



Watch The Recording

5G mmWave Meter Learning Session

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www.safelivingtechnologies.com

www.slt.co

Safe and Sound Pro mm Wave Meter

Introductory Video



<https://www.youtube.com/watch?v=bwISuoQ0s-4&t=1s>

S & S Pro mm Wave Meter - Challenges

8 months of development – Release date June 30 2023 (Apologies for Delays)

Getting stable response required additional R & D to get desired BBI spec

We don't want to compromise on specifications and pricing

- Power usage very high (Difficult getting 6 hour battery life)
- Antenna development was challenging
- Sensitivity below $0.5 \mu\text{W}/\text{m}^2$ - biggest challenge

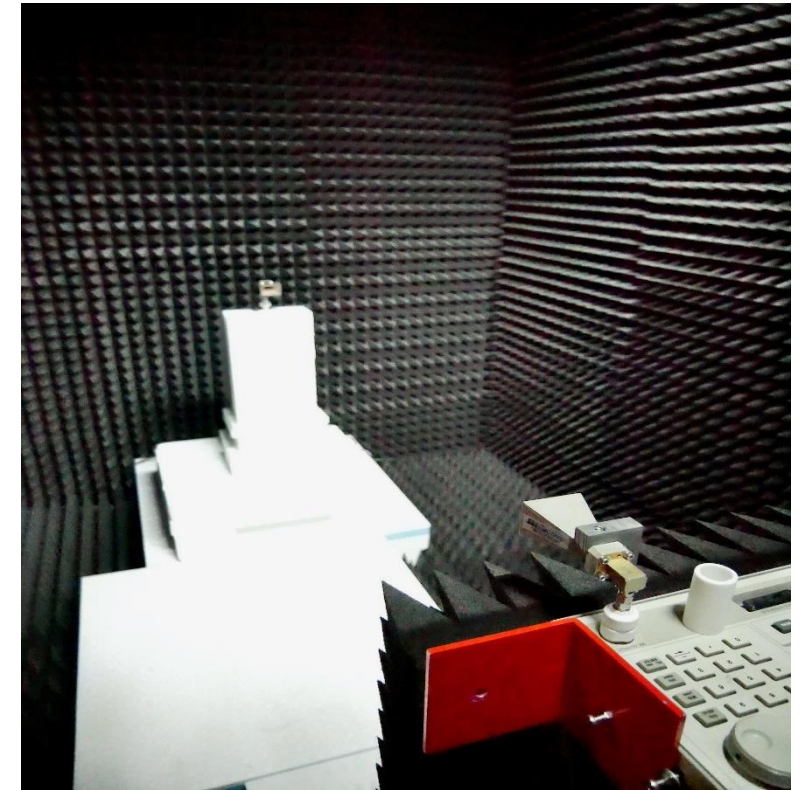
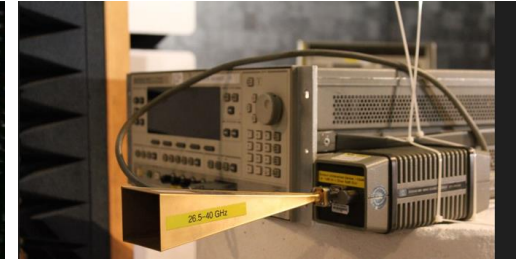
It is challenging – know of other companies that have tried and failed after 2 years of development

Parts are very expensive and hard to source

Found testing is expensive at 3rd party facilities - Found they did not have adequate equipment to test to our needs and no testing methodology

Purchased own signal generators and power meters / spectrum analyzers
1 MHz to 40 GHz

Constructed SLT Full Anechoic Chamber (700MHz - ∞) (ceilings, walls and floor)



Safe and Sound Pro mm Wave Meter

Base Model



Frequency Range - **20** GHz to 40 GHz - High Band 5G RF Meter

- USA covers 28 and 39 GHz 5G mmWave bands – live in major cities Verizon Wireless, AT&T, T-Mobile, Dish
- Canada covers 26, 28 and 38 GHz - mmWave bands - spectrum auction planned for 2024
- They're called mmWave because their wavelengths are under a centimeter
- Industry calls this service Ultra Wideband (UW) (5G+)

