## **1 HAP Charts**

Hourly Area Prediction (HAP) Charts, such as the one shown in Figure 1, display the optimum frequency (FOT) for communications between a specified location (the base city) and a selected distant station. Los Angeles, California is the base city for the HAP Chart in Figure 1.

HAP Charts are produced by the Australian Government Bureau of Meteorology Space Weather Services division. Space Weather Services provides a wide range of reports, maps, and charts covering current conditions for HF communications. HAP Charts are one of several HF Prediction Tools available at the Space Weather Services web site: <a href="https://www.sws.bom.gov.au/HF\_Systems/6/5">www.sws.bom.gov.au/HF\_Systems/6/5</a> . Access to the web site is also available under the Links tab.





Figure 1 Los Angeles HAP Chart for 1900 UT on June 4, 2020

The vertical axis of the chart is degrees Latitude. The horizontal axis is degrees East Longitude (Longitude measured from the Prime Meridian eastward around the Earth).

HAP Chart color bands represent the recommended HF frequency (FOT) for communications between the base city and a selected distant location for a given date and hour. The color bands for the HAP Chart shown in Figure 1 represent different amateur radio frequency bands. For example, 30 meters (10.1 MHz) is the FOT for communications between Los Angeles and Portland, Oregon at 1900 UT (noon local time) on June 4, 2020.

The color band at the location of the base city (yellow in this example) is by definition the critical frequency  $f_c$  for the region at the time the chart was produced. Critical frequency being the highest frequency signal that can be transmitted straight up at the base city location and be reflected back straight down to Earth.

HAP Charts are an estimate of the current FOT. Remember that Maximum Usable Frequency MUF > FOT (FOT = 0.8 \* MUF). Consequently, the MUF for reaching a particular destination could be the next higher frequency band from that shown on the HAP Chart. For example, the MUF for Los Angeles to Portland could be 20 meters instead of the 30 meter FOT shown in Figure 1. However, it is unlikely that Portland could be reached on 17 meters.

HAP Charts are a starting point in selecting a frequency band.

It is important to realize that the color bands on a HAP Chart represent the Highest frequency band for dependable communications from the base city to the selected distance location. Lower frequency bands could also be used for communications with the distant location. However, the quality of communications on the lower frequency bands may be poor. For example, 40 meters could be used for communications between Los Angeles and Portland at 1900 UT on June 4<sup>th</sup>. However, the 40 meter path may encounter multi-path interference and deep D Layer absorption problems not present on the 30 meter FOT frequency.

## 2 Selecting and Configuring a HAP Chart

The procedures for selecting and configuring a HAP Chart are outlined in this section.

- 1. Under the Tools > HAP Charts Tab, click on "Select HAP Chart".
- 2. When the web page comes up, select "Min-Max (Area of Coverage) HAP" in the drop down window under HF Prediction, if not already selected. The following screen will appear with a row of categories to select from (Map, Base, Area, Freqs, Date + T, Help). The arrow keys on the left side of the map move the map right and left in addition to up and down. The plus and minus keys are zoom in and zoom out.



3. Click on "Base". The following screen will appear.

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In the Base Location box enter the city that you wish to be the base location. I have entered Los Angeles. A drop down Base Location menu will appear as you begin typing in the base location city. Only certain large cities around the world are supported. If the city that you are entering does not appear in the drop down menu, then you must enter a city that does appear which is close to your desired base location. For example, Portland, Oregon does not appear in the drop down menu. Instead, Seattle must be used as the base city for that region. The Latitude and Longitude for the base location city that you select will automatically appear.

4. Next click on "Area". The following page will be displayed.

In the Area Center box you enter the city that you want the HAP Chart centered on. I entered Denver. The Latitude and Longitude for Denver automatically appeared the in the appropriate boxes. Often you will want to enter the base city in the Area Center box to center the HAP Chart map on the base city. If that were done for Los Angeles half of the chart would be the open ocean west of Los Angeles. Not very informative. So I chose to center the chart on Denver to display the FOT color bands east of Los Angeles across the United States.

Next you have to enter the Height and Width of the HAP Chart in degrees. I entered 60 for both. However, I often enter smaller numbers (typically 20) to focus in on conditions in California, Nevada, and Arizona.

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5. Click on "Freqs" to get the next display.

Click on "New Amateur" to have amateur radio frequencies displayed as the color bands.

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6. Click on "Date + T" to display the next configuration page.

Enter the date and hour (UT) for your desired HAP Chart. Usually you will enter the current date (automatically filled in for you) and the hour that you want. In entered June 4, 2020 and 19 UT.

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7. Finally, click on the "Predict" button at the far right edge of the screen to display your desired HAP Chart. Doing this gave me the following HAP Chart.

This process becomes very quick after doing it a couple of times.



Dashed contours (if present) delineate areas where low signal strength may be experienced Copyright Commonwealth of Australia 2020, Australian Bureau of Meteorology