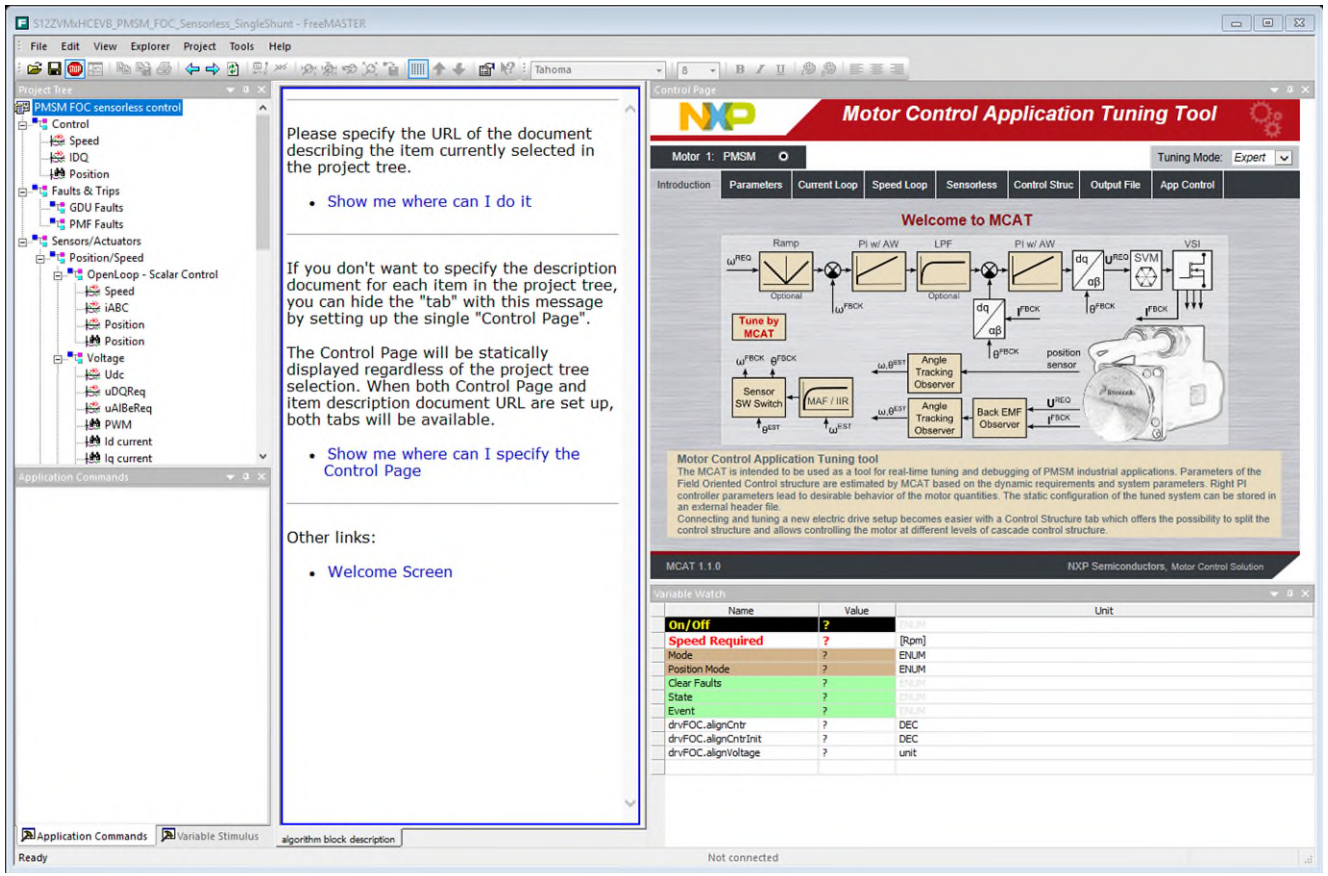
CURRENT LOOP TUNING

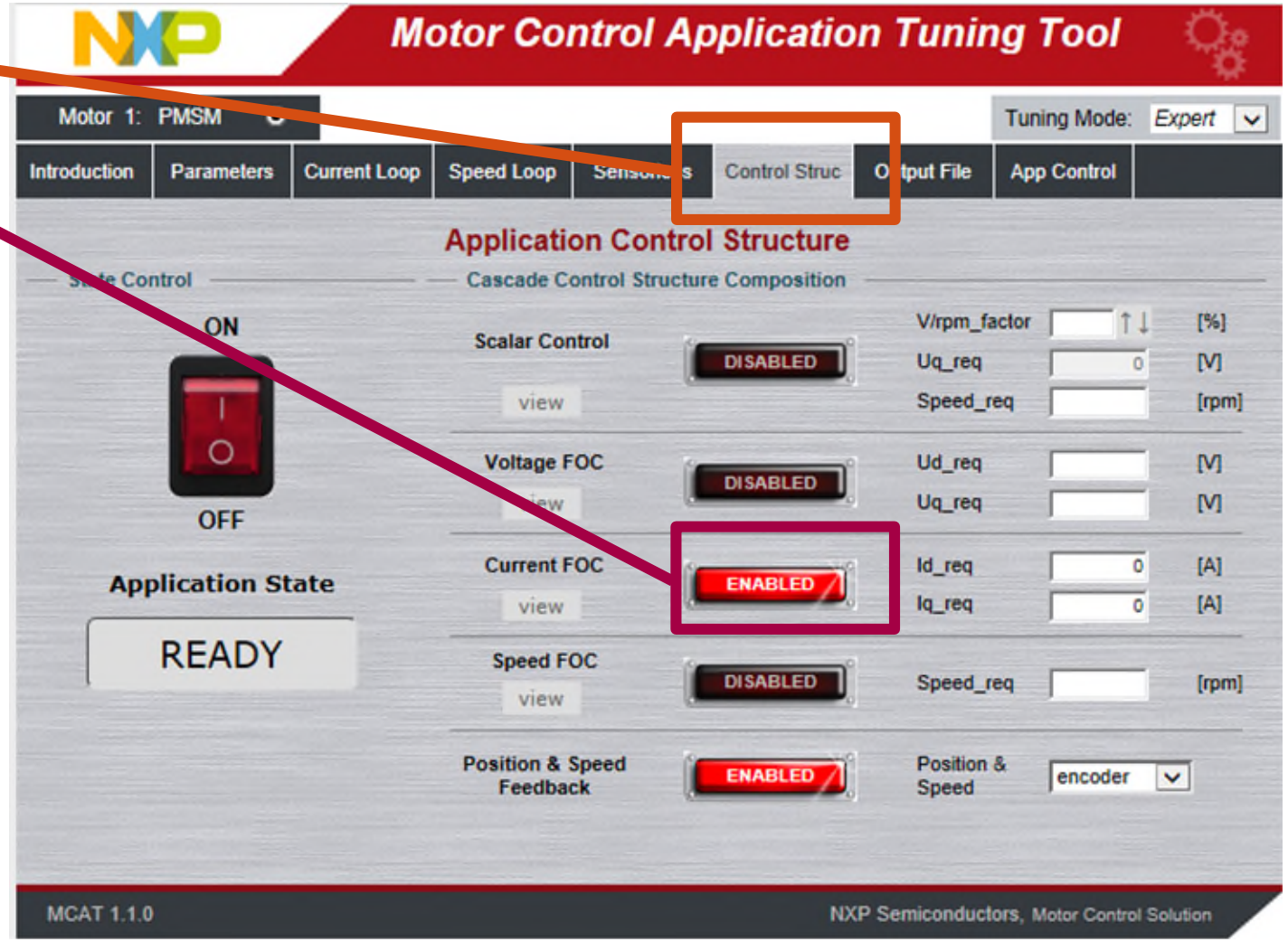
FreeMASTER layout settings

- Show the control page as a bar
  - Sets the layout to see the control page as well as the algorithm block description/oscilloscope/recorder
  - Ctrl+5 or menu/View/Show Control Page as a Bar

