**DEPARTMENT OF HEALTH & HUMAN SERVICES** Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
Document Control Center – WO66-G609
Silver Spring, MD 20993-0002

TOSHIBA MEDICAL SYSTEMS CORPORATION
PAUL BIGGINS
DIRECTOR REGULATORY AFFAIRS
2441 MICHELLE DRIVE
TUSTIN CA 92780

June 7, 2017

Re: K170412
Trade/Device Name: Vantage Titan 1.5T, MRT-1510, M-Power GX
Regulation Number: 21 CFR 892.1000
Regulation Name: Magnetic resonance diagnostic device
Regulatory Class: II
Product Code: LNH
Dated: May 16, 2017
Received: May 17, 2017

Dear Mr. Paul Biggins:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638 2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

For

Robert A. Ochs, PhD
Director
Division of Radiological Health
Office of In Vitro Diagnostics
and Radiological Health
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

# Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: January 31, 2017
*See PRA Statement below.*

510(k) Number *(if known)*

K170412

Device Name
Vantage Titan 1.5T, MRT-1510, M-Power GX

Indications for Use *(Describe)*

Vantage Titan systems are indicated for use as a diagnostic imaging modality that produces cross-sectional transaxial, coronal, sagittal, and oblique images that display anatomic structures of the head or body. Additionally, this system is capable of non-contrast enhanced imaging, such as MRA.
MRI (magnetic resonance imaging) images correspond to the spatial distribution of protons (hydrogen nuclei) that exhibit nuclear magnetic resonance (NMR). The NMR properties of body tissues and fluids are:

- Proton density (PD) (also called hydrogen density)
- Spin-lattice relaxation time (T1)
- Spin-spin relaxation time (T2)
- Flow dynamics
- Chemical Shift

Contrast agent use is restricted to the approved drug indications. When interpreted by a trained physician, these images yield information that can be useful in diagnosis.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

**CONTINUE ON A SEPARATE PAGE IF NEEDED.**

This section applies only to requirements of the Paperwork Reduction Act of 1995.

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# 510(k) SUMMARY

This summary of 510(k) safety and effectiveness information is being submitted in accordance with the requirements of Safe Medical Device Act 1990 and 21 CFR § 807.92

1. **CLASSIFICATION and DEVICE NAME**

| | |
|---|---|
| **Classification Name:** | **Magnetic Resonance Diagnostic Device** |
| **Regulation Number:** | **90-LNH (Per 21 CFR § 892.1000)** |
| **Trade Proprietary Name:** | **Vantage Titan 1.5T** |
| **Model Number:** | **MRT-1510** |

2. **SUBMITTER'S NAME**

Toshiba Medical Systems Corporation (TMSC)
1385 Shimoishigami
Otawara-Shi, Tochigi-ken, Japan 324-8550

3. **OFFICIAL CORRESPONDENT**

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Senior Manager, Regulatory Affairs and Vigilance

4. **CONTACT PERSON, U.S. AGENT and ADDRESS**

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5. **MANUFACTURING SITE**

Toshiba Medical Systems Corporation (TMSC)
1385 Shimoishigami
Otawara-shi, Tochigi 324-8550, Japan

6. **ESTABLISHMENT REGISTRATION**

9614698

7. **DATE PREPARED**

February 6, 2017

8. **DEVICE NAME**

Vantage Titan 1.5T, MRT-1510, V4.0 Software

9. **TRADE NAME**

   Vantage Titan 1.5T

10. **CLASSIFICATION NAME**

    Magnetic Resonance Diagnostic Device (MRDD)

11. **CLASSIFICATION PANEL**

    Radiology

12. **DEVICE CLASSIFICATION**

    Class II (per 21 CFR 892.1000, Magnetic Resonance Diagnostic Device)

13. **PRODUCT CODE**

    90-LNH

14. **PREDICATE DEVICE**

    **Primary Predicate Device (system):** Vantage Titan 1.5T, MRT-1510, V3.6

    **Reference Predicate Device (added software functionalities):** Vantage Galan 3T, MRT-3020, V4.0

| | Subject | Primary Predicate | Reference Predicate |
|---|---|---|---|
| **System** | Vantage Titan 1.5T, MRT-1510, V4.0 | Vantage Titan 1.5T, MRT-1510, V3.6 | Vantage Galan 3T, MRT-3020, V4.0 |
| **Marketed By** | Toshiba America Medical Systems | Toshiba America Medical Systems | Toshiba America Medical Systems |
| **510(k) Number** | This Submission | K160632 | K162183 |
| **Clearance Date** | | August 23, 2016 | November 25, 2016 |

15. **REASON FOR SUBMISSION**

    Modification of a cleared device

16. **SUBMISSION TYPE**

    Traditional 510(k) Premarket Notification

17. **DEVICE DESCRIPTION**

    The Vantage Titan (Model MRT-1510) is a 1.5 Tesla Magnetic Resonance Imaging (MRI) System, previously cleared under K160632. This system is based upon the technology and materials of previously marketed Toshiba MRI systems and is intended to acquire and display cross-sectional transaxial, coronal, sagittal, and oblique images of anatomic structures of the head or body.

