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# Specification For Wide Channel Bandwidth One-Inch Video Tape

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# SPECIFICATION FOR WIDE CHANNEL BANDWIDTH

# ONE-INCH VIDEO TAPE

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## INTRODUCTION

The purpose of this specification is to establish standards and controls for the procurement of wide channel bandwidth one-inch video magnetic recording tapes for Very Long Base Interferometer (VLBI) system applications.

The Magnetic Tape Certification Facility (MTCF) currently has an established program for the Quality Products List (QPL) testing and acceptance testing for all new analog and digital magnetic tapes and IBM/IBM compatible 3480 tape cartridges purchased by NASA-Goddard. Extensive tests are conducted in the MTCF on a yearly basis for QPL qualification. Acceptance tests are conducted on every lot of magnetic tapes received by NASA-Goddard.

The MTCF maintains three specifications for the QPL and acceptance testing of magnetic tapes. NASA Technical Memorandum 79724 (GSFC Specification for Intermediate and Wideband Instrumentation Magnetic Recording Tape) is used for the QPL and acceptance testing of new analog tapes; NASA Technical Memorandum 80599 (GSFC Specification for Electronic Data Processing Magnetic Recording Tape) is used for the QPL and acceptance testing of new digital tapes; and NASA Technical Memorandum 100702 (Specification for IBM/IBM Compatible 3480 Tape Cartridge) is used for the QPL and acceptance testing of new IBM/IBM 3480 compatible magnetic tape cartridges. This specification will be used for the QPL and acceptance testing of new wide channel bandwidth one-inch video magnetic recording tapes.

The one-inch video tapes used by the Jet Propulsion Laboratory, the Deep Space Network and the Haystack Observatory will be covered by this specification. These NASA stations will use the video tapes for their VLBI system applications. The VLBI system is used for the tracking of quasars and the support of interplanetary exploration such as the Russian Phobos-Mars Mission.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GODDARD SPACE FLIGHT CENTER

# SPECIFICATION FOR WIDE CHANNEL BANDWIDTH ONE-INCH VIDEO TAPE

This specification was developed by the Goddard Space Flight Center (GSFC) Magnetic Tape Certification Facility (MTCF), Greenbelt, MD 20771 and the National Aeronautics and Space Administration's Jet Propulsion Laboratory (JPL). This specification generally reflects available state-of-the-art products. Copies of this specification may be obtained from the GSFC, Code 562.2.

## 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the detailed requirements for wide channel bandwidth one-inch transverse oriented video magnetic recording tapes, which are wound on reels or hubs, and which are designed for use in Very Long Base Interferometer (VLBI) recording system applications.

1.2 Classification. Examples of the tape types covered by this specification are designated in the following form:

| Designator | Reference |
|---|---|
| TVT | Basic Indicator. The basic indicator defines the general application for a particular type of tape. The basic indicator is "TVT" for tape, video type. |
| HT | Backing-Thickness Indicator. The backing and thickness indicator combines two letters as an indicator. The first letter identifies the type of backing material and the second letter indicates the nominal thickness of the backing. The backing material is indicated by the letter "H" for polyester base film. The backing material of a nominal thickness of 1.0 mil is defined by the letter "T" for "thin." |
| 1000 | Width Indicator. The width indicator is the nominal width of the tape in thousandths of an inch. |
| SCP | Reel or Hub Indicator. The reel or hub indicator is identified by letters. The reels and hubs |

shall conform to the requirements of the W-R-175D specification unless otherwise specified.

9100 Length Indicator. The length indicator is the nominal length, in feet, of a tape wound on a reel or hub.

## 2. APPLICABLE DOCUMENTS

2.1 Specifications and Standards: The following documents of the issues in effect on the date of invitation for bids, or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

| | |
|---|---|
| L-P-378 | Plastic, Sheet and Strip, Thin Gauge, Polyolefin. |
| W-R-175D | Reels and Hubs for Magnetic Recording Tape, General Specification for. |
| W-R-175D/1 | Reels, Standard, Plastic, and Fiberglass, 5/16 inch Center Hole. |
| W-R-175D/2 | Reel Hubs, Standard, Fiberglass and Metallic, 3-inch Center Hole. |
| W-R-175D/3 | Reels, Standard, Fiberglass and Metallic, 3-inch Center Hole. |
| W-R-175D/4 | Reels, Precision, Aluminum and Magnesium, 3-inch Center Hole. |
| W-R-175D/6 | Reels, Precision, Glass Flange with Aluminum Hub, 3-inch Center Hole. |
| PPP-B-636H | Box, Shipping, Fiberboard. |
| PPP-T-60 | Tape, Pressure-Sensitive Adhesive, Waterproof for Packaging and Sealing. |
| HH-I-595A | Insulation Tape, Electrical, Pressure-Sensitive, Adhesive Plastic. |

Federal Standards:

Federal Test Method Std. No. 406 - Plastics: Methods of Testing.

Federal Test Method Std. No. 406/1013 - Tensile Properties of Thin Sheets and Films.

Federal Test Method Std. No. 406/4041 - Electrical Resistance.

Military Specifications:
MIL-STD-105D - Sampling Procedures and Tables for Inspection by Attributes.

NASA-Goddard Standards:

NHB 5300.4(1C) - NASA Quality Publication - Inspection Provisions for Suppliers of Space Materials, Parts, Components, and Service.

TM79724 - GSFC Specification/Intermediate and Wideband Instrumentation Magnetic Recording Tape.

2.2 Other Publications. The following document(s) form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on the date of invitation for bids, or request for proposals, shall apply:

American Society for Testing and Materials (ASTM) Standard

D638 - Tensile Properties of Plastics: Methods of Test for.

Inter-Range Instrumentation Group (IRIG) Standards:

No. 106-77 - Telemetry Standards.

3. REQUIREMENTS

3.1 General Requirements. The video tapes supplied under this specification shall be new and shall have been tested for conformance to the requirements specified herein. In addition, the supplier must have met the requirements of NASA Quality Publication NHB 5300.4(1C).

3.1.1 Product Qualification. Qualification testing shall be conducted at the Magnetic Tape Certification Facility (MTCF), Goddard Space Flight Center, Greenbelt, MD 20771 and shall consist of all tests listed in this section. All samples subjected to these tests must also conform to the requirements listed in this specification, unless otherwise specified. Qualification of a particular tape type of a given base material, thickness, width, oxide, and performance characteristics shall constitute qualification of all tapes of identical characteristics regardless of length. Hereinafter, the term certifying agency shall mean the NASA Goddard Space Flight Center.

3.1.1.1 Qualified Products List. The video tapes supplied under this specification shall be products which have been tested and have passed the

qualification tests specified herein, and that are listed or approved for listing on the applicable Federal Qualified Products List (QPL).

