DE KUNSTMAAN

December 2019 – 46e jaargang nr. 4

Uitgave van de Werkgroep Kunstmanen

In dit nummer o.a.

- Nieuwe ontwikkeling wsat
- De Patch antenne
- Decodering met Scilab

en nog veel meer

Dear member,

This pdf contains translated articles of our Dutch magazine “De Kunstmaan”.
Translation for each article is normally done by the author, using Google Translate (and manual corrections afterwards). But for sure these translations are not perfect! If something isn't clear please let us know.

Formatting is not as perfect as the paper magazine, but figures are all added.

Internet links mentioned in the articles can be found at our website; see under menu 'Weblinks' at: www.kunstmanen.net

Older magazines, from 2014 to 2017, are now also available in English; see menu “De Kunstmaan”, “Archief”.

I hope these translations will help you to understand the Dutch articles.

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Content

Photo front page:
Measuring 'in the field'.

Preface

It was nice to see everyone at the last meeting. As always, the time was too short to chat with everyone extensively. At least after the meeting I came home with lots of ideas and enthusiasm to continue.

Job gave a fascinating lecture about noise and how you can measure this. For the occasion, he had brought his HP noise meter and demonstrated it. Very handy if you have such a nice measuring device!

QPSK receiver

We had a lively questionnaire where Harry quite rightly asked about the state of affairs regarding the QPSK receiver. This is perhaps the place to elaborate on that.

The recipient 's design was published in December 2016 . This receiver works, but can always be improved. In the March 2017 Kunstmaan an important change came with which the separate display print could be cancelled. A year later, the tuner print was adjusted for the UV1316 because the UV916 is no longer available. In addition, Rob has created a constellation viewer and coordination via wsat .

The question rightly comes: where are we now. What developments are still to be expected?

The following can be said in random order:

- The EL5170, a differential amplifier , is no longer available. For those who still want to start with the receiver, this is a challenge . If someone knows an alternative f for the EL5170 . Let this know . Another solution direction is to drop the EL5170 (and possibly the SAW filter).

- Capturing the QPSK demodulator could be better. In practice it appears that every now and then you have to flip the HRPT / QPSK switch once to get in lock . Furthermore, the control loop is temperature sensitive. We are looking at whether a VCXO, as is now being used in the HRPT decoder, offers a solution.

- Rob has designed a nice constellation viewer. You then have two displays in the receiver. Is it possible to equip the receiver with one display and still show all information?

Despite the best intentions to publish a design that has been completed , you cannot escape progressive insight and changes to the design. Up to the time of publication, five versions of the prints were made!

The only answer to the question of where we stand with the receiver so that it is never finished. There will always be adjustments and improvements. It is difficult for the followers because they have to work their way through partly outdated information. It would be very welcome to summarize everything written about the QPSK receiver in one document. And then the problem comes in time and who do you do this for? The parts are not available for sale ..... A more fundamental point is that we are a group and not a company engaged in the design and supply of generation - some receivers.

This observation is perhaps a barrier to bringing in new members. We do not have a simple description of the weather satellite reception. The entry into our hobby can be very low: cross dipole and an RTL dongle . For some of these quick loafers, the spark will skip to start the real work, such as receiving HRPT signals.

And here too there is an o b link. We as electrical engineers the soldering knowledge to handle, deal less useful software, is building a gross rotor antenna and a very big challenge. I would like to see a story from members in the Kunstmaan how you can follow satellites without a rotor control, but with manual control. The next step is then to build a rotor control. My first reception was three seconds long (the decoder went into lock) because my rotor was very badly adjusted. But knowing that I could receive something was a great incentive for me to move on.

Website

Our website is the place where we have to publish the latest status regarding the projects. This is easy to maintain. We are now working on a new design of the website where our projects are an important part.

The Kunstmaan

I do not know if anyone noticed, but changed printer. It was no longer possible to have the Kunstmaan printed at Nimeto . The shipment happened by Sandd . We had some start-up problems with the September Kunstmaan, but that should be a thing of the past for December Kunstmaan. We hope that this Kunstmaan is on the doorstep for Christmas.

In this Kunstmaan again a contribution from Fred from distant Vietnam. Unfortunately we will have to miss him at the New Year's reception because he will be back in Vietnam.

Furthermore in this Kunstmaan an article from Rob about the use of Github where we can publish software. It now includes Arduino sketches for the receiver , attenuator , and the STM32 (OLED display) . In addition, an article about the extensions of wsat .

My hand an article on Scilab with a picture of .dat files from the HRPT decoder distillate l could.

Our librarian Paul has been busy for the interesting facts from the VHF SMSs n get to and also another " from the library " to produce.

Eumetsat

We are busy organizing a visit to Eumetsat in the summer of 2020. See the announcement later in this Kunstmaan.

It remains for me to wish everyone a Merry Christmas and a Happy New Year . The first meeting of the new year is on January 11, with the traditional New Year's reception , until then!

Ben Schellekens

Chair of the Kunstmanen Working Group

PS: We remind you to pay your contribution for 2020. We hold the contribution of 25 Euro per year for members in the Netherlands and 30 euros for members abroad. For members outside the Netherlands and Belgium we have the option of a PDF membership for 10 Euro.

Visit Darmstadt 2020

Summary

Next year, on July 2nd and 3rd a visit to the headquarters of Eumetsat and ESOC will be organized . This program for this trip is packed with keynotes , tours, meetups and demonstrations. We are currently checking the level of interest for this trip. P lease sent an email (without obligation) to ben@towerhouse.nl when you are interested in participating in this event.

Preface

We visited Eumetsat three times before , in 2007, 2011 and 2015. Each time we received a warm welcome and we had nice "behind-the- scenes" guided tours . That is why I am pleased that we will return to Darmstadt next year. Slowly but surely, the visit to Eumetsat and ESOC will start taking shape in 2020. Make a note of at least 2 and 3 July 2020 in the agenda.

On Thursday 2 July we were invited to the Eumetsat head office in Darmstadt. The day will be filled with presentations and tours. The program for Friday is not yet fully determined d. In the morning we can visit ESOC, but if someone has other suggestions we would like to hear from you.

Geo

The visit to Eumetsat will also be promoted by the Geo . It's fun to work with h e go one to Eumetsat too. We will see that g elegenheid is together to discuss and th ee n / thoughts to be exchanged.

In addition to promoting this visit together with Geo , we are also looking into whether we can get other radio enthusiasts enthusiastic about receiving weather satellites and who also want to visit Darmstadt. Perhaps it will yield nice new members.

Requirement and stay

Darmstadt can be reached in about 5 hours from the Netherlands. In practice this means leaving on Wednesday. The trip and stay to Darmstadt are the responsibility of the participant. This is therefore not an organized trip! We will give recommendations for hotels.

There is also entertainment in the evening. From 2 to 6 June there is the Heinerfest which takes place around the castle. For wine lovers there is a vineyard where it is well rested and of course there is no missing beer hall on Karolinenplatz . There are many stands with snacks, drinks and live music. Ideal for a long weekend!

In short, it will be an educational and fun trip. We look forward to hearing from you as soon as possible if you are interested in coming along.

Weersatellieten in Vietnam (34) **Fred van den Bosch**

Summary
My experiences with weather satellites etc. in Vietnam.

General
The past period was mainly characterized by many problems. A lot of things crashed or went wrong. Murphy had brought his entire family here. A small anthology of a number of relevant issues.

PC
The complete folder with all the files on my large system, bought in Vietnam, that I have collected from the working group over the years, had completely disappeared. First looked at whether I had accidentally moved him somewhere. Nothing.
Then snooped into the trash like a real trash dog. Nothing.
Then try to get it back from my NAS. It suddenly turned out to be unavailable. &%*&$#*&(
With the help of Arne I was able to recover the files on the HD. Only my file with notes for version 34 turned out to be completely empty. Well, then no fuss from Vietnam.

NAS
Whatever I tried, I could no longer reach my NAS. Not entirely strange: I have always ignored networks as much as possible and am therefore still quite a noobt into it. But the specialist in the form of Arne was of course (figuratively speaking) close by. And after a series of attempts, Arne had found the solution and I could download my notes already made. Hence this contribution.

APT
Due to the busy period with other repairs I hadn't noticed that there were no APT recordings. My first shock was that the rats had been working on the antenna cables again. My continuous fear here. After a more detailed check, it turned out that the receiver did not get electricity: the (Vietnamese) electronic timer had given up. I knew for sure that I had to have some mechanical ones somewhere. And yes, after digging for a while I had found one. Just trying out how things were with the buttons (the bottom turned "on") and it all worked again.

HRPT
In between all the repair problems I sometimes thought that I could try to receive something like HRPT. Then I looked outside, saw the monsoon, shook my head and reluctantly began the next repair.

Nakri
On Saturday 9/11 (what's in a name) Minh received a text message that there would be a lot of wind and rain the following evening. Immediately looked at HK-Warnings [1] and yes, a severe tropical storm was on its way. Fortunately for us he would land a lot higher. My internet weather program [2] did not really indicate abnormal values. Quickly turned on the receiver. At the top right you can see the storm. Unfortunately, for unknown reasons, the reception stopped earlier than expected. The situation on Sunday was in line with the forecasts of the weather program. Rain all day, total according to my weather station 94 mm., Which I don't think is extreme for here, no storm and only some dripping in the evening. But I don't have to spray (and mow) the garden for now.

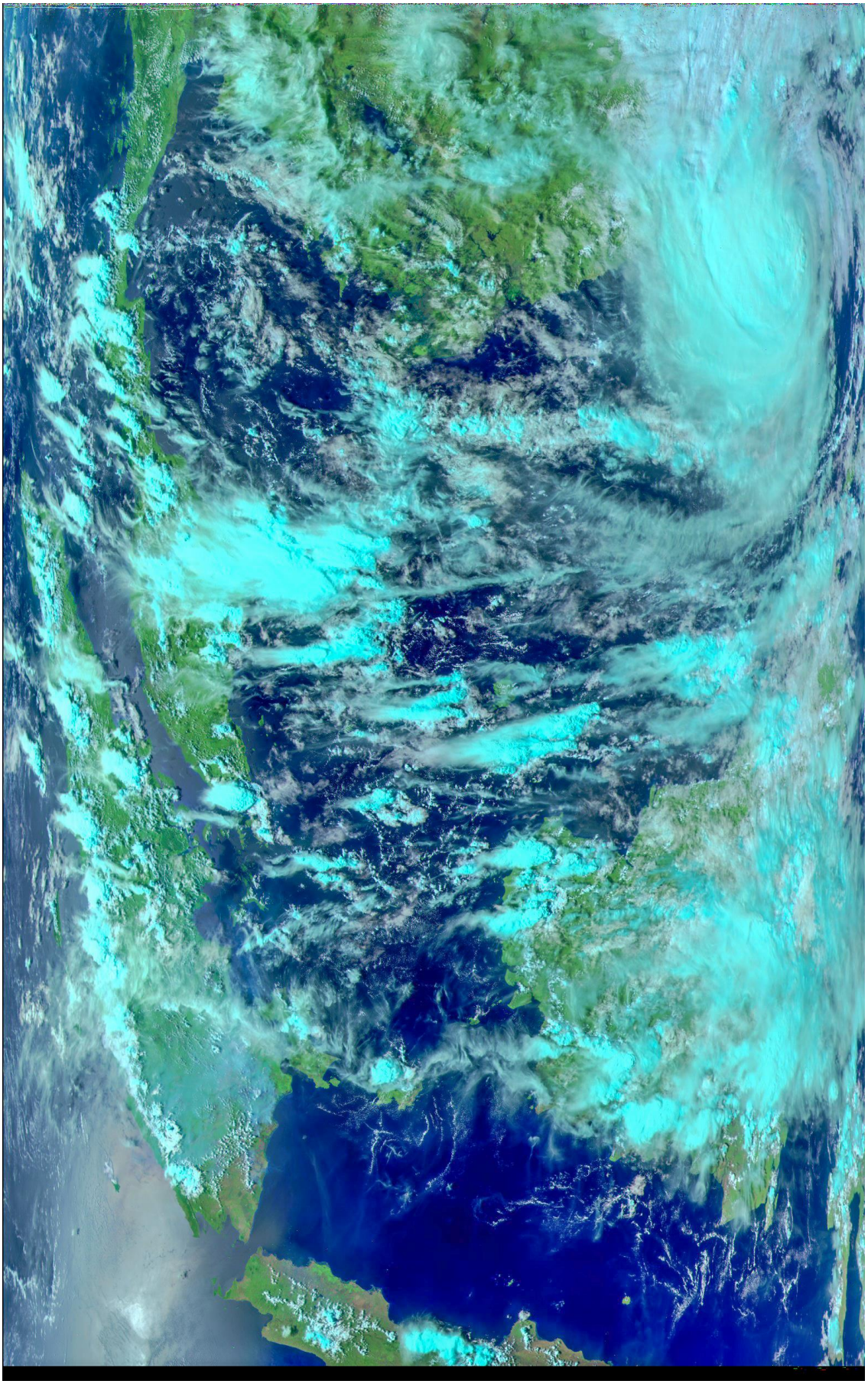
PC
Finally, some good news. Last holidays I bought an HP 260-G3 desktop mini-PC in the Netherlands and have been in use since 24 January in my often (un)reasonably warm hobby room. To date (and this beating on unplaned wood) he remains excellent. In short, I don't

regret this release for a second. And recommended for those looking for a small system in terms of location.