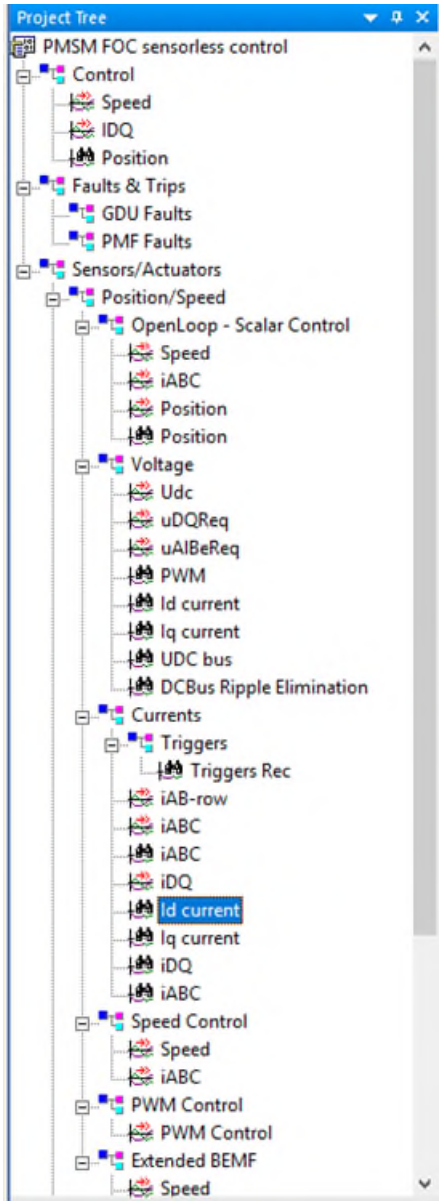


Select Control Struct. Page, Enable the Current FOC

- Control Struc. Page
- Current FOC



Select Oscilloscope to Track the Step Response

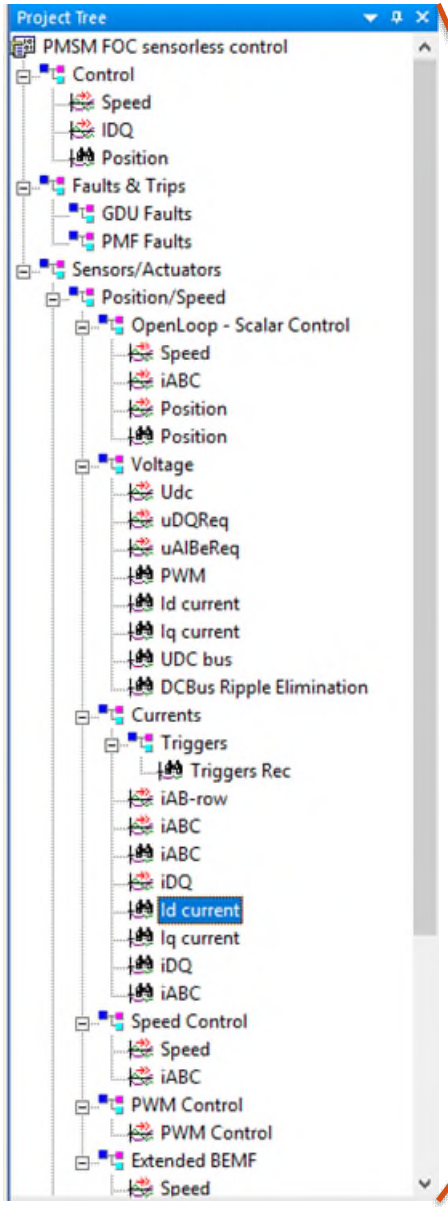


- Select Id current from the left Project Tree panel
  - This recorder is set to make a snapshot of the step response in the “D-axis” current loop
  - The embedded code is set to not spin the motor if the “D-axis” current is demanded and the Current FOC is enabled