3.1.1.2 Qualified Product Testing. Products may be submitted by prospective suppliers of video tapes on dates to be announced by the certifying agency. A prospective supplier may submit only the type of video tape requested for testing on these submission dates. Qualifying video tapes submitted must be identified by a manufacturer's designator. Should the submitted product fail to meet the specification as defined herein, the certifying agency reserves the right to refuse to accept such a product for additional qualifications tests until satisfactory data and test results have been submitted indicating correction of product deficiencies. The certifying agency shall accept only one type of video tape for qualification testing from each prospective supplier within any one-year period. Two copies of the manufacturer's printed commercial specification and technical data shall be submitted with the video tape samples. The certifying agency reserves the right to levy a charge to cover the cost of product qualification testing; however, such charges shall only be made when so specified in the procurement documents.

3.1.1.3 Samples for Qualification. The sample size shall consist of thirty (30) video tapes for each particular type of a given base material, thickness, oxide and performance characteristics for which qualification is desired. All samples shall be submitted on reels which conform to the requirements of this specification unless otherwise specified. The manufacturer shall also submit test data showing that each video tape type for which qualification is desired has successfully met all of the requirements of this specification.

3.1.1.4 Sample Disposition. Samples submitted for qualification shall be retained by the certifying agency.

3.1.1.5 Qualification Withdrawal. A supplier's qualified product listing shall be withdrawn for any of the following reasons: (1) the product offered under contract does not meet the requirements of the specification; (2) the manufacturer is delivering a product differing in material and/or manufacturing process from the one originally qualified; or (3) other reasons considered to be sufficient by the certifying agency.

3.1.1.6 Requalification. A supplier's product, once withdrawn from the QPL, shall not be accepted for requalification within one year from the date of product listing withdrawal notice and until satisfactory data and test results have been submitted to the certifying agency by the supplier indicating correction of the product's fault(s).

3.1.1.7 Process Change. Qualification and certification of a supplier's product under this specification, once established, applies only to those video tapes manufactured by the specific process in use at the time of qualification. All process changes shall be reported to the certifying agency indicating the extent and probable effect of such changes on the delivered product. The certifying agency reserves the right to require six weeks notice, and sufficient samples of the new product for quality

assurance tests, from the supplier prior to delivery of products manufactured under any such change in process. The foregoing requirements, quality control, and testing necessary to ensure that all products delivered under this specification are equal to or better than those products originally submitted for qualification.

3.1.2 Lot Size and Definition. On orders exceeding 1000 video tapes, the maximum lot size shall be 1000. For orders of less than 1000 video tapes, the lot size may be the order size. A lot shall consist of video tapes of the same type that have been manufactured and processed for the same batch or mix of the basic coating materials used in the production of the video tape. This batch or mix shall be sufficient to ensure compliance with lot size requirements. In the case of a continuous batching or production process, a lot shall consist of video tapes selected from concurrent production runs to meet lot size requirements.

3.1.3 Compatibility. The video tapes supplied under this specification shall not act as an inhibitor. The performance of other magnetic tapes shall not be degraded by the use of the tapes supplied under this specification. The video tapes supplied under this specification shall have performance characteristics such that no degradation of system performance shall result from use of such tape; i.e, frequency response, signal/noise, sensitivity, wave length response, output level, etc.

3.1.4 Materials

3.1.4.1 Tape. The video tape supplied under this specification shall be new and shall consist of a layer of magnetic material on a suitable backing material and shall have the physical, magnetic, and other characteristics as specified herein.

3.1.4.2 Toxic Compounds. Materials which may cause bodily harm through contact, inhalation or ingestion during normal use of the video tapes shall not be used.

3.1.4.3 Flammable Materials. Materials which will ignite from a match flame and when so ignited will continue to burn in a still carbon dioxide environment shall not be used.

3.1.5 Reels and Hubs. The reels and hubs shall conform to the requirements of W-R-175D, unless otherwise specified.

3.1.6 Splices. All video tapes supplied under this specification shall have tape lengths which are continuous and splice free.

3.1.7 Operating Environment. Operating temperatures shall range for 50 to 90 degrees F (10 to 32 degrees C) and relative humidity from 20 to 80 percent.

3.1.8 Storage Environment. After storage for one year from date of delivery at 40 to 120 degrees F (5 to 49 degrees C) and 20 to 80 percent relative humidity, no deterioration of magnetic oxide, binder, or base

material shall take place which will prevent the magnetic tape from meeting the specification.

3.1.9 Workmanship and General Examination

3.1.9.1 Workmanship. The video tapes shall be manufactured and processed in a careful and workmanlike manner in accordance with good practice. All surfaces of the tapes shall be free from raised edges, dust, flakes, powder, holes, scratches, creases, or any other defects which would render the tape unsuitable for its intended use.

3.1.9.2 General Examination. The tapes as initially received from the supplier shall be examined to determine that the tapes are free from the defects listed in Table II.

3.1.10 Physical Damage. All video tapes supplied under this specification shall be free from physical damage. Any tape that is found to be physically damaged during any quality assurance testing shall be considered a failure.

3.1.11 Frictional Vibration. Frictional vibration manifests itself as a frequency and amplitude modulation of a recorded signal and may be accompanied by an audible squeal as the tape passes over the guides and heads of the recorder. The tape shall contain a lubricant dispersed equally throughout the oxide coating thickness. The lubricant must not exhibit harmful effects to tape transports, components, or performance.

3.2 Inspection

3.2.1 Responsibility for Inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that supplies and services conform to prescribed requirements.

3.2.2 Quality Conformance Inspection. The supplier shall be responsible for the performance of quality conformance inspections. The contractor shall select a sample number of video tapes from each lot offered for delivery and shall subject the samples to the examinations and tests necessary to ensure compliance with the specification requirements. Furthermore, every tape in any lot offered for delivery shall be 100 percent dropout tested to ensure compliance with the requirements of this specification.

3.2.3 Reporting of Quality Conformance Inspection. Unless otherwise directed by the contracting officer, the supplier shall maintain a complete record of all production test results for the duration of the contract. The production test records shall include the information necessary to identify the lot, the video tapes, the inspection, and the date of the

test.

3.3 Test Sample Environmental Conditioning

3.3.1 Standard Temperature and Humidity. The standard temperature and humidity is 75 +/- 5 degrees F (24 +/- 3 degrees C), and 50 +/- 5 percent relative humidity. This is the temperature and humidity used for conditioning and/or making tests and measurements unless otherwise specified.

3.3.2 Qualification Sample Preliminary Conditioning. Preliminary conditioning of each video tape will be required prior to qualification testing, unless otherwise specified, to relieve stresses and establish uniformity. The video tapes shall be conditioned at 125 +/- 5 degrees F (52 +/- 3 degrees C), and 80 to 90 percent relative humidity for 3 hours. The video tapes shall then be conditioned at 70 +/- 5 degrees F (21 +/- 3 degrees C), and 50 +/- 5 percent relative humidity for a minimum of 3 hours. This temperature-humidity cycle shall be repeated with the transition times between temperature extremes not to exceed 60 minutes, until the tape has been subjected to a total conditioning time, including transitions, of 24 hours. After the last cycle, the video tapes shall then be held in a room conditioned at the Standard Temperature and Humidity for a minimum of 24 hours before any tests are made. Preliminary conditioning shall not be required for supplier quality conformance or acceptance testing.

