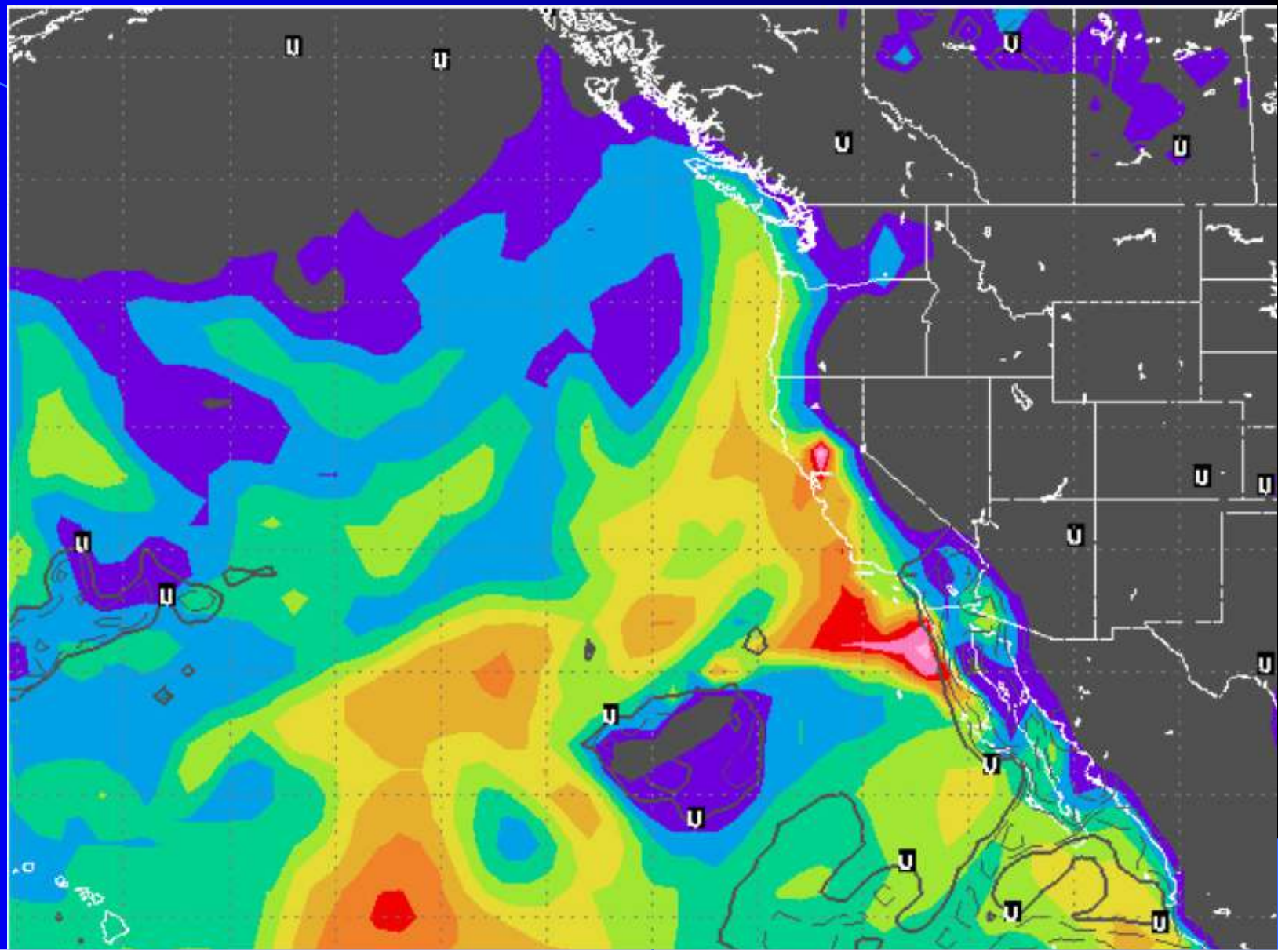
Working Hawaii on VHF, 1957-2014: an eyewitness account



