October 17, 2022

Acutus Medical, Inc.
Subhadra Elango
Senior Specialist, Regulatory Affairs
2210 Faraday Ave., Suite 100
Carlsbad, California 92008

Re: K222209
Trade/Device Name: AcQMap High Resolution Imaging and Mapping System
Regulation Number: 21 CFR 870.1425
Regulation Name: Programmable Diagnostic Computer
Regulatory Class: Class II
Product Code: DQK, IYO, ITX
Dated: July 22, 2022
Received: July 25, 2022

Dear Subhadra Elango:

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,

Aneesh Deoras
Assistant Director
Division of Cardiac Electrophysiology,
Diagnostics and Monitoring Devices
Office of Cardiovascular Devices
Office of Product Evaluation and Quality
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: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
K222209

Device Name
AcQMap High Resolution Imaging and Mapping System

Indications for Use *(Describe)*
The AcQMap High Resolution Imaging and Mapping System is intended for use in patients for whom electrophysiology procedures have been prescribed. When used with the AcQMap Catheters, the AcQMap High Resolution Imaging and Mapping System is intended to be used to reconstruct the selected chamber from ultrasound data for purposes of visualizing the chamber anatomy and displaying electrical impulses as either charge density-based or voltage-based maps of complex arrhythmias that may be difficult to identify using conventional mapping systems alone.

AND

When used with the specified Patient Electrodes, the AcQMap High Resolution Imaging and Mapping System is intended to display the position of AcQMap Catheters and conventional electrophysiology (EP) catheters in the heart.

OR

When used with conventional electrophysiology catheters, the AcQMap High Resolution Imaging and Mapping System provides information about the electrical activity of the heart and about catheter location during the procedure.

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.

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510(K) NOTIFICATION K222209

GENERAL INFORMATION [807.92(a)(1)]

Date Prepared: 17 October 2022

Applicant:	Contact Person:
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DEVICE INFORMATION [807.92(a)(2)]

Trade Name:	AcQMap High Resolution Imaging and Mapping System
Generic/Common Name:	Programable diagnostic computer and Ultrasonic pulsed echo imaging system
Classification:	Class II / 21 CFR § 870.1425 Class II / 21 CFR § 892.1560
Product Code(s):	DQK, IYO, ITX

PREDICATE DEVICE [807.92(a)(3)]

Predicate Device	Manufacturer	FDA 510(k)
AcQMap High Resolution Imaging and Mapping System	Acutus Medical, Inc.	K220784

DEVICE DESCRIPTION [807.92(A)(4)]

The AcQMap High Resolution Imaging and Mapping System operates outside of the sterile field and consists of the AcQMap Console, the AcQMap Workstation and the AcQMap Auxiliary Interface Box.

The AcQMap High Resolution Imaging and Mapping System is a diagnostic recording system. This computer-based system is intended for use in the Electrophysiology (EP) Lab, and it is capable of imaging, navigation, and mapping of the atrial chambers of the heart.

The AcQMap High Resolution Imaging and Mapping System hardware consists of three functional subsystems:

- Ultrasound imaging,
- ECG and EGM recording; and
- Impedance based electrode Localization.

The AcQMap High Resolution Imaging and Mapping System is used in conjunction with the associated AcQMap 3D Imaging and Mapping Catheter models 900003 and 900009 (cleared under K201341). The AcQMap High Resolution Imaging and Mapping System provides:

- 3-D cardiac chamber reconstruction – Contact and non-contact (ultrasound),

- Three-dimensional position of the AcQMap Catheter and conventional electrophysiology catheters,
- Cardiac electrical activity as waveform traces,
- Contact LAT and voltage amplitude maps
- Remapping of the chamber at any time during the procedure; and
- Dynamic, three-dimensional, charge density maps overlaid on the cardiac chamber reconstruction to show chamber-wide electrical activation.

The AcQMap High Resolution Imaging and Mapping System is intended to create a surface reconstruction of the cardiac chamber as well as an electrical map of the substrate. The surface reconstruction and electrical map are then used by physicians to identify the source(s) of the arrhythmia.

