



SCANDITRONIX

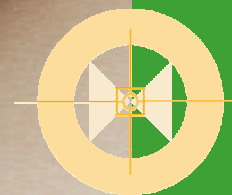
WELLHÖFER

Member of the IBA Group

StarTrack

AK IMRT Heidelberg März 07

Salih Arican
Product Manager RT



FAST_{est} | most ACCURATE | most RELIABLE

Top 3 customer pains....

Need for accuracy

Economics

Lack of time

SCANDITRONIX
WELLHOFER

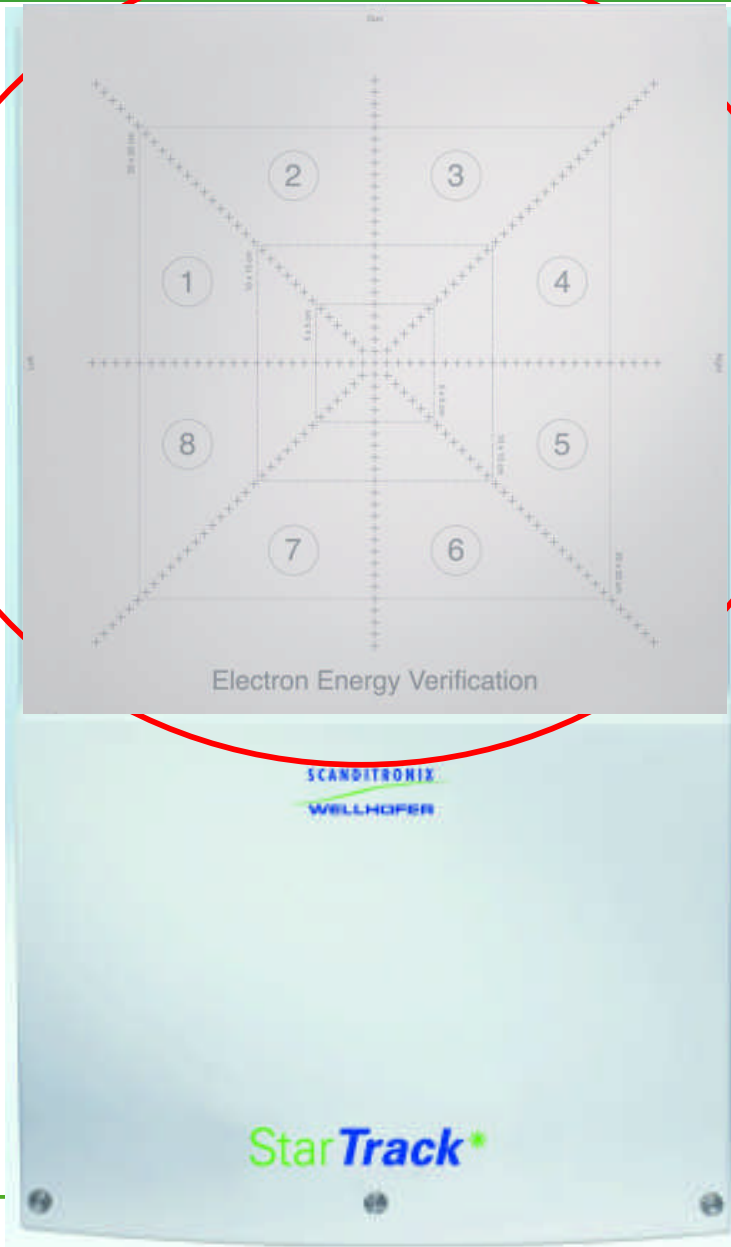
We help you save time
Time is money

Rely on the competence
of the leader in
Relative Densimetry.
It's your time.

Find out how you can save time on
www.scanditronix-wellhofer.com

Member of the ISA Group

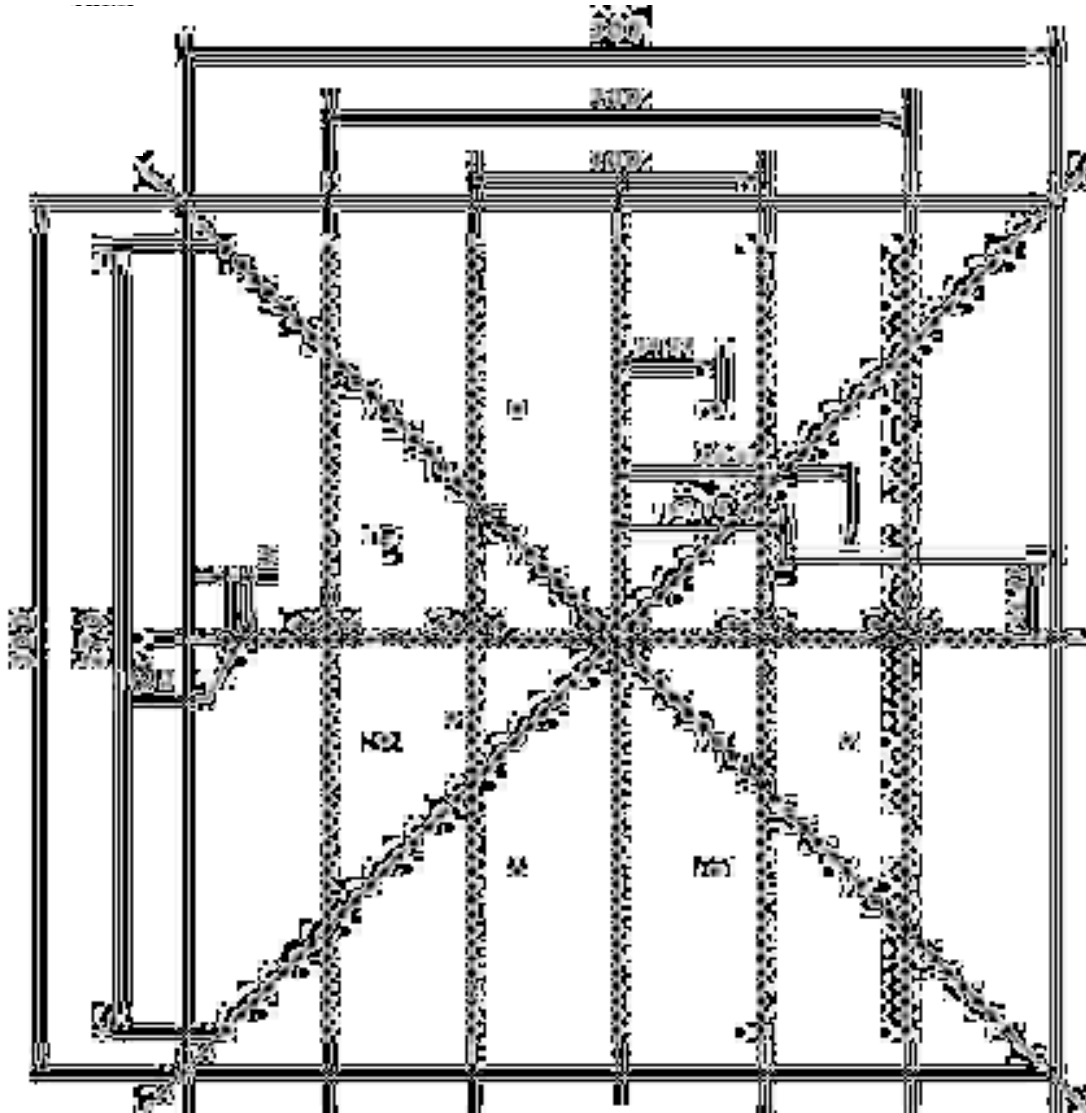
StarTrack → The universal QA solution



- Air-vented pixel ionization chambers
- Main axis and diagonals
- Additional rows for MLC QA
- Additional chambers dedicated to energy constancy verification
- 2 build up plates

