



Gamma Radiography (cont.)

- Most of the radioactive material used in industrial radiography is artificially produced.
- This is done by subjecting stable material to a source of neutrons in a special nuclear reactor.
- This process is called activation.





Gamma Radiography (cont.)

Unlike X-rays, which are produced by a machine, gamma rays cannot be turned off. Radioisotopes used for gamma radiography are encapsulated to prevent leakage of the material.

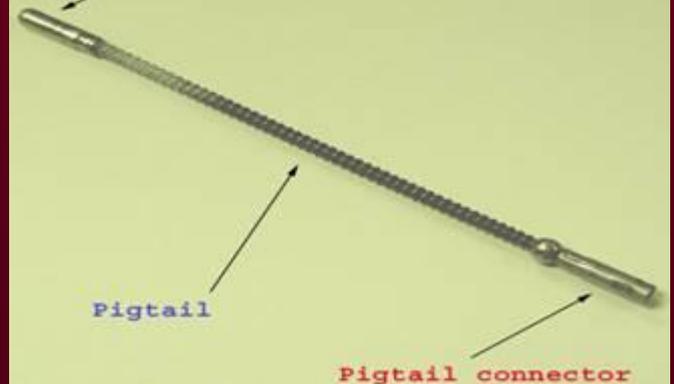
The radioactive “capsule” is attached to a cable to form what is often called a “pigtail.”

The pigtail has a special connector at the other end that attaches to a drive cable.

Iridium 191 wafers before activation & encapsulation



Welded Capsule containing source material





Computed Radiography (cont.)

After exposure:



Photo courtesy of Fuji NDT

The imaging plate is read electronically and erased for reuse in a special scanner system.

