

Quality and dose control for CR/DR

John Gibbs

Global Product Manager Modality Workstations

+32-3-444-7560

From analogue to digital

What is the impact of going digital on my daily work?

- Radiographers' questions
 - How do I know my work quality is OK?
- Radiology Supervisor's questions
 - How can I monitor team quality?
- Physicist's questions
 - How can I monitor the system quality?

NX Tools

- Radiographer
 - E.I - Exposure Index
 - Dose Bar-graph
- Radiology supervisor
 - Repeat Reject Report
 - Extended Dose Monitoring **New**
 - IHE REM Profile **New**
- Physicist
 - Auto AC2
 - Auto QC Mammo

NX Tools for everyone

- Radiographer
 - E.I - Exposure Index
 - Dose Bar-graph
- Radiology supervisor
 - Repeat Reject Report
 - Extended Dose Monitoring **New**
 - IHE REM Profile **New**
- Physicist
 - Auto AC2
 - Auto QC Mammo

Why Exposure Index ?

Four Systems four ways of measuring exposure at the plate

Exposure in μGy
2.5
5
10
20

What is Exposure Index ? (IEC 62494-1)

- The Exposure Index (EI) is related to receptor exposure
 - The Exposure Index provides a **relative** exposure measurement within an exam type
 - **It is not (and should not be used as) a calibrated patient dose meter!!!**
 - The dose in μGy to the plate can only be determined when a **a flat field exposure is made under calibrated (RQA-5) X-Ray beam conditions**
 - **Three Parameters**
 - **EI Exposure Index**
 - **TEI Target Exposure Index**
 - **DI Deviation Index**

Target Exposure Index and Deviation Index

- Target Exposure Index: **TEI**
 - The reference exposure index for a particular exposure*
 - Extremities - 1000*, Chests – 500*, Abdomens – 250*
 - Can be determined by statistical averaging (50 exposures)→ preferred scenario
 - Can be preset (fixed) by the user
- What is it used for
 - To calculate the Deviation Index

* Example values - actual values should be based on customer statistics

Target Exposure Index and Deviation Index

- Deviation Index :

$$DI = 10 * \text{Log} \left[\frac{EI}{TEI} \right]$$

- Expresses how far the exposure is away from a reference value
- Provides a relative indication for under/over exposure
- In a perfect situation the DI would be zero (rarely the case)
- 1 deviation unit equals ~ 25% (+1 or -1) on a AEC
- 3 deviation units equals 2x exposure or ½ exposure (+3 or -3)

Dose bar-graph

- Has been introduced to improve interpretation of Lgm or E.I./D.I (Exposure Index/Deviation Index) by the radiographer.
- This feature allows radiographers to personally monitor their own exposure technique quality.

=> Are they working inline with the agreed average dose for each exposure type?

Dose bar-graph

- Colour improves interpretation of Lgm / D.I.
 - $-0.3 < \text{Lgm} < +0.3$ Green bar
 - $-0.6 < \text{Lgm} < -0.3$ or $+0.3 < \text{Lgm} < +0.6$ Yellow bar
 - $\text{Lgm} < -0.6$ or $+0.6 < \text{Lgm} < \text{Red bar}$
 - $-3 < \text{D.I.} < +3$ Green bar
 - $-6 < \text{D.I.} < -3$ or $+3 < \text{D.I.} < +6$ Yellow bar
 - $\text{D.I.} < -6$ or $+6 < \text{D.I.} < \text{Red bar}$
- D.I.= Deviation Index is displayed on an Exposure Index acquisition system (= all new CR30, DX-G and DX-D systems)

Patient

Full Name : Cavia

Comments :

Patient Identification :

Birth Date :

Sex :

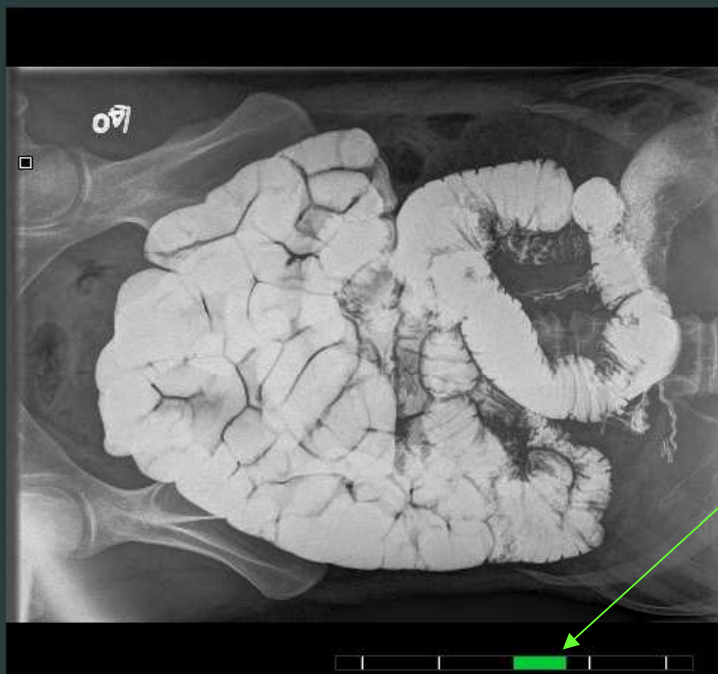
Add to Manual
Worklist

Edit

Image Overview (1/1)



Image Detail



Exam Group : Abdomen

Exposure Type : Abdomen Lat Dec

Accession Number :

View Position : LL

Cassette Orientation : Portrait

Film size :

Edit

Stitch Images

Dose between
average and
double the
average dose.

L

R



STAND

DOWN

KVP (kV):

Exposure (mAs):

Thickness (mm):

Compression (N):

Reject Image

Print Image

Send Image

ID

Add Image

Close and Send
All

Worklist

Examination

Editing

Main Menu

Duif

AGFA

Patient

Full Name : Duif

Comments :

Add to Manual
Worklist

Edit

Patient Identification :

Birth Date :

Sex :

Image Detail



Exam Group : Skull

Exposure Type : TMJ Closed Mouth

Accession Number :

View Position : AP

Cassette Orientation : Landscape

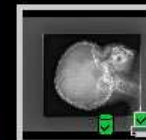
Film size : 8INx10IN

Edit

Stitch Images

Dose higher than
double, but lower
than 4x the
average.

Image Overview (2/2)



L

R



KVP (kV):

Exposure (mAs):

Thickness (mm):

Compression (N):

STAND

DOWN

Reject Image

Print Image

Send Image

ID

Add Image

Close and Send
All

Worklist

Examination

Editing

Main Menu

Red

AGFA

Patient

Full Name : Red

Comments :

Add to Manual
Worklist

Edit

Patient Identification :

Birth Date :

Sex :

Image Overview (1/1)



Image Detail



Exam Group : Spine

Exposure Type : Lumbar Spine Right 3/4

Accession Number :

View Position : AP

Cassette Orientation: Portrait

Film size : 8INx10IN

Edit

Stitch Images

Dose higher
than 4x
average dose

L

R



KVP (kV):

Exposure (mAs):

Thickness (mm):

Compression (N):

STAND

DOWN

Reject Image

Print Image

Send Image

ID

Add Image

Close and Send
All

Worklist

Examination

Editing

Main Menu

Exposure Index Guidelines*

	Low Dose	General Work		Extremities
Historic Film Speed	600	400	200	100
Exposure Index	~200	~300	~600	~1000
Deviation Index	"+ or - 3 units maximum"			

***These are guidelines only!!!!**

The customer has to decide on exposures settings using the ALARA principle. The dose level used corresponds with the noise level the customer accepts.

