Micro Actuator Tests and Servo Loop for Guzik Spinstands
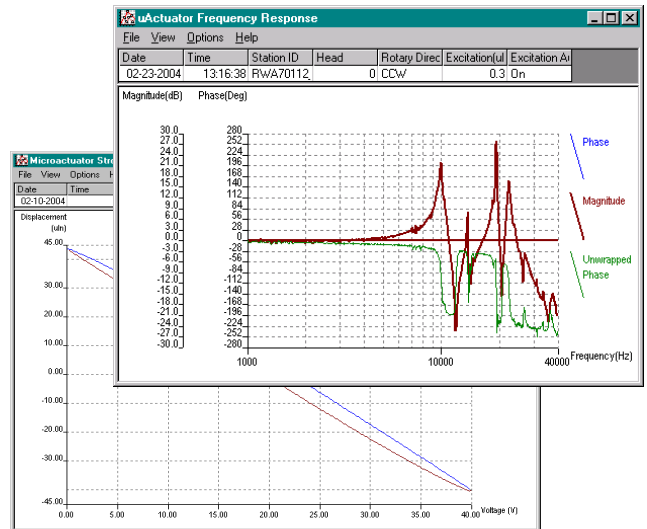
- ## Stroke Test

- ## Frequency Response Test (Bode Plot)

- ## Servo Loop with Bandwidth 2-3 kHz

- ## Automatic Servo Loop Adjustment for Easy Use in Production Sequence **New**

Micro Actuator is a device located on the suspension of a magnetic head that can transform applied voltage to radial displacement of the head. Guzik offers the package of tests to measure mechanical properties of the Micro Actuator piezo. Two tests are included in the package:

- Stroke Test – measures piezo displacement versus applied voltage

- Frequency Response Test – builds bode plot of the micro actuator piezo

It is beneficial not only to test the properties of the Micro Actuator piezo, but also use it in a high-bandwidth servo positioning loop. HGAs may have variation of mechanical properties, such as resonance magnitude and frequencies. In order to run tests using a Micro Actuator Servo loop, you need to adjust the servo loop settings. There are two ways to adjust the loop settings:

- Manual Servo Loop Adjustment – you choose the PID coefficients and notch filter settings manually

- Automatic Servo Loop Adjustment – the new feature implemented in WITE32 ver.4.40. In this mode a Micro Actuator Closed Loop Adjustment test can be included in a production sequence. The test measures the mechanical frequency response of the HGA and adjusts the loop accordingly. After the test completes, you can write servo and enable the loop.

