

This Certification Package relates to the following substrate:

Recycling Mirror

Serial number: RM06

LIGO-T990164-v1 RM06 Polish

The Package consists of the following documents:

Vendor Data Package

1. Printed documents

HABA - LIGO - C - PD:	Certification of Physical Dimensions and Registration Mark location, orientation and dimensions
HABA - LIGO - C - SB:	Certification of Side and Bevel Polish
HABA - LIGO - C - SP:	Certification of Scratches and Point Defects
HABA - LIGO - C - SN:	Certification of Serial Number location, dimensions
HABA - LIGO - C - SF:	Certification of Surface Figure for Sides 1 and 2
HABA - LIGO - C - SL:	Certification of Surface Errors - Low Frequency, for Sides 1 and 2
HABA - LIGO - C - SH:	Certification of Surface Errors - High Frequency, for Sides 1 and 2
Attachment 1	Hard copy print out of LADI data for Side 1 with piston, tilt removed and also for piston, tilt, power, astigmatism removed
Attachment 2	Hard copy print out of LADI data for Side 2 with piston, tilt, removed and also for piston, tilt, power, astigmatism removed
Attachment 3	Hard copy printouts of TOPO 2D data obtained with 2.5X and 40X heads at three central positions (side 1)
Attachment 4	Hard copy printouts of TOPO 2D data obtained with 2.5X and 40X heads at three central positions (side 2)

2. Electronic data

Surface maps for sides 1 and 2 are available at the CSIRO ftp site under the following file names:

LADI data:	RM6B1.ZIP (Side 1)	RM6B2.ZIP (Side 2)
TOPO data: (2.5X)	T2RM61A.ASC (Side 1)	T2RM62A.ASC(Side 2)
	T2RM61B.ASC	T2RM62B.ASC
	T2RM61C.ASC	T2RM62C.ASC
(40X)	T4RM61A.ASC	T4RM62A.ASC
	T4RM61B.ASC	T4RM62B.ASC
	T4RM61C.ASC	T4RM62C.ASC

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Physical Dimensions and Registration Mark
4	LIGO specification reference:	D960785-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-PD
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LN00028 p. 32
8	Team member responsible for measurement/inspection:	Carl Sona
9	Measurement/inspection results reviewed by:	Bob Oreb

10. Results

[Measurement errors ($\pm 1\sigma$) shown only where they are comparable to tolerances specified or when measurement is within 2σ of boundary of acceptability]

Physical Quantity	Result
Diameter	250.96 mm
Cylindricity	0.01 mm
Thickness (maximum - for FM, RM, ETM) (minimum - for BS)	97.47 mm
Bevel as per drawing (height, angle):	(S1) Height:2.19 mm Angle:45 ⁰ 30' (S2) Height:2.22 mm Angle:44 ⁰ 20'
Wedge angle:	2 ⁰ 24'
Location of registration mark (\pm angle with respect to minimum part thickness):	0 ⁰
Location of other 3 marks (with respect to registration mark at minimum thickness)	90 ⁰ 0', 180 ⁰ 0', 270 ⁰ 0'
Registration mark dimensions (OK/ not OK)	OK

11. Certification

The measurements and inspection data presented in this report were obtained using the procedures outlined in the relevant CSIRO procedures document (sec. 5). These results have been reviewed against the LIGO specifications (sec. 4). Taking into account the variations (if any) from these measurement procedures noted in sec.6, CSIRO certifies the substrate to comply with the LIGO specification for this physical quantity.

Project Manager:

Chris Walsh

Chris Walsh

Date:

1 June 99

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Side and Bevel Polish
4	LIGO specification reference:	E960092-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-SB-A
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LN00062
8	Team member responsible for measurement/inspection:	E Pavlovic
9	Measurement/inspection results reviewed by:	J Seckold

10. Results

Defects, if any, in the side and bevel polish compared to the LIGO specification (4 above) are detailed below (*team member to note defects here; if none seen, note "no defects observed"*).

