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Technical Details of the system:

The **KFS Quad KiwiSDR** system is co-located with the **KFS WebSDR** HF radio server system near the mouth of Lobitos Creek on the Pacific coast, six miles south of Half Moon Bay, California, USA. This RF quiet location, on a 150 foot cliff overlooking the Pacific Ocean, is in maidenhead grid square CM87tj02; the geographic coordinates are 37° 23' 6" North, 122° 24' 45" West. You can easily locate the site using Google Maps or Google Earth by searching for "*KFS WebSDR*". Click [here](#) for a quick comparison between a KiwiSDR and a WebSDR.

The 0-30 MHz. receivers are KiwiSDR kits from [Seeed Studio](#), mounted on a [custom rack mount shelf](#). See [KiwiSDR](#) for complete documentation. The receivers are preceeded by AM broadcast stop-band filters. RF signals are from the TCI antennas through the house distribution system.

The Kiwi server computers are [BeagleBone Green](#) boards running the Debian Linux operating system. The Kiwi receivers use [OpenWebRX](#) software written by András Retzler, HA7ILM, and maintained as an open-source project on [GitHub](#). Community based support is available on the [Kiwi forum](#). The system computers are connected to the Internet through a Ubiquiti Model ER-10X Edge Router. The Internet service provider is [Coastside.net](#) in Half Moon Bay.

This system offers a total of forty channels, including thirteen user channels, allocated as follows: Seven waterfall user channels on the Omni antenna and two waterfall user channels on each of the three directional antennas (NW, SW, & SE). The remaining channels are normally in use for gathering WSPR spots using **wsprdaemon** software, by AI6VN, running on a Lenovo ThinkCentre server. More information on WSPR is at [wsprnet.org](#), and for the wsprdaemon program at [wsprdaemon.org](#).

The system operator (Sysop), Craig, W6DRZ greatly appreciates the technical assistance provided by Bob KO6AQ, Clint KA7OEI, Rob AI6VN, Paul W7JVY, and Hal KK6HY. Antenna and rack space facilities are provided as a public service by Globe Wireless Radio Services. Also appreciated are the [donations](#) by many users. Comments and questions are always welcome. Please [email Craig](#).

KFS Antenna Details:

There are four [TCI](#) receive-only HF antennas at the KFS site. The antennas feed lines entering the building are connected to a house RF distribution system that provides signals to all co-located HF tenants. Five Redifon MCU100 Antenna Multi-coupler units feed the second-floor tenants including the KiwiSDR and WebSDR receivers. Pictures of the antennas, courtesy of Hal, KK6HY, are [here](#). Each antenna has a friendly name - Omni, NW Sector, SW Sector, or SE Sector - as described below:

"Omni" is a [TCI 530 Short and Medium Range Log-Periodic Antenna](#) (Model 530-5-02). Its dimensions are 230 feet long by 230 feet wide. It is supported by a single aluminum tower 101 feet high. The rated frequency coverage is 2.75 to 30 MHz. The pattern is omnidirectional with circular, horizontal, polarization. The nominal gain is 6 dBi.

"NW Sector" is a [TCI 532 Medium Range Log Periodic Antenna](#) (Model 532-4-02). Its dimensions are 330 feet long by 410 feet wide. It is supported by a single aluminum tower 149 feet high. The frequency coverage is 3 to 30 MHz, horizontally polarized, nominal 12 dBi gain, 13 dB F/B ratio. The take-off angle varies from 20 degrees at 30 MHz to 37 degrees at 3 MHz. A beamwidth of 55 degrees, at a bearing of 278 degrees provides coverage from 251 to 306 degrees; this includes Japan, Indonesia, Western Australia, Hawaii, and the Western Pacific Ocean.

"SW Sector" is a [TCI 532 Medium Range Log Periodic Antenna](#) (Model 532-4-02). Its dimensions are 330 feet long by 410 feet wide. It is supported by a single aluminum tower 149 feet high. The frequency coverage is 3 to 30 MHz, horizontally polarized, nominal 12 dBi gain, 11 dB F/B ratio. The take-off angle varies from 20 degrees at 30 MHz to 37 degrees at 3 MHz. A beamwidth of 55 degrees at a bearing of 222 degrees provides coverage from 195 to 250 degrees; this includes Hawaii, Eastern Australia, New Zealand, and the South Pacific Ocean.

