ボース凝縮体の光双極子トラップ

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目的

^{87}Rbのボース凝縮体を光双極子トラップする

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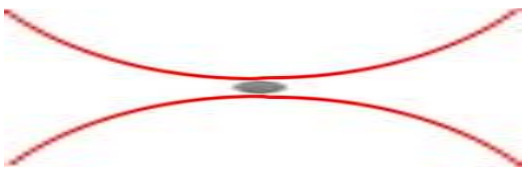
FORT (Far-Off-Resonant optical dipole force Trap)

Naでは実現 [PRL.80,2027 (1998)]

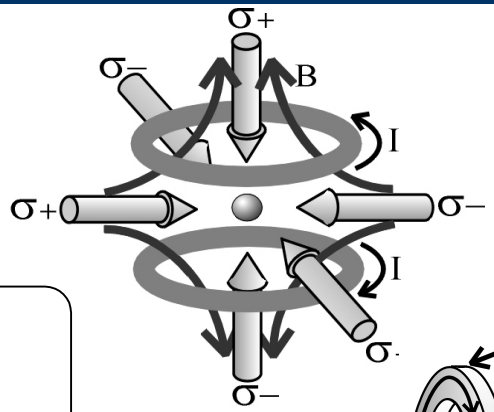
- スピン自由度のあるBEC
- 磁性
- F=1とF=2を混ぜる

Red detuned ($\delta<0$)
Single FORT

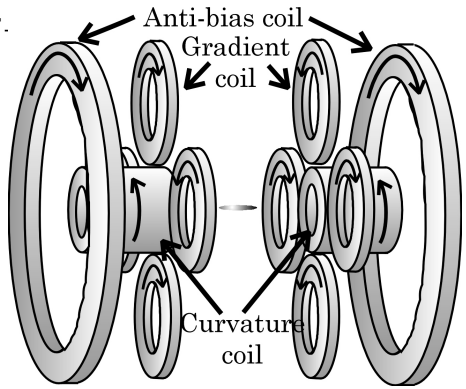


実験手順

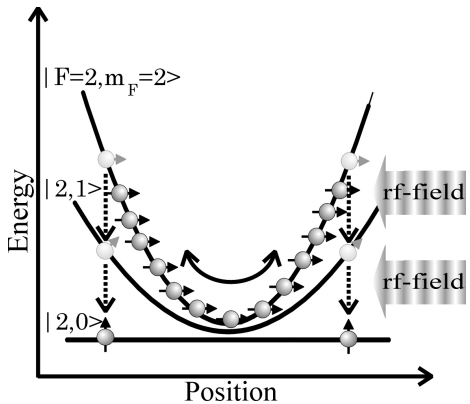
1.MOT



2.PGC

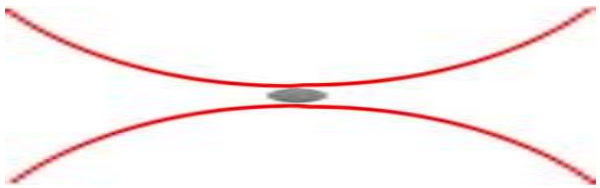