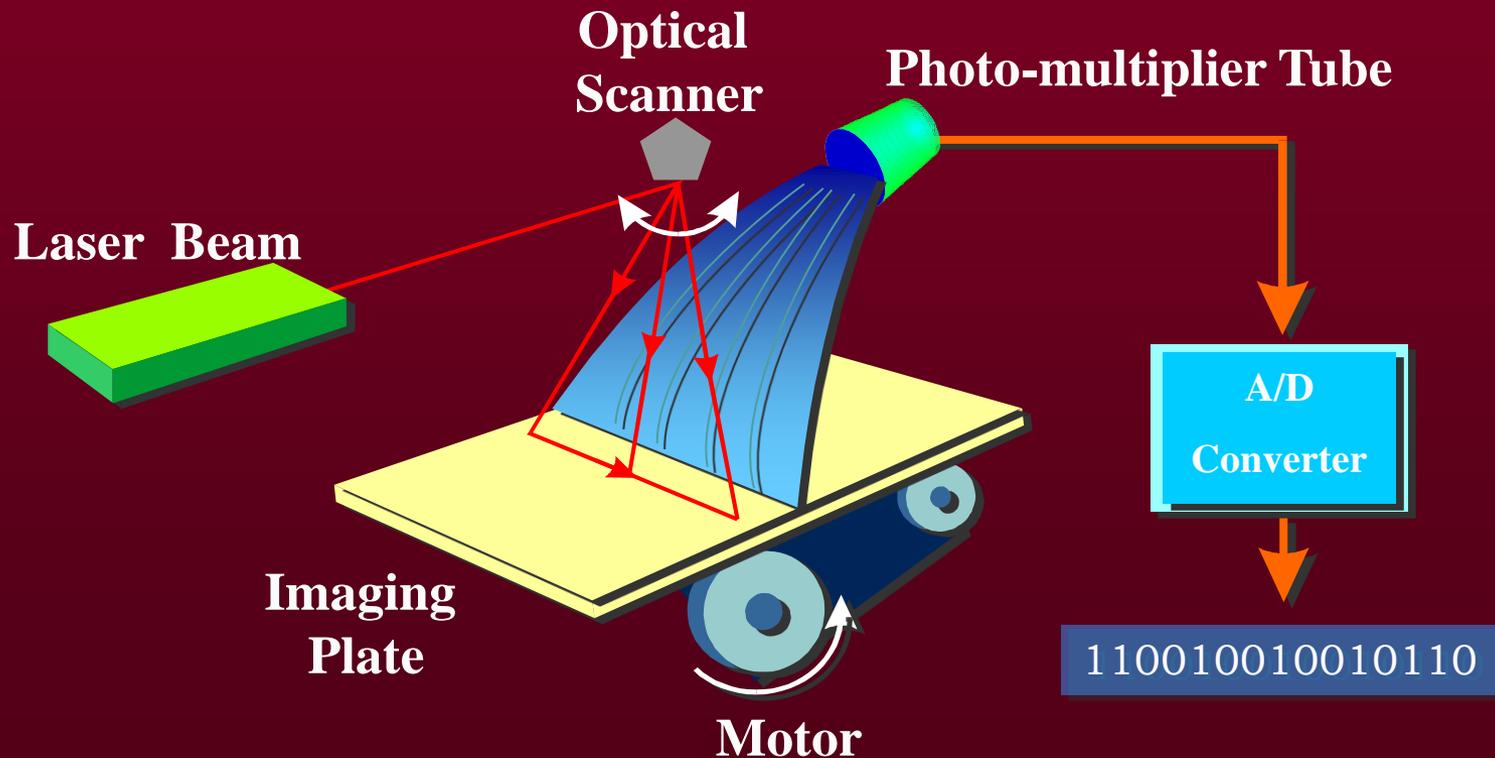


Photo courtesy of Fuji NDT



Computed Radiography (cont.)

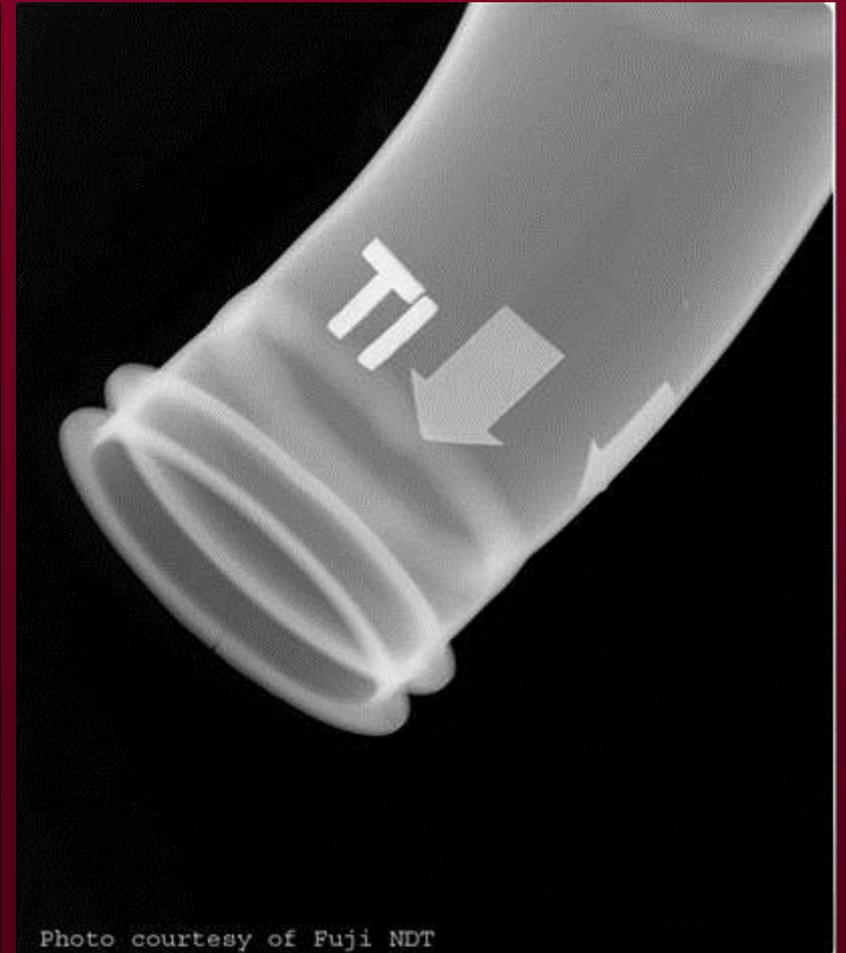
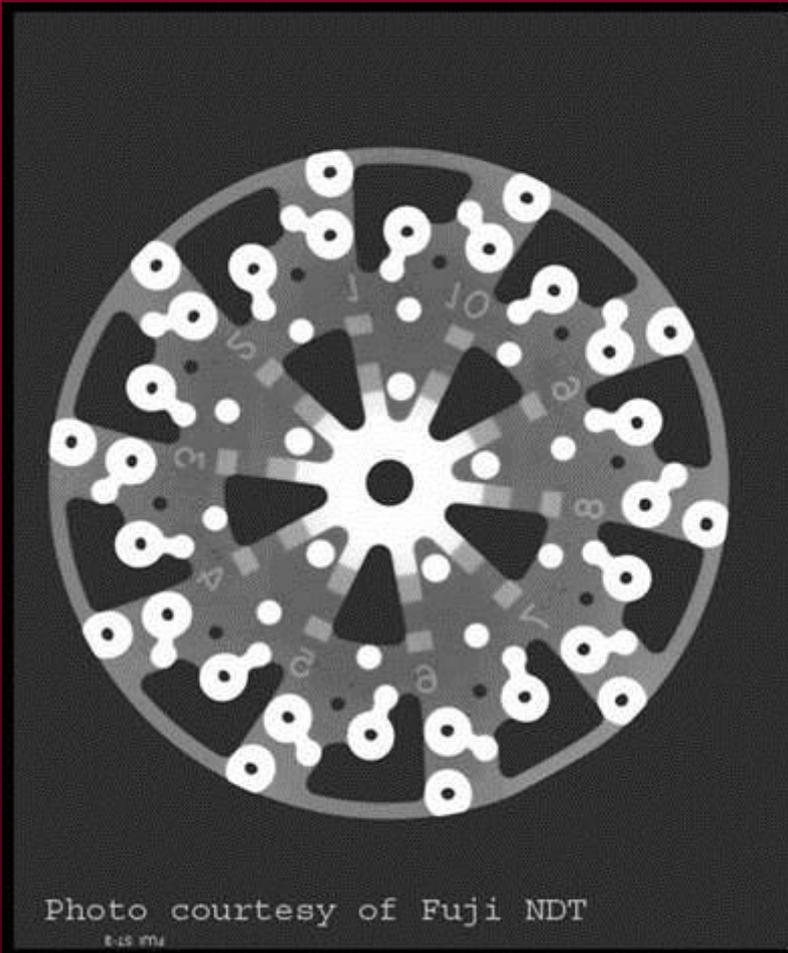
As a laser scans the imaging plate, light is emitted where X-rays stimulated the phosphor during exposure. The light is then converted to a digital value.





