

Unleashing Creativity with Zynq



Club Vivado Users Group Paris



Oct. 8th, 2015

Agenda

1. Project presentation in pictures
 - . 3 slides
2. Description of modules built with Vivado
 - . 12 slides
3. Conclusions
 - . 4 slides

High-End Audio Playback



2004: PC-based

- bulky
- >2 min to boot-up
- ~ \$2000

2015: Zynq-based

- slim
- ~2 sec to boot-up
- ~ \$200

Loudspeakers Setup



YL & Onken Horns with Compression Drivers (Japan), Altec Bass Cabinet (USA) 1. 2/3

Quad-Amps Setup



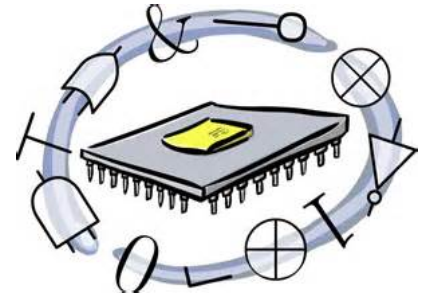
Tact Audio Digital Amplifiers (USA), Rotal CD player (Japan)

Current Functionalities



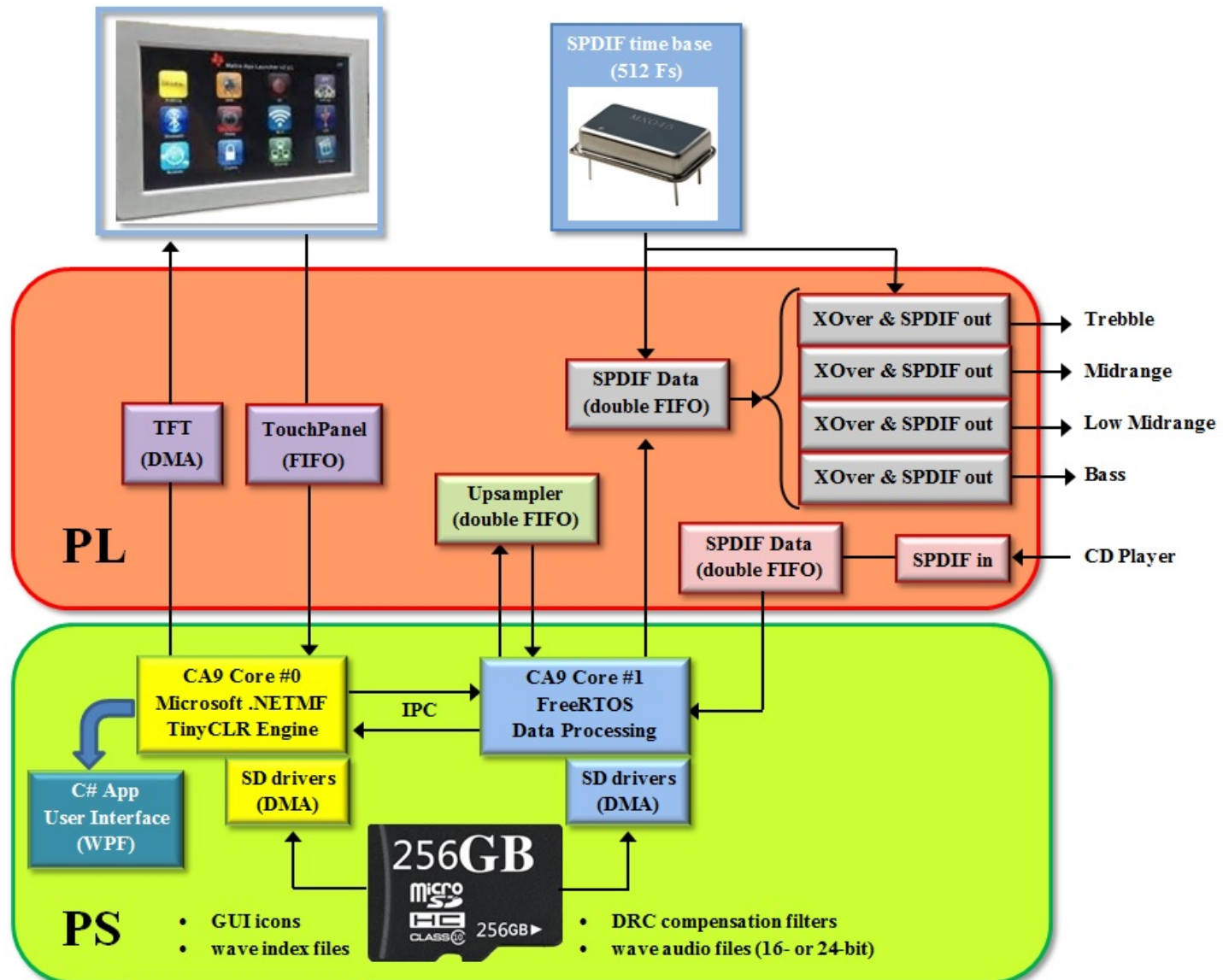
- ✓ “Jukebox”-like Graphical User Interface
- ✓ Standard CD & High-Resolution Audio
- ✓ Digital Room Correction
- ✓ Digital Crossovers
- ✓ Upsampling
- ✓ System & Room Measurements

