

Cooling Tube Glue Test and 3rd Batch Preparation @ASUKA co.

RIKEN/RBRC
Itaru Nakagawa

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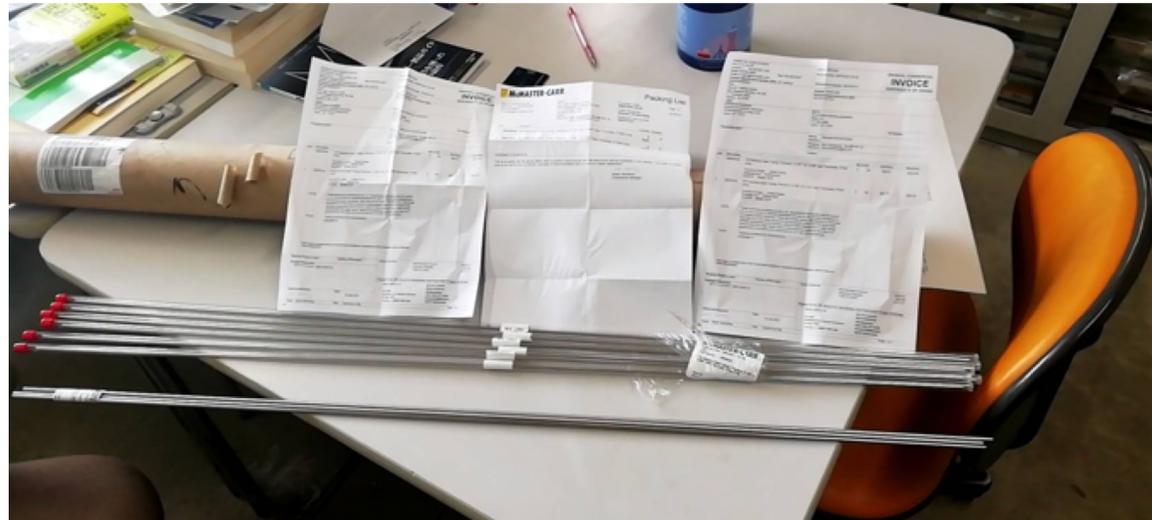
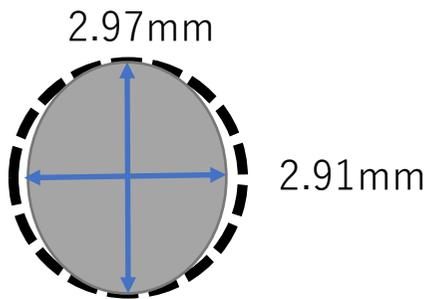
Itaru has been visiting Asuka to improve the strength of the joint for SUS and carbon tubes.

1. SUS Inner Diameter Measurement with error
2. Glue Space Dependent Leak Performance
3. Optimized carbon tube outer diameter and glue space
4. DP460 Attempts and 1Nm Torque Test
5. Establish Conductivity of Ground Pins