No defects observed

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Project Manager:

Chris Walsh

Chris Walsh

Date:

1 June 99

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Serial Number and location
4	LIGO specification reference:	E960092-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-SN-A
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LN00062
8	Team member responsible for measurement/inspection:	E Pavlovic
9	Measurement/inspection results reviewed by:	J Seckold

10. Results

Quantity inspected	Result of Inspection (OK / not OK)
Location of serial number as per drawing (sec. 4)	OK
Orientation of serial number as per drawing (sec. 4)	OK
Height of lettering	OK

11. Certification

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Project Manager:

Chris Walsh
1 June 99

Chris Walsh

Date:

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Scratches and Point Defects
4	LIGO specification reference:	E960092-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-SP-A
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LN00062
8	Team member responsible for measurement/inspection:	E Pavlovic
9	Measurement/inspection results reviewed by:	J Seckold

10. Results

	Numbers of point defects		Total Area of scratches (square micrometres)	
	Inside central 80 mm	Entire surface (235 mm)	Inside central 80 mm	Outside central 80 mm (235 mm)
Surface 1	nil	nil	nil	< 5,000
Surface 2	nil	nil	< 5,000	< 10,000

11. Certification

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Project Manager:



Chris Walsh

Date:

1 June 99

↑ THIN

RM06 B
SIDE 1

2001

RM06 B
SIDE 2

2000

1000

0000

2000

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Surface Figure
4	LIGO specification reference:	E960092-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-SF-A
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LLN/0137-02; Bk 5; p. 106
8	Team member responsible for measurement/inspection:	E Pavlovic
9	Measurement/inspection results reviewed by:	B Oreb

10. Results

	Radius of Curvature in km	Astigmatism (nm)	Electronic data file reference
Surface 1	15.20	3.9	RM6B1.ZIP
Surface 2	> -1000	-3.1	RM6B2.ZIP

Hardcopies of the phase maps are attached to this certification as part of Attachment 1 for Side 1 and Attachment 2 for Side 2. Phase map data is stored in electronic format at the CSIRO ftp site under the filenames shown in the third column.

11. Certification

The measurements and inspection data presented in this report were obtained using the procedures outlined in the relevant CSIRO procedures document (sec. 5). These results have been reviewed against the LIGO specifications (sec. 4). Taking into account the variations (if any) from these measurement procedures noted in sec.6, CSIRO certifies the substrate to comply with the LIGO specification for this physical quantity.

Project Manager:

Chris Walsh
1 June 99

Chris Walsh

Date:

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Surface Errors - Low Spatial Frequency
4	LIGO specification reference:	E960092-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-SL-A
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LLN/0137-02; Bk 5; p. 106
8	Team member responsible for measurement/inspection:	E Pavlovic
9	Measurement/inspection results reviewed by:	B Oreb

10. Results

	Low Frequency Surface Errors (nm)	
	80 mm aperture	200 mm aperture
Surface 1	0.8	1.4
Surface 2	0.7	0.8

Hardcopies of the phase maps over the central 200 mm with piston, tilt, power and astigmatism removed are attached to this certification in Attachment 1 for Side 1 and Attachment 2 for Side 2.

11. Certification

The measurements and inspection data presented in this report were obtained using the procedures outlined in the relevant CSIRO procedures document (sec. 5). These results have been reviewed against the LIGO specifications (sec. 4). Taking into account the variations (if any) from these measurement procedures noted in sec.6, CSIRO certifies the substrate to comply with the LIGO specification for this physical quantity.

Project Manager:

Chris Walsh

Chris Walsh

Date:

1 June 99

1	Substrate Type:	Recycling Mirror
2	Serial Number:	RM-06
3	Physical quantity certified:	Surface Errors - high spatial frequency
4	LIGO specification reference:	E960092-B-D
5	CSIRO measurement/inspection procedure reference:	HABA-LIGO-M-SH-A
6	Variations to the measurement/inspection procedure: (indicate Yes/No and attach separate sheet if Yes)	No
7	CSIRO Log Book Reference	LLN/091
8	Team member responsible for measurement/inspection:	F Lesha
9	Measurement/inspection results reviewed by:	C Walsh

10. Results

10.1 Surface errors in nanometres averaged over sampling locations within central 80 mm:

Side 1: 0.25

Side 2: 0.15

10.2 Surface errors in nanometres averaged over all sampling locations on surface:

Side 1: 0.23

Side 2: 0.16

10.3 Surface errors in nanometres at different positions A through H on surface:

	A	B	C	D	E	F	G	H
Surface 1	0.24	0.26	0.25	0.26	0.23	0.18	0.19	0.19
Surface 2	0.15	0.16	0.15	0.16	0.14	0.18	0.16	0.16

Two - dimensional surface maps at three central locations are available at the CSIRO ftp site under filenames of the form TORM0YZA.asc, where O is the objective used (O=2 for 2.5X, 4 for 40X), RM is the substrate type, 0Y is the number, Z = 1 or 2 is the side and A = A, B, C, ... is the sampling position. Hard copies of the data are at Attachment 3 (Side 1) and Attachment 4 (Side 2).

