A Zonal Analysis Approach to Transatlantic DX

by Mark Connelly

This article attempts to group Trans-Atlantic countries in a manner which will permit the DXer to recognise different types of openings and to utilise each type in the most efficient manner. This idea has been spotlighted in my earlier "Common Sense TADX Strategy" article and in articles in recent IRCA Foreign Logs. This article is an updated, more formal, version of previous works.

The paths from eastern North America to Europe and western Asia pass through an area which is often within the auroral oval. This doughnut-shaped absorption zone varies in size according to solar phenomena. The more northerly a route, the more likely it is to be rendered useless by absorption. Trans-Polar DX does occur, however; two different phenomena seem to permit it.

One is that a station skips in the "doughnut-hole" of the auroral absorption zone. The statements to follow refer to the north polar region. A normal skip may occur just south of the absorption zone, a subsequent normal skip occurs in the doughnut-hole, and the following skip occurs south of the auroral zone in the opposite hemisphere. Reception of Russians and other TA's by Brian Vernon in the Yukon appear to result from a first skip (heading out from Yukon) within the doughnut-hole and subsequent skips south of the absorption zone in the eastern hemisphere. His remarkable receptions are aided by high-gain Beverage aerials and by a lack of local stations.

A second type of Trans-Polar propagation involves "chordal-mode" propagation, sometimes referred to by hams as "grey-line" propagation. This enhancement occurs when the shortest great-circle path coincides with the sunset/sunrise line. In spring and autumn, sunset in the northeastern USA corresponds with sunrise in western China. When Wulumqi was on 1525 (clear of European QRM), the long-haul northeast US-to-west China route exhibited viability, especially in late September/early October. Chordal-mode skip is one theory offered by propagation analysts. The idea behind this is that reflective ionospheric layers are tilted at sunrise and sunset in such a way that a Trans-Polar signal bounces from a tilted (sunrise) layer in the eastern hemisphere just south of the auroral oval straight through the arctic region (under, and roughly parallel to, the layers in the region of highest absorption; the signal subsequently arrives at a tilted (sunset) layer just south of the absorption zone in the western hemisphere. From that point southward to the receiving site one or more additional normal skips could occur without excessive absorption.

Despite these Trans-Polar propagation possibilities, reception on far-north paths is generally much less reliable than that on routes farther to the south. Regularity of TA propagation to the east coast can be tagged to two parameters transcending individual station-power and interference-factor considerations: these parameters are the great-circle bearing, specified in degrees east of true north, and the great-circle distance. Based upon years of loggings, it can be stated that TA stations from due north (0°) to 40 (E of N) are usually absorbed by the auroral zone and they offer little chance of reception. They may be heard during periods of low sunspot activity and prolonged auroral "quiet" (several days of low A & K indices). Apparent chordal-mode trans-polar receptions seem to occur for high-band stations on bearings from 0° to 20° at a distance of 5500 to 6500 miles/8855-10465 km. In the table to follow, these are "zone 5F" stations.

In medium-wave TA propagation, the closer the station is to you, the more often you will hear it, if all other factors (power, bearing, freq., band cx., QRM, etc.) are equal. The possible exception is on polar paths (zone group 5 in the table): stations in the 5500-6500 mi. range may do better than closer signals because of the special-case Trans-Polar modes discussed previously.

Based upon loggings, receptions on most bearings of TA stations located farther than 6500 mi./10465 km. from the US listener are exceedingly rare. This is partially due to the high amount of absorption on such a long route (especially if much of the route is over land); also it results from co-channel interference from closer TA's. However, if South Africa had a megawatt coastal station on a good high-band split, it would have a fighting chance to get to the US because of a clear water-path and a very southerly route, far from the auroral oval. Moderate AU CX could block out co-channel Europeans & North Africans, thereby clearing the channel. Pete Taylor's recent receptions of American stations from South Africa demonstrate the viability of this long-haul path. South Africa is 7820 mi./12590 km. from NA., at a bearing of 105°.

The table at the end of this article arranges TA countries into zones, based upon bearing and distance from an eastern Massachusetts QTH (G. C. 70.22°W./41.68°N.). This table should be of general usefulness to DXers living between Virginia and Nova Scotia; this region encompasses the great eastern industrial megalopolis from which most TA DX reports emanate. For those outside this area, TA zone tables may be prepared in the same manner by ordering a set of great-circle bearing & distance charts from a computer service. These services advertise in QST and other hobby publications; you will have to supply the service your home geographical coordinates. In my table, zones are specified by a number which refers to the bearing and by a letter referring to distance.

