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Peraso Technologies, Inc.

# Corporate / Product Presentation

December 2015

# Peraso Highlights

Consumer Electronics (WiGig)

Wireless Infrastructure

Small Cell Backhaul

- Peraso is World's Only Start-up Shipping 60GHz WiGig Silicon Today
  - Only 3 Companies total, including Intel and Qualcomm, shipping WiGig
- Leveraged WiGig Silicon Across Multiple Markets
  - CE, Wireless Infrastructure, Small Cell Backhaul
- Peraso is a Leader in WiGig Interoperability Compliance
- Demonstrated World's First WiGig mesh network at MWC 2015
- Achieved wireless links over ***One Kilometer*** in distance
- Peraso launched the world's ***First/Only*** WiGig USB dongle reference design; fundamental to WiGig ecosystem





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# Corporate Snapshot

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| Business Model | Location |
|---|---|
| Fabless Semiconductor – VC Funded<br>IP Licensing | Toronto, Canada |
| **Technology** | **Products** |
| mmWave RF Circuits (60 GHz – 80 GHz)<br>mmWave Packaging and Antenna Design<br>High speed Wireless MAC/PHY Architecture | 802.11ad/WiGig mmWave RF Ics<br>802.11ad/WiGig MAC/PHY Baseband ICs |

| Partnerships | tsmc | life.augmented | Amkor Technology® | KYOCERA | SYNOPSYS® |
|---|---|---|---|---|---|





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# Management Team

## Ron Glibbery +25 yrs Experience

*President and CEO (Founder)*

- President Intellon Corp. (NASDAQ:ITLN)
- President and CEO, Cogency Semiconductor
- Executive Director, LSI Logic, Canada (TSX:LSI)

## Brad Lynch 20 yrs Experience

*VP, Product Development (Founder)*

- Dir., Software Engineering, Intellon Corp. (NASDAQ:ITLN)
- System Architect, Cogency Semiconductor

## Graham Baldwin +25 yrs Experience

*CFO*

- VP Bus. Dev., ITS Electronics
- GM, Scientific-Atlanta, Canada

## Mihai Tazlauanu +25 yrs Experience

*VP, Analog Engineering/Operations*

- PMTS, AMD
- Senior Device Engineer, AMCC

## Keith Riley +25 yrs Experience

*VP, Product Engineering*

- Senior Dir., Qualcomm (NASDAQ:QCOM)
- VP Engineering, Intellon (NASDAQ:ITLN)
- VP, LSI

## John Tryhub +20 yrs Experience

*VP, Sales*

- VP Sales, Fresco Microchip
- Director of Marketing, Genesis Microchip (NASDAQ:GNSS)





