



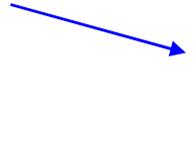
The UWB Example A Place to Start

Disclaimer

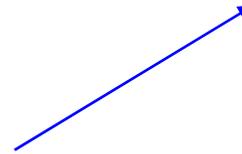
The views and opinions expressed herein do not necessarily reflect the official policy or position of any government agency

What's Ultra WideBand (UWB)

Very narrow time
domain pulses



Create a very wide
frequency spectrum

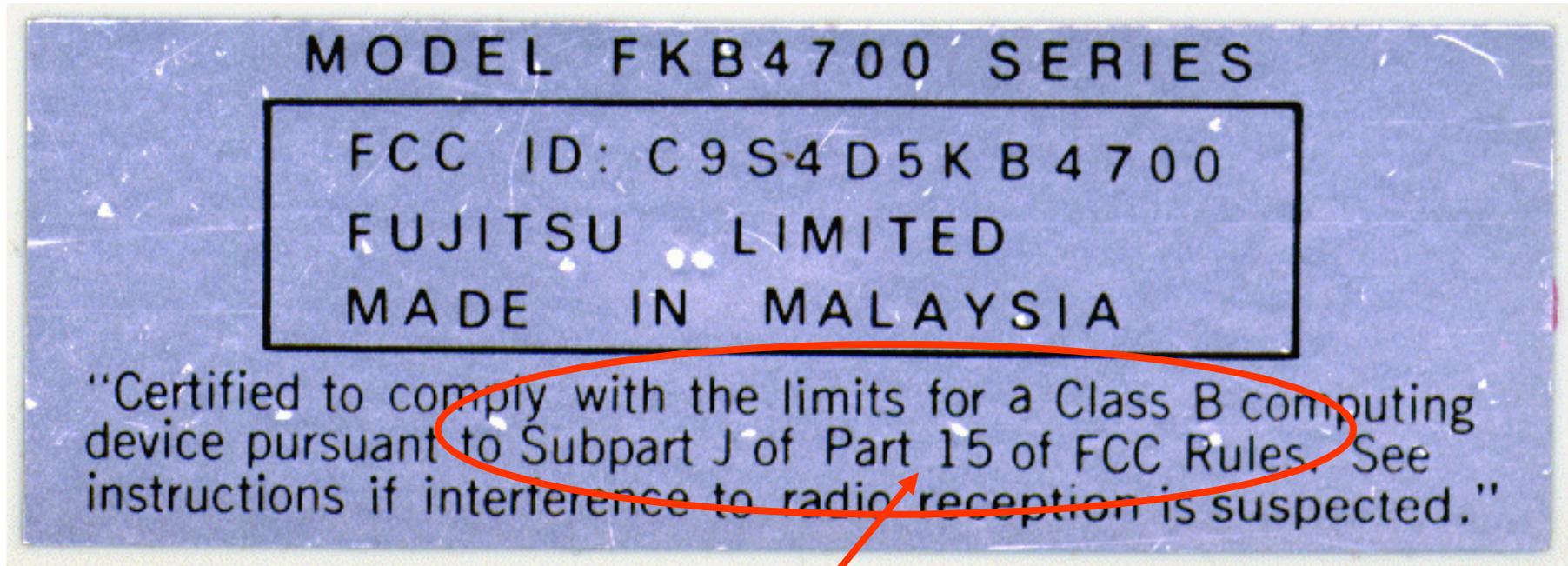


Sub-nanoseconds \Rightarrow GigaHertz

