

# CEBAF Large Angle TOF Prototype Photomultiplier Circuits

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The photomultiplier tube (PMT) circuit for the prototype Large Angle Time of Flight detector was designed to incorporate features found in the Forward Angle TOF circuits while accommodating the electronic/geometric specifications due to a new 3" tube from Philips (type XP4312B).

Features used from the old circuit include the FET stabilization/overload protection for the last four dynode stages in the tube, as well as a current-limiting resistor connected to the charged  $\mu$ -metal shield for safety. Resistor and capacitor values were modified slightly and some unnecessary components removed (see fig. 1). The new circuit was analyzed and tested by making a prototype.

The schematic was converted to an actual design template using Autocad™ for making the prototype circular circuit boards (see fig. 2).

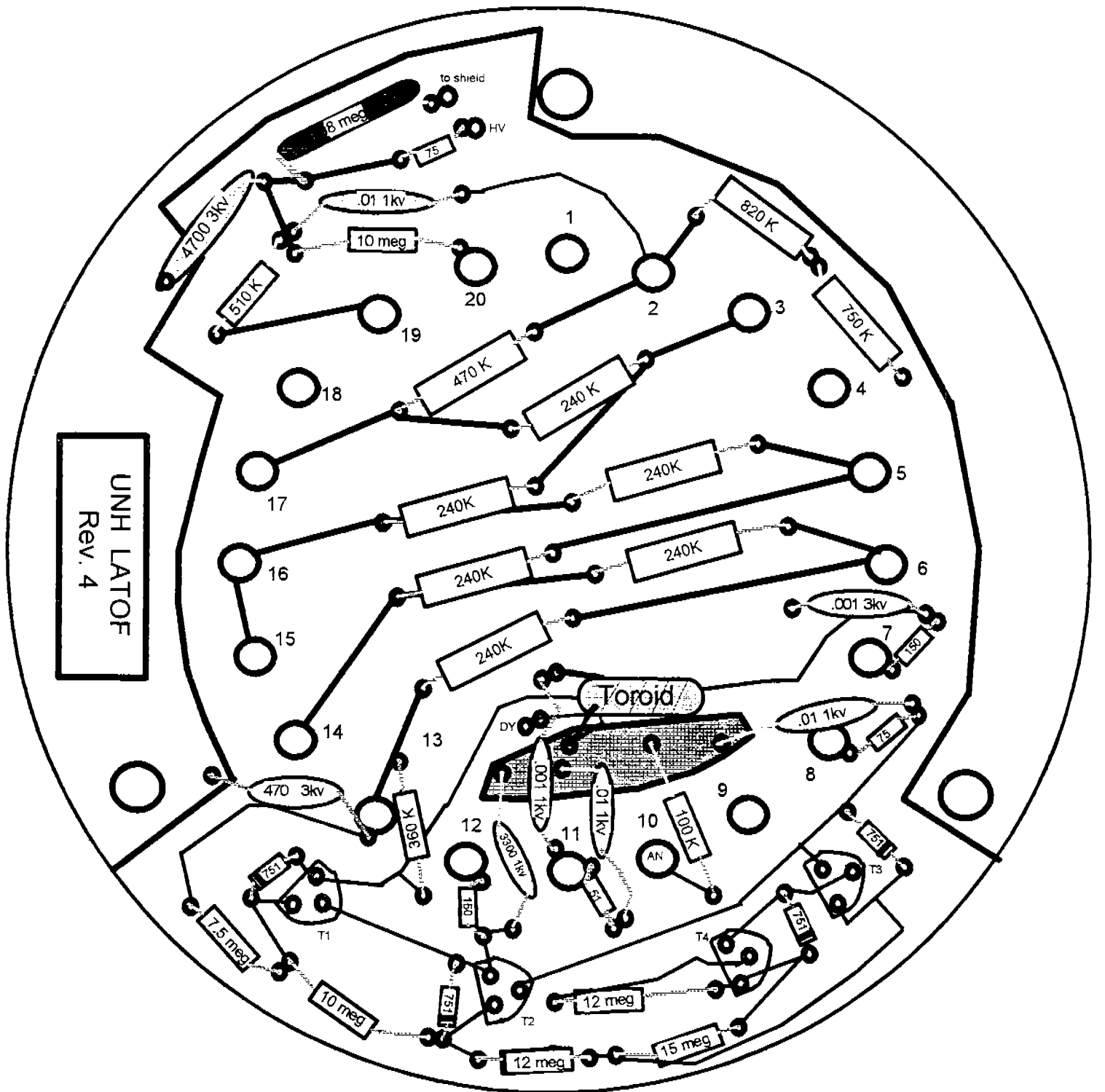
The components and PMT socket were soldered to the board and connected with posts to an aluminum cap where the HV and BNC connections were made. The entire circuit was encased in a tubular housing (see fig. 3).