3.MT

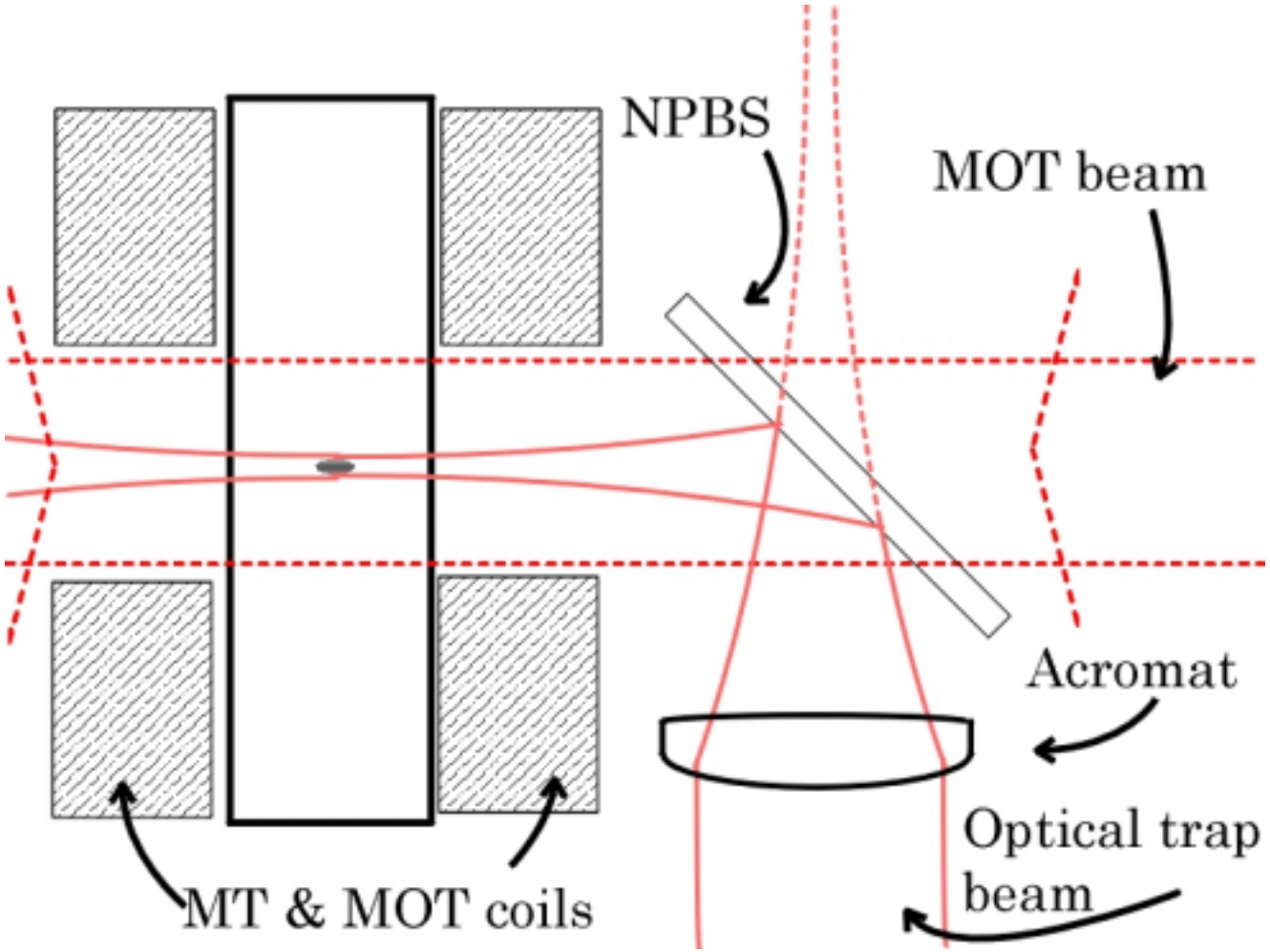


4.Evaporative cooling

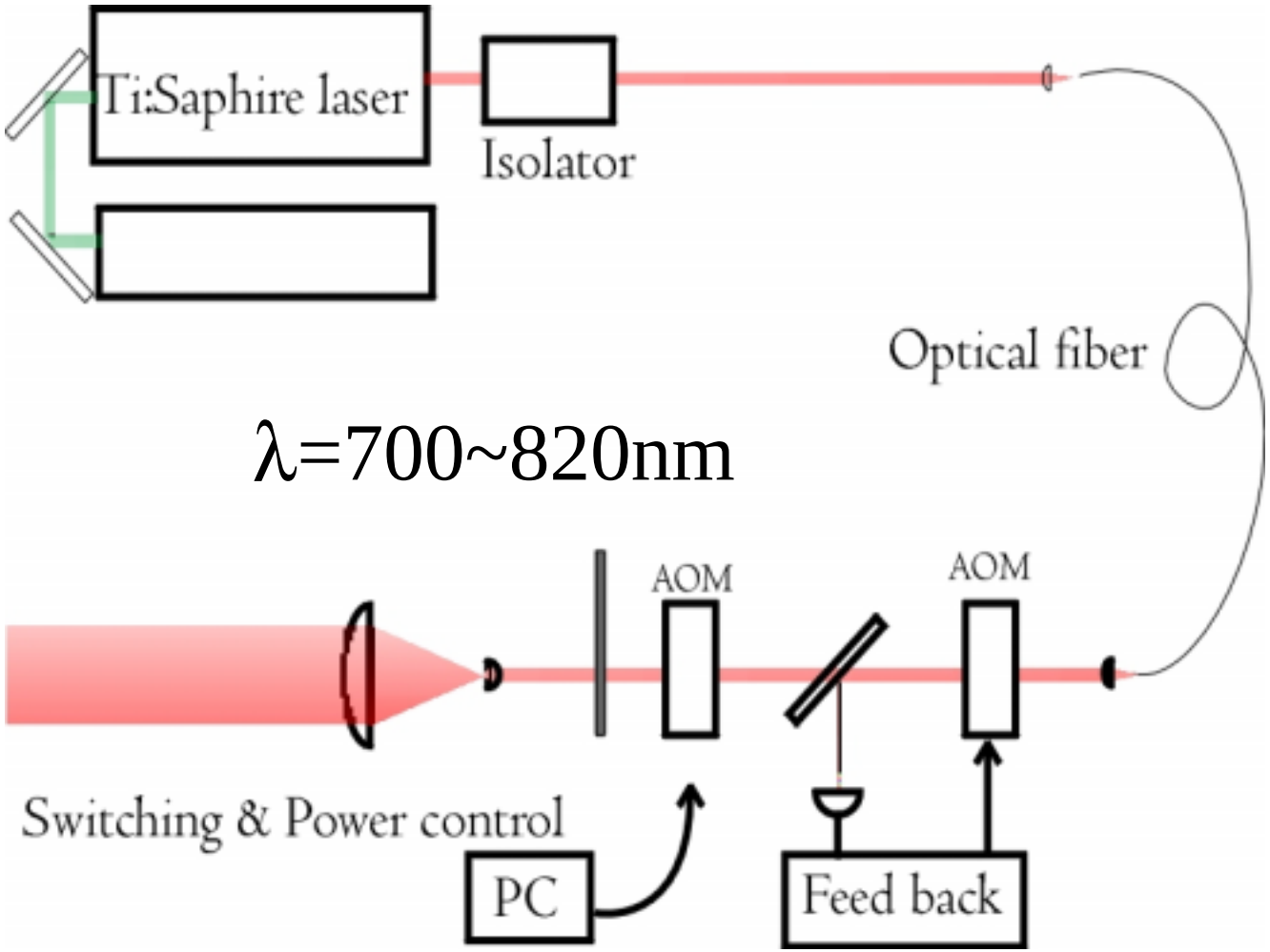
5.FORT



光学系



光源および強度安定化システム

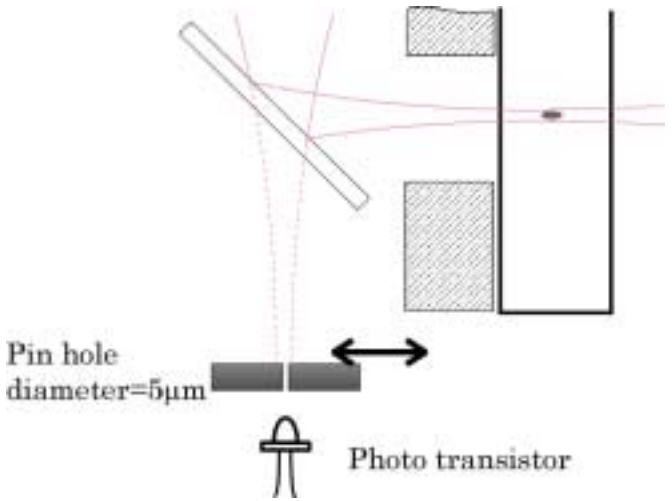


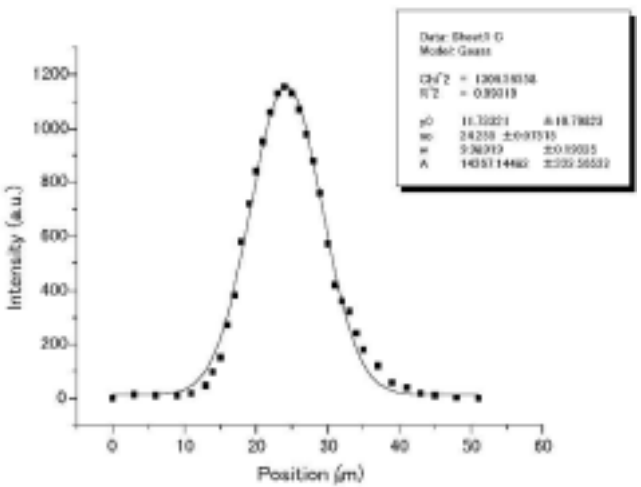
δ<0 (red)

