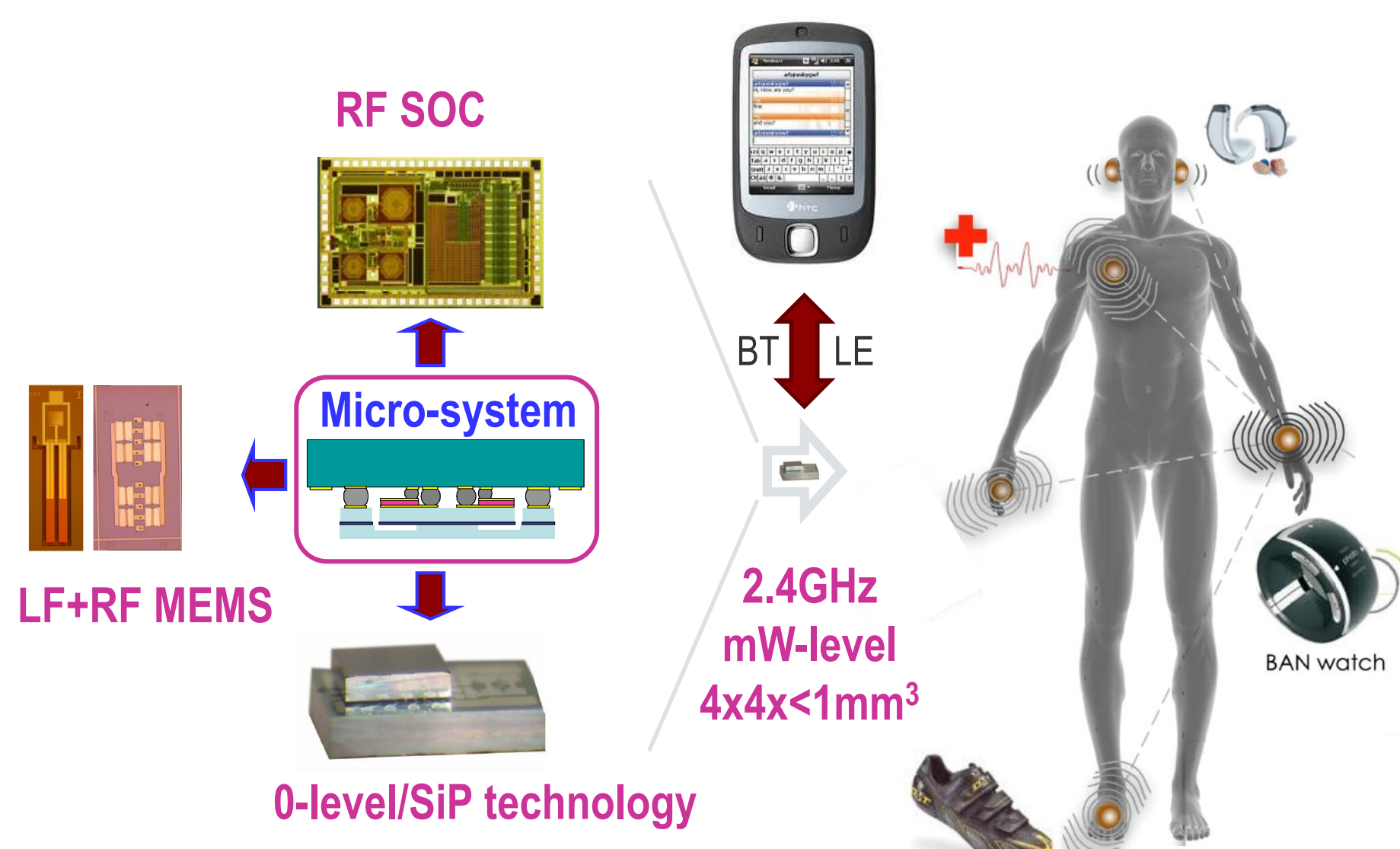


Ultra-low Power MEMS-based Radio Demonstrator

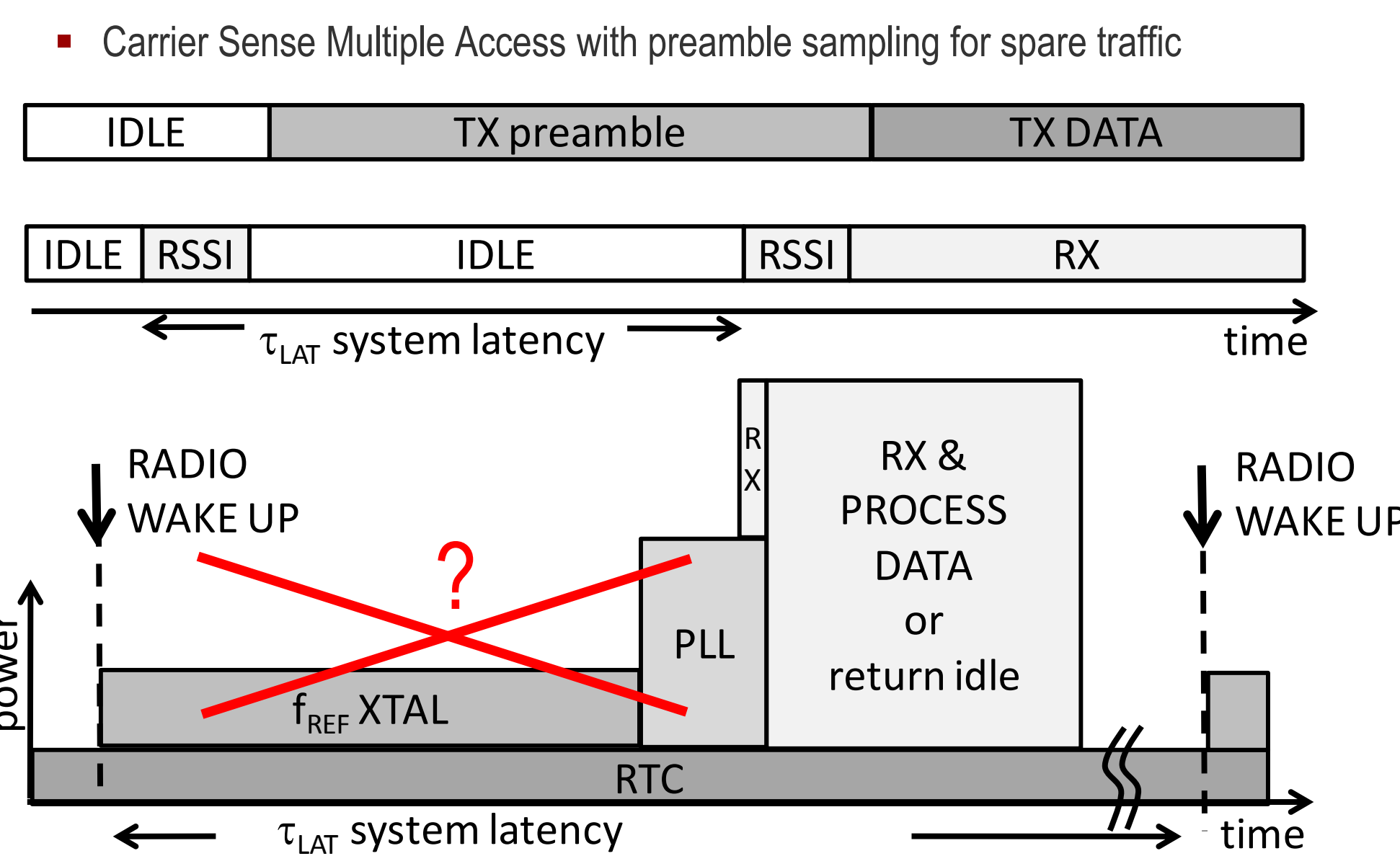
C. Henzelin, M. Contaldo, D. Ruffieux, C. Enz
