95.7 W239CM Morgantown, WV (5)
96.5 W243EB Coudersport, PA (6)
96.7 W244CH Rockton, PA (7)
96.7 W244DX Erie, PA (8)
96.7 WLLF Mercer, PA
96.9 W245CZ Altoona, PA (9)
97.5 W248DJ New Castle, PA (10)
97.5 WDDH Saint Mary's, PA
98.1 W251CL Franklin, PA (11)
99.3 W257EA Beaver Falls, PA (12)
99.7 W259DC Du Bois, PA (7)
99.7 W259DG Altoona, PA (13)
100.1 W261AX Pittsburgh, PA (14)
100.7 W264BZ Tyrone, PA (9)
100.7 W264DK Meadville, PA (15)
100.9 W265DI Punxsutawney, PA (16)
101.1 W266CZ Homer City, PA (17)
101.1 W266DB Uniontown, PA (18)
101.3 W267CM Johnstown, PA (19)
103.1 W276DQ Cumberland, MD (20)
103.5 W278CR Somerset, PA (21)
103.7 W279DK State College, PA (22)
103.9 W280EW Wheeling, WV (23)
104.3 WNAE Clarendon, PA
104.5 W283CR Morgantown, WV (24)
104.5 W283DH New Martinsville, WV (1)
105.3 W287DC Titusville, PA (25)
107.5 W298CM Bradford, PA (26)
107.5 W298CW Butler, PA (27)
107.5 W298DH Latrobe, PA (28)

Notes: * denotes Pirates' list has old call WNTJ, ** denotes Pirates' list has old call WNTI, # denotes Pirates' list has old call WVAM, ## denotes Pirates' list has old call WQWK, **Relays:** 1) WETZ 1330, 2) WRVC 930, 3) WKAZ 680, 4) WMBA 1460, 5) WMMN 920, 6) WFRM 600, 7) WCED 1420, 8) WJET 1400, 9) WTRN 1340, 10) WJST 1280, 11) WFRA 1450, 12) WBVP 1230, 13) WTNA 1430, 14) **KDKA 1020**, 15) WMGW 1490, 16) WECZ 1540, 17) WCCS 1160, 18) WMBS 590, 19) WKGE 850, 20) WCBC 1270, 21) WGGI 990, 22) WLEJ 1450, 23) WBBD 1400, 24) WAJR 1440, 25) WTIV 1230, 26) WESB 1490, 27) WISR 680, 28) WCNS 1480

SAINT LOUIS CARDINALS John Rooney, Rick Horton, Mike Claiborne, Joe Pott, Web: **mlb.com/cardinals/**

AM
680 WMFS Memphis, TN
730 WFMW Madisonville, KY
740 WVLN Olney, IL
790 WMC Memphis, TN
800 KAGH Crossett, AR
870 WTIM Assumption, IL
870 KAAN Bethany, MO
900 KHOZ Harrison, AR
980 KSGM Chester, IL
990 KRMO Cassville, MO
1000 WHNY Paris, TN
1010 WORM Savannah, TN
1050 KSIS Sedalia, MO
1070 KHMO Hannibal, MO
1120 KMOX Saint Louis, MO
1220 KJAN Atlantic, IA
1230 WHCO Sparta, IL
1230 WJBC Bloomington, IL
1230 KZYM Joplin, MO
1230 WBBZ Ponca City, OK
1240 KTLO Mountain Home, AR
1240 KWAK Stuttgart, AR
1240 WTAX Springfield, IL
1240 KNEM Nevada, MO
1250 KBTC Houston, MO
1280 KCOB Newton, IA
1290 WIRL Peoria, IL
1310 KOKX Keokuk, IA
1310 WDXI Jackson, TN
1340 WSOY Decatur, IL
1340 WNBS Murray, KY
1340 KSMO Salem, MO
1340 KXEO Mexico, MO
1360 KFFA Helena, AR
1390 KCRC Enid, OK
1400 WGIL Galesburg, IL
1400 KREF Norman, OK
1400 KWON Bartlesville, OK
1420 WINI Murphysboro, IL
1430 WYMC Mayfield, KY
1450 WAOV Vincennes, IN
1450 KIRX Kirksville, MO
1450 KWPM West Plains, MO
1450 KGFF Shawnee, OK
1460 WROY Carmi, IL
1490 WDAN Danville, IL
1500 KPGM Pawhuska, OK
1540 WSMI Litchfield, IL
1550 KAPE Cape Girardeau, MO
1570 WTAY Robinson, IL
1570 WTRB Ripley, TN
1580 KTGR Columbia, MO