target
^{87}Rb (F=2)
D1線～795nm
D2線～780nm

トラップ光

Beam profile



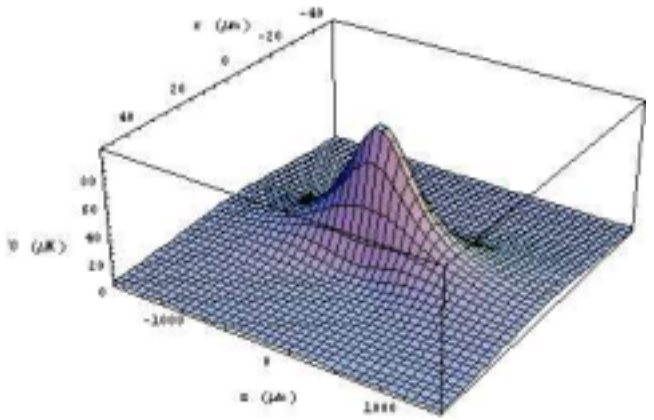


w_0 ($1/e^2$ radius)~10μm

λ=816.5nm

power 4mW

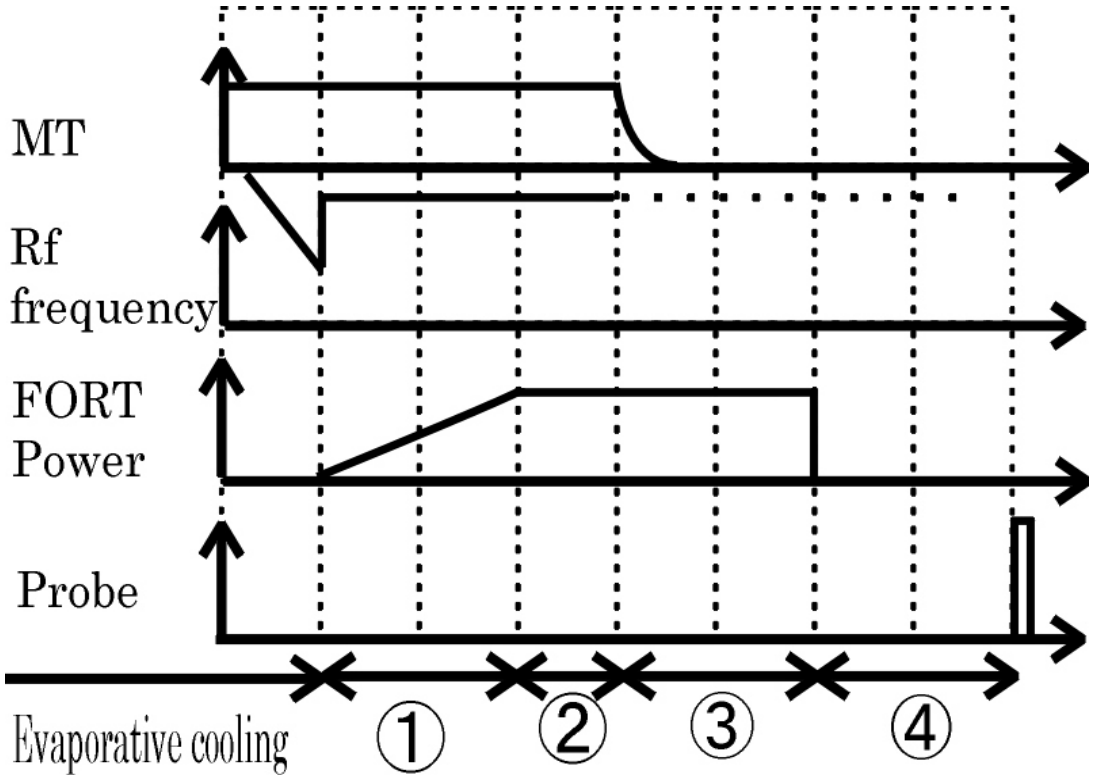
Trap potential (calculation)



ポテンシャルの深さ ～55nK
アスペクト比　～60

Time table

MOT→PGC→MT→Evaporative cooling and then….



