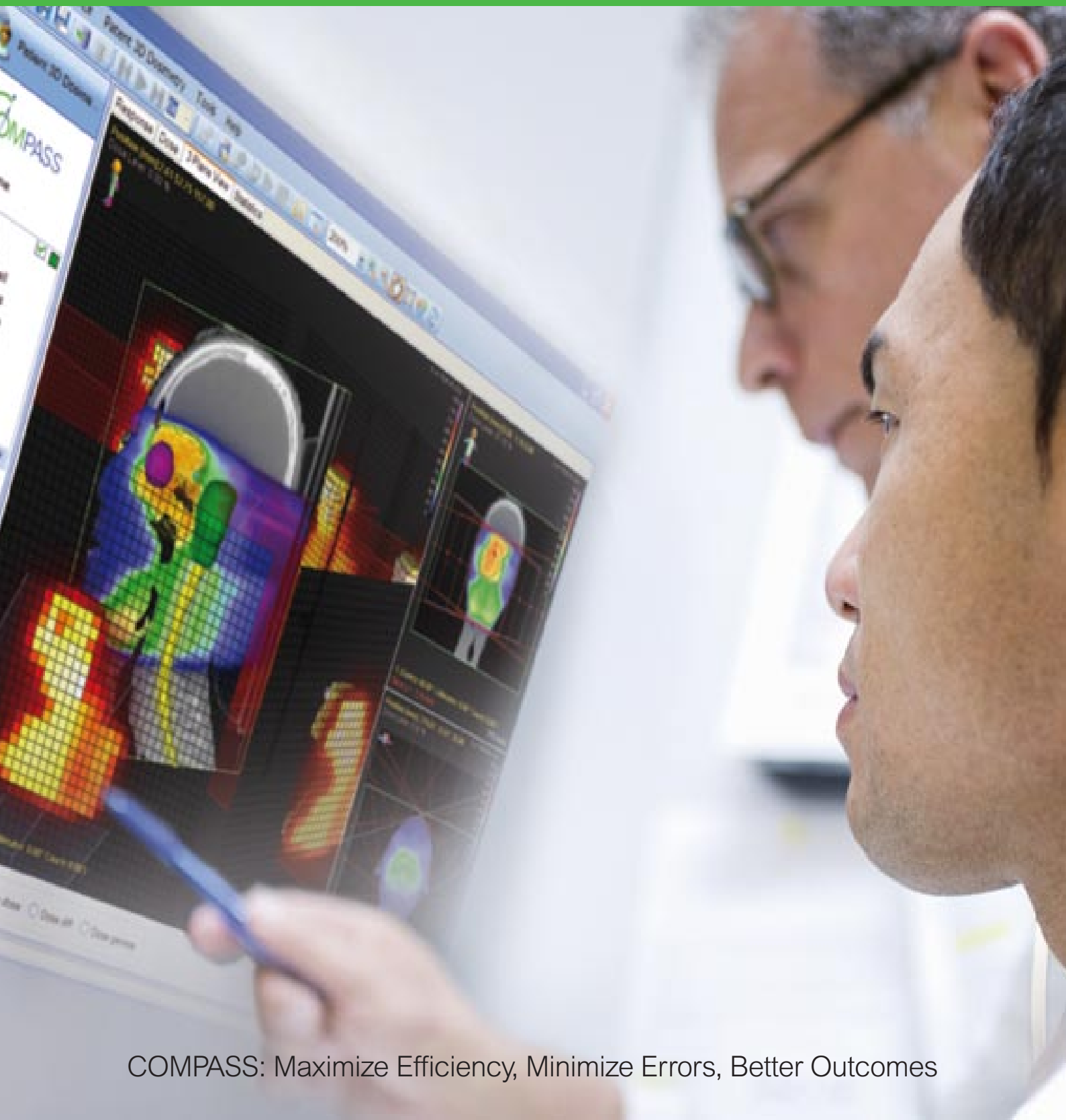




3D treatment verification  
and Patient Dose Analysis



COMPASS: Maximize Efficiency, Minimize Errors, Better Outcomes





**Radiation Therapy is advancing rapidly, improving treatment accuracy but also introducing new uncertainties and risks.**

