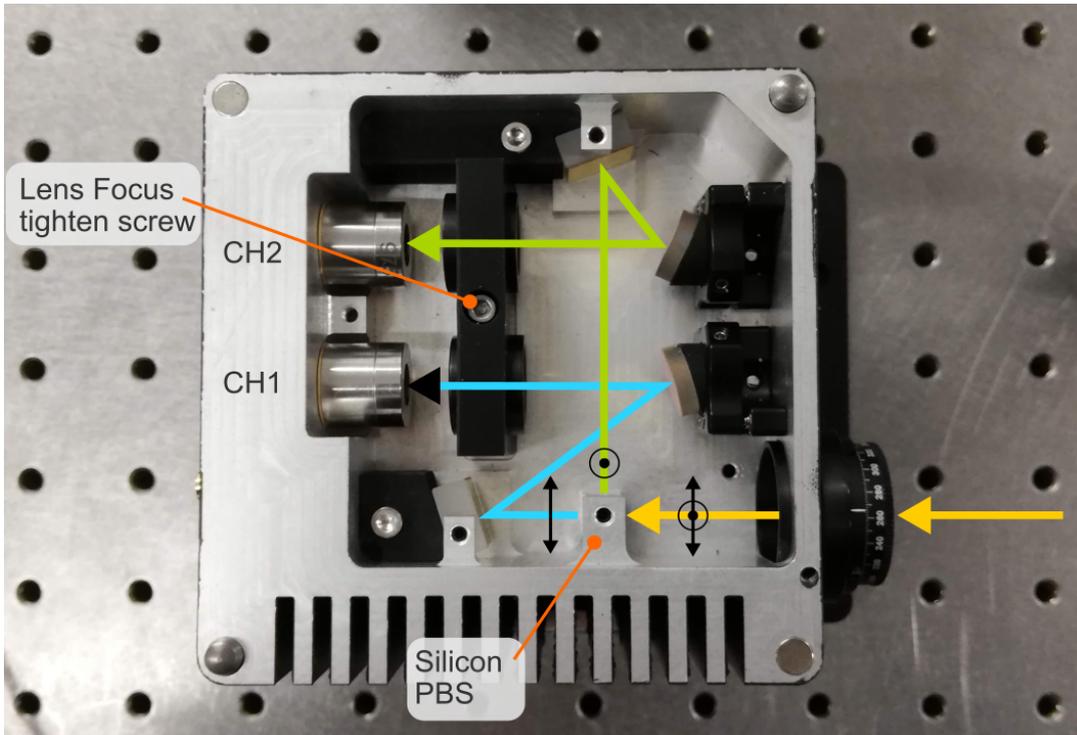
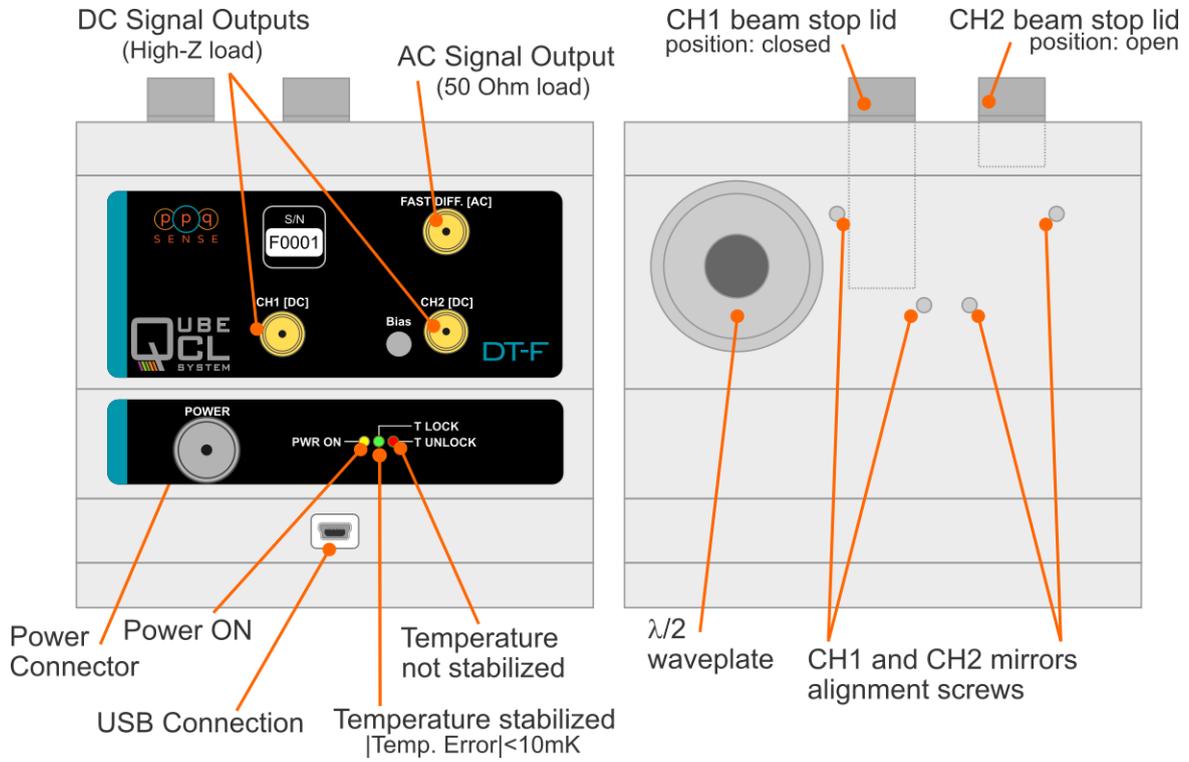


