

REPORT DOCUMENTATION PAGE

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119 128

36 separate files are enclosed

C2

TP-FY99-0133

✓ Spreadsheet
✓ OTS

MEMORANDUM FOR PRS (~~Contractor~~/In-House Publication)

FROM: PROI (TI) (STINFO)

16 June 1999

SUBJECT: Authorization for Release of Technical Information, Control Number: AFRL-PR-ED-TP-FY99-0133
C.T. Liu, "Microstructure Induced Inhomogeneous Strain in a Particulate Composite"

1999 ASME Summer Conference

(Public Release)

**Microstructure Induced
Inhomogeneous Strain in a
Particulate Composite**

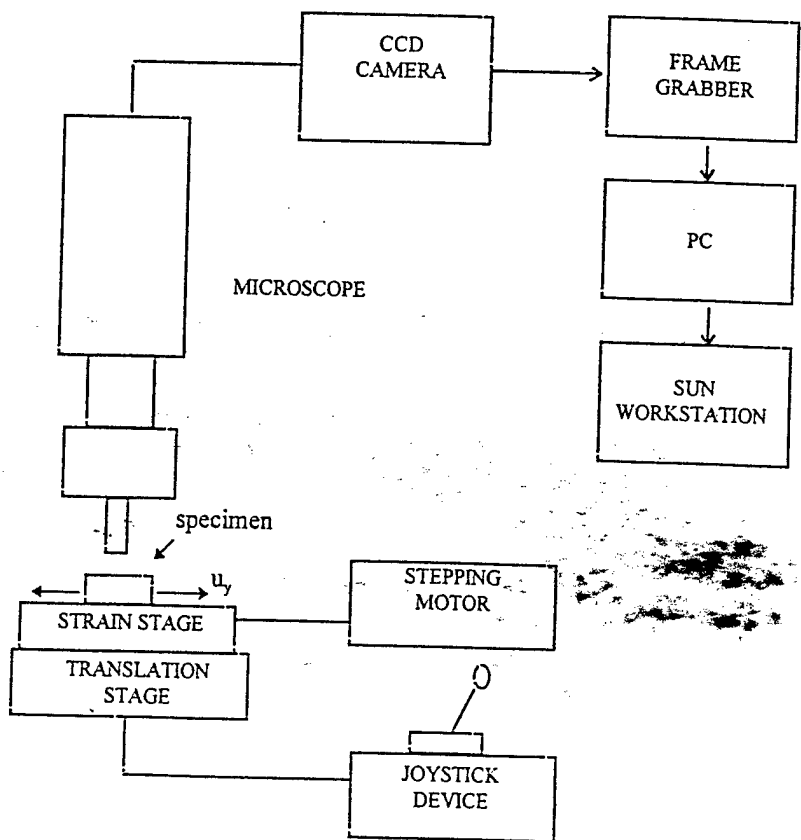
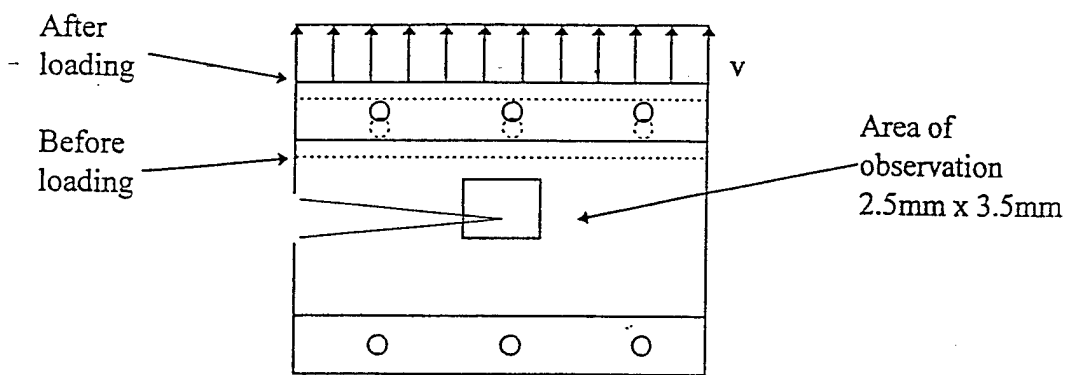
C. T. Liu
And
J. Gonzales

