Status of the Transverse Feedback System at BESSY-II

(T. Knuth, S. Khan)

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Features:

- bunch by bunch analog system
- very similar to ALS-TFB design
- exception $\Longrightarrow$ hor./vert. kicker in one structure
- two 150 W amplifiers (Amplifier Research)
- one stripline powered in each direction

system layout:

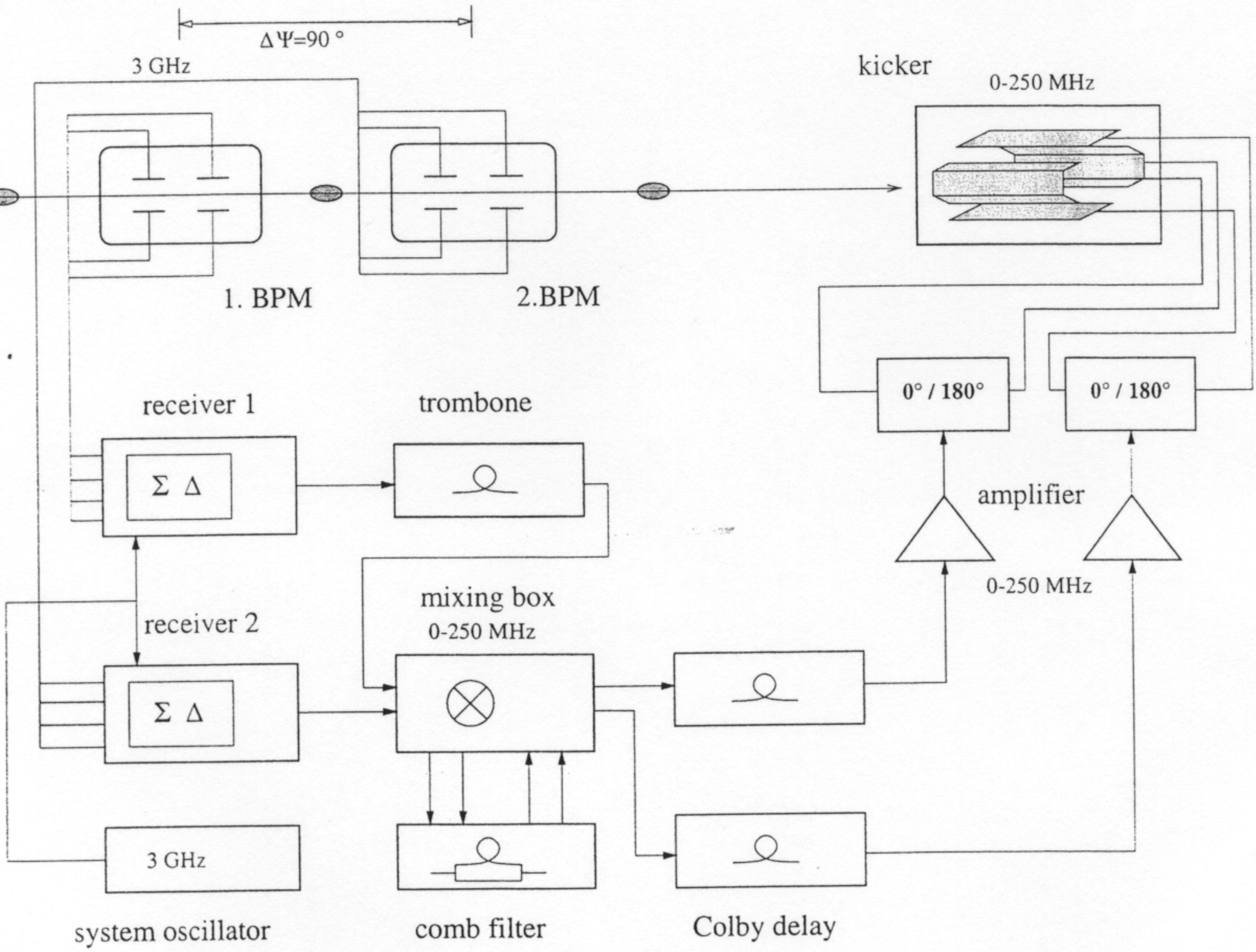


Figure 0.0.1: *transverse bunch by bunch feedback system at BESSY-II*

- two BPM stations (about 90 degrees apart)
- receivers for heterodyne detection at 3 GHz
  ($\rightarrow$ position=$\Delta x_{1,2}; \Delta y_{1,2}$)
- analog mixing box (kicksignal $\rightarrow x^{'} = Ax_1 + Bx_2$)
- notch filter designed from long cables ($\approx$ 240 m)
- signal delay by COLBY lines (range=10.2 ns, step=10 ps)
- broadband amplifiers (10 kHz-250 MHz) / stripline kickers

