



The RELAY)))

March
2024

The Official Publication of the Arrowhead Radio Amateur Club

A.R.A.C. Inc. P.O. Box 7164 Duluth MN 55807-7164 <http://www.thearac.org> Dues: Member \$20/Family \$25

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Total Solar Eclipse 2024 Super Active Solar Cycle 25

In the January 2024 issue of the *Relay*, we encouraged participation in **NASA's Citizen Scientist** program, and in particular **HamSci**, short for **Ham Radio Science Citizen Investigation**. HamSCI was started by ham-scientists who study upper atmospheric and space physics. These scientists recognized that projects such as the [Reverse Beacon Network](#), [WSPRNet](#), [PSKReporter](#), [DX Cluster](#), [ClubLog](#), and more are generating big data sets that provide useful observations of the Earth's ionosphere and related systems. Our current solar cycle is the focus on one HamSci's active projects, with research data collection regarding the solar eclipses on October 14th of last year and April 8, 2024.

We planned on discussing more about the solar eclipses in the upcoming annual Weather Issue in April, however our current 11-year solar cycle, [Solar Cycle 25](#) has been popping up in the news *a lot* more frequently the past couple of months. As such, we're focusing this month's *Relay* on the Sun and will report on additional weather topics in April.

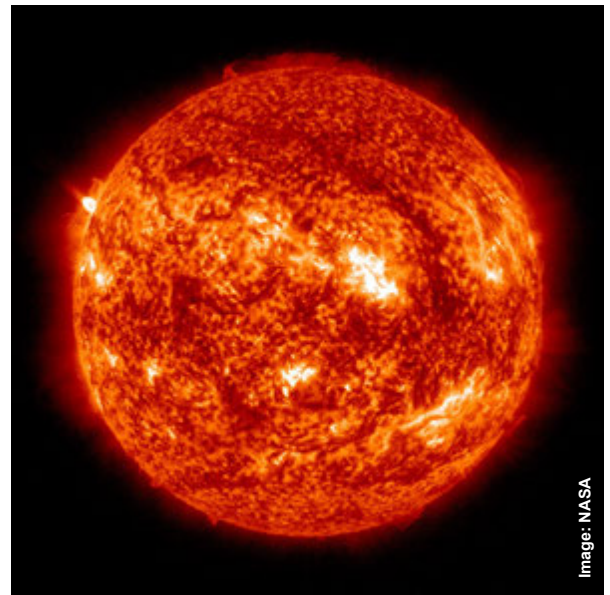


Image: NASA

Review: What is a Solar Cycle?

The big ball of electrically-charged hot gas that is our Sun generates a powerful magnetic field as it moves. The cycle that the Sun's magnetic field goes through about every 11 years is called a **Solar Cycle**. We are currently in Solar Cycle 25, which started in December 2019, and will end in 2030.

Why is it called Solar Cycle 25?

Well it's the 25th solar cycle since 1755, the year that solar **sunspot** activity began to be recorded. [Space.com](#) says, "Sunspots are dark, planet-size regions of strong magnetic fields on the surface of the sun. They can spawn eruptive disturbances such as **solar flares** and **coronal mass ejections (CMEs)**. These regions of the sun appear darker because they are cooler than their surroundings. **Solar Flares** are naturally-occurring **electromagnetic pulses**, commonly

NASA's Solar Dynamics Observatory posted this image of sunspot activity on October 6th, 2023.

Continued on Page 13

The Relay Co-Editors:
Kim & Steve Waller

Kim - KE0NQS Steve - KE0NQT
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SPRING 2024



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facebook!

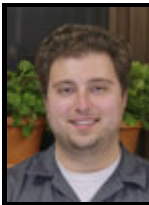
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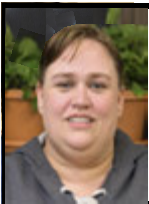
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1ST YEAR BOARD



KD9VKI
Justin Cheever

Board Meeting Minutes - February 6, 2024

Present:

Board Members

Gene Ellefsen – NØVRM, Dave Pyrlík – KØDJP, Melinda Nelson – KFØGJW, Dave Davis – AAØAC, Doug Nelson - AAØAW, Sam Frey – KEØYTM, Justin Cheever – KD9VKI

Board Advisors (Non-Board Members)

Randy Wabik – KRØB, Grant Forsyth – KCØWUP

Guest: Rochelle Nelson

Meeting called to order by President Gene – NØVRM at 18:29 (6:29 pm)

Minutes:

Minutes were sent via email. Motion to approve Gene Ellefsen – NØVRM. Seconded by Doug Nelson – AAØAW, motion passed.

Treasurer's Report:

Checking: \$1,656.33
Savings: \$2,342.85
Repeater: \$2,070.60
Subtotal Cash: **\$6,069.78**

Winter CD: \$1,748.93
Summer CD: \$0.00
Subtotal CD: **\$1,748.93**
Assets Subtotal: **\$7,818.71**

Motion to accept as presented by Doug Nelson – AAØAW, seconded by Justin Cheever – KD9VKI, motion passed.

Testing:

Will have a test session on Saturday Feb 10th. The next big one will be at the Ham-Fest on May 4th. As always if you are looking to test or upgrade, or know of anyone that is interested in testing please contact Doug Nelson at AAØAW@arrl.net

Repeater:

Dave Pyrlík – KØDJP Nothing currently for the repeaters.

New Business:

Looking for a new company to do name badges for the club HamFest – May 4th – Looking for Volunteers and donations

Motion to adjourn by Melinda Nelson – KFØGJW. Seconded by Dave Davis – AAØAC, motion passed at 18:42 (6:42 pm)





ARAC Club Meeting Minutes

February 8, 2024

Present:

President: Gene Ellefsen – N0VRM
Vice President: Dave Pyrlík – K0DJP
Secretary: Melinda Nelson – KF0GJW
First Year Board: Justin Cheever – KD9VKI
Third Year Board: Doug Nelson – AA0AW
Special Events: Open/Gene Ellefsen – N0VRM (acting)
Parliamentarian: Grant Forsyth – KC0WUP
Testing: Doug Nelson – AA0AW
Repeater: Dave Pyrlík – K0DJP
Property/Picnic: Scott Ahlgren – N0VYU
HamFest/Education: Bob Schulz – KC0NFB

Absent:

Treasurer/Membership: Sam Frey – KE0YTM
Second Year Board: Dave Davis – AA0AC
Chaplin:
Web Site: Thomas Dorr – KE0RHA
Newsletter/Historian: Kim Waller – KE0NQS
Newsletter/Historian: Steve Waller – KE0NQT

Meeting called to order at 19:01 (7:01 PM) by President Gene Ellefsen – N0VRM. Forty-seven (47) members were in attendance.

Minutes:

Minutes are posted on the website and in the newsletter. Motion to accept by Grant Forsyth – KC0WUP, seconded by Alan Nordin – WB0DBQ, motion Passed.

Treasurer's Report:

| | |
|-----------|------------|
| Checking: | \$1,656.33 |
| Savings: | \$2,342.85 |
| Repeater: | \$2,070.60 |

Subtotal Cash: \$6,069.78

| | |
|--------------|------------|
| Winter CD: | \$1,748.93 |
| Summer CD: | \$0.00 |
| Subtotal CD: | \$1,748.93 |

Assets Subtotal: \$7,818.71

Continued on Page 4



ARAC Club Meeting Minutes, cont.

Motion to accept as presented by Bob Schulz – KC0NFB, seconded by Jon Nelson – N0UOZ, motion passed.

Education:

Bob Schulz – KC0NFB nothing at this time. Diane Saunders – K0DSL will be starting a General Class March 5th through June 4th. If you are interested in upgrading to General Class please reach out to Diane. Next Tech Class will be starting in the fall.

Testing:

Doug Nelson – AA0AW Next big test session will be May 4th at HamFest. As always if you are looking to test or upgrade, or know of anyone that is interested in testing please contact Doug Nelson at AA0AW@arrl.net

Repeater:

Dave Pырlik – K0DJP nothing currently.

