

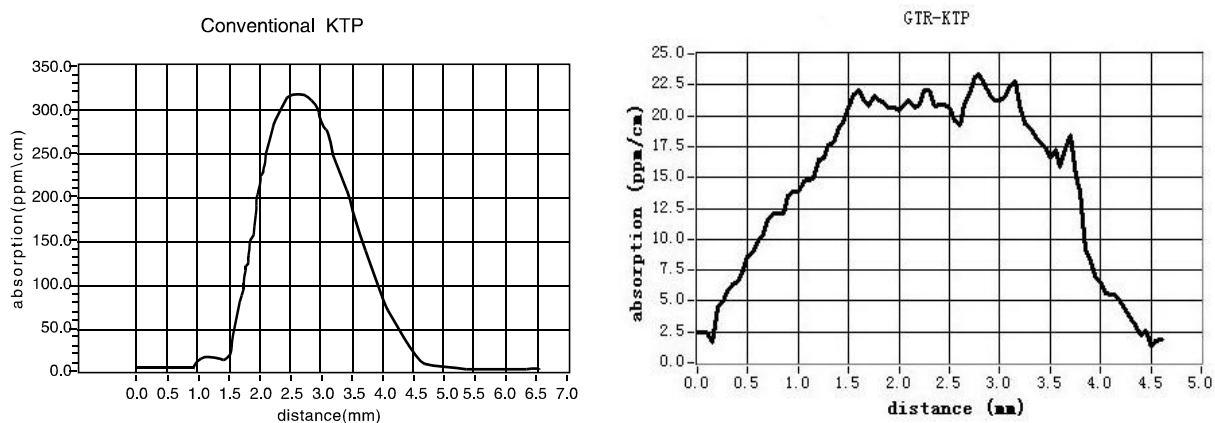
# GTR-KTP

## - Gray Tracking Resistance Potassium Titanyl Phosphate

### Introduction

KTP is an excellent nonlinear crystal, but its gray tracking phenomena limits its use in high repetition rate and high power laser systems. CASTECH's **GTR-KTP crystal** has higher gray tracking resistance than the regular flux grown KTP crystal. Through Photo-thermal Common-path Interferometer, the occurrence of gray tracking can be measured by an increase of bulk absorption through a strong CW 532 nm green laser within several minutes.

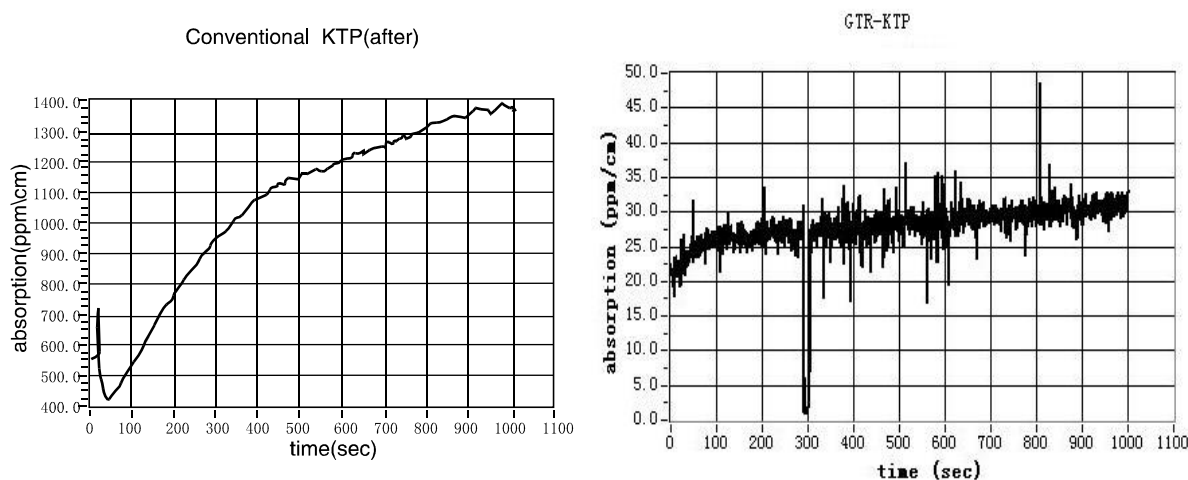
### 1. Bulk absorption measurements before gray tracking testing:



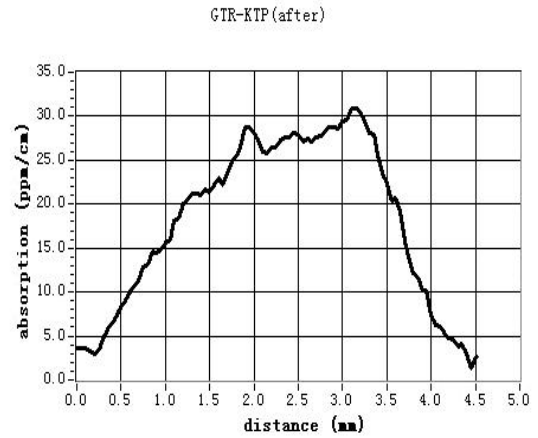
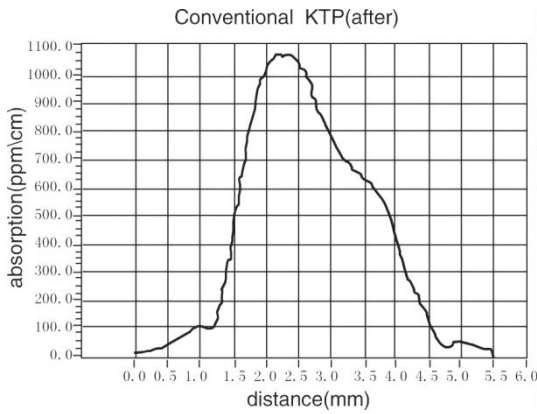
It appears that the absorption of CASTECH's GTR-KTP at 1064 nm is only 1/10 of conventional KTP.

### 2. Gray Tracking Testing:

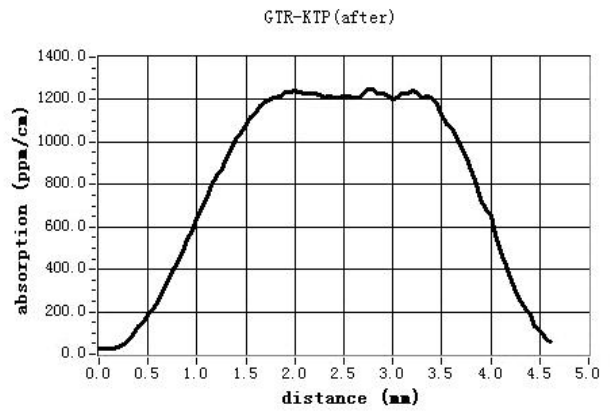
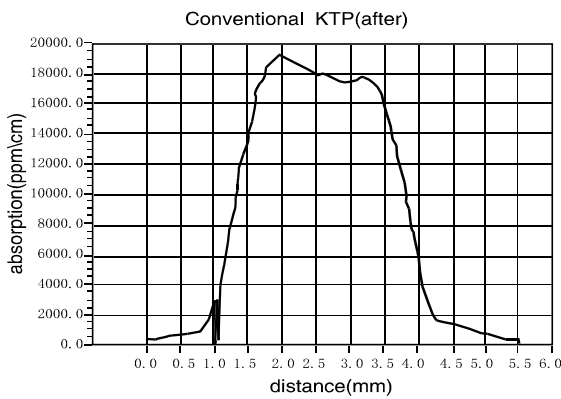
When a green laser beam (400 mW, beam diameter 0.07 mm, power density 10 KW/cm<sup>2</sup>) goes through the crystal, it causes an increase in the IR absorption of the crystal. This phenomenon is correlated with “gray tracking effect”. The following graphs show the absorption level changes over time at 1064 nm for CASTECH's GTR-KTP and the conventional KTP separately.



