

1 quED: Entanglement Demonstrator Manual

1.1 Quickstart Manual

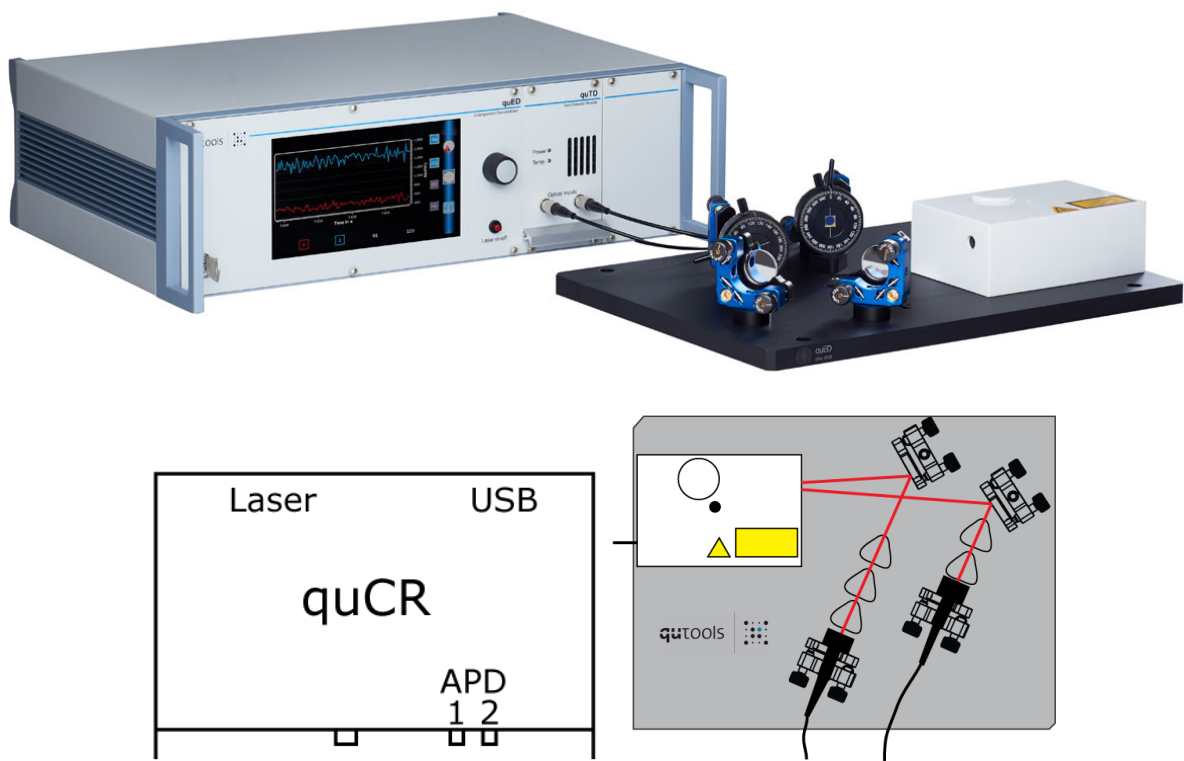


Figure 1.1: The two main components of the quED and how they are displayed in schematics.

1.1.1 Safety instructions

Please read the safety instructions carefully as mistreatment might harm you or the product irreparably.

Laser Safety

This product contains Class 3B laser according to IEC 60825-1 (or EN 60825-1) Safety Standards.



