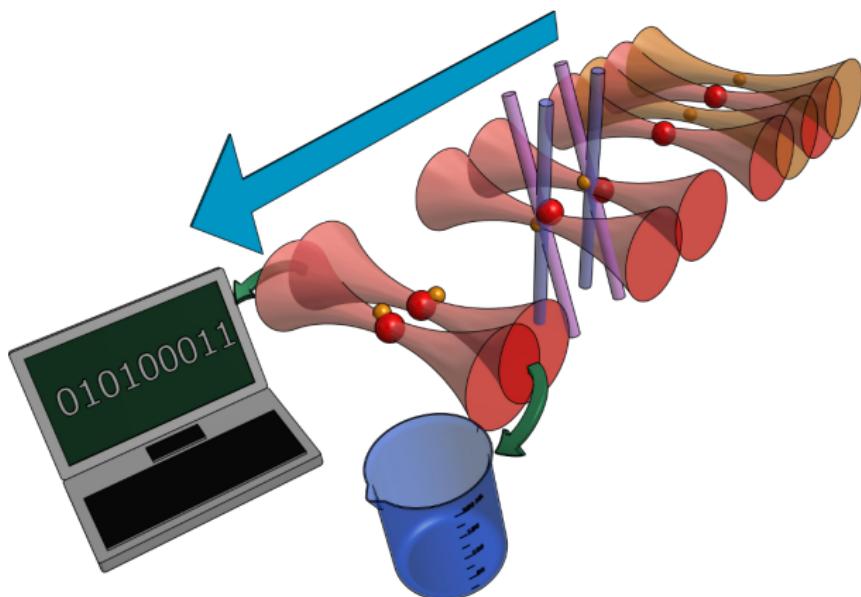
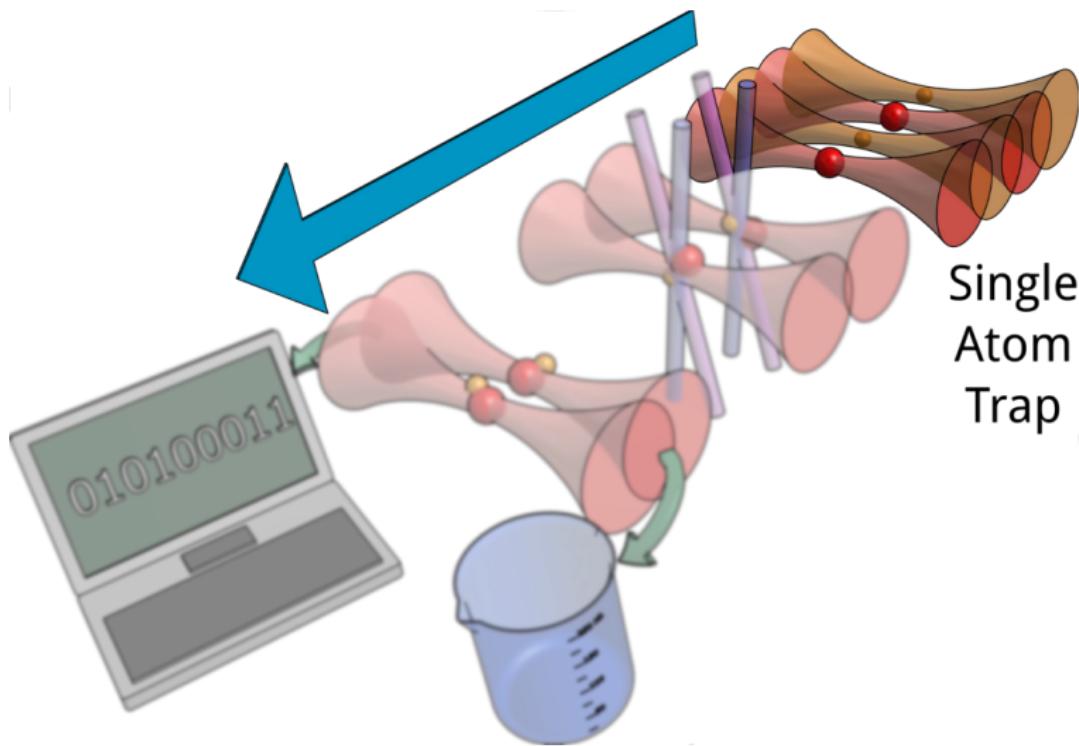