By
Wayne
Overbeck,
N6NB

Some distances…

Mauna Loa (Hawaii) to Orange County, California: 2,510 miles

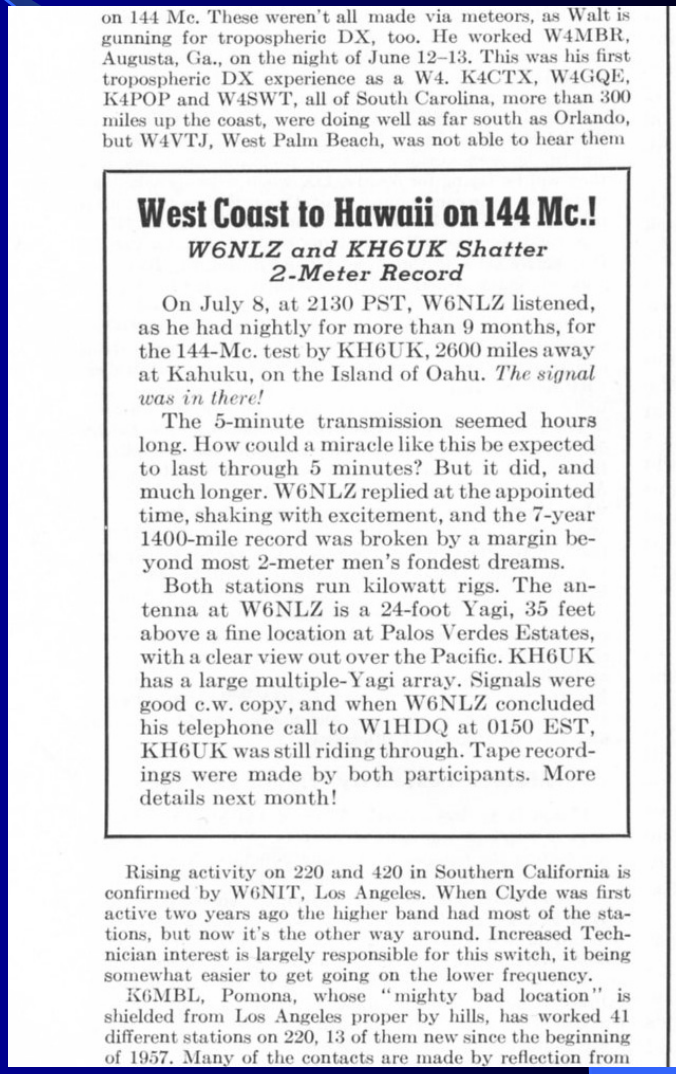
Manchester, CT to Orange County, California: 2,510 miles

Imagine working from here to California on 144 MHz--or 5.7 GHz

The breakthrough, July 8, 1957

W6NLZ works KH6UK on 144 MHz:

- Distance – 2,540 miles
- Almost double old DX record
- Success after 9 months of nightly skeds
- W6NLZ wakes W1HDQ, QST vhf editor, at 1:50 a.m. to share the news and says…
- "Stop the presses!"
- QST squeezes item at right into August, 1957 edition (details in September)
- Propagation method uncertain then



on 144 Mc. These weren't all made via meteors, as Walt is gunning for tropospheric DX, too. He worked W4MBR, Augusta, Ga., on the night of June 12–13. This was his first tropospheric DX experience as a W4. K4CTX, W4GQE, K4POP and W4SWT, all of South Carolina, more than 300 miles up the coast, were doing well as far south as Orlando, but W4VTJ, West Palm Beach, was not able to hear them

West Coast to Hawaii on 144 Mc.!

W6NLZ and KH6UK Shatter 2-Meter Record

On July 8, at 2130 PST, W6NLZ listened, as he had nightly for more than 9 months, for the 144-Mc. test by KH6UK, 2600 miles away at Kahuku, on the Island of Oahu. *The signal was in there!*

The 5-minute transmission seemed hours long. How could a miracle like this be expected to last through 5 minutes? But it did, and much longer. W6NLZ replied at the appointed time, shaking with excitement, and the 7-year 1400-mile record was broken by a margin beyond most 2-meter men's fondest dreams.

Both stations run kilowatt rigs. The antenna at W6NLZ is a 24-foot Yagi, 35 feet above a fine location at Palos Verdes Estates, with a clear view out over the Pacific. KH6UK has a large multiple-Yagi array. Signals were good c.w. copy, and when W6NLZ concluded his telephone call to W1HDQ at 0150 EST, KH6UK was still riding through. Tape recordings were made by both participants. More details next month!

