

Item	company	details	part num	quant	unit cost	total cost
<u>Photon Counting</u>						
Photon counters	ALPhA www.advlab.org	One set of (4) Single-Photon Counting Modules (Excelitas), for educational use	SPCM-EDU CD3375	1	5720	5720
fibers	Pacer/USA	opaque jacket fiber (50 micron)	SPCM-QC9	4	150	600
power supplies	Allied Electronics	Phihong PSAA15W-050-R	653-0061	4	15	60
Power cord	Allied Electronics	Phihong AC15WNAR	653-0097	4	5	20
Surge protector		computer-type surge protecting power strip for SPCM power supplies				
FPGA coincidence unit	Altera	Educational FPGA board	DE2	1	269	269
Adapter box for FPGA		See DE2 Coincidence unit info	Homemade	1	40	40
Computer with LabVIEW		Needs 2 RS232 COM ports (or suitable adapters)				
Optical table or breadboard		4x6 is luxury, 3x5 is sufficient. 3x4 might work, but I think you'd be cramped				
<u>Down Conversion</u>						
Violet laser - 405 nm, 150 mW, runs on 12VDC	Aixiz.com	laser with TEC and power supply	AIX-405-150T	1	63.5	63.5
12V, 6W, DC power supply	your favorite supplier	wall wart power supply				
Mount for laser	You'll need to build something					
Beam block for violet laser	Thorlabs		LB1	1	45.2	45.2
2 turning mirrors for violet light, with mount	Thorlabs		KM100-E02	2	105.35	210.7
iris for defining violet beam	Thorlabs		ID12	1	42	42
Violet half-wave plate	Newlightphotonics.com		WPA03-H-405	1	249	249
Mount for violet half-wave plate	Thorlabs		RSP1	1	81.1	81.1
Down-conversion crystal (long crystal for single-crystal expts)	Newlight Photonics		BBO: 5x5x3 mm, theta = 29.3 deg, Type I PDC, cone angle 3 deg, AR coated at 810/405 nm, mounted 1" anodized Al holder	1	499	499
Mount for down-conversion crystal	Thorlabs		KM100	1	40	40
Linear polarizer	Edmund Optics	Cheap linear polarizer. Not great specs at 810nm, but good enough	NT54-926	1	23	23
rotation stage for linear polarizer	Thorlabs		RSP1	1	81	81
base	Thorlabs	base	BA1	8	6	48
2" post	Thorlabs	2" post	TR2	8	5	40
2" post holder	Thorlabs	2" post holder	PH2	8	8	64
Laser Safety glasses	lasershields.com	the YLW filter eliminates the strong blue pump, but allows you to see the 810nm alignment laser. To eliminate that as well, get filter CYN	Filter: YLW	1	96	96

<u>Alignment Laser</u>						
808nm laser diode module	Aixiz.com	10mW, runs on 3VDC	AD808-101235	1	19	19
3V DC power supply	your favorite supplier	wall wart power supply				
adapter	Thorlabs	adapter for laser	AD12F	1	29	29
fiber coupling lens	Thorlabs	FC connector fiber coupling lens	F220FC-780	1	128	128
mount	Thorlabs	Kinematic mount	KC1-T	1	89	89
adapter	Thorlabs	adapter for coupling lens	AD11F	1	27	27
cage rods	Thorlabs	Cage assembly rod - 3"	ER3	4	7	28
plate	Thorlabs	Threaded Cage Plate	CP02	1	16	16
lens tube	Thorlabs	Lens Tube 1"	SM1L05	1	15	15
base	Thorlabs	base	BA1	1	6	6
2" post	Thorlabs	2" post	TR2	1	5	5
2" post holder	Thorlabs	2" post holder	PH2	1	8	8
fiber patch cable	Pasternack	1m multimode, FC connectors	PE300013-1	1	15	15
<u>Fiber-Coupled Detectors (4-channel)</u>						
Lens	Thorlabs	f=11mm, NA=0.25, AR coat 600-1050nm	C220TME-B	4	87	348
lens adapter	Thorlabs	Lens to SM1	S1TM09	4	20	80
fiber adapter	Thorlabs	FC fiber to SM1	SM1FC	4	26	104
1" mount for fiber lens	Thorlabs	kinematic mount	KM100T	4	60	241
lens tube	Thorlabs	SM1 lens tube, 1"	SM1L10	4	14	56
FC/PC to FC/PC Dual L-Bracket Mating Sleeve, Wide Key	Thorlabs	for swapping with alignment laser	ADAFCB2	3	52	155
irises for defining downconversion beams	Thorlabs		ID12	4	42	168
base	Thorlabs	base	BA1	8	6	48
2" post	Thorlabs	2" post	TR2	4	5	20
2" post holder	Thorlabs	2" post holder	PH2	8	8	64
fiber patch cable	Pasternack	1m multimode, FC connectors	PE300013-1	4	15	60
<u>Optical Filters (4-channel)</u>						
Lens	Thorlabs	f=11mm, NA=0.25, AR coat 600-1050nm	C220TME-B	8	87	696
lens adapter	Thorlabs	Lens to SM1	S1TM09	8	20	160
fiber adapter	Thorlabs	FC fiber to SM1	SM1FC	8	26	208
mount	Thorlabs	Kinematic mount	KC1-T	4	89	356
lens tube	Thorlabs	SM1 lens tube, 1"	SM1L10	8	14	112
plate	Thorlabs	Threaded Cage Plate	CP02	4	16	64
cage rods	Thorlabs	Cage assembly rod - 4"	ER4	16	7	112
RG780 filter	Thorlabs	780 nm longpass filter in filtering unit	FGL780	4	50	200
retaining ring	Thorlabs	For holding filters	SM1RR	8	5	40
base	Thorlabs	base	BA1	4	6	24
2" post	Thorlabs	2" post	TR2	4	5	20
2" post holder	Thorlabs	2" post holder	PH2	4	8	32
fiber patch cable	Pasternack	1m multimode, FC connectors	PE300013-1	4	15	60
<u>Grangier Experiment</u>						
Polarizing beamsplitter	Thorlabs	use with half-waveplate to make adjustable beamsplitter	PBS122	1	178	178
Polarizing beam splitter mount	Thorlabs		KM100PM	1	69	69
Clamping arm for polarizing beam splitter mount	Thorlabs		PM3	1	18	18

