



The Systems Hacker's Guide to the Galaxy

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Australian Government

Department of Broadband, Communications
and the Digital Economy

Australian Research Council

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“What does it matter? Science has achieved some wonderful things, of course, but I'd far rather be happy than right any day.”

– Douglas Adams

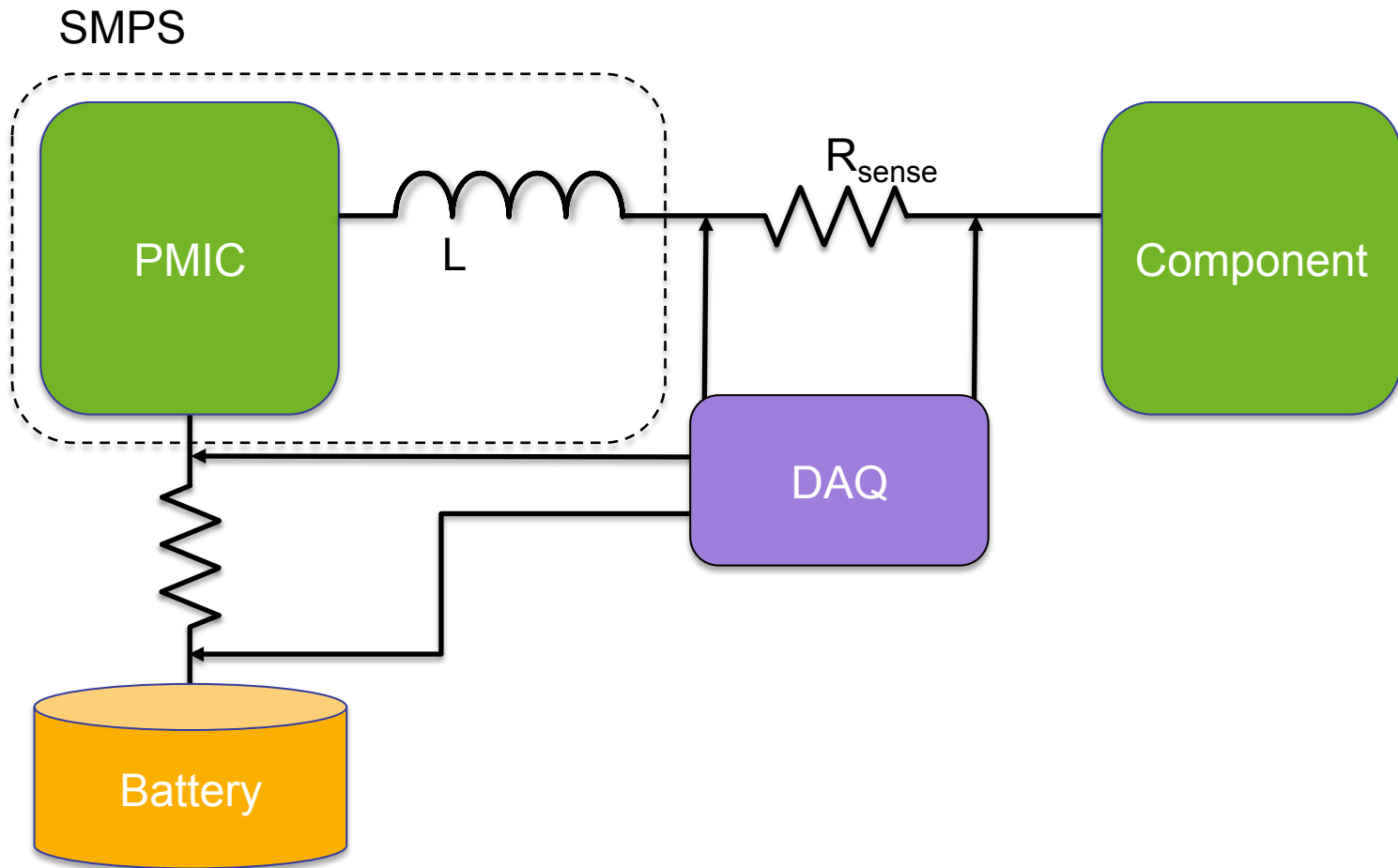
2010...