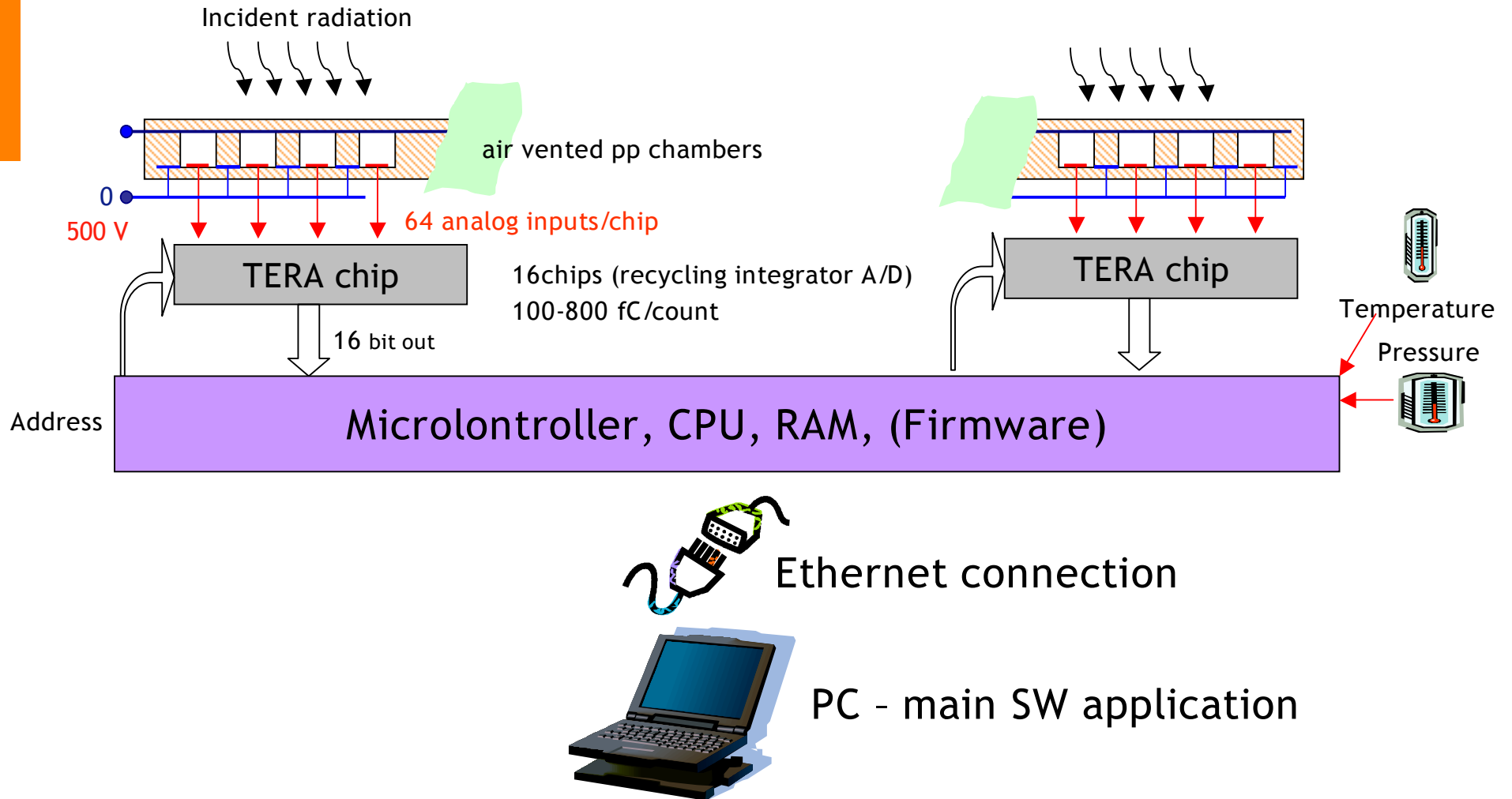


Sensor



- Based on Pixel Ionization Technology as MXX
- Active area: 27cm x 27cm
- 453 detectors
- Ø3mm/5mm height
- 5 mm pitch on the main axis and MLC columns, 7 mm on the diagonals

Electronics



Intended use

□ Daily machine QA:

- Field size
- Penumbra
- Flatness
- Symmetry
- Dose output
- Light field vs. radiation field
- Beam energy (constancy test)
- ☺ All at once!!!

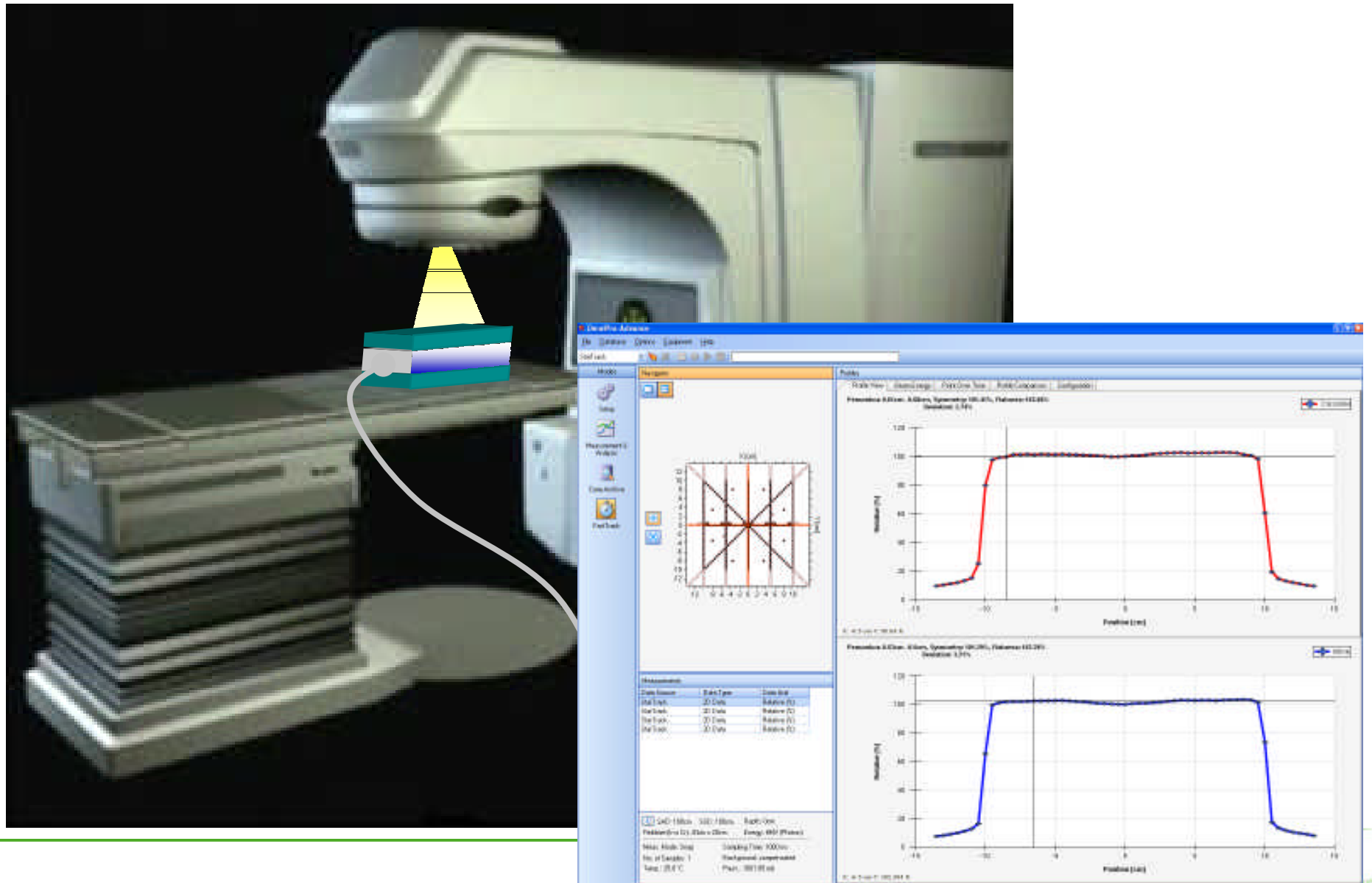
□ Wedge QA:

- Wedge factor

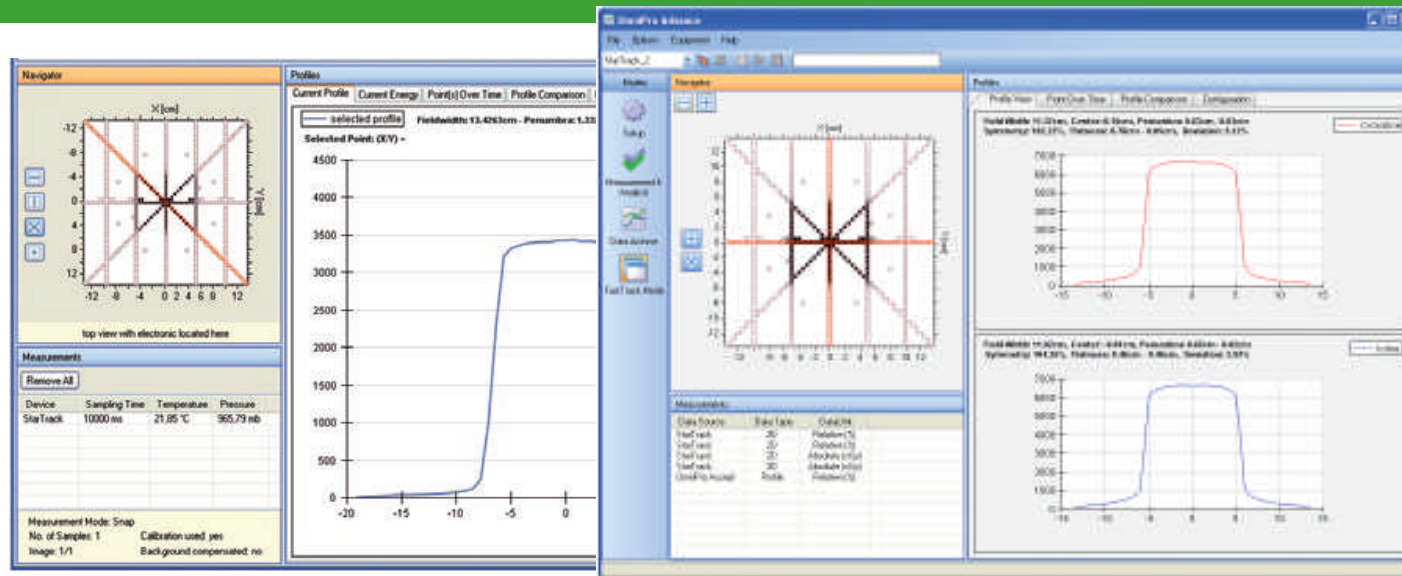
□ MLC QA:

- Relative position of leaves at 0, ± 5 cm, ± 10 cm

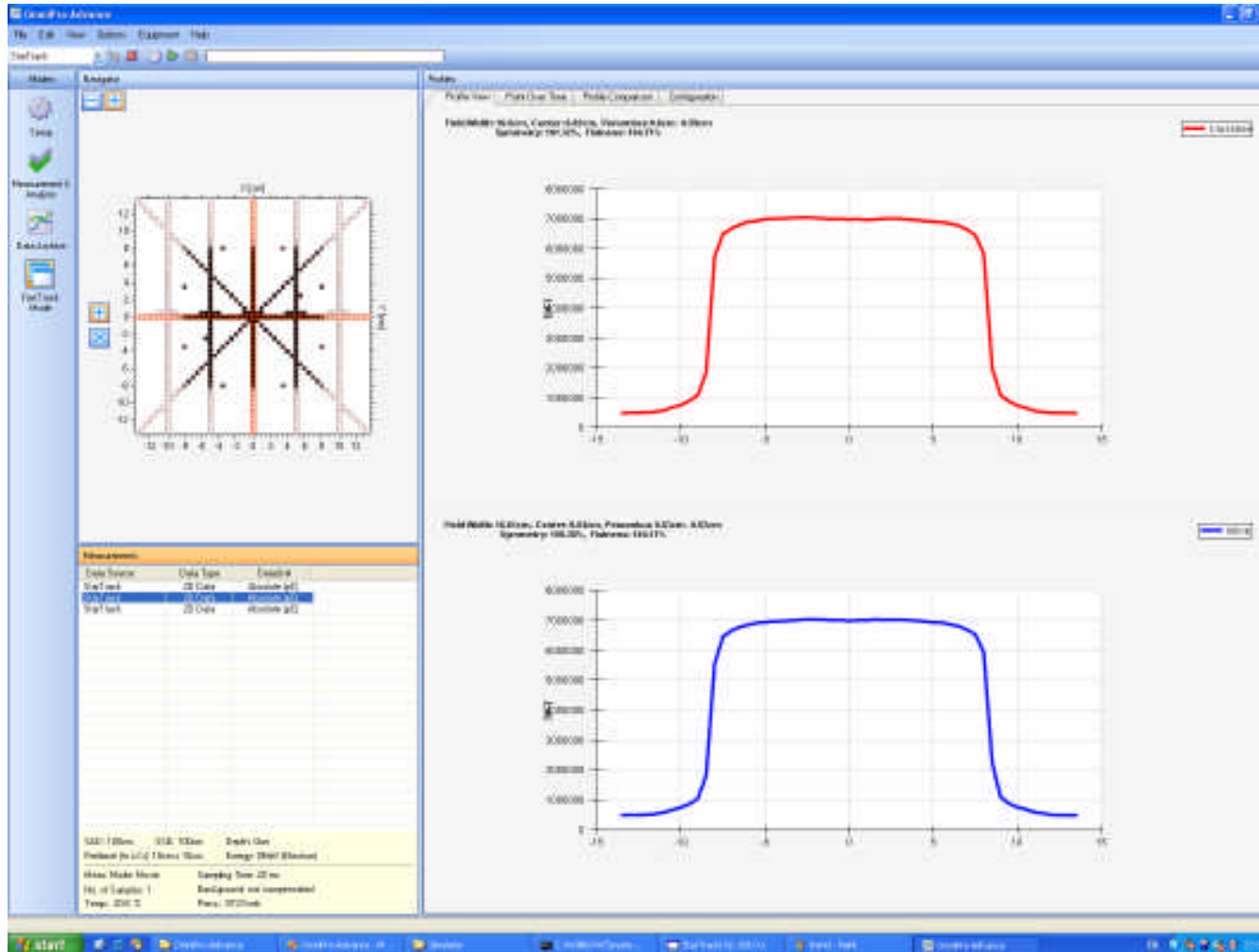
StarTrack Set-Up



OmniPro-Advance SW

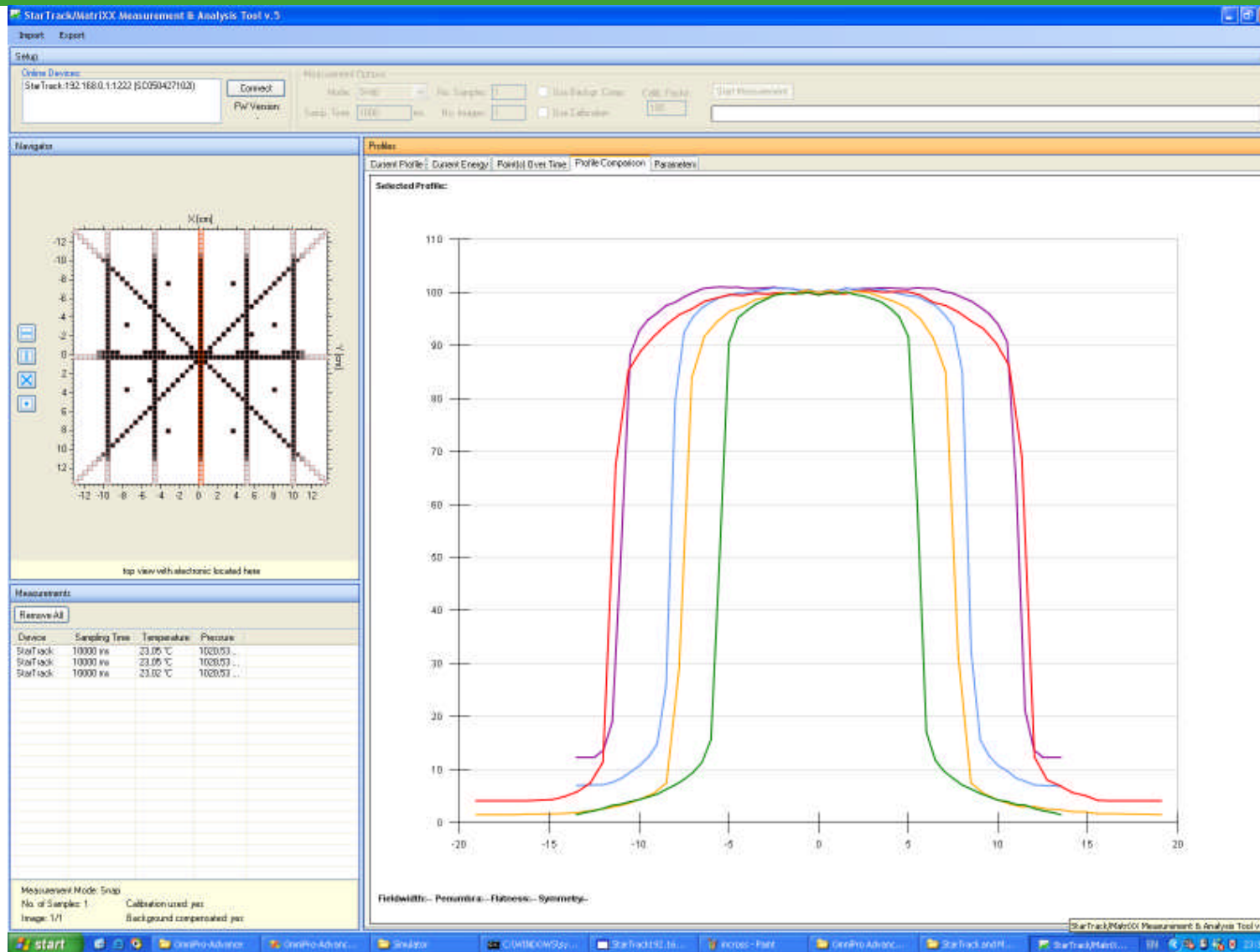


Fast Track measurement mode

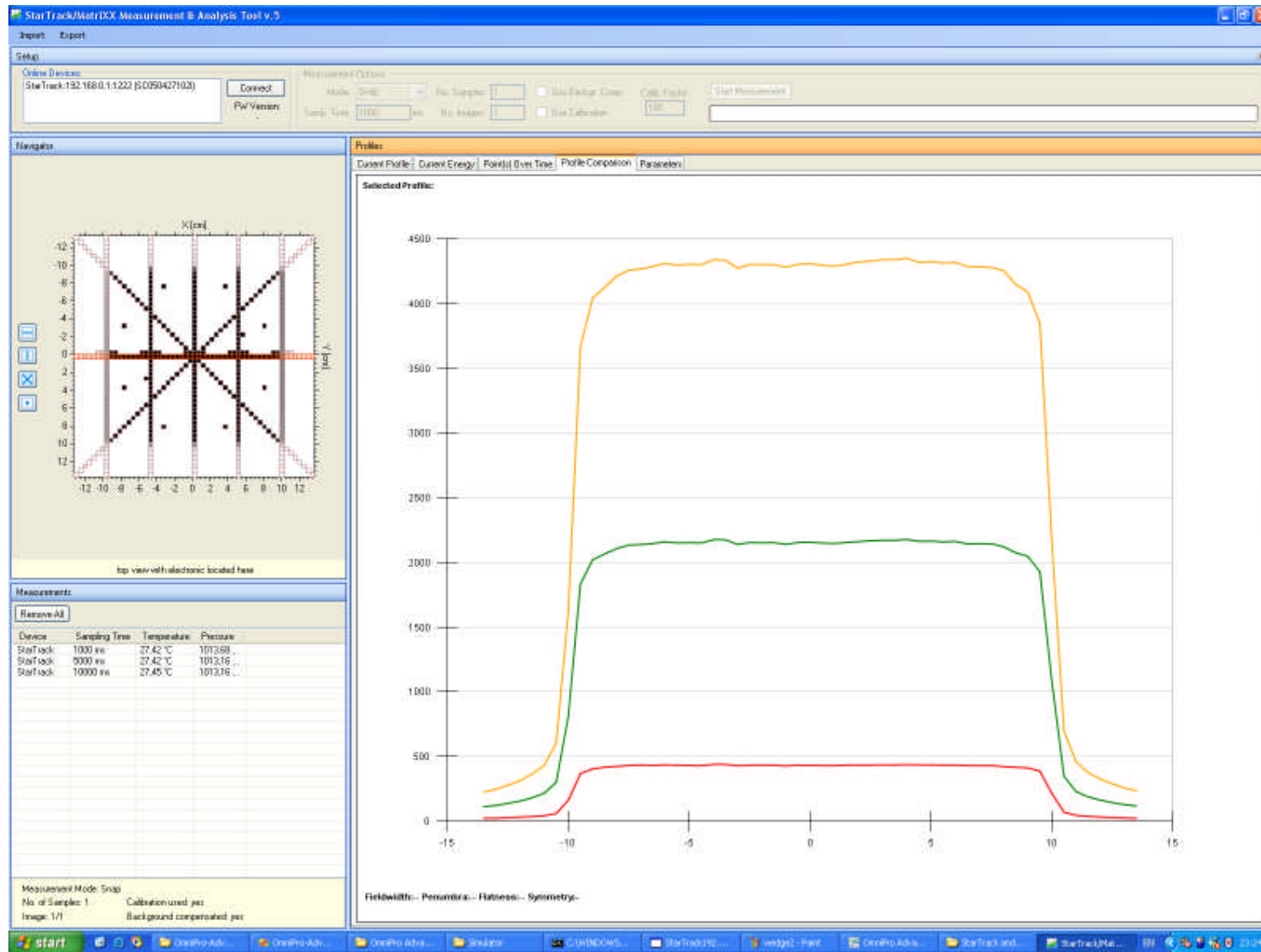


Real time measurement and analysis of symmetry, flatness, penumbra

Beam Profile



Beam Profile



OmniProAdvance: perform reference measurement

The screenshot displays the OmniPro Advance software interface. The main window is titled "OmniPro Advance" and contains a menu bar (File, Database, Options, Equipment, Help) and a toolbar. The interface is divided into several sections:

- Left Sidebar:** Contains navigation icons for Modes, Setup, Measurement & Analysis, Data Archive, and FastTrack.
- Configuration Area:**
 - Configuration:** Clinic: 2 Alice; Radiation Device: Mevatron; Test Queues: Profiles. Buttons: New, Edit, Delete.
 - Test Queue Items:** A table listing 8 items. Item 1 is highlighted with a blue bar and a green checkmark, indicating "Setup complete".
- Profile Analysis Configuration:**
 - Sampling Time: 30000 ms; No. of Samples: 1; Total Time: 30s.
 - Buildup: water eq., 12 cm; Field created with: mlc leaves; StarTrack aligned with: laser.
 - Parameter Protocol: DIN; Interpolation Method: Fermi Fit.
 - Included Profiles in Analysis: Inline, Crossline, Diagonals.
- Reference Values and Tolerance Values:**
 - Reference Values - Inline:** Field Width: 5 cm; Center: 0 cm; Penumbra (l/r): 0.5 cm, 0.5 cm; Symmetry: 100%; Flatness: 100%; Deviation: %.
 - Tolerance Values - Inline:** Field Width: +/- 0.2 cm; Center: +/- 0.2 cm; Penumbra: +/- 0.2 cm; Symmetry: +/- 3%; Flatness: +/- 3%; Deviation: +/- %.
- Tasks Panel:** Save Setup, Reset Setup.
- Info Panel:** How to measure the reference values: 1) Configure your selected setup and connect to your StarTrack device; 2) Push the "Start Measurement" button to execute the measurement.
- Comment Panel:** A text area for user comments.
- Bottom Status Bar:** Shows the user "admin" and the system tray with various icons and the time "9:56 AM".

