



# Stability of Co- $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> Tape

54-82  
121951  
P-11

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# Overview of Archival Stability of Recording Media

Environment	Magnetic Pigment						
	$\gamma\text{Fe}_2\text{O}_3$	Co- $\gamma\text{Fe}_2\text{O}_3$	BaFe	CrO <sub>2</sub>	MP	CoNi	CoCr
Temp $\geq 50^\circ\text{C}$	●	●	●	○	◐	●	●
Humidity $\geq 75\%$	●	●	●	●	●	●	●
Pollutants $\geq \text{Cl II}^*$	●	●	●	●	○	●	●
Temp & Humid	●	○	●	●	◐	●	●
Temp & Poll	●	●	●	○	○	●	○
Humid & Poll	●	○	●	●	◐	●	○
T & H & Poll	●	○	●	●	●	●	●

**PRODUCT:** Audio Cassette 9T Comp. Tape Lo-Density Diskettes  
 Video D-1 Hi-Bias Audio Hi-Density Diskettes  
 4 MByte Diskettes Hi-8mm  
 Video 3480 Cart. Hi-Bias Audio  
 Hi-8mm R-DAT D-2 Audio  
 Hi-8mm Next Generation

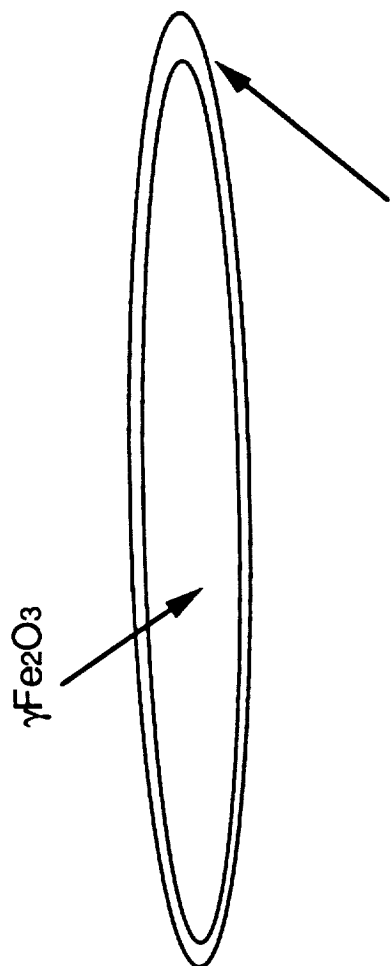
**KEY:** ● = GOOD    ○ = FAIR    ◐ = POOR  
 No corrosion or signal loss problems expected  
 May be suitable if some signal loss and/or bit errors can be tolerated  
 Unsuitable for storage under this condition

**NOTES:** Interim recommendations, based on results of NML and others, as of January, 1991.  
 Does not include possible binder and substrate problems not specific to media type.

