ENERGY UPGRADE OF THE EHF SCL

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1.2 ⟶ 2. GeV

- 1.2 / 2 GeV REGION:
  - β : 0.90 → 0.95
  - CELL LENGTH $(\beta\lambda/2)$ SLIGHTLY INCREASES
  - SHUNT IMPEDANCE $ZT^2 \simeq$ CONST.
  - GRADIENT $E_0 T \simeq$ CONST.

- ITERATION OF THE SCL MODULES OF TO 2 GeV (LINEAR STRUCTURE)

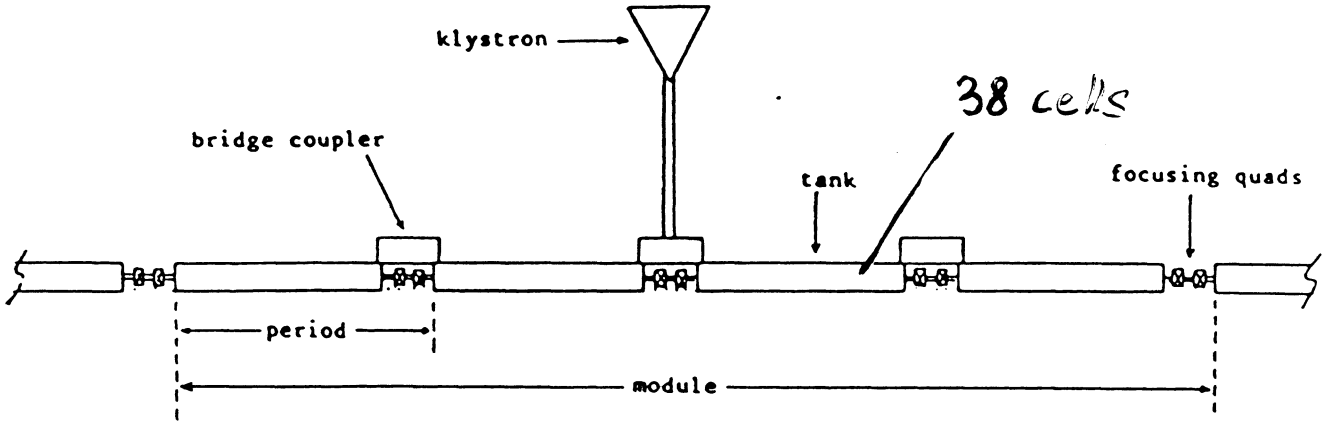
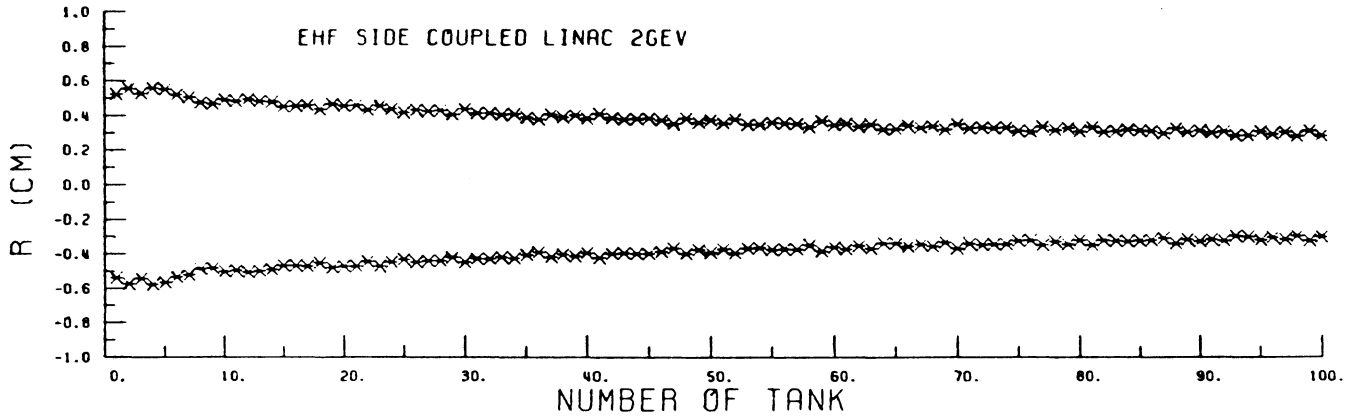


