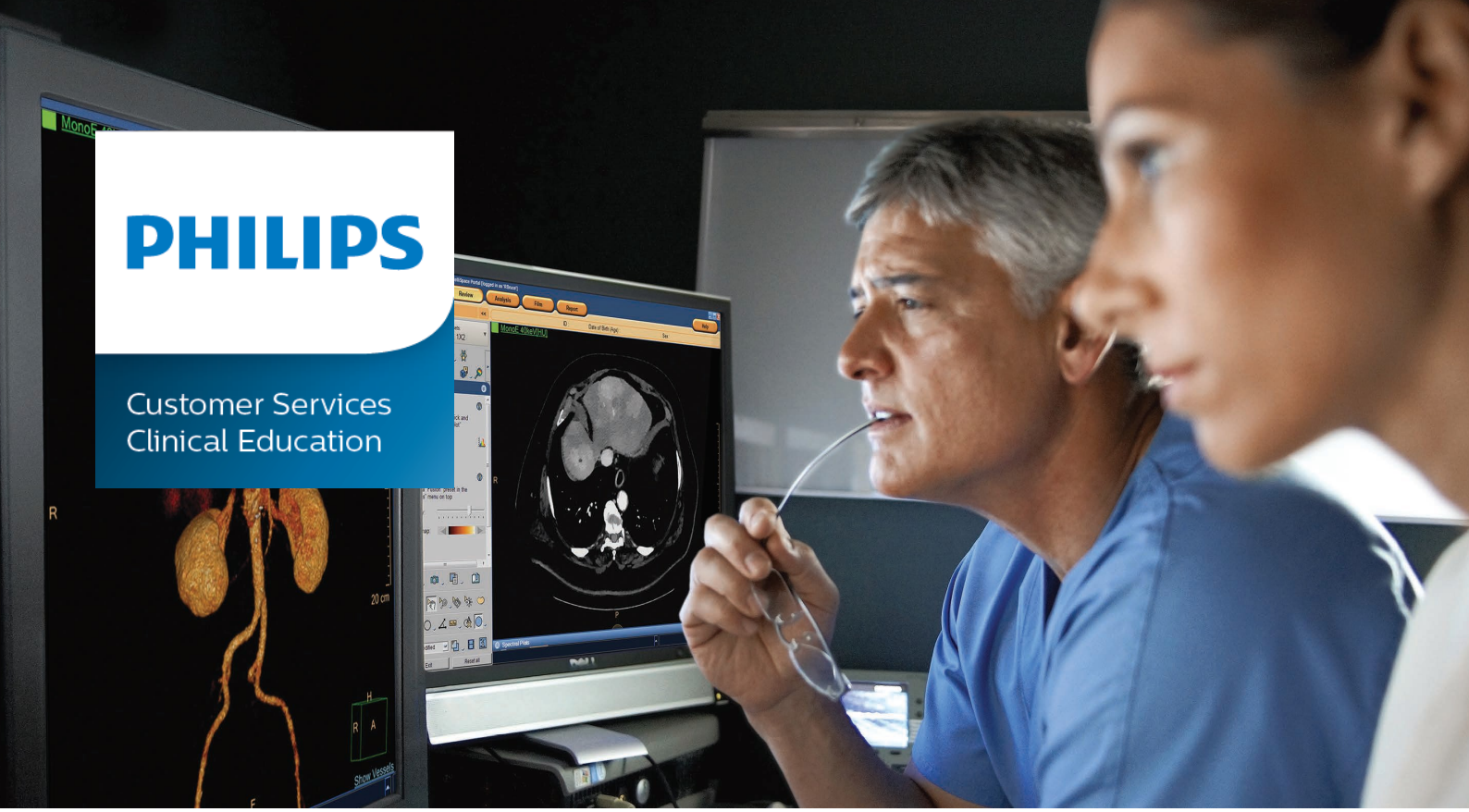


MR Cardiac Analysis Suite

Cardiac Mapping

IntelliSpace Portal V8 and up

MR Applications

Quick Step Guides

Application

MRI Cardiac Mapping allows quantitative measurements of the myocardium in terms of diffuse, infiltratory and inflammatory processes. It is useful to characterize diffuse/infiltrative myocardial diseases, including myocardial fibrosis, myocarditis, and amyloidosis. Cardiac Mapping enables the user to quantify myocardial fibrosis, edema and iron load by quantifying the Relaxation Times of the tissue.