1. SUS Tube Inner Diameter Measurement

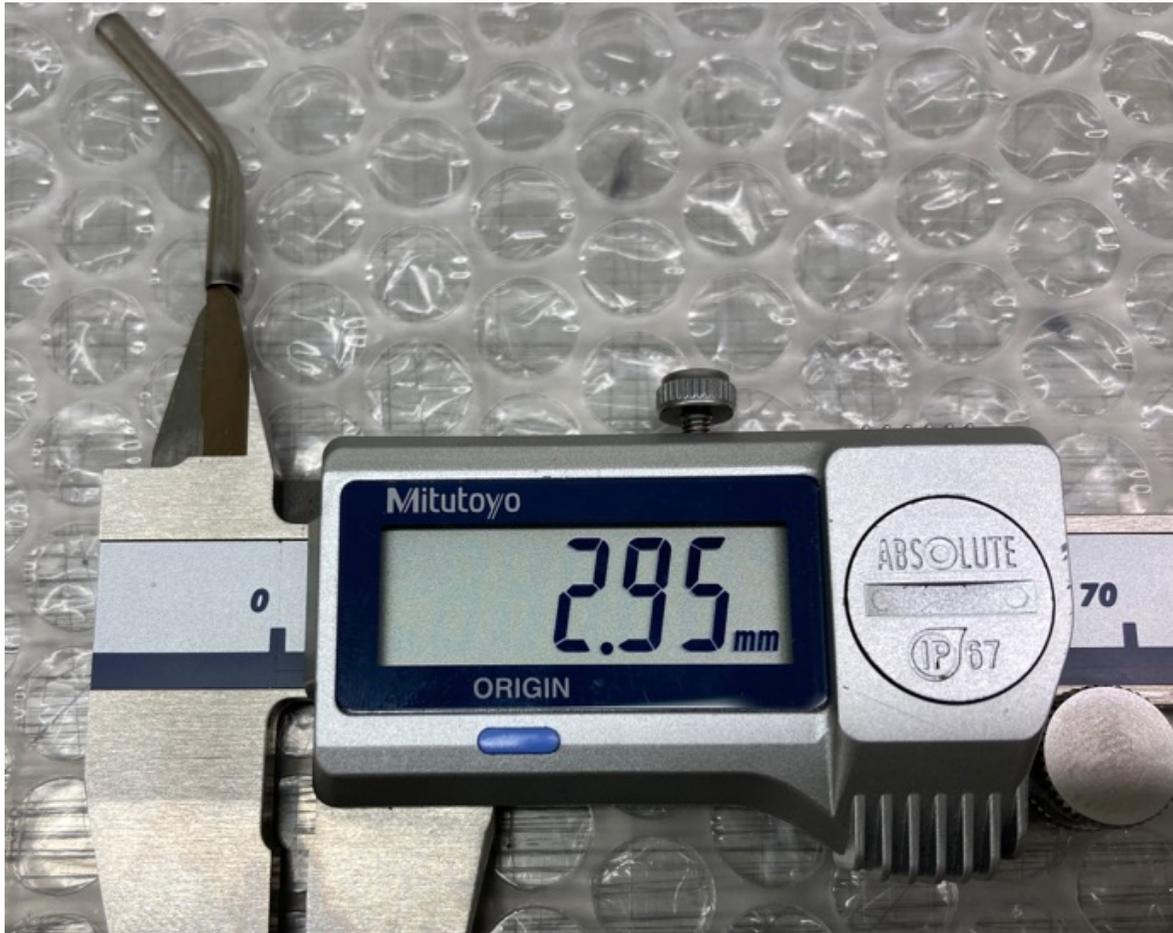
Delivered SUS Tubes

- SUS Tubes were delivered to RIKEN on April 28th.
- Requested inner diameter measurement record was not provided from McMaster co by their mistake.
- Measured inner diameter at Asuka is $\Phi 2.91 \sim \Phi 2.97$ mm elliptic shape instead of perfect round for all tubes. Turned out to be negative side and outside of the officially claimed

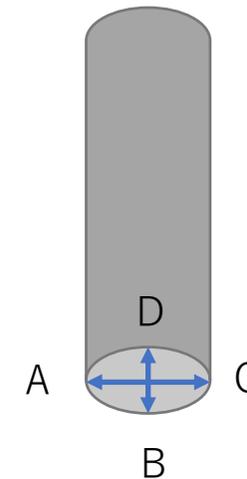


Slide from Itaru's May 13th Presentation

SUS Tube Inner Radius Measurement

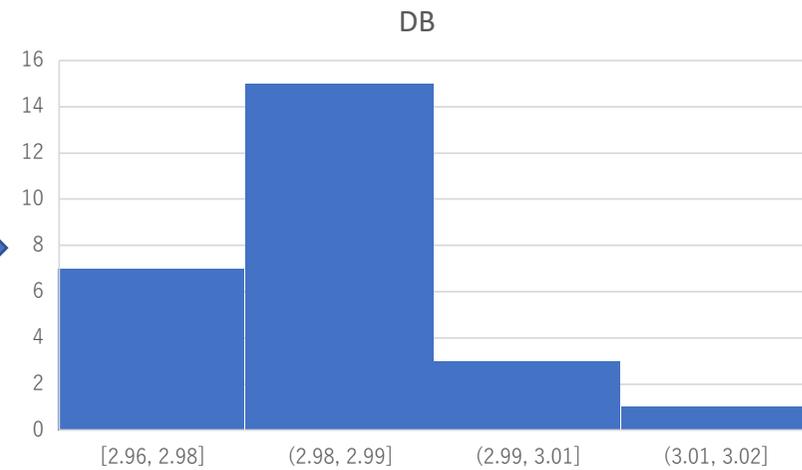
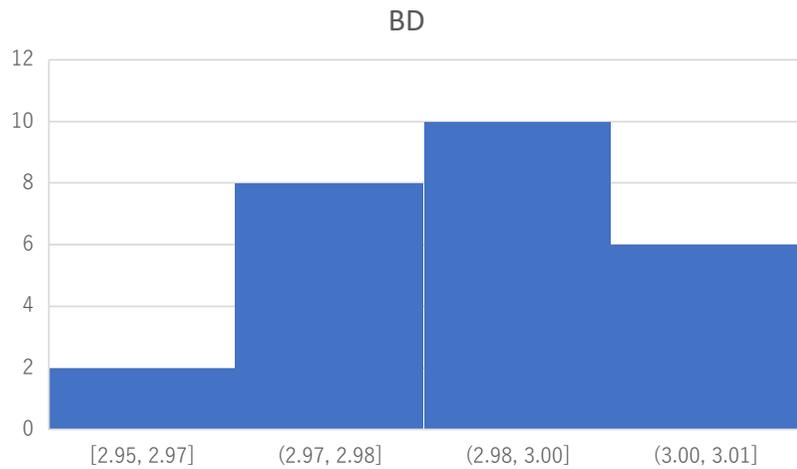
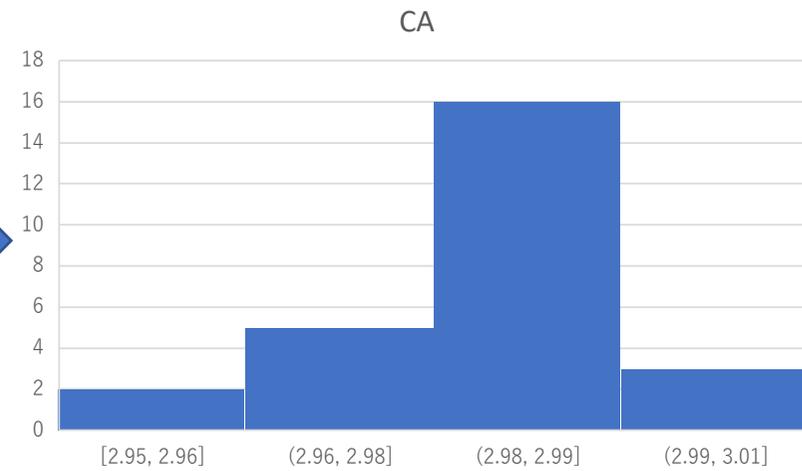
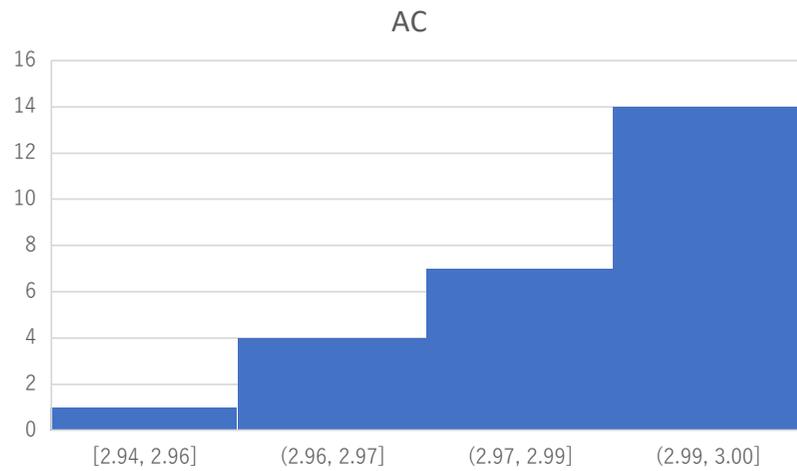