Rising activity on 220 and 420 in Southern California is confirmed by W6NIT, Los Angeles. When Clyde was first active two years ago the higher band had most of the stations, but now it's the other way around. Increased Technician interest is largely responsible for this switch, it being somewhat easier to get going on the lower frequency.

K6MBL, Pomona, whose "mighty bad location" is shielded from Los Angeles proper by hills, has worked 41 different stations on 220, 13 of them new since the beginning of 1957. Many of the contacts are made by reflection from

Who were those guys?

Ralph “Tommy” Thomas, KH6UK…

- Prominent New Jersey VHFer as W2UK
- Sent to Hawaii in 1955
- Chief engineer of RCA (Marconi) station, Oahu
- Built first-rate VHF station with almost nobody to work…

Who were those guys?

John T. Chambers, W6NLZ…

- Up and coming 30-something engineer in L.A. aerospace industry
- Builder of an excellent VHF station in Palos Verdes, overlooking L.A. and the Pacific
- Agreed to run skeds with KH6UK in 1956

How did they do it? With patience and perseverance, but HOW?

- Meteor scatter? No. Signal stable for hours.
- F2 propagation? No. MUF not *nearly* high enough.
- E skip? No. No Es noted even on lower frequencies.
- Extreme tropopheric bending? Possibly.
- A previously unknown kind of tropospheric propagation? Well, let's look into this…

So how did they *really* do it?

"Evidence from the Los Angeles Weather Bureau, and scientific opinion gathered by (W1HDQ) while attending the URSI General Assembly at Boulder, Colo., point definitely to tropospheric propagation. While the 2,540-mile path is some 25 percent longer than any previous proven reception of signals at 100 Mc. or higher, some authorities on tropospheric propagation over ocean paths are of the opinion that the new record is far from unbeatable." - QST, October, 1957, pg. 93

The U.S. Navy weighs in…

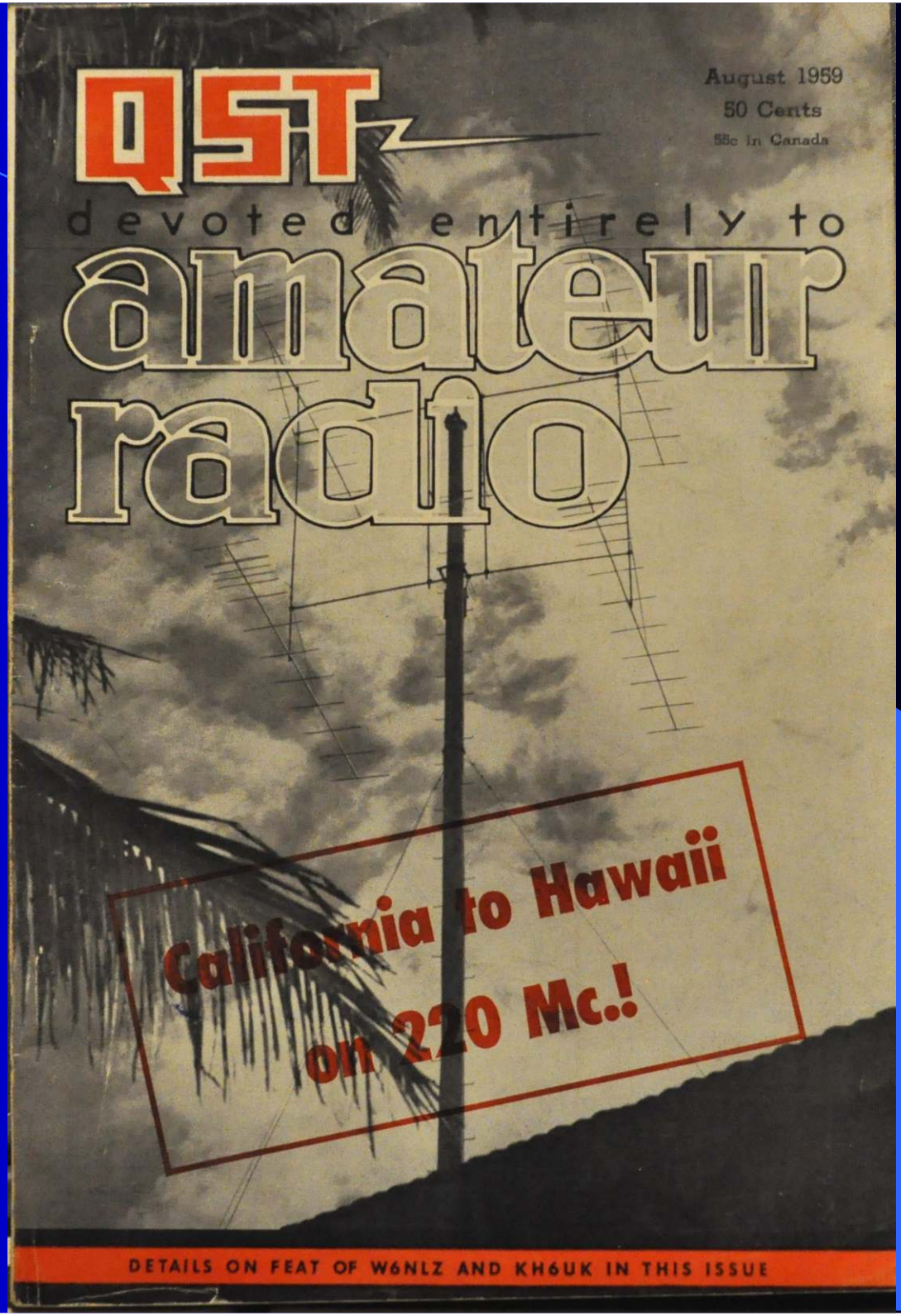
Here's a footnote in large type: If you *Google* Charles G. Purves, author of Naval Research Laboratory Publication No. 7725 (1974), you will find a summary of Navy research in the 1950s and 1960s that documented the existence of elevated ducts in tropical ocean regions. The Navy conducted four "Project Tradewinds" studies of ducting that involved hundreds of long flights at various altitudes.

