

REPORT DOCUMENTATION PAGE

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Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

4 different papers enclosed for Task # 78

* Paper Rec'd After 30-day Deadline = 16 days until Deadline } No rush issued

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

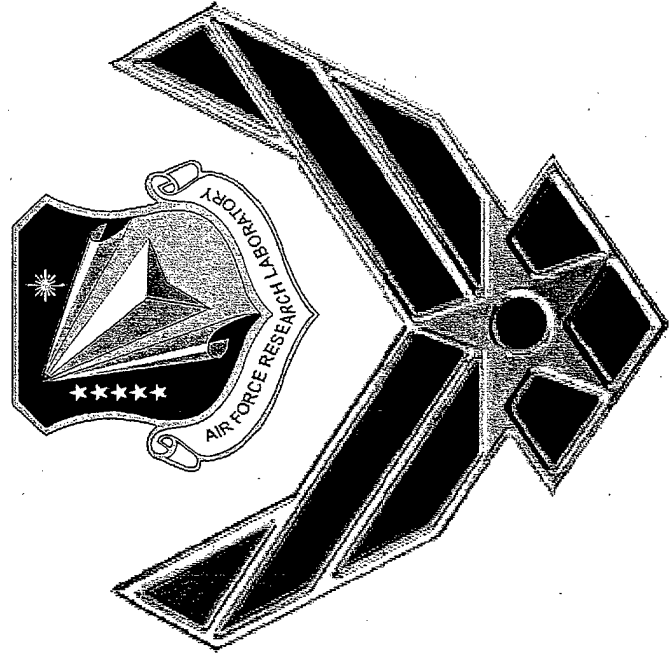
01 Nov 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: ~~AFRL-PR-ED-VG-2002-258~~
C.T. Liu (PRSM) et al., "Multi-Scale Strain Measurements of a Particular Composite Material"
(viewgraphs only)

ASME Int'l Mechanical Engineering Congress & Exhibit
(New Orleans, LA, 17-22 November 2002) (Deadline: 15 Nov 02)

(Statement A)

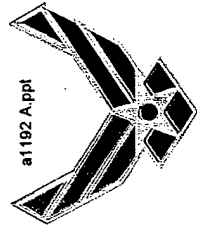
Multi-Scale Strain Measurements of a Particulate Composite Material



C.T. Liu
AFRL/PRSM
10 E. Saturn Blvd.
Edwards. AFB, California 93524-7680

C.W. Smith
Engineering Science and Mechanics Department
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

G. Ravichandran
Graduate Aeronautical Laboratory
California Institute of Technology
Pasadena, California 91125

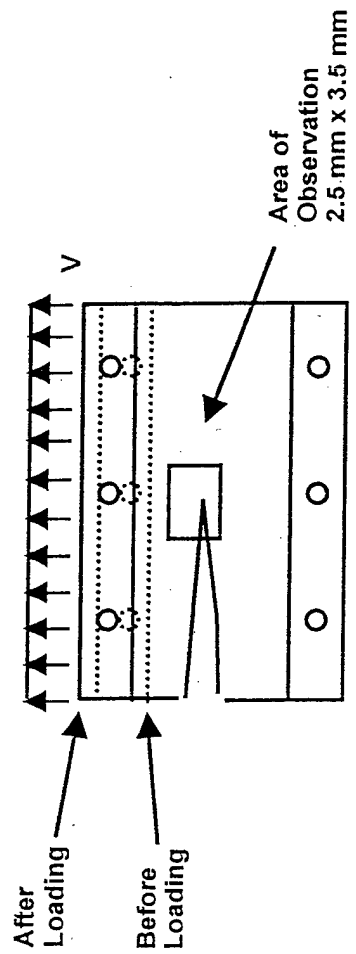
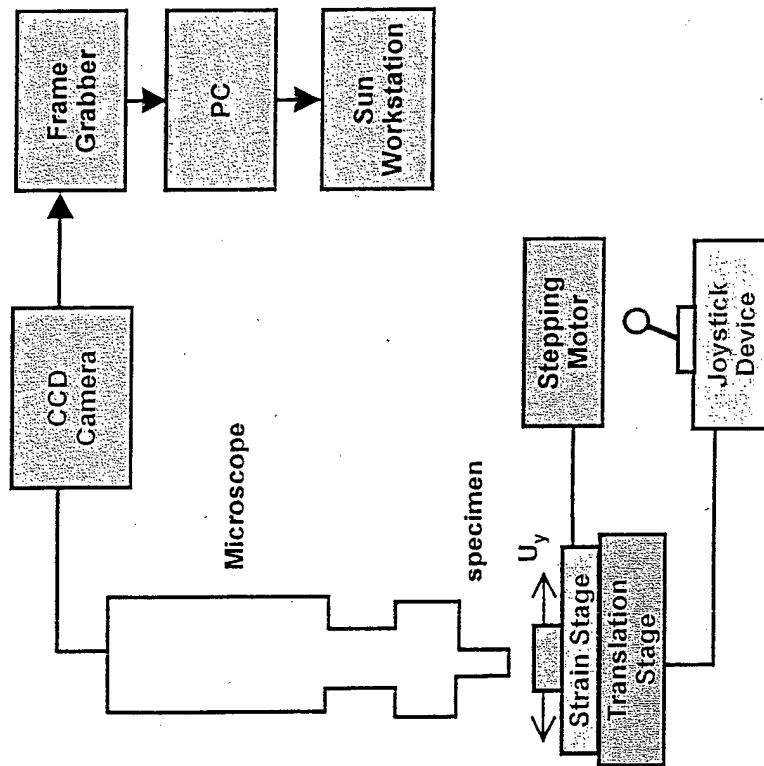


