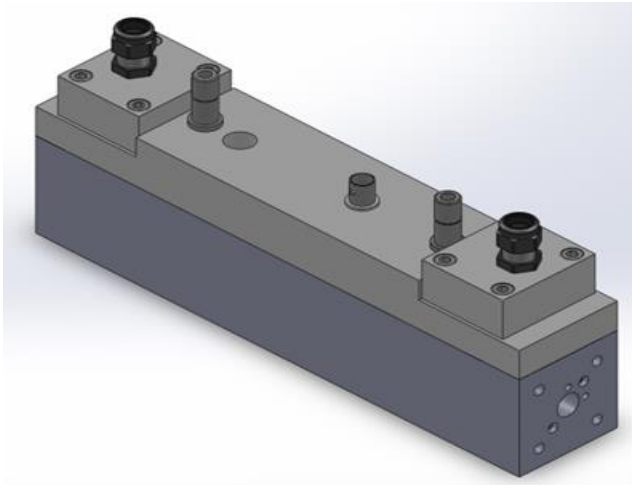


# 40 Watt 2.09 $\mu\text{m}$ SOLID-STATE RESONATOR



<b>Holmium</b>	
67	164.93032
<b>Ho</b>	
[Xe] 4f <sup>11</sup> 6s <sup>2</sup>	
175 pm	581.0 kJ·mol <sup>-1</sup>
3	8790 kg·m <sup>-3</sup>
1.23	1461/2720 °C

## Compact, Room-Temperature Water-Cooled, Flashlamp-Pumped Ho:YAG Resonator Assembly

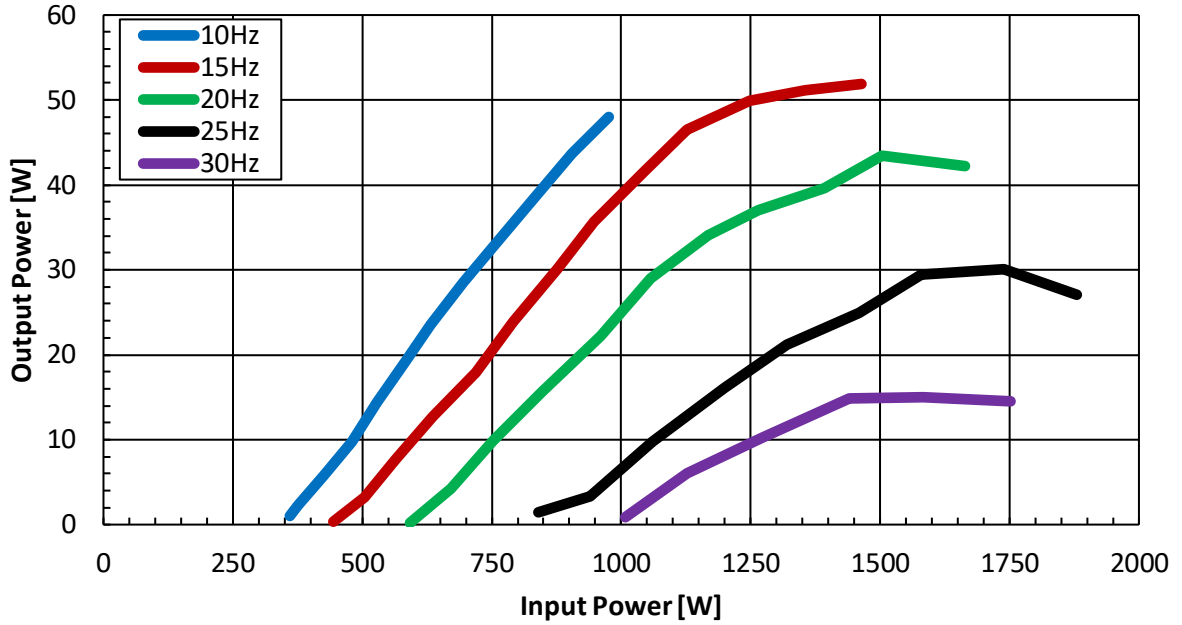
MegaWatt Lasers is pleased to offer off-the-shelf laser resonator assemblies. These resonators are intended for OEM's or R&D applications. Laser assemblies include: pump chamber, flashlamp, laser rod, trigger electronics, and resonator optics tailored for the specific application. This resonator assembly is perfectly suited as a laboratory laser which can easily transform into an OEM design. Also available are resonator assemblies using other solid-state laser media, such as Er:YAG, Er:Glass, Nd:YAG, Nd: Glass, Ruby, and Alexandrite. MegaWatt Lasers also offers custom resonators with average powers up to 60 W (2.09  $\mu\text{m}$ ) and 200 W @ (1.06  $\mu\text{m}$ ) as well as turnkey systems. Our Engineering department has considerable experience assisting OEM customers with custom as well as complete system designs.