Visit to NL
I will also be back in the Netherlands for the coming holidays (1½ month away at the time of writing) I would then like to take this opportunity to have the latest version loaded into GODIL.
Unfortunately, the January meeting is the second weekend and I'll be back by then. Because I cannot shake hands with people personally, I wish all members a very prosperous 2020.

Everything
For those who are still looking for deployment for their 3D printer. [3], [4], [5]

References, see website
[1] HKWarnings, iPad app
[2] WeatherPro, iPad app
[3] 3D printer (1)
[4] 3D printer (2)
[5] 3D printer (3)



Meteor, 2019-11-09-14:46. Severe tropical storm Nakri. ©Fred van den Bosch

New developments wsat

In the 'wsat' program, with which the polar (A) HRPT satellites can be recorded, I have added a number of novelties (version 2019.4):

- zoom in / zoom out the image while it is being built up during reception
- zoom in / out in the tracker window
- Timeline of passages
- adding coastlines

This is a sequel to [1].

Zoom in / out 'Live'

Until now you can *specify* the maximum number of lines displayed during recording in *wsat* . When the screen is full, writing starts again, overwriting the previous part. Of course, the entire image can be viewed after recording, but this is a very primitive way to display an image immediately during recording. The structure can be adjusted so that the entire image is finally visible, but at the start of a recording there is still very little image to be seen on a very small piece of the screen. This cannot be changed during recording.

This has been adjusted with version 2019.4. There is now a special tab for 'Live' reception. This screen then has the functionality of 'GIMP': GNU Image Manipulation Program (similar to photoshop). [3] That means that the same 'hot keys' can be used for zooming in and out, among other things.

Fig. 1 shows the 'record' window in which all this can be set; fig. 2 shows the 'Live' image. With the hotkeys (including 'i', 'o', '-', '+') you can zoom during recording and the scroll bars also work as such.

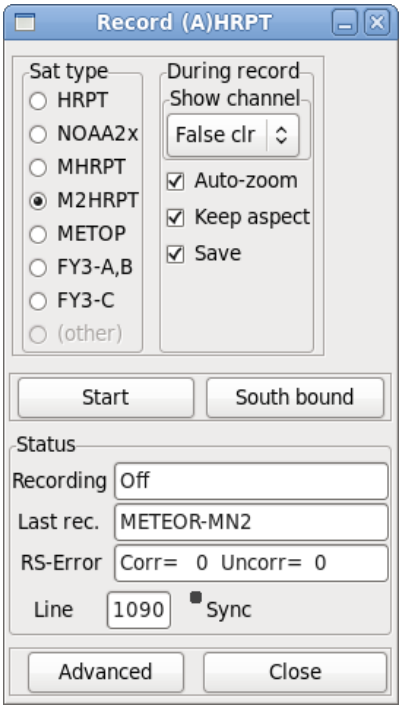


Fig. 1. Settings window when recording.

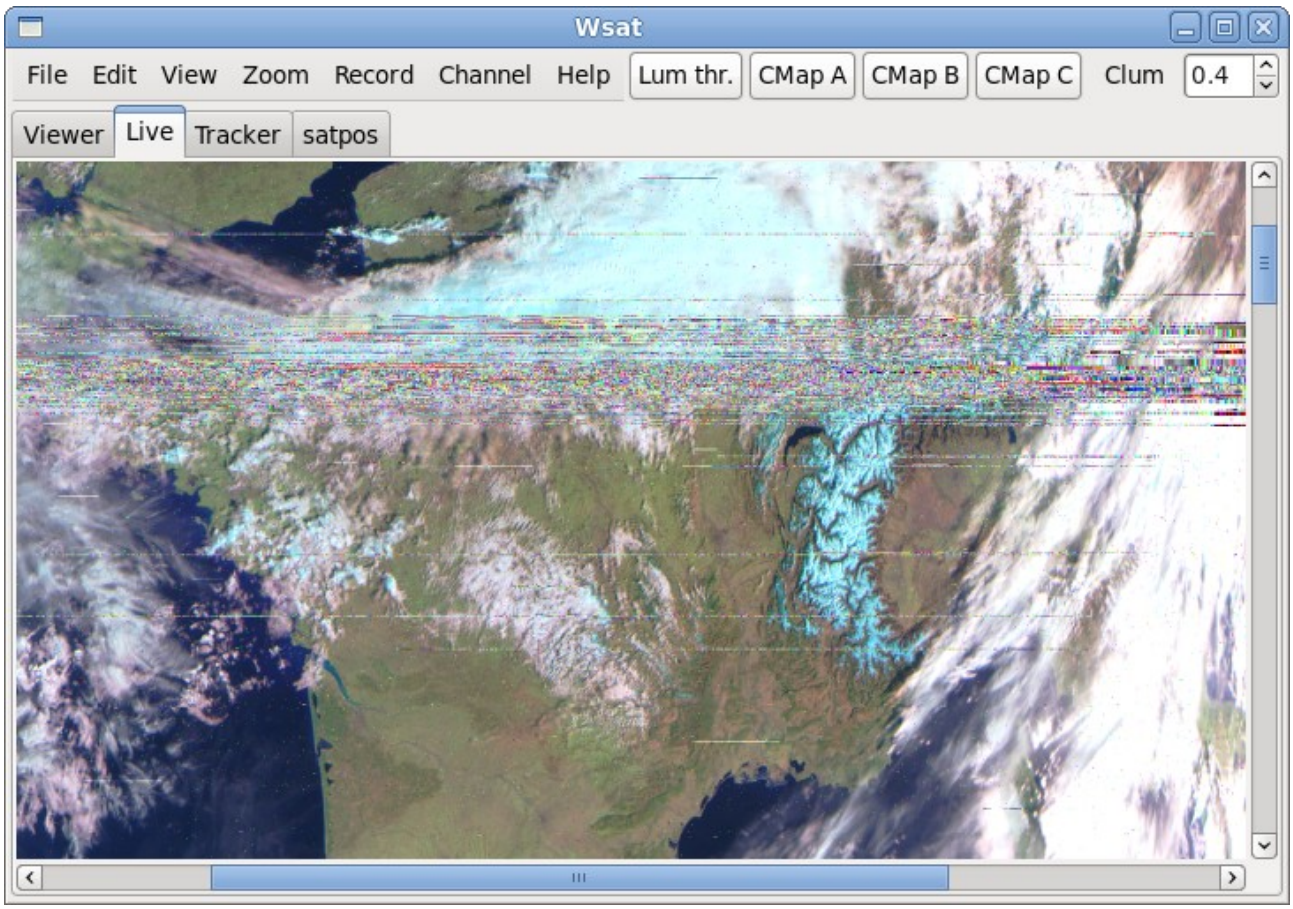


Fig. 2. The 'Live' window.

A number of zoom options are possible:

- *Auto zoom* on: during recording, the zoom factor is constantly adjusted so that the image is displayed as large as possible. If this is not checked then you can zoom in / out manually.
- *Keep aspect* on: the aspect ratio is maintained during auto zoom so that no distortion occurs. If this is not checked, but Auto-zoom is, then the entire image recorded so far will be displayed in the full window. This means that at the start of recording, the image is stretched strongly in the vertical sense, which then becomes less and less during recording.

Furthermore, the 'live' image can now also be displayed in color; previously only a single channel could be selected. See 'Show channel'. Also during recording the brightness of the displayed image can be adjusted with 'Clum' (see fig. 1, top left).

The automatic zoom during recording requires a bit more CPU power. If a slow computer can no longer keep up, this can be solved by switching off Auto-zoom.

Zoom in / out 'Satpos'

In the 'Satpos' tab, the current positions of the satellites are shown during tracking. You can now zoom in on the observation point. The number of satellites to be displayed can now also be adjusted here; in Fig. 3 the two next passing satellites are shown. This is adjusted during tracking every time after a satellite has passed.

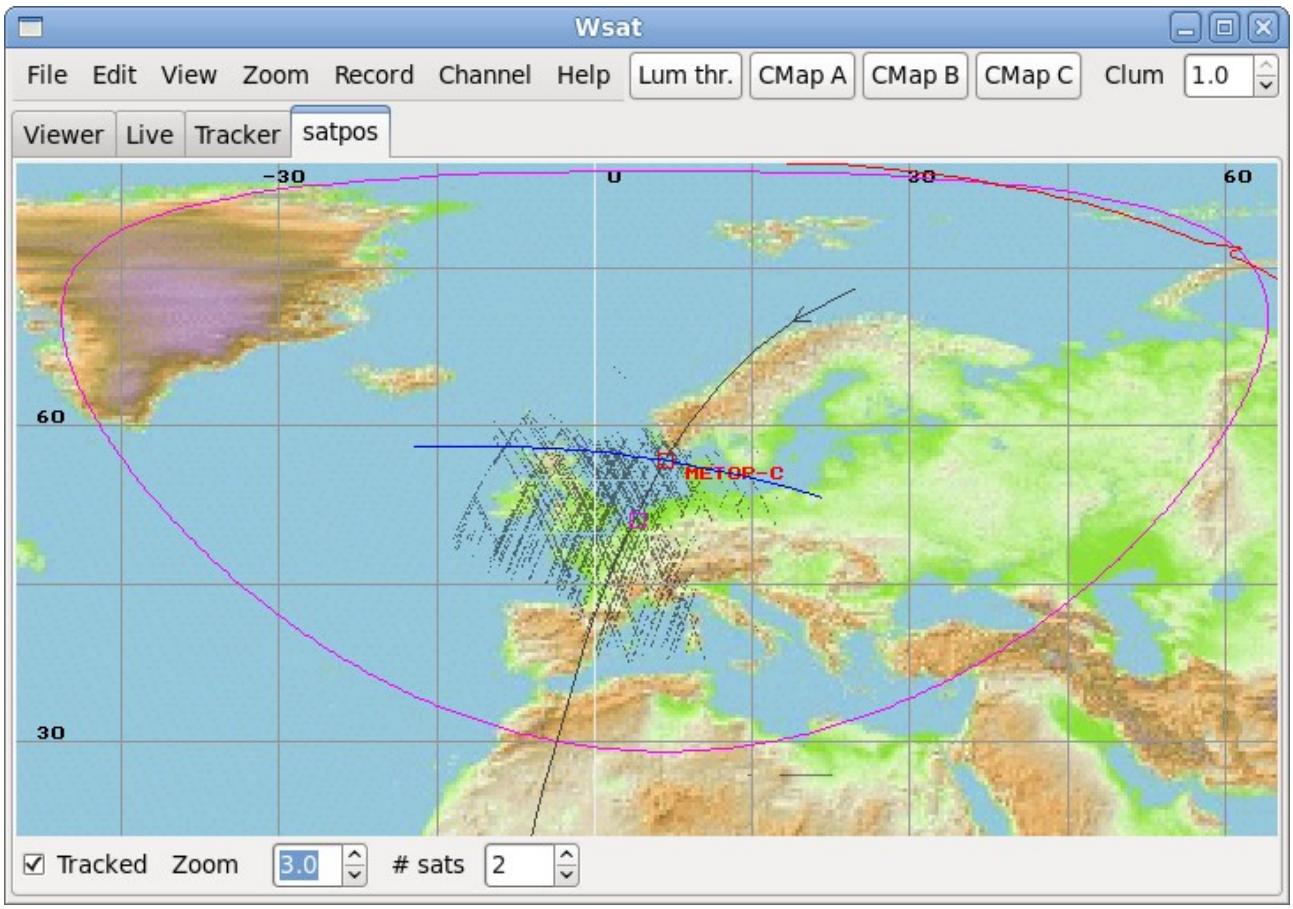


Fig. 3. Satellite position during tracking, zoomed in, with 'historical' tracks.

