W3ZZ

THE WORLD ABOVE 50 MHz

Magic Days on "The Magic Band" Long Path on 50 MHz — *Part 1*

Given the sunspot cycle predictions for the current Cycle 24 and beyond, most of us may never again experience the king of all propagation modes — F-layer, F2 —on 6 meters. Yet some amazing contacts have been made over the years since Cycle 18 in the 1940s. Readers with long memories will remember Bob Cooper's (ZL4AAA) fascinating description of transatlantic tropospheric ducting in the March 2003 column. Now Bob returns to discuss F2 long path, a subject well-known on HF but almost never probed on 6 meters. Return with us to the heady days of 2001-2002 when the Magic Band was truly magic.

JG3IFX

Figure 1 — Yutaka, JG3IFX/2, operating portable in southern Japan.

The past Northern Hemisphere "summer E_s season" produced many two-way 50 MHz contacts over distances as great as 13,000 km at the virtual "bottom" of the solar sunspot cycle. Magic Band enthusiasts have always viewed such distances as solar-cycle dependent and requiring high sunspot numbers. Equally unexplained are contacts during peak sunspot years that exceed 20,000 km; "half-way around the planet" or the so-called "long-path." Research has uncovered several hundred such contacts, some exceeding 30,000 km distance (roughly 75% around our globe), and the more spectacular of these form the basis of the following discussion.

This study began as a personal quest; a "disagreement" between ZL4AAA and those who maintain "longest distance VHF-UHF records" for New Zealand's NZART. By definition they limit records only to great circle short path so the ODX (greatest distance) cannot exceed halfway around the world or ~20,000 km regardless of the actual path. For instance, for contacts between ZL1MQ and ZBØT and ZS3E during Cycle 21 April 17, 1981, both peaked due north at essentially 0° for ZL1MQ. The short path to ZBØT is at a 160° heading so this was ostensibly *not* short path.

For those who do not subscribe to this particular geometric rationale, we begin our quest.

"He Simply Appeared out of the Noise . . .!"

On April 7 (UTC), 2001, Yutaka, JG3IFX/2 portable in PM84jj with his friend JN3NFQ (K1GI), on a mountainside overlooking the Pacific with a 5 over 5 Yagi (Figure 1), worked a series of four contacts in the eastern Mediterranean including OD5/OK1MU. The distance? If you were on the US East Coast pointing your 6M antenna "east" and found KH6/K6MIO only on that heading (as in "long path"), you'd be in the same league. Provided he *only* found you when pointing "west." Long Path is a generic description of any contact that exceeds halfway around the Earth, a distance in excess of 20,000-20,035.5 km given that at the equator the Earth is 40,075 km in circumference. To understand "LP" it helps if you first appreciate "antipode" contacts. And while the subject is 50 MHz, what immediately follows works for any ham frequency, dc to daylight.

In modern English, "antipode" is defined as "the exact opposite point on Earth from you"; it is *always* in the other hemisphere (if you are north of the equator; your antipode point is south of that line). For Amateur Radio, if you contact someone at "your antipode" he or she will be so located as to have an *infinite* number of "ionospheric radio paths" to you; *any direction* their beam points will be the *same distance* to you. From Washington (DC) the antipode sits off the coast of Western Australia (think VK6PA near Perth [18,493km for W3ZZ] and keep going for another 1507 "very wet" km). From Auckland, New Zealand, Madrid (Spain) is close (if not precisely) to antipode.

Beginning at 2043Z April 7, 2001 JG3IFX/2, made the first of four "LP" contacts in an all-too-brief 19 minute opening. It is not possible to calculate the actual distance the signals traveled for none of the stations found the other's signal while pointing their directional beam antennas either short path (SP) or precisely the LP opposite. Pavel, OD5/OK1MU, recalls, "*Yutaka was the only* (DX) *signal on the band — for 24 hours prior and 24 hours after. He simply appeared up out of the noise, we worked (RST559/559) and he faded out (2152).*" The SP distance would have been 8893 km and pure LP (by Williams' calculation —

This Month

January 4	Quadrantids Meteor Shower
January 22-24	ARRL January Sweepstakes
*January 23	Very good EME conditions*

*Moon data from DL7APV

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see sidebar) would have been 40,075 – 8893 or ~31,182 km. But the actual distance being something other than pure LP is something else again.

JG3IFX/2 had four LP 50 MHz contacts between 2143Z and 2152Z: 4X1RF at 2143Z, JY9NX at 2148Z, 5B4FL at 2149Z and OD5/OK1MU at 2152Z. At 2202Z he heard SV1DH along the same path, but Costas, who reports "*one of the problems associated with living in an urban area is a high 6 meter noise level*," did not hear Yutaka's CW responses. Here forensic backtracking becomes interesting. Remember Pavel's comment about hearing only Yutaka.

Yutaka was pointing southeast with his 5/5 at ~140°. OD5/OK1MU and 5B4FL report they found the Japanese signal at around 210-240°. The "true" LP heading from OD5 to JA would have been ~235° and very similar for the other stations. We might label the *actual* path "Long Path *Enhanced*" (LPE); a term I create knowing it will bring a smile to the face of my friend Jim Kennedy, KH6/K6MIO (see **www.bobcooper.tv**).

