Final Presentation

Project System Design

Group 1

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Plan

1. Introduction
2. Design
3. Challenges and Experiences
4. Time Summary
5. User manual

Apollinaire Criquet, Johan Klassén, Henrik Lindgen, Nell Party, Omid Najafi

Introduction

Visualization

- Volume
- Balance
- Frequencies analyses
- Oscilloscope

Controls

- Volume
- Balance
- Mute

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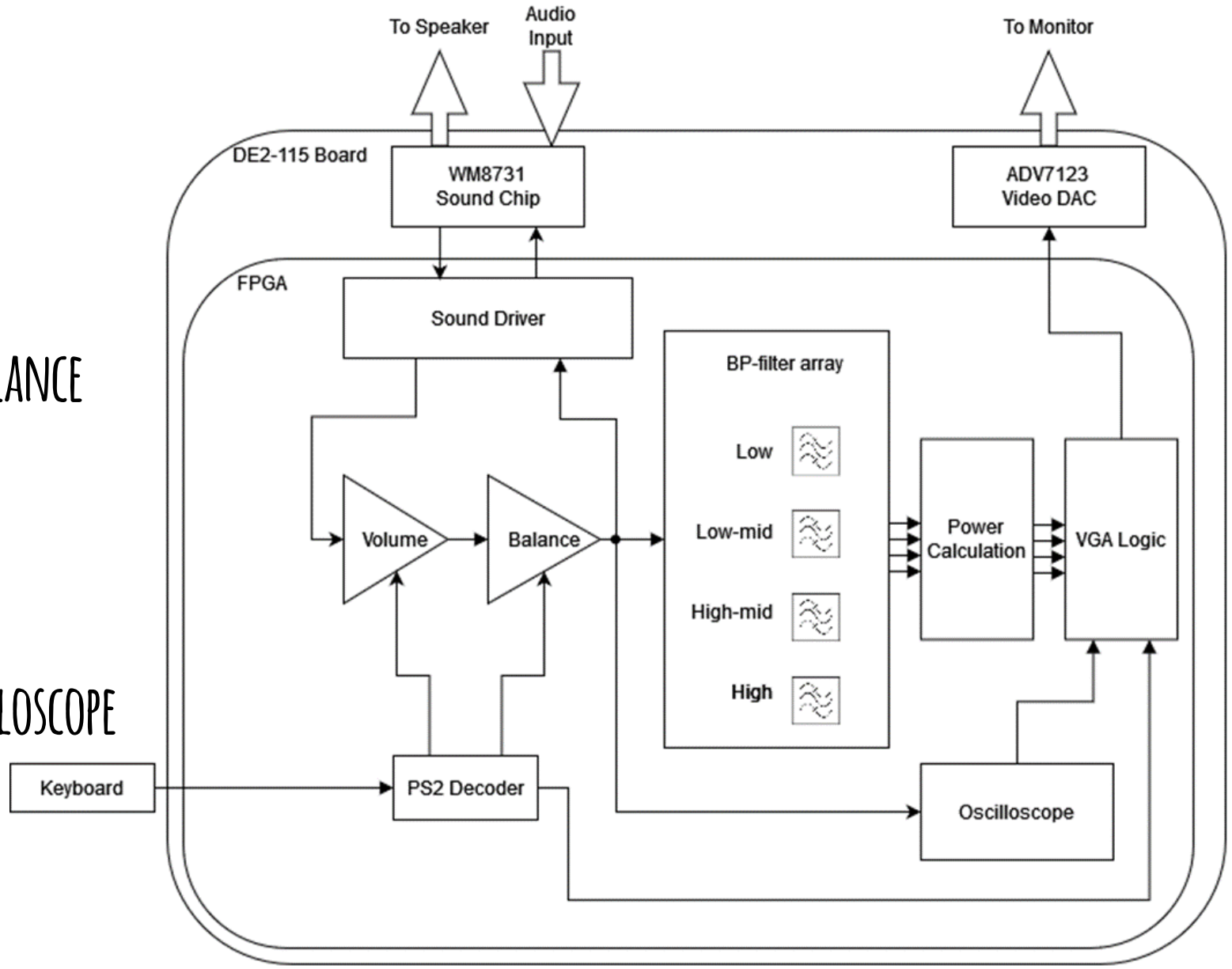
Design | General

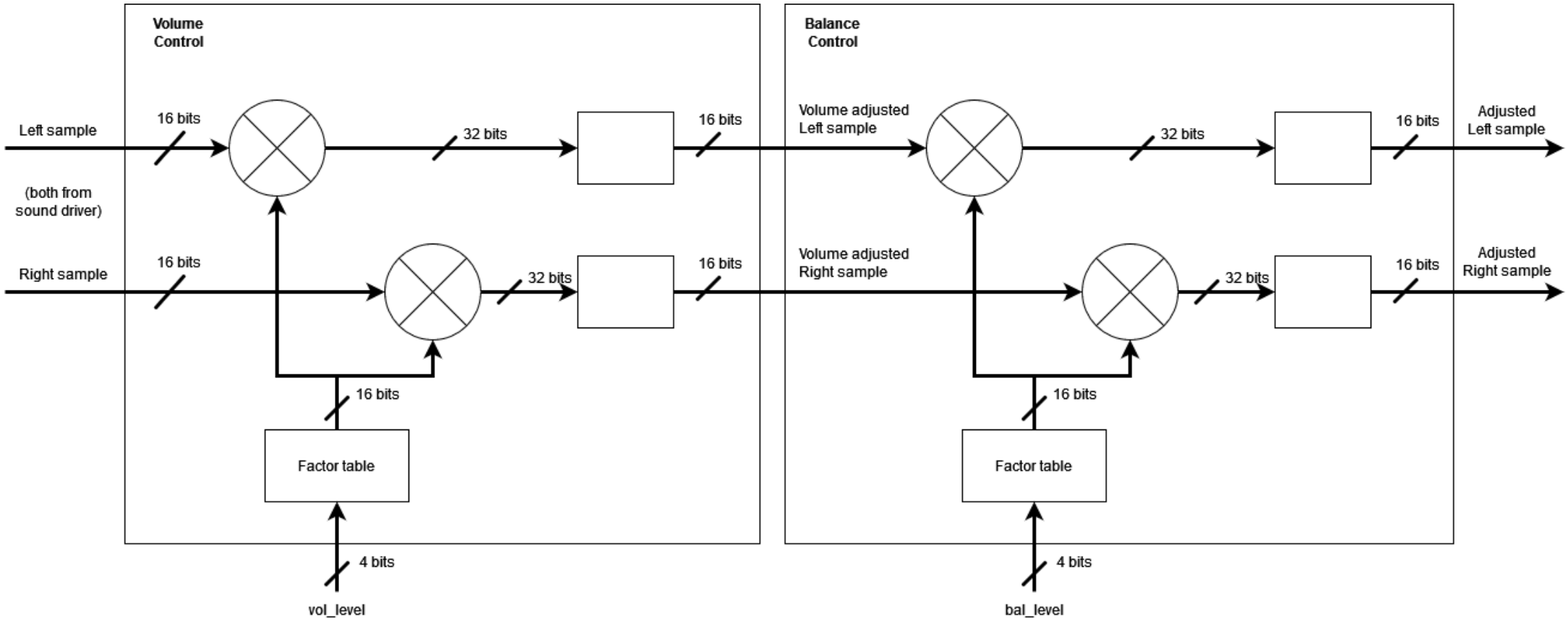
1. Keyboard
2. Volume and Balance
3. FIR Filter
4. Power Calculator and Oscilloscope
5. VGA Control