**Table of Standard Specifications for R4X125C2-CTH**

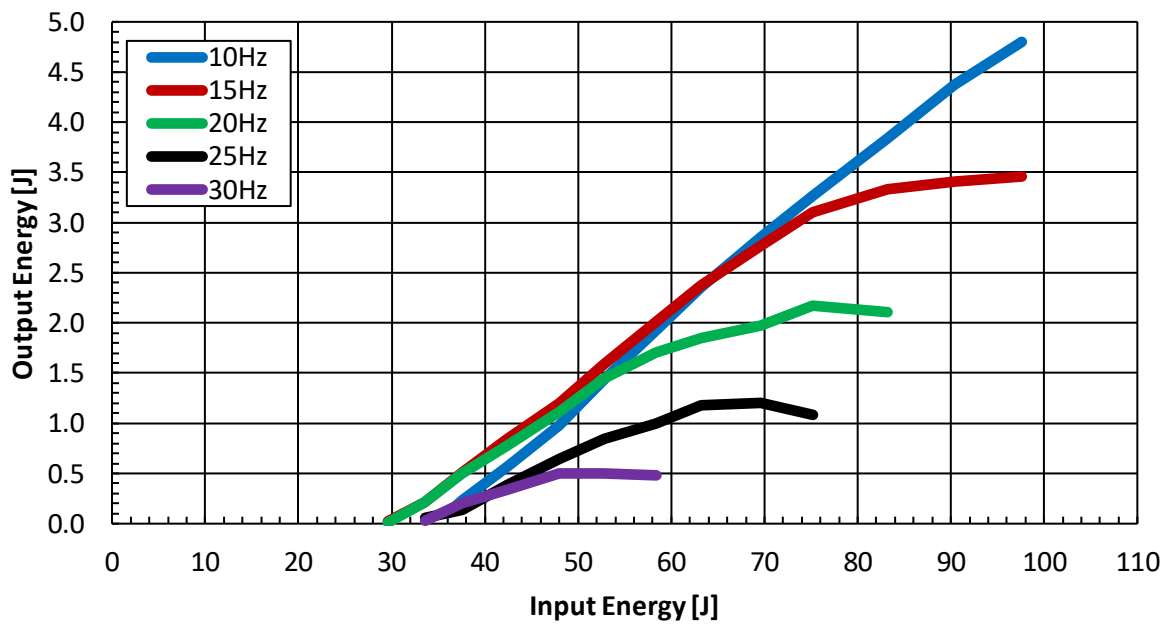
Parameter	Value	Unit	Notes
Wavelength	2.09	$\mu\text{m}$	
Resonator Output	40	W	@ 10 Hz & 500 $\mu\text{s}$
Lamp Voltage	700	V	@ 40 W & 500 $\mu\text{s}$ typical
Pulse Width Range	300 – 800	$\mu\text{s}$	
Coolant Temp	20	°C	Typical (deionized H <sub>2</sub> O)
Coolant Flow Rate	8	Liters/min	
Repetition Rate	5 – 30	Hz	
Dimensions	26.5 X 4.8 X 9.5	cm	
Pump Parameters			
Energy	$\leq 100$	Joules	
Power	$\leq 1800$	Watts	
Peak Power	$\leq 200$	kW	



