RADIATION PROTECTION SERVICE

HEALTH AND SAFETY SERVICES

UNIVERSITY OF LEEDS

RPA GENERIC RISK ASSESSMENT NO 28:
HAZARD IDENTIFICATION & RISK ASSESSMENT FOR A CARESTREAM DENTAL CS 2200 X-RAY UNIT

INTRODUCTION

1) The Carestream Dental CS 2200 is an intra-oral dental x-ray radiography system emitting x-rays up to 70kV and 7mA.

2) The unit is housed in 7.04h Brenner Building which is an ex-dark-room accessible through a revolving door from 7.04g.

3) The unit is used for taking radiographs of samples and is not used on patients or volunteers.

4) The x-ray tube is directed down onto a stainless steel sample tray with lead beam stop.

5) Normal operating parameters are 70kV, 7mA, 0.129s.

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1.0	ARC			13 April 2016

DOSE ASSESSMENT

6) Measurements of radiation doses were undertaken using a PTW UNIDOS electrometer with an LS-01 ionisation chamber (ref 1).

7) The measured doses per exposure were:

208µGy in the beam

1.8µGy close to the x-ray head

3nGy at the operating console

8.7nGy at the closest point in the adjacent room

8) The projected maximum usage of the unit 2000 radiographs per year.
The maximum radiation doses during normal operation are therefore 0.006mGy/year and at the closest point in an adjacent room (not normally accessible) 0.02mGy/year.

HAZARD & RISK ASSESSMENT

Condition	Persons exposed	Radiation exposure	Risk reduction measures	Residual level of risk
Normal operation				
Exposure to scatter radiation during normal operation: **at operators console and adjacent rooms.**	Operators and other workers	Estimated dose <<0.02mSv/y.	Operator training. Access restrictions for 7.04h whilst the x-ray unit is in use. Local rules and operating instructions include instructions for operator to ensure that 7.04h is clear of personnel whilst radiograph in progress. Critical Examination before the x-ray tube is first used; if repaired, altered or moved; and annually by RPM.	**Negligible** The estimated dose is less than 0.02 of the annual UK natural background level. Dose rate is well below the university's dose constraint of 1mSv for radiation workers.
Exposure to scatter radiation within x-ray cubicle: **inside 7.04h**.	Operators	Estimated dose 2µGy/operation.		**Low** If local rules and operating procedures are followed the estimated dose is less than 0.01 of the annual UK natural background level. Dose rate is well below the university's dose constraint of 1mSv for radiation workers.
Exposure to x-ray radiation within x-ray area, abnormal operation (e.g. tube not directed into sample chamber).	Operators	Estimated dose up to 0.2mSv/operation.		**Low** If local rules and operating procedures are not followed radiation exposure could exceed the University dose constraint and legal dose limits.

Condition	Persons exposed	Radiation exposure	Risk reduction measures	Residual level of risk
Damage to equipment				
Damage to the equipment by impact or fire.	Operators.	x-rays; potential dose rate several mSvh-1 If the equipment were subject to damage it is possible that the x-ray shielding might be compromised although this is unlikely.	If the equipment has been damaged in any way the user should: - switch the power off and - inform the RPS and seek advice before using the equipment.	**Low** If the equipment was damaged but still operated radiation exposure could exceed the University dose constraint and legal dose limits.
Maintenance / servicing				
Removal of panels / shielding giving access to unguarded x-ray beam	All persons entering the room.	Penetrating x-rays; potential dose rate – several mSv h^{-1}. Removal of panels or shielding could give access to areas where there is a high dose rate.	All repairs, modifications and servicing of the equipment must only be carried out by a qualified service engineer. The service engineer must have sole use of the room if servicing requires the removal of shielding or over-riding of safety features.	**Low** If servicing not carried out correctly radiation exposure could exceed the University annual dose constraint and legal dose limits.

REFERENCES:

Ref 1: REP1404 IRX OB.