

## Overview of Tape Research at CMRR

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**on January 22, 2002**

# **Overview of Tape Research at CMRR**

**Frank E. Talke**

**UCSD - CMRR**

**THIC Meeting, Del Mar**

**Jan. 22, 2002**

# **1. Measurement of Tape Edge Force as a Function of Tape Path Misalignment**

## **2. Tape Edge Wear Studies**

**Graduate Students: Jason Wang, Ryan Taylor,  
Robert Dunsch**

**Advisor: Frank E. Talke**

University of California, San Diego

Center for Magnetic Recording Research

# **Measurement of Tape Edge Force as a Function of Tape Path Misalignment**

**Ryan Taylor, Robert Dunsch, and Frank E. Talke**

# Introduction

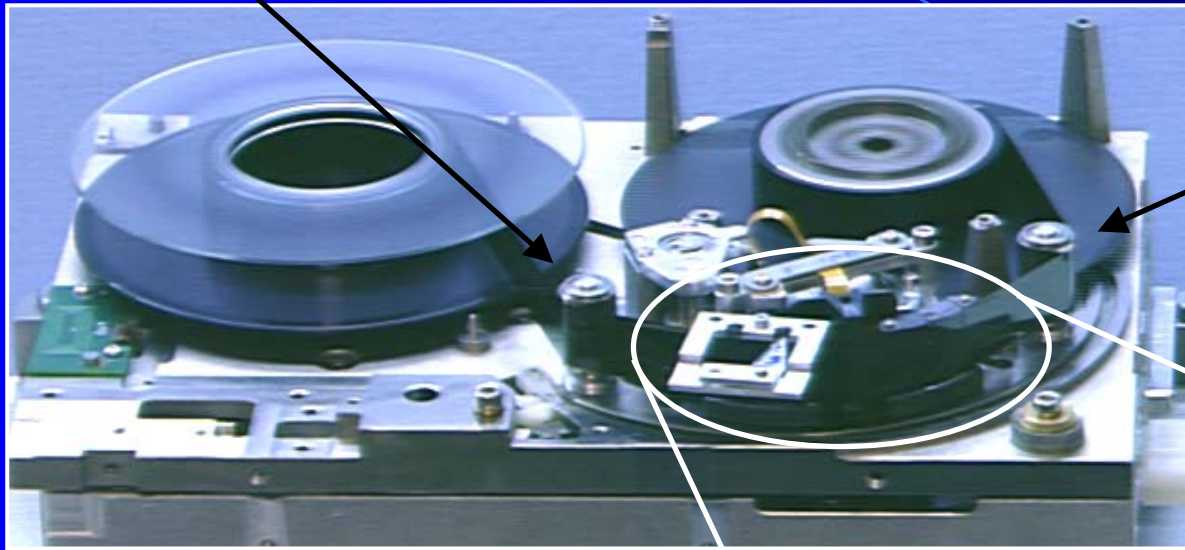
- Background
- Experimental Setup
- Results
- An Improved Setup
- Conclusions
- Intro to Tape Width Variation Measurement

# Background and Motivation

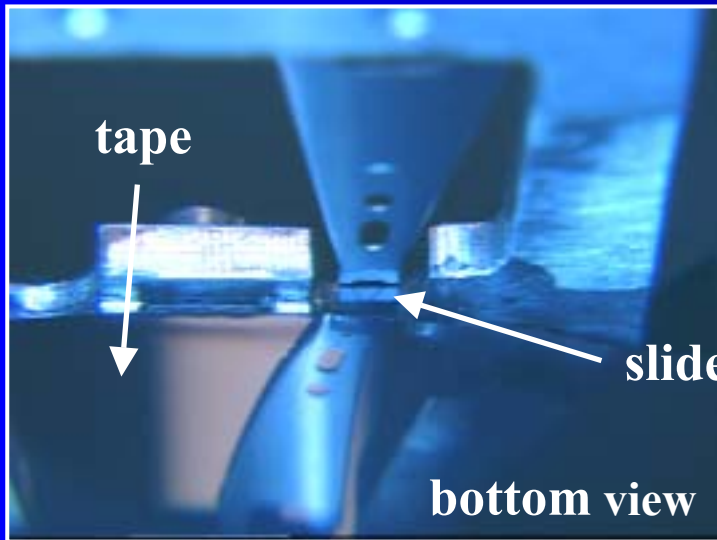
- With the development of thinner tapes for high volumetric density, smooth tape guiding is essential.
- Tape edge motion is caused by forces acting on the tape surface and the tape edge
- These forces cause wear, and must be quantified

# Tape edge force measurement

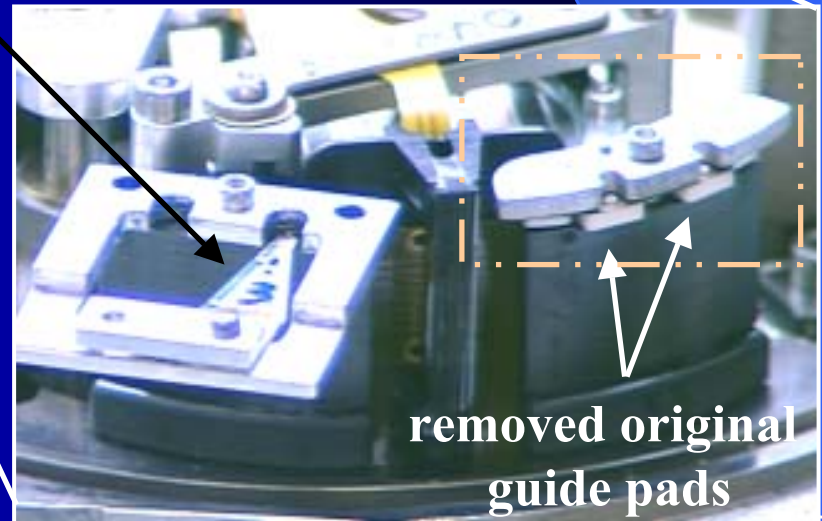
no flange



flanged roller

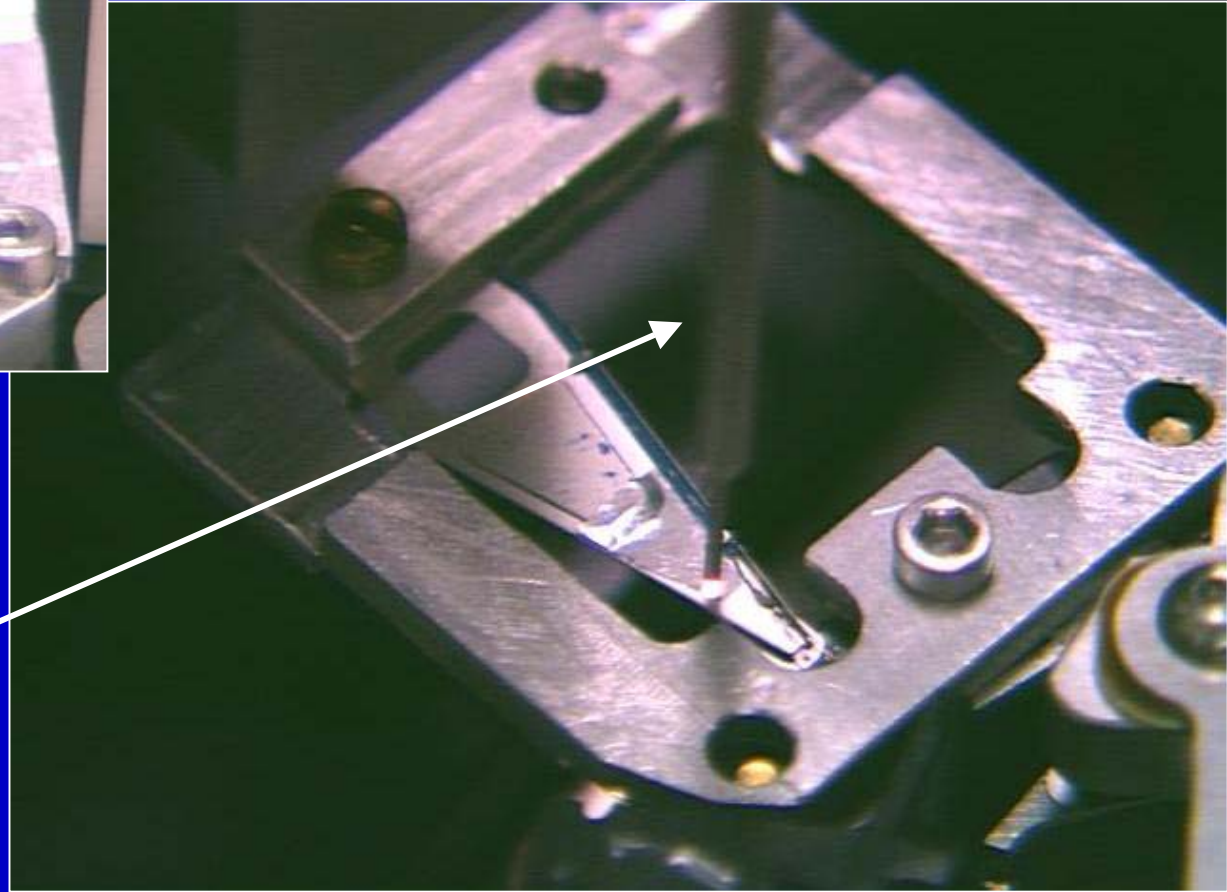
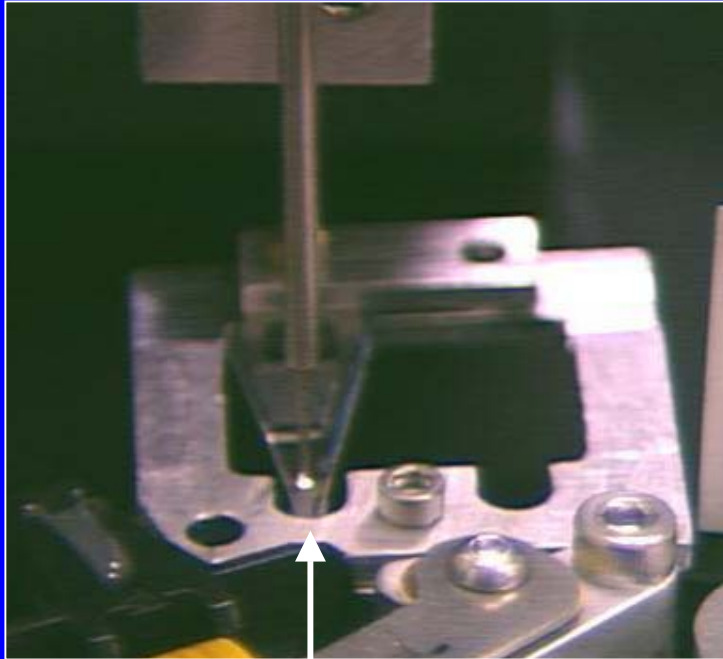


suspension (force calibrated)



