Washington State University Vancouver Cleanroom
Standard Operating Procedure

Process:	Wafer Dicing		
Equipment Name:	Disco DAD 2H16T Wafer Dicing Saw		
Scheduling Name:	Dicing Saw	**Revision Number:**	4.2.2
Model:	Disco DAD 2H16T	**Revisionist:**	Sam Judd
Location:	VECS 040	**Date:**	10/26/2016

Serial No.: 112-02-0477
Asset No.: 393887
Voltage: 208V 3-phase

Safety Warnings

Cut Hazard, Guards Required

Shut off DI water when done

Safety Glasses Required

Dicing saw is located in Service Area, VECS 040 between AWN and DI water systems.

Safety
1- **Always wear safety glasses or goggles when operating the dicing saw.** Blade spins at 30,000 rpm! Blade failure can throw sharp particles from spindle.
2- **Do not open the saw water shield when the saw is cutting.**
3- Do not cut hazardous substrates on the dicing saw. Do **not** cut GaAs or PZT wafers.
4- Always mount wafer on frame.
5- **Never leave saw unattended while cutting wafer.**

Start the System:
1- Wear safety glasses or goggles.
2- Air requirement: compressed air (CDA) should be on ALL THE TIME, even when the system is turned off. This is to protect the flange. When the machine is active, use 80 psi compressed air; when the machine is idle (off), use ~20 psi air. Confirm pressure change with air wand.
3- Turn on air and water. Make sure the water is open all the way and air pressure is at 80 psi.
4- Turn on the main breaker at the power supply. Triple pole switch at back &↙ left switch at front.
5- Turn on the dicer power [AUTO BREAKER] which is located at the right side of the tool.
6- Lights will start flickering on the control panel. [STANDBY] light should be on.
7- Turn on monitor and camera below it.
8- Turn on illuminator power switch.

Tool Set Up (Before Loading a Wafer)

9- Be sure to have the larger chuck on with the tool, the larger chuck has two pins that the wafer holder should mount on it.

10- Press **[SPINDLE]**. The spindle will ramp up.

11- Press **[VACUUM]** to turn on the vacuum for the chuck.

12- Press **[SETUP]**. The blade will zero itself on the chuck by touching the chuck lightly. If there is an error displayed as [E] then be sure the vacuum is on. To clear the error press **[SHIFT]** key.

13- Press **[ILLUMINATION]** to turn microscope lamps on. You should see two green dots on the chuck.

14- Turn on the monitor which is located on the upper right side of the tool.

15- Be sure **[mm]** for the metric unit system is on.

16- Push **[SHIFT]** key until you select **[CUT -STRK]** is on. If not, press **[SHIFT]** until it is on.

17- Press **[C/E]** to clear the old values.

18- Under **[Block]** enter 1 which means round wafers. Under **[Data]** enter 100 for 100 mm/4-in wafers.

19- Press **[W]** to save [write] the values.

20- Press **[SHIFT]** to advance to **[CUT -SPD]** which means cutting speed in mm/sec.

21- Press **[C/E]** to clear **[CUT-SPD].**

22- Press **[9]** for 4-in wafers. Here "9" translates to 4 mm/sec cutting speed. If you need to change this speed, check the lookup table in the manual, Table B-2 on page B-10. **Appendix A has an abbreviated table of cut speeds.**

23- Press **[W]** to save (write) the cut speed value to memory and display in the DATA window.

24- Press **[SHIFT]** to advance to **[Y-IND].**

25- Press **[C/E]** to clear the old values.

26- At **[Block 1]** and **[Block 2]** enter 10 mm then press **[W]**. Here 10 is the index number that indicates the distance the chuck travels when [INDEX] is pressed. This number should be changed according to your die dimensions.

27- Press **[SHIFT]** to advance to **[Z-IND] [Block 1]**.

28- Press **[C/E]**.

29- Enter **[0.05]** mm. This number indicates the clearance of the blade to the chuck. The blade should cut through the wafer and partially into the tape. Be aware of the blade size you use, there should be enough blade outside the flange. See the note below on **How to pick the correct blade to cut Si**.

30- Press **[W]** to save.

31- Press **[SHIFT]** to advance **to [Z-IND] [Block 7]**, it should be at 1.200 mm.

32- Press **[SHIFT]** to advance to **[Z-IND] [Block 8]** and set it as 0.010 mm.

33- Press **[SHIFT]** to advance to **[Ө-IND] [Block 1]** only. Press **[C/E]** then make sure it is set to 90 degree rotation. Then press **[W]** to save.

34- Press **[SHIFT]** to advance to **[CUT-NO]**.

35- Hit **[C/E]** then set it to 9999. Press **[W]** to save.

36- Press **[SHIFT]** to advance to **[CUT #]**. Set it to **[0]** by pressing **[C/E]**. Press **[W]** to save.

37- If you want to change any of the previous values, press **[SHIFT]** until you select the desired parameter.

Loading and Cutting a 4-in Wafer

1- Move the blade to the furthest back position; press **[REPEAT]** and **[↗]** a few times.

