Ours	:	Baseline = 0	20,000ps	40,000ps		sd000,08	100,000ps		 120,000ps	140,000ps	1 6
+ P DW_UART ADDENT	'd8 'd4	8 4									
+ ADDRW	'd12	12									
+ P ADDRW_DM	. d8	8									
BAUD_RATE	1,49600	0096									
+ BITS_TO_COUNT	, d8	œ									
		1.10+08								1.16	1.1e+08
CLOCK_FREQ	1e+08										
		1.10+U0 1.10+U0								9 1.1	9e+07 1.1e+06
CLOCK_OUT	1e+06	16+06									
		= 950000 = 1.1e+08								900	900000
P CLOCK_SYS	1e+08	1e+08									
										6	9e+07
MO ■	1 d32	32									
+ MEM_SIZE_IN_KB	'dl	1									
+ NO_OF_REGS	1,4256	256									
ů.	1432	32									
- NO_OF_SEGS	1 d8	8									
+ P REGW	1 d5	5									
+ P REG_SIZE	'd32	32									
	1										
	'h00000088	00000000 4 ×××××	00	0000 \	0000008c	00000000	80000000	06800000	00000001		
T	'h22	00 xx		23	00 \		02	X E4	00 \		
-	'h0	0								1	
-	1h000000000	00000000 4 ×××××	00				06000000	00000000		00000001	001
	, hxxxxxxxx	xxxxxxx									
+ 15 alu_out_m[31:0]	'h00000088					00000000	80000000	06800000	00000001		
	1h000000000	00000000 4 ×××××	00 0000080		00000000	00000008	06800000	00000001		080000000	080
alu_src	ı										

Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

P DW_UARI ADDENT ADDRW ADDRW_DM B BAUD_RATE BITS_TO_COUNT	'd4 'd12	C	-		sdoon on the		240,000ps, 260	260,000ps -		900,000		320,000
TND	'd12	ж 4										
TNU		12										
	- d8	æ										
	، ط9600	0096										
	,d8	ω										
		00+09									1.16+08	4
CLOCK_FREQ	1e+08	1e+08										
		1.18+00 1.18+00									9e+07 1.1e+06	▶ 4 90:
CLOCK_OUT	1e+06											
		950000									000006	
											1.1e+08	4
CLOCK_SYS	80+91	000 +a1									96+07	107
DW	1432	32										
MEM_SIZE_IN_KB	'd1	1										
NO_OF_REGS	'd256	256										
NO_OF_REGS_REG_FILE	'd32	32										
NO_OF_SEGS	,d8	80										
REGW	'd5	r)										
REG_SIZE	'd32	32										
	1											
addr_data_mem[31:0]	,h00000088	080000000	Ĭ	00800000	08800000	000003A8	00000010	00000000	Ĭ	00000005	00000000	
addr_dm[7:0]	'h22	V 20	00 \		20	EA	04	00) 01		17	
alu_control[2:0]	,h0	1	°									
alu_operand_1[31:0]	,h000000000	0000001	1000	00000000	00000084	00000088	00000000		000 (00000014	00000018	000
alu_out_e[31:0]	hxxxxxxx	xxxxxxx										
alu_out_m[31:0]	'h00000088	080000080	Ĭ	00000000	08800000	000003A8	00000010	00000000	Ĭ	00000005	00000005C	
alu_result[31:0]	ооооооооо,	00800000	Ĭ	00000080	000003A8	00000010	00000000	00000002	Ĭ	0000005C		000

3 stage pipelined RISC-V Core Ahsan Ali (2019-EE-115)

P4 00000000 00000000 9e+07 9e+07 1.16+06 000006 1.1e+08 1.1e+08 480,000ps 00000078 00000000 00000078 00000000 460,000ps 0000000 00000078 440,000ps 00000000 00000000 420,000ps 00000000 400,000ps 00000000 0000000 380,000ps 00000064 00000064 00000000 360,000ps 0000000 00000020 00000064 0000000 00 340,000ps 1.05e+06 1.16+06 1.10+08 0000005 950000 00000000 00000000 0000000 xxxxxxx 1e+06 T. T 7 , h000000000 1h00000088 , h000000000 hxxxxxxx .h00000088 0096P. 1e+08 1e+06 1e+08 , d256 'd12 - d8 d32 d32 d32 'h22 -d8 d5 . ho .d4 'd1 - d8 Cursor = 2,843,015psCursor-Baseline = 2,843,015ps NO_OF_REGS_REG_FILE addr_data_mem[31:0] alu_operand_1[31:0] MEM_SIZE_IN_KB BITS_TO_COUNT Baseline = 0 alu_out_e[31:0] alu_out_m[31:0] NO_OF_REGS alu_result[31:0] CLOCK_FREQ NO OF SEGS alu_control[2:0] BAUD RATE CLOCK_OUT CLOCK_SYS addr_dm[7:0] ADDRW DM REG_SIZE DW_UART ADDENT ADDRW REGW ě ů. ů. ů. **•** • • • • **• • • • • •** • • • • • •

Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

148 8 4 4 4 4 4 4 4 4	520,000ps 540,000ps	560,000ps 580,	580,000ps 600,000ps	s 620,000ps	640,000ps	† 9 9
ADDRW						
ADDRW_DM						
ADDRW_DM BAUD_RATE '43600 9600 BAUD_RATE '43600 9600 BAUD_RATE '43600 96000 CLOCK_FREQ 1e+08 1.16+006 1						
B HTS_TO_COUNT '48 8 1.10 + U/US						
BITS_TO_COUNT .d8 BITS_TO_COUNT						
CLOCK_FREQ						
CLOCK_FREQ						1.16+08
CLOCK_OUT 1e+06 1e+06 1.1e+06 1.1e+						
CLOCK_OUT 1e+06 1e+08						9e+07
P CLOCK_OUT 1e+06 1						1.1e+06
CLOCK_SYS						
P CLOCK_SYS 1e+08						000006
P						1,16±08
DW 1432 32 32 32 32 32 32 32						
D W						9e+07
MEM_SIZE_IN_KB 'd1 1						
NO_OF_REGS_ NO_OF_REGS_REG_FILE '432 32 NO_OF_SEGS '488 8 NO_OF_SEGS '488 '488 '488 8 NO_OF_SEGS '488 '488 **********************************						
NO_OF_REGS_REG_FILE						
P NO_OF_SEGS 148 8						
PEGW						
PEG_SIZE						
Tx 1 1 1 1 1 1 1 1 1						
document document						
document document	O000037E	00000000	00000064	00000000		00000001
Incorporation Incorporati	DF O	00	19	01		00
display 'hxxxxxxxx	00000000	00000020	00000000			00000000
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	(0000037E	00000000	00000064	00000005		00000001
alu_result[31:0]	37E X 00000000	00000064	00000002		00000001	00000004
alu_src 1						

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Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

820,000						1.1e+08		9e+07	1.1e+06		1.1e+08		9e+07									000	00		000		000	000	
						1.1		00 .	-	Ö	1.1		0)									0000004C	(13		00000000 \		00000040	00000000	
sd0000008																						X 0000000A	X 02		00000054		X 0000000A	0000004C	
780,000ps																						0000000	00		0000000		0000000	0000000A	
																						00000004			00000004		00000004	00000003	
740,000ps																						Ĭ	01		000 X		\bigcap		
720,000ps																						8 (0000000	00 (0		8 (00000000	0 00000004	
, sd000,000/																						00000048	(12		00000000 \		00000048	00000000	
																						00000002			8 000000038		00000002	00000048	
ω -	8 4	12	8	0096	8	1.16+08	1e+08	77 F 1.1e+Ub	1.05e+06	1e+00 - 950000	T.10+08		- 007	32	1	256	32	8	ro.	32		• 00000004	• 01	0	00000000 🚶 🖣	xxxxxxxx	• 00000004	00000002	
		8		009			 80							2		26	2			2		'h00000088	2		, 4000000000	hxxxxxxx	'h00000088	,h000000000	
	. d8	'd12	-d8	00960.	. d8		1e+08			00+00		1e+08		'd32	'd1	'd256	'd32	- d8	' d5	'd32	T	, h0	'h22	. h0	.h0	hx:	, h0	'h0	П
Curs	+ P DW_UART ADDENT	± F ADDRW	+ ADDRW_DM	E BAUD_RATE	# BITS_TO_COUNT		CLOCK_FREQ			CLOCK_OUT		CLOCK_SYS		MQ +	+ MEM_SIZE_IN_KB	+ NO_OF_REGS	* NO_OF_REGS_REG_FILE	+ NO_OF_SEGS	F REGW	F REG_SIZE	ř E	+ the addr_data_mem[31:0]	+ 4 addr_dm[7:0]	+ the alu_control[2:0]	т.		+ the alu_out_m[31:0]		alu_src

3 stage pipelined RISC-V Core Ahsan Ali (2019-EE-115) UET

sd ₀ ,						1.1e+08		9e+07	1.1e+06		000006	1.16+08	9e+07									00000030	OF		00000000		0000003C	00000000	
8000'086																						0000004C	13		00000058		0000004C	0000003C	
sd000,096																							X				\bigcap	Ĭ	
940,000ps																						00000014	0.5		00000054		00000014	00000040	
																						00000001			0000000E		0000001	00000014	
920,000ps																						00000000			00000002		00000000	0000001	
sd000,000																							00		Ĭ		Ĭ	Ĭ	
																					,	00000040	13		00000000		00000040	00000000	
880,000,088																						000000E	03		00000054		000000E	0000004C	
860,000ps																					ì				Ĭ			\bigcap	
840,000ps																					·	00000000			0000000A		00000000	0000000	
840,	ω 4	12	8	0096	ω	1.10+08	90+91 T			16+06	E 330000	88 5 77		32	1	256	32	ω	ഗ	32		00000000	00	0	0000000	xxxxxxx	00000000	00000005	
				00												9						'h00000088			1h00000000	hxxxxxxx	,h00000088	, h000000000	
	. d8	'd12	- d8	0096P.	- d8		1e+08			1e+06		1e+08		1, d32	'd1	d256	d32	1 d8	1 d5	d32	1	. h00	'h22	. h0	, hoo	'hxx	, h00	, h00	Н
Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps	P DW_UART	P ADDBW	P ADDRW_DM	P BAUD_RATE	BITS_TO_COUNT		-F CLOCK_FREQ		I	CLOCK_OUT		P CLOCK SYS		MQ 🖪	MEM_SIZE_IN_KB	NO_OF_REGS	NO_OF_REGS_REG_FILE	NO_OF_SEGS	-F REGW	F REG_SIZE	ř	पित्ने addr_data_mem[31:0]	4 addr_dm[7:0]	শিক্রি alu_control[2:0]	الاباد] alu_operand_1[31:0]	्रात्र alu_out_e[31:0]	्रात्र alu_out_m[31:0]	শিলী alu_result[31:0]	alu_src
	±) (±] 🛨	+	+									+	+	+	•	±	±	+		±	Đ	•	Ð	•	+	+	

Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

, d8	8 8 9600 8 1.18+U8 1.16+U0 1.16+U0 1.1050+06 950000							1.10+08	
ADDRW_DM ADDRW_DM ADDRW_DM ADDRW_DM BAUD_RATE BITS_TO_COUNT CLOCK_FREQ CLOCK_OUT CLOCK_SYS CLOCK_SYS CLOCK_SYS Te+08 Till The to	1.18+U8 1.18+U8 1.16+U9 1.056+06 1.056+06 1.19+U9							1.16+08	
ADDRW_DM	1.18+U8 1.18+U8 1.16+U9 1.056+06 1.056+06 1.18+U9							1.16+08	
ADDRW_DM BAUD_RATE BITS_TO_COUNT CLOCK_FREQ CLOCK_FREQ CLOCK_OUT 1e+06 1d+08 1d32 DW MEM_SIZE_IN_KB 1d1 1d8 1d8 1d8 1d8 1d8 1d8 1d	1.16+UB 16+0B 1.16+UB 1.056+0B 1056+0B 1056+0B 116+UB							1.10+08	
BAUD_RATE BITS_TO_COUNT CLOCK_FREQ CLOCK_OUT 1e+06 1e+06 CLOCK_SYS DW WEM_SIZE_IN_KB 1d1 1abbet 1d2 1d3 1d3 1d3 1d3 1d3 1d3 1d3	1.18+08 1.6+08 1.050+06 1.050+06 1.1050-06							1.1e+08	
CLOCK_FREQ 1e+08 1	1.18+U8 16+08 1.16+Ub 1.050+06 1950000 0000000000000000000000000000000							1.16+08	
CLOCK_FREQ 1e+08 1	1.18+U8 1e+08 1.156+U6 1.1056+06 1.16+U0							1.1e+08	
CLOCK_FREQ 1e+08 1e+06 1e+06 1e+06 1e+06 1e+06 1e+06 1e+06 1e+08 1e+06 1e+08 1e+08 1e+08 1e+08 1e+06 1e+08 1e+06 1	1.18+06 1.050+06 1.050+06 1.05000								
CLOCK_OUT 1e+06 CLOCK_SYS 1e+08 DW 'd32 WEM_SIZE_IN_KB 'd32 1000 100	1.05e+06 1.05e+06 1e+08 950000 1.10e+08								
CLOCK_OUT 1e+06 CLOCK_SYS CLOCK_SYS 1e+08 1d32 DW WEM_SIZE_IN_KB 1d1 1	16+06 950000 1.18+U8							9e+07 1.1e+06	4
CLOCK_SYS 1e+08 33 DW 'd32 33 MEM_SIZE_IN_KB 'd1	1.10+08							000006	•
DW '432 32 32 MEM_SIZE_IN_KB '41 1	-0+00 -0+00							1.16+08	4
DW '432 MEM_SIZE_IN_KB '41	0 0							96+07	•
MEM_SIZE_IN_KB 'd1	01								
00 TO CA									
	56								
P NO_OF_REGS_REG_FILE 'd32 32	01								
P NO_OF_SEGS 8									
P REGW 'd5 5									
P REG_SIZE 132	O.								
1 7									
addr_data_mem[31:0] 'h00000088 000	00000000 (100000	00000000	00000000	00000003	00000014	00000048	00000000	00000003	
addr_dm[7:0] 'h22 0F	نے \ 00) oc	00 \		0.5	12	00 \		
alu_control[2:0] 'h0 0									
alu_operand_1[31:0] 'h00000000	0000000	00000000	00000004	00000000 \	8 00000038	00000000)		00000003	
alu_out_e[31:0] hxxxxxxxx	xxxxxxx								
alu_out_m[31:0] 'h00000088	00000000 (4000000	00000000	000000000	00000003	00000014	00000048	000000000	00000003	
alu_result[31:0]	0000000 0000030	00000000	00000003	00000014	00000048	00000000	00000003	00000000	

