

*Passive UWB:
Long Range, Low Cost and Precise Location*

*What We Do? **Passive UWB!***

Provides Active Awareness at Passive Price

Cost Effective:

- Total cost of ownership 100 times less than GEN2 and active RTLS

Zero Watt Passive Transceiver:

- Tag consumes less than 2 μ W of power when actively communicating

Accurate Location and Long Range:

- 2-3 inch resolution from 100 meters away

Primary Markets:

- RTLS & Indoor tracking
- RFID
- Sensors
- Surveillance

Company Overview



Team:

- Dr. Kourosh Pahlavan, Co-Founder, CEO & CTO
- Dr. Farokh H. Eskafi, Co-Founder, President & COO
- Five full time employees plus four contractors

Expertise:

- Designing extremely low power RF, RF-CMOS, digital/baseband, communication systems

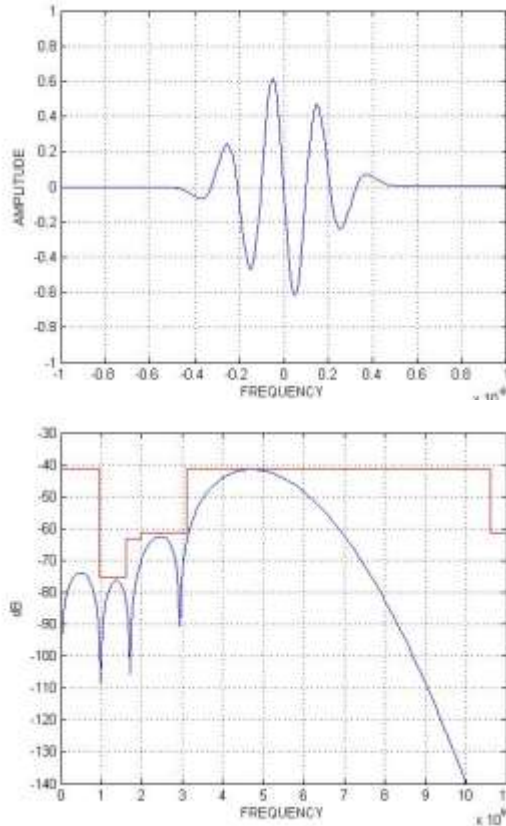
Funding:

- Funded from Intel Capital, LSIS, Startup Capital Ventures and group of angel investors

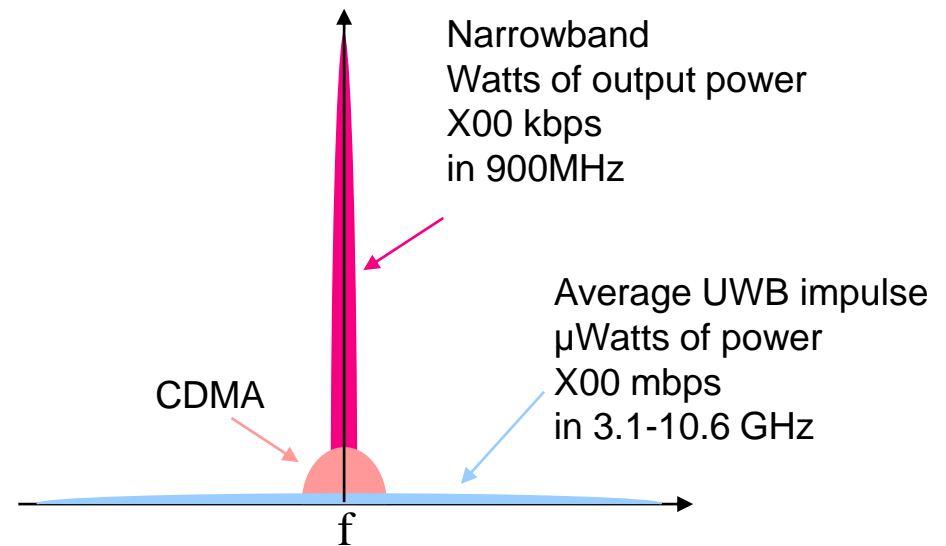
Awards:

- Three NSF research grants: 2006, 2007 and 2011
- Two NSF prototyping grant: 2008 and 2010

Ultra Wideband (UWB) Radio

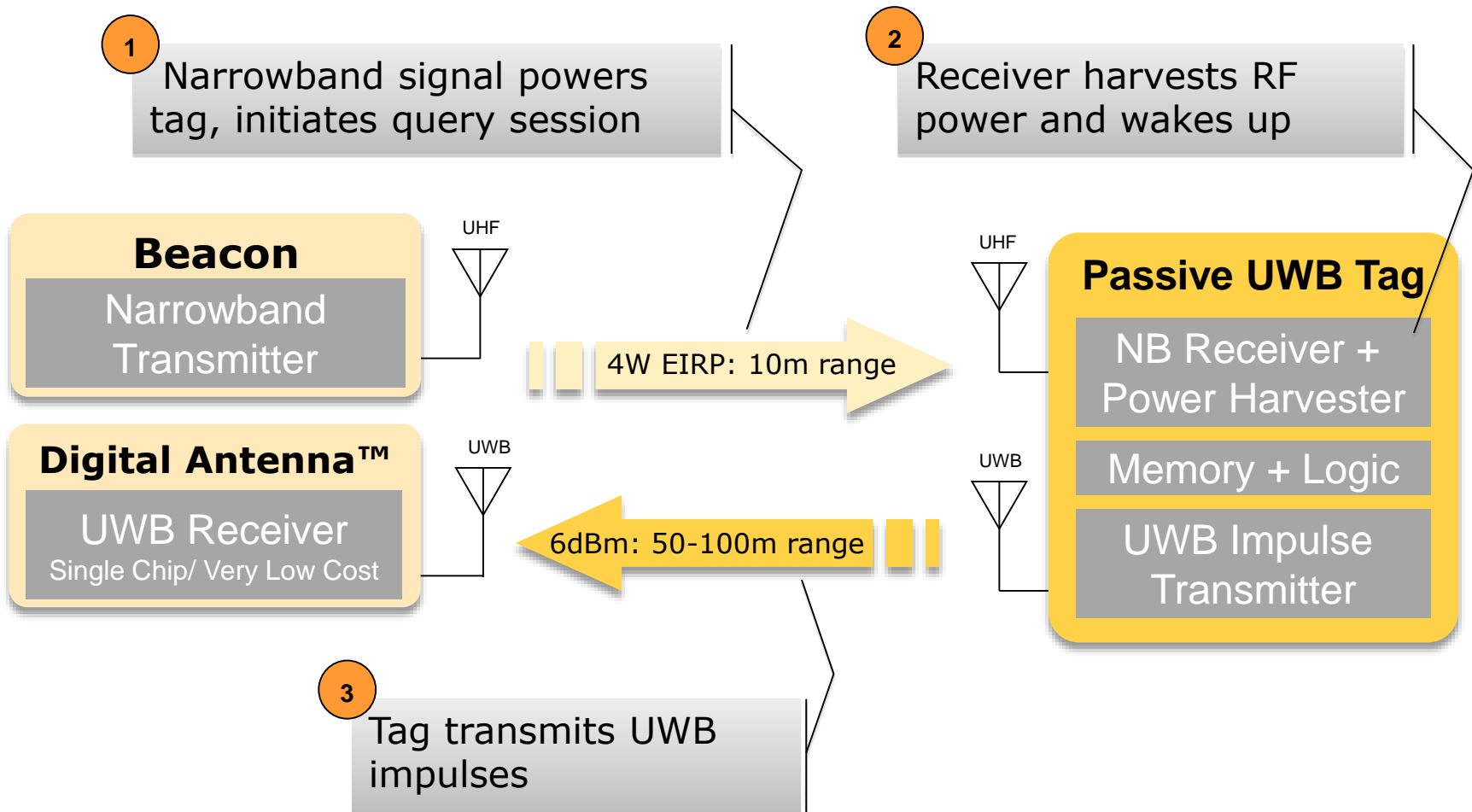