removed original  
guide pads

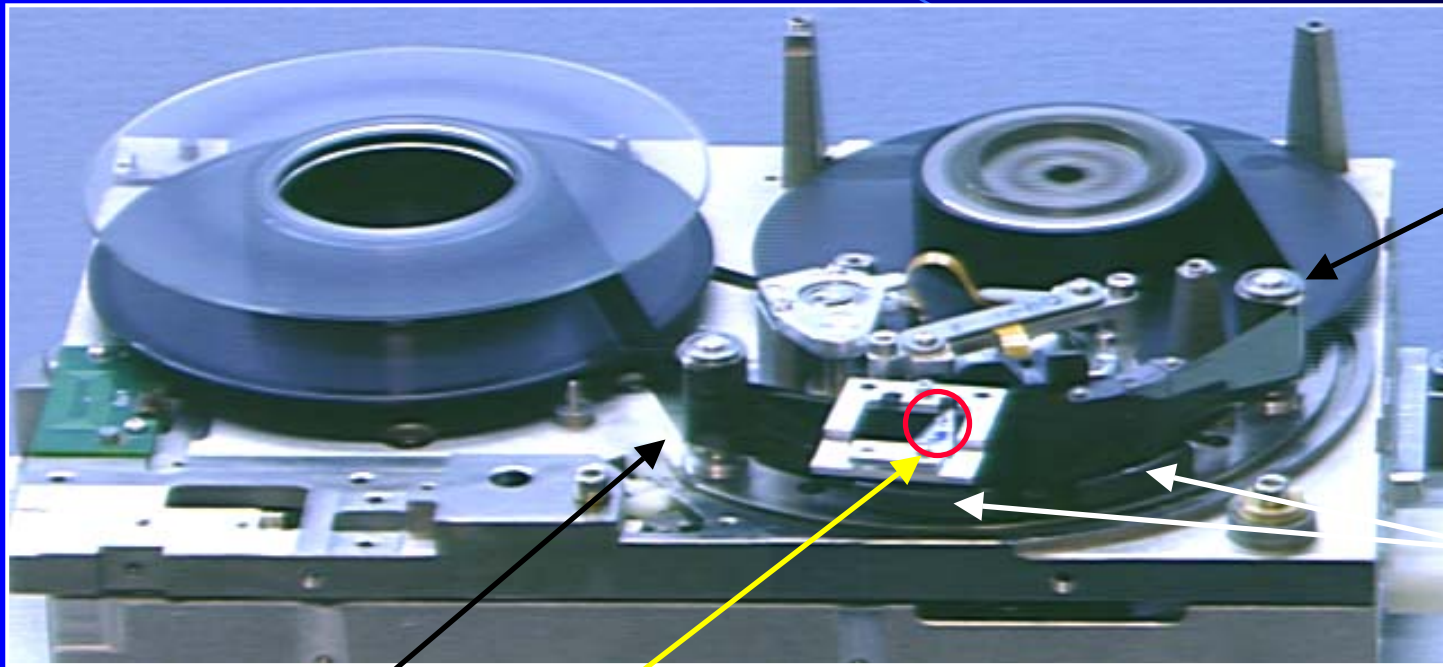
# Tape edge force measurement



**Linear optical sensor  
measures the motion  
of the suspension  
and force variation  
can be obtained**



# Tape edge force measurement



flanged  
roller

stationary  
guides

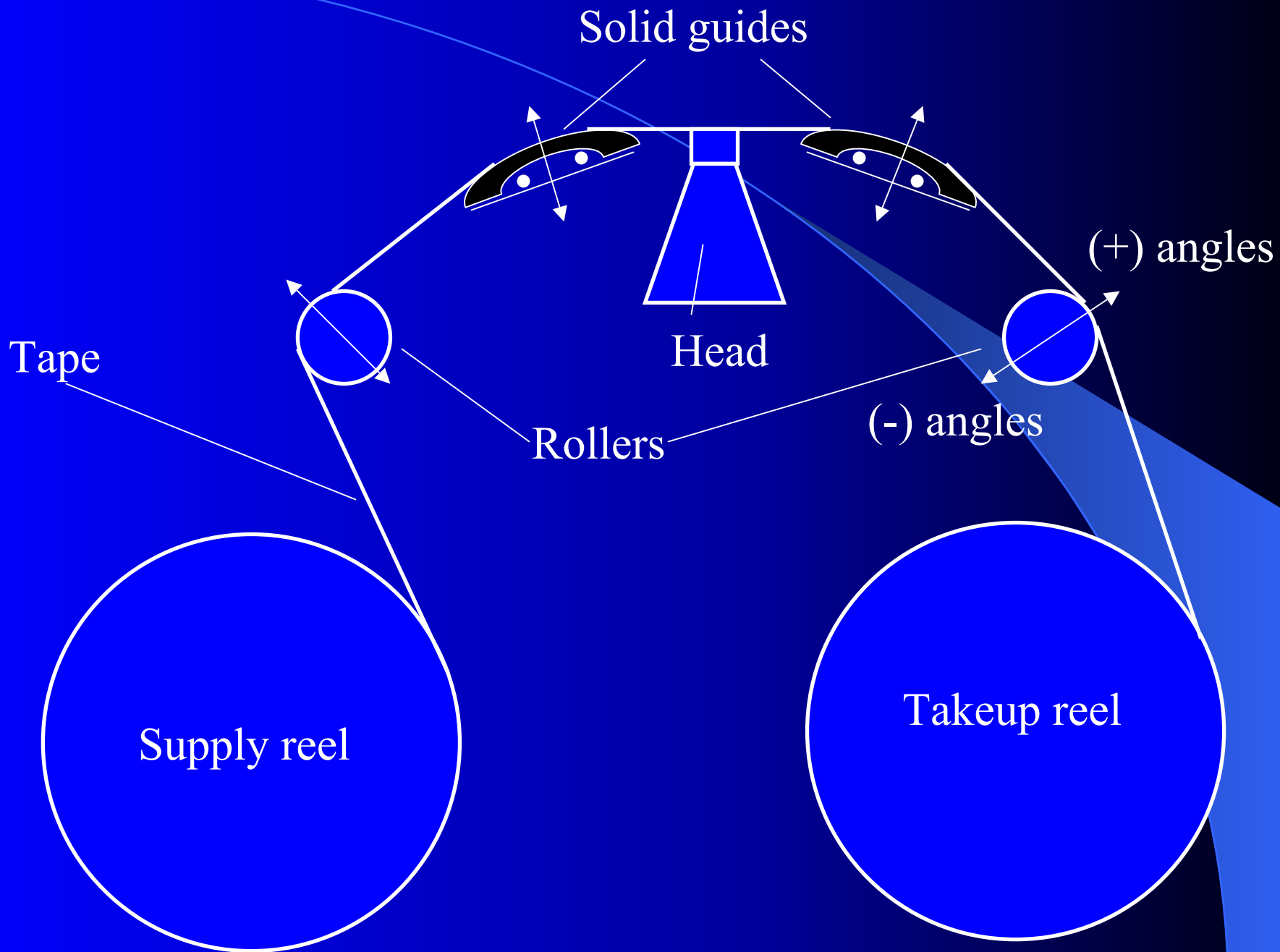
misaligned roller  
(no flanges)