- Measured inner diameter of 10 randomly selected SUS tube samples using a digital caliper

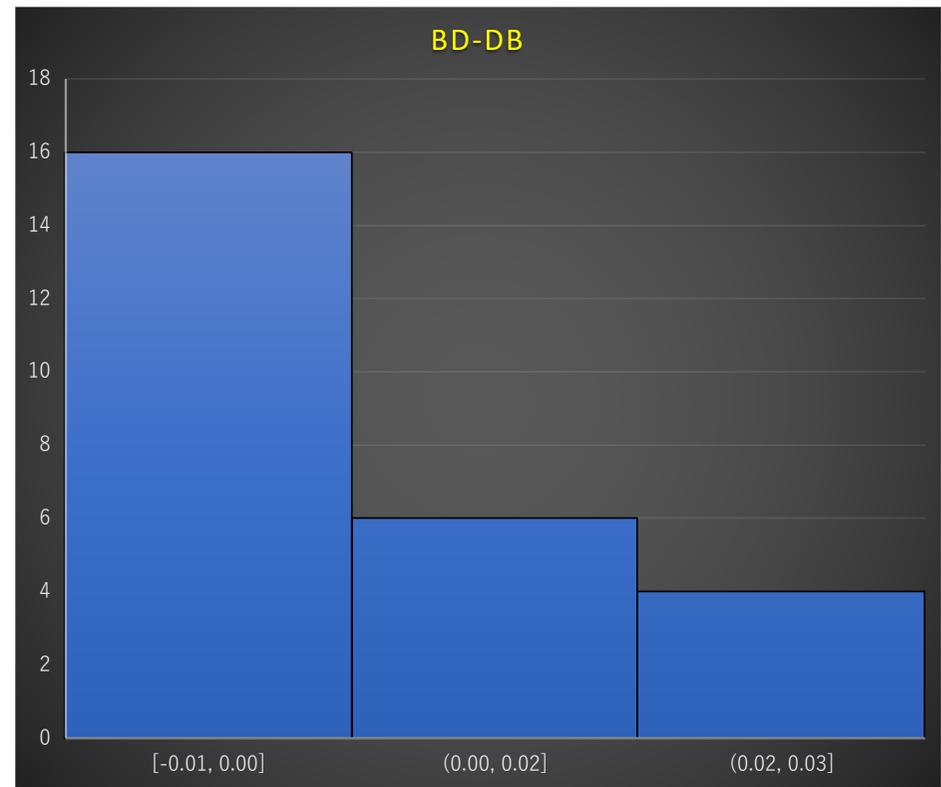
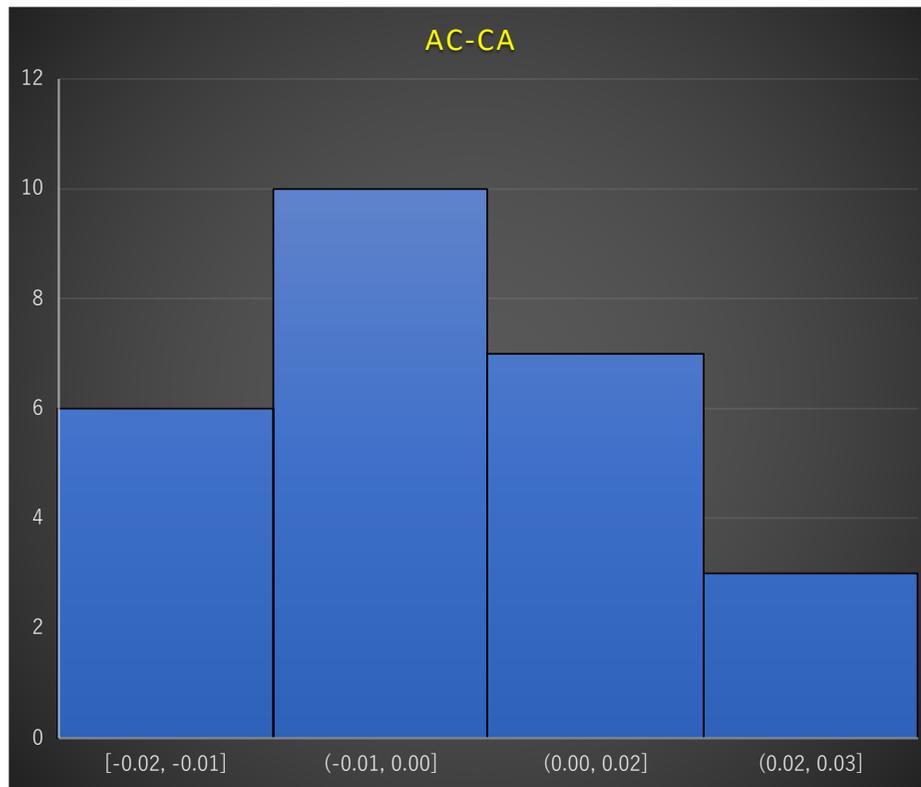


- Measurement on AC, BD, CA, DB for at least two times. Redundancy are used to evaluate standard deviation