Furthermore, a number of black stripes can be seen in this picture. These are the orbits of satellites followed in the past; they have been collected / saved in a pgm file (if the 'Plot track' button is checked in the 'Tracker' tab, see fig. 4) and can be displayed with the 'Tracked' button. See [1].

Timeline of passages

The 'Tracker' tab now also includes a timeline with passing satellites; see fig. 4. (This had already been discussed in the Kunstmaan of June, [2].)

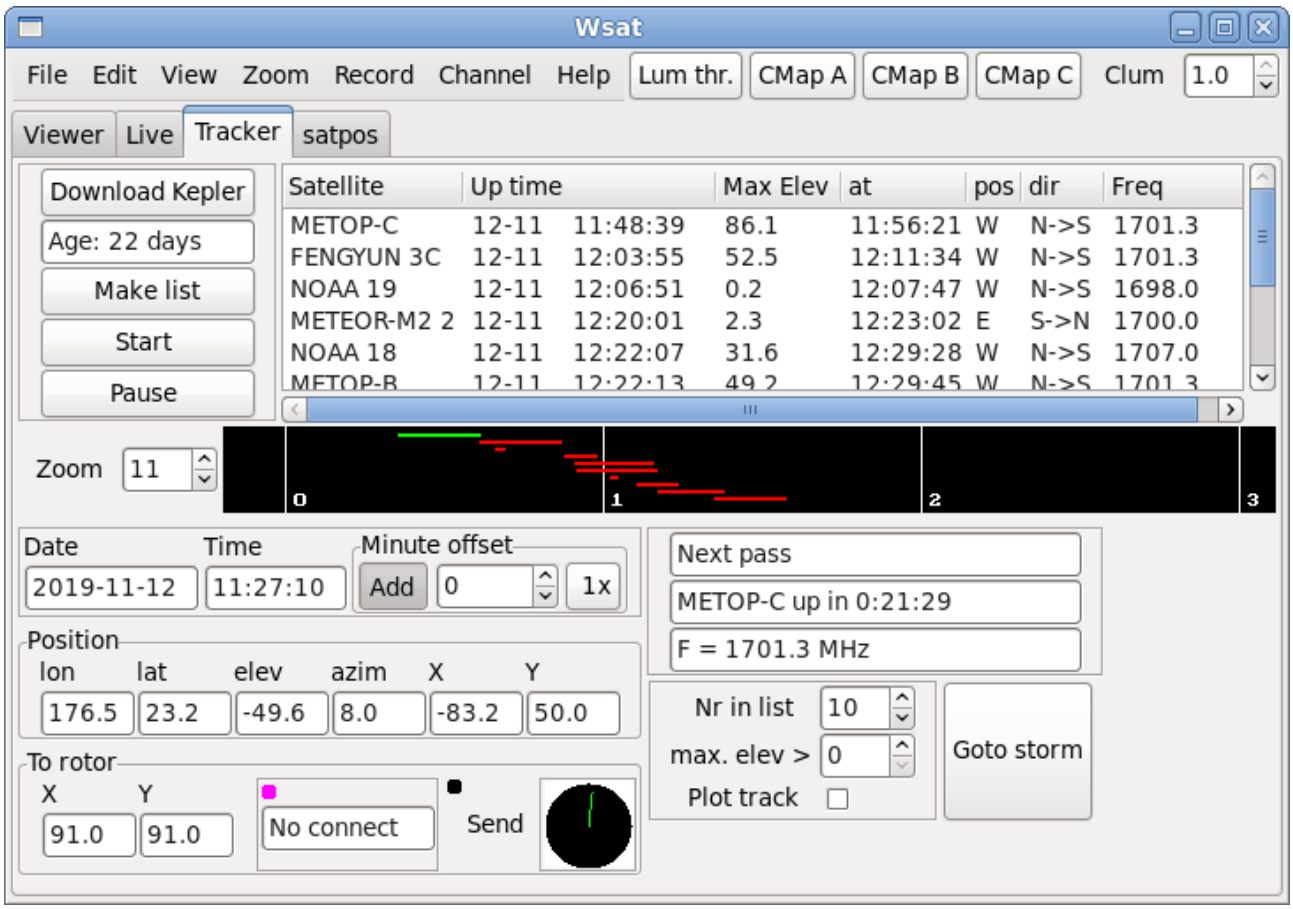


Fig. 4. Tracker settings with timeline.

Each line represents a satellite; the green is the one that is being or will be followed. It is a visualization of the list shown above. The length of a line corresponds to the time that the satellite is above the horizon. This horizon can be set with the 'max. elev ', then short, unusable passages are skipped. You can also zoom in / out with the 'button to the left of the timeline.

Incidentally, it is easy to see here that entire clusters of satellites are coming over simultaneously or one close after the other. (The numbers in the timeline are hours in the future, 0 is 'now'.)

Add coastlines

A file from the so-called "Global Self-consistent Hierarchical High-resolution Geography" is used for this, see [4]. The Kepler data used are in the recorded file; they are added automatically after a recording. Minor corrections in time and longitude can be made in the 'Edit-> Kepler' menu, but this should not be necessary if the saved Kepler data were recent during recording. So something needs to be improved on this.

The file with the coastlines, gshhs_i.b, can be taken from my web site. I see that this is an outdated file, but for now this is usable. In Preferences, tab 'Dirs / files', it can be checked whether this file is present in the correct location (click on 'Check').

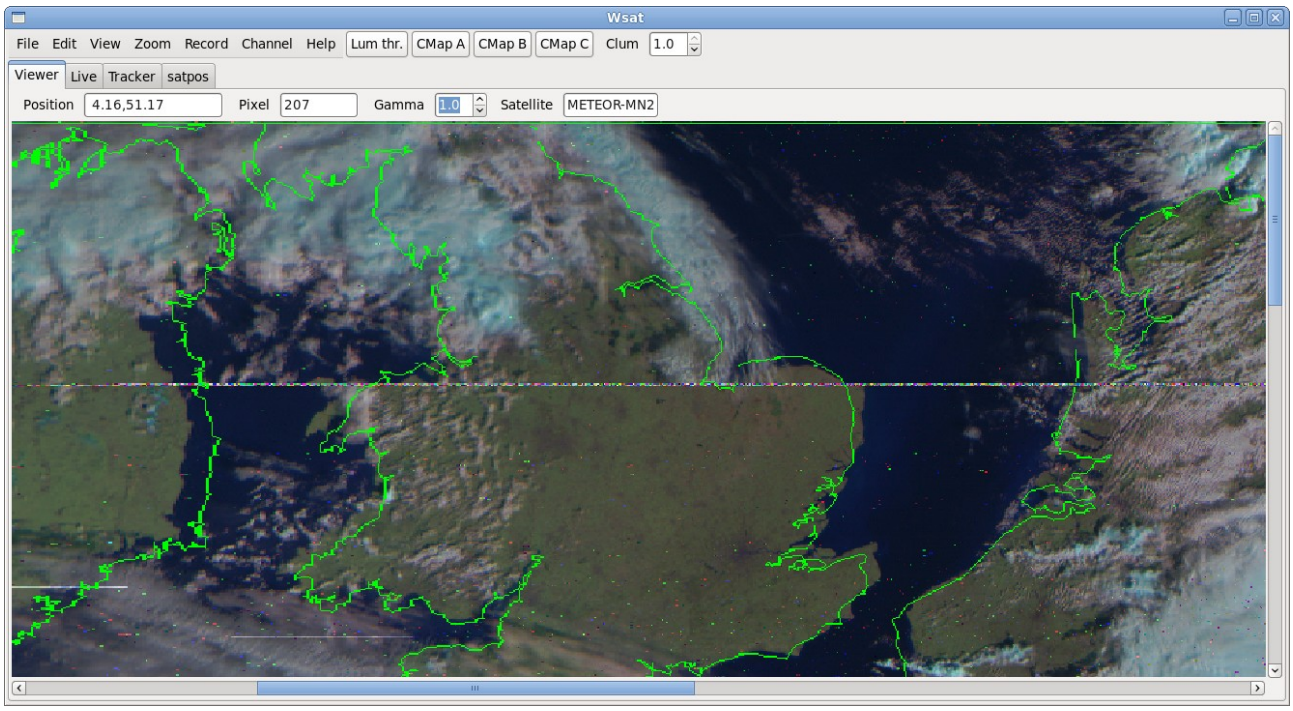


Fig. 5. Added coastlines.

References

[1] New WSAT developments. the Kunstmaan, 2018 no. 2, p. 20 ((English pdf version).

[2] Receiver frequency setting (tracker tab adjustment). de Kunstmaan, 2019 no. 2, p. 16 (English pdf version).

[3] GIMP: https://www.gimp.org/

[4] NOAA shorelines, see website for the link

Github

GitHub is a popular website on which software can be placed. GitHub is built around the Git version control system, so GitHub offers all the possibilities of Git and own additions.

As a working group we have now our own github account . The location is:

https://github.com/werkgroep-kunstmanen

On our website this can also be found under menu:

Software -> Github

Here you can find the codes of different projects that have been described in our magazine in the past. Currently these are:

- wrx_qpsk_controller: the code for the Atmega on the tuner print of the QPSK receiver
- constel_viewer: code for the constellation viewer (STM32 processor)
- AttenuatorDriver: Arduino code for the Agilent attenuator

See fig. 1.

