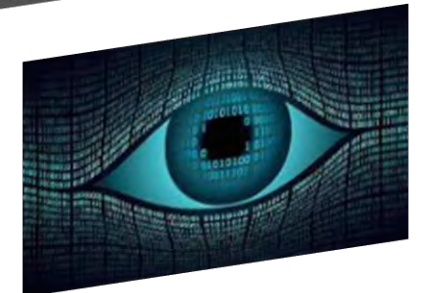
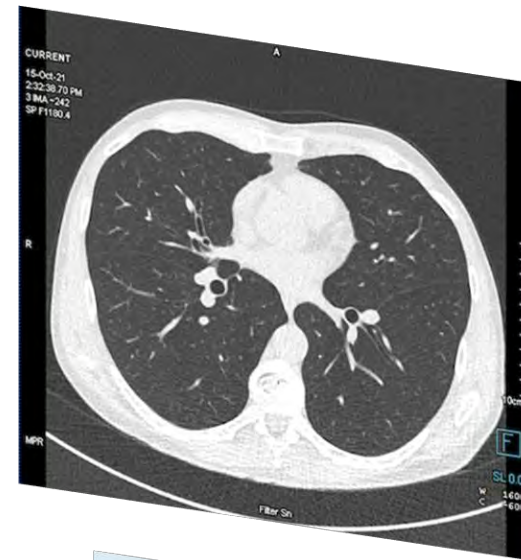
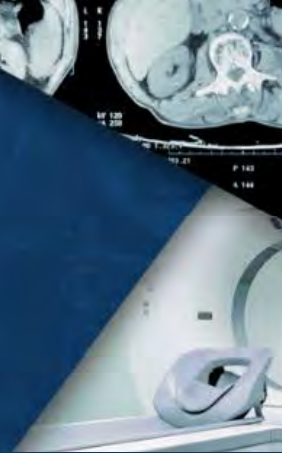


QUANTITATIVE IMAGING WORKSHOP XVIII:

*Optimizing Thoracic Imaging to Detect and
Manage Early Lung Cancer/COPD*

November 4-5, 2021 | Virtual



SESSION FIVE: LUNG CANCER & COPD IMAGING – TECHNICAL IMAGING GUIDANCE

*Improving CT Lung Cancer Screening Through
Image Quality Optimization*

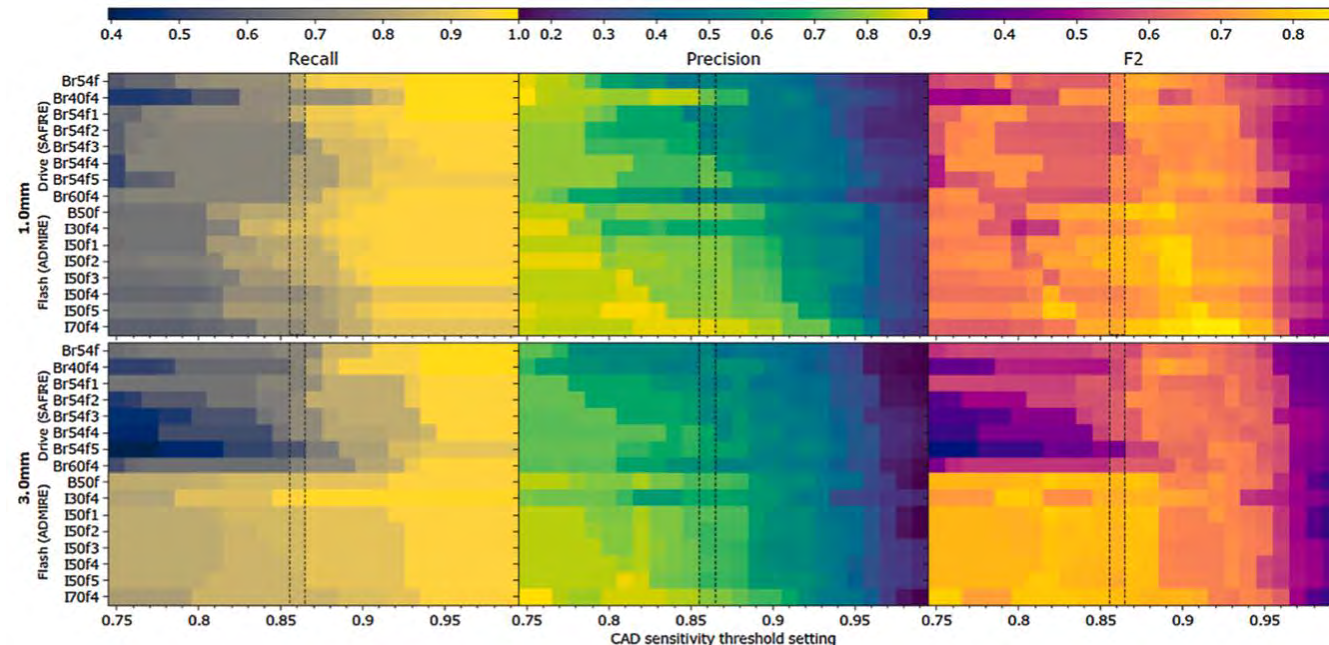
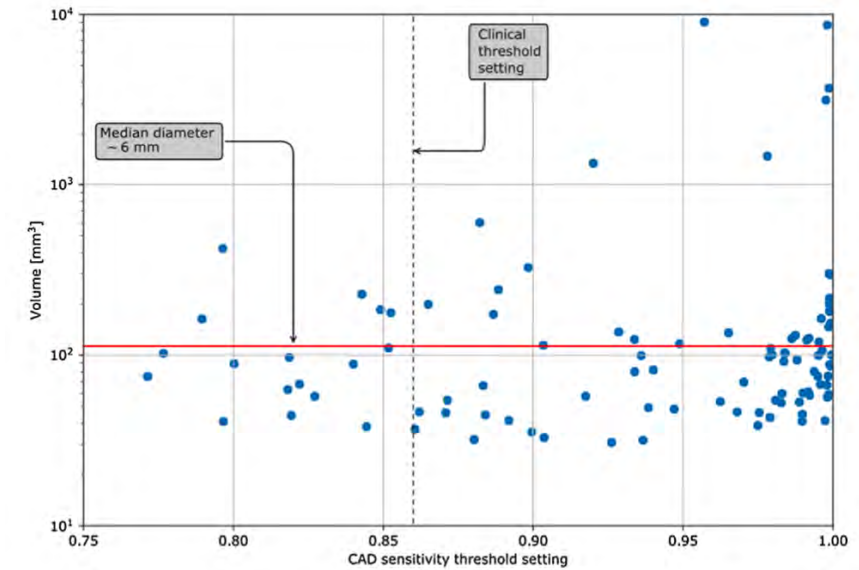
Mario Silva, MD, PhD

University of Parma (Italy)

UMass Chan Medical School, Worcester (MA)



- Performance of CAD:
 - Target size (Baseline VS Incidence round)
 - Software setting (Recall/Precision)
 - Image quality
 - slice-thickness
 - reconstruction algorithm