**Ensure patient safety and better treatment outcomes by eliminating the unknown.**

**COMPASS provides you critical details needed for confident plan verification and approval.**



# COMPASS 3D Treatment Plan Verification at a glance

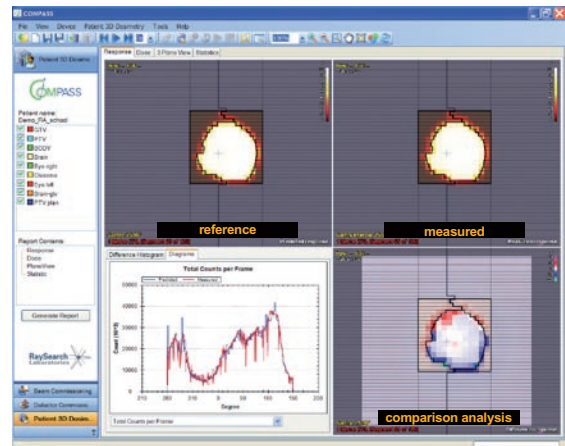
## Physics Analysis

Conventional phantom-based QA is a generally accepted method to validate the treatment plan based on comparison of measured vs. planned dose. These common QA techniques are reaching their limits\* when advanced treatments require a more advanced analysis. In cases of discrepancies a full understanding of the clinical impact and relevance is needed.

**True Volumetric Measurement:  
Linac output and gantry angle**



**COMPASS Efficiency:  
Fast pass / fail analysis**



“[...] We used the unique COMPASS solution for verification of over 220 patient plans in the first 18 months after introduction. COMPASS was primarily used for QA of complex IMRT treatment plans for H&N but also in some cases like prostate, sarcomas, and carcinomas of the skin.”

*Erik Korevaar, PhD, Medical Physicist, Radiotherapy Department of the University Medical Center Groningen, Netherlands*

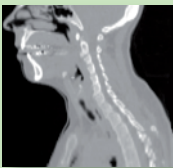
# Patient-based Clinical Evaluation

COMPASS builds on our past knowledge and provides the power to verify dose based on the patient's individual CT data set in addition to the common QA tools: The Physicist and the Radiation Oncologist can now review plans on a common understandable platform, enabling better plan verification and safer treatments.

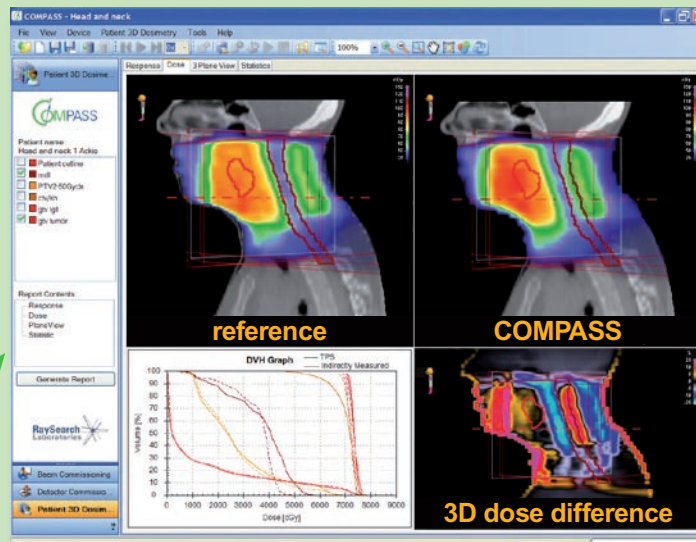
## COMPASS Accuracy and Reliability: Evaluation of the clinical relevance of discrepancies



