

Measurement of Nb/Al -STJ response to photon using VTS at FNAL (first run)

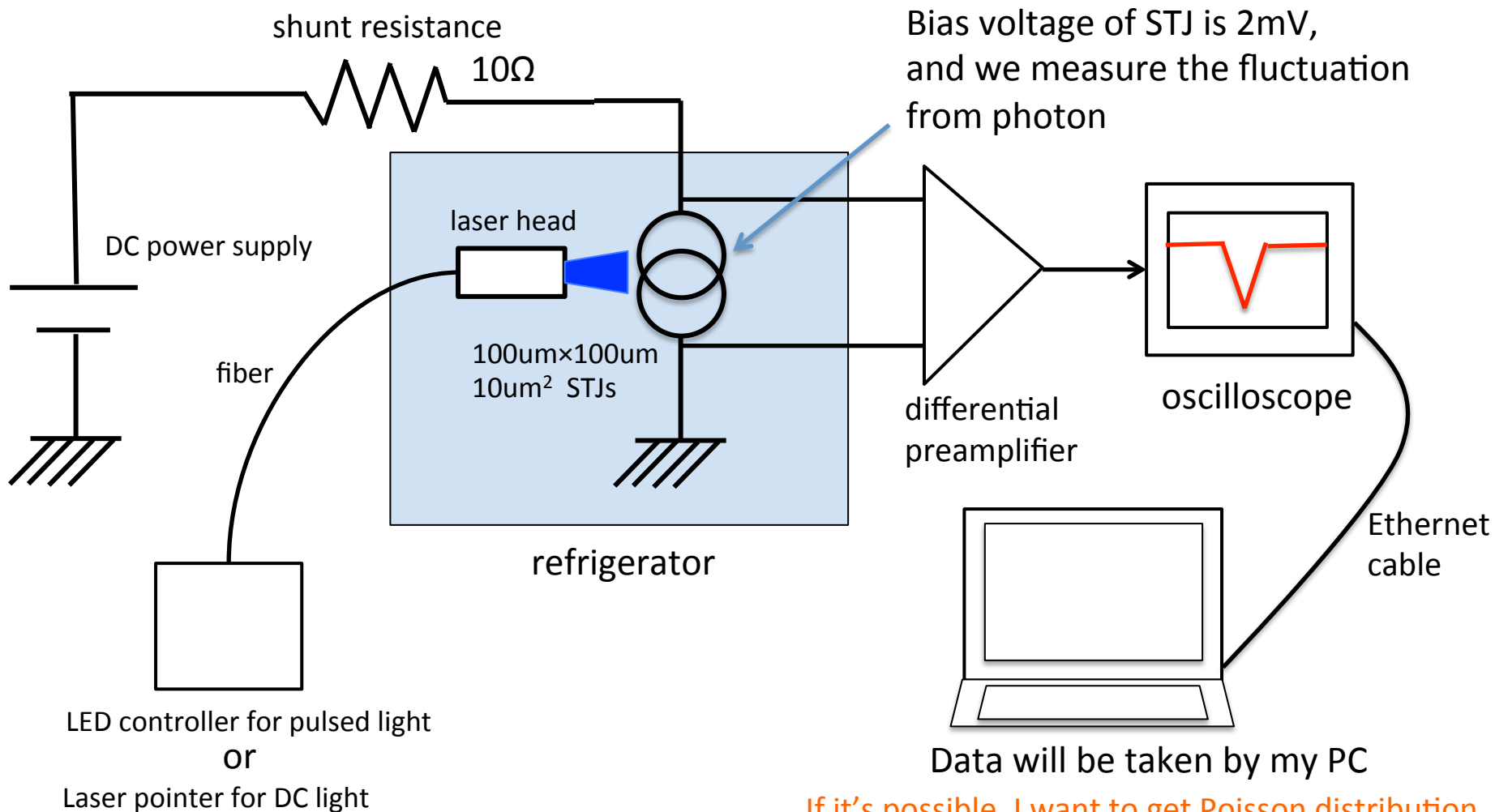
10/1/2013

HOU 2013 report

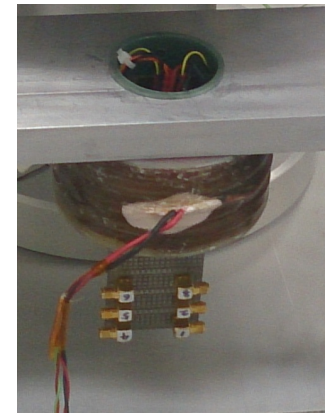
Takuya Okudaira

Measurement circuit

Our plan was to measure response to pulsed light and its pulse height distribution