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Objectives

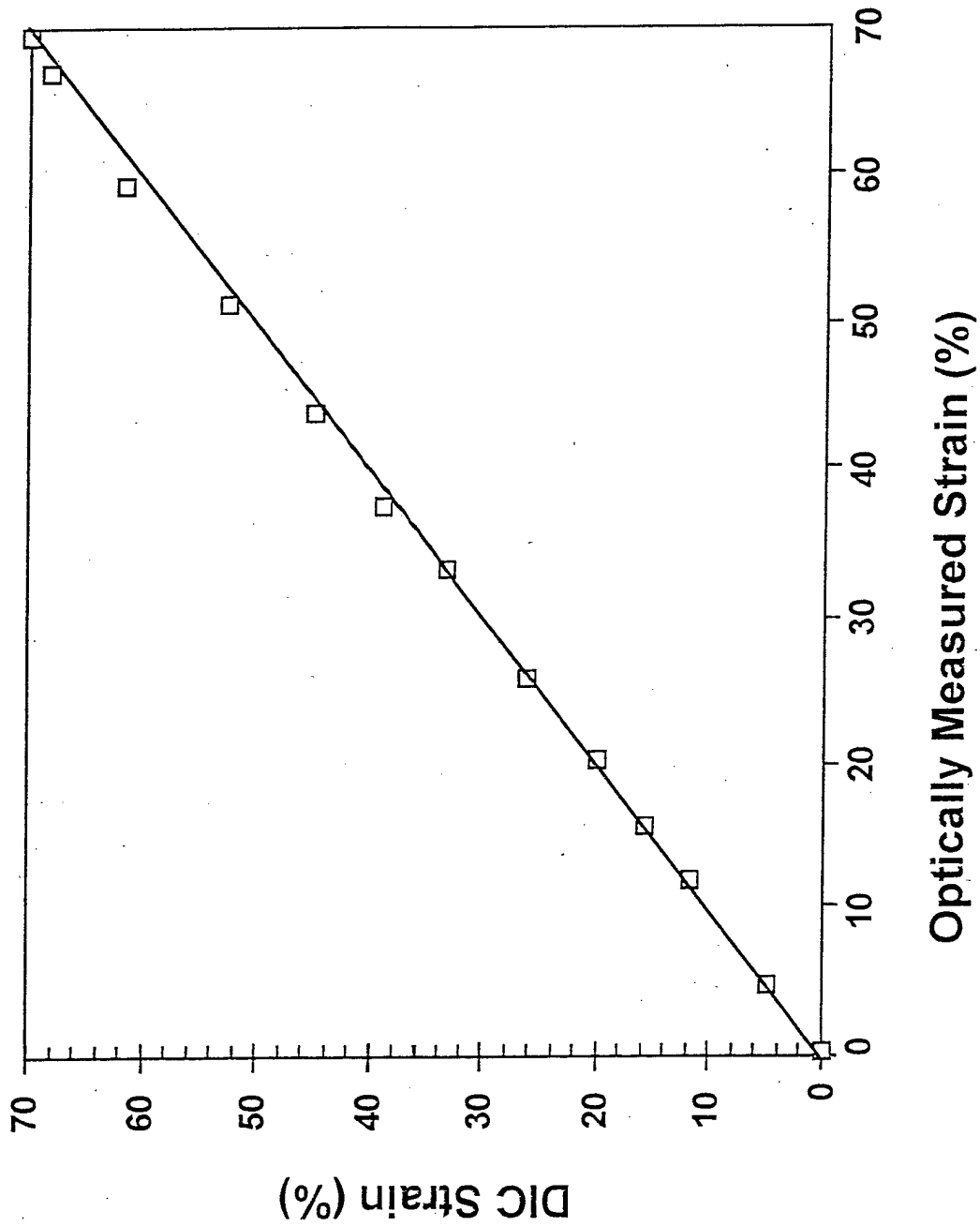
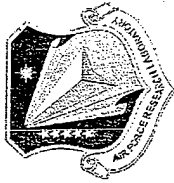


