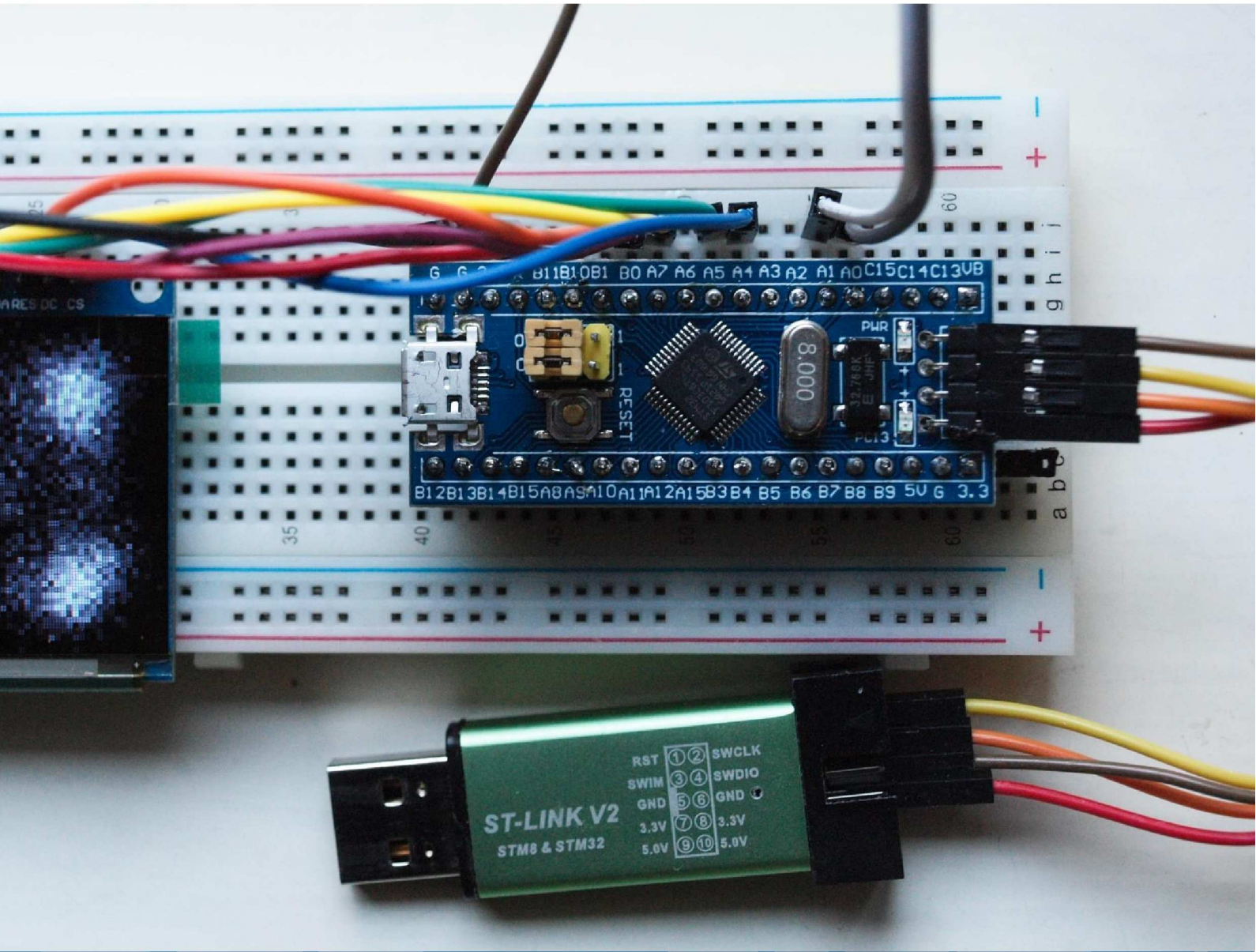
DE KUNSTMAAN

Maart 2019 - 46e jaargang nr. 1

Uitgave van de Werkgroep Kunstmanen



In dit nummer o.a.

Constellatieviewer voor QPSK-ontvanger
Patch antenne vs helical voor de 1700 MHz
Diverse jaarverslagen
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.

Rob Alblas
werkgroep Kunstmanen
kunstmanen@alblas.demon.nl

Content

Photo front page: Experimental constellation viewer.

