



Konica Minolta Medical Imaging USA, Inc

Xpress CR Quality Acceptance (QA)

Presented by:
Charles A. Ross, BSRT, Med
and
Darren Werner

Type of Readers

- Konica Minolta Manufactures and Markets primarily three Readers of which all are direct digital units.
 - Xpress CR which is a dual bay cassette based system
 - Regius 150 is a multiple bay cassette system
 - Regius 350 is an upright cassette-less system

Plate Technologies

- Xpress CR and the Regius 150 uses a rigid plate with BaFl:Eu.
- Regius 350 uses the same phosphor as above

Equipment Required for QA

Equipment Included in QA Kit

1. Filtration: Two 0.5 mm Copper and one 1.0 mm Aluminum
2. Xpress CR QA Phantom, manufactured by LEEDs to Konica Minolta Specifications
3. Support stand or holder for placing the ionization chamber of the Dose meter at a specified area behind the Xpress CR QA phantom

Equipment Required for QA (Cont.)



Equipment Supplied by Health Care Provider

1. Calibrated Dose meter
2. lead apron to prevent scatter
3. Lead block, ≥ 5 mm thick, ca. 12 cm x 15 cm area
4. Calibrated Laser printer with linear Look Up Table
5. Calibrated PACS Monitor
6. 5x magnifying glass or loupe
7. Calibrated Radiographic room within six months
8. Wire mesh or Scanogram Ruler
9. Tape to mark the plate position

Equipment Required for QA (Cont.)



Konica Minolta Xpress CR System

1. Xpress Reader
2. Xpress Control Station
3. Xpress Barcode Reader
4. Xpress Cassettes
5. Xpress Operating Manual
6. Xpress User Tool Manual

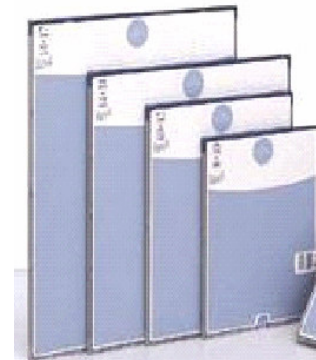
Components of Xpress CR



Control Station (CS-1)



Reader(170)



Cassettes



Barcode Reader
(For Cassette Registration)