TFB kicker:

- y: flat electrodes
- x: C-shaped electrodes
- to improve cooling: blackened surfaces (TiAlN-layer)
  (theoretically: $105°C \longrightarrow 35°C$,
  measured: $32°C$ @ 200 mA)

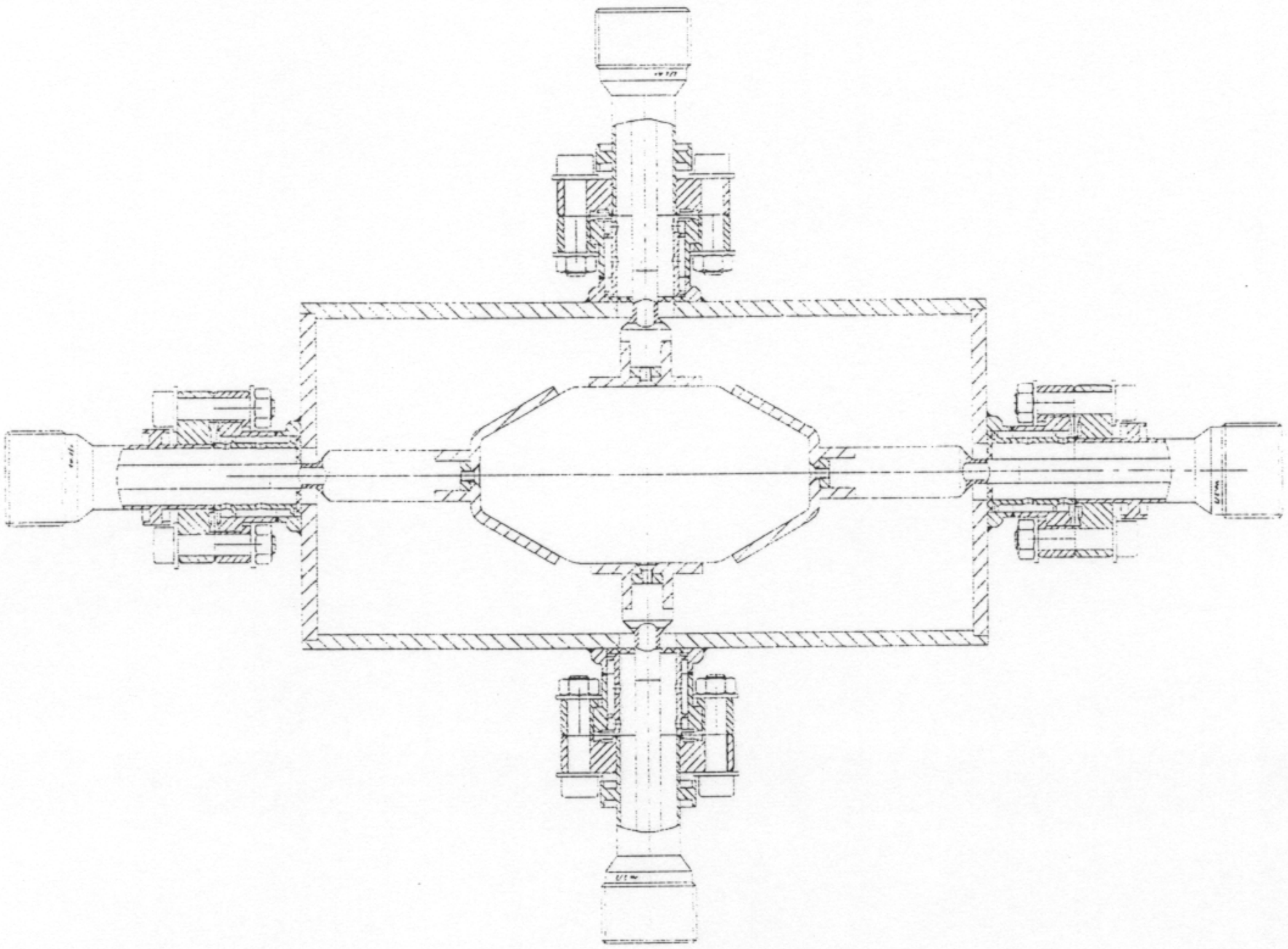


Figure 0.0.2: *transverse feedback kickers for BESSY-II*

shunt impedance:

