

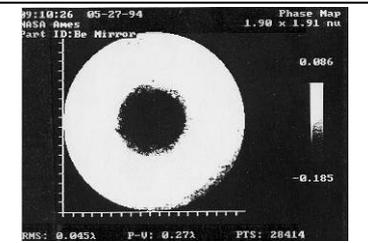
JWST Mirror Segment Status at Tinsley

Glen Cole & Tony Hull

Tech Days 2007



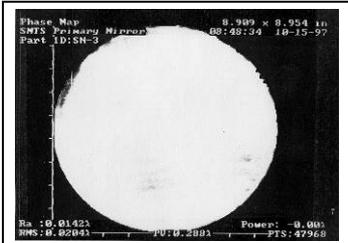
Beryllium Mirror History at Tinsley



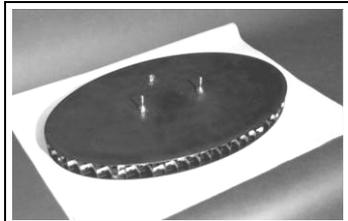
NASA Ames Demo Mirror
 •0.5 meter diameter
 •28 nm RMS



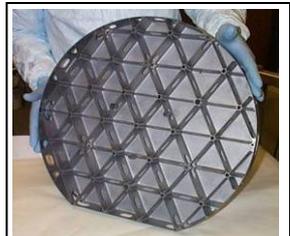
Earthwatch
 •0.45 x 0.3 meters
 •6 nm RMS



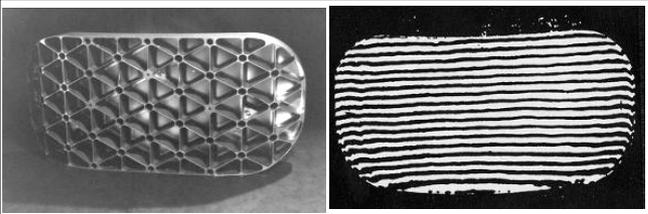
SMTS
 •0.25 meter diameter
 •12 nm RMS



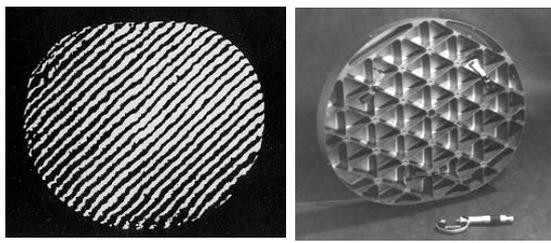
TIR
 •17 nm RMS 0.45 x 0.3 m
 •Figured to < 5 mm of edge



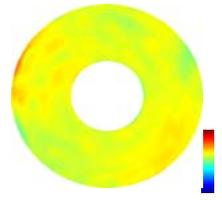
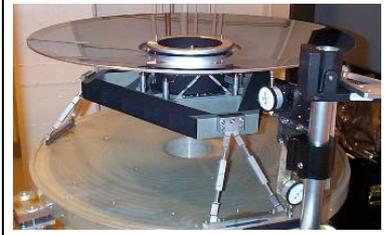
SBMD
 •JWST pathfinder
 •19 nm RMS (20 K)



GSTS (M3)
 •0.75 x 0.37 meters
 •39 nm RMS
 •Figured to < 5 mm of edge



GSTS (M1)
 •~0.5 meter diameter
 •15 nm RMS
 •Figured to < 5 mm of edge



SIRTTF Primary
 •0.85 m diameter
 •67nm RMS (20 K)
 •25nm RMS (ambient)



AMSD
 •JWST pathfinder
 •22nm RMS 1.4m

Tinsley has demonstrated the ability to successfully finish optics on a number of beryllium mirror programs to requirements tighter than required for JWST

