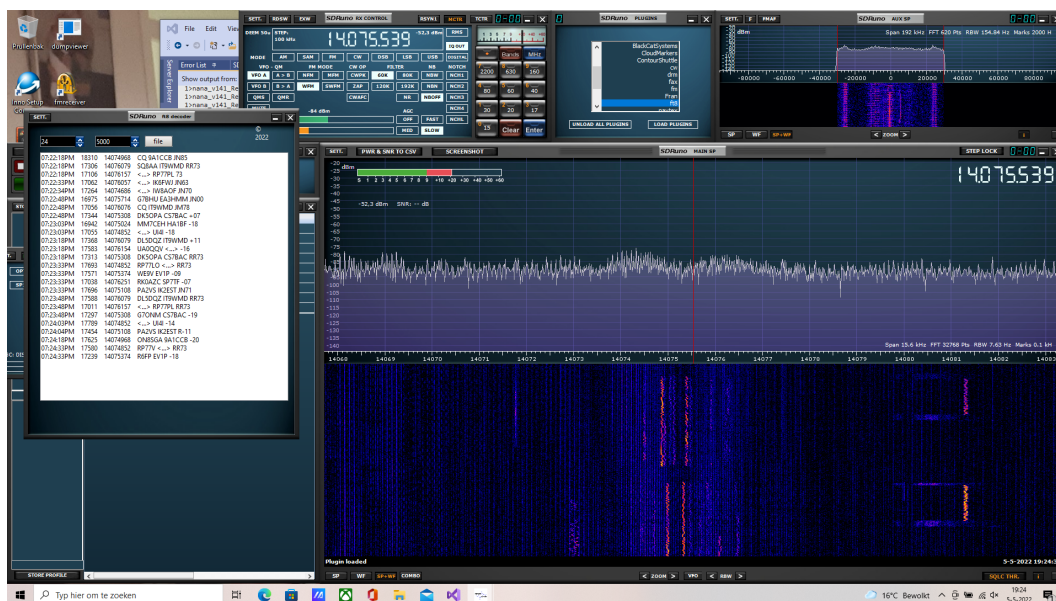# An experimental FT8 decoder plugin for SDRuno

Jan van Katwijk

Lazy Chair Computing

The Netherlands

J.vanKatwijk@gmail.com

May 6, 2022

1 Introduction

The FT8 plugin is an experimental plugin for decoding FT8 messages and showing the decoded messages.

The plugin - as a community plugin - can be installed by placing it in the folder for community plugins. Ask SDRplay where the folder would be on your system, on my system the folder can be found as subfolder in "Documenten".

Note that where I live the sun is now shining abundantly, and since most neighbours around have solar panels, reception of radio during day time is sub-optimal, which may be reflected in the pictures and the results shown.

2 Selecting a samplerate

The plugin uses the SP1 output of the SDRuno platform. This output is 192000 samples per second. The plugin itself will reduce the samplerate to 12000.

The default setting for SDRuno (at least with me) is that the input samplerate is 2 MHz, and the main spectrum display will show a spectrum of the full 2 MHz. It is advised to apply some reduction to the samplerate, see the picture.

Even then, it is often useful to zoom in in the spectrum, after all the spectrum of the region of interest is only a few KHz wide.

