Report on WUSTL/Bioinformatics-supported ATC activities

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Programmers (0.5 FTE spread among)

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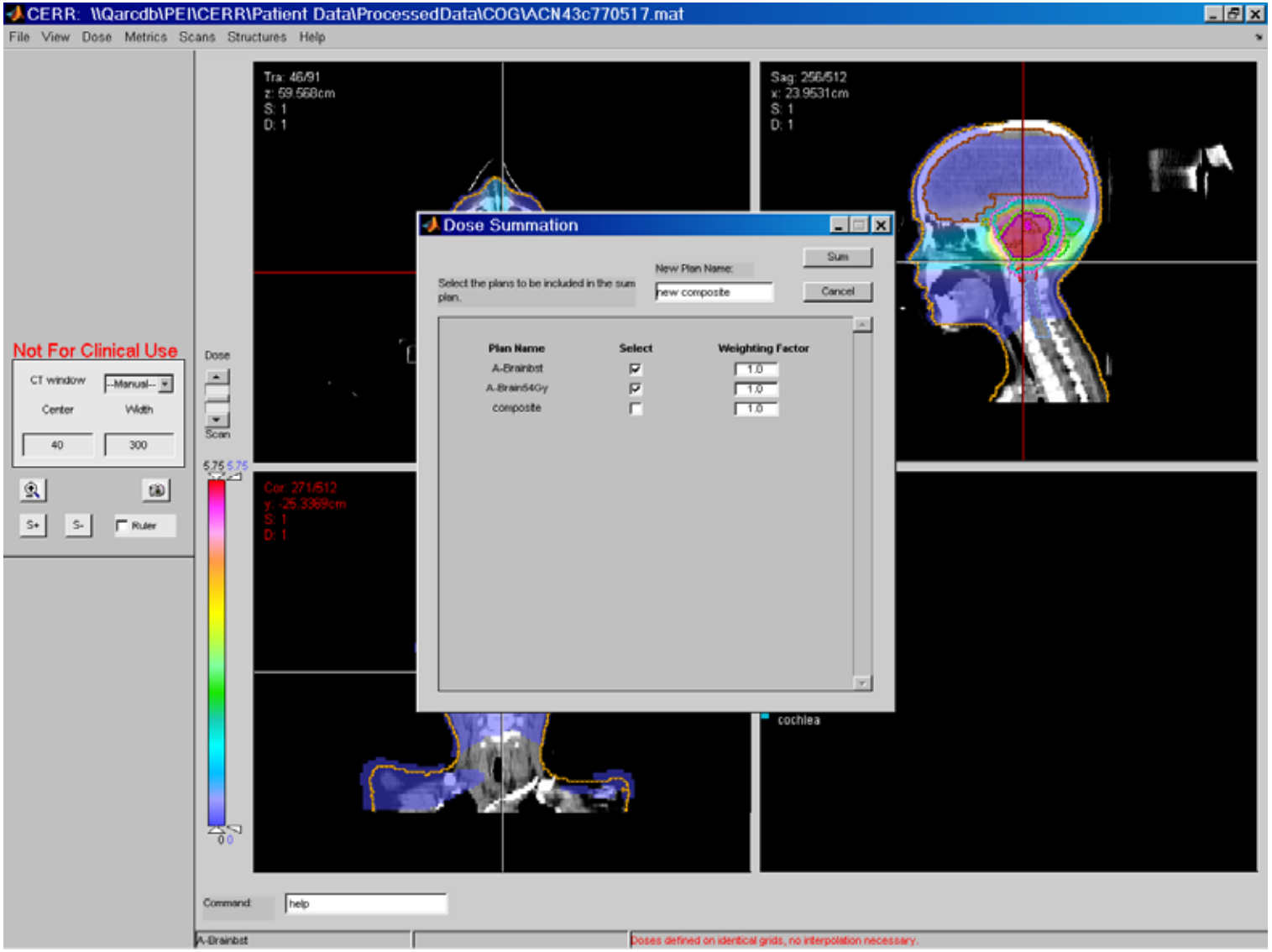
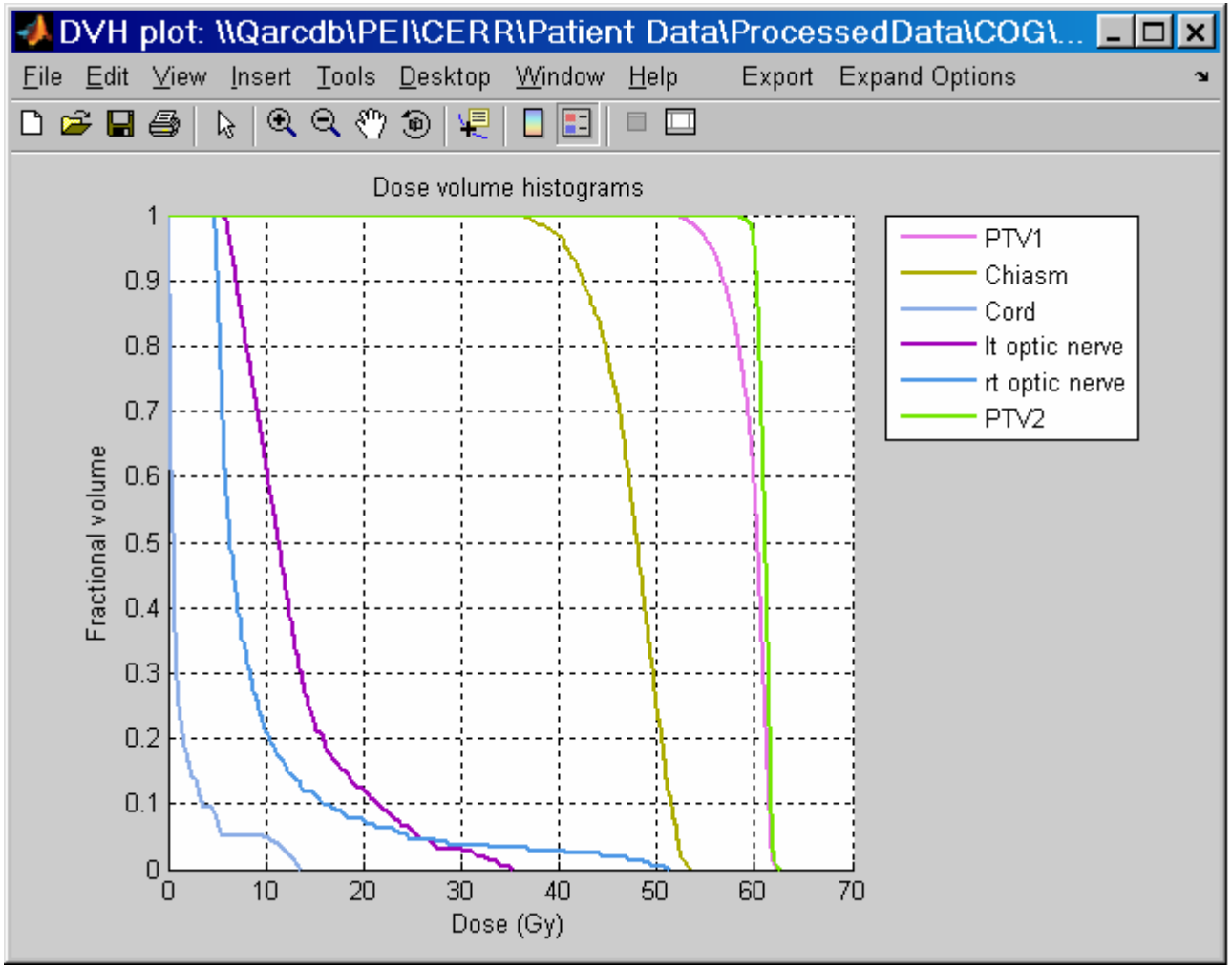
Short term goals [1/2]

