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[illegible]

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

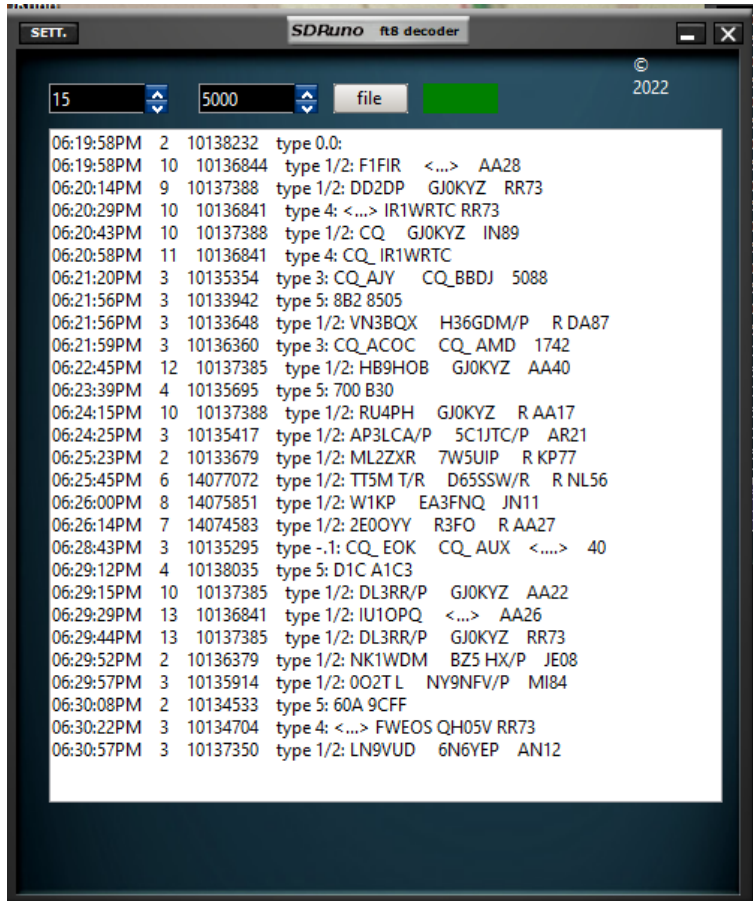
The plugin uses the SP1 output of the SDRuno platform. This output is 192000 samples per second. The plugin itself will reduce the samplerate to 12000 (and filter accordingly).

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 relative strength of the FT8 message, relative to the average signal strength during reception of the FT8 message.
- the frequency of the message with an accuracy of 3.125 Hz (tone distance is 6.25 Hz).
- the message type;
- 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; Default value is 20.

- the *second* selector sets the bandwidth in the spectrum in which ft8 messages are searched for. Default value is 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.

Settings for the LDPC number of iterations and the searchwidth are maintained between invocations of the plugin.

The widget will show up to 50 of the last received messages. Of course all messages are saved in a file whenever a file is selected

```

03:41:28PM 16 21075880 CQ LA5PPA JP40
03:41:43PM 20 21074569 YD3CER RM4HC 73
03:41:44PM 13 21075493 JA3LVJ LA8ENA RR73
03:41:58PM 17 21075330 YC3PJY LA3LUA J048
03:41:58PM 18 21075880 PA3CPS LA5PPA RR73
03:42:14PM 21 21074981 YC4AOK PA3GAE J021
03:42:43PM 20 21074566 EA5WO RM4HC -17
03:42:44PM 17 21075493 JR0JVF LA8ENA R-18
03:43:14PM 18 21074981 YC4AOK PA3GAE R+01
03:43:44PM 19 21074981 YC4AOK PA3GAE 73
03:43:58PM 13 21075880 PA7ZZ LA5PPA -07
03:45:14PM 2 14075137 DM2GON SP7TF RR73
03:45:28PM 10 14074197 <...> PA3BGQ J022
03:45:43PM 8 14076334 CQ ES6DO K027
03:45:58PM 21 14076496 PD0GIP <...> R-05
03:45:58PM 18 14075455 CQ HA1ZW JN86
03:45:58PM 13 14075537 CQ PD9FJ J022
03:45:58PM 18 14075065 CQ HA1BF JN86
03:46:28PM 12 14076496 <...> I80HQ/AWD 73
03:47:29PM 12 14074881 STOP WAR RUSS
03:47:43PM 4 14075224 DG8KAD LA2GCA 73
03:47:43PM 11 14075549 ON4JPV IZ7KGB 73
03:47:44PM 6 14074903 OZ7GO F1DXP JN05
"test3.txt" [dos] 25L, 1040B 1,1 Top

```

## 4 A note on FT8 decoding

FT8 decoding is essentially based on a - more or less - "intelligent" brute force approach (sounds like a "Contradictio in terminis"). In a first step an attempt is made to preselect "potentials", i.e. potential messages based on matching the input with a costas array of 7 tones.

In the second step for each of these potentials an LDPC based error detection/recovery mechanism is applied. First the 79 subsequent tones are collected, the 58 non-synchronization tones are mapped upon 174 soft bits and the LDPC algorithm is asked to make that into "hard" bits. Finally, in a third step the resulting message is subjected to a CRC check. If the check succeeds the bits are translated into a message.

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 that incoming garbage is transformed to something resembling a message, and the other way, a correct message may suffer from errors in the error correction bits and may be transformed into garbage. A CRC check is therefore absolutely needed.

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 Future work

While, as said, the plugin contains apparently an error, it sometimes causes a crash, and the Linux version does not, no guarantees can be given that newer - improved - versions of the plugin will even appear.

For the Linux version it holds that current work is on optimizing parameter settings and extending the encoding.

In the current version an attempt is made to decode all message types, however, messages in some message types need further processing.

## 6 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.

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