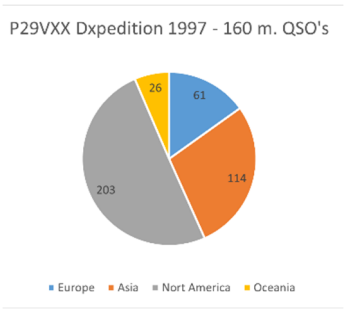
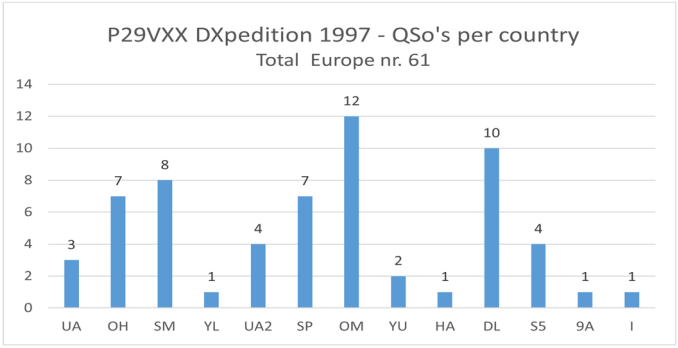
Feb. 1997: P29VXX – Papua New Guinea DXpedition.

by Pierluigi "Luis" Mansutti, IV3PRK

In the month February 1997, after completing a very successful low-band operation from Bangladesh, as S21XX, the German Team of Dietmar, DL3DXX, Falk, DK7YY, Jan, DL7UFN, and Joerg, YB1AQS, arrived in Papua New Guinea for the second DXpedition of the year. They have been active as P29VXX from Misina island, a location with a good take-off to Europe and North America, but 160 meters band conditions to Europe have been very difficult.

Despite the usual efficiency of the Titanex V80E 20 m. high vertical and all the efforts they dedicated to our continent, the CW QSO's with Europe were no more than sixty, 15% of the four hundred worked on the band from Febr. 20 to March the 3rd, out of the 18 thousand totals. Eleven QSO's have been made also on SSB, all with nearby stations in Oceania and a couple in NA.





Compared to their previous VK9CR, VK9XY and S21XX operations, the location was farthest East, facing the Pacific Ocean, and the path to Europe became tougher. The crew posted the complete dupe sheet on the Topband Reflector, accompanied by these remarks:

«Many ops lost their chance due to their missing sensibility and cleverness. The average signal level here was S4… 5, the average noise level at our local evening S9+10. The static crashes were sometimes up to 15 s. long, with only some hundred ms. of pause in between. I've been here around for a while, but this was the worst QRN I I've heard so far. Unfortunately, we couldn't erect a Beverage this time, only a very low hanging halfwave-dipole gave us a little more S/N ratio.
Two major mistakes made by a lot of stations:

1. Calling with other stations exactly on the same frequency.

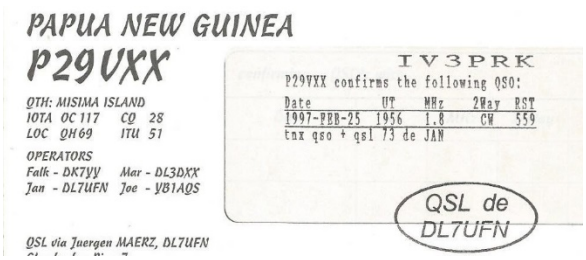
There is no chance to copy even a piece of any callsign. It's a waste of time and energy. Calling 200 Hz or even 1 KHz beside our given split frequency is no problem for us here in the very empty part of the Pacific, we'll catch everybody.

