



Canon Medical Systems Corporation
% Ms. Janine F. Reyes
Manager, Regulatory Affairs
Canon Medical Systems USA
2441 Michelle Drive
TUSTIN CA 92780

July 14, 2020

Re: K193097

Trade/Device Name: Vantage Orian 1.5T, MRT-1550, V6.0 with AiCE
Reconstruction Processing Unit for MR

Regulation Number: 21 CFR 892.1000

Regulation Name: Magnetic resonance diagnostic device

Regulatory Class: Class II

Product Code: LNH

Dated: June 3, 2020

Received: June 5, 2020

Dear Ms. Reyes:

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. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm> identifies combination product submissions. 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) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see <https://www.fda.gov/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products>); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

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 <https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems>.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (<https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance>) and CDRH Learn (<https://www.fda.gov/training-and-continuing-education/cdrh-learn>). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (<https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-dice>) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

For

Thalia T. Mills, Ph.D.
Director
Division of Radiological Health
OHT7: Office of In Vitro Diagnostics
and Radiological Health
Office of Product Evaluation and Quality
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug AdministrationForm Approved: OMB No. 0910-0120
Expiration Date: 06/30/2020
See PRA Statement below.**Indications for Use**

510(k) Number (if known)

K193097

Device Name

Vantage Orian 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR

Indications for Use (Describe)

Vantage Orian 1.5T 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

Depending on the region of interest, contrast agents may be used. 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 Orian 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR
Model Number:	MRT-1550

2. SUBMITTER'S NAME

Canon Medical Systems Corporation
1385 Shimoishigami
Otawara-Shi, Tochigi-ken, Japan 324-8550

3. OFFICIAL CORRESPONDENT

Naofumi Watanabe
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4. CONTACT PERSON, U.S. AGENT and ADDRESS

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5. MANUFACTURING SITE

Canon Medical Systems Corporation
1385 Shimoishigami
Otawara-shi, Tochigi 324-8550, Japan

6. ESTABLISHMENT REGISTRATION

9614698

7. DATE PREPARED

November 6th, 2019

8. DEVICE NAME

Vantage Oran 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR

9. TRADE NAME

Vantage Oran 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR

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

Predicate Device: Vantage Orian 1.5T, MRT-1550, V6.0 (K193021)

Reference Device: Vantage Galan 3T, MRT-3020, V6.0 with AiCE Reconstruction Processing Unit for MR (K192574)

TABLE No. 1: Predicate Device

System	Subject Device	Predicate Device
	Vantage Orian 1.5T, MRT-1550, V6.0	Vantage Orian 1.5T, MRT-1550, V6.0
Marketed By	Canon Medical Systems USA, Inc.	Canon Medical Systems USA, Inc.
510(k) Number	This Submission	K193021
Clearance Date		June 3, 2020

15. REASON FOR SUBMISSION

Modification of a cleared device

16. SUBMISSION TYPE

Traditional 510(k) Premarket Notification

17. DEVICE DESCRIPTION

The Vantage Orian (Model MRT-1550) is a 1.5 Tesla Magnetic Resonance Imaging (MRI) System. The Vantage Orian uses 1.4 m short and 3.8 tons light weight magnet. It includes the Pianissimo™ technology (scan noise reduction technology). The design of the gradient coil and the WB coil of the Vantage Orian 1.5T provides the maximum field of view of 55 x 55 x 50 cm. The Model MRT-1550/AC, AD, AG, AH includes the standard gradient system and Model MRT-1550/AK, AL, AO, AP includes the XGO gradient system.

AiCE is an optional noise reduction algorithm that improves image quality and reduces thermal noise by employing Deep Convolutional Neural Network methods. AiCE is designed to remove Gaussian distributed noise in MR images for reducing contributions of thermal noise. In order to train a DCNN that can learn a model that represents thermal noise, the training datasets are created by adding Gaussian noise of different amplitudes to high-SNR images acquired with large number of averages. The device is targeted for Brain and knee regions. This software and its associated hardware are used on Canon MRI systems that are designed to communicate with the AiCE Reconstruction Processing Unit for MR.

This system is based upon the technology and materials of previously marketed Canon Medical Systems 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. The Vantage Orian 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR is comparable to the current 1.5T Vantage Orian MRI System (K193021), cleared June 3rd, 2020 with the following modifications.

