

SDR console

Adding an SDR and brief set up

Introduction

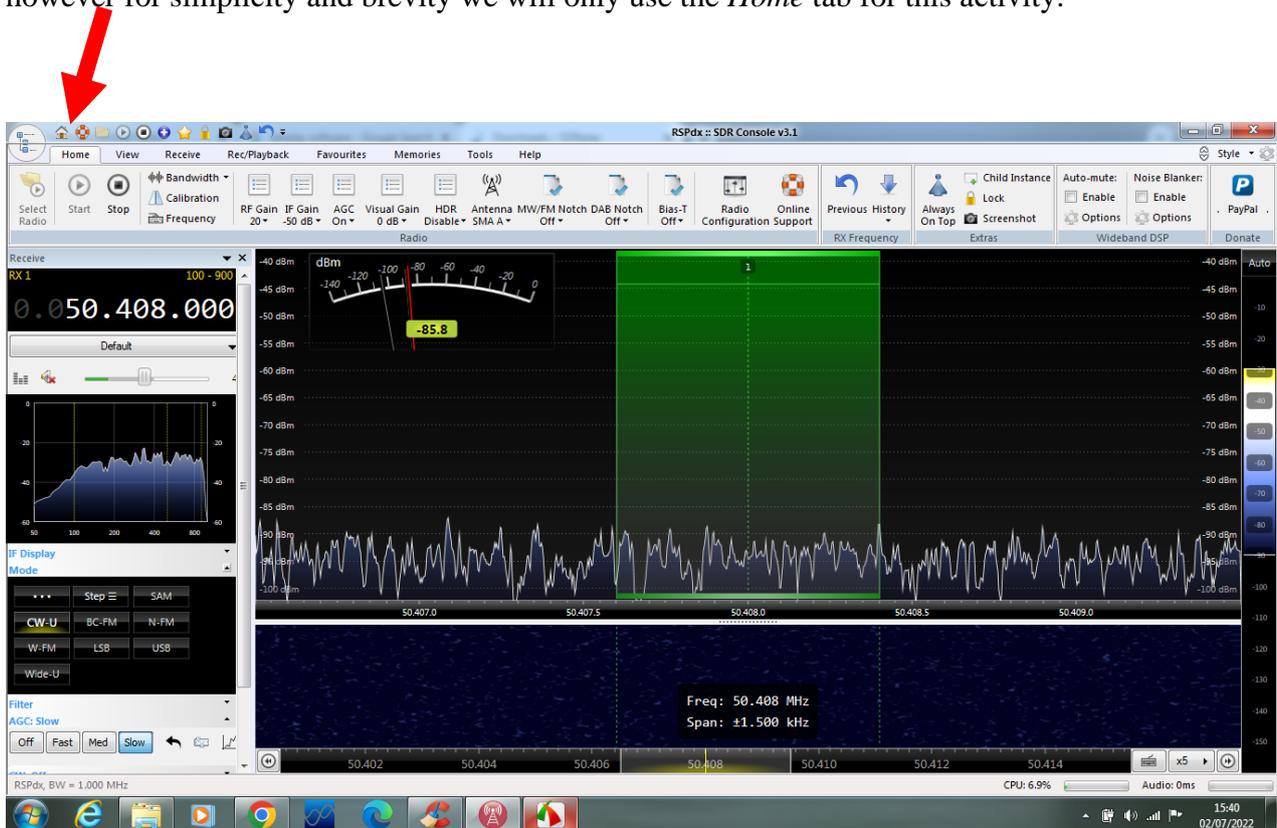
SDR console is a both a very comprehensive and also easy to use Software Defined Radio package that has been developed within the amateur radio community for the said same community. This software is regularly updated and improved and has gained the reputation of one of the go to software package for both SDR receive and transmission. There are a great many things it can do but for the purposes of these instructions we will only focus on the addition of a network provided SDR receiver.