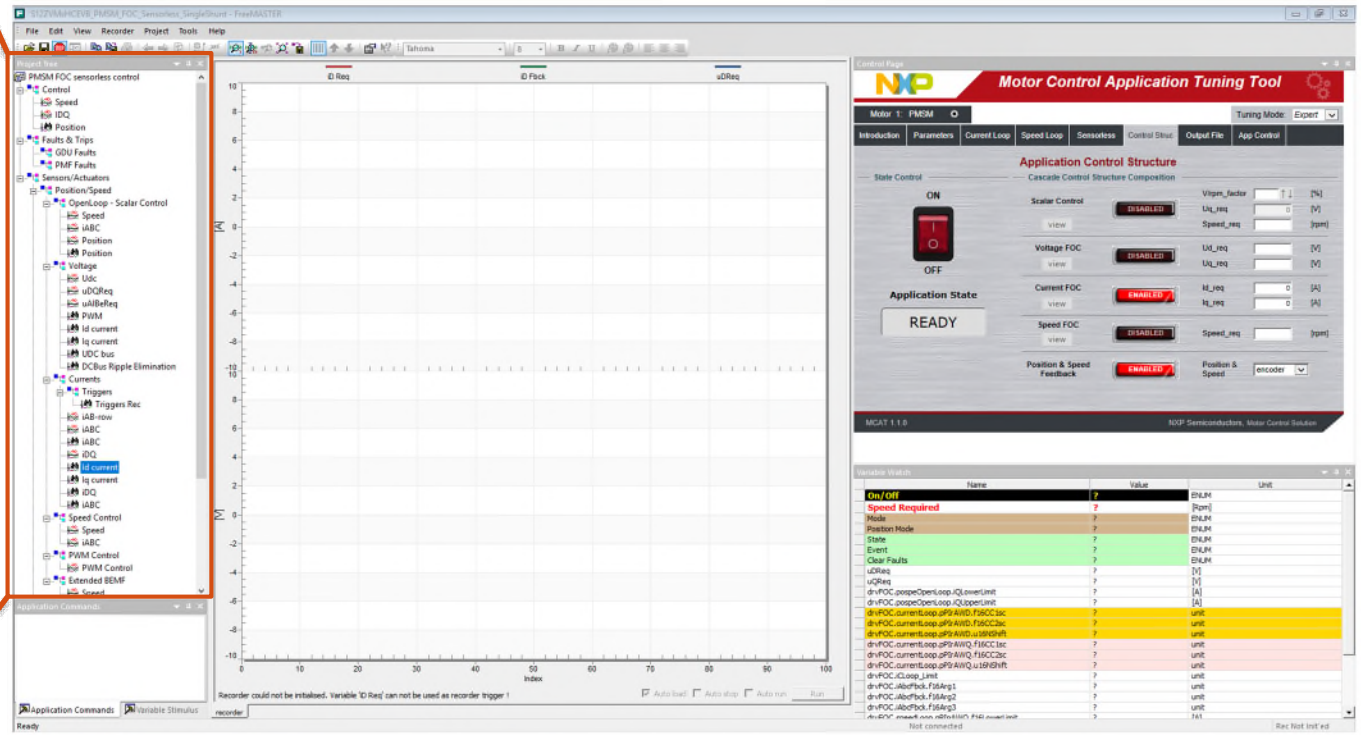
```
static tBool focSlowLoop()
{
    tFrac16 current = 0;
    tFrac16 weight = 0;
    SWLIBS_2Syst_F16 tempIDQReq;

    if(cntrState.usrControl.FOCcontrolMode != speedControl)
    {
        // required speed for open loop start-up in sensorless mode = MERG_SPEED_1_TRH*1.5
        //wRotElReq = MERG_SPEED_1_TRH * 9.55 * 1.5 / pp = MERG_SPEED_1_TRH * 4.775 = ((MERG_SPEED_1_TRH*Frac16(0.596875)) << 3;
        if (cntrState.usrControl.FOCcontrolMode == voltageControl && drvFOC.uDQReq.f16Arg2==0)
            drvFOC.pospeControl.wRotElReq = 0;
        else if (cntrState.usrControl.FOCcontrolMode == currentControl && drvFOC.currentLoop.pIDQReq->f16Arg2==0)
            drvFOC.pospeControl.wRotElReq = 0;
        else if (cntrState.usrControl.FOCcontrolMode != scalarControl)
            drvFOC.pospeControl.wRotElReq = MLIB_ShL_F16(MLIB_Mul_F16(FRAC16(0.75),MERG_SPEED_1_TRH),1);
    }
```