Preface

At the time of this writing, we have already had two meetings. Our traditional New Year's reception with 25 attendees on 5 January . It was traditionally cozy. There were two lectures: ideas from your chairman for a downconverter and Rob who presented a constellation viewer. Indispensable for tuning into a QPSK signal .

At the meeting yesterday, March 9, the patch antenna and the helical were compared. These antennas serve as an illuminator for a satellite dish. More about this in this Kunstmaan. Speaking of satellite dishes: Hendrik drew my attention to a French-language site [1] from a radio amateur who created a satellite dish based on the geodesic principle.

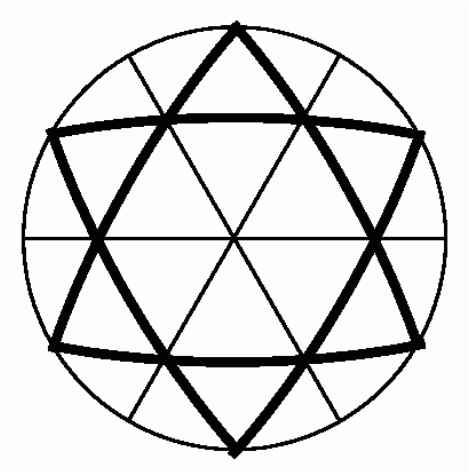


FIG 1 No radians coming from the center, but a kind of diamond pattern.

The big advantage is that the dish can be constructed from aluminium strips instead of U-profiles . This produces a light dish that is still sufficiently stiff in terms of construction. The construction seems to be very simple: drill holes and bolt the strips together. In this Kunstmaan no article about this dish yet, but this will certainly come in the course of the year. I will try to build a 1.50 meter dish myself .

Visit Eumetsat

At the time of writing, it seems that the visit to Eumetsat on July 4 is cancelled due to lack of interest. It seems that there were only 8 interested people (fear of Brexit ?) .

X band

In the last Geo (free to download [2]) a story by Jean-Luc Milette about receiving the X-band . He uses an LNB to receive TV satellites, replacing the DRO with one with a lower frequency. He also has a bandpass filter deleted. The

hardware platform ' HackRf ' is used as SDR and decoding is done with GNU Radio on Windows. The dish he uses has a diameter of 1.7 meters. He recommends 2.4 meters for the NOAA20 ! He follows by hand. With this installation, he receives the following satellites: NOAA 20, Aqua , Terra and FengYun 3D. The tricky part of his solution is that these LNBs are no longer available.

Rob has set up the viterbi decoding differently and should already be suitable for the higher data rate of the NOAA 20.

With "my" downconverter it is progressing slowly. I have a 6.5 GHz signal at 0 dBm. Now I need a filter with pipe caps and then make the mixer. Still a long way to go….

Air Force Days 2019

Write in your agenda: on 14 and 15 June we will be at the Air Force Days in Volkel . This is an incredibly large public event with hundreds of thousands of visitors. Take hearing protection with you, the noise is deafening. We will be there with a booth and will immediately show receipt of Eumetsat .

Fig 2 Mobile antenna on the Air Force Days

The Kunstmaan

Fred has managed to write another report from Vietnam, despite the misery he has with his DiSEqC rotors . Rob describes a very nice constellation viewer based on the STM32, this solution is a full replacement for the oscilloscope . He also provided the financial overview and reports from the past two meetings . Paul has nice reflections from the library again .

Fred has expressed, due to the condition of his eyes, having to stop preparing the Kunstmaan. Job will take over Fred's work from June .

Next meeting is on 11 May, and not like in the previous Kunstmaan one week later. It is our General Assembly, so everyone is coming.

Meeting 11 May
At the time of writing, it is not yet known where the presentation will be at 11 May will be going on.

Sincerely,

Ben Schellekens

Left

[1] Geodesic antenna

http://f4buc.pagesperso-orange.fr/parabole_geodesique2.htm

[2] Geo number 61

http://www.geo-web.org.uk/quarterly/geoq61.pdf

Weather satellites in Vietnam (31) **Fred van den Bosch**

Summary
My experiences with weather satellites etc. in Vietnam.

