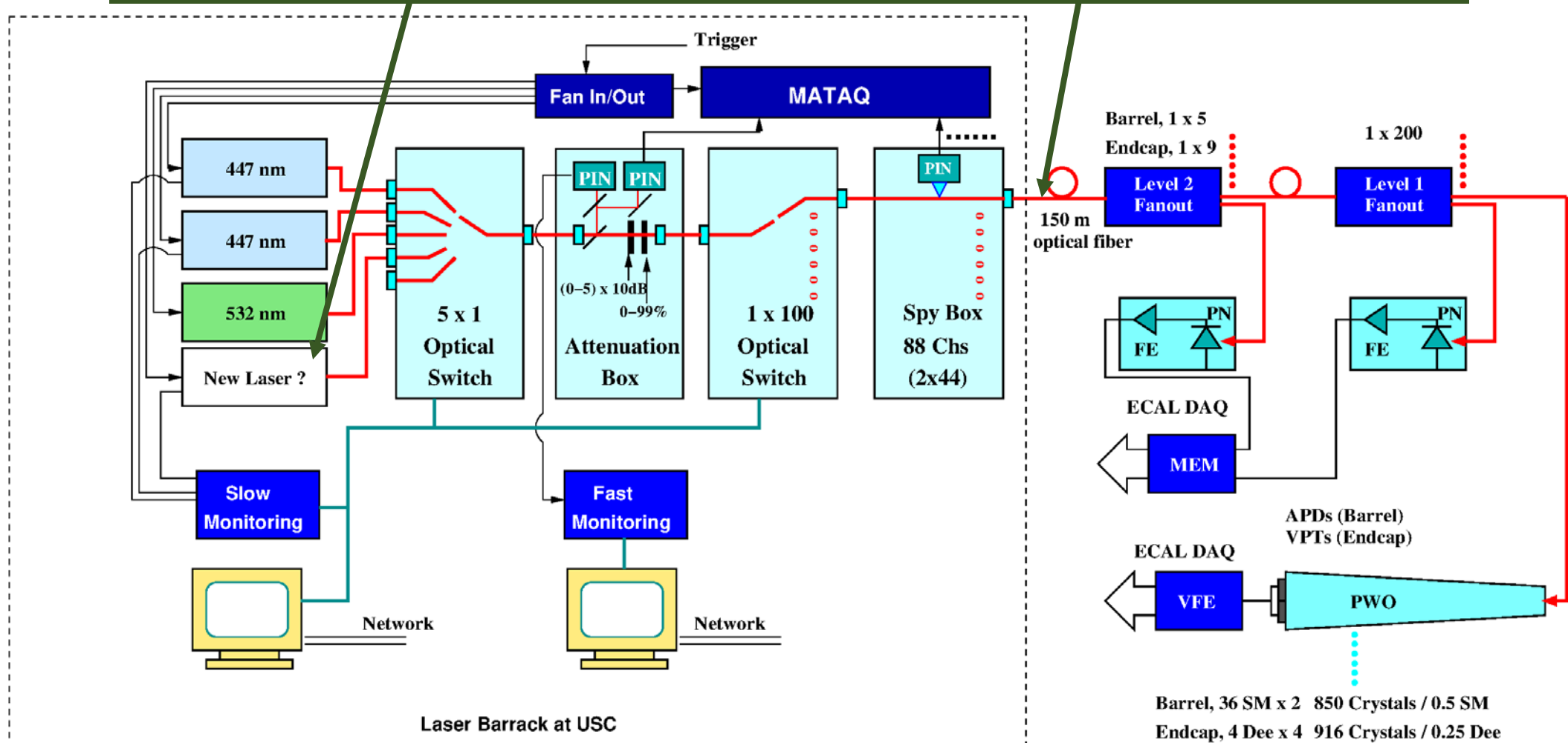


Laser Damage Threshold for Fibers

- Laser damage threshold (LDT) defines the maximum laser pulse intensity density for fibers, and thus the pulse intensity.
- According to OFS (optical fiber manufacturer), the LDT for HCG-M0365T 365 μm quartz fiber is about 10 J/cm^2 for 527 nm laser pulses of 7 ns FWHM, corresponding to 10 mJ/pulse.
- A long term (~ 1 week) operation test is required for HCG-M0365T quartz fibers and the DiCon optical switch, if 527 nm laser pulses of 7 ns FWHM with intensity of $> 10 \text{ mJ}$ is used.

