Some preliminary results of the FC TPC electric field simulation

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The first approximation of the drift space structure of Time Projection Chamber (TPC) for TESLA.

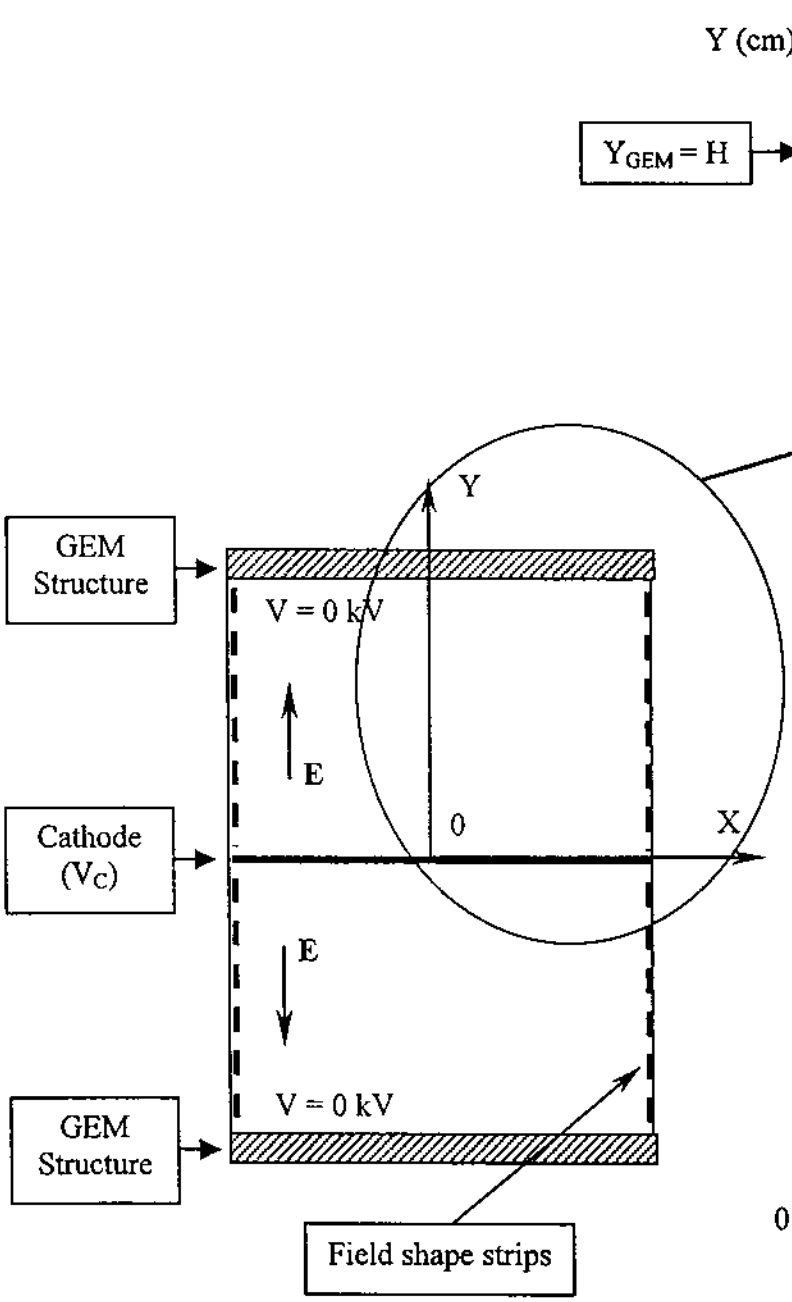


Fig.1a

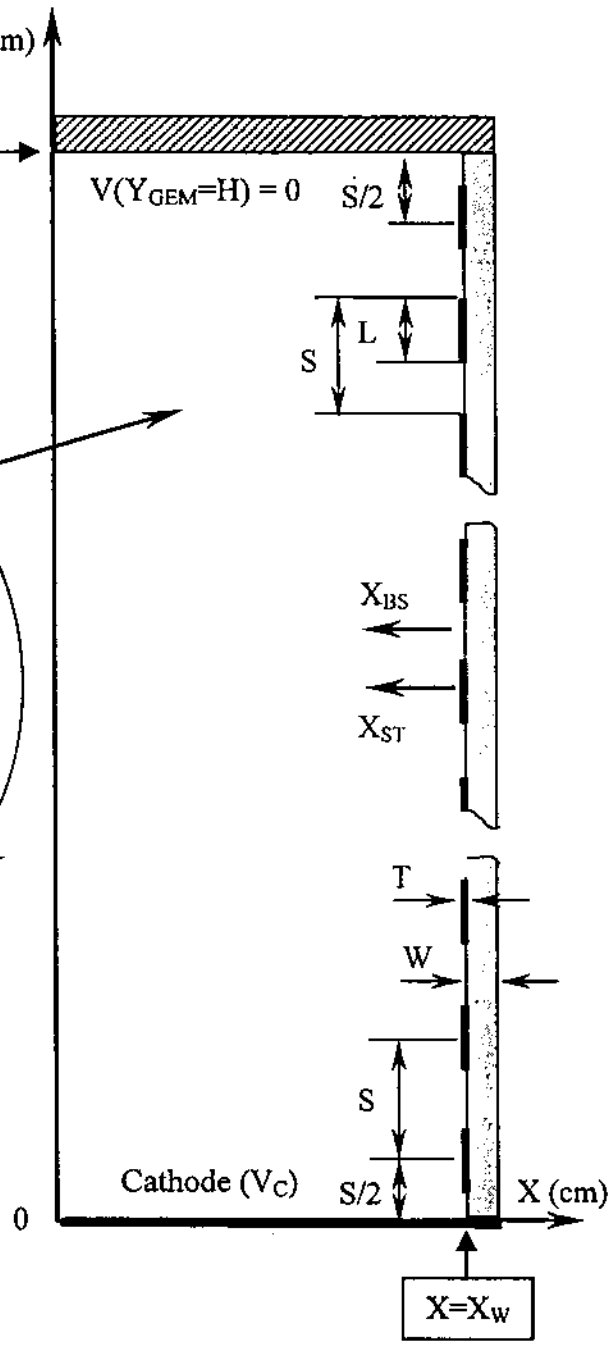


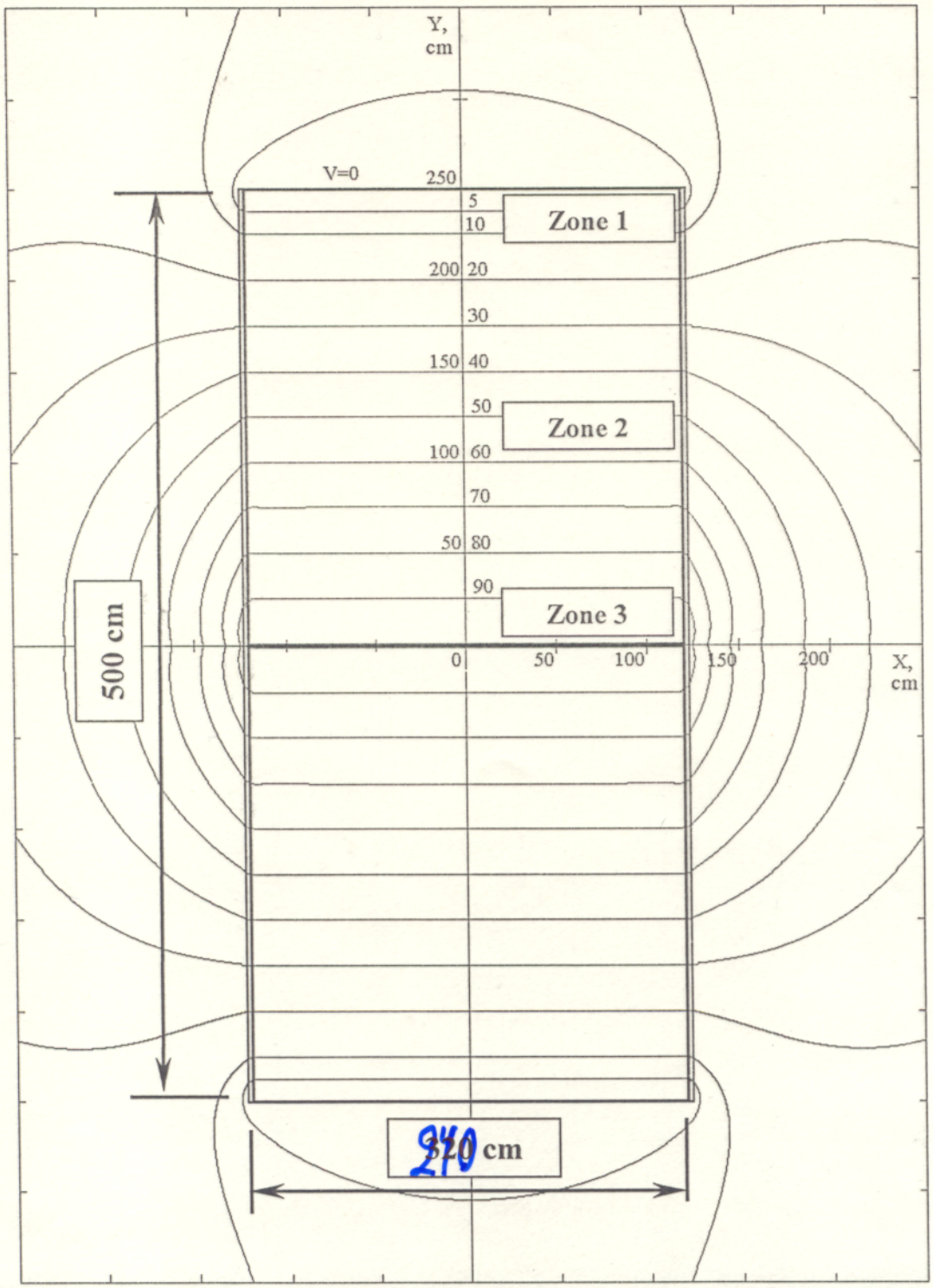
Fig.1b

Description of Fig.1.

