Distribución de Tecnologías Avanzadas

SunCHECK™
Plataforma Integrada de Control de Calidad

Fernando Borge

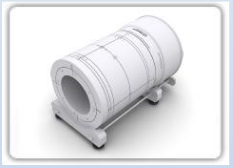
Jornadas SARH 2017, Antequera

Distribución de Tecnologías Avanzadas

Patient QA Solutions

PATIENT

Measurement Arrays



ArcCHECK®

MapCHECK®

EPID Based Dosimetry

PerFRACTION™

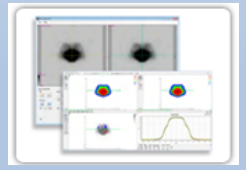
Secondary Calculations

DoseCHECK™

Plan Quality

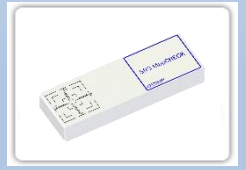
PlanIQ™

SRS Film QA



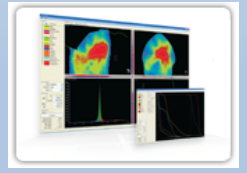
SRS Film QA™

SRS Array QA



SRS MapCHECK®

3D & DVH Analysis



3DVH®

In Vivo Solutions

IVD™2 / rf-IVD™2

Distribución de Tecnologías Avanzadas

Machine QA Solutions

Machine QA

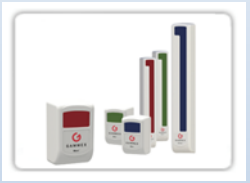
SNC Machine™

QA & Dosimetry Management

Daily Arrays

Daily QA™3

Laser Solutions



Full Field LINAC Arrays

IC PROFILER™

PROFILER™2

Stereotactic Radiosurgery (SRS)

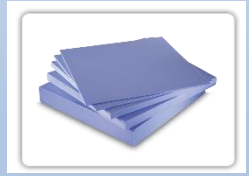
SRS PROFILER™

StereoPHAN™

TomoTherapy

TomoDose™

Phantoms



Solid Water® HE

Distribución de Tecnologías Avanzadas

Dosimetry QA Solutions

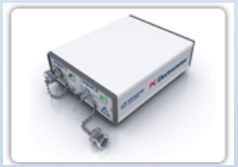
PATIENT

Water Tanks

3D SCANNER™

1D SCANNER™

Electrometers



PC Electrometer™

Dosimetry Detectors

WaterProof PROFILER™

EDGE Detector™

SNC350p™

SNC125c™

SNC600c™

Reference Detector

Distribución de Tecnologías Avanzadas

MacroMedics®

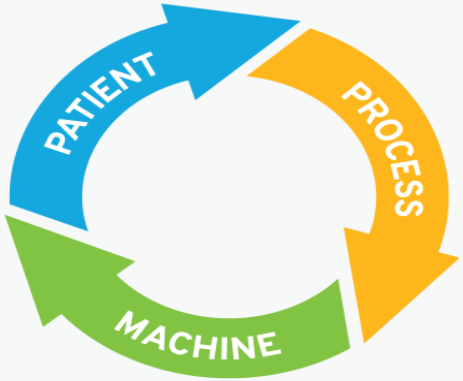
Distribución de Tecnologías Avanzadas

La Visión

Features and Functions

Plan Quality
Secondary Checks
Pre-Treatment QA
In-Vivo Monitoring
Live Device Integration

TG-142 & VMAT QA
Daily, Monthly, Annual QA
3D SCANNER Data
Live Device Integration



Facility Management
Dashboard
Data Mining
Informatics
Compliance
Incident Reporting
Decision Support
Statistics
Reporting

Distribución de Tecnologías Avanzadas

¿Qué es DoseCHECK™?

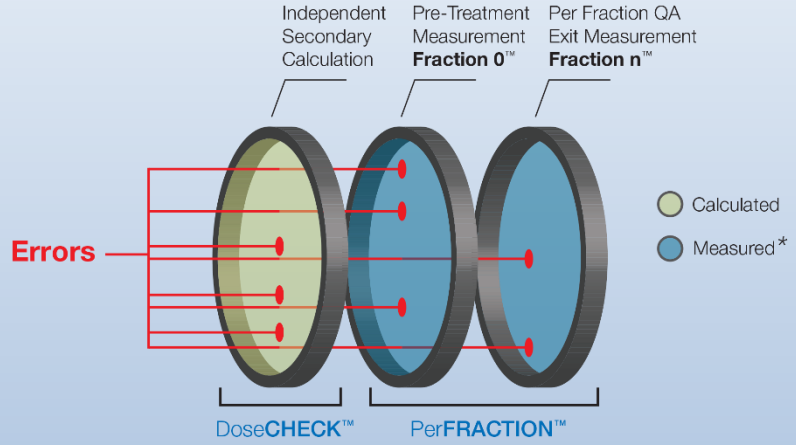
Cálculo redundate de dósis 3D

Interfaz de usuario web

- Acceso desde cualquier equipo en red

Algoritmo de dósis de última generación

- Collapsed Cone Convolution Superposition (CCCS)
- Acelerado mediante GPU



** When using EPID data for dose reconstruction*

Distribución de Tecnologías Avanzadas

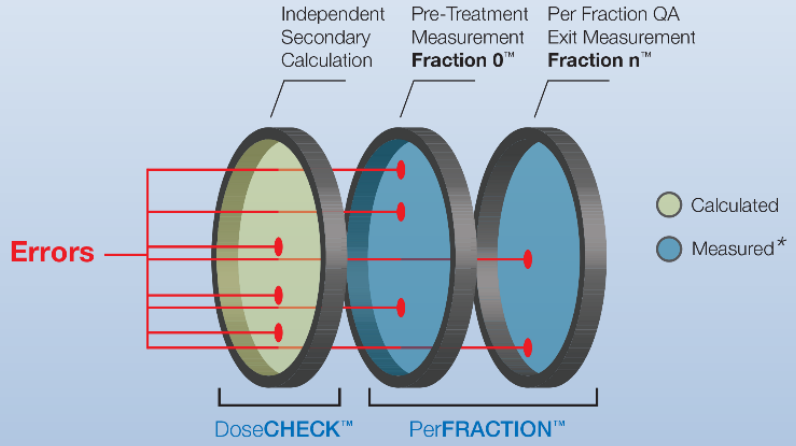
¿Qué es PerFRACTION™?

Control de Calidad Pre-Tratamiento

- Fraction 0™
- QA basado en EPID y/o basado en archivos Log
- Compatible con IMRT, VMAT, SRS, SBRT

Dosimetría In-Vivo

- Fraction n™ - Control de calidad de cada fracción
- Basado en medidad EPID y/o en archivos Log



** When using EPID data for dose reconstruction*

Distribución de Tecnologías Avanzadas

¿Qué es SNC Machine?

TG-142 Tests

- Image Quality & Accuracy
  - CBCT
  - kV
  - MV
- MLC
  - Picket Fence
  - Log File Positioning & Leaf Speed
  - *New* Hancock MLC test with absolute positioning
- Starshot
  - Gantry
  - Couch
  - Collimator
- Beam
  - Light/Radiation Field Congruence
  - Field Size
  - Flatness
  - Symmetry
  - Max Penumbra
- Winston-Lutz Radiation Isocenter (3D)
- Winston-Lutz Mechanical Isocenter (3D)

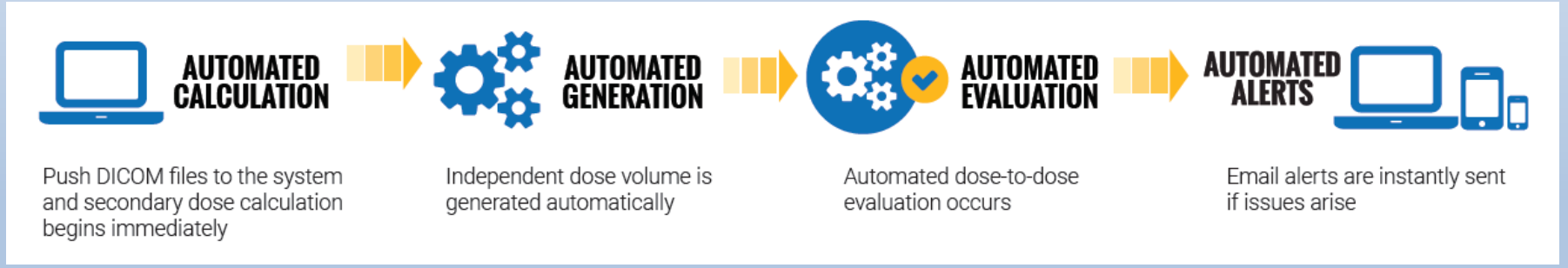
VMAT Tests

- Dose Rate versus Gantry Speed
- Leaf Speed
- Arc Point Dose
- DMLC Point Dose

Distribución de Tecnologías Avanzadas

Automatización

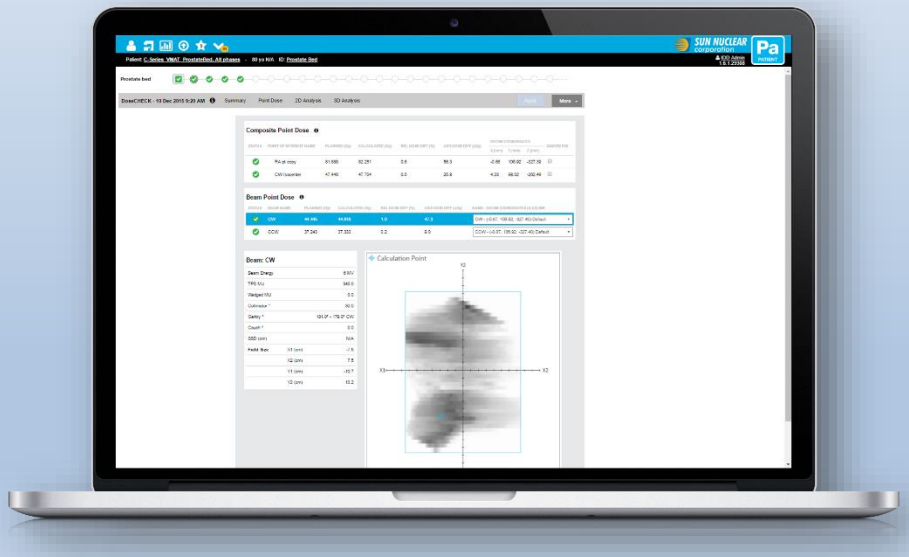
- DoseCHECK™, PerFRACTION™ y SNC Machine requieren una interación del usuario mínima
- No requiren crear pacientes en el sistema de forma manual
- Compatibilidad:
  - **R&V: Aria y Mosaiq**
  - **Aceleradores Lineales: Varian y Elekta**



Distribución de Tecnologías Avanzadas

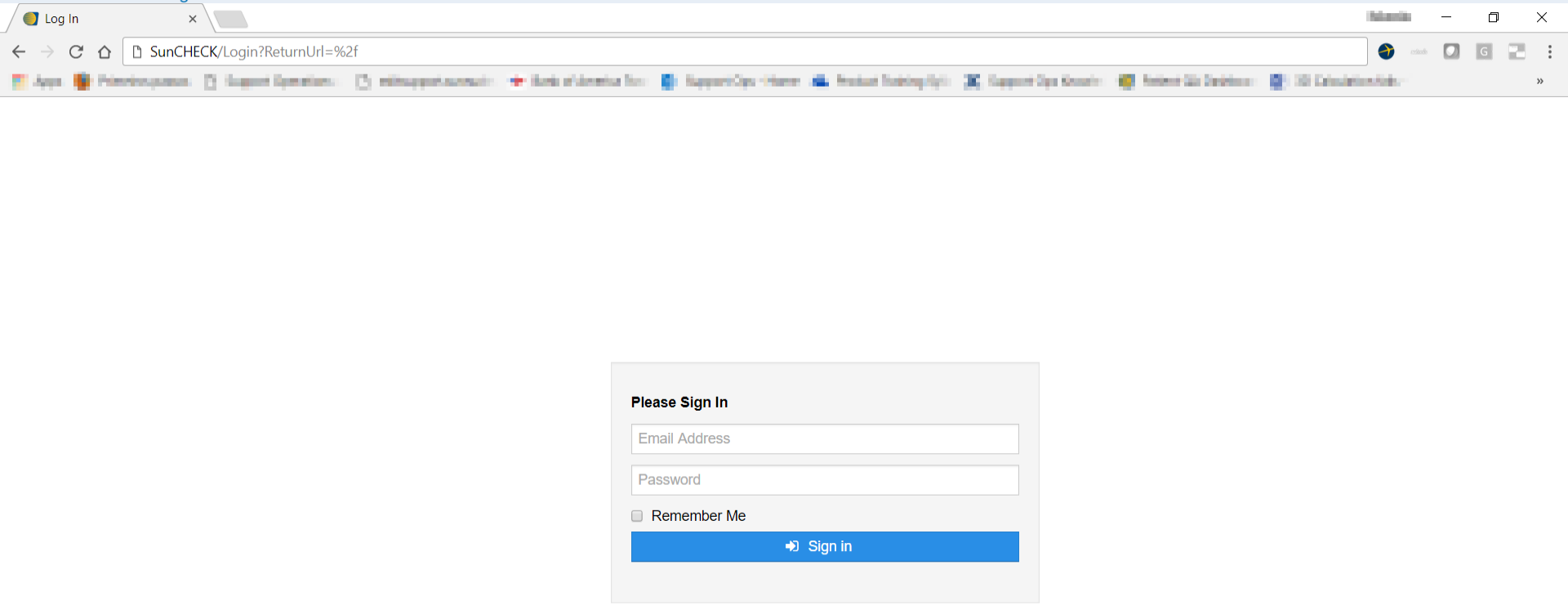
Infraestructura

- Interfaz de usuario web
  - Se accede a la aplicación desde cualquier equipo en red
  - Compatible con: Google Chrome (Recomendado) e Internet Explorer 11



