

Nonlinear Characterization of the Crack Growth Behavior in a Filled Elastomer



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Report Documentation Page

Form Approved
OMB No. 0704-0188

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1. REPORT DATE JUL 2004		2. REPORT TYPE		3. DATES COVERED -	
4. TITLE AND SUBTITLE Nonlinear Characterization of the Crack Growth Behavior in a Filled Elastomer				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) C Liu; M Yen				5d. PROJECT NUMBER 2302	
				5e. TASK NUMBER 0378	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Laboratory (AFMC), AFRL/PRSM, 10 E. Saturn Blvd., Edwards AFB, CA, 93524-7680				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT N/A					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 17	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



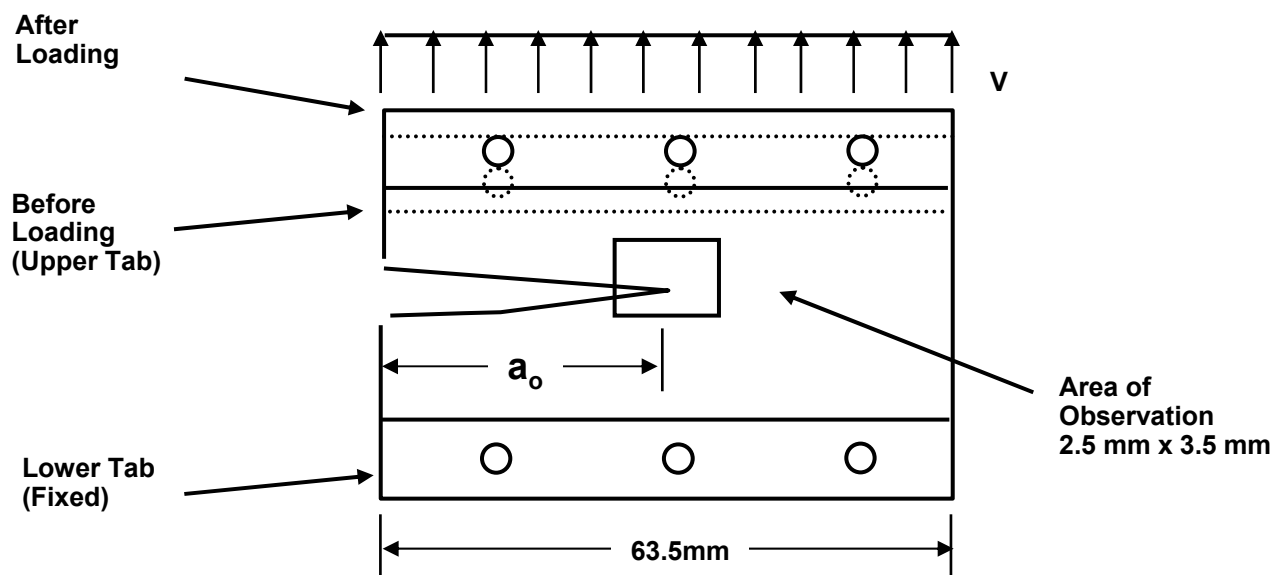
OBJECTIVES



- **Determine J-Integral Using a Hybrid Experimental-Numerical Technique.**
- **Investigate the Effects of Initial Crack Length on the Crack Growth Behavior in the Filled Elastomer.**

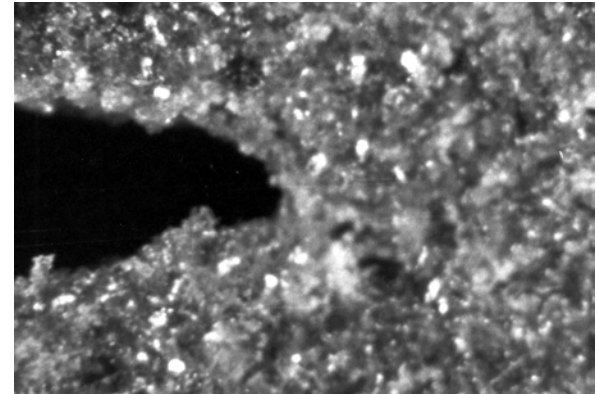
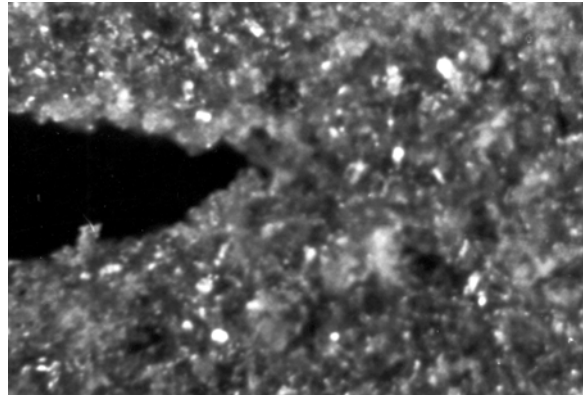
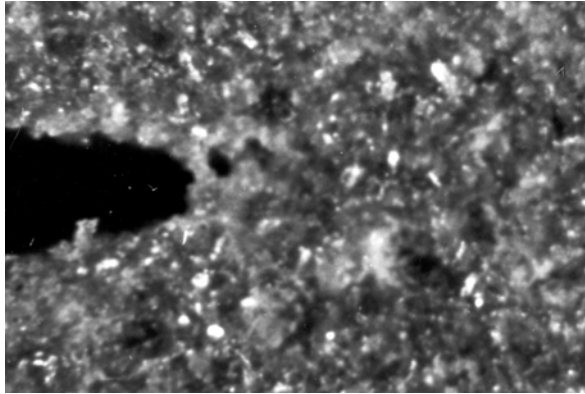