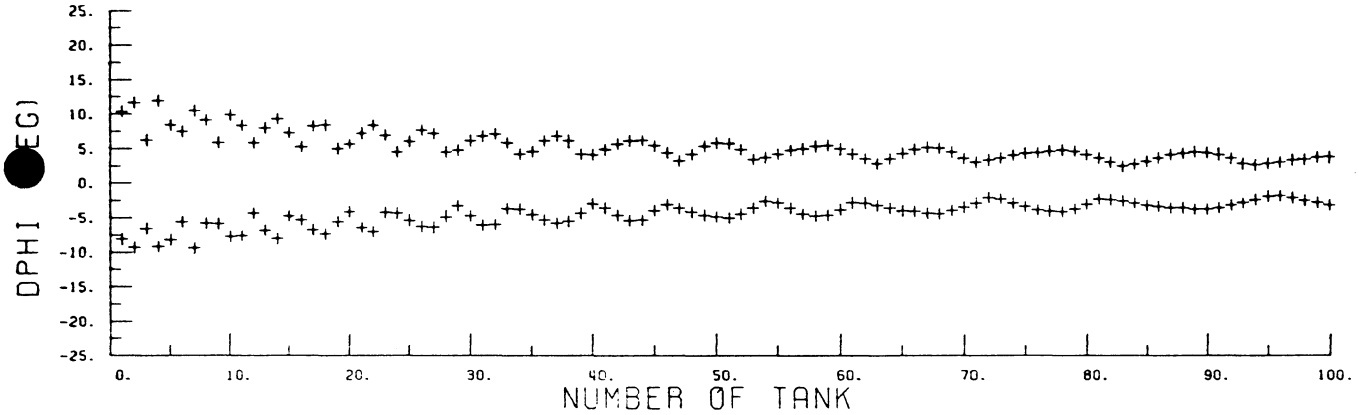
Figure 13.10: SCL Layout

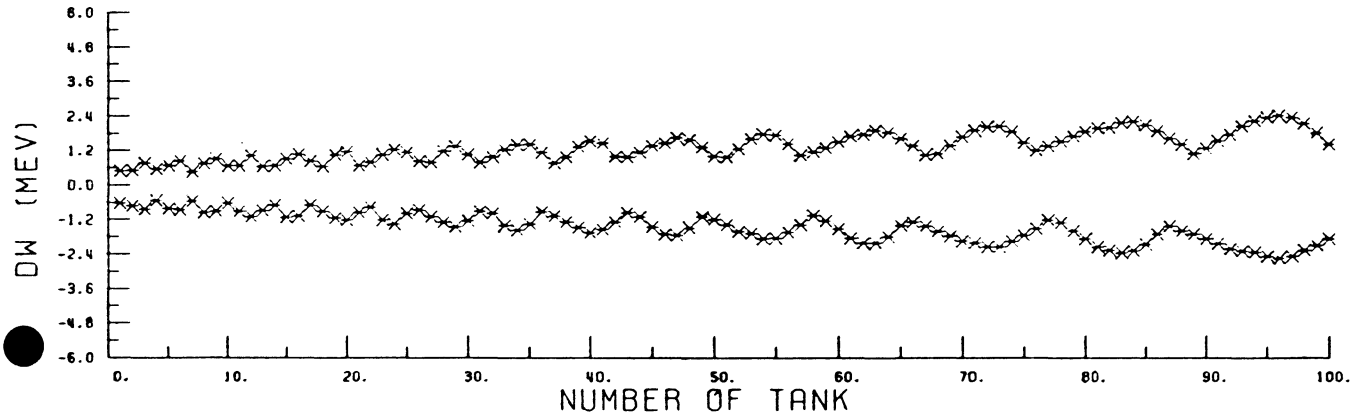
2 GEV SCENARIO

Table 13.6: SCL - Table of Parameters

Input Energy	150	MeV	
Output Energy	1200	MeV	- 2025
Frequency	1200	MHz	11
Number of Modules	16		- 27 (+8)
Number of Tanks	64		- 108 (+44)
Number of Acc. Cells per Tank	38		
Accelerating Field E_oT	5.6-4.7	MV/m	
Peak Power	117	MW	- 200
Average Power	1.2	MW	- 2.
Duty Cycle	1%		
Total Length	284.2	m	- 485 (+201)
Synchronous Phase	-25°		
Beam Radius	0.4-0.25	cm	
Norm. Transv. Emittance (RMS)	$\sim 0.6\pi$	mm.mrad	
Norm. Long. Emittance (RMS)	$\sim 4\pi$	deg.MeV	
Output Phase Spread	8°		
Output Energy Spread	2.7	MeV	
Bore Hole Radius	1	cm	
Ratio of gap/cell length	0.3-0.5		
Accelerating Cell Radius	8.8-9.4	cm	
Real Eff. Shunt Impedance	47-58	MΩ/m	
Transit Time Factor	0.89-0.85		
Quality Factor	19-25	$\times 10^3$	
Peak Surface Electric Field	38-32	MV/m	
Quadrupole Gradients	35-55	T/m	- 35-71


EHF SIDE COUPLED LINAC 2GEV
R (CM)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
0.
10.
20.
30.
40.
50.
60.
70.
80.
90.
100.
NUMBER OF TANK


DPHI (DEG)
25.
20.
15.
10.
5.
0.
-5.
-10.
-15.
-20.
-25.
0.
10.
20.
30.
40.
50.
60.
70.
80.
90.
100.
NUMBER OF TANK


DW (MEV)
6.0
4.8
3.6
2.4
1.2
0.0
-1.2
-2.4
-3.6
-4.8
-6.0
0.
10.
20.
30.
40.
50.
60.
70.
80.
90.
100.
NUMBER OF TANK

COSTS FOR THE ENERGY UPGRADE OF THE SCL

- STRUCTURE'S COST → $C_s = 0.55$ MDM/tank
- RF SYSTEM'S COST → $C_p = 2.20$ MDM/module
- TUNNEL COST → $C_t \simeq 11$ kDM/m