NRL conclusions of note to hams:

- These ducts are rarely large enough to conduct signals below about 75 MHz.
- 800 feet of duct thickness = waveguide-like signal "trapping" at two meters and higher frequencies
- Ducts rise in elevation at a typical rate of 230 feet per 100 nautical miles up to 5000', then 100 feet per 100 n.m.

BOTTOM LINE: Ducts start near sea level in California and rise to 5,000-8,000 feet elevation in Hawaii

Enough theory.
Check out this 1959 QST cover!



W6NLZ and KH6UK do it again!

- June 22, 1959: they work on 222 MHz.
- It happens on fifth night of schedules!
- QST splashes red box across its cover (very unusual then)
- QST talks about ducting, later reports on Navy's "Tradewinds III" study (41 flights from San Diego to Hawaii)

W6NLZ and KH6UK try 432 in 1960

- July 20, 1960: W6NLZ hears KH6UK on 432 MHz with signals as strong as S8
- KH6UK can't hear W6NLZ – no 2-way contact
- They work crossband, with KH6UK listening on 144
- KH6UK later finds bad 416B tube in his 432 front end
- Too late: the opening is over

The 13-year drought

After the 1960 skeds on 432, no known mainland-to-Hawaii contacts occurred on two meters or higher for 13 years…

John Chambers, 1920-1969

On Oct. 5, 1969, W6NLZ died of an inoperable brain tumor after collapsing at work. He was 49.

Central States VHF Society created its famous John Chambers Memorial Award in 1970.

Tommy Thomas, W2UK/KH6UK won the award in 1973.

N6NB's John Chambers memorabilia: an antenna tuner he built and 1978 Chambers award…

After 13 years, a mega-opening!

