Superconducting Cavity for KEKB

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Cavity

- Large beam pipe diameter to damp HOM
- Ozonized water rising stabilize surface by thin Nb_2O_5 film
- Vertical test Eacc>10MV/m ⇨ 13MV/m (Max 14.4MV)
- Pulse aging effective to increase a field gradient at horizontal test
- Horizontal test Eacc>10 MV/m ⇨ 11.4MV/m

Superconducting Cavity for KEKB

	Bench test	Beam test	design
Cavity Max Vc	3.3 MV	2.5 MV (2.9 MV)	1.6 MV
Coupler	800 kW (300kW)	160 kW (250kW)	500 kW
HOM load	15 kW	4 kW	5 kW

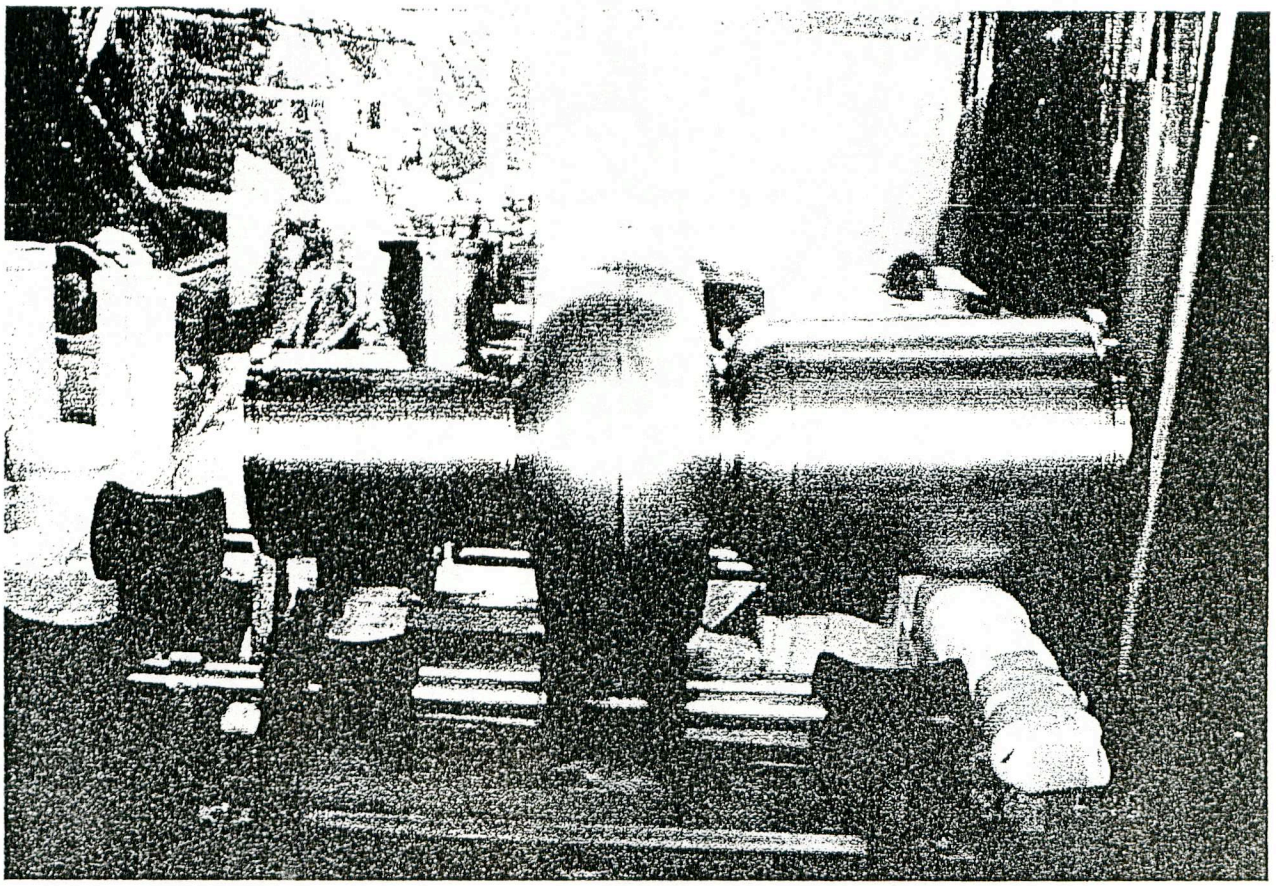
4-1 Cavity

* Stable operation of the cavity voltage up to 2MV with 500mA, and 2.5MV with 350mA without any problem.
  These currents were limited by heating up of other ring components.
  The desired voltage for HER is 0.9 - 1.6MV/cavity in the full SC version.
  The maximum stored current of 573mA is just the half of our goal for HER.
* No change of cavity performance.
* Frequent RF trips happened at 1st and 2nd test.
  This trip was caused by a large amount of condensed gas from the ring.
  The trip can be suppressed by the improvement of vacuum pressure of the neighboring sections(~1 x 10^9 Torr).

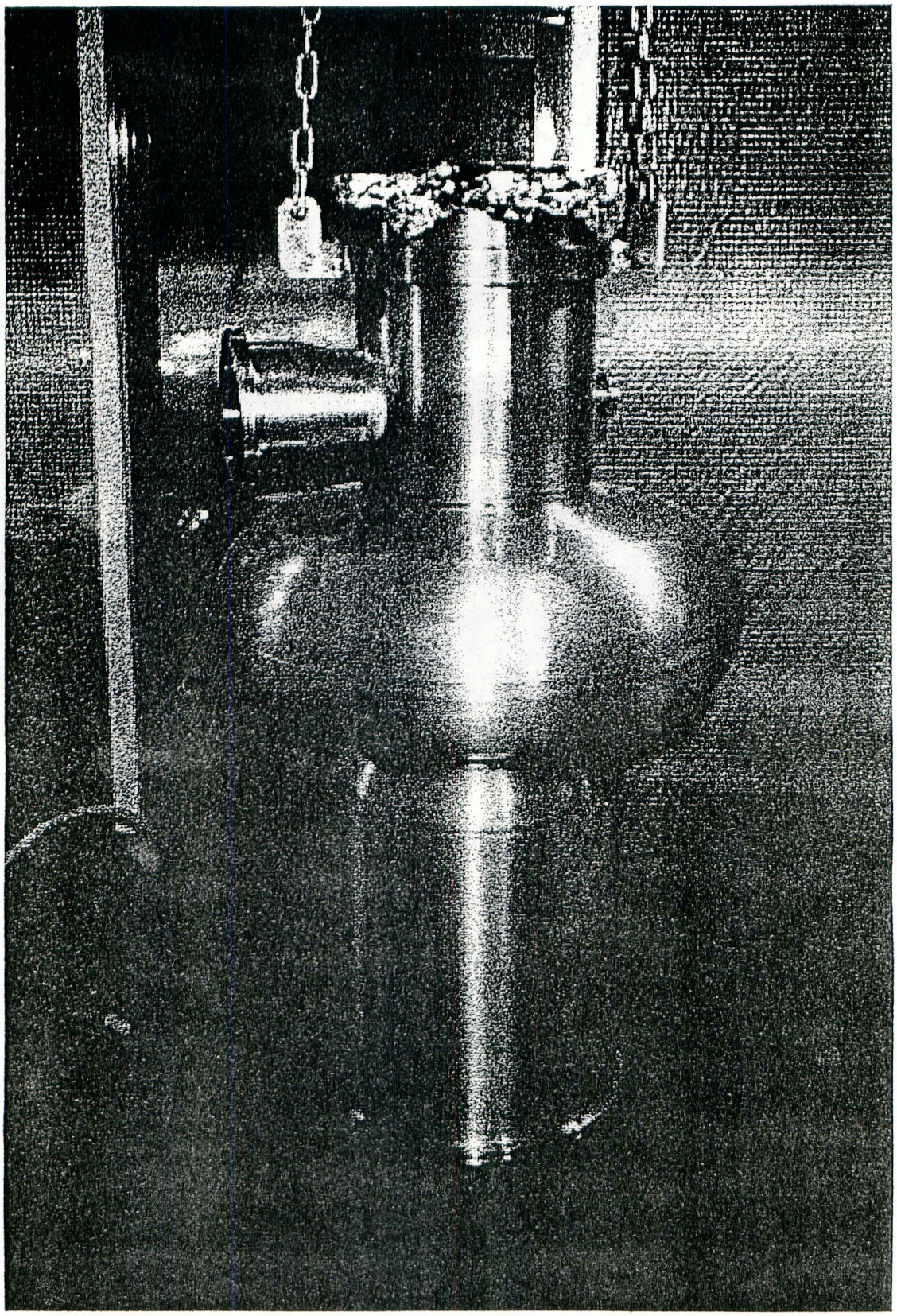
* The vacuum circumstance around the SC cavities is the most impotant factor for the stable operation of SC cavities.