Additionally, the AcQMap High Resolution Imaging and Mapping System allows physicians to perform traditional contact mapping activities, including establishing a coordinate system, localizing conventional electrophysiology catheters relative to one another within the coordinate system, recording contact electrograms, and initiating a procedure without the AcQMap Catheter present. Based on the information captured in the contact electrograms, the physician may decide to treat an arrythmia without deploying the AcQMap Catheter.

The modifications to the AcQMap High Resolution Imaging and Mapping System include the addition of new accessories to facilitate connectivity between the cleared AcQMap High Resolution Imaging and Mapping System and DiamondTemp™ Ablation Generator.

INDICATIONS FOR USE [807.92(A)(5)]

The AcQMap High Resolution Imaging and Mapping System is intended for use in patients for whom electrophysiology procedures have been prescribed.

When used with the AcQMap Catheters, the AcQMap High Resolution Imaging and Mapping System is intended to be used to reconstruct the selected chamber from ultrasound data for purposes of visualizing the chamber anatomy and displaying electrical impulses as either charge density-based or voltage-based maps of complex arrhythmias that may be difficult to identify using conventional mapping systems alone.

AND

When used with the specified Patient Electrodes, the AcQMap High Resolution Imaging and Mapping System is intended to display the position of AcQMap Catheters and conventional electrophysiology (EP) catheters in the heart.

OR

When used with conventional electrophysiology catheters, the AcQMap High Resolution Imaging and Mapping System provides information about the electrical activity of the heart and about catheter location during the procedure.

COMPARISON OF TECHNOLOGICAL CHARACTERISTICS WITH THE PREDICATE DEVICES [807.92(A)(6)]

Tables 1 and 2 provides a comparison of the modified AcQMap High Resolution Imaging and Mapping System classification and indications for use against the predicate device. Table 3 provides a comparison of the technological characteristics for the modified AcQMap High Resolution Imaging and Mapping System against the predicate device.

Table 1: Comparison of Classification with the Predicate Device

Characteristics	Subject Device	Predicate Device	Rationale for Substantial Equivalence
	AcQMap® High Resolution Imaging and Mapping System	AcQMap® High Resolution Imaging and Mapping System (K220784)	
510(k) Number	K222209	K220784	--
Classification/	Class II	Class II	Identical
Regulation	21 CFR § 870.1425, Programable diagnostic computer 21 CFR § 892.1560, Ultrasonic pulsed echo imaging system	21 CFR § 870.1425, Programable diagnostic computer 21 CFR § 892.1560, Ultrasonic pulsed echo imaging system	Identical
Product Code	DQK, IYO, and ITX	DQK, IYO, and ITX	Identical

Table 2: Comparison of Indications for Use with the Predicate Device			
Characteristics	Subject Device AcQMap® High Resolution Imaging and Mapping System	Predicate Device AcQMap® High Resolution Imaging and Mapping System (K220784)	Rationale for Substantial Equivalence
Indications for Use	The AcQMap High Resolution Imaging and Mapping System is intended for use in patients for whom electrophysiology procedures have been prescribed. When used with the AcQMap Catheters, the AcQMap High Resolution Imaging and Mapping System is intended to be used to reconstruct the selected chamber from ultrasound data for purposes of visualizing the chamber anatomy and displaying electrical impulses as either charge density-based or voltage-based maps of complex arrhythmias that may be difficult to identify using conventional mapping systems alone. AND When used with the specified Patient Electrodes, the AcQMap High Resolution Imaging and Mapping System is intended to display the position of AcQMap Catheters and conventional electrophysiology (EP) catheters in the heart. OR When used with conventional electrophysiology catheters, the AcQMap High Resolution Imaging and Mapping System provides information about the electrical activity of the heart and about catheter location during the procedure.	The AcQMap System is intended for use in patients for whom electrophysiology procedures have been prescribed. When used with the AcQMap Catheters, the AcQMap System is intended to be used to reconstruct the selected chamber from ultrasound data for purposes of visualizing the chamber anatomy and displaying electrical impulses as either charge density-based or voltage-based maps of complex arrhythmias that may be difficult to identify using conventional mapping systems alone. AND When used with the specified Patient Electrodes, the AcQMap System is intended to display the position of AcQMap Catheters and conventional electrophysiology (EP) catheters in the heart. OR When used with conventional electrophysiology catheters, the AcQMap System provides information about the electrical activity of the heart and about catheter location during the procedure.	Identical, with the exception of device trade name.