New Business:

Feb 17th St. Cloud HamFest

May 4th Our HamFest (Looking for volunteers and donations)

April – Skywarn (Meeting starts at 6:00 PM)

June – Grandma's Marathon (Registration is open Password – HAM24)

June 22nd – Grandma's Marathon and Field Day

Silent Key: (Please keep their family in your thoughts)

Door Prize was won by Randy Wabik – KR0B

Motion to adjourn by Bill Turk – KF0ILA, seconded by Jon Nelson – N0UOZ, motion passed at 19:19 (7:19 PM).



CLUB REPEATER

W0GKP

146.94 (-)

CTCSS TONE

103.5



Prez Sez...

Hello Everyone,

March is here and Spring is just around the corner! Sure has been some crazy weather we have had!

Remember, don't forget to "spring" your manual clocks one hour forward at 2 a.m. Sunday, March 10th! Our Club meeting this month is March 14th, 7 p.m. at the Copper Top Church, and don't forget the ARAC monthly breakfast at 8 a.m. on March 30th at the Chalet.

A look ahead: Next month is Skywarn Training with National Weather Service staff, which means our April meeting will start an hour earlier than usual, so put that on your calendar as a "time change" as well.

Happy St. Patty's Day!

73's Gene Ellefsen NØVRM



LOOKING for an Amateur Radio License TESTING SESSION?

Schedule your own Testing Session TODAY!

Contact Doug Nelson-AA0AW at aa0aw@arrl.net or 218-391-5874

All Exam Candidates are REQUIRED to have an FCC Registration Number (FRN) before exam day, which will require your email address.

Not Currently Licensed? For New License Candidate FRN registration, go to: www.fcc.gov/new-users-guide-getting-started-universal-licensing-system-uls

Upgrading to General or Expert Class & not sure you have an FRN number?
go to

<https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp>

UPGRADE CANDIDATES:

Please bring a copy of your current license to the exam session.

CW Abbreviations

| | | | |
|--------------------------|-------------------|--------------------------|-------------------|
| AR End of Message | AS Pse QRX | BK Back to You | SK End of Contact |
| TU Thank You | PSE Please | K Invite to Transmit | |
| QST Calling all Amateurs | QRL Are You Busy? | QRU Have anything for me | |
| QRV Are You Ready? | QRX Standby | QRS Transit Slower | |

| | | |
|---|---|---|
| A | M | Y |
| B | N | Z |
| C | O | 1 |
| D | P | 2 |
| E | Q | 3 |
| F | R | 4 |
| G | S | 5 |
| H | T | 6 |
| I | U | 7 |
| J | V | 8 |
| K | W | 9 |
| L | X | 0 |

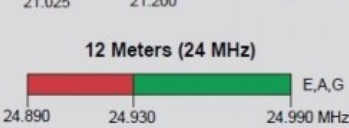
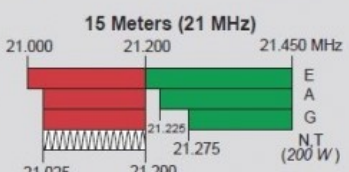
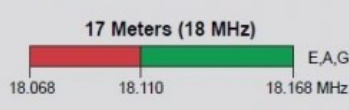
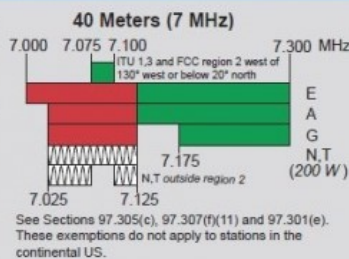
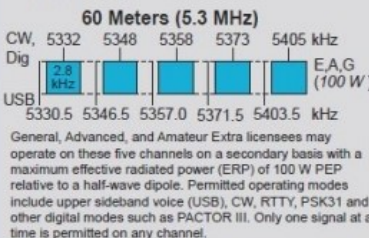
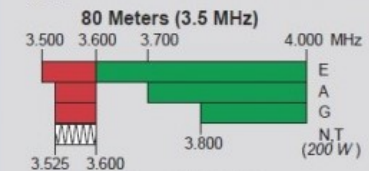
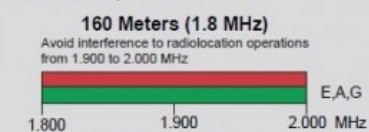
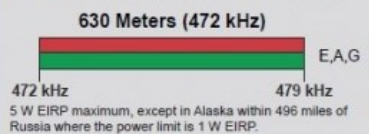
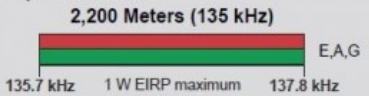


US Amateur Radio Bands

US AMATEUR POWER LIMITS

FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

On March 28, 2017, the Federal Communications Commission adopted rules that will allow Amateur Radio access to 472-479 kHz (630 meters) and to 135.7-137.8 kHz (2,200 meters). However, amateurs cannot use these frequencies until 30 days after the Report and Order is published in the Federal Register and the final procedures for registering stations with the Utilities Telecom Council (UTC) have been approved and announced. At the time this chart was created, the Report and Order had not been published and the UTC online registration site is not yet available. Follow ARRL news for further information. New charts will be published at www.arrl.org/graphical-frequency-allocations when the bands are fully available for use.



Effective Date for
2,200 and 630 Meters
to be announced



ARRL The national association for AMATEUR RADIO

KEY

Note: CW operation is permitted throughout all amateur bands.

MCW is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

- █ = RTTY and data
- █ = phone and image
- █ = CW only
- █ = SSB phone
- █ = USB phone, CW, RTTY, and data
- █ = Fixed digital message forwarding systems only

- E = Amateur Extra
- A = Advanced
- G = General
- T = Technician
- N = Novice

See ARRLWeb at www.arrl.org for detailed band plans.

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Toll-Free 1-800-326-3942 (860-594-0355)
email: news@arrl.org

Exams: 860-594-0300 email: vec@arrl.org

All licensees except Novices are authorized all modes on the following frequencies:
2300-2310 MHz 10.0-10.5 GHz ‡ 122.25-123.0 GHz
2390-2450 MHz 24.0-24.25 GHz 134-141 GHz
3300-3500 MHz 47.0-47.2 GHz 241-250 GHz
5650-5925 MHz 76.0-81.0 GHz All above 275 GHz
‡ No pulse emissions

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NETS

Have a favorite HF/6m/2m/1.25m/70cm net that you check into or listen in on? Also, please send corrections and we will add it to the list below - Kim KEØNQS at my email KEØNQS.mn@gmail.com.

