W6SBA SOUTH BAY AMATEUR RADIO CLUB

SPECIAL SERVICE CLUB

ARCOver

September 2020

A Community Service Organization Dedicated to Amateur Radio Since 1970

In this issue:

President's Message

SBARC members,

I still hope everyone has been able to find something radio related to fill the time during all this COVID down time. The traffic in my estimate is up to maybe 75% of normal. That's good for us, that have to now go into work. I am now back pretty much full time in the office. For the 25% not on the road, I hope they are able to return to work. I happen to think this is going to alter our working culture for some time to come. Either people will lose their jobs longer term or the employers will allow more work from home as a regular course of their employment practices. Only time will tell. The club is still on the side lines as far as activities go. Let's just keep on checking in with each other on 224.38MHz!

Another adventurous balloon story! Tom, KI6RC and Bruce, KK6BJ, had another balloon launch from TMMC on August 29th, 2020. This balloon may set a record for time on orbit. It caught an odd jet stream that caused it to loop east and then down through Mexico. Then travel up the west coast, loop back east of the sierras following them south, then making a north turn through the central valley travelling very slowly. Then back over Mexico making a north east turn and traveling across the United States to Maine. We then lose track of it over the ocean since there are no ground stations. And, I believe overnight it shuts down due to no solar charging availability. As of this writing, I see it pop up over an island 1000 miles west of Spain. I may have some of the play by play incorrect. The tracking program only stores the last seven days. We'll have to ask Tom & Bruce how they setup the adventurous auto pilot program, LOL…

The September meeting will be held on Zoom. The club leadership will send out a Zoom invite. Click on the link, enter the password, and you should be good to go. This month we will present Dean Bouvier-N5DQ "The Air Force MARS operations" Dean always has a good informative presentation. Please join us on Zoom for this one.

I want to remind everyone we have club elections coming up in November. Please consider taking an active role in your club. The SBARC could be changing and you can be a part of that.

Upcoming monthly club activities include, the SBARC club meeting on September 17th on Zoom, and at the time of writing this, the TRW/NGC swap meet remains cancelled. After the swap meet a few of us use to head over to Denney's. This has been suspended until after the COVID shutdown.

Thanks for your club participation, stay healthy, stay in touch, and see you at the next SBARC virtual meet up in September!

73's… Scott-N6LEM

Meeting

September 17th at 7:30 p.m.
on Zoom

Expect an email with the invite to the meeting. Click the link in the email and Zoom software launches and you join.

Topic: Dean-N5DQ will make a presentation on "'The Air Force MARS"

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First Element of ARISS Next-Generation Radio System Installed and Operating on ISS

ARRL.com 09/02/2020

The initial element of the Amateur Radio on the International Space Station (**ARISS**) next-generation radio system has been installed onboard the ISS, and amateur radio operations using the new gear are now under way. The first element, dubbed the InterOperable Radio System (IORS), was installed in the ISS *Columbus* module. The IORS replaces the Ericsson radio system and packet module that were originally certified for spaceflight in mid-2000.

"Finally! It's been a scramble the last few days with coordination over the weekend and yesterday with astronaut Chris Cassidy, KF5KDR," ARISS-US Delegate for ARRL Rosalie White, K1STO, said. "But the new ARISS radio system is now installed, set up, and functioning. What a long road we've traveled over the past 5 years!"

Initial operation of the new radio system is in FM cross-band repeater mode using an uplink of 145.99 MHz (CTCSS 67 Hz) and a downlink of 437.800 MHz. System activation was first observed at 01:02 UTC on September 2. Special operations will continue to be announced, ARISS said.

The IORS was launched from Kennedy Space Center last March onboard the SpaceX CRS-20 resupply mission. It consists of a special, "space-modified" JVC-Kenwood D710GA transceiver, an ARISS-developed multi-voltage power supply, and interconnecting cables. The design, development, fabrication, testing, and launch of the first IORS was the culmination of a 5-year engineering effort by the ARISS hardware team of volunteers.

ARISS says the system "will enable new, exciting capabilities for ham radio operators, students, and the general public." Capabilities include a higher-power radio, voice repeater, digital packet radio (APRS) capabilities, and a Kenwood VC-H1 slow-scan television (SSTV) system.

A second IORS will undergo flight certification for later launch and installation in the Russian Service Module. The second system enables dual, simultaneous operations, such as voice repeater and APRS packet. It also provides on-orbit redundancy to ensure continuous operations in the event of an IORS component failure.