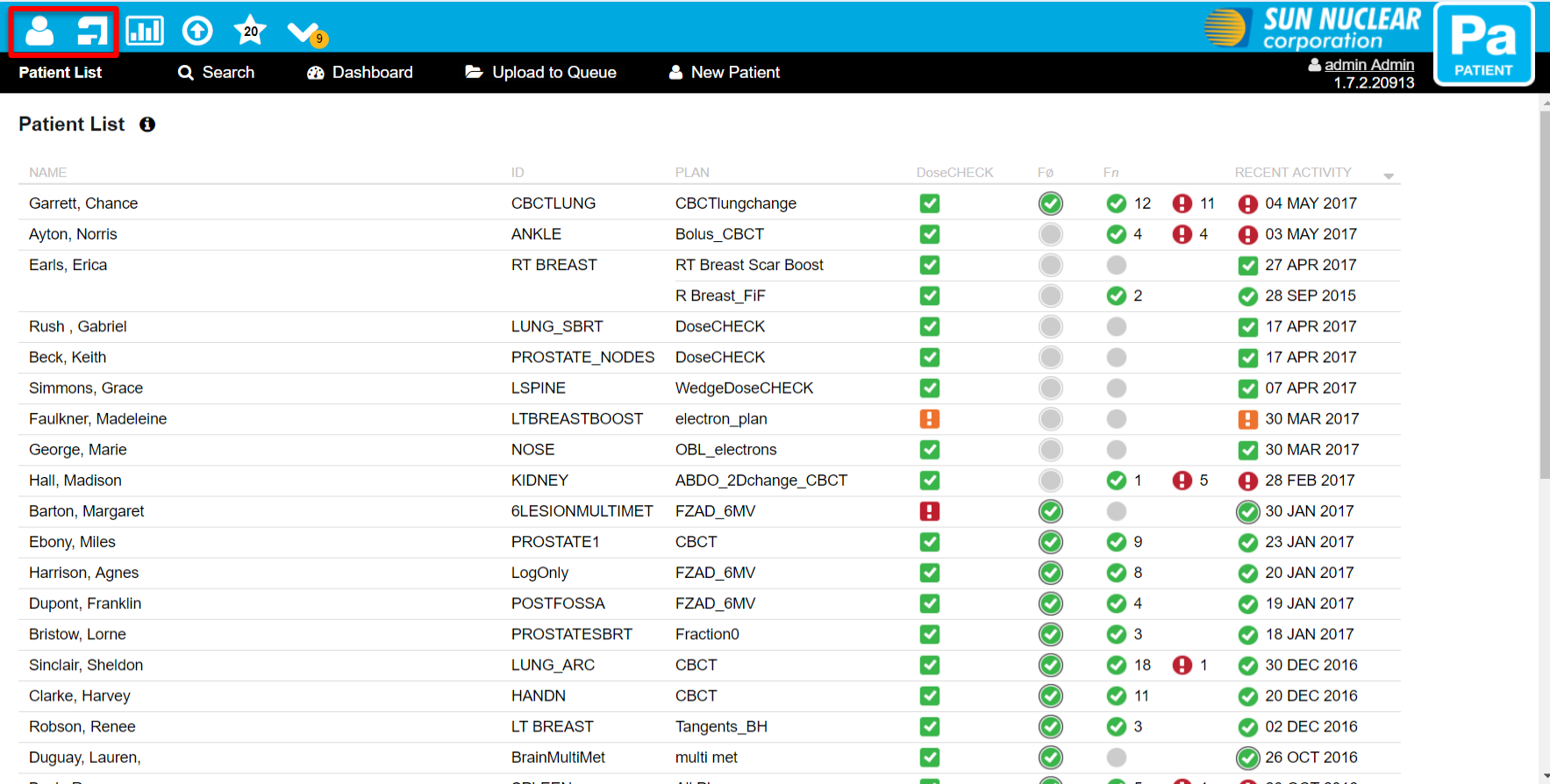
Distribución de Tecnologías Avanzadas

Software



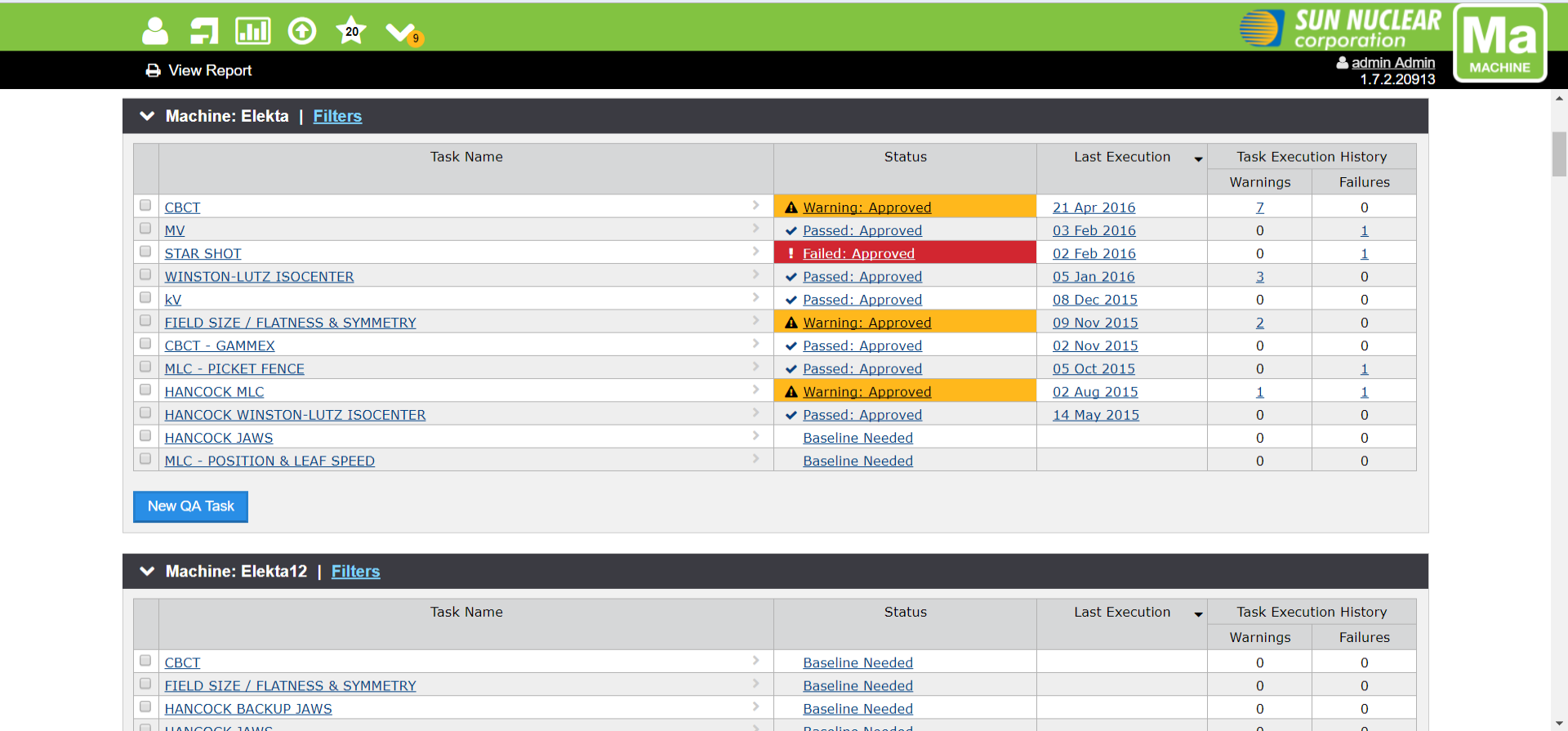
Distribución de Tecnologías Avanzadas

Software

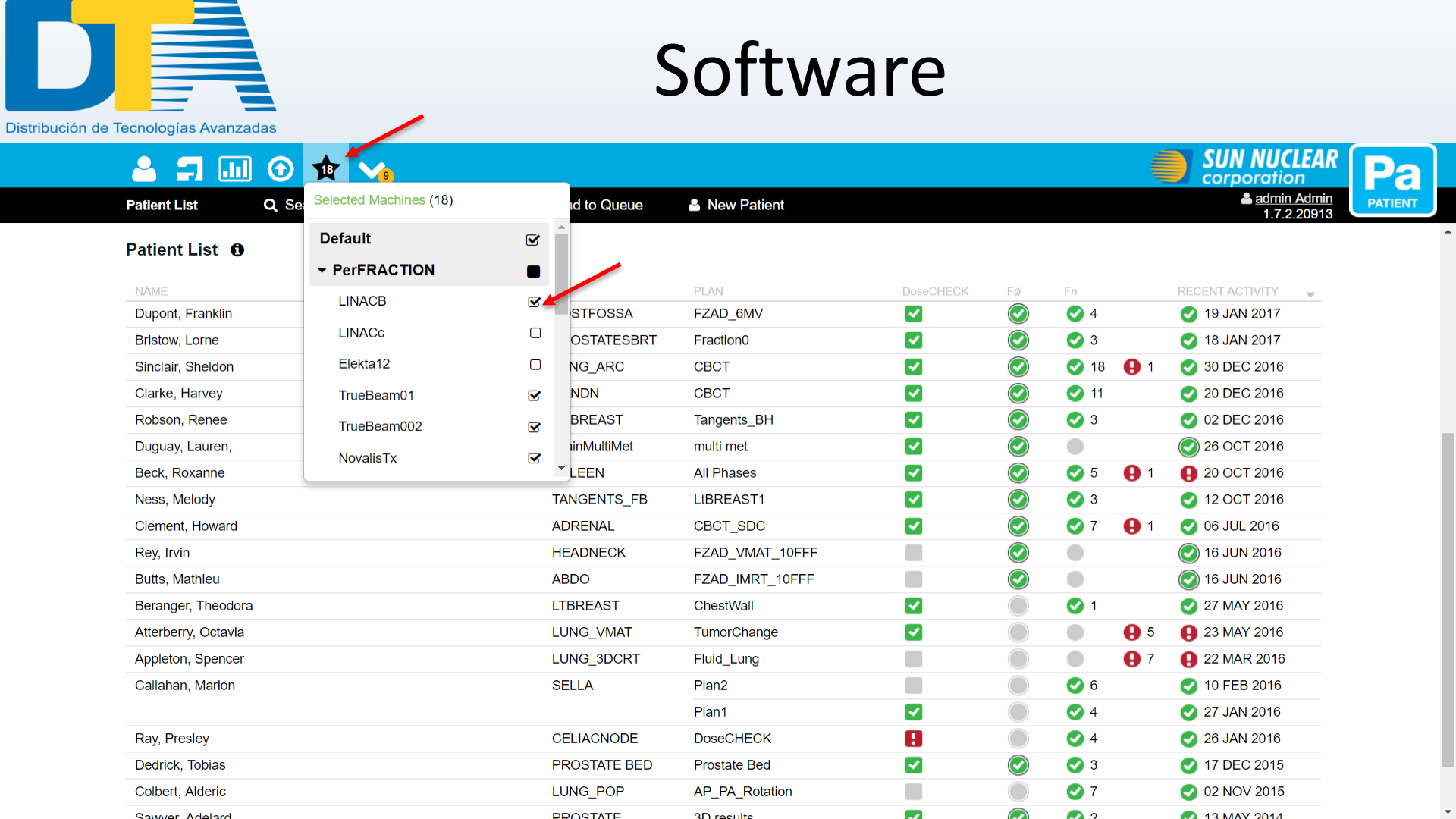


Software

Distribución de Tecnologías Avanzadas



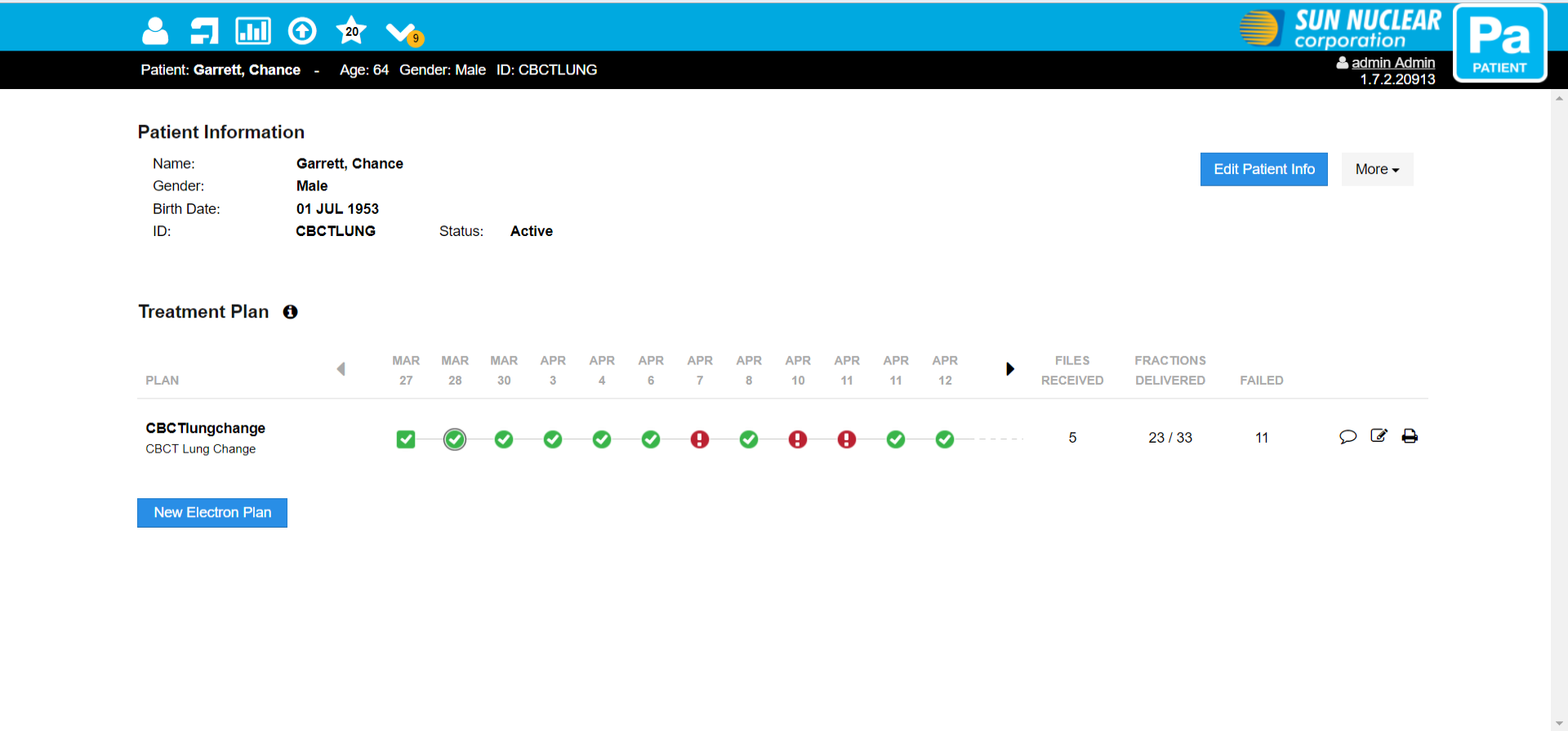
Software



NAME		PLAN	DoseCHECK	Fø	Fn		RECENT ACTIVITY
Dupont, Franklin	STFOSSA	FZAD_6MV	✓	✓	✓ 4		✓ 19 JAN 2017
Bristow, Lorne	OSTATESBRT	Fraction0	✓	✓	✓ 3		✓ 18 JAN 2017
Sinclair, Sheldon	NG_ARC	CBCT	✓	✓	✓ 18	! 1	✓ 30 DEC 2016
Clarke, Harvey	NDN	CBCT	✓	✓	✓ 11		✓ 20 DEC 2016
Robson, Renee	BREAST	Tangents_BH	✓	✓	✓ 3		✓ 02 DEC 2016
Duguay, Lauren,	inMultiMet	multi met	✓	✓			✓ 26 OCT 2016
Beck, Roxanne	LEEN	All Phases	✓	✓	✓ 5	! 1	! 20 OCT 2016
Ness, Melody	TANGENTS_FB	LtBREAST1	✓	✓	✓ 3		✓ 12 OCT 2016
Clement, Howard	ADRENAL	CBCT_SDC	✓	✓	✓ 7	! 1	✓ 06 JUL 2016
Rey, Irvin	HEADNECK	FZAD_VMAT_10FFF		✓			✓ 16 JUN 2016
Butts, Mathieu	ABDO	FZAD_IMRT_10FFF		✓			✓ 16 JUN 2016
Beranger, Theodora	LTBREAST	ChestWall	✓		✓ 1		✓ 27 MAY 2016
Atterberry, Octavia	LUNG_VMAT	TumorChange	✓			! 5	! 23 MAY 2016
Appleton, Spencer	LUNG_3DCRT	Fluid_Lung				! 7	! 22 MAR 2016
Callahan, Marion	SELLA	Plan2			✓ 6		✓ 10 FEB 2016
		Plan1	✓		✓ 4		✓ 27 JAN 2016
Ray, Presley	CELIACNODE	DoseCHECK	!		✓ 4		✓ 26 JAN 2016
Dedrick, Tobias	PROSTATE BED	Prostate Bed	✓	✓	✓ 3		✓ 17 DEC 2015
Colbert, Alderic	LUNG_POP	AP_PA_Rotation			✓ 7		✓ 02 NOV 2015
Sawyer, Adelard	PROSTATE	3D results	✓	✓	✓ 2		✓ 13 MAY 2014

