ADALM Pluto : Transmission and Reception

4TE05 (Ex: TELECOM205)

Germain PHAM et Chadi JABBOUR
dpham@telecom-paris.fr ; chadi.jabbour@telecom-paris.fr
Mars 2026

Project deliverables: complete overview

Mandatory

- Hardware focused part:
  - Plot the measured AM/AM and efficiency characteristics of the PA allocated to your group
  - ADALM-Pluto back-to-back experiments:
    - Plot the SER+BER vs DAC scale for Tx Gain fixed to -10 dB[1].
    - Plot the SER+BER vs Tx Gain for DAC scale fixed to -10 dBFS[1].
- Simulation focused part:
  - For each functional block (UST) of both the transmitter and receiver, provide the detail performance analysis. Example:
    - filters: passband and stopband frequency and attenuations analysis,
    - converters: quantization noise analysis,
    - ...
  - Provide a hardware configuration that minimises the RX and TX power consumption that meets the desired specifications
  - For the global simulation chain, provide the SNR at the receiver output (ADC) against the distance between transmitter and receiver.

[1] The choice of the RX AGC mode is left to the student but should be properly discussed.

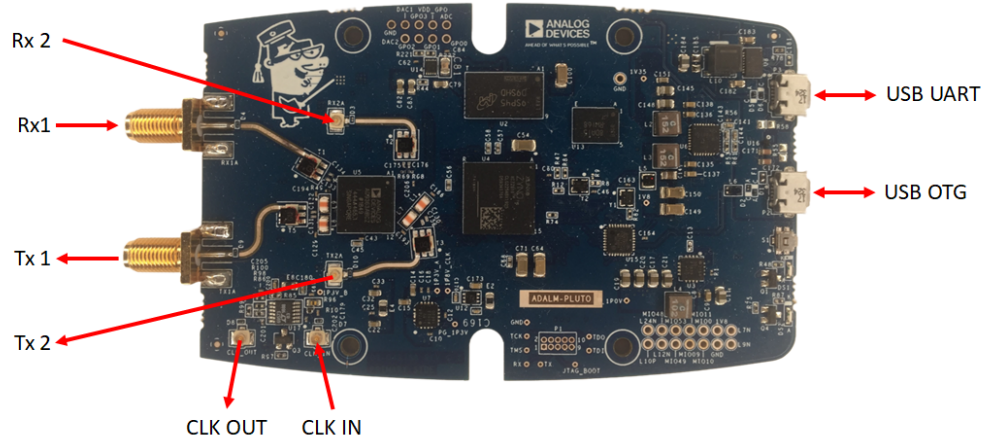
Project deliverables: complete overview (continued)

Extra credits

- Hardware focused part:
  - Provide a description of each blocks of the SDR board with the support of slides and explain the hardware main specifications of the blocks
  - Demonstrate the transmission over a wireless channel with two ADALM-Pluto boards and provide the instantaneous BER.
  - Demonstrate the BER variation with an exogenous perturbation. The perturbation is left to the student choice but it should be properly justified.
- Simulation focused part:
  - Plot the BER against the distance between transmitter and receiver.
  - Use one of the en/decoder of D1 to encode and decode the bitstream,