Tinsley Large Optics Facility



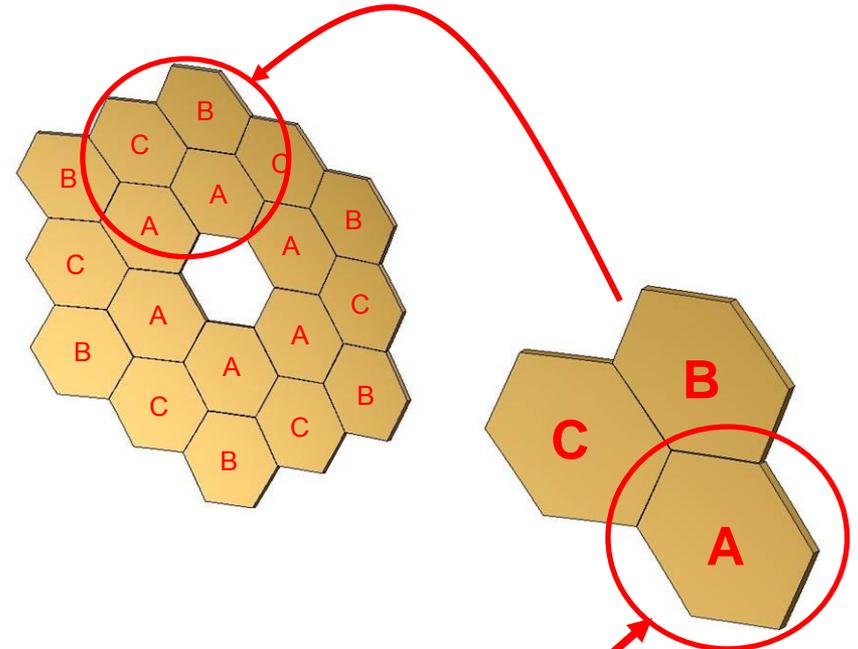
- > 30,000 ft²
- CCOS Manufacturing
- Cryo-thermal processing
- Precision Profilometry
- Optical Metrology
- JWST and Large Optics
- Comprehensive Be handling facilities



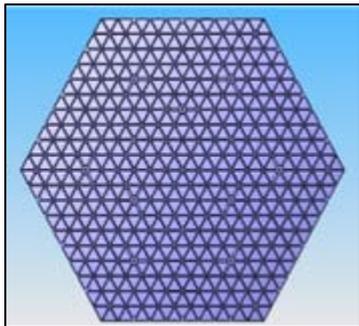
JWST Segment Types & Specs

Maximum surface errors

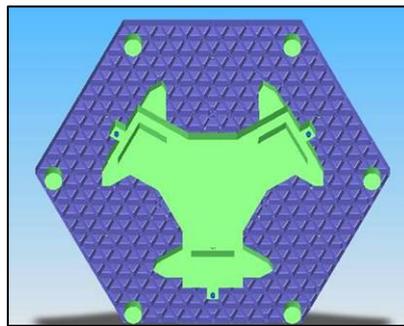
<u>Name</u>	<u>Period of Error</u>	<u>nm RMS</u>
Mid	$\geq 222\text{mm}$	20
High	222mm to 0.080mm	7
Surface Roughness	$< 80\mu\text{m}$	4



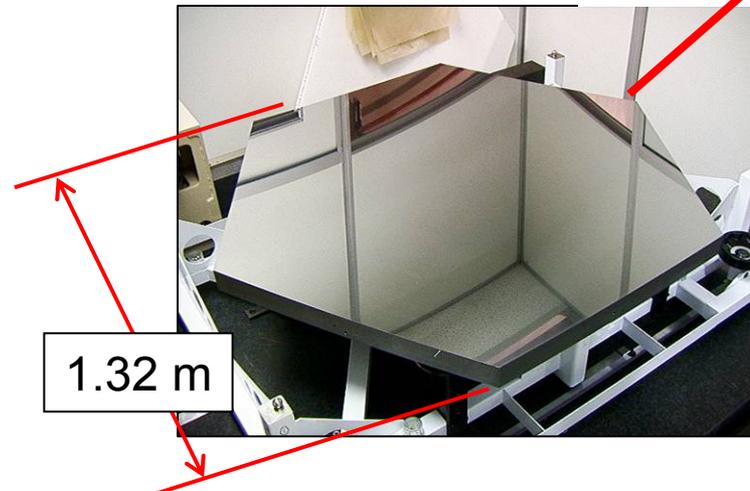
There are 3 segment types: A, B, C
 There are 6 of each segment type



Configuration 1:
Beryllium Mirror only



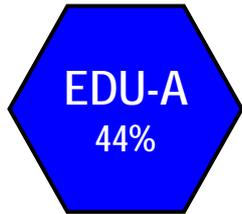
Configuration 2:
Beryllium Mirror with Back Structure