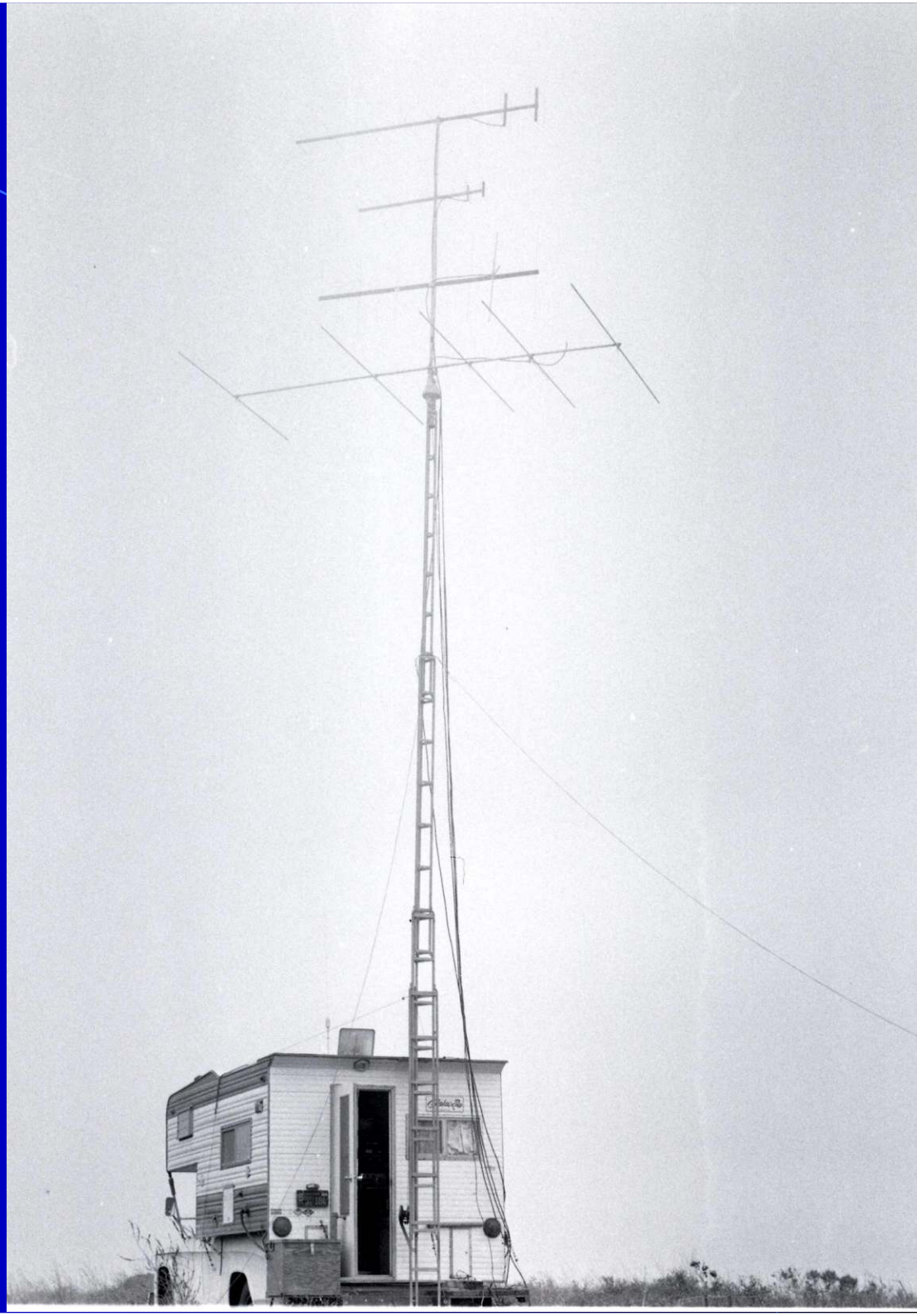
- July 28, 1973: California stations starting with K6DYD discover they can key up KH6EQN/R, Mauna Loa.
- K6YNB (now N6NB) in Orange County works over 100 Hawaiians via KH6EQN.
- Several stations work Hawaii on simplex, breaking the W6NLZ-KH6UK distance record.
- Now everyone starts working the duct on FM or SSB.
- The opening lasts five days.


