

Progress Report

RIKEN/RBRC

Itaru Nakagawa

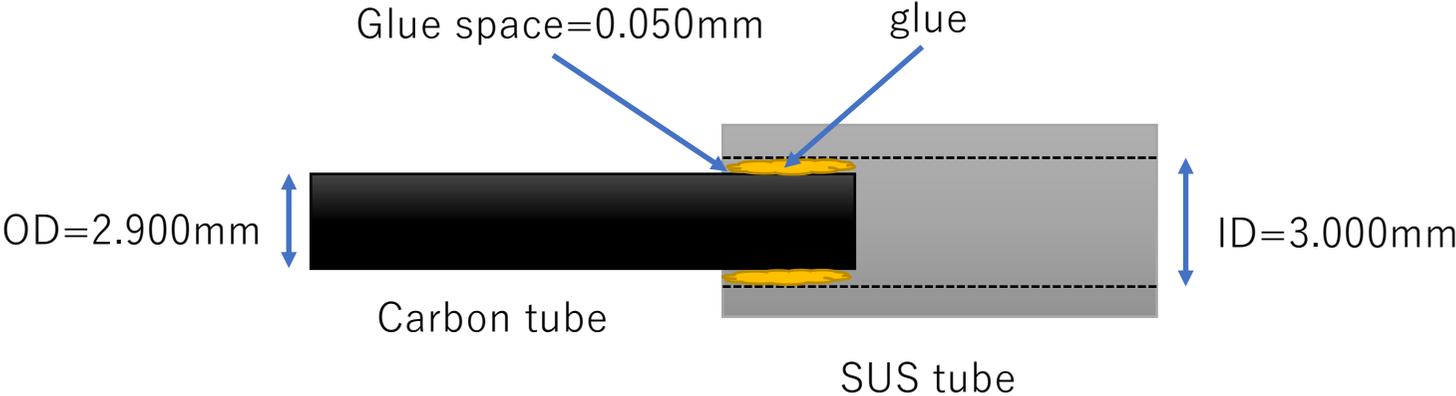
Shipping Status and Misc

- Interception boards with the alignment jig to BNL were picked up on May 12th. To be delivered within a week.
- 2nd Source test fixture will be delivered soon. To be forwarded to NWU.
- We'll start measuring signals from silicon sensors of BNL preproduction ladders. However, the access to NWU test bench is somewhat constrained (not wide open). Major cities (Tokyo, Osaka, ...) have been in state of emergency since the end of April and continues until end of May (can be extended).

Stave Status

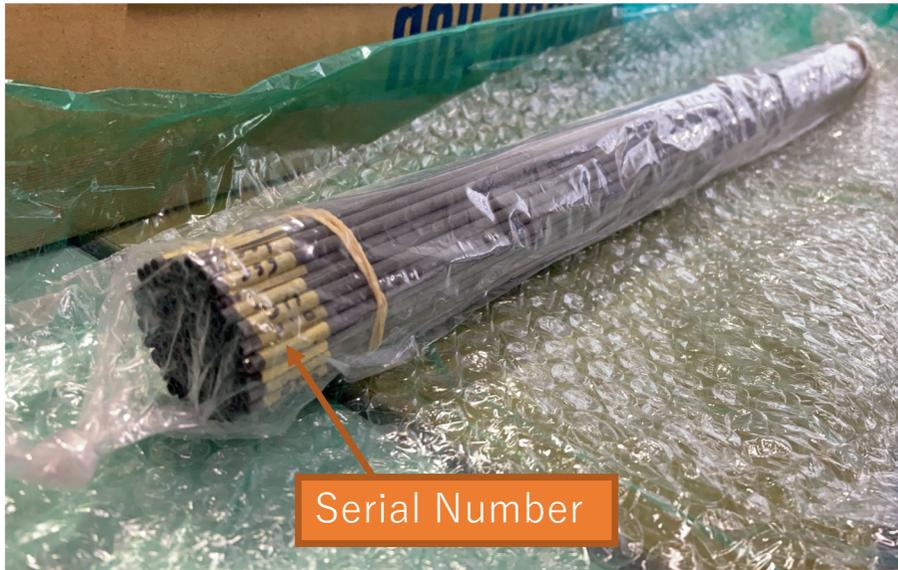
Cooling Tube Test and 3rd batch preparation

Ideal Cooling Tube Assembly



Batch-3 Carbon Tube Outer Diameters

100 tubes delivered on April 11th from Kimuraya Co.

