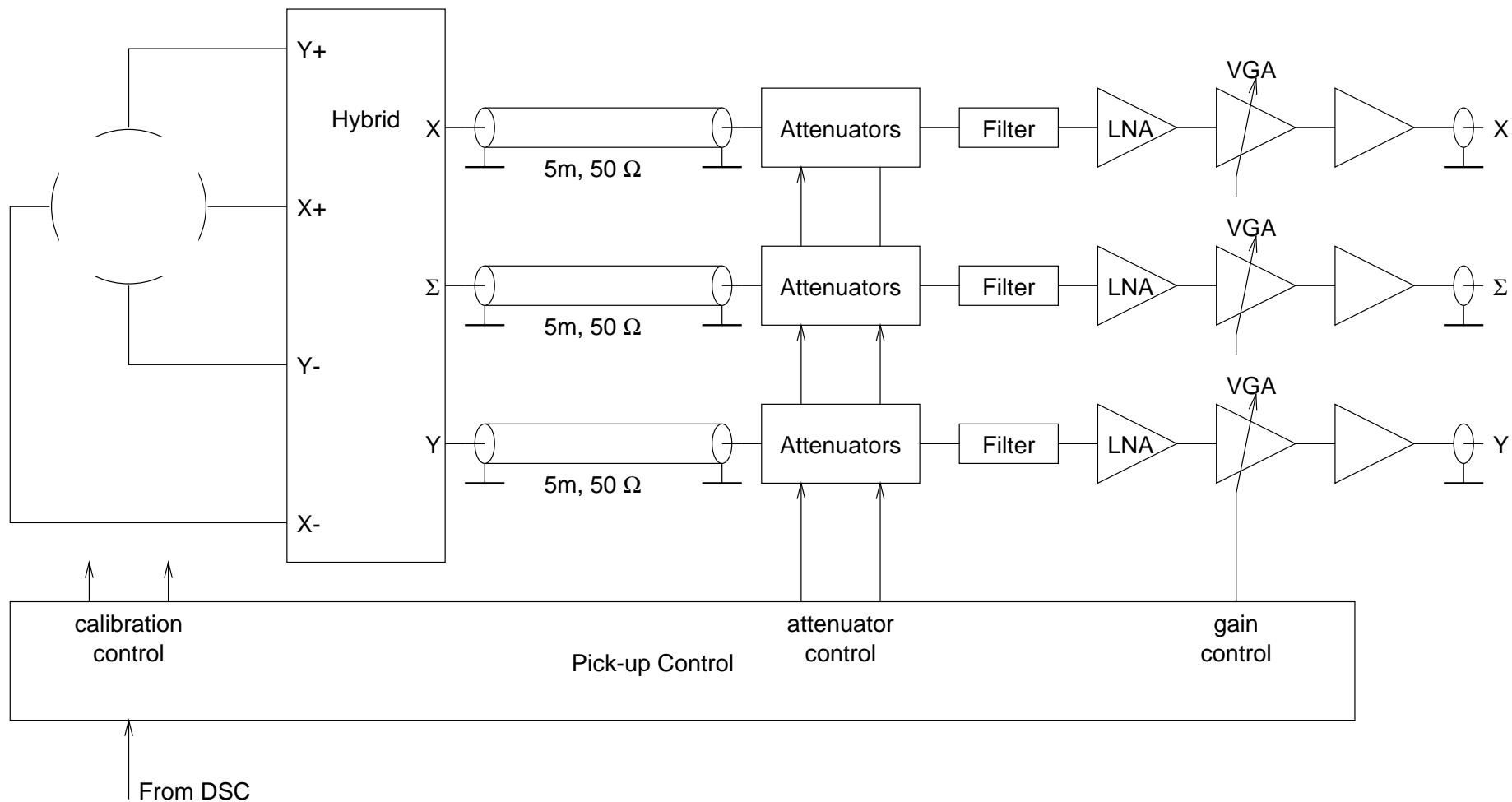


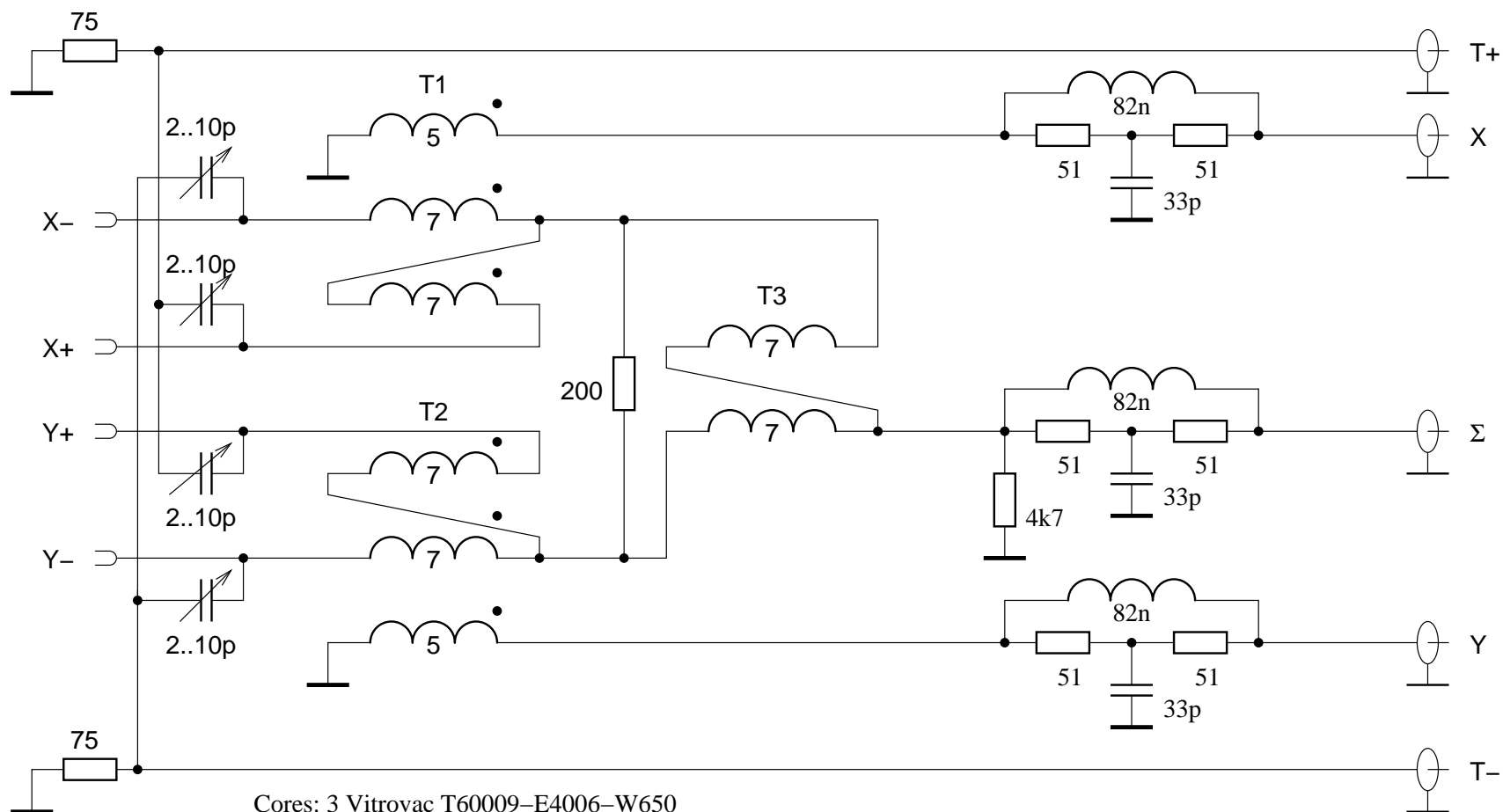


Signal processing chain block diagram





Hybrid coupler

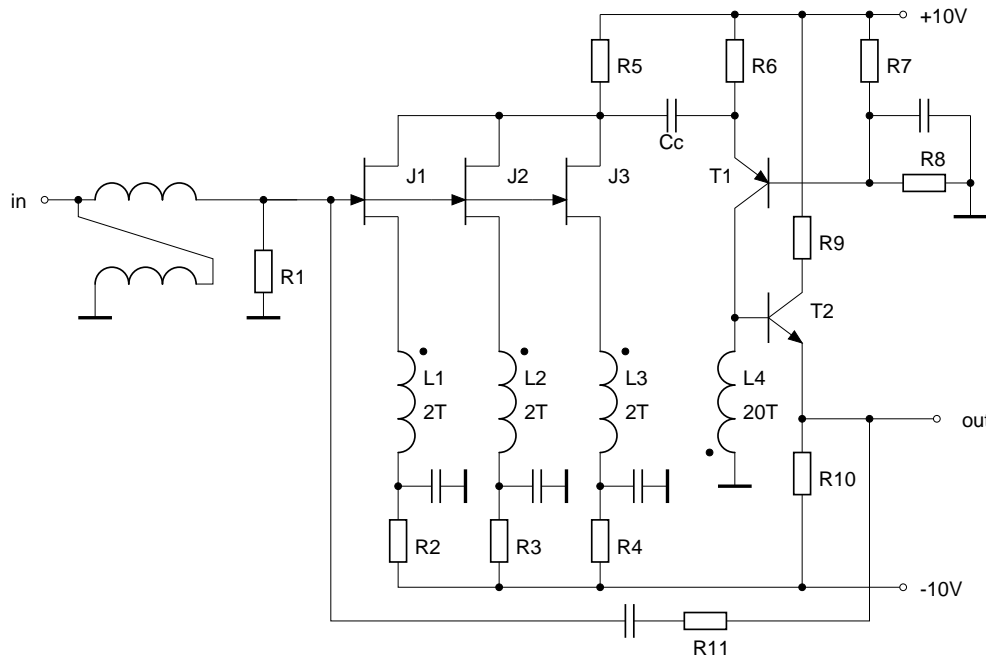


Cores: 3 Vitrovac T60009-E4006-W650

Variable capacitors: Johanson model 8052



