GE Healthcare
Vivid Club

Spring 2015

Application News

IB25503XX

GE imagination at work

AFI

on

Vivid™

S70 / E90 / E95

and associated

EchoPAC™ Software only

Content

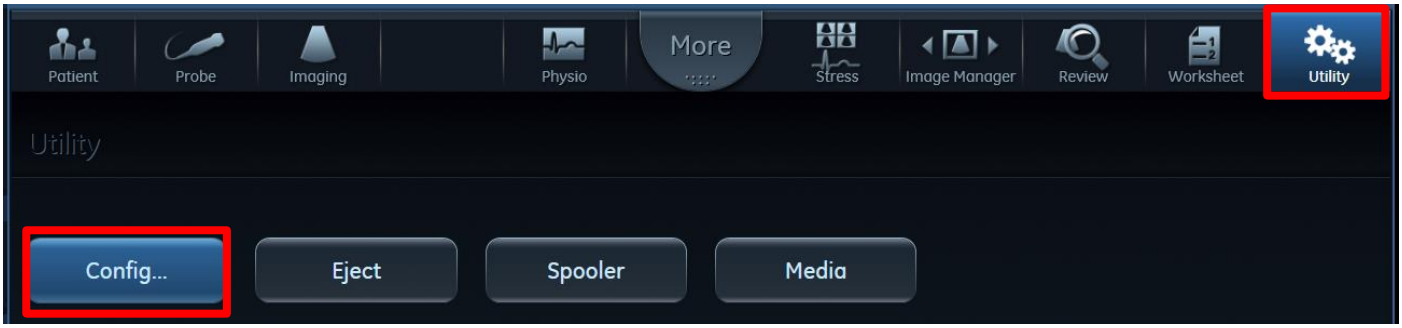
NOTE

This hand out is a summary and is not comprehensive.
For more detailed information please refer to the user manual and/or reference manual.

AFI

Configuration

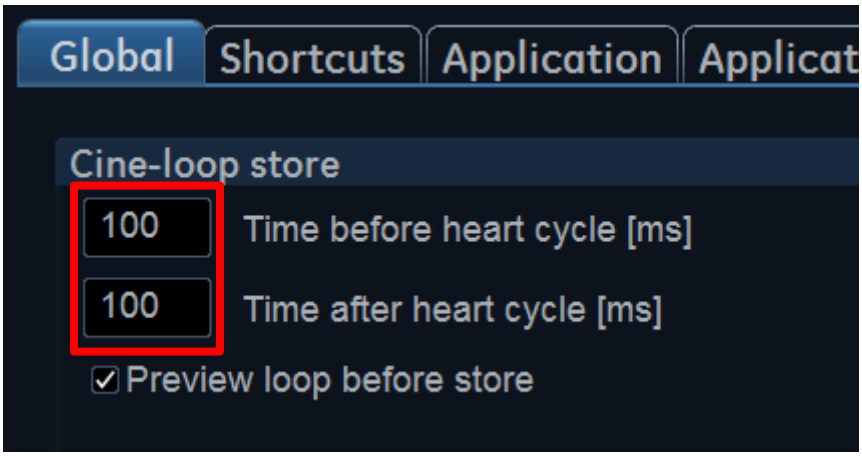
Select the **Utility** button on the touch panel. Utility can be found either in the short cut menu or under More.
Select **Config** to open the configuration



The following configurations only need to be done once on the system.

Image capture

Select **Imaging** from the Main Topics and choose the **Global** Tab.
These settings will apply globally to all probes and presets.



Time before heart cycle / Time after heart cycle

Using an ECG the system detects automatically one heart cycle. Additional ms before and after the trigger points need to be stored to make sure a bit more than a complete heart cycle is captured.

For using AFI it is recommended entering **100 ms** in each field, before and after.