UWB vs GPS – Conflict in Priorities

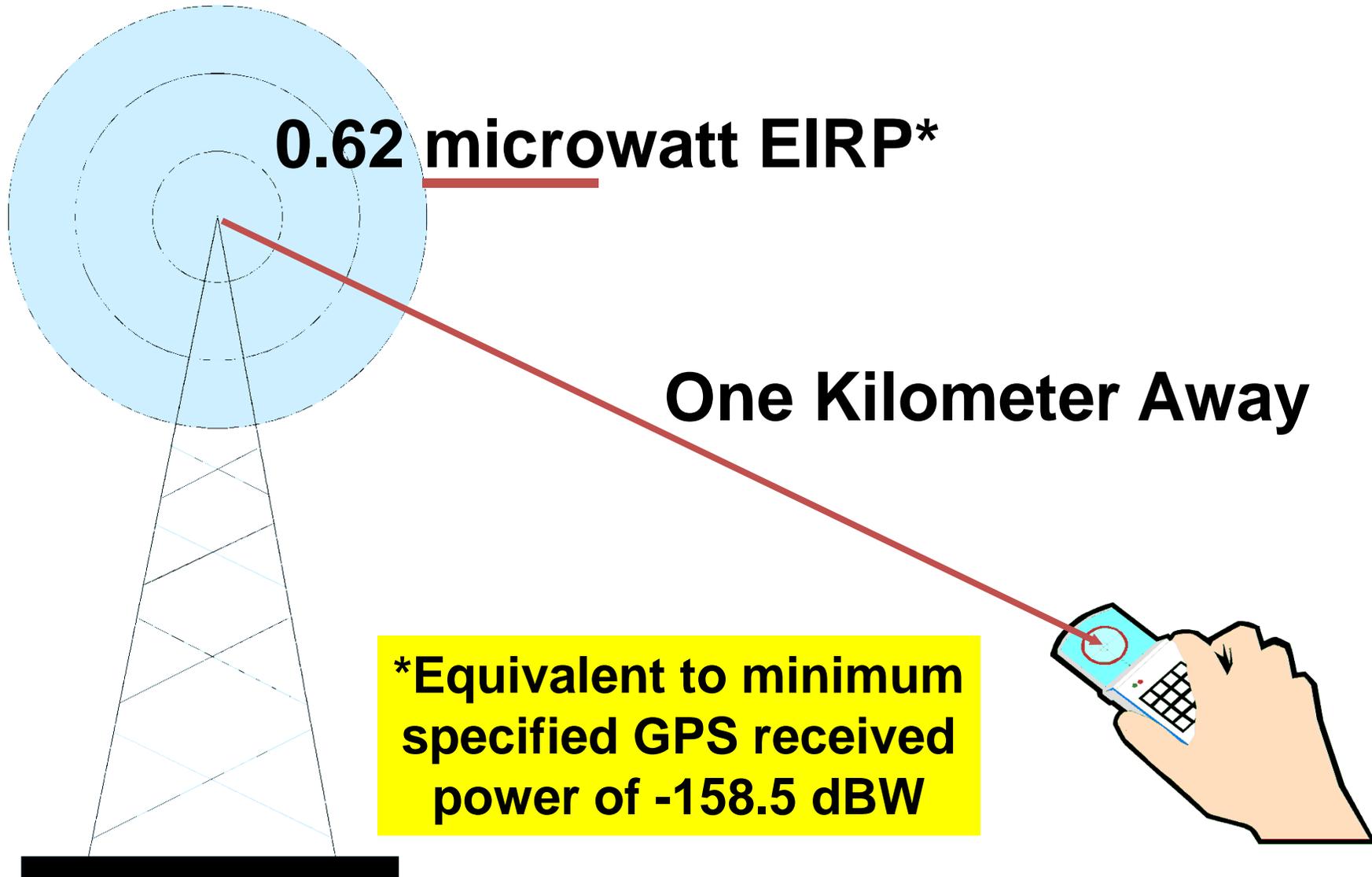
- The FCC and companies like Intel, Microsoft, and Sony saw UWB as an important step forward
 - Wideband, multipath-free communications
 - “Free” spectrum
 - UWB energy is lightly sprinkled across many frequency bands
 - With such low spectral power density, who could care?
- Omnidirectional users of satellite signals care
 - Because satellite signals are extremely weak

