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New X-Ray Sensors Take Aim at Market Leaders

Gordon's Clinical Observations: Do you like sensors that are thick and rigid, or don't show initial caries? Do you like high prices and frequent repairs? Can't we do better? Sensor technology has remained relatively unchanged for years. As companies recognize our frustration, some are optimizing sensors for better ease of use while others hope to develop new technology. *CR Scientists and Clinicians have evaluated some of the current sensor designs.*

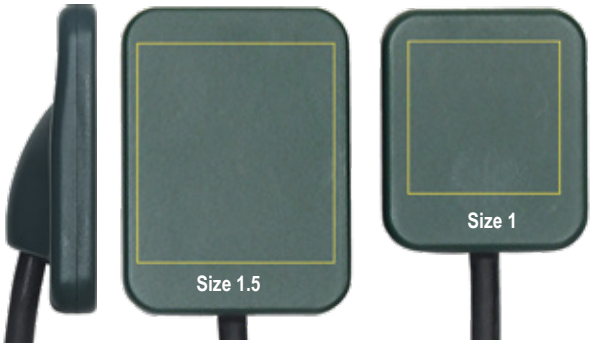
New sensors of size 1.5: Acuity (AMD Lasers) left, CARINA (Henry Schein) right

The speed and ease with which digital radiographs can be made, viewed, enhanced, stored, and retrieved has revolutionized diagnostics. However, there continues to be some challenges related to the size, thickness, patient discomfort, and cost associated with rigid sensors. Mid-sized sensors with rounded corners, epitomized by the DEXIS sensor, have become the most popular because of their balance of shape, size, imaging area, and ease of use. New sensor brands are aiming to compete in this mid-size range.

The following report shows features and performance characteristics of the Acuity sensor (AMD Lasers) and the CARINA sensor (Henry Schein), and compares them with other popular brands.

Features and Performance

► Acuity by AMD Lasers



Actual size

- CMOS sensor with direct x-ray detection technology that eliminates the scintillation layer—potentially improving image quality and allowing thinner, more durable construction
- $4,499 size 1.5 sensor; $3,499 size 1 sensor
- 3-year warranty; optional support and replacement plan $799/year
- Compatible with many major imaging systems; USB connector
- 6.2 mm thick (not counting connector), one of the thinnest sensors available
- Active imaging area of approximately 755 mm^2 for size 1.5 sensor and 400 mm^2 for size 1 sensor (shown by yellow lines superimposed over sensor housings)
- Comparisons: The DC-Air (FTG Imaging) wireless, size 2 sensor (~$11,000) also uses direct detection technology and produces excellent images. The DEXIS Titanium (DEXIS) size 1.5 sensor (~$10,000) has a similar size. The Open Sensor (DentiMax) size 2 sensor has a competitive price (~$3,000).

► CARINA by Henry Schein

Actual size

- CMOS sensor with a well-proven combination of shape and size. Clipped and rounded corners improve patient comfort and ease of positioning. Installation support and ongoing support by Henry Schein with no additional fees.
- $6,995 size 1.5 sensor
- 2-year warranty; optional 3-year extension (5-year total) available for $1,995
- Compatible with many major imaging systems; USB connection
- 8.3 mm thick (not counting connector)
- Active imaging area of approximately 790 mm^2 (shown by yellow lines superimposed over sensor housing)
- Comparisons: The DEXIS Titanium sensor (DEXIS, ~$10,000) has similar shape and size and is one of the most popular sensors in current use.

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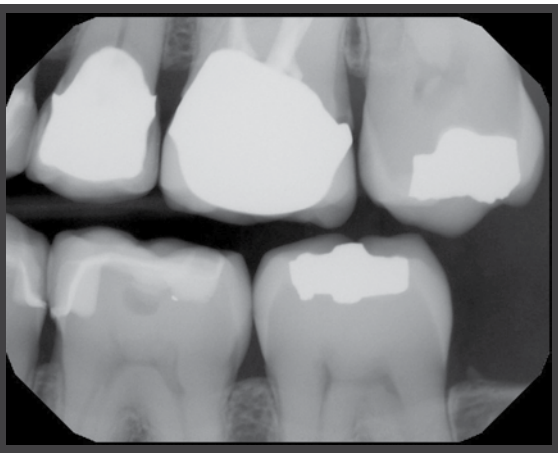
Features and Performance (Continued)