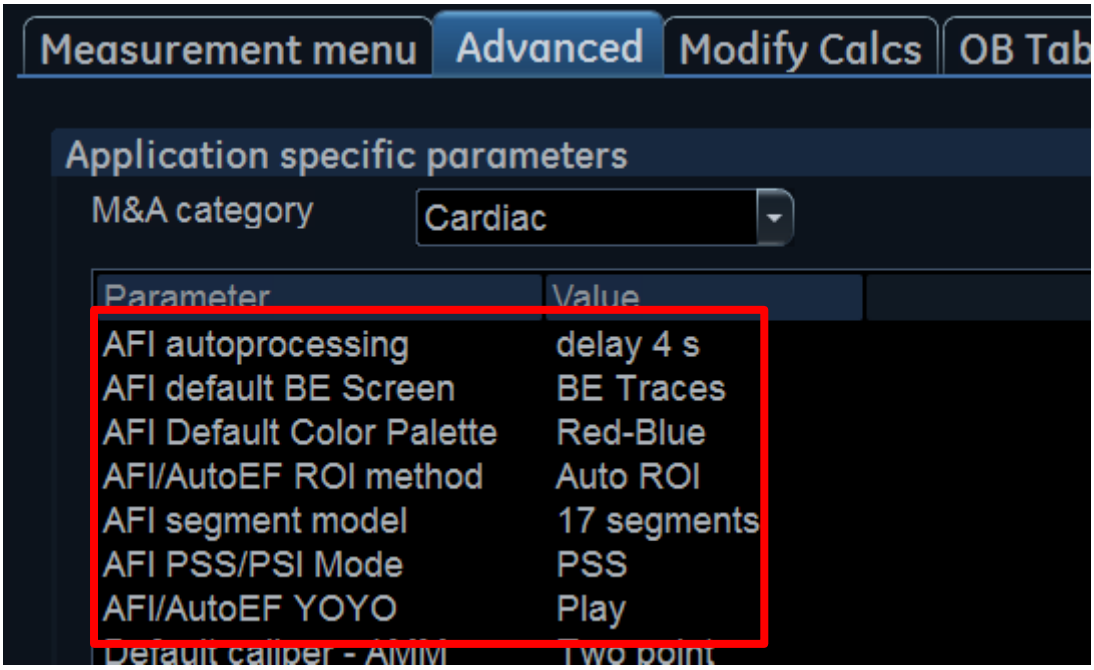
Preview Loop before store

If check marked, the system will show a preview of the loop after pressing the **Image Store** button and before finally storing the cineloop into the archive. This might be helpful to double check if the loop that gets stored is suitable to the user's needs/preferences, potentially avoiding storing non-useful images.

AFI configuration

Select **Meas/Text** from the Main Topics and choose the **Advanced** Tab.

Scroll down and find the following selections:



AFI auto processing

It represents the time delay after the region of interest (ROI) is displayed and before the system starts processing AFI. This time allows checking the contours and doing some more adjustments if needed.

AFI default BE Screen

The user can define the information that will be displayed when the analysis is finished: either the BE with Traces from all the views or the BE with the respective 2D images.

AFI default Color Palette

Color scheme for the BE representation.
Red – blue scheme, where red is shortening and blue lengthening

Green – Yellow – Red scheme: Traffic light-like map. Green indicates high (absolute) values, yellow is questionable and red represents low values, for this segment.

AFI/Auto EF ROI method

Select which ROI method you would like to use: the Auto method, where the system automatically creates the region of interest (ROI) or the 3 points method to set the 3 reference points manually

AFI segment model

The BE can show either with;

- A 17 segment model, where the apical region is split only into 4 segments and an additional segment is representing the Apex.
- A 18 segment model, which uses no averaging, but shows purely the data which was analysed. Each of the three apical views is split into 6 segments.

AFI PSS/PSI/TTP

Select which parameter(s) should be shown with the BE maps.

PSS Peak Systolic Strain.
The system detects the peak longitudinal strain values **in systole**

PSI Post Systolic Index
The system detects the peaks longitudinal strain values in systole and the overall peak value during the hear cycle, which can appear after systole.
It indicates how much post systolic shortening a segment has.

TTP Time To Peak
The system is detecting the time to the peak longitudinal strain over the entire heart cycle.

The bulls-eye displays the segmental time to peak contraction in a color scheme where green color indicates contraction with a peak at or around AVC, cyan to blue color indicates early contraction and yellow to red indicates late contraction

AFI/AutoEF Yoyo

While in the stage to set the reference points, the system is scrolling the image a bit back and forth.
This should help to identify the myocardium, since usually this can be better seen in motion.

Exit

Press/Tap **Config (or 2D)** to leave the configuration page with the new settings.

Getting started

Create a patient/exam

Connect the ECG
Tap **Physio** and change **ECG Lead** if necessary to get the best signal
Obtain a stable ECG trace

Optimising images

Sector width

It is recommended to choose an optimal sector width, where the entire myocardium is visible during the whole cardiac cycle but not too large as this will lower the frame rate.
The Virtual Apex function may help to see the apical segments completely without widening the sector too much.

Frame rate

Optimal between 40-90 fps

Storage of images

Store loops from all apical views:

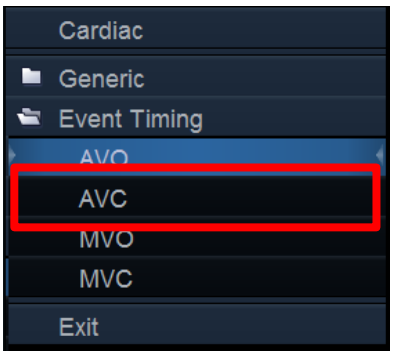
- Apical 4 CH
- Apical 2 CH
- Apical LAX

It is recommended to acquire all three apical views sequentially in order to get comparable heart rates in all views.
Images have to be stored first into the clipboard before starting the analysis.