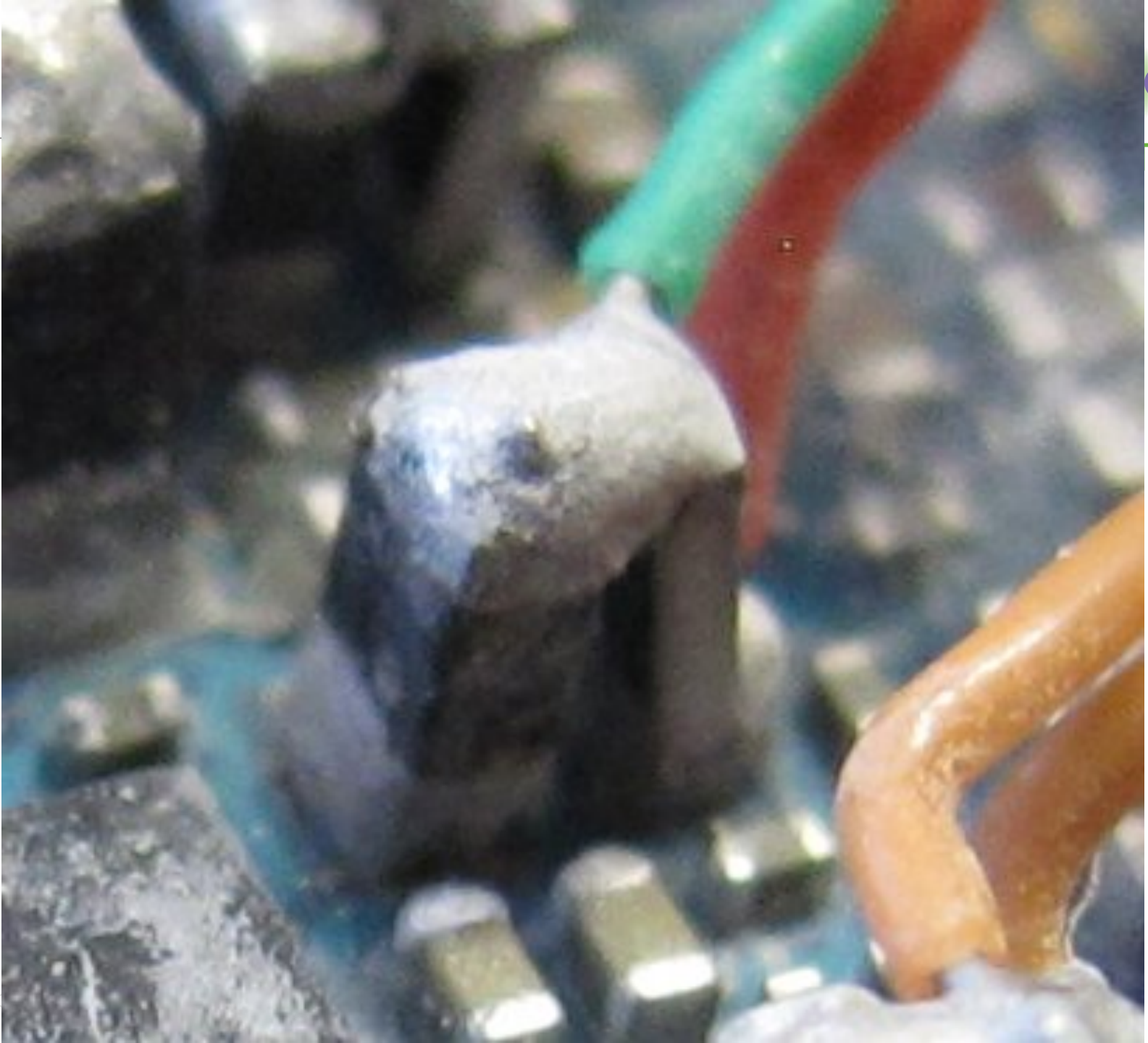


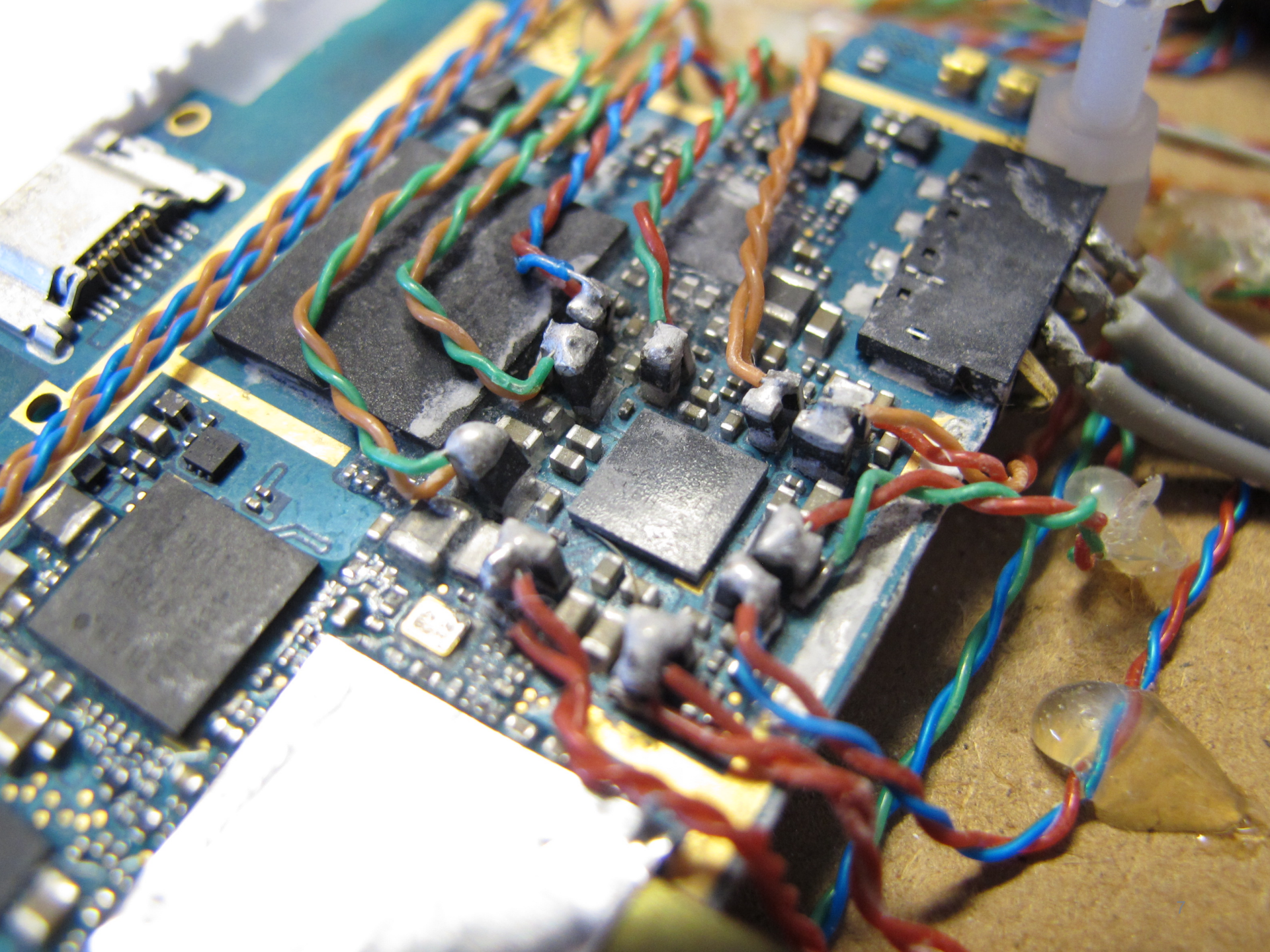
- Fine grained energy accounting
 - CPU, RAM, screen, etc.
- Not a “typical” device
- Missing:
 - 3G
 - GPU
 - Camera
 - etc.