Design | Keyboard

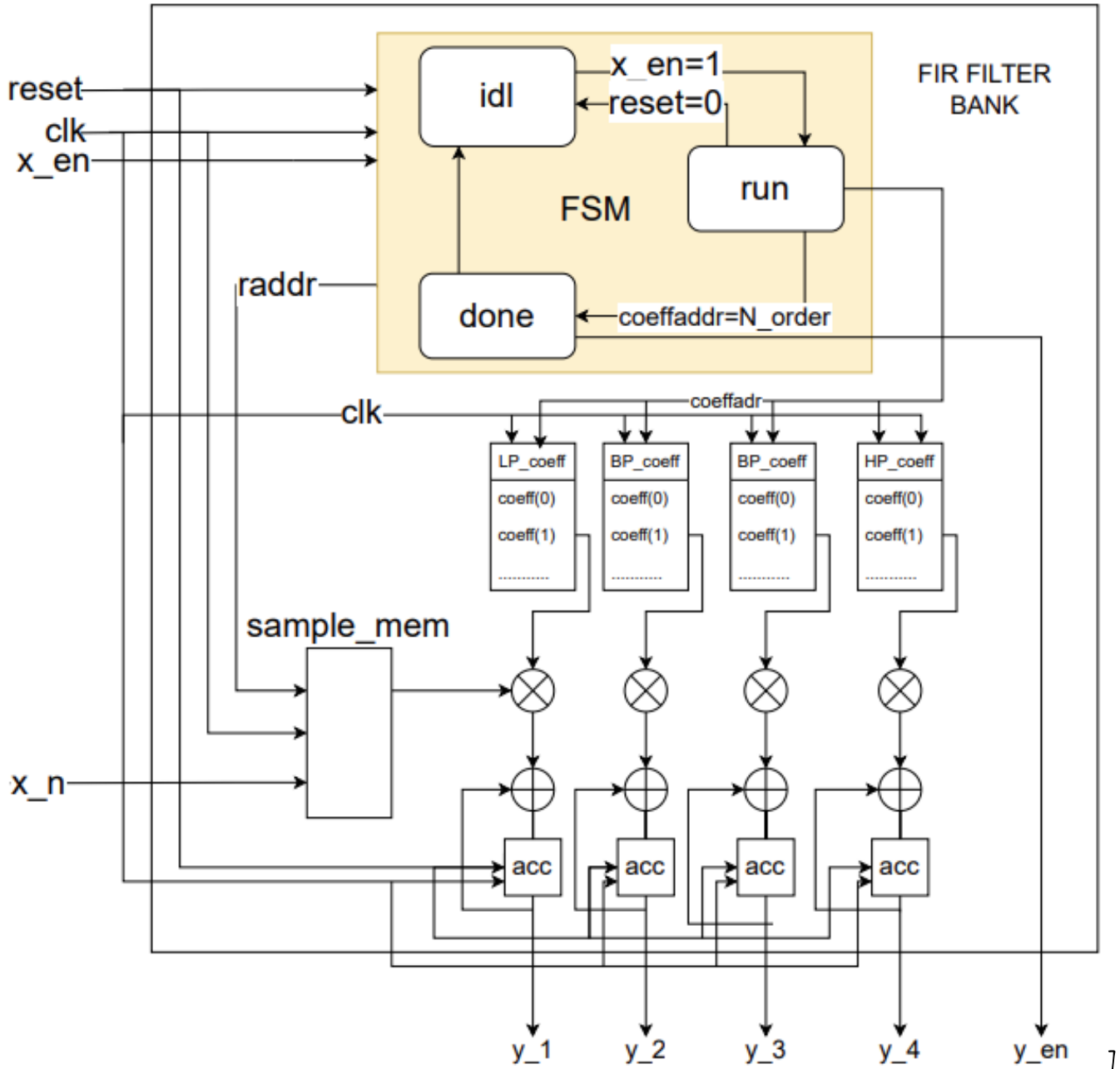
Key	Scancode	Action
Up arrow	**E075**	Increase the volume
Down arrow	**E072**	Decrease the volume
Left arrow	**E06B**	Shift the balance to the left speaker
Right arrow	**E074**	Shift the balance to the right speaker
M	**3A**	Toggle mute on the sound output

