GEM TN-92-223

Muon Stiffness Calculations for CSC Chambers

Coleman Johnson
Lawrence Livermore National Laboratory - SSC Laboratory

October 28, 1992

Abstract:

Deflection calculations for CSC MUON chambers show more than adequate stiffness for GEM.

GEM Note

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10-28-92

MUON stiffness calculations for CSC chambers

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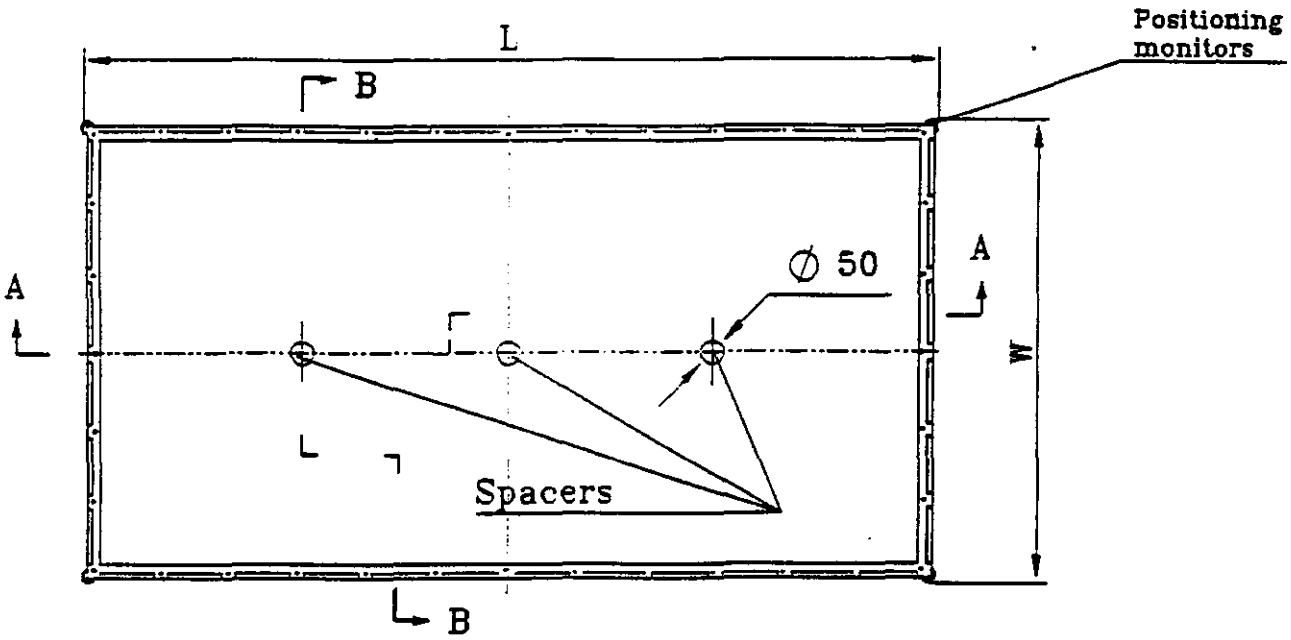
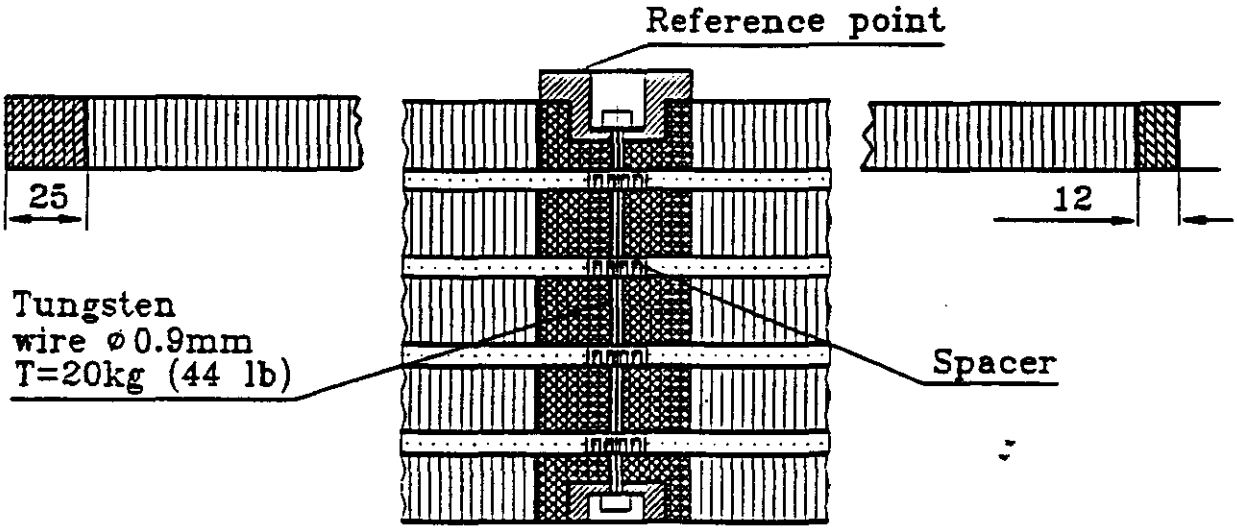
The proposed MUON chamber design based on Cathode Strip Chamber technology has been analyzed to evaluate chamber sag under gravity loads. The chamber was modeled after the construction scheme proposed by the Dubna team. The resultant four gap chamber was modeled as supported at the four corners and the total deflection was calculated. The results were that the widest chamber sagged less than 30 microns and the longest chamber sagged less than 60 microns.