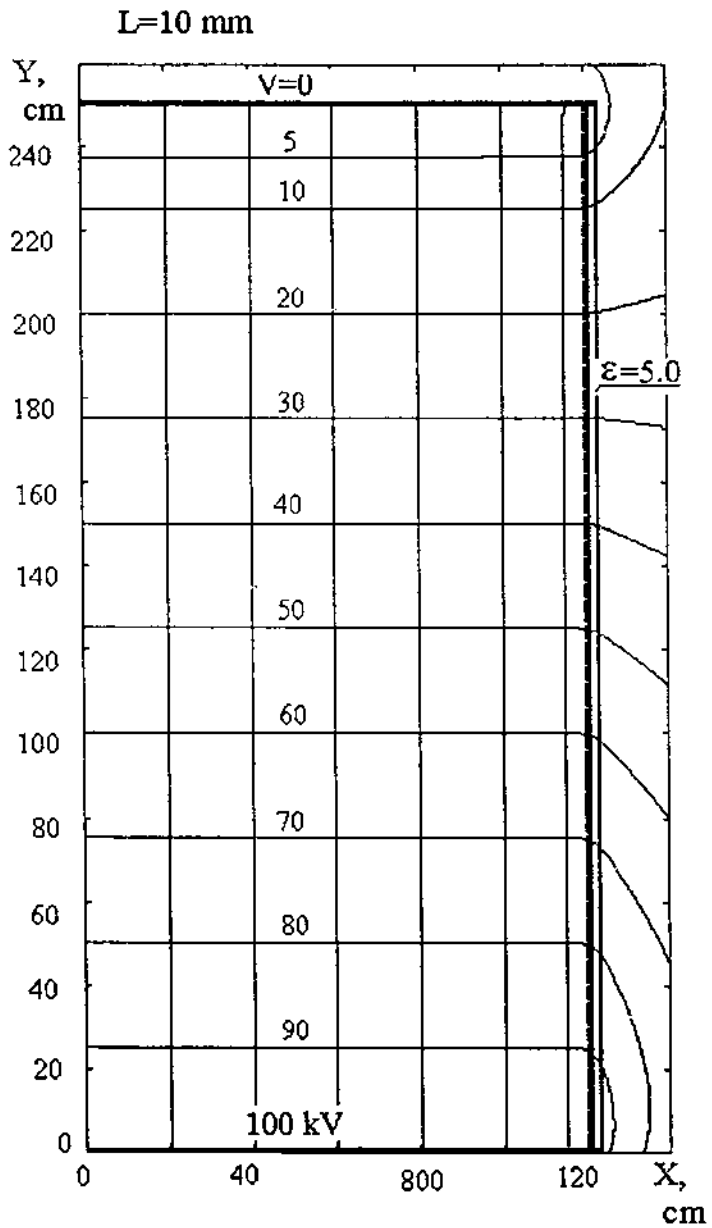
1. L=250cm.
2. X_W=160cm.
3. Electric field tension is E=400V/cm.
4. Cathode potential is V_C= +100kV.
5. Distance between strips is S=2cm.
6. Thickness of the strip T=0.5mcm (5*10**-4cm).
7. Wall thickness is W=3cm.
8. Potential (V_H) that should be fixed on the strip number "N" and the strip coordinate (Y_N) should be calculated according to the following equations:

V_N=ES(N-1/2). Y_N=S(N-1/2).

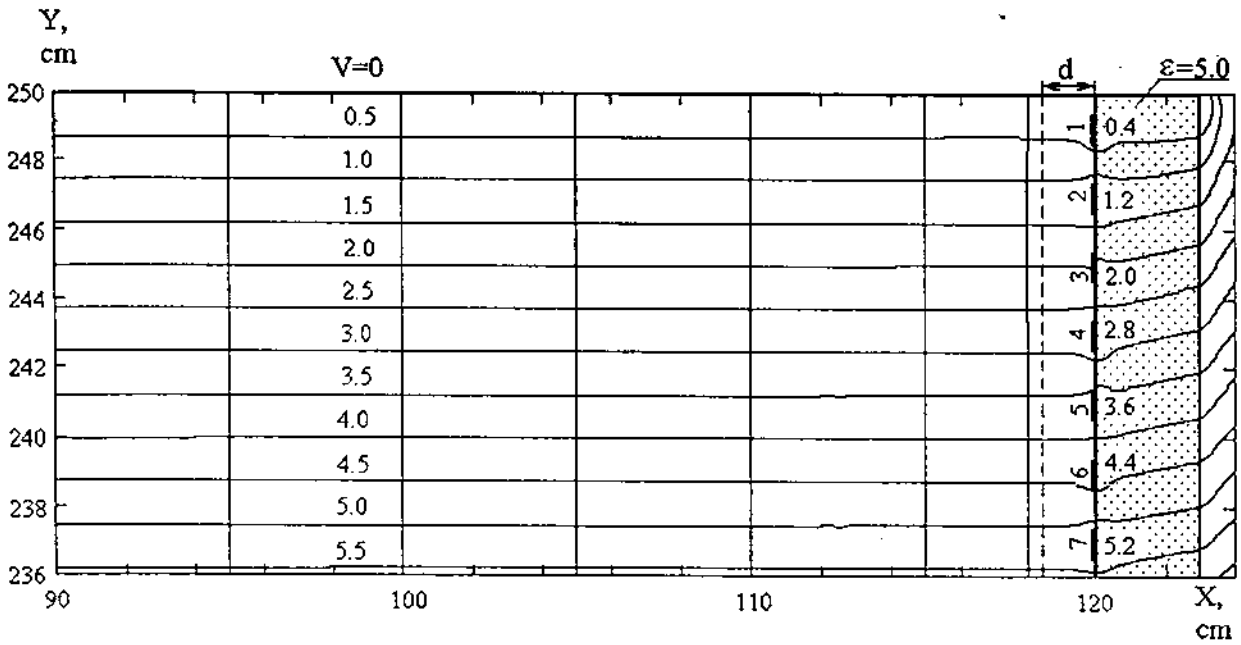
Distribution of equipotential lines. General view.