Inner Diameter Measurement Results

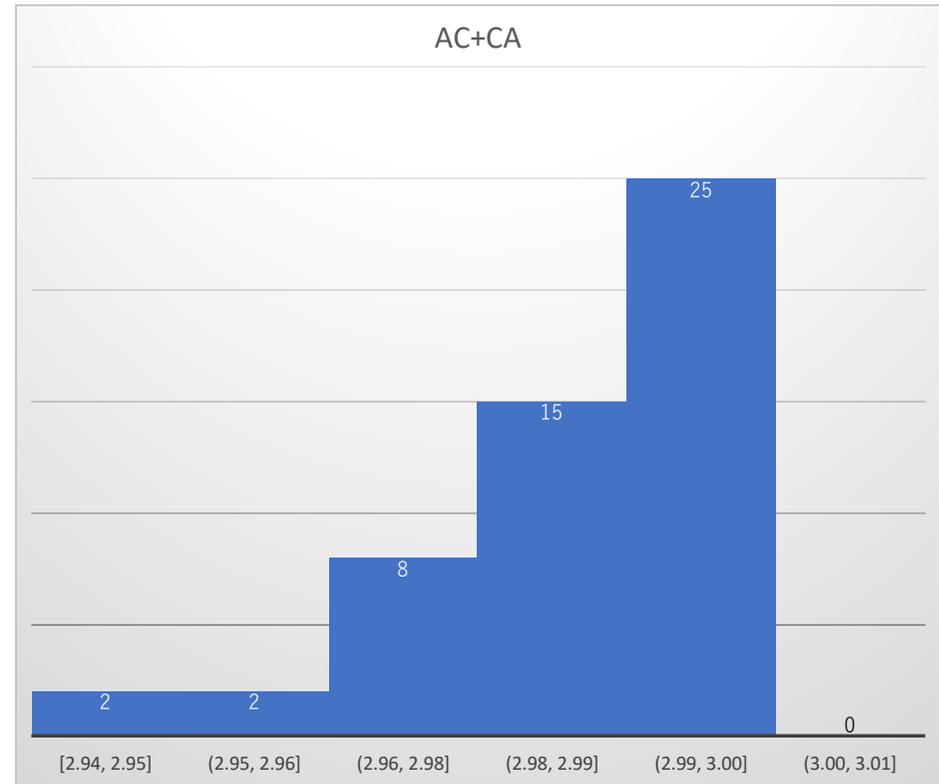
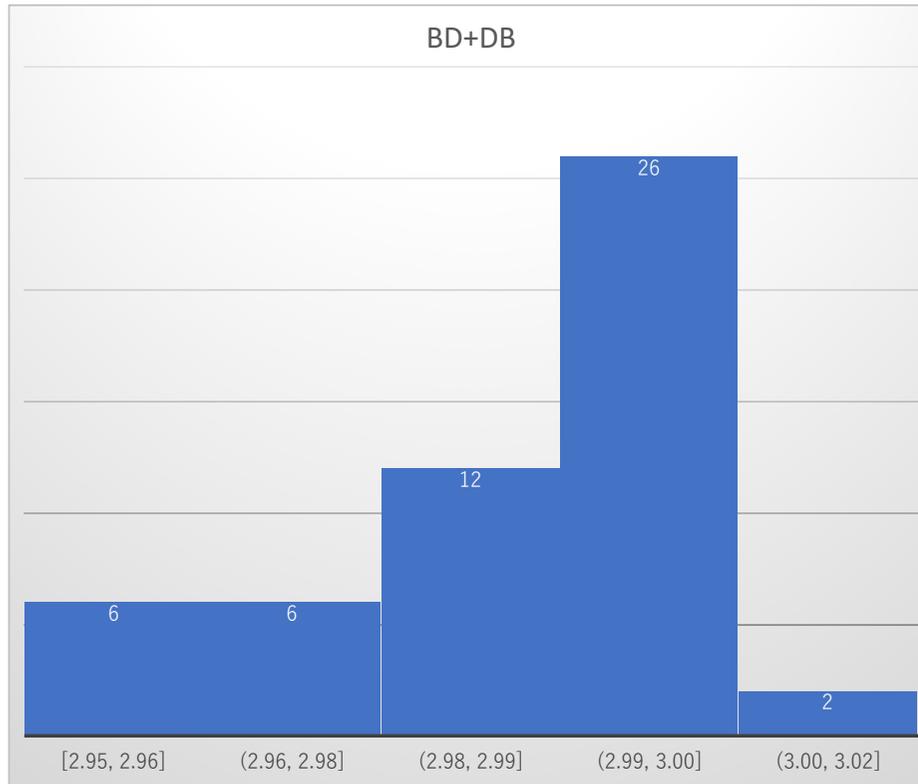