Design | Volume & Balance



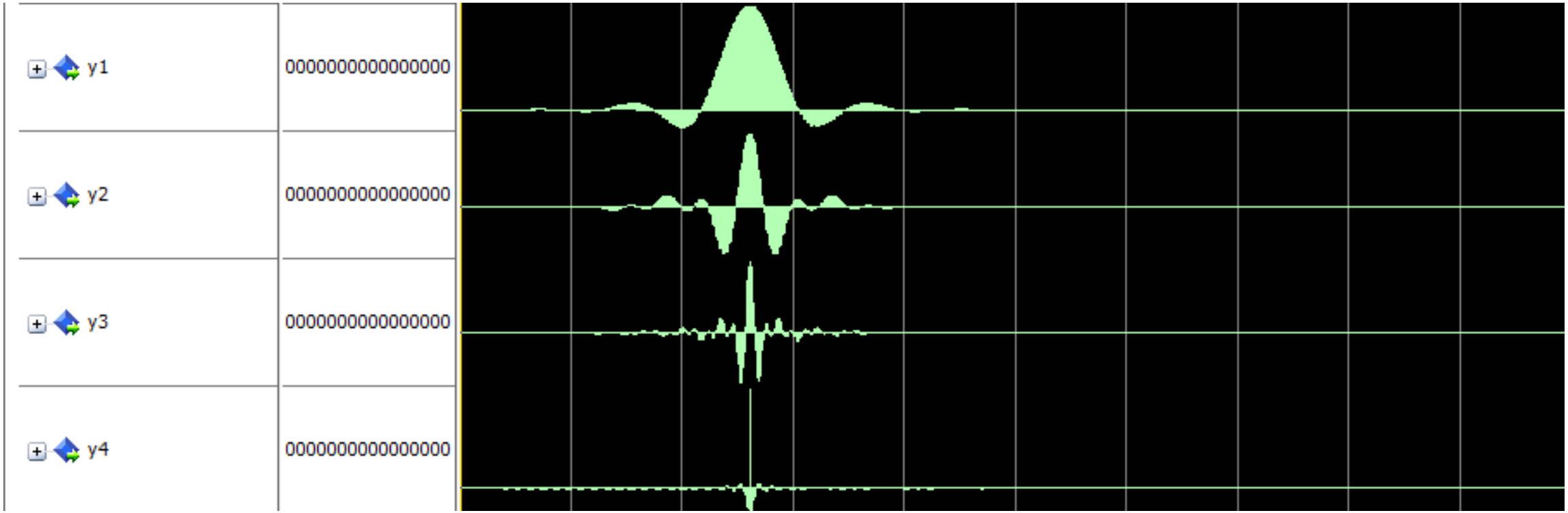
DESIGN | FIR FILTER

- 4 different frequency band
- Lowpass, bandpass and highpass fir filters
- Sample memory and coefficient memory inside the FPGA



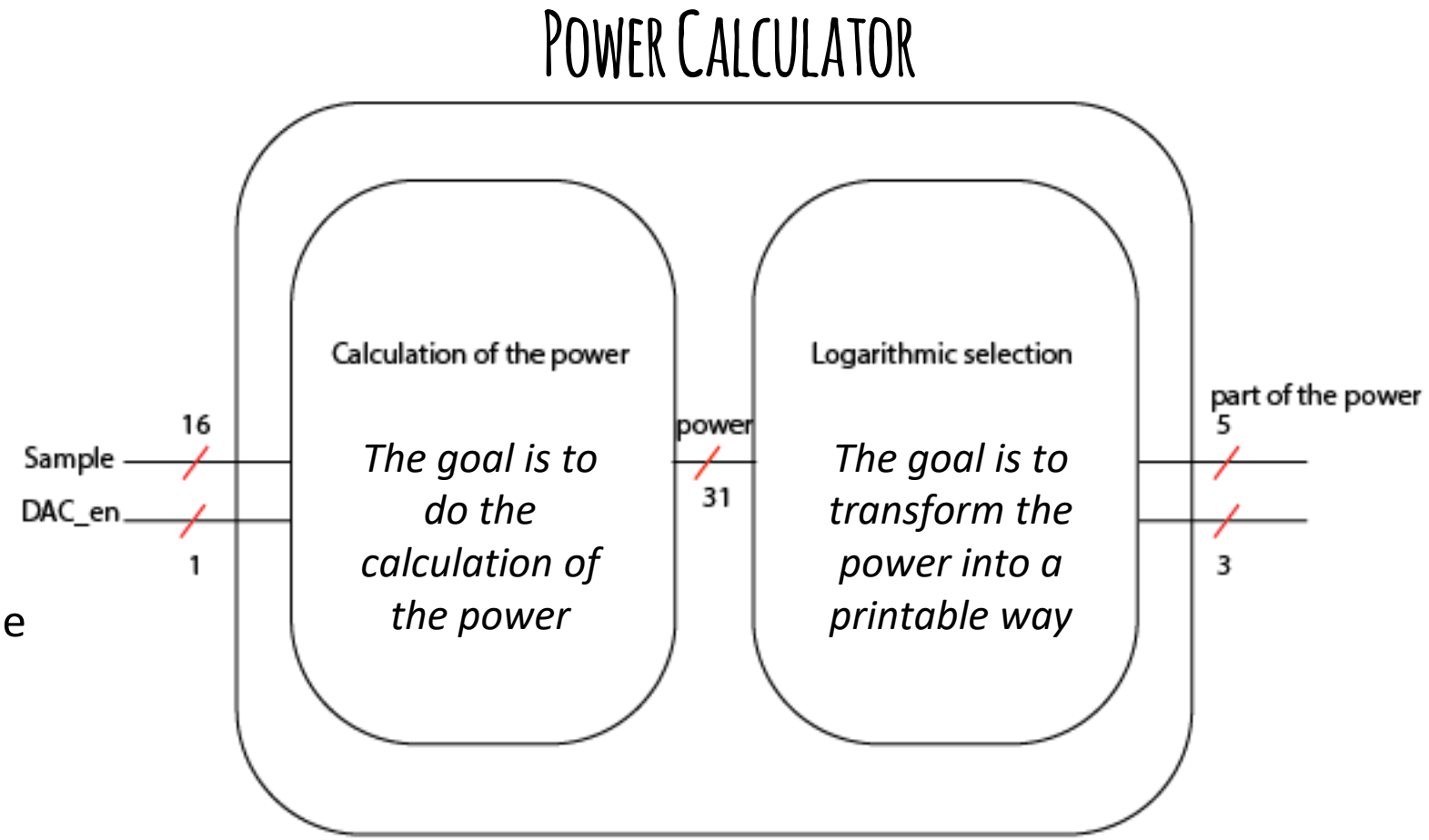
Design | FIR Filter

Simulation in Modelsim



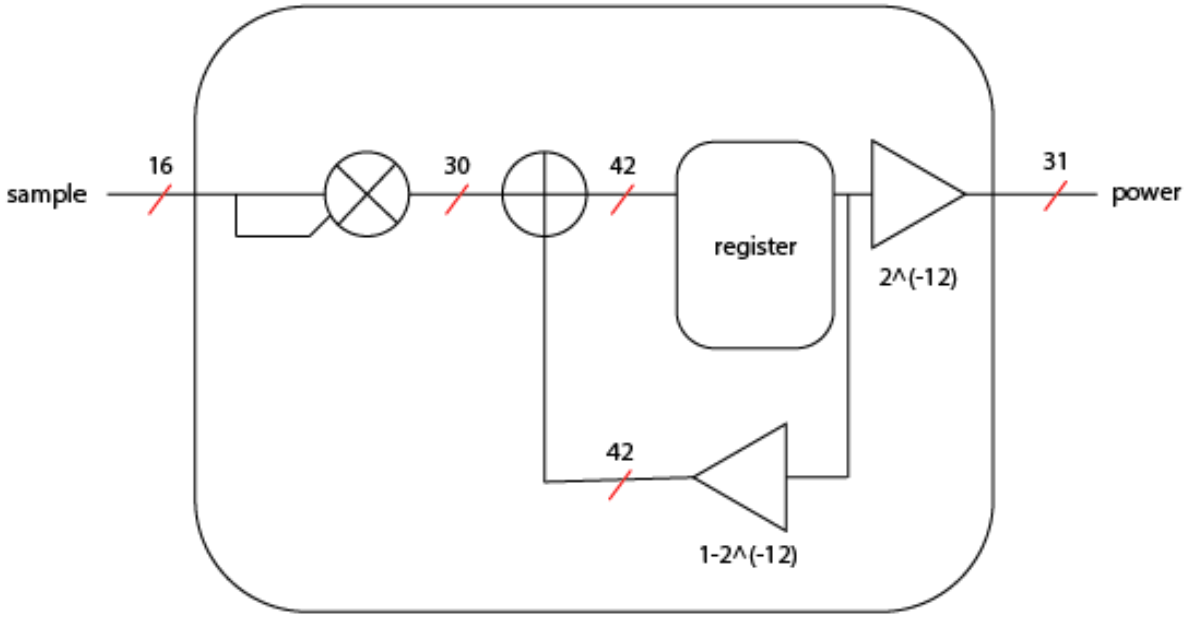
Design | Power Calculator

The goal Is to sent the power of the signals after each filter, in a way that can be print