Specimen Geometry



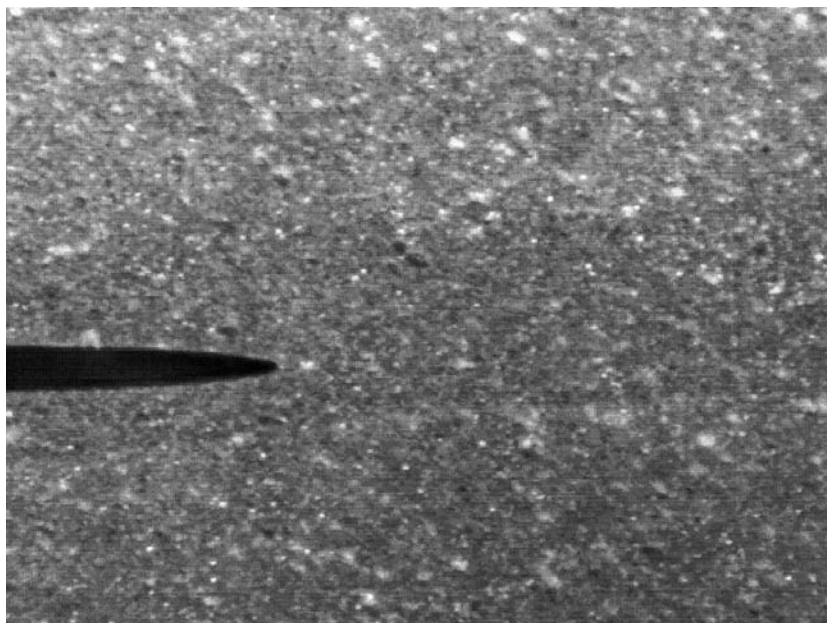


Crack Tip Profiles

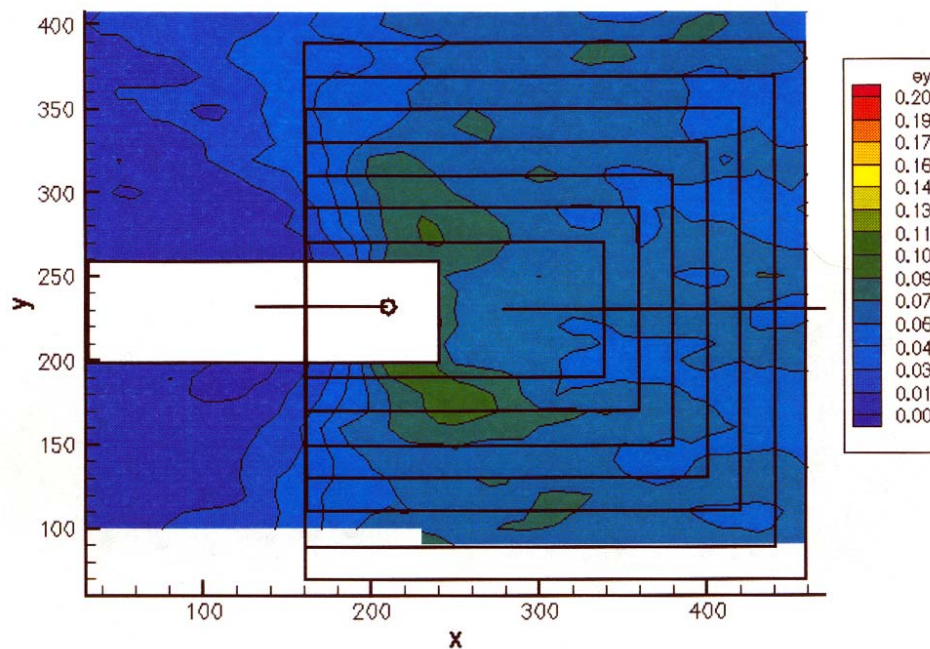




Step 11



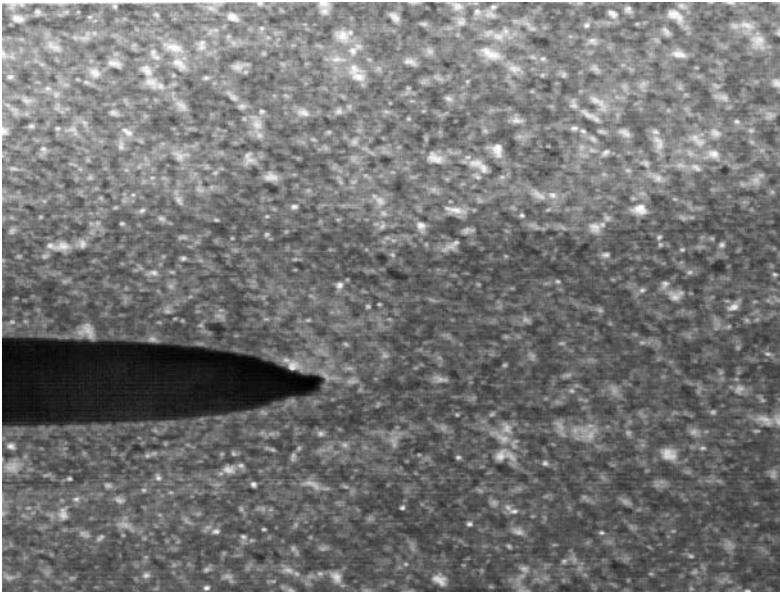
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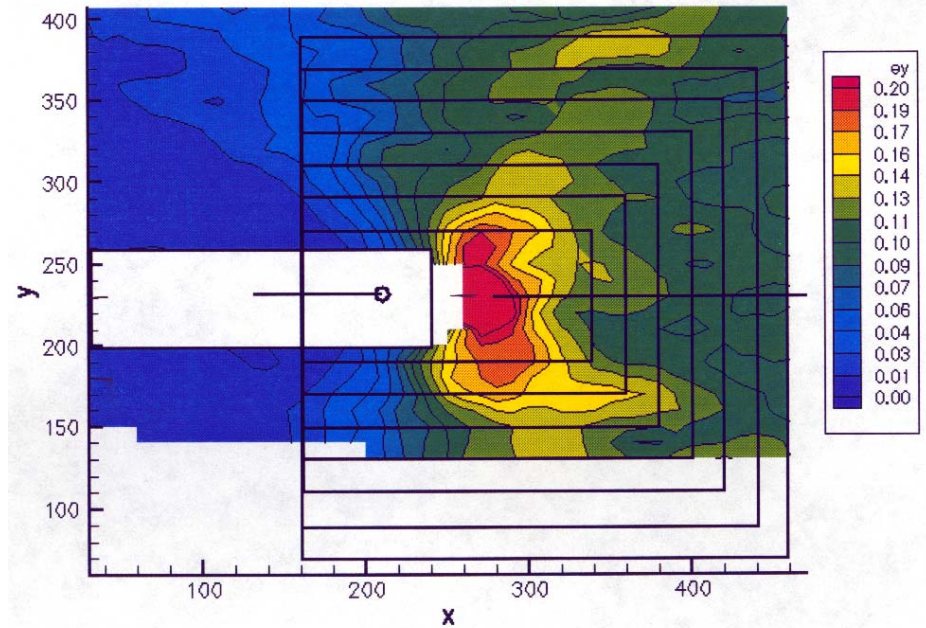
**Strain Distributions and
Integration Paths**



