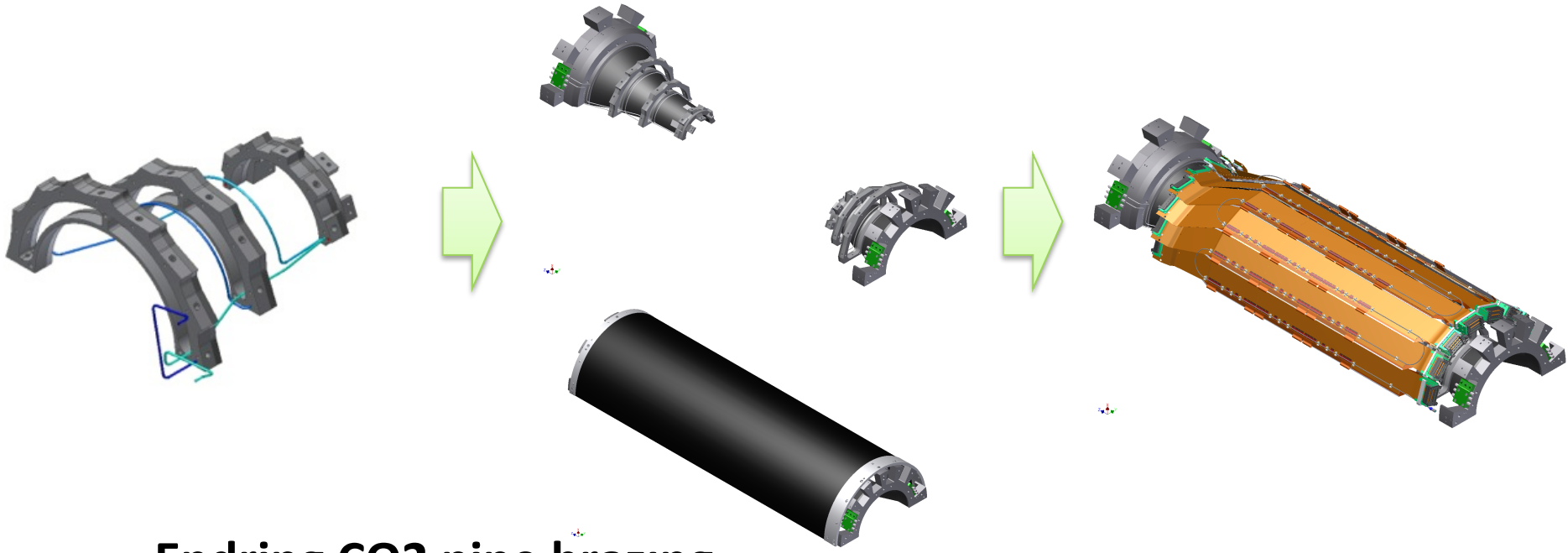
SVD assembly and plan

Katsuro Nakamura

Sep. 7, 2015

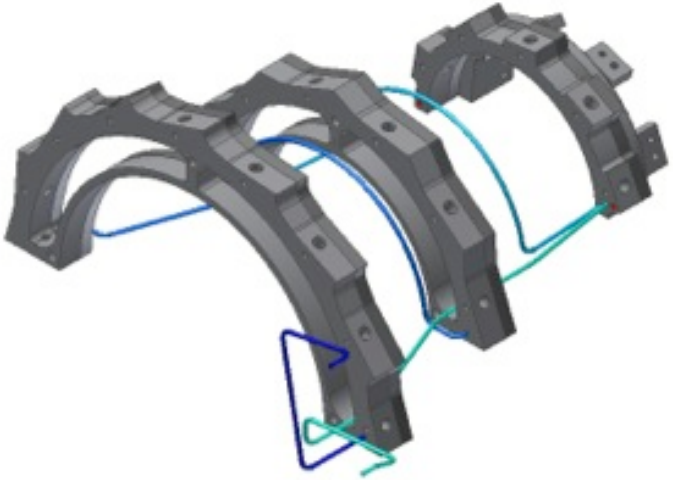
VXD mechanics meeting

Flow of SVD assembly



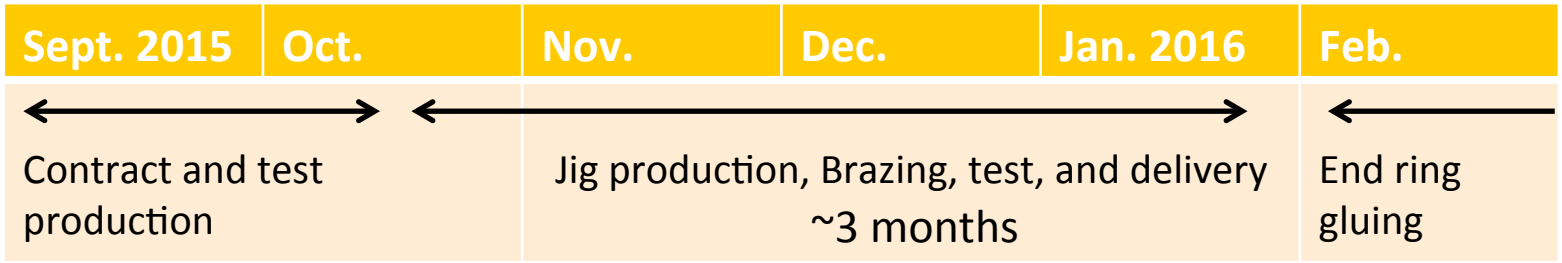
- Endring CO2 pipe brazing
- Endring/endflange gluing
- Outer cover gluing
- Ladder mount

SVD endring CO2 pipe brazing



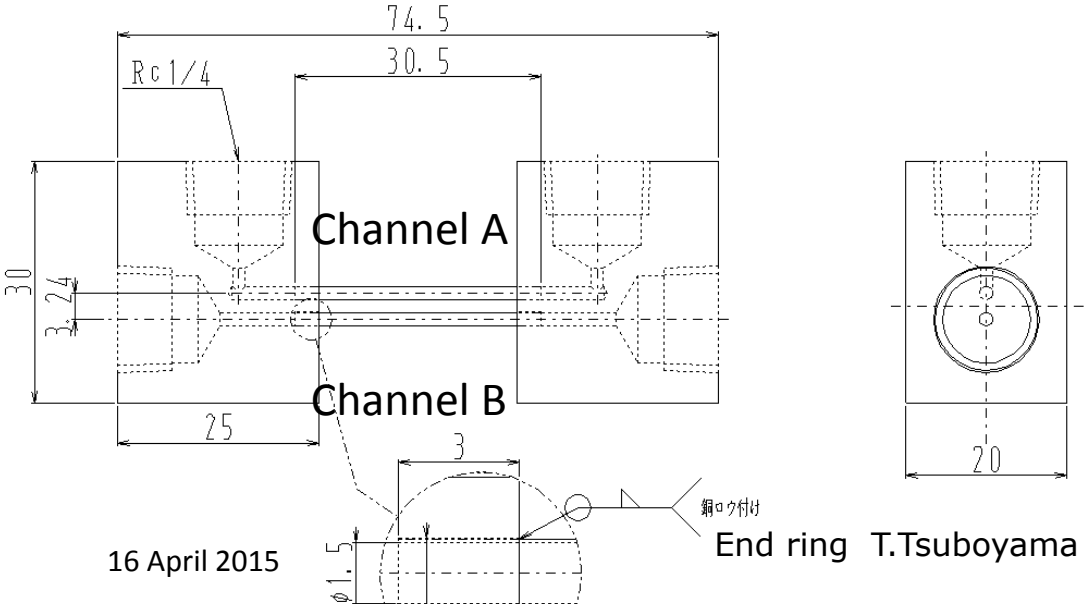
Background

