



Quality control in IR

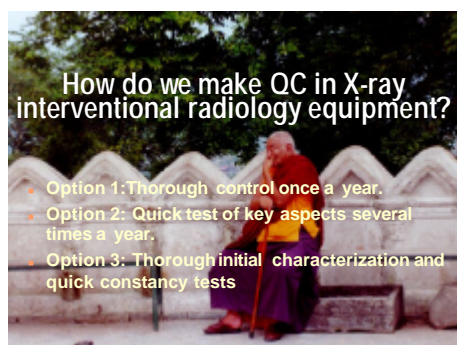
- ✓ Very complex equipment (different dose modes, zoom, filters, pulse height and frequency, protocols ...).
- ✓ High workload in labs.
- ✓ Staff have to work inside the X-ray room.

Quality control in IR

- ✓ QC of the X-ray device dose+ image.
 - ✓ QC of the procedure:
 - patient dose (DAP, skin dose)
 - staff dose.
- ↓
- ✓ Readjustment of the equipment.
 - ✓ Training.

Quality control in IR

- ✓ **Control of the equipment :**
 - Constancy tests
 - Initial characterization.
- ✓ Patient dose
- ✓ Staff dose



Quality control in IR

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MATERIAL

- Ionisation Chamber
- Cu filters at least 20 cm × 20 cm in area.
- Ruler
- Image quality test TOR(18FG) or equivalent.

QC equipment
Constancy test



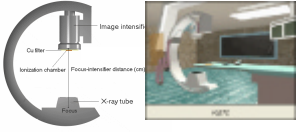
METHOD

Dose rate at the entrance of the Cu sheet

Measurements are made for the most frequently settings used in clinical practice and for 2 mm and 4 mm of Cu:

- dose rate in fluoroscopy modes
- dose/image in protocols of acquisition for the field sizes used.

QC equipment
Constancy test



METHOD

Dose rate at the Image Receptor entrance surface

For the same modes and field sizes, but with this configuration:

QC equipment
Constancy test

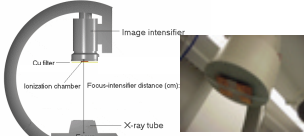


Image quality

Same configuration with the test object instead of the ionisation chamber

PROBLEMS FOUND

- Ionisation chamber not completely inside the field size.
- Volume of Ionisation chamber affected by the weight of Cu sheets.
- Part of the field is not covered by the Cu sheet (direct irradiation of the image receptor, different AEC setting).
- Image in motion with Iodine contrast is evaluated with a Pb (resolution grate) static image phantom.

QC equipment
Constancy test

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INITIAL CHARACTERISATION OF THE SYSTEM

Maximum dose rate at the entrance of the patient (highest skin dose in the worst conditions):

- ✓ 2 mm Pb (or a folded leaded apron)
- ✓ Tube as close as possible to the table.
- ✓ Highest dose rate in fluoroscopy mode and image acquisition mode
- ✓ Maximum magnification available
- ✓ Image receptor as far as possible from the table.

QC equipment
Initial Characterisation



INITIAL CHARACTERISATION OF THE SYSTEM

Image quality assesment

- ✓ Image phantom at the isocenter.
- ✓ Image receptor at 5 cm the PMMA

QC equipment
Initial Characterisation

INITIAL CHARACTERISATION OF THE SYSTEM

PMMA entrance dose rate

- ✓ Dose rate and radiographic technique for 14, 20, 24, 28 cm of PMMA.
- ✓ Repeat for all fluoroscopy modes, image acquisition and field sizes.

QC equipment
Initial Characterisation

INITIAL CHARACTERISATION OF THE SYSTEM

HVL measurements: Method when manual mode is not available.

QC equipment
Initial Characterisation

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Patient dose

- Reference levels
- Measure of the DAP

Patient dose

Patient deterministic effects

- TLDs
- Slow films
- Radiochromicfilms

Patient dose

Patient dose

- Retrospective analysis of DAP and even the skin dose distribution if the DICOM headers of series contain the relevant information.