\*Battelle Class II Environment



# Co- $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> Pigment



Surface Adsorbed Co

Hc (oe) - 450-900

$\sigma$ s (emu/gm) - 84

l/d - 5:1 to 10:1

# Storage Systems Using Co- $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> Tape

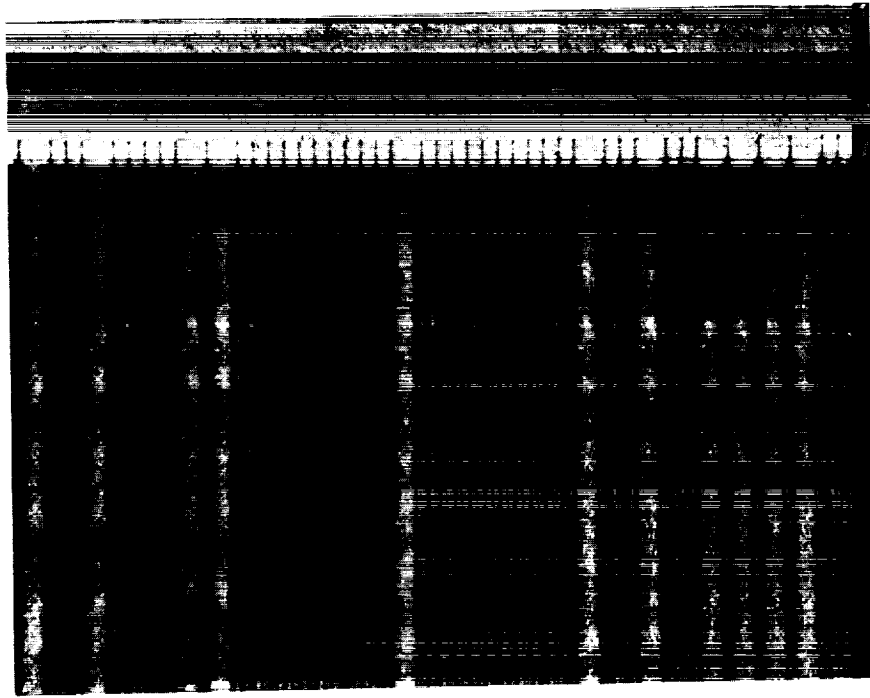


System ID	Head	Media Format	Thickness ( $\mu$ )	Capacity/Pkg (Gbits)	Durability (passes)
QIC 525	Fixed	1/4" Cart.	11	4.2	10,000
QIC 1350	Fixed	1/4" Cart.	13	10.8	10,000
Interferometrics	Fixed	1"x14" reel	16	5500	1,000
DCRsi	Trans.	1" Cart.	25	380	200
VHS	Helical	1/2" Cart.	20	32	NI
Digidata	Helical	1/2" Cart.	20	43	NI
VLDS	Helical	1/2" Cart.	16	80	NI
ID1	Helical	19mm Cart.	16	300	300
DCR	Helical	1" Cart.	25	240	200

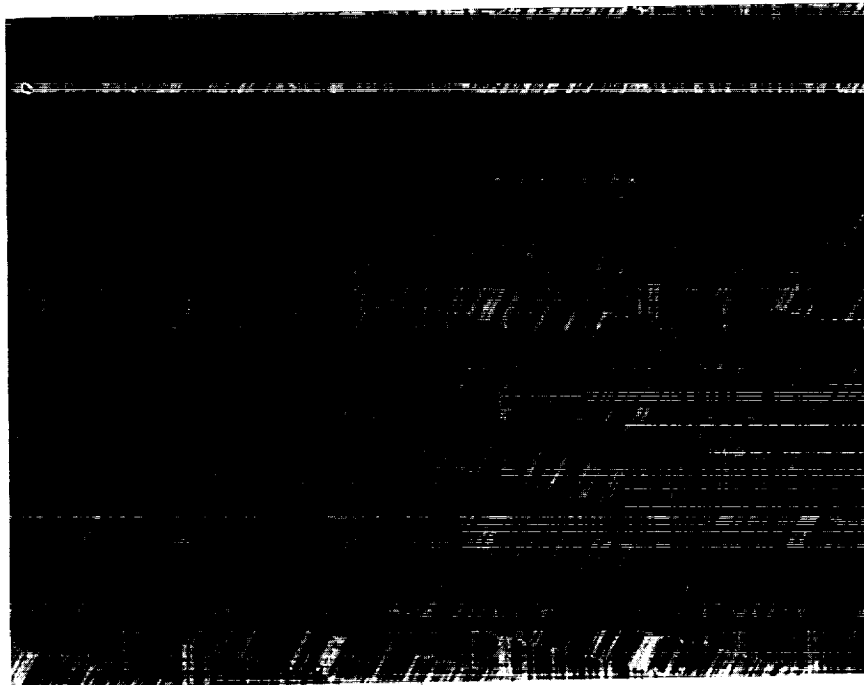
\* NI - No Information

## Recording Bit Density Comparison

Linear, Low Density: 2060 bits per inch, 20 mil width; 165X.



Helical, High Density: 45,000 bits per inch, 1.2 mil width; 165X.