Standard Deviation



Standard deviations are both 0.01mm

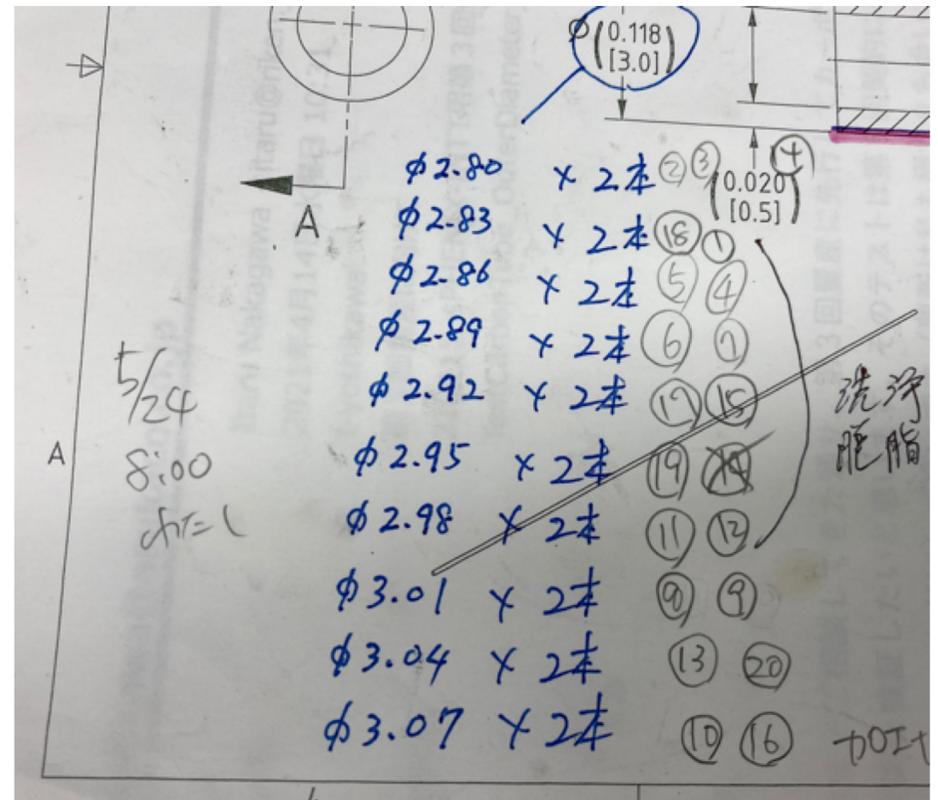
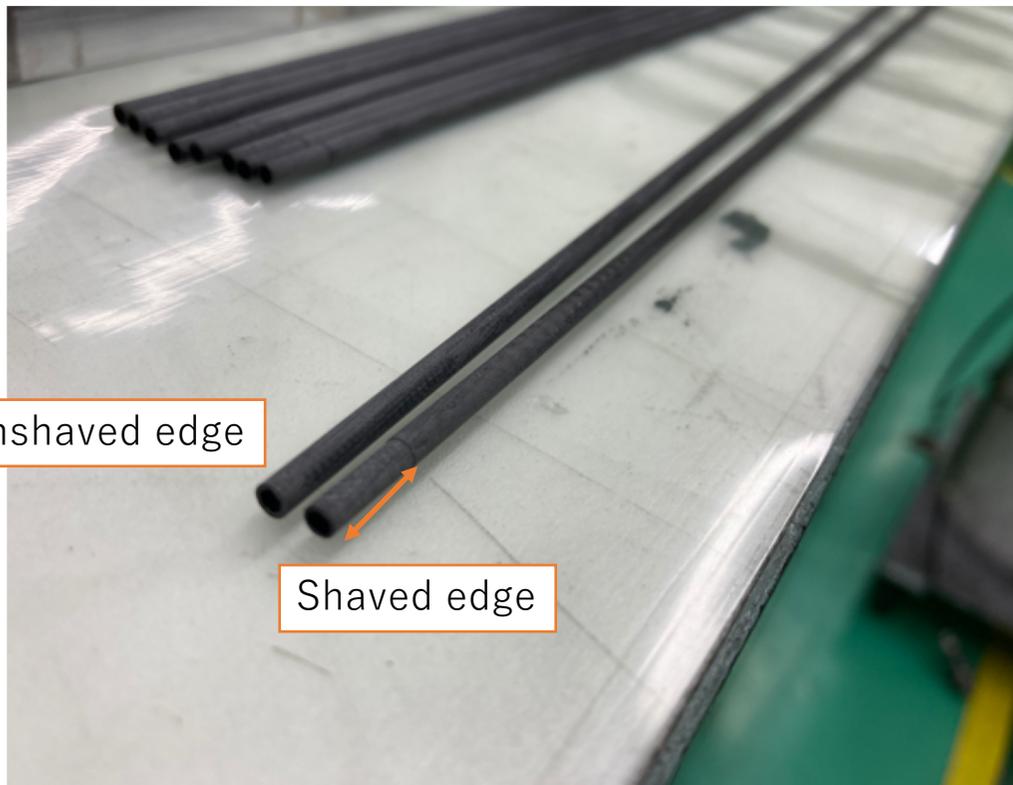
Average Inner Diameter



