Why do quality assurance testing of X-ray equipment?

Guidance on what to consider

Photo courtesy Unilabs Almedal, Sweden

Why do we need to make QA-testing?

Quality assurance is an organized set of activities and processes ensuring properly functioning X-ray equipment which provide satisfactory diagnostic information with minimum radiation dose to patients. Poor equipment performance is a significant cause of poor image quality. Poor image quality means less adequate diagnostic information. Repeated imaging may be required, thereby leading to increased radiation dose for both patients and personnel. A good quality control program is proactive, and can in addition result in equipment and operational cost savings.
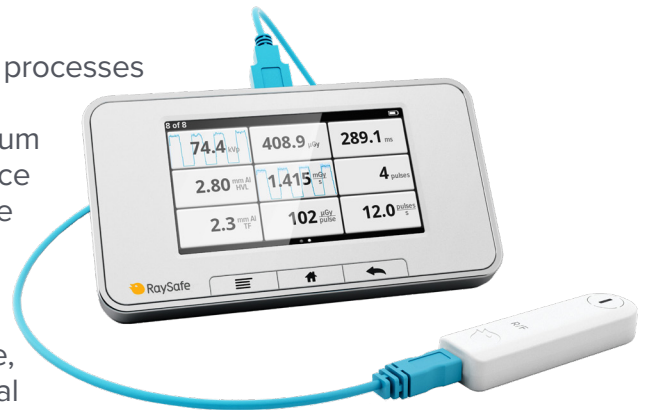
What happens when X-ray tubes are ageing?

Quality assurance (QA) tests are first done to establish measurement references (acceptance testing), and thereafter serve to uncover possible malfunctions or wear and tear problems in the X-ray machine over time (constancy testing).

There are several likely problems which might occur and could effect performance which regular quality assurance testing can detect at an early stage.

Every time X-ray is produced, the cathode filament will lose some atoms. Over time, it becomes thinner and thinner until it eventually breaks. This may affect image resolution negatively. For that reason, X-ray machines need to have their filament current adjusted from time to time.

Moreover, the metal from the vaporized anode and filament will be deposited on the inside of the X-ray tube, causing the glass to blacken over time. This can affect the X-ray beam quality (e.g. the HVL may increase). It can deteriorate the image contrast and may even cause the X-ray tube to break. The anode will also suffer from wear and tear with use and may become rougher, affecting the radiation quality.

Quality assurance measurement solutions

RaySafe provides reliable, accurate and easy-to-use solutions for quality assurance and service of diagnostic X-ray equipment. The RaySafe X2 and X2 Solo product lines include a wide range of sensors for various applications and modality needs. Each sensor is connected to a base unit, which communicates with supporting software. The RaySafe test equipment portfolio also includes accessories such as a variety of sensor holders, filters, phantoms, pinholes, and test patterns. With a RaySafe device you don´t have to worry about special measurement settings. Just measure, don´t worry, and trust your results!

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National and international standards for acceptance and constancy testing

Quality control tests are performed according to a pre-determined schedule under standardized conditions ensuring performance is tested before the equipment is used on patients.

Examples of functional verification tests:

- Accuracy of loading factors, i.e. deviation in voltage, current, and loading time is within limits for different combinations of loading factors

- Beam filtration (measuring the half-value layer of aluminum)

- Entrance skin air kerma is within established limits

- Spatial resolution and contrast

- Automatic exposure control assessed according to the manufacturer's instructions

More information on regulations and guidelines can be gained via IEC 60601, IEC 61223, part 3-2 to 3-6, or by national standards and recommendations for accreditation (e.g FDA for the US market).

Testing for potential tube leakage.

RaySafe

We empower our everyday heroes to focus only on protecting lives

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