On Easter Island South Dakota's W7XU was portable CEØY with his spouse Holly NØQJM. Their DXpedition lasted slightly longer than a week. It began March 30 on 6 meters with Arliss initially commandeering the triband HF beam at XQØYAF and soon thereafter installed a 7 element 6 meter beam. While working 5B4FL on April 7 at 2115Z, he heard "various PYs, the TRØA/ beacon and attracted TR8KPJ at 2137Z" (when was the last time you worked Chad on *any* band?). JG3IFX/2 heard none of this although his antennas were pointed essentially at CEØY. Six minutes after Arliss logged TR8KPJ, Yutaka began his run. In fact Yutaka and Arliss would work April 8 at 0224Z — just over 4 hours later, on the same beam heading Yutaka had used on the 7th.

Nick, 5B4FL notes "at 2100Z I worked KH8/N5OLS 57, CEØY/W7XU at 2115Z and then nothing until JA3IFX/2 popped through at 2149Z." No other JA signals were heard; in fact, 5B4FL heard no other DX until hours later (April 8 UTC). One of Japan's leading 6 meter operators, JA-1VOK, labels the OD5/OK1MU contact as "unique." Except it was *not* quite unique. On October 13, 2001 OD5/OK1MU appeared again — this time at JA3IFX/3 who was now located at Shiono-misaki (PM73rg) in Yamaguchi prefect, which happens to be the southernmost land point on mainland Japan. JA1VOK reports this was a date (~23-24Z) when he and many other JAs worked LP to CT, EA and 5B4. *But* no other JA worked the Middle East, only Yutaka, who had an apparent geographical advantage (when in doubt, move closer to the geomagnetic equator).

The period between April 4 and 10, 2001 is still labeled "the magic days" in Europe. IØWTN explains. "That night [April 8] we still call 'the magic night' here — very peculiar propagation conditions from our grid square to a wide side of the Pacific! We were four stations of Roma (IØJX, IKØFTA, IWØFFK and I); a few minutes after contacting KH8/N5OLS we were able to work CEØY/W7XU." CEØY appeared at 2122Z; of interest, although dozens of other Italian stations were glued to their 6 meter radios, CEØY did not appear beyond the immediate "Roma Grid Square" (6 others outside Rome did work KH8, however).

A "forensic signature" is beginning to appear here: JA3IFX/2 to OD5 and other eastern Mediterranean stations, Italian stations to not just KH8 (AH45su) but also CEØY (DG52iv). Stay tuned — it gets better!

The key player in this bit of "magic" would turn out to be CEØY/W7XU. A veteran of previous 6 meter jaunts, Arliss first found 50 MHz signals on his arrival with the triband HF Yagi March 30. By 2030Z that day he had his 6 meter antenna functional and immediately began working DX, which virtually anyone would find "beyond magic." Mixed into his first serious contacts was 4X1RF (16,499 km at 2222Z March 30), the tip of a giant incredible long-haul propagation iceberg that lasted throughout his Easter Island jaunt.

Distance Calculations

There are many great circle distance calculation tools. After comparing results, ZL4AAA settled on the Williams tool at **williams.best.vwh.net/gccal.htm**. This JavaScript-based calculation allows modification of longitude, latitude, beam heading and/or path length for either station. Some of the calculations in this column use distances derived from the source stations or from the July 2001 "World Above 50 MHz" column; the remainder utilize the Williams tool. Williams (on short path) *initially* assumes "most-direct-path."

The Long Path 50 MHz World

Accept that anything passing calculated "half-way-around" is subject to controversy and naysayers maintaining, "You don't know the front of your beam from the back." Given the nonstandard world of collecting such reports, nobody is going to do justice to 6 meter contacts that approach the antipode or "magically" exceed that point. This discussion is merely a set of examples that *probably* did happen (and gives you something to fantasize about while Cycle 24 stumbles and trips on its nonproductive self).

Steve Gregory, VK3OT, one of the 50 MHz legends of our time, maintains excellent records from a location where his antipode falls someplace into the Atlantic well off the coast of Nova Scotia. In other words, he cannot claim an Antipodean 50 MHz contact on land. Australian records claim contacts on "long path" (spread over two consecutive cycles from 1989-2002) between 25,517 km (VK9ML to PY5CC; 15-IV-2002) and 28,397 km (VK6JQ to TL8MB 03-IV-1991). Of the "record long path" contacts, all six occurred in the month of April spread over 13 years. *Is April "magic"?*

Using the July 2001 *QST* "World Above" column, we find references to April 2001 contacts that "exceed expectations": VK-4CP-LU8MB (28,076 km) on the 3rd at 1430Z, KH8/N5OLS-IØWTD (23,106 km) on the 8th at 2115Z approaching that 'magic hour' again, PY5CC-VK8MS and VK8AH (24,493 km) on the 25th at 1230+Z.[1] And *the capper* CEØY/W7XU to a trio of Indonesian stations at ~25,500 km. *These* deserve further investigation.