Micro Actuator Stroke Test

Micro Actuator Stroke test shows the dependency of a head radial displacement in respect to the voltage applied to a Micro Actuator. The Micro Actuator Stroke Test sweeps a Micro Actuator voltage in forward and backward directions and measures the displacement, which allows observing the Micro Actuator range and the hysteresis.
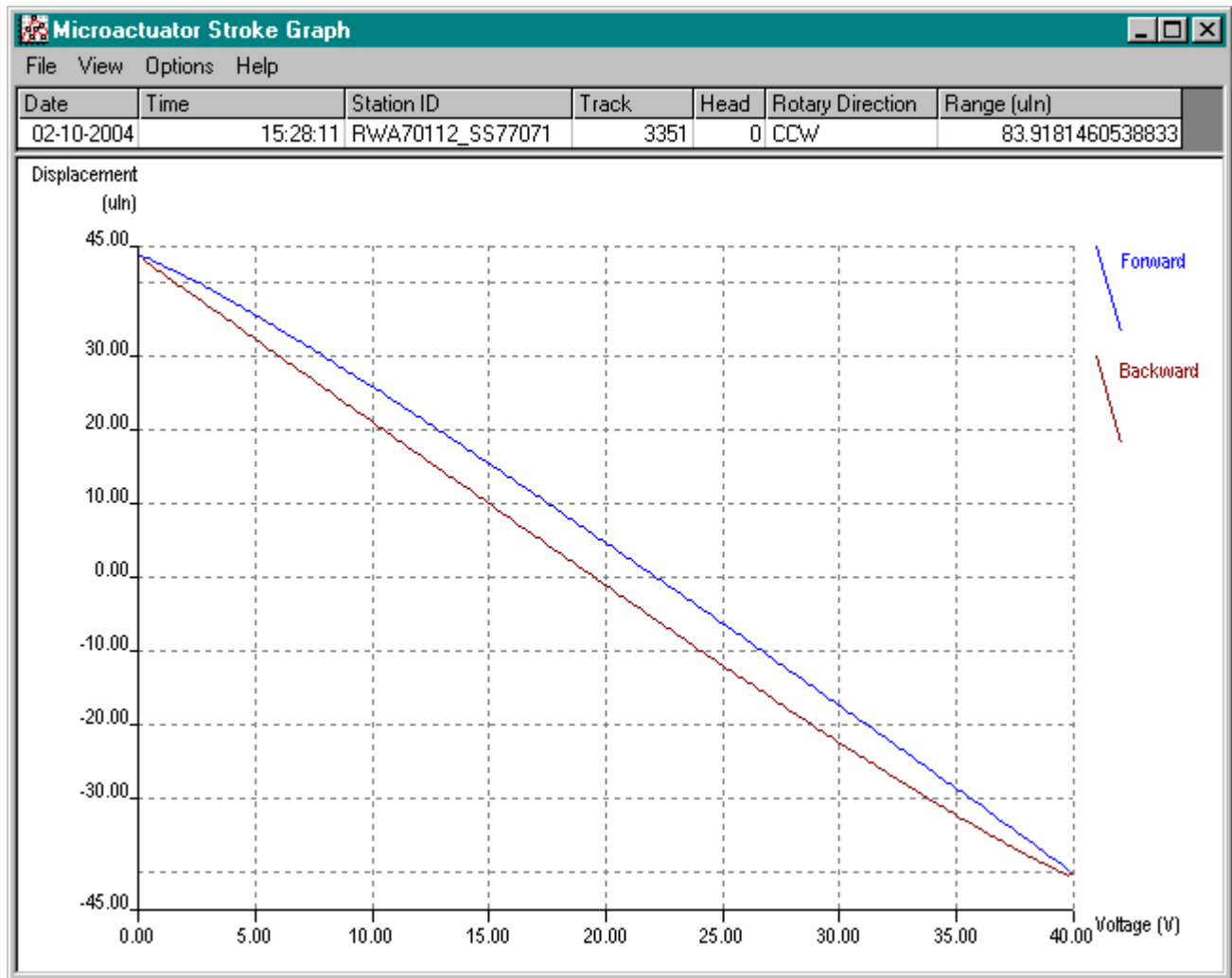
Figure 1: Example of Micro Actuator Stroke Plot