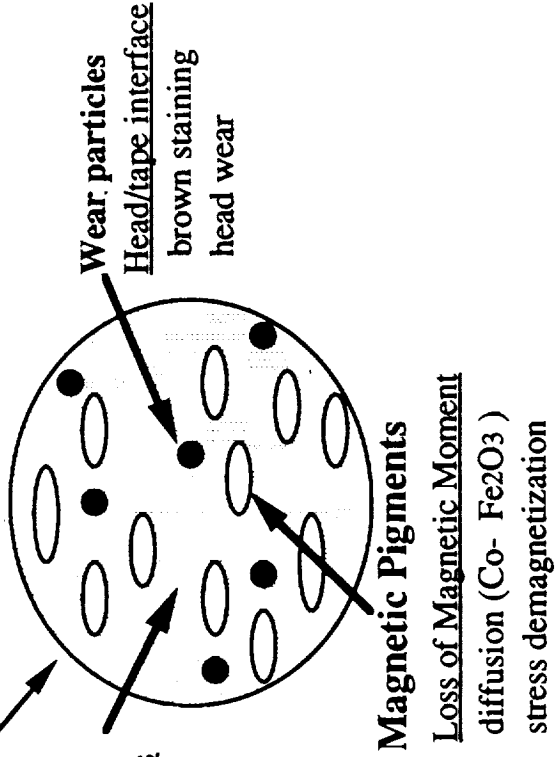
**Magnetic Tape Components:**  
Environmental Sensitivities of  
Co-γ -Fe2O3 Tape

**Substrate:**  
Dimensional Stability:  
 directional modulus  
 temp./humidity coeff.  
 stress relaxation

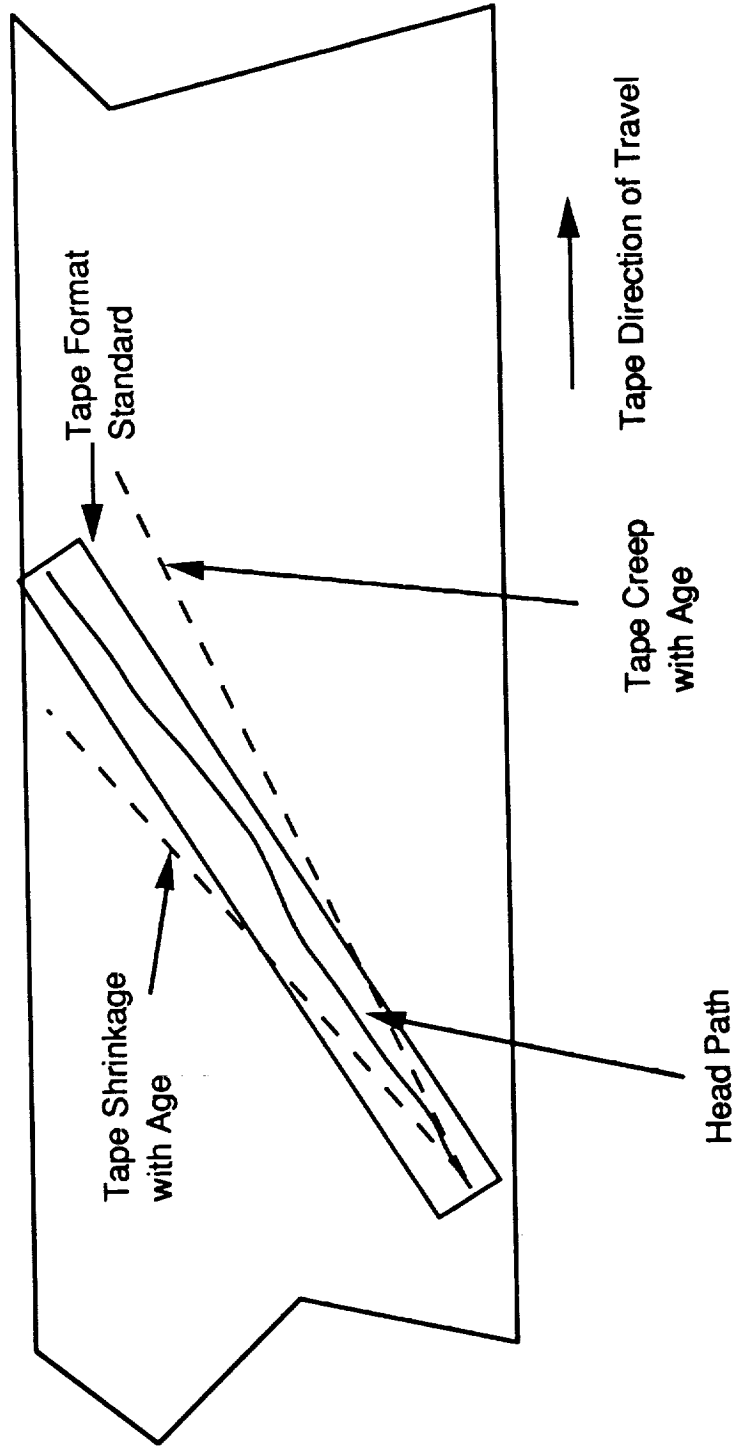
**Magnetic Coating**

**Organic Binder/  
 Lubricant System**  
Surface Tribology Changes  
 stick-slip  
 swelling...  
Composition Changes  
 hydrolysis  
 molecular wt. change  
 lubricant loss

