

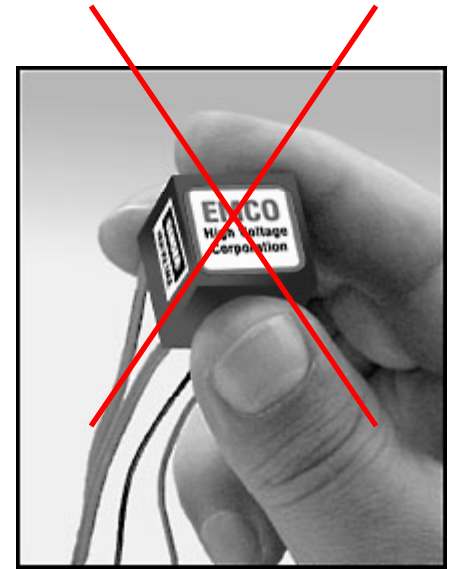


# **Development of $\mu$ HV miniature HV supplies**

Harry van der Graaf, Henk Groenstege, Fred Hartjes and Jaap Kuijt

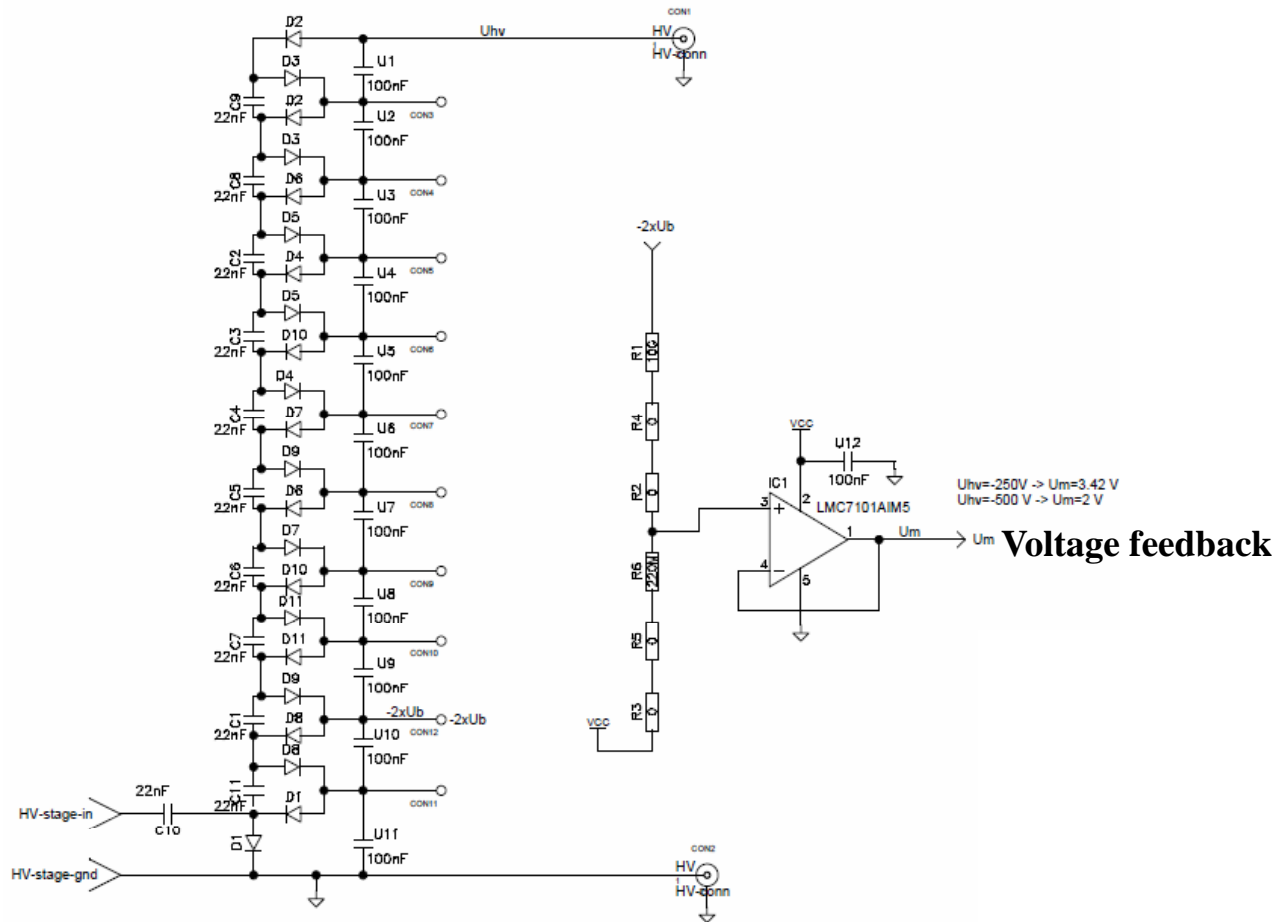
# Concept

- ◆ Putting dedicated HV units in the vicinity of a detector
- ◆ Commercially available HV supplies are not suited for this
  - Often too bulky
  - May use iron based transformers
    - => do not operate in a magnetic field
  - Not radhard
  - Designed to deliver substantial power (1 W or more) where powers in the mW region are needed
  - Mostly no trip level in the nA region
- ◆ Need for dedicated HV supplies in HEP
  - As small as possible