# Apparatus for making dipolar NaCs molecules

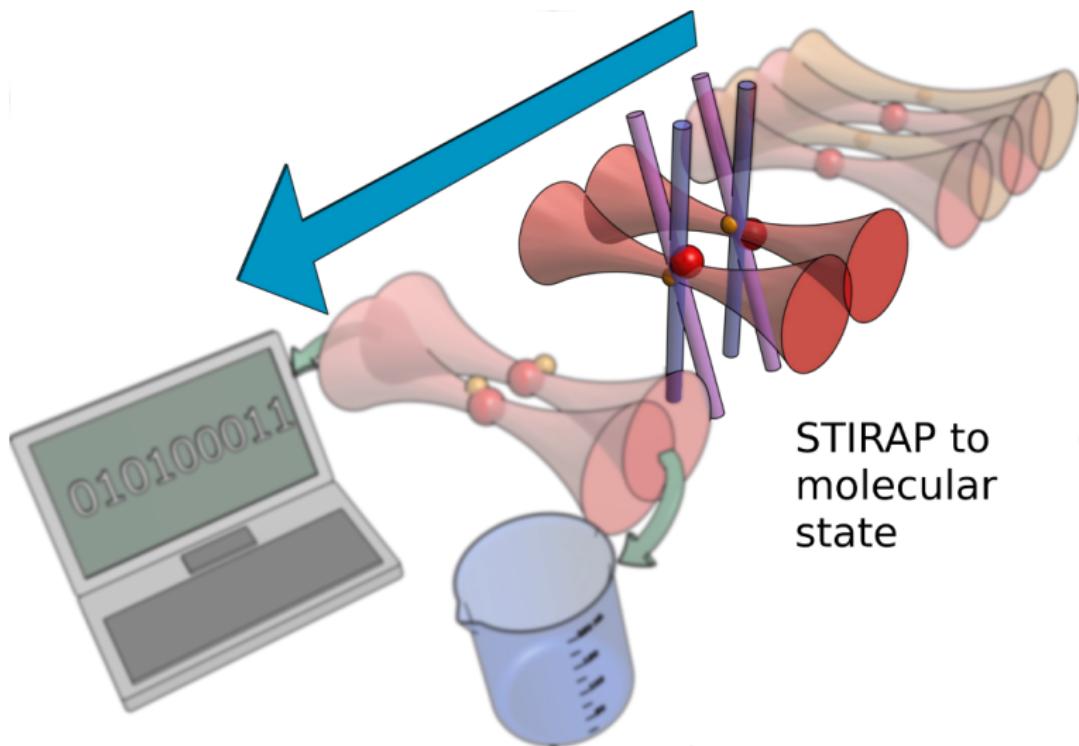


Yichao Yu  
May 5, 2015  
Ni Group/Harvard

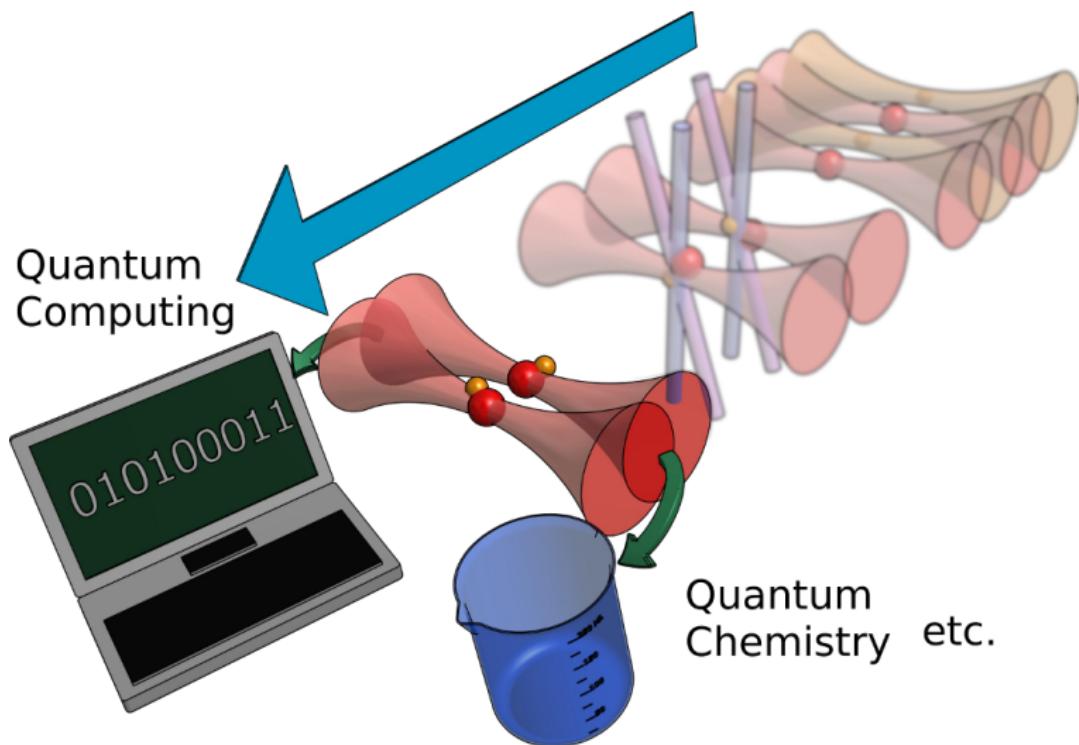
# Apparatus for making dipolar NaCs molecules



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# Apparatus for making dipolar NaCs molecules



