

(Hiroshima University)							
3 2							
(1) (2) (3) (4) (5)							
31 2 13							
	4	120	-	480	()	49	
	4	40	-	160	()	30 4	
	4	130 3	10	540	()		
	4	157	-	628	()	12	
	4	82	-	328			
	4	73	-	292			
	4	81	-	324			
	4	52	-	208	() ()		
	4	140 3	10	580	()		
	4	30 3	10	140	()		
	4	150 3	5	610	()		
	4	45 3	5	190	()		
	4	47	3 10	188	()	24	
	4	66		264		29	
	4	59		236		24	
	4	34		136		5	

	4	24		96		4	
	6	118 105		656 630		2 4 1	
	4	120	-	480	() ()	4	
	6 4	53 40	- -	318 160	() ()	40 21	
	6 4	38 22	- -	228 88	() ()	18	
	4 4 4 4	150 90 115 90	5 3 4 3	610 366 468 366	()	30 4 1 2 4 3	4
	4	90	3 10	380	()	54	4 4
	4	80	3 5	330	()	30 4 1 2 4 3	4
		2,336 (2,323)	3 80	9,870 (9,844)			
						2 4 M50 D17 2 4 M64 D32 2 4 P20 M4 M5	
						M80 M4 D49	M80 M9
						2 4 M24 D5 M28 D14 2 4	M28 D9
						M22 D11 M23 D11	M80 D13 M0 D5
						2 4 M25 D12 2 4 M28 D9 M84 D11	M5 D7 M80 D10 M87 D13
						M24 D8 M20 D7	M26 D9 M20 D7
						M21 D7	

13

3

720

	118	0	718
	118	0	716
	105	0	701
	105	0	686
	105	0	671
	105	0	656
	105	0	643
	105	0	630

2 4

M43 D22 M28 D14

P20 2 4

6

M257 D85 M63 D50

P30 (P20)

M449 D128

8

M2

M2

	51	50	2	18	121	0	30
-	(51)	(50)	(2)	(18)	(121)	(0)	(30)
	9	10	2	0	21	0	83
	(9)	(10)	(2)	(0)	(21)	(0)	(83)
	33	20	0	7	60	0	27
	(33)	(20)	(0)	(7)	(60)	(0)	(27)
	18	17	5	1	41	0	55
	(18)	(17)	(5)	(1)	(41)	(0)	(55)
	16	14	3	1	34	0	45
	(16)	(14)	(3)	(1)	(34)	(0)	(45)
	16	8	1	1	26	0	31
	(16)	(8)	(1)	(1)	(26)	(0)	(31)
	15	12	0	3	30	0	49
	(15)	(12)	(0)	(3)	(30)	(0)	(49)
	17	12	1	5	35	0	55
	(17)	(12)	(1)	(5)	(35)	(0)	(55)
	17	9	1	2	29	0	23
	(17)	(9)	(1)	(2)	(29)	(0)	(23)
	20	15	1	4	40	0	9
	(20)	(15)	(1)	(4)	(40)	(0)	(9)
	11	11	2	5	29	0	9
	(11)	(11)	(2)	(5)	(29)	(0)	(9)
	16	17	0	13	46	0	2
	(16)	(17)	(0)	(13)	(46)	(0)	(2)
	14	9	1	15	39	0	4
	(14)	(9)	(1)	(15)	(39)	(0)	(4)
	12	11	3	17	43	0	2
	(12)	(11)	(3)	(17)	(43)	(0)	(2)
	6	5	0	4	15	0	3
	(6)	(5)	(0)	(4)	(15)	(0)	(3)
	52	44	55	71	222	0	191
	(52)	(44)	(55)	(71)	(222)	(0)	(191)
	21	5	9	21	56	0	86
	(21)	(5)	(9)	(21)	(56)	(0)	(86)
	19	9	13	59	100	0	123
	(19)	(9)	(13)	(59)	(100)	(0)	(123)
	6	2	5	4	17	0	111
	(6)	(2)	(5)	(4)	(17)	(0)	(111)
	9	6	0	11	26	0	27
	(9)	(6)	(0)	(11)	(26)	(0)	(27)
	4	3	0	4	11	0	37
	(4)	(3)	(0)	(4)	(11)	(0)	(37)
	21	20	0	13	54	0	11
	(21)	(20)	(0)	(13)	(54)	(0)	(11)
	16	17	2	15	50	0	26
	(16)	(17)	(2)	(15)	(50)	(0)	(26)
	21	19	1	23	64	0	38
	(21)	(19)	(1)	(23)	(64)	(0)	(38)
	11	13	0	11	35	0	37
	(11)	(13)	(0)	(11)	(35)	(0)	(37)

