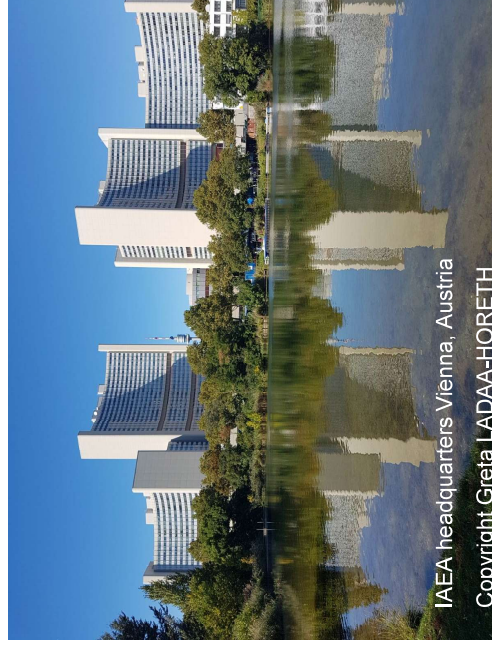


## TECHNICAL ASPECTS OF GATED SPECT MPI ASSESSMENT OF LEFT VENTRICULAR DYSSYNCHRONY USED IN THE VISION-CRT STUDY

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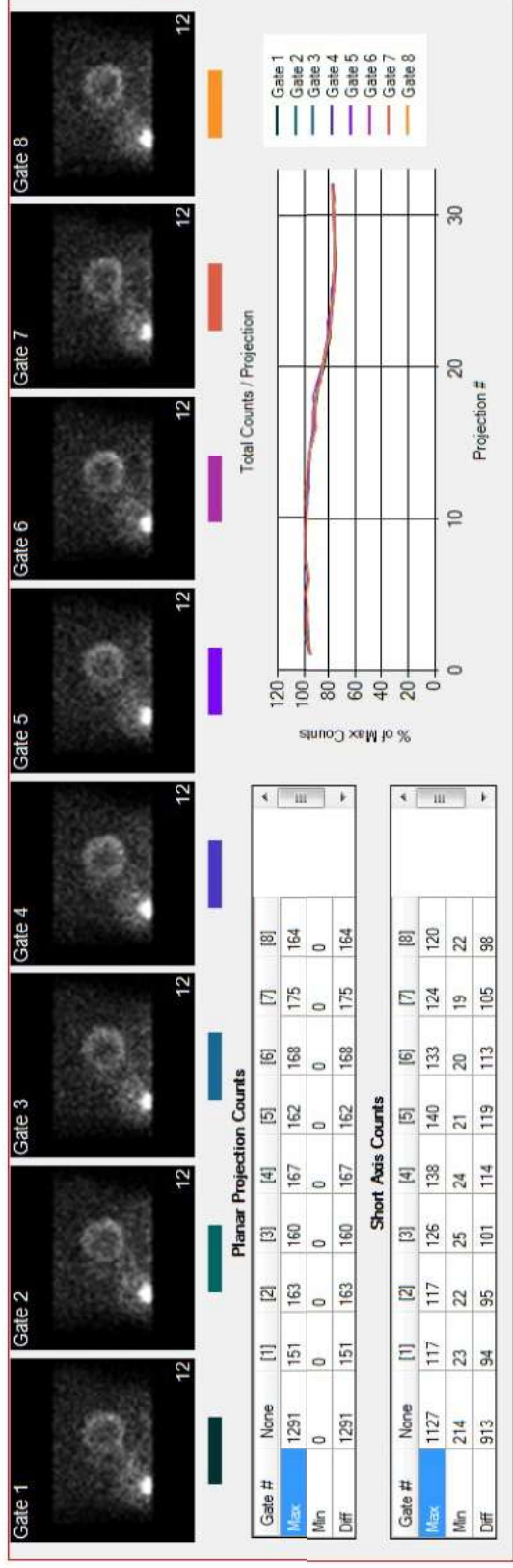


# BACKGROUND

1. Describe the technical considerations undertaken in the IAEA VISION-CRT trial (identification of heart failure patients who will improve with cardiac resynchronization therapy) to assure valid results and the ECTb4 algorithms used to measure synchronicity-pertinent LV parameters.
2. Some of the descriptions are specific to ECTb4, but the quality control, the processing technical tips and algorithms descriptions are universal to technologists, physicians and industries interested in assessing LV mechanical dyssynchrony (LVdys).
3. Technical aspects of gated MPI acquisition, reconstruction & filtering, processing & quantification as well as processing quality control are reviewed.

# Summary-1

1. Acquisition: Both the accuracy of the ECG gating as well as the appropriateness



Quality control page in ECTb4 program provides information regarding gating and count statistics.

