Development of a Compact Load Lock System and a New Tuning Structurer for a Cs2Te Cathode RF Gun

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Works done by

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Outline

- Introduction
- Compact Load Lock System
- Compact Tuner
- Process of the Fabrication and Status
- Conclusion

Motivation of this study

In Waseda Univ., Photo-Cathode RF Gun has been studied for mainly two applications

- == Soft X-ray biological microscope
- == Pico-seconds pulse radiolysis system
 Please see a poster presentation (id=271)

Higher current is better for the applications!!

Study of New RF Gun with Cs2Te Cathode has been started.

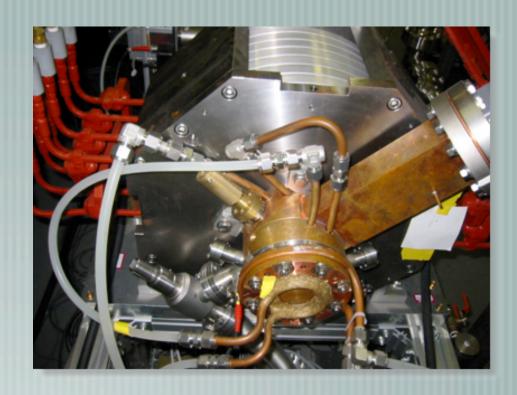
Cu to Cs2Te Cathode

Now: Cu cathode

QE about 0.1% - 0.01%

Change to: Cs2Te cathode

QE about 10% - 1%



Existing RF Gun at Waseda Univ.

Higher current is expected

or Small (Stable) laser system can be used for Gun drive

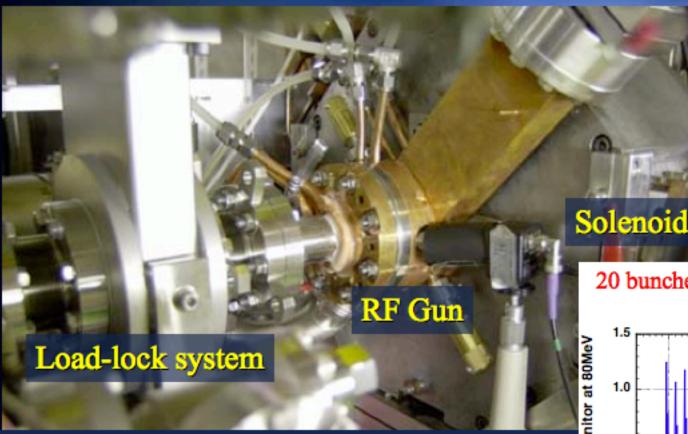
Start point of the development

Cs2Te cathode guns are working with good performance at the KEK-ATF and KEK-LUCX.

Plug-cathode and load lock system for cathode attachment are adopted for two gun system.

These are start points of the new Gun system development.

