

Experimental Study of Electromagnetically Induced Transparency in Rubidium 87

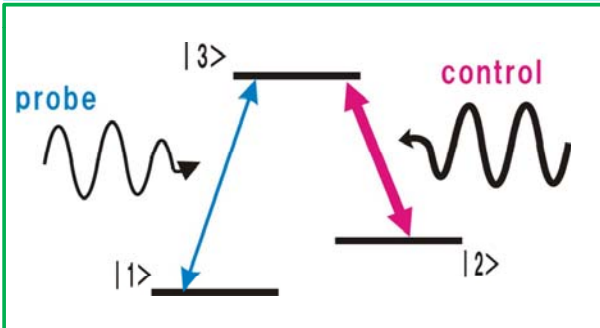
Summary

- Approximately **90%** of transmittance was obtained
- Pulsed probe light was decelerated up to **32 km/s**
- Storage time of light was **6.8 μ s**
- Storage efficiency was estimated to be **43%**

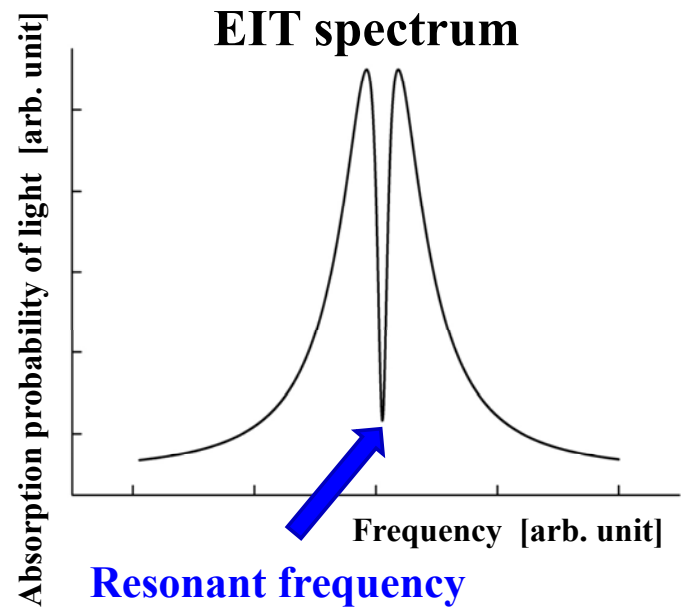
Electromagnetically Induced Transparency (1)

(1) Suppression of light absorption

EIT condition (three-level atom and two kinds of resonant lights)



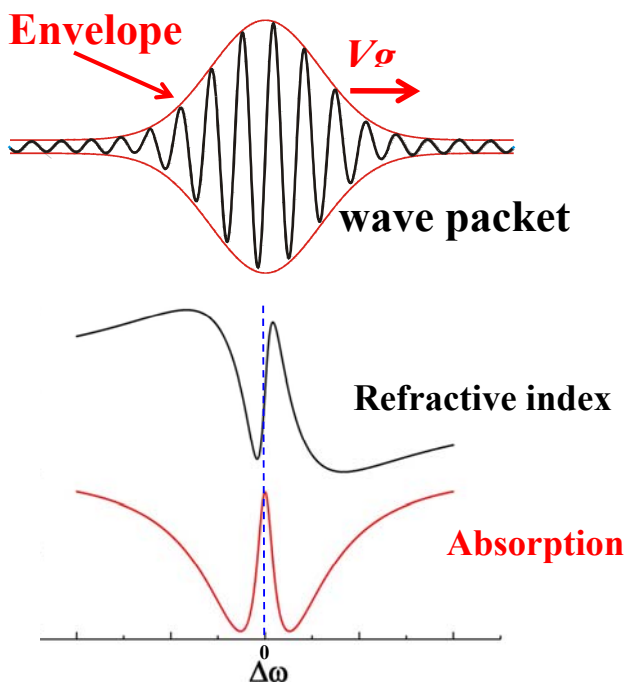
If the intensity of **probe light** is **10~100 times weaker** than that of **control light**, the absorption of **probe light** by atoms is extremely **reduced**.



