Digital Integrated Circuits and Systems

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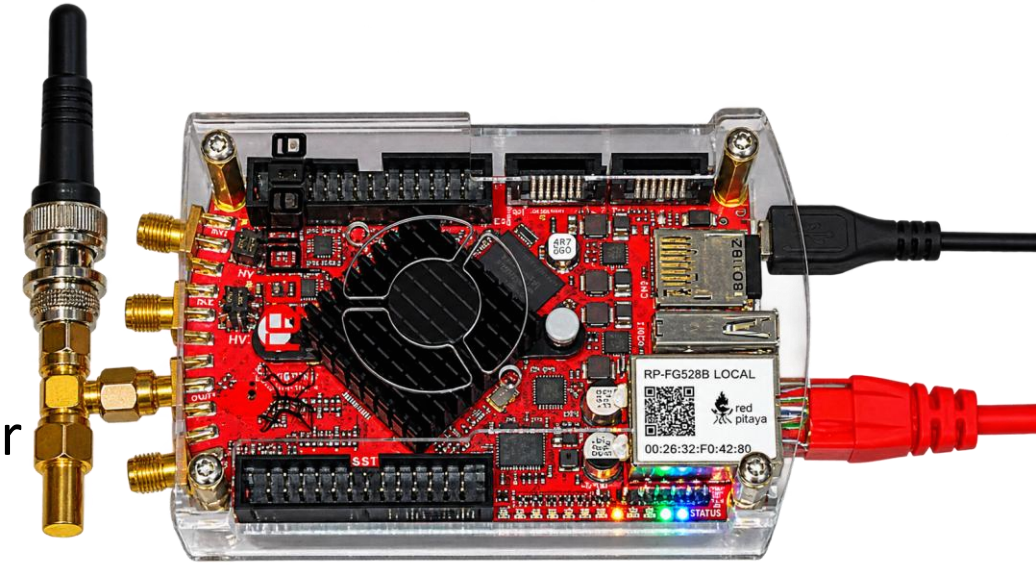

Lab 7: Test on Red Pitaya STEMlab

Tools: Vivado, SSH Client, Scope
Task: Include your square wave generator in RP project, compile and test on board

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Vivado Project

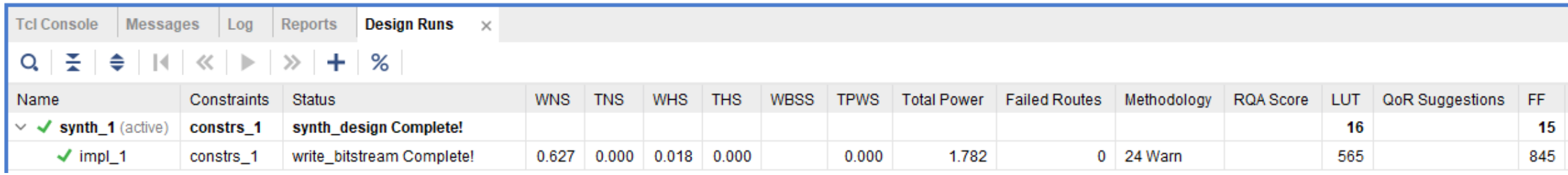
- Download and unzip rp_swave.7z to your local folder C:/proj/*your_name*
- Open project **rp_swave.xpr** and edit **gen.sv**
  - replace with your square wave generator
  - check connections in **rp_top.sv**
  - correct signal names with dot to match the names from your file




```
gen gen_u (
    .clk     (clk),
    .rst     (rst),
    .setfreq (reg0),
    .amp     (reg8),
    .y       (wave)
 );
```

- Save files and **Run Synthesis**
- **Run Implementation**, **Generate Bitstream**

Prepare bin File



Name	Constraints	Status	WNS	TNS	WHS	THS	WBSS	TPWS	Total Power	Failed Routes	Methodology	RQA Score	LUT	QoR Suggestions	FF
synth_1 (active)	**constrs_1**	**synth_design Complete!**											**16**		**15**
impl_1	constrs_1	write_bitstream Complete!	0.627	0.000	0.018	0.000		0.000	1.782	0	24 Warn		565		845

