HIGH DENSITY CARTOGRAPHY MAPPING WITH CONFIDENCE (Carto3 –Biosense)

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A.D.R.I.S
ASSOCIATION DE RYTHMOLOGIE INTERVENTIONNELLE & STIMULATION

Multi Electrode Mapping (MEM)

- This simultaneous point acquisition from multiple electrodes appears a step forward in the mapping process
- but manual annotation of all of the points can be challenging
- Physicians often feel that mapping with just a single mapping channel is easier.
- The **CONFIDENSE module** is a new process of collecting points, with the ability to automatically annotate the points and review the map

Electro-Anatomical (EA) Mapping

Important elements of mapping:

✓*Quickly* create a geometry of the chamber of interest

✓*Simultaneously collect* data points with relevant information *(activation time, voltage)*

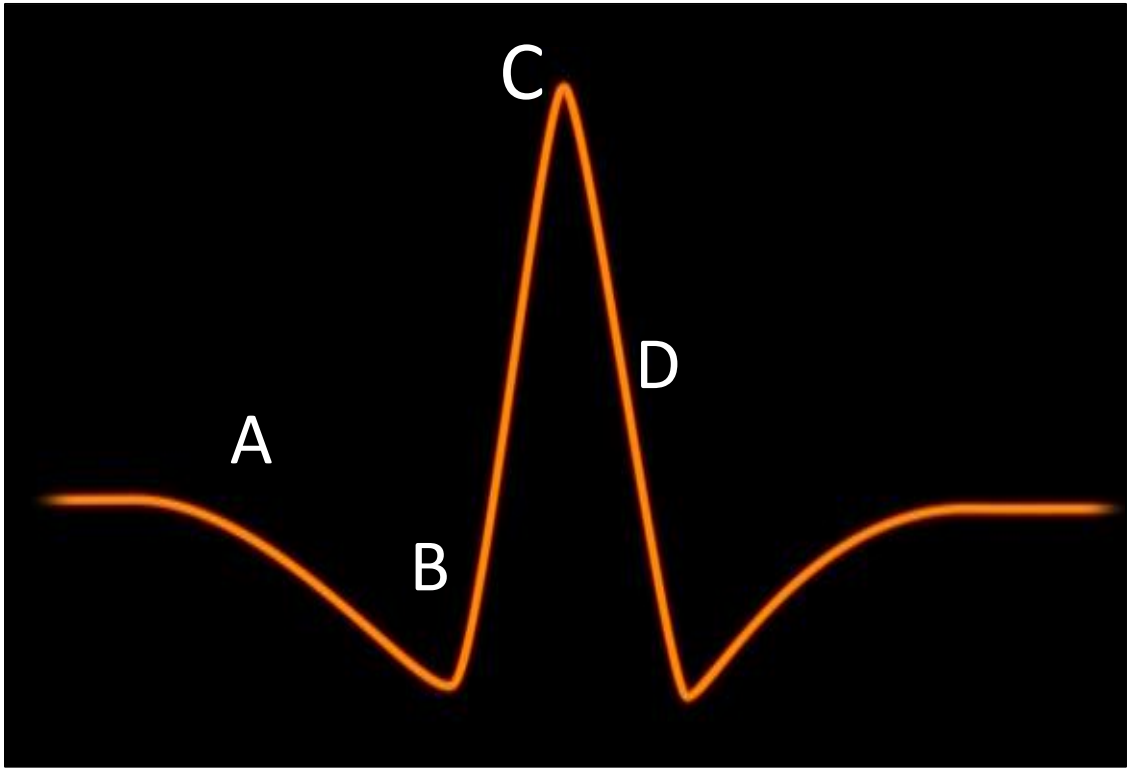
✓Ensure point data is *acquired at appropriate time* *(was the catheter stable and touching the tissue when the point was collected?)*

➢Get a *consistent and accurate annotation*

➢Easy to *interpret* the map

Signal annotation

- When creating an Activation map, where would you annotate this signal?
- What is accurate ?



A – Onset

B – First negative deflection

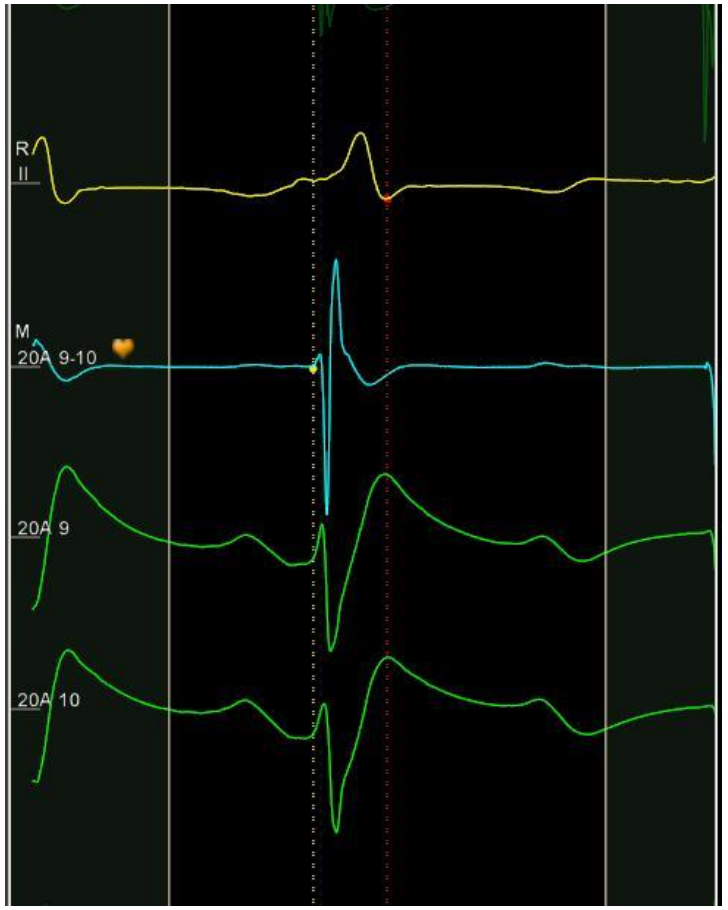
C – Maximum amplitude

D – Most negative dV/dT

Bipolar Signal : Onset Annotation

- Intuitive.
- Proved useful for Focal Tachycardia

- <u>Requires manual editing for each and every point</u>
- Doesn't necessarily reflect the true moment of activation
- **Annotation varies based on catheter orientation**
- Far field residuals effect

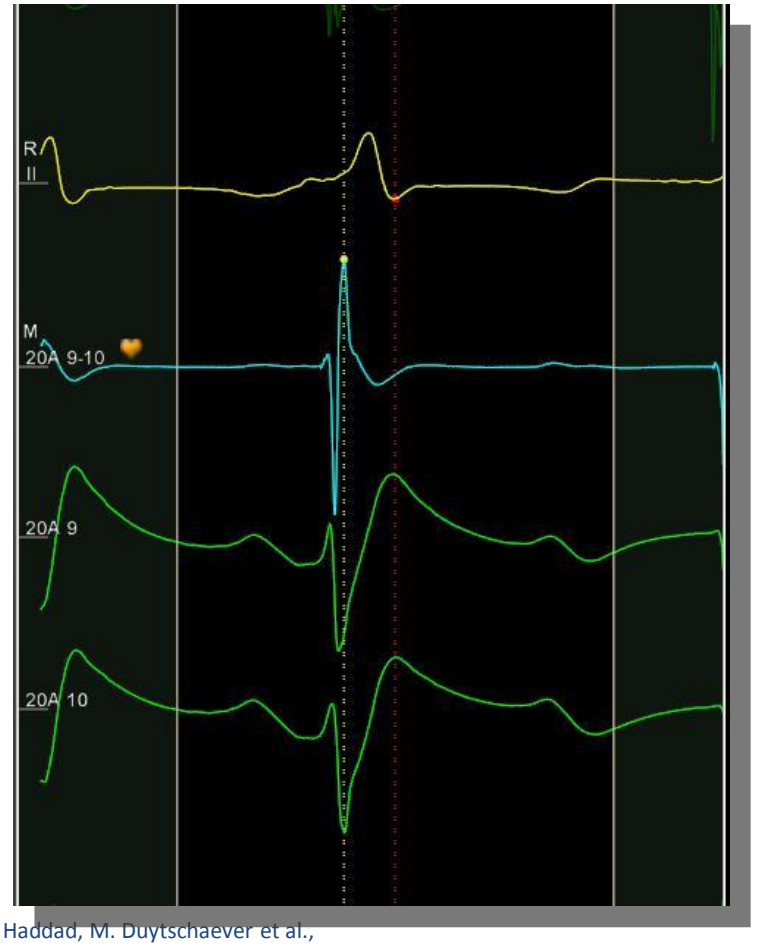


M. El Haddad, M. Duytschaever et al.,
Algorithmic detection of the beginning and end of bipolar electrograms: Implications for novel methods to assess local activation time during atrial tachycardia, Biomed. Signal Process. Control (2012)

Bipolar Signal - Max Amplitude

- Intuitive and unambiguous.
- Easy to identify by the user.

- Signal of interest can be beneath either the distal or proximal electrodes.
- Doesn't necessarily reflect the true moment of activation
- Difficult for double potentials



M. El Haddad, M. Duytschaever et al.,
Algorithmic detection of the beginning and end of bipolar electrograms: Implications for novel methods to assess local activation time during atrial tachycardia, Biomed. Signal Process. Control (2012)

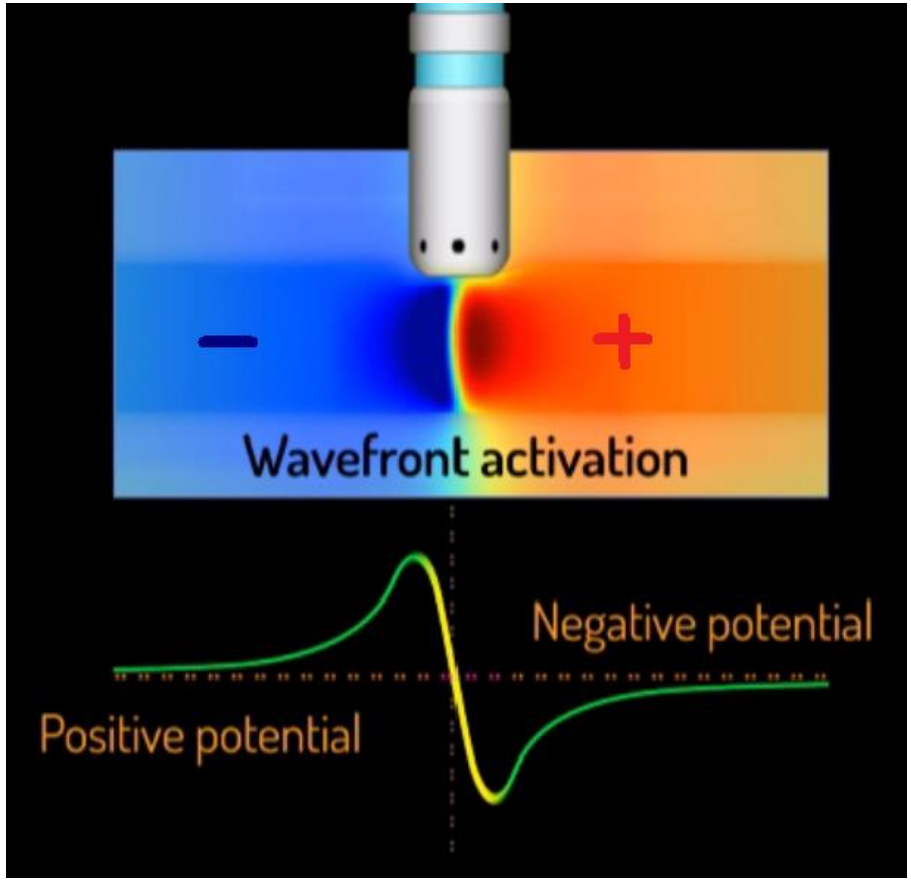
Unipolar Signal: Maximum negative slope

In uniformly conducting tissue,

maximum negative slope

coincides with the arrival of the **depolarization wavefront**

beneath the electrode.

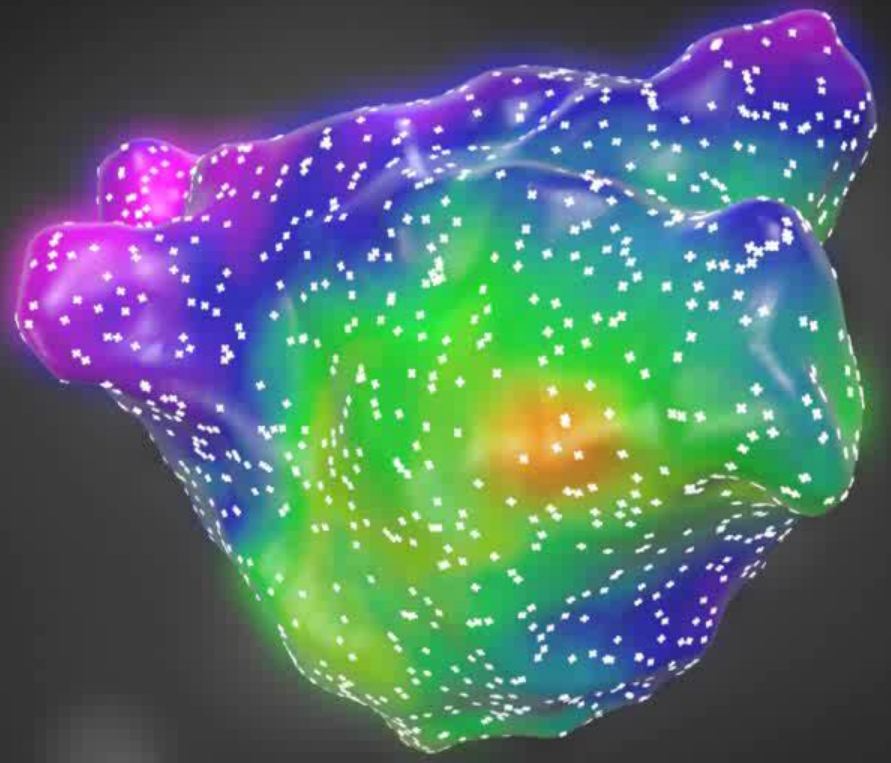


Far Field potentials make unipolar algorithm detection alone impossible

Recording Techniques for Clinical Electrophysiology, William G. Stevenson, M.D., Kyoko Soejima, M.D.
J Cardiovasc Electrophysiol. 2005;16(9):1017-1022.