2. Calling very fast and only one/two times.

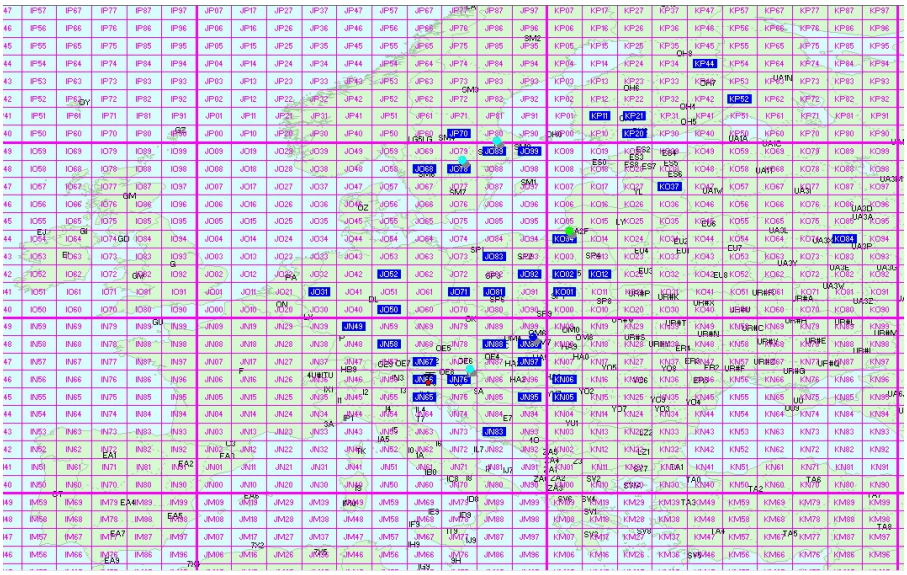
Even if it sounds sometimes like the 20m. band, 160m. isn't easy at all!
That you hear us very well doesn't mean the same for us. You will not hear any of the QRN we have here shortly after sunset when you are at your sunrise. The discipline was really appreciated, thanks for that. Some exceptions calling us continuously without listening, even across ongoing QSO's with other stations or disturbingly on our transmitting frequencies are well recorded and of course didn't find the way in our log. Some even made - "ghost" QSO's with somebody - definitely not with us!
Nevertheless, we've enjoyed our journey to S2 and P2 very much. I guess with in total 1400 QSO's on 160, 4500 on 80 and 6400 on 40 from both locations we again reached our main goal to serve the low bands».

In fact, working this DXpedition was a challenge: you had to really copy them, as they were changing continuously their split frequency. So, you had to be smart and jump to the new one before the other callers. On my paper logbook, I put a note in line with this QSO: *«Tx 1827 – up 9 - Rx 1836»*.

Not yet people calling on cluster spots!


PAPUA NEW GUINEA
P29VXX
QTH: MISIMA ISLAND
IOTA OC 117 CQ 28
LOC QH69 ITU 51
OPERATORS
Falk - DK7yy Mar - DL3DXX
Jan - DL7UFN Joe - YB1AQS
QSL via Juergen MAERZ, DL7UFN
IV3PRK
P29VXX confirms the following QSO:
Date UT MHz 2Way RST
1997-FEB-25 1956 1.8 CW 559
tnx qso + qsl 73 de JAN
QSL de DL7UFN

As for all my DXpedition analysis, I assigned to each callsign its grid locator and filled that square on DX Atlas.



At this point, I was not only surprised to be the only station from Italy in the log, but also to be the most western in Europe, on a line going down from JO31 in north Germany, to JN83 in southern Croatia: nobody else ahead of that line! Could has been due to "ducting"?

I contacted Professor Robert Brown, NM7M, who was recognized for his expertise in low-band propagation and had published articles on this subject in various magazines. He responded promptly, expressing interest in the topic and stating that he would also analyze those logs, anticipating that: «Luis, with regard to the question of ducting, I am firmly convinced it is a significant part of the propagation picture. But it is NOT all of it; there are still the earth-ionosphere hops via the F-region too…».

Later, after examined P29VXX logs, he wrote a long a long article (9 pages and 9 figures) with the title "Reflections on 160 Meters: The Joys of Salt Water and the Sorrows of Ground – Robert R. Brown, NM7M" to be published on "Communications Quarterly". Bob sent me, by mail, the paper draft telling: «Luis, feel free to share it with friends or even translate it for a ham magazine if you think people would be interested in it». So, now I scanned all the papers and upload on my web page.

This summary will focus on points that are straightforward to understand and provide final comments, without addressing complex scientific details.

Looking deeper.

But before getting to that, I went through my usual routine, making a great-circle map for the P29VXX DXpedition, as shown in Figure 1.

