DE KUNSTMAAN

In dit nummer o.a.
Frequentie-instelling ontvanger
Constellatieviewer: deel 2
X-band experimenten
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:

Workplace of Mike Still. The spectrumanalyzer shows some strong signals around 7,8 GHz. See page 28 for more info.

Preface

Last General Members' Meeting was not super crowded, we were twenty. The mandatory agenda items were handled without problems. After the official part Rob gave a lecture about the decoding of the NOAA-20. The Godil is ready, now a receiver.

The Kunstmaan

Time to take a closer look at my satellite dish, you will find a story about my malheur in this Kunstmaan. I have also been busy with attenuators and frequency dividers. All this for the great purpose of enabling reception at 7.8 GHz .

Now that this Kunstmaan is finished, I will start working on the new decoder print. Turning the trimmer is now a thing of the past. Rob wrote about this in September 2018 Kunstmaan.

Fred's purchase of a new PC has kept him from the hot street for a long time. Automating everything as much as possible is still a long way. A comprehensive report of his journey of discovery through the Windows 10 computer.

Rob gives a sequel to his constellation viewer, also software installation problems here. Rob also describes Mike 's X-band experiments.

Paul has made a summary of what has appeared in the UKW reports . The Werkgroep has a subscription to this! So everyone comes to the library, opened at our meetings in Utrecht.

Github

The Workgroup has a GitHub account . What is that? Git Hub is to manage source code / software. The source code is placed on the internet and can be easily downloaded by anyone. The idea is that all software that has to do with our Workgroup will come under this. That way you always know that you have the latest software and don't have to search in multiple places.

If you want to make adjustments to the software, you can and the changes can be easily implemented (after permission). Another option is to work with multiple people on the same source code, without getting in each other's way. This is what they call version management. GitHub is from Microsoft and is also free for us.

https://github.com/werkgroep-kunstmanen

Advertising column

Thanks to Hendrik who made an aluminium construction to hang four monitors. The whole is removable, transportable, etc. Slideshows of our activities are shown on these monitors . The slideshows are provided by Raspberry Pi's. The baptism of fire is on the Air Force Days in Volkel where we stand with a stand.

Summer

I do not dare to admit it, but I do not find receiving weather satellite photos in the winter so interesting. Because it gets dark quickly, the photos are especially dark towards the north. But that will change now, it will be summer! Incidentally, the word and about three weeks days again shorter.

It remains for me to wish everyone a nice summer, with lots of craft fun. Enjoy the holiday, get inspiration for new projects. I myself sometimes think about how we can use a smart phone for the hobby because of some abhorrence . Perhaps as an aid to aim an antenna, to control the receiver, what else can you think of?

I hope to see everyone again at the meeting at September 14th. The November meeting is on the 9th.

Wether satellites in Vietnam (32)　　　　　　　　**Fred van den Bosch**

Summary

My experiences with weather satellites etc. in Vietnam.

Preface

This time a somewhat different approach. In the previous article [1] I already indicated that I wanted to look at automation and integration of everything on my satellite PC. The ultimate goal is a fully automatic system. In this episode a more detailed description of elaborations and plans. It is possible that others will also come up with ideas. We would like to hear the results.

Hardware and Software

Articles about much of the following have been published in the Kunstmaan and the Handbook. I did not name these further because the list of references would then take up at least a full page. Much can be found on the website of the working group http://www.kunstmanen.net. The Handbook also offers extensive information on a number of topics. For this article, I limit the references to the most important ones.

Automation

Various programs already include a way of automation, such as schedulers or uploading data to websites. AHK scripts or bat files have been created for a number of specific tasks. The aim is in any case to make the whole function as independently as possible. I only describe the most important scripts here: there are more running here.

Mindmap

Everything that has to be done anywhere on the entire installation is recorded in a mind map. Successively a logical design has emerged from this and individual points have been addressed and resolved. Often there also appeared to be interaction: changes to the settings of one program had consequences for (a number of) other programs.

PC

The choice was made for an HP 260-G3 [2] purchased in the Netherlands with a speed of 2.7 GHz, 4 GB RAM, 128 GB SSD HD and Windows 10 Pro. I already had the 23" monitor.

The electricity often fails here. Sometimes it's just a short hiccup (but just long enough to turn off the PC), sometimes a day-long break. The PC therefore, like my large system, first hung on a UPS. During a period of several days with several hic-ups per day, the disadvantages became clear: you must always switch on the UPS manually. And for me it must all be automatic!

It is now resolved differently. The PC is automatically switched on as soon as there is electricity again (a setting in the BIOS). The most important programs are also started automatically. This can be done in various ways. After a while I have been fumbling with the Windows task scheduler, I now use the freeware program WinPatrol [3].

The big advantage of this program is that you can give each task its own delay and thus shorten the start-up time: ten programs in succession together have a shorter lead time than 10 programs simultaneously. An interesting option is that you can also start programs minimized (such as, for example, WxSim, which is on the taskbar). WinPatrol actually worked smoothly right from the start, unlike the standard Windows programs, which sometimes gave the strangest reactions. Simply recommended!

Groups and utilities
Groups
Three different main groups have been set up, with "Weather" still having a subdivision:
• APT
• HRPT / QPSK
• Weather
    o Weather station
    o Weather maps
    o Weather forecasts

Utilities
In addition, a number of programs have been installed, with which I myself, sometimes for a very long time, have had good experiences and are in principle installed on all my systems.
• IrfanView [4]
  This is the photo viewer that I have been using for a long time.
• AutoHotKey [5]
  From their website: "AutoHotkey is a free, open source scripting language for Windows that allows users to easily create small to complex scripts for all children or tasks such as: form fillers, auto-clicking, macros, etc.".
• SyncBackPro [6]
  A program that can make fully automatic backups. The freeware version will be sufficient for many. Everyone can find out the best files for which to back up. That is very personal.
• Start Menu X [7]
  An alternative to the Windows 10 tile menu. See under Integration for an explanation.
• Digital clock [8]
  At the bottom center of the screen is a large digital clock incl. Seconds, which is also clearly visible from a distance. Simply handy.

APT
Hardware
• Antenna: PADAT 137
• Receiver: R2FX on timer (only daylight passes from 12:00 - 18:00)
• Audio: Behringer UCA202 audio-to-usb interface [9]

Software
WXtoImg [10]
This program is no longer maintained by the author, but can still be downloaded and registered via another site, so that it becomes the pro version. It offers a huge range of options. An extensive manual is included in the Handbook.

Automation
WXtoImg can run fully automatically. It must be indicated in advance which photos must be generated per pass. The program can then be set to Auto Record and all passes that match the set values are automatically recorded. The receiver is switched to the correct frequency via the serial cable.

Scripts
On my old system it worked flawlessly for years, but now the program jumped out of the "Auto Record" for completely obscure reasons. I had already tried everything but found no solution. So I thought I could solve it with an AHK script. That was disappointing: the WXtoImg screen responded completely differently to all other screens. In the end, I succeeded with a lot of trial and error. The script is started every 15 minutes by the Windows Task Scheduler.

HRPT / QPSK

Hardware

This is described in detail in [11]. A short summary:

- Satellite dish: Peter Kuipers 1.20 m., Taken from Holland and mounted here.
- Rotors: DIY with 2 pieces of HH390 Disecq, incl. DIY construction.
- Receiver: HRPT / QPSK Workgroup receiver
- Down converter: LNC-1700
- Decoder: GODIL.

Software

Currently only the two Rob Alblas programs:

- Xtrack [12]
  This screen is displayed continuously.
- Wsat [12]
  This program is started for receiving satellites or for editing the received photos via an AHK script. This is faster and you do not forget to adjust any settings.

I also have many David Taylor programs. I do not exclude the possibility that I will also use them for specific applications. The current situation is currently adequate for the "bulk processing" standard.

Automation

These programs also have a form of built-in automation, such as setting the Godil to the correct type of satellite. To make it easier to control, I built some scripts around it myself.

Scripts

Wsat

- Wsat Reception (AHK)
  Starting up reception incl. Instructions for settings.
- Wsat Stop (AHK)
  Stopping the reception and closing all screens and processes.
- Sat everything on (AHK)
  Show all fixed screens again after they have been reduced for reception.
- Wsat Develop (AHK)
  Modifying the photo before it is further processed in Lightroom. See integration.

Xtrack

- Xtrack Run (AHK)
  Full startup of Xtrack. incl. the "Run" and "Sat.sel" buttons. This script is also used when starting the PC automatically.
- Xtrack Predict (AHK)
  A report of the coming satellites.

Batch

In the AHK script Wsat Develop, a bat file is started at the end, as soon as Wsat is closed. There are currently two command lines in the .bat file:

- Move: all photos that are saved in Wsat Develop are moved to Dropbox for later processing in Lightroom. Via Dropbox because my large system does not necessarily have to be switched on.
- Robocopy: that moves all dat files, older than 20 days, to my NAS. That way I keep space on my satellite PC. Those 20 days are arbitrary, but it gives me the opportunity to wait a while to process recordings.

Weather stations

<u>Hardware</u>

Davis Vantage Pro [13]

The price was shocking. I actually went for a cheaper one, but the arguments of Dick van De Weerspecialist were such that, partly due to the climate, there were actually no other options. The display is connected to the PC via a USB cable.

Ventus W-266 [14]

I actually only bought this one for the lightning detector. In this case, a complete weather station turned out to be cheaper than a single detector. And as an extra it also indicates the UV index. Unfortunately, no connection to the PC is possible, so I cannot do anything with the information in an automated manner.

<u>Software</u>

Weather Display (WD) [15]

This program is linked to the Davis weather station and provides a lot of (extra) information. For example, WD can also automatically create web pages.

<u>Automation</u>

This is actually too much to mention. I want to highlight a few.

- Backup weather station
  As soon as WD is switched on, all data that has not yet been downloaded from the weather station is first downloaded and processed.
- Website
  A website can be maintained fully automatically from WD.
- All kinds of log files are kept, which are used for example by Wxsim.

Weather maps

<u>Software</u>

Digital Atmosphere (DA) [16]

Synoptic weather maps can be created and analyzed with this program. Weather maps can be made of any desired area and on any desired scale. The most recent measurements can be downloaded and plotted on the map in many different ways. Here with the APT photo corresponding in time as background (photo from the Handbook).
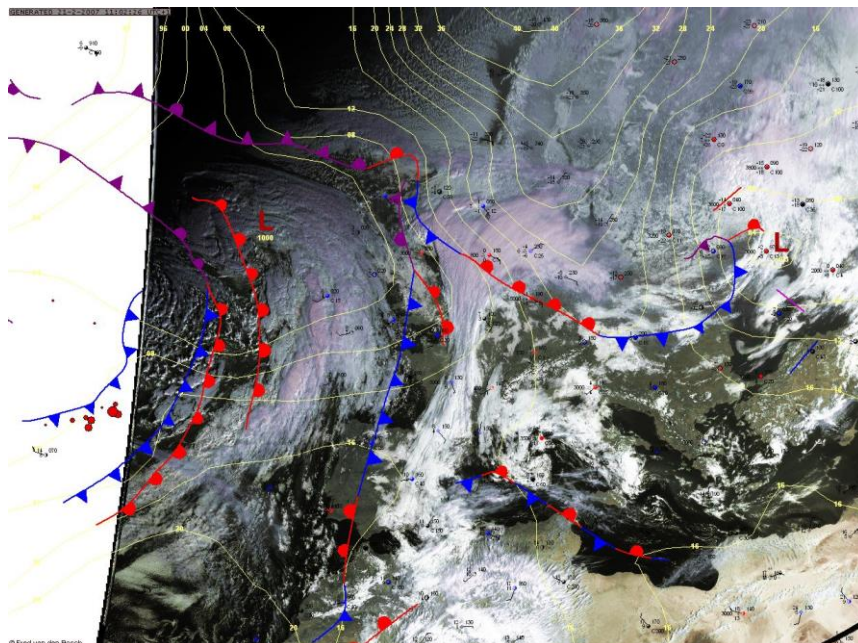
Automation

DA can be automated by scripts. A script is a combination of commands that are executed in sequence. A script is made with a simple word processor such as Notepad. DA has two types of scripts: Scheduler and Analysis.

• Scheduler script:
  This type is used to allow DA to perform various tasks simultaneously and unattended.
• Analysis script:
 There are intended to make products in a very flexible way.

In practice, both ways are combined into one script that runs at predetermined times and produces predefined products.