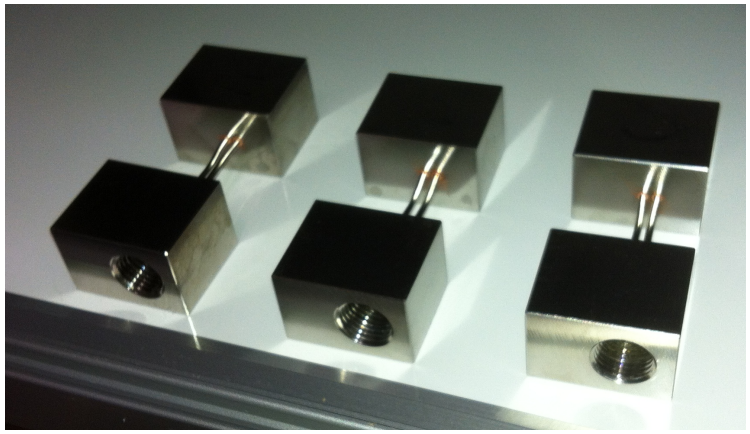
- We would like to glue the end ring to the CFRP cones before the B2GM in February 2016 and start the preparation of the ladder mount. The brazing of CO2 tubes to the end rings should be finished earlier.
- I like to assign 3 months for the brazing and examination after the production
- We need to finish contract at beginning of October.
- We started discussion with Welcon.