## Current state: Atom cooling

### Cesium



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Cesium

MOT

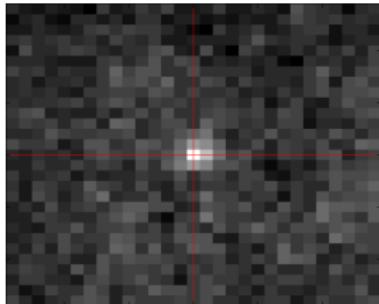


## Current state: Atom cooling

Cesium

MOT

Trapping  
single  
atom



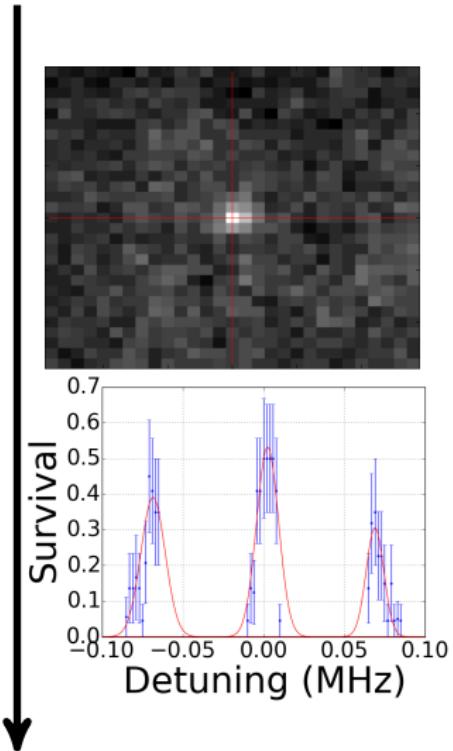
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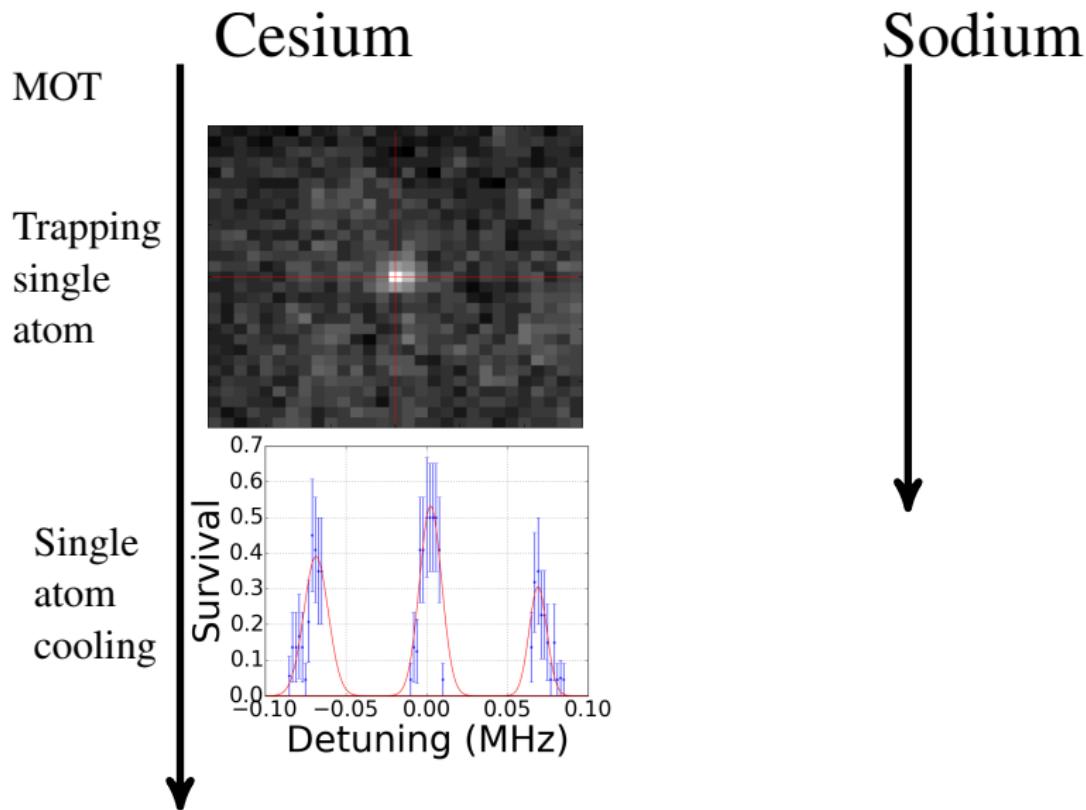
MOT