3

Electromagnetically Induced Transparency (2)

(2) Deceleration of group velocity of light



Group velocity

$$V_g = \frac{c}{n + \omega \frac{dn}{d\omega}}$$

ω : frequency of light

n : refractive index

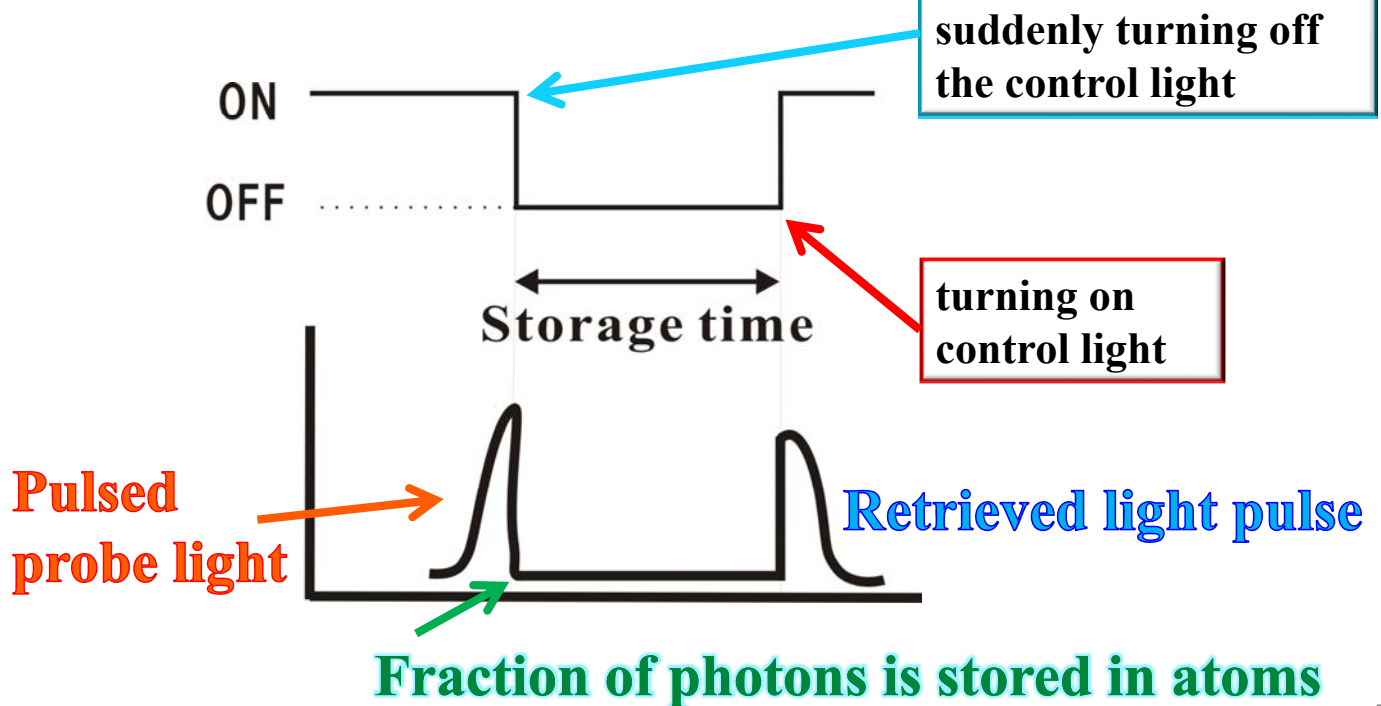
k : wavenumber

c : speed of light

4

Electromagnetically Induced Transparency (3)