$$C = B \log_2 \left(1 + \frac{S}{N} \right)$$

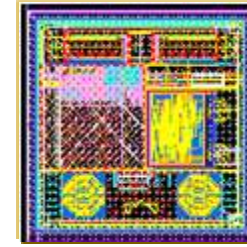
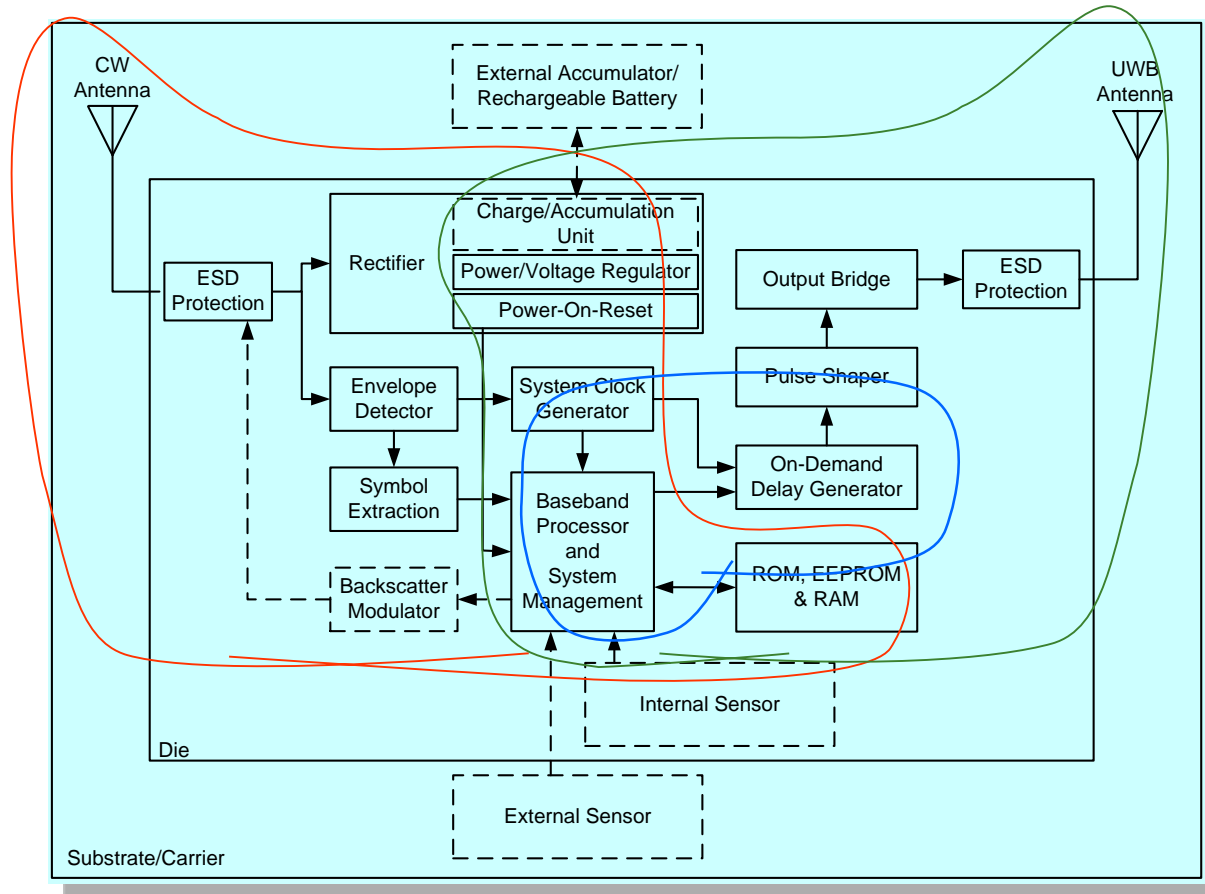