"Next-gen development efforts continue," ARISS said. "For the IORS, parts are being procured and a total of 10 systems are being fabricated to support flight, additional flight spares, ground testing, and astronaut training." Follow-on next-generation radio system elements include L-band repeater uplink capability — currently in development — and a flight Raspberry-Pi, dubbed "ARISS-Pi," that is just in the design phase. The ARISS-Pi promises operations autonomy and enhanced SSTV operations, ARISS explained.

ARISS this year marks 20 years of continuous amateur radio operations on the ISS. The largely volunteer organization welcomes donations to the ARISS program for next-generation hardware development, operation, education, and administration.

Scouting's Jamboree on the Air Set for October 16, 17, and 18

ARRL.com 08/31/2020

Jamboree on the Air (JOTA) and Jamboree on the Internet (JOTI) will be held this year on October 16, 17, and 18. Register online as an individual or as a group.

Jamboree on the Air is the largest Scouting event in the world. In a typical year, more than 1 million Scouts participate in JOTA, with over 11,000 stations operated by 20,000+ young radio amateurs from 150+ countries around the world.

JOTA details are available on the K2BSA website. The website menu will direct users to additional supporting information. K2BSA's Jim Wilson, K5ND, says many locations are already offering virtual radio merit badge classes "and no doubt will be using similar approaches for Jamboree on the Air."

UNDERSTANDING NVIS

Paul Denisowski | Version 1.0 | 07.2020
ROHDE&SCHWARZ
Make ideas real

[Understanding NVIS will be covered over several issues of the newsletter breaking down the paper into smaller segments]

Introduction

Near vertical incidence skywave (NVIS) is an HF propagation mode in which signals are transmitted towards, and returned from, the ionosphere almost vertically in order to provide local or regional coverage. NVIS is also often used in environments that are challenging for traditional HF propagation modes, such as in mountainous regions. This educational note is divided into two sections. The first section provides a brief overview of HF and the more common HF propagation modes. NVIS can be considered a special case of skywave propagation, and thus emphasis is placed on ionospheric propagation, in particular the role of frequency and incidence angle. The second section discusses the technical principles underlying NVIS, the different types of antennas commonly used for NVIS operation, as well as the technical and operational aspects of NVIS.

HF Overview

Figure 1 - Amateur radio operator Dr. Ulrich L. Rohde, DJ2LR / N1UL, operating on HF

About HF: HF stands for “high frequency” and refers to frequencies in the range of 3 MHz to 30 MHz, although in many cases the practical definition of HF can be extended down to approximately 1.5 MHz. These frequencies correspond to wavelengths in the range of approximately 10 to 100 meters. HF is most commonly associated with long range or global communications, and this capability sets HF apart from most other communications technologies. Broadcasters use HF to reach listeners worldwide and HF is also widely used for government and military applications, in part because HF does not require a fixed and potentially vulnerable “infrastructure” such as terrestrial cables or satellites. The ability to use HF in an ad hoc manner also makes it well suited for use in disaster relief and recovery, or in parts of the world that may be lacking a reliable communications infrastructure. Amateur radio operators around the world also frequently use and experiment with HF. HF is best known for its usefulness in reaching stations thousands of kilometers away, but HF can also be effectively used for local or regional communications within a range of several hundred kilometer s.

HF Propagation Modes: One of the challenges in HF is choosing the optimum frequency for communicating with a given location at a given date and time and under given propagation conditions. The choice of frequency is strongly dependent on the propagation mode, i.e. the way in which HF signals travel between source and destination. There are three main HF propagation modes: line of sight, groundwave, and skywave.

Line of Sight: In line of sight or "direct wave" propagation, signals travel in a straight, unobstructed path between the transmitter and the receiver. Line of sight is the only HF propagation mode which is fairly constant – the ability to use line of sight to communicate with a given station doesn’t vary substantially over periods of minutes, hours, days, months, years, etc. Furthermore, the range of frequencies that can be used for line of sight HF communication is fairly large. HF is, however, not often used for line of sight communications between ground-based stations. There are several reasons for this. Since HF wavelengths are long compared to VHF and UHF wavelengths, larger antennas are often required and the bandwidth available at HF frequencies is also somewhat limited. Furthermore, there tends to be much more noise at HF compared to higher frequencies, and this higher noise is even more problematic given that HF communications are usually carried out using AM or single-sideband. These modulation types are much more sensitive to noise than FM. Another potential disadvantage of line of sight propagation is that intervening objects between transmitter and receiver can significantly attenuate signals. Trying to use HF for line of sight communications in a jungle or from within a valley often does not yield acceptable results.