11. Certification

The measurements and inspection data presented in this report were obtained using the procedures outlined in the relevant CSIRO procedures document (sec. 5). These results have been reviewed against the LIGO specifications (sec. 4). Taking into account the variations (if any) from these measurement procedures noted in sec.6, CSIRO certifies the substrate to comply with the LIGO specification for this physical quantity.

Project Manager:

C Walsh

Chris Walsh

Date:

1 June 99

LADI CERTIFICATION DATA

Title: RM6B1

Date: 05/14/99

Diameter: 200 mm

Astig: 3.9 nm

Power: 329.5 nm

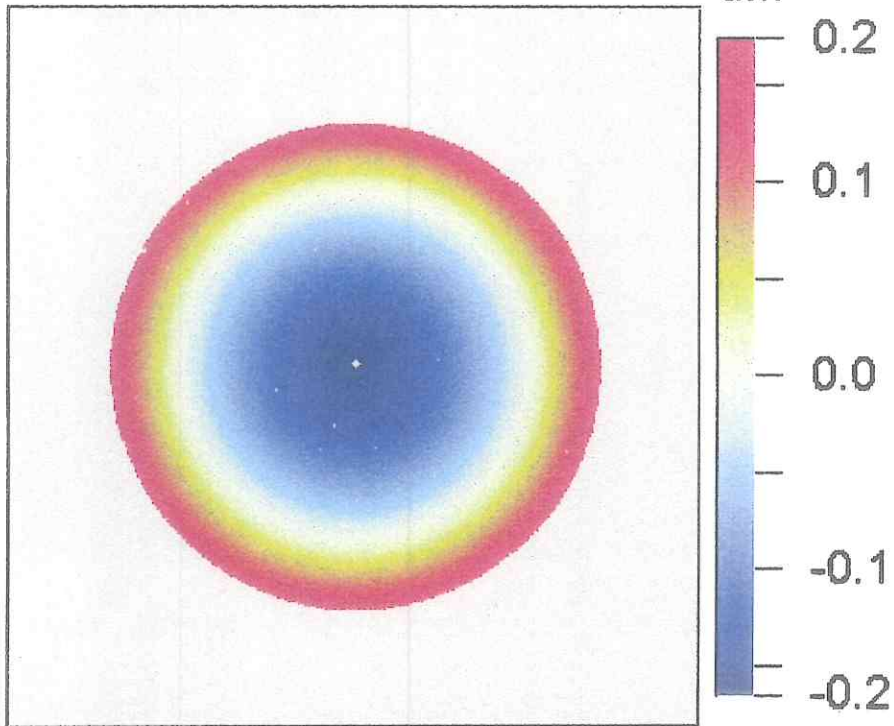


CSIRO

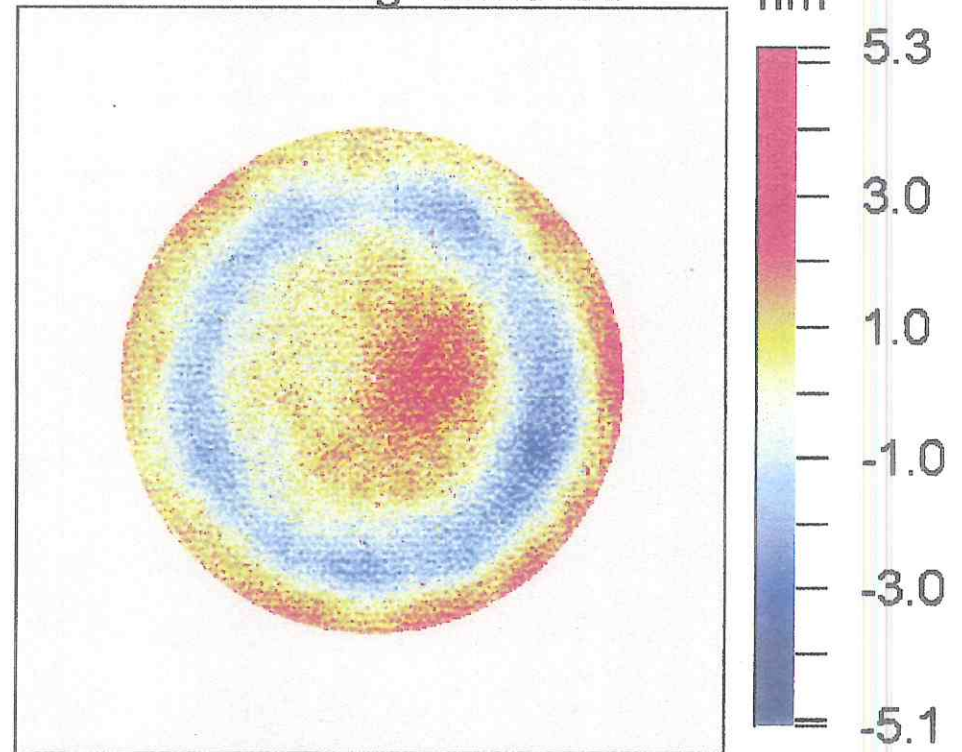
PV: 10.4 nm

RMS: 1.4 nm

Tilt Removed



Tilt/Power/Astig Removed



LADI CERTIFICATION DATA

Title: RM6B2

Date: 05/25/99

Diameter: 200 mm

Astig: -3.1 nm

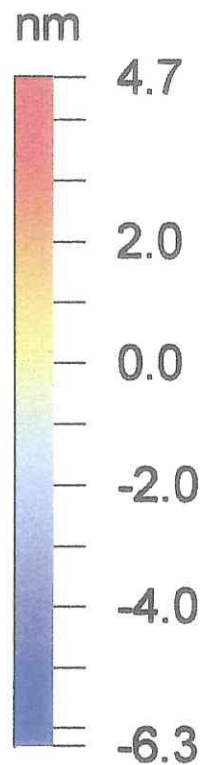
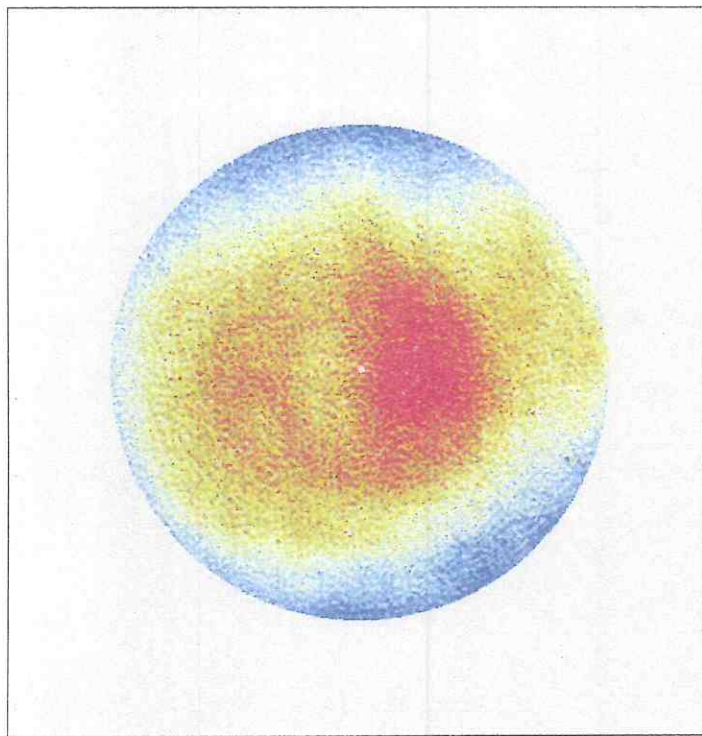
Power: -4.3 nm