FM
92.3 KSAR Salem, AR
92.5 KPPL Poplar Bluff, MO
92.7 KCON Villonia, AR
92.9 W225CX Staunton, IL (1)
92.9 WSEI Olney, IL
92.9 WMFS-FM Bartlett, TN
93.3 W227ED Fairfield, IL (2)
93.3 WPBG-HD3 Peoria, IL
93.3 WQTY Linton, IN
93.3 K227DO Keokuk, IA (3)
93.3 K227CQ Bartlesville, OK (4)
93.5 W228DP Carbondale, IL (5)
93.5 WSJK Tuscola, IL
93.7 W229BO Galesburg, IL (6)
93.9 WTAX-FM Sherman, IL
93.9 W230BQ Bruceville, IN (7)
93.9 W230BN Mayfield, KY (8)
93.9 KSSZ Fayette, MO
94.1 WMIX-FM Mount Vernon, IL
94.1 K231BM Poplar Bluff, MO (9)
94.3 W232DC Robinson, IL (10)
94.3 KATI California, MO
94.9 K235CE Harrison, AR (11)
95.1 KMAQ-FM Maquoketa, IA
95.1 K236CT Pawhuska, OK (4)
95.5 KAAN-FM Bethany, MO
95.7 K239CQ Cape Girardeau, MO (12)
95.7 K239CU Salem, MO (13)
95.9 KWHF Harrisburg, AR
95.9 W240DM Peoria, IL (14)
95.9 KCOB-FM Newton, IA
95.9 WGKY Wickliffe, KY
96.1 W241CF Taylorville, IL (15)
96.1 K241CK Cape Girardeau, MO (16)
96.7 KOKR Newport, AR
97.3 W247CP Sparta, IL (17)
97.3 W247CZ Washington, IN (7)
97.3 KYRX Marble Hill, MO
97.5 WBBA Pittsfield, IL
97.5 KNMO Nevada, MO
97.5 KOEA Doniphan, MO
97.7 WHET West Frankfort, IL
97.7 W249DC Vincennes, IN (7)
97.7 WREF Sebree, KY
97.9 W250CK Murray, KY (18)
97.9 KBXB Sikeston, MO
98.5 WQKZ Ferdinand, IN
98.5 KWKJ Windsor, MO
98.7 K254CR Saint Louis, MO (19)
98.9 WHQQ Neoga, IL
99.1 KMA-FM Clarinda, IA
99.1 WCBL-FM Grand Rivers, KY
99.1 K256CP Bartlesville, OK (20)
99.3 KASR Atkins, AR
99.3 K257DA Norman, OK (21)
99.3 WZLT Lexington, TN
99.7 K259BF Kirksville, MO (22)
99.7 KTTR-FM Saint James, MO
99.9 K260DP Nevada, MO (23)
99.9 KIRK Macon, MO
100.3 KURM-FM Gravette, AR
100.3 KUKU Willow Springs, MO
100.5 KMEM Memphis, MO
100.9 K265FE Shawnee, OK (24)
101.1 K266AN Atlantic, IA (25)
101.3 WMSK Sturgis, KY
102.1 W271DC Bloomington, IL (26)
102.3 WEBQ-FM Eldorado, IL
102.3 WRMJ Aledo, IL
102.5 KEZK-HD2 Saint Louis, MO
103.3 W277DB Decatur, IL (27)
103.7 K279AP Bethany, MO (28)
103.7 KJEL Lebanon, MO
104.1 KPOC-FM Pocahontas, AR
104.3 KDBB Bonne Terre, MO
104.7 W284DD Danville, IL (29)
104.7 KRES Moberly, MO
104.7 WHNY-FM Henry, TN
104.9 KAGH-FM Crossett, AR
104.9 W285FL Ripley, TN (30)
104.9 KYTN Union City, TN
105.1 WGEM Quincy, IL
105.1 K286CK West Plains, MO (31)
105.1 K286CL Columbia, MO (32)
105.5 WREZ Metropolis, IL
105.7 K289CK Houston, MO (33)
105.9 WOKZ Fairfield, IL
106.5 KTMO New Madrid, MO
106.7 WMVI Mount Vernon, IN
106.9 W295BQ Litchfield, IL (1)
106.9 KUDV Bloomfield, IA
107.1 WEAI Lynnville, IL
107.5 W298CD Shelbyville, IL (15)
107.7 W299CN Madisonville, KY (34)*
107.9 W300EH Assumption, IL (15)

Note: * denotes Cardinals' list has old frequency 94.9 MHz, **Relays:** 1) WSMI 1540, 2) WROY 1460, 3) KOKX 1310, 4) KWON 1400, 5) WINI 1420, 6) WGIL 1400, 7) WAOV 1450, 8) WYMC 1430, 9) KOEA 97.5, 10) WTAY 1570, 11) KHOZ 900, 12) KAPE 1550, 13) KSMO 1340, 14) WIRL 1290, 15) WTIM 870, 16) KYRX 97.3, 17) WHCO 1230, 18) WNBS 1340, 19) **KMOX 1120**, 20) KPGM 1500, 21) KREF 1400, 22) KIRX 1450, 23) KNEM 1240, 24) KGFF 1450, 25) KJAN 1220, 26) WJBC 1230, 27) WSOY 1340, 28) KAAN 870, 29) WDAN 1490, 30) WTRB 1570, 31) KWPM 1450, 32) KTGR 1580, 33) KBTC 1250, 34) WFMW 730

LOS CARDENALES DE SAN LUIS Polo Ascencio, Bengie Molina, Web: **mlb.com/cardinals/**