- **Northland Weather Group Net:** Mondays 2000 on the ARAC repeater (146.940 MHz with a tone of 103.5 and standard offset).
- **Minnesota D-Star Net:** Sundays at 19:30 on Reflector 53A
- **Minnesota Section Net** 1200 and 1730 on 3.860 [Net Manager: NØYR] http://www.mn-section.org/dept_stm.html
- The non-non-net: Evenings 2000 144.200 USB except for Sunday evenings.
- Badger WX Net: 0500-0715 on 3.985. Give 24 hour high/low/current temperature, precipitation and snowfall.
- **PICONET:** 3.925 from 0900-1100 CT Mon-Sat and 1600-1700 CT Mon-Fri. Info at: <http://www.piconet3925.com>
- Michigan Upper Peninsula Net: 1600 (CST) on 3.921 MHz Sun-Sat and 1200 Sun. Info: <http://www.michupnet.com>
- Great Lakes Marine/Maritime Mobile Net: Morning 07:30 - 3.932; 08:15 - 7.261 MHz and evening 18:30 - 3.1730927; 19:15 - 7.268 MHz. Weekend extra net: 10:00 - 7.261/7.268 MHz. All CST, LSB and +/- QRM. See: <http://www.sailblogs.com/member/glimmnet/>
- MIDCARS: 07:30-13:00 - 7.258 MHz. See: <http://www.midcars.net>
- Iowa snowbird net on 14.257MHz, M-W-F at 10:00 am Local Time. This is an open net.
- Spider Web Net (Marco Island FL) on 14.347 every morning at 0730 CST/CDT: <http://www.spiderwebnet.net>
- Maritime Mobile Service Network: Daily at 1100—2100 Central on 14.300. <http://mmsn.org> and <http://www.14300.net>
- RV Radio Network: Every day at 1900 Central on 7.265 MHz. Web site: <http://www.rvradionetwork.com>
- Upper Midwest Ten Meter Net: Every Thursday Evening @ 8 PM – 28.480 MHz USB
- Wisconsin Sideband Net: Daily @ 5:15 PM – 3985 [or 3982.5] KHz LSB
- Hobby Helpers Net - Tuesday @ 8 PM – 28.330 MHz USB (Isanti MN) LSB [Net Manager: WOØA].
- Northstar Trader Net: 3.908 +/- at 0830 CST Sundays
- WARFA: 3.908 +/- Sun/Tue/Thu nights at 2200 CST, <http://warfa.org/>
- Youth Net: 14.320-14330 Sundays 1800-1900 UTC, Net Control: AC8PI
- YACHT: Saturdays 1900 CST on EchoLink #481872, <http://yachthams.webstarts.com>
- Northwestern Ontario ARES Net: Evenings at 20:15 (Central) on +/- 3.750Mhz
- The Iron Range Net: Saturdays at 0800 Central time on or near 3.919 Mhz. Look them up on Facebook!
- FORX Net: Mondays at 1900 Central at 3.941 Mhz +/- QRM. WAØJXT — Grand Forks, North Dakota
- HF CW: Fridays 08:00 CST, 7.112 MHz. Informal slow speed CW Net. W8IRT NCS. Email: w8irt@aol.com
- Minnesota ARES Digital Net: Thursdays at 2000 CST, 3.5835 MHz USB +/- QRM, Mode: Olivia 8/500.
- SARA Digital Net: Sundays at 1900 Local, 3.582.150 MHz USB +/- QRM, Mode: BPSK31/BPSK63
- Spider Web Net (Marco Island FL): 14.347 every morning at 0730 CST/CDT: <http://www.spiderwebnet.net>
- Broadcaster Net: 7.231 or 3.855 M/W/F @ 1500 UTC. 14.255 M-F @ 2130 UTC. <http://www.cbsretirees.com/ham.htm>
- Old Military Radio Net: 7.268 +/- nightly at 0200z. Other times/Frequencies too. See: <http://www.mrca.ar88.net/>
- Rag Chew Crew/Tailgaters/Freewheelers Nets: 3.916 +/- nightly at 1900 CST, <http://www.tailgatersnet.com>
- North South Net: 7.214.6 +/- at 0700 CST, Monday-Saturday



DULUTH AREA REPEATERS

ARAC System WØGKP

| Frequency | Offset | Tone | Location |
|-----------|------------|-------|------------------------|
| 146.940 | minus | 103.5 | Duluth |
| 146.940 | minus | 107.2 | Lakeside (recv) |
| 146.940 | minus | 151.4 | Two Harbors (recv) |
| 146.940 | minus | 100.0 | Gary-New Duluth (recv) |
| 146.940 | minus | 110.9 | Cloquet (recv) |
| 147.000 | minus | 103.5 | Mahtowa |
| 444.100 | plus 103.5 | | Duluth UHF Link |

N9MMU/N9QWH System (WI)

| | | | |
|---------|------------|-------|---------------|
| 145.310 | minus | 110.9 | Duluth |
| 145.490 | minus | 110.9 | Solon Springs |
| 147.255 | plus 110.9 | | Hayward |
| 145.110 | minus | 110.9 | Rice Lake |
| 147.345 | minus | 136.5 | Holcombe |
| 145.230 | minus | 110.9 | Eau Claire |

WECOMM – WI Statewide Linked System WE9COM

| | | | |
|---------|------------|--|---|
| 147.075 | plus 110.9 | | Meteor Hill (closest repeater to Duluth) |
|---------|------------|--|---|

LSAC System # 1

| | | | |
|---------|------------|-------|---------------------------|
| 147.330 | plus 151.4 | | Proctor |
| 147.330 | plus 103.5 | | Duluth (recv for Proctor) |
| 147.270 | plus 114.8 | | Two Harbors |
| 147.270 | plus 103.5 | | Wales |
| 147.090 | plus 114.8 | | Silver Bay |
| 145.410 | minus | 114.8 | Finland |
| 147.300 | plus 114.8 | | Isabella |
| 145.150 | minus | 103.5 | Washburn, WI |
| 146.700 | minus | 103.5 | Bayfield, WI |
| 443.850 | +5.00 | none | Bayfield, WI |
| 147.165 | plus 110.9 | | Hurley, WI |
| 146.640 | minus | 151.4 | Ely |
| 443.500 | +5.00 | 141.3 | Gilbert |
| 147.060 | plus 103.5 | | Virginia |
| 147.360 | plus 162.2 | | Cook |
| 147.165 | plus 114.8 | | Coleraine |
| 443.925 | +5.00 | 110.9 | Brainerd |
| 443.200 | +5.00 | 114.8 | Tamarack |
| 147.360 | plus 203.5 | | Aitkin |
| 146.865 | minus | 146.2 | Giese |
| 147.570 | simplex | 146.2 | Hinckley |
| 444.575 | +5.00 | 146.2 | Hinckley |
| 443.325 | +5.00 | 146.2 | Isanti |



DULUTH AREA REPEATERS, continued

NARC System NAØRC

147.135 plus 103.5 Knife River
 145.450 minus 114.8 Park Point (rcv)
 147.135 plus 114.8 Knife River - Park Point (rcv)

Stand Alone Repeaters

145.210 minus 110.9 Clam Lake, WI
 146.880 minus 123.0 Grand Rapids, MN
 146.910 minus 146.2 Duxbury, MN
 146.955 minus 146.2 Askov, MN
 147.105 plus 110.9 Chaffey, WI
 444.850 +5.00 141.3 Cloquet, MN

Fusion

Fusion (Analog has tone and C4FM digital with no tone)

147.150 plus 151.4 NTØB Gilbert, MN Fusion Repeater
 145.170 minus 110.9 WA9KLM Superior, WI – Douglas County RACES/ARES Fusion Repeater (Digital only) Fusion Room 28373

145.250 minus 103.5 KBØYHX Cloquet, MN – Carlton County RACES/ARES Fusion Repeater

444.300 +5.00 103.5 NØEO Duluth, MN – Spirit Valley Amateurs Fusion Repeater WIRES-X NØEO (Analog only) Fusion Room 40494

444.400 +5.00 103.5 NAØRC Knife River, MN – Wires X Connected to NØEO Room 40494
 444.500 +5.00 103.5 NØLCR Two Harbors, MN – Wires X Connected to NØEO Room 40494
 444.600 +5.00 103.5 NØLCR Silver Bay, MN – Wires X Connected to NØEO Room 40494
 444.800 +5.00 103.5 NØLCR Grand Marais, MN – Wires X Connected to NØEO Room 40494

D-Star

147.375 plus NØEO D Star
 442.200 plus NØEO D Star

Rev. KCØWDQ as of 10/1/22 For ARAC Newsletter

Elmers

El-mer / el-mər/ [el-mer]

1. a male given name: from Old English words meaning "noble" and "famous."
2. an adhesive used to bond like or unlike materials
3. An experienced ham radio operator who mentors new and prospective hams.

| Name | Call Sign | Expertise |
|--------------|-----------|--|
| Jeff Nast | KCØMKS | APRS, EchoLink, WinLink, Fusion, Contesting |
| Bob Schulz | KCØNFB | Contesting |
| Jim Anderson | NØJWA | QsoNet |
| Doug Nelson | AAØAW | HF, VHF/UHF, Contesting, Packet, APRS, Morse Code, VE testing, Echolink, Allstar, EmCom... |

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Members, please check your name and email address for accuracy. If you are not on this list and want to be on the list, contact us with your info. If you need to make a change, please let us know at KEØNQS.mn@gmail.com OR KEØNQT@gmail.com