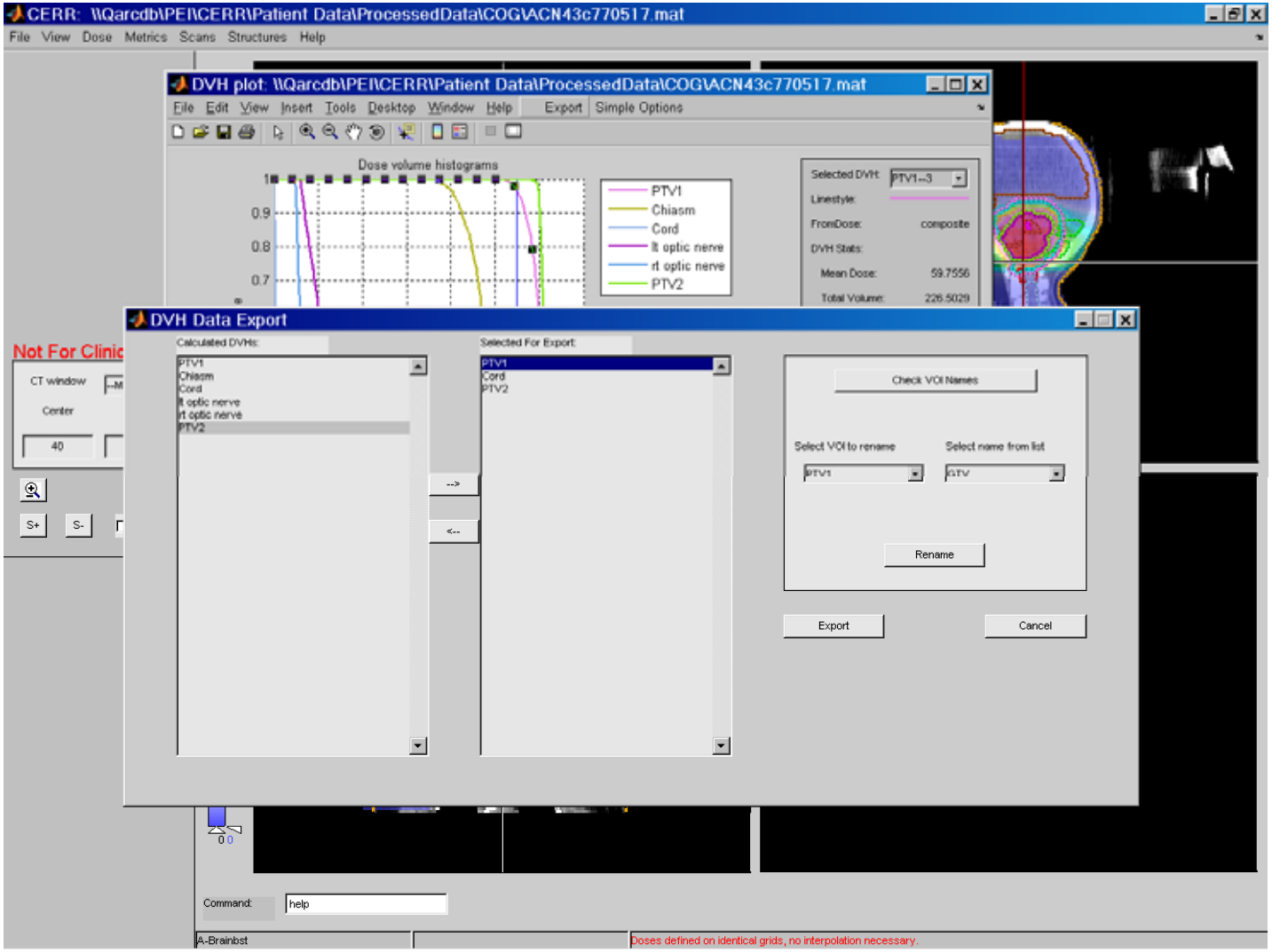
- Support QARC use of CERR
  - Migrate Ken Ulin's changes/improvements to our newest version
  - Speed up importing
- Support ITC use of CERR
  - Compiled versions
  - CERR as universal import tool
    - Improved batch conversion with graphical review



