

# VGA controller- VSYNC

Rok Češnovar, Patricio Bulić

# VSYNC

- The VSYNC signal defines if the current in the vertical deflection coils is increased or decreased
  - Higher current -> the ray is deflected further down
- The impact of the HSYNC signal
  - VSYNC = 1 -> linear increase of the current
  - VSYNC = 0 -> decrease of the current

# VSYNC signal

- VSYNC depends on the HSYNC module
  - Uses the ROWCLK, generated by HSYNC
- Count ROWCLK cycles
  - 1 cycle = 1 row

# VSYNC signal

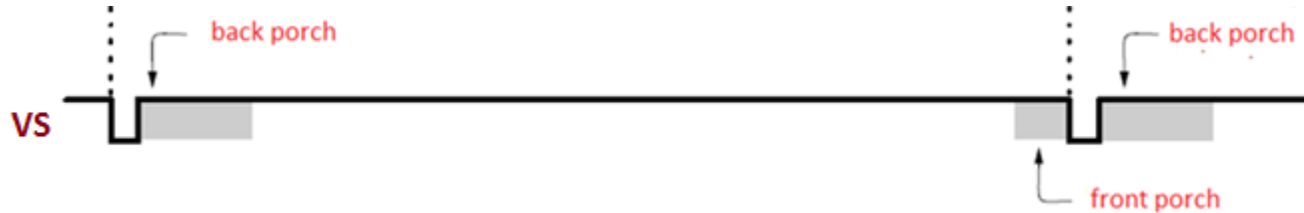
- display time
  - The beam is moving to down and is inside the display limits
- sync pulse
  - The beam is returning to the top position
- back porch
  - The beam is moving down and is on top of the display area
- front porch
  - The beam is moving down and is below the display area

# VSYNC

- For the resolution 640x480 and a frequency of 25MHz these are the durations for each signal part

Frame part	Part duration[num. of cycl.]
Sync pulse (SP)	2
Front porch (FP)	10
Back porch (BP)	29
Display time (DT)	480

# VSYNC module



- Scan time (ST) = SP + BP + FP + DT
  - 521 cycles in our case
- Create a counter that counts from 0 to (ST -1)
  - The enable signal for the counter is the rowclk signal from HSYNC
- Based on the counter set
  - VSYNC
    - 0, when in SP, 1, otherwise
  - VVIDON
    - 1, when in the display area, 0, otherwise
  - ROW
    - The row number (0 to 479)

# Exercise

- Create a VSYNC module
  - inputs
    - CLK, RESET, ROWCLK
  - outputs
    - VSYNC, ROW, VVIDON

# VGA controller

- top module
  - Connect the HSYNC and VSYNC modules
  - Implement the RED, GREEN, BLUE signals
- In the display area set the RED, GREEN in BLUE signals to a constant value
  - Set it to 0 (black) outside the display area