For further reading and more detailed support please go to the home page for this software <https://www.sdr-radio.com/>

Download from here > <https://www.sdr-radio.com/download>

Overview

This is the main operations page of the software, in this case setup for the GB3MBA meteor scatter beacon. You can see the key tabs on the top row that provide access to the key pages, however for simplicity and brevity we will only use the *Home* tab for this activity.



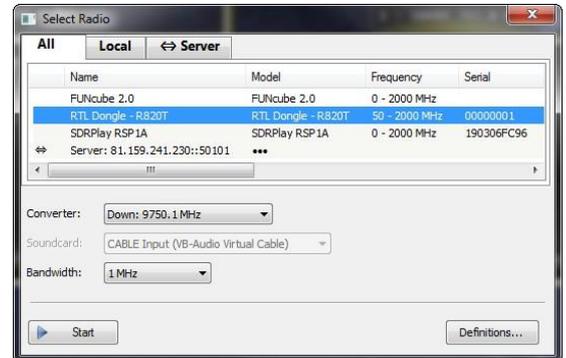
Prerequisites

1. A windows PC (V7,10 or 11) with the current version (3.1) SDR console installed
2. Supported SDR receiver, such as RSPDX, Funcube dongle, RTL dongle, or see here for the full list <https://www.sdr-radio.com/radios>

Adding an SDR receiver

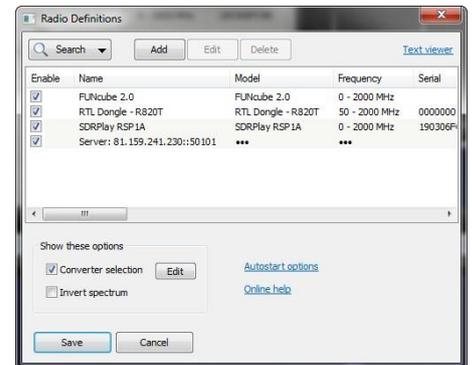
If this is a fresh installation then you will see a dialogue box pop up saying there are no radios defined and asking if you wish to do so. If this is an existing installation then click on the button marked as select radio, it is the first icon on the left of the top row

You should see the window on the right pop up, this is where all of the initial radio selection is done. In this example you can see a few locally connected devices and one network connected SDR. If it is a fresh installation then there will be nothing listed.



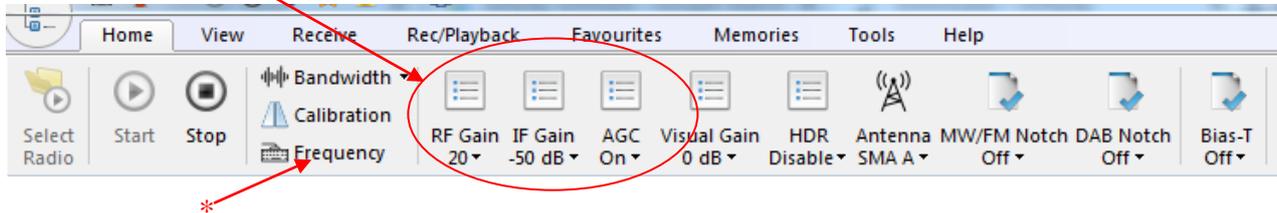
Configuration steps

1. Click on the definitions button, you should now see the SDR radio definitions list as shown on the right. Again if this is a fresh installation then this list will be empty.
2. Click on the Search button and a drop down list will appear. This contains a list of the supported hardware that can be directly connected. Look for your connected device and select it.
3. Once added select save and the window will exit back to the select radio dialogue box where you should now see your radio.
4. For some of the radios there are some extra steps
 - a. RSPDX, you must first download and install the API from here <https://www.sdrplay.com/downloads/>
 - b. For the funcube dongle you must ensure that on the select radio page you also select the sound card setting to match ie to show the FCD. This is an extra step for all SDR's that use an audio codec.
5. Select the appropriate bandwidth for your SDR, for this application choose the smallest
6. Select start and your radio should now be active and running.