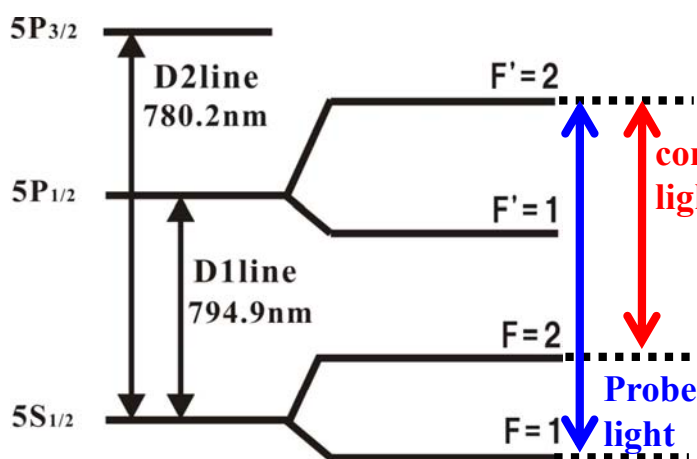
(3) Storage of light



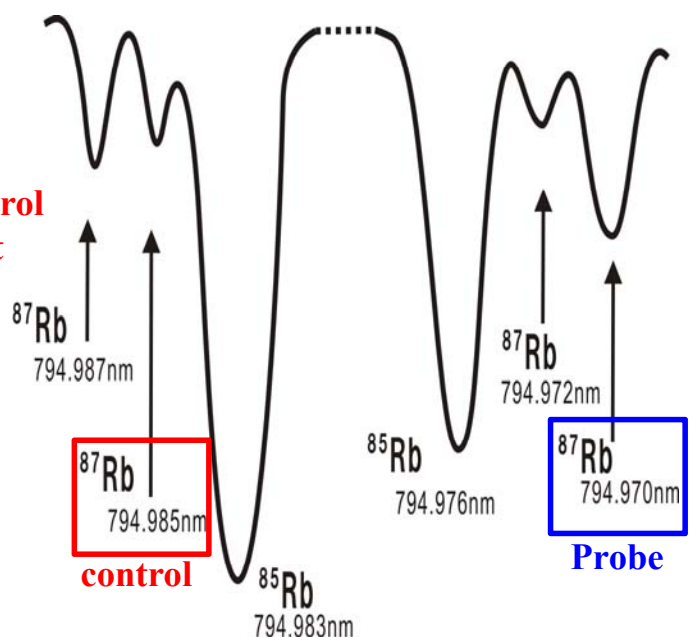
5

Structure and absorption spectrum of ^{87}Rb

Energy levels of ^{87}Rb



Absorption spectrum of ^{87}Rb D1 line



6

Experimental setup

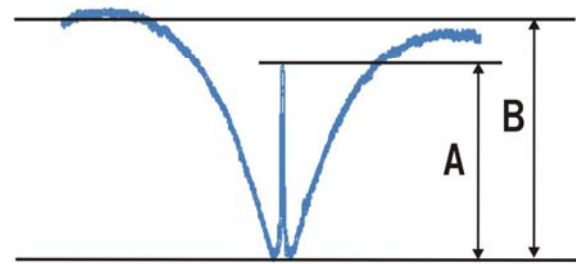
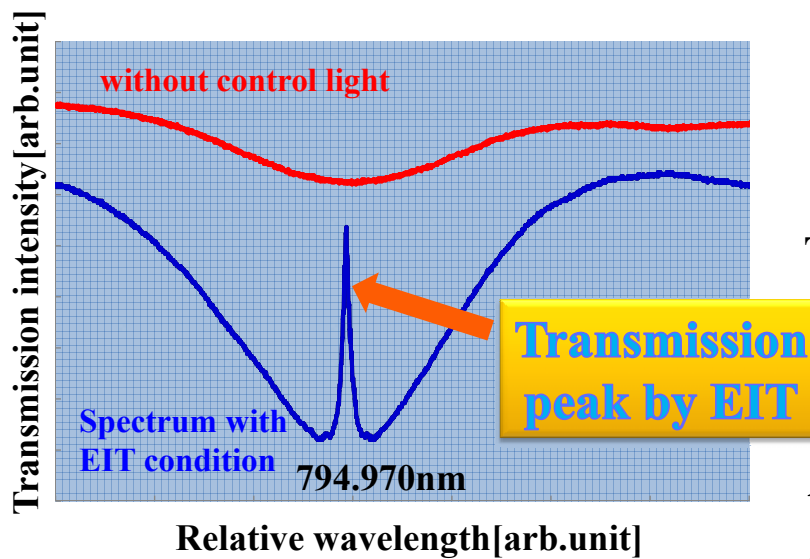


PBS: Polarization beam splitter PD: Photo detector BS: Beam splitter AOM: Acoustic optical modular