Computed Radiography (cont.)

Examples of computed radiographs:





Real-Time Radiography (cont.)

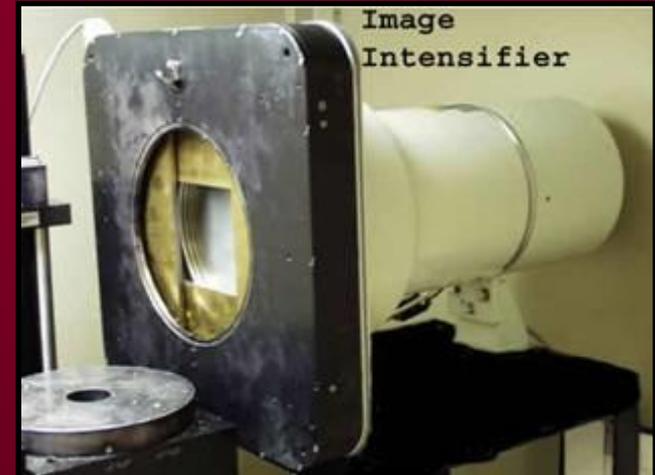
- The equipment needed for an RTR includes:
 - X-ray tube
 - Image intensifier or other real-time detector
 - Camera
 - Computer with frame grabber board and software
 - Monitor
 - Sample positioning system (optional)





Real-Time Radiography (cont.)

- The image intensifier is a device that converts the radiation that passes through the specimen into light.
- It uses materials that fluoresce when struck by radiation.
- The more radiation that reaches the input screen, the more light that is given off.
- The image is very faint on the input screen so it is intensified onto a small screen inside the intensifier where the image is viewed with a camera.





Real-Time Radiography (cont.)