2- Move the stage to the furthest right press **[→]**.
3- Press **[VACUUM]** to turn off the vacuum.
4- Mount your 4-in wafer on the vacuum chuck. (Before this step, you need to mount your 4-in wafer on a clear UV tape and a wafer holder (metal frame) using the wafer mounter.)
5- Load your wafer holder onto the chuck, the narrow side of the wafer holder goes in first, the wafer flat should face you.
6- Press **[VACUUM]**, to turn it on.
7- Slide the chuck cover open so you can see the wafer on the monitor to align it.
8- Be sure **[REPEAT]** is on. Then move the wafer and get close to features of interest.
9- Select **[REPEAT], [INDEX]**, OR **[JOG SCAN]** mode, use **[↗]** and **[↙]** to find a line on the monitor screen.
10- Press **[Θ]** and **[JOG SCAN]** to slowly rotate the wafer to get the line appeared and aligned on the monitor screen.
11- Use **[↗]** or **[↙]** to align the cross hair on the monitor screen to the middle of the appeared line.
12- Before cutting, select **[INDEX]** mode, press **[↙]** to move the wafer toward you and then press **[↗]** to move the wafer back. This extra step is recommended by the service engineer to take out backlash.
13- Press **[SEMI-AUTO]** to start the water. Be sure the water is splitting the blade then close door.
14- Press **[↗]** then **[INDEX]** for a single cut.
    a. Be sure that the cut is aligned with the chosen line, if not, adjust the microscope lamps.
15- Press **[SEMI-AUTO]** and **[↗]** for multiple indexed cuts. Press **[INDEX]** to stop the cut.
    a. Make sure to start wafer cuts on far side of wafer and index toward user.
16- To cut the wafer from another angle, press **[ROTATION]** to rotate the wafer for 90 degrees.
17- Repeat steps 7-16 for cutting. Blow off water with air gun as needed.
18- When the cutting is finished, press **[REPEAT]** and **[↗]** to move the blade to the furthest back.
19- Press **[→]** to move stage the furthest right.
20- Blow water off the wafer with the air gun.
21- Press **[SPINDLE]** to ramp blade down.
22- Press **[VACUUM]** to release the wafer off the chuck.

Turning Off the System

23- Press **[ILLUMINATION]** to turn microscope lamps off.
24- Turn off **[AUTO BREAKER]**.
25- Turn off main breaker at the power supply.
26- Turn off the video monitor and box below it.
27- Turn off water.
28- Turn DOWN air (CDA) to ~20 psi.

In Case of Emergency

1- **[EM STOP]** button. Pressing this button will stop everything.
2- If you run into problems, please contact Sam Judd (360)546-9201 or your professor for help.

How to pick the correct blade to cut Si

The current flange has an outer diameter of 50.4 mm. The blade should be large enough to cut through the wafer. For example,

Blade: Disco NBC-Z 1070 53X0.04X40 (last three numbers: outer diameter; thickness, inner diameter)

53-50.4 = 2.6 mm; 2.6/2 = 1.3 mm> 0.5 mm (can cut through silicon wafers with thickness of 0.5 mm).

1.3 mm/0.04 = 32.5 (this value should be below or close to 30, otherwise, the cutting may be wobbly)

Blade: Disco NBC-Z 1060 52X0.075X40.

52-50.4 = 1.6 mm; 1.6/2 = 0.8 mm> 0.5 mm (can cut through silicon wafers with thickness of 0.5 mm).

0.8 mm/0.075 = 10.67 (< 30)

Appendix A: Cutting Speed Table [CUT -SPD]

The speed of the X-axis can be controlled from 0.3-0.12"to 300mm- 12"/sec.

STEP	SPEED		STEP	SPEED		STEP	SPEED	
	mm/sec	in/sec		mm/sec	in/sec		mm/sec	in/sec
0	0.3	0.011	6	1.8	0.07	12	7	0.276
1	0.5	0.02	7	2	0.079	13	8	0.315
2	0.8	0.032	8	3	0.118	14	9	0.354
3	1	0.04	**9**	**4**	0.158	15	10	0.394
4	1.2	0.047	10	5	0.197	16	13	0.512
5	1.5	0.06	11	6	0.236	17	16	0.63

Appendix B: Control Photos

Appendix C: Useful information

Adhesive Tape

Mitsui Chemicals America, Inc.
ICROS Tape
Grade: SB-205S-CN
Size: 225x100 (225 mm wide roll)

Recommended Feed Rate (CUT -SPD]

Silicon: 3-4 mm/sec for 0.5 mm thick silicon wafers.
Glass: 1-2 mm/sec for 0.5 mm thick glass or Pyrex.
Sapphire: 0.50 – 0.80 mm/sec for 0.5 mm thick sapphire.

Calculate the distance between 2 points.

1- Go to the position of your first cut (where you want the cut to go).
2- Press **[DATA SEL]** then *press 1*. This will set the counter to 0. Press **[JOG]** then either up or down arrow to the next point you want to cut. The value displayed on the screen will be the distance between the 2 points.
3- Press [**SHIFT**] until you get to the **[Y-IND].** Clear out the old value and input the new distance. Press **[W]** to write the value.
4- Check the distance by pressing **[REPEAT]** and the up or down arrows before starting your cut.