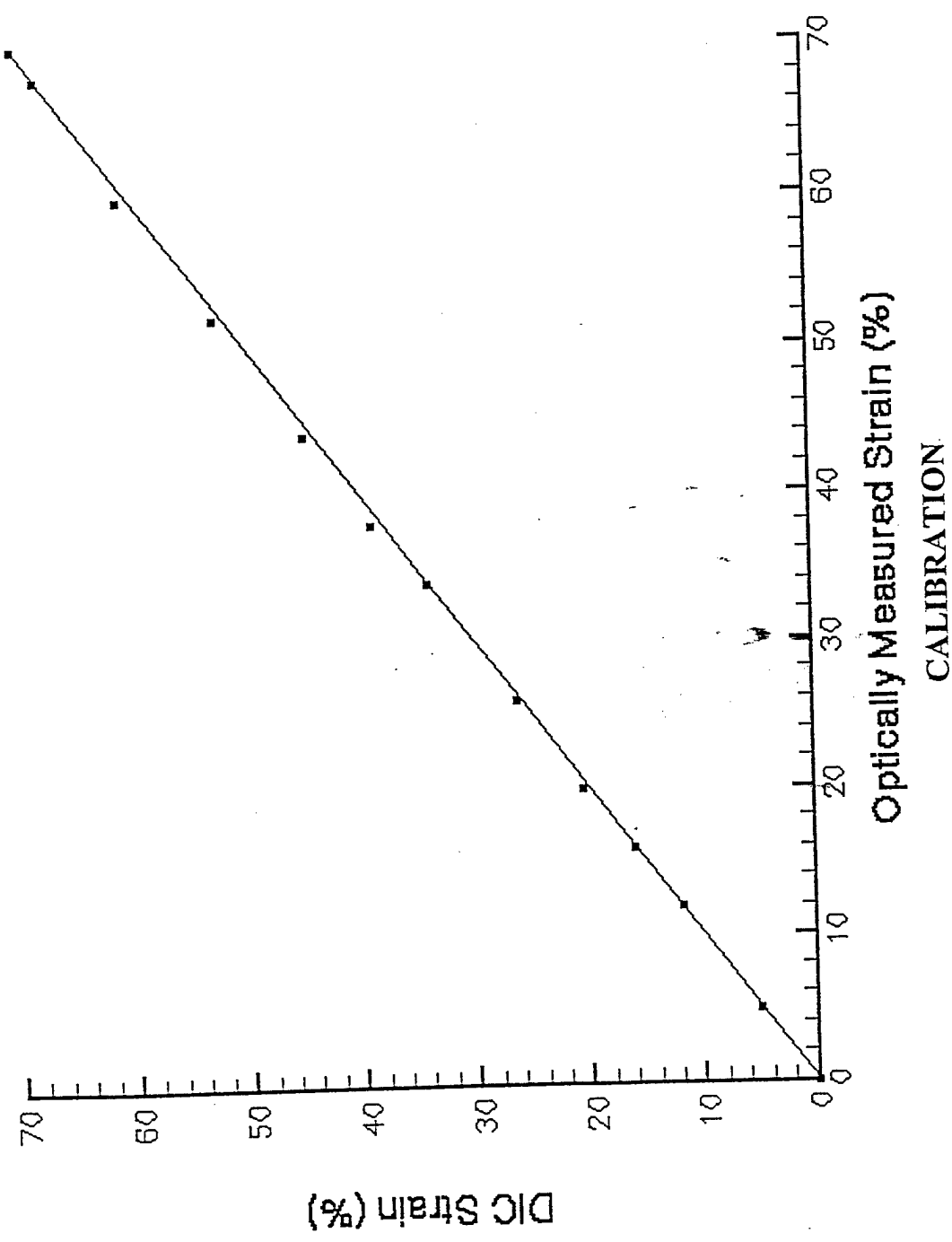
Air Force Research Laboratory
Edwards AFB CA 93524-7680

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Objectives

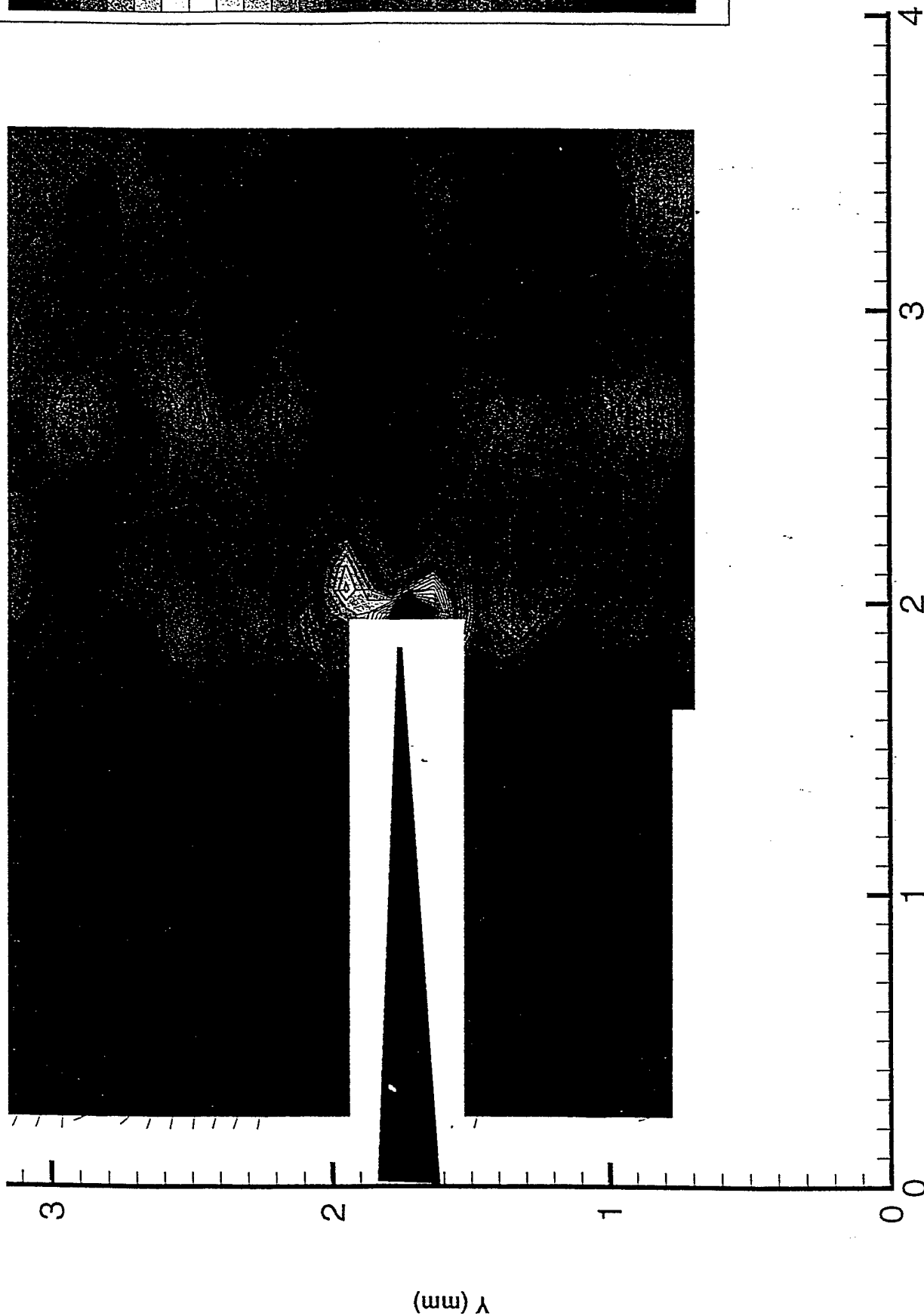
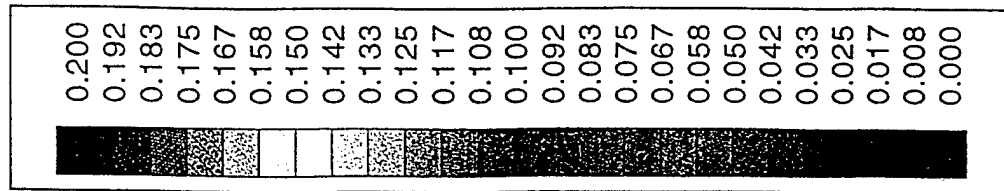
- **Investigate the Effect of Microstructure on the Strain Distribution near the Crack Tip.**
- **Determine the Local Strain Concentration Factor and Strain Rate near the Crack Tip.**