Step 19



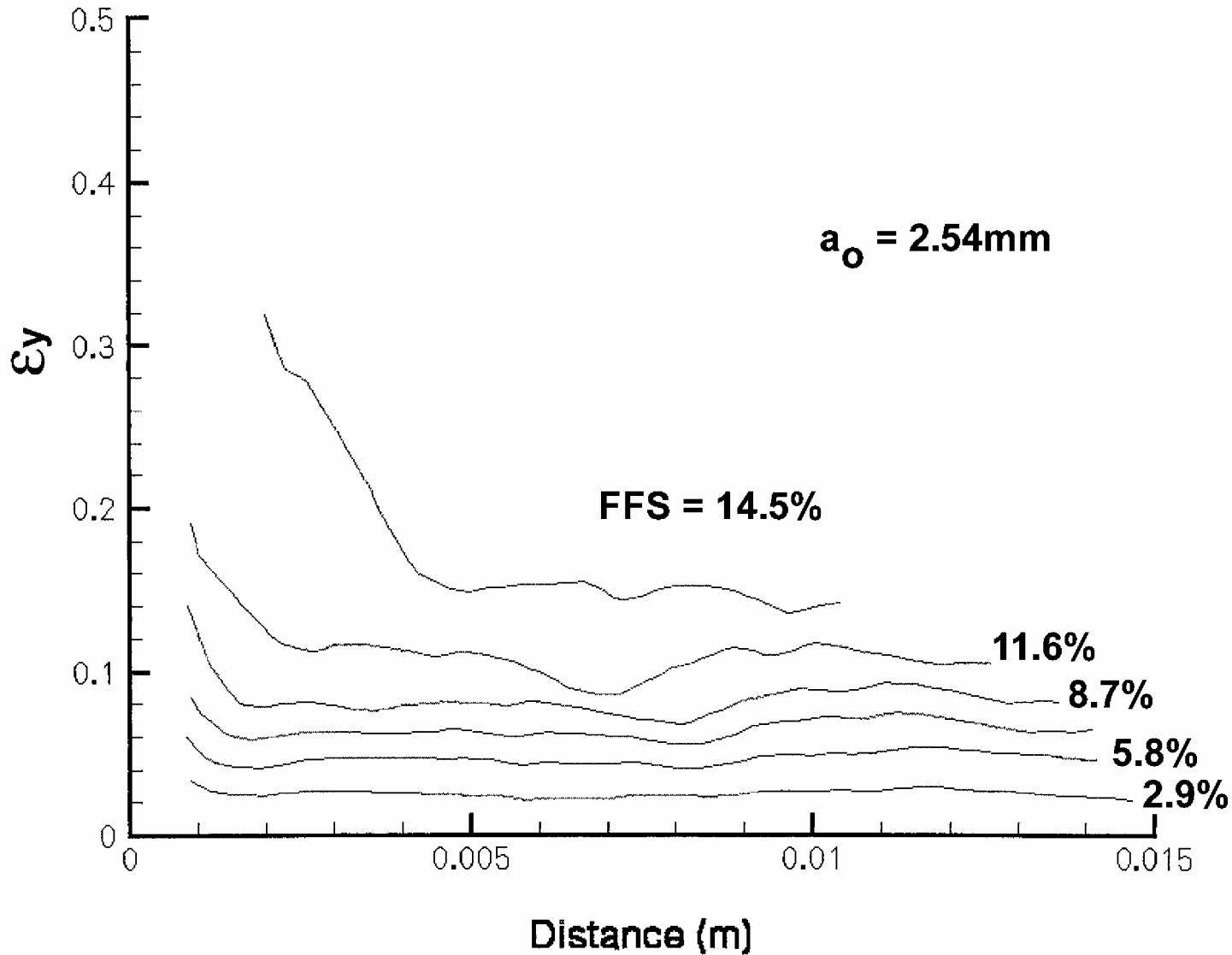
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**Strain Distributions and
Integration Paths**