Blazis SP, Eur J Radiol 2021

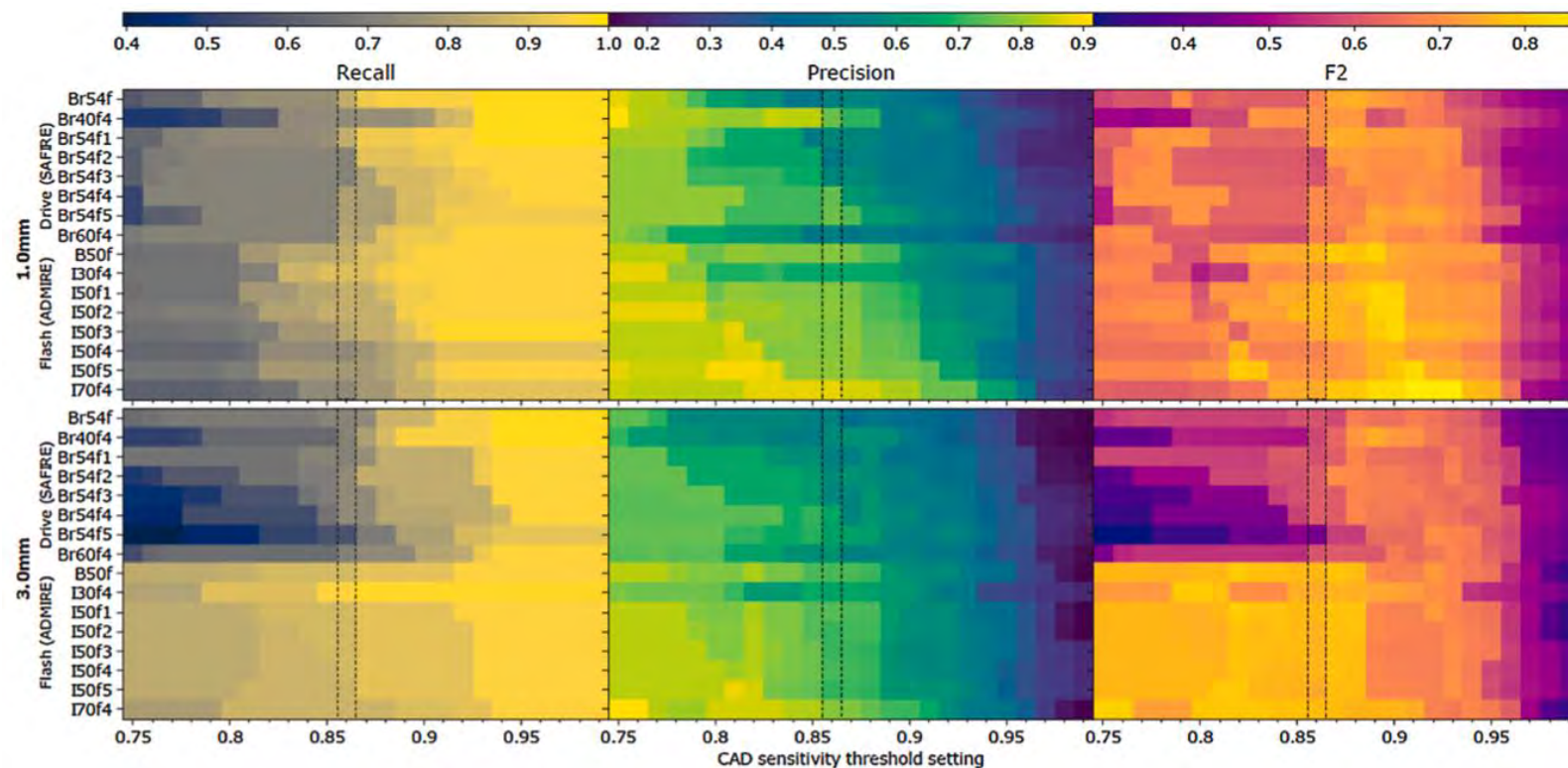
- Detection

- DL-CAD on IR strengths
 - gradual drop in recall
 - growth in precision

Target nodule: solid ≥ 4 mm

Software: Veye Chest, Aidence *

*mostly trained on FBP



Blazis SP, Eur J Radiol 2021

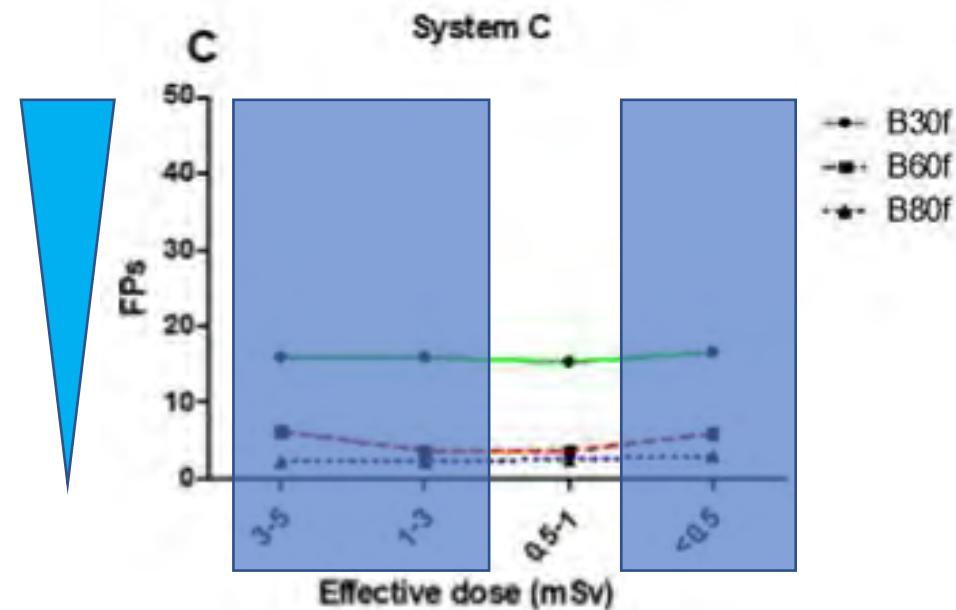
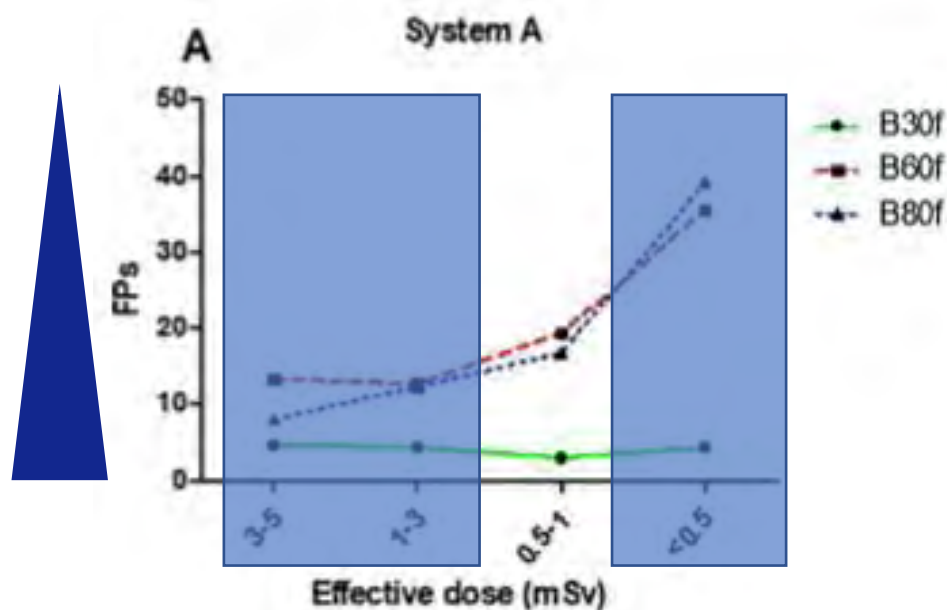
- Detection

system	kernel	FPs				FNs			
		3-5 mSv	1-3 mSv	0.5-1 mSv	< 0.5 mSv	3-5 mSv	1-3 mSv	0.5-1 mSv	< 0.5 mSv
A	B30f	4.67 P2 = 0.043	4.33 P2 = 0.005	3 P2 < 0.0001	4.33 P2 = 0.006	6	6	6	5.67
	B60f	13.33 P2 = 0.006	12.67	19.33	35.67 P1 = 0.001	6	6	6	7 P1 = 0.040
	B80f	8	12.33	16.67	39.33 P1 = 0.001	6	6.33	6	7
B	B30f	1.67	1.67	1.67	4	0.33	0	0	0.67
	B60f	0	0	0	2 p1 = 0.022	0	0	0	1 P1 = 0.040
	B80f	0	0.33	0.67	5 p1 = 0.004	0	0	0	1 P1 = 0.040
C	B30f	16 P2 < 0.0001	16 P2 < 0.0001	15.33 P2 < 0.0001	16.67 P2 < 0.0001	4	3	2.67	3.33
	B60f	6.33	3.67	3.67	6	4	4.33	4	4.67
	B80f	2.33	2.33	2.67	3	4	4.33	4	5
D	B30f	0.67	0.33	0.33	0.67	2	2.67	2	3
	B60f	1	1	0.67	1.33	2	2	2	5 P1 < 0.0001
	B80f	1	1	0.67	1.33	2	2	2.33	4 P1 = 0.003