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1,320,0							1.1e+08		9e+07	1.1e+06		900000		9e+07									000	00		000		000	000	
							1.16		ő	91.1		900		ő									0000003C	OF		00000000 🚶		0000003	00000000	
1,300,000ps																							0000004C			00000058		0000004C	0000003C	
1,280,000ps																							Ĭ	(13		Ĭ		Ĭ		
1,260,000ps																							0000003) OF		00000054		0000003	00000040	<u> </u>
																							00000001			00000028		00000001	0000003C	
1,240,000ps																							00000000			00000002		00000000	0000001	
1,220,000ps																							Ĭ	00 \				\bigcap		
1,200,000ps																							00000040	13		00000000		00000040	00000000	
																							00000028	0A		00000054		00000028	0000004C	
1,180,000ps							œ			90:		Ω											00000002			00000014	v	00002	00028	
sd000	ω	4	12	ω	0096	ω	1.10+08	80±a1 - 1e±08		سلسنا	16+06	E	- 1e+08		32	1	256	32	∞	ιΩ	32		0000	00	0	0000	xxxxxxx	00000000	00000028	
	- d8	.d4	'd12	1d8	00960.	.d8		1e+08			1e+06		1e+08		'd32	'd1	'd256	'd32	.d8	'd5	'd32	_	1h00000088	h22	, ho	, h000000000	'hxxxxxxx	'h00000088	, h000000000	1
015ps 015ps																														
Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps	DW_UART	LNE	M۶	ADDRW_DM	BAUD_RATE	BITS_TO_COUNT		CLOCK_FREQ			CLOCK_OUT		CLOCK_SYS			MEM_SIZE_IN_KB	NO_OF_REGS	NO_OF_REGS_REG_FILE	NO_OF_SEGS	3	REG_SIZE		addr_data_mem[31:0]	addr_dm[7:0]	alu_control[2:0]	alu_operand_1[31:0]	alu_out_e[31:0]	alu_out_m[31:0]	alu_result[31:0]	j.
B Cursor-B	MQ +	+ ADDENT	+ ADDRW	ů.	ů.	û		CLOC		[CLOC		OTO GEOG		MQ +	ů.	ů.	ů.	0 0 1	+ REGW	۵	¥	ø	ø	ø		ø	ø	ø	alu_src

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P4 0000003 87000000 0000000 0000000 9e+07 9e+07 1.16+06 1.1e+08 1.1e+08 900000 1,480,000ps 0000000 00000000 00000000 00000000 1,460,000ps 00000000 00000000 0000000 1,440,000ps 000000048 00000048 00000000 1,420,000ps 0000003C 00000048 00000030 00000038 1,400,000ps 000000002 00000000 00000002 1,380,000ps 000000000 00000000 00000003 1,360,000ps 00000000 00000000 00000000 00000000 00 1,340,000ps 1.05e+06 1.16+05 1.10+08 00000000 950000 00000000 0000000 0000000 xxxxxxxx 1e+06 T. 7 T. *h00000088 , h000000000 hxxxxxxx .h00000088 , h000000000 1d9600 1e+08 1e+06 1e+08 d256 'd12 - d8 d32 · d32 d32 'h22 -d8 d5 . ho .d4 'd1 - d8 Cursor = 2,843,015ps Cursor-Baseline = 2,843,015ps NO_OF_REGS_REG_FILE addr_data_mem[31:0] alu_operand_1[31:0] MEM_SIZE_IN_KB BITS_TO_COUNT Baseline = 0alu_out_m[31:0] alu_out_e[31:0] NO_OF_REGS alu_result[31:0] alu_control[2:0] CLOCK_FREQ NO OF SEGS BAUD RATE CLOCK_OUT CLOCK_SYS addr_dm[7:0] ADDRW DM REG_SIZE DW_UART ADDENT ADDRW REGW M ů. ů. ů. a a <u>a</u> a a a **+ + + + • • • • • •** • • • • • •

00ps 1, 6▶							1.1e+08		9e+07	1.16+06			1.16+08		9e+07									00000001		1	00000001		00000001	00000400	
00ps 1,640,000ps																								00000000	00				00000000 \	00000001	
0ps 1,620,000ps																								89000000) 1A		00000000		89000000	00000000	
ps 1,600,000ps																								00000000	၁၀ (00000040		00000000	89000000	
sc 1,580,000ps																								00000000	00		0000003C		00000000	00000000	
s 1,560,000ps																								0000003C	0F		00000000		0000003C	00000000	
1,540,000ps																								0000004c	13		00000058		0000004C	0000003C	
1,520,000ps																								00000078	1E		Ĭ		00000078	0000004C	
1,500,000ps	ω	4	12	ω	0096	æ	1.16+08	90+e1	-001	سليبينا	16+06	300000			0 . 01	32	1	256	32	ω	S)	32		0 0 0 0 0	00	0	000000 00000054	×××××××	0 0 0 0 0 0	0 0 0 0 0 0	
	- d8	1 d4	'd12	. d8	00960.	. d8		1e+08			1e+06			1e+08		'd32	.d1	, d256	1 d32	. d8	. d5	1 d32	1	. h000000088	'h22	, ho	1,4000000000	'hxxxxxxx	1,400000088	1,4000000000	T
Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps	ů.	+ ADDENT	+ P ADDRW	+ ADDRW_DM	BAUD_RATE	# BITS_TO_COUNT		- CLOCK_FREQ			CLOCK_OUT			P CLOCK_SYS		MQ •	T MEM_SIZE_IN_KB	+ NO_OF_REGS	H NO_OF_REGS_REG_FILE	+ NO_OF_SEGS	+ REGW	+ F REG_SIZE	ž G	+ data_mem[31:0]	-	+ the alu_control[2:0]				+	alu_src

1,820,							1.1e+08		9e+07	1.1e+06			1.1e+08		9e+07									000	22		000		000	000	
1,800,000ps							1.16		0	1.16		006	1.16		0								,	00000000	00 \		880000000		00000000	880000000	
																								880000000	22		00000000 \		88000000	00000000 \	
1,780,000ps																								00000000	00		88000000		00000000	88000000	
s 1,760,000ps																								88000000	22		00000000		00000088	00000000	
1,740,000ps																								00000000	0		88000000		00000000	88000000	
1,720,000ps																								0 00000088 0000000	00 \		00000000		0 00000088	0 00000000	
1,700,000ps																							·)00)	(22				000		
1,680,000ps																								0.0			00 0000074		0.0	88000000	
sd0000	ω ς	3 1	12	ω	0096	ω	1.16+08	90±a1	-0	1.1e+Ub 1.05e+06	90±a1	920000			L 0 07	32	1	256	32	ω	Ŋ	32		▶ 000000400	00	1 0	▶ 000000400	xxxxxxx	▶ 00000400	00000400	
	8 7 7 7	45D	'd12	- d8	1,49600	. d8		1e+08			1e+06			1e+08		'd32	'd1	·d256	1 d32	. d8	. d5	1 d32	1	.h00000088	'h22	.h0	1,400000000	'hxxxxxxx	1,000000088	, h000000000	1
Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps			+ ADDRW	+ ADDRW_DM	BAUD_RATE	BITS_TO_COUNT		P CLOCK_FREQ			CLOCK_OUT					MQ 4	T MEM_SIZE_IN_KB	+ NO_OF_REGS	TOOOF REGS REG FILE	+ NO_OF_SEGS	+ REGW	+ P REG_SIZE	¥	+ the addr_data_mem[31:0]	-	+ Table alu_control[2:0]	+ 4 alu_operand_1[31:0]	Т	_	_	alu_src

DW_UART	90							99+07 1.1e+06 900000 900000
ADDRW	90							
ADDRW ADDRW ADDRW ADDRW DM ADD	99							
ADDRW_DM ADDRW_DM BAUD_RATE BITS_TO_COUNT CLOCK_FREQ CLOCK_FREQ CLOCK_OUT CLOCK_SYS CL	99							
BAUD_RATE 'd9600 96 BITS_TO_COUNT 'd8 8 CLOCK_FREQ 1e+08 ::: CLOCK_OUT 1e+06 ::: CLOCK_SYS 1e+08 ::: DW 'd32 32 NO_OF_REGS_NEG_FILE 'd3 25 NO_OF_REGS_REG_FILE 'd3 32 NO_OF_REGS_REG_FILE 'd3 32 NO_OF_SEGS 'd5 32 REGW 'd5 5 REGW 'd5 5	90							
CLOCK_FREQ 1e+08	99							
CLOCK_FREQ 1e+08 ::	90						± ± 00 ±	
CLOCK_FREQ 1e+08 ::	99						÷ 00 ÷	
CLOCK_OUT CLOCK_SYS CLOCK_SYS CLOCK_SYS DW MEM_SIZE_IN_KB NO_OF_REGS_ NO	90						7 00 4	
CLOCK_OUT CLOCK_SYS CLOCK_SYS DW WEM_SIZE_IN_KB NO_OF_REGS NO_OF_REGS_REG_FILE NO_OF_REG_FILE NO	0.90						÷ 00 ÷	
CLOCK_OUT CLOCK_SYS CLOCK_SYS DW MEM_SIZE_IN_KB NO_OF_REGS NO_OF_REGS_REG_FILE NO_OF_REG_FILE NO_OF_REG_FIL	200						90 -	
CLOCK_SYS CLOCK_SYS CLOCK_SYS DW MEM_SIZE_IN_KB NO_OF_REGS NO_OF_REGS_REG_FILE NO_OF_REGS_REG_FILE NO_OF_SEGS REGW 1d5 1d5 1d5 1d5 1d5 1d5 1d5 1d	70						9 1	
CLOCK_SYS CLOCK_SYS DW MEM_SIZE_IN_KB NO_OF_REGS_ NO_OF_REGS_ NO_OF_REGS_REG_FILE NO_OF_SEGS NO_	2							
CLOCK_SYS CLOCK_SYS CLOCK_SYS DW MEM_SIZE_IN_KB NO_OF_REGS NO_OF_REGS_REG_FILE NO_OF_REGS_REG_FILE NO_OF_SEGS HEGW 1432 328 1455 328 1								
DW 'd32 32 MEM_SIZE_IN_KB 'd1 1 NO_OF_REGS 'd256 256 NO_OF_REGS_REG_FILE 'd32 32 NO_OF_SEGS 'd8 8 REGW 'd5 5								
DW 'd32 32 MEM_SIZE_IN_KB 'd1 1 NO_OF_REGS 'd256 256 NO_OF_SEGS 'd8 8 REGW 'd5 5) OFFICE
MEM_SIZE_IN_KB								
NO_OF_REGS								
NO_OF_REGS_REG_FILE 'd32 NO_OF_SEGS 'd8 REGW 'd5								
NO_OF_SEGS 'd8 REGW 'd5								
REGW 'ds								
P REG_SIZE 'd32 32								
1 7								
addr_data_mem[31:0] 'h00000088 00000088	00000000	88000000	00000000	88000000	00000000	88000000	00000000	00000088
	00 \	22	00	22	00 (22	00 (22
alu_control[2:0] 'h0 0								
in_ operand_1[31:0] h00000000 00000000000000000000000000	88000000 🚶	00000000	88000000	00000000	88000000 🚶	00000000	88000000	00000000
dia_out_e[31:0] 'hxxxxxxxx xxxxxxx								
alu_out_m[31:0] 'h00000088 00000088	00000000	88000000	00000000	88000000	00000000	88000000	00000000	00000088
	88000000)	00000000	88000000	00000000	88000000	00000000	88000000	00000000