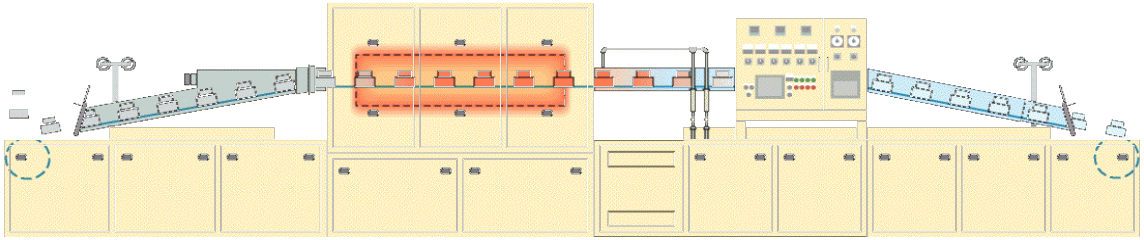
Test brazing in March 2015

- **They made test pieces by using an hydrogen brazing oven.**
  - A copper based brazing solder (JIS Z3262).
  - Process temperature: ~1100 °C.
- **3 samples were produced**
  - Two channels are made with 3 mm separation.
  - The ⌀1.7 mm tube from DESY is used.
  - passed the flow test, leak test and pressure test successfully.





18 meter

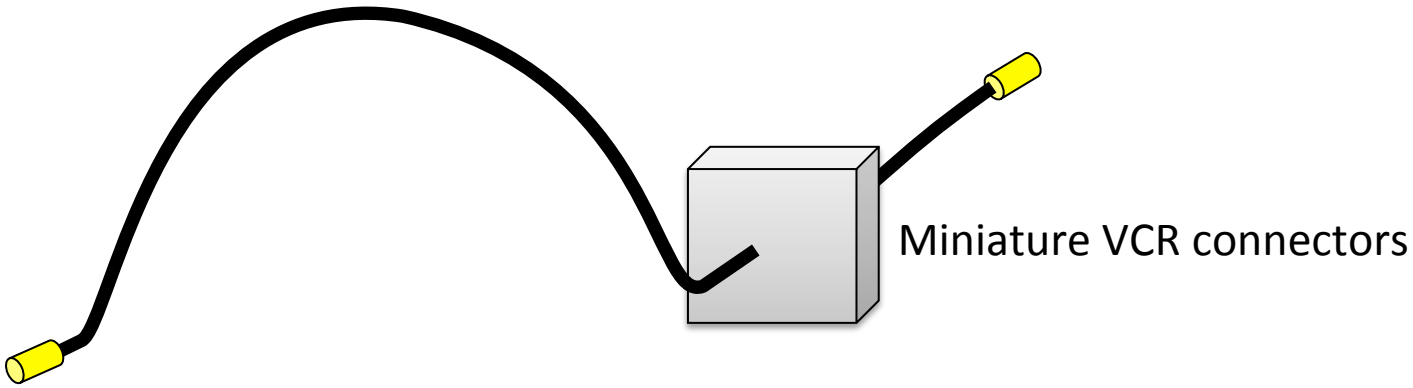


- **The continuous hydrogen brazing oven used by Welcon.**

http://www.tokyobraze.co.jp/device/
http://www.tokyobraze.co.jp/wp-content/uploads/2013/06/2009_St.pdf

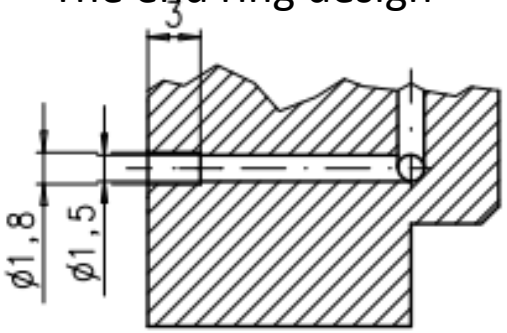
Remaining issues

- **In the spring test, they used short tubes. We are interested in how stably the tubes are set to the end ring before brazing.**
  - If tube are loose, brazing solder can overflow.
- **Brazing of the miniature VCR connector to the tube.**
  - Put a nut of VCR connector on the pipe in advance?



