

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0															
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
off															

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112		
0	Player/missile graphics																
2																	
4																	
6																	
8																	
10																	
12																	
14																	

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	
0	Player/missile graphics	Player/missile graphics														
2																
4																
6																
8																
10																
12																
14																

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

Timing diagram for HSCR (Horizontal Sync Rate Counter) showing various DMA requests and blocked DMA over 112 horizontal sync lines. The diagram shows HSCR at 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, and 112. The HSCR signal is 'off' for the first 24 lines and then 'on' (red) for the rest. DMA requests are shown as colored bars: Player/missile graphics (red), Memory refresh (magenta), Playfield DMA (blue), Character map DMA (cyan), Display list DMA (orange), and Blocked DMA (yellow).

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0															
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0															
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	
off																

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0	Player/missile graphics	Player/missile graphics													
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	
0	Red	Red	Grey	Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	
2				Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
4				Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
6				Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
8				Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
10				Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
12				Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
14	Blue	Magenta	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

Timing diagram for HSCR (Horizontal Sync Rate Counter) showing various DMA requests and blocked DMA over 112 horizontal sync lines. The diagram shows HSCR values from 0 to 112. Requests include Player/missile graphics (red), Memory refresh (magenta), Playfield DMA (blue), Character map DMA (cyan), Display list DMA (orange), and Blocked DMA (yellow).

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0	Player/missile graphics	Memory refresh	Playfield DMA	Memory refresh	Playfield DMA	Memory refresh	Playfield DMA	Memory refresh	Playfield DMA	Memory refresh	Playfield DMA	Memory refresh	Playfield DMA	Memory refresh	Playfield DMA
2															
4															
6															
8															
10															
12															
14	Character map DMA	Display list DMA	Blocked DMA	Character map DMA	Display list DMA	Blocked DMA	Character map DMA	Display list DMA	Blocked DMA	Character map DMA	Display list DMA	Blocked DMA	Character map DMA	Display list DMA	Blocked DMA

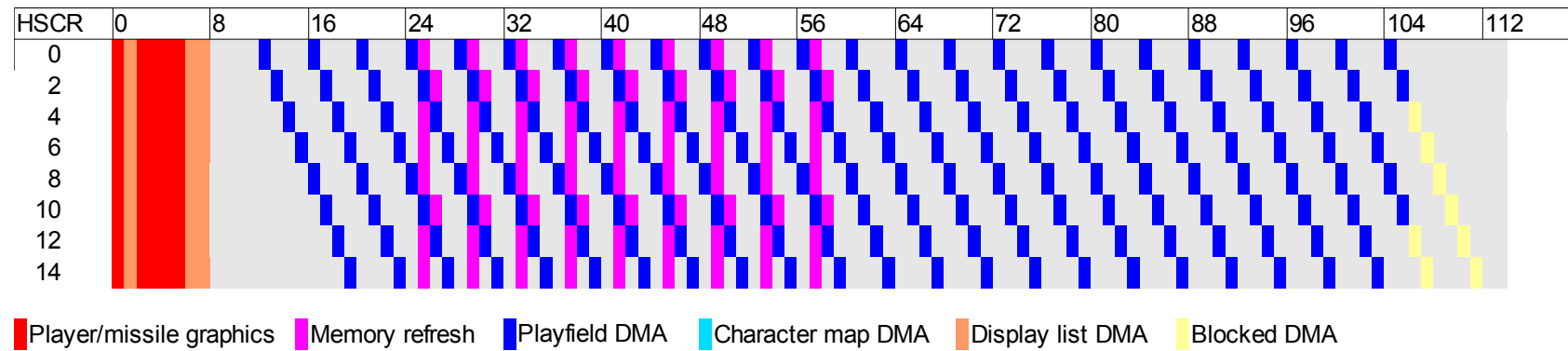
HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0															
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

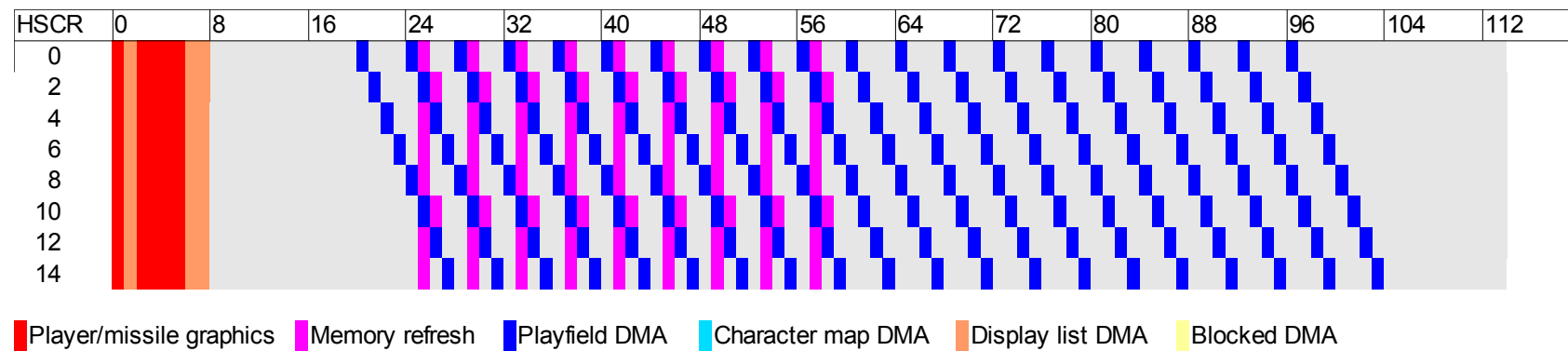
HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	
off																

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

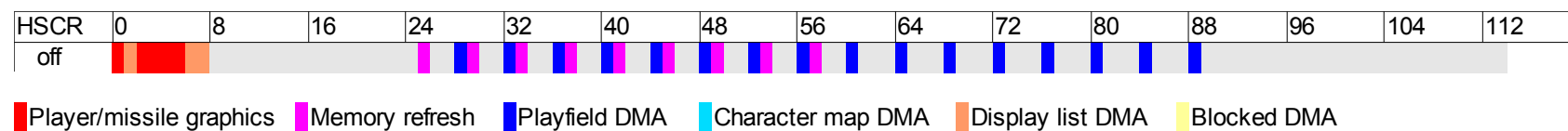
ANTIC modes A-C, mode line, wide playfield



ANTIC modes A-C, mode line, normal playfield



ANTIC modes A-C, mode line, narrow playfield



HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0															
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112
0															
2															
4															
6															
8															
10															
12															
14															

■ Player/missile graphics
 ■ Memory refresh
 ■ Playfield DMA
 ■ Character map DMA
 ■ Display list DMA
 ■ Blocked DMA

HSCR	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	
off	[DMA Activity Timeline]															

Legend:

- Player/missile graphics
- Memory refresh
- Playfield DMA
- Character map DMA
- Display list DMA
- Blocked DMA