CAVITY

- 4 Superconducting cavities aer making now,the surface treatment of first one just starting.
- These cavities will be installed in D11 straight section.

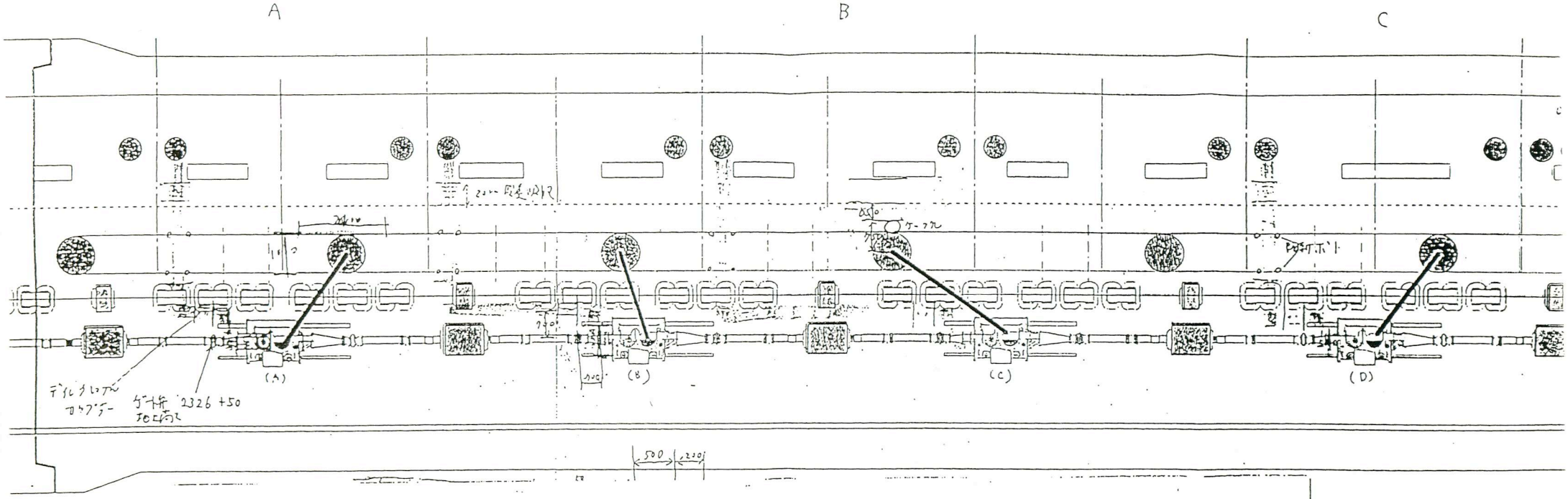


Superconducting Cavity for HER of KEKB



Water Shower Rinsing of SCC for KEKB

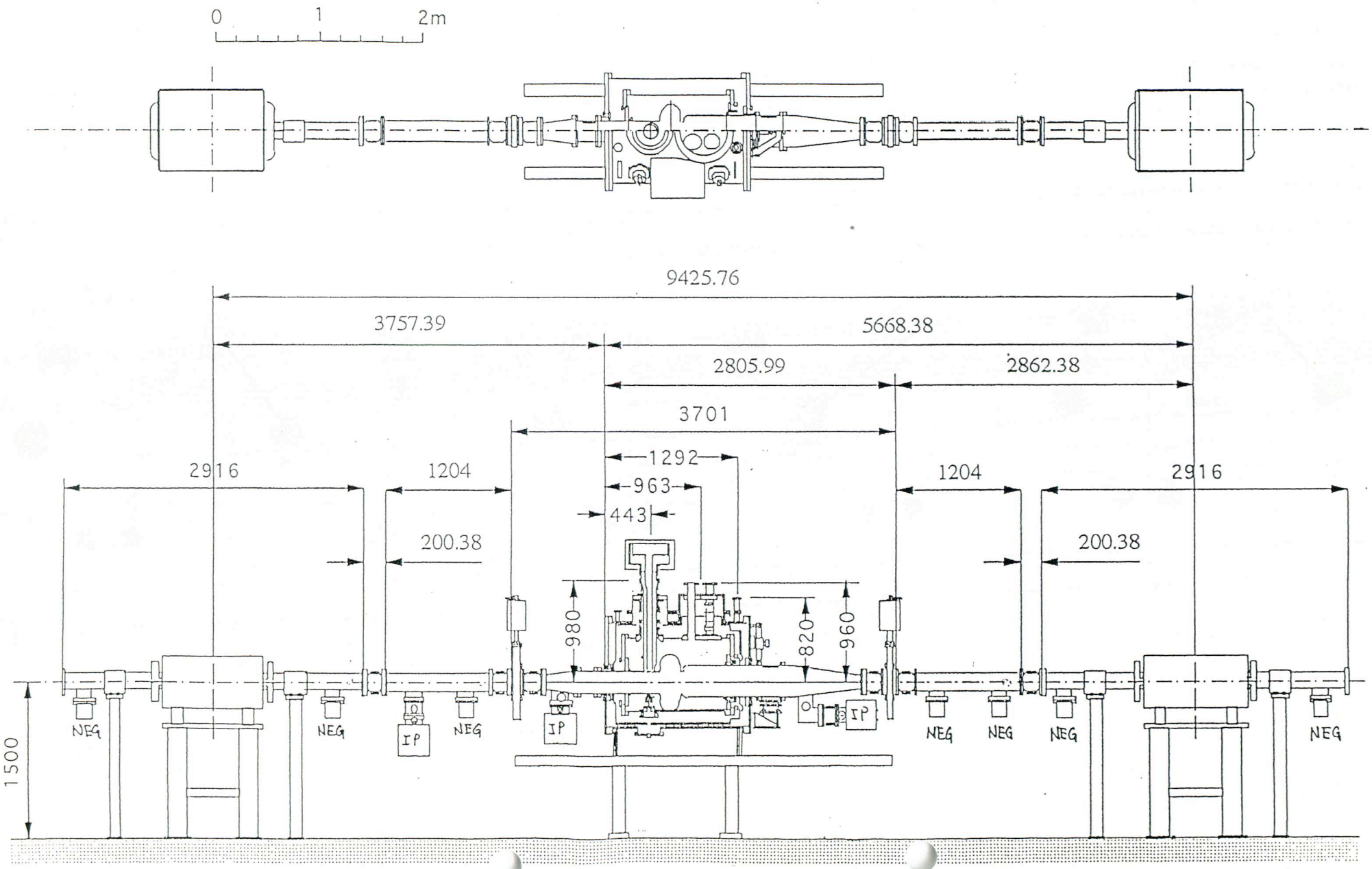
D11



+1500 +150 = 2630
+1500 +110 = 2610

(底) 取付ける.

HER-SCC Layout



INPUT COUPLER

- The coupler tested up to 800 kW by traveling wave and 300 kW totally refrected standing wave,changing phase of half wave.
- The biased Type doorknob transition was developed,and tested at test bench to 300 kW standing wave changing phase of half wave.