- ≠ Investigate the Effect of Microstructure on the Strain Distributions Near a Crack Tip
- ≠ Conduct Numerical Modeling Analysis to Determine the Displacement and Strain Fields



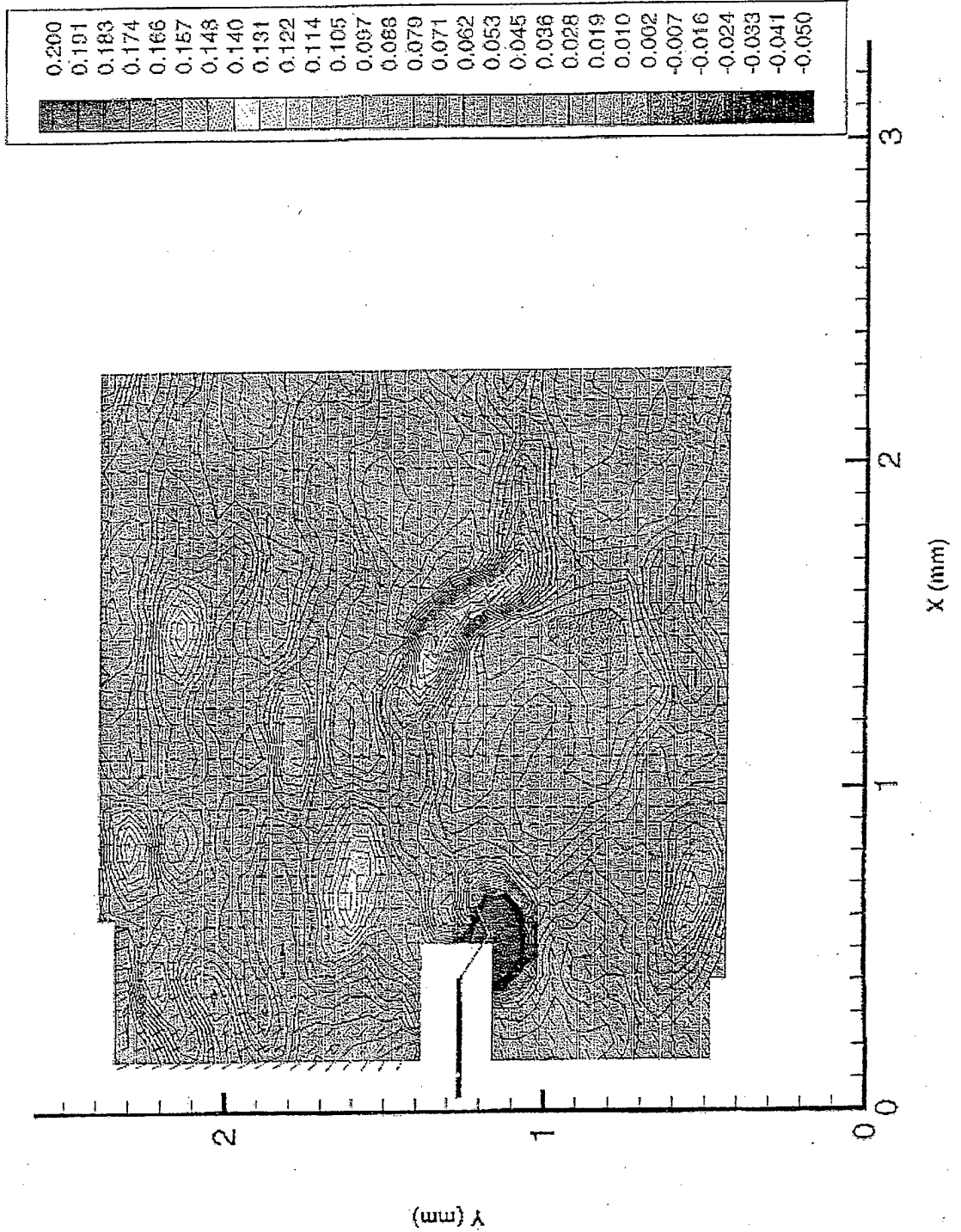
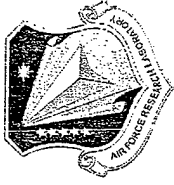