3.4 Physical Requirements

3.4.1 Tape Wind. The tape shall be wound, oxide surface toward the reel hub, in a clockwise direction, i.e., when the reel is viewed from the front, the loose end of the tape shall hang from the right side of the reel.

3.4.1.1 Wound Pile Envelope. The tape as initially received from the manufacturer shall be smoothly wound to form an integral mass and shall not be loose either axially or circumferentially. There shall be no visible folds, buckling, cinching, spoking, or gaps between the tape layers. The edges of the wound tape shall be in a single plane with a minimum of protruding tape edges, layers, or groups of layers. The tape shall be wound in such a manner that it will not be physically damaged on either edge resulting in functional failure.

3.4.2 Dimensions

3.4.2.1 Length. The tape length shall be 9150 feet +/- 100 feet.

3.4.2.2 Width. The width of the tape shall be 1.000 inch +0.000/-0.004 inch.

3.4.2.3 Thickness. The total thickness of the base film shall be 1.0 mil (nominal).

3.4.2.4 Oxide Coating Thickness. The thickness of the oxide coating shall be 0.20 mil (nominal).

3.4.2.5 Backcoat Thickness. The thickness of the back coating shall be 0.04 mil (nominal).

3.4.2.6 "TF" Value. The minimum "TF" (tape to flange) value shall not be less than 0.125 inch. The "TF" value is defined as the radial distance by which the reel flanges extend beyond the outer-most layer of tape when the tape is wound at a tension of 8 ounces +/- 2 ounces.

3.4.3 Slitting

3.4.3.1 Requirement. The tape edges shall be cut clean with no ragged coating or backing. No torn particles shall be clinging to the edges of the tape. The coating shall not be mashed or fractured along the edges.

3.4.3.2 Test Equipment. A microscope with 100x magnification.

3.4.3.3 Sample Preparation. Standard.

3.4.3.4 Test Procedure. A minimum length of five feet of tape at the beginning, middle and end shall be inspected on both edges for evidence of poor slitting. The tape shall be examined for compliance with this specification.

3.4.4 Magnetic Properties

3.4.4.1 Requirement. The intrinsic coercive force of the recording surface shall be 660 oersteds +/- 10%, and the retentivity shall be 1100 gauss +/- 10%.

3.4.4.2 Test Equipment. Scientific Atlanta Model 651B BH Meter.

3.4.4.3 Sample Preparation. Standard.

3.4.4.4 Test Procedure. The BH Meter shall be calibrated using the manufacturer's procedures. Test samples shall then be cut and measured. The results will then be logged. The tape shall be examined for compliance with this specification.

3.4.5 Tensile Strength

3.4.5.1 Requirement. The minimum tensile strength shall be 16.0 pounds per one-inch tape width.

3.4.5.2 Test Equipment. The Amthor Testing Instrument Company, Inc., Vertical Tensile Tester Type 272 or equivalent shall be used for this test.

3.4.5.3 Sample Preparation. QPL. Lengths of sample tapes sufficient for this test shall be unwound from the tapes and placed in a 70 +/- 5 degrees F (21 +/- 3 degrees C), and 50 +/- 5 percent relative humidity environment

for at least 24 hours prior to testing. The tape shall be free of bends and kinks.

3.4.5.4 Test Procedure. A strip of tape not less than 7 inches in length shall be clamped in the grips set for an initial separation of 4 inches. The test specimen shall be clamped in the testing machine taking care to align the long axis of the specimen with an imaginary line joining the points of attachment of the grips to the machine. The grips shall be tightened evenly and firmly to the degree necessary to prevent slipping of the specimen during the test. The rate of grip separation shall be 12 inches per minute. The point of yield shall be noted and logged.

3.4.6 Shock Tensile Strength

3.4.6.1 Requirement. The minimum energy absorption shall not be less than 2.32 foot-pounds per one-inch tape width.

3.4.6.2 Test Equipment. The equipment for the test shall be a pendulum-type slipperiness tester, as specified in the Bureau of Standards Research Paper RP1879 Volume 40 of May 1948, or equivalent such as that made by Wiedemann Baldwin, King of Prussia, PA.

3.4.6.3 Sample Preparation. QPL. Lengths of sample tapes sufficient for this test shall be unwound from the tapes and placed in an environment of 70 +/- 5 degrees F (21 +/- 3 degrees C) and 50 +/-5 percent relative humidity for at least 24 hours before the test. The tape samples shall be free of bends and kinks.

3.4.6.4 Test Procedure. The tapes shall be looped through the clamps, magnetic side inward, and securely clamped. The pendulum shall be raised until it makes an angle with the vertical corresponding to a potential of 2.32 foot-pounds. The pendulum shall then be released smoothly and shall be allowed to strike the free loop of the tape. The tape shall not break.

3.4.7 Modulus of Flexibility

3.4.7.1 Requirement. The minimum angle of deflection shall be greater than 45 degrees.

3.4.7.2 Test Equipment. Test fixture as shown in figure 1.

3.4.7.3 Sample Preparation. Standard.

3.4.7.4 Test Procedure. The sample shall be clamped in the test fixture in a horizontal plane with 3 inches of magnetic tape extended beyond the point of clamping, free to assume a natural curvature which will be a function of its flexibility. The sample shall be clamped with the oxide coating facing the direction of curvature. The angle of curvature (deflection from the horizontal) shall be measured from the axis to the free end of the sample. The angle shall be measured in degrees from the horizontal axis.

3.4.8 Elongation Under Stress

3.4.8.1 Requirement. The elongation shall not exceed 0.30 percent.

3.4.8.2 Test Equipment. A suitable fixture from which to hang the tape sample, with positive nonslipping tape clamps, a standard scale for measuring length, a scribe with which to mark the tape, a 7X magnifier through which to measure results, a 30-gram weight, and a 5-pound weight.

3.4.8.3 Sample Preparation. QPL. Samples at least 24 inches long shall be clamped so as to hang in the test area at 70 +/- 5 degrees F (21 +/- 3 degrees C) and 50 +/- 5 percent relative humidity for at least 24 hours under no externally applied stress before the test.

3.4.8.4 Test Procedure. The tape sample shall be clamped in the fixture and the 30-gram weight attached to the free end. A reference mark shall be scribed on the tape approximately 20 inches from the point of clamping. The mark will be used as a reference to measure elongation and recovery of the sample. The distance between the mark and the clamping point shall be measured accurately to the nearest 0.01 inch. This distance shall be taken as the base distance for calculation of residual elongation. When the measurement of the base distance has been made, the test shall begin. A weight of 5 pounds for all polyester film base shall be attached to the tape below the mark at zero time, and allowed to hang undisturbed for 180 minutes +/- 30 seconds, at which time the weight shall be removed from the tape. The tape shall be allowed to hang under its own weight for an additional 180 minutes +/- 30 seconds. The 30-gram weight shall then be attached to the free end of the tape. The distance between the mark and the point of clamping shall then be measured to the nearest 0.01 inch. The difference between the base distance and the final distance shall be expressed as a percent of the base distance to determine compliance with this specification.

