



Prez Says

The GARS Repeater

June 2024

Salutations from the lair of KF6OBI! – The month of May brought many surprises, in forms that were not expected. From a death in our family to an emergency event in which we are still recovering from. Please know that we are seeing a daily healing progression. As we go through trying times we hold on to the faith that we are held in love and support by those around us. We take time each day to relish the many daily blessings that befall us.

This past month Amateurs all around the world have given witness to extreme and oft times bazaar RF conditions. These are the results of our solar star spewing forth Solar Flares, and Coronal Mass Ejections. Luckily earth, and its inhabitants, have not witnessed any direct hits. But there have been some really close calls!

For the first time since the Halloween Solar Storms of 2003 we reached the Extreme G5 geomagnetic storm threshold on Saturday, 11 May 2024, which peaked at 22:54 UTC. During this event many things happened that some casual observers may have noticed. But there were in fact some serious hits to our communications infrastructures, namely Satellites, and HF/VHF/UHF radio circuits. For the radio circuits it was noticed that there were radio blackouts and bands just disappearing for long periods of time, like someone just flipped a switch. [we may again see these same conditions the first weekend of June?]

Should you want to know or learn more about our Space Weather, what is taking place now, and how it effects us worldwide, then go to <<https://www.spaceweatherlive.com/en/news.html>>, and <<https://www.spaceweatherwoman.com/>>.

If you are a Starlink system user you may have notice a significant loss of bandwidth. Others may have noticed some really odd behavior with other communications devices and services, but paid no attention, nor asked what is going on here. Are we, as a society, becoming so oblivious to the infrastructure that we have at hand, and are creating, that we can no longer see the tree for the forest? There is one group of farmers that are starting to pay attention; the precision farmers. These folks relay on GPS-based systems to prep their fields, plant their crop, and then harvest that crop, for maximum yields. Those farmers that were in the mist of doing their work got a grand surprise when their GPS-based guidance flipped on its head and sent them askew.

This upset in the GPS system not only effected them that day but will also effect them come harvest time. Because the way-points that are/where saved when planting are also the same ones used for harvest. So every part of their farming operations has been effected by this major solar event.

This led me to start asking some serious questions and to do some research. But then I found I would loose so much time in this endeavor that I would not be able to bring that research to you in a quick manor. So, I went to a new acquaintance, ChatGPT, which if asked appropriate and thoughtful questions does the research for you and responds back with some solid answers, to give serious though to.

So in the main part of this newsletter I present you with the 6 questions I asked ChatGPT and the answers she gave back to me. I am in awe of the AI technologies, when they are used for the greater good of mankind. All the answers are very thought provoking and one does not have to read much between the lines to realize the true weakness of our communications infrastructures and other technologies that we have become so reliant on.

Let me know what you think about the questions asked of ChatGPT. At this time I do not totally agree with the order of importance placed on key technologies and critical communications infrastructure, but I do realize some are on the same level of importance. The critical infrastructures that we are talking about are worldwide and would also include the World Wide Web and Internet operations.

More EMI testing of the DRT generator will take place over the next few weeks at time permits. Please note that this year the DRT will not be used for summer Field Day. We will be making it ready to present at the Hot RF Nights event in July. Please see the notice of this event, which is posted on <<https://www.garshamradio.org/>>.

During the month of May a recon trip to check out summer ARRL Field Day sites in the Mendocino Forest was conducted. Pictures of the two sites are posted on <<https://www.garshamradio.org/>>. It has been decided that GARS will activate the Squaw Camp site for the ARRL 2024 Field Day. This event site will pose many challenges that will strengthen our Amateur Radio skills. Plans for Field Day will include a Fox Hunt and also encompass a POTA event. See PDF flier that accompanies this newsletter issue.

Tentative plans are in the works to check and test the passage to the Saint John site. This trek is being planned for the 8th or the 15th of June.

Up and coming events are: –See notices are on the GARS Website <<https://www.garshamradio.org/>>

This months membership meeting will be on the second Friday, the 14th of June, at the Lutheran Fellowship Hall, 565 Main Street, Artois CA, at 7:00pm. Late arrivals and guests are always welcome. Also remember that one does not have to be a member of the club to participate in our membership meetings and activities. Be safe in all you do and may you all have many blessings in the days and months ahead!