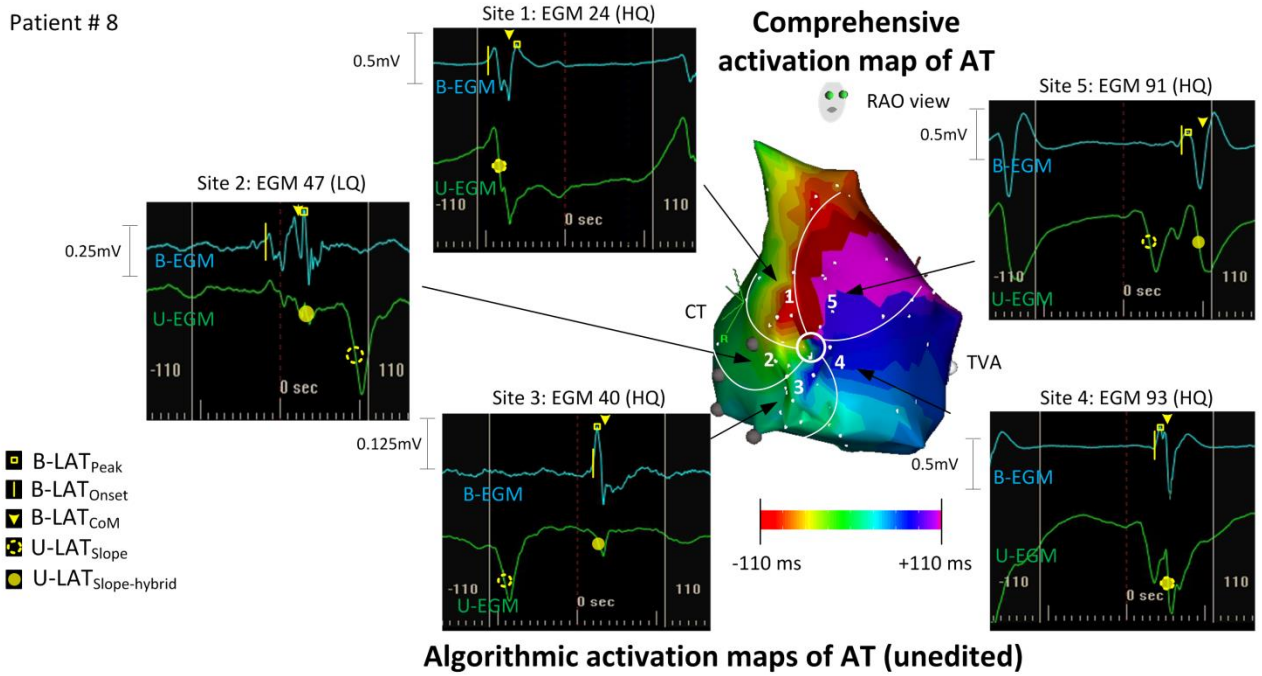
CONFIDENSE™

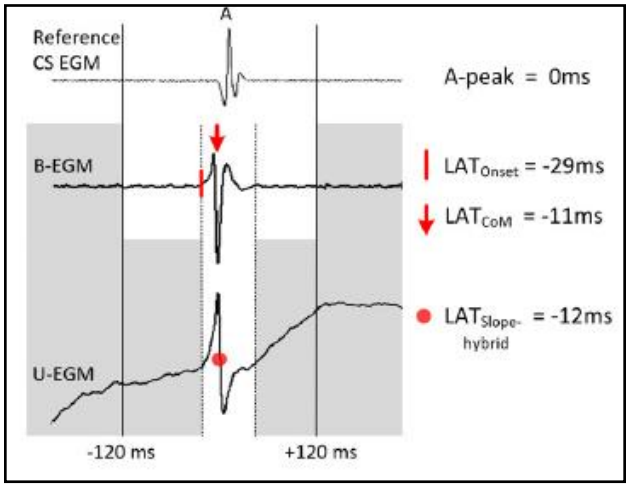
Module



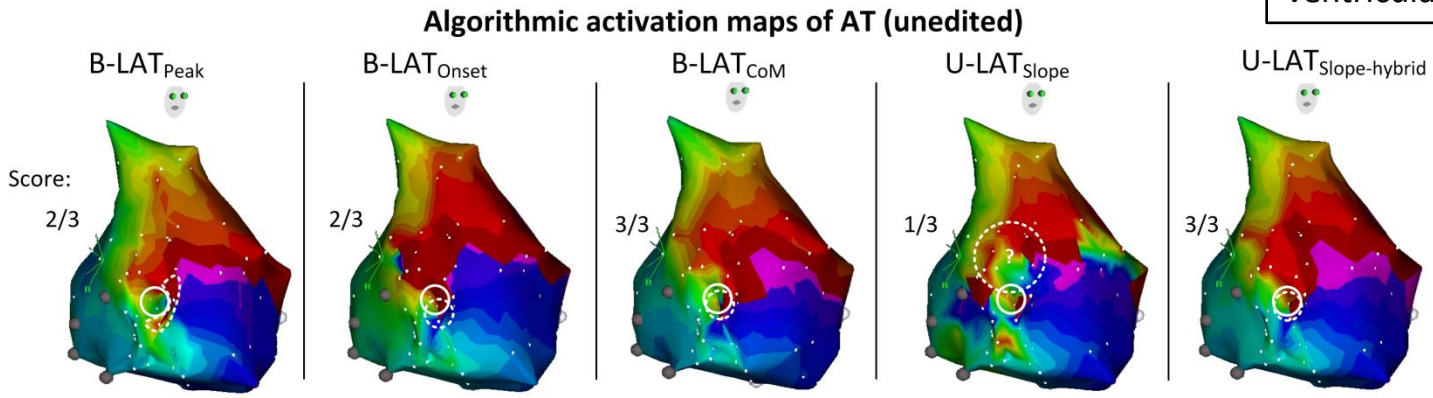
WaveFront Annotation

- Need for an accurate automatic annotation
- Comparison of available methods

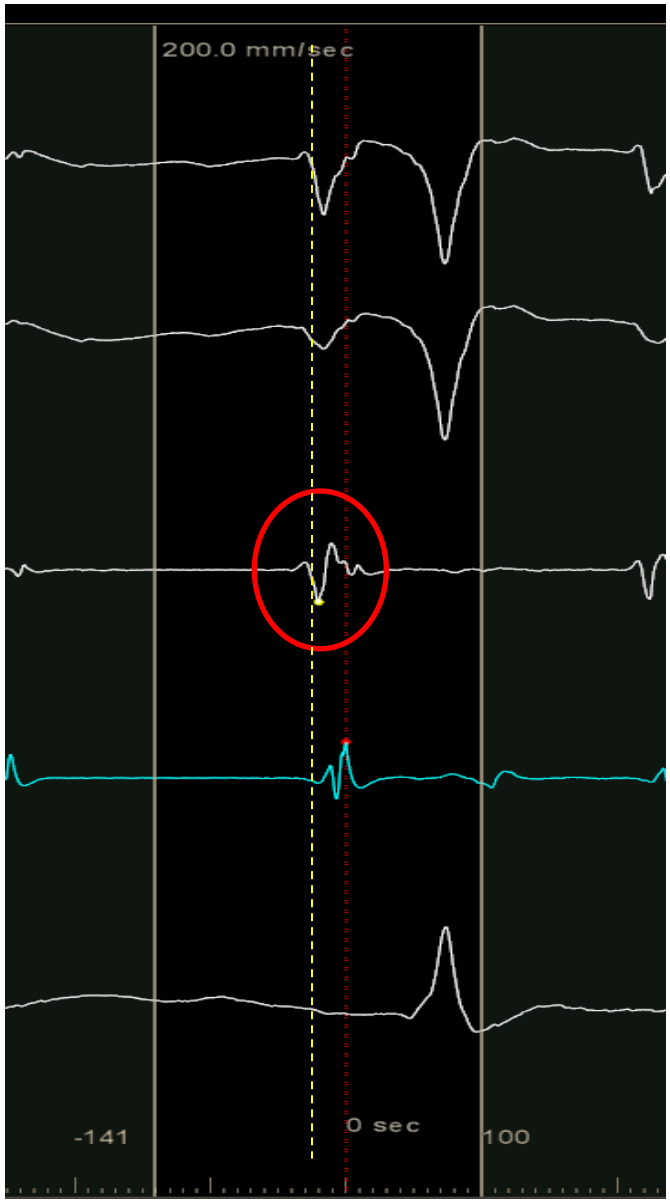




M. El Haddad, M. Duytschaever et al., Novel algorithmic methods to assess local activation time in atrial and ventricular tachycardia. Circ AE 2014

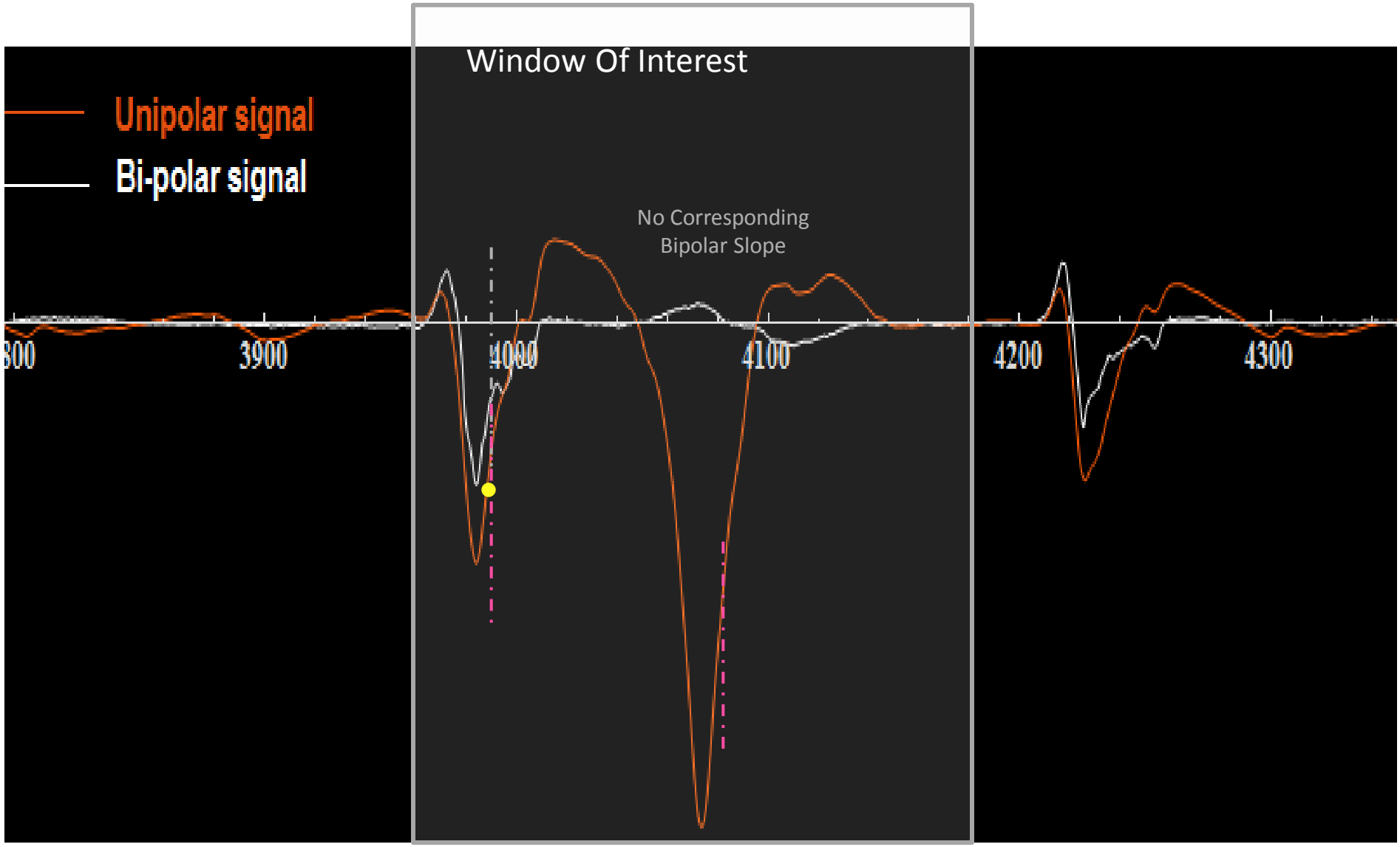


Wavefront Annotation

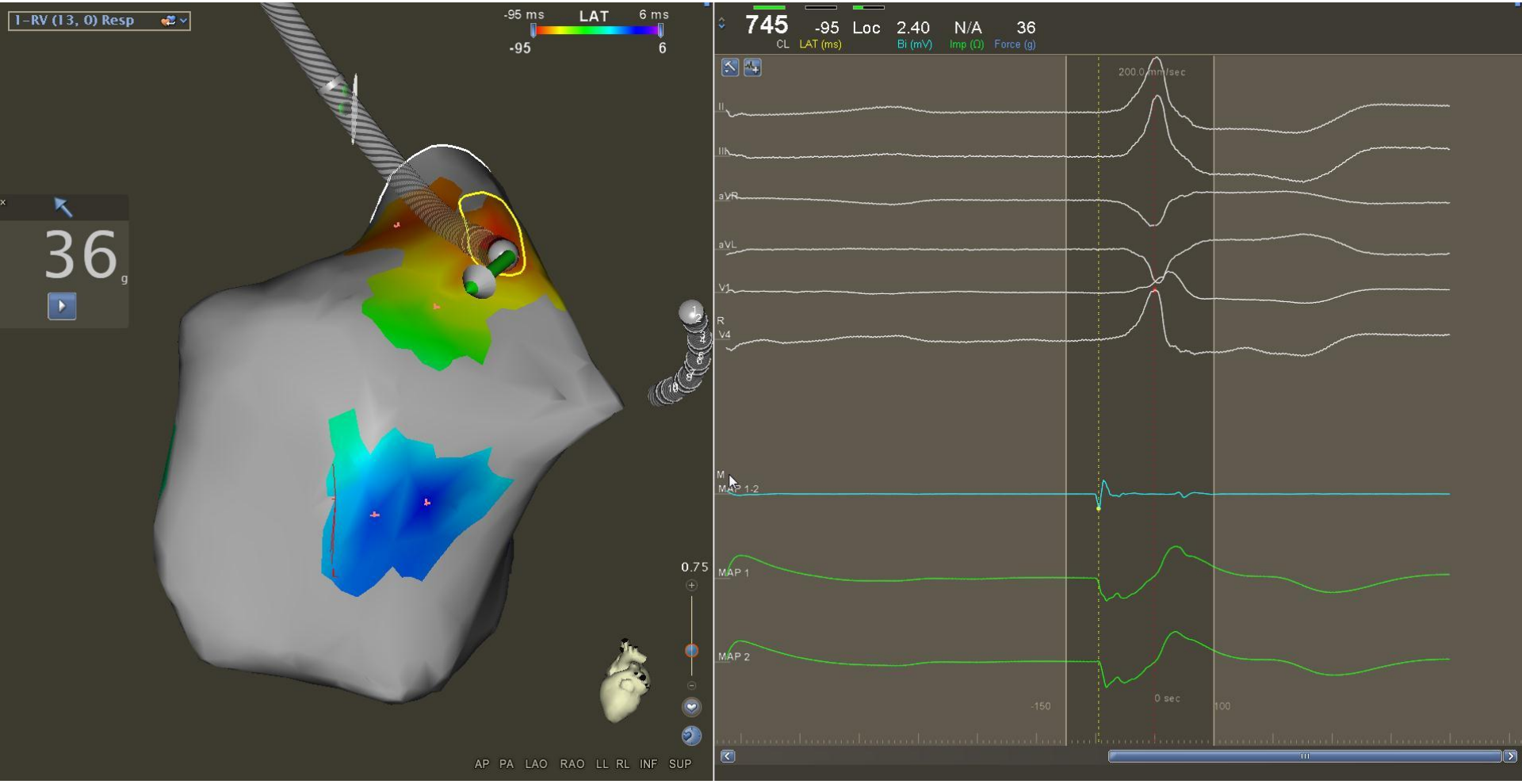


- The system uses the **maximum negative slope** of the **unipolar distal signal** to set the **timing** of the Mapping annotation.
- Map **annotation is displayed** on the corresponding **bipolar signal**