Input Power Vs. Output Power  
CTH:YAG 4X125, 500  $\mu$ s, 20°C

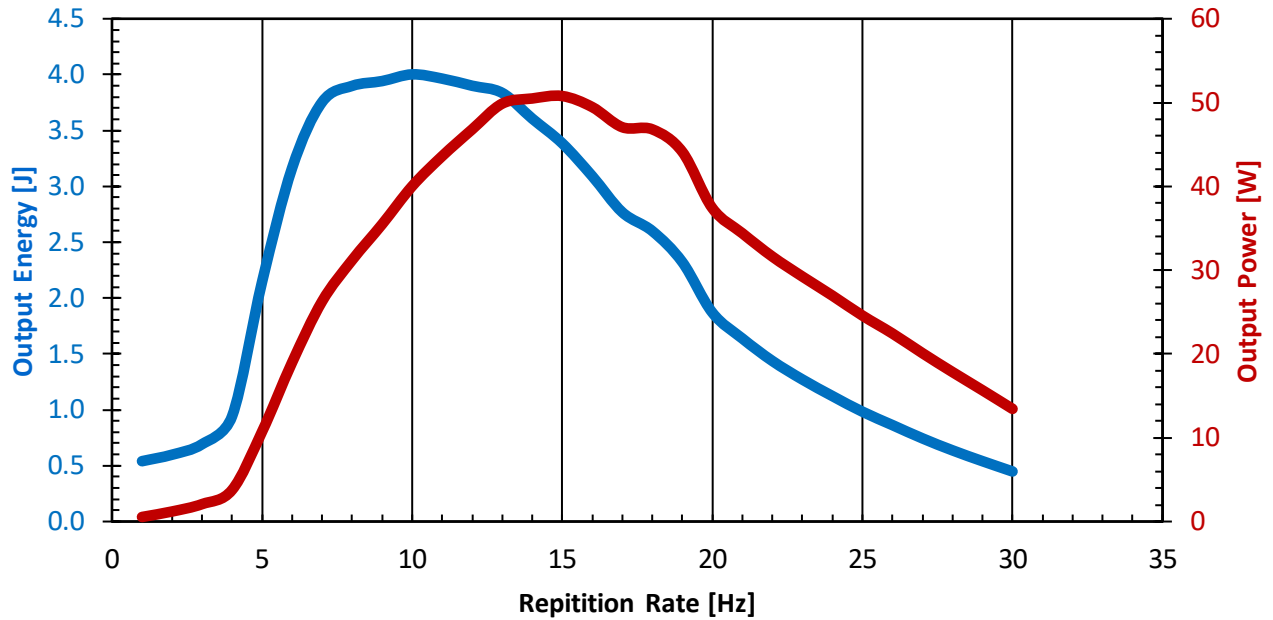


Input Energy Vs. Output Energy  
CTH:YAG 4X125, 500  $\mu$ s, 20°C

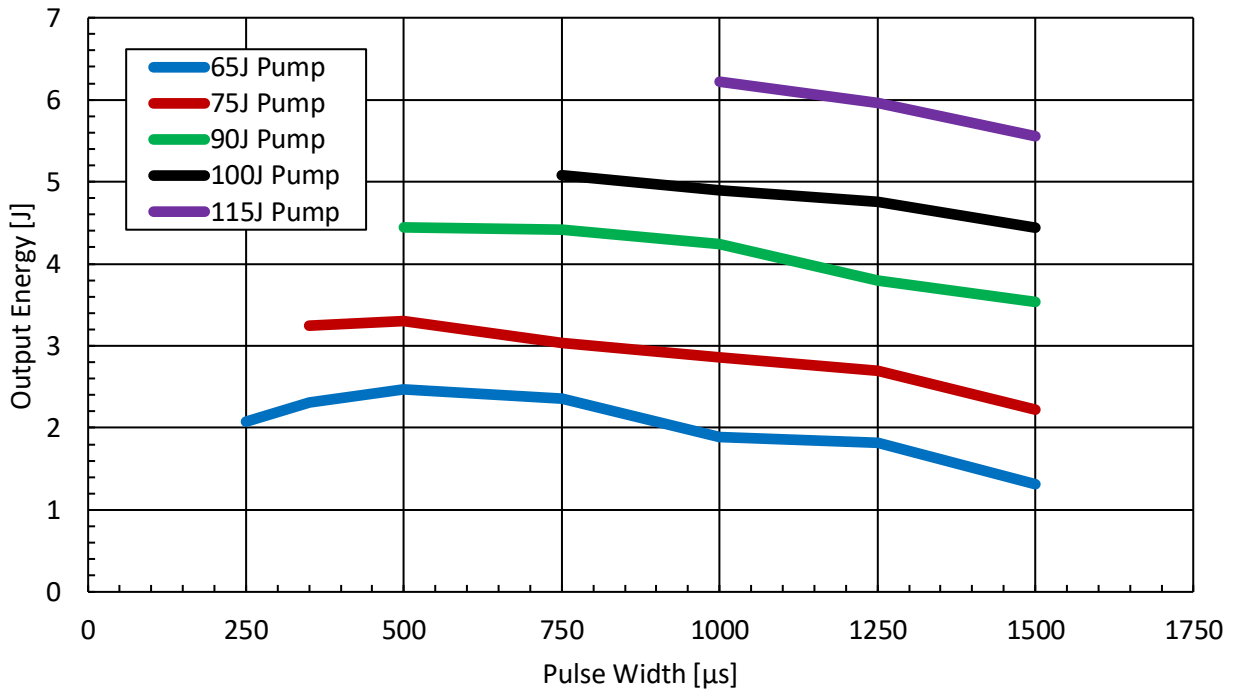




