


На второй лабе будем организовывать взаимодействие комп-ПЛИС через UART для судя по всему управления переходами по автомату на ПЛИСе

Сегодня реализуем трансмиттер

 Pasted image 20250403092843.png

^ Автомат работы

```
module uart_tx (parameter data_width = 8)(
    input clk, rst, clk_en, data_valid,
    input [data_width - 1:0] data_in,
    output reg tx,
    output data_ready)
)

localparam idle = 3'b000;
localparam start = 3'b001;
localparam trn = 3'b010;
localparam stop = 3'b011;
localparam ready = 3'b100;
reg [2:0] state, next_state;
assign data_ready = (state == ready);

// Counter - up to 8
reg [2:0] count;
always @(posedge clk) begin
    if (rst) count <= 3'b000;
    else if (state == trn) begin
        if (clk_en) count = count + 1;
    end else count <= 0;
end

always @(posedge clk) begin
    if (rst) state = idle;
    else if (clk_en) state <= next_state;
end

always @(*) begin
    case(state):
        idle: begin if (valid) next_state <= start;
                    else next_state <= valid;
                    tx = '1;
                end
        start: begin
                    if (clk_en) next_state = trn;
                    tx = '0;
                end
        trn: begin
                    if (en & count == 7) begin
                        next_state = stop;
                        tx = '0;
                    end else begin
                        next_state = trn;
                    end
                end
        stop: begin
                    if (clk_en) next_state = ready;
                    else next_state = stop;
                end
        ready: next_state = idle;
    end
end
```