① Ramp up time

0~120ms

②Delay time

0~10ms

③Optical trap time

0~400ms

④TOF time

0~25ms

Time-of-Flight images of BEC

λ=816.5nm

power 4mW

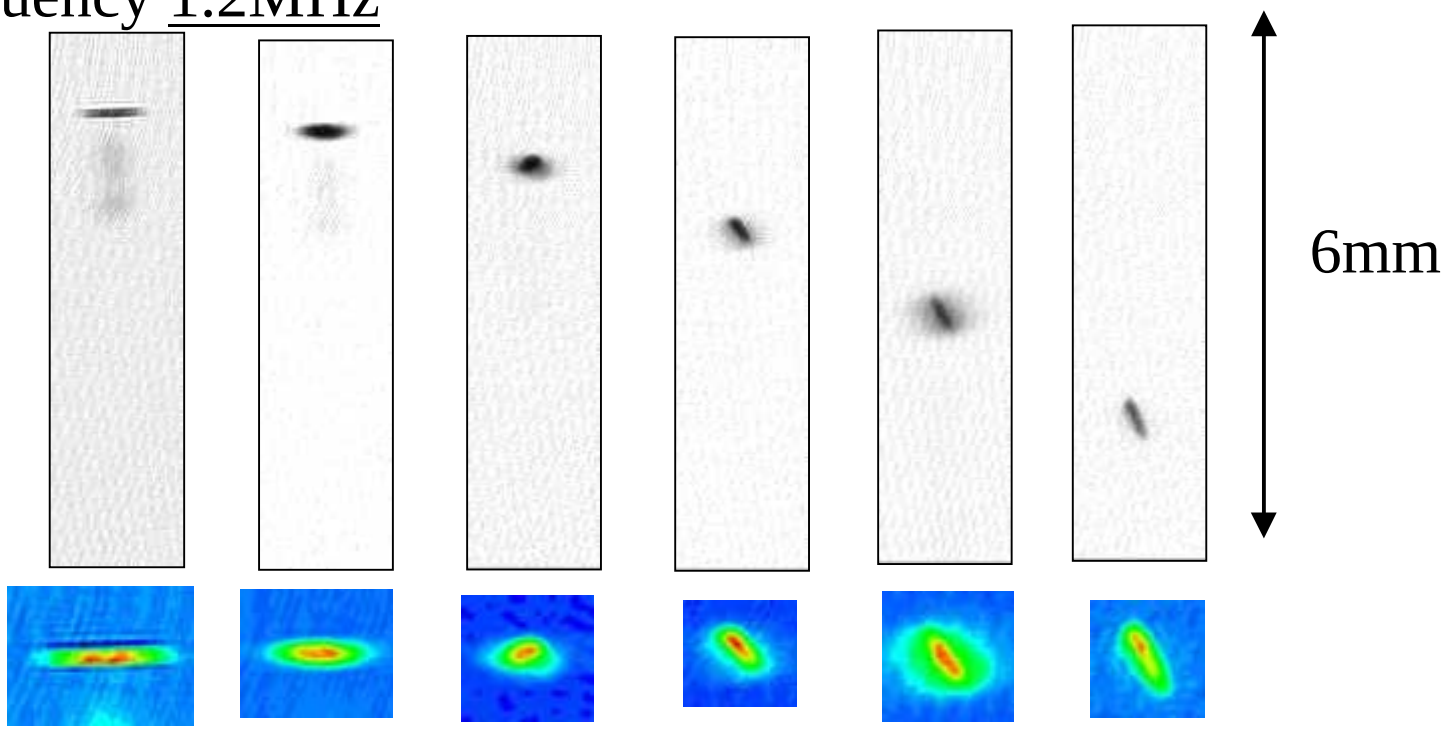
w_0 (1/e^2 radius)=10μm

①Ramp up time 120ms

②Delay time 0ms

③Trap time 10ms

Final Rf frequency 1.2MHz



④Tof time 0ms 5ms 10ms 15ms 20ms 25ms

Life time of optical trap (1)