Before you begin

Note: IntelliSpace Portal MRI Cardiac Suite - Cardiac Mapping is a puchasbale option available from Version 8 and up. Cardiac Mapping - Motion Correction is available from Version 9 and up.

MRI Cardiac Mapping supports T1 Modified Look Locker Image datatypes (**MOLLI**) as well as T2 and T2* Multi-Echo/Gradient and Spin Echo (**GraSe**) sequences. Until Version 8, the application will only work with the derived parametric maps calculated on the MRI scanner. Calculation of parametric (delay) maps from source data is only provided in IntelliSpace Portal Version 9 and up.

Motion Correction and Re-Calculation Stage (recommended for T1 MOLLI datasets)

The additional Motion Correction (MoCo) and Re-calculate Stage provides several tools for the detection of motion within the source data as well as the ability to remove specific time points from the calculation to improve the results.

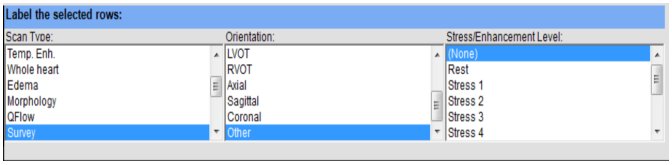
As an additional feature, **Ɛ maps / ECV maps and values** can be calculated from T1 native and enhanced series in combination with a current hematocrit factor.

Workflow

From the **Patient Directory**, select the study and click

Labeling Stage

The **Labeling** screen displays a list of the series selected in the study. Thumbnail images of each series are displayed for reference. Each series should be labeled with its **scan type** and **orientation**. If applicable, a stress level label can be applied optionally. Details of currently applied labels are displayed on the right side of the series list.



When all labels are set correctly, proceed to Stage 2 of the MR Cardiac Viewer (Viewing).

Start Analysis

In the MR Cardiac Viewing stage, select T1, T2 or T2* from the protocol list and mark the short axis (SA) series by clicking on the corresponding image. For T1 native and enhanced comparisson, mark the native and enhanced image series by holding the **Shift** key while clicking.

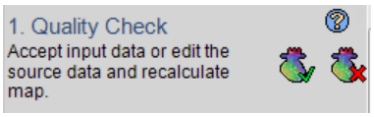
Step 3 of the task guidance should now show Mapping as the analysis method. Under 3.3, click on **Start Analysis**

Segmentation Stage

The Application will open in Stage 2 - Segmentation. The left viewport will show source data (if available) while the right viewport will display the parametric maps calculated on the MRI scanner.

Optional workflow step in IntelliSpace Portal 9 and up

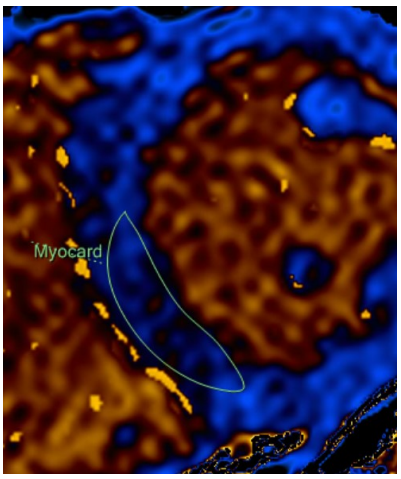
*From step 1 of the task guidance (Quality Check) select either **Accept** to work with the dataset provided by the MRI scanner or click on **Reject** to proceed to the Re-calculation Stage (also see **(Re)Calculation Stage** in the same document)*



Local Segmentation

When selecting **Local Segmentation** from the task guidance, segmentation of a specific area of interest can be done by using your prefered segmentation tools (spline or freehand contour). To proceed, select the **Draw Contour tool** and draw a ROI to a suspect area of the myocardium. Once finished, select **Myocard** from the floating window to complete segmentation.