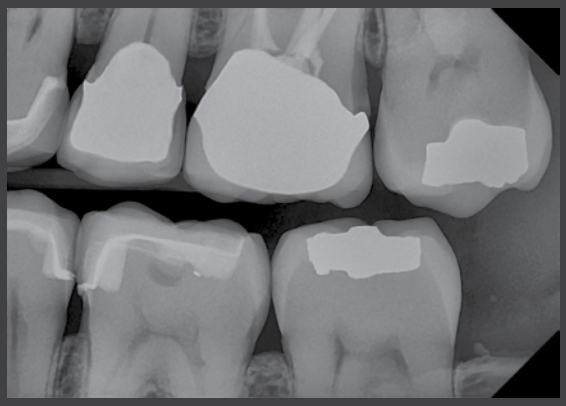
► Example clinical images

• The following radiographs were made using each system on the same patient over the course of several years as the sensors have been introduced. Each has been exported with the default settings, and additional enhancements can be made using the tools in their software.

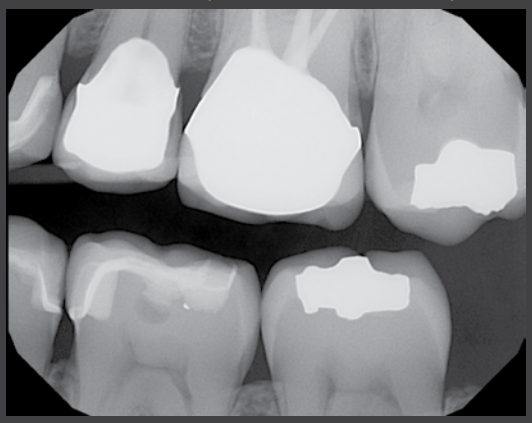
Acuity (29.0 × 26.1 mm, size 1.5)



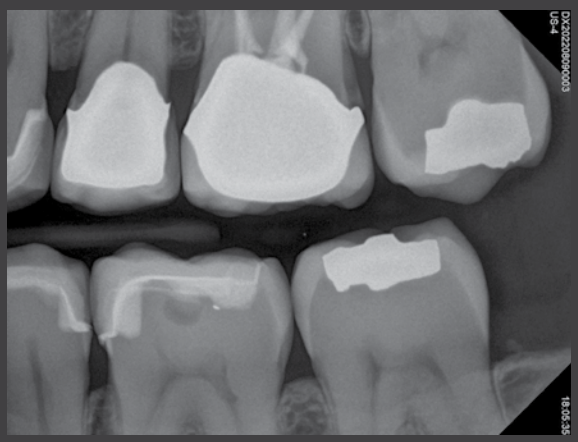
CARINA (32.7 × 25.5 mm, size 1.5)



DC-Air (34.8 × 24.4 mm, size 2)



DEXIS (32.4 × 25.4 mm, size 1.5)



Open Sensor (35.6 × 25.7 mm, size 2)

Key Observations

- **Acuity:** Good detail, sharp appearance, high contrast creating some "burnout" effect.
- **CARINA:** Good detail, smooth and "soft" appearance is reminiscent of film while retaining accurate grayscale data.
- **DC-Air:** Good detail, sharp appearance, large size captures more anatomy.
- **DEXIS:** Good detail, sharp appearance.
- **Open Sensor:** Good detail, sharp appearance, large size captures more anatomy.

Notes on anatomy: The radiolucency on tooth 19 is a buccal pit. The mesial of tooth 18 has deep cavitation through the enamel and well into the dentin, as shown by Logicon and A.I. analyses, and visualizing it is a significant challenge for digital radiography systems.

