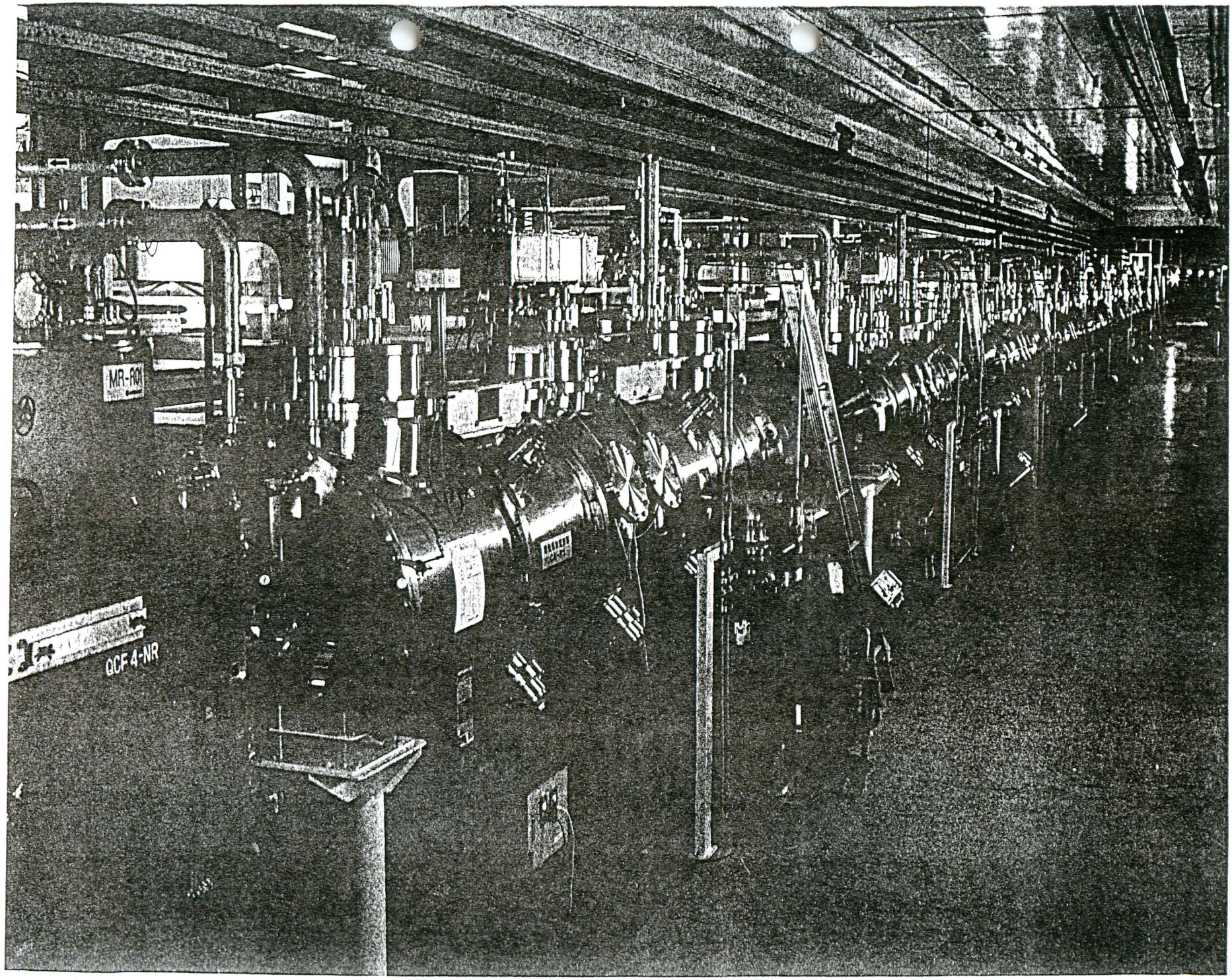
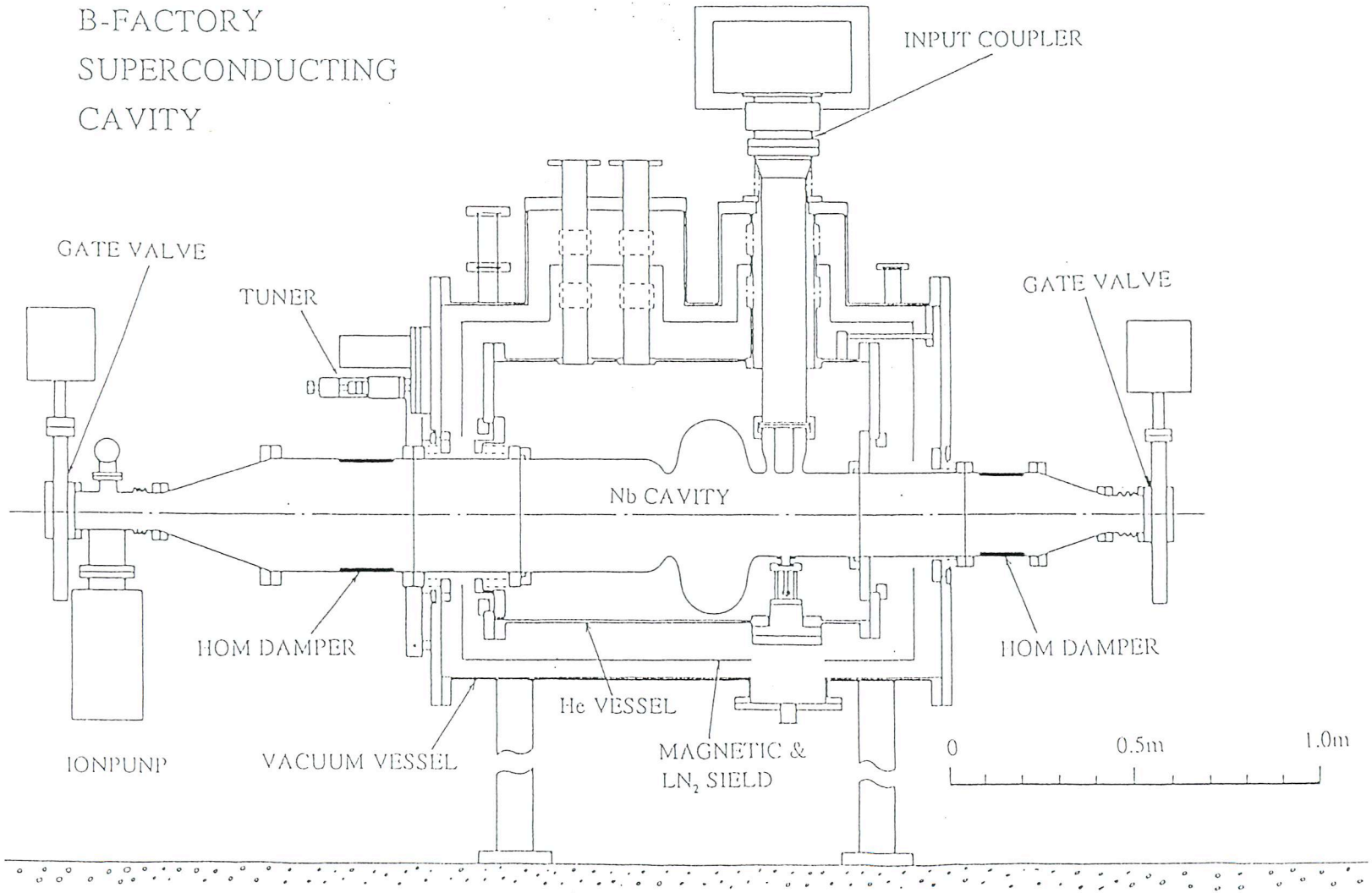
Superconducting Cavity for B-Factory

S. Mitsunobu


MR-RQ1
QCF 4-NR

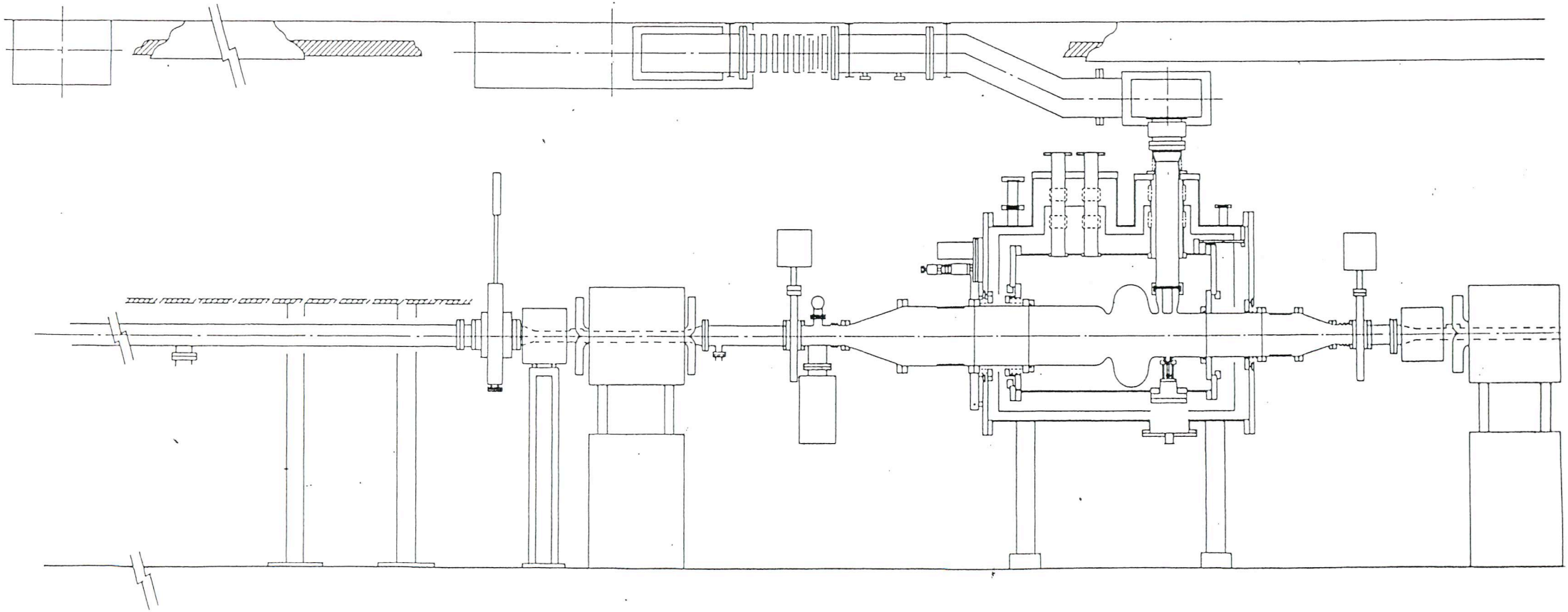
B-FACTORY
SUPERCONDUCTING
CAVITY



~3.1m

SCRF AR Beam Test

April 1996~



Superconducting Cavity for KEK B-Factory

			TRISTAN (5cell)	Cornell
Structure				
Frequency	508.6 MHz		508.6	500
	single cell structure		5 cell	single
Cavity length	960.9 mm		1965mm	760
Cell length	243 mm		296 mm	240
RF Parameters				
R/Q	93.3	Ohm / cell	120 Ω/cell	89
Q - value (Cu)	4.28×10^4			
Geometrical Factor	251	Ohm	269	
Field Strength				
Eacc (cell=0.3m)	$32.2 \times \sqrt{PQ}$	V/m		
Esp/Eacc	2.3		1.97	2.5
Hsp/Eacc	50.0	Gauss/ MV/m	40.6	51.6