The construction scheme is shown in figures 2.8 and 2.9. The individual panels are 20 mm thick with an edge reinforcement that is 12 mm wide. Central support systems that maintain gap accuracy were provided in three axial locations on the center line. The modeled geometry is shown in figure 1 which shows one quarter of a chamber stack with a corner in the upper right and the center as the lower left of the drawing. The two chamber geometry's modeled are listed on figure 1 as: Outer = 3506 mm X 960 mm; and Middle = 2515 mm X 1320 mm.

The deflection results are listed in the memo from F A House to C Johnson, dated Oct. 22, 1992. The deflection distributions are shown on the following two contour plots. The widest chamber had a more distinct central deflection while the longer chamber showed a more beam like contour. Both are more than adequate for the required accuracy.



A-A (B-B)



	Outer Layer	Middle Layer	Inner Layer
L	3.506m	2.515m	3.152/3.028m
W	0.960m	1.320m	0.740m

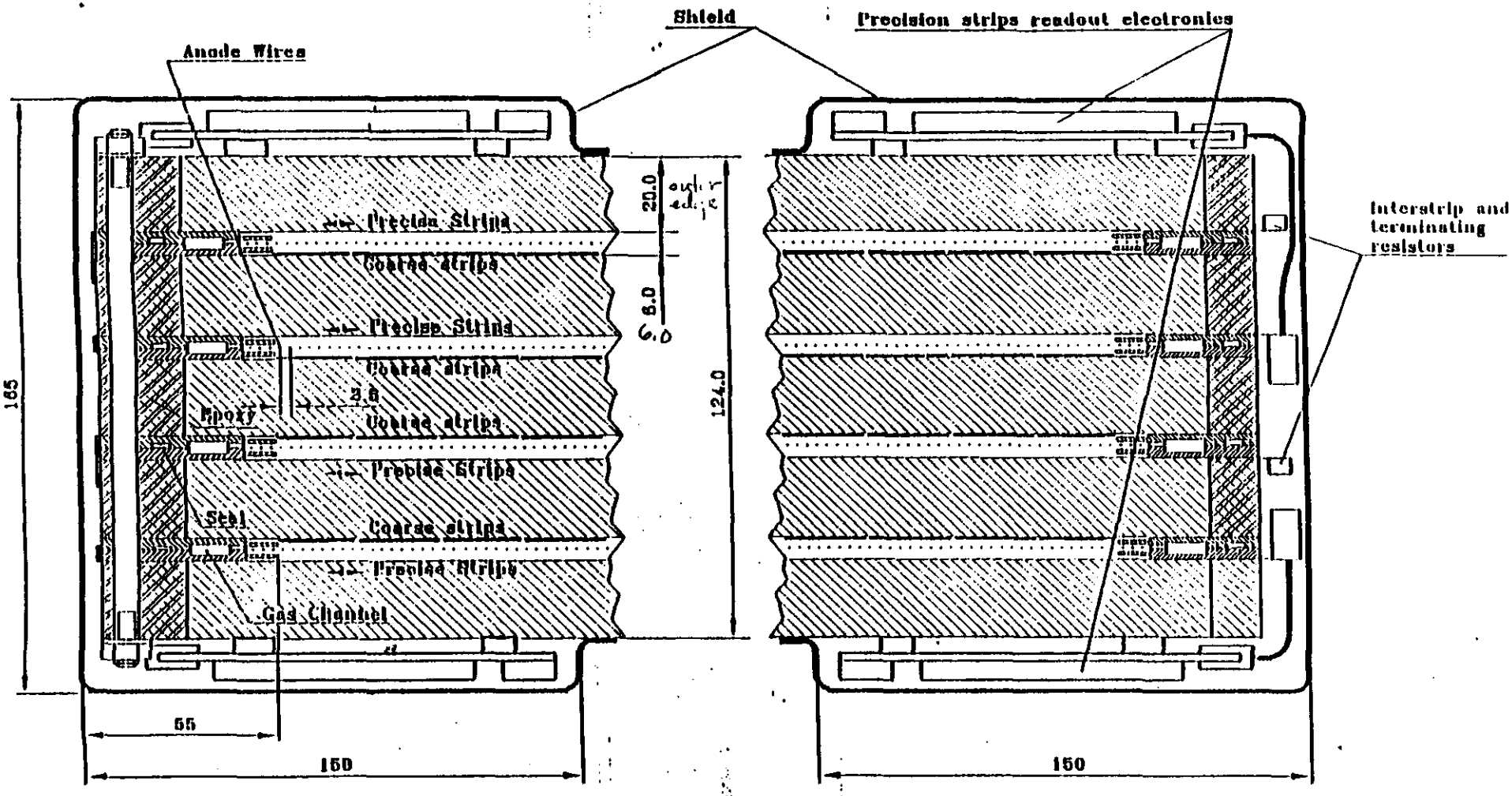
Fig. 2.8

Y.Ershov
I.Golutvin
V.Lysiacov
S.Movchan

BARREL CSC

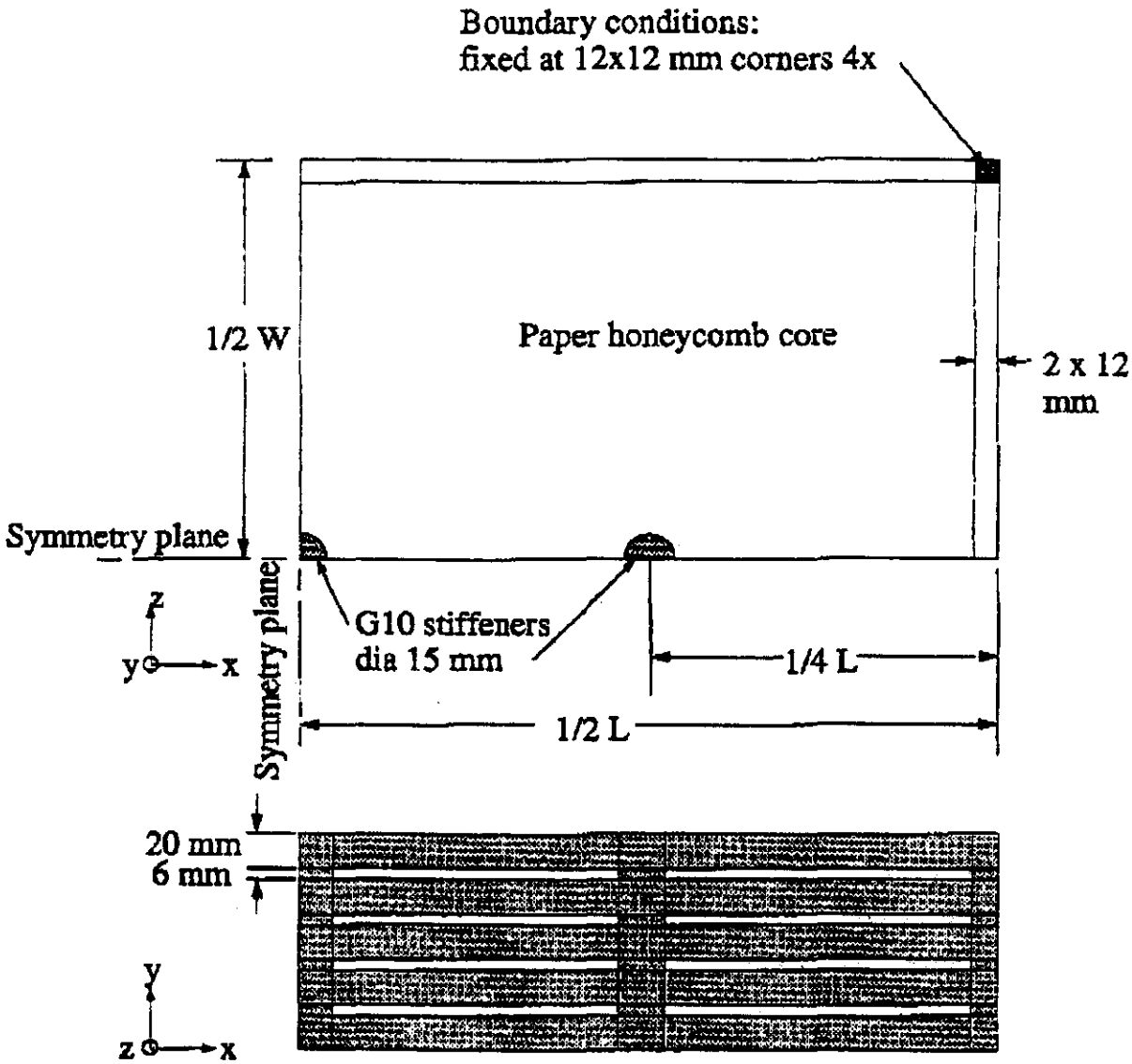
CROSS SECTION ALONG THE STRIPS

(A–A)



Y.Ershov
I.Golutvin
V.Lysiakov
S.Movchan

Fig.2.9



G10 skin, edge, and edge gap
Skin: 0.5mm thick
Edge: solid 12x20 mm thick
Edge gap: solid 12x6 mm
thick

Overall size: Outer layer L = 3506 x W = 960 x 124 mm
Middle layer L = 2515 x W = 1320 x 124 mm

Figure 1

To: C. Johnson October 22, 1992

From: F.A. House

Subject: Multilayer CSC deflection calculation

I have completed two finite element computer models of the outer layer and middle layer Cathode Strip Chambers. The model geometry is shown in Figure 1.