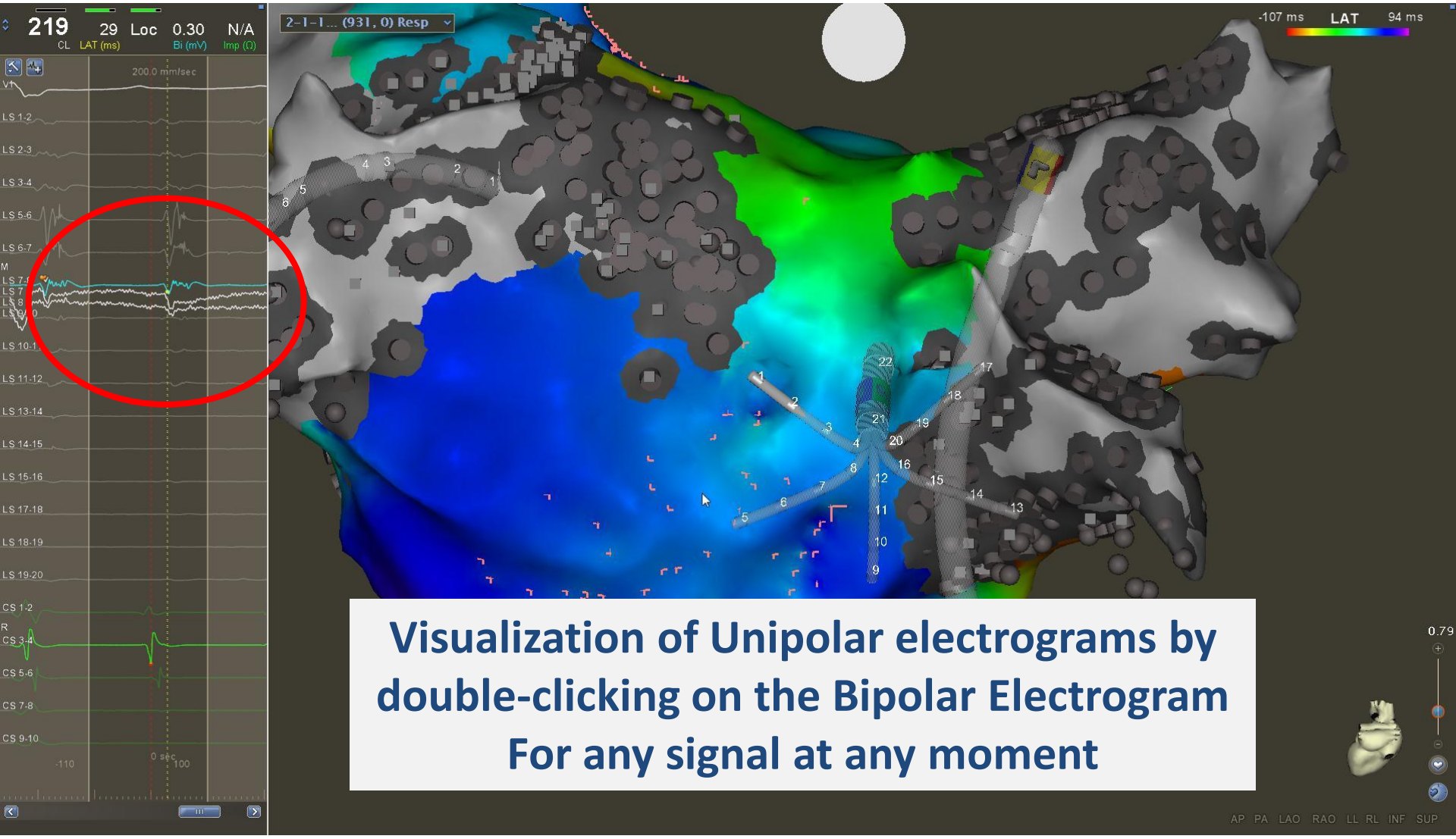
Wavefront Annotation:
Analysing both Unipolar and Bipolar Signals



WaveFront Annotation



WaveFront Annotation



Visualization of Unipolar electrograms by double-clicking on the Bipolar Electrogram For any signal at any moment

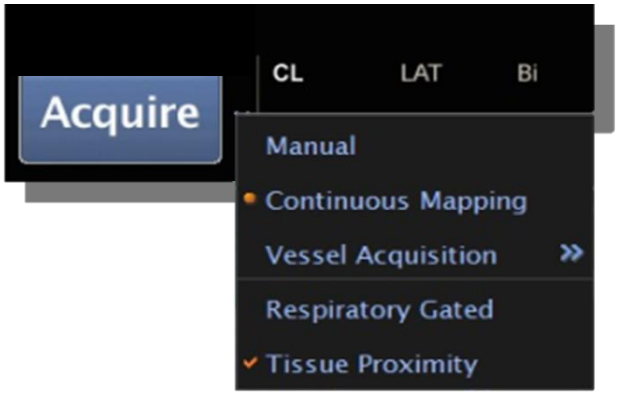
Continuous Mapping

Set window of interest

Activate continuous mapping

1. Set the mapping filters

2. Start automatic points acquisition



Continuous Mapping can collect:

- Up to **6000 points per map**
- Up to **13 000 points per study**

Not Available

- During ablation
- *During* CFAE mapping

Continuous Mapping: Filters

Cycle Length -> Only acquiring points with a consistent cycle length

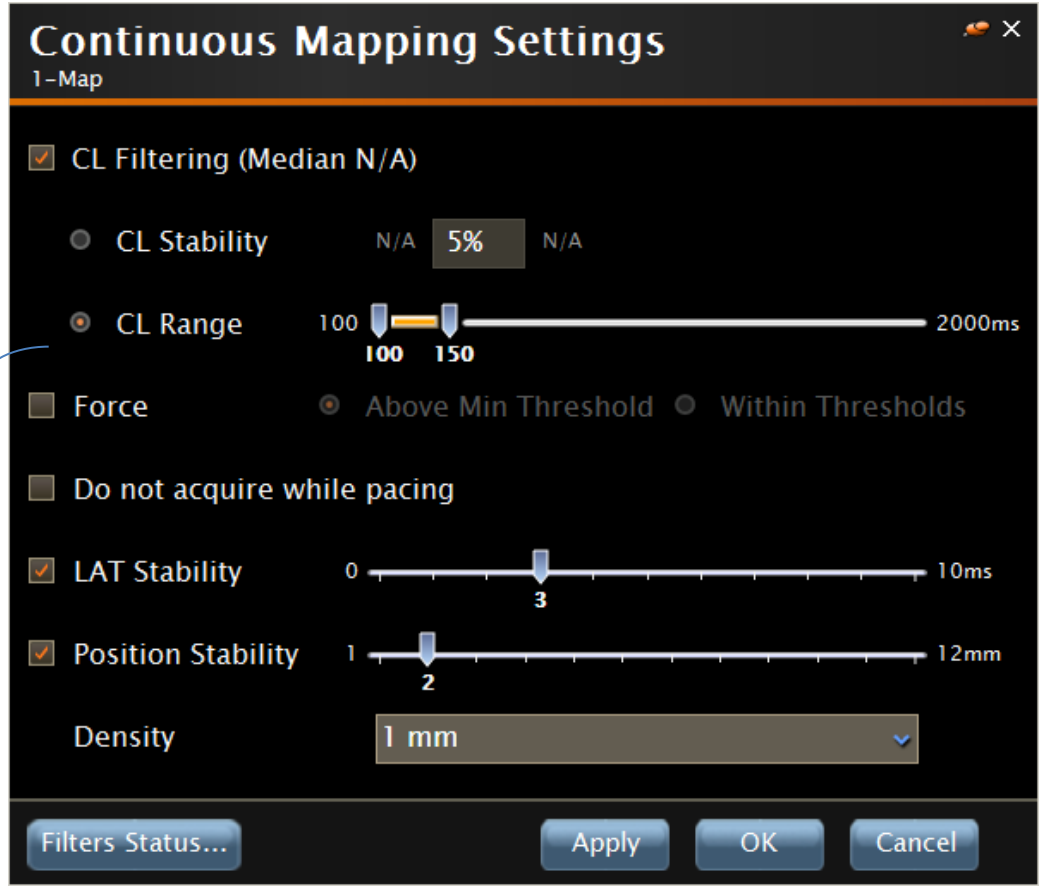
Force -> Ensuring the catheter is in contact at the time of point collection

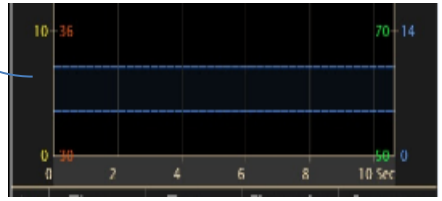
Catheter stability -> Acquiring points when the catheter location is stable

- LAT stability
- Position stability

Density -> Minimises acquisition of points when the catheter is not being moved

Tissue proximity indicator (TPI)



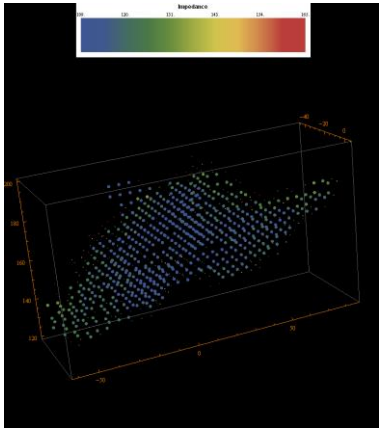


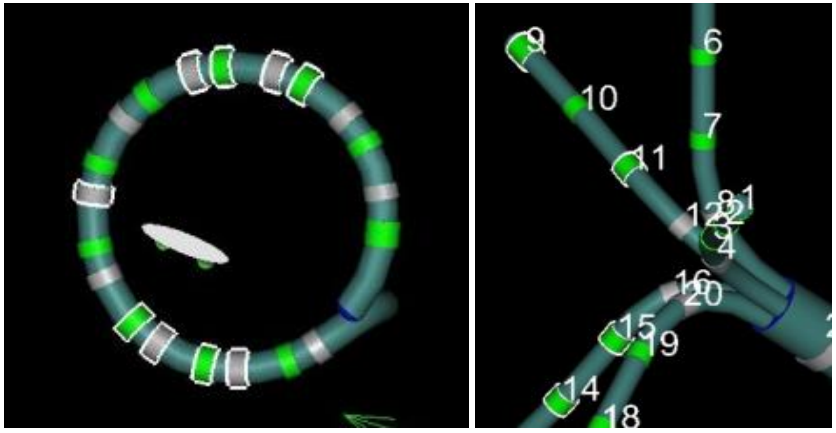
Click here for more details on Continuous Mapping filters

Continuous Mapping

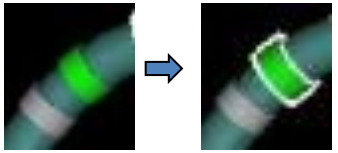
Tissue Proximity Indicator (TPI)

- **Impedance measurements to determine the electrode proximity to cardiac tissue**
- **Contact Indication, non-contact, Unknown**
- **Compatible**
  - **Lasso® NAV (10/20 poles)**
  - **Pentaray ® NAV**
- **Non available During Ablation**