Centre Suisse d'Electronique et de Microtechnique, Neuchâtel, Switzerland

csem

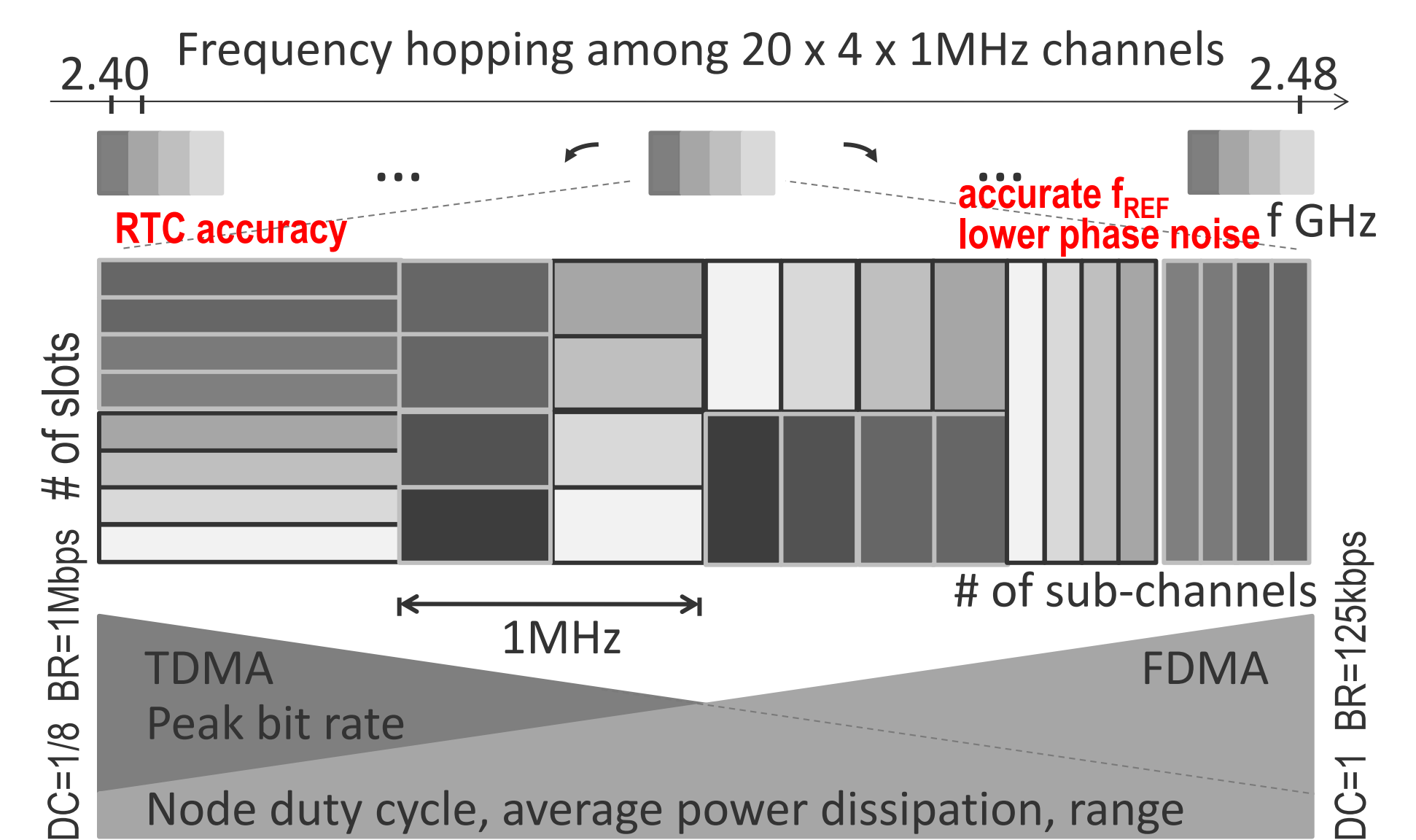
BAN & WSN call for ULP, miniature, wireless sensor nodes