Measure the AVC

From M-Mode

Acquire a nice M-Mode signal where the aortic valve closure is clearly visible.
Press **Measure.**
Open the folder for **Event Timing.**
Select **AVC**.
Set the marker for the closure.
or



From Doppler

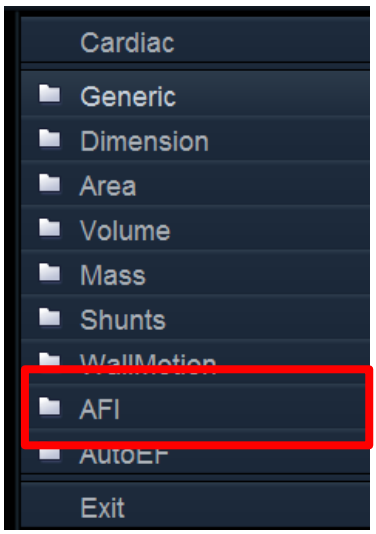
Acquire a nice Aortic Flow signal; preferably including the valve clicks.
Press **Measure**.
Open the folder for **Event Timing**.
Select **AVC**.
Set the marker for the closure.

The AVC measurement is stored in the worksheet and will be used for the AFI analysis.

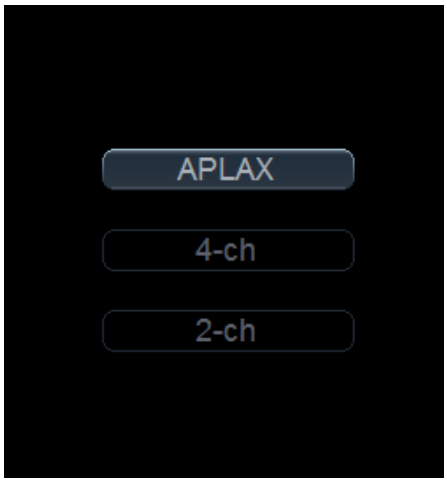
Starting the analysis

The measurement

Recall the **APLAX** view
Press on **MEASURE**
In the Measurement menu, select **AFI**.



The *View selection menu* is displayed



Select **APLAX**
It is mandatory to start with the APLAX view. This allows to visually checking in 2D the Aortic Valve closure event (AVC).

Defining the ROI

If the system is configured with the Auto ROI method, the region of interest will automatically be defined by the system.

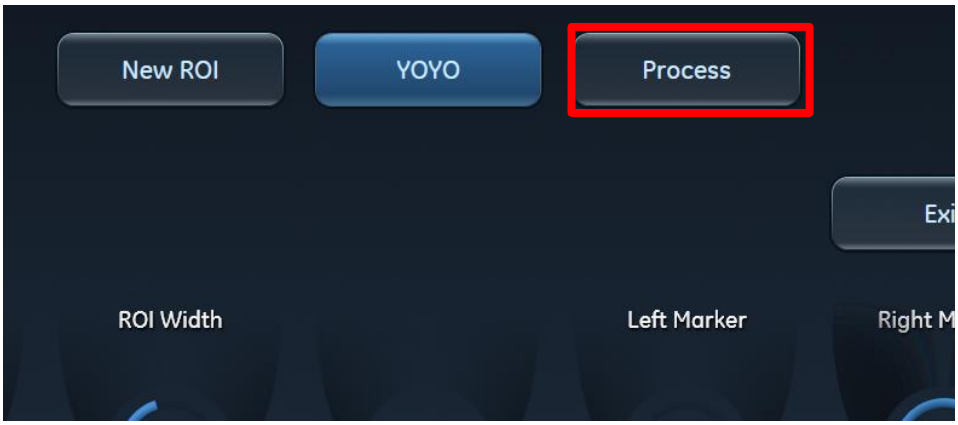
If the system is configured with the 3 points method, two basal and one apical reference point need to be defined.
Follow the instructions on the pointer or in the status bar.

Correct ROI definition is crucial to get good tracking.
Check the ROI width in order to cover the entire myocardium, but not including unnecessary tissue.