<u>Scripts</u>

At the moment, one script is started four times / day with a map slightly larger than Vietnam. With all cards my place of residence is the center of the map. One of these maps shows the air pressure and the wind in vectors.
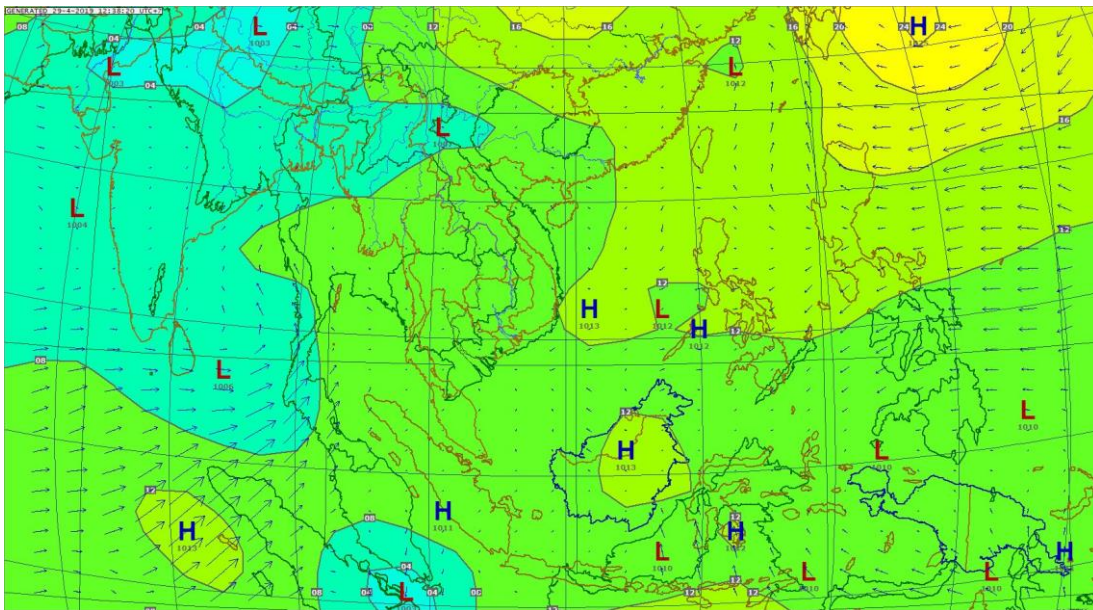
A second script for a relatively local map is started a little later. An example of this too. This indicates the temperature and the stations plots. The darker the color, the warmer it is.
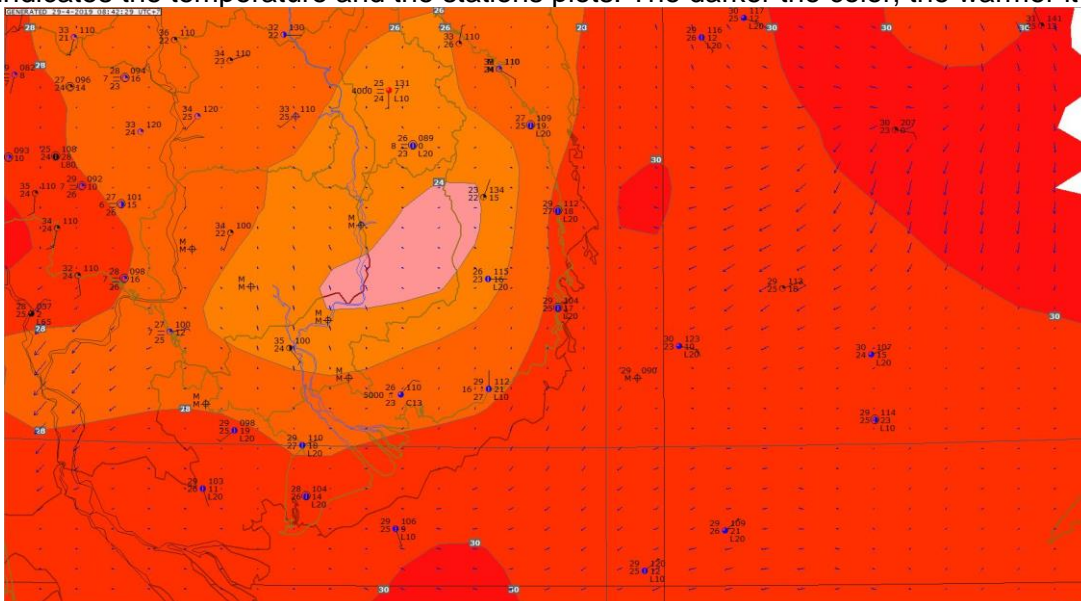
Work is still being done on the various scripts.

<u>Batch</u>
Once a day, the Windows Task Scheduler launches a batch file that permanently removes all maps older than 7 days.

Weather forecast
<u>Software</u>
WxSim [17]
WXSIM (Weather Simulator) is a program for weather forecasting or for studying the weather. It makes detailed predictions for your own specific location. A combination of imported real-time data, model data from the internet is used for this, optionally supplemented with data from your own weather station and your own internal modeling capabilities. It can improve the predictions by learning from previous results.

Testing the complete program is free with the built-in site Atlanta. To get a good prediction from your own site, the program must be tailor-made. This customization must of course be paid.

<u>Automation</u>
The options are very extensive and fully integrated into the software. Both the reading of the data and the processing thereof into a prediction can be fully automated at times to be set by the user. WxSim and the utilities are also included in the automatic startup. The scheduler set is therefore immediately effective. A very comprehensive manual is available. The - to be purchased - AutoLearn program provides automatic learning of previous results. The demo version is fully functional but can only learn from 10 days.

Various types of scripts have been worked out by various users to put the forecast on a website. Is in the ToDo.

<u>Scripts</u>
• Wret (AHK)
 Start up the Wret program, which can display the predictions and then the detail screens with text and plot data.

Integration
The ultimate goal is to integrate the individual products with each other. This is also partly embedded in software. Eg WxSim uses the measurements from my weather station from WD. Another option is to have APT photos serve as the background for weather maps from DA.

<u>Monitor image</u>
The monitor continuously shows the screens of top left xtrack (the current satellite situation above my head), below that WeatherDisplay (the current weather according to my weather station) and right WXtoImg (with a number of received APT recordings). In between a series of AHK scripts, partly compiled (= working properly for the time being), partly still in test. In the middle below the clock.
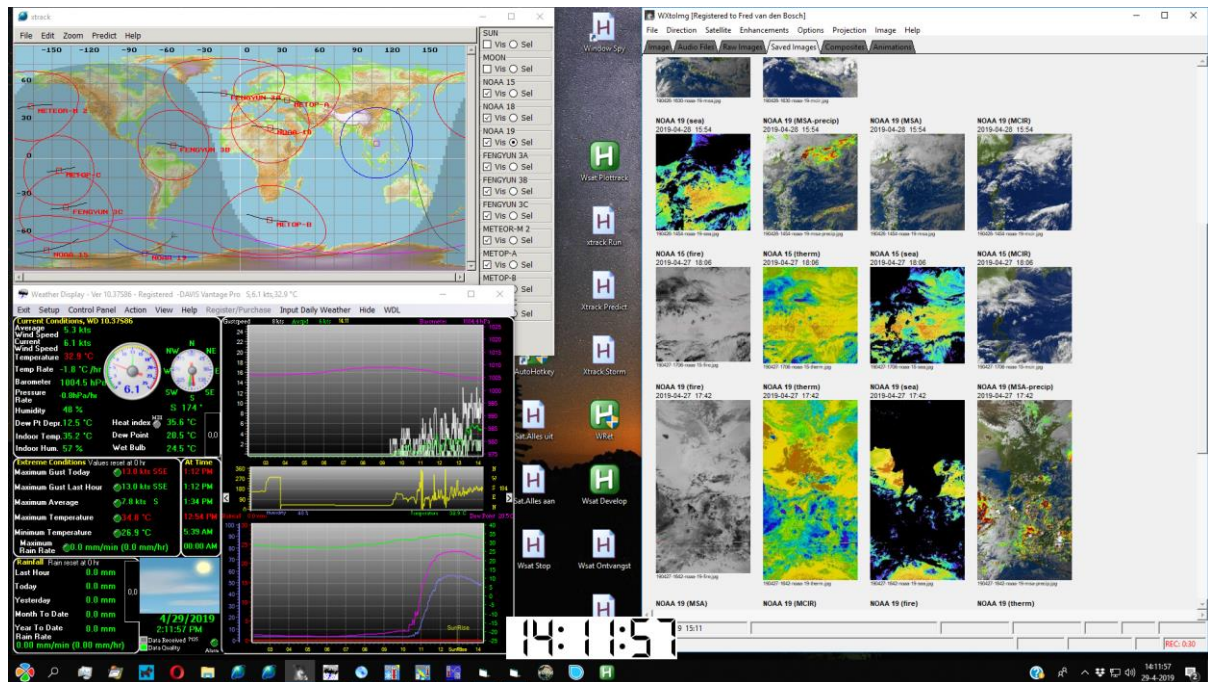
Start Menu X [7]

As you can see on the photo, there is little room for shortcuts on the screen. I can make the existing screens smaller, but of course that is not a structural solution. Screen blanking with an AHK script is also peanuts in itself: that is already embedded in a number of scripts. What I actually wanted is a sort of list per group mentioned earlier. Start Menu X turned out to be the perfect solution. You can copy / paste all shortcuts to "Programs" and then organize them into a number of virtual groups. The result is exactly what I had in mind, especially if I always leave "Other" closed. I leave the most important and most used on the screen, the rest is behind one of the screens.
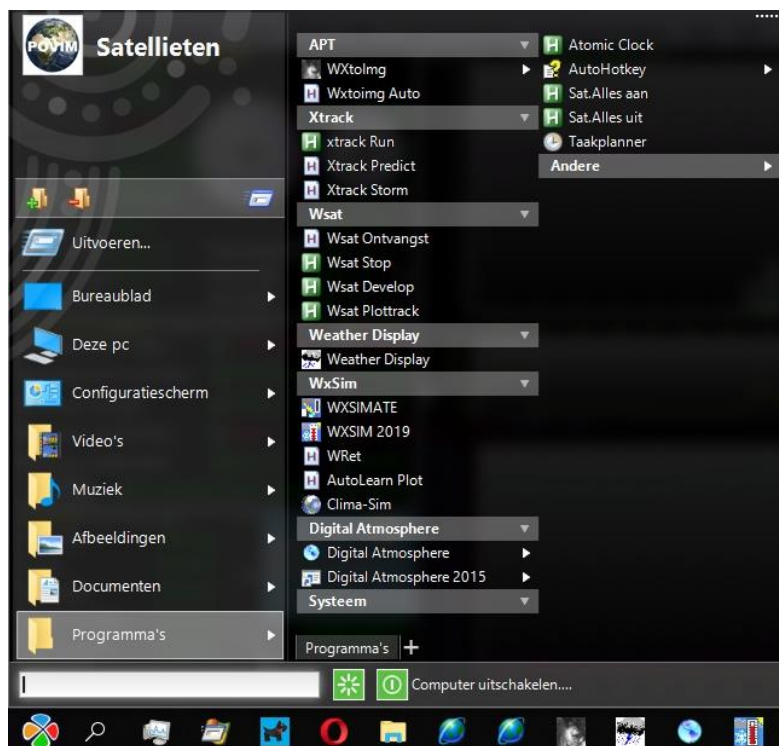
<u>Lightroom</u>
I edit HRPT and QPSK photos in Lightroom.
1. The colors are adjusted to the standard colors of Harrie van Deursen via the script "Wsat Develop:
2. On the Luminance screen, the default value is set with <Lum.Thr>.
3. This result is saved as .jpg and written to Dropbox.
4. That photo is copied from Dropbox to the Photo drive on my large system. Then imported into Lightroom and there, among other things, the brightness is adjusted based on the histogram.

[18] provides a number of options for those looking for a free alternative to Lightroom.

<u>POVIM PM (Presentation Manager) [19]</u>
This is a program that I wrote in Delphi a long time ago. It can display data from different sources and programs on the basis of roughly the same time in order to be able to view a specific situation, for example the state of the weather and the weather forecast at around 3:00 PM. It still appears to work "a little bit", i.e. some maps etc. are still shown. Others are not, so it is really no longer working reliably at the moment. .

<u>View</u>
Because POVIM is not yet working, I have made a number of scripts that you can use to scroll through a series of photos. The script starts IrfanView with a parameter that specifies the files you want to see. Unfortunately, it is not possible to provide wild characters to, for example, only show the msa recordings from WXtoImg. This requires, therefore, that the naming is such that it shows the order of the files in the folder. If necessary, change the names of the files afterwards [20].

Finally
My ultimate pursuit of a fully automated system has already come a lot closer. Starting up the entire system, followed by receipt of APT and Weer basically no longer requires any manual work, except viewing the results. And that is often a matter of starting a script, where screens are also immediately placed in a good place.

The whole thing was and is a parallel process. Adjusting the mind map, hardware and software, setting up the PC and writing this article happened more or less simultaneously.

