

# Fabrication of 3.0-GHz Single-cell Cavities for Thin-film Study

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**Abstract :** We fabricated 3.0-GHz single-cell cavities with Cu and Nb materials for testing thin-film creations on the inner surface of the cavities in collaboration between Jefferson Laboratory (JLab) and KEK. The cavity was designed at JLab. According to the design of cavity, the press-forming dies and trimming fixtures for the cavity-cell were also designed and fabricated at JLab. These dies and trimming fixtures were transported to KEK, and the rest of fabrication processes were done at KEK. Finally nine Cu 3.0-GHz single-cell cavities and six Nb 3.0-GHz single-cell cavities were fabricated. Two Cu 3.0-GHz single-cell cavities were mechanically polished at Jlab. All of these cavities will be utilized for the tests of various thin-film creations at JLab and KEK. This presentation describes details of the fabrication of these cavities.

## Press-Forming and Trimming of 3.0-GHz Cu and Nb Cups



Annealing of Cu (C1020) disks in vacuum furnace at KEK ( 520 C x 2 hours )



Nb plates were produced by Tokyo Denkai. Press-forming of cups at KEK. Press dies were designed and fabricated at Jlab



Trimming of Cu and Nb cups at KEK. Trimming fixture were designed and fabricated at Jlab



## Fabrication of 3.0-GHz Cu Cavities at KEK and Surface Preparation at JLab



Brazing of stainless-steel flanges and Cu beam-pipes. Brazing: Ag 72.5% , Cu 27.5%, others < 0.15%



Seven Cu cavities were fabricated by a NEC 6-kW EBW machine at KEK. EBW parameters: Iris (V = 80 kV, Speed = 10 mm/sec, I1 = 15 mA, I2 = 29-31 mA) Equator outside (V = 80 kV, Speed = 10 mm/sec, I1 = 15 mA, I2 = 23-25 mA) Equator inside (V = 80 kV, Speed = 10mm/sec, I = 17-18 mA)



Two cavities were sent to JLab



Two Cu cavities: Mechanical polishing (CBP: Centrifugal Barrel Polishing) at JLab



Seven 3.0-GHz Cu cavities were fabricated at KEK and two of them were sent to Jlab for surface preparation. Plan: Nb-film creation on the inner-surface by KEK or Jlab, and performance test (vertical test) at Jlab.

## Fabrication of 3.0-GHz Cu Cavity at Company



EBW machine: Steiger EBOCAM KS 150-G150KM-CNC  
Stainless-steel flange + Cu beam-pipe: 10 – 12 mA, Equator inside: 14 – 17 mA, Equator outside: 13 mA, Iris: 26 – 29 mA.



Two 3.0-GHz Cu cavities were fabricated at a company.

## Fabrication of 3.0-GHz Nb Cavity at Company



Buffered Chemical Polishing (BCP) was done at KEK



Packing by plastic bag



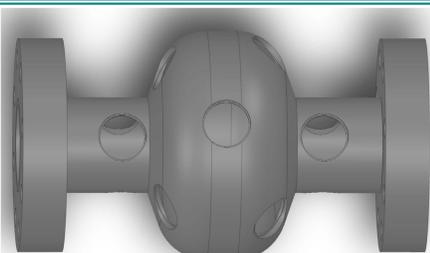
Nb parts sent to company.



Mitsubishi Electric Low-Voltage-type EBW machine: EBW parameters. Nb-Ti flange + Nb beam-pipe: 60 kV, 12 mA  
Iris: 60 kV, 48 mA, Equator outside: 60 kV, 27 mA. Equator inside: 60 kV, 30 mA.

Six 3.0-GHz Nb cavities were fabricated at company and three of them were sent to Jlab for surface preparation. Plan: EP and VT's for base-performance at Jlab and thin-film creation at Jlab and KEK.

## Coupon Cavity



Coupon-cavity is under fabrication for the coupon test of film-creation on inner surface.

## Summary

- We fabricated 3.0-GHz single-cell cavities with Cu and Nb materials for testing thin-film creations on the inner surface of the cavities in collaboration between JLab and KEK. The cavity was designed at JLab.
- According to the design of cavity, the press-forming dies and trimming fixtures for the cavity-cell were also designed and fabricated at JLab.
- These dies and trimming fixtures were transported to KEK, and the rest of fabrication processes were done at KEK and company. Finally nine Cu 3.0-GHz single-cell cavities and six Nb 3.0-GHz single-cell cavities were fabricated. Two Cu cavities were mechanically polished at Jlab. Three Nb cavities were set to Jlab for EP and VT of base-performance test (vertical test).
- All of these cavities will be utilized for the tests of various thin-film creations at JLab and KEK.