Calibration



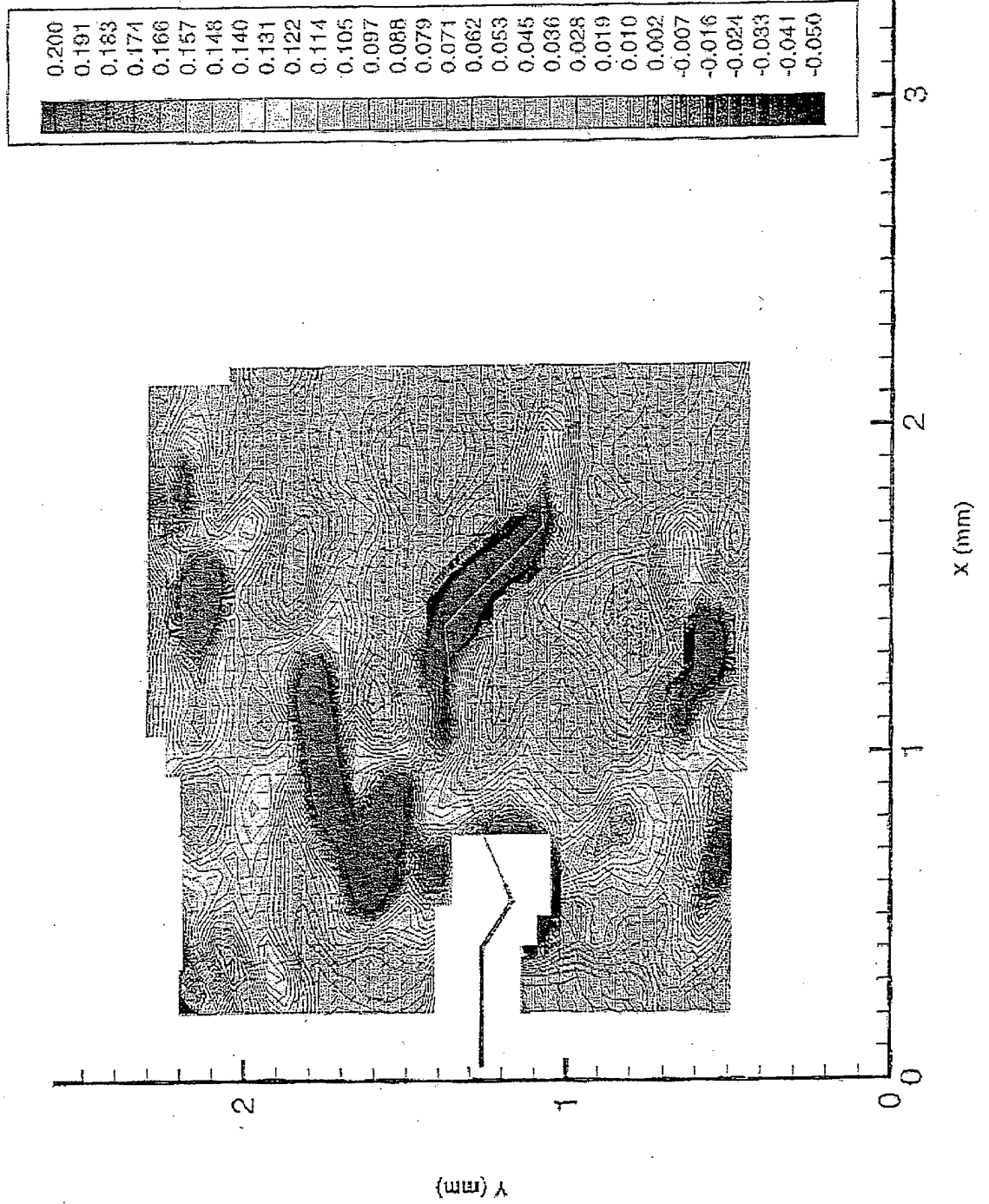


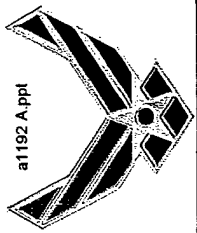
Maximum Principal Strain Distribution of 6.0% Far Field Strain During Loading