FPGA Programmable Logic

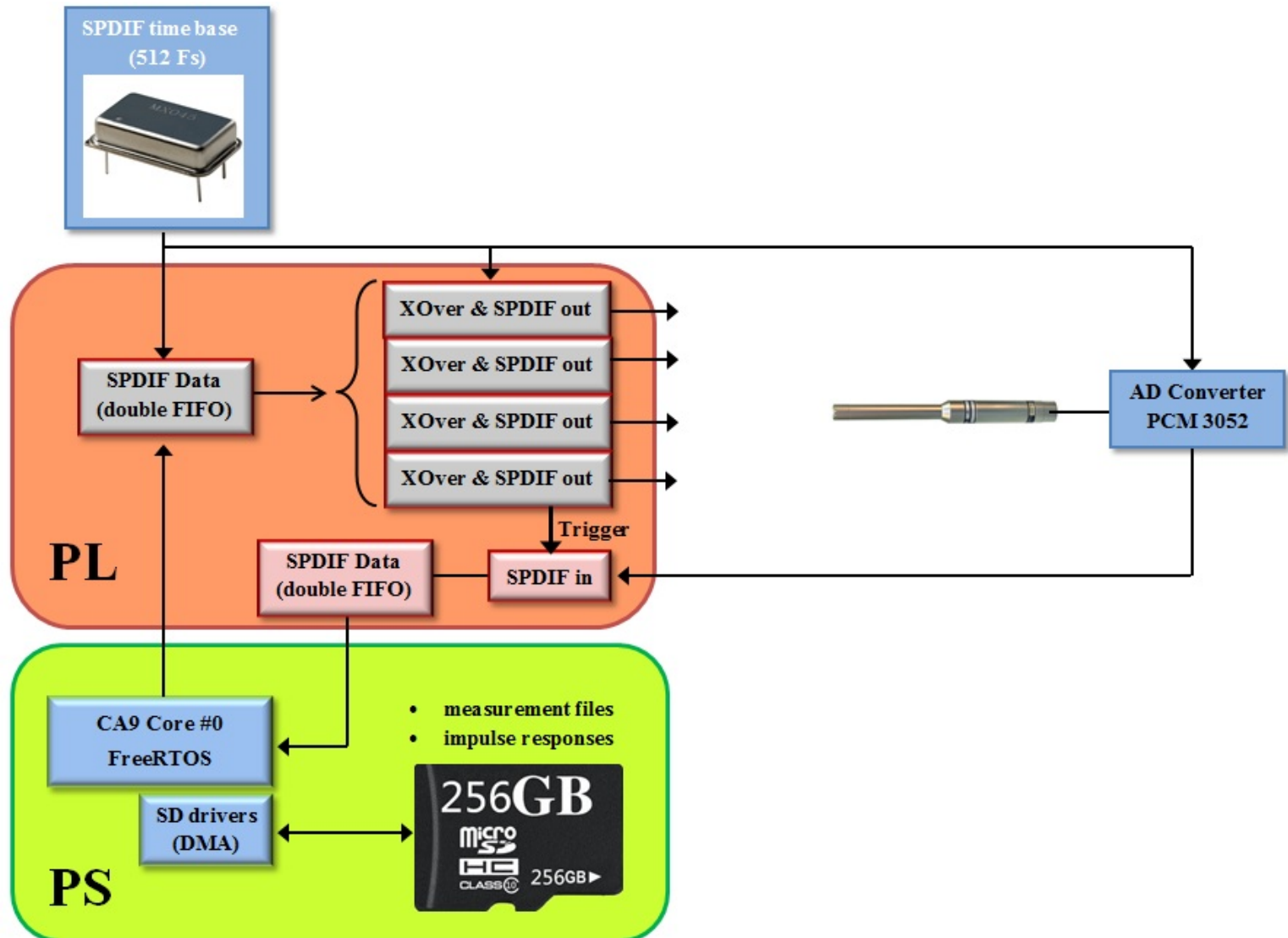


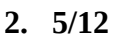
- TFT & Touch Panel interfaces
- PS/PL data transfers
- Crossover, Loudspeaker Time-Alignment and SPDIF output IP
- Upsampler
- SPDIF input

