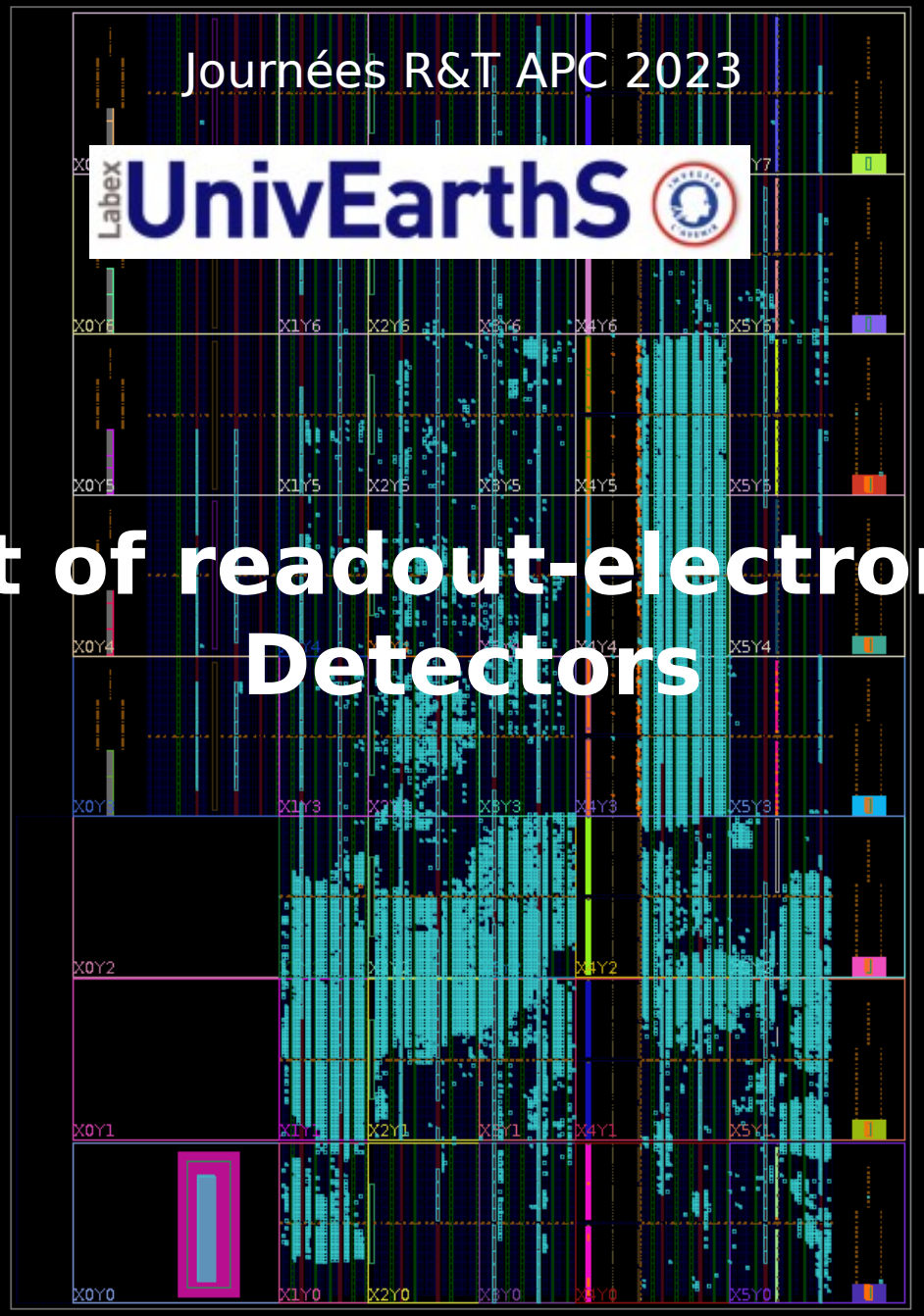
Journées R&T APC 2023



Development of readout-electronic for NGKID Detectors

Michel Piat - Jie Hu - Beng Ky* - Jean Lesrel - Guy Monier

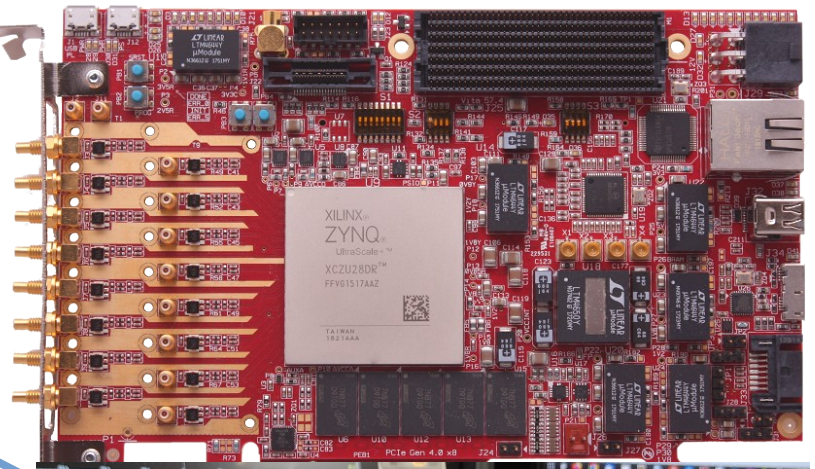
Implication technique de l'APC et principaux défis (1)