1973 tropo duct
hot spots
Alturas
Arcata
Redding
Winnemucca
Elko
Brigham City
Roy
Salt Lake City
Tooele
Orem
Spanish Fork
Lovelock
Chico
Reno
Price
Ukiah
Yuba City
Carson City
Ely
South Lake Tahoe
Woodland
Sacramento
Richfield
Santa Rosa
Napa
Fairfield
Lodi
Tonopah
San Rafael
Vallejo
San Francisco
Goldfield
Cedar City
Tracy
Modesto
Turlock
Merced
San Jose
Palo Alto
Saint George
Page
Santa Cruz
Seaside
Salinas
Fresno
Selma
Reedley
Visalia
Hanford
Porterville
Las Vegas
Henderson
Boulder City
Grand Canyon Village
Delano
Ridgecrest
Atascadero
Bakersfield
DM05sb
San Luis Obispo
Grover Beach
Santa Maria
Bullhead City
Kingman
Flagstaff
Barstow
Lompoc
Lancaster
Victorville
Lake Havasu City
Prescott
Solvang
Santa Barbara
Ventura
Santa Monica
Los Angeles
Riverside
Palm Springs
Long Beach
Hemet
Newport Beach
Phoenix
Mesa
San Clemente
Oceanside
Escondido
Encinitas
Brawley
San Diego
Mexicali
Tijuana
Tucson
Vail
Ensenada
UNITED STATES
MEXICO

New kids on the bluff!

WB6ASR (now W6IT, left) and WB6RAL (now W6MT) key up the Mauna Loa repeater from Pt. Sal, Calif. with 10 watts and a quagi antenna at a very low height!

In the fog at Pt. Sal (CM95), K6YNB's "cabover kilowatt" works Hawaii after the opening ends in Southern California, 29 July 1973. This site is 700' asl on a bluff overlooking the Pacific.



Starting in 1976, it happens again, and again, and again and again

California to Hawaii on 2 Meters — 1976 Edition

That radio rainbow has just made its second showing within three years.

By Wayne Overbeck,* K6YNB

Everyone from amateurs to the U.S. military considered it an impossible feat until the late John Chambers, W6NLZ and Ralph Thomas, KH6UK, did it in July, 1957, after some 10 months of daily scheduling. The same pair repeated their incredible accomplishment on 220 MHz in June, 1959. But after that, it was 14 years until the next W6-KH6 QSO above 144 MHz. We recall the spectacular five-day-long 1973 opening and compare it with the shorter but equally dramatic opening this summer.

Ever since those five warm, summer days in late July, 1973, Californian and Hawaiian hams have been waiting, hoping, wishing and praying for more of those thrilling days when vhf signals miraculously span 2500 miles of ocean to make each other sound like locals on 2 meters.[1]

Sure enough, it happened again on another hot, summer day — June 28, 1976. Conditions were the same in many ways, but different in others. For some vhfers the latest opening was better, but frustrating for others because it failed to last as long or travel as far north as the previous spectacular.

The basic mechanism that makes those line-of-sight signals cross an ocean on such rare occasions is a tropospheric duct. It might be likened to an enormous, flat, elongated pipe conveying vhf signals thousands of miles close to the earth's surface. Unlike typical E- or F-layer ionospheric propagation on lower frequencies, the ducted signal never rises to any great height or bounces back down. Thus, sporadic E and F2 signals can rise over mountains while the tropospheric duct can be blocked by any large terrestrial object along the way.

Usually, the duct is fairly low at the California end, rises as it moves west and ends at both shorelines. The east elevation is less than 1500 feet while the Hawaii side lies between 5000 and 8500 feet above sea level. That means Californian stations with a clear shot to sea at modest heights have a big edge on their side of the path and Hawaiian mountaintoppers, or mountainside repeaters, have the advantage there.

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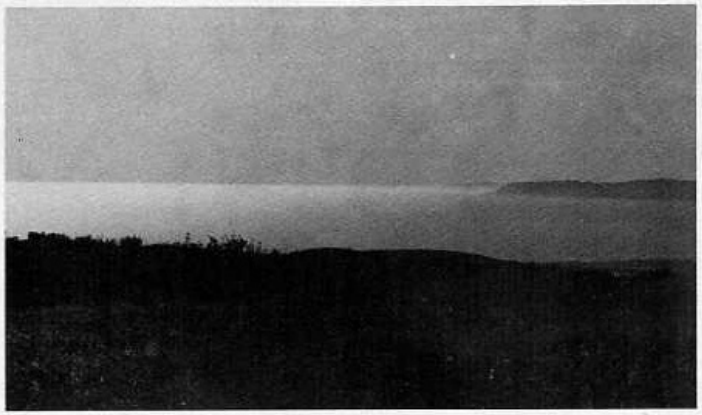
[1] References appear on page 48.