3 The plugin
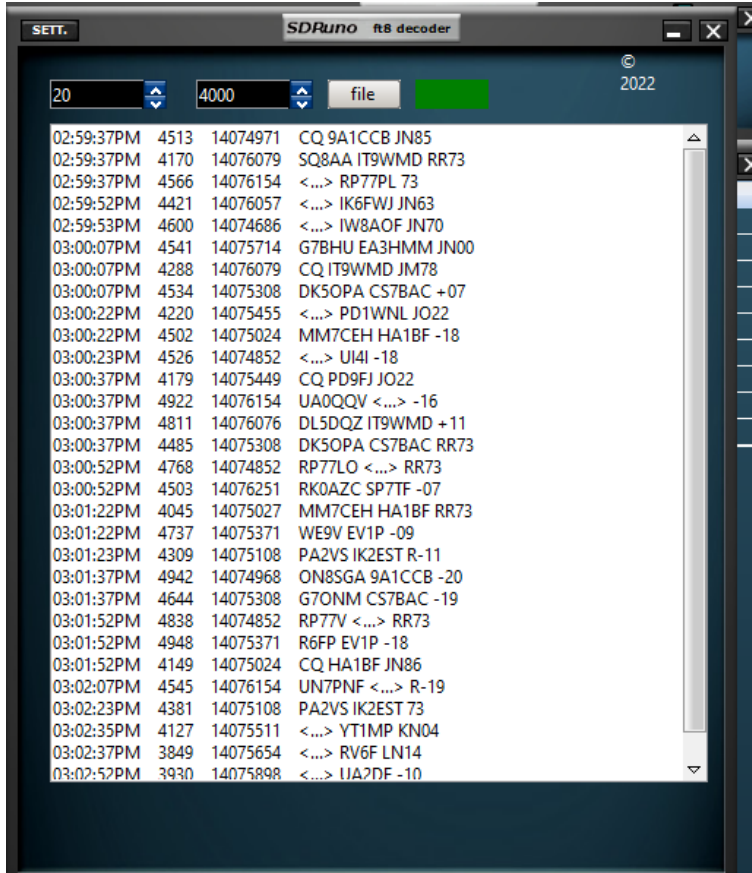
The widget for the FT8 plugin is straight forward, it will show for each decoded FT8 message a few fields

- the time of decoding the message;

- the value of the costas detector. In later versions this value will be changed to a signal strength indication

- the frequency of the message with an accuracy of 3.125 Hz (tone distance is 6.25 Hz).

- the message itself

On top of the widget there are two selectors and a button

- The *first* selector sets the value for the number of iterations, to be applied in the LDPC decoding (see later on). Higher values may lead to better decoding but are expensive in terms of CPU load;

- the *second* selector sets the bandwidth in the spectrum in which ft8 messages are searched for. Default values here are 20 and 4 KHz. Note that the plugin starts with band filtering the incoming signal on a band of 5 KHz, the assumption is that the width of the region for FT8 signals is less than 5 KHz.

- Next a button labeled "file" is there. As the name suggests, a file can be selected in which the data is stored. If the data is being written the label next to the button will be colored red, if no data is written the color of the label will be green.

4   A note on FT8 decoding

FT8 decoding is essentially based on a - more or less - "intelligent" brute force approach. In a first step an attempt is made to preselect the potential messages using detection of a costas array. In the second step for each of these potentials an LDPC based error detection/recovery mechanism is applied, in a third step the resulting message is subjected to a CRC check.

Note that the parameters in the first stage may be too strict, and not all messages are in the set of potentials, or they may be too loose, and the set of potentials is too large. Some criteria have to be applied to do the selection, but it is not obvious that a single set of criteria is optimal under all circumstances.

An encoded FT8 message is 91 bits (including the CRC), and 83 error correction bits are appended. Of course, the probability that on receiving a transmission, the error correction bits contain - roughly - the same amount of errors as the message bits is pretty large.

The net effect is that the result of the application of the error correction may be an incorrect message, that is why the CR check comes in.

Anyway, the decoder may - and probably will - miss some messages in the transmitted band, and I am still looking for the "best" parameter settings for the different functions.

5   Copyright and acknowledgments

The code in the plugin uses parts of the code of the FT4FT8 decoding software of Karlis Goba. Especially the LDPC decoder is a copy of his code, and the copyright to the parts taken or derived from his code are gratefully acknowledged.

The Copyrights of the code - not covered by the above - is by me. The software is available under a GPL V2. Note that under this license you are free to use the plugin, and you can even get the source, but the software is provided "as is", and no garantees are given that the software meets your requirements.

Note that - as the title of this document states - the plugin is still experimental, implying that the search for optimal parameter settings continues.