IBIC 17
INTERNATIONAL BEAM INSTRUMENTATION CONFERENCE

THE DESIGN IMPROVEMENT OF TRANSVERSE STRIPLINE KICKERS IN TPS STORAGE RING

TUPCF07

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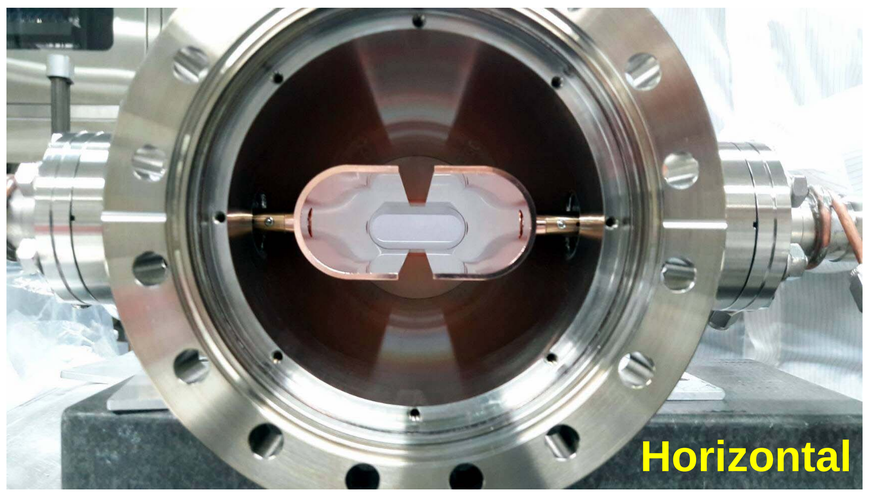
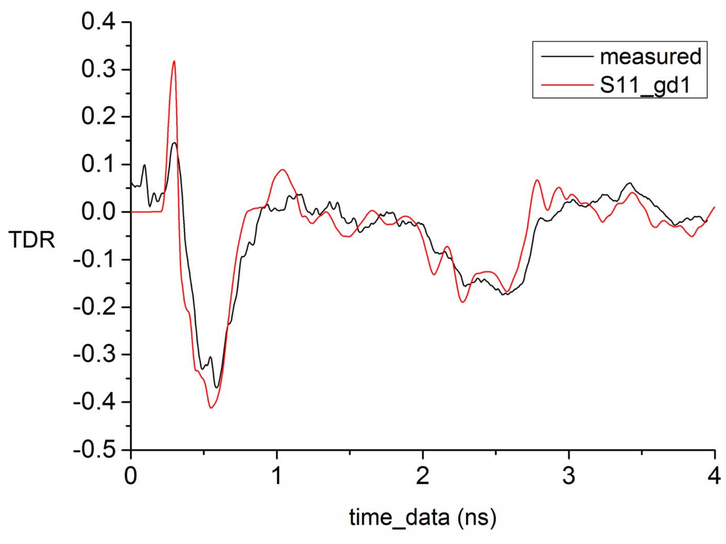
SUMMARY

We have improved the design of horizontal and vertical stripline kickers. The loss factor is reduced by a factor of 3.37 for the horizontal kicker and 4.50 for the vertical one. The simulation reveals that trapped longitudinal resonant modes in both the horizontal and vertical stripline kickers will not cause the longitudinal coupled bunch instabilities at the designed beam current 500 mA. The estimated kick strength per turn of the improved vertical kicker indicates the kick strength is sufficient to damp the resistive wall instabilities with all phase-I IDs at 500 mA.