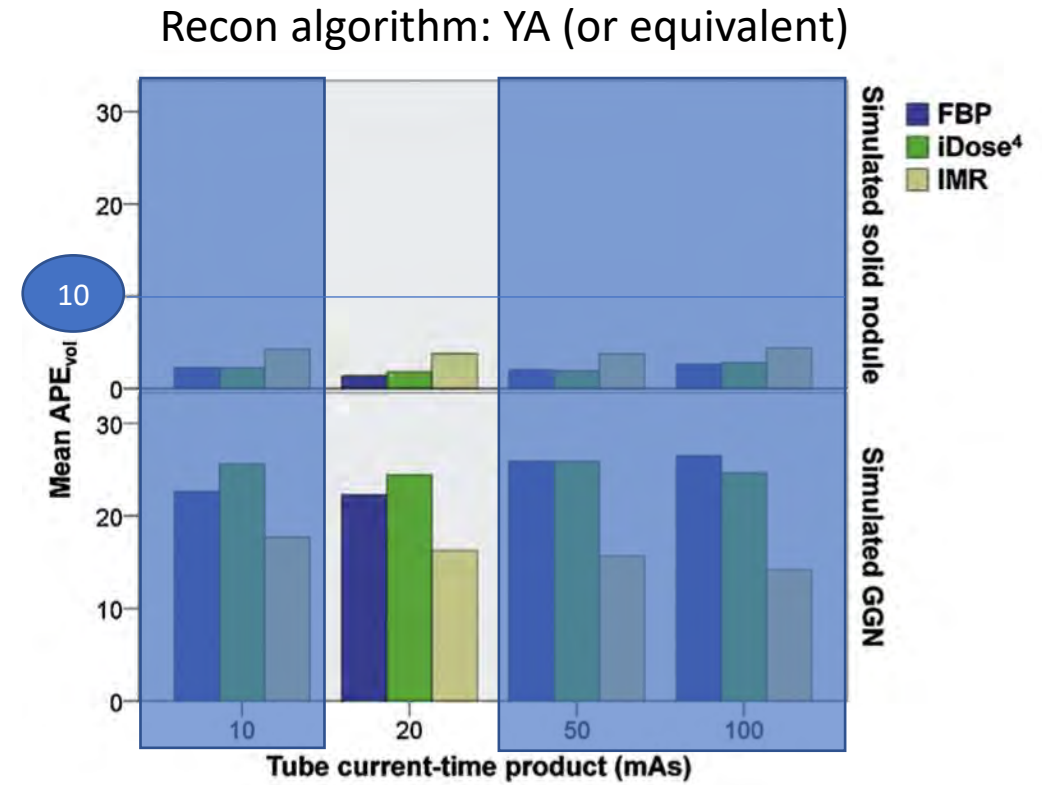
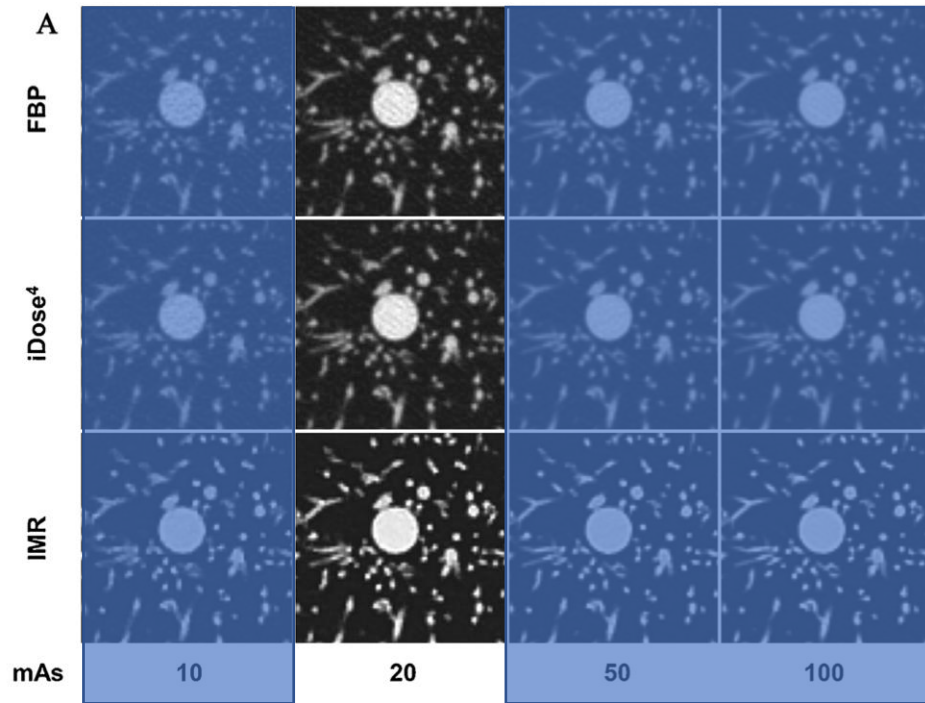
Kernel → FP/scan