Playback Configuration



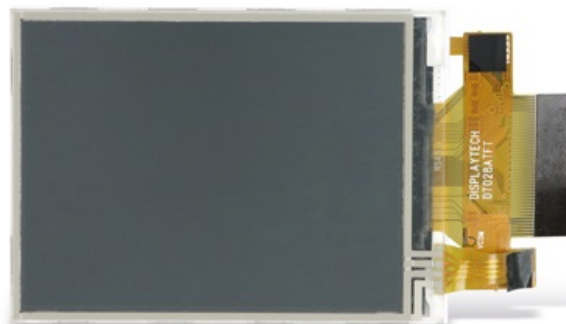
Measurements Configuration



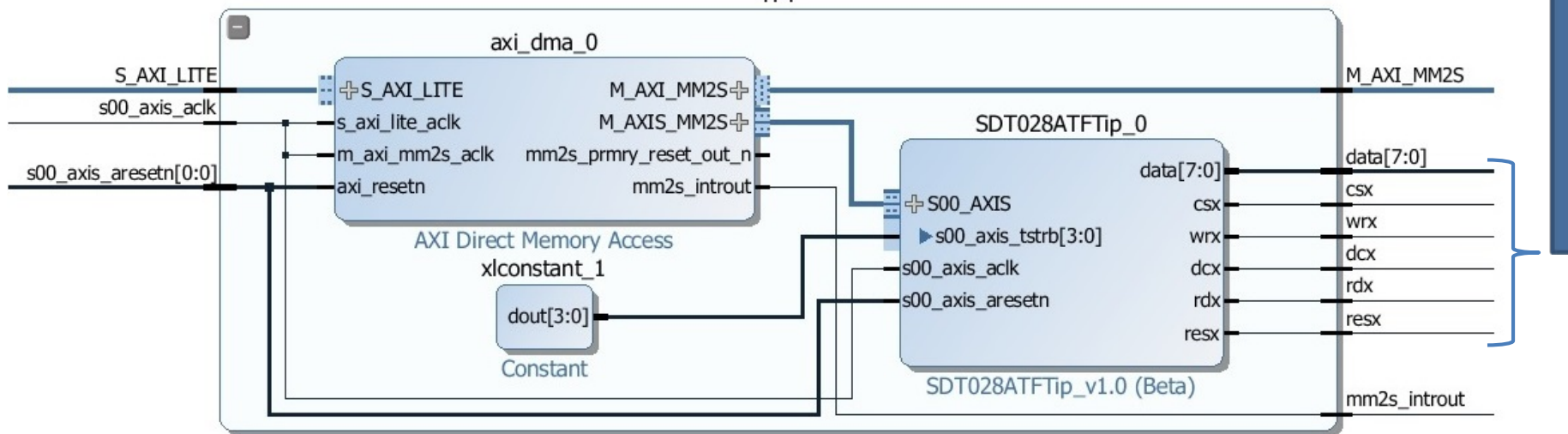




