「小型加速器による小型高輝度X線源とイメージング基盤技術開発」

（スポーク型超伝導空胴開発に於ける設計及び非破壊検査）

Y. Iwashita
Kyoto U.

AccLab BmSci ICR KyotoUniversity

2013.06.26

H25年度の計画と目的

(1)原子力機構で行うスポーク空胴本体、および、高次モード(HOM)カップラーの設計最適化の過程において、計算機シミュレーションによるマルチパクタリング解析を行う。マルチパクタリングが運転の障害となる可能性のある事が判明した場合、設計へ反映させる。

(2)複雑な構造を持ったスポーク空胴における非破壊検査の手法について設計検討を行う。

(3) SRF2013に参加し、超伝導空洞高分解能内視鏡やTmap,Xmap等、非破壊検査に関する発表を行い、同時に、超伝導加速器の世界動向について調査を行う。

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Multipactoring

Proceedings of LINAC2012, Tel-Aviv, Israel MOPB056

MULTIPACTING ANALYSIS OF HIGH-VELOCITY SUPERCONDUCTING SPOKE RESONANTORS*

C. S. Hopper† and J. R. Delayen
Center for Accelerator Science, Department of Physics,
Old Dominion University, Norfolk, VA, 23529, USA and
Thomas Jefferson National Accelerator Facility, Newport News, VA 23606, USA

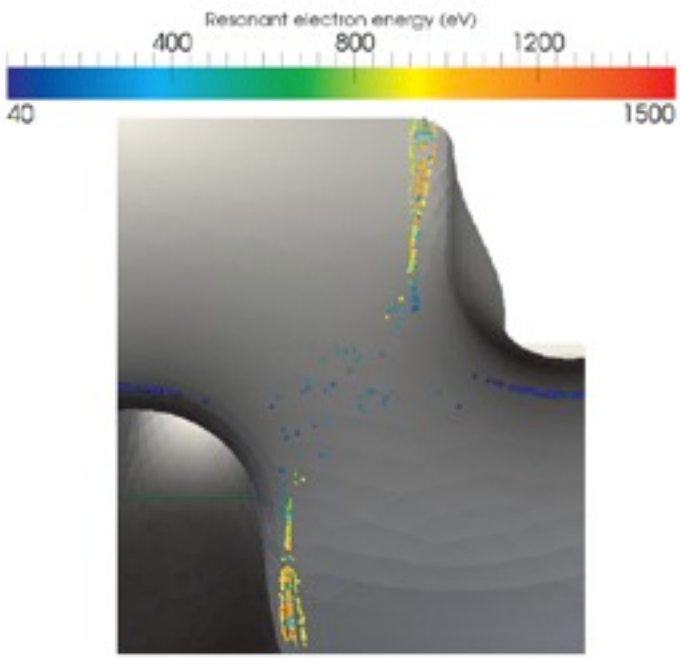
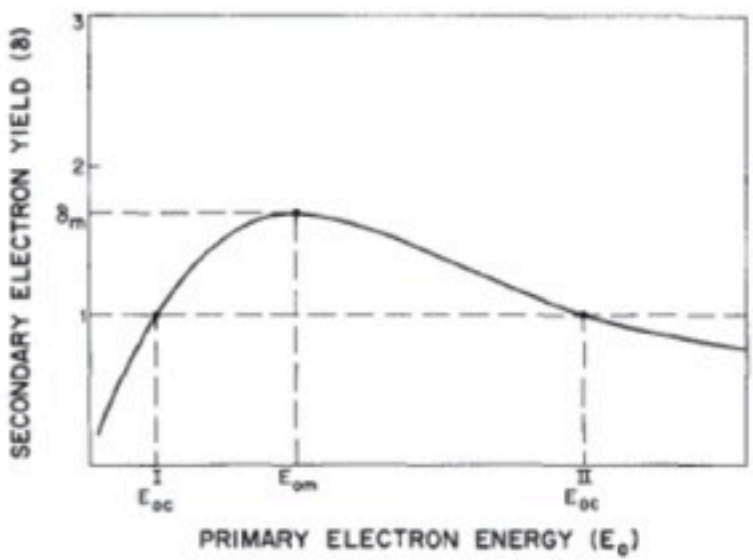


Figure 6: Resonant electrons and their impact energies surviving after 50 rf cycles as simulated by Track3P.

g spoke cavi-
high-velocity
ed geometry,
ts multipact-
he results of
ions of mul-
cavities and

equencies of
of $\beta_0 = 0.82$



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非破壊検査

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CavCam2

Camera to observe the appearance of wall surface in the cavity

Export agency : REPIC CORPORATION

TEL : +81-3-3918-5326 FAX : +81-3-3918-5240

e-mail: hoshiya@repic.co.jp

Japan Neutron Optics Inc.

Riken-Wako Incubation Plaza 407

Minami 2-3-13, wako, Saitama, 351-0104, Japan

e-mail: info@j-nop.com

URL http://www.j-nop.com

Details of CavCam2 Module Package

1) CavCam2-Cylinder "Upper Module of CavCam2"

Weight < 20 kg

(1) Camera

9M Pixel color CMOS Camera

Better than 4 microns/pixel(about 3.7 micron/pixel)

Focus adjustable by movement of camera position

USB interface to PC with English viewer software, driver software and manual

(2) Mirror

Adjustable tilt angle of the mirror by pulse motor

(3) Illumination

Ten white-LEDs at both sides of camera window

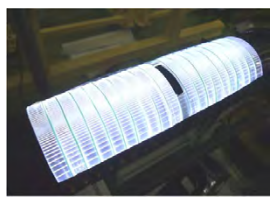
Semi-coaxial illumination by LED through the mirror

The illumination housing slides with the mirror tilting angle synchronously.

(4) Illumination control box

Illumination on/off for 21 LEDs

Illumination intensity for LED are adjustable

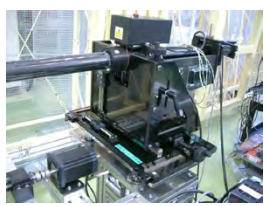


(5) Camera cylinder holder

Cylinder positions are adjustable in horizontal and vertical direction with position indicators.

The cylinder tilt angle and yaw angle are also adjustable.

- The cylinder itself is rotatable by pulse motor from 0 to 360 degree and its angle is displayed to LED indicator and also readable from RS232C.
- The cylinder rotation axis is adjustable by two fine pitch screws to make camera axis in the rotation center.



A built-in damper against the cylinder vibration

(6) Cylinder alignment to cavity

Camera cylinder has rotatable red laser indicator which will guide you the cylinder direction to avoid touch to cavity iris.

(7) motor controller

2 ch pulse motor controller for focus adjustment and mirror angle adjustment.

Another 2 ch pulse motor controller (only 1-ch is used) for cylinder rotation.

These two controllers are linked together so that one handy control terminal can control all three channel.

2) CavCam2-Table "Lower module of CavCAM2"

(1) Table body

Width: 581 mm

Height: 1023 mm

Length: 2950 mm (table at operation), 2950 + 339 mm (including cylinder tail)
2090 mm (retractable for transportation)

Stroke: 1500 mm

Weight: < 230 kg

Cavity rotetes by pulse motor.

(2) Rotary encoder for cavity rotation angle measurement

(3) Motor controller

2-ch pulse motor controller, handy terminal

(4) The camera cylinder holder sits on the table.

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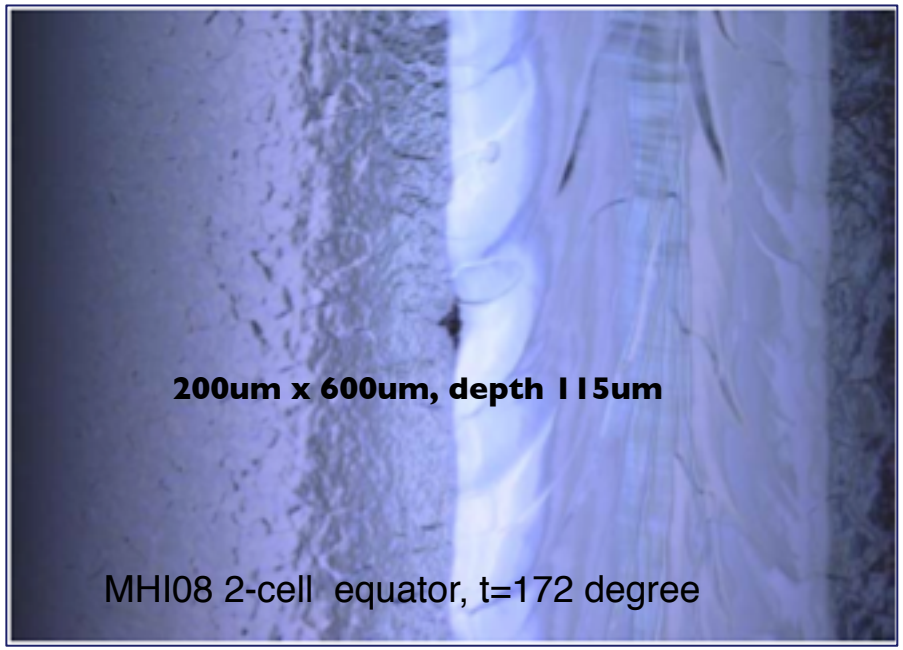
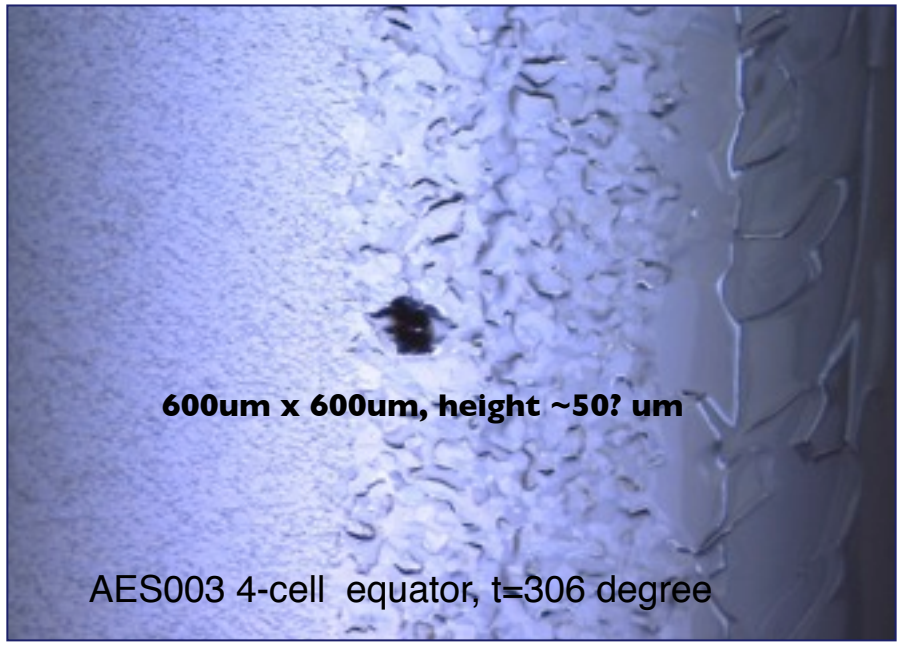
Local Grinding Treatment of Quenched Part





