Mauna Kea Technologies
% Michael Daniel
President
Daniel & Daniel Consulting
340 Jones Lane
Gardnerville, Nevada 89460

April 11, 2022

Re: K220477
Trade/Device Name: Cellvizio 100 series system with confocal Miniprobes
Regulation Number: 21 CFR 876.1500
Regulation Name: Endoscope and accessories
Regulatory Class: Class II
Product Code: OWN, GCJ, GWG
Dated: February 16, 2022
Received: February 18, 2022

Dear Michael Daniel:

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 and Part 809); 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,

Neil R.P. Ogden, M.S.
Assistant Director
DHT4A: Division of General Surgery Devices
OHT4: Office of Surgical and Infection Control 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)*
K220477

Device Name
Cellvizio® 100 series system with Confocal Miniprobes™

Indications for Use *(Describe)*
The Cellvizio® 100 series system with Confocal Miniprobes™ is a confocal laser system with fiber optic probes that are intended to allow imaging of the internal microstructure of tissues including, but not limited to, the identification of cells, vessels and their organization or architecture.

The Cellvizio® 100 Series System F400 is indicated for imaging blood flow in vascular areas, including microvasculature and capillaries.

Upon intravenous administration and use of an ICG consistent with its approved labeling, the Cellvizio® 100 Series System F800 is used to perform fluorescence angiography.

Upon interstitial administration and use of ICG consistent with its approved labeling, the Cellvizio® 100 Series System F800 is used to perform fluorescence imaging and visualization of the lymphatic system, including lymphatic vessels and lymph nodes.

Upon administration and use of pafolacianine consistent with its approved labeling, the Cellvizio® 100 Series System F800 is used to perform fluorescence imaging of tissues that have taken up the drug.

The GastroFlex™ (UHD, UHD-C) and ColoFlex™ (UHD, UHD-C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., gastrointestinal systems, accessed by an endoscope or endoscopic accessories.

The AlveoFlex™ (-, -C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., respiratory systems, accessed by an endoscope or endoscopic accessories.

The CholangioFlex™ (-, -C) Confocal Miniprobes™ are intended to allow imaging of the upper gastrointestinal tract including biliary and pancreatic ducts, accessed by an endoscope or endoscopic accessories.

The AQ-Flex™ 19 (-, -C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., gastrointestinal and respiratory tracts, accessed by an endoscope or endoscopic accessories (e.g. aspiration needles used during procedures including but not limited to EUS-FNA, EBUS-TBNA and TBNA).

The CystoFlex™ (F, F-C, and UHD, UHD-C) and UroFlex™ B (-, -C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., urinary, including, but not limited to, urethra, bladder, and ureter, accessed through an endoscope or endoscopic accessories.

The CelioFlex™ (UHD 5, UHD 5-C) Confocal Miniprobes™ are intended to provide visualization of body cavities, organs, and canals during endoscopic and laparoscopic surgical procedures, including robot-assisted procedures.

The CranioFlex™ (-, -C) Confocal Miniprobes™ are indicated to provide visualization within the central nervous system during cranial diagnostic and therapeutic procedures such as tumor biopsy and resection.

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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1 Premarket Notification 510(k) Summary

This summary of 510(k) safety and effectiveness information is submitted in accordance with the requirements of SMDA 1990 and 21 CFR 807.92.

510(k) Number: K220477

Applicant Information:

Date Prepared: March 28, 2022

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Contact Person:	Michael A Daniel, Consultant
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Phone Number:	(415) 407-0223

Subject Device Information:

Device Trade Name:	Cellvizio® 100 series system with Confocal Miniprobes™
Common Name:	Confocal Optical Imaging
Classification Name(s):	Endoscope and Accessories
Product Code/ Regulation:	OWN / GCJ / GWG 21 CFR 876.1500, 21 CFR 882.1480
Classification:	Class II

Predicate Device:

VS3 Iridium System, Visionsense Ltd., K210265.

Reference Device:

Cellvizio 100 Series System with Confocal Miniprobes, Mauna Kea Technologies, K191144.

Indications for Use:

The Cellvizio® 100 series system with Confocal Miniprobes™ is a confocal laser system with fiber optic probes that are intended to allow imaging of the internal microstructure of tissues including, but not limited to, the identification of cells, vessels and their organization or architecture.

The Cellvizio® 100 Series System F400 is indicated for imaging blood flow in vascular areas, including microvasculature and capillaries.