### 3. Bulk absorption measurements at 1064 nm after gray tracking testing



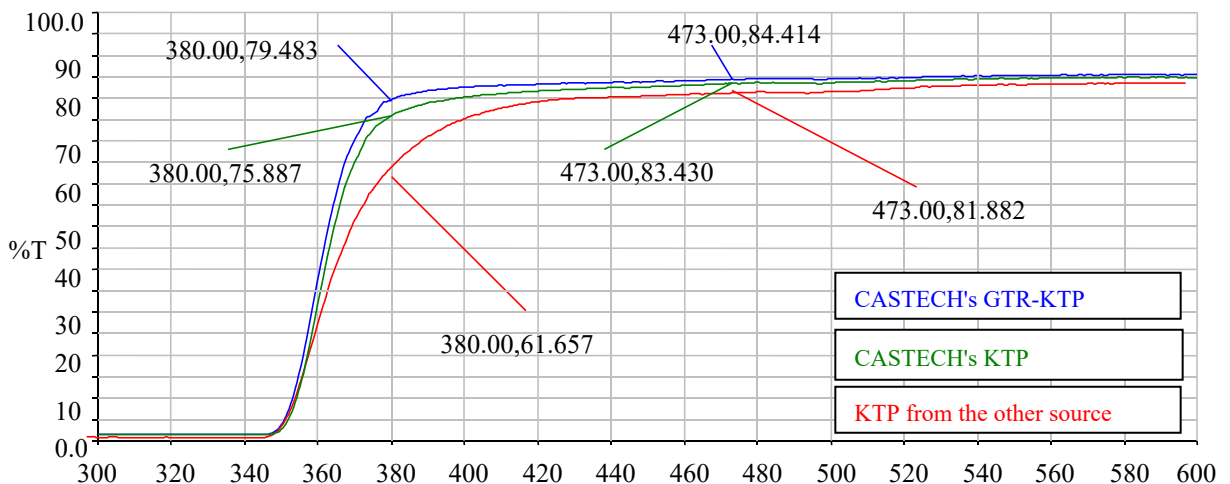
### 4. Bulk absorption measurements at 532 nm after gray tracking testing



### 5. Damage threshold testing:

After testing a group of GTR-KTP and the conventional KTP crystals (polished only) with laser condition of 10 ns, 1 Hz, we found that CASTECH's GTR-KTP has laser damage threshold around 1.8 GW/cm<sup>2</sup> at 1064 nm, which is much higher than the conventional KTP (450 MW/cm<sup>2</sup> in the same condition).

### 6. Transmission curves in visible and UV region:



Apparently CASTECH's GTR-KTP has lower absorption than the conventional KTP in the range of 350-550 nm. We can conclude that CASTECH's GTR-KTP is expected to have a higher gray tracking resistance than the regular flux grown KTP crystals.

## CASTECH offers GTR-KTP with

- Strict quality control
- Large crystal size up to  $7 \times 7 \times 20 \text{ mm}^3$
- Quick delivery (3 weeks for polished only, 4 weeks for coated)
- Unbeatable price and quantity discount
- Technical support
- AR, HR-coating, mounting and re-working service

## GTR-KTP's Parameters

Table 1. Specifications

Dimension Tolerance	$(W \pm 0.1 \text{ mm}) \times (H \pm 0.1 \text{ mm}) \times (L + 0.5/-0.1 \text{ mm}) \times (L \geq 2.5 \text{ mm})$ $(W \pm 0.1 \text{ mm}) \times (H \pm 0.1 \text{ mm}) \times (L + 0.1/-0.1 \text{ mm}) \times (L < 2.5 \text{ mm})$
Clear Aperture	Central 90% of the diameter
Internal Quality	No visible scattering paths or centers when inspected by a 50 mW green laser
Flatness	$\leq \lambda/8$ @633 nm
Transmitted Wavefront Distortion	$\leq \lambda/8$ @633 nm
Surface Quality (Scratch/Dig)	10/5 (Polished) to MIL-PRF-13830B 20/10 (AR-coated) to MIL-PRF-13830B 40/20 (HR-coated) to MIL-PRF-13830B
Parallelism	20 arc sec
Perpendicularity	$\leq 15$ arc min
Angle Tolerance	$\leq 0.25^\circ$
Chamfer	$\leq 0.2 \text{ mm} \times 45^\circ$
Chip	$\leq 0.1 \text{ mm}$

## AR-coatings

CASTECH provides the following AR-coatings:

- Dual Band AR-coating (DBAR) of GTR-KTP for SHG of 1064 nm  
low reflectance ( $R < 0.2\%$  @1064 nm and  $R < 0.5\%$  @532 nm)  
High damage threshold ( $> 1 \text{ GW/cm}^2$  @1064 nm,  $> 300 \text{ MW/cm}^2$  @532 nm, at 10 ns, 10 Hz), long durability.
- High reflectivity coating: HR1064 nm & HT 532 nm,  $R > 99.8\%$  @1064 nm,  $T > 95\%$  @532 nm.
- Broad Band AR-coating (BBAR) of GTR-KTP for OPO applications.
- Other coatings are available upon request.