



iRay Technology Taicang Ltd.  
% Meng Li  
Registration & Regulation Affairs Engineer  
No.33 Xinggang Rd., Taicang Port Economic  
Technological Development Zone  
Taicang, Jiangsu 215434  
CHINA

March 3, 2021

Re: K210316

Trade/Device Name: Mars 1417X Wireless Digital Flat Panel Detector  
Regulation Number: 21 CFR 892.1680  
Regulation Name: Stationary x-ray system  
Regulatory Class: Class II  
Product Code: MQB  
Dated: January 13, 2021  
Received: February 3, 2021

Dear Meng Li:

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](mailto: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

## Indications for Use

510(k) Number (if known)

K210316

Device Name

Mars1417X Wireless Digital Flat Panel Detector

Indications for Use (Describe)

Mars1417X wireless digital flat panel detector is indicated for digital imaging solutions designed to provide general radiographic diagnosis for human anatomy including both adult and pediatric patients. It is intended to replace film/screen systems in all general-purpose diagnostic procedures. The device is not intended for mammography or dental applications.

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) SUMMARY OF SAFETY AND EFFECTIVENESS**

(As Required by 21 CFR 807.92)

K210316

**1. Date Prepared [21 CFR 807.92(a)(1)]**

January 13, 2021

**2. Submitter's Information [21 CFR 807.92(a)(1)]**

**Company Name:** iRay Technology Taicang Ltd.  
**Company Address:** No.33 Xinggang Road, Taicang Port Economic and  
Technological Development Zone, Jiangsu, China 215434  
**Contact Person:** Junjie.Qian  
**Phone:** 0512-53690872  
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**3. Trade Name, Common Name, Classification [21 CFR 807.92(a)(2)]**

**Trade Name:** Wireless Digital Flat Panel Detector  
**Common Name:** Solid State X-Ray Imager  
**Model Name:** Mars1417X  
**Classification Name:** Stationary X-Ray System  
**Product Code:** MQB  
**Regulation Number:** 21 CFR 892.1680  
**Device Class:** Class II

**4. Identification of Predicate Devices(s) [21 CFR 807.92(a)(3)]**

The identification predicates within this submission are as follows:

<b><u>Manufacturer:</u></b>	iRay Technology Taicang Ltd.
<b><u>Trade Name:</u></b>	Wireless Digital Flat Panel Detector
<b><u>Model Name:</u></b>	Mars1417V-TSI
<b><u>Product Code:</u></b>	MQB
<b><u>Classification Name:</u></b>	Stationary X-Ray System
<b><u>Regulation Number:</u></b>	21 CFR 892.1680
<b><u>Device Class:</u></b>	Class II
<b><u>FDA 510 (k) #:</u></b>	K201004

**5. Description of the Device [21 CFR 807.92(a)(4)]**

Mars1417X Wireless Digital Flat Panel Detector (Hereinafter referred to as Mars1417X) is the kind of wireless digital flat panel detector. It supports the single frame mode, with the key component of TFT/PD image sensor flat panel of active area: 35cm×43cm.

The sensor plate of Mars1417X is direct-deposited with CsI scintillator to achieve the conversion from X-ray to visible photon. The visible photons are transformed to electron signals by diode capacitor array within TFT panel, which are composed and processed by connecting to scanning and readout electronics, consequently to form a panel image by transmitting to PC through the user interface.

The major function of the Mars1417X is to convert the X-ray to digital image, with the application of high resolution X-ray imaging. Both kinds of detectors are the key component of DR system, enable to complete the digitalization of the medical X-ray imaging with the DR system software.

iRay SDK(include iDetector) is intended to supply API interface for DR system manufacturers. DR system manufacturer control the detector by SDK interface. SDK is not intend to be used directly by other users beside DR system manufacturers.

**6. Intended Use [21 CFR 807.92(a)(5)]****6.1. Indications for use**

Mars1417X wireless digital flat panel detector is indicated for digital imaging solutions designed to provide general radiographic diagnosis for human anatomy including both adult and pediatric patients. It is intended to replace film/screen systems in all general-purpose diagnostic procedures. The device is not intended for mammography or dental applications.

**6.2. Suitable patient**

It is suitable for providing digital X-ray imaging for DR system to provide general radiographic diagnosis for human anatomy including both adult and pediatric patients, but not intended for mammography or dental applications. The remaining notes depend on the DR system.

**6.3. Processing of input and output**

When flat panel detector works continuously, it can automatically distinguish X-ray and output an imaging for diagnosis of disease, injury, or of any applicable health problem.