Auto processing

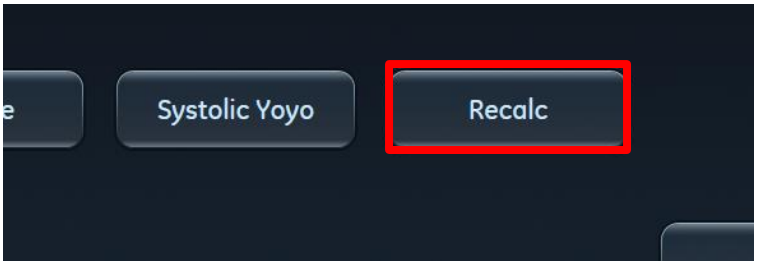
If auto processing is used, the system waits a few seconds (as configured in the AFI Auto processing parameter) without any user interaction and then starts the processing.

When auto processing is turned off the user needs to tap the Process button on the touch panel, whenever ready to proceed.



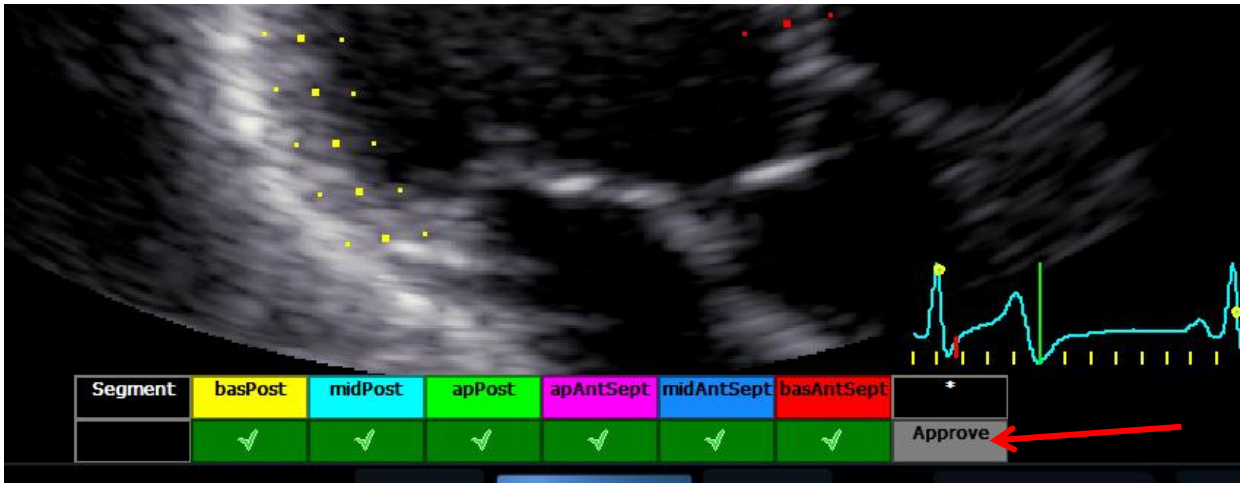
Tracking quality

Check the tracking quality. If changes on the ROI are necessary, tap **Recalc** to go one step back and adjust the ROI.



Tap **Process** to continue (see above).

Approve the scoring table, once you agree with it.

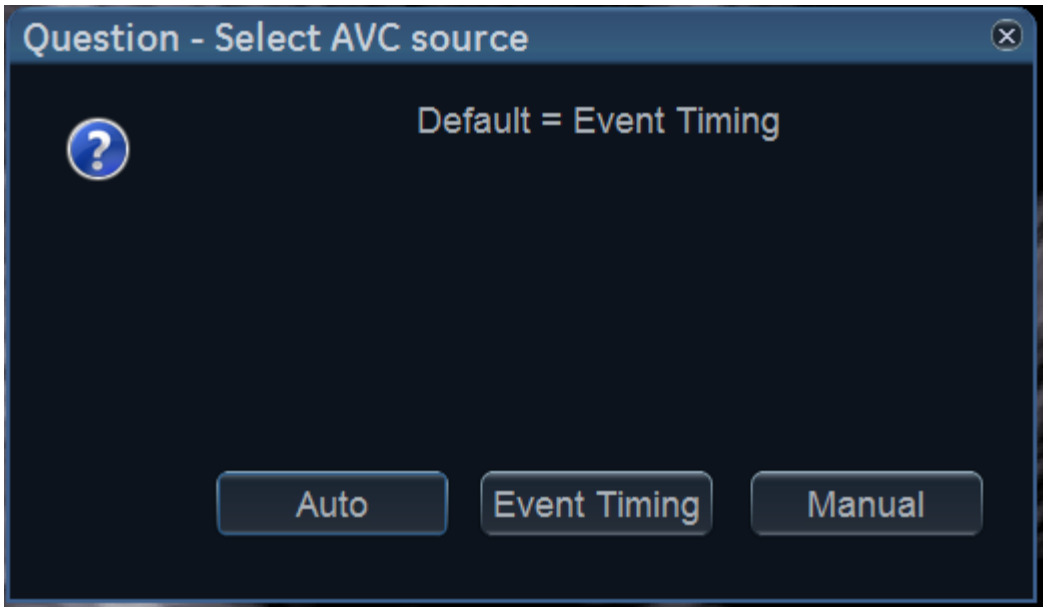


Set the AV closure

There are three ways to define the AVC:

- Measure the event timing before starting the AFI (see page 7).
- AVC is selected by the system (determined by the temporal contraction of all LV segments -strain curves).
- From the 2D image select the first frame where the AV is closed (only visible in APLAX, therefore we start with this view) and press Select.