A warning in advance. A lot of time has gone into this. It is good to realize this in advance. Very often scripts do not work as expected or not at all. Programs do not want what you want them to do. Sometimes you can work around a problem. Often not.

Some adjustments were a lot more difficult than told here. Eg Weather Display suddenly gave the values in Fahrenheit, which subsequently gave WxSim problems again, etc .. You get to know the content of all kinds of files that way. This error, for example, resulted in the log files also being incorrect. Well, just delete the wrong rules.

AHK in particular wants to react very strangely under Windows 10. Working scripts that suddenly stop working or do something else, screens that are placed in a different place, etc.

I'm still fine-tuning and that will stay that way for a while, I'm afraid: you keep coming across all sorts of small dots. In addition, there are absolutely still things that could be better, smarter or simpler. Who knows, in time...

ToDo
These major actions are still (partly) open
- Allow HRPT / QPSK to run automatically. In itself not that difficult: a few minor changes to an existing script, reprogram the GODIL to automatically tune the receiver and you're done. The real problem are the rotors, which I prefer not to overload and run continuously, which cannot be checked with an automatic receipt. A pity, but unfortunately: for that reason, yet no automatic HRPT / QPSK.
- Weather maps with APT or HRPT images as background. APT works with individual commands, but the script with the same commands gives error messages. For HRPT, the type of projection and the location on the map must be considered. Groundmap from David Taylor may be helpful.
- Programming Godil so that I have the most recent version faster than having to wait for my vacation.
- Up to date, nothing has been posted on my website. In the past I received an urgent warning from my provider that I had exceeded the maximum upload capacity. And in my opinion that was not too bad then. Sometimes I will make a separate project with selections and calculations.
- Fine tune the entire system
- Document everything, including the scripts.
- Learning a recent version of Delphi, so that I can adjust POVIM to my latest ideas.

We are off the (quite hot here lately) street.

Tips & tricks
Design
Make a design in advance (on paper, a computer program, a mind map, etc.) containing what must be shown, the coherence and everything that can be useful during the design. Only when this is a bit right start with the actual set up.

SyncBackPro
It is a good idea to install and set up this program rather quickly after starting the device. If things go wrong (and that happens by definition, so also with me) then there is always somewhere - preferably on a separate medium, eg Dropbox - a copy. Do not forget to check regularly whether all new developments are also included.

Excel
One of the tools for me is a spreadsheet, which lists all the times when programs, scripts, etc. are started. In this way the load on the entire system can be distributed as well as possible over time.

Processes
Check regularly via Task Manager to see if there are any processes running that should not be allowed. This is especially true for AHK scripts. At the end of a script always close all processes of that script with WinClose and ExitApp. Also check the load occasionally if one or more processes are running and adjust start times if necessary.

More info?
For those who want to know more, just ask for the details. All AHK scripts and batch files are available for those who want a first setup to develop their own script from there. Suggestions for improvements or additions are always very welcome.

References (see website)
[1] De Kunstmaan, 2018-1, p. 5
[2] HP 260-G3,
[3] WinPatrol,
[4] IrfanView,
[5] AutoHotKey,
[6] SyncBackPro,
[7] Start Menu X,
[8] Digital clock,
[9] Behringer UCA202
[10] WXtoImg,
[11] Hardware, De Kunstmaan, 2018-2, p. 6: First image.
[12] Wsat / Xtrack,
[13] Davis Vantage Pro,
[14] Ventus W-266,
[15] Weather Display,
[16] Digital Atmosphere,
[17] WxSim,
[18] Lightroom alternatives,
[19] POVIM,
[20] Advanced Renamer

Auto-setting frequency of the receiver.

Summary.

An extension or decoder hardware and QPSK receiver is described to allow automatic setting or frequency and modulation type of the receiver. The combination QPSK receiver, decoder and software 'wsat' now allows fully automatic reception of high resolution polar satellites, including tracking and applying the right settings of decoder and receiver, depending on the satellite to receive.

Preface

With the combination (A) HRPT decoder and software '*wsat'* , it is possible to follow and record polar satellites automatically. 'Wsat' ensures that the decoder is set for the next satellite to be tracked, in terms of satellite type (NOAA, METOP etc.), controls the antenna rotor system and starts recording as soon as the satellite is received. After the satellite has "gone under", the next satellite to pass is automatically "caught".

What was still missing was the tuner frequency and modulation type (PSK or QPSK), which still had to be done manually. Because of this I sometimes missed passes.

Determine the frequency

Setting the tuner frequency, along with other issues such as showing RF level and VCO control frequency, is provided by an ATmega processor on the tuner board. With a rotary switch the frequency is selected and with the right firmware in the ATmega also the modulation type (PSK for HRPT or QPSK). I have expanded this firmware, made by Ben Schellekens in the Arduino environment, so that in addition to a manual tuner setting, this can also be done automatically by 'wsat'.

To determine the correct frequency it is necessary that "wsat" "knows" which satellite will pass. It is therefore necessary that the tracker is activated in 'wsat'. That does not necessarily have to control the rotors, but that could lead to a wrong satellite choice. This is because there are several satellites that may pass at about the same time, so a choice has to be made as to which satellite to follow. If wsat and the tracker used make different choices, then this goes wrong.

Example: a Meteor that rises at 10:39 above the horizon but has a maximum of 44 degrees elevation and a Fengyun that rises at 10:42 above the horizon with a maximum elevation of 79 degrees. The pass times overlap. This situation occurred on February 21 (location Hilversum, the Netherlands), but such situations are much more common. If the external tracker 'picks up' the first satellite to come (Meteor) and the (unused) tracker in 'wsat' only picks up satellites with more than 45 degrees elevation, the Meteor is followed while the tuner is set for Fengyun.

To prevent problems of this kind, it is therefore best that the tracker in 'wsat' is used for actually controlling the rotors. (Incidentally, the tracker can control rotors in various ways in wsat; via DiSEqC, UART port or via starting an external program, which get the current position using arguments.)

'Wsat' already had a table built in with frequencies and modulation types for NOAA, Meteor, Metop and the Fengyuns ; the frequency is already shown in the 'Tracker' tab, see fig. 1, right.
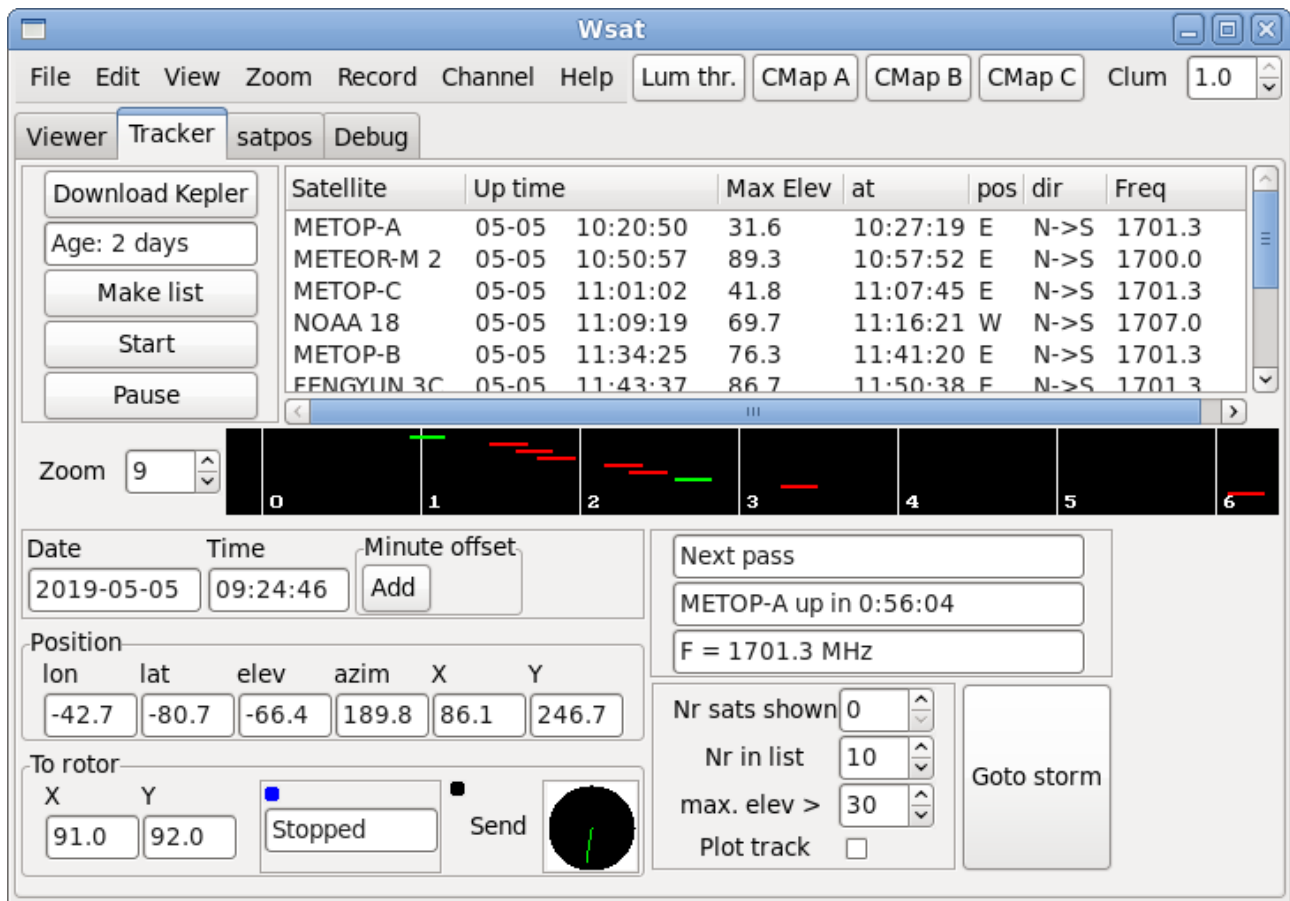
Fig. 1. wsat tracker.

This information must therefore be sent "in one way or another" to the ATmega on the tuner print.

The hardware of the (A) HRPT decoder (FPGA on the GODIL module) is not only used for decoding. In "De Kunstmaan" of 2014, No. 2 [1], an article describes how this hardware can also generate rotor control signals for DiSEqC rotors. The control information (X / Y or elevation / azimuth) is sent from the tracker software in 'wsat' via USB to the hardware (the same USB connection that is used for data transfer from decoder to 'wsat'). So there is already 2-way traffic between wsat on the PC and decoder hardware.

In the FPGA there is still some space left to add logic to receive the tuner information and then send it to the ATmega via a UART connection. A UART input is still free on the ATmega, and the GODIL module contains a crystal of 49,152 MHz. This frequency has not been chosen completely randomly, because it is easy to derive the different baud rates for a UART connection. With a baud rate of 38,400 kb / s, a division factor of 1280 is needed.