DESIGN IMPROVEMENT



Improved horizontal kicker

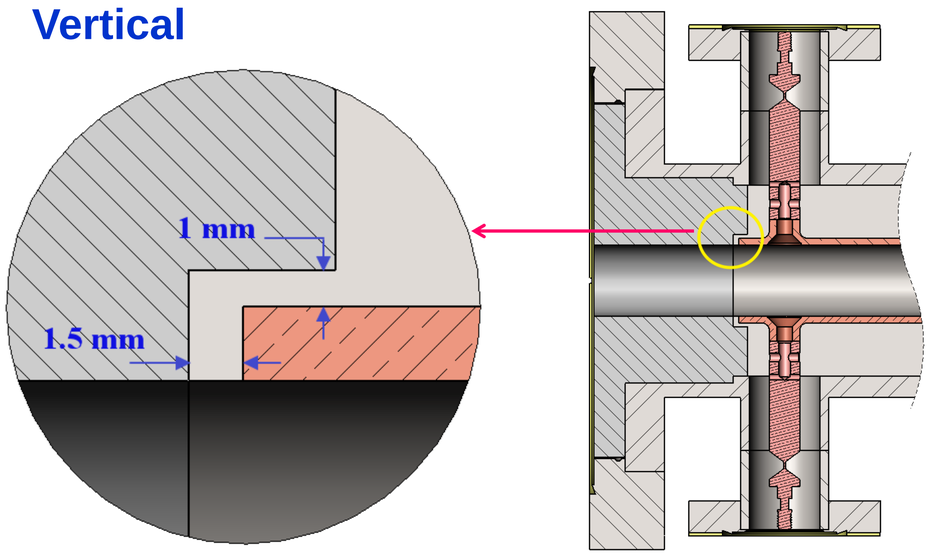


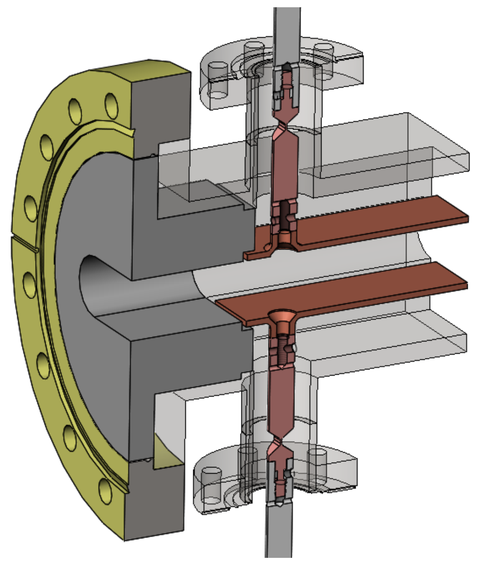
The impedance of both TEM modes of horizontal stripline kicker

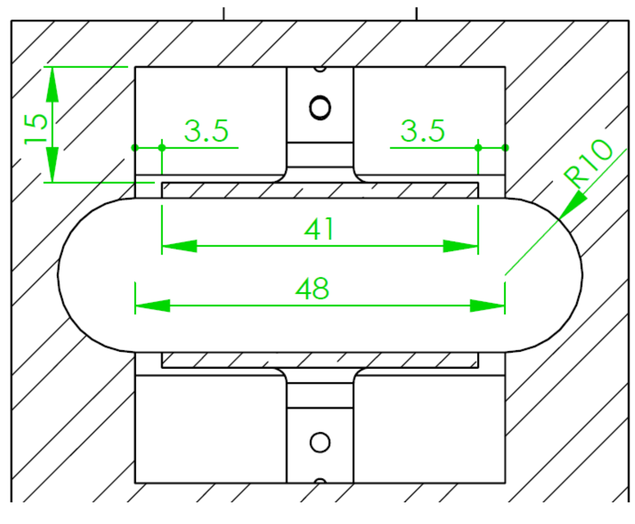
Mode	[Ω]
Z_{even}	66.58
Z_{odd}	34.70
$Z_{even}*Z_{odd}$	2310

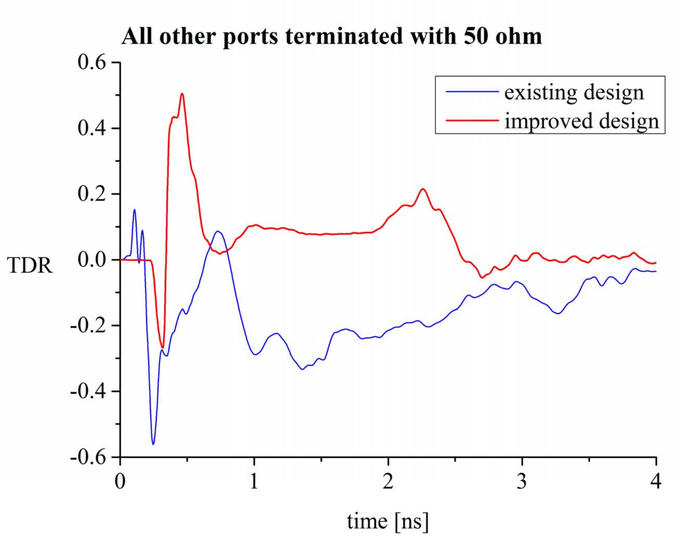
The input impedance of a drive port is matched based on $Z_{even}Z_{odd}=Z_0^2$