Arliss notes, "…(during my time on Easter) the openings were pretty impressive to a guy from South Dakota where working any DX on 6 m is a big deal." Indonesia from Easter, on a path that was not SP but as we will see cannot be traced even forensically, works out by Ed Williams' calculation (see sidebar) to at least 25,400 km. Indonesia is an "interesting" spot for 6 meters for (as Pacific region 6 meter DXers know); "*they use it like expensive CB and even have a six meter-only license.*" Since many YC-YF licensees only use FM, actually working the country on 6 meters can be a challenge in spite of high "activity" levels. CEØY/W7XU managed to entice several of these "amateurs" to answer his calls on April 3, 2001: YBØCBI (Jakarta; 25,402 km) at 1607Z; YC1MH (Bogar; 25,412 km) at 1610Z and YF1OO also in Bogar at 1746Z. Some like YC1MH would repeat (on April 6 at 1701Z) and of forensic interest here, *all* of the Indonesian stations identified and worked fell into a 50 km diameter "ionospheric worm hole" at local Indonesian time between 10 PM and midnight.

Next month Bob will conclude this interesting discussion of 6 meter long path. Still more fascinating contacts are in store.

[1]E. Pocock, W3EP, "World Above 50 MHz," *QST*, Jul 2001, pp 95-97.

ON THE BANDS

EME. This was an extraordinary month on 70 cm EME. Matej, OK1TEH completed what is believed to be the first single Yagi WAC on 432 by working PY1KK on JT65b. He was running an 800 W solid state amplifier to a 23 element Yagi on a 5.7 m boom. After more than 30 years, Al, K2UYH completed 432 MHz DXCC, the third 70 cm DXCC after DL9KR and HB9Q and the first from outside of Europe. Al completed the first above 6M WAC in 1976. Al's DXCC was accomplished with the aid of digital techniques. He notes that with his current noise levels and tree blockage to the east and west, there is no way he could have done it without using JT65. [Thanks K2UYH]

Lance, W7GJ reports that he, 3D2LR and Bob, ZL1RS/3D2RS completed a very successful 6M EME DXpedition from the Fiji Islands from Sep 27 to Oct 9. Lance operated 6M while Bob operated 2M. The DXpedition took advantage of optimal EME conditions, the first weekend of the ARRL EME Contest and common windows with EU during their moonrise and moonset. Bob was pleased to work many new call signs and worked 198 different stations in 41 DXCC entities. He was using a pair of 8 element homebrew Yagis.

On 6M, Lance worked a total of 52 different stations in 17 DXCC (20 EU, 29 NA, 2 OC, 1 AS), with 17 additional stations copied but not worked in an additional six DXCC (9 EU, 5 NA, 2 OC, 1 AS). He used and Elecraft K3 driving an M^2 solid state kW amplifier to an M^2 6M8GJ Yagi that could be elevated manually up to 65°. Many small horizon-only antennas were worked; the smallest was N3CXV's single 6M5X Yagi. Lance thanks all for their support and contacts! More details are at **www.bigskyspaces.com/w7gj/** and **www.qsl.net/zl1rs/**.

Ray, WA4NJP continues to work new stations on 222 MHz after putting a 222 feed in his dish with two new states — AZ and ID — added to his totals. Ray has also had fun working DXpeditions in 3D2 on 6M, 3D2, CE and CEØY on 2M and CE and CEØY on 70 cm.

6 meters. Six meters was virtually nonexistent in October. NØJK notes the band open from the southeast to ZF1 on the 17th and TEP between PJ and PY 2,4,5,7. On Oct 24 Jon worked FM16 as part of a marginal opening from the southeast to the Far Midwest [OK/KS]. On Oct 24 DM03 heard beacons on Oahu and the Big Island under high geomagnetic field conditions (k=5). On Oct 26 Bob, K6QXY heard ZL video around 0100Z. The mechanisms supporting either of the latter observations are not clear.

2 meters and up. October often brings decent tropo conditions but not this year. East coast conditions in the 432 Sprint Oct 6-7 were dreadful. On Oct 11 Vic, WB4SLM (EM82) worked KØVXM in EL98 on 2304 but noted that his signals were weaker the lower in frequency they went. Vic worked stations down to EL87 on 70 and 23 cm. Dave, N9HF (EL99) encountered a better than normal Orionids meteor shower Oct 21 and used it to work state #48 WV on 2M. On October 5 CT1HZE worked a station in France on 2M E_s, the first October 2M E_s reported in Europe. Finally Flavio, PY2ZX reports 2M TEP between PY (GG65, GG48) and Martinique.

HERE AND THERE

ARRL VHF Sweepstakes. This contest begins at 1900Z on Jan 22 and ends at 0359Z Jan 24. Conditions are often not good because of the cold weather but club interest increases the amount of activity. Further information may be found in December 2010 *QST* and on the ARRL Web site at **www.arrl.org/january-vhf-sweepstakes**.

Quadrantids Meteor Shower. The Quadrantids are a short duration but energetic shower with a ZHR (zenith hourly rate) of 60-120 at speeds up to 40 km/hr. This year the peak is predicted at 0000Z January 4.