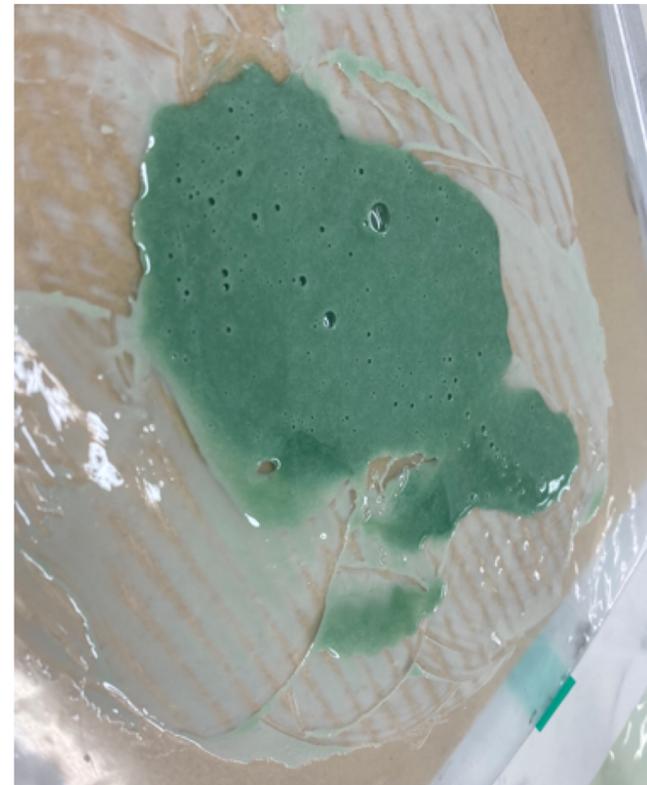
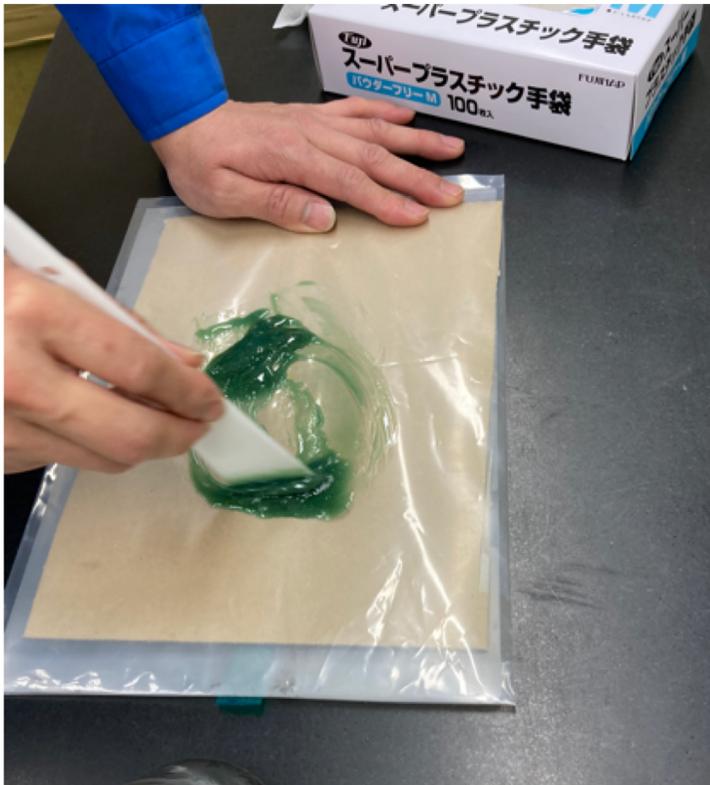
Average inner diameters are calculated to be $2.98 \pm 0.01\text{mm}$ in both directions. This is symmetric and not as asymmetric as previous measurement. To secure 0.05mm thick glue layer, the carbon tube diameter has to be smaller than $2.88 \pm 0.01\text{mm}$.

2. Glue Space Dependent Leak Performance

Shaved Edge Carbon Tubes for the Testing



LOCTITE 9396 Glue



SUS Tube Assembly



Curing Glue Process



Glue is cured for 24hours at the room temperature and then assembled tubes experienced the heat cycle for 1hour at 40 degrees before the bubble test

Bubble Test Results



OK : No bubble for 1 min. at 60psi

Serial #	OD [mm]	Bubble Test
14	2.80	OK
2	2.80	OK
3	2.80	NG
1	2.83	OK
18	2.83	OK
4	2.86	OK
5	2.86	OK
6	2.89	NG
7	2.89	OK
15	2.92	OK
17	2.92	OK
19	2.95	OK
11	2.98	OK
12	2.98	OK
8	3.01	N/A
9	3.01	N/A
13	3.04	N/A
20	3.04	N/A
10	3.07	N/A
16	3.07	N/A

- No glue space dependence observed.
- Two NG's observed, but they are related with less amount of glue pasted.
- Perhaps glue was not sufficient to be uniformly distributed.

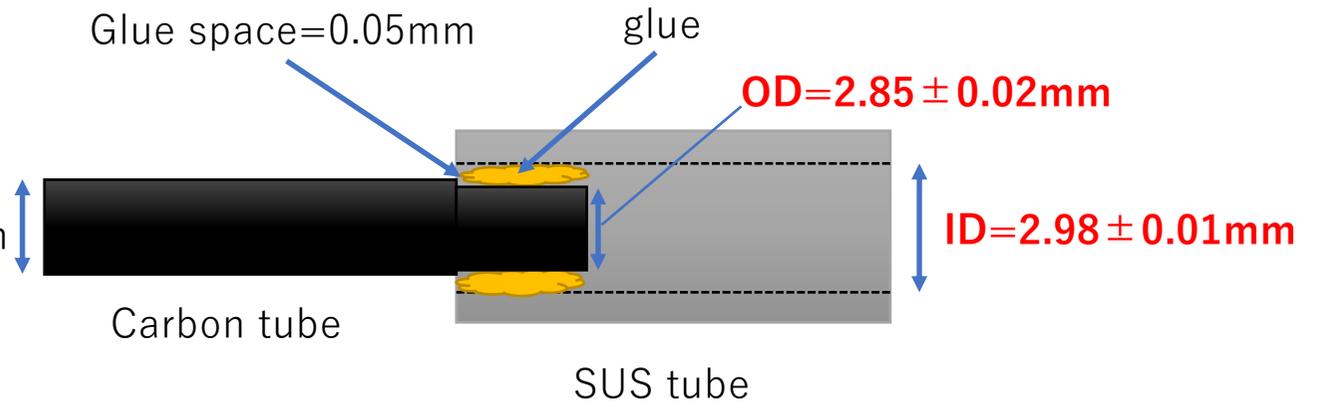
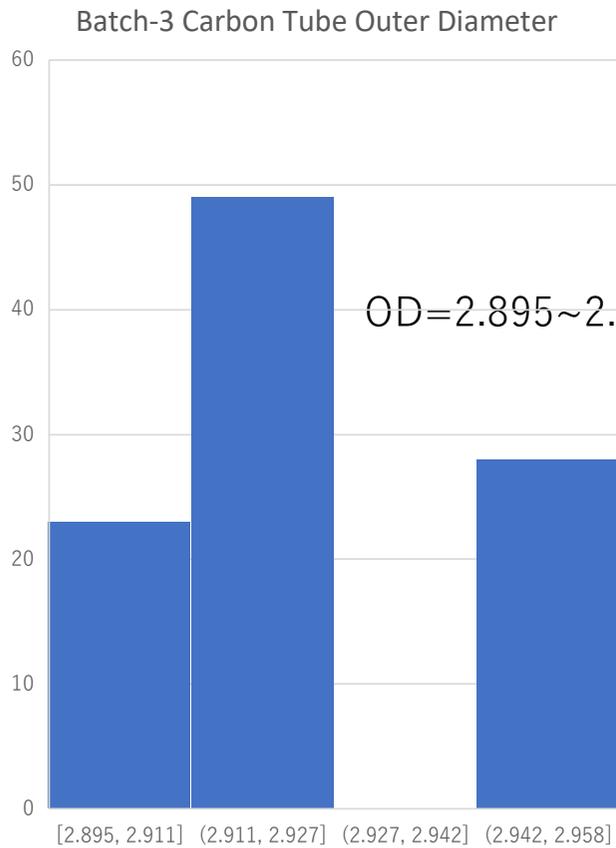
Conclusion