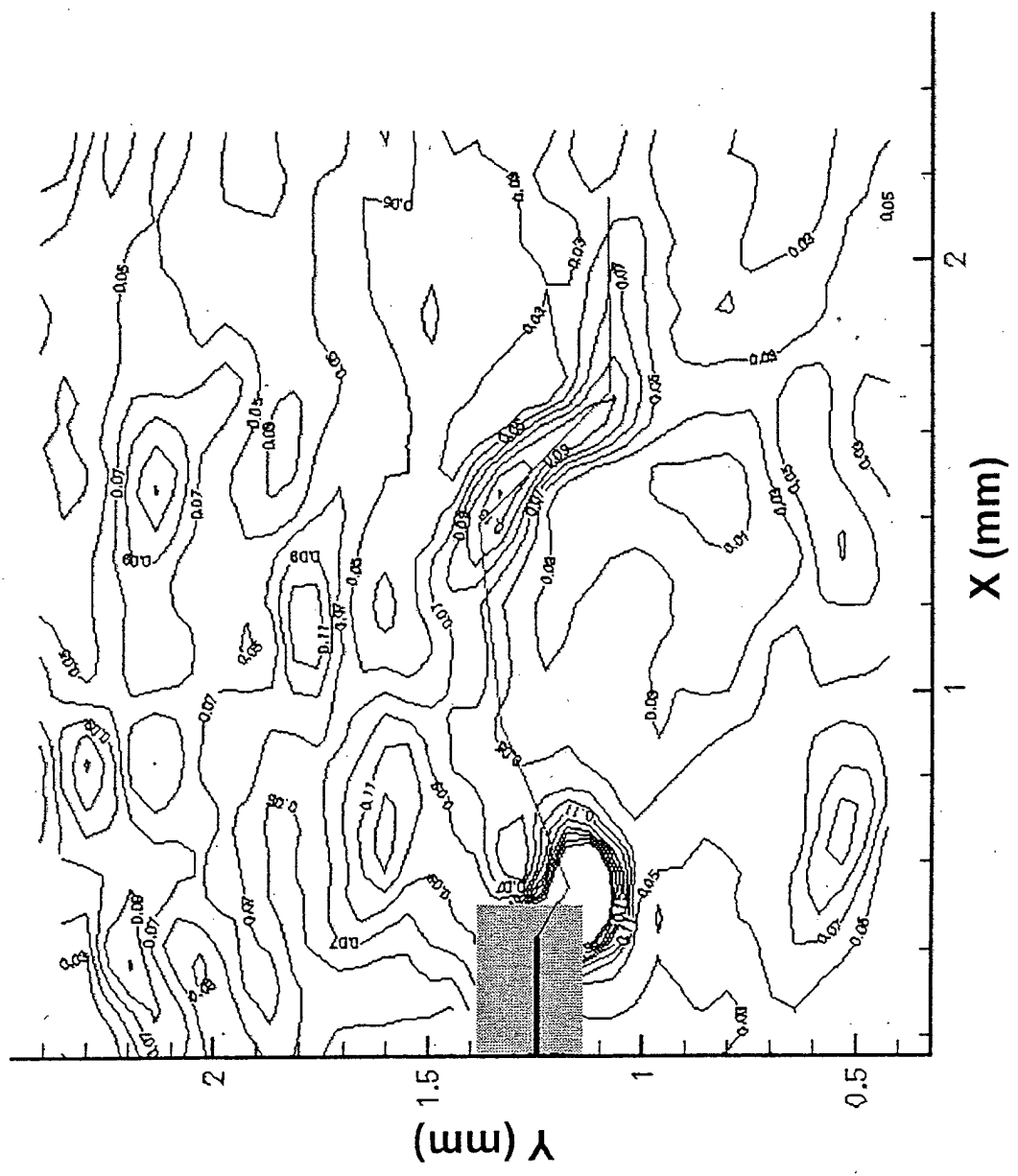
Maximum Principal Strain Distribution of 10.0% Far Field Strain During Loading