Upon intravenous administration and use of an ICG consistent with its approved labeling, the Cellvizio® 100 Series System F800 is used to perform fluorescence angiography.

Upon interstitial administration and use of ICG consistent with its approved labeling, the Cellvizio® 100 Series System F800 is used to perform fluorescence imaging and visualization of the lymphatic system, including lymphatic vessels and lymph nodes.

Upon administration and use of pafolacianine consistent with its approved labeling, the Cellvizio® 100 Series System F800 is used to perform fluorescence imaging of tissues that have taken up the drug.

The GastroFlex™ (UHD, UHD-C) and ColoFlex™ (UHD, UHD-C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., gastrointestinal systems, accessed by an endoscope or endoscopic accessories.

The AlveoFlex™ (-, -C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., respiratory systems, accessed by an endoscope or endoscopic accessories.

The CholangioFlex™ (-, -C) Confocal Miniprobes™ are intended to allow imaging of the upper gastrointestinal tract including biliary and pancreatic ducts, accessed by an endoscope or endoscopic accessories.

The AQ-Flex™ 19 (-, -C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., gastrointestinal and respiratory tracts, accessed by an endoscope or endoscopic accessories (e.g. aspiration needles used during procedures including but not limited to EUS-FNA, EBUS-TBNA and TBNA).

The CystoFlex™ (F, F-C, and UHD, UHD-C) and UroFlex™ B (-, -C) Confocal Miniprobes™ are intended to allow imaging of anatomical tracts, i.e., urinary, including, but not limited to, urethra, bladder, and ureter, accessed through an endoscope or endoscopic accessories.

The CelioFlex™ (UHD 5, UHD 5-C) Confocal Miniprobes™ are intended to provide visualization of body cavities, organs, and canals during endoscopic and laparoscopic surgical procedures, including robot-assisted procedures.

The CranioFlex™ (-, -C) Confocal Miniprobes™ are indicated to provide visualization within the central nervous system during cranial diagnostic and therapeutic procedures such as tumor biopsy and resection.

Subject Device Description:

Confocal Miniprobes™ are used with Cellvizio® 100 series (F800) system, which is a confocal imaging system with fiber optic probes which allows visualization of internal microstructure of tissues and blood flow including, but not limited to, the identification of cells, vessels and their organization or architecture, during endoscopic and laparoscopic surgical procedures, including robot-assisted procedures.

To achieve this function, the Cellvizio® 100 series system F800 with its Confocal Miniprobes™ has been designed:

- To excite fluorescent components within the human tissue with the laser light emitted by the Cellvizio® at 785nm.
- To receive fluorescence signal emitted from tissue microstructures within the spectral detection bandwidth of the Cellvizio® 800-905 nm.

ICG absorbs light in the near-infrared (NIR) region within a range of 780 nm to 805 nm with a peak absorption of 805 nm and emits fluorescence within a range of 810 nm to 850 nm with a peak emission of 820 nm (cf. ICG labeling).

Therefore, the Cellvizio® 100 series system F800 can excite ICG circulating in the vascular and lymphatic systems and image signal emitted by ICG in these two systems.

Pafolacianine absorbs light in the near-infrared (NIR) region within a range of 760 nm to 785 nm with a peak absorption of 776 nm and emits fluorescence within a range of 790 nm to 815 nm with a peak emission of 796 nm (cf. Pafolacianine Sodium labeling).

Therefore, the Cellvizio® 100 series F800 model can:

- excite ICG in the vascular system or the lymphatic system and image signal emitted by ICG in the vascular system or the lymphatic system after ICG has been administered to the patient according to its approved labeling.
- excite pafolacianine or tissues that have taken up pafolacianine and image signal emitted by pafolacianine or tissues that have taken up pafolacianine after pafolacianine has been administered to the patient according to its approved labeling.

Comparison to Predicate and Reference Devices:

The table below details the Indications for Use between the subject device, the predicate device and the reference device.