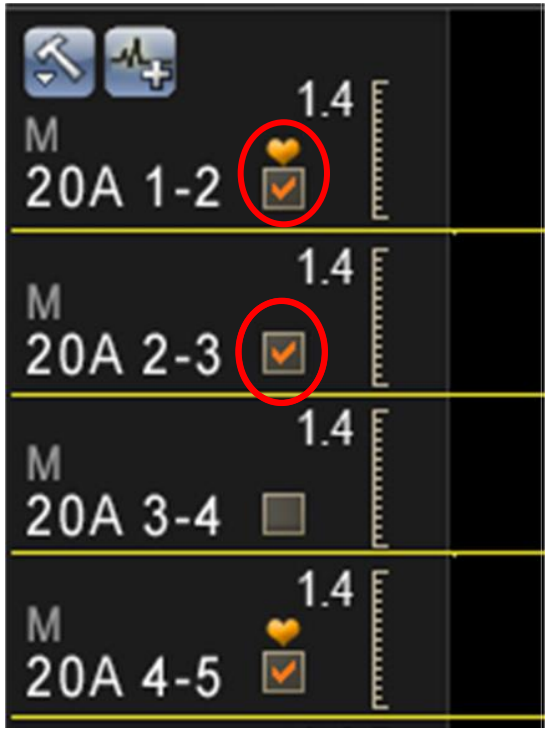




Proximity is indicated: white frame around the individual electrodes



Tissue proximity filter for MEM



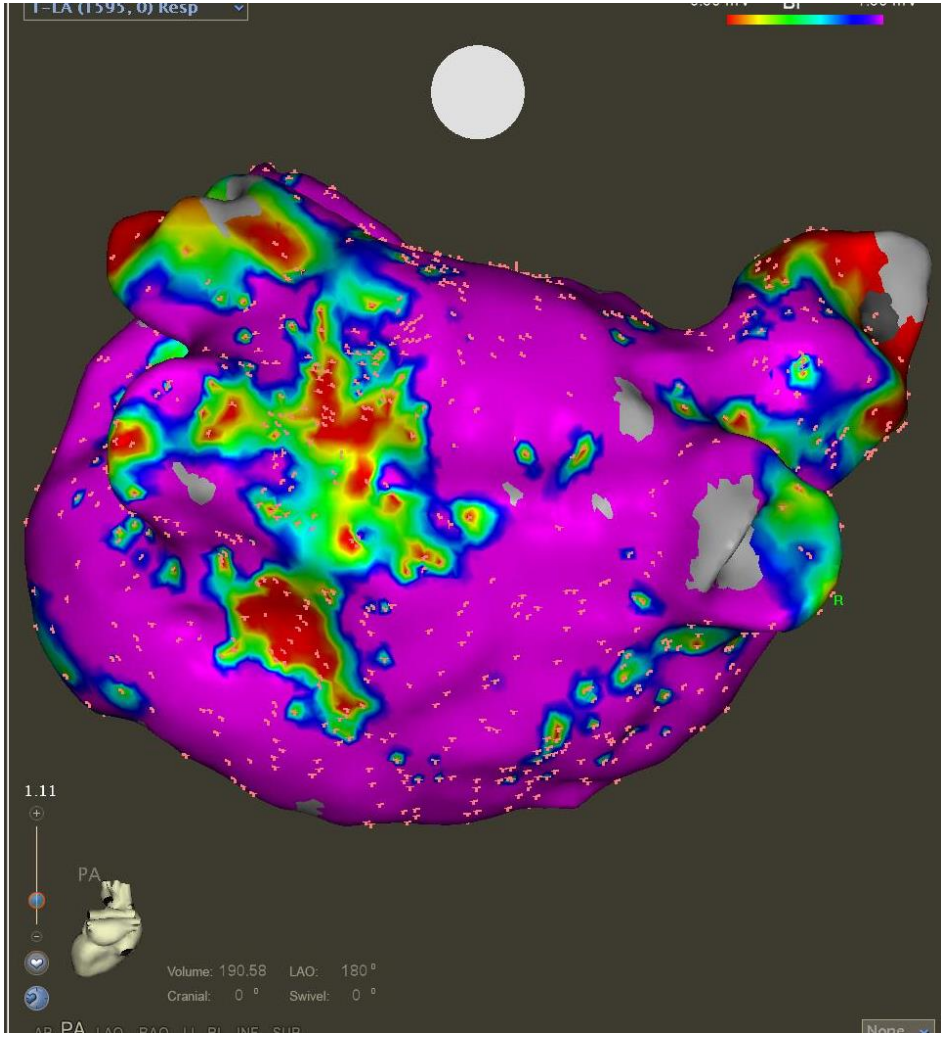
Selected Point Viewer

With proximity filter **ON** :

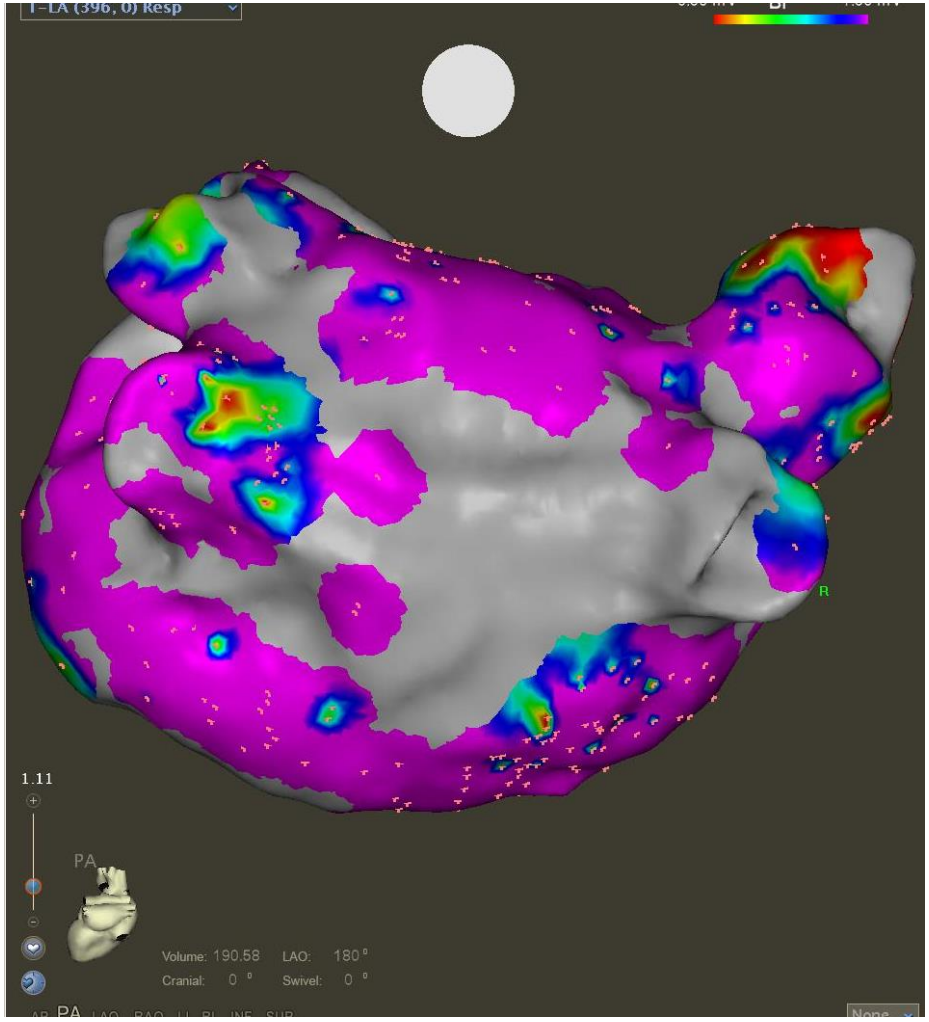
the system will:

- **Automatically accept** points found to be in close proximity to the tissue
- **Automatically reject** points not found to be in close proximity to the tissue

Voltage maps performed with Lasso (using TPI function or not)



TPI -



TPI +

Continuous Mapping

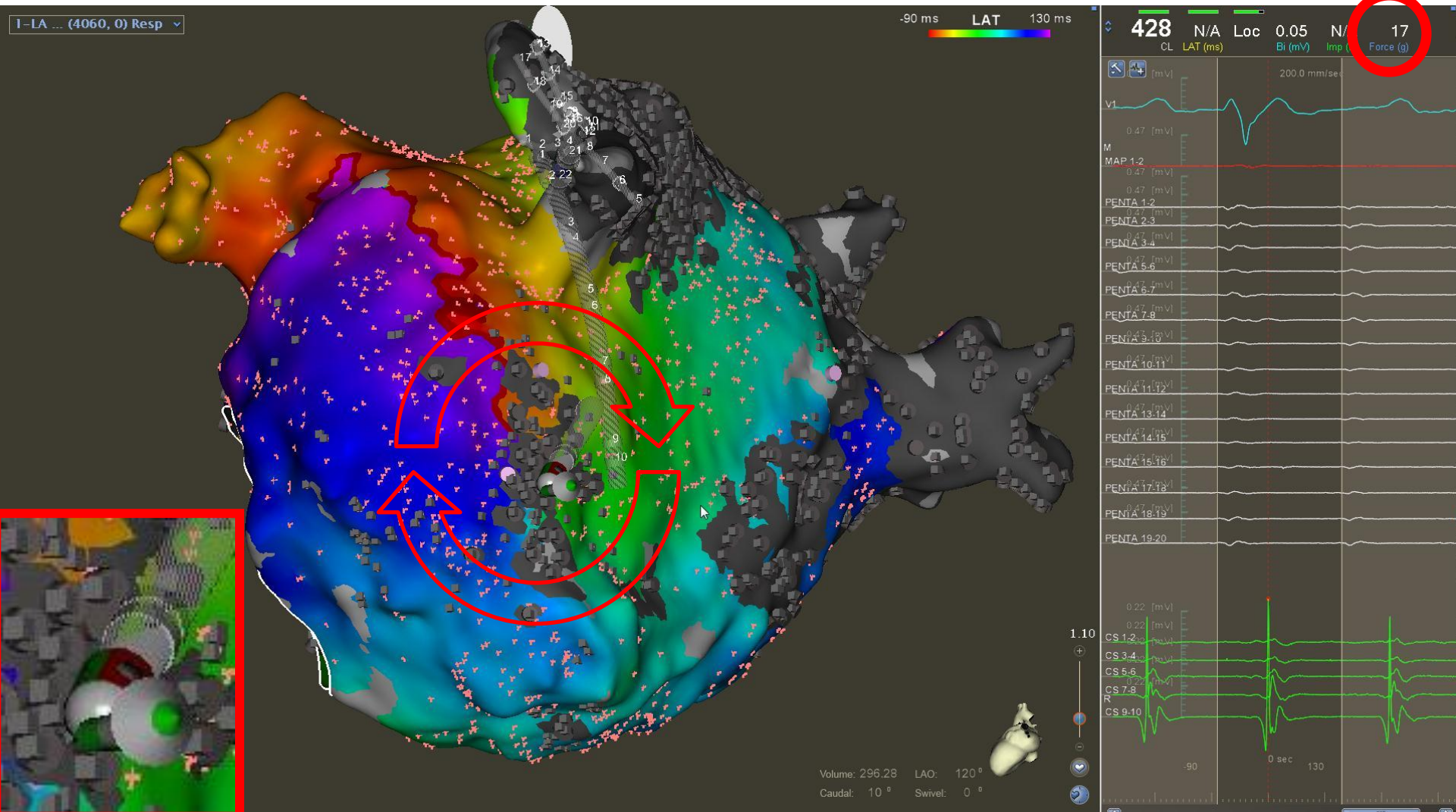
- **Available with all NAV Catheters**
  - **Lasso® 10 and 20 poles**
  - **Pentaray®**
  - **Ablation Catheters**

Pentaray

SmartTouch SF

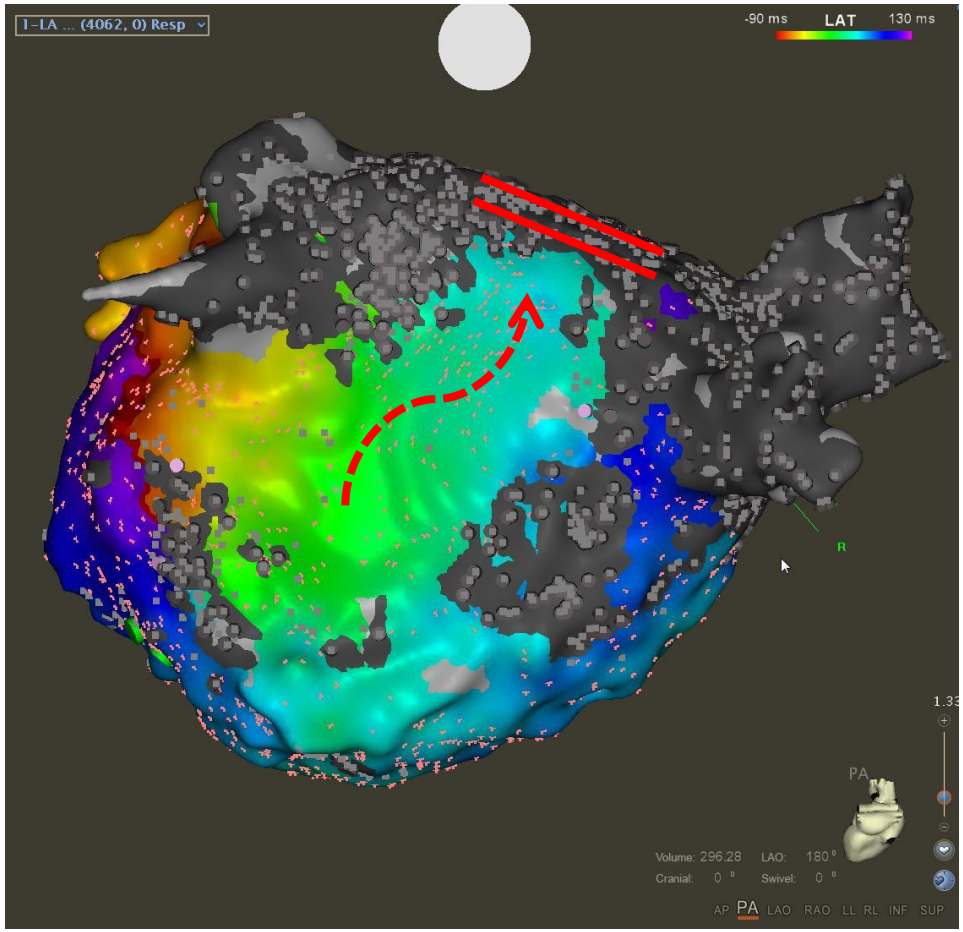
Continuous Mapping

- Contact force integration - SmartTouch

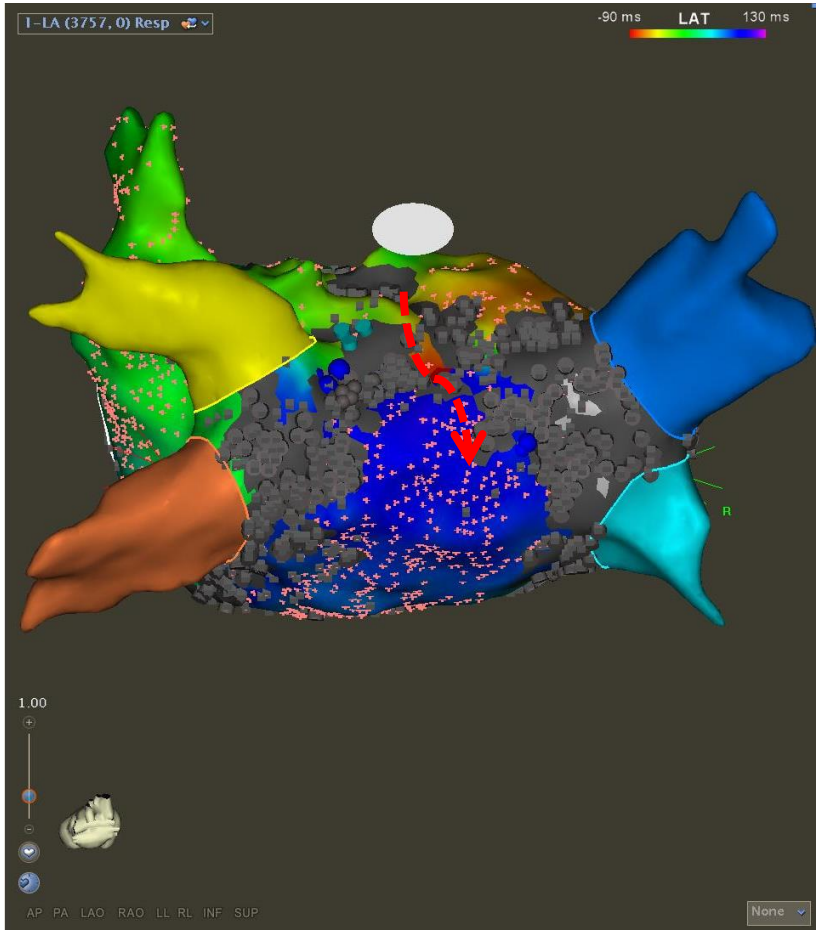


Continuous Mapping

- **Better identification of scar**



Blocked roof line



Non-Blocked roof line

Electro-Anatomical (EA) Mapping

Important elements of mapping:

✓*Quickly* create an anatomical geometry of the chamber of interest

✓*Simultaneously collect* data points with relevant information *(activation time, voltage)*

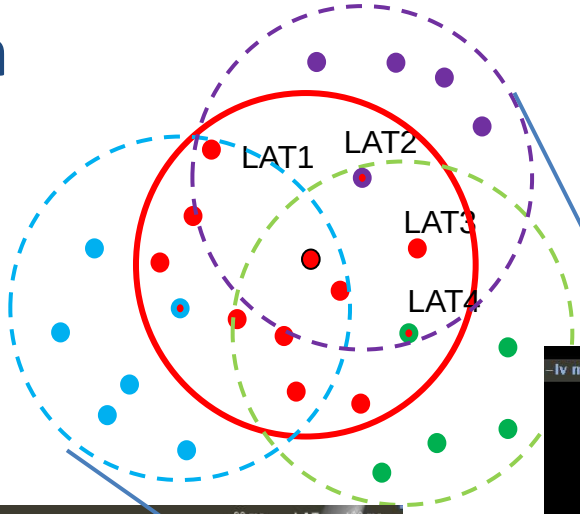
✓Ensure point data is *acquired at appropriate time* – *was the catheter stable and touching the tissue when the point was collected?*

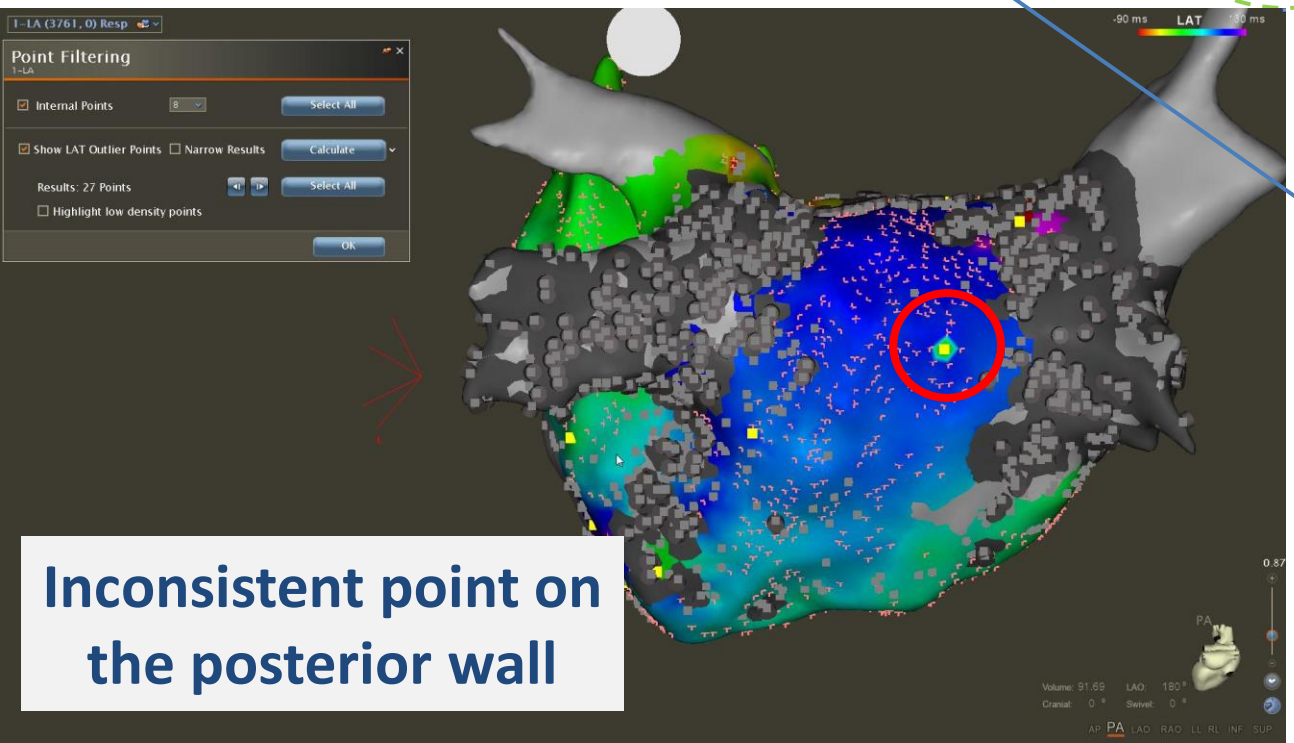
✓Maintain a *consistent and accurate annotation*

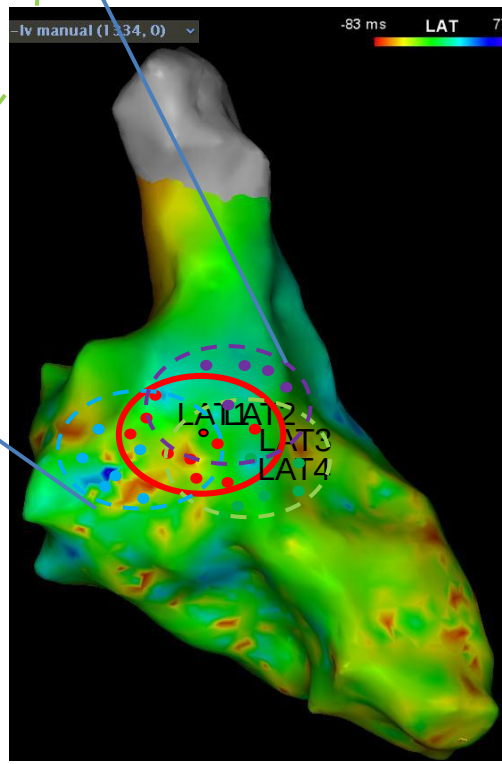
➢**Easy to *interpret* the map**

Map Consistency

- **Automatic identification of inconsistent points**
  - **Isolated points**
  - **Surrounding activations**







Inconsistent point on the posterior wall

Indications

- Left Flutters +++
- Atrial Tachycardias ++
- Line validations +++
- Ventricular Tachycardias
  - Substrate mapping +
  - VT mapping ++

Clinical EP Case

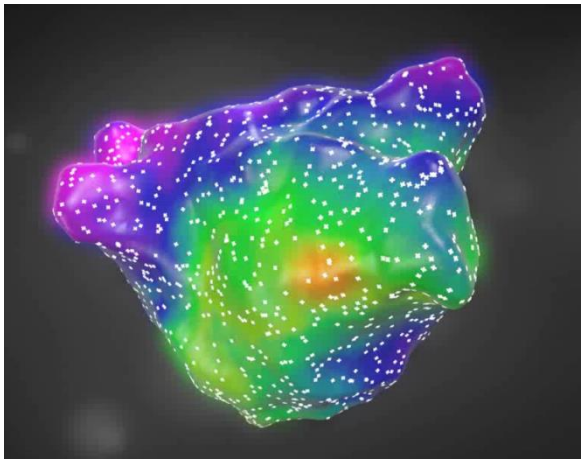
Patient

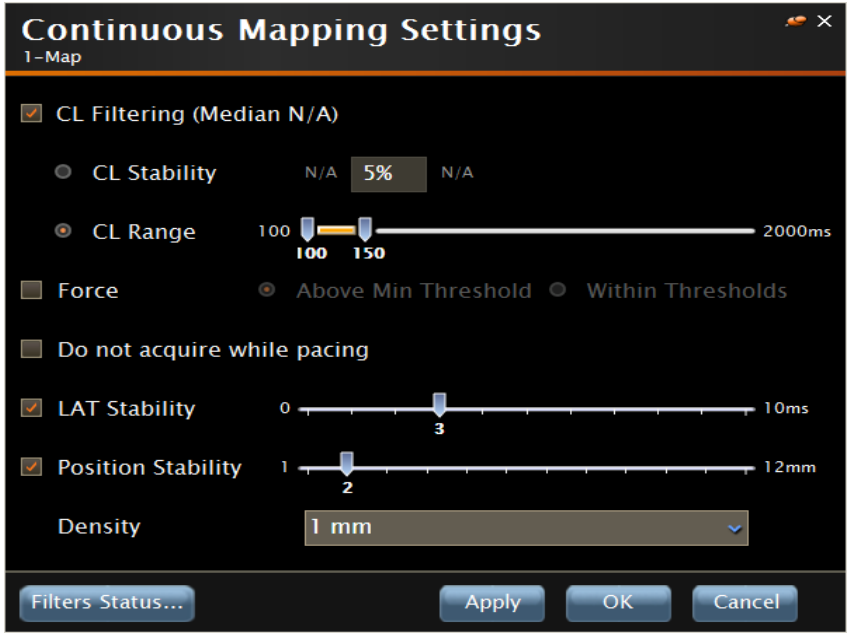
- Woman 58 yo
- 2001 Late surgery ASD
- 2012 Paroxysmal AF
- 06/2014 Persistent Atypical Flutter
  - EPS in 07/2014 – Left Atypical Flutter
  - Ablation in 12/2014 (Hansen Robotic)
    - PVs isolation
    - Roof line for Roof dependent flutter
    - Unstable septal Flutter - Difficult mapping
- 03/2015 redux ablation for A Flutter recurrence

Admission EKG

Continuous mapping - filters

- CL Stability 5%
- LAT Stability 5ms
- Position Stability 2 mm
- Density 1mm
- Scar 0,05mV