50 MHz Standings by DXCC Entities Worked

Call Sign	State	States Worked	DXCC Entities Worked	Grids	DX (km)
1					
K1TOL	ME	50	178	1,416	15,185
K1SIX *	NH	50	171	1,060	15,549
W3EP/1	CT	50	150	1,121	15,750
K1AC	NH	50	145	—	14,535
K1MS	MA	50	142	—	14,696
W1AIM	VT	50	132	561	14,928
2					
K2ZD	NJ	50	156	468	15,610
K2MUB	NY	50	156	—	16,784
NY2NY	NY	50	118	573	13,124
K2QE	NY	50	116	700	—
3					
W3JO	PA	50	159	—	14,929
W3VZ	MD	50	148	823	14,038
W3ZZ	MD	50	143	879	15,769
AE3T	PA	50	140	—	16,664
N3DB	MD	50	135	970	15,083
N3II	MD	50	134	793	15,876
W3TC	PA	50	133	790	15,221
W3CMP	PA	50	129	—	—
AK3E	MD	50	117	815	—
W3UR	MD	50	116	619	10,590
4					
K4MM	FL	50	152	—	16,326
W4UM	FL	50	142	—	—
N4MM	VA	50	141	939	—
W4TJ	VA	50	136	755	15,688
WA4LOX	FL	50	134	—	15,664
K4QI	NC	50	129	945	—
K4PI	GA	50	128	800	12,522
KE4WBO	FL	49	120	600	11,060
K4RWP	TN	50	116	767	15,228
W4WA	GA	50	110	348	9,860
AA4H	TN	50	109	721	12,580
KB4ET	FL	50	106	—	—
W4AS	FL	50	100	176	—
5					
W5OZI	TX	50	164	1160	15,131
WD5K	TX	50	151	1202	14,924
K5UR	AR	50	146	1248	—
K5SW	OK	50	143	—	16,746
K5AM	NM	50	144	853	17,861
W5HNK *	TX	50	120	733	14,815
W5HJV	TX	50	115	—	15,106
AA5AM	TX	50	112	748	14,963
W4UDH	MS	50	109	907	13,903
W5LUA *	TX	50	102	—	—
6					
K6QXY *	CA	50	158	—	15,555
N6CA	CA	50	127	500+	18,464
KB6NAN	CA	50	91	782	16,638
KR7O *	CA	50	78	672	12,783
N6ZE	CA	47	70	330	—
7					
W7GJ *	MT	50	159	710	16,102
W7KNT	MT	50	114	778	15,557
W7MEM *	ID	50	72	658	16,106
K7CW *	WA	50	57	651	13,330
8					
K8MFO	OH	50	156	—	—
W8UV	OH	50	107	350	12,349
W8TN	WV	50	105	492	12,436
K4OM	WV	50	100	—	15,533
N4DB	OH	50	91	487	11,037
K8ROX	OH	50	85	620	11,037
WA8RJF	OH	50	84	587	15,365
9					
W9RPM	WI	50	132	829	16,059
W9RM	IL	50	110	757	13,712
W9VHF	IN	50	109	608	13,766
W9JUV	IL	50	109	400	15,903
W9VA	IL	50	102	550	13,670
KC9KBB	IL	50	102	—	14,050
K9MU	WI	50	63	540	10,447
W9GM	WI	50	57	410	11,312
WA9PWP	WI	50	57	455	10,400
Ø					
NWØW	MO	50	134	—	14,675
KØAZ	MO	50	127	762	14,392
KØFF	MO	50	126	741	16,246
NØLL	KS	50	125	872	14,901
KØGU	CO	50	123	885	17,142
WAØKBZ	MO	50	105	627	16,354
KØCS	CO	50	84	533	13,409
NØPB	MO	50	75	503	13,246
KBØPE	MO	50	63	502	10,211
KØKP	MN	50	54	554	10,051
KØAWU	MN	50	53	518	15,578
WØLD	CO	50	42	180	—
WØRT	KS	50	40	170	13,651
Canada					
VE1YX	NS	50	177	1,261	15,515
VE3KKL	ON	50	119	618	18,207
VE2XK	PQ	50	73	579	7,495
VE2PIJ	PQ	49	57	433	6,104
VE3KH	ON	48	27	246	7,769
International					
IKØFTA	I	38	233	1117	18,236
GØJHC	G	42	218	1199	15,951
SM7FJE	SM	43	210	1034	15,912
NP3CW	PR	50	118	585	13,533
W3CMP/VP9	VP9	36	39	—	—

*Includes EME contacts
— Not given

W3ZZ

THE WORLD ABOVE 50 MHz

Magic Days on "The Magic Band" Long Path on 50 MHz — *Part 2*

Last month Bob Cooper, ZL4AAA, began a "forensic" study of exceptional long-haul 50 MHz two-way contacts involving one or more forms of F-layer propagation that provide evidence for "some path" other than great-circle "short path." With distances exceeding 31,000 km in the extreme, crossing 18 time zones, existing propagation knowledge fails to provide an explanation. We continue the two-part series by considering long path oddities and eventually returning to the first week in April 2001 and the operation of W7XU and his spouse NØQJM on Easter Island (CEØY) (see Figure 1).

ARLISS THOMPSON, W7XU

Figure 1 — Holly, NØQJM, operating at Easter Island CEØY with Arliss, W7XU.

More 50 MHz Long Path

The examples given in Part 1 of this series emphasize some of the oddities experienced via long path. The first challenge is to substantiate that the signal path was not direct/short path. This is difficult at 7 MHz and even more so at 3.5 MHz where few at both ends of a contact have accurate directional capability.