Need adequate low power synchronization protocols

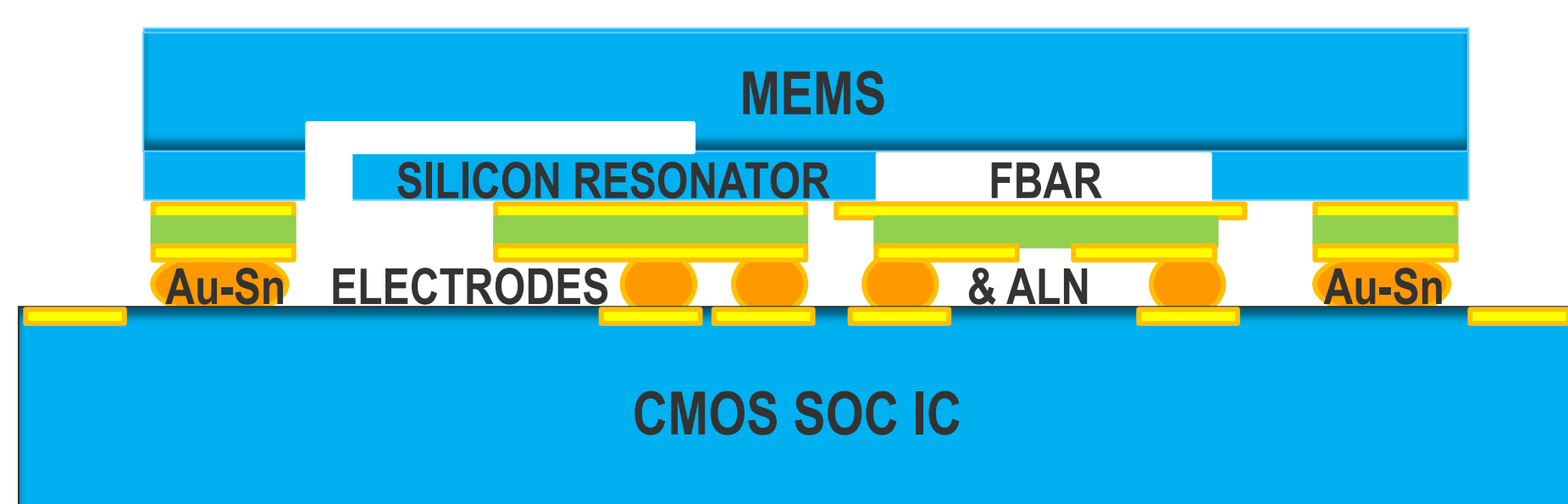


Low average power with TDMA, long range with FDMA

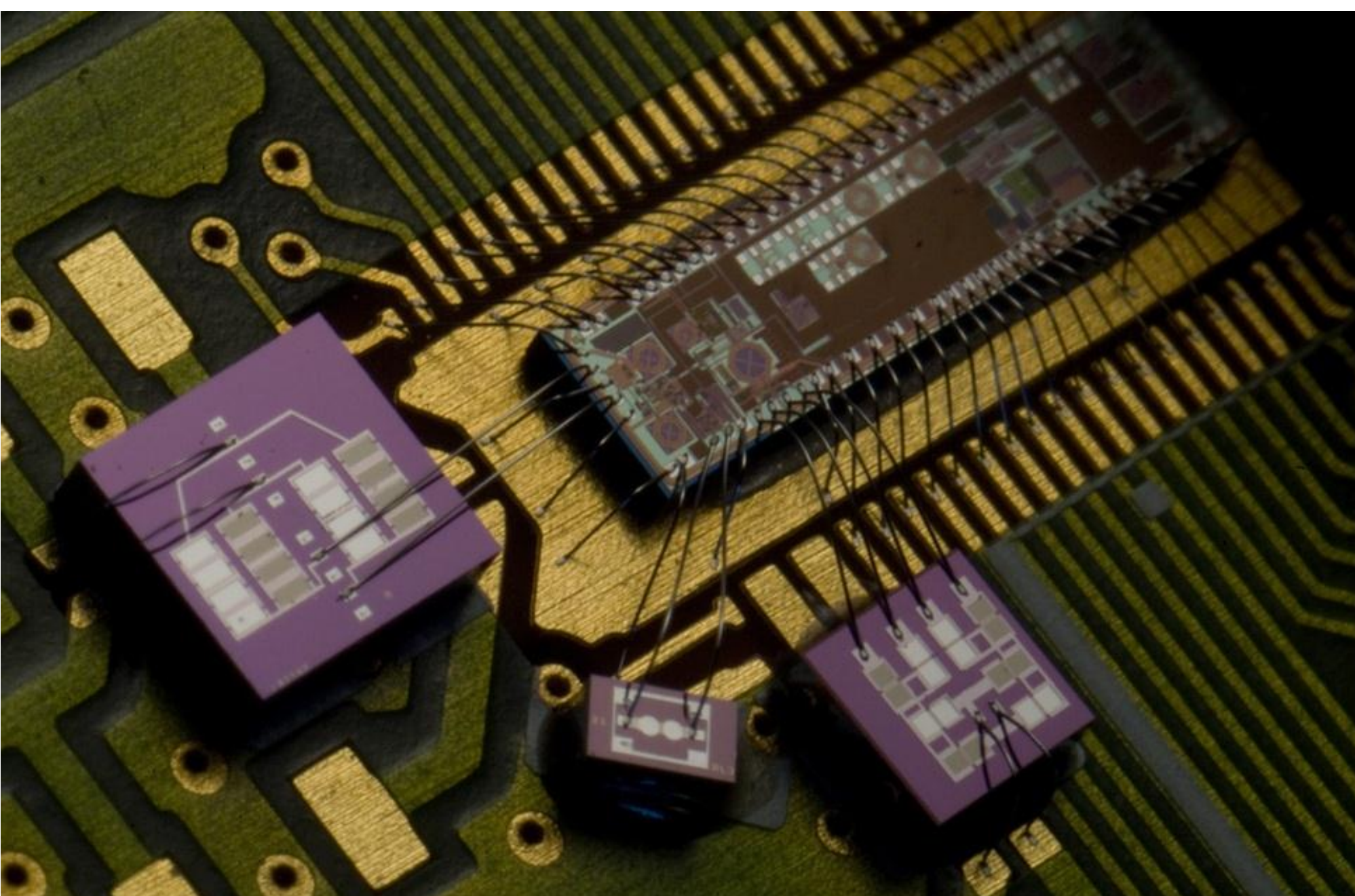


MEMS-based circuits for wireless connectivity