Power and capacity in NB and UWB

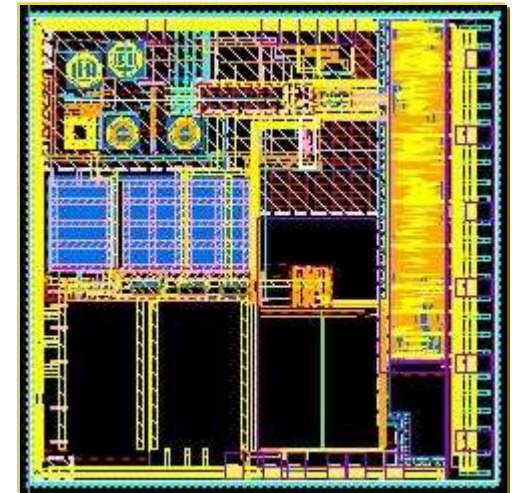
Basic Operation of Our Passive UWB



TagArray Passive UWB Tag Chip



Tag plot 1mm x 1mm



Reader plot 2.5mm x 2.5mm

- Gen-2 common blocks
- UWB common blocks
- TagArray specific blocks

Advantages of Passive UWB

Simple Hardware Small Form Factor

- Readers are 100 times less costly and 20 times smaller than Gen2
- Lowest cost of ownership when compared with GEN2 or active RTLS

Power/Data Separation

- Increased read distance (50-100 meters)
- Power : any source, any frequency

Precise Location of Many Tags

- Achieve extremely high resolutions of 2-3 inches
- 1000s of reads per second per reader