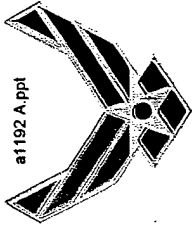




Maximum Principal Strain at 6% Far Field Strain

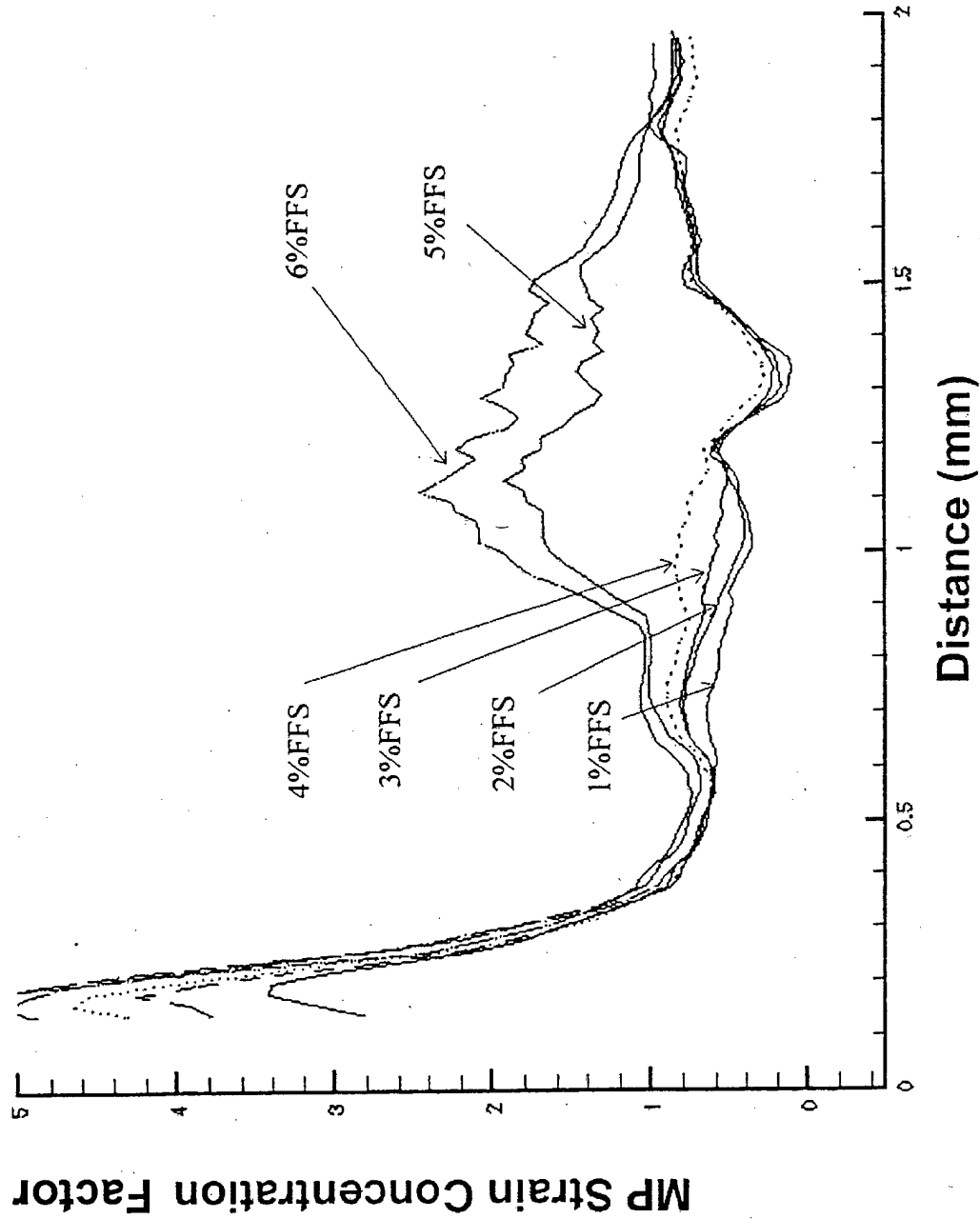
Field Strain

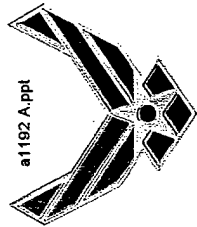




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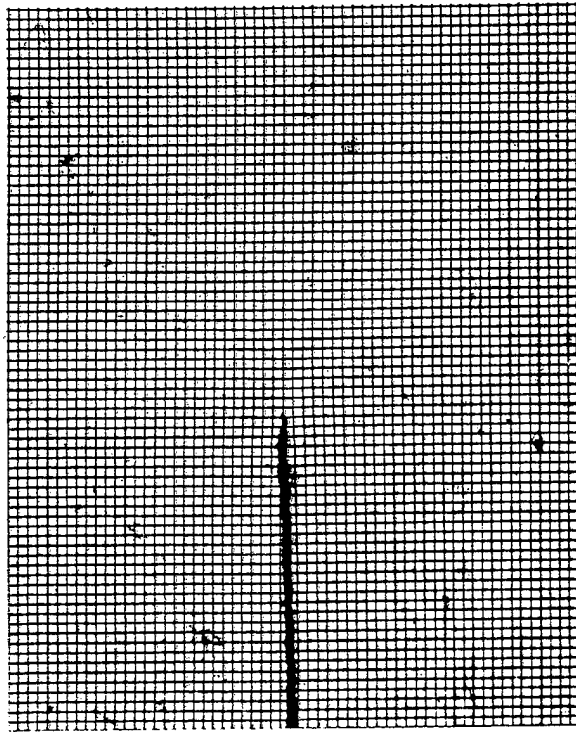
Maximum Principal Strain Concentration Factor at Various Far Field Strain Values