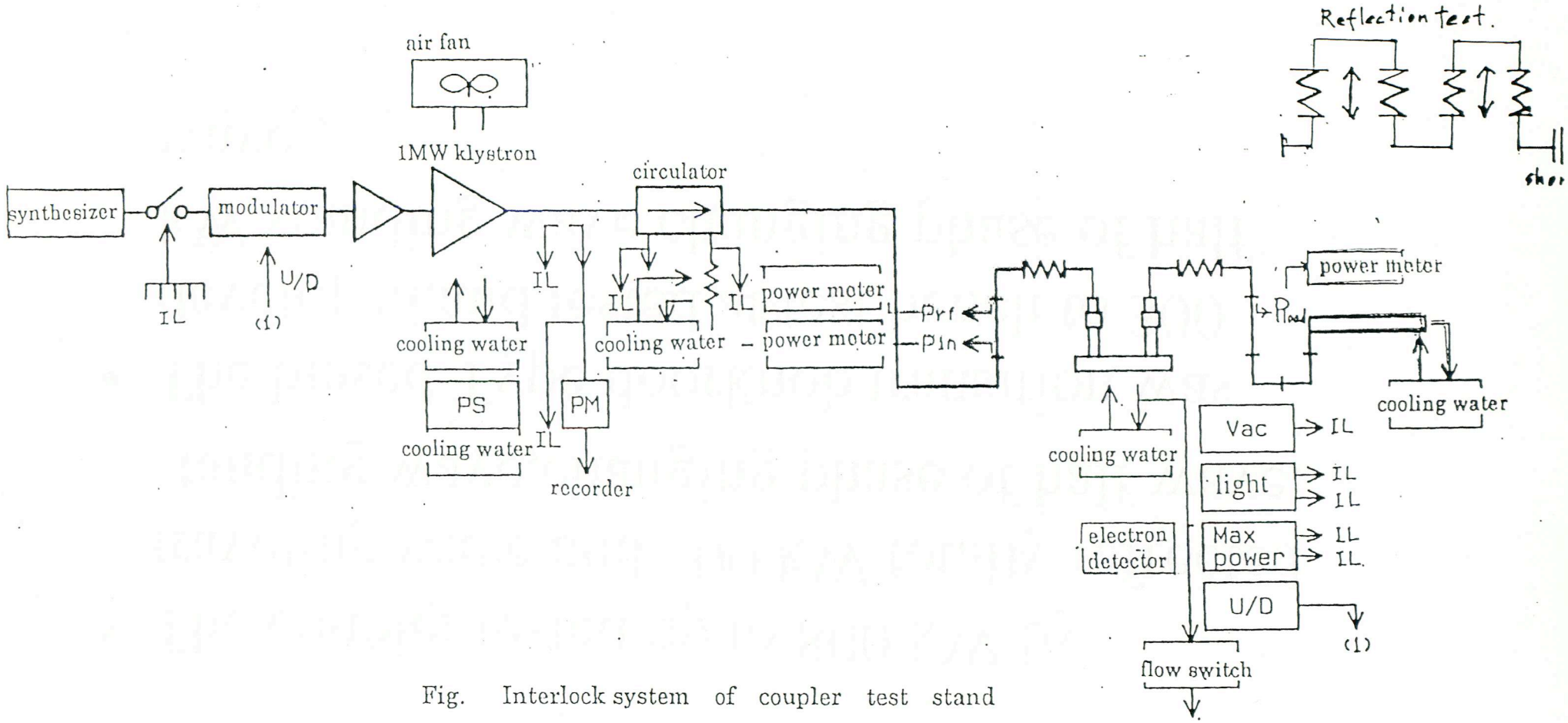
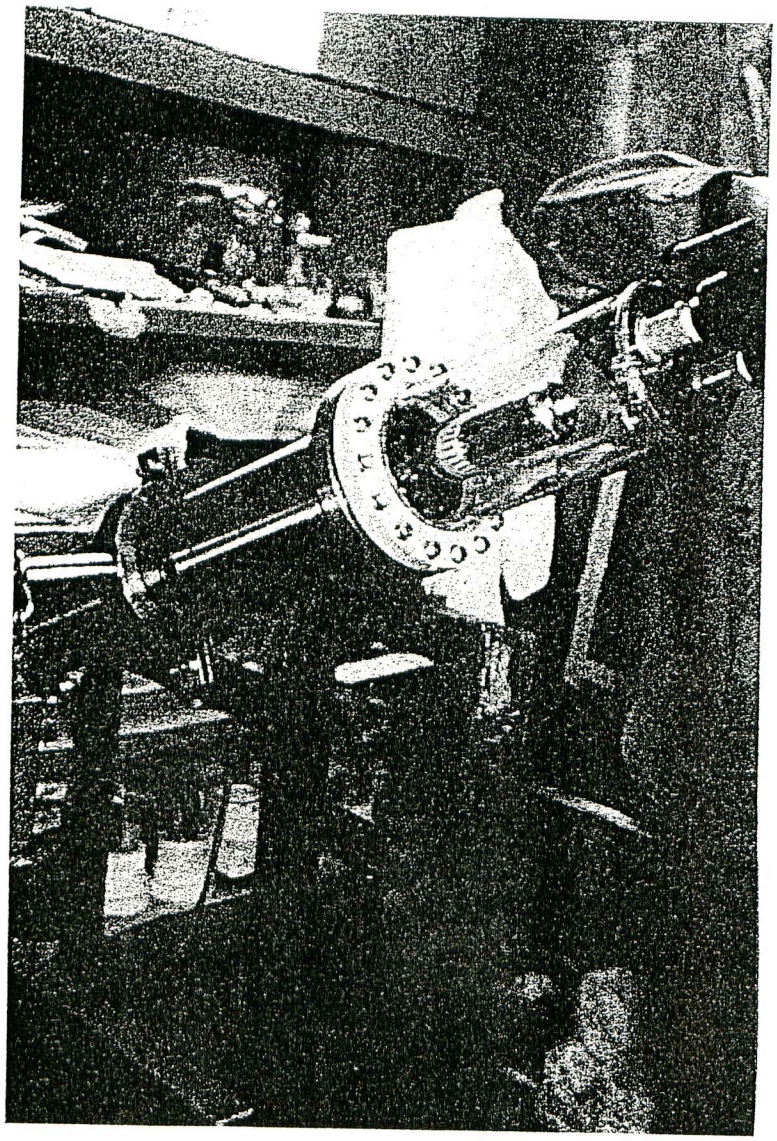