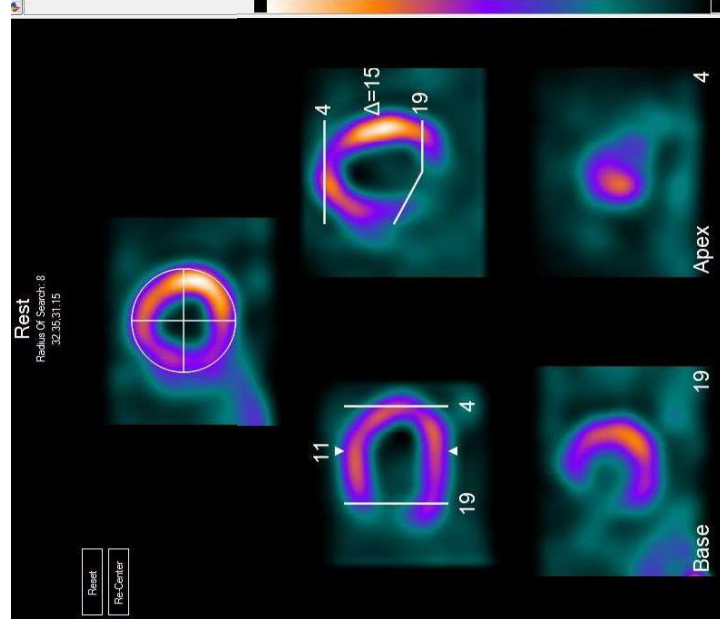
Technical Quality	Max Counts in Gated LV
Adequate	>80 (300 typical)
Marginal	20-80
Inadequate	<20

## Summary- 2

1. **Reconstruction & filtering:** Standard OSEM reconstruction is used and the goal is to optimizing the number of counts per pixel. Additional spatial-temporal filtering is performed on the SA slices to reduce count noise.
2. **gMPI Processing & quantification:**  
The time-activity curve of a myocardial segment is equivalent to its temporal thickening curve.  
Both the measurements of thickening and onset of contraction measurements have been shown to be robust even in areas of hypoperfused myocardium allowing a good differentiation of patients with cardiac dysfunction from normal ones.

## Summary- 3

1. Processing quality control: Careful processing of gated SPECT MPI for dyssynchrony assessment is required to avoid and guarantee consistency. Therefore, a systematic approach is needed for optimal phase analysis

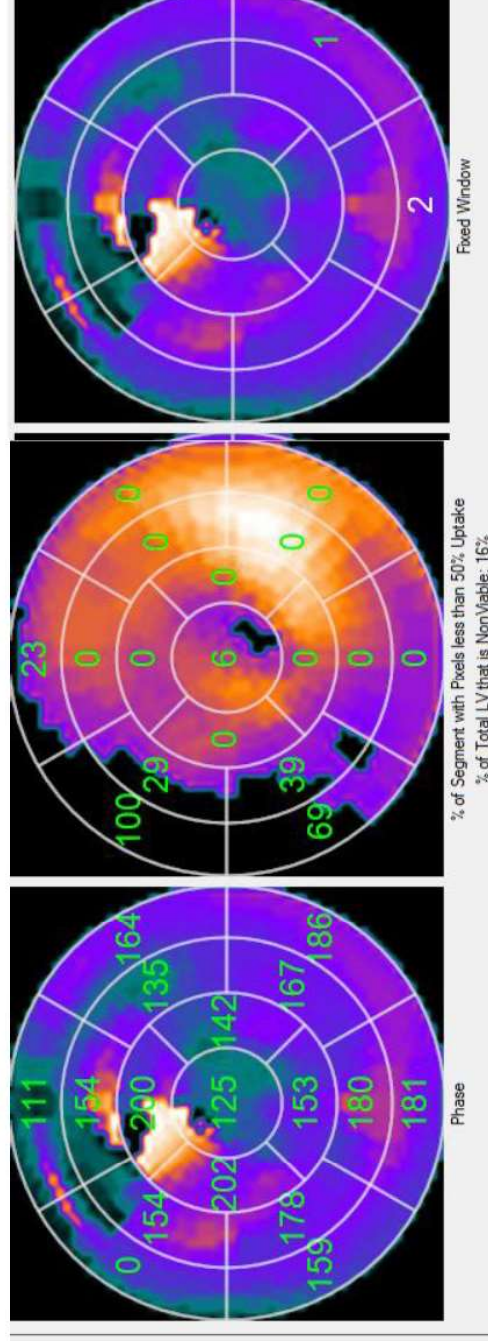


Correct base and apex determination to avoid phase artifacts

- 1) if the LVEF > 50% the base is allowed to move 2 slices in from ES to ED
- 2) if the LVEF > 35% and  $\leq$  50%, the base is allowed to move 1 slice from ES to ED
- 3) if the LVEF  $\leq$  35%, the base selection is not allowed to move

## Summary- 4

1. Quantification to help guide and evaluate CRT:  
Phase SD is preferred over the histogram bandwidth because of its lower susceptibility to phase noise.  
The automatic identification of the last contracting viable segment(s) by ECTb4 is a 3-step process that is used to define the target region in the LV to place the CRT lead.



Automatic determination of the last viable segment(s) to contract

## CONCLUSIONS & FUTURE DIRECTIONS

1. This report presents helpful tips used in the VISION-CRT trial intending to explain and guide the correct gMPI acquisition, processing and parametrization of synchrony-pertinent LV functional parameters that may assist in the identification of patients who respond to CRT and in the evaluation of the treatment.
2. The procedures described in this report were used by the nuclear cardiology core laboratory at Emory University to generate the trial's results and each of the individual trial sites independently followed this guidance to generate the site's results. By following these procedures applied to the automated algorithms described here should ensure widespread use of reproducible dyssynchrony measurement techniques that overcome the disagreements reported in the PROSPECT trial when using echocardiographic techniques for the same purpose<sup>12</sup>.
3. The agreement between the Emory core lab results and those from the independent VISION-CRT sites is the subject of a future report.