**Backcoat:**  
Backcoat/Magcoat  
 Adhesion (blocking)

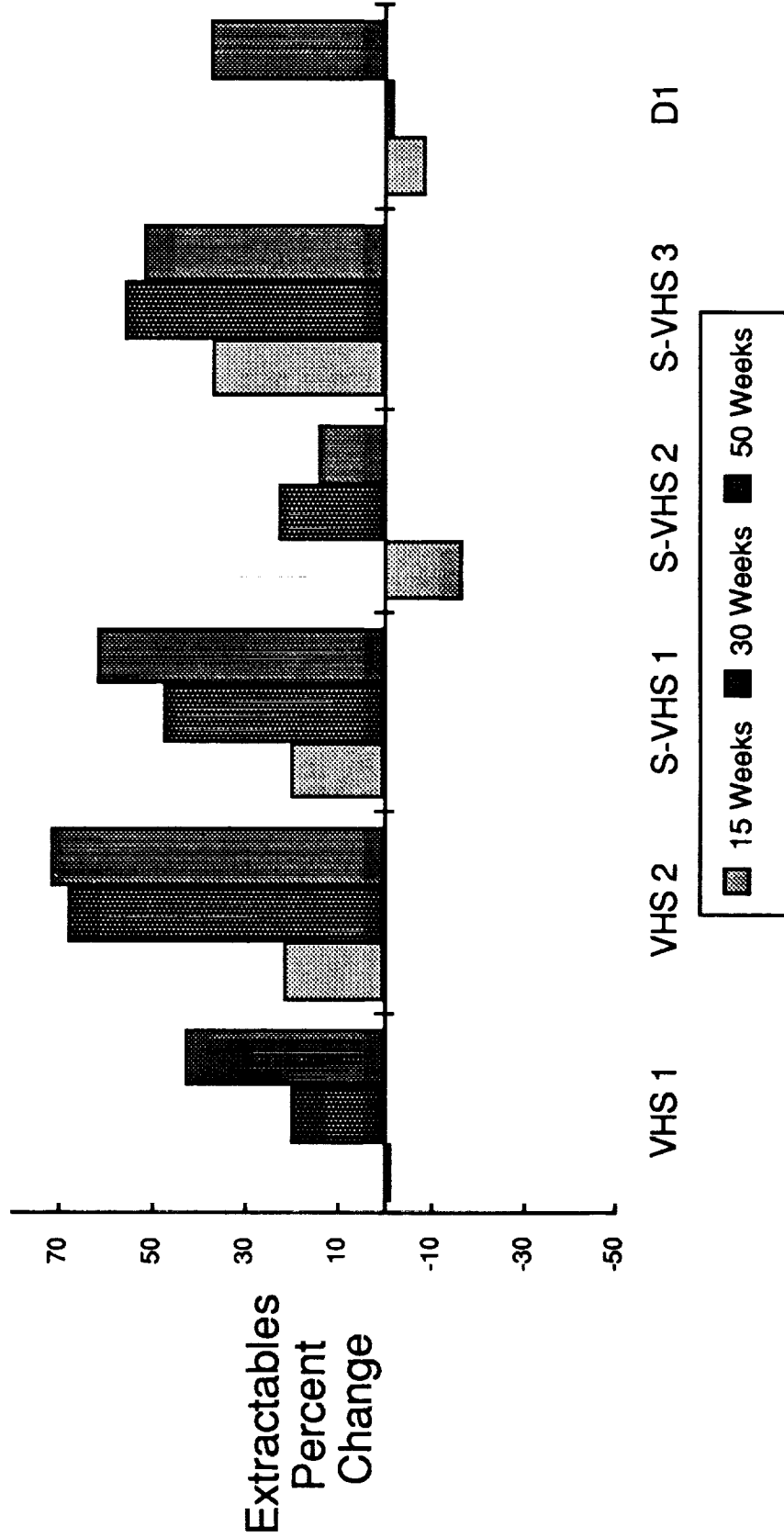


# Dimensional Stability and Crossplay





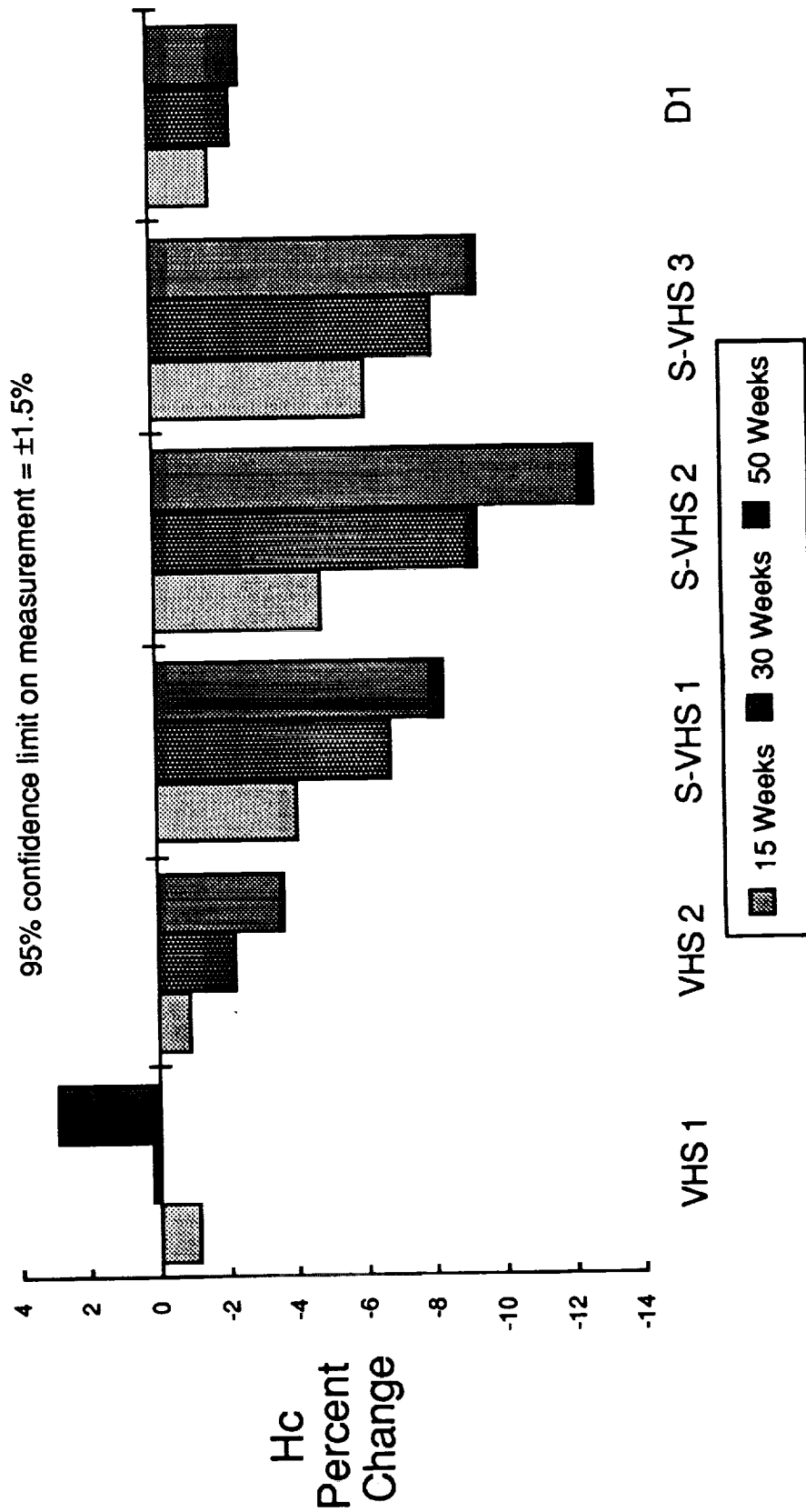
# 58°C - 90% RH Acetone Extraction





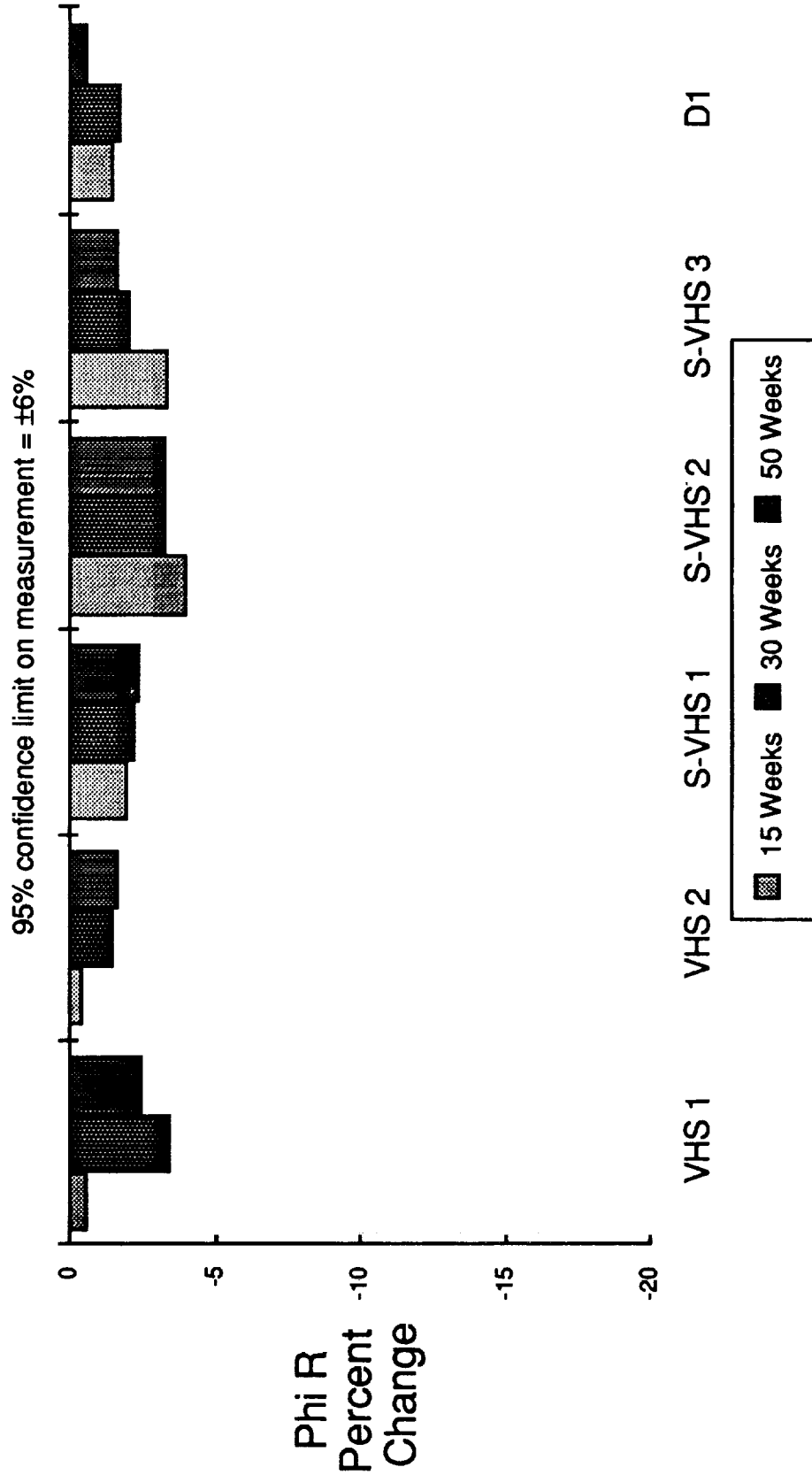


# 58°C - 90% RH Coercivity





# 58°C - 90% RH Phi R



# Summary

## Co- $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> Tape Stability

- Archive Stability: 10 yrs in a dry, controlled environment
  - Retensioning
  - Cleaning
  - Recertification
- Archive requirements are system specific
  - Wide range of system performance
  - User requirements outside recommended controlled environments
- Distributed Storage Systems require Shipping
- Anomalous events