• Detection

system	kernel	FPs				FNs			
		3-5 mSv	1-3 mSv	0.5-1 mSv	< 0.5 mSv	3-5 mSv	1-3 mSv	0.5-1 mSv	< 0.5 mSv
A	B30f	4.67 P2 = 0.043	4.33 P2 = 0.005	3 P2 < 0.0001	4.33 P2 = 0.006	6	6	6	5.67
	B60f	13.33 P2 = 0.006	12.67	19.33	35.67 P1 = 0.001	6	6	6	7 P1 = 0.040
	B80f	8	12.33	16.67	39.33 P1 = 0.001	6	6.33	6	7
B	B30f	1.67	1.67	1.67	4	0.33	0	0	0.67
	B60f	0	0	0	2 p1 = 0.022	0	0	0	1 P1 = 0.040
	B80f	0	0.33	0.67	5 p1 = 0.004	0	0	0	1 P1 = 0.040
C	B30f	16 P2 < 0.0001	16 P2 < 0.0001	15.33 P2 < 0.0001	16.67 P2 < 0.0001	4	3	2.67	3.33
	B60f	6.33	3.67	3.67	6	4	4.33	4	4.67
	B80f	2.33	2.33	2.67	3	4	4.33	4	5
D	B30f	0.67	0.33	0.33	0.67	2	2.67	2	3
	B60f	1	1	0.67	1.33	2	2	2	5 P1 < 0.0001
	B80f	1	1	0.67	1.33	2	2	2.33	4 P1 = 0.003