MARCH

CLUB EVENTS

SUNDAY NIGHT NETS

1930 - CW - 28.125 MHz USB-CW
 2000 - USB 28.450 MHz
 2100 - Southern St. Louis County
 Emergency Services Net

MONDAY NIGHT NETS

2000 - Northland WX Net - ARAC Repeater

TUESDAY NIGHT NETS

2000 - Douglas Cty 145.490 MHz
 2030 - Central Carlton County

WEDNESDAY NIGHT NETS

1900 - Lake County - LSAC1
 2nd & 4th Wednesdays
 2100 - BWAR



| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|--|---|---|---|--|
| | | | | | 1 | 2 |
| 3 CW 1930 AA0AW USB 2000 N0VRM ES 2100 KD9VKI | 4 WX 2000 KC0MKS | 5 ARAC BOARD MEETING Sammy's Pizza 6:30 pm DC Net 2000 CC Net 2030 | 6 2100 - BWAR | 7 | 8 | 9 |
| 10 2 a.m. Daylight Savings Time: 1 Hour Ahead! CW 1930 N0PDG USB 2000 AA0AW ES 2100 KC0WDQ | 11 DC ARES/ RACES Mtg 1900 DC EOC WX 2000 KC0MKS | 12 DC Net 2000 CC Net 2030 | 13 Happy Valentine's Day Lake County ARES/ RACES Meeting 1800 Lake County Net 1900 2100 - BWAR | 14  | 15 ARAC Club Meeting Coppertop Church 7:00 PM | 16 |
| 17  Happy St Patrick's Day CW 1930 AA0AW USB 2000 AA0AW ES 2100 W0NWO | 18 WX 2000 KC0MKS | 19 DC Net 2000 CC Net 2030 | 20 St Louis County ARES/RACES Meeting 1800 2100 - BWAR | 21 | 22 | 23 |
| 24 CW 1930 N0PDG USB 2000 KB9WLB ES 2100 N0VRM | 25 WX 2000 KC0MKS | 26 DC Net 2000 CC Net 2030 | 27 Lake County Net 1900 2100 - BWAR | 28 Carlton County ARES/RACES Meeting 1900 CC EOC | 29 | 30 ARAC Club Breakfast The Chalet 8 am |
| 31 CW 1930 AA0AW USB 2000 K9KDK ES 2100 KE0YTM | | | | | | |

Get this newsletter *faster*
via email!

Email Doug AAØAW at
aa0aw@arrl.net

Next Club Meeting:
Thursday,
March 14th, 2024 - 7 pm
at the Coppertop Church!

ARAC Committee Chairs



Club License Trustee:

Ray Barnes KEØZN

Control Operators:

AAØAW - NØKXT - KCØNFB

Newsletter/Historian:

Kim KEØNQS & Steve KEØNQT
Waller

Education Chair:

Bob Schulz KCØNFB

Hamfest Chair:

Bob Schulz KCØNFB

Chaplain:

Rollie Bockbader KBØCK

Visiting Chaplain:

Parliamentarian:

Grant Forsyth KCØWUP

Website:

Thomas Dorr KEØRHA

Membership:

Sam Frey KEØYTM

Property Chair:

Scott Ahlgren NØVYU

Testing:

Doug Nelson AAØAW

Field Day:

Picnic Chair:

Scott Ahlgren, NØVYU

Repeater Chairs:

Randy Haglin NØBZZ
Randy Wabik KAØJZV

Contest Calendar at www.contestcalendar.com

National Contest Journal at www.ncjweb.com

QSO Party Note: State/Province/National QSO Parties are abbreviated with the 2 or 3 letter abbreviation for the state/province/national designation followed by QP for QSO Party:

Examples: Minnesota QSO Party is MNQP
British Columbia QSO Party = BCQP

QRZ web site at www.qrz.com

VHF Propagation site at www.aprs.mountainlake.k12.mn.us

Reminder: The Contest Corral monthly listing of contests can be found in each issue of QST. ARRL sponsored contests can be found in Contest Corral, highlighted, or on the ARRL's web site at arrl.org.

Solar Activity continued from page 1

called **EMPs**, for short. In July of 2023, a solar flare occurred that caused radio signal blackouts on earth. Peaking at 7:14 p.m. EST on July 2nd, NASA reported that the flare erupted from a sunspot that was seven times the width of Earth. The top of Earth's atmosphere was ionized from the solar flare's radiation, and according to Spaceweather.com, this resulted in a "deep radio shortwave blackout over western parts of the U.S. and Pacific Ocean." The radio blackout was 30 minutes in duration.

The **National Oceanic and Atmospheric Administration** (NOAA) reported that the Sun recently emitted two strong solar flares, the first one peaking at 6:07 p.m. EST on Feb. 21, 2024, and the second peaking at 1:32 a.m. EST on Feb. 22, 2024. These two solar flares electromagnetically impacted the Earth and were classified as X-class, the most intense type of solar flare, according to NASA. That intensity of flare can send out a **coronal mass ejection (CME)** which is sun material ejected into space. A **CME** electromagnetic pulse can most certainly interfere with and interrupt navigational systems and communication on Earth. These also have the potential to damage power grid infrastructure. Though no power outages were reported as a result of the February intense solar flares, both AT&T and Verizon had cell coverage outages during this time. **NOAA** quickly released this official statement: "While solar flares can affect communication systems, radar, and the Global Positioning System, based on the intensity of the eruption and associated phenomena, it is highly unlikely that these flares contributed to the widely reported cellular network outages."

Highly Active Solar Cycle 25

Though somewhat reassuring for the time being, NOAA's official statement does not quell speculation of an observant public: The fact is Solar Cycle 25 has been highly active, much more than was predicted by the experts. Consider the following data:

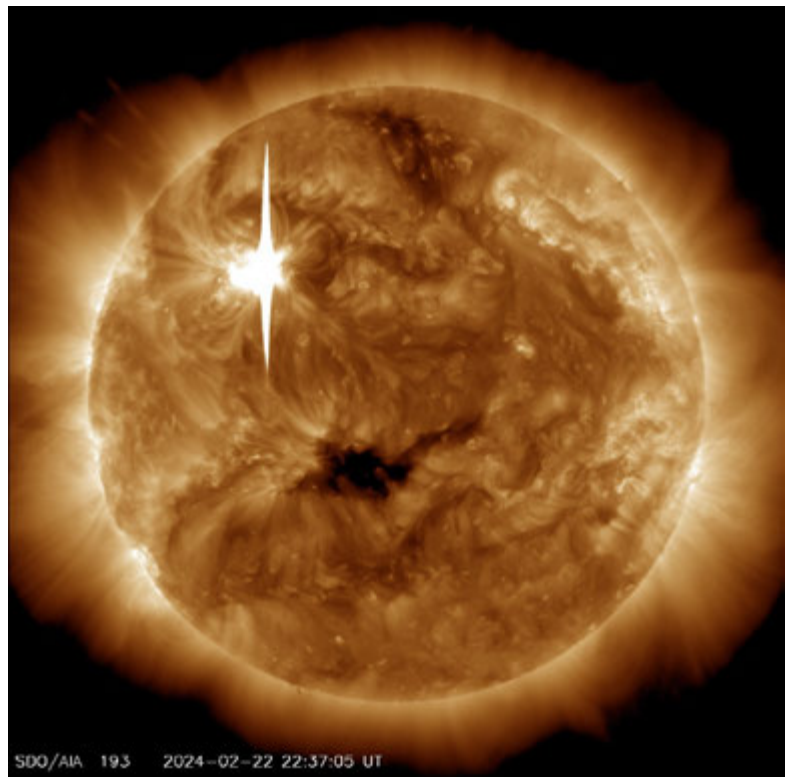
- ◆ As at Feb 14 2024, solar cycle 25 is averaging **28% more spots per day** than solar cycle 24 at the same point in the cycle (Feb 14 2013)

We are in Year 5 of Solar Cycle 25 and here's reported activity so far:

- ◆ Year 1 of SC25 (Dec 2019 to Nov 2020) **averaged 101% more spots per day** than year 1 of SC24.
- ◆ Year 2 of SC25 (Dec 2020 to Nov 2021) **averaged 7% more spots per day** than year 2 of SC24.
- ◆ Year 3 of SC25 (Dec 2021 to Nov 2022) **averaged 8% more spots per day** than year 3 of SC24.
- ◆ Year 4 of SC25 (Dec 2022 to Nov 2023) **averaged 41% more spots per day** than year 4 of SC24.
- ◆ Year 5 of SC25 (Dec 1 2023 to Feb 14 2024) is **currently averaging 70% more spots per day** than the corresponding period of SC24.

