



SNS impedance budget update

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January 26, 2004

Changes in Impedance Budget



Following diagnostic review (January'04), impedance of some diagnostics devices was updated/added:

- Beam-in-gap kicker (change in length)
- Tune kicker (TK) and PU
- Quadrupole mode kicker (QMM) and PU
- 2 Damper kickers

Tune/QMM/Damper Kickers



	Tune kicker/Pu	Damper kicker	QMM Kicker/PU
Overall length	1.5 m	0.5 m	0.75m
Overall impedance	50 ohms (dipole differential mode)	50 ohms (dipole differential mode)	50 ohms (quadrupole differential mode)
Signal feedthru	N-type, 50 ohms, HF	N-type, 50 ohms, HF	N-type, 50 ohms, HF
Stripline subtended angle	60°	60°	20°

Beam-In-Gap (BIG) Kicker

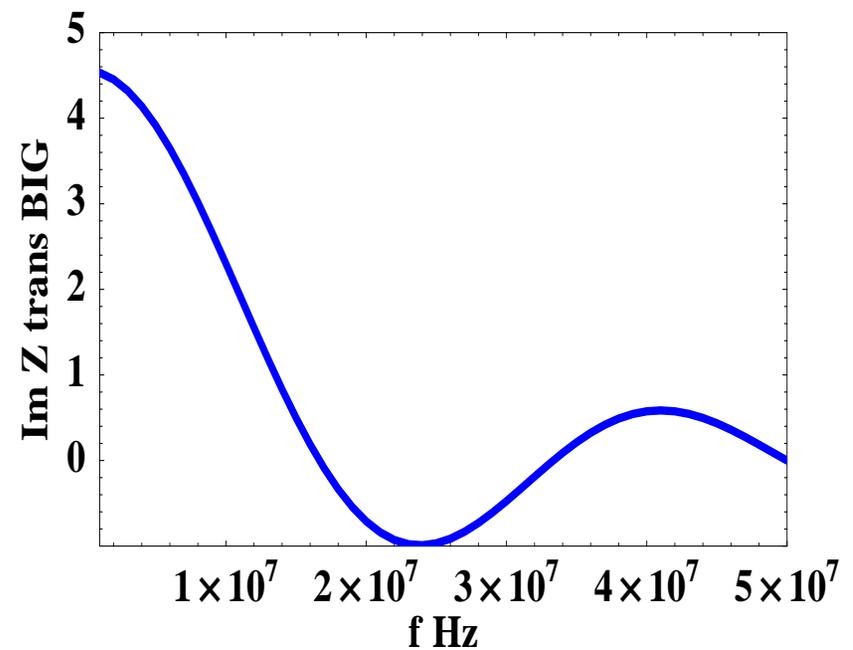
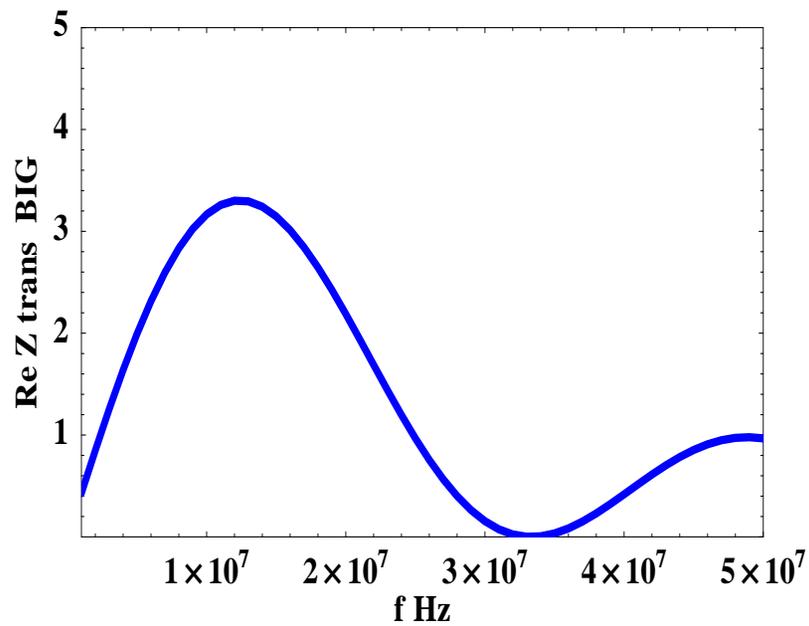


- Overall length: 4.5 m
- Use the 1-5/8" Heliax cable and the EIA Flange connector to provide a 7 kV power input.
- Overall impedance: 50 ohms (dipole differential mode)
- Stripline subtended angle: 60 degrees

