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# Low Temperature GaAs (LT-GaAs)Experimental Results (2012.07.13-20, 30)

# Briefing *Low Temperature GaAs*

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## Preparation for pump & probe measurement

Reflectance spectra measurement：we could not observe the reflectance peak.

PL spectra measurement ： PL spectra were observed between 810 and 845 nm.

## Pump & probe measurement (10 K)

- We have observed 0.6-1.6 picosecond decay at 822 nm excitation wavelength. This fast decay can be attributed to non-radiative recombination induced by low temperature growth.
- Two kinds of time-resolution were used; high time resolution (1 step = 0.07 ps) for short time span (25 ps) and low time resolution (1 step = 1.67 ps) for long time span (800 ps). High time resolution is more reliable for measuring sub-picosecond decay time.
- We also measured the decay time at 826 nm excitation wavelength. The tendency of excitation power dependence measured on July 30 was different from that measured on July 20.

# *Sample Low Temperature GaAs*

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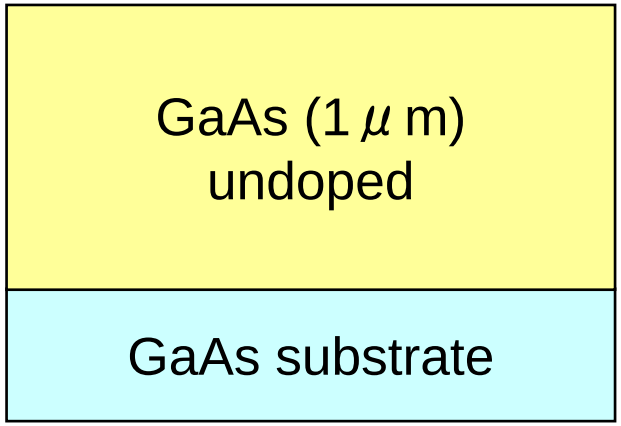
**LT-GaAs-01**



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# Reflectance spectra measurement

(***Low Temperature GaAs***)