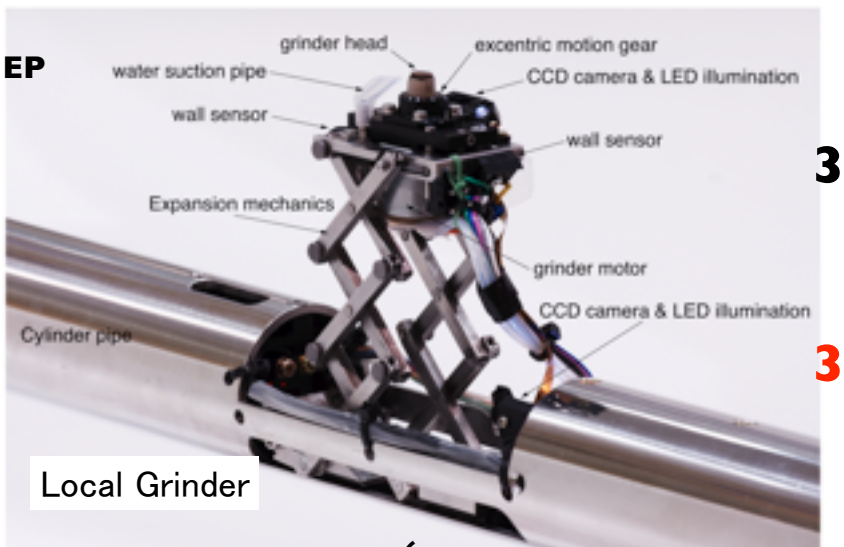
Pit; appeared after bulk EP, limit to 16MV/m

local grinding & EP

27MV/m

additional EP

38MV/m



Local Grinder

Bump at heat affecting zone, limit to 20MV/m

local grinding & EP

30MV/m

additional HPR and bake

34MV/m

Ken Watanabe
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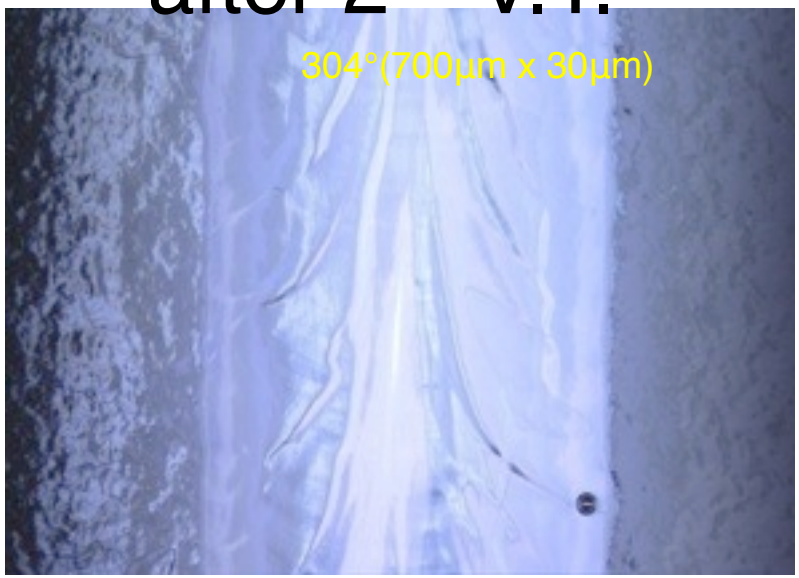
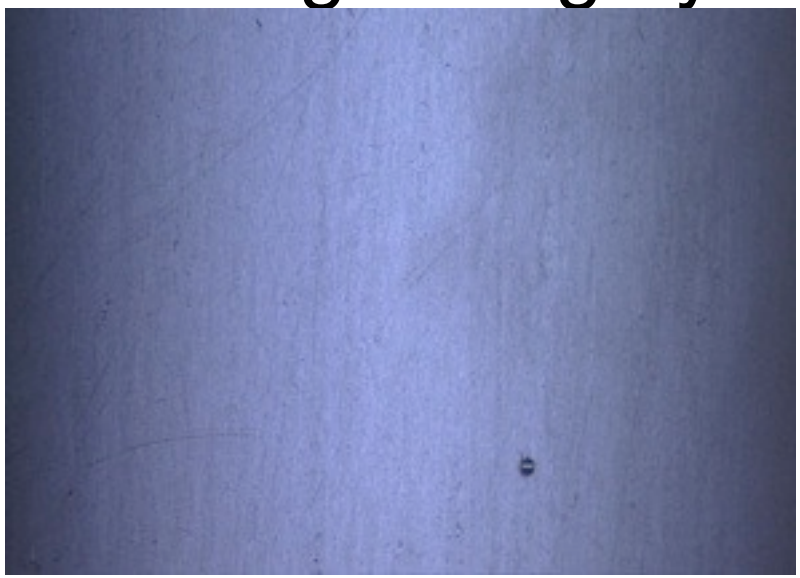
Example of Local Grinding

after 2nd V.T.