**7. Technological Characteristic [21 CFR 807.92(a)(6)]**

Item	Predicate Device: Mars1417V-TSI Wireless Digital Flat Panel Detector Mano4336W Wireless Digital Flat Panel Detector	Proposed Device: Mars1417X Wireless Digital Flat Panel Detector
510(K) Number	K201004	K210316
Intended Use	Mars1417V-TSI Wireless Digital Flat Panel Detector and Mano4336W Wireless Digital Flat Panel Detector are indicated for digital imaging	same

Item	<p>Predicate Device:</p> <p>Mars1417V-TSI Wireless Digital Flat Panel Detector</p> <p>Mano4336W Wireless Digital Flat Panel Detector</p>	<p>Proposed Device:</p> <p>Mars1417X Wireless Digital Flat Panel Detector</p>
	<p>solution designed for providing general radiographic system in all general-purpose diagnostic procedures.</p>	
Indications for Use	<p>Mars1417V-TSI wireless digital flat panel detector and Mano4336W wireless digital flat panel detector are indicated for digital imaging solutions designed to provide general radiographic diagnosis for human anatomy including both adult and pediatric patients. They are intended to replace film/screen systems in all general-purpose diagnostic procedures. These two devices are not intended for mammography, dental applications.</p>	<p>Mars1417X wireless digital flat panel detector is indicated for digital imaging solutions designed to provide general radiographic diagnosis for human anatomy including both adult and pediatric patients. It is intended to replace film/screen systems in all general-purpose diagnostic procedures. The device is not intended for mammography or dental applications.</p>
Classification Name	Stationary X-ray system	Same
Product Code	MQB	Same
Regulation Number	21 CFR 892.1680	Same

Item	Predicate Device: Mars1417V-TSI Wireless Digital Flat Panel Detector Mano4336W Wireless Digital Flat Panel Detector	Proposed Device: Mars1417X Wireless Digital Flat Panel Detector
Panel:	Radiology	Same
Classification:	II	Same
X-Ray Absorber (Scintillator):	CsI	Same
Installation Type:	Wireless, Portable	Same
Readout Mechanism:	Thin Film Transistor	Same
Image Matrix Size:	2304 × 2800 pixels	3500 × 4300 pixels
Pixel Size:	150µm	100µm
ADC Digitization	16 bit	Same
Effective Imaging Area:	345.6 mm × 420.0 mm	350.0 mm × 430.0 mm
Spatial Resolution:	Min. 3.3lp/mm	Min. 4.3lp/mm
Modulation Transfer Function (MTF)	0.68 at 1 lp/mm	0.65 at 1 lp/mm
Detective Quantum Efficiency (DQE)	0.36 at 1 lp/mm (RQA5, 2.5µGy)	0.54 at 1 lp/mm (RQA5, 2.5µGy)
Power Consumption:	Max. 19W	Same



Item	Predicate Device: Mars1417V-TSI Wireless Digital Flat Panel Detector Mano4336W Wireless Digital Flat Panel Detector	Proposed Device: Mars1417X Wireless Digital Flat Panel Detector
Communications: (Wireless functionality)	a) Wired (only for service) : Gigabit Ethernet (1000BASE-T) b) Wireless: IEEE 802.11a/b/g/n/ac (2.4 GHz / 5 GHz)	Same
Imaging protect Plate:	Carbon Fiber Plate	Same
Cooling:	Air cooling	Same
Dimensions:	384 mm × 460 mm × 15 mm	Same
Detector IP grade	IPX1	IP56
Surface pressure	Uniform load: 150 kg over the whole area of the surface; Local load: 100 kg on an area 4 cm diameter of center	Uniform load: 300 kg over the whole area of the surface; Local load: 150 kg on an area 4 cm diameter of center
Operation:	Temperature: +5 ~ +35°C Humidity: 10 ~ 90% (Non-Condensing) Atmospheric pressure: 70 ~ 106 kPa Altitude: Max. 3000 meters	Temperature: +10 ~ +35°C Humidity: 5 ~ 90% (Non-Condensing) Atmospheric pressure: 70 ~ 106 kPa Altitude: Max. 3000 meters
Storage and Transportation:	Temperature: -20 ~ +55°C Humidity: 5 ~ 95%	Temperature: -20 ~ +55°C Humidity: 5 ~ 95%