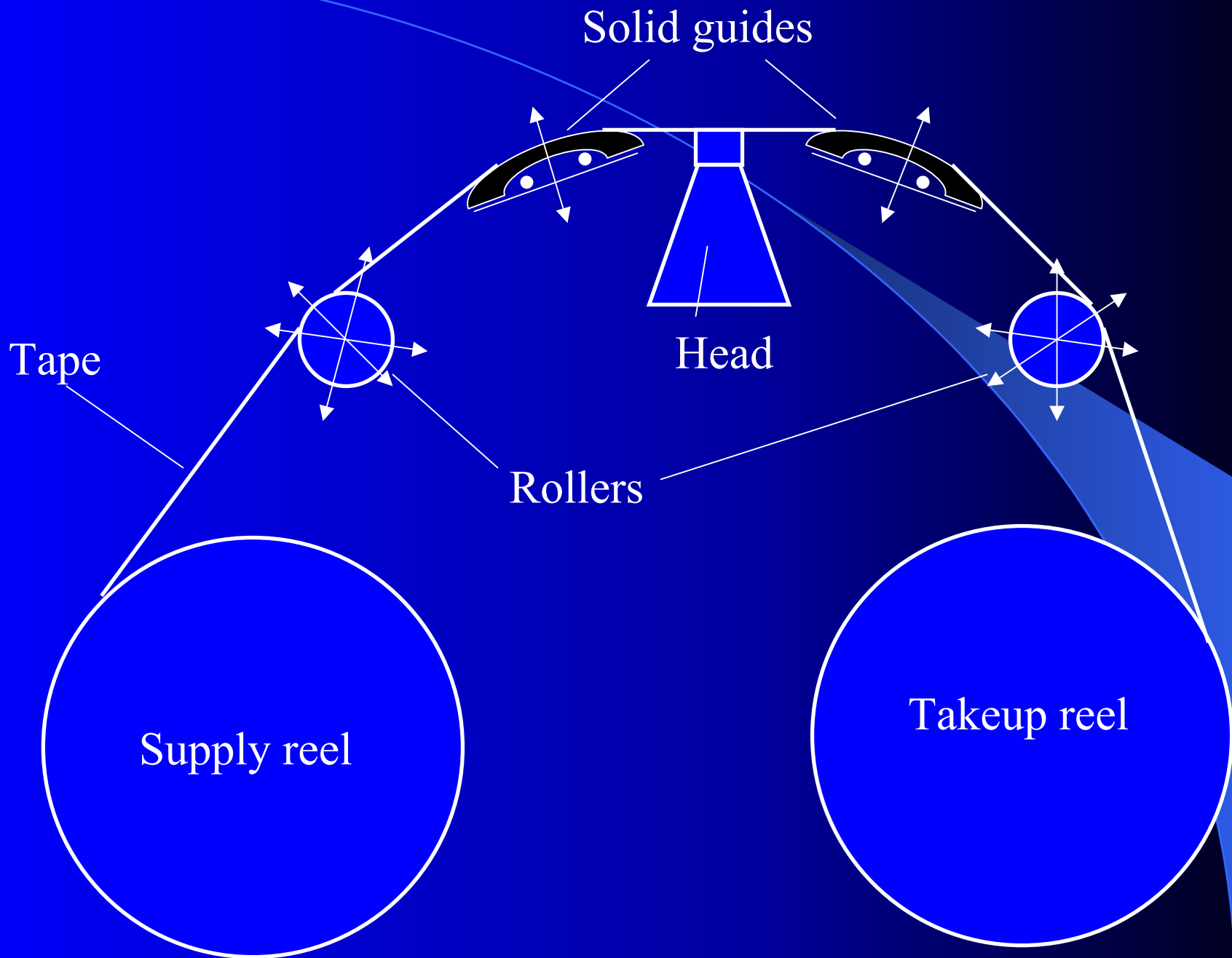
tape direction

<=====from the reel (out)=====

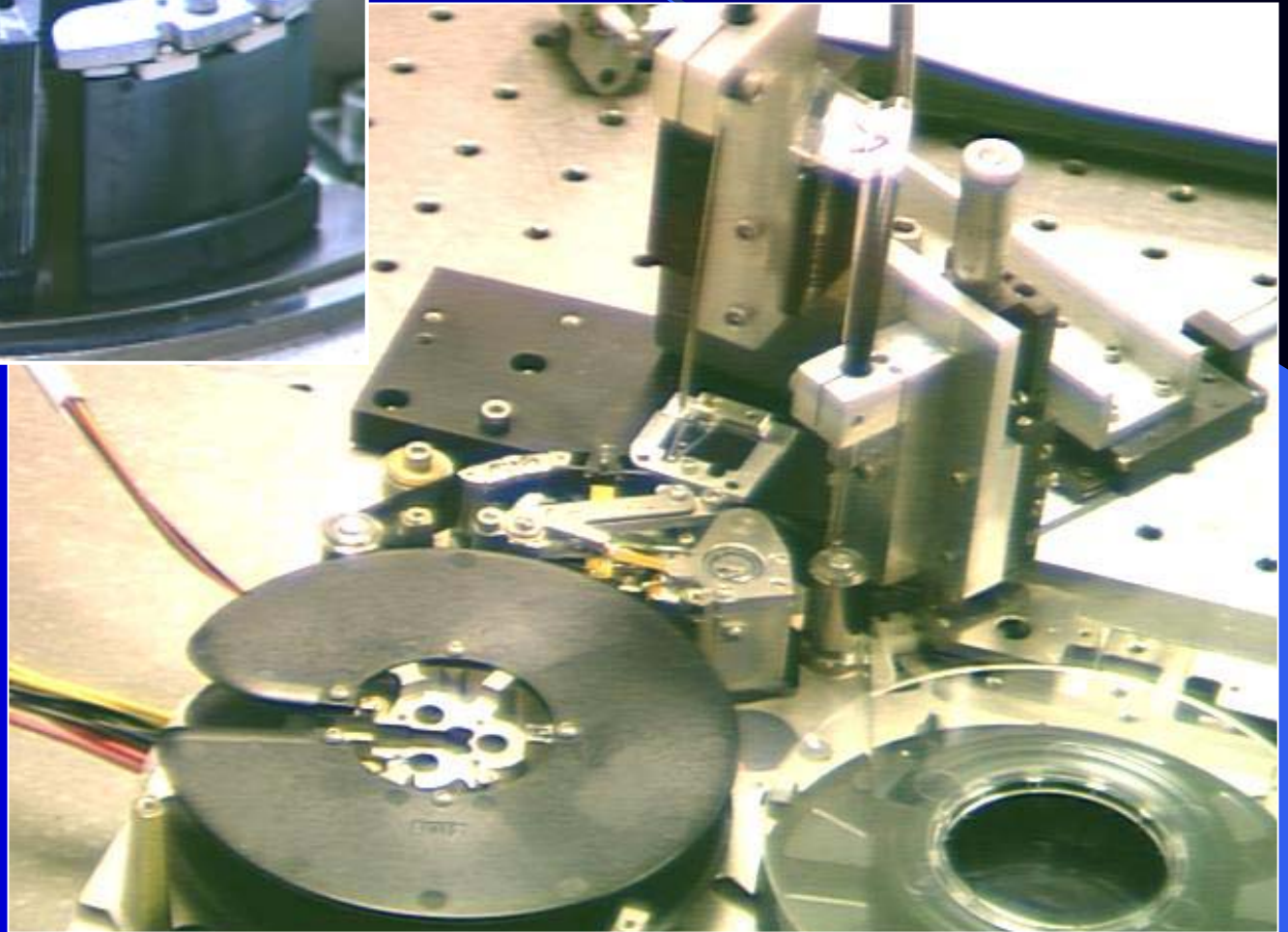
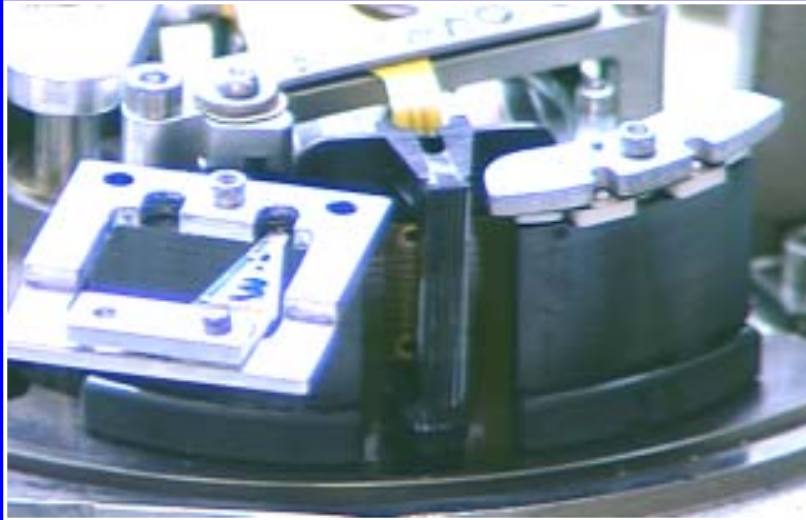
====from the misaligned roller (in)====>