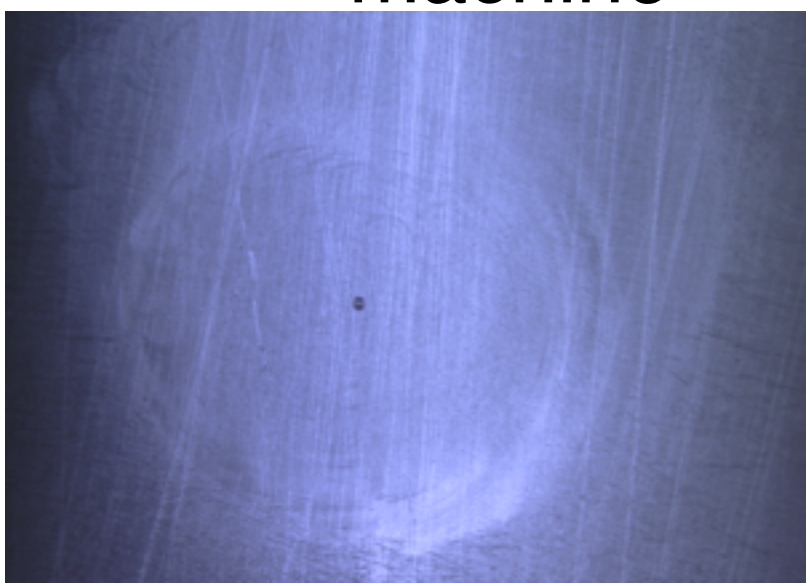


Local Grinding

grinding by

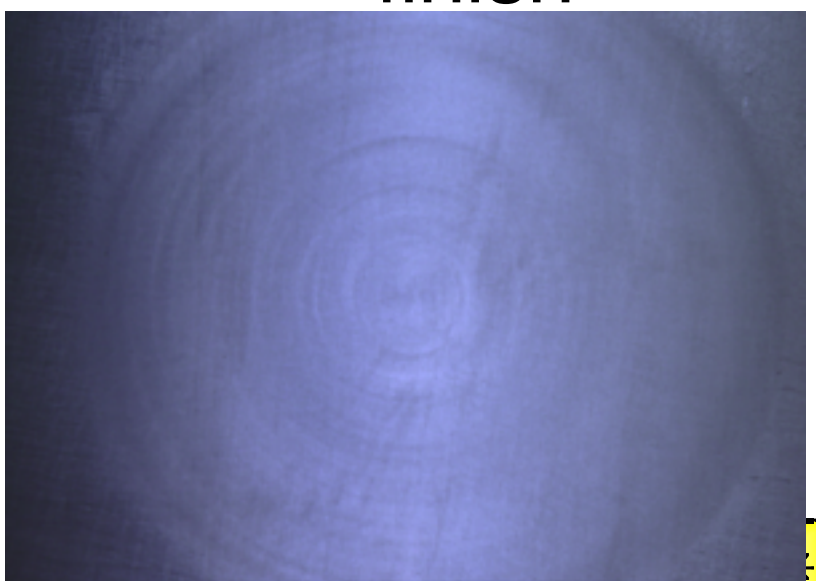


machine



Local Grinding

finish



Local Grinding

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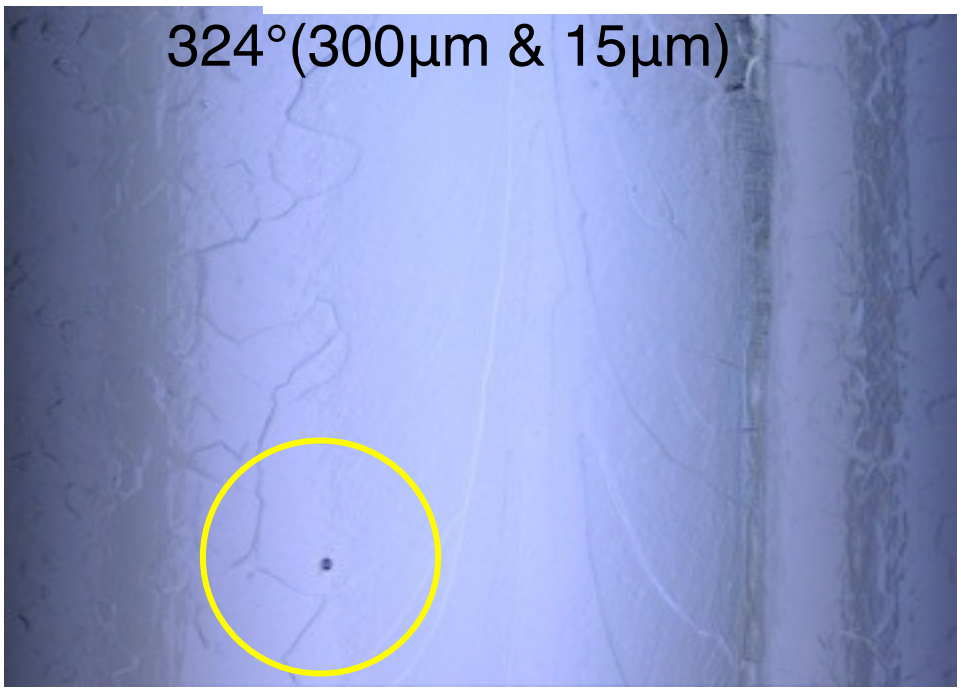
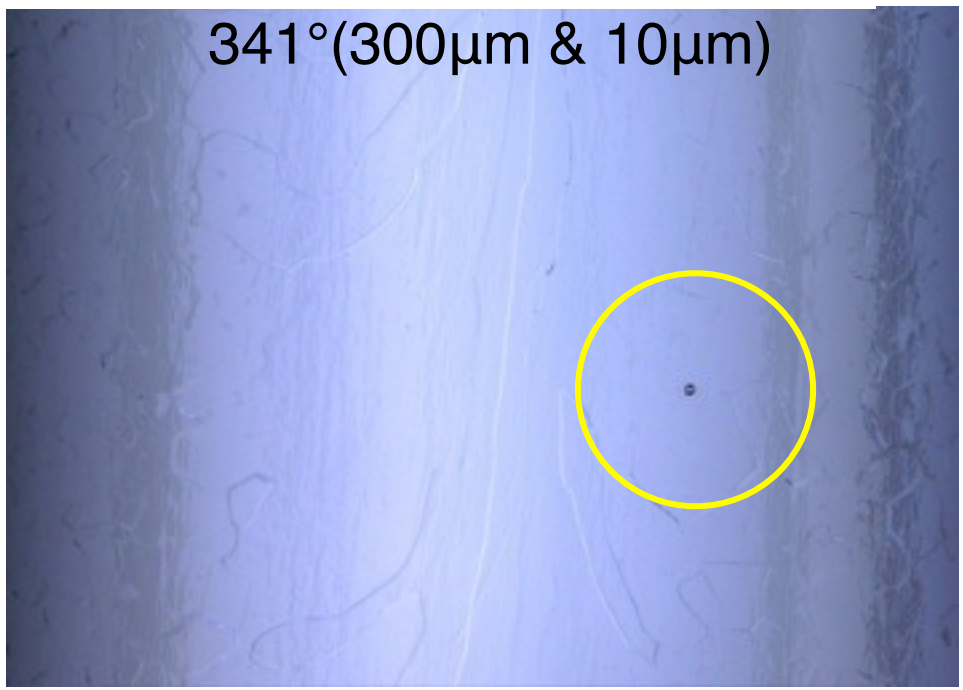
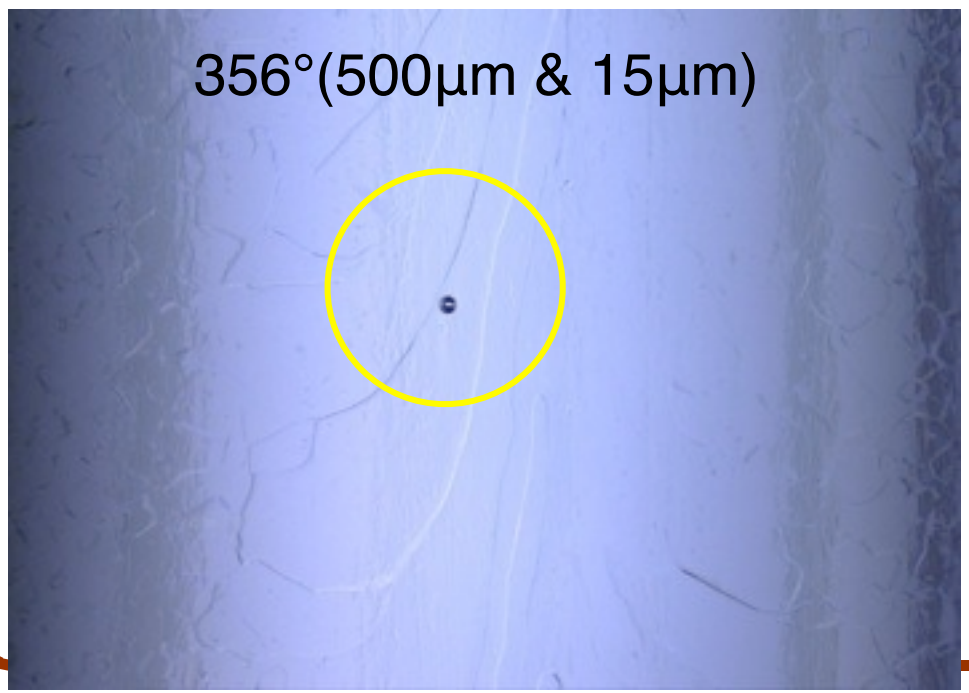
MHI-010

After the LocalGrinding and EP, new defect appeared! Furthermore, it grew with the LocalGrinding!







MHI-010:

1st VT	**23.8MV/m @ Q0=1.1E10**	**May 20,2010**
2nd VT	**25.7MV/m @Q0=8.1E9**	**June 17,2010**

local grinding and 100mm EP

3rd VT	**20MV/m @ Q0=1.1E10**	**Sep 02,2010**

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X-Ray Imaging

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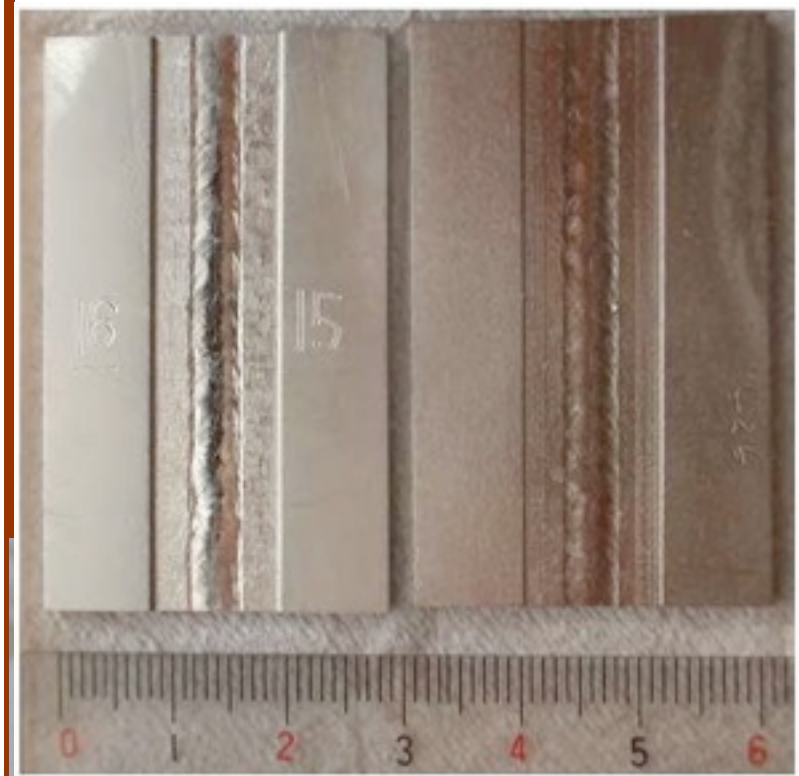
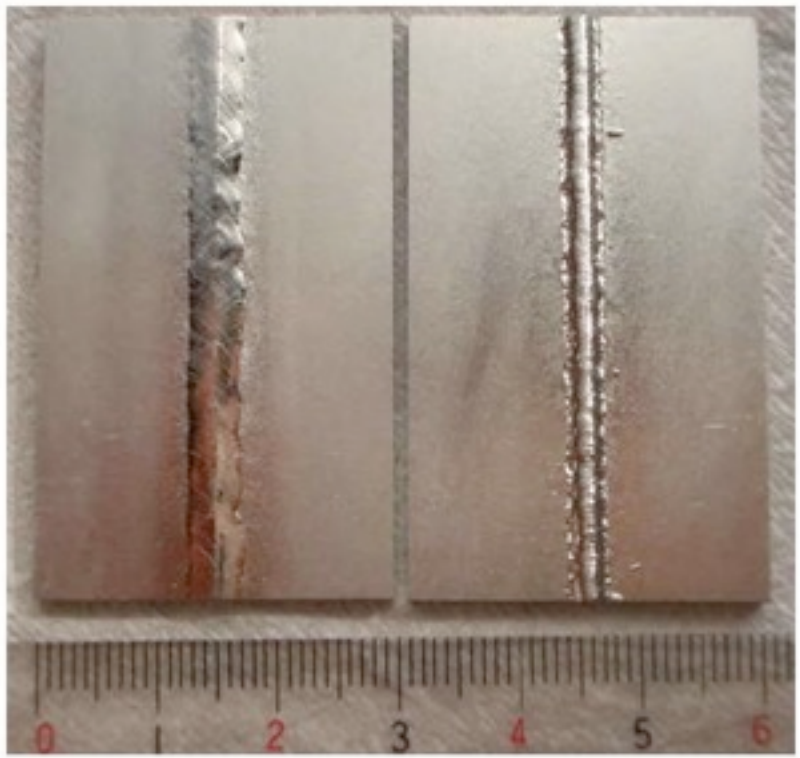
Nb EBW Samples