Fig. 2 gives an overview of the entire receiver / decoder environment. The only hardware that needs to be added is a connection between GODIL and the ATmega on the tuner print (indicated here in red). You also need:

- FPGA load: version 2019.4 or later required
- ATmega load: version 2.1
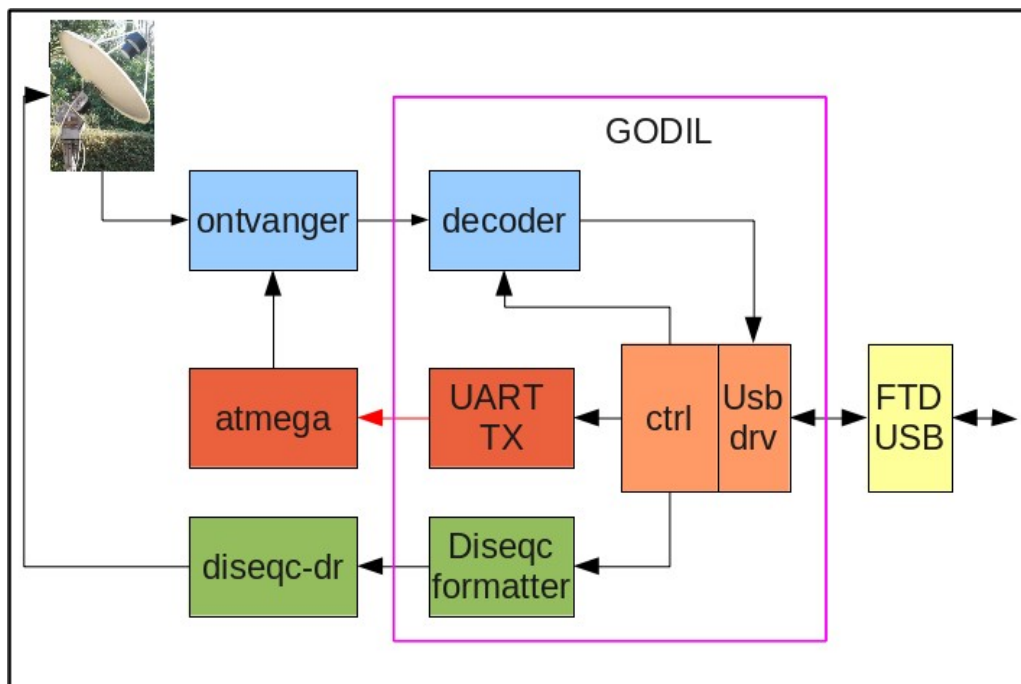- wsat: version 2019.2 or later

Fig. 2. The GODIL used as decoder and controller

In wsat the feature must be activated in Preferences: in tab FPGA ctrl: (fig. 3)
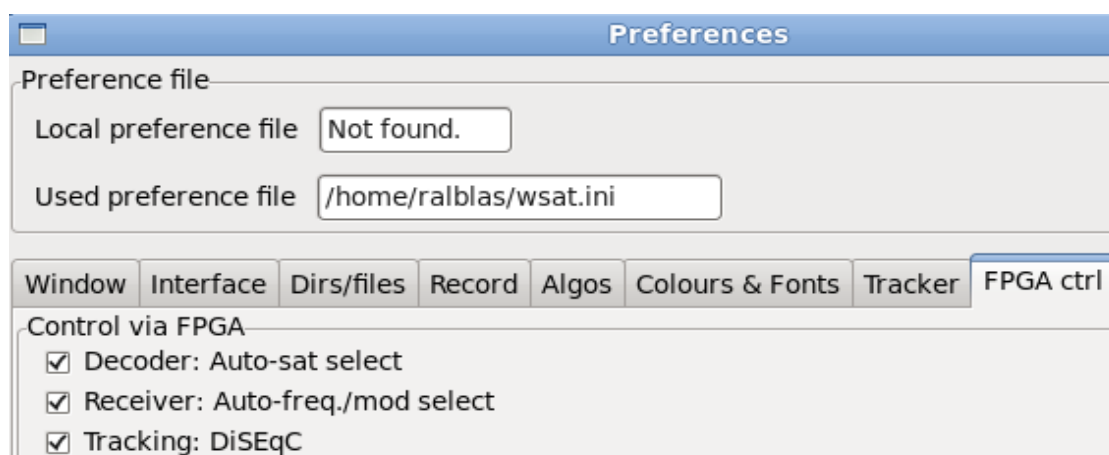
- Receiver: Auto-freq./mod select

Fig. 3. Some things that can be set via 'wsat'. In the middle activating the aurtomatic frequency setting.

Transmission.

The following information is transferred via the UART connection;

Byte	meaning	Value (example)
1	sync	0x53 (= 'S' in ASCII; fixed)
2-3	Freq. x10	1701.3 = 17013 => 0x4275
4	Modulation	ASCII "P" or "Q"
5-15	Satellite name	FENGYUN 3C
16	CRC	Sum modulo 256

- The first byte serves as a code to indicate the start of a message.
- The frequencies are "ingrained" in the software of "wsat", but this can in principle be any frequency. So any frequency between 0 and 6553.5 MHz can be set. (Note: for frequencies > 2000.0 MHz, a further translation to the actual tuner frequency takes place here; above this frequency it is assumed that a down converter is present! This translation is done in the ATmega and depends on the down converter. Example: with a down conversion of 1557 MHz, a specified frequency of 1703.3 MHz is converted to 1703.3-1557 = 146.3 MHz, which is the frequency at which the tuner is set.)
- Modulation: PSK for HRPT / Meteor, QPSK for METOP / Fengyun
- Name: only used to show on the display. The name is taken from the used "NORAD-2 lines" file (weather.txt) that is also used for the rotor control. This name is also used in 'wsat' to determine from the table which frequency / modulation must be set.
- CRC: check whether all bytes have been transferred correctly

The CRC check is necessary to prevent the tuner from being set incorrectly in the event of an incorrect transmission from FPGA to ATmega. Every message (= setting frequency) is sent 5 times; only the last error-free message sent is used for the frequency setting.

Errors can occur if the UART connection (incl. GND) between FPGA and Atmega is not properly established. In the beginning, when my decoder and receiver were still in separate cabinets with power supply, those errors often occurred; now that everything is in 1 cabinet, the number of errors has decreased considerably.

The CRC check means that all 16 bytes are added together, modulo 256. The CRC is determined so that the result is always 0. The same addition is done in the ATmega; a result not equal to 0 means one or more bit errors; the message is considered unreliable and ignored.

The bytes to be transferred, including CRC, are entirely determined by 'wsat'; the FPGA only adds a start and stop bit for each byte and sends the data serially via pin D9 of the GODIL to pin PD0 of the ATmega. (See section "Connections".)

The UART input of the ATmega receives the bits, which are again converted into bytes. If the CRC check indicates that the transmission is correct, the frequency and modulation type are set, and the satellite name is briefly shown on the bottom line of the display. (Unfortunately, there is no place on the display to show both frequency and RF level, VCO level and satellite name.)

The original ATmega software uses a rotary switch to choose the reception frequency. Of the 12 positions, only 7 were used (this includes a test frequency). So there is room to use

another position for the automatic tuner setting; the manual setting remains possible.

The choice 'auto' or 'manual' is visible on the display:

- manual: 1st line shows frequency + satellite type, eg:
  - 1698.0 MHz HRPT
  - 1701.3 MHz QPSK
- auto: 1st line shows frequency + modulation type (abbreviated)
  - 1698.0 MHz BP
  - 1701.3 MHz QP

Behind this is a number that indicates how often a CRC error has occurred.

Connections

- Pin D9 of the GODIL is on the PCB at the connector where also the inputs reside. Counting from the first pin:
  - pin 1, 2: I / Q inputs
  - pin 3, 4: I / Q outputs
  - pin 6, 8: DiSEqC outputs
  - pin 9: UART TX output, connect it to the ATmega.

- Pin PD0 = pin 2 on the ATmega is on the tuner board on pin 4 of connector P9; counting from the pin on the print at the reset button:
  - pin 1,2 = GND
  - pin 3 not connected
  - pin 4 = UART RX input

Code

The original code, made by Ben Schellekens, is "Displayprint.ino". I have extended this code for the automatic tuner setting described above. The new name is:

WRX_QPSK1700_ctrl.ino
and can be downloaded from github, see [2]. This code, after being read into the Arduino-IDE, can be loaded directly into the ATmega via an upload cable connected to P9 of the tuner print. An alternative is to plug the ATmega into an Arduino Uno and then program it.

Some adjustments in wsat

The tracker tab in 'wsat' has recently been updated with some handy additions. See fig. 1. The bar below the satellite list gives an overview of the coming passes. A green line means that this is the next satellite to be followed. The lines move to the left over time; if the green line touches the 0 line, the corresponding satellite is above the horizon and tracking starts.

At the very bottom, the line in the circle indicates the direction of the satellite to be followed; here south.

References (see website kunstmanen.net, menu 'Weblinks', 2019)

[1] the Kunstmaan 2014, no. 2, p. 57 and further (also in English)

[2] New tuner / LCD controller code

Constellation viewer: part 2

Summary

Some detailed installation instructions are given to use STM32 related programming in Windows.
Also some extra setings are discussed: scaling and colour of the constellation as shown on the display.

A constellation viewer is described in "De Kunstmaan "2019 No. 1. An STM32 "Blue Pill" and an OLED display were used for this. Getting the software up and running, to compile and load the code, appears to be a bit more difficult in Windows than in Linux (the reverse world?).
Hence a more precise description of how to install the correct programming environment, for Windows in particular.
In addition, a number of extra settings are discussed.

Installation programming environment.
The starting point is the Arduino environment. The other way, via ST's STM workbench, is quite difficult to get to work; maybe more about that later.

For completeness, the entire installation will be described, so there is some overlap with what is described in part 1. The starting point is the Arduino environment; the ST-Link V2 is used for programming ("uploading") (see fig. 4 in part 1).
The following things are needed:
1. Installed Arduino environment
2. Arduino_STM32-master.zip: Files with information about STM32 boards (just as the "normal" ATmega series also requires information for the Uno, Nano, etc. boards)
3. Programs for compiling the STM32 series
4. Upload program

Most of these things are easy to install:

- Install Arduino, if not already done. It is important to know where Arduino is installed. In my case the location is:
  - C: \ Users \ <user> \ Documents \ hardware (enter the login name for <user>)

- Download Arduino_STM32-master.zip (see [1])
  - unzip at position C: \ Users \ <user> \ Documents \ Arduino \ hardware

The result is: C: \Users\<user>\Documents\Arduino\hardware\ Arduino_STM32-master\ ....

Start Arduino now. Under menu Tools-> Board you will find new items for the STM32. For the "Blue Pill" board you must choose:
- Generic STM32F103C series

Again under Tools-> Board, at the very top, choose:
- Boards manager, in the popup search for: Arduino SAM boards (32-bit Arm ....
  - Install

With this, compilers etc. for the STM32 are retrieved and installed.

Everything is now ready to write and compile code for the STM32. The result is a binary

file that must be loaded into the STM32 processor.

There are various options for loading; it is also possible to load a boot loader into the processor, as is usual with the "normal" ATmega processors under Arduino. Another possibility is the use of a USB programmer: the STLink V2. Select this under Tools-> Upload method:

- STLink

So far there is not much difference between Windows and Linux. For Windows, an additional driver must now be installed that can be found on the ST website:
- en.stsw-link009.zip (see [2])

Unfortunately ST is a bit annoying; you must register. It doesn't mean much; if you want to download the driver you must first enter your email address. Then you will receive an email with a registration button, after which you can download the software.

After unzipping there is a file:
- stlink_winusb_install.bat

Execute this file; the driver will be installed using a wizard.

In principle, this should be sufficient to program the STM32 via the ST-link. However, it may be that some DLLs still have to be installed. Unfortunately, Arduino does not show that it is not yet working, but just says that programming has succeeded.
In the Arduino console, a message like "Flash programming:" should be shown:

Fig. 1. Arduino console after programming.

If this doesn't happen then some DLLs are missing. These can be found at Visual C ++ Redistributable for Visual Studio 2010, see [3]:
- vcredist_x86.exe (this is the 32-bist version).

Please note: it is possible that the 32-bit version is required, even if you are running a 64-bit PC.
After this, programming (uploading) must succeed.

Comments on compiling the constellation viewer

The code is available under git; see [4].

- Via the green button "Clone or download", choose Download ZIP
    - Result: constel_viewer-master.zip
- unzipping gives a folder: constel_viewer-master
    - Rename this folder to constel_stm32. There are now 8 files in this folder:
        - constel_stm32.ino
        - constel_stm32.h
        - adc.ino
        - do_constel.ino
        - oled.ino
        - spi.ino
        - str2oled.ino
        - xy2oled.ino

In Arduino, open file constel_stm32.ino. Do NOT open the other files, only constel_stm32.ino. The remaining files are automatically included when compiling. PAY ATTENTION! Arduino is now **NOT allowed to** request a new sub folder!

Reason: Arduino requires that the file to be opened is in a subfolder with the same name, in this case: **constel_stm32.ino** in the sub folder **constel_stm32** . We had just created that.
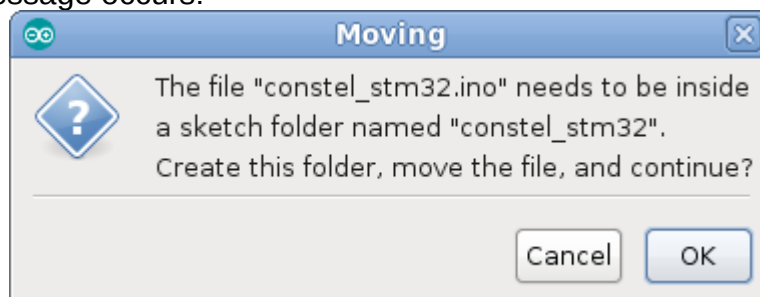If the following message occurs:

Fig. 2. This screen may NOT appear!

then cancel this and correct the name of the sub folder ('sketch folder').

After programming, there must already be something moving on the OLED screen. This does depend on "hum" on the analogue inputs and can therefore be very different from what Fig. 3 shows. Sometimes the program does not start and it is necessary to interrupt the power supply (disconnect for a short while the ST-link from USB).