# Reflectance spectra (RT, 10 K)

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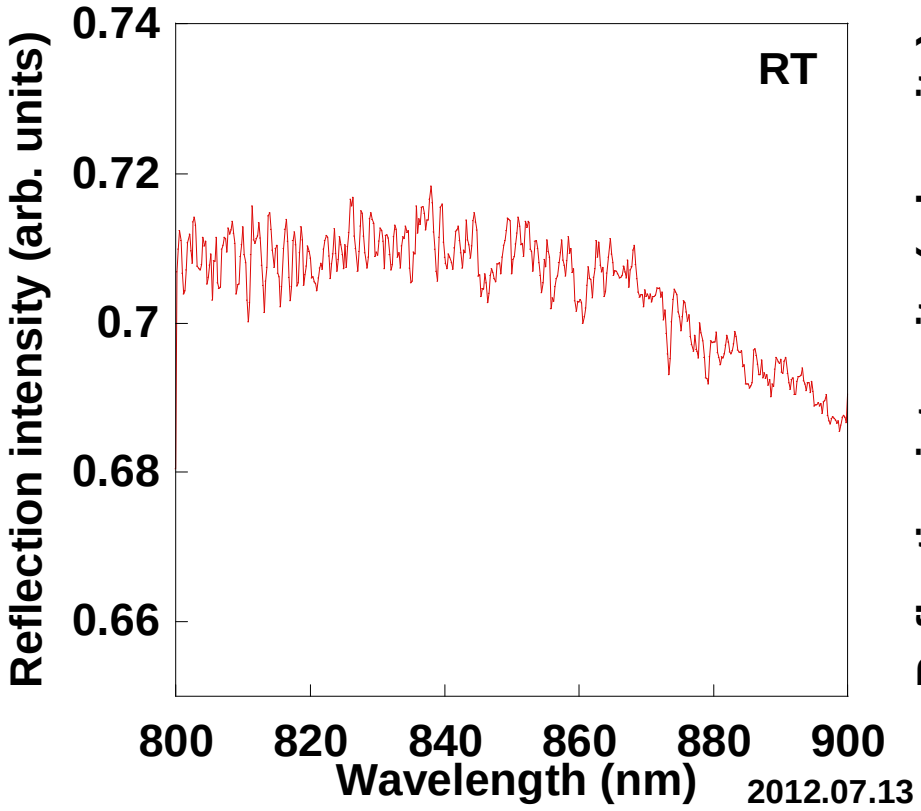
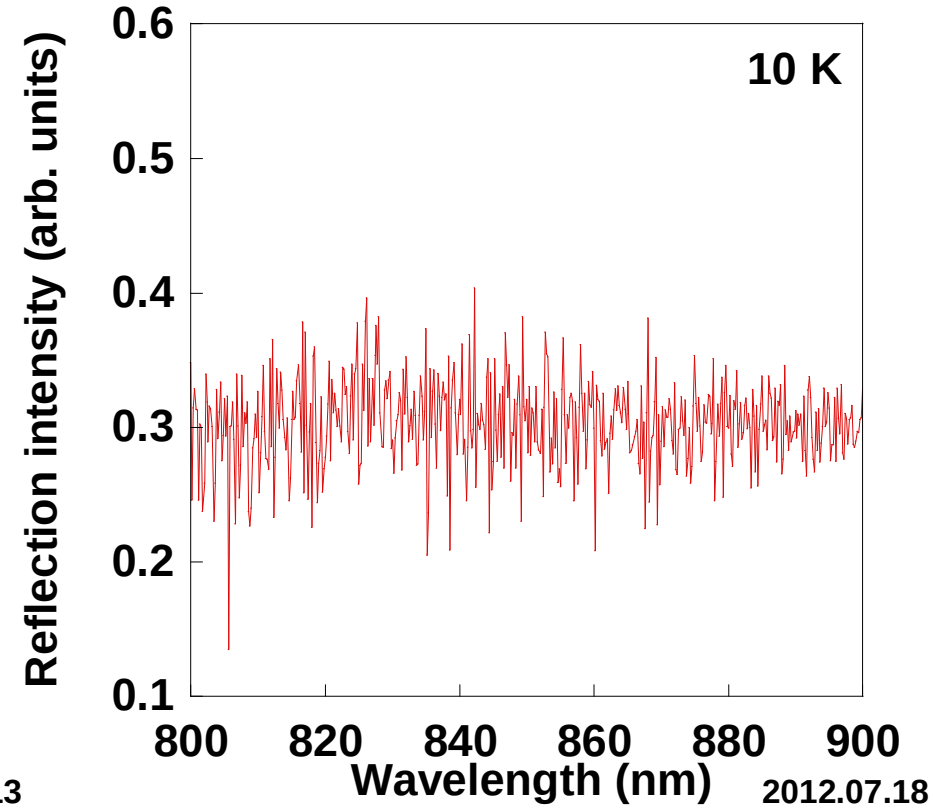
*Low Temperature GaAs*