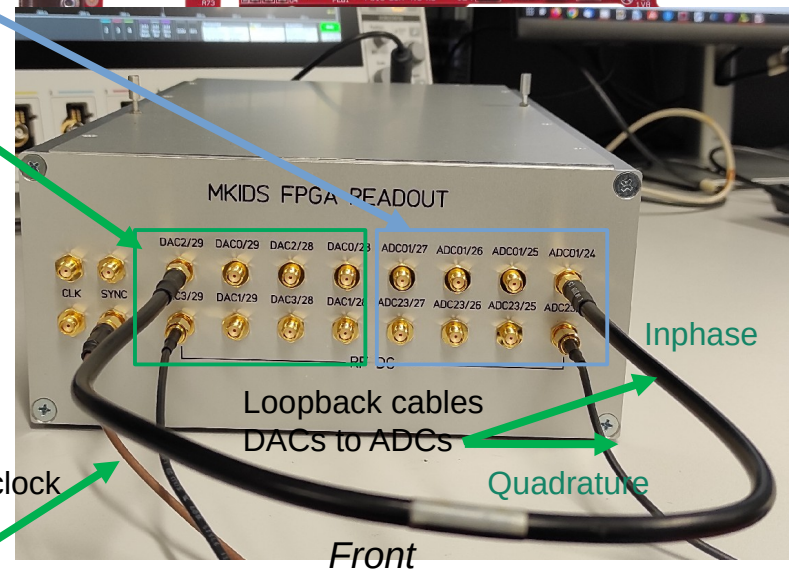
WP3: KIDs readout electronics

FPGA board HTG-ZRF8 from HitechGlobal

8 channels 4 GSPS 12-bit ADC

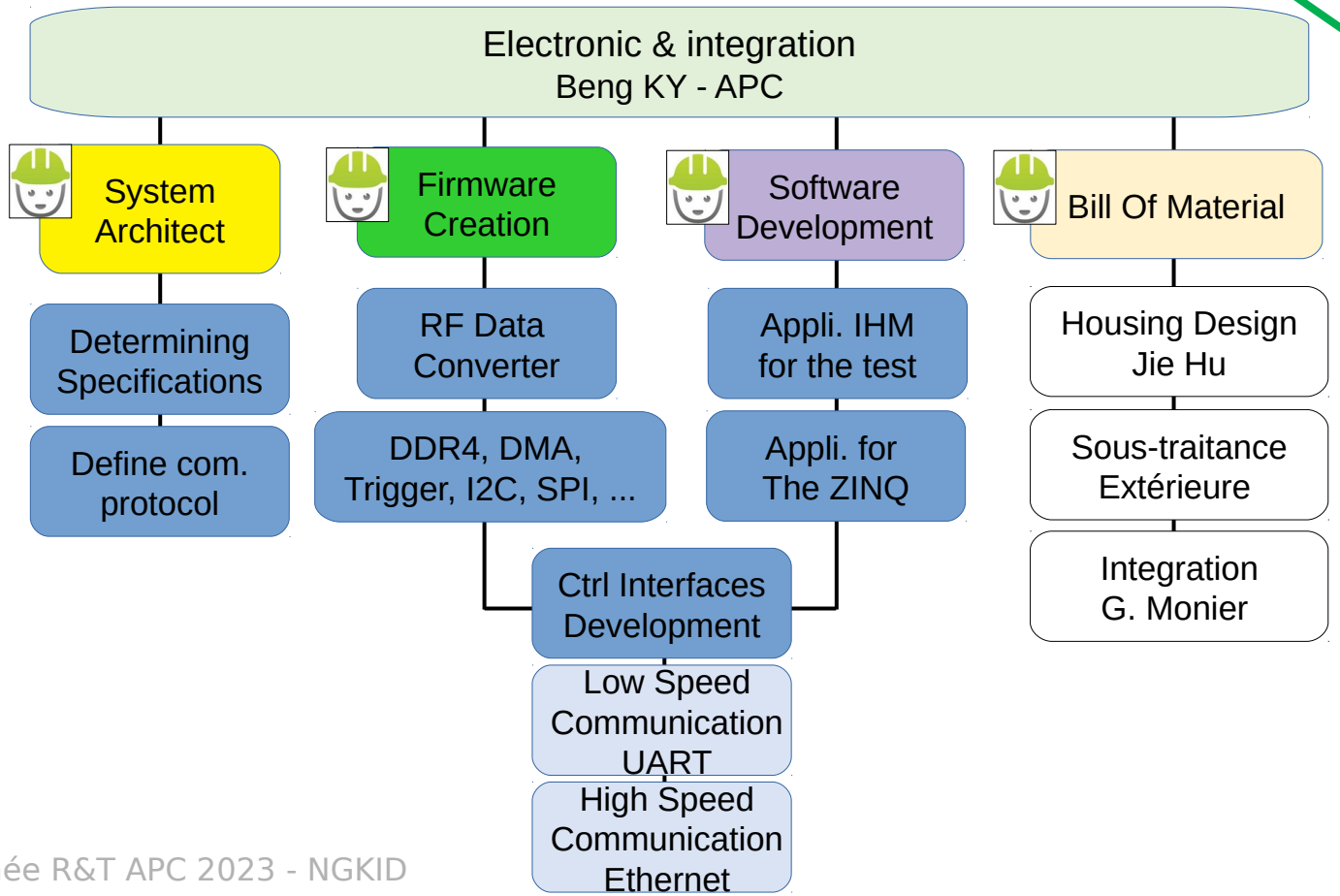
8 channels of 6.4 GSPS 14-bit DAC





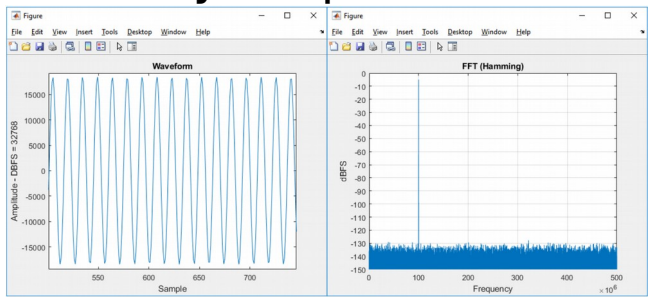
Front

Back

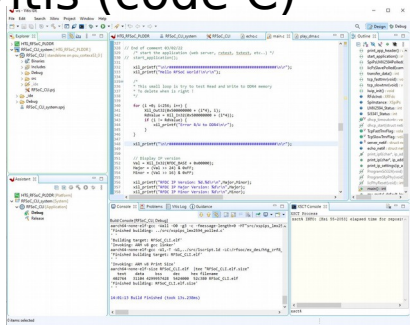


Implication technique de l’APC et principaux défis (2)

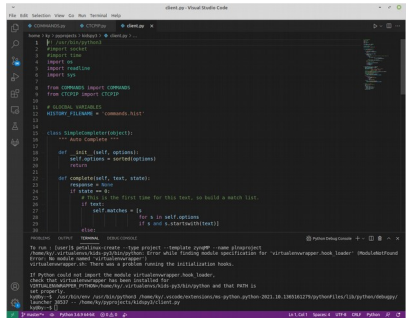
Matlab (by script)



Vitis (code C)



VSCode (code Python)



Laptop
- Vivado
- Vitis
- MATLAB
- JTAG Interface to HTG-ZRF8
- Ethernet & UART

HTG-ZRF8

RFSoC

ARM PS

AXI Clock – 200.00 MHz
8 Samples per clock
(512 bits)

4GB PL DDR

200.00 MHz

AXI DMA

200.00 MHz

FIFO & Data Width/Clock Conversion

AXI Streaming Clk
128,0 MHz
16 samples per clk
(256 bits)

DACs
Tile1 Ch2 & Ch3
Fs = 4,096 GHz
Fs Data Rate = 128 MHz
Interpolation x2

SMA

AXI DMA in Scatter/Gather Mode for Transfers between PL DDR memory and the Data converters.