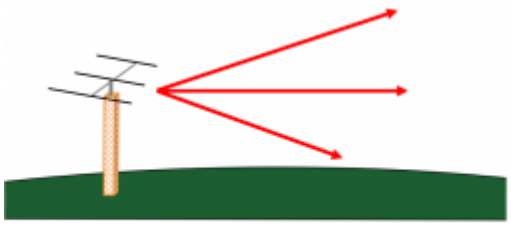


Figure 2 - Line of sight propagation

UNDERSTANDING NVIS Continued

Groundwave If line of sight between two stations does not exist, groundwave is a possible solution for short-range communication at HF. Groundwave, sometimes also called "surface wave," involves signals propagating along the surface of the Earth. Interaction between the lower part of the transmitted wavefront and the Earth's surface cause the wave to tilt forward, allowing the signal to follow the curvature of the Earth, sometimes well beyond line of sight. Groundwave propagation is, however, highly dependent on two different factors: the conductivity of the surface and the frequency of the transmitted signal. In general, higher surface conductivity gives better results in the form of greater distances that can be covered. Salt water has excellent conductivity, especially compared to dry or rocky land, so groundwave is a good choice for ship-to-ship or ship-to-shore communications. Groundwave works best for lower frequencies. For example, the theoretical range of 150 watt transmitter at 7 MHz is 35 kilometers over land, and close to 250 kilometers over the sea. At 30 MHz, however, the theoretical range falls to only 13 kilometers over land and just over 100 kilometers at sea.

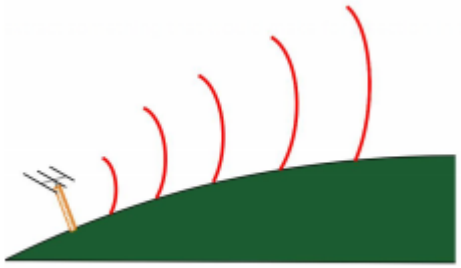


Figure 3 - Groundwave propagation

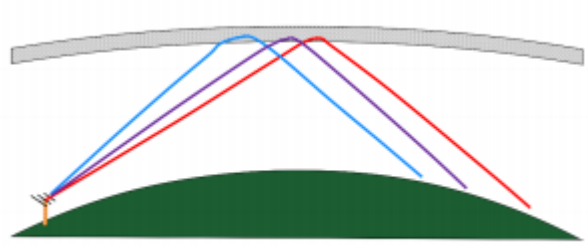


Figure 4 - Skywave propagation

Skywave: The most well-known HF propagation mode – and the mode that is used in NVIS – is skywave. Skywave propagation enables beyond line of sight or even global communications, depending on propagation conditions. In skywave, layers of ionized particles in the upper atmosphere refract HF signals back towards earth, allowing communications over many thousands of kilometers. The distances that can be covered using a given frequency is primarily a function of two factors. The first is the state of these layers of ionized particles, collectively referred to as the ionosphere, and the second is the incidence angle.

The Ionosphere

About ionization: The ionosphere gets its name from the fact that this is the region where most atmospheric ionization occurs. When ultraviolet energy or radiation from the sun strikes gas atoms or molecules in the atmosphere, this energy can cause electrons to become detached. The result is a positive ion and, more importantly, a free electron. The Earth's magnetic field keeps these free electrons roughly in place. The level of ionization and the number of free electrons increases as the amount of sunlight striking a given part of the atmosphere increases. When a region of the atmosphere rotates away from the sun, i.e. at night, this ionization energy is removed and the ions recombine to form electrically neutral atoms. Note that recombination is a slower process than ionization – atmospheric ionization increases rapidly at dawn, but decreases less rapidly after dusk.

About the ionosphere: As mentioned earlier, the region of Earth's atmosphere that undergoes this ionization is collectively called the "ionosphere." The level or density of ionization in the ionosphere is different at different altitudes, and areas with ionization peaks are grouped into so-called "layers" or "regions." The layers that are important for HF skywave propagation are the D-layer, from 60 to 100 km; the E-layer, from 100 to 125 km; and the F-layer, or layers, from about 200 to 275 km. Note that these are only rough numbers – the "thickness" and "altitude" of ionospheric layers varies based on many factors such as the amount of solar radiation they receive. Each of these layers affects HF signals in different ways. It is important to remember that the ionosphere does not reflect signals but rather refracts signals. The different electron densities at different altitudes is responsible for ionospheric refraction of radio frequency signals.