Design | Power Calculator

Calculation of the power



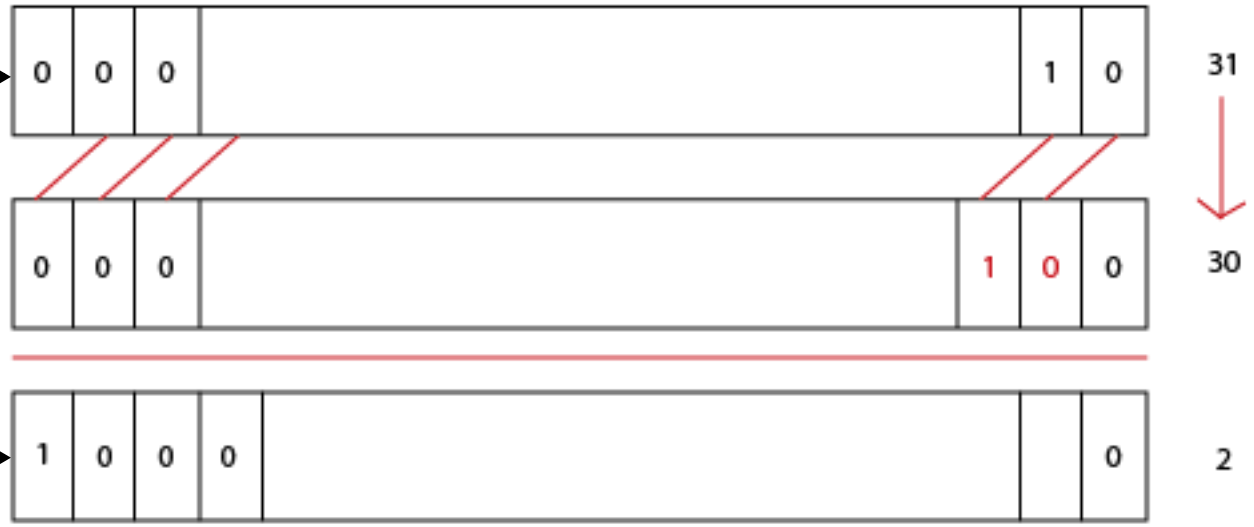
In this way we have the formula :

