Table 1

Reported studies on machined surfaces

Process	Reference	Study in frequency domain?	Decomposition of surface feature?	Correlation of decomposed surface feature to machining conditions?
Drilling	[14]			
Electrical discharge machining	[15]	Yes	Yes	Yes
	[16]	Yes		
	[17–19]			
Grinding	[20,21]	Yes		
	[22–24]			
Milling	[25–30]	Yes		
	[31–35]			
Polishing	[36,37]			
Turning	[38–46]	Yes		
	[47–50]			
Rotary ultrasonic machining	[51]			
Ultrasonic machining	[52]	Yes	Yes	
	[53,54]			
Wafer Grinding	[7-9,11]			

Table 2

Process variables and their values for coarse grinding

Variable	Unit	Value
Removal	μm	10
Wheel speed	rev s^{-1} (rpm)	32.05 (1923)
Chuck speed	rev s^{-1} (rpm)	1.67 (100)
Feedrate for step 1	μm s^{-1}	4
Feedrate for step 2	μm s^{-1}	0.5
Feedrate for step 3	μm s^{-1}	0.3

Table 3

Test matrix for fine grinding

Test	Chuck speed	Feedrate
1	-	-
2	-	0
3	-	+
4	0	-
5	0	0
6	0	+
7	+	-
8	+	0
9	+	+

Removal = 20 μm

Wheel speed = 72.50 rev s^{-1} (4350 rpm)

Chuck speed – (Low level) = 0.28 rev s^{-1} (17 rpm)

0 (Intermediate level) = 5.88 rev s^{-1} (353 rpm)

+ (High level) = 11.45 rev s^{-1} (687 rpm)

Feedrate – (Low level) = 0.3 μm s^{-1}

0 (Intermediate level) = 0.6 μm s^{-1}

+ (High level) = 1.0 μm s^{-1}

Table 4

Wafer identifications and peak-to-valley (PV) values over the entire wafer surfaces after grinding and polishing

		Feedrate for fine grinding		
		Low (-)	Intermediate (0)	High (+)
Chuck speed For Fine grinding	Low (-)	Wafer #1, 93 nm; Wafer #10, 48 nm	Wafer #2, 101 nm; Wafer #11, 101 nm	Wafer #3, 137 nm; Wafer #12, 84 nm
	Intermediate (0)	Wafer #4, 123 nm; Wafer #13, 81 nm	Wafer #5, 358 nm; Wafer #14, 64 nm	Wafer #6, 52 nm; Wafer #15, 43 nm
	High (+)	Wafer #7, 133 nm; Wafer #16, 60 nm	Wafer #8, 86 nm; Wafer #17, 61 nm	Wafer #9, 61 nm; Wafer #18, 68 nm