



1993 IEEE WORKSHOP ON
CHARGE-COUPLED DEVICES
AND ADVANCED IMAGE SENSORS



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**Deposited Multi-Spectral Filter Stripes
on
Transparent Tin Oxide Gate CCD Imaging Arrays**

B. Frias, L. Colquitt, A. Santos, R. Tacka, A. Turley
Westinghouse Electric Corporation
P.O. Box 1521, MS 3D12
Baltimore Md., 21203

J. Aguilera, R. Shimshock
Deposition Sciences Incorporated
386 Tesconi Ct.
Santa Rosa, Ca. 95401

Presented by Bron Frias

PHASE 1A FILTER DEPOSITION AND CHARACTERIZATION



STUDY OBJECTIVE:

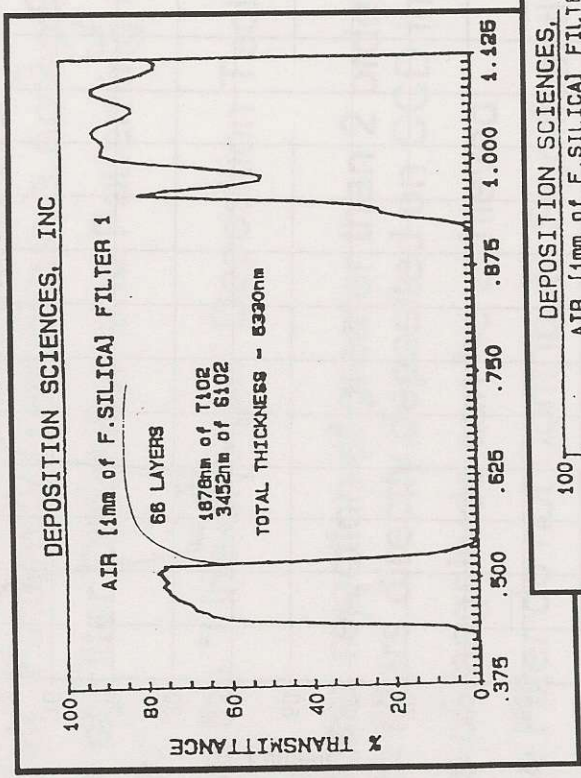
- Determine Limitations of Directly Depositing Visible Bandpass Filters on High Quantum Efficiency CCD Devices
- Utilize a previously demonstrated CCD Imager
- Concentrate the Study toward:
 - Filter Definition Techniques
 - Minimum Filter Width
 - Filter Uniformity
 - Filter-to-Filter Transitions
 - CCD Tolerance to Filter Process
- Landsat Bands 1, 2 and 3 will be used as baseline.
- Assume the Filter Bandpass Requirements can be achieved by Iteration