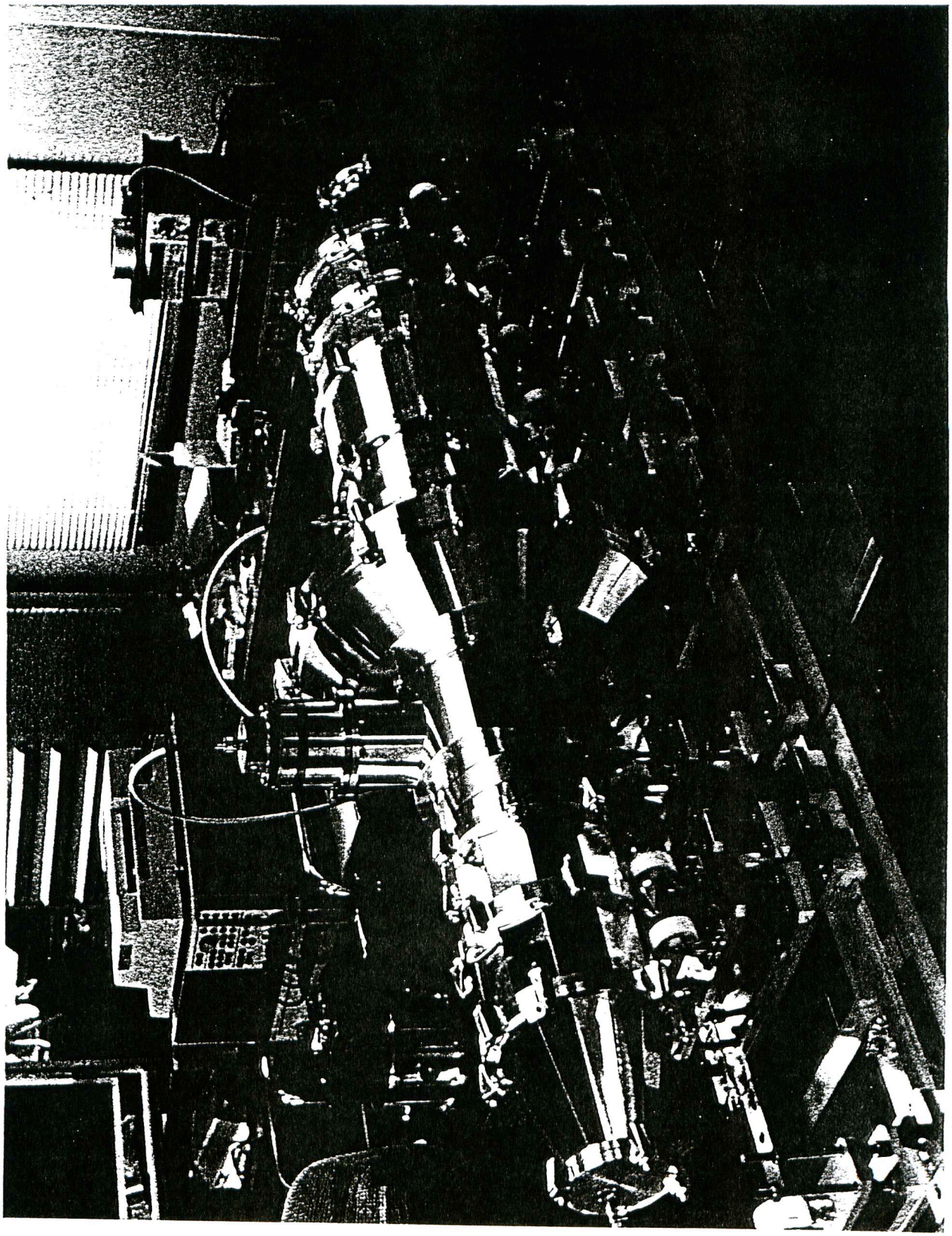


Table 8.8: The measured frequency and the Q value of HOMs together with the power generated by the beam of 1.1A in the HER.

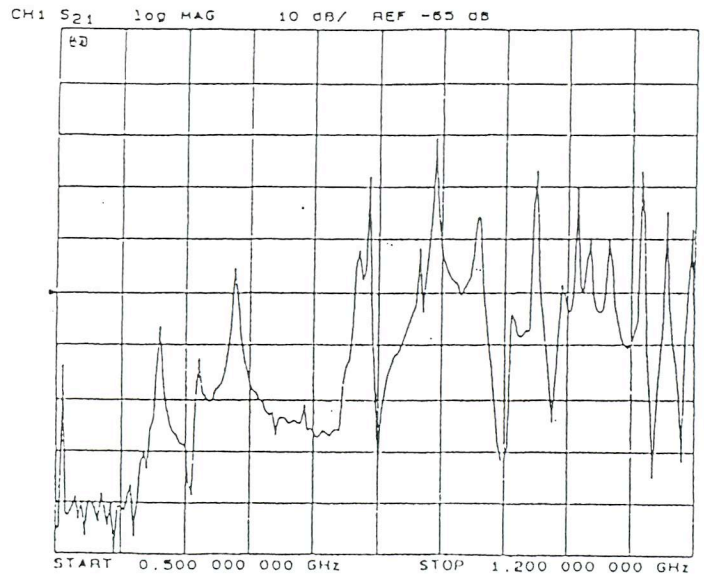
monopole

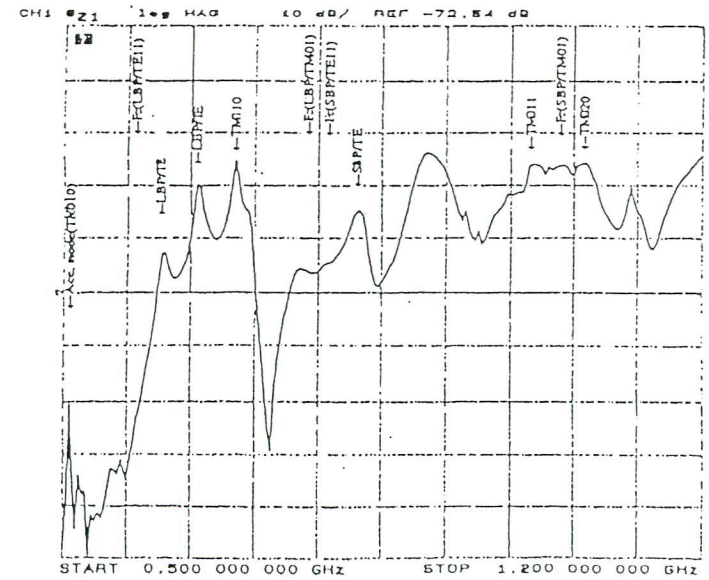
frequency	mode	R/Q	Q	power
(measured)		(URMEL)	(measured)	
MHz		Ohm		$Watts$
783	LBP-TM01	0.12	132	-
834	LBP-TM01	0.34	72	-
1018	TM011	6.6	106	900
1027	TM020	6.4	95	201
1065	SBP-TM01	1.6	76	4
1076	LBP-TM01	3.2	65	6
1134	LBP-TM01	1.7	54	1