Item	<p>Predicate Device:                  Mars1417V-TSI Wireless Digital Flat Panel Detector                  Mano4336W Wireless Digital Flat Panel Detector</p>	<p>Proposed Device:                  Mars1417X Wireless Digital Flat Panel Detector</p>
(detector)	<p>(Non-Condensing)                  Atmospheric pressure: 70 ~ 106 kPa                  Altitude: Max. 3000 meters</p>	<p>(Non-Condensing)                  Atmospheric pressure: 60 ~ 106 kPa                  Altitude: Max. 3000 meters</p>
Software	<p>iRay SDK(include iDetector) is intend to supply API interface for DR system manufacturers. DR system manufacturer control the detector by SDK interface. SDK is not intend to use directly by other users beside DR system manufacturers.</p>	<p>Same</p>
Utilized FDA guidance documents	<ol style="list-style-type: none"> <li>1. Guidance for the Submission of 510(k)'s for Solid State X-ray Imaging Devices;</li> <li>2. The 510(k) Program: Evaluating Substantial Equivalence in Premarket Notifications[510(k)];</li> <li>3. Content of Premarket Submissions for Management of</li> </ol>	<p>Additionally:</p> <ol style="list-style-type: none"> <li>1. The Special 510(k) Program;</li> <li>2. Design Control Guidance For Medical Device Manufacturers;</li> <li>3. Appropriate Use of Voluntary Consensus Standards in Premarket Submissions for Medical Devices.</li> </ol>

Item	Predicate Device: Mars1417V-TSI Wireless Digital Flat Panel Detector Mano4336W Wireless Digital Flat Panel Detector	Proposed Device: Mars1417X Wireless Digital Flat Panel Detector
	Cybersecurity in Medical Devices; 4. Radio Frequency Wireless Technology in Medical Devices; 5. Guidance for “Premarket Assessment of Pediatric Medical Devices”; 6. Guidance for “Pediatric Information for X-ray Imaging Device Premarket Notifications”.	

**8. System requirements to operate with other radiographic system components**

1) Recommended Generator Specification:

Energy range: 40~150kVp

mA range: 10~1000mA (depending on the generator power)

ms range: 10~6300ms to produce 0.1~1000mAs (depending on the generator power)

Note: To our best knowledge, the detector is compatible with the X-ray generators with the specifications described above. If you have any questions regarding the compatibility issue for other generators, please contact the distributor or iRay’s service office.

2) Application Program Interface (API) for system integration manufacturer

Peripheral hardware: Mars1417X connected via wireless communication.

Operating System:	Windows XP/7/8/10, 32/64bit
CPU:	Intel Core i7 3.6G
Memory:	4G DDR3
Hard Disk:	640 G
LAN Card:	Intel Pro EXP9301CT PRO Gigabit Network Adapter with PCIe interface

3) X-ray exposure mode

The AED trigger module is a unit can connect X-ray signal in the Mars1417X. Once there is X-ray generator exposure exist, the AED trigger module will detect the X-ray radiation and output signal to the detector. Until the exposure finished, the detector will receive a signal which represent the end of exposure from the inner trigger module and begin to acquire the image.

**9. Substantial Equivalence [21 CFR 807.92(b)(1) and 807.92(b)(2)]**

1) Electrical Safety and EMC testing:

Electrical, mechanical, environmental safety according to IEC/ES 60601-1 was performed, and EMC testing was also conducted in accordance with IEC 60601-1-2. All test results are meet the standard requirements.

2) Biological Evaluation:

The materials of the detector which contact operators' or patient's skin have been evaluated with the ISO 10993-1. And the evaluation results and test result assured the safety the same as the predicate device.

3) Non-clinical Considerations:

One main modification from the predicate device is Amorphous Silicon (a-Si) panel size design, related to Amorphous Silicon (A-Si) panel size. Another modification is structure design with higher IP grade and surface pressure performance.

The non-clinical studies have been performed and the results have shown that sections of the non-clinical consideration mentioned in the 'Guidance for the

Submission of 510(k)s for Solid State X-ray Imaging Devices' are substantially equivalent to the non-consideration of predicate devices on the Market (Mars1417V-TSI, K201004).

4) **Clinical Consideration:**

Intended use, fundamental scientific technology, regulatory requirement, non-clinical performance, labeling, quality-assurance program and software keep the same with those of predicate device. Additionally, as mentioned in clinical considerations in 'Guidance for the Submission of 510(k)s for Solid State X-ray Imaging Devices', clinical consideration may not necessary for changes in the dimensions of the image receptor with otherwise identical materials if non-clinical information is sufficient to support the substantial equivalence.

**10. Conclusion [21 CFR 807.92(b)(3)]**

In accordance with the Federal Food, Drug and Cosmetic Act, 21 CFR Part 807 and based on the information provided in this premarket notification, iRay Technology Taicang Ltd. concludes that Mars1417X is substantially equivalent to predicate device with regards to safety and effectiveness.