MODELED TRANSMISSION CHARACTERISTICS

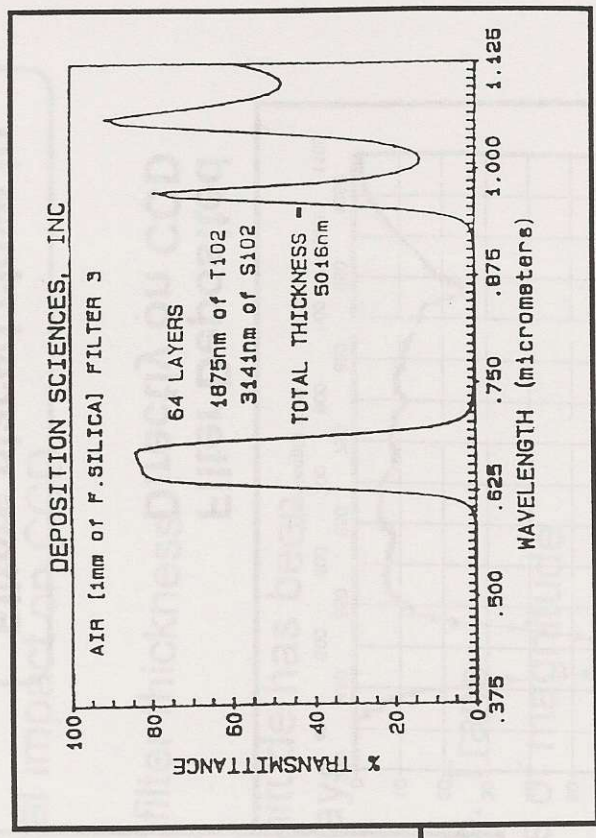
DSI
DEPOSITION
SCIENCES
INCORPORATED



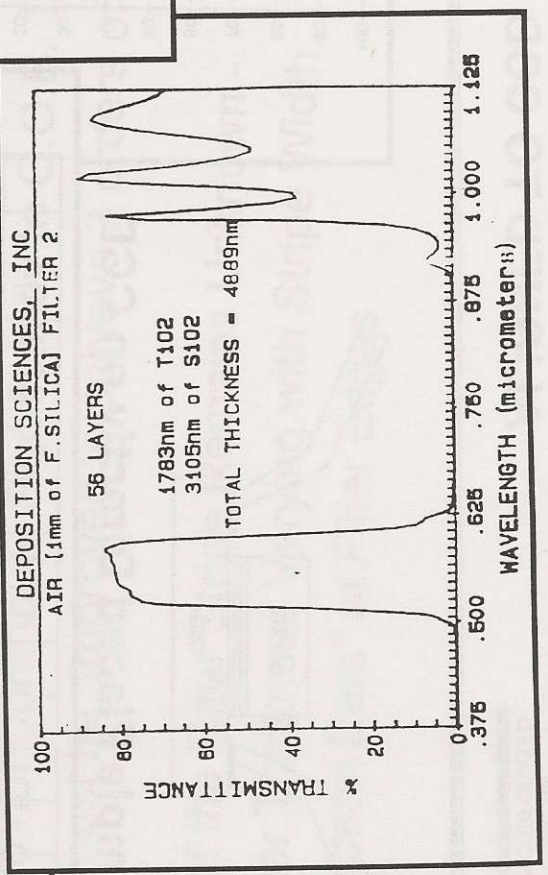
BAND 1 (BLUE)

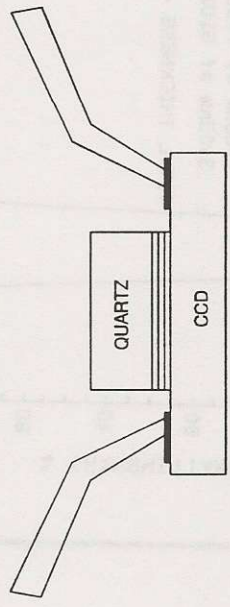


BAND 3 (RED)