APT
Finally big, or perhaps better said rather small news from this front. For various reasons I have decided to buy a new PC not in Vietnam but in the Netherlands. The choice was made on the HP 260-G3, a mini desktop of approx. 17 * 17 * 3 cm. and a weight of 1.25 kg. See [1]. One of the reasons for this model was that it has a serial port. With this WxToImg sets my R2FX receiver on the right band.
We will have to wait and see how this PC without fan will start working 24/7 in the tropical temperatures in my room. Ben and I have been brainstorming about climate chambers, etc. Starting up did not cause much problems. The existing monitor and the supplied mouse and keyboard were put into the correct holes, power supply added and everything worked.

Audio
APT gave a lot more problems. The connection to the PC appears to be a combined headphone / microphone connection. And whatever I tried, I couldn't get it working. Then suddenly, again by accident, I came across a Behringer UCA202 USB / audio interface [2], of which I can't even remember for what I once bought it. The box connected to a USB port, audio cable from the receiver on the other side and the first satellite was a hit: a low NOAA 19 (11 g.).

Auto Record.
WxToImg has the option of "Auto Record". You set in advance which pictures you want to make, click on Auto Record and the whole process proceeds automatically. What struck me was that that option "by itself" was regularly disabled. Previously it never bothered me. Now I have to regularly check whether this is still in the right position. I have had an extensive discussion about this on [3]. Despite all the help I have not yet found the cause. Anyone?

One more comment about the R2FX. I noticed that the LEDs that indicate the channels do not jump to another channel when another satellite is received. An image does appear so internally everything just seems to go well.

HRPT / QPSK
During my visit to NL, Ben immediately put the latest version in GODIL. After reinstalling in the receiver cabinet, a quick test showed that both HRPT and QPSK worked. Great, this trick also succeeded.

Before the holidays I had some problems with the reception of HRPT: the reception did not want to start automatically. Turning the coil helped. Because this happened in a somewhat uncontrolled way ("if the reception starts it will be fine for me now") I have carefully adjusted the whole once more. Afterwards HRPT started automatically again as usual.

Harrie van Deursen had another adjustment tip:
"With QPSK, it is possible to automatically capture the 3 Metops and FY3-C without having to turn the switch. The procedure:
- *Receive on 1701.3 and turn RV2 until you catch it, you have to go towards the reference VCO level of HRPT.*
- *For FY3-A-B you still have to flip the switch because of the different DC offset caused by the higher data rate.*
- *You can also adjust to FY3-A-B and then switch to everything else.*

The new PC was also purchased for the reception of HRPT / QPSK in order to replace - in time - the very old laptop, which I had temporarily installed on the first floor with the various cables outside through a window inside. For that I would have to pull the cables through the pipe from the roof to my hobby room, where the PC is installed. Because there are already several cables in the pipe, no job that you are really looking forward to. But that decision was made for me. After adjusting, I checked whether HRPT wanted to start up again on its own. That happened, but immediately afterwards the laptop got stuck. Rebooting resulted in a continuous squeak. A few hard beats to the thing helped for the time being, but to speak of a stable situation now….

So the new PC temporarily installed on the first floor at the place of the laptop. Unfortunately, the recipient was not recognized. Receiver and PC were dragged back and forth a few times between the top and bottom and suddenly the receiver was recognized. The how and why will always remain veiled.
Arne had the following hints:
"Sometimes USB2 devices on a USB3 port are not recognized properly. If the PC no longer has usb2 ports, test this by inserting a USB2 hub, which forces the USB3 back to USB2. Normally USB 3 ports are blue inside but HP is stubborn again and also uses black ports with USB3 with the text SS (SuperSpeed). If this helps, see if there is a driver update from HP for the USB3 ports or a separate USB2 card from China / Vietnam. I sometimes use the USBview.exe program [4] to see what connects and why not ".

When the reception upstairs went well, the whole was moved back to my workroom and the cables pulled down the pipe. The reluctance to start this was based on my previous experiences with a plastic tension spring and proved unnecessary. I bought a heavy metal spring last year because the rats had gnawed through the old ones. I put it in the pipe from above and when it was on its way it dropped naturally and quickly. I could just grab him or I would have had to pick him up below and start over again. It also went quite smoothly with the cables attached. In short, a heavy one is ideal for vertical pipes.

And yes, wsat (HRPT) and WxToImg (APT) can work at the same time. The next step is looking at integration and automation.

<u>Lightroom</u>
In [5] I described my workflow to improve received photos. In collaboration with Rob, I came to a slightly modified workflow. I use the screens from the article.