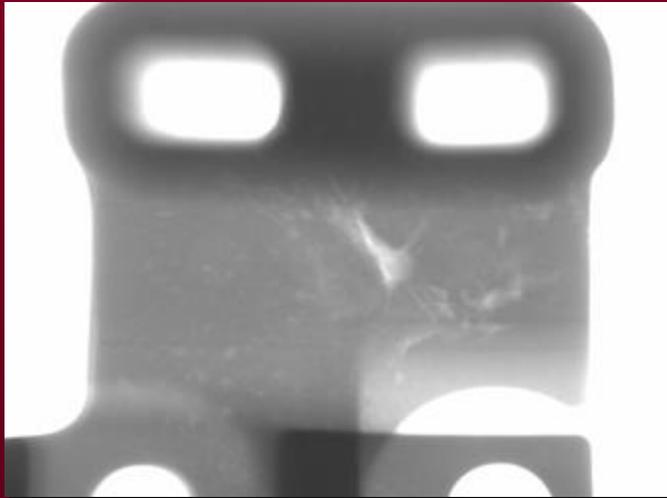
- A special camera which captures the light output of the screen is located near the image intensifying screen.
- The camera is very sensitive to a variety of different light intensities.
- A monitor is then connected to the camera to provide a viewable image.
- If a sample positioning system is employed, the part can be moved around and rotated to image different internal features of the part.



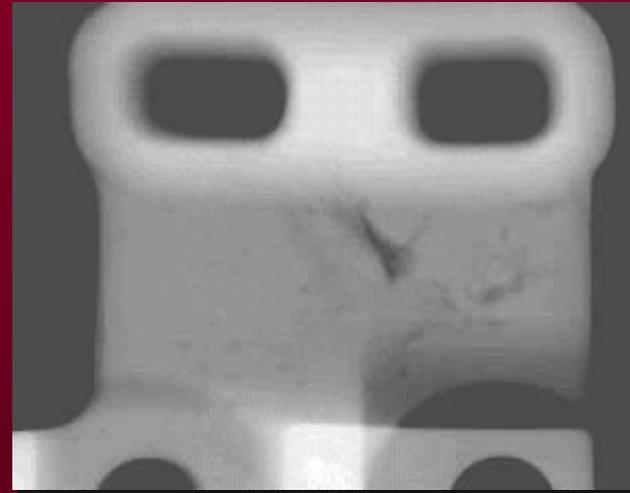


Real-Time Radiography (cont.)

Comparing Film and Real-Time Radiography



Real-time images are lighter in areas where more X-ray photons reach and excite the fluorescent screen.



Film images are darker in areas where more X-ray photons reach and ionize the silver molecules in the film.



Direct Radiography

- Direct radiography (DR) is a form of real-time radiography that uses a special flat panel detector.
- The panel works by converting penetrating radiation passing through the test specimen into minute electrical charges.
- The panel contains many micro-electronic capacitors. The capacitors form an electrical charge pattern image of the specimen.
- Each capacitor's charge is converted into a pixel which forms the digital image.

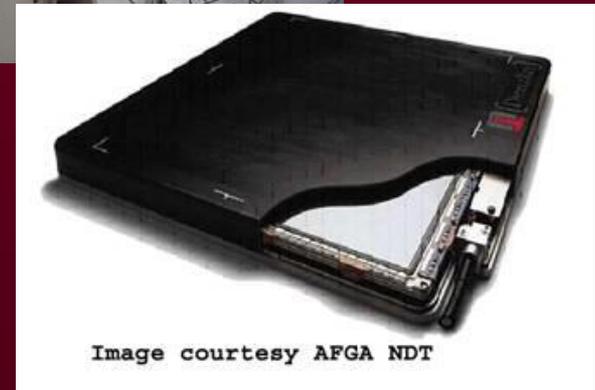
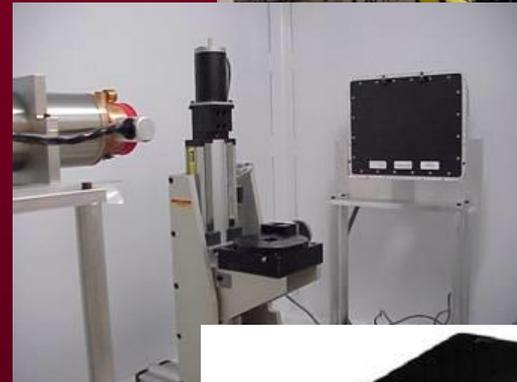


Image courtesy AFGA NDT