**Output Vs. Repetition Rate**  
CTH:YAG 4X125, 500  $\mu$ s, 20°C, 98 J Pump Energy, Aligned @ 10 Hz

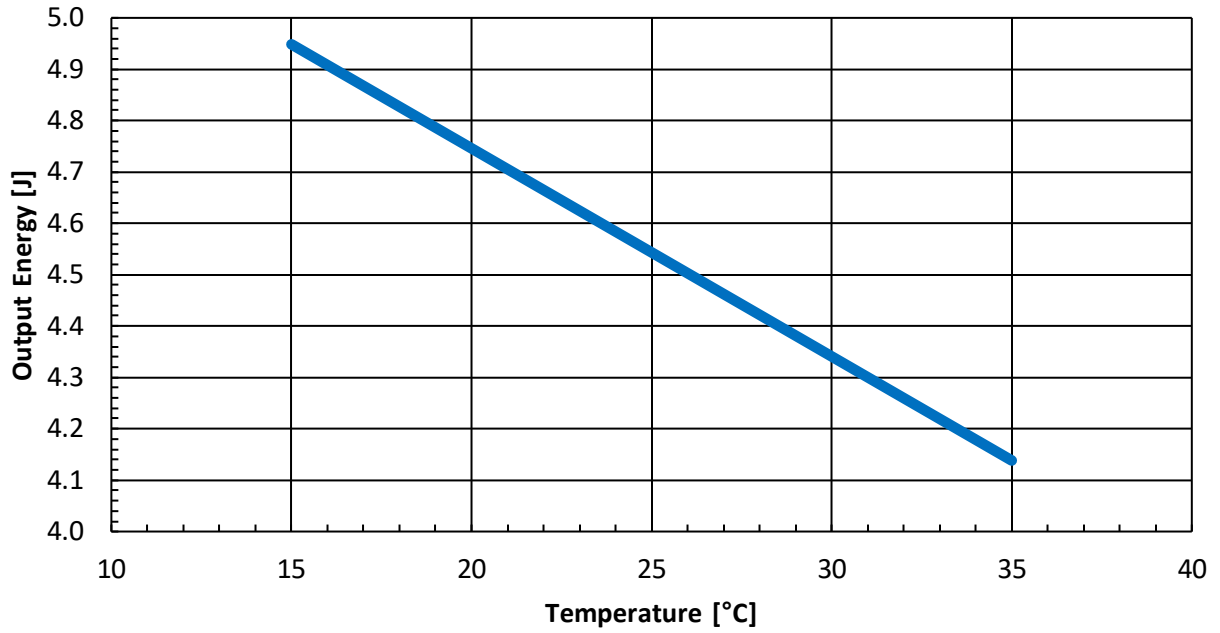


**Output Energy Vs. Pulse Width**  
CTH:YAG 4X125, 10Hz, 20°C