Fig. Interlock system of coupler test stand

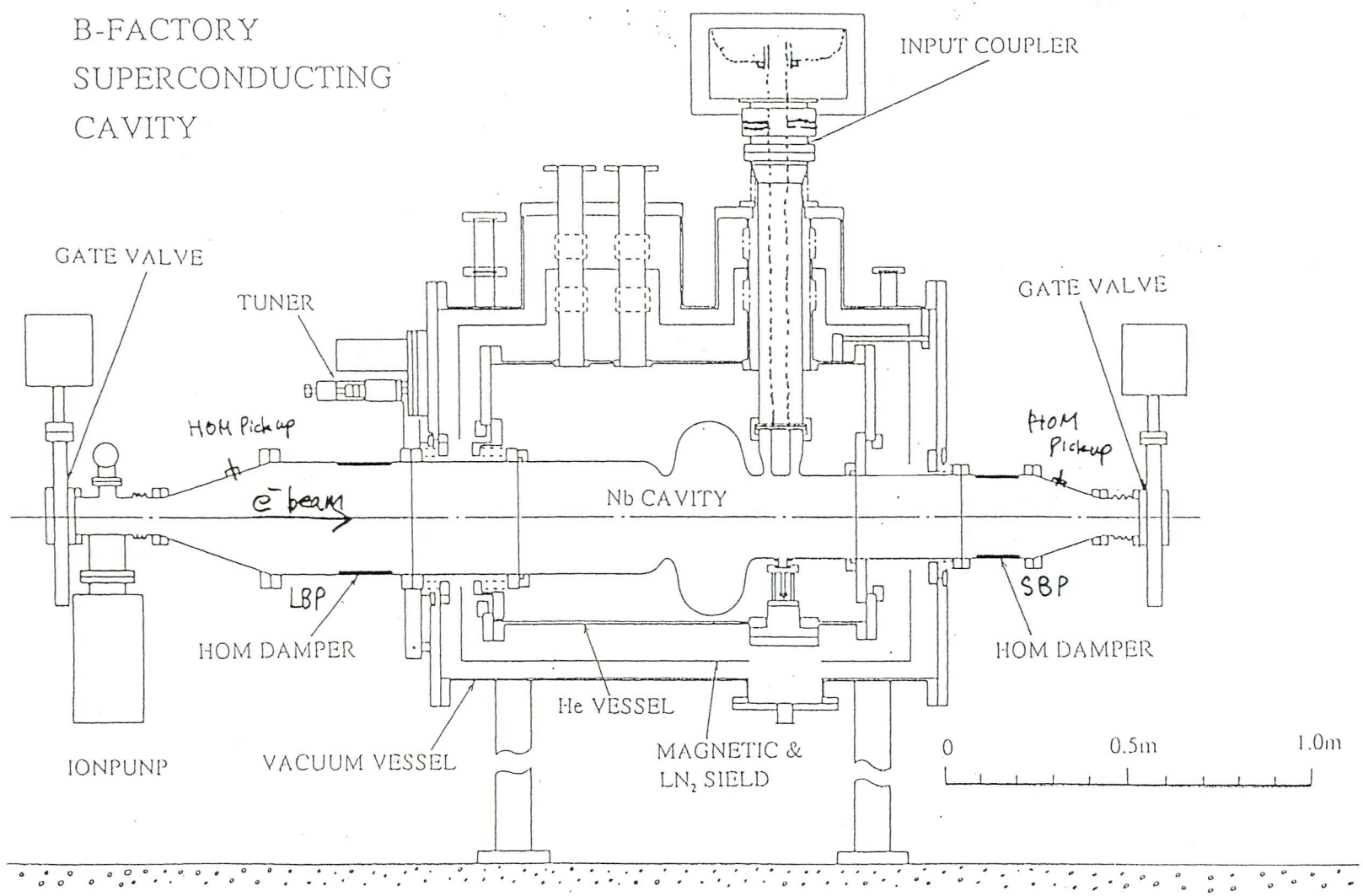
Input Coupler Rinsing



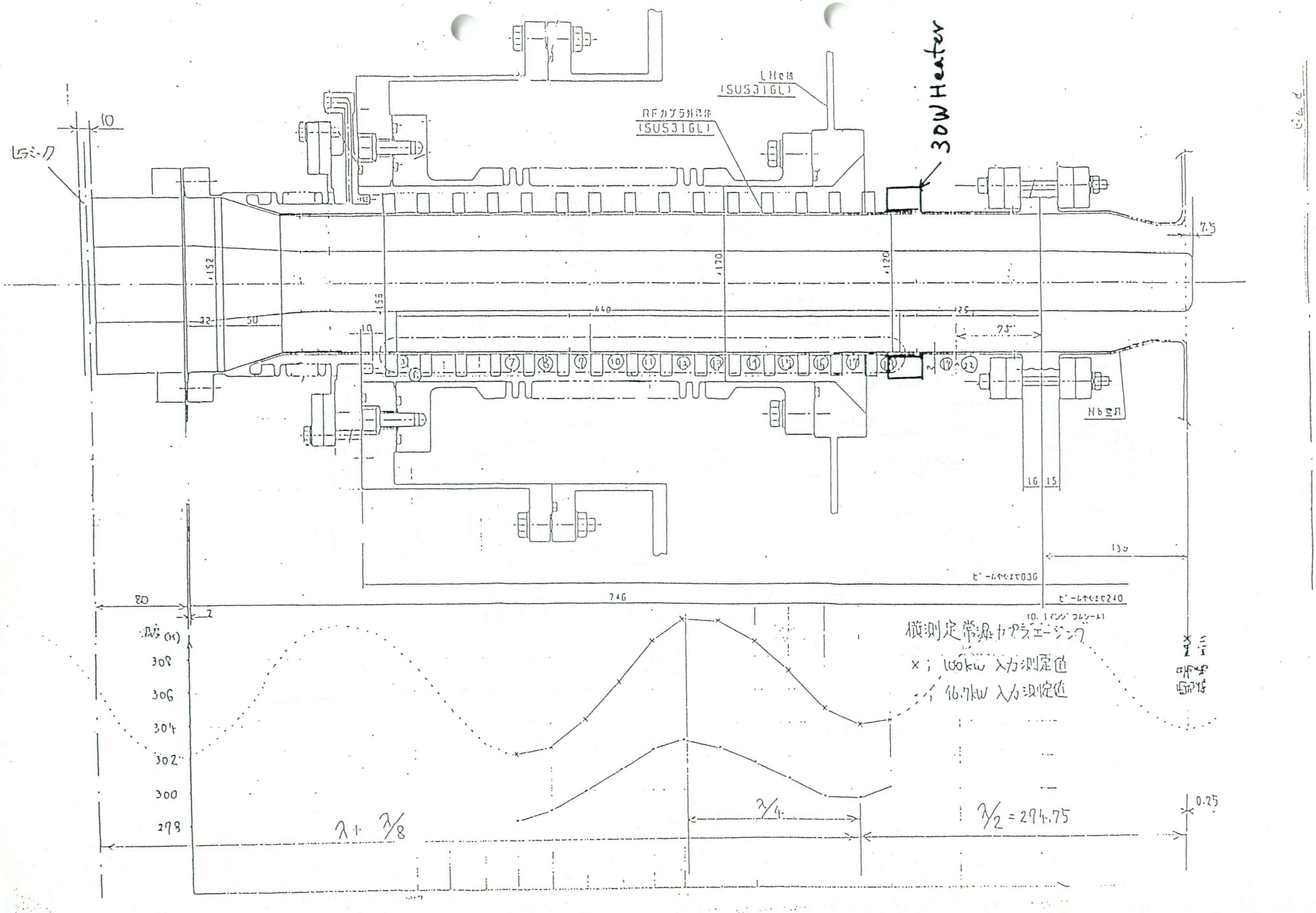
Ceramic Window for Our High Power Input Coupler

	New Al_2O_3	800^0C	TiN coating	1000^0C	800^0C	OUR
Surface conductivity by AES	Resistive (charge up)	Conductive	Resistive (charge up)	Conductive	Conductive	Less conductive
Surface Carbon Contamination ($\lesssim$10Å)	1	1.7		2.0	1.8	0.27
x;				0.68	0.48	0.67
TiNxO1-x			after	Ar ion 30sec	0.64	0.67
(TiC ; not included)				11min	0.66	0.67

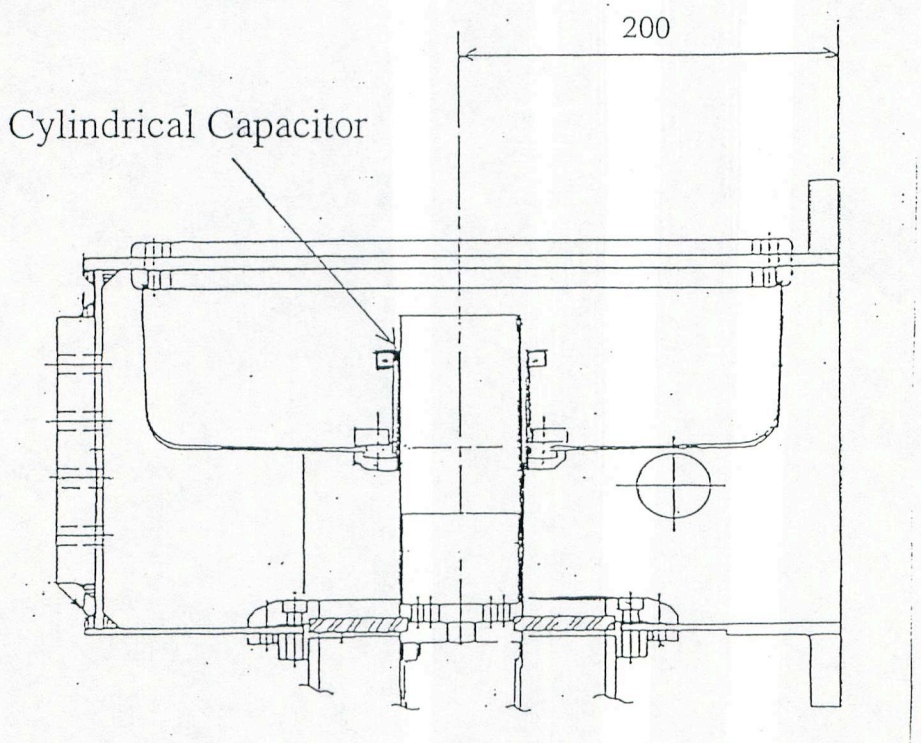
W15 Asano et al


B-FACTORY
SUPERCONDUCTING
CAVITY
INPUT COUPLER
GATE VALVE
TUNER
GATE VALVE
HOM Pickup
HOM Pickup
e⁻ beam
Nb CAVITY
LBP
SBP
HOM DAMPER
HOM DAMPER
He VESSEL
IONPUNP
VACUUM VESSEL
MAGNETIC &
LN2 SIELD
0
0.5m
1.0m