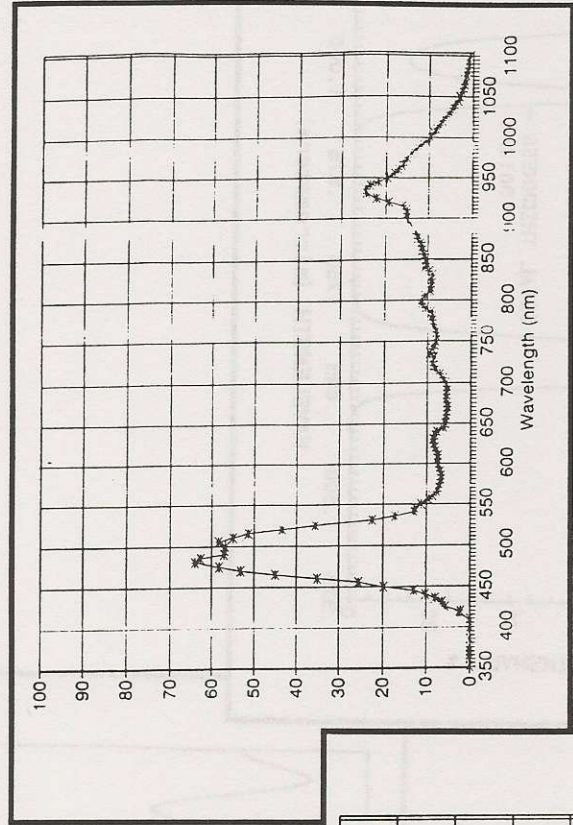
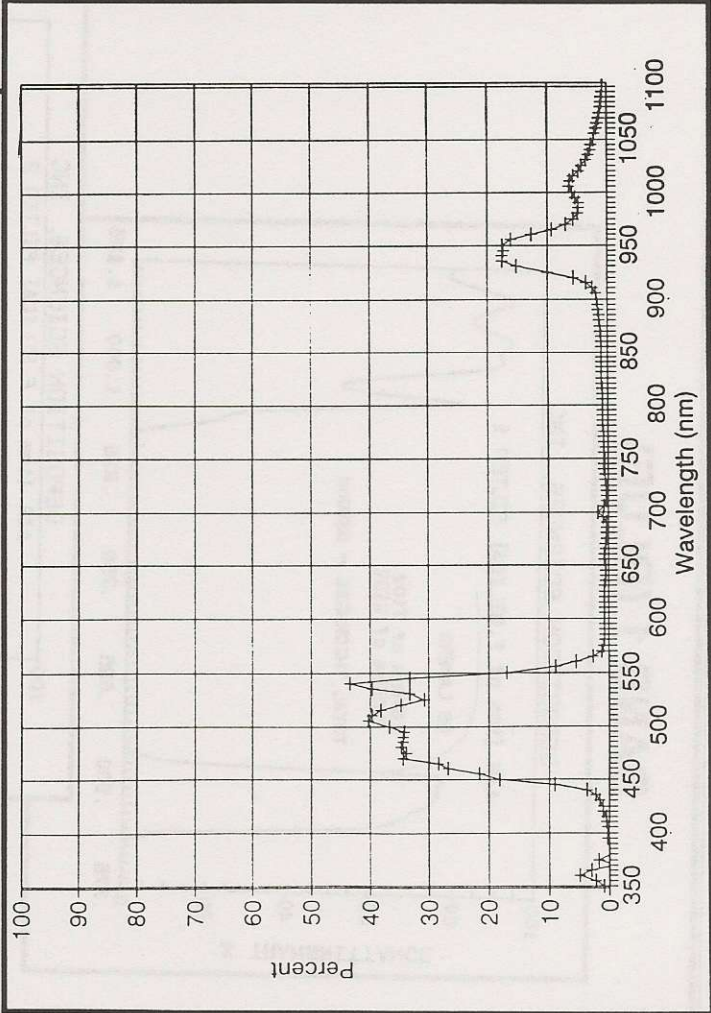


BAND 2 (GREEN)





Witness Sample Placed Directly on CCD



**Filter Deposited
Directly on CCD**

**Filters placed close to
CCD behave
Normally**

- Existing “Liftoff” Patterning Technique is Acceptable for intended application.
- The addition of Filter Deposition and Patterning has minimal impact on CCD performance.
- Must improve the “Line-of-Sight” Deposition Technique for filter thickness control.
- Out-of-Bandpass rejection of greater than 2 orders of magnitude has been achieved with filters directly deposited on CCD imaging arrays.
 - 3 orders of magnitude can be achieved.
- Defects in the Filter do not Contribute Significantly to O.O.B. Trans.
- Filter Defect Density must be Improved to achieve 3 orders of magnitude OOB .
- The Minimum Width of the Filter Stripe Remains Unknown -
 - Obscured by Filter Thickness Varying with Stripe Width
 - Obscured by “Batman Ears” at Filter Edges