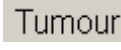


1.1. The General Biopsy Functions

Tracking and locating biopsy positions as well as assigning the lab results to the respective biopsies will help in focal therapy and general therapy. For this reason Encage Target Plus allows the user to plan the required biopsies. It is advantageous to use a tracking stepper in this case.


The biopsy functions are located:

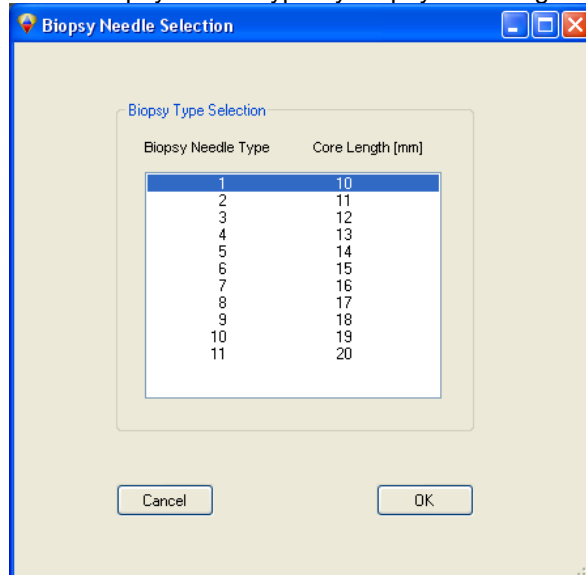
On Register Card:  Biopsy











In the Drop-down menu:  Tumour


On the toolbar the Icons:  and

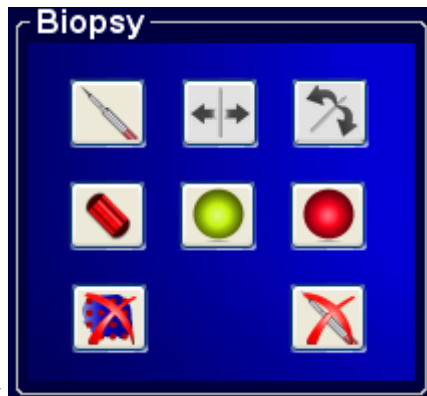
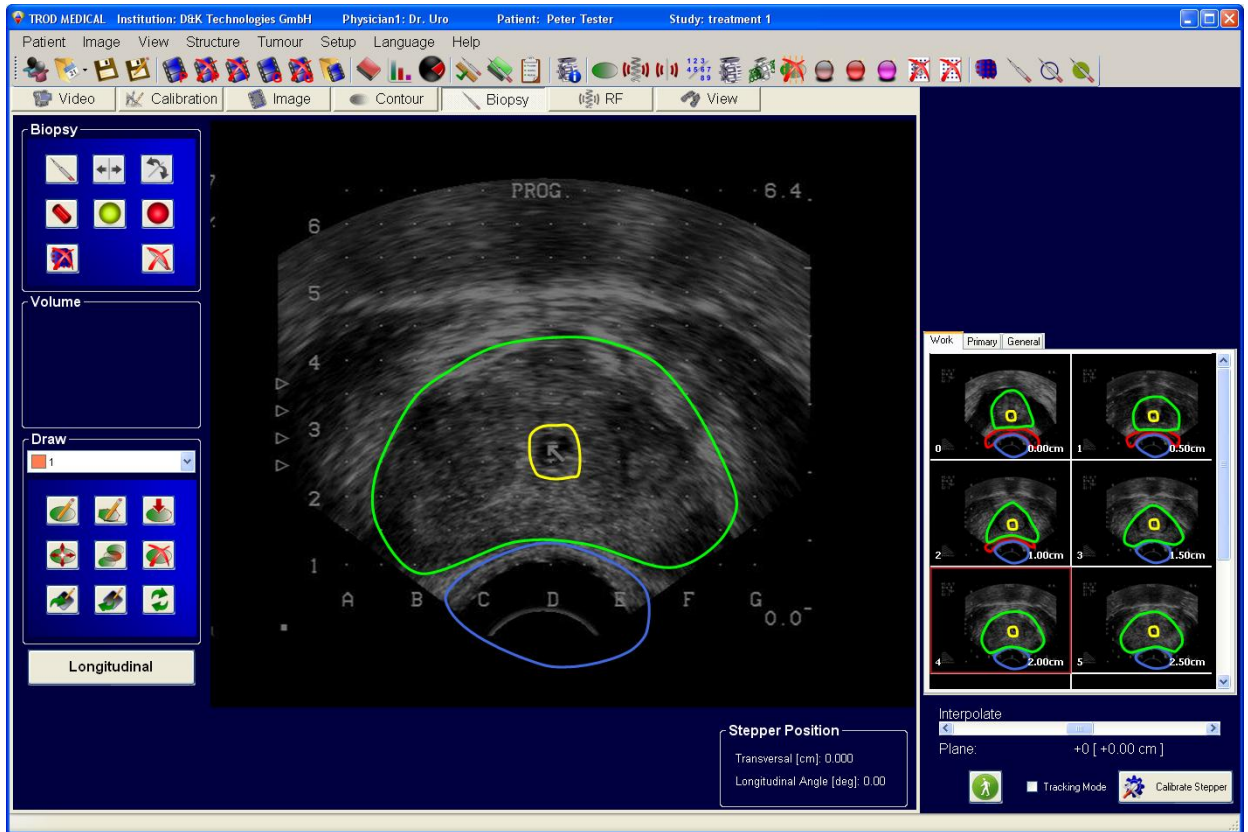
The meanings of the icons are:

-  : Select biopsy needle type by biopsy core length from the list:



















-  : Display Biopsy Report
-  : Display Biopsy Data Form
-  or  : Show or hide drawn tumor areas
-  or  : Show or hide all biopsy guides and biopsy positions
-  or  : Show or hide unused biopsy needles
-  or  : Show or hide non-malignant biopsies


In order to use the biopsy functions calibrated ultrasound images must have been collected as described above. It is then advantages to draw in the required organ contours (see chapter "Drawing Organ Contours into Ultrasound Images and other Image Types"). After that has been completed swith to the register card . That register card includes all required biopsy functions as well as the fuctions required to draw recognized tumor areas into the images.



The box lists the required biopsy functions:



-  : Determin the x, y-position of a planned biopsy guide line by selecting this function and the clicking at the required position in the main image window. The position in the  image is marked with a . The number designates the biopsy to be acquired. Only one biopsy per guide position can be acquired. A right mouse click will delete that mark. Until actual biopsies have been acquired the biopsy positions will renumber automatically. After that the numbers will always count upward and deleted positions numbers will not be reused. Thus it is advatagious to first definy all the x, y-position for all biopsies planned. Up to 50 biopsies are possible.
-  : Move a biopsy guide line. This function only works in longitudinal display on biopsy guide positions. If a planned biopsy postion is to be move somewhere else then fist click  and the delete a planned position and the place the guide somewhere else.
-  : Bend a biopsy guide line. This function only works in longitudinal display on biopsy guide positions.




-  : Place a biopsy core, i.e. complete a biopsy. The position of the core defines the exact position in x-, y-, z-coordinates from which the biopsy sample was taken. The position is marked as  in the main image. A yellow color marks the sample as undefined at the time.
-  : After the biopsy samples have been analyzed the biopsy cores can only be benign or malignant. By clicking the biopsy mark  it will change its color to  to designate a benign sample. In order to go back to undefined just click the mark again with a right mouse click.
-  : After the biopsy samples have been analyzed the biopsy cores can only be benign or malignant. By clicking the biopsy mark  it will change its color to  to designate a malignant sample. In order to go back to undefined just click the mark again with a right mouse click.
-  : If tumors have been drawn into the images they can all be removed at once after a prompt if this icon is clicked.
-  : This function will delete all unused biopsy guide lines.