\(\)\(\)\(\)\(\)\(\)\(\)\(\)\(\)\(\)\(\	2,020,000ps 2,040,000ps 2,060,000ps 2,	2,080,000ps 2,100,000ps	2,120,000ps	2,140,000ps 2,1
ADDRIAN				
DODRW				
DOOK FREQ Section Se				
Party Parte 149600 26000				
B ITS_TO_COUNT '48 \$\frac{1}{10} \frac{1}{10} \frac{1}{1				
CLOCK_FREQ 1e+08 1e+06				
CLOCK_FREQ				1.16+08
D CLOCK OUT 1e+06 106e+06				
P CLOCK_OUT 1e+06 1 1e+06 1 1e+06 1 1e+06 1 1e+06 1e+06 1e+06 1e+06 1e+06 1e+06 1e+06 1e+06 1e+08 1e+				96+07
Dow 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+08 14+04				000
P CLOCK_SYS 1e+08				0000
D D D D D D D D D D				1.16+08
D D D D D D D D D D				
P DW '432 32 P MEM_SIZE_IN_KBB '41 1 P NO_OF_REGS '4256 256 P NO_OF_REGS_REG_FILE '435 32 P NO_OF_SEGS '468 8 P REG_SIZE '45 5 P REG_SIZE 1 'A0000008 '0000008 '00000008 '00000008 Interpretation 'ho 'ho 'ho 'A0000000 '0000008 '00000008 '00000008 Interpretation 'ho 'ho 'ho 'ho 'ho 'ho 'ho 'ho Interpretation 'ho <				9e+07
MEM_SIZE_IN_KB 'd1 1 1 1 1 1 1 1 1 1				
No_OF_REGS No_OF_REGS 1435 256				
No_OF_BEGS_REG_FILE				
Package 148 8 8 8 8 8 8 8 8 8				
PEGW				
FEG_SIZE				
Tx Tx Tx Tx Tx Tx Tx Tx				
Included	(00000000)	00000000)	00000088 00000000	880000000
Incomposition 1.00	00 \	000	22 \ 00	(22
Incorporate				
	00000000 (000000000)	00000088	00000000	00000000 \
88000000 \ 00000000 \ 88000000 \ 0000000 \ 88000000 \ 00000000				
[c::]	000000000 (880000000)			
्राच_न्डध्या[31:0] 'h00000000 (00000) (00000088 (00000088 (000000000 (00000088 (00000000	(00000000 (00000000)	00000088	88000000 00000000	00000000

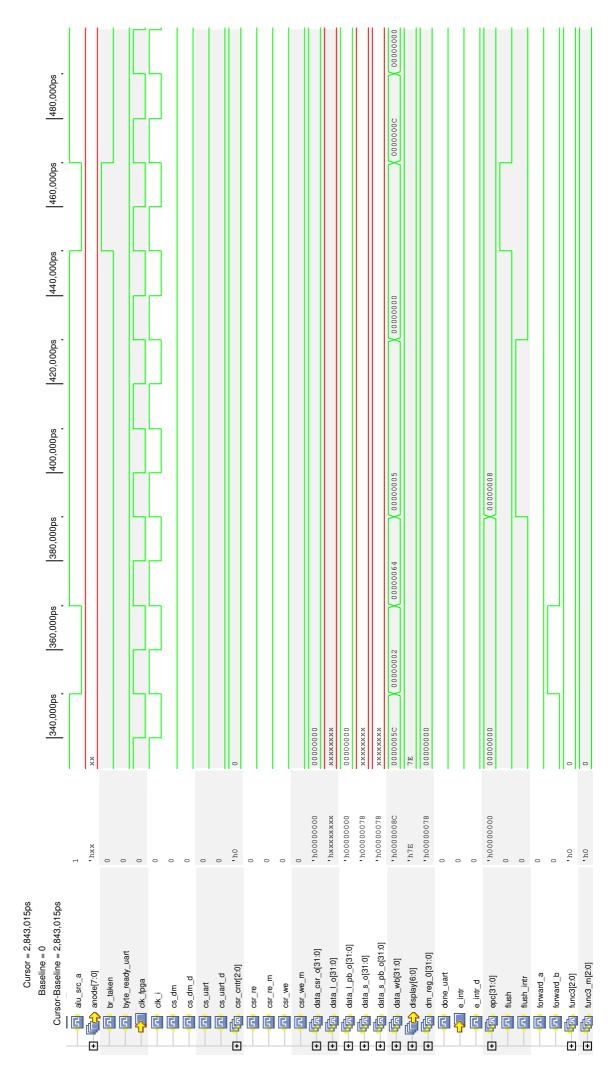
2, 320, 🗬							1.1e+08		70,00	36+07				1.16+08		9e+07									000	00 (000		000	00)	
2,300,000ps 2,							1.1		0	" ÷			06	1.1		0)									880000000 \	22		00000000 \		880000000 \	00000000 \	
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s 2,260,000ps																									00000000	00		00000088		00000000	00000088	
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sd000	ω	4	12	ω	0096	8	F 1.10+UX			F 1.18+00	1.05e+06	16+06	× × × × × × × × × × × × × × × × × × ×	000		0	32	1	256	32	80	S	32		00000000	00	0	880000000	×××××××	00000000	880000000	
	. d8	1 d4	'd12	.d8	00960.	, d8		1e+08			;	le+06			1e+08		'd32	'd1	'd256	'd32	.d8	, d5	'd32	1	'h00000088	'h22	, h0	1,400000000	'hxxxxxxx	'h00000088	, h000000000	1
Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps	_	ů.	+ ADDRW	+ ADDRW_DM	+ BAUD_RATE	BITS_TO_COUNT		CLOCK FREQ				P CLOCK_OUT			P CLOCK_SYS		MQ ±	# MEM_SIZE_IN_KB	+ NO_OF_REGS	H NO_OF_REGS_REG_FILE	+ NO_OF_SEGS	+ P REGW	+ P REG_SIZE	¥	+ data_mem[31:0]	+ 4 addr_dm[7:0]	-	1				alu_src

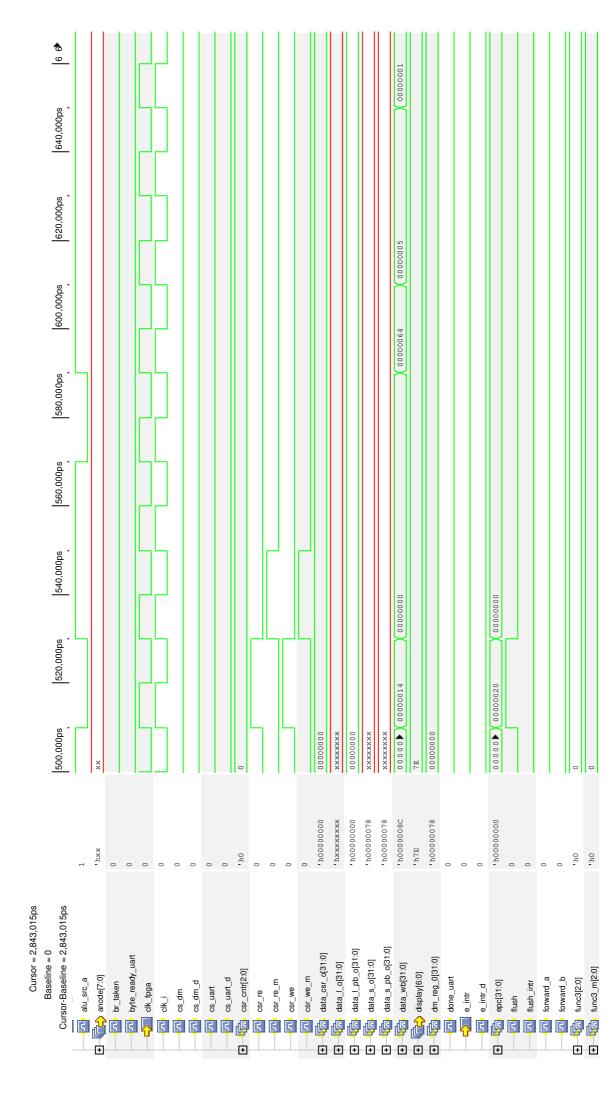
Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

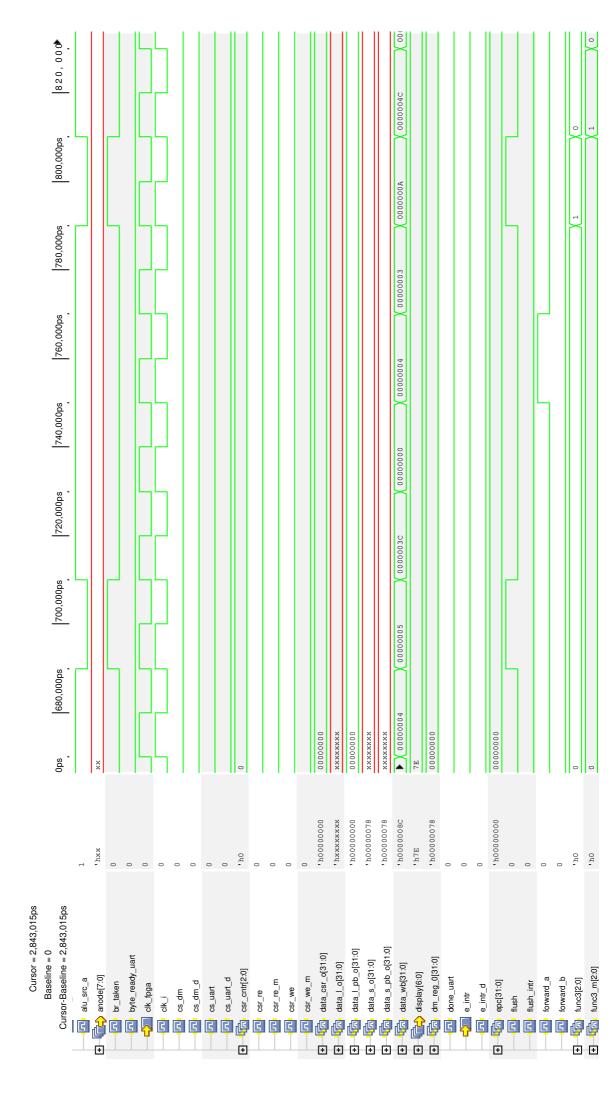
	<u>.</u>	2,340,000ps	00ps 2,360,000ps		2,380,000ps	2,400,000ps	2,420,000ps	2,440,000ps	s 2,460,000ps		2,480,000ps
	, d8 , d4	8 7									
	'd12	12									
ADDRW_DM	. d8	æ									
BAUD_RATE	00960.	0096									
BITS_TO_COUNT	. d8	œ									
		1.10+08									1.1e+08
CLOCK_FREQ	1e+08	1e+08									
		سلينيا ليب									9e+07 1.1e+06
CLOCK_OUT	1e+06	950000 - 950000 - 1.16+08									900000
CLOCK_SYS	1e+08	80+a1									000
	0 K T	32									9e+07
DW MEM SIZE IN KB	. d1) 									
NO_OF_REGS	, d256	256									
NO_OF_REGS_REG_FILE	1,432	32									
NO_OF_SEGS	, d8	80									
	1 d5	S									
	1 d32	32									
	1										
addr_data_mem[31:0]	1,4000000088	00000000	88000000 🗎	00000000	880000000		00000000	00000088	0000000	88000000	00000000
addr_dm[7:0]	'h22	00	22	00)	22	00 \	(22		00	(22	00
alu_control[2:0]	'h0	0									
alu_operand_1[31:0]	1,4000000000	0000088	00000000	00000088	00000000	Ĭ	000000088	00000000	88000000	000000000	880000000
alu_out_e[31:0]	'hxxxxxxx	×××××××									
alu_out_m[31:0]	'h00000088	00000000	88000000	00000000	880000000		00000000	00000088	00000000	88000000	00000000
alu result[31:0]	1 h000000000	88000000	00000000	880000000	00000000		00000088	00000000	88000000	00000000	880000000