ADALM-Pluto in one minute

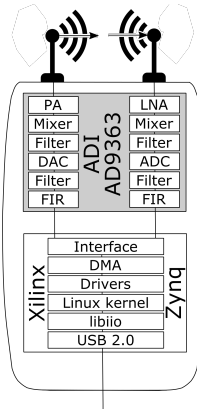
Under the hood, the AD9363

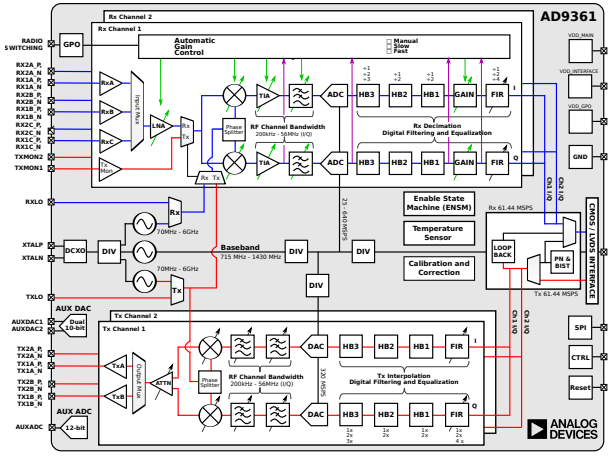


https://wiki.analog.com/university/tools/pluto/hacking/hardware

ADALM-Pluto in one more minute

Under the hood, the AD9363 (continued)





https://pysdr.org/content/pluto.html

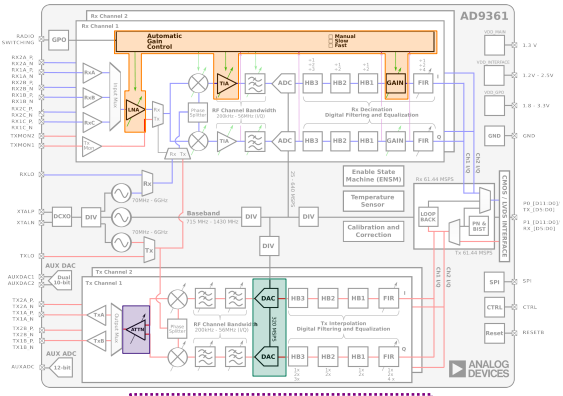
https://wiki.analog.com/university/tools/pluto/users/transmit

Hardware and Python parameters I

Example values

```
sdr.gain_control_mode_chan0 = 'manual'
sdr.rx_hardwaregain_chan0 = 70.0 # dB
```

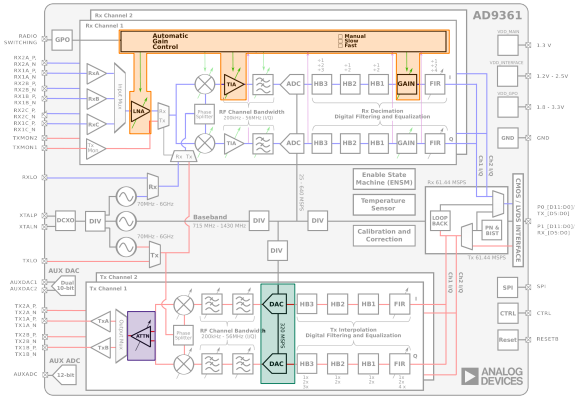
```
sdr.gain_control_mode_chan0 = 'fast_attack'
```




```
sdr.tx_hardwaregain_chan0 = -50
```

Hardware and Python parameters II

Example values



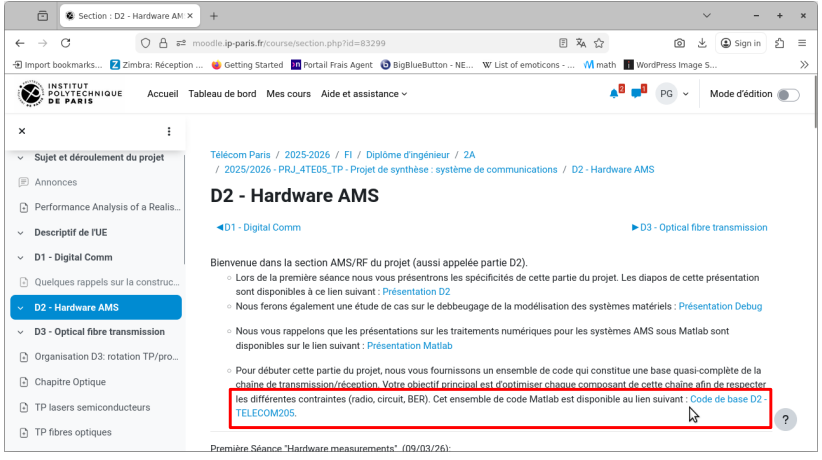

```
samples = np.exp(2.0j*np.pi*100e3*t) # Simulate a sinusoid of 100 kHz, so it should
show up at 915.1 MHz at the receiver
samples *= 2**14 # The PlutoSDR expects samples to be between -2^14 and +2^14, not -1
and +1 like some SDRs

DAC_scale_factor = 0.75; % Adjust this factor to ensure the signal does not saturate
the DAC.
tx.transmitRepeat(DAC_scale_factor*samples)
```