After the biopsies have been taken the user can click the tool  and display all the biopsy results:

Biopsy Number	Core Length [mm]	Biopsy Type	Gleason Score +	Gleason Score	PCI Positive	PNI Positive	ASAP Positive	PIN Positive	X [mm]	Y [mm]	Z [mm]
1	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50.27	59.99	15
2	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	55.48	47.78	15
3	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	70.36	39.39	10
4	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	82.18	44.22	10
5	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	92.61	57.06	15
6	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	89.18	65.71	15
7	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	55.1	65.2	15
8	10	Undetermined	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	73.16	63.93	15
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

The Biopsy Number is unique and cannot be changed as it points to the respective biopsy core. If a biopsy guide line was placed but no biopsy taken that line number will not be listed. The core length

is the length chosen from the list accessible by clicking  in the toolbar. The numbers under x, y, and z represent the center of the biopsy core taken. The origin is the central bottom point on the general template (see chapter "Calibrating the General Template to the Ultrasound Device and thus the Ultrasound Images"). These numbers cannot be changed. All other entries are user selectable. This table will be transferred to the Biopsy Report. The table allows a simple entry of laboratory data. By clicking on  in the column **Biopsy Type** the type of tissue can be selected

from . The Gleason score may also be selected from a list . The remaining data can be marked as **Positive** by clicking the reseptive box .

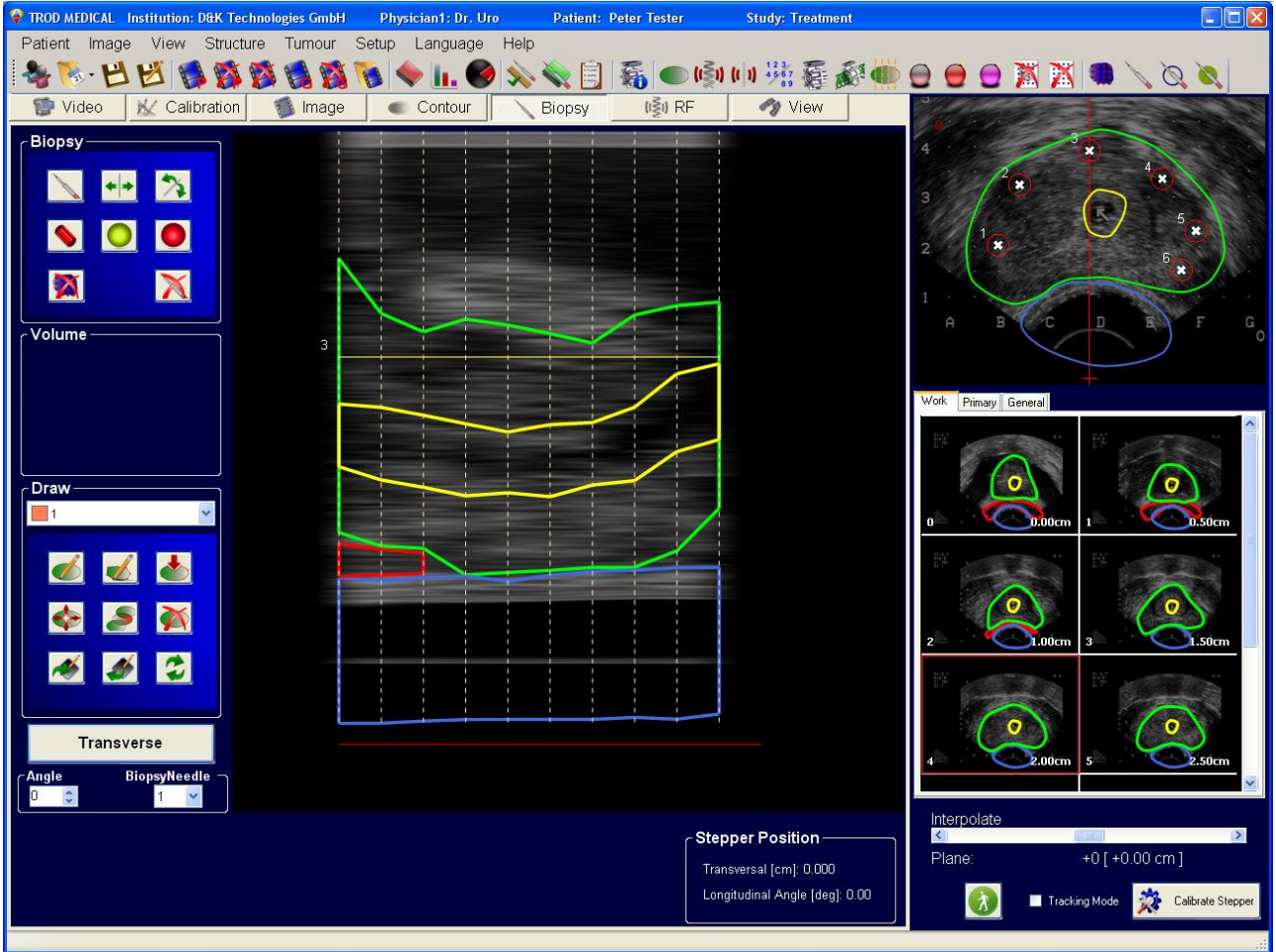
The entries that can be marked as positive are:

- PCI: Prostate Capsular Infraction
- PNI: Peri-Nervous Invasion
- ASAP: Atypical Small Acinar Proliferation
- PIN: Prostatic Intra-Epithelial Neoplasia

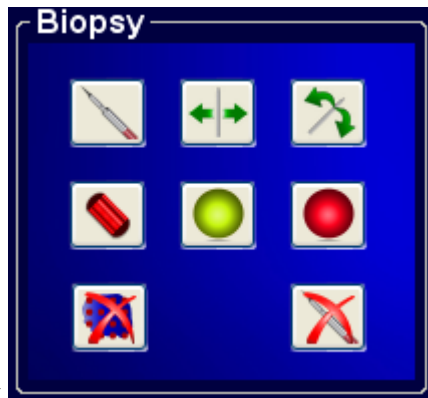
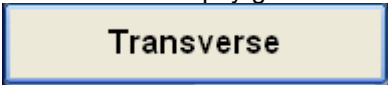
1.2. The Longitudinal Image Display on Register Card Biopsy



In order to access the longitudinal display just click **Longitudinal** on register card **Biopsy**. The display changes to:



In this case 6 biopsy guide line have been positioned. To return to the transverse display click



The box lists the available biopsy functions:




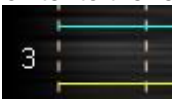
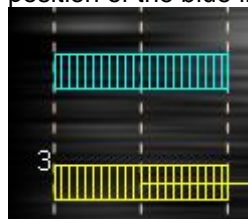
-  : Determine the x, y-position of a planned biopsy guide line by selecting this function and the clicking at the required position in the main image window. The position in the


image is marked with a . The number designates the biopsy to be acquired. Only one biopsy per guide position can be acquired. A right mouse click will delete that mark. Until actual biopsies have been acquired the biopsy positions will renumber automatically. After that the numbers will always count upward and deleted positions numbers will not be reused. Thus it is advantageous to first define all the x, y-position for all biopsies planned. Up to 50 biopsies are possible.


-  : Move a biopsy guide line. This function only works in longitudinal display on biopsy guide line positions. If a planned biopsy position is to be moved somewhere else then move the mouse pointer to the required guide line and hold the left mouse button

down. A blue line  will then appear. Move the blue line to the desired position and the release the mouse button. Then yellow guide line will then jump to the position of the blue line. In case as biopsy has been taken a blue box will appear




and the functions works accordingly.


-  : Bend a biopsy guide line. This function only works in longitudinal display on biopsy guide line positions. If a planned biopsy position is to be bent somewhere then move the mouse pointer to the required guide line and hold the left mouse button down. A

blue line  will then appear. Move the blue line to the desired position and the release the mouse button. Then yellow guide line will then jump to the position of the blue line. In case as biopsy has been taken a blue box will appear




and the functions works accordingly.

-  : Place a biopsy core, i.e. complete a biopsy. The position of the core defines the exact position in x-, y-, z-coordinates from which the biopsy sample was taken. The position

is marked as  in the main image. A yellow color marks the sample as undefined at the time. After moving to the next biopsy the guide line disappears





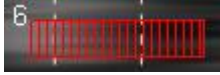


. If the core graphic is in the wrong position just left click the mouse somewhere else along the guide line and the core will move accordingly. If the core is to be removed then just click on the core with the right mouse button held down.