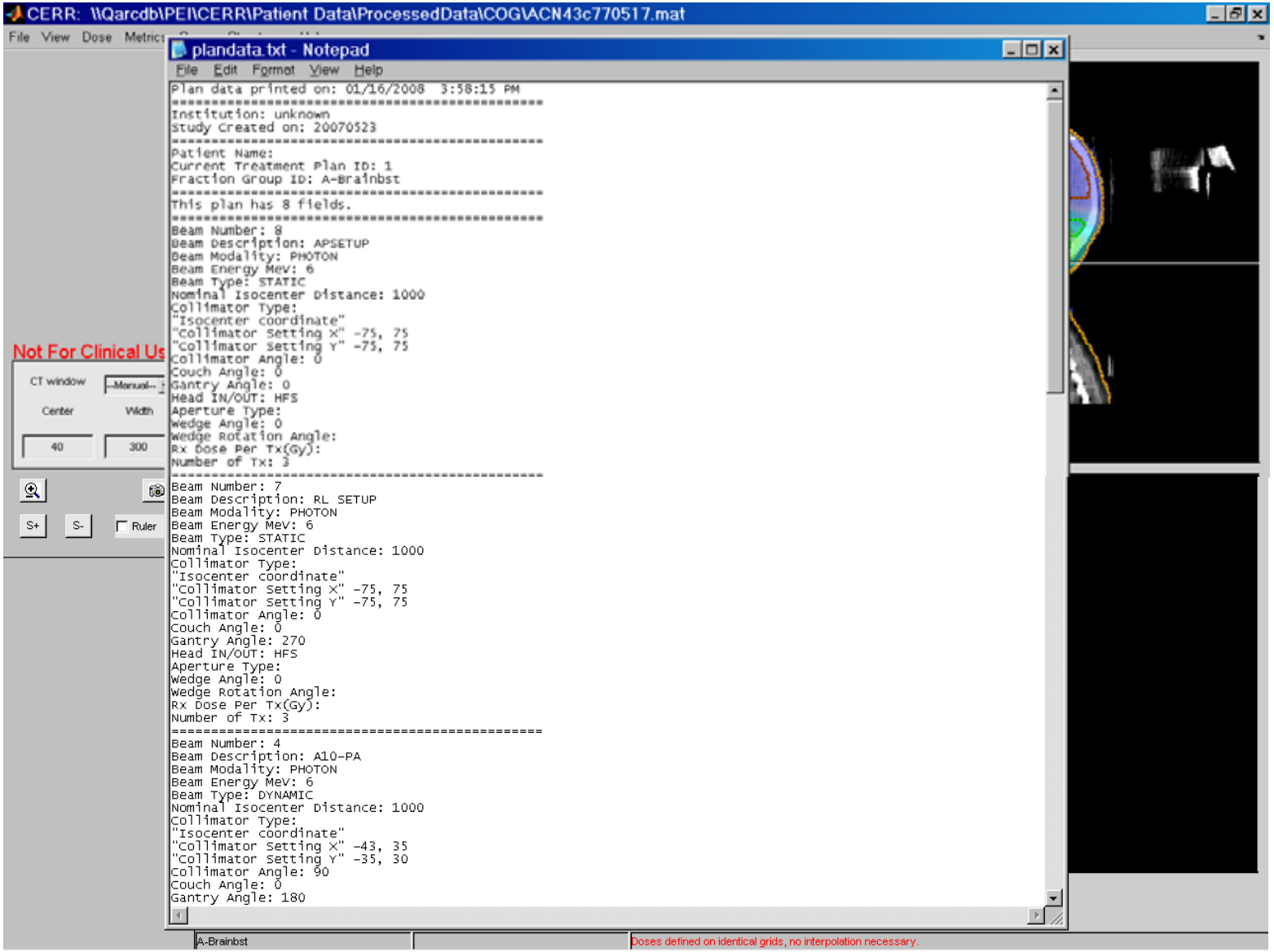
(Image couresy Ken Ulin)