OmniPro-Advance: perform daily QA

The screenshot displays the OmniPro Advance software interface. The main window shows a test queue for profiles for clinic 2 Alice and radiation device Mevatron. A 'Profile analysis' row is highlighted in blue and marked as 'failed' and 'not archived'. Below this, a detailed table shows measurement results for 'Profile: Inline' and 'Profile: Crossline'.

Test Queue Profiles:

Selection	Energy	Field Size	SDD	Setup	Gantry Angle	Collimator Angle
<input type="checkbox"/>	Photons - 6 MV	5 x 5 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 6 MV	10 x 10 cm	100 cm	0° - table top	0°	0°
<input checked="" type="checkbox"/>	Profile analysis			failed	not archived	
Selection	Energy	Field Size	SDD	Setup	Gantry Angle	Collimator Angle
<input type="checkbox"/>	Photons - 6 MV	20 x 20 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 6 MV	25 x 25 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	5 x 5 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	10 x 10 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	20 x 20 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	25 x 25 cm	100 cm	0° - table top	0°	0°

Measurement Results:

Test	Reference	Tolerance	Result	Status
Profile: Inline				
FieldWidth	10 cm	+/- 0.5 cm	10.13 cm	Passed
Center	0 cm	+/- 0.2 cm	-0.08 cm	Passed
PenumbraLeft	0.5 cm	+/- 0.2 cm	0.42 cm	Passed
PenumbraRight	0.5 cm	+/- 0.2 cm	0.14 cm	Failed
Flatness	100 %	+/- 3 %	102.59 %	Passed
Symmetry	100 %	+/- 3 %	101.26 %	Passed
Profile: Crossline				
FieldWidth	10 cm	+/- 0.5 cm	10 cm	Passed
Center	0 cm	+/- 0.2 cm	0.08 cm	Passed
PenumbraLeft	0.5 cm	+/- 0.2 cm	0.54 cm	Passed
PenumbraRight	0.5 cm	+/- 0.2 cm	0.56 cm	Passed
Flatness	100 %	+/- 3 %	102.49 %	Passed
Symmetry	100 %	+/- 3 %	101 %	Passed

The interface also includes a 'Tasks' panel on the right with options like 'Archive the selected tests' and 'Print the current test'. A 'Measurement info' section at the bottom right contains the instruction: '1. Configure your Linac according with the setup and measure the open field'.