SDR console settings

There are a great many settings on SDR console as it is a very versatile piece of software, we will only focus on a few as it is very often easy to get lost and soon lose functionality. The key ones for us are RF gain, AGC / IF gain, plus some display settings.



We will also focus on the frequency setting, mode and bandwidth settings for what we need to get the most from the GB3MBA beacon.

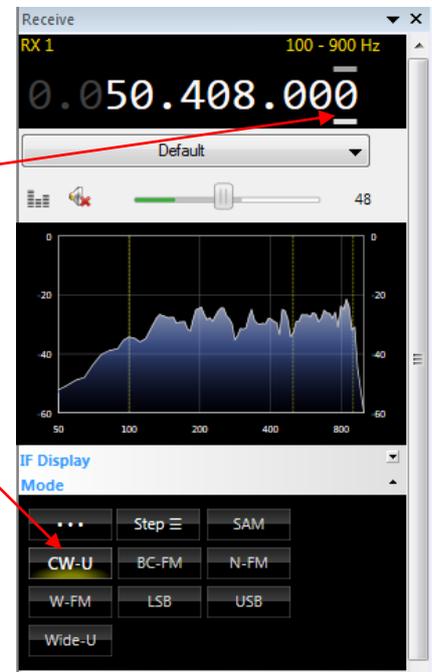
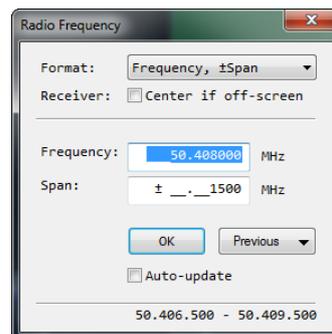
Frequency and mode

The frequency is displayed and adjusted from the receive window as shown to the right, there is also a direct entry method. To use the main display just click on each digit and either use the scroll wheel on the mouse or click up and down on the bars shown above and below the selected digit.

The mode we require is CW-U, it is better to setup up a specific mode setting but that is a bit advanced for this guide.

The bandwidth we need is ideally ± 1.5 KHz, now this can be set by dragging the green mask over the selected centre frequency or by direct entry by selecting frequency from the main menu bar as shown above *.

When selected you will see the following dialogue box. You will note that the frequency is already shown as is the bandwidth in this example. Set yours the same and then click OK.



RF + IF gain and AGC

This can be a tricky aspect of the performance of the radio as we are working on very small signals at times in a part of the band that can be very noisy and also have some very strong signals nearby. This means that we need a high performance receiver set to its optimal performance point, this can be left to the device and or software to do but might not always be optimum or we can manually set the key parameters ourselves. Without knowing the specifics of each site it is not possible for these instructions to have a one size fits all and as such a guide will be provided on the key parameters.

RF gain

This will set the sensitivity of the receiver however it is not as simple as set it for maximum due to other issues that might result such as overload. Also it does vary between devices on the maximum level and the impacts on performance in general. For the RSPDX the default is set at 20 and in a good noise free environment can be set as high as maximum without any serious issues. That being said if your local noise is too high then the more gain you have the more noise you will see so nothing will really be gained and in fact you might make it worse.

The recommendation is to increase the gain until you see a rise in the noise floor and then leave it set at that level.

IF gain

This is very device dependant and if the AGC is set to on will be automatically controlled for maximum performance. It is not recommended to adjust this unless you are familiar with how it works on your chosen device.

AGC

AGC or automatic gain control, on some devices it is very effective and is best left ON while you are getting used to your system though for some you can get improved performance by setting it to manual and adjust RF and IF gains yourself. It is recommended to leave this on auto until you get familiar with the performance and environment you are using it in.

When you are comfortable with how your setup performs then it is advisable to switch off the AGC just in case it has any impacts on any strong meteor echoes, just be mindful of any overload issues from out of band signals that can cause a number of issues, if in doubt switch it back on to compare.