"SE Sector" is a [TCI 527B Super High Gain Log-Periodic Antenna](#) (Model 527B-8-02). Its dimensions are 357 feet long by 450 feet wide. Two aluminum towers, each 151 feet high spaced 150 feet apart support this antenna. The 527B consists of two standard transposed dipole arrays, which are horizontally polarized and stacked in the vertical plane. The frequency coverage is 6.2 to 30 MHz, horizontally polarized, nominal 15 dBi gain, 13 dB F/B ratio. The take-off angle varies from 13 degrees at 30 MHz to 20 degrees at 6.2 MHz. The beamwidth of 64 degrees at a bearing of 135 degrees provides coverage from 103 to 167 degrees; this includes the Southwest USA, Western Caribbean, Mexico, Central and South America and the Eastern Pacific Ocean.

This KiwiSDR system is provided as a community service by the KFS Radio Club. Your contribution will help offset our operational costs.

Any and all support is appreciated. Thanks & 73, Craig, W6DRZ

Donate



History of KFS:

The KFS story begins with the Beach Station (Ocean Beach), which was put into

operation in July 1910 by the Poulsen Wireless Telephone and Telegraph Company. The Beach Station was located just north of the San Francisco zoo at 48th Avenue and Noriega Street.

The Dollar Steamship company formed DOLLARADIO in 1929 (in 1930 becoming **Globe Wireless**) to handle their ship-to-shore communications. Dollar's first shore station was constructed at Mussel Rock about 15 miles south of San Francisco near the north end of of Pacifica. Eventually, Globe opened their facilities to the public and to communicate with ships of any line.

The 200 acre Half Moon Bay facility on the coast near Lobitos Creek, "**LO**", was constructed in 1932 by the Mackay Radio and Telegraph Co. as the receive site for maritime radio station KFS and point-to-point station KTK. (The transmit site for KFS and KTK, "**MX**", was established in the Palo Alto bayland marsh.) Operations from Ocean Beach and Mussell Rock were all moved to the new facilities. The International Telephone and Telegraph Company (ITT) subsequently purchased the stations and operated them for many years. Eventually, in the early 1990s, ITT sold KFS (KTK had ceased operations) to a group of local investors. These investors also obtained, from the Tropical Radio and Telegraph company (TRT), station WNU near Slidell, Louisiana and, from the United States government, the former Voice of America sites near Dixon, California. This was the beginning of a modernized HF network, reusing the name **Globe Wireless**.

The last commercial radiotelegraph transmission in North America was keyed from **LO** and transmitted from **MX** at 2359 UTC on July 12, 1999. The final words transmitted by KFS? "*What hath God wrought*". By the turn of the century, the Half Moon Bay facility had become the central control, database server farm, and west coast receive site for the Globe Wireless HF data and email network providing **GlobeEmail** and **GlobeData** services to 40,000 commercial shipping vessels from stations at 23 worldwide sites. When Inmarsat purchased Globe Wireless in December 2013, the HF portion of the operation was retained as Globe Wireless Radio Services.

Craig, W6DRZ, a former Globe Wireless executive installed a WebSDR system at the KFS LO site in February 2016, initially named *LO WebSDR* and renamed to *KFS WebSDR* in January 2017. The system is on its second set of computer and receiver hardware and enjoys support from the HF listening community. In 2019 he installed a KiwiSDR system at the site. Currently, the KFS site is also in use by radio providers serving the aeronautical, cellphone, emergency response, Internet data and military communities.

The February 2018 edition of [Electric Radio](#) magazine published an article entitled *The KFS Story* on page 2 with a nice [cover picture](#) of the building. It was authored by Gary, K6GLH, with help from Craig, W6DRZ, and adds more detail and pictures to the above brief account.

In March of 2020, three former Globe Wireless employees - ham radio operators - formed the **KFS Radio Club**; the FCC issued the callign *W6KFS*.

FAQ for the KFS KiwiSDR:

"The Kiwi kicked me off/won't allow me to log in - why?"