OmniProAdvance: perform daily QA

OmniPro Advance

File Database Options Equipment Help

StarTrackSimulator

Modes

Setup

Measurement & Analysis

Data Archive

FastTrack

Test queue Profiles for clinic 2 Alice and radiation device Mevatron

Selection	Energy	Field Size	SDD	Setup	Gantry Angle	Collimator Angle
<input type="checkbox"/>	Photons - 6 MV	5 x 5 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 6 MV	10 x 10 cm	100 cm	0° - table top	0°	0°
<input checked="" type="checkbox"/>	Profile analysis			failed		not archived
Selection	Energy	Field Size	SDD	Setup	Gantry Angle	Collimator Angle
<input type="checkbox"/>	Photons - 6 MV	20 x 20 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 6 MV	25 x 25 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	5 x 5 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	10 x 10 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	20 x 20 cm	100 cm	0° - table top	0°	0°
<input type="checkbox"/>	Photons - 15 MV	25 x 25 cm	100 cm	0° - table top	0°	0°

Parameters Results Data

Temperature: 25.6 °C
Pressure: 1010.5 hPa

Tasks

- Archive the selected tests
- Archive all the performed tests
- Print the current test
- Print the test queue
- Reset the test status

Measurement info

- Configure your Linac according with the setup and measure the open field

admin

Start 2 Microsoft Office ... 2 Windows Explorer Microsoft PowerPoin... OmniPro Advance Shortcuts Clinical QA 10:23 AM

OmniProAdvance: data archive

OmniPro Advance

File Database Options Equipment Help

StarTrackSimulator

Modes

Profile analysis (C:\Documents and Settings\All Users\Application Data\MBAD osimetry\OmniPro-Advance\1.0\Database\archive.fdb)

Drag a column header here to group by that column.

Test...	Time stamp	Field ...	Energy...	Energy type	Buildup type	Buildup si...	Clinic	Radiation d...	StarTrack	Queue	StarTrack ...	StarT
<input type="checkbox"/>	2006-11-28 07:09	5 x 5 cm	6 MV	Photons	WaterEqui...	12 cm	2 Alice	Mevatron	StarTrack N...	Profiles	Table	0°
<input type="checkbox"/>	2006-10-23 07:22	10 x 10 cm	6 MV	Photons	WaterEqui...	1.5 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°
<input checked="" type="checkbox"/>	2006-11-06 06:19	10 x 10 cm	6 MV	Photons	WaterEqui...	15 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°
<input type="checkbox"/>	2006-11-28 07:10	10 x 10 cm	6 MV	Photons	WaterEqui...	12 cm	2 Alice	Mevatron	StarTrack N...	Profiles	Table	0°
<input type="checkbox"/>	2006-11-28 09:09	20 x 20 cm	14 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-28 09:11	20 x 20 cm	8 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-28 09:14	20 x 20 cm	12 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-10-23 07:25	20 x 20 cm	6 MV	Photons	WaterEqui...	1.2 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°

Record: 3 Of 17

Parameters Results Data

Test	Reference	Tolerance	Result	Status
Profile: Inline				
FieldWidth	10.13 cm	+/- 0.5 cm	10.14 cm	Passed
Center	-0.08 cm	+/- 0.2 cm	-0.06 cm	Passed
PenumbraLeft	0.6 cm	+/- 0.2 cm	0.6 cm	Passed
PenumbraRight	0.58 cm	+/- 0.2 cm	0.58 cm	Passed
Flatness	105 %	+/- 2 %	104.21 %	Passed
Symmetry	102.82 %	+/- 2 %	102.33 %	Passed
Profile: Crossline				
FieldWidth	9.67 cm	+/- 0.5 cm	9.72 cm	Passed
Center	0.12 cm	+/- 0.2 cm	0.04 cm	Passed
PenumbraLeft	0.51 cm	+/- 0.2 cm	0.52 cm	Passed
PenumbraRight	0.53 cm	+/- 0.2 cm	0.49 cm	Passed
Flatness	105.08 %	+/- 2 %	104.41 %	Passed
Symmetry	104.46 %	+/- 2 %	102.59 %	Passed

Taskbar

Filters

Time period

Today

This week

This month

This year

Between 31-Jan-07 and 31-Jan-07

All

TestType

Profile analysis

Energy verification

Dose output measurement

Wedge constancy check

All

Search

Data archive tasks

Delete selected tests

Analyze selected tests

Switch to single test view mode

Print the current test...

Print the selected tests...

admin

Start 2 Micros... 2 Windo... Microsoft ... C:\WINDO... StarTrack... OmniPro ... Shortcuts Clinical QA 10:13 AM

OmniProAdvance: data archive, profile analysis

OmniPro Advance

File Database Options Equipment Help

StarTrackSimulator

Modes

Setup

Measurement & Analysis

Data Archive

FastTrack

Profile analysis (C:\Documents and Settings\All Users\Application Data\MBAD\osimetry\OmniPro-Advance\1.0\Database\archive.fdb)

Drag a column header here to group by that column.

Tes...	Time stamp	Field ...	Energy...	Energy type	Buildup type	Buildup si...	Clinic	Radiation d...	StarTrack	Queue	StarTrack ...	StarT...
<input type="checkbox"/>	2006-11-28 07:09	5 x 5 cm	6 MV	Photons	WaterEqui...	12 cm	2 Alice	Mevatron	StarTrack N...	Profiles	Table	0°
<input type="checkbox"/>	2006-10-23 07:22	10 x 10 cm	6 MV	Photons	WaterEqui...	1.5 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°
<input checked="" type="checkbox"/>	2006-11-06 06:19	10 x 10 cm	6 MV	Photons	WaterEqui...	15 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°
<input type="checkbox"/>	2006-11-28 07:10	10 x 10 cm	6 MV	Photons	WaterEqui...	12 cm	2 Alice	Mevatron	StarTrack N...	Profiles	Table	0°
<input type="checkbox"/>	2006-11-28 09:09	20 x 20 cm	14 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-28 09:11	20 x 20 cm	8 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-28 09:14	20 x 20 cm	12 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-10-23 07:25	20 x 20 cm	6 MV	Photons	WaterEqui...	1.2 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°

Record: 3 Of 17

Parameters Results Data

Temperature: 23.3 °C
Pressure: 1020.5 hPa

Charge [nC]

Position [cm]

Legend: Inline (blue line), Crossline (red line)

Taskbar

Filters

Time period

Today

This week

This month

This year

Between 31-Jan-07 and 31-Jan-07

All

TestType

Profile analysis

Energy verification

Dose output measurement

Wedge constancy check

All

Search

Data archive tasks

Delete selected tests

Analyze selected tests

Switch to single test view mode

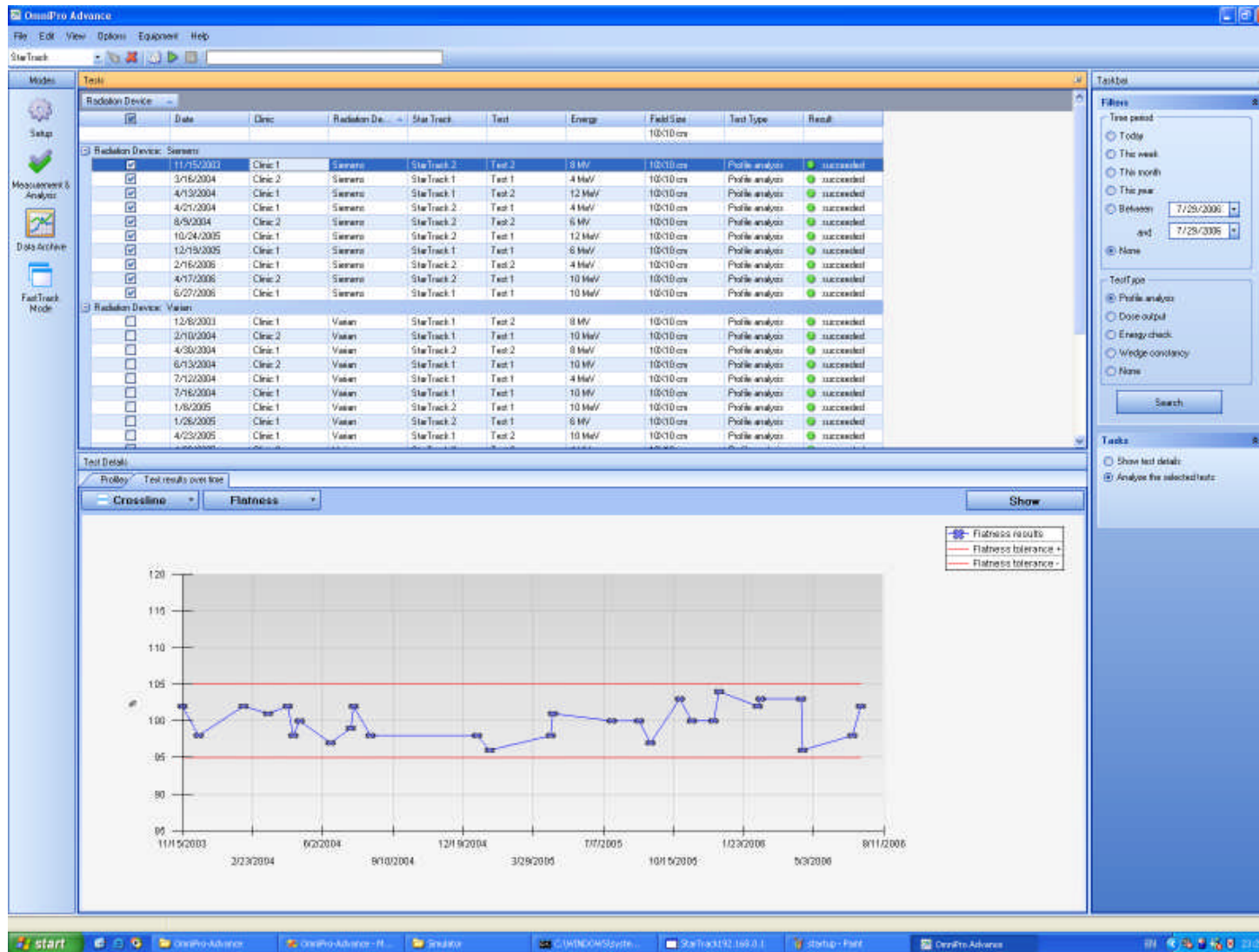
Print the current test...