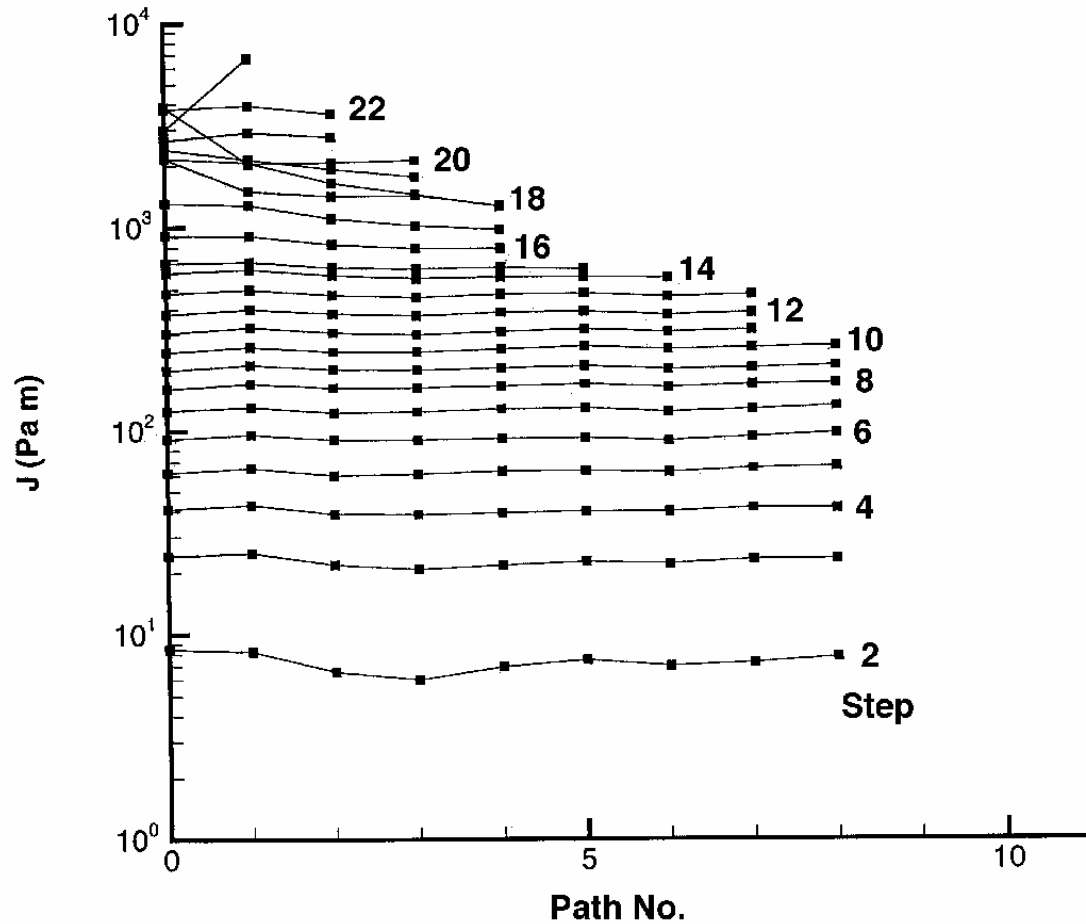


Normal Strain Vs. Distance from Crack Tip



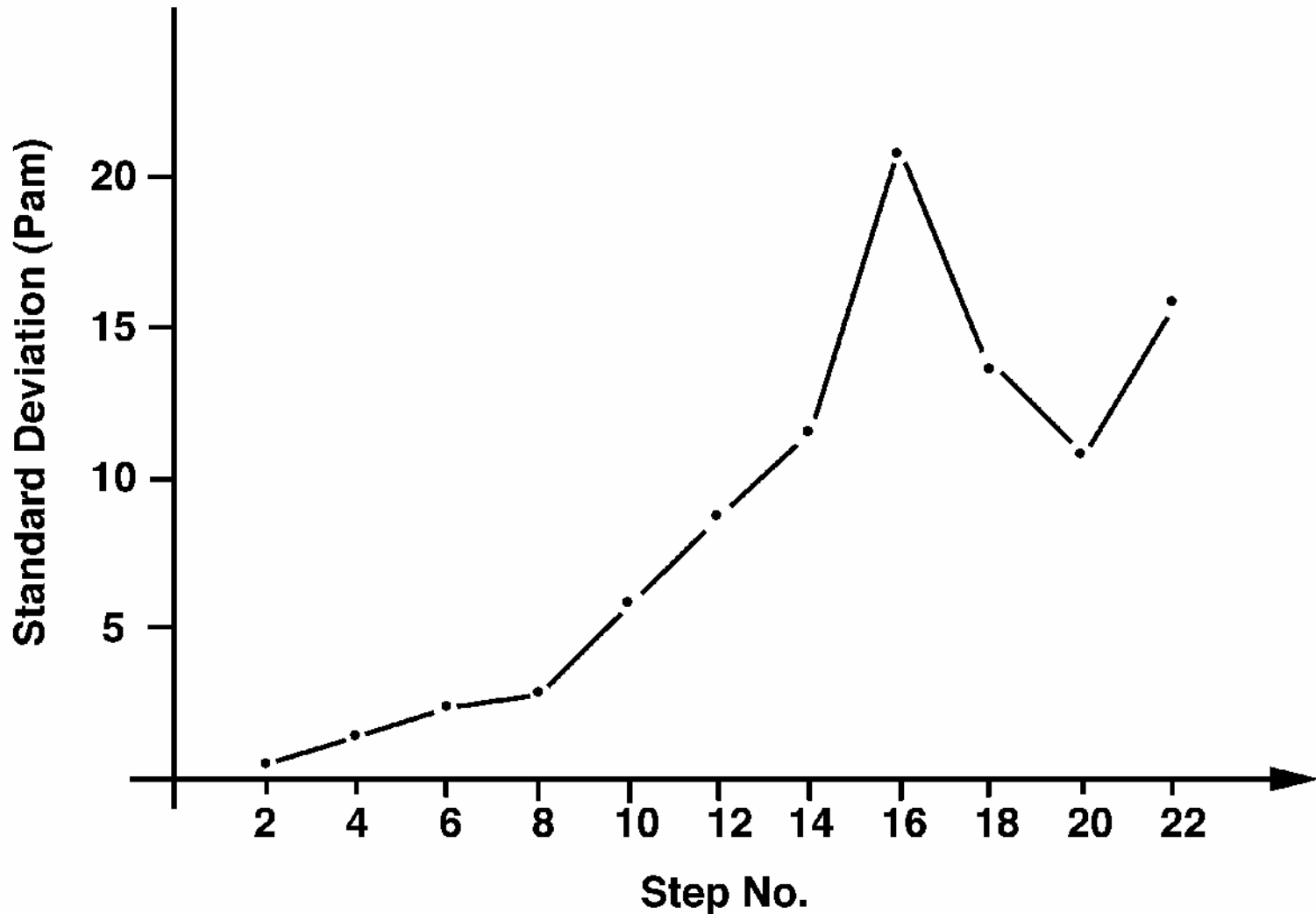


J-Integral Versus Path Number