3.4.9 Longitudinal Curvature

3.4.9.1 Requirement. The deviation of each tape edge from a straight line shall not exceed 0.125 inch per 36-inch length of tape.

3.4.9.2 Test Equipment. No special apparatus other than a 48-inch straight edge is required.

3.4.9.3 Sample Preparation. QPL.

3.4.9.4 Test Procedure. A 36-inch length of tape shall be made to lie flat on a horizontal surface. The tape shall be under no tension and free from bends, kinks, or other visible distortions. The straight edge shall be placed along either edge of the tape and any deviation from a straight line shall be measured.

3.4.10 Magnetic Coating Electrical Resistance

3.4.10.1 Requirement. The electrical resistance of the magnetic coating

shall have a minimum resistivity of 0.5 megohms per square and a maximum of 1000 megohms per square.

3.4.10.2 Test Equipment. The apparatus for this test shall consist of that required by Method 4041, Insulation Resistance for Flexible Tapes, of Federal Test Method Std. No. 406; and Freed Transformer Co. Model 1620 megohmeter.

3.4.10.3 Sample Preparation. QPL or Standard. Lengths of tape sufficient for this test shall be unwound from the reels and placed in a 70 +/- 5 degrees F (21 +/- 3 degrees C) and 50 +/- 5 percent relative humidity atmosphere without kinks or bends and allowed to remain for at least 24 hours before the test.

3.4.10.4 Test Procedure (Oxide Surface). The surface electrical resistance of the oxide construction shall be determined in accordance with Method 4041, Insulation Resistance for Flexible Tapes, of Federal Test Method Std. No. 406 to determine conformance with this specification. Two layers of the sample tape shall be placed in the strip electrodes, backing material to backing material, so that only the oxide surfaces of the tape are in contact with the electrodes. The method of clamping shall be similar to that specified. The measurement potential shall be 500 +/- 10 volts DC.

3.4.11 Back Coating Electrical Resistance

3.4.11.1 Requirement. The electrical resistance of the back coating (when applicable) shall not be greater than 1.0 megohm per square.

3.4.11.2 Test Equipment. (Same as stated in paragraph 3.4.10.2)

3.4.11.3 Sample Preparation. (Same as stated in paragraph 3.4.10.3)

3.4.11.4 Test Procedure (Backing). (Same in paragraph 3.4.10.4)

3.4.12 Layer-to-Layer Adhesion

3.4.12.1 Requirement. The tape shall show no sticking or layer-to-layer adhesion when tested as specified.

3.4.12.2 Test Equipment. The test equipment shall consist of: a temperature and humidity controlled chamber in which to process the prepared samples; a special winding apparatus; hollow metal tubes on which tape samples are wound; and 2000-gram weights. The tube shall be made of nonoxidizing metal such as brass or corrosion resisting steel 0.5 inch in diameter and 4 inches in length, and shall weigh no less than 15 grams or more than 30 grams. The tube shall be capable of being mounted in bearings so that it may be rotated freely around its central axis and easily removed from the bearings.

3.4.12.3 Sample Preparation. QPL or Standard.

3.4.12.4 Test Procedure. A 3-foot sample length of tape shall be fastened at one end, magnetic side down, to the 0.5-inch diameter hollow tube with a nonflowing adhesive material. The tube shall then be mounted in the bearings so that the tape hangs free below the tube.

Attached to the free end of the tape shall be the 2000-gram weight. A small strip of double-coated adhesive tape shall be affixed to the magnetic side of the tape 1 inch above the weight. The tube shall then be slowly and uniformly rotated so that the tape, held in tension by the weight, winds uniformly around the tube into a compact and even roll. The double-coated tape when wound into the test roll acts to secure the roll and prevent its unwinding when the weight is removed.

The tube supporting the rolled tape shall be removed from the winding setup and subjected to a heat and humidity cycle in which the first 16 hours shall be at 130 degrees F (53 degrees C) and 85 +/- 5 percent relative humidity, and the final 4 hours shall be at 130 degrees F dry heat (less than 5 percent relative humidity). During the humidification and dry heat cycle, the air surrounding the tube shall be constantly circulated to ensure uniformity of conditions throughout the test area. At the end of the dry heat cycle, the rod shall be removed from the conditioned area and allowed to come to equilibrium with room conditions, approximately 70 degrees F (31 degrees C) and 50 +/- 5 percent relative humidity.

To evaluate the tape for layer-to-layer adhesion, the end of the roll on the rod shall be carefully opened and the double-coated tape removed. The rod shall then be held between the thumb and fingers and the untabbed tape shall be observed to note if the first two or three layers loosen up of their own accord; if this occurs, there is obviously no adhesion and the tape has passed the test. If no loosening or very little loosening of the outermost layers is observed, the free end of the tape shall be unwound slowly until 9 inches has been unwound. The free end shall then be allowed to hang and the tape shall be observed to see if it will loosen by itself. If it will not unwind unaided, the rod, with the tape hanging freely, shall be slowly rotated in the direction of tape unwind. If the tape adheres to itself and refuses to begin to unwind after the rod has been rotated through one-fourth revolution or 90 degrees, it shall be considered to have failed the test. After the rotation test has been made, the free end of the tape shall be held and the rod allowed to fall, thereby unwinding the tape. The unwound tape shall be checked for evidence of coating delamination and in this way the severity of adhesion is established. Any tape which will not self-unwind after rotating the rod through 90 degrees or which shows any delamination except in the 2 inches nearest the rod, shall be considered as having failed the test.

3.4.13 Humidity Stability (Cupping)

3.4.13.1 Requirement. The tape shall show no cupping in excess of 10 degrees for polyester film when tested as specified.

3.4.13.2 Test Equipment. The apparatus for this test shall consist of the following:

Chamber. The humidity chamber shall be of materials which are nonreactive to water vapor and potassium chloride solution and shall be constructed so that all joints are sealed tight when the chamber is closed. It shall consist of two separate compartments each approximately 11 by 13 by 7 inches. The front and back sides of the compartments shall be of a transparent material such as glass. The trays used to hold the chemicals inside the chamber shall measure approximately 10 by 10 by 4 inches and shall be made from aluminum, glass, or any nonreactive material. The trays shall be provided with removable perforated aluminum cover plates to permit placing tape holders above the conditioning chemicals with minimum interference with free air circulation. Means shall be provided for circulation of air within each compartment with a velocity of at least 20 feet per minute across both the conditioning chemicals and the tape holders.

Tape Holders. Each tape holder shall clamp the tape along its longitudinal axis and shall prevent any movement of the longitudinal axis of the tape by positively contacting it beginning at the end where the cupping is to be measured and continuing at least 1 inch along the tape length. The holder shall raise the tape at least 0.125 inch above the holder base plate and shall be separated from the adjacent tape holder by at least 0.625 inch, thus ensuring that there will be no interference to cupping in either direction. For example, this may be accomplished by constructing the holder from two pieces of straight, corrosion-resistant wire, the bottom piece being 0.125 inch in diameter and the top piece being 0.0625 inch in diameter, 1.5 inches in length, which are soldered or brazed together at the front tips, and then brazed onto a base plate of noncorrosive material. When the tape holders are in place in the chamber compartment with tapes inserted for measurement, the longitudinal axis of the tapes shall be substantially horizontal.