-  : After the biopsy samples have been analyzed the biopsy cores can only be benign or

malignant. By clicking the biopsy mark  it will change its color to



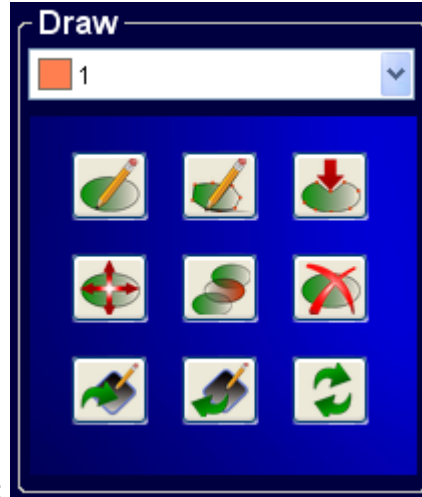
to designate a benign sample. In order to go back to undefined just click the mark again with a right mouse click.

-  : After the biopsy samples have been analyzed the biopsy cores can only be benign or malignant. By clicking the biopsy mark  it will change its color to  to designate a malignant sample. In order to go back to undefined just click the mark again with a right mouse click.
-  :If tumors have been drawn into the images they can all be removed at once after a prompt if this icon is clicked.
-  :This function will delete all unused biopsy guide lines.

1.3. The Tumor Draw Function

If recognized tumors may be drawn into the image stack in the same way as the other structures were drawn. Please see chapter “Drawing Organ Contours into Ultrasound Images and other Image Types” for more details. Only the items that are different will be explained here.

In this case 10 Tumors numbered 1 to 10 may be drawn. The tumor draw functions can be found

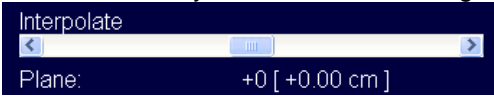


on register card  in the box:

The meaning of the icons are the same as in of drawing organ structures. In short:


- Draw functions are only available if the image in the main window is a non-interpolated

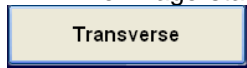


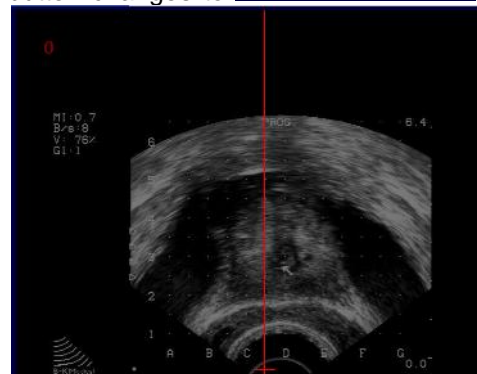
image: , i.e. if the number between the brackets [+0.00 cm] is not 0.00 then an interpolated image is displayed in the Encage Target Plus main window and not all draw functions are accessible.

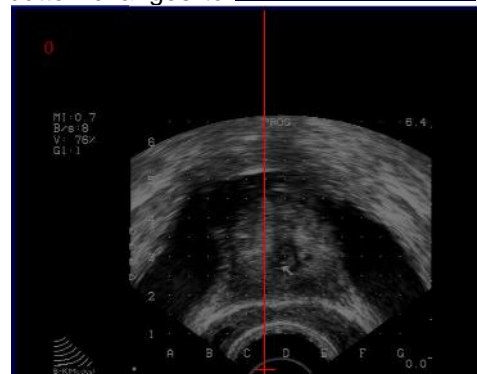
- Tumors can only be drawn in the transverse image mode. That means that the button





is displayed on this register page. Contours can be corrected in longitudinal display as well by clicking then button .