**measurement  
position**

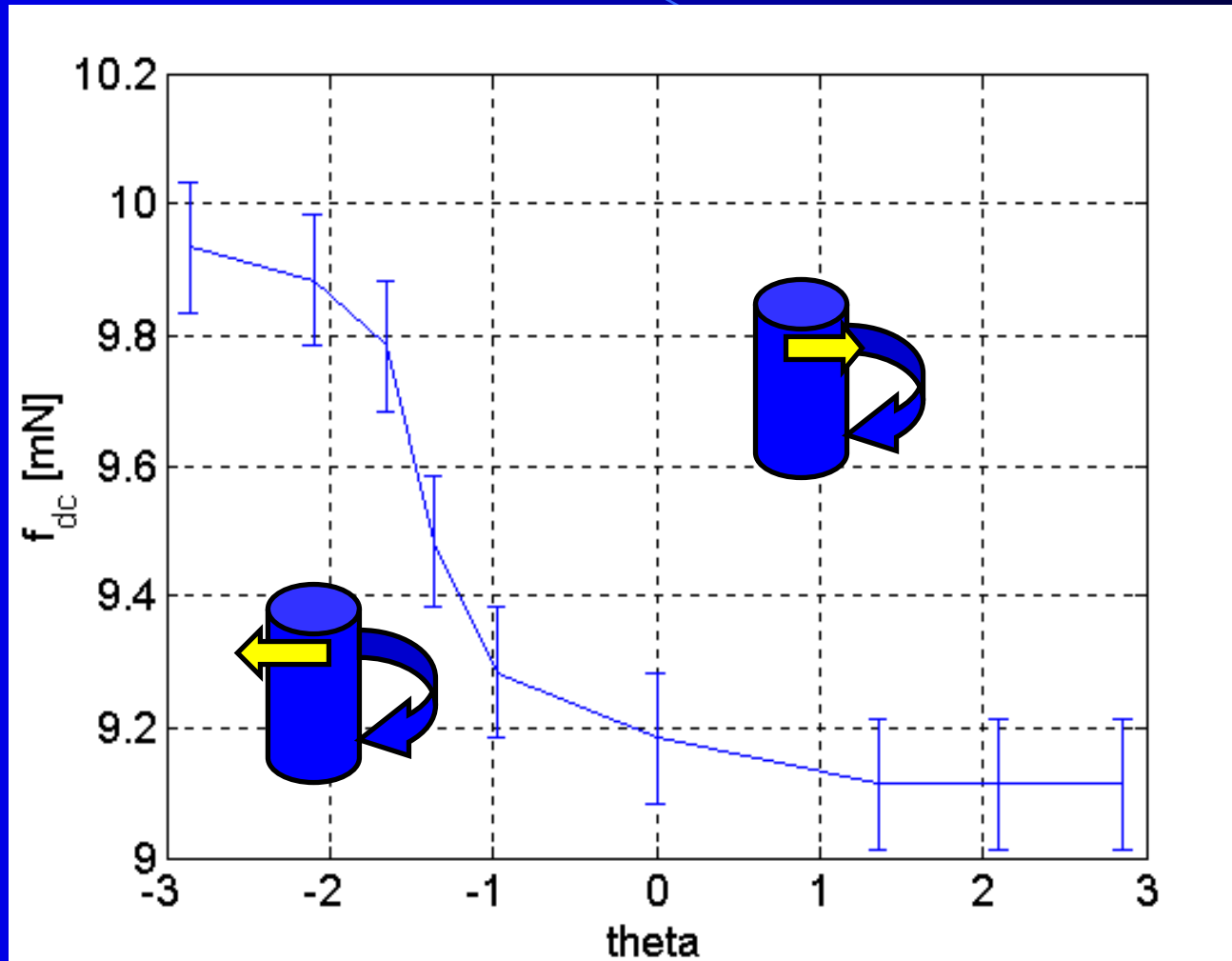




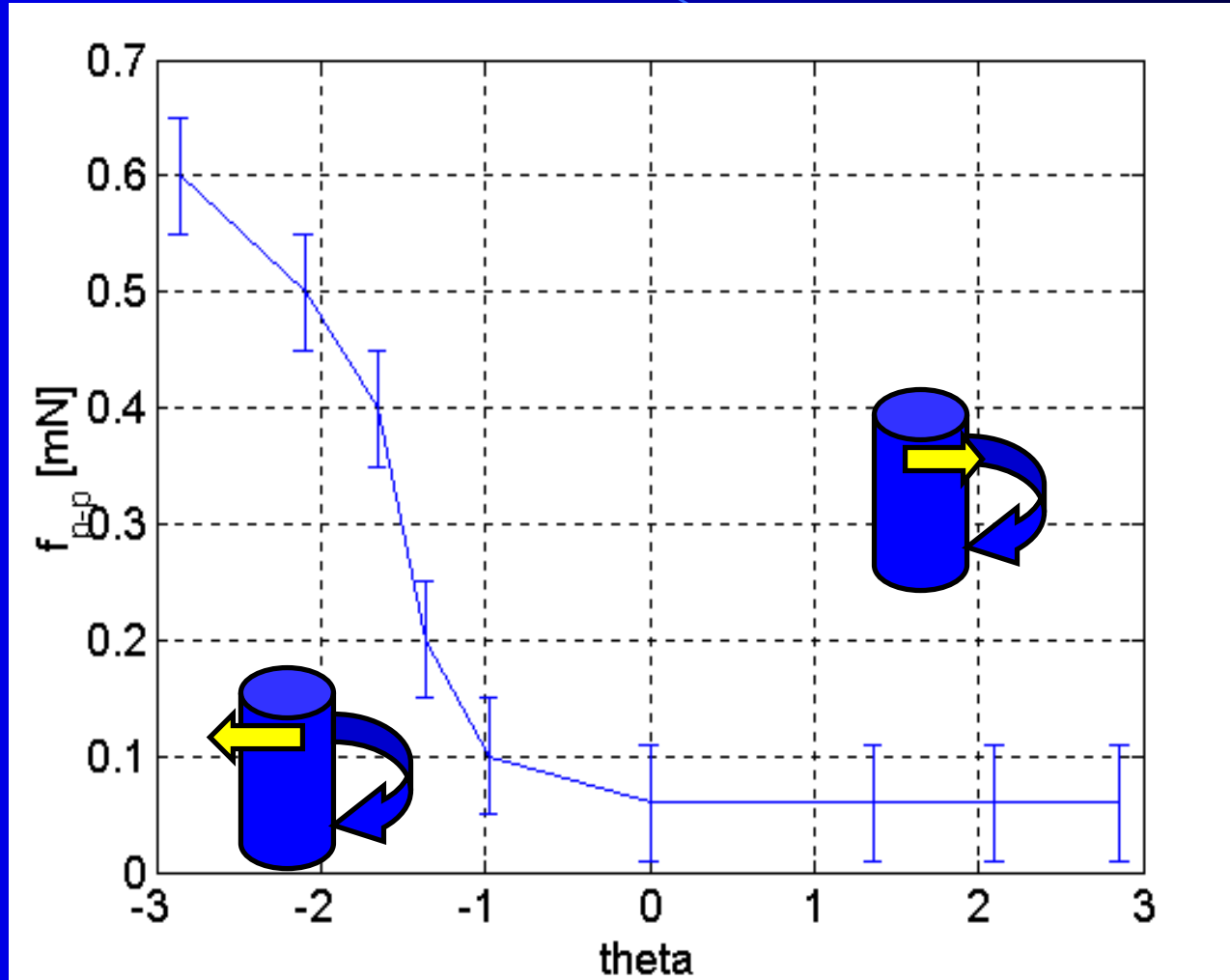
# Tape edge force measurement



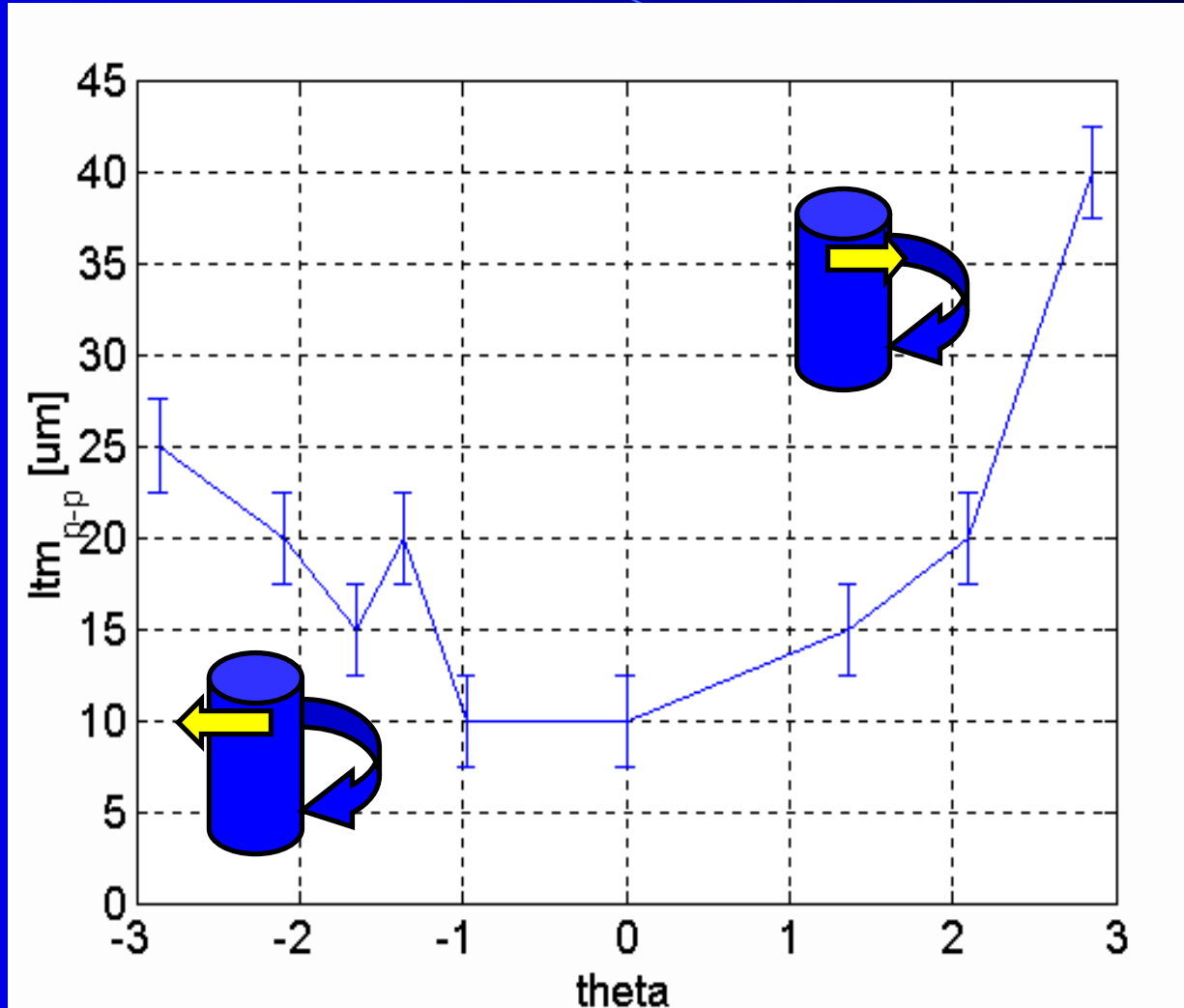
# Tape edge force measurement (in)



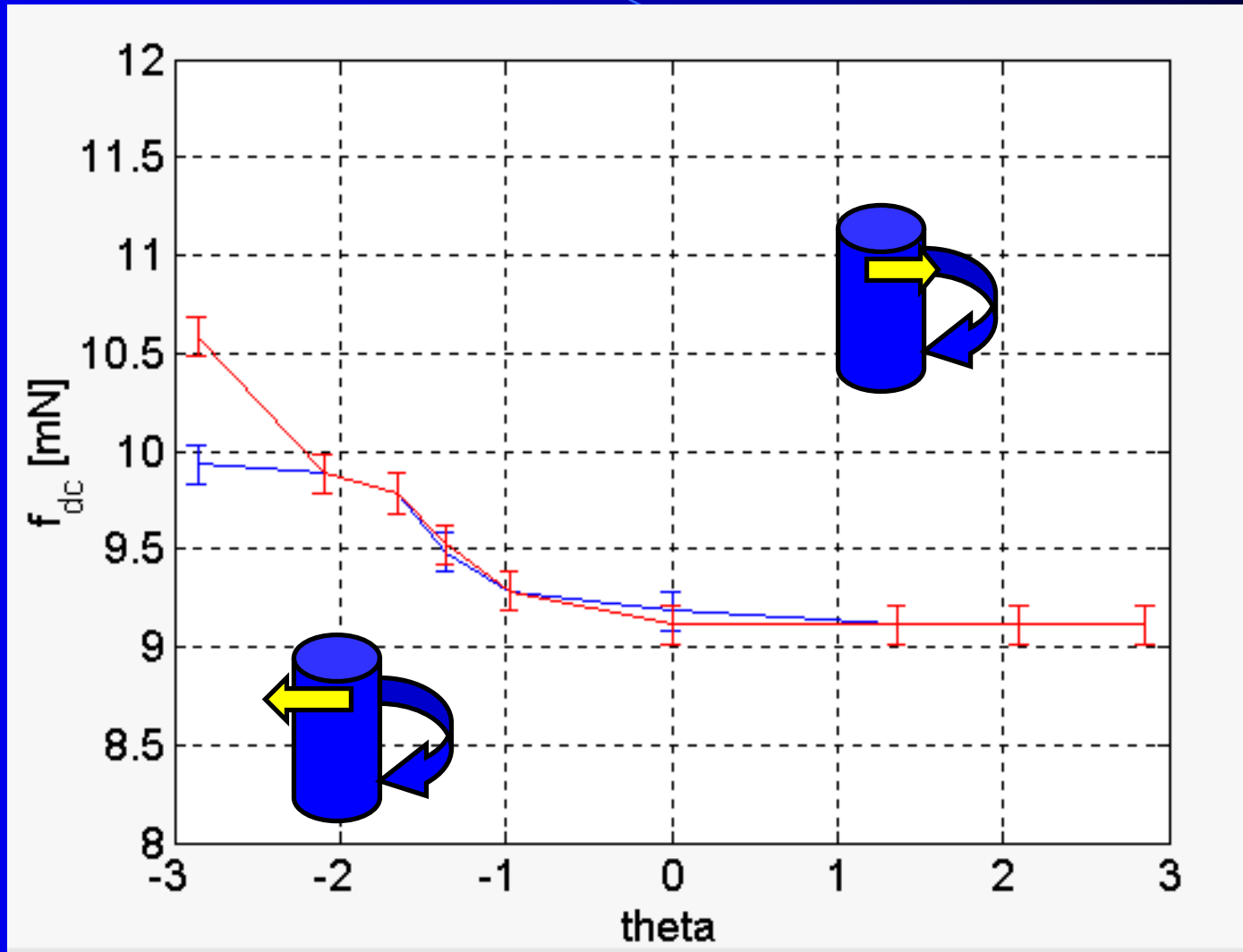
# Tape edge force measurement (in)