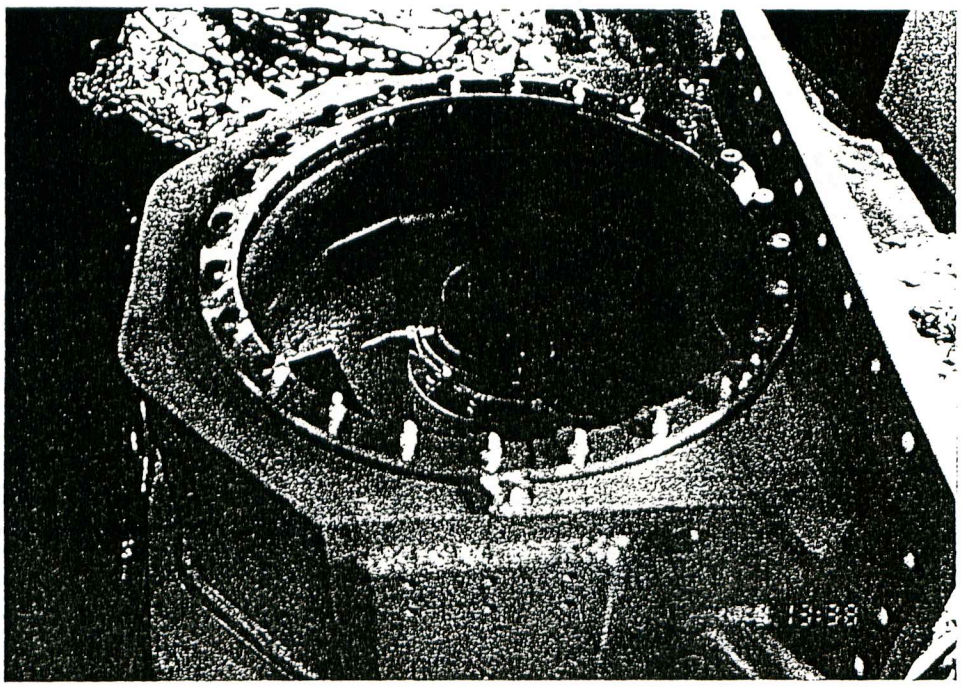
~3.1m

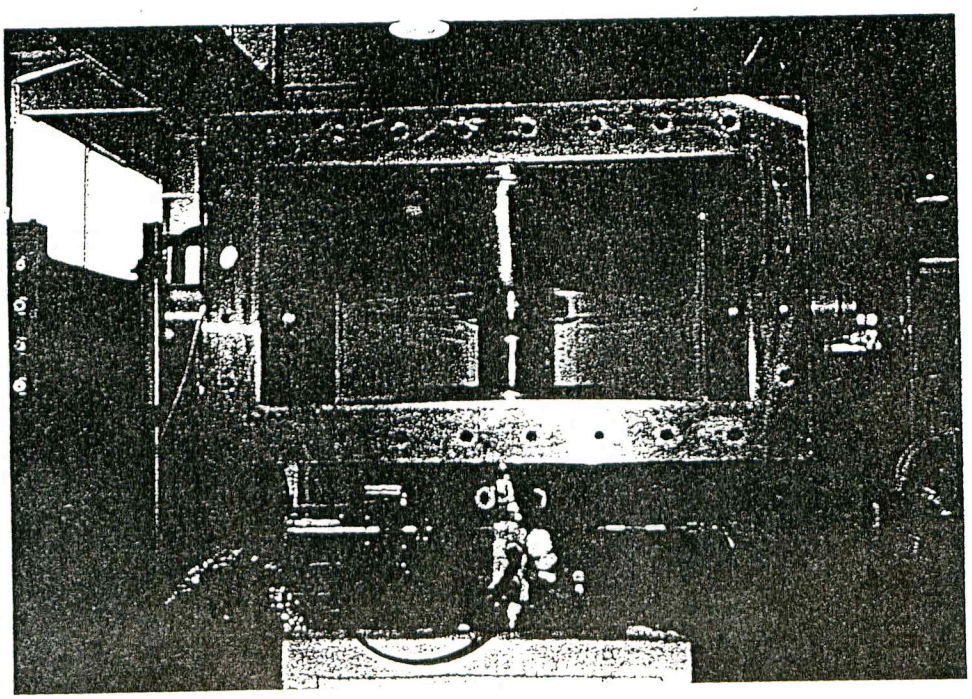

セラミック
LHe槽
(SUS316L)
RFカプラ外容器
(SUS316L)
30W Heater
横測定常温カプラエージング
×; 100kW 入力測定値
; 16.7kW 入力測定値
λ+ λ/8
λ/4
λ/2 = 294.75

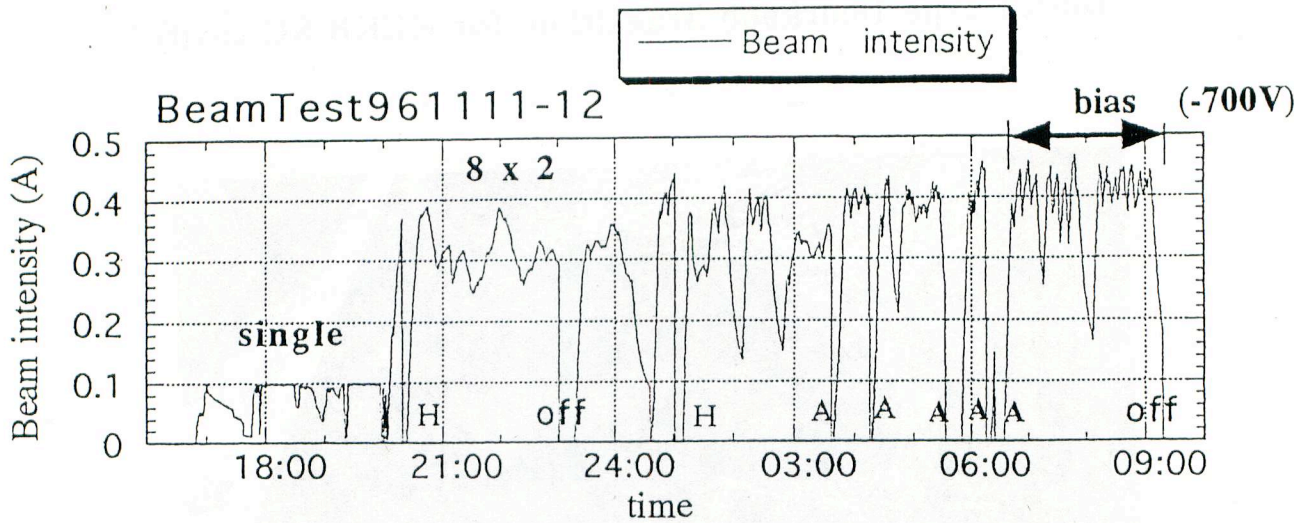
Biased Type Doorknob Transition for KEKB SC cavity

