R&D of Nondestructive Inspection Systems for SRF Cavities

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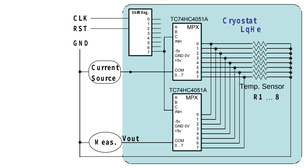
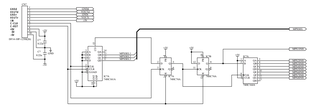
INTRODUCTION

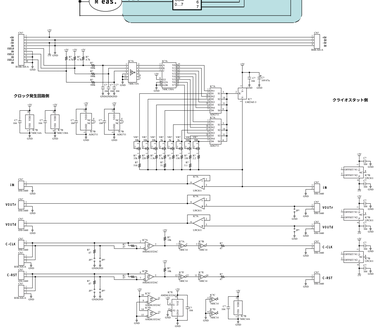
Nondestructive surface inspections are important method to improve yields of super conducting cavities. Starting from the development of the high resolution optical inspection system, temperature mapping system, X-ray mapping system, eddy current inspection system for bare Nb plates are under investigation. Investigation of an autofocus capability on the camera, automatic defect detection system and EBW bead height measurement are are started.

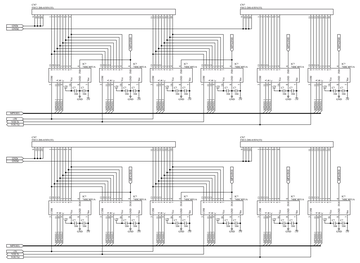
HI DENSITY T-MAP & X-MAP

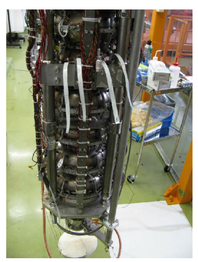
Block Diamgram

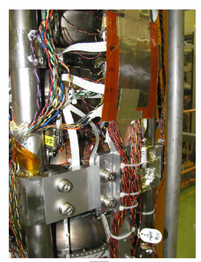












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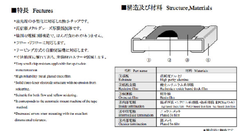
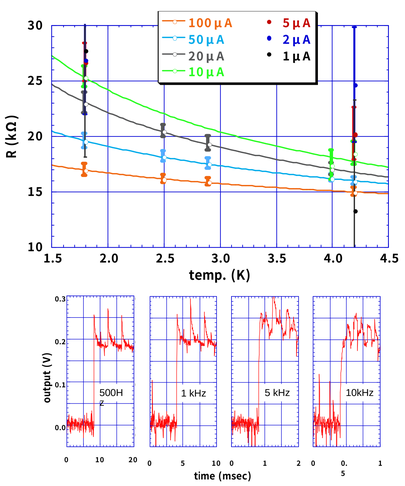
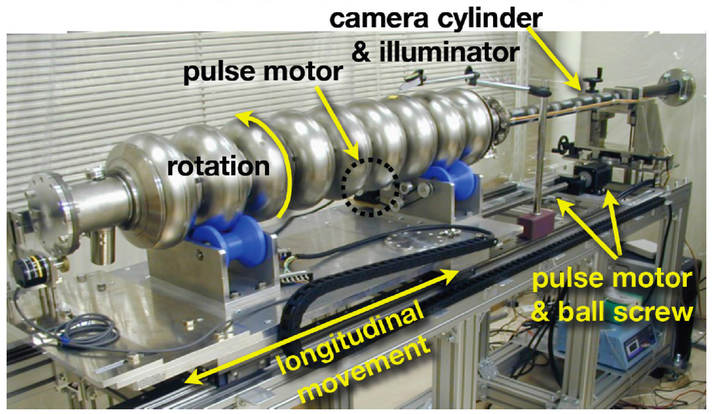


