

Machining process for disk damped
cell
taking the example of TD18 #2, #3

091127

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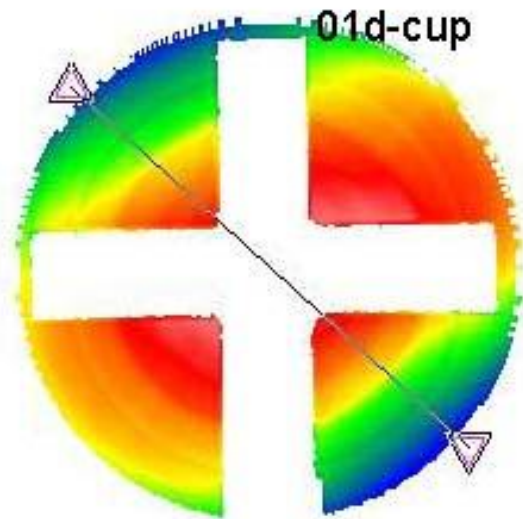
Process (1)

- Cut bar of $\phi 82\text{mm}$
- Rough machining
 - Turn disk side
 - Turn cup side
 - Machining center tuning hole
 - Machining center damping waveguide
- Medium finish
 - 0.1mm undercut with chucking
- Annealing
 - 500C, 2hr
- Make reference flat plane in disk side
 - Turning , undercut 0.01~0.015

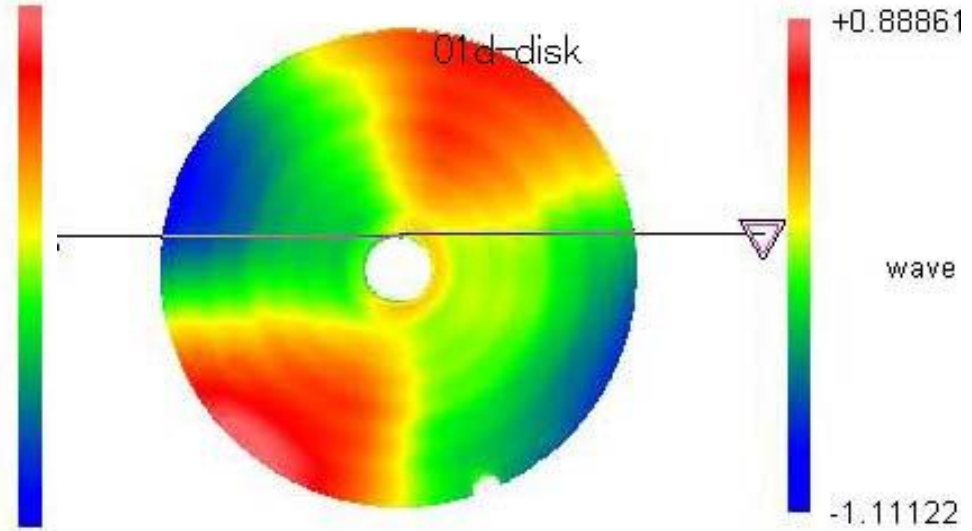
Process (2)

- Finish tuning hole and inscribe numbering
- Milling damping waveguide
 - Carbide tool
 - Care should be taken to smoothly connect to turned surface
- Final turning of disk side
 - With Seibu-denki, second grade machine
 - Disk side diamond turning with vacuum chuck
 - Cup side diamond turning with vacuum chuck
- Measurement
 - Interferometer, CMM, etc.
- Shipping

TD18 #3 01D



PV 1.614 μm

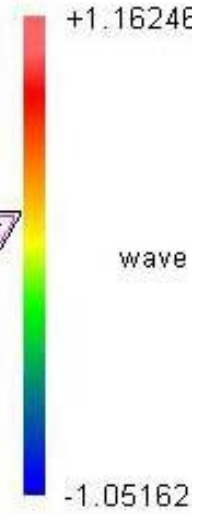
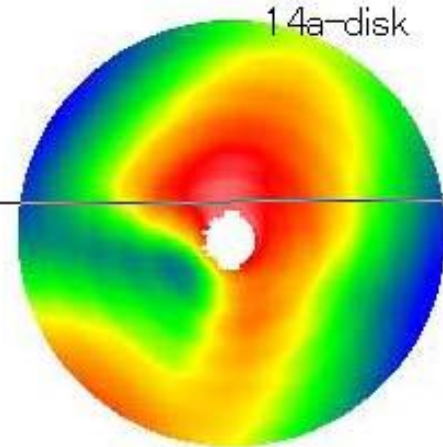
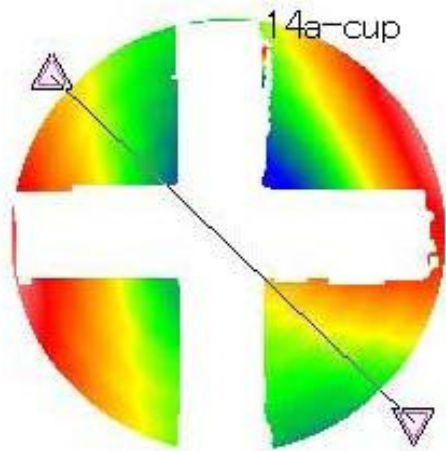