Cost: \$849 USD (Base Model) **Release Date:** June 30, 2023 (In Stock)

<https://safelivingtechnologies.com/products/safe-and-sound-pro-mmwave-meter.html>

Features:

- Detects and measures 5G in the High mmWave band, **20** GHz to 40 GHz
- Common sources in this range: 5G high band cell towers, 5G high band cell phones, radar, some automobile radar, point to point communication dishes and more...
- Built in North America, consumer-level
- Accurate and affordable – at a fraction of the cost of current High band detectors
- Digital display in $\mu\text{W}/\text{m}^2$ and V/m - peak and average readings - Peak Hold
- Response Time < 50 μs
- Battery Life of 6 Hours with sound
- Audio feature – each source has unique sound – 3 levels

Horn Option



S & S Pro mm Wave Meter – LED Indicators



4 Colored LEDs like the Pro II and Classis II:

Red (Fast Flash)	100,000 - 500,000 $\mu\text{W}/\text{m}^2$
Red (Flash)	10,000 - 100,000 $\mu\text{W}/\text{m}^2$
Red	1000 - 10,000 $\mu\text{W}/\text{m}^2$
Orange	100-1000 $\mu\text{W}/\text{m}^2$
Yellow	10-100 $\mu\text{W}/\text{m}^2$
Green	1-10 $\mu\text{W}/\text{m}^2$
Green (Flashing)	$< 1 \mu\text{W}/\text{m}^2$