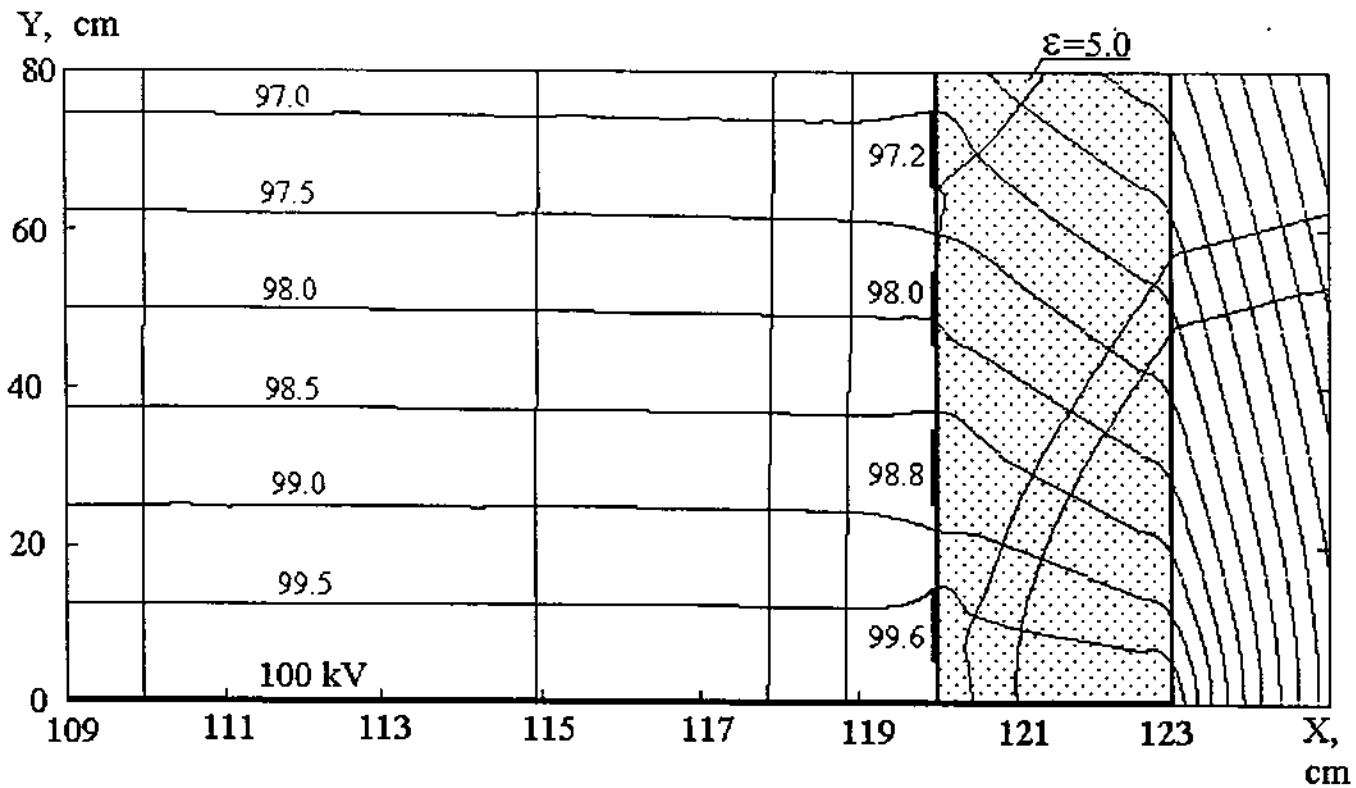
Zone #1. Distribution of equipotential lines



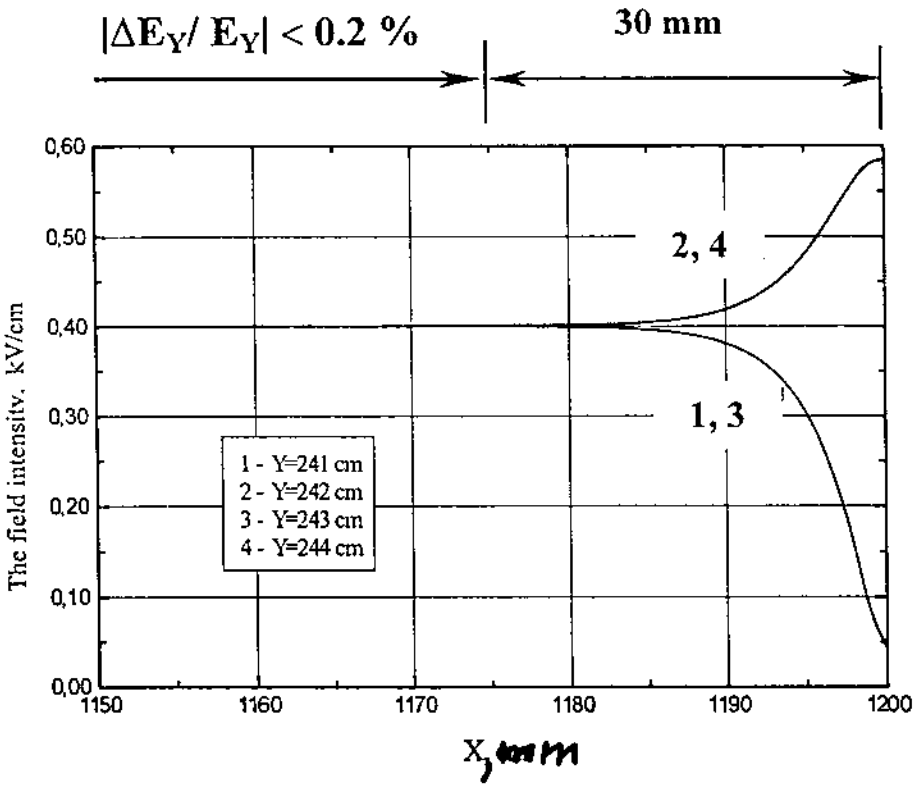
Zone #1. Distribution of equipotential lines

