

Generalized electronics for vapor-cell atomic clocks

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We present the electronics we developed in the frame of IND55 EMRP project [1] with the goal to support next generation sub- 10^{-13} compact atomic clocks. In this regard, particular attention has been devoted to reduce the Dick/intermodulation effect in the low 10^{-14} , very close to the shot-noise limit. The scheme can adapt to Cs and Rb clocks with minimal modifications. The digital implementation guarantees a high degree of flexibility that allows to run very different clock typologies and to implement innovative schemes such as the frequency lock of the laser to the internal cell or Auto-Balanced Ramsey to detect and compensate for light shift. This electronics has been successfully installed on the POP clock [2] at INRIM (Torino, Italy), DMCPT clock [3] at Syrte (Paris, France) and, recently, on the PPOP clock [4] at FEMTO-ST (Besancon, France).

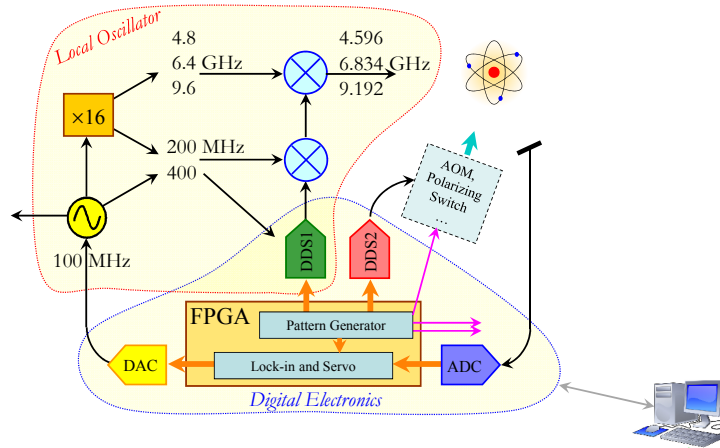


Figure 1. Block diagram of the generalized electronics. It can be subdivided into local oscillator and digital electronics. The dashed box contains the parts that are peculiar of each clock.

[1] www.inrim.it/Mclocks.

[2] S. Micalizio et al., Metrological characterization of the pulsed Rb clock with optical detection, *Metrologia*, vol. 49, p. 425-436 (2012).

[3] M. A. Hafiz et al., A high-performance Raman-Ramsey Cs vapor cell atomic clock, *Journal of Applied Physics* 121, 104903 (2017)

[4] 1. P. Yun et al., High-Performance Coherent Population Trapping Clock with Polarization Modulation, *Phys. Rev. Applied*, vol. 7, issue 1 (2017)