Device & Predicate Device(s):	K220477	K210265	K191144
General Device Characteristics			
Device Name	Cellvizio® 100 Series System with Confocal Miniprobes	VS3 Iridium system	Cellvizio® 100 Series System with Confocal Miniprobes
Operating mechanism	The tissue is illuminated by the laser light transmitted by the fibers of the Confocal Miniprobe™ through its distal objective lens. The optical signal from the tissue is collected back by the same objective and fibers. The fibers are connected to the Laser Scanning Unit (LSU) that integrates the illumination source and the optical detector. Once digitized, the signal is transmitted to the Confocal Processor™ that processes the image to be displayed on a monitor.	IR laser/LED is integrated in VS3- 785 nm Iridium System endoscope / microscope, and it is used to provide illumination of the anatomy under examination. The light is transmitted from the IR laser/LED to the distal tip via two glass fiber light bundles. The raw data captured at the distal tip Silicon Image Sensor in the Camera is converted to a video signal by the printed circuit board (PCB). It allows the image to be displayed on a monitor.	The tissue is illuminated by the laser light transmitted by the fibers of the Confocal Miniprobe™ through its distal objective lens. The optical signal from the tissue is collected back by the same objective and fibers. The fibers are connected to the Laser Scanning Unit (LSU) that integrates the illumination source and the optical detector. Once digitized, the signal is transmitted to the Confocal Processor™ that processes the image to be displayed on a monitor.
Light Source	Laser	Laser	Laser
Maximum output power	40 mW	500 mW	15 mW
Excitation wavelength	785 nm	785 nm	488 nm
Detection bandwidth	800 – 905 nm	800 – 850 nm	500 – 650 nm
Optical components	Rigid section including objective lens, flexible optical fibers to transmit visible light to and from the tissue.	Rigid section including objective lens, flexible optical fibers to transmit NIR light to and from the tissue.	Rigid section including objective lens, flexible optical fibers to transmit visible light to and from the tissue.
Angle of view	0 degrees	0 and 30 degrees	0 degrees
Field of view	Circular, diameters of 240, 325, and 600 µm	70 – 95 degrees to provide visualization at a macroscopic level	Circular, diameters of 240, 325, and 600 µm
Depth of observation	0 – 65 µm	0 µm	0 – 65 µm
Lateral resolution	1 – 3.5 µm	50 – 250 µm	1 – 3.5 µm
Visualization of Real-Time Images	9 – 12 FPS	45 FPS	9 – 12 FPS
Use of contrast agent	ICG, pafolacianine	ICG, pafolacianine	Sodium Fluorescein

Table: Comparison the subject device and previously cleared predicate and reference devices

Materials, design, and intended use of the aforementioned Cellvizio® 100 series F800 system Confocal laser imaging systems and its Confocal Miniprobes™ remain exactly the same as previously cleared in K191144. The F800 system is similar to the VS3 Iridium System (cleared via K210265) including the use of the system with the approved infrared contrast agents, ICG or pafolacianine sodium injection (or Pafolacianine).

The subject device, the Cellvizio® 100 series F800 with Confocal Miniprobes™ operates in an identical way as the reference device, the Cellvizio® 100 F400 series with Confocal Miniprobes™ (cleared via K191144) in order to provide confocal images of the internal microstructure of tissues including, but not limited to, the identification of cells, vessels and their organization or architecture.

No change is being made in terms of design, fundamental technology, and operating principle of the previously cleared CholangioFlex™, AQ-Flex™ 19, CystoFlex™ F, and UroFlex™ B Confocal Miniprobes™ (cleared via K172844 and K183640). The commercial name of these Confocal Miniprobes™ has been changed when they are used with a Cellvizio 100 Series F800 model. Indications for use of the CholangioFlex™ -C, AQ-Flex™ 19 -C, CystoFlex™ F-C, and UroFlex™ B-C Confocal Miniprobes™ are the same as the reference device (K191144).

The subject device, the Cellvizio® 100 (F800) series with its Confocal Miniprobes™ and the reference device, the Cellvizio® 100 (F400) series with its Confocal Miniprobes™ (cleared via K191144) are similar as they have the identical indications for use, material, design, fundamental technology, and operating principle.

Performance Testing - Bench Completed:

Bench testing has been performed to validate the capability of the Cellvizio® 100 series F800 model with Confocal Miniprobes™ to image ICG and pafolacianine. These tests consisted of the following:

In vitro imaging of ICG with different concentrations,

In vitro imaging of pafolacianine with different concentrations,

In vitro imaging of human cervical carcinoma cell line with known overexpression of FRα, stained with different concentrations of pafolacianine.

These tests showed that the Cellvizio 100 series F800 model with Confocal Miniprobes™ is capable of imaging ICG at different concentrations and pafolacianine-labeled cells.