S & S Pro mm Wave Meter – Antenna Reception Pattern

Horn - Directional
35 degree Beam width
Front only
Left Right and Up and Down

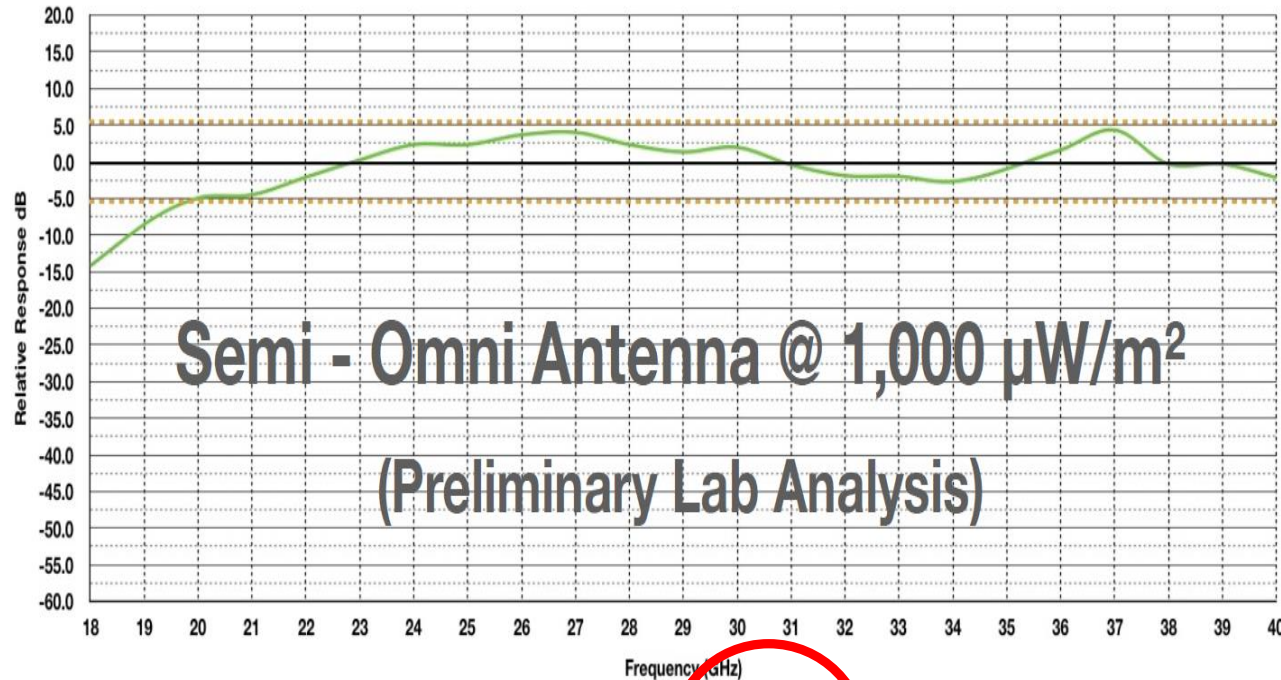


Stub – Semi Omni Directional
50 degree Beam width
Front and Back
Left Right and Up and Down



Stub Will yield higher readings

S & S Pro mm Wave Meter - Specifications



Stub Antenna :Semi Omni-directional

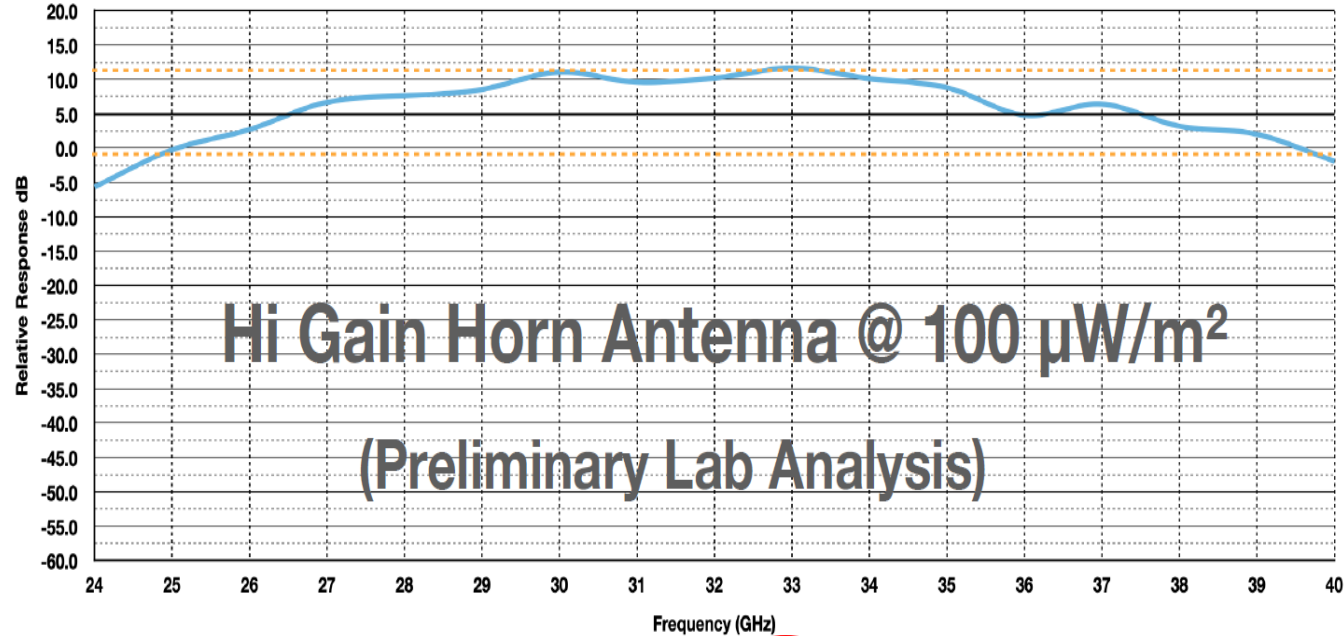
Frequency Response: +/- 5dB from 20-40 GHz (effective down to 18 GHz with reduced tolerance)

Minimum measurable signal: 5 $\mu\text{W}/\text{m}^2$

Maximum measurable signal: 500,000 $\mu\text{W}/\text{m}^2$ or (50,000,000 $\mu\text{W}/\text{m}^2$ with attenuator)

Best reception: Best to have SLT Logo on Stub Facing the source, blank side faces the user