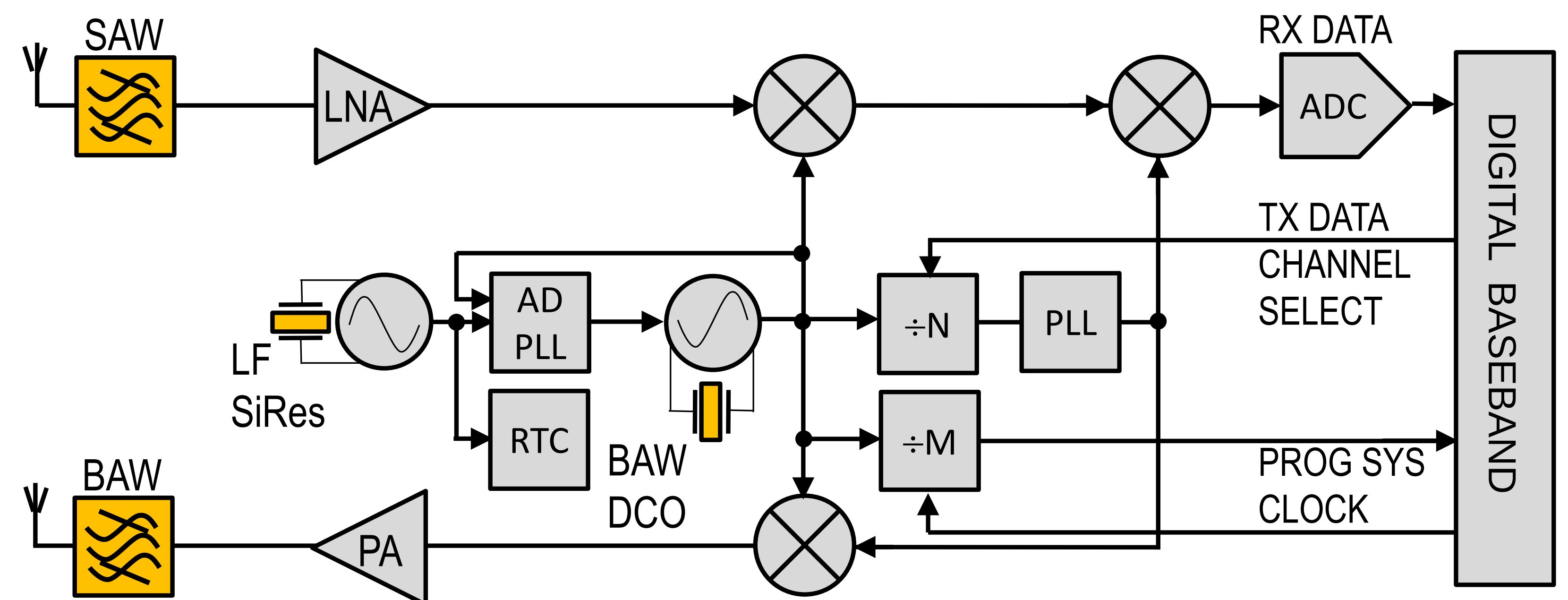
- Co-integrated piezoelectric MEMS on SOI
 - BAW resonator to build RF LO and filters
 - Silicon resonator for f_{REF} and RTC
- Hybrid integration (yield, reduced complexity)
- 0-level packaging (vacuum sealing & interconnects)