AM
880 WIJR Highland, IL
990 WITZ Jasper, IN
1520 KRHW Sikeston, MO

FM
92.9 KWRH-LP Webster Groves, MO
94.9 K235CY Sikeston, MO (1)
97.7 KQMO Shell Knob, MO
98.9 K255AW Sikeston, MO (1)
99.1 W256DA Jasper, IN (2)
102.9 KXOK-LP Saint Louis, MO

Note: Only home games are aired. **Relays:** 1) KRHW 1520, 2) WITZ 990

It's quite a surprise to see more and more professional sports teams keeping information on where to hear their games on AM and FM radio off their Web sites. It's been especially shocking to see most NFL teams keeping that information from the public, especially us DXers. These lists help us identify what we're hearing. Do we really have a right to know that information? In the next edition, the radio listings from the American League West and National League West will be featured. 73 and play hard from the Florissant Valley Dial Twister.

IRCA TECHNICAL COLUMN – *Nick Hall-Patch – 1538 Amphion St – Victoria BC Canada V8R 4Z6*

nhp@ieee.org

(ed. note: the first part of this article appeared in DX Monitor of April 20 2024, but more detail is included here, along with further developments. Thanks to David for this.)

Peak Signal Strength of MW Stations Received Along the Path of the 2024 Solar Eclipse

by **David Kingsley**, Stanford California USA, **davidk56@gmail.com**

Inspired by Joe Rao's Sky and Telescope article earlier this year on tracking the total eclipse by AM radio, I carried out a low-tech radio observing project for the total solar eclipse in North America on Monday April 8 2024. Rather than scanning for everything I could hear from my location, I was particularly interested in whether DX signals peak when totality is centered over a transmitter location, a receiving location, or somewhere in between. Previous accounts on this issue differ. See for example, Ruth Bamford's nice write-up from a large UK radio observing campaign of the 1999 total eclipse in Europe, which reported that the best reception may usually occur when totality was located over a distant transmitter, rather than over an observer or somewhere in between (see Table 2 and

discussion in RADIO AND THE 1999 UK TOTAL SOLAR ECLIPSE, **https://arxiv.org/pdf/1703.01491.pdf**). In referring to another document, IRCA Reprint **G-096**, observations differed, but it should be noted that the transmitter and receiver locations in that report were located on opposite (and pretty distant) sides of the line of totality, with neither the transmitter nor the observing stations ever fully eclipsed. In contrast, my listening geometry in 2024 was to be within and parallel to the line of totality, so totality would travel over all of the transmitting stations and the receiver station in succession.

For my experiment, I traveled to Morrilton, Arkansas (35.1769499 N, -92.7433297 W), which would provide over 4 minutes of totality and a chance to listen in both directions as the eclipse swept across the USA. I brought a simple Grundig Eton Executive Traveler III portable radio (no external antenna), and used both my ear and the radio's digital dBu readouts for signal detection. When we arrived in Morrilton on Sunday April 7, I oriented the small portable radio to face the direction of the eclipse path, and compared reception scans across the AM band in the late afternoon Sunday, Sunday night, and again Monday morning.

Because of the relatively low radio clutter in central Arkansas, I was pleased to find many distant stations that were clearly detectable from Morrilton only after dark, and had no competing signals during the day. I then chose five 50kW stations strategically located along the path of totality that I could monitor as the eclipse approached and receded. Two stations would experience totality before my own location (in the southwest direction in Texas), and three stations that would experience totality after my location (in the northeast direction in Missouri, Kentucky, and Ohio).

In geographic order along the line of totality, my five strategic stations were:

- WOAI 1200 San Antonio TX (located 503 miles from Morrilton to the southwest, with a mid-eclipse time 17 minutes earlier than me at 1835 UTC)
- WBAP 820 Dallas TX (310 miles to the southwest, mid-eclipse time 11 minutes earlier at 1841 UTC)
- KMOX 1120 St Louis MO (287 miles from Morrilton to the northeast, mid-eclipse eight minutes later than me at 1900 UTC)
- WHAS 840 Louisville KY (458 miles to the northeast, mid-eclipse time 15 minutes later at 1907 UTC)
- WCKY 1530 Cincinnati OH (523 miles to the northeast, mid-eclipse time 17 minutes later at 1909 UTC).

I stored each of these 5 channels in Eton memory registers, and could then quickly toggle between the preset channels every two to five minutes before and after my local eclipse in Arkansas (mid-totality at 1852:39). None of the five stations were detectable initially on eclipse day, including during a full hour of partial phase observing in Morrilton (1733 to 1840 UTC). However, each of the five channels then came up in the expected geographic sequence, first San Antonio only at 1842 UTC (10 minutes before Arkansas mid-eclípse), then Dallas, then St Louis, then Louisville, then Cincinnati, before everybody was back to background levels by 1920 UTC (see **Figure 1**)

A few simple observations from this fun radio observing run during the eclipse:

- The time of "first audibility" was NOT when totality was located directly over the broadcast site, but somewhere in between the broadcast and receiving site. For example, I couldn't hear San Antonio or Dallas in Morrilton until about 7 or 8 minutes after totality had passed beyond each of the respective broadcast locations to the southwest. Similarly I began to hear Louisville and Cincinnati about 11 minutes before their own respective mid-eclipse times to the northeast. Thus in both directions from my location, increased reception was when totality was somewhere between transmitter and receiver, not when totality was centered over one of the other.
- The period of increased reception for individual stations lasted about 10 to 20 minutes, with the earlier eclipse stations located to the southwest already returning to background when the later eclipse stations to the northeast were still being received.
- The rise in signal for each station during the eclipse was 20-25 dBu units on the Eton display. Since every 6 dBuV units corresponds to a two-fold increase in signal strength, this corresponds to an 8 to 16 fold overall increase in signal measured by the internal electronics of my convenient little travel radio. (For comparison, each 6 dBu change corresponds to a one unit change on traditional S-meters of other radios).
- Despite the very different geometries either along (2024) or on opposite sides of totality (2017), the conclusion that the DX signal peak occurs when eclipse maximum is at a position intermediate between transmitting and receiver stations is similar. I look forward to additional reports from 2024, when everyone has had time to dig through their much more sophisticated scans and recorded radio data from the April 8 2024 eclipse.

During the eclipse, volunteers from HamSCI (**https://hamsci.org/eclipse**) at various locations in six countries were recording the medium wave band using software defined radios. Among the participants in HamSCI's MW Recordings Event was Scott Newell, N5TNL, in Fort Smith AR, about 100 miles west of Morrilton, who made SDR recordings using an RX888 and random wire antenna, so it was possible to generate his data's take on these observations (see **Figure 2,** kindly prepared by Nick Hall-Patch in the same format as **Figure 1**). This looks generally quite similar to the Morrilton observations, although of course with a much higher sampling rate, yielding much more detailed traces of signal strength variations. The Fort Smith and Morrilton results look gratifyingly very similar, and I'm actually somewhat surprised the high tech and low tech methods correspond as well as they do.

You may notice in **Figure 1** that WCKY-1530 from Cincinnati has much higher background than the other channels I monitored. That's because of competition from KXTD-1530, a 5 kW daytime-only Spanish language station in Wagoner OK that is located to the west of both Fort Smith and Morrilton in Arkansas. I was still able to see the transient peak from WCKY Cincinnati by orienting my Eton radio NE towards the eclipse line, minimizing but not eliminating the signal from the Oklahoma daytimer. But I might have missed Cincinnati (or chosen a different target) if I had been 100 miles closer to this competing channel in Oklahoma.

The Fort Smith data shows a number of carriers, but the one that faded up before WCKY did (see **Figure 3**) with Spanish talk about beisbol had the offset of KGBT, a Spanish sports 50 kw station in Harlingen TX, near the Mexican border. In addition, that carrier peaked at 18:45UT in Arkansas, about five minutes before San Antonio's WOAI-1200 peaked there. The eclipse reached local maximum in Harlingen at 1830 UTC, about five minutes before mid-eclipse in San Antonio at 1835 UTC. So if the ID's are right, KGBT also came up in the expected geographic order, and at a time that was again intermediate between mid-eclipse maximum at the transmitter and the receiver.