Micro Actuator Frequency Response Test

Micro Actuator Frequency Response test measures the mechanical frequency response of a Micro Actuator. It applies the sinusoidal excitation to a Micro Actuator and measures the response using the servo feedback. The frequency of the sinusoidal excitation is swept in the user specified range. The Micro Actuator Frequency Response test displays the result in the form of the Bode plot.
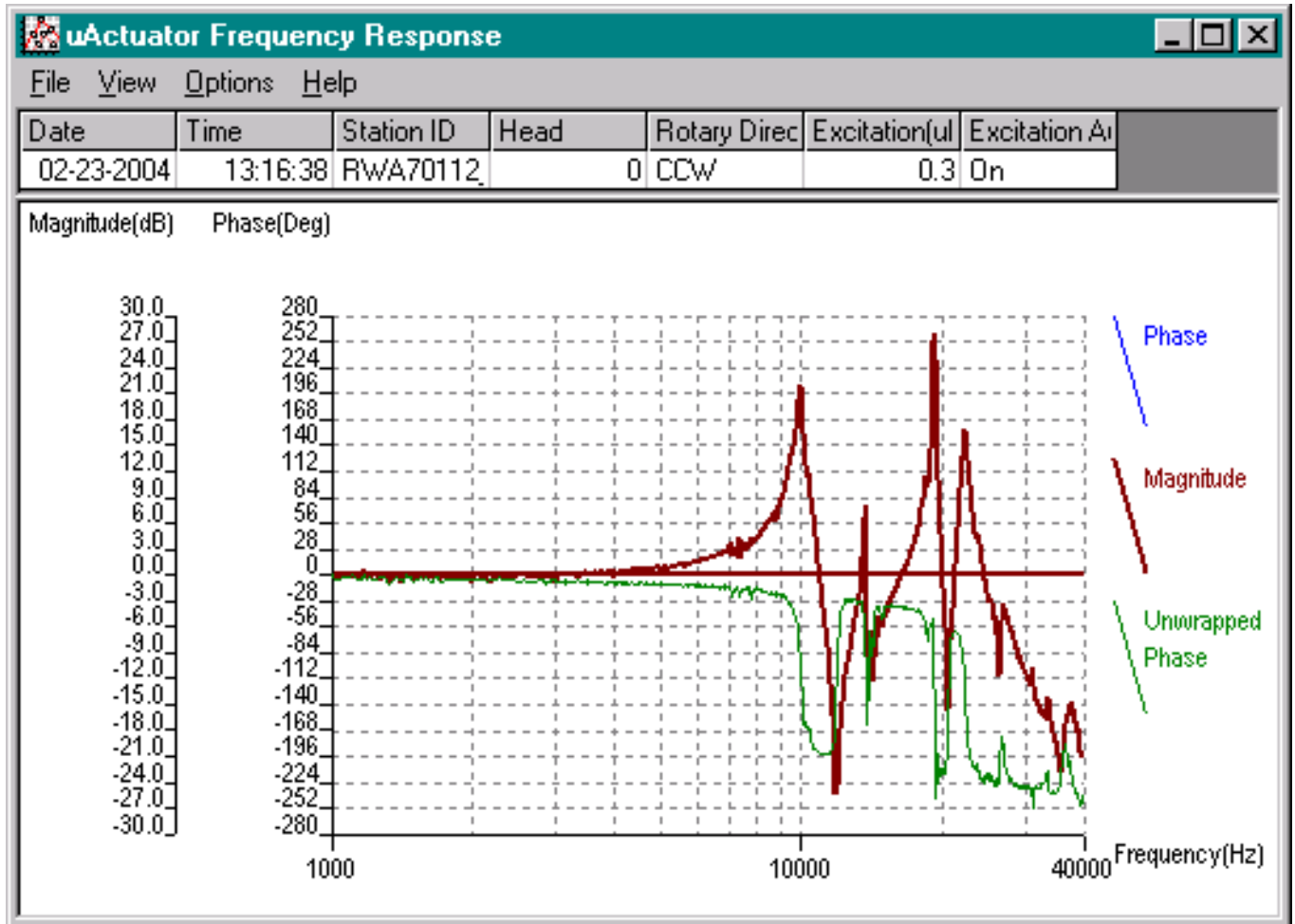

Figure 2: Example of Micro Actuator Frequency Response Plot

Micro Actuator Servo Loop

The Micro Actuator piezo can be used for servo positioning of a head. The typical servo bandwidth, when using the Micro Actuator, is in the range of 2–3 kHz. This allows for non-repeatable run-out reduction and improvement of the test results. Figures 3 and 4 compare positioning performance for the following cases:

1. Head positioning is performed in non-servo mode

2. Head positioning is performed in standard servo mode, the main piezo-actuator of V2002 spinstand is used.

3. Head positioning is performed in high-bandwidth servo mode, the Micro Actuator piezo on suspension is used.
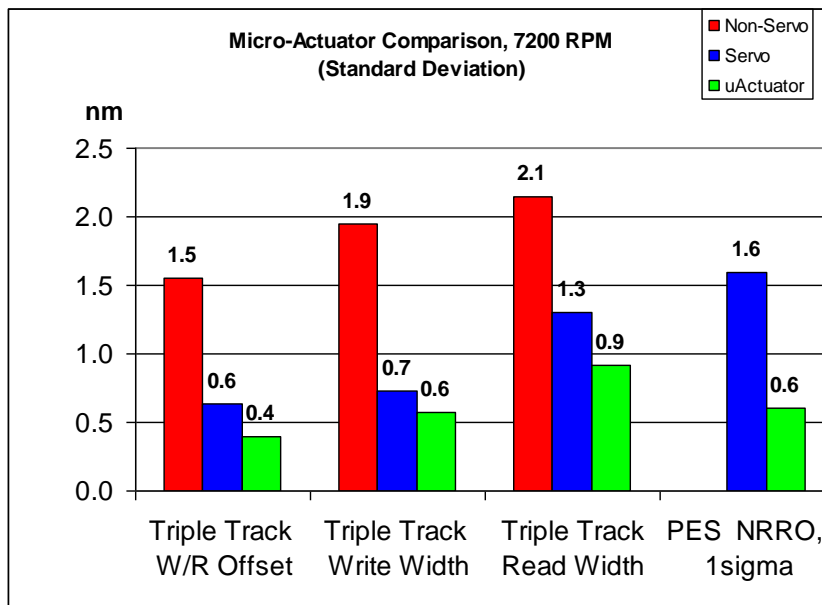

Figure 3: Position Error Reduction and Triple Track Results Improvement
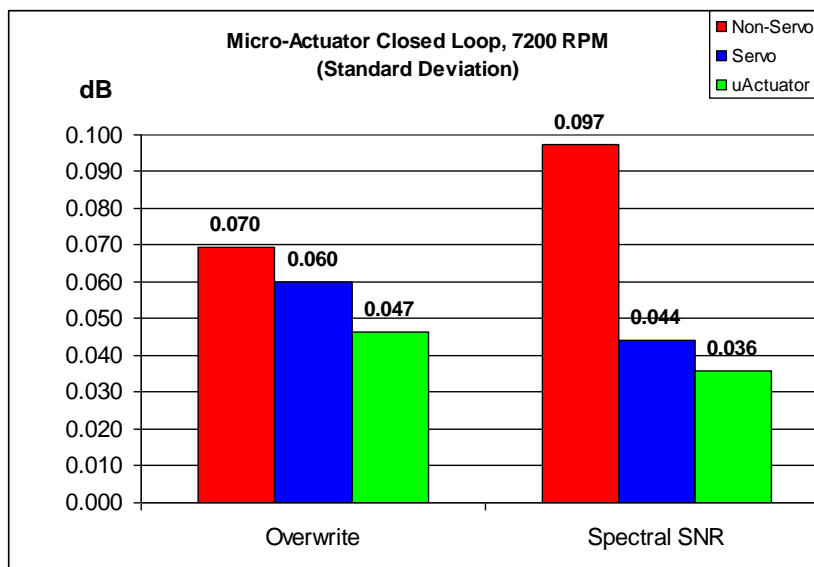(Measurement Conditions: 20 runs of the same head)

Figure 4: Overwrite and SNR Results Improvement
(Measurement Conditions: 20 runs of the same head)

Hardware and Software Requirements

For Stroke and Frequency Response Tests

- Guzik RWA-2000 series with Servo Revision 3 or later, RWA DTR 3000, or RWA 4000

- Guzik V2002 spinstand with Micro Actuator Kit

- WITE32 version 4.00 or later is recommended

- Micro Actuator test license

For Servo Loop (Manual Adjustment Mode)

- Guzik V2002 spinstand with Servo Controller 5 (P/N 330890) and Servo Driver 5 (P/N 330880) for Servo Loop

- Guzik RWA-2000 series with Servo Revision 3 or later, RWA DTR 3000, or RWA 4000

- Guzik V2002 spinstand with Micro Actuator Kit

- WITE32 version 4.20 or later is recommended

- Micro Actuator test license

For Servo Loop (Automatic Adjustment Mode)

- Guzik RWA-2000 series with Servo Revision 4 or later, RWA DTR 3000, or RWA 4000

- Guzik V2002 or DTR3000 spinstand with Micro Actuator Kit and the following boards:

    o Servo Controller 5 (P/N 330890) or later,

    o Servo Driver 5 (P/N 330880) or later,

    o Coldfire board (P/N 317950) revision "T" or later.

- WITE32 version 4.40 or later[i]

- Micro Actuator test and Micro Actuator Loop Adjustment licenses

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[i] An active software maintenance and support contract is required to upgrade to WITE32 Revision 4.40.

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