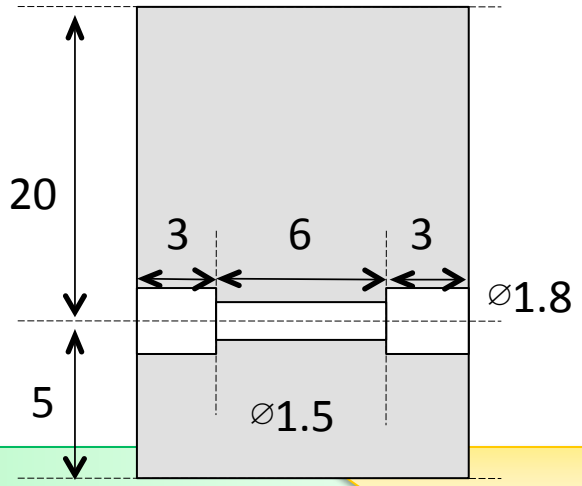
Brazing test pieces

The end ring design

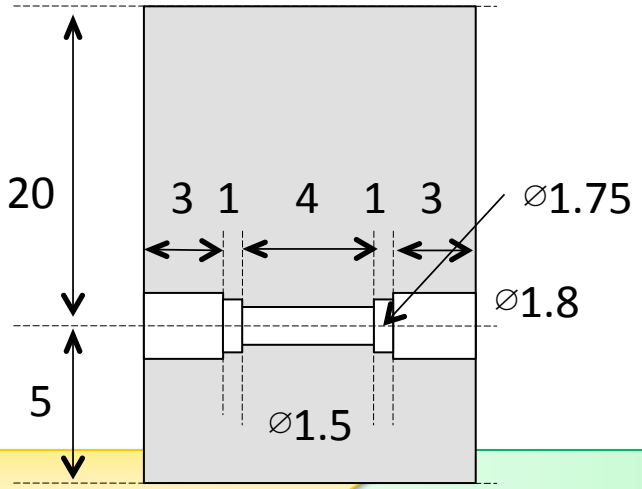


- Additional step in the brazing hole structure: which might prevent overflow of the solder to tubes, inspired by the discussion with Carsten in June and Kohriki san in August.
- Final endrings has Φ1.65 holes for the pipe insertion. We can enlarge them as we want.

The test piece used in test 2015 spring

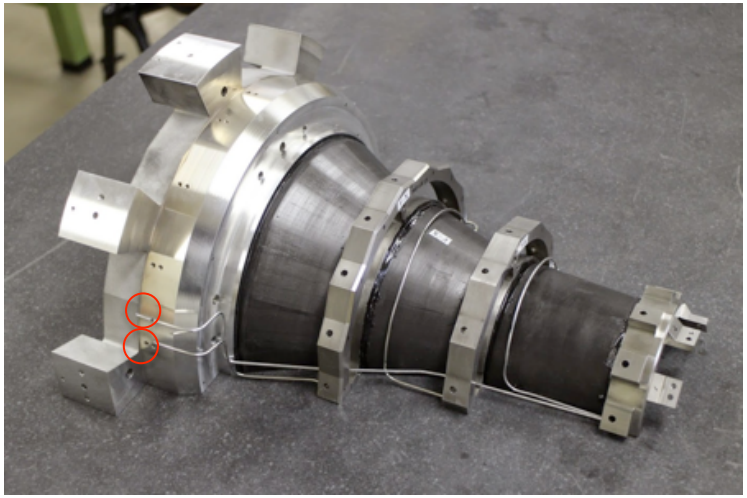


Proposed hole shape: The added step might prevents solder overflow

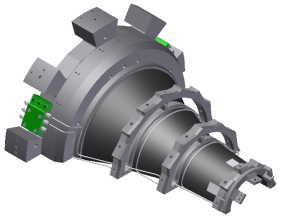


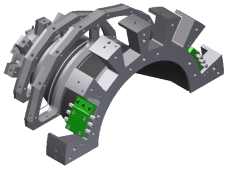
Readiness of VCR connector

- **8 half VCR connectors are necessary for the final Endring brazing.**
  - 2 half VCR connectors/ FWD or BWD half structure
- **Which male or female nuts should we put on Endrings?**
- **When are these VCR connectors available?**