Photograph



Absorption and EIT spectrum of ^{87}Rb

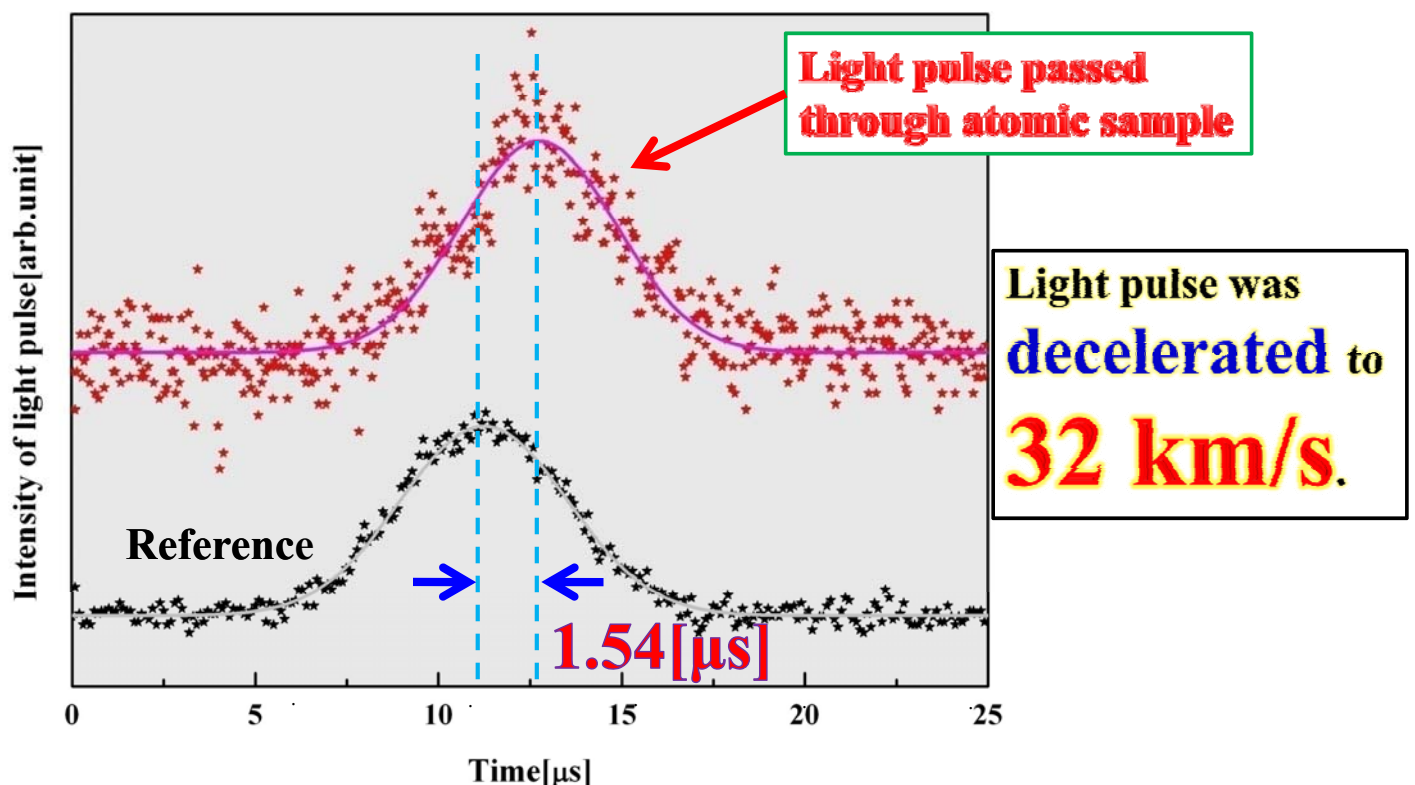


$$\text{Transmittance} = A / B \times 100\%$$

Approximately **90%** of transmittance was obtained.