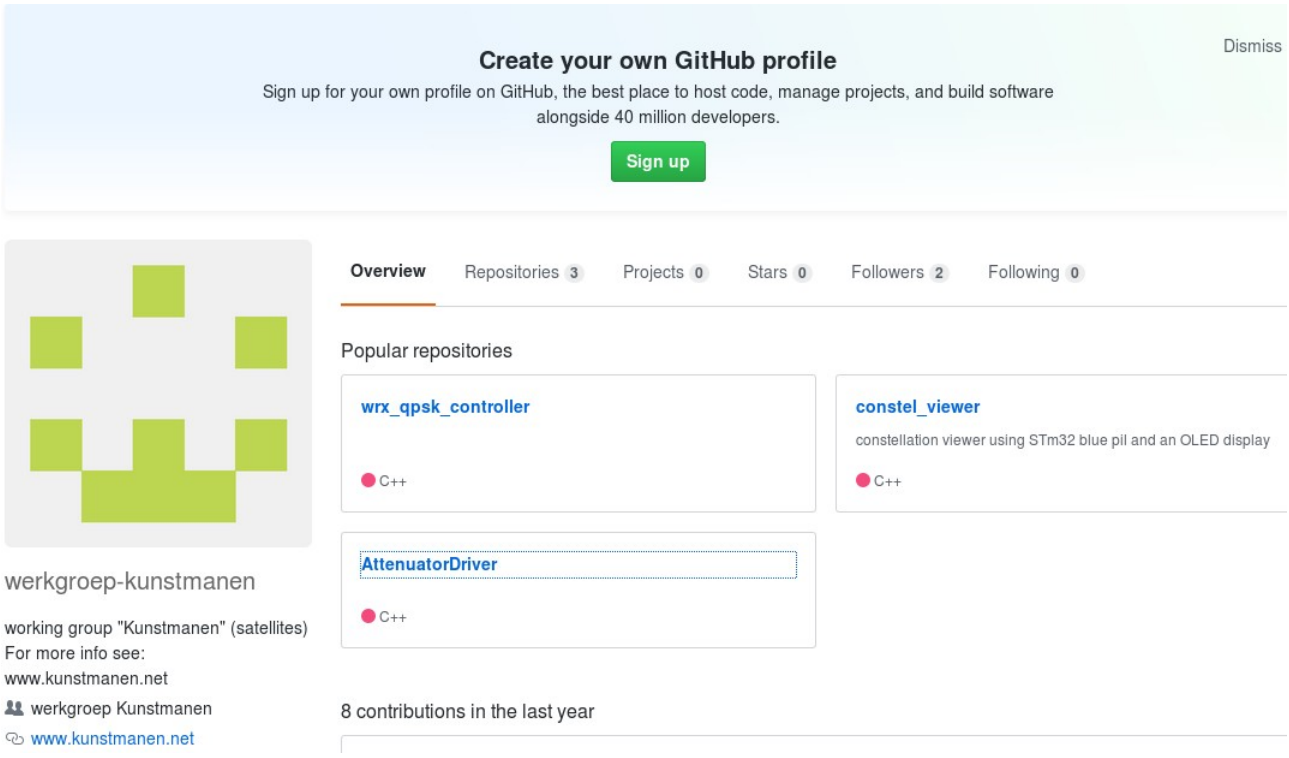


Fig. 1. Github web page of the working group.

After choosing one of the topics, a new page appears, for example, see fig. 2:

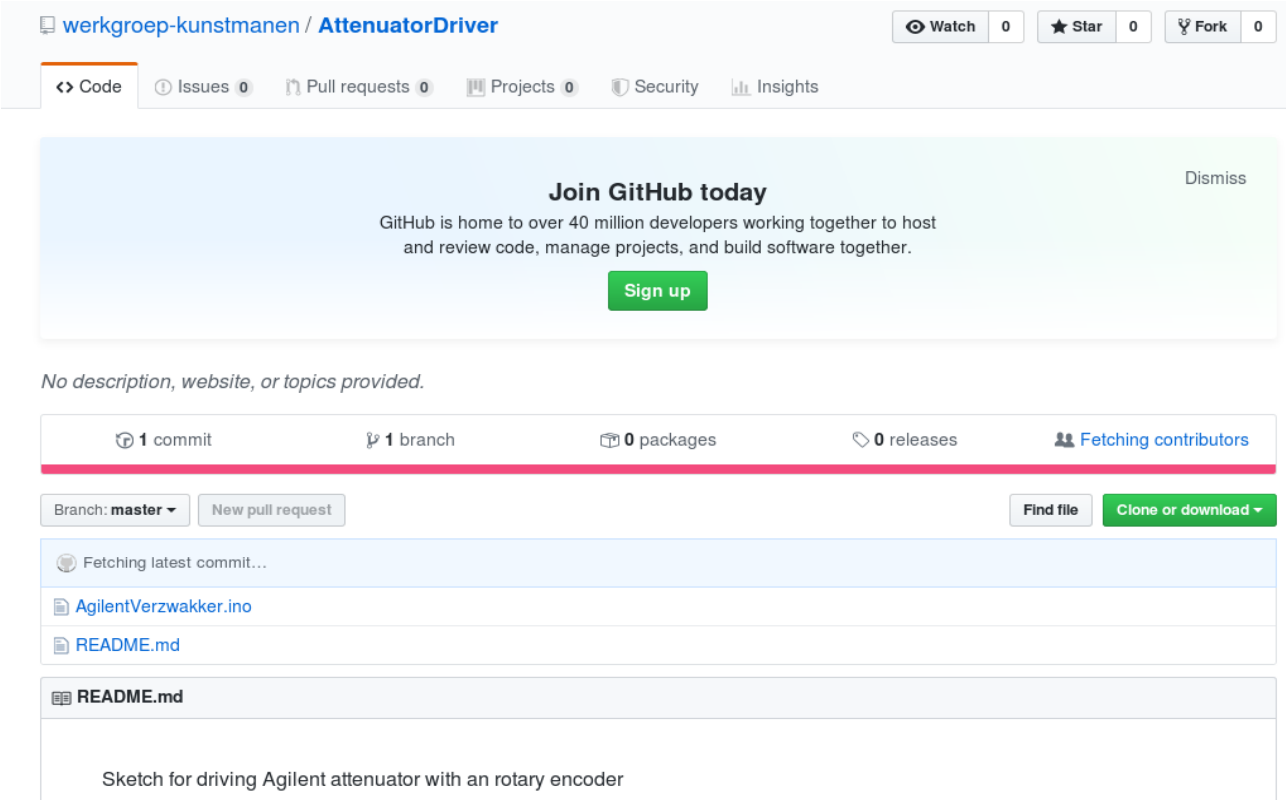


Fig. 2. List of files from a project

In this case the code consists of one file but there may also be several.

Download code.

There are a number of options for viewing or using the content of the various projects:

- View code: Click on one of the files. Normally there is also a 'README' text file.
- Download code to use: it is best to do this with the green button on the right: ***Clone or download***

In the latter case, you will receive a zip file containing all the necessary files. After unpacking at the correct location (in this case, where the code must be compiled by Arduino, that location must be a subfolder called *AgilentVerzwakker*) . Then the code can be used, in this case compile and upload to the processor with Arduino.

Upload code.

To be able to put your own code on the github, or to change existing code, it is necessary to have a login. This can be your own account, which you can create via the github website. You do this with ' *Sign up* ', a button that appears on just about every page of github. (Not to be confused with ' *Sign in* ', then you log in to an existing account.)

To add code to the workgroup account, login and password of that account are required. For understandable reasons I do not mention that password now. If something needs to be put on a github on an occasional basis, someone from the board can do that. If a member of our working group wants to make more intensive use of this github account, then after consultation, someone can be given access.

References

https://github.com/

Decoding of 10B files with Scilab

Summary

This article describes the use of Scilab for decoding 10B files generated by the Alblas decoder. This Scilab script is by no means an alternative to wsat , which is far more advanced.

Preface

If you use the .dat files from Rob Alblas' HRPT decoder , these will be saved in the so-called 10B format. With the Scilab script , which I describe in this article , I will use a 10B file to make a picture. Does this make sense? No, WSAT k an so much better / easier, but it's a fun exercise to explore the possibilities of Scilab. But as I wrote in the previous article [1] , I want to know more about what is happening beneath the surface . In particular: what data comes from the sensor in the satellite and how can I translate this into a picture. This article is about 10B files that come from an HRPT recording. Files from the MetOp and FengYun have a different format.

It was quite a puzzle but it succeeded, partly due to the valuable information on Rob's website [2].

In the previous article I had already described that Scilab [3] works with matrices (rows and columns), vectors (one row or one column) and variables. First an explanation of what the 10B file is and then a description of how I dealt with the processing of the 10B file. Then I will zoom in on the different instructions. The total program code is included at the end of the article.

The 10B file

The data straw is provided by the HRPT- word satellites and transmitted consist of so-called words of 10-bits wide. This while our computers are very useful in processing 8-bit wide words, the so-called bytes.

To save the 10-bit wide data to disk, Rob has devised the 10B format. The 10-bit words are distribution d of 8-bit wide bytes.

In large steps to a picture

In Scilab terms you could consider the 10B file as one long row vector . This long line contains the image lines that we need to make a picture (matrix).

The 10B file has a fixed structure, with the image line starting at equal distances from each other . When we have found all image lines , we can put them underneath each other and we have a matrix from which we can distil the image .

With HRPT, one frame contains one image line,
with MetOp / Meteor and FengYun this is different. Such a frame contains the information of 5 channels. With this we can, as we will see later, make a " false-colour " image,

Because we want a colour picture , should we so from the two-dimensional matrix (x and y, with only grayscale information) a three-dimensional (x and y, where the third dimension red, green, blue) make matrix. And we can then convert this to a picture

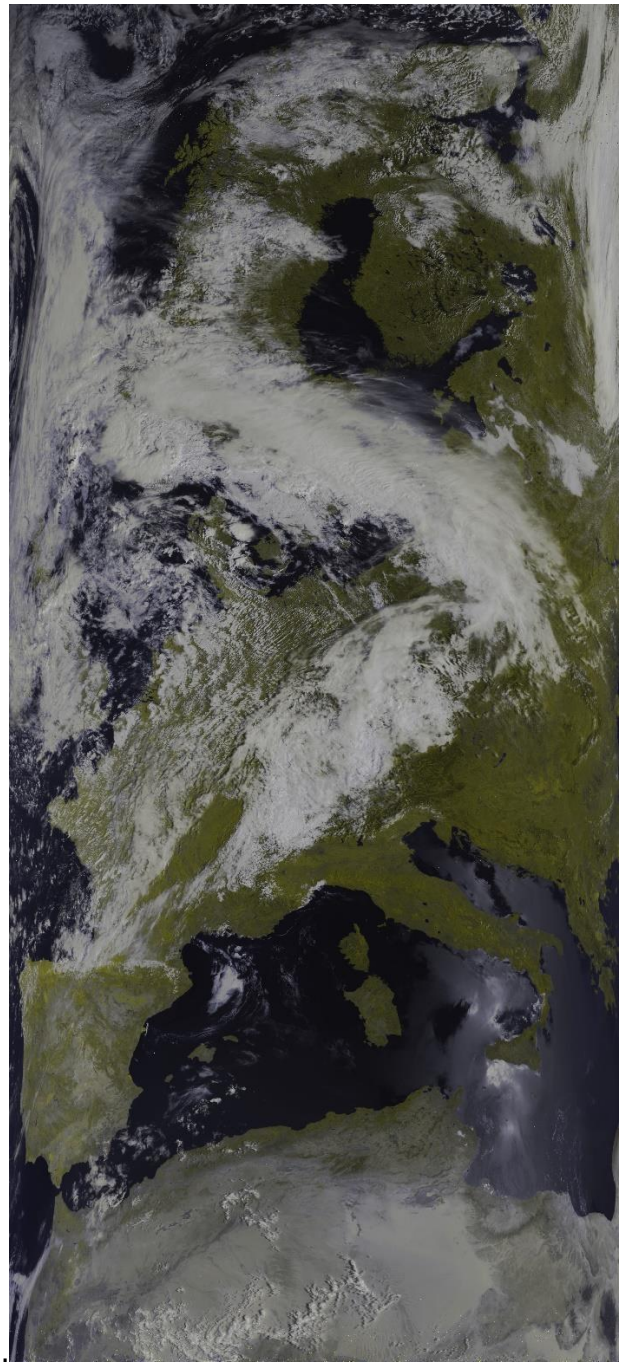


Fig 1. The generated image on disk . 14 MB in size

Reading in the file

Lines 5 - 6. With the mgeti () function I read the file. You give the maximum size, in this case 100MB. It is important to read the file as ' integers ' (integers) . The entire file is in the Stream vector.

