Quality and dose control for CR/DR

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AGFA HealthCare

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
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  - Extended Dose Monitoring New
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- 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 :

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

  - 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?

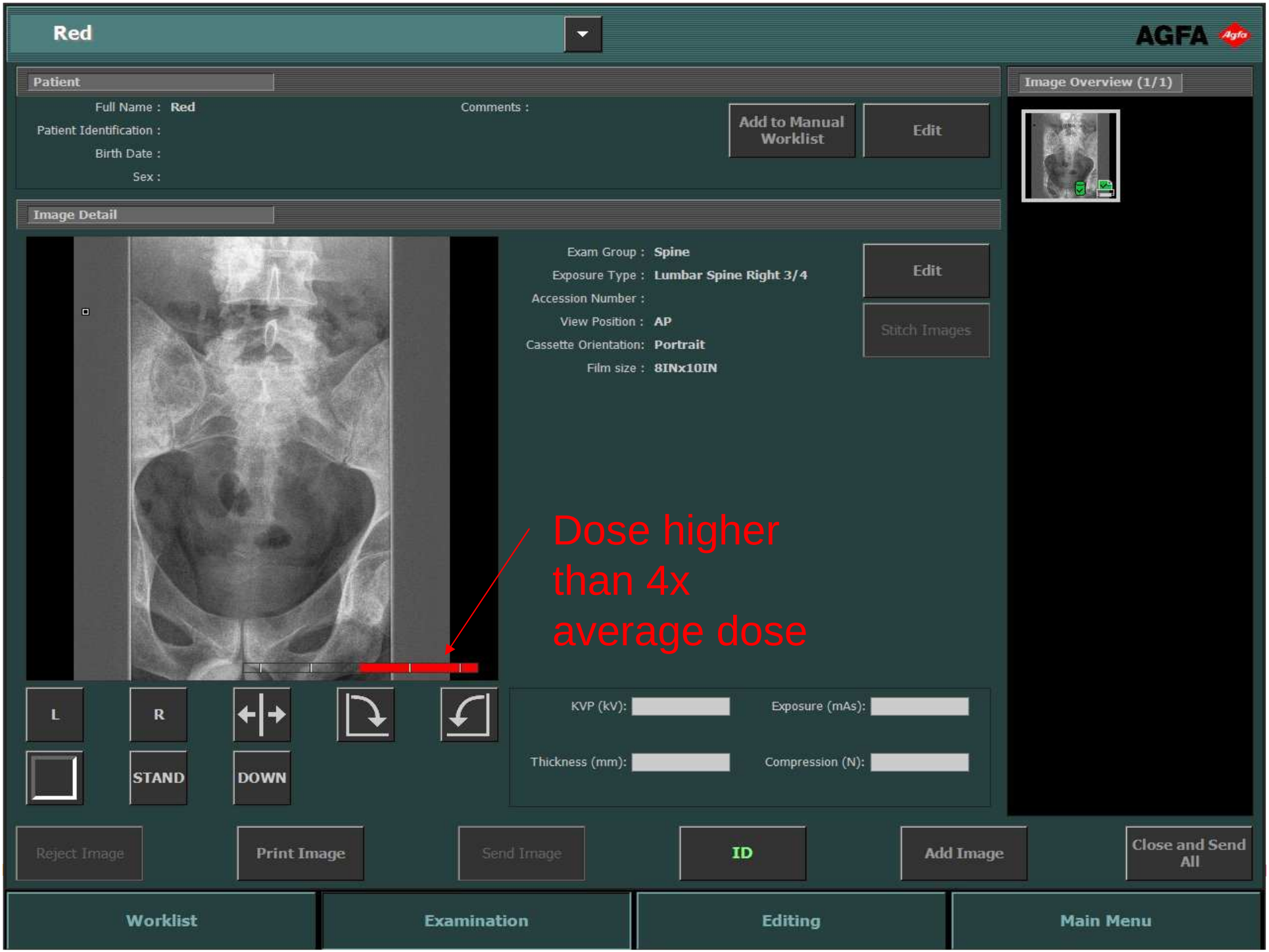
Dose bar-graph

- Colour improves interpretation of Lgm / D.I.
  - -0.3 < Lgm < +0.3 Green bar
  - -0.6 < Lgm < -0.3 or +0.3 < Lgm < +0.6 Yellow bar
  - Lgm < -0.6 or +0.6 < Lgm < Red bar
  - -3 < D.I. < +3 Green bar
  - -6 < D.I. < -3 or + 3 < D.I. < +6 Yellow bar
  - D.I. < -6 or +6 < D.I < Red bar

  - D.I.= Deviation Index is displayed on an Exposure Index acquisition system (= all new CR30, DX-G and DX-D systems)


Cavia
AGFA
Patient
Full Name : Cavia
Patient Identification :
Birth Date :
Sex :
Comments :
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
Patient Identification :
Birth Date :
Sex :
Comments :
Add to Manual Worklist
Edit
Image Overview (2/2)
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.
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


Red
AGFA
Patient
Full Name : Red
Patient Identification :
Birth Date :
Sex :
Comments :
Add to Manual Worklist
Edit
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
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

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!!!!**

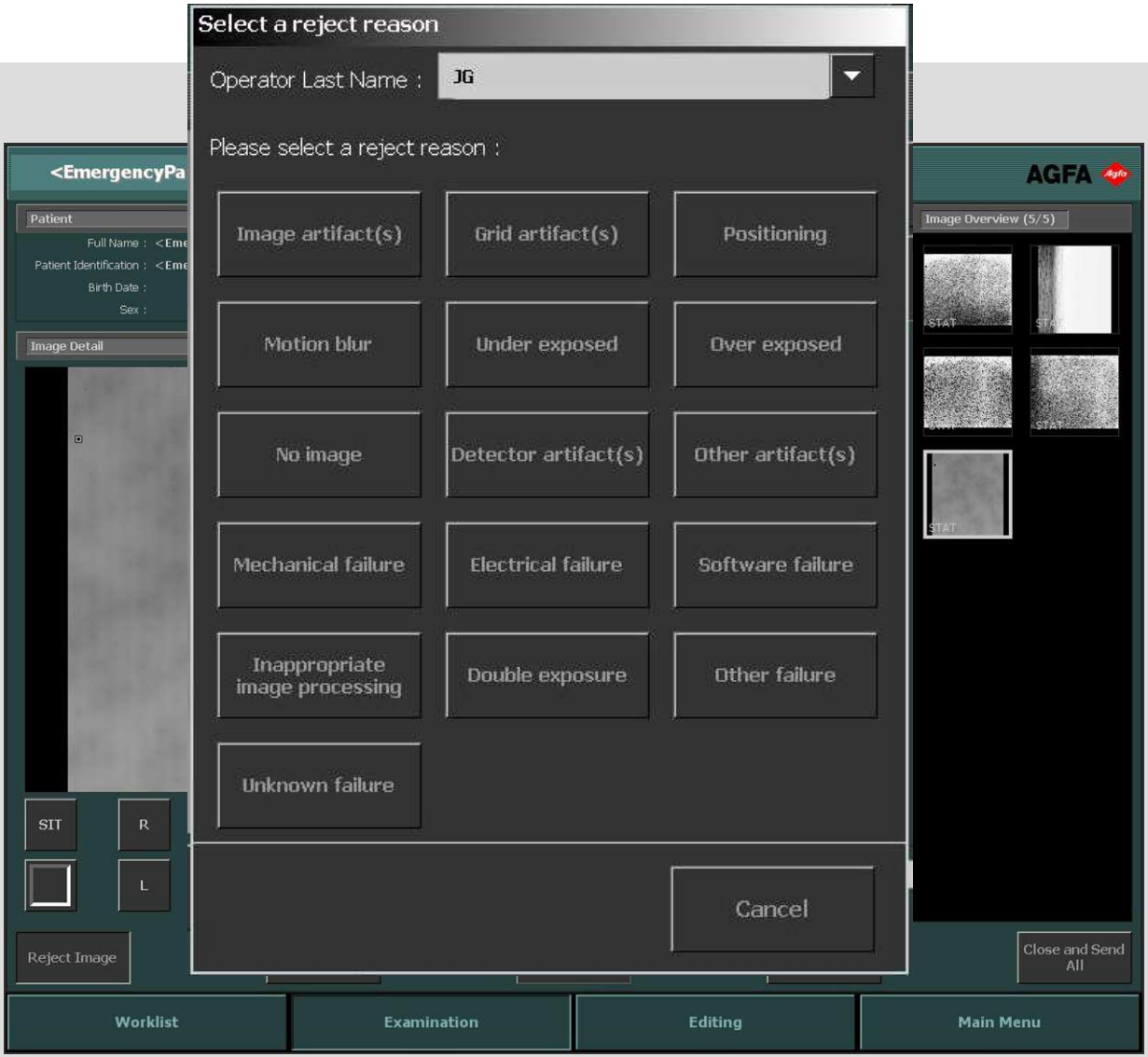
The customer has to decide on exposures settings using the ALARA principle. The dose level used corresponds with the noise level the customer accepts.