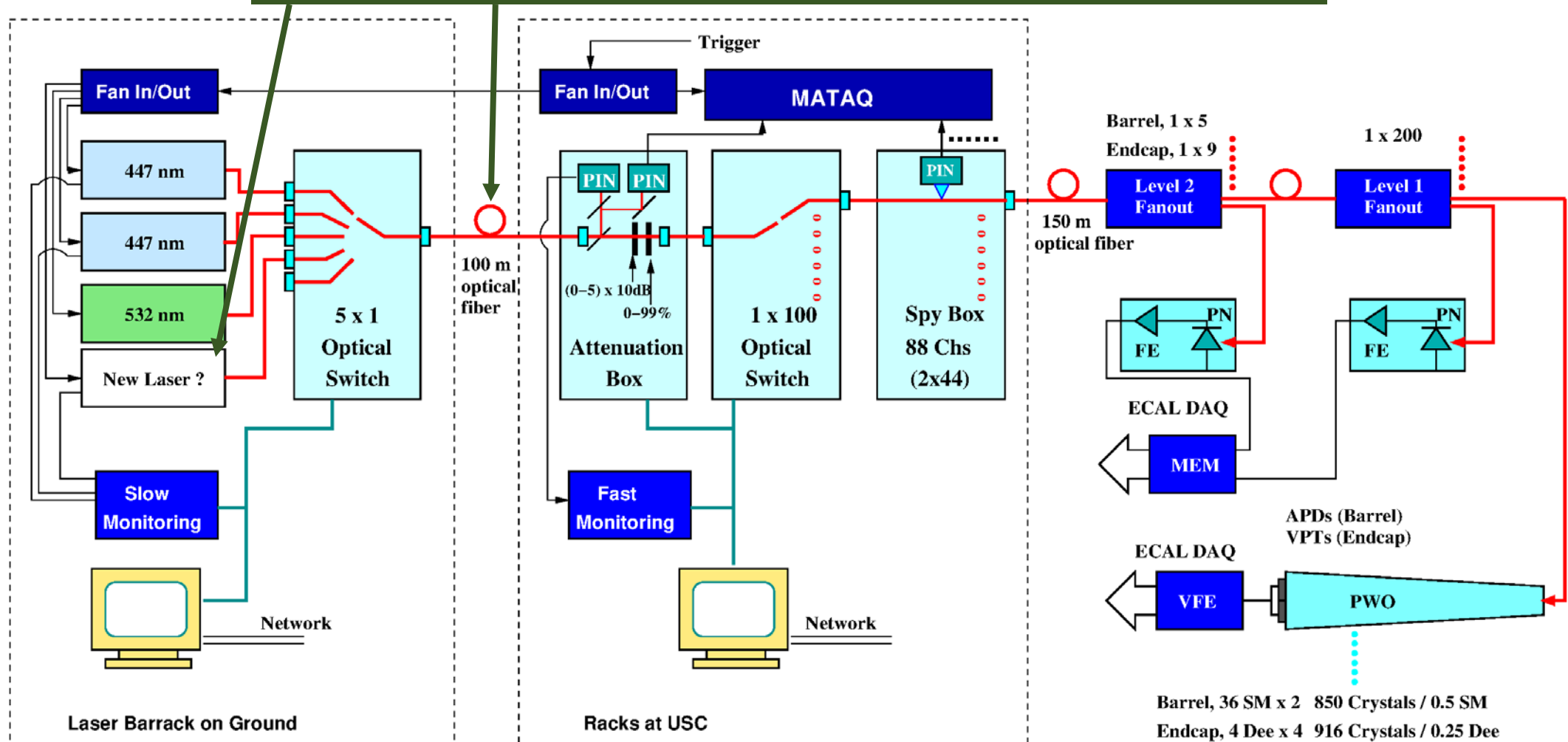
Scenario 1: Moving Entire System to Ground

Adding 88+ spare long fibers and a new 527 nm laser
 Pro: Current system untouched and No laser DAQ modification
 Con: 527 nm for EE, MATAQ far away from ECAL, and High fiber cost