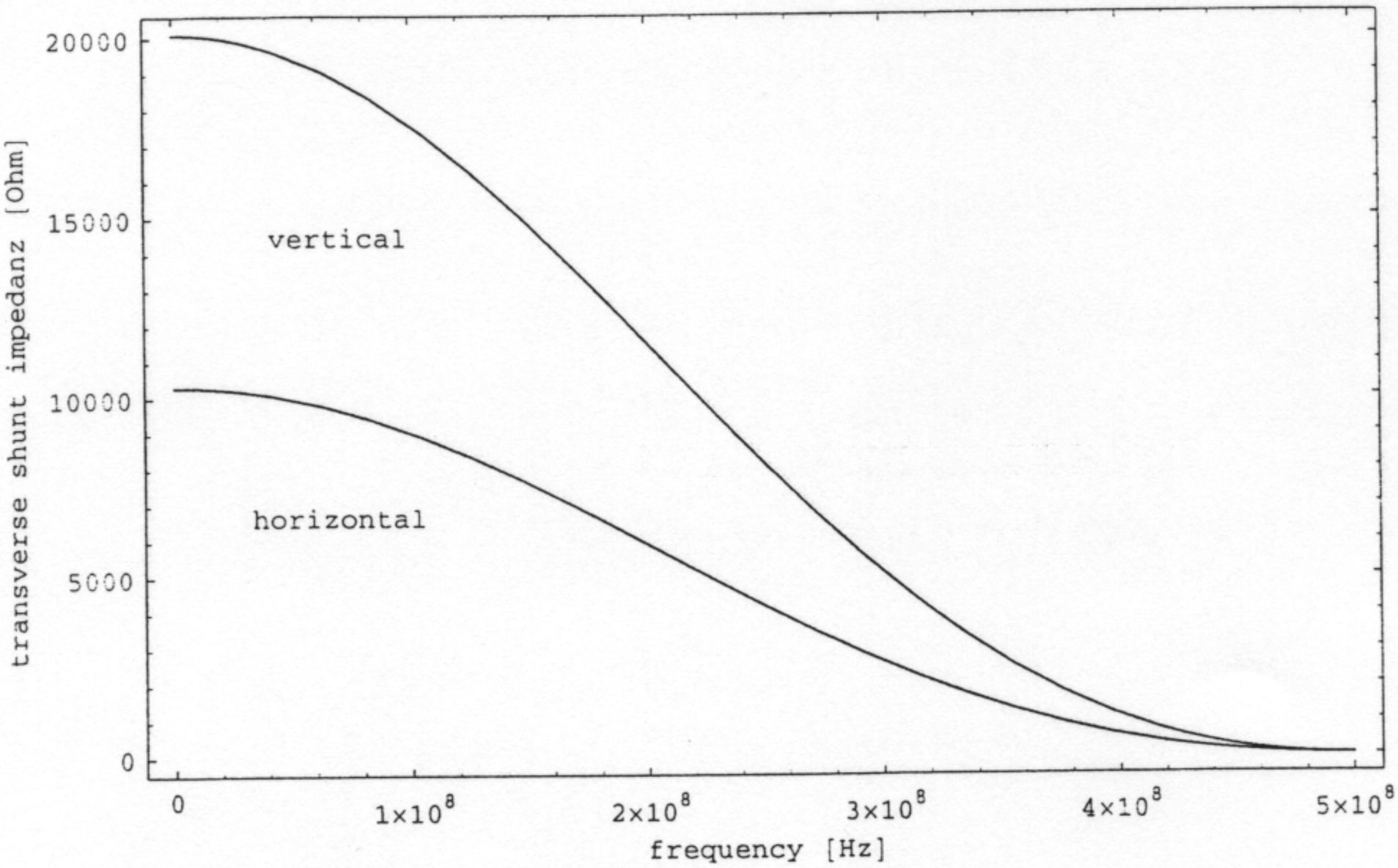


Figure 0.0.3: *shunt impedance of the BESSY-II TFB-kickers*

line impedance	50 Ω
electrode length	0.3 m
overall length	0.6 m
electrode separation (x,y)	0.065 m, 0.035 m
geometrie factor (x,y)	1.1, 0.83
kick voltage @ 1 Mhz (x,y)	1.1 kV, 1.6 kV
kick voltage @ 250 Mhz (x,y)	1 kV, 0.7 kV

commissioning experiences:

- started/ended in December 99

1. cable timing at different points in the system
2. quickly done by fast scope using a single bunch
3. fine tuning of the correction kick by a Colby delay line
4. setting of the notch filter in multibunch mode for best suppression of revolution harmonics
5. adjustment of the mixing coefficients for best damping (no transfer function measurement done)

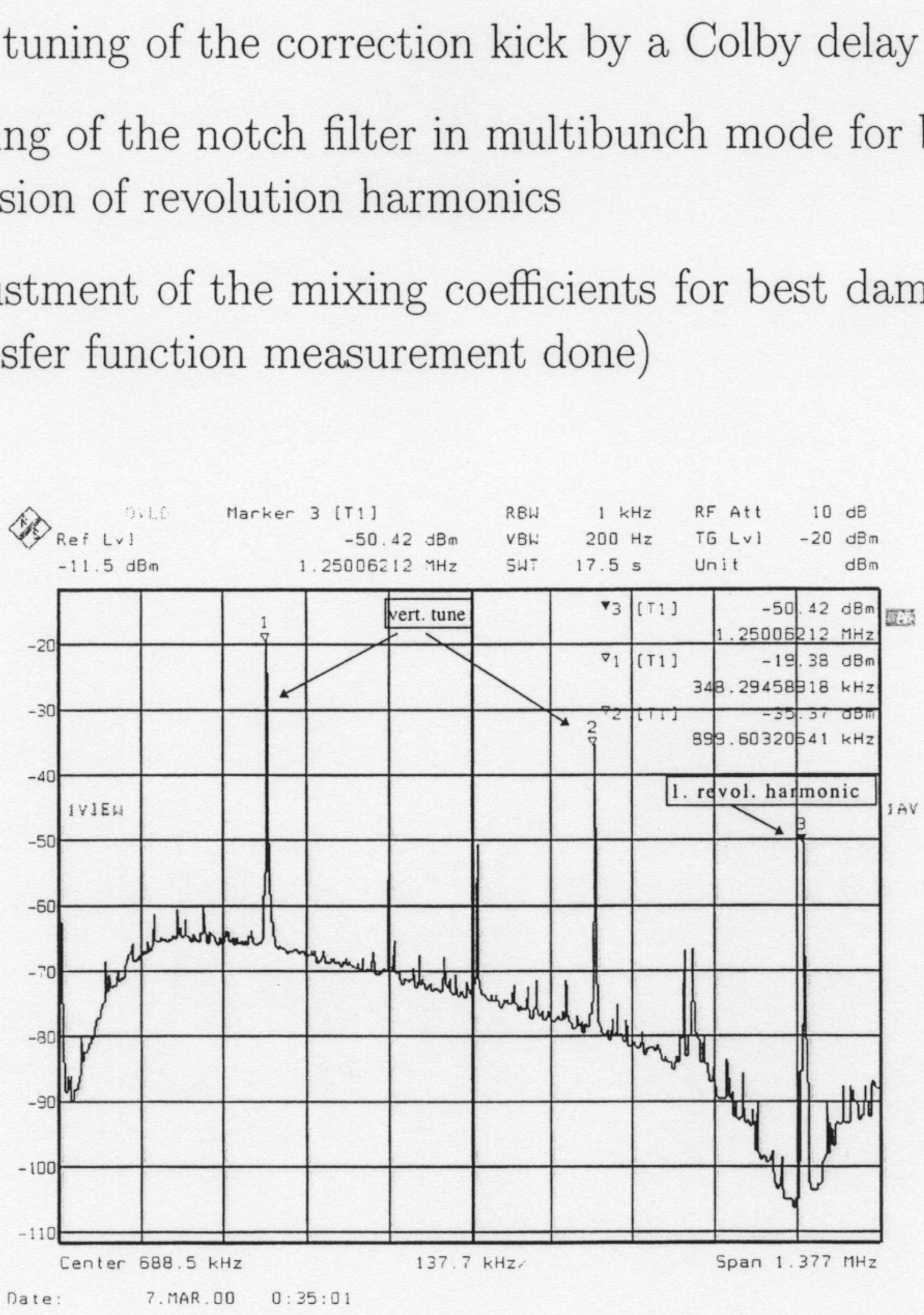
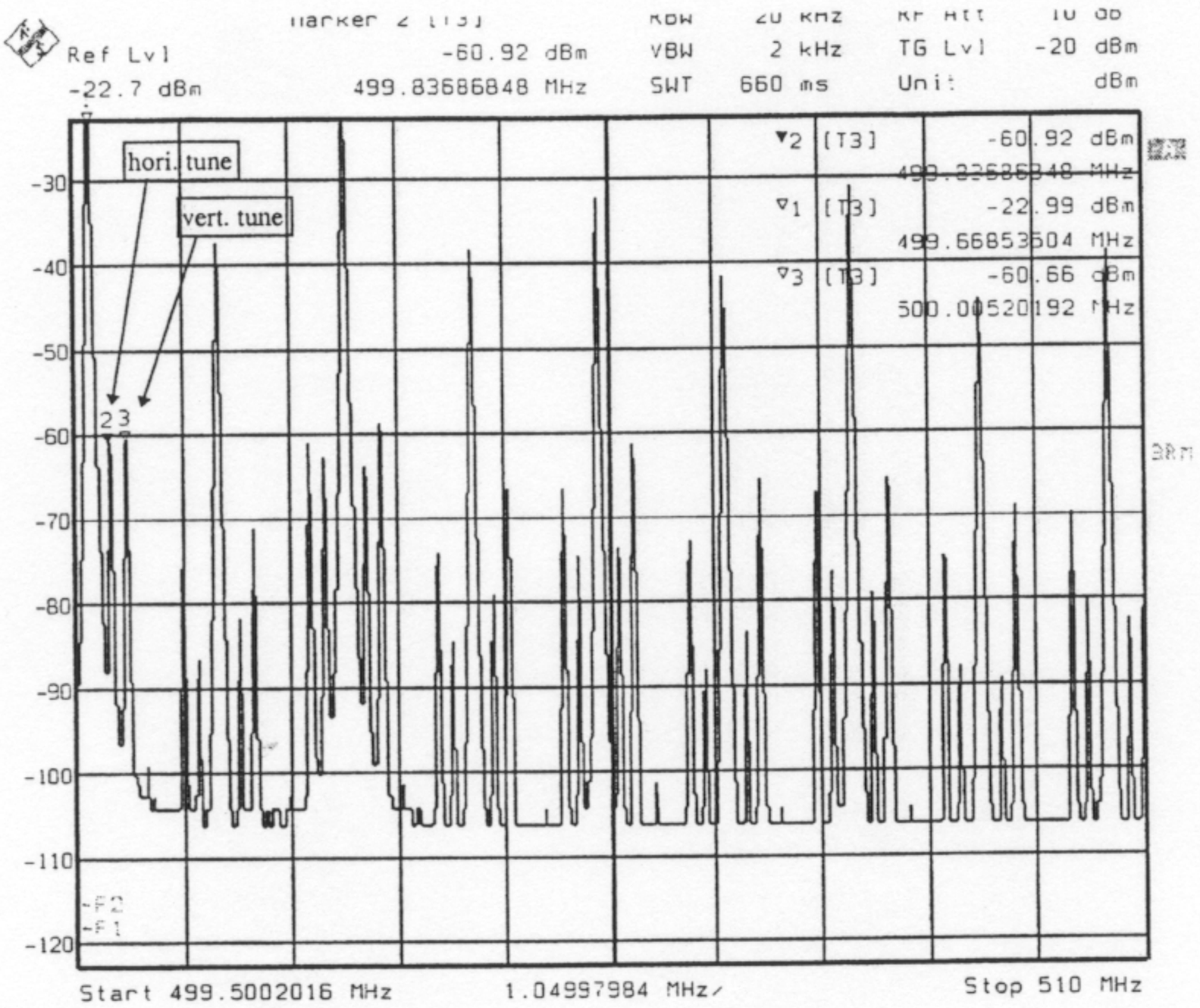