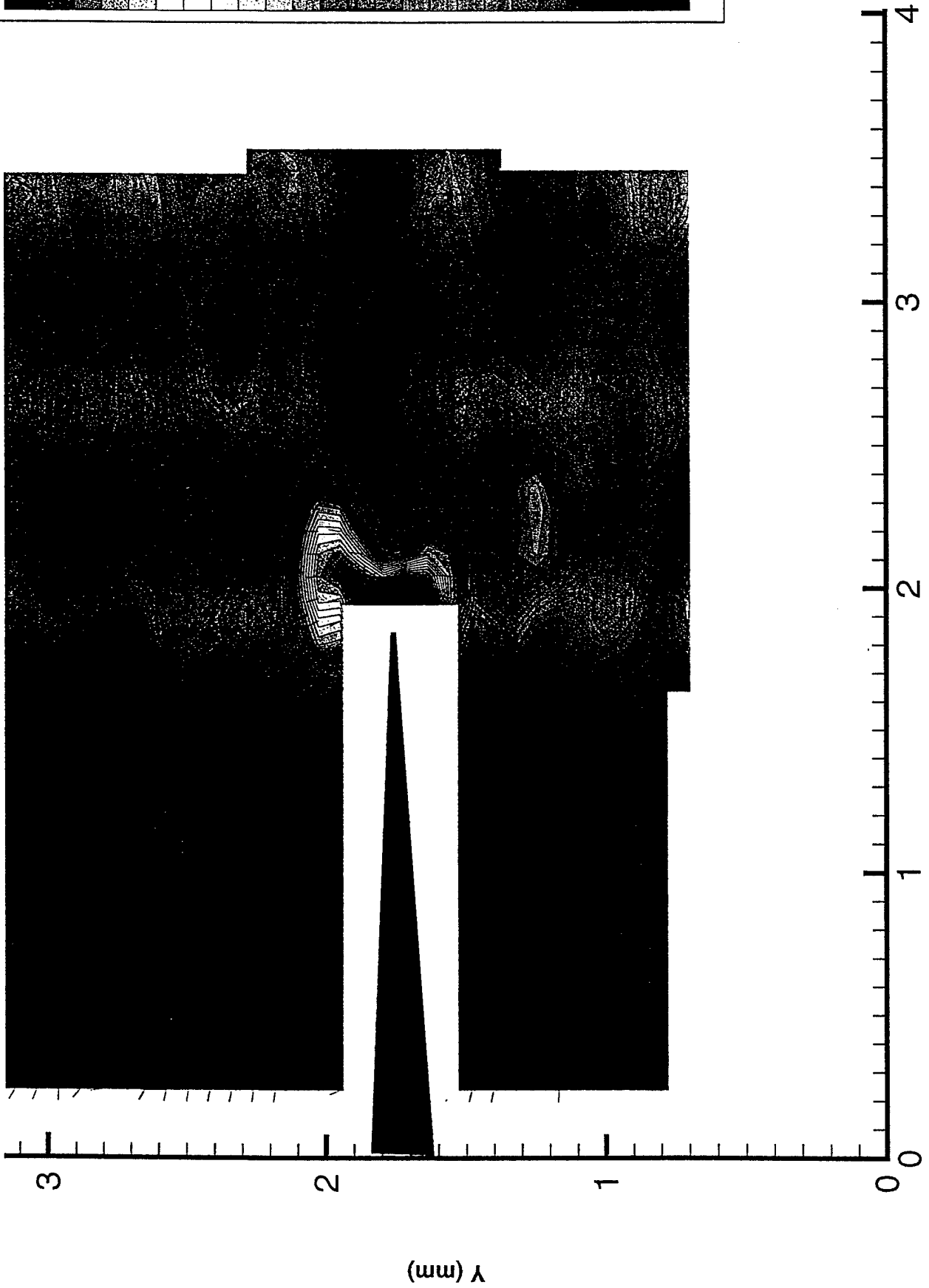


Optically Measured Strain (%)
CALIBRATION

Maximum Principal Strain Distribution for
2.8% Far Field Strain
Test 1



Maximum Principal Strain Distribution for
4.2% Far Field Strain
Test 1