  - Limited output power
    - 5 mW for MPGDs and diamond
    - Up to few 100 mW for silicon
  - => two different versions have to be made
  - Small input power (< few mW without output power)
  - Ranging from 400 to ~ 1000V
  - Very radhard (until 1 Grad,  $10^7$  Gy)
  - Minimal noise emittance
  - Output voltage stabilization, low ripple
  - High resolution current measurement (< 1 nA resolution)
  - Trip level in the nA region
  - External communication via CAN bus



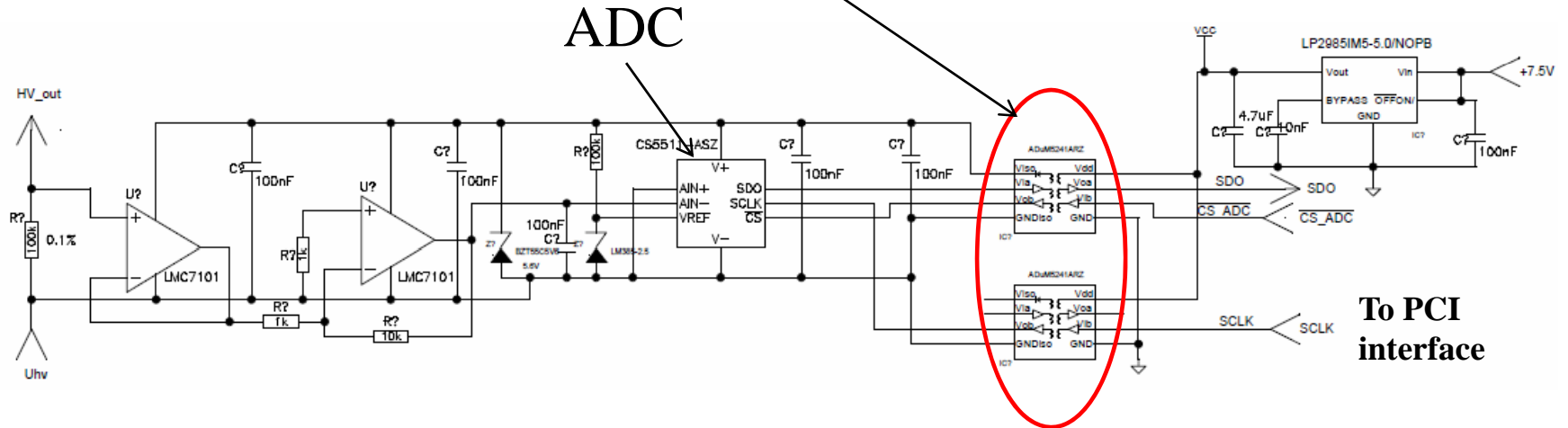
# Creating HV with Cockcroft-Walton circuit

- ◆ Block pulses in (duty cycle modulation)
- ◆ No transformer
- ◆ Voltage divider feedback for stabilisation