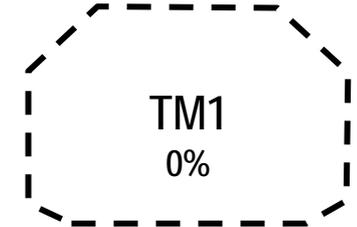
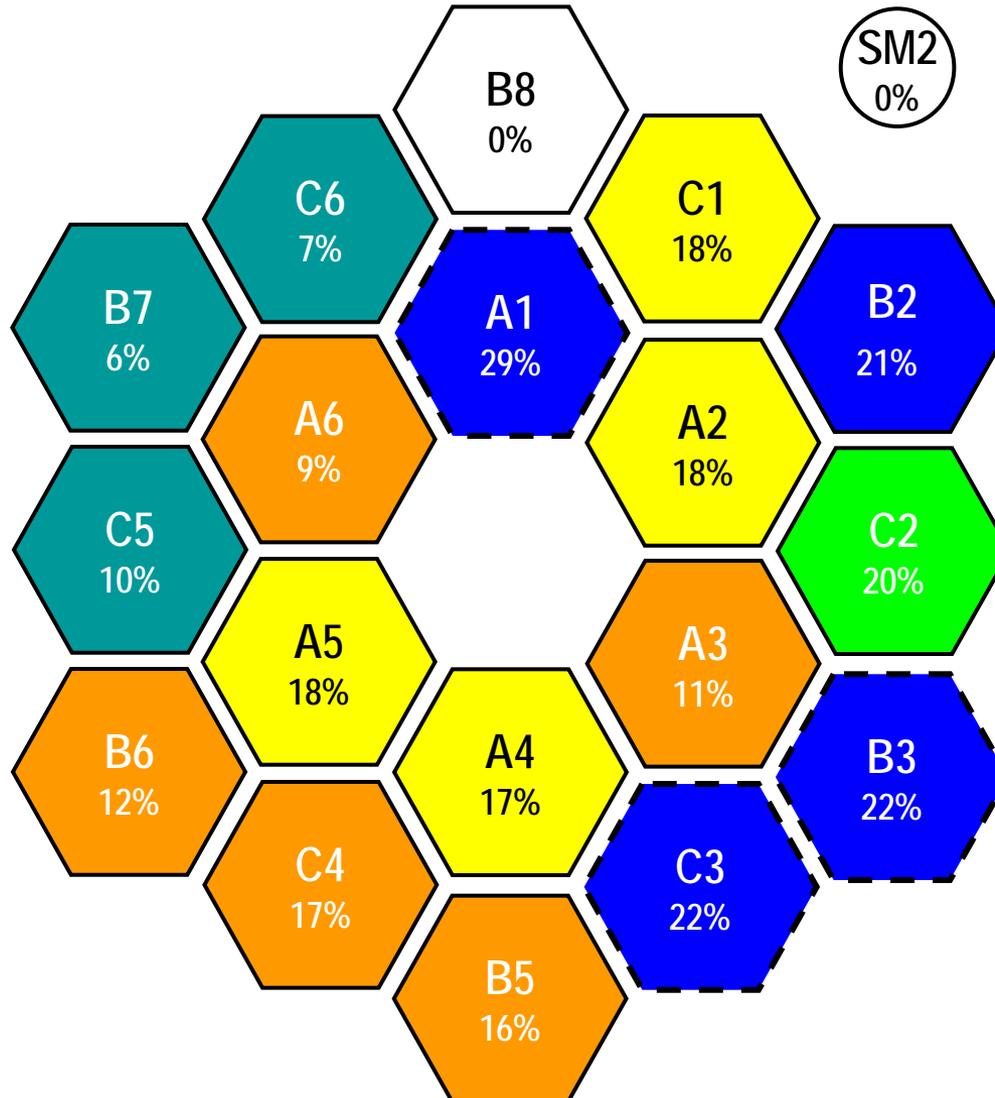
1.32 m

PM / SM / TM Production Progress at L-3 SSG-Tinsley

(by Mirror SN and % Complete)



LEGEND
Not at Tinsley
In-House
Even Slice
Figure Grind Coarse >5um
Figure Grind Fine <5 um
Smooth Out
Polish
Complete
--- Pathfinders