Carl, K9LA explores some of these challenges (see "Long Path Propagation" by Bill, W4ZV (then WØZV) in **users.vnet.net/btippett/w4zv.pdf**) in a well documented article that focuses on our "lower" bands. While these skewed paths are quite well known to operators with directional low frequency arrays, at 50 MHz, where any F layer propagation is rare, something coming on the reverse (long) path is very unusual. As Jim Kennedy, KH6/K6MIO, documents (see **www.bobcooper.tv**), the related cousin, "*skew path,*" is much more common and has been from the first day a JA discovered an LU on 6 meters back in 1956.

Skewing makes "proofing" a "long path" murky and difficult to calibrate or justify. For example; in March/April 2001 W7XU operating from CEØY "discovered" what he interpreted to be a 6 meter "polar path" (north he believed) to Raj, VU2ZAP (Bengaluru, southern India) and Raj would later report he heard Easter Island continuously for as long as 5 hours. That works out to be 18,278 km; not quite antipodal but an amazing bit of VHF propagation none the less.

As a point of reference, the *short path* direct heading for Raj would be 157° while for W7XU/CEØY it should have been 205°; in neither case even close to 0/360° (north). Here were two skilled, experienced 6 meter operators who certainly knew enough to point their antennas where the signal was strongest. It was 2 AM local time in Bengaluru when Easter Island finally faded out. And it happened several days in a row, centered on April 5, 2001.

An additional oddity was 9M2TO/B copied first on April 3 at 1820Z from Penang, western Malaysia. While it sounds impressive, the Easter Isle to Penang path is nearly 1500 km shorter than the path to Indonesia. Of greater forensic interest, just *prior* to hearing the Malaysian beacon (at 1813Z) Arliss noted the end of the path to VU2ZAP, "*Path fading out*" and then immediately after first hearing 9M2TO/B, "*I now hear V29JKV.*" Jimmy's Caribbean signal would be pervasive throughout the Easter Island DXpedition.

The VU fadeout lasted as long as the 9M2 beacon persisted (not very long) but by 1840Z the VU path returned at full strength until past 1957Z; beyond the brief interruption, Arliss noted, "*The band was open to VU today from at least 1538 to 1957 hours.*" Given the 18,500 km distance here, the use of power levels as low as 0.125 W (to a 4 element beam) or 1 W to a 12 foot dipole, 4+ hours of continuous propagation seems mind-boggling. "*Magic*" indeed and for slightly more than a week, W7XU was magician-in-charge.

Although this has been our focus, these conditions were not restricted to April in 2001. VK3OT says that other Aprils (1989, 1991, 2000 and 2002) produced record long path contacts. The evidence suggests if you want to be on one end of a 50 MHz long path contact, you are well advised to be in the South Pacific — from Easter Island to Australia. *All* of the six record VK contacts are Southern Hemisphere to Southern Hemisphere (as well as being in the month of April). This makes the 2140-2200Z JG3IFX (et al) contacts with the eastern Mediterranean stand out. Why? Because both ends were Northern Hemisphere although all logic suggests it would not have happened without traversing at least a portion of Southern Hemisphere (see K6MIO's "50 MHz Long-Path Propagation" at **www.bobcooper.tv**). K6MIO's rules for long path are presented in the sidebar.

The Japanese Magic Band

At 2140Z it is 0640 LST (local standard time) in Japan and 2340 LST for 4X1RF. Thus this would be a dawn opening for Yutaka while in Israel and nearby the local time was exiting the evening TEP (transequatorial propagation) window; *only* there had been virtually no TEP for those working JG3IFX/2 that night. Yutaka recalls: "*The opening on long path (on this morning) seems to be unusual for 3 points. First, the season is too late (the peak LP season should be March); second, the time is too early; normally it starts around 0800 JST (2300 UTC). Finally, this was to a most unusual area; frequently when this path opens it is to CT, EA, EH8, and perhaps I and 9H1. From Japan, the Middle East is very far for LP.*"

That's one of the marvels of the Japanese "Magic Band" conditions: from the JG3IFX location to, say, EH7KW, long path, is still

This Month

*February 19-20	*Excellent* EME conditions

*Moon data from F5SE/DL7APV

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Rules of TPL/TEL (Long Path Extended)

[courtesy of KH6/K6MIO]

Refer to Jim Kennedy's, KH6/K6MIO, series of seven in-depth papers reprinted at **www.bobcooper.tv**. *2003's "50 MHz Long-Path Propagation" is essential reading.*

Some of Jim's rules follow:

1. If the signal path crosses the equator twice on anything like a Great Circle, the path must be long path (eg, VK3OT to 9Q5EE).

2. The possible exception for point 1 is if both stations are close to the equator and beaming essentially east or west, long path is possible with a singular equatorial crossing (eg, OA4TT to YB).

3. TPL (Transpolar Long Path) over the south-polar region has headings ~160° for the daytime station (~1100 LST) and headings of ~200° (~0000 LST) for the nighttime station (eg, EH to KH6).

4. TPL over the north-polar region has headings of ~20° for the daytime station (~1100 LST) and headings of ~340° (~0000 LST) for the nighttime station (eg, FO to S79).