Performance Testing - Animal Completed:

The objective of this animal study was to assess the capability of the Cellvizio® 100 series F800 model with its Confocal Miniprobes™, also called Confocal Laser Endomicroscopy (CLE), to image cells targeted by pafolacianine sodium in tumor cell culture, and in tumor-bearing mice *in vivo* and *ex vivo*.

This animal study demonstrated that Cellvizio® 100 series F800 model with its Confocal Miniprobes™ can provide high quality images at microscopic level, in real-time, pafolacianine sodium targeted cells and tissues. Endomicroscopic images demonstrated adequate resolution and sensitivity to identify different cell types in different tissues and visualize distinct cell architectures based on pafolacianine sodium biodistribution in the tumor and normal organs.

Performance Testing - Clinical:

Five (5) studies have been reported on the use of the Cellvizio® 100 series F800 confocal laser endomicroscopy for tissue characterization using ICG as a contrast agent.

All studies reported clear visualization of the cellular cytoarchitecture with the Cellvizio® 100 series F800 after intravenous injection of ICG in different tissues, such as the brain, liver, peritoneum, lymph node, diaphragm, colon, stomach, and adrenal gland.

Summary:

The subject device, the Cellvizio® 100 series F800 model with Confocal Miniprobes™ and the predicate device Medtronic VS3-785 nm Iridium System (K210265) have the same intended use and the same operating procedure and are made of the same, main components (optical fibers and optical lenses) that allow imaging of tissues, the vascular system or the lymphatic system.

The subject device, the Cellvizio® 100 series F800 model with Confocal Miniprobes™ and the predicate device Medtronic VS3-785 nm Iridium System (K210265) are comparable when used in conjunction with ICG or pafolacianine as:

- The concentration, rate of administration, or route of administration for the use of ICG or pafolacianine are the same for both devices and as those described in the approved labeling of the contrast agents.
- Body systems imaged with the Cellvizio® 100 series F800 model and the predicate device in conjunction with pafolacianine (tissues that have taken up pafolacianine) and ICG (vascular system or lymphatic system) are the same as those described in the approved labeling of the contrast agent, pafolacianine and ICG.
- The patient population for which the subject device will be used is the same as the predicate, the VS3 Iridium System. Indeed, the predicate system is used to perform intraoperative fluorescence imaging of tissues that have taken up the drug. The subject device is used to perform fluorescence imaging of tissues that have taken up the drug during endoscopic, laparoscopic surgical, and surgical procedures.
- The imaging modality performed by both the predicate and the subject devices is comparable. Both devices achieve fluorescence imaging by:
  - ✧ exciting fluorescent components within the human tissue that have taken up pafolacianine with the laser light emitted at 785nm
  - ✧ receiving fluorescence signal emitted from tissues that have taken up pafolacianine within the spectral detection bandwidth (800-850 nm for the VS3 Iridium System and 800-905 nm for the Cellvizio®).

In both cases, ICG and Pafolacianine are administered to the patient according to their approved labeling, excitation light is shown onto the tissue and emitted fluorescent light is used to observe the blood flow in vascular areas or visualize the lymphatic system for ICG (depending on the route of administration or ICG), or perform fluorescence imaging of tissues that have taken up the Pafolacianine. While the systems have specific technological differences, they each have the functions for viewing and recording fluorescent images. The technological differences do not raise different questions of safety or effectiveness.

Both devices use ICG and Pafolacianine as contrast agents to perform fluorescent imaging without changes to the formulation, mode of action, approved dose or route of administration.

ICG and Pafolacianine are used in an identical manner for both devices.

Additionally, the Confocal Miniprobes™ of the subject device have the same technical characteristics (maximum field of view, depth of observation, lateral resolution) as Confocal Miniprobes™ of the reference device.

The subject device, the Cellvizio® 100 (F800) series system with Confocal Miniprobes™ and the reference device, Cellvizio® 100 (F400) series system with Confocal Miniprobes™ (cleared via K191144), have the same indications for use. The resolution and optical characteristics of the Confocal Miniprobes™ on both the reference and subject devices are identical.

Therefore, Mauna Kea respectfully asserts that the Cellvizio® 100 series system with its Confocal Miniprobes™ described in this submission is as safe, as effective, and performs as well as the VS3-785 nm Iridium System (K210265) and is identical to the previously cleared Cellvizio® 100 Series system with Confocal Miniprobes reference device (cleared via K191144).