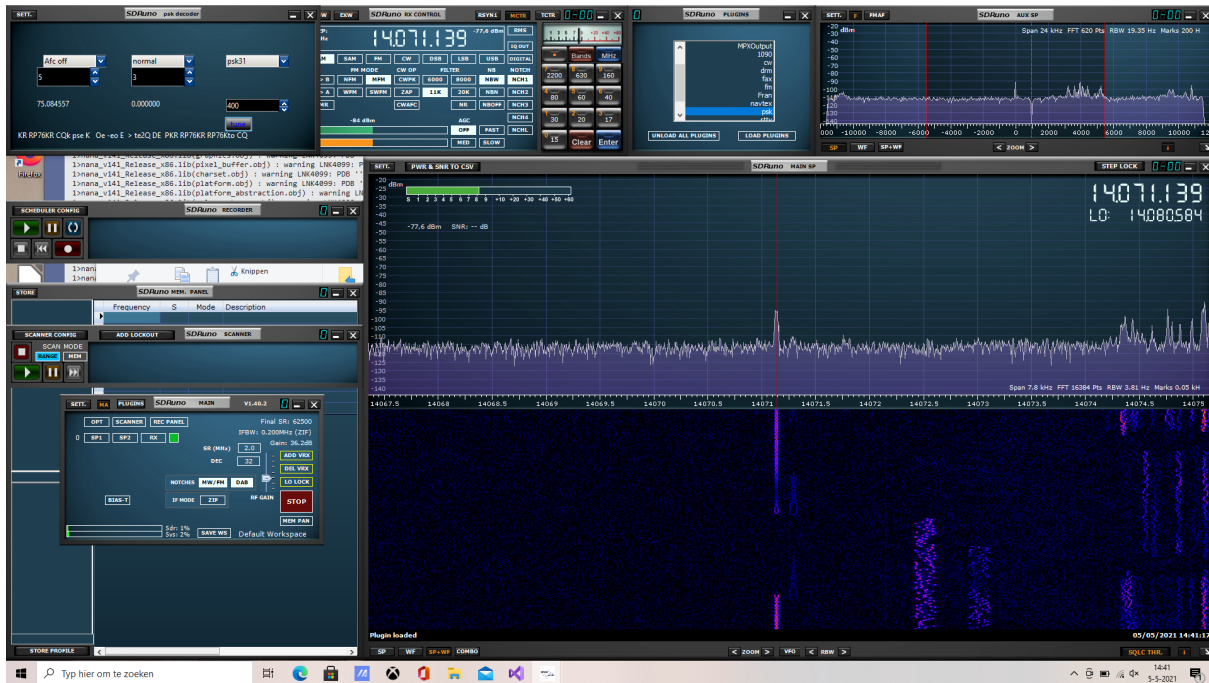


# A simple PSK plugin for SDRuno (version 2)

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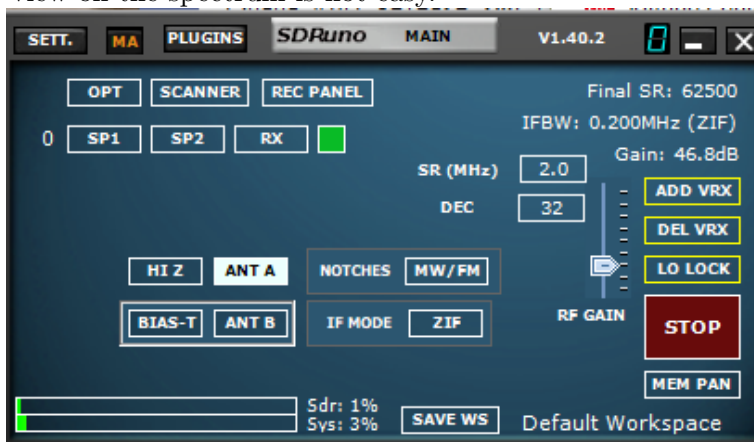
## 1 Introduction

The SDRuno psk plugin is a simple plugin to decode a psk signal that is tuned to. The current version supports BPSK31, BPSK63, and BPSK125. PSK is less popular than about 5 to 10 years ago, nevertheless, the region just above 14070 KHz usually contains quite some amateur calls using the mode.

## 2 Settings

psk is a signal with a very small footprint, the width used on the band is less than 50 Hz. The decoder therefore works with a low intermediate samplerate, 2000 samples/second. Since the minimal samplerate for the SDRplay family is 2000000, a lot of decimation has to be done. Part of it will be done by the half band filters in SDRuno, the resulting decimation is done in the plugin implementation.