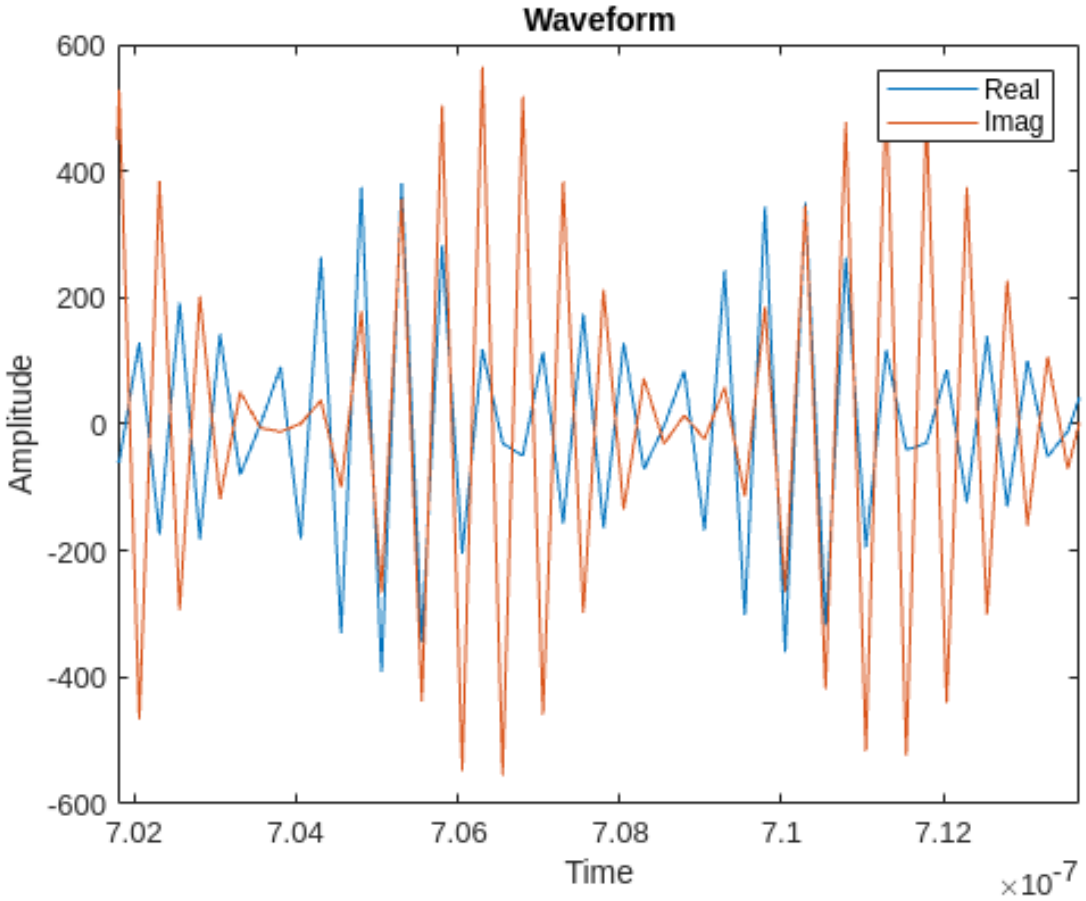
AXI Streaming Clk
512,0 MHz
8 samples per clk
(128 bits)

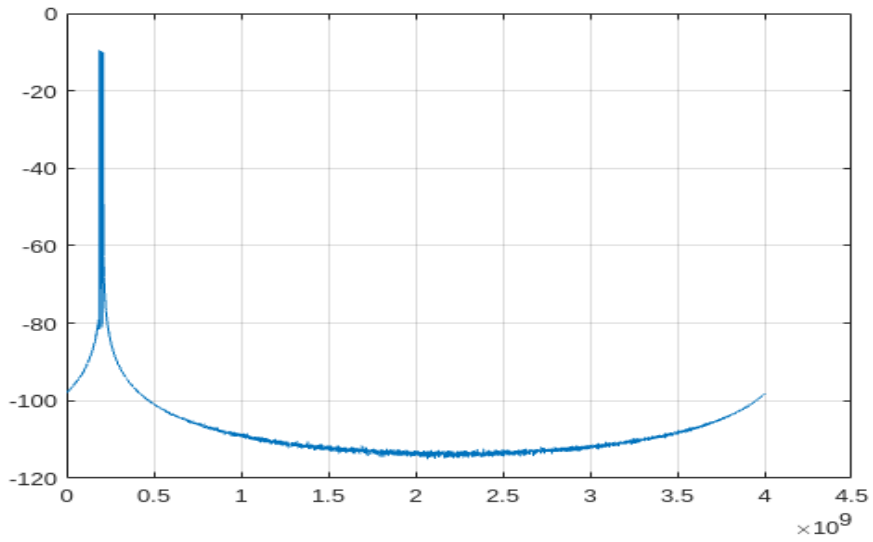
ADCs
Tile0 Ch0 & Ch1
Fs = 4,096 GHz
Decimation x1