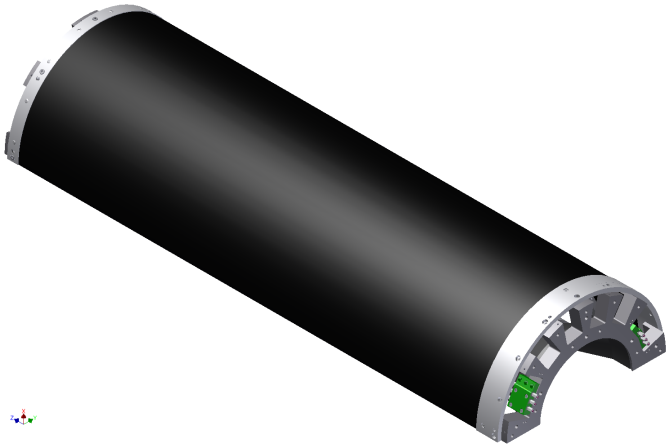


SVD support structure assembly





Endring + Endflange

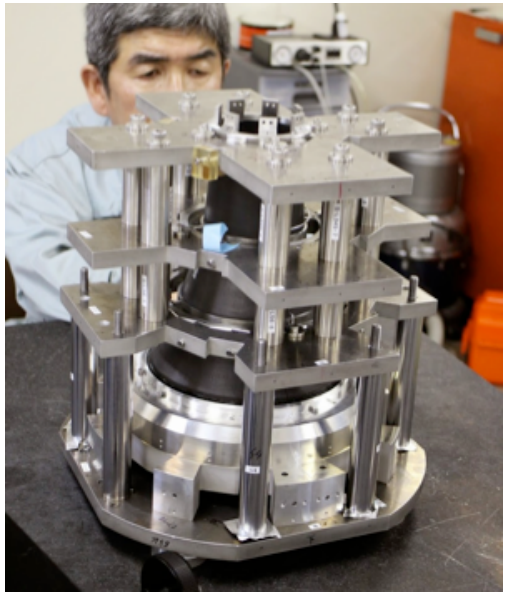


Outer cover

Status

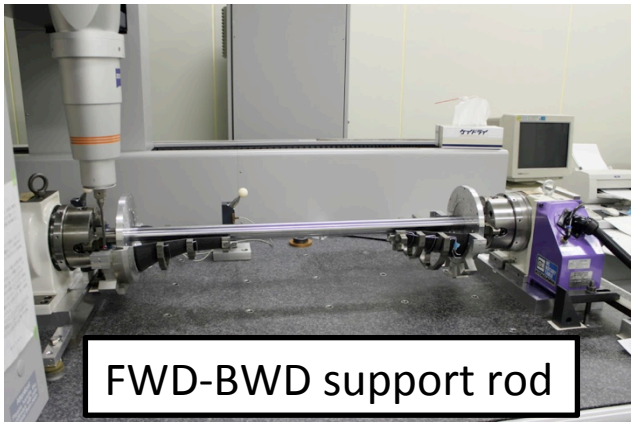
Endring gluing:

- **1st trial of Endring gluing has been done for both FWD/BWD**
  - with 1st half of FWD/BWD mockup Endring
  - STYCAST 2850FT + Catalyst23LV
- **Several issues were found from the 1st trial. Remedies for them were applied on jigs. They are now in production.**
  - Better jig flatness
  - Controlled alignment with linear bushings
- **2nd trial of Endring gluing will be done after the production of the modified jigs finishes.**
  - FWD: the middle of Oct. or the begin of Nov.
  - BWD: the middle of Dec.