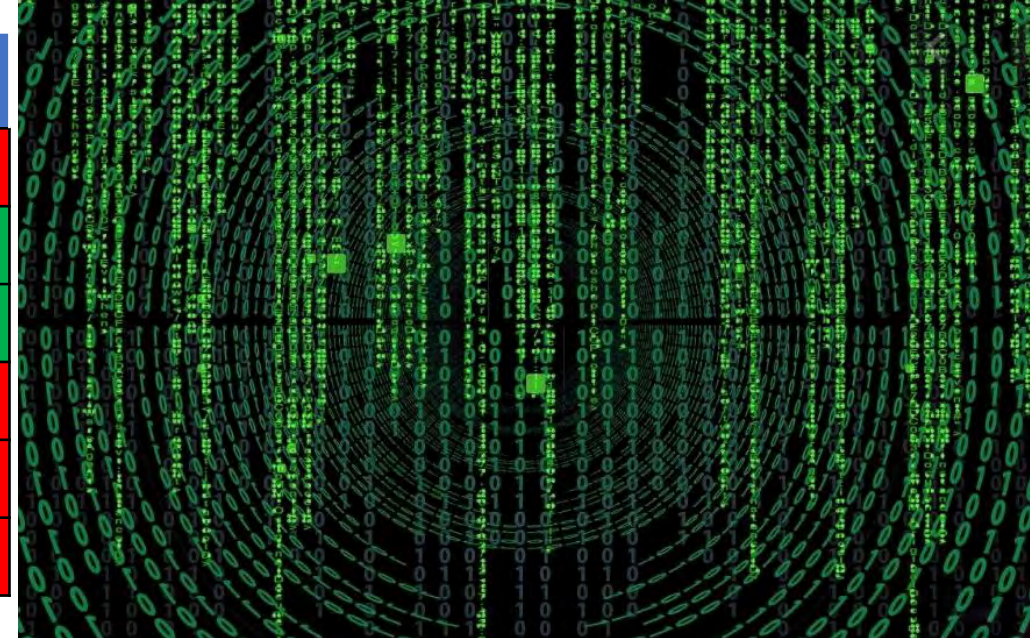
- Segmentation



- Segmentation

Image quality by recon kernel (thickness 1.0 mm – increment 0.7 mm)

	Br 36	Br 38	Br 40	Br 43	Br 46	Br 49	Br 51	Br 54	Br 57	Br 58	Br 59	Br 60	Br 62
Edge enhancement	Green	Green	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red
3D resolution	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Spatial warp	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
3D res aspect ratio	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red
HU bias	Green	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red
Noise	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red



Phantom: CTLX1 (Accumetra)

Metrics: QIBA CT Small Lung Nodule (SLN) Profile

Scanner: Siemens SOMATOM Definition Edge (equipped with beam filtering tools)

Dose index: CTDIvol < 1 mGy

mario.silva@unipr.it

Optimizing Thoracic Imaging to Detect and Manage Early Lung Cancer/COPD

- Edge enhancement
- 3D resolution
- Spatial warp
- 3D res aspect ratio
- HU bias
- Noise



Model for Optimized Implementation of Early Lung Cancer Detection: Prospective Evaluation Of Preventive Lung Health

PEOPLE



Optimizing Thoracic Imaging to Detect and Manage Early Lung Cancer/COPD

MM Onco + CT Bone

MM Oncology Reading

3D Reading

RECIST 1.1

Solid Lesion Liver Lymph Node Generic RECIST

Lung CAD Auto Zoom

Trending

CT Bone Reading

MM Reading

Findings Navigator

Tools

Synch Align Custom Text Hide Graphics Hide Lines Reset Timepoints

Edit Layout Snapshot Print Image Export Image Undo Redo

5:23 PM

Series

CT, 15-Oct-21

Chest_PEOPLHE(Adult)

CT 1

Torace 1,00 Br48 S3 Lung [3]

Torace 1,00 Sa36 S3 LCAD [6]

Torace 3,00 Sa36 S3 Mediasti...

Additional Data

Lung CAD [6] Candidates [7]

Patient Protocol [501]

Topogramma AP 0,60 Tr20 cor [2]

Findings Navigator

Name	Value	Source

Total mAs 1431 Total DLP 18 mGycm

Scan	kV	mAs / ref.	CTDIvol* mGy	DLP mGycm
Patient Position H-SP				
Topogramma	1	Sn100 74 mA	0.01 L	0.4
Torace	2	Sn100 124 /100	0.50 L	17.5

Optimizing Thoracic Imaging to Detect and Manage Early Lung Cancer/COPD

MM Onco + CT Bone

MM Oncology Reading

3D Reading

RECIST 1.1

- Solid Lesion
- Liver
- Lymph Node
- Generic
- RECIST

Lung CAD

Trending

CT Bone Reading

MM Reading

Findings Navigator

Name	Value	Source
✓ L2VO1	5.54 ...	MM On...
✓ L4VO1	5.33 ...	MM On...
✓ L5VO1	5.71 ...	MM On...