Trapping  
single  
atom

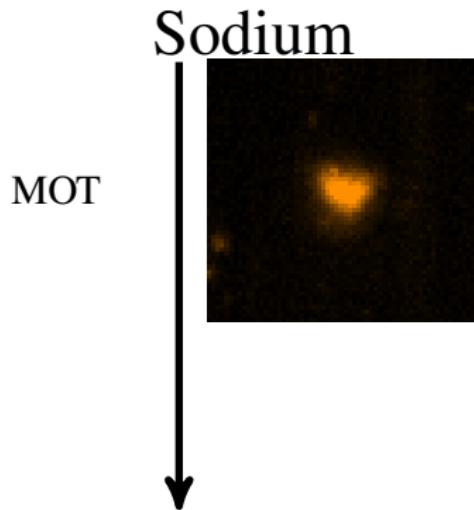
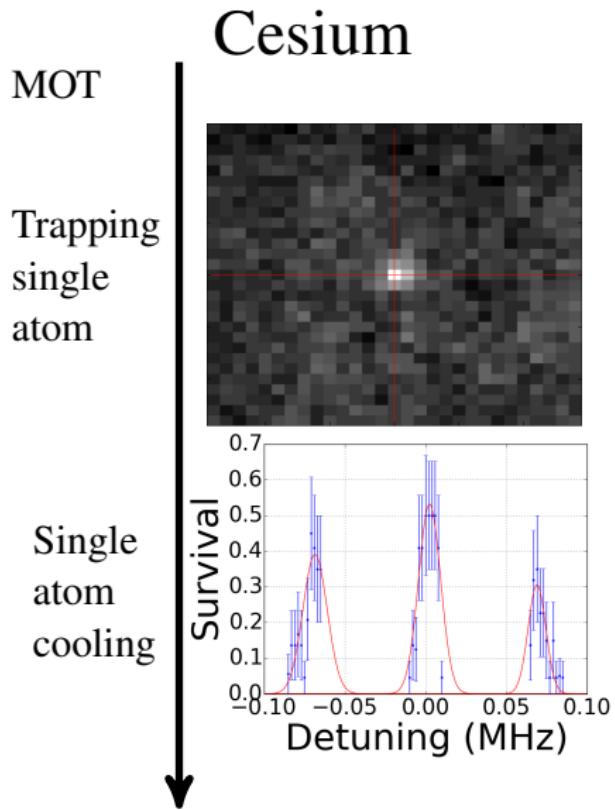
Single  
atom  
cooling



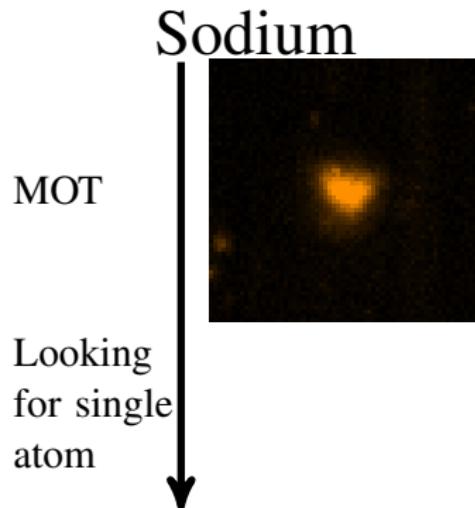
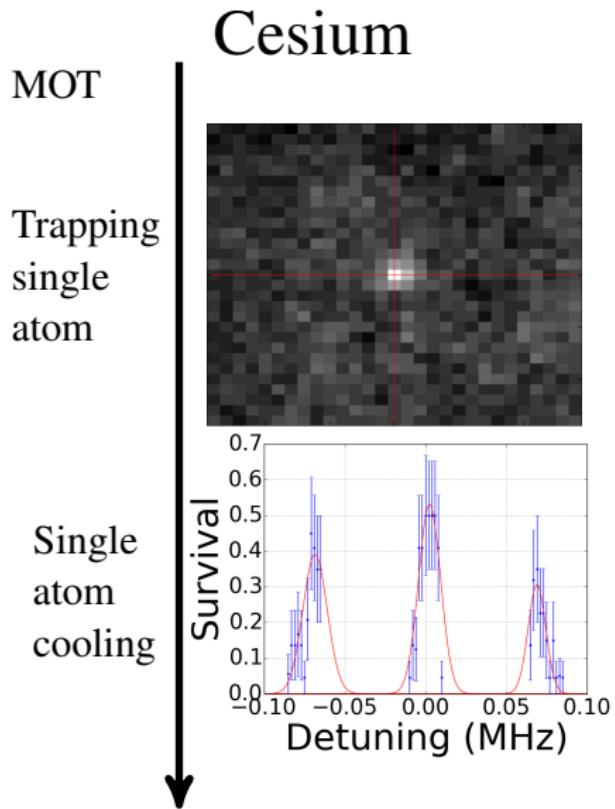
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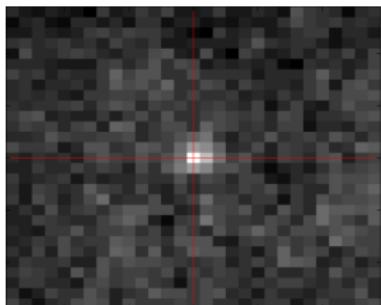
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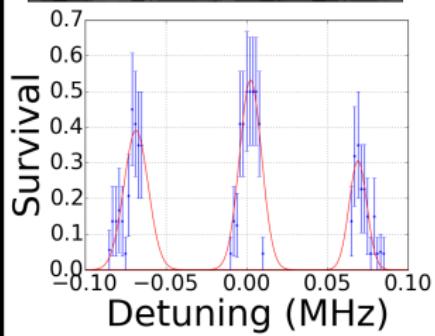
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MOT