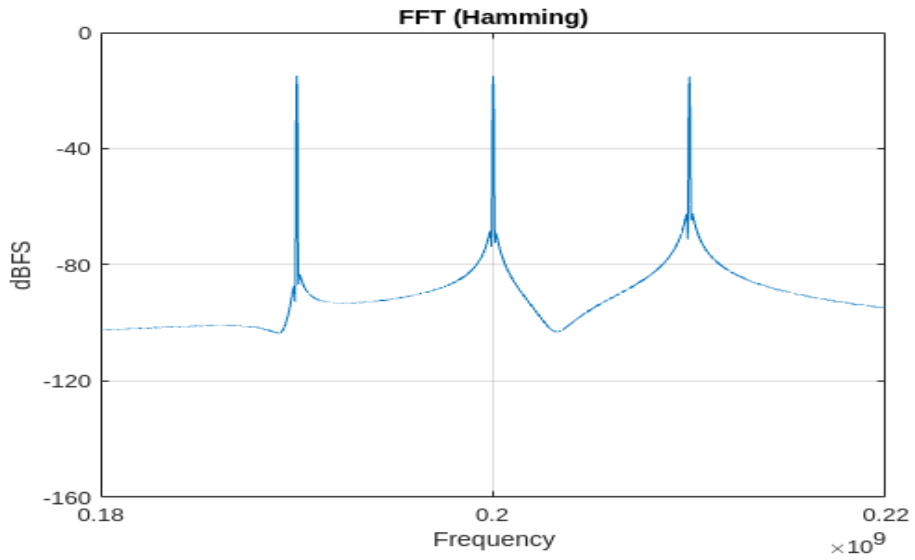
SMA

Principaux faits marquants (1)