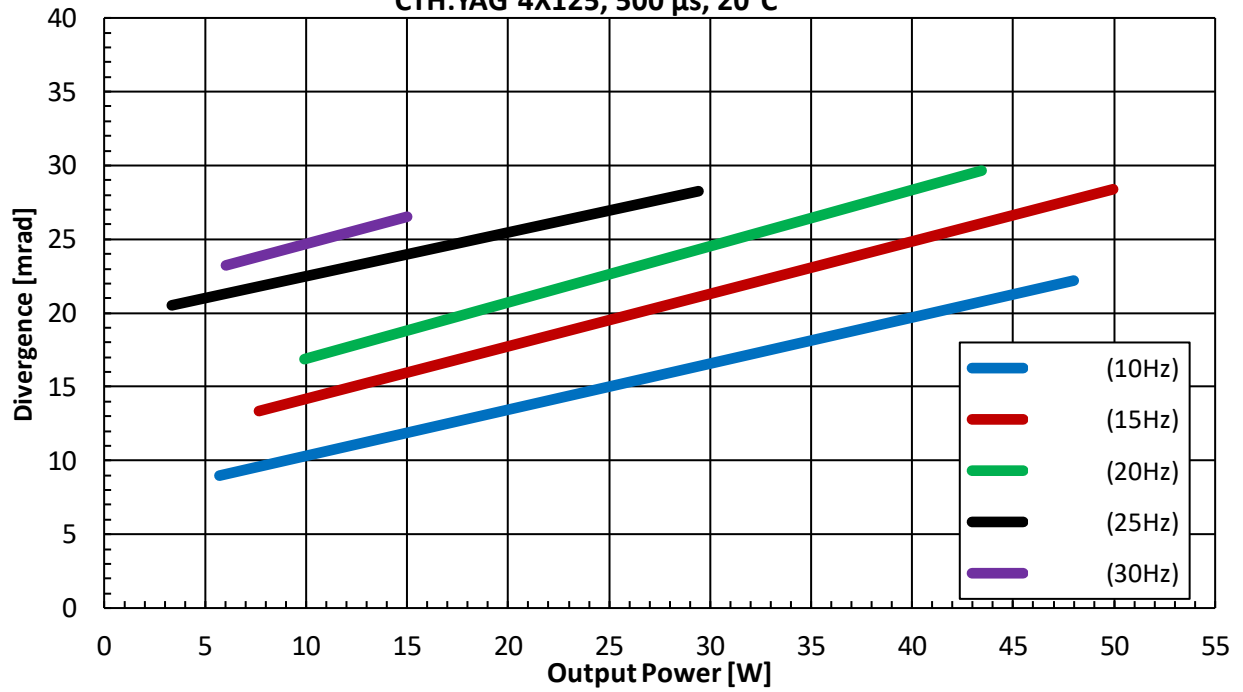


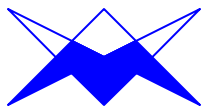


Output Vs. Temperature  
CTH:YAG 4X125, 10 Hz, 500  $\mu$ s, 98 J Pump Energy, Aligned @ 20°C