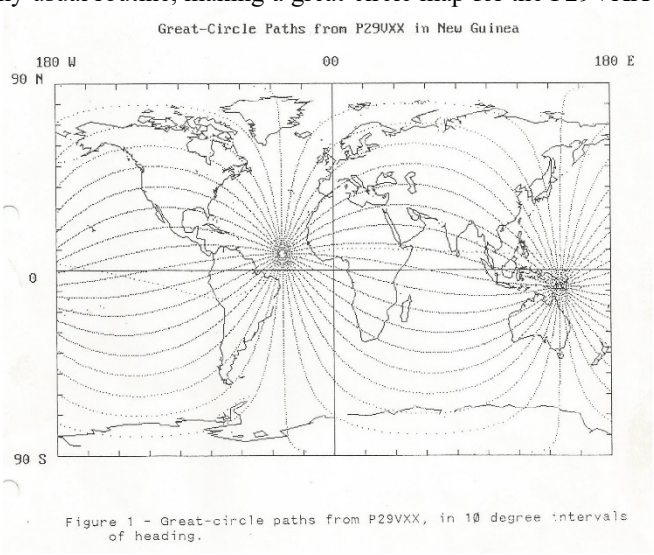


Figure 1 - Great-circle paths from P29VXX, in 10 degree intervals of heading.

With a QTH at 8 deg. South latitude, the polar axis of the great-circle was tipped 98 degrees with respect to the earth's geographic axis. That had a profound effect on the great-circle paths to areas with major concentrations of amateurs, like Wester Europe and North America. In particular, the paths were all in the mid-latitude range. But IV3PRK's remark suggested a finite length to the paths over which contacts with P29VXX were possible – nothing going as far as France, the British Isles or the Iberian Peninsula.

In looking at that map, I immediately noticed that there was a certain symmetry to the paths, those to the west towards Europe being quite similar to the ones to the east toward North America.

So, I sorted through the logs, identifying the 160-meter contacts with NA and looking for prefixes in Europe to the west of Italy. For the USA, I found 242 contacts, from the West Coast to the East Coast. Looking even closer, I found that contacts with P29VXX were made with 42 of the 48 states in the continental USA, and looking at the distances involved, the two extremes of the West Coast were at 10,700 km (Seattle) and 10,900 km (Los Angeles) while those on the East Coast were at 14,668 km (Maine) and 14,400 km (Florida).

Turning to European contacts, the distance from Udine, Italy, to P29VXX is 13,900 km. As indicated above, the logs showed only a few German contacts that might be at a greater distance. On checking, there were three contacts at greater distance, the furthest being DL0TU at 14,090 km. So, IV3PRK was not far from the mark, there was an upper limit to the distance for contacts in Europe with Papua New Guinea on this occasion

Actually, with the new precise database on PropLab Pro v.3, the distance between IV3PRK (JN66ne) and P29VXX on Misina is. appears to be 14,465 km. and that from DL0TU (JN67hu) in southern Bavaria is only 190 km. Incidentally, while 42 U.S. continental states were in the log, only 13 countries have been worked in whole Europe, East and West. But let's continue with NM7M paper:

In that regard, the path to DL0TU and IV3PRK as well as some other representative path from P29VXX are shown in Figure 2. That figure is a gnomonic projection in which all great-circles are straight lines and includes the position of the terminator at 20.20 UTC, sunrise in New Guinea. The paths shown are parts of the great-circles that are above 30 N latitude and clearly show the finite range to the contacts with Western Europe, paths falling short of Portugal (15,850 km to Lisbon) and Spain (14,400 km to Madrid). Paths to contacts with eastern locations in the USA, but at different times, are included for comparison.