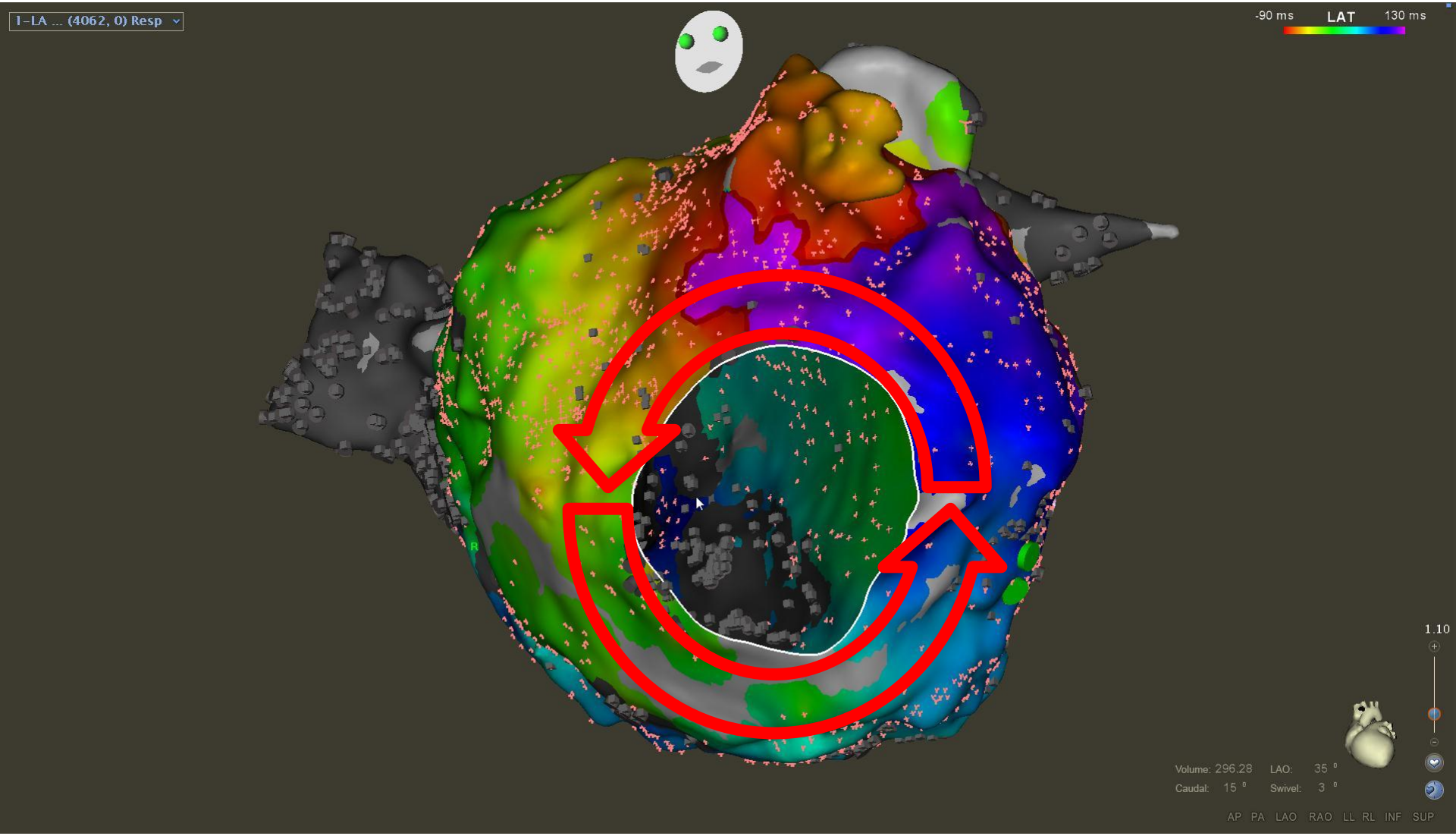
Continuous mapping – Pentaray

- 18min 3975pts

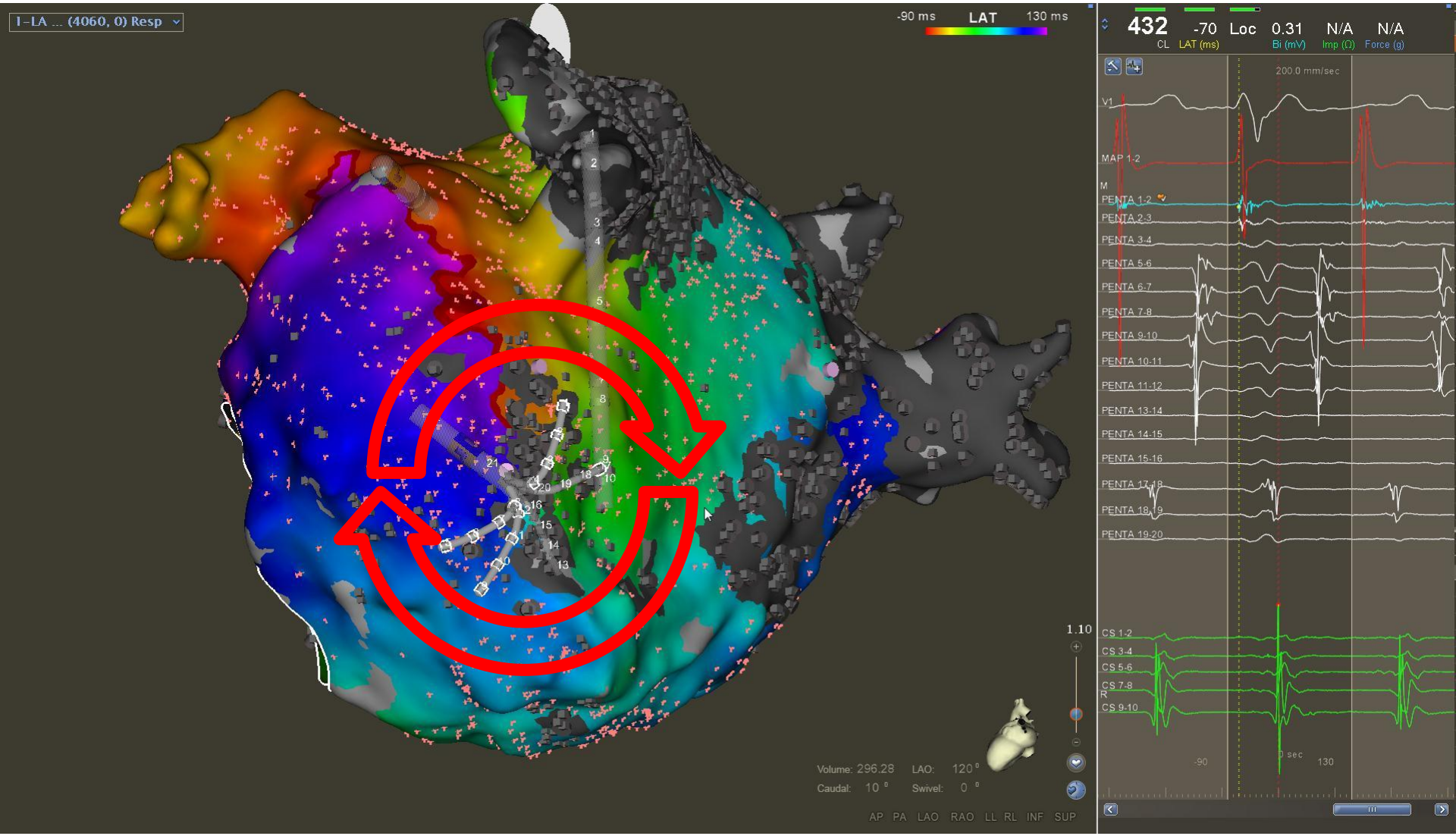
- LA volume = 300 ml

Scar identification – SmartTouch SF

LAT map – Counter-Clockwise Perimitral loop



LAT map – Clockwise Periscar loop

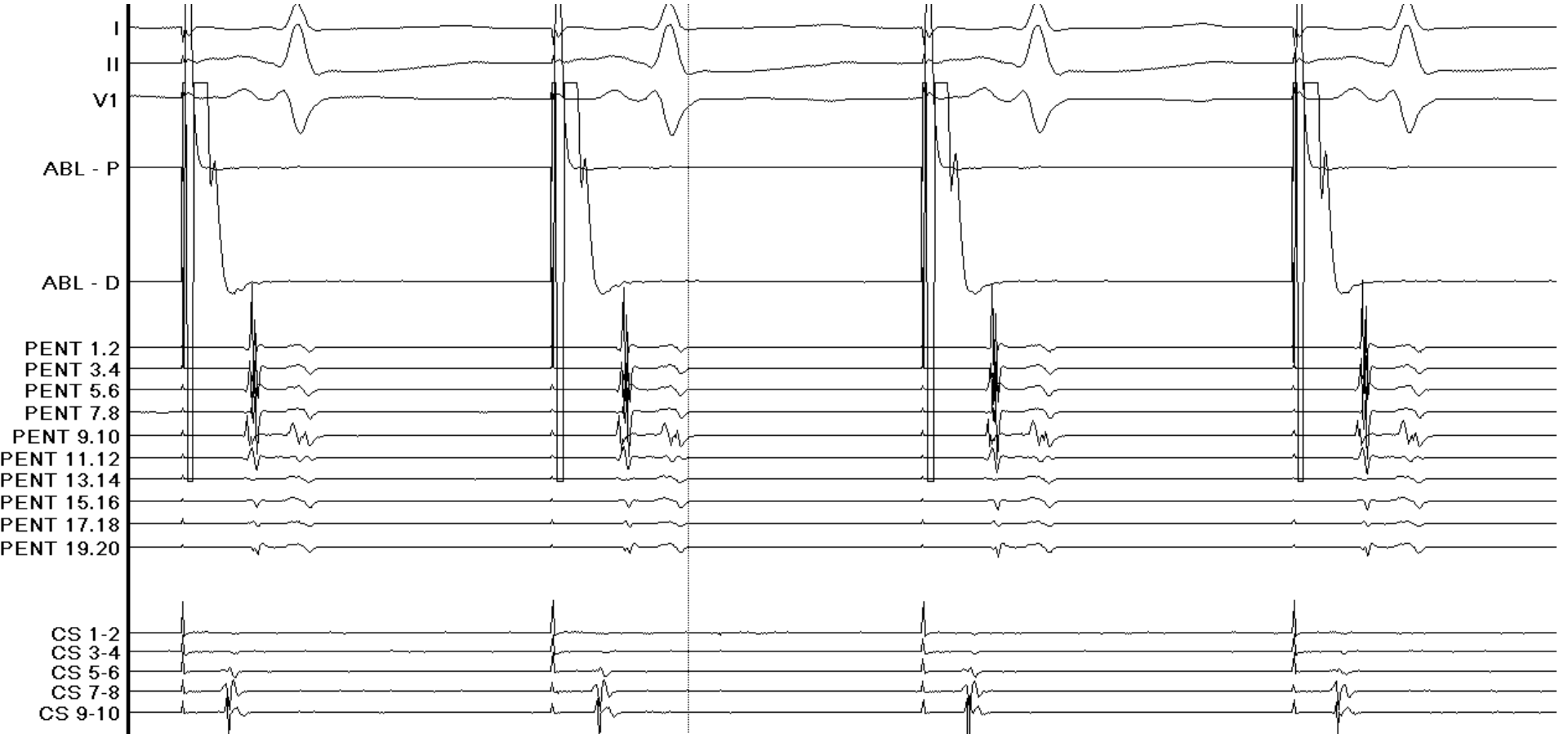


Propagation map – Figure 8 dual loop flutter

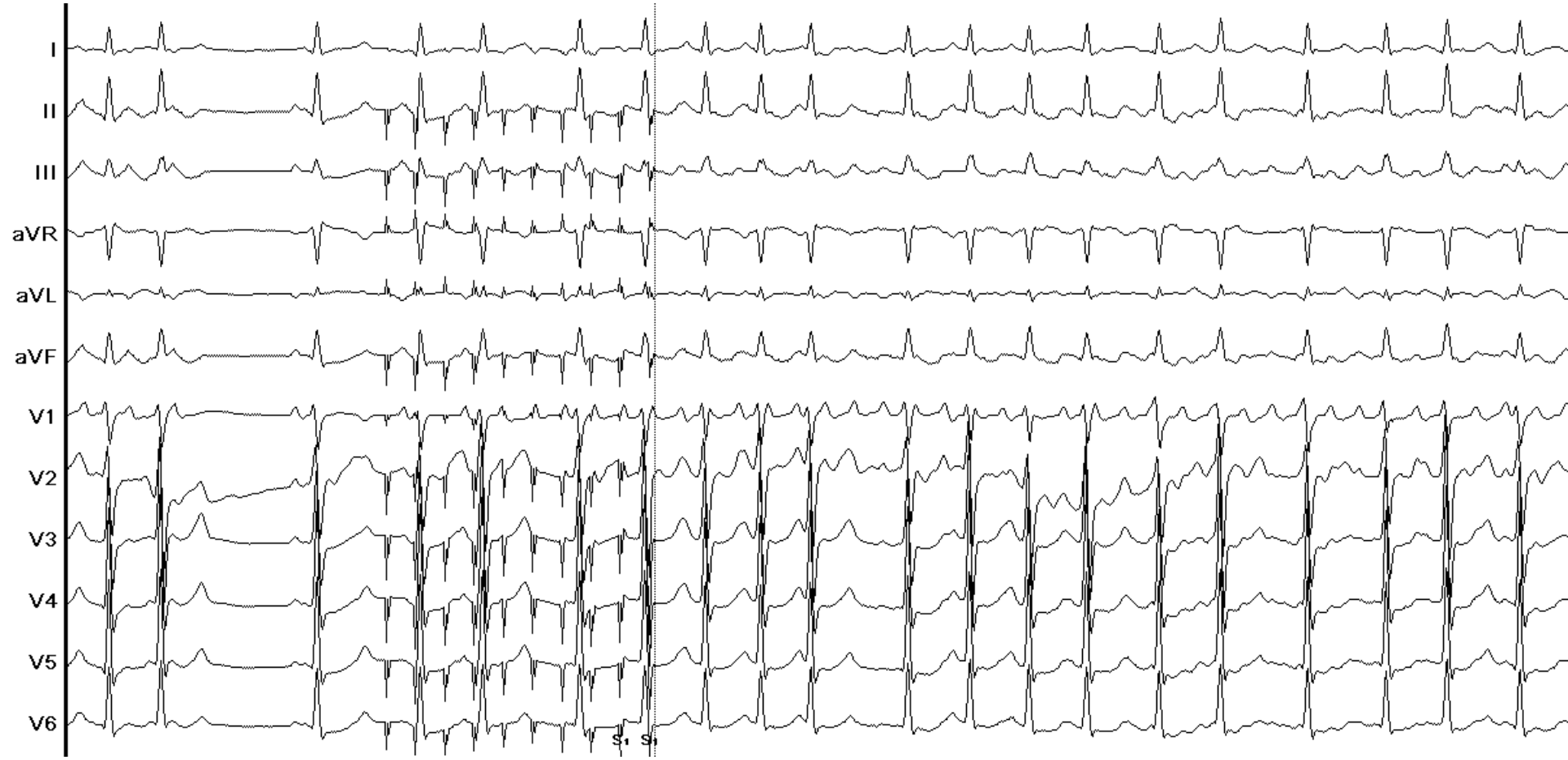
Ablation line - Mitral valve / Mitral scar