Distribución de Tecnologías Avanzadas

Software



Distribución de Tecnologías Avanzadas

DoseCHECK

Analysis Settings

Rel Dose Diff (%)	3
Abs Dose Diff (cGy)	0
Search Radius (mm)	0

Composite Point Dose

STATUS	POINT OF INTEREST NAME	PLANNED (Gy)	CALCULATED (Gy)	REL DOSE DIFF (%)	ABS DOSE DIFF (cGy)	DICOM COORDINATES X (mm)	Y (mm)	Z (mm)	IGNORE POI
✓	1 Isocenter	65.446	64.772	1.0	67.4	67.84	155.17	-74.19	☐
	ref					9.42	119.26	-193.50	☑

+ Add DICOM Point + Add Structure Centroid Point

Beam Point Dose

STATUS	BEAM NAME	PLANNED (Gy)	CALCULATED (Gy)	REL DOSE DIFF (%)	ABS DOSE DIFF (cGy)	NAME - DICOM COORDINATES (X,Y,Z) MM
✓	1	31.826	31.462	1.1	36.4	1 - (67.84, 155.18, -74.20) Default
✓	2	33.620	33.309	0.9	31.1	2 - (67.84, 155.18, -74.20) Default

DoseCHECK

Patient: **Garrett, Chance** - 64 yo Male ID: **CBCTLUNG**

admin Admin
1.7.2.20913

Pa
PATIENT

CBCTlungchange

DoseCHECK - 27 Mar 2017 9:49 AM | Summary | Point Dose | 2D Analysis | **3D Analysis** | Apply | More

Analysis Settings

Diff (%)	3	DIST (mm)	3
TH (%)	10	Norm.	Global
		Pass Tol (%)	90

3D Gamma

GAMMA RESULTS	PERCENT
Passing Rate	100.00%
Failed High	
Failed Low	0.00%
Total Points	478026

Clinical Goals **Passed**

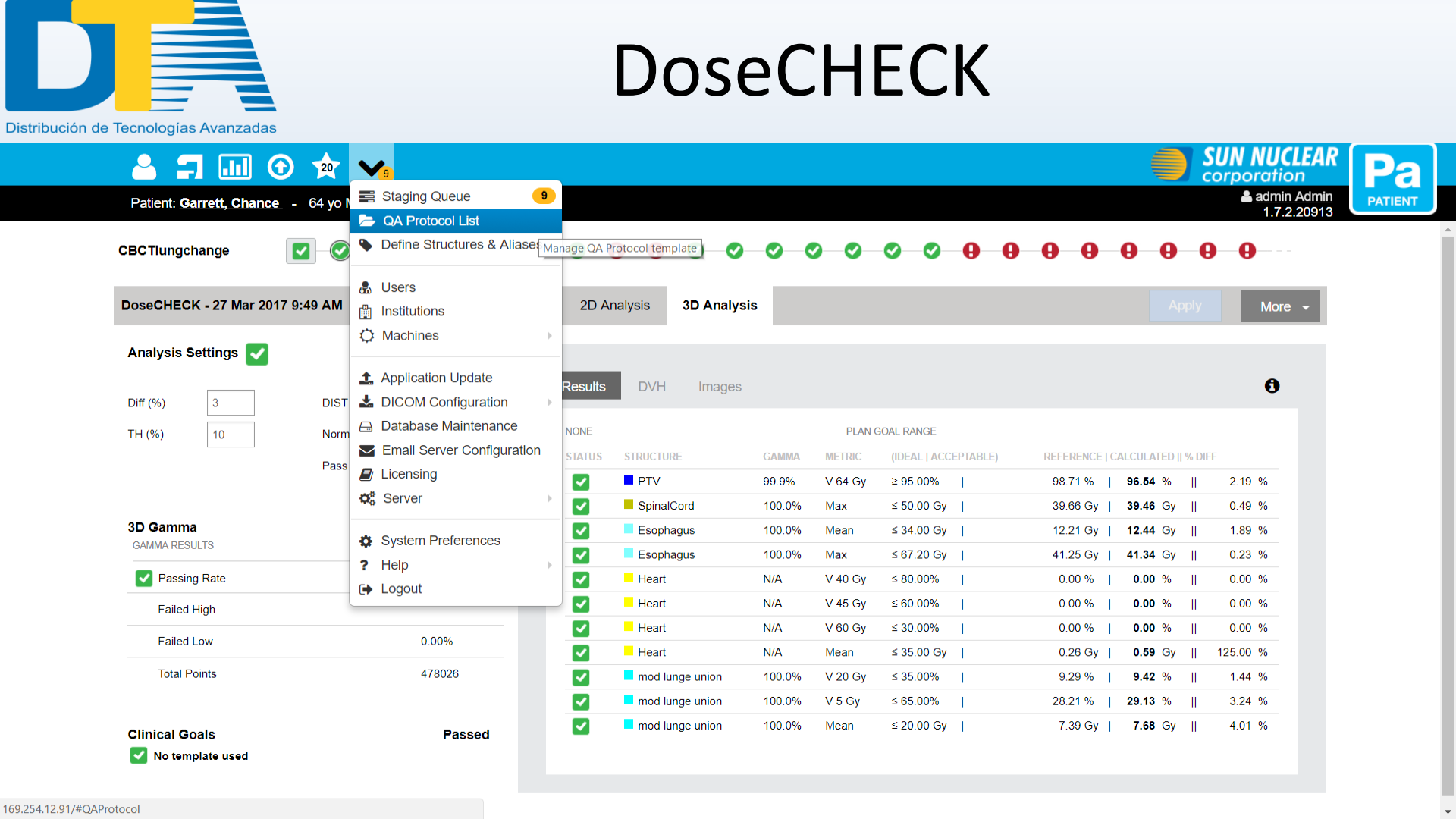
No template used

Results | DVH | Images

NONE — PLAN GOAL RANGE

STATUS	STRUCTURE	GAMMA	METRIC	(IDEAL | ACCEPTABLE)	REFERENCE | CALCULATED || % DIFF
✓	PTV	99.9%	V 64 Gy	≥ 95.00%	98.71 % | **96.54** % || 2.19 %
✓	SpinalCord	100.0%	Max	≤ 50.00 Gy	39.66 Gy | **39.46** Gy || 0.49 %
✓	Esophagus	100.0%	Mean	≤ 34.00 Gy	12.21 Gy | **12.44** Gy || 1.89 %
✓	Esophagus	100.0%	Max	≤ 67.20 Gy	41.25 Gy | **41.34** Gy || 0.23 %
✓	Heart	N/A	V 40 Gy	≤ 80.00%	0.00 % | **0.00** % || 0.00 %
✓	Heart	N/A	V 45 Gy	≤ 60.00%	0.00 % | **0.00** % || 0.00 %
✓	Heart	N/A	V 60 Gy	≤ 30.00%	0.00 % | **0.00** % || 0.00 %
✓	Heart	N/A	Mean	≤ 35.00 Gy	0.26 Gy | **0.59** Gy || 125.00 %
✓	mod lunge union	100.0%	V 20 Gy	≤ 35.00%	9.29 % | **9.42** % || 1.44 %
✓	mod lunge union	100.0%	V 5 Gy	≤ 65.00%	28.21 % | **29.13** % || 3.24 %
✓	mod lunge union	100.0%	Mean	≤ 20.00 Gy	7.39 Gy | **7.68** Gy || 4.01 %

DoseCHECK


Distribución de Tecnologías Avanzadas
SUN NUCLEAR corporation
admin Admin
1.7.2.20913
PATIENT
Patient: Garrett, Chance - 64 yo
Staging Queue 9
QA Protocol List
Define Structures & Aliases
Manage QA Protocol template
Users
Institutions
Machines
Application Update
DICOM Configuration
Database Maintenance
Email Server Configuration
Licensing
Server
System Preferences
Help
Logout
CBCTlungchange
DoseCHECK - 27 Mar 2017 9:49 AM
2D Analysis
3D Analysis
Apply
More
Analysis Settings
Diff (%) 3
TH (%) 10
3D Gamma
GAMMA RESULTS
Passing Rate
Failed High
Failed Low 0.00%
Total Points 478026
Clinical Goals
Passed
No template used
Results
DVH
Images
NONE
PLAN GOAL RANGE
STATUS STRUCTURE GAMMA METRIC (IDEAL | ACCEPTABLE) REFERENCE | CALCULATED || % DIFF
PTV 99.9% V 64 Gy ≥ 95.00% | 98.71 % | 96.54 % || 2.19 %
SpinalCord 100.0% Max ≤ 50.00 Gy | 39.66 Gy | 39.46 Gy || 0.49 %
Esophagus 100.0% Mean ≤ 34.00 Gy | 12.21 Gy | 12.44 Gy || 1.89 %
Esophagus 100.0% Max ≤ 67.20 Gy | 41.25 Gy | 41.34 Gy || 0.23 %
Heart N/A V 40 Gy ≤ 80.00% | 0.00 % | 0.00 % || 0.00 %
Heart N/A V 45 Gy ≤ 60.00% | 0.00 % | 0.00 % || 0.00 %
Heart N/A V 60 Gy ≤ 30.00% | 0.00 % | 0.00 % || 0.00 %
Heart N/A Mean ≤ 35.00 Gy | 0.26 Gy | 0.59 Gy || 125.00 %
mod lunge union 100.0% V 20 Gy ≤ 35.00% | 9.29 % | 9.42 % || 1.44 %
mod lunge union 100.0% V 5 Gy ≤ 65.00% | 28.21 % | 29.13 % || 3.24 %
mod lunge union 100.0% Mean ≤ 20.00 Gy | 7.39 Gy | 7.68 Gy || 4.01 %
169.254.12.91/#QAProtocol

DoseCHECK

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Garrett, Chance - 64 yo Male ID: CBCTLUNG

admin Admin
1.7.2.20913

PATIENT

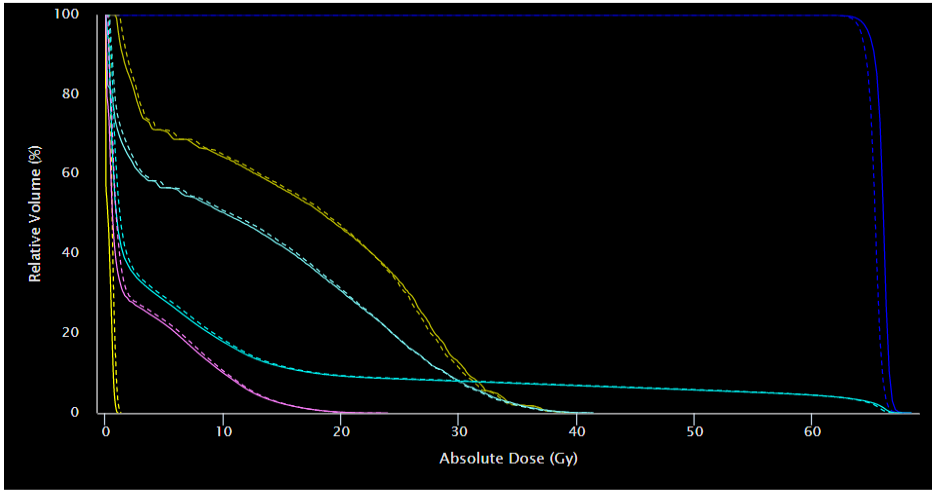
CBCTlungchange

DoseCHECK - 27 Mar 2017 9:49 AM | Summary | Point Dose | 2D Analysis | 3D Analysis | Apply | More

Calculated Results

STRUCTURE NAME	MIN	MAX	MEAN
PTV	60.48 Gy	67.70 Gy	65.23 Gy
SpinalCord	1.16 Gy	39.45 Gy	16.65 Gy
Esophagus	0.29 Gy	41.35 Gy	12.45 Gy
Heart	0.25 Gy	1.30 Gy	0.58 Gy
mod lunge union	0.14 Gy	67.70 Gy	7.68 Gy
PTV	60.48 Gy	67.70 Gy	65.23 Gy
Lung_R	0.14 Gy	23.61 Gy	3.05 Gy
GTV_T	63.78 Gy	67.10 Gy	65.35 Gy
External	0.00 Gy	67.70 Gy	7.75 Gy
Lung_L	0.11 Gy	67.70 Gy	9.05 Gy
Trachea	7.24 Gy	26.44 Gy	17.38 Gy
MainBronchus_L	3.64 Gy	20.64 Gy	10.95 Gy
MainBrochus_R	4.97 Gy	15.29 Gy	10.59 Gy