- View Reports, Check Design Runs output
  - observe LUT and FF utilization
- Open Tcl Console and type

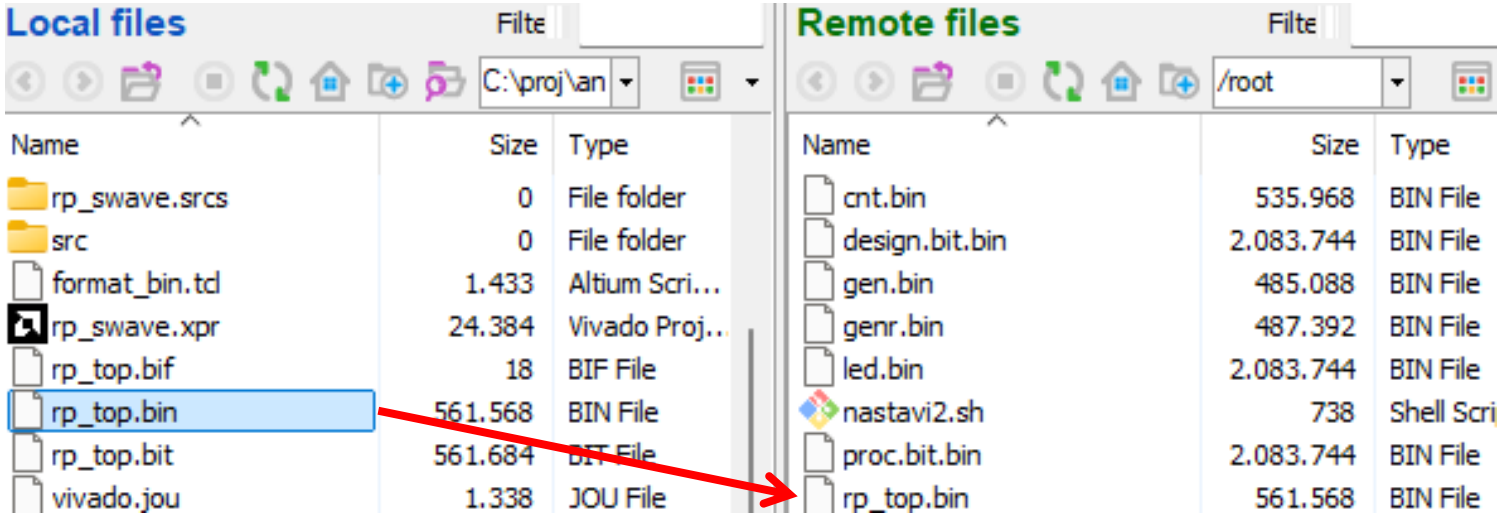
  cd c:/proj/*your_name*/rp_swave

  source ./format_bin.tcl -notrace

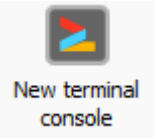
  - the command converts bitstream to FPGA programming file **rp_top.bin**

Connect Red Pitaya Board

- Connect board to USB power supply and Ethernet cable to the PC
- Transfer **rp_top.bin** with Bitwise SSH Client
  - the PC Ethernet Adapter should have IP4 address 192.168.1.1
  - Run **Bitwise SSH Client** and click Log in (Host: 192.168.1.15)
  - Click **New SFTP window**, open your project folder (Local files) and transfer rp_top.bin to remote board



Program FPGA and check output



- Open **New terminal** console in **Bitwise SSH Client** and type

```
fpgautil -b rp_top.bin
monitor 0x41200000
```

  - the response should be: 0x00000001
- Connect out1 to oscilloscope and observe generated signals
- Command monitor is used to read and set registers
  - to set frequency to 2 kHz write:

```
monitor 0x41200000 2
```

  - to set amplitude to 5000, write:

```
monitor 0x41200008 5000
```