relating physics  
analysis to  
3D patient dose



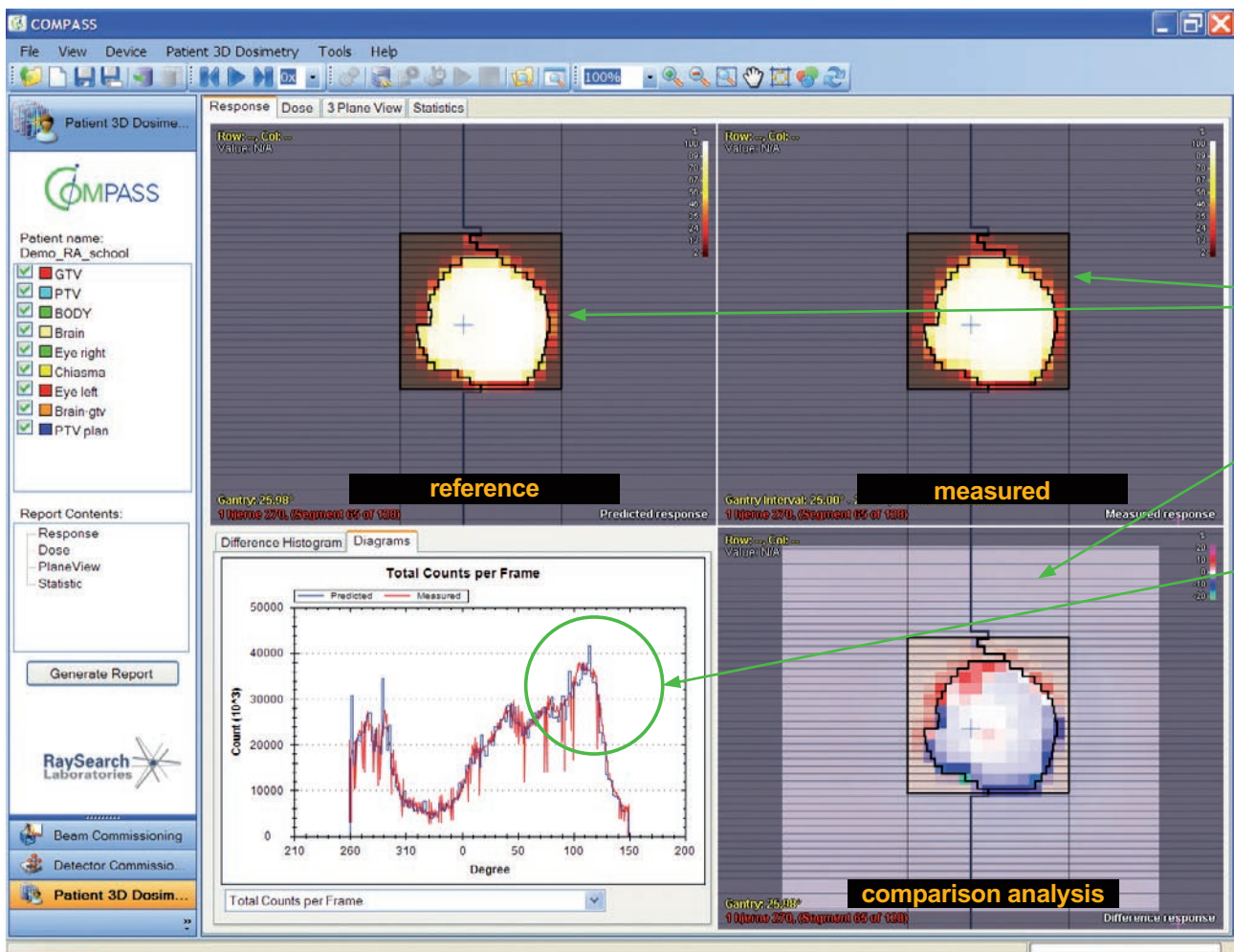
Patient CT



DVH, 3D dose difference and 3D gamma analysis at organ level

## COMPASS Efficiency: Fastest Plan Analysis

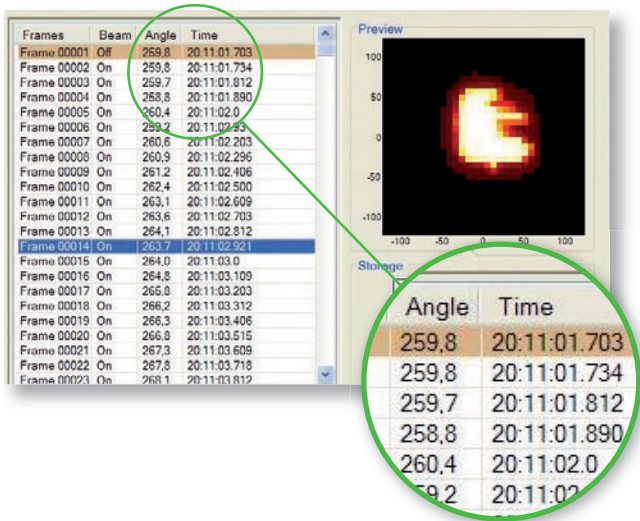
COMPASS provides a fast and familiar plan QA solution based on standard physics acceptance criteria. This plan QA solution allows a rapid pass or fail analysis. In case of substantial dose discrepancies of plan vs. measurements COMPASS extends into 3D patient anatomy based analysis.