What's even more interesting, about these numbers, is the fact that this level of solar activity was not predicted by the models.

Most scientists predicted SC25 would be weaker than, or at least similar to, SC24. The **Solar Cycle 25 Prediction Panel**, an international group of experts co-sponsored by NASA and NOAA, predicted in December 2019 that solar cycle 25 will be similar to solar cycle 24, with the preceding solar cycle minimum in April 2020 (± 6 months), and the number of sunspots reaching a (smoothed) maximum of 115 in July 2025 (± 8 months). This prediction was in line with the general agreement in the scientific literature, which held that solar cycle 25 would be weaker than average (i.e. weaker than during the exceptionally strong Modern Maximum). However, observations from 2020 to 2024, as noted above, significantly exceed predicted values! A basic graph plotting the actual activity as



NASA's Solar Dynamics Observatory captured this image of a solar flare - as seen in the bright flash in the upper left of the sun on Feb. 22, 2024. The image shows a subset of extreme ultraviolet light that highlights the extremely hot material in flares and which is colorized in bronze. Credit: NASA/SDO

Continued on Page 14

Solar Activity continued from page 13

compared to the predicted values can be seen below right. The red line is the sunspot activity as predicted and the graph reflects a **higher** activity level, meaning more sunspots than predicted. In addition, while not fully depicted on this graph, a larger number sunspots are classified as more **intense** this solar cycle than expected.

1755 through 2032

Our Solar Cycle 25 graph also has one other interesting feature. Notice the wavy line at the very bottom. That depicts the recorded sunspot occurrences since 1755. Since we still have about six years to go in this solar cycle, we see only the predicted (red) arch shown for SC25, with no actual data applied yet. But based on the activity so far, we may very well see a much higher spiked arch representing these 11 years on the historical record when final data is plotted.

We'll see what March holds for sunspot activity and solar flare intensity and report it in the Weather Issue next month if anything noteworthy arises. And speaking of April, we now turn to the subject of the Total Solar Eclipse on April 8th.

What Exactly is a Solar Eclipse?

Here's a concise description from NASA:

"A solar eclipse occurs when the Moon passes between the Sun and the Earth, allowing the Moon's long, thin shadow to intersect the Earth's surface. The shadow comprises two concentric cones called the **umbra** and the **penumbra**. Observers on the Earth who are within the smaller, central umbra see the Sun completely blocked. Within the larger penumbra, the Sun is only partially blocked. On April 8, 2024, a total solar eclipse will cross North America, passing over Mexico, the United States, and Canada. The sky will darken as if it were dawn or dusk."

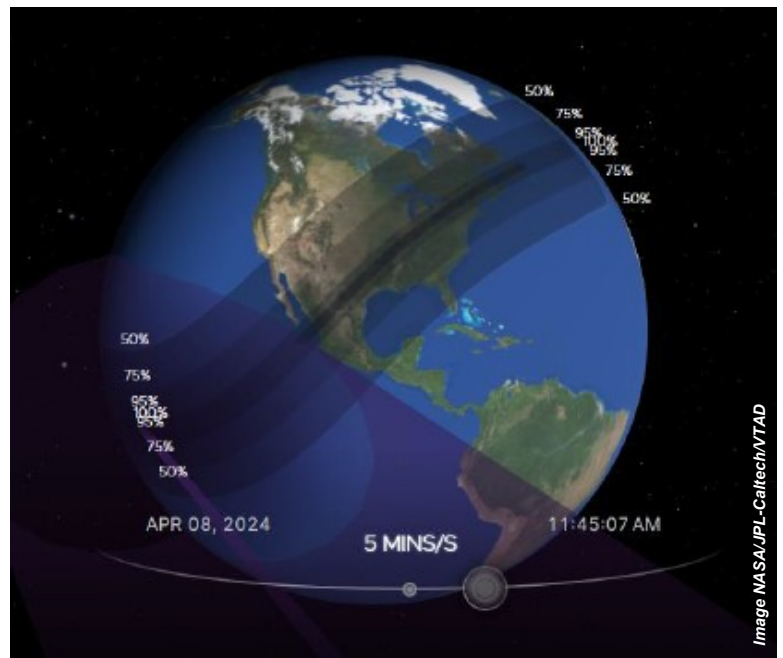
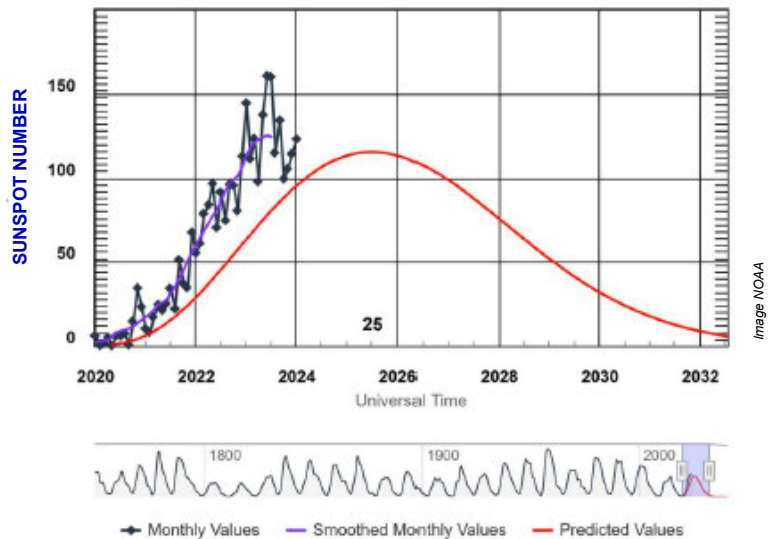
Solar Eclipse Safety

"Safety is the number one priority when viewing a total solar eclipse. Be sure you're familiar with when you need to wear specialized eye protection designed for solar viewing. Except for a specific and brief period of time during a total solar eclipse, you must never look directly at the Sun without proper eye protection, such as safe solar viewing glasses (eclipse glasses). Eclipse glasses are NOT the same as regular sunglasses; **regular sunglasses are not safe for viewing the Sun**. During a total solar eclipse, you must wear your eclipse glasses (or use other solar filters) to view the Sun directly during the partial eclipse phase. You can only take your glasses off during the short time when the Moon completely obscures the Sun – known as the period of totality. If you don't have eclipse glasses, you can use an indirect viewing method, such as a pinhole projector, which projects an image of the Sun onto a nearby surface."

NASA has some really nice eclipse graphics and video simulations you can see by visiting <https://science.nasa.gov/eclipses/> The globe image at right is a snapshot from a video simulation of the upcoming April 8th solar eclipse and we highly

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SOLAR CYCLE 25 SUNSPOT NUMBER PROGRESSION



NASA's Scientific Visualization Studio built this 3D visualization of the 2024 total eclipse with real science data, and shows the shadow of the Moon on Earth. 3D interactive technology allows your mouse or touchpad to click and interact with Earth and see how the eclipse will pass over your region. Visit <https://science.nasa.gov/eclipses/>

Solar Activity continued from page 14

recommend viewing. NASA also has beautiful visualizations comparing the October 14th total solar eclipse and the upcoming April 8th eclipse, using both a 3D globe view and a 2D map view.

At right we see a virtual globe showing the full paths of the 2023 annular eclipse (in yellow and black) and the 2024 total eclipse (in purple and black).