Measuring Instrument and Illumination. The measuring device shall be any optical system with a magnification of from 5X to 25X, having at least one cross-hair which can be referred to a clinometer or goniometer so as to measure the angle between the cross-hair and a reference line and having a focal length such that it can be focused on the near end of a tape when the tape is mounted in the chamber and the measuring device is placed in front of the chamber. A source light shall be placed behind the chamber during measurement to outline the tapes when viewed through the measuring instrument.

3.4.13.3 Sample Preparation. QPL.

3.4.13.4 Test Procedure

Prior to conditioning the samples, the initial tape cupping shall be measured on each test specimen. The measurement on each specimen is performed by viewing the ends of the specimen through the measuring

instrument so as to measure the angle formed by the conjunction of lines constructed perpendicular to the edges of the view tape end. Local irregularities shall be averaged when setting the cross-hair for these measurements.

When using a two-compartment chamber for conditioning the samples, one chamber shall desiccant and shall be humidifying. The desiccant chamber shall contain a desiccant anhydrous calcium chloride with indicating "Drierite" in the ratio of 3 to 1. The humidified chamber shall have a saturated solution (plus an excess) of potassium chloride in distilled water as the humidifying agent. The chambers containing the condition media shall be closed and the air circulated for at least 12 hours immediately preceding the insertion of the tapes to ensure equilibrium. The test shall be run at a temperature of 90 +/- 5 degrees F (32 +/- 3 degrees C) in both cabinets. The humidity conditions shall be 90 +/- 5 percent in the wet chamber and 15 +/- 5 percent in the dry chamber. If a two-compartment chamber is used, a 6-inch length of tape shall be selected and cut into two 3-inch pieces with scissors (not a razor blade). These shall be mounted as specified with the backing side down on two separate holders, one to be placed in the desiccant chamber and the other in the humidifying chamber, so that the measured ends are those made by the scissors cut in each case. The tape holders containing the tape specimen shall be placed in their respective sections. The compartments shall be closed, and the air shall be made to circulate for at least 16 hours before the measurements are made. At the end of conditioning, the differential cupping, the arithmetical difference in degrees between the angle measured on the desiccated tape, and the angle measure in the same manner on the humidified tape, will be the criteria for acceptance or rejection of the samples. Since this test is designed to measure the effect of differential cupping, local irregularities shall be averaged when setting the cross-hair for these measurements. Neither the initial cupping, differential cupping, nor the cupping under any one condition (wet or dry chamber) shall fail to meet the requirements specified.

3.4.14 Abrasivity

3.4.14.1 Requirement. The abrasivity of the magnetic surface of the tape shall be measured using the procedures indicated. When tested as specified herein the abrasivity of the tape should not exceed 10 units.

3.4.14.2 Test Equipment. The equipment required for this test shall consist of a Bell & Howell 3400C intermediate recorder/reproducer (or equivalent); A Fulmer Thin Film Sensor consisting of a resistive film deposited onto a ceramic cylinder; and a Fulmer Abrasivity Meter.

3.4.14.3 Sample Preparation. QPL.

3.4.14.4 Test Procedure

A JPL approved reference tape with proven low abrasivity shall be passed over the sensor in alternate forward and reverse directions of 100ft lengths. The abrasiveness shall be measured for each pass. Consecutive

forward and reverse passes shall be made until consistent values are achieved in both directions. The sensor shall then be suitable for abrasivity measurement tests.

The sample tape shall be installed on the transport and five (5) passes in both the forward direction and reverse direction shall be made. Each pass shall consist of 100ft lengths, and the abrasiveness value for each pass shall be recorded.

The sample tape shall then be wound onto a new length, and one forward and one reverse pass shall be made. The abrasiveness value for each pass shall then be recorded.

The sensors and guides shall be re-cleaned and the reference tape reinstalled. Two (2) forward and two reverse passes shall be made and the abrasivity values shall be recorded for each pass. The results from the reference tape shall be used to produce a normalizing factor. The normalizing factor is calculated by dividing the average abrasiveness of the reference tape by the average value obtained from the last four passes.

Once the normalizing factor has been established, each abrasivity value of the tape under test shall be multiplied by this factor. The results from the final pass shall be recorded as the abrasivity of the tape.

3.4.15 Fungus Resistance

3.4.15.1 Requirement. The tape shall not support the growth of fungus when tested as specified.

3.4.15.2 Test Equipment. Temperature-controlled environmental chamber and other items as required by MIL-I-631.

3.4.15.3 Sample Preparation. QPL.

3.4.15.4 Test Procedure. Resistance to fungus shall be determined in accordance with the method specified in MIL-I-631, except that a 2-inch diameter roll of tape shall be tested. The entire sample shall be tested in the rolled condition. Tapes shall be considered fungus resistant if at least two of three specimen are rated 0 or 1.

3.4.16 Anchorage

3.4.16.1 Requirement. The magnetic layer of the tape shall show no visible evidence of anchorage failure when tested as specified. Anchorage failure may be manifested as a separation of the coating from the base material of the tape or failure of the coating layer itself.

3.4.16.2 Test Equipment. Ampex FR-2000A, Bell and Howell VR3700, Honeywell 96 or equivalent wideband record/reproduce system.

3.4.16.3 Sample Preparation. QPL or Standard.

3.4.16.4 Test Procedure. A visual examination shall be made of the tape and magnetic tape recorder tape path, heads, guides, and rollers after the completion of all dynamic tests to determine compliance with this specification.

3.5 Performance Requirements

3.5.1 Sensitivity

3.5.1.1 Requirement. When measured as specified, the output of the particular type of tape being tested shall not vary from the standard output level by more than 0 +/- 1.0 db.

3.5.1.2 Test Equipment. Ampex FR-2000A, Bell and Howell 3700, Honeywell 96 wideband record/reproduce system, 3M Model 6110 Test Set (or equivalent), Hewlett-Packard Model 3400A RMS Voltmeter, and Hewlett-Packard Model 651B Test Oscillator (or equivalent).

3.5.1.3 Sample Preparation. QPL or Standard.

3.5.1.4 Test Procedure. The standard output level for the particular type of tape being tested shall be established to calibrate the test recorder for the sensitivity measurement.

A 200 Khz signal shall be recorded on the tape to be tested at a record level 6 db below the standard record level and with operating bias current. The equalization settings and reproduce amplifier gain shall not be changed from those obtained when establishing the standard output level. The tape shall be reproduced and the output of the recorder measured to determine compliance with this specification.