Select Oscilloscope to Track the Step Response

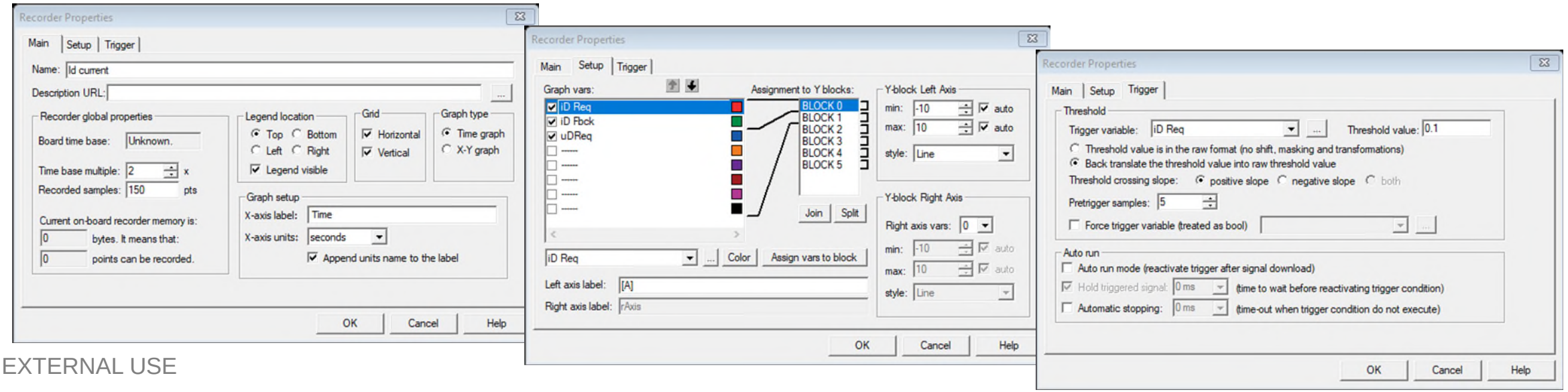


- Select Id current from the left Project Tree panel
  - This recorder is set to make a snapshot of the step response in the “D-axis” current loop



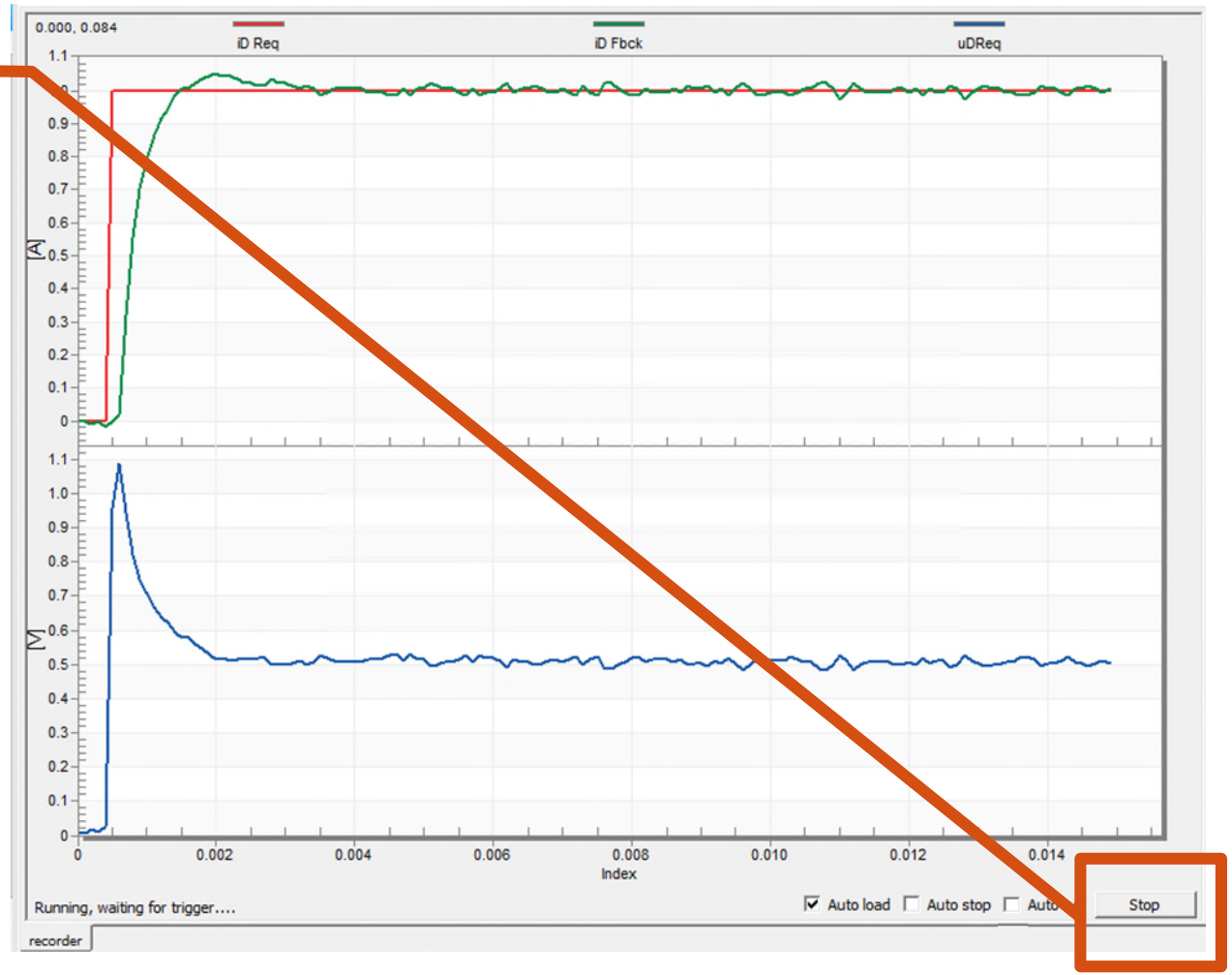
Select Oscilloscope to Track the Step Response