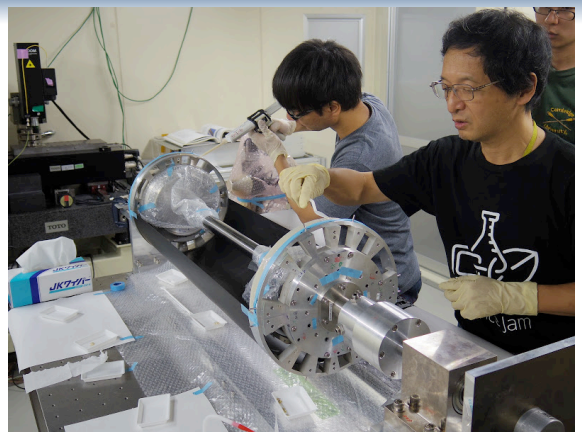


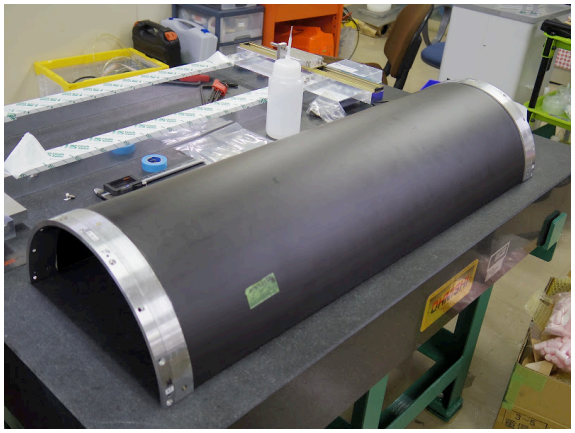
Outer cover gluing:

- **1st trial of outer cover gluing has been done.**
  - Araldite2015
- **2nd trial of outer cover gluing will be done after reproduction of the FWD-BWD support rod.**
  - The end of Nov.

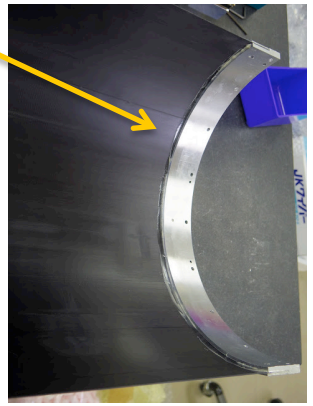


Outer cover gluing





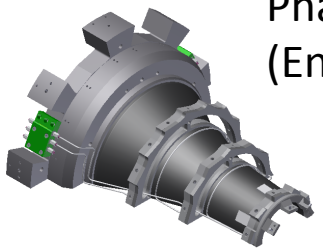
lack of adhesive



- **We had an exercise of outer cover gluing.**
  - Araldite2015
  - we found control of glue mount is an issue for the gluing.

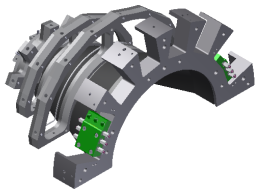
Required components

- **Phase-3**
  - Endring
  - Endflange
  - CFRP outer cover

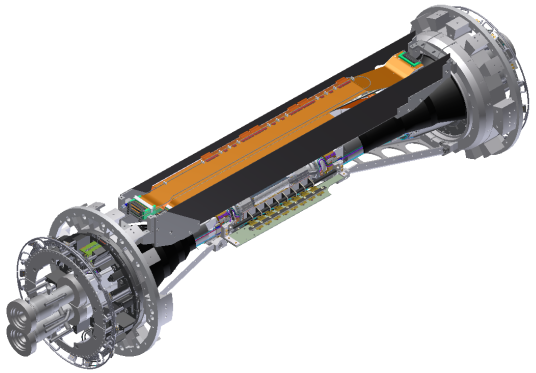


Phase-3 SVD support structure
(Endring + Endflange)

- **Phase-2/DESY beam test**
  - SVD cartridge
    - no Endring and no CFRP cone
  - Endflange (phase-2 design)
  - CFRP outer cover (phase-2 design)



- **Schedule of DESY beam test**
  - March or April, 2016
- **By the beam test, SVD cartridge preparation, and phase-2 outer cover assembly have to be finished.**



Schedule of SVD structure assembly (2015)

- **Sep. 2015**
  - CMM measurement for the assembled 1st half FWD-BWD mockup Endring
    - The gluing was done at
  - SVD cartridge: finalize design and start production
  - Wire-cut for FWD-Endring-gluing jig
- **Oct. 2015**
  - Practice of Endring gluing (2nd half FWD mockup Endring)
  - Phase-3 Endring: CMM measurement
  - (Start preparation of BWD Endring gluing jigs)
  - 22nd B2GM
- **Nov. 2015**
  - Reproduction of FWD-BWD support rod
  - **Phase-2/beam test outer cover gluing**
    - or with another practice
    - finalize the method
  - Wire-cut for BWD-Endring-gluing jig
- **Dec. 2015**
  - Practice of Endring gluing (2nd half BWD mockup Endring)
    - finalize the assembly method