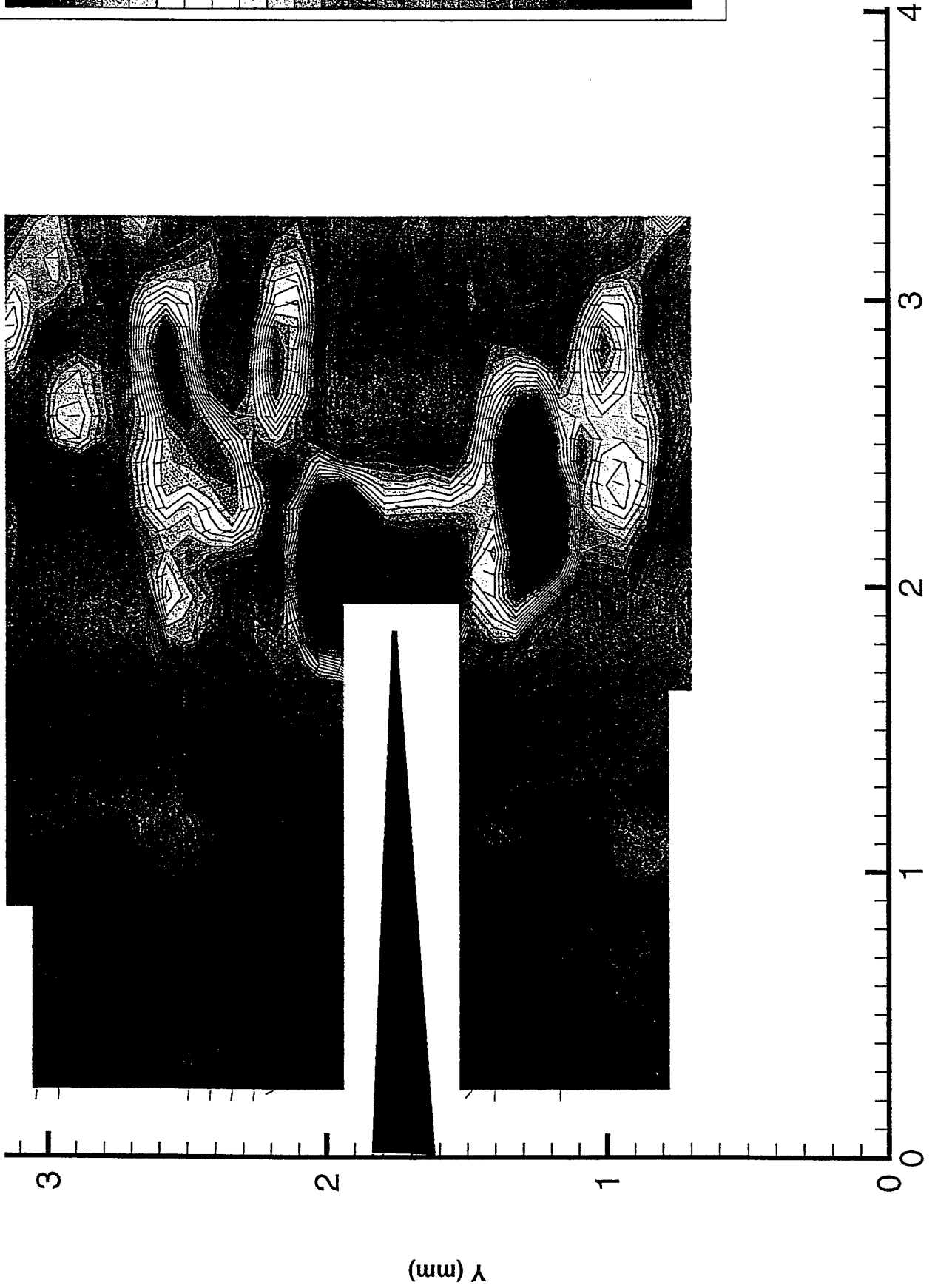
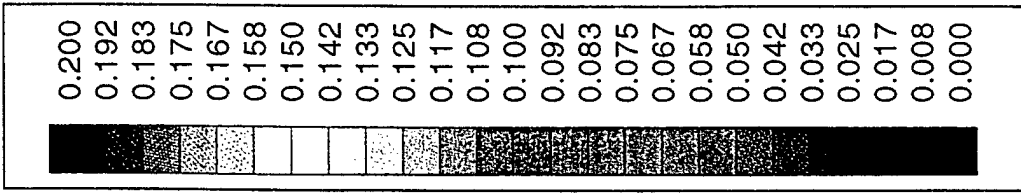


0.200
0.192
0.183
0.175
0.167
0.158
0.150
0.142
0.133
0.125
0.117
0.108
0.100
0.092
0.083
0.075
0.067
0.058
0.050
0.042
0.033
0.025
0.017
0.008
0.000

Y (mm)

X (mm)