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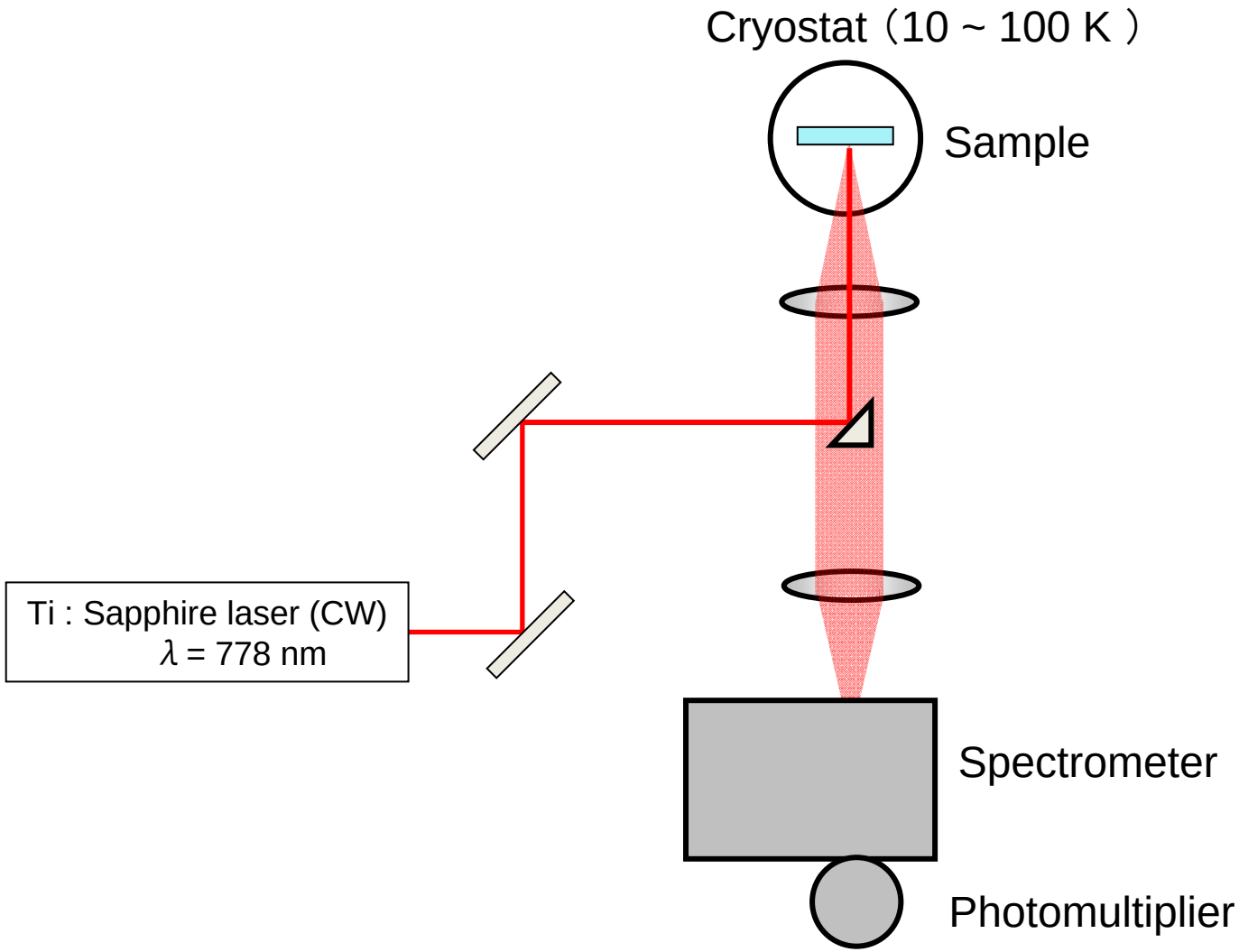
# PL spectra measurement

(***Low Temperature GaAs)***

# Experimental Setup

## -PL spectra measurement *Low Temperature GaAs*



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# PL spectra measurement Excitation Power Dependence (10 K) (*Low Temperature GaAs*)