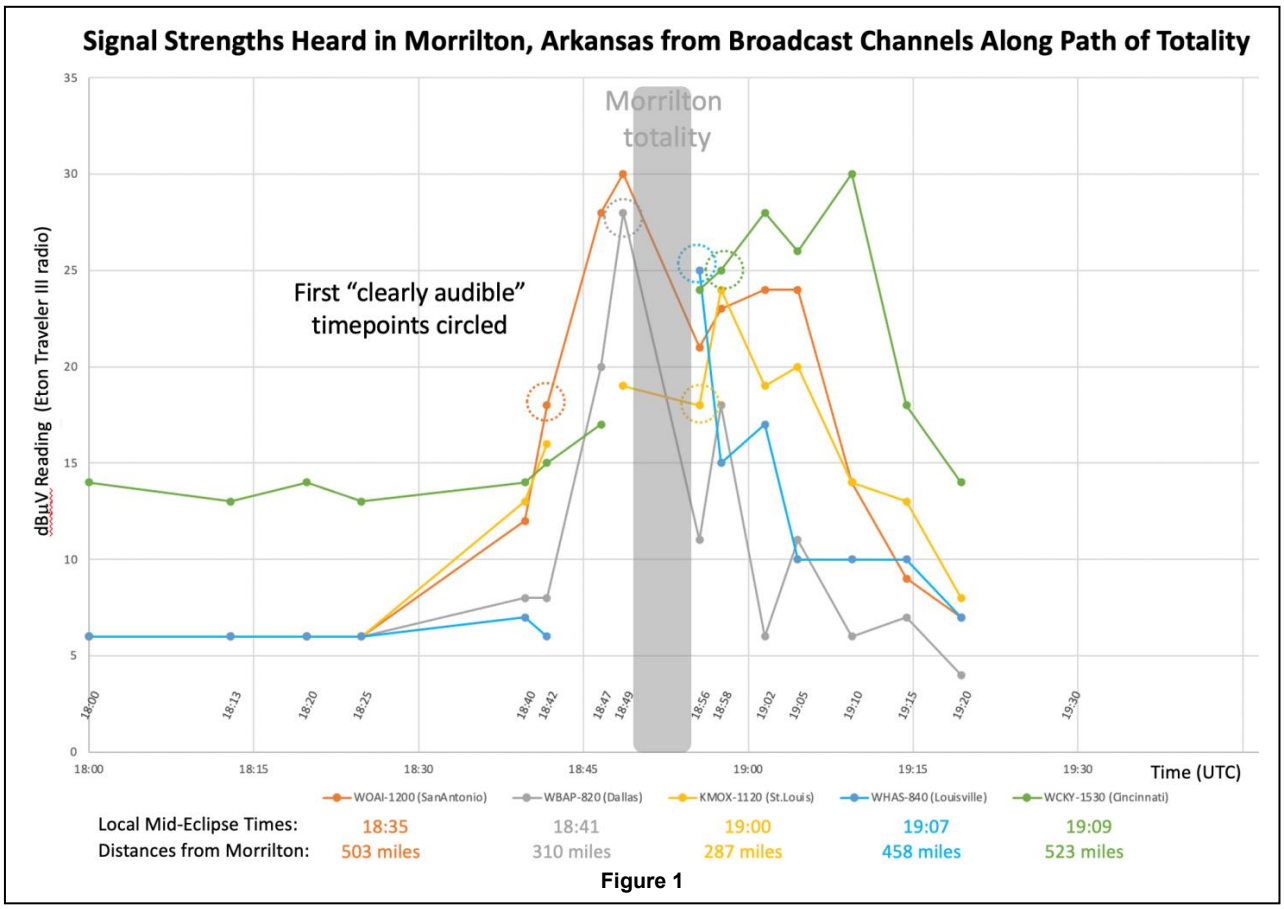

Figure 1

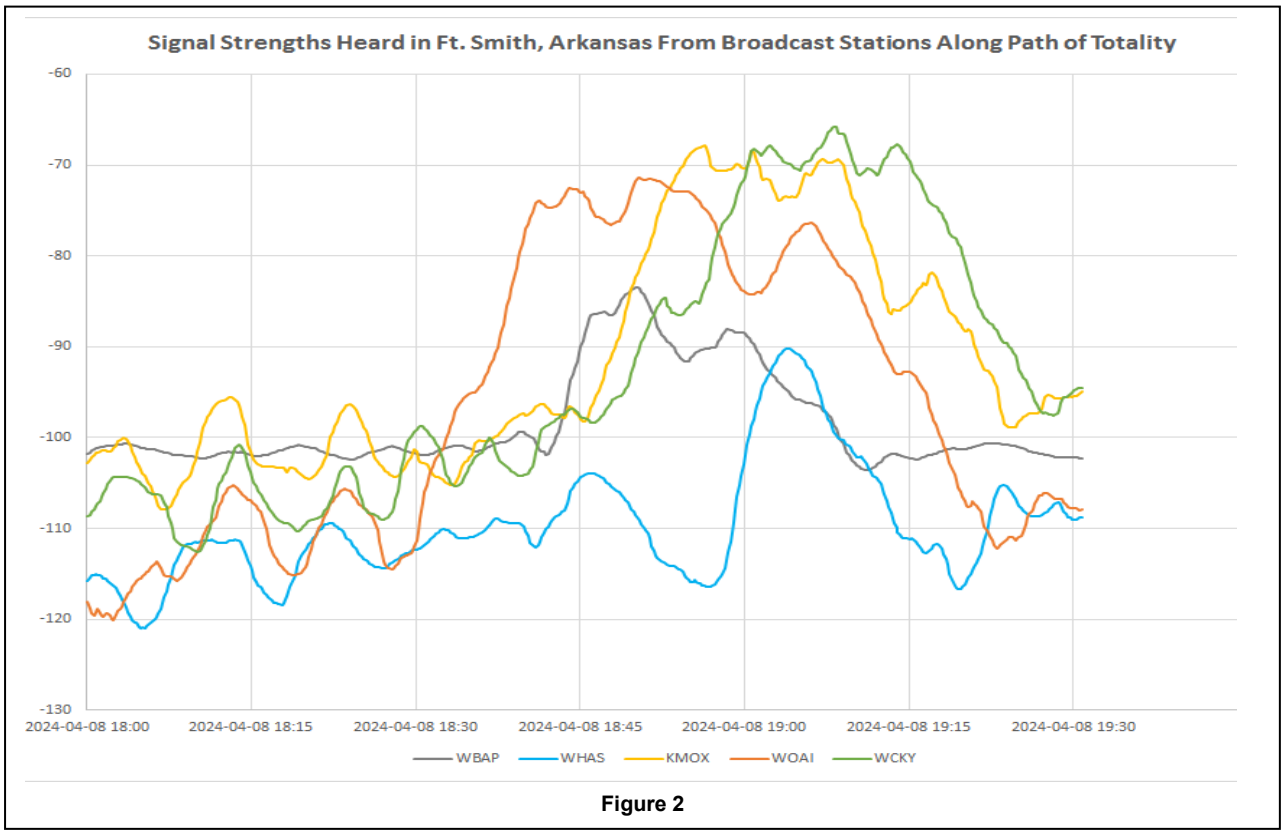

Figure 2

The biggest difference between the two data sets is probably WHAS-840 Louisville (blue line). The Ft Smith record shows 840 apparently DIPPING before 1900 UTC, whereas as at Morrilton, I already detected 840 as audible at 1856 UTC, and clear by 1858 UTC. Morrilton's position 100 miles east of Fort Smith does put Morrilton in a better position to receive signal from Louisville. But I'm still somewhat surprised by an apparent dip in the SDR record for this channel at the Fort Smith pre-19:00 UTC time points.