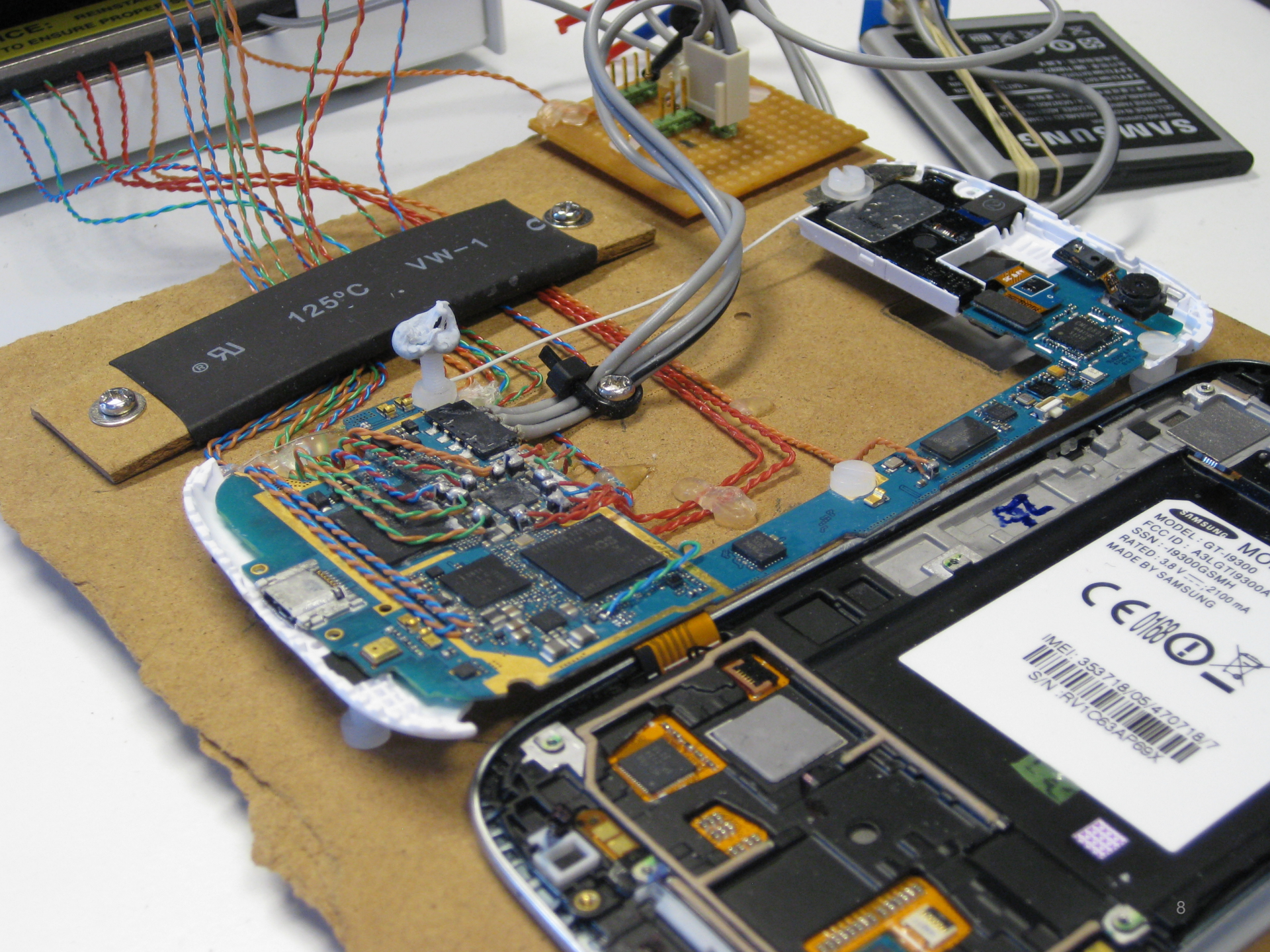
Now











SAMSUNG
MODEL: GT-I9300
FCC ID: A3LGT19300A
SSN: 19300GSMH
RATED: 3.8 V 2100 mA
MADE BY SAMSUNG

CE 0168

IMEI: 353718/05/470718/7
S/N: RV1C63AP69X

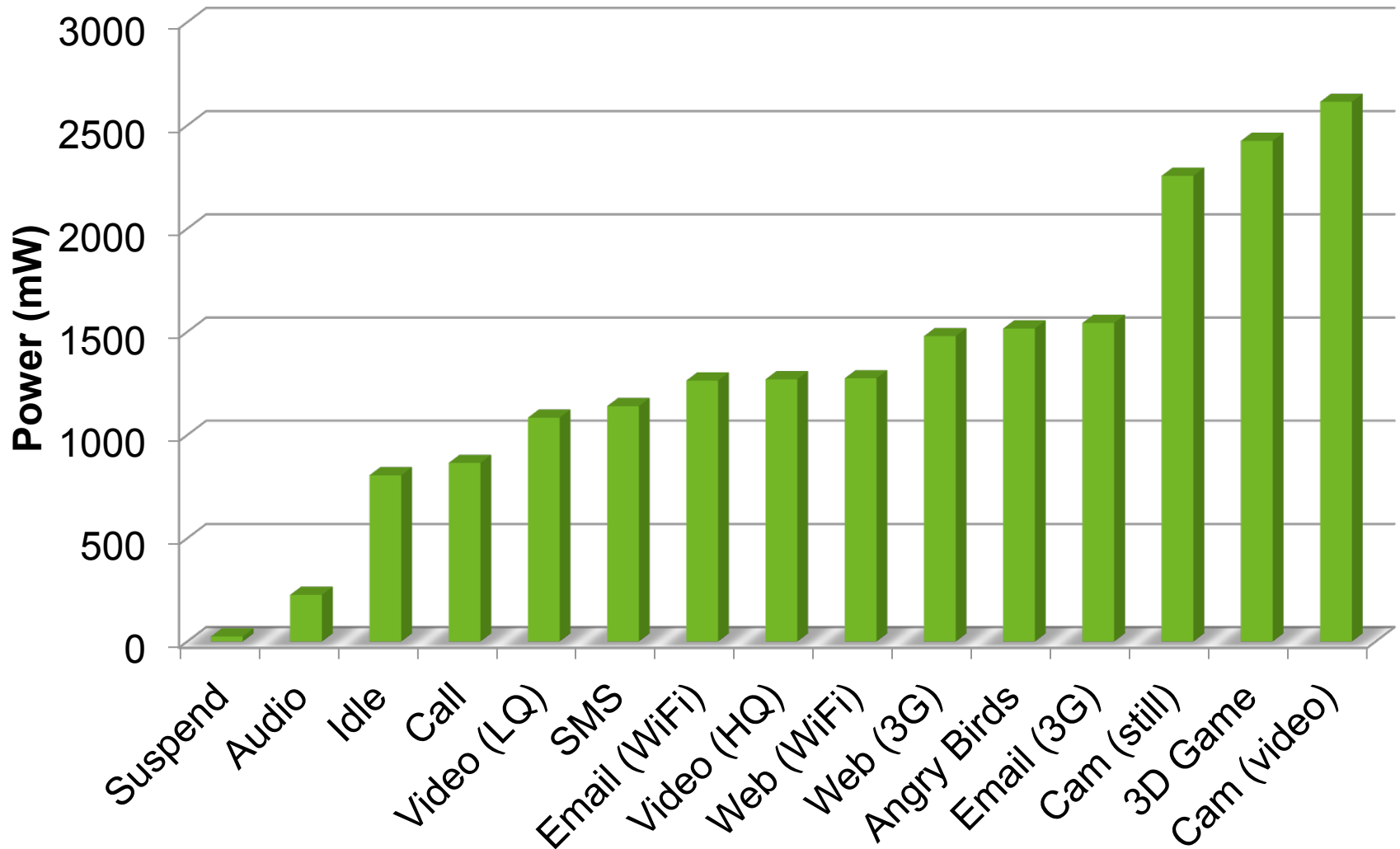