S & S Pro mm Wave Meter - Specifications



Horn Antenna - Directional

Frequency Response: +/- 6dB from 25 GHz - 40 GHz

Minimum measurable signal: 0.5 $\mu\text{W}/\text{m}^2$

Maximum measurable signal: 30,000 $\mu\text{W}/\text{m}^2$ or
(3,000,000 $\mu\text{W}/\text{m}^2$ with attenuator)

Antenna: Customized for SLT



S & S Pro mm Wave Meter - Specifications



Attenuator

(-20dB or 100X signal reducer)

Attach between antenna and meter

Multiply display reading x 100

Allows the meter to display higher power density signals by a factor of 100

Range of up to 50,000,000 $\mu\text{W}/\text{m}^2$ with Stub Antenna + Attenuator

Range of up to 3,000,000 $\mu\text{W}/\text{m}^2$ with Directional Horn Antenna + Attenuator

S & S Pro mm Wave Meter - Specifications



Attenuator

(Built in Power Overload Protection)

This RF detector chip is susceptible to damage if exposed to continuous high levels of RF

Overload Protection is activated when the following Power Density levels are exceeded:

Stub Antenna ($> 500,000 \mu\text{W}/\text{m}^2$ sustained)

Horn Antenna ($> 30,000 \mu\text{W}/\text{m}^2$ sustained)

Meter will power down after 3 seconds of elevated exposure and display a warning message

To read these higher power density levels, Install the attenuator

S & S Pro mm Wave Meter - Operation



Startup

Self Calibration

Battery Life

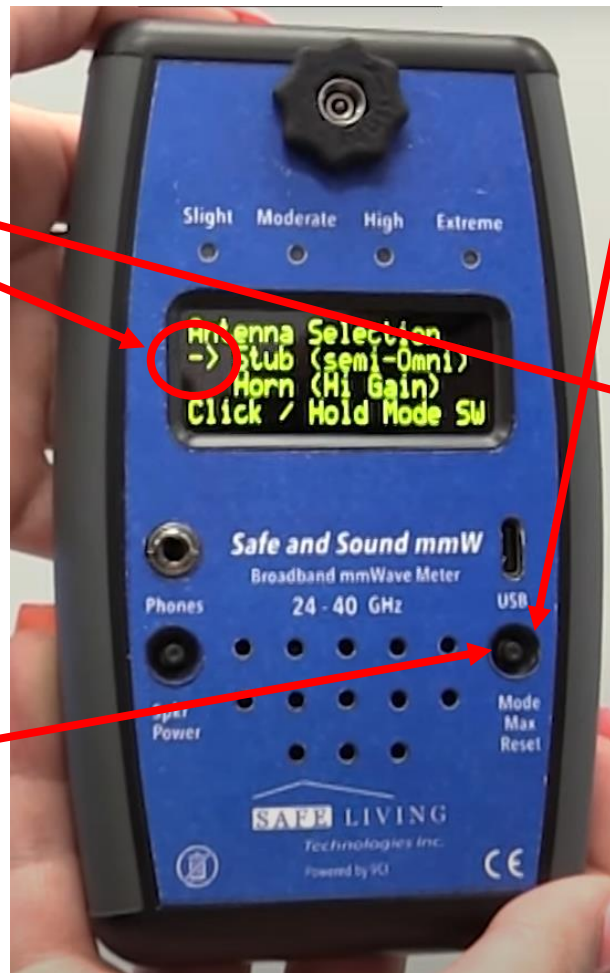
Can run continually if plugged into USB C Power

S & S Pro mm Wave Meter - Operation

Select Antenna Type VIA the Mode Switch (SW)

Press Mode Switch once to Toggle Antenna (Stub/Horn)

Press and Hold Mode Switch for 3 seconds to Select and Set Desired Antenna



S & S Pro mm Wave Meter - Operation

Measurement Types:

Peak

Peak Max

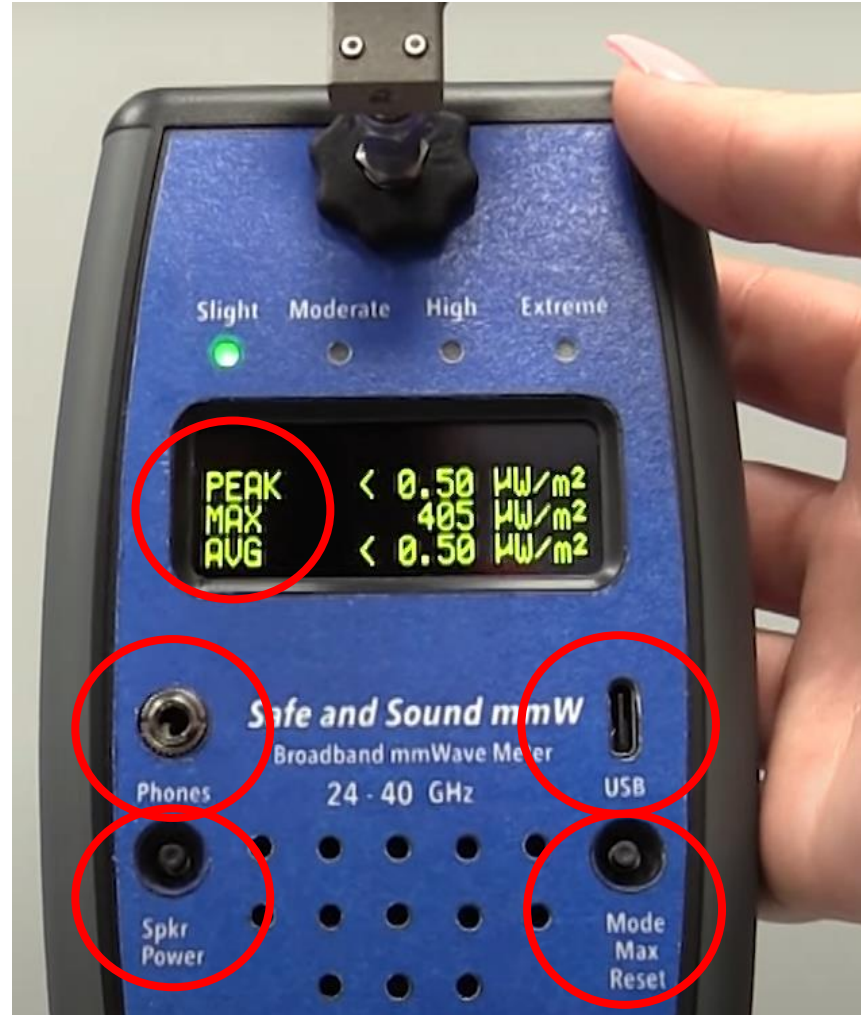
Average

Headphone Jack

3.5mm

Speaker/Sound 3 levels

Power



Power via USB Port
Continuous monitoring

Mode to select
Antennas

Max Reset

Hold to change units of
Measurement $\mu\text{W}/\text{m}^2$
to V/m

S & S Pro mm Wave Meter – Future Meters

Some Possible Options:

(200MHz – 8 GHz) + (20 GHz – 40 GHz)

8 GHz - 20 GHz

40 - 60 GHz – (60 GHz = High Band WiFi)

60 GHz - 90 GHz - (75 GHz = Car Radar)

Send us your suggestions!



Thank you!

- For attending today's session
- To all of our Beta Testers
- For considering adding these meters to your EMF Tool Kit



Rob Metzinger

5G mmWave Radiation Learning Session 2 — Field Experience with Safe & Sound mmWave RF Meter

July 12, 2023

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Introduction

- ▶ This presentation contains videos and still photos from further field use of the Safe & Sound mmWave 5G RF meter in Santa Monica, California
- ▶ Presentation covers field testing in July 2023
- ▶ Most mmWave antennas found on busy boulevards
- ▶ Exclusively Verizon 5G mmWave Antenna arrays
- ▶ Also noted 4G LTE and Verizon low band 5G antennas
- ▶ These findings are a snapshot in time in one location
- ▶ We look forward to input from colleagues in other locations

mmWave Antennas in California

- ▶ Additional Verizon mmWave antennas
- ▶ Signal strength reduces turning in place