“Using the MatriXX-based pre-treatment configuration it has been shown that the COMPASS system can achieve the necessary precision in plan verification while shortening the time required for pre-treatment QA.”

*Prof. Dr. Frank Lohr, University Heidelberg, Universitätsmedizin Mannheim, Germany*

## Measurement accuracy down to the details



- seamless measurement of the whole plan delivery
- accurate analysis of rotational plans
- individual check for each IMRT segment (step and shoot or dynamic)

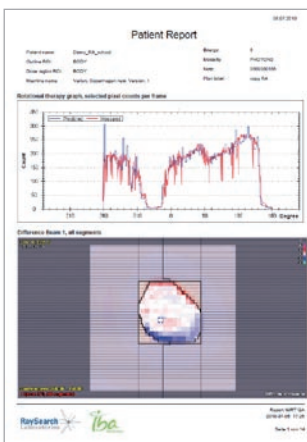
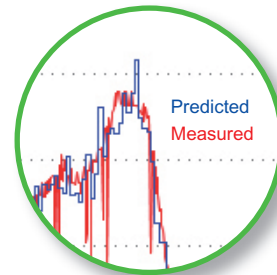
- precise measurement of gantry angle per frame
- rapid response measurement with sampling rate up to 20 frames/sec

## Comprehensive analysis

- fast analysis of response difference (plan vs. delivered)
- precise evaluation per field or for each segment/control point
- reliable check even for small MLC errors

## Fast overview of all frames (planned vs. measured)

- overview provides fast response comparison on control-point level
- analytic overview of delivery process
- check reference vs. planned consistency for small fluctuations