5. TEL (Transequatorial Long Path) goes east from a daytime station (~0730 LST) in the *northern* magnetic hemisphere with headings of ~120°, with the nighttime station (~2030 LST) in southern magnetic hemisphere having a heading of ~300° (eg, FY to VK).

6. TEL goes east from a daytime station (~0730 LST) in the *southern* magnetic hemisphere with headings of ~60°, with the nighttime station (~2030 LST) in the northern hemisphere having a heading of ~240° (eg, KH8 to JY).

7. Trans-"Anything" time of year: is typically September-November, February-April.

8. For K Index and Solar Flux requirements see **www.bobcooper.tv** (under KH6/K6MIO).

Note that for both TPL and TEL, the daytime station is on the west end of the circuit. In the case of TEL, it appears the reason is that the path starts in the morning looking east into daylight nF2; by the time it reaches the afternoon longitudes the ionosphere's "afternoon fountain" [a bulging of the F-layer that occurs over the geomagnetic equator after sunset — *Ed.*] is beginning to establish TEP layers, which then provide an F2 to TEP link into the late evening east-end station

an amazing 28,887 km distance but the JAs (at least a cycle ago) considered this *standard stuff*. But the extra distance to 4X1RF (31,063 km) caught Yutaka's attention (setting aside the "wrong month" and "wrong time"). Perhaps this is one of the reasons why, by country, there may be more 50 MHz JA DXCCs than any other region.

In a sense, given the near or total lack of "other signals" at *either end* when a *single* signal pops out of the background noise at 20,000-31,000 km on 50 MHz, we have a forensic mystery of significant proportions. Moving away from this class of event there are instances when during a major F layer opening in the 12,000-14,000 km range a lone signal at *twice* the distance pops through. VK3OT was working a string of 5th call district (US) stations on April 6, 1991 when he copied "5EE." Asking for a repeat to get the prefix correct in his log, the station repeated three times "Q5EE." Steve was hearing only W5s and the signal levels were not spectacular:

"*I first copied the caller as WQ5S; I called him back and no answer. Next I thought, 'maybe it is PJ9EE' and tried that. No response but thinking it a PJ9 had moved the beam off of W5 to Aruba. The noise floor dropped and returning the beam to W5 now heard the caller again.*"

9Q5EE was the *correct* call and Steve had been savvy enough to try to repeak the beam. Democratic Republic of the Congo and Texas from suburban Melbourne do not share a common heading (the short path to Houston, eg, is 14,720 km while the 9Q5EE "longer path" works out to 27,207 km). KB5LIU (and others) stood by — enchanted. The contact required only 30 seconds and 9Q5EE went on to also work VK2 and FK8. Nobody in the States heard *any* sign of the 9Q5. "*It was midnight at 9Q5 and just ahead of 10 AM here.*"

An F-layer First

Research unearths dozens of contacts that fit this genre; a "much farther" away single station busting through during a more moderate F-layer opening at 50 MHz. A 6 meter path from 9Q5 to W5/Texas is not only uncommon, it has apparently *never* happened. But for 10 minutes on April (that month again!) 6 (and that year — 1991) VK3OT (plus VK2, VK5, FK8) found the long-path 9Q5 struggling against the W5-land competition; 14 "time zones" on the "Magic Band."

Logic here suggests a "forensic coincidence" between the month of April (a few weeks past the Northern Hemisphere "spring equinox") and antipode-plus 50 MHz links, at least during moderate to high sunspot years. Setting aside the very brief October 2001 period when OD5/OK1MU and JG3IFX/3 heard each other a second time (and within the "predictable" 2300-2400Z time frame; see last month's column), virtually all of the beyond-antipode 50 MHz contacts occurred within what IØWTN labels "*the magic month.*"

Returning to the January 2011 column, there is one more highly unusual circumstance, which involves W7XU's presence on Easter Island. That would be the four 28,709 km contacts in 3 days between ZL4AAA and VU2ZAP. In April, 2001 I did not hear (or work) CEØY/W7XU although he was a mere 7224 km to my east. In fact, Arliss worked only a single VK (VK4) and no ZLs. But, April 6 at 1946Z while ignoring some EAs and CN8s near my Antipodean 20,000 km zone plus the potent signal of V29JKV, I worked VU2ZAP. His signal peaked at 150° and we exchanged reports. Raj would also work two other ZLs neither quite as far "west" as this reporter.

Raj asked, "*Is this a world record?*" on his QSL card. But given that world records do not apparently recognize LP paths longer than 20,000 km this would not count. We repeated the contact at 1950Z the next day; April 7. What is important here is the "coincidence" between this "LPE" distance and the VK3OT-9Q5EE contact *also* on April 6 (2001) approximately 4 hours later; one is an almost mirror-image of the other as if an F-layer "tunnel" was *hanging* up there connecting points 14-16 time zones apart.

A review of solar events and HF conditions for the period April 1-10 provides few clues. A (minor) SID (Sudden Ionospheric Disturbance) did occur on April 6 around 1915 UTC; it knocked out all 14-28 MHz HF signals *at ZL4AAA* for around 45 minutes and in the midst of this VU2ZAP appeared from 28,709 km away (on 50 MHz). The SID may have had an influence on April 6; it does not explain the same path also being open on April 7 or the consistency of the 18,500 km 50 MHz path from VU to CEØY from April 3 until Arliss left CEØY April 8.