2 GeV SCENARIO :

- 108 tanks → $C_s = 59.4$ MDM
- 27 modules → $C_p = 59.4$ MDM

$\Rightarrow$ **$C \simeq 119$ MDM**

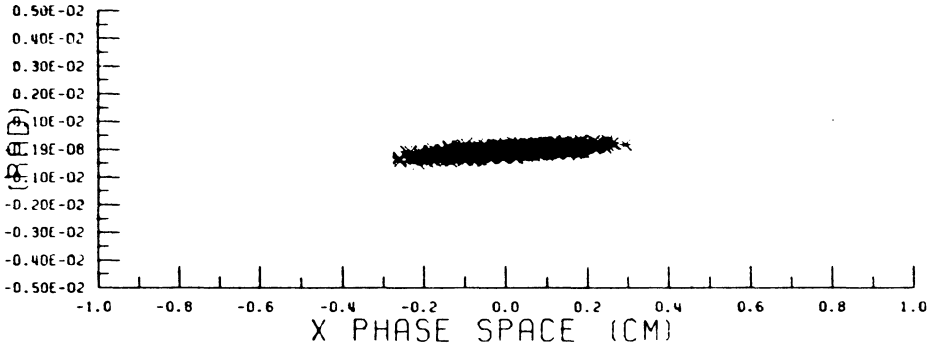
COSTS UPGRADE.

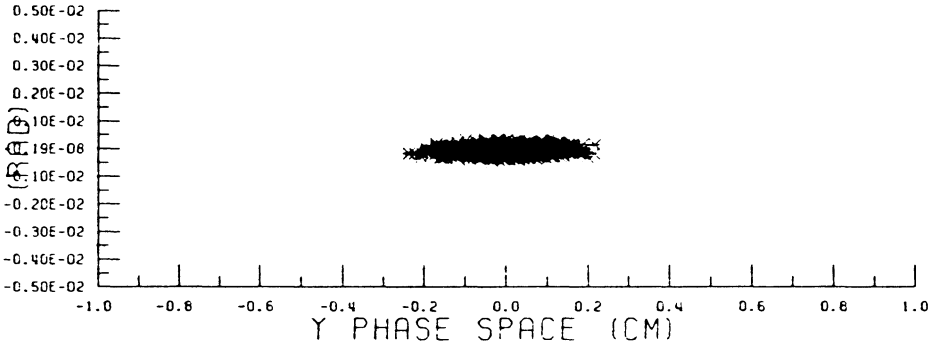
$\Delta C = 49$ MDM for $\Delta W = 820$ MeV, $W = 2020$ MeV

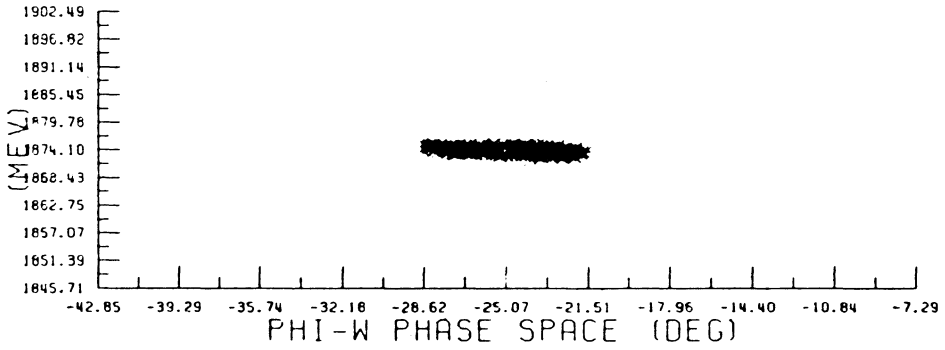
↳ (+ 2MDM for the tunnel)

$$\Delta C \simeq 60 \ \frac{\text{kDM}}{\text{MeV}}$$

Length : $\Delta L = 24 \ \frac{\text{cm}}{\text{MeV}}$


0.50E-02
0.40E-02
0.30E-02
0.20E-02
0.10E-02
0.19E-08
-0.10E-02
-0.20E-02
-0.30E-02
-0.40E-02
-0.50E-02
(RAD)
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
X PHASE SPACE (CM)


0.50E-02
0.40E-02
0.30E-02
0.20E-02
0.10E-02
0.19E-08
-0.10E-02
-0.20E-02
-0.30E-02
-0.40E-02
-0.50E-02
(RAD)
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
Y PHASE SPACE (CM)


1902.49
1896.82
1891.14
1885.45
1879.78
1874.10
1868.43
1862.75
1857.07
1851.39
1845.71
(MEV)
-42.85
-39.29
-35.74
-32.18
-28.62
-25.07
-21.51
-17.96
-14.40
-10.84
-7.29
PHI-W PHASE SPACE (DEG)