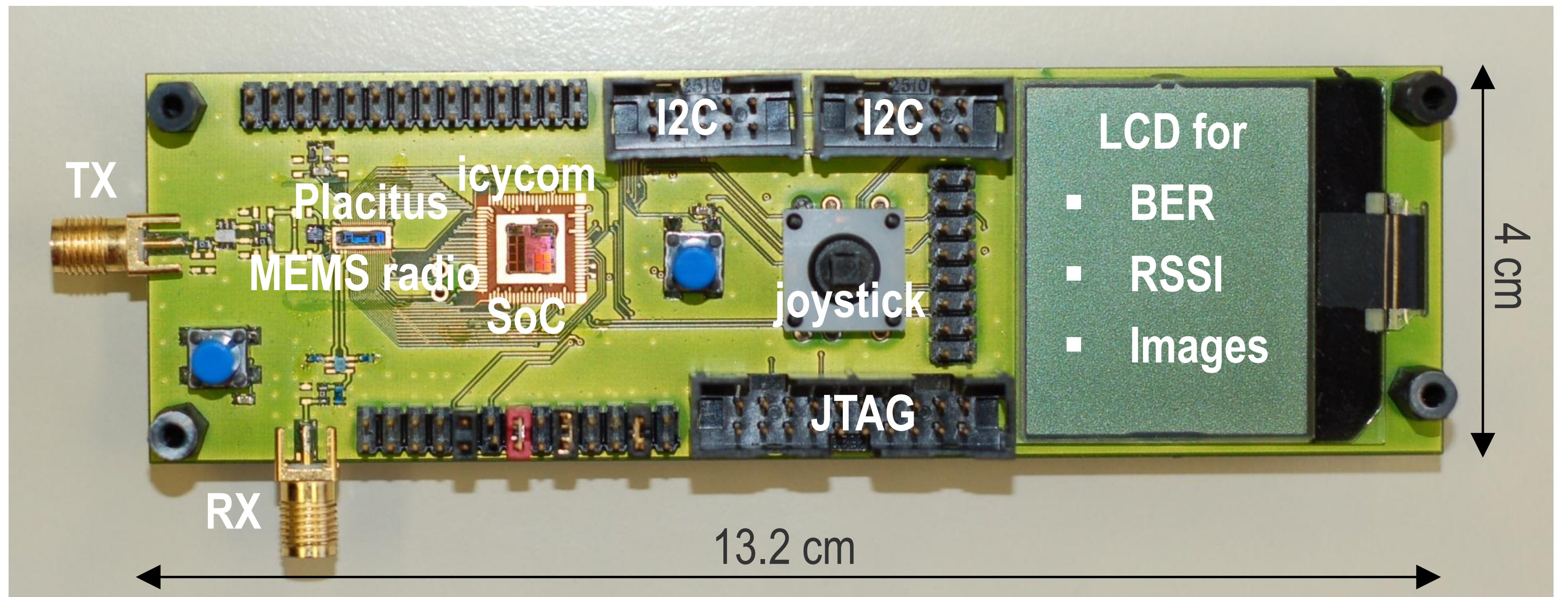
Photograph of MEMS-radio



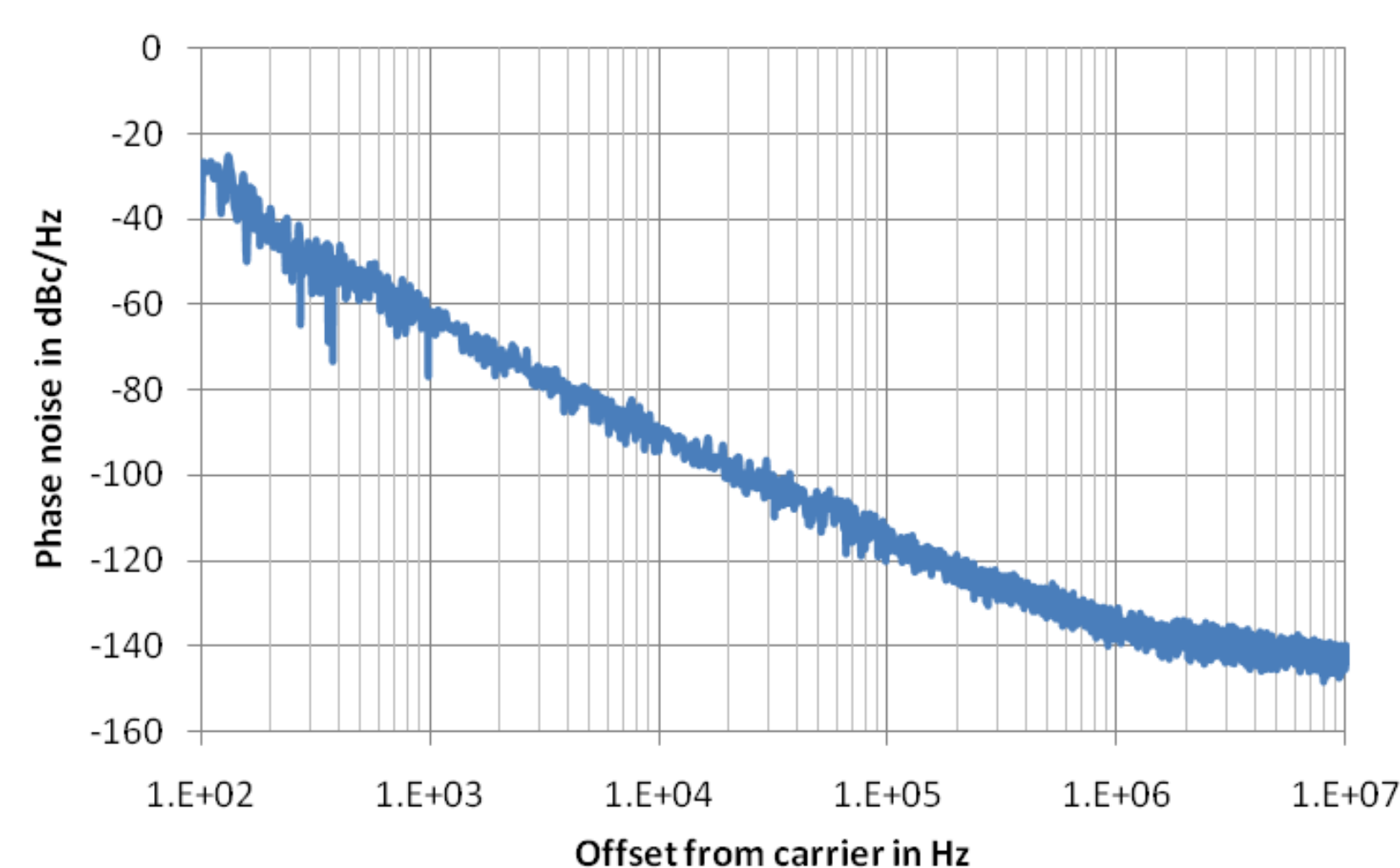
Simplified architecture of the MEMS-based TRX