What's measured

- Core
- RAM
- GPU
- SoC
- Display
- Radios
 - WiFi
 - 3G
- Camera
- Audio
- GPS

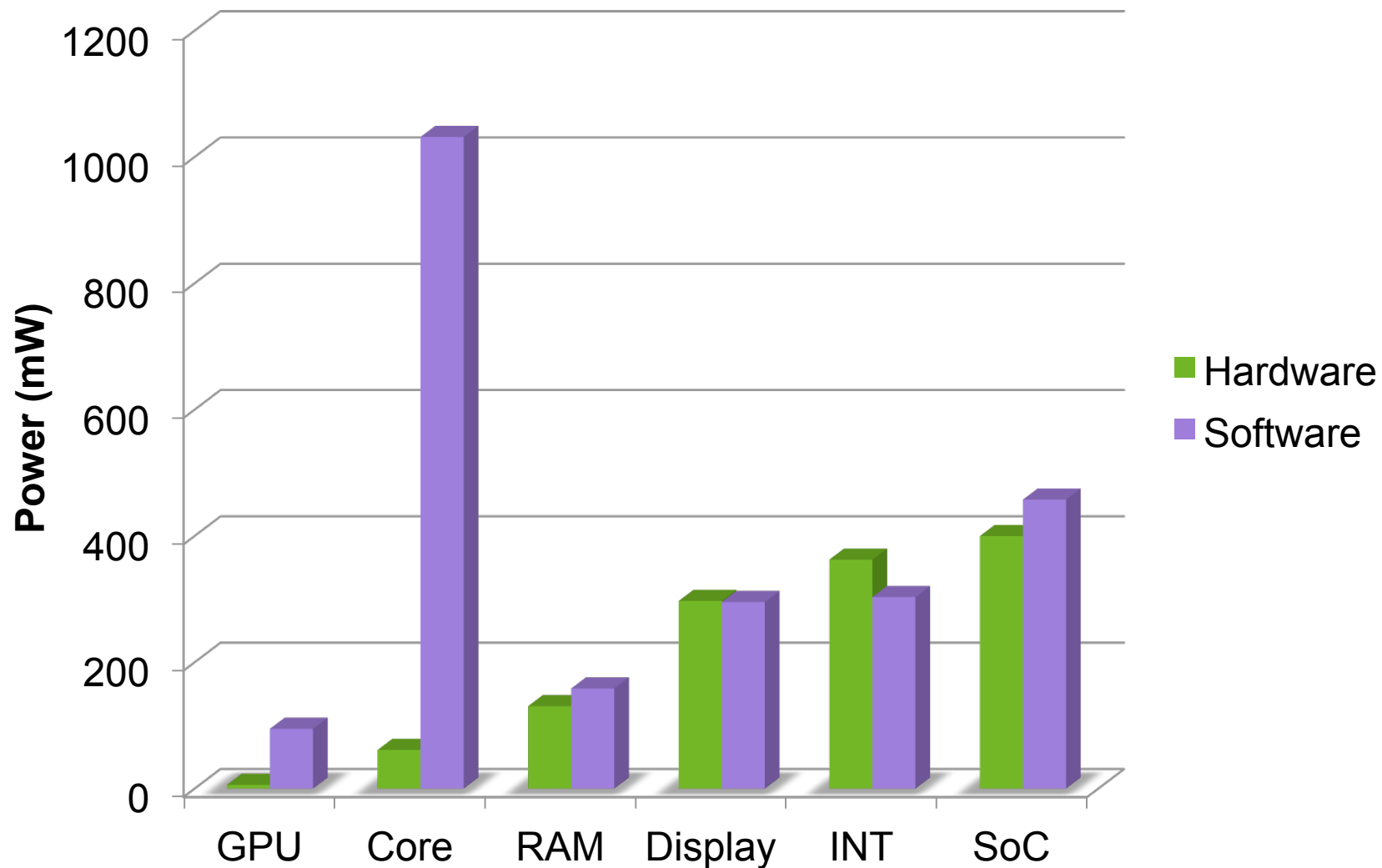
“Only by counting could humans demonstrate their independence of computers.”