Low-noise pre-amplifier

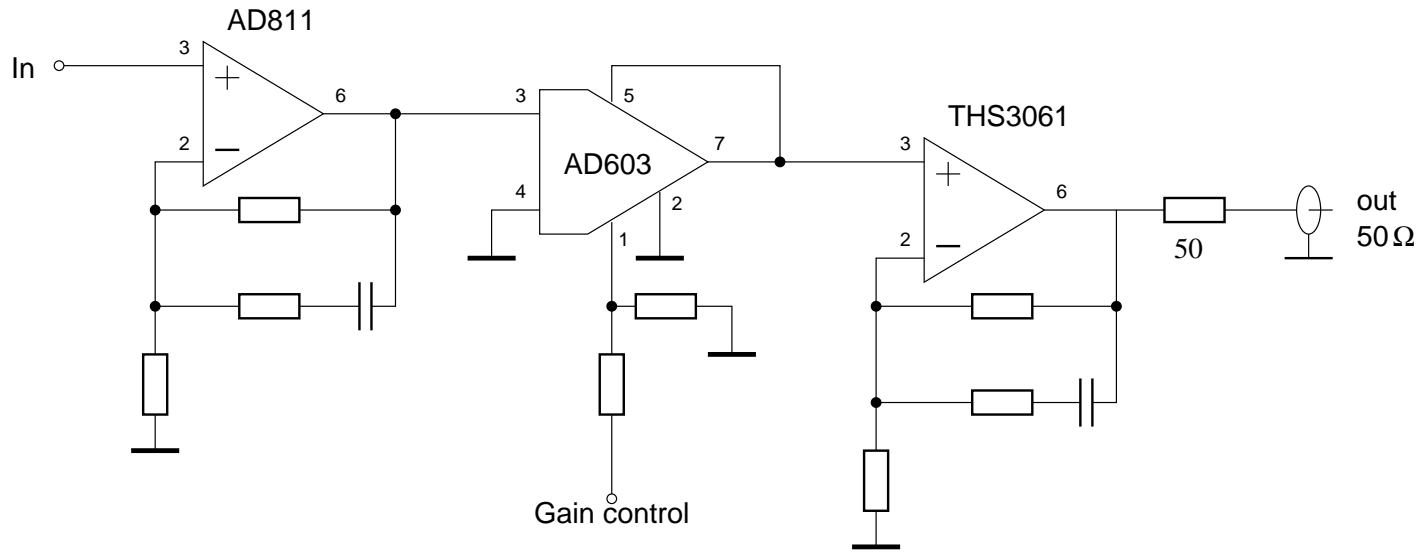


Simplified schematic diagram

- Basically a folded cascode
- Parallel input FETs lower V_n
- Gain set by transformer feedback
- $Z_{in} = 200 \Omega$ set by 'cooled resistor' feedback
- 1:4 input Xformer changes Z_{in} to 50Ω ...
- ... and improves noise match
- Equivalent input noise voltage: $300 \text{pV}/\sqrt{\text{Hz}}$
- Bandwidth: 20kHz-75MHz
- Note: Supply rejection is very poor:
- Supply voltages must be **clean**