- At present, the Kiwi will limit the duration of any single listening period to 30 minutes and 90 minutes during any 24 hour period. Because these receivers are a scarcer resource than the KFS WebSDR, there are stricter time limits on their use.
- If there are too many receivers already in use, it will give you a message saying so.

•"My browser doesn't work with the Kiwi SDR. Why?"

- Only modern browsers that support HTML5 are supported. Here is a list from the author:

Windows: Firefox, Chrome & Edge work; IE does not work.

Mac & Linux: Safari, Firefox, Chrome & Opera should work fine.

A full screen system with keyboard is preferred, however KiwiSDR works well on my iPad, and poorly on my iPhone.

•"Why do you have a KiwiSDR in addition to the WebSDR?"

- Unlike the WebSDR, the KiwiSDR is capable of tuning continuously from (nearly) DC to 30 MHz, covering all HF amateur bands, shortwave broadcast bands and those in between.

•"If the KiwiSDR is 'better', I should be using it instead of the 'normal' WebSDRs, right?"

- Actually, even though it is using exactly the same antenna as the normal WebSDR system, the performance is inferior to the individual amateur band receivers on the WebSDR system. This is because the "narrowband", "high performance" WebSDR receivers use high-quality 16-bit A/D converters and narrow-band RF filters on their front-end which improves their effective sensitivity and makes them far more resistant to overload and noise degradation in the face of other strong signals on the band and lightning crashes.
- The KiwiSDR uses "only" a 14 bit A/D converter - and that "sees" the entire HF spectrum which means that strong signals in, say, the 31 meter shortwave band can cause subtle degradation everywhere else. What's worse than that is lightning static that often appears from across the country on the lower bands (e.g. 160, 80, 40 meters) that can simply overload the A/D converter, causing that same "crash" to appear all across the HF spectrum - even though it really doesn't do that!

•"Which is better for ham radio usage - the KiwiSDR or the normal WebSDR?"

- For the reasons noted above, the WebSDR is better for things like round-tables on most amateur bands: It can be slightly more sensitive, more resistant to nearby signals, and more resistant to out-of-band static crashes. In the opinion of many, the WebSDR just sounds slightly "better".
- The KiwiSDR can, at most, handle 8 users - it is currently configured for four. In contrast, the WebSDR system can handle well north of 60 users at once.
- The audio delay on the normal WebSDR is only a fraction of a second while the audio delay on the KiwiSDR is around nearly 2 seconds, making it harder to participate in round-tables!
- Note: If we see too many people "sitting" on the KiwiSDR when they normal WebSDR would be better, we will consider taking action to prevent this - so please don't do it!

•"The KiwiSDR just kicked me off - why?"

- To prevent "squatting" or other abuse, there is a maximum 30 minute time limit per

session of the KiwiSDR and a maximum of 90 minutes per user during each 24 hour period.

• **"How the hell do you tune this thing?"**

- The easiest way to tune the receiver is to select the mode first (e.g. USB, LSB, AM) and then enter the frequency in kHz (including decimal places) in the bar in the upper-left corner of the pop-up on the right edge of the screen.
- You can also click on the waterfall display, the frequency bar, or in the white (blank) area just above it - but note that the frequency to which it will tune will be in the center of the receive passband as defined by the yellow brackets.
- On some frequencies above the frequency bar you will see labels: Clicking on those will tune the receiver to the frequency and mode defined by that label. (Users cannot change these labels.)
 - Somewhat annoyingly, after you click to tune, your mouse cursor may drag the frequency around. Click ONCE to change the cursor back to normal to stop this.
- If you click and hold the left mouse button on the waterfall, frequency bar or the area above with the labels, you can drag the waterfall back and forth on the screen.

• **"I somehow dragged the yellow passband brackets around and now my (USB/LSB/AM) mode doesn't work right. How do I 'fix' that?"**

- If you have somehow changed the passband setting for a mode, it will remain "changed" during your current session. Because this is so easy to do by accident, there's a simple way to fix it:
 - Hold the SHIFT key down while Right-Clicking on the waterfall or frequency bar. In the options that show up you will see "restore passband" and click on that to "fix" your mode filtering.
 - On some browsers you'll get a dialog box from the browser itself. I'm not quite sure how to dismiss this without also making the dialog box go away other than selecting something like "copy".
 - To make the box (from the KiwiSDR) go away (that is, if you don't want to pick anything) hit the ESCape key or left-click once somewhere on the waterfall display.