The major geographic order of signals is clear in both datasets, with San Antonio, Dallas-Ft Worth, St Louis, Louisville and Cincinnati peaking in the same temporal sequence as the path of totality, rather than all peaking at the same time that totality occurred in Arkansas. That's one of the main effects I was interested in, and both data sets also show that the rise and peak times are intermediate between transmitter and receiver.

I also think that it's interesting that both data sets also have evidence for a secondary hump that occurred about 10 minutes after totality in Arkansas. I had seen this earlier for the 1200 "San Antonio" trace, which had fallen in strength at Morrilton immediately after totality (1856 UTC observation), before rising again slightly afterward (1902-1905 UTC). For me the secondary hump had audio evidence of "doubled voices" and "jumbled mess", so I thought was likely due to additional reception coming from other 1200 transmitters. Interestingly, I see some evidence for a secondary hump in the 820 Hz frequency (grey, Dallas-Ft Worth), and 840 frequency (blue, Louisville) from the Morrilton graph as well. And in the Fort Smith SDR recordings, MOST of the channels also show a secondary peak between 1900 and 1910 UTC.

Thus, I now think there are maybe two different things going on:

1) A geographic sequence driven by the time that totality is located somewhere between transmitter and receiver station, giving rise to a corresponding geographic sequence in the order that signals first arise and peak at a particular receiver location.

   AND

2) An additional effect from general decay of the ionosphere around the location of the receiver station, which is maximized in the period shortly after totality. Presumably, the D layer is falling throughout the accumulated time between first and third contact, including the complete loss of sunlight during totality. As the sun begins to shine again after 3rd contact, the D layer must begin to recover, but perhaps with a short time delay.

If both effects are happening, you would have both a geographic sequence of rises and peaks along path of totality for individual traces, but then also a more general "secondary hump time" for the receiver data taken at a given location, seen across many different channels, until the D layer begins to recover. If that is true, a bunch of other frequencies that I was not monitoring at Morrilton might show a shared time of increased reception during the secondary hump. I would be interested to hear if evidence is found of BOTH of the geographic and secondary hump patterns in the rest of the Fort Smith or other HamSCI data.

(ed. note: Note that you can now actually go look for patterns in the data yourself. The Carrier Sleuth file that contains the1530 signal strength data illustrated in **Figure 3 is available to download** and contains pages from every medium wave channel as observed during the eclipse at Fort Smith AR. It's 270 MB in size, so be prepared for a wait if your link is slow. If you don't own Carrier Sleuth, you can get an evaluation copy from **https://www.blackcatsystems.com/software/medium_wave_carrier_display_app.html** . The data in this file is not just in pictorial form, because you can also right click on individual carriers, and generate a signal strength versus time plot for that carrier, or you can save a carrier or carriers to a CSV file, which can allow you to generate signal strength charts in MS Excel or other programs, similar to what is seen in **Figure 2**. IRCA Reprint **T-104** or the Carrier Sleuth help file will give the details.