TFT Display

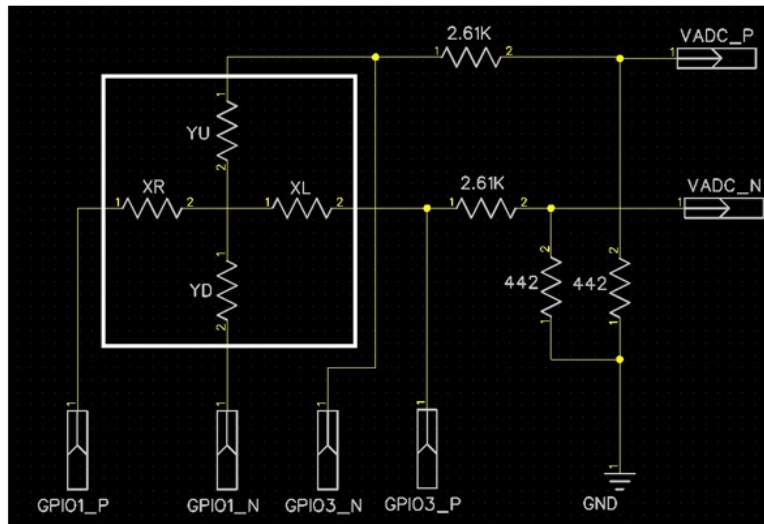


TFT

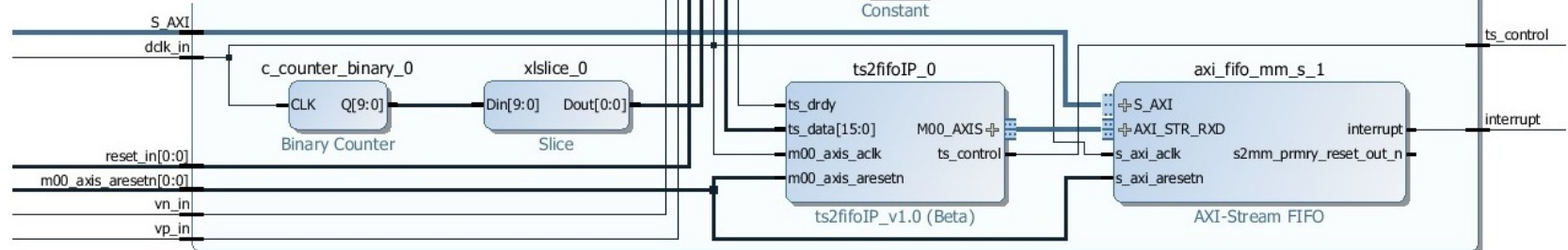