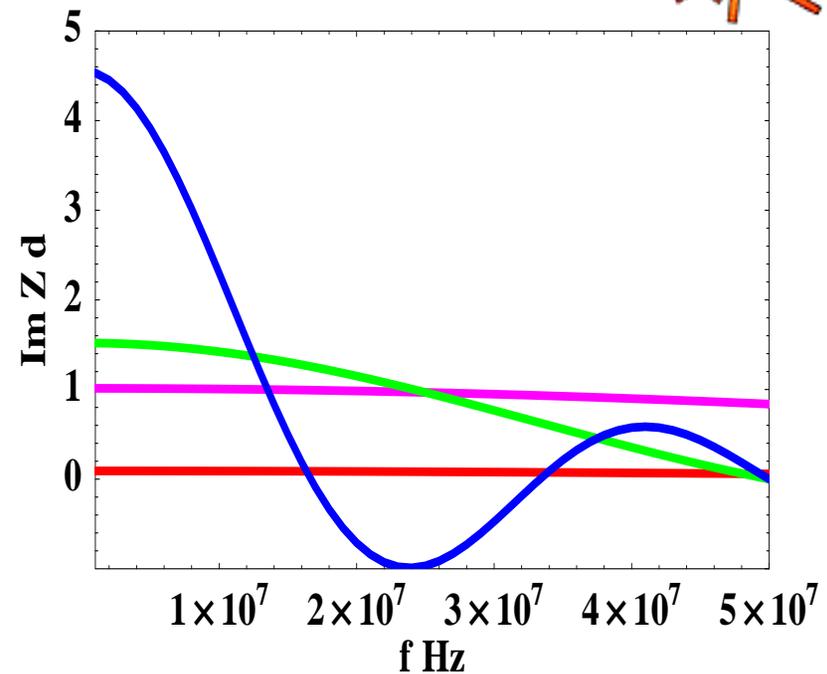
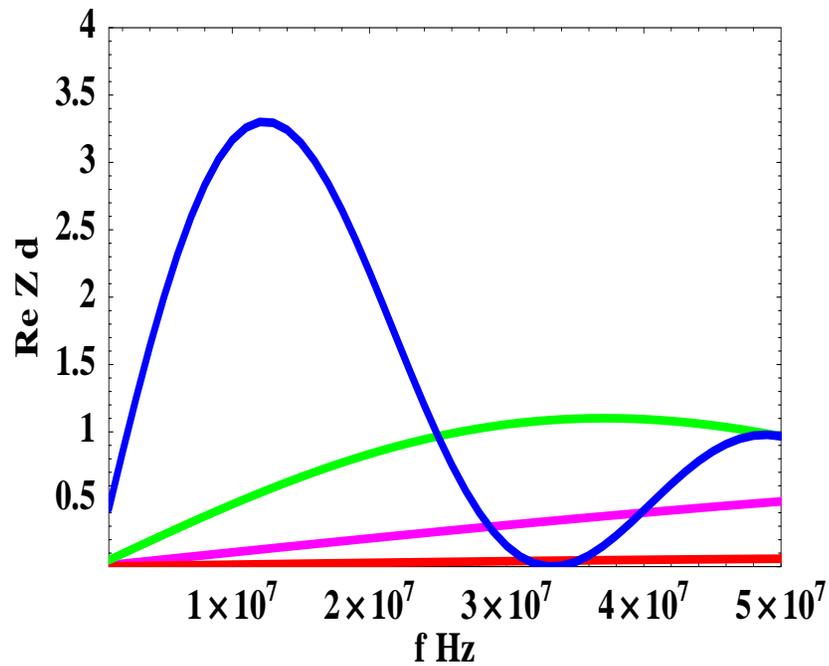