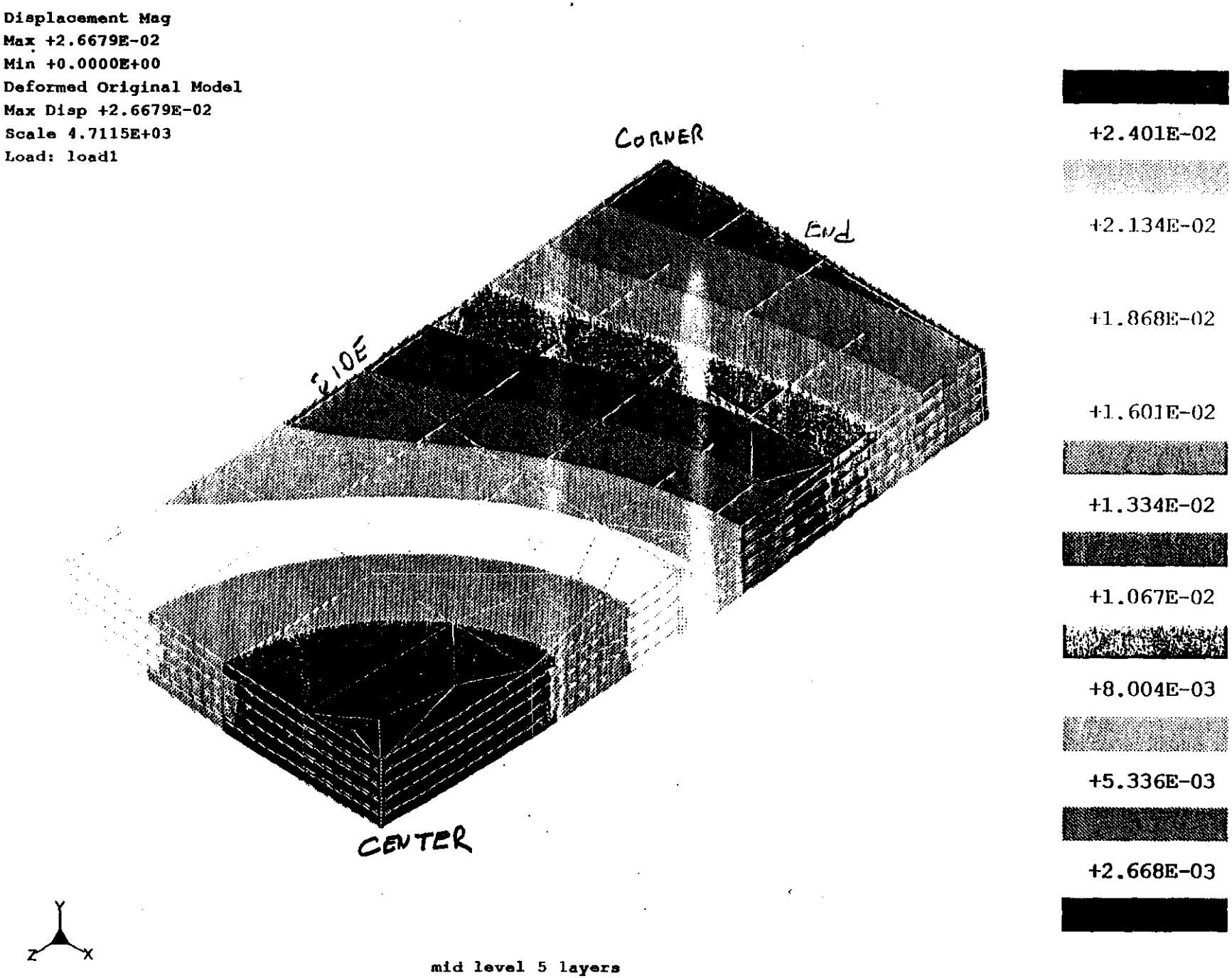
The models were loaded by gravity perpendicular to chambers. Results were as follows:

	maximum deflection	mass
outer layer	0.06 mm	18.3 kg
middle layer	0.03 mm	17.2 kg

Displacement contour plots are shown in Figures 2 and 3.