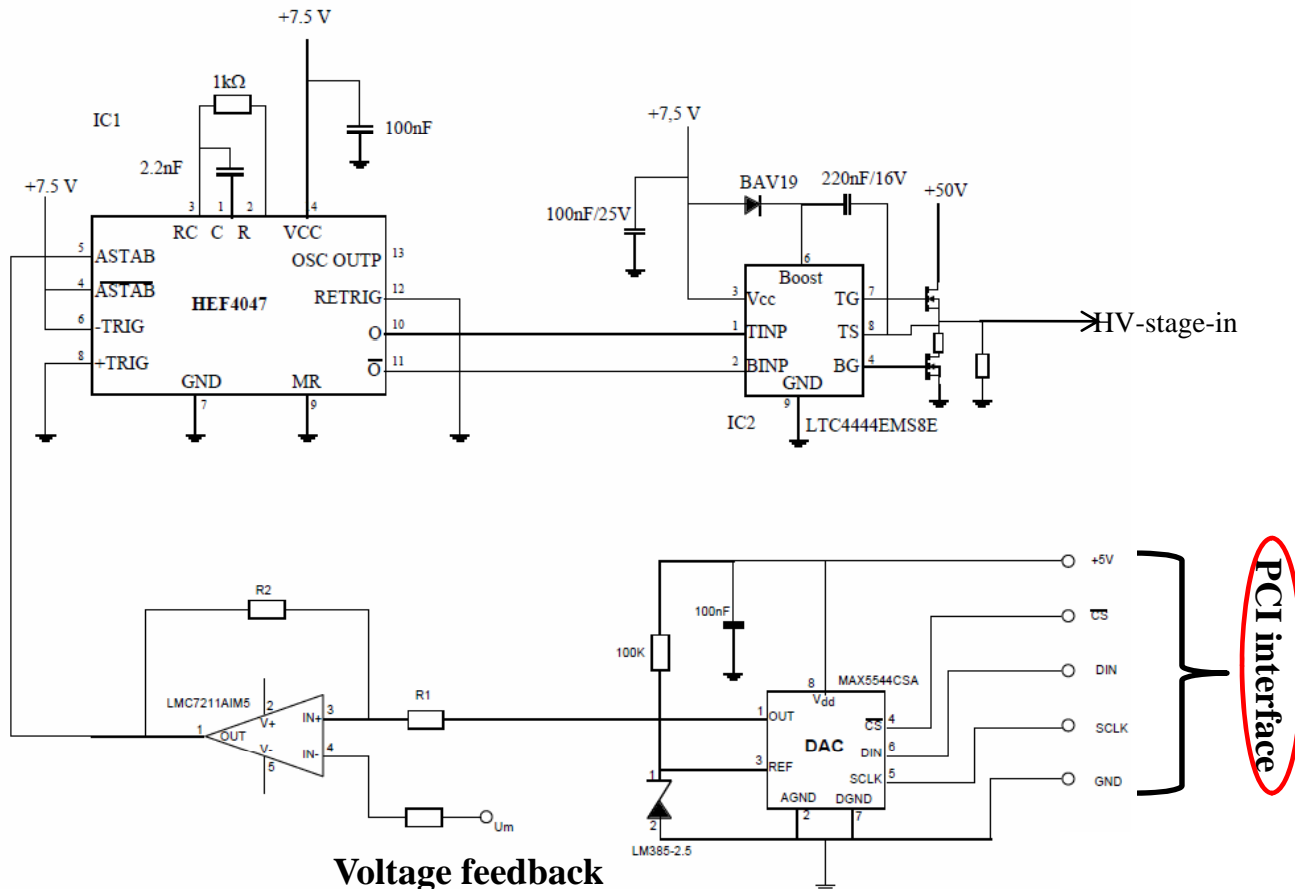
## Measurement output current

- ◆ Using inductive DC-DC converters
- ◆ Analogue current digitized



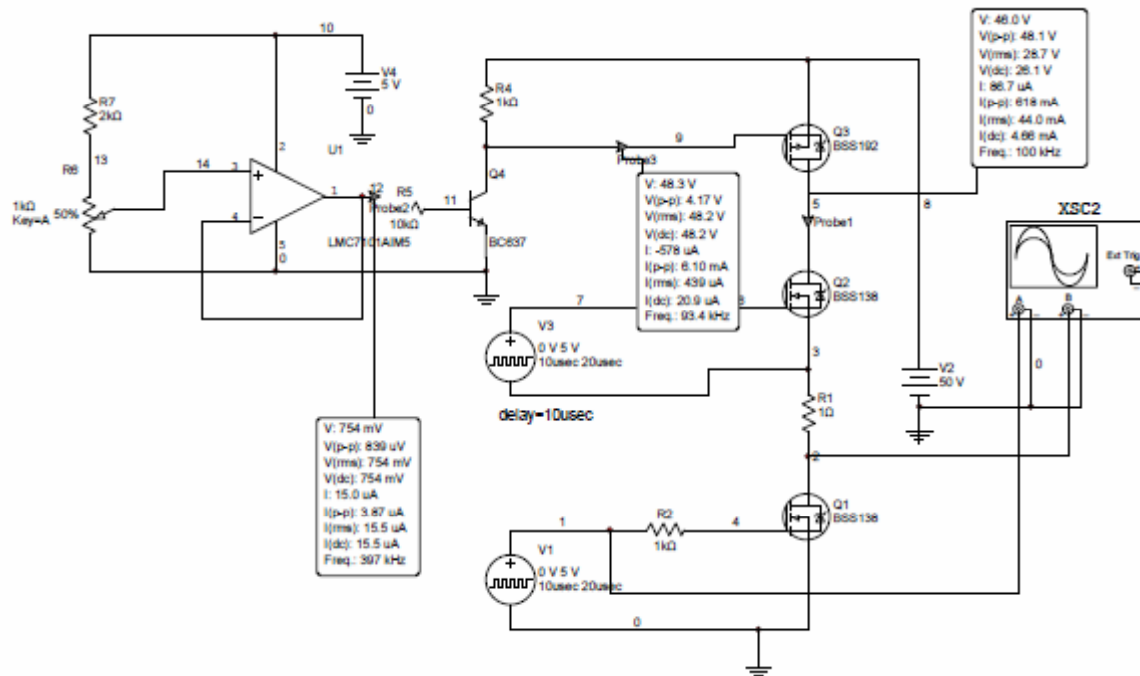
# Cockcroft-Walton supply

- ◆ Control by PCI-bus
- ◆ Voltage control by regulating duty cycle at output stage
  - Need to regulate +50V supply (amplitude block pulse) as well