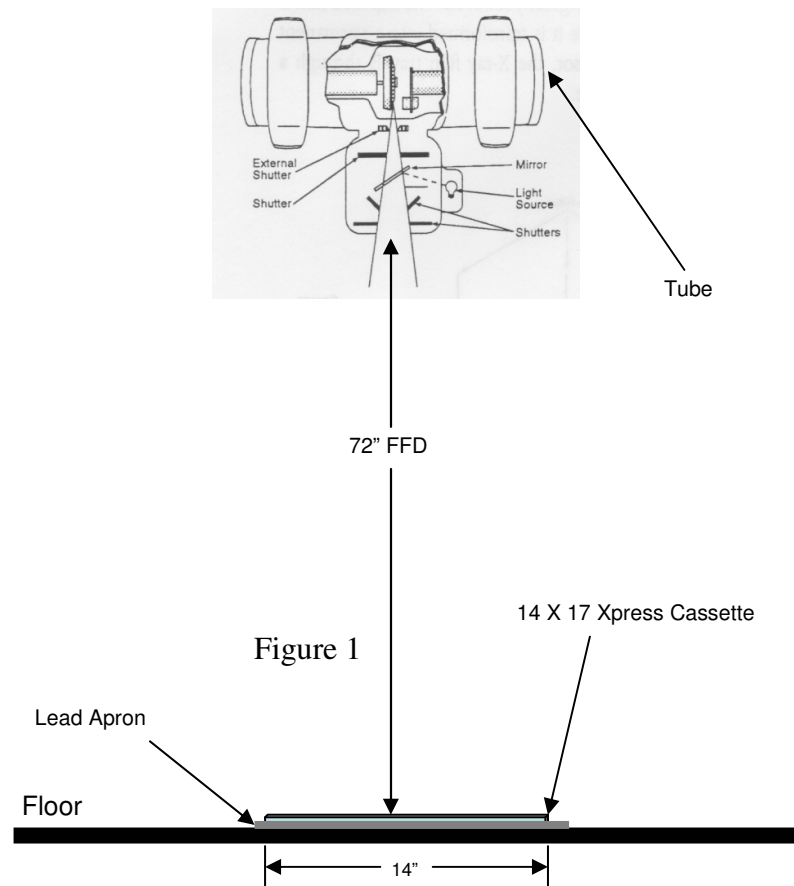
X-Ray Room Preparation for QA test



KONICA MINOLTA

- Position a calibrated Dose meter at least 72" from a well-calibrated x-ray source or floor. To reduce the effect of scatter radiation place a sheet of lead behind the Dose meter (a lead-apron can be used).

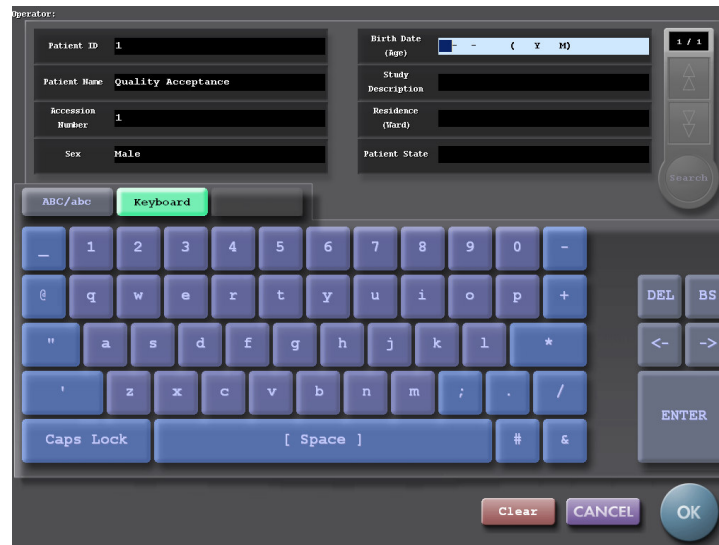
Note: Make sure the short axes of the Cassette are parallel to tube as shown in figure 1 to minimize the Heel effect.



Create QA test patient on CS-1



1. Create the patient name as “Quality Acceptance” for QA test or as “Quality Control” for QC test, and Patient ID as “1” rest of the field are optional. Click ok to register.



2. To create the exam tags select the created test patient form the list and click perform, the system will goes to exam tag selection page. Click QA-QC palette then select QA test for Quality Acceptance test or QC test for Quality control test. This will select all the tags which are required to perform the QA or QC test.



3. Select OK button and the system is ready for test.

Xpress CR QA Tests



1. Dark Noise
2. Reproducibility Check for X-Ray Source
3. S-Value Calibration and Sensitivity of Imaging Cassette
4. System Linearity
5. System's Shading, Artifacts and Uniformity
6. System Erase Function

Xpress CR QA Tests (Cont.)



7. Spatial Resolution or Limiting Resolution
8. Spatial Accuracy and Resolution Uniformity
9. Low Contrast Resolution
10. Jitter
11. Grid Response and Aliasing
12. Reader Throughput

Dark Noise

1. Procedure:

1. Register a test patient with “Dark Noise” exam tag on CS-1.
2. Erase QA test imaging cassette.
3. Process QA test erased plate using the “Dark Noise” Test exam tag.

2. Measuring Criteria:

1. Record the results for QA test imaging cassette. (S-value should be ≥ 5000 .)



KONICA MINOLTA

Reproducibility Check for X-Ray Source

1. Exposure criteria:

Four exposures at 1.0 mR should be taken using 80 kVp, 72" SID, no grid, and 0.5 mm Cu (Cu closer to the x-ray tube) and 1.0 mm Al additional filtration.

