

- (1) During the webinar, a question arose regarding using DAP or KAP to estimate skin dose. You can find a reasonable answer at the following site:

https://rpop.iaea.org/RPOP/RPoP/Content/InformationFor/HealthProfessionals/4_InterventionalRadiology/patient-staff-dose-fluoroscopy.htm#FLUPS_FAQ05

How are the dose indices for fluoroscopy connected to patient skin dose and effective dose?

PSD is by definition equal to the maximum dose absorbed anywhere on the skin surface of the patient and is therefore directly related to the possibility and intensity of [skin injury](#). According to current data, minimum prompt skin reactions may occur in sensitive patients within hours after an acute PSD exceeding 2 Gy [[BALTER et al., 2010](#)]. Medically important reactions occur in average patients several weeks later at PSDs exceeding 5 Gy. If the reference point happens to be on the patient's skin, and the beam does not move during the procedure, the PSD is the CAK multiplied by a backscatter factor. As noted above, in most cases, more complex calculations are needed to account for beam motion, patient position, and field overlap. KAP can be used to estimate CAK. If the field size at the level of the reference point is 100 cm², a KAP reading of 200 mGy·cm² is observed after one minute of fluoroscopy. The corresponding CAK rate is 2 mGy/min. The same KAP could be observed with a larger field such as 400 cm². Under these conditions, the CAK rate is 0.5 mGy/min. Assuming that the same organs are irradiated in both cases, the total energy imparted to the patient, and the effective dose is approximately the same for both cases. However, the PSD will be a factor of four smaller for the larger field. X-ray beam intensity is controlled by the automatic brightness control system to accommodate differences in patient thickness, projection angles, detector settings, and source to detector distance. Therefore PSD values based on KAP must be used with caution in most circumstances. Newer systems provide CAK at the reference point, incremental KAP, and geometry at an individual irradiation level in a radiation dose structured report [[BALTER, 2008](#)]. When such reports are available in real time they will be used to produce skin dose maps [[JOHNSON et al., 2011](#)].

- (2) Also during the webinar, a question arose regarding how to set the dose per pulse if you decided to reduce the pulse rate. Guidance on this is provided in “**Perceptual comparison of pulsed and continuous fluoroscopy**”, Richard Aufrichtig, Med. Phys. 21 (2), February 1994

For pulse rates lower than 30 pps, Aufrichtig recommends using a “perceptual pulsed fluoroscopy scale factor” to adjust dose per frame for different frame rates

$$(\text{Dose/Pulse})_2 = (\text{Dose/Pulse})_1 \cdot \text{SQRT}[(\text{Pulse Rate})_1 / (\text{Pulse Rate})_2]$$

Example: Change from 15 pps to 7.5 pps

$$(\text{Dose/Pulse})_2 = (\text{Dose/Pulse})_1 \cdot \text{SQRT}[15/7.5]$$

$$= (\text{Dose/Pulse})_1 \cdot 1.4$$

If you have any other questions, please contact Curtis Caldwell, Ph.D. at: cccaldwell@radiationsafety.ca or 416-650-9090 ext25