



# CARBONICS

## Company Overview

November 2014



### Abundance

the carbon era



### Integration

silicon meets carbon



### Evolution

escape all limits

## The Carbonics Story

Carbonics will revolutionize traditional electronics by employing earth-abundant carbon nanomaterials to vastly improve the power consumption and performance of wireless products that include smartphone and wearable devices.

- Raised \$5.5M investment
- A product of university research driven by Semiconductor Research Corporation (SRC)
- Technology licensed from USC and UCLA
- Fabless model, with internal test facility
- Headquarters in Marina Del Rey, CA



# Users want...



## Increased Battery Life

Increased Power Efficiency

## Less Heat

Increased Power Efficiency

## Reduced Weight

Less Power Demand  
Consolidate Components

## Reduced Cost

Integrating Components

## Sustainability

Natural abundant carbon  
Fair Trade

## Increased Data Rates

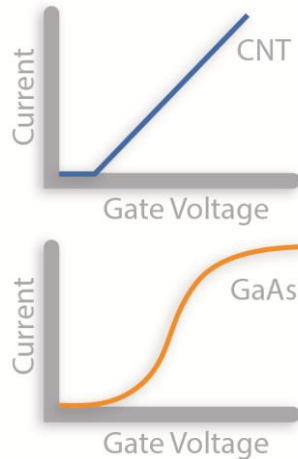
Wide Bandwidth, Low Noise  
Higher Frequency





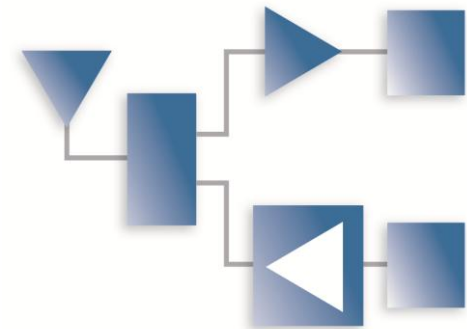
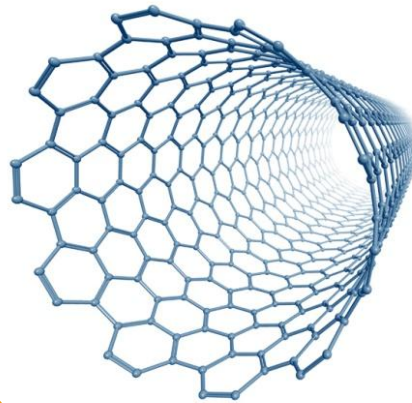
## Carbon Era

full integration,  
Si meets carbon,  
Si compatible  
processing



### Carbon Performance

superior linearity  
characteristics,  
low noise

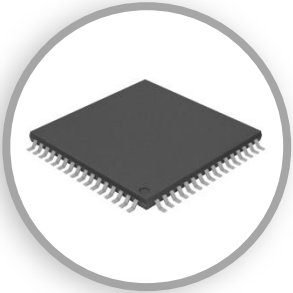


### Wireless Design

RF + digital integration,  
consolidation of radios

### Carbon Nanotech

quasi ballistic transport 99%,  
semiconductor purity,  
7x times higher  $V_{sat}$



## Front End Modules

Wide bandwidth to accommodate 5G & 802.11ad (>60GHz)