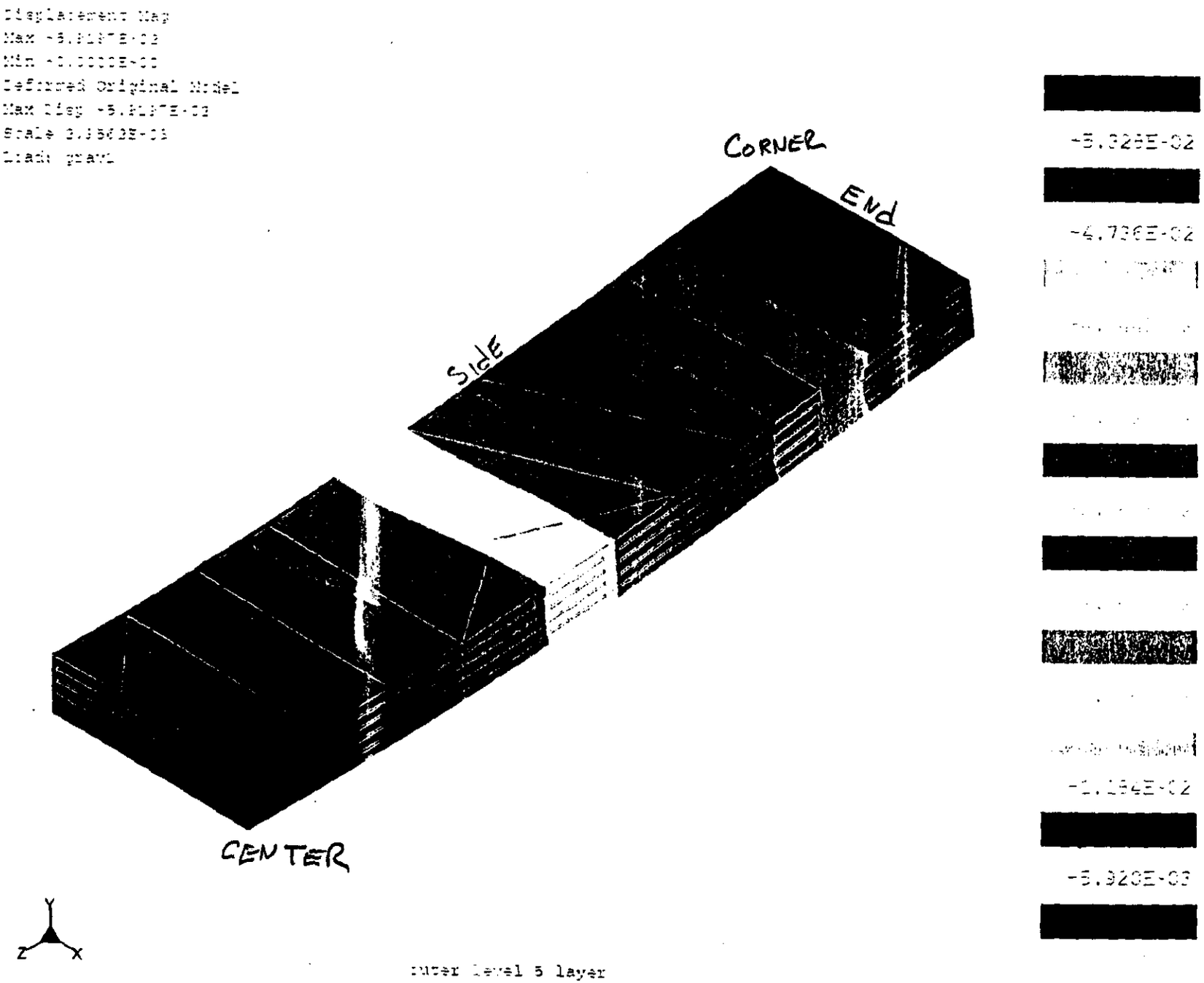
Distribution

G. Deis
C. Wuest
L. Pedrotti
F. Taylor
F. Nimblett
M. Harris
I. Galutvin



mid level 5 layers

Figure 1



Outer Level 5 layer

Figure 2