– Douglas Adams

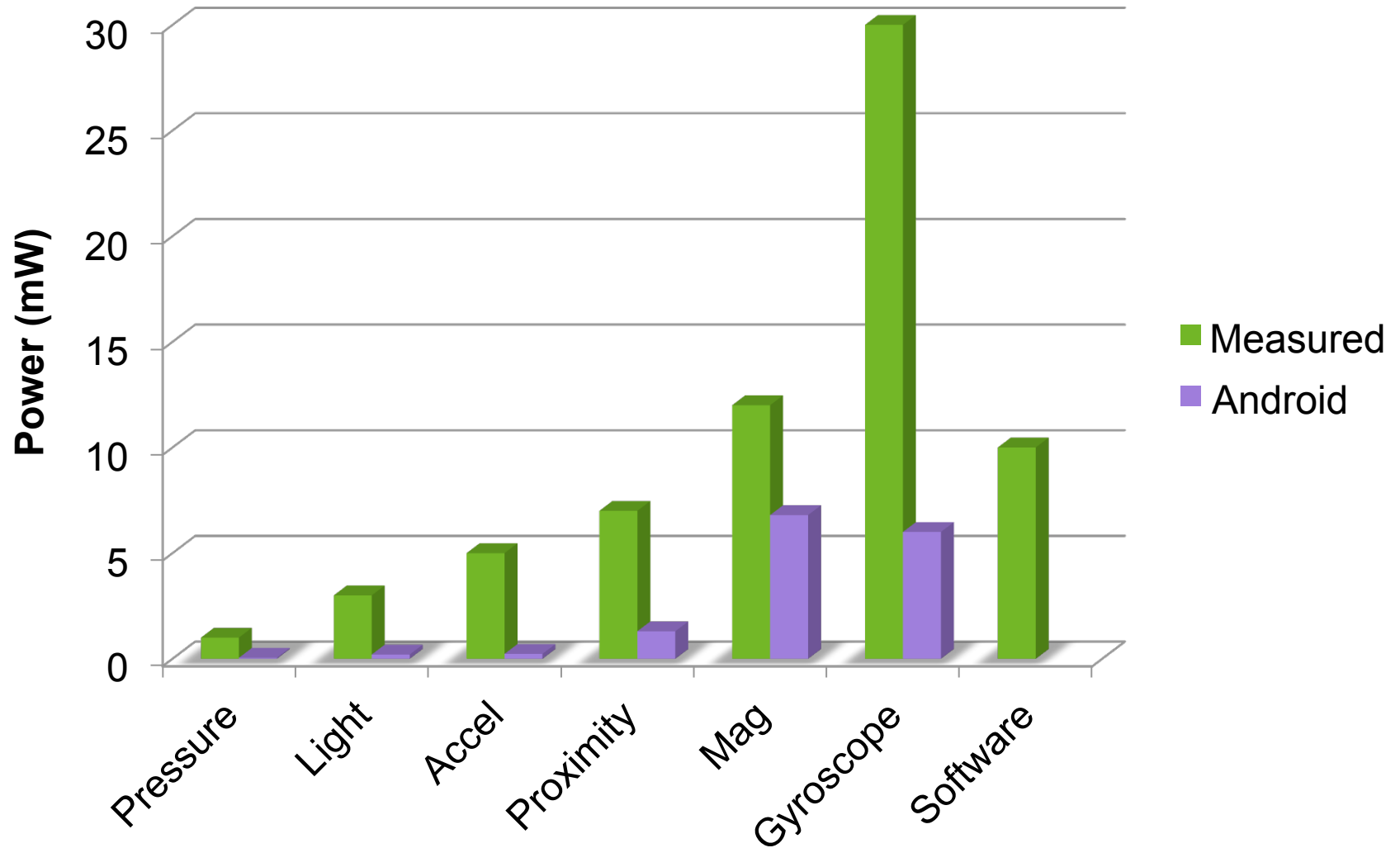
Usage Scenarios



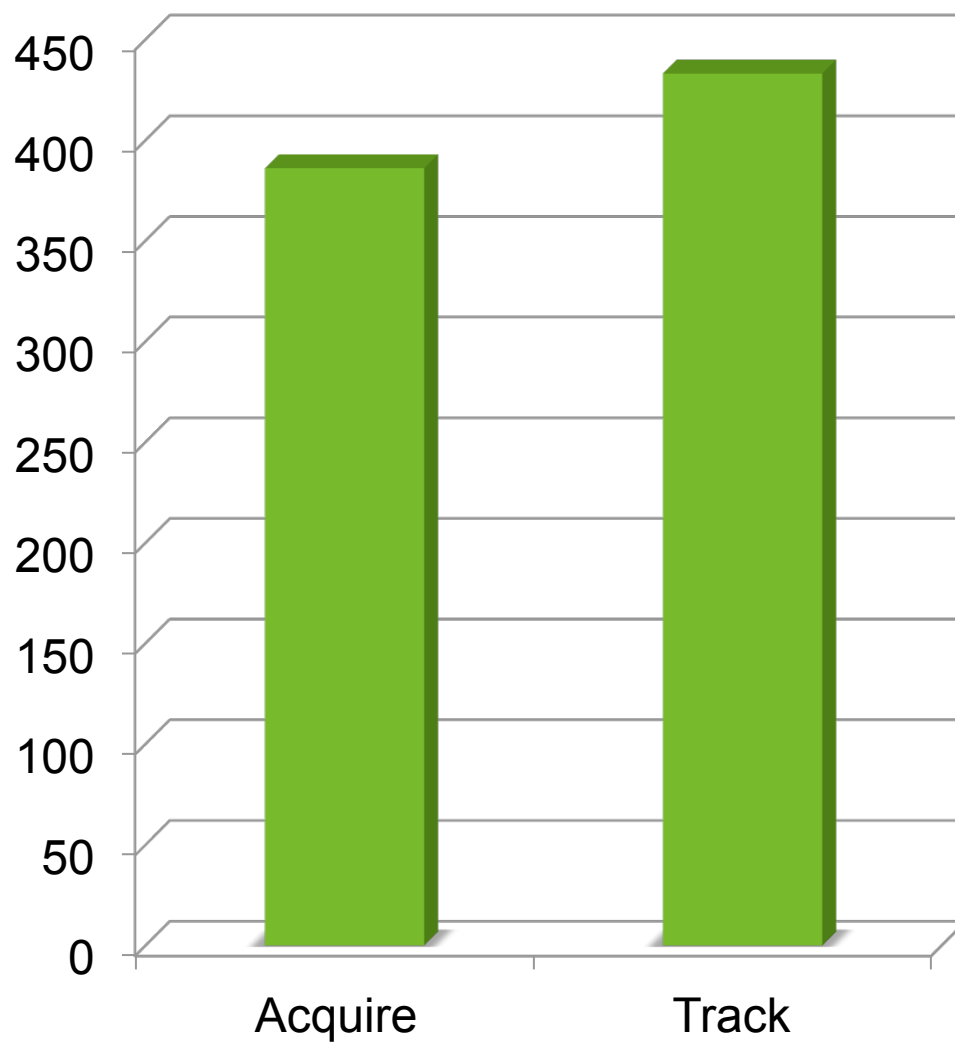
Video Decoding

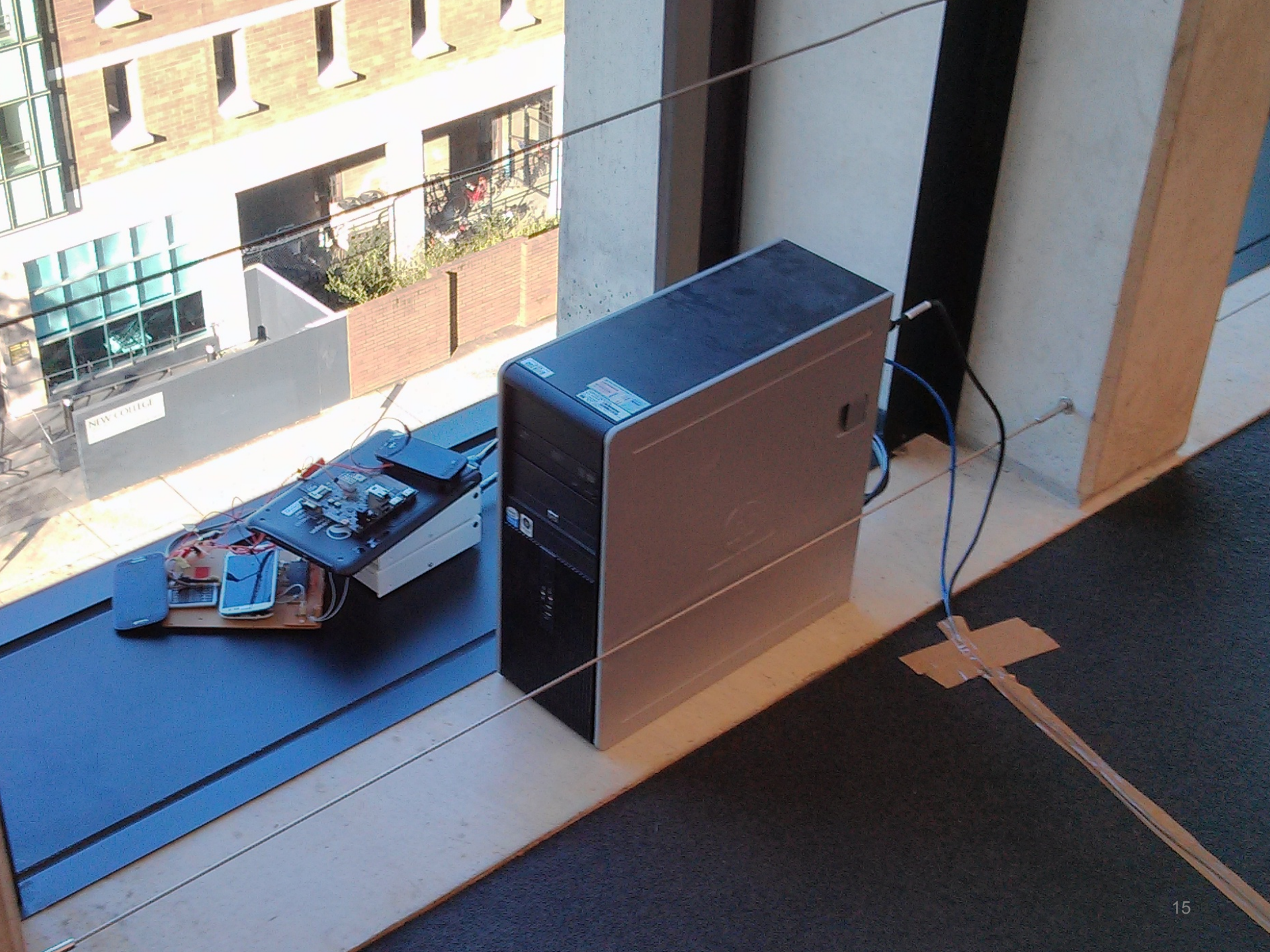


Sensors