Print the selected tests...

admin

Start 2 Micros... 2 Windo... Microsoft... C:\WINDO... StarTrack... OmniPro... Shortcuts Clinical QA 10:13 AM

Trend analysis



OmniProAdvance: data archive, beam quality analysis

The screenshot displays the OmniPro Advance software interface. The main window shows a data table with columns for Status, Energy, Energy type, Time stamp, Clinic, Radiation, StarTrack, Queue, Buildup type, Buildup size, Field size, StarTrack..., and StarTrack. The selected row is 14 MeV Electrons, 2006-11-28 09:09, 2 Alice Mevatron, StarTrack N., Mix, Special, 20 x 20 cm, Table, 0°.

Below the table is a 'Parameters' tab with a 'Results' sub-tab. The results table shows the following data:

Label	Reference	Result	Status
Chamber 1	101.34 %	101.34 %	Passed
Chamber 2	98.12 %	98.08 %	Passed
Chamber 3	83.18 %	83.17 %	Passed
Chamber 4	52.61 %	52.61 %	Passed
Chamber 5	27.76 %	27.80 %	Passed
Chamber 6	11.10 %	11.12 %	Passed
Chamber 7	8.71 %	8.71 %	Passed
Chamber 8	8.86 %	8.87 %	Passed

To the right of the results table is a graph showing the percentage of results versus chamber number. The graph includes a legend for Reference (blue line with '+' markers), Result (red line with '+' markers), Tolerance + (red line), and Tolerance - (blue line). The Y-axis is labeled '%' and ranges from 0 to 120. The X-axis is labeled 'Chamber' and ranges from 1 to 8. The graph shows that the results are very close to the reference values and within the tolerance limits.

On the right side of the interface, there is a 'Filters' panel with options for Time period (Today, This week, This month, This year, Between, All) and TestType (Profile analysis, Energy verification, Dose output measurement, Wedge constancy check, All). Below the filters is a 'Data archive tasks' panel with options like Delete selected tests, Analyze selected tests, Switch to single test view mode, Print the current test..., and Print the selected tests....

The Windows taskbar at the bottom shows the Start button, several open applications (2 Micros..., 2 Windo..., Microsoft..., C:\WINDO..., StarTrack..., OmniPro...), and the system tray with the date and time (10:17 AM).

OmniProAdvance: data archive, trend analysis

OmniPro Advance

File Database Options Equipment Help

StarTrack Simulator

Modes

Setup

Measurement & Analysis

Data Archive

FastTrack

Profile analysis [C:\Documents and Settings\All Users\Application Data\IBADosimetry\OmniPro-Advance\1.0\database\archive.fdb]

Drag a column header here to group by that column.

Test	Time stamp	Field size	En...	Energy type	Buildup type	Buildup si...	Clinic	Radiation d...	StarTrack	Queue	StarTrack ...	StarT...
<input type="checkbox"/>	2006-10-23 07:13	20 x 20 cm	6 MV	Photons	WaterEqui...	1.2 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°
<input type="checkbox"/>	2006-10-23 07:16	20 x 20 cm	6 MV	Photons	WaterEqui...	1.2 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°
<input checked="" type="checkbox"/>	2006-11-28 09:11	20 x 20 cm	8 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input checked="" type="checkbox"/>	2006-11-28 08:30	20 x 20 cm	8 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input checked="" type="checkbox"/>	2006-11-28 08:55	20 x 20 cm	8 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-28 09:14	20 x 20 cm	12 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-28 09:09	20 x 20 cm	14 MeV	Electrons	Special		2 Alice	Mevatron	StarTrack N...	Mix	Table	0°
<input type="checkbox"/>	2006-11-06 06:49	20 x 20 cm	15 MV	Photons	WaterEqui...	3 cm	2 Alice	Mevatron	StarTrack (S...	QA1	Table	0°

Record: 14 Of 17

Profiles Results over time

Inline Field size

Field size measurements for inline profiles (2006-11-28 - 2006-11-28)

Legend:

- Field size results
- Field size tolerance +
- Field size tolerance -

Taskbar

Filters

Time period

Today

This week

This month

This year

Between 31-Jan-07 and 31-Jan-07

All

TestType

Profile analysis

Energy verification

Dose output measurement

Wedge constancy check

All

Search

Data archive tasks

Delete selected tests

Analyze selected tests

Switch to single test view mode

Print the current test...

Print the selected tests...

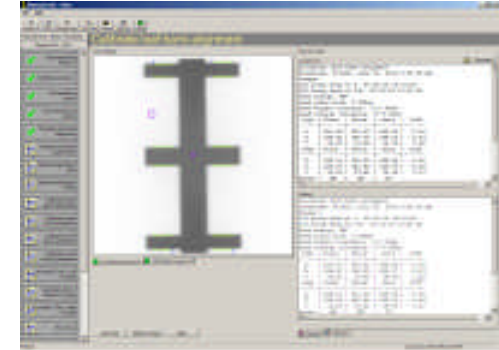
admin

Start 2 Micros... 2 Windo... Microsoft... C:\WINDO... StarTrack... OmniPro... Shortcuts Clinical QA 10:17 AM

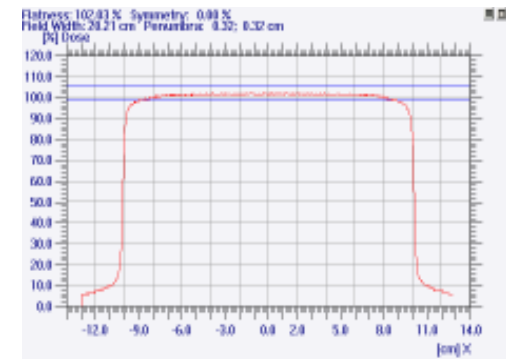
Digital IMRT QA concept



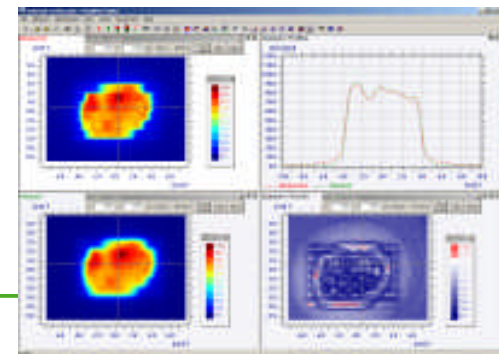
MLC calibration
with **ManualCal**



QA
with **OmniPro-Advance**



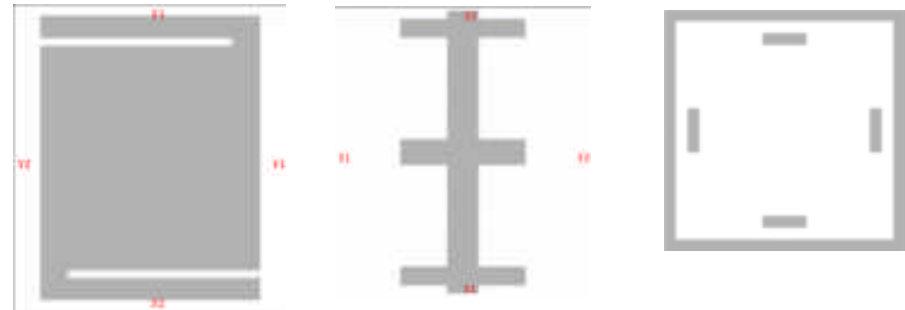
Plan verification
OmniPro-ImRT



Digital IMRT QA concept: Basic Principle



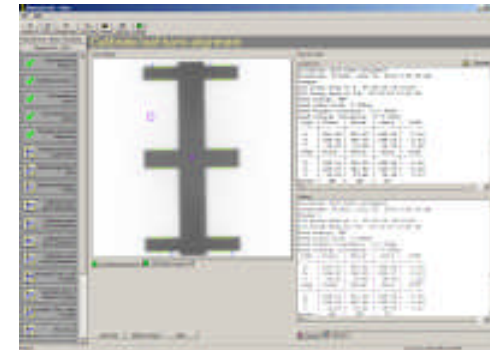
Use of the EPID to acquire images



Take images using field shapes dedicated to certain calibration tasks



Load the images into the Auto-CAL-SW



Analyze the images and compute calibration factors



Set these calibration factors in the LINAC-SW which controls the head.