Who?

- Radiographer
 - E.I - Exposure Index
 - Dose Bar-graph
- Radiology supervisor
 - Repeat Reject Report
 - Extended Dose Monitoring **New**
 - IHE REM Profile **New**
- Physicist
 - Auto AC2
 - Auto QC Mammo

Repeat Reject

- Reject workflow: rejecting an image automatically generates a new exposure for the repeat, user can assign a reject reason.

Select a reject reason

Operator Last Name : JG

Please select a reject reason :

Image artifact(s)	Grid artifact(s)	Positioning
Motion blur	Under exposed	Over exposed
No image	Detector artifact(s)	Other artifact(s)
Mechanical failure	Electrical failure	Software failure
Inappropriate image processing	Double exposure	Other failure
Unknown failure		

Cancel

Close and Send All

Repeat Reject report

- Formatted report available for Repeat/Reject



HTML Document

- When exporting statistics now two file are created, the xml file (as before) and a html file that contains a readable/printable summary of the exported data.

Extended Dose Reporting New NX8600

- Allows searching the dose database of 60.000 exposures to create reports
- Search for a certain time period, digitizer, x-ray room, exam type or operator
- Create report for statistics of all exposures or only look at the extremes (DI outliers)

Extended Dose Reporting

Extended Dose Reporting

Select Room

RHAGFANICU

Select Exam Group

All

Select Begin Date

27 August 2009

Select Exposure Type

All

Select End Date

02 September 2010

Select Operator

OLDFILE

Select Entries

All

Select Digitizer / Detector

DX-S

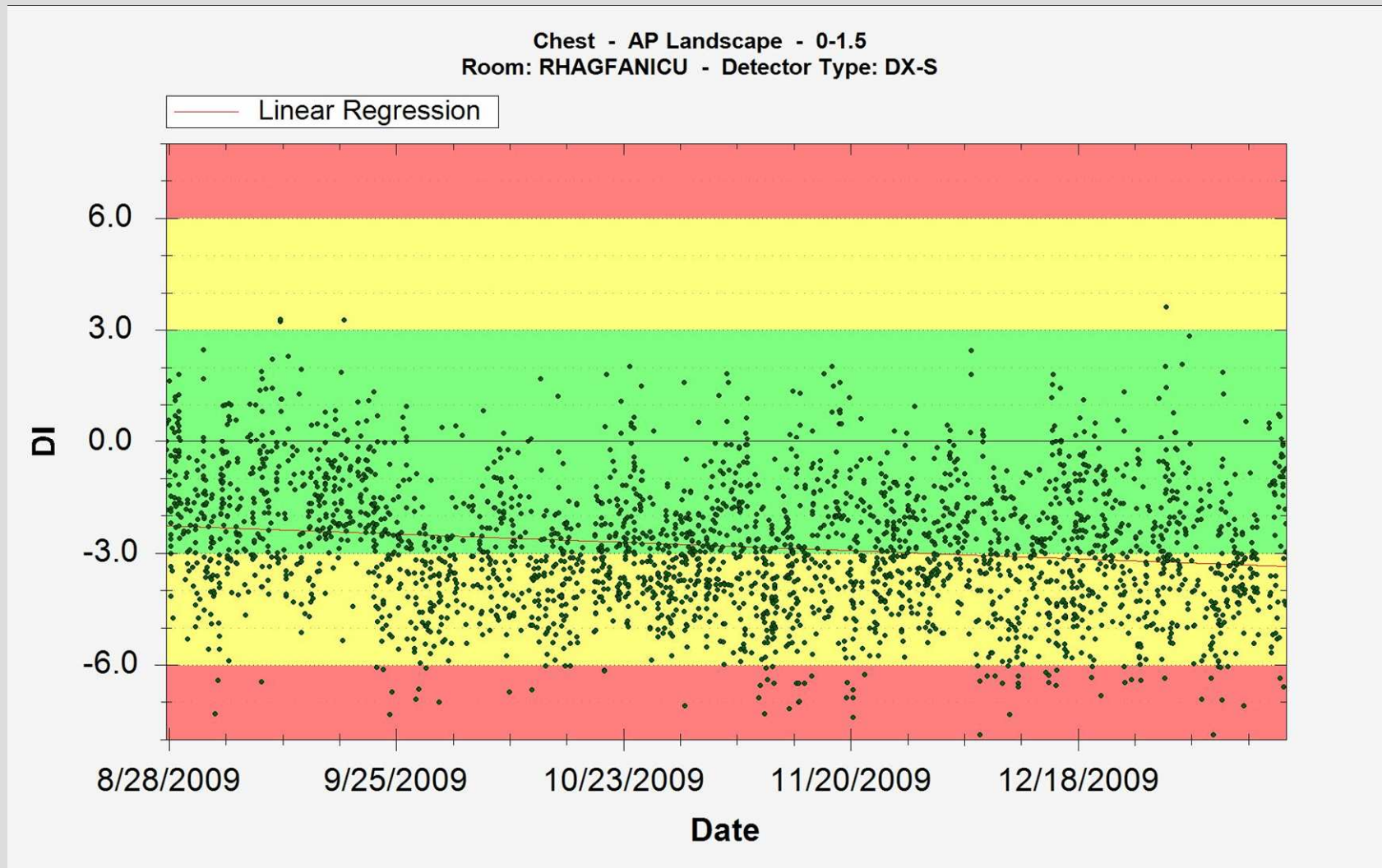