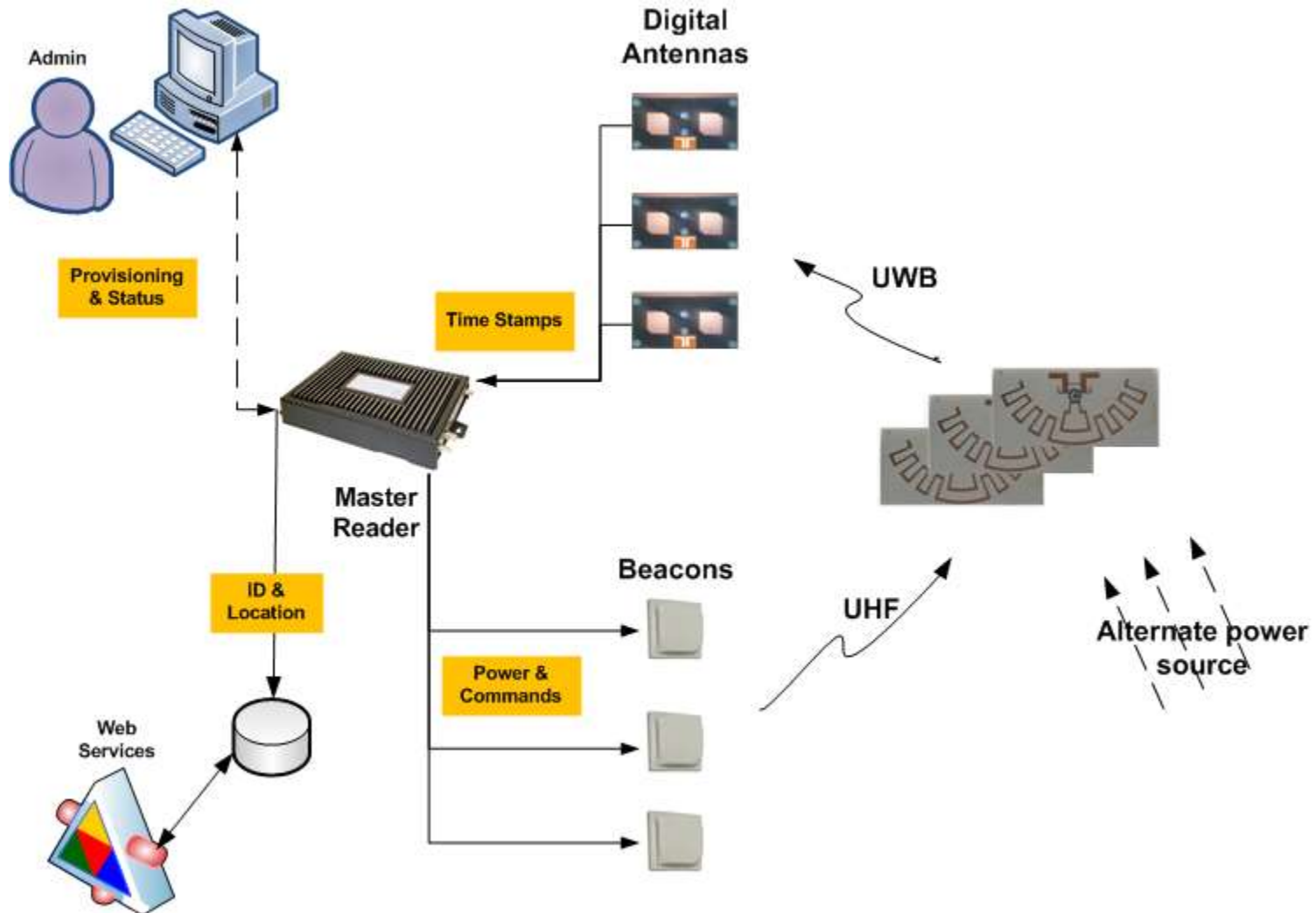
Multipath Fading Immunity

- Robust tag detection and location determination
- Signal propagates to reader through openings and cracks

Lower Power

- Tag chip consumes average of 2 μ W (including memory)
- Enables alternative power options: micro solar cell, MEMS harvesters, etc.

RTLS System Overview



Current RTLS/RFID Development

Tag:

- Chip: 180 nm CMOS, 1x1 mm
- Tag substrate: 4 cm x 8 cm
- Sensitivity: -15 dBm (915 MHz) @2uA load
- Impulse strength: 6dBm

Digital Antenna™ (DA) Chip:

- 180 nm CMOS, 2.5x2.5 mm
- Sensitivity: ~ -60 dBm
- Next generation: 90 nm CMOS

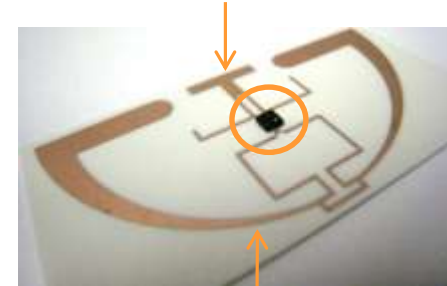
Software:

- Software for identification and location

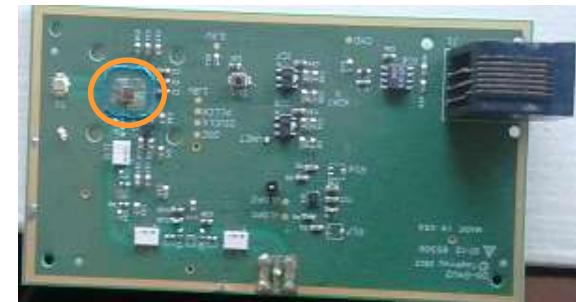
Antenna:

- Wide angle circularly polarized 2"x2"
- High gain circularly polarized 2"x4"
- High gain linearly polarized 4"x4"

UWB Antenna



Narrowband Antenna



Current Engineering Sample Availability:

- Passive UWB-RFID Tag
- Single chip UWB-RFID Receiver
- Location determination software

Next Steps:

- Increase DA sensitivity to achieve 100m range in a single chip
- Enhance tag antennas
- Corner and temperature analysis (tag chip and DA chip)
- Performance and cost optimization of Master Reader
- Software improvements to handle massive real-time tracking
- FCC qualification

Patents- Issued and Pending



Asymmetric Dual Mode Communications

- US Patent # 7,180,421; filings include PCT as well as individual countries Japan, China, and European Union
- Radio frequency tag and reader with asymmetric communication bandwidth
- Integration of ultra wideband and narrowband (continuous wave)

Low Power Modulation and Massive Medium Access Control

- US Patent Application # 20090051496 is being granted; PCT is filed

Inductive Antenna Coupling

- US Patent Application # 20090264067

+ 6 other pending/provisional patents

Demo Clip



Objective



Looking for a strategic partner to bring the applications of
our technology to the market

Contact us for more information

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