- Key recorder properties (already set):
  - Main/Time base multiple – the embedded recorder routine is called within the PWM reload interrupt. The “Time base multiple” set to 2 means that the recorder collects data every 2nd reload opportunity
  - Trigger/Threshold value sets the trigger-point threshold of the iD Req to start data acquisition right after the user changes the required D-current.
  - Trigger/Autorun is set to wait for the trigger and to make one snapshot of the transient



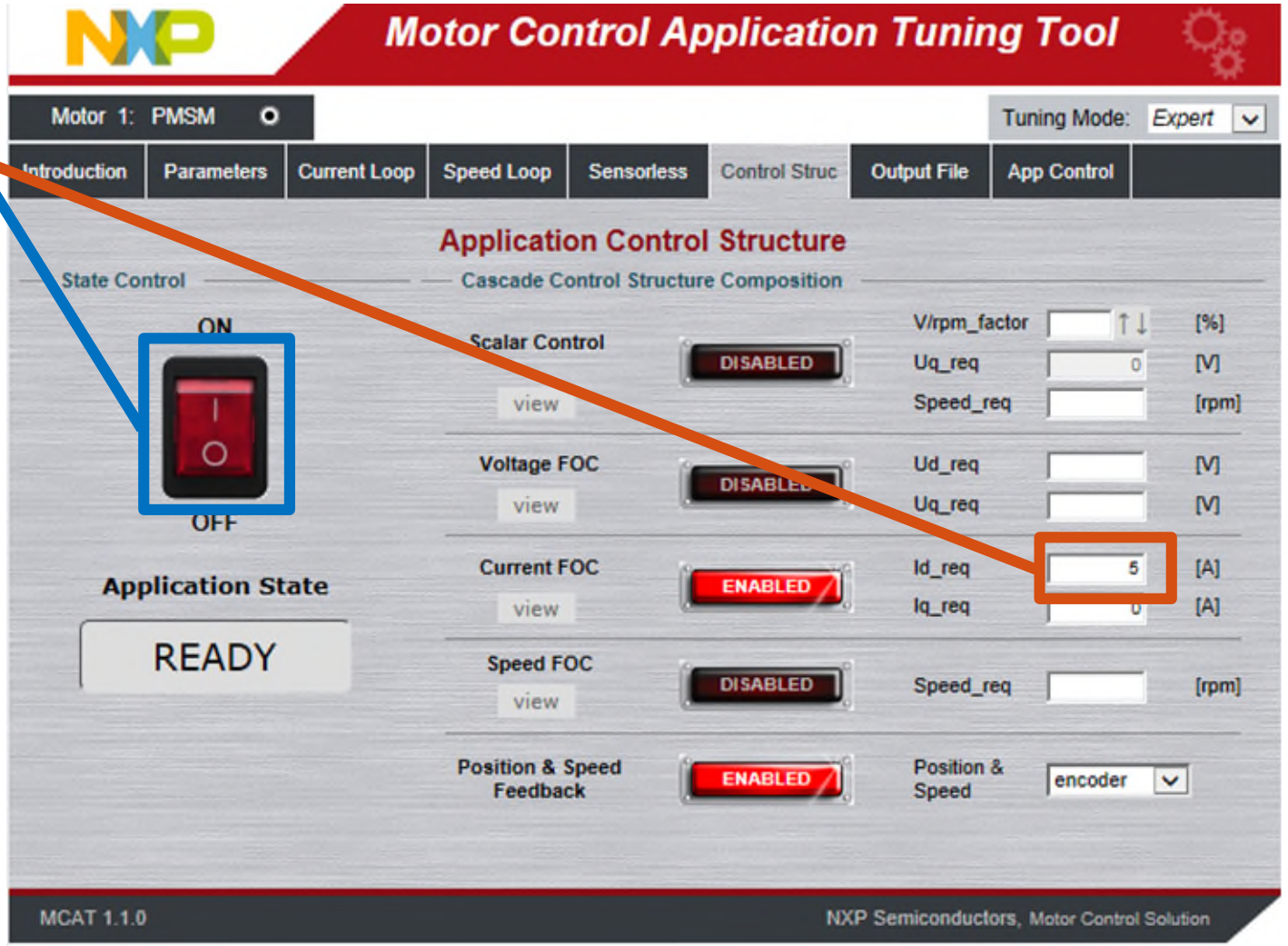
Start the Recorder

- Click “Run” to get the Recorder ready



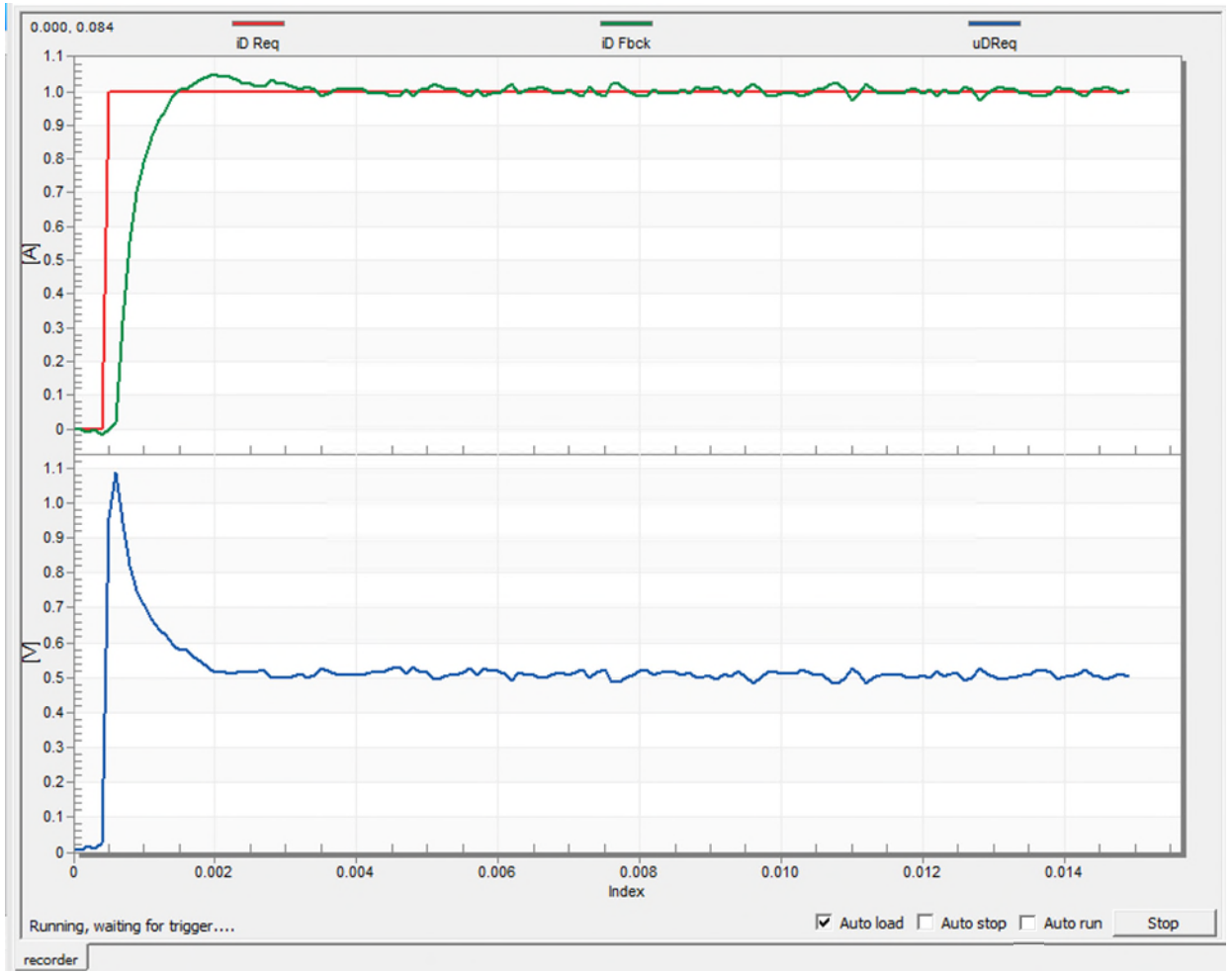
Switch ON the Application and Set the Demanded Current