# Tape lateral displacement p-p (in)

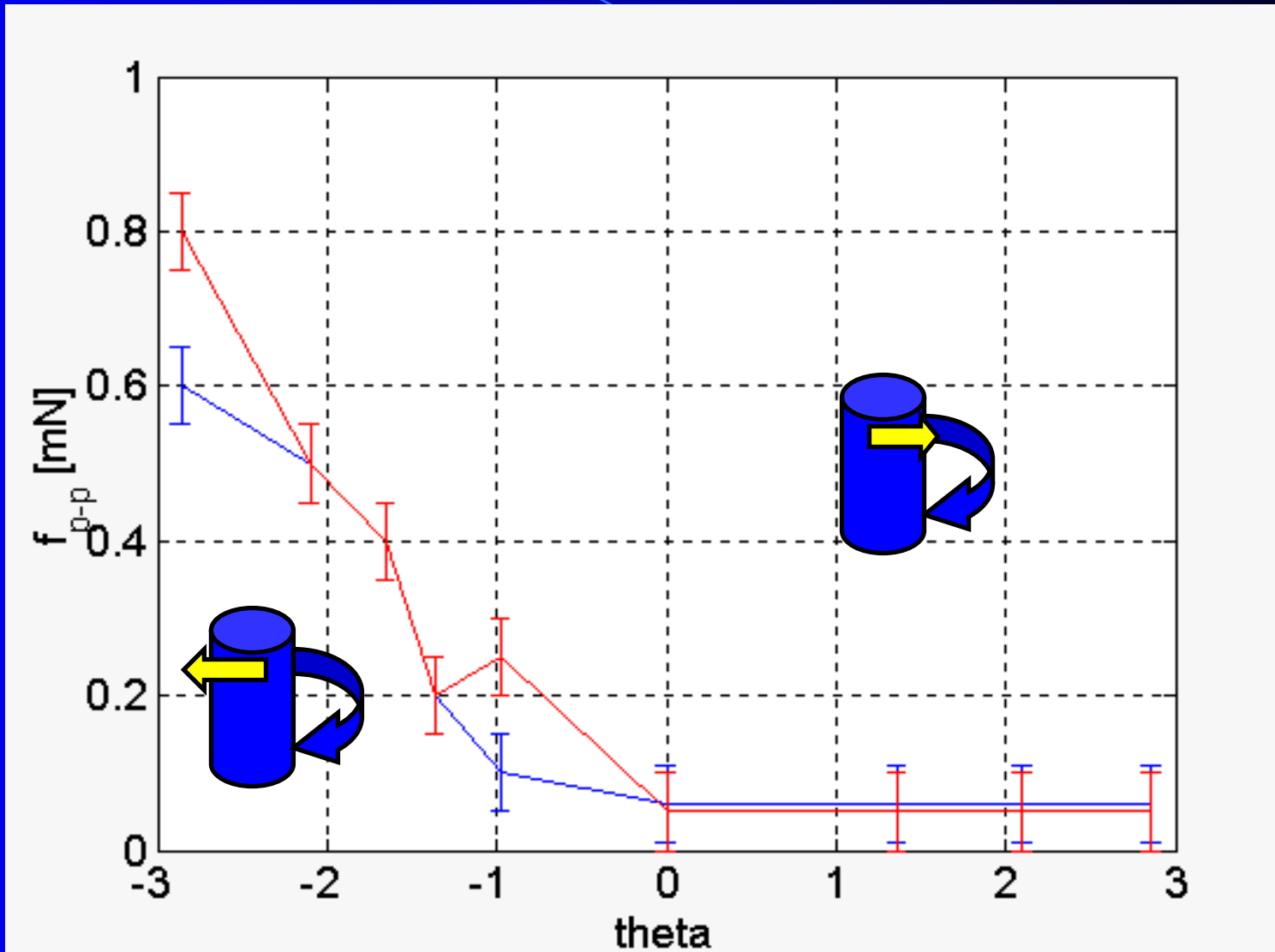


# Tape edge force measurement (red-out)

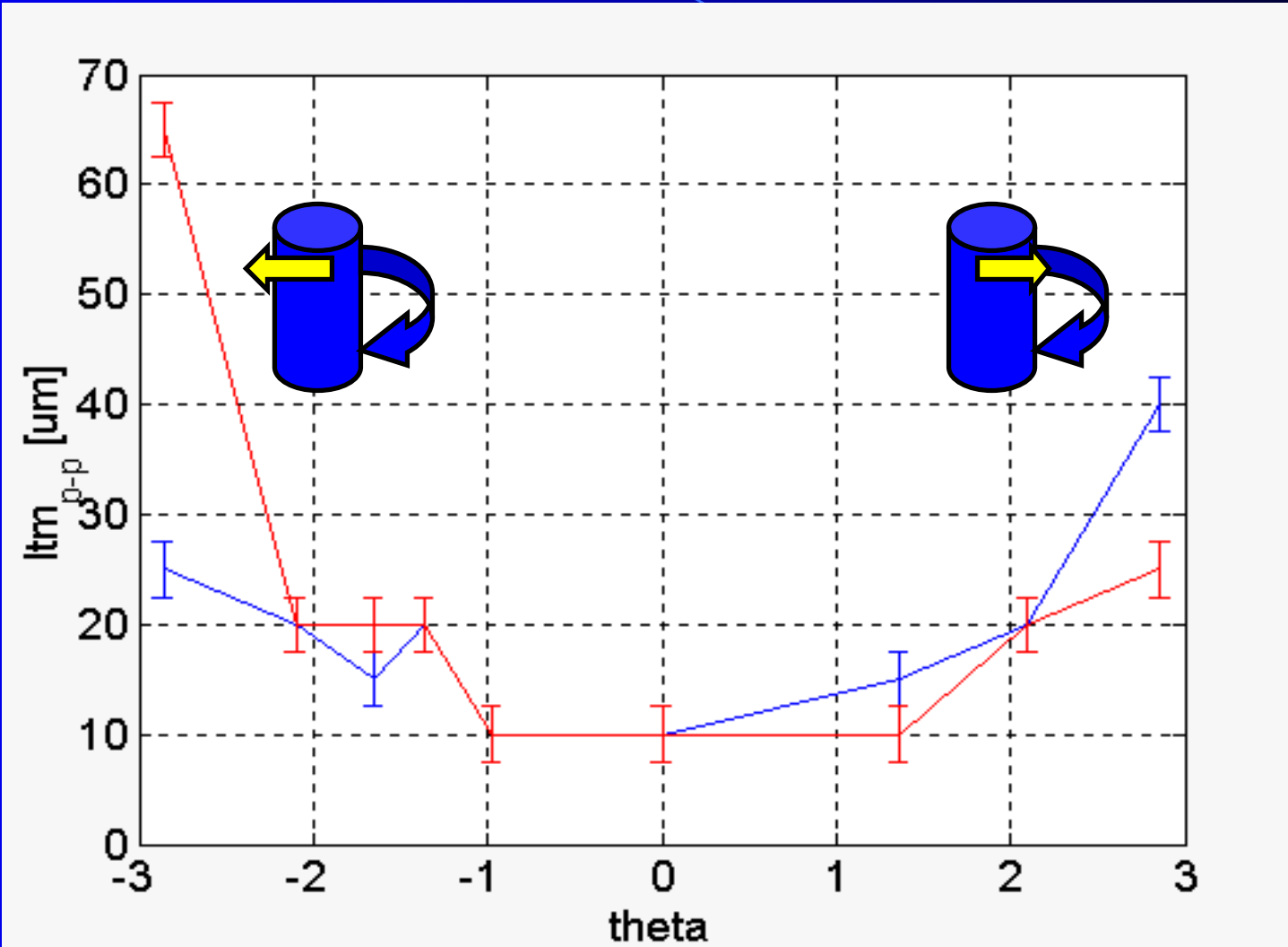




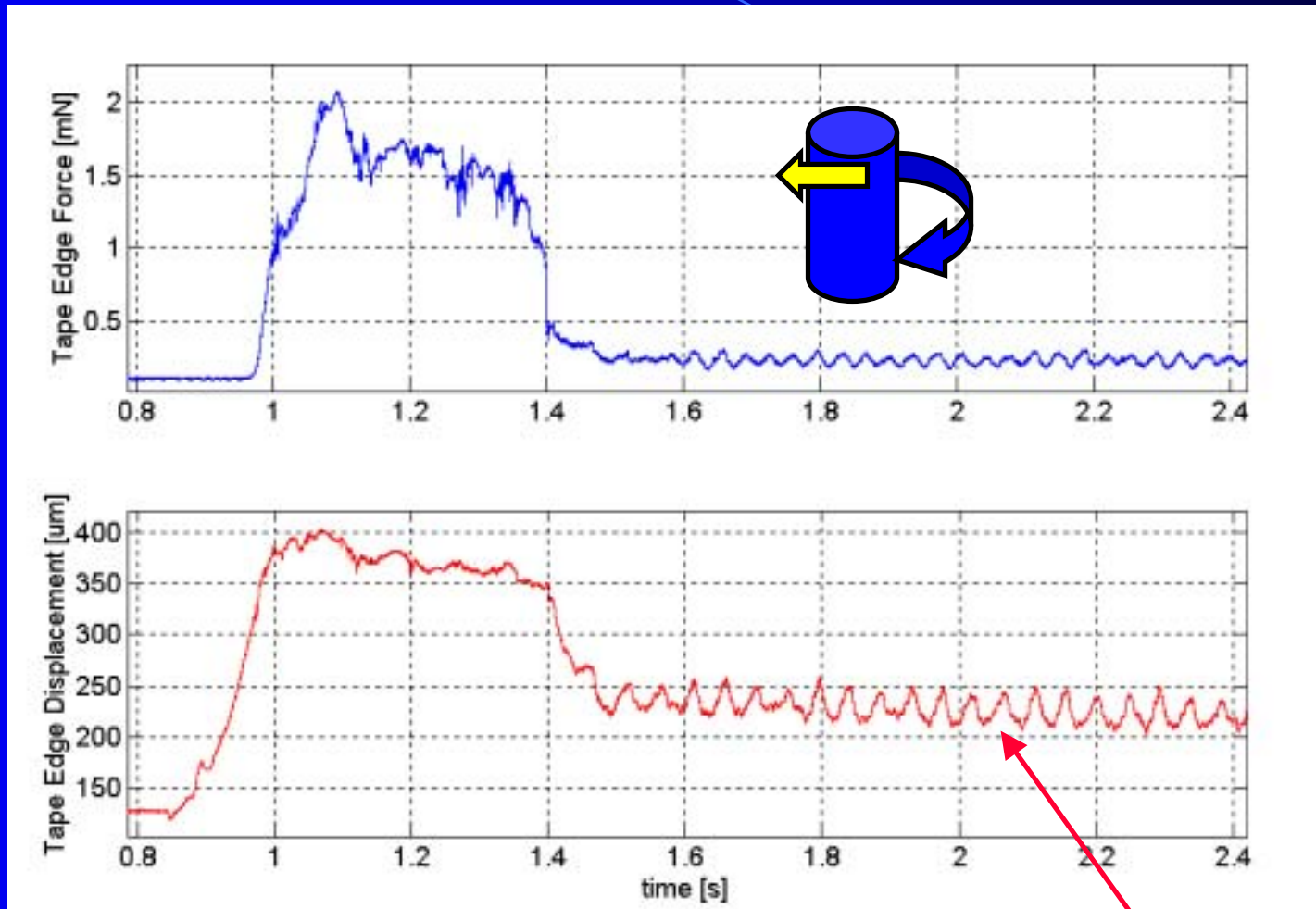
# Tape edge force measurement (red-out)