If a message appears read carefully and make your decision.

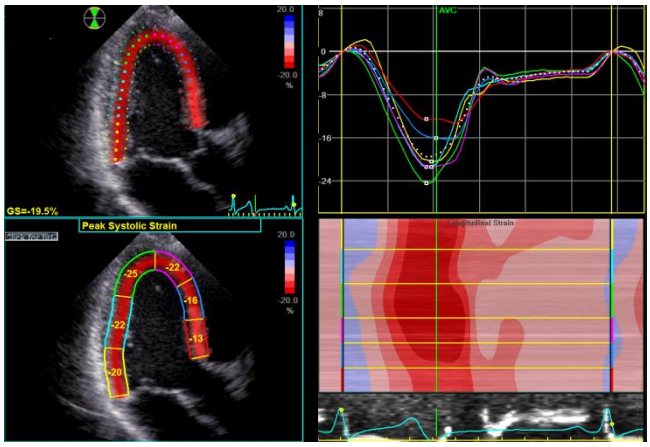


Once the AVC is defined, this will be used for the other views as well (therefore comparable heart rates are crucial).

Now the *Parametric systolic strain APLAX view* is displayed

The quad screen

If interested in the details tap **quad screen** to see all information.



Press **Image store** to store the quad screen to the clipboard.

Next views

4-Chamber view

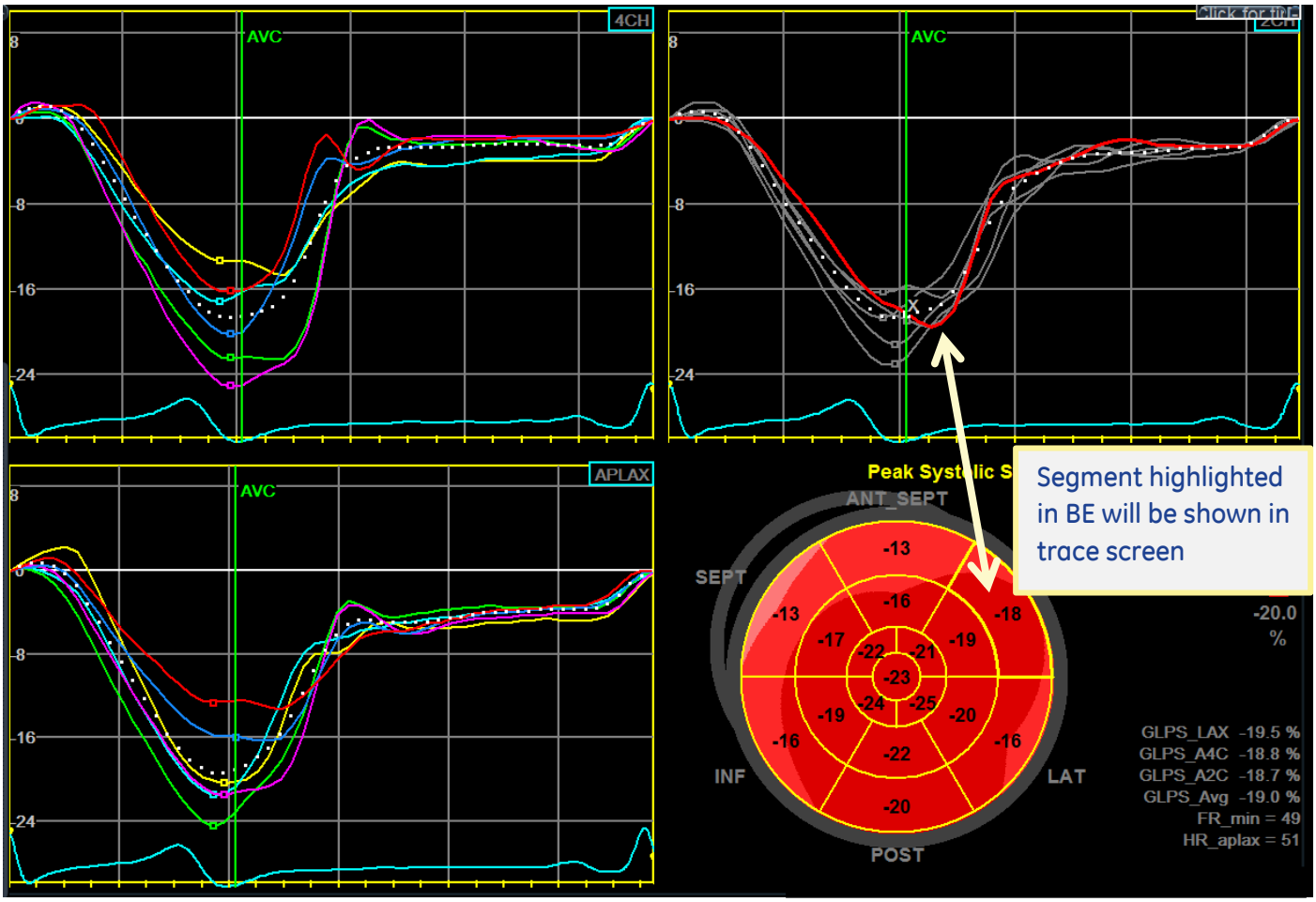
Take the 4CH view from the clipboard and repeat the procedure:
Click on 4 CH in the view selection menu.
Check the tracking quality and approve.
Enter the quad screen and store.