Down conversion half-wave plate	Newlightphotonics.com		WPA03-H-810	1	249	249
rotation stage for half-wave plate	Thorlabs		RSP1	1	81	81
base	Thorlabs	base	BA1	2	6	12
2" post	Thorlabs	2" post	TR2	2	5	10
2" post holder	Thorlabs	2" post holder	PH2	2	8	16
<u>Single-Photon Interference</u>						
Beam Displacing Polarizers	Thorlabs	4 mm beam displacement	BD40	2	590	1180
Down conversion half-wave plate	Newlightphotonics.com	(need 3, have one from Grangier)	WPA03-H-810	2	249	498
rotation stage for half-wave plate	Thorlabs		RSP1	2	81	162
beamdisplacing prism mounts	Newport	Suprema mount	SN100-F2KN	2	120	240
Stepper motor and controller	Newport	Newstep actuator and controller	NSC200-KT	1	874	874
cable	Newport	3 meter cable	NSC-CB3	1	12	12
adapter	Newport	RS485-232 adapter	NSC-485-232-I	1	65	65
base	Thorlabs	base	BA1	4	6	24
2" post	Thorlabs	2" post	TR2	4	5	20
2" post holder	Thorlabs	2" post holder	PH2	4	8	32
<u>Hardy/Bell</u>						
Down-conversion crystals (double crystal)	Newlight Photonics		Paired BBO (2pcs) for photon entanglement, size 5x5x0.5 mm(each), cut for Type I PDC pumped by 405nm with the external half opening angle of 3 deg, theta=29.3deg., AR coated at 810/405 nm, mounted back-to-back with one crystal rotated by 90 degree about axis normal to incident face in an 1" anodized Al holder	1	949	949
phase adjuster for 2 crystal downconversion	MTI Crystals http://www.mtixtl.com/	x-cut 10x10x0.5 mm quartz substrate polished on 2 sides NOTE: for better results, replace this with thin BBO (optional equipment, below)	SOX101005S2	1	25	25
Polarizing beamsplitter	Thorlabs	need 2, have 1 from Grangier expt. NOTE: Could replace with Rochon polarizers for better results (optional equipment, below)	PBS122	1	178	178
Mount for down-conversion crystal	Thorlabs		KM100	1	40	40
Polarizing beam splitter mount	Thorlabs		KM100P	1	59	59
Clamping arm for polarizing beam splitter mount	Thorlabs		PM1	1	10	10
mount for quartz phase adjuster	Thorlabs	1/2 lens mount	LMR05	1	15	15
adapter	Thorlabs	9mm adapter to hold 10mm crystal	LMRA9	1	14	14
base	Thorlabs	base	BA1	3	6	18

2" post	Thorlabs	2" post	TR2	3	5	15
2" post holder	Thorlabs	2" post holder	PH2	3	8	24
multi-axis box for motion controller	Newport	8-axis switchbox	NSC-SB	1	847	847
motor-controlled rotation stage	Newport	need adapter to raise height from 3" to 4"	NSR1	2	876	1752
<u>Quantum State Measurement</u>						
Quarter-wave plates	Newlightphotonics.com		WPA03-Q-810	2	249	498
<u>Tools</u>						
spanner wrench	Thorlabs	for Aspheric optics	SPW301	1	14	14
spanner wrench	Thorlabs	For SM1 lens tubes	SPW602	1	29	29
spanner wrench	Thorlabs	For fiber coupling lens focus adjustment	SPW909	1	28	28
SUB-TOTAL						20359
<u>Optional Equipment</u>						
CCD Camera	SuperCircuits	micro-video camera to easily see 810nm alignment laser (can use LCD monitor that comes with Fiber microscope to display image)	PC212XS	1	40	40
TAC	Ortec	Time-to-Amplitude Converter for observing timing of photon pairs (NOTE: you'll also need a NIM crate to plug this into--most labs have one lying around somewhere)	566	1	1632	1632
A/D for LabVIEW MCA	National Instruments	use with TAC to display histogram of photon-pair timing	NI USB-6210	1	629	629
high quality polarizing beamsplitters for local realism experiments	CVI Melles Griot	Rochon polarizers, 15 degree beam deviation, AR 670-1064 nm	RCHP-15-CA- 670-1064	2	1070	2140
Down-conversion crystal (short crystal)	Newlight Photonics	replaces quartz crystal for phase adjustment in Hardy/Bell expts. Compensates group-velocity dispersion for better entanglement. Can also use for Grangier Expt.	BBO: 5x5x0.5 mm, cut for Type I SPDC pumped by 405nm with the external half opening angle of 3 deg, theta=29.3deg., AR coated at 810/405 nm, mounted 1" anodized Al holder	1	499	499
video fiber microscope	Fiber Instrument Sales	Very useful for inspecting fibers for dirt/scratches. Comes with LCD monitor	F1VM400LCD	1	595	595
fiber cleaner	Fiber Instrument Sales	Cleans fiber tips	F16270S	1	90	90
Green LED safe-lights	LEDtronics.com	illuminates lab, but blocked by filters	PAR20-66-0AG-120AN			
TOTAL						25984