# PL spectra (10 K)

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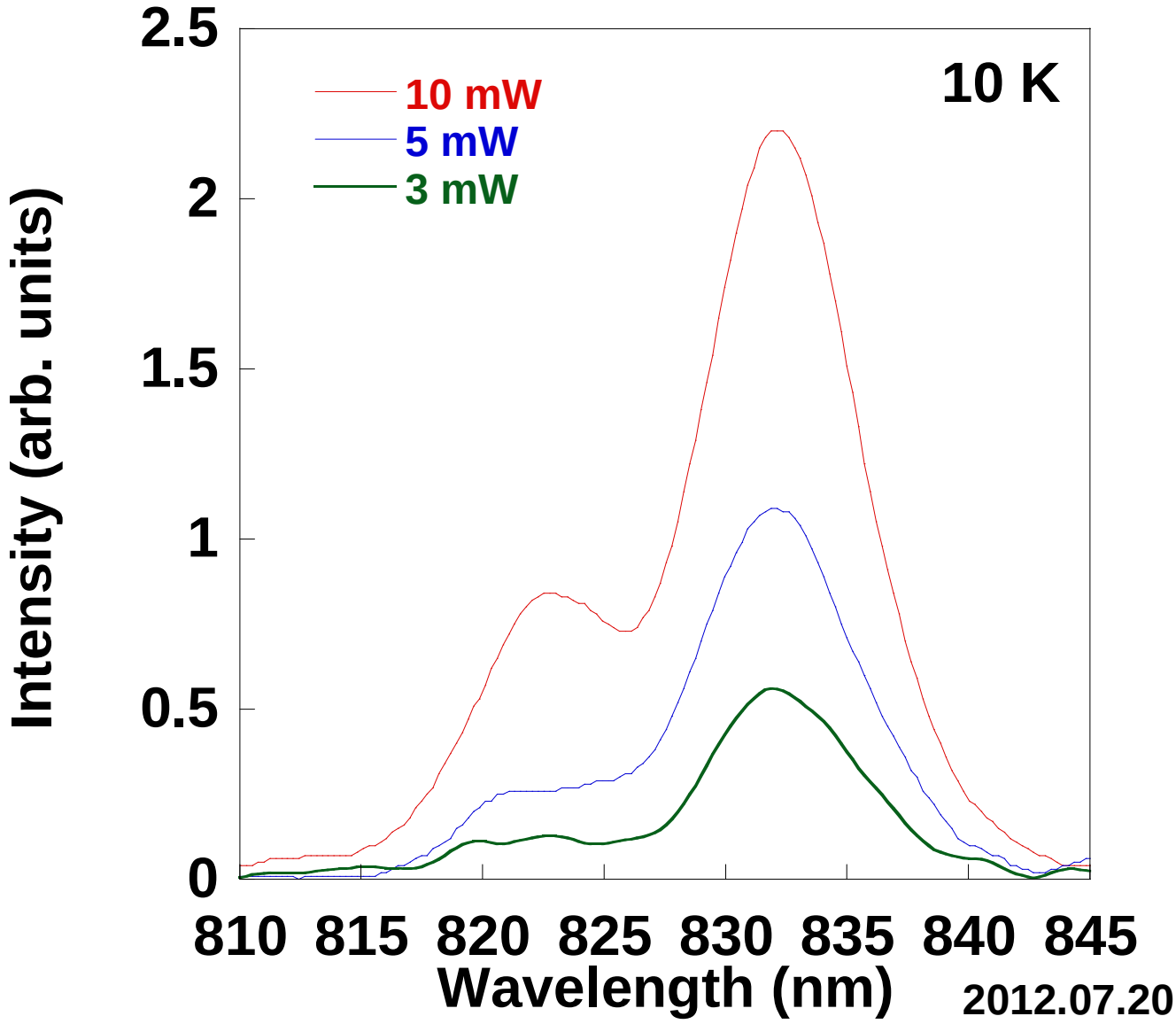
***Low Temperature GaAs***