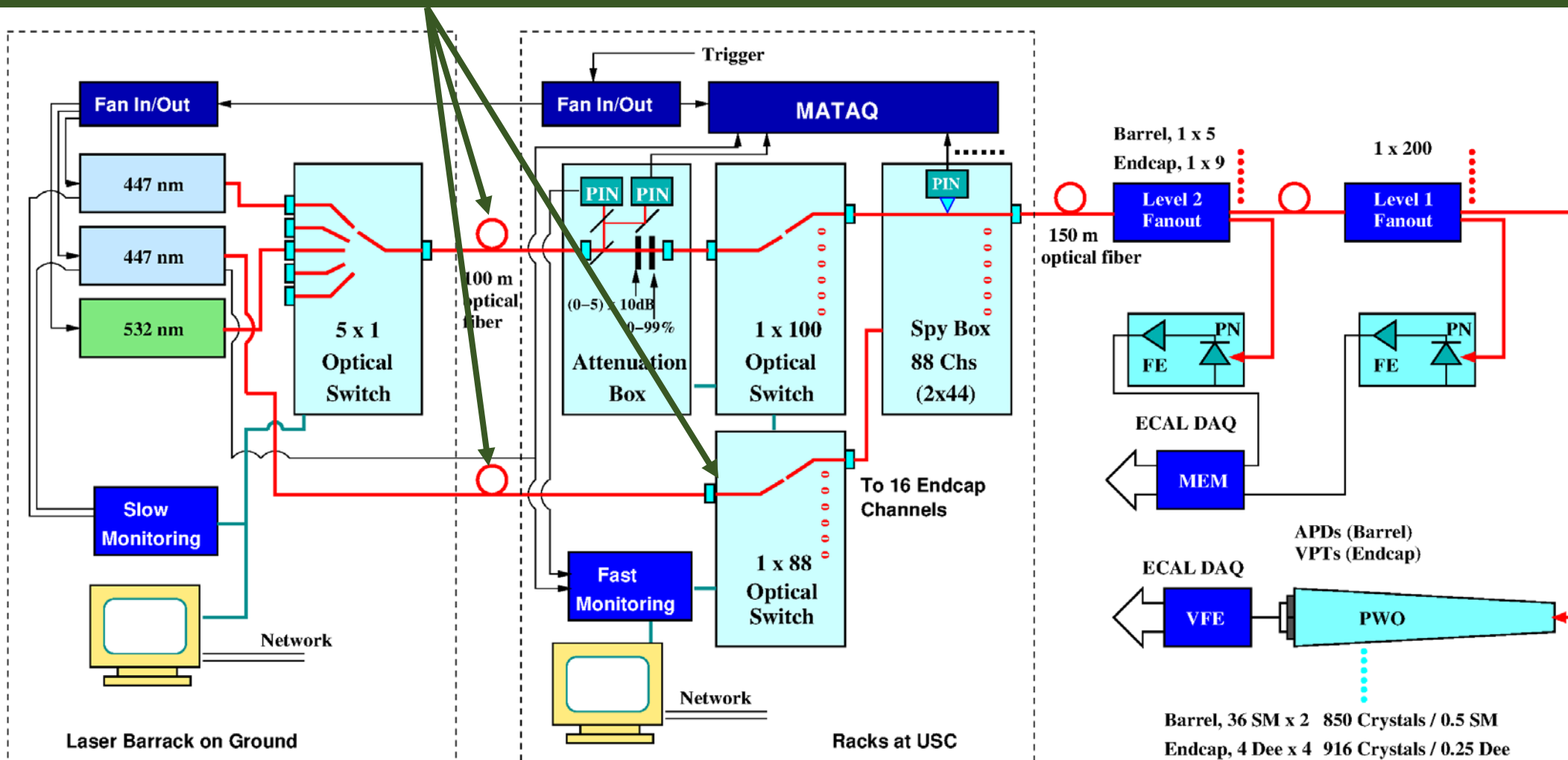
Scenario 2: Leaving MATACQ Underground

Adding one+spare long fiber and a new 527 nm laser
 Pro: MATACQ close to ECAL, and Low fiber cost
 Con: 527 nm for EE, and Minor laser DAQ modification



Scenario 3: Using Spare DP2 and Switch

Adding two+spare long fiber, reducing DP2 upstream optics for 5x pulse energy to EE
 Pro: 447 nm for EE, MATAQ close to ECAL, and Low fiber cost
 Con: Major laser DAQ modification, No spare laser and optical switch



Comparison and Questions

Pros/Cons	Scenario-1	Scenario-2	Scenario-3
More photons delivered to EE	X	X	X
Low cost for additional optical fibers (~\$90k)		X	X
No need for new laser and Low risk of optical fiber damage			X
Spare 447 nm laser and optical switch	X	X	
Minimum work for Test and DAQ	X		

Questions:

- 1) What is the laser pulse intensity needed for EE monitoring in Run 3?
- 2) Is the laser pulse profile measured at laser head useable for MATAQ?
- 3) Can the spy box be bypassed for EE?