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.



Repeat Reject report

- Formatted report available for Repeat/Reject

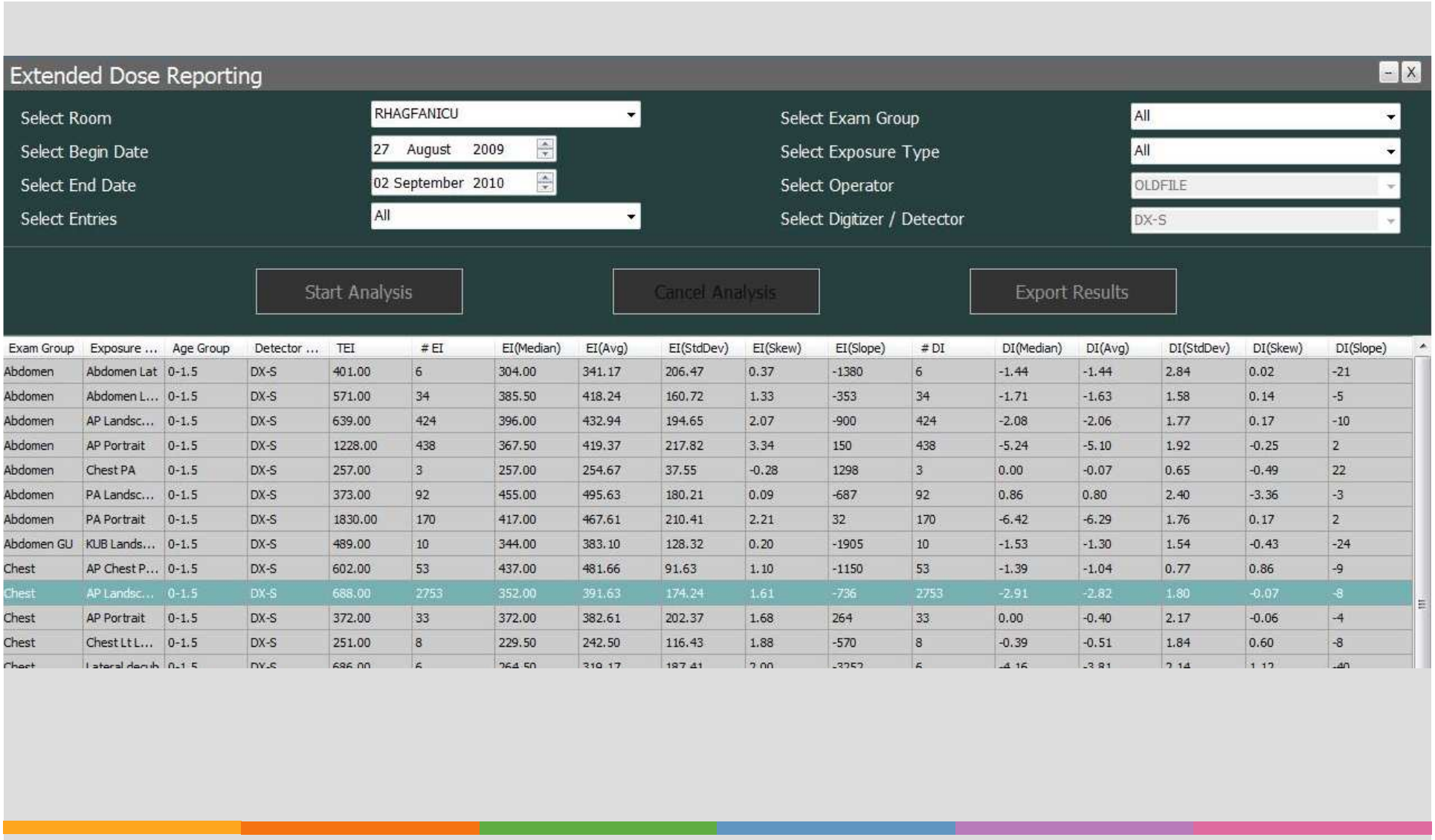
HTML Document

  - 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

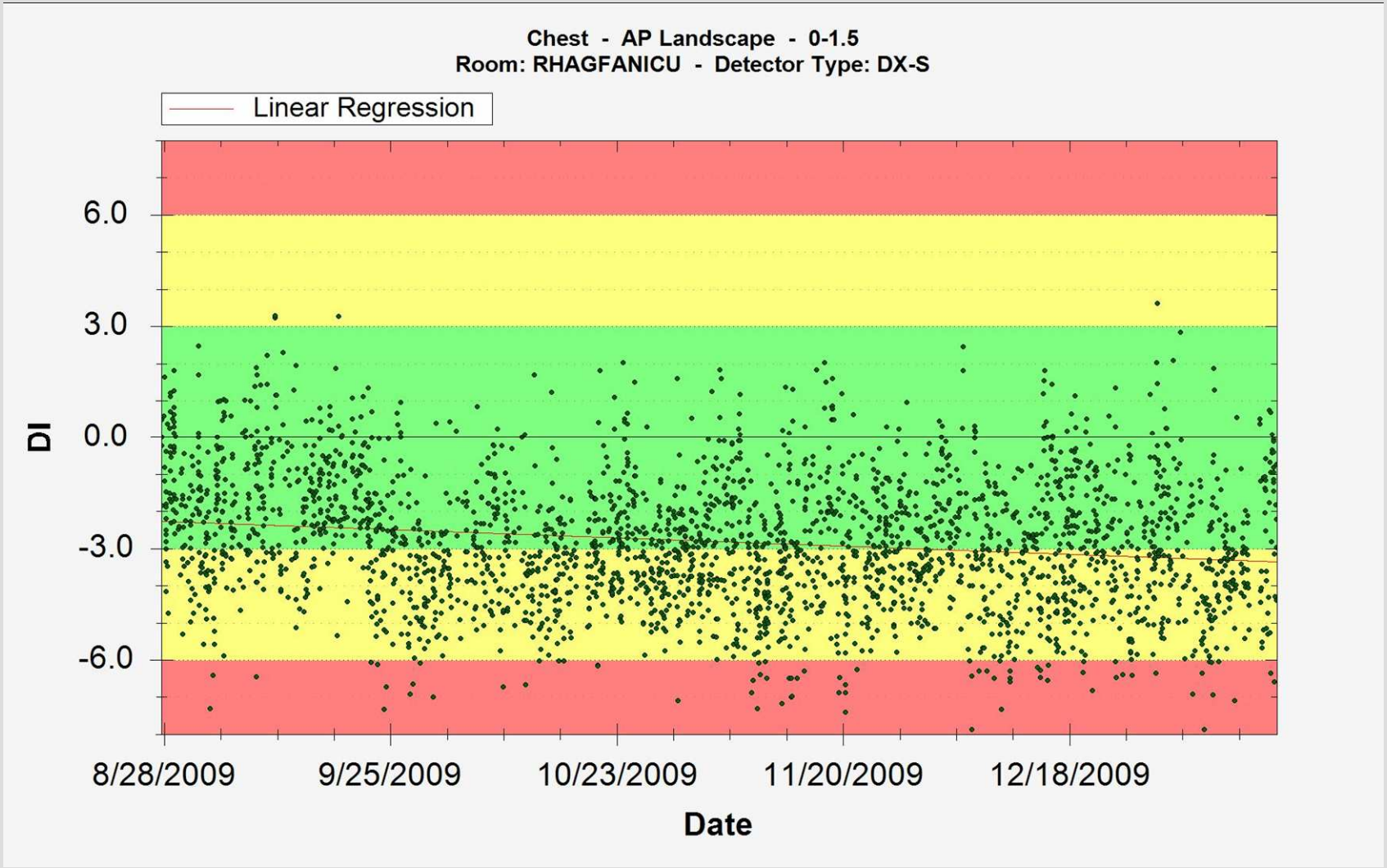
- Allows searching the dose database of 60.000 exposures to create reports
- Search for a certain time period, digitizer, x-ray room, exam type or operator
- Create report for statistics of all exposures or only look at the extremes (DI outliers)