On line 8 I use the size () function to determine the number of bytes in the file. If you did not provide the parameter "c", you will receive a matrix in return:

```
-> size_Stream = size (Stream)

size_Stream   =

   1. 63660736.
```

With the parameter "c", you get a number back.

```
-> size_Stream = size (Stream, "c")

size_Stream   =

   63660736.
```

Looking for the image lines

In the first version of this program, I had made it far too difficult for myself to look for the fixed text FRAME that marks the start of an image line. But Rob said it could be much easier.

Namely, the first frame starts at position 16001, the frame length is 13.872. Provided the file has been saved correctly, this always applies, so even if the decoder has no lock .

A matrix with frames

Line 11 , in nr_of_rows we determine the number of image lines . How we get the number 13,872 is later in this article .

By the way, you have a viewer in Scilab in which all variables are shown. This is very useful when programming.

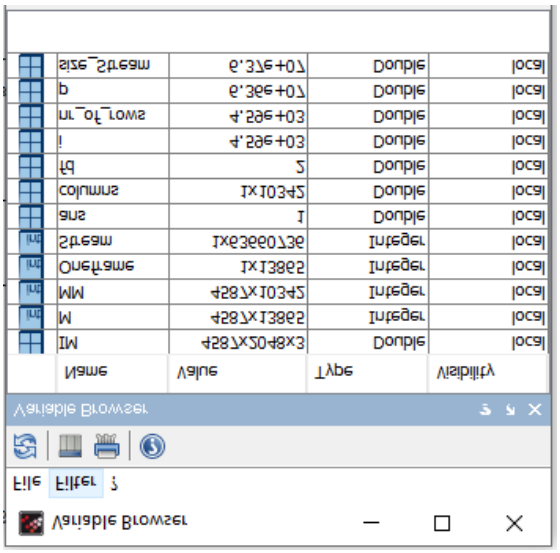


Fig 2 The variables browser in Scilab . Can be found in the Scilab Console under Applications.

In line 12 we make a matrix with only zeros. And then I ran into a thing. It was sooo slow. By default, Scilab creates matrices , vectors in so-called doubles. These are 4 bytes large data types where you can also work with decimal places. Not necessary at all. In line 13 I convert the matrix to an integer (one byte), which results in a huge speed gain.

How long is the frame that we have to cut out. The pieces that we stick under each other must all have the same length. Here too, the Rob website gives a definite answer.

```
Frame header     752
Data 5 x 2048      10,240
100 frame trailer
Total 11,092
```

These are 10-bit words. When we convert this to bytes we come up with:

11,092 x 10/8 = 13,865 bytes. If we add the length of the word FRAME and two extra bytes, we arrive at 13,872 bytes. So this is the length that we have to read.

Lines 15 to 19 is a loop over the number of lines where the matrix M is filled with the frames.

Delete columns

In the matrix M all frames are now under each other. But we do not need all columns. In line 2 3 we create a row vector with all possible columns. We will clean this row vector for the columns that we do not need.

As I said before , the 10-bit words are repackaged over bytes. Namely: 4 words of 10 bits become 5 bytes, the fifth byte containing the two right bits (LSB) of the first four bytes. We can remove these fifth bytes because a JPEG image has a colour depth of 8 bits. If you want to be able to look deep into black then these two bits are necessary, but if we don't want a simple picture. In line 24 , we throw away 5th byte each.

Furthermore, the first 750 columns of the header are and we can also delete them, line 25 .

In line 27 we make the matrix MM from M (which contains all frames) with only the columns that we want. This method is many times faster than removing columns (from matrix M) that you do not want.

Making a picture

In lines 30 to 32 we make a picture. The matrix IM is a so-called . hyper-matrix, this is a matrix that has more than two dimensions. The first layer, line 30 is the red layer, the second the green layer and the third layer is blue. This is the setting that I have taken from wsat .

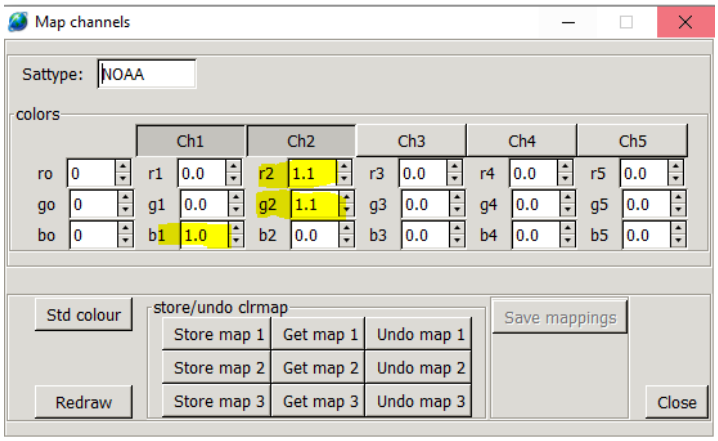


Fig 3 the setting in wsat of the channel mapping

Red is therefore the value of the second channel multiplied by 1.1. Green is also the value of the second channel multiplied by 1.1 and blue is the value of the first channel (not multiplied). So we know how to create a beautiful colour image from two channels. Thanks to Harrie who it invented.

In line 34 we divide the matrix IM by 255 because the function imwrite () expects numbers between 0 and 1.

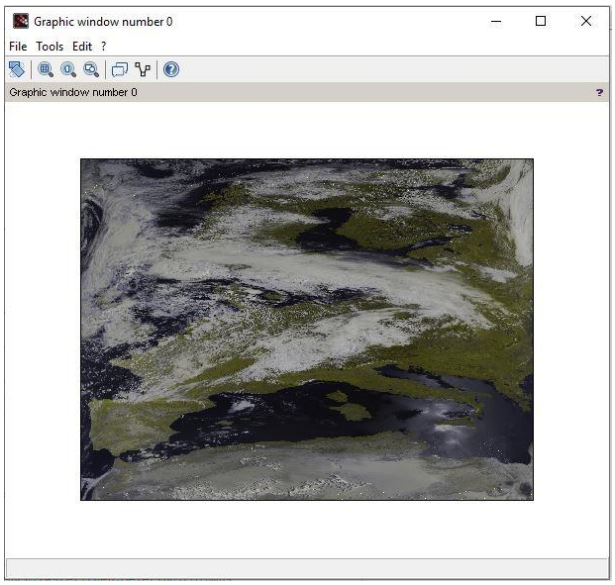


Fig 4 As it is shown in the Scilab image viewer.

Conclusion

I did not expect me a script that ' s small could make a picture in 40 lines. It has taken some time to figure it all out. What's the next step? Maybe decoding a QPSK file from the MetOp of FengYun .

```
// Scilab script to process a 10B hrpt-.dat-file from the Alblas-HRPT-decoder
clear;
clf;

fd = mopen("C:\Temp\wxsat-opnames\hrpt_20190810_0839.dat", "rb");
Stream = mgeti(100000000,'uc',fd); // getting all the values as integers
mclose(fd);
size_Stream = size(Stream, "c");

// Create an empty matrix. uint8 for 100 times faster processing
nr_of_rows = (size_Stream - 16000) / 13872 - 1;
M = zeros(nr_of_rows, 13865);
M = uint8(M);

for i = 1:1:nr_of_rows
  p = 16001 + 7 + i * 13872;
  Oneframe = Stream(p:p + 13864);
  M(i,:) = Oneframe;
end;

// Remove every 5th colomn and frameheader
// Creating a new matrix is much faster then deleting columns
columns = [1:13865];
columns(5:5:13865)=[];
columns(:,[1:750]) = [];

MM = M(:,columns);

// Create image matrix
IM(:,:,1) = double(MM(:,2:5:10240)) * 1.1;
IM(:,:,2) = double(MM(:,2:5:10240)) * 1.1;
IM(:,:,3) = double(MM(:,1:5:10240)) * 1.0;

IM = IM / 255;

imwrite(IM,'hrptplaatje.png');
imshow(IM);

```

The complete Scilab program for converting a 10B file

Links

[1] Operating Spectrum Analyzer with Scilab

September Kunstmaan 2019, page 20

[2] Information about the 10B format

http://www.alblas.demon.nl/wsat/software/h10format.html

[3] Scilab

https://www.scilab.org/

THE PATCH ANTENNA.

Now that a number of members of our working group are using a patch antenna as a radiator in their parabola , I thought it would not be a bad idea to delve into this special antenna and write it down right away, so that you might also benefit from it .

The patch antenna, also called microstrip antenna, because it can be realized quite easily using a multi-layer printed circuit board, can have many geometric shapes. I will concentrate in this first part to the square shape.

The antenna consists of a base plate and a so-called radiator, or the patch. Base plate and radiator are separated by a diëlectric (substrate). See drawing.

Basic shape of a patch antenna.

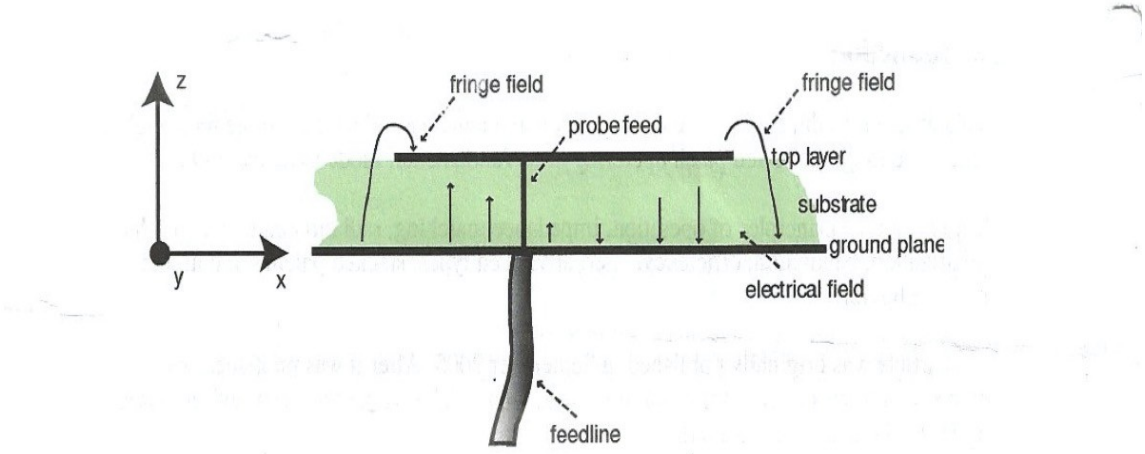


Fig. 1. Basic shape of a patch antenna.

The distance between the base plate and the patch determines, among other things, the bandwidth and the gain. Unfortunately , these are not directly proportional to the distance between base plate and patch. A far thicker substrate increases the gain *) , but also leads to an disturbed radiation pattern, in other words, there must be found a compromise.
The base plate must be generously sized and must extend beyond the patch on all sides. Usually one chooses here three times the thickness of the material from which the antenna is made. For example: if the antenna consists of 2 mm copper plate, this means that the base plate must be 6 mm larger on all sides than the patch. A too small base plate results in a decrease in the front-to-rear ratio of the antenna. For the size of the base plate, 1.1 to 1.25 times the dimensions of the patch are also used.

If you make the base plate larger than the aforementioned three times the thickness of the material, this does result in a slightly higher gain, but this cannot be applied endlessly. Further increase of the base plate to more than six times the thickness of the material results in no further increase in gain .
Then there is the distance between the base plate and the patch : the “height” of the dierectric. This distance is usually many times smaller than the wavelength for which the patch is made, but again not less than 0.05λ. The wavelength for us, eg λ = 18 cm, is 0.9 cm. A further reduction of h results in a deterioration of the antenna efficiency.