The constellation viewer can be fed via the STLink programmer, but in the end a separate feed will be desirable. That must be a power supply of 3.3V, approx. 120 mA.
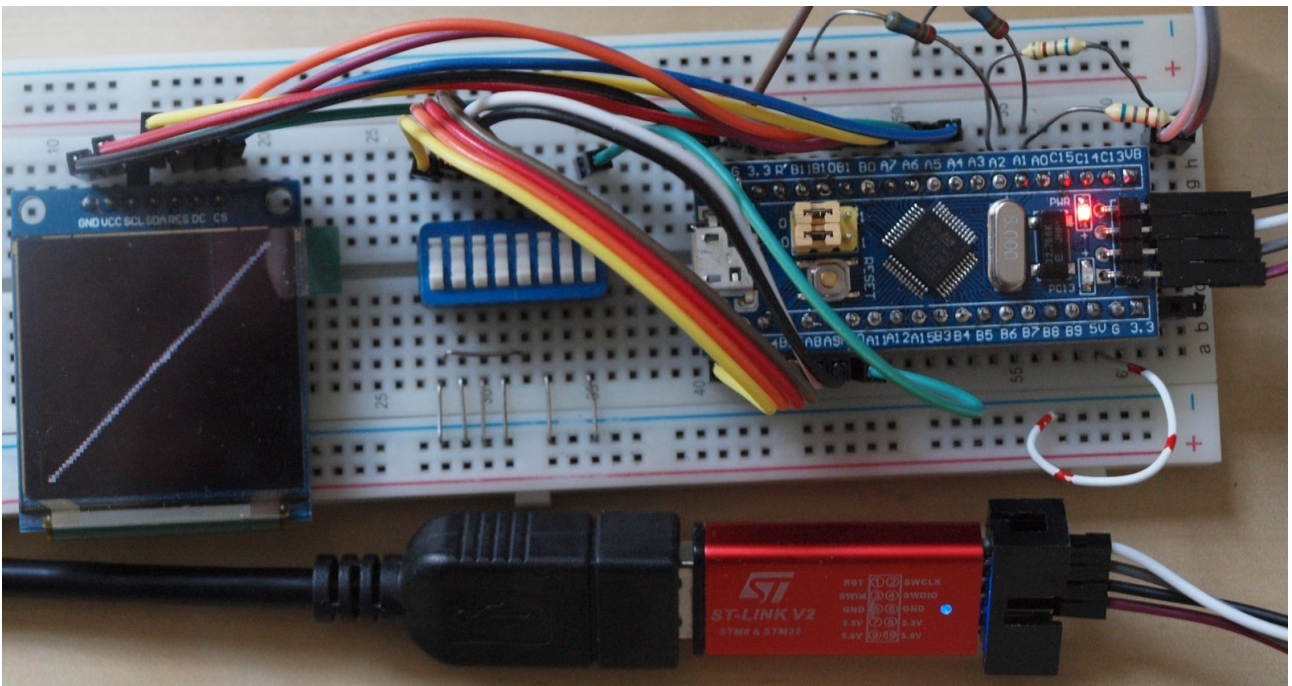
Fig. 3. The constellation viewer, powered from USB with the STLink (bottom right).

Extra settings: scaling
A number of dip switches can be seen in Fig. 3. A number of things can be set with this:
- fix scaling of X and Y
- showing the calculated scaling parameters
- colour of the constellation diagram

In part 1 it was already mentioned that the scaling of the constellation diagram is done in an automatic way. For this reason no adjustment potentiometers are required to ensure that the diagram is shown in the correct dimensions on the OLED display.

However, it is possible that external interferences result in constantly rescaling, which causes the constellation diagram to become "unsettled" (dimensions and position that constantly change).

A number of options have therefore been built in to set the scaling behaviour:
- Pin PB13:
  - open: continuously calculate scaling
  - GND: fixed scaling on last calculated values
- Pin PB12:
  - open: use the calculated scaling factors
  - GND: use fixed scaling factors, see constel_stm32.h:
    - FIXED_xyoffset
    - FIXED_xyslope
- Pin PB14:
  - open: show constellation diagram
  - GND: display the calculated scaling factors

Note: this requires the code that is now on the Kunstmanen github ([4])

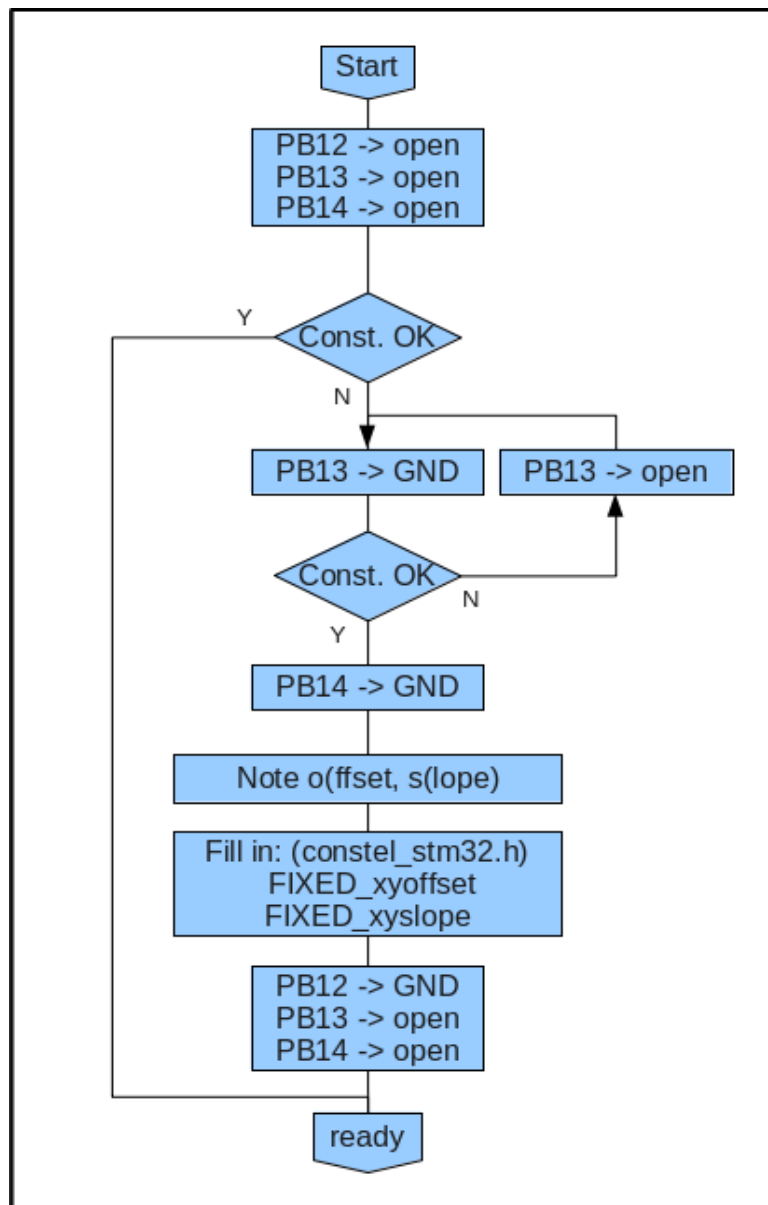The procedure according to fig. 4 can be used:

Fig. 4. Determine the correct scaling parameters.

The first decision relates to whether the constellation diagram is stable enough.
The second decision: if PB13 is closed to GND, the scaling factors will no longer be adjusted. If that was done at a time when the constellation diagram was not at the right position / size, then this must be repeated: PB13 open and then back to GND.
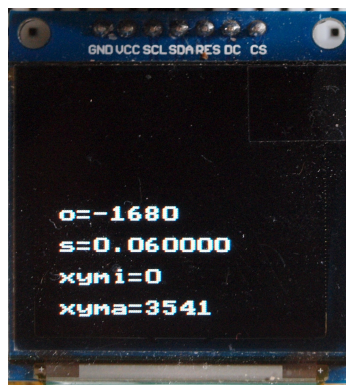

Fig. 5. Displayed scaling parameters: o (ffset), s (slope)

Clipping ADC

If the constellation diagram shows lines at the edges, the input voltage of the ADC converters is too high (clipping). This can be fixed using attenuators; see fig. 6. (For me only a little bit of attenuation was needed.) The scaling parameters have to be determined again after adding/changing the resistors.
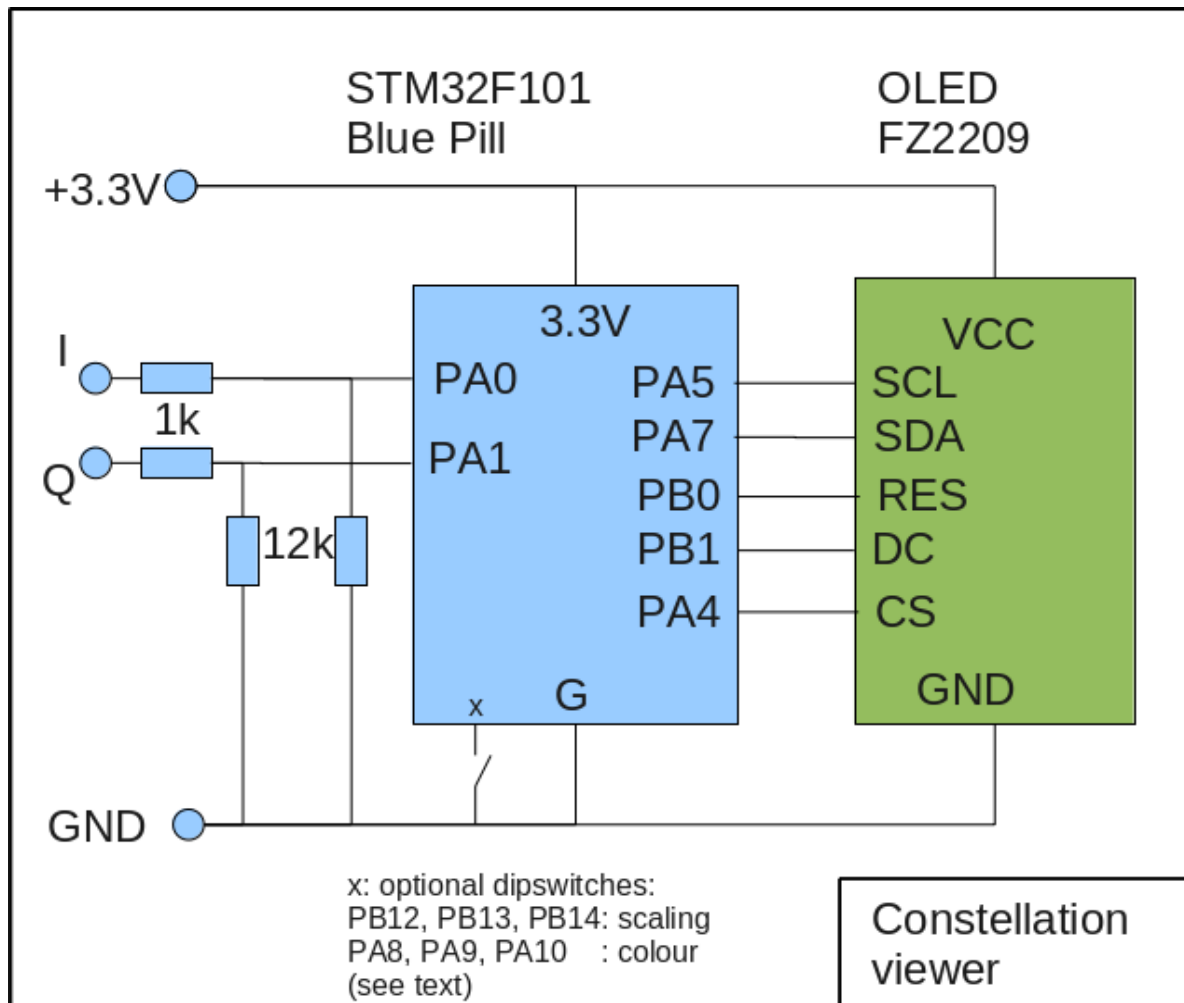

Fig. 6. Adjusted schedule with attenuators.

Extra settings: colour

The colour of the constellation diagram can be set:

PA8	PA9	PA10	colour
Open	Open	Open	white
Open	Open	gnd	yellow
Open	gnd	Open	magenta
Open	gnd	gnd	red
gnd	Open	Open	cyan
gnd	Open	gnd	green
gnd	gnd	Open	blue
gnd	gnd	gnd	black

The brightness of the OLED display is not really high, so usually the white option will be preferred.

References: see web page for the links.
[1] Arduino_STM32-master.zip
[2] Driver for the STLink
[3] Extra DLLs for the driver
[4] Code of the constellation viewer (now on the github of artists!)

X-band experiments abroad

Also ouside the Netherlands people are working hard to achieve X-band reception.