Michael A. Ellithorpe, KF6OBI/WRHY416

President, GARS

kj6hcg@gmail.com

Glenn Amateur Radio Society, P.O. Box 212, Willows, CA 95988



=====

Questions KF6OBI asked ChatGPT on 29 May 2024 concerning the effects of solar activities on our communications infrastructure. Here are the questions provided to, and answers from ChatGPT.

>> Question 1: *Looking forward what would happen to global communications if GPS were to go off line for 24, 48, and 72 hours. List the critical communications that would fail in order of importance?*

ChatGPT answer to question 1: If the Global Positioning System (GPS) were to go offline for 24, 48, and 72 hours, it would have significant impacts on various critical communication systems. Here's an analysis of the potential failures in order of importance:

1. Emergency Services (24 hours)

- **Impact:** High
- **Reason:** Emergency response units (ambulances, police, fire services) rely heavily on GPS for dispatching and navigation. An outage would lead to slower response times, potentially endangering lives.

2. Aviation Navigation and Control (24 hours)

- **Impact:** High
- **Reason:** Aircraft rely on GPS for navigation, positioning, and timing. An outage would disrupt air traffic management, leading to flight delays, cancellations, and increased risk of accidents.

3. Maritime Navigation (24 hours)

- **Impact:** High
- **Reason:** Ships use GPS for safe navigation and avoiding collisions. An outage would affect commercial shipping and maritime safety, leading to potential accidents and disruptions in global trade.

4. Telecommunications Networks (24 hours)

- **Impact:** High

- **Reason:** GPS provides precise timing needed for synchronizing cellular networks, internet data transfer, and financial transactions. An outage would degrade network performance and could lead to service disruptions.

5. Banking and Financial Systems (24 hours)

- **Impact:** High
- **Reason:** Financial institutions use GPS for time-stamping transactions. An outage could lead to synchronization issues, potentially causing transaction delays and errors.

6. Power Grid Synchronization (24 hours)

- **Impact:** High
- **Reason:** Power grids use GPS for synchronizing the grid's operations. An outage could lead to imbalances and inefficiencies, increasing the risk of outages.

7. Logistics and Supply Chain (24 hours)

- **Impact:** Medium
- **Reason:** Logistics companies rely on GPS for tracking and managing shipments. An outage would cause delays and inefficiencies in the supply chain.

8. Personal Navigation Systems (24 hours)

- **Impact:** Medium
- **Reason:** Personal and commercial navigation systems in vehicles rely on GPS. An outage would cause inconvenience and potential safety issues for drivers.

9. Military Operations (24 hours)

- **Impact:** High
- **Reason:** Military operations rely on GPS for navigation, targeting, and communications. An outage would compromise operational effectiveness and security.

10. Weather Forecasting and Earth Observation (48 hours)

- **Impact:** Medium
- **Reason:** Some weather forecasting models and earth observation satellites rely on GPS data. An extended outage could affect the accuracy of forecasts and environmental monitoring.

Cascading Effects over Time

- **24 Hours:** Immediate disruptions in emergency services, aviation, maritime navigation, telecommunications, and financial systems.
- **48 Hours:** Escalation of issues in power grid synchronization, logistics, and supply chains.
- **72 Hours:** Prolonged impacts on military operations, weather forecasting, and earth observation. Increased economic losses and potential societal unrest due to prolonged disruptions.

Summary of Critical Failures in Order of Importance:

1. Emergency Services
2. Aviation Navigation and Control
3. Maritime Navigation
4. Telecommunications Networks

5. **Banking and Financial Systems**
6. **Power Grid Synchronization**
7. **Logistics and Supply Chain**
8. **Personal Navigation Systems**
9. **Military Operations**
10. **Weather Forecasting and Earth Observation**

→ An extended GPS outage would have a compounding effect, exacerbating disruptions across multiple sectors and potentially leading to a cascading series of failures with **serious** global implications.

>> **Question 2: *What communications infrastructure has been effected by solar activity in the last 45 days?***

ChatGPT answer to question 2: In the last 45 days, solar activity has significantly impacted various aspects of global communications infrastructure. Major solar flares and coronal mass ejections (CMEs) have resulted in geomagnetic storms with several notable effects.

1. **Radio Communications:**

- High-frequency (HF) radio communications experienced significant disruptions. Temporary or complete blackouts were reported in areas on the sunlit side of the Earth during intense solar flare activity, notably on May 10, 2024 ([Space Weather Prediction Center](#)), ([SpaceWeatherLive.com](#)).
- Very high frequency (VHF) and ultra-high frequency (UHF) bands were also affected, although to a lesser extent, primarily due to increased ionospheric absorption during the storms, ([Wikipedia](#)).