Start Analysis

Cancel Analysis

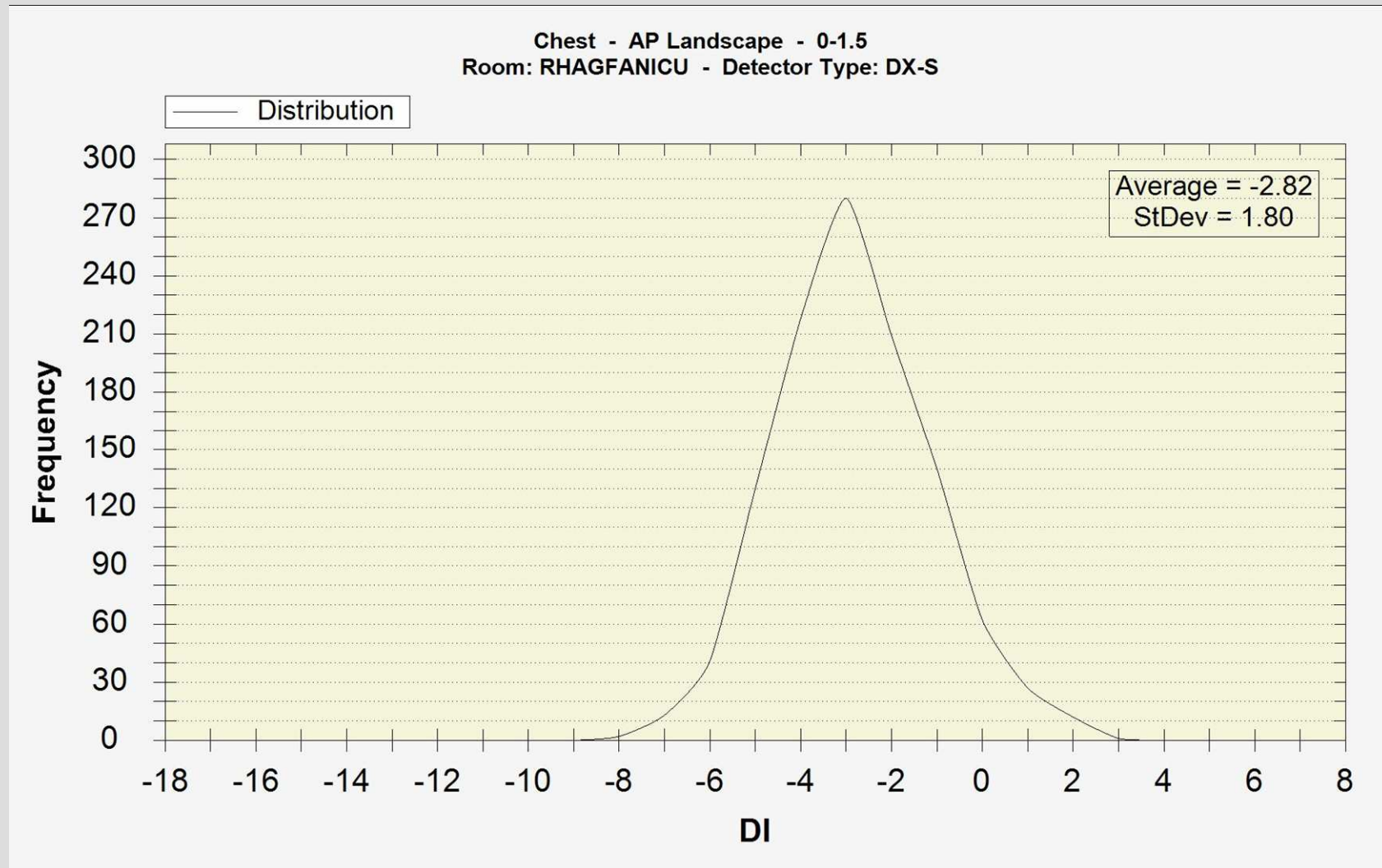
Export Results

Exam Group	Exposure ...	Age Group	Detector ...	TEI	# EI	EI(Median)	EI(Avg)	EI(StdDev)	EI(Skew)	EI(Slope)	# DI	DI(Median)	DI(Avg)	DI(StdDev)	DI(Skew)	DI(Slope)
Abdomen	Abdomen Lat	0-1.5	DX-S	401.00	6	304.00	341.17	206.47	0.37	-1380	6	-1.44	-1.44	2.84	0.02	-21
Abdomen	Abdomen L...	0-1.5	DX-S	571.00	34	385.50	418.24	160.72	1.33	-353	34	-1.71	-1.63	1.58	0.14	-5
Abdomen	AP Landsc...	0-1.5	DX-S	639.00	424	396.00	432.94	194.65	2.07	-900	424	-2.08	-2.06	1.77	0.17	-10
Abdomen	AP Portrait	0-1.5	DX-S	1228.00	438	367.50	419.37	217.82	3.34	150	438	-5.24	-5.10	1.92	-0.25	2
Abdomen	Chest PA	0-1.5	DX-S	257.00	3	257.00	254.67	37.55	-0.28	1298	3	0.00	-0.07	0.65	-0.49	22
Abdomen	PA Landsc...	0-1.5	DX-S	373.00	92	455.00	495.63	180.21	0.09	-687	92	0.86	0.80	2.40	-3.36	-3
Abdomen	PA Portrait	0-1.5	DX-S	1830.00	170	417.00	467.61	210.41	2.21	32	170	-6.42	-6.29	1.76	0.17	2
Abdomen GU	KUB Lands...	0-1.5	DX-S	489.00	10	344.00	383.10	128.32	0.20	-1905	10	-1.53	-1.30	1.54	-0.43	-24
Chest	AP Chest P...	0-1.5	DX-S	602.00	53	437.00	481.66	91.63	1.10	-1150	53	-1.39	-1.04	0.77	0.86	-9
Chest	AP Landsc...	0-1.5	DX-S	688.00	2753	352.00	391.63	174.24	1.61	-736	2753	-2.91	-2.82	1.80	-0.07	-8
Chest	AP Portrait	0-1.5	DX-S	372.00	33	372.00	382.61	202.37	1.68	264	33	0.00	-0.40	2.17	-0.06	-4
Chest	Chest Lt L...	0-1.5	DX-S	251.00	8	229.50	242.50	116.43	1.88	-570	8	-0.39	-0.51	1.84	0.60	-8
Chest	Lateral den...	0-1.5	DX-S	686.00	6	264.50	310.17	187.41	2.00	-3252	6	-4.16	-3.81	2.14	1.12	-40