In the GEO Quarterly Newsbrief no. 61, Jean-Luc Milette describes how he receives X-band satellites NOAA20, Aqua and Fengyun-3D using a self-adapted LNB and SDR (including a LimeSDR) in combination with Gnu Radio. He uses a 2.4 meter dish, which, although on a tripod, is aimed manually. See [1].

Mike Still in Sussex, member of our working group, has tried the Jean-Luc method but is also working on a hardware variant. He has already achieved promising results; strong Fengyun-3D, and Aqua; NOAA20 is a bit weaker (seems to have a small defect in the transmitting antenna, making the signal received 3 dB weaker than it should be). Here are some photos of his work, with commentary. These photos may raise more questions than they answer, but perhaps that is precisely the intention...

FIG. 1. Converted TV LNB; the bottom box contains a PLL that generates 6300 MHz; see fig. 2.
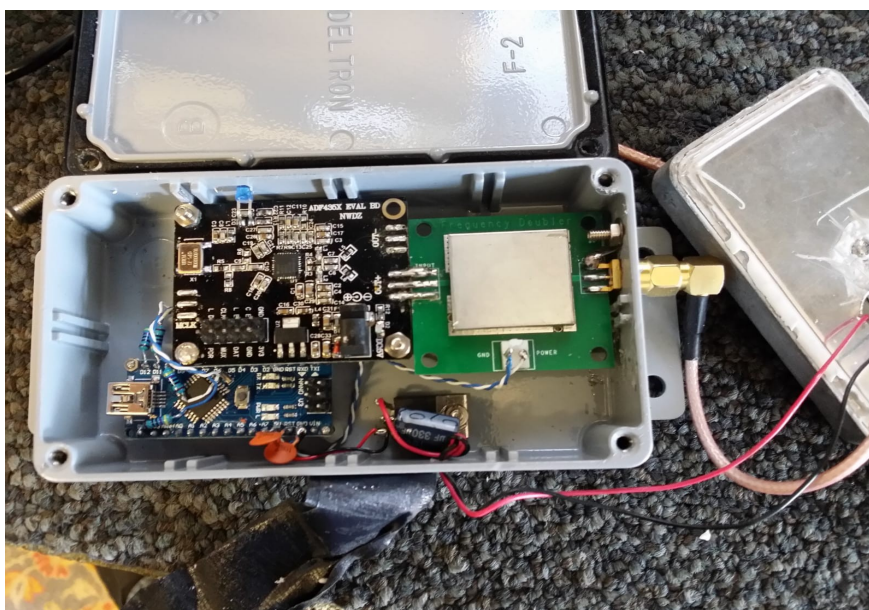

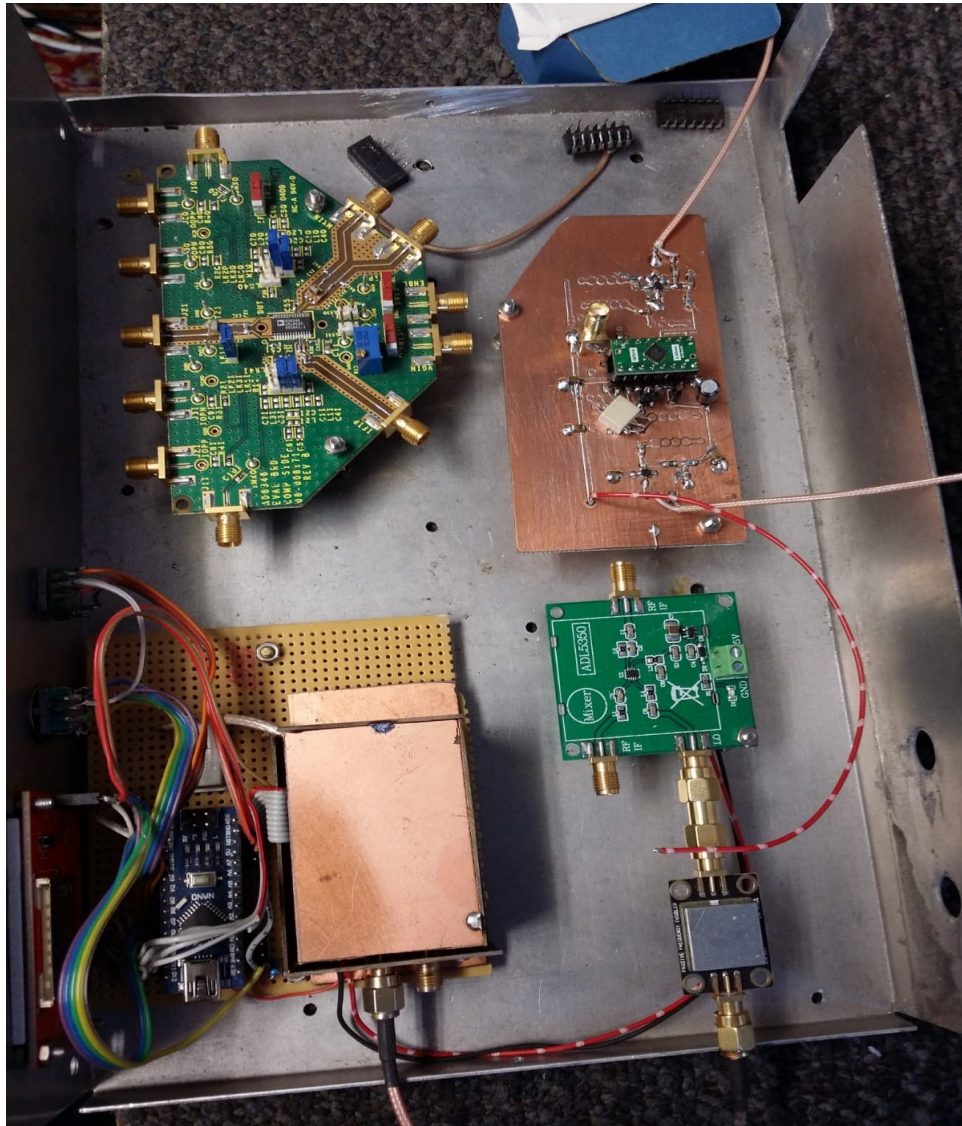FIG. 2. The PLL, with an Adruino as controller at the bottom.

FIG. 3. Receiver. Bottom left an oscillator based on the ADF4351 with an Arduino as controller.
Bottom right a passive doubler followed by a mixer based on an ADL5330.
Top right the QPSK demodulator .
Top-left is an experimental QPSK modulator based on an AD8348.

FIG. 4. The antenna; the big black one is for 1700 MHz, below it the X-band feed with the LNB as shown in Figs. 1 and 2, followed by 2 linear amplifiers of 20 dB each.
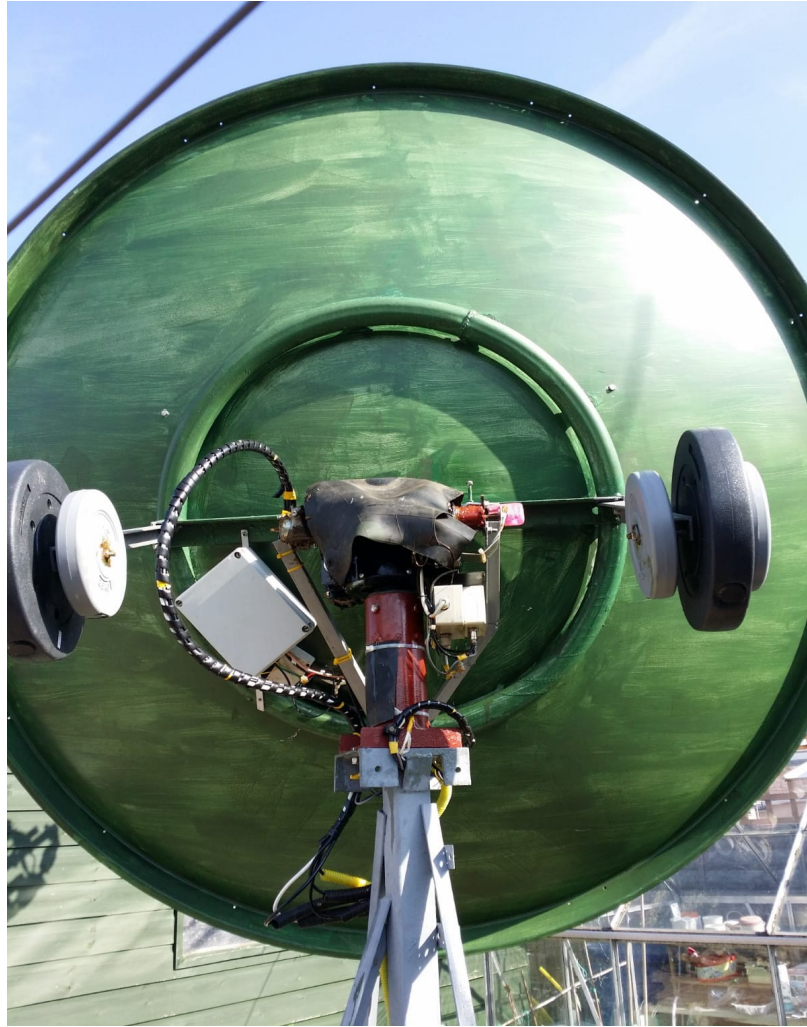
FIG. 5. The dish at the back, with adapted Spid big Razz Rotors for elevation and azimuth.

[1] http://www.geo-web.org.uk/quarterly/geoq61.pdf#11

My helical illuminator

Summary

This article describes my misfortune and the rebuilding of my helical antenna .

preface

Because my satellite dish is on the side of my house I can look at it. Coincidentally, at the end of March, I looked at my satellite dish that was in a storm position. The illuminator is protected against the elements with a bucket. What I saw didn't make me happy: the bucket was torn at the bottom and rainwater could affect everything.

Immediately I dismantled the illuminator to prevent further damage. The interdigital filter and the LNA are particularly valuable.

Misery

What I found was a container with misery:

- The interdigital filter was mounted on the base plate with an N-sma adapter . I attached the filter with tire-wraps . The adapter connector was broken and fell apart.

- The adapter strip was completely rusted

- The voltage regulator print was unrecognizable due to water damage

Rebuilt everything

It was clear that everything had to be rebuilt. Without the use of tire-wraps which eventually become loose, with all its consequences. Connectors must not be supplied with voltage from the structure. The SMA connectors are not suitable for this, with N connectors this plays less.

I still had a few pieces of rigid cable with SMA connectors, Canadian fabric, purchased from Quakkelstein on an fair. Instead of an N-connector , I now soldered a piece of cable on both sides of the base plate and this goes directly to the interdigital filter.

With the same piece of rigid cable from the interdigital filter to the LNA.
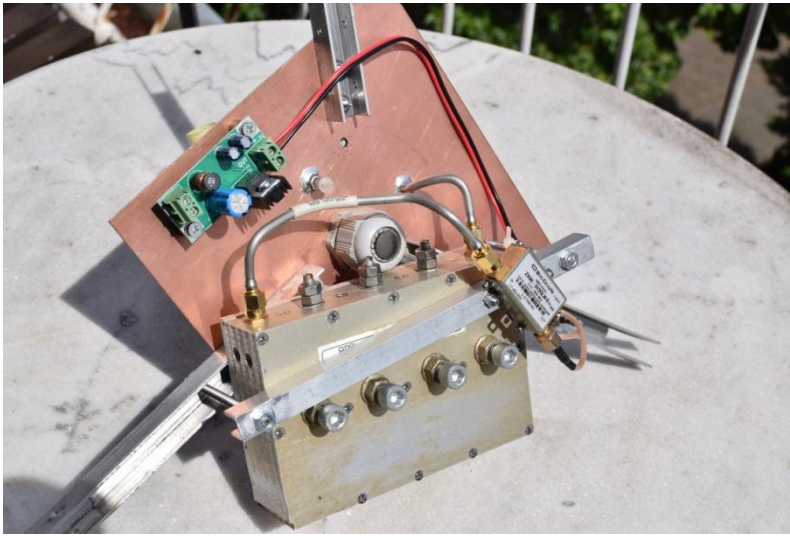
FIG 1 The rear of the illuminator. The filter is clamped with an aluminium profile. The LNA is mounted on this.

A cable goes from the LNA to an F-female chassis part that is mounted in the aluminium profile .

Fig 2 An F-type connector

After the whole thing was assembled again, I sprayed everything with plastic spray . Hopefully this will stop the corrosion a bit.

Calibration

So that's a thing. Since Eumetsat has turned off our measuring channel in the form of the MSG-2, there is no satellite that I can use to set things up.

FIG 3 Mounted on the antenna, without the bucket as protection.

I have tried to turn the adjusting knob of the strip in case of a low match, but this gives no visible change in the signal level. So I left it that way, as it was set with my old helical .