2. Procedure:

Set the x-ray unit to the above determined mAs-value for 1.0 mR and make an exposure. Record the mR readout. Repeat this process four times and determine the average mR dose for each mR value.

3. Measurement Criteria:

The standard deviation should not exceed 2%. Calculate the average and peak-to-peak variation and record the mAs-values.

S-Value Calibration and Sensitivity of Imaging Cassette



1. Exposure criteria:

One exposure at 1.0 mR should be taken using 80 kVp, 72" SID.

2. Procedure:

1. Register the test procedure as "Sensitivity" exam tag on CS-1.

2. Take the exposure using the above exposure criteria on 14 X 17 QA designated imaging plate.

3. The plate should be processed after waiting 2 minutes.

4. Read and record the S-value.

3. Measurement Criteria:

Ideal conditions result in an S-Value = 200. For a single imaging plate, the S-value should be $200 \pm 20\%$ (acceptable range: 160 - 240). **

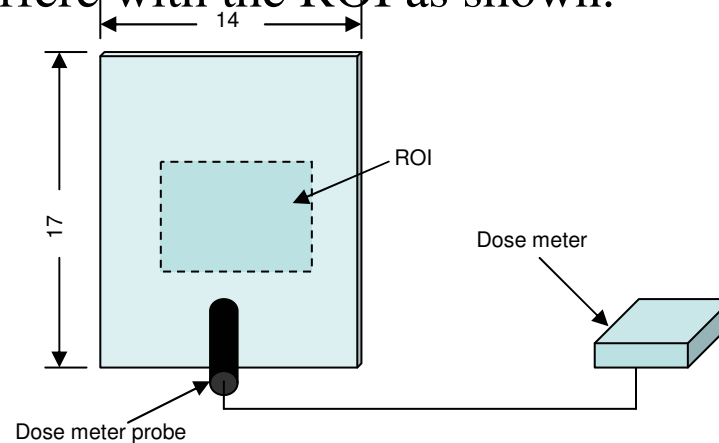
System Linearity

1. Exposure criteria:

Three exposures at 0.1 mR, 1.0 mR and 10.0 mR should be taken using 80 kVp, 72" SID, no grid, and 0.5 mm Cu and 1.0 mm Al additional filtration.

2. Procedure:

1. Register the test procedure using “Linearity” exam tag on Xpress CR.
2. To monitor the actual exposure, a Dose meter (≤ 1 inch diameter) should be placed on the imaging cassettes slightly off-center so that it does not interfere with the ROI as shown.



System Linearity (Cont.)



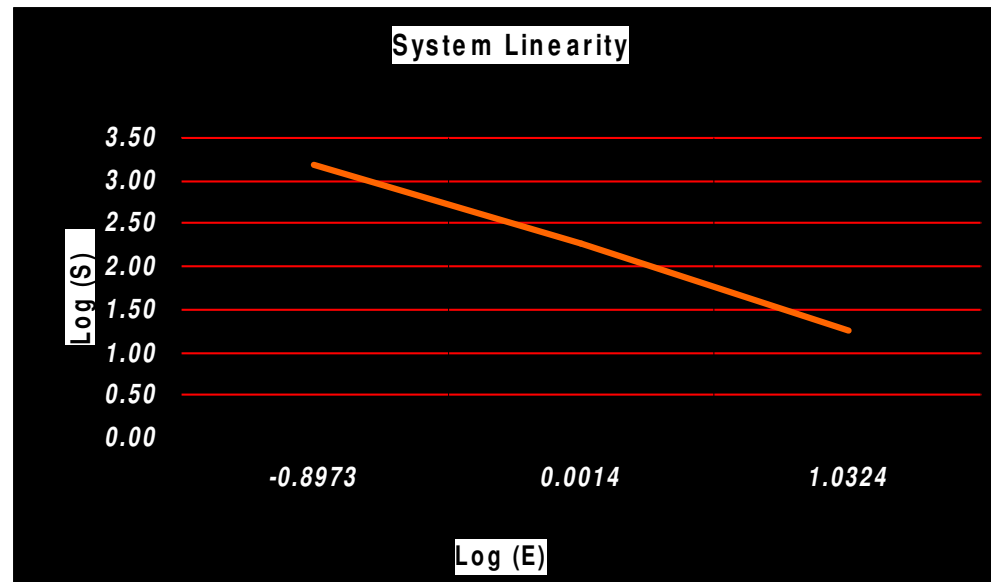
2. Procedure: (Cont.)