Extended Dose Reporting



Extended Dose Reporting



Extended Dose Reporting

Select Room

MORWF087

Select Protocol Code

All

Select Begin Date

15 June 2010

Select End Date

08 March 2012

Select Entries

DAP Statistics Protocol Code

Start Analysis

Cancel Analysis

Export Results

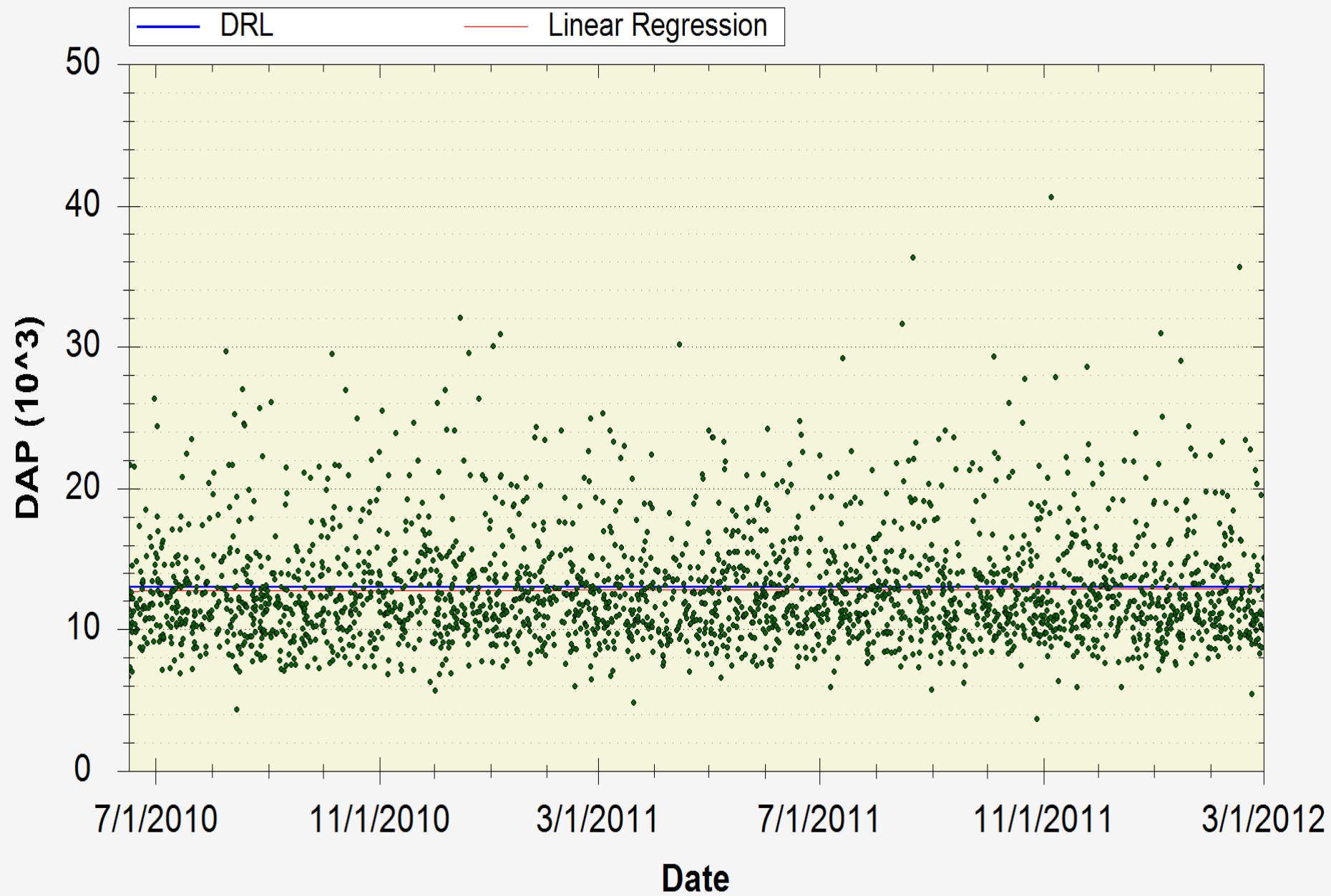
Protocol Code	DRL	#	DAP(Median)	DAP(Avg)	DAP(StdDev)	DAP(Skew)	DAP(Slope)
Protocol 10 (4000, 5000)		2495	8238.88	8913.73	3444.11	1.82	283
Protocol 1 (1020, 1040)	9800.0	2523	9220.33	9868.27	3517.13	1.68	230
Protocol 2 (1030, 1041)	13000.0	2500	11944.97	12770.71	3914.63	1.64	259
Protocol 4 (1050, 1043)		2557	5862.82	6320.21	2326.93	1.73	-96
Protocol 5 (1060, 1044)		2566	5786.45	6226.24	2239.77	1.79	-164
Protocol 12 (8900, 0001)	12000.0	2528	14100.89	15055.23	4573.73	1.44	-25
Protocol 3 (1040, 1042)	6000.5	2495	3548.79	3989.32	2079.07	2.46	-186
Protocol 9 (3000, 3000)		2492	6200.03	6700.54	2470.66	1.67	-165
Protocol 11 (9999, 1111)	4000.0	2457	5237.76	5834.43	2960.60	2.30	189
Protocol 7 (2050, 2046)	13500.0	2404	9073.72	9752.65	2895.12	1.33	-197
Protocol 8 (2060, 2047)		2504	9368.14	10170.00	3808.79	1.69	88
Protocol 6 (2040, 2045)		2478	5330.14	5936.17	3156.47	2.63	-78

For each Protocol code, statistics are shown for the received DAP values

Select a single line to see graphical representation of the results

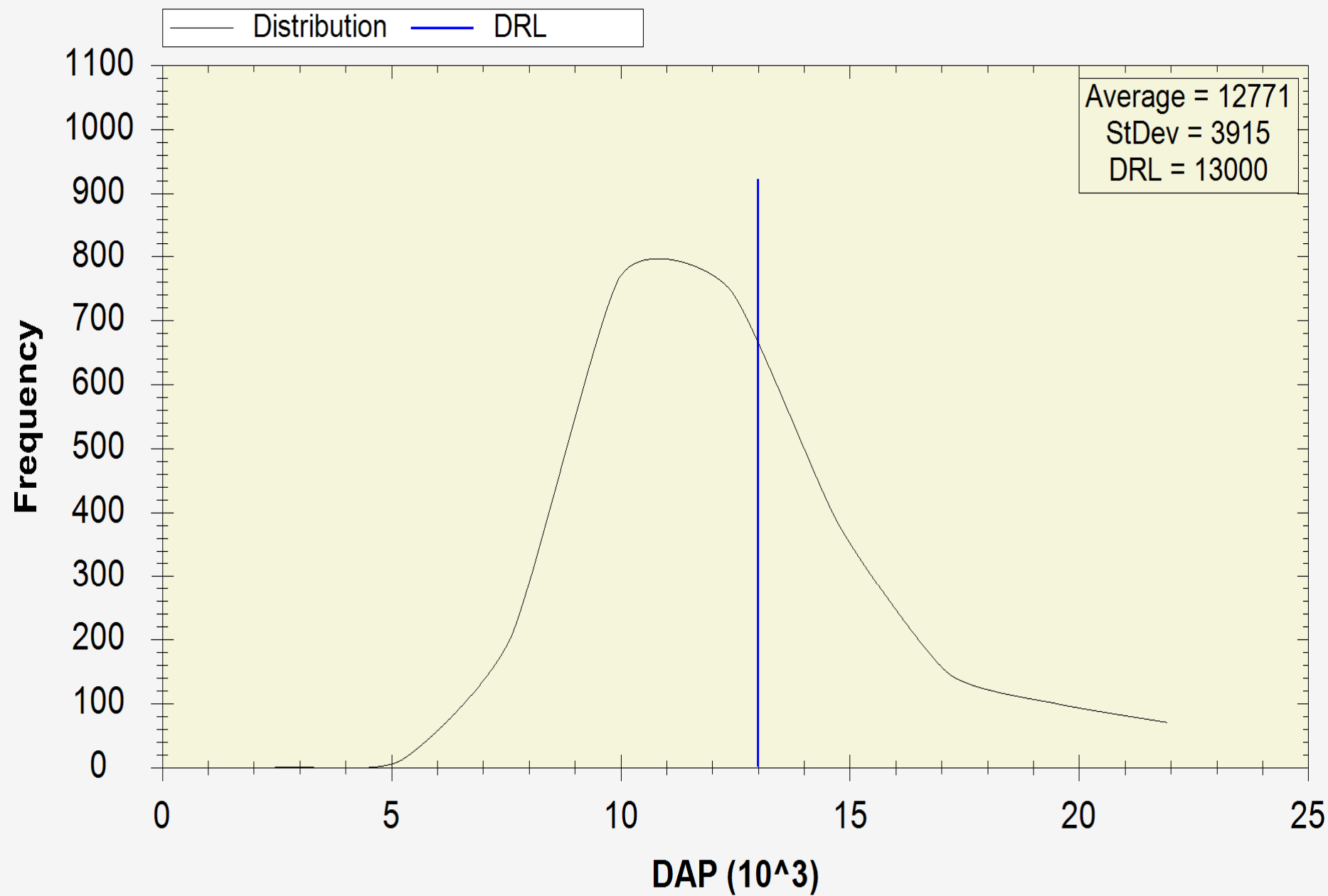
A Diagnostic Reference Level (DRL) can be entered for each code