2. **Satellite Operations:**

- Satellites in low Earth orbit faced increased drag, irregularities in orientation, and potential surface charging. These issues caused anomalies in satellite operations and impacted their communication capabilities, ([SpaceWeatherLive.com](#)), ([Wikipedia](#)).
- The GOES-16 satellite, crucial for weather monitoring, stopped transmitting data on May 13, 2024, highlighting the vulnerability of satellites to space weather, ([Wikipedia](#)).

3. **GPS Navigation:**

- GPS signals were degraded, leading to significant issues for precision-dependent applications. For instance, agricultural operations using John Deere RTK GPS equipment reported severe accuracy degradation, forcing a halt in certain activities like planting, ([Wikipedia](#)).

4. **Power Grids:**

- Power grid systems, especially at high latitudes, experienced fluctuations and voltage alarms. While no major outages were reported, the potential for significant disruptions was high during periods of intense geomagnetic activity, ([SpaceWeatherLive.com](#)), ([Wikipedia](#)).

5. **Aviation:**

- The increased energetic particle flux posed biological risks to crew and passengers on high-latitude flights, necessitating rerouting or altitude adjustments for certain flights, ([SpaceWeatherLive.com](#)).

→ Overall, the recent solar activity underscores the critical importance of monitoring space weather and preparing for its potential impacts on communication and navigation infrastructure.

>> **Question 3: *How would Land Mobile Radio and Amateur Radio be effected by extreme solar activity?***

ChatGPT answer to question 3: Extreme solar activity, such as intense solar flares and coronal mass ejections (CMEs), can significantly impact both Land Mobile Radio (LMR) and Amateur Radio (HAM) operations. Here's how each would be affected:

Land Mobile Radio (LMR)

Land Mobile Radio systems, commonly used by public safety organizations, utilities, and transportation services, rely on radio frequency bands that can be impacted by solar activity in several ways:

1. Signal Fading and Interference:

- **Impact on VHF and UHF Bands:** Solar flares and associated geomagnetic storms can cause increased ionization in the Earth's ionosphere, particularly in the D and E layers. This increased ionization can lead to higher levels of signal absorption and scattering, resulting in signal fading and intermittent communication on VHF (30-300 MHz) and UHF (300 MHz-3 GHz) bands, ([SpaceWeatherLive.com](https://spaceweatherlive.com)), ([Wikipedia](https://en.wikipedia.org)).
- **Noise and Interference:** Enhanced solar activity increases the noise floor, making it harder to distinguish between desired signals and background noise. This is especially problematic for LMR systems operating in urban environments where interference is already high.

2. Coverage Area Reduction:

- **Line-of-Sight Communication:** LMR systems generally rely on line-of-sight communication, which can be disrupted by ionospheric conditions. The range of communication can be significantly reduced during solar storms due to increased signal degradation.

Amateur Radio (HAM)

Amateur Radio operators use a variety of frequency bands, many of which are directly impacted by solar and geomagnetic activity:

1. High Frequency (HF) Bands (3-30 MHz):

- **HF Propagation:** HF bands are highly dependent on ionospheric conditions for long-distance communication. During solar flares and CMEs, the D layer of the ionosphere becomes highly ionized, causing severe absorption of HF signals. This can lead to blackouts on these frequencies, making long-distance communication difficult or impossible for hours to days, ([Space.com](https://space.com)),([SpaceWeatherLive.com](https://spaceweatherlive.com)), ([Wikipedia](https://en.wikipedia.org)).
- **Solar Flares and Radio Blackouts:** Intense solar flares can cause immediate and widespread HF radio blackouts on the sunlit side of the Earth. These blackouts can last from minutes to hours, disrupting emergency communications and routine amateur radio operations, ([SpaceWeatherLive.com](https://spaceweatherlive.com)).

2. VHF/UHF Bands:

- **Ionospheric Scatter and Tropospheric Ducting:** While VHF and UHF bands are less affected by ionospheric conditions than HF bands, extreme solar activity can still cause irregularities. Enhanced ionization can lead to sporadic E-layer propagation, causing unexpected signal paths and interference over long distances.

3. Geomagnetic Storm Effects:

- **Auroral Propagation:** Geomagnetic storms can enhance auroral propagation, allowing VHF communications over unusual paths, especially at higher latitudes. While this can be an interesting phenomenon for amateur operators, it also introduces unpredictable variability in signal paths and strengths.

