April 29, 2022

EXINI Diagnostics AB
℅ Donna-Bea Tillman, Ph.D.
Senior Consultant
Biologics Consulting Group, Inc.
1555 King Street, Suite 300
ALEXANDRIA VA 22314

Re: K220590
Trade/Device Name: aPROMISE X
Regulation Number: 21 CFR 892.2050
Regulation Name: Medical image management and processing system
Regulatory Class: Class II
Product Code: LLZ
Dated: February 28, 2022
Received: March 1, 2022

Dear Donna-Bea Tillman:

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,

Julie Sullivan, Ph.D.
Assistant Director
Nuclear Medicine and Radiation Therapy Branch
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 Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
K220590

Device Name
aPROMISE X

Indications for Use *(Describe)*
aPROMISE X is intended to be used by healthcare professionals and researchers for acceptance, transfer, storage, image display, manipulation, quantification and reporting of digital medical images. The system is intended to be used with images acquired using nuclear medicine (NM) imaging, using PSMA PET/CT. The device provides general Picture Archiving and Communications System (PACS) tools as well as a clinical application for oncology including marking of regions of interest and quantitative analysis.

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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In accordance with 21 CFR 807.87(h) and 21 CFR 807.92 the 510(k) Summary for aPROMISE X is provided below.

1. SUBMITTER

K220590

Applicant:	EXINI Diagnostics AB Ideon Science Park Scheelevägen 27 223 70 Lund Sweden
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Submission Correspondent:	Donna-Bea Tillman, Ph.D. Senior Consultant Biologics Consulting 1555 King Street, Suite 300 Alexandria, Virginia 22314 (410) 531-6542 dtillman@biologicsconsulting.com

Date Prepared:	February 28, 2022

2. DEVICE

Device Trade Name:	aPROMISE X
Device Common Name:	Picture Archiving and Communication System
Classification Name	21 CFR 892.2050 Medical Image Management and Processing System
Regulatory Class:	II
Product Code:	LLZ

3. PREDICATE DEVICE

Predicate Device:	Exini aPROMISE (K211655)

4. DEVICE DESCRIPTION

*aPROMISE (**a**utomated **PRO**state specific **M**embrane Antigen **I**maging **SE**gmentation) X* is an updated version of previously cleared device, *aPROMISE v 1.2.1 (*K211655), with a web interface where users can upload body scans of PSMA PET/CT image data in the form of DICOM files, review patient studies and share study assessments within a team. The software platform has two installation configurations: either deployed to a cloud infrastructure or to a local server at a clinical facility. The software platform can communicate via http-protocol as described in part 18 of the DICOM standard. This compatibility enables direct transmission of DICOM data from a PACS to aPROMISE X. Manual upload via aPROMISE X user interface is also supported. The software complies with the Digital Imaging and Communications in Medicine (DICOM) 3 standard.

Multiple scans can be uploaded for each patient and the system provides a separate review for each study. The review page display studies in a 4-panel view showing PET, CT, PET/CT fusion and maximum intensity projection (MIP) simultaneously and includes the option to display each view separately. The device is used to review entire patient studies, using image visualization and analysis tools for users to identify and mark regions of interest (ROIs). While reviewing image data, users can mark ROIs by selecting from pre-defined hotspots that are highlighted when hovering with the mouse pointer over the segmented region, or by manual drawing, i.e selecting individual voxels in the image slices to include as hotspots. Selected or drawn hotspots are subject to automatic quantitative analysis. The user can review the results of this quantitative analysis and determine which hotspots should be reported as suspicious lesions.

To create a report the signing user is required to confirm quality control, and electronically sign the report preview. Signed reports are saved in the device and can be exported as a JPG or DICOM file.

5. INTENDED USE/INDICATIONS FOR USE

aPROMISE X is intended to be used by healthcare professionals and researchers for acceptance, transfer, storage, image display, manipulation, quantification and reporting of digital medical images. The system is intended to be used with images acquired using nuclear medicine (NM) imaging, using PSMA PET/CT. The device provides general Picture Archiving and Communications System (PACS) tools as well as a clinical application for oncology including marking of regions of interest and quantitative analysis.

6. SUBSTANTIAL EQUIVALENCE

Comparison of Indications

aPROMISE X and the predicate aPROMISE have identical Indication for Use statements.