Part 15 of FCC Rules

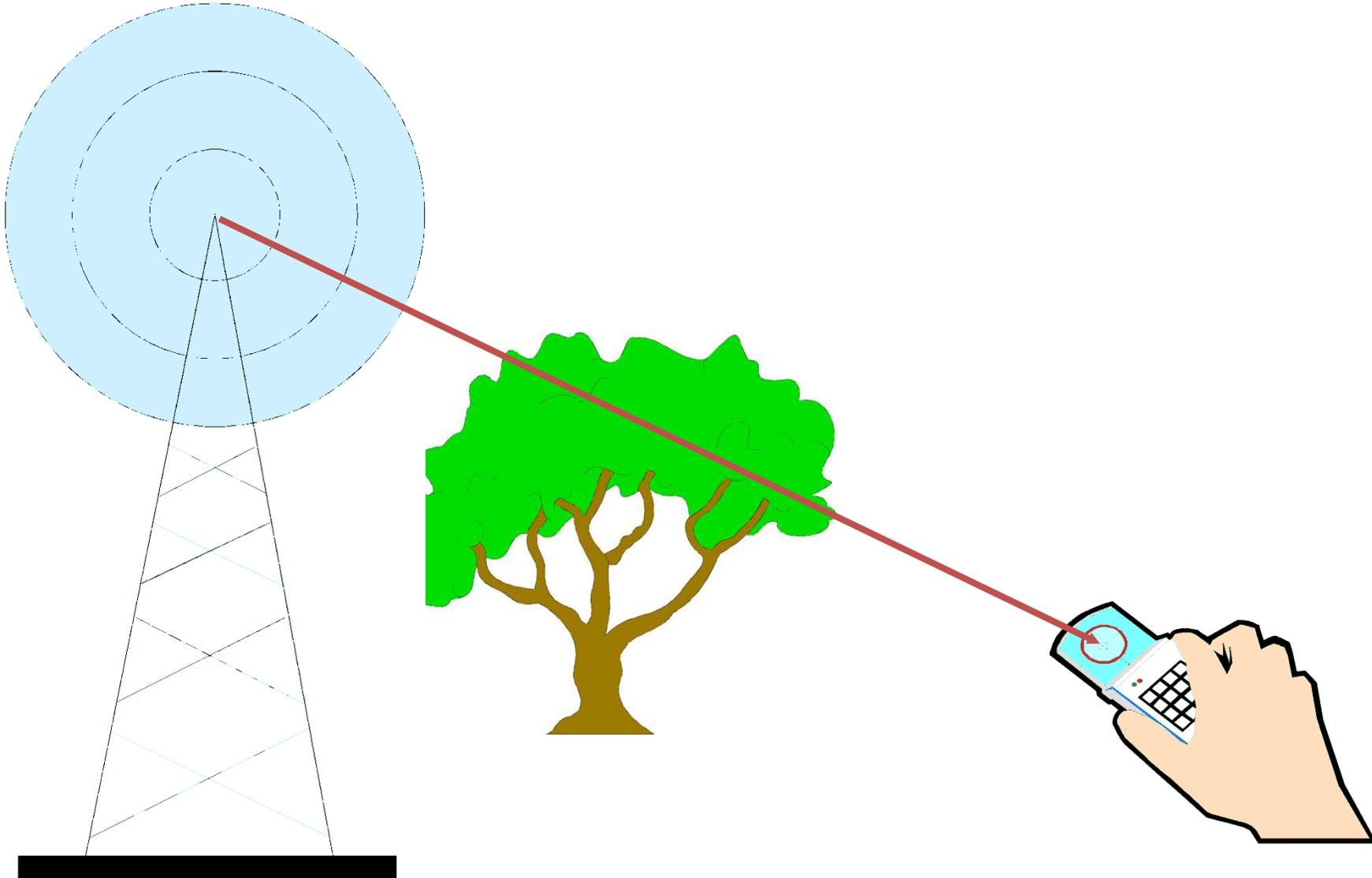


Unintentional radiation is limited by FCC Part 15 rules to -41.3 dBm/MHz EIRP

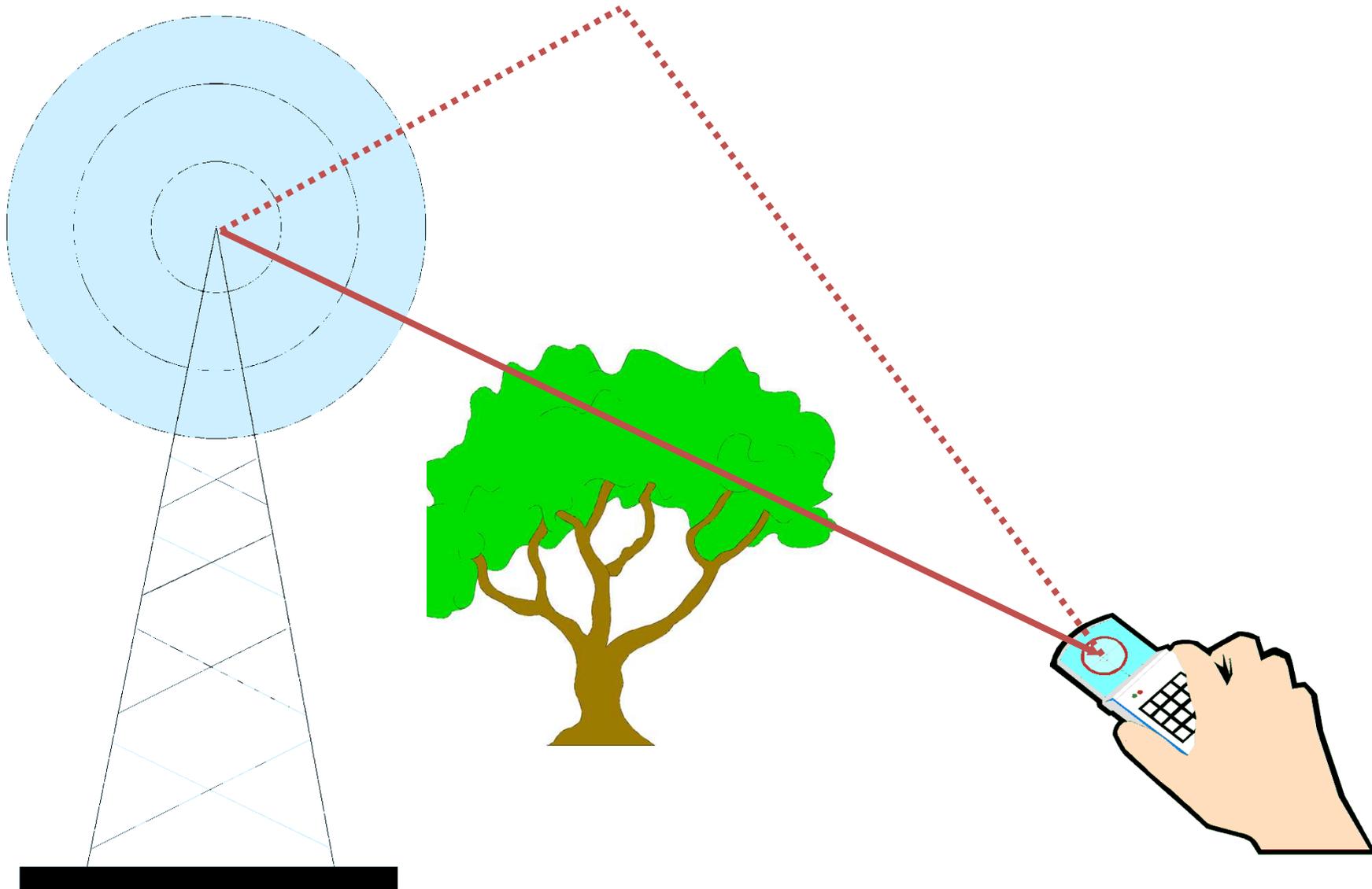
GPS Signals Start Out Very Weak



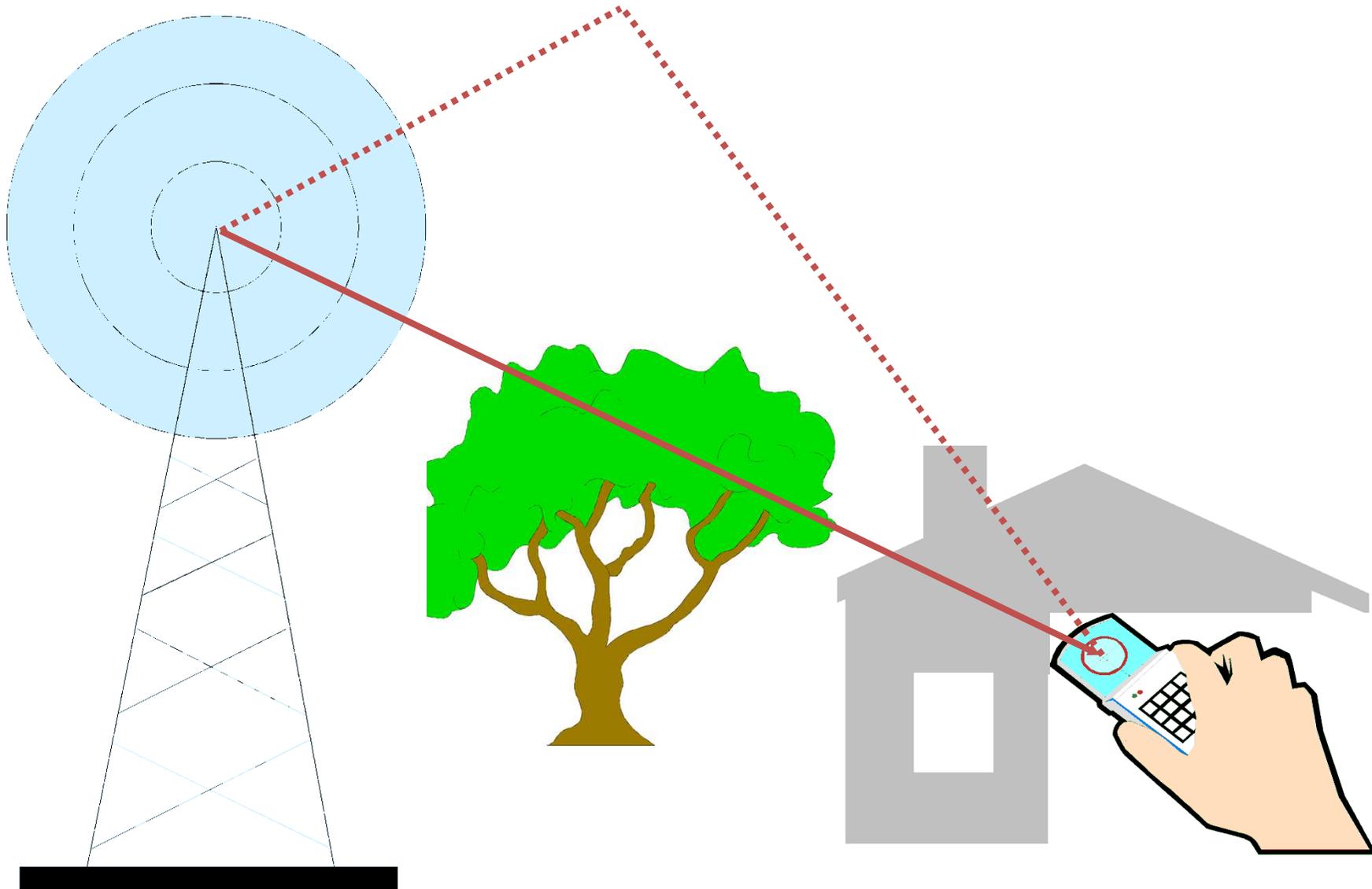
And can be Attenuated by Foliage



Further Attenuated by Multipath



Even More Attenuation Indoors



UWB Criteria Selected for GPS Protection

- It is **not** possible to regulate the user density of Unlicensed, Uncontrolled, Ubiquitous UWB emitters
 - One prediction: “1,000’s in homes, 1,000,000’s in an industry”
- It is only possible to regulate the emissions from **each** individual device
 - Backed by a vigorous testing and product recall program
- Therefore, in the GPS bands the UWB criteria is:
 - Allow each UWB emitter to raise the GPS noise floor
 - By 26% (1 dB) at a distance of 6 feet (1.83 m)
 - Which requires an EIRP at or below -75.3 dBm/MHz (-105.3 dBW/MHz)
- In comparison, the cost and the time required to raise the power of all 28-31 GPS satellites by 26% would be Billions of dollars and at least 15 years