Most temperature inversions have gradual changes with height. However, the one that ducted 2-meter signals 2500 miles across the Pacific Ocean had a very abrupt boundary as seen here on June 29, 1976, near Santa Maria, California.



Characteristics of the Modern Openings

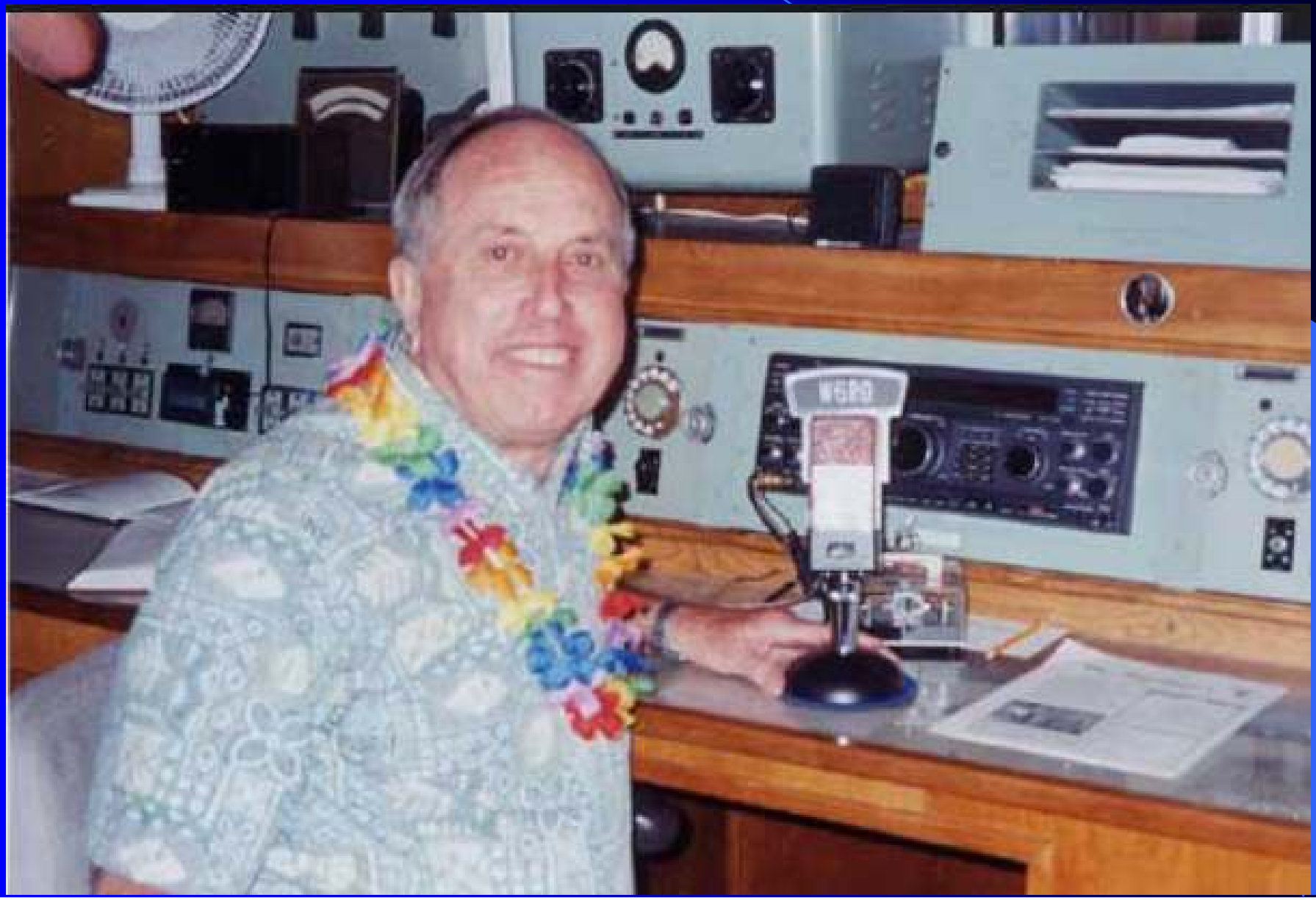
The original mainland-to-Hawaii duct was first worked by Jerry Gastil, K6DYD, on July 28, 1973, when he keyed the 16/76 repeater at the 8300-foot level of Mauna Loa — 13,000 feet high. His kilowatt rig fed an 80-element Yagi array at his home 300 feet above the sea on Point Loma near San Diego. Since that day Jerry has maintained a daily morning ritual of attempting to key it again. Finally, his perseverance was rewarded at 1657 UTC on June 28, 1976, when he hit the Hawaiian repeater and quickly worked nine KH6 stations.