Technological Comparisons

The table below compares the key technological feature of the subject device aPROMISE X to the predicate devices, Exini aPromise (K211655).

Table 1: Technological Comparison

Specification/ Characteristic	***aPROMISE*** X (proposed device)	**aPROMISE 1.2.1** (predicate device)	***Comparison to predicate***
General			
Intended user	Health care professionals and researchers	Health care professionals and researchers	No difference
Intended use environment	Healthcare clinics	Healthcare clinics	No difference
Classification	21 CFR 892.2050 System, Image Processing, Radiological (LLZ) Class II	21 CFR 892.2050 System, Image Processing, Radiological (LLZ) Class II	No difference
Installation	Web-based service accessed through cloud infrastructure **or local server network** with personal log-in.	Web-based service accessed through cloud infrastructure with personal log-in.	Equivalent The difference involves an additional option for product deployment. The difference does not affect the clinical use of the device and does not raise different questions of safety or effectiveness.
Operating system	Windows or macOS with Chrome browser	Windows or macOS with Chrome browser	No difference
DICOM compatibility and Imaging Modalities	DICOM 3: Whole body • PET • CT	DICOM 3: Whole body • PET • CT	No difference
Image upload	Via file selector or drag and drop from a local computer or network. Upload can handle zip files. **Semiautomatic transfer via http-protocol enabling direct transmission of DICOM data if integrated with a PACS.**	Via file selector or drag and drop from a local computer or network. Upload can handle zip files.	Equivalent The difference involves an additional option for image upload. The difference does not affect the clinical use of the device and does not raise different questions of safety or effectiveness.
Support for multiple scans	Yes, multiple scans can be analyzed one at a time.	Yes, multiple scans can be analyzed one at a time.	No difference

Specification/ Characteristic	***aPROMISE*** X (proposed device)	**aPROMISE 1.2.1** (predicate device)	***Comparison to predicate***
Colormaps	A selection of commonly used colormaps supported: For PET image: • Cool • Inverted grayscale • Grayscale with overflow • Hot Iron • Spectrum • Warm For CT image: • Grayscale	A selection of commonly used colormaps supported: For PET image: • Cool • Inverted grayscale • Grayscale with overflow • Hot Iron • Spectrum • Warm For CT image: • Grayscale	No difference
Zoom	Automatically adjusted image size. Manually adjustable zoom in planar views	Automatically adjusted image size. Manually adjustable zoom in planar views	No difference
Windowing	Manual adjustment of windowing. Slider or selection form a drop-down menu for PET. Click'n'drag or selection from a drop-down menu for CT	Manual adjustment of windowing. Slider or selection form a drop-down menu for PET. Click'n'drag or selection from a drop-down menu for CT	No difference
Image layouts	4 panel view showing PET, CT, PET/CT fusion and MIP simultaneously and option to display each view separately. Coronal, axial and sagittal views can be displayed	4 panel view showing PET, CT, PET/CT fusion and MIP simultaneously and option to display each view separately. Coronal, axial and sagittal views can be displayed	No difference
Intensity display	Local intensity displayed in left corner of the image when hovering over image	Local intensity displayed in left corner of the image when hovering over image	No difference
Hotspot display	Segmented hotspots can be displayed in planar views if the user turns on the hotspot segmentation display option from the control panel resulting in	Segmented hotspots can be displayed in planar views if the user turns on the hotspot segmentation display option from the control panel resulting in	No difference

Specification/ Characteristic	***aPROMISE*** X (proposed device)	**aPROMISE 1.2.1** (predicate device)	***Comparison to predicate***
	visually presenting pre-defined hotspots in the viewer.	visually presenting pre-defined hotspots in the viewer.	
Organ Segmentation	AI enabled automated segmentation of skeleton and soft tissue organs.	AI enabled automated segmentation of skeleton and soft tissue organs.	Equivalent The option to segment the prostate is removed since it is no longer needed as a result of the new hotspot detection model. The difference does not affect the clinical use of the device and does not raise different question of safety or effectiveness.
Pre-definition of Hotspot	Algorithm, using a **machine-learning** model to detect high local intensity regions of interest in the PET series.	Algorithm, using an **analytical model** to detect high local intensity regions of interest in the PET series.	Equivalent Same feature but adjusted method for the detection of high local intensity regions to segment as hotspots. The difference does not affect the clinical use of the device and do not raise different questions of safety or effectiveness.
Hotspot pre-selection	No hotspot pre-selection occurs. It is always the user who needs to select hotspots to include for quantification and reporting. All detected high local intensity ROIs can be shown for review by the user.	No hotspot pre-selection occurs. It is always the user who needs to select hotspots to include for quantification and reporting. All detected high local intensity ROIs can be shown for review by the user.	No difference
Hotspot verification	The user can select pre-defined segmentation of hotspots or segment each hotspot manually that are considered to be lesions by the user.	The user can select pre-defined segmentation of hotspots or segment each hotspot manually that are considered to be lesions by the user.	No difference
Hotspot Quantification	Standard Uptake Values (SUV): -SUV-max	Standard Uptake Values (SUV): -SUV-max	No difference