Extended Dose Reporting

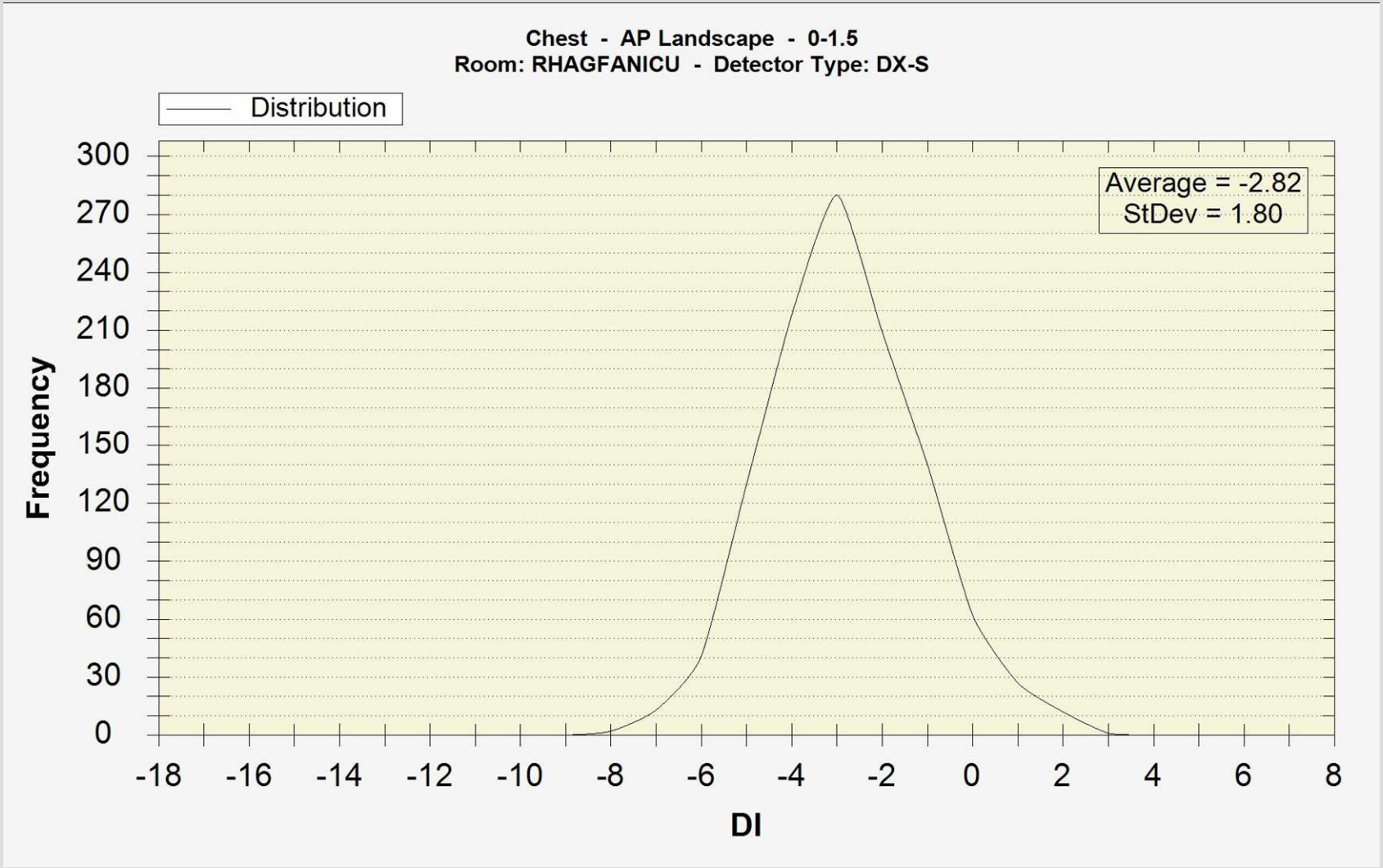


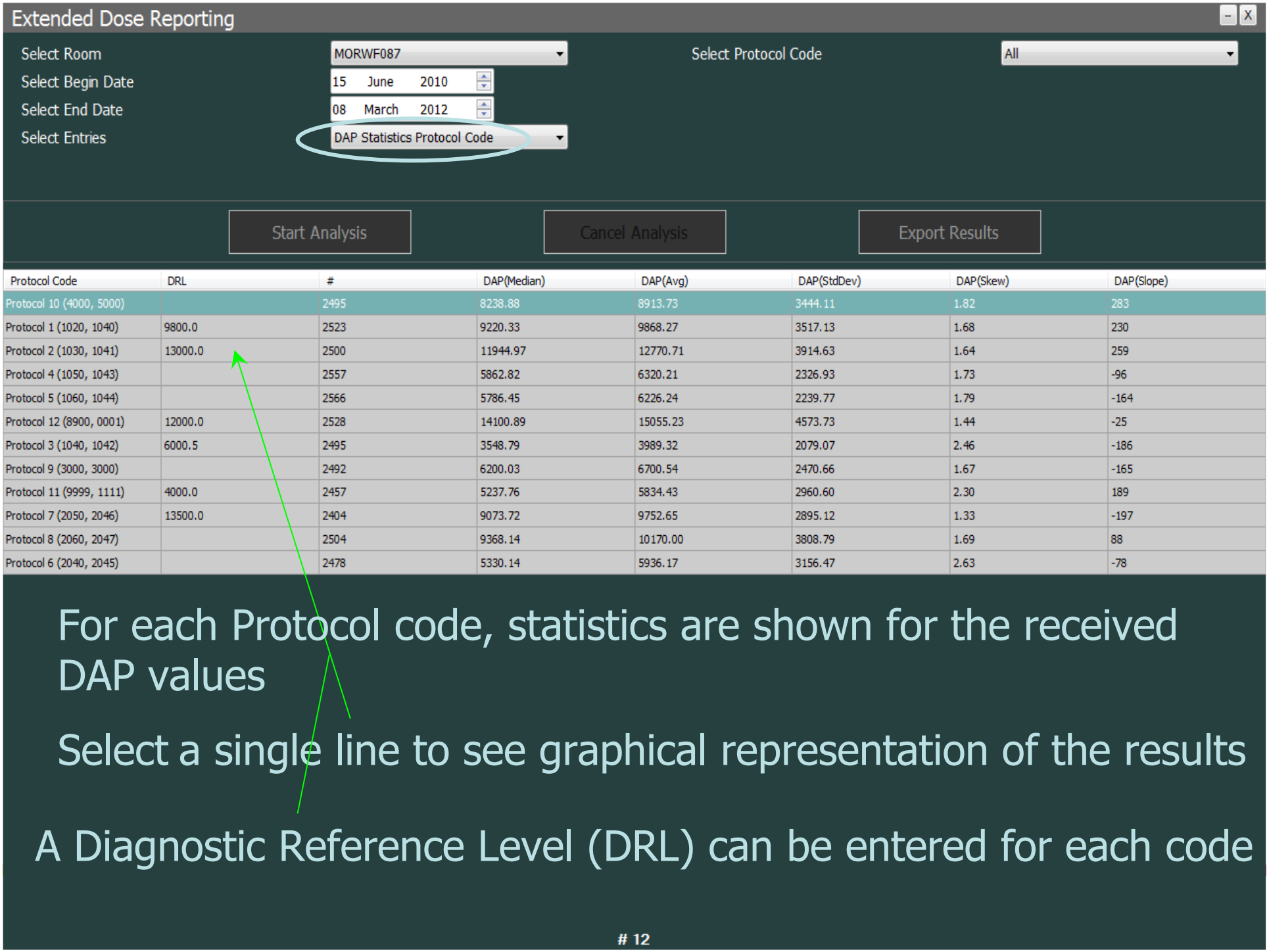
Exam Group	Exposure ...	Age Group	Detector ...	TEI	# EI	EI(Median)	EI(Avg)	EI(StdDev)	EI(Skew)	EI(Slope)	# DI	DI(Median)	DI(Avg)	DI(StdDev)	DI(Skew)	DI(Slope)
Abdomen	Abdomen Lat	0-1.5	DX-S	401.00	6	304.00	341.17	206.47	0.37	-1380	6	-1.44	-1.44	2.84	0.02	-21
Abdomen	Abdomen L...	0-1.5	DX-S	571.00	34	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 decub	0-1.5	DX-S	686.00	6	264.50	319.17	187.41	2.00	-3252	6	-4.16	-3.81	2.14	1.12	-40