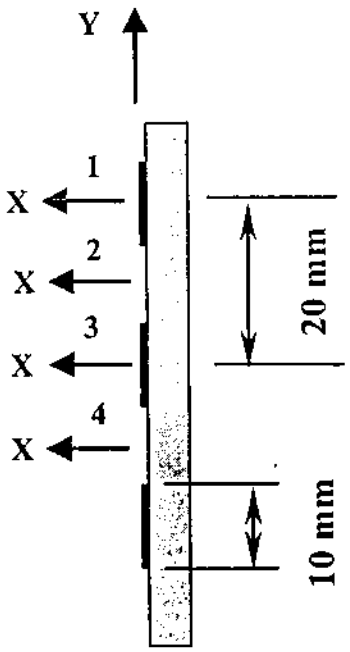


Zone #3. Distribution of equipotential lines

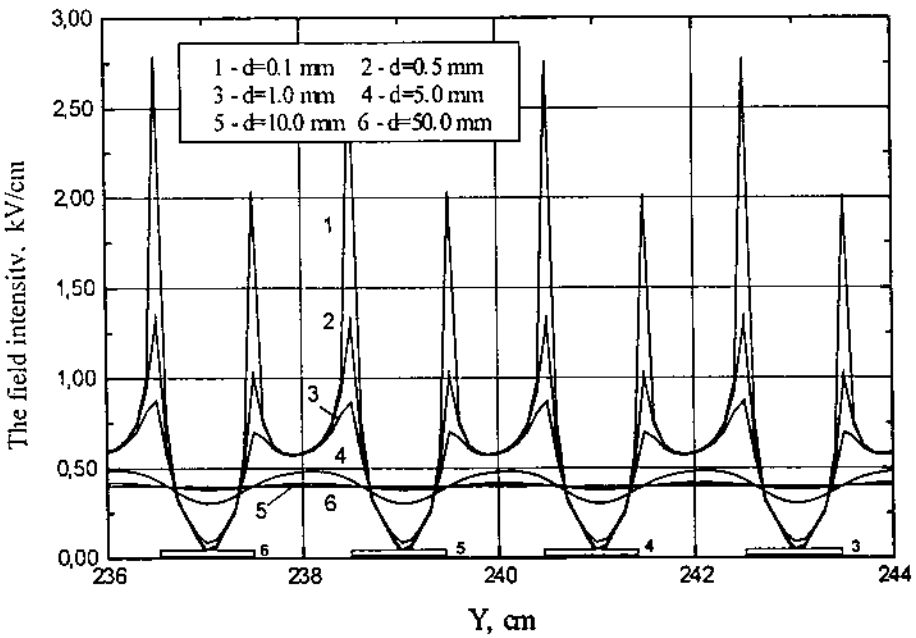


Distribution of longitudinal components (E_Y) of the field intensity

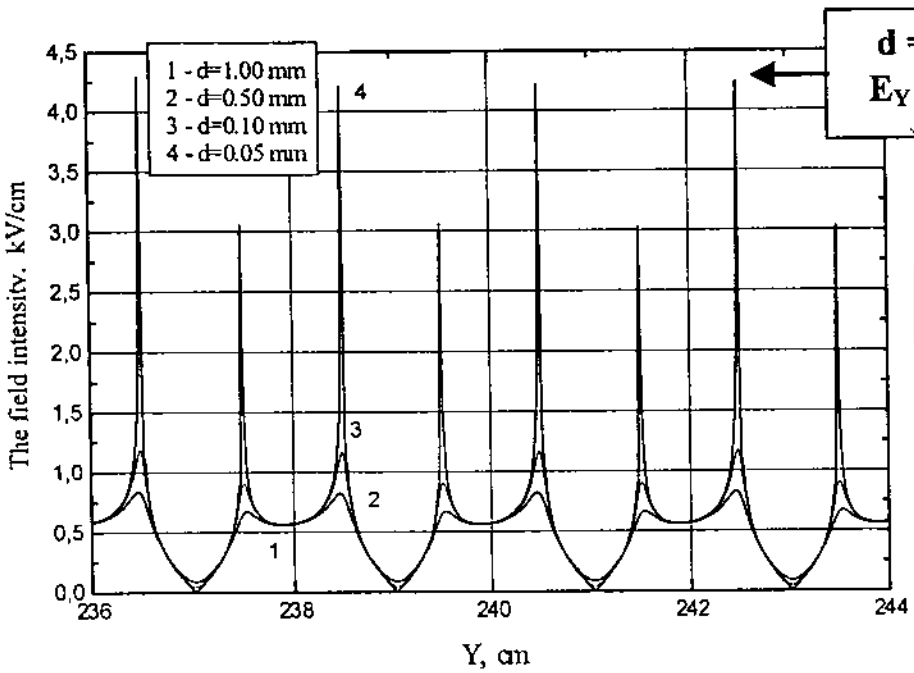




Longitudinal (E_Y) components of the electric field for different distances from the strips. Zone #1.