# Tape lateral displacement (red-out)

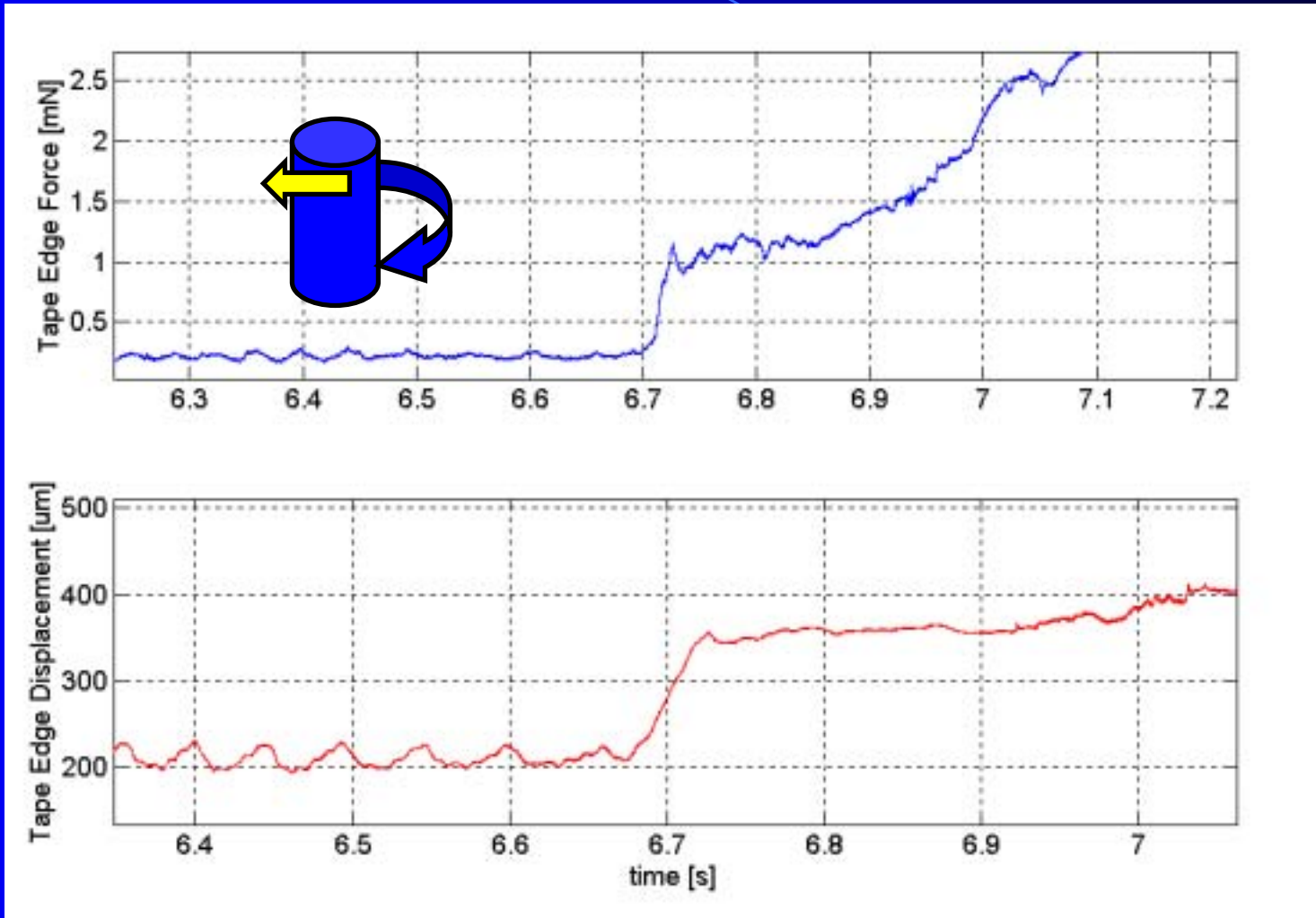


# Comparison of ltd and edge force (-0.97° - in)

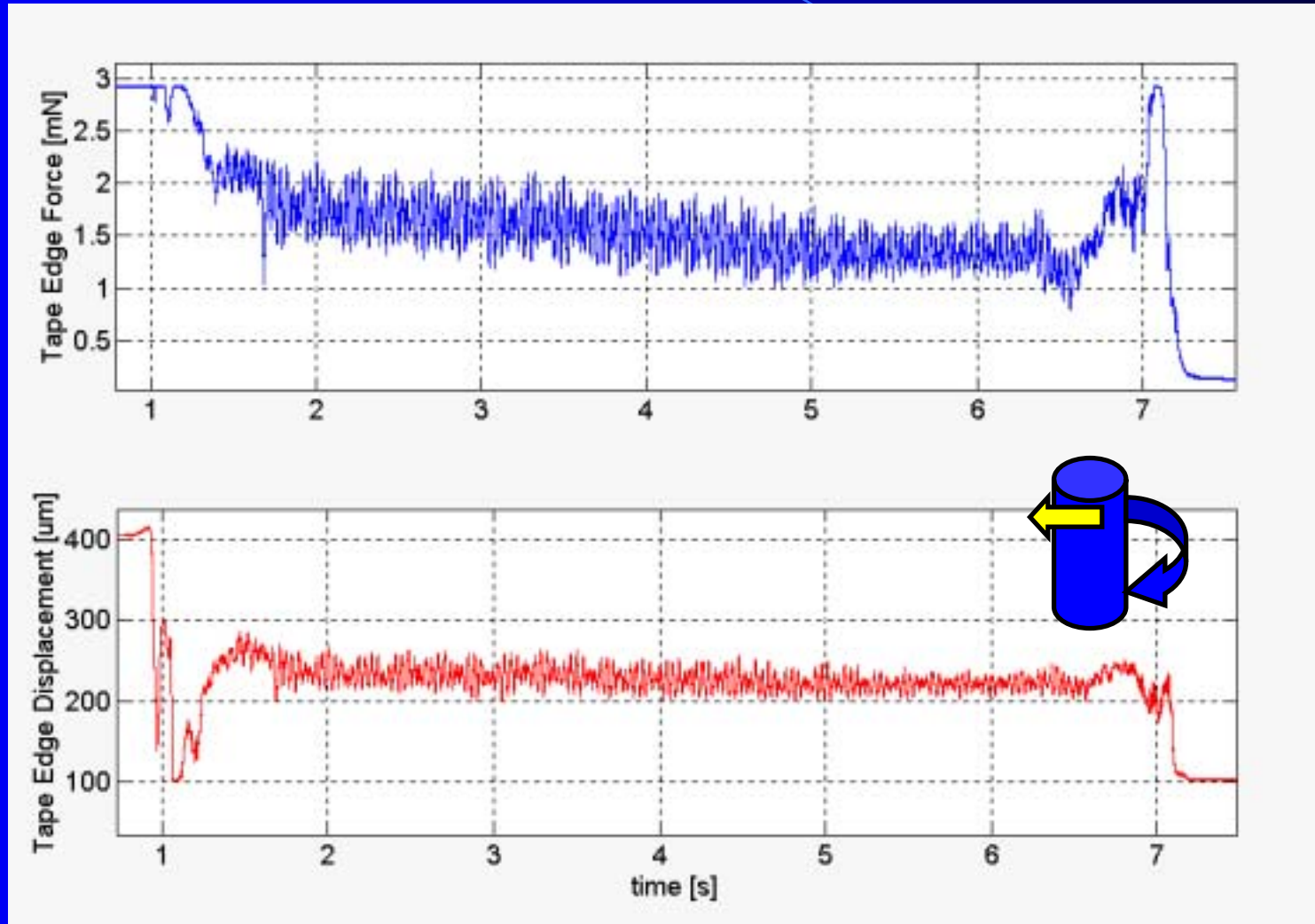


**25 Hz pack runout**

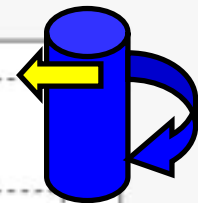
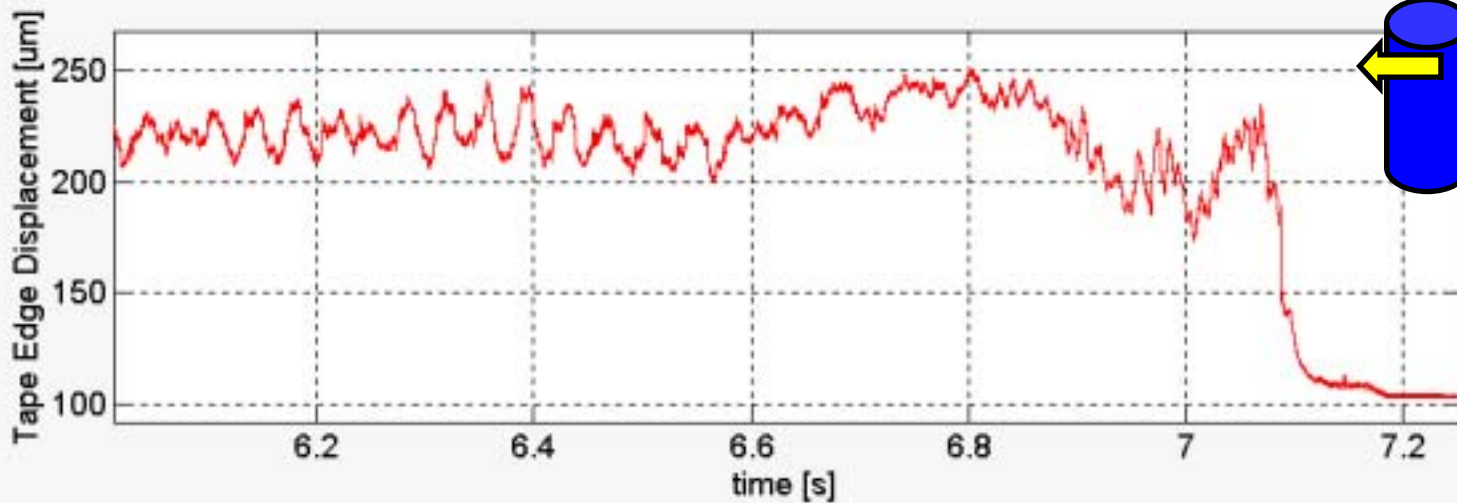
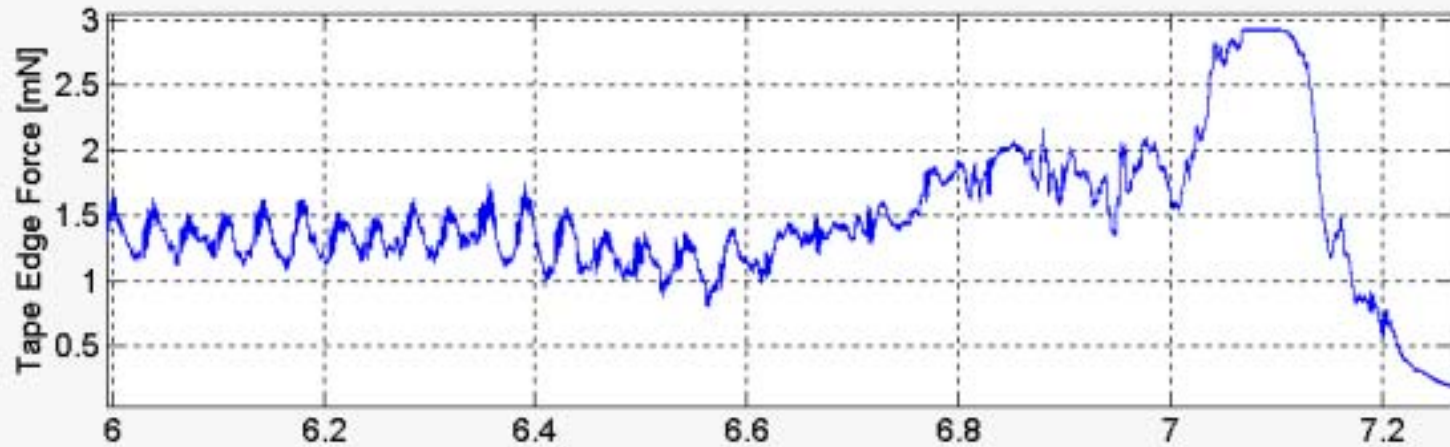
# Comparison of ltd and edge force (-0.97° - in)



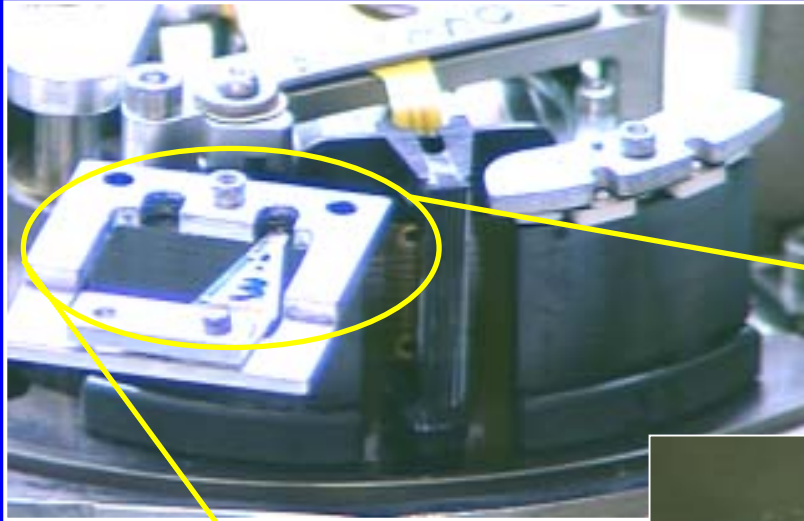
# Comparison of ltd and edge force (-2.86° - out)