Where to start? I

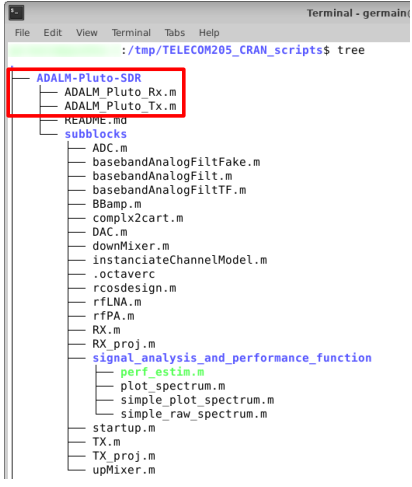
The moodle page :

https://moodle.ip-paris.fr/course/section.php?id=83299



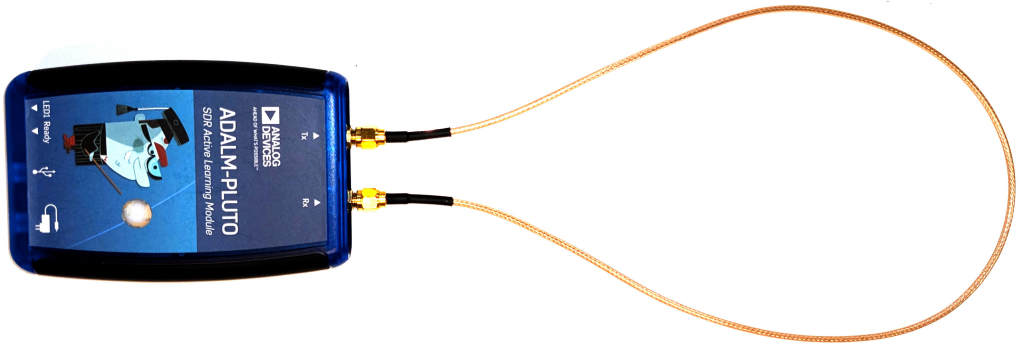
Where to start? II

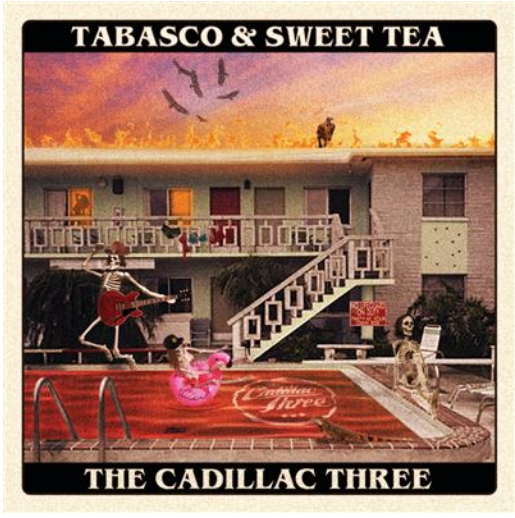
In the `ADALM-Pluto-SDR/` directory:



Where to start? III

Begin with the back-to-back experiments, and then move to the wireless transmission.





https://youtu.be/UohP6mSBFhs?si=KxfWgT9EpJmOITsR&t=38

Turn The Radio On by *The Cadillac Three*