Protocol 2 (1030, 1041)
Room: MORWF087



Protocol 2 (1030, 1041)

Room: MORWF087



Extended Dose Reporting

Select Room
Select Begin Date
Select End Date
Select Entries

MORWF087
15 June 2010
08 March 2012
DAP Statistics Protocol Code

Select Protocol Code
Protocol 2 (1030, 1041)

Start Analysis
Cancel Analysis
Export Results

Protocol Code	Exposure Type	Age Group	DRL	#	DAP(Median)	DAP(Avg)	DAP(StdDev)	DAP(Skew)	DAP(Slope)
Protocol 2 (1030, 1041)	Chest Acht	17+		2500	3743.67	4133.65	2046.84	2.30	236
Protocol 2 (1030, 1041)	Chest Drie	17+		2500	2962.81	3270.20	1694.74	2.60	-227
Protocol 2 (1030, 1041)	Chest Vijf	17+		2500	4746.39	5366.86	2820.89	2.45	249
Protocol 2 (1030, 1041)			13000.0	2500	11944.97	12770.71	3914.63	1.64	259

Select a single Protocol code to see statistics of the exposures that are part of the protocol code.

Extended Dose Reporting

Select Room

MORWF087

Select Age Group

All

Select Begin Date

15 June 2010

Select Exam Group

All

Select End Date

08 March 2012

Select Exposure Type

All

Select Entries

Outliers

Select Operator

Jouri

Exposure Deviation Index Limits

-8.25 7.35

Select Digitizer / Detector

Solo

Start Analysis

Cancel Analysis

Export Results

Exam Group	Exposure Type	Age Group	Detector Type	Acquired Study Date ...	Operator Name	Patient ID	TEI	EI	DI
Lower Extremities	Lower Extremities Twee	17+	Solo	6/20/2010 1:20 AM	Jouri	Drie	211.70	1175.49	7.45
Lower Extremities	Lower Extremities Twee	17+	Solo	10/20/2011 9:50 PM	Jouri	Nul	211.70	1176.04	7.45
Pelvis	Pelvis Drie	17+	Solo	8/23/2011 9:35 PM	Jouri	Acht	350.78	1906.48	7.35
Special 1	Special 1 AP	17+	Solo	10/18/2011 9:05 PM	Jouri	Vijf	266.61	1474.97	7.43
Special 1	Special 1 AP	17+	Solo	11/10/2010 7:35 PM	Jouri	Twelve	266.61	1460.44	7.39
Skull	Skull Zeven	7-16	Solo	3/30/2011 10:05 PM	Jouri	Een	523.50	2897.46	7.43
Skull	Skull Zeven	7-16	Solo	6/2/2011 6:50 PM	Jouri	Zeven	523.50	2857.70	7.37

Limit that determines outliers can now be configured.

Extended Dose Reporting

Select Room
MORWF087

Select Begin Date
15 June 2010

Select End Date
08 March 2012

Select Entries
Exposure Information

Select Age Group
All

Select Exam Group
All

Select Exposure Type
All

Select Operator
Jouri

Select Digitizer / Detector
Solo

Start Analysis

Cancel Analysis

Export Results

Exam Group	Exposure T...	Age Group	Protocol C...	Detector T...	Station Name	Acquired S...	Operator ...	Patient ID	Body Part	TEI	EI	DI	DAP	SOP Instan...	Session UID
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/15/2010 2...	Jouri	Zeven	CHEST	229.03	162.44	-1.49	1640.65	0b47d182-1...	00edb7fa-5...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/15/2010 4...	Jouri	Een	CHEST	229.03	235.61	0.12	2379.67	287bfa5b-7...	39083762-0...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/15/2010 9...	Jouri	Negen	CHEST	229.03	372.04	2.11	3757.65	4e37950d-5...	16191fd1-1...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/15/2010 8...	Jouri	Negen	CHEST	229.03	58.34	-5.94	589.27	ffe7c574-96...	7484e092-2...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/16/2010 4...	Jouri	Elf	CHEST	229.03	175.87	-1.15	1776.30	d884eed7-9...	080f1587-0...
Special 4000	Spe								T	229.03	135.21	-2.29	1365.58	a8846707-4...	bfd12565-4...
Special 4000	Spe								T	229.03	293.56	1.08	2964.94	7ee52aaa-0...	e414a334-1...
Special 4000	Spe								T	229.03	181.59	-1.01	1834.07	648388dd-4...	3d9a0805-d...
Special 4000	Spe								T	229.03	607.57	4.24	6136.44	751f3270-c...	36678441-0...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/19/2010 1...	Jouri	Twelve	CHEST	229.03	125.08	-2.63	1263.33	b09ad194-0...	39e771f0-d...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/19/2010 1...	Jouri	Elf	CHEST	229.03	239.83	0.20	2422.23	93944668-1...	537b7e6b-2...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/19/2010 9...	Jouri	Vijf	CHEST	229.03	165.80	-1.40	1674.62	0f20b7d2-4...	e00cf10d-b...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/20/2010 1...	Jouri	Vier	CHEST	229.03	224.39	-0.09	2266.29	74ac236e-b...	8b9c87cc-a...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/20/2010 4...	Jouri	Twelve	CHEST	229.03	178.15	-1.09	1799.35	e3ccb858-4...	f926b6ac-6...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/20/2010 8...	Jouri	Vier	CHEST	229.03	228.19	-0.02	2304.71	b3a84b62-5...	aa5608b5-a...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/20/2010 9...	Jouri	Twee	CHEST	229.03	652.37	4.55	6588.95	7ad7c325-5...	5b9333b2-2...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/21/2010 1...	Jouri	Zeven	CHEST	229.03	248.37	0.35	2508.51	318ce09c-4...	8223e193-c...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/21/2010 7...	Jouri	Twelve	CHEST	229.03	169.71	-1.30	1714.02	8321935d-7...	b4af7e84-bf...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/21/2010 1...	Jouri	Zeven	CHEST	229.03	208.16	-0.42	2102.40	d91ac3f2-3...	988f20de-5...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/21/2010 5...	Jouri	Negen	CHEST	229.03	121.14	-2.77	1223.53	4ce98e70-f...	ae26572d-7...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/22/2010 4...	Jouri	Nul	CHEST	229.03	127.14	-2.56	1284.15	30cdb37c-8...	a5610e15-8...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/22/2010 8...	Jouri	Vijf	CHEST	229.03	665.27	4.63	6719.18	d4e153a5-8...	157fc3c9-90...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/22/2010 2...	Jouri	Een	CHEST	229.03	273.96	0.78	2767.05	3d8c1569-3...	00c7fbc3-9...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/23/2010 5...	Jouri	Twee	CHEST	229.03	300.67	1.18	3036.80	da49b9fa-d...	6f394c82-0...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/23/2010 8...	Jouri	Acht	CHEST	229.03	374.54	2.14	3782.82	9785ac97-e...	d4265428-a...
Special 4000	Special 400...	0-2	Protocol 10 ...	Solo	MORWF087	6/24/2010 2...	Jouri	Vier	CHEST	229.03	210.67	-0.36	2127.73	53a22a08-c...	0aabca21-2...