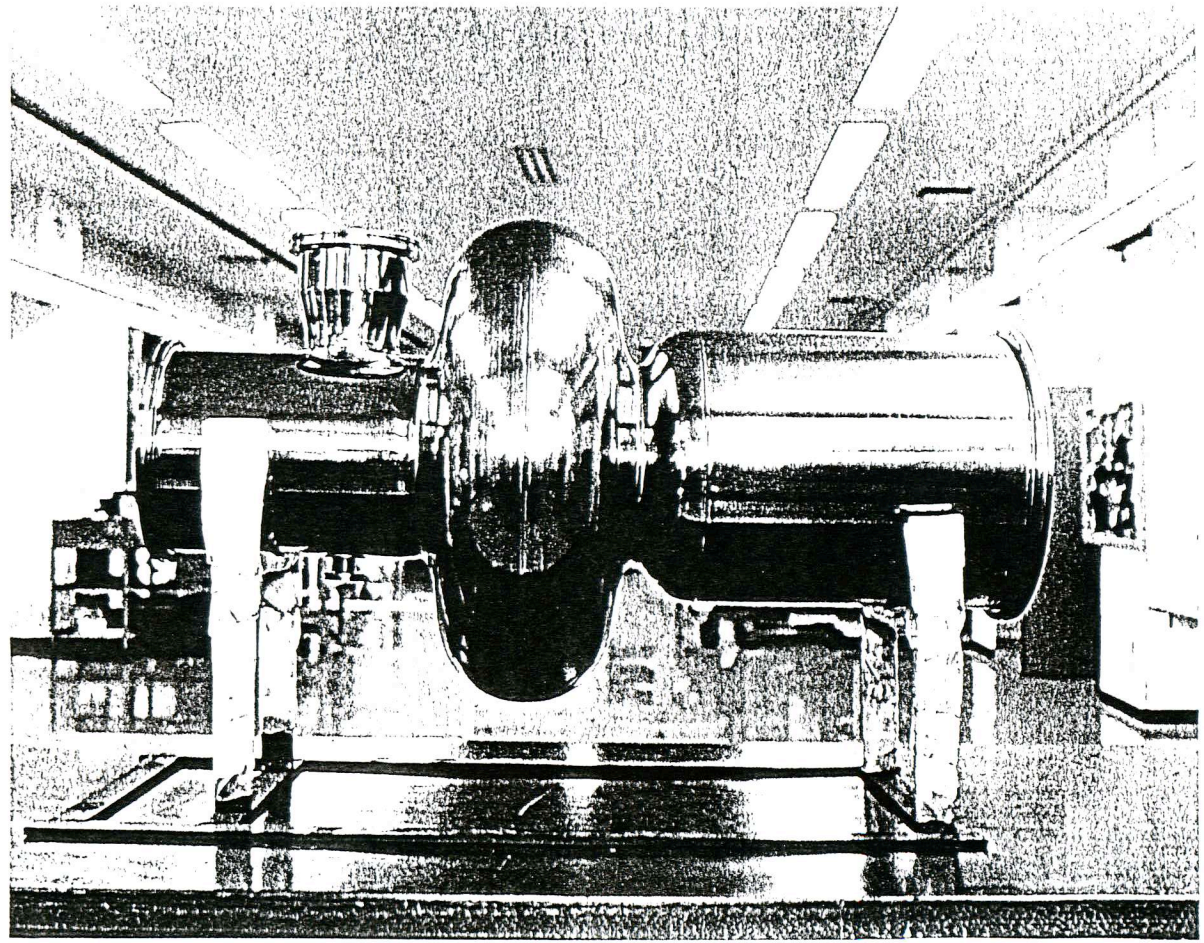
dipole

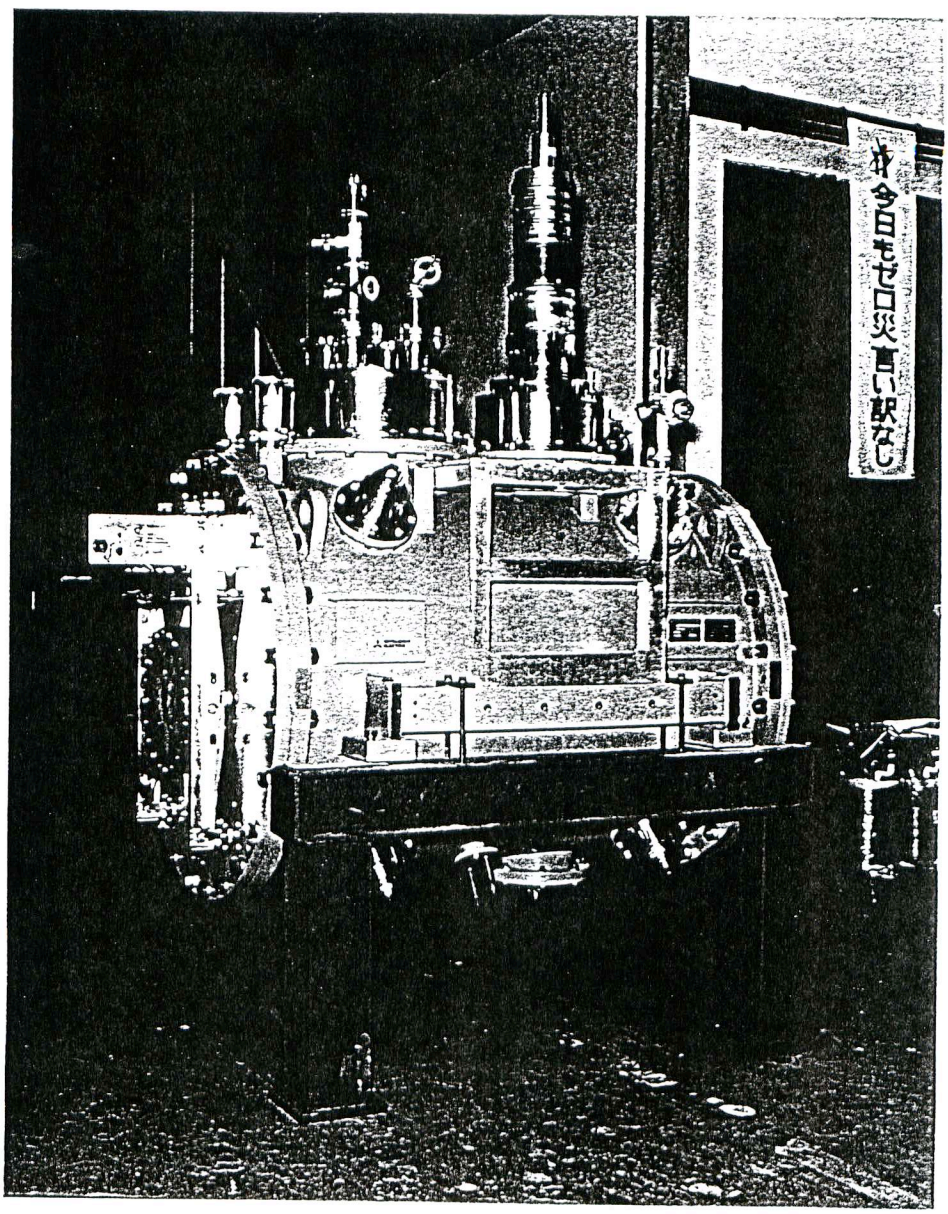
frequency	mode	R/Q'	Q
(measured)		(URMEL)	(measured)
MHz		Ohm/m	
609	LBP-TE11	1.9	92
648	LBP-TE11	40.19	120
688	LBP-TE11	170.4	145
705	TM110	227.3	94
825	SBP-TE11	6.16	60
888	SBP-TE11	3.52	97

$R/Q' = (R/Q)_r/kr^2, \quad (\ r = 5cm\ )$


CH1 S21 log MAG 10 dB/ REF -65 dB
START 0.500 000 000 GHz
STOP 1.200 000 000 GHz


CH1 S21 log MAG 10 dB/ REF -72.54 dB
Fc(LBP/TE11)
LBP/TE
COP/TE
TM10
Fc(LBP/TM01)
Fc(SBP/TE11)
SBP/TE
TM11
Fc(SBP/TM01)
TM20
START 0.500 000 000 GHz
STOP 1.200 000 000 GHz




今日もゼロ災 言い訳なし

オゾン（O_3）処理法の開発.

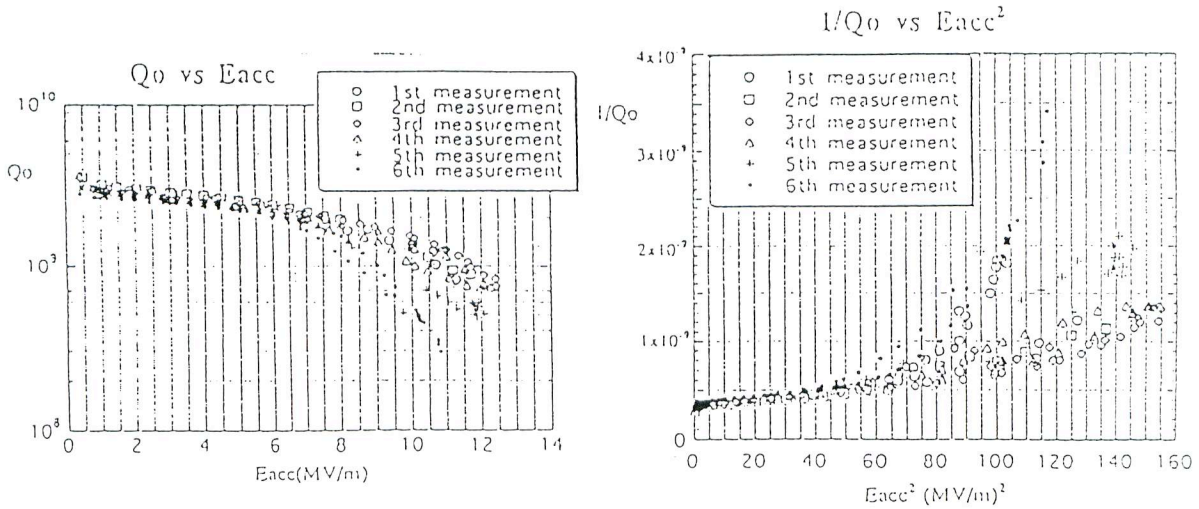


Fig. 4 Q_0 vs E_{acc} and $1/Q_0$ vs E_{acc}^2 curves for the 6 times tests of the B factory Nb cavity. 6th; after air exposure for 88 hours.

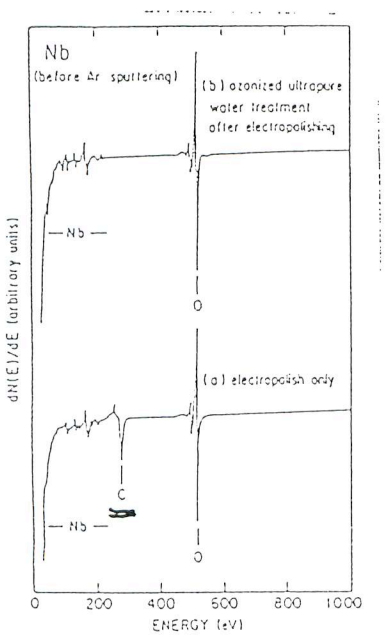


Fig. 5 AES data for the Nb surfaces after EP only(a) and after ozonized ultrapure water treatments(b).