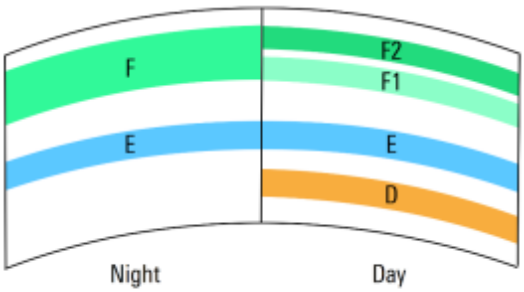


Figure 5 - Ionospheric layers

Continued on page 6

UNDERSTANDING NVIS Continued

D-layer: The D-layer only exists during daytime hours and disappears at night. Although the D-layer is ionized by solar radiation, the density of free electrons in the D-layer is too low to effectively refract HF signals and therefore the D-layer cannot be used for skywave communications. In fact, the D-layer inhibits HF skywave communications because it acts as an absorber of HF signals. The lower the frequency of a signal, the more that signal is attenuated by D-layer absorption. D-layer absorption also increases with increasing ionization, so absorption is usually highest at midday, when solar radiation is highest. Because of D-layer absorption, higher frequency HF skywave signals propagate better during the daytime, whereas lower frequency signals propagate better at night, after the D-layer has disappeared.

E-layer: The next highest layer, the E-layer, is the lowest layer of the ionosphere that has the ability to refract HF signals back towards the Earth. Compared to the other layers of the ionosphere, the E-layer is relatively thin, usually approximately 10 - 25 km. Like the D-layer, the E-layer is much more "dense" or ionized, during the day, but unlike the D-layer it does not completely disappear at night. However, aside from mostly shortrange, daytime communications and a few other special cases, E-layer propagation is not responsible for the vast majority of HF skywave communications. It is however worth noting that at the higher VHF frequencies, E-layer propagation is very important and supports some rather exotic and less predictable propagation modes, such as sporadic-E, that enable long-distance VHF communication over thousands of kilometers.

F-layer: The F-layer is by far the most important ionospheric layer for HF skywave propagation. During daylight hours, the F-layer splits into two sub-layers: F1 and F2, which then merge back into a single layer again at night. Compared to the D and E layers, the height of the F-layer(s) changes considerably based on various factors such as time of day, season, and solar conditions The lower F1-layer primarily supports short- to mediumdistance communications during daylight hours. The F2-layer, on the other hand, is present more or less around the clock. The F2-layer has the highest altitude and the highest ionization of all the layers and is therefore responsible for the vast majority of long-distance skywave communications at HF

(Next month topic to cover: Frequency and Incidence Angle)

IARU Announces HF Digital Mode Band Plan Review

08/14/2020

An International Amateur Radio Union (IARU) working group has been formed to develop solutions to reduce congestion within very popular mode segments while preventing mutual interference between "incompatible modes" as much as possible. The working group includes representatives of the three regional band-planning committees, marking the first time the IARU three regions have joined together to directly coordinate band planning efforts.

"Because frequency allocations and amateur radio operating interests vary in different parts of the world, the development of band plans — voluntary guidelines on the use of the spectrum that is available to radio amateurs — is a responsibility of the three IARU regional organizations," the IARU explained in announcing the working group. "Each of the three regions has a band-planning committee to focus on this work."

The IARU says this approach to band planning has generally kept pace with the evolution of amateur radio operating, but the explosive growth in HF digital modes, particularly FT8, has led to perceived overcrowding of HF digital-mode band segments.

The new working group has already had fruitful discussions with the *WSJT* Development Group led by Joe Taylor, K1JT. Additional discussions, including with other HF stakeholders, will be held as part of a fundamental review of the different HF digital modes, and how they can be best categorized and arranged to share the limited spectrum available.

In recent years, moves have been made to bring the regional band plans into alignment wherever possible. Final approval of any band plan revisions typically occurs during regional conferences of IARU member-societies, held every 3 years on a rotating basis.

While the proposed band plan revisions will have to be approved by member-societies in each region, recent administrative changes mean that revisions can be implemented without having to wait for the regional conferences.

Amateurs can follow the working group's progress through their IARU member-societies and their respective IARU websites (all are accessible via the main IARU page).

New Contest for Portable Stations to Debut in October

ARRL.com 08/18/2020

A new amateur radio contest for portable operators — the Fox Mike Hotel Portable Operations Challenge (POC) — will debut October 3 – 4. The event is aimed at leveling the competitive playing field between fixed stations and portable stations. Scoring for the POC, based upon a kilometers-per-watt metric, will be handicapped in favor of the portables. The contest is the brainchild of Frank Howell, K4FMH. Sponsors include *National Contest Journal* (*NCJ*) — an ARRL publication — but the POC will not be an official *NCJ* or ARRL contest.