# PL spectra (10 mW)

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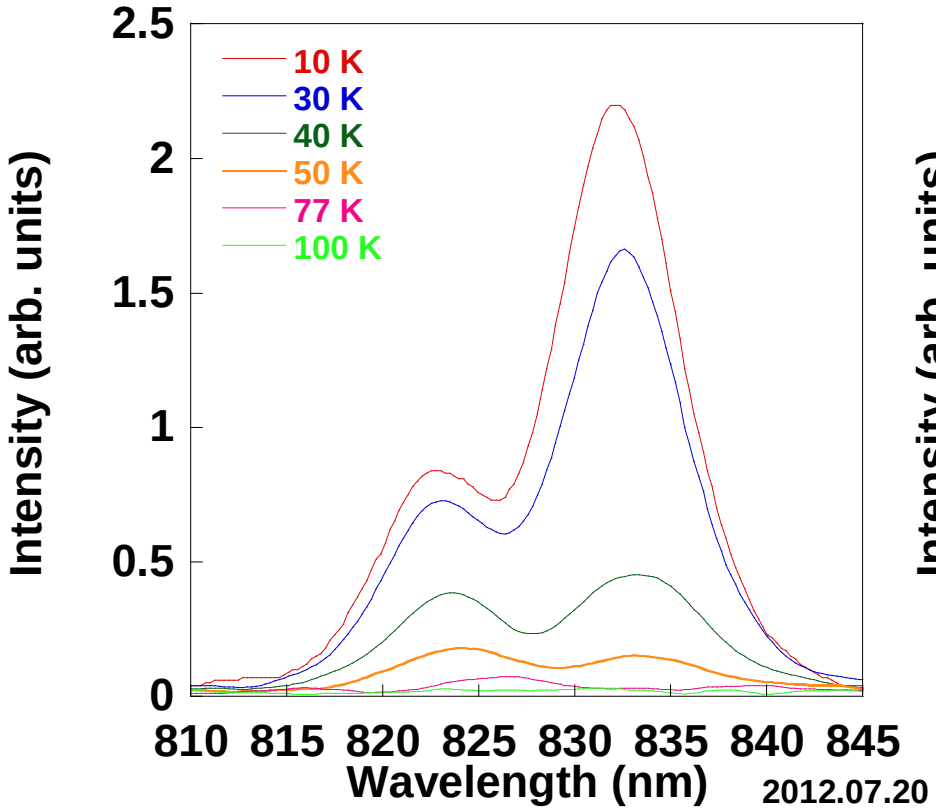
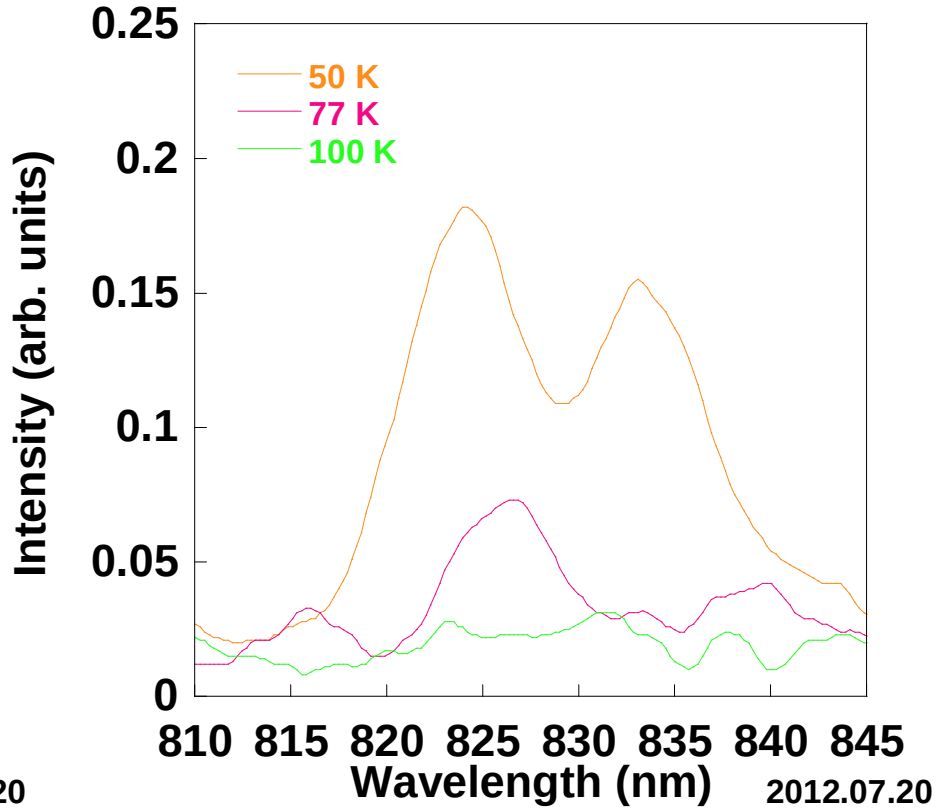
***Low Temperature GaAs***



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# pump & probe measurement (cross)

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# Experimental Setup -pump probe