2-Chamber view

To finish do the same procedures for the 2 CH view:
Click on 2 CH in the view selection menu.
Check the tracking quality and approve.
Enter the quad screen and store.

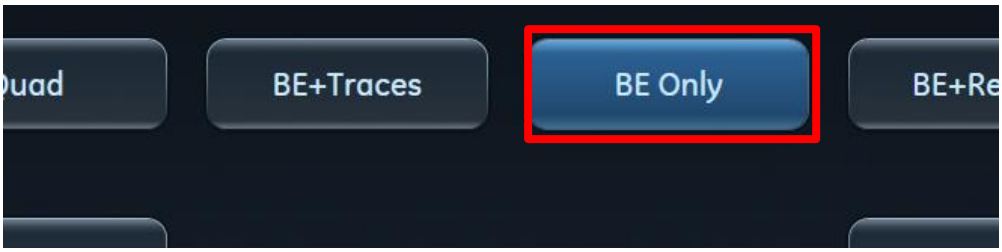
Result

Once all views are analysed, the system shows the Bulls eye and the traces from all three views.
The user can hover the cursor over each segment in the Bulls eye and the curve of this specific segment will be highlighted in the traces screen.



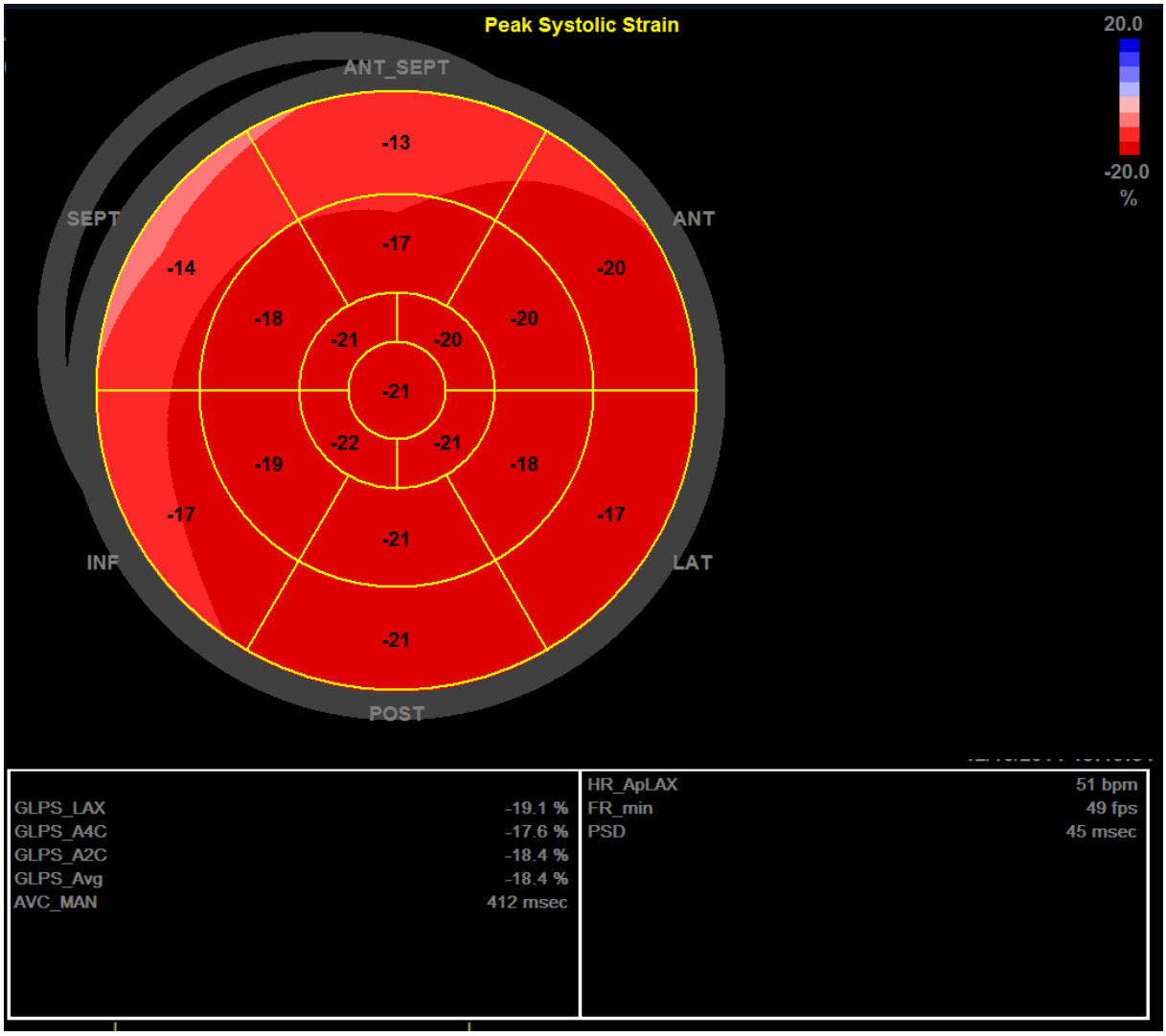
The Bull's Eye

Select "BE only" on the touch to active the bull's eye only screen.



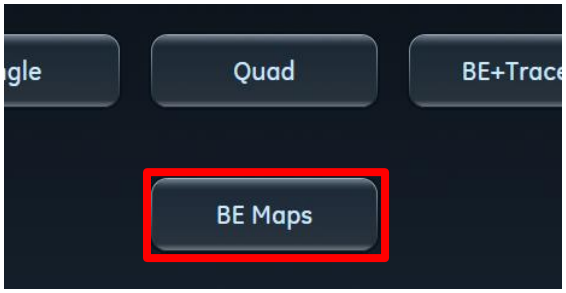
The Bull's eye can be seen together with:

- Global strain values for each view