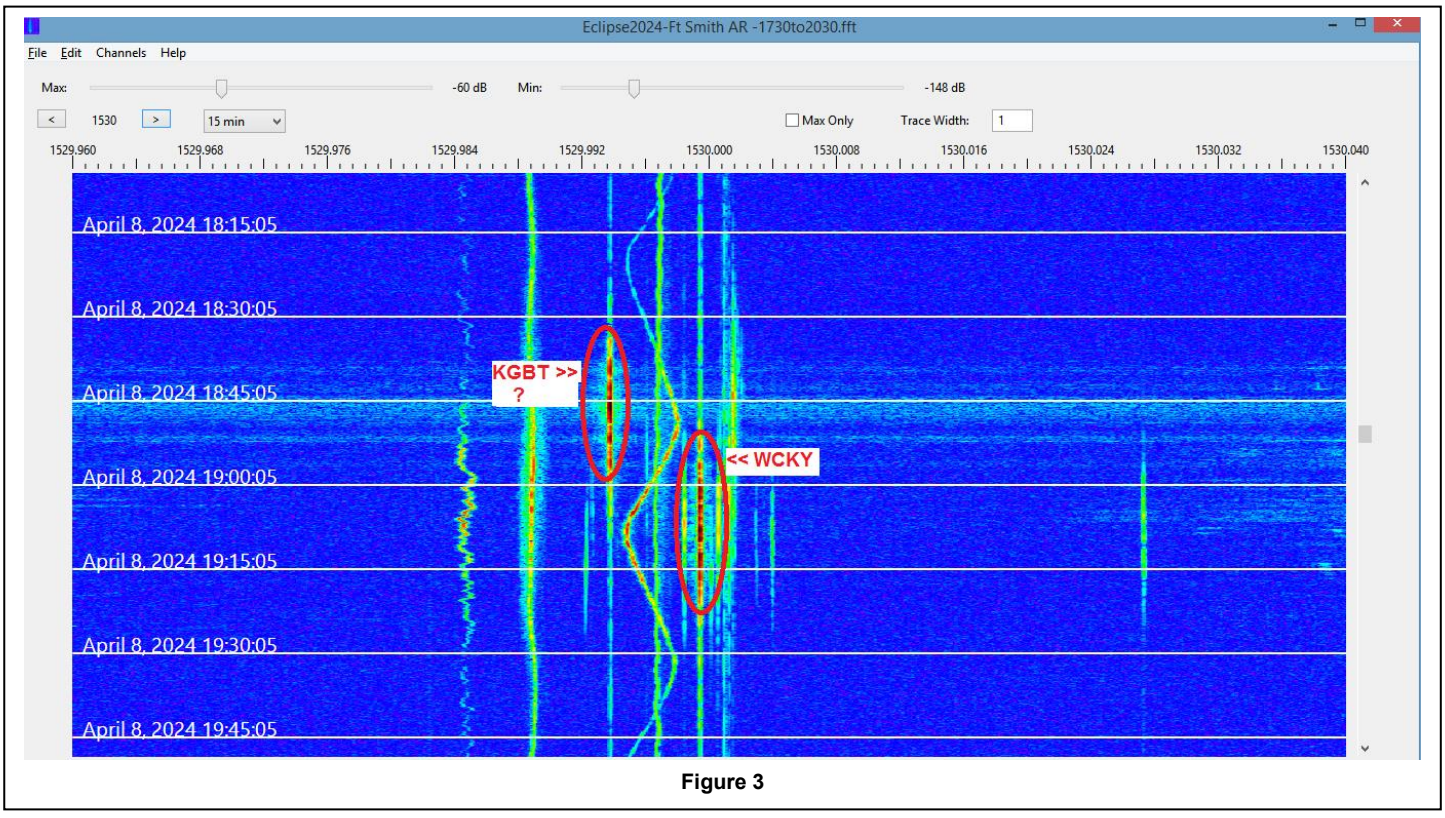

Figure 3

In addition, if you purchase Bill Scott's maps from **https://mwcircle.org/radio-data-mw-rdmw-2022/** you can see where target stations associated with those carriers might be located, for example, **Figure 4** shows the map for stations on 1530 along with their patterns. Perhaps you can get additional assistance from MWoffsets **https://www.mwlist.org/mwoffset.php?khz=1530** ,because N5TNL's RX888 was GPS locked, so the frequency readings shown by Carrier Sleuth should be accurate.

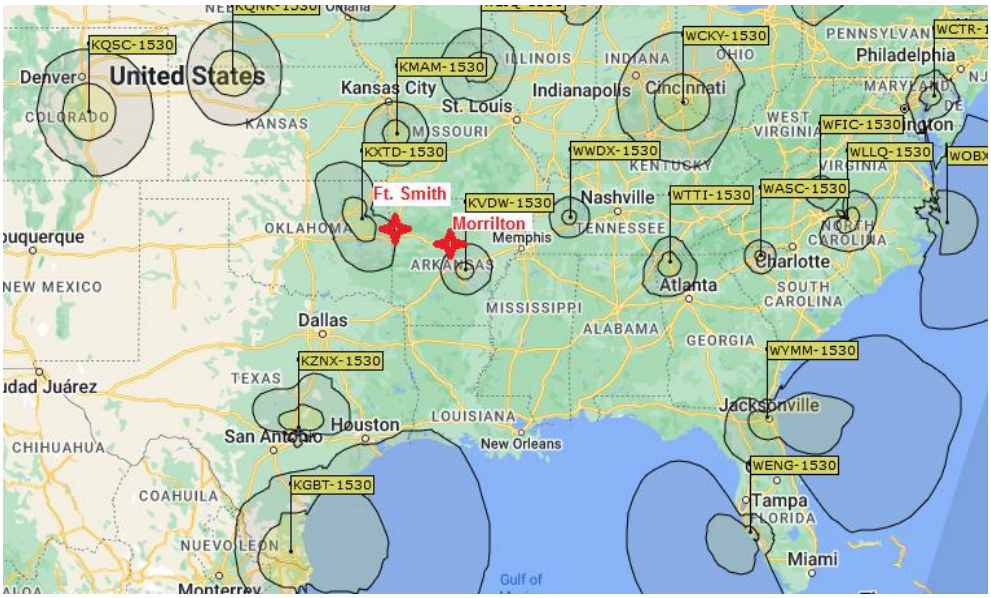

Figure 4

Think also in terms of David's suggestion that a station's signal peaks when eclipse maximum is at a position intermediate between transmitter and receiver. 35.35290 N and -94.31586 W are the coordinates for the Fort Smith receiver. If you generate a graph from Carrier Sleuth showing that a station peaked at 1846 UTC, you can find out where the eclipse maximum took place at that time. **https://eclipsewise.com/solar/SEgmapx/2001-2100/SE2024Apr08Tgmapx.html#map** or **http://xjubier.free.fr/en/site_pages/solar_eclipses/TSE_2024_GoogleMapFull.html?Lat=40.29830&Lng=-85.10794&Elv=294.0&Zoom=6&LC=1** can tell you that information.