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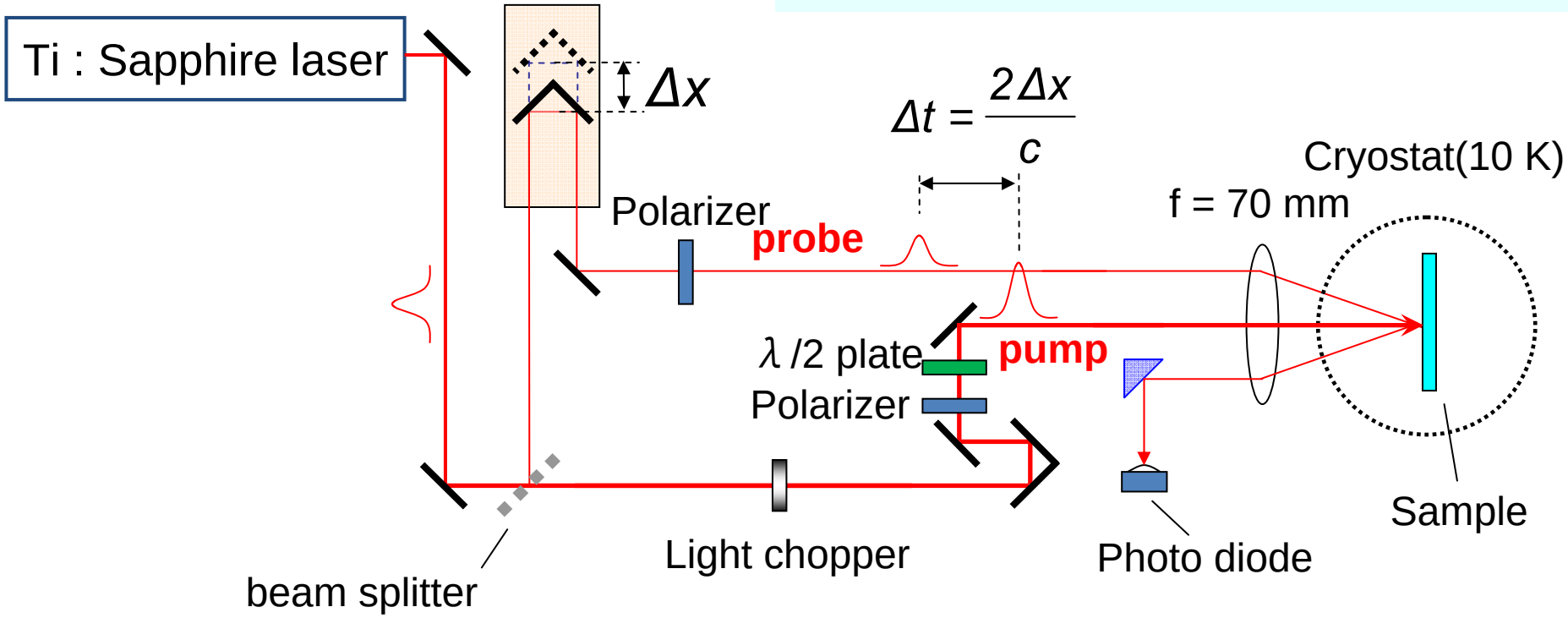
**Excitation wavelength: 820 ~ 828 nm**
**Temperature : 10 K**
**Time resolution: 200 fs**




To avoid the observation of coherent artifact, we used the linear orthogonal polarization (cross). Both pump and probe beams are linear polarization, but they are orthogonal.

# 822 nm, 70 mW-14 mW

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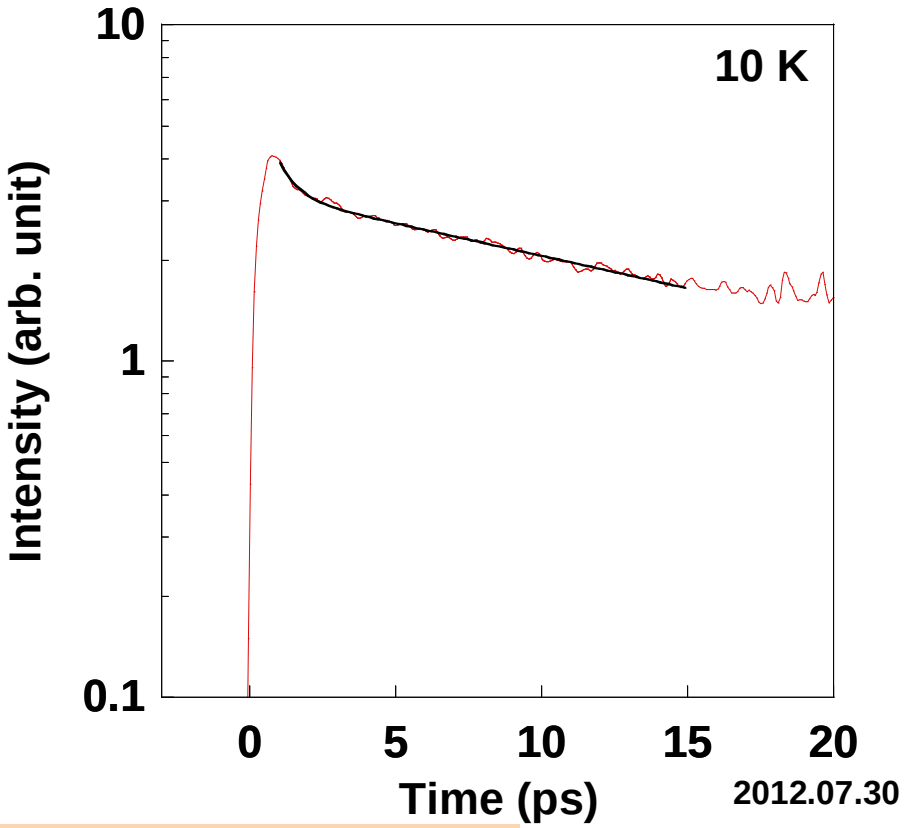
high time resolution
(1 step = 0.07 ps, time span = 25 ps)




