Rig Testing @ July Picnic

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3 Jun 25

What When Where

- Each summer, we measure our 10 and 24 GHz rigs at our picnic.
- This is a chance
  - to test your radio before the Aug/Sep contest season
  - to see how other folks built their rigs (transverter, antenna, mount)
  - to see how your rig's performance compares to others'
- We will set up our test range next to the **Sandy Wool Lake picnic area at Ed Levin County Park in Milpitas**.
- The test/picnic date is Saturday, July 26th.
- The park opens at 8am ($6 vehicle entry fee).
- We start testing by 9am, followed by the picnic, around noon.
- The club provides food & drink. You bring sunscreen & hat.

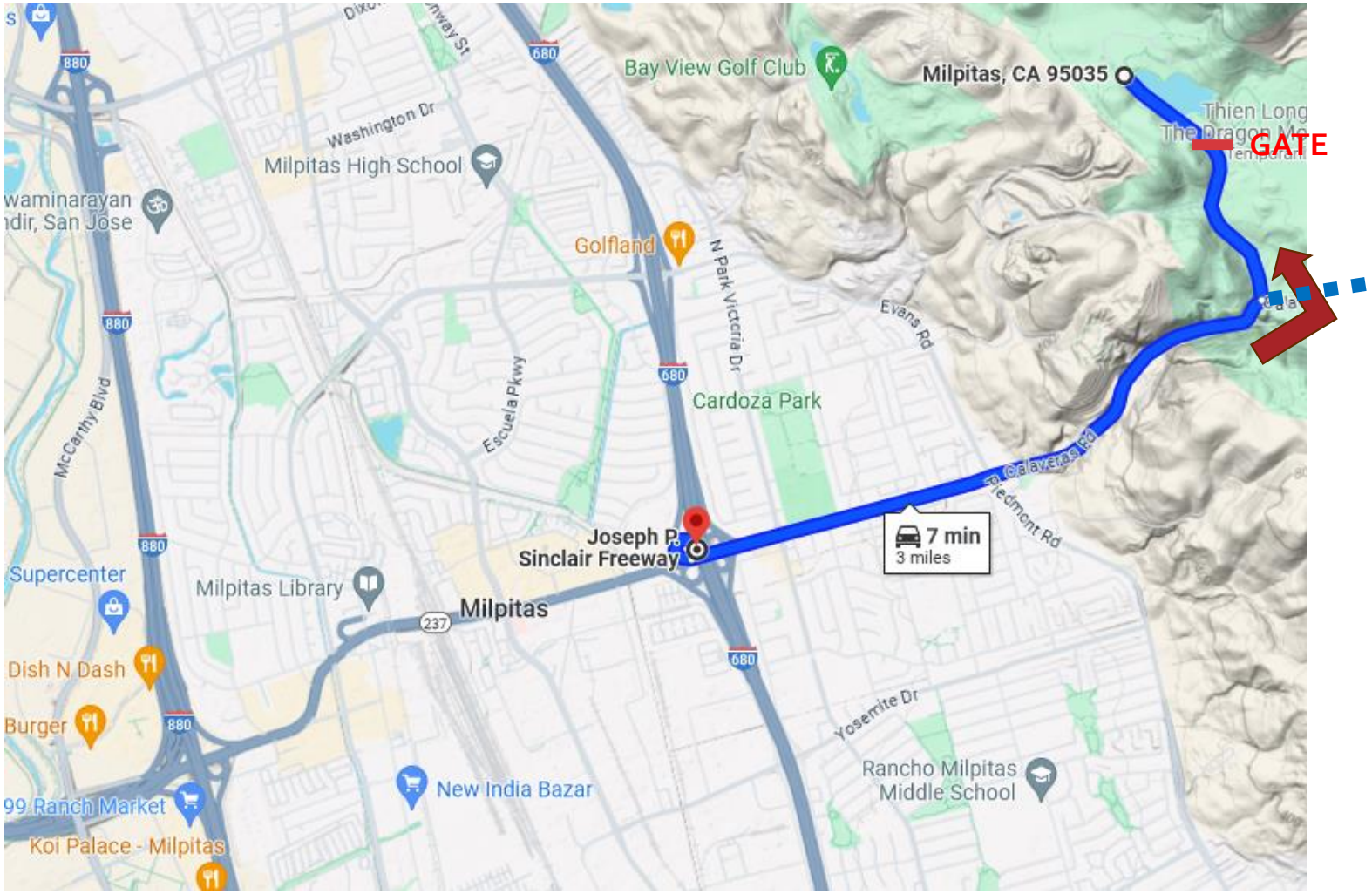
Where:

880 or 680 to Calaveras Blvd (237) in Milpitas…

Calaveras Blvd thru the hills…

Left at the fork onto Downing Rd…

thru **gate** ($6 fee) to **Sandy Wool** area



Where
How

Park opens 8 am.
Please arrive no later than 0830 to set up and to get aligned on the target, so that we can **start by 0900 sharp** and finish in time for lunch.