	28	24	2	17	71	0	14		
	(28)	(24)	(2)	(17)	(71)	(0)	(14)		
	18	11	1	2	32	0	16		
	(18)	(11)	(1)	(2)	(32)	(0)	(16)		
	0	1	0	0	1	0	593		
	(0)	(1)	(0)	(0)	(1)	(0)	(593)		
	103	93	6	17	219	0	123		
	(103)	(93)	(6)	(17)	(219)	(0)	(123)		
	95	89	4	1	189	0	34		
	(95)	(89)	(4)	(1)	(189)	(0)	(34)		
	64	56	8	1	129	0	146		
	(64)	(56)	(8)	(1)	(129)	(0)	(146)		
	66	56	4	0	126	0	40		
	(66)	(56)	(4)	(0)	(126)	(0)	(40)		
	6	10	2	0	18	0	120		
	(6)	(10)	(2)	(0)	(18)	(0)	(120)		
	14	1	1	0	16	0	85		
	(15)	(1)	(1)	(0)	(17)	(0)	(85)		
	6	4	0	0	10	0	57		
	(6)	(4)	(0)	(0)	(10)	(0)	(57)		
	121	109	5	79	314	0	104		
	(121)	(109)	(5)	(79)	(314)	(0)	(104)		
	121	107	3	47	278	0	50		
	(121)	(107)	(3)	(47)	(278)	(0)	(50)		
	3	5	0	0	8	0	54		
	(3)	(5)	(0)	(0)	(8)	(0)	(54)		
	48	49	6	36	139	0	134		
	(48)	(49)	(6)	(36)	(139)	(0)	(134)		
	44	49	6	30	129	0	39		
	(44)	(49)	(6)	(30)	(129)	(0)	(39)		
	52	40	22	34	148	0	69		
	(52)	(40)	(22)	(34)	(148)	(0)	(69)		
	84	32	25	25	166	0	151		
	(84)	(32)	(25)	(25)	(166)	(0)	(151)		
	40	4	5	1	50	0	99		
	(40)	(4)	(5)	(1)	(50)	(0)	(99)		
	534	425	122	386	1467	0			
	(535)	(425)	(122)	(386)	(1468)	(0)			
	534	425	122	386	1467	0			
	(535)	(425)	(122)	(386)	(1468)	(0)			
	523		938		1,461				
	523		938		1,461				
	1,119		211		1,330				
	1,119		211		1,330				
	26		0		26				
	26		0		26				
	4		352		356				
	4		352		356				
	1,672		1,501		3,173				
	1,672		1,501		3,173				
	951,632		0		951,632				
	244,009		0		244,009				
	1,195,641		0		1,195,641				
	1,134,377		0		1,134,377				
	2,330,018		0		2,330,018				

	514,567	0	0	514,567
	514,567	0	0	514,567
203	365	1,393	15	8
			20	18
			1,468	

3,494,421	1,315,991	61,208	25,362	5,769	5,762	5,637	12,757	133
(3,494,421)	(1,315,991)	(61,208)	(25,362)	(5,769)	(5,762)	(5,637)	12,757	1133
3,494,421	1,315,991	61,208	25,362					
				(5,769)	(5,762)			

1 2 3 4 5 6

() —

1 1 2 4 5 6

	4	150	3	5	615	()	1.07 1.07			30 (5)
	4	45	3	5	220	()	1.06			30 (15)
	4	47	} 3 10		192	()	1.06	24		
	4	66			268	()	1.03	10		
	4	59			240	()	1.07	24		
	4	34			140	()	1.06			
	4	24			100	()	1.06			
	6	120		720	()	1.00 1.03 1.00	28			6 4
	4	120								
	4	60		240	()	1.03				
	4	30		120	()	1.02				
	4	30		120	()	1.02				
	6	53		318	()	1.00 1.05 1.00	40			6 4
	4	20		160	()					
	4	20		80	()	1.05	21			
	4	20		80	()	1.06	21			
	6	38		228	()	1.03 1.07 1.03	18			6 4
	4	22		88	()	1.07	18			
	4					1.03	13			30
	4					()	13			30
()	4					()	13			30
()	4	150	3	5	300	()	1.04	30		
()	4	90	3	3	180	()	1.04	30		
()	4	115	3	4	465	()	1.02	13		30 (4)
()	4	90	3	3	180	()	1.06	30		
	4	90	3	10	380	()	1.13 1.13	54		
	4	80	3	5	160	()	1.06 1.06	30		
	2	50		110	()	0.98	18			2 31 (10)
	3	17		57	()	0.81	18			31 (3)