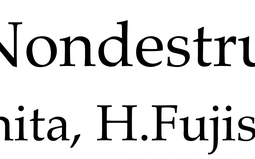


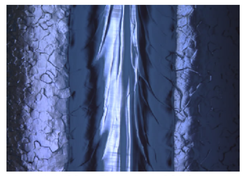
IMPROVEMENTS ON KYOTO CAMERA



Strip LED illumination

- long lived
- very bright

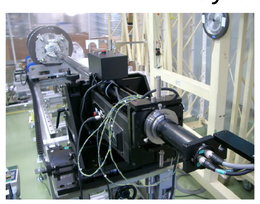


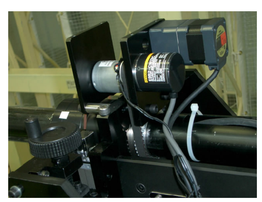


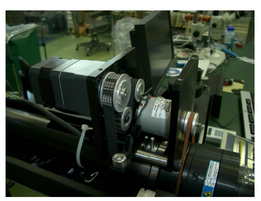
MHI-09 #1Equator, t=000deg
,EL sheet, OLD

MHI-09 #1Equator, t=000deg
,LED+LGP New

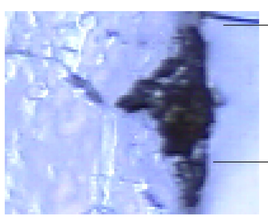
Cylinder rotation mechanism

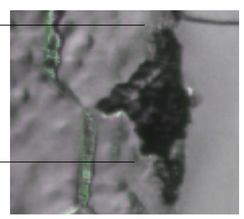






9Mpix new CMOS camera and High resolution lens





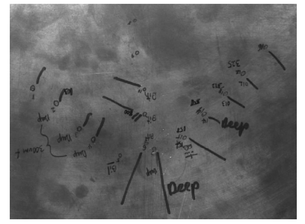
1400 x 1000, 1/1.8", 5 x 5 μm
50 Lux, F1.4 (Max gain, Level 50%), 6.87fps

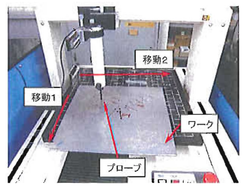
9.3 μm/pix @ 13 x 9 mm

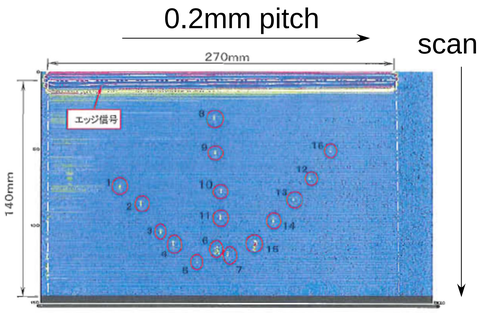
3488 x 2616, 1/2.3", 1.75 x 1.75 μm, Bayer
0.44V/Lux-sec (550nm), 2.45fps

3.7 μm/pix @ 13 x 9 mm

PRELIMINARY TEST ON EDDY CURRENT SCAN



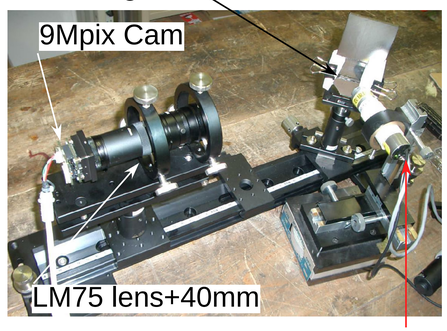




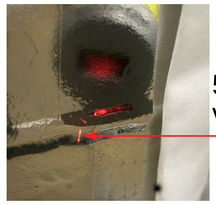
EM/C ET5002A with probe:EPT-4
512kHz, 42dB, 10~220Hz, 63º, lift off 0.5mm, 20mm/s

EBW SEAM HEIGHT MEASUREMENT

Target: NbTi-Nb EBW seam

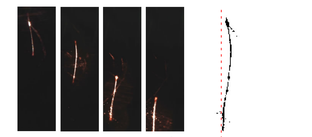


Line Laser: MFL-670S-1-5º-20-k
(5μm width)



5μm? width vertical line

Line Laser was moved down:



Four pics are overlapped.

SUMMARY

Further improvements on KYOTO camera are performed. High density T-map and X-map will be achieved by surface mount print circuit technology. Preliminary test on eddy current scan showed promissing results; real stand is under design. We are trying to measure the EBW seam height with a line laser projector and the camera system.