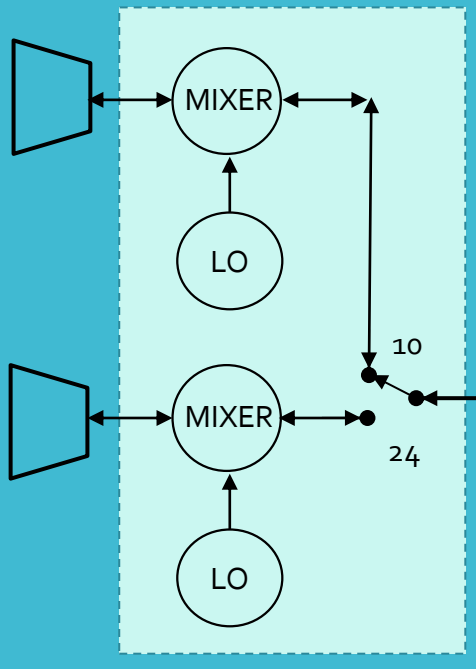
Park by the row of trees.
We will set up cones to mark the 'firing line' on the other side of trees & sidewalk.
Set up your rig on the 'firing line', facing the test head.

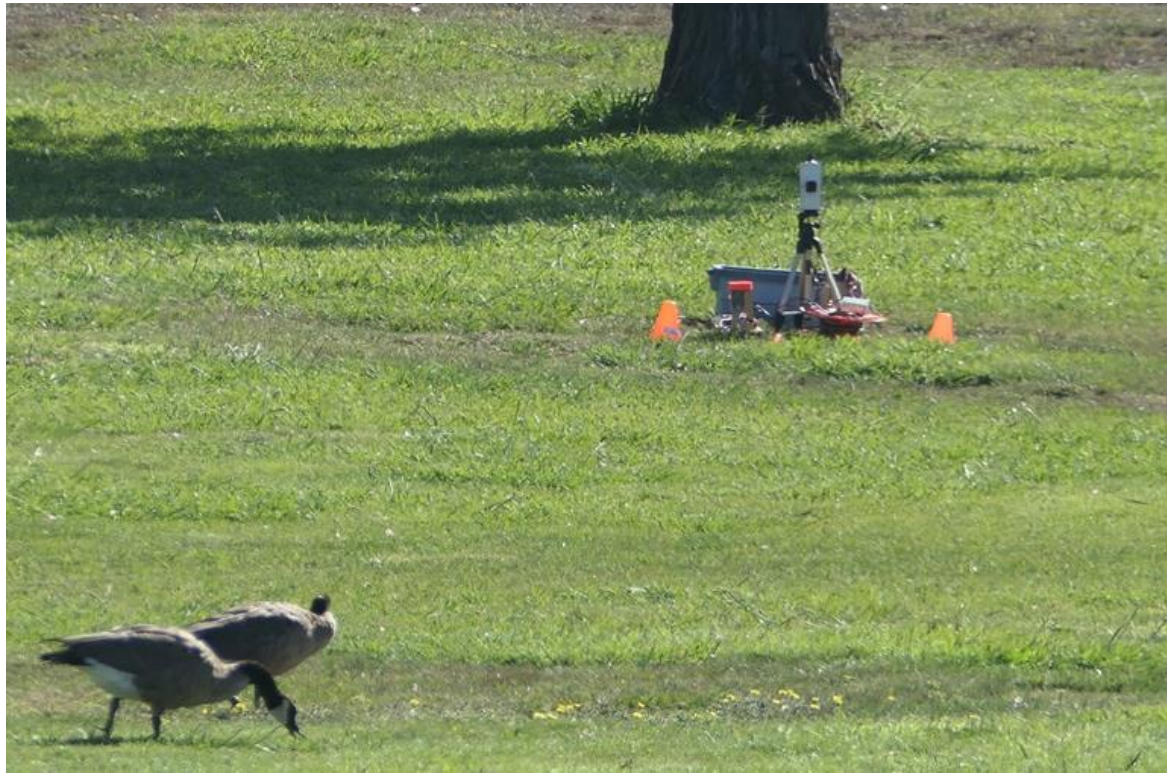
How:

Setup & Prep

- Tune in the test head, which will be transmitting near 10368.1 MHz (Later, we will also use 24192.1)
- Aim your dish at the test head (**adjust bearing & elevation for peak signal**); also **adjust height above ground for peak signal**.
- **Be prepared to tell me when I ask**:
  - Your name & callsign, what bands (10, 24) you have
  - Your transmitter's expected PA output power on each band
  - Your antenna aperture (height & **width**) or nominal gain on each band
  - Your transverter's Rx IF frequency (10m, 2m, 432, etc) on each band
- **Bring your own power (battery; gas generators not allowed).**
- **Have a BNC or SMA jack/cable available to hook up to your Rx IF**
- **Have a way to generate a full power Tx carrier (CW key down).**

Remote Test Head





- **Test head is a dual band transverter with horn antennas**
- **At least 400’ away; gives far field up to: 48” 10GHz dish, 30” 24GHz dish**
- IF signal thru 450’ of coax back to measurement station on firing line
- Battery powered
- Mounted on small tripod so that rigs under test can be ~5ft off the ground

Next: List of Tests

How:

Running the Tests

- *By 0900, everyone should be peaked on the 10 GHz test source. Be sure you are peaked in Az, El and height and lock it down! **
- We will run four tests, each rig by rig, walking down the line:

1. **10 GHz receiver MDS. I will hook up my SDR to your Rx IF output**** and measure the S+N/N
2. **10 GHz transmitter ERP.** With test head in Rx10 mode, **I will ask you to send a 'key down' steady CW carrier**
3. **24 GHz receiver MDS.** *I will switch the test head to Tx24 and send the test signal… everyone will find the signal and re-check antenna height above ground for max strength on the new band.* Again, **I will hook up my SDR to your Rx IF output**** and measure the SNNR
4. **24 GHz transmitter ERP.** With test head in Rx24 mode, **I will ask you to send a 'key down' steady CW carrier**

* Try to peak your pointing (Az,El,Z) and keep it locked during each pair of Rx/Tx tests (MDS10 & ERP10, MDS24 & ERP24).

** I will need to know your IF freq & to have SMA or BNC connection

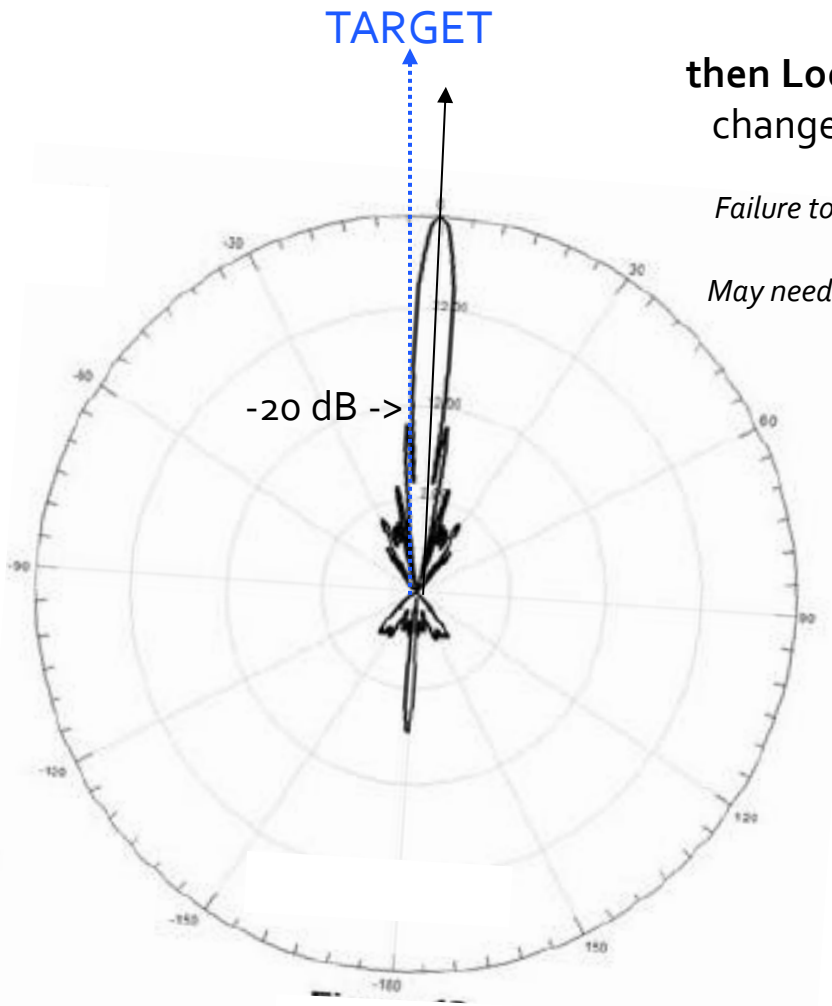
Next: Two Ways to Shoot Yourself in the Foot

Your antenna & your ability to aim it are key parts of your system!