As of 5/14/07

JWST Segments, % Complete, 15 June 2007

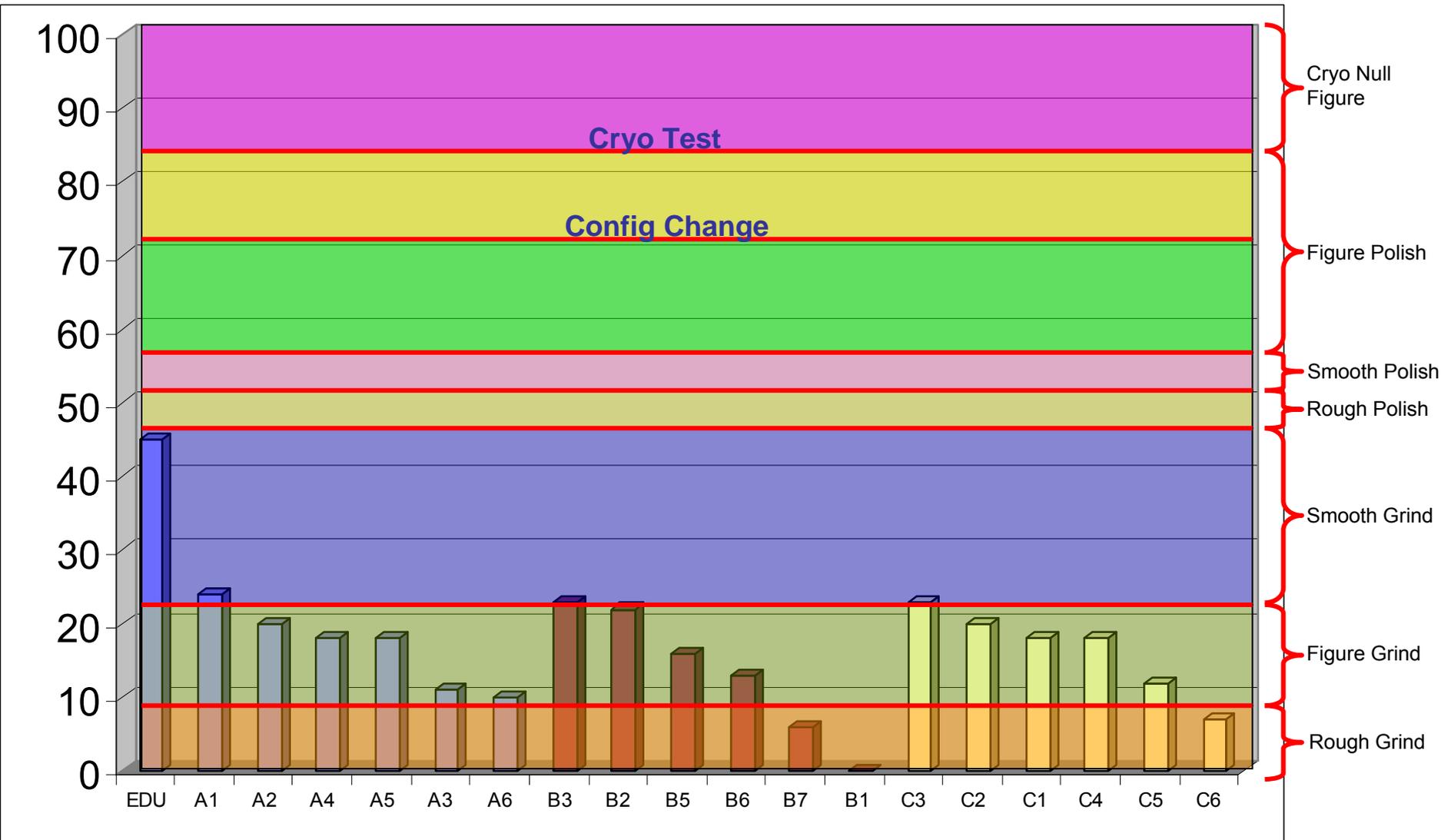
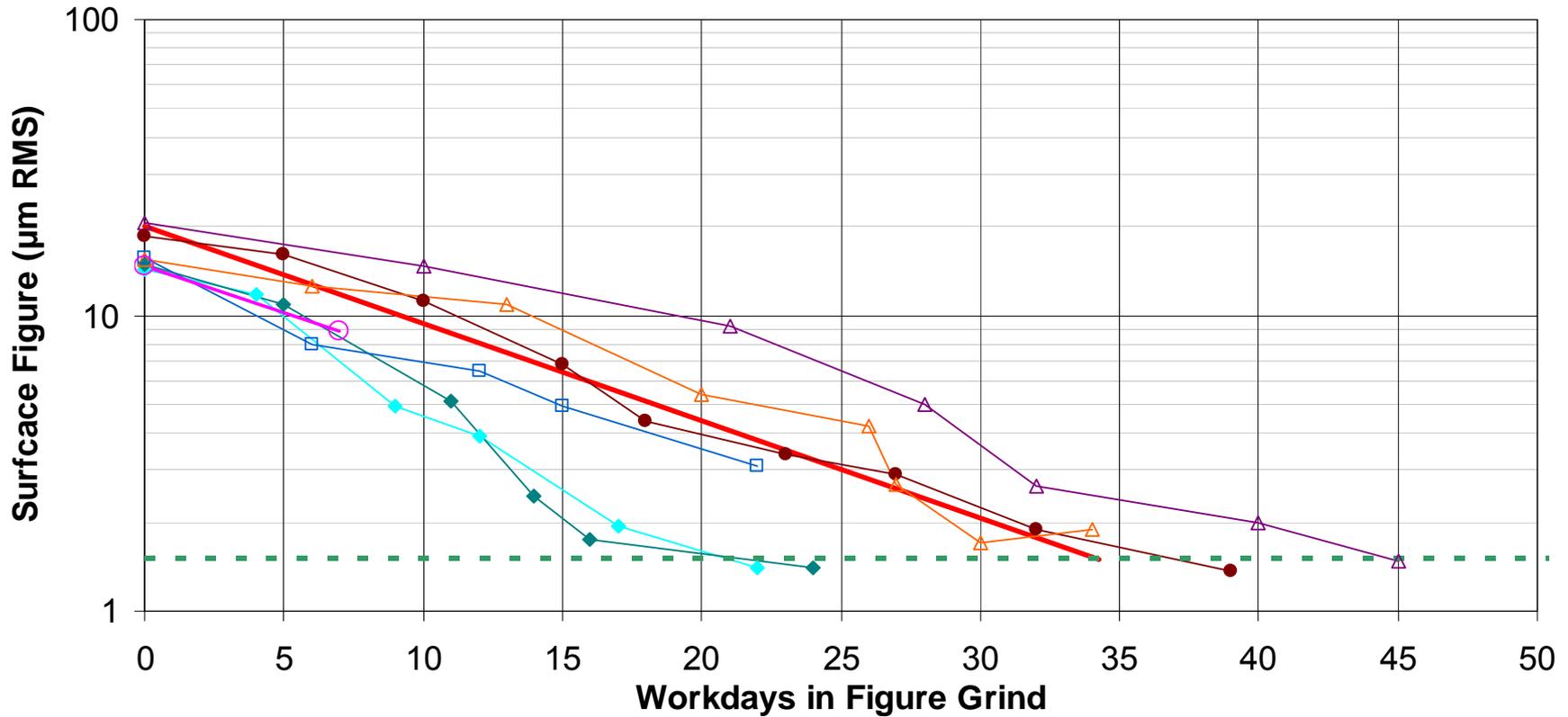