Calibration questions

Then a few adjustment questions arise to me . The starting point is that the combination of dish antenna and illuminator is adjusted together and not just the illuminator.

When using a spectrum analyzer (SA) with tracking generator (TG)

- Can I determine the focal point with an SA and TG? Emotionally, I say no, because a spotlight illuminator will not lead to a misalignment. Perhaps a piece of metal (dish) in the neighbourhood does have influence but not related to the fact that the illuminator is or is not at the focal point.

- Set to frequency by setting the helical with turning and pulling, will probably work.

- Tune the impedance adjustment strip , this will probably also work.

- Does this adjustment provide the highest signal-to-noise distance?
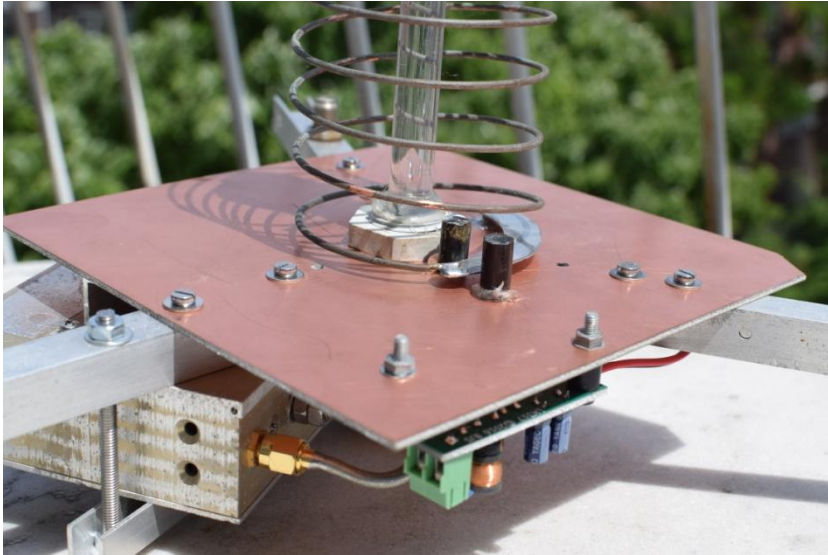
FIG 4 The adjustment strip between two spacers. This prevents the helical from going in all directions when you pull and turn.

Or am I going to hang a signal source from my attic room (10 meters high) and point the antenna at it .

- Can I focus than well determine if I suffer from reflections?

- Can the circularity of the helical be adjusted? The satellite transmission t a circular signal from my own source linear.

Closing remarks

It is clear to me that you build a helical, which stands for years in the weather, do not cut corners and you no concessions should do one of firmness, etc.

The adjustment is not yet completely clear to me how I can best do this. Otherwise I just have to see if I can hang a signal source with a quadrifilar antenna in a church tower ....

You can read my findings in September Kunstmaan.

Control of attenuators from HP / Agilent / Keysight

Summary

This article describes a controller for Agilent / Keysight attenuators. The attenuation can be selected with a rotary encoder and is shown on an Oled display.

Preface

I have a weakness for attenuators. In the past I have written about the control of a Weinschel attenuator . I also have a whole collection of attenuators from Mini - Circuits at home . But these have a fixed attenuation, it is more fun if the attenuation is adjustable.

What are attenuators useful for? If you have a source than you can attenuate it to eg. to tune a receiver. Also the oscillator signal that enters the mixer may only have a certain level and you want to be able to adjust it easily.

Now that we are going up with the frequency it is necessary that the attenuators can also handle this high frequency. The fixed attenuators of Mini - Circuits go up to 6 GHz. Now also around 8 GHz will work, but it is all less accurate.

Attenuators from Agilent

So on eBay went looking for attenuators. My preference was for Agilent because its about to find detailed specifications and documentation. Agilent also has attenuators with a turning knob, problem is that they are almost impossible to find. For those attenuators that need to be controlled electronically, some work needs to be done, and that is what this article is about.

The attenuators are available in various designs

- from DC to 4, 18, 26.5, 40 or 50 GHz

- with a attenuation of 0 to 11, 70 and 110 dB, among others

Bear in mind that they are stepper attenuators. The attenuators of 70 and 110 dB go in steps of 10 dB and the attenuators up to 11 dB go in 1 dB steps. That is why two attenuators are often used in series to cover a large area in 1 dB attenuation steps. For more information I refer to the Agilent site [1].

After a long search on the internet, I found the following attenuators in Israel:

- Agilent 8495H - a 70 dB attenuator up to 18 GHz

- Agilent 8494H - an 11 dB attenuator up to 18 GHz

In total I come to 81 dB attenuation. In combination with my fixed attenuators from Mini Circuits , I can attenuate the signal sufficiently to test a downconverter at 8 GHz . With an Agilent 8496H, which weakens 110dB, a fixed attenuator is not necessary.

If you come across the 4 GHz models, it is not said that they do not work on the 8 (or 18) GHz . In the production of these attenuators look to the specifications. Do they not meet the 18- GH z specs then it is sold as a 4 GH z version.

These attenuators can be purchased on the second-hand market under the names HP, Agilent or Keysight . Agilent is split from Hewlett in 1999 Packard. And Keysight was split off from Agilent in 2014 . So the brand name is an approximation of the age of your attenuator . An HP is therefore more than 20 years old.


Fig 1 An HP / Agilent / Keysight attenuator , depending on the year of manufacture . On the right you see the connection for a so-called Viking connector .

Performance

Internally, the attenuator relay that connects a strip or through or runs through a resistance attenuator. The 8495H 70 dB attenuator internally has a 10, 20 and a 30 dB attenuator section . The 8494H 11 dB attenuator has an internal 1, 2 and two 4 dB attenuator sections .

The coils require 20 - 30 V at 125 mA. Switching takes place within 20 mS . After switching, the current flow through the relay coil is interrupted, by means of a magnet the relay remains in its new position, a bistable relay . Due to this setup, a coil is only briefly activated during the switch over.
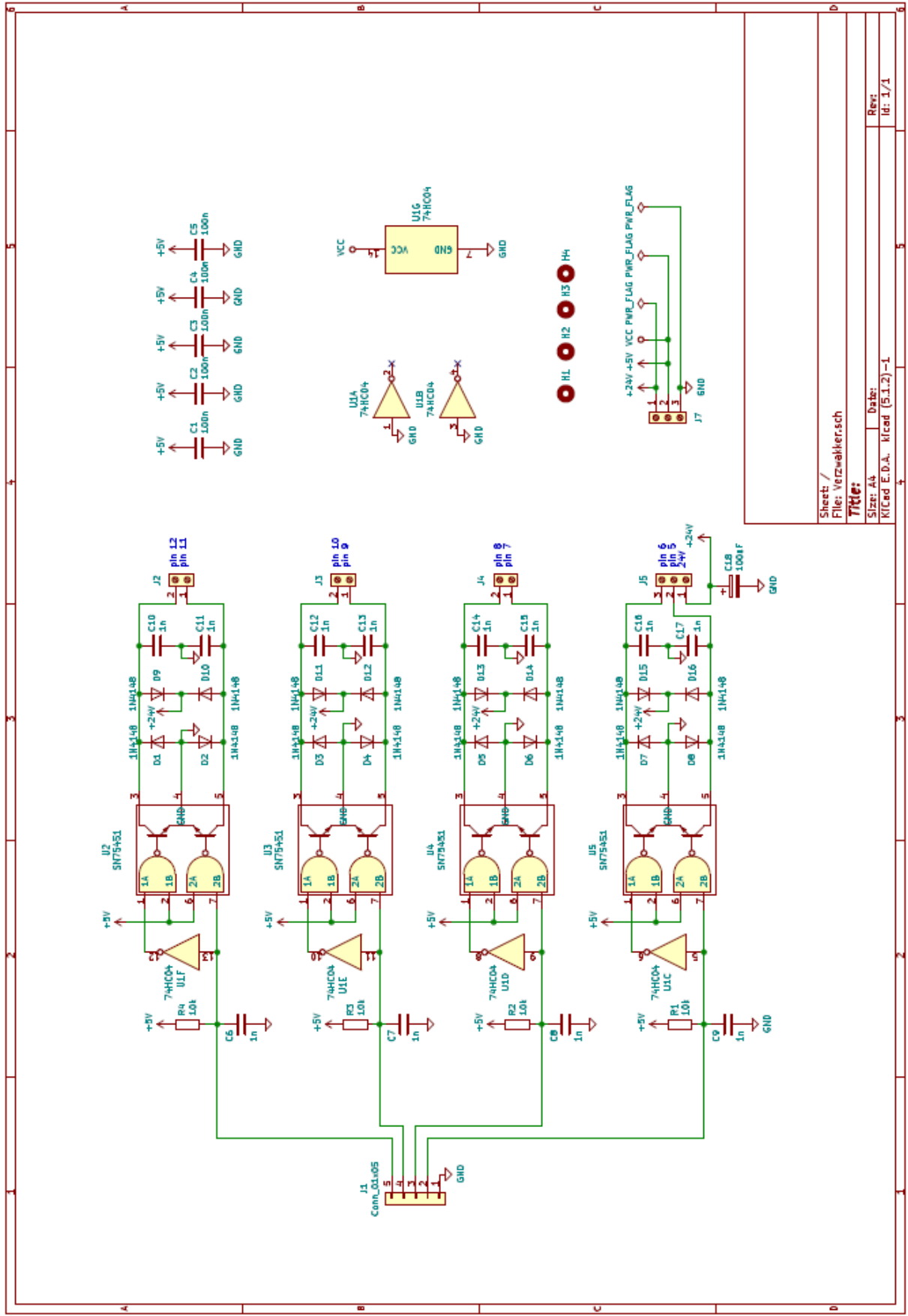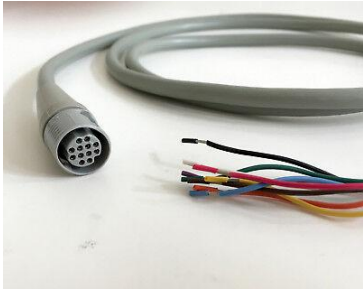
In addition to the mentioned variations in frequency and attenuation, they are also available in SMA or with an N-connector version. The connection for the attenuator sections is via a flat cable (easy) or via a special cable with a Viking connector . T his last show I come from Malaysia.

Cable with "Viking" - connector of Agilent

Schedule driver for the attenuators

I copied the scheme with a few minor adjustments from the datasheet. The SN75451 is used as a driver to control two coils, being one attenuator section . I have placed the inverter the other way around so that the attenuation is maximal when switched on. Furthermore, some C's for suppression of malfunctions.

Scheme 24V

The coils need 24V. Because I want to feed it entirely from 5V, I have designed an up-converter with an MC34063. This has become a separate print. Always handy if you want to have a high voltage somewhere else.

The diagram below comes directly from the datasheet.
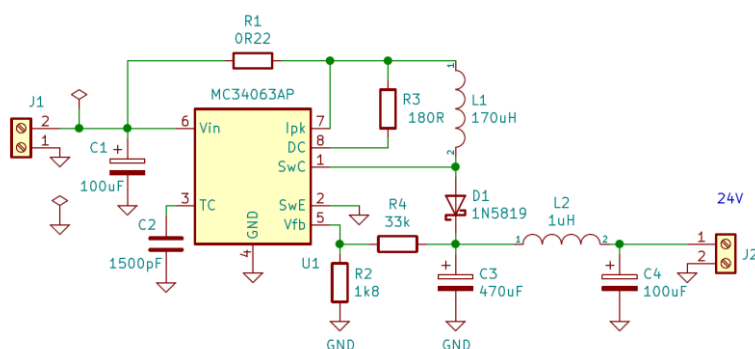
FIG 3 24V upconverter , according to the datasheet of the MC34063, page 8.