In the calculations for the construction of a patch antenna it must be taken into account that, for example, a half wave patch, used at 1700 MHz, must have a length of 17.6 / 2 = 8.8cm square.
In practice, this is incorrect. The frequency at which the antenna resonates, will be less than 1700 MHz. The cause of this must be found in the so-called fringing fields. This is because the electric field of the antenna does not stop at the edges of the Patch, but continues a bit beyond the edges of the Patch. The antenna is therefore a little longer from an electrical point of view. This phenomenon is known as the fringing fields and ensures that the antenna radiates anyway. A good approximation for the calculation of the radiation length of the patch antenna, and taking into account the fringing field, is:
L = 0. 52 λ/√ E.

- L = resonance length .
- λ = wavelength in free space .
- E = dielectric constant. In our case: air = 1.

Other parameters such as dimensions of the base plate, material (e.g. copper) have little influence on the calculation. If we apply the formula for 1700 MHz, it will result in a radiator length of: 0.52x17.6/ √ 1 = 9,152 cm. This value is quite similar to the value that Oleg uses for its patch antenna. (See also: http://www.sat.cc.ua).
If we look at the current and voltage diagram of the Patch antenna (see fig. 2), we see that the current field has a maximum in the middle of the patch and decreases towards the edges of the patch. The voltage field has a maximum at the edges of the patch and decreases towards the center of it.
As a result the impedance in the middle is Z = 0Ω and becomes higher outwards.
One can also see that there are two points, somewhere on the resonance axis of the Patch (X axis), that are 50Ω .

The patch antenna behaves as a voltage-carrying open dipole, in contrast to a wire antenna where the current supplies the radiation field.

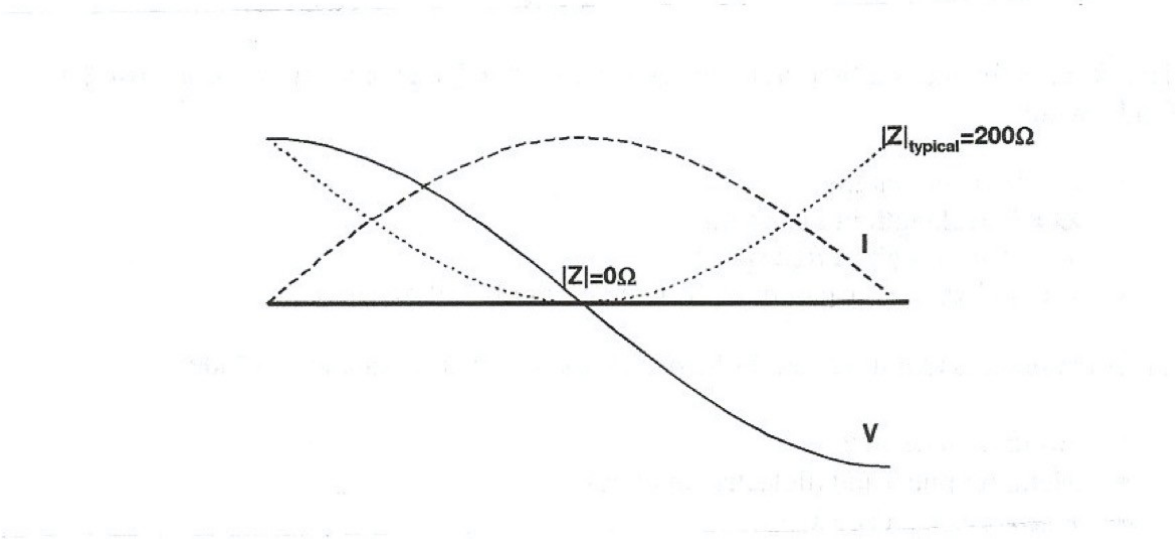


Fig. 2. Voltage (V), current (I) and impedance (Z) diagram of a patch antenna.

The ability to feed the Patch at different impedance points can be very attractive. Impedances up to 200Ω are no exception. As an example: a two-element array (collection of antennas) can be fed with a simple parallel connection by connecting each patch separately at the 100Ω point in parallel. The result is a 50Ω impedance without having to use impedance transformers. The same applies to a four-element array, where the patches are fed separately in parallel at their 200Ω points.

To be continued.

*) Antenna amplification. An antenna has no gain, since it is a passive element. One can speak of a forward efficiency. This can never be greater than 100% and is always compared with an isotopic radiator.

References

[1] Website Oleg

[2] The Basic of Patch Antennas, Updated. D. Orban and G.J.K. Moernaut.

Measurement day August 16

A number of members held a measurement day on 16 August:
Peter Smits (initiator), Peter Kuiper, Arne, Job, Ben, Rob.
Location: Ooltgensplaat, at Goeree-Overflakkee, Netherlands. Here we could use a piece of land from acquaintances of Peter Kuiper where electricity was also present (fig. 1)

Fig. 1

The purpose of this measurement day was to determine the properties of antennas for the 1700 MHz band, and in particular the ‘feed’-part (a helical or patch antenna). We also wanted to try whether we could measure the noise floor of the receiver using noise from the sun.

To start with the latter: this measurement can be done by measuring the noise behind the LNA while the dish is aimed at the sun resp. "Cold" heaven. We had 2 spectrum analyzers at our disposal: one that can measure directly at 1.7 GHz and one that did not go beyond 1.3 GHz. To use the latter, a downconverter must be connected behind the LNA.
This measurement proved to be impossible with the LNAs and spectrum analyzers we had with us; no increase in noise was seen when the antenna was turned towards the sun. The noise level of the spectrum analyzer was too high for this, or the amplification of the LNA used was too low.

For the second measurement we used a measuring transmitter (Marconi 2024) that was set to 1.7 GHz (Fig. 2, 3.). This measurement was more successful; we could compare antennas of Peter S, Peter K and Job. Later we also tried a "Chinese measuring transmitter" from Arne (fig. 4). More about this in another article.

During the measurements we discovered a mysterious 1700 MHz signal, which remained

even when we switched off all measuring transmitters. It is not clear where this signal comes from. To be sure, we have set the measuring transmitter to 1702 MHz so as not to be bothered by this ghost signal.

Measurement results
The Marconi measuring transmitter was set to -50dBm, a helical feed from Ben was used as a transmitting antenna. The measurement transmitter with helical was placed at approx. 35 meters away from the reception areas.

The Spectrum Analyzer Siglent SSA3021X was set to:
Freq 1700MHz (later 1702 due to interference signal), Span 1MHz, RBW 1KHz, VBW 100Hz.
With the delta-peak function, the difference in dB is measured of the transmitter carrier peak to the noise floor at 351 kHz distance

The same LNA was used for each measurement o make sure that gain and noise at each measurement is the same.

1st Measurement:
Job (with helicalfeed in fine meshed bait dish 109cm): 45dB

Peter Kuiper (with patch feed in bait dish 119cm): 47dB

Peter Smits (with patch feed in bait dish 120cm): 48.3dB

Unfortunately, Job and Peter Kuiper were slightly further away from the measuring station than Peter Smits, which is why Job has moved his dish between that of Peter Smits and Peter Kuiper and has been measured again:

Job (now moved a bit closer = closer): 52.5dB

Peter S provided (stood in the same place): 48dB

Peter Kuiper but now with Helical without filter instead of Patch feed with band filter: 52dB

Noise measurement of the sun compared to the cold sky:
It is unfortunately not managed to find the sun-noise with the SSA connected to the output of the LNA.
There were clouds that prevented aiming to the sun by sight.
To get more gain, a downconverter (with 1000 MHz LO) has been put in between and the SSA3021x has been set to 700 MHz, but here too, no noise increase was seen on the SSA3021x when the dish was turned to the sun.
When searching for a position in the sky with minimal noise, we discovered that there is an interference signal with slow fading at 1700 MHz, especially visible at low elevations.

But even at 1702 MHz the sun noise was not perceptible.

Measurement with portable SA (Spectrum Analyzer) and a log-periodic antenna :
During the measurement day I measured the transmission signal at various places with my portable SA (KC901S) and a log-periodic antenna from Banggood . What was striking is that there is approx. 2.5 dB difference between a Horizontally and Vertically arranged log-periodic antenna!

I checked this later in my garden (distance: 10 meters and 2 meters above the ground). With the feeding point of the sending helical at “12 o'clock” I measure vertically with the log-per -54.5 dB and with log-per horizontal -57.0 dB.
What is also noticeable is that I have to aim the log-per a little bit next to the helical (right next to V, slightly above H) for max signal!

What can we conclude:
Apart from the fact that the distance to the measuring transmitter has proved to be decisive , we have not measured a large difference. It seems that the helical feed is doing slightly better than the patch feed.

The values read on the SSA vary rapidly, an accuracy of better than approx. 1 dB is not feasible in this way.

The fact that Job sees 7 dB more after moving his dish is not only explained by the slightly shorter distance to the measuring transmitter (was at most 3 meters shorter in 35 meters). Possibly the used antenna doesn’t give a homogeneous field and Job ‘s antenna was first placed in a side lobe. Therefore, antenna measurements at 144 MHz in the "De Lichtmis" are done at a distance of 250 meters and greater distance from the ground in order to get a homogeneous field. See [1]

It seems that the used short helical is not circular, and possibly also the radiation pattern is not symmetric.
On the measuring day I noticed that the dishes received more signal if they were directed slightly below the transmitting antenna. I also see this with the log-in as a receiving antenna .

This has major consequences for the measurement results, the used helicalfeed has same construction as the one used with the transmitter. By rotating the helical in the dish around its axis, you may receive up to 2.5 dB more signal and you cannot compare well with, for example, the patch feed!

What have we learned:
At a subsequent meeting, we must ensure that all reception points have the same distance to the transmitter and are closer to each other .

Possibly the measuring station further away and higher placed so that the field in all receiving places is equal.

Fig. 2. Tramsmitter.

[1] https://a32.veron.nl/ Activiteiten-2/uitleg-antennemeten/

UKW-BERICHTE
Paul Baak

Summary
In this article a small review of articles published in the 3nd edition of 2019 of the German magazine UKW-Berichte. We have a subscription to this magazine.

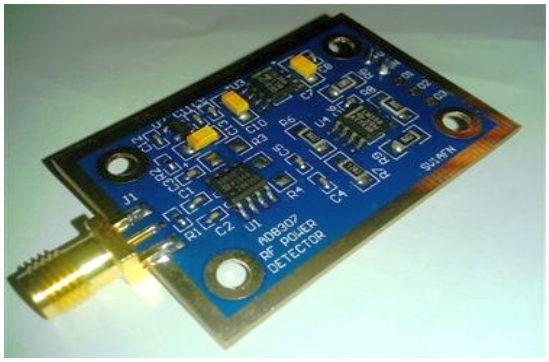
People at UKW Berichte are still lagging one volume. Here an overview of UKW Berichte 2019 Vol 3 (and not Vol 4). Our club has a subscription to this magazine. Please let us know whether you like this subscription! Positive or negative, that doesn't matter, as long as your board hears something. The last issues are at meetings on the library table for viewing.

We find here 4 articles, plus an overview with interesting links.

Gunthard Kraus describes a synthesizer with a ADF4351, purchased on Ebay. There are two embodiments: a working print (16 to 30 euro) and then you have to manage it yourself e.g. with an Arduino and heavy programming or a print with LCD touch screen (45 to 65 euros). The price of an accurate external clock generator at 25 MHz must be added because the internal one is moderate. The final verdict on the synthesizer with its sweep generator is rather positive, but the

writer warns about an apparently same version with ADF4355 that goes up to 6.4 GHz (100 euros) but with much worse properties.

Wolfgang Schneider describes a power measurement with a logarithmic detector, the AD8307 which goes up to 500MHz. The module is again purchased complete and ready for working, and the price is only 16 euros incl. special Greek VAT. Further processing requires again an Arduino and OLED screen. See www.sv1afn.com/projects.html. Who wants go higher must go to the ADL5513 (100 to 4000MHz) or AD8318 (1 to 8000 MHz) but that is not covered in this article.