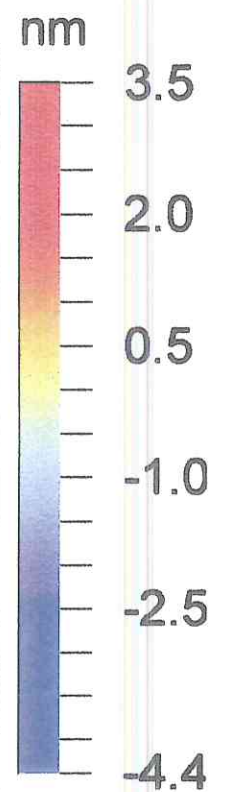
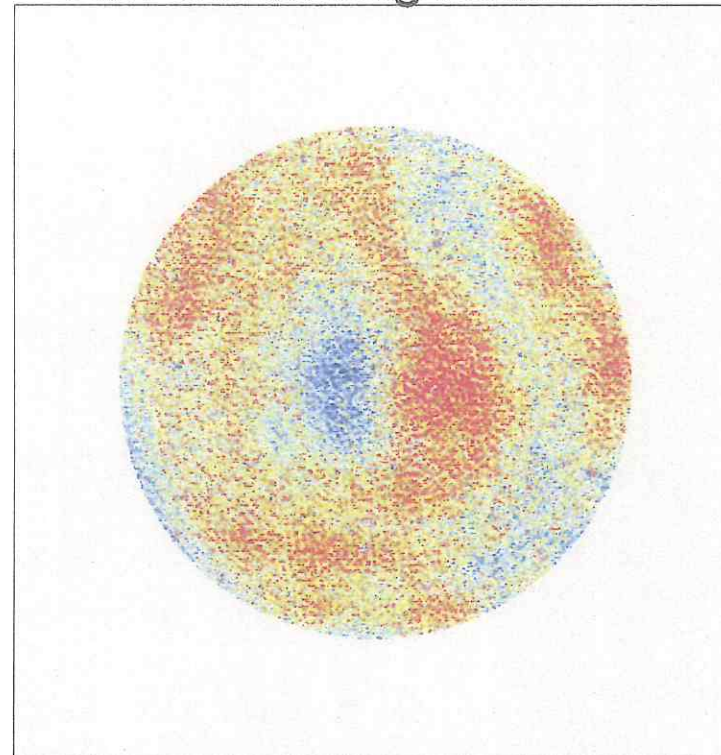
PV: 7.9 nm