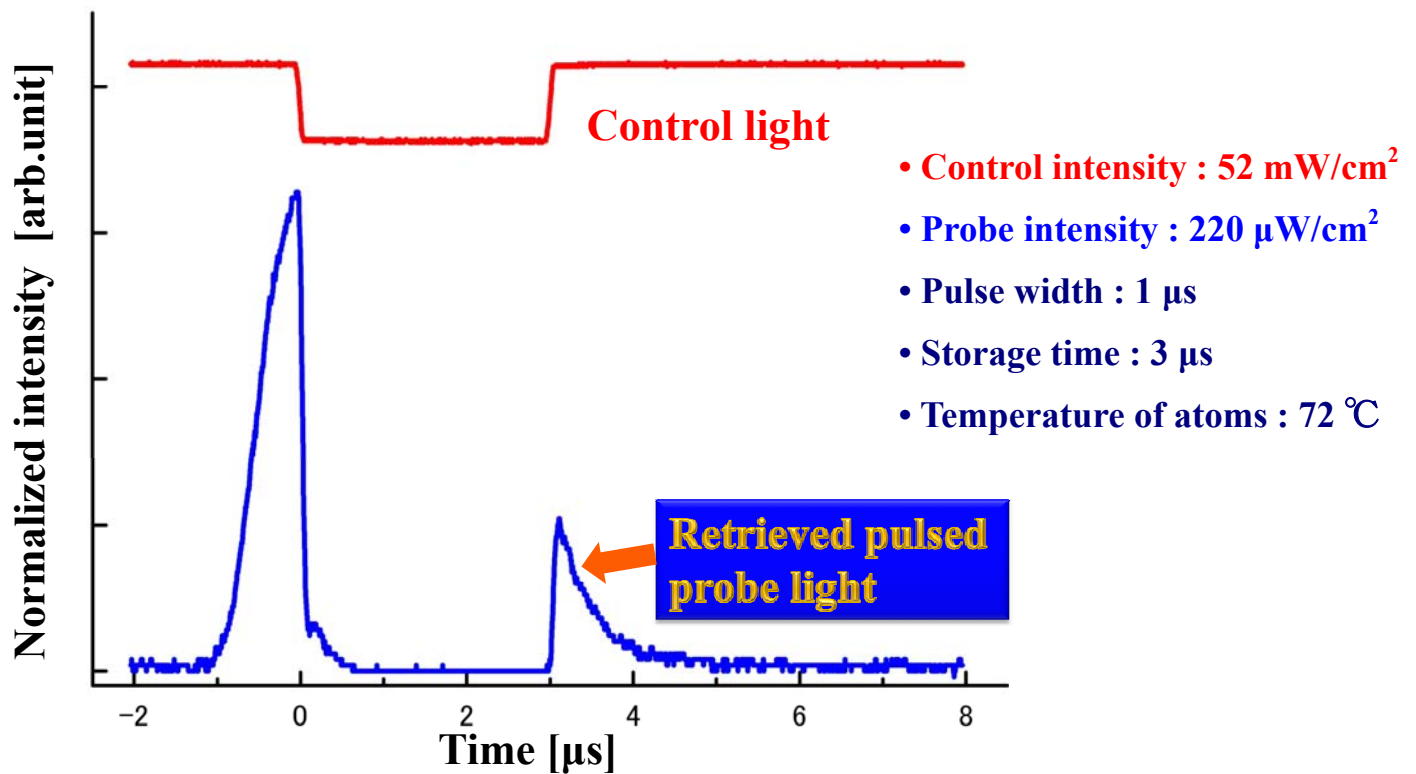
9

Deceleration of probe light pulse



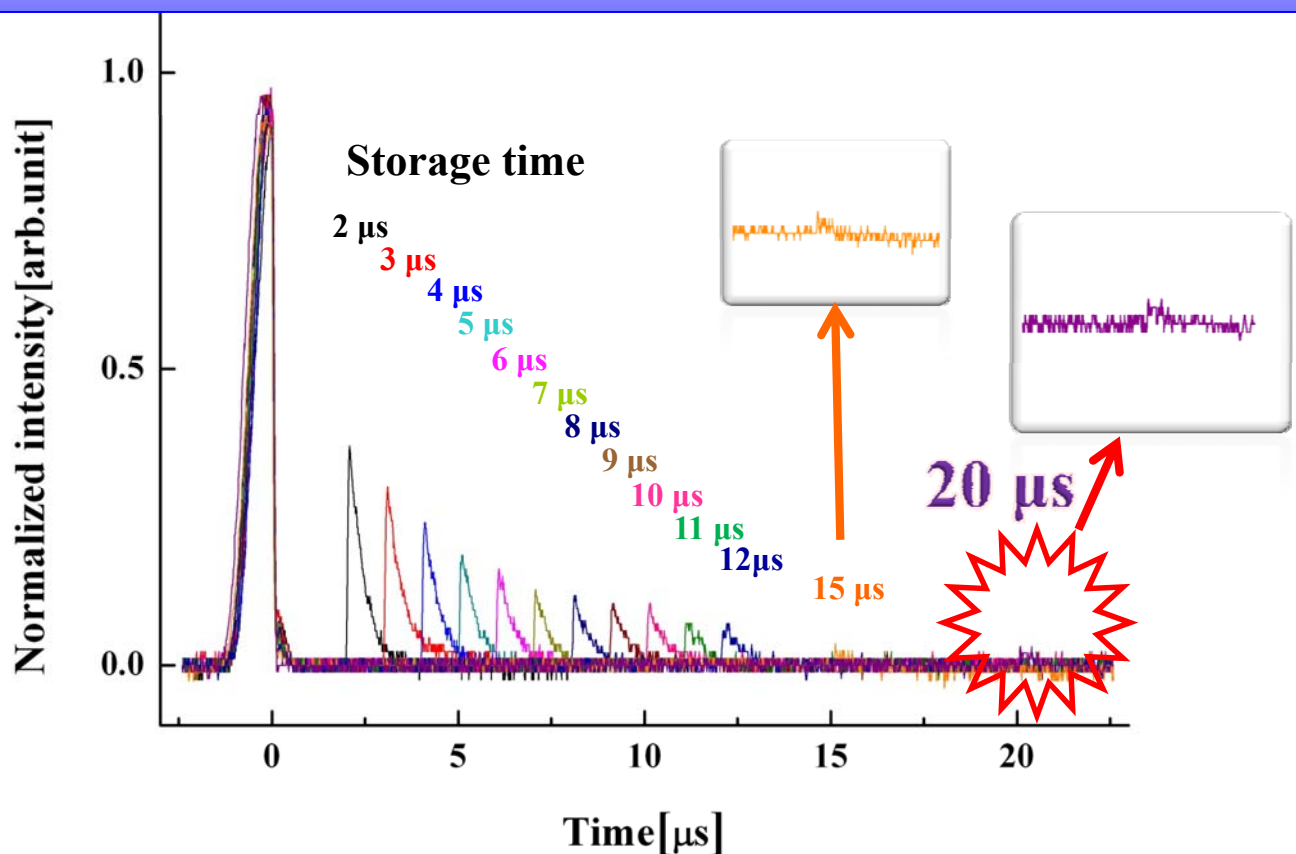
10

Storage of light