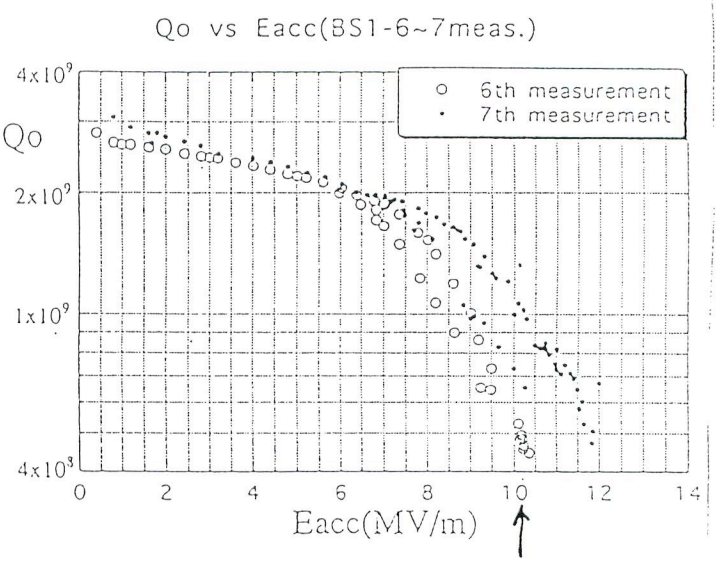
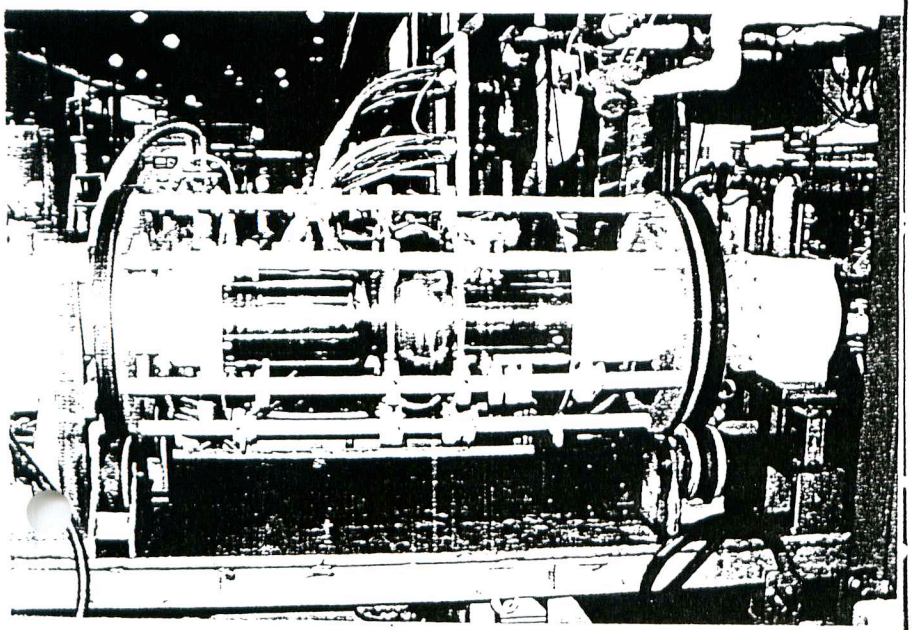
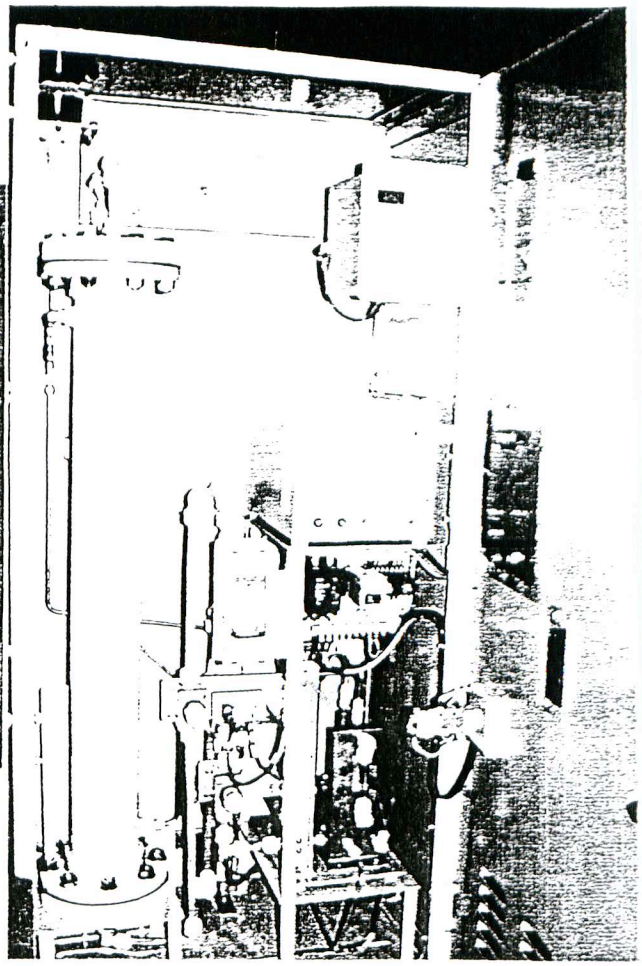
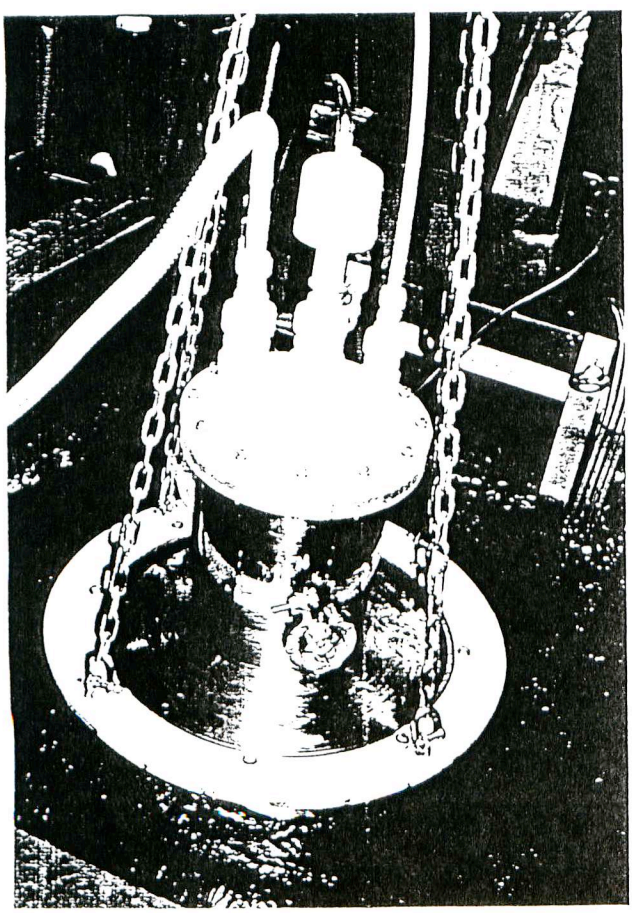
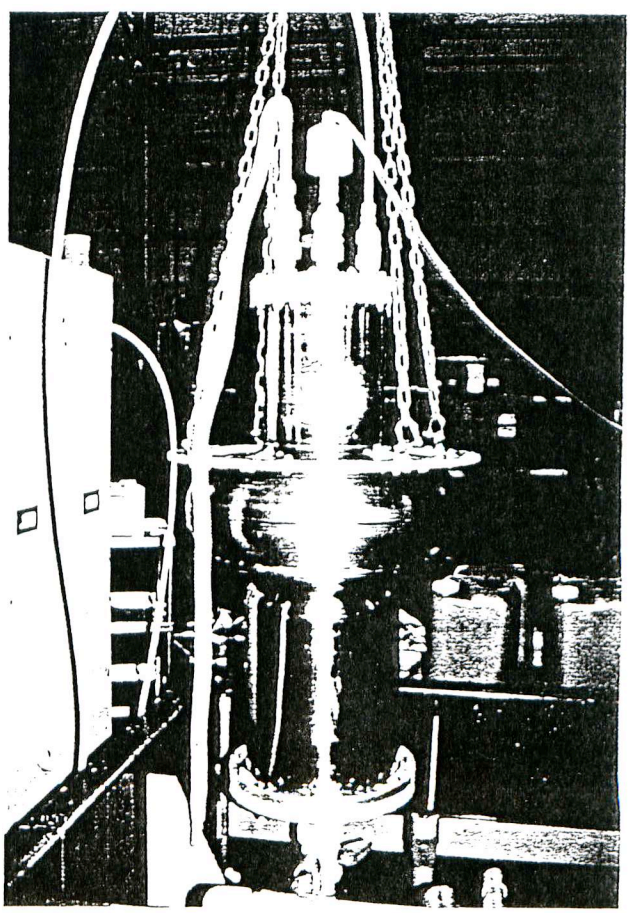


Fig.6 Performance recovery of the B factory Nb cavity by ozonized ultrapure water rinsing