Resistive Touch Panel



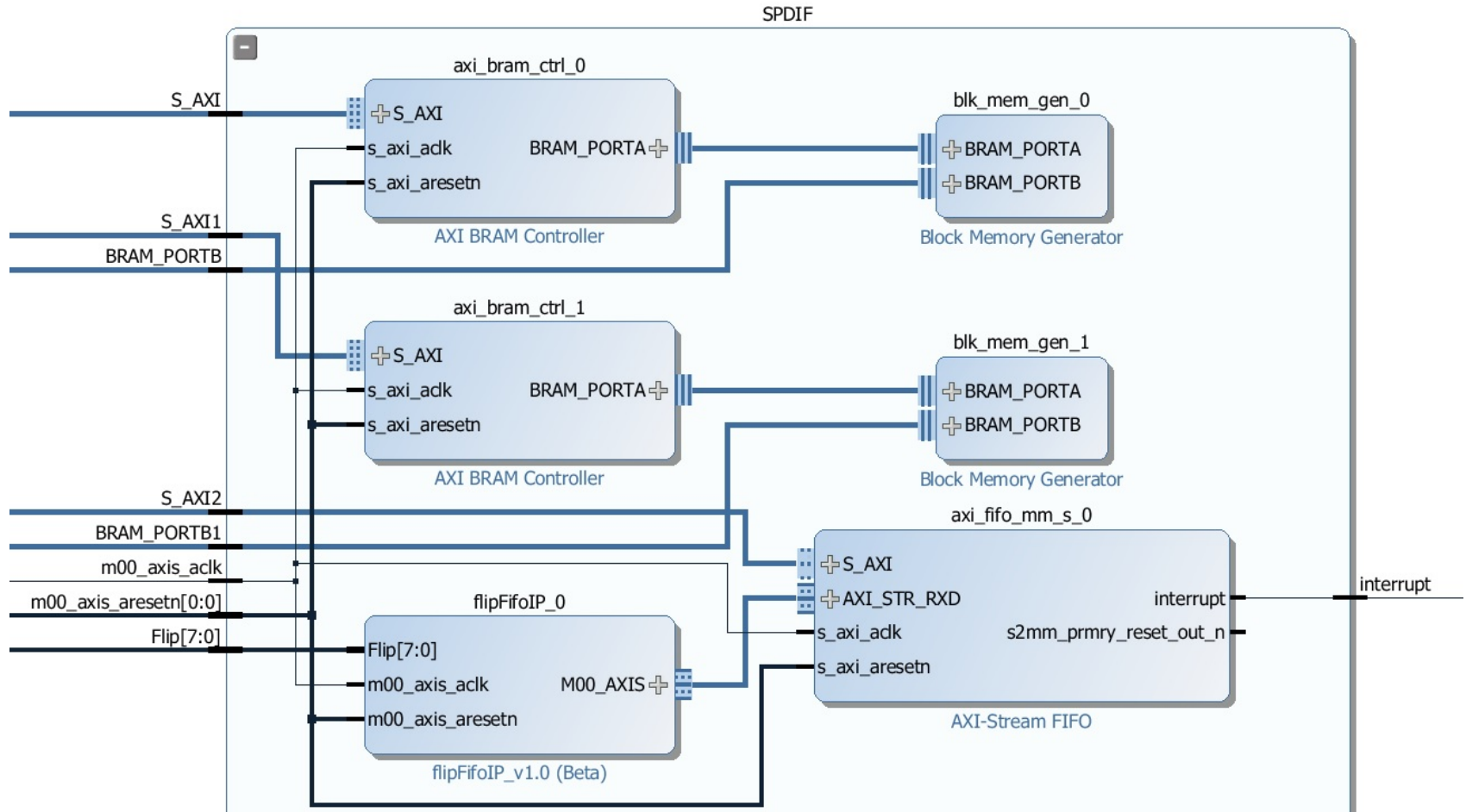
ts_control





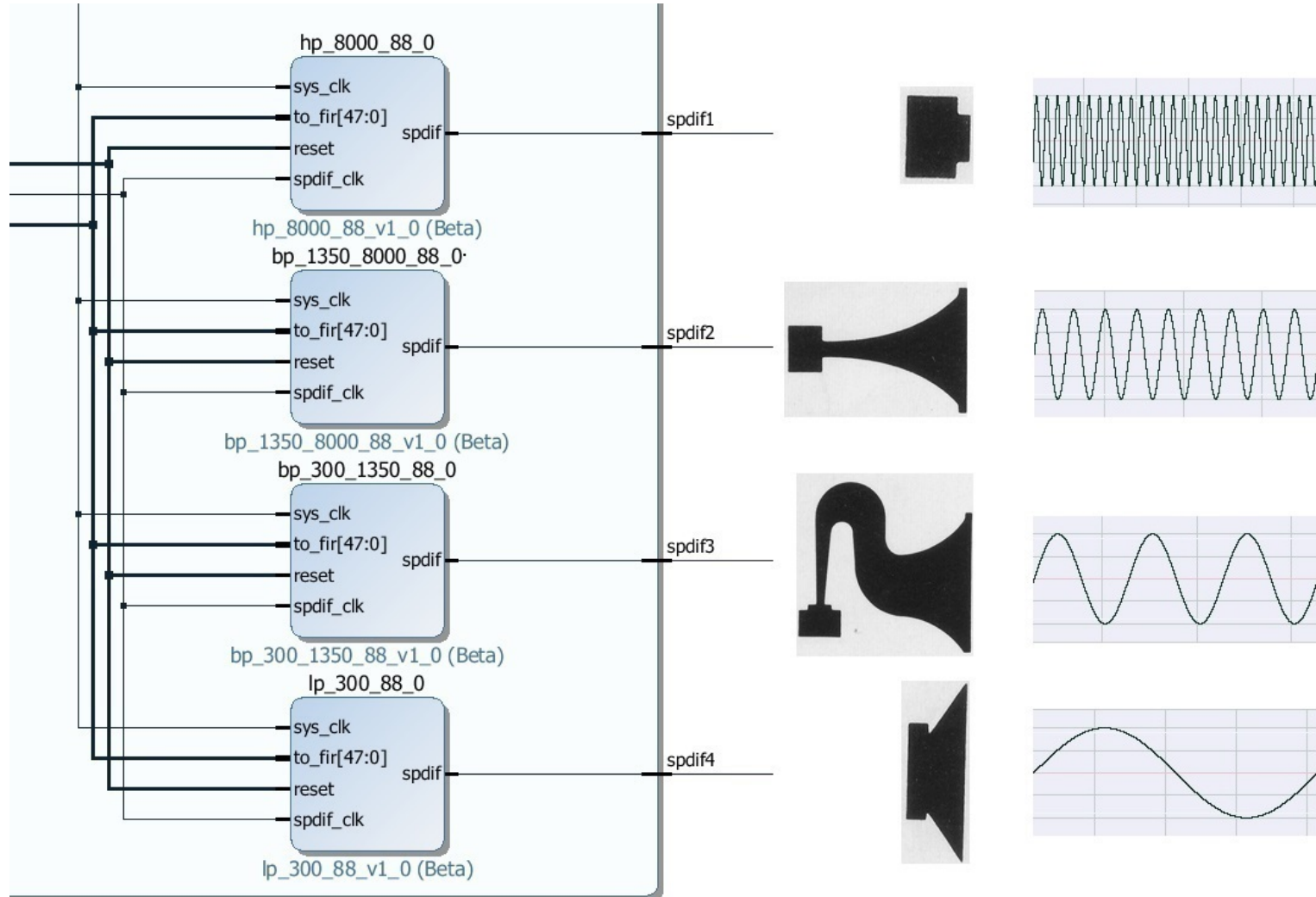
