Application Note

Ref. : ARF Low Power Management

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LOW POWER MANAGEMENT

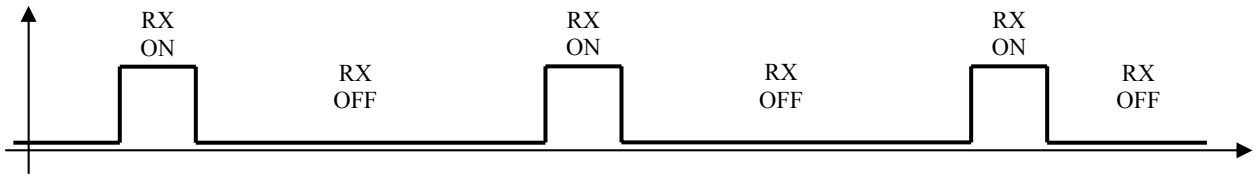
1 - PRESENTATION OF THE DOCUMENT

The object of this document is to illustrate the method to be used to obtain a low power consumption on the basis of medium consumption receiver modules.

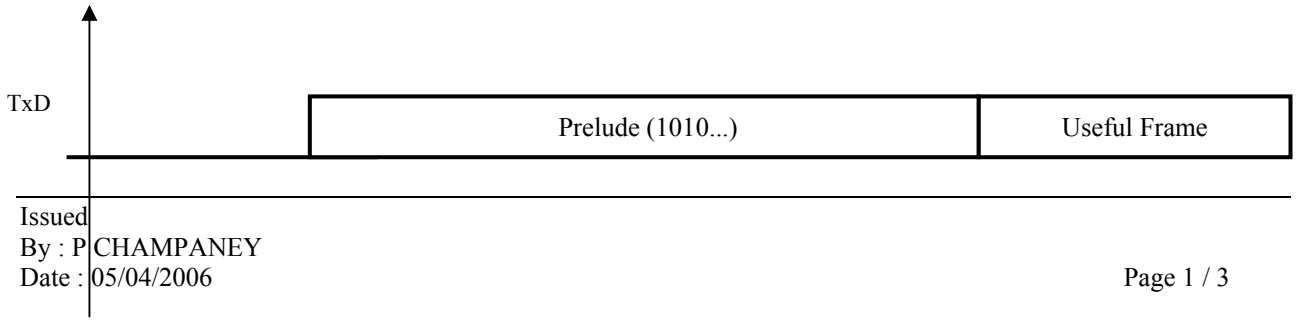
2 - SAMPLING

Traditional superheterodyne receivers present power consumptions from a few milliamps to a few tens of milliamps. Under such conditions, an autonomy of more than one month is impossible even using heavy duty Lithium batteries.

The solution consists in making the receiver operate in "sampled" mode, that is to say it is periodically switched to standby and activated. The duty cycle of this operation directly determines the residual mean consumption. Power consumption reductions of 95 to 99 % are then commonplace; the autonomies are thus increased to several years.

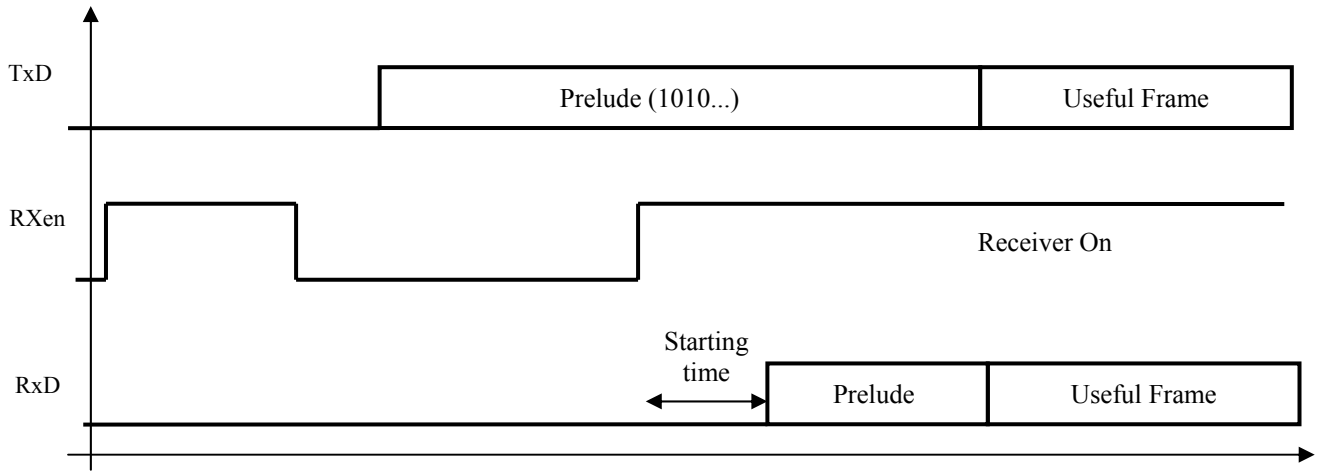


The fact that the receiver is switched off most of the time gives rise to a great risk of missing messages or of waking up in the course of a message. The associated transmitter therefore has to transmit a prelude frame with a duration at least equal to the listening period of the receiver before transmitting data. The transmission time is then longer but, for applications where the transmissions are fleeting, the incidence on the power consumption on transmission is very small.



In a listening phase, detection of the prelude means the beginning of a message. The logic associated to the receiver therefore has to keep the receiver in operation to receive the useful data. At the end of the frame, the logic will cut the receiver off and start sampling again.

The receiver power-up time is a function of the listening time necessary for detection of a prelude when transmitted, but it also has to integrate the receiver start-up time. Only times less than 10 ms enable low power consumption.



Digital example:

Binary transmission rate of 2000 bits/s.
Prelude detection on 10 bits = Listening time = 5 ms
Receiver start-up time = 2 ms

- Receiver wake-up time > 7 ms

Let us choose a wake-up time of 8 ms.
Receiver power consumption on wake-up = 10 mA
Receiver power consumption on standby = 50 µA

Receiver wake-up period = 500 ms

- Mean consumption = 10 x 8 + 0.05 x 492 / 500 = 0.210 mA
- **Mean consumption = 210 µA ! ! !**

The power consumption reduction is in this case 97.9 % ; the autonomy increase on the batteries is therefore of the same order (care should however be taken over the self-discharge phenomenon of the batteries).