AD8307 RF Power Detector

Jochen Jirmann describes in a second article an active antenna, especially for the Reuter RDR51 pocket, a nice but expensive (2500 euro) receiver which itself goes up to 240MHz. The active antenna designs here go up to approx. 50 MHz. We read here many nice theoretical considerations the designs.

Heiko Leutbecher describes a linear broadband amplifier using MMIC and that goes up to 2500 MHz. Including the PGA103 + and TQP3M9028 that are deployed here.

A site in the Funkstelle Internet links drew my attention about receiving weather data on the shortwave. On the site of Rob Kalmeijer we see an explanation about the noise behavior of amplifiers. Also a Simplified Approach to Noise Figure Measurement discussion and a note of the latest version of the free simulation program MicroCap.

On the back an advertisement for antenna motors with an azimuth elevation arrangement. There are no specs and so I can't oversee if these are candidates for our environment. UKW berichte themselve delivers it, unfortunately for a very large price. A satellite tracking engine goes to 1800 euros.

UKW-Berichte is a German-language publication, nowadays without an English version that previously existed under the name VHF communications. The magazine costs, including shipping from Germany, 32 Euro per year.

FROM THE LIBRARY

Paul Baak

Summary

Some thoughts from our Librarian.

Dear people,

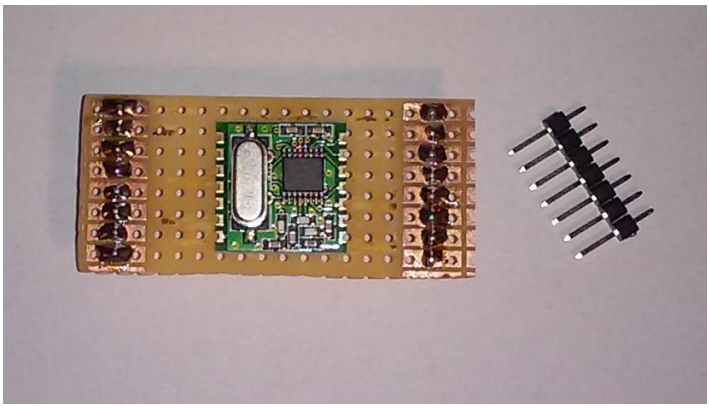
At the end of the summer, with the first storm in fall, I like to sit in the bay window at the edge of the garden. I then enjoy the forces of nature that are the ground for our hobby. Of course I hope as well to see fluttering away all those tv dishes from the upstairs neighbors with their 99 useless sports, cooking and living programs. Then at last some space comes free on top of the building for my own grand antenna plans. A big X-band dish or even a longwire for a lightning detector, it all takes space. In the meantime I am sitting here a full hour already, but there is no progress yet. Sometimes life is just a bit disappointing. So I will write something for you. You will appreciate.

A few years ago there was some device available called Bus Pirate. I saw it somewhere on our meetings. It can monitor SPI, I2C, frequency, create waveforms and program IC's. While I still considered purchasing, it went out of production, if I remember well. It disappeared from my attention. In any case, a version 4 has now appeared. Count on 45 euros at Elektor-Elektor-ElektorLabs-ElektorMagazine - the name sometimes changes. In the meantime, the question for me is what to do with it. When it comes to SPI or I2C you can go with a Arduino all the same. Maybe a nice device but I already have too many printed circuit boards left in it their packaging, never seen daylight (or in this case: the plus 5 volts). I refrain myself. I let go Black Friday in these days as well.

In the third Space Travel (Ruimtevaart, magazine of the NVR) in 2019 an article about the newly launched Aeolus satellite that indeed (Aeolus is the god of the wind) does wind measurements. Can we receive those signals? Unfortunately I don't see any info about reception frequency or signaling method. In the 4th Space travel an article about effort from TNO (dutch research institute) for high-quality RF technologies. Maybe worth reading for the people now working on the 8 GHz.

Bought years ago: two boards RFM12b, with SPI over the 433 ISM band, with a remote thought about motor controls for antenna dishes. I bought it because of a voucher meant only shipping costs to pay and then you can't say no. These days I finally went at work then it turned out that the boards had a unworkable pitch for a breadboard. On the web I searched for adapter boards with little success. Either senselessly expensive, or people didn't want to trade with the EU from Switzerland for bad experiences, or it would still need much additional work. My

solution: I take a sawn hole plate with islands of three, remove the islands in the middle with a hot 100 watt soldering iron and solder header pins at the ends. Picture: the DIY adapter PCB, still without the wires.



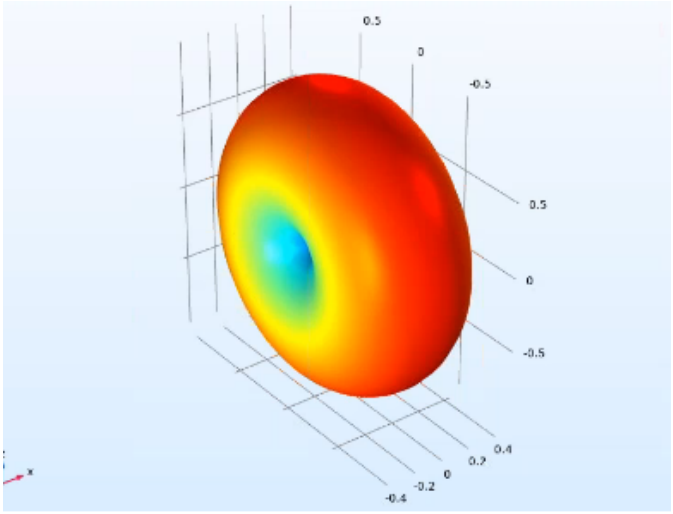
Fun with Huawei. Six months ago Huawei asked us to trust them because they can be trusted. They want to build the future 5G network in the West. There were and are now objections from governments. I think rightfully so. You can already have second thoughts in Europe about the connections between government and large companies, in China there is no difference at all. Huawei cannot be independent at all. Does that affect us? Don't we do everything stand-alone? I think we should look ahead. Although we can not see it right now, In the future we might get much more dependent on the internet then now. I'm just thinking about a configuration where our reception dishes link together to increase the definition, as with radio telescopes. It seems far-fetched, but who had figured out 20 years ago that you without it internet one can no longer book a holidaytrip?

Book Review: Robert LaCoste's Darker Side. When I saw that book that at the November meeting at the table of the board, I thought our chairman was absorbed by spiritual matters and for our club could be considered lost. I saw things too gloomy once again. This is a solid book. I've taken a view and am very positive. Topics of interest for us: impedance matching, transmission lines, modulation techniques, tutorial Scilab, filters, oscillators and their stability, DDS and PLL and more. Of course there are more books like these, but this book struck me by the approach, whereby the step becomes very smooth from theory to the practical situation and self-construction. Recommended!

On October 6, 2019, a day with a lot of rain, I visited the annual open day from the ESA. Everything that ever reminded of my favourite comet 67P is gone. Well worth mentioning: ESA has a radio amateur callsign PI3ESA and that deals with reception of weather satellites. It may be that I be mistaken - it's hard to hear and follow something on the open day. I have not been able to find anything on the

internet about this, but I will still inquire. A another hint was the SatNOGS network, Satellite Networked Open Ground System. Simple ground stations connected in a global network. The intention is to get data from the many satellites together and forward via the Internet to, among others, the builders of the satellites that process data. Perhaps relevant to us? Something for 2020 to be seen.

Comsol is a company that makes simulation software for many branches of science; electronics, chemistry to name a few. Also antennas can be simulated. Attached a color picture with a normal simple dipole. Something new compared to a radiation diagram on flat paper. The software is however very expensive (say 1200 euros) and that is out of reach for our club. I would have liked to see a helix antenna tested in simulation.



In Elektor magazine: an extraction system for the soldering fumes. The description claims that modern solder becomes hotter and therefore gives more health risk. I do not know. In my younger years I was very tough about health risks. In the meantime some years and especially medical experience richer, I am more careful. This machine takes for 60 euros (DIY kit) the smoke to an activated carbon filter. I do miss information about purchasing new filters, for when the two filters supplied are gone ... Electron in the September issue also deals with our health and warns of soldering fumes and also the drill debris of printed circuit boards. Something for the modern times with all discussions about the environment and health and future; you did not hear about this in the old days; at least I can't remember.

I have spent words on soldering here sometimes. You may think that I have a solder fetish. If so, I don't know and as long as the soldering irons here at home are not hanging from leather straps from the ceiling it is okee. So I'll continue for

a while. In the meantime I have the modern version of S39 flux tested and it is a revelation. I still stick quick something to each other now and then - take a shielded cord to a 3.5 mm plug - and that flux works great. In the meantime I also have two other soldering fluxes. I have to compare them yet - also something for 2020.

I recently started working with smd parts. Some parts are simply not available in DIL. It is a big job to hold smd in place when soldering. Arne van Belle has a fixture for this; I would like to hear the findings. From mister Theo from Radio Twenthe shop I also got a nice hint: Stick the part on with a little bit of Pritt Stick glue. That's sufficient to make it not jump like a flea as happened to me. It is a miracle that I have found that little AD9833 back. The domestic flies here are bigger.

The regular reader is still searching for the usual cheerful report of the summer vacation. In vain. This is the case: I have not been on holidays at all! I had to go for a week to a rehabilitation camp in the old peat colonies, somewhere in the east of the Netherlands. Nowadays this is called "Luxe Bungalowpark", because the marketing has greatly improved in 200 years. I had to also do forced labor there: all day walking -and cycling under the hot sun. Probably another one old community service because I spent too much time again this year on our club. Otherwise I can not explain. But I've been smart! I took a big binoculars with me. Late in the evening, at the edges of the night, as the entire department Law Enforcement lay on her one ear, I sneaked out with the 10x50 to search for satellites. We would almost forget it among all gigahertzes, but visual observation is also part of the goals of our club. It was Gotcha! within the first 5 minutes. A beautiful golden yellow satellite, from left to right. So everything turned right after all. So you don't have to feel any compassion with

your librarian

NOISE

Job de Haas

Summary
This is a short summary of the presentation on Noise that was given at the last meeting

During the last meeting I was asked by Ben to give a presentation about noise and noise measurements. This was because I had told him several times about my progress in collecting and building noise measurement equipment. In this piece a short summary of the content of my presentation.

Anyone who deals with radio reception is aware of noise. And usually it doesn't make us happy. However, what should you do to minimize the impact? What should we pay attention to when designing and putting together a receiving system?

Now there are different sources of noise and they produce different types of noise. For this discussion, we limit ourselves to "white" noise. Which is about the same level throughout the entire spectrum.

Noise Figure
The first finding is that a component always adds noise on top of the noise it transfers when it has an input. For example, an amplifier amplifies the incoming noise, but also adds noise. The signal-to-noise ratio (SNR) never gets better from an amplifier! What the amplifier does is ensure that the signal is more resistant to the noise that is added afterwards.

To be able to calculate this and to characterize the noise that a component adds, we define the *noise figure*. This is (the logarithm) of the ratio of the input signal-to-noise ratio versus the output signal-to-noise ratio:

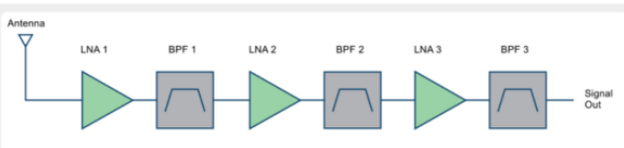
$$\mathrm{NF}\ (\mathrm{dB}) = 10\log_{10}(\mathrm{NF}) = 10\log_{10}\left(\frac{\mathrm{SNR}_{\mathrm{INPUT}}}{\mathrm{SNR}_{\mathrm{OUTPUT}}}\right)$$

If we now use the noise figure to calculate noise of a chain of components, an important effect of the cascade of noise contribution and gain factors appears: the noise contribution of the successive components is inversely proportional to the previous gain factors. So the contribution of a component after an amplifier with a gain of 100x is only 1/100 of its own noise contribution.

