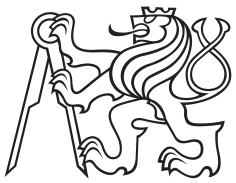
Master's thesis



Czech Technical University in Prague

F3

Faculty of Electrical Engineering
Katedra měření

Rychlý vícekanálový systém sběru dat pro radioastronomický přijímač

Jakub Kákona

June 2014

http://petr.olsak.net/ctustyle.html

Draft: 16. 4. 2014

Acknowledgement / Declaration

Prohlašuji, že jsem předloženou práci vypracoval samostatně a že jsem uvedl veškeré použité informační zdroje v souladu s Metodickým pokynem o dodržování etických principů při přípravě vysokoškolských závěrečných prací.

V Praze dne 13. 13. 2013

.....

Abstrakt / Abstract

.

Klíčová slova:

.

Keywords:

/ Contents

Chapter 1

Testing construction

1.1 Required parameters

Wide dynamical range and high 3 intercept point are desired. The receiver must accept wide dynamic signals because radioastronomical signal in typically weak signal covered by strong man made noise signal.

1.2 System description

1.2.1 Design of ADC modules

For PCB layout KiCAD design suite was used. Used version has the CERN Push & Shove routing capability integrated but was slightly unstable and sometimes falls on exception during routing. Design must be often saved due to this stability issues. But Open-source KiCAD works well compared to commercial solutions as MentorGraphics PADS or Cadence Orcad.

1.2.2 ADC modules interface

All two ADCdual01A modules was connected to FPGA ML605 board trough

1.2.3 Output data format

		160bit packet							
Data name	FRAME	ADC1 CH1		ADC1 CH2		ADC2 CH1		ADC2 CH2	
Data type	uint32	int16	int16	int16	int16	int16	int16	int16	int16
Content	saw signal	$t1$	t_{1+1}	$t1$	t_{1+1}	$t1$	t_{1+1}	$t1$	t_{1+1}

Table 1.1. System device `/dev/xillybus_data2_r` data format

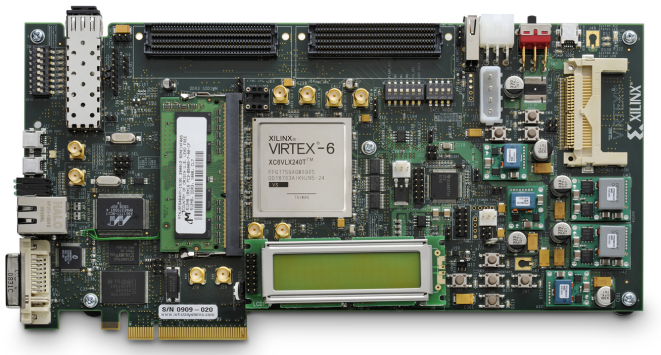


Figure 1.1. Used FPGA ML605 development board.

1.3 Achieved parameters

1.3.1 Data reading and recording

For reading data stream from ADC driver Gnuradio software was used. Gnuradio suite consist gnuradio-companion which is a graphical tool for creating signal flow graphs and generating flow-graph source code. This tool was used to create basic RAW data grabber to record and interactive wiev data stream output from ADC modules.