Prepared at KEK





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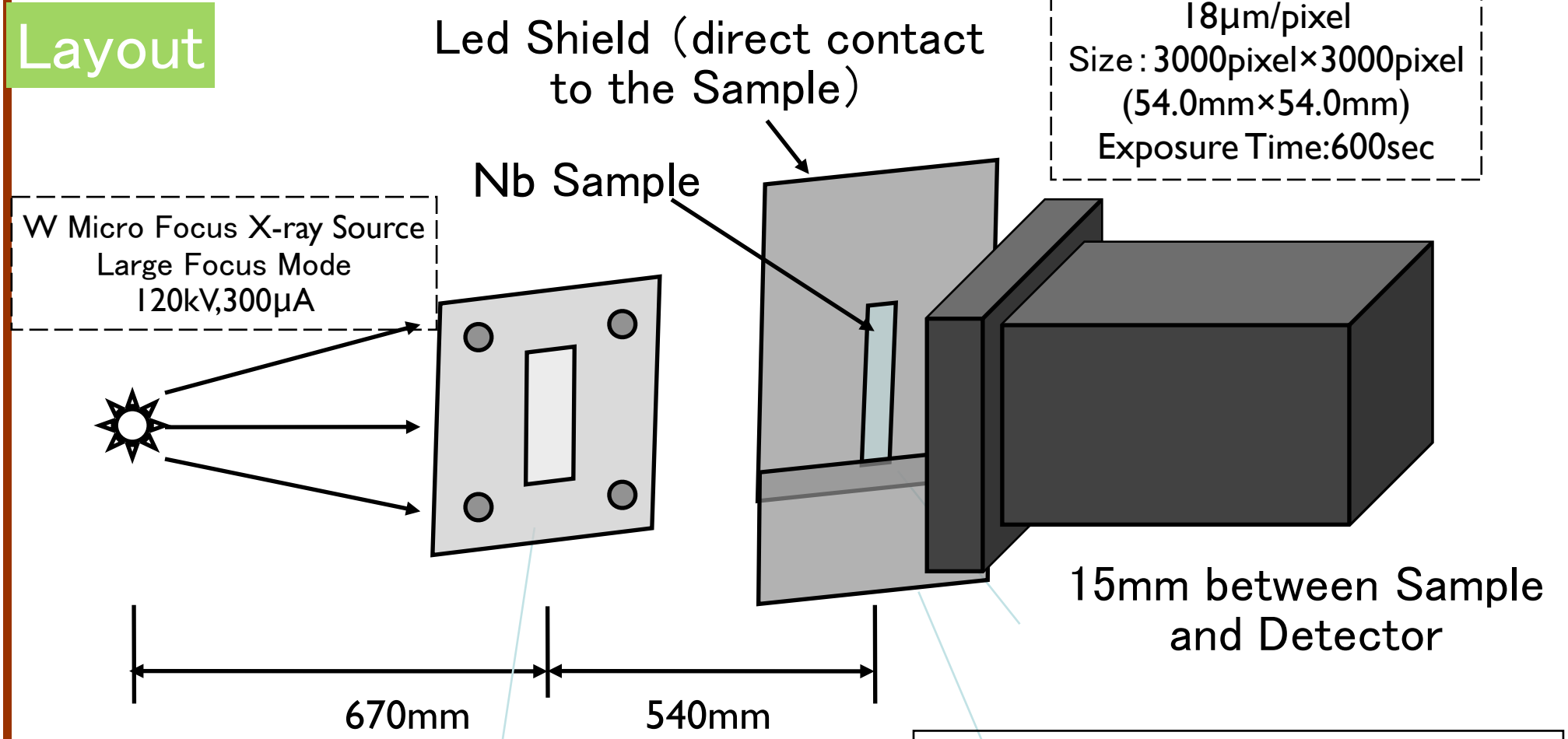
Imaging of Nb sample

Layout



Courtesy of Dr.Yashiro @ Momose Lab., U-Tokyo

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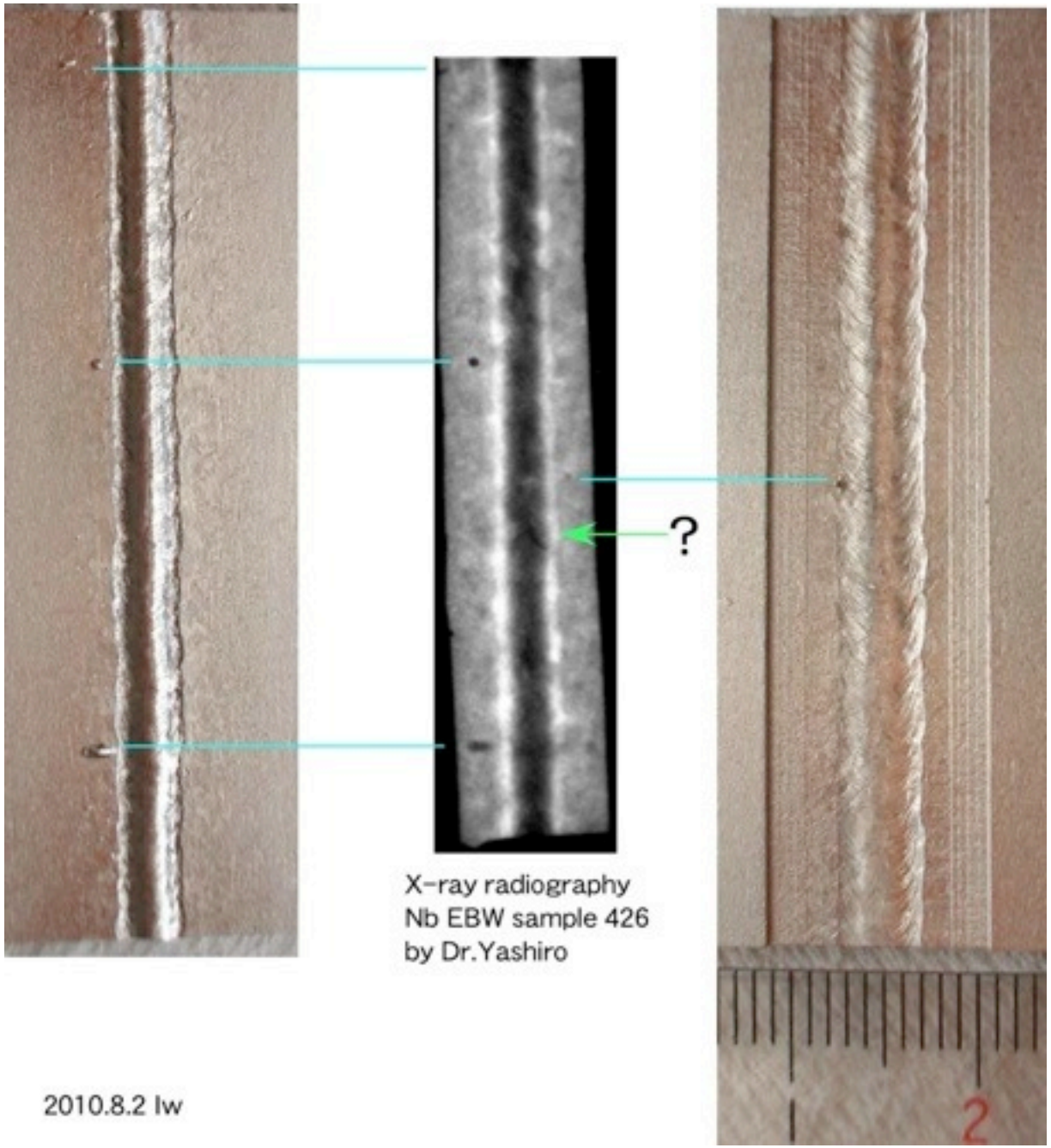
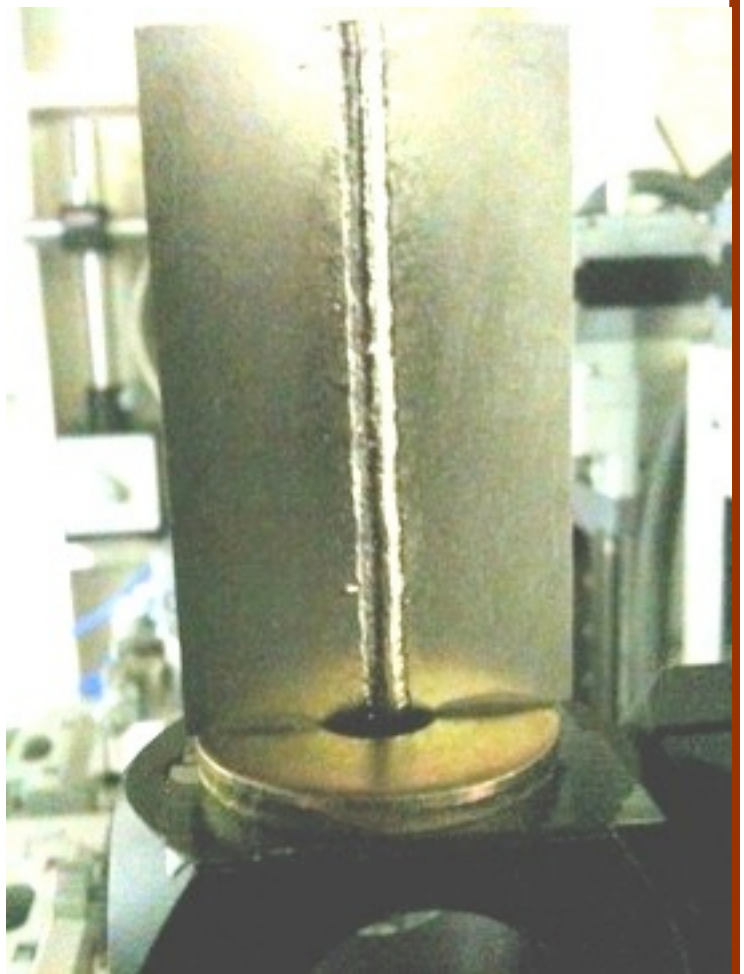
Transmission（Gray Scale：0.3~0.55）