as a Function of Step Number (Applied Strain)



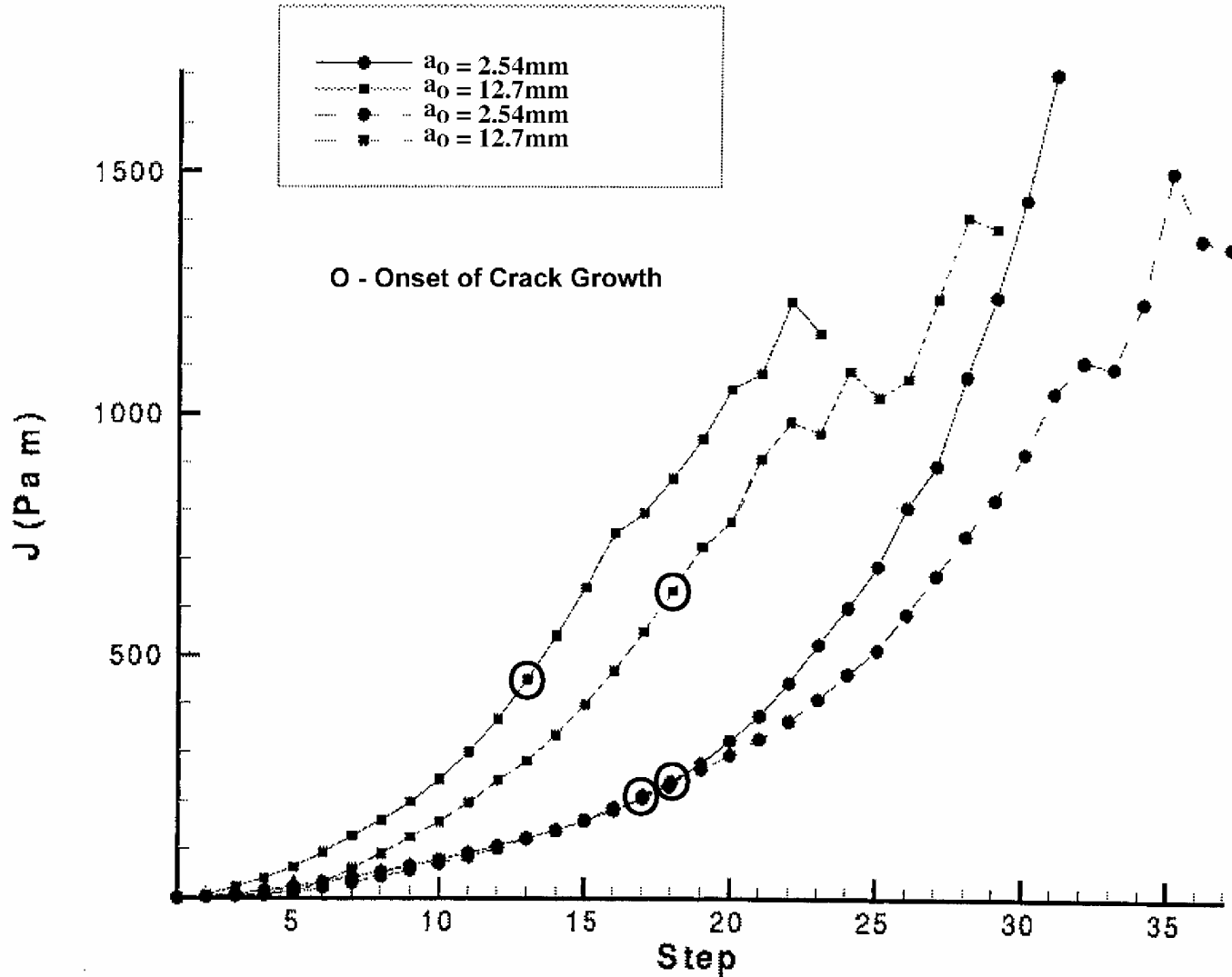


Standard Deviation of J-Integral Versus Step Number (Applied Strain)