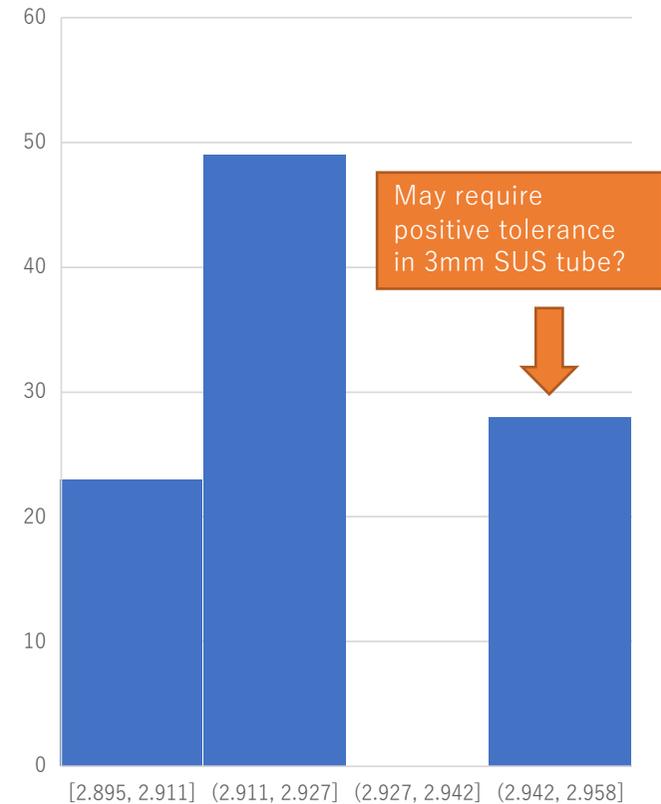


Serial Number

The specification of the carbon tubes:
OD: 2.9 +/- 0.1mm

1	Serial No.	Position-1 [mm]	Position-2 [mm]	Difference
2	300	2.955	2.956	-0.001
3	301	2.953	2.953	0.000
4	302	2.952	2.954	-0.002
5	303	2.953	2.953	0.000
6	304	2.953	2.953	0.000
7	305	2.947	2.945	0.002
8	306	2.954	2.956	-0.002
9	307	2.958	2.954	0.004
10	308	2.954	2.955	-0.001
11	309	2.943	2.945	-0.002
12	310	2.955	2.954	0.001
13	311	2.947	2.949	-0.002
14	312	2.952	2.950	0.002
15	313	2.954	2.955	-0.001
16	314	2.951	2.949	0.002
17	315	2.952	2.953	-0.001
18	316	2.955	2.954	0.001
19	317	2.950	2.939	0.011
20	318	2.950	2.950	0.000
21	319	2.952	2.951	0.001
22	320	2.948	2.945	0.003
23	321	2.954	2.955	-0.001
24	322	2.950	2.951	-0.001
25	323	2.957	2.958	-0.001
26	324	2.951	2.950	0.001
27	325	2.951	2.950	0.001
28	326	2.950	2.949	0.001
29	327	2.951	2.949	0.002
30	328	2.920	2.919	0.001
31	329	2.913	2.911	0.002
32	330	2.917	2.916	0.001
33	331	2.920	2.916	0.004
34	332	2.912	2.915	-0.003

Batch-3 Carbon Tube Outer Diameter



McMaster-CARR Stainless Tube

McMASTER-CARR

89935K39

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Precision Stainless Steel Tubing