(Image couresy Ken Ulin)



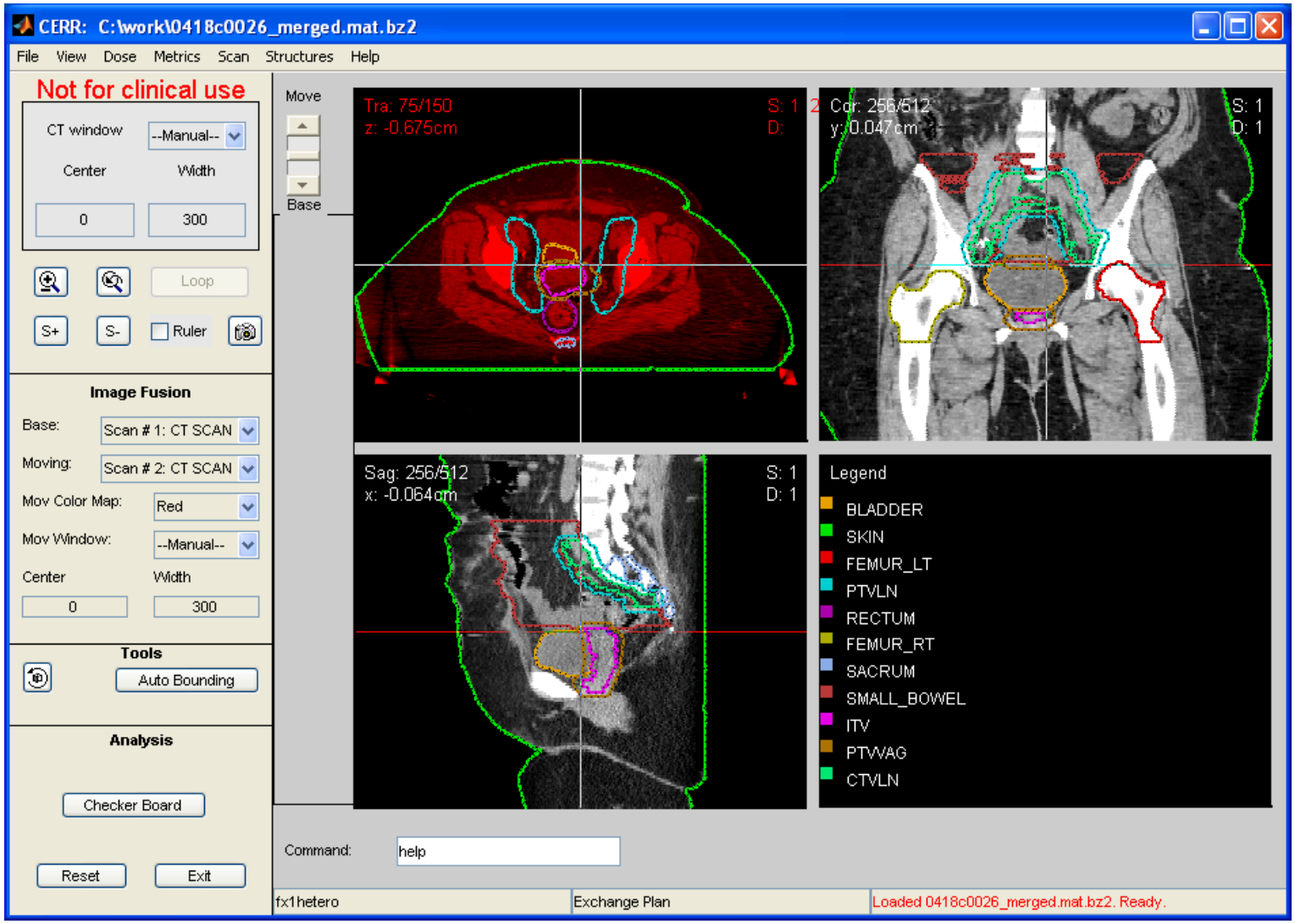
(Image couresy Ken Ulin)