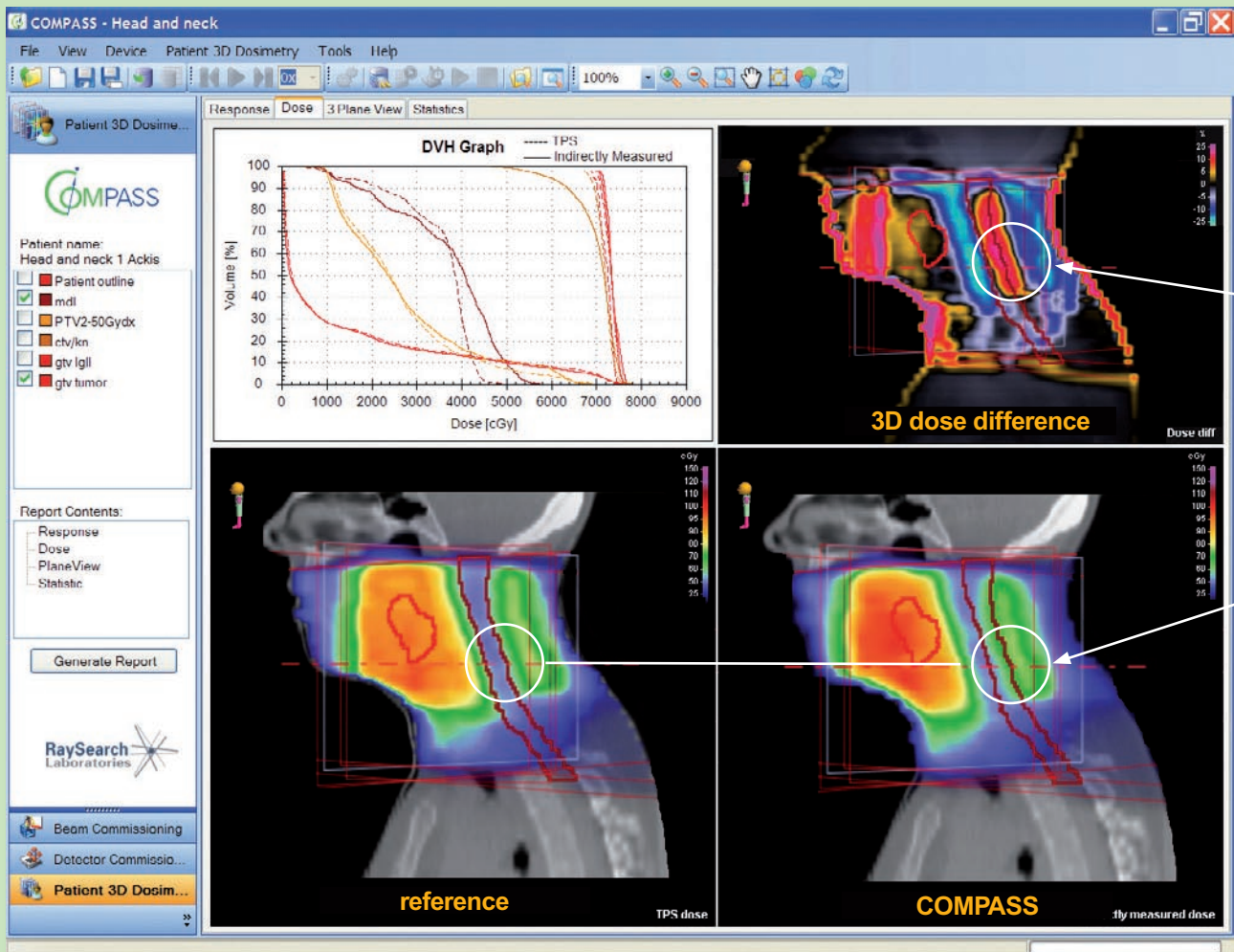
## Reporting

- fast one-click automatic generation of comprehensive report
- patient individual reporting for electronic records, print or export to Excel

add patient anatomy to the equation

## COMPASS Accuracy and Reliability: With Patient Anatomy

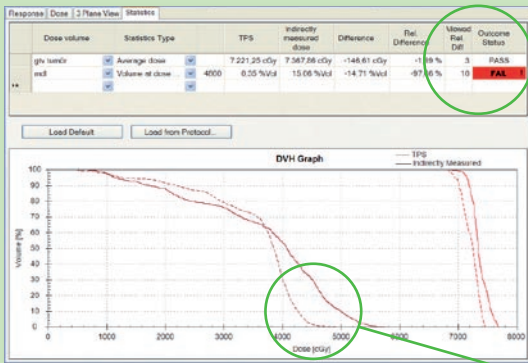
COMPASS enables the Radiation Therapy Team to combine their physics and clinical expertise for a full treatment evaluation based on the clinical protocol. The team benefits from a complete understanding of the clinical relevance of dose discrepancies and necessary corrective action, speeding up processes and enabling earlier and better patient treatment.



“COMPASS’ output display on patient CT will be very beneficial for our physicians. [...] COMPASS will take a significant place for our IMRT and Rotational treatment plan verification.”

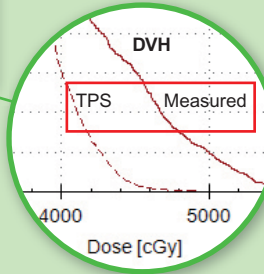
*Charles W. Coffey, Ph.D. and Justin Brian Crass, M.S., Radiation Oncology Department, Vanderbilt-Ingram Cancer Center, USA*

## Fastest overview of the entire plan



Allowed Rel. Diff	Outcome Status
9 %	3
3 %	10
	FAIL !

