

COMPARISON: 2017 ARRT CONTENT SPECS VS. 2009 AAPM STATEMENT

2017 ARRT Radiography Examination Content Specifications:

Page 6 Table: "Selection of Technical Factors Affecting Radiographic Quality"

This table lists four displayed digital image qualities as

1. Receptor Exposure
2. Contrast
3. Spatial Resolution
4. Distortion

These are correlated to initial exposure conditions including set mAs and kVp
No postprocessing or computer-related factors are listed as impacting the final electronically displayed digital image.

Does this appear to imply that initial exposure factors still "control" quality of the final image and that postprocessing does not? If so, is this implication accurate?

2009 AAPM Report of AAPM Task Group #116, First Paragraph:

Unlike screen-film imaging, image display in digital radiography is independent of image acquisition. The final image brightness **and contrast** can be modified by digital processing of the acquired image data. Consequently, overexposed images will not necessarily be dark, and underexposed images may not appear light. Inadequate or excessive exposure is manifested as higher or lower image noise levels instead of as a light or dark image. Brightness of **the image is controlled not by the exposure to the detector, but by post-processing** applied to the image data. This may be a new and confusing concept for operators of digital radiography systems who are accustomed to screen-film imaging.

1. AAPM specifically rules out "exposure to the detector" as a control over image brightness:

ARRT lists "receptor exposure" as a factor affecting final digital image quality.

2. AAPM repeatedly uses the term "brightness" to describe the image. (See above.)

In 2017 this term was eliminated from the ARRT table in favor of "receptor exposure." We should go back to "brightness" and separate exposure and receptor conditions into other sections of the Specs., not in Image Quality.

3. AAPM states that the final CONTRAST of the displayed image, as well as its brightness, are modified by digital post-processing. Some authors and speakers

continue to assert that “kVp continues to be the primary controlling factor” over final digital image contrast.

In response, please see 3rd Ed. of Radiography in the Digital Age pages 566-576 which includes a study of over 200 radiographs from nine different digital manufacturers conducted by Dr. Phil Heintz at the U. of New Mexico, myself, and Dennis Bowman. If you only have the 2nd Ed. this is on pages 562-572.

In the context of their impact on final displayed image quality, the following concepts are missing from the ARRT Content Specifications:

- a. Leveling and Windowing (affecting brightness and contrast, respectively)
 - b. Rescaling (affecting brightness)
 - c. LUTs during gradation processing (affecting contrast)
 - d. Detail Processing (affecting local contrast)
 - e. Digital Post-Processing in general
4. AAPM states that in digital radiography, the displayed image is independent of image acquisition.

The use of “receptor exposure” in the ARRT Table links a condition of the initial radiographic exposure to final displayed digital image qualities.

We should request any guidance the AAPM can provide on these questions.