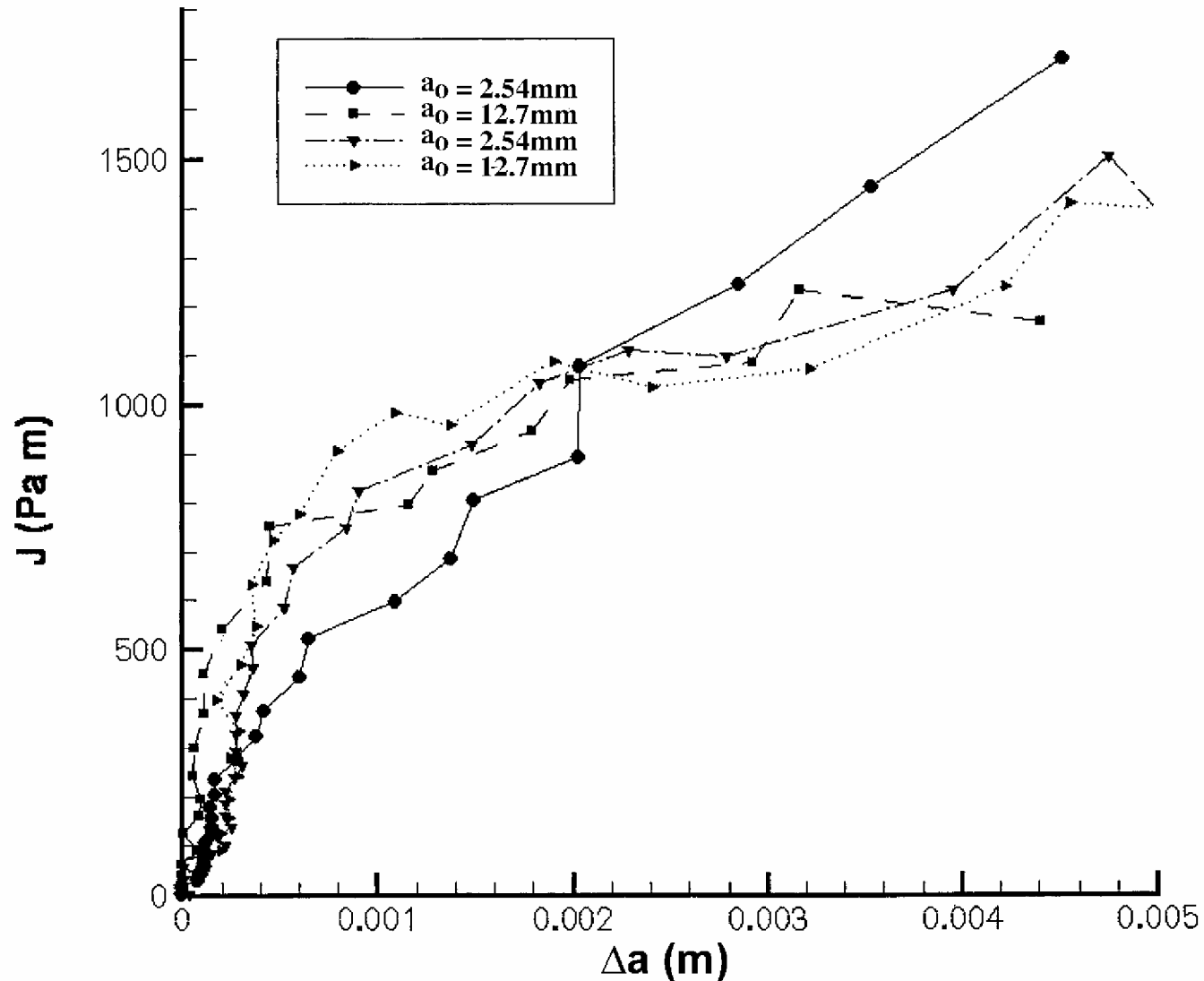


J-Integral Vs. Step Number (Applied Strain)



