system rapidly and automatically generates a map of the magnetic properties of the disk on both sides (Figure 1). The number and location of measurement points and the maximum applied field are user-settable and can be saved in recipe files. The system can simultaneously measure both sides of the disk within less than 20 seconds. The Polar Kerr system is capable of characterizing the most advanced media, utilizing a user-defined sweep rate and a maximum applied field of  $\pm 2.65$

Tesla, exceeding any current production requirements and allowing for future generations of PMR media.

### SELECTABLE LASER WAVELENGTHS

In an optical system, penetration depth is a strong function of wavelength. This is relevant since PMR media is made up of multiple types of layers. The recording layer is expected to decrease in thickness over future product generations, whereas the SUL is expected to increase. For this reason, users can select two wavelengths on opposite ends of the visible spectrum. The tool, when configured with the red laser, is able to penetrate to a depth that is 1.5 times as deep as the violet laser. Thus, the measured loop shapes will be different for each wavelength. This difference can be utilized for both production and research applications.

### PROCESS CONTROL

The system simultaneously measures full hysteresis loops on both sides of the media and can automatically extract  $H_c$ ,  $H_n$ ,  $S$  and  $S^*$  and many other industry-standard parameters (Figure 2). The mapping results are displayed both graphically and in tables and can be saved to a network.

### DATA PORTABILITY

All data can be exported in ASCII format, allowing the Polar Kerr software to integrate seamlessly with many analysis programs, such as MS Excel, MatLab and industrial statistical process control software packages.

### MULTI-LEVEL USER MANAGEMENT

The Polar Kerr system has two modes of operation. A production mode provides a simple start/stop type interface, using a recipe as determined by the process engineer. The number and location of measurement points, maximum field, and selection of output parameters are all user-specifiable during recipe creation (Figure 3). In the password-protected engineering mode, measurement sequences can be modified without affecting production mode. A broad array of analytical and diagnostic tools, such as measurement and display of full hysteresis loops, are available to provide insight into the media deposition process control.

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## MACRO PROGRAMMING CAPABILITY

A module may be added to the Polar Kerr software which allows the creation of complex measurements (Figure 4). Building blocks provided in this module include looping structures, the definition of sub-macros and programmatic access to hardware components of the tool.

## DATA ANALYSIS

The Polar Kerr software includes a powerful data analysis module (Figure 5). This built-in analysis capability enables visualization of saved data. In addition, many data manipulation functions are provided to allow post-processing of measurement data. Manipulated results can be exported or saved in the same way as raw data.

## SUMMARY

By quickly and accurately measuring the magnetic parameters crucial to PMR media production, the Polar Kerr system improves the ability to keep the deposition process under control. The full disk, non-contact measurement technique and automated handling make the Polar Kerr system essential for production use and yield improvement.

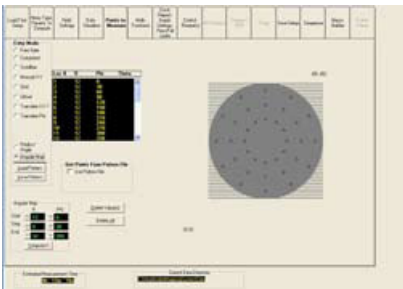


Figure 3. Easy-to-use GUI for recipe creation.

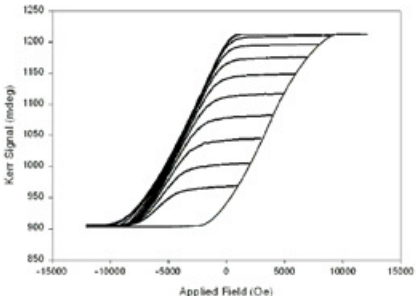


Figure 4. Recoil loop measurements and other complex measurements may be programmed using macro language.

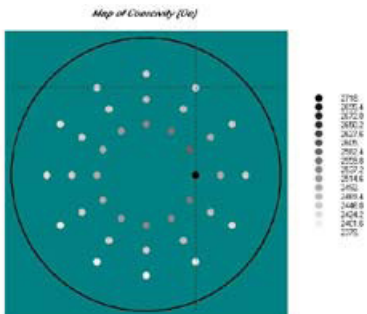


Figure 1. Gray-scale map of recording layer H<sub>c</sub>.

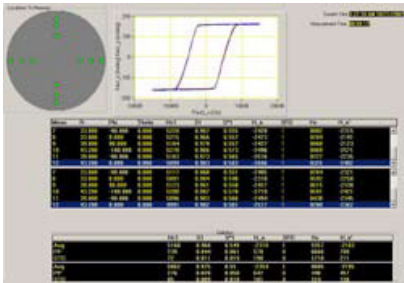


Figure 2. Production screen mapping results in graphical and tabular format.

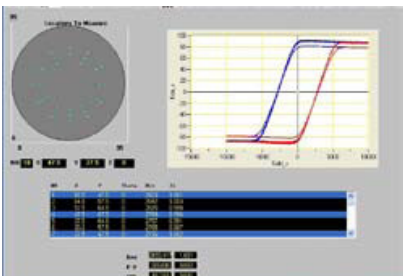


Figure 5. Typical screen shot of offline data analysis.