

# MobileDaRt Evolution EFX Version Mobile X-Ray System

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## 1. Introduction

As X-ray systems progressively switch to digital technology, mobile X-ray systems are increasingly being equipped with flat panel detectors (FPDs). Key advantages of FPD-equipped systems are the immediacy of being able to view images immediately after they are obtained and the improved workflow achieved due to the ability to continue obtaining images without having to change cassettes. In addition, mobile X-ray systems equipped with an internal battery allow the mobile system to be used for multiple purposes other than for ward rounds, such as for emergency care, operating rooms, neonatal intensive-care units, or for disaster relief.

Therefore, Shimadzu released the MobileDaRt in 2005, which was Shimadzu's first mobile X-ray system equipped with a 14 × 17-inch portable FPD. Since then, Shimadzu has continued to release new models with improved performance, including the MobileDaRt Evolution, an improved version released in 2008, and a model equipped with a wireless cassette-sized FPD in 2011. As a result, over 2300 units from this series have been delivered to customers throughout the world.

In response to requests from customers using MobileDaRt Evolution mobile X-ray systems, Shimadzu has now released the EFX version, which features a variety of functionality improvements. This MEDICAL NOW article describes this new EFX version (Fig. 1).

## 2. Enhanced Basic Functionality

### (1) Significantly Shorter DR System Startup Time

The DR system startup time is now less than 1 minute, compared to over 3 minutes for previous models. A faster startup time allows you to respond more quickly to emergency radiography requests. This increased speed is achieved by including an internal solid state drive (SSD) as the DR system



Fig. 1 MobileDaRt Evolution EFX Version

memory. Unlike previous hard disk drive (HDD) units, SSD units contain no driving parts, which makes them more resistant to vibration and further improves the reliability of mobile systems. Moreover, we use industrial grade high-reliability SSDs, which eliminates any problems with sudden slow-downs that can occur with consumer-grade SSDs. Nevertheless, the SSD still provides plenty of recording capacity, which allows you to save the same number of images (over 3500) as before.

### (2) Higher Image Quality for Touch Panel Reference Monitor

A high image quality monitor provides high contrast, high brightness, and more natural shades of grade. When viewed at an angle, images were sometimes difficult to view on previous monitors, due to gradation inversion that caused low contrast or color inversion. Therefore, the new version includes an IPS type LCD monitor with a wide viewing angle that provides almost the same image quality regardless of the viewing angle.

Furthermore, LEDs are used as the light source for the backlight. LED backlighting not only provides longer monitor life, but also consumes far less energy (about half of the previous monitor) and contributes significantly to extending the system battery run time.

The touch panel is based on the same surface acoustic wave technology as before. This technology is especially well suited for medical applications, because it allows you to operate the panel with gloves on and is highly durable.



**Fig. 2** Collimator Lamp with LED Lighting

### (3) Improved Visibility and Longer Life of Collimator Lamp

Previously, a halogen lamp was used as the light source for the collimator lamp, but the new model uses an ultra bright LED lamp (Fig. 2). Consequently, the brighter illumination provides better visibility for confirming the exposure field during positioning. The halogen lamp required periodic replacement due to burned-out filaments, but the LED lamp has an extremely long life, which eliminates the need for periodic replacement. In addition, the LED lamp consumes over 80 % less power than the halogen lamp, which helps reduce the overall power consumption of the system.

### 3. New Wireless FPD Models

New models have been added to our line of wireless cassette-sized FPDs. Their main specifications are listed in Table 1. Key features are described below.

- A 17 × 17-inch size has been added to the 14 × 17 and 11 × 14-inch sizes previously available. This is especially useful for emergency care applications which require viewing images over a wide range and for larger patients.
- All three sizes are offered with either regular GOS or high-sensitivity CsI scintillators, which allows you to select an FPD best suited for the given application.
- Images can be viewed more immediately due to faster processing, requiring about 2 seconds from exposure until a preview image is displayed.

**Table 1** Key Specifications of New Wireless FPD Models

	17 × 17-inch	14 × 17-inch	11 × 14-inch
Effective Field of View	42.6 × 41.5 cm	35 × 42.6 cm	27.4 × 35 cm
Pixels	3,408 × 3,320	2,800 × 3,408	2,192 × 2,800
External Dimensions	W460 × D15.4 × H460 mm	W384 × D15 × H460 mm	W307 × D15 × H384 mm
Weight	3.8 kg (including battery)	3.3 kg (including battery)	2.2 kg (including battery)
Water Resistance	IPX4	-	-
Scintillator	CsI or GOS		
Pixel Pitch	125 × 125 μm		
Grayscale Levels	4,096 grayscale levels (12-bit)		
A/D	65,536 grayscale levels (16-bit)		
Wireless LAN Bands	2.4 GHz/5 GHz		
Preview Display Time	About 2 sec		
Battery Type	Li-ion		

- All three sizes are as thin as about 15 mm cassettes, which makes them lighter weight than previous FPD models and easier to handle.
- Multi-grid compatibility provides compatibility with a wider range of grid densities, due to improved processing technology for eliminating grid lines. The 52 lines were previously supported, but 34, 40, and 60 lines are now supported.
- The IPX4 level water resistance is achieved (waterproof to incidental water exposure, only available on the 17 × 17-inch size). This prevents any blood or water droplets that get on the FPD during use from getting inside the unit easily.
- Fast and reliable IEEE.802.11n (2.4 GHz) and IEEE.802.11n (5 GHz) bands are used for wireless communication between the FPD unit and main cart unit. The large selection of channels ensures reliable communication by reducing the risk of crosstalk or interference with other modalities.



**Fig. 3** Design Conveys a Sense of Advanced Technology and High Performance



**Fig. 4** Trim Design Around Monitor Improves Monitor Visibility

## 4. Design Conveys a Sense of Advanced Technology and High Performance

Though simple, the design concept maintains the same sense of comfortable familiarity and yet the use of colors in the design are intended to convey a sense of advanced technology and high performance (Fig. 3). For example, changing the border color around the monitor to black not only helps tie together the overall instrument design, but also helps improve functionality by improving the visibility of the monitor (Fig. 4).

## 5. Summary

Shimadzu has developed the new EFX version MobileDaRt Evolution mobile X-ray system, described above, which offers the same immediacy and other features of the previous model, but with improved performance and ease-of-operation for those features.

This system reduces the stress on operators and patients. It can be used not only to facilitate ward rounds, but also for improving the efficiency and quality of diagnostics in a wide range of other applications, such as in the pediatric department, operating room, ICU, or for emergency care.