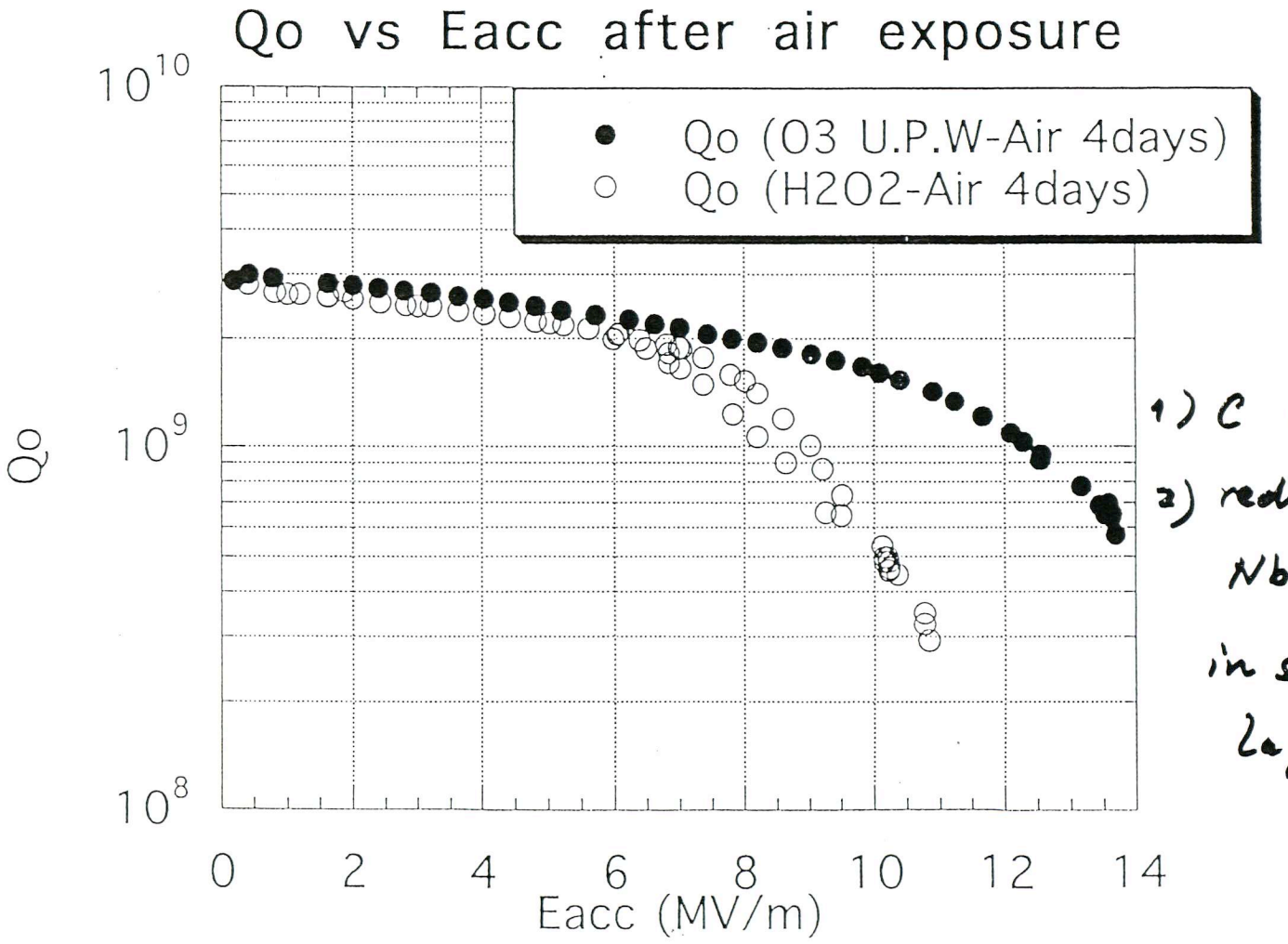




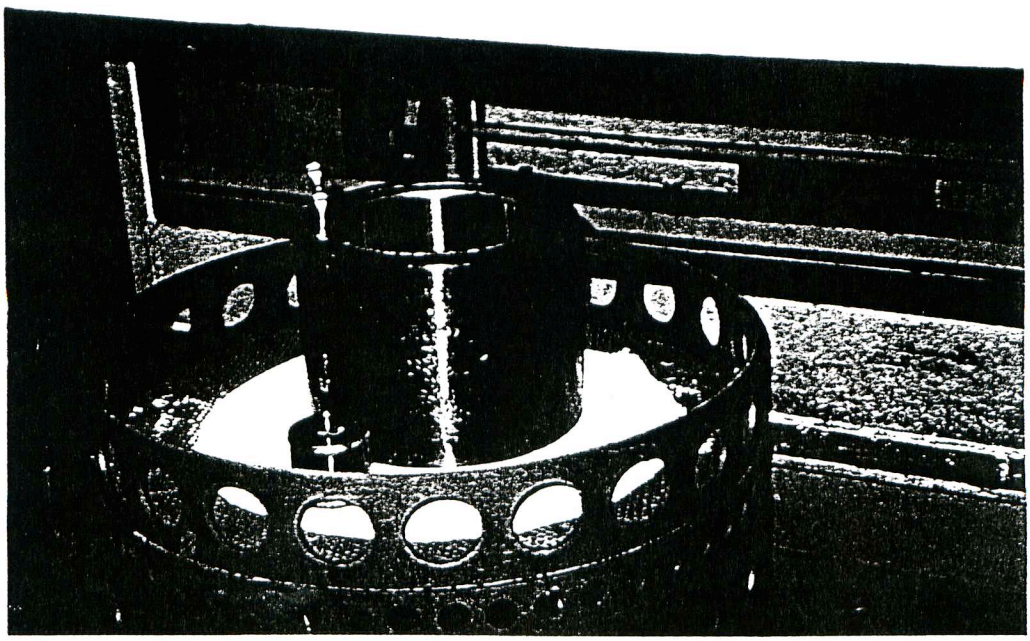


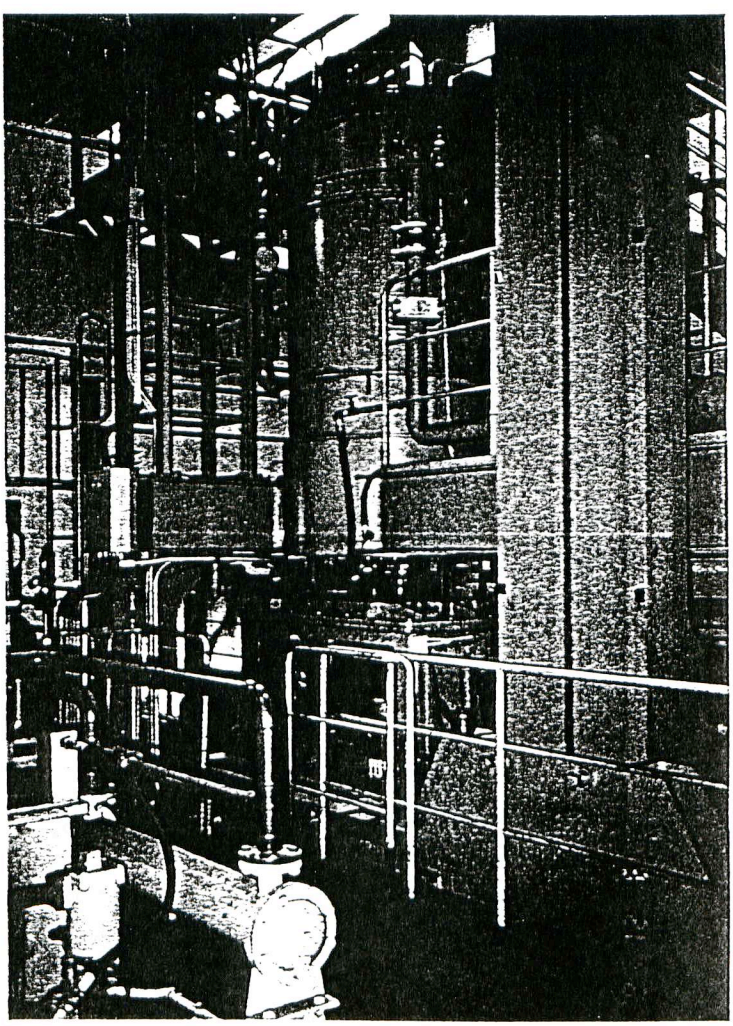


2×10^{14} L



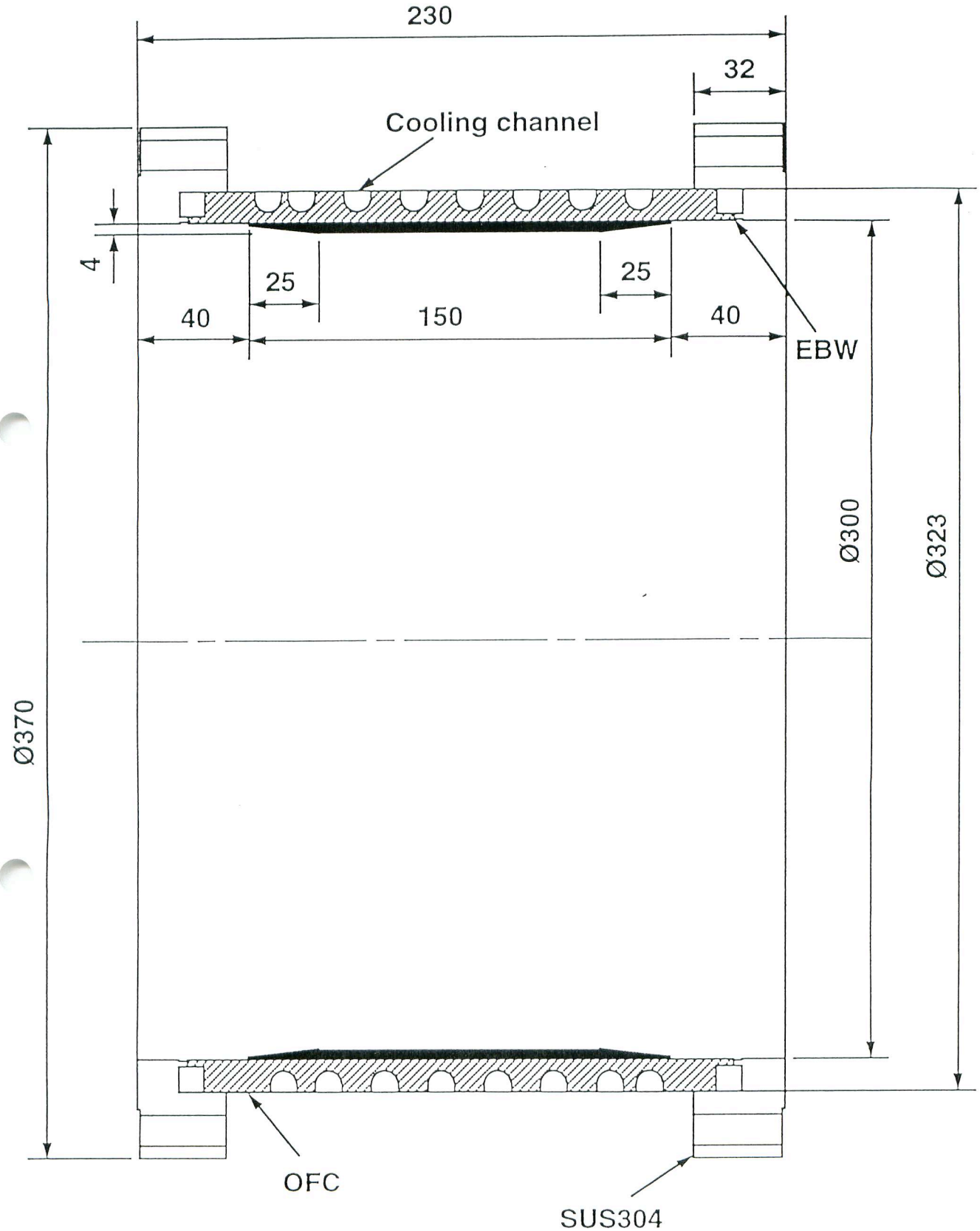
1) C removal
2) reduction of Nb hydroxide in surface oxide layers





HIP of full-size ferrite loads (300ϕ & 220ϕ)

Large Beam Pipe



C95052501

temperature to be 850°C, which is 150°C lower than that in the powder hot-pressing mentioned above. We also decided to hold the temperature at 300°C for 2 hours in the course of cooling to reduce the residual stress in the copper, thereby reducing the residual compressive stress in the ferrite.