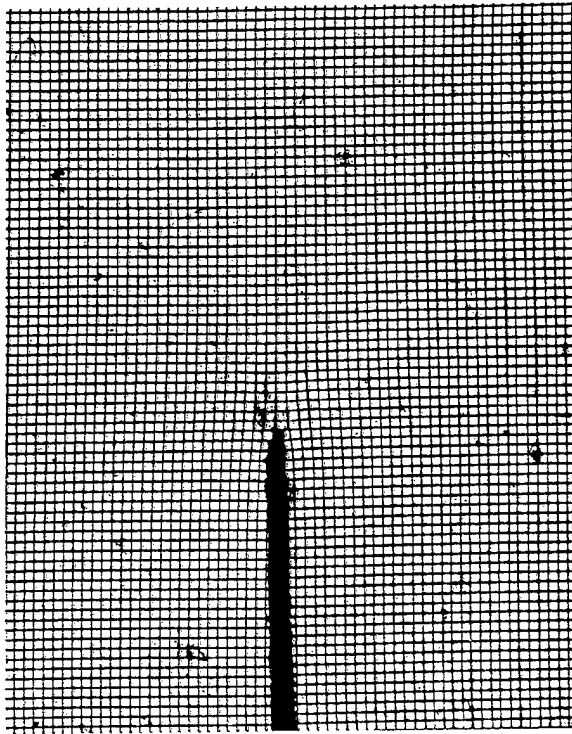


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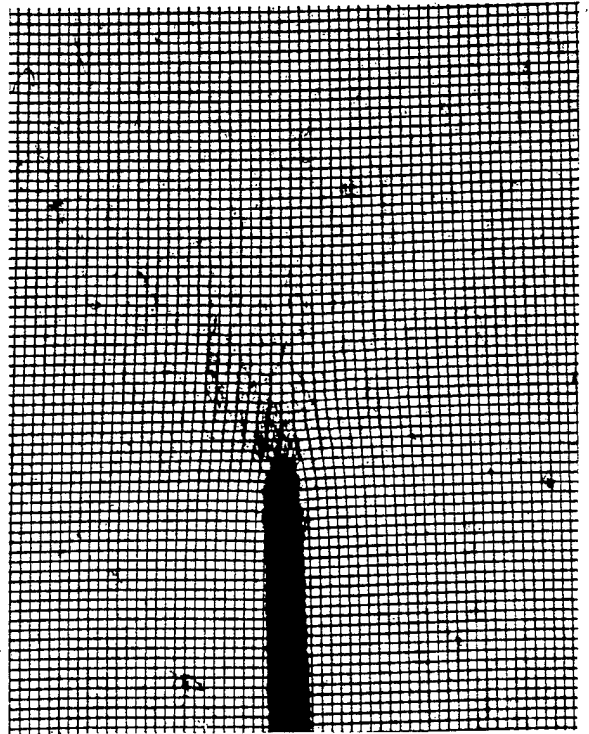
Grid Deformation During the Crack Blunting Phase



a

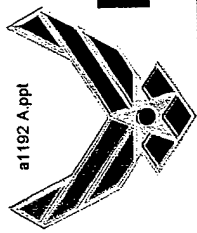


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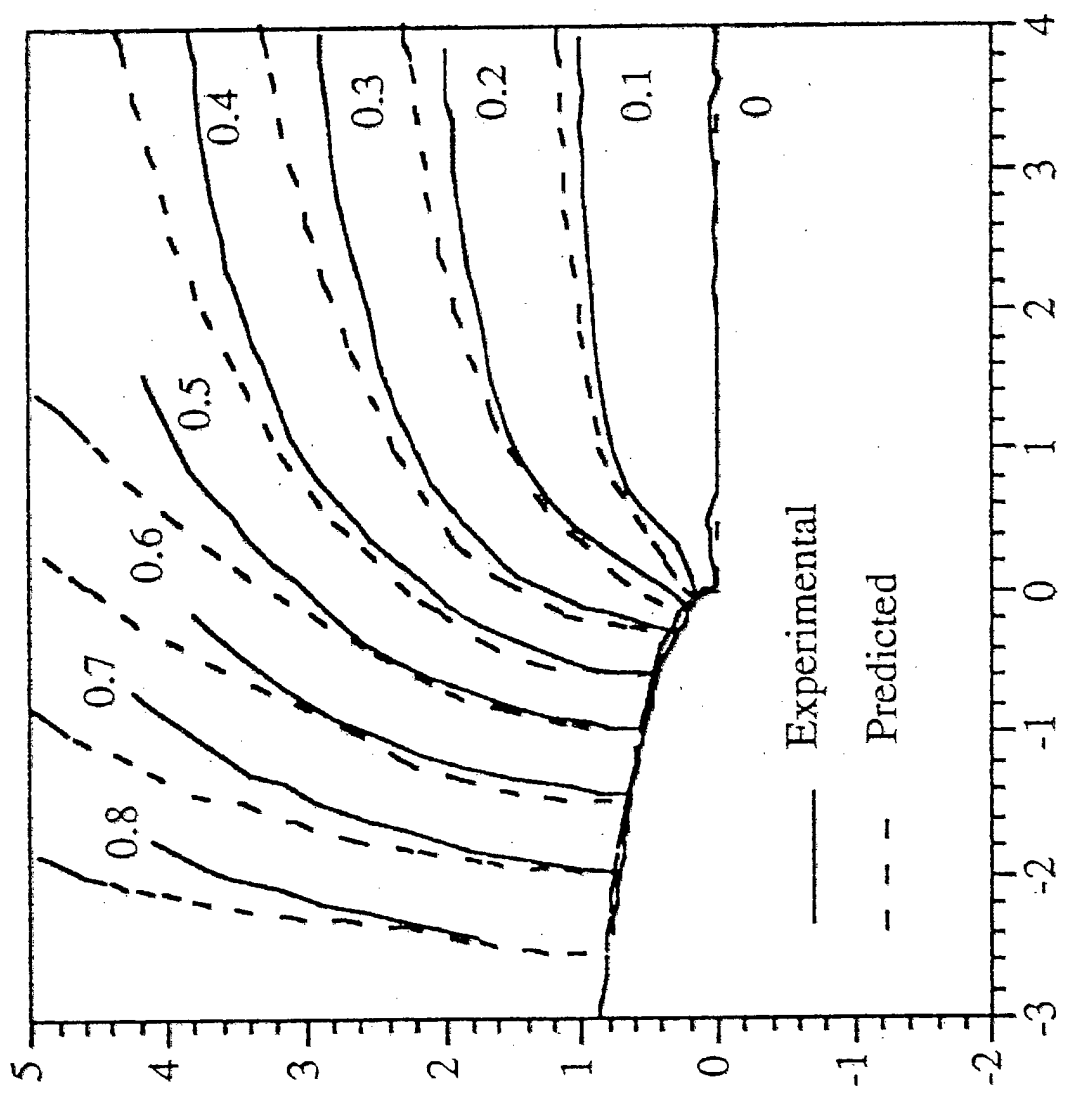