Schedule of SVD structure assembly (2016)

- **Jan. 2016**
  - CMM measurement for the assembled FWD-BWD mockup Endring
- **Feb. 2016**
  - 23rd B2GM
  - **FWD/BWD phase-3 Endring gluing**
- **Mar. 2016**
  - CMM measurement for the assembled FWD-BWD phase-3 Endring
  - Delivery of phase-2 SVD structure to DESY
  - DESY beam test?
- **Apr. 2016**
  - DESY beam test?
- **May. 2016**
  - **Phase-3 outer cover gluing**
- **Jun. 2016**
  - 24th B2GM

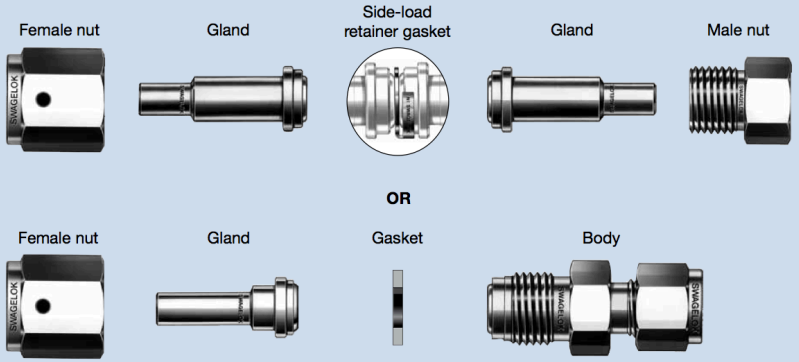
Schedule of SVD structure assembly

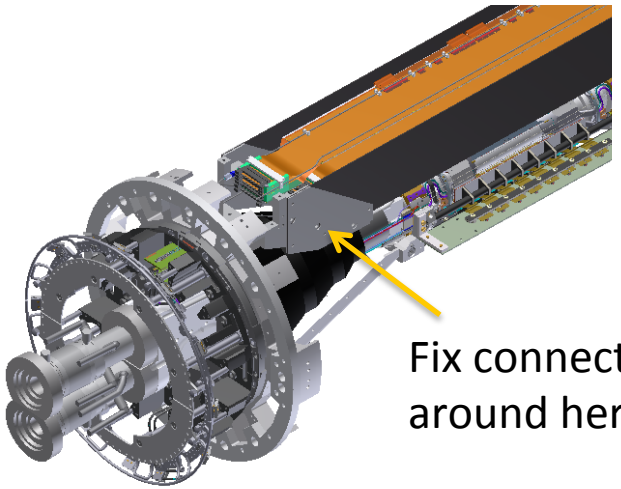
2015	Sep.		Finalize SVD cartridge design and start production
	Oct.	22nd B2GM	2nd trial of Endring gluing (2nd half FWD mockup Endring)
	Nov.		**2nd trial of outer cover gluing (beam test)**
	Dec.		2nd trial of Endring gluing (2nd half BWD mockup Endring)
2016	Jan.		CMM measurement for the glued FWD-BWD mockup Endring
	Feb.	23rd B2GM	**Endring gluing (FWD/BWD phase-3 Endring)**
	Mar.	DESY beam test	CMM measurement for the glued FWD-BWD phase-3 Endring
	Apr.		
	May.		**3rd trial of outer cover gluing (phase-2)** **Outer cover gluing (phase-3)**
	Jun.	24th B2GM	

CO2 cooling on SVD cartridge (phase-2)

- **We'd like to use Swagelok connectors.**
  - fix them on SVD cartridge
- **Does they match to connectors on IBBelle/Marco?**