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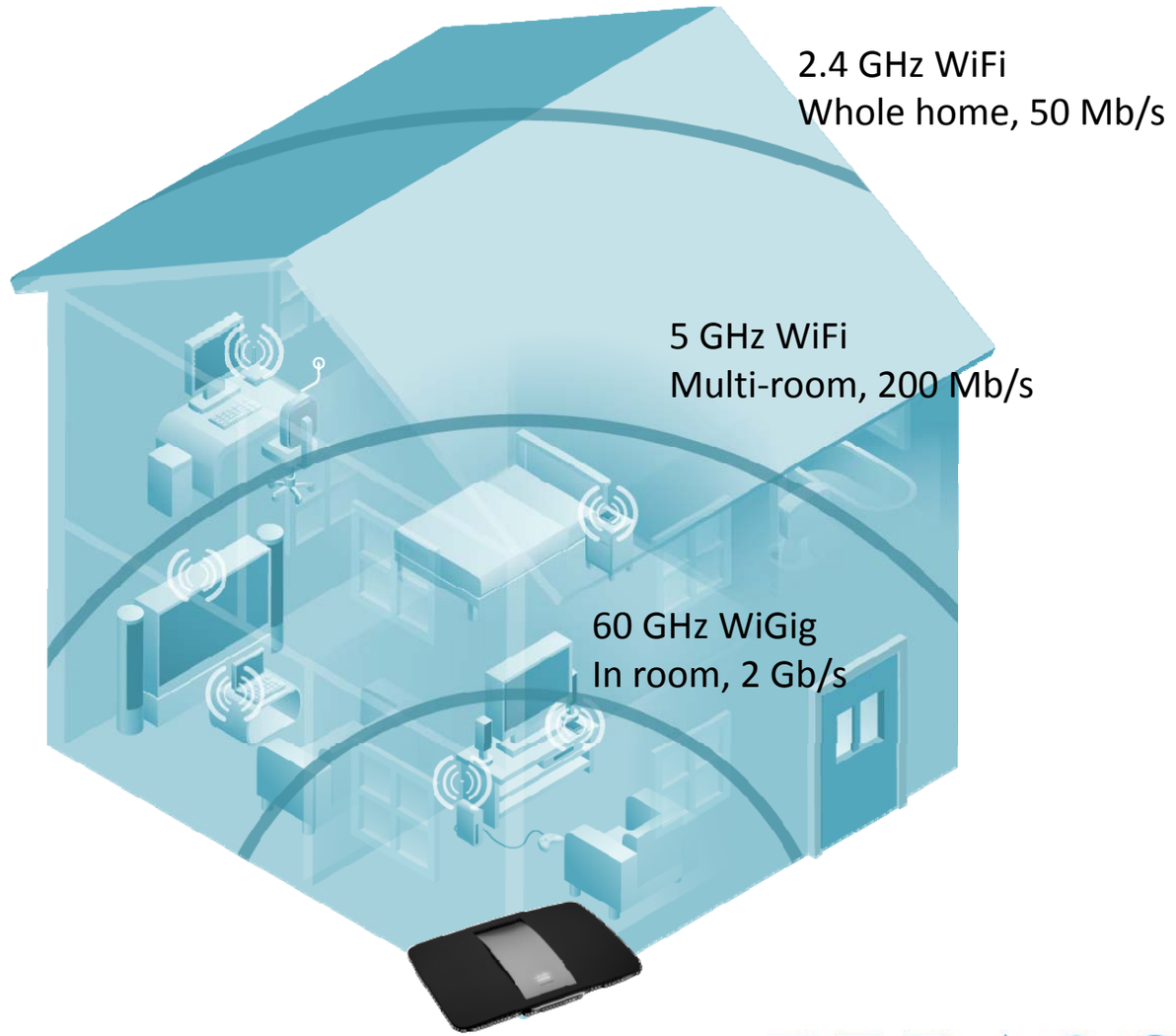
# Next Generation Tri-band Access Points (Residential)

**Next Generation Access Points**

- Support 2.4/5/60 GHz bands
- Seamless transition between bands; optimize performance, customer always linked

**WiGig Benefits:**

| Application | File Size | Performance |
|---|---|---|
| File transfer between devices | 2 GB movie | ~10 s (at 2Gb/s) |
| Media Back-up | 1000 pictures<br>1000 MP3 songs | 5 seconds<br>25 seconds |
| 4K video gaming | 1 Gb/s | <10ms latency (essential for gaming) |
| Extreme power efficiency | 1 hour gaming | 2.7% battery reduction |