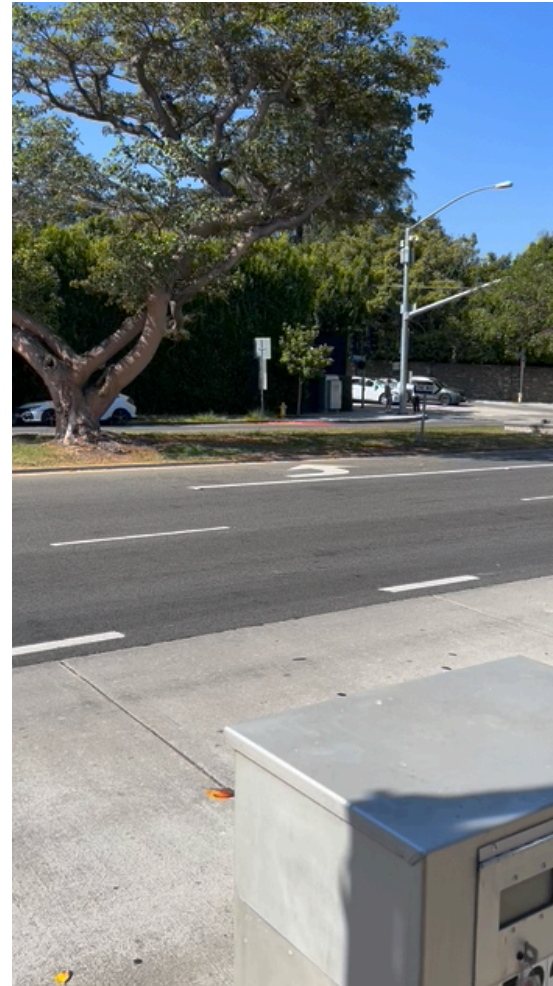
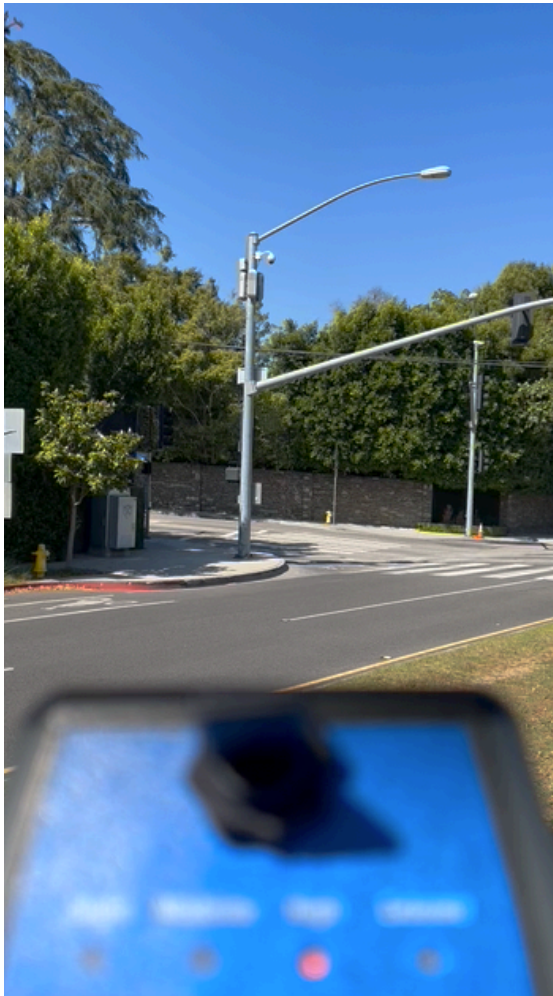
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mmWave Antennas in California

- ▶ mmWave signal strength diminishes at width of cone pattern
- ▶ Also diminishes with distance from mmWave antenna

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mmWave Antennas in California

- ▶ mmWave antenna strength diminishes behind tree
- ▶ Drove through residential area testing for mmWave signal

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mmWave Antennas in California