Shaded bands (yellow for the annular eclipse and purple for the total eclipse) also show where a partial eclipse can be seen.

Reading the United States 2D Map (below)

NASA says: "The dark paths across the map are where the largest area of the Sun is covered by the Moon. People in these paths experience either an annular or total solar eclipse. Inside these dark eclipse paths are irregular ovals that delineate the Moon's shadow on the Earth's surface. For an annular solar eclipse, these ovals are called the antumbra and together make up the path of annularity. For a total solar eclipse, the ovals are called the umbra and create the path of totality. On the map, the ovals contain times inside corresponding to the shape of the Moon's shadow cast at that time during the eclipse.

"Also within the dark paths are duration contours. These delineate the length of time annularity or totality will last. The closer to the center of the solar eclipse path, the longer it will last. For the annular path, times range from a few seconds on the outer edge to a maximum of around 4.5 minutes in the center. For the total path, times range up to 4 minutes.

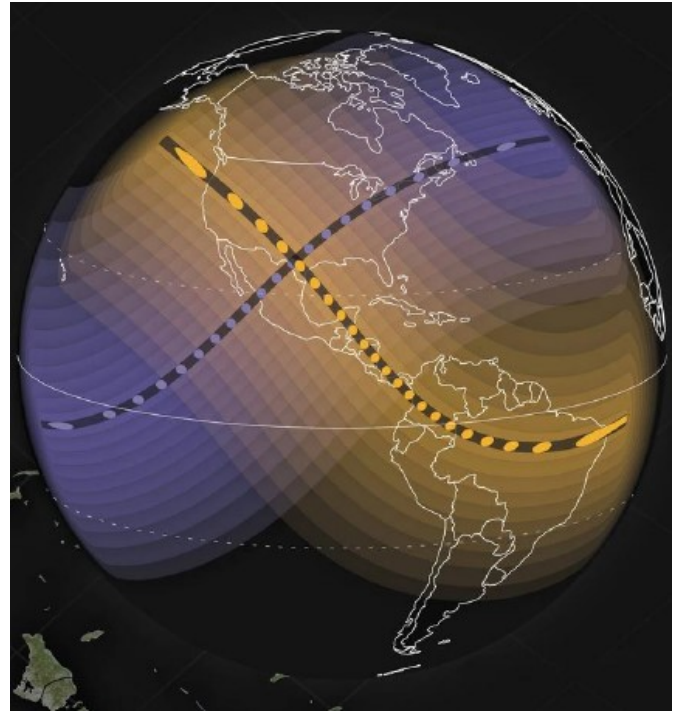


Image: NASA/Scientific Visualization Studio/ Michala Garrison; eclipse calculations by Ernie Wright, NASA Goddard Space Flight Center

"Outside the eclipse paths, the map displays contours of obscuration, or percentage of the Sun's area covered by the Moon. Readers can trace the lines to percents printed along the left and top of map for the 2023 annular solar eclipse and along the right and bottom for the 2024 total solar eclipse. Notice how the 2024 total solar eclipse has a higher maximum percentage because the Moon will completely cover the Sun's surface.

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Solar Activity continued from page 15

Based on observations from several NASA missions, NASA has created a truly invaluable eclipse map depicting with great detail the path of the Moon's shadow crossing the contiguous U.S. during the annular solar eclipse on October 14, 2023, and total solar eclipse on April 8, 2024.

The dark paths across the continent show clearly where observers were able see the "ring of fire" when the Moon blocked all but the outer edge of the Sun during the October annular eclipse, and the ghostly-white outer atmosphere of the Sun (the corona) when the Moon completely blocks the Sun's disk during the upcoming April 8 total eclipse.

Outside those paths, the map also shows where and how much the Sun will be partially eclipsed by the Moon. On both dates, all 48 contiguous states in the U.S. will experience at least a partial solar eclipse (as will Mexico and most of Canada).

X Marks the Spot in Texas!

Last September, Space.com posted this:

"What if the same place on the planet had two solar eclipses in under six months?"

"That's what will [begin to] happen in southern Texas, on Saturday, Oct. 14, 2023, with a 'ring of fire' annular solar eclipse. Less than six months later on Monday, April 8, 2024, comes the total solar eclipse 2024. This is celestial good luck on the grandest of scales.

"There are about 375 years on average between total solar eclipses in a given location and thousands of years between getting two solar eclipses in a row so this is an extraordinary thing," says **Dr. Angela Speck**, Co-Chair of the American Astronomical Society's Solar Eclipse Task Force and teacher of astrophysics at the University of Texas in San Antonio.

As the April 8th eclipse path moves from Mexico into Texas on a northeastern trajectory, Eagle Pass, Texas is in the middle of the band shown on the map below.

According to Space.com, "A square of Texas measuring 120 miles (193 kilometers) on each side — over 14,000 square miles (36,000 square km) in total — will see both a 'ring of fire' (for up to 4 mins 50 secs in 2023) and totality (for up to 4 mins 46 secs in 2024). Prime locations that experience both eclipses include Rocksprings, Junction, Fredericksburg, Kerrville, Bandera, Comfort, Medina, Utopia, Vanderpool, Concan, Leakey, Rio Frio and Uvalde."

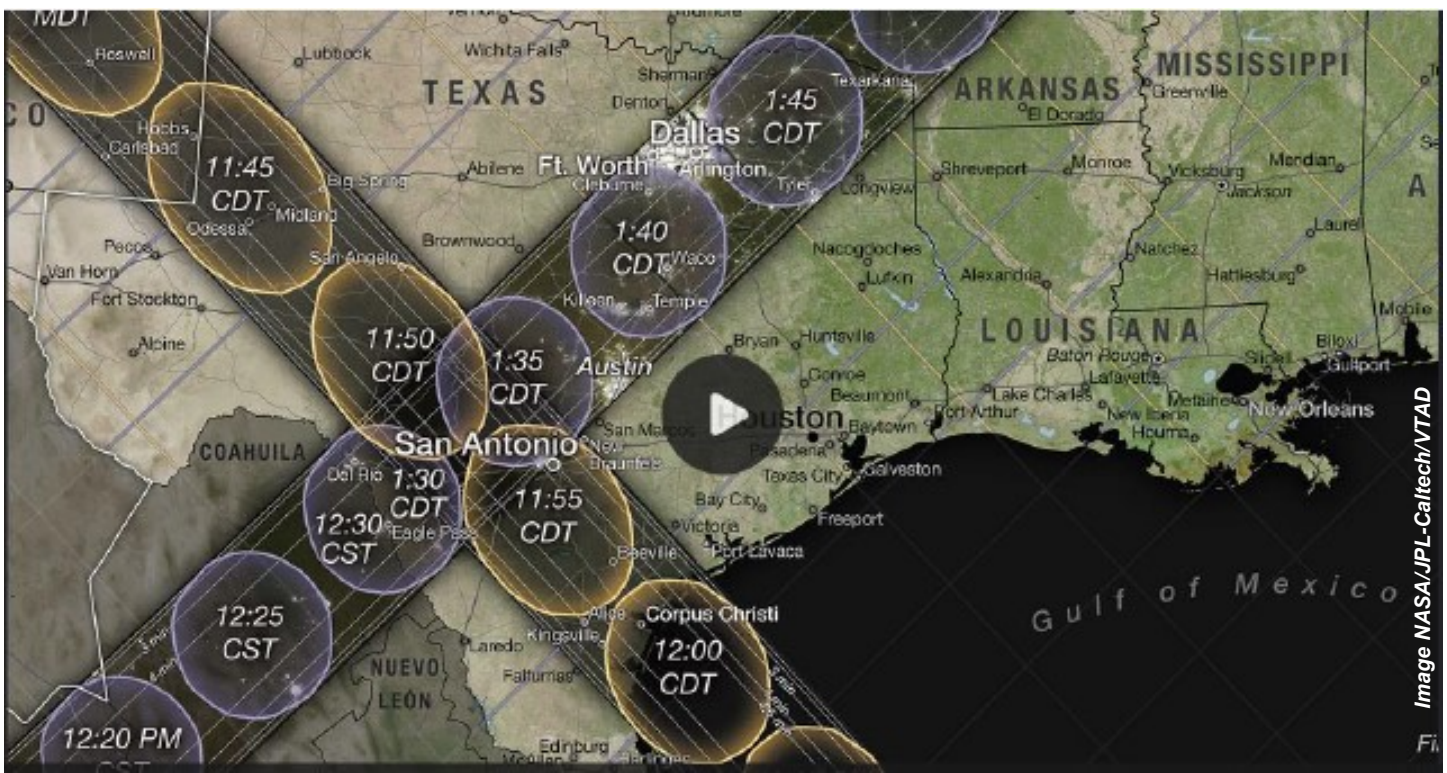


Image: NASA/Scientific Visualization Studio/Michala Garrison; eclipse calculations by Ernie Wright, NASA Goddard Space Flight Center