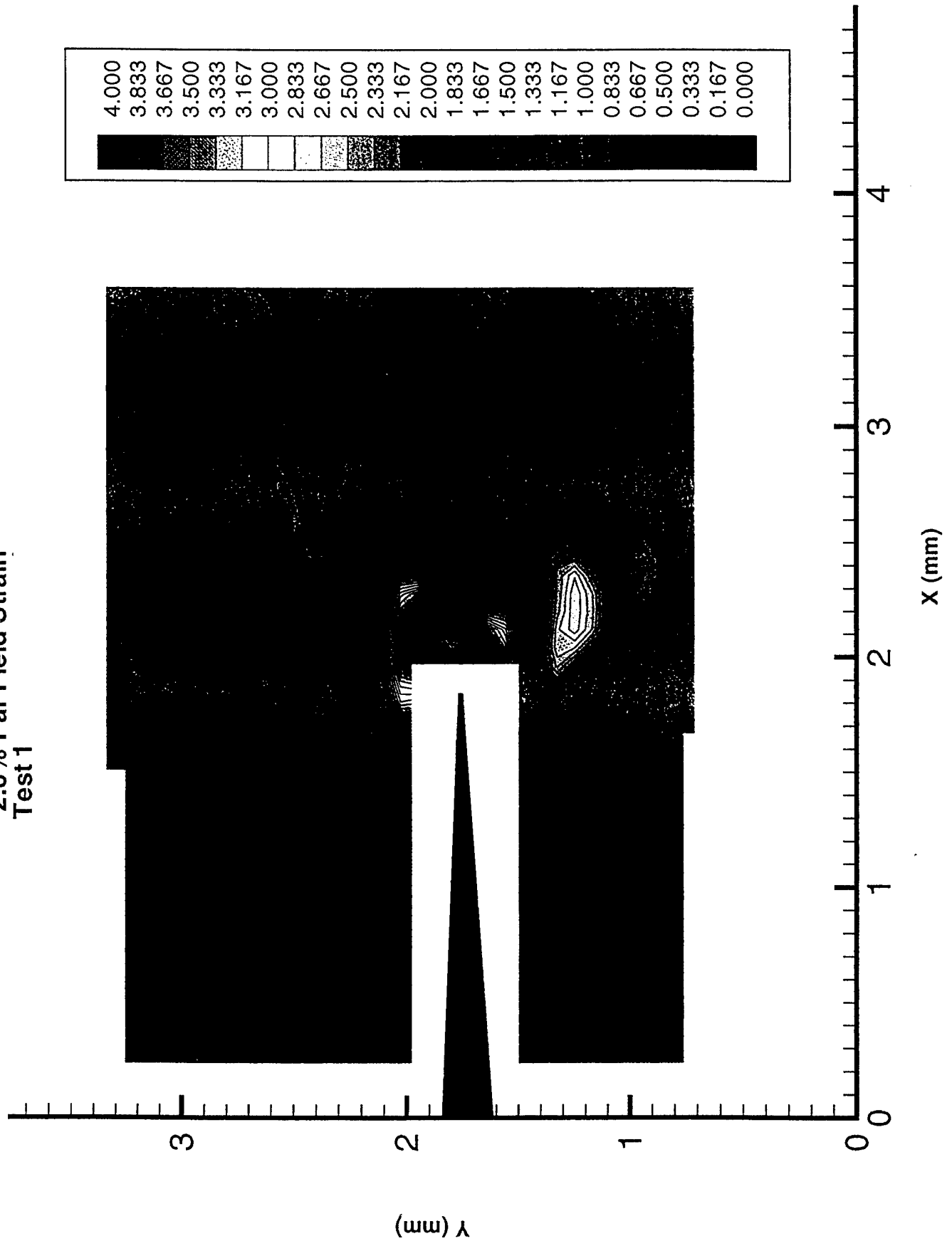
Maximum Principal Strain Distribution for
8.2% Far Field Strain
Test 1



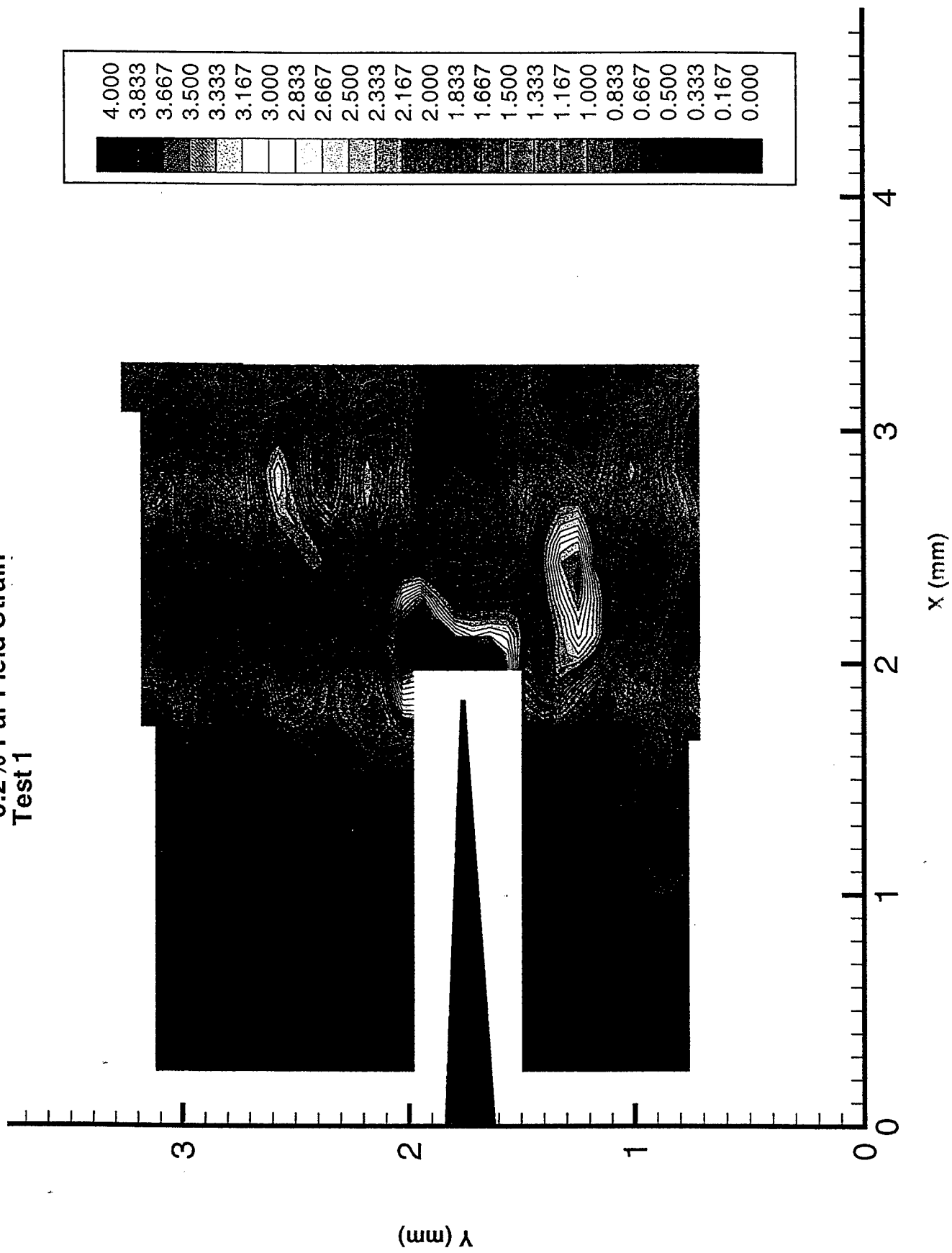
X (mm)