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New X-Ray Sensors Take Aim at Market Leaders *(Continued from page 2)*

Clinical Tips

- **Sensor size:** Thick and rigid CMOS sensors force a tradeoff between image size and ease of use and patient comfort. Size 2 sensors, traditionally used for bitewings and periapicals in adults, can be challenging to position in some patients with small mouths, narrow arches, active gag reflex, tori, etc. Size 1 or size 0 can be used in such situations, but the reduced image size makes capturing the critical anatomy a greater challenge. The mid-size sensor, popularized by DEXIS, has proven to be a comfortable compromise and is now the most-used sensor on the U.S. market. Acuity and CARINA both offer sensors in the 1.5 size.
- **Rounded corners:** Smooth and rounded corners significantly improve ease of insertion, positioning, and patient tolerance. Unfortunately, many barrier sleeves have sharp edges and prickly corners that defeat the smooth design of the sensor. Look for soft, pliable sheaths without sharp welded seams. The cord dictates the position of the sensor in the mouth. As the sensor is positioned closer to the midline (mesial), the corners near the cord should be rounded to adapt to the restricted space. When positioned vertically, the corners away from the cord should be rounded to better fit the mandibular vestibule or palatal arch. Ideally, all four corners should be rounded.
- **Future developments:** Conventional film had higher resolution and greater density sensitivity than digital sensors. Despite this, the advantages of digital have eclipsed film-based dental radiography. Many manufacturers are pursuing further advancements, including artificial intelligence for detecting defects that are unperceivable to human vision or when image alignment is poor; soft and flexible sensors; extraoral imaging with resolution adequate for caries diagnoses; imaging with non-ionizing radiation; and other advancements.

CR CONCLUSIONS:

The Acuity and CARINA intraoral radiography sensors both offered distinct advantages that made them competitive with current leading brands.

- Acuity utilizes direct detection technology and had lower cost than most current brands. Images were detailed and sharp appearing. Available in size 1.5 and size 1 sensors.
- CARINA utilizes a mid-size shape with clipped and rounded corners for easy positioning and patient comfort. Images were detailed with film-like appearance. Available in a size 1.5 sensor.

Both brands represent refinements of the technology and optimization of size and shape for ease of use. Their clinical image quality and competitive prices are significant advantages, and they should be strongly considered for new or replacement sensor purchases. Manufacturers are encouraged to continue their pursuit of new technology to address the challenges of hard, rigid sensors that lack the resolution of conventional film radiography.

What is CR?

WHY CR?

CR was founded in 1976 by clinicians who believed practitioners could confirm efficacy and clinical usefulness of new products and avoid both the experimentation on patients and failures in the closet. With this purpose in mind, CR was organized as a unique volunteer purpose of testing all types of dental products and disseminating results to colleagues throughout the world.

WHO FUNDS CR?

Research funds come from subscriptions to the Gordon J. Christensen Clinicians Report®. Revenue from CR's "Dentistry Update®" courses support payroll for non-clinical staff. All Clinical Evaluators volunteer their time and expertise. CR is a non-profit, educational research institute. It is not owned in whole or in part by any individual, family, or group of investors. This system, free of outside funding, was designed to keep CR's research objective and candid.

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Each year, CR tests in excess of 750 different product brands, performing about 20,000 field evaluations. CR tests all types of dental products, including materials, devices, and equipment, plus techniques. Worldwide, products are purchased from distributors, secured from companies, and sent to CR by clinicians, inventors, and patients. There is no charge to companies for product evaluations. Testing combines the efforts of 450 clinicians in 19 countries who volunteer their time and expertise, and 40 on-site scientists, engineers, and support staff. Products are subjected to at least two levels of CR's unique three-tiered evaluation process that consists of:

1. Clinical field trials where new products are incorporated into routine use in a variety of dental practices and compared by clinicians to products and methods they use routinely.
2. Controlled clinical tests where new products are used and compared under rigorously controlled conditions, and patients are paid for their time as study participants.
3. Laboratory tests where physical and chemical properties of new products are compared to standard products.

Clinical Success is the Final Test

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***CRA Foundation® changed its name to CR Foundation®* in 2008.**

This team is testing resin curing lights to determine their ability to cure a variety of resin-based composites.

Every month several new projects are completed.

THE PROBLEM WITH NEW DENTAL PRODUCTS.

New dental products have always presented a challenge to clinicians because, with little more than promotional information to guide them, they must judge between those that are new and better, and those that are just new. Because of the industry's keen competition and rush to be first on the market, clinicians and their patients often become test data for new products.

Every clinician has, at one time or another, become a victim of this system. All own new products that did not meet expectations, but are stored in hope of some unknown future use, or thrown away at a considerable loss. To help clinicians make educated product purchases, CR tests new dental products and reports the results to the profession.