The path of the **total** solar eclipse is not over Minnesota, of course. But if the sky is clear, we'll still experience the eclipse gradation shown on the NASA globe. Do you have plans to travel to an area in the path of the total eclipse to witness this rare event in person? If so, tell us about your experience and we'll publish it in the May Relay. Remember: After the total eclipse on April 8, 2024, the **next total solar eclipse** that can be seen from the contiguous United States will be on **August 23, 2044!** I will leave it to a future **Relay** editor to cover upcoming details on that event :) ★



Contest Calendar - March 2024

- + NCCC FT4 Sprint
 - + Weekly RTTY Test
 - + QRP Fox Hunt
 - + NCCC Sprint Ladder
 - + K1USN Slow Speed Test
 - + Novice Rig Roundup
 - + ARRL Inter. DX Contest, SSB

 - + Wake-Up! QRP Sprint
 - + Open Ukraine RTTY Championship
 - + UBA Spring Contest, CW

 - + NSARA Contest
 - + SARL Hamnet 40m Simulated Emerg Contest
 - + WAB 3.5 MHz Phone
 - + K1USN Slow Speed Test
 - + ICWC Medium Speed Test
 - + OK1WC Memorial
 - + ICWC Medium Speed Test
 - + RSGB 80m Club Championship, Data
 - + Worldwide Sideband Activity Contest
 - + ARS Spartan Sprint
 - + ICWC Medium Speed Test
 - + AGCW YL-CW Party
 - + QRP Fox Hunt
 - + Phone Weekly Test
 - + A1Club AWT
 - + CWops Test
- 0100Z-0130Z, Mar 1
 - 0145Z-0215Z, Mar 1
 - 0200Z-0330Z, Mar 1
 - 0230Z-0300Z, Mar 1
 - 2000Z-2100Z, Mar 1
 - 0000Z, Mar 2 to 2359Z, Mar 10
 - 0000Z, Mar 2 to 2400Z, Mar 3
 - 0600Z-0629Z, Mar 2 and
0630Z-0659Z, Mar 2 and
0700Z-0729Z, Mar 2 and
0730Z-0800Z, Mar 2
 - 1800Z, Mar 2 to 1359Z, Mar 3
 - 0700Z-1100Z, Mar 3
 - 1200Z-1600Z, Mar 3 and
1800Z-2200Z, Mar 3
 - 1200Z-1400Z, Mar 3
 - 1800Z-2200Z, Mar 3
 - 0000Z-0100Z, Mar 4
 - 1300Z-1400Z, Mar 4
 - 1630Z-1729Z, Mar 4
 - 1900Z-2000Z, Mar 4
 - 2000Z-2130Z, Mar 4
 - 0100Z-0159Z, Mar 5
 - 0200Z-0400Z, Mar 5
 - 0300Z-0400Z, Mar 5
 - 1900Z-2100Z, Mar 5
 - 0200Z-0330Z, Mar 6
 - 0230Z-0300Z, Mar 6
 - 1200Z-1300Z, Mar 6
 - 1300Z-1400Z, Mar 6

Continued on Page 18



Contest Calendar - March 2024

- + VHF-UHF FT8 Activity Contest
 - + Mini-Test 40
 - + Mini-Test 80
 - + CWops Test
 - + UKEICC 80m Contest

 - + Walk for the Bacon QRP Contest
 - + CWops Test
 - + CWops Test

 - + NRAU 10m Activity Contest
 - + SKCC Sprint Europe
 - + NCCC FT4 Sprint
 - + Weekly RTTY Test
 - + QRP Fox Hunt
 - + NCCC Sprint
 - + K1USN Slow Speed Test
 - + YB DX RTTY Contest
 - + SARL Field Day Contest
 - + SARL VHF/UHF FM Contest
 - + RSGB Commonwealth

 - + DIG QSO Party, SSB
 - + SKCC Weekend Sprintathon
 - + South America 10 Meter Contest
 - + EA PSK63 Contest
 - + AGCW QRP Contest
- 1700Z-2100Z, Mar 6
1700Z-1759Z, Mar 6
1800Z-1859Z, Mar 6
1900Z-2000Z, Mar 6
2000Z-2100Z, Mar 6
0000Z-0100Z, Mar 7 and
0200Z-0300Z, Mar 8
0300Z-0400Z, Mar 7
0700Z-0800Z, Mar 7
1800Z-1900Z, Mar 7 (CW) and
1900Z-2000Z, Mar 7 (SSB) and
2000Z-2100Z, Mar 7 (FM) and
2100Z-2200Z, Mar 7 (Dig)
2000Z-2200Z, Mar 7
0100Z-0130Z, Mar 8
0145Z-0215Z, Mar 8
0200Z-0330Z, Mar 8
0230Z-0300Z, Mar 8
2000Z-2100Z, Mar 8
0000Z-2359Z, Mar 9
0800Z, Mar 9 to 1000Z, Mar 10
0800Z, Mar 9 to 1000Z, Mar 10
1000Z, Mar 9 to 1000Z, Mar 10
1200Z-1700Z, Mar 9 (20m-10m) and
0700Z-0900Z, Mar 10 (80m) and
0900Z-1100Z, Mar 10 (40m)
1200Z, Mar 9 to 2400Z, Mar 10
1200Z, Mar 9 to 1200Z, Mar 10
1200Z, Mar 9 to 1200Z, Mar 10
1400Z-2000Z, Mar 9

Continued on Page 19



Contest Calendar - March 2024

- + Stew Perry Topband Challenge
 - + Oklahoma QSO Party
 - + TESLA Memorial HF CW Contest
 - + Idaho QSO Party
 - + North American Sprint, RTTY
 - + UBA Spring Contest, 2m
 - + FIRAC HF Contest
 - + YOTA Contest
 - + Wisconsin QSO Party
 - + 4 States QRP Group Second Sunday Sprint
 - + K1USN Slow Speed Test
 - + ICWC Medium Speed Test
 - + OK1WC Memorial
 - + ICWC Medium Speed Test
 - + Worldwide Sideband Activity Contest
 - + ICWC Medium Speed Test
 - + QRP Fox Hunt
 - + Phone Weekly Test
 - + A1Club AWT
 - + CWops Test
 - + VHF-UHF FT8 Activity Contest
 - + Mini-Test 40
 - + Mini-Test 80
 - + CWops Test
 - + RSGB 80m Club Championship, CW
 - + AWA John Rollins Memorial DX Contest
 - + CWops Test
 - + CWops Test
- 1500Z, Mar 9 to 1500Z, Mar 10
1500Z, Mar 9 to 0200Z, Mar 10 and
1500Z-2100Z, Mar 10
1800Z, Mar 9 to 0559Z, Mar 10
1900Z, Mar 9 to 1900Z, Mar 10
0000Z-0359Z, Mar 10
0700Z-1100Z, Mar 10
0700Z to 1700Z, Mar 10
1000Z-2159Z, Mar 10
1800Z, Mar 10 to 0100Z, Mar 11
0000Z-0200Z, Mar 11
0000Z-0100Z, Mar 11
1300Z-1400Z, Mar 11
1630Z-1729Z, Mar 11
1900Z-2000Z, Mar 11
0100Z-0159Z, Mar 12
0300Z-0400Z, Mar 12
0200Z-0330Z, Mar 13
0230Z-0300Z, Mar 13
1200Z-1300Z, Mar 13
1300Z-1400Z, Mar 13
1700Z-2100Z, Mar 13
1700Z-1759Z, Mar 13
1800Z-1859Z, Mar 13
1900Z-2000Z, Mar 13
2000Z-2130Z, Mar 13
2300Z, Mar 13 to 2300Z, Mar 14 and
2300Z, Mar 16 to 2300Z, Mar 17
0300Z-0400Z, Mar 14
0700Z-0800Z, Mar 14