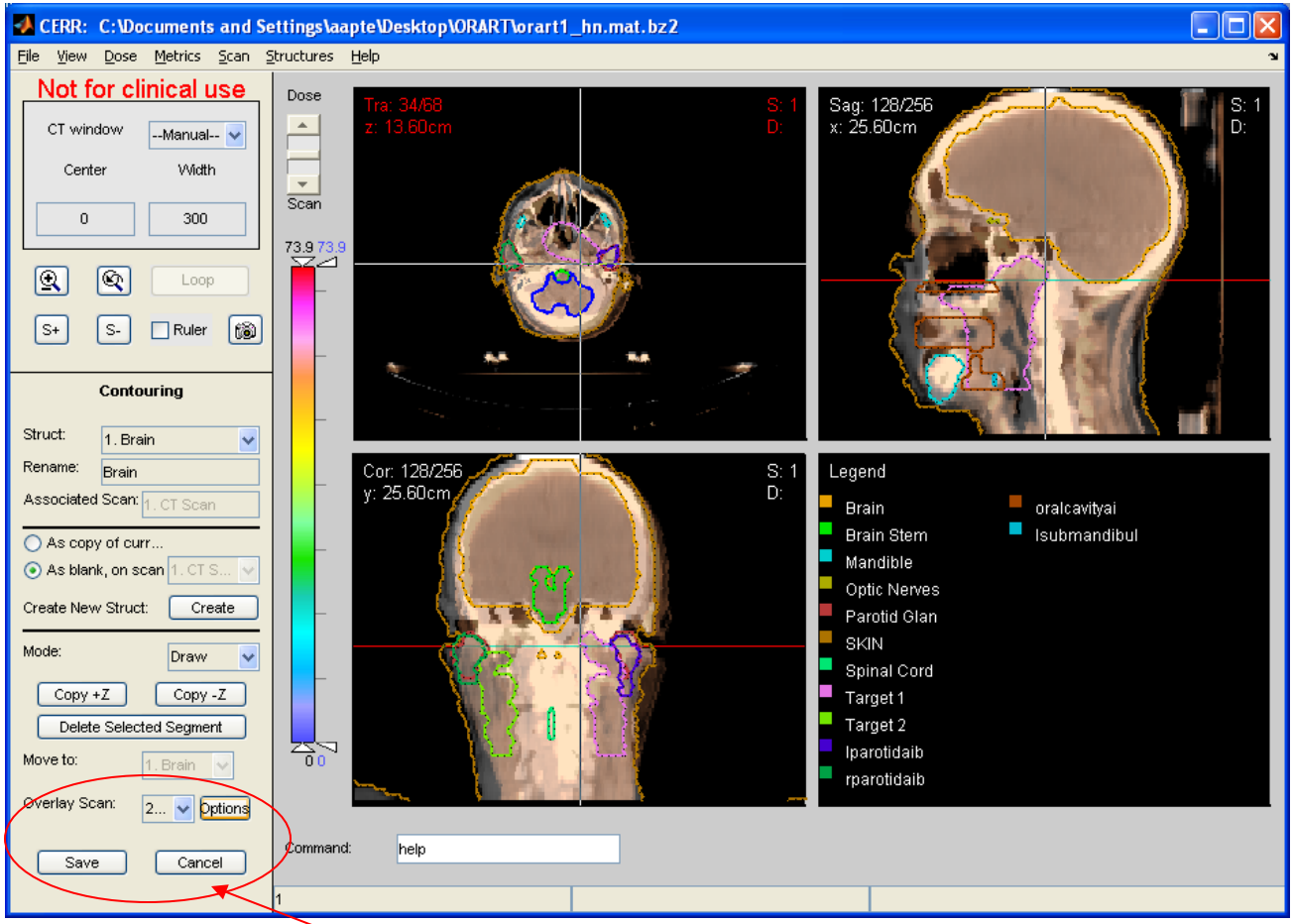
(Image couresy Ken Ulin)