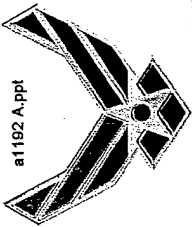
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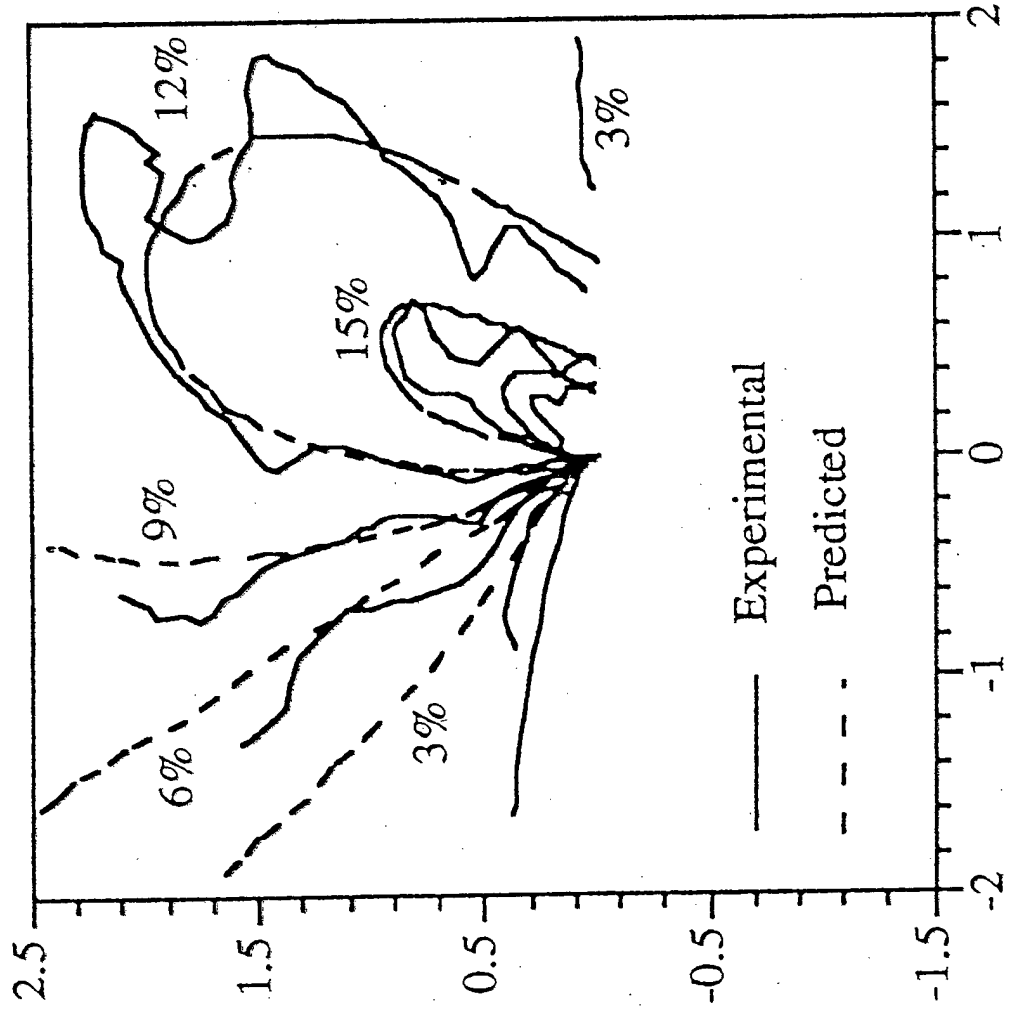


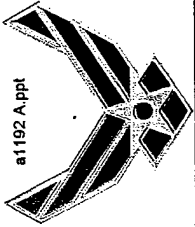
Contours of Constant Vertical Displacement (V) in the Crack Tip Region





Finite Element Results for a Normal Strain Contours Superimposed Upon Experimental Result





Conclusions

- ✚ The Microstructure of the Material has a Significant Effect on the Strain Fields Near the Crack Tip
- ✚ The Crack Growth Mechanism Consists of Void Generation and Coalescence with the Main Crack Tip
- ✚ The Displacement and Strain Fields Determined from Numerical Modeling Analysis Compare well with Experimental Results