NSTX CALCULATION



TITLE Outboard Divertor Ring Assy

CALC. NO. NSTX-CALC-11-03 DATE 5/5/98

ORIGINATOR G.Barnes GWB CHECKER I. Zatz IZ Rev.0

PURPOSE:

This calculation determines the thermal and operational stresses of the outboard divertor ring assembly.

REFERENCES:

1) NSTX drawings EDB-1015 Upper and Lower Outboard Divertor , Rail Drilling and Assembly

ASSUMPTIONS:

The finite element model of the outboard divertor ring assembly is a 360-degree model with some geometric simplification that would not reflect on the results by more than a few percent. See figure 1. A review of the model will reveal slight variances in the location of some of the radial stiffening members and the location of the poloidal breaks. Mechanical loads are assumed uniformly distributed while thermal conditions are assumed uniform throughout the divertor structure at one temperature and uniform in the dome at another. The analysis is linear elastic.

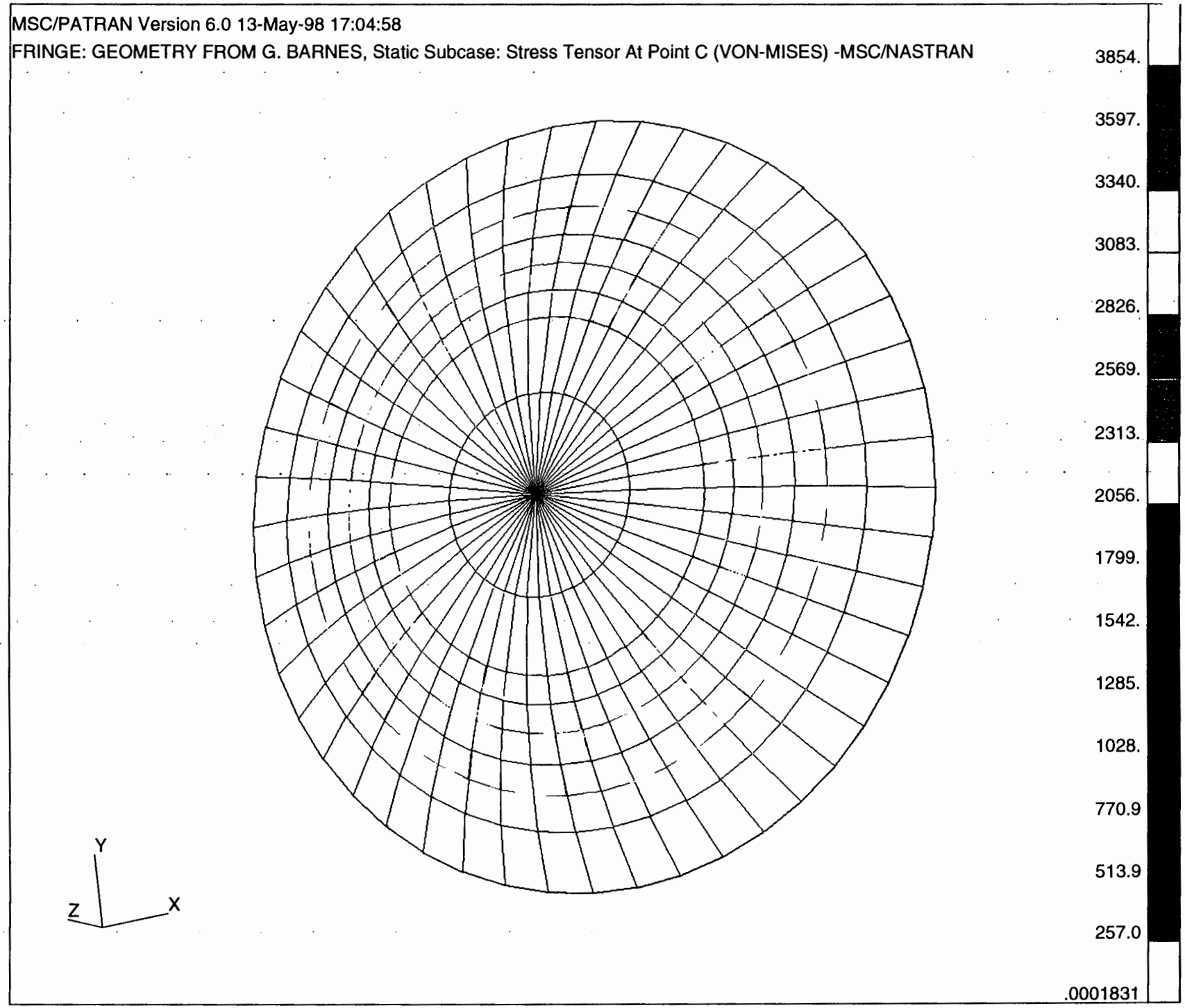
CALCULATION:

MSC/NASTRAN was used to perform the analyses with the results post-processed in MSC/PATRAN. Several analyses were performed. An initial set of electromechanical (EM) loads as defined in the NSTX Peer Review on 1/29/98 were updated in a memo by C. Neumeyer on 2/23/98. Boundary conditions were varied on the outboard divertor frame and stiffeners to minimize stresses. The dome was added to the model to evaluate the thermal stresses due to the difference in temperature between the dome and divertor structure. The complete stress picture is represented by combining stresses of these two load cases.

CONCLUSION:

The analysis has shown that stresses in the outboard divertor structure due to the combined effects of EM and thermal loads are acceptable, provided the specified degrees

of freedom are permitted allowing for unrestricted in-plane spherically radial motion ( parallel to the dome) in the clevis pins. Maximum stress in the rings is 4244psi and maximum stress in the rings due to a temperature change of 200 ° C is 3854 psi . Conservatively by adding these two stresses (since they don't occur at the same location) the total would be 8098psi, well within design limits.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3083.
2826.
2569.
2313.
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1799.
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513.9
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Y
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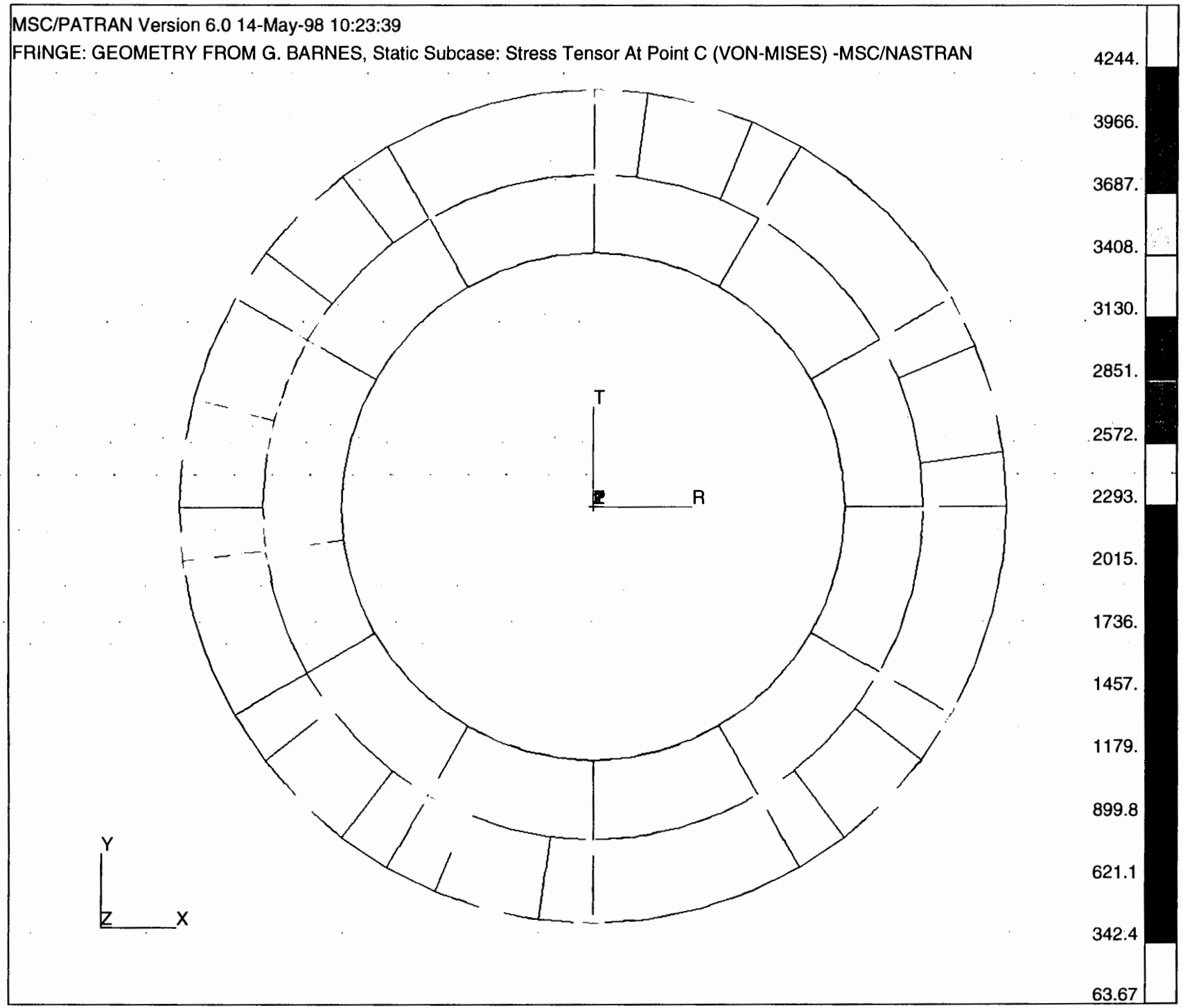
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3130.
2851.
2572.
2293.
2015.
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1457.
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899.8
621.1
342.4
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R
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Z
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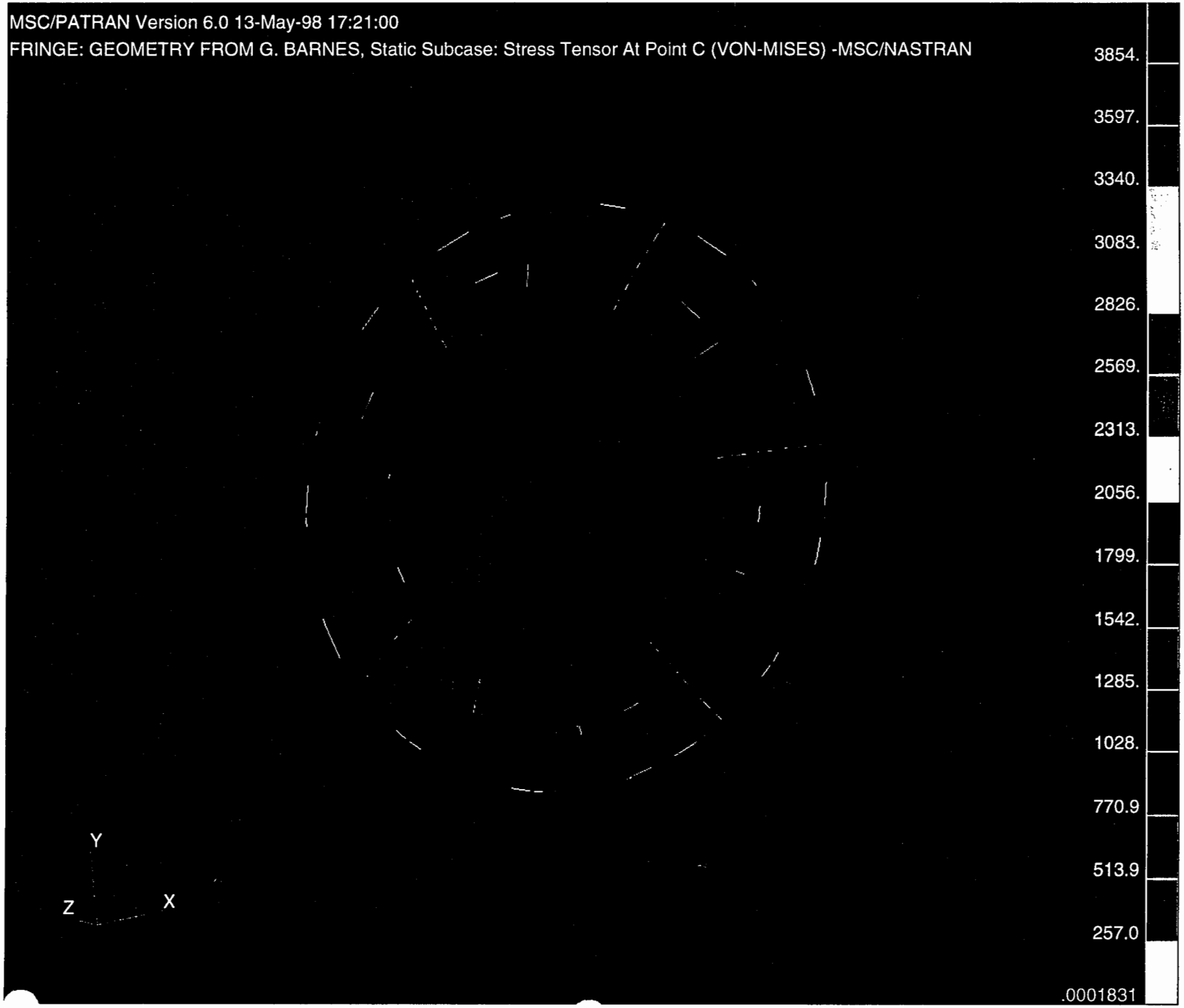
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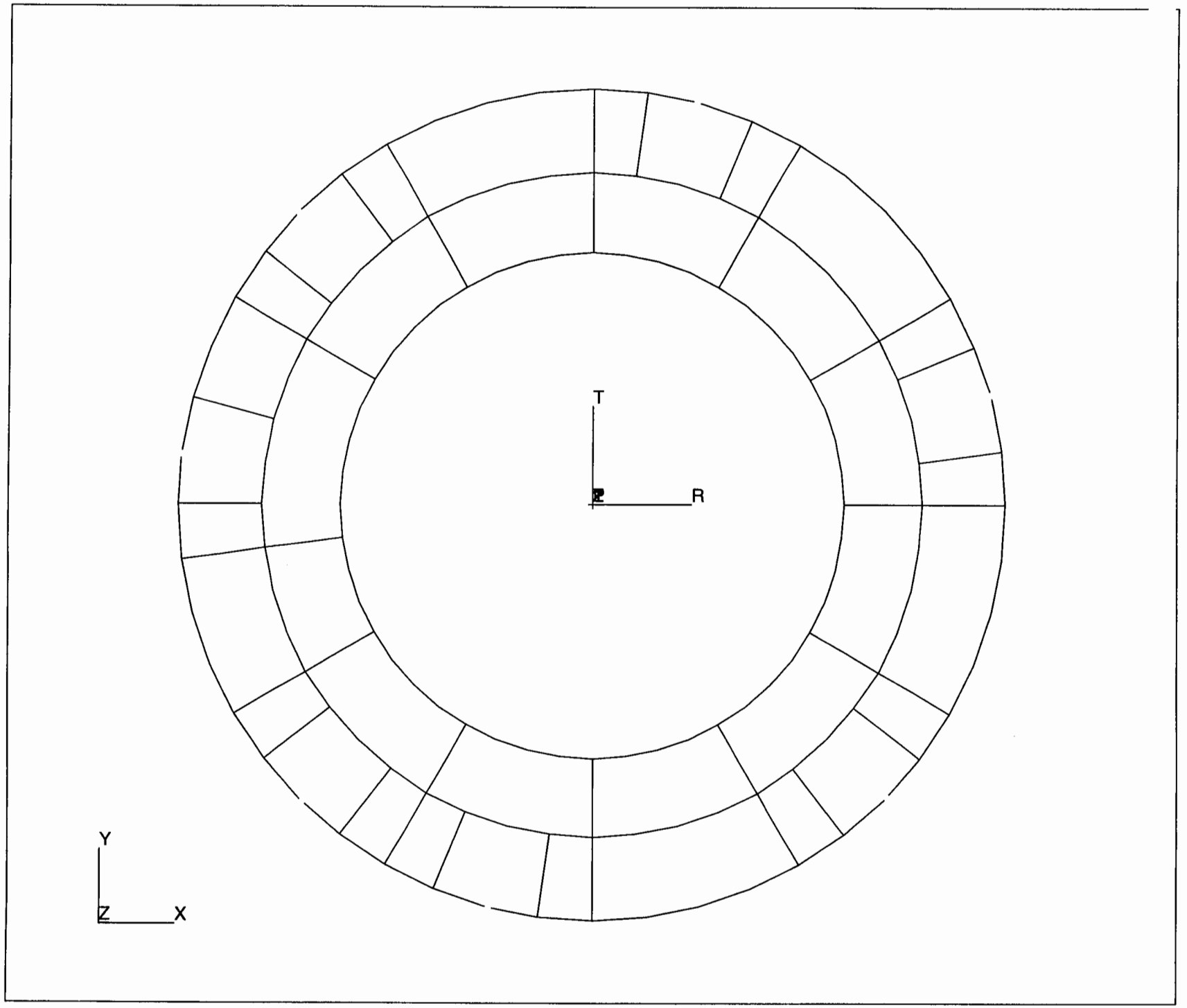