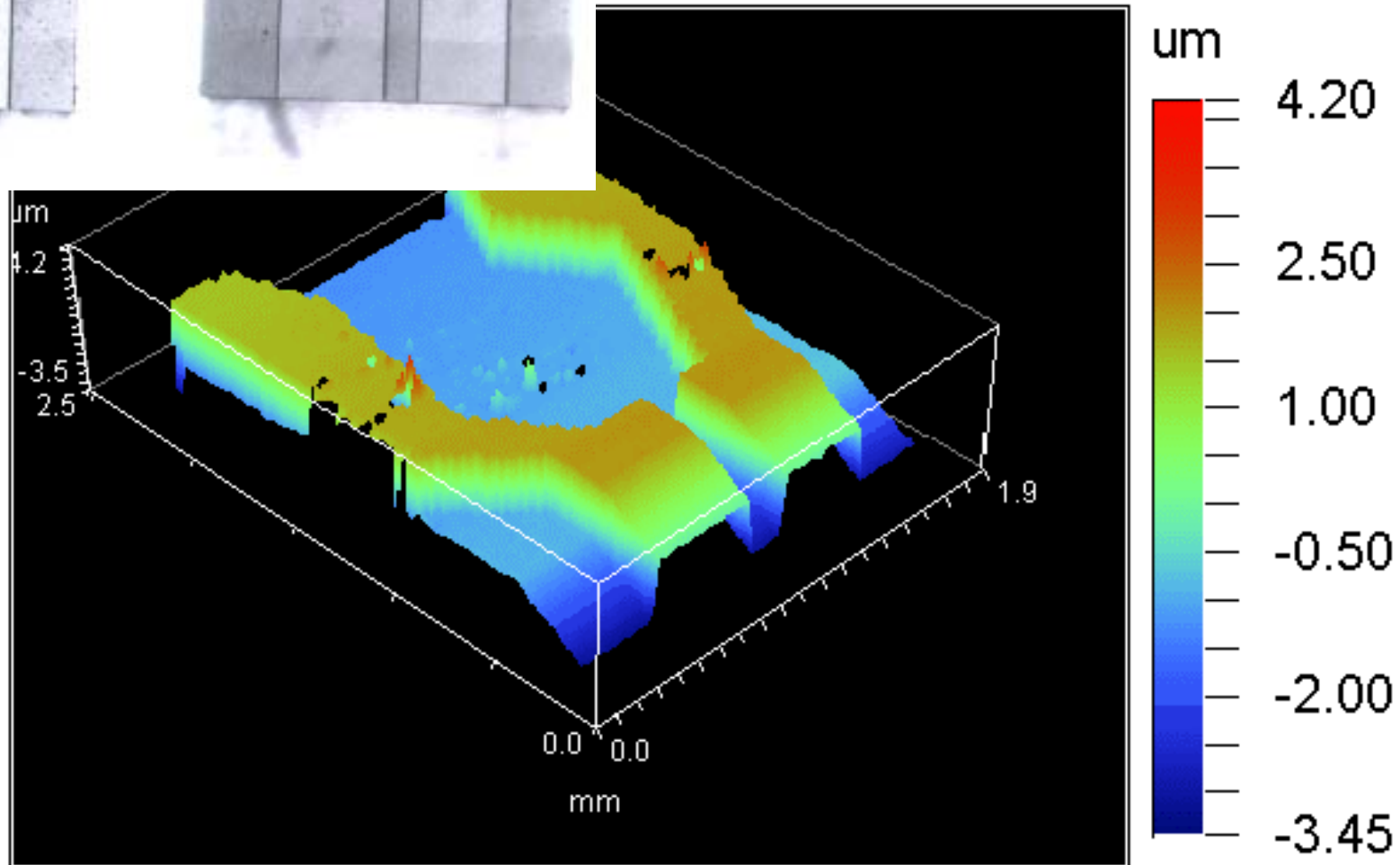
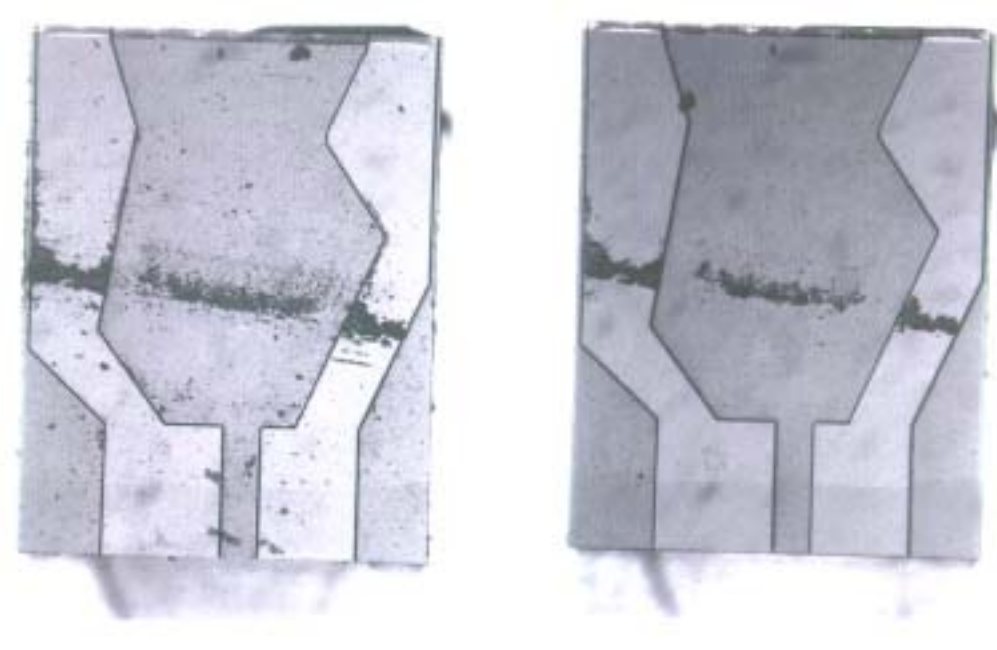
# Comparison of ltd and edge force (-2.86° - out)



# Debris from the tape

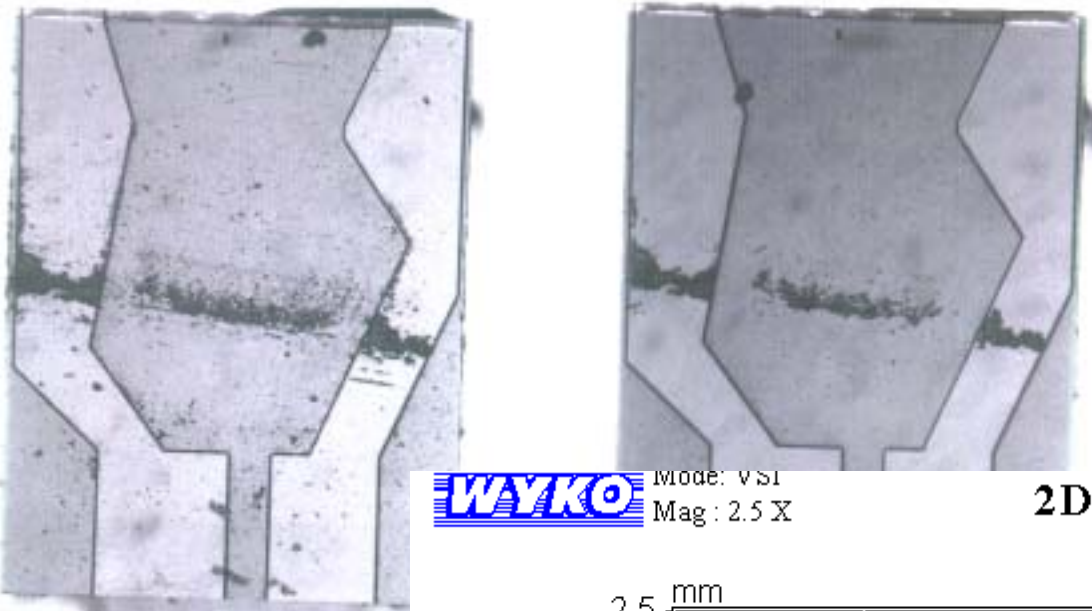


# Slider analysis





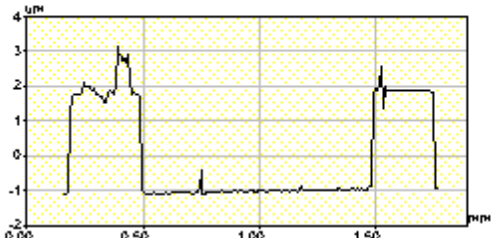
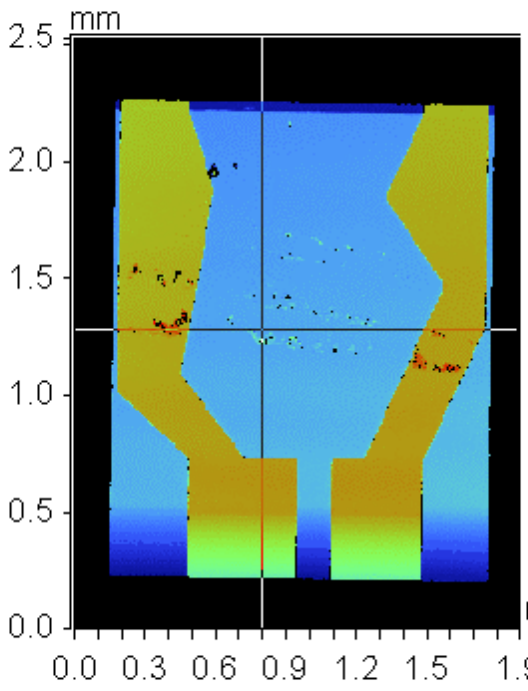
# Slider analysis



**WYKO** Mode: VSI  
Mag: 2.5 X

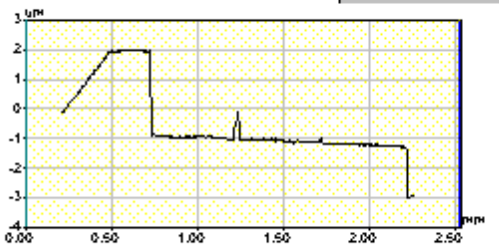
## 2D Profiles X-Profile / 2 Pt / Radial

12/20/01  
16:13:25



Rq: 1.42 um	L: 0.00 mm ---
Ra: 1.34 um	R: 1.89 mm ---
Rt: 4.23 um	D: 1.89 mm ---
Rp: 3.15 um	Angle: ---
Rv: -1.09 um	Curve: 92.02 mm
	Terms: None
	AvgHt: 0.04 um
	Area: 0.08 um <sup>2</sup>