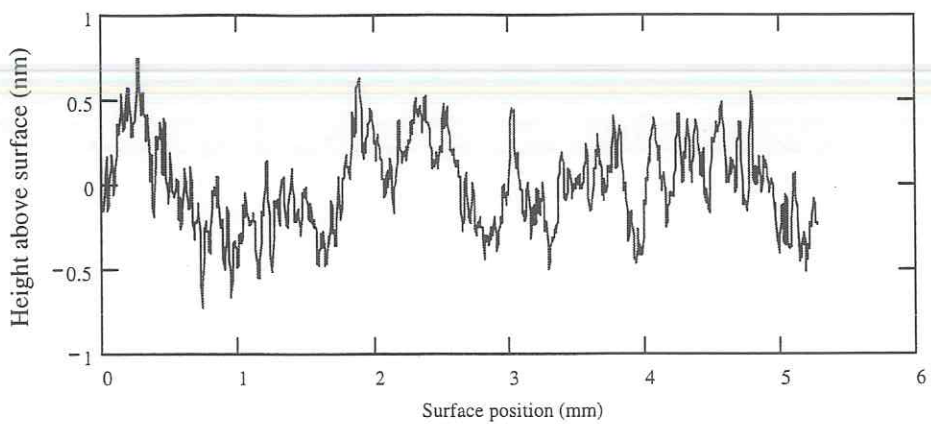
RMS: 0.8 nm

Tilt Removed

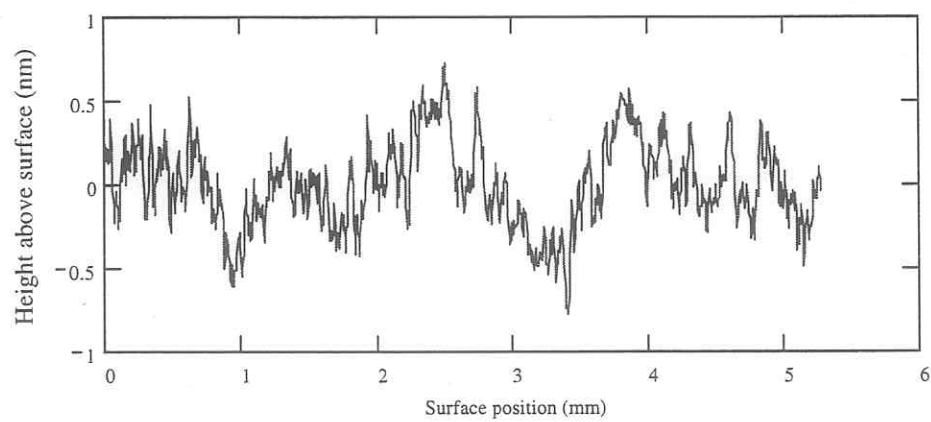


Tilt/Power/Astig Removed

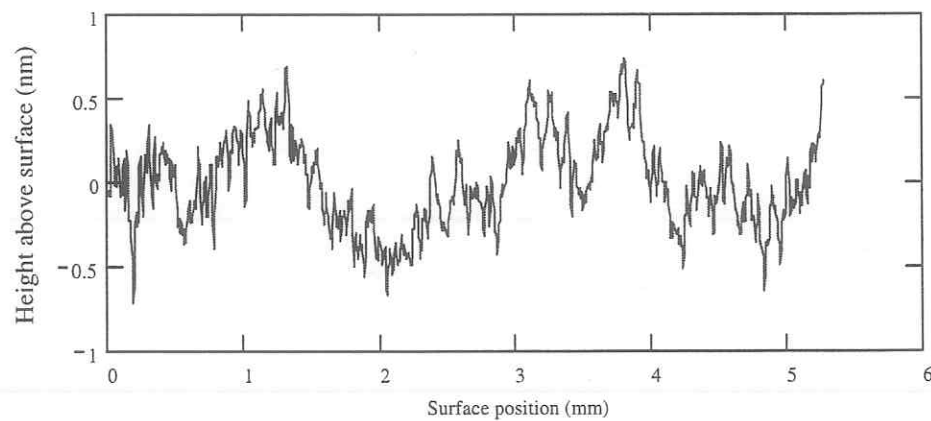




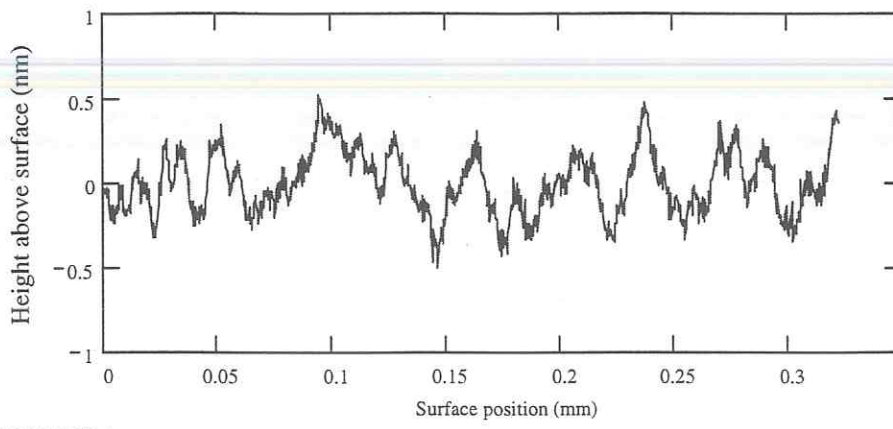
T2RM61A.asc



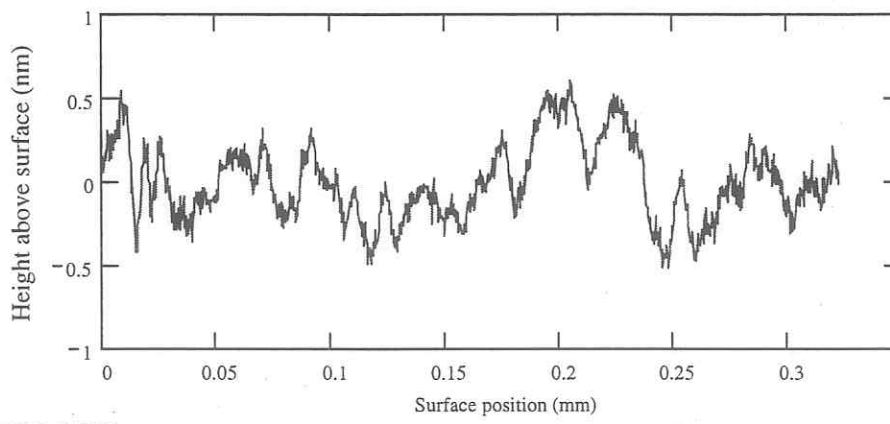