MATLAB 3 Tones Generator time domain and FFT waveforms



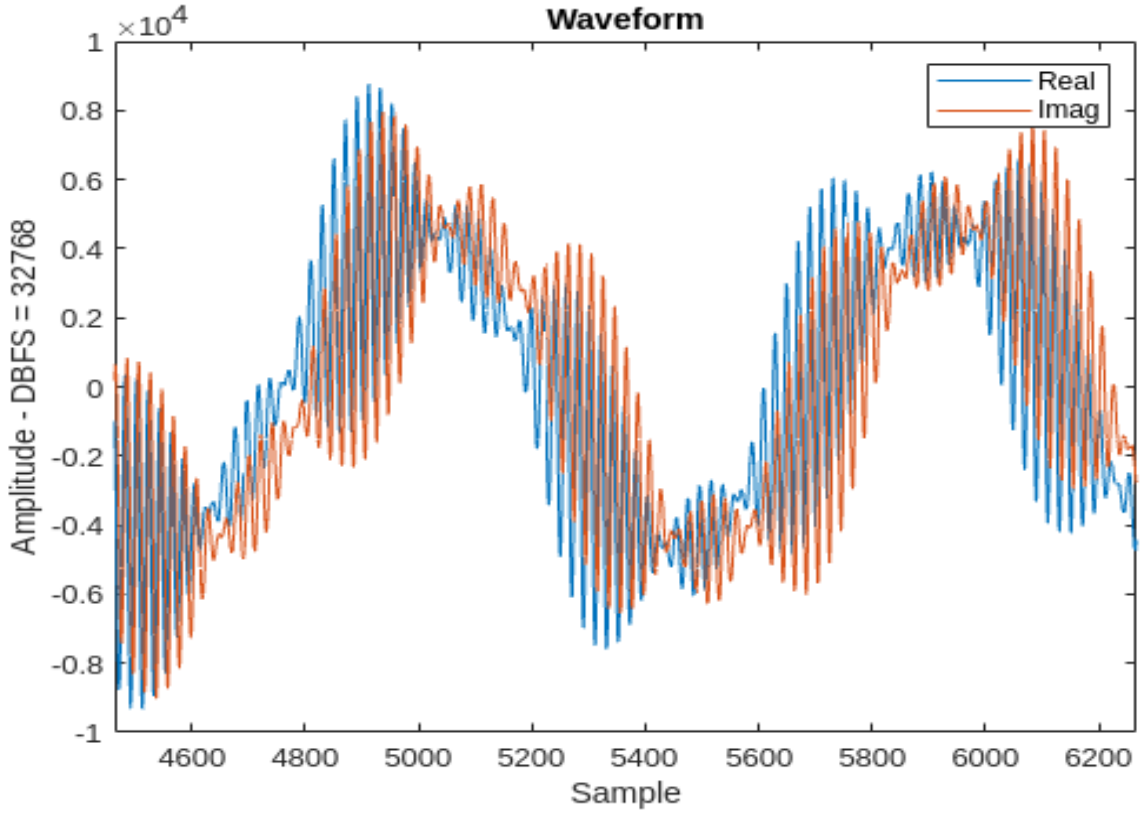




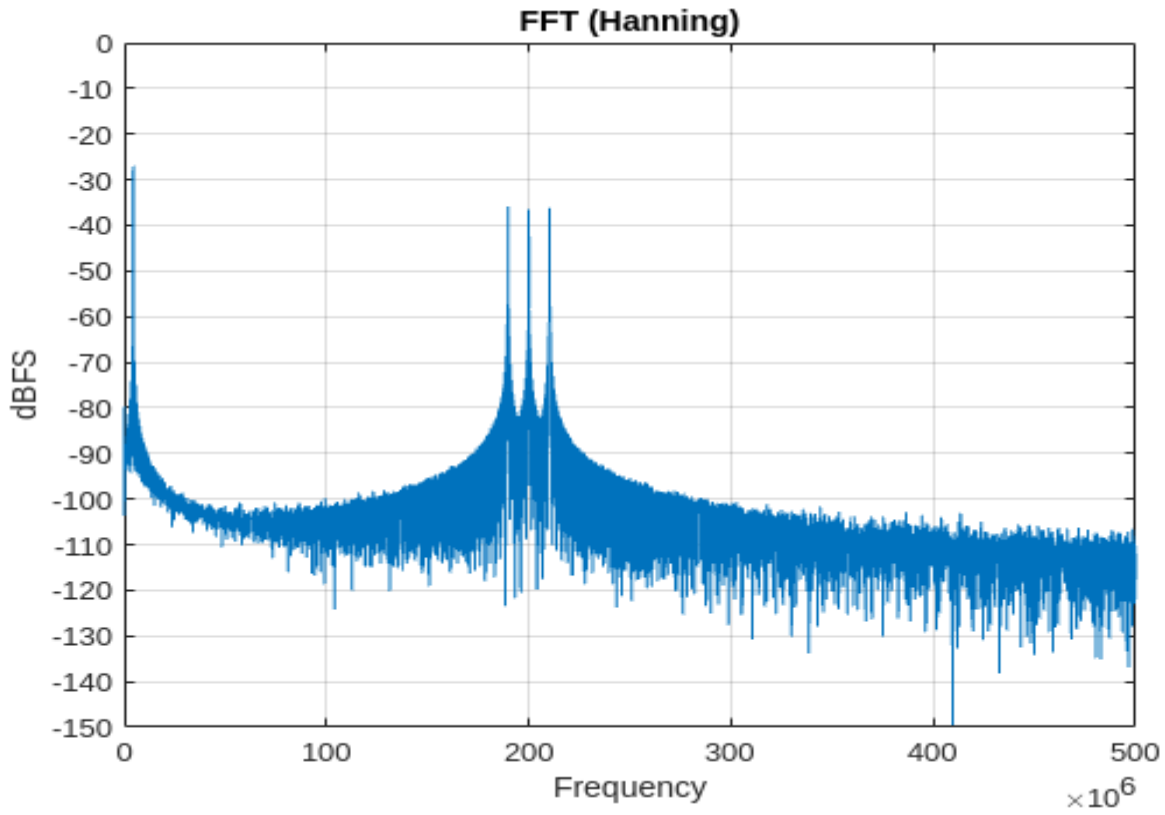
Principaux faits marquants (2)

ADC Capture with MATLAB (3 tones from DAC)

