

VLBA ACQUISITION MEMO #154¹

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

HAYSTACK OBSERVATORY

WESTFORD, MASSACHUSETTS 01886

9 April 1991

Telephone: 508-692-4764

Fax: 617-981-0590

To: VLBA Data Recording Group
From: J.F. Connolly, H.F. Hinteregger, D.L. Smythe
Subject: MKIIIA/VLBA Narrow Track Headstack Commercial Specifications

Attached is the performance specification and a description of key mechanical/electrical specifications for narrow-track headstacks for Mark IIIA and VLBA recording systems. The headstack performance and gap length specifications are necessary conditions for adequate system performance and are based on development and production experience by Metrum and Haystack jointly and on operational use of stacks in about 30 Mark IIIA data acquisition and processing systems. These headstacks are critical components of the Mark IIIA and VLBA VLBI systems. They must be form-and-fit compatible with pre-production stacks both to replace these as they wear out and to go into new systems. The specifications (performance and mechanical) are intended to fulfill current write and read requirements of VLBI applications in astronomy and geodesy for which Haystack has developed the overall system.

¹Revised Copy of VLBA Acquisition Memo #154 dated 31 May 1989.

The following is a summary description of the narrow-track headstack characteristics. It emphasizes key mechanical specifications.

Key Mechanical Specifications:

Number of Heads per Stack: 36

Head Pitch: 0.6985 mm (.0275")

Head Width: 0.0381 mm (.0015")

Head Edge Location Tolerance: ±.003 mm (.00012")
(Worst error out of 72 w/r best fit ideal pattern at 23 C)

Initial Depth of Gap: .0381 mm (.0015") nominal,
.0305 mm (.0012") minimum

Gap Length: 0.33 μm ±0.05 μm, as measured by scanning electron microscope

For Reference:

Stack Dimensions: 0.4" x 1.56" x 0.3" overall HxWxL

Mounting: Side, two 0-80 screws, one through each end

Contour: Stepped, .012" contact arc length centered on gap;
rotated, 5 deg toward mount side, for 10 deg total wrap;
grind, 10 deg each side with respect to 5 deg rotated contact area

Head Inductance: ~20 μH, 48 turns #50 wire, ~12 MHz resonance,
optimized for read at 9-18 Mbps, formatted NRZ data rate.
MkIIIA standard is 4.5 Mbps; VLBA 9 Mbps

Electronic Interface: Two 40-socket ultraminiature connectors, spaced .15" servicing 18 odd and even numbered heads respectively with 36 central sockets (two adjacent sockets, one for each end of each head coil). Compatible with MkIIIA write-only, read-only, and VLBA read-or-write interfaces.

Application: Write or read 1" video or VHS-equivalent tape at 4/3 to 3/2 or D1- or S-VHS-equivalent tape to 2.25 transitions per micrometer.

Read Performance Specification:

For each of the 36 heads in a stack, SNR \geq 24 dB when reading a MkIII formatted test recording of random noise (9-bit odd parity NRZM channel code @ 33.3 Kfci).

Conditions:

- Tape Speed 135 ips, bidirectional.
Output for SNR measurement is taken to be the larger of the forward-write/forward-read or reverse-write/reverse-read values.
- 30 KHz slot @ 2.20 MHz (avoid 'parity pip' at 2.25 MHz)
- Noise Level measured with Tape Stopped
- Test Recordings, supplied by Haystack, checked with master reference headstack as needed
- Fuji H621 tape (unbiased, direct recording, current for maximum bandedge response)
- Use MkIIIA/VLBA Read Interface & Preamps
- Use scope and spectrum analyzer or equivalent to check for normal eye pattern and spectrum

Write Performance:

Not separately tested, inferred from read performance, and gap length specification.