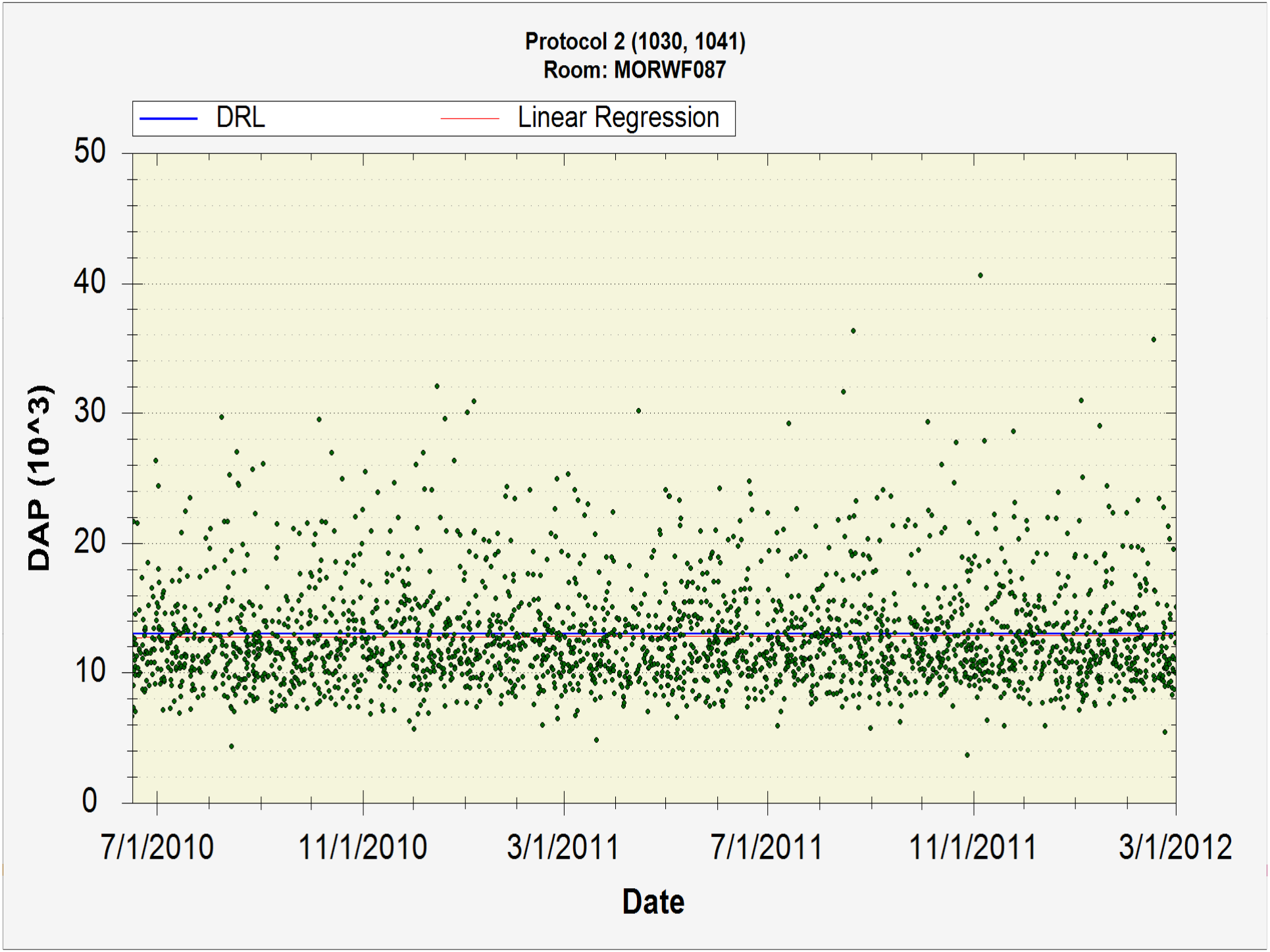
Extended Dose Reporting

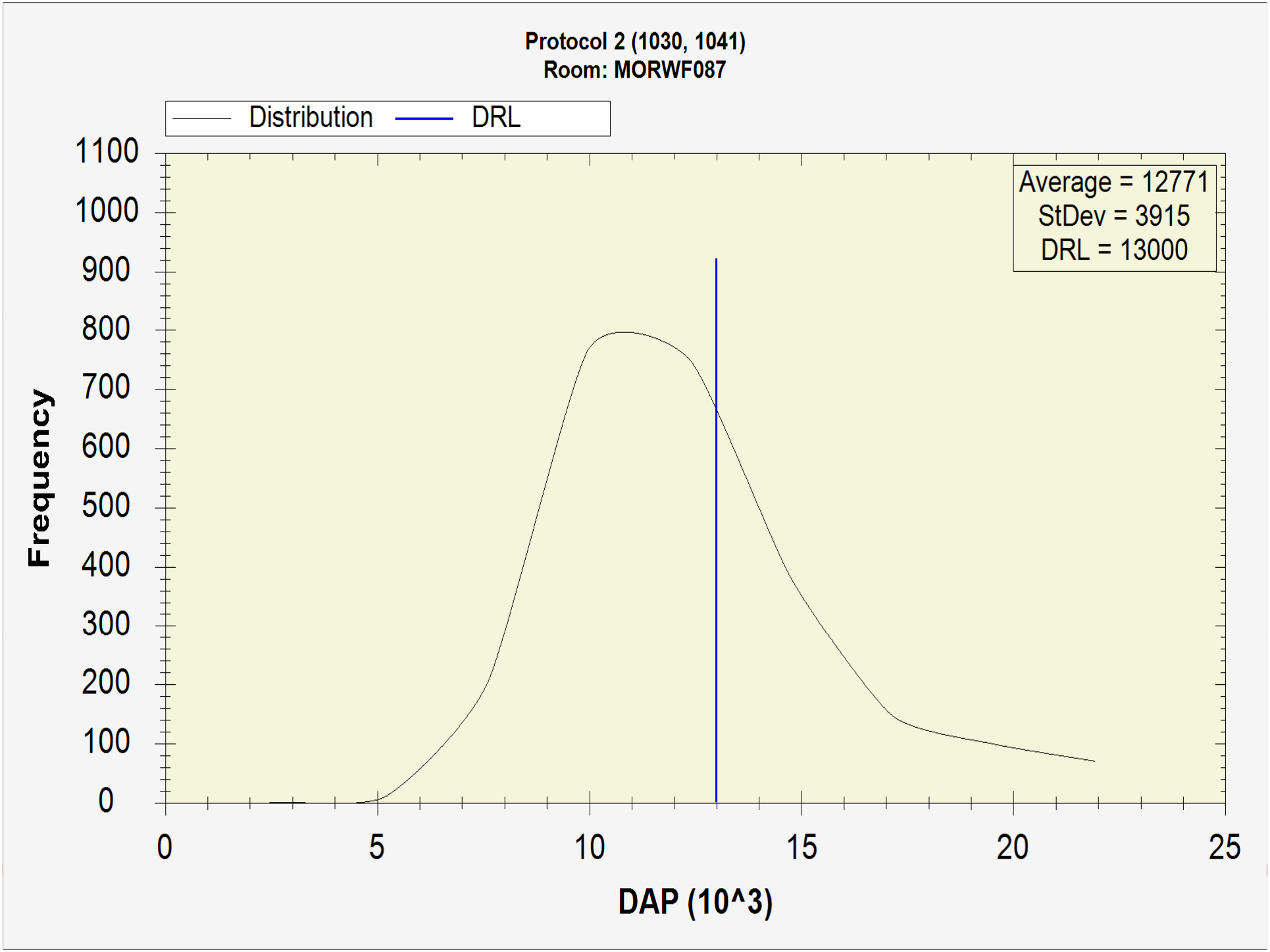


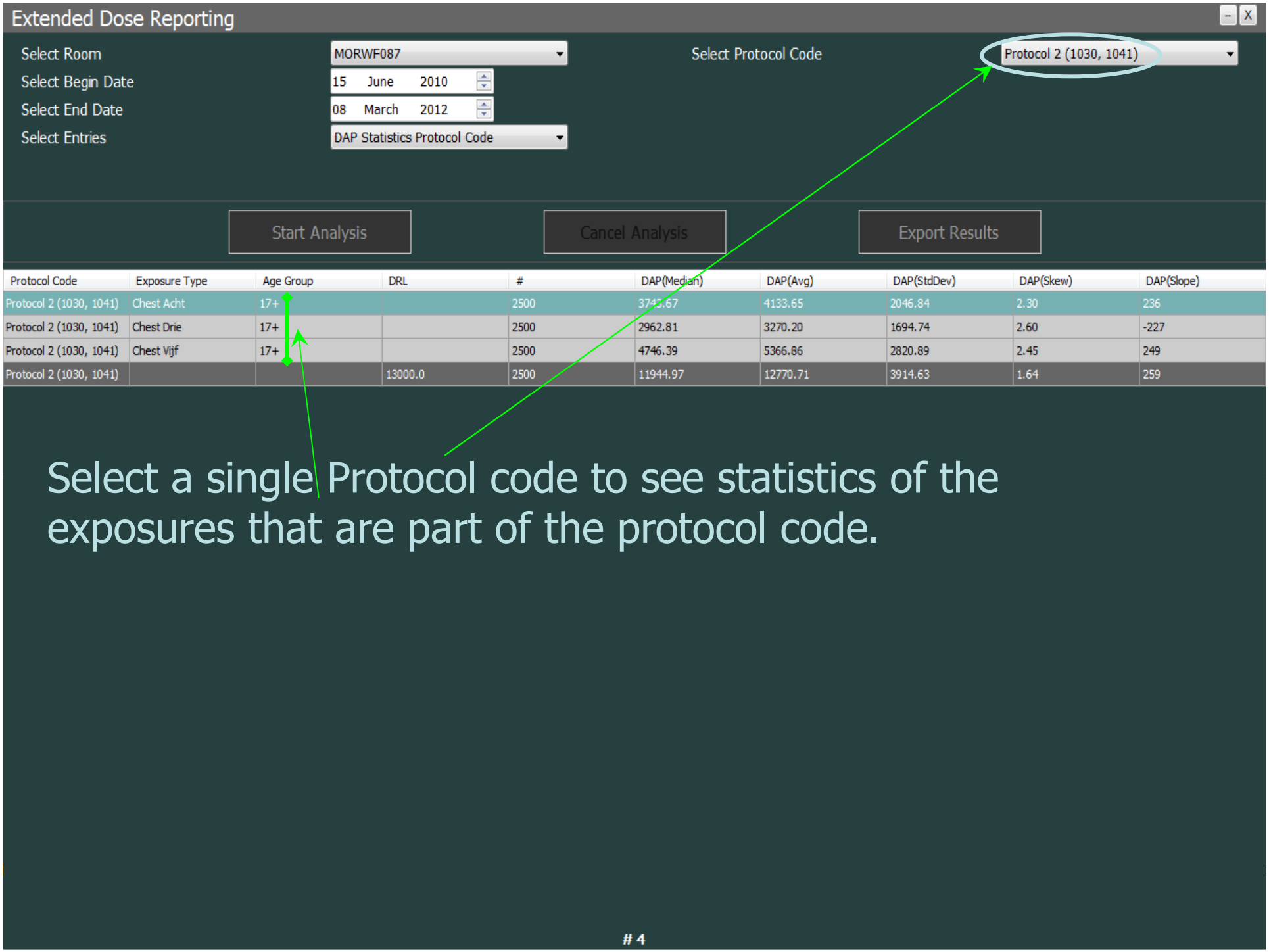
Extended Dose Reporting

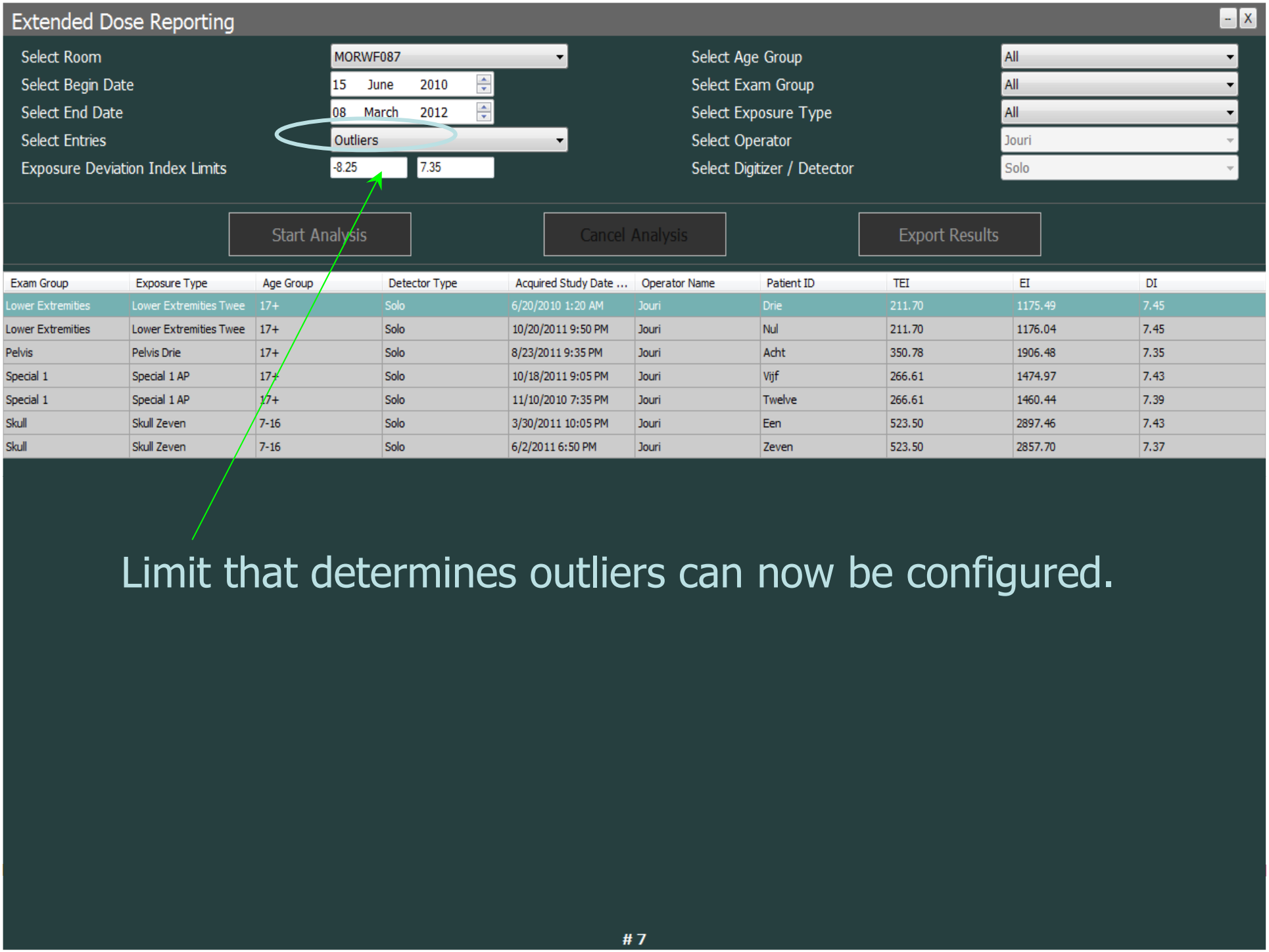


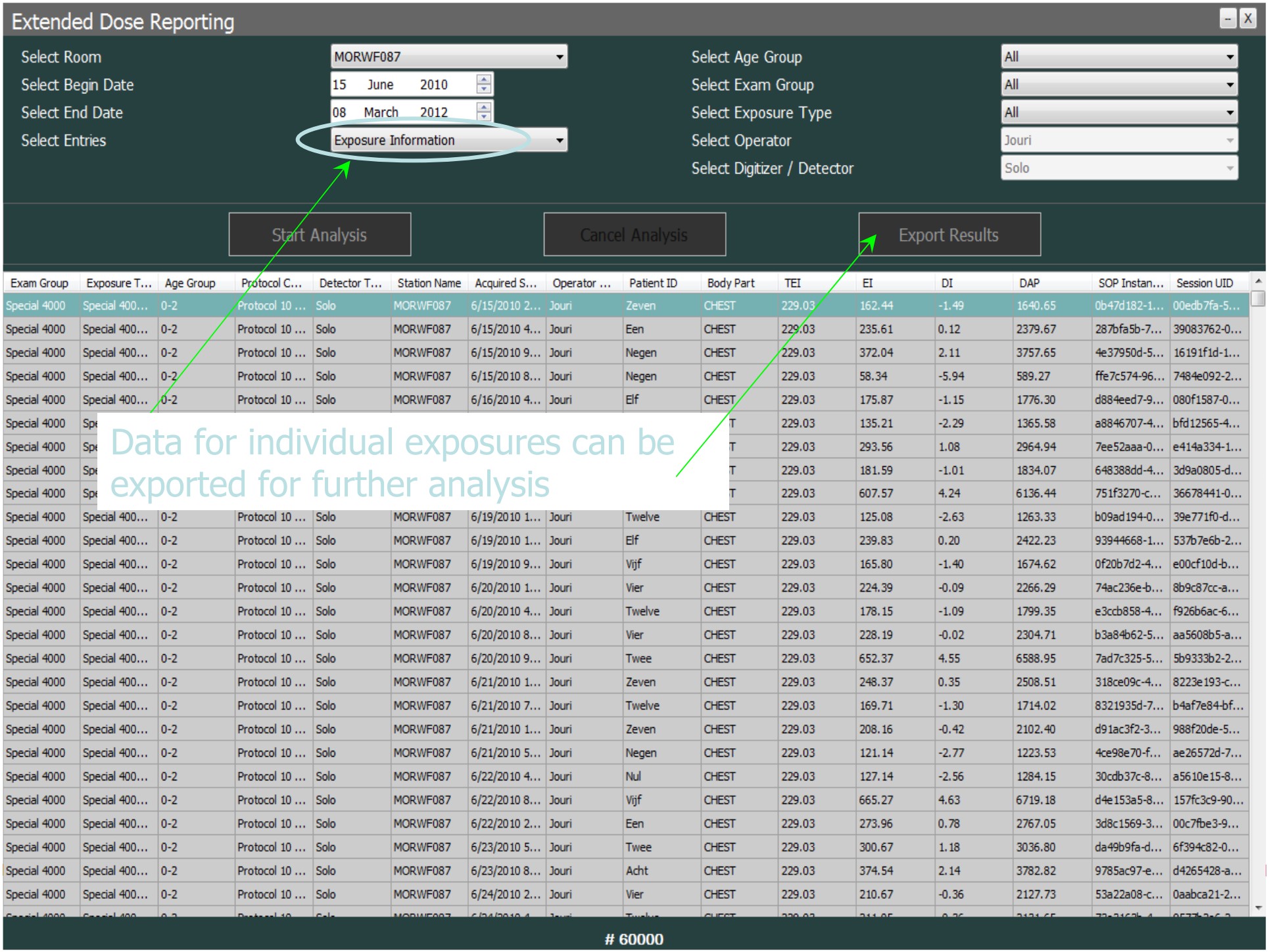

Extended Dose Reporting
Select Room
MORWF087
Select Protocol Code
All
Select Begin Date
15 June 2010
Select End Date
08 March 2012
Select Entries
DAP Statistics Protocol Code
Start Analysis
Cancel Analysis
Export Results
Protocol Code | DRL | # | DAP(Median) | DAP(Avg) | DAP(StdDev) | DAP(Skew) | DAP(Slope)
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
DRL
Linear Regression
DAP (10^3)
50
40