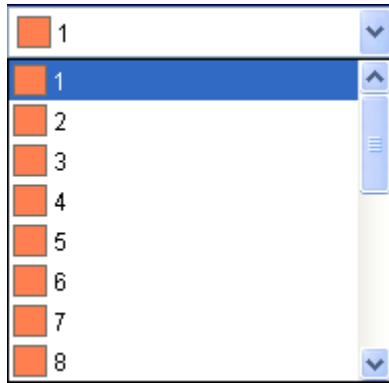
The image stack is now displayed in longitudinal projection and the button changes to . On




the top right the angle selection box appears: . As long as the image is not switched to live video display additional calibration is not required. This is only necessary in case the image is switched to live. How this is done is explained in chapter “Correcting Contours in Longitudinal Display” – please see there.

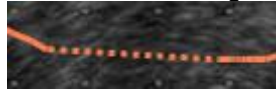


-  : This is the tumor select function. The tumor visible in the box is the one that can be draw, copied, pasted or interpolated at the time being. After clicking  select the structure to be drawn from the selection box





The structures setup function is described below. The names are user definable.

- 
 After clicking this icon the selected tumor contour can be drawn (draw mode) with the mouse by moving the mouse while holding down the left mouse button at the same time. Alternatively, the contour is also drawn by clicking individual points on the selected organ contour. As soon as the cursor gets near the position from where the organ was




drawn a dotted line shows how the contour will be completed. If the proposal is correct just let go of the left mouse button and the organ is auto-completed.

- 
 is the quick draw function. By clicking a few points on an tumor contour and then double clicking at the end a contour is automatically entered.
- The volumes of the tumors drawn are displayed in the box above. The volume is constantly updated as soon as the tumor contours on other image planes have been completed.


- 
 After clicking this icon (or pressing [Ctrl] [C]) the contour selected in

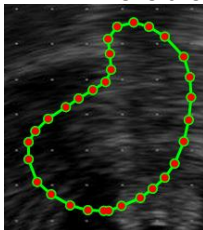
■ Prostate

 on the image plane within the main Encage Target Plus is copied.

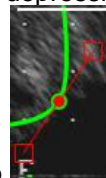
- 
 After clicking this icon (or pressing [Ctrl] [V]) the stored contour is pasted into the image in the main Encage Target Plus window at the same position from which it was copied.


Pressing the [Page ↑] or [Page ↓]-key while , , or  is selected will result in transferring the selected contour to the next thumbnail image. This is equivalent to pressing [Ctrl] [C], then clicking the next thumbnail and then pressing [Ctrl] [V].











- 
 This is the “rubber banding” tool. After clicking the icon, points appear on all contours



These points are the “supports” of the drawn contours. The mouse may be moved to any contour support point. As soon as the cursor “sees” the contour it will change from an arrow to a hand with a pointed finger. By depressing the left mouse button on a




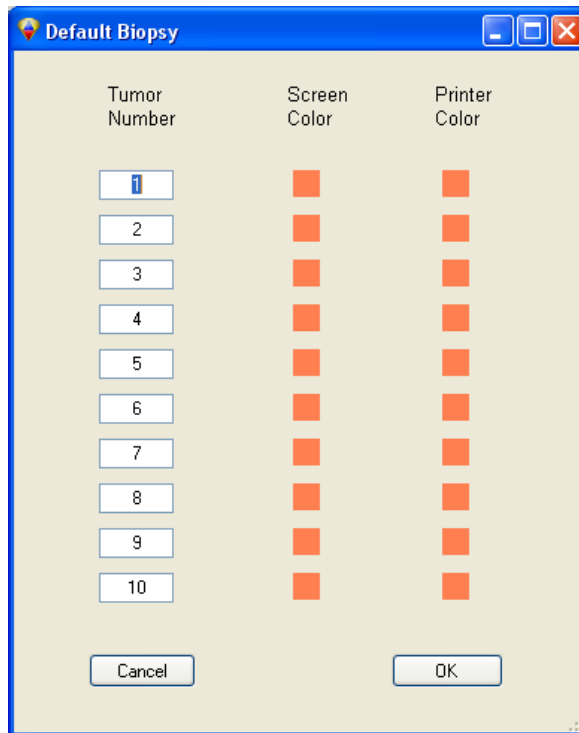
support point the points on the contour change to . By moving the mouse with the left mouse button pressed the contour will follow the mouse movement. By moving one of the red squares, the shape of the contour will change accordingly. A support point may be deleted by clicking the desired point with the right mouse button. Alternatively, points may be added by clicking the desired contour position with the left mouse button.