Table 3: Comparison of Technological Characteristics Against the Predicate Device			
Characteristics	Subject Device AcQMap® High Resolution Imaging and Mapping System	Predicate Device AcQMap® High Resolution Imaging and Mapping System (K220784)	Rationale for Substantial Equivalence
Patient Anatomy	Intracardiac Structures	Intracardiac Structures	Identical
Testing to Support Substantial Equivalence	Software V/V Electromagnetic and Electrical Safety Verification Testing, Accuracy Testing, and Animal Testing	Software V/V Electromagnetic and Electrical Safety Verification Testing, Accuracy Testing, and Animal Testing	Identical
System Safety Standards	IEC 60601-1:2005 /A1:2012 IEC 60601-1-2:2014 IEC 62366-1: 2015 IEC 60601-2-25:2015 IEC 60601-2-37:2015	IEC 60601-1:2005 /A1:2012 IEC 60601-1-2:2014 IEC 62366-1: 2015 IEC 60601-2-25:2015 IEC 60601-2-37:2015	Identical
Physical Characteristics			
System Components & Accessories	Console Workstation Workstation Cable Auxiliary Interface Box ECG Input Cable Ampere Ablation Catheter Adapter Cable Ampere RF Generator Adapter Cable ECG Output Cable Ablation Reference Cable Ablation Electrogram Cable ECG w/Snaps Cable ECG POST Cable 2mm Pin Jumper Set Patient Electrode Kit Ampere Generator Adapter SmartAblate Generator Adapter Maestro Generator Adapter Adapter Cable- Short - Ablation Adapter	Console Workstation Workstation Cable Auxiliary Interface Box ECG Input Cable Ampere Ablation Catheter Adapter Cable Ampere RF Generator Adapter Cable ECG Output Cable Ablation Reference Cable Ablation Electrogram Cable ECG w/Snaps Cable ECG POST Cable 2mm Pin Jumper Set Patient Electrode Kit Ampere Generator Adapter SmartAblate Generator Adapter Maestro Generator Adapter Adapter Cable- Short - Ablation Adapter	All system components are identical, except the new accessories. Verification testing on the new accessories demonstrates that the AcQMap High Resolution Imaging and Mapping System and the new accessories perform as intended. There are no different questions of safety or effectiveness.

Table 3: Comparison of Technological Characteristics Against the Predicate Device			
Characteristics	Subject Device AcQMap® High Resolution Imaging and Mapping System	Predicate Device AcQMap® High Resolution Imaging and Mapping System (K220784)	Rationale for Substantial Equivalence
	Adapter Cable- Long - Ablation Adapter SmartAblate Adapter Cable - Catheter Maestro Adapter Cable - Catheter Maestro Adapter Cable – Generator Carto Force Adapter Cable DiamondTemp Generator Adapter DiamondTemp Adapter Cable – Generator	Adapter Cable- Long - Ablation Adapter SmartAblate Adapter Cable - Catheter Maestro Adapter Cable - Catheter Maestro Adapter Cable – Generator Carto Force Adapter Cable	
Visual/Mapping Characteristics	3-D cardiac chamber reconstructions – Contact and non-contact (ultrasound); Three-dimensional position of the AcQMap Catheter and conventional electrophysiology catheters; Cardiac electrical activity as waveform traces; Contact LAT and voltage amplitude maps; Remapping of the chamber at any time during the procedure; Dynamic, three-dimensional, Charge Density maps overlaid on the cardiac chamber reconstruction to show chamber-wide electrical activation.	3-D cardiac chamber reconstructions – Contact and non-contact (ultrasound); Three-dimensional position of the AcQMap Catheter and conventional electrophysiology catheters; Cardiac electrical activity as waveform traces; Contact LAT and voltage amplitude maps; Remapping of the chamber at any time during the procedure; Dynamic, three-dimensional, Charge Density maps overlaid on the cardiac chamber reconstruction to show chamber-wide electrical activation.	Identical
Visualization Device/Catheter	AcQMap Catheter (electrodes & transducers) or Conventional electrophysiology catheters	AcQMap Catheter (electrodes & transducers) or Conventional electrophysiology catheters	Identical
Physical Characteristics – Console/Amplifier Comparison			
Dimensions	99 cm L x 58 cm W x 76 cm D	99 cm L x 58 cm W x 76 cm D	Identical
Weight Maximum	80 kg	80 kg	
Power Requirement	100-127 VAC, 50/60 Hz, 220-230 VAC, 50 Hz	100-127 VAC, 50/60 Hz, 220-230 VAC, 50 Hz	
Input Current	4.6 A	4.6 A	