Cover of December 2001 FCC Presentation

Walk DON'T Run - The First Step in Authorizing Ultra-Wideband Technology



Ron Chase

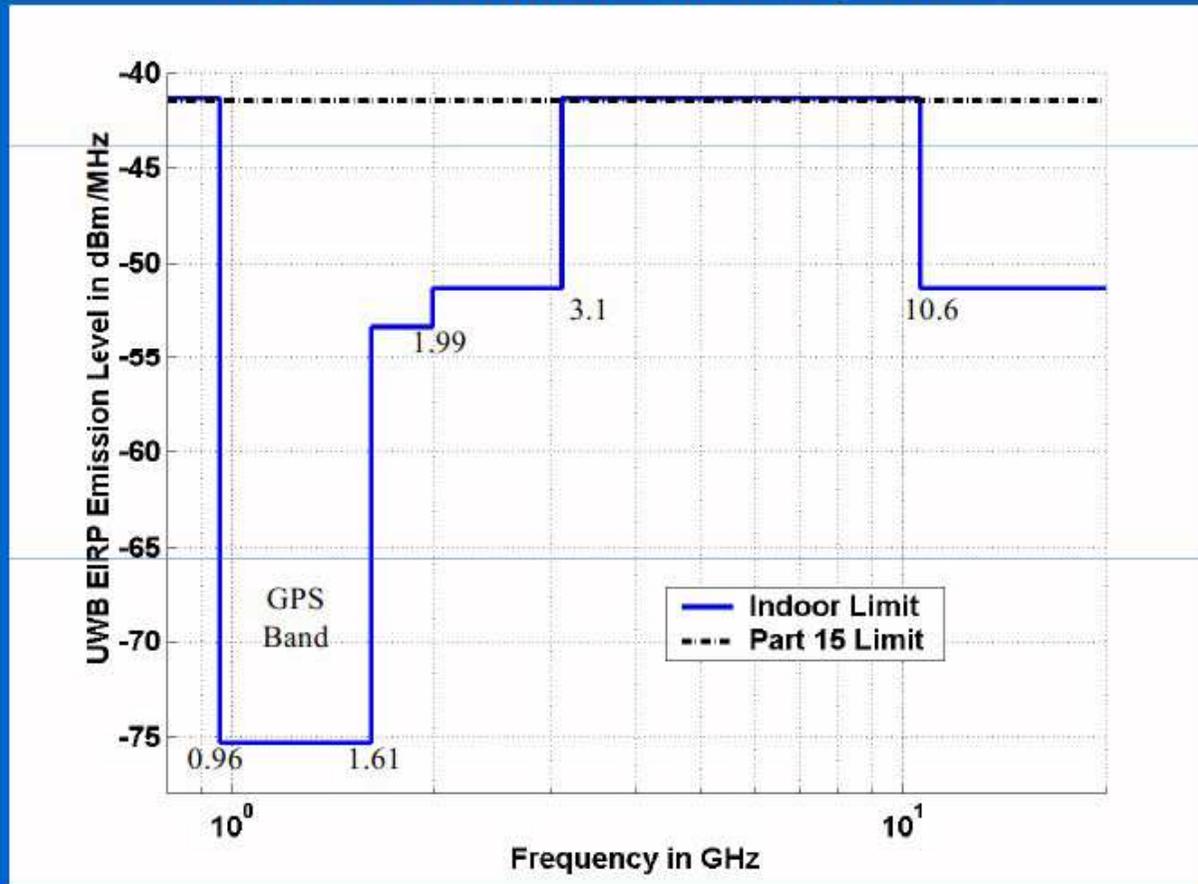
ITU-R Chair U.S Task Group 1/8 on UWB

Federal Communications Commission

-75.3 dBm/MHz, 34 dB Below Part 15 Limit