Short term goals [2/2]

- Plan metric summary on batch conversion
- Selected graphical views of plans on batch conversion
- Support for RTOG protocols
  - Cervical Ca 0418: image registration and review of structures on ‘bladder empty’ and ‘bladder full’ scans
    - Use of registration
    - Test PTV coverage metrics for structures derived from ‘new’ (post-planning) scans.
    - Support collaborative use of CERR over Webex
    - Option to copy structure from one scan to another


CERR: C:\work\0418c0026_merged.mat.bz2
File View Dose Metrics Scan Structures Help
Not for clinical use
CT window
--Manual--
Center
Width
0
300
Loop
S+
S-
Ruler
Image Fusion
Base:
Scan # 1: CT SCAN
Moving:
Scan # 2: CT SCAN
Mov Color Map:
Red
Mov Window:
--Manual--
Center
Width
0
300
Tools
Auto Bounding
Analysis
Checker Board
Reset
Exit
Move
Base
Tra: 75/150
z: -0.675cm
S: 1
D:
Cor: 256/512
y: 0.047cm
S: 1
D: 1
Sag: 256/512
x: -0.064cm
S: 1
D: 1
Legend
BLADDER
SKIN
FEMUR_LT
PTVLN
RECTUM
FEMUR_RT
SACRUM
SMALL_BOWEL
ITV
PTVVAG
CTVLN
Command:
help
fx1hetero
Exchange Plan
Loaded 0418c0026_merged.mat.bz2. Ready.

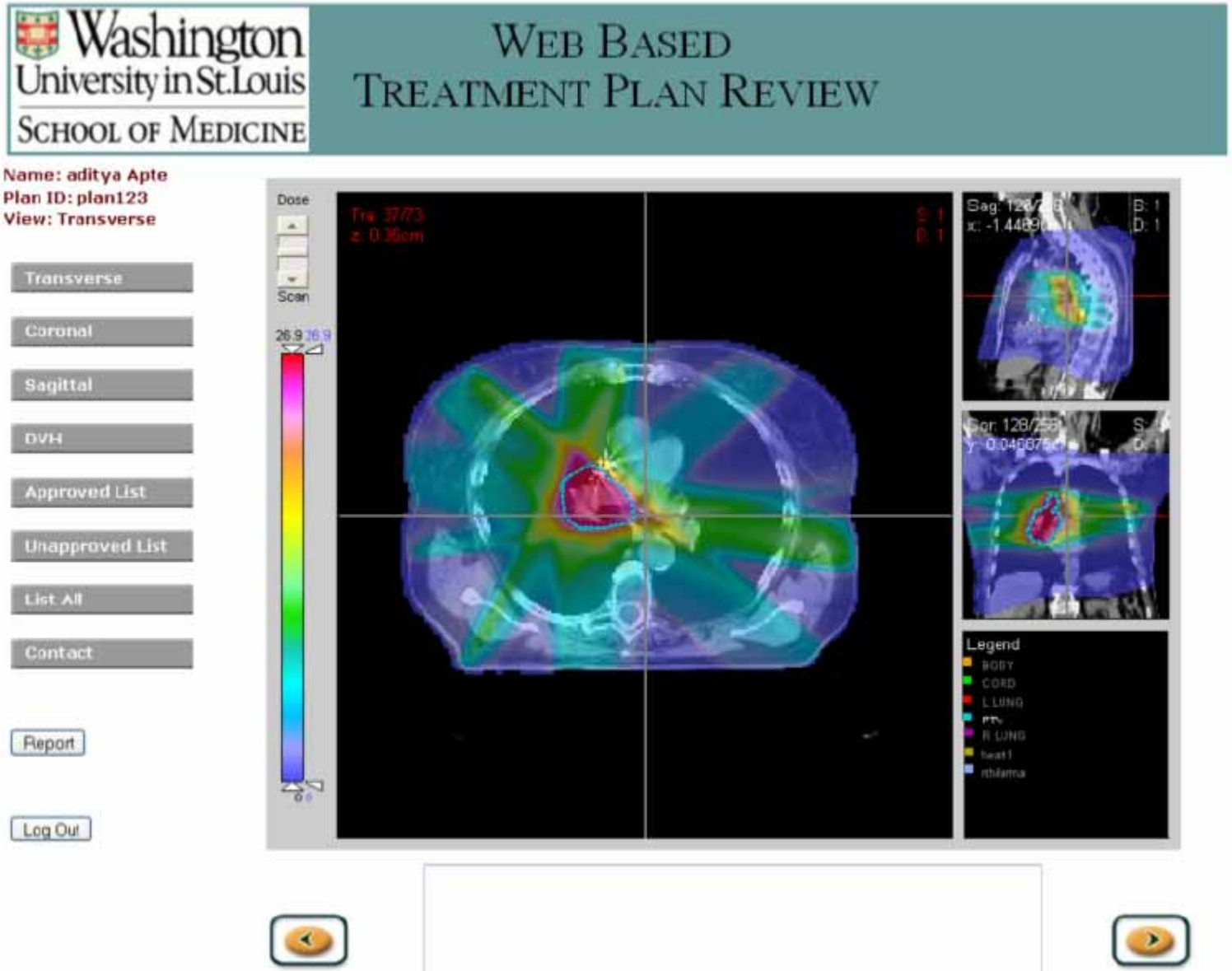
An option to overlay a scan in contouring mode