Return to Sinus

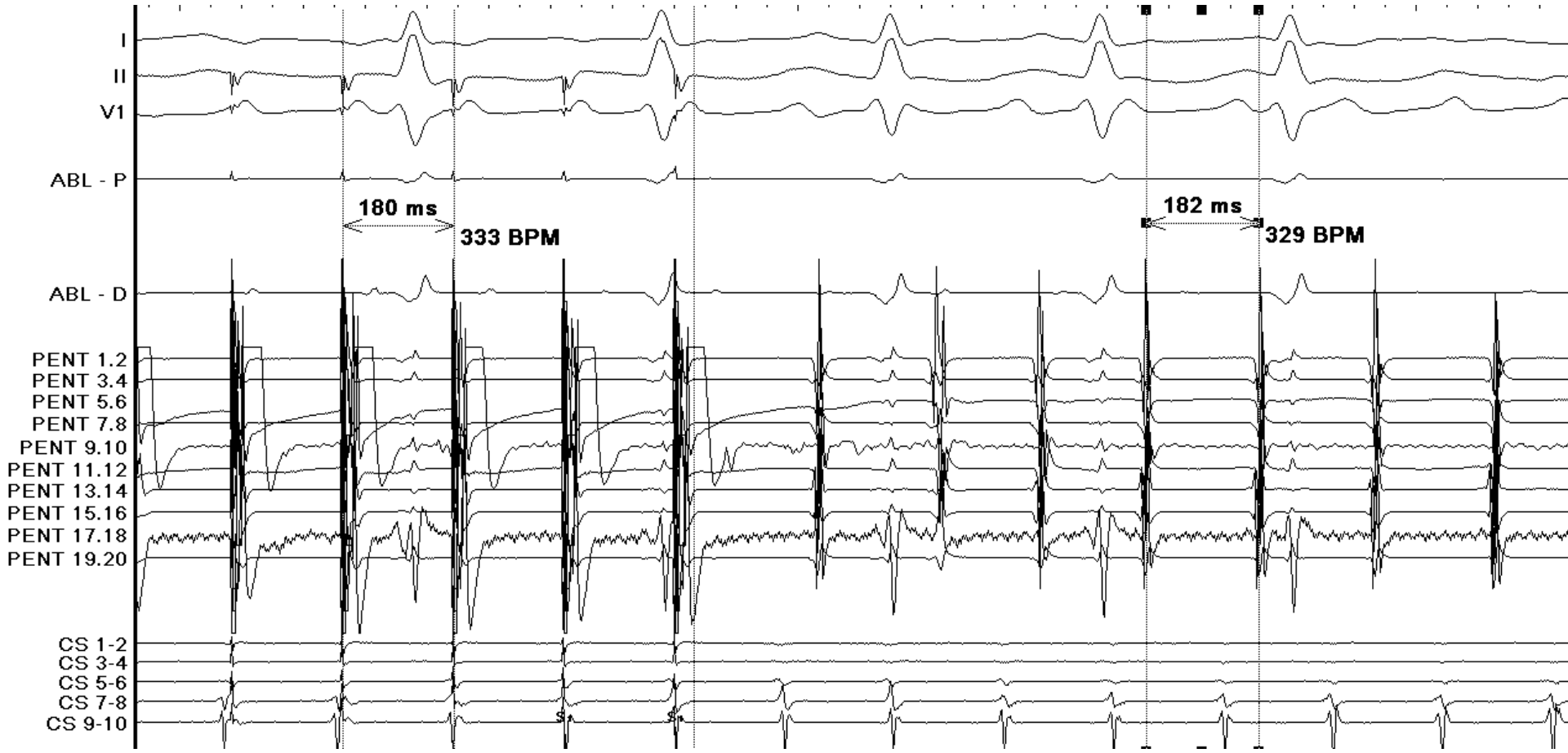
Mitral Isthmus Block



Burst – Fast Atrial Flutter

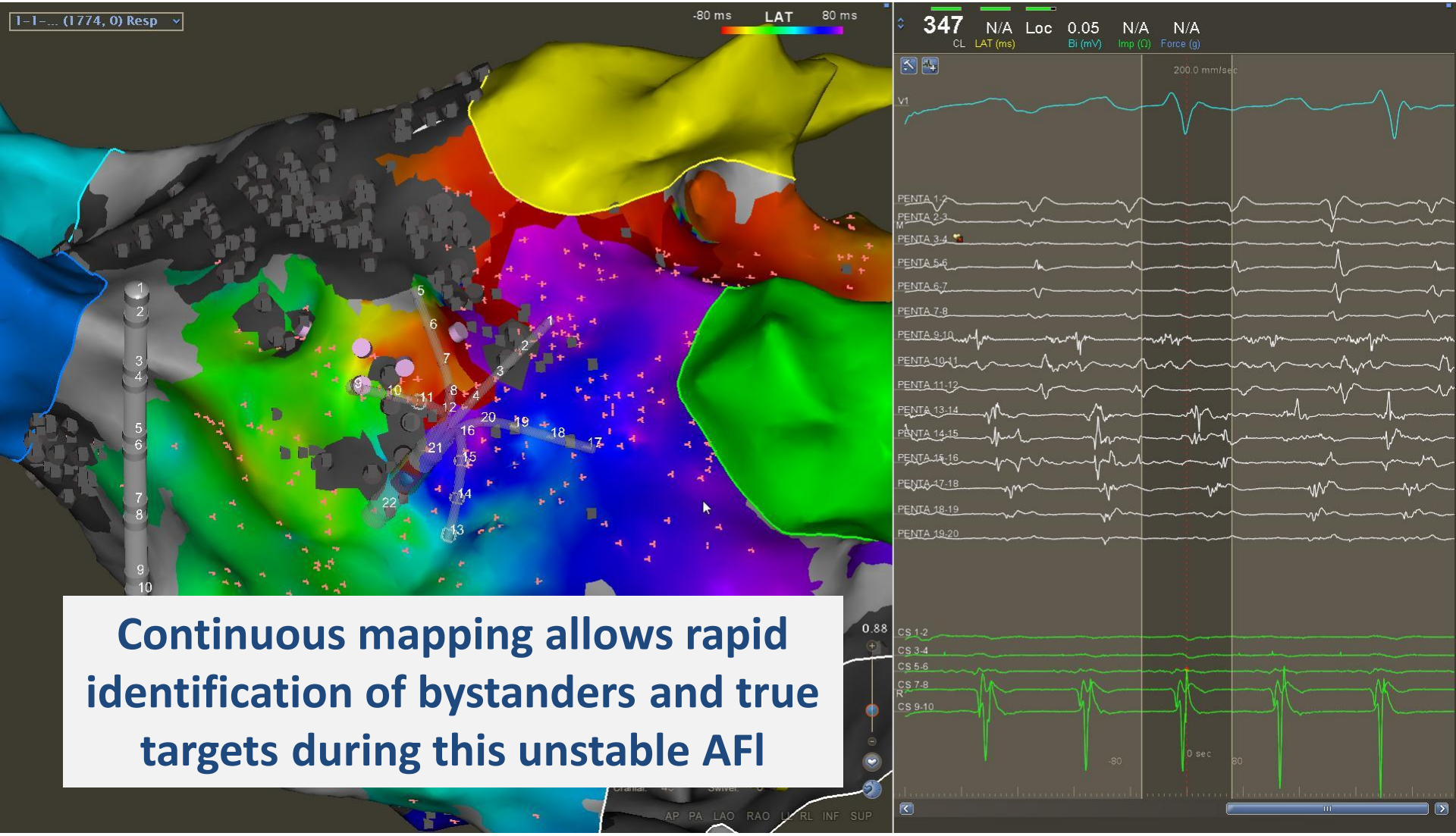


Cycle Lenght 180ms



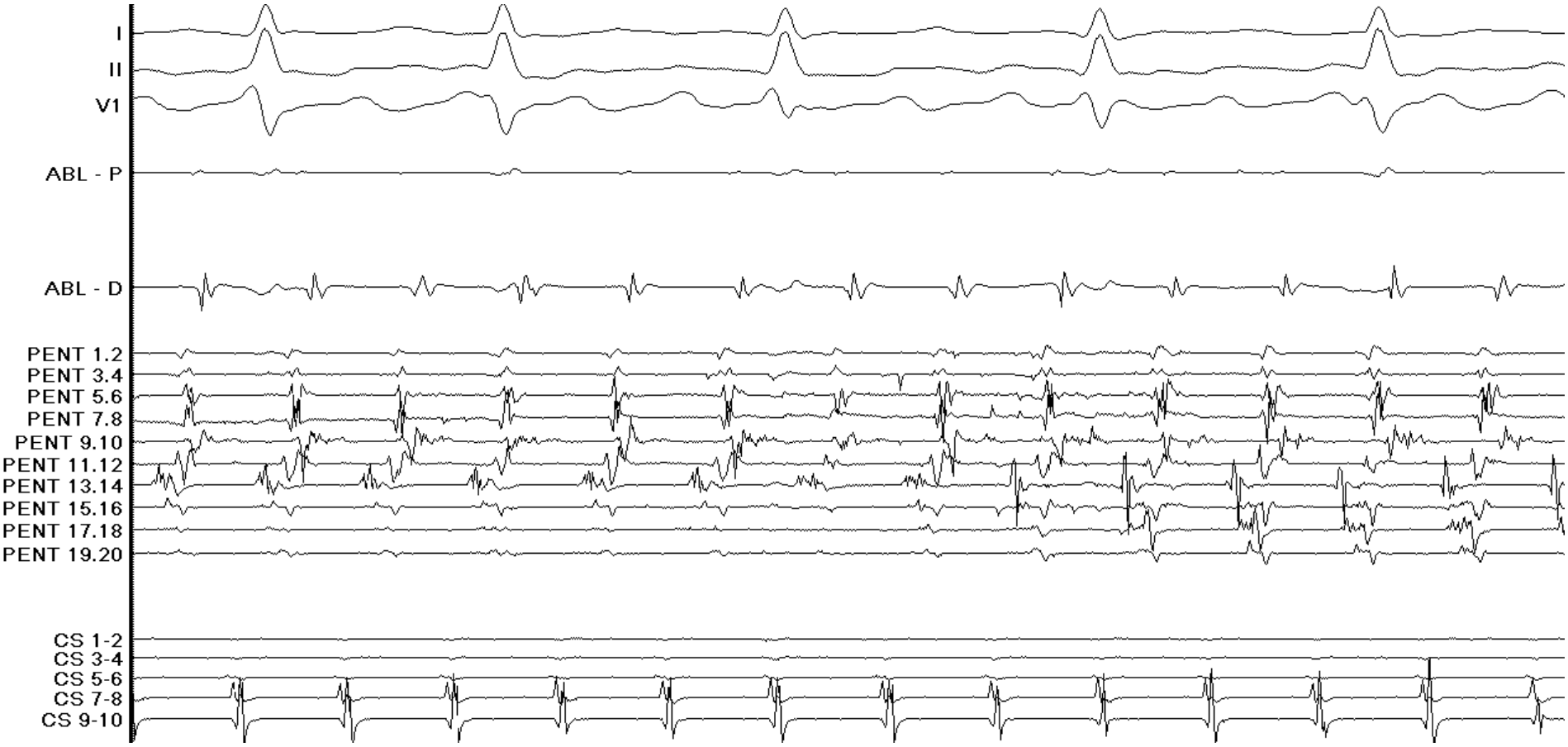
Continuous mapping – Micro-reentry

9min 1787pts – Stops Spontaneously

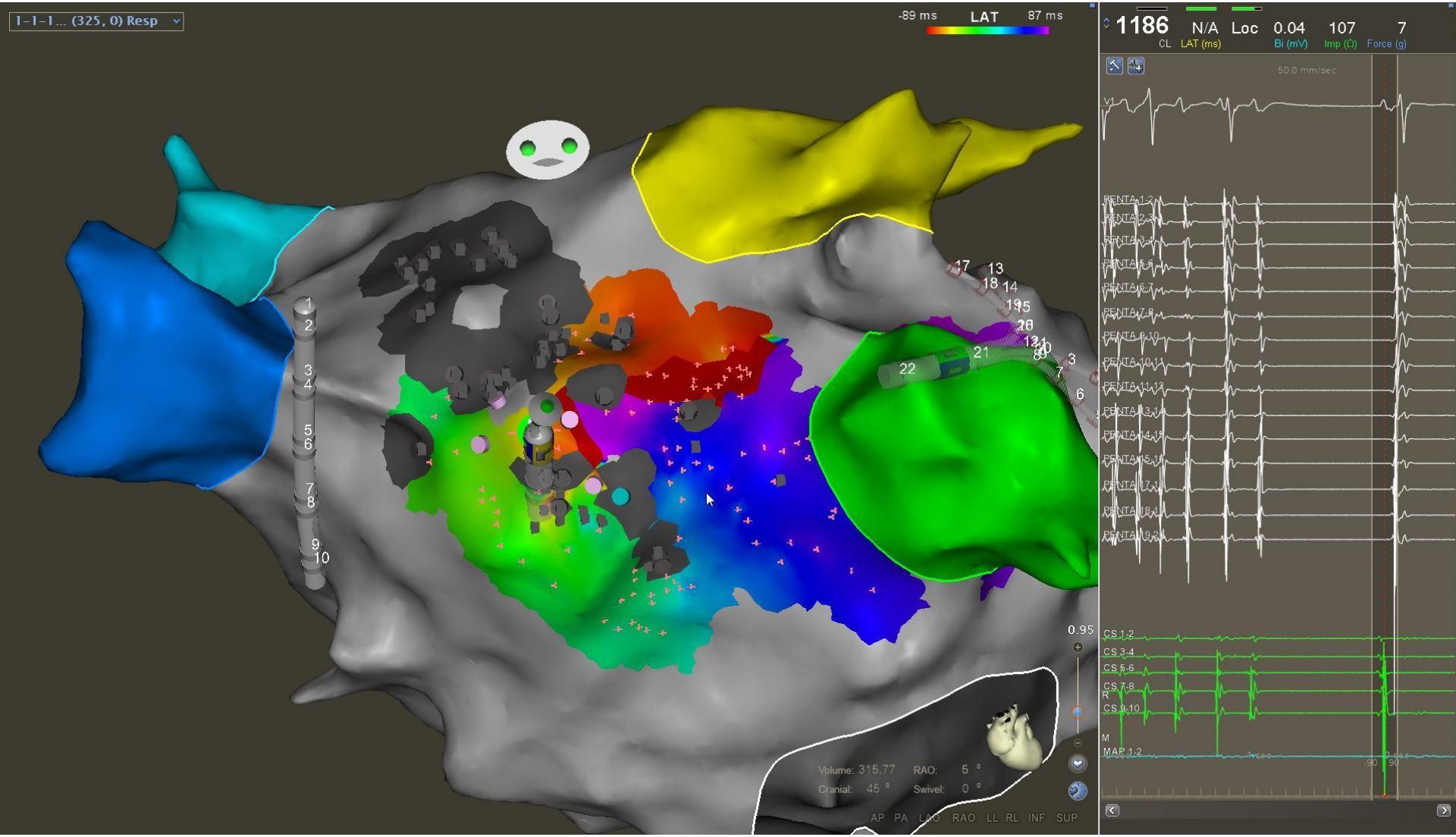


Continuous mapping allows rapid identification of bystanders and true targets during this unstable AFl