Straights

316 Stainless Steel—For Use With Air, Hydraulic Fluid, Natural Gas, Oil, Water

OD	OD Tolerance	Wall Thick.	ID	Gauge	Max. Pressure	Temper Rating	1 ft.	3 ft.	
0.219"	-0.002" to 0.004"	0.020"	0.162"	—	3,500 psi @ 72° F	Hard	1800T533	17.33	30.00
0.219"	-0.002" to 0.004"	0.035"	0.148"	—	3,500 psi @ 72° F	Hard	1800T536	17.67	36.98
0.25"	-0.002" to 0.004"	0.005"	0.24"	—	3,500 psi @ 72° F	Hard	1800T537	19.67	41.15
0.25"	-0.002" to 0.004"	0.01"	0.23"	—	3,500 psi @ 72° F	Hard	1800T538	17.53	36.68
0.25"	-0.002" to 0.004"	0.015"	0.22"	—	3,500 psi @ 72° F	Hard	1800T539	17.82	37.29
0.25"	-0.002" to 0.004"	0.02"	0.21"	—	3,500 psi @ 72° F	Hard	1800T541	18.39	38.47
0.25"	-0.002" to 0.004"	0.028"	0.194"	—	3,500 psi @ 72° F	Hard	1800T542	18.68	39.09
0.25"	-0.002" to 0.004"	0.035"	0.18"	—	3,500 psi @ 72° F	Hard	1800T543	19.40	40.58
0.281"	-0.002" to 0.004"	0.005"	0.271"	—	2,000 psi @ 72° F	Hard	1800T544	21.24	44.44
0.281"	-0.002" to 0.004"	0.01"	0.261"	—	2,000 psi @ 72° F	Hard	1800T545	18.83	39.40
0.281"	-0.002" to 0.004"	0.015"	0.251"	—	2,000 psi @ 72° F	Hard	1800T546	19.10	39.97
0.281"	-0.002" to 0.004"	0.02"	0.241"	—	2,500 psi @ 72° F	Hard	1800T547	19.54	40.88
0.281"	-0.002" to 0.004"	0.028"	0.225"	—	2,500 psi @ 72° F	Hard	1800T548	20.68	43.26
0.281"	-0.002" to 0.004"	0.035"	0.211"	—	3,000 psi @ 72° F	Hard	1800T549	21.39	—
0.313"	-0.002" to 0.004"	0.01"	0.292"	—	2,500 psi @ 72° F	Hard	1800T551	21.53	—
0.313"	-0.002" to 0.004"	0.015"	0.282"	—	3,000 psi @ 72° F	Hard	1800T552	19.54	—
0.313"	-0.002" to 0.004"	0.02"	0.272"	—	3,500 psi @ 72° F	Hard	1800T553	19.81	—
0.313"	-0.002" to 0.004"	0.028"	0.256"	—	3,500 psi @ 72° F	Hard	1800T554	20.11	—
0.313"	-0.002" to 0.004"	0.035"	0.242"	—	3,500 psi @ 72° F	Hard	1800T555	21.09	44.13
0.375"	-0.002" to 0.004"	0.01"	0.355"	—	2,000 psi @ 72° F	Hard	1800T556	22.67	47.42
0.375"	-0.002" to 0.004"	0.015"	0.345"	—	2,000 psi @ 72° F	Hard	1800T557	21.39	44.74
0.375"	-0.002" to 0.004"	0.02"	0.335"	—	2,000 psi @ 72° F	Hard	1800T558	21.68	45.36
0.375"	-0.002" to 0.004"	0.028"	0.319"	—	2,500 psi @ 72° F	Hard	1800T559	22.82	47.74
0.375"	-0.002" to 0.004"	0.035"	0.305"	—	3,000 psi @ 72° F	Hard	1800T561	23.52	49.22
316 Stainless Steel—For Use With Air, Natural Gas, Oil, Water									
0.134"	-0.001" to 0.001"	0.008"	0.118"	10	2,000 psi @ 72° F	Hard	89935K39	15.39	40.51

316 Stainless Steel Tubing, Precision, 0.134" OD, 0.008" Wall Thickness

Length, ft. 3

6 each added to your order April 1.