ATF RF Gun

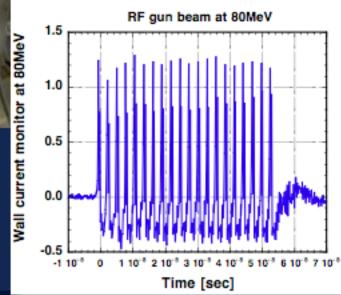


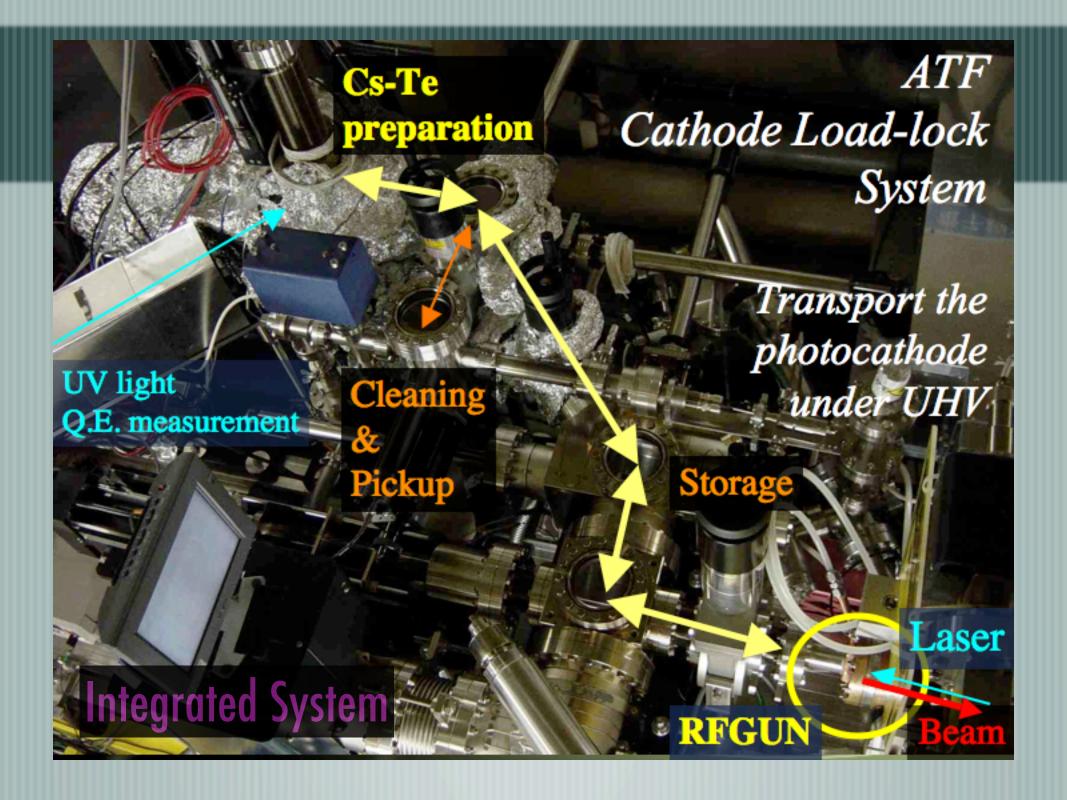
High quality Multi-bunch beam is generated.

1 ~ 20 bunches/pulse, 2.8ns spacing

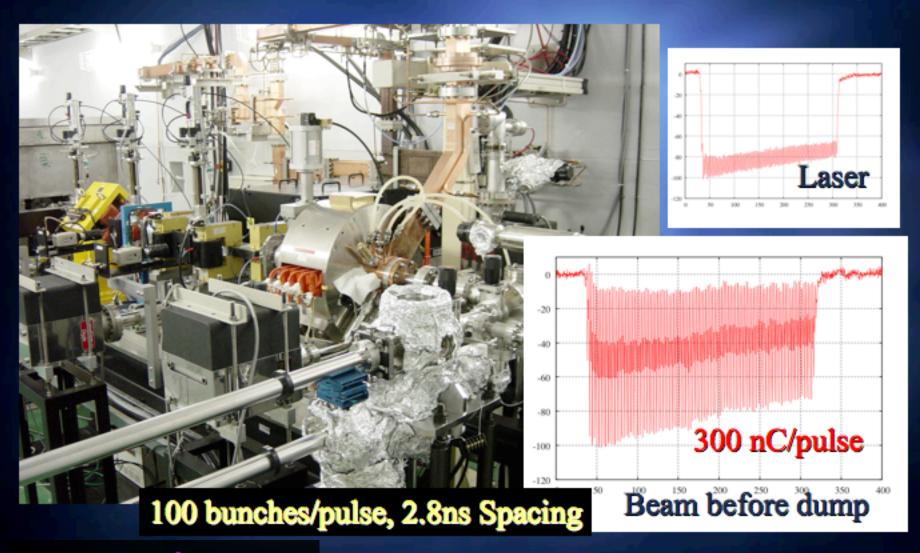
~ 2 x 10¹⁰ electrons/bunch

20 bunches/pulse, 2.8ns Spacing





RF Gun Test Bench (RFGTB->LUCX)



Separated System vshqe, INFN, Milan 10/4-6/2006

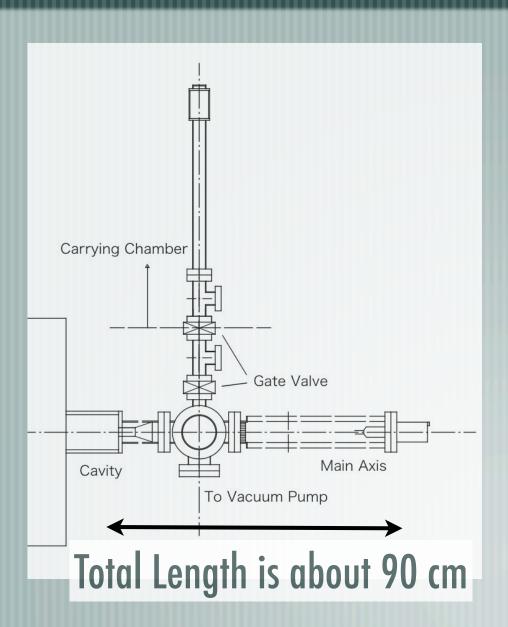
Modifications (1)

Existing RF Gun at Waseda Univ.