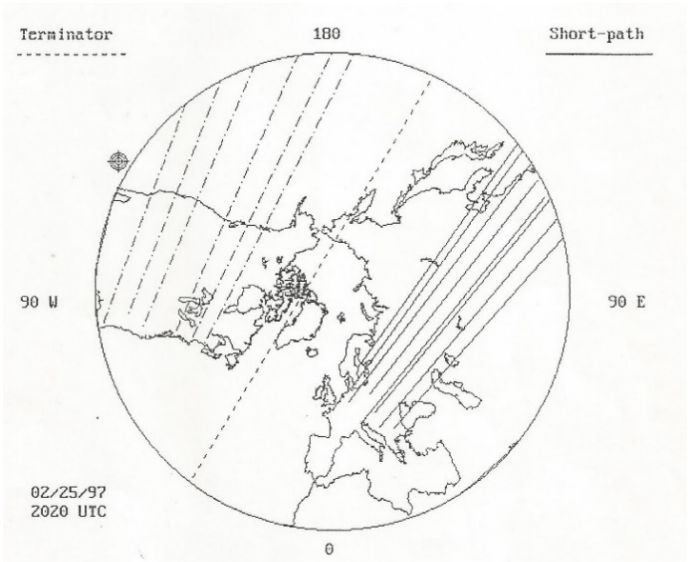


Figure 2 - A gnomonic projection of representative paths from P29VXX toward Western Europe. Only the portions of the paths poleward of 30 North latitude are shown.

The distance from P29VXX to the East Coast of NA is about 1,000 km shorter than that to the far reaches of Western Europe. But the paths to W. Europe ended a bit shorter of the limit of paths in the USA. So, we now turn to the question as to why the finite range of P29VXX signals, what factors were involved and what does this mean for DXing in general.

On finite range.

When making any sort of comparison, it should be noted that for DX contacts on 160 meters, two factors are involved: - signal strength and noise - or, in combination, - a S/N ratio. Thus, there is a minimum S/N ratio for a successful contact - if contacts are not made, then either the noise was too great for the signal strength, or the signal strength became too weak for the prevailing level of noise. Now it is difficult to determine details of the noise over an area the size of Western Europe, where the contacts were made with P29VXX. So, we have to assume that it was about the same over that broad region, man-made in origin, as noise of atmospheric origin would seem to be minimal in February.

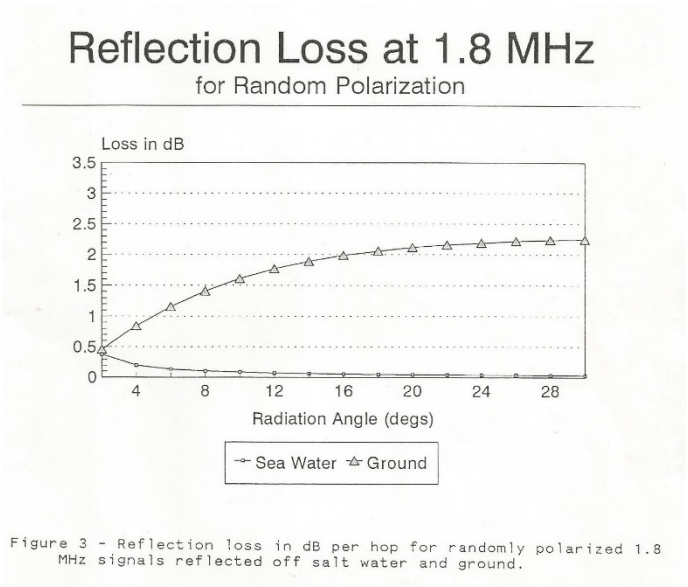


Figure 3 - Reflection loss in dB per hop for randomly polarized 1.8 MHz signals reflected off salt water and ground.

Turning then to signal strength, the first question is whether one group of paths or the other had any advantage or disadvantage. In that regard, the paths to the USA were over about 10,500 km of salt water, and then over ground the rest of the way. It was just the opposite for the paths to Europe, over salt water for about 3,500 km, and over ground the rest of the way. If one looks at the usual reflection loss properties for salt water and ground on 1.8 MHz, shown in Figure 3, the reflection losses for a ground surface are about 30 times greater over ground than salt water, for the typical radiation angles for DXing, thus favouring signals going toward the USA over those to Europe, if a comparable number of hops were involved.

Then, prof. Brown continues with deep analysis of the paths, involving gyrofrequency, path field angles and modified dip latitudes, elliptical and linear polarization in magneto-ionic theory… too much scientific stuff that can be read in the downloadable document. Figure 5 is one of the graphics examining the modified dip latitudes, point after point of ionospheric reflection, of several paths. The upper latitude limits of the two set of paths (Europe and North America) are essentially the same, 60 degrees, well below the aurora oval, out of harm's way.