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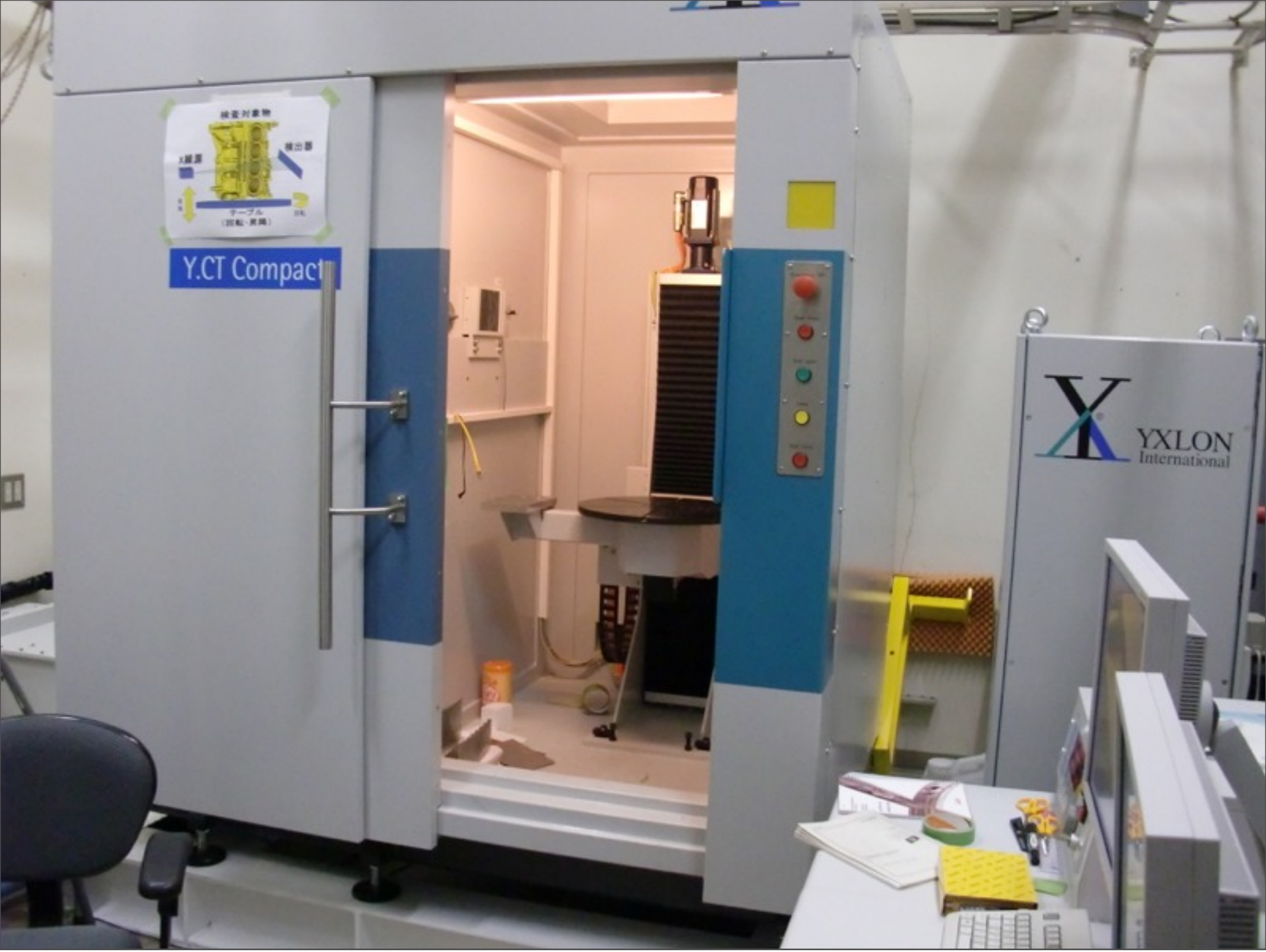
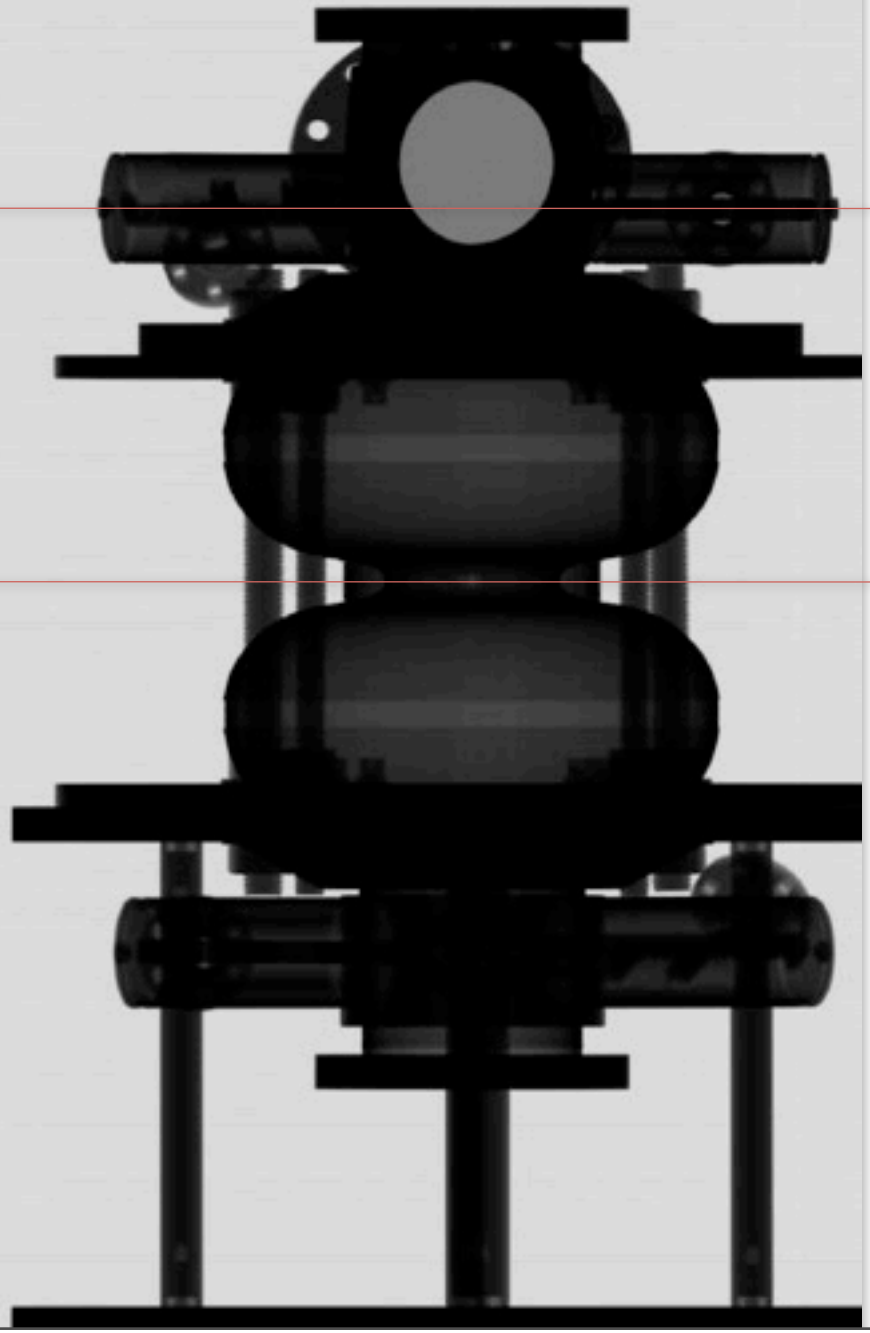
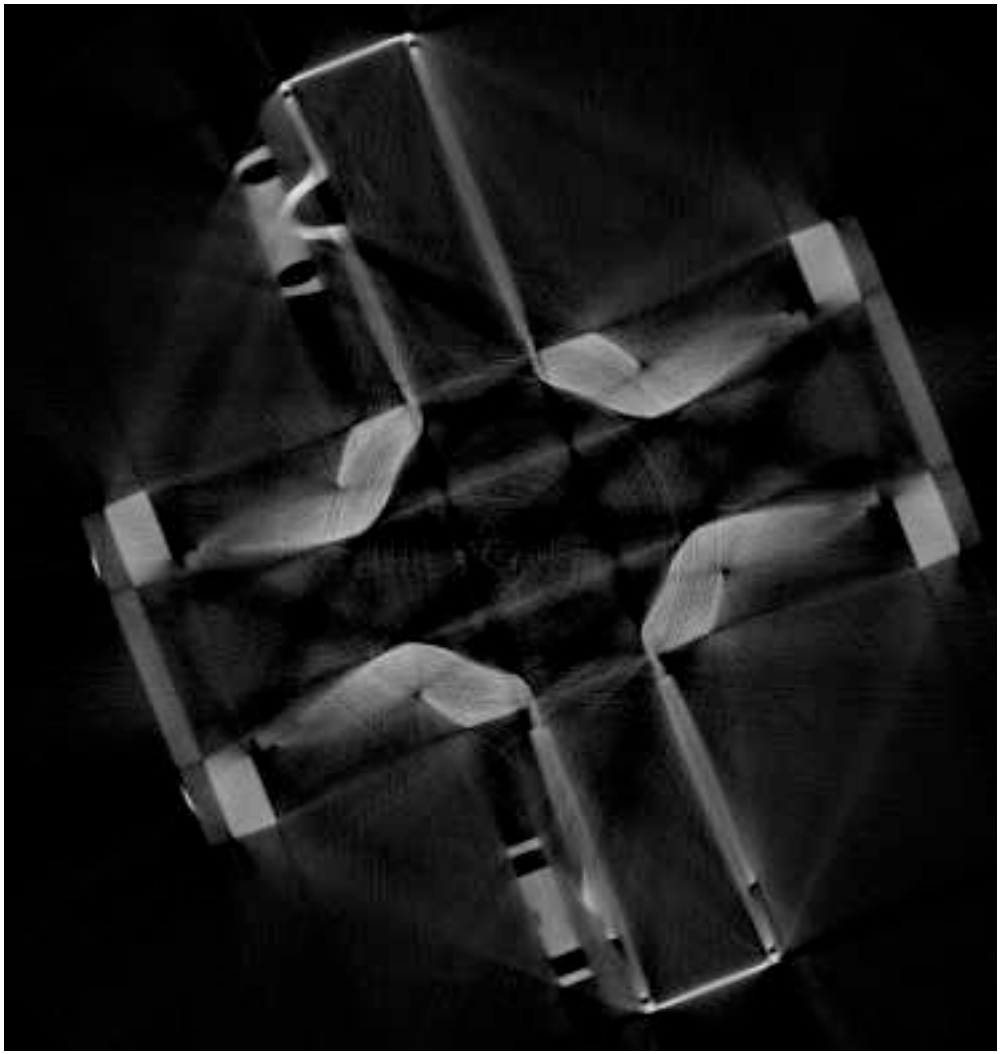

