



RF/Analog Circuits and Integrated MEMS for IoT

FIRST

Applied Electronics Research Core, ICE Cube Center
NuFlare Future Technology Laboratory

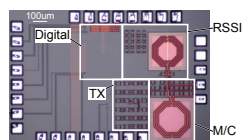
<http://masu-www.pi.titech.ac.jp>

- Ultra Low Power (<1μW) RF/Analog Circuits
- High Sensitivity (< μG) MEMS Accelerometer
- Low Noise Synthesizer, Small Atomic Clock
- Advanced Electron Beam Writer
- Cow Monitoring System
- Hydroponic Cultivation System, and so on

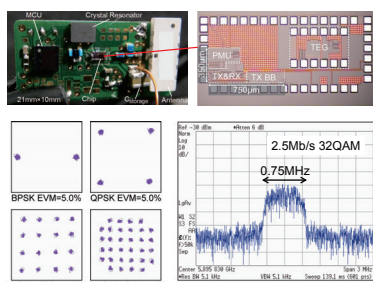
IoT/IoE

Integrated Circuit & RF Technology

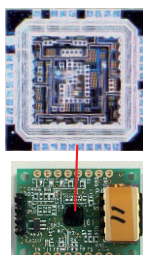
Ultra Low Power
Wireless Circuit



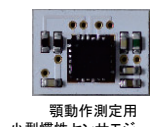
Quadrature Backscattering



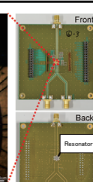
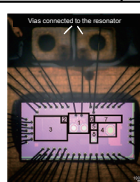
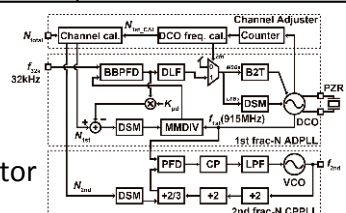
Low noise Sensors



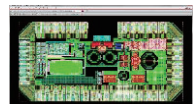
Edge Device



Low Noise
Synthesizer
Exploiting
Piezo Resonator

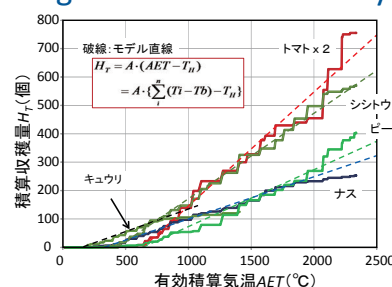


	This work	F. Ahmed (ISSCC'16)	X. Gao (ISSCC'16)	D. Taseca (ISSCC'11)
Tech. (nm)	65	16	28	65
Ref. (MHz)	0.032	7	40	40
Freq. (GHz)	8.865	3.25	5.825	4
RMS jitter (Ruc)	180	450	159	560
Power (mW)	12.7	7.1	8.2	4.5
FOM (dBc)	-240.5	-238.4	-246.8	-238.5

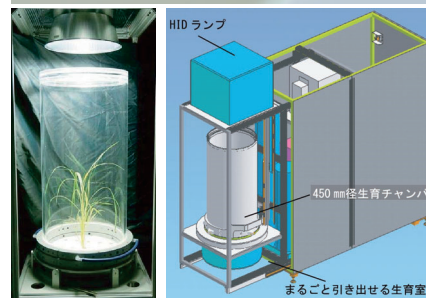
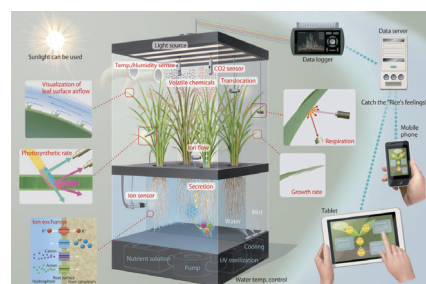


Application

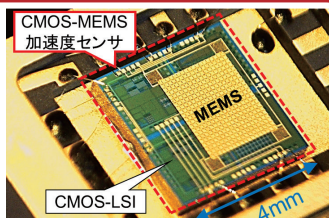
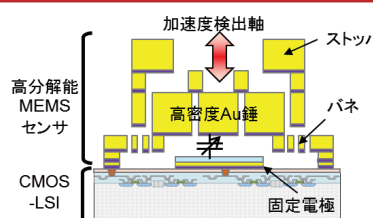
Agriculture & Husbandry



Sun-Rice Project



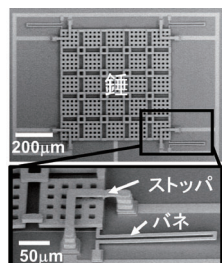
MEMS
Accelerometer
with micro-G
Resolution



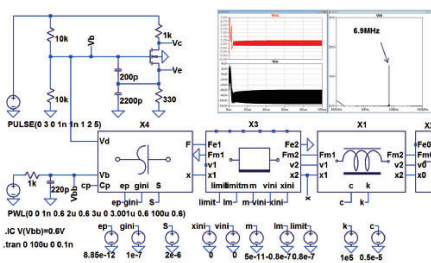
Integrated CMOS-MEMS

Energy Harvesting
Device

Heterogeneous
Integration
(CMOS-MEMS)



MEMS Accelerometer



CMOS-MEMS Co-Design

Medical & Health Care