

Cost of Single Photon Experiments
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Attached are current prices for all the components needed for single-photon experiments. I have divided them in three categories:

1. Basic down-conversion: All you need to get photon pairs via parametric down-conversion. This includes a laser, down-conversion crystal, necessary optics, detectors and electronics.
2. Single-photon interference: Additional components to do interference and the quantum eraser. It also includes a measurement that photons exists-the Hanbury-Brown-Twiss test. This involves only additional optics components and their mounts.
3. Entanglement and Bell: Additional components to obtain polarization entangled photons, measure correlations and violations of Clauser-Horne-Shimony-Hold version of Bell inequalities. This entails an additional crystal and some polarization optics. One expensive item is a good polarizer (Glan Thompson). It is good to have, but it is not absolutely necessary.

The grand totals are given in the table below:

Apparatus	Total
Basic	\$10.6k
Single photon int.	\$3.2k
Entanglement	\$3.6k
Totals	\$17.4k

The details are in the spreadsheets that are enclosed. Implementing the experiments will require some planning. The costs can be reduced, so in the next table we present the costs under a different rubric. What components do we absolutely need to purchase and which components we can get used from in-house or elsewhere? The next table makes this breakdown. (There may be some round-off errors.)

Apparatus	Total	New	Used
Basic	\$10.6k	\$6.9k	\$3.7k
Single photon int.	\$3.2k	\$1.0k	\$2.1k
Entanglement	\$3.6k	\$3.4k	\$0.1
Totals	\$17.2k	\$11.3k	\$5.8k

Notice that the price tag of the “must buy” goes down. Those under “new” are components such as down-conversion crystal, detectors, laser, etc., and those under “used” are mirrors, mounts, the breadboard, laser goggles, etc. Some more sacrifices can be made, but those must be informed decisions. Often being stubborn does not work out (we say this by own experience...). For example, there is no way to compromise on the detectors. Photomultipliers will not work (yet). In the next table we list the type of components, so you get an idea. I have divided them into three categories: “single items” (breadboard, crystals, detectors, etc.), “optics” (mirrors, waveplates) and “mounts” (hardware).

Apparatus	Single items	Optics	Mounts
Basic	\$7.4k	\$1.3k	\$1.6k
Single photon int.	\$0.1k	\$1.4k	\$1.8k
Entanglement		\$2.8k	\$0.8k
Totals	\$7.5k	\$5.5k	\$4.2k

Suppose we have some money this year and some more next year, what are the most expensive items? That is in the next table. Amazingly, the most expensive item is a breadboard. Listed is the range of prices. For example, in optics, the least expensive is a \$70 mirror, and the most expensive is a Glan-Thompson polarizer (\$550). At the high end of mounts we have the beam splitter mounts. I note that one can mount hardware with anything at hand, but for the interferometer I highly recommend the “pedestal mounts” because they are rigid and stable.

Item	Cost
Optical breadboard	\$1.9k
Detectors	\$1.4k (each; need 2-3)
Crystal	\$500-1000
Laser	\$20-500
Optics	\$70-550
Mounts	<\$350

Finally, in a separate spreadsheet I give the individual prices, part numbers and photos of the components..