Results | DVH | Images



Reference Calculated

Distribución de Tecnologías Avanzadas

DoseCHECK

SUN NUCLEAR corporation

Patient: **Garrett, Chance** - 64 yo Male ID: **CBCTLUNG**

admin Admin
1.7.2.20913

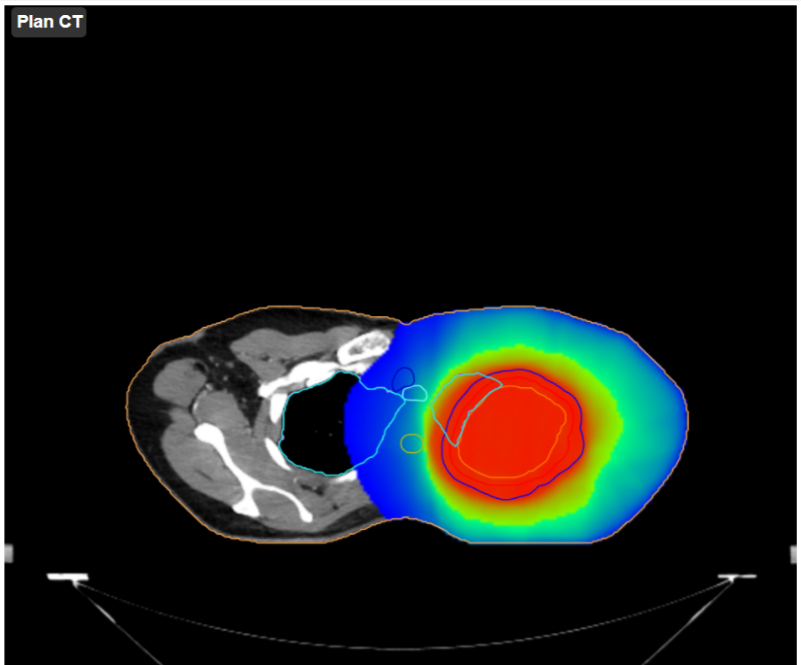
Pa PATIENT

SpinalCord	100.00%
Esophagus	100.00%
Heart	N/A
mod lunge union	100.00%
Lung_R	100.00%
GTV_T	100.00%
External	99.99%
Lung_L	100.00%
Trachea	100.00%
MainBronchus_L	100.00%
MainBrochus_R	100.00%
BrachialPlexus_L	100.00%
ITV_T	99.95%
Lung_L+R-GTV	100.00%

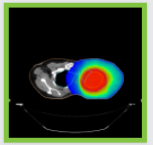
Dose Displayed: Calculated | Gamma | Planned

Dose Opacity: 100%

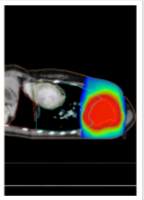
Absolute Dose (Gy): 0 — 67.71 — >67.71



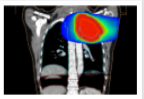
Transverse



Sagittal



Coronal



Fraction 0

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Harrison, Agnes - 69 yo Female ID: LogOnly

admin Admin
1.7.2.20913

PATIENT

FZAD_6MV

Fraction 0 - 03 Jan 2017 12:34 PM | Summary | Point Dose | 2D Analysis | 3D Analysis | Apply | More

Point Dose

Analysis Settings

3D Calculation Mode: EPID

Rel Dose Diff (%)	3
Abs Dose Diff (cGy)	0
Search Radius (mm)	0

Composite Point Dose

POI NAME	REL DOSE DIFF (%)	ABS DOSE DIFF (CGY)
01 Isocenter	0.5	1.2

Beam Point Dose

BEAM NAME	REL DOSE DIFF (%)	ABS DOSE DIFF (CGY)
1	0.6	0.6

2D Analysis

Analysis Settings

Method	Gamma		
Diff (%)	3	DIST (mm)	3
TH (%)	10	Norm.	Global
Auto Align	OFF		

Beams

BEAM NAME	PERCENT
1	97.37%
2	99.41%

3D Analysis

Analysis Settings

3D Calculation Mode: EPID

Diff (%)	3	DIST (mm)	3
TH (%)	10	Norm.	Global
		Pass Tol (%)	93

Image Source

Calculated On: Plan CT

3D Gamma

GAMMA RESULTS	PERCENT
Passing Rate	97.47%

Clinical Goals

Passed

Fraction 0

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Harrison, Agnes - 69 yo Female ID: LogOnly

admin Admin
1.7.2.20913

PATIENT

Analysis Settings

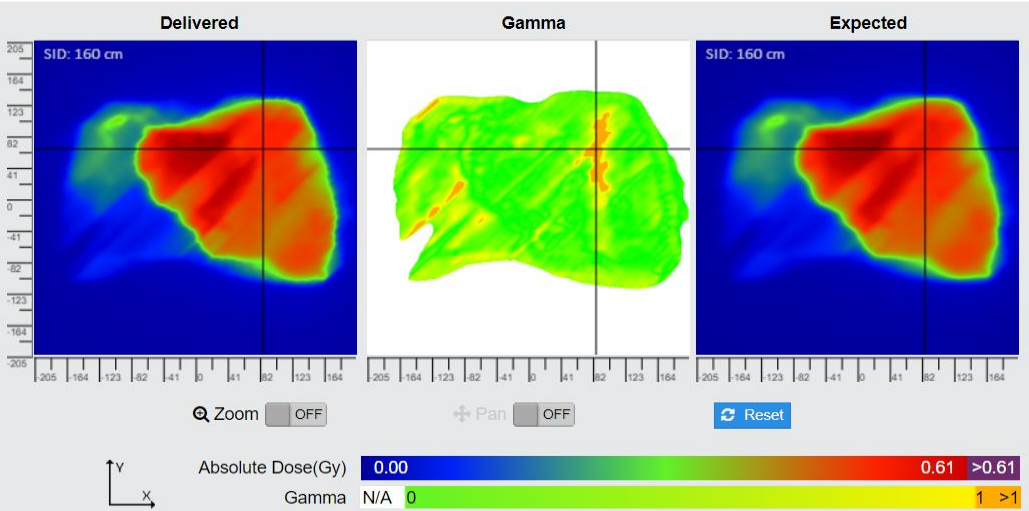
Method	Gamma		
Diff (%)	3	DIST (mm)	3
TH (%)	10	Norm.	Global
Auto Align	OFF		

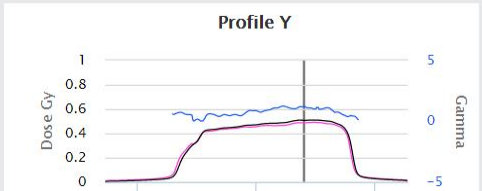
Beams

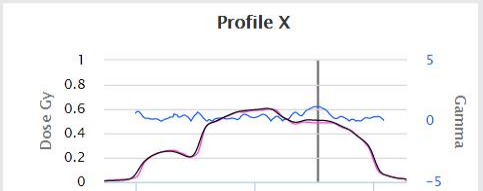
BEAM NAME	PERCENT
01	97.37%
02	99.41%

Results

RESULT	PERCENT	POINTS
Passing	97.37%	119,782
Failed High	0.59%	726
Failed Low	2.03%	2,501
Total Points		123,009
Points Average (Std Dev)		0.38 (0.26)







Fraction 0

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Harrison, Agnes - 69 yo Female ID: LogOnly

admin Admin
1.7.2.20913

PATIENT

FZAD_6MV

Fraction 0 - 03 Jan 2017 12:34 PM | Summary | Point Dose | 2D Analysis | 3D Analysis | Apply | More

Analysis Settings

3D Calculation Mode: EPID

Rel Dose Diff (%)	3
Abs Dose Diff (cGy)	0
Search Radius (mm)	0

Composite Point Dose

STATUS	POINT OF INTEREST NAME	PLANNED (Gy)	DELIVERED (Gy)	REL DOSE DIFF (%)	ABS DOSE DIFF (cGy)	DICOM COORDINATES X (mm)	DICOM COORDINATES Y (mm)	DICOM COORDINATES Z (mm)	IGNORE POI
✓	01 Isocenter	2.076	2.064	0.5	1.2	25.48	-209.51	-81.99	☐

Beam Point Dose

STATUS	BEAM NAME	PLANNED (Gy)	DELIVERED (Gy)	REL DOSE DIFF (%)	ABS DOSE DIFF (cGy)	NAME - DICOM COORDINATES (X,Y,Z) MM
✓	1	0.881	0.875	0.6	0.6	01 - (25.49, -209.51, -82.00) Default
✓	2	1.195	1.189	0.5	0.6	02 - (25.49, -209.51, -82.00) Default

Fraction 0

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Harrison, Agnes - 69 yo Female ID: LogOnly

admin Admin
1.7.2.20913

PATIENT

FZAD_6MV

Fraction 0 - 03 Jan 2017 12:34 PM | Summary | Point Dose | 2D Analysis | **3D Analysis** | Apply | More

Analysis Settings

3D Calculation Mode: EPID

Diff (%)	3	DIST (mm)	3
TH (%)	10	Norm.	Global
		Pass Tol (%)	93

Image Source

Calculated On: Plan CT

3D Gamma

GAMMA RESULTS	PERCENT
Passing Rate	97.47%
Failed High	1.32%
Failed Low	1.20%
Total Points	158995

Results | DVH | Images

NONE — FRACTION GOAL RANGE

STATUS	STRUCTURE	GAMMA	METRIC	(IDEAL | ACCEPTABLE)		REFERENCE | DELIVERED || % DIFF
✓	PTV60	99.4%	D 90 %	≥ 1.93 Gy	≥ 1.90 Gy	2.02 Gy | **2.01** Gy || 0.49 %
✓	Spinal Cord	100.0%	Max	< 1.67 Gy		1.45 Gy | **1.49** Gy || 2.96 %
✓	Heart	98.5%	V 45 Gy	< 60.00%		4.79 % | **5.38** % || 12.20 %
✓	Heart	98.5%	V 60 Gy	< 30.00%		1.35 % | **1.37** % || 1.40 %
✓	Heart	98.5%	Mean	< 1.17 Gy		0.32 Gy | **0.34** Gy || 5.16 %
✓	Heart	98.5%	V 40 Gy	< 80.00%		6.00 % | **6.69** % || 11.49 %
✓	Esophagus	98.8%	Mean	< 1.13 Gy		0.85 Gy | **0.85** Gy || 0.11 %
✓	Esophagus	98.8%	Max	< 2.13 Gy		2.09 Gy | **2.12** Gy || 1.57 %
✓	LUNG_R	99.2%	V 5 Gy	< 65.00%		29.65 % | **32.63** % || 10.06 %
✓	LUNG_R	99.2%	V 20 Gy	< 35.00%	< 38.00%	5.88 % | **6.36** % || 8.14 %
✓	LUNG_R	99.2%	Mean	< 0.67 Gy	< 0.68 Gy	0.19 Gy | **0.20** Gy || 5.75 %

Fraction 0

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Harrison, Agnes - 69 yo Female ID: LogOnly

admin Admin
1.7.2.20913

PATIENT

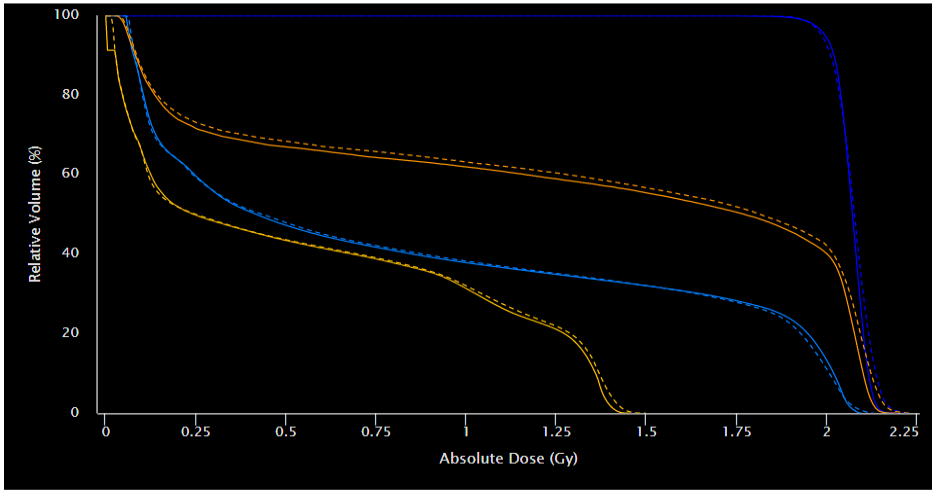
FZAD_6MV

Fraction 0 - 03 Jan 2017 12:34 PM | Summary | Point Dose | 2D Analysis | 3D Analysis | Apply | More

Delivered Results

	STRUCTURE NAME	MIN	MAX	MEAN
☑	PTV60	1.76 Gy	2.23 Gy	2.07 Gy
☑	Spinal Cord	0.01 Gy	1.49 Gy	0.56 Gy
☐	Heart	0.04 Gy	2.17 Gy	0.34 Gy
☑	Esophagus	0.05 Gy	2.12 Gy	0.85 Gy
☐	LUNG_R	0.01 Gy	1.80 Gy	0.20 Gy
☑	PTV60	1.76 Gy	2.23 Gy	2.07 Gy
☐	PTV1 - Lung 60	1.82 Gy	2.23 Gy	2.07 Gy
☐	PTV2 - Mediastinu...	1.76 Gy	2.19 Gy	2.07 Gy
☐	External	0.00 Gy	2.23 Gy	0.39 Gy
☐	Spinal Cord+5mm	0.00 Gy	1.56 Gy	0.56 Gy
☐	Esophagus+3mm	0.00 Gy	2.12 Gy	0.81 Gy
☑	LUNG_L	0.03 Gy	2.23 Gy	1.31 Gy
☐	LUNG_TOTAL	0.01 Gy	2.23 Gy	0.65 Gy

Results | DVH | Images



Reference Delivered

Fraction 0

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Harrison, Agnes - 69 yo Female ID: LogOnly

admin Admin
1.7.2.20913

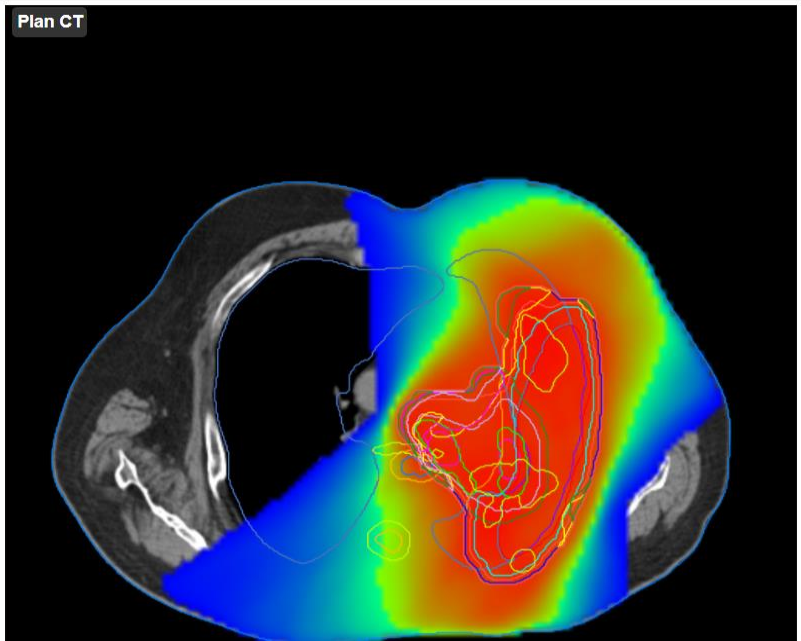
PATIENT

PTV60	99.41%
Spinal Cord	100.00%
Heart	98.58%
Esophagus	98.85%
LUNG_R	99.20%
External	98.43%
Spinal Cord+5mm	100.00%
Esophagus+3mm	99.04%
LUNG_L	99.55%
LUNG_TOTAL	99.44%
Total Lung-ITV	99.35%
TRACHEA	98.54%
CARINA	100.00%
PET+	100.00%
CTV1 - Lung	99.55%
CTV2 - Mediastinum	99.78%
ITV1 - Lung	99.70%
ITV2 - Mediastinum	100.00%
PTV1 - Lung 60	99.34%