PV 1.265 μm

Good

091127: We accepted this typical type, because it can be pushed to flat, to some extent, before the diffusion bonding process.

14A



PV 1.502 μm

PV 1.401 μm

Acceptable, though strange deformation shape

091127: We accepted even this type, because it can be pushed to flat, but not so confident due to the strange pattern.

Semi-final data on flatness of TD18

TD18_VG2.4_Disk #2				TD18_VG2.4_Disk #3			
Cell Name	Cell No.	flatness		Cell Name	Cell No.	flatness	
		cup side	disk side			cup side	disk side
COUPLER COVER	CP-C-A			COUPLER COVER	CP-C-C		
COUPLER BODY	CP-B-A			COUPLER BODY	CP-B-C		
INPUT-RING	IN-R-A	1.035	0.831	INPUT-RING	IN-R-B	0.857	0.495
INPUT-MATCH-IRIS	IN-M-B	0.628	0.788	INPUT-MATCH-IRIS	IN-M-A	1.664	0.66
STANDARD CELL 01	01-C	1.658	1.941	STANDARD CELL 01	01-D	1.614	1.265
STANDARD CELL 02	02-A	0.472	0.674	STANDARD CELL 02	02-B	1.206	1.532
STANDARD CELL 03	03-B	1.186	1.3	STANDARD CELL 03	03-A	1.16	1.313
STANDARD CELL 04	4-B	1.435	1.478	STANDARD CELL 04	4-A	2.113	1.771
STANDARD CELL 05	5-B	1.812	1.636	STANDARD CELL 05	5-A	0.66	0.815
STANDARD CELL 06	6-B	1.189	1.114	STANDARD CELL 06	6-A	1.237	1.604
STANDARD CELL 07	7-B	2.578	2.465	STANDARD CELL 07	7-A	0.773	1.042
STANDARD CELL 08	8-B	0.96	0.983	STANDARD CELL 08	8-A	0.784	0.954
STANDARD CELL 09	9-B	3.091	2.425	STANDARD CELL 09	9-A	0.758	0.711
STANDARD CELL 10	10-B	0.869	1.044	STANDARD CELL 10	10-A	2.572	1.598
STANDARD CELL 11	11-B	1.047	0.728	STANDARD CELL 11	11-A	0.863	0.768
STANDARD CELL 12	12-B	2.376	1.453	STANDARD CELL 12	12-A	2.061	1.597
STANDARD CELL 13	13-B	2.351	1.123	STANDARD CELL 13	13-A	1.482	1.55
STANDARD CELL 14	14-B	1.973	1.529	STANDARD CELL 14	14-A	1.502	1.401
STANDARD CELL 15	15-B	2.167	1.335	STANDARD CELL 15	15-A	1.644	1.697
STANDARD CELL 16	16-B	1.755	2.295	STANDARD CELL 16	16-A	2.859	3.506
STANDARD CELL 17	17-B	2.419	1.612	STANDARD CELL 17	17-A	2.489	2.184
STANDARD CELL 18	18-B	2.858	3.242	STANDARD CELL 18	18-AC	2.332	2.001
STANDARD CELL 19	19-C	1.15	1.107	STANDARD CELL 19	19-DE	2.049	1.68
STANDARD CELL 20	20-B	1.108	0.674	STANDARD CELL 20	20-A	0.806	0.831
OUTPUT-RING	OUT-R-B	0.255	0.578	OUTPUT-RING	OUT-R-A	0.575	0.645
COUPLER BODY	CP-B-B			COUPLER BODY	CP-B-D		
COUPLER COVER	CP-C-B			COUPLER COVER	CP-C-D		

2ミクロンずつ追加工

Additional 2 μ m
cut was required.