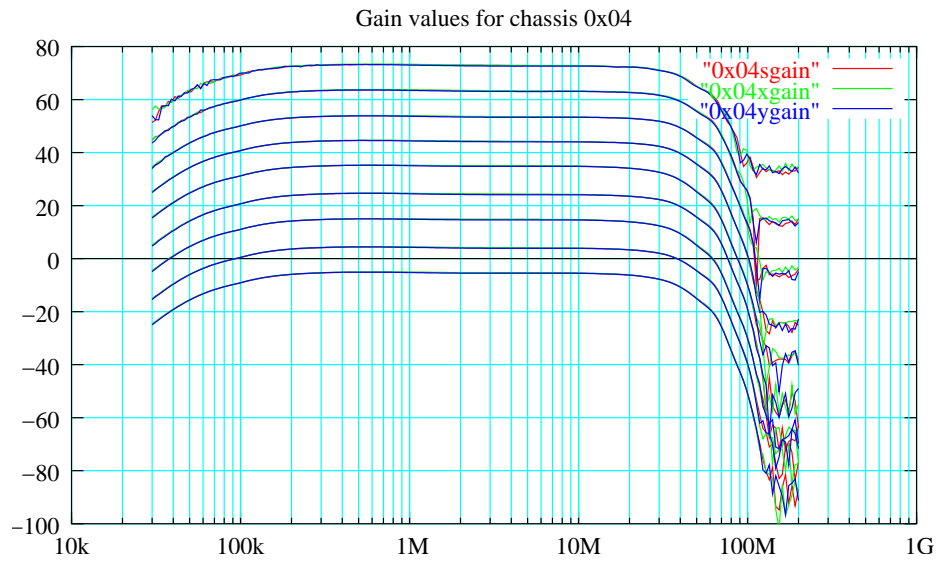
Variable gain amplifier



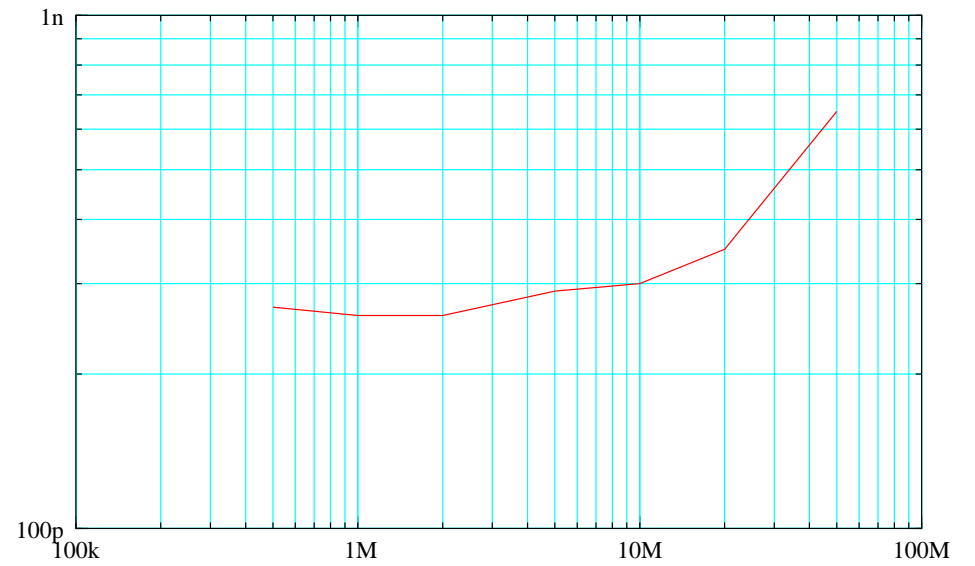
- ΔG 40dB using an AD603
- Corrects frequency response of PU-hybrid combination