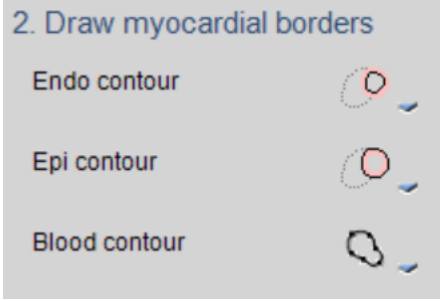
Proceed to step 4 of the task guidance **Accept Segmentation** and click on the green checkmark. This will automatically open the **Result Stage**.



Local Segmentation

Regional Segmentation

When selecting **Regional Segmentation** from the task guidance, segmentation of the entire myocardium visualized on the images can be done by drawing an endo– and epi contour. To proceed, select Draw Endo/Epi Contour from step 2 of the task guidance.



Regional Segmentation Tools

Start with the first slice, select **Endo contour** and draw a contour along the inner borders of the myocardium. Double click to finish drawing. Proceed drawing contours on the outer borders of the myocardium for **Epi contour**. Double click to finish drawing. If desired, scroll to the next slice and continue drawing as described above.

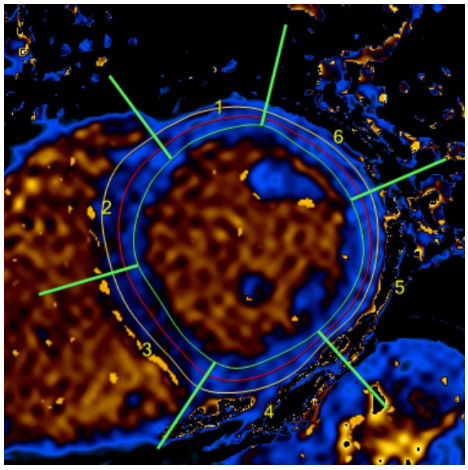
➔ ***To ensure optimal results, contours should only be drawn on parametric maps!***

Optional workflow step for Ɛ maps / ECV calculation

For the calculation of the Ɛ maps / ECV maps and values, draw an additional blood contour on one of the slices. Place the blood contour in the center of the blood pool avoiding to include the papillary muscle.

To create a **spoke wheel**, proceed with step 3 of the task guidance, selected the number of spokes needed and click on

Note that spoke wheels need to be created for each slice seperately!

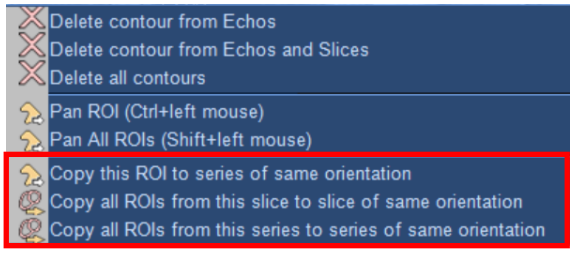


Regional Segmentation with Spoke Wheel

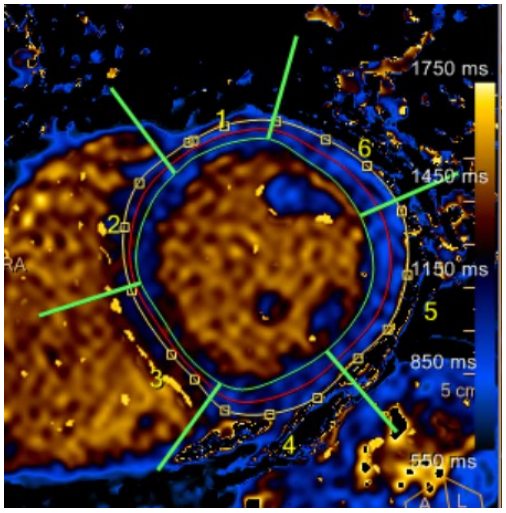
Segmentation for additional series in T1 Mapping

To propagate the drawn contours from a native series to series with contrast enhancemet as used in T1 mapping, right click on the drawn contours and select **Copy all ROI from this series to series of same orientation**. All ROI will be copied to the enhanced series.

A manual adjustment of the ROI may be necessary due to patient movement that may have happened inbetween the 2 scans. To fit all ROI to the tissue of interest simultaneously, hold she **Shift key** while moving the contours. All other ROI will be moved accordingly.