Noise measurements
The second topic is about how we can determine what the noise contribution of a component is. This appears to be more difficult than expected due to the various effects of our measuring equipment. A number of techniques are described in the presentation, but the one most commonly used is the so-called Y-factor method. This uses the ratio of the noise power that comes from a component with a "cold" and a "hot" input. This can be, for example, a terminating resistance in ice and boiling water, but also a special noise source that is switched off and on.

These techniques are described in the presentation and various references can also be found there. The number of errors found in publications during the background research was striking. Apparently it is a subject that is more difficult than it seems at first sight.

References, see website
[1] Presentatie Ruis: wat kan je ermee?



Stage	NF (dB)	Gain (dB)	Overall NF (dB)	Overall Gain (dB)
Antenna Cable	4	-4	4	-4
LNA 1	2	16	6	12
BPF 1	3	-3	6.07	9
LNA 2	2	16	6.15	25
BPF 2	1.5	-1.5	6.15	23.5
LNA 3	2	10	6.15	33.5
BPF 3	3	-3	6.15	30.5

Report of the members' meeting 9 November 2019.

Opening by the chairman.
Ben is still trying to tidy up his house. The things that he has now taken with him and for which there is no interest will be thrown away.

Ben has brought a number of “difficult” parts for the new decoder print, such as the print itself, a VCXO and the USB module from Adafruit. These can be purchased after the meeting.

In the 8 GHz area, not much has happened yet. With regard to antenna and feed, a septum feed is looked at, this is circularly polarized. Mike Still has received X-band, Rob will review the information he has received from him. Job is working on a measuring transmitter.

Setting the agenda
No adjustments.

Administrative Affairs
No specialties.

Satellite status

Arne gives the current status; see elsewhere in this magazine.

Any other business

Job: Is fully operational again after his move.
The same applies to Harrie v. Deursen. When he moved, he came across some old things, such as a picture drum from 40 years ago.

Harry: Asks how things are going with the overview of articles from specific projects, especially the QPSK receiver. Nothing has been done about this yet. Rob will make an overview with references to articles for the QPSK receiver and decoder. Eventually this kind of lists will appear on the new, yet to be created, website. This also includes a Wiki. Furthermore, the request to place diagrams in black and white in the Kunstmaan from now on. The colors as they come from KiCad give a poorly readable scheme.

Harm: Wonder how many people have a working recipient. Approximately 20 parts packages have been delivered. Those packages do not always seem to result in a working receiver. Ben says that making a complete receiver set, including the mechanics of rotors and the like, is difficult; many people start building but don't finish it. It is also our task as a working group to make this type of construction activity more accessible to our members.

Peter Smits: He suffers from "squeaky rotors", a result of the method of control (Arduino). With another control (8051 from Harrie v. Deursen) there is no squeaking. Rob tries to find out where this "squeaking" comes from. Paul Baak has an acquaintance who also had the problem of the buzzing engines with a telescopic set-up. He found an electronic solution. Paul will check again.

Paul: Reports that an old Koden receiver is available for the enthusiast.

Rob: Has made a decoder for the NOAA20; NOAA20 is on the X-band. The decoder has not yet been tested with 'real' data.

Closure .

The next meeting is on January 11.

Lecture: Noise measurement (by Job)

Two important points that are mentioned: the first component in the receiving chain (amplifier directly behind the antenna) has the largest noise contribution and must therefore be designed for minimal noise contribution. Components behind this can be designed for optimum amplification. He also discusses how noise and signal-to-noise ratio can be measured.
There will be another article on these topics.

Rob Alblas
(secretary AI)

satellietstatus

Arne van Belle, Augustus 25th 2019

POLAIR	APT (MHz)	HRPT (MHz)	Overkomst
NOAA 15	137.620	1702.5	Morning/evening, HRPT weak + sync problems
NOAA 18	137.9125	1707.0	Early morning/afternoon
NOAA 19	137.100	1698.0	noon/night
FengYun 3A	-	1704.5	AHRPT 2.80 Msym/s
FengYun 3B	-	1704.5	AHRPT 2.80 Msym/s
FengYun 3C	-	1701.3	AHRPT 2.60 Msym/s
FengYun 3D	-	7820.0 X-band	noon MPT 30 Msym/s
Metop-A	off(137.100 LRPT)		1701.3 LRPT/AHRPT 2.33 Msym/s
Metop-B	-	1701.3	Alleen AHRPT 2.33 Msym/s
Metop-C	-	1701.3	Alleen AHRPT 2.33 Msym/s
METEOR M N2	137.100 LRPT	1700.0	LRPT/MHRPT
METEOR M N2-2	137.900 LRPT	1700.0	LRPT/MHRPT testphase
NPP	-	7812.0 X-band	HRD 15 Mbps
JPSS-1/NOAA 20	-	7812.0 X-band	HRD 15 Msym/s

NOAA 15, 18 and 19 are the last satellites that still broadcast APT.

On July 5th METEOR M N2-2 was successfully launched. LRPT can be received with an SDR dongle just like M N2 [1]

NPP (NPOESS Preparatory Project) and JPSS-1 (NOAA-20) only broadcast on the X-band at 15 Mbit/s. A tracking dish with a diameter of 2.4 meters is recommended! [2]

FengYun 3A, 3B and 3C broadcast AHRPT, this can only be received with the new QPSK receiver from Harrie and Ben. This AHRPT is not entirely according to the standard so that even a Metop AHRPT receiver is not suitable for the FY-3 series! FengYun 3C also has a different data rate than 3A and 3B and broadcast on X-band with LHCP. Rob Alblas has expanded his GODIL decoder and can now demodulate HRPT, Meteor HRPT, METOP and FY3A / B and FY3C in the 1700 MHz band!

Like NPP and JPSS-1, FY-3D only broadcasts on the X-band!

GEOSTATIONAIR	APT (MHz)	(SDUS)/PDUS (MHz)	Baanpositie
MET-11 (MSG-4)	no LRIT	1695.15 HRIT	0 degree, operational
MET-10	no LRIT	1695.15 HRIT	9.5 degree O, RSS
MET-9	no LRIT	1695.15 HRIT	3.5 degree O, RSS parallel operation
MET-8	no LRIT	1695.15 HRIT	41.5° degree O, IODC
GOES-E (no. 16)	1686.6 GRB	1694.1 HRIT	75.2 degree W via Eumetcast
GOES-W (no. 17)	1686.6 GRB	1694.1 HRIT	137.2 degree W via Eumetcast
GOES 14	1691 LRIT	1685,7 GVAR	105 degree W, Backup
GOES 13	1691 LRIT	1685,7 GVAR	60 degree W, Backup
GOES 15	1691 LRIT	1685,7 GVAR	128 degree W parallel with GOES 17
Elektro-L2	1691 LRIT	1693 HRIT	78 Degree O, via Eumetcast
MTSAT-1R	1691 LRIT	1691 HRIT	140 degree O, Backup for MTSAT2
MTSAT-2	1691 LRIT	1687.1 HRIT	145 degree O, via Eumetcast
Himawari-8	no LRIT	no HRIT	140 degree O, via HimawariCast
Himawari-9	no LRIT	no HRIT	140 degree O, Backup for 8
Feng Yun 2E	-	-	86.5 degree O, Backup
Feng Yun 2F	-	-	112.5 degree O, Backup
Feng Yun 2G	-	-	99.5 degree O
Feng Yun 2H	-	-	79 degree O
Feng Yun 4A	1697 LRIT	1681HRIT	99.5 degree O, Operational

Launches

Elektro-L no 3 Launch moved to Fall 2020, possibly it will be active again at 1691 MHz!

Unfortunately, DVB-S and most “DVB-S2 without VCM” receivers are no longer usable for EUMETCast. With a special driver, some recent DVB-S2 receivers can still be made suitable for Basic Service Only. (only the TBS-5980 and Skystar 2 eXpress HD, unfortunately this does not apply to the Skystar HD USB box)
The signal at 10 degrees east has a larger bandwidth and is therefore weaker than before.
Recommended dish diameter is 80-90 cm for Basic Service and at least 120 cm for High Volume Service 1 and 2

The 2nd EUMETCast TP2 transponder is set to 11387.500 MHz Horizontal and broadcasts HVS-2. The Symbol Rate and mode is the same as HVS-1 (33000 kSym / s DVB-S2, CCM mode, MODCOD 16APSK2 / 3).
For good reception the same applies as for HVS-1, in good weather a 90 cm dish is sufficient, but a 120 cm is recommended.

After requesting, users can receive live GOES 16 and 17 data on TP1 / HVS-1. Unfortunately this is in NetCDF format. In addition to SNAP, EUMETCastView by Hugo van Ruys can also display this. [3]
David Taylor has written the excellent GOES ABI Manager for Goes 16 and 17 NetCDF data. [4]

Due to "congestion" in the TV satellite world, we see that more and more transponders are being used on Eutelsat 10A. For optimum signal quality (SNR) you must rotate (Skew) the LNB in such a way that vertical transmitters are weakened as much as possible. A moderate or poor quality LNB can suddenly cause problems if it has poor attenuation for the vertical signals. This is called Cross-polarization. This value should be better than 22 dB and indicates how much a vertical transmitter is weakened if the LNB receives horizontally.
Dishes smaller than 120 cm have a larger opening angle and may experience more interference from neighboring satellites.

Eumetsat recommends repeating the fine alignment of your dish every year and paying attention to the correct rotation (Skew) of the LNB. If possible, also check the focus (sliding in and out towards the dish). If the old SNR values are no longer achievable, it may be necessary to replace the LNB with one with better "Cross-polarization Isolation". [5]

With a splitter you can connect a second receiver to the same dish / LNB and receive Transponder 2 at the same time. The same PC runs 3 instances of Tellicast, for BAS, for HVS-1 and for HVS-2. If you also want to save all data then you must use a ram disk and multiple hard disks or a fast SSD.
The TBS dual or quad tuner cards are able to receive both transponders at the same time and have a build-in splitter/switch. Unfortunately the Ayecka SR1 cannot decode both TP1 and TP2 although it has dual tuners.

Eumetsat has released an update for Tellicast, TC 2.14.5. In addition to improvements, the license can handle up to 500 Mbit/s instead of 200. The channel files are also completely revised. Make a backup of your old ini and channels file in advance! The software update arrives 2x every day on Eumetcast on “Info-Channel-1”
This update is only necessary if you have problems with the reception of HVS-1 or 2.
If you have problems with Tellicast, Eumetsat advises you to upgrade first.

Eumetsat is now testing with the addition of certain Metop-C and Meteor-M N2 data, which will soon also be available via EUMETCast.

Himawari-8 images are now broadcast every 10 minutes via EUMETCast. Because this concerns all 16 spectral channels with a resolution of 2 km, these are transmitted via HVS-1 under channel E1H-TPG-2. Unfortunately, this stopped the half-hourly Himawari-8 images on the Basic Service on 10 October.

GOES 16 channel B01 is now available so that you can make "real" RGB images.

With effect from 15 January 2019, a license is no longer required for the hourly Meteosat data.
For the more frequent data and that of many other satellites, however, a license (including 3 annual renewal) is required. You still need your EKU for this.

Currently EUMETSAT is testing with Sentinel-5P data and is adding Wave height data from Sentinel-3A and 3B, all on HVS-2. After successful testing this data will be available for users after requesting on EO-portal.

[1] Meteor reception with RTL dongle http://happysat.nl/Setup_Meteor/Setup.html
[2] NOAA20 info https://goo.gl/k6hAbi
[3] EUMETCastView http://hvanruys.github.io/
[4] GOES ABI Manager http://www.satsignal.eu/software/GOES-ABI-Manager.html
[5] EUMETCast Europe Link Margins Explained. https://goo.gl/8bB4Jj

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