Take Three exposures of each mR using the above exposure criteria on 14 X 17 QA designated imaging plate.

The cassette should be processed after waiting 2 minutes.

3. Measurement Criteria:

Actual mR-values and S-values should be recorded in the Excel linearity workbook. Linearity will automatically be calculated.



System's Shading, Artifacts and Uniformity



1. Exposure criteria:

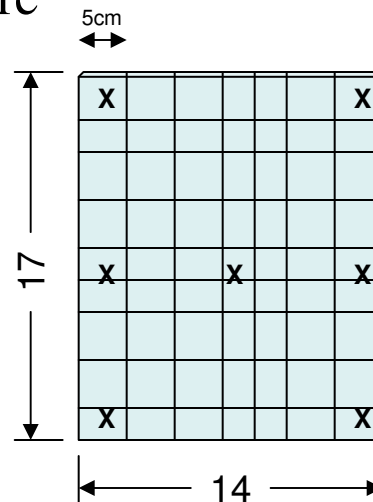
Expose QA test cassette with 10 mR using 80 kVp with 0.5 mm Cu and 1 mm Al added filtration, SID = 72”.

Note: Collimator should be opened slightly larger than cassette size.

2. Procedure:

1. Register the test procedure using “Uniformity” exam tag on Xpress CR.

2. Take three exposures by placing dose meter at each designated cross marks on figure



System's Shading, Artifacts and Uniformity (Cont.)



2. Procedure: (Cont.)

3. QA test cassette should be processed after waiting 2 minutes.
4. Print the film and also send the image to PACS workstation for evaluations.

3. Measurement Criteria:

Film evaluation:

Variation among the seven measurements should not be greater than ± 0.10 at a mean optical density of 1.2.

Or

Softcopy evaluation:

Variation in the processed digital values should be less than ± 128 .
Record your measurements in excel spread sheet.

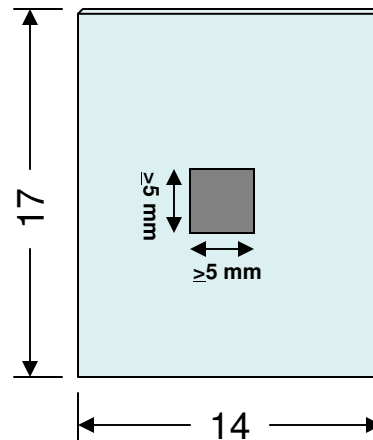
System Erase Function

1. Exposure criteria:

Make an exposure of approximately 50 mR or, if the x-ray generator does not have sufficient power, with the highest possible exposure. Using a 60 kVp x-ray beam without added filtration at an SID of 72", collimate in by about 5 cm on each side of the cassette.

2. Procedure:

1. Make sure the plates were erased before start the procedure.
2. Register the test procedure using "Erase" exam tag on Xpress CR.
3. Place a thick lead block (≥ 5 mm) at the center of a 14x17 cassette.



System Erase Function (Cont.)



2. Procedure:

3. Make an exposure of 50mR to the test plate in accordance with the exposure criteria.
4. Read the plate.
5. Reread the plate with no exposure

3. Measurement Criteria:

For exposed image S-value should be ≤ 20 and for no exposure image S-value should be ≥ 5000 .

Spatial Resolution or Limiting Resolution

KONICA MINOLTA

1. Exposure criteria:

Expose the Konica Minolta CR QA Phantom. Use a 60 kVp, unfiltered x-ray beam, SID=72". Expose cassette with about 5 mR.