30
20
10
0
7/1/2010
11/1/2010
3/1/2011
7/1/2011
11/1/2011
3/1/2012
Date


Protocol 2 (1030, 1041)
Room: MORWF087
Distribution
DRL
Average = 12771
StDev = 3915
DRL = 13000
Frequency
1100
1000
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
DAP (10^3)

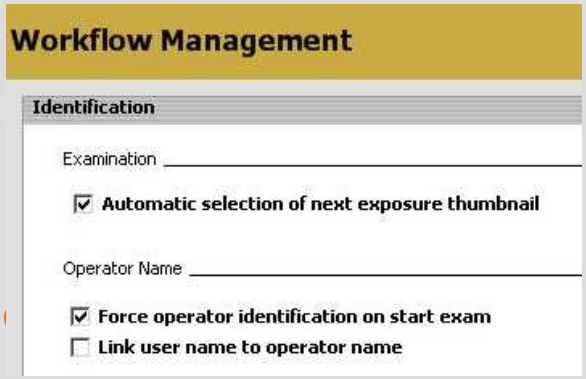

Extended Dose Reporting
Select Room
MORWF087
Select Protocol Code
Protocol 2 (1030, 1041)
Select Begin Date
15 June 2010
Select End Date
08 March 2012
Select Entries
DAP Statistics Protocol Code
Start Analysis
Cancel Analysis
Export Results
Protocol Code | Exposure Type | Age Group | DRL | # | DAP(Median) | 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.