FIG 4 The 24V upconverter in 3D version

Arduino

To control the whole, I use a bare Arduino print with only an ATmega328 and crystal. What is connected to the Arduino print :

- Rotary encoder to set the attenuation

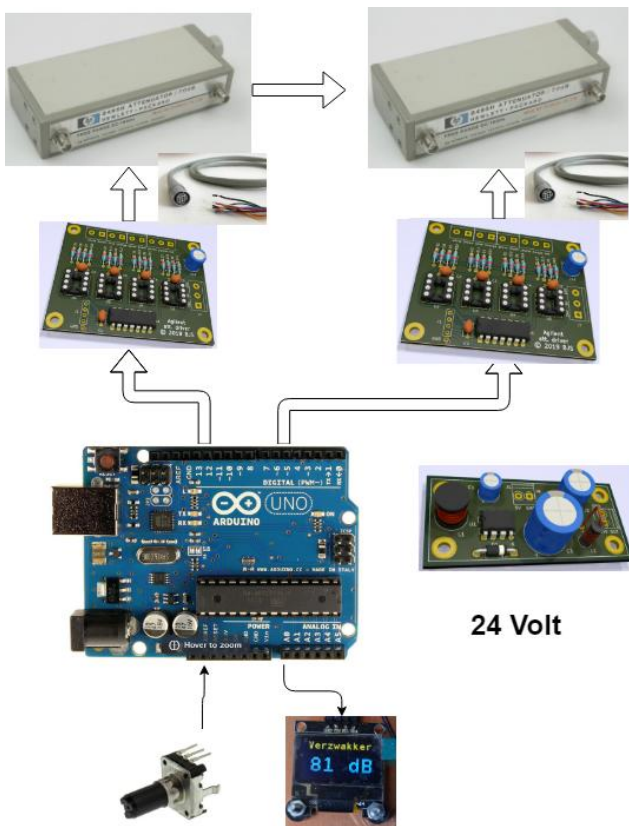- OLED display for reading

- Two driver prints for the attenuators

Fig 5 How everything hangs together

Software

I do not want to include the entire program in this article, it would be too long. It can be found on GitHub: AttenuatorDriver . I would nevertheless like to mention a few points for attention:

- In addition to being able to set the attenuation in 1-dB steps, you can also set 10 dB steps by holding down a push button.

- With a changeover switch you can set whether the weakening should be performed immediately or only after pressing a button. This will prevent to many switches if you want to set the attenuator significantly higher or lower.

- The attenuation must be between 0 and 81 dB.

- The fourth attenuator section of the 8494H is 4 dB and not 8 dB

PCB

The print is not at all exciting. At the bottom there are still the necessary disconnection C's in the SMD version .
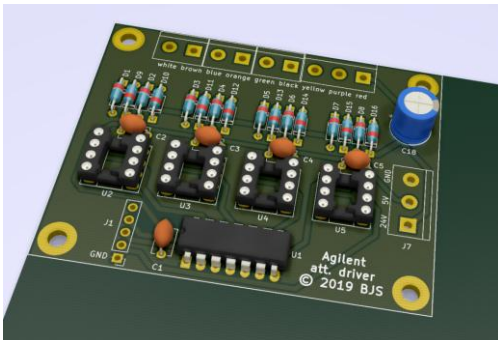
FIG 6 3D animation of the driver print . Is a print needed for each attenuator Agilent.

The two attenuators on the left and the control on the right

Accuracy

The attenuators are very accurate but still have a frequency-dependent deviation. So if you want absolute accuracy, you will have to make a translation table with a recalculation. See also tables 1-6 and 1-8 in the manual [2] . For example, at 18 GHz and 70 dB attenuation in the 8495H the deviation is at most 2.8 dB and at 8494H and 11 dB at most 0.9 dB. Making such a translation misses my goal. If you want this, you have to have a super- accurate measuring transmitter again, so you can keep busy.

Concluding remarks

I thought I would make this "briefly", but it has become a big story again that you don't design and build on a lost afternoon . What remains is the whole place in a cabinet.

It was an educational event and I got on a stock exchange or elsewhere against such attenuator call then controlling them no problem.

Left

[1] Information about Agilent attenuators

https://literature.cdn.keysight.com/litweb/pdf/5989-6948EN.pdf

[2] Manual attenuators

https://literature.cdn.keysight.com/litweb/pdf/08495-90025.pdf

UKW MESSAGE

Paul Baak

Summary
In this article a small review or articles published in the 1st edition of 2019 or the German magazine UKW-Berichte. We have a subscription to this magazine.

Visited for you: a lecture about the satellite BepiColombo, presented by the Dutch Association for Space Travel in March this year. This satellite from the ESA and the Japanese sister organization JAXA goes to Mercury and that is a more interesting object than one at first sight may think. The core and the fairly strong magnetic field are still a mystery and the gravitation is strong, so there is also something to investigate as to orbit and relativity. BepiColombo will split into two separate probes upon arrival in 2025. In the lecture most interesting for me was data communication. Telemetry goes at 7.8 GHz and data transmission at 40 GHz. Is this our future for the club? A good reason to look at the content of UKW message, 2019 Vol 1. Our club has a subscription to this magazine. Please indicate or appreciate your subscription!

Sigurd Werner further elaborates on a theme of the previous edition and uses the ADMV7710 for frequency multiplication with increased power at 76 GHz. The housings of the experiments are milled from brass and galvanized. The author will continue his efforts; he aims at 1 Watt and is now at 840 mW. Michael Margraf uses QucsStudio to calculate S parameters with complex impedances. The original purpose was to adjust one Bluetooth module on an inverted F-antenna. We mainly see the calculation work with a few here measurement as verification. Gunthart Kraus is experiencing problems with printed circuit boards at 5.8 GHz. High losses and tolerance problems with FR4 (i.e. standard fiber optic circuit board) to RO4003 from the Rogers brand. The prices are not low: 3 x 5 cm for 200 Euro! Fortunately he has a cheaper address found at www.micron20.com in Bulgaria for a few tens of Euro. He builds a 5.8 GHz filter and use the free simulation software Ansoft Designer (www.gunthart-kraus.de).

This edition has a summary of the topics in the year 2018, also available on the internet. Also an overview of useful links. For example an explanation of many antenna types, a free Gerberfile viewer and a reference to Analog Devices with converters and solutions for the GHz range.

Heiko Leutbecher combines the FPA103 MMIC the FPA103 MMIC with various fet's, transistors and configurations to get more power from a low-noise broadband preamplifier. The description does not make clear what the purpose is of the combination of low noise, broadband and power.

Guido Schönwälder describes a home built directional coupler. It leans on the BDCH 35-272 of Mini Circuits. Very careful working gives him professional results.

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

Report of the members' meeting 11 May 2019.

Opening by the chairman.
Ben has taken a few things "from the attic". Free to take or for a small price, which benefits the working group.

The decoder print, designed by Harry Arends, has been tested by Rob Alblas. A few modifications have to be made, one of which really has to be done (a scratch-through job with USB interface) but the rest is functionally OK.

The preference is to make future prints in KiCAD. It is freeware, and is widely used. There has even been a conference. Version 5.2.1 has just been released.

For antenna / helical adjustments, we would like to use a geostationary satellite at 1700 MHz. Perhaps the Russian GOMS is a possibility. A measuring transmitter would be sufficient for receiver testing; that is already being worked on.

Financial report for 2018 + statement of the Cash Audit Committee
The Treasurer explains the financial figures, published in the first "Kunstmaan" of this year. The expenses are now around 4000 euros per year. We still have around 9000 euros. The loss in 2018 was around 600 euros. If we assume a minimum of 4000 euros in reserves (1x the expenditure in a year), and assuming a loss of 700 euros a year, then we can still survive (9000-4000) / 800 = 7 years. By that time the contribution will have to be looked at, but for the time being we will not increase it.

The Cash Audit Committee in the person of Job de Haas and also on behalf of Herman ten Grotenhuis reports; no irregularities were found. Discharge is granted to the treasurer.

Job resigns from the committee, Herman stays another year. So we are looking for a new person to staff the CAC for 2 years.

Policy pursued 2018
The members present discharge the board from liability for the policy pursued.

Budget 2019
The treasurer explains the budget. The income from contribution is decreasing due to the introduction of the PDF subscription for foreigners. On the other hand, spending on printing / shipping costs will go down, apart from the ever-increasing costs of paper and postage.

Administrative Affairs
Job de Haas will take over the editing of the magazine "de Kunstmaan" from Fred. He will do the June issue together with Fred.

Visit Eumetsat

This visit will definitely not take place this year. As a working group for 2020, we now want to organize this ourselves. It is preferable to make it two days, because of the travel time (a long journey for just one day is not desirable). The question is how we get those two days full; with more lectures, possibly a visit to the antenna park in Usingen?
As a working group, we also want to profile ourselves there. There are ideas about this; but this must also be done in consultation with Eumetsat. Ideas from members are

welcome.
In terms of organization (apart from arranging 'sign up', etc.), it will mainly be at Eumetsat for the first day; we would have to arrange a possible visit to Usingen ourselves (incl. transportation).

Satellite status

Arne gives the current status; see elsewhere in this "Kunstmaan".

Any other business

Where can I get Mini-Circuits modules at a great price? You can't get them for really cheap; the advantage is more being able to order per piece. Possibilities:
- funkamateur, box73.de
- minikits.com.au
- kingcom@chello.nl, to be found on radio fairs .

Fred Jansen, new member, introduces himself. He is still working at ESA, and has in the past (70s) been concerned with receiving weather satellites. He has now picked it up again.

Various people look at / experiment with X-band related items. Among others Wim Bravenboer and Fons Buitelaar.

Arne has purchased a Lime SDR; this allows direct reception of up to 3.8 GHz.

Closure.

Lecture: NOAA-20 decoder is ready, what to do next?

Rob tries to explain how Viterbi coding can improve the reception quality, and how he has adapted the decoder so that it can process the bit rate of NOAA20 (30 Mb / s). Most of the existing hardware (the GODIL module) can be reused, but with a different load (firmware). The USB module must be replaced by a faster type based on the FT232H. The current SparcFun, based on the FT245R, is much too slow (actually too slow for the 4 Mb / s from Metop). The FT232H is much faster. The CHRPT mode, which is still in the current FPGA load, has now been replaced by a mode for NOAA-20, in addition to the old NOAAs, Meteor, Metop and Fengyung-3A-C
The Fengyun-3D is another 2x faster than NOAA-20, that will be a challenge, also for the receiver. We first try to get NOAA-20 to work.

For interested people: the operation of a Viterbidecoder is also described in the KM 2012, No. 1, page 18 . See website, web links (unfortunately only in Dutch)

Rob Alblas
(secretary AI)

Arne van Belle, June 8 2019

POLAR	APT (MHz)	HRPT (MHz)	Orbit
NOAA 15	137.620	1702.5	Morning/evening, HRPT weak
NOAA 18	137.9125	1707.0	Early morning/afternoon
NOAA 19	137.100	1698.0	noon/night
FengYun 3A	no	1704.5	AHRPT 2.80 Msym/s
FengYun 3B	no	1704.5	AHRPT 2.80 Msym/s
FengYun 3C	no	1701.3	AHRPT 2.60 Msym/s
FengYun 3D	no	7820.0 X-band	noon MPT 60 Mbps
Metop-A	off(137.100)	1701.3	LRPT/AHRPT 2.33 Msym/s
Metop-B	no	1701.3	Only AHRPT 2.33 Msym/s
Metop-C	no	1701.3	Only AHRPT 2.33 Msym/s
METEOR M N1	off(137.100 LRPT)		1700.0 Black image
METEOR M N2	137.100 LRPT	1700.0	LRPT on/MHRPT on
NPP	no	7812.0 X-band	HRD 15 Mbps
JPSS-1/NOAA 20	no	7812.0 X-band	HRD 15 of 30 Mbps

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

The LRPT signal from METEOR M N2 can be received with an SDR dongle.

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!

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!

Harrie van Deursen has already received Metop-C on 13 November, the same frequency and strength as A and B.
The Fenyuns give a little more signal, but unfortunately regular disturbance lines.

Launches
Meteor M N2-2 Launch delayed, probably July 5 2019
Elektro-L no 3 Launch moved to 2020, possibly it will be active again at 1691 MHz!

GEOSTATIONAR	APT (MHz)	(SDUS)/PDUS (MHz)	position
MET-11 (MSG-4)	no LRIT	1695.15 HRIT	0 , operationeel
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. 15)	1691 LRIT	1685,7 GVAR	128 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-17	1686.6 GRB	1694.1 HRIT	137.2 degree W
Elektro-L2	1691 LRIT	1693 HRIT	78 Degree O, via Eumetcast
MTSAT-1R	1691 LRIT	1691 HRIT	140 degree O, Backup voor 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 voor 8
Feng Yun 2E	-	-	86.5 degree O
Feng Yun 2F	-	-	112.5 degree O, Backup
Feng Yun 2G	-	-	99.5 degree O
Feng Yun 2H	-	-	79 degree O, test fase
Feng Yun 4A	1697 LRIT	1681HRIT	99.5 degree O, Operationeel

Lanceringen

Meteor M N2-2 Launch delayed, most likely to June 2019
Elektro-L no 3   Launch moved to 2020, May bring back a signal 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 you actually need 120 cm.

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.
http://hvanruys.github.io/
David Taylor has written a GOES ABI Manager for Goes 16 and 17 NetCDF data.

http://www.satsignal.eu/software/GOES-ABI-Manager.html

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 the LNB in such a way (Skew) 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 isolation. 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 feasible, it may be necessary to replace the LNB with one with better "Cross-polarization Isolation".

See "EUMETCast Europe Link Margins Explained" at https://goo.gl/8bB4Jj

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 3x 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.

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 testdata 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.

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