2. Procedure:

1. Register the test procedure using "Resolution" exam tag on Xpress CR. This exam tag will divide into 2 views, "Standard Res" and "High Res."
2. Expose the plate using the above exposure criteria.
3. Read and process imaging cassette once for standard and once for high resolution.
4. Evaluate printed images and/or send to a PACS workstation

3. Measurement Criteria:

Record the number of visible line pairs for softcopy and hardcopy; if about 80% of the line pair is discernable, it may be accepted as "visible."

Spatial Accuracy and Resolution



KONICA MINOLTA

Uniformity

1. Exposure criteria:

Expose the cassette to approximately 5 mR using a 60 kVp beam without any added filtration, SID 72”.

2. Procedure:

1. Register the test procedure using “Acc & Res Uni” exam tag on Xpress CR.
2. Place the wire mesh or Ruler over the QA cassette. Expose using the above exposure criteria.
3. Read and process imaging cassette.

3. Measurement Criteria:

Visually inspect the wire mesh pattern on the PACS workstation and/or film; it should present a uniform grid pattern without any distortion and the wires should be uniformly sharp over the whole image. The distance between grid lines should be less than $\pm 2\%$

Low Contrast Resolution



1. Exposure criteria:

For standard and high-resolution operation, three images are acquired with exposures $E = 0.1, 1.0, \text{ and } 10 \text{ mR}$, using the same designated QA imaging plate and a 75 kVp x-ray beam filtered with 1 mm copper.

2. Procedure:

1. Register the test procedure using “Contrast” exam tag on Xpress CR.
2. Place the Konica Minolta QA Phantom test tool over the QA cassette. Expose using the above exposure criteria.
3. Read and process imaging cassette three for “Standard Res” and three for “High Res” Exam Tag.

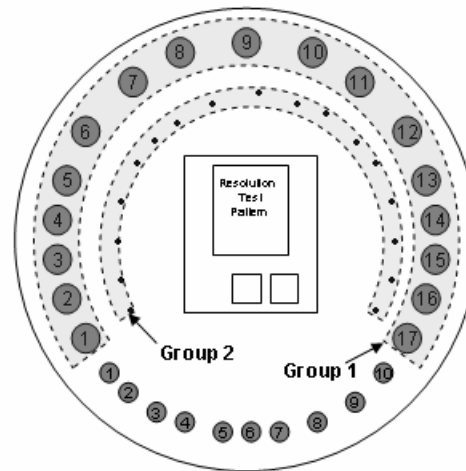
Low Contrast Resolution (Cont.)



KONICA MINOLTA

2. Procedure:

4. Visually inspect the contrast patches and determine the minimum discernable contrast both for the 11-mm-diameter large-area (nodules), low contrast (Group 1) and the 0.5-mm-diameter small (micro-cal) high-contrast details (Group 2) as shown in the figure



3. Measuring Criteria:

For the 1.0 mR exposure the maximum discernable contrast patch for

- a. Group 1 should be no less than disk No: 10 for high resolution.
- b. Group 1 should be no less than disk No: 7 for Standard resolution

Grid Response and Aliasing



1. Exposure criteria:

Make an exposure using 80 kVp, 1 mR, no additional filtration and select the SID appropriate for the grid; the x-ray tube should be centered to the plate and the irradiation field limited to the cassette size.

2. Procedure:

1. Register the test procedure using “Grid Response” exam tag on Xpress CR.
2. Place the 14”x14” QA cassette into the bucky, select each size grid commonly used, and disable the grid motion if available. Position the cassette firstly such that the grid lines are perpendicular to the laser scan direction, i.e., parallel to the blue line on the cassette.
3. Read and process imaging cassette using above exposure criteria.
4. Repeat the above process rotating the grid 90 degrees.

3. Measurement Criteria:

No moiré pattern should be visible when displaying the processed data range on PACS and also on film.

Thank You