Y.CT Compact
YXLON
International

Two Cell Cavity





Neutron Imaging

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Neutron CT

50x50mm

ø1.5 thru hole

ø0.5 x 2.5, ø0.2 WC

Mat'l	Abs. xs	
Nb	1.15	41
Ta	20.6	73
W	18.5	74

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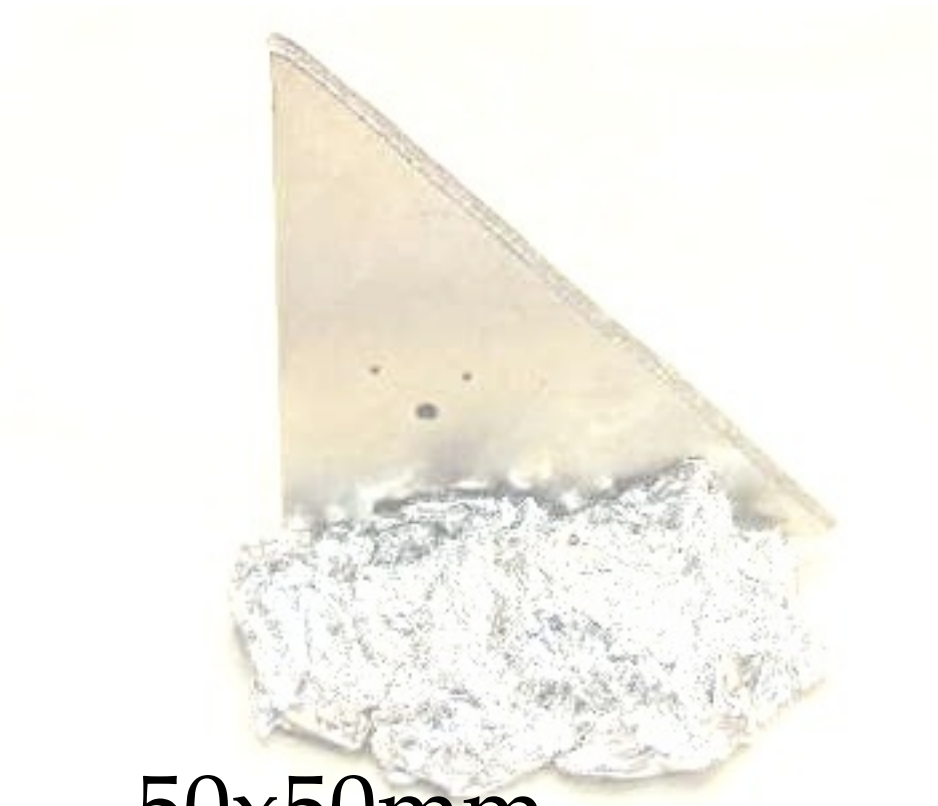
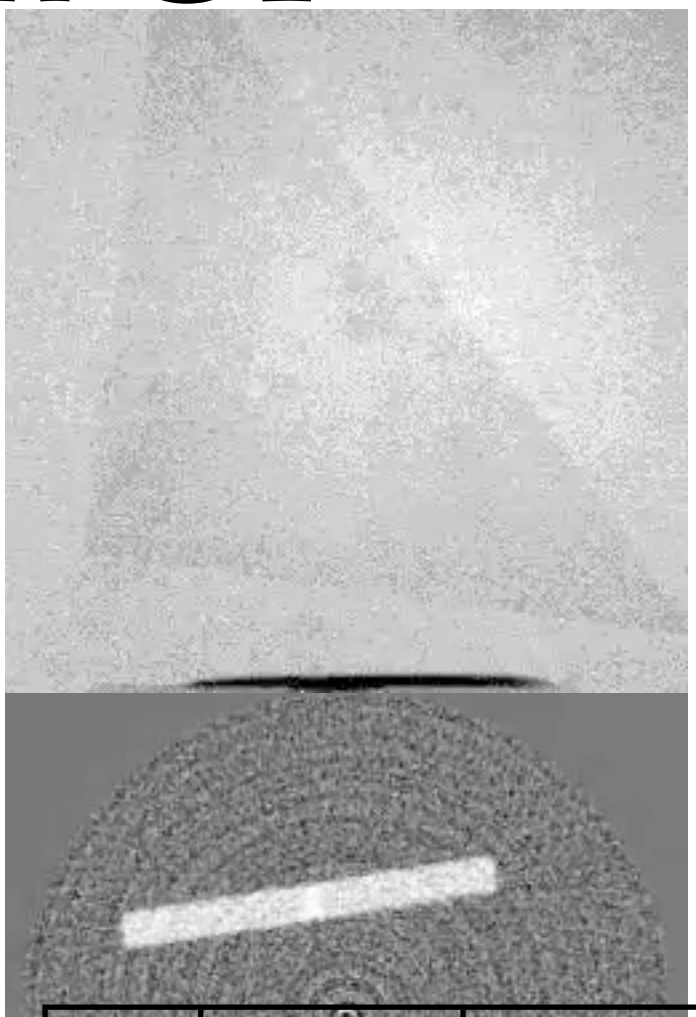
Neutron CT