①Ramp up time 120ms

②Delay time 0ms

④TOF time 0ms

Final Rf frequency 1.2MHz

③Optical trap time

0ms

20ms

40ms

60ms

80ms

100ms

③Optical trap time

150ms

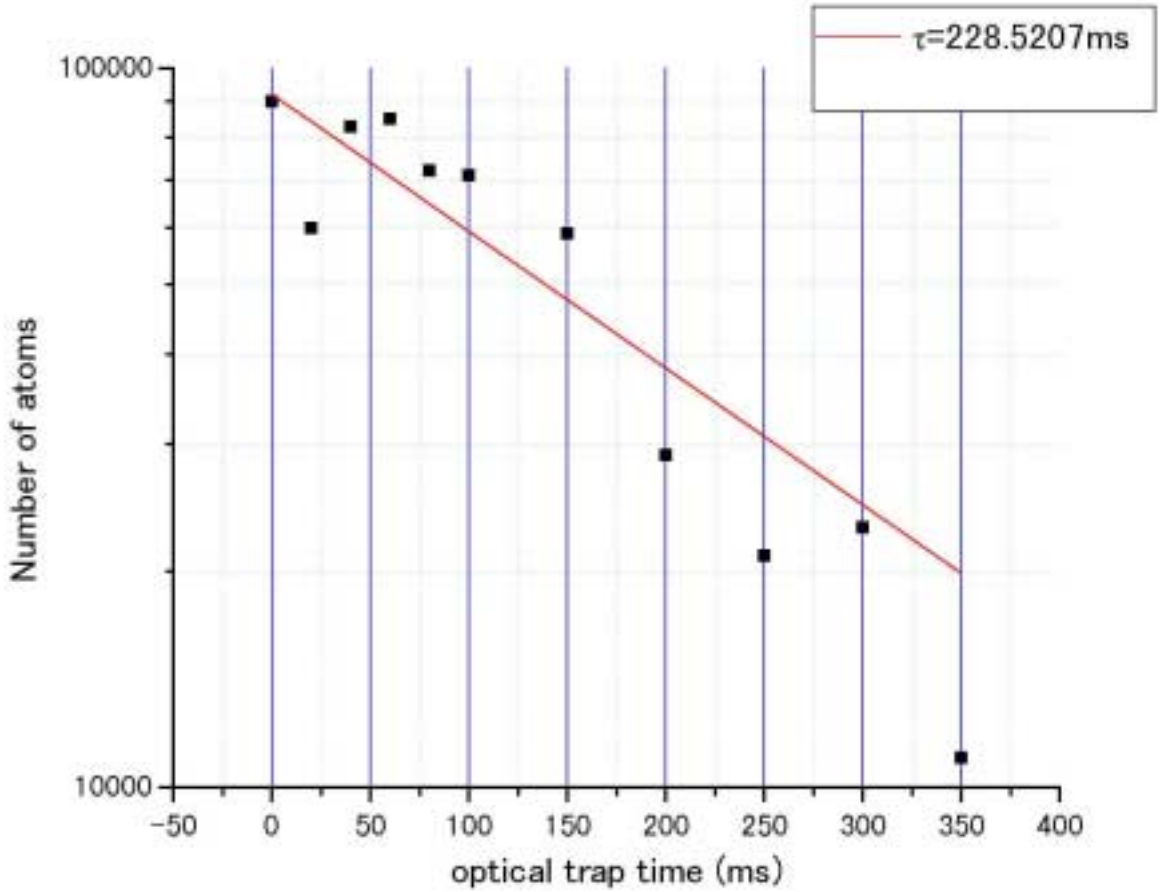
200ms

250ms

300ms

350ms

Life time of optical trap (2)



Conclusion

^{87}Rb(F=2)のBECを光双極子力トラップした

最適化はまだ（強度、アライメント）

最適化できたら・・

- 寿命の測定
- Stern-Gerlach