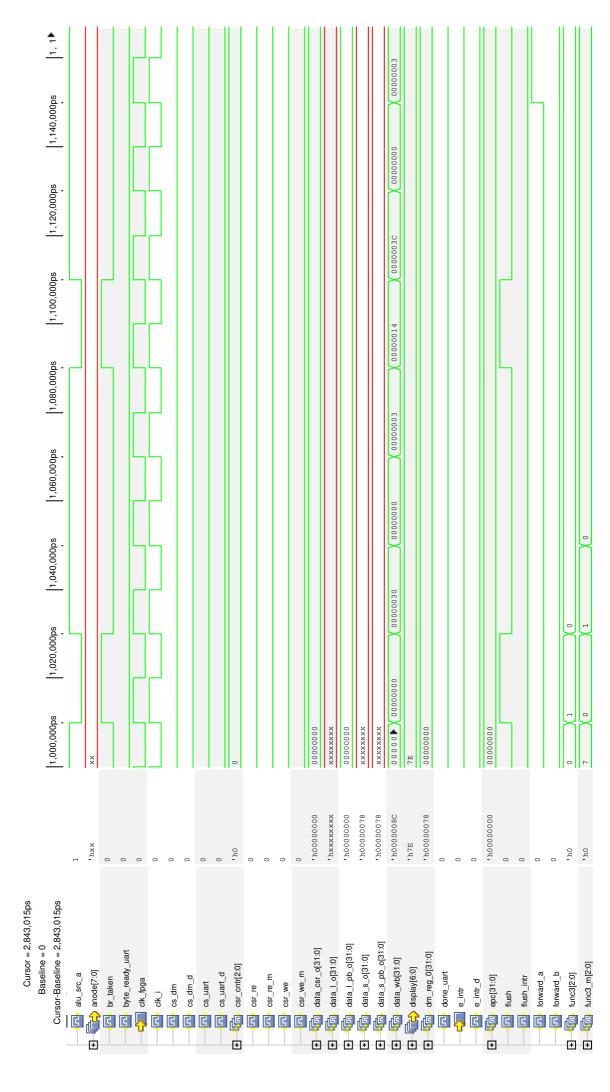


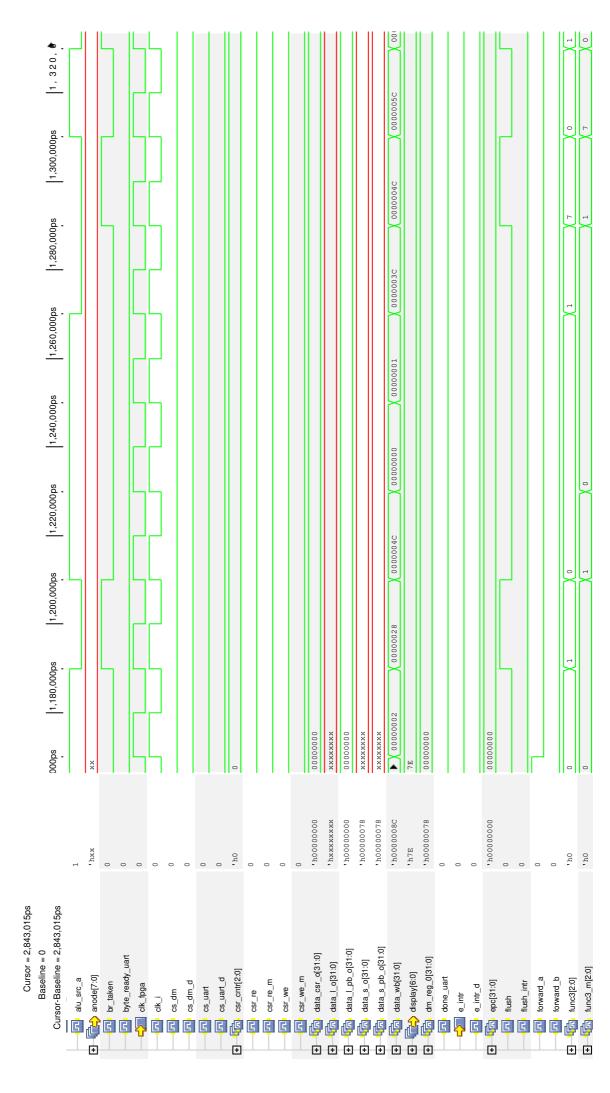






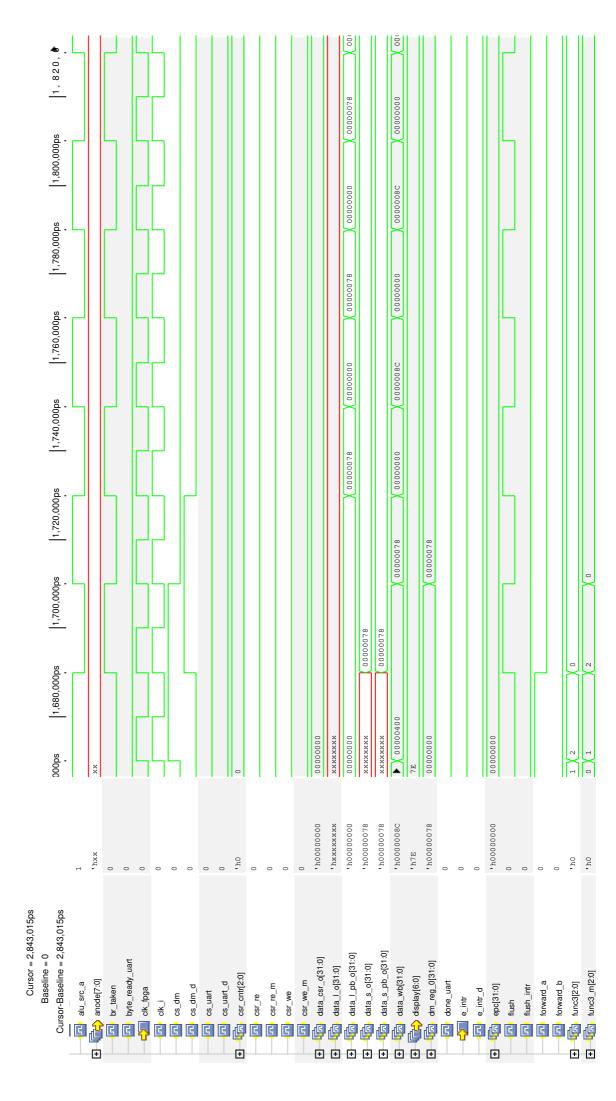




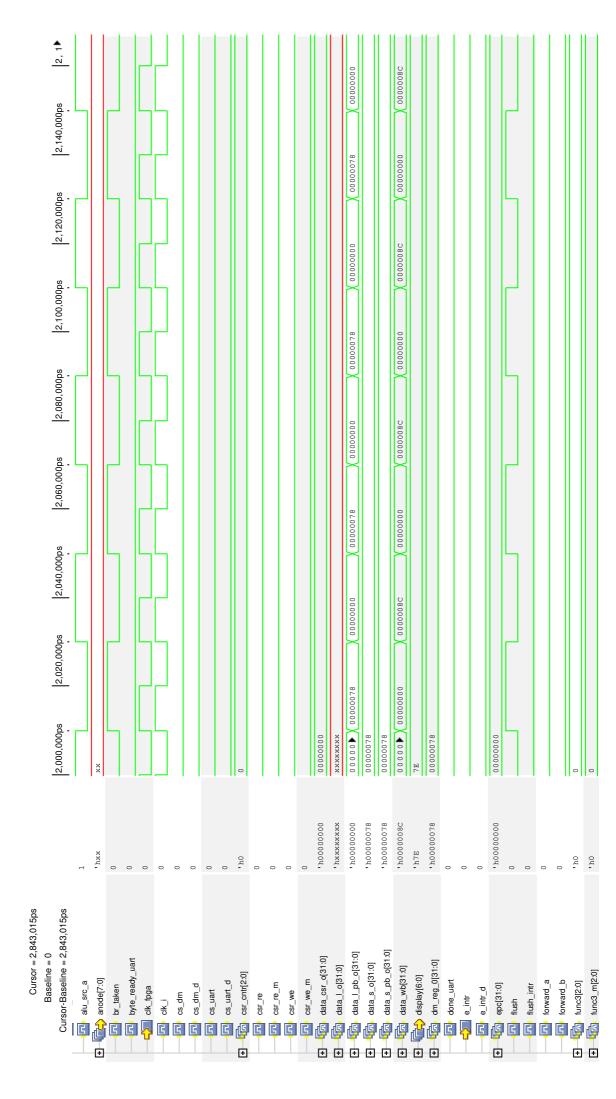


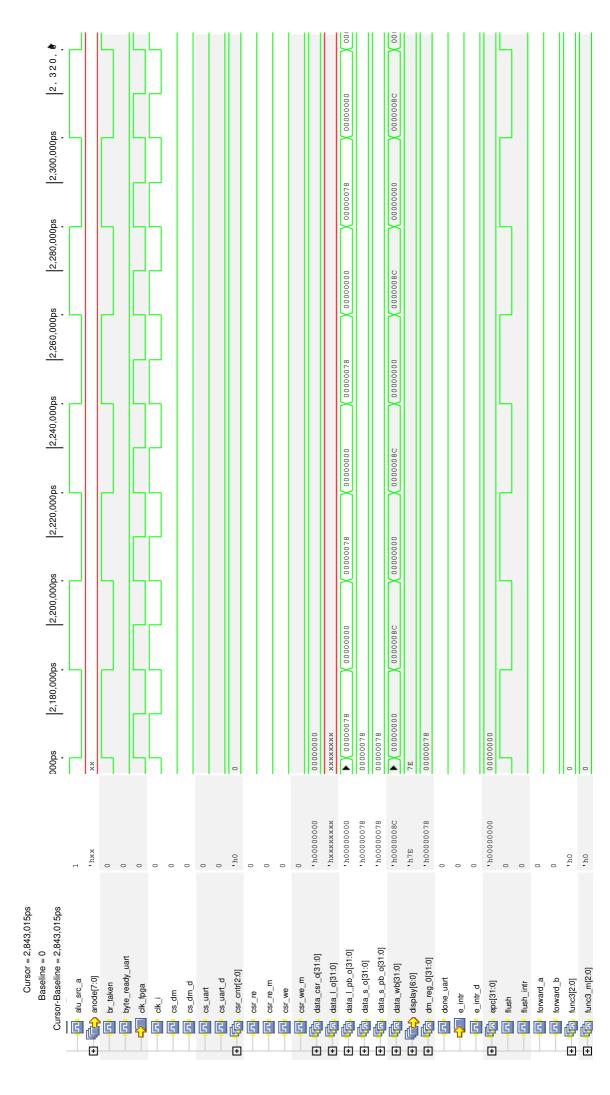














Cursor = 2,843,015ps		Baseline = 0	0									
Baseline = 0 Cursor-Baseline = 2,843,015ps		0	20,000ps	40,000ps	-	60,000,09	80,000ps	100,000ps		120,000ps	140,000ps	<u></u>
+	, 400	××	00	04	00			18	00			
+ fa going_in_alu_a[31:0]	· h000000000	*****	00000000					80000000	00000000			0000000
4	1h00000000	* × × × × ×	00000000									
+	'hxxxxxxx	xxxxxxx										
4	'h00000000	▲ ×××××	00000000		00000080	00000000	0000	80000000	00000300	00000001	0001	
قي ا	1,h00000000	▲ ×××××	00000000	28000000	00000000	80000000	0008	00000000	00000001		0	0000000
+ tim ext_d[31:0]	· h000000000	*****	00000000					80000000	000000300		0	00000001
+ 1 imm_src[2:0]	. h0	0		3	0			5	0			
	'h0000006F	* × × × × ×	08C0006F	00C0006F	00800B13	300B1073	1073	00100B93	007B9C13		0	00BB9C93
4	'h00000013	▲ ×××××	00000000	08C0006F	00000013	00800B13	0B13	300B1073	00100B93		0	007B9C13
4	' h0000006F	▲ ×××××	00000000		08C0006F	00000013	0013	00800B13	300B1073	00100B93)B93	
	0											
is mret	0											
+ The mask(3:0)	'hF	×										
+ 15 mask_dm[3:0]	'hF	×										
mem_write	0											
mem_write_m	0											
+	'h13	××	00	6F	13			73	13			
+ 1 opcode [[6:0]	'h6F	××	6F		13	73		13				
+ de opcode m[6:0]	'h6F	××	00		(6F	13			73	13		
+ P pc[31:0]	.h00000088	* × × × × × ×	00000000	00000004	00000080	060000000	0600	00000094	86000000			26000000
+	.h00000088	******	00000000			00000000	0080	06000000	00000094			86000000
+	'h0000008C	******	00000004	0000008C	06000000	00000094	0094	86000000	26000000			00000000
+ 1 pc_m[31:0]	'h00000088	★ ×××××	00000000					0000008C	06000000	00000094	0094	
+	1h0000008C	*xxxxx	00000004	80000000	06000000	00000094	0094	86000000	26000000			0000000A0
+ to pc_plus_4[31:0]	'h0000008C	*×××××	00000004	80000000	06000000	00000094	0094	86000000	260000000			000000A0
+ 15 pc_plus_4_d[31:0]	'h0000008C	*×××××	00000000	00000004		060000000	0600	00000094	86000000		0	26000000
+ to pc_plus_4_m[31:0]	'h0000008C	* ×××××	00000000		00000004			06000000	00000094	86000000	8600	
+	'h0000008C	*****	00000004	28000000	060000000	00000094	0094	86000000	26000000		°	00000000
+ 1 rd_m[4:0]	, h00	××	00					16	00	71		
+ rdata1[31:0]	1h00000000	* ×××××	00000000					0000	00000000			00000001
+ rdata2[31:0]	1,h000000000	*****	00000000									
+ data_data_mem[31:0]	1,4000000000	*****	00000000									

Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps		sd0(180,000ps	200,000ps	220,000ps	s 240,000ps	ps 260,000ps	ps 280,000ps	sd000'00E sd0C	_	320,000
+ tnnc7[6:0]	.h00	00			18	7B	00		02		00
+	, h00000000	00000001	000	08000000	08800000	00000000			00000000		000
+	'h00000000	00000000	000 \	00800000	00000000						
+ 15 imm_csr_d(31:0)	'hxxxxxxxx	×××××××									
+	'h00000000	▼ (00000007		0000000B	00000019	00000304	FFFFF68	00000000 \	00000002	00000048	000
+ ta imm_ext[31:0]	'h00000000	■ 00000000B		00000019	00000304	FFFFF68	00000000	00000005	00000048	00000044	00
+ imm_ext_d[31:0]	, h00000000	00000000		000000B	00000019	00000304		00000000	00000000	00000048	000
+ Imm_src[2:0]	'h0	0			5	3	0		2		0
4	'h0000006F	▶ 019C0D33		304D1073	F69FF06F	×××××××	00500193	0401C463	04018263	00200093	04:
+ 15 instr_d[31:0]	'h00000013	▼ 00BB9C93		019C0D33	304D1073	F69FF06F	00000013	00500193	0401C463	04018263	000
+ ha instr_m[31:0]	'h0000006F	▶ 007B9C13		00BB9C93	019C0D33	304D1073	F69FF06F	00000013	00500193	0401C463	041
intr	0										
is_mret	0										
+ 15 mask[3:0]	'hF	×									
+	'hF	×									
mem_write	0										
mem_write_m	0										
+ de opcode_d[6:0]	'h13	13	33		73	(6F	13		(63		13
+ 15 opcode_[[6:0]	'h6F	33	73		6F	××	13	(63		13	63
+ docode_m[6:0]	'h6F	13			33	73	(6F	13		(63	
+ P pc[31:0]	'h00000088	▼ X 000000A0		000000A4	000000088) 000000AC	00000010	00000014	00000018	00000010	000
+	'h00000088	26000000	Ĭ	00000000	000000A4	00000088		00000010	00000014	00000018	000
+ 15 pc_final[31:0]	'h0000008C	▶ 000000A4	Ĭ	000000A8	000000AC	00000010	00000014	00000018	00000010	00000020	00
+ 15 pc_m[31:0]	'h00000088	86000000	Ĭ	26000000	00000000	(000000A4	00000088		00000010	00000014	000
+	'h0000008C	▼ 000000A4	Ĭ	000000A8	000000AC	00000000	00000014	00000018	00000010	00000020	000
+ L pc_plus_4[31:0]	'h0000008C	▶ 000000A4		000000A8	000000AC	00000000	00000014	00000018	00000010	00000020	000
+ 15 pc_plus_4_d[31:0]	'h0000008c	▶ 0000000A0	\bigcap	000000A4	000000088	(000000AC		00000014	00000018	00000010	000
+	'h0000008C	26000000 🗎	Ĭ	000000A0	000000A4	00000088	000000AC		00000014	00000018	000
+ the pc_target[31:0]	'h0000008C	▶ 000000A4	\bigcap	000000A8	000000AC	00000010	00000014	00000018	00000010	00000020	00
+ 1 rd_m[4:0]	'h00	18	19		1A	00 (03	80	04
+ 15 rdata1[31:0]	'h00000000	00000001	000	08000000	•0000 •0000	00000000			0000000	0005	000
+	'h00000000	00000000		•0000	00000000						
🛨 पिने rdata_data_mem[31:0]	, h00000000	00000000									