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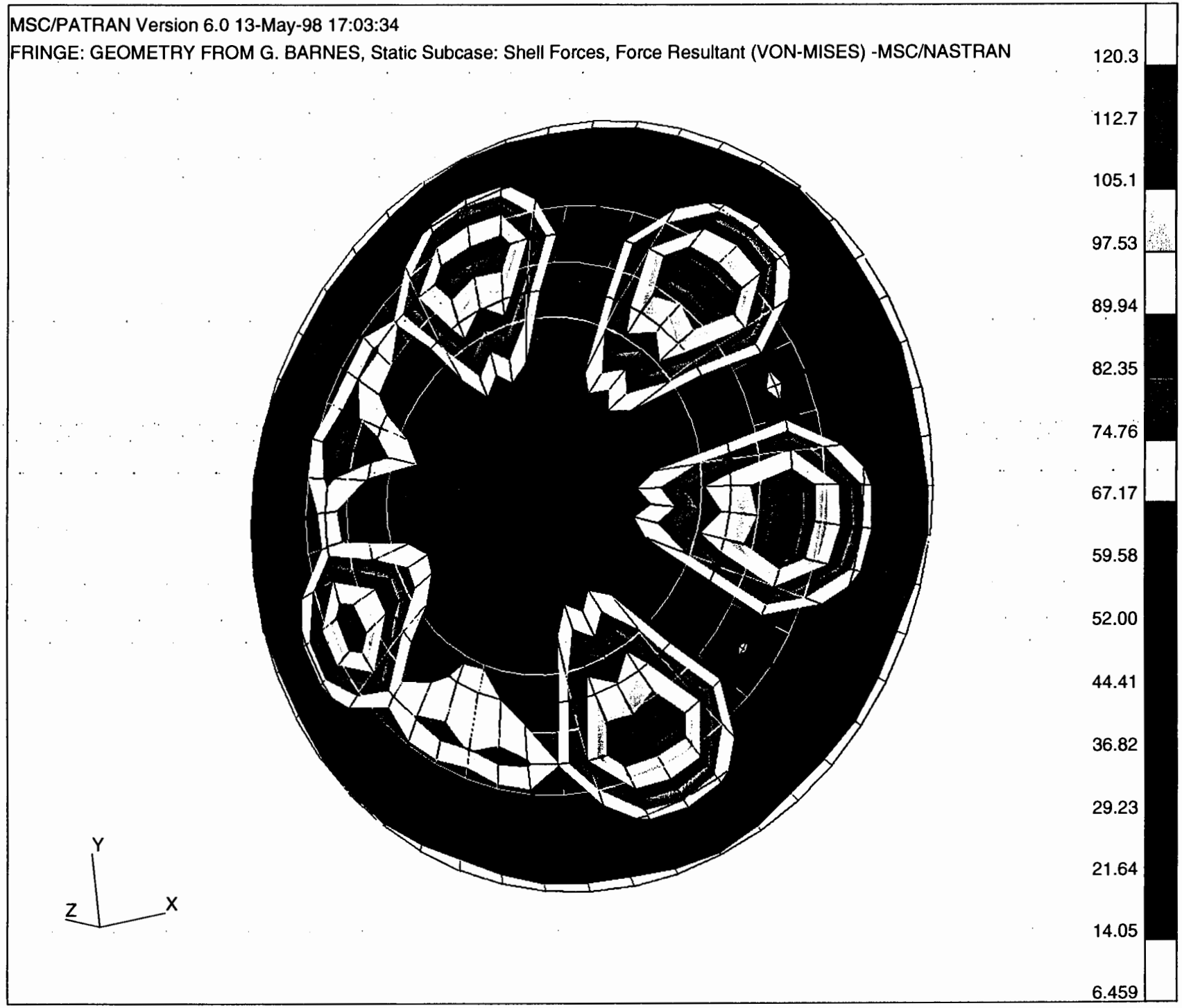
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74.76
67.17
59.58
52.00
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29.23
21.64
14.05
6.459
Y
Z
X