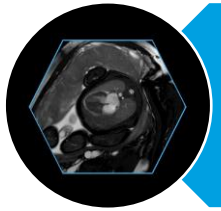
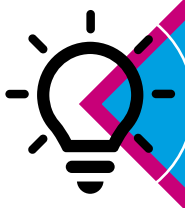
Section 3 - How to adapt sequences and optimize images



3.1 BFFE Cine Setup

3.2 Flow quantification



3.3 Tips & tricks and Challenges

3.4 Common pitfalls and artifacts

Tips & tricks and Challenges

1. Tips & Tricks to deal with poor breath-holders(BH) and to reduce the scan time per BH with Cine sequences

Aim: follow the steps below and optimize the parameter settings.

- ***Reduce number of sclices acquired per breath-hold*** (=increase overall scan time)
- ***Increase voxel size*** (=Decrease spatial resolution)
- ***Use parallel imaging/acceleration technique*** (Sense/CS-Sense/AI)
- On *Siemens Scanner**:***
  - The ***Concatenation*** parameters determine the number of slices to be measured per BH. Small number of concatenation divide the measurement into only a few but long BH. A large number o concatenation divides the measurement into many short BH.

$$\frac{\text{Total number of slice}}{\text{Concatenation}} = \text{number of slice per BH}$$

- ***Increase Segments*** *(Siemens & GE scanners).*

Tips & tricks and Challenges

2. Tips & Tricks for CINE Free Breathing(FB)

Aim: follow the steps below and optimize the parameter settings.

- **Can Fetal CMR be difficult?**
  - Small physique
  - High heart rate
  - Uncoperative with breath hold
  - Fast and shallow breathing pattern

- ***Need manual optimization for parameter settings***
  - FOV smaller
  - Decrease voxel size
  - Increase NSA/Average/NEX (between 2 and 5). *An increased number of signal average could help with maternal movement (respiratory)*

Tips & tricks and Challenges

3. Challenges of Cine sequences

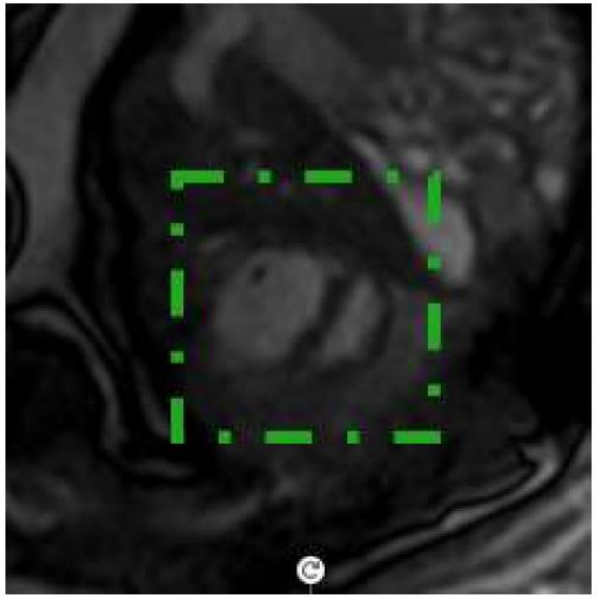
Aim: consider how important the parameters below are.

- **TR, TE and Flip Angle (FA) consideration:**
  - Keep repetition time (TR) and echo time (TE) as short as possible to maximize the image quality;
  - Avoid TR ▸ 4ms;
  - Keep Flip Angle:
    - 1.5T (70-80 is preferred)
    - 3T (60 is preferred

- **How to further decrease the TR?**
  - TR decreases with lower resolution → increase voxel size (low matrix size & large FOV)
  - Generally, keep the frequency voxel size higher than phase voxel size

- **SAR**
  - High SAR level are easily reached with large Flip Angle and short TR (3T)
  - Reduce FA to reduce TR

- **Shimming box**
  - Correct positioning of the shim box is essential for a good image quality and to avoid black bands artifacts & ghost artifacts from large vessels (also refer to Artifacts: How to avoid them). Therefore, always ensure to move the shim box to the region of interest



Note: *Shim box volume covering the entire heart*