Copy all ROI simulatneously

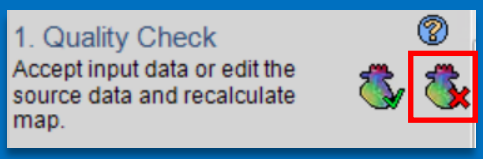


Hold the Shift key while moving a contour

Proceed to step 4 of the task guidance **Accept Segmentation** and click on the green checkmark. This will automatically bring you to the **Result Stage**.

(Re)Calculate Stage (Version 9 and higher)

To proceed to the (Re)Calculate Stage, select Reject in step 1 of the task guidance within the **2. Segmentation Stage**. The tool will automatically move back to **1. Segmentation Stage**.



The application offers several tool for motion detection

The **Measure Point Tool** helps identifying motion visual ly and will additionally show a **(Re)Claculate Graph Map** on the upper right side of the screen that can be helpful in dentifying **Outlayers** that are associated with motion.

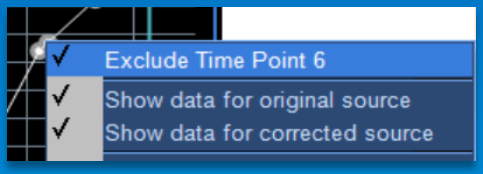
The **Draw Spline Contour lets the user draw a ROI on a specific are of the myocardium that shows an avera- ge inversion delay time on both the Inline and ISP map.**

The **Grid Tool** adds a grid overlay to the parametric maps to visually detect motion. The grid size can optio- nally be adjusted by using the **Grid Spacing Icon** next to the **Grid Tool**

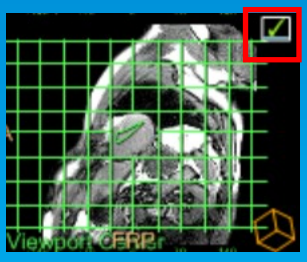
How to exclude time points from the calculation

Time points can either be deleted by right clicking on the (Re) Calculation Graph on the upper right side of the screen or by un- checking a specific time point on the source data.

To exclude a specific time point from the **graph**, right click on the corresponding time point and select **Exclude Time Point**.



To exclude a specific time point from the **source data**, uncheck the box on the upper right part of the image.

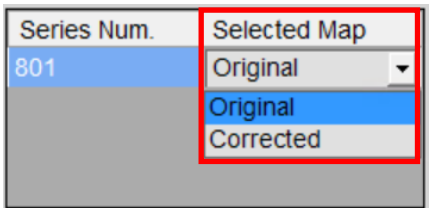


Run Motion Correction

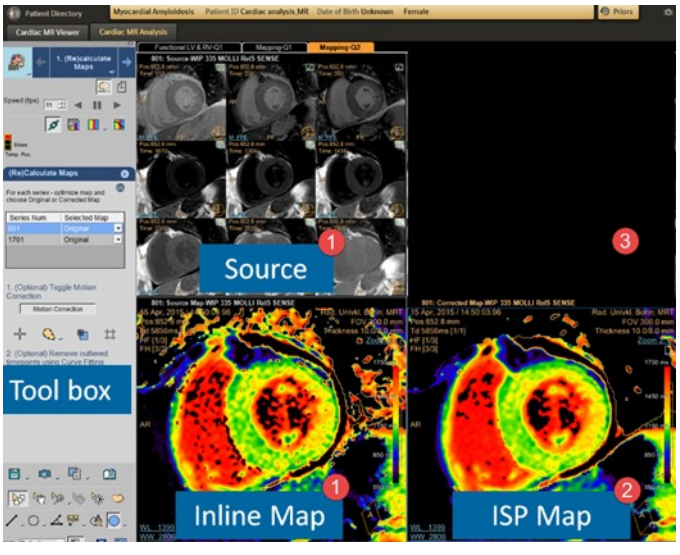
To run Motion Correction, click the **Motion Correction Button** in step 1 of the task guidance.

A new parametric map will be calculated and displayed on the lower right viewport while the inline map will still be displayed on the lower left part of the screen (see image below).

To proceed to the **Segmentation Stage**, select either the original or the recalculated map for segmentation by selecting the desired map from the drop-down menu of the task guidance.



Proceed to **2. Segmentation Stage** on top of the task guidance and follow the workflow described on the pre- vious page.



Koninklijke Philips, 2017

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