QubeDT-F Fast Balanced Photodetector

Operating Instructions

Legend:



Switching on the detector:

To switch on the QubeDT differential detector please follow the steps described below:

1. Connect the CD Channels (CH1 and CH2) to an oscilloscope or a multimeter (High-Z load).
2. Make sure that no light hits the detectors (close the beam-stop lids).
3. Plug the power connector: the “Power On” LED lights up. After a few seconds the QubeDT will automatically start to stabilize the temperature. Wait until the T LOCK led lights up in order to get a complete temperature stabilization.
4. Check the DC signal (CH1 and CH2): the DC bias voltage should be measured (500mV typical value). This will be the zero level of the DC signal.

N.B.: Do not act on the “Bias” trimmer on the front panel. It affects the detectors bias voltage and it can irreparably damage the detectors.

5. Open the beam-stop lids and check the DC signals for beam alignment.

Aligning the detectors

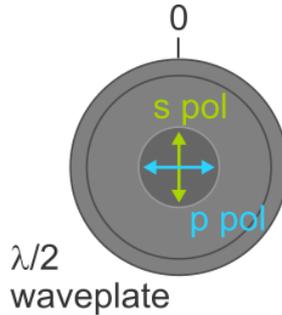
A proper differential measurement relies on a careful alignment of the laser on the detectors. Follow the procedure below to get a good alignment.

1. Open the QubeDT magnetic cover.
2. The fast axis of the $\lambda/2$ waveplate is aligned along the 0 of the rotating mount scale. According to the polarization of the incoming beam, rotate the $\lambda/2$ waveplate in order to have both the transmitted and reflected beam out from the silicon PBS.
3. Check if the incoming beam properly passes through the silicon PBS, and centrally hits the mirrors and the collimators.
4. Block the CH2 with its beam-stop lid and check the CH1 DC signal.
5. Align the external CH1 mirror in order to maximize the CH1 DC signal
6. *Optional: release the lens focus tighten screw and manually move the CH1 collimator in order to maximise the CH1 DC signal. Iterate over point 5 and 6 until the CH1 DC signal is maximum. Then tighten again the screw.*
7. Block the CH1 with its beam-stop lid and check the CH2 DC signal.
8. Align the external CH2 mirror in order to maximize the CH2 DC signal
9. *Optional: release the lens focus tighten screw and manually move the CH2 collimator in order to maximise the CH2 DC signal. Iterate over point 5 and 6 until the CH2 DC signal is maximum. Then tighten again the screw.*
10. Tune the $\lambda/2$ waveplate in order to have comparable comparable DC signals on both CH1 and CH2.

Fast differential balanced detection

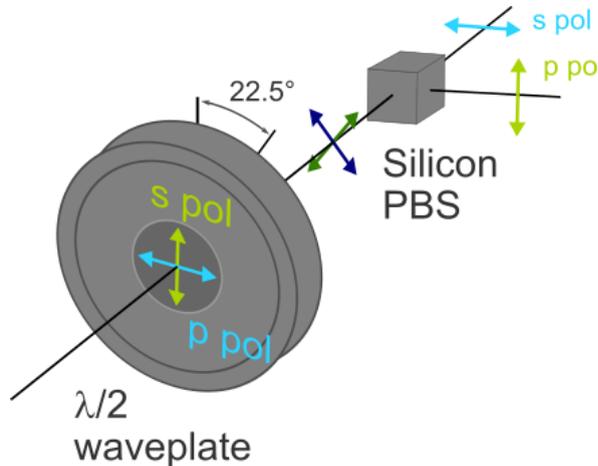
You are now ready for a balanced differential detection on the fast AC channel. In case of the detection of a beating signal you have to carefully regulate the incoming polarizations of the two beating beams according to the scheme below:

1. Connect the fast AC channel to a spectrum analyzer (50 Ohm load)
2. Make sure that the $\lambda/2$ waveplate fast axis (0 on the scale) is oriented along the vertical, and that the incoming beams have the following polarization:



In this condition you will detect one beam on one channel and the other beam on the other channel. You can check this by independently blocking the two beams and checking the CH1 and CH2 signals.

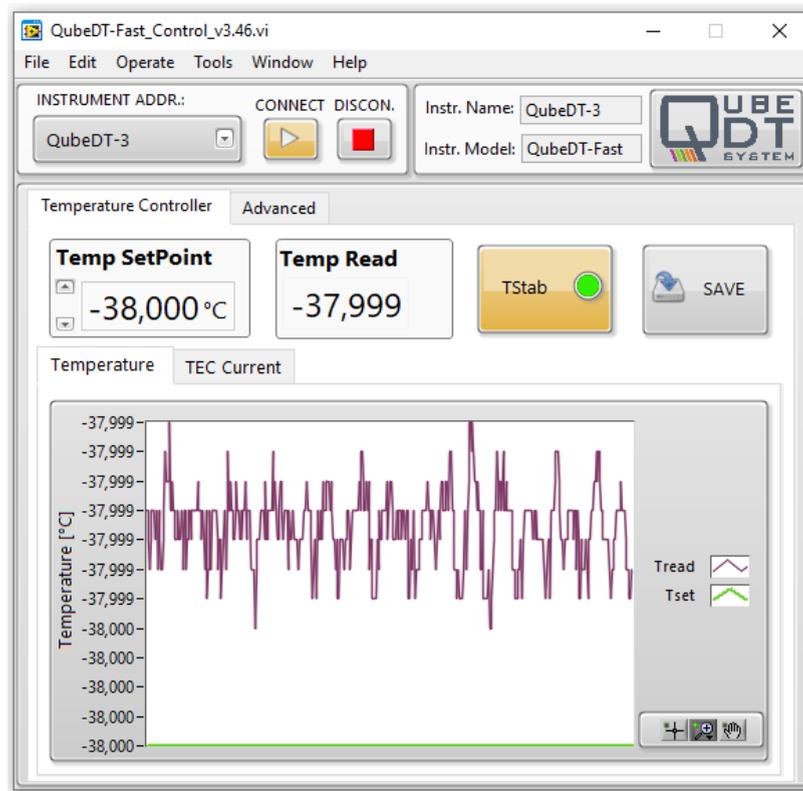
3. Rotate the $\lambda/2$ waveplate by about 22.5° in order to split the power of each beam among the two channels as follows:



In this condition you should see half of each beam power on each channel. You can check this by independently blocking the two beams and checking the CH1 and CH2 signals.

4. Check the fast AC signal on the spectrum analyzer, and find the optical beatnote.
5. Finely tune the $\lambda/2$ waveplate position in order to maximize the S/N ratio of the observed beatnote. You have now found the optimal balanced condition.

Connection to QubeDT-F Control software



1. Install the QubeDT-F Control software in your computer: you will find the software in the USB key in the QubeDT box together with the installing instructions (file).
2. Switch on the QubeDT.
3. Connect the QubeDT USB cable to your computer.
4. Launch the QubeDT-F Control software. In the Instrument address field select your QubeDT serial number from the drop down menu. Then press the **Connect button**.
5. The QubeDT-F Control software windows will appear as in figure. Now you can control the temperature stabilization of your QubeDT. In detail it is possible to:
 - a. Switch ON/OFF the temperature stabilization by pressing the **T Stab button**;
 - b. Stabilize the QubeDT at different temperatures than the default temperature, by changing the **Temp Set Point** value;
 - c. Save all the current QubeDT parameters by pressing the **SAVE button**. In detail if the SAVE button is pressed when the TStab button is ON, the QubeDT will stabilize automatically when powered up. If the SAVE button is pressed when the T Stab button is OFF then the QubeDT will not stabilize automatically when powered up: it will be necessary to turn on the temperature stabilization from the software as described above.
6. To disconnect the QubeDT press the **Disconnect button**.