Market Growth >12% per year to \$13B in 2018



## Wearables

New functionality to accommodate flexible embedded RF chips

Market Growth 24% per year to \$11B in 2020



## Vehicular Communication Systems

Higher frequency to accommodate 63-64GHz communications

Market Growth 11% per year to \$30B in 2019

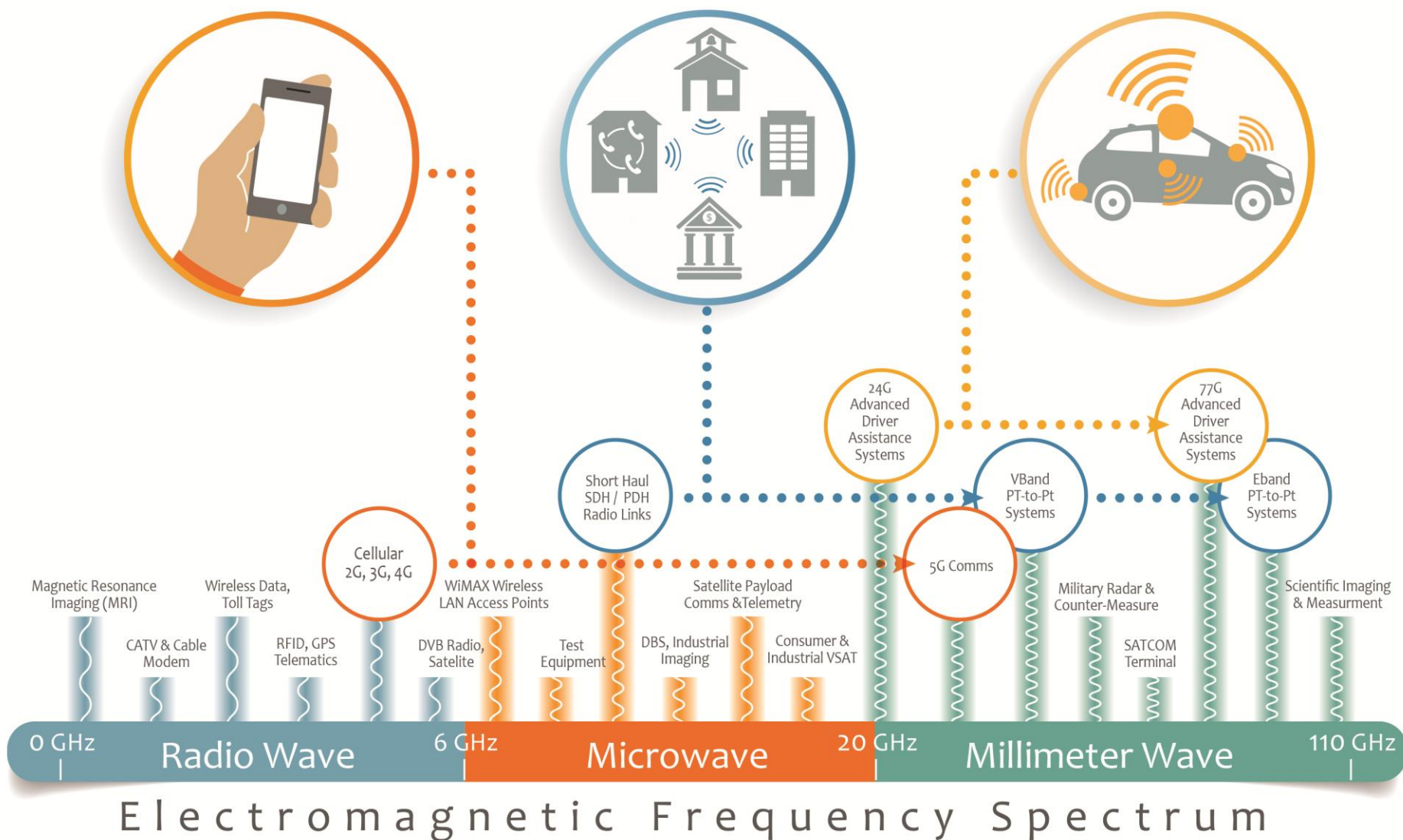


## Internet of Things

Low power and higher frequency, RFID, WiGig, E-band and ISM (GHz)