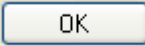
-  If a contour has been drawn on two nonadjacent image planes, the contours of the selected structures on the images between the ones already drawn will be filled in. The position and shapes of the contours are interpolated.
-  After clicking this tool the organ structures can be moved. The mouse must be positioned on the structure borderline and the left mouse button held down. The structure will then follow the mouse movements.
-  By clicking this tool with the left mouse button the selected structure in  on the image plane displayed in the main Encage Target Plus window is deleted. By clicking this tool with the right mouse button the selected structure in  on all image planes are after a prompt .
-  This is the undo / redo button. The last action can be reversed by clicking the undo / redo button. As soon as an action pertaining to one plane only such as draw, rubber banding, delete structures, or others have be done, the icon changes its appearance from  to  if the function has not been used before. A second click on the button reverses the change back to the start case before the first click on the button.
-  :If tumors have been drawn into the images they can all be removed at once after a prompt if this icon is found in the box **Biopsy** at the top of the register card .

In order to define the Tumor names and colors go to the drop-down menu **Tumour** and then the

menu  appears.


- After clicking  with the left mouse button the following dialog box pops up:



All data displayed in this menu can be stored as default (see chapter “Storing / Loading Structure Data (Preset)”). To change anything just click on the respective box and change accordingly. To store any changes just click .

1.4. The Biopsy Report













The biopsy report is accessible after clicking  in the toolbar.

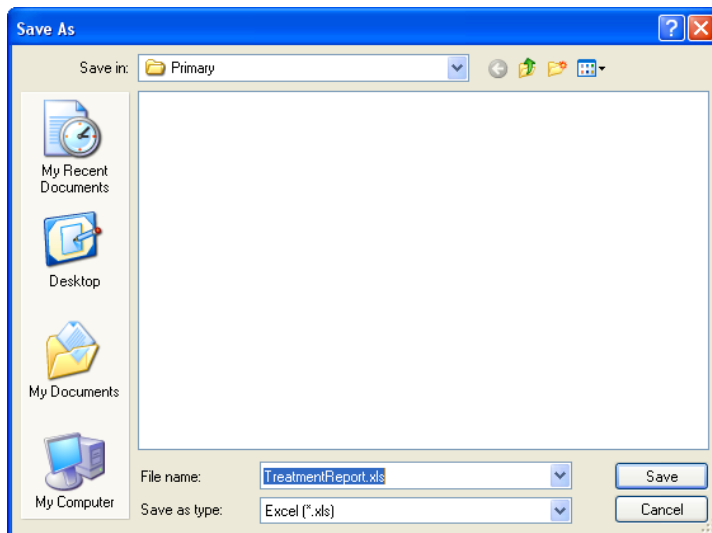
The report will appear in its own window. An additional menu is at the top of the window



having the following functions, that can be clicked on.




-  : Show or hide the document map
-  : Go to first page
-  : One page backward
-  : One page forward
-  : Go to last page
-  : Refresh
-  : Print report – After clicking this function a special printer menu pops up. The menu depends on the printer used.
-  : Switches the page layout
-  : Printer page layout - After clicking this function a special printer menu pops up. The menu depends on the printer used.
-  : Export the report either to MS Excel or create a PDF file. This can be selected from a drop-down menu

After clicking  and selecting EXCEL or PDF the box appears:



Please store the data where required.

To open the data file please open EXCEL first and then import the file.

-  : The size of the display can be selected here. If this function is clicked the size can also be selected with the mouse wheel
-  : After typing in a word, that word is searched for after clicking 

The following data is at the top of all report pages:

- Name of the hospital and the department
- Patient name
- Treatment date and time
- Name of the treatment plan

The first page includes the patient and study data.

