Measurement Methodology

The measurement results outlined in this brochure are based on a methodology that considers all decisive radiation factors:

- Tube voltage
- Filtering
- Phantom material type
- Scattered radiation direction with respect to primary beam direction

Measurement methods, which could result in unrealistic values, have been completely discounted, for example the use of water phantoms. These results correspond to the material and morphological compositions of the phantom used and not to the human body.

Applied Method

An Alderson Rando-Phantom in laying position was irradiated in the abdominal region in a field measuring 22 x 22 cm. The focus-skin distance was set at 60 cm, and the tube focus was 160 cm above ground level.

The inherent tube filtration was 2.5 mm aluminium. The generator used was a Philips 50 CPH multi-pulse device. Outside the irradiated field, the phantom was clad covered with lead rubber to minimize interference and backscatter radiation from the room.

The "Babyline 81" calibrated measuring chamber with protective cover* was placed 60 cm from the phantom's side axis. In addition to that, a 2 mm thick lead screen measuring 100 x 100 cm with a 30 x 30 cm opening shielded the unwanted scattered radiation from the rest of the phantom's body. A protective film overlapped the 30 x 30 cm opening by approximately 20 cm. The protective film was measured in a level position.

** The measurement is approximatly to the ICRU Ambient Dose Equivalents Measurement Parameters H*(10)*

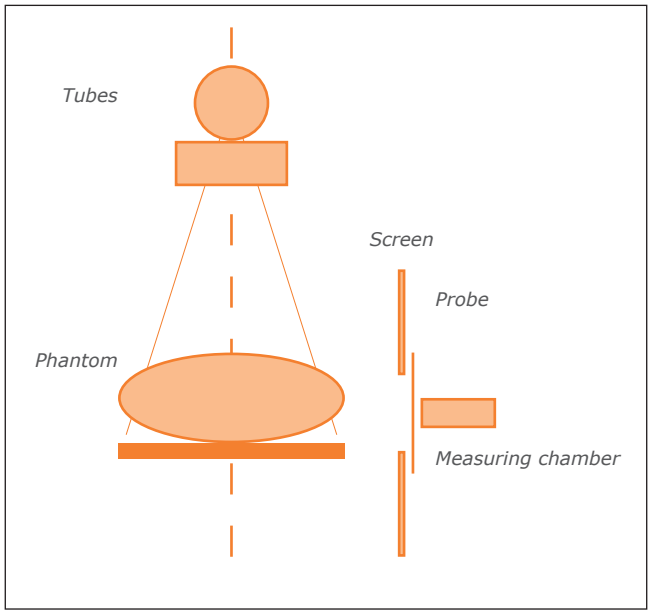

Fig. 1: Test layout with an Alderson Rando-Phantom

Radiation Absorption

of X-ray protective clothing for medical radiation users

This brochure contains the absorption values of MAVIG X-ray protective clothing in Pb 0.25 mm / 0.35 mm / 0.50 mm lead equivalents and compares the different MAVIG "pure lead" and "lead composite" materials.

Choosing a correct product for specific workplace situations is made easier by our evaluation of the protective effect with respect to different X-ray tube voltage ranges.

MAVIG

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Appropriate Measuring Methods

Only a prooven measurement method can provide trustworthy guidance with respect to your choice of the most suitable protective clothing. Unfortunately, among the many comparisons of protective properties of X-ray protective materials currently available, there are some that are not based on trustworthy measurement methods.

This can cause unrealistically high absorption values, for example, where water phantom measurements are involved. However, anthropomorphic phantoms provide exact data regarding the true protective effect.

Therefore, whenever a comparison is made between different protective clothing manufacturers, it is important to ensure that the measurement methodology used is recognised, comparable and appropriate.

Conclusion

A practical comparison between the radiation absorption of different lead equivalence values shows that the protective clothing classified in Standard DIN EN 61331-3 as "light radiation protective aprons" with a lead equivalence of Pb 0.25 mm is applicable in certain cases.

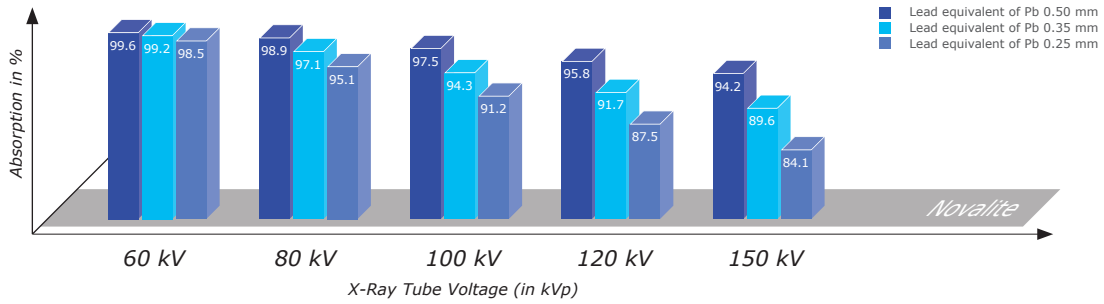
The standard refers to protective clothing with a lead equivalence of Pb 0.35 mm as "heavy radiation protection aprons". The results of the measurement analysis show that in the 60 to 100 kV range of X-ray tube voltages protective clothing with a lead equivalence of Pb 0.50 mm does not absorb a significant larger amount of radiation than protective clothing with a lead equivalence of Pb 0.35 mm.

In addition: Standard DIN 6815 recommends to base your choice of protective clothing on the medical discipline for which it is to be used, e.g. cardiac catheterisation, angiography, urological and intraoperative X-ray examinations. The classification into light (Pb 0.25 mm) and heavy (Pb 0.35 mm) protective clothing also applies here.

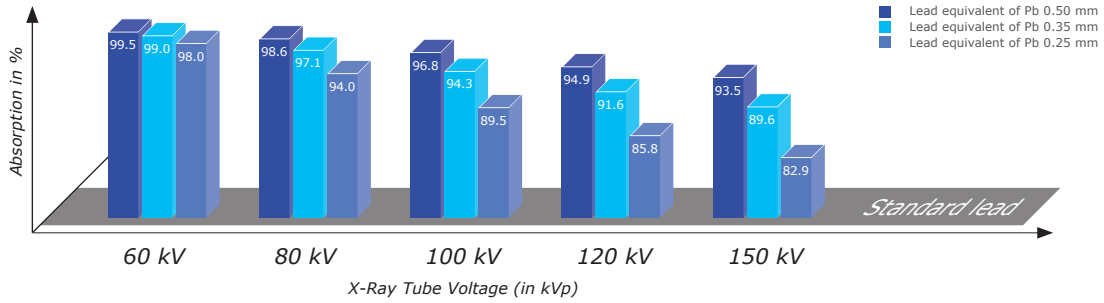
Comparing MAVIG X-ray Protective Materials

The diagram below demonstrating protective effect values in respect to different X-ray tube voltages has been provided to help you on deciding which lead equivalent of the X-ray protective clothing for the field of application in question.

1. Novalite X-Ray Protective Material *(lead composite)*



2. Standard Lead X-Ray Protective Material *(pure lead)*



MAVIG's "NovaLite" (lead composite) and "Standard lead" (pure lead) protective materials are compared below using the Pb 0.25 mm, Pb 0.35 mm and Pb 0.50 mm lead equivalent values. The results show that the materials perform equally well in regard to protective effect.

Comparison between Novalite *(lead composite)* ***with Standard Lead*** *(pure lead)* ***at Pb 0.35 mm***