- **Satellite Communications:** Amateur radio satellites can experience increased drag and potential orientation issues during geomagnetic storms, affecting the stability and reliability of satellite-based communications, ([SpaceWeatherLive.com](https://spaceweatherlive.com)), ([Wikipedia](https://en.wikipedia.org/wiki/Satellite_communications)).

Mitigation Strategies

- **Frequency Adjustments:** Operators might switch to less affected bands or frequencies during high solar activity.
- **Signal Monitoring:** Constant monitoring of space weather alerts from NOAA and other space weather services can help operators anticipate and prepare for disruptions.
- **Redundancy:** Implementing redundant communication paths and using multiple bands can help maintain connectivity when primary frequencies are disrupted.

-> In summary, both Land Mobile Radio and Amateur Radio systems are vulnerable to the effects of extreme solar activity. The extent of the impact varies based on the frequency bands used and the nature of the solar event, with HF bands being the most severely affected. Operators can mitigate some of these effects through careful monitoring and adaptive communication strategies.

>> Question 4: Could extreme solar activities degrade satellites enough for them to drop out of orbit?

ChatGPT answer to question 4: Extreme solar activities, such as intense solar flares and coronal mass ejections (CMEs), can indeed degrade satellites to the point where they might drop out of orbit, although this is relatively rare and would typically involve several compounding factors. Here's how solar activity affects satellites and the potential for them to fall out of orbit:

Mechanisms of Satellite Degradation Due to Solar Activity

1. Increased Atmospheric Drag:

- **Geomagnetic Storms:** CMEs can cause geomagnetic storms, which increase the density of the Earth's upper atmosphere (thermosphere). This increased density results in greater atmospheric drag on satellites in low Earth orbit (LEO), causing them to lose altitude more quickly than usual, ([SpaceWeatherLive.com](https://spaceweatherlive.com)), ([Wikipedia](https://en.wikipedia.org/wiki/Geomagnetic_storm)).
- **Orbital Decay:** Over time, if the drag is significant and continuous, it can cause the satellite to gradually descend. Without corrective maneuvers, this can lead to re-entry and potential disintegration upon re-entry into the denser layers of the atmosphere.

2. Surface Charging and Radiation Damage:

- **Electrostatic Discharge:** High-energy particles from solar flares and CMEs can charge satellite surfaces, leading to electrostatic discharge events. These discharges can damage electronic components, causing malfunctions or failure, ([Wikipedia](https://en.wikipedia.org/wiki/Electrostatic_discharge)).
- **Radiation Effects:** Increased radiation can degrade solar panels, sensors, and other critical components, potentially leading to loss of power or control systems necessary for maintaining orbit.

3. Magnetic Field Disruptions:

- **Attitude Control Systems:** Satellites use magnetic field sensors for orientation and attitude control. Geomagnetic storms can disrupt these sensors, leading to loss of control over the satellite's orientation, which can affect its ability to maintain a stable orbit and perform orbital corrections, ([SpaceWeatherLive.com](https://spaceweatherlive.com)).

Historical Examples and Risks

- **Skylab (1979):** The increased solar activity during the solar maximum of 1979 contributed to higher atmospheric drag on the Skylab space station, which eventually re-entered the Earth's atmosphere earlier than expected and disintegrated over Australia.
- **Iridium Satellites:** In 2017, the Iridium satellite network experienced increased drag during periods of heightened solar activity, requiring frequent adjustments to maintain their orbits, ([Wikipedia](#)).

Mitigation Measures

- **Orbital Maneuvers:** Satellites equipped with propulsion systems can perform orbital maneuvers to counteract increased drag and maintain their designated orbits.
- **Hardened Components:** Satellites designed with radiation-hardened components are more resilient to the damaging effects of solar particles.
- **Real-time Monitoring:** Operators use real-time space weather monitoring to predict and mitigate the effects of solar activity by adjusting satellite operations and orientations.

-> Conclusion

While extreme solar activity can degrade satellites and potentially cause them to drop out of orbit, this scenario typically requires sustained and severe conditions. Satellite operators mitigate these risks through design features, real-time monitoring, and active management of satellite orbits. Nevertheless, as solar activity varies in cycles, periods of high activity pose significant challenges to maintaining satellite health and stability.