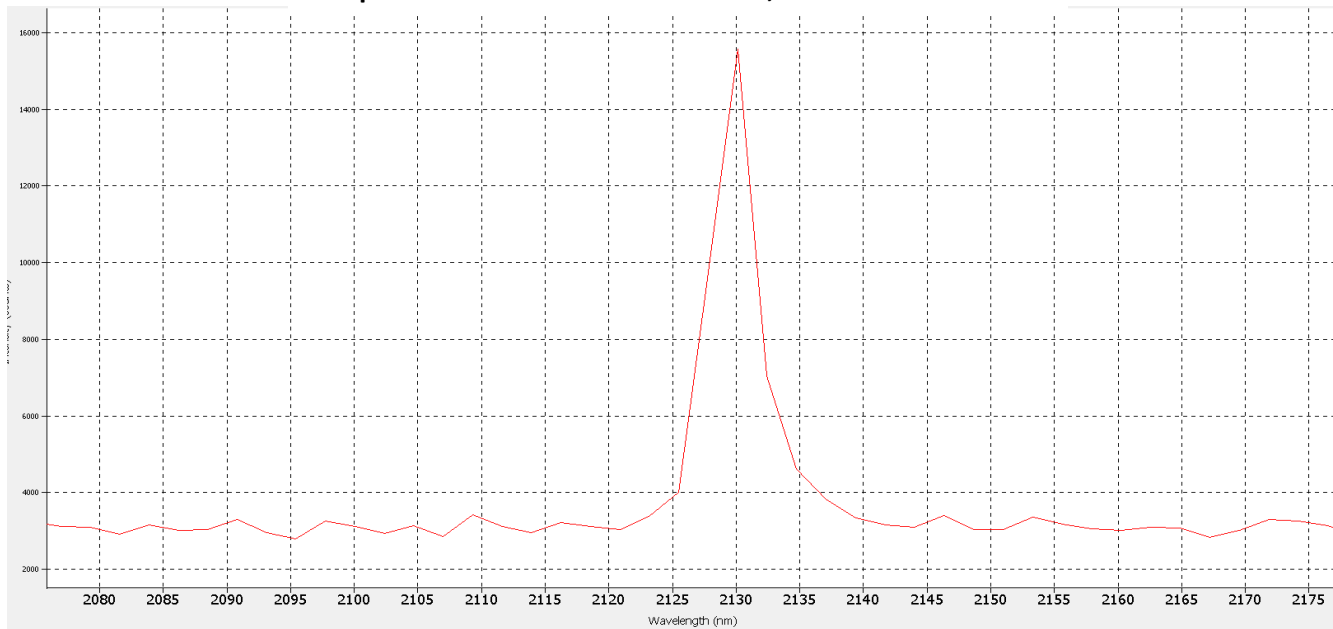


Output Power Vs. Divergence  
CTH:YAG 4X125, 500  $\mu$ s, 20°C





Spectral measurement of CTH:YAG, 4mm diameter rod



Pump Chamber	Output Coupler	Coolant Temperature	Repetition Rate	Pulse Width	Output Power
[Type]	[%]	[°C]	[Hz]	[µs]	[W]
4X125	82.5	18	10	500	33.7

**Recommended Cooling Specifications and Requirements:**

MegaWatt Lasers, Inc. recommends the use of a minimum of 1 kW cooling, at minimum of 8 liters/min (~2 gal/min). Careful selection of wetted cooling system components is very important for long pump chamber life. The pump chamber requires clean deionized water as a coolant. The resistivity should be about 1 MΩ·cm (conductivity ~ 1 S/cm) and should be free of organic contamination. High quality stainless steel, such as 316-L is acceptable, but parts should be passivated. Aluminum must be anodized with a high quality process, such as MIL-A-8625F, Type II, Class 1. Titanium is also acceptable and Grade 2 (unalloyed, standard oxygen) has been used successfully. Copper and copper alloys, such as brass, should be avoided. Many plastics, including polypropylene, polyethylene, Teflon, Delrin, Noryl, etc. have been used successfully, but it is important that these materials do not leach plasticizers into the coolant. Wetted materials that are rated for milk transport are often good candidates for cooling system components. When considering cooling components, it is important to ensure the components do not introduce contamination into the coolant. This is different from the components being “compatible with distilled or deionized water.” Ordinary Steam Distilled Water, available from grocery stores usually has a resistivity of 0.6- 1.2 MΩ·cm and this is acceptable coolant if laboratory distilled or deionized water is not available. If all wetted components are inert, it is generally not necessary to use a deionization filter in the cooling system. If a deionization filter is used, ensure it does not introduce organic contamination into the coolant. The UV from the flashlamp will sterilize biological organisms in the coolant. If the system will not be operated for more than a month, the cooling system should be drained and dried using