$$P = \sum_{n=0}^{\infty} x[n] \cdot (1 - H)^{n}$$

Design | Power Calculator

Logarithmic scale

The data load in a first way



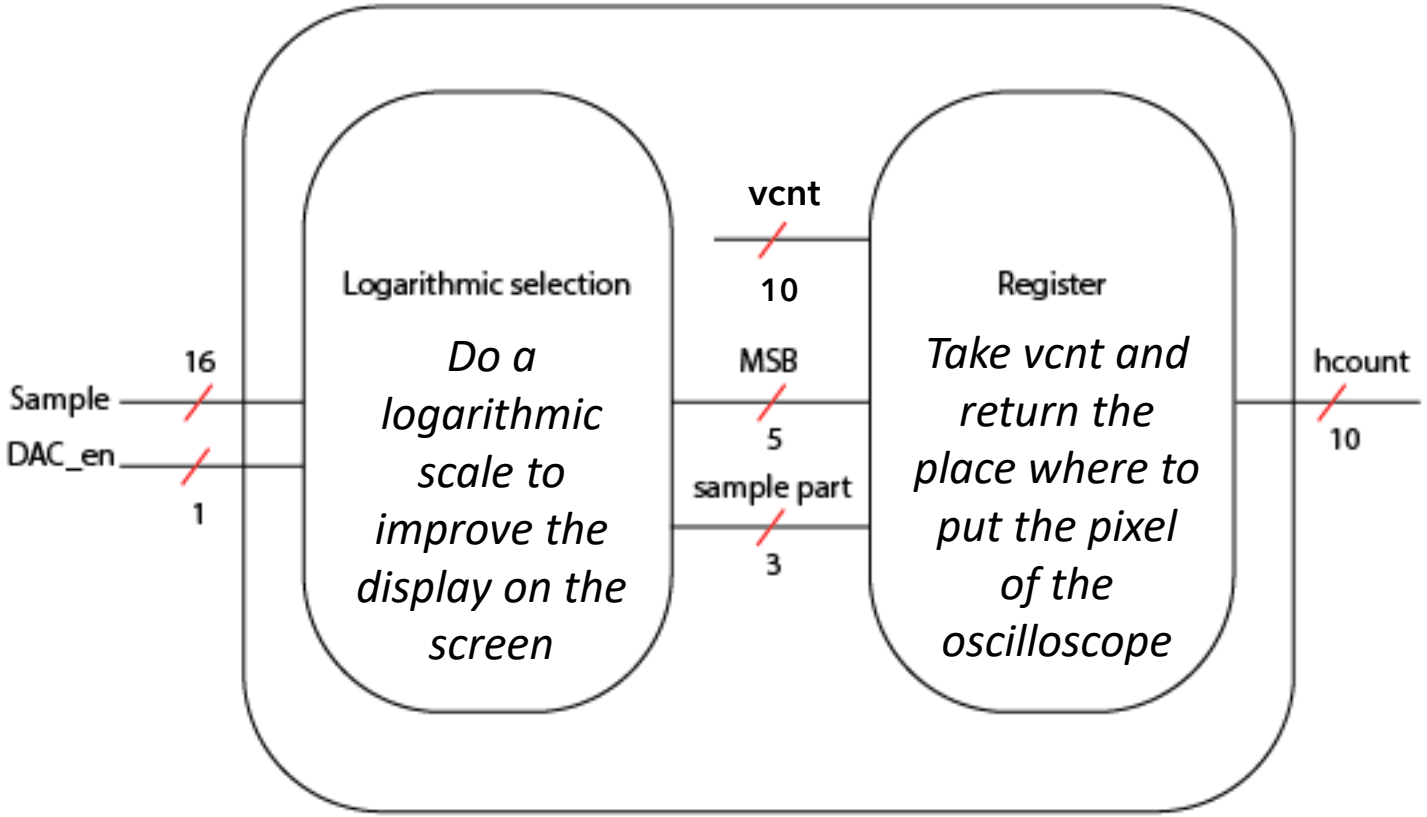
The first bit is to one

A counter decrease

We take the 3 bits after to improve the display

Design | Oscilloscope

Oscilloscope



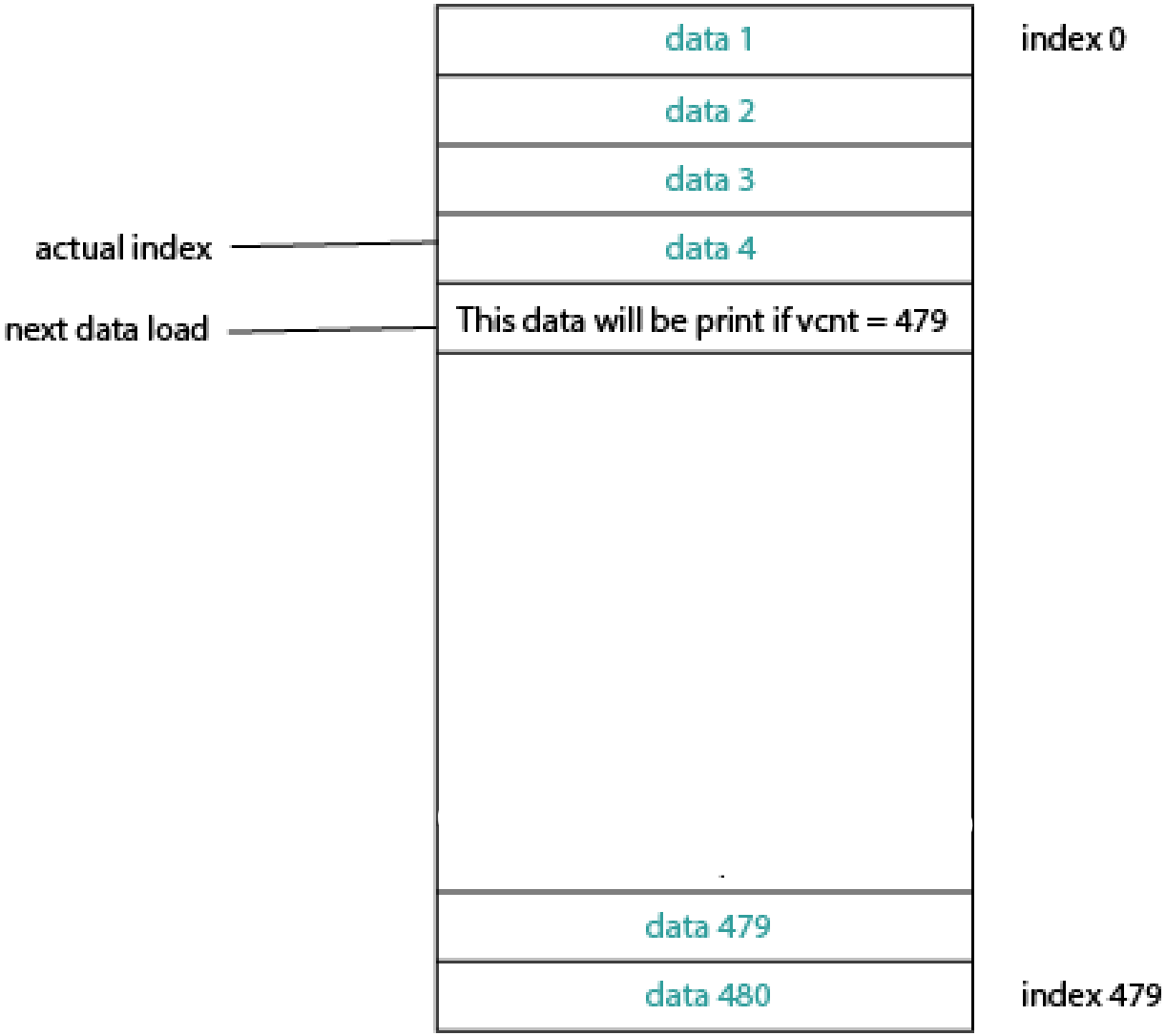
The goal is to send where to put the pixel of the oscilloscope for each line

Design | Oscilloscope

Register

The next data to be printed will be the one with the index : actual index – vcnt

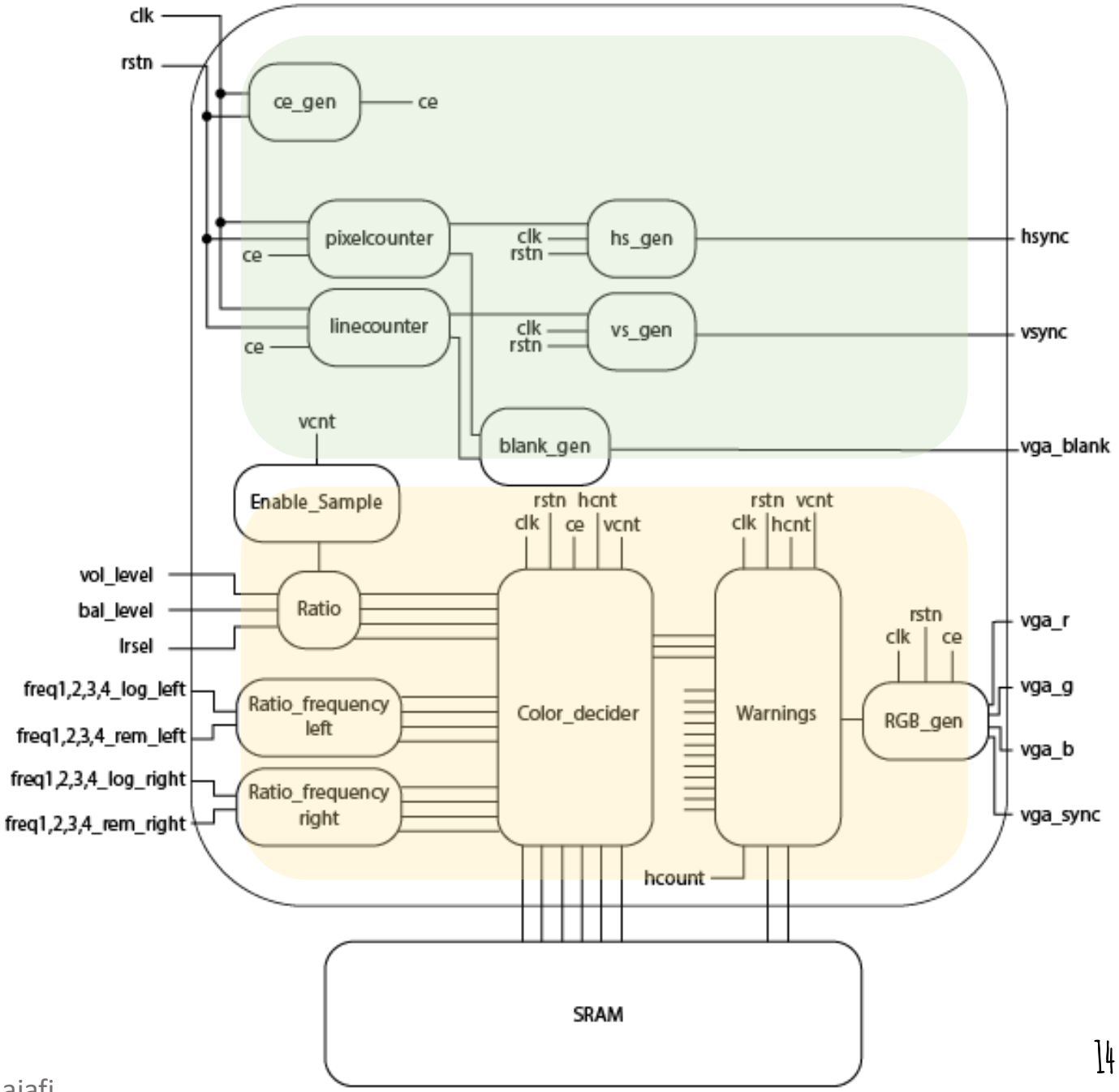
Be careful with index out of bounds !!!