UWB Emission Limits

Indoor Communications Systems

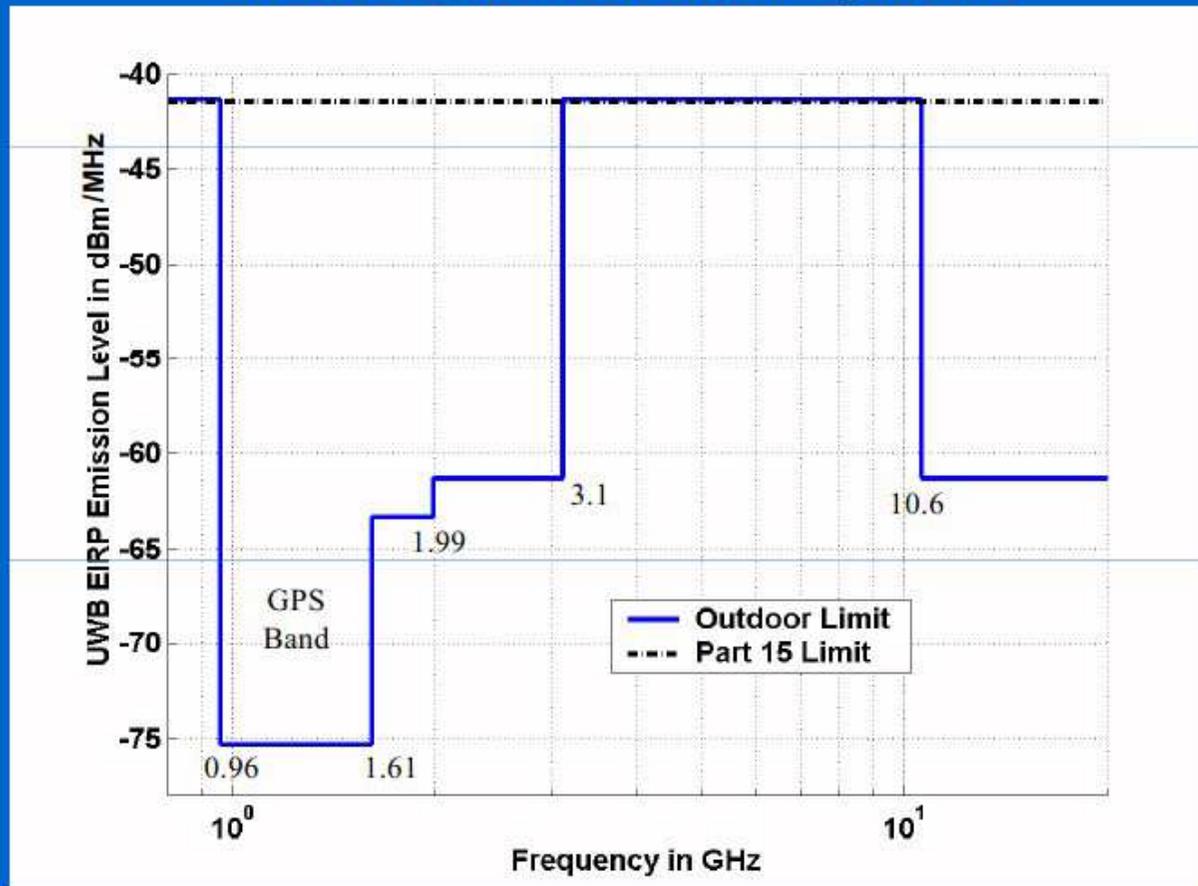


Equipment must be designed to ensure that operation can only occur indoors or it must consist of hand-held devices that may be employed for such activities as peer-to-peer operation.