D&K Technologies GmbH Physics				
Patient:	Peter Tester			
Treatment Date:	6/17/2011 1:27:30 PM	Treatment Plan:	Treatment	
Patient Data				
Study created:	6/17/2011 1:27:30 PM			
Study modified:	6/17/2011 1:27:30 PM			
Report printed:	6/17/2011 5:33:38 PM			
Patient Name:	Tester	First Name:	Peter	
Date of Birth:	6/14/1955			
Registration No.:	123			
Address				
Street, No.:	Top St.	ZIP:	4BCDE	
City:	Top Town	Country:	USA	
		Social Security No:	SolSec	
Insurance Co.:	InsureMe	Policy No.:	PolicyName	
Physician1:	Dr. Uro			
Physician2:	Dr. Logic			
Anesthetist:	Dr. Sleep			
Hospital / Office:	D&K Technologies GmbH / Physics			
Street, No.:	Kanalweg 7			
ZIP:	21357	City:	Barum	
Country:	Germany			
Patient History:	None			
Previous Tumor Related Therapy:	None			
Tumor Staging:				
T:	1b	N:	0	
		M:	0	
		G:	2	
Gleason Score:	1 + 1		PSA:	10.5ng/ml
Number of preknown Biopsies:	6		Number of preknown Positive Biopsies:	4
Number of Biopsies from Target Plus:	6		Number of Positive Biopsies from Target Plus:	4
Prostate Volume from Ultrasound:	50 ccm			
Prostate Volume from Target Plus:	49.5 ccm			
JetSoft - TROD - Target Plus				
		1/3	6/17/2011 5:33:38 PM	

The second page (possibly more pages are required to display all results) displays the biopsy positions and data on the core lengths.

D&K Technologies GmbH Physics

Patient: Peter Tester

Treatment Date: 6/17/2011 1:27:30 PM

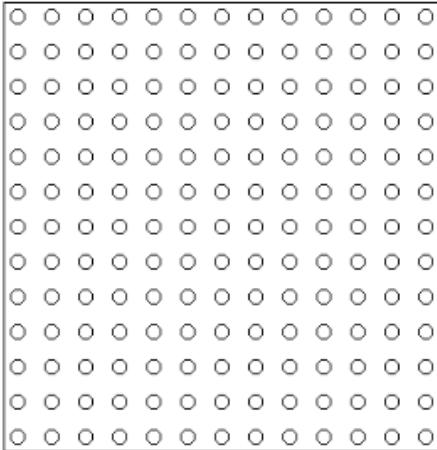
Treatment Plan: Treatment


Biopsy Coordinate Report

Number of Biopsies taken: 6

Biopsy Needle Types used: 10,

Biopsy Number	Biopsy Core Length(mm)	Biopsy Position(x,y)	Biopsy Position(z)
1	10	48.7, 63.4	25
2	10	50.7, 52.6	25
3	10	59.2, 45.3	25
4	10	70.7, 42	25
5	10	80.7, 48	25
6	10	88, 62	25



The third page (possibly more pages are required to display all results) displays the biopsy results entered into the biopsy after clicking  in the toolbar. See chapter “The General Biopsy Functions” for more details.

D&K Technologies GmbH Physics

Patient: Peter Tester

Treatment Date: 6/17/2011 1:27:30 PM

Treatment Plan: Treatment

Biopsy Data

Biopsy No.	Core Length [mm]	Biopsy Type	Gleason Score +	Gleason Score	PCI Positive	PNI Positive	ASAP Positive	PIN Positive	X [mm]	Y [mm]	Z [mm]
1	10	Malignant	1	1	Yes	Yes	No	No	48.7	63.4	25
2	10	Benign	2	1	Yes	No	No	Yes	50.7	52.6	25
3	10	Malignant	3	3	No	No	No	No	59.2	45.3	25
4	10	Malignant	3	2	No	Yes	No	No	70.7	42	25
5	10	Malignant	2	1	No	No	No	No	80.7	48	25
6	10	Undetermined	2	2	No	No	Yes	No	88	62	25

The last pages display the images including all contours and other items drawn into the images.