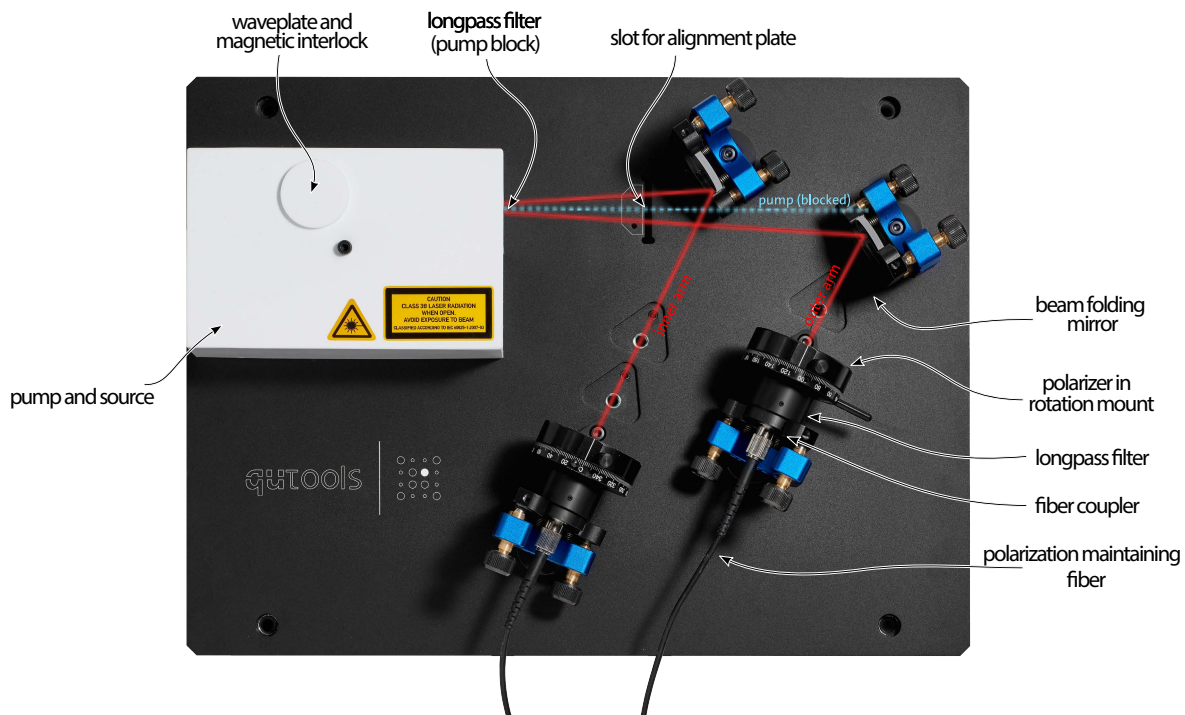
Class 3B lasers are hazardous to the eye from direct beam viewing, and from specular reflections even for short and unintentional exposures! Therefore it is absolutely necessary to take overall safety measures when operating the source with the white cover removed.

Additional Warnings

The following precautions should be thoroughly reviewed and followed to avoid the risk of any damage or failure.

- Avoid any back-reflection into the aperture of the laser head. Permanent damage to the laser diode can occur.
- Never connect or disconnect the cable between the quCR control unit and the source while the laser is switched on. This can lead to laser hazard for the operator and possible permanent damage to the laser diode.
- The lifetime of the laser diode can be significantly shortened by applying the driving currents higher than the limiting value preset in the quCR control unit. Therefore, the laser diode should be operated strictly below this value.
- Make sure to always turn off the laser diode (red push button) prior to turning off the quCR with the key switch. Otherwise, permanent damage can occur to the laser diode.
- ESD (electrostatic discharge) sensitive device! Electrostatic charges as high as several thousand volts might readily accumulate on the human body and equipment and can easily discharge. If this happens in the immediate vicinity of the laser diode, its permanent damage can occur. Therefore, proper ESD precautions are strongly recommended when handling and operating the source. These include avoiding wearing clothes, which easily generate ESD, putting on work gloves to protect against static electricity, maintaining environmental humidity 40–50% or more, wearing an anti-static-wristband, etc.
- Opening or removing the housing of the laser head might expose the user to the danger of laser radiation, and might cause the laser diode failure.

1.1.2 Starting up



- Be careful NOT to move the adjusting knobs of the mirror mounts and the fiber couplers when unpacking the breadboard!
- Plug the fibers into the quCR control unit.
- Connect the Laser unit to the quCR control unit using the included SUB-D9 cable.
- Make sure the half waveplate is unpacked and inserted into the beam path properly. You can access the waveplate by removing the small round cover in the white source enclosure. Please note that removing the cover will activate the safety interlock and shut off the laser, if it was turned on.
- Make sure the polarizers are both inserted securely in the two beam paths of the optical setup. If you have the motorized version, please note that the third motor position in the left beam path of the quED can only be used by a horizontally mounted motor! Vertically mounted motors can only be fixed in the other two positions.
- Probably the system will have to be slightly readjusted. For this purpose, set both polarizers to 45° and the integration time to 0.1s. Keep the laser diode covered under the white housing and turn on the laser. Set the operating current specified in the inspection data sheet.
- A small coincidence rate should already be visible. Otherwise, you have to refer to the complete alignment procedure in the operation manual. Make sure, the coincidence rate is not comprised of accidental coincident events only. A rate of a few hundred per second is usually fine and enough to start with.

- Maximize the single count rates and the coincidences by **carefully** adjusting the four knobs of the two fiber couplers. Do not touch the knobs of the mirror mounts. The maximal count rate should lie within a $\pm 180^\circ$ turn of the knobs. Only slightly turn the knobs remembering the starting positions and make sure you never lose the coincidence rate completely.
- Set the polarizers to $45^\circ / -45^\circ$, The coincidence rate should drop close to zero.
- Congratulations, you can now use the Entanglement Demonstrator.

For environmental reasons, we do not print out the rest of the full manual. You can find the full manual and a lot more on our website at <https://qutools.com/qued/> under *Downloads & Links*.