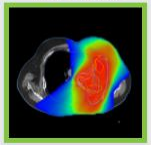
Dose Displayed: Delivered | Gamma | Planned

Dose Opacity: 100%

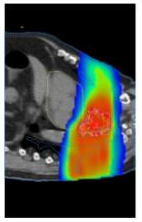
Absolute Dose (Gy): 0 — 2.23 — >2.23



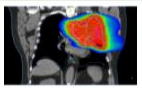
Transverse



Sagittal



Coronal



Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Patient: **Appleton, Spencer** - 41 yo Male ID: **LUNG_3DCRT**

Fluid_Lung

Fraction 1 - 09 Mar 2016 3:14 PM | Summary | Point Dose | **2D Analysis** | 3D Analysis | Apply | More

Analysis Settings

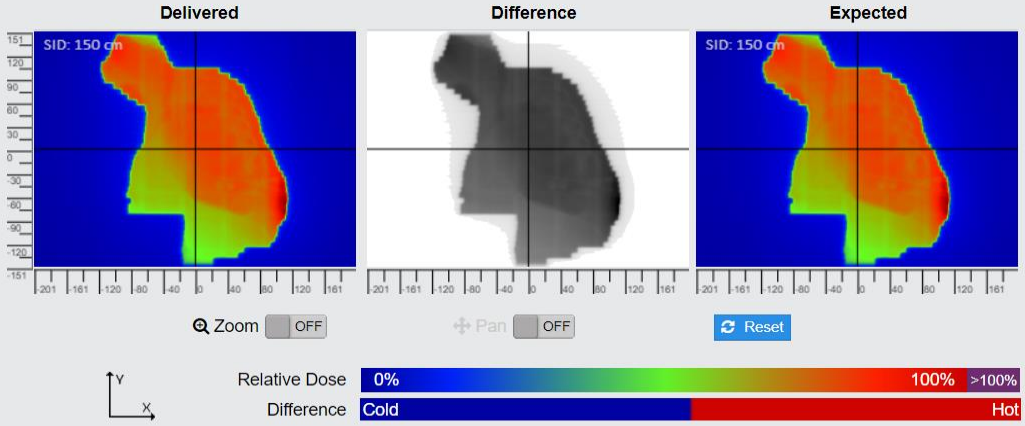
Method	Difference		
Diff (%)	3	DIST (mm)	N/A
TH (%)	10	Norm.	Global
Baseline	Fraction 1 (09 Mar 2016 3:14 PM)		
Auto Align	*Not Available*		

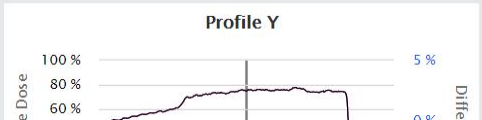
Beams

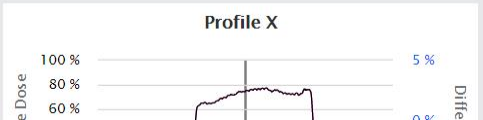
BEAM NAME	PERCENT
1A AP	Baseline
1B PA	Baseline

Results

RESULT	PERCENT	POINTS
Passing	100.00%	365,267
Failed High	0.00%	0







Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Patient: **Appleton, Spencer** - 41 yo Male ID: **LUNG_3DCRT**

PATIENT

Fluid_Lung

Fraction 2 - 10 Mar 2016 1:07 PM | Summary | Point Dose | **2D Analysis** | 3D Analysis | Apply | More

Analysis Settings

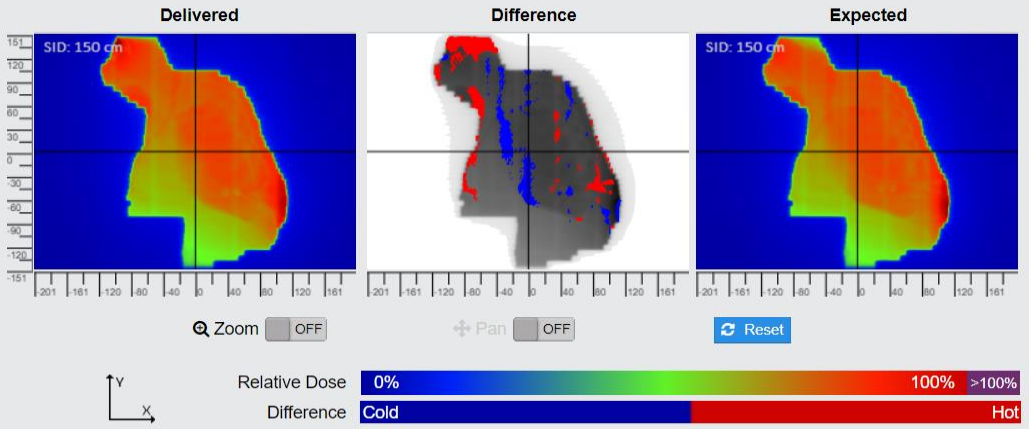
Method	Difference		
Diff (%)	3	DIST (mm)	N/A
TH (%)	10	Norm.	Global
Baseline	Fraction 1 (09 Mar 2016 3:14 PM)		
Auto Align	*Not Available*		

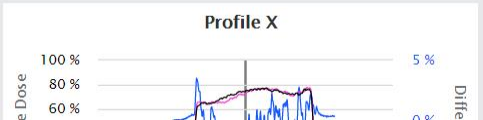
Beams

BEAM NAME	PERCENT
1A AP	88.29%
1B PA	89.05%

Results

RESULT	PERCENT	POINTS
Passing	89.05%	328,367
Failed High	5.86%	21,621





Distribución de Tecnologías Avanzadas

Fraction N

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Pa PATIENT

Patient: **Appleton, Spencer** - 41 yo Male ID: **LUNG_3DCRT**

Fluid_Lung

Fraction 8 - 22 Mar 2016 12:40 PM | Summary | Point Dose | **2D Analysis** | 3D Analysis | Apply | More

Analysis Settings

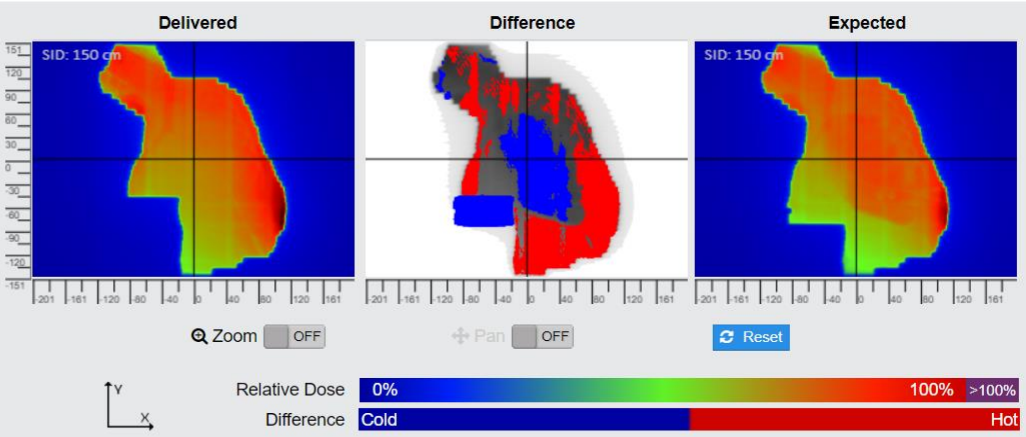
Method	Difference		
Diff (%)	3	DIST (mm)	N/A
TH (%)	10	Norm.	Global
Baseline	Fraction 1 (09 Mar 2016 3:14 PM)		
Auto Align	*Not Available*		

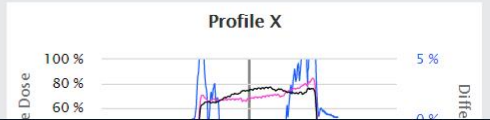
Beams

BEAM NAME	PERCENT
1A AP	52.29%
1B PA	53.95%

Results

RESULT	PERCENT	POINTS
Passing	53.95%	197,834
Failed High	27.06%	99,253





Distribución de Tecnologías Avanzadas

Fraction N

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Patient: Garrett, Chance - 64 yo Male ID: CBCTLUNG

CBCTlungchange

Fraction 1 - 30 Mar 2017 11:16 AM | Summary | Point Dose | 2D Analysis | 3D Analysis | Apply | More

Analysis Settings

3D Calculation Mode: EPID

Diff (%)	3	DIST (mm)	3
TH (%)	10	Norm.	Global
		Pass Tol (%)	90

Image Source

Calculated On: CBCT (30 Mar 2017 11:16 AM)

3D Gamma

GAMMA RESULTS	PERCENT
Passing Rate	99.97%
Failed High	
Failed Low	0.02%
Total Points	486457

Results | DVH | Images

NONE — FRACTION GOAL RANGE

STATUS	STRUCTURE	GAMMA	METRIC	(IDEAL | ACCEPTABLE)	REFERENCE | DELIVERED || % DIFF
✓	PTV	99.7%	V 64 Gy	≥ 95.00%	98.71 % | **95.12** % || 3.63 %
✓	SpinalCord	100.0%	Max	≤ 1.52 Gy	1.20 Gy | **1.20** Gy || 0.16 %
✓	Esophagus	100.0%	Mean	≤ 1.03 Gy	0.37 Gy | **0.38** Gy || 2.97 %
✓	Esophagus	100.0%	Max	≤ 2.04 Gy	1.25 Gy | **1.26** Gy || 1.52 %
✓	Heart	N/A	V 40 Gy	≤ 80.00%	0.00 % | **0.00** % || 0.00 %
✓	Heart	N/A	V 45 Gy	≤ 60.00%	0.00 % | **0.00** % || 0.00 %
✓	Heart	N/A	V 60 Gy	≤ 30.00%	0.00 % | **0.00** % || 0.00 %
✓	Heart	N/A	Mean	≤ 1.06 Gy	0.00 Gy | **0.01** Gy || 112.50 %
✓	mod lunge union	99.9%	V 20 Gy	≤ 35.00%	9.29 % | **9.60** % || 3.33 %
✓	mod lunge union	99.9%	V 5 Gy	≤ 65.00%	28.21 % | **30.02** % || 6.38 %
✓	mod lunge union	99.9%	Mean	≤ 0.61 Gy	0.22 Gy | **0.23** Gy || 5.35 %

Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Garrett, Chance - 64 yo Male ID: CBCTLUNG

admin Admin
1.7.2.20913

PATIENT

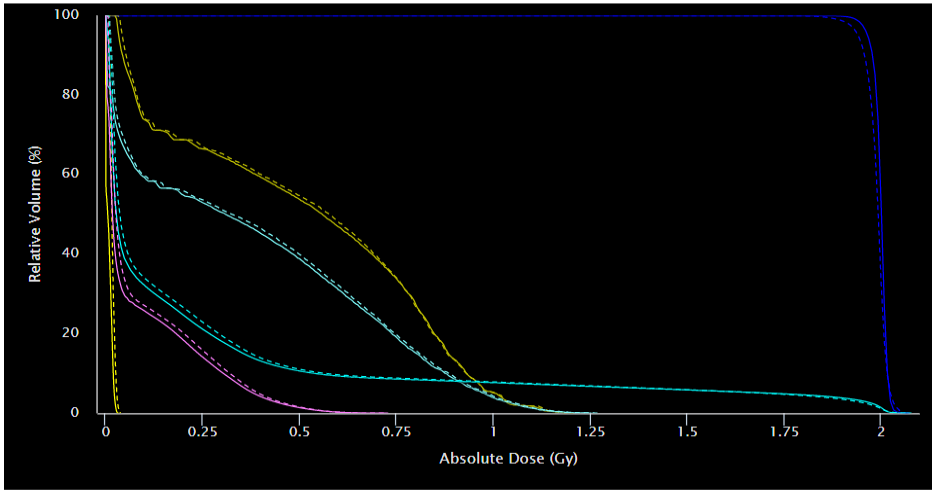
CBCTlungchange

Fraction 1 - 30 Mar 2017 11:16 AM | Summary | Point Dose | 2D Analysis | 3D Analysis | Apply | More

Delivered Results

STRUCTURE NAME	MIN	MAX	MEAN
PTV	1.74 Gy	2.07 Gy	1.98 Gy
SpinalCord	0.03 Gy	1.20 Gy	0.50 Gy
Esophagus	0.00 Gy	1.26 Gy	0.38 Gy
Heart	0.00 Gy	0.03 Gy	0.01 Gy
mod lunge union	0.00 Gy	2.07 Gy	0.23 Gy
PTV	1.74 Gy	2.07 Gy	1.98 Gy
Lung_R	0.00 Gy	0.72 Gy	0.09 Gy
GTV_T	1.93 Gy	2.05 Gy	1.99 Gy
External	0.00 Gy	2.07 Gy	0.23 Gy
Lung_L	0.00 Gy	2.07 Gy	0.27 Gy
Trachea	0.21 Gy	0.80 Gy	0.53 Gy
MainBronchus_L	0.10 Gy	0.63 Gy	0.34 Gy
MainBrochus_R	0.16 Gy	0.47 Gy	0.33 Gy