Group 1 refers to stations on the most southerly TA bearings, from 90° to 140°. These stations may be heard best during moderately-auroral conditions when the more-numerous Europeans are eliminated and domestic skip is weakened: a typical night will have these Africans in at US sunset, followed by good Latin American conditions. To wit, Dakar - 765 and Surinam - 725 are often heard well at the same time, indicating similar characteristics of favourable propagation modes. The Africans may be heard again in the late evening/early morning as many of them sign-on just before their local sunrise times. Senegal - 765, Mauritania - 1349, and Guinea - 1404 lead the way. If these are strong and Europeans aren't in, you have auroral cx. favourable for the further pursuit of African DX targets. You might check for Gambia - 648, Sierra Leone - 1205 (or 1206), Benin- 1475, Togo - 1502 (or 1503), Gabon - 1554, Ivory Coast - 1493, and Upper Volta - 747. Historically, the spring months have provided the best openings. A coastal site, phased Beverage aerials, and low levels of electrical noise/local station QRM are advisable to "milk" sunset AU CX African openings effectively. Mike Dunn, in his DXing from Nova Scotia in the mid-70s, raised the pursuit of African DX to the status of an art and a science.

Group 2, stations on bearings of 70° to 90°, are fairly consistent, but they can be knocked out by the type of auroral cx. which kills domestic skip. The big Portuguese stations on 666, 719, 756, 782, 1035, 1061, and 1578 are your propagation beacons to zones 2A to 2D. Also check the powerhouse Moroccans on 612, 819, 828, 936, & 1044. Many of the Portuguese and Moroccan stations come in loud & clear on car radios & Realistic TRF's at Massachusetts beachfront locations around sunset. Sudan on 1296 (very rare) signals the potential for other exotic east African DX (zones 2E to 2H).

Group 3, 55° to 70° east of due north, is comprised of stations which are slightly less consistent than those in group 2. These will be heard on nights when domestic medium skip is strong (e. g. WIS strong in Boston or in Washington). The closer-in Group 3 stations are quite consistently heard at east coast sunset (before stateside QRM builds up) and then again at European sunrise. There are many high-powered stations here, some of which can be considered as 'regular' in the eastern USA. Tune for: Algeria - 531, 549; Andorra - 819; France - 711, 792, 837, 864, 945, 1161, 1206, 1377, 1494, &1557; Albania - 1089, 1215, 1395, 1458; Italy - 846, 1062, 1332, & 1575; Monaco-1467; Spain - 585, 639, 684, 738, 774, 855, 1224; Tunisia - 1566; Austria - 1476; and Malta - 1557. If many of these are strong, longer paths may be viable. Israel on 738 may show during fades on the Spaniard. Libya on 827 should be noted hetting Morocco - 828; the 1125 outlet might be heard. Egypt - 1107 has occasionally been noted at sunset on Cape Cod with AA chanting at good levels. Switzerland sometimes over-rides the powerhouse 1566 Tunisian.

Group 4: The vagaries of propagation are much more apparent when we deal with this group of stations, on bearings from 40° to 55°. Paths are frequently impeded by the auroral oval: many nights are "marginal" with only the superpowered higher-frequency (e. g. 1521, 1593) stations making it through, often with very fluttery/fadey signals. "Good" openings to this area occur about 3 days a month from August to March, less frequently from April through July. Auroral blanketing is sometimes total: even the 1593-type juggernauts don't make it. European dawn has traditionally provided better reception than North American sunset & early evening. You might want try for the following: Ireland - 567; Belgium - 927; Czechoslovakia - 1098, 1233, 1287, 1521 ; Denmark - 1062, 1431; Sweden-1179; East Germany - 783, 1044, 1559, 1575; West Germany - 1017, 1197 (VOA), 1269,

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1422, 1539, 1593; Great Britain - 648, 693, 882, 909, 1053, 1089, 1215, 1296 and 1458; Holland - 747, 1008; Luxembourg - 1440 (dissectible from the domestics during top-notch cx.); Bulgaria - 747; Hungary - 1188; Turkey-1017; Poland - 1368, 1503; Romania - 1152; Vinnitza, USSR - 1548; Yugoslavia - 1134, 1143; Saudi Arabia - 1521 (remarkably loud for the distance); and Lebanon - 836 or 837. If many of these stations are strong, you have an excellent opening - a comparatively rare event. Given this, it would be wise to seek out rarer DX, such as low-powered British locals or exotic catches like Iraq - 1035, Qatar - 954, United Arab Emirates - 1481, and Oman - 1413 (BBC relay). These have all been heard in North America, primarily at Bill Bailey's Phased Beverage Farm in Holden, MA. and at Brian Vernon's Yukon Beverage site.