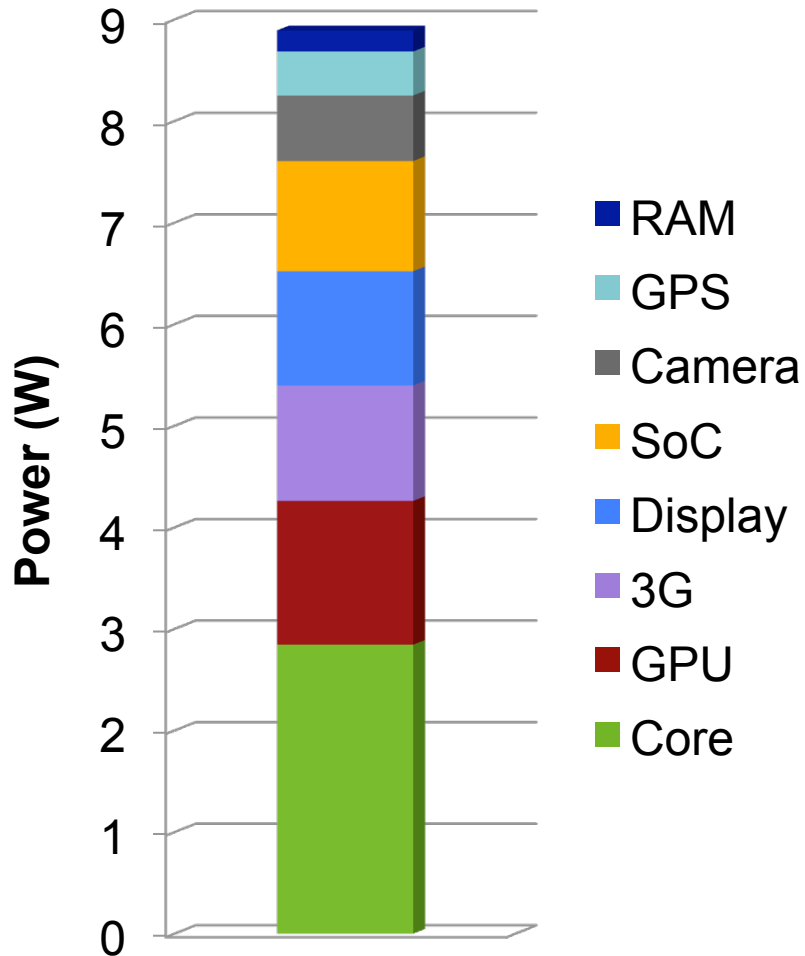


GPS





Max Power



- $P_{avg} \ll P_{max}$
- Demands efficient intermediate power states

Observations

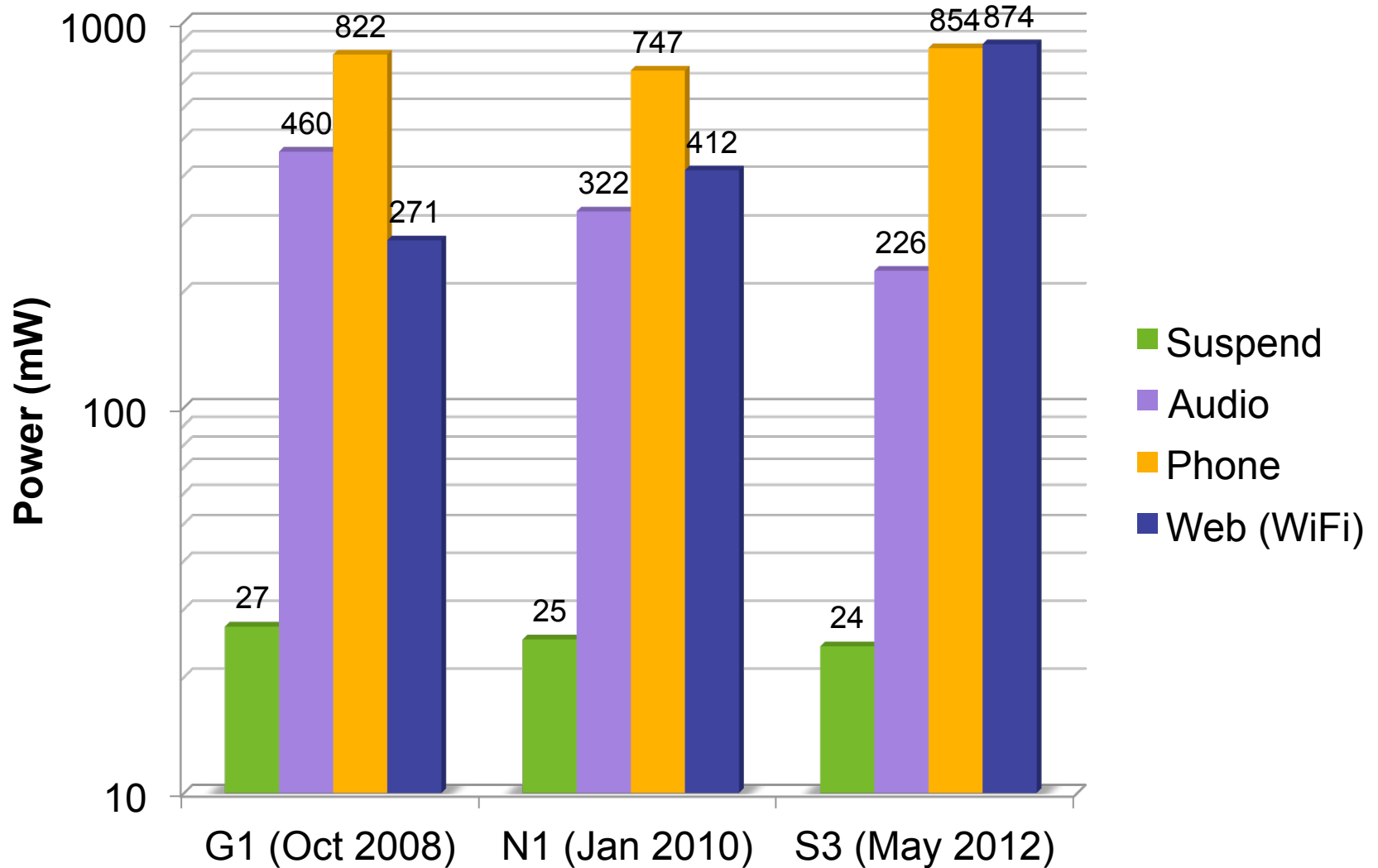
- High peak power for many components
- Display always important
- RAM power insignificant
 - 6% on average
 - Always correlates with CPU/GPU
- Irrelevant:
 - Sensors
 - Audio
 - Storage