The plugin operates with an input sample rate of 62500 samples/second, this requires the setting of the mainwidget to a samplerate of 2000000, and a decimation of 32, as shown in the picture. One should realize that the SDRuno spectrum display shows a band of 62.5 KHz, the advantage is that one sees a lot of signals, the disadvantage is that precise tuning, based on the view on the spectrum is not easy.



The plugin generates an audiotone of 800 Hz + the tuning offset, In my experience, sound is very helpful in precise tuning. The sound is output with a rate of 48000, setting "AM" in the RX control window will set this rate.

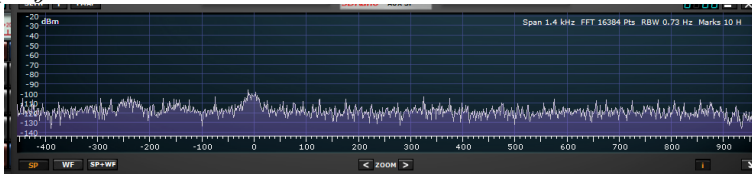
## 3 Tuning

As said, psk is a signal with a small footprint, and since many of the amateur transmissions are brief messages (such as CQ CQ ...), lasting just a couple of seconds, tuning requires some training.

A frequency offset of even a few Hz can make decoding the signal in a correct way virtually impossible. Therefore, in version 2 of the decoder, an *automatic frequency shift* option is included. The *tune* button, when touched, instructs the software to detect the strongest signal in the neighbourhood of the tuned frequency - a signal at least 6 dB stronger than the average signal strength of the region. If such a point is found in the spectrum, the tuning will move slowly to that point. If no valid point in the region can be detected, searching will stop after at most 5 seconds.

The *search width* is selected in a spinbox. Since psk signals are often very close to each other, the width can be selected to up to 300 Hz (of course both up and down). The default value on the selector is 400, indicating a searchwidth of 200 Hz on each side of the current frequency.

What further helpful in tuning is using the zoom on the main or the *auxiliary spectrum display* on SDRuno.

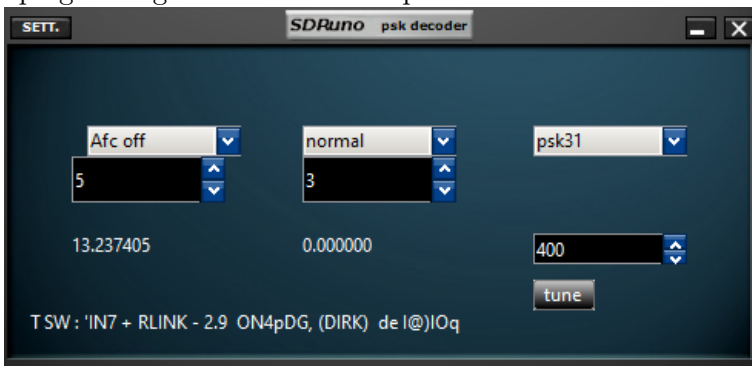


My way to tune is in two steps

- coarse tuning with the mouse on the main spectrum display;
- fine tuning with the mouse controlled numerical display until the psk signal is above the '0' in the auxiliary spectrum display, or
- if we are close enough to the desired signal, touch the "tune" button, to instruct the software to tune to the strongest signal in the selected region.

## 4 The plugin

The plugin widget is shown in the picture



The widget has three control comboboxes, and two spinboxes.

- the combobox, with *Afc off* on the picture, controls the afc. It just has two options *Afc on*, or *Afc off*. If "on", the frequency offset used for correcting the measured frequency offset is in the right label, here -2.7... Hz;
- the combobox, with *normal* on the picture, let chose between normal and inverse decoding;
- the combobox, with *psk31* on the picture, controls the decoding mode. As said, current modes are restricted to bpsk modes, in a later stage the qpsk modes might be added.
- the spinbox to the left tells the filter depth used for eliminating the noise in the signal<sup>1</sup>;
- the spinbox to the right sets a squelch level, below which there is no decoding.

<sup>1</sup>the filter is a low pass FIR filter with a degree that is twice the indicated number + 1. Of course a lot of filtering was already done to get a reasonable clean signal

The number label to the left, below the filter depth indicator, here with a value of 12..., shows the "quality" of the decoding of the signal. As usual with this kind of indicators, 100 is best, but to get it requires a decent signal.

New in version 2 is the spinbox, here set to "400", that specifies the width of the search region for fine tuning. Below this there is a button, when touched the software is instructed to search in the specified region - with the currently selected frequency in the middle - for the strongest signal and change tuning to that signal. If no signal with a strength of over 6dB over the average signal strength in the selected region within a specified time (5 seconds), searching stops.

The bottom line of the widget is reserved for the decoded signal. Note that bpsk does not provide an error correction mechanism, and garbage may be shown.