PS/PL data transfers

Double-FIFO with DMA



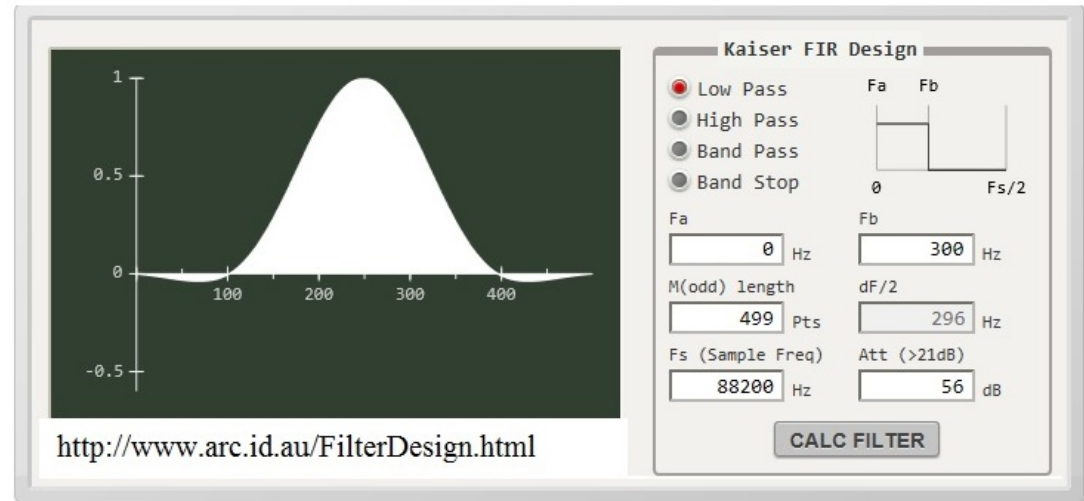
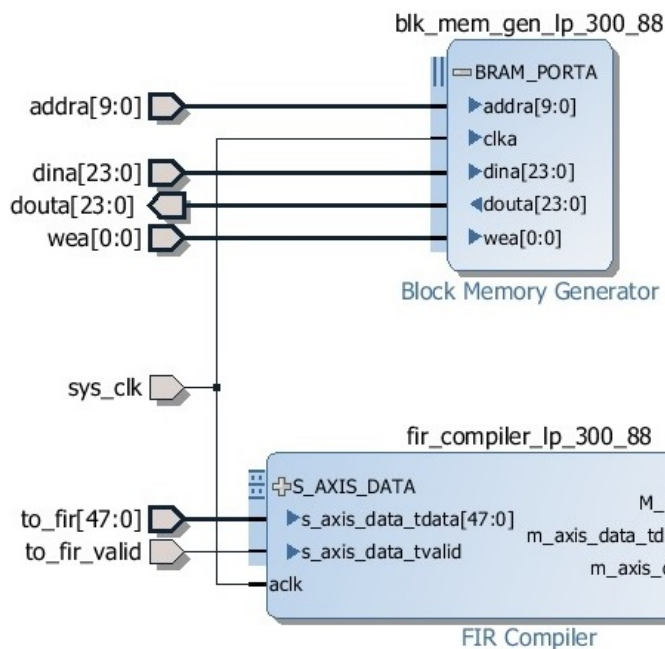