Y (mm)

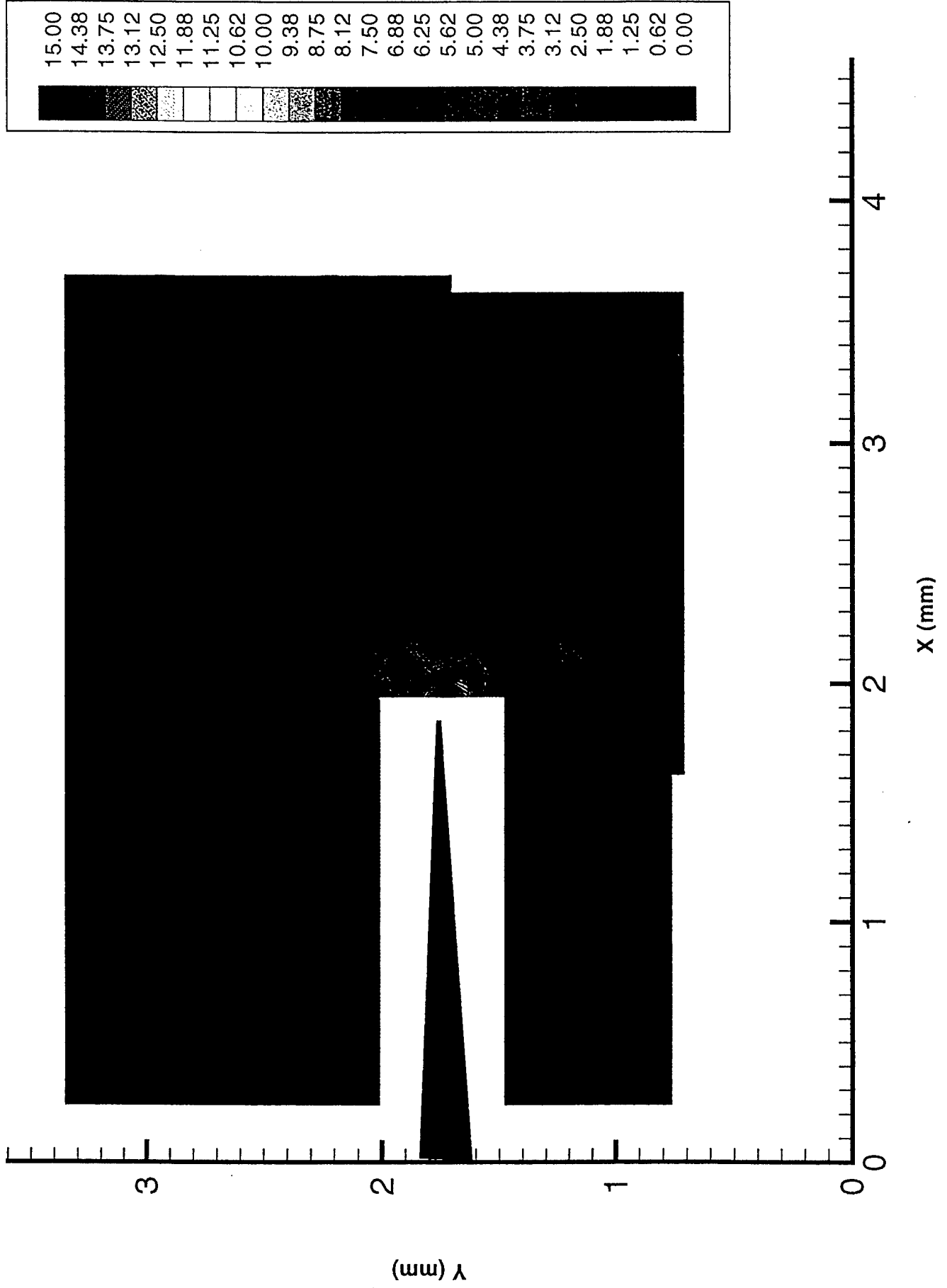
Strain Concentration Distribution for Step 4
 2.8% Far Field Strain
 Test 1