3 stage pipelined RISC-V Core Ahsan Ali (2019-EE-115)

00000000 070000E 0000013 00300133 00000028 00000000 00000000 00000020 00000000 0000000 02 13 6F 400,000ps 00128293 00300133 00000000 00300233 00000024 00000030 00000028 0000000 0000000 00000020 00000028 800000000 00000020 00000030 13 33 380,000ps 0000044 00300233 0000002C 00000000 00000000 0000044 00300133 04118263 00000028 00000024 00000020 00000020 0000002C 00000028 00000024 0000000 00000020 63 360,000ps 00300233 00000002 00000044 04118263 0000001C 00000028 00000024 00000002 00000000 00200093 00000020 00000028 00000028 00000020 00000000 00000024 00000028 02 63 33 13 340,000ps 00000044 000001C 0000018 00000024 00000024 00000010 xxxxxxx 0000000 00000044 04118263 00200093 04018263 0000024 00000020 00000024 00000000 00000000 00000020 .hoooooooo hxxxxxxx , h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h00000088 , h0000008C , h00000088 1 h0000008C , h0000008C h00000000 1 h000000000 .h00000088 , h0000008C , h0000008C h0000008C . h00 'h13 'h6F 'h6F . PO . hF hF Cursor = 2.843.015psCursor-Baseline = 2,843,015ps going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] obcode_m[6:0] pc_target[31:0] imm_ext[31:0] mem_write_m mask_dm[3:0] obcode_d[6:0] obcode_f[6:0] pc_final[31:0] pc_next[31:0] imm_src[2:0] instr_m[31:0] inst_o[31:0] instr_d[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] pc[31:0] is_mret int. 999999 ⊕ ⊕ \bullet \bullet \bullet \bullet \bullet \bullet \bullet • • • • • • • • • • • • • • •

01400A13

00000013

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01400A13 00000013 070000EF

0740006F

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00000000 00000000

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480,000ps

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420,000ps

00

03

08000000 08000000

00000007

00000010 00000010

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800000000

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37000000 00000080

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00000000 00000000 00000078

13 13 6F

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, h00000000 , h00000000 , h00000000

rdata1[31:0] rdata2[31:0]

0000

00000000

0000000

rdata_data_mem[31:0]

Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

*****9 00000001 00000000 FFFFFFF 004001B3 FFF10113 00000000 0000002C 00000038 00000034 00000000 00000000 00000001 00128293 00000034 00000038 00000038 00000000 00000038 00000000 33 640,000ps FFF10113 00128293 00000034 00000034 00000000 00000000 00000002 00300133 00000000 00000002C 00000034 00000028 0000002C 00000034 02 13 620,000ps 00128293 00300133 00300233 00000000 00000030 0000002C 00000028 0000000 0000002C 00000028 0000000 00000024 00000030 00000000 13 33 600,000ps 00000044 00000000 00000000 00000044 0000000 00300133 00300233 04118263 00000028 00000024 00000020 00000020 00000020 00000020 00000028 00000024 00000020 00000000 0000000 63 04 00 33 580,000ps 00300233 00000020 00000000 0000000 00000000 00000024 00000028 00000028 00000028 00000024 00000028 00000000 00000002 00000044 04118263 02 63 33 560,000ps 00000000 00000013 540,000ps 00000302 04118263 0000013 30200073 0000000 00000024 00000000 00000000 00000020 00000024 00000024 0000000 00000024 00000000 00 00 13 63 73 520,000ps 000000 0000000 0000000 00000000 000000 000000 00000302 01400 30200073 000000 00000084 000000 00000014 30200 V 00A00A93 00000 V 01400A13 000000 00000020 0000000 08000000 \ 4000000 000000 \ 00000070 08000000 | 4000000 000000 V 4000007C 000000 00000084 73 13 14 xxxxxxx 00000000 00000000 00000000 .hoooooooo hxxxxxxx h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h00000088 , h0000008C , h00000088 , h0000008C , h0000008C , h00000000 , h00000000 , h00000000 h00000000 1 h000000000 .h00000088 , h0000008C , h0000008C h0000008C 1 h00 'h13 'h6F 'h6F , h0 . hF hF Cursor = 2.843.015psCursor-Baseline = 2,843,015ps rdata_data_mem[31:0] going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] pc_target[31:0] imm_ext[31:0] obcode_m[6:0] mem_write_m mask_dm[3:0] obcode_d[6:0] obcode_f[6:0] pc_final[31:0] pc_next[31:0] instr_m[31:0] imm_src[2:0] inst_o[31:0] instr_d[31:0] rdata1[31:0] rdata2[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] pc[31:0] is_mret ıt. 999999 ⊕ ⊕ • • • • • • • • • • • • • •

•	ops 680,000ps		700,000ps 720,	720,000ps 7.	740,000ps	760,000ps	sc 780,000ps		800,000ps 820	820,000
\succeq	0.0				7F		00) 7F	00	7F
X	00000000				000	00000004	00000000	00000000	00000000	00
H	0000000	00000000 🚶		00000004	000	00000000	00000005	00000001	00000000	
×××	xxxxxxx									
	FFFFFF	00000004	00000010	00000000	000 (00000002	FFFFFF	0000000 (FFFFF8	00
°	0000004	00000010	00000000	00000005	FFF	FFFFFF	00000003	Y FFFFFF8	00000000	FF
Ē	म स स स स स स स स स स	00000004		00000000	000	00000002	HEFFFFF	00000000		00
0		3	0					2	0	
0	0100006F	FE111AE3	002003B3	FFF38393	003	00320233	FE539CE3	FESFFO6F	FFF38393	00
8	004001B3	0100006F	00000013	002003B3	FFF	FFF38393	00320233	FE539CE3	00000013	FF
FF	FFF10113	004001B3	0100006F	00000013	002	002003B3	FFF38393	00320233	FE539CE3	00
v										
33		6F	13	33	13		33	(63	13	
6F		(63	33	13	33		(63) 6F	13	33
13		33	(6F	13	33		13	33	(63	13
ŏ	00000038	0000003	00000048	00000040	000	00000000	00000054	00000058	00000040	00
ŏ	00000034	8 0000000 🚶		00000048	000	0000004C	00000000	00000054		00
Õ	0000003C	00000048	00000040	00000020	000	00000054	00000058) 0000004C	00000000	00
	00000000	00000034	86000000		000	00000048	0000004C	00000000	00000054	
	0000003C	00000040	00000040	00000020	000	00000054	00000058	0000005C	00000000	00
ŏ	0000003C	00000040	00000040	00000020	000	00000054	00000058	00000000	00000000	00
00	00000038	0000003		00000040	000 (00000000	00000054	00000058		00
	00000034	8 0000000 \	0000003C		000 (0000004C	00000000	00000054	00000058	
X	0000003C	00000048	0000004C	00000020	000	00000054	00000058) 0000004C	00000000	000
	02	(03	00		07			04	19	00
X	00000000					0000	\simeq	00000000	00000000	00
`	2000000	0000000		7	7	000000	3000000	10000001	00000000	

3 stage pipelined RISC-V Core Ahsan Ali (2019-EE-115)

920,000ps 00000000 00000054 0000000 00000000 FFFFFFF 00320233 FFF38393 0000013 00000000 0000004C 00000054 00000054 00000000 00000054 0000000 00 7 F 33 13 900,000ps FFFFFF8 00000000 00000000 FFF38393 00000000 00000000 00000000 00000000 00000000 0000013 FE539CE3 0000040 00000054 00000000 00000058 00000000 19 00 13 13 63 880,000ps FFFFFF8 FE539CE3 00000028 0000005 0000005 00000002 0000000 FE5FF06F 00320233 00000054 000004C 00000000 00000058 00000054 0000004C 00000002 00000001 00000000 0000000 04 63 9 E 860,000ps 00000000 00320233 0000004C 00000058 00000058 00000054 0000000A 00000000 FFFFFFF 00000000 FFFFFFF FE539CE3 FFF38393 00000000 00000058 00000000 00000000 00000054 00000058 7.0 00 33 63 840,000ps 00000000 0000054 00000054 00000054 00000058 00000000 xxxxxxx 00000000 00320233 00000000 0000004C 00000054 00000000 00000054 0000000 00000000 FFFFFFF FFF38393 0000013 00000000 0000000 .hoooooooo h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h0000008C , h0000008C , h0000008C , h00000000 , h00000000 .hoooooooo hxxxxxxx , h00000000 .h00000088 .h00000088 h00000088 , h0000008C , h0000008C h0000008C 1 h00 'h13 'h6F 'h6F , h0 . hF hF Cursor-Baseline = 2,843,015ps Cursor = 2.843.015ps going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] pc_target[31:0] imm_ext[31:0] obcode_m[6:0] mask_dm[3:0] mem_write_m obcode_d[6:0] obcode_f[6:0] pc_next[31:0] instr_m[31:0] pc_final[31:0] imm_src[2:0] instr_d[31:0] rdata1[31:0] rdata2[31:0] inst_o[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] pc[31:0] is_mret ıt. 999999 ⊕ ⊕ • • • • • • • • • • • • • •

00000013

FE5FF06F

FE111AE3

00100213 FE5FF06F FE539CE3

FE5FF06F FE539CE3 00320233

FE539CE3 00320233 FFF38393

FFFFFFF8

FFFFFE4 0000000

FFFFFF8 FFFFFFE4

> FFFFFF8 00000000

> > FFFFFFF

0000000

FFFFFFF 00000000

0000000

00

00000000

00000001

0000000E 00000000

00

00000001

980,000ps

960,000ps

940,000ps

00000040

0000003C

00000058

00000054

0000005

00000058

00000054 00000000 00000058 0000004C 00000058 00000028 00000054 00000000 00000058

0000000

0000000

00000000

6F

13 63

6F 13 63

63 6F 33

33 63 00000040

09000000 09000000

00000054

00000000 0000005 0000005 00000058 00000054

00000040

00000040

00

0000000

00000000

00000058

0000003

00000005

04

0.7

00000000

0000000

0000000 0000000

0000000

00000000

, h00000000

rdata_data_mem[31:0]

Cursor-Baseline = 2,843,015ps		1,000,000ps	1,020,000ps 1,0	1,040,000ps	1,060,000ps	1,080,000ps	1,100,000ps)ps 1,120,000ps	000ps 1,140,000ps	000ps 1, 1
func7[6:0]	, h00	00 \ 7F	00) 7F	00					7E
going_in_alu_a[31:0]	· h000000000	000000 00000004	00000000	00000004	00000000	00				00000000
going_in_alu_b[31:0]	١ ٢٥ ٥٥ ٥٥ ٥٥ ٥٥	000000 00000000	00000000		00000014	Ĭ	00000000		00000000	00000000
imm_csr_d[31:0]	'hxxxxxxx	xxxxxxx								
imm_csr_m[31:0]	, h00000000	FFFF ▶ 000000000	FFFFFF4	00000000	FFFFFF		00000004	00000010	00000000	00000005
imm_ext[31:0]	· h00000000	00000 FFFFFF4	00000000	THEFFFF	00000004		00000010	00000000	00000000	HFFFFF
imm_ext_d[31:0]	, h00000000	FFFF 00000000			FFFFFF	Ĭ	0000004		00000000	00000000
imm_src[2:0]	. h0	0	0			3		0		
inst_o[31:0]	' h0000006F	FE111 ► 0280006F	FFF10113	004001B3	0100006F	Ĭ	FE111AE3	X 002003B3	FFF38393	00320233
instr_d[31:0]	h00000013	00000 FE111AE3	00000013	FFF10113	004001B3	Ĭ	0100006F	00000013	002003B3	FFF38393
instr_m[31:0]	'h0000006F	FE5FF ♥ 00000013	FE111AE3	00000013	FFF10113		004001B3	X 0100006F	00000013	002003B3
intr	0									
is_mret	0									
mask[3:0]	' hF	×								
mask_dm[3:0]	'hF	×								
mem_write	0									
mem_write_m	0									
[0:9]p¯epoodo	'h13	13 63	13		33) 6F		13	33	13
obcode_f[6:0]	'h6F	63 (6F	13	33	\ 6F	(63		(33	13	33
opcode_m[6:0]	'h6F	6F 13	(63	13		33		(6F	13	33
pc[31:0]	'h00000088	000000 00000000000000000000000000000000	000000030	00000034	8 0000000		0000003C	00000048	0000004C	00000020
pc_d[31:0]	*h00000088	000000 00000030		00000030	00000034	Ĭ	00000038		00000048	00000040
pc_final[31:0]	'h0000008C	0000000		8 00000038	Ĭ	Ĭ	00000048	0000004C	00000000	00000054
pc_m[31:0]	*h00000088	00000028	0000003C		00000000	Ĭ	00000034	8 0000000		00000048
pc_next[31:0]	'h0000008C	000000 00000044	00000034	8 00000038	00000030	Ĭ	00000040	0000004C	00000000	00000054
pc_plus_4[31:0]	'h0000008C	000000	00000034	8 00000038	0000003	Ĭ	00000040	0000004C	00000000	00000054
pc_plus_4_d[31:0]	'h0000008C	000000 00000000000000000000000000000000		00000034	8 0000000	Ĭ	0000003C		0000004C	00000020
pc_plus_4_m[31:0]	, h0000008C	0000002C	00000040		00000034	Ĭ	00000038	0000003C		0000004C
pc_target[31:0]	, h0000008C	0000000	00000034	880000000	0000000	Ĭ	00000048	0000004C	00000000	00000054
rd_m[4:0]	. h00	00	15	00	02	03		00		70)
rdata1[31:0]	· h000000000	000000	00000000	00000004	00000000	00				000
	0000001		7		1,000000	ľ	000000		20000000	0000000