	2	64		128	()	0.95	13		2
	3	32		96	()	0.67	13		
	3				()		12		28
	3				()		12		28
	3				()		12		28
	2	20		40	()	1.00	28		2
	2	20		40	()	1.72	28		2
	2	80		160	()	1.23	28		2
	2	14		28	()	1.21	28		2
	2	14		28	()	1.21	12		2
	2	19		38	()	1.12	12		2
	2	5		10	()	0.80	28		2
	3	49		147	()	1.36	28		2
	2	24		48	()	1.02	16		2
	3	5		15	()	0.53	16		
	2	28		56	()	1.28	16		
	3	8		24	()	0.41	16		
	2	28		56	()	0.67	12		
	3	14		42	()	0.45	12		
	2	22		44	()	0.67	28		2
	3	11		33	()	0.48	28		
	2	30		60	()	1.08	28		2
	3	13		39	()	0.63	28		
	2	23		46	()	1.56	28		2
	3	11		33	()	0.75	28		
	2				()		28		31
	3				()		28		
	2	10		20	()	1.05	28		2
	3	5		15	()	0.53	28		
	2				()		11		31
	3				()		11		

	2	25		50	() () ()	1.26	10		2
	3	12		36	() () ()	0.30	10		
	2				() () ()		10		31
	3				() () ()		10		
	2	15		30	() () ()	1.33	16		2
	3	7		21	() () ()	0.23	16		
()	4				() () () ()		24		31
	2				()		24		
	3				()		24		
	2				()		24		
	3				()		24		
	2				()		24		
	3				()		24		
	2				() () ()		24		
	2				() () ()		14		24
	3				() () ()		14		
	2	28		56	()	1.23	22		2
	3	9		27	()	0.70	22		
	2	30		60	()	1.61	22		
	3	10		30	()	0.96	22		
	2	34		68	() ()	1.58	22		
	3	11		33	() ()	0.78	22		
	2	37		74	() ()	1.40	22		
	3	13		39	() ()	0.43	22		
	2	24		48	()	1.47	22		
	3	8		24	()	0.74	22		
	2	26		52	()	1.32	22		
	3	9		27	()	0.29	22		
	2	20		40	()	1.42	22		
	3	7		21	()	0.80	22		
	2	20		40	()	1.32	22		
	3	7		21	()	0.66	22		

3

3

2

3

4

2

3

					()				
					()				
					()				
					()				
					()				
	3	20		60	()	0.66	16		2

1 2 3
36 4
(144,700) 7,971

1 2 3
31 4
(144,700) 122,552

1 2 2
24 5
(2,492,191) 29,584

1 2 3
55 4
(144,700) 298

7 4
53 10
2,675 840

1 1 1
41 4
(2,492,191) 44,097

1 1 1
63 4
(2,492,191) 44,097

1 1 1
7 4
(2,492,191) 44,097

1 1 1
14 4
(2,492,191) 44,097

5
(18,470) 3,163

1 3 1
19 4
(2,492,191) 34,461

2965 5 8 1
15 4
(2,492,191 4,268) 1,353

2445
24 5
21,197 1,590

1156-2
49 4
102,076 578

1 4 3
52 4
(2,492,191) 794

1 2 3
18 6
(144,700) 84,633

1 2 3
21 4
(144,700) 120

1 1 89
17 4
(18,470) 53

1 2 3
42 6
(144,700) 7,971

2 313
8 5
(2,492,191) 3,881

47 4 570
111,469 1,022

8 5 1 4 2
(2,492,191) 4,153

12 4 1 2 2
(2,492,191) 1,207

13 4 1 4 2
(2,492,191) 2,507

15 4 1 4 2
(2,492,191) 13,074

9 4 1 5 1
(2,492,191) 306

44 4 1 7 1
(2,492,191) 1,146

50 7 1 1 89
(18,470) 386

1 5 3
 17 3
 (2,492,191) 2,374

- (1)
- (2)
- (3)

1 1 1
 18 4
 (2,492,191) 443

83

14 10
 (243)