Results | DVH | Images



Reference Delivered

Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

PATIENT

Patient: **Garrett, Chance** - 64 yo Male ID: **CBCTLUNG**

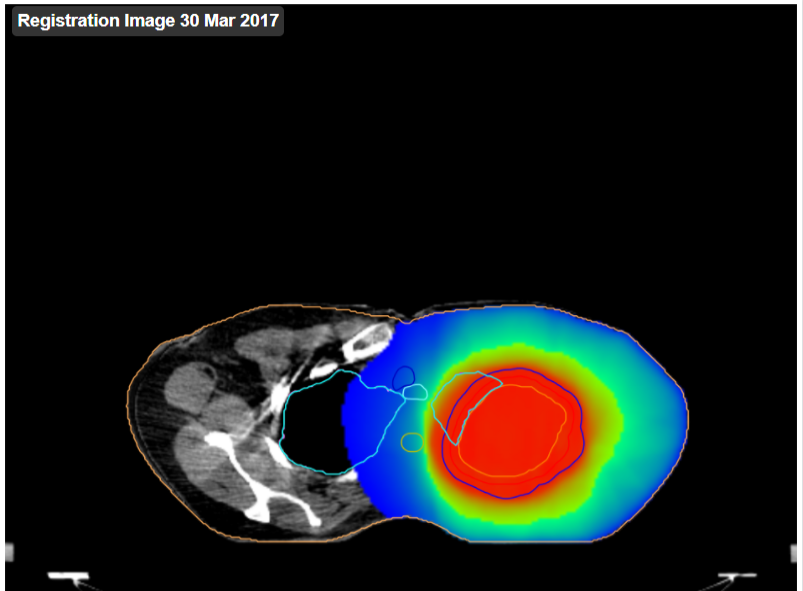
STRUCTURE NAME	GAMMA
PTV	99.75%
SpinalCord	100.00%
Esophagus	100.00%
Heart	N/A
mod lunge union	99.93%
Lung_R	100.00%
GTV_T	100.00%
External	99.97%
Lung_L	99.87%
Trachea	100.00%
MainBronchus_L	100.00%
MainBrochus_R	100.00%
BrachialPlexus_L	100.00%
ITV_T	99.91%
Lung_L+R-GTV	99.93%

Results DVH Images

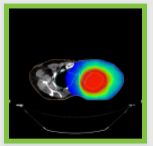
Dose Displayed: Delivered Gamma Planned

Dose Opacity: 100%

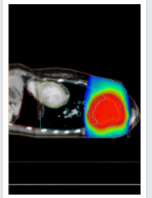
Absolute Dose (Gy): 0 — 2.08 >2.08



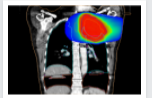
Transverse



Sagittal



Coronal



Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

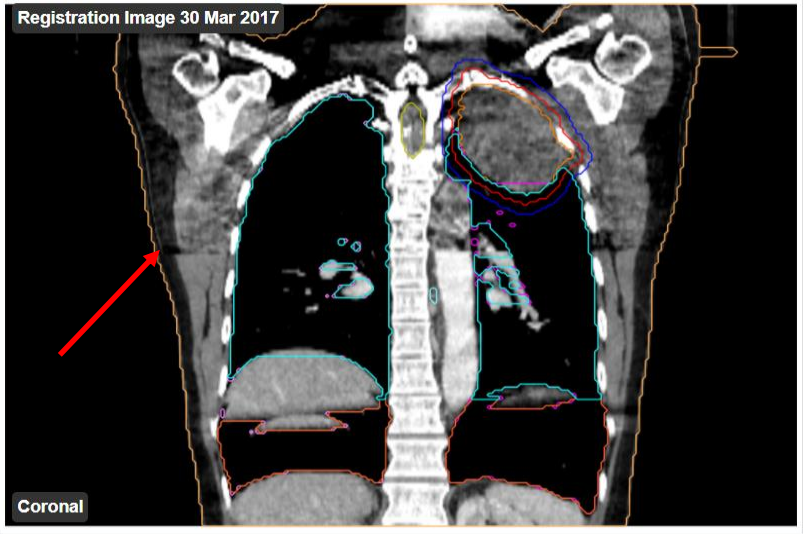
Patient: Garrett, Chance - 64 yo Male ID: CBCTLUNG

PTV	99.75%
SpinalCord	100.00%
Esophagus	100.00%
Heart	N/A
mod lunge union	99.93%
Lung_R	100.00%
GTV_T	100.00%
External	99.97%
Lung_L	99.87%
Trachea	100.00%
MainBronchus_L	100.00%
MainBrochus_R	100.00%
BrachialPlexus_L	100.00%
ITV_T	99.91%
Lung_L+R-GTV	99.93%

Dose Displayed: Delivered | Gamma | Planned

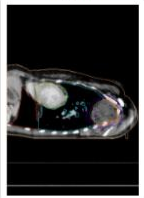
Dose Opacity: 0%

Absolute Dose (Gy): 0 — 2.08 — >2.08

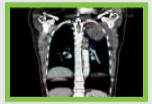


Transverse

Sagittal



Coronal



Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Patient: Garrett, Chance - 64 yo Male ID: CBCTLUNG

admin Admin
1.7.2.20913

PATIENT

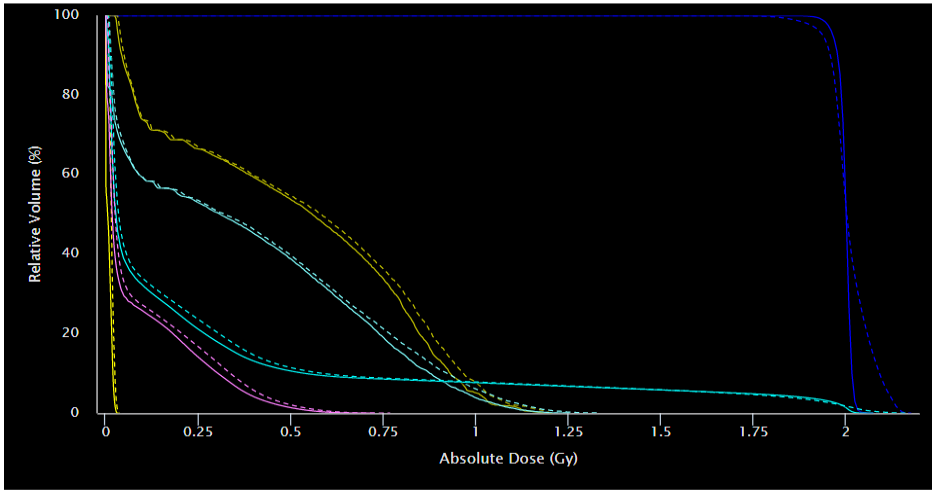
CBCTlungchange

Fraction 23 - 04 May 2017 10:42 AM | Summary | Point Dose | 2D Analysis | **3D Analysis** | Apply | More

Delivered Results

	STRUCTURE NAME	MIN	MAX	MEAN
☑	PTV	1.70 Gy	2.17 Gy	2.01 Gy
☑	SpinalCord	0.03 Gy	1.21 Gy	0.52 Gy
☑	Esophagus	0.00 Gy	1.33 Gy	0.38 Gy
☑	Heart	0.00 Gy	0.03 Gy	0.01 Gy
☑	mod lunge union	0.00 Gy	2.16 Gy	0.23 Gy
☑	PTV	1.70 Gy	2.17 Gy	2.01 Gy
☑	Lung_R	0.00 Gy	0.76 Gy	0.09 Gy
☐	GTV_T	1.91 Gy	2.16 Gy	2.03 Gy
☐	External	0.00 Gy	2.17 Gy	0.23 Gy
☐	Lung_L	0.00 Gy	2.16 Gy	0.27 Gy
☐	Trachea	0.21 Gy	0.85 Gy	0.55 Gy
☐	MainBronchus_L	0.10 Gy	0.65 Gy	0.33 Gy
☐	MainBrochus_R	0.15 Gy	0.48 Gy	0.33 Gy

Results | DVH | Images



Reference Delivered

Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Patient: **Garrett, Chance** - 64 yo Male ID: **CBCTLUNG**

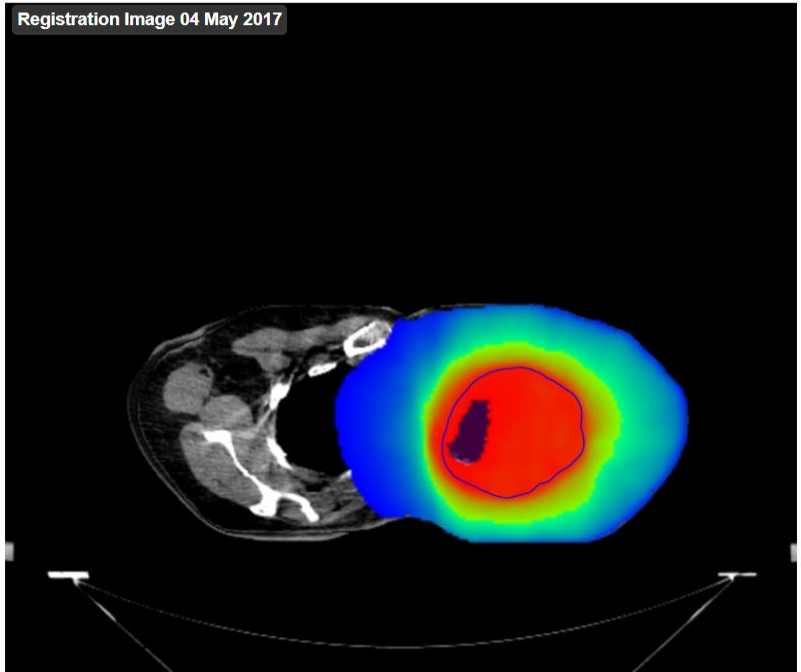
PATIENT

SpinalCord	100.00%
Esophagus	100.00%
Heart	N/A
mod lunge union	96.68%
Lung_R	100.00%
GTV_T	73.62%
External	97.98%
Lung_L	92.86%
Trachea	99.62%
MainBronchus_L	100.00%
MainBrochus_R	100.00%
BrachialPlexus_L	100.00%
ITV_T	77.98%
Lung_L+R-GTV	96.68%

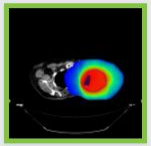
Dose Displayed: Delivered | Gamma | Planned

Dose Opacity: 100%

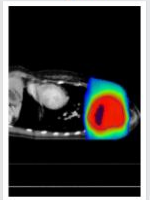
Absolute Dose (Gy): 0 — 2.17 — >2.17



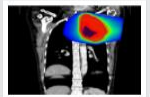
Transverse



Sagittal



Coronal



Fraction N

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

PATIENT

Patient: Garrett, Chance - 64 yo Male ID: CBCTLUNG

Planned Structures List

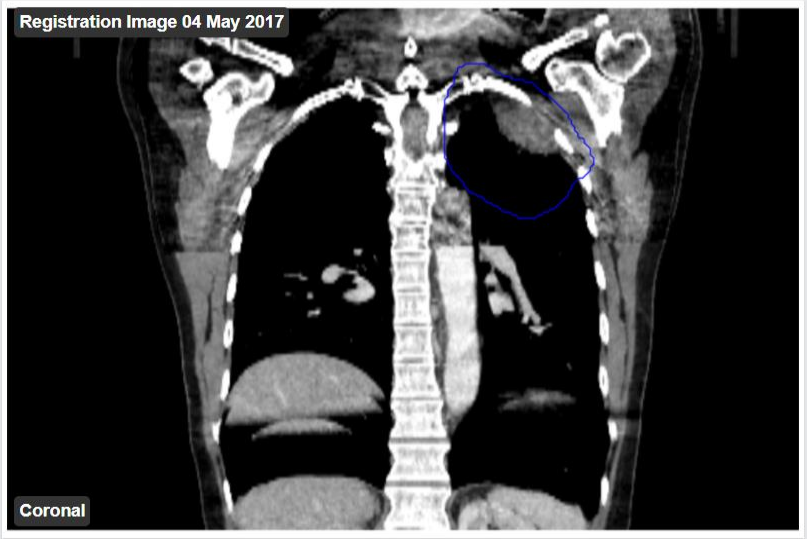
STRUCTURE NAME	GAMMA
PTV	81.51%
SpinalCord	100.00%
Esophagus	100.00%
Heart	N/A
mod lunge union	96.68%
Lung_R	100.00%
GTV_T	73.62%
External	97.98%
Lung_L	92.86%
Trachea	99.62%
MainBronchus_L	100.00%
MainBrochus_R	100.00%
BrachialPlexus_L	100.00%
ITV_T	77.98%
Lung_L+R-GTV	96.68%