1. The colors are adjusted to the standard colors of Harrie van Deursen.
2. On the Luminance screen, the default value is set with <Lum.Thr>. I don't aim for the best photo here, I just adjust the range. The reason is according to Rob: *"Assuming that you generate a jpeg from wsat, you go from 10 to 8 bits, so you throw away 75% of the grades of gray. In particular if the brightness distribution is very small, what you see with WV channels, for example, the result will be dramatically worse. With normal VIS that is not too bad. If the lum boundaries are between, say, 128 and 383 then you can get the same quality with lum adjustment in wsat as you work in 10-bits at all. Then you shift the range from 128-183 to 0-255, which fits exactly in the 8-bit range of, for example, jpeg. With the difference that everything below (originally) 128, which thus becomes <0, is clipped to 0, and everything above (originally) 383 (which thus becomes> 255) to 255. So you throw away that info (gray gradations), what you can clearly see in for example clouds if you set the high value too low. The gain is 4x as many gray gradations in the middle area, which you will never be able to get back later with LR without this operation in wsat."* Extensive testing with playing with these values gave little difference in the Lightroom result. So I choose convenience and speed here.
3. This result is saved as .jpg.

4. That photo is imported into Lightroom and there the brightness is adjusted based on the histogram.

The big advantage is that in Lightroom you have much more options to properly edit the photo. The final difference in Lightroom between an unprocessed photo in wsat as a base and one according to the above procedure is quite large in favor of the latter. Lightroom is mentioned here, because I use it a lot myself. Other photo packages will undoubtedly satisfy as well.

Weather

The Weather applications Weather Display [6], Digital Atmosphere [7] and WxSim [8] are already installed too. From the first I still had the .cfg file, so it was immediately working for a large part right away. I have to work extensively with the rest to set it up properly. Nice job when the rainy season starts. Only when that is, I dare not indicate in recent years. Seems to be a rather random event. Even all these programs do not answer that question ...

Miscellaneous

Barometer

Despite the title not really weather-related, but nice to read. [9]

Reception 21 cm.

Some amateur radio astronomy. [10]

Life is hard ...

... and that sometimes also applies to our hobby. This video only indirectly has something to do with it. Nevertheless, I have watched with excitement. Enjoy! [11]

Images of the moon

At CAMRAS Dwingeloo they have received images of the Moon from the Chinese DSLWP-A / LONGJIANG-1. See [12]. Information about the up / down link is at [13].

References

See www.kunstmanen.net, menu Weblinks.

[1] HP 260-G3
[2] Behringer UCA202
[3] WxToImg Auto Record
[4] USBView
[5] Weather satellites in Vietnam (29)
[6] Weather Display
[7] Digital Atmosphere
[8] WxSim
[9] Barometer http://www.rbs0.com/baromete.htm
[10] Reception 21 cm.
[11] Life is hard ...
[12] Images of the moon
[13] Ditto, up / download links

Constellation viewer for QPSK receiver.

Preface

When receiving an (A) HRPT / QPSK signal it is very useful to have the constellation diagram available. This shows clearly how strong the signal is and whether the demodulator is in-sync.

The receiver has two analog outputs for this (connector P2); connected to an XY scope, the constellation diagram is clearly visible. See [1], page 12.

It is not ideal to reserve a scoop for this, or to have to change the scope between receiver and a project you are working on.

Oleg has already made hardware for a constellation viewer using a STM32 processor. The hex files are available on his web site [2], but we want to have more control over the whole. So design / make it yourself!

Set up.

What is needed:

- A display
- A processor
- AD converters

The receiver has analogue outputs for I and Q, containing eye patterns. These signals must be converted into an X resp. Y-value, and then on this (x, y)-coordinate a pixel is to be turned on. In the case of successive samples, the previously pixel must then be switched off again, and the pixel 'on' at the new (x, y) position. If that is done quickly enough, then the constellation diagram automatically arises. See fig. 1.