4

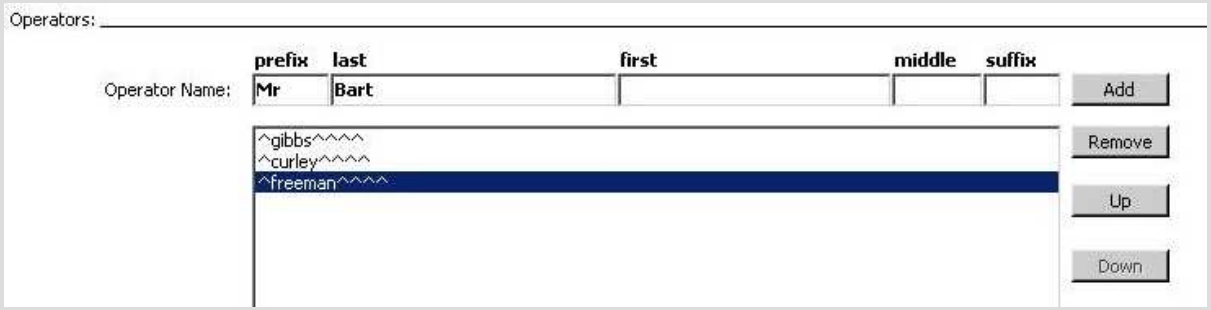

Extended Dose Reporting
Select Room
MORWF087
Select Begin Date
15 June 2010
Select End Date
08 March 2012
Select Entries
Outliers
Exposure Deviation Index Limits
-8.25
7.35
Select Age Group
All
Select Exam Group
All
Select Exposure Type
All
Select Operator
Jouri
Select Digitizer / Detector
Solo
Start Analysis
Cancel Analysis
Export Results
Exam Group | Exposure 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.
7



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...	16191f1d-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...	00c7fbe3-9...
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...