Design | VGA Control

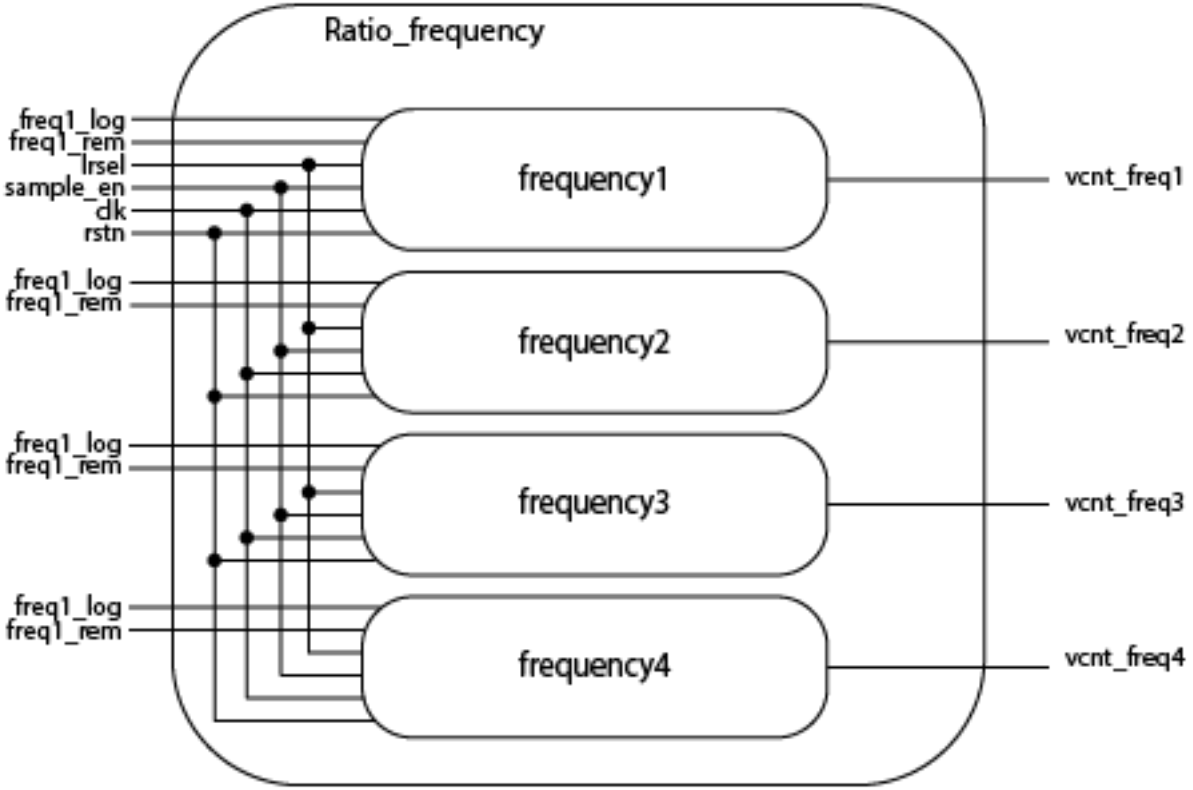
Control part : generate all the control signals needed to use the VGA screen

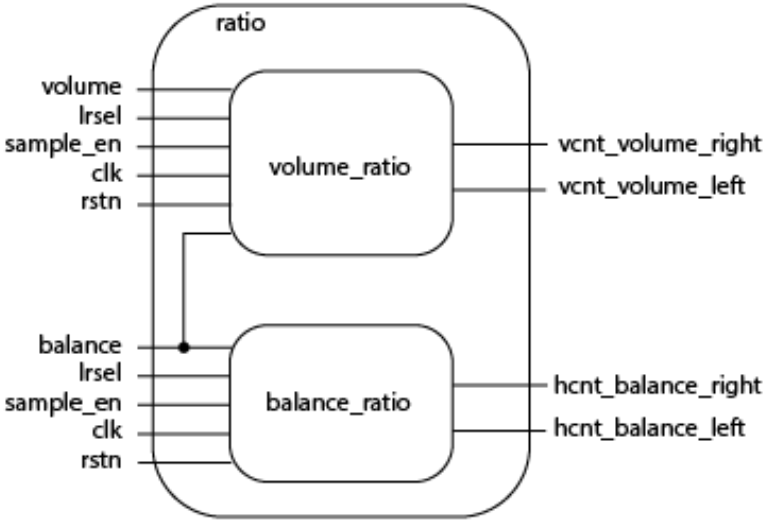
Color part : decides and generates the color code for each pixel