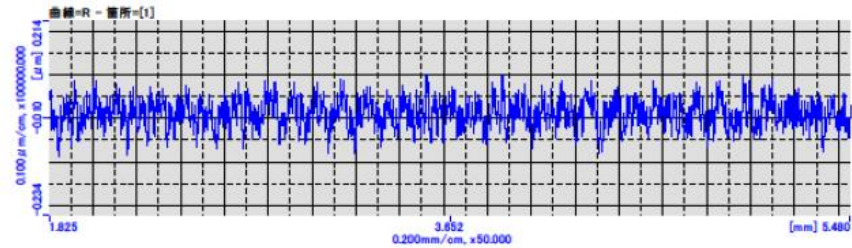
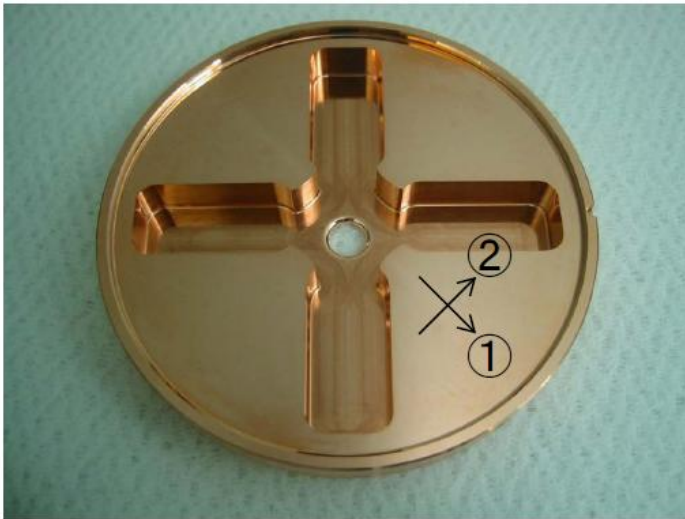
赤は2ミクロンずつ追加工

Some of these were bad and KEK asked o re-make them from the beginning.

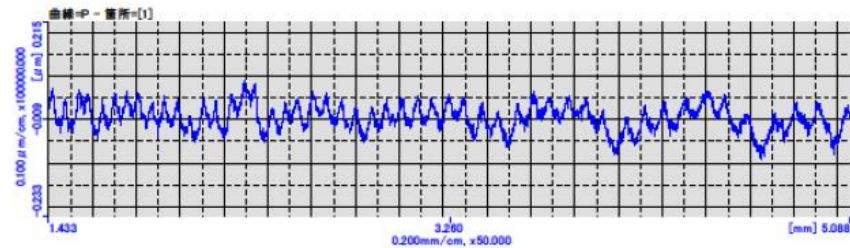
Roughness

- We did not pay much attention to roughness.
- One of the reason is that there is milled surface, which is usually much worse than turning.
- We should have the roughness of both area in mind.

TD18 roughness of turned surface



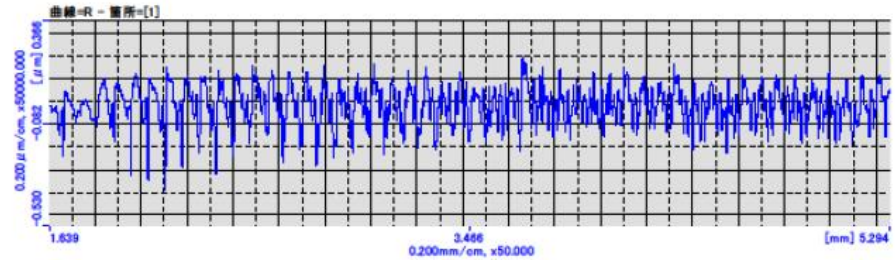
① Ra0.026 : Ry0.177



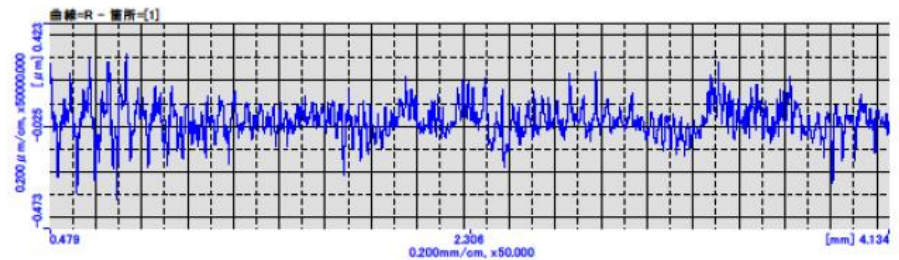
② Ra0.021 : Ry0.129

Diamond turned surface, but not with a top-class lathe.

TD18 roughness of milled surface



③ Ra0.064 : Ry0.423



④ Ra0.052 : Ry0.469

Roughness of wall shaped by milling cannot be measured without cutting.