T2RM61B.asc



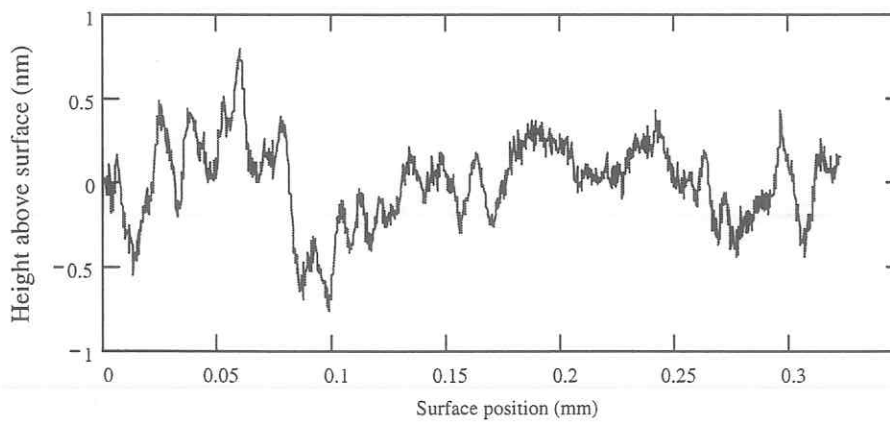
T2RM61C.asc



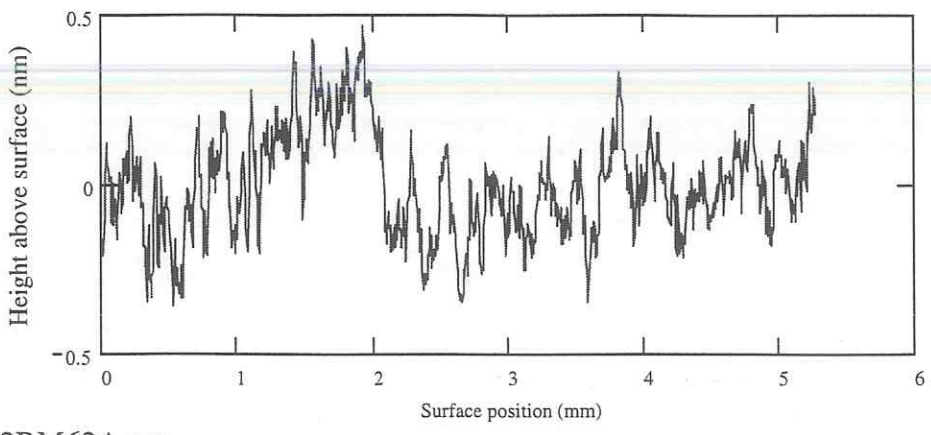
T4RM61A.asc



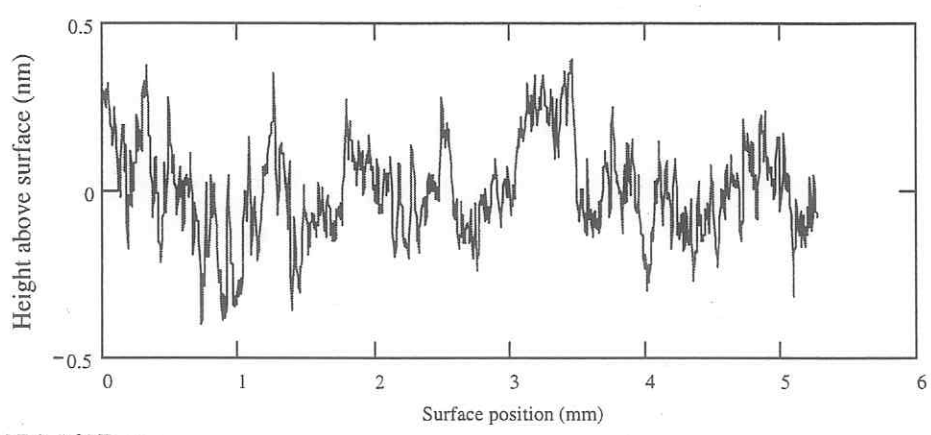
T4RM61B.asc



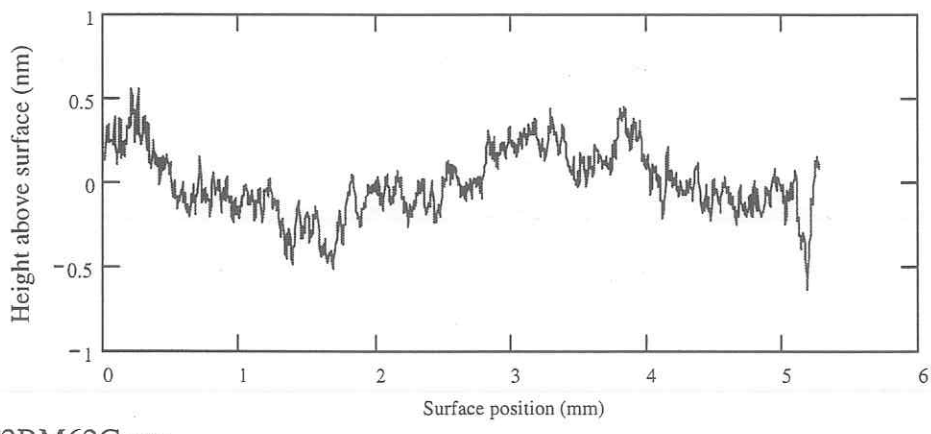