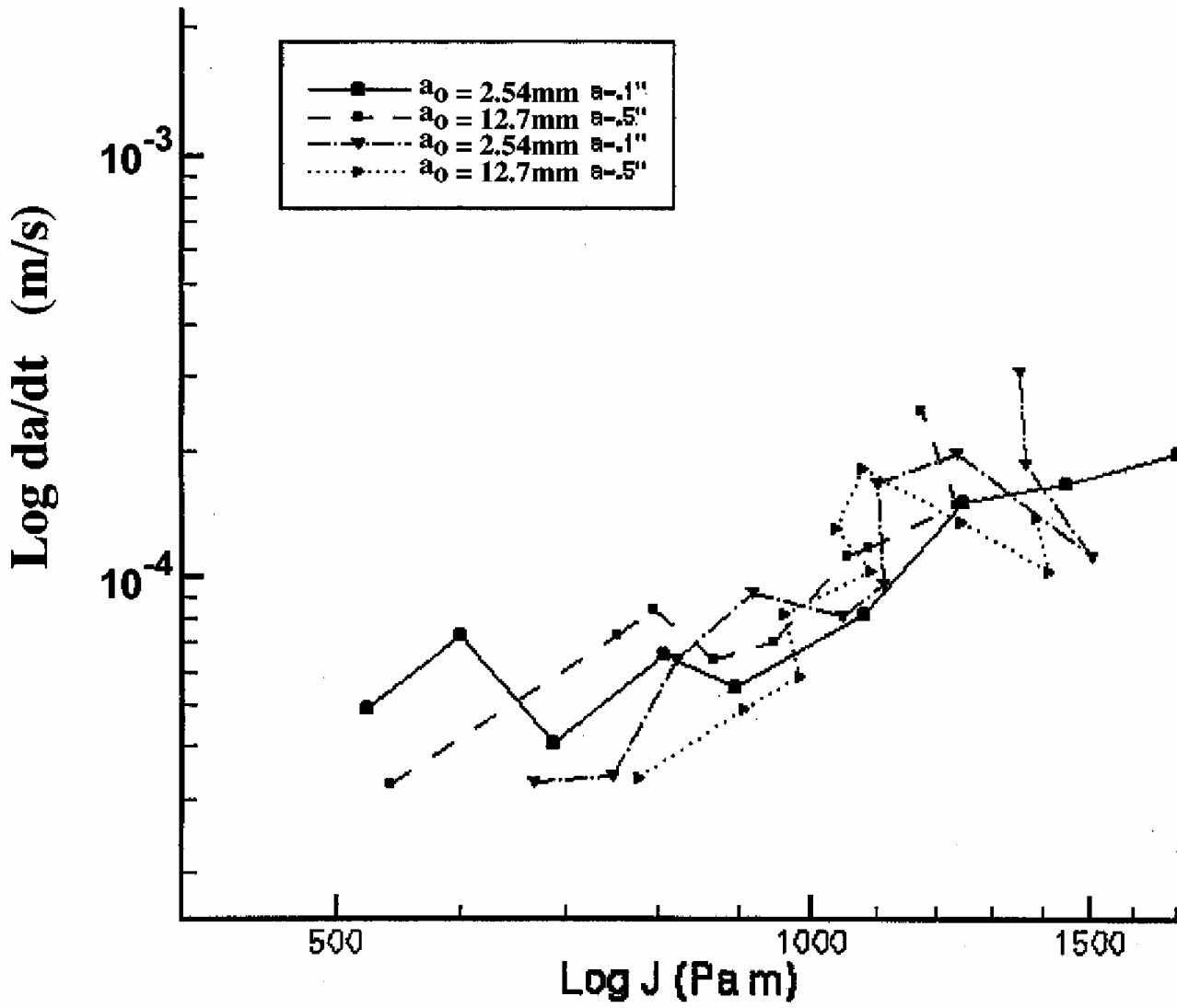


Crack Growth Resistance Curves





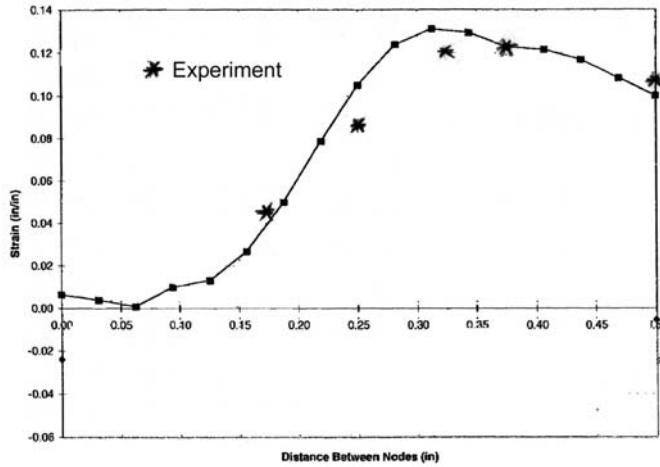
Crack Growth Rate Vs. J-Integral



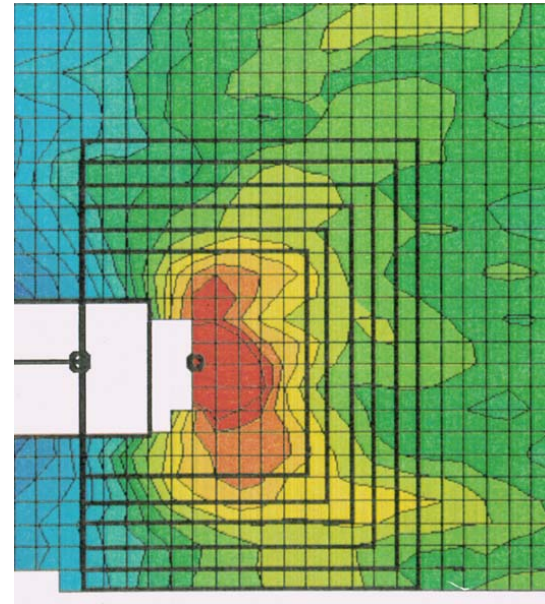


CONCLUSIONS

- **On the macroscopic scale, the J-integral is independent of the integration path.**
- **The initial crack length has no significant effect on the crack growth behavior.**
- **A considerable amount of stable crack growth takes place before unstable crack growth occurs.**
- **A power law relationship exists between the crack growth rate and the J-integral**