Display settings

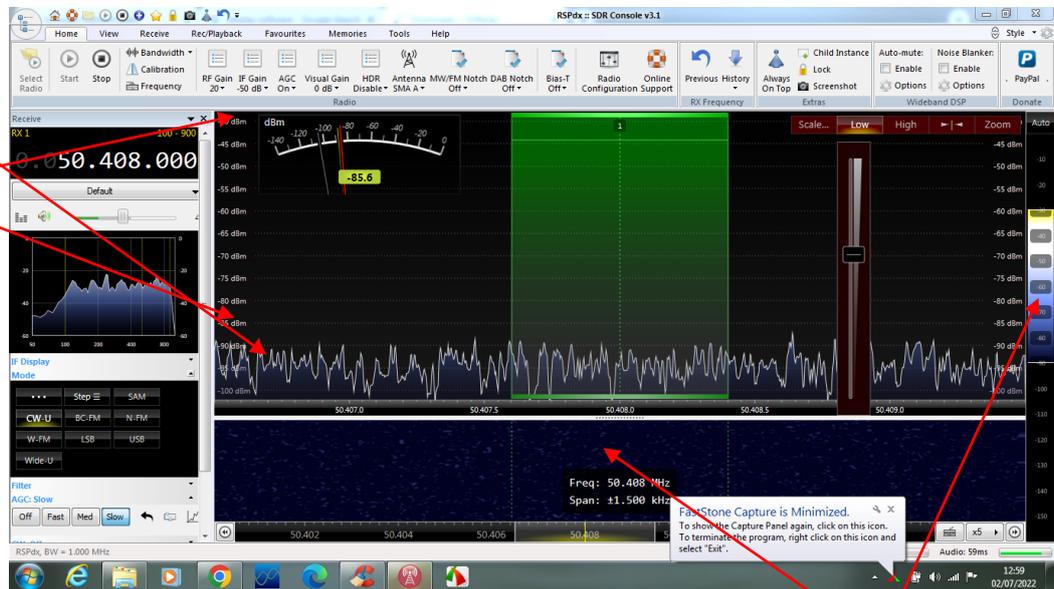
There are a great many very useful settings however we will just focus on the key ones needed to get you started. The key ones show up when you hover your mouse over the centre right of the display, scale, Low, High, >|< and zoom.

Low sets this point

High sets this range

>|< set the frequency to the centre of the display

Zoom does as it says, it zooms in and out of the main display.



There is one other display setting that is essential and that is the contrast of the water fall in the lower window this is set by dragging the highlighted bar on the right up or down.

For meteor observations and for checking noise levels the digital meter option is recommended. From the view menu set scale to dBm – Auto. Signa, meter Digital – select.

For certain soundcards such as the Fun Cube Dongle that use an audio type ADC there can be what is referred to as a DC spike in the centre of the selected bandwidth. This is managed automatically by SDR console by using a very narrow +10 Hz 20 db notch. In normal use you this will go unnoticed, however in this case if you are looking for a direct signal from the beacon you might not see it.

The procedure to manage this is pretty simple and is as follows :-

1. set the frequency to 50.408.500
2. Click the centre the display icon on the pop up display on the right >|<
3. Retune to 50.408.000
4. Your wanted frequency will now be 500hz to the left of the centre
5. The notch is still there but at a known 500hz high point the the observation frequency

Antennas and Noise

An antenna suitable for 50MHz is essential and a simple wire dipole is a good starting point.

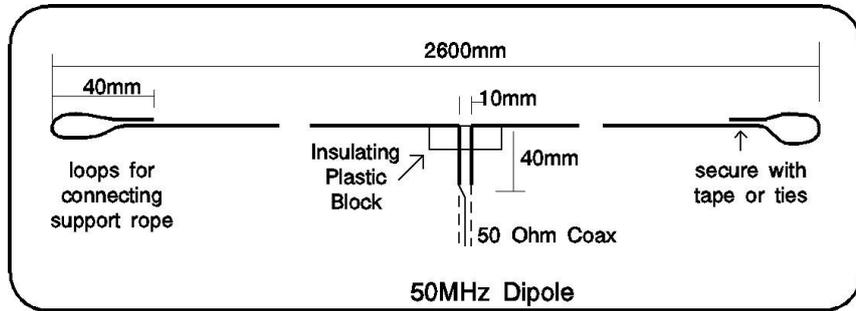


Figure 2

Man made noise is a problem on 50MHz and it is a good idea to check the noise level at your location before you invest too much time, money and effort.