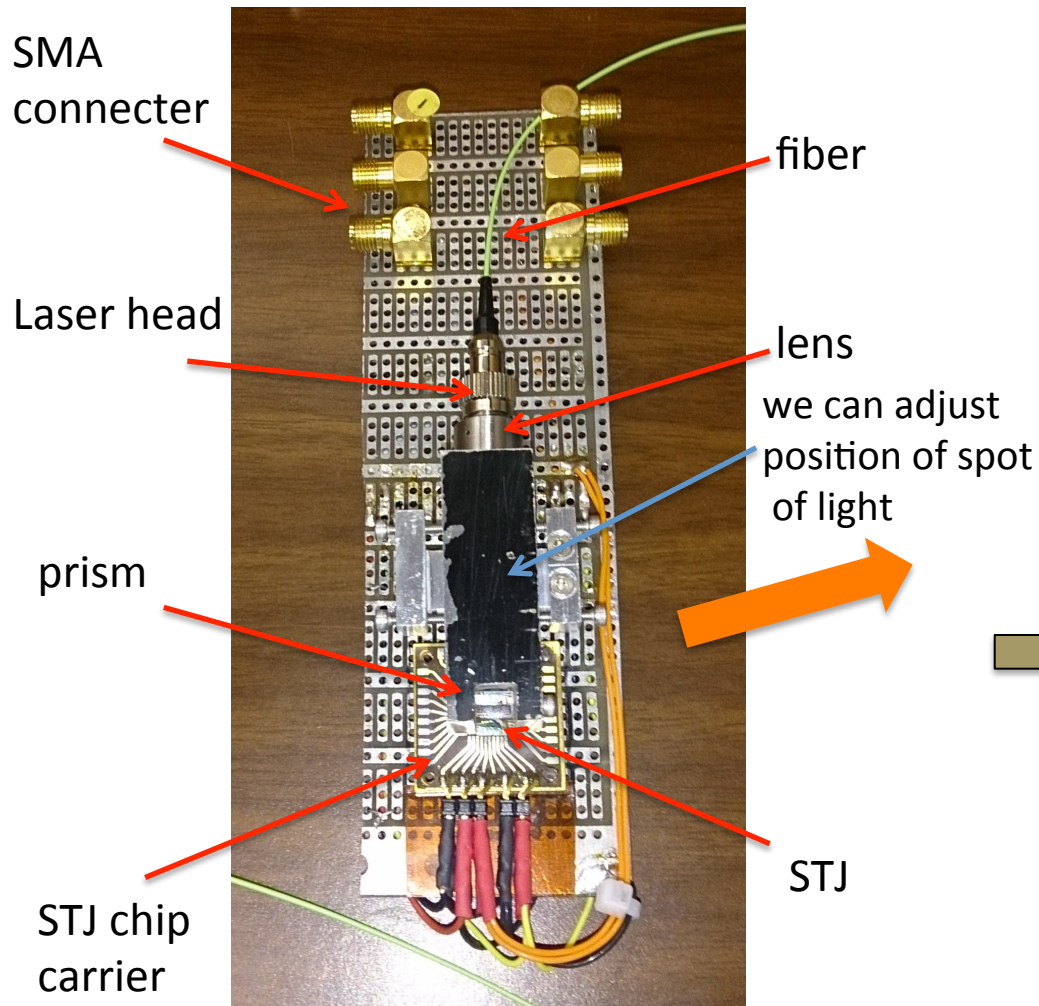


PC board

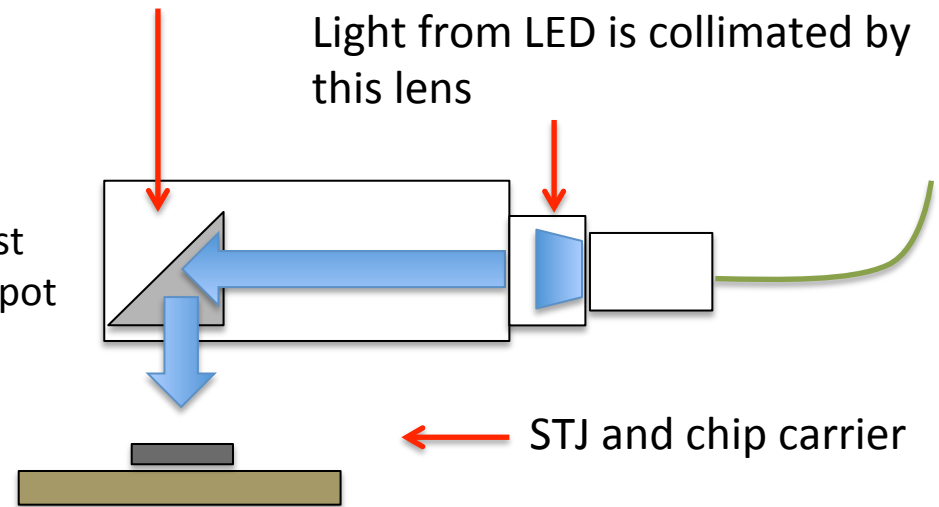


PC board was inserted into superconducting magnet
