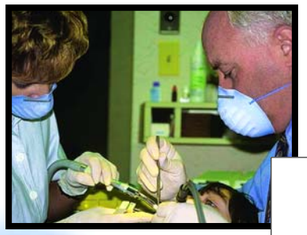
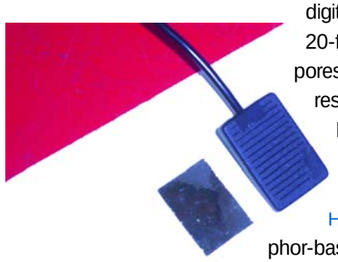


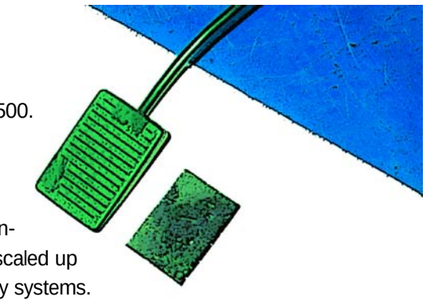
Here is a numbing fact: Fewer than 10 percent of dentists in the United States use digital imaging systems to record, enlarge, store, and transmit x-ray images of a patient's teeth. Digital imaging equipment is often bulky—which clutters small dental offices—and expensive, leading many dentists to continue using traditional film-based systems. Here is a product that makes digital x-ray imaging more attractive to dentists.

Digital Imaging Sensor

How It Helps: By providing higher resolution, improved contrast, and reduced radiation dosages, the digital imaging sensor may convince more dentists to switch from film to digital x-ray imaging. The device uses doped nanocrystalline (DNC) phosphors that can be modulated to increase light output, thereby enabling higher contrast and requiring less radiation than other digital x-ray detectors. To date, light output has been increased about 20-fold. The containment of the light within the small, closely packed pores of the device's micro-channel plate (MCP) enables increased resolution. The smaller size of the nanophosphor-based scintillator bonded to the complementary metal-oxide semiconductor (CMOS) sensor allows the unit to fit easily inside the patient's mouth.



How It Works: The digital imaging sensor consists of a nanophosphor-based scintillator integrated with a CMOS sensor. The scintillator, which converts x-ray radiation into visible light, consists of an MCP composed of between 2 and 3 million channels per square inch, each deposited with DNC phosphors. These DNC phosphors use quantum-confined atoms to emit above-normal amounts of light when acted upon by radiation. The individual channel walls of the MCP reflectively transmit the visible light generated by the DNC phosphors, similar to optical fiber, toward the CMOS sensor for digital detection. The small channels both enhance and prevent light scattering to help produce high resolution and contrast digital images that can be stored or displayed on a computer screen.



How Much It Will Cost: The digital imaging sensor and accompanying software can be purchased for about $3,500.

When It Will Be Ready: The product is slated for production in mid-2003. Prototypes have been successfully tested by the leading manufacturers of dental imaging sensors in Europe and Japan. The technology is also being scaled up and evaluated for use in retrofitting current mammography systems.

Who Is Working On It: Nanocrystals Imaging Corporation (NIC) developed this product. The company was founded in 1997 as a spinoff of Nanocrystals Technology (NCT), LP (which has raised more than $5 million in funding from private investors, mostly doctors) to exploit discoveries in the creation of high-quality digital x-ray images. NIC employs eight people and occupies 3,000 square feet of office and laboratory space. For more information, contact Dr. Rameshwar Bhargava of NIC at (914) 923-1142 or rbhargava@nanocrystals.com. The company Web site is www.nanocrystals.com.

MDA Origins

NCT developed the nanophosphor-based scintillator as part of its BMDO SBIR research. The company had already developed its DNC phosphors when, in 1994, the company applied for and won an SBIR Phase I contract from BMDO. This research aimed to measure the light-output potential of the materials. In 1999, the company won a BMDO SBIR Phase II contract to build the DNC-based scintillator, combine it with a CMOS sensor, and produce high-resolution images. BMDO supported this technology because it could be combined with x-ray, ultraviolet, or visible radiation detectors to create sensitive missile detection and tracking systems.