This can be done quite easily using SDR Console by comparing the noise floor with the antenna connected to the noise floor with the antenna replaced by a 50 Ohm resistor. (2 x 100 Ohms in parallel is ideal) .

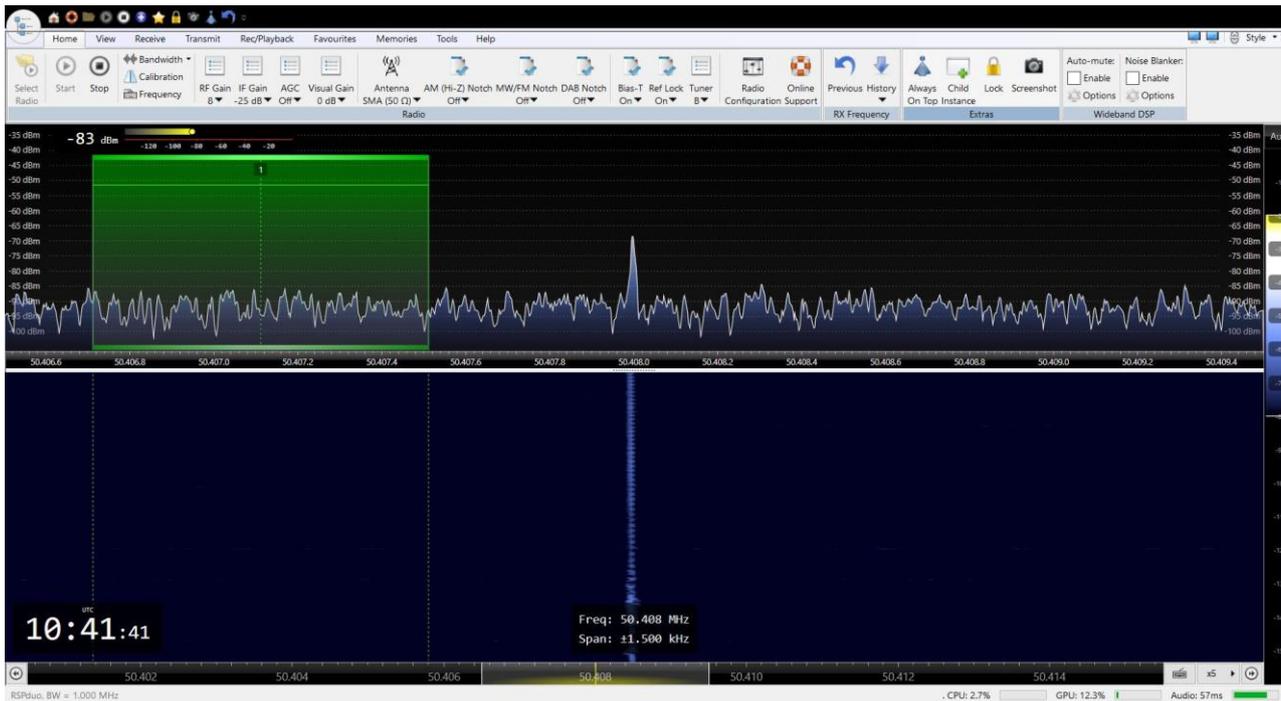


Figure 3

Figure 3 shows noise floor with antenna connected. It is important to “tune” the receiver to a part of the spectrum with no signals present by clicking the pointer on spectrum display. In this case 50.404 was clear of signals.

