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RTP Q-Switch
Model RT series

DATA SHEET 742

RTP Q-switch
MODEL RT series

FEATURES:

- **Low half-wave voltage**
- **Low resonance**

Rubidium Titanyl Phosphate (RTP) single crystals are recently grown by Top Seeded Solution Growth (TSSG) from self-flux and treated electro-thermally. Present materials used for Pockels cells, KD*P and BBO have high damage thresholds of 750MW/cm^2 and 1GW/cm^2 at 1064nm. However both are hygroscopic and require hermetically sealed housings with protective windows. KD*P has high optical uniformity and is useful for large aperture applications. BBO has a high damage threshold and a low dielectric constant and is useful in high repetition rate, high average power (up to 150W) diode pumped solid state lasers (DPSS lasers). Crystal Lithium Niobate (LN) has higher transmission, and high contrast ratio at average powers in the KW range. However, it has a low damage threshold (250MW/cm^2), piezoelectric ringing, and pyroelectric depolarization. Lithium Tantalate (LTA) does not exhibit piezoelectric ringing. However, its damage threshold (200MW/ cm^2) is still not sufficient for use with high peak power and high repetition rate used for Q switching in a thermally compensated mode.

The new crystal RTP is an isomorph of KTP. However, it has higher damage threshold (about 1.8 times KTP), higher resistivity, and no sign of electro-chromism. These are Biaxial crystals and natural birefringence needs to be compensated by use of two crystal rods specially oriented so that beam passes along the X-direction. Input beam is polarized along the diagonal of the input face and Z and Y axis are perpendicular to the two side faces. Y and Z faces are rotated by 90° in the second crystal for thermal compensation.

The ‘o’ ray in the first crystal becomes the ‘e’ ray in the second crystal and vice versa, so that the thermal birefringence is compensated. Matched pairs (equal lengths polished together) are required for effective compensation.

The effective E-O constant r_{c1} (light propagating along the Y axis) is 23.6 pm/V and E-O constant r_{c2} (light propagating along the X axis) is 20.3 pm/V. The contrast ratio is better for r_{c2} constant. At repetition rates of 50KHz, the noise due to piezo-electric ringing is less than 1% while that in BBO it is 10% when operated at 30KHz. However in RTP Pockels cells, the half-wave voltage is about 40% and the contrast ratio is about 10-20% (200:1 typ) of that of BBO pockels cell. RTP has been operated up to 1MHz with minimal effect of piezoelectric resonances.

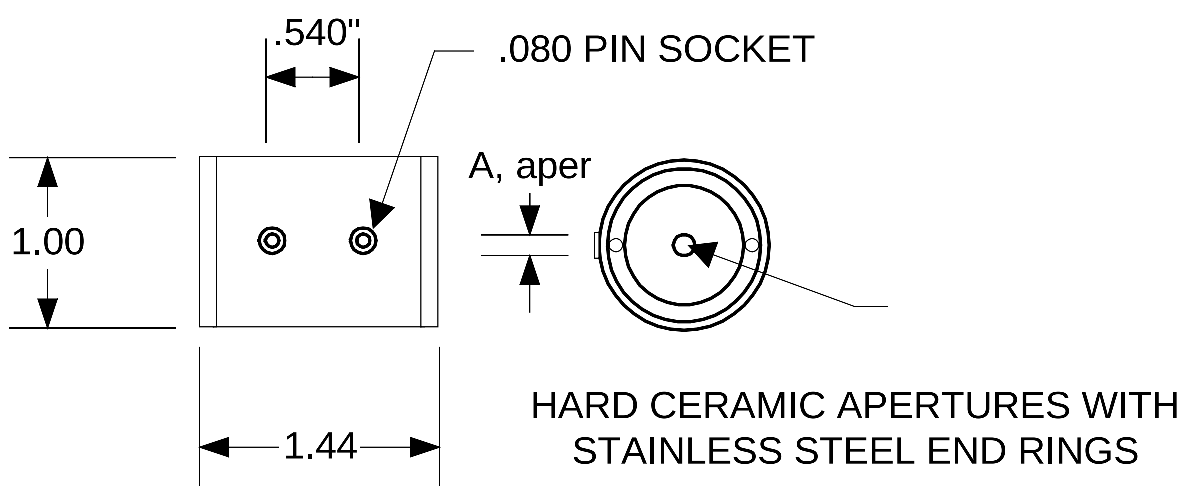
Comparison Table

Model	Crystal	Half-wave V @ 1064nm	Contrast Ratio	Capacitance
RT-4	RTP	1.32 KV	20dB (>100:1)	6pF
QS-4-2	BBO	4.80 KV	30dB (>1000:1)	< 4pF

These are transverse Pockels devices and the voltage increases linearly with wavelength for a given aspect ratio. BBO is slightly hygroscopic while RTP is not, so hermetically sealed housing is not required. Water cooled BBO Q switches are tested for average powers up to 150W, and RTP may be usable up to these levels at 1064nm. BBO optical bandwidth is 200nm to 2000nm while that of RTP is 500nm to 2500nm.

RTP POCKELS CELL MODELS

MODEL NO	APER mm	CONTRAST RATIO TYPICAL	INSERTION LOSS TYPICAL	V1/2 @ 1064 KV-TYP	SPECTRAL RANGE nm	DAMAGE THRESHOLD
RT-3	2.5	100:1	1.5%@1064	2.4	500-2500	700MW/sq.cm
RT-3-20	2.5	100:1	1.5%@1064	1.2	500-2500	700MW/sq.cm
RT-4	3.5	100:1	1.5%@1064	1.6	500-2500	700MW/sq.cm
RT-5	4.5	100:1	1.5%@1064	2.0	500-2500	700MW/sq.cm
RT-6	5.5	100:1	1.5%@1064	2.4	500-2500	700MW/sq.cm
RT-8	7.5	100:1	1.5%@1064	3.6	500-2500	700MW/sq.cm



1 inch DIAMETER RTP POCKELS CELL BODY DIMENSIONS