• **"I used to see a waterfall for the whole HF spectrum, but I don't see it now. What's the deal?"**

- It takes a lot of powerful hardware to "inhale" all of the HF spectrum at once and process it: Were it done only with a computer, the fastest PC around may not even be able to do it unless it also used a fancy graphics card's GPU cores as well! The "other" way to do this is to use FPGAs (which are versatile programmable logic devices) in which one can "program" specialized hardware that is very good at this task - and the KiwiSDR has one of those. Because its resources are limited, in addition to being able to receive signals, this FPGA also has to function as a GPS receiver and it is what produces the data for the waterfall display.

Features of the KiwiSDR:

• **"I hear that the KiwiSDR has some fancy features. What can you tell me about them?"**

- The KiwiSDR has a number of additional features that are available under the "*Extension*" drop-down tab. Very briefly, these include:

■ ***cw_decoder - Morse decoder.*** This is a relatively new addition and is likely to be greatly improved as time goes on. The key to making this work is to zoom in on the signal to be decoded and dragging the bandpass filter's edges to make the filter as narrow as possible. This extension also includes a "threshold" graph and the received tones should be near the top. The "cleaner" (e.g. less noisy) the signal, the more space there will be between the CW tone at the top and the noise (random dots) lower down in the graph. The threshold value should be set such that it's "comfortably below" the CW notes at the top - but this threshold gets narrow and narrow the noisy the signal gets and also the wider the bandpass filter is. Read the KiwiFAQ for more information.

■ ***devl - A "development" tab*** that may or may not have any options. (It usually does not...)

■ ***fax - HF FAX*** Can be used to receive and display HF facsimile transmissions in the browser.

Within the tabs are lists of stations that may or may not be transmitting and you may or may not even have propagation to those stations.

The map will slowly appear on the screen when properly tuned in.

■ There will probably be a black bar somewhere in the picture with the contents on either side.

To manually synchronize the FAX transmission place your mouse's cursor in the middle of that black bar and while holding the SHIFT key, click the left mouse button.

■ You will have to re-synchronize when you tune to another station - and probably when the FAX transmissions from a given station stop and resume.

■ Read the KiwiFAQ for more information.

■ ***fsk - RTTY, or RadioTeletype.*** The various settings allow both Baudot and ASCII to be decoded but the precise configuration for these modes is beyond the scope of this document. Read the KiwiFAQ for more information.

■ ***ibp scan - Beacons:*** On certain frequencies in the upper HF bands are CW beacons located across the world that transmit on a particular schedule, enabling one to quickly determine if the band is open: This extension facilitates monitoring of these beacons. Read the KiwiFAQ for more information.

■ ***integrate*** - This sets up a second audio-only waterfall that allows one to integrate over time, potentially allowing persistent weak signals to be made more visible. Read the KiwiFAQ for more information.

■ ***iq display*** - Almost every SDR uses "I" and "Q" signals to recover the signals and in this mode, the amplitude of those signals are displayed on a phasor scope with the "I" in one axis and "Q" in the other. If you tune in an AM signal zero beat you can see this "spin" depending on the frequency error. The box that pops up has various filtering and phase-locking options. Read the KiwiFAQ for more information.

■ ***lms filter - noise reduction and notch filter*** capabilities that are still a work in progress available under the "Audio" tab in the right-hand window. This selection brings up some "knobs and buttons" that directly affect how well these filters do/don't work. Read the KiwiFAQ for more information.

■ ***loran c*** - In some parts of the world (Russia, parts of Europe and Asia, east coast of the U.S.) there are Loran C stations still in operation - or undergoing testing with new technology that may result in the system being rebuilt as an "un-jammable" augment to GPS. This extension allows analysis of the signals from these stations. Read the KiwiFAQ for more information.