Quad-Amps Crossovers



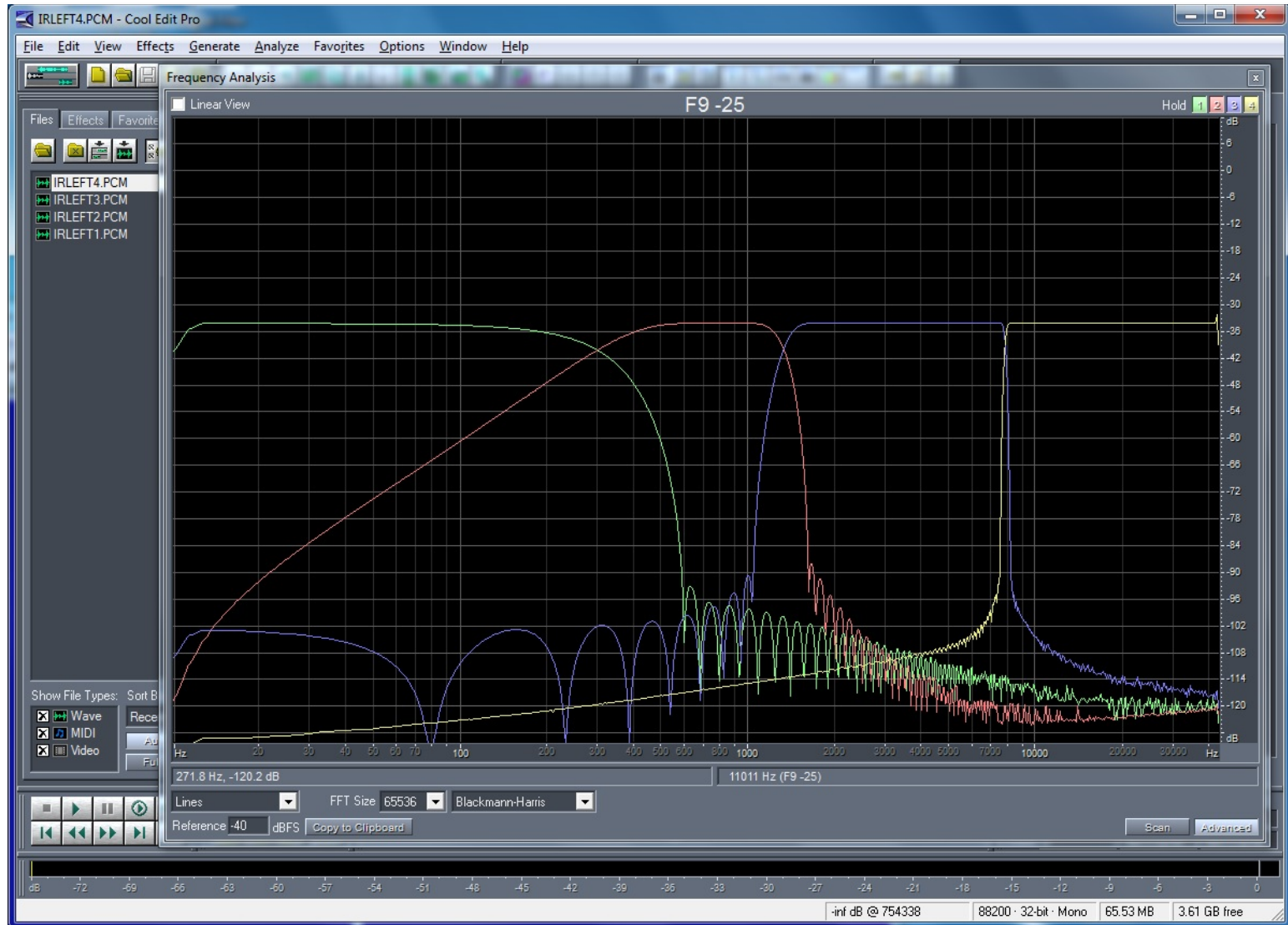


Crossover, Loudspeaker Time-Alignment and SPDIF_output IP



Crossovers Verification & Validation

Loopback Test SPDIF output to input



Upsampler

Converting the 44.1KHz sampling rate of standard CDs to 88.2KHz or 176.4KHz with:

http://www.xilinx.com/support/documentation/xcell_articles/efficient-parallel-real-time-upsampling-with-xilinx-fpgas.pdf

Conclusions

Zynq-7000 All Programmable SOC

Combining the flexibility of software development with concurrent programmable hardware provides tremendous leverage to design great applications effectively



Resources on Internet

1. Starting up with Vivado and Zynq
<http://svenand.blogdrive.com/archive/160.html#.VQf3MU10xlY>
2. To get up to cruising speed
<http://zynqhowto.blogspot.kr/>
3. AXI, don't leave home without it!
<http://www.googoolia.com/wp/category/zynq-training/>

Special Thanks

- **Digital Room Correction:** Denis Sbragion
- **Crossover Articles:** Rod Elliott
- **SPDIF:** Mike Field and ACKspace
- **Upsampler:** William D. Richard
- **Vivado WebPack:** Xilinx Corp.
- **NETMF:** Microsoft Corp.
- **FreeRTOS:** Real Time Engineers Ltd.

and many others...

Free Open-Source Audio Project Follow-up

➤ YouTube Videos

https://www.youtube.com/watch?v=dTkPmM64F_U

➤ Forum

<https://parallella.org/forums/viewtopic.php?f=51&t=1752>



Thank You...