Market – too big, touches all product segments

# Trends to Higher Frequency



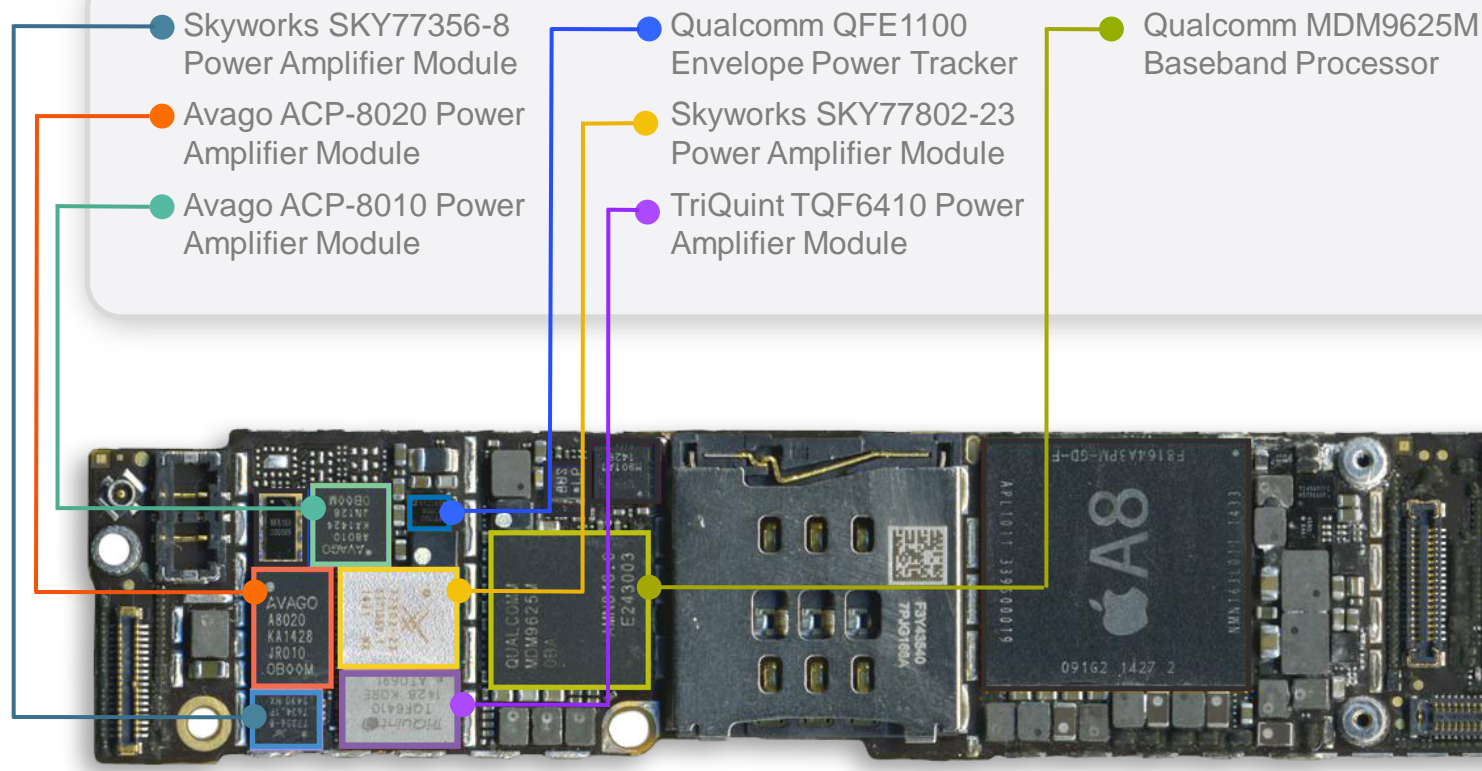
# Example: iPhone

## Incumbent Technology (III-V & Si)

- Power loss in OFF state (both DC & RF)
- Lack of super linear devices to consolidate radios
- Inability to Monolithically Integrate (III-V with Si) towards 5G

## Carbon Platform

- ✓ RF + DC platform integration (carbon + Si)
- ✓ Reduce chip count
- ✓ Higher linearity, wider bandwidth, lower noise
- ✓ Higher frequency operation towards 5G





# Ecosystem



Foundry

RFIC (MMIC)

Distributors

OEM





# Board of Directors



**Kos Galatsis**

CEO

Emerging tech ambassador, problem-solution innovator and nanotechnologist. Over 10 years managing and directing emerging technology mega-programs for the semiconductor and defense industries.



**Hani Enaya**

Board Member

Energy and semiconductor technologist with experience in structured finance and international development. Hani brings depth to global strategy, business development and venture capital.



**Patrick Suel**

Board Member

A seasoned corporate venture capitalist for over 20 years specializing in Nanotechnologies, Materials and Semiconductors.



**Kang L Wang**

Board Member

A pioneering scientist in semiconductors and nanoelectronics holding the prestigious Raytheon Chair Professor at UCLA.



**Chris Tubis**

Board Member

A silicon valley entrepreneur with over 30 years of experience in wireless, semiconductor, manufacturing and management.



**Chongwu Zhou**

Scientific Board Chairman

A champion of carbon nanoelectronics, credited for many advancements in the carbon field. Holds joint appointments in physics and chemistry at USC.



**Daniel Francisco**

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**CARBONICS**

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