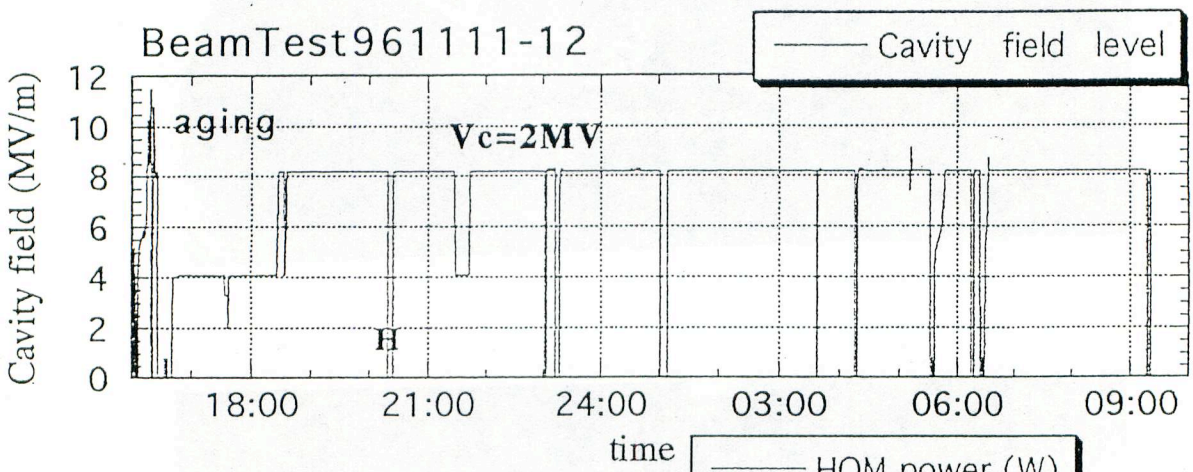


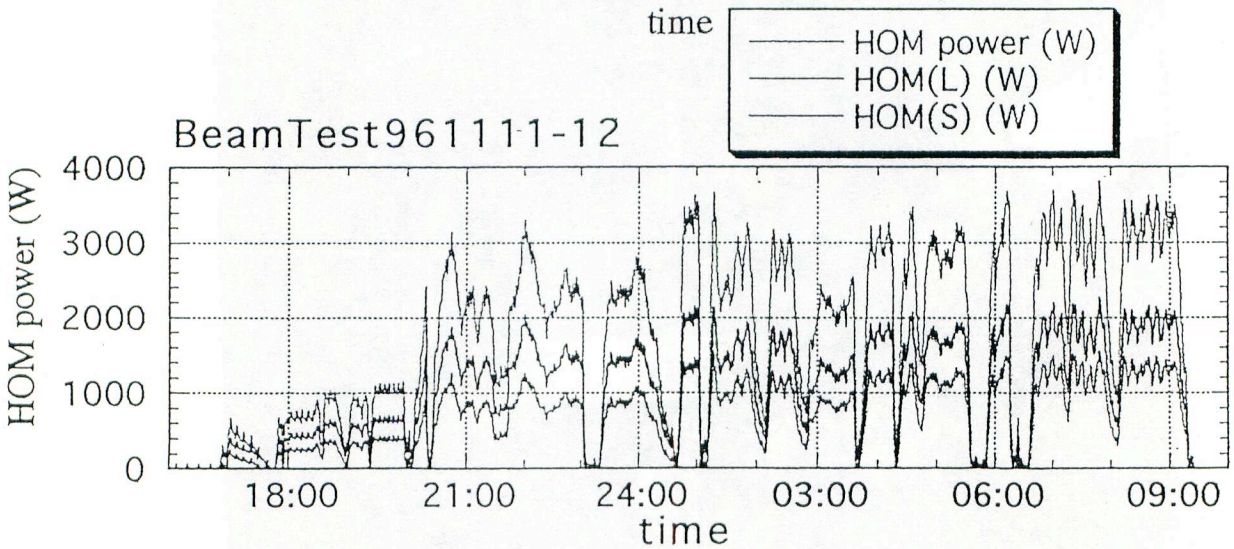
Biased Type Doorknob Transition for KEKB SC cavity



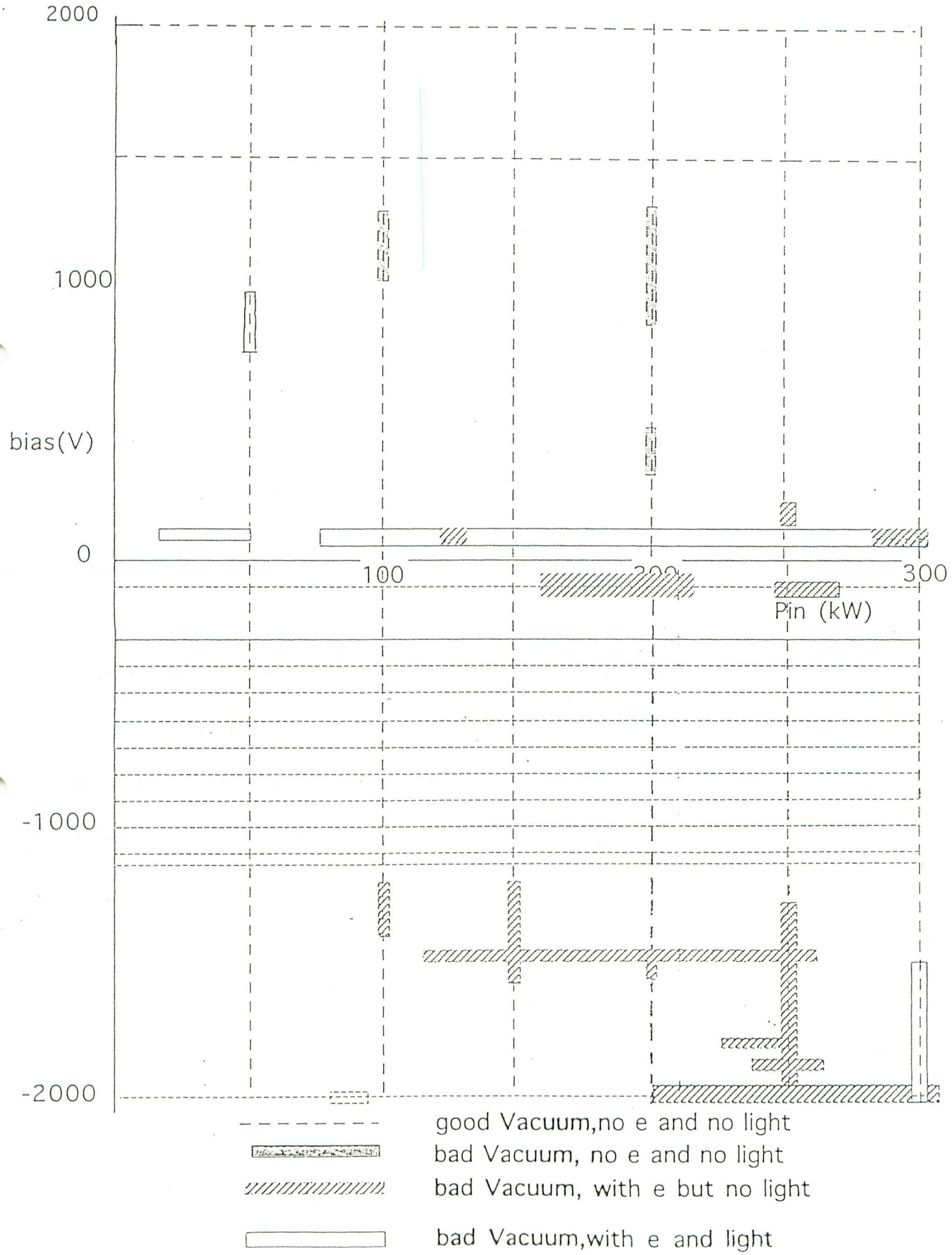



Beam intensity
BeamTest961111-12
bias (-700V)
8 x 2
single
H
off
H
A
A
A
A
A
off
Beam intensity (A)
0.5
0.4
0.3
0.2
0.1
0
18:00
21:00
24:00
03:00
06:00
09:00
time