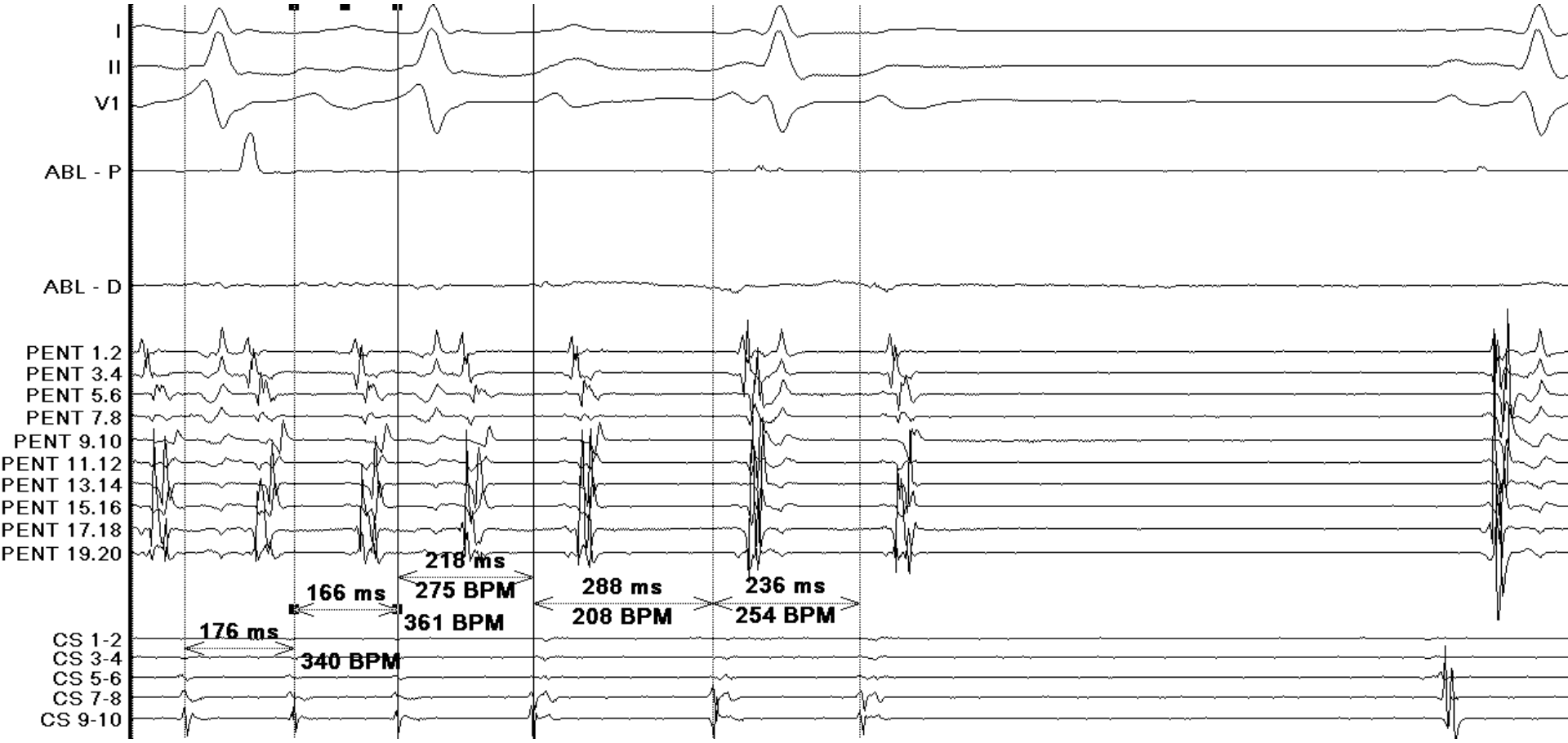
Fast AFl 180ms – Fragmented electrograms in the Antero Septal region



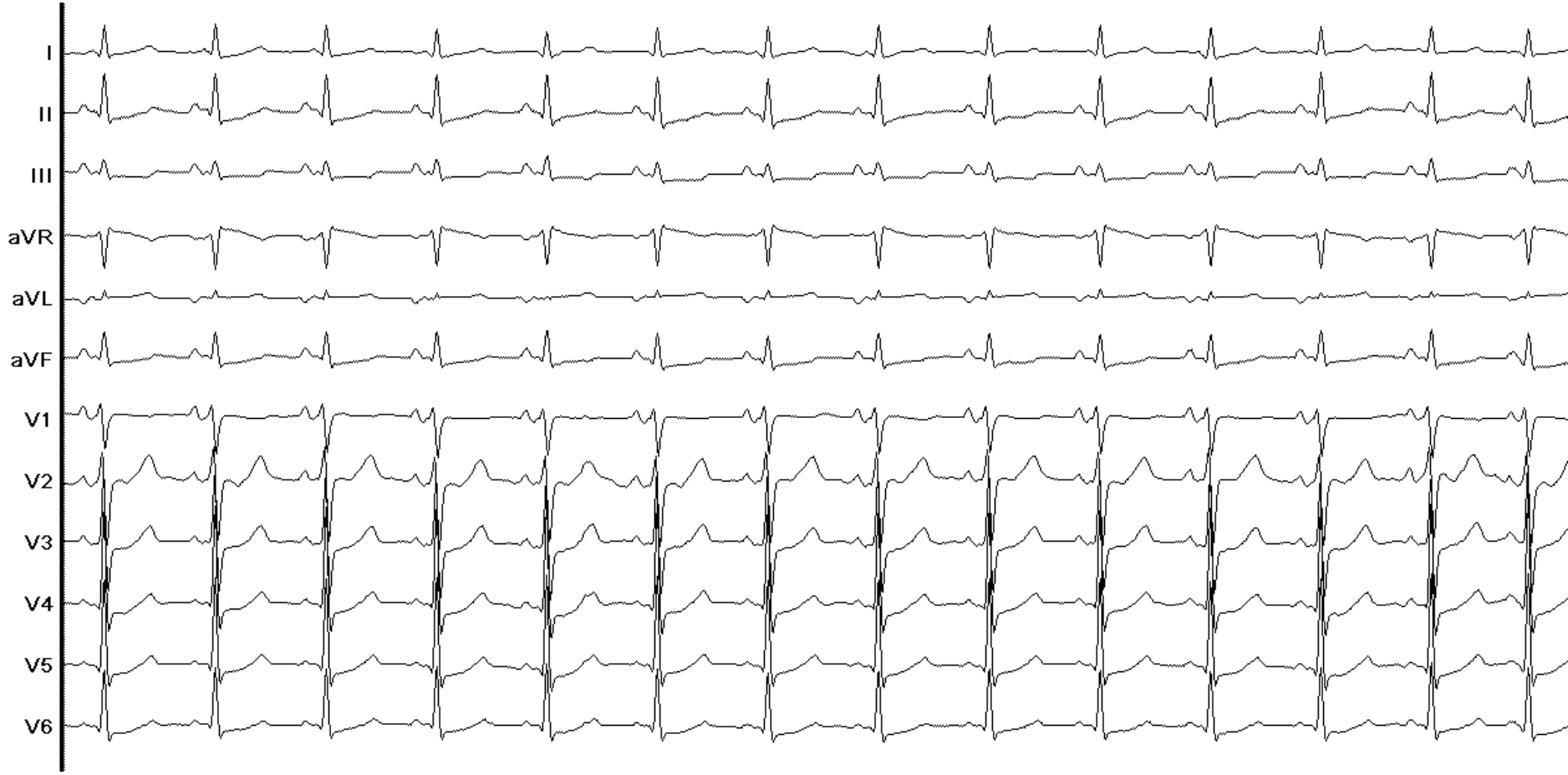
Burst - Fast AFl 180ms retriggered - remap
Same reentry – RF Application #1 – Sinus



Fast AFl 180ms – Return to Sinus
Cycle length prolongation



End EKG

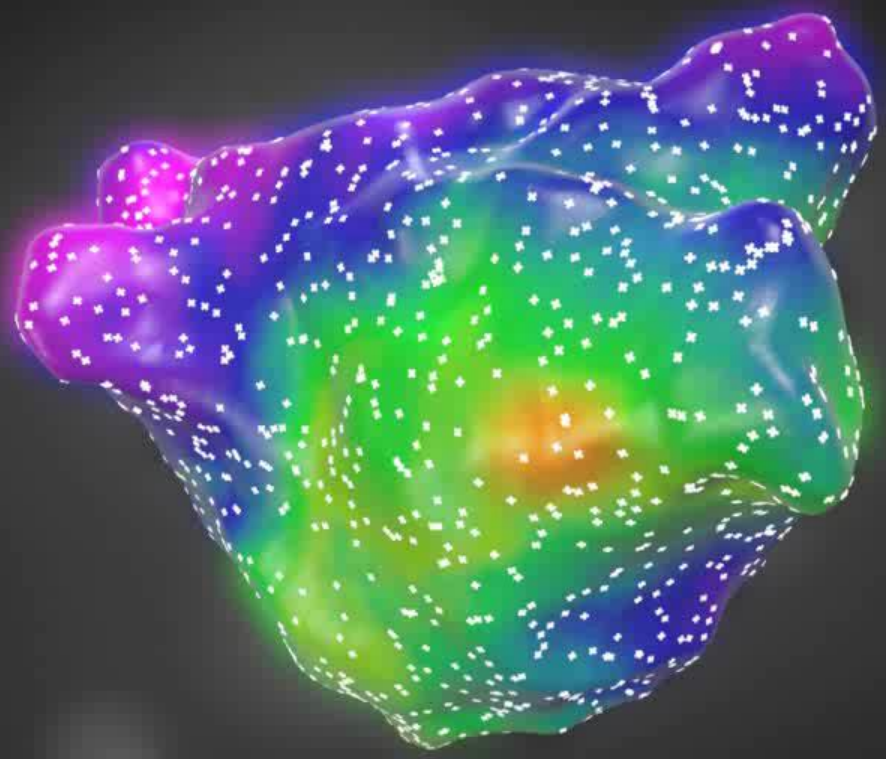


Conclusions

- Confidence is a useful tool to perform high density activation mapping

- Wavefront annotation (combined or not, with Tissue proximity indicator) provides a quick and easy assessement of one tachycardia circuit especially when using multi-electrode catheters.

Thank you



Carto 3 - CONFIDENSE™ Mapping

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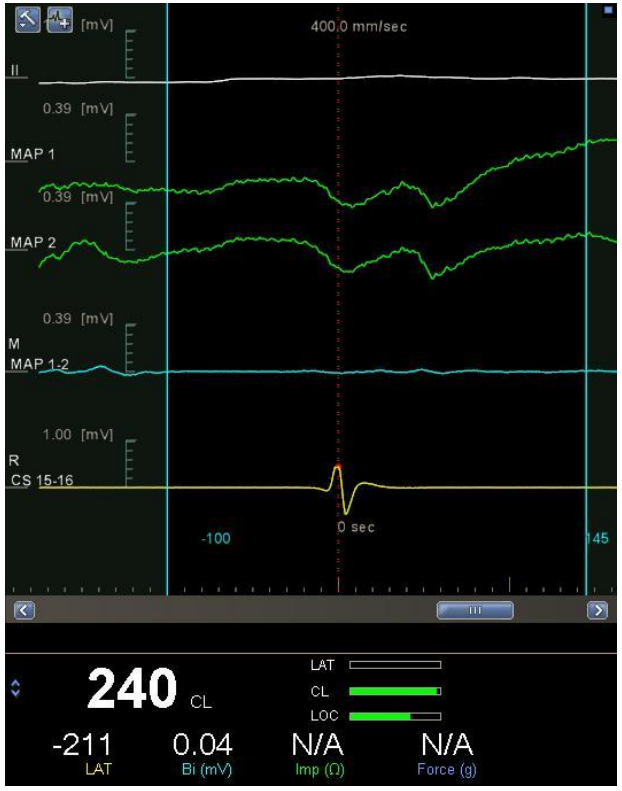
A.D.R.I.S
ASSOCIATION DE RYTHMOLOGIE INTERVENTIONNELLE & STIMULATION

Biosense Webster
a Johnson & Johnson company

Wavefront Annotation of Abnormal Signals

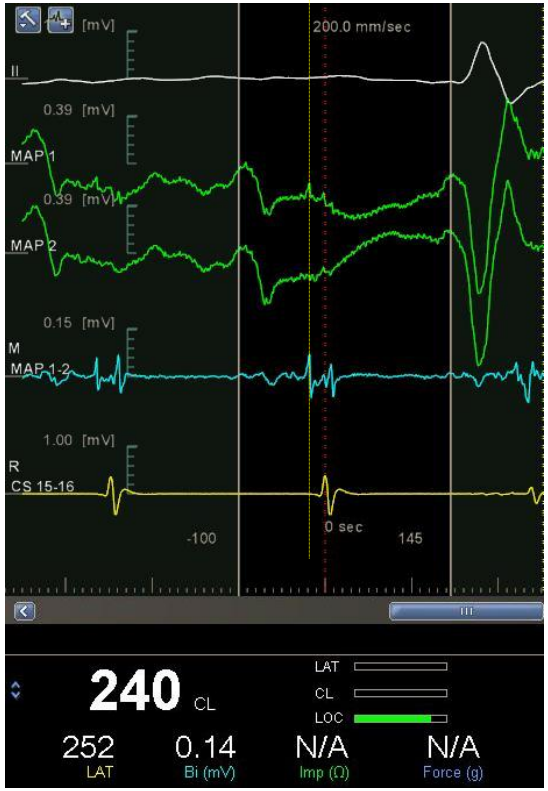
Scar

No steep negative slope on either unipolar distal or bipolar → the point is “no LAT” point.



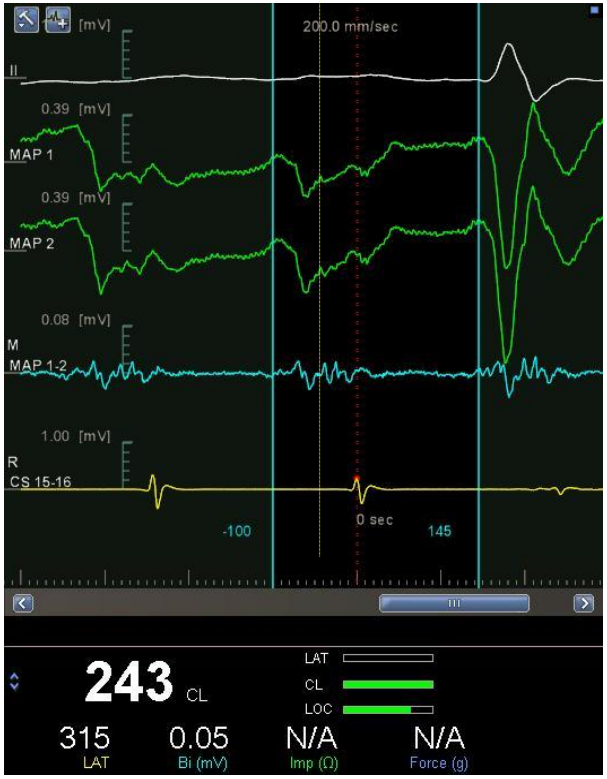
Double Potential

The algorithm annotates the distal signal steepest negative slope in the zone of bipolar slope



Fractionated Signal

The algorithm annotates the steepest negative unipolar distal slope coincides with steep bipolar



CARTO® System Maps

Maps of the heart can be:

- ❖ Anatomical
  - 3D reconstruction of the mapped chamber and structures
  - e.g LA for PVI ablation

- ❖ Electro-Anatomical (EA)
  - Correlation of location information to electrical information

<u>Activation</u> –

Atrial tachycardia, Ventricular tachycardia, SVT's, ectopics and pacing

<u>Voltage</u> –

Ischaemic VT, Redo ablations