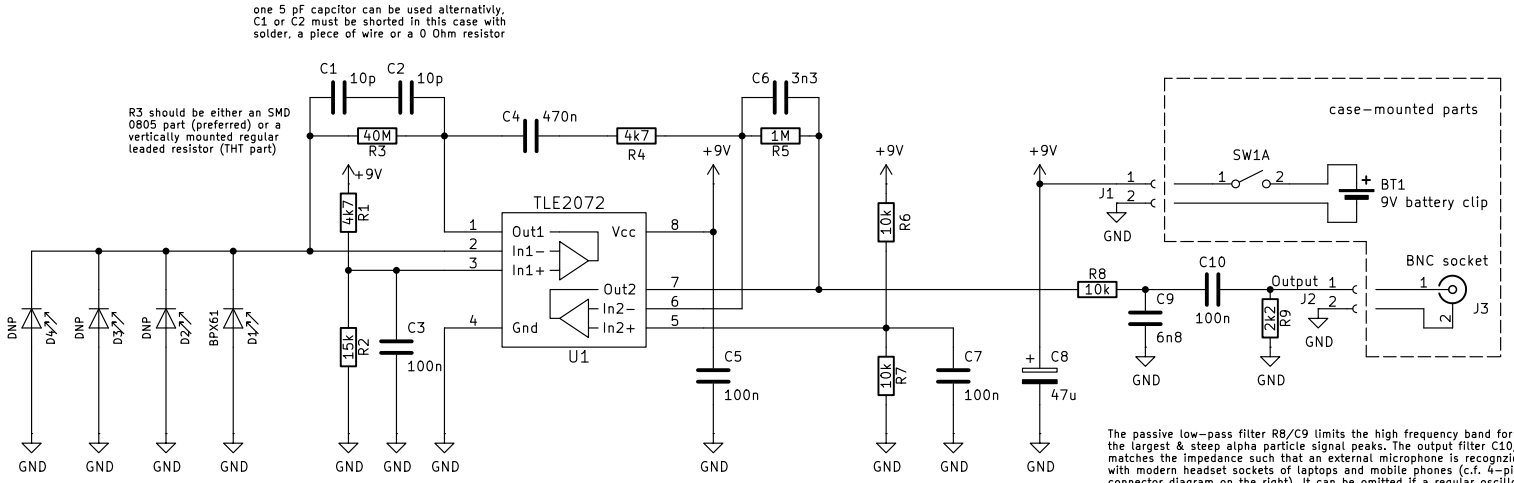
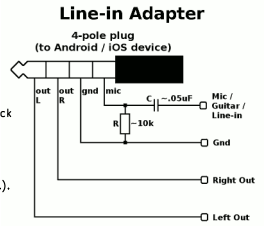


The passive low−pass filter R8/C9 limits the high frequency band for the largest & steep alpha particle signal peaks. The output filter C10/R9 matches the impedance such that an external microphone is recognzied with modern headset sockets of laptops and mobile phones (c.f. 4−pin mini−jack connector diagram on the right). It can be omitted if a regular oscilloscope records the signals but that might require a new energy calibration using a reference alpha source if alpha energies shall be measured precisely. Most microphone and audio line−in connectors expect an output resistance between 2 and 10 kilo Ohm. The reference energy calibration in the paper was carried out with the default values as written in the schematic (R9 as 2.2k etc.).



For measuring characteristic energies of alpha particles, one BPX61 with a destroyed glass window is needed. Alternatively up to 4 x BPW34F(A) diodes can be populated (like in V1.1). In this case only electrons will be detectable plus few gamma photons as with the BPX61. The advantages of using 4 x BPW34F(A) diodes are:

- x4 increased sensitivity towards ionizing radiation (x4 sensitive volume)
- less sensitive to disturbing electromagnetic interferences (due to lower signal amplification)
- less sensitive to stray light (due to the black plastic cases of the BPW34F(A) diodes)
- much less susceptible to the microphony effect / mechanical vibrations (due to lower signal amp.)

Following changes are need for the 4−diode variant using BPW34F(A) diodes:

D1 − D4 = BPW34F or BPW34FA, from Osram or Vishay
R3 = 10M
R4 = 1k
R5 = 100k
R8 = 0 (short with a wire)
C4 = 100n
C6 = 10p
C9 = not needed (DNP = do not populate)

All hardware & software source files plus detailed instructions on:
www.github.com/ozel/DIY_particle_detector
Details on the physics of the sensors & reference measurements:
www.mdpi.com/1424−8220/19/19/4264
(www.doi.org/10.3390/s19194264)