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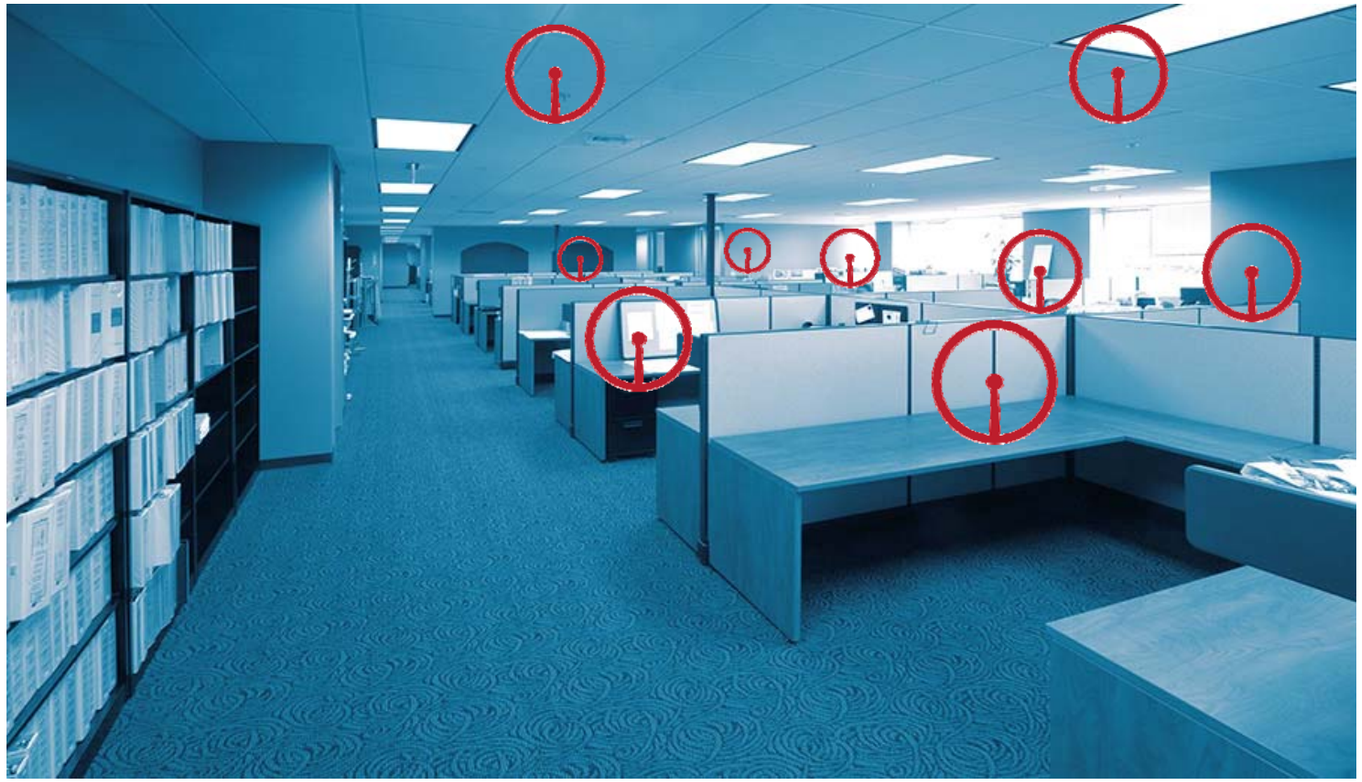
# Next Generation Tri-band Access Points (Commercial)

**Next Generation Access Points**

- Support 2.4/5/60 GHz bands
- Seamless transition between bands; optimize performance, always linked
- WiGig Benefits
  - High bandwidth links to all users
  - Relatively low power allows use for PoE
  - High immunity to interference
  - Scales to additional users; no pulling new wires



USB 3.0 Peripherals are essential to enable legacy devices to connect





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# 60GHz for Wireless and Mobile Connectivity

## More bandwidth affects all aspect of mobile experience

**Wireless Hard Drive Using Wireless USB 3.0**

- Extremely rapid, real-time back-up
- No need to find proper cables; highly convenient
- 2GB movie back-up in 10s

**Wireless Display (HDMI cable replacement)**

- 60GHz is ideal for interactive wireless display (e.g. gaming)
- Emergence of 4k displays requires high bandwidth
- 10ms latency for wireless gaming

**Trend towards eliminating physical connectors**

- New Apple MacBook Pro has ***one*** connector
- Very thin devices, more reliable, waterproof

**Wireless Docking and Charging**

- WiGig enables a completely wireless desktop using wireless docking
- Latest generation of mobile devices are using wireless charging, e.g. applications in cars





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# Fixed Wireless Infrastructure

## Exploding use of unlicensed bands (2.4/5/60GHz) for communications

- High speed wireless links eliminate the need to install and maintain fibre connectivity
  - Fixed wireless broadband
  - Metro WiFi
  - Campus interconnection
  - Wireless Internet Service Providers
- Various deployment configurations
  - Point-to-point
  - Point-to-multipoint
  - Mesh