Aim at the target and **carefully peak & lock dish beam elevation and azimuth**
A few degrees error in either direction can cost **10 or more dB** MDS & ERP!!!
(This is true during field operations as well as on the test range)

> 10 dB Errors:

Poor Antenna Pointing



Peak *before* MDS test starts,
then Lock your mount's El & Az so that it won't change during or between MDS and ERP test

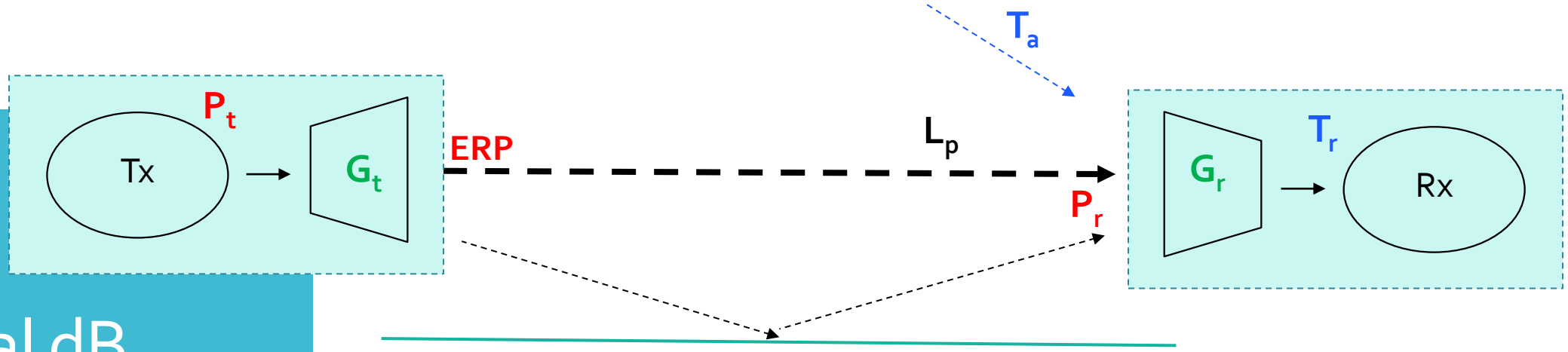
Failure to lock can result in loss of peaking, hurts 2nd(ERP) test

May need to repeak height, then El-Az, when we change bands

Some Peaking Tips:

- Turn off your AGC, reduce RF gain, listen for peak audio (full quieting)
- Opening up bandwidth and/or tuning slightly off frequency can mix in some crackly background noise (AM or FM mode) for contrast with the signal, but remember to get back on frequency when done.
- I will have a portable audio voltmeter that you can use if you don't trust your ears. It plugs into 1/8" headphone jack (turn your AGC off)

A great way to shoot yourself in the foot!



Several dB Errors:

Test Range Ground Reflection Gain/Loss

For a ***perfect*** ground plane (metal sheet), P_r will be **+6dB greater** if reflection is exactly **in phase** and P_r will be **zero** (cancelled) if reflection is exactly **out of phase**. But ***real*** ground is lossy (grass, dirt) and uneven, so P_r is considerably less than +6dB greater when peaked/in phase.

We try to choose the test head antenna height so that the reflection path will be in phase at a reasonable rig under test tripod height (~5 feet).

Assuming that all rig antenna heights are adjusted to one of the in phase reflection peaks and a fairly even test range surface, the effect of ground reflection is a slight ground gain (about 1-3 dB), about the same for all rigs. This is a calibration error for absolute measurements, but should have no impact on relative results.

If you have an up/down crank and clutch on your tripod head, **you can minimize reflection error by adjusting your tripod height for peak signal & locking at that height**. If you don't, find a neighbor who does, observe (center) dish height of his El-Az-Z peaked dish, **copy** that height to yours by adjusting your tripod leg lengths.

After peaking in height, you will need to (re)peak in El-Az. *(rinse & repeat)*

Summary

Come to the rig testing at the July picnic:

- ***Arrive by 8:30; be set up, peaked & locked on target by 9:00***
- ***Peak your antenna bearing, elevation and height above ground***
- Check that your rig (still) works
- Learn about it's strengths and weaknesses
- Learn how others built their rigs & how well they work
- Tests measure overall system performance, not components
- Come prepared and know the drill, so we can get the tests done in less time and more accurately
- **Enjoy the picnic**

Thank you

For more detail, see the 50mhzandup.org on-line Tech Library:
"Annual Rig Testing" (6/4/24) **https://50mhzandup.org/show/ukv6**
& "Rig Test Results" (2024 and earlier)