-75.3 dBm/MHz, 34 dB Below Part 15 Limit

UWB Emission Limits

Outdoor Communication Systems



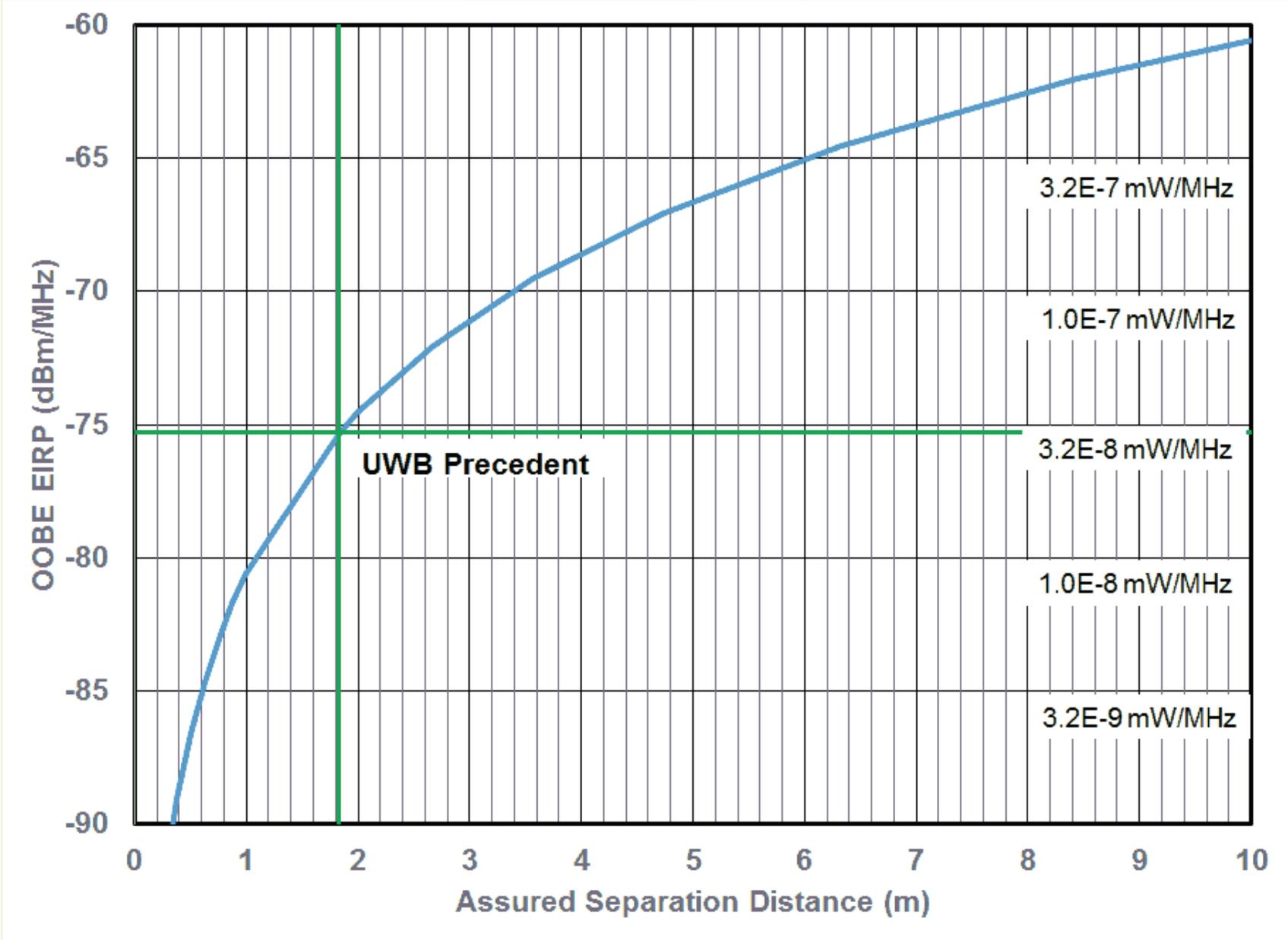
Equipment must be hand-held.

Using the UWB Agreement as a Model

- Based on the UWB Agreement, the following chart shows:
 - The Equivalent Isotropic Radiated Power (EIRP)
 - Of Out-Of-Band-Emissions (OOBE)
 - Received within the GPS L1 band
 - From a transmitter at an assured minimum distance from any GPS receiver
- This must be achieved by
 - Filtering at the transmitter
 - Transmitter power control if needed
- Assured distance means the GPS receiver and the transmitter must never be that close



OOBE EIRP vs. Assured Separation Distance



Unintentional Radiation Limit

- The FCC regulates unintentional radiation with Part 15 rules, requiring EIRP to be less than -41.3 dBm/MHz
- The UWB industry asked the FCC for permission to intentionally transmit that level of noise-like signal, including within the GPS spectrum
- Ultimately, the FCC UWB Report & Order (R&O) limited most UWB emissions to -75.3 dBm/MHz EIRP, 34 dB less than Part 15 power in GPS bands
- What reasonable limit should apply to unintentional radiation?
- What standard does your country use?