>> Question 5: *What is the main and secondary synchronizing source for the GPS system?*

ChatGPT answer to question 5: The main and secondary synchronizing sources for the GPS (Global Positioning System) are critical for ensuring its accuracy and reliability. Here's a detailed look at these sources:

Main Synchronizing Source: Atomic Clocks

The primary synchronizing source for the GPS system is a network of highly precise atomic clocks. These clocks are located both on the GPS satellites and at ground control stations. Atomic clocks are known for their extremely high accuracy, often losing less than a second over millions of years.

1. Cesium Atomic Clocks:

- **Precision:** Cesium atomic clocks are the primary type used in GPS satellites due to their high precision and stability.
- **Function:** They provide the fundamental timekeeping mechanism that enables the satellites to generate precise timing signals.

2. Rubidium Atomic Clocks:

- **Backup:** Rubidium atomic clocks are often used as backup to the cesium clocks. They are slightly less precise but still extremely accurate and reliable.
- **Usage:** These clocks are more compact and are used when there are constraints on space or power within the satellite.

Secondary Synchronizing Source: Ground Control Stations

The secondary synchronizing source involves ground control stations that monitor and maintain the accuracy of the satellite clocks and their orbits. These stations help to synchronize and update the satellite clocks regularly.

1. Master Control Station (MCS):

- **Location:** The main control station is located at Schriever Space Force Base in Colorado.

- **Role:** The MCS is responsible for calculating the precise positions of the satellites and updating the satellite clocks to correct any drifts.

2. Monitor Stations:

- **Global Network:** A network of globally distributed monitoring stations constantly tracks the GPS satellites.
- **Data Collection:** These stations collect data on the satellites' positions and clock performance, which is then sent to the MCS for analysis and corrections.

3. Ground Antennas:

- **Communication:** Ground antennas communicate with the satellites to send updates and corrections based on the data from the monitor stations.
- **Frequency:** These updates ensure that any discrepancies in timing or orbital data are corrected to maintain the overall accuracy of the GPS system.

Synchronization Process

1. Satellite Broadcasts:

- Each GPS satellite broadcasts its own time and position.
- The signals from multiple satellites are received by GPS receivers, which use the timing data to triangulate the receiver's position.

2. Clock Corrections:

- The ground control stations monitor the clock signals and send correction updates to the satellites.
- These corrections account for any drifts in the atomic clocks and ensure synchronization across the entire constellation of satellites.

3. Relativistic Effects:

- Due to the high speeds and altitudes of the satellites, relativistic effects (both general and special relativity) must be accounted for in the synchronization process.
- Ground control stations continuously adjust for these relativistic effects to maintain precise timing.

→ By utilizing highly accurate atomic clocks and a robust ground control infrastructure, the GPS system can provide precise time and positional information globally. These synchronizing sources are essential for the system's reliability and accuracy.

Sources

- **GPS.gov** provides detailed information on the functioning and maintenance of the GPS system: [GPS Overview](#)
- **NIST** explains the role of atomic clocks in timekeeping and their importance in GPS: [NIST Atomic Clocks](#)

>> **Question 6: *What interference source can take a GPS receiver off line, or kill the receiver?***

ChatGPT answer to question 6: A GPS receiver can be taken offline or rendered inoperative by several types of interference. These interference sources can be natural or man-made and can vary in their impact based on intensity and duration. Here are the primary sources of interference:

1. Jamming

Jamming is the deliberate transmission of radio frequency signals that disrupt the operation of GPS receivers. This can be done with specialized equipment designed to emit signals at the same frequencies used by GPS (L1, L2, L5 bands).

- **Types of Jamming:**
 - **Broadband Jamming:** Covers a wide range of frequencies and can be highly effective at close ranges.
 - **Narrowband Jamming:** Targets specific GPS frequencies and can be effective at longer ranges.
- **Effects:**
 - **Loss of Signal:** The GPS receiver cannot lock onto the GPS signals, resulting in a complete loss of position information.
 - **Degraded Accuracy:** In cases of partial jamming, the accuracy of the position data can be significantly reduced.

2. Spoofing

Spoofing involves the transmission of false GPS signals that mimic the authentic ones, leading the receiver to calculate incorrect positions.

- **Methods:**
 - **Coherent Spoofing:** Mimics the actual GPS signals closely and can be difficult to detect.
 - **Non-Coherent Spoofing:** Easier to detect but can still cause significant errors.
- **Effects:**
 - **False Positioning:** The receiver provides inaccurate position data, which can lead to navigation errors.
 - **System Failures:** Critical systems relying on precise GPS data can fail if fed erroneous information.