1-5/8" EIA Flange
L46R

Transverse impedance of BIG kicker

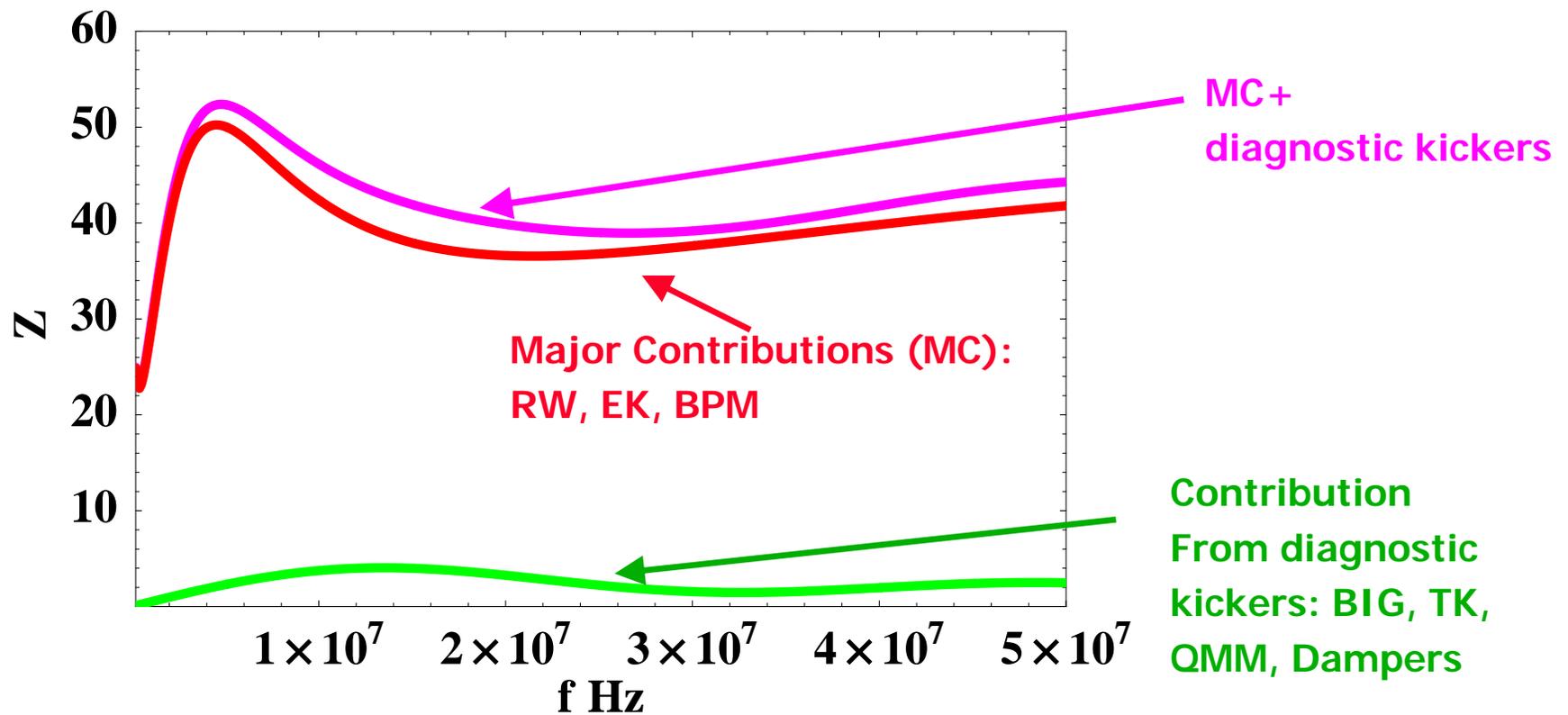


Total transverse impedance contribution from diagnostic kickers



Blue - BIG
Green - TK
Pink - Dampers
Red - QMM

Correction to total $\text{Re}(Z)$ transverse impedance due to diagnostic kickers



Impedance update: February 2004 (< 10 MHz)



	Z_e / n [Ω]	Z_T [k Ω /m]
Space charge	-j196	$j(-5.8+0.45)^1 \times 10^3$
Extraction kicker ²	0.6n+j50	33+j125 ³
Injection kicker ⁴	≈ 0.5 , at ω_0	17.5 (lowest tune 200 kHz)
RF cavity	Resonances: (f=7.5 MHz, Q \approx 88, 0.6 Ω); (11.37, 59, 0.2); (35, 1, 0.1); (87, 20, 0.9). ⁵	18 (at resonance) ⁶
Injection foil assembly	j0.05 ⁷	j4.5
Resistive wall	(j+1)0.71, at ω_0	(j+1)8.5, at ω_0
Broadband		
BPM	j4.0	j18
BIG,TK,QMM,Damp.	4+j7.0	3+j0.8
Bellows	j1.3	j11
Steps	j1.9	j16
Ports	j0.49	j4.4
Valves	j0.15	j1.4
Collimator	j0.22	j2.0
Total BB	4+j15	3+j54

Impedance update: February 2004 (at 50 MHz)



	Z_ℓ / n [Ω]	Z_T [k Ω /m]
Space charge	-j196	$j(-5.8+0.45)^8 \times 10^3$
Extraction kicker, 25 Ω termination	$19.4^{13} + j12$	$12.5 + j65^9$
RF cavity	See before	$\cong 0^{10}$
Injection foil assembly	j0.05	$j4.5^{11}$
BPM	$2 + j3.5$	$9 + j16$
BIG,TK,QMM,Damp	$0.5 + j1.2$	$0.5 + j0.1$
Broadband		
Bellows	j1.3	j11
Steps	j1.9	j16
Ports	j0.49	j4.4
Valves	j0.15	j1.4
Collimator	j0.22	j2.0
Total BB	j4.1	j35

Summary



- Impedance of diagnostic kickers/PU was added.
- There is a noticeable contribution at low frequency from Beam-In-Gap kicker.
- This contribution is very small compared to the largest contribution: Extraction Kickers (impedance of all 14 kickers is presently estimated within a factor of 2 accuracy).