Make the compact load lock system to fit on Waseda's space Separate a evaporation chamber from the load lock system

Compact Load Lock System





Carrying Chamber



Main Chamber

Separated System

Benefits from the plug-cathode system

Not Only

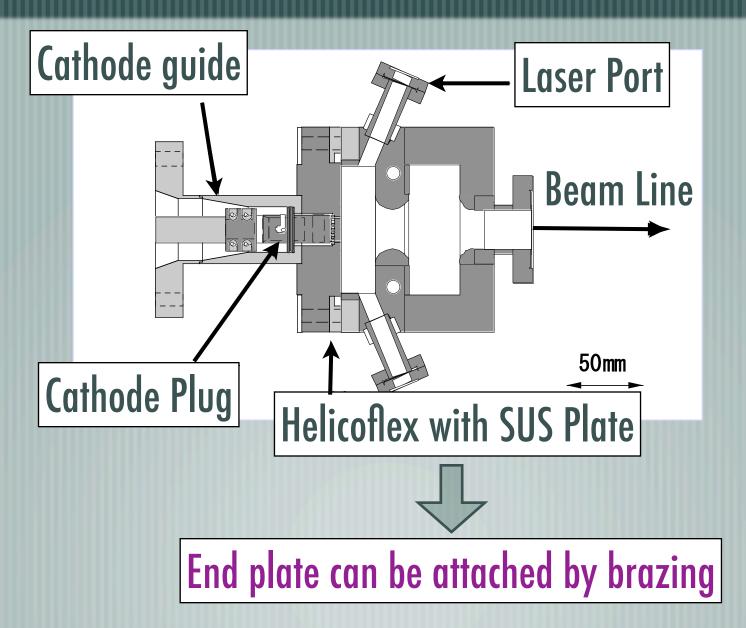
can easily replace the cathode when its QE get low

can easily test different type of cathodes

But Also

do not need to use the Helicoflex seal on the end plate attachment

Modifications (2)



needs of compact RF tuner

Helicoflex play a role as a tuner for half cell by changing screw tightening torque on the end plate.

To remove the Helicoflex, we need alternative tuners for the half cell.

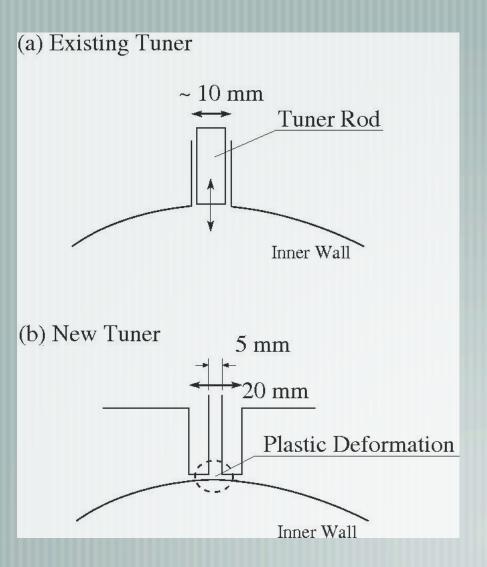
Therefore, development of a compact tuner, which can also be attached on the half cell, is needed.

Existing Tuner on the Full Cell

Existing RF Gun at Waseda Univ.



