iv. The Wideband Cavity

The wideband cavity will be similar to the acceleration cavities, i.e., a λ/4 coaxial resonator with $f_{res} = 360\ f_o$. However, there will be no tuning, the gap will be ceramic and directly coupled to the power source. The latter will be a wideband (10 kHz - 220 MHz)
10 kW power amplifier capable of developing 1000 V of pulsed 28.15 MHz signal into a 50 Ω load which will be connected across the cavity gap. For a bandwidth of $\pm 57\ f_o$, which is the minimum required to control all the coupled bunch modes for 114 bunch operation, a cavity with $R/Q > 175$ Ω is necessary.

Together with the output impedance of the amplifier, the combination cavity is then a strongly overdamped resonator ($Q \approx 1/7$ for $R/Q \approx 175$ Ω) whose transient response determines how well the system operates on a bunch to bunch basis. For 120 bunch stacking the correction signal would consist of pulses of three 28.15 MHz rf cycles. It can be shown that the worst-case scenario would result in 1% of the correction signal for one bunch remaining when a following bunch, if present, passes the gap. Further reduction of the transient amplitude is possible but this can only be accomplished by actual system testing.

Since this cavity can be driven remotely by coaxial cables it can be mounted on the insertion side of Q4 where the ring separation is still ~80 cm so that both units can be opposite each other.