
APPLICATION NOTE

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Measuring mammographic HVL using the MX-detector

Most protocols throughout the world require the measurement of the HVL on mammographic equipment. This is normally carried out by using an ionisation chamber and high purity Al-filters. RTI research in cooperation with the Sahlgren Hospital, Gothenburg, has shown that this method can also be applied on the newly introduced dose detector MX.

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Introduction

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To ensure optimum image quality to dose ratio, all the factors involved in the image creating process must be checked, if possible. One of the most important image properties in mammography is contrast. High contrast is needed for easier detection of microcalcifications that may be in a prestage of cancer. The lower the kVp - the better the contrast and therefore most screening programmes are carried out at 25 - 30 kVp. "kVp" can be seen as the maximum energy but a better way to describe the contrast properties of the spectrum is needed: the "HVL".

HVL = Half Value Layer, the layer of Aluminium needed to attenuate the dose detector signal to 50 % of its original value.

The HVL-value is closely related to the effective energy (rather than the maximum) of the incident radiation beam.

Method

To measure HVL is rather straight forward. To measure HVL in a correct manner can on the other hand be rather difficult. Most protocols define two kVp at which the HVL evaluation should be done. Usually 30 kVp and at the most used kVp-setting. This will introduce a new problem: How does one know that the set value is correct? The HVL-value will not give a clear indication since it can vary between 0.25 to 0.4 mm Al in the range of 25 - 30 kVp. The answer is of course to check the kVp with a kVp-meter. The next step is to use high purity Al-filters (99.999 % is recommended). The total thickness of all the filters should be approximately 0.7 mm to ensure sufficient attenuation of the incident radiation. The most convenient is then to use oRTIgo for the evaluation.

- Place the MX-detector in the primary beam.
- Collimate the field to a size just covering the detector.
- Make three exposures, note the value every time and calculate the average.
- Add a filter. Make further three exposures.
- Continue this process until the measured value is lower then half the initial value.

Calculate the HVL in the usual way and multiply the MX-value by 0.77. The HVL value is correct within ± 0.02 mm Al for 25 - 30 kVp.

Example: the MX detector indicates the HVL to be 0.35 at 26 kVp. 0.35×0.77 yields 0.27 mm Al.

This correction is made automatically if the software package oRTIgo is used. All data is stored in the ADI module. Modules delivered before October 1, 1992, must be upgraded.

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