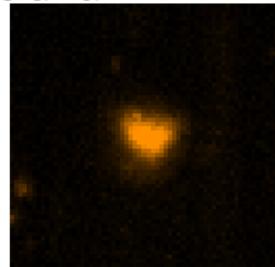
Trapping  
single  
atom

Single  
atom  
cooling



### Sodium

MOT



Looking  
for single  
atom

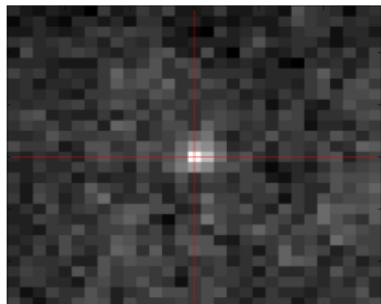
### Challenges

- Sodium laser
- MOT stability

## Current state: Atom cooling

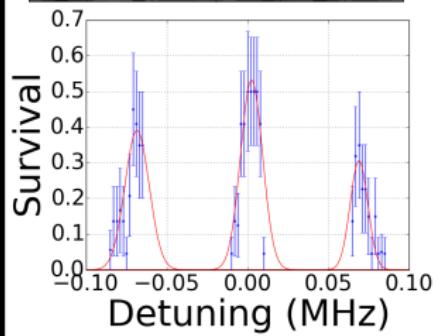
### Cesium

MOT



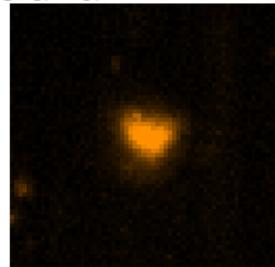
Trapping  
single  
atom

Single  
atom  
cooling



### Sodium

MOT



Looking  
for single  
atom

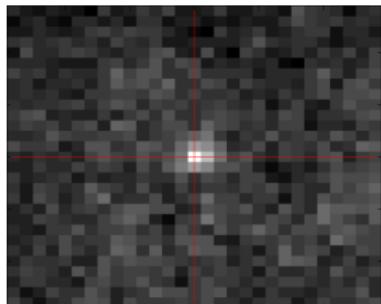
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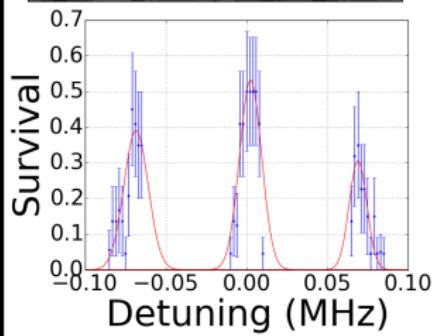
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MOT



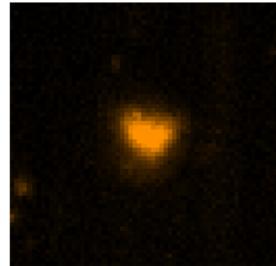
Trapping  
single  
atom

Single  
atom  
cooling



### Sodium

MOT



Looking  
for single  
atom

### Challenges

- Sodium laser
- MOT stability

# Laser system for Sodium

## Sodium D lines $\approx 589\text{nm}$

- D2 line  
Cooling and Imaging
- D1 line  
Pumping and Cooling
- Off resonance  
( $\delta \approx 10\text{GHz}$ )  
Raman transition

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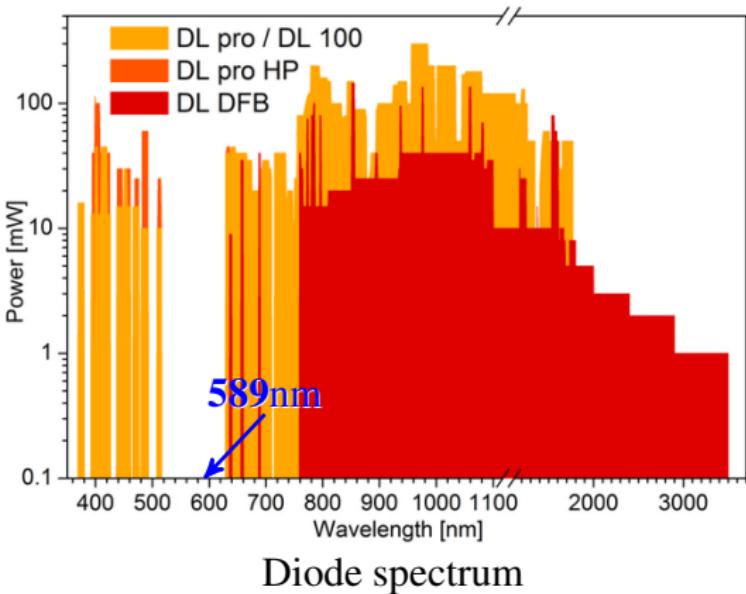
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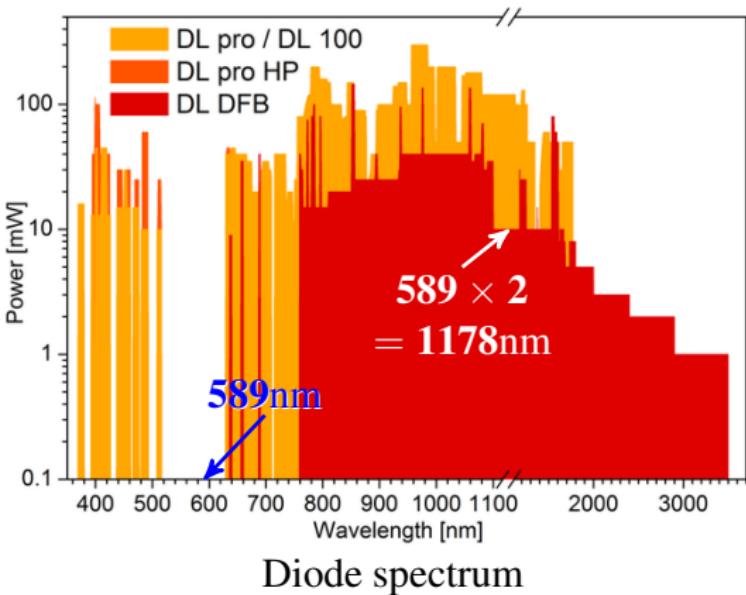