filtered compressed air or Ultra High Purity (UHP) nitrogen. For a system that is used weekly, the coolant should be changed every six months. Wetted components in the pump chamber include anodized 6061-T6 aluminum, passivated SS 316-L, silicate glass or fused silica, and silicone O-rings.

### **Flashlamp Driver Recommendations:**

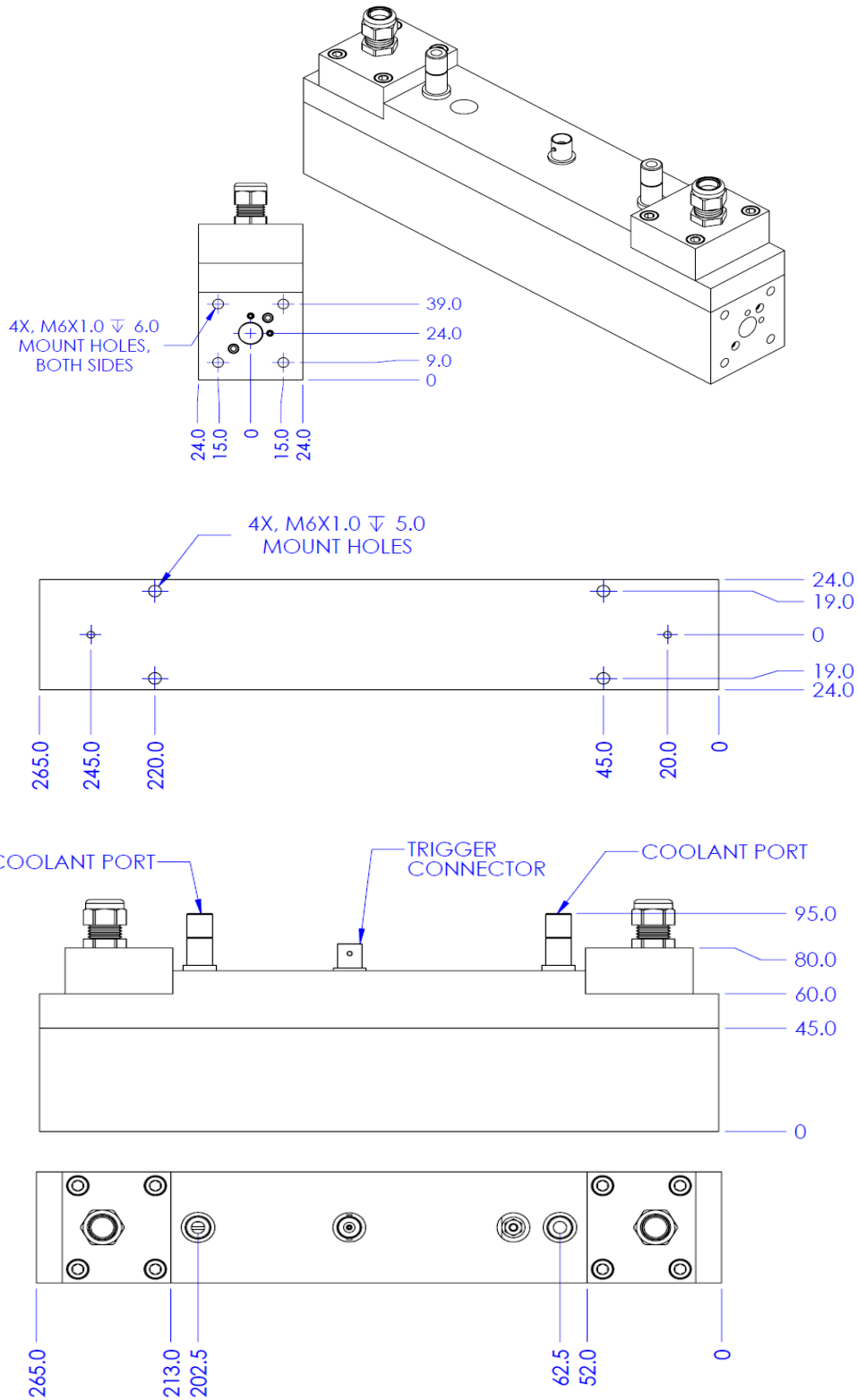
For lithotripsy applications, typical operational parameters are up to 40 Watts of average power at 10 Hz with an electrical pulse duration of 500 microseconds. Using an M187 flashlamp, the capacitor bank voltage is approximately 700 volts. Usually a relatively large capacitor bank (~ 3000uF) is used and the flashlamp current is switched with an IGBT. The resulting current pulse is roughly “square” in shape. A good laboratory driver would be MegaWatt’s KALD-20-10.