Tools

- Synch
- Align
- Custom Text
- Hide Graphics
- Hide Lines
- Reset Timepoints
- Edit Layout
- Snapshot
- Print Image
- Export Image
- Undo
- Redo

5:39 PM

CURRENT
16-Oct-21
12:40:33.74 PM
2 IMA n.a. FRM n.a.
SP A81.8

RECIST 1.1 Diam: 6.3 mm
Max. Orth. Diam: 4.5 mm
Volume: 0.023 ml

CURRENT
16-Oct-21
12:40:33.74 PM
5 IMA n.a. FRM n.a.
SP L80.4

RECIST 1.1 Diam: 6.3 mm
Max. Orth. Diam: 4.5 mm
Volume: 0.023 ml

CURRENT
16-Oct-21
12:40:33.74 PM
2 IMA ~346
SP F1094.1

CURRENT
16-Oct-21
12:40:33.74 PM
5 IMA ~346
SP F1094.1

RECIST 1.1 Diam: 6.3 mm
Max. Orth. Diam: 4.5 mm
Volume: 0.023 ml

Optimizing Thoracic Imaging to Detect and Manage Early Lung Cancer/COPD

MM Oncology Reading

3D Reading

RECIST 1.1

- Solid Lesion
- Liver
- Lymph Node
- Generic
- RECIST

Lung CAD

Auto Zoom

Trending

CT Bone Reading

MM Reading

Findings Navigator

Name	Value	Source
✓ L5VO11	5.31...	MM O...

Tools

- Synch
- Align
- Custom Text
- Hide Graphics
- Hide Lines
- Reset Timepoints
- Edit Layout
- Snapshot
- Print Image
- Export Image
- Undo
- Redo

16-Oct-21 11:10:37.64 AM 2 IMA n.a. FRM n.a. SP A110.4

16-Oct-21 11:10:37.64 AM 2 IMA n.a. FRM n.a. SP R73.0

16-Oct-21 11:10:37.64 AM 5 IMA n.a. FRM n.a. SP A110.4

16-Oct-21 11:10:37.64 AM 5 IMA n.a. FRM n.a. SP R73.0

16-Oct-21 11:10:37.64 AM 2 IMA ~38 SP F871.7

16-Oct-21 11:10:37.64 AM 5 IMA ~38 SP F871.7

16-Oct-21 11:10:37.64 AM 2 IMA ~38 SP F871.7

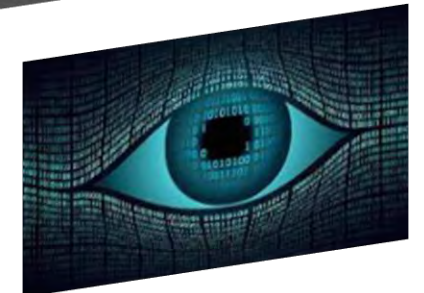
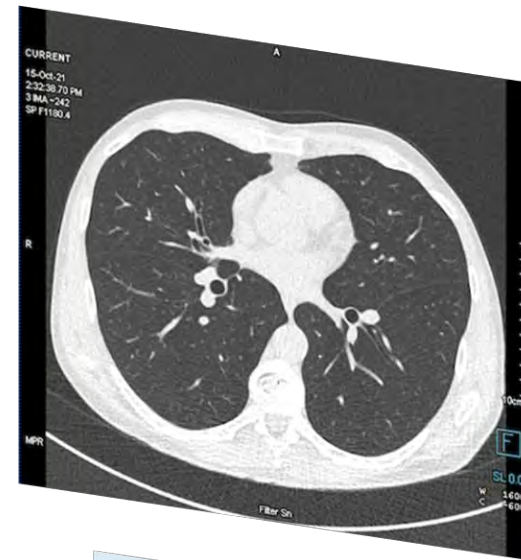
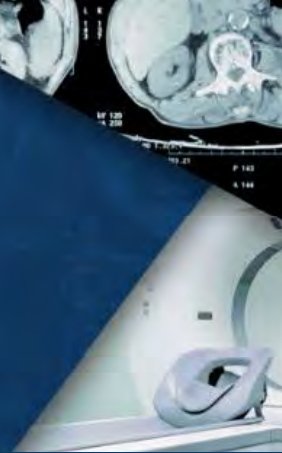
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5:54 PM

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