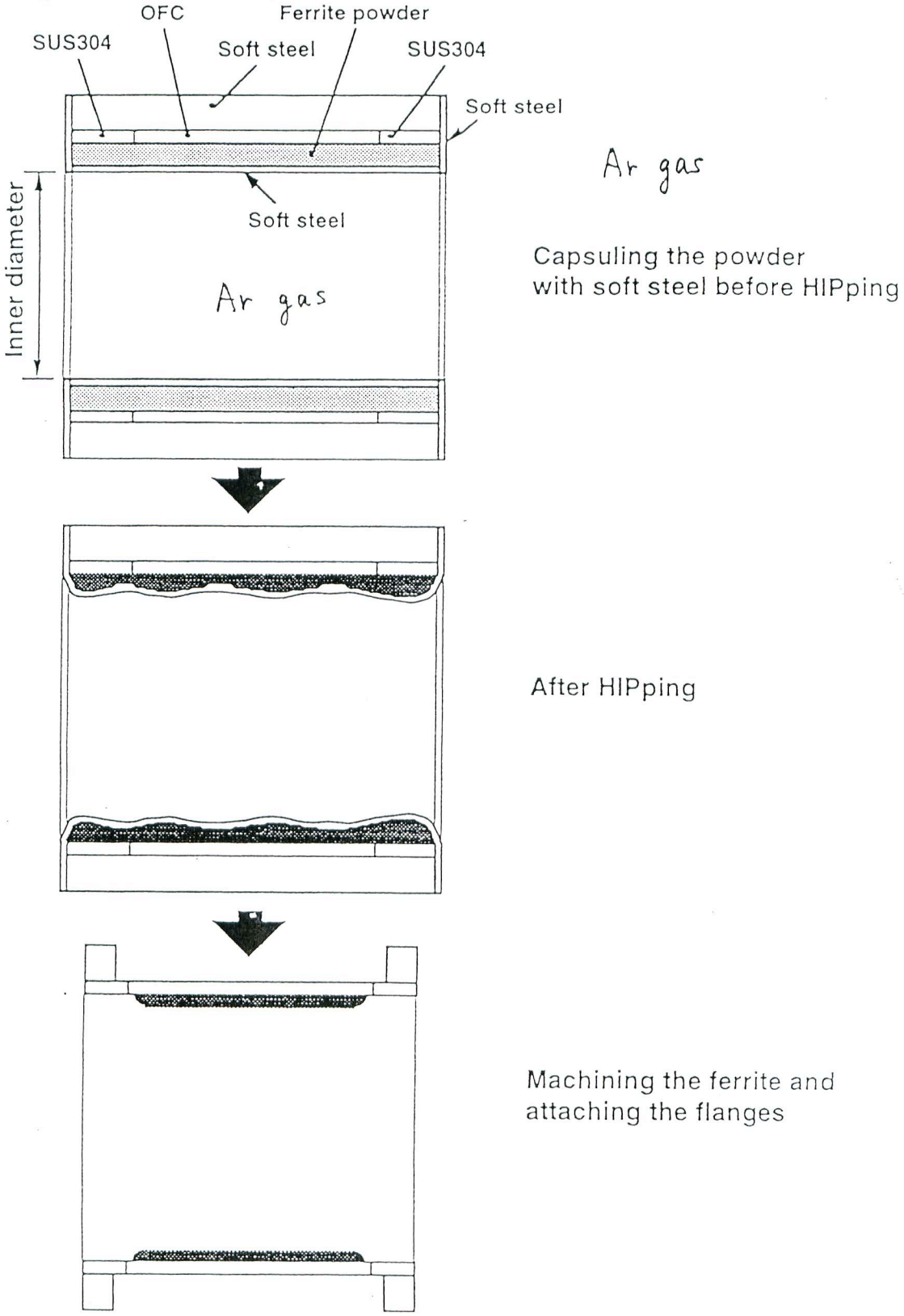
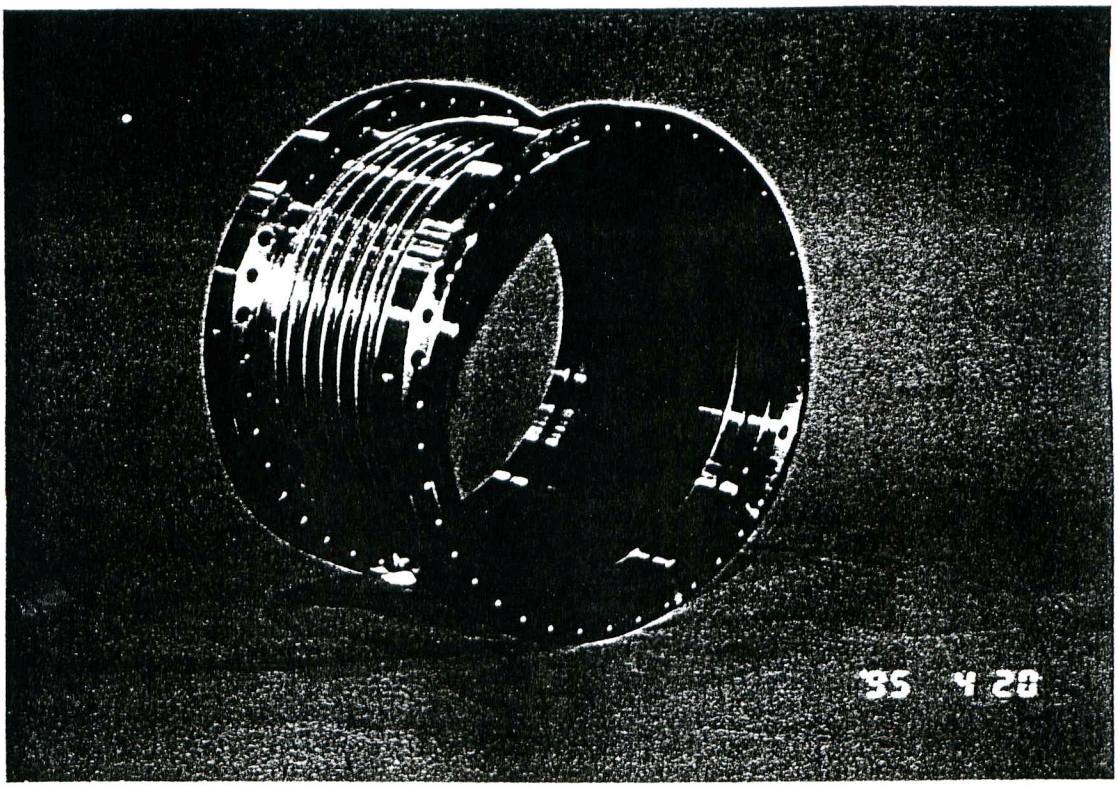
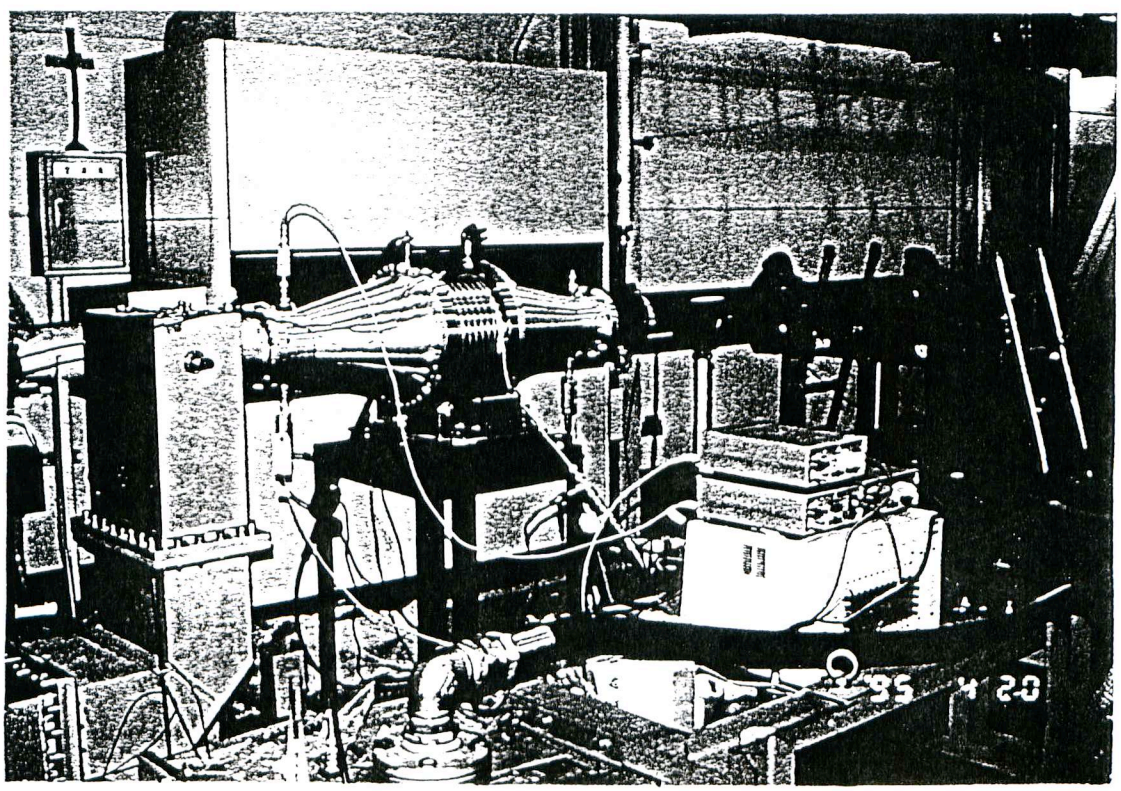


Fig. 16. Plan of the fabrication process of HOM load by HIPping.

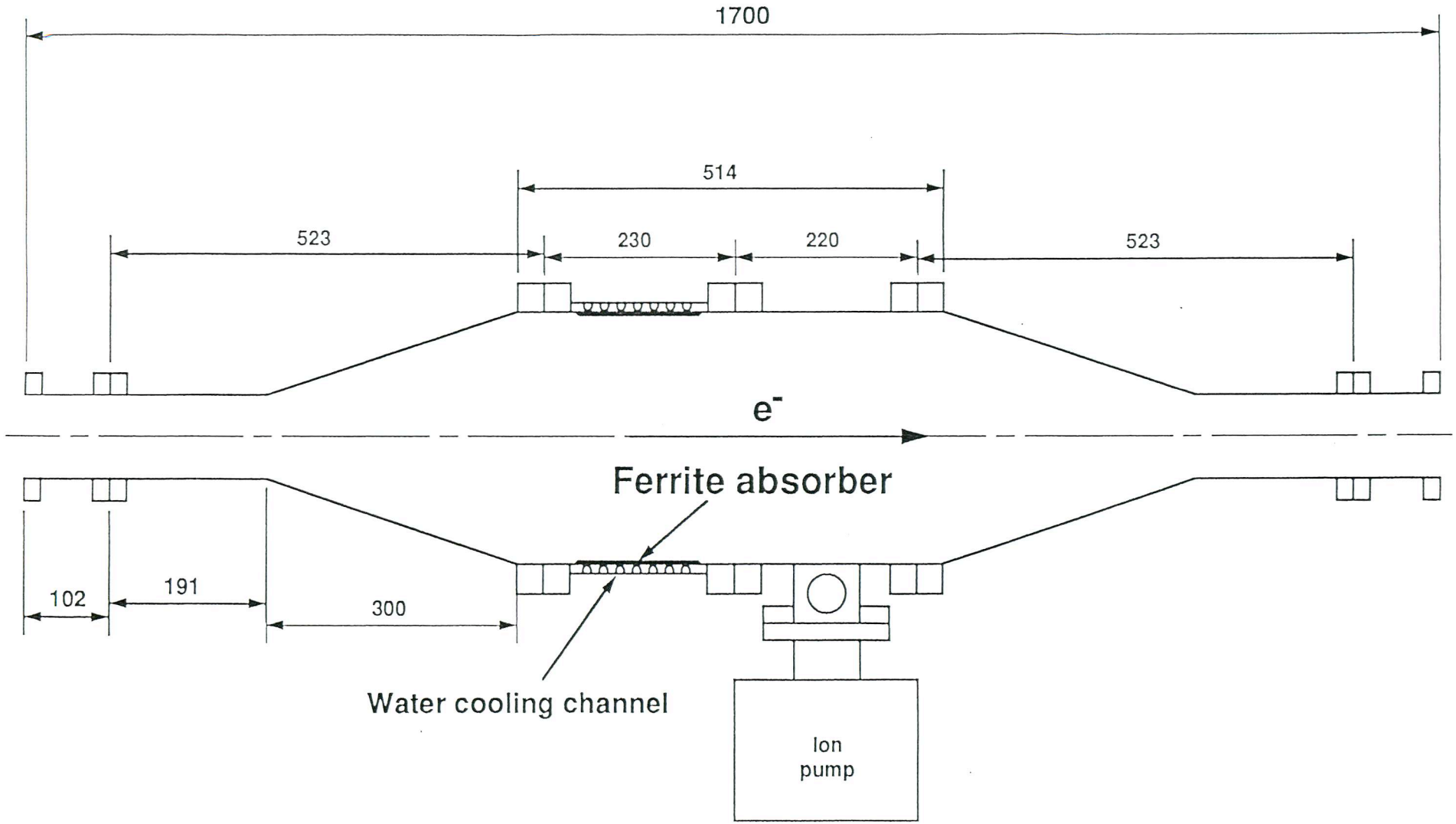

'95 4 20


'95 4 20

Results of 508 MHz Coax. High Power Test

- Up to 11.7 kW (S) and 14.8 kW (L) were absorbed with out any damage on ferrite.
- Up to an average power density of 14.6 W/cm^2 was reached.
- Temperature distribution on ferrite was flat and the max. temp. was 140 - 149 C.