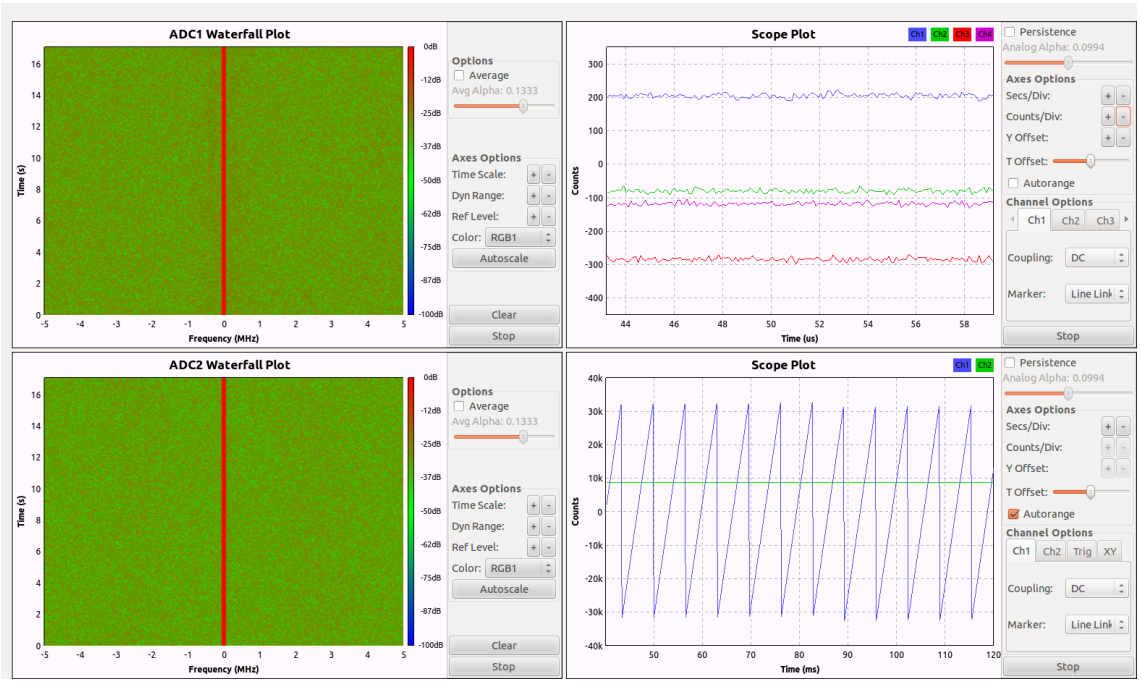


Figure 1.3. User interface window of running ADC grabber.

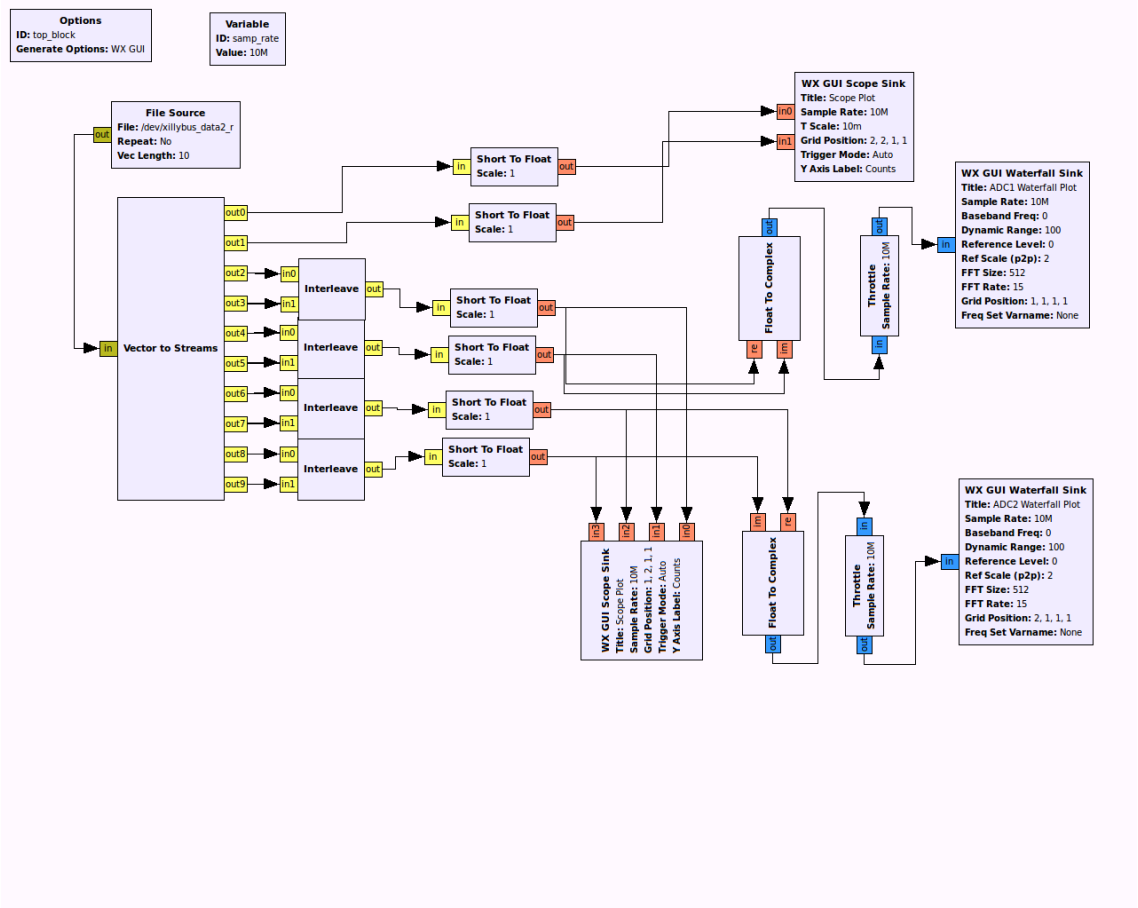


Figure 1.2. ADC recorder flow graph created in gnuradio-companion.

Interactive graber wiewer user interface shows live osciloscope-like time-value display for all data channels and live time-frequency scrolling display (waterfall wiev) for displaying frequency components of grabbed signal.