		sdnnn	1,180,000ps	1,200,000ps			1,240,000ps 1,26	1,260,000ps	-	sd000,000;	-, 010, -
©	, h00	00	7E		00	7F	00	7E		00 \	
4	, 4000000000	▶ 00000014)14 00000002	0002	00000000	00000002	00000028	00000001	000000000		
	, h000000000	▶ 00000014	114 00000001	0001	00000000		00000014	00000001		00000000	
+ 1 1 imm_csr_d[31:0]	hxxxxxxx	××××××									
+ 15 imm_csr_m[31:0]	, h000000000	मसमस्यम् ▲	FF (00000003	0003	FFFFFF8	00000000	HEFFFFF	00000003	8 44 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	FFFFFE4	
+ + imm_ext[31:0]	· h000000000	00000003)03 FFFFFF8	FFF8	00000000	मसमसमसस 🗎	0000000	FFFFFF8	FFFFFE4	00000000	
4	, h000000000	FFFFFF	FF (00000003	0003		00000000	FFFFFF	00000003	FFFFFF		
+ 15 imm_src[2:0]	, h0	0	2		0			2	3	0 \	
(G	' h0000006F	► FE539CE3	E3 FESFFOGF	F06F	FFF38393	00320233	FE539CE3	FESFFOGF	00100213	FE111AE3	
+ 15 instr_d[31:0]	'h00000013	▶ 00320233	:33 FE539CE3	9CE3	00000013	FFF38393	00320233	FE539CE3	FESFF06F	00000013	
+ 15 instr_m[31:0]	'h0000006F	► FFF38393	393 00320233	0233	FE539CE3	00000013	FFF38393	00320233	FE539CE3	FESFF06F	
intr	0										
is_mret	0										
+ mask(3:0)	'hF	×									
+ The mask_dm[3:0]	'hF	×									
mem_write	0										
mem_write_m	0										
+ the opcode_d[6:0]	'h13	33	(63		13		33	(63) 6F	13	
+ 1	'h6F	6 3	OF.		13	(33	83	(6F) 13	(63	
+	'h6F	13	33		(63	13		33	83) 6F	
+ 1 1 pc[31:0]	'h00000088	▶ 00000054)54 00000058	0058	0000004C	00000000	00000054	00000028	00000002	0000003	
Т	'h00000088	▶ \ 00000050	150 00000054	0054		0000004C	00000000	00000054	00000028		
+ 1 pc_final[31:0]	'h0000008C	▶ 000000058	158 0000004C	004C	00000000	00000054	00000058	00000020	00000030	00000040	
+ 1 1 pc_m[31:0]	'h00000088	▶ 0000004C	14C \ 00000050	0020	00000054		00000040	00000020	00000054	00000028	
+ Fin pc_next[31:0]	'h0000008C	▶ 000000058	Ĭ	0000005C	00000000	00000054	00000058	00000020	09000000	\bigcap	
+ 15 pc_plus_4[31:0]	'h0000008C	00000028)58 0000005C	0050	00000000	00000054	00000028	00000020	09000000	00000040	
+ 15 pc_plus_4_d[31:0]	'h0000008C	▶ 00000054)54 (00000058	0058		00000000	00000054	00000028	0000002		
+ 15 pc_plus_4_m[31:0]	'h0000008C	000000020)50 00000054	0054	00000058		00000020	00000054	00000028	00000002	
+ The pc_target[31:0]	'h0000008C	▶ 000000028)58 0000004C	004C	00000000	00000054	00000028	00000020	0000003	00000040	
+ 1 1 rd_m[4:0]	'h00	0.7	0.4		19	00	70)	0.4	19	00 (
+ 1	, h000000000	▶ 00000014	Ĭ	0002	00000000	00000000	00000028	00000001	00000000		
+ 1 1 rdata2[31:0]	, h00000000	00000014	114 00000001	0001	00000000		00000014	00000001		00000000	

Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

FE539CE3 00000040 0000000 FFFFFF 00000000 00320233 FFF38393 0000000 000000 0000000 0000000 00000030 0000000 FFFFFF 0000000 0000000 0000000 00000008 63 00 33 1,480,000ps 00000000 00000000 FFFFFFF FFF38393 00000000 00000000 00320233 002003B3 00000000 0000004C 00000054 00000048 00000054 00000054 00000000 0000004C 00000054 00000000 13 33 07 1,460,000ps 00000000 00000000 00000000 FFF38393 002003B3 0000004C 00000048 00000000 00000000 0000004C 00000002 0000013 00000000 00000000 0000000 33 13 13 1,440,000ps 00000010 00000000 002003B3 0000013 010000EF 0000048 000004C 00000038 0000004C 00000040 0000000 0000004C 13 33 6F 00 1,420,000ps 00000004 00000010 00000040 00000004 FE111AE3 0000000 0000048 0000040 00000038 00000000 00000000 010000EF 004001B3 00000038 0000034 0000003 0000048 6Е 63 33 03 1,400,000ps 00000004 FFFFFFF 0000003 0000003 FFFFFFF 010000E 0000003 004001B3 00000034 0000000 00000000 0000003 00000038 00000034 00000000 00000000 FFF10113 00000038 0000003 02 00 33 6F 1,380,000ps FFF10113 0000000 00000038 0000000 00000000 004001B3 0000013 0000034 00000000 00000038 00000034 0000000 0000000 FFFFFFF 00 33 1,360,000ps FFFFFF4 0000013 FE111AE3 0000034 00000000 00000000 00000000 00000000 FFF10113 0000034 00000034 00000034 00000000 0000000 00000040 00000000 15 00 13 13 63 1,340,000ps 00000000 00000058 0000044 00000044 xxxxxxx 00000000 FFFFFF4 FE111AE3 0000040 00000040 00000050 00000000 0000000 0000000 00000002 00000000 0280006F 0000013 0000003C 00000000 0000000 .hoooooooo , h000000000 , h00000000 h00000013 , h0000006F , h0000008C , h0000008C , h0000008C , h00000000 h00000000 .hoooooooo hxxxxxxx , h00000000 , h0000006F .h00000088 .h00000088 h00000088 , h0000008C , h0000008C h0000008C , h00000000 1 h00 'h13 'h6F 'h6F , h0 . hF hF Cursor-Baseline = 2,843,015ps Cursor = 2.843.015ps rdata_data_mem[31:0] going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] pc_target[31:0] imm_ext[31:0] obcode_m[6:0] mem_write_m mask_dm[3:0] obcode_d[6:0] obcode_f[6:0] pc_next[31:0] instr_m[31:0] pc_final[31:0] imm_src[2:0] instr_d[31:0] rdata1[31:0] rdata2[31:0] inst_o[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] is_mret pc[31:0] ıt. 999999 ⊕ ⊕ • • • • • • • • • • • • • • 1,6

Computer Architecture

3 stage pipelined RISC-V Core Ahsan Ali (2019-EE-115)

Cursor = 2.843.015ps

0000 00000001 00000000 00000000 00412023 00A09113 00000000 00000000 00000074 00000068 00000074 00000074 00000000 00000000 00000074 00000000 00000001 00100093 00000000 23 1,640,000ps 00000000 00000000 00000000 00A09113 00100093 00000000 00000000 00000000 0000013 00000000 89000000 00000000 29000000 00000000 00000000 13 1,620,000ps 00100093 00000013 00000000 00000000 29000000 00000028 00000000 0280006F 00000068 0000000 00000040 0000044 13 13 6F 00 00 1,600,000ps 00320233 00000000 00000000 FFFFFF4 00000028 FFFFFF4 0280006F FE111AE3 0000044 00000040 00000068 0000003 0000048 0000048 0000044 00000040 89000000 00000000 00000000 15 6Е 33 63 1,580,000ps FFFFFF4 00000000 0000003 00000044 00000040 00000044 00000000 0000000 00000002 00000000 0280006F FE111AE3 00000040 00000044 00000044 0000000 0000013 63 6F 13 1,560,000ps 00000000 00000000 FFFFFE4 00000040 00000040 FE111AE3 00000013 00000040 0000040 FE5FF06F 0000000 00000008 0000000 00000000 00 00 13 63 6F 1,540,000ps FFFFFE4 FFFFFF8 00100213 FE5FF06F FE539CE3 00000005 0000003 00000054 09000000 09000000 00000005 00000058 FFFFFF8 00000058 0000003 00000000 00000000 19 13 6F 63 1,520,000ps 00320 FE539CE3 000000 FFFFF V 00000003 00000 FFFFFF8 FE539 F FESFF06F FFF38 ► 00320233 000000 00000054 000000 0000000 00000020 000000 000000000 000000 \ 00000058 000000 00000054 000000 00000001 FFFFF (00000003 000000 00000028 000000 000000000 000000 00000001 0000000 00000000 000000 00000000 63 6F 33 04 xxxxxxx 00000000 .hoooooooo h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h0000008C , h0000008C , h0000008C , h00000000 , h00000000 h00000000 h00000000 hxxxxxxx , h00000000 , h00000088 , h00000088 h00000088 , h0000008C , h0000008C h0000008C 1 h00 'h13 'h6F 'h6F , h0 . hF hF Cursor-Baseline = 2,843,015ps rdata_data_mem[31:0] going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] pc_target[31:0] imm_ext[31:0] obcode_m[6:0] mask_dm[3:0] mem_write_m obcode_d[6:0] obcode_f[6:0] pc_next[31:0] instr_m[31:0] pc_final[31:0] imm_src[2:0] instr_d[31:0] rdata1[31:0] rdata2[31:0] inst_o[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] pc[31:0] is_mret ıt. ⊕ ⊕ • • • • • • • • • • • • • •

Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

00 00 1,820, 🖢 06000000 00000000 88000000 06000000 87000000 00800B13 88000000 0000000E 0000013 13 13 6F 1,800,000ps 00000088 00000000 00000080 00000013 00000080 00000080 00000000 000000E 0000006F 13 6F **6F** 1,780,000ps 00000080 00000088 06000000 00800B13 000000E 0000013 06000000 00000088 00000078 6F 13 13 1,760,000ps 00000080 00000088 00000080 00000080 000000E 0000013 000000E 00000088 0000000 00000080 00000000 13 9 E 9 E 1,740,000ps 00000080 06000000 06000000 00000078 000000E 00000088 00000088 00000080 00000000 00800B13 0000013 00000088 6Е 13 13 1,720,000ps 00000014 0000013 00000080 00000080 00000000 00000000 00000000 000000E 0140006F 00000088 00000000 00000074 00000080 00000078 9 E 9 E 1,700,000ps 0000007 00000014 00000014 00000000 00000014 01400A13 0140006F 00000078 00000074 00000088 00000000 0000007C 00000074 00000000 (00000) 00000 00000000 00000000 00412023 00000078 880000000 6F 13 1,680,000ps ► 00000000A 00000078 00000000 00000078 00000078 00000074 00000000 00000078 00000400 00000078 00000000 0000000 0140006F 00412023 00A09113 00000074 00000000 00000078 xxxxxxx 00000000 23 02 9 E .hoooooooo hxxxxxxx , h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h00000088 , h0000008C , h00000088 , h0000008C h0000008C h0000008C , h0000008C , h00000000 , h00000000 h00000000 h00000000 , h00000000 , h00000088 h0000008C 1 h00 'h13 'h6F 'h6F . hF hF Cursor = 2.843.015psCursor-Baseline = 2,843,015ps rdata_data_mem[31:0] going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] obcode_m[6:0] pc_target[31:0] imm_ext[31:0] mem_write_m mask_dm[3:0] obcode_d[6:0] obcode_f[6:0] pc_final[31:0] pc_next[31:0] imm_src[2:0] instr_m[31:0] inst_o[31:0] instr_d[31:0] rdata1[31:0] rdata2[31:0] mem_write pc_m[31:0] pc_d[31:0] mask[3:0] func7[6:0] rd_m[4:0] pc[31:0] is_mret int 999999 ⊕ ⊕