Clearly whether we ever see sunspot numbers well over 100 again in the foreseeable future, there are locations on this globe where 6 meters is not only "magic" but beyond explanation. The antipode is of special interest because it is "as far as you can go" on any band without reverting to a different beam heading and a shorter distance.

The ZL4AAA antipode is a rural desert location in Morocco, Sidi Yahya du Rhab. During the 1991 ARRL 10 Meter Contest a Moroccan multioperator station was not only worked "early" but stayed "in" for the *full* length of the contest (although the beam heading for peaking the CN8 signal did of course vary as would be expected). Ten meters is not 6 meters but it is instructive; at no time during the contest period did this antipode signal drop below S9; even at 4 AM local (ZL) time. If the

LUF (lowest usable frequency) were >28 MHz for the full contest weekend at whatever beam heading, what might the daylight-enhanced MUF (maximum usable frequency) have been to the same "Antipodean" location?

More Mysteries

What we do *not* know (understand) about antipode propagation is perhaps far more than what we do know. For the bulk of the North American readers, your antipode falls someplace in the water between Western Australia and Africa and this obviously reduces your opportunity to create similar observations (on *any* band).

The K1ZZ *QST* editorial of August 2010, "*Anomalies: Is the ionosphere changing in ways we do not yet understand?*" perhaps lays down the gauntlet.[1] Amateur Radio has always been largely about discovery ("*we*" did indeed first discover the benefits of HF via the ionosphere and have contributed significantly to what is known about E skip, auroral propagation, TEP, etc). K1ZZ again described it well: "*For more than a century Amateur Radio has provided an outlet for curiosity — people who seek a better understanding of the natural forces that shape life on our planet.*" And the "Magic Band" remains our best *anomaly* resource.

[1]D. Sumner, K1ZZ, "Anomalies," *QST*, Aug 2010, p 9.

ON THE BANDS

One expects a dearth of reports in mid-winter but this November has been perhaps the least interesting in many years. Let's take a look at the lack of activity.

6 meters. The minor winter E-skip (E_s) season is off to a slow start this year. Jon, NØJK (EM17), worked southern CA and reports contacts from CA into the Rockies November 13. Dave, N7DB (CN85), worked AZ the same day. Bob, K6QXY (CM88), notes E_s to AZ and OK on the 16th. DX Sherlock reports widely scattered contacts from TX/OK into PA, OH, GA and AL on the 26th. NØJK worked into GA and then southern CA and nearby Mexico on November 29. He reports that southern CA worked into GA on double hop E_s. Let's hope that conditions improve in December and early January. Meanwhile K6QXY notes weak ZL video on November 17 and 18.

Tropospheric ducting. Many Novembers have some excellent tropo. A warm spell around Thanksgiving time or earlier has produced some outstanding openings including some rare east/west enhancement over the Appalachian Mountains including the East Coast and even trans-Gulf ducts from Texas to Florida. Not so this year. Not one single tropo report this November. Since 2002 only in 2002 and 2008 were there no instances of tropo reported.

Aurora. The best guestimate of smoothed sunspot numbers puts the value at around 25 for November 2010 [we won't know final numbers for sure for another year]. Solar flux is only at 80. Aurora producing events like CMEs [coronal mass ejections] and >M class flares with associated high solar wind have not yet occurred in Cycle 24. So aurora reports have been essentially nonexistent.

Meteor scatter. Not a single report reached me concerning this year's Leonids. Data indicates a sharp, narrow peak zenith hourly rate of only 32 at 0140Z November 18. There was no obvious increase in the steady state digital WSJT meteor scatter activity at that time. Thus one can be relatively assured that little if any interesting meteor scatter happened during Leonids 2010.

EME. Al, K2UYH, notes that Paul, WA6PY (ex-SMØPYP), recently completed with PY1KK for what is believed to be the first 432 MHz single Yagi WAC on CW. Paul was running 1.5 kW to a 26 element manually elevated SMØPYP Yagi (see Figure 2). This amazing feat attests to Paul's exceptional operating abilities. Congratulations Paul! Herb, K2LNS, thanks Jeremy, W7EME/KH6, for state #50 on 144 MHz on November 30 via JT65B. Jeremy was running only a single 5 λ Yagi. Congratulations Herb!

HERE AND THERE

New DXCC entities on 6 meters. The dissolution of the Netherlands Antilles has caused the deletion of two DXCC entities, Leeward Netherlands Antilles PJ2, 4 and Windward Netherlands Antilles PJ5, 6, 7 and the concomitant formation of four new DXCC entities: Curacao PJ2, Bonaire PJ4, St Eustatius/Saba PJ5/6 and Sint Maarten PJ7. Plans are being made to activate each of these new entities on 6 meters during the summer E_s season. Stand by.

Microwave Standings

Published Microwave Standings include only regional leaders as of December 1. For a complete listing of all stations, check the VHF/UHF/Microwave Standings boxes at **www.arrl.org/wa50-standings**. To ensure that the Standings Boxes reflect recent activity, submit reports at least every 2 years by e-mail to **standings@arrl.org**. Printed reporting forms are available by sending a request with an SASE to Standings, ARRL, 225 Main St, Newington, CT 06111. Stations are grouped into regions based on call area.