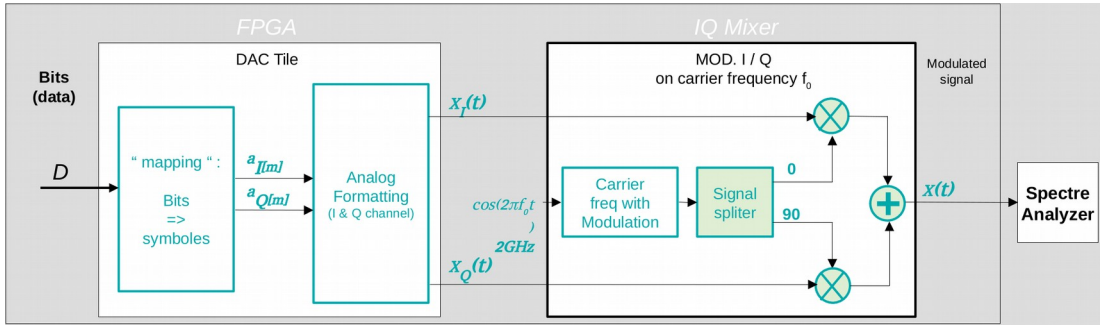
Waveforme



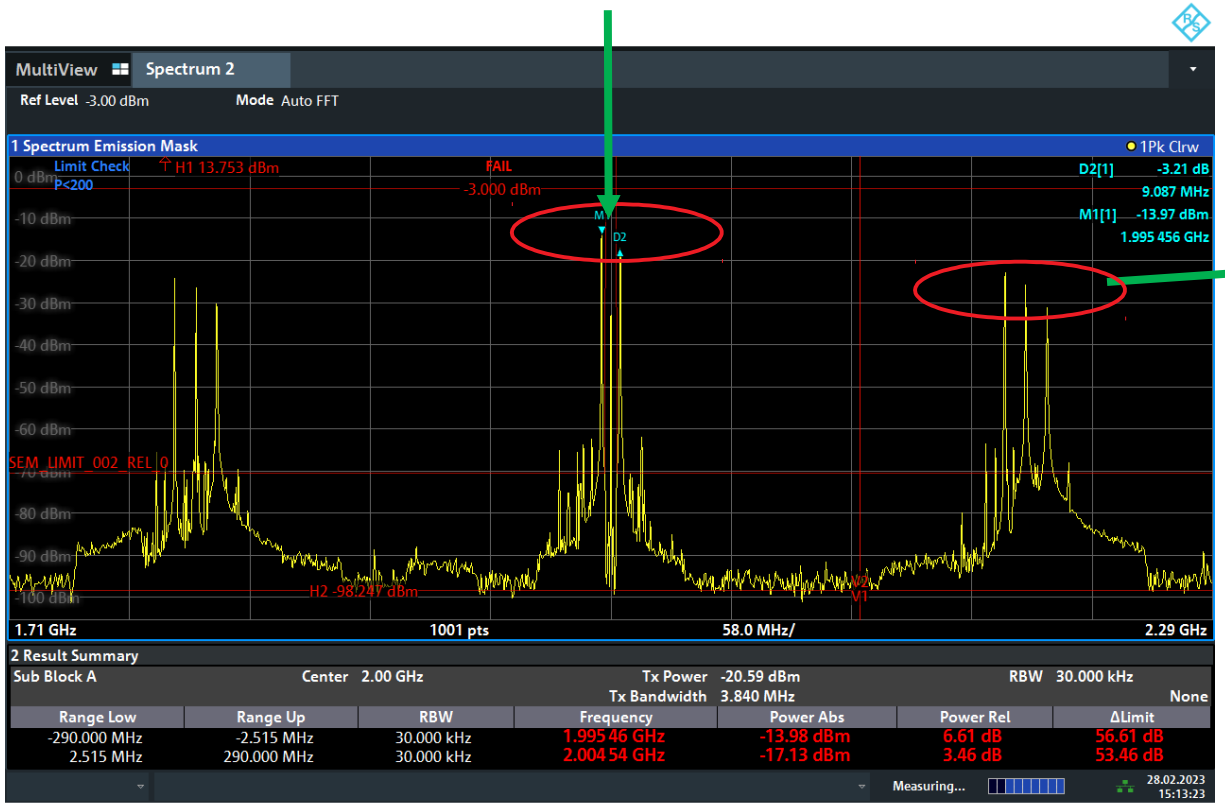
FFT



DAC Play (with an IQ Mixer)