Table 3: Comparison of Technological Characteristics Against the Predicate Device			
Characteristics	Subject Device AcQMap® High Resolution Imaging and Mapping System	Predicate Device AcQMap® High Resolution Imaging and Mapping System (K220784)	Rationale for Substantial Equivalence
Fuse protection	250 V, 6.3A, two high breaking capacity fuses	250 V, 6.3A, two high breaking capacity fuses	
System Specifications			
Safety Information	IEC 60601-1, Class I, Type Defibrillator Protected CF, continuous operation, no sterilization, equipment not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide	IEC 60601-1, Class I, Type Defibrillator Protected CF, continuous operation, no sterilization, equipment not suitable for use in the presence of a flammable anesthetic mixture with air, oxygen or nitrous oxide	Identical
Ingress Protection	The Console is rated IP20	The Console is rated IP20	Identical
Functional and Performance Characteristics			
Ultrasound Output	Frequency: 10 MHz+/-400 kHz Maximum Voltage: 50V p-p Maximum Power: 1 W peak	Frequency: 10 MHz+/-400 kHz Maximum Voltage: 50V p-p Maximum Power: 1 W peak	Identical
Ultrasound Performance	Single operating mode Thermal Index less than 1.0 Mechanical Index less than 1.0	Single operating mode Thermal Index less than 1.0 Mechanical Index less than 1.0	Identical
Localization Output	Frequency: Variable 15 kHz to 50 kHz Maximum current: 1.2mA	Frequency: Variable 15 kHz to 50 kHz Maximum current: 1.2mA	Identical
ECG & EGM Input	Bandwidth: 0.05 Hz to 500 Hz Resolution: +/-1uV Timing Accuracy: +/-1.6 microsecond	Bandwidth: 0.05 Hz to 500 Hz Resolution: +/-1uV Timing Accuracy: +/-1.6 microsecond	Identical
Front Panel Connections			
AcQMap Catheter	Custom, black, Defibrillator Protected Type CF	Custom, black, Defibrillator Protected Type CF	Identical
ECG Input	12-pin, latching, red, Defibrillator Protected Type BF	12-pin, latching, red, Defibrillator Protected Type BF	Identical
ECG Output	14-pin, latching, blue	14-pin, latching, blue	Identical
Auxiliary Interface Box	Custom, green, Defibrillator Protected Type CF	Custom, green, Defibrillator Protected Type CF	Identical

Table 3: Comparison of Technological Characteristics Against the Predicate Device			
Characteristics	Subject Device	Predicate Device	Rationale for Substantial Equivalence
	AcQMap® High Resolution Imaging and Mapping System	AcQMap® High Resolution Imaging and Mapping System (K220784)	
AcQRef Introducer Sheath or Electrical Reference Catheter	1, 2mm female, yellow, Defibrillator Protected Type CF	1, 2mm female, yellow, Defibrillator Protected Type CF	Identical
Localization Reference Electrodes	6, 2-pin, square, multi-color, Defibrillator Protected Type BF	6, 2-pin, square, multi-color, Defibrillator Protected Type BF	Identical
Patient Reference Electrode	1, 2-pin, square, blue, Defibrillator Protected Type BF	1, 2-pin, square, blue, Defibrillator Protected Type BF	Identical
Ablation Generator	10-pin, latching, grey	10-pin, latching, grey	Identical
Ablation Catheter	10-pin, latching, grey, Defibrillator Protected Type CF	10-pin, latching, grey, Defibrillator Protected Type CF	Identical
Ablation Reference	1, 2mm, female, black, Defibrillator Protected Type BF	1, 2mm, female, black, Defibrillator Protected Type BF	Identical
Ablation Electrogram Interface	1, 13-pin, latching, white	1, 13-pin, latching, white	Identical