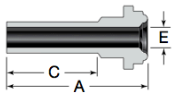
Typical VCR Assemblies





Fix connectors around here

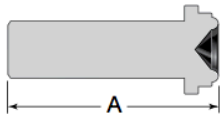
Glands



Short Tube Butt Weld

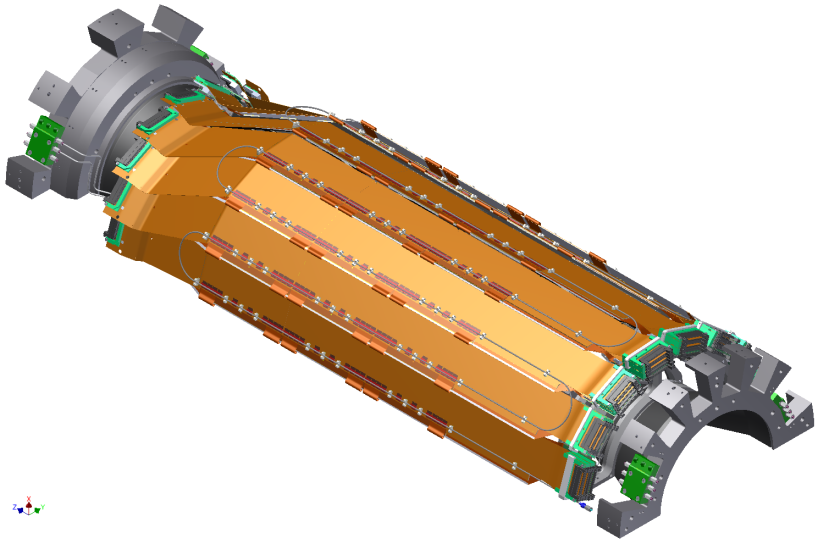
Tube Size	Nominal Wall Thickness	VCR Size in.	Ordering Number	Dimensions A	Dimensions C	Dimensions E	Working Pressure Ni	Working Pressure SS	Working Pressure Cu
Dimensions, in. (mm)							psig (bar)		
1/8	0.028	1/8	6LV-2-VCR-3S-2TB7①	1.08 (27.4)	0.75 (19.1)	0.06 (1.5)	8500 (585)	8500 (585)	6800 (468)
		1/4	6LV-4-VCR-3S-2TB7	1.10 (27.9)			5100 (351)	5100 (351)	5100 (351)

Blind (Undrilled) Gland



VCR Size	Ordering Number	A
Dimensions, in. (mm)		
1/8	SS-2-VCR-3-BL①	0.70 (17.8)

Ladder mount



Task list

- **Ladder mount jig: Sato-san**
  - after B2GM
- **Keratherm attachment jig: Sato-san**
  - prototype: the middle of Oct.
- **Set-screw fixation tool: Florian**
  - prototype is already developed
- **CO2 cooling pipe bending: Florian**
- **CO2 cooling pipe attachment: Fillipo and Florian**
- **Cabling/piping during ladder mount: Katsuro and Suzuki-san**
- **Collision test with Class-C ladders**
  - Oct. 27 at Tsukuba B1

Necessary days for Layer 3 mounting

- **Ladder mounting: 1.5 days/ladder**
  - including EQA test (noise & calibration measurement) and coordinate measurement
  - Left half: 3 ladders
  - Right half: 4 ladders
- **Thermal test: 1.5 days/half-layer**

Necessary days for Layer 4, 5, and 6 mounting

- **Ladder mounting: 1.5 days/ladder**
  - including EQA test (noise & calibration measurement) and coordinate measurement
  - Layer 4: 5 ladders/half-layer
  - Layer 5: 6 ladders/half-layer
  - Layer 6: 8 ladders/half-layer
- **Keratherm attachment + ORIGAMI cooling pipe attachment: 1.5 day/half-layer**
- **Thermal test: 1.5 days/half-layer**

Others

- **Outer cover attachment + Transportation of half-structure from the mount table to a strage:**
  - 1 day/half-structure

Total

- 1st Layer 3: 6.0 days
- 1st Layer 4: 10.5 days
- 1st Layer 5: 12.0 days
- 1st Layer 6: 15.0 days
- Half-layer detachment: 1 day
- 2nd Layer 3: 7.5 days
- 2nd Layer 4: 10.5 days
- 2nd Layer 5: 12.0 days
- 2nd Layer 6: 15.0 days
- Half-layer detachment: 1 day

- Total: 90.5 working days ~ 5 months

Assembly Schedule

based on Tanaka-san's slide on VXD meeting

- We have to share the VXD assembly table for assemblies of two VXD systems
  - VXD for phase-2 and BEAST
  - VXD for physics run (phase-3)