Tuner structures

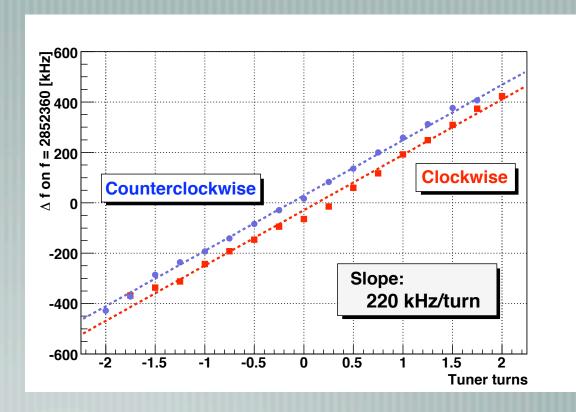


- + tuned by moving a rod
- + need hole on the cavity inside wall

- + tuned by deformation of the wall
- + do not need hole on the wall

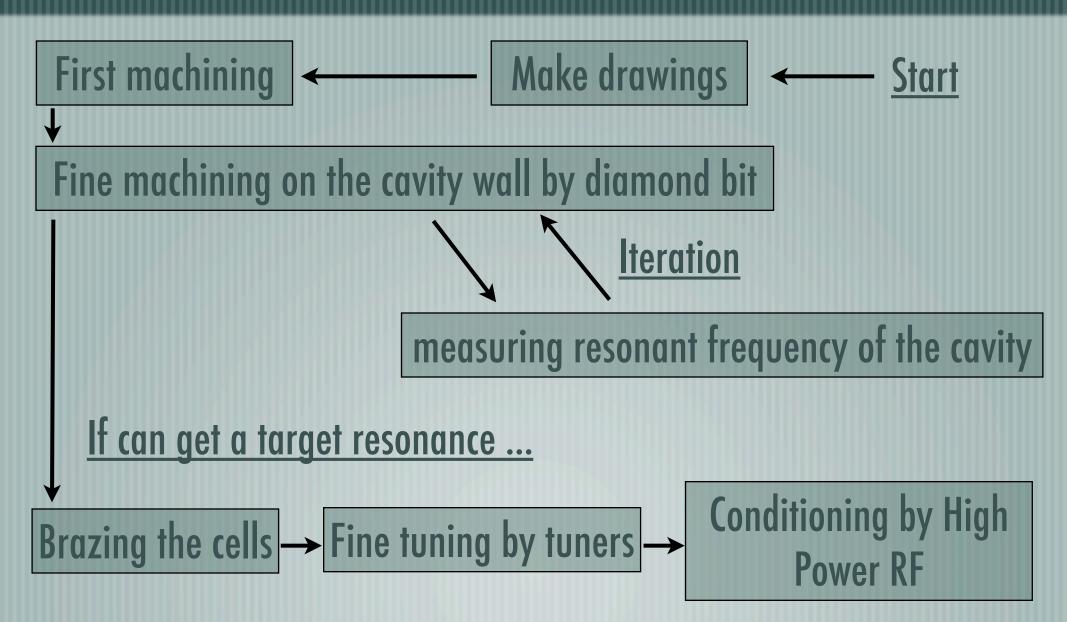
Tuning ability test



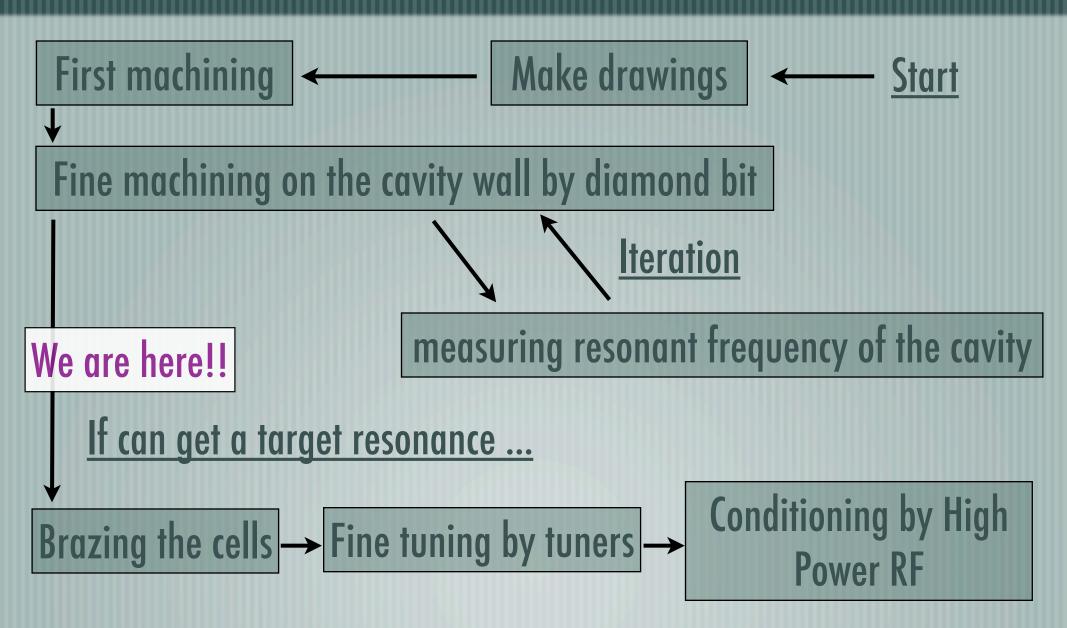


Tuning ability: 220 kHz/turn/1 tuner Enough for Gun!! —> Start fabrication with the new tuners