(Picture from Topica)

# Laser system for Sodium

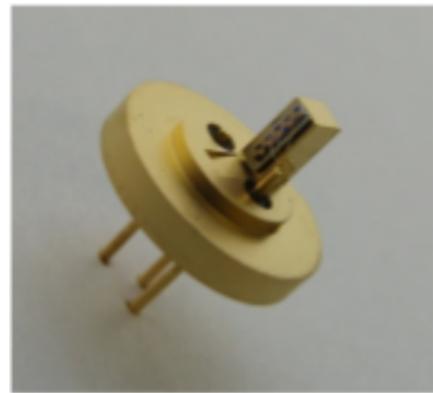
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(Picture from Topica)

# 1178nm seed diode laser

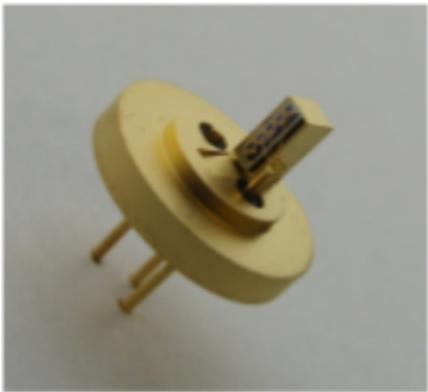


Picture from Innolume

## Laser diode from Innolume

- Max power: 200mW  
Max current: 500mA
- Tunable over > 100nm: 1175-1280nm

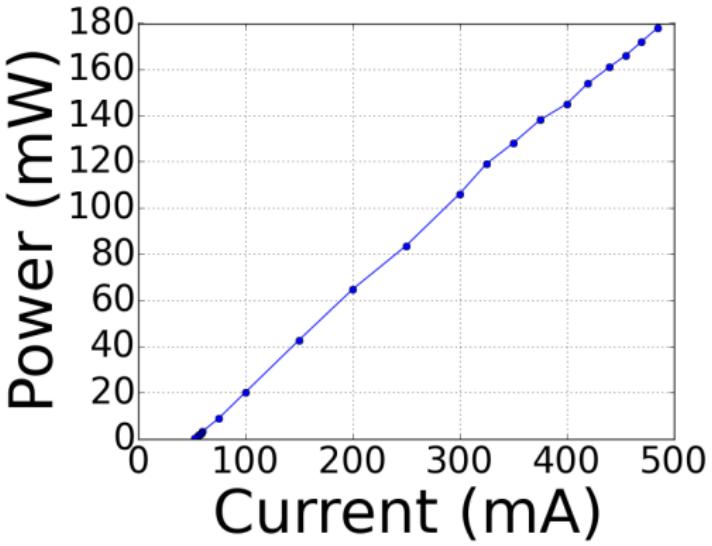
# 1178nm seed diode laser



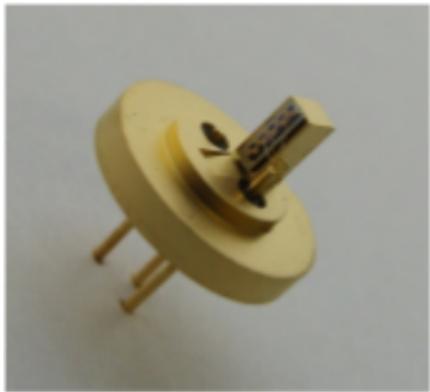
Picture from Innolume

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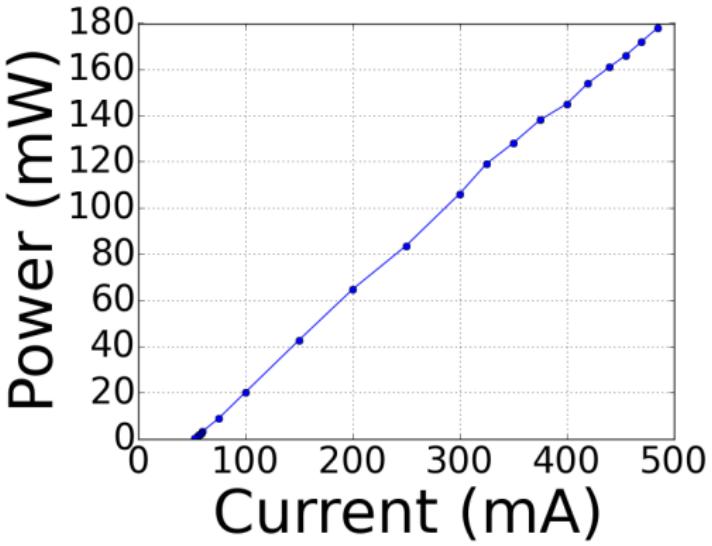
# 1178nm seed diode laser