Design | VGA Control

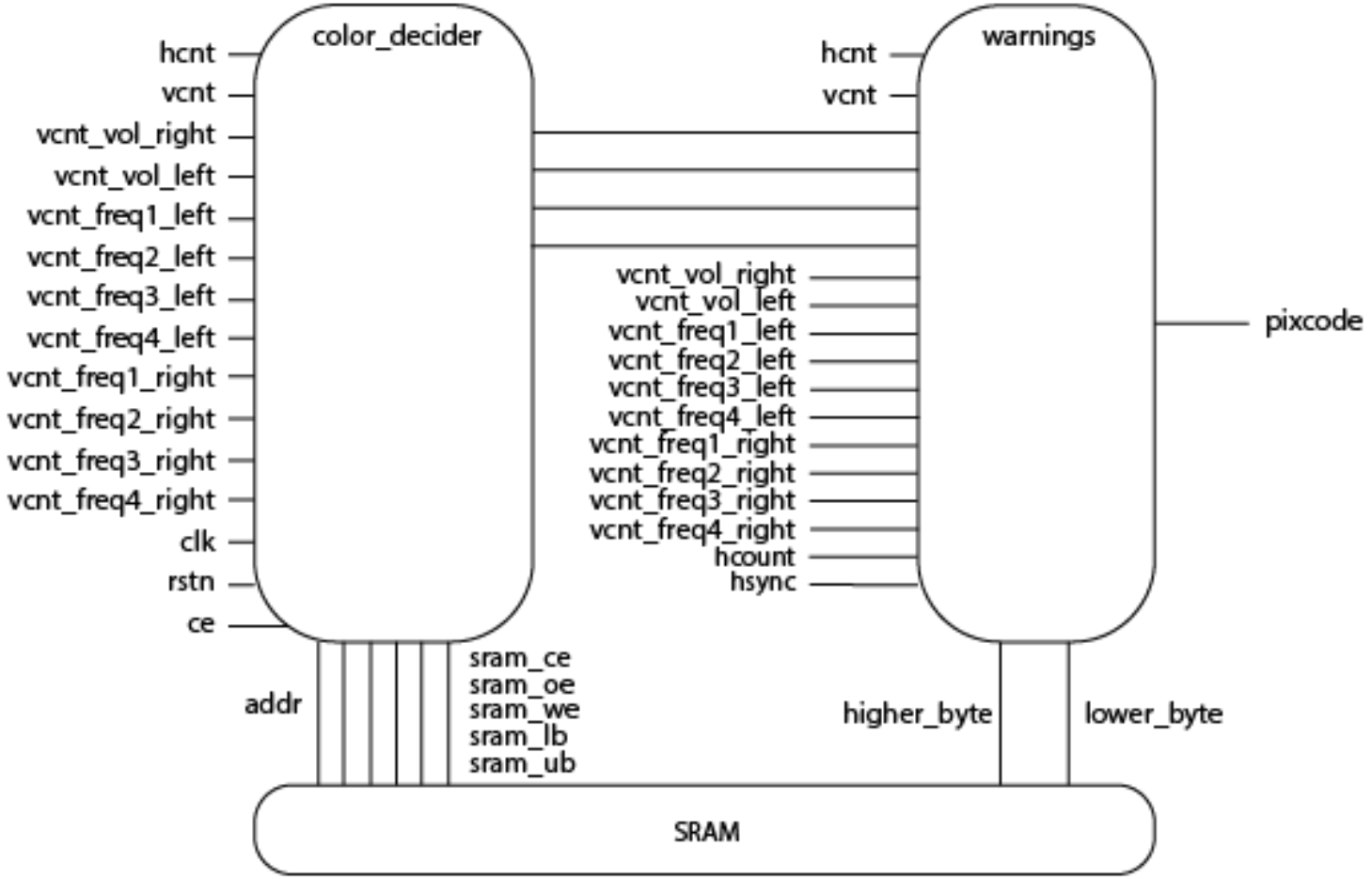
Convert power values into gauge limits between colored area and the rest of the gauge





Design | VGA Control

- Decides the color of the pixel depending all the parameters : gauge limits, warnings, mute and oscilloscope
- IF statements
- Background picture store in the SRAM



Challenges & Experiences | challenges

Time-consuming (FIR filter) : lot of adjustments needed to obtain the expected result

Communication : different schedules that reduce the time together to talk about the project

Challenges & Experiences | Experiences

some problems just need TIME to be solved

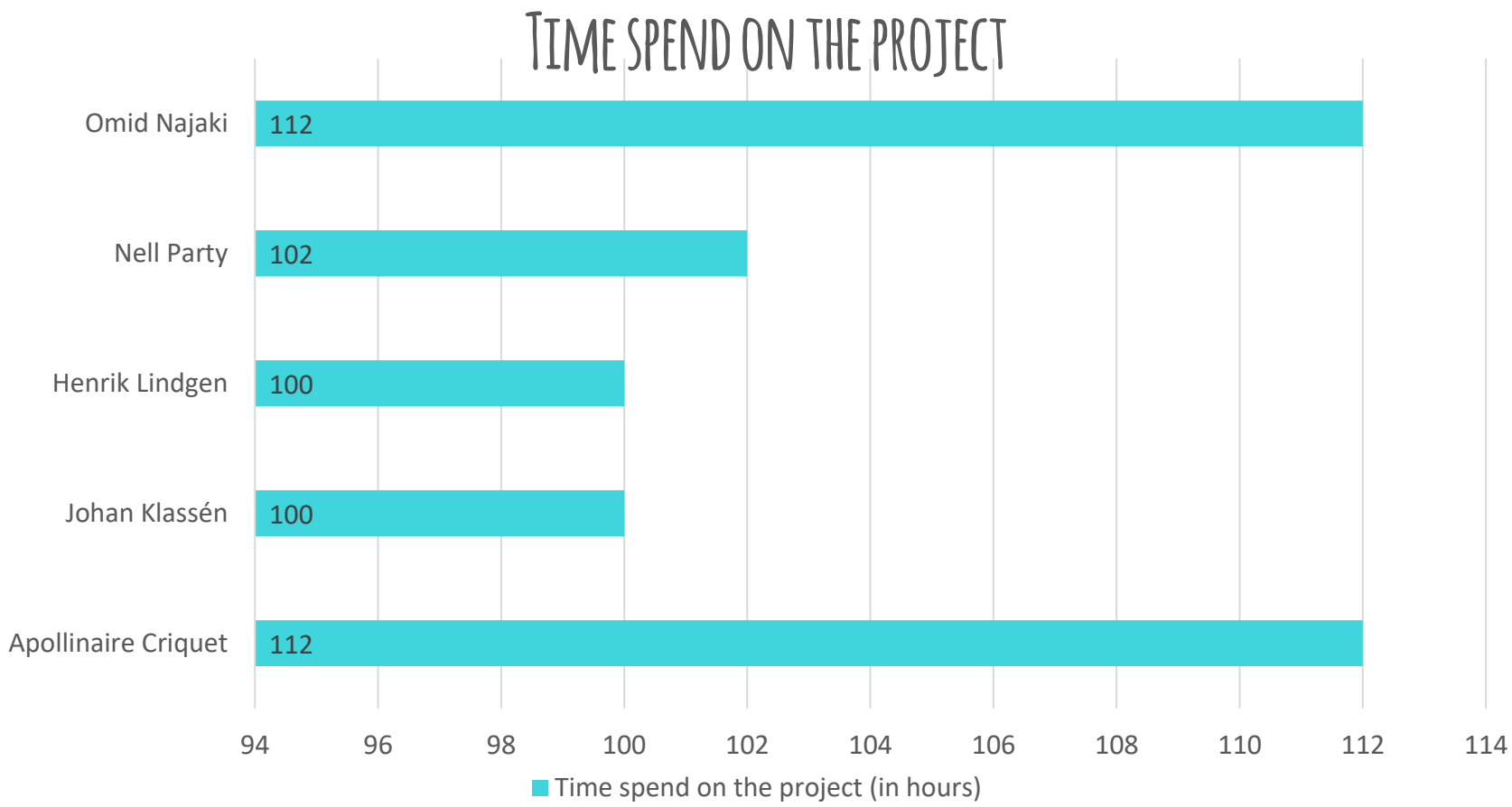
simulation TESTBENCHES are a very powerful and useful tool