- ▶ AT&T and Verizon 4G LTE and Verizon mmWave antennas

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mmWave Antennas in California

- ▶ mmWave 5G once again easily blocked by tree; car radar end of video
- ▶ Passing cars emit mmWave RF from radar (maybe Verizon phones)

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mmWave Antennas in California

- ▶ mmWave antenna signal strength closer with stub and horn antennas

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mmWave Antennas in California

- ▶ Close up of 4G LTE and mmWave antenna
- ▶ Second sound on mmWave meter when antenna increased signal

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mmWave Antennas in California

- ▶ Strength of mmWave antenna readily drops off with distance

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mmWave Antennas in California

- ▶ Strength of mmWave antenna readily drops off with distance, continued

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mmWave Antennas in California

- ▶ “5G” seen on Verizon phone—what would you expect to see on your RF meters?

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mmWave Antennas in California

- ▶ Analysis of findings on RF meters from “5G” on Verizon phone
- ▶ Do not see “5GUW”; no activity on mmWave meter

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mmWave Antennas in California

- ▶ First, and only, mmWave 5G antenna array found in residential neighborhood
- ▶ Includes 4G LTE antenna at the top

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mmWave Antennas in California

- ▶ Speculation on potential harm to local residents close to mmWave 5G antenna
- ▶ Further evidence of rapid reduction in mmWave signal with distance from antenna

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mmWave Antennas in California

- ▶ Recap of finding of minimal mmWave antenna presence in residential neighborhood in Santa Monica, California

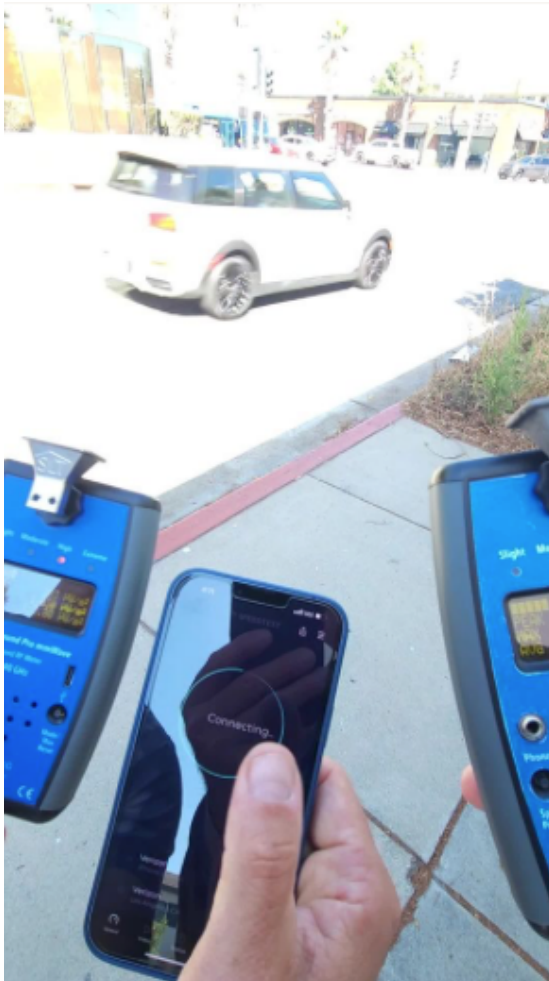
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mmWave Antennas in California

- ▶ Phone data triggers mmWave beam-formed signal; reduces with distance
- ▶ Demonstration of width of beam-formed mmWave signal, with Mitch Marchand

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mmWave Antennas in California

- ▶ Further reduction in beam-formed signal moving phone further away from RF meter
- ▶ Demonstrated from two separate locations within full mmWave antenna cone

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mmWave Antennas in California

- ▶ Horn pegs at 31,600 $\mu\text{W}/\text{m}^2$ and stub pegs at 501,000 $\mu\text{W}/\text{m}^2$
- ▶ Number on “Average” reveals how you set up meter (stub vs. horn)

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mmWave Antennas in California

- ▶ mmWave antenna and phone signal strengths, two mmWave RF meters with horn antennas, beam-form triggered by phone data usage