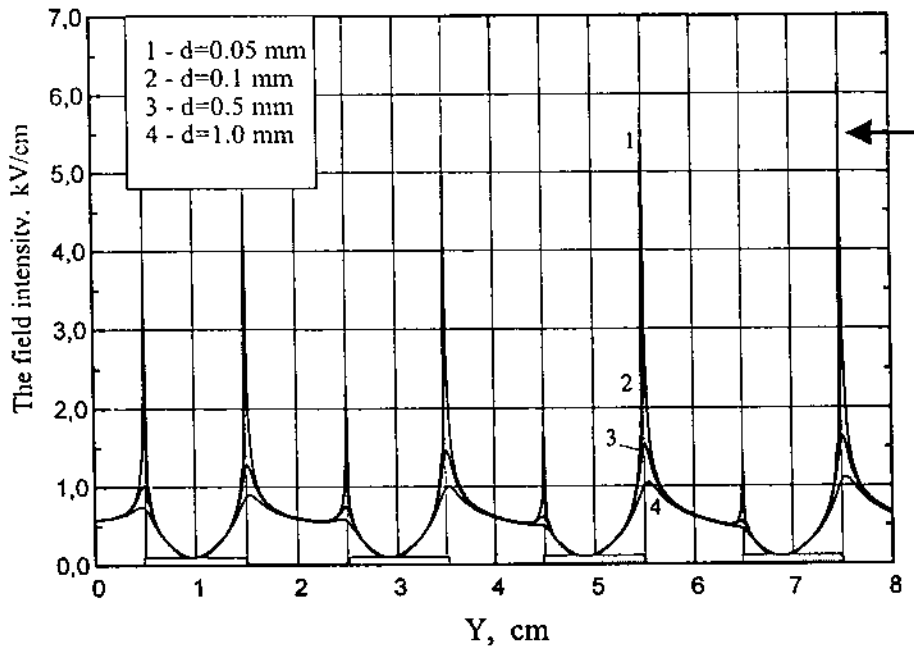


Longitudinal (E_Y) components of the electric field for different distances from the strips.