18. **SUMMARY OF CHANGE(S)**

    This submission is to report the following software functionalities have been added:

    - **FFE3D:**
      - **mUTE:** Ultra short TE T1 weighted sequence with reduced acoustic noise
      - **mUTE 4D-MRA:** Ultra short TE time resolved MR angiography with reduced acoustic noise
      - **2D-RMC:** Two dimensional real-time motion correction
    - **MP2RAGE:** Images with multiple TI (Inversion time) to create T1 map

- **FSE2D mEcho:** Images with multiple TE (Echo time) to create T2 map
- **FFE2D mEcho:** Images with multiple TE (Echo time) to create T2* map
- **mASTAR:** Multi Phase ASL (Arterial Spin Labeling)
- **FASE DWI:** Spin Echo based Diffusion Weighted Imaging with reduced acoustic noise
- **PSIR:** Phase Sensitive Inversion Recovery
- **MOLLI:** Modified Look Locker Inversion recovery
- **V-TISP:** Variable TI[*1] and TS[*2] Prep ([*1] inversion recovery time; [*2] saturation recovery time)
- **Enhancement of SPEEDER post-processing:** Improvement of SPEEDER algorithm
- **Improvement of [SURE]ECG R-wave detection:** Morphology-matching based R-wave detection.

**19. SAFETY PARAMETERS**

| Item | Subject Device: Vantage Titan 1.5T, V4.0 | Predicate Device: Vantage Titan 1.5T, V3.6 (K160632) | Notes |
|---|---|---|---|
| Static field strength | 1.5T | 1.5T | Same |
| Operational Modes | Normal and 1st Operating Mode | Normal and 1st Operating Mode | Same |
| i. Safety parameter display | SAR dB/dt | SAR dB/dt | Same |
| ii. Operating mode access requirements | Allows screen access to 1st level operating mode | Allows screen access to 1st level operating mode | Same |
| Maximum SAR | 4W/kg for whole body (1st operating mode specified in IEC 60601-2-33:2010 +Amd.1:2013) | 4W/kg for whole body (1st operating mode specified in IEC 60601-2-33(2010)) | Same |
| Maximum dB/dt | <1st operating mode specified in IEC60601-2-33(2010) +Amd.1:2013 | <1st operating mode specified in IEC 60601-2-33 (2010) | Same |
| Potential emergency condition and means provided for shutdown | Shut down by Emergency Ramp Down Unit for collision hazard for ferromagnetic objects | Shut down by Emergency Ramp Down Unit for collision hazard for ferromagnetic objects | Same |

**20. IMAGING PERFORMANCE PARAMETERS**

No change from the previous predicate submission, K160632.

**21. INDICATIONS FOR USE**

Vantage Titan systems are indicated for use as a diagnostic imaging modality that produces cross-sectional transaxial, coronal, sagittal, and oblique images that display anatomic structures of the head or body. Additionally, this system is capable of non-contrast enhanced imaging, such as MRA.

MRI (magnetic resonance imaging) images correspond to the spatial distribution of protons (hydrogen nuclei) that exhibit nuclear magnetic resonance (NMR). The NMR properties of body tissues and fluids are:

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- Flow dynamics
- Chemical Shift

Contrast agent use is restricted to the approved drug indications. When interpreted by a trained physician, these images yield information that can be useful in diagnosis.

No changes to the previously cleared indication, K160632.

**22. SUMMARY OF DESIGN CONTROL ACTIVITIES**

PS Risk List for new software functionalities and pulse sequences are included in this submission. The test methods used are the same as those submitted in the previously cleared submissions of the primary predicate device, Vantage Titan 1.5T, MRT-1510, V3.6 (K160632), and the reference predicate device, Vantage Galan 3T, MRT-3020, V4.0 (K162183). A declaration of conformity with design controls is included in this submission.

**23. SAFETY**

This device is designed and manufactured under the Quality System Regulations as outlined in 21 CFR § 820 and ISO 13485 Standards. The changes to this device are limited to the application software that is being presented for review. As the hardware and related safety considerations remain unchanged from the previous submission no information related to these aspects are presented for the determination of safety. Performance and/or clinical testing are being provided to demonstrate the safety and effectiveness of the application software.

This device is in conformance with the applicable parts of the following consensus standards published by the International Electrotechnical Commission (IEC) for medical devices and the National Electrical Manufacturers Association (NEMA).

**LIST OF APPLICABLE STANDARDS**

- IEC 60601-1:2005 +Amd.1:2012
- IEC 60601-2-33:2010 +Amd.1:2013
- IEC 60601-1-2:2007
- IEC 60601-1-8:2006 +Amd.1:2012
- IEC 60825-1:2007
- IEC 62304:2006
- IEC 62366:2007 +Amd.1:2014

**24. TESTING**

Software Documentation for a Moderate Level of Concern, per the FDA guidance document, “Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices Document” issued on May 11, 2005, is also included as part of this submission.

**25. SUBSTANTIAL EQUIVALENCE**

Toshiba Medical Systems Corporation believes that the Vantage Titan 1.5T, MRT-1510, V4.0 Magnetic Resonance Imaging (MRI) System is substantially equivalent to the previously cleared predicate devices referenced in this submission. Toshiba Medical Systems Corporation believes that the changes incorporated into the Vantage Titan 1.5T, MRT-1510, V4.0 software are substantially equivalent to the previously cleared predicate devices.

**26. CONCLUSION**

The modifications incorporated into the Vantage Titan 1.5T, MRT-1510, V4.0 software do not change the indications for use or the intended use of the device. Based upon bench testing, phantom imaging, volunteer clinical imaging, successful completion of software validation and application of risk management and design controls, it is concluded that the subject device is safe and effective for its intended use.