Cursor = 2,843,015ps Baseline = 0 Cursor-Baseline = 2,843,015ps		1,840,000ps	0ps 1,860,000ps	ps 1,880,000ps	0000s (1,900,000ps	1,920,000ps	1,940,000ps		1,960,000ps	1,980,000ps
+ 1 time func 7 [6:0]	, h00	00								
+ fa going_in_alu_a[31:0]	.h00000000	00000000								
+ The going_in_alu_b[31:0]	'h00000000	00000000								
+ + imm_csr_d(31:0]	'hxxxxxxx	×××××××								
+ 15 imm_csr_m[31:0]	1,40,0000000	00000000								
+ tal imm_ext[31:0]	, h00000000	00000000								
+ imm_ext_d[31:0]	.hoooooooo	00000000								
+ imm_src[2:0]	, ho	0	3	0	3	0 \	3	0	3	0
+ 1 inst_o[31:0]	'h0000006F	000000E	00800B13	O000006F	00800B13	0000006F	00800B13	0000006F	00800B13	0000006F
+ 1 instr_d[31:0]	'h00000013	00000013	0000006F	00000013	0000006F	00000013	0000006F	00000013	0000006F	00000013
+ 1 instr_m[31:0]	'h0000006F	000000E	00000013	0000006F	00000013	X 0000006F	00000013	0000006F	00000013	0000000E
intr	0									
is_mret	0									
+ 1 mask[3:0]	'hF	Ēų								
+ + mask_dm[3:0]	'hF	Ēι								
mem_write	0									
mem_write_m	0									
+ + opcode_d[6:0]	'h13	13	(6F	13	V 6F	13	(6F	13) 6F	13
+	'h6F	6F) 13	(6F) 13	(6F	13	(6F	13) 6F
epcode_m[6:0]	'h6F	6F	13	(6F	13) 6F	(13	(6F	13	(6F
+ po[31:0]	'h00000088	00000088	28000000	88000000	00000080	88000000	00000080	88000000	00000080	00000088
+ 1 pc_d[31:0]	'h00000088	00000088								
+ 15 pc_final[31:0]	'h0000008C	0000008C	88000000	00000080	88000000	0000008C	88000000	0000008C	880000000	00000080
+ 1 pc_m[31:0]	'h00000088	00000088								
+	'h0000008C	0000008C	06000000	00000080	06000000	0000008C	06000000	00000080	06000000	00000080
+ 15 pc_plus_4[31:0]	'h0000008C	0000008C	06000000	00000080	06000000	0000008C	06000000	0000008C	06000000	00000080
+ 15 pc_plus_4_d[31:0]	'h0000008c	0000008C								
+ 15 pc_plus_4_m[31:0]	'h0000008C	0000008C								
+ The pc_target[31:0]	'h0000008C	00000080	88000000	28000000	88000000	0000008C	88000000	00000080	880000000	00000080
+ 1 rd_m[4:0]	'h00	00								
+ 1 rdata1[31:0]	'hoooooooo	00000000								
+ 1	'h00000000	00000000								
🛨 पिक rdata_data_mem[31:0]	, h000000000	00000000	8 0 0 0 0 0 0 0 1 8	00000000 🚶	00000078	00000000	00000078	00000000 \	00000078	00000000

Cursor = 2,843,015ps Baseline = 0											,
Cursor-Baseline = 2,843,015ps		2,000,000ps	2,020,000ps	2,040,000ps	s 2,060,000ps		2,080,000ps 2,10	2,100,000ps	2,120,000ps	2,140,000ps	2, 1
+ 1 1 tunc7[6:0]	1,400	00									
+ The going_in_alu_a[31:0]	,h000000000	00000000									
+ 15 going_in_alu_b[31:0]	, h000000000	00000000									
+ 15 imm_csr_d[31:0]	hxxxxxxx	xxxxxxx									
+	, h000000000	00000000									
+ imm_ext[31:0]	, h000000000	00000000									
+ - imm_ext_d[31:0]	,h000000000	00000000									
+ imm_src[2:0]	'h0	0	0		е	0	3	0	3	Ĭ	0
+ 1 inst_o[31:0]	'h0000006F	000000 00800B13	\bigcap	0000006F	00800B13	0000006F	00800B13	0000006F	00800B13	\bigcap	0000006F
+ instr_d[31:0]	'h00000013	00000 \ 000000E	Ĭ	00000013	000000E	00000013) 000000E	00000013	0000006F	Ĭ	00000013
+ instr_m[31:0]	'h0000006F	000000 00000013	Ĭ	0000006F	00000013	0000000	00000013	0000006F	00000013	Ĭ	0000006F
intr	0										
is_mret	0										
+ 15 mask[3:0]	'hF	Ĺŧų									
+ 15 mask_dm[3:0]	'hF	H									
mem_write	0										
mem_write_m	0										
+	'h13	13 6F	13		6F	13	6F	13	6F	Ĭ	13
+ 1 opcode_f[6:0]	'h6F	6F 13	OF.		13	OF.	13	(6F	(13	Ĭ	6F
copcode_m[6:0]	'h6F	6F 13	OF.		13	(GF	13) 6F	13	×	6F
+ 1 pp[31:0]	.h00000088	0000000	Ĭ	88000000	0000008C	88000000	00000080	880000000 \	08000000	Ĭ	00000088
+ 1	'h00000088	88000000									
+ 1 pc_final[31:0]	'h0000008C	000000 00000088	Ĭ	00000000	00000088	00000080	88000000)	00000080	880000000	Ĭ	0000008C
+ 15 pc_m[31:0]	'h00000088	00000088									
+ 1 pc_next[31:0]	'h0000008C	06000000 . • 00000	Ĭ	00000000	06000000	00000080	06000000 (00000080	060000000	Ĭ	0000008C
+ 1 pc_plus_4[31:0]	'h0000008C	06000000 . • 00000	Ĭ	00000000	06000000	00000080	06000000 (00000080	06000000	Ĭ	0000008C
+ 15 pc_plus_4_d[31:0]	'h0000008C	0000008C									
+ 15 pc_plus_4_m[31:0]	'h0000008C	0000008C									
+ Paraget[31:0]	'h0000008C	0000000	Ĭ	0000008C	00000088	00000080	880000000	00000080	880000000	Ĭ	0000008C
+ fg rd_m[4:0]	'h00	00									
+ the rdata1[31:0]	'hoooooooo	00000000									
_	'h000000000	00000000									
+ ানি rdata_data_mem[31:0]	, 4000000000	000000 0000000	Ĭ	00000000	00000078	00000000	8 0000000	00000000	8 0000000	Ĭ	00000000

Ahsan Ali (2019-EE-115)
UET
3 stage pipelined RISC-V Core

00 00 2, 320, 🕒 00000000 00000080 00000080 00000000 0000000E 00000088 00000080 00000013 0000006F 6F 13 6F 2,300,000ps 00000080 88000000 06000000 06000000 00000078 00000088 00800B13 0000000E 0000013 6F 13 13 2,280,000ps 00000088 00000080 0000008 000000E 0000013 000000E 00000080 00000080 00000000 13 6F 6Е 2,260,000ps 00000080 00800B13 000000E 00000088 06000000 0000013 06000000 00000088 00000078 6F 13 13 2,240,000ps 0000000E 00000080 00000000 00000013 00000088 00000080 00000080 00000000 000000E 13 6F 6F 2,220,000ps 00000080 00000088 06000000 06000000 00000078 00800B13 000000E 0000013 00000088 6F 13 13 2,200,000ps 00000080 00000088 00000080 000000E 0000013 000000E 00000080 00000080 00000000 13 6F 6F 2,180,000ps 00800B13 00000080 06000000 ▶ 000000078 0000000E 0000013 880000000 06000000 00000088 00000088 00000088 00000000 xxxxxxx 00000000 00000000 0000008C 00000080 00000000 00000000 00000000 00000000 <u>Б</u>Е 13 13 .hoooooooo hxxxxxxx , h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h00000088 , h0000008C , h00000088 1 h0000008C h0000008C h0000008C , h0000008C , h00000000 , h00000000 , h00000000 h00000000 1 h000000000 , h00000088 h0000008C . h00 'h13 'h6F 'h6F . ho . hF hF Cursor = 2.843.015psCursor-Baseline = 2,843,015ps rdata_data_mem[31:0] going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] obcode_m[6:0] pc_target[31:0] imm_ext[31:0] mem_write_m obcode_d[6:0] mask_dm[3:0] obcode_f[6:0] pc_final[31:0] pc_next[31:0] imm_src[2:0] instr_m[31:0] rdata1[31:0] rdata2[31:0] inst_o[31:0] instr_d[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] pc[31:0] is_mret int 99999999 **+ +** \bullet \bullet \bullet \bullet \bullet \bullet \bullet

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2,480,000ps 00000080 0000008 00000000 00000088 00000000 00000080 0000000E 00000013 0000006F 6F 13 6F 2,460,000ps 00000080 00000088 06000000 06000000 00000088 00000078 00800B13 0000006F 0000013 6Е 13 13 2,440,000ps 00000088 00000080 0000008 000000E 0000013 000000E 00000080 00000080 00000000 13 6F 6Е 2,420,000ps 00000080 00000088 06000000 06000000 00000088 00000078 000000E 00800B13 0000013 6Е 13 13 2,400,000ps 00000080 00000088 00000080 00000080 00000000 000000E 00000080 0000013 000000E 13 6F 6F 2,380,000ps 00000080 00000088 06000000 06000000 00800B13 0000006F 0000013 00000088 00000078 6F 13 2,360,000ps 00000080 00000080 000000E 0000013 00000088 00000080 00000080 000000E 00000000 6F 9 E 13 2,340,000ps 88000000 06000000 06000000 00000078 xxxxxxx 00000088 00000000 00000000 00000000 00000000 00000000 00800B13 0000000 0000013 00000000 00000088 88000000 0000008C 00000080 00000000 00000000 .hoooooooo hxxxxxxx , h00000000 , h00000000 , h0000006F h00000013 , h0000006F , h00000088 , h0000008C *h00000088 1 h0000008C , h0000008C пооооооо , h00000000 , h00000000 h00000000 1 h000000000 , h00000088 , h0000008C , h0000008C h0000008C . h00 'h13 'h6F 'h6F . ho . hF hF Cursor = 2.843.015psCursor-Baseline = 2,843,015ps rdata_data_mem[31:0] going_in_alu_a[31:0] going_in_alu_b[31:0] pc_plus_4_m[31:0] pc_plus_4_d[31:0] Baseline = 0 imm_csr_m[31:0] imm_csr_d[31:0] imm_ext_d[31:0] pc_plus_4[31:0] obcode_m[6:0] pc_target[31:0] imm_ext[31:0] mem_write_m mask_dm[3:0] obcode_d[6:0] obcode_f[6:0] pc_final[31:0] pc_next[31:0] imm_src[2:0] instr_m[31:0] rdata1[31:0] rdata2[31:0] inst_o[31:0] instr_d[31:0] mem_write pc_m[31:0] pc_d[31:0] func7[6:0] mask[3:0] rd_m[4:0] pc[31:0] is_mret int وفوفوفو ⊕ ⊕ \bullet \bullet \bullet \bullet \bullet \bullet \bullet

00800B13 0000006E 87000000

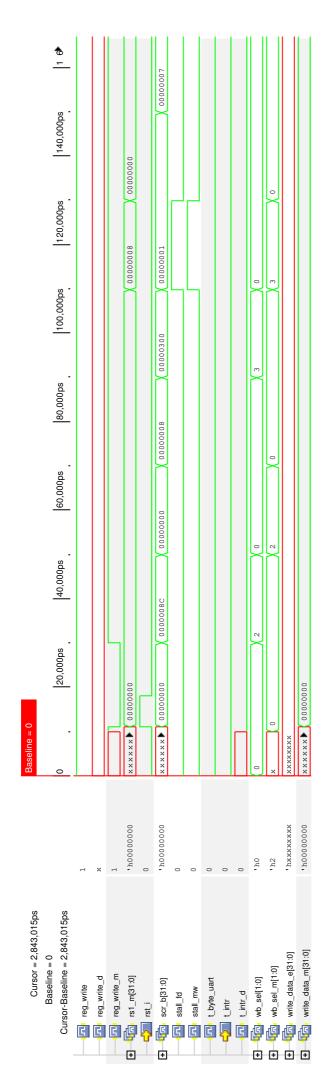
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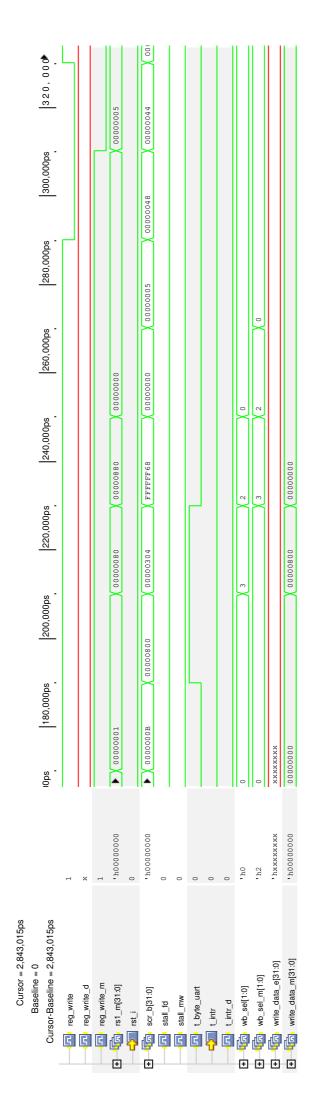
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13