- Did not observe the boundary condition of the glue thickness to survive the bubble test.
- The optimization of the thickness is thus relies on the specification of the glue $> 0.05\text{mm}$.
- Thus the optimized thickness is now 2.85mm .

3. Batch-3 Carbon Tubes

Optimized 3rd Batch Cooling Tube Assembly

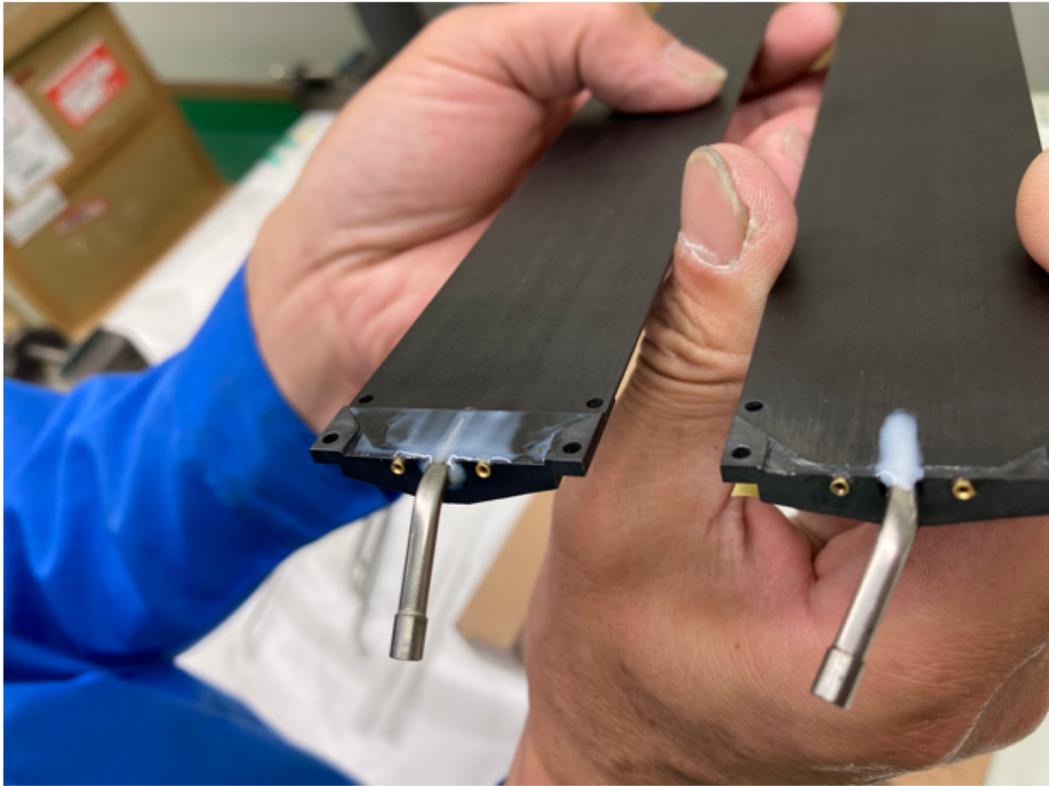
Goal is to secure the glue space of 0.05mm

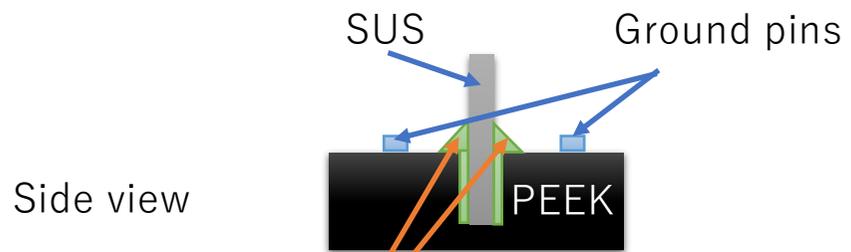


The chance the carbon and SUS tube combination leaves glue thickness of <0.05mm is less than 10%.