SUBSTANTIAL EQUIVALENCE

The AcQMap High Resolution Imaging and Mapping System is intended to reconstruct the physiology and display the anatomic and electrical data in the same way. These modifications are to include new accessories to facilitate connectivity between the cleared AcQMap High Resolution Imaging and Mapping System and the DiamondTemp Ablation Generator. The indications for use of the subject device are identical to those of the predicate device. Any differences in the technological characteristics between the devices do not raise any different questions of safety or effectiveness. Thus, the modified AcQMap High Resolution Imaging and Mapping System is substantially equivalent to the predicate device.

PERFORMANCE DATA [807.92(B)]

All necessary bench testing was conducted on the modified AcQMap High Resolution Imaging and Mapping System to support a determination of substantial equivalence to the predicate device. The necessary clinical testing was completed for the original AcQMap High Resolution Imaging and Mapping System (K170948) and is incorporated by reference. No further clinical testing is required to support the subject device.

NONCLINICAL TESTING SUMMARY [807.92(B)(1)]

The necessary bench testing was performed on the modified AcQMap High Resolution Imaging and Mapping System to ensure that it conforms to the design specifications and to support a determination of substantial equivalence to the predicate device.

The following bench testing was repeated for the modified device:

- Third party system Compatibility with AcQMap High Resolution Imaging and Mapping System, Model 900100 Testing
- System RF Attenuation characterization
- Therapeutic Waveform Fidelity Assessment
- Safety Testing
- Packaging Testing
- Inspection and Labeling Review
- Common Mode Choke (CMC) performance verification Testing

The balance of testing is incorporated by reference to the original AcQMap High Resolution Imaging and Mapping System 510(k), includes the following:

- Transportation Testing
- AcQMap High Resolution Imaging and Mapping Verification Testing
- System Accuracy Testing
- Electromagnetic Compatibility and Electrical Safety Testing
- AcQMap Catheter Validation Testing-Animal Study
- Accuracy Validation Testing Animal Study
- Software Verification and Validation
- Clinical Simulation (Reliability)
- Map Accuracy Evaluation
- In-vitro Localization Accuracy Study

The modified AcQMap High Resolution Imaging and Mapping System was tested to verify that the device meets the established performance specifications. The collective results of the testing demonstrate that the design of the modified AcQMap High Resolution Imaging and Mapping System meets its established performance specifications necessary for performance during its intended use.

The collective results of the nonclinical testing, either repeated for the modified device or incorporated by reference to the original AcQMap High Resolution Imaging and Mapping System 510(k), demonstrate that the materials chosen, the manufacturing processes, and design of the modified AcQMap High Resolution Imaging and Mapping System meet the established specifications necessary for consistent performance during its intended use. In addition, the collective bench testing demonstrates that the proposed device does not raise different questions of safety or effectiveness when compared to the predicate device.

CLINICAL TESTING SUMMARY [807.92(B)(2)]

As discussed above, no further clinical testing is required to support the modified AcQMap High Resolution Imaging and Mapping System. The necessary clinical testing was completed for the original AcQMap High Resolution Imaging and Mapping System (K170948) and is incorporated by reference. That study, entitled, "Dipole Density Right (and left) Atrial Mapping and Assessment of Therapy In Complex Supraventricular Tachycardia, (DDRAMATIC-SVT)" was a prospective, non-randomized, open-label study conducted at eight clinical sites outside the U.S. The results for 84 patients demonstrated that the AcQMap High Resolution Imaging and Mapping System is substantially equivalent to the predicate device.

CONCLUSIONS [807.92(B)(3)]

Extensive nonclinical performance testing, either repeated for the modified device or incorporated by reference to the original AcQMap High Resolution Imaging and Mapping System 510(k), was conducted on the AcQMap High Resolution Imaging and Mapping System to evaluate the overall performance of the device. The clinical validation of the original AcQMap High Resolution Imaging and Mapping System (K170948) is applicable to the modified device. Based on the performance testing and the technological characteristics, it can be concluded that the modified AcQMap High Resolution Imaging and Mapping System is substantially equivalent to the predicate device.