18. SUMMARY OF CHANGE(S)

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

Summary of Hardware Changes:

- **AiCE Reconstruction Processing Unit for MR**

Summary of Software Changes:

- **AiCE:** Advanced Intelligent Clear-IQ Engine (AiCE) is a newly-added optional noise reduction algorithm that improves image quality and reduces thermal noise by employing deep convolutional neural network methods. The device is targeted for brain and knee regions and is MR system independent, meaning that this software and its associated hardware are used on Canon MRI systems that are designed to communicate with the AiCE Reconstruction Processing Unit for MR.

19. SAFETY PARAMETERS

Item	Subject Device: Vantage Orian 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR	Predicate Device: Vantage Orian 1.5T, MRT-1550, V6.0 (K193021)	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+A1:2013+A2:2015)	4W/kg for whole body (1st operating mode specified in IEC 60601-2-33: 2010+A1:2013+A2:2015)	Same
Maximum dB/dt	1st operating mode specified in IEC 60601-2-33: 2010+A1:2013+A2:2015	1st operating mode specified in IEC 60601-2-33: 2010+A1:2013+A2:2015	Same
Potential emergency condition and means provided for shutdown	Shutdown by Emergency Ramp Down Unit for collision hazard for ferromagnetic objects	Shutdown by Emergency Ramp Down Unit for collision hazard for ferromagnetic objects	Same

20. IMAGING PERFORMANCE PARAMETERS

No change from the previous predicate submission, K193021.

21. INDICATIONS FOR USE

Vantage Orian 1.5T 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

Depending on the region of interest, contrast agents may be used. When interpreted by a trained physician, these images yield information that can be useful in diagnosis.

22. SUMMARY OF DESIGN CONTROL ACTIVITIES

Risk Management activities for new software functionalities are included in this submission. The test methods used are the same as those submitted in the previously cleared submission of the predicate device, Vantage Orian 1.5T, MRT-1550, V6.0 (K193021). 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.

This device is based upon the same technologies, materials and software as the predicate device. Risk activities were conducted in concurrence with established medical device development standards and guidance. Additionally, testing was done in accordance with applicable recognized consensus standards published by the International Electrotechnical Commission (IEC) for medical devices and the National Electrical Manufacturers Association (NEMA):

LIST OF APPLICABLE STANDARDS

- ANSI AAMI ES60601-1:2005/(R)2012 and A1:2012
- IEC60601-1-2 (2014)
- IEC60601-1-6 (2010), Amd.1 (2013)
- IEC60601-2-33 (2010), Amd.1 (2013), Amd.2 (2015)
- IEC60825-1 (2007)
- IEC62304 (2006), Amd.1 (2015)
- IEC62366 (2007), Amd.1 (2014)
- NEMA MS 1 (2008)
- NEMA MS 2 (2008)
- NEMA MS 3 (2008)
- NEMA MS 4 (2010)
- NEMA MS 5 (2010)

24. TESTING

AiCE deep learning reconstruction underwent performance (bench testing) using a model observer study to determine that image low contrast detectability was maintained or improved. Additionally, a human observer study was conducted with 6 board certified radiologists and 160 image data sets that demonstrated a statistical preference of AiCE when compared to other performance filters. The results of the testing demonstrated that AiCE performed either at the same level or above the performance of the commercially available predicate device.

In order to quantify the increase in SNR with AiCE over standard protocols, SNR measurements of sample clinical brain and knee images were obtained. Additionally, contrast was measured using the absolute signal intensity differences between two tissues. The results of the testing demonstrated that AiCE both increased SNR and maintained contrast.

25. SUBSTANTIAL EQUIVALENCE

Canon Medical Systems Corporation believes that the Vantage Orian 1.5T, MRT-1550, V6.0, Magnetic Resonance Imaging (MRI) System with AiCE Reconstruction Processing Unit for MR is substantially equivalent to the previously cleared predicate device, Vantage Orian 1.5T, MRT-1550, V6.0, referenced in this submission. Canon Medical Systems Corporation believes that the changes incorporated into the Vantage Orian 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR are substantially equivalent to the previously cleared predicate device.

26. CONCLUSION

The modifications incorporated into the Vantage Orian 1.5T, MRT-1550, V6.0 with AiCE Reconstruction Processing Unit for MR 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.