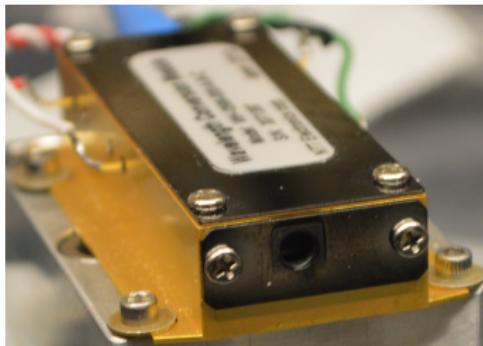
Picture from Innolume

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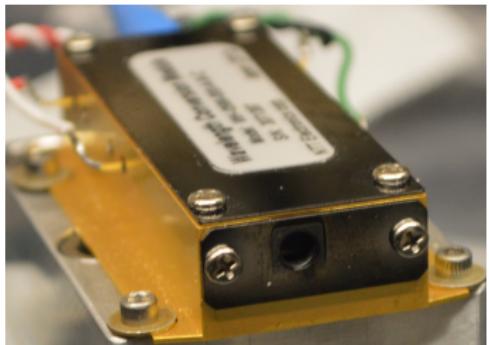


## Frequency doubling to 589nm

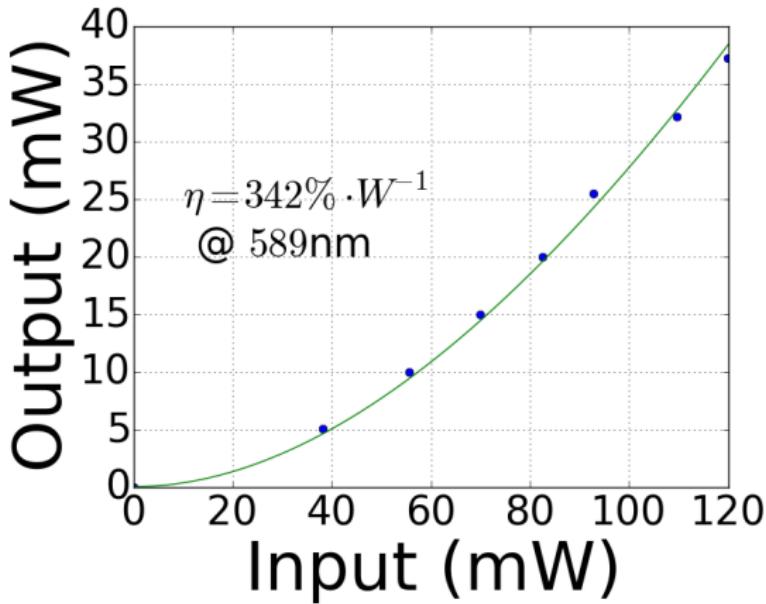


Waveguide doubler module  
from NTT Electronics

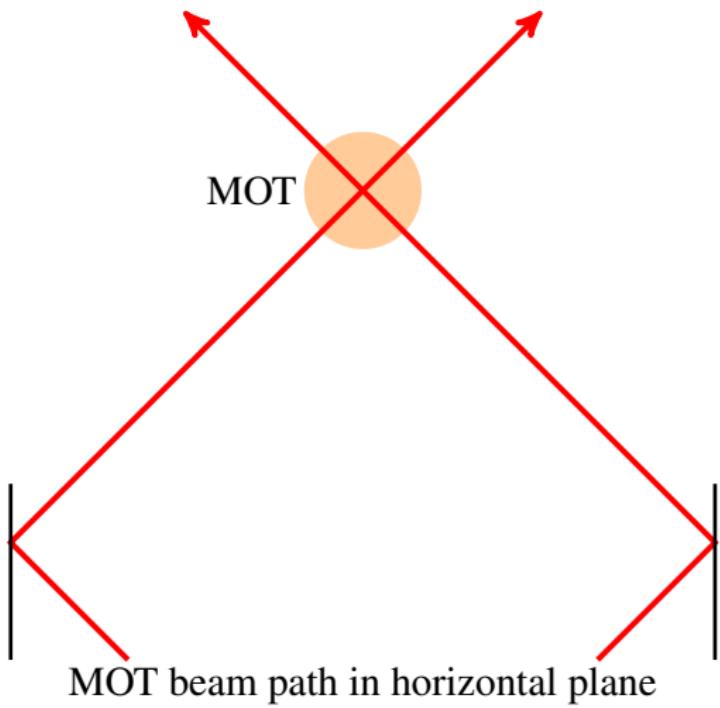
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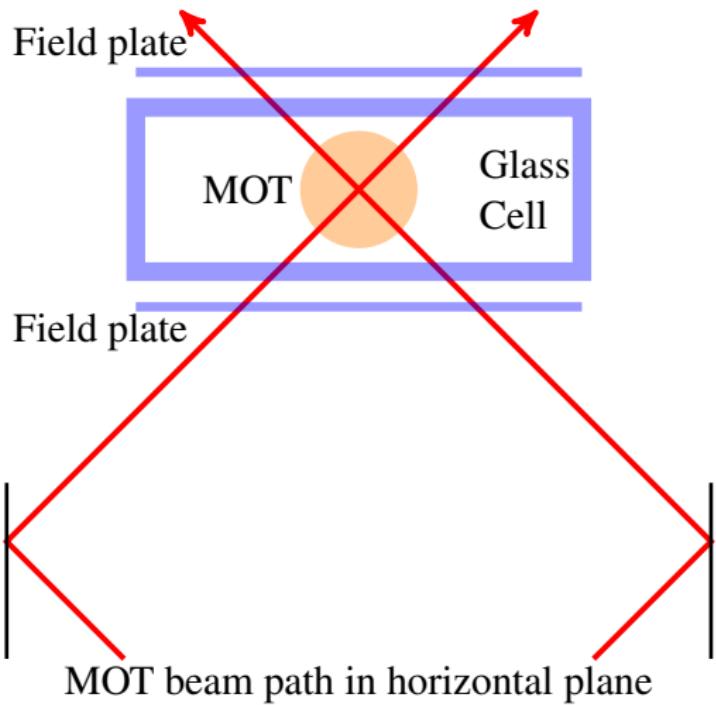
Waveguide doubler module  
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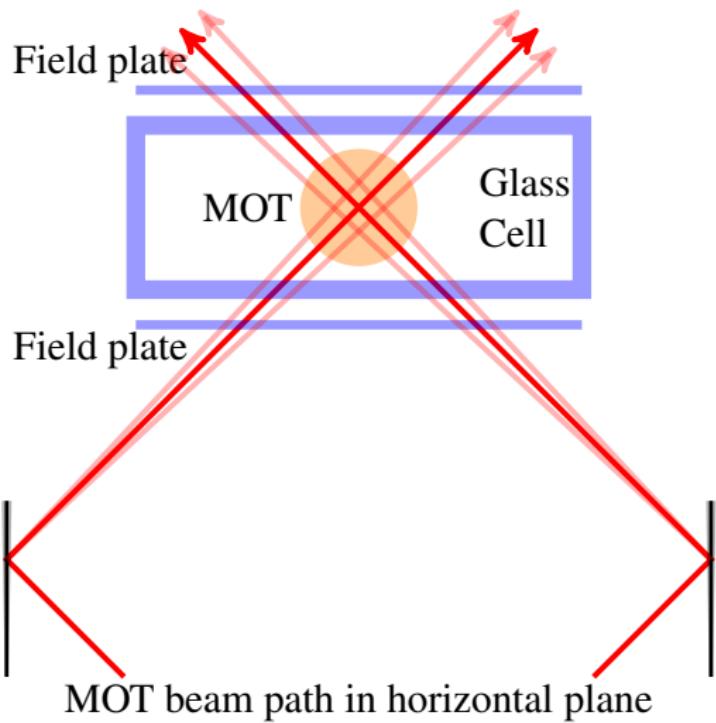