ORGANIZE the project well to make the integration of all individual parts smooth

writing some DESIGN SPECIFICATIONS before doing any code

have good COMMUNICATION to keep track of the advance in the project

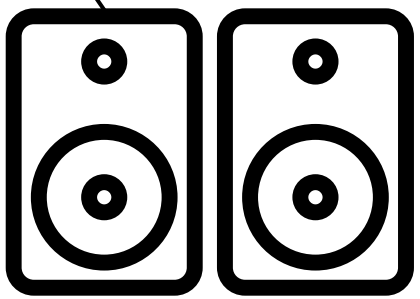
Time Summary

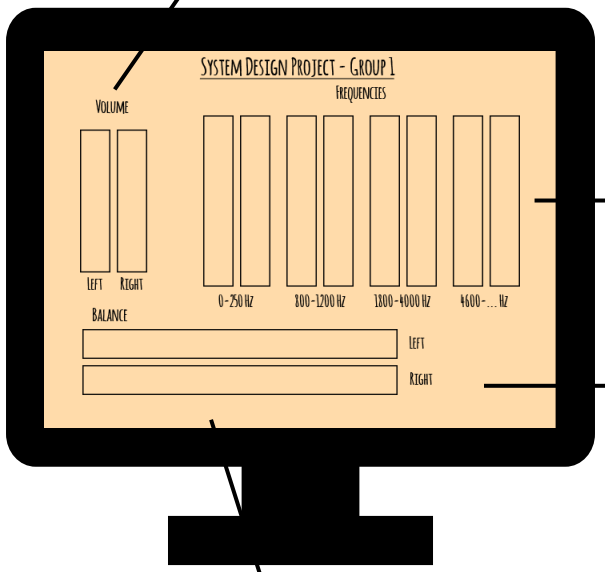


User Manual | Functionalities

Volume visualization

Sound in output with a stereo option

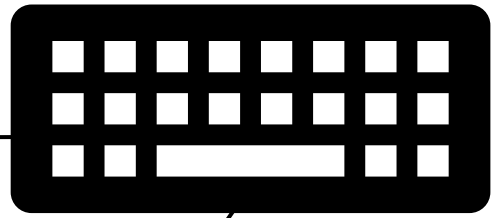




Frequencies analyses

Oscilloscope in the background

Control the volume and the balance



Balance visualization

Mute option

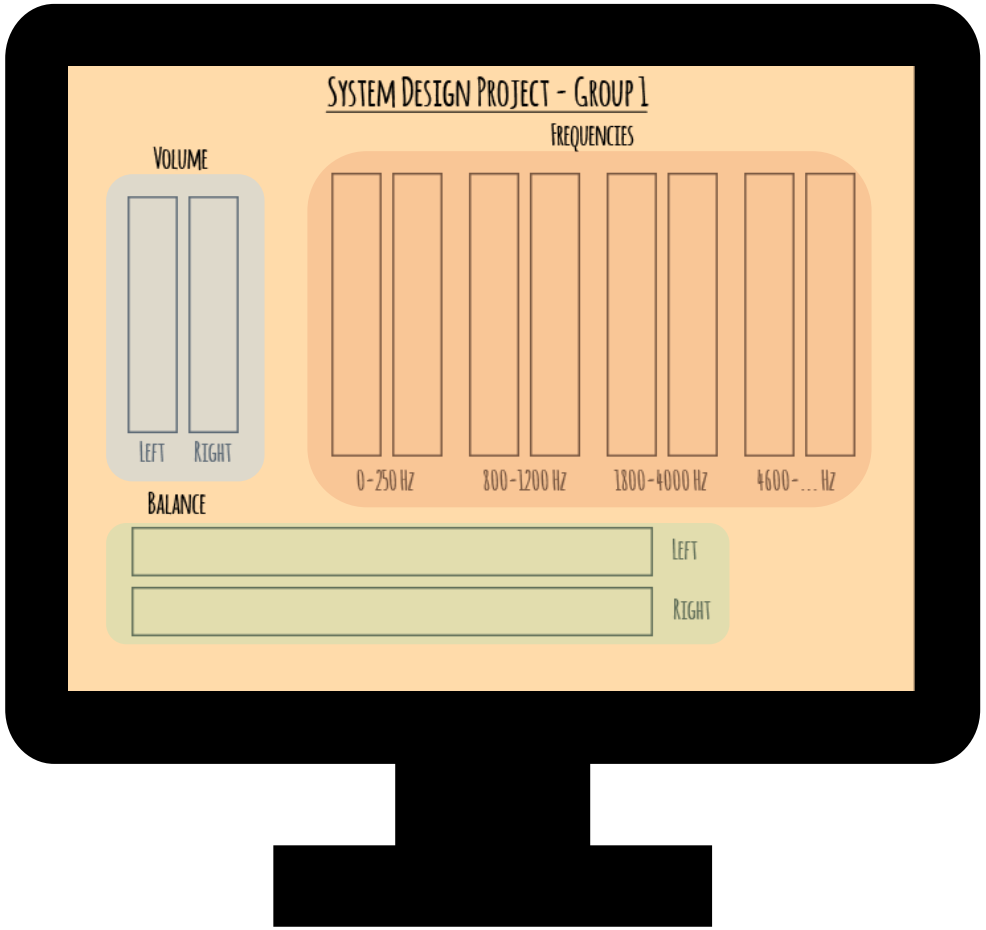
User Manual | Controls

Volume control : *up arrow increase the volume and down arrow decrease the volume*

Balance control : *left arrow shifts the balance to the right and right arrow shifts the balance to the left*

Mute control : *turn off the sound on the speakers*

User Manual | Visualization



- Frequencies Analyses
- Volume visualization
- Balance visualization

An oscilloscope is visible on the background