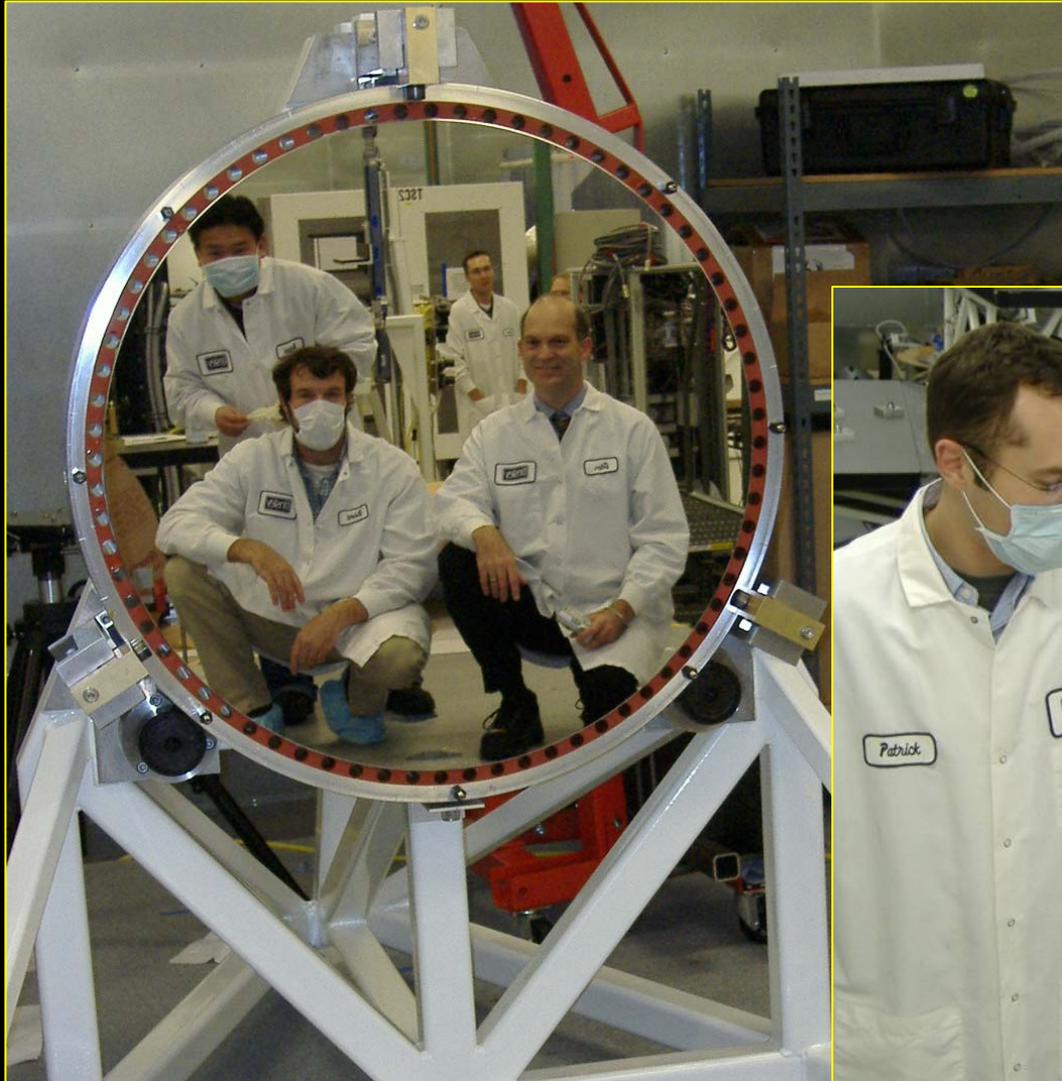
Figure Grind Convergence

Surface Figure Convergence

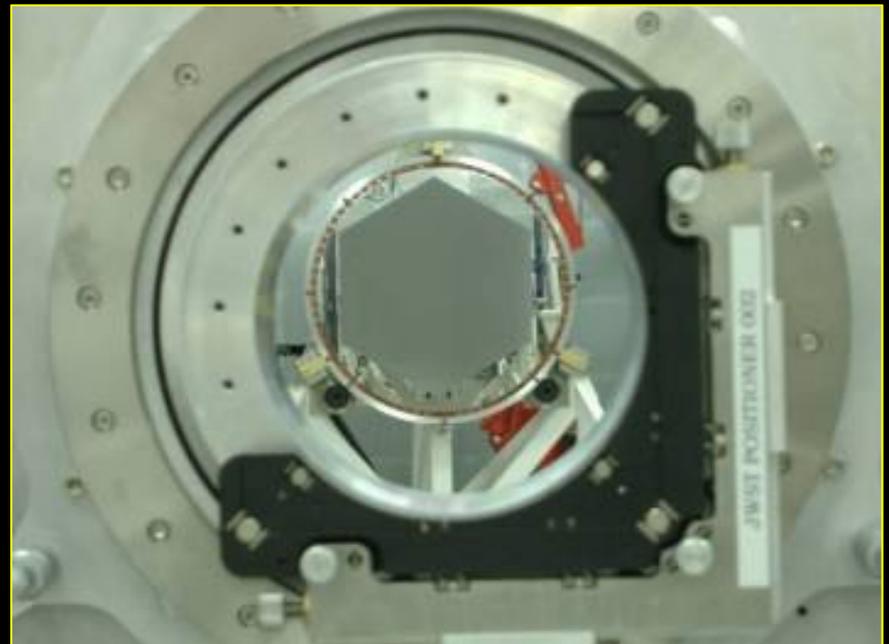
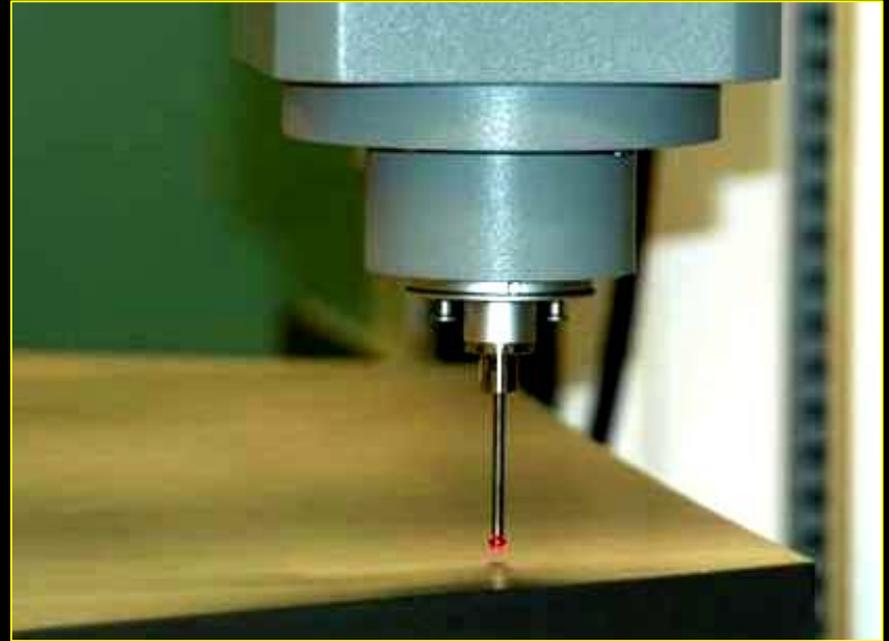