- immediate “FAIL” alert if predefined **prescription doses and tolerances** are missed
- automatic OAR and PTV analysis based on **your clinical protocols**



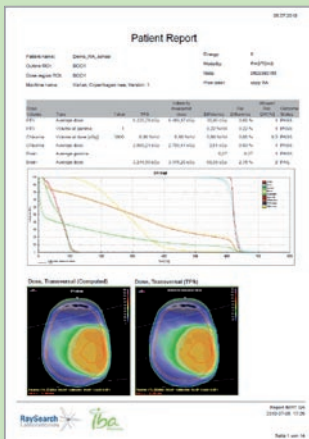
- comparative DVH enables fastest assessment of reference (TPS) vs. delivered dose
- full visualization flexibility (all ROI's or one by one)

## Reliable analysis of dose discrepancy details

- the % difference between reference (TPS) and actual measured dose (Compass) is determined in the patient CT
- immediate understanding of dose discrepancies in single organs

## Most accurate verification of clinical relevance of errors

- patient dose guided decisions instead of traditional physics pass criteria
- analyze doses in absolute Gy (gray) values; verify target average dose and homogeneity, analyze OAR dose constraints
- understand clinical relevance, gain full treatment confidence and better outcome



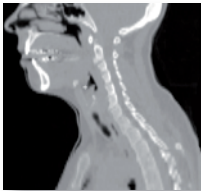
## Comprehensive Reporting

- indication specific template for consistent report generation
- including DVH, displays of planned and reference patient dose, dose difference etc.

**COMPASS: Maximize Efficiency, Minimize Errors, Better Outcomes**

# Workflow Driven Analysis

## Patient Data

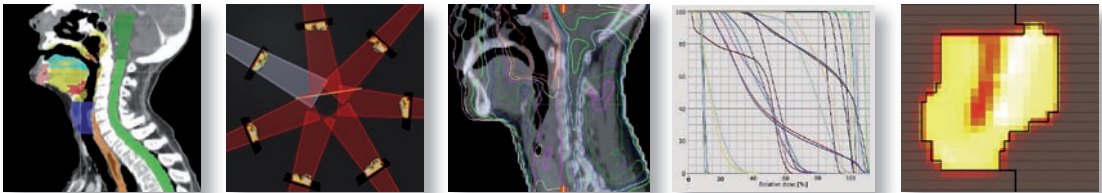


## True 3D Volumetric Measurement

MatriXX<sup>Evolution</sup> mounted on Gantry enables full 360° data acquisition for true 3D dose reconstruction and analysis