Figure 0.0.4: *vertically unstable beam measured after the comb filter*

results:



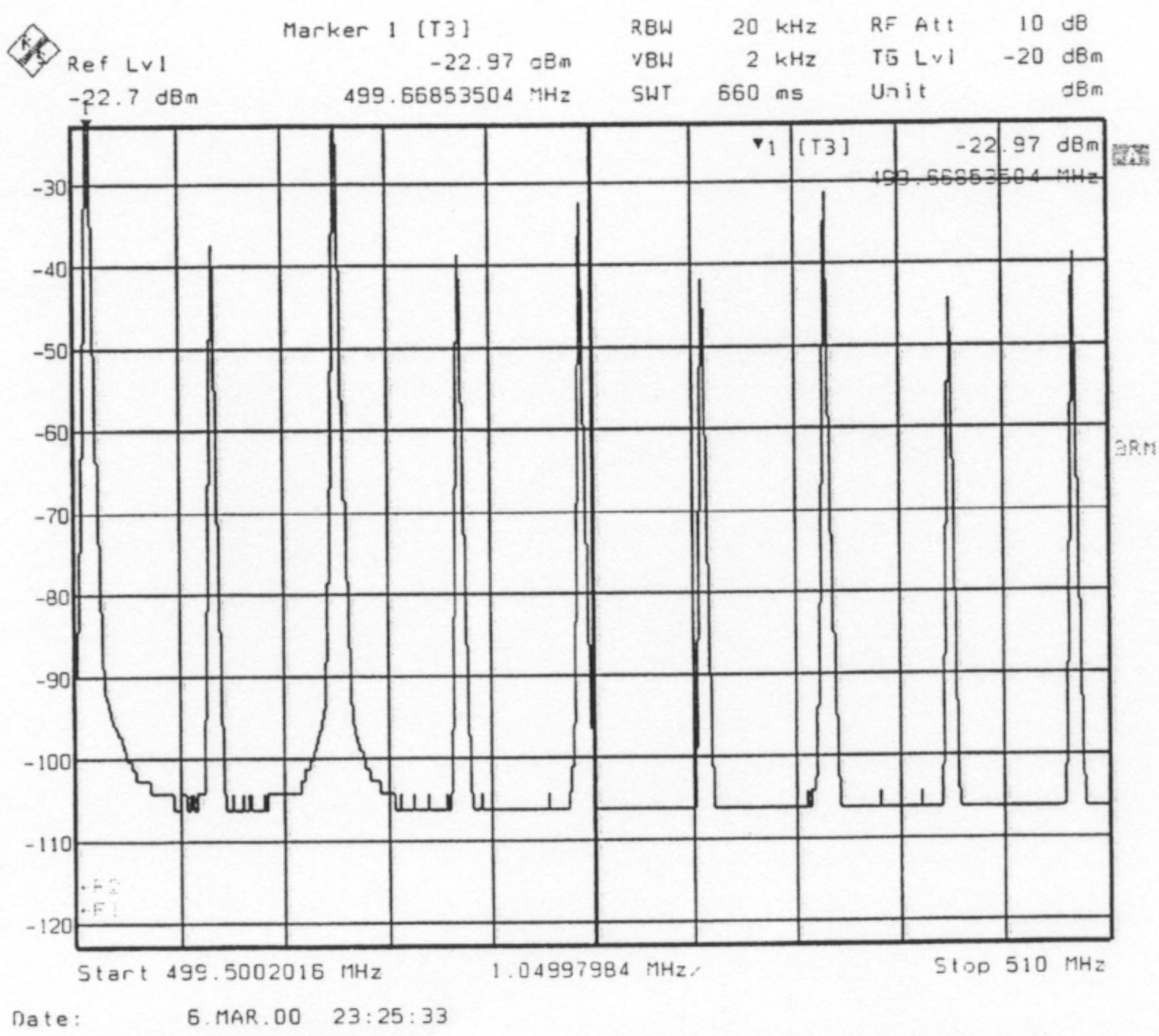


Figure 0.0.5: *beam spectrum (TFB off/on); I=150 m;* $\xi_{x,y} = +1$

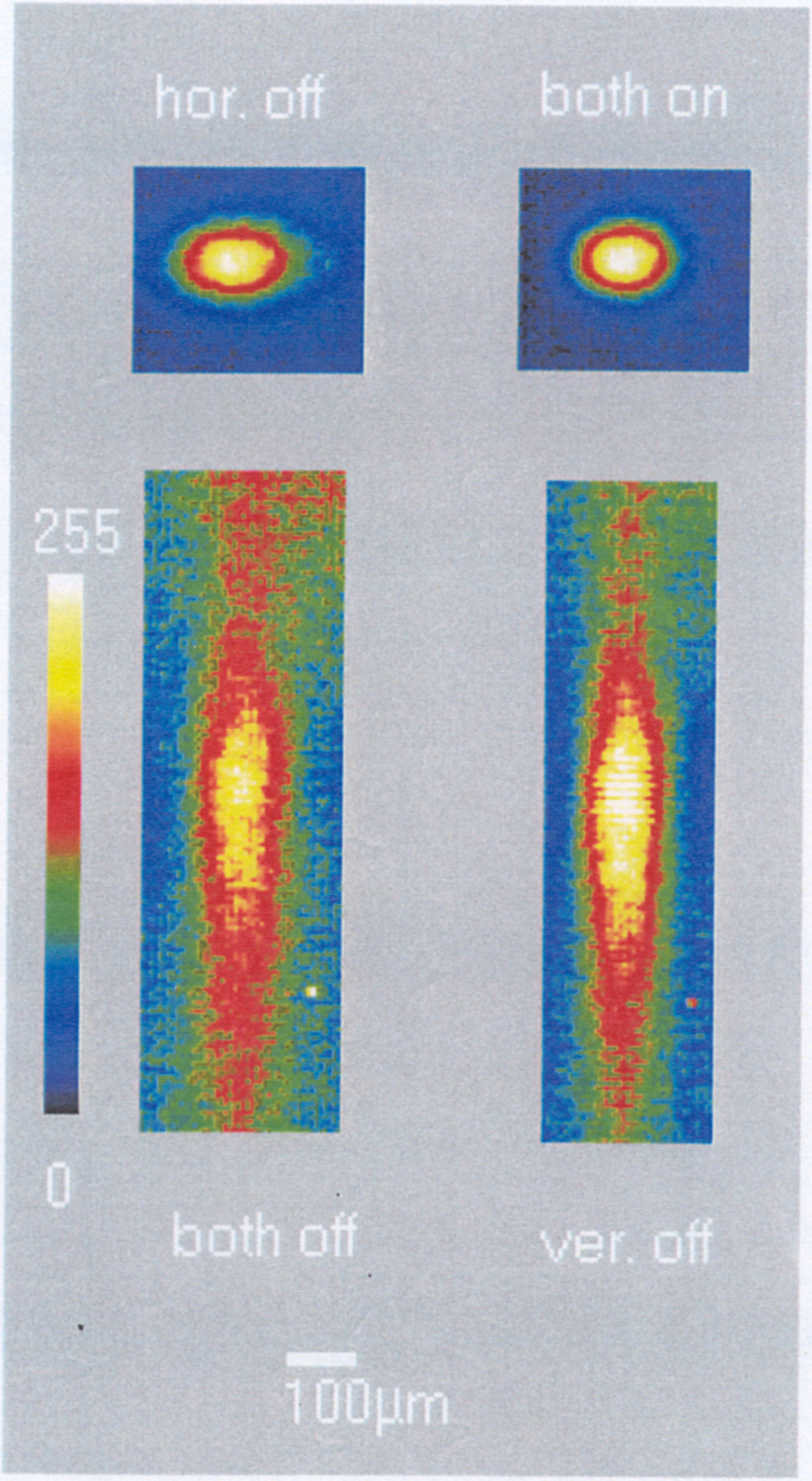


Figure 0.0.6: *beam dimensions with TFB on/off*

summary:

- commissioning very quickly done
- system successfully tested up to 350 mA
- TFB and LFB work well together
- system runs continously in user operation
- no problems to report
  (might change with Landau cavities installed)

Many thanks to all helping us commissioning the TFB !!!!
(esp: J. Byrd, G. Stover from ALS)