Group 5 stations, from due north (0^o) to 40^o E. of N. , are generally blanked by the absorption of the auroral oval. The chordal-mode and doughnut-hole mode discussed earlier are the exception. What we conceive of as "normal mode propagation" can occur during very prolonged periods of auroral "quiet" when the oval is at its smallest size. Enhanced high-latitude TA cx. often precede a major geomagnetic "blow-out". The mechanism at work seems to be that during a solar upheaval, radiation travelling at the speed of light enhances DX for a few days before more-slowly-moving ionised matter reaches Earth's ionosphere. As soon as the matter hits reflective layers, auroral absorption with a vengeance begins and most TA DX is wiped out. If many of the stations in Group 4 are booming in (especially Sweden - 1179), more northerly paths may be open. Norway - 1514; Greenland - 1425; & USSR - 801, 1386 should be checked. You are a very lucky DXer indeed if you get an opening good enough to hear these with readable audio. Other Russian & Scandinavian stations might be heard. Zones 5E to 5H might not be as good under these super cx. as they might be at a time of greater geomagnetic disturbance when special-case Trans-Polar propagation modes (e. g. chordal) are operative.

The author hopes that this article will spur DXers in other TA-active areas (such as Florida/Caribbean islands and far-northern Canada), experiencing considerably-differing propagation, to write similar articles.

Zonal-analysis chart for TA DX countries from an eastern MA. QTH

	A < 2500mi < 4025km	B 2500-3250mi 4025-5232km	C 3250-4000mi 5232-6440km	D 4000-4750mi 6440-7647km
5 0^o-40^o	Greenland Iceland	-	Finland Norway USSR Tallinn n. Sweden	USSR Moscow Arkhangelsk Riga Vilnius
4 40^o-55^o	-	Ireland	Belgium Czechoslovakia Denmark E. Germany W. Germany Great Britain Holland Luxembourg Sweden	Bulgaria Poland Hungary Romania Yugoslavia USSR Kiev Minsk
3 55^o-70^o	-	-	Algeria Andorra France Monaco Spain Switzerland	Albania Austria Greece Italy Libya Malta Sicily Tunisia
2 70^o-90^o	Azores	Canary Is. Madeira Is. Morocco Portugal	Gibraltar	-
1 90^o-140^o	-	Cape Verde Is.	Gambia Guinea-Bissau Mauritania Senegal	Guinea Rep. Ivory Coast Liberia Mali Niger Sierra Leone

	E 4750-5500mi 7647-8855km	F 5500-6500mi 8855-10465km	G 6500-8000mi 10465-12880km	H > 8000mi > 12880km
5 0^o-40^o	USSR Sverdlovsk Tbilisi Zhigulevsk	Mongolia China Wulumqi USSR Alma-Ata Ashkhabad Dushanbe Frunze Irkutsk Tashkent	Afghanistan Bangladesh Bhutan India Nepal Pakistan Tibet	Indonesia Jakarta Burma Christmas Is. Khmer Rep. Laos Malaysia Singapore Sri Lanka Thailand
4 40^o-55^o	Lebanon Syria Turkey USSR Yerevan	Bahrain Iran Iraq Kuwait Saudi Arabia USSR Baku	Oman Qatar United Arab Emirates	Maldives
3 55^o-70^o	Cyprus Egypt Israel	Jordan	Djibouti Ethiopia Yemen Rep. Yemen PDR	Seychelles
2 70^o-90^o	Chad	Central African Rep. Sudan	Burundi Kenya Rwanda Somalia Tanzania Uganda	Comoro Rep. Malagasy Rep. (Madagascar) Mauritius Reunion
1 90^o-140^o	Ascension Is. Benin Equatorial Guinea Ghana Nigeria Togo Upper Volta	Angola Cameroon Congo Rep. Gabon São Tomé St. Helena Zaire	Botswana Lesotho Malawi Rhodesia (Zimbabwe) South Africa Swaziland Tristan da Cunha Zambia	Mozambique