Product Detail Select a CAD file type Download

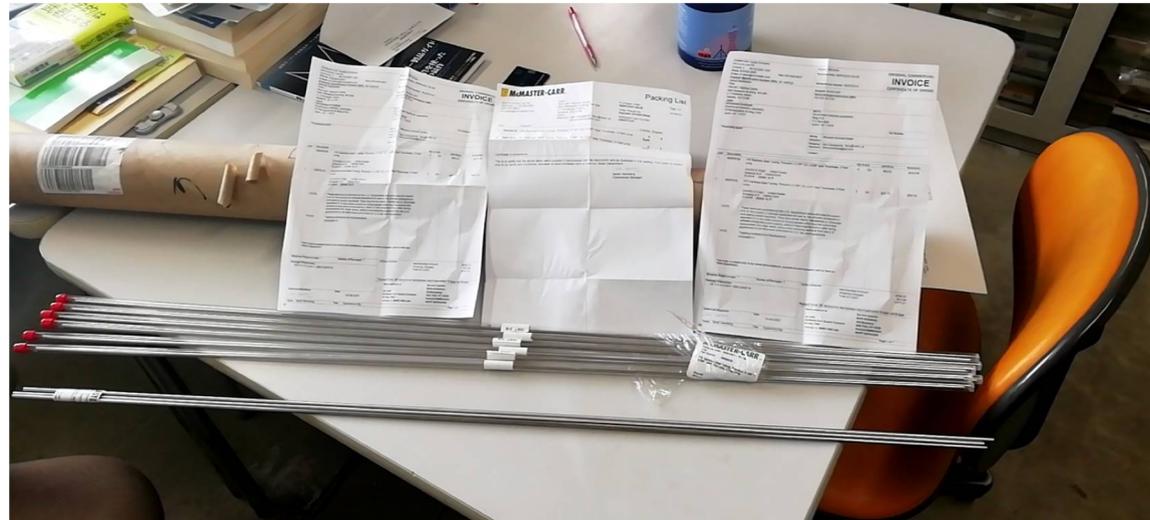
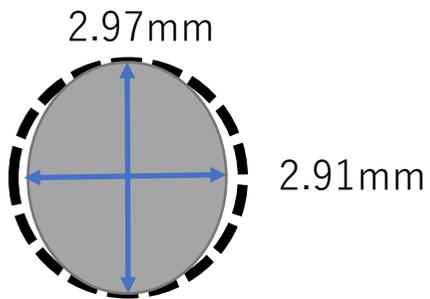
0.134" -0.001" to 0.001" 0.01" 0.114" 10 3,000 psi @ 72° F Hard 89935K41 13.29 34.97

316 Stainless Steel Tubing
Precision, 0.134" OD,
0.008" (0.2mm) Wall Thickness,
3 Feet Long Each

Inner Diameter 3.0mm tolerance is +/-0.002" (0.05mm)

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



What to do?

- McMaster co. admits $\Phi 2.91\text{mm}$ is outside of their officially claimed tolerance ($3.00 \pm 0.05\text{mm}$) and they offers to re-send new tubes which satisfies the tolerance.
- Cutting and bending SUS tubes is the schedule driver for the cooling tube assembly, and it will cause additional delay by 3 – 4 weeks.
- I decided to let Asuka to move on to cutting/bending SUS tubes and go for the tube assembly test.
- In parallel, I will let McMaster to resend SUS tubes again and keep the new tubes for 3rd batch mass production.

Why these trouble happens repeatedly?

- It is caused by the tight tolerance we require.
- If the tolerance is loose, then I don't have to push these company to their limit.

List of Batch-3 Stave Tests

- Assembled tubes are then go through:
 1. Twist test = Twist both ends by 45 degrees with 1Nm force using torque screw
 2. Heat cycle $+40^{\circ}\text{C} \sim 0 \pm 5^{\circ}\text{C}$
 3. 200ml/min. flow test $< 1.125 \pm 0.056$ psi
 4. 60 psi burst test
 5. Leak test $< 120\text{ml-mbar}/10\text{h}$
- After stave assembly
 1. Heat cycle $+40^{\circ}\text{C} \sim 0 \pm 5^{\circ}\text{C}$
 2. Twist test = Twist both ends with 1Nm force using torque screw. Staves didn't rotate are taken as good stave.
 3. Leak test $< 120\text{ml-mbar}/10\text{h}$
 4. Alignment measurements (do we require back plane flatness?)