Data for individual exposures can be exported for further analysis

Forced entry of operator ID per exam

Workflow Management

Identification

Examination _____

☒ Automatic selection of next exposure thumbnail

Operator Name _____

☒ Force operator identification on start exam

☐ Link user name to operator name

Operators: _____

prefix	last	first	middle	suffix	
Operator Name:	Mr	Bart			Add
					Remove
^gibbs^^^^					Up
^curley^^^^					Down
^freeman^^^^					

Select 'force operator ID'
Create operator list in configtool

Operator selection box will pop up at first ID of each open exam.

Cassette Orientation: Portrait
Cassette size : _____

Identify Operator

Operator Name : _____

Mr. Bart

Mr. Jeff

Lieve Boonen Johan

Select or
type in name

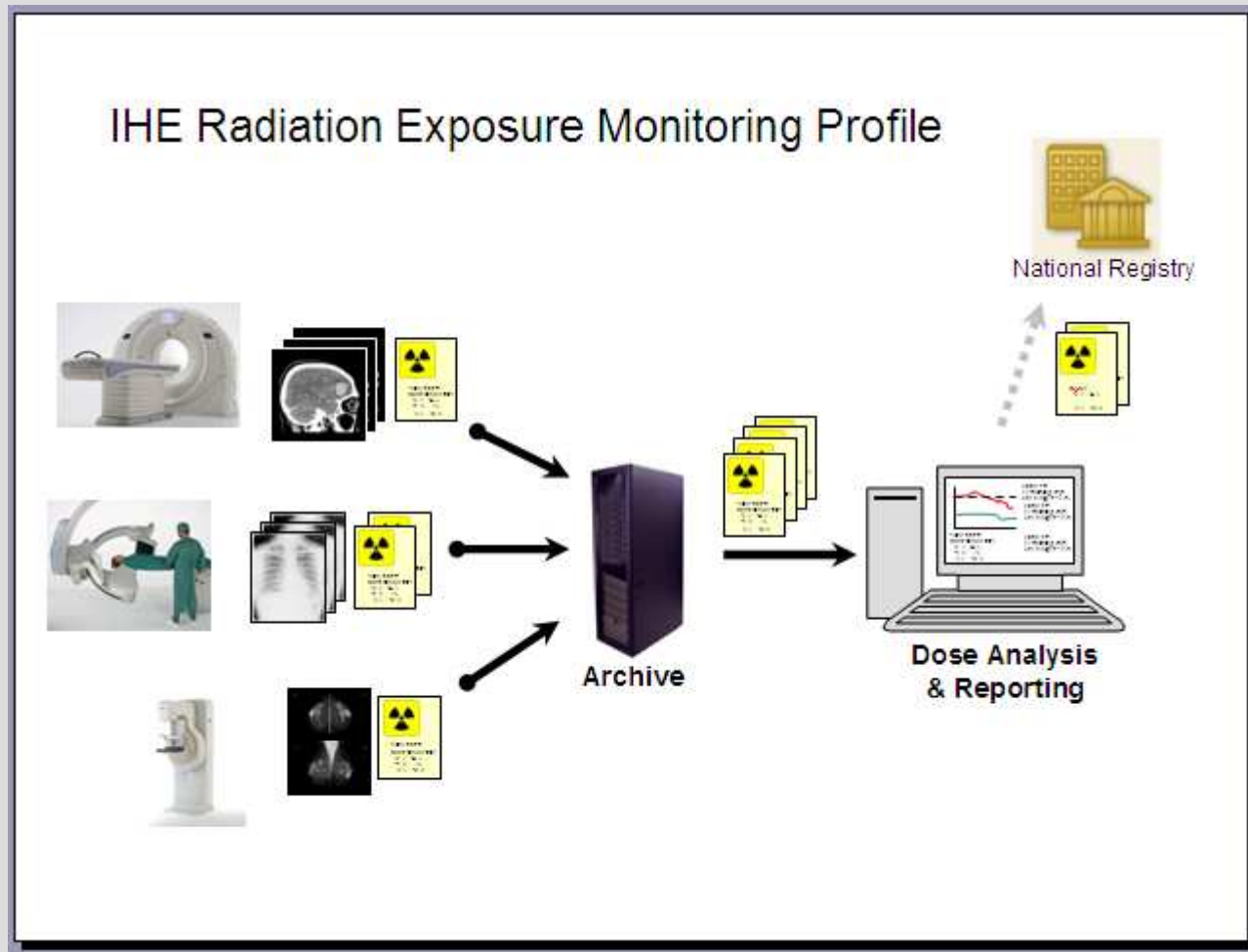
Extended Dose Reporting

- Limitations:
 - CR DR only
 - Agfa modalities only
 - Hospital wide dose reporting ➔ IHE REM

