

## Outline

- Fuji CR
- Fuji CR image formation
- Fuji General description of image processing
  - Automatic sensitivity correction (EDR)
  - Image Processing
    - Gradation
    - Spatial Filtering
    - Multi-objective frequency filtering (MFP)



## **CR Basics**

Computed Radiography refers to the use of Photostimulable Storage Phosphors (PSPs) in image capture and subsequent image digitization for Projection Radiography applications.





### **PSP – The Imaging Plate**

Sizes : (FCR) 17 x 17 (5501/5502) 14 x 17 14 x 14 10 x 12 (24 x 30) 8 x 10 (18 x 24)

*Types* Available: ST – Standard HR – High Resolution









- EDR- Exposure Data Recognizer
- PRIEF (Pattern Recognizer for Irradiated Exposure Fields)
  - •
  - Recognition of divided exposure patterns
- Histogram Analysis













- Digital imaging is contrast limited wide dynamic range
- FCR digitizes ONLY the necessary range of "Exposure" and convert to 10 bits digital numbers
- The process is based on the acquired "histogram"







### Histogram analysis

- Density will be adjusted to be close to film OD
- L value = width of the range
- S value = 4 x 10^ (4-SK)
- Smax-Smin = max and min S (Plate exposure values)
- Q max- Q min = max and min quantized digital values

# "L" Value - Latitude

- "L" represents the number of decades covered by exposure
- Each exposure menu has a range that sets the minimum and maximum "L" value
- Typical L values range from 1.6 to 2.3

# "S" Number - Sensitivity

It reflects the center of the usable portion of the histogram

Calibration is based on a 1 mR exposure at 80 kVp to the IP. Using a 72<sup>°</sup> distance through air to achieve an "S" number of 200 with a fixed latitude of 1.







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Good collimation practices should be used

Your lead marker *Must* be in the exposure area

Avoid Overlapping Exposures















- No Histogram analysis
- ♦ No PRIEF
- "S" number and "L" values are fixed
  - "S" number set by the user
  - "L" value set by the menu selected









- Distance- SID and OFD
- Collimation
- Menu selection
- Delay in processing from time of exposure

# "S" Number

An "S" number under 75 is typically considered overexposure

Under exposure is generally represented by an "S" number greater than 500

Typical <sup>*</sup> S <sup>*</sup> # Range			
Chest, General	200-600	Chest, Port.	100-400
Skull	100-400	Abdomen	100-400
Spine	100-400	GI	100-300
Extremities	75-200		
Chest, Pedi.	200-700	Abdomen, Pedi.	200-700
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#### "S" and "L" Range

- Exposures falling outside recommended range can compromise image quality
  - "S" number below 25 or above 2000 with and an "L" value greater than 2.0
  - Grossly over exposed images could appear light due to EDR over correction of saturated IP



#### Standard Image Processing for FCR Images

- The seven standard processing parameters can be divided into two groups.
  - <u>Gradation Processing</u>: dealing with image contrast and density.
  - <u>Spatial Frequency Processing</u>: dealing with image enhancement and blurring.
- These parameters can be adjusted to optimize diagnostic accuracy, expanding the diagnostic scope of the image.























# Gradation Adjustment

- First, adjust GS to obtain proper density
- Next, vary GA parameter to obtain proper contrast



# GT – Frequently used E – Chest G – Latitude type O – Orthopedics

- P General HR-S gradation
- R Mammo (high contrast gradation)



# Spatial Frequency Filtering

- Mainly for sharpness control
- Refer as spatial frequency filtering
- Start with "unsharp" masking images
- Process based on Fourier Transformation













## Multi-Objective Frequency Processing (MFP)

- Develop to improve image quality provided by image processing
- MFP enhances various structures at the same time
  - Grey-scale shadow and shape shadows can be enhanced in a well balance manner without sacrificing the graininess
  - Invisible areas can be depicted with an increase degree of naturalness (improve DR control process)
  - The degree of enhancement is suppressed for metals and other extraneous to the human body