Collimator head can be fixed on PC board, and we used prism and
collimator lens to illuminate STJ

PC board



Parallel Light is reflected vertically by prism

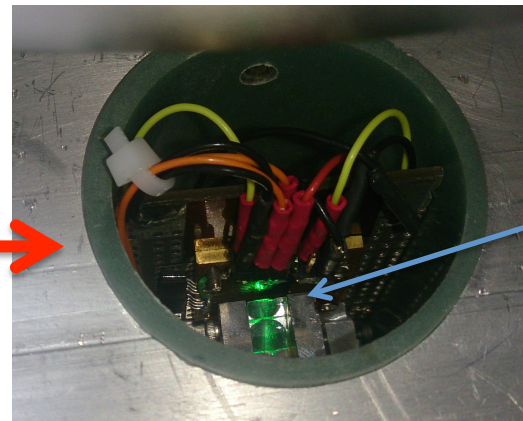
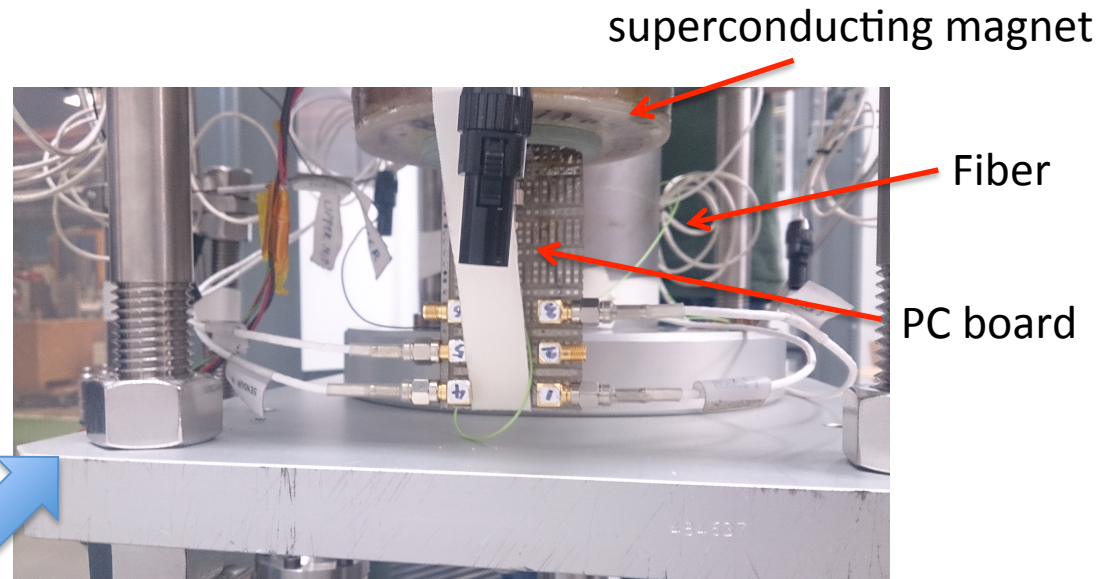
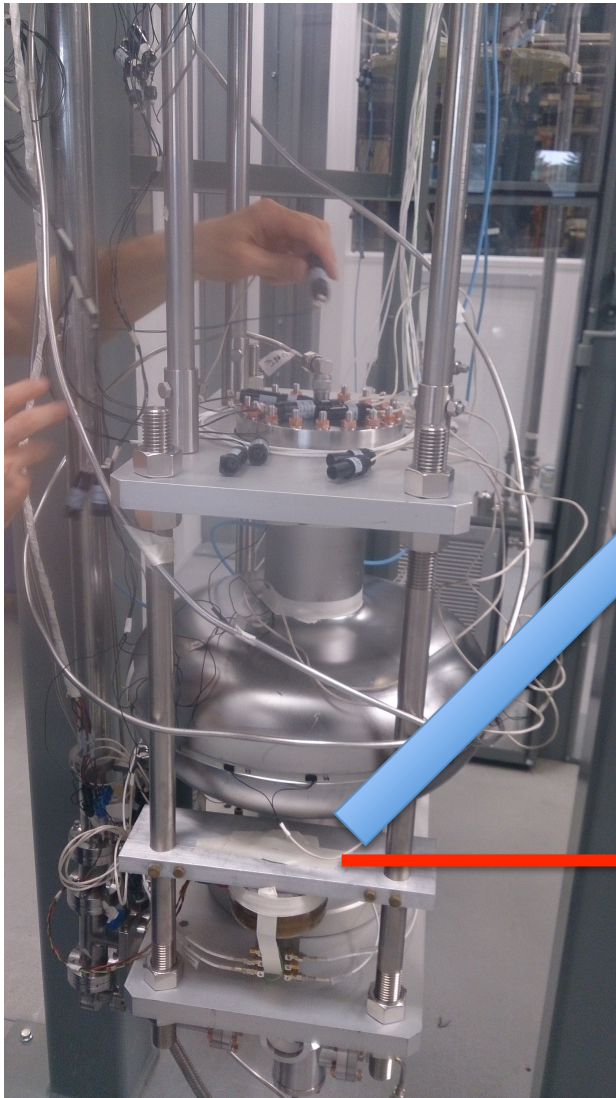