## Treatment Plan (reference)





# Visualize, Verify, Validate

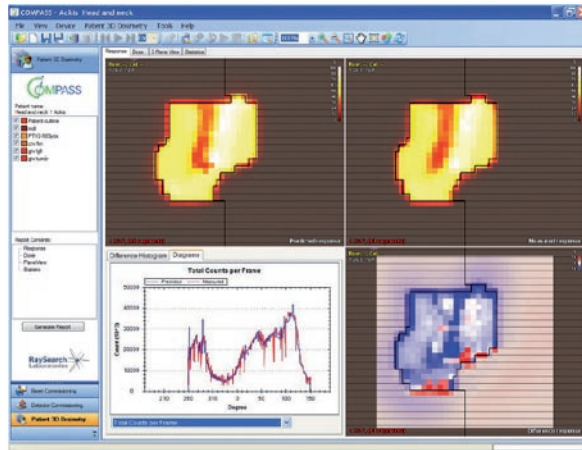
## Plan Delivery Verification

Fast comparison and analysis



Patient CT import

planned & measured data import

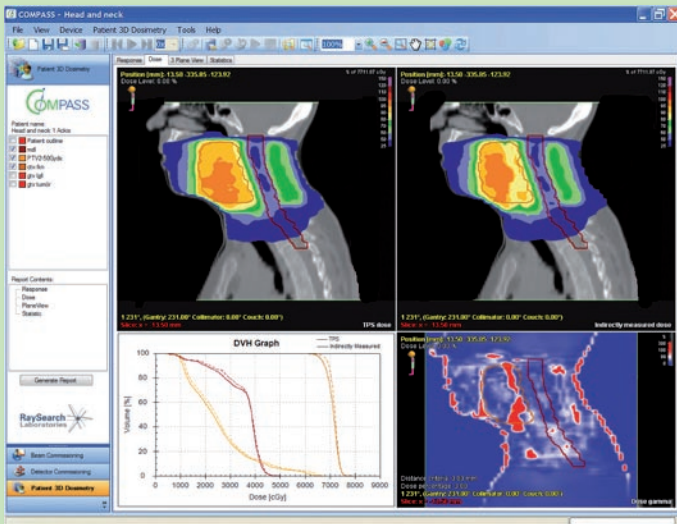


## Patient Based Verification

3D dose comparison, DVH analysis

## Treatment Validation

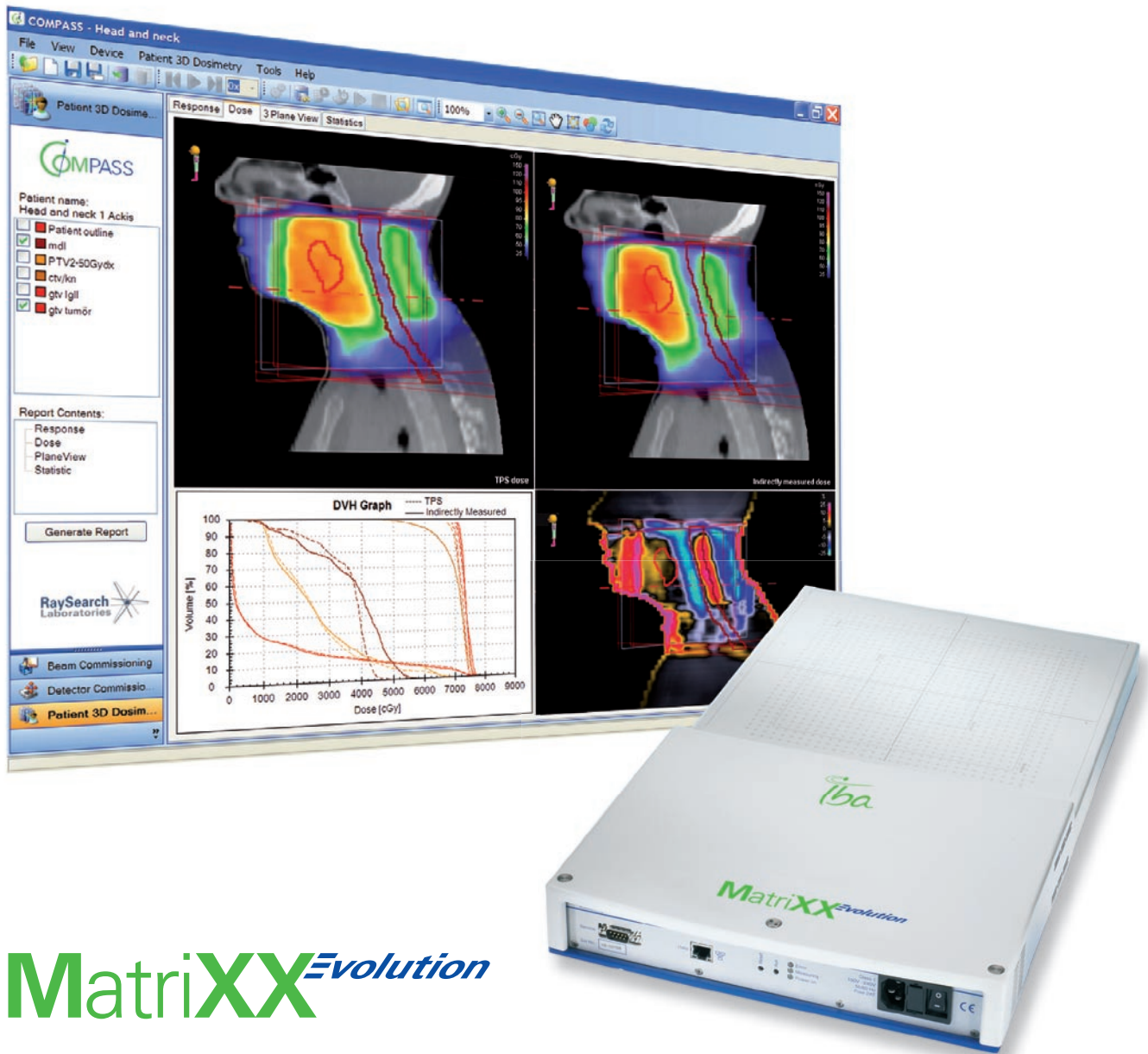
Protocol-based PASS/FAIL criteria, reporting in comparative DVH/table