3.5.2 Wavelength Response

3.5.2.1 Requirement. The output at each frequency, when normalized to the 0.6 mil wavelength output and compared with the response of the reference tape, shall be as indicated below:

| Recorded Wavelength (mils) | Response (db) | Test Frequency (Khz) at 120ips |
|---|---|---|
| 1 | 0 +/- 1.0 | 120 |
| 0.25 | 0 +/- 1.0 | 480 |
| 0.125 | 0 +/- 1.0 | 960 |
| 0.10 | 0 +/- 1.0 | 1200 |

| | | |
|---|---|---|
| 0.08 | 0 +/- 1.5 | 1500 |
| 0.06 | 0 +/- 2.0 | 2000 |

3.5.2.2 Test Equipment. (Same as stated in paragraph 3.5.1.2)

3.5.2.3 Sample Preparation. (QPL or Standard)

3.5.2.4 Test Procedure. The procedure specified in paragraph 3.5.1.4 shall be repeated at all frequencies specified in paragraph 3.5.2.1 for the particular type of tape being tested. The measurements shall be made on a center track and over the middle portion of the reel to determine compliance with this specification.

3.5.3 Layer-to-Layer Signal Transfer

3.5.3.1 Requirement. A signal resulting from layer-to-layer signal transfer, when measured as specified, shall be down a minimum of 40 db from the original signal.

3.5.3.2 Test Equipment. (Same as stated in paragraph 3.5.1.2)

3.5.3.3 Sample Preparation. QPL.

3.5.3.4 Test Procedure. The tape shall be externally erased. With the appropriate reference recorder operating at 15 inches per second and with operating bias current but no input signal, ten layers of tape shall be recorded and wound onto a reel which conforms to W-R-175D. The record level shall be increased to 10 db above standard record level at operating bias current with a 1000 Hz signal, and one additional layer recorded and wound onto the reel. The record level shall be returned to zero and ten additional layers shall be recorded and wound on the reel. The recorded tape shall then be conditioned at a temperature of 150 degrees F., (dry heat) for a period of 4 hours. The tape shall then be played back at 15 inches per second and the output level of the recorded signal and the maximum level of the signal resulting from signal transfer shall be measured through a properly terminated 1Khz filter having a 10 Hz passband to determine compliance with this specification.

3.5.4 Signal-to-Noise-Ratio

3.5.4.1 Requirement. The signal-to-noise ratio of a particular type of tape, when tested as specified, shall not be less than the signal-to-noise ratio of the reference tape by more than 4 db.

3.5.4.2 Test Equipment. (Same as stated in paragraph 3.5.1.2)

3.5.4.3 Sample Preparation. QPL or Standard.

3.5.4.4 Test Procedure. Using the appropriate reference tape, the reference test recorder shall be adjusted for the appropriate operating bias current and standard record level. The reproduce equalization shall

be adjusted as recommended by the recorder manufacturer. The specified frequency or 200 Khz shall be recorded and the reproduced output level noted. The tape shall then be externally erased. The input signal shall be disconnected and replaced with a load equal to the input impedance of the recorder and the recorder operated in the record mode. The reproduced noise output level shall be measured without any adjustment of the recorder. The signal-to-noise ratio is the value in db of the signal level minus the value of the noise level. The signal-to-noise measurements shall be made utilizing a band pass filter which provides no more than a 3 db attenuation at the recorder band edge frequencies (at the applicable speed) and has an 18 db per octave rolloff characteristic. The above measurements shall be repeated (without any recorder adjustment) on the tape being tested to determine compliance with this specification.

3.5.5 Output Level Uniformity (Within a Reel)

3.5.5.1 Requirement. The uniformity of the signal output at the specified test frequency of 1.0 Mhz shall be such that the measured deviation from maximum to minimum peak output does not exceed 2.0 db.

3.5.5.2 Test Equipment. (Same as specified in paragraph 3.5.1.2).

3.5.5.3 Sample Preparation. QPL and Standard.

3.5.5.4 Test Procedure. The uniformity measurements shall be made on three tracks (the center and both edge tracks) of a virgin reel of tape. The specified test frequency of 1.0 Mhz shall be recorded at standard record level and with the bias current adjusted as recommended by the recorder manufacturer, to that value which is optimum for the tape type being tested. The signal shall be recorded over the entire length of tape. Upon playback, the signal level shall be at least 20 db above the noise level measured as recommended by the recorder manufacturer. The output voltage variations shall be measured by means of a linear recording oscillograph having a response which is uniform to at least 200 Hz. Dropout defect areas shall be excluded from this measurement.

The tape uniformity, over any 10 second interval, shall be measured by determining the maximum variation in output as a percentage (db ratio) of maximum peak output.

The uniformity test shall be conducted simultaneously with recording and all output level variations occurring in the first and last 1 percent of the nominal tape length shall be disregarded. The results shall be measured and recorded to determine compliance with this specification.

3.5.6 Instantaneous Nonuniformity (Dropout)

3.5.6.1 Requirement. There shall be less than 10 dropouts per 100 feet of tape per track, and the dropouts shall not be more than one track in width. A dropout is defined as a 10 db or greater signal loss for a period of 10 microseconds when producing a 1 Mhz test signal at 120 ips on 25 mil width tracks.

3.5.6.2 Test Equipment. Ampex FR-2000 and 14-track electronic dropout counter.

3.5.6.3 Sample Preparation. QPL and Standard.

3.5.6.4 Test Procedure. A 1 Mhz signal shall be recorded at the standard record level and with the bias current adjusted as recommended by the recorder manufacturer, to that value which is optimum for the tape type being tested. The dropout count shall be conducted simultaneously with recording and on all tracks over the entire length of the tape sample. The final dropout counts shall be counted to determine compliance with this specification.

3.5.7 Environmental Extremes

3.5.7.1 Requirement. The tape, when subjected to the temperature and humidity conditions specified, shall meet the requirements of Output Level Uniformity (paragraph 3.5.5).

3.5.7.2 Test Equipment. (Same as specified in paragraph 3.5.1.2 and a temperature/humidity controlled chamber).

3.5.7.3 Sample Preparation. QPL.

3.5.7.4 Test Procedure. The sample tapes shall be recorded under the conditions specified for Output Level Uniformity. The tapes shall then be subjected to a temperature of 120 +/- 5 degrees F (48 +/- 2 degrees C), and a relative humidity of 80 to 90 percent for a period of 8 hours. Upon removal from this environment, the tapes shall be rewound once at a tension of 8 ounces +/- 2 ounces and kept at a temperature of 70 +/- 5 degrees (21 +/- 3 degrees C) and a relative humidity of 50 +/- 5 percent for minimum of 16 hours. The tape shall then be tested for Output Level Uniformity to determine compliance with this specification. Following these tests, the tape shall then be subjected to a temperature of 10 +/- 5 degrees F (-12.5 +/- 2.5 degrees C) and a relative humidity of less than 10 percent for a period of 8 hours. Upon removal from this environment, the tapes shall be rewound once at a tension of 8 ounces +/- 2 ounces and kept at a temperature of 70 +/- 5 degrees F (21 +/- 3 degrees C), and a relative humidity of 50 +/- 5 percent for a minimum of 16 hours. The tape shall again be tested for output level uniformity to determine compliance with this specification.

3.5.8 Durability

3.5.8.1 Requirement. When subjected to the wear test specified, the wear characteristics of the tapes shall not increase the dropout counts beyond the rate of 15 dropouts per 100 ft per track.