- Global strain value average for the entire heart
- AVC time point
- Heart rate in APLAX and frame rate min
- PSD as the standard deviation of the spread of all peak values over the entire heart cycle



Alternative BE displays

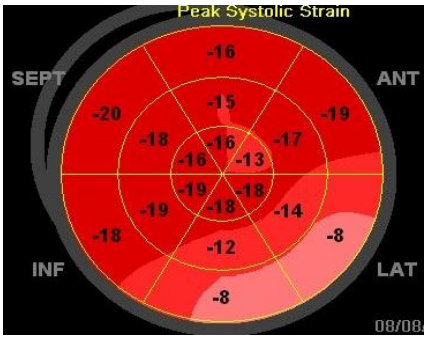
Tap on BE Maps to get a selection of alternative BE mappings



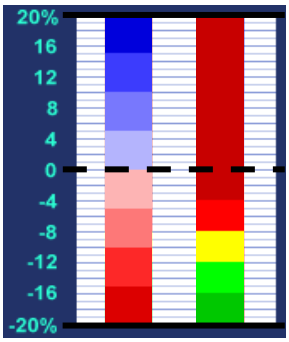
Make your selection from the List on the monitor.

Green-yellow-red

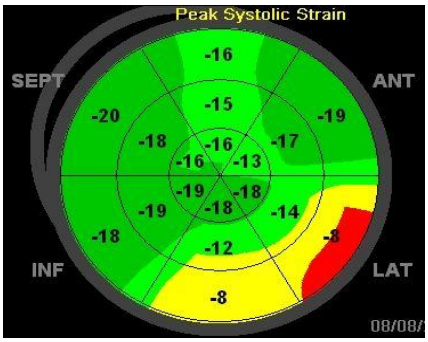
The green-yellow-red map offers an alternative to the conventional Red-Blue Map.
It uses the same numbers but with a different color overlay
It emphasizes the negative systolic strain (shortening of the myocardium) and allows a better differentiation within LV function at a glance.



