A.5: High speed data acquisition and processing platform (HSADC631)

A four-channel high speed data acquisition and processing platform has been developed. This consists of an ADC card and supports Hardware Development Kit (HDK) and Software Development Kit (SDK) softwares. HDK supports the IP core for on board FPGA whereas SDK supports the on board micro controller unit (MCU) and higher level driver for PC application development. The ADC card is capable of working with VME 32/64 systems. It can also be used in standalone applications using on-board ARM 7 MCU that can be clocked up to 1 GHz and works with USB/Ethernet interface. The board along with the developed tool chain is in use for digital beam position indicator (BPI) development for Indus-2. The main design parameters of HSADC631 board are listed as follows:

Number of channels: 4 with 16-bit ADC
Input coupling type: Single ended 50 Ω, AC-coupled
Support features: ADC temperature monitoring, front-end Gain & mode settings.
Input signal bandwidth: 3 to 630 MHz
Sampling rate: 1.5 to 130 MHz
Internal sample clock oscillator: 3 to 130 MHz
External clock input: LVCMOS, PLL with zero delay mode
Output clock for sync: one of LVCMOS type
Trigger Input & Output: one each of LVCMOS type
Calibration reference on Front Fascia: one LVCMOS type
SNR: >70 dBFs @ fin =505.8 MHz @ 119 MSPS type
FPGA: Xilinx® Kintex-7 XC7K325T with DDR3 1 Gbit SDRAM, 128 Mbit Flash
MCU: ARM 7 @1GHz with Secure RTC, WDT, Ciphers & TRNG
Interface:
1. Bus mode: VME 32/64 DTB Slave/BLT
2. Standalone mode: USB 2.0/Ethernet 100T

I/O: 32 buffered + 16 direct on P2 connector
I/O type: P2 user definable LVDS and LVCMOS signal levels
Application support: Board condition monitoring and board utility manager.
Tool chain : HDK, SDK, LabVIEW Driver

Figure A.5.1 shows the block diagram and the interconnect between different board modules. Figures A.5.2(a) and (b) show the actual board photograph and a GUI panel for software defined radio (SDR) example application testing, respectively. This board is ideally suited for demanding applications in particle accelerators like digital BPI electronics, cavity BPI electronics, accelerator low-level radio frequency (RF) systems and RF protection systems. This board can also be used in other applications like sound navigation and ranging (SONAR), radio detection and ranging (RADAR), magnetic resonance imaging (MRI) and active vibration suppression applications that need multiple analog channel synchronous sampling. It can also be used for applications like SDR, nuclear magnetic resonance (NMR) spectrometer, high speed magnetic bearing position sensor, medical and diagnostics instruments, power quality analyzer, low frequency vector network analyzer (VNA) and low frequency digital storage oscilloscope (DSO) that need analog signal processing and data compression for few channels.

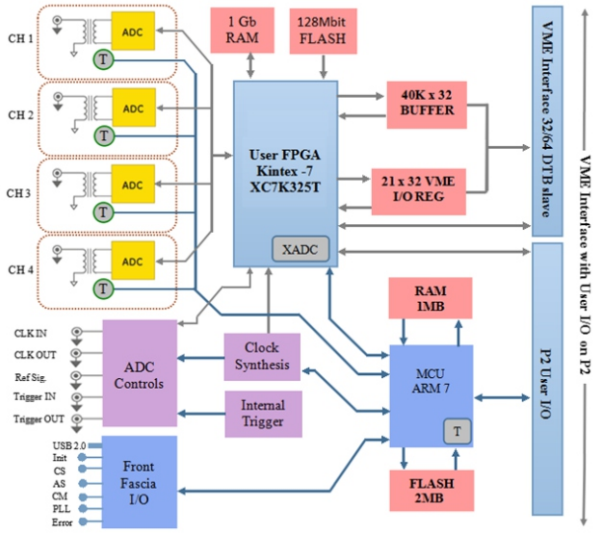
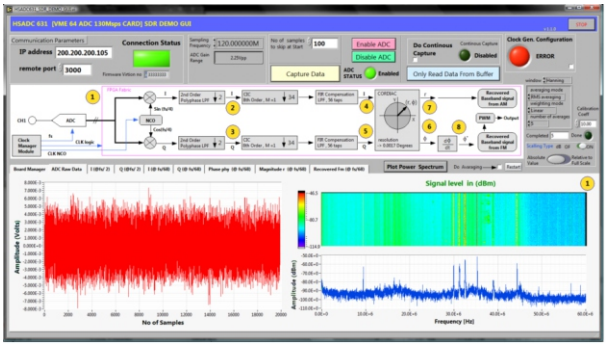


Fig. A.5.1: Block diagram of HSADC631 board.

(a)



(b)

Fig. A.5.2: (a) Photograph of the HSADC631 board. (b) Test GUI panel for SDR application.

Reported by:
R. P. Yadav (rpyadav@rrcat.gov.in)