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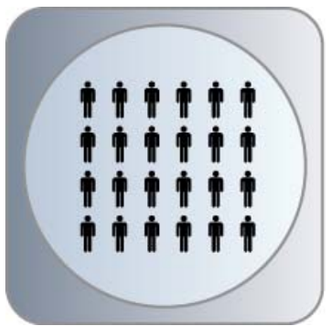
# Small Cell Backhaul

## Network densification used to increase capacity

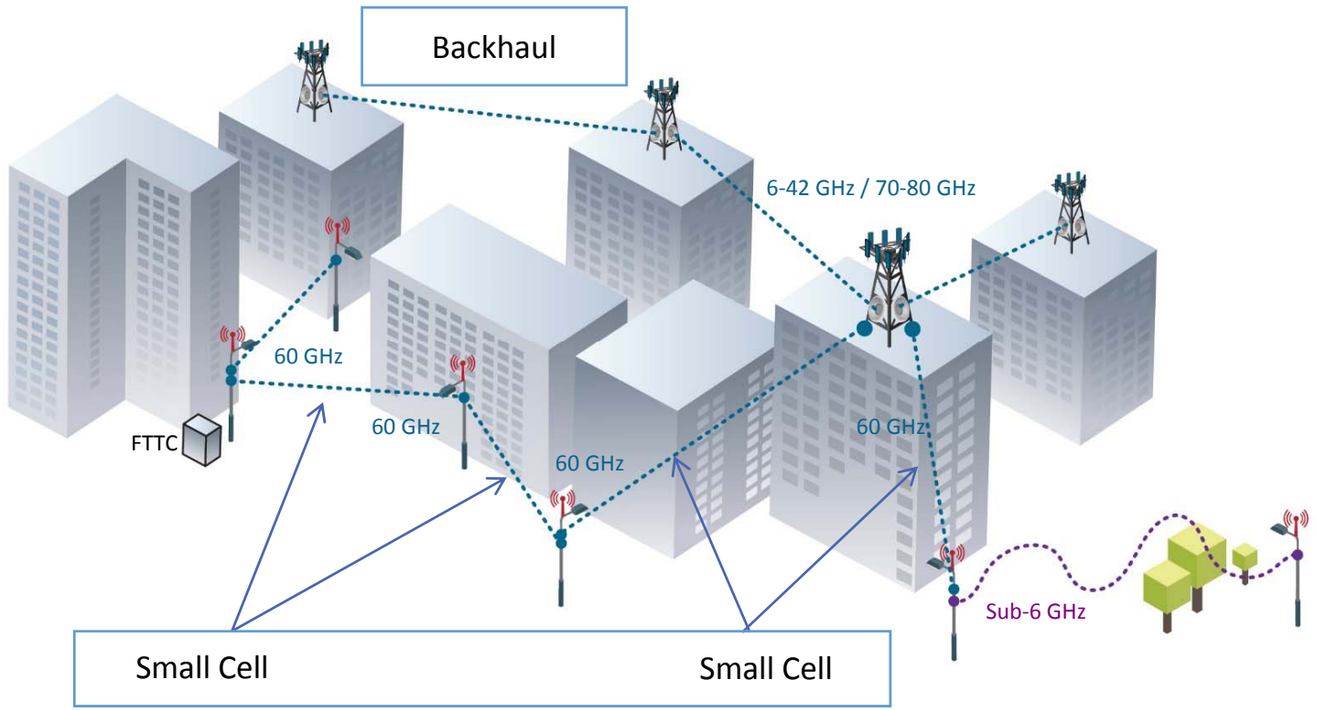
Spectrum re-use is the most efficient way to increase network capacity