## MOT stability



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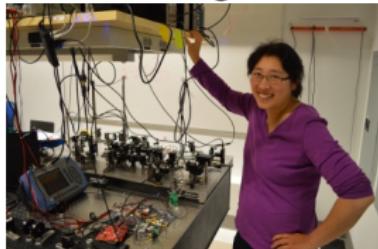


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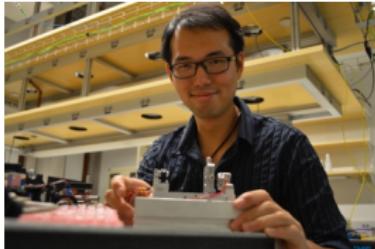


# MOT stability

Prof. Kang-Kuen



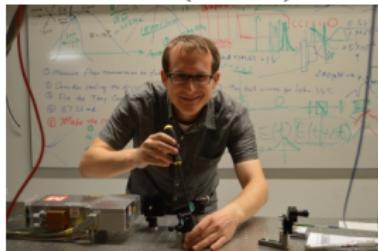
Yu (KRb)



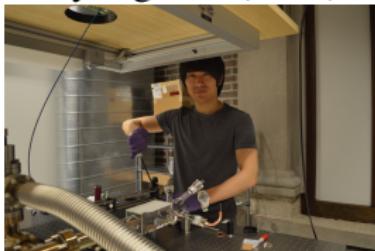
Saahil (Undergrad.)



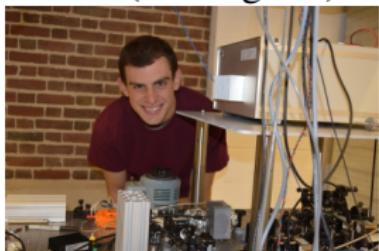
Nick (NaCs)



Hyungmok (KRb)



Will (Undergrad.)



Lee (NaCs)