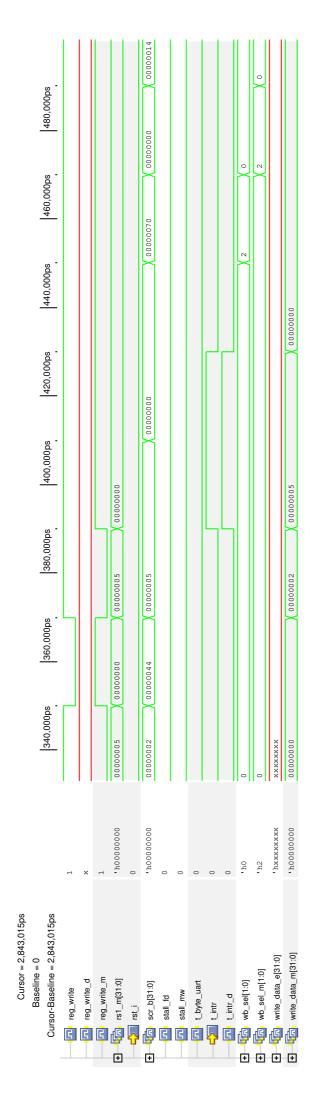
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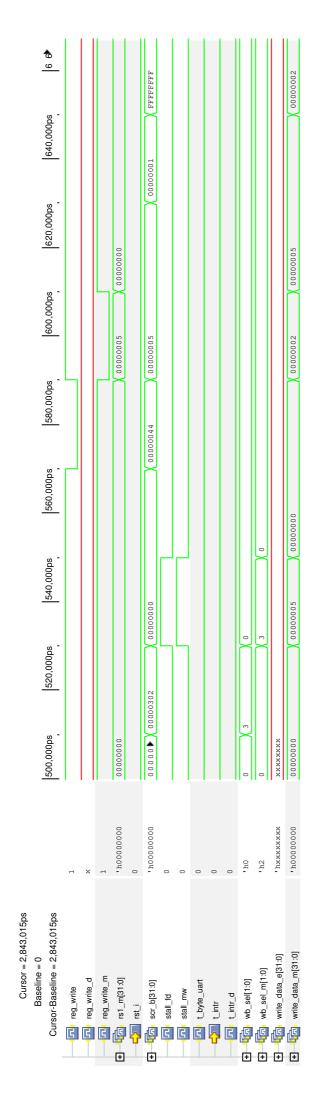
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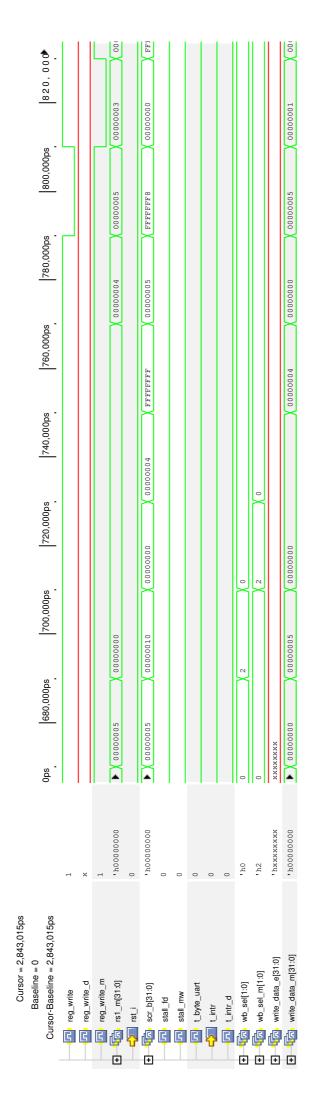


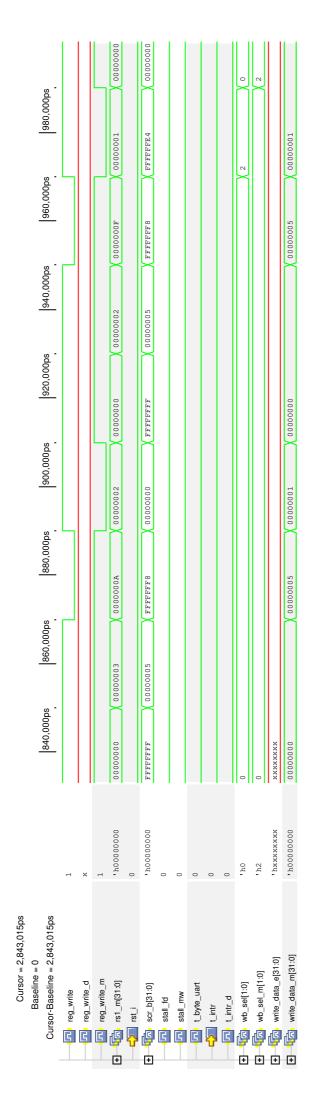
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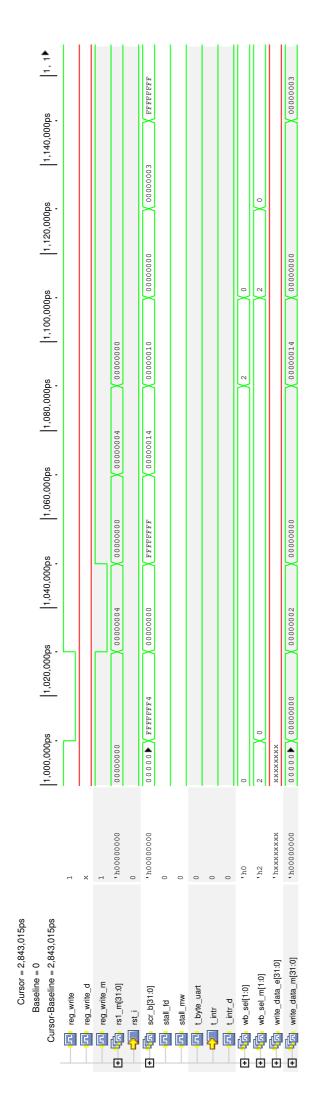


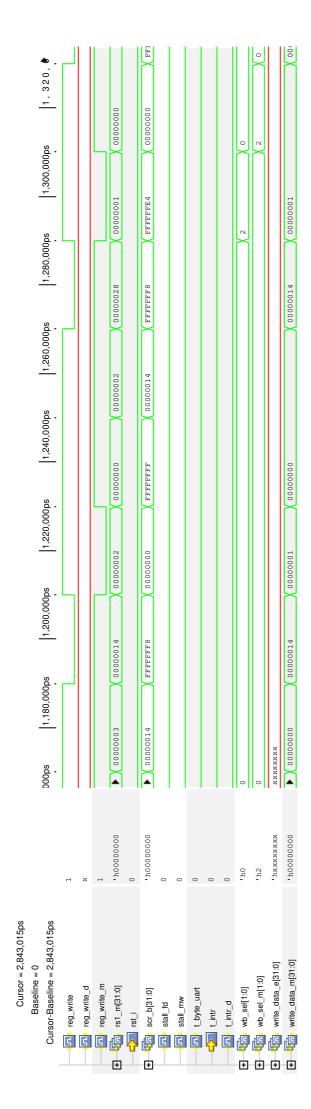
Ahsan Ali (2019-EE-115) UET 3 stage pipelined RISC-V Core

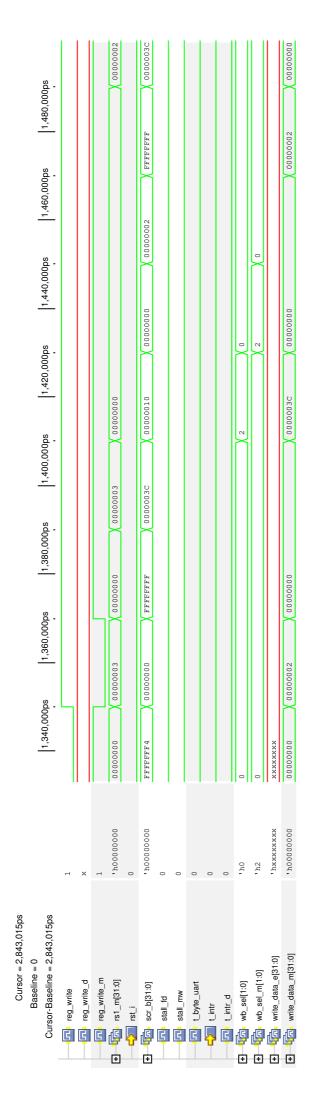


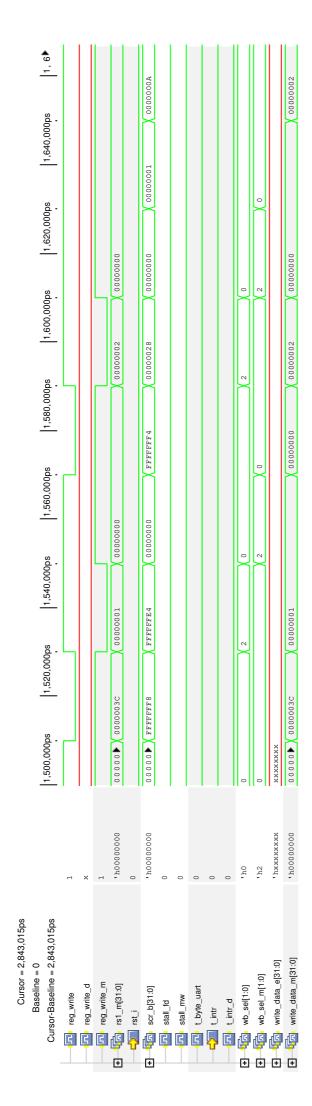


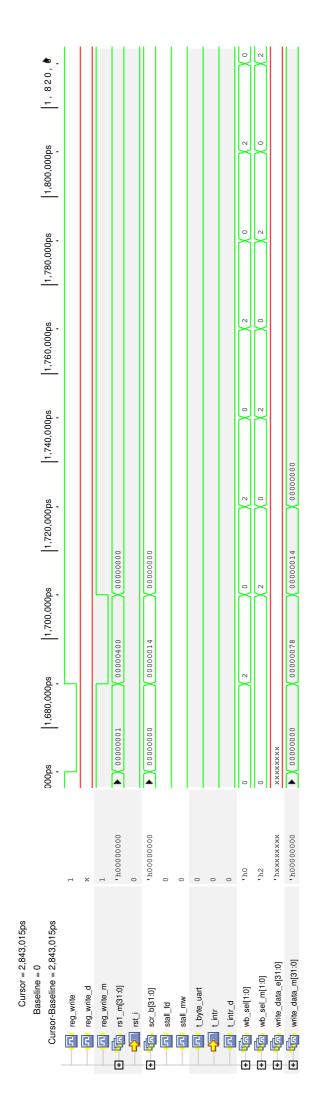




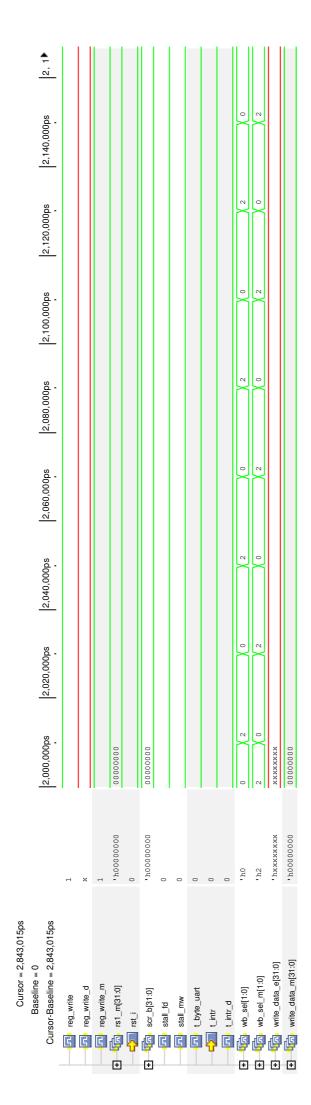




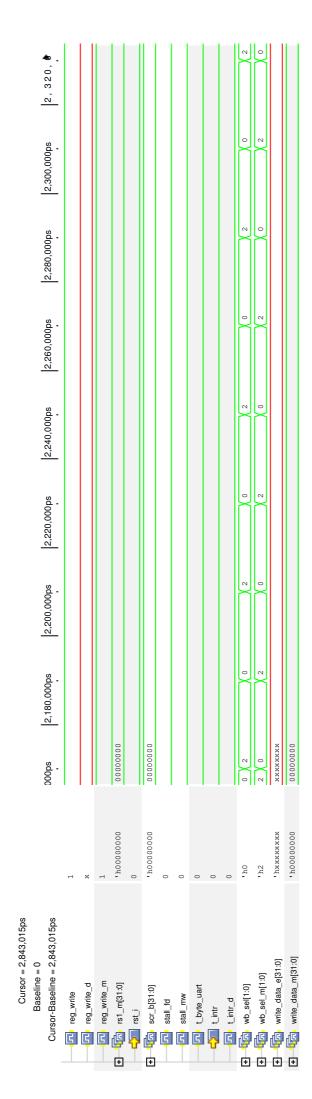




Cursor = $2,843,015$ ps									
Baseline = 0		_		_	-	_	-	_	_
Cursor-Baseline = 2,843,015ps		1,840,000ps	1,860,000ps	1,880,000ps	1,900,000ps	1,920,000ps	1,940,000ps	1,960,000ps	1,980,000ps
reg_write	1								
reg_write_d	×								
reg_write_m	1								
+ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	,h000000000	00000000							
rst_i	0								
+ 4 sc_b[31:0]	'h00000000	0000000							
stall_fd	0								
stall_mw	0								
t_byte_uart	0								
Lintr	0								
t intr_d	0								
+ 1 wb_sel[1:0]	'h0	0 2	° /	2	0 \	2	0)	2	0
+ 15 wb_sel_m[1:0]	'h2	2 0	2	0	2	0 \	2	0	2
+ 15 write_data_e[31:0]	'hxxxxxxx	xxxxxxx							
+ The write_data_m[31:0]	1,4000000000	0000000							



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Cursor = $2,843,015$ ps										
Baseline = 0										-
Cursor-Baseline = 2,843,015ps		2,340,000ps	2,360,000ps	2,380,000ps	2,400,000ps	2,420,000ps	2,440,000ps	2,460,000ps	2,480,000ps	_
reg_write	1									
reg_write_d	×									
reg_write_m	1									
+ 15 rs1_m[31:0]	. h00000000	00000000								
rst_i	0									
+ scr b[31:0]	1,400000000	00000000								
stall fd	0									
stall_mw	0									
T_byte_uart	0									
t intr	0									
T tintr_d	0									
+ wb_sel[1:0]	04.	2 0	2	0)	2	0	2	0 (2	
+ wb_sel_m[1:0]	. h2	0	0	2	0	2	0	2	0	
+ write_data_e[31:0]	'hxxxxxxx	xxxxxxx								
+ 4 write_data_m[31:0]	1 h00000000	00000000								

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