3. Interference from Other Electronic Devices

Various electronic devices can emit signals that interfere with GPS reception. This is often unintentional but can be disruptive.

- **Sources:**
 - **Mobile Phones and Towers:** High-power transmissions can create interference.
 - **Broadcasting Equipment:** TV and radio transmitters, especially those operating near GPS frequencies.
 - **Industrial Equipment:** Machines with strong electromagnetic emissions can disrupt GPS signals.
- **Effects:**
 - **Signal Degradation:** Weaker or distorted GPS signals lead to reduced accuracy.
 - **Intermittent Loss of Signal:** Temporary loss of GPS signals, resulting in unreliable navigation data.

4. Solar Activity

Solar flares and coronal mass ejections (CMEs) can cause significant disruptions to GPS signals.

- **Mechanisms:**

- **Ionospheric Disturbances:** Increased ionization in the Earth's ionosphere can absorb or reflect GPS signals.
- **Geomagnetic Storms:** These storms can induce currents in the ionosphere, leading to signal scintillation and fading.
- **Effects:**
 - **Signal Loss:** Complete loss of GPS signals in severe cases.
 - **Accuracy Reduction:** Increased errors in position data due to signal refraction and reflection.

5. Environmental Factors

Natural obstructions and atmospheric conditions can also interfere with GPS signals.

- **Obstructions:**
 - **Buildings and Terrain:** Urban canyons and mountainous areas can block or reflect GPS signals.
 - **Vegetation:** Dense foliage can attenuate GPS signals, reducing their strength.
- **Atmospheric Conditions:**
 - **Heavy Rain and Snow:** Can absorb or scatter GPS signals, leading to reduced signal strength.
 - **Multipath Interference:** Signals reflecting off surfaces can cause the receiver to process delayed signals, leading to errors.

Mitigation Measures

- **Shielding and Filtering:** Use of filters to block unwanted frequencies and shielding to protect from EMI.
- **Anti-Jamming and Anti-Spoofing Technologies:** Advanced GPS receivers are equipped with technologies to detect and mitigate jamming and spoofing.
- **Redundancy and Augmentation:** Use of additional navigation systems (e.g., GLONASS, Galileo) and augmentation systems (e.g., WAAS, EGNOS) to improve reliability.

→ Conclusion

GPS receivers are susceptible to various sources of interference that can degrade or disrupt their operation. Understanding these sources and implementing appropriate mitigation measures is crucial for maintaining the reliability and accuracy of GPS-based systems.

For further details, you can refer to the following sources:

- [NOAA: Space Weather Prediction Center](#)
- [GPS.gov: GPS Signal Jamming](#)
- [NIST: GPS and Timing](#)

GARS Officers: (Board of Directors)

President Michael A. Ellithorp, KF6OBI
 Vice President Bob Wirth, KC6UIS
 Secretary Jeramie Finch, W6LAD
 Treasurer Phil Zabell, KI6SMN
 Past President
 Board Ryan Elliott, AG6VA
 Board Mike "Smitty" Smith, WB1G
 Training Vacant
 Publications Vacant
 Webmaster / Social Media — Mike "Smitty" Smith, WB1G
 Radio Officer Phil Zabell, KI6SMN

Emcomm Officer Vacant

Board Meeting, 2nd Wednesday of each month, meetings starting at 6:30 PM via Google Meets
General Membership Meeting, 2nd Friday of each month, meetings starting at 7:00 PM

GARS Meeting locations: Main site is the Lutheran Fellowship Hall, 565 Main Street, Artois CA, our alternate meeting site is the Willows Seventh-Day Adventist Church, 543 1st Avenue, Willows, CA.

GARS Net: Mondays, 8:00 PM **Primary until further notice; see the GARS website at**
<https://www.garshamradio.org/> Secondary:147.105 (N6YCK) (+)110.9 PL)

GEARS Club Net: Tuesday, 7:30 PM 146.850 MHz-PL 110.9

Sacramento Valley Traffic Net: Nightly 9:00 PM 146.850 MHz-PL 110.9

ARES Nets:

Butte Mondays 20:00 146.850 MHz-PL 110.9

Yuba Sutter Thursdays 19:00 146.085+MHz PL 127.3

Editor Michael A. Ellithorp, KF6OBI

Distribution—via email—monthly