50x50mm

ø1.5 thru hole

ø0.5 x 2.5, ø0.2 WC



Mat'l	Abs. xs	
Nb	1.15	41
Ta	20.6	73
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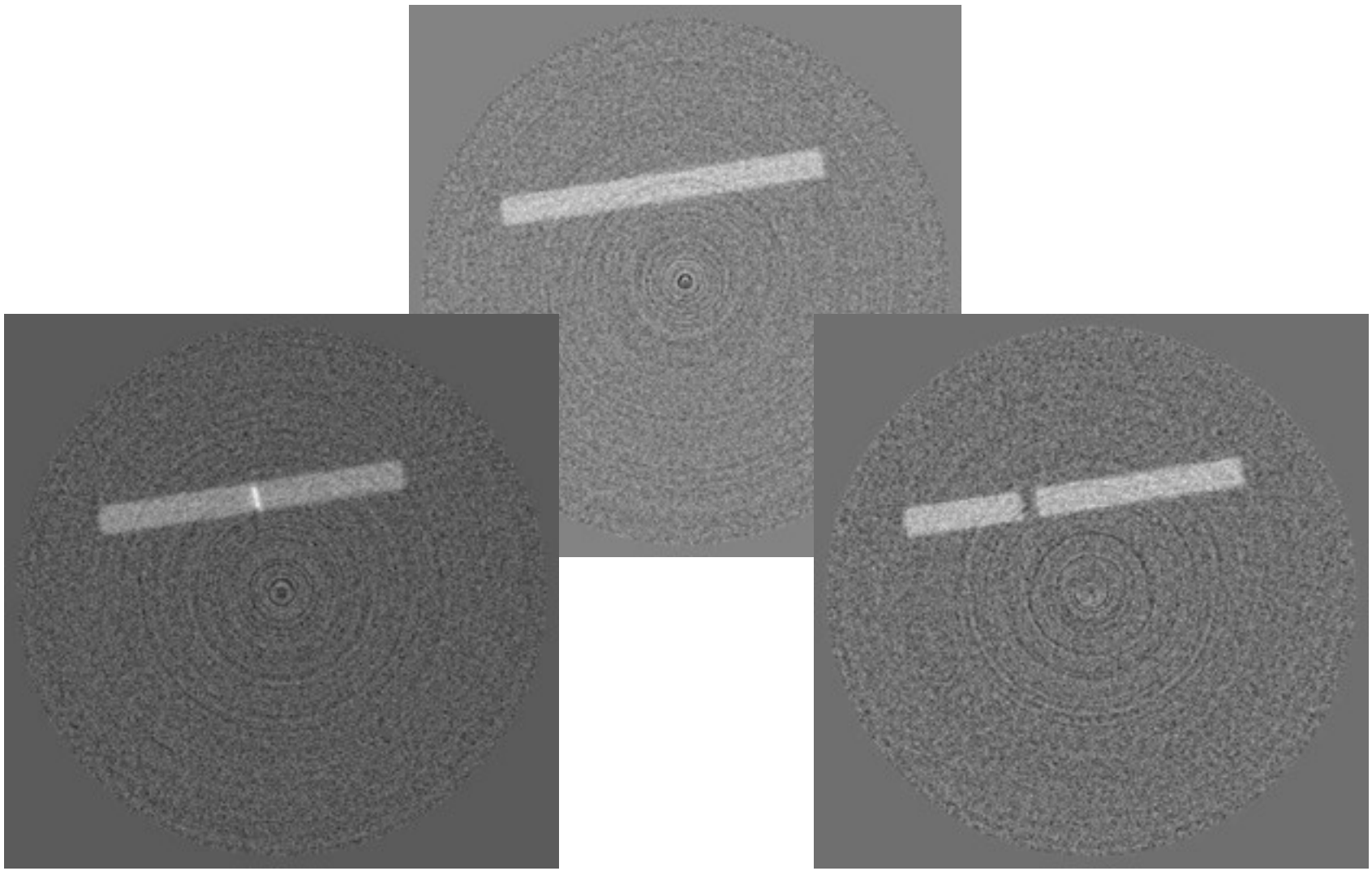
Neutron Imaging



ø0.2 WC

ø1.5 thru hole

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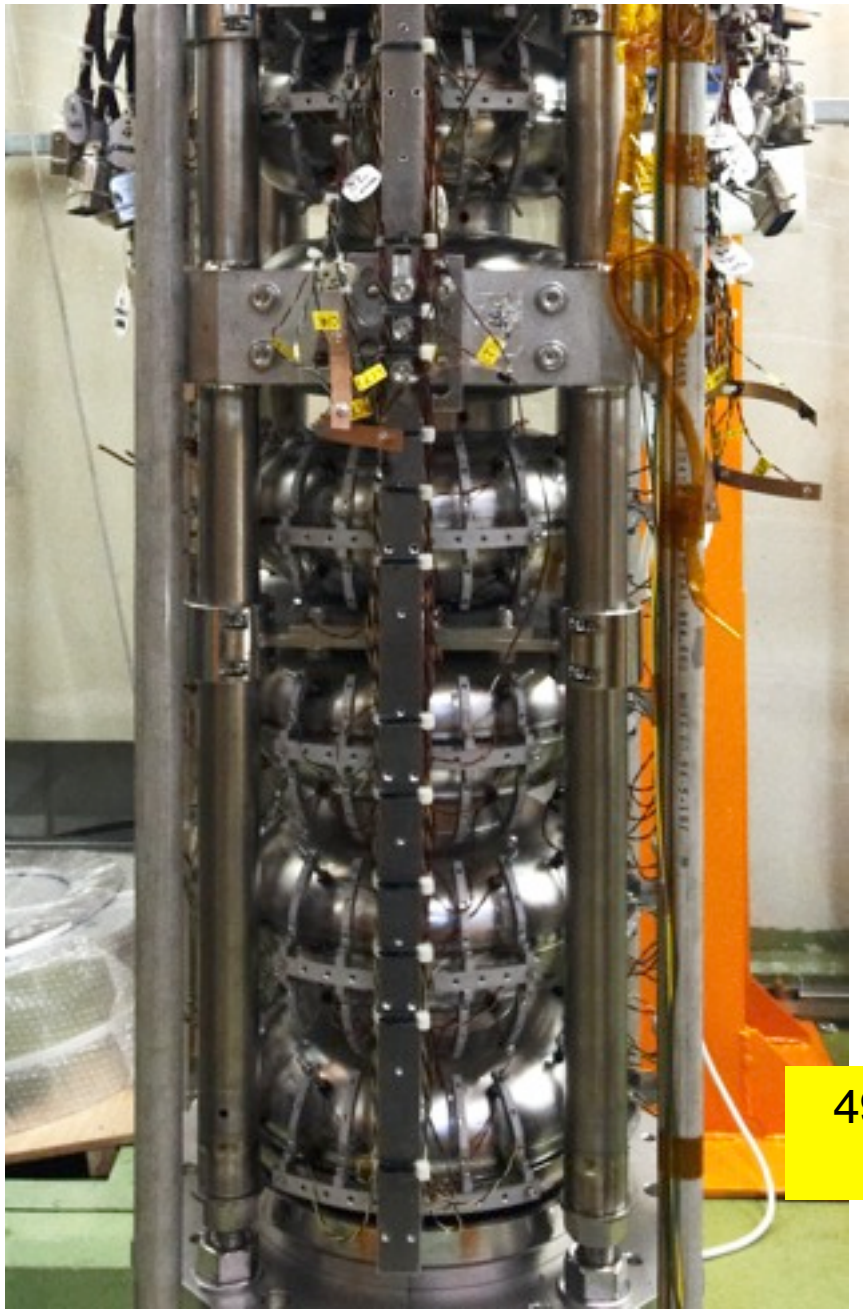
Tmap, Xmap

Tmap and Xmap are used during Vertical Test

T-sensors are installed on the surface:
on equators and walls.

352 carbon resistors
(Allen-Bradley, 50 or 100Ω)



X-sensors on Iris

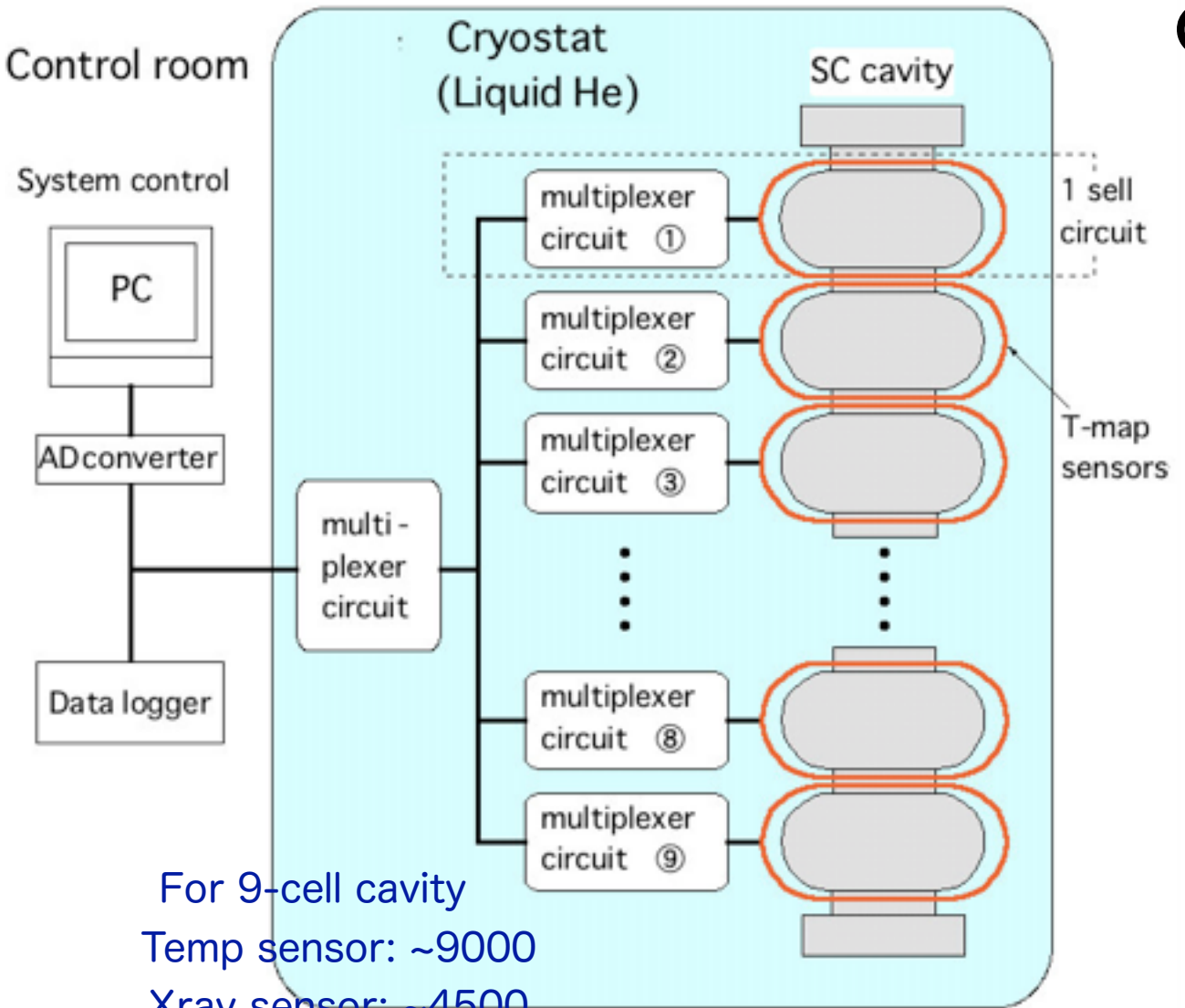
142 PIN diodes
(HAMAMATSU, S1223-01)

