

White Light Interferometry & Heliotis Camera Register Settings

Formulas and Step By Step Calculation Guide

Heliotis

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Demodulation Frequency as a Function of Illumination Wavelength and Scan Speed:

- Know your illumination wavelength (given by Heliotis)
- Choose your scan speed (good general starting point: 5mm/s)
- Calculate the resulting modulation/demodulation frequency as:

$$f_d = 2 v_{scan} / \lambda$$

- Set the demodulation frequency of the camera via the *SensTap* register according to the C3 manual:

$$SensTap = 70MHz / 8f_d - 30$$

Background Suppression Feature and Frame Thickness:

- Decide whether to activate the background suppression feature via the *BSEnable* Register bit (activation generally recommended)
- If *BSEnable* is set, Heliotis recommends activation of *CalDur1Cyc* Register bit (for details please refer to C3 manual)
- Choose your Frame Thickness via the *SensNavM2* Register Value:

$$d_{frame} = 0.5 * (2 \text{ SensNavM2} + 3) \lambda$$

If *BSEnable*=1, *CalDur1Cyc*=1

$$d_{frame} = 0.5 * (2 \text{ SensNavM2} + 2) \lambda$$

If *BSEnable*=0

Frame Rate:

- Calculate the sensor output frame rate according to any of the below formulas:

$$FR = \frac{v_{scan}}{d_{frame}} = \frac{35MHz}{(SensTqp + 30) * 4 * \left(2 * SensNavM2 + \begin{Bmatrix} +3 \\ +2 \end{Bmatrix}\right)}$$

- Make sure to operate the camera below the maximum Frame Rate (reduce scan speed or increase frame thickness if required):

$$FR < \frac{35MHz}{9089 + 2(SensTQP + 30)} = \frac{1}{260us + 1/(2 f_{demod})}$$

Scan Range:

- Define your scan range by selecting the number of frames per scan in the *SensNFrames* register:

$$d_{scan} = SensNFrames * d_{frame}$$

- Note: Make sure the motor drives at constant speed through a distance at least equal to the scan range after triggering camera acquisition
- Respect the maximum number of frames per scan and increase frame thickness if higher scan range is required:

$$SensNFrames \leq 511$$

Exposure Time:

- The frame exposure time is defined by the parameters discussed above and can be calculated as follows:

$$t_{exp,frame} = 8 * (SensNavM2 + 1) * (SensTqp + 6) / 35MHz$$

- For increasing exposure time, reduce scan speed and/or increase frame thickness
- For reducing exposure time, increase scan speed and/or reduce frame thickness. If reaching maximum frame rate, use *SensDeltaExp* feature (refer to C3 manual)