Photograph of MEMS-radio demonstrator



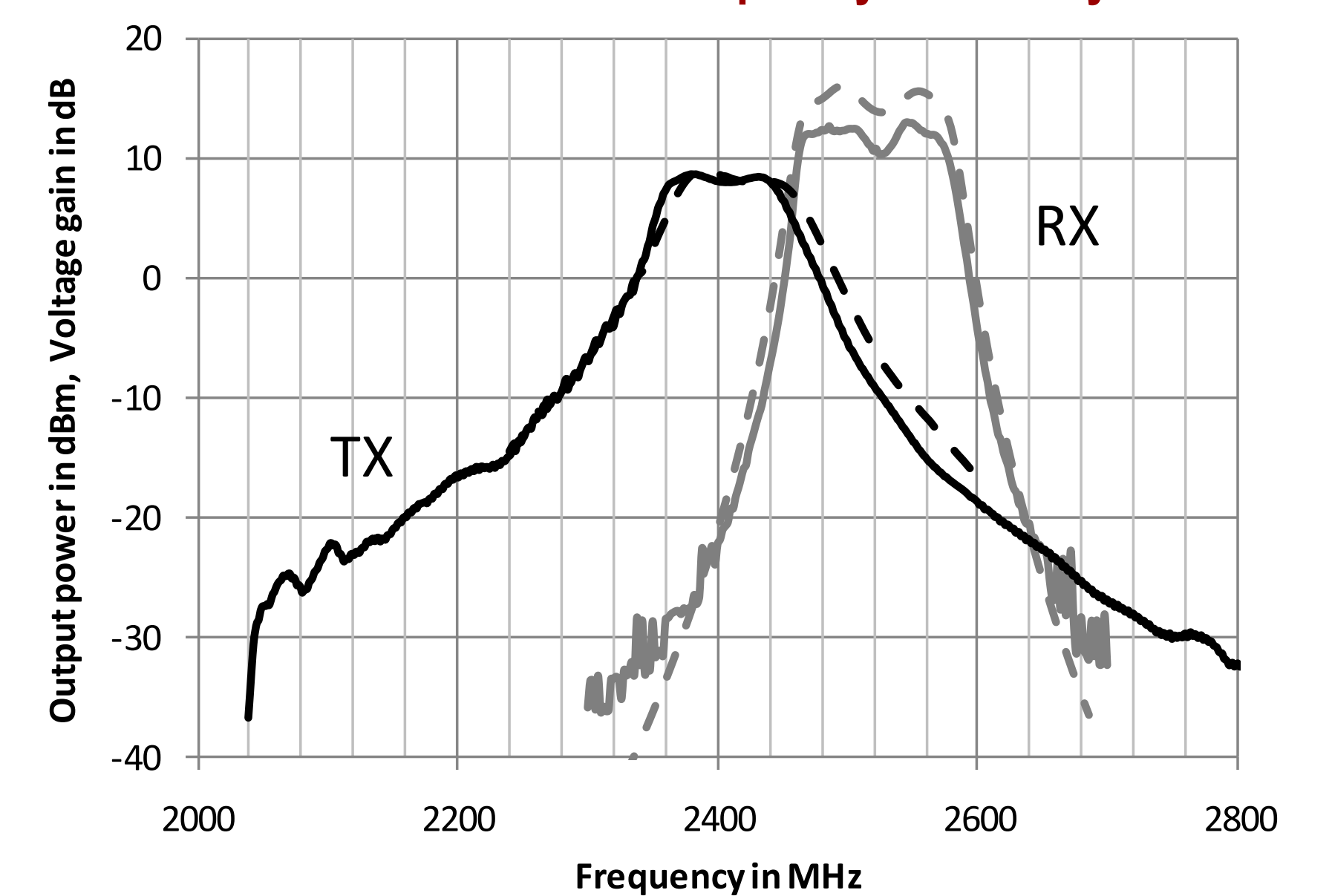
Transmitter phase noise spectrum with 80MHz IF