Results DVH Images

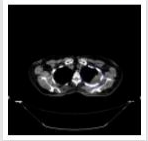
Dose Displayed Delivered Gamma Planned

Dose Opacity 0%

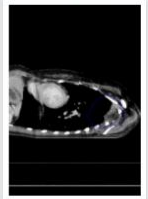
Gamma Cold Hot



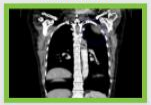
Transverse



Sagittal

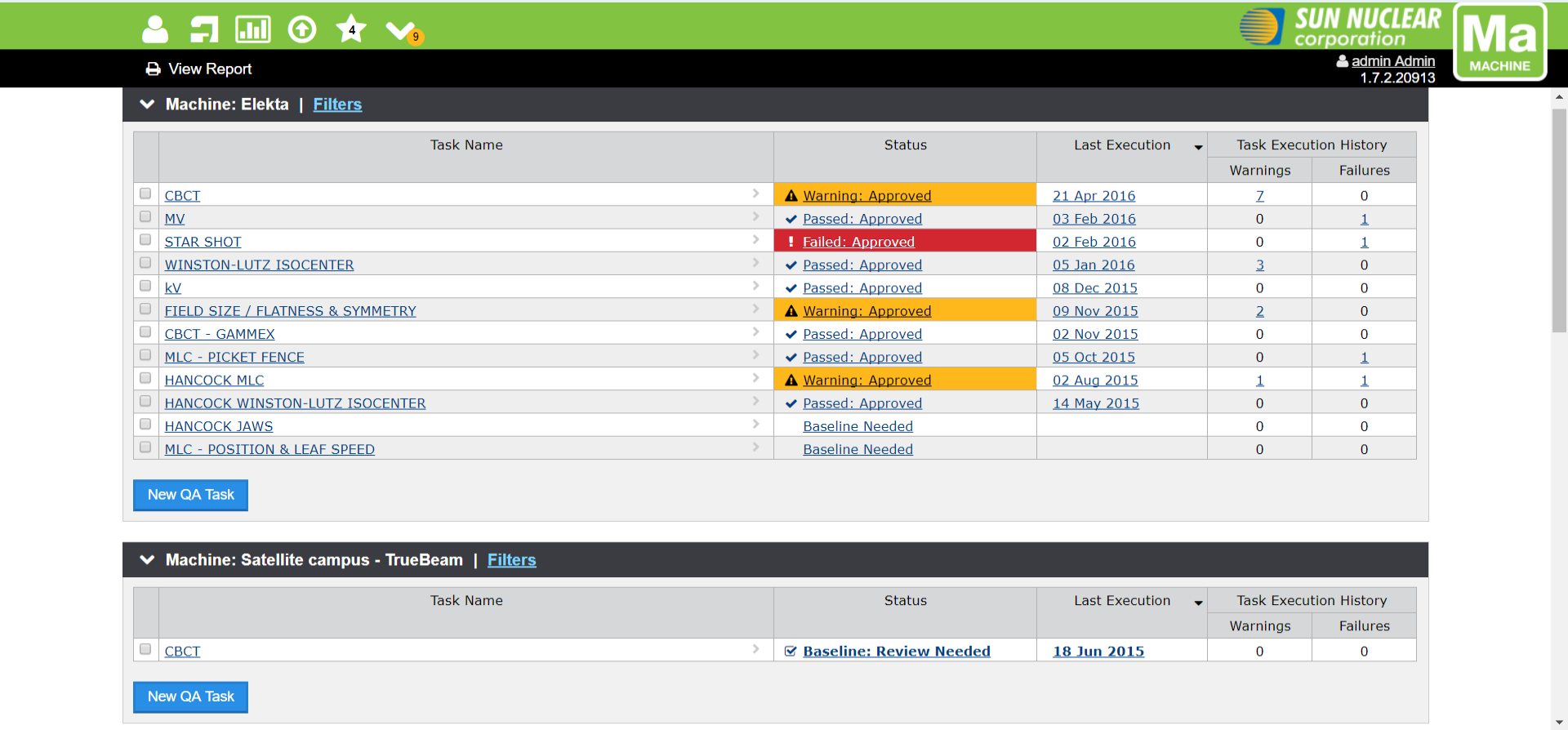


Coronal



SNC Machine

Distribución de Tecnologías Avanzadas



	Task Name	Status	Last Execution	Task Execution History	
				Warnings	Failures
	CBCT	Warning: Approved	21 Apr 2016	7	0
	MV	Passed: Approved	03 Feb 2016	0	1
	STAR SHOT	Failed: Approved	02 Feb 2016	0	1
	WINSTON-LUTZ ISOCENTER	Passed: Approved	05 Jan 2016	3	0
	kV	Passed: Approved	08 Dec 2015	0	0
	FIELD SIZE / FLATNESS & SYMMETRY	Warning: Approved	09 Nov 2015	2	0
	CBCT - GAMMEX	Passed: Approved	02 Nov 2015	0	0
	MLC - PICKET FENCE	Passed: Approved	05 Oct 2015	0	1
	HANCOCK MLC	Warning: Approved	02 Aug 2015	1	1
	HANCOCK WINSTON-LUTZ ISOCENTER	Passed: Approved	14 May 2015	0	0
	HANCOCK JAWS	Baseline Needed		0	0
	MLC - POSITION & LEAF SPEED	Baseline Needed		0	0

New QA Task

Machine: Satellite campus - TrueBeam | Filters

	Task Name	Status	Last Execution	Task Execution History	
				Warnings	Failures
	CBCT	Baseline: Review Needed	18 Jun 2015	0	0

New QA Task

SNC Machine

Distribución de Tecnologías Avanzadas

Delete Baseline | Upload | Calculate | Save | Comments

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Task List

CBCT Baseline Setup

Task Name*: CBCT

Execution Date*: 12 Aug 2015 5:22 PM

% of MTF*: 50

ATLAS ID: 0

Phantoms*: Catphan® 503 (Elekta)

- Catphan® 504 (Varian)
- Catphan® 503 (Elekta)
- Catphan® 600
- Gammex 464
- Catphan® 604 (Varian)

- #1 - 12 Jun 2015
- #2 - 12 Jul 2015
- #3 - 12 Aug 2015

Upload Baseline Set

3 datasets

Dataset #1 — 66 files

Auto Import Configuration

- [x] Use as default Image Registration
- [ ] Exclude from baseline results
- [x] Use file header for automatic processing

Patient Name: L1 ZZMonthlyQA XVI
Patient ID: MonthlyQA

Image Registration

Delete dataset from baseline

1.3.46.423632.141000.1397689707.

Use	Parameter		Baseline	Lower Failure	Lower Warning	Upper Warning	Upper Failure
☑	Geometric distortion (mm)	Edit	1.55	-0.56	0.50	2.60	3.66
☑	Spatial resolution (lp/mm)	Edit	0.55	0.30	0.39	0.72	0.80
☑	Uniformity (HU)	Edit	7.73	-60.91	-26.59	42.05	76.37
☑	Contrast (units)	Edit	1.22	0.67	0.85	1.59	1.77
☑	Noise (units)	Edit	16.95	9.32	11.86	22.04	24.58
☑	Air (HU)	Edit	-912.28	-1,322.81	-1,185.96	-638.60	-501.75
☑	Teflon 'R' (HU)	Edit	503.82	277.10	352.67	654.97	730.54
☑	Delrin 'R' (HU)	Edit	66.00	36.30	46.20	85.80	95.70
☑	Acrylic (HU)	Edit	-94.22	-136.62	-122.49	-65.95	-51.82

SNC Machine

Distribución de Tecnologías Avanzadas

SUN NUCLEAR corporation

Delete Baseline | Upload | Calculate | Save | Comments

admin Admin
1.7.2.20913

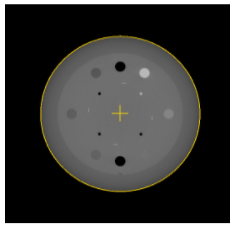
Task List

Baseline Details

View All | Geometric distortion | Spatial resolution | Uniformity | Contrast | Noise | Air | Teflon 'R' | Delrin 'R' | Acrylic | Polystyrene | Low density polyethylene (LDPE) | Polymethylpentene (PMP) | Slice thickness

Parameter	Tolerance Settings	Results

Geometric distortion (mm)



Average: 1.55

Baseline: 1.55 mm

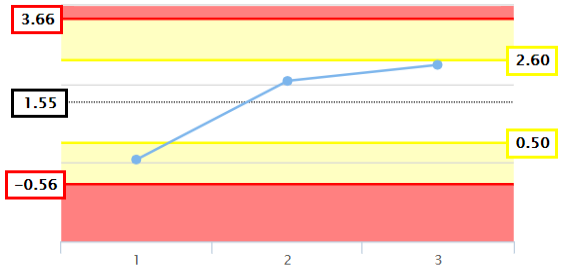
Use average

Module Reference Slice : 59

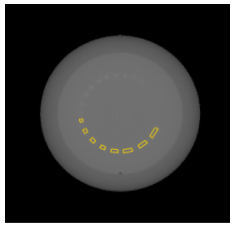
Limits

- Upper Failure + 2 σ
- Upper Warning + 1 σ
- Lower Warning - 1 σ
- Lower Failure - 2 σ

Set limits by: Standard deviation



Spatial resolution (lp/mm)



Average: 0.55

Baseline: 0.55 lp/mm

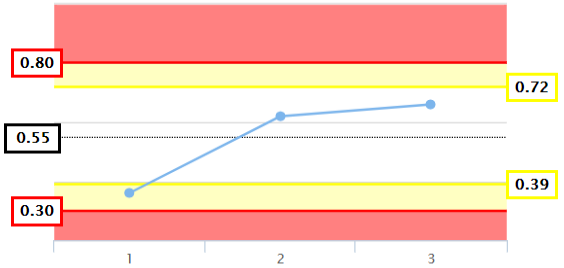
Use average

Module Reference Slice : 44

Limits

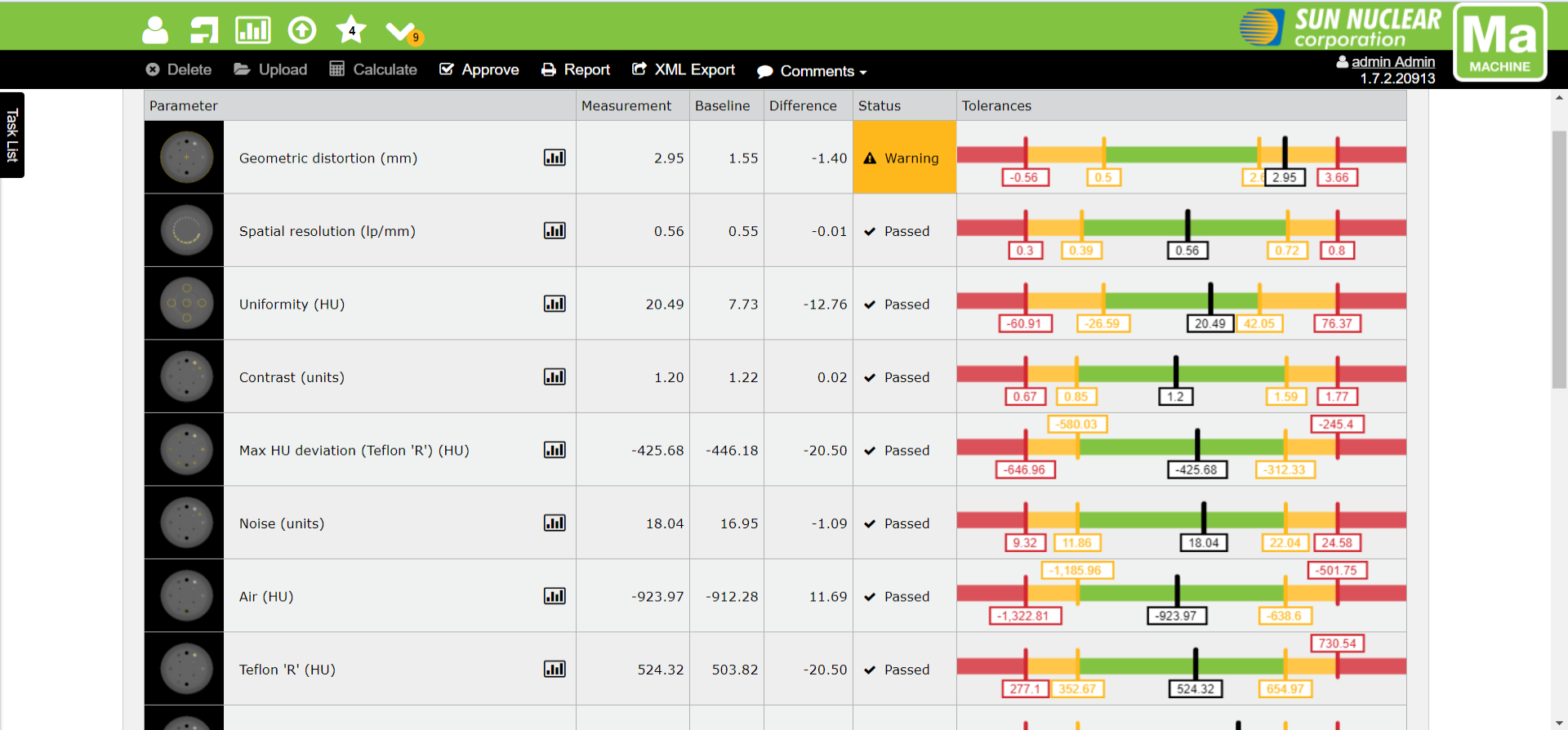
- Upper Failure 0.8 lp/mm
- Upper Warning 0.72 lp/mm
- Lower Warning 0.39 lp/mm
- Lower Failure 0.3 lp/mm

Set limits by: Absolute value



Distribución de Tecnologías Avanzadas

SNC Machine



Parameter	Measurement	Baseline	Difference	Status	Tolerances
Geometric distortion (mm)	2.95	1.55	-1.40	⚠ Warning	-0.56 · 0.5 · 2.95 · 3.66
Spatial resolution (lp/mm)	0.56	0.55	-0.01	✔ Passed	0.3 · 0.39 · 0.56 · 0.72 · 0.8
Uniformity (HU)	20.49	7.73	-12.76	✔ Passed	-60.91 · -26.59 · 20.49 · 42.05 · 76.37
Contrast (units)	1.20	1.22	0.02	✔ Passed	0.67 · 0.85 · 1.2 · 1.59 · 1.77
Max HU deviation (Teflon 'R') (HU)	-425.68	-446.18	-20.50	✔ Passed	-580.03 · -646.96 · -425.68 · -312.33 · -245.4
Noise (units)	18.04	16.95	-1.09	✔ Passed	9.32 · 11.86 · 18.04 · 22.04 · 24.58
Air (HU)	-923.97	-912.28	11.69	✔ Passed	-1,185.96 · -1,322.81 · -923.97 · -638.6 · -501.75
Teflon 'R' (HU)	524.32	503.82	-20.50	✔ Passed	277.1 · 352.67 · 524.32 · 654.97 · 730.54

SNC Machine

Distribución de Tecnologías Avanzadas

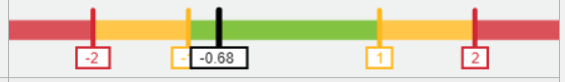
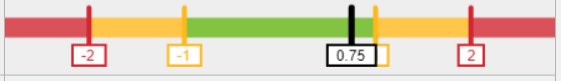
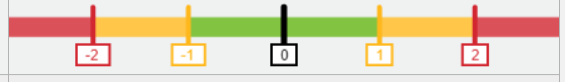
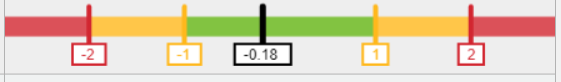
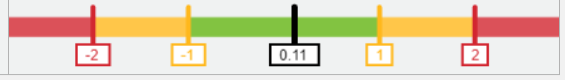
Delete | Upload | Calculate | Approve | Report | XML Export | Comments

SUN NUCLEAR corporation

admin Admin
1.7.2.20913

Task List

WINSTON-LUTZ ISOCENTER Task Execution | Image Detail | Results

Parameter	Measurement	Baseline	Difference	Status	Tolerances
Maximum delta (2D) (mm)	-0.68	0.00	0.68	✔ Passed	
Maximum total delta (2D) (mm)	0.75	0.00	-0.75	✔ Passed	
3D X offset (mm)	0.00	0.00	0.00	✔ Passed	
3D Y offset (mm)	-0.18	0.00	0.18	✔ Passed	
3D Z offset (mm)	0.11	0.00	-0.11	✔ Passed	

Task Information

Execution Date:*
05 Jan 2016 11:18 AM

Radiation threshold (%):*
50

Center object threshold (%):*
75

Uploaded File(s)

SPI00747.dcm
SPI00748.dcm

Task Execution History

Execution Date	Status

SNC Machine

Distribución de Tecnologías Avanzadas

Done

SUN NUCLEAR corporation

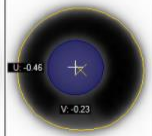
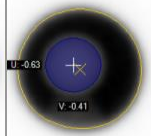
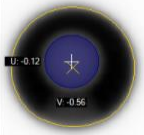
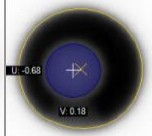
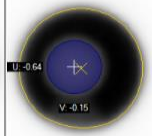
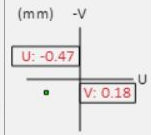
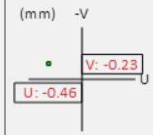
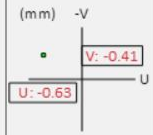
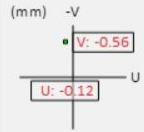
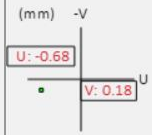
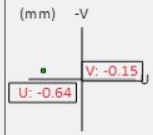
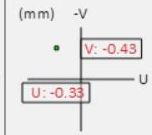
admin Admin
1.7.2.20913