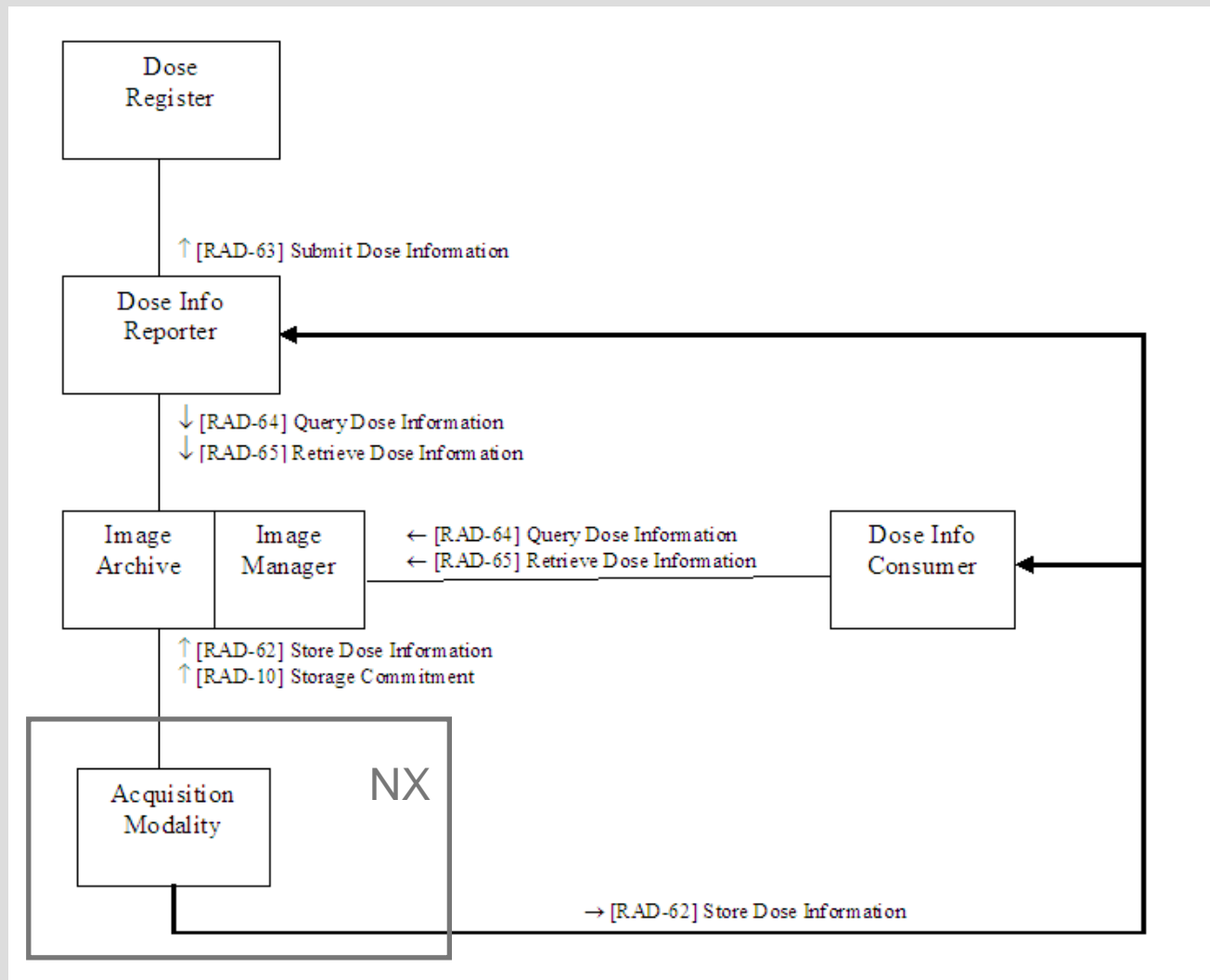
IHE REM Profile

- Radiation Exposure Monitoring
- We will send DICOM Structured Reports of radiation events (Dose objects) to Radiation Reporting Systems.
 - Some of the **key details** include:
 - All modalities
 - kVP, mA, collimation, filters, etc.
 - Patient/Order/Study details
 - Projection X-Ray
 - DAP, Dose@RP, Imaging geometry, Fluoro Dose, Fluoro Time
 - Mammography
 - AGD, Entrance Exposure@RP, Compression, Half Value Layer
- What is in report depends on what is provided by the modality!
 - OR manually entered.

IHE REM Profile New



IHE REM Profile New



Agfa Dose Info Reporter

- Under development
 - CT + Agfa CR
 - US + Canada
 - Vendor Neutral
 - Data accessible by AGFA PACS /RIS

Who?

- Radiographer
 - E.I - Exposure Index
 - Dose Bar-graph
- Radiology supervisor
 - Repeat Reject Report
 - Extended Dose Monitoring **New**
 - IHE REM Profile **New**
- Physicist
 - Auto AC2
 - Auto QC Mammo

Auto QC²

- Hardware
 - One test phantom
 - Filters, filter module, positioning template
- Delivered in one suitcase



Auto QC² - Product information

- Software
 - Automatic calculation on raw images
 - Artifact inspection (visual check)
 - Automated report
 - Search & history functions
 - Based on NX GUI, with 4 main panes
 - Follows the NX licensing (protected by dongle & ELMS)

Auto QC² - Overview of tests

- Periodic quality control & Acceptance test procedure
 - Scan Line Drop Outs
 - Overshoots
 - Signal-to-Noise Ratio (SNR)
 - Sensitivity
 - Dynamic Range
 - Signal Uniformity (banding)
 - Spatial Resolution [MTF]
 - Laser Jitter
 - System Linearity
 - Distance Accuracy
 - Sweep Error
 - Pixel Aspect Ratio (V/H)
 - Pixel Size Horizontal & vertical
 - Skew
 - Image Width
 - Image Length
 - Radiation Quality (KVP, tube-wear)
 - Dark Noise
 - Erasure Efficiency
- Plate inventory
- Monitor check

Auto QC² software UI

AutoQC² WorkList

Test Group: **Periodic Quality Control**

Digitizer: **Digitizer DR1 [7B]**

Test	Exp. Type	Scan Date	Comment
Accuracy of Exposure	ATP_PH_2	01-JAN-2006 15:45	Test comment
Artifacts Analysis	ATP_FFE	01-JAN-2006 15:45	Test comment
Dark Noise	ATP_FFE	01-JAN-2006 15:45	Test comment
Dynamic Range determination	ATP_PH_4	01-JAN-2006 15:45	Test comment
Laser Beam Function - After analysis	ATP_FFE	01-JAN-2006 15:45	Test comment
Laser Beam Function - Overshoots	ATP_PH_1	01-JAN-2006 15:45	Test comment
Noise and Low Contrast Sensitivity	ATP_PH_2	01-JAN-2006 15:45	Test comment
Pixel Aspect Ratio	ATP_FFE	01-JAN-2006 15:45	Test comment
Pixel Orthogonality	ATP_PH_1	01-JAN-2006 15:45	Test comment
Pixel Size Resolution	ATP_FFE	01-JAN-2006 15:45	Test comment
Scan Line Uniformity	ATP_PH_1	01-JAN-2006 15:45	Test comment
Scanned Length (perpendicular ruler)	ATP_PH_1	01-JAN-2006 15:45	Test comment
Scanned Width	ATP_PH_1	01-JAN-2006 15:45	Test comment
Sensitivity calculations	ATP_PH_1	01-JAN-2006 15:45	Test comment
Slow Scan Banding	ATP_FFE	01-JAN-2006 15:45	Test comment
Spatial Resolution determination (MTF)	ATP_PH_1	01-JAN-2006 15:45	Test comment

Buttons: Remove, Edit, View, Generate Results, Worklist, History, Search, Main Menu

Auto QC² History

Digitizer: **Digitizer DR1**

Report Date: Start: End: Tube No: Detector Description:

Buttons: History, Report, Export Data

Pixel Size Horizontal

Scan Date

Pixel Size Vertical

Scan date

Buttons: Worklist, History, Search, Main Menu

AutoQC² Periodic Quality Control Report

Tube nr: **TUBE123456789**

Comment:

Report comment:

Test	Unit	Result	Min	Max
Pixel Size Horizontal	micron	100.2	98.0	101.5
Pixel Size Vertical	micron	143.2	149.0	151.0
Pixel Aspect Ratio V/H	row/col	0.953	0.990	1.025
Sweep Error	mm	5.3		4.1
Distance Accuracy Horizontal	%	1.5		3.7
Distance Accuracy Vertical	%	1.5		3.4
Spatial Resolution	mm	346.9	346.5	
Image Width	mm	426.9	430.5	
Image Length	mm	5.00	2.75	6.75
Skew	degree	0.57		0.50
Skew - Standard Deviation Error	pixel			

Spatial Resolution - MTF Horizontal

Result	MTF Hor	MTF Ver
Accept	0.85, 0.82, 0.77, 0.74, 0.70, 0.65, 0.60, 0.53, 0.45, 0.30	0.25, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 5

Spatial Resolution - MTF Vertical

Result	MTF Ver
Accept	0.84, 0.83, 0.82, 0.78, 0.72, 0.65, 0.56, 0.46, 0.34, 0.15

Buttons: Publish Report, Close, Worklist, History, Search, Main Menu

Auto QC² Plate Inventory Report

Tube nr: **TUBE123456789**

Comment:

Report comment:

#	Case ID	Det. Descr	Case Size	Sens	N/Unif	Comment
1	QM40	MD30	18CMx24CM	-0.3	3.7	Severe scratch near...
2	ALM40	MD40	18CMx24CM	1.5	4.9	Coating cracked
3	QPM40	MD40	18CMx24CM	1.7	4.4	
4	QPM40	MD40	18CMx24CM	1.7	4.4	
5	QPM40	MD40	18CMx24CM	-4.1	4.6	
6	QPM40	MD40	18CMx24CM	-3.9	4.5	
7	QPM40	MD40	18CMx24CM	-3.7	4.2	
8	QPM40	MD40	18CMx24CM	-3.5	4.1	Coating cracked
9	QPM40	MD40	18CMx24CM	-3.2	4.0	
10	QPM40	MD40	18CMx24CM	-3.1	4.0	
11	QPM40	MD40	18CMx24CM	-3.1	4.0	Plate replaced due to...
12	QPM40	MD40	18CMx24CM	-1.4	3.7	
13	QPM40	MD40	18CMx24CM	-1.4	3.7	
14	QPM40	MD40	18CMx24CM	-1.4	3.7	
15	QPM40	MD40	18CMx24CM	-1.4	3.7	
16	QPM40	MD40	18CMx24CM	-1.4	3.7	
17	QPM40	MD40	18CMx24CM	-1.4	3.7	
18	QPM40	MD40	18CMx24CM	-1.4	3.7	
19	QPM40	MD40	18CMx24CM	-1.4	3.7	
20	QPM40	MD40	18CMx24CM	-1.4	3.7	

Relative Sensitivity (%)

Buttons: Publish Report, Close, Worklist, History, Search, Main Menu

AutoQC Mammo - Phantom + PMMA



AutoQC Mammo - Software

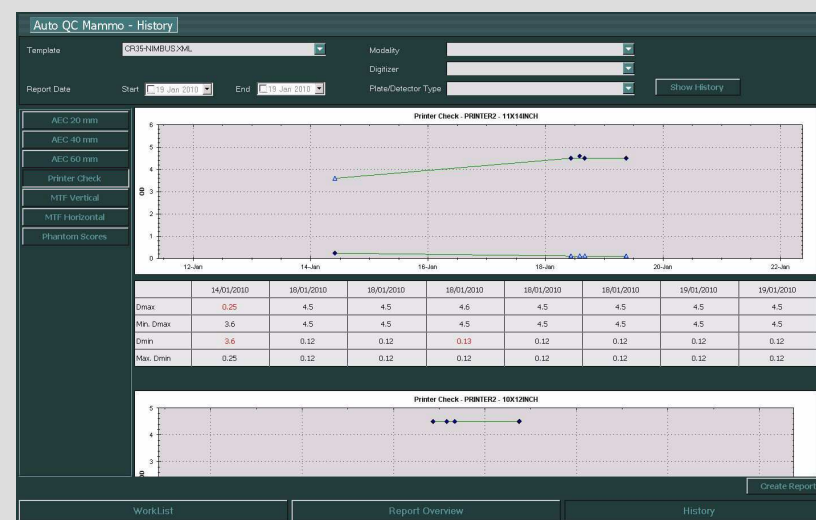
- Software package installable on NX or on a separate (physicists) PC

QC Mammo - Report Overview

Report type: Template:
 Report Date: Start End Operator:

Date	Type	Template	Operator	Result	Images	Comment
14/02/2007	QC	Weekly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
14/02/2007	QC	Weekly Venlo VieCuri	Lizzy	✓	c:\qc\mammo\images\wed	
15/02/2007	QC	Weekly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
16/02/2007	QC	Weekly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
17/02/2007	QC	Weekly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
18/02/2007	QC	Weekly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
19/02/2007	QC	Weekly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
20/02/2007	QC	Monthly Venlo VieCuri	Romy	✓	c:\qc\mammo\images\wed	
10/07/2007	QC	Weekly Venlo VieCuri HCP only	Lizzy	✓	c:\qc\mammo\images\wed	
11/07/2007	QC	Weekly Venlo VieCuri HCP only	Lizzy	✓	c:\qc\mammo\images\wed	
12/07/2007	QC	Weekly Venlo VieCuri HCP only	Lizzy	✓	c:\qc\mammo\images\wed	

Worklist | Report Overview | History



QC for DR - Overview of tests

- Periodic quality control & Acceptance test procedure

- Overshoots/Ringing
- Signal to Noise Ratio (SNR)
- System Sensitivity
- System Linearity (Dose response)
- Dynamic Range determination
- Slow Scan Banding
- Scan Line Uniformity
- Spatial Resolution (MTF)
- Laser Beam Jitter
- Laser beam positioning error (Sweep Error)
- Pixel Aspect Ratio
- Pixel Size / Resolution
- Image Skew
- Image Width and Height
- (Radiation Quality) Only relevant for automated Auto QC calculations
- Artifact Analysis

- AEC test
- Bad pixels
- Low contrast

- Dark Noise(ATP)
- Erasure Efficiency(ATP)

Ghosting is not relevant due to Dark Images correction

QC for DR - Overview of tests

- DR Periodic quality control & Acceptance test procedure

- Signal to Noise Ratio (SNR) (covered by low contrast test)
- System Sensitivity **
- System Linearity (Dose response) *
- Dynamic Range determination *
- Spatial Resolution (MTF) *
- Artifact Analysis **
- AEC test
- Bad pixels ***
- Low contrast *

- Current Procedure

* Tested with Normi 13 phantom

** Tested with Flatfield exposure

*** Panel type dependant

Thank you.