## Y-Profile / Circular

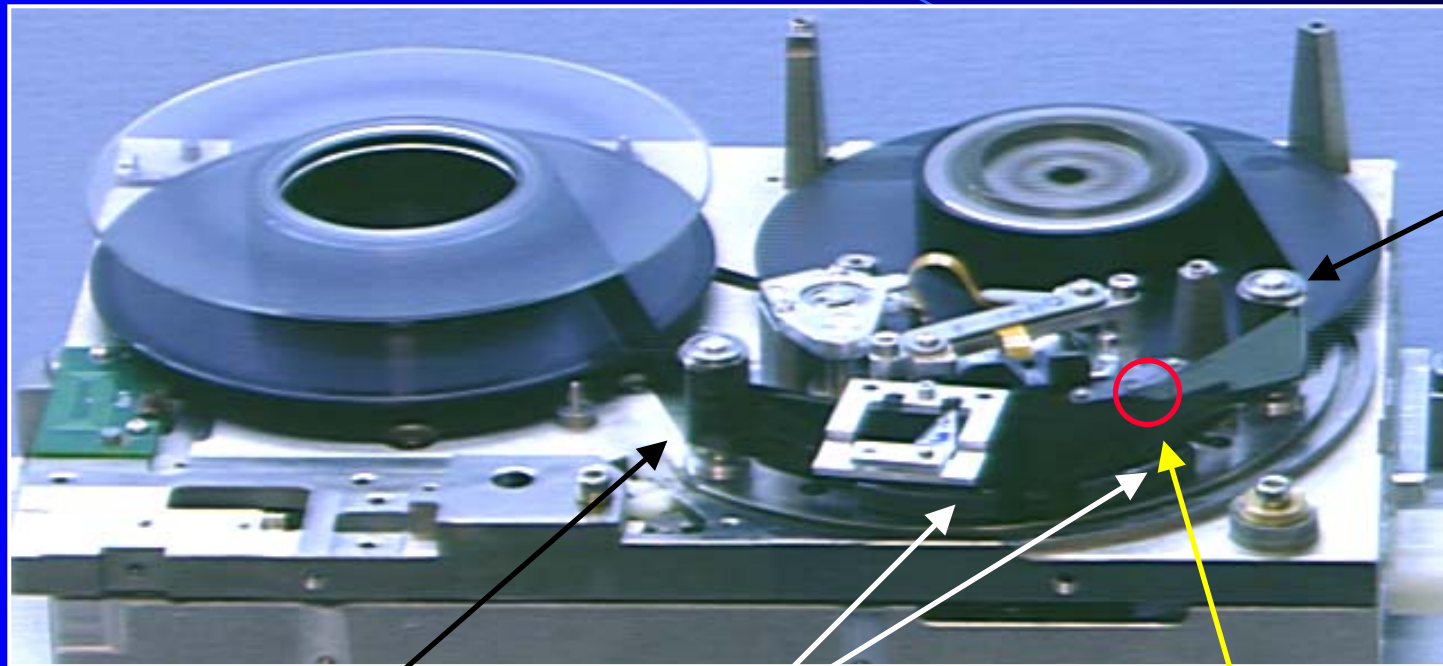


Rq: 1.18 um	L: 0.00 mm ---
Ra: 0.95 um	R: 2.53 mm ---
Rt: 5.01 um	D: 2.53 mm ---
Rp: 2.00 um	Angle: ---
Rv: -3.01 um	Curve: 626.41 mm
	Terms: None
	AvgHt: -0.48 um
	Area: -1.20 um <sup>2</sup>

Title:

Note:

# Other measurement position



flanged  
roller

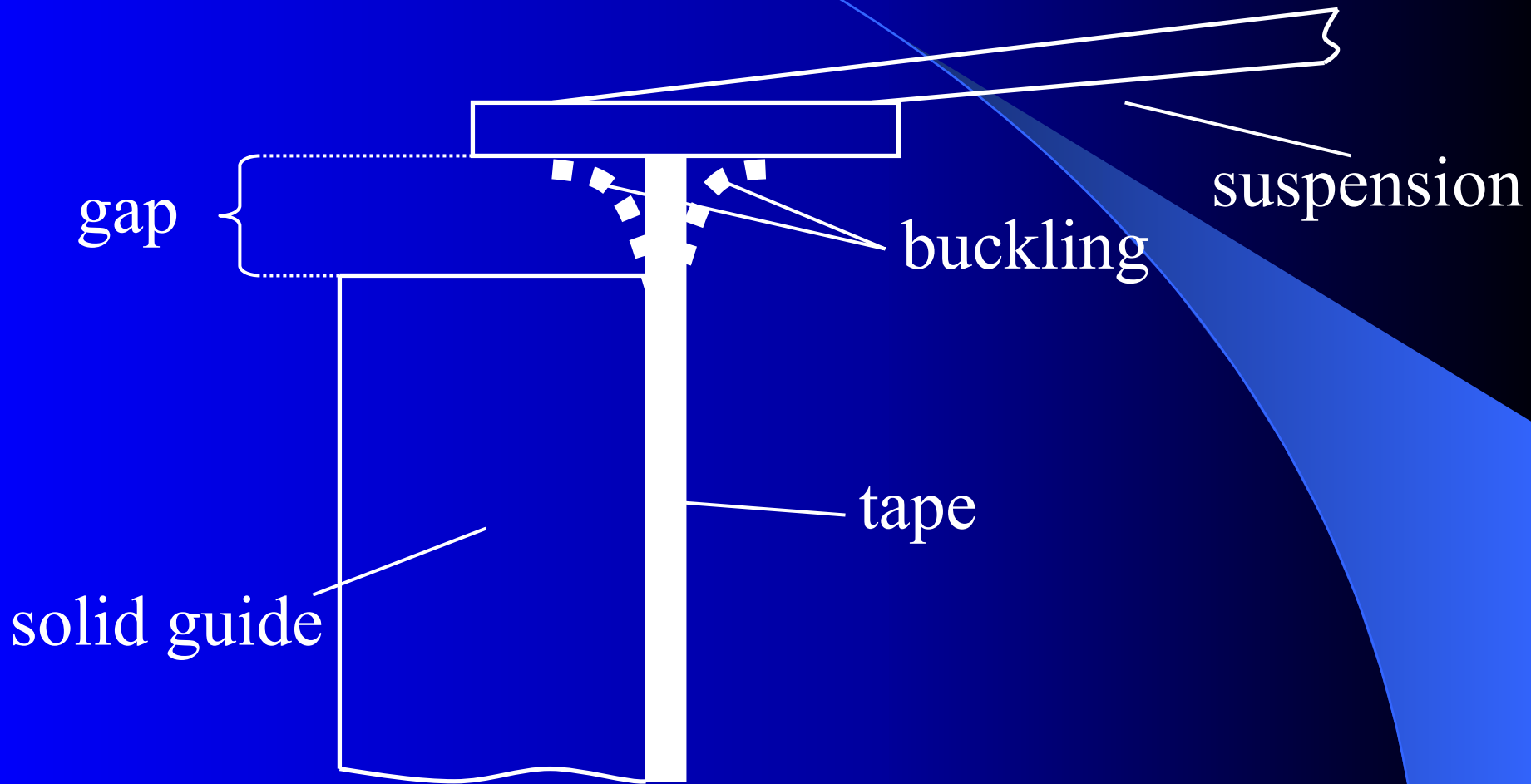
misaligned roller  
(no flanges)

stationary  
guides

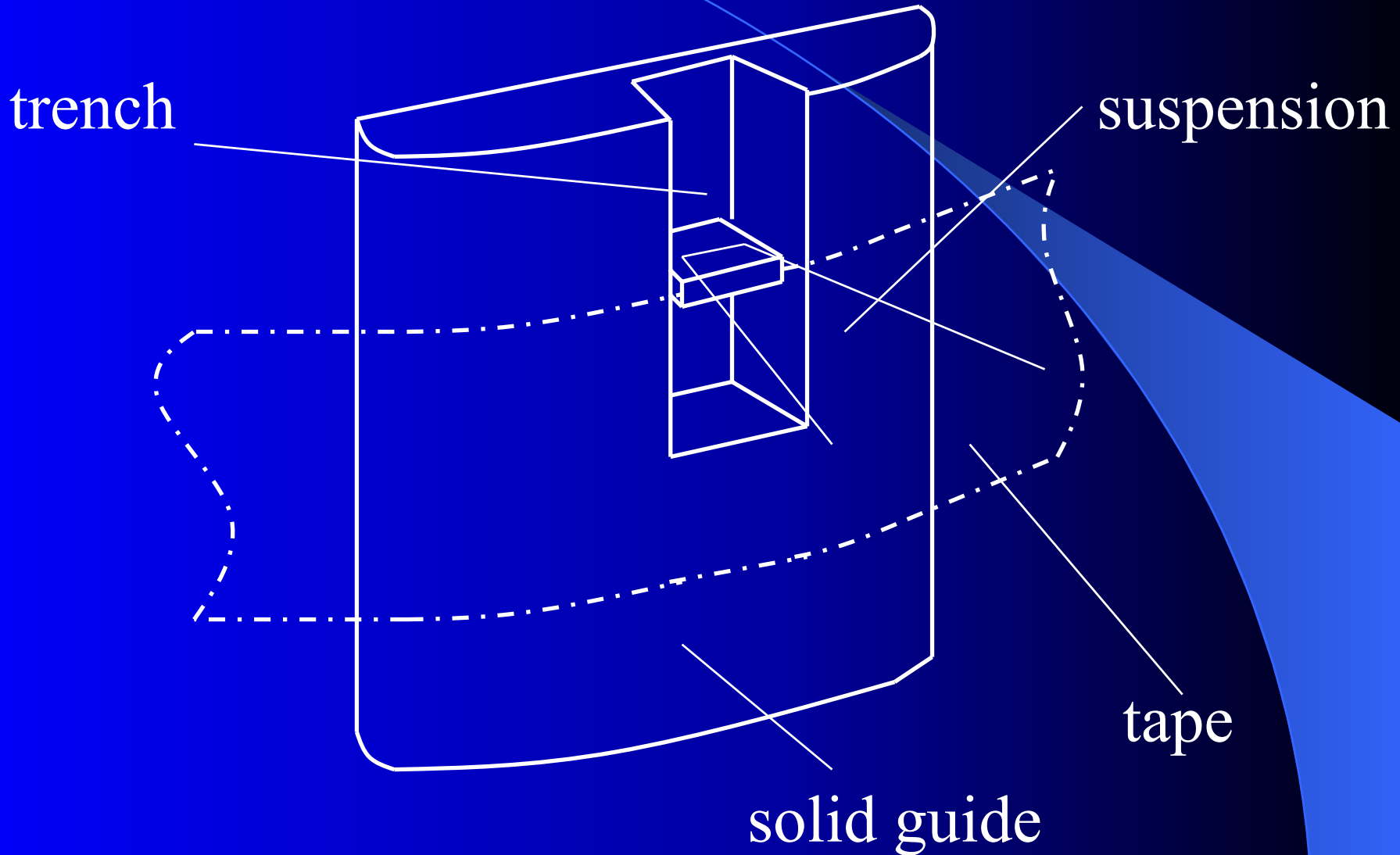
measurement  
position

The tape climbed up very high and  
buckled when measuring in this position

# Development of an improved setup



# Development of an improved setup



# Conclusions

- Upward force (- angles) tends to be higher when coming out of the drive (from the reel) towards the misaligned roller, so the disturbance is propagated 'upstream'
- Downward force pushes tape down against hard stop
- Lateral tape displacement (p-p) increases for both (+) and (-) misalignments

# Intro to tape width variation measurement

# Future Work

- Improved edge force measurement setup
- Use of two edge sensors
  - tape width variation measurement
  - Investigation of spectral content of lateral displacement on either side of a roller/guide to identify the ‘filtering’ effect of rollers and guides
- Development of theoretical analysis of the effect of rollers and guides on guiding