Ferrite Absorber for MR Beam Test



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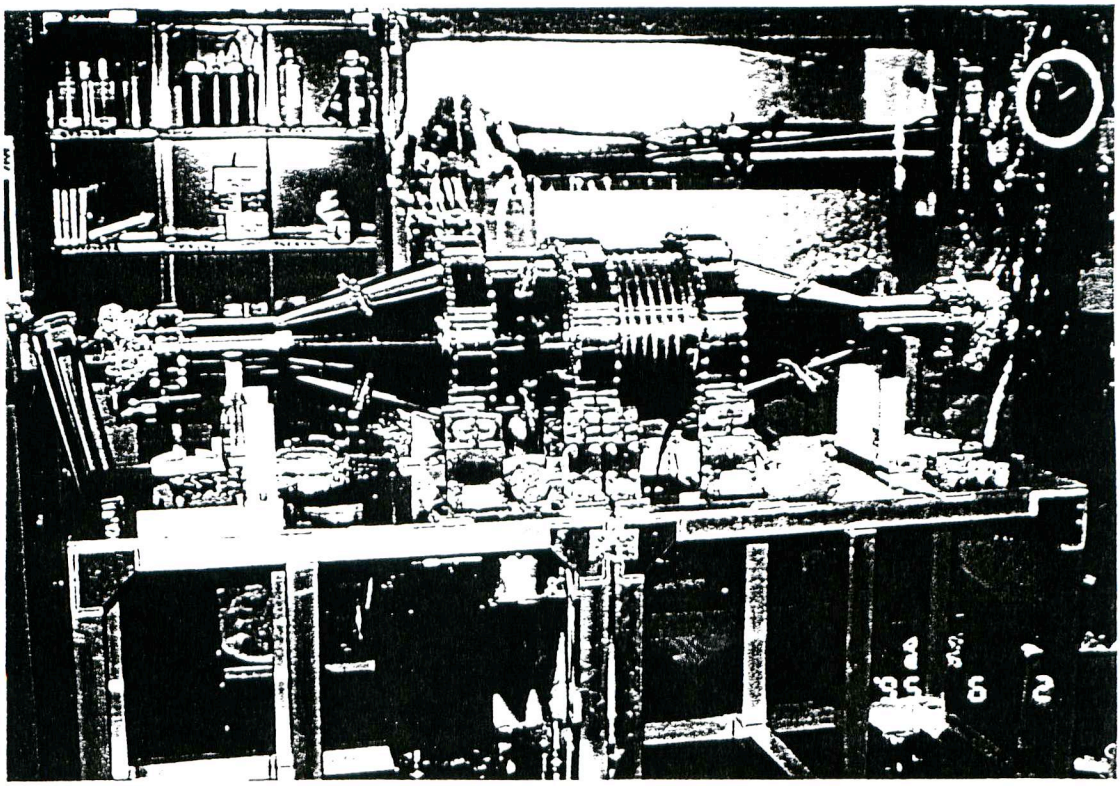
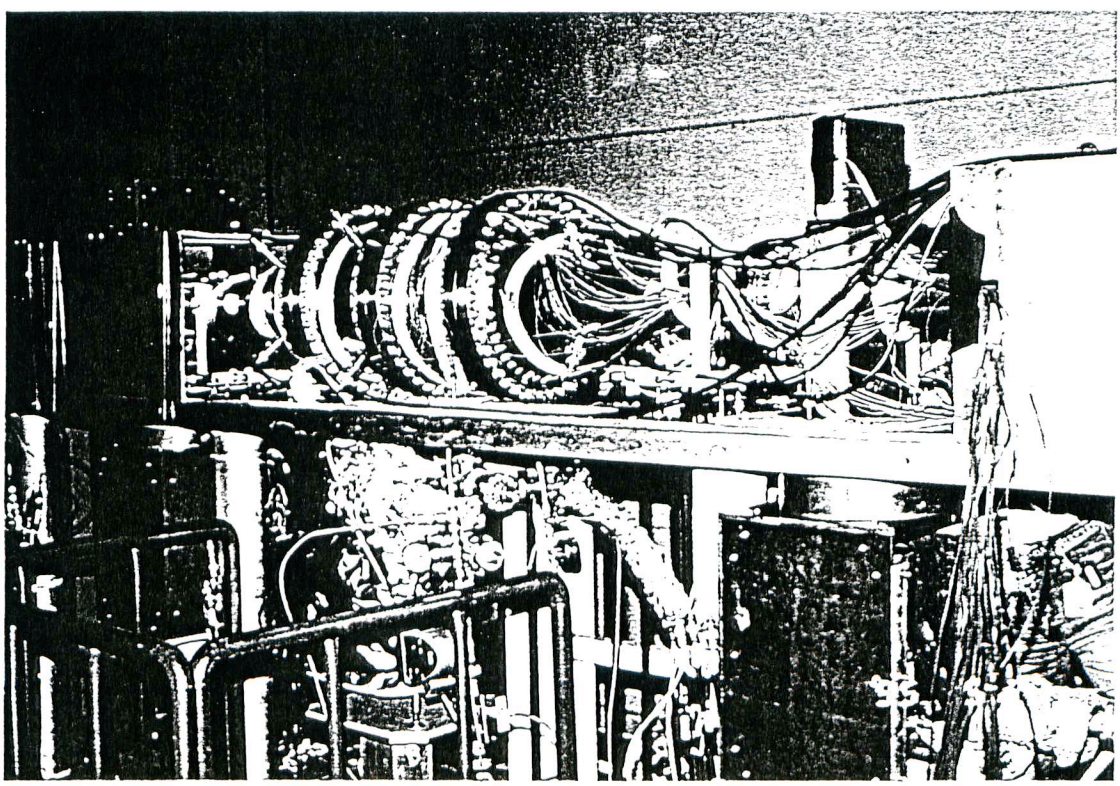
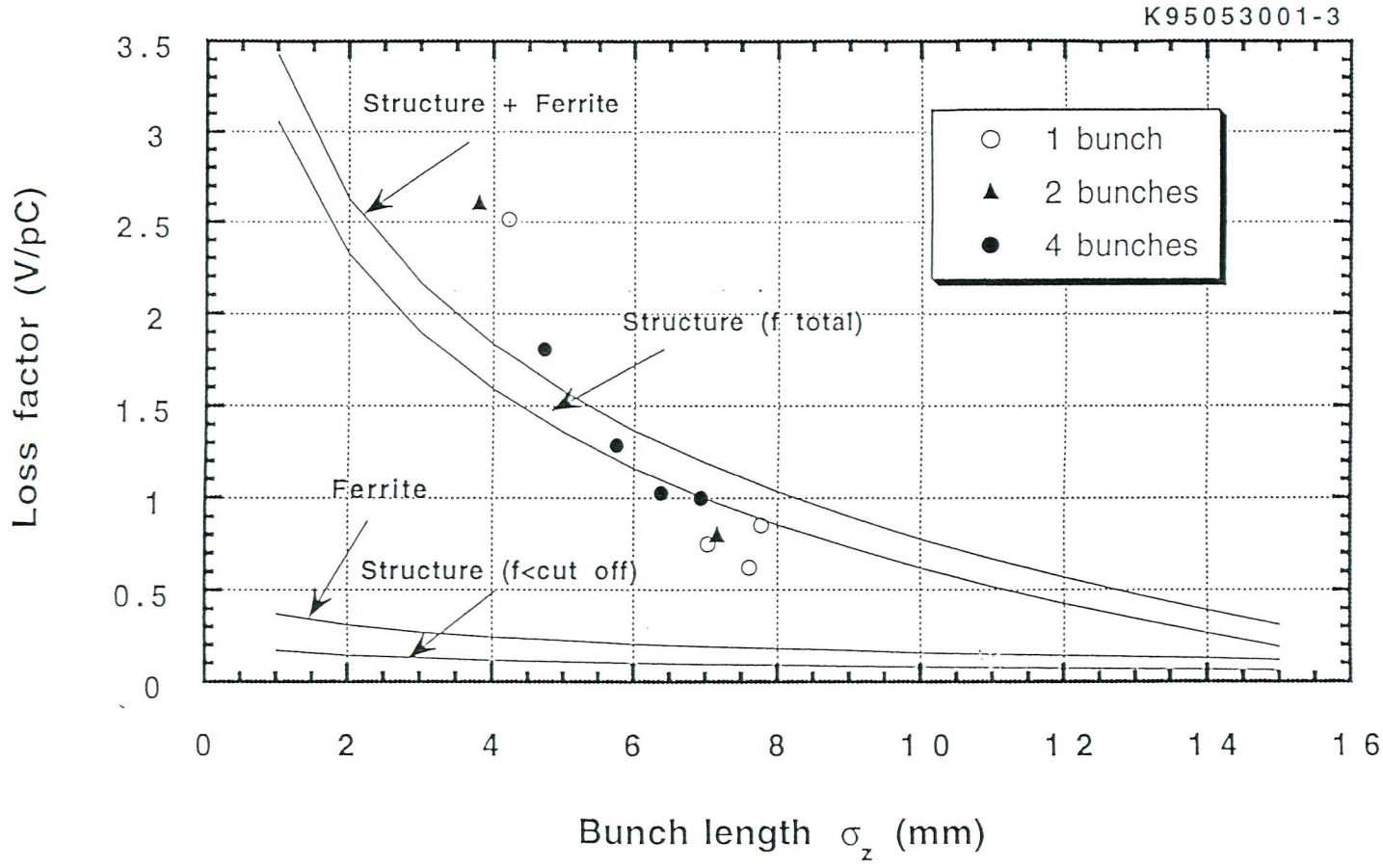






Bunch length was measured by streak camera.