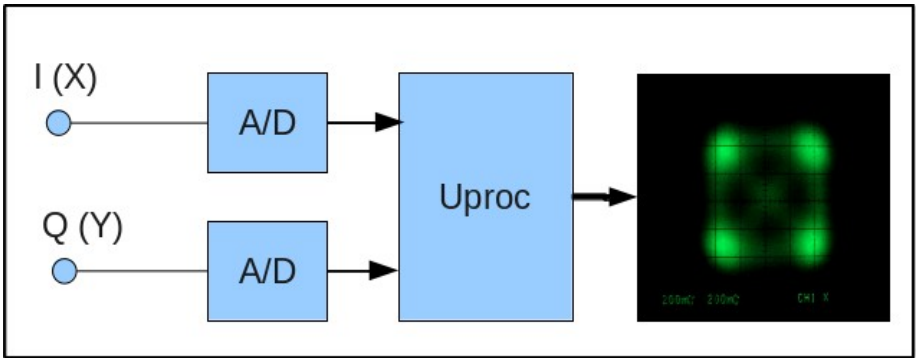


Fig. 1. Set up constellation viewer. Here still with a scoop picture.

Note that the digital I and Q, such as going to the decoder can **not** be used. You will not see that much; with a QPSK you will always see only 4 sharp points in the 4 corners, whether there is a signal or not, and whether the demodulator is in-sync or not.

The question now is how quickly sampling has to take place. The bit rate is up to 2.8 Mb / s for I and Q. However, it is not necessary to sample at this (or much higher) speed; your eyes cannot follow that anyway. A much lower speed, eg 50 kb / s, is enough. It is important here to not synchronize the sampling with the bit stream; otherwise, only samples on eg the corner points would be taken. With that, the transitional behavior would be lost from one point to the other. It also makes the whole thing unnecessarily complicated.

Microprocessors such as the ATmega's, which are used in an Arduino environment,

already have AD-converters on board. With a low required sampling frequency, these can be used so that no separate AD converters are required. This simplifies the case considerably.

Ultimately, only two components are required: a processor-with-AD-converters and a display.

Display.

There are many in circulation, both OLED and LCD displays. The display does not have to be large; it would be nice if it fits in the receiver “box”. Then you come to a height of up to approx. 4 cm.

There is also something to say for an elongated display, where other information can also be shown, replacing the character display that has been used.

A nice small OLED display is available on the market; 1.5 inches, which corresponds to approx. 27X27 mm. Resolution is 128x128 pixels; with max. 262K colors. Maybe too beautiful in color options, but for 25 euros I wanted to play with it. The display is controlled with an SSD1351, which, together with the display, is mounted on a small PCB. The control is via a serial SPI interface.
The documentation indicates that the SSD1351 driver can also be controlled with 16 or 18 bits at the same time. However, the board, where both OLED display and driver are installed, only provides for the SPI interface.

Incidentally, there are several variants of this OLED-with-driver board; there is one with a slot for a micro SD card. You could store multiple images in it. Not really useful for our application.

The SPI interface has a small deviation: 4 instead of 3 wires are needed:

- CLK: the clock; after each pulse a bit is read from the data input:
- SD: the data input
- CS: 0 during bit transfer. This also indicates the beginning of a bit sequence (CS from '1' to '0').
- D / C: the extra connection; Data / Control:
  - 1: control bits, indicates what the subsequent data bits represent
  - 0: data bits

(Note: According to the documentation of the display, the D / C bit should be able to be sent as an extra bit in the data stream, so that you have units of 9 bits (1 byte + 1 D / C bit), and 3 instead of 4 wires. I was not able to get this working; the documentation is also not very clear about this.)

Documentation of the SSD1351 can be found at [3].

There are a number of color modes possible:

- 16 bits per pixel (in 2 bytes): 5 for red, 6 for green, 5 for blue
- 18 bits per pixel (in 3 bytes): 6 for red, green and blue

I opted for the first mode, where fewer bytes need to be sent over the serial SPI. Writing must be done as quickly as possible, so as not to get a "flickering" image. (The maximum bit rate of the SSD1351 is 4.5 Mb / s.)

Furthermore, there are many possibilities to, for example, move a line or a column across the entire image, to enter tables with gamma corrections, etc. Not really usable for this application.

The SSD1351 must be set to the correct mode after the voltage has been connected. All in all there is only one register that needs to be put right; the rest is already on the right value by default.