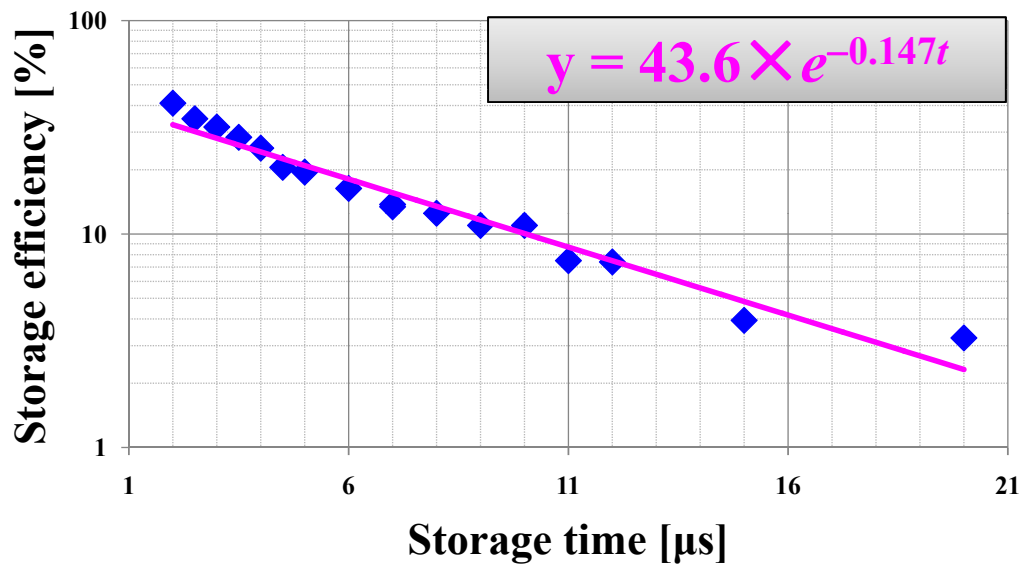
11

Retrieved pulse intensity for variance storage time



12

Storage efficiency



Storage efficiency : 43%

Storage time : 6.8 μs