Macro Cell

Increase cell density
Enhanced user experience

Small Cell





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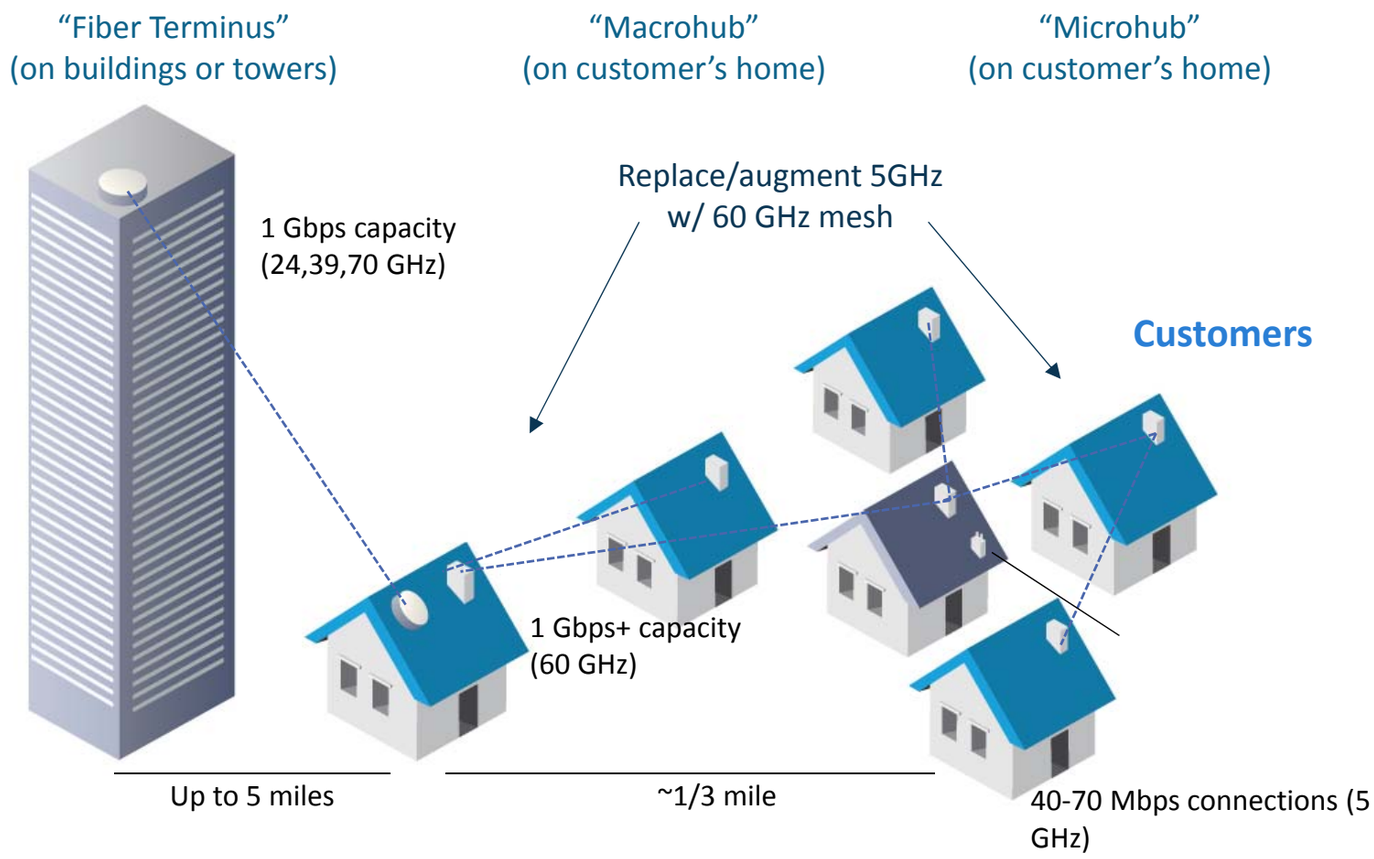
# 60 GHz WiGig Mesh Network (SON)

## Mesh Network is Next Generation Wireless Infrastructure Architecture

- Mesh backhaul allows network operators to dynamically re-configure their network
- Underlying technology includes mesh software, phased array (steerable beam)
- Peraso is a dominant player in this market for both RF IC and baseband IC
- Significant benefits to operators;
  - Dynamically add/remove new customers
  - Steer around interference issues
  - Optimize link margin