Continued on Page 20



Contest Calendar - March 2024

| | |
|--|--|
| + BCC QSO Party | 1900Z-2059Z, Mar 14 |
| + NCCC FT4 Sprint | 0100Z-0130Z, Mar 15 |
| + Weekly RTTY Test | 0145Z-0215Z, Mar 15 |
| + QRP Fox Hunt | 0200Z-0330Z, Mar 15 |
| + NCCC Sprint | 0230Z-0300Z, Mar 15 |
| + K1USN Slow Speed Test | 2000Z-2100Z, Mar 15 |
| + PODXS 070 Club St Patrick's Day Contest | 0000Z-2359Z, Mar 16 |
| + BARTG HF RTTY Contest | 0200Z, Mar 16 to 0159Z, Mar 18 |
| + Africa All Mode International DX Contest | 1200Z, Mar 16 to 1200Z, Mar 17 |
| + F9AA Cup, SSB | 1200Z, Mar 16 to 1200Z, Mar 17 |
| + Russian DX Contest | 1200Z, Mar 16 to 1200Z, Mar 17 |
| + Virginia QSO Party | 1400Z, Mar 16 to 0400Z, Mar 17 and 1200Z-2400Z, Mar 17 |
| + AGCW VHF/UHF Contest | 1400Z-1700Z, Mar 16 (144) and 1700Z-1800Z, Mar 16 (432) |
| + Feld Hell Sprint | 2000Z-2159Z, Mar 16 |
| + UBA Spring Contest, SSB | 0700Z-1100Z, Mar 17 |
| + Run for the Bacon QRP Contest | 2300Z, Mar 17 to 0100Z, Mar 18 |
| + K1USN Slow Speed Test | 0000Z-0100Z, Mar 18 |
| + ICWC Medium Speed Test | 1300Z-1400Z, Mar 18 |
| + OK1WC Memorial | 1630Z-1729Z, Mar 18 |
| + Bucharest Digital Contest | 1800Z-2059Z, Mar 18 |
| + ICWC Medium Speed Test | 1900Z-2000Z, Mar 18 |
| + RSGB FT4 Contest | 2000Z-2130Z, Mar 18 |
| + Worldwide Sideband Activity Contest | 0100Z-0159Z, Mar 19 |
| + ICWC Medium Speed Test | 0300Z-0400Z, Mar 19 |
| + IRTS 80m Evening Counties Contest | 2000Z-2100Z, Mar 19 |
| + QRP Fox Hunt | 0200Z-0330Z, Mar 20 |
| + Phone Weekly Test | 0230Z-0300Z, Mar 20 |
| + A1Club AWT | 1200Z-1300Z, Mar 20 |

Continued on Page 21



Contest Calendar - March 2024

| | |
|---------------------------------------|--------------------------------|
| + CWops Test | 1300Z-1400Z, Mar 20 |
| + VHF-UHF FT8 Activity Contest | 1700Z-2100Z, Mar 20 |
| + Mini-Test 40 | 1700Z-1759Z, Mar 20 |
| + Mini-Test 80 | 1800Z-1859Z, Mar 20 |
| + CWops Test | 1900Z-2000Z, Mar 20 |
| | 0000Z-0100Z, Mar 21 and |
| | 0200Z-0300Z, Mar 22 |
| + Walk for the Bacon QRP Contest | 0030Z-0230Z, Mar 21 |
| + NAQCC CW Sprint | 0300Z-0400Z, Mar 21 |
| + CWops Test | 0700Z-0800Z, Mar 21 |
| + CWops Test | 1900Z-2000Z, Mar 21 |
| + NTC QSO Party | 0100Z-0130Z, Mar 22 |
| + NCCC FT4 Sprint | 0145Z-0215Z, Mar 22 |
| + Weekly RTTY Test | 0200Z-0330Z, Mar 22 |
| + QRP Fox Hunt | 0230Z-0300Z, Mar 22 |
| + NCCC Sprint | 2000Z-2100Z, Mar 22 |
| + K1USN Slow Speed Test | 0000Z, Mar 23 to 2359Z, Mar 24 |
| + Maidenhead Mayhem Sprint | 0000Z-2359Z, Mar 23 |
| + FOC QSO Party | 0000Z-0400Z, Mar 24 |
| + North American SSB Sprint Contest | 0600Z-1000Z, Mar 24 |
| + UBA Spring Contest, 6m | 0000Z-0100Z, Mar 25 |
| + K1USN Slow Speed Test | 1300Z-1400Z, Mar 25 |
| + ICWC Medium Speed Test | 1300Z-1400Z, Mar 25 |
| + QCX Challenge | 1630Z-1729Z, Mar 25 |
| + OK1WC Memorial | 1900Z-2000Z, Mar 25 |
| + ICWC Medium Speed Test | 1900Z-2000Z, Mar 25 |
| + QCX Challenge | 0100Z-0159Z, Mar 26 |
| + Worldwide Sideband Activity Contest | 0300Z-0400Z, Mar 26 |
| + QCX Challenge | 0300Z-0400Z, Mar 26 |
| + ICWC Medium Speed Test | 0000Z-0200Z, Mar 27 |
| + SKCC Sprint | |

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| | |
|-----------------------------------|--------------------------------|
| + QRP Fox Hunt | 0200Z-0330Z, Mar 27 |
| + Phone Weekly Test | 0230Z-0300Z, Mar 27 |
| + A1Club AWT | 1200Z-1300Z, Mar 27 |
| + CWops Test | 1300Z-1400Z, Mar 27 |
| + Mini-Test 40 | 1700Z-1759Z, Mar 27 |
| + Mini-Test 80 | 1800Z-1859Z, Mar 27 |
| + CWops Test | 1900Z-2000Z, Mar 27 |
| + UKEICC 80m Contest | 2000Z-2100Z, Mar 27 |
| + CWops Test | 0300Z-0400Z, Mar 28 |
| + CWops Test | 0700Z-0800Z, Mar 28 |
| + RSGB 80m Club Championship, SSB | 2000Z-2130Z, Mar 28 |
| + NCCC FT4 Sprint | 0100Z-0130Z, Mar 29 |
| + Weekly RTTY Test | 0145Z-0215Z, Mar 29 |
| + QRP Fox Hunt | 0200Z-0330Z, Mar 29 |
| + NCCC Sprint | 0230Z-0300Z, Mar 29 |
| + Sasquatch Stomp | 1900Z, Mar 29 to 0300Z, Mar 30 |
| + K1USN Slow Speed Test | 2000Z-2100Z, Mar 29 |
| + Feld Hell Sprint | 0000Z-2359Z, Mar 30 |
| + CQ WW WPX Contest, SSB | 0000Z, Mar 30 to 2359Z, Mar 31 |

Our thanks to **Bruce Horn, WA7BNM** for use of this calendar!
 Visit Bruce at www.contestcalendar.com/contestcal.html

The ARAC RELAY



Published monthly and distributed free to members, "The RELAY" is the official publication of the Arrowhead Radio Amateur Club, Inc. Members are encouraged to submit articles, opinions, and classifieds. Your submission will be placed as soon as possible providing it does not conflict with the bylaws of the Arrowhead Radio Amateur Club, Inc. The editors reserve the right to omit any submission that is not a required item. If a submission is questionable, it will be presented to the Board of Directors at the next scheduled board meeting for authorization.

