

# TUNE SHIFT DUE TO THE TRAPPED MODES OF THE SPS (HORIZONTAL) PROTOTYPE OF THE LHC COLLIMATOR

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## TABLE OF TRANSVERSE MODES FOR GAP = 5 MM (FROM A. GRUDIEV, RLC meeting, 28/01/05)

f [GHz]	Q	$r_1/Q$ [Ohm/mm <sup>2</sup> ]	$r_1$ [Ohm/mm <sup>2</sup> ]	$k_1$ [V/nC/mm <sup>2</sup> ]	$r_1/Q$ [Ohm/mm]	$r_1$ [Ohm/mm]	$k_1$ [V/nC/mm]	$k_1$ (Py) [V/nC/mm]
0.605	139	6.105e-004	8.486e-002	5.802e-004	4.815e-002	6.693e+000	4.576e-002	4.507e-002
0.769	612	1.467e-006	8.976e-004	1.772e-006	9.100e-005	5.570e-002	1.099e-004	1.078e-004
0.799	639	8.823e-007	5.638e-004	1.107e-006	5.269e-005	3.367e-002	6.613e-005	6.769e-005
0.848	687	1.135e-005	7.798e-003	1.512e-005	6.387e-004	4.388e-001	8.508e-004	8.432e-004
0.909	751	1.449e-005	1.088e-002	2.068e-005	7.604e-004	5.710e-001	1.086e-003	1.074e-003
1.226	934	4.174e-003	3.898e+000	8.037e-003	1.624e-001	1.517e+002	3.128e-001	3.154e-001
1.228	961	9.441e-003	9.072e+000	1.821e-002	3.668e-001	3.525e+002	7.076e-001	7.040e-001
1.255	1070	1.473e-005	1.576e-002	2.904e-005	5.601e-004	5.993e-001	1.104e-003	1.072e-003
1.295	808	6.198e-003	5.008e+000	1.261e-002	2.283e-001	1.845e+002	4.645e-001	4.513e-001
1.306	570	9.626e-005	5.487e-002	1.975e-004	3.517e-003	2.005e+000	7.214e-003	6.707e-003
1.312	560	1.452e-005	8.134e-003	2.993e-005	5.282e-004	2.958e-001	1.089e-003	1.178e-003
1.315	530	1.910e-005	1.012e-002	3.944e-005	6.929e-004	3.672e-001	1.431e-003	1.255e-003
1.565	1294	1.143e-007	1.480e-004	2.811e-007	3.486e-006	4.511e-003	8.570e-006	9.109e-006
1.595	172	1.158e-002	1.991e+000	2.901e-002	3.463e-001	5.957e+001	8.677e-001	8.508e-001
1.611	171	1.288e-005	2.203e-003	3.259e-005	3.817e-004	6.526e-002	9.656e-004	1.628e-003
1.636	170	8.031e-002	1.365e+001	2.064e-001	2.342e+000	3.982e+002	6.019e+000	5.867e+000
1.659	925	1.585e-010	1.466e-007	4.130e-010	4.558e-009	4.216e-006	1.188e-008	1.182e-008
1.672	169	5.269e-002	8.905e+000	1.384e-001	1.504e+000	2.541e+002	3.949e+000	3.924e+000
1.673	940	9.243e-008	8.688e-005	2.429e-007	2.636e-006	2.478e-003	6.927e-006	6.866e-006
1.674	1356	2.806e-007	3.805e-004	7.379e-007	7.998e-006	1.085e-002	2.103e-005	2.075e-005
1.696	945	2.062e-009	1.948e-006	5.492e-009	5.800e-008	5.481e-005	1.545e-007	1.470e-007
1.717	168	2.603e-002	4.374e+000	7.021e-002	7.234e-001	1.215e+002	1.951e+000	1.872e+000
1.727	958	6.217e-010	5.956e-007	1.687e-009	1.718e-008	1.646e-005	4.660e-008	6.611e-008
1.767	981	5.264e-011	5.164e-008	1.461e-010	1.421e-009	1.394e-006	3.945e-009	4.446e-009
1.772	167	1.948e-001	3.253e+001	5.422e-001	5.245e+000	8.759e+002	1.460e+001	1.429e+001
1.785	1430	9.523e-010	1.362e-006	2.670e-009	2.546e-008	3.640e-005	7.138e-008	1.497e-007
1.815	1012	3.334e-008	3.374e-005	9.506e-008	8.765e-007	8.870e-004	2.499e-006	2.525e-006
1.835	165	1.318e-001	2.175e+001	3.800e-001	3.428e+000	5.656e+002	9.881e+000	9.742e+000
1.868	1028	4.096e-007	4.210e-004	1.202e-006	1.046e-005	1.075e-002	3.070e-005	3.003e-005
1.898	1494	3.463e-008	5.173e-005	1.032e-007	8.705e-007	1.300e-003	2.595e-006	2.913e-006
1.906	164	2.506e-003	4.109e-001	7.502e-003	6.272e-002	1.029e+001	1.878e-001	1.866e-001
1.930	1067	3.838e-007	4.095e-004	1.164e-006	9.489e-006	1.012e-002	2.877e-005	2.992e-005
1.983	164	7.304e-002	1.198e+001	2.275e-001	1.757e+000	2.882e+002	5.474e+000	5.509e+000
1.995	1000	8.990e-006	8.990e-003	2.817e-005	2.150e-004	2.150e-001	6.738e-004	7.114e-004

⇒ I will look at the 13 most critical modes (in blue)

## HORIZONTAL SINGLE-BUNCH TUNE SHIFT FOR THE HEAD-TAIL MODE $M = 0$

TM1 :  $-4.07966 \times 10^{-9}$   
TM2 :  $-1.16218 \times 10^{-8}$   
TM3 :  $-2.6238 \times 10^{-8}$   
TM4 :  $-1.61796 \times 10^{-8}$   
TM5 :  $-2.48907 \times 10^{-10}$   
TM6 :  $-2.39339 \times 10^{-8}$   
TM7 :  $-1.61517 \times 10^{-7}$   
TM8 :  $-1.03494 \times 10^{-7}$   
TM9 :  $-4.96801 \times 10^{-8}$   
TM10 :  $-3.59482 \times 10^{-7}$   
TM11 :  $-2.34405 \times 10^{-7}$   
TM12 :  $-4.28072 \times 10^{-9}$   
TM13 :  $-1.19632 \times 10^{-7}$

With the experimental  
parameters ( $E = 270 \text{ GeV} \dots$ )  
 $\Rightarrow$  See FZ's talk at LCE  
meeting (22/10/04)

$$\text{Im}[Z_{x,m=0}^{eff, \text{All TMs}}] \approx 9.3 \text{ k}\Omega/\text{m}$$

$$\Delta Q_{x,m=0}^{\text{SB, All TMs}} \approx -1.1 \times 10^{-6}$$

A. Grudiev found  
 $8.7 \text{ k}\Omega/\text{m}$  and  $1.2 \times 10^{-6}$  but  
at 26 GeV (See RLC  
meeting 28/01/05)