### **Resonator Table of replacement components:**

<b>Table of Standard replacement components for R4X125C2-CTH</b>		
<b>Part #</b>	<b>Description</b>	<b>Notes</b>
4X125C2	Pump Chamber	
CTHY4X127-40 CTHY1X130-35	CTH:YAG laser rod, 4X127 with 40cm CC ROC CTH:YAG laser rod, 4X130 with 35cm CC ROC	Choice of 1
M187	Flashlamp	
HR-2100-0525	HR mirror, Ø ½ x ¼ in thick	
PR-2100-75-0525	PR output coupler mirror, Ø ½ x ¼ in thick	



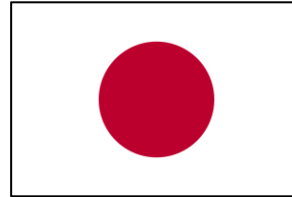
Resonator Mechanical Interface





**United States**

**MegaWatt Lasers, Inc.**  
P.O. Box 24190  
Hilton Head Island, SC  
29925-4190  
+1 843-342-7221 Phone  
+1 843-342-7223 Fax  
sales@megawattlasers.com  
<http://www.megawattlasers.com>



**Japan**

**New Metals and Chemicals Corporation, Inc.**  
Kyobashi TD Building  
No. 2-5, 1-chome, Kyobashi  
Chuo-ku, Tokyo, Japan  
104-0031  
81 (3) 3201-8600 Phone  
81 (3) 3271-5860 Fax  
info@newmetals.co.jp  
<http://www.newmetals.co.jp>



**Israel**

**IL Photonics BSD Ltd.**  
Moshe Bril, General Manager  
511 Hashita  
Beit Shemesh 99552, Israel  
+972-2-9923532 Phone  
+972-2-9921480 Fax  
moshe@ILPhotonics.com  
<http://www.ILPhotonics.com>



**China**

**林翔 (Sharon Lin)**  
销售代表, Sales Representative  
Fuzhou, China  
Tel: +86 136 0081 0883  
+86 (591) 8756 1137  
WeChat: 1002550988  
sharon.lin@megawattlasers.com



**S. Korea**

**L2K (Laser Leader of Korea) Co.**  
Jae-Pil Jeon  
530-ho, 187, Techno-2ro,  
Yuseong-gu, Daejeon 305-500 Korea  
Phone: +82-42-934-7744  
+972-2-9921480 Fax  
jpjeon@l2k.kr or sales@l2k.kr  
<http://www.l2k.kr>



**Europe**

**MegaWatt Lasers, Inc.**  
P.O. Box 24190  
Hilton Head Island, SC  
29925-4190  
+1 843-342-7221 Phone  
+1 843-342-7223 Fax  
sales@megawattlasers.com  
<http://www.megawattlasers.com>