Rerun the test again until the tolerances are met

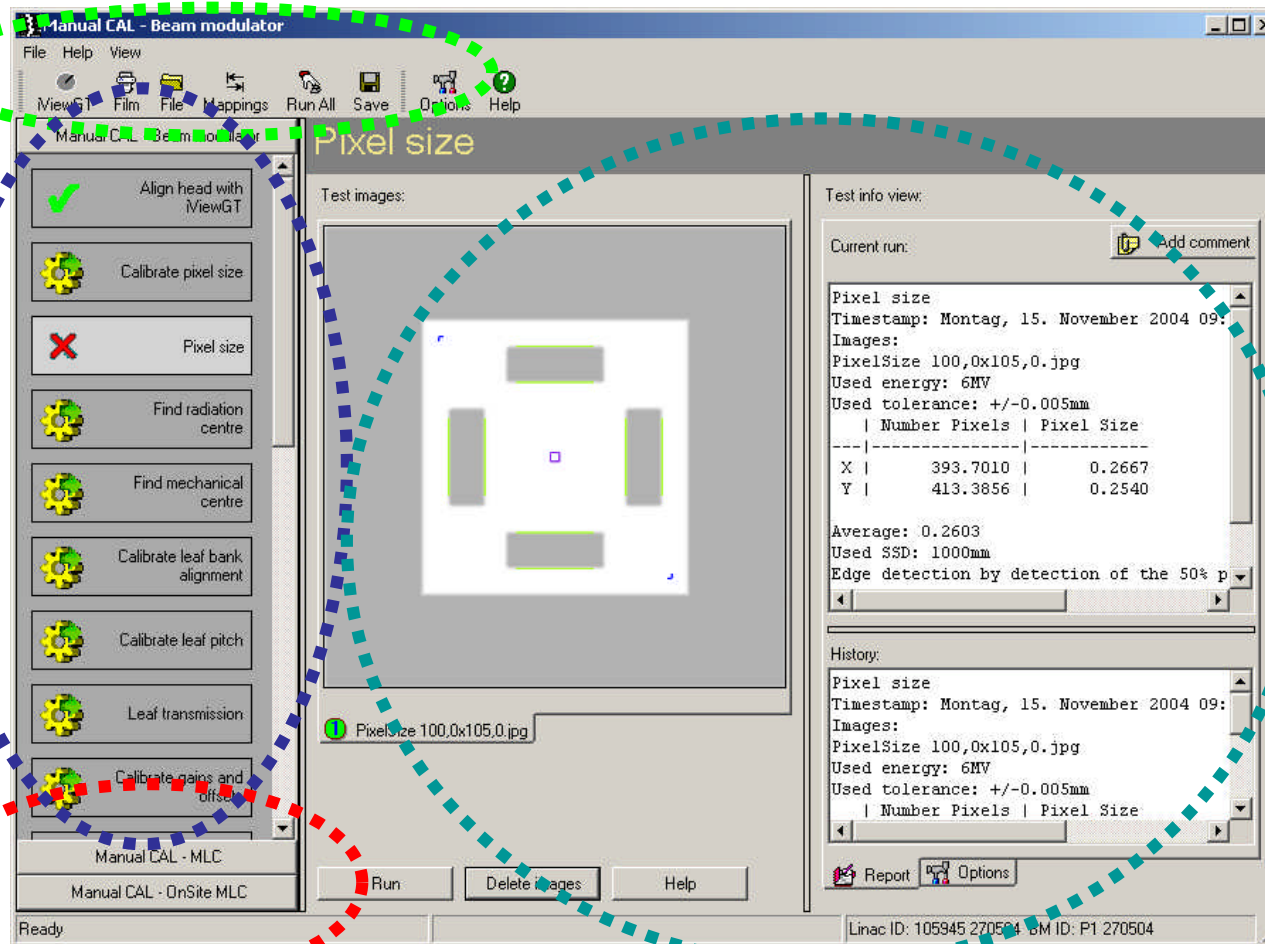
AutoCAL user Interface

Common tasks for all tests

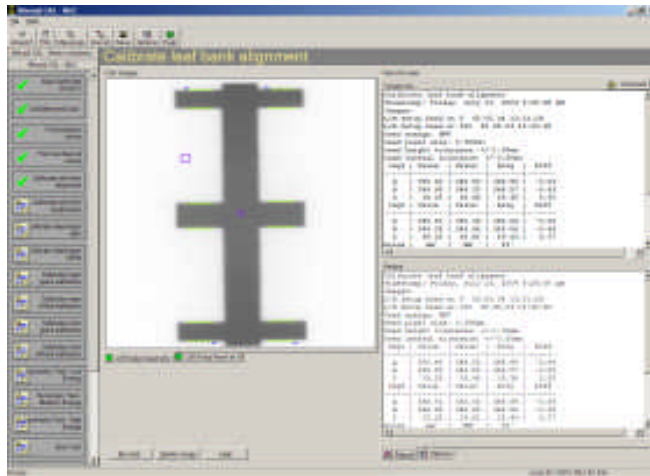
Workflow

Current Test

Other applications



Functions



Set up panel (EPID):
Head Alignment, pixel size,
mechanical and radiation centre

Calibration:
Leaf bank Setup (lateral and height)
Leaf transmission
Major/Minor gains and offsets
(positions)

Acceptance:
Field size, Symmetry, Light field,
Penumbra, Striped image

Archive:
Used images and results

Configuration

Functionality	Product configuration
1. MLC calibration	- AutoCal / license
2. Machine QA and patient plan verification	- OmniPro-I`mRT - License additional workstation - I/f to EPID - <u>DICOM import / workstation</u> Total average system
3. Optional: Film IMRT	- OmniPro-I`mRT - <u>Body Phantom</u> Total film dosimetry option



Fluence in 1600 pixels 2 D

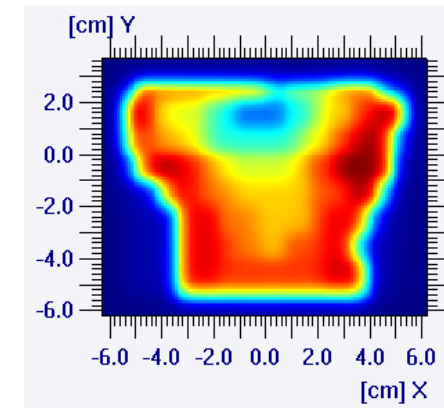
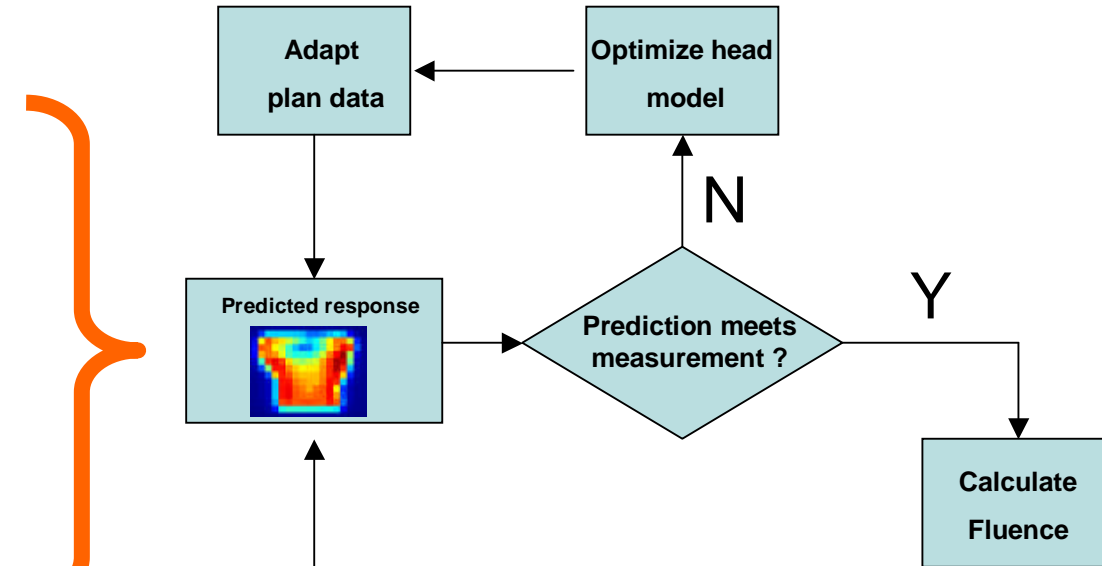
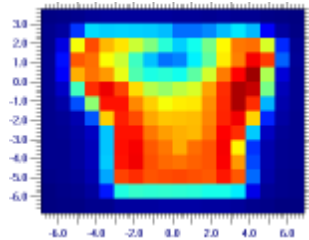
Plan data



Head Model



Measured Response





Online Surveillance

The screenshot displays the COMPASS software interface for online surveillance. The main window is divided into three primary visualization areas and a control panel:

- Predicted:** A heatmap showing the predicted signal distribution. The color scale ranges from 0 (black) to 3283 (yellow), with intermediate values at 2980, 2678, 2375, 2072, 1770, 1467, 1164, 861, and 558.
- Measured:** A heatmap showing the measured signal distribution. The color scale ranges from 0 (black) to 3283 (yellow), with intermediate values at 2980, 2678, 2375, 2072, 1770, 1467, 1164, 861, and 558.
- Difference:** A heatmap showing the difference between predicted and measured signals. The color scale ranges from -6 (dark green) to 6 (dark red), with intermediate values at -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, and 5.