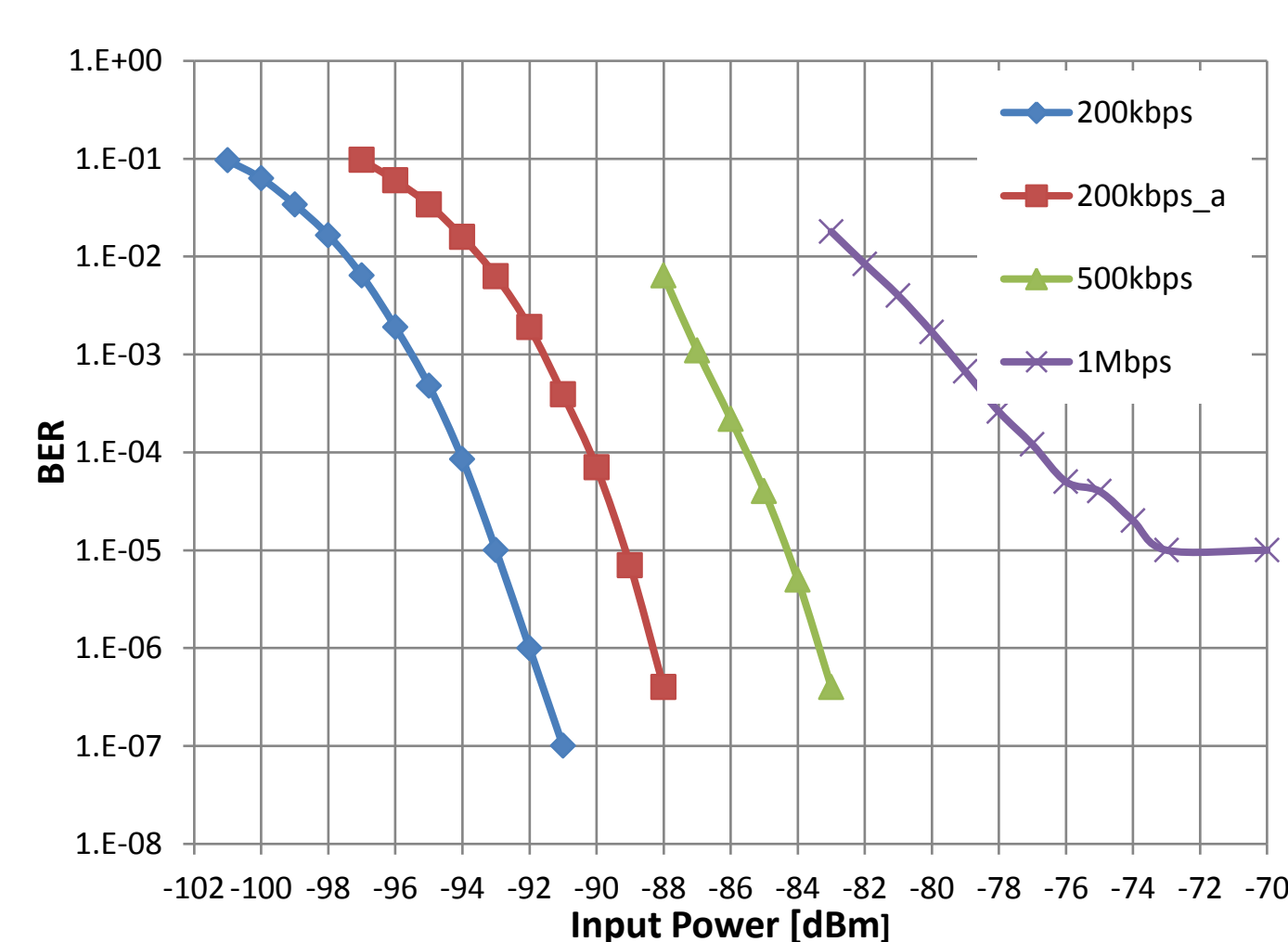
Power consumption

	Current [mA]
Synthesizer	7.6
RX @ 200kbps	4.7
Tx @ 5.4dBm	28.0
0dBm	15.3

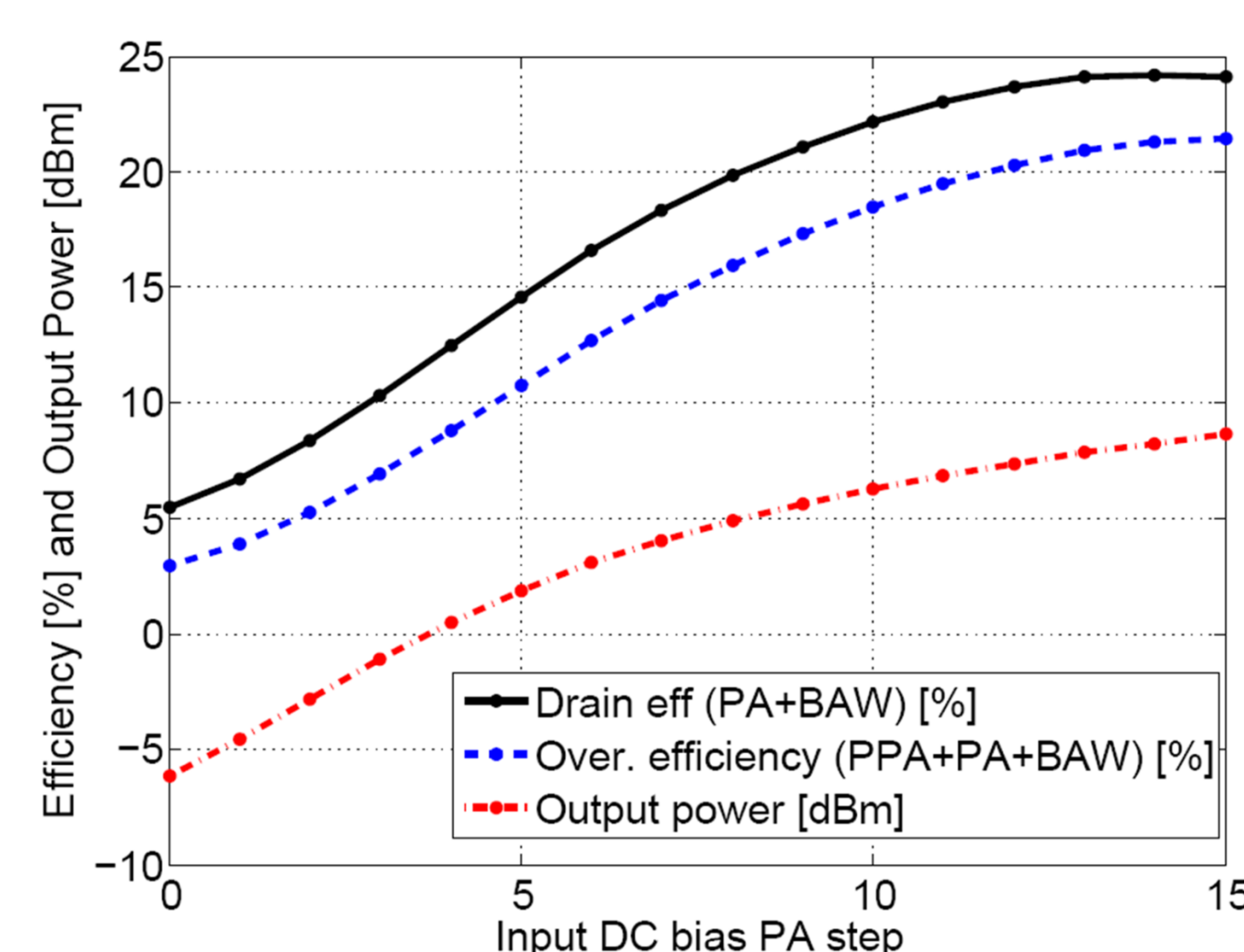
Measurement of RX and TX frequency selectivity



Receiver sensitivity at various bit rates



Measured output power and efficiency



Broadband TX output spectrum with IF harmonics