3.5.8.2 Test Equipment. (Same as specified in paragraph 3.5.1.2)

3.5.8.3 Sample Preparation. QPL.

3.5.8.4 Test Procedure. An initial recording and dropout measurement shall be performed on each tape. The tape shall then be subjected to 100 wear passes on the test recorder at 120 ips. A wear pass shall consist of a normal play pass and a high-speed rewind pass over the tape heads for the entire tape length. After completion of the last wear pass, the tape path shall be cleaned and a dropout count for each of the tracks shall be conducted to determine compliance with this specification. Should the final count after the one hundredth wear pass exceed the limit specified, two additional dropout counts shall be conducted without any additional wear passes. The arithmetical average of these three counts shall conform to this specification.

3.5.9 Performance Requirements Definitions

3.5.9.1 Reference Tape. An unrecorded magnetic tape of the same type the tape manufacturer wishes to supply shall be furnished to the GSFC for certification that the tape will meet the system performance specification (including frequency response and signal-to-noise) of the reference test recorder. The maximum allowable correction factor for the reference tape shall be no more than 1.0 db. When found acceptable, this tape will become the reference tape for that manufacturer's particular product type. It will be used for establishing the operating bias current, the standard record level, and the standard output level for the reference recorder when submitted samples of that particular tape type are tested as specified herein. The certification of output performance acceptability of the reference tape does not constitute product qualification.

3.5.9.2 Secondary Reference Tape. The secondary reference tape is an unrecorded tape, the magnetic characteristics of which have been calibrated against those of the reference tape. The secondary reference tape is used for preliminary adjustments of the reference test recorder and as a working reference.

3.5.9.3 Operating Bias Current. The operating bias current is that bias current through the recording head which will give a 2.0 db fall off (over bias peak) of the peak output from the reference tape when a 2.0 Mhz signal is recorded at the standard record level at a tape speed of 120 inches per second.

3.5.9.4 Standard Record Level. The standard record level is that input level of a 200 Khz signal recorded on the reference tape at 120 ips and with operating bias current, such that on playback, the output signal will have 1 percent third harmonic distortion as measured with a wave analyzer (or equivalent) having a pass band of 1000 Hz. The reproduce equalization shall be adjusted as recommended by the recorder manufacturer.

3.5.9.5 Standard Output Level. The standard output level is that reproduce level of a 200 Khz signal recorder on the reference tape at 6 db below standard record level and with operating bias current.

3.5.9.6 Test Setup. The test setup for the reference test recorder prior to performing magnetic tests shall be as follows:

A. The recorder shall be thoroughly cleaned and demagnetized, the heads shall be adjusted for correct azimuthal orientation.

B. The tension of the recorder shall be measured to determine that the recorder is in proper adjustment.

C. Unless otherwise specified, the record and reproduce head and head stack configuration shall conform to the dimensions specified in IRIG Document 106-77.

D. Unless otherwise noted, all measurements on the tape samples shall be performed at a tape speed of 120 ips.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Product Acceptance Testing. Acceptance testing shall be conducted at the Magnetic Tape Certification Facility, Goddard Space Flight Center, Greenbelt, Maryland 20771. Normal acceptance testing will be those tests indicated in Test Group A, B, and C (Table I). Group D (Table I) tests shall be required at the time of qualification and as often thereafter as is deemed necessary to insure continued compliance with the specified requirements. Failure to conform to any of the requirements of Group D tests or inspection shall be cause for rejection of that lot represented by the samples.

4.2 Samples for Acceptance Testing. Samples shall be drawn from lots delivered to the MTCF unless otherwise indicated in the procurement. The number of samples required for acceptance testing is governed by lot size and shall be in accordance with MIL-STD-105D, Normal Inspection, Level 1, Single Sampling Plan, at an AQL of 2.5.

4.3 Examination of Preparation for Delivery. Unless otherwise specified in the contract or purchase order, interior and exterior examinations shall be made to determine that the packaging, packing, and marking comply with the requirements of this specification.

## 5. PREPARATION FOR DELIVERY

5.1 Reel Packaging. Unless otherwise specified in the contract or purchase order, reel packaging shall be level A or B.

5.1.1 Level A. The reels of tape shall be individually enclosed in close-fitting heat sealable plastic bags, 2 to 3 mils thick. The material for these bags shall conform to L-P-378, type I, grade B, finish 1. Included air volume of the sealed bags shall be kept to a practicable minimum.

5.1.2 Level B. The reels of tape shall be individually packaged in accordance with the manufacturer's standard practice providing that it will insure protection for the tape during shipment and safe delivery to its destination.

5.2 Intermediate Packaging. Unless otherwise specified in the contract or purchase order, the intermediate packaging shall be level A, B, C or D as specified.

5.2.1 Level A. Each packaged reel of tape shall be further packaged in a close-fitting box conforming to PPP-B-636, class weather-resistant, style FPF or OPF. Each box shall be provided with a centering hub constructed from a material adequate to provide support for the reel by the hub in such a manner as to suspend the reel in the box to prevent "resting" on the flanges or movement within the closed box. The boxes shall be sealed in accordance with appendix to PPP-B-636. Alternatively, the packaged reels shall be further packaged in telescope metal containers of the type normally used for reels of film. The containers shall be sealed with electrical tape as specified in HH-I-595.

5.2.2 Level B. The packaged reels shall be further packaged in accordance with paragraph 5.2.1 except that the fiberboard boxes shall be class-domestic.

5.2.3 Level C. The reels of tape packaged as specified in paragraph 5.1.2 shall be further packaged in accordance with the manufacturer's standard practice providing that it will insure protection for the tape during shipment and safe delivery to its destination.

5.2.4 Level D "NASA PAC." The reels shall be further packaged in telescoping metal containers. The metal containers shall be made of 27 gauge electro-zinc coated steel, painted gray with a protective Epon varnish coating. The metal containers shall be sealed with type 33 electrical tape or equivalent and placed into a close fitting two-piece double-sleeve style corrugated box (NASA PAC) with mailing label affixed.

5.3 Packing. Unless otherwise specified in the contract or purchase order, the packing shall be level A, B, C or D.

5.3.1 Level A. The tape packaged as specified herein shall be packed in multiples in a close-fitting box conforming to PPP-B-636, class weather-resistant. The shipping container shall be closed, sealed, and strapped in accordance with the appendix to PPP-B-636.

5.3.2 Level B. The tape packaged as specified herein shall be packed in quantities as specified in accordance with paragraph 5.3.3, except that the fiberboard boxes shall be class-domestic.

5.3.3 Level C. The packing shall be in accordance with level B of this specification, and the master outer carton shall hold five (5) 14 inch diameter reels.

5.3.4 Level D. The packing shall be in accordance with the manufacturer's standard practice providing that it will insure protection for the tape during shipment and safe delivery to its destination. Additionally, the manufacturer's standard practice for packing must be adequate for the safe staging of the product.