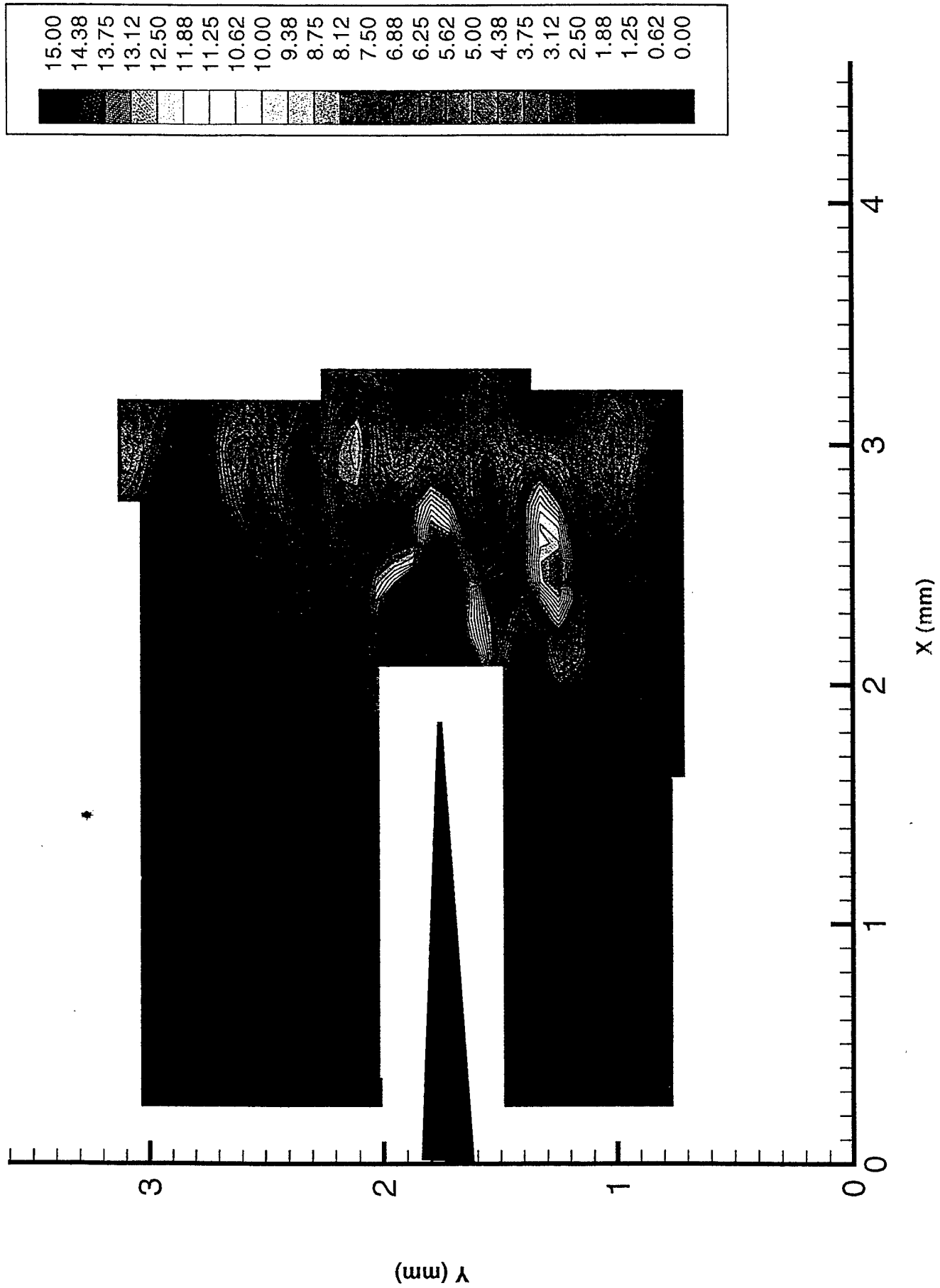
Strain Concentration Distribution for Step 12
8.2% Far Field Strain
Test 1



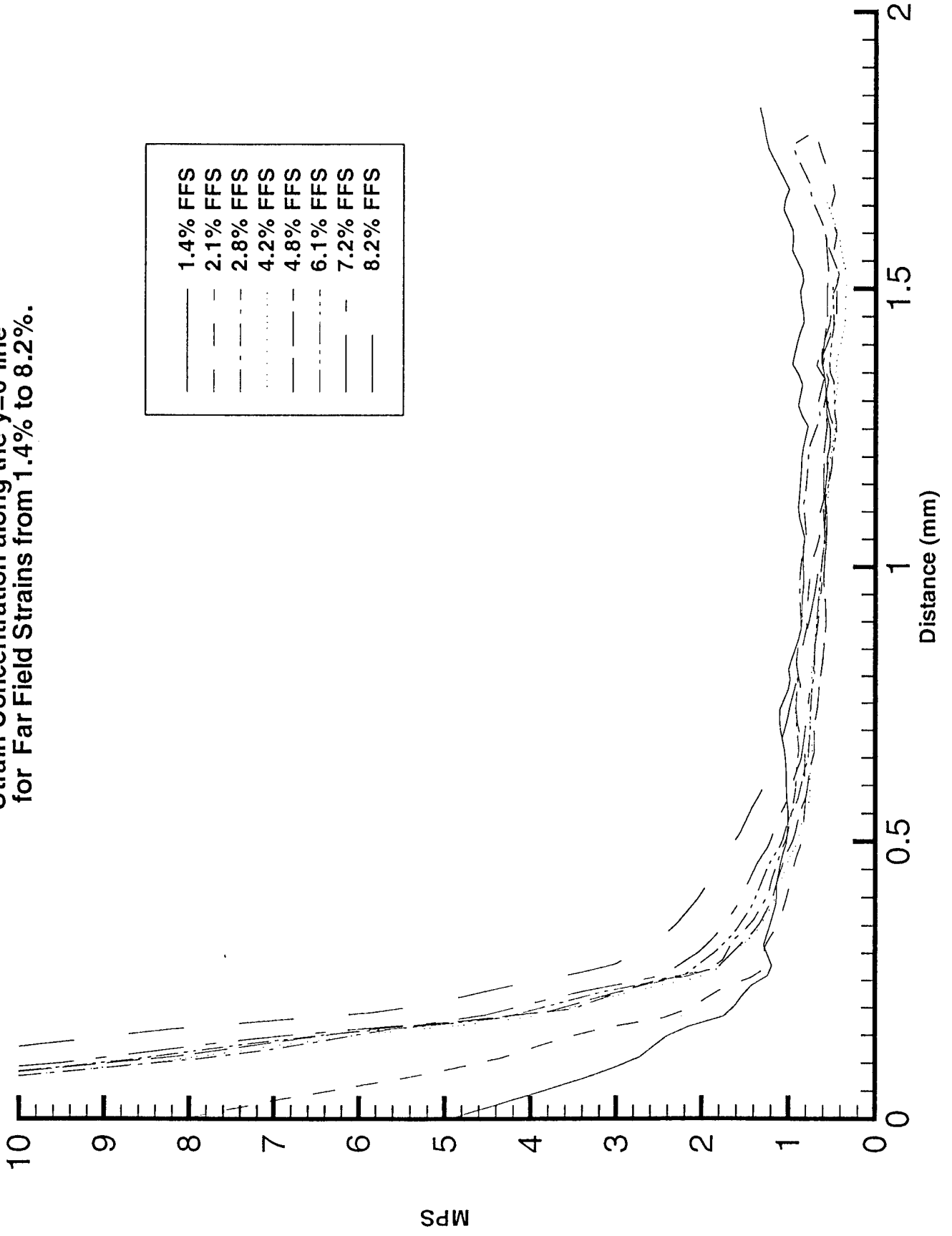
Non Dimensional Local Strain Rate in the y - Direction
At 0.001 (1/s) Far Field Strain Rate and 2.5% Far Field
Strain. Test 1