The control panel on the left includes the following sections:

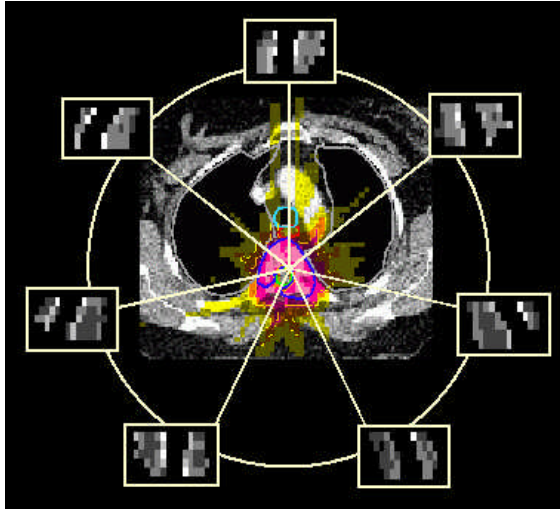
- RT Plan:** A dropdown menu.
- Predictions:** A dropdown menu.
- Tolerances:** A section with "Min Difference: -2.27%" and "Max Difference: 1.88%". It includes a "Fuzz" checkbox, a "Tolerance" input field set to "5", and a "Radius" input field set to "3".
- Misc (device, testing):** A dropdown menu.

At the bottom of the control panel, there are logos for SCANDITRONIX and WELLHOEFER, and a "Calculate Predictions" button. The Windows taskbar at the bottom shows the start button, taskbar icons for COMPASS, "Myrcos device (27.6...)", and "untitled - Part". The system tray shows the date and time as 11:00 AM.

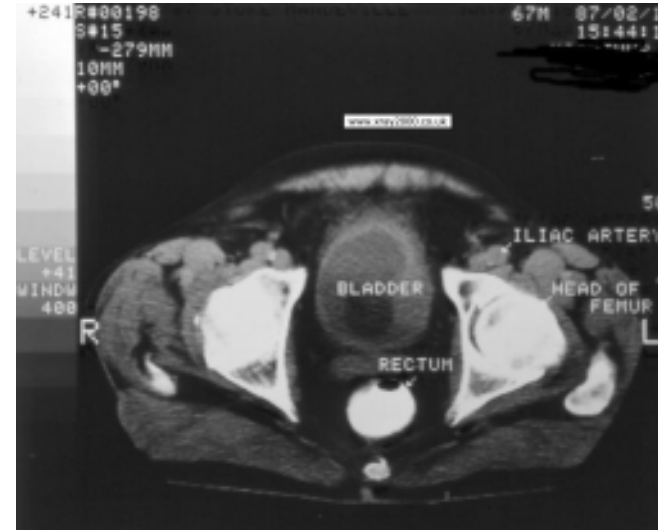
Basic



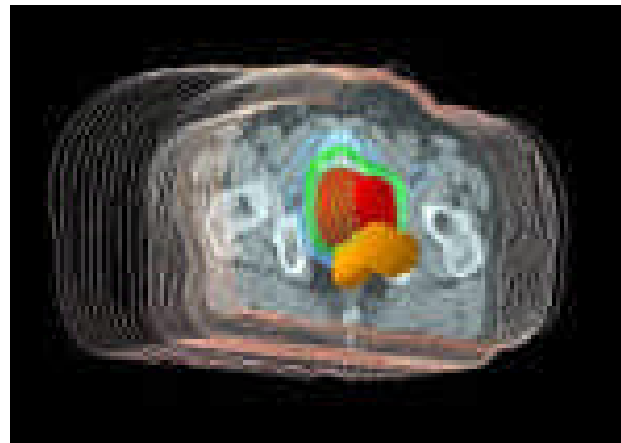
Concept



Take incoming fluence



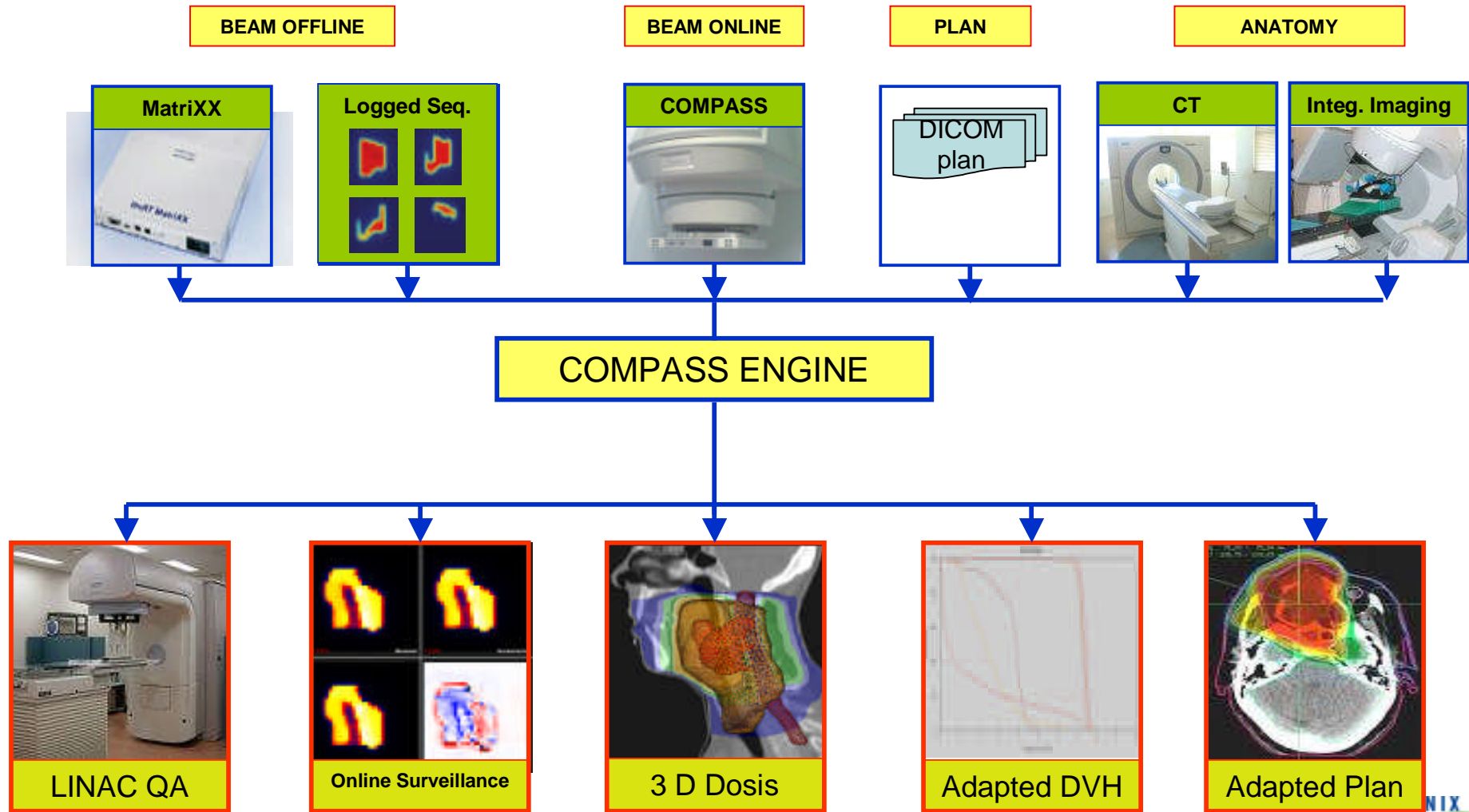
Take Patient anatomy CT



Reconstruct 3D Dose distribution !

COMPASS Engine

INPUT SOURCES



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Iba