5.4 Special Markings

5.4.1 Reels. Unless otherwise specified in the contract or purchase order, unique identification of tapes supplied under this specification shall be provided. On the outer flange of each reel, a removable gummed label shall be affixed. The label shall show a manufacturer's type number; a serial number; GSFC specification number; lot number; manufacturer's name; and a unique code by which the manufacturer identifies the product batch, coater slitter, web position of the tape and date of manufacture.

5.4.2 Canister and Master Carton. Unless otherwise specified in the contract or purchase order, each can and master carton shall be labeled with a four to five inch, die cut label containing the following information:

A. Tape, video, magnetic oxide coated

B. Manufacturer's type number

C. GSFC Specification Number plus width and length of tape

D. Manufacturer's Lot Number

E. Date of Manufacture (month and year)

F. Contract Number

The master carton label shall be affixed to the upper left hand corner of the end of the carton.

5.5 Palletizing. Unless otherwise specified by the contract or purchase order, all master cartons shall be palletized for shipment. The cartons must be securely banded to the pallets. No more than 500 reels may shipped on any one pallet.

5.5.1 Pallet Description. The pallets are to be 42 inches by 48 inches, 3/4 -inch board on top and bottom, chambered on outer edges with three (3) each 2 by 4 stringers - one (1) in the middle. The boards shall be securely banded to the pallet.

6. ADDITIONAL INFORMATION

6.1 Ordering Data. Purchasers should exercise the preferred options permitted herein and include the following information in the procurement

documents:

A. Title, number, and date of this specification

B. Quantity of tapes required

C. Tape Designator (paragraph 1.2)

D. Width required (paragraph 1.2)

E. Reel or hub required (paragraph 1.2)

F. Length required (paragraph 1.2)

G. Inspection responsibility (paragraph 4.3)

H. Packaging and packing required (paragraphs 5.1, 5.2, 5.3 and 5.5)

I. Special Markings - if required (paragraph 5.4)

6.2 Contract Awards. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the Qualified Products List NASA/GSFC/JPL QPL-TM-_____ whether or not such products have actually been so tested by that date. The attention of suppliers is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer to the government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The organization responsible for the Qualified Products List is the Goddard Space Flight Center, Magnetic Tape Certification Facility (MTCF), Code 562.2, Greenbelt, MD 20771. Information pertaining to product qualification can be obtained from this organization.

TABLE I. Test and Examination Criteria

| Normal Inspection<br>Level I<br>AQL 2.5 | |
|---|---|
| Group A | Requirement Paragraph |
| Workmanship and General Examination | 3.1.9 |
| Wind | 3.4.1 |
| Wound Pile Envelope | 3.4.1.1 |
| Length | 3.4.2.1 |
| "TF" Value | 3.4.2.6 |
| Output Level Uniformity | 3.5.5 |
| Instantaneous Nonuniformity | 3.5.6 |
| **Special Inspection<br>Level S-1<br>AQL 4.0** | |
| Group B | Requirement Paragraph |
| Width | 3.4.2.2 |
| Slitting | 3.4.3 |
| Magnetic Properties | 3.4.4 |
| Modulus of Flexibility | 3.4.7 |
| Longitudinal Curvature | 3.4.9 |
| Electrical Resistance | 3.4.10/3.4.11 |
| Layer-to-Layer Adhesion | 3.4.12 |
| Sensitivity | 3.5.1 |
| Wavelength Response | 3.5.2 |
| Signal-to-Noise Ratio | 3.5.4 |
| Durability | 3.5.8 |

TABLE I. Test and Examination Criteria (cont'd)

Normal Inspection
Level 1
AQL 0.40

| Group C | Requirement Paragraph |
|---|---|
| Reels and Hubs | 3.1.5 |
| Splices | 3.1.6 |
| Physical Damage | 3.1.10 |
| Frictional Vibration | 3.1.11 |
| Anchorage | 3.4.16 |

Other Tests and Examination
Special Inspection
Level S-1
AQL 4.0

| Group D | Requirement Paragraph |
|---|---|
| Toxic Compounds | 3.1.4.2 |
| Flammable Materials | 3.1.4.3 |
| Tensile Strength | 3.4.5 |
| Shock Tensile | 3.4.6 |
| Elongation Under Stress | 3.4.8 |
| Humidity Stability | 3.4.13 |
| Abrasivity | 3.4.14 |
| Fungus Resistance | 3.4.15 |
| Layer-to-Layer Signal Transfer | 3.5.3 |
| Environmental Extremes | 3.5.7 |

TABLE II. Preparation for Delivery Defects

| Examine | Defects |
|---|---|
| Interior Packaging | Use of improper or defective materials. |
| | Quantity in unit container not as specified. |
| | Quantity in shipping container not as specified. |
| | Incorrect Packaging method employed. |
| | Cushioning or padding omitted. |
| | Cushioning inadequate for the physical protection of the item. |
| | Unsealed, punctured, or improperly sealed bag, wrap or envelope. |
| | Damaged or otherwise defective reels. |
| Exterior Packing and Marking | Use of improper or defective materials. |
| | Type, grade, class and style of shipping container not as specified. |
| | Marking incorrect; incomplete, illegible, omitted, improper size, location, sequence, or method of application. |
| | Inadequate application of components such as: |
| | Incomplete closure of case liners or container flaps, loose or inadequate sealing, strapping or stapling. |
| | Bulged or distorted containers. |

TABLE III. Letter Indicators - Reel Types and Sizes

| Indicator | Flange Diameter | Reel Description | Center Hole | Flange |
|---|---|---|---|---|
| PCP-II | 10.5 in. | Aluminum Precision | 3 in. | Straight |
| QCP-II | 12.5 in. | Aluminum Precision | 3 in. | Straight |
| SCP-II | 14 in. | Aluminum Precision | 3 in. | Straight |
| TCP-II | 15 in. | Aluminum Precision | 3 in. | Straight |
| UCP-II | 16 in. | Aluminum Precision | 3 in. | Straight |

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15. Supplementary Notes

16. Abstract

The purpose of this specification is to establish standards and controls for the procurement of wide channel bandwidth one-inch video magnetic recording tapes for Very Long Base Interferometer (VLBI) system applications. The Magnetic Tape Certification Facility (MTCF) currently maintains three specifications for the Quality Products List (QPL) and acceptance testing of magnetic tapes. NASA TM-79724 is used for the QPL and acceptance testing of new analog tapes; NASA TM-80599 is used for the QPL and acceptance testing of new digital tapes; and NASA TM-100702 is used for the QPL and acceptance testing of new IBM/IBM compatible 3480 magnetic tape cartridges. This specification will be used for the QPL and acceptance testing of new wide channel bandwidth one-inch video magnetic recording tapes. The one-inch video tapes used by the Jet Propulsion Laboratory (JPL), the Deep Space Network (DSN) and the Haystack Observatory will be covered by this specification. These NASA stations will use the video tapes for their VLBI system applications. The VLBI system is used for the tracking of quasars and the support of interplanetary exploration.

| 17. Key Words (Suggested by Author(s)) | 18. Distribution Statement |
|---|---|
| One-inch video tapes, Very-Long-Base Interferometer (VLBI), wide-channel bandwidth, | Unclassified - Unlimited<br>Subject Category 60 |

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