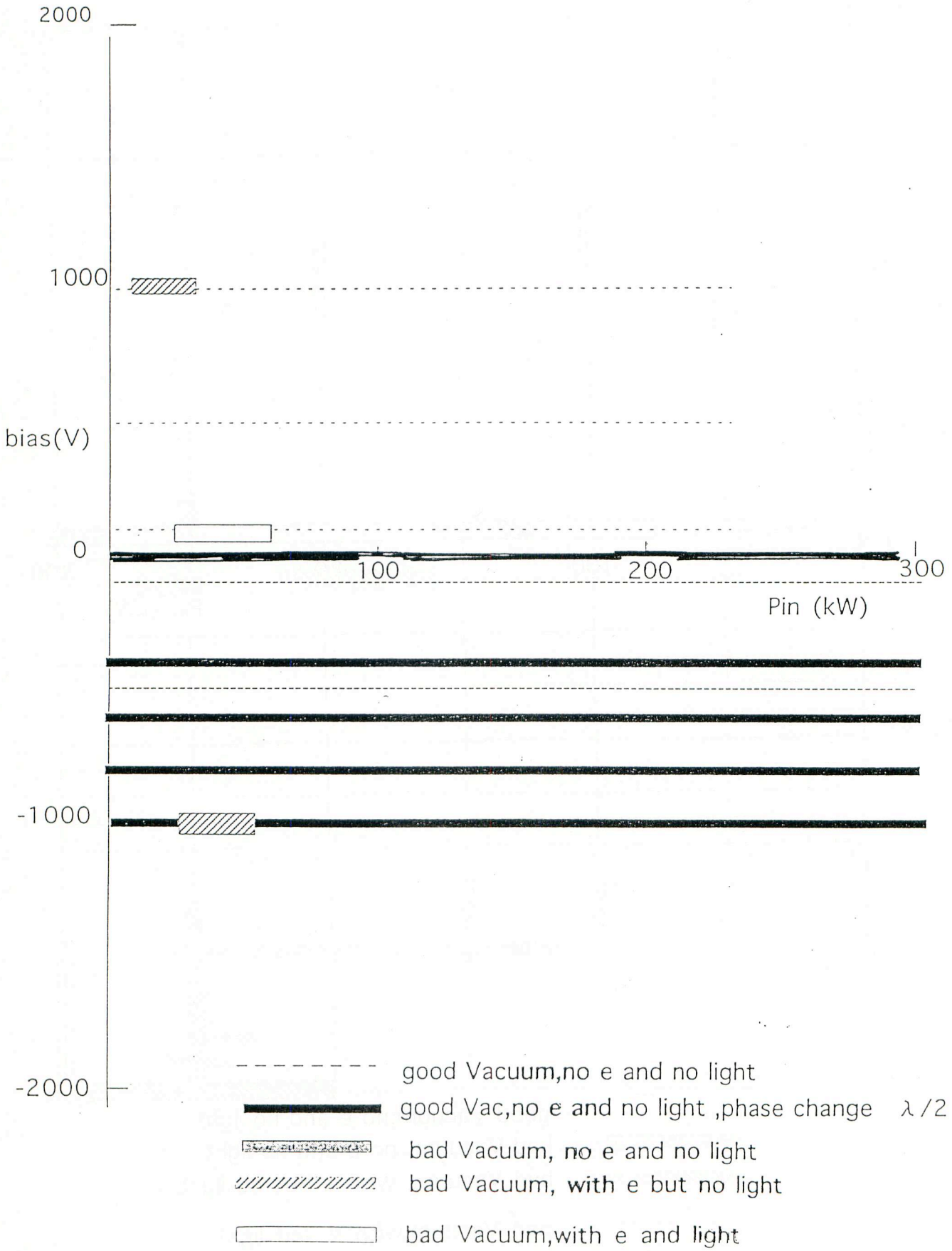

BeamTest961111-12
Cavity field level
aging
Vc=2MV
H
Cavity field (MV/m)
12
10
8
6
4
2
0
18:00
21:00
24:00
03:00
06:00
09:00
time

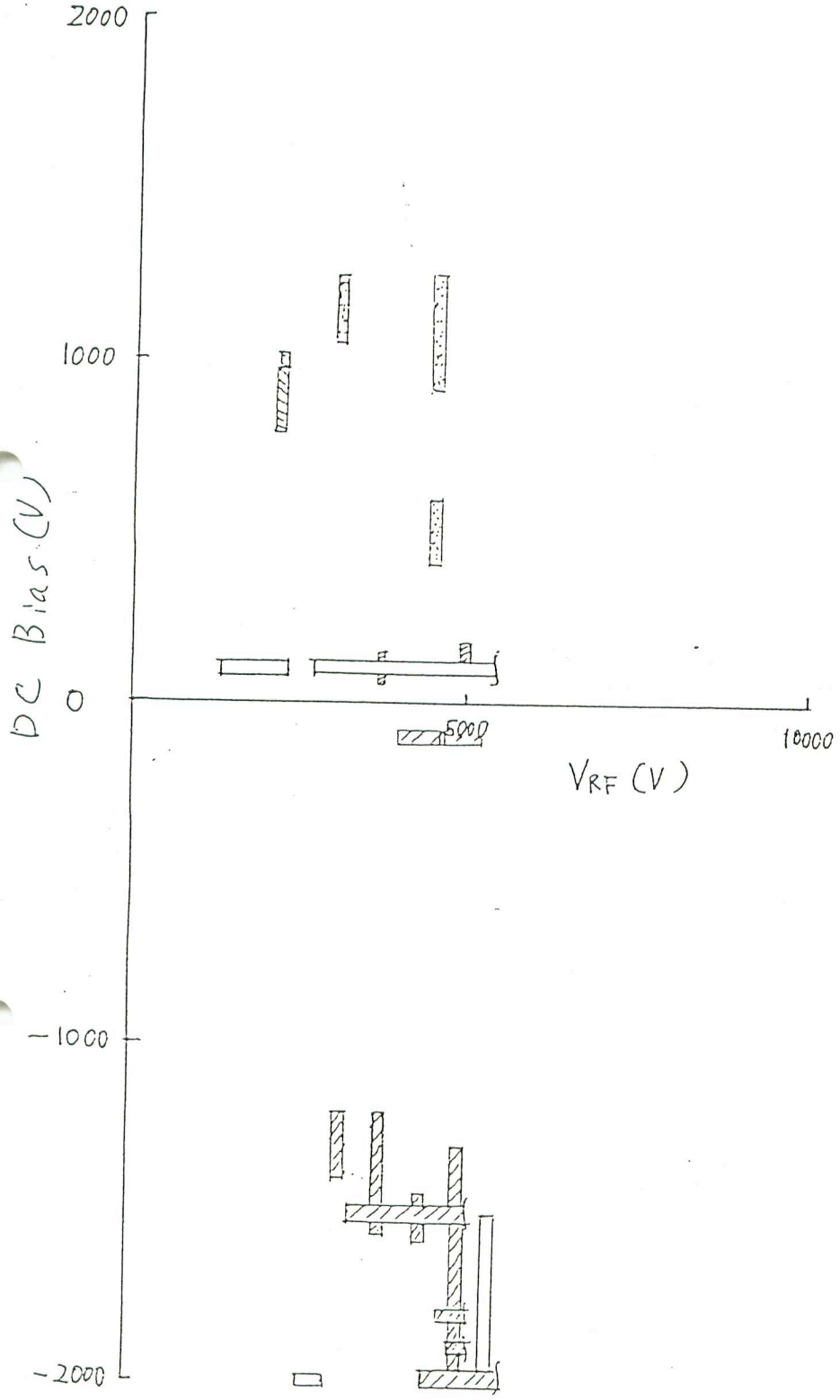

HOM power (W)
HOM(L) (W)
HOM(S) (W)
BeamTest961111-12
HOM power (W)
4000
3000
2000
1000
0
18:00
21:00
24:00
03:00
06:00
09:00
time

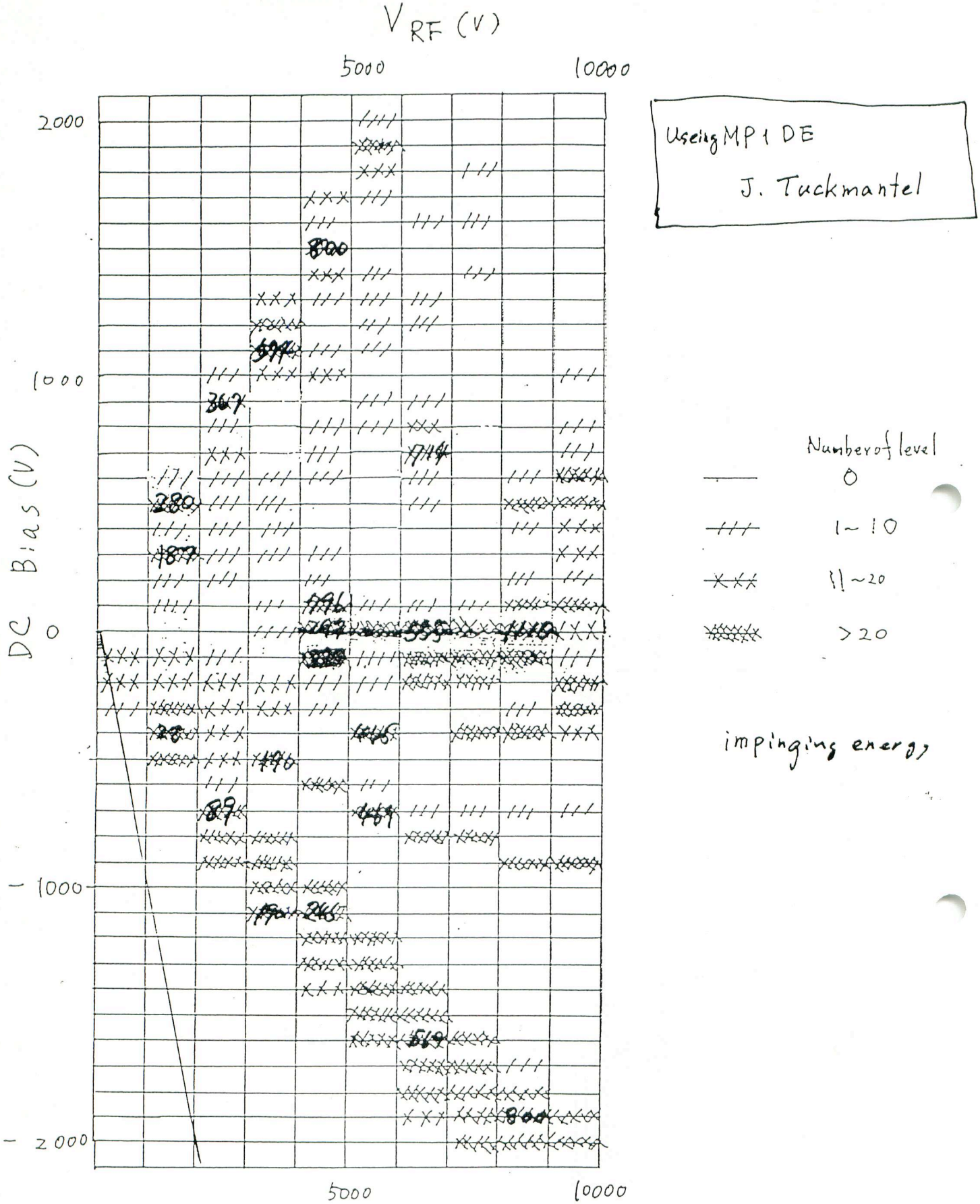
Coupler test with bias
(Throu put Power Condition)