There is quite a rabbit hole of detail waiting to be investigated in these programs and web pages.)

****

Steve Ratzlaff via groups.io ratzlaffsteve@gmail.co

Over 3 years ago several folks noticed their ALA1530LN's were intermittent. In the morning when temperatures were cool the loop amp would work but when temps rose they became intermittent. One person decided he'd try to open the unit and figure out what was wrong. A couple of us joined in. One guy did all the hard work, picking off the black potting material and tracing out what he could, then sending it to me and I was able to trace out more. The hard part was getting the transformer turns since the potting was covering the wires. We eventually opened 3 defective units; the one guy even cut open the transformers with a carbide bit and we eventually got the transformer turns. 2SK715s were still available, even on eBay. I built up several versions from our final traced-out diagram and they worked the same as the genuine Wellbrook ALA1530LN. Everett Sharp N4CY made PCBs and we all had our own clone ALA1530LNs. Of course Wellbrook was still in business and we all agreed to never divulge the circuit publicly. When we learned the 2SK715 was being discontinued, I bought 1500 of them from a distributor (I still have about 900 left). Then we looked for surface mount equivalents and found the 2SK932 and the CPH3910, and Everett made a PCB for those, and those transistors also worked properly. (The 2SK932 is preferred, it has a higher typical as-measured-by-me transconductance closer to the old 2SK715's transconductance.) I also experimented with different JFETs, and none had anywhere close to the very high transconductance of the 2SK715 and would not work like the 2SK715. By experimenting I discovered that the loop amp input impedance steadily decreased each time another JFET was paralleled. Putting 4 in parallel as the final ALA1530LN used, brought the input impedance low enough to work well at LF.

I used to regularly buy almost all the different Wellbrook products. I have a large terminated loop I use the FLG100LN with, and due to lightning storms zapping the loop amp I would have to buy a new FLG100LN every year. But with the same methods we used for the ALA1530LN, we eventually figured out the FLG100LN (and the ALA100LN circuit too), so I can now build my own.

73, Steve AA7U

GEOMAGNETIC INDICES – *Compiled by: Phil Bytheway*

DXM.EiC@gmail.com

Geomagnetic Summary April 01 2024 through April 30 2024

Tabulated from Geomagnetic forecast Email status daily (K @ 0000 UTC).

Date	Flux	A	K	Space Wx										
4/1	125	10	1.67	minor, R1	4/11	144	06	1.00	moderate, R2	4/21	217	19	3.00	minor, R1
2	113	08	1.33	no storms	12	152	06	1.67	no storms	22	**227**	08	2.33	minor, R1
3	112	07	1.33	no storms	13	161	05	1.33	minor, R1	23	219	**08**	2.33	minor, R1
4	114	12	3.67	no storms	14	178	06	1.67	minor, R1	24	199	04	0.67	minor, R1
5	121	12	2.33	no storms	15	192	08	3.00	minor, R1	25	167	03	1.33	minor, R1
6	123	10	2.33	no storms	16	199	31	**5.00**	minor, G1, R1	26	153	19	2.00	minor, G1
7	125	06	1.67	no storms	17	217	07	2.00	minor, G1, R1	27	153	12	2.67	minor, R1
8	125	08	0.67	no storms	18	**227**	04	2.00	minor, R1	28	140	06	1.00	no storms
9	124	11	3.00	no storms	19	213	**41**	4.33	**strong, G3, R1**	29	138	06	1.33	minor, R1
4/10	131	08	1.67	no storms	4/20	210	12	2.67	no storms	4/30	130	12	4.33	moderate, R2

Gx – Geomagnetic Storm Level Rx – Radio Blackouts Level Sx – Solar Radiation Storm Level

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IRCA Slogans List (updated frequently)

The IRCA Slogans List includes radio slogans from the US and Canada (over 4600) as gleaned from various DX publications and monitoring. The current IRCA Slogans List is posted by Kraig Krist for all to download. The link is: **https://misc.kg4lac.com/irca/**

A DXers Technical Guide, 4th Edition (Spring 2004)

In its nearly 200 pages you will learn about the principles underlying the design of successful receivers, antennas and receiving accessories, find reviews of the best commercially available DXing equipment in different price ranges, as well as detailed instructions for building one's own antennas and other DXing aids. Although it focuses on the technical backdrop to medium wave DXing, it will also be of interest to serious shortwave listeners and low band radio amateurs.

Prices: **IRCA/NRC members** – $15.00 (US), $16.50 (Canada) $18.00 (México), $20.00 (rest of the world). **Non-IRCA/NRC members** – add $2.00.