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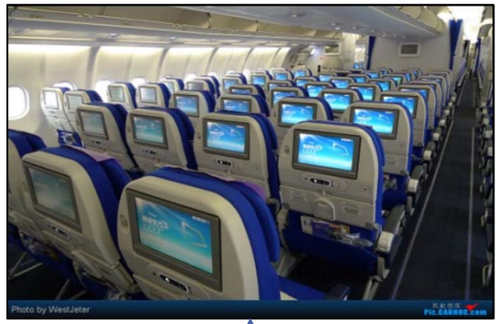
# Next Generation WiGig Underway: IEEE 802.11ay

## Up to 100 Gb/s!



Massive Video
Distribution 100 Gb/s

Data Centers 20 Gb/s

802.11ay
Baseline: 20 Gb/s
Optional: 100 Gb/s

Wireless USB 3.1 11 Gb/s

Wireless VR
Goggles 20 Gb/s


5G Backhaul
100 Gb/s





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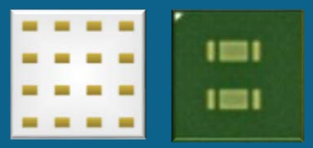
# Peraso RF IC Advantages



- Peraso is uniquely positioned to utilize SiGe for WiGig RF ICs
- SiGe provides clear differentiation in the WiGig market place

## WiGig – Consumer & Enterprise

- 14dBm single element radio highest power WiGig radio available
- 5dB NF best in class for WiGig products
- Efficiency of SiGe enables market leading phased array architecture
  - Half the silicon area, half the elements, equivalent performance
  - Cost, real estate advantages critical for consumer electronics, especially mobile

## Outdoor Backhaul

- Peraso in production with single element RF IC for small cell backhaul
- SiGe has excellent temperature tolerance in outdoor environment
- SiGe phased array ideal for backhaul
  - High power density allows for long links
  - SiGe phased array improves link margin
  - Low NF improves link margin





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# Peraso RF Outperforms the Competition

| | Peraso | XXXXXXXX | XXXXX | XXXXXXXX | XXXXXXX |
|---|---|---|---|---|---|
| Process | 130nm SiGe | 40nm CMOS | 120nm SiGe | 65nm CMOS | 65nm CMOS |
| WiGig Channels | >4 | 4 | 4 | 4 | 2 |
| Die Area ($mm^2$) | 4.97 | 26.3 | 81.5 | 17.64 | 72.7 |
| $P_{DC}$ × Si Area / Distance ($mW \times mm^2/m$) | **263.4** | 2827.3 | 50711.1 | 5975.6 | 1213.0 |

## Peraso Sets a Record for Power/Silicon Area/Distance

*"IEEE Journal of Solid State Circuits"*

- Core Peraso Value Proposition for RF IC is Highest Efficiency in the World
  - Enables low price, low power, small footprint, esp. for mobile devices
- Peraso RF is Extremely High Performance; Proven to Work Over 1KM
  - High performance leads to reduced 'on' time for radio; significantly reduced power consumption through duty cycling