More interesting is how the pixels should be controlled. This goes as follows:

- Specify X start and end values
- Specify Y start and end values
- Send 2 bytes per pixel in which the color is recorded

Suppose that the pixels in the area between the (x, y) values: (10.30) to (12.33) must be described. The following bytes must then be sent:

D / C	Byte	meaning
0	0x15	Command X range
1	0x0A (10)	Start X
1	0x0C (12)	End X
0	0x75	Command Y range
1	0x1E (30)	Start Y
1	0x21 (33)	End Y
1	0x5C	Start sending data bytes
1	0xabcd	1st pixel (at (10.30)
1	0xabcd	2nd pixel (at 11.30)
1	0xabcd	3rd pixel (at 12.30)
1	0xabcd	4th pixel (at 10.31)
1	...	... (7 pixels)
1	0xabcd	12th pixel (at 30.33)

Where 0xabcd are the 16 bits with the desired color information (0xFFFF = maximum white). The use of the extra data / control bit D / C is also indicated here.

If more bytes with D / C = 1 are sent afterwards, writing starts again at the first coordinate. This stops until a control byte (D / C = 0) is sent.

To write to the entire screen, the start and end coordinates must be set to (0,0) and (127,127) resp., and then 32,768 bytes must be sent (128 * 128 * 2).

As said, for the constellation diagram, 1 pixel should be set ('on') and the previous pixel should be set off. This gives a lot of overhead because for each pixel to send at least the start coordinate should be given. Those are 3 bytes and then again 3 bytes (including a write start command) has to be given. So to set one pixel, 6 bytes have to be sent in total. (The final coordinate could be put at one time to (127.127).)

The solution is to build up the image in an array in the CPU and then send it as a whole to the display. As will be shown later this also gives the opportunity to significantly improve the quality of the constellation diagram.

ATmega CPU

The CPU must on the one hand convert the analog inputs to digital, and on the other hand control the display. The ADC conversion of the I and Q input must occur simultaneously.

I first went to see what is possible with an ATmega processor. This has one ADC, which can be controlled from multiple inputs via a multiplexer. This ADC can not be used directly for two reasons:

- Conversion of 2 inputs is not possible at the same time; that goes one by one . This means that the X and Y values do not belong together (are not of the same time).
- The analog input must remain stable during the conversion process. Apparently there is no sample & hold for the ADC in the processor.

These problems can be circumvented by setting up two sample & hold circuits for the ATmega. See fig. 2.

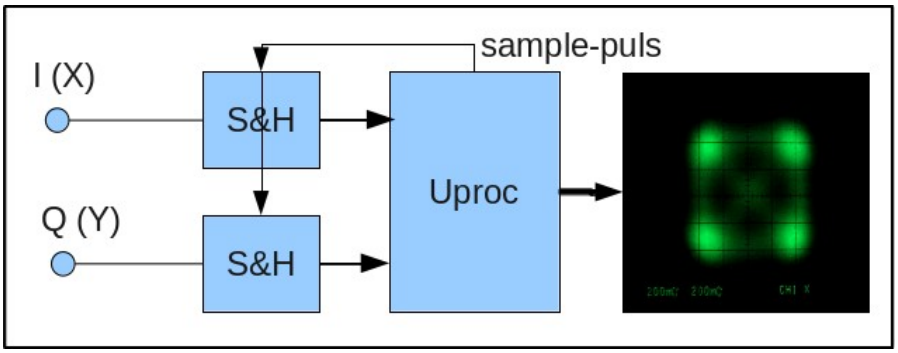


Fig. 2. Attempt to use an ATmega processor. The result shown on the right is what whe wish...

The CPU generates a sample pulse, both S & H do their work simultaneously. Then the CPU with the ADC can convert both samples one at a time.

Unfortunately, the ATmega that is used as standard in an Arduino (ATmega328) is not powerful enough to do this quickly and well enough. In particular, the limited amount of memory needed to store the pixels plays a part; more than 32x32 is not possible. That actually means that the resolution is only 32x32; too little to also make noisy constellation diagrams visible/interpretable. There are larger ATmega types, but also better alternatives.

STM32 CPU

In addition to the 8-bit ATmega processors, there are also 32-bit processors on the market, including ST's STM32F101 series. This processor offers many advantages over the old-fashioned ATmega:

- Much faster
- 32-bit processing instead of 8-bit
- Much more memory
- 2 ADCs with S & H circuit
- And ... cheaper!

Fig. 3 shows the so-called "Blue Pill", a board slightly larger than an ATmega-nano, but for less than 5 euros (the ATmega-nano "fake" must yield 7 euros). The Blue Pill contains the aforementioned STM32 processor, USB connection and programming connector and some small stuff. Enough to let it work independently.