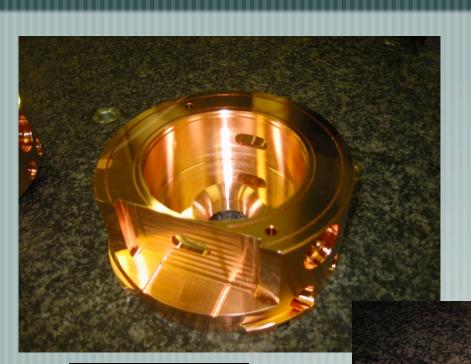
Process of gun fabrication



Process of gun fabrication



After first machining



Full Cell

Half Cell

End Plate

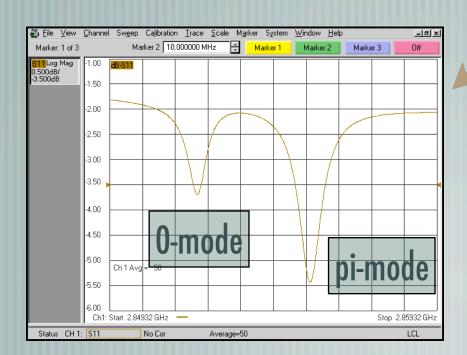
Assembly image

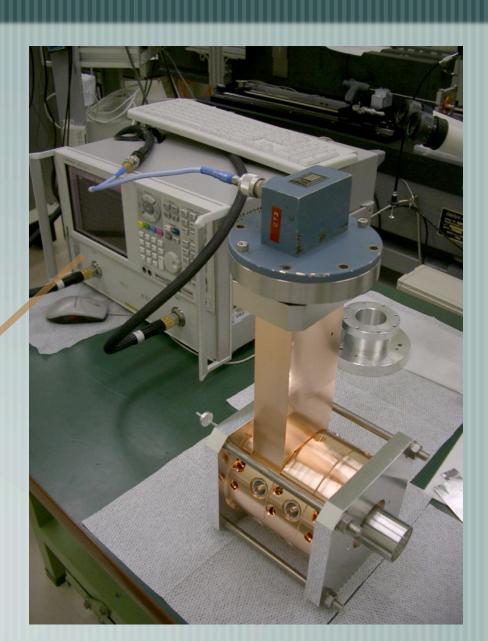


Resonance measurement

Measure the resonant frequencies using a Network Analyzer.

Target frequency is 2855.2 MHz on pi-mode for our system.

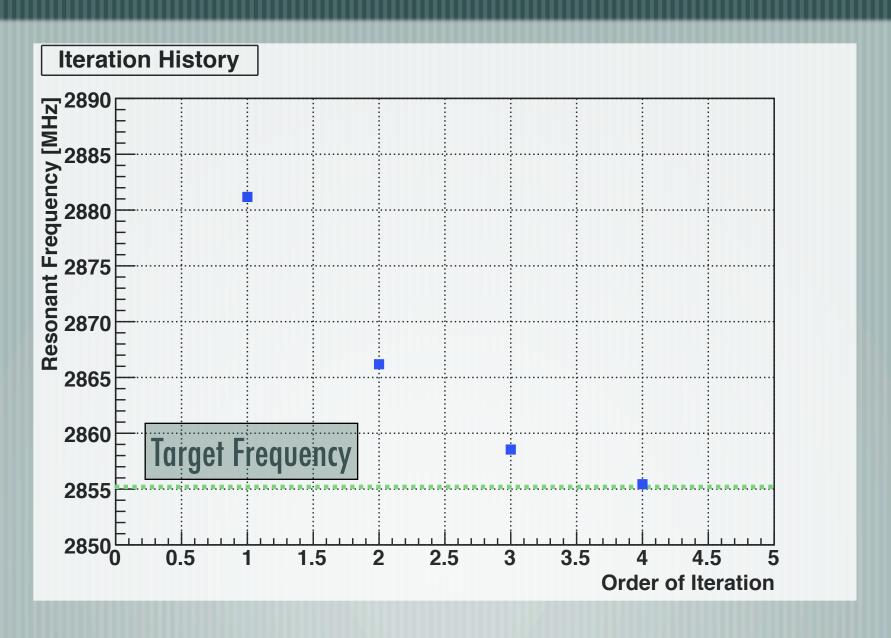




Fine machining



Iteration history



Conclusion

- Compact load lock system and new tuner structure are developed for a Cs2Te cathode RF Gun.
- The load lock system was assembled. We are going to do a vacuum test.
 - We are fabricating the new gun cavity with the compact tuners. Now brazing procedure is going on.