Forced entry of operator ID per exam





Select ‘force operator ID
Create operator list in configtool

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

Select or
type in name

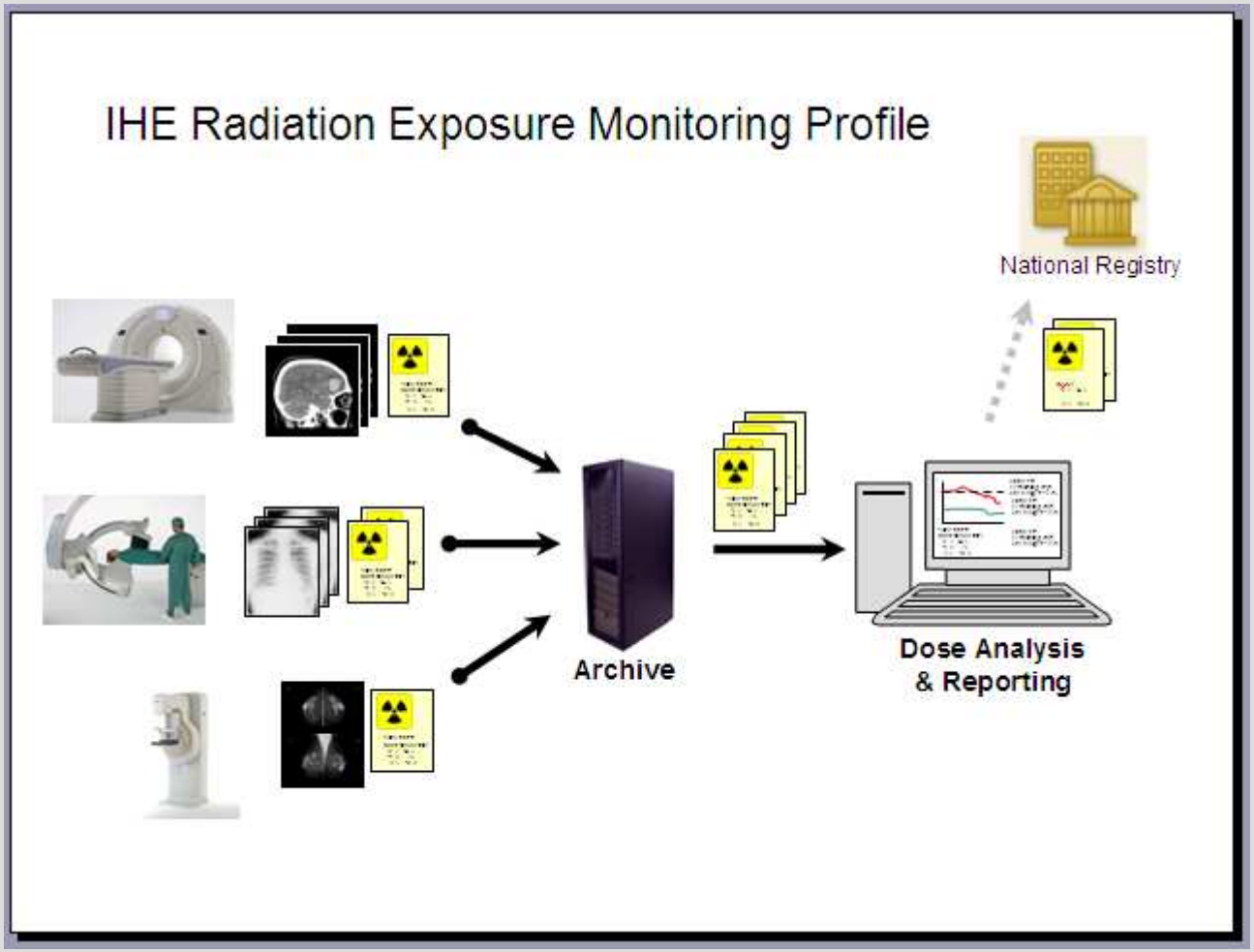
Extended Dose Reporting

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

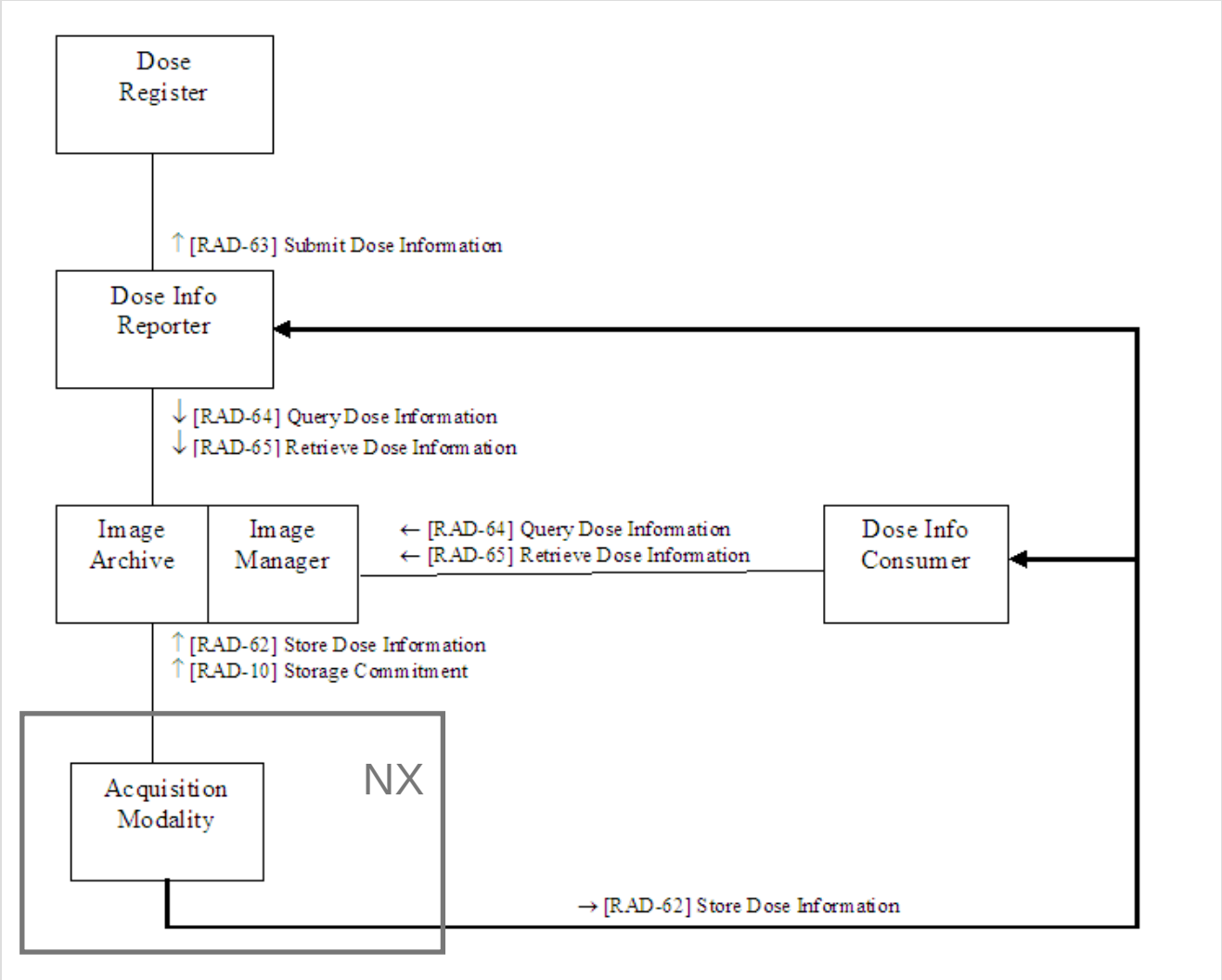
IHE REM Profile

- 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)