“For a moment, nothing happened. Then, after a second or so, nothing continued to happen.” – D.A.

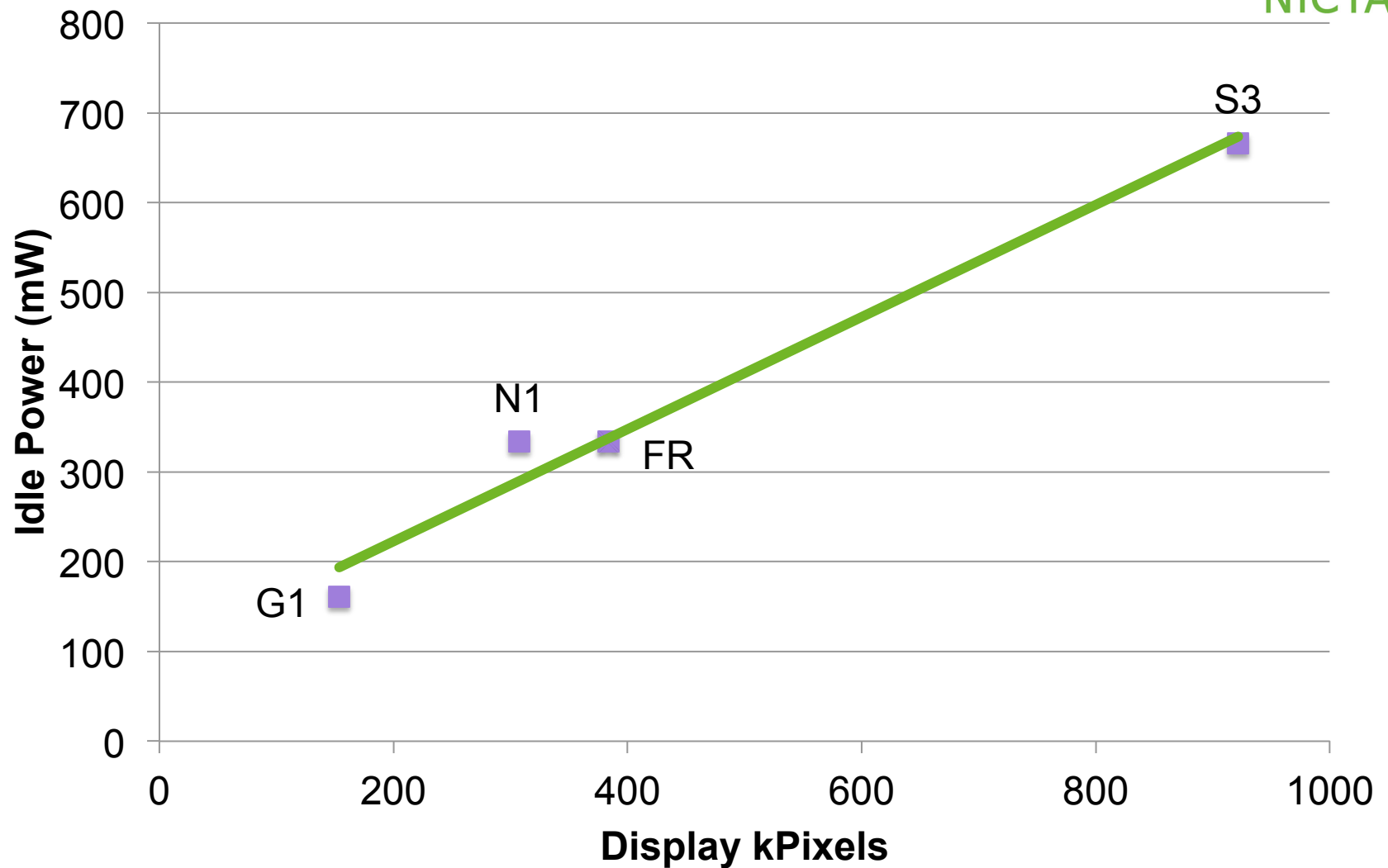
Trends

- Previously:
 - FreeRunner fine grained
 - Full system power:
 - HTC Dream (G1)
 - Nexus One

Trends



Trends



- Get the data:
 - ssrg.nicta.com.au/projects/energy-management

“Do you find coming to terms with the mindless tedium of it all presents an interesting challenge?”

– Douglas Adams