GE ADVANTX LCV-DLX (Cardio mode)	
(0008,0032) - Acquisition Time	19.24.33
(0008,1103) - Series Description	PCRCM1810
(0018,0090) - kVp	76
(0018,1110) - Distance Source to Detector	1060.000
(0018,1111) - Distance Source to Patient	1005
(0018,1140) - Field of View Dimension(s)	140
(0018,1150) - Exposure Time	328 (number & x ms per fr)
(0018,1151) - X-ray Tube Current	81
(0018,1510) - Positioner Primary Angle	30 (deg to 1)
(0018,1511) - Positioner Secondary Angle	0 (deg to 1)
(0018,1010) - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100	
(0019,1010) - 1 (Dose mode: 0, 1, 2, and 3 for A, B, C and D)	
(0019,1011) - 4 (This is the 0019,1010, 0019,1012, 0019,1013, 0019,1014, 0019,1015, 0019,1016, 0019,1017, 0019,1018, 0019,1019, 0019,1020, 0019,1021, 0019,1022, 0019,1023, 0019,1024, 0019,1025, 0019,1026, 0019,1027, 0019,1028, 0019,1029, 0019,1030, 0019,1031, 0019,1032, 0019,1033, 0019,1034, 0019,1035, 0019,1036, 0019,1037, 0019,1038, 0019,1039, 0019,1040, 0019,1041, 0019,1042, 0019,1043, 0019,1044, 0019,1045, 0019,1046, 0019,1047, 0019,1048, 0019,1049, 0019,1050, 0019,1051, 0019,1052, 0019,1053, 0019,1054, 0019,1055, 0019,1056, 0019,1057, 0019,1058, 0019,1059, 0019,1060, 0019,1061, 0019,1062, 0019,1063, 0019,1064, 0019,1065, 0019,1066, 0019,1067, 0019,1068, 0019,1069, 0019,1070, 0019,1071, 0019,1072, 0019,1073, 0019,1074, 0019,1075, 0019,1076, 0019,1077, 0019,1078, 0019,1079, 0019,1080, 0019,1081, 0019,1082, 0019,1083, 0019,1084, 0019,1085, 0019,1086, 0019,1087, 0019,1088, 0019,1089, 0019,1090, 0019,1091, 0019,1092, 0019,1093, 0019,1094, 0019,1095, 0019,1096, 0019,1097, 0019,1098, 0019,1099, 0019,1100)	
(0028,0008) - Number of Exposures	82

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- Control of the equipment:
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- Patient dose
- Staff dose

Staff dose

- Measurements (electronic dosimeters, TLDs, OSL dosimeters) to optimize RP of staff: left shoulder, left eye, left hand. Evaluation of the right use of RP tools.

Table B: Entrance dose values for 2 mm Cu, measured at 30 cm from chamber distance

X-ray system	Large entrance field (cm)	Fluoroscopy mode	Dose Rate (μSv/h)
Philips Integris R-300	23	Lite	8.7
		Medium	18.8
		High	21.4
Philips RP300+	23	Normal	8.2
		High	15.9
Philips Optima 200	23	Normal	24.9
		High	3.7
Sodas DFF200	24.5	Lite	11.9
		High	16.9
Siemens Polystar 100	28	Normal	21.3
		High	24.5
Sodas J-20-C-100	23	Normal	5.0
		High	20.4
Philips Densight	23	Normal	27.2
		High	18.2
GE Admate I	22	Lite	21.9
		High	46.9
GE Admate II	22	Lite	8.7
		Medium	18.3
		High	18.4
Philips Afluo	31	Low	4.1
		Medium	19.9
		High	22.6

INITIAL CHARACTERISATION OF THE SYSTEM. EXAMPLES.

- Variation of the entrance surface air kerma with the field size in different fluoroscopy modes.
- Variation of the entrance surface air kerma with PMMA thickness in different fluoroscopy modes.
- Entrance surface air kerma in different PMMA thickness and field sizes.