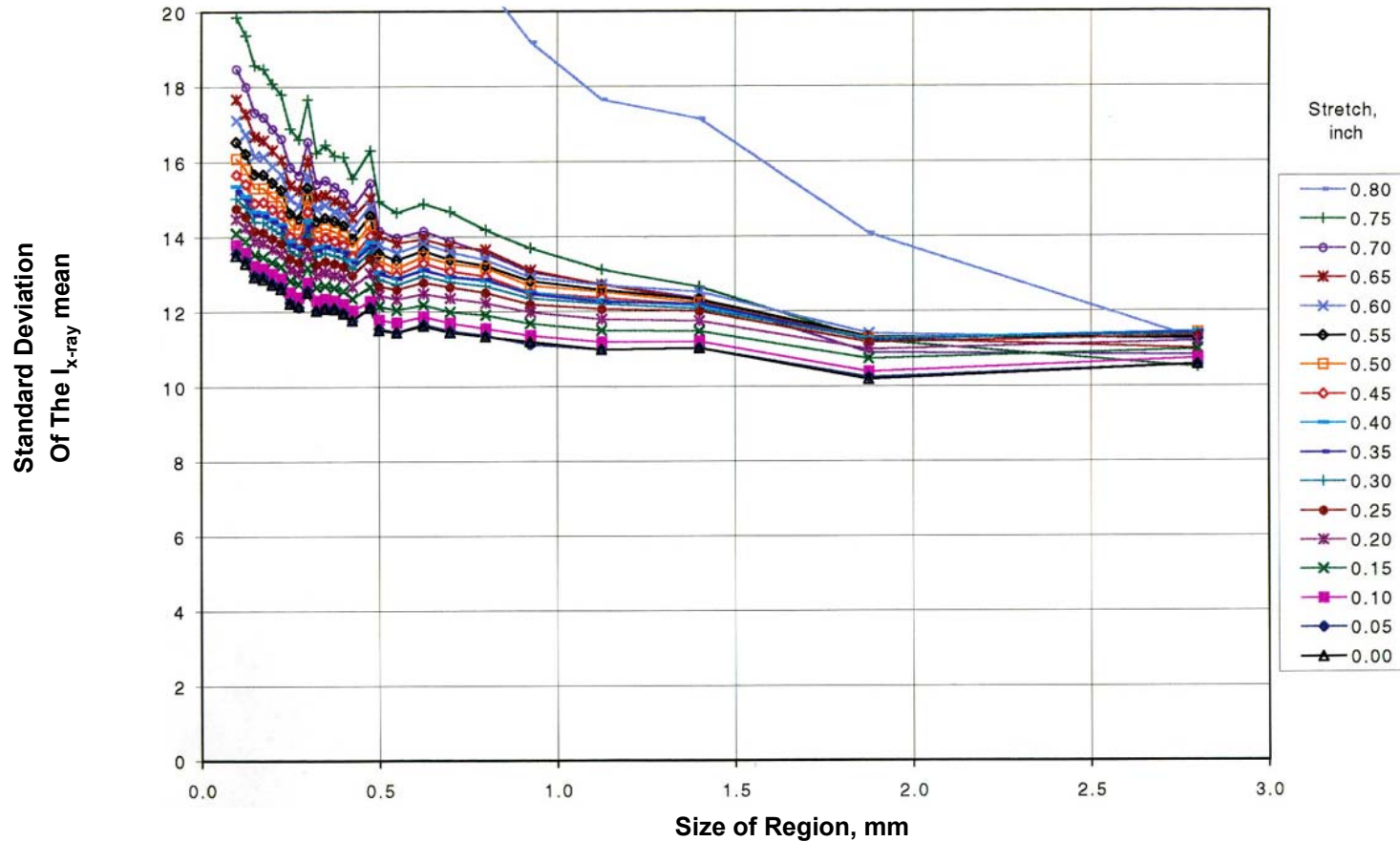
Normal Strain Along an Integration Path



Strain Distributions and Integration Paths

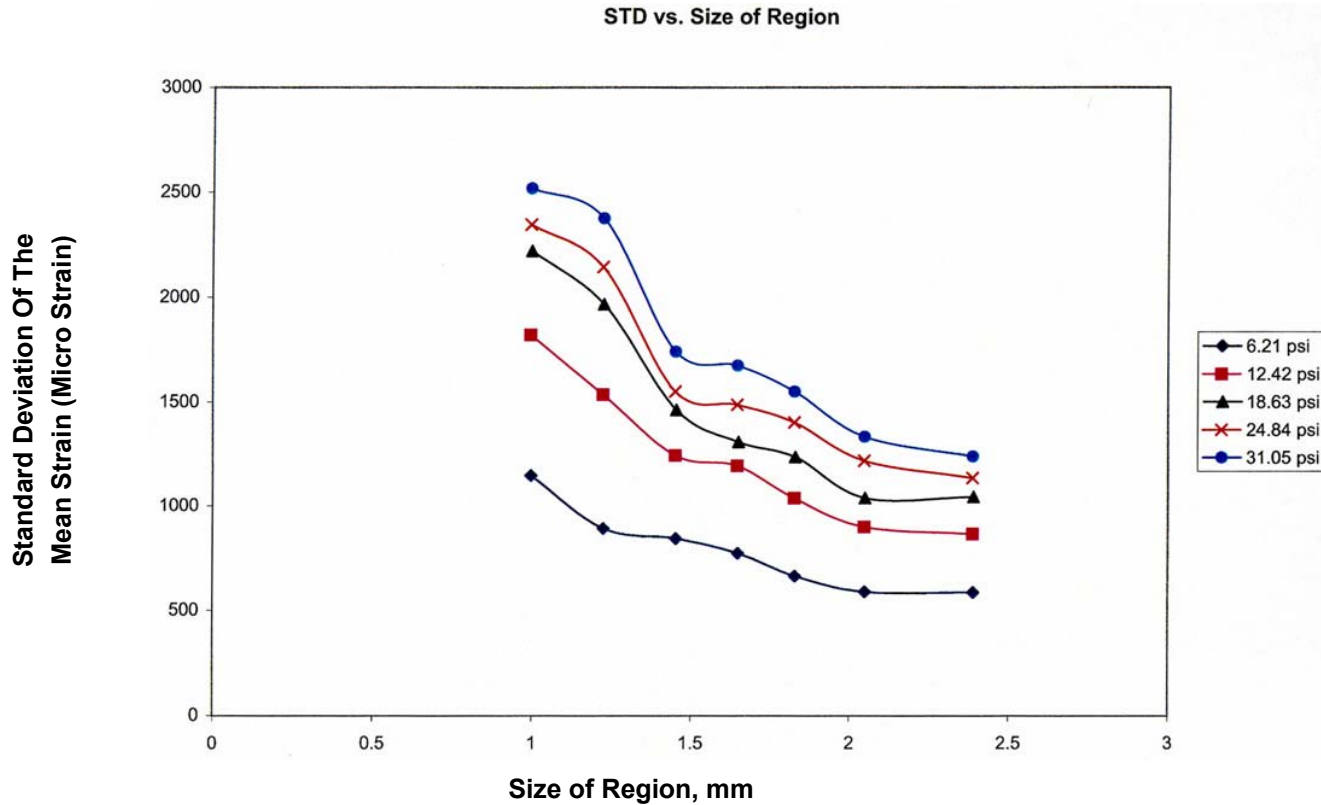


Standard Deviation of X-Ray Intensity Versus Size of Region as a Function of Applied Deformation





Standard Deviation of Strain Versus Size of Region as a Function of Applied Stress





Maximum Principal Distribution at 6% Applied Strain