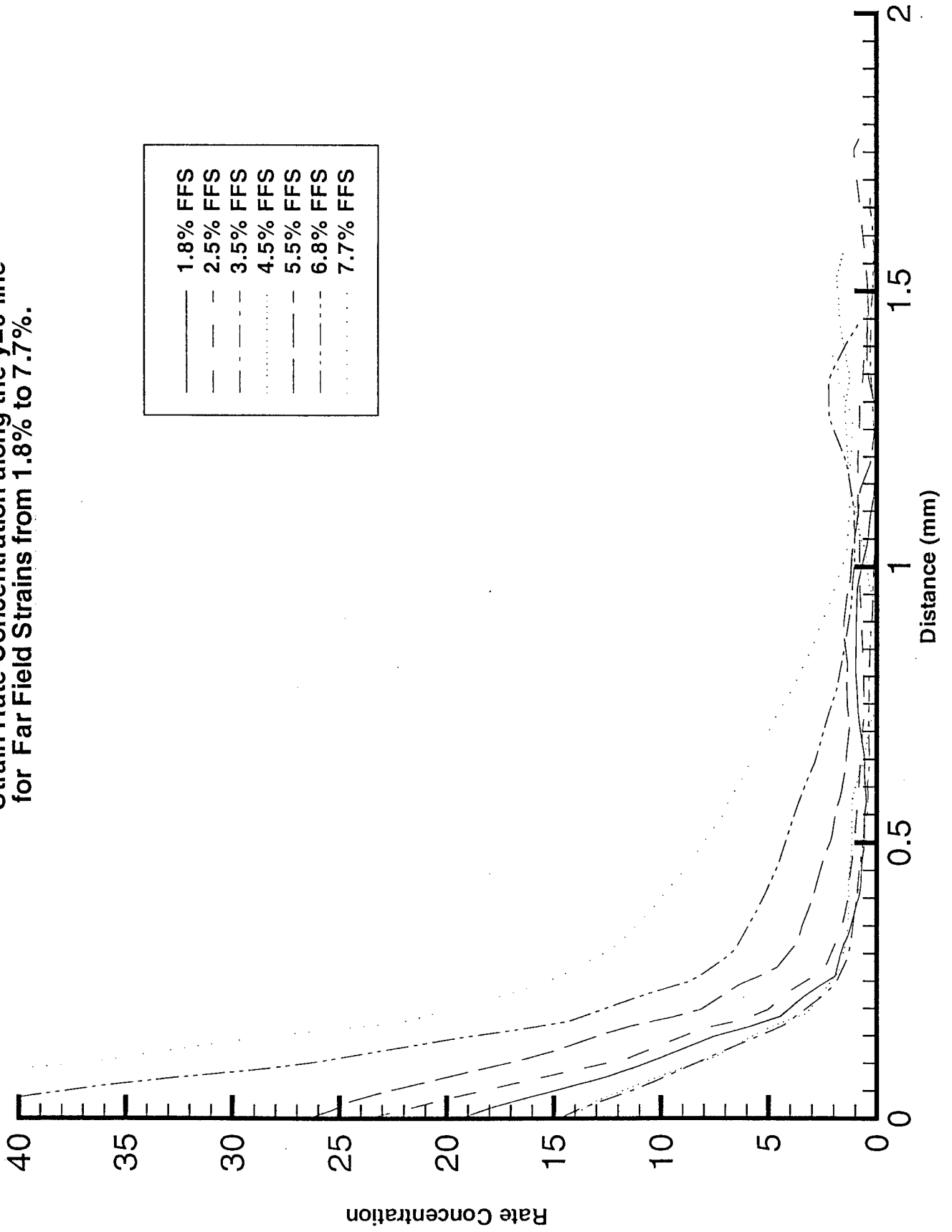
Non Dimensional Local Strain Rate in the y - Direction
At 0.001 (1/s) Far Field Strain Rate and 8.5% Far Field
Strain. Test 1



Strain Concentration along the y=0 line
for Far Field Strains from 1.4% to 8.2%.



Strain Rate Concentration along the $y=0$ line
for Far Field Strains from 1.8% to 7.7%.



Conclusions

1. The Digital Image Correlation Technique can be used to Determine Strain Fields where Inhomogeneous Deformations are presented.
2. The High Strain Field is Localized within 1 mm of the Crack Tip.
3. The Microstructure of the Material has a Significant Effect on the Strain Fields near the crack tip.
4. The Crack Growth Mechanism Consists of Void Generation and Coalescence with the Main Crack Tip.