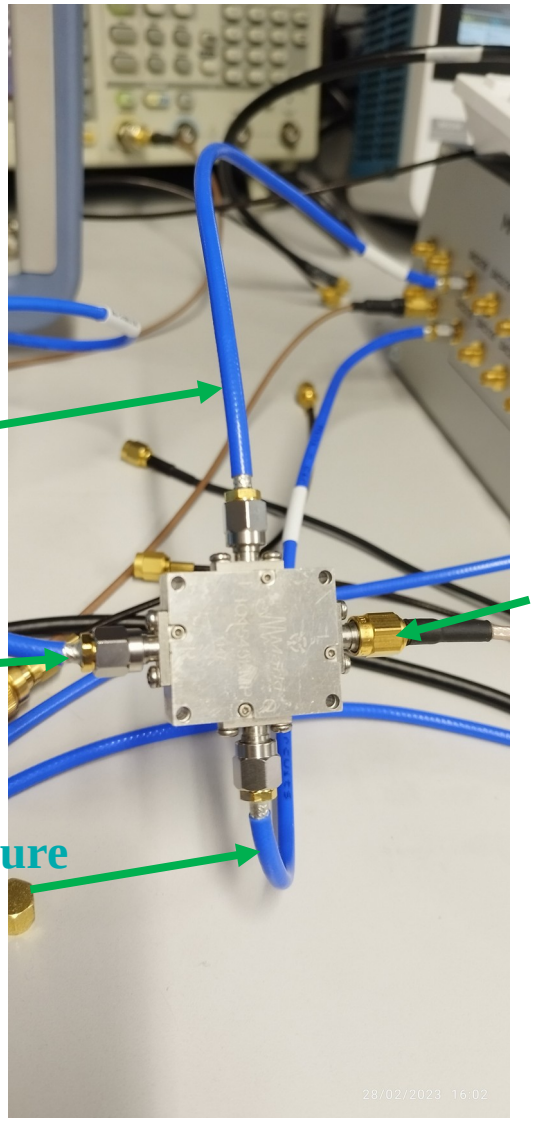


LO = 2GHz



In-phase

Quatrature



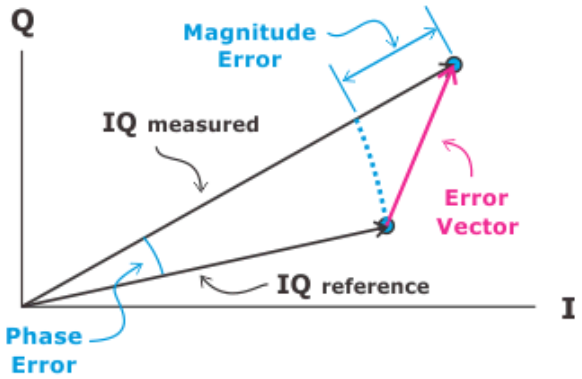
LO = 2GHz

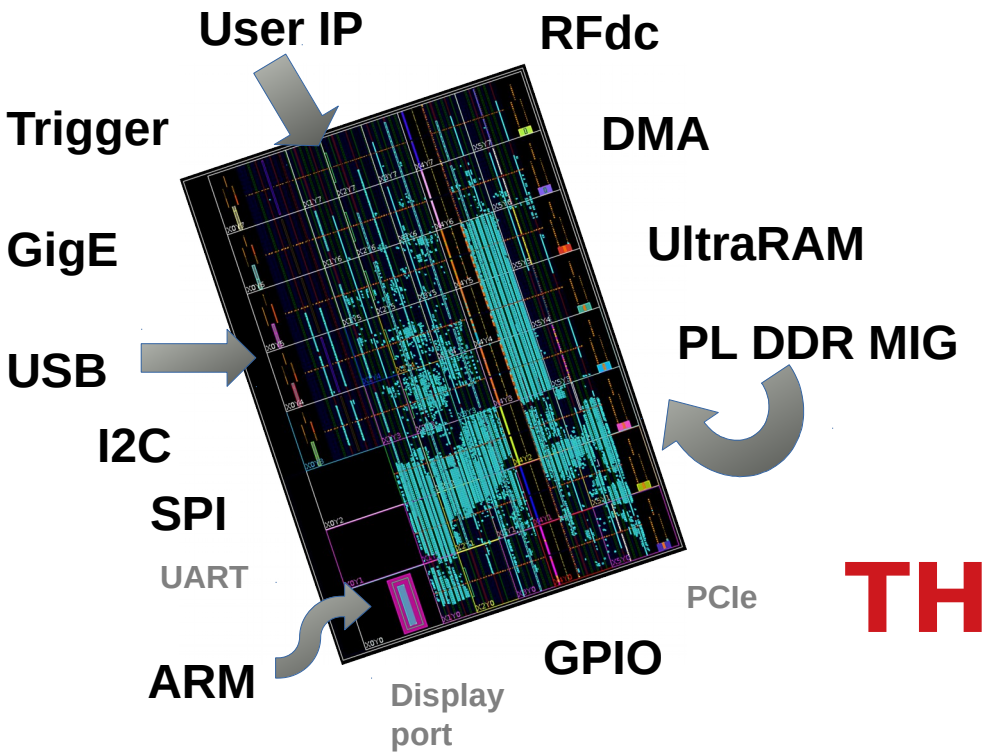
Objectifs :

- Écrire des codes C et/ou des scripts Matlab pour calibrer les signaux I/Q afin d'obtenir des signaux les plus stable possible.

Les dégradations I/Q entraînant une incertitude de mesure peuvent résulter de composants non appariés dans les chemins de signaux I et Q séparés.

1- Déséquilibre du gain I/Q
2- Déséquilibre de phase I/Q
3- Décalage I/Q
4- Dérive temporelle I/Q




User IP
RFdc
Trigger
DMA
GigE
UltraRAM
USB
PL DDR MIG
I2C
SPI
UART
PCIe
ARM
GPIO
Display port

THANK YOU