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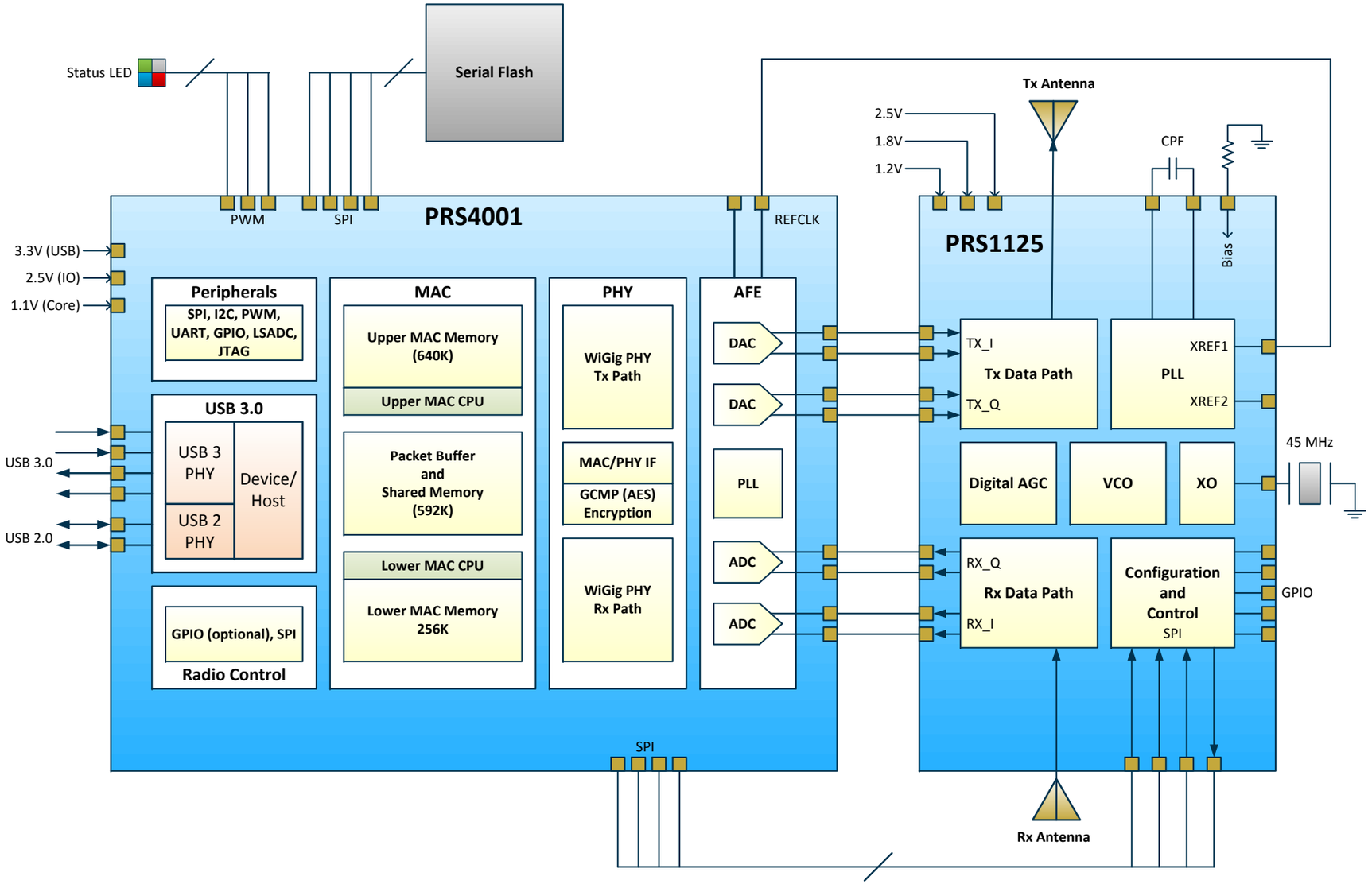
# W110 WiGig Chipset / USB Reference Design





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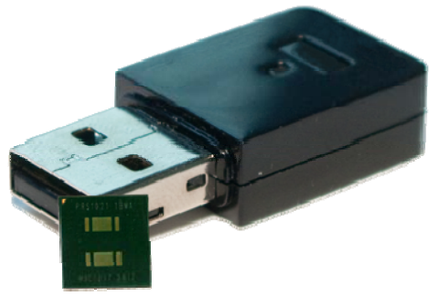
# USB Peripheral Devices



- Peraso is one of three leading WiGig IC vendors
  - Intel (notebooks, tablets) and Qualcomm (tri-band routers, mobile) are focussed on embedded designs
  - USB 3.0 Peripherals are essential to enable legacy devices to connect

- Peraso is currently the only provider of a compliant USB3.0 reference design
  - Customers of Intel, Qualcomm are demanding USB dongles to support legacy equipment; Peraso working closely with Intel, Qualcomm to ensure interoperability with USB dongle
  - USB reference design launched

# Thank you!





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