A difference this time was that the Mauna Loa repeater had changed to 22/82, a fact which made it much more difficult for California stations to work through it. There are busy 22/82 repeaters all along the California coast that covered the weaker Hawaiian sig-

A duct as it appears near Pt. Sal: a sharp line over the sea

A portable station works Hawaii, 1976

The KH6HME run begins…



Paul Lieb, KH6HME

In 1979, an extraordinary man named Paul Lieb began setting up beacons at the 8,000-foot level on Mauna Loa, allowing mainland hams to tell exactly when there was a tropo duct that extended all the way to Hawaii. When the band opened, Paul would go to the beacon site and stay for days if necessary to work everyone who wanted to work Hawaii. Over the next 33 years, he was on the Hawaiian end of thousands of trans-Pacific VHF+ QSOs. The era ended with his passing on July 16, 2012.

KH6HME's DX records

After 33 years of VHF+ DXing from Mauna Loa, Paul held ALL of the terrestrial DX records on all bands from two meters through 5.7 GHz. No one has yet worked from Hawaii to the mainland on 10 GHz. Here is a list of the records as compiled by W5LUA and posted on the ARRL website.

W5LUA's current Pacific duct record data

Band	DX(km)	Calls of stations	Date
144	4,754	KH6HME (BK29go) - W1LP/MM (DL51ce)	21-Aug-1999
	4,333	KH6HME (BK29go) - W7FI (CN87ws)	01-Jul-1995
222	4,150	KH6HME (BK29go) - XE2/N6XQ (DL29cx)	15-Jul-1989
432	4,150	KH6HME (BK29go) - XE2/N6XQ (DL29cx)	15-Jul-1989
902	4,064	KH6HME (BK29go) - N6XQ (DM12jr)	13-Jul-1994
1296	4,150	KH6HME (BK29go) - XE2/N6XQ (DL29cx)	15-Jul-1989
2304	3,982	KH6HME (BK29go) - N6CA (DM03tr)	14-Jul-1994
3456	3,982	KH6HME (BK29go) - N6CA (DM03tr)	28-Jul-1991
5760	3,982	KH6HME (BK29go) - N6CA (DM03tr)	29-Jul-1991
10 GHz		A new frontier waiting to be conquered!	


CAUTION

The greatest duct ever?

In 1995 there was an opening from Hawaii to the mainland that extended all the way to the Canadian border and beyond, allowing stations from San Diego to Seattle to work Hawaii on two meters. W7FI set the modern land-to-land record during that opening, but N7MWV and W7YOZ worked KH6HME from sites only a few kilometers closer to Hawaii than W7FI. The duct extended inland from the Bay Area to the river delta region. K7XC, on a mountaintop near Reno, managed to get a signal into the duct and worked KH6HME from Nevada.

One of the longest ducts ever

In early July of 2014 there was an opening to Hawaii that lasted for eight days, one of the longest-lasting ducts yet observed.

KH7Y, signing KH6HME (now a memorial club call sign), went to the Mauna Loa beacon site and worked a number of stations from San Diego to the Bay Area on July 5, the fourth day of the duct.

Here is how the beacons sounded at N6NB in Orange County during that opening.

A contact on 223.5 FM

Here is part of a trans-Pacific QSO on 223.5 MHz FM between KH6HME (KH7Y, operator) and N6NB. With only 15 watts of power output, Fred was solid copy on FM at a distance of 2,500 miles.

These videos are on YouTube (search for keywords KH6HME and N6NB).

Where these videos were made…

The duct as it appeared on 5 July 2014

www.n6nb.com