494 sensors total,
55 sensors/cell

Yasuchika Yamamoto
2013.06.26

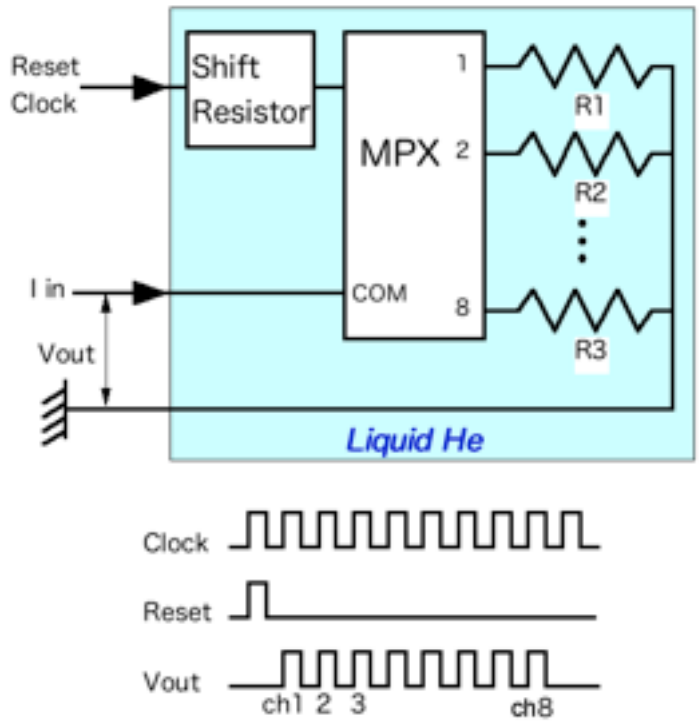
High resolution XT-map with Multiplexer

Electron trajectory and emission point can be speculated by XT-map information



For 9-cell cavity
Temp sensor: ~9000
Xray sensor: ~4500
cable feed-through: 25 lines
read out speed: ~1 sec/9cell

CMOS MPX circuit



Many sensor signals can be handled with the small number of lines by multiplexing technique.

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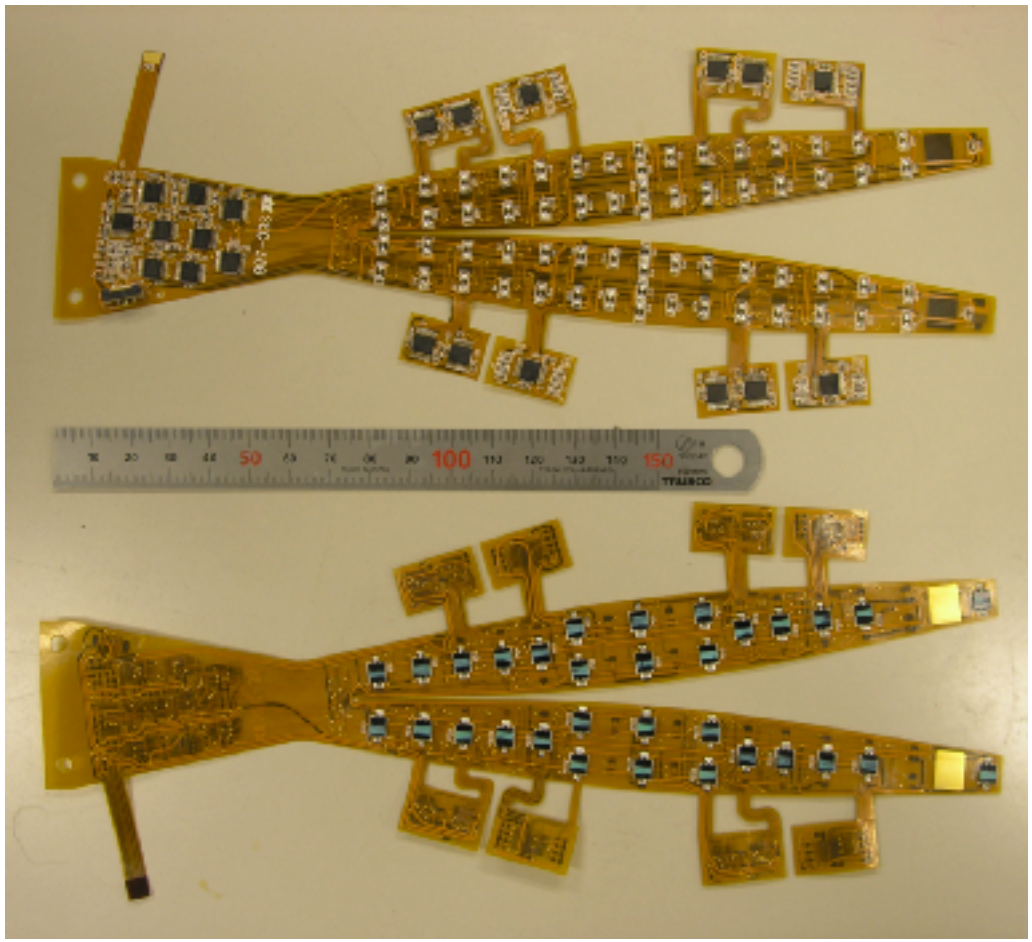
High Density XT-map

64 T-sensors / double leaf



32 X-sensors / double leaf

XT-sensors

XT-map PCB installed
on the cavity surface

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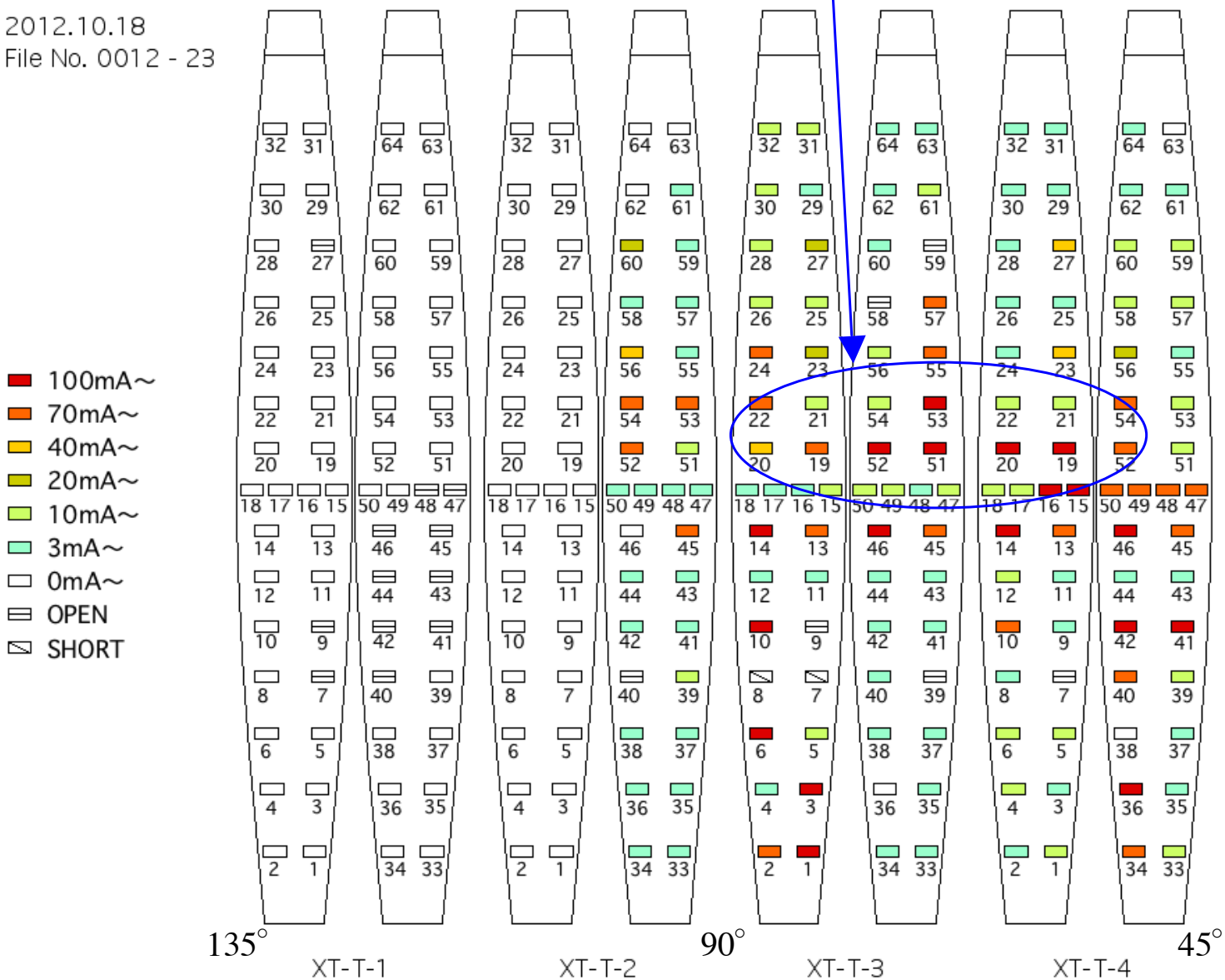
T-map signal

クエンチ検出試験　πモード



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