4. DP460 Attempts and 1Nm Torque Test

DP460 Glue

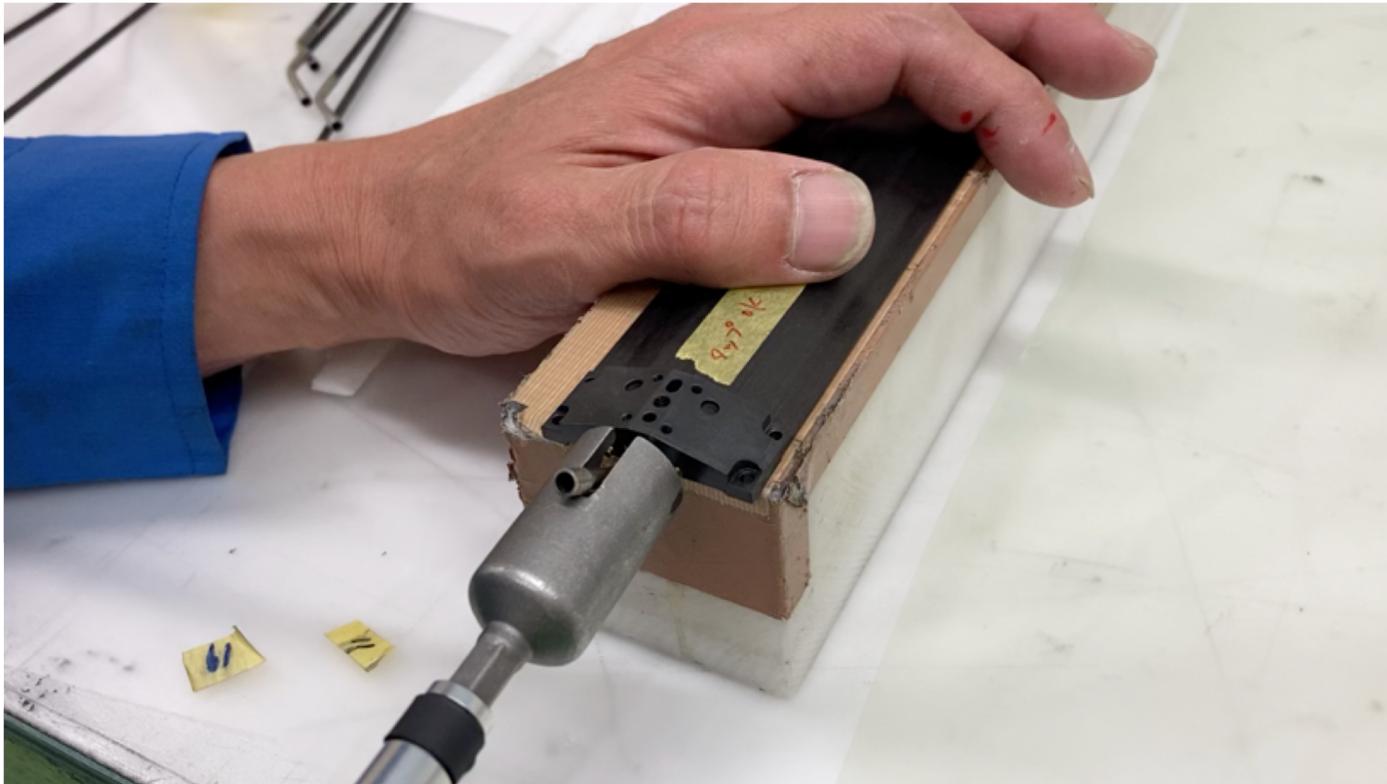




Is it OK for DP460 to exceed above the surface?



1Nm Twist Test



None of the attempts here survived the twist test.

Establish Conductivity of Ground Pins

Ground Pin Assembly (Batch-1, 2)



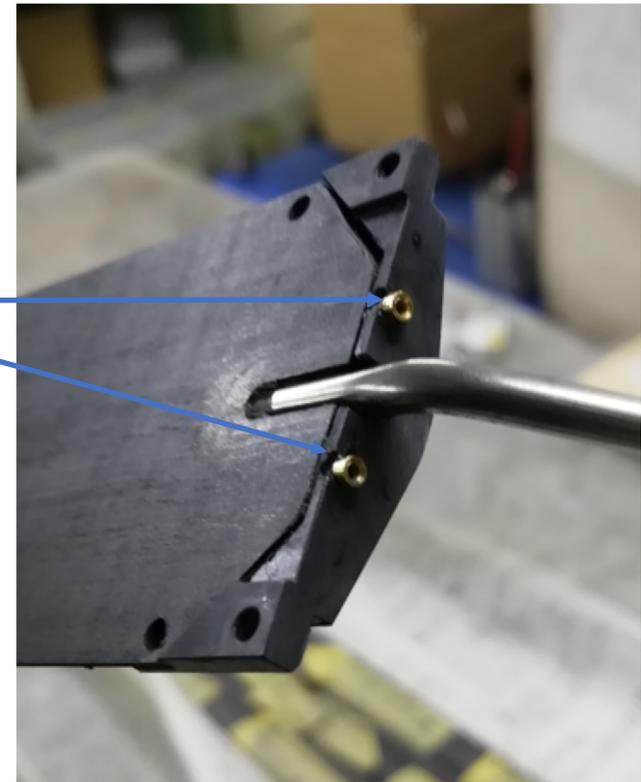
Making holes in Rohacell (non-conductive) to insert ground pins with a tooth pick

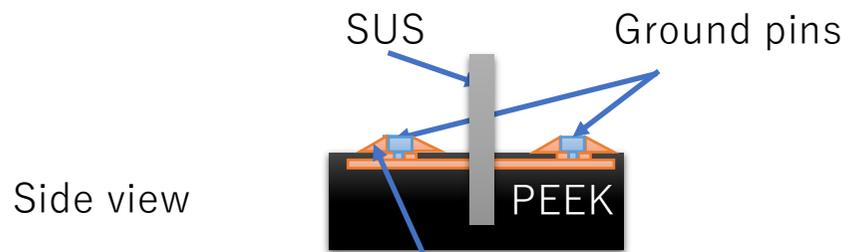


Holes in Rohacell (non-conductive) to insert ground pins



Pins are mostly accommodated within rohacell which is not conductive. Perhaps we need to apply more EP75-1 conductive glue in these area to achieve good conductivity. This is the only region the pin expose to the conductive part of stave body.





Is it OK for EP75 to exceed above the surface?