Gain and noise curves



Gain vs. frequency

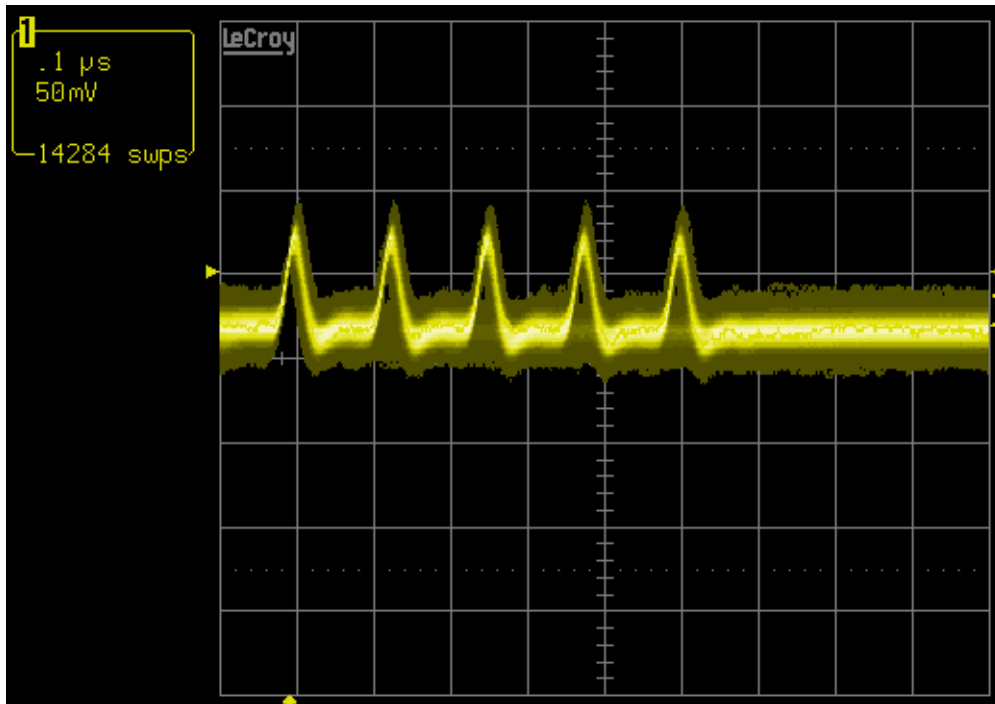


Input-referred noise voltage vs. frequency



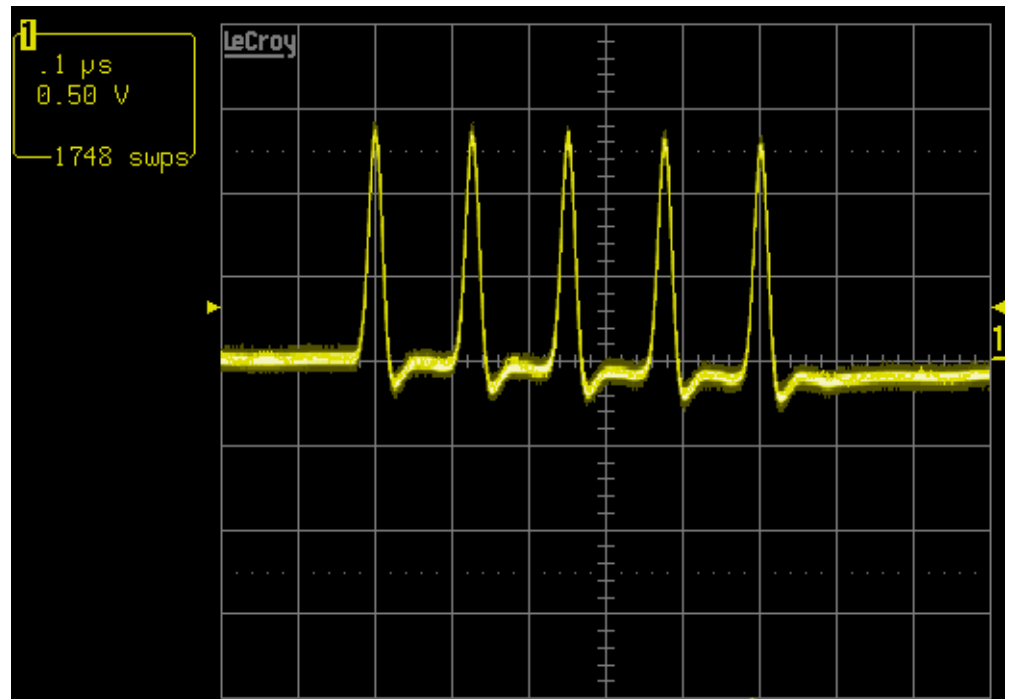
Comparing old and new

Old system, maximum gain



100ns, 50mV

New system (and there is gain to spare)



100ns, 500mV

- Simulated beam intensity $1e9p/b$ ($I_{bp} \sim 2mA$)