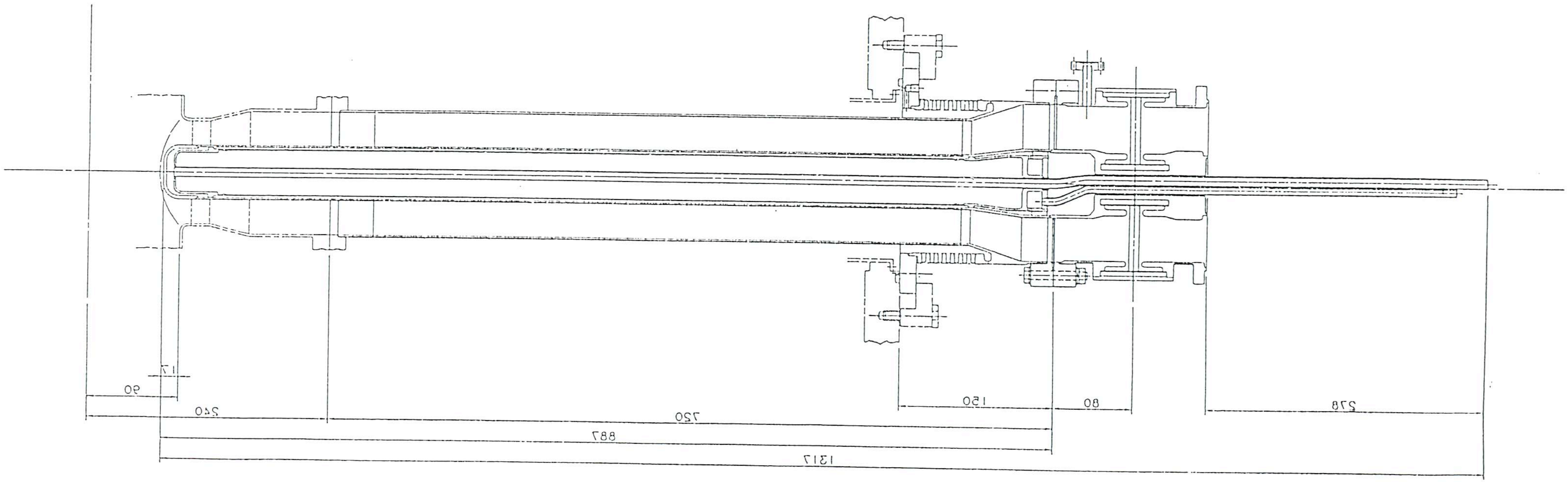
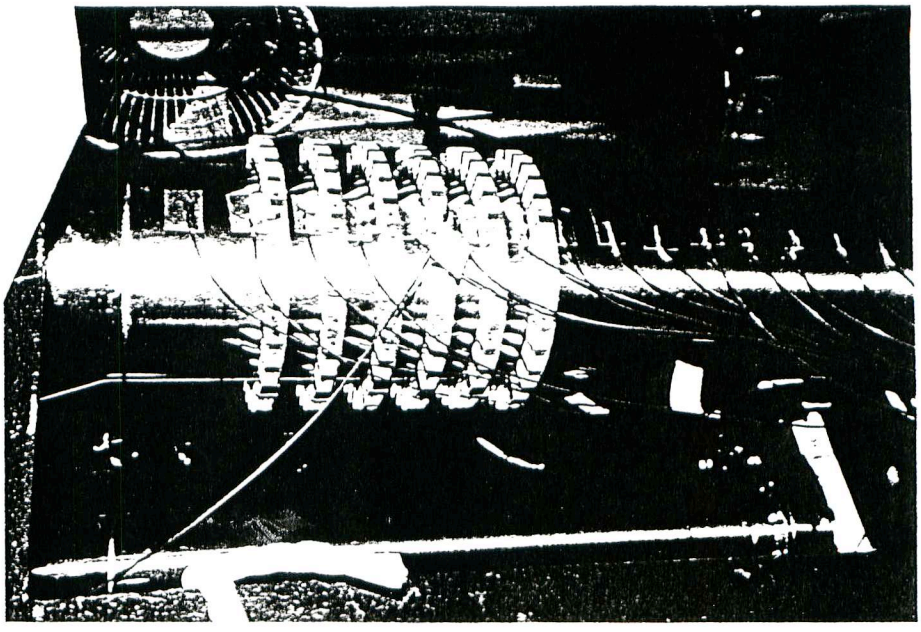
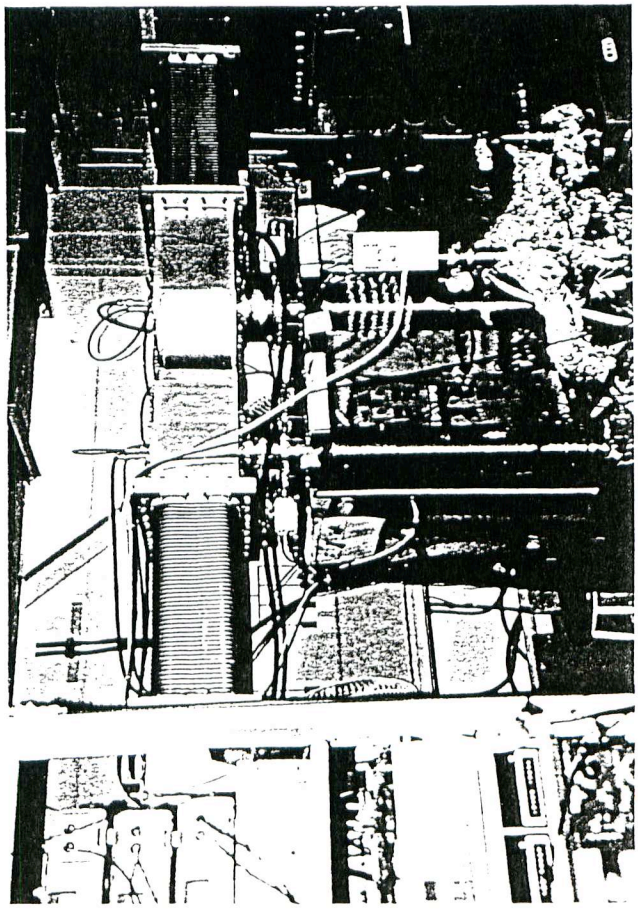


図6 インプット・カプラ組立&基本寸法図





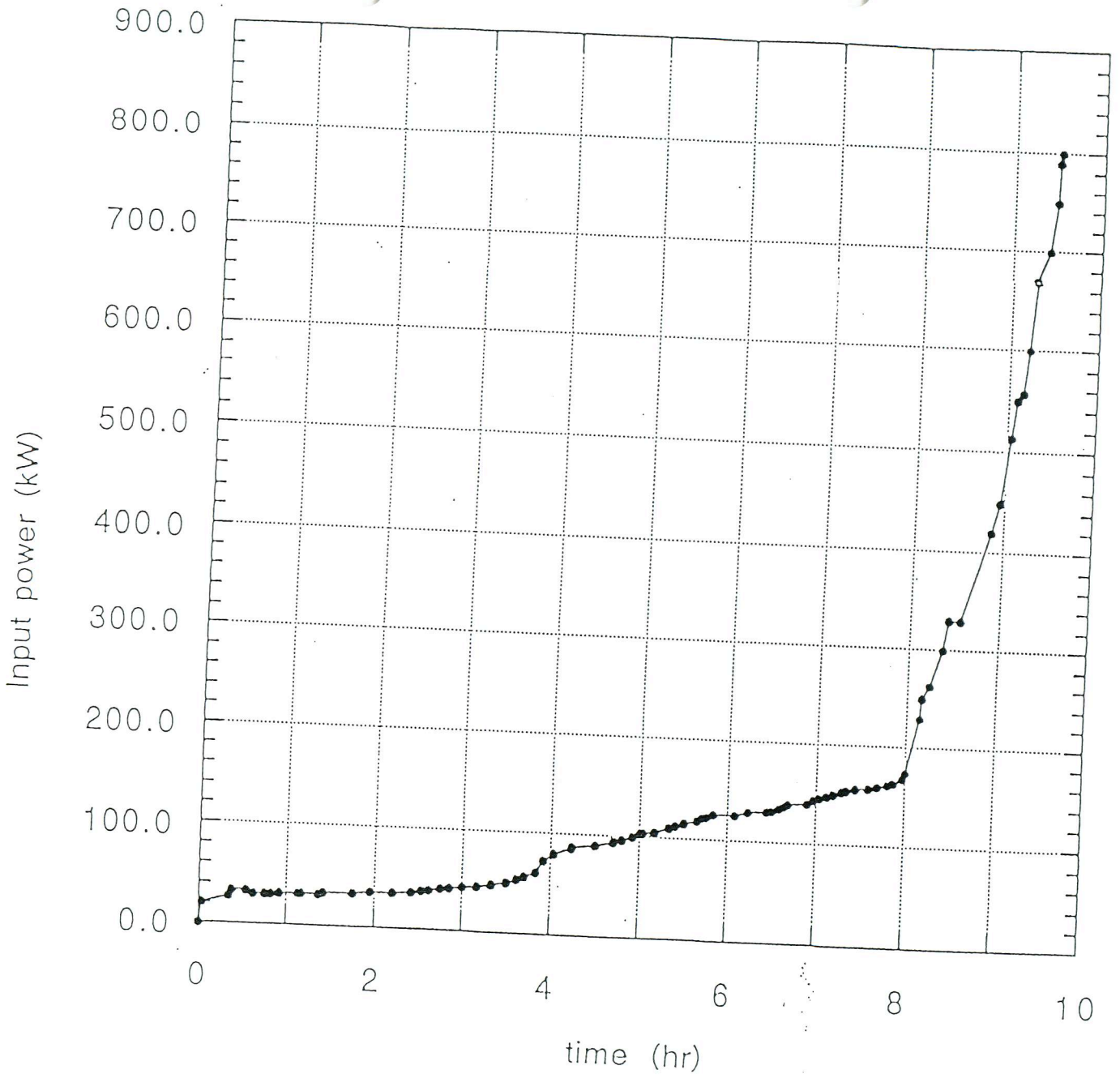
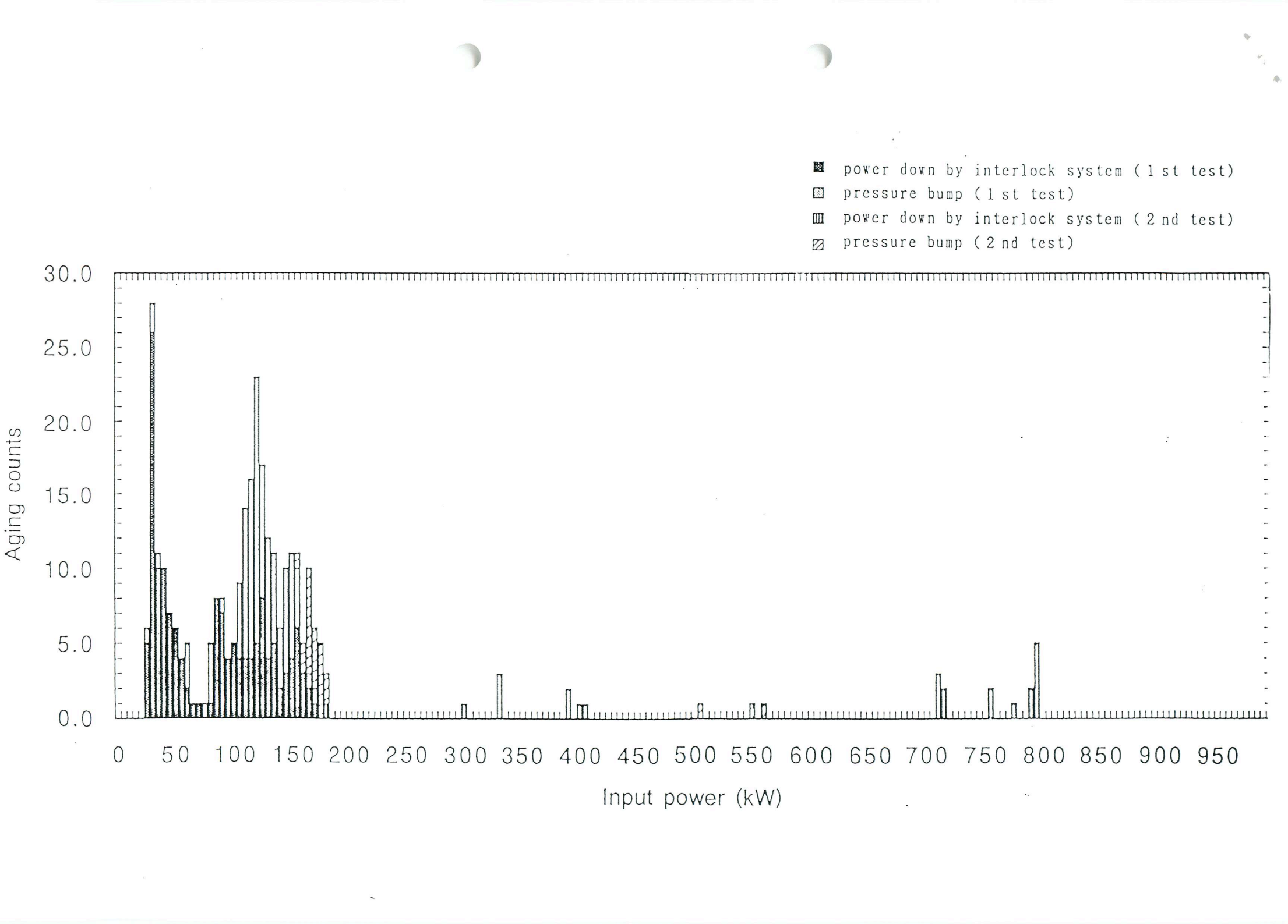


Fig.3 Coupler-2 aging history


power down by interlock system (1 st test)
pressure bump (1 st test)
power down by interlock system (2 nd test)
pressure bump (2 nd test)
Aging counts
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950
Input power (kW)