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mmWave Antennas in California

- ▶ Antenna and phone, two mmWave RF meters, horn antennas, phone on data much further away

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mmWave Antennas in California

- ▶ Summary of mmWave antenna activity and beam-formed signal

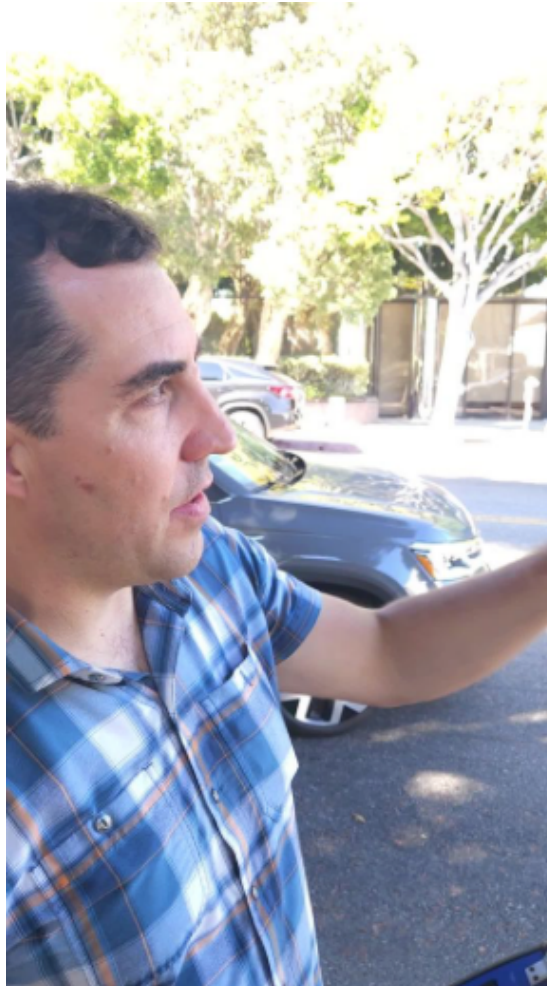
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mmWave Antennas in California

- ▶ Further summary of mmWave antenna activity and beam-formed signal

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mmWave Antennas in California

- ▶ Triggering of Verizon beam-formed signal with Verizon cell phone data
- ▶ Summary of mmWave impact on nearby residents

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Summary Points of mmWave 5G

- ▶ Conclusions by Mitch Marchand, BSc, EE, EMRS
- ▶ Beam-formed signal fairly significant from mmWave antenna
- ▶ Three separate effects when in proximity to mmWave 5G antenna:
 1. 24/7 background level across full cone (120 degrees wide?)
 2. Phone triggers beam-formed signal with data usage as “spot light” to phone or tablet, 3-4 feet wide, $>31,600 \mu\text{W}/\text{m}^2$
 3. At same time, background exposure level across full cone elevates slightly, $100 \mu\text{W}/\text{m}^2$, when a customer accesses data

Summary Points of mmWave 5G

- ▶ Conclusions by Mitch and Oram to date
- ▶ Beam-formed signal fairly significant from mmWave antenna, triggered by phone from *same* cell carrier as mmW antenna
- ▶ Three separate effects in proximity to mmWave 5G antenna
- ▶ mmWave antennas still rare in residential neighborhoods
- ▶ mmWave signal blocked by solid walls, foil, paint
- ▶ mmWave signal *not* blocked by glass, fabric or mesh screen (signal can pass through holes in fabric or screen)

Summary Points of mmWave 5G

- ▶ Recommendations for further testing:
- ▶ Use cell phone from *same* cell carrier as mmW antenna to trigger beam-formed signal from mmWave antenna
- ▶ Verizon predominates mmWave 5G service in U.S.
- ▶ Use attenuator when measuring with horn antenna, as signal from antenna and from phone will exceed rated capacity for horn antenna of $31,600 \mu\text{W}/\text{m}^2$
- ▶ Note increase in Average value, indicating more dense antenna RF transmission (less time between pulses)

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