Response	Dose	Plan	View	Statistics								
					Dose volume	Statistics Type	TPS	Indirectly measured dose	Difference	Rel. Difference	Allowed Rel. Diff. [%]	Outcome Status
	Total dose			Average dose			387.63 cGy	400.53 cGy	12.90 cGy	-3.22 %	5	PASS
	Total dose			Average gamma			1.331.23 cGy	1.287.43 cGy	43.80 cGy	3.40 %	5	PASS
	Patient outline			Average dose			3.533.98 cGy	3.472.53 cGy	61.45 cGy	1.77 %	5	PASS
	ind			Average gamma			0.42	0.42	0.00	0.00 %	1	PASS
	PTV2-50Gy			Average dose			2.609.09 cGy	2.491.62 cGy	117.47 cGy	4.51 %	5	PASS
	PTV2-50Gy			Average gamma			0.37	0.37	0.00	0.00 %	1	PASS
	div/An			Average dose			7.179.16 cGy	7.114.73 cGy	64.43 cGy	0.91 %	5	PASS
	div/An			Average gamma			0.40	0.40	0.00	0.00 %	3	FAIL
	div/Sp			Average dose			7.310.87 cGy	7.309.47 cGy	1.40 cGy	0.02 %	3	PASS
	div/Sp			Average gamma			0.21	0.21	0.00	0.00 %	3	PASS
	div/tumor			Average dose			7.221.25 cGy	7.334.75 cGy	-113.50 cGy	-1.58 %	3	PASS
	div/tumor			Average gamma			0.47	0.47	0.00	0.00 %	3	FAIL

COMPASS provides instant and most reliable plan verification based on the user's individual clinical treatment protocol.

Tolerances, maximum/minimum doses and dose homogeneity can be set per critical organ and treatment volume.



# MatriXX<sup>Evolution</sup>

- 3D volumetric measurement with all 1020 detectors permanently in the beam
- PIC (Ionization Chamber Technology) for optimum detector performance and stability
- angle sensor to precisely correlate linac output and gantry angle
- upgrade path available for existing MatriXX users



### **Maximize Efficiency**

COMPASS relates  $\gamma$  to 3D patient dose revealing the clinical relevance of dose discrepancies.

### **Minimize Errors**

COMPASS gives you the power to analyze the entire treatment chain from the plan to the patient.

### **Better Outcome**

COMPASS provides a platform to combine the expertise of the RT team, putting the clinical protocol in the center of plan verification.

# Add Patient Anatomy into your equation



**Plan QA + Patient Anatomy = Accuracy**

**Gamma Analysis + Patient Anatomy = Efficiency**

**Expertise + Patient Anatomy = Better Outcome**

# COMPASS



# IBA activities in a nutshell

IBA delivers solutions of unprecedented precision in the fields of cancer diagnosis and therapy. The company also offers sterilization and ionization solutions to improve the hygiene and safety of everyday life.

## Therapy

IBA has developed Radiotherapy solutions and dosimetry equipment to treat cancer with the greatest accuracy. IBA is the undisputed leader in Particle Therapy, acknowledged to be the most precise and effective clinical radiotherapy method in the selective destruction of cancer cells.

## Diagnostics

IBA has unique expertise in the design of cyclotrons and in the production and distribution of radiopharmaceutical tracers which are used every day in hospitals to quickly and accurately detect cancer, neurological and cardiac diseases. IBA also offers dosimetry products used in many hospitals for quality assurance in X-Ray diagnosis and for patient-dose monitoring

## Sterilization & Ionization

IBA designs electron accelerators and high power X-Ray solutions used in many industries to sterilize medical devices, to cold pasteurize food products and to improve polymer properties. Over 250 IBA Industrial accelerators are used in the world today, some for more than 40 years.

IBA a Belgian company, is listed on the paneuropean stock exchange EURONEXT and its Annual Reports can be downloaded on the Website: [www.iba-group.com](http://www.iba-group.com).

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COMPASS software is developed in cooperation with RaySearch Laboratories AB. patent pending

MatriXX was designed and built in cooperation with Torino University and INFN

Technical data is subject to change without prior notice.

Protect,  
enhance  
and save  
lives