Red-Blue Map



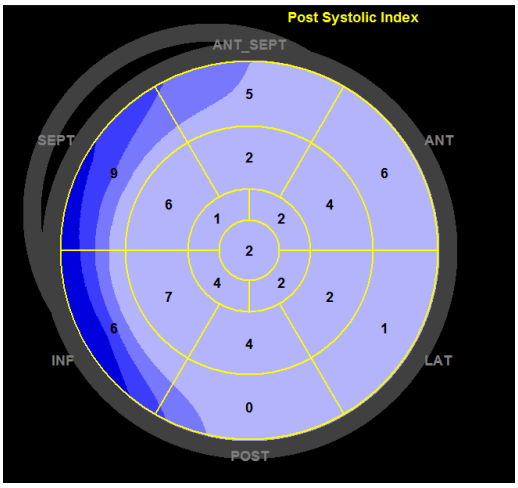
>-8% Red
-8...-12% Yellow
<-12% Green



Green-Yellow-Red Map

PSI

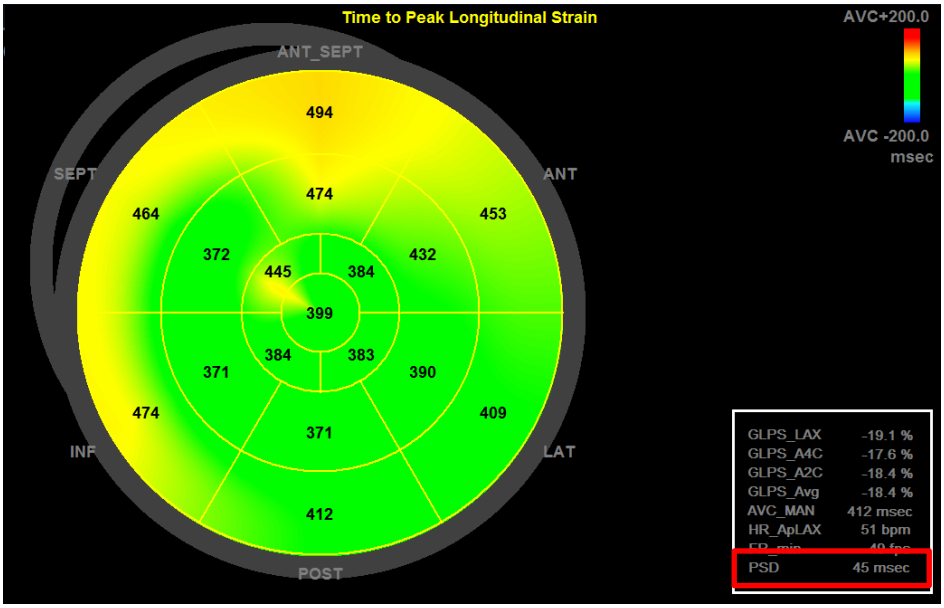
Post Systolic Index
It shows the amount of post systolic shortening in a segment.
Dark blue colors show higher post systolic shortening values.
Formula for the post systolic strain index:
PSI = 100 (PS – ESS) / PS*
Where:
ESS = Strain at AVC
PS= peak strain after AVC

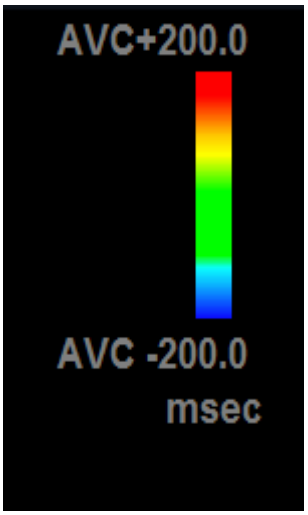


TTP

Time To Peak
The system is detecting the time to peak strain for each curve during the **entire** heart cycle.

PSD (Peak Strain Dispersion) also called Mechanical Dispersion
From these segmental Times to Peak numbers, the system then calculates the standard deviation.
The Standard deviation of the times to peak is then displayed as PSD (Peak Strain Dispersion, also called Mechanical Dispersion) in the BE Parameter List.
The PSD is the numeric value for the spread of the peak values over time.
It has a higher value if the peak values are widely spread and a lower value if all the peaks get closer together (are less spread out in time)
It is an indication of the discordance of the deformation of the LV.





The Bulls' eye color scheme

Yellow/Red

Yellow or Red color indicates the peak strain value is detected **after** AVC (up to 200 ms after AVC, see indication on the scale).

Green

The green part in the middle reflects the time point **around** Aortic Valve Closure (AVC)

Blue

Cyan or blue indicates the peak strain values that are detected **before** AVC (up to 200 ms before AVC, see indication on the scale).

In other words

Cyan/blue shows early peak strain
Green shows peak strain around AVC
Yellow/red shows peak strain after AVC

Examples:
In a patient with all peak strain values very close around AVC, the Bulls Eye will be all green.

In patients with peaks late after AVC the Bull's Eye can show green for the segments with peak strain values at AVC and yellow/red for segments with peak strain values in post systole.

In patients where the peak strain appears in about mid systole, the BE will show blue color in these segments.