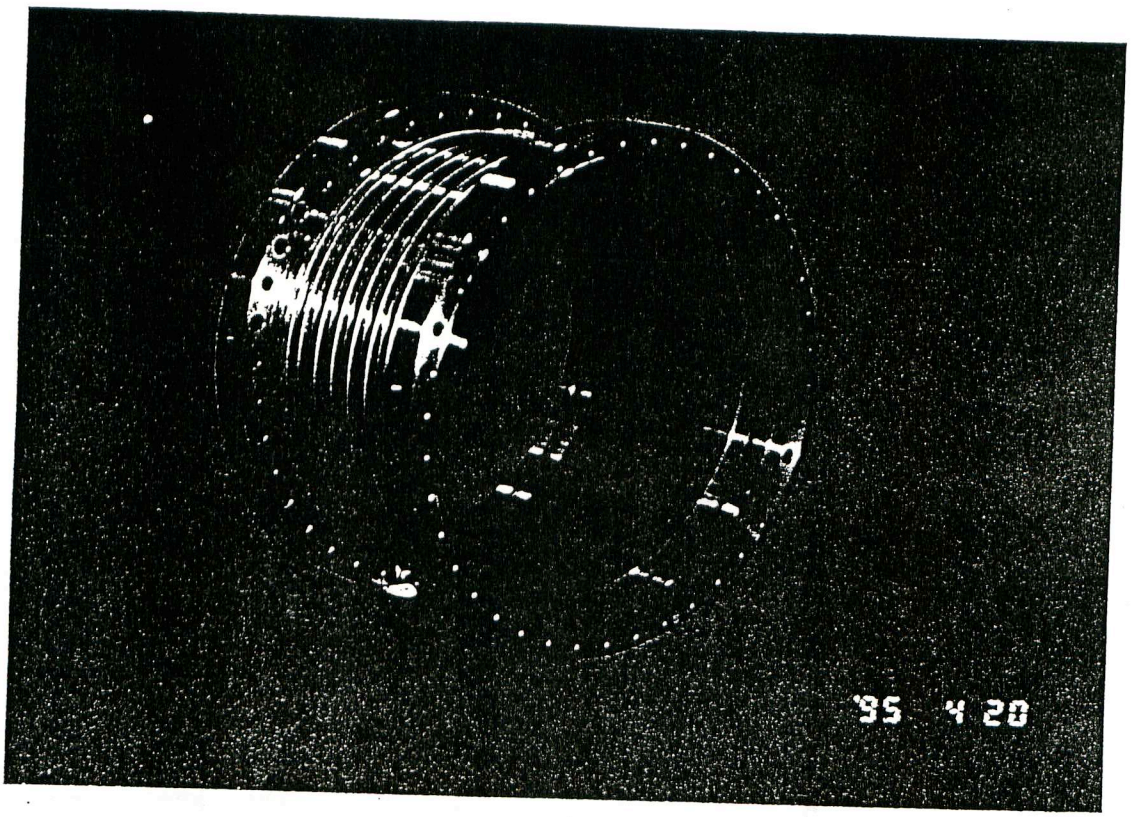
Coupler test with bias
(Total Reflection Condition)

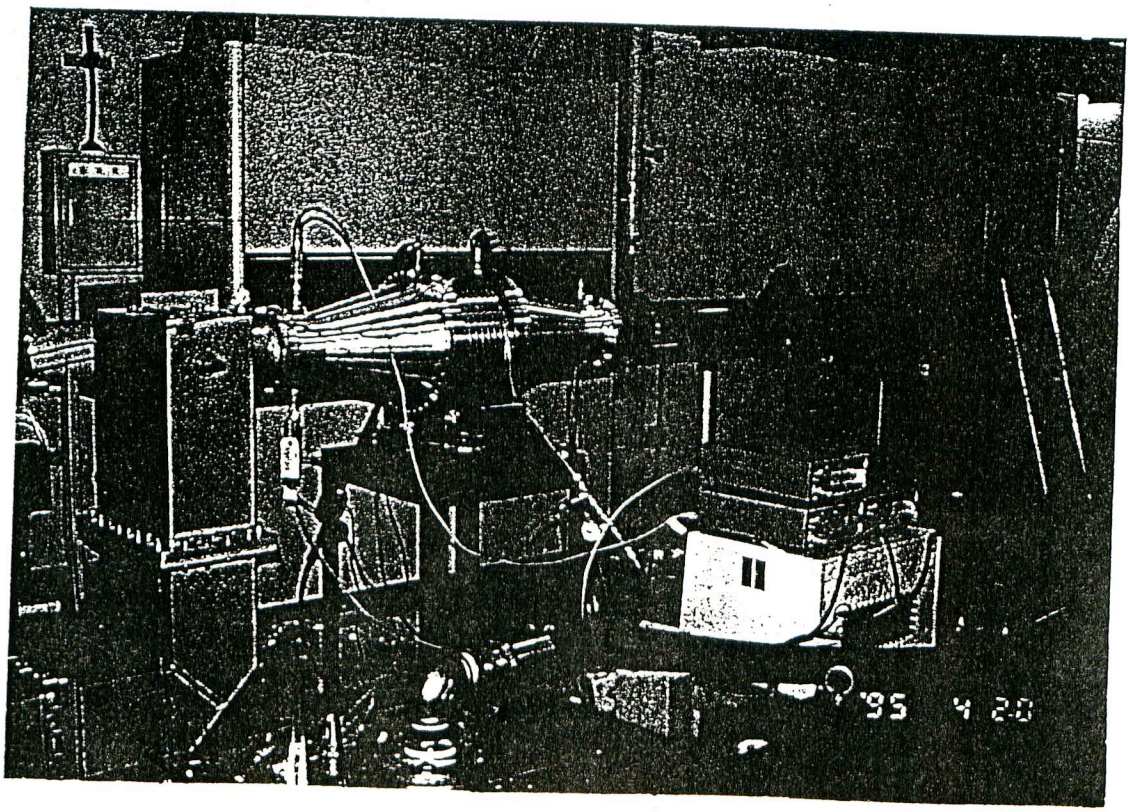



2000
1000
0
-1000
-2000
DC Bias (V)
5000
10000
VRF (V)



Map of Multipactor level density.





$P_{abs} \sim 15 kW$

SUMMARY

- We reached the design requirement but should continue detailed test for critical coponents.
- The improuvement of the vacuum pumpes and surface treatment of vacuum ducts nearest to SCC is essential for stable operation of SCC. For HER we will add NEG pumps on usual ionpumps.

Summary

- We constracted OUR equipment in KEK. The OUR rinse will be use to clean up vacuum compornents and input couplers.
- The bias type doorknob transition will be used for HER modules. Tow doorknob transition which have VSWR less than 1.10 were made by Furukawa.