Photonics Laser 2021 Quotations

A new laser market survey is under way

527 nm, 7 ns, 18 mJ: \$105k

473 nm, 80 ns, 3 mJ: \$190k

473 nm, 50 ns, 8 mJ: \$325k



Photonics Industries
International, Inc.



Photonics Industries
International, Inc.



Photonics Industries
International, Inc.

Quotation Number: Q21-0503JK3 *QUOTATION*
Date: 5/3/21
Valid Until: 6/3/21
Payment: 25/50/25
Freight: EXW
Delivery: 8 to 12 Weeks ARO (exact date provided at time of order acceptance)

Quotation Number: Q21-0503JK3 *QUOTATION*
Date: 5/3/21
Valid Until: 6/3/21
Payment: 25/50/25
Freight: EXW
Delivery: 8 to 12 Weeks ARO (exact date provided at time of order acceptance)

Quotation Number: Q21-0503JK2 *QUOTATION*
Date: 5/3/21
Valid Until: 6/3/21
Payment: 25/50/25
Freight: EXW
Delivery: 8 to 12 Weeks ARO (exact date provided at time of order acceptance)

To: California Institute of Technology From: Photonics Industries
1200 E California Blvd, 1800 Ocean Avenue
Pasadena CA 91125 Ronkonkoma, NY 11779

Tel: Tel: 631-218-2240
Fax: Fax: 631-218-2275
Attn: Liyuan Zhang Attn: J Kilmer

To: California Institute of Technology From: Photonics Industries
1200 E California Blvd, 1800 Ocean Avenue
Pasadena CA 91125 Ronkonkoma, NY 11779

Tel: Tel: 631-218-2240
Fax: Fax: 631-218-2275
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Tel: Tel: 631-218-2240
Fax: Fax: 631-218-2275
Attn: Liyuan Zhang Attn: J Kilmer

Description	Price
DP-527-18 Laser - Specifications Wavelength 527 nm Pulse Energy @ 100Hz 18mJ Pulse Width ~7 ns Beam Mode TEM00	\$80,000
Low Jitter Option low jitter option which would reduce the jitter to ~1 to 2ns	\$25,000
System Software DP Control software provides basic system operating controls in a convenient graphical user interface configuration.	Included
Utility Requirements Operating voltage is 100 to 240VAC, operating frequency is 47 to 63Hz, single phase power, 10 to 30°C.	
Warranty Standard Photonics Industries one-year parts and labor warranty. Warranty repairs are to be performed at Photonics Industries facilities or at customer's site. Travel and living expenses to be paid by customer.	Included
Total (US\$)	\$ 105,000.00

Description	Price
DP-527-18 Laser - Specifications Wavelength 527 nm Pulse Energy @ 100Hz 18mJ Pulse Width ~7 ns Beam Mode TEM00	\$80,000
Low Jitter Option low jitter option which would reduce the jitter to ~1 to 2ns	\$25,000
System Software DP Control software provides basic system operating controls in a convenient graphical user interface configuration.	Included
Utility Requirements Operating voltage is 100 to 240VAC, operating frequency is 47 to 63Hz, single phase power, 10 to 30°C.	
Warranty Standard Photonics Industries one-year parts and labor warranty. Warranty repairs are to be performed at Photonics Industries facilities or at customer's site. Travel and living expenses to be paid by customer.	Included
Total (US\$)	\$ 105,000.00

Description	Price
DP-473-8 Laser - Specifications Wavelength 473 nm Pulse Energy @ 100Hz 8mJ Pulse Width ~50 ns Beam Mode TEM00	\$300,000
Low Jitter Option low jitter option which would reduce the jitter to ~1 to 2ns	\$25,000
System Software DP Control software provides basic system operating controls in a convenient graphical user interface configuration.	Included
Utility Requirements Operating voltage is 100 to 240VAC, operating frequency is 47 to 63Hz, single phase power, 10 to 30°C.	
Warranty Standard Photonics Industries one-year parts and labor warranty. Warranty repairs are to be performed at Photonics Industries facilities or at customer's site. Travel and living expenses to be paid by customer.	Included
Total (US\$)	\$ 325,000.00

Standard Warranty and Terms & Conditions attached.
Authorized Signature

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Authorized Signature

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