The circuit was high voltage tested at -2000 VDC and nominal pin voltages were recorded (see table). Once tested at voltage, the circuit was connected to a suitable PMT (Philips type XP4312B) which was connected to a lightguide and scintillator. A good cosmic ray pulse height spectrum was generated (see fig. 4).

## Conclusions:

The prototype LATOF circuit functions well and awaits further testing and approval before going into full LATOF production.





UNH LATOF  
Rev. 4

FIG. 2

LATOF CIRCUIT BOARDS  
Rev. 4  
Assembly Schematic

LATOF PMT and Shield Housing Schematic

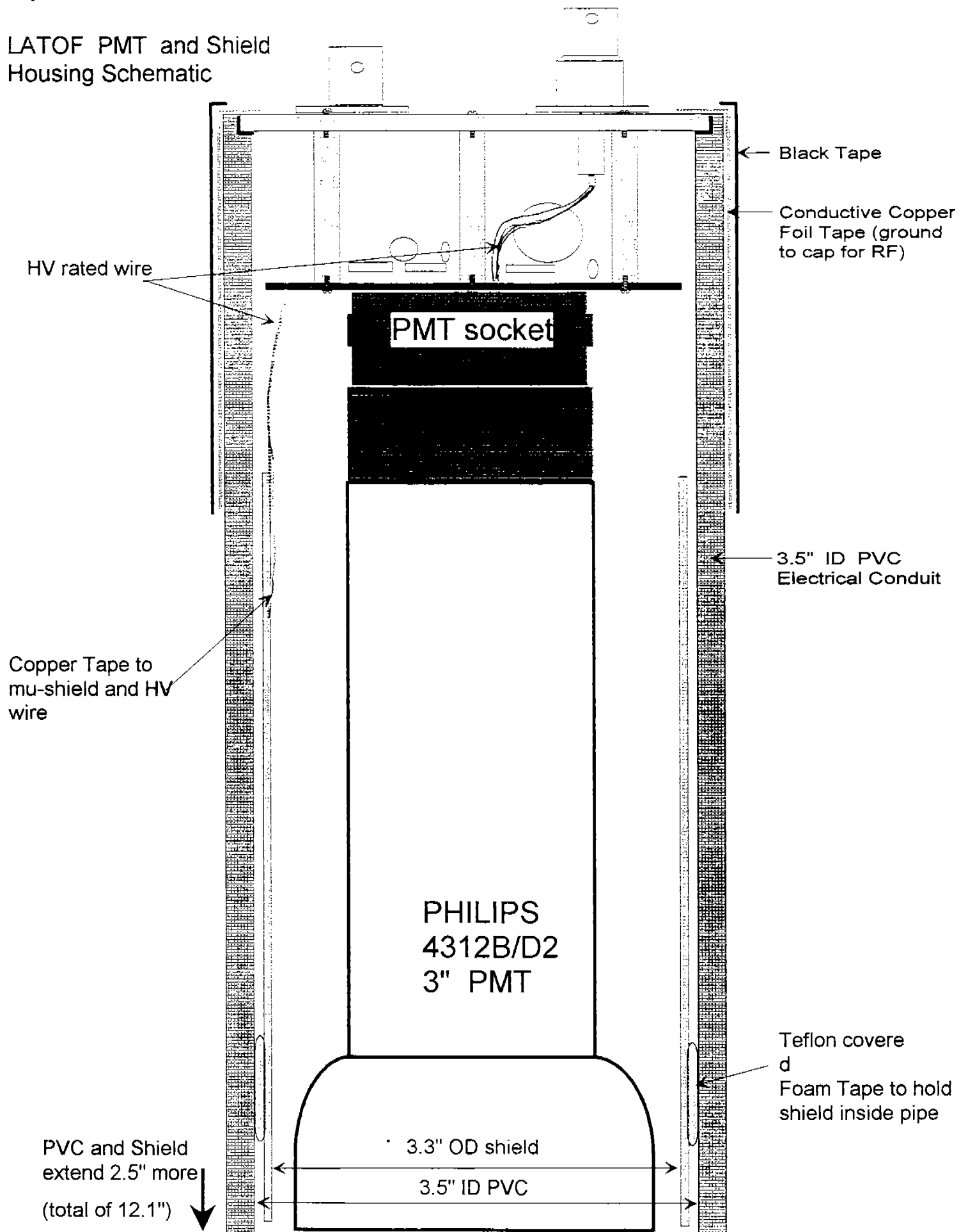


FIG 3

Table of PMT Circuit Pin Voltages  
 (@ -2000 VDC Supply Voltage - no PMT)

Pin #	- HV	Function	Pin #	- HV	Function
20	1712	Cathode	10	0	Anode
19	1830	Grid	9	0	nc
18	0	nc	8	370	Dynode 11
17	1197	Dynode 2	7	679	Dynode 9
16	1049	Dynode 4	6	833	Dynode 7
15	1049	Dynode 4	5	977	Dynode 5
14	906	Dynode 6	4	0	nc
13	762	Dynode 8	3	1122	Dynode 3
12	543	Dynode 10	2	1334	Dynode 1
11	168	Dynode 12	1	0	nc

Cosmic Ray Pulse Height Spectrum  
 (Philips XP4312B/D2 tube)

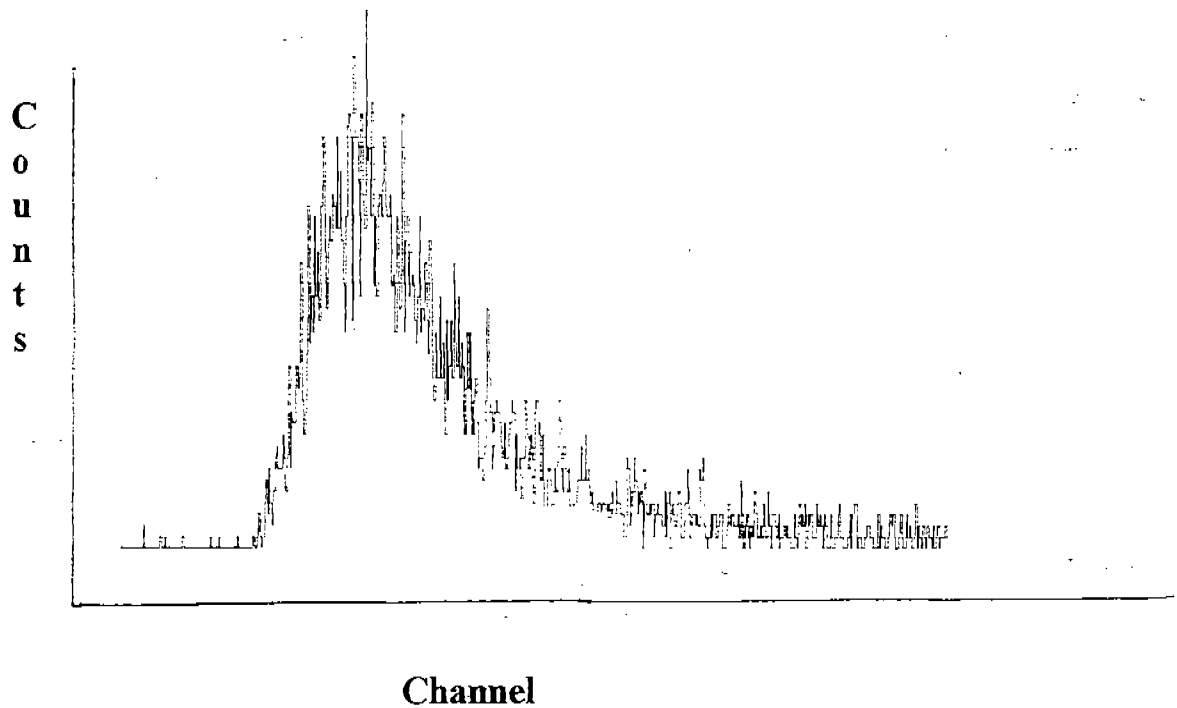


fig. 4