Select the scan to overlay here

Medium term goals (< 1 yr)

- Automated reporting
  - DVH metrics: D98, D95, etc. in report form
  - Graphical images associated with batch for easy QA review (eventual use for protocol reviews?)
- Automated graphical snapshots of plan quality
- Support CERR as a component of Ca-GRID delivery of plan review services
  - Push architecture so plans are available on a physicians laptop/office machine when they can review them
- Basic image-registration QA tools



(Khullar, Mullen, Apte et al.)

http://localhost:3000 - Mozilla Firefox

WASHINGTON UNIVERSITY IMRT DOSE QA TABLE

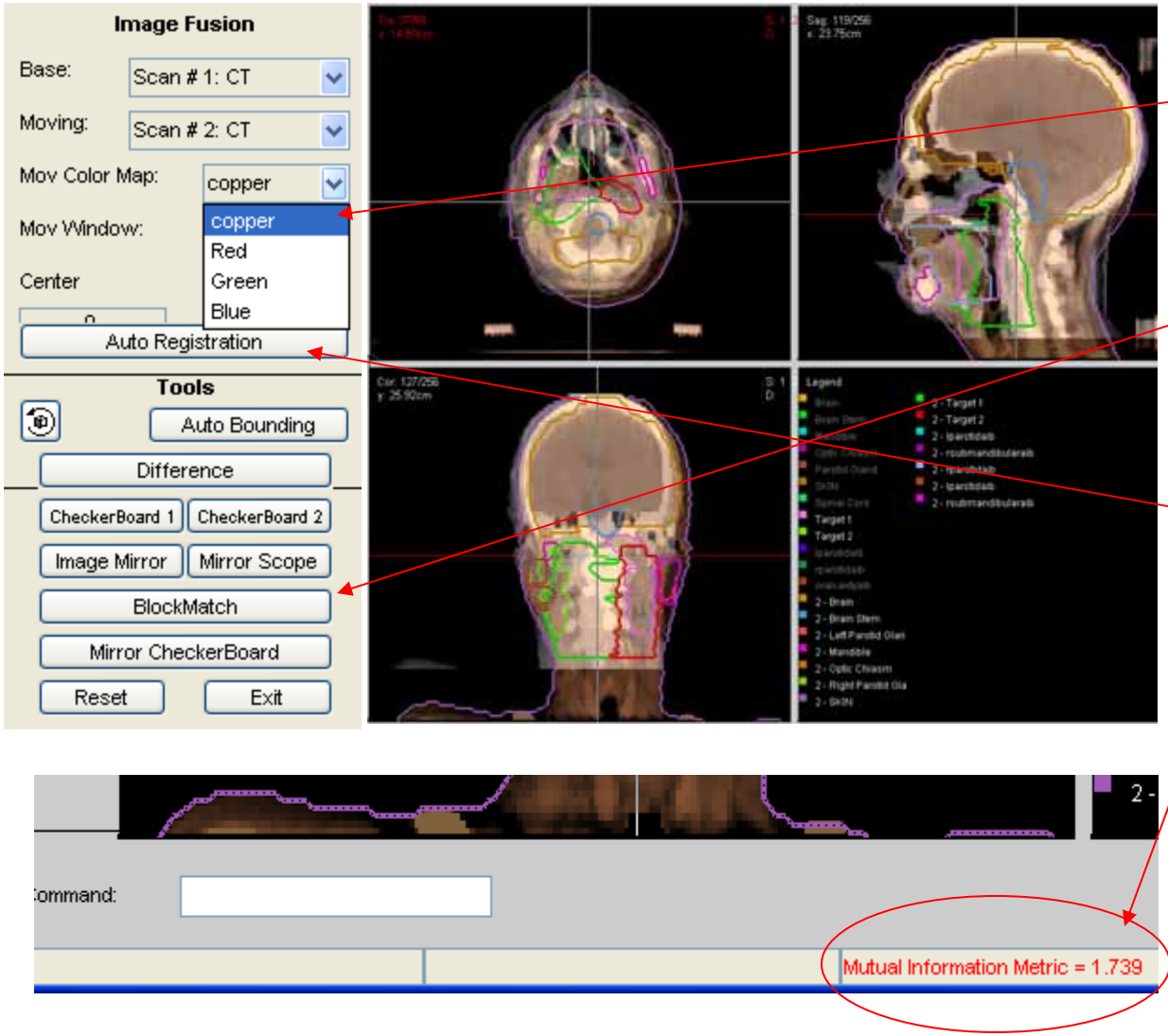
Head and Neck Target Volume Goals for Protocol 06-0001