Specification/ Characteristic	***aPROMISE*** X (proposed device)	**aPROMISE 1.2.1** (predicate device)	***Comparison to predicate***
	-SUV-mean -SUV-peak -Volume -Lesion Index (LI) -Intensity-weighted Tissue Lesion Volume (ITLV)	-SUV-mean -SUV-peak -Volume -Lesion Index (LI) -Intensity-weighted Tissue Lesion Volume (ITLV)	
Quality Control	SW enforced requirement to verify the user review of - Image quality - PET/CT image alignment - Patient study data - Reference values - Study is not a superscan	SW enforced requirement to verify the user review of - Image quality - PET/CT image alignment - Patient study data - Reference values - Study is not a superscan	No difference
User confirmation for report generation	User completion of the Quality Control and report preview confirmation by electronic signature using user-ID and password is required for report creation	User completion of the Quality Control and report preview confirmation by electronic signature using user-ID and password is required for report creation	No difference
Report (Summary page export)	The user can export the report with quantification results of a study to the hard drive (jpg or DICOM Secondary Capture) **or PACS** (DICOM Secondary Capture).	The user can export the report with quantification results of a study to the hard drive (jpg or DICOM Secondary Capture.	No difference
CSV export	Supports export of study and quantification values as a CSV file for all created reports	Supports export of study and quantification values as a CSV file for all created reports	No difference

7. PERFORMANCE DATA

Sterilization and Shelf Life

aPROMISE X consists entirely of software; accordingly, there are no sterilization concerns. As a software only device, shelf-life (including performance date) is also not applicable because of low likelihood of time-dependent product degradation.

Biocompatibility Testing

There are no direct or indirect patient-contacting components of the subject device. Therefore, patient contact information is not needed for this device.

Electrical safety and electromagnetic compatibility (EMC)

Not applicable. The subject device is a software-only device. It contains no electric components, generates no electrical emissions, and uses no electrical energy of any type.

Software Verification and Validation Testing

Software verification and validation testing were conducted and documentation was provided as recommended by FDA's Guidance for Industry and FDA Staff, "Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices." The software for this device was considered as a **moderate** level of concern.

Bench Testing

Exini performed the following studies verify and validate the performance of aPROMISE.

- Digital Phantom Validation Study. This study assessed the accuracy, linearity, and limit of detection of aPROMISE X against the known values of a digital reference object (NEMA phantom). All SUV and volume quantification tests of aPROMISE X met their predetermined acceptance criteria.
- Comparison to Predicate. This study demonstrated the equivalent performance of aPROMISE X as compared to the previous version, predicate aPROMISE v1.2.1 (K211655) for standard functions in marking and quantitative assessments of user defined region of interest in PSMA PET/CT.
- Analytical Performance in Clinical Study. This study compared the performance of aPROMISE X to that of clinicians and demonstrated that aPROMISE X enables the automated quantification of tracer uptake are more reproducible, and efficient than those obtained manually. The study demonstrated that aPROMISE X enables the reader to achieve a higher efficiency and quantitative consistency, while maintaining the diagnostic performance of the physicians.

These results demonstrate that aPROMISE X performs in accordance with specifications and meets user needs and intended uses.

Animal Testing

Not applicable. Animal studies are not necessary to establish the substantial equivalence of this device.

Clinical Data

Not applicable. Clinical studies are not necessary to establish the substantial equivalence of this device.

8. CONCLUSION

Based on the detailed comparison, the differences between the subject and predicate devices do not raise new questions of safety and effectiveness. Software verification and performance testing demonstrate that the device performs according to the device requirements. Therefore, the aPROMISE X device can be found substantially equivalent to the predicate device.