- Planned Flight Segment Figure
- B3 Figure
- C2 Figure
- A1 Figure
- C3 Figure
- A2 Figure
- B2 Figure
- RMS = 1.5 µm
- C1 Figure

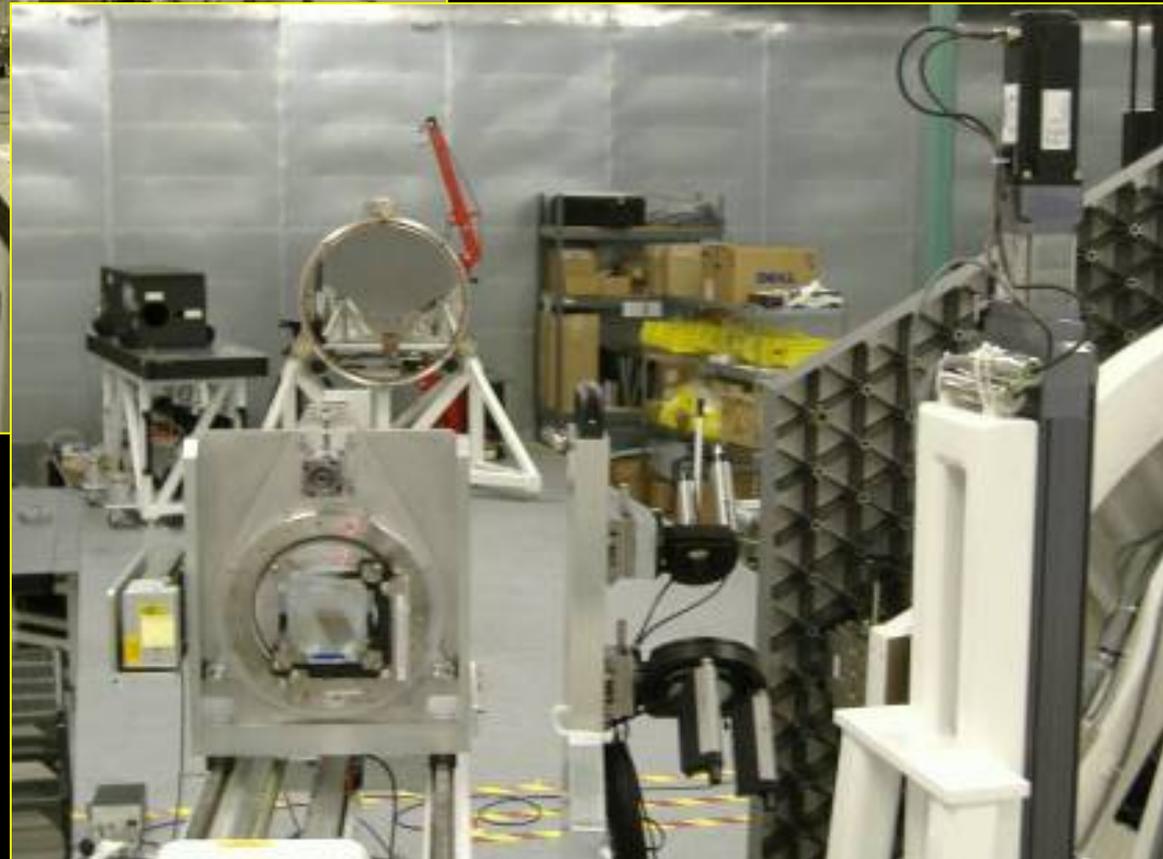
Metrology



Metrology



Metrology



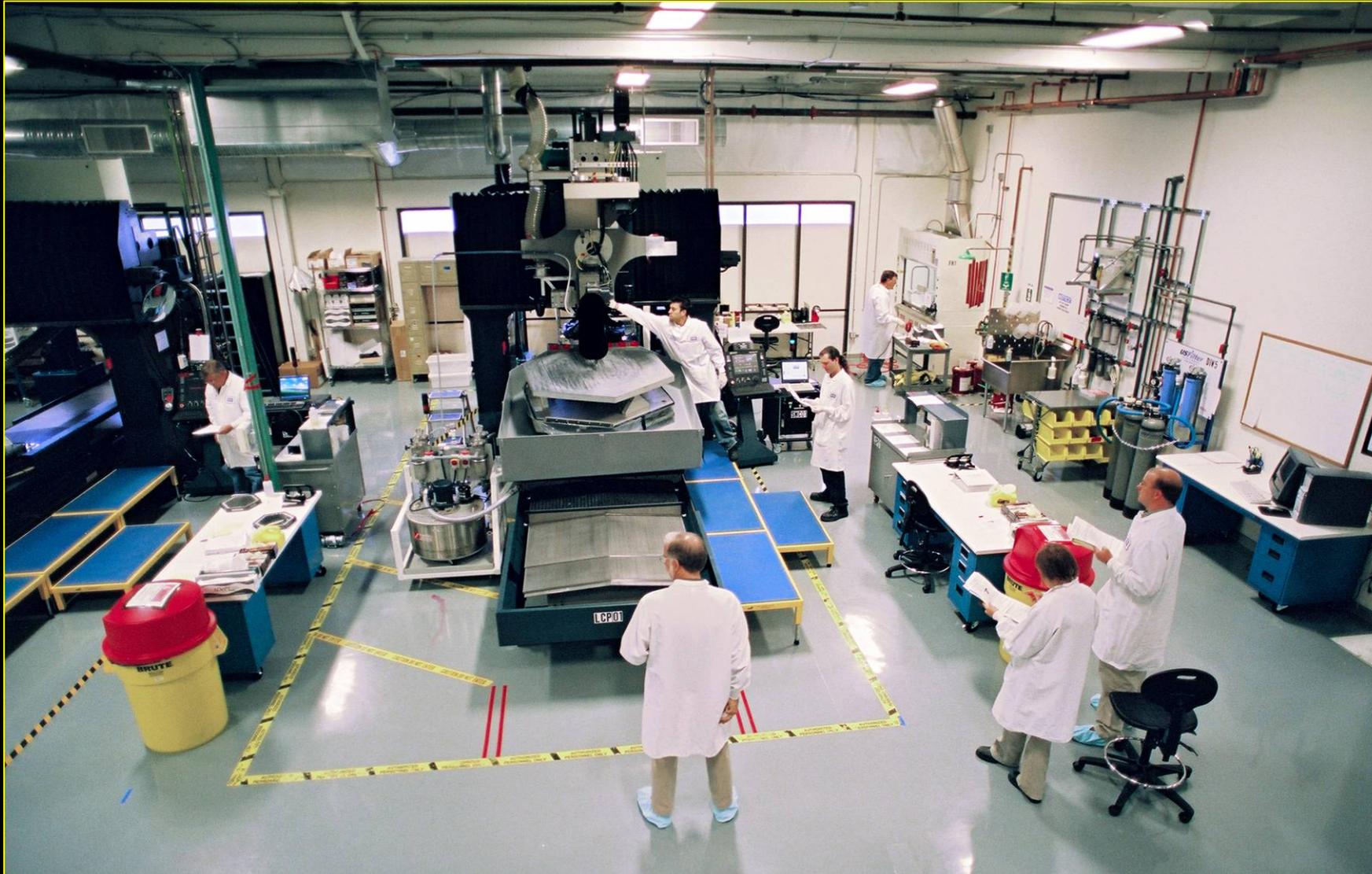
Optical Fabrication at Tinsley



Loading of JWST Segments onto CCOS Machines



CCOS Machine Process Development



Large Optics Facility at Tinsley



Eight Identical CCOS Machines



Summary



- Robust grinding processes & equipment are working well
- Polishing processes and equipment are in place and about to begin on JWST segments
- After JWST, precision facilities are in place to optically finish, process, handle and measure up to 1.6m x 2.5m mirrors on
 - 8 Computer Controlled Optical Surfacing machines
 - 2 in-process precision profilometry sets
 - 2 comprehensive optical metrology systems
 - Compatible with Be, Ceramics and Glass substrates