- Switch ON the Application
- Set the Demanded Current



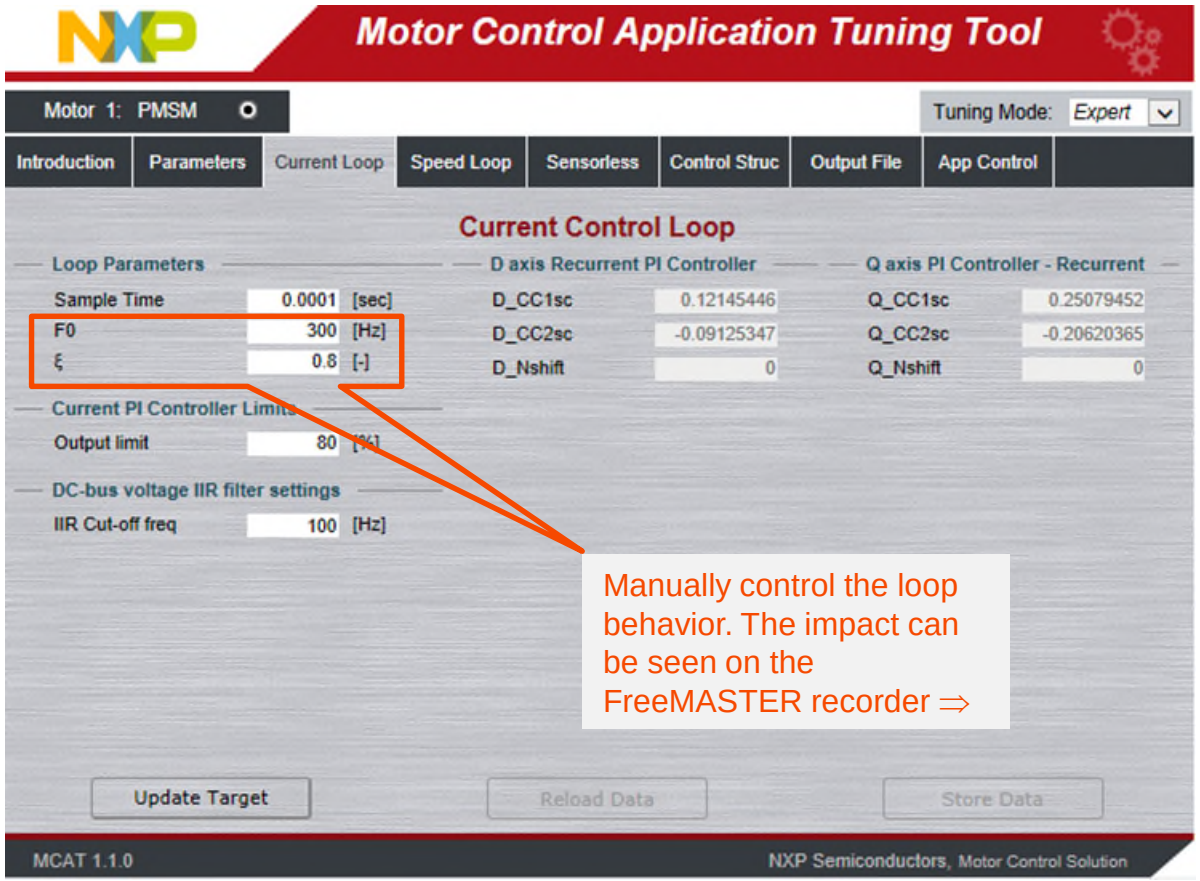
See the Transient, Repeat if Necesary

- Rotor should not move between the end of the alignment (already aligned with the D-axis) and the D-axis current loop being activated.
- This test should be repeated for various demanded currents, such as 25%, 50%, 75% and 100% of the nominal current. However, the app should be deactivated every time after the transient has been displayed (to not overheat the motor). For these tests, the transients can be different due to the Ld (inductance) changes.
- Exponential response is a first step only. The system may require to “slow down” the control loop due to various reasons.



Change the PI Controller Settings

- Switch OFF the application
- Open the “Current Loop” tab
- Change the settings of the PI Controller as shown
- Repeat steps above to see different behavior



Getting Ready for the Test - Checklist

- ✓ Communication is running
- ✓ MCAT visible
- ✓ Id current recorder visible
- ✓ Recorder started
- ✓ Control Structure set to Current FOC
- ✓ Demanded Id_req set to non zero value

- ✓ The resulting step response is shown