Diameter of spot size of light is about 5mm.
This light can cover the STJ chip completely.

About LED and Laser Pointer

- LED driver
 - can make 20ns pulsed light.
 - needs dual DC power supply and function generator as trigger
- LED
 - can control number of photons by adjusting driver voltage.
 - we have 4 kind of LED, and these wave length are 405nm, 470nm, 525nm and 527nm.
 - Number of photon/ $100 \times 100 \mu\text{m}^2 \cdot 20\text{ns}$ is about 10^2
- Laser Pointer
 - 1mW, $\lambda=532\text{nm}$
 - we used laser pointer as DC light source
 - Number of photon/ $100 \times 100 \mu\text{m}^2 \cdot 20\text{ns}$ is about 10^5

Set up

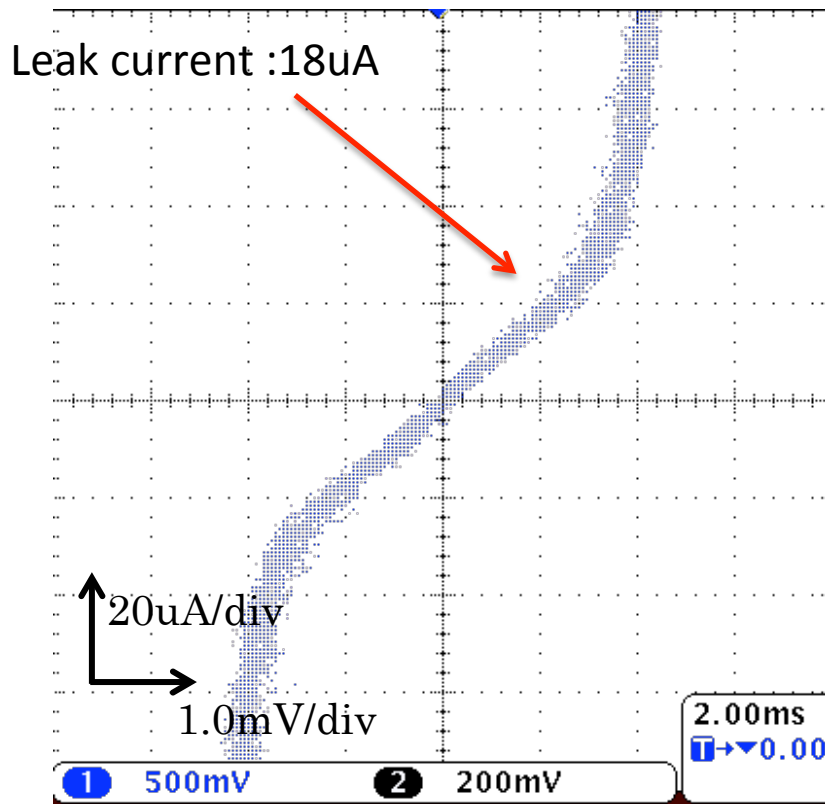


We can confirm that light intensity is enough

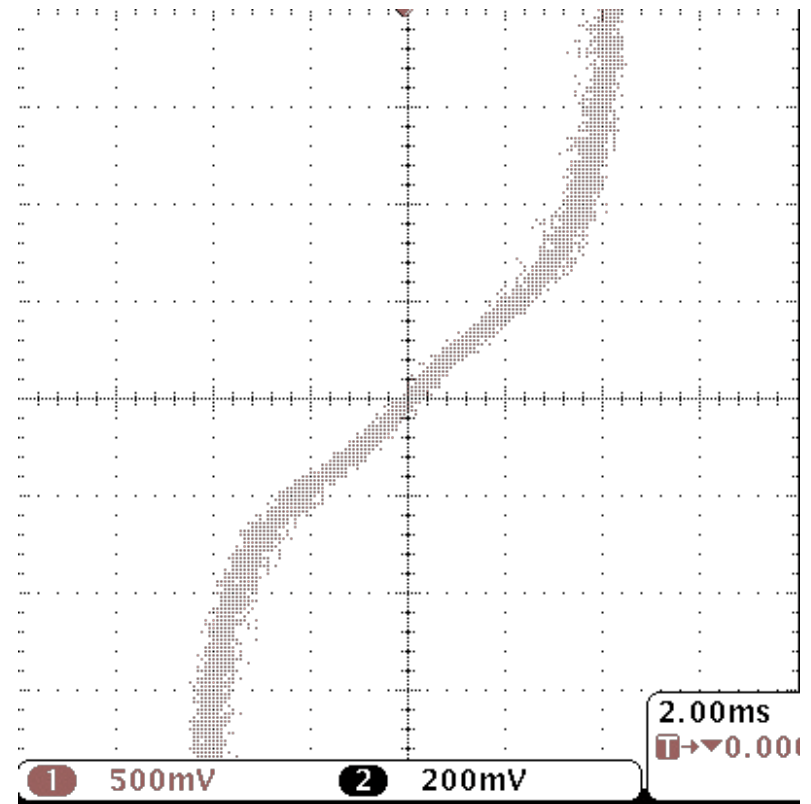
Result

We could get only very small response to light of LED and Laser Pointer.....

I-V curve of $100 \times 100 \mu\text{m}^2$ STJ to 1mV laser pointer




Without light



With light

Why the response was very small

- Equipment was broken ?
 - but we could confirm that light intensity didn't change between before and after measurement
(Fiber, prism and equipment for fixing collimator head were not broken in room temperature after experiment)
 Prism or collimator lens had any invisible cracks in room temperature, and these got bigger in liquid helium temperature?
- The light intensity was not enough?

We can't understand why response was very small

Summary

- We tried to measure response to light of LED and laser pointer from $100 \times 100 \mu\text{m}^2$ STJ, but could see only very small response
 - We couldn't find its cause.
- Collimator head or Prism might cause any problems
 - We illuminate light to STJ directly without collimator head and Prism
- The light intensity might not be enough
 - We use PIN photo diode to confirm that light intensity is enough
 - We use brighter laser pointer (5mW)