ROI	Vol (cc)	Goal	Meet Goal						
PTV Coverage Goals									
PTV 66	46	99% Vol > 93% Rx (65.1 Gy)	Yes	93% Rx=	99.50%	6243 Gy	PTV 66	Mean Dose	67
		20% Vol ≤ 110% Rx (77 Gy)	Yes	% Vol ≥ 102% Rx=	5%	6937 Gy		Max Dose	74
				% Vol ≥ 110% Rx=	1%	7260 Gy		Min Dose	43
				% Vol ≥ 120% Rx=	0%	N/A Gy			
PTV 63	75	99% Vol > 93% Rx (63 Gy)	Yes	99% Vol=	99.2% Rx	6249 Gy	PTV 63	Mean Dose	64
		20% Vol ≤ 110% Rx (63 Gy)	Yes	20% Vol=	32.4% Rx	6526 Gy		Max Dose	67
				10% Vol=	12.5% Rx	6728 Gy		Min Dose	39
				2% Vol=	6.5% Rx	7234 Gy			
PTV 56	104	99% Vol > 93% Rx (56 Gy)	Yes	99% Vol=	99.9% Rx	6229 Gy	PTV 56	Mean Dose	56
		20% Vol ≤ 110% Rx (56 Gy)	Yes	20% Vol=	34.5% Rx	6500 Gy		Max Dose	66
				10% Vol=	13% Rx	6721 Gy		Min Dose	39
				2% Vol=	4.5% Rx	7002 Gy			
Critical Structure Constraints									
Cord		0.1 cc Vol ≤ 45 Gy	Yes	0.1 cc = 3700 cGy					
				Max = 3894 cGy					
Brainstem		0.1 cc Vol ≤ 60 Gy	Yes	0.1 cc = 5834 cGy					
		1% ≤ 60 Gy		Max = 5994 cGy					
Brain		1% ≤ 60 Gy	No	60 Gy Volume= 1.50%					
		5 cc ≤ 65 Gy	Yes	5 cc Max = 6137 cGy					
Optic Chiasm		0.1 cc Vol ≤ 60 Gy	Yes	0.1 cc = 210 cGy					
		1% ≤ 60 Gy	Yes	Max = 253 cGy					
Left Optic Nerve		0.1 cc Vol ≤ 60 Gy	Yes	0.1 cc = 154 cGy					
		1% ≤ 60 Gy	Yes	Max = 198 cGy					
Right Optic Nerve		0.1 cc Vol ≤ 60 Gy	Yes	0.1 cc = 128 cGy					
		1% ≤ 60 Gy	Yes	Max = 190 cGy					

Done 0.235s

(Khullar, Mullen, Apte, Clark et al.)

Upgrades to Image Registration tool



- Option to select different types of colormaps for moving images
- Comparison options like Mirror-Scope, BlockMatch, Mirror Checkerboard.
- Using ITK/VTK for auto-resigtration
- Display of Mutual-Information metric for manual registration to guide user in right direction.

Longer-term goals (within 2 yrs)

- CERR version that works seamlessly with IGRT datasets and deformable image registration (proper ‘Context, Storage, Linkage’)
- QA tools for deformable image registration
- MRI and PET in the same review process.
- Capability to handle 4D tools?
- Tools for data-mining of ITC data & data-analysis

RPC subcontract

- Continue to support QA tool that integrates with 3D treatment planning system.
- Continue to develop and support Monte Carlo tool that can be used to accurately recompute dose distributions given DICOM plan information.
  - Note the MC tool will ultimately integrate with the QA tool

Reminder

- RTOG Bioinformatics Committee
  - Overall informatics flow within RTOG