d = 0.05 mm
$E_Y \cong 4$ kV/cm

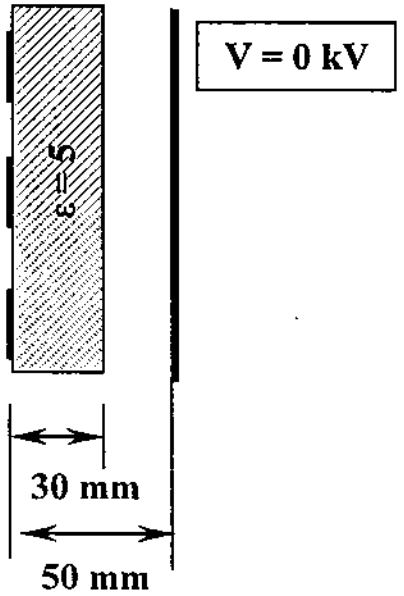
Zone #1



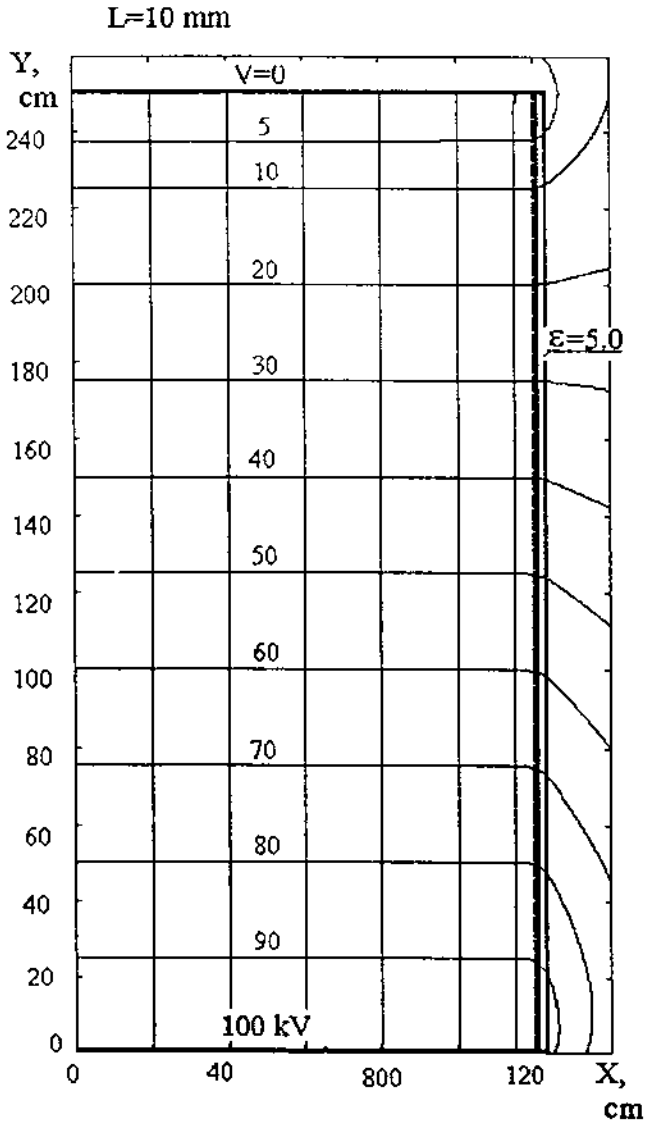
d = 0.05 mm
$E_Y \cong 6$ kV/cm

Zone #3

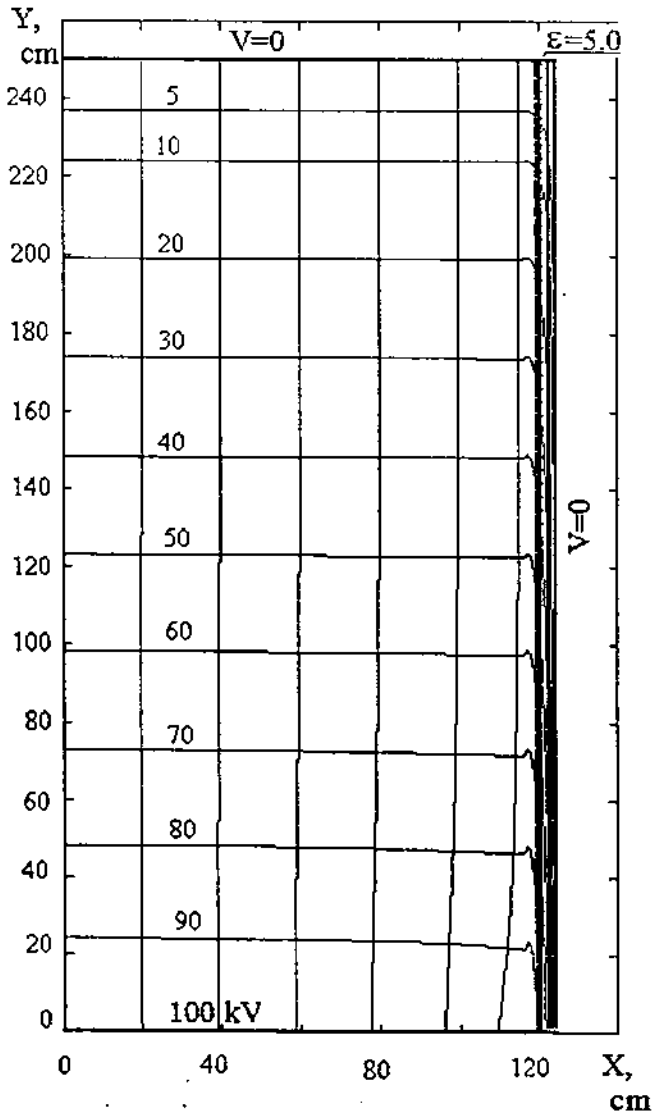
The field intensity in vicinity of the edges of strips is increased more that <u>10 times</u> in compare to the nominal value ($E_Y = 0.4$ kV/cm) and achieved very high value $E_Y \geq 6$ kV/cm