Double exponential fitting:

$$I(t) = ae^{-\frac{t}{\tau_1}} + be^{-\frac{t}{\tau_2}}$$

Fast: 0.6 ps
Slow: 22 ps
a:b=58:42

# 822 nm, 50 mW-10 mW

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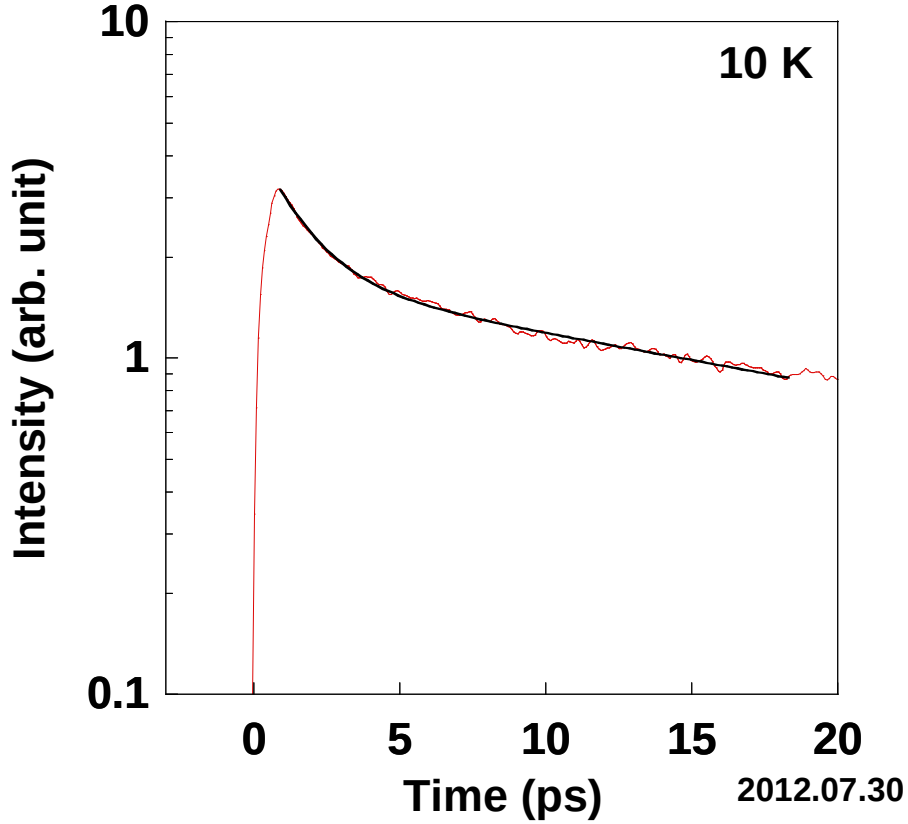
***Low Temperature GaAs***

high time resolution
(1 step = 0.07 ps, time span = 25 ps)




Fast: 1.5 ps
Slow: 27 ps
a:b=61:39

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In room temperature, lifetime should be faster, which can be <1ps