33 cm (902-928 MHz)
Minimum Terrestrial DX = 1000 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
K1WHS	ME	18	2	48	1,212
W1AIM	VT	9	2	25	1,078
KØVXM	FL	7	1	29	1,747
K4RF	GA	2	1	10	1,045
W5LUA*	TX	22	2	70	1,725
K5LLL	TX	9	1	32	1,608
N6CA	CA	4	—	19	3,978
K6QXY	CA	4	3	24	3,794
WA8RJF*	OH	14	2	37	1,306
K3SIW/9	IL	19	2	62	1,265

23 cm (1240-1300 MHz)
Minimum Terrestrial DX = 1000 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
K1WHS	ME	20	2	55	1,688
W1AIM	VT	12	2	34	1,103
W1ZC	NH	12	2	19	1,116
WA2FGK	PA	21	2	55	1,571
WA4NJP*	GA	28	25	82	1,696
K4RF	GA	17	1	32	1,067
AA4ZZ	NC	13	1	26	1,201
KØVXM	FL	9	1	36	1,698
W4WA	GA	7	1	35	1,506
N4QWZ	TN	18	—	30	1,040
W5LUA*	TX	50	65	300	2,060
WD5AGO*	OK	39	36	210	1,705
K5UR	AR	18	1	92	1,102
K5SW	OK	17	1	60	1,570
K5YPV	MS	12	1	26	1,198
K5LLL	TX	10	1	40	1,608
W5UWB	TX	7	1	14	1,664
W5HNK	TX	7	1	—	1,272
WA5VJB	TX	14	—	29	1,980
N6CA	CA	11	—	44	3,978
K6QXY	CA	4	3	24	3,794
KR7O	CA	2	1	15	444
N6ZE	CA	1	1	2	60
WA8RJF*	OH	19	10	60	1,306
K2YAZ	MI	18	2	58	1,300
K3SIW/9	IL	23	2	80	1,265
N9LR	IL	19	2	61	1,151
NØLL	KS	13	1	54	1,321
WØRT	KS	8	1	10	1,065

13 cm (2300-2310, 2390-2450 MHz)
Minimum Terrestrial DX = 1000 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
K1WHS	ME	18	2	45	1,212
KØVXM	FL	6	1	19	1,698
W5LUA*	TX	33	33	124	1,533
K5LLL	TX	5	1	22	1,608
N6CA	CA	5	—	20	3,798
WA8RJF*	OH	10	10	39	1,306
K3SIW/9	IL	14	1	53	1,109

9 cm (3300-3500 MHz)
Minimum Terrestrial Distance = 600 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
K1WHS	ME	16	2	43	1,212
KØVXM	FL	3	1	15	1,802
W5LUA*	TX	16	17	52	1,353
K5LLL	TX	5	1	11	1,608
AA5AM	TX	1	1	4	159
N6CA	CA	5	—	20	3,978
WA8RJF	OH	6	2	14	1,306
K2YAZ	MI	4	1	7	843
K3SIW/9	IL	11	1	44	936
WØLD	CO	3	1	6	828

5 cm (5650-5925 MHz Standings)
Minimum Terrestrial Distance = 600 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
K1WHS	ME	16	2	39	1,212
W5LUA*	TX	9	19	49	1,187
N6CA	CA	5	—	20	3,978
W6OYJ	CA	1	1	1	344
K3SIW/9	IL	9	1	36	930

3 cm (10-10.5 GHz)
Minimum Terrestrial DX = 800 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
W1AIM/1	RI	11	2	19	1,008
K1WHS	ME	14	1	33	1,212
WA2FGK	PA	12	2	21	1,086
W4DEX	NC	17	1	28	1,214
W5LUA*	TX	15	22	83	918
W6OYJ	CA	5	2	21	1,020
KJ6HZ	CA	2	2	19	808
N6CA	CA	4	—	18	3,978
K2YAZ	MI	7	1	21	924

12 mm (24-24.5 GHz)
Minimum Terrestrial DX = 250 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
W5LUA*	TX	3	8	17	542
W6HCC	CO	3	1	5	259

6 mm (47-47.2 GHz)
Minimum Terrestrial DX = 100 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
K2DH	NY	1	2	6	134
W4SW	VA	1	1	1	174
WA1ZMS/4	VA	2	1	7	114
KØRZ	CO	2	1	6	125
W6HCC	CO	2	1	5	217

4 mm (75.5-81 GHz)
Minimum Terrestrial DX = 10 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
WA1ZMS/4	VA	2	1	5	114

2.5 mm (119.98-120.6 GHz)
Minimum Terrestrial DX = 5 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
WA1ZMS/4	VA	2	1	5	114

2 mm (142-149 GHz)
Minimum Terrestrial DX = 5 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
WA1ZMS/4	VA	2	1	5	114

1.25 mm (241- 250 GHz)
Minimum Terrestrial DX = 5 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
WA1ZMS/4	VA	2	1	5	79

1 mm and Above (300+ GHz)
Minimum Terrestrial DX = 1 km

Call Sign	QTH	States	DXCC	Grids	Best DX (km)
WA1ZMS/4	VA	1	1	1	7.3

*Includes EME contacts
— Not given