In that regard, the magnetic activity was quiet (Kp = 1), and P29VXX worked a few stations in Sweden and Finland above 60 degrees, so auroral activity did not play a role. On the right, we see a PropLab Pro screenshot showing more clearly the 14,465 km path to P29VXX to IV3PRK at 20.00 z.

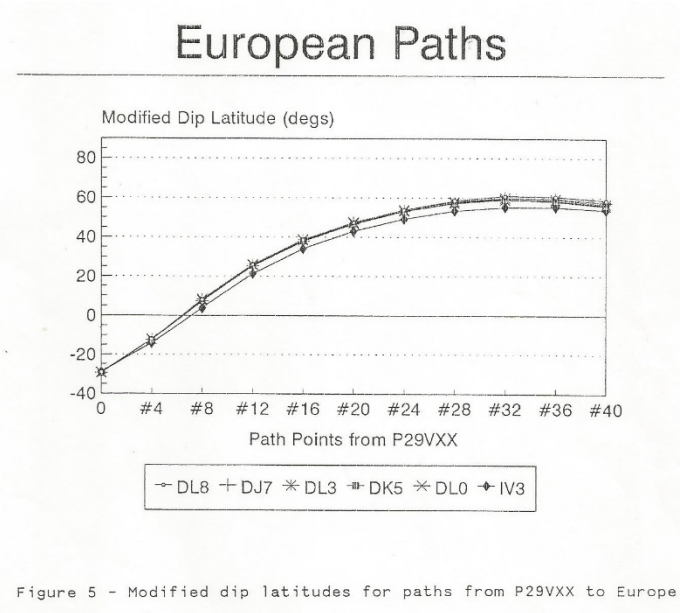
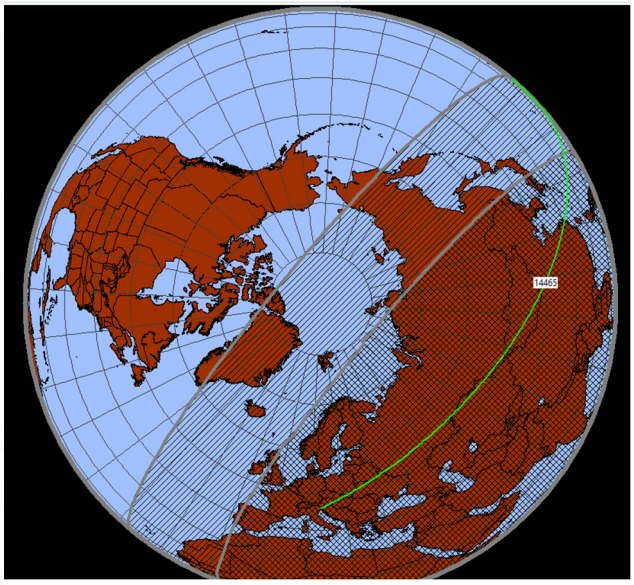


Figure 5 - Modified dip latitudes for paths from P29VXX to Europe



Due to a complicated field angles situation, prof. Brown concluded that, this time, ducting did not work on the path from P29VXX to Europe:

> In regard to signal ducting, there is a greater probability of that happening for paths with small angles with the field, the quasi-longitudinal approximation, and Figure 7 shows that would be the case for the locations (ME and MA) at higher latitudes in the USA… thus, there would be a significant chance for ducting at the start of the paths toward upper latitudes in the North America.
>
> Since the P29VXX logs showed that stations in the USA were making their contacts as the sunrise terminator was sweeping westward, there is the possibility of a dawn enhancement, signals dumped out of the duct by F-region tilts from solar heating at sunrise.
>
> In Europe, there was no such advantage, as Figure 2 shows the sunset terminator is well removed from the paths and there would be no F-region tilts to affect any signals that happened to be ducted toward Europe. Thus, no signal enhancement would be expected in the European area.

In other words, it was too late in Europe - three hours after sunset – and F-region ionization, necessary to keep signals trapped in the duct, had already vanished.

So, it was a typical multi-hop path with known reflection losses as stated in the title of prof. Brown article: "Reflections on 160 Meters. The Joys of Salt Water and the Sorrows of Ground"!

October 1997 – Revisited August 2025 Luis IV3PRK