MACHINE

Task List

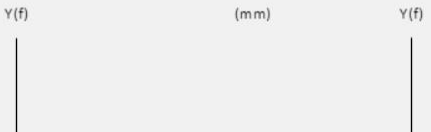
WINSTON-LUTZ ISOCENTER Results

Collimator: 0°

Collimator°	0	0	0	0	0	0	0
Gantry°	0	0	0	90	135	180	270
Couch°	0	300	45	0	0	0	0
File Name	SPI00748.dcm	SPI00749.dcm	SPI00750.dcm	SPI00751.dcm	SPI00752.dcm	SPI00753.dcm	SPI00754.dcm
Image							
Graph							
Total (mm)	0.5	0.51	0.75	0.58	0.7	0.66	0.54

3D Results

X(f) (mm):	0
Y(f) (mm):	-0.18
Z(f) (mm):	0.11



SNC Machine

Distribución de Tecnologías Avanzadas

Done

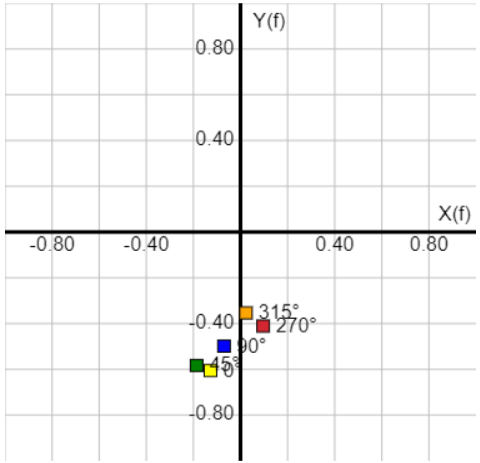
SUN NUCLEAR corporation

admin Admin
1.7.2.20913

MACHINE

HANCOCK WINSTON-LUTZ ISOCENTER Diagrams

Couch - No Offset



Required Couch Shift for optimal orientation (mm):

X(f)	0.19
Y(f)	0.16

Gantry	Couch	Collimator	X-dev	Y-dev	Z-dev	Long.	Trans.	Total
0	0	0	-0.17	-0.73	0	0.61	-0.13	0.62
0	45	0	-0.23	-0.71	0	0.59	-0.29	0.65
0	90	0	-0.12	-0.62	0	0.58	-0.24	0.62
0	270	0	0.05	-0.54	0	0.58	0.17	0.61
0	315	0	-0.02	-0.48	0	0.42	0.1	0.43
180	0	0	0.08	0.48	0	-0.61	-0.13	0.62
90	0	0	0	-0.23	-0.19	0.1	0.19	0.21
270	0	0	0	-0.23	0.19	0.1	0.19	0.21
180	270	0	0.3	0.68	0	-0.63	0.43	0.76
180	315	0	0.23	0.73	0	-0.79	0.35	0.86
180	45	0	0.02	0.5	0	-0.62	-0.03	0.63
180	90	0	0.14	0.59	0	-0.64	0.01	0.64

X-dev and Y-dev are ball from beam center in room coordinates

Longitudinal and transverse are deviation of beam center from ball if ball is at isocenter when couch = 0

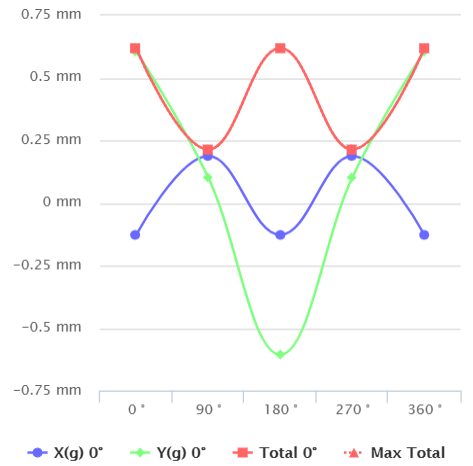
Isocenter longitudinal shift=0.124 mm. Move ball 0.12 mm toward G(+Y) to bring it to gantry isocenter

Isocenter transverse shift=0.047 mm. Move ball 0.05 mm toward B(+X) to bring it to gantry isocenter

Transverse radius -0.083 mm = 0.5 * transverse walkout

Longitudinal radius -0.044 mm = 0.5 * longitudinal walkout

Gantry



Maximum Total Deviation

X(f) (mm)	-0.04
Y(f) (mm)	-0.12
Z(f) (mm)	0.00

Distribución de Tecnologías Avanzadas

¿Qué es SNC Routine?

Test and Data Management

- Daily, Monthly and Annual Test Templates
- User-Friendly Test Configurator
- Electronic Signatures for Every Test
- Automated and Manual Data Entry
- Create Facility Specific Tests

Live Device Integration

- Daily QA™ 3 Connectivity for Daily Tests
- IC PROFILER™ Connectivity for Monthly and Annual Tests

Scheduling Notifications

- Determine Which Tests are Overdue or Have Failed
- Automatic E-mail Alerts

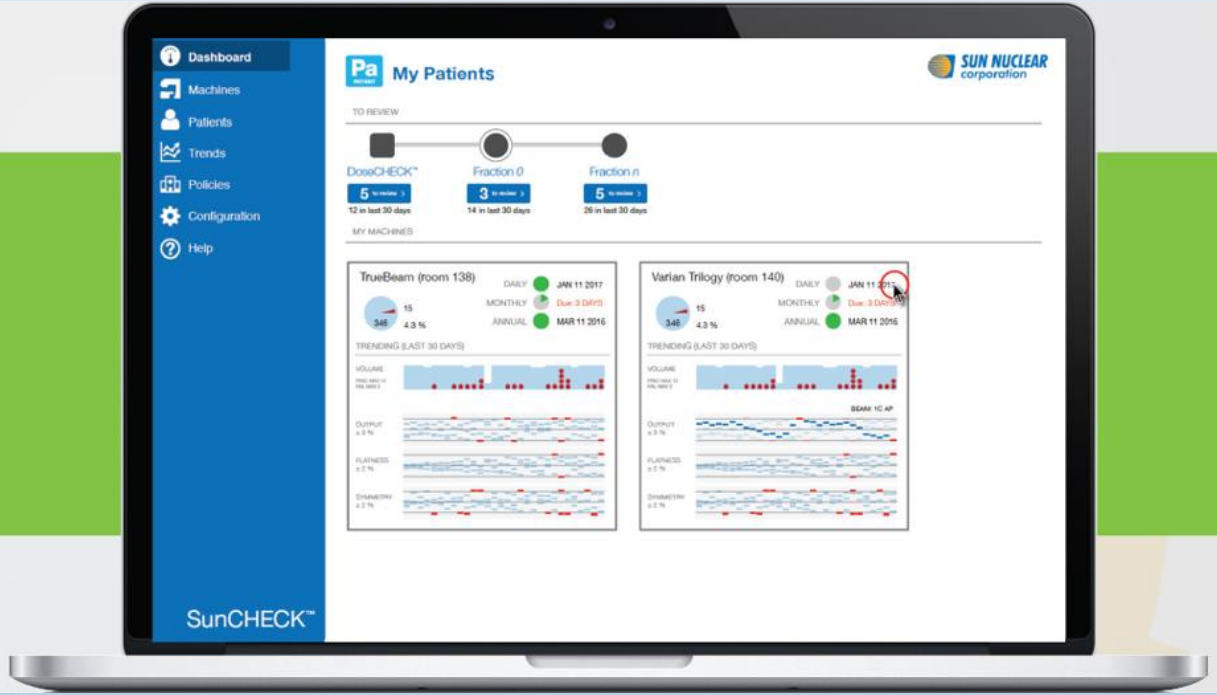
Data Review

- Reporting with Filters and Trend Data
- Quick Approval of all Pending Data
- Approve or Reject Pending Data

Distribución de Tecnologías Avanzadas

SNC Routine

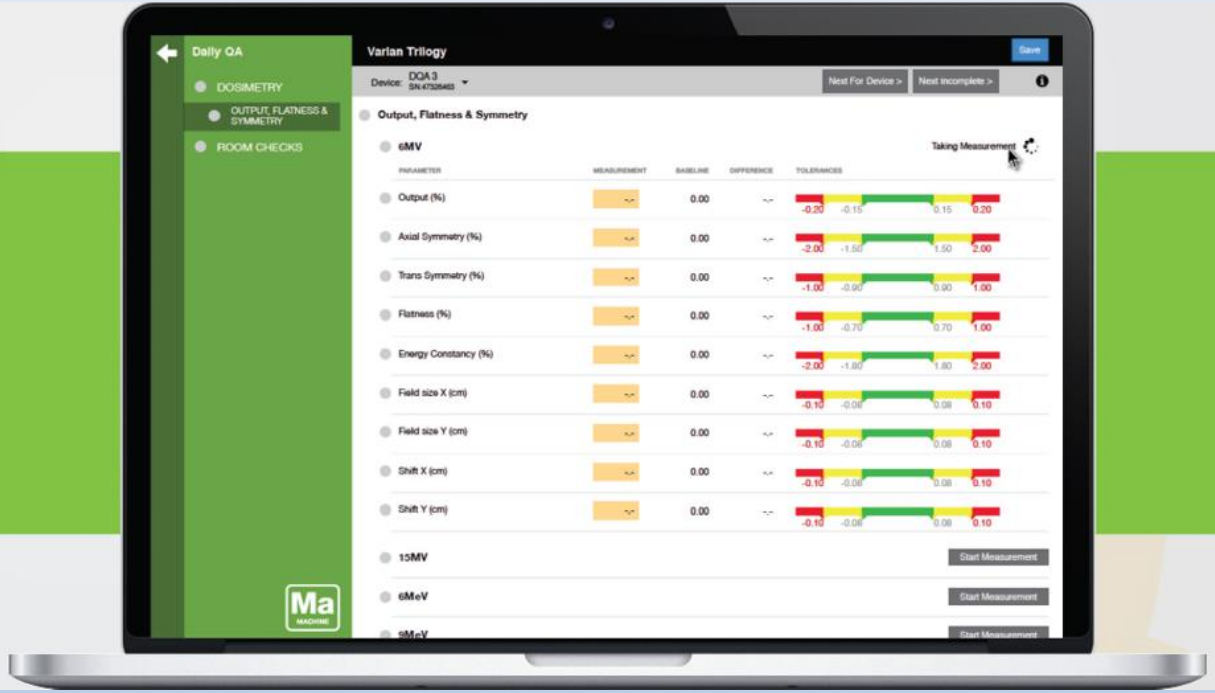
The Dashboard:
Clinic Overview



Distribución de Tecnologías Avanzadas

SNC Routine

Device Integration:
Daily **QA™ 3**

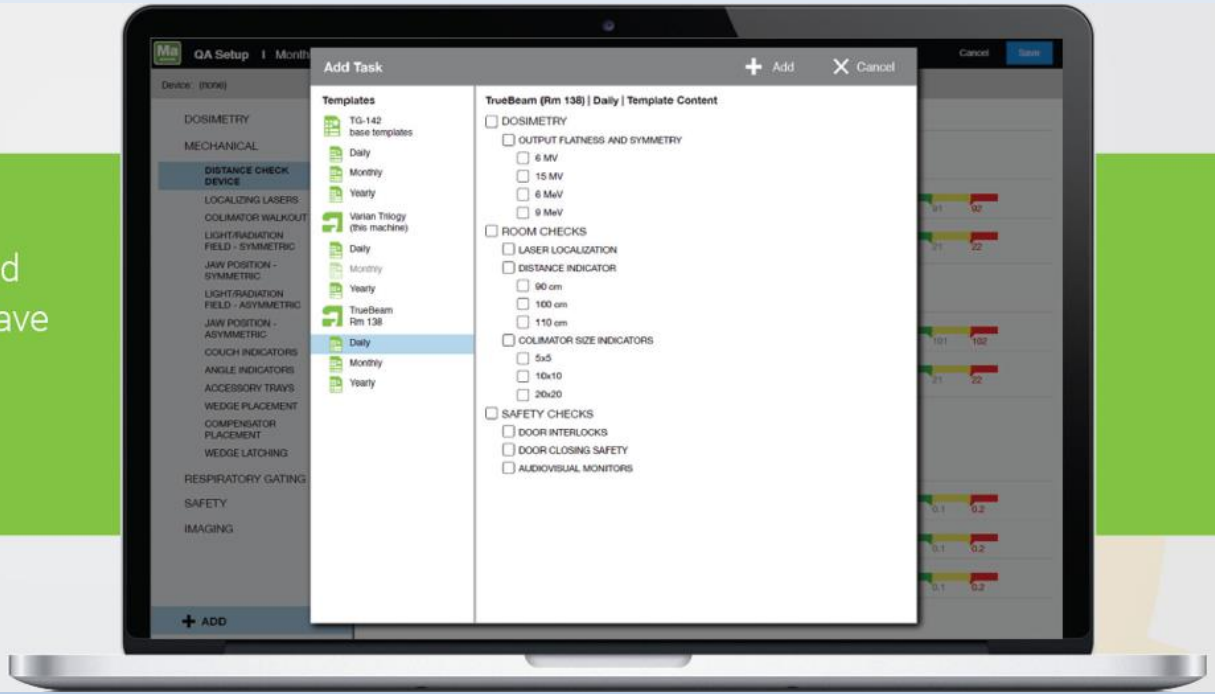


Distribución de Tecnologías Avanzadas

SNC Routine

Templates:

- TG-142 Templates Pre-Configured
- Ability to Customize, Copy and Save Machine Templates



Distribución de Tecnologías Avanzadas

En conclusión

SunCHECK™ // In Summary

Enabling Comprehensive Quality Management
Only Possible From Sun Nuclear

- Automated File Retrieval and Analysis
- Approvals
- Notifications
- Trending
- Reports
- Machine and Patient QA in One Place
- One User Interface and Database
- Fully Independent QA

Machine:

- TG-142 Image and VMAT Tasks
- Daily, Monthly, Annual Tasks and Templates
  - Pre-Built and Customizable
- Direct Device Control/Integration
  - Daily QA™ 3, IC PROFILER™
  - Enhanced Integration of SNC Hardware

Patient:

- Secondary Checks
- Pre-Treatment QA
- In-Vivo Monitoring QA
  - EPID and Log File

Distribución de Tecnologías Avanzadas

¡Muchas Gracias!