1 3 1
 16 4
 (2,492,191) 478

1 7 1
 16 4
 (2,492,191) 1,195

1 1 1
 16 4
 (2,492,191) 783

1 1 1
 17 4
 (2,492,191) 26

HSIM

HSIM(Hrosi na university STARC
 IGFET Model) CMC(Compact Modeling Council)
 ()
 3 CMC

1 3 1
17 7
(2,492,191) 87

1 1 1
22 4
(2,492,191) 60

1 3 2
28 4
(2,492,191)

1 3 1
28 10
(2,492,191) 3,886

1 2 3
30 4
(144,700)

1 4 1
30 9
(2,492,191)

1 1 1
30 10
(2,492,191) 1,001

“ ”
100

1 2 3

31


2

	120		480
	40		160
	³ 130	10	540
()	157		628
()	82		328
()	73		292
()	81		324
()	52		208
	³ 140	10	580
	30	10	140
	³ 150	5	610
	45	5	190
	47		188
	66		264
	59		236
	34		136
	24		96
	³	10	20
	105		630
	120		480
	53		318
	40		160
	38		228
	22		88
()	³ 150	5	610
()	90	3	366
()	115	4	468
()	90	3	366
	³ 90	10	380
	³ 80	5	330
	³ 2,323	80	9,844



	120		480
	40		160
	³ 130	10	540
()	157		628
()	82		328
()	73		292
()	81		324
()	52		208
	³ 140	10	580
	30	10	140
	³ 150	5	610
	45	5	190
	47		188
	66		264
	59		236
	34		136
	24		96
	³	10	20
	<u>118</u>		<u>656</u>
	120		480
	53		318
	40		160
	38		228
	22		88
()	³ 150	5	610
()	90	3	366
()	115	4	468
()	90	3	366
	³ 90	10	380
	³ 80	5	330
	³ <u>2,336</u>	80	<u>9,870</u>

³ (13)

								<u>2 4</u>
50	100			⓪	⓪			
17	51			⓪	⓪			
								<u>2 4</u>
64	128			⓪	⓪			
32	96			⓪	⓪			
								<u>2 4</u>
20	40			⓪	⓪			
20	40			⓪	⓪			
80	160			⓪	⓪			
14	28			⓪	⓪			
14	28			⓪	⓪			
19	38			⓪	⓪			
5	10			⓪	⓪			
49	147			⓪	⓪			
								<u>2 4</u>
24	48			⓪	⓪			
5	15			⓪	⓪			
28	56			⓪	⓪			
8	24			⓪	⓪			
28	56			⓪	⓪			
14	42			⓪	⓪			
								<u>2 4</u>
22	44			⓪	⓪			
11	33			⓪	⓪			
30	60			⓪	⓪			
13	39			⓪	⓪			
23	46			⓪	⓪			
11	33			⓪	⓪			
10	20			⓪	⓪			
5	15			⓪	⓪			
								<u>2 4</u>
25	50			⓪	⓪			
12	36			⓪	⓪			
15	30			⓪	⓪			
7	21			⓪	⓪			
								<u>2 4</u>
28	56			⓪	⓪			
9	27			⓪	⓪			
30	60			⓪	⓪			
10	30			⓪	⓪			
34	68			⓪	⓪			
11	33			⓪	⓪			
37	74			⓪	⓪			
13	39			⓪	⓪			
24	48			⓪	⓪			
8	24			⓪	⓪			
26	52			⓪	⓪			
9	27			⓪	⓪			
20	40			⓪	⓪			
7	21			⓪	⓪			
20	40			⓪	⓪			
7	21			⓪	⓪			
21	42			⓪	⓪			
7	21			⓪	⓪			

					<u>2 4</u>
43	86		0	0	
22	66		0	0	
28	56		0	0	
14	42		0	0	
					()
			<u>257</u>	<u>514</u>	
			<u>85</u>	<u>255</u>	
			<u>163</u>	<u>326</u>	
			<u>50</u>	<u>150</u>	
			<u>30</u>	<u>60</u>	
			<u>20</u>	<u>60</u>	
			<u>2</u>	<u>4</u>) (
					()
			<u>449</u>	<u>898</u>	
			<u>128</u>	<u>384</u>	
			<u>2</u>	<u>4</u>) (
170	340		170	340	
70	210		70	210	
97	388		97	388	
76	152		76	152	
25	75		25	75	
			0	0	<u>2 4</u>
20	60				
			<u>1,561</u>	<u>3,732</u>	
			<u>1,624</u>	<u>3,820</u>	