■ ***navtex*** - This is an information service used to pass along traffic to ships at sea. Because of its naval use and the low frequencies involved, you may not ever "hear"

anything unless you have an antenna that works well at these frequencies and you live near-ish a coastline. Read the KiwiFAQ for more information.

■ **S_Meter - Graphical analysis of the S-meter readings.** This may be used to track the fading of the station to which you are tuned or, if they are "local", it may help facilitate that other station's antenna testing. Read the KiwiFAQ for more information.

■ **TDoA** - This allows coordination with other KiwiSDRs to help determine the geographical location of signals being received. At the present time, it takes a 30 second snapshot of the signal in question and uses this, along with a digital recording pulled from other selected stations (at least 3 are needed for an unambiguous fix) that can also hear this same station to calculate the likely location (to within a few 10s of miles/km at best): This means that if you have any hope of determining a station's location, it must be audible to all other stations that you have selected, the transmission must be more or less continuous over the 30 second period and that it must be the only station that was transmitting at this time. DO NOT expect decent or consistent results from this system until you get practice and have a better understanding of how it works. In addition to the HELP button on this screen, please read the KiwiFAQ for more information. Nils, DK8OK has written about how to use the TDOA extension in a .PDF that may be found [HERE](#) - be sure to check it out if you use the TDOA.

■ **WSPR** - Read the KiwiFAQ for more information about using the WSPR decoder built into the KiwiSDR.

• **"In the stats I see reference to a GPS receiver. What's that for?"**

◦ Because the KiwiSDR uses a fairly powerful FPGA, it was easy to add an inexpensive GPS "front end" chip and implement "simulated" GPS receiver hardware/software on the FPGA. This allows the KiwiSDR to not only determine its precise location, but it also allows it to precisely set its "dial" frequency and have an accurate time-of-day clock.

◦ It is this accurate clock that allows the KiwiSDR to participate with others in the TDoA ("direction finding") function by precisely time-stamping the sound recordings that are processed - along with those of other receivers - to determine the signals' likely locations.

◦ The GPS clock is also used for WSPR reception which requires a precise clock along with frequency stability and accuracy.

◦ The results of the GPS receiver's operation (location, timing, etc) are not available to the casual user.

Propagation Observations using the KFS KiwiSDR:

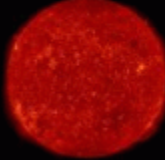
I have always preferred to *observe* propagation, rather than to *predict* it. With that in mind, here are some ideas using the KFS KiwiSDR:

WWV & WWVH: These 24-hour time signal stations (AM on 2.5, 5, 10, 15, 20 and 25 MHz.) can be a good quick check of propagation from either Colorado or Hawaii to KFS. However can be confusing to tell which one is being received. Listen to the voice announcement at the end of each minute; if you hear a male voice that is WWV at Fort Collins, Colorado; if you hear a female voice that is WWVH at Kauai, Hawaii. Sometimes you will hear both.

CHU: This is also a 24-hour time signal station (USB, on 3.33, 7.85, and 14.67 MHz) located in Ottawa, Ontario, Canada. It can be a good check or propagation from the

northeast to KFS.

VOLMET: These stations continuously broadcast aviation weather in USB on various HF frequencies. A good list, sorted geographically, is [here](#) and one sorted by frequency is [here](#). Be aware that many stations are on-the-air for only a portion of each hour. For instance Gander Radio, VFG, sends only from minute 20 to 30 and minute 40 to 50 of each hour. (Note that New York Radio, WSY-70, which shares the Gander frequencies has been off the air for years.)

Solar-Terrestrial Data - http://www.n0nbh.com			
19 Oct 2021 0429 GMT		Current Solar	HF Conditions
SFI 77	SN 0		Band Day Night
A 10 K 3 / PIntry			80n-40n Poor Fair
X-Ray A4.9			30n-20n Fair Fair
304A 115 @ EVE			17n-15n Poor Poor
Ptn Flx NoRpt			12n-10n Poor Poor
Elc Flx NoRpt			Geomag Field UNSETTLD
Aurora 1/n=1.99			Sig Noise Lvl S2-S3
MUF Boulder 8.68			(C) Paul L. Herrman 2021

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