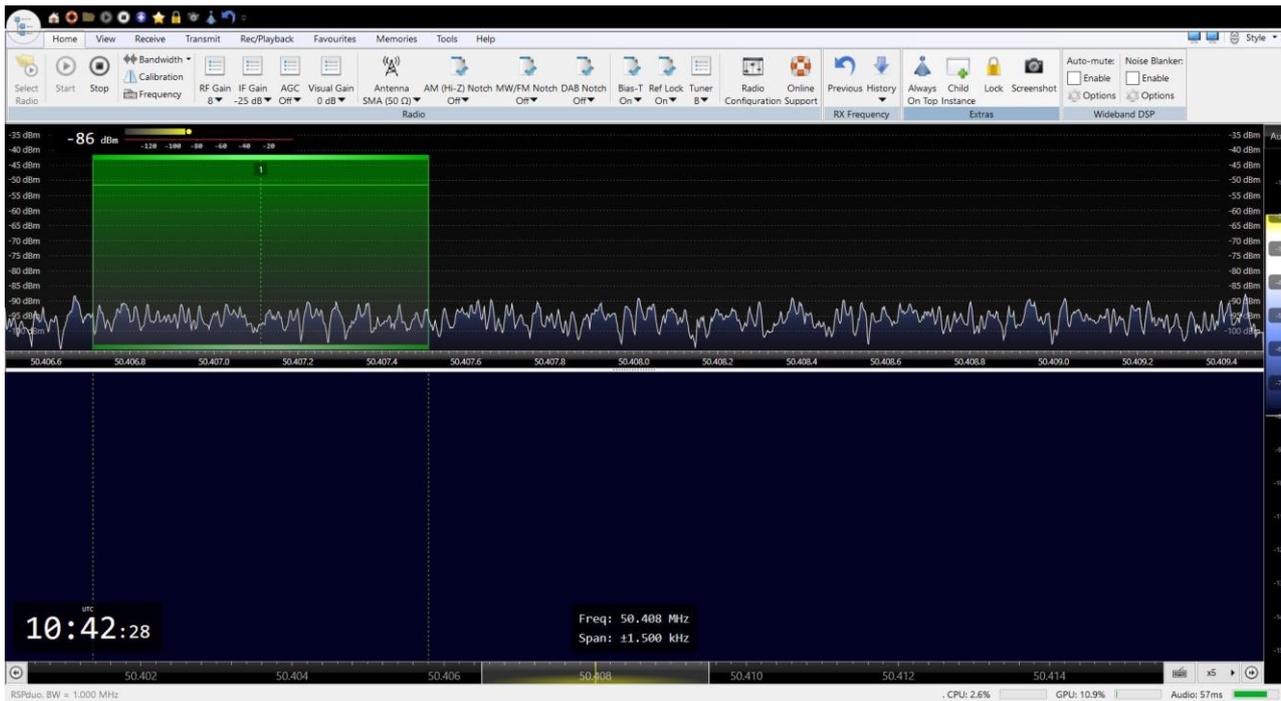


Figure 4

Figure 4 Shows system noise with the antenna replaced by a 50 Ohm load.

In this example the noise floor with antenna was -75dB and with 50 Ohm load was -80 so noise increase with antenna is 5dB. This is for a fairly quiet location. An increase of much more than 10dBs suggest that unless the antenna type or position can be improved to reduce the noise level then reception of echoes from GB3MBA may be difficult. In this case, when Phase II of the project has progressed, use the web based receivers that will be available as these will be in radio quiet locations.

Other factors such as the receiver sensitivity can affect this measurement so some care must be taken when interpreting the results. Early versions of the RSP series of SDR were found to turn OFF their LNA bellow a frequency of 60MHz making a pre amplifier necessary to achieve good results. A filter may also be useful and as very strong out of band signals may cause problems.

This diagram illustrates the issue of noise. The long arrow shows the level of the wanted signal. If the noise is at the level of the lower small arrow then we will see it, however if the noise is at the level of the upper small arrow then it will be hidden by the noise



Notes and additional information

This section will be updated as specific questions and requirements become known