"*NCJ*'s role is to encourage hams who don't contest to give it a try," *NCJ* Editor Dr. Scott Wright, K0MD, said. "It will encourage activity by operators who are limited by real estate and do not have a full-blown contest station. Events like this stimulate more interest in contesting, and this will have an international scope to give chances to snare some new DXCC entities."

Other sponsors include the UK DX Foundation (CDXC), the Hellenic Amateur Radio Association of Australia (HARAOA), and the South African Radio League (SARL).

"I think the [POC] steering committee, consisting of both veteran DX contest participants and some of the best portable operators in the world, has come up with something worth giving a go," Howell said. "With this scoring metric, it's more about radiosport than radio gear."

According to the contest rules, scoring will be calculated using the distance between stations (Maidenhead grid squares) in kilometers divided by power output in watts. Fixed (QTH) stations will compete against portable (P) stations on 80, 40, 20, 15, and 10 meters. Allowable modes include phone, CW, and digital. For the 2020 event, the number of transmitters concurrently in use will be restricted to two.

Portable stations may not make use of permanently installed amateur radio equipment or facilities but may use ac mains power. The exchange is call sign, station class (P or Q), consecutive serial number, and four-character grid square.

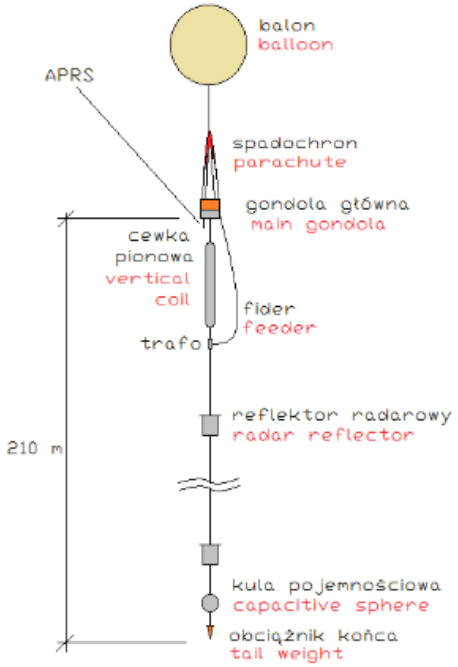
Contact Howell (fmhpoc@gmail.com) for more information.

University in Poland will Launch Balloon with VLF Transmitter On Board

ARRL.com 09/10/2020

A balloon experiment by Warsaw University of Technology is planned to lift off on September 12, carrying a unique very-low-frequency (VLF) 210-meter long fully-airborne antenna system, and a transmitter on 14.2 kHz — the former frequency of the Babice transatlantic radio station in Poland. The project is to gather data for a doctoral dissertation, and any and all feedback on the reception of the signal is important.

The balloon will lift off in the early afternoon from Przasnysz Airport. The flight is set to last about 3 hours, with the balloon reaching a maximum altitude of 30 kilometers above sea level. The emission will be A1 (narrow-band carrier). Operation will start on the ground, with the antenna unfolding as the balloon ascends. Additional radionavigation signals: 144.8 MHz APRS (call sign SP5AXL). The VLF antenna center-fed half-folded vertical dipole with both capacitive and inductive loading.



CALENDAR

Council Meeting - **4th Wednesday** of the month
Call Joe - WB6MYD (310) 328-0817

Club Meeting - **3rd Thursday of the month**
September 17, 2020 - 7:30 p.m.

Via Zoom
(look for email)

Club Nets - **W6SBA WEEKLY NET**
Every Thursday @7:30pm
(except the night of club meetings)
PVUSD EMERGENCY NET
1st Tuesday of the month
09:30 Hours on the W6SBA repeater

TRW Swap Meet **Cancelled Until Further Notice**

VE Sessions - **Scheduled on Saturday of even months**
Contact Betty, N6VZF, with questions
(All VE sessions are scheduled for Room 4 in the Health Conference Center)

Social Event - **Contact: Joe WB6MYD**
Phone: (310) 328-0817
jmlanphen@gmail.com

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South Bay Amateur Radio Club Repeater
224.38 MHz ·PL - 192.8 Hz Offset -1.6 MHz
(See Calendar for Weekly Net Times)

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W6SBA

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