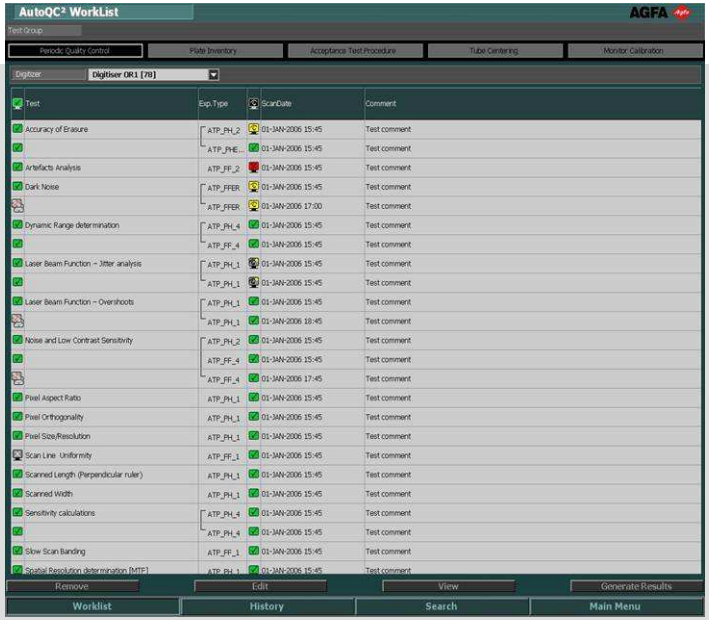
Auto QC² - Overview of tests

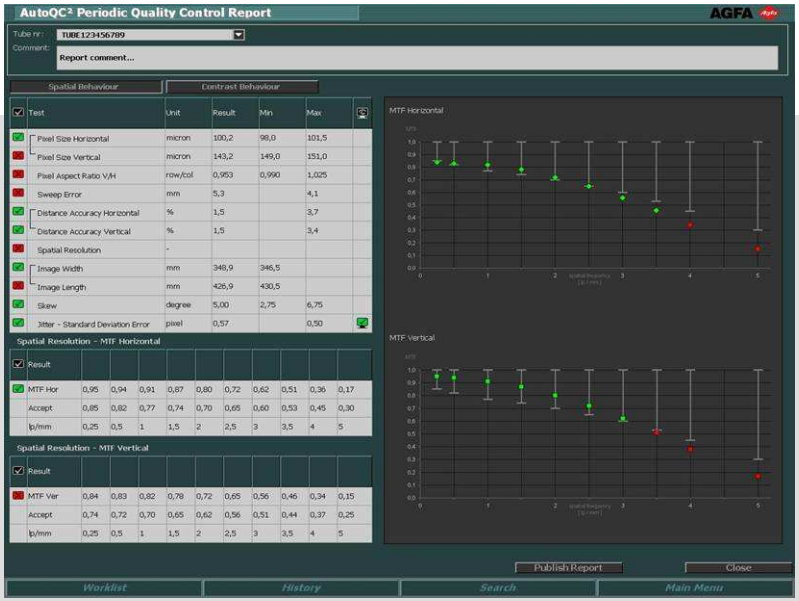
- Periodic quality control & Acceptance test procedure

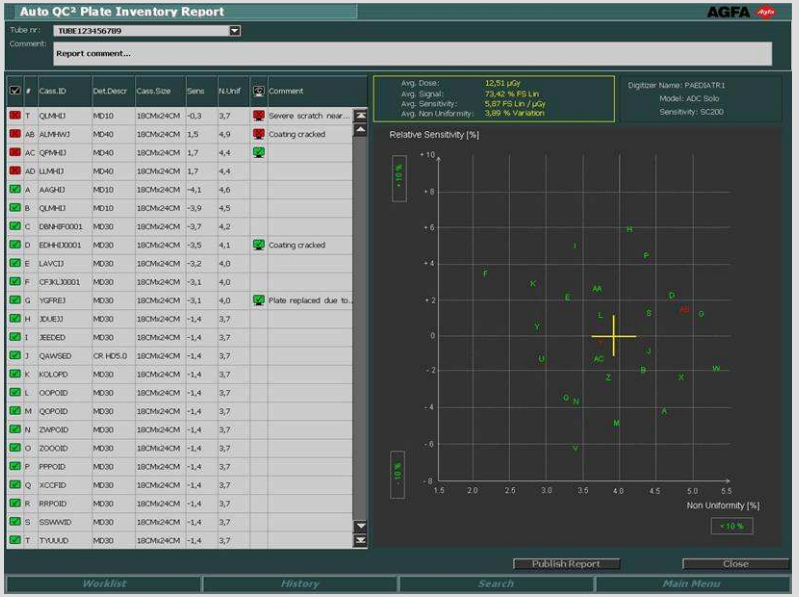
  - Scan Line Drop Outs
  - Overshoots
  - Signal-to-Noise Ratio (SNR)
  - Sensitivity
  - Dynamic Range
  - Signal Uniformity (banding)
  - Spatial Resolution [MTF]
  - Laser Jitter
  - System Linearity
  - Distance Accuracy
  - Sweep Error
  - Pixel Aspect Ratio (V/H)
  - Pixel Size Horizontal & vertical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

- Plate inventory
- Monitor check

Auto QC² software UI





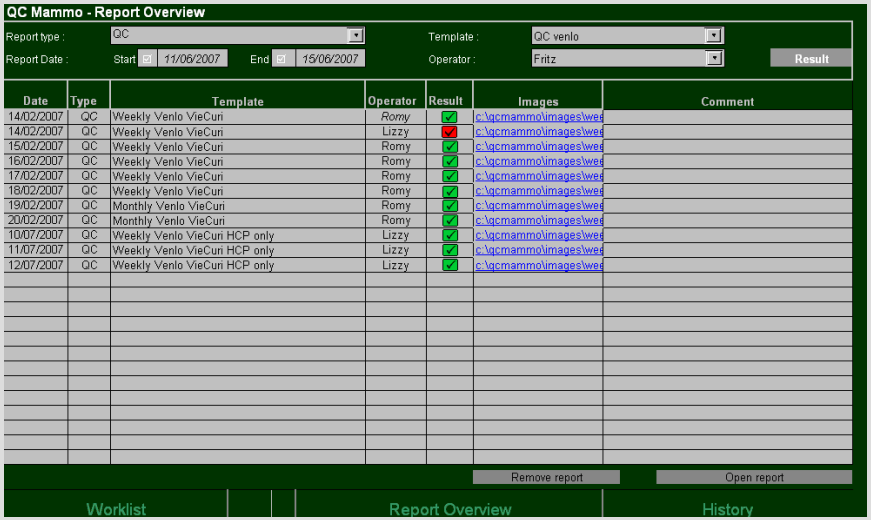


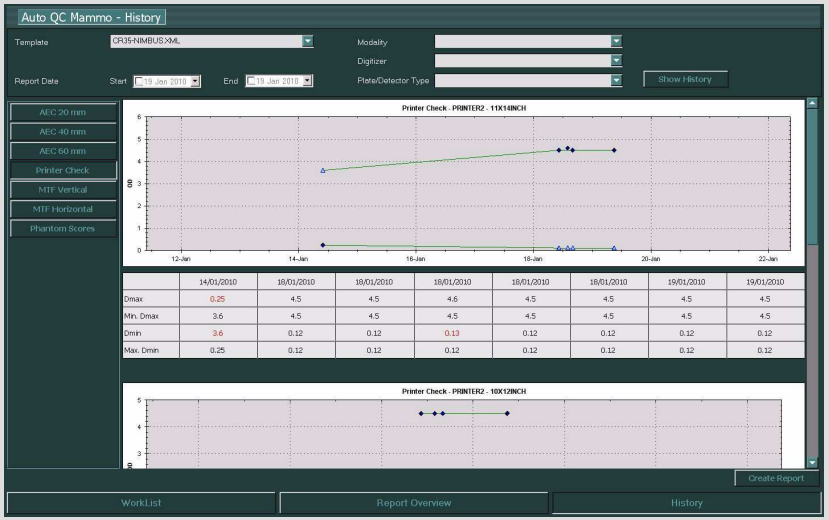
AGFA HealthCare

AutoQC Mammo - Phantom + PMMA

AutoQC Mammo - Software

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





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.