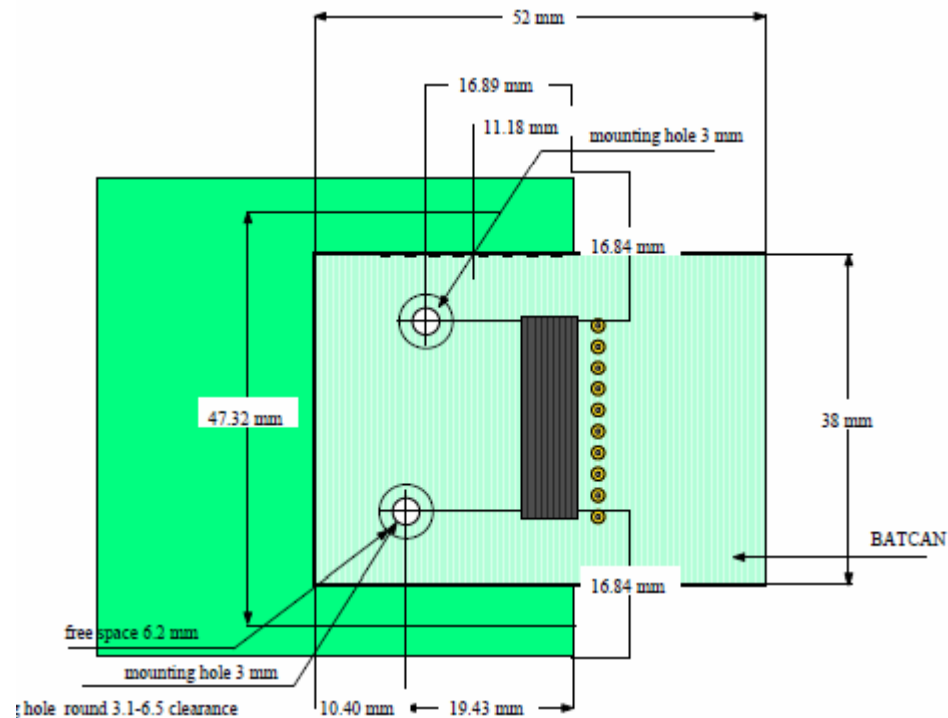
## Regulating block pulse amplitude

◆ Only simulated



# Not miniature yet

- ◆ Presently 38 x 52 mm PCB
- ◆ To be treated with Parylene (moisture barrier)



# Status

- ◆ Project just started up
- ◆ Regulation 50V supply to be implemented
- ◆ Miniaturize components
  - Radhard