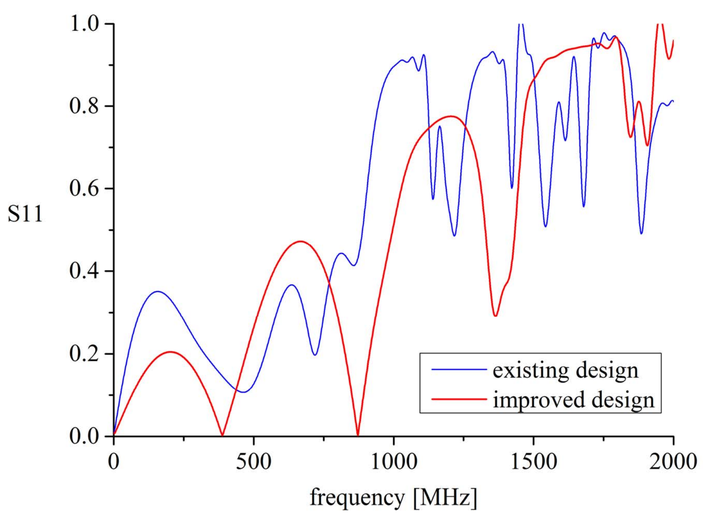
Vertical









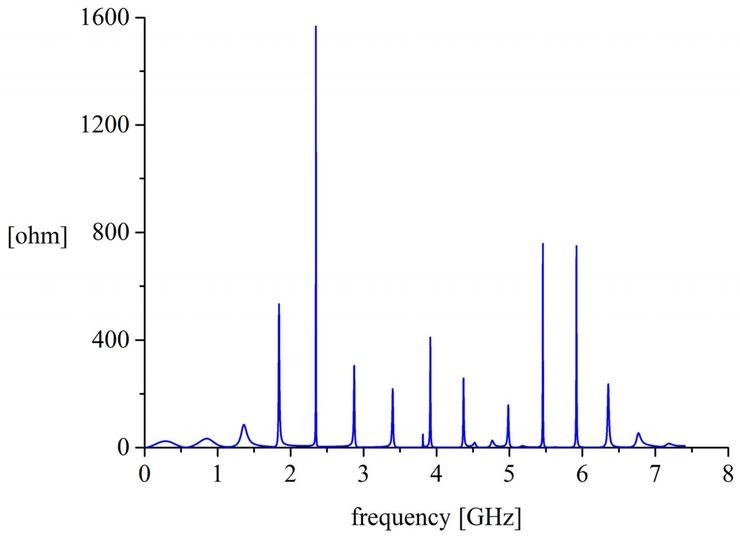


Mode	Existing kicker	Improved design
Z_{even} [Ω]	150.55	50.08
Z_{odd} [Ω]	49.92	34.27
$Z_{even}*Z_{odd}$	7515	1716

	Loss factor [V/pC]	Dissipated power [W]
Old design	1.070	1108.6
Improved design	0.238	246.6

* rms bunch length= 4.5 mm, beam current= 500 mA

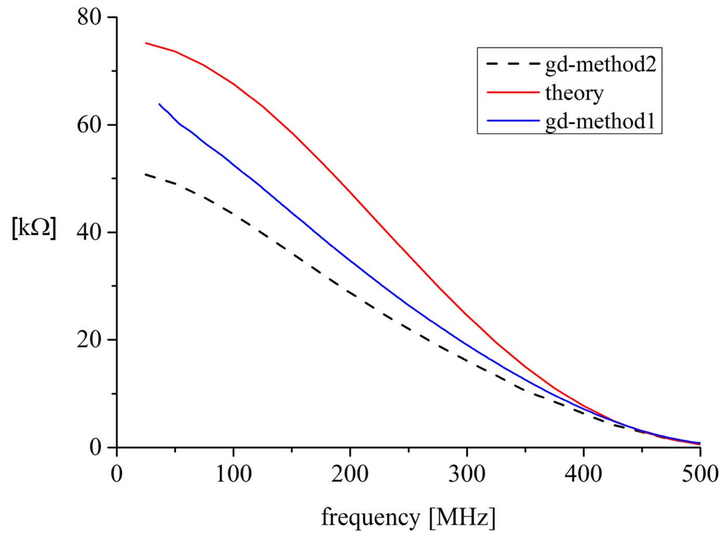
Longitudinal beam impedance



f [GHz]	R/Q [Ω]	Q_{total}	Growth time [ms] at 500 mA total current
2.348	1.879	834	78.1
5.918	0.507	1480	83.7

* Longitudinal radiation damping time= 6.08 ms

Shunt impedance of stripline kicker



	Theory	Method-1	Method-2
Shunt impedance [kΩ]	75	65	51
$\Delta y'$ [μrad]/turn	2.88	2.68	2.37

* Assuming an input power 500 W