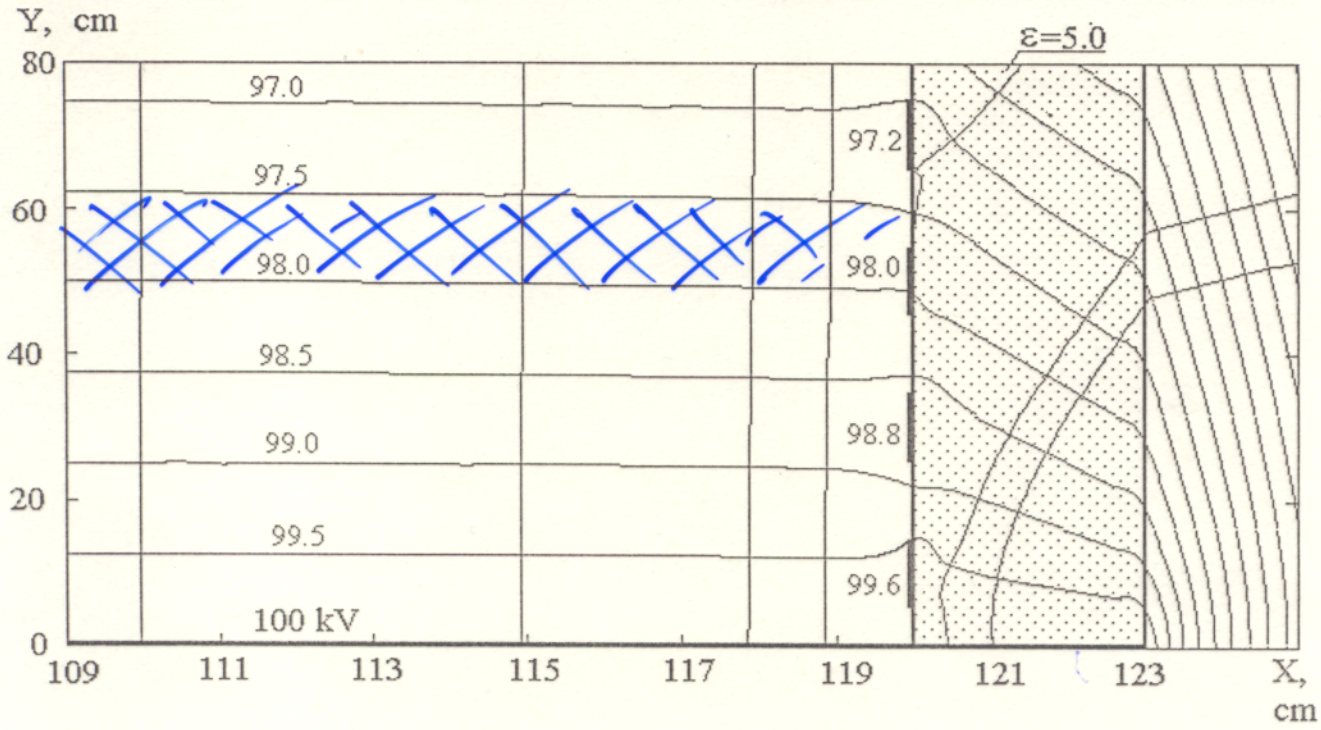
FC wall design without grounded screen



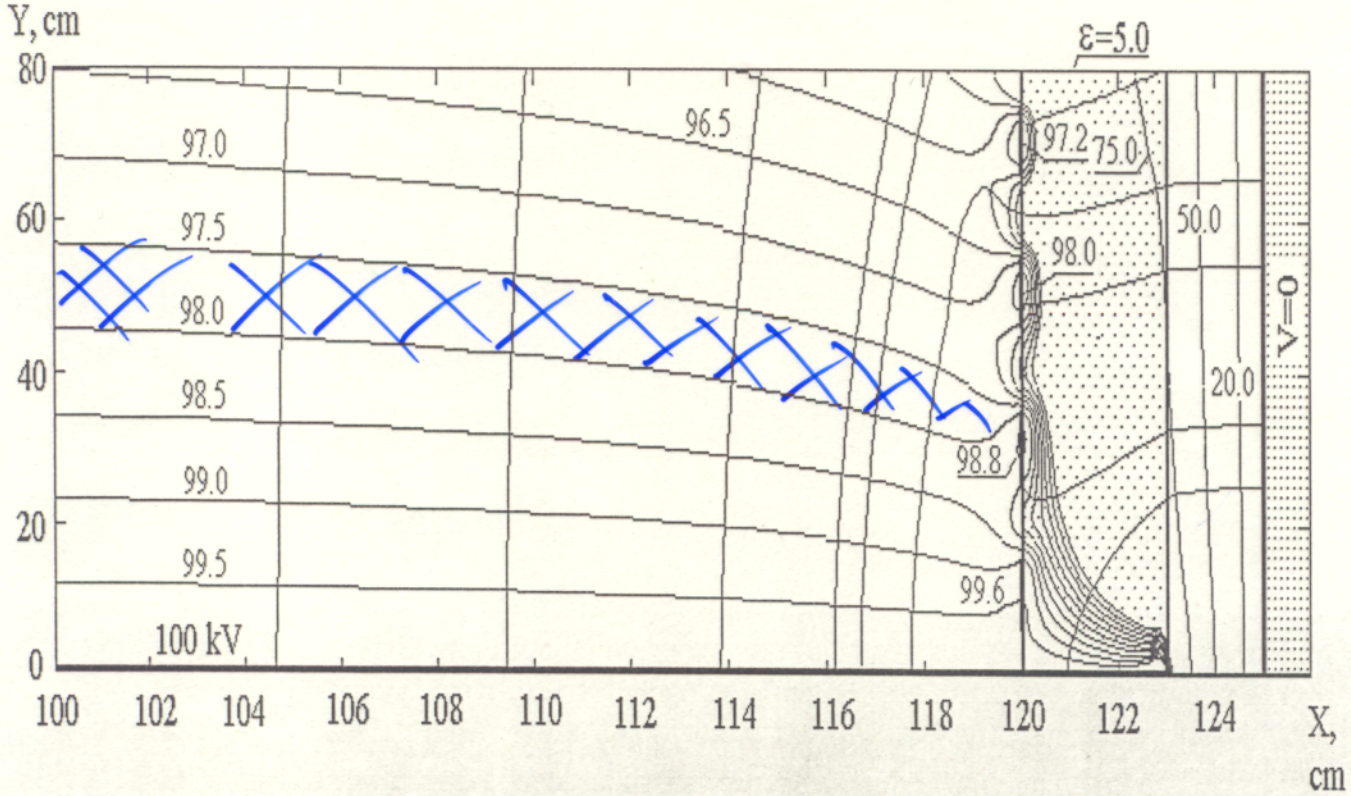
FC wall design with grounded screen



Distribution of equipotential lines for the FC wall design without external grounded screen. Zone #3.



Distribution of equipotential lines for the FC wall design with external grounded screen. Zone #3.



Conclusion

1. **Optimization of the boundary conditions is the only way for the field structure optimization inside of FC TPC.**

2. **Correct choice of the strip granularity provides both the required field uniformity and moderate surface fields on the strip edges, and hence stable operation of detector.**

3. **External grounded screens (TPC vessel, for instance) distort the FC internal field and stimulate increasing of the field intensity on the strip edges.**