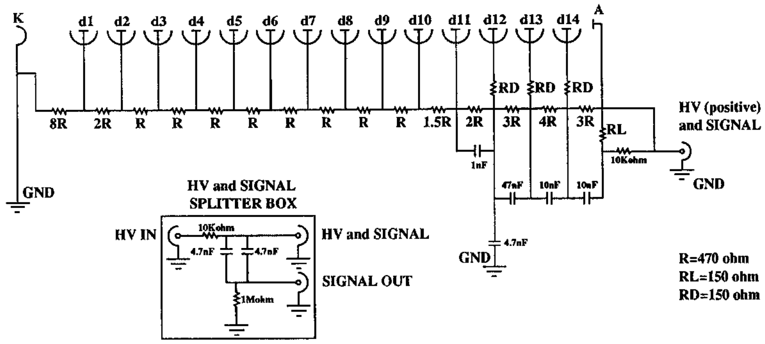

Fig. 1. The HV divider and the signal splitter box for the EMI 9356KA photomultiplier.

2. The photomultiplier and the divider

The PMT type was selected according to the following requirements: large photocathode surface, high amplification, good (but not ultra-fast) time properties, good P/V ratio in the single photoelectron pulse spectrum, low sensitivity to magnetic fields, low radioactive background, acceptable cost. The choice was a variety (EMI 9356KA B53) of the EMI 9350 8-in. diameter 14-dynodes photomultiplier. The high amplification ($\approx 10^7$) satisfies the electronics needs ($\approx$ 30 mV for a single photoelectron pulse); the transit-time jitter ($\approx$ 8 ns FWHM at the 1-phe light level) matches the liquid scintillator decay time ($\approx$ 7 ns); the B53 specification refers to the low radioactivity glass of the PMT envelope (ultra low background glass: $K = 60$ ppm, Th = 20 ppb $U = 10$ ppb [4]).

The voltage divider design and construction were optimized in order to comply with the stringent requirements imposed by the experiment on electrical, mechanical, chemical and radiopurity characteristics. The selected solution of surface mounting on printed circuit board (PCB) technique minimizes at the same time the electrical connections length, the total mass of the voltage divider base and thus the integrated mass of the small fraction of residual radioactive contaminants. At the last stages of the divider chain the charge storage capacitors are also of the surface mounting type while only two standard type, larger size, high voltage capacitors are required for the anode signal extractions and for the ground referencing of the charge storage system on the last dynodes. For what concerns the electrical characteristics of the voltage divider, instead of the "linear bleeder" version, with equal interdynode voltages, which maximizes the amplification for a given high voltage, we chose a "tapered bleeder" progressive divider type, with interdynode voltages progressively increasing in the last dynode stages. This solution, corresponding to the "O" option on the EMI data sheets, has been proved to provide enhanced linearity at a still acceptable high voltage for the required gain.

The PCB, with all components soldered on it, is a circular disk with a diameter equal to the one of the PMT socket so it is soldered to its pins and glued to the back of the socket itself. Around both a Plexiglas cylinder encloses everything preventing contact of liquid scintillator with any other material except Plexiglas and socket. Both high voltage and signal are carried by a single high quality Teflon RG303, coaxial, 50 Ω cable coming out of a sealed hole in the Plexiglas cylinder. The divider layout is shown in Fig. 1.

3. The dark room and the mechanical structure

The test facility PMT holding structure, the light sources and the optical bench are all located in a dark room adja-

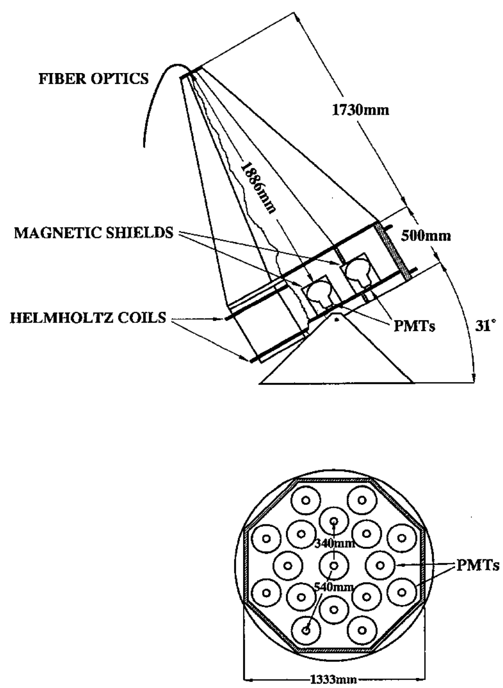

Fig. 2. Two views of the structure of the CHOOZ photomultiplier test facility.