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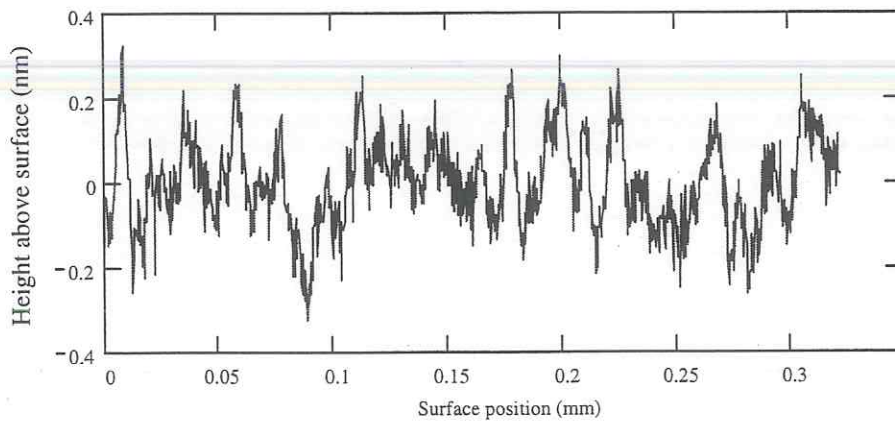
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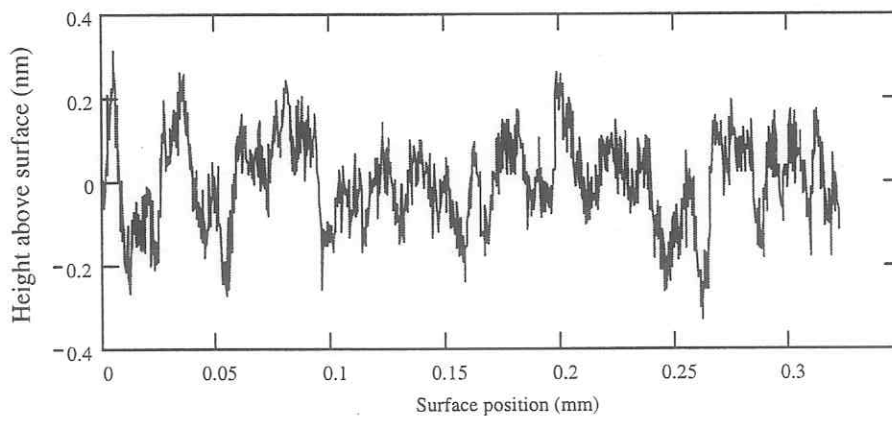
T2RM62B.asc



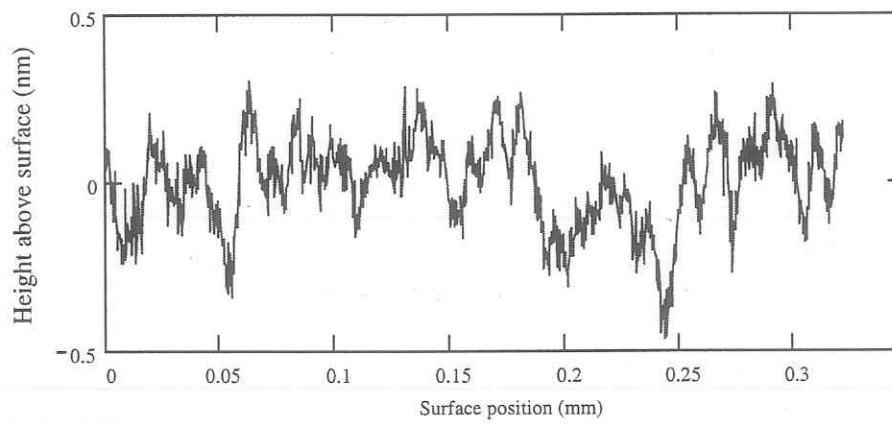
T2RM62C.asc



T4RM62A.asc



T4RM62B.asc



T4RM62C.asc