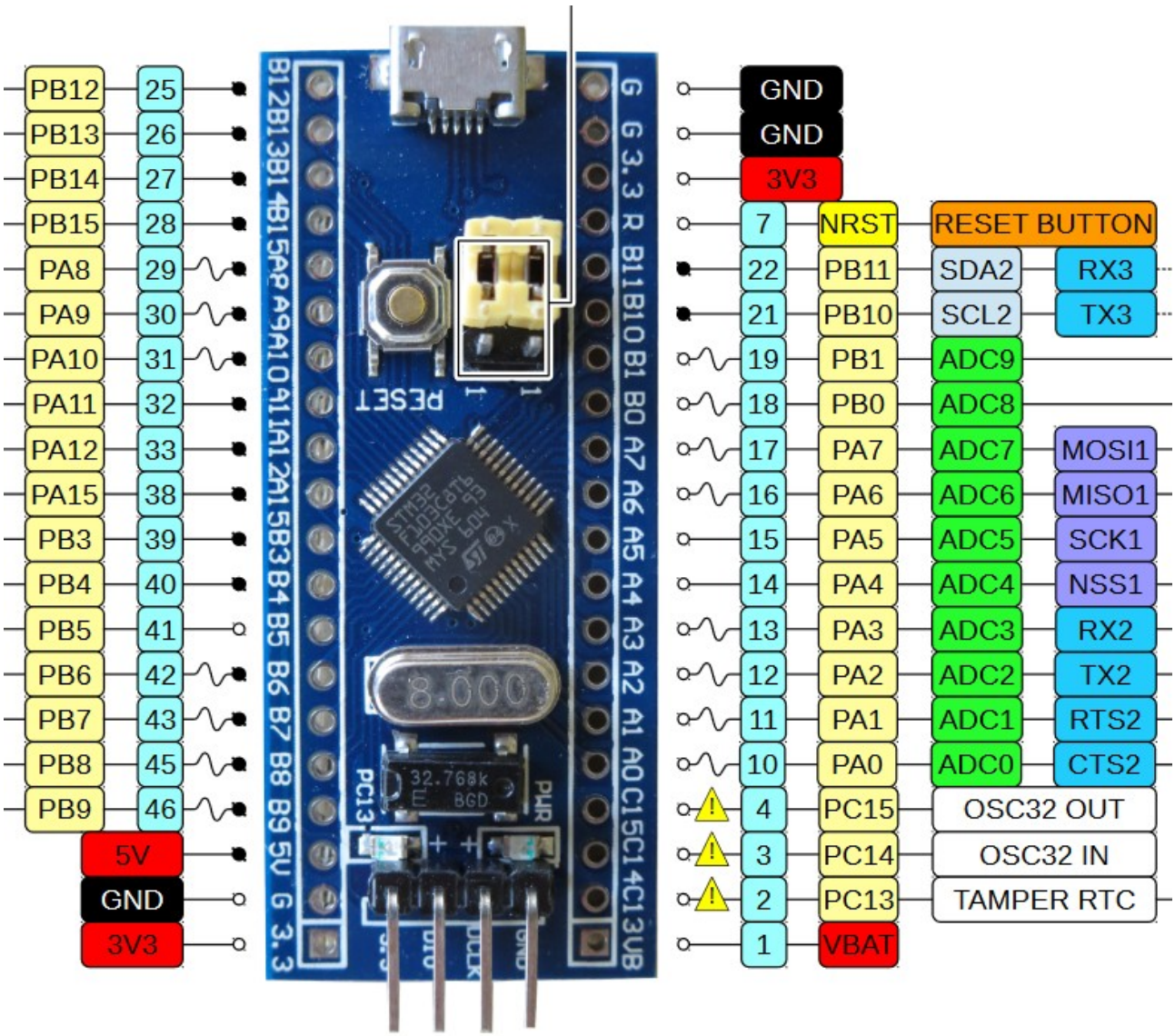


Fig. 3. Part of what is possible with the "Blue Pill".

As can be seen in fig. 3, there are several ADC inputs (internally there are 2 parallel ADCs). There is also an SPI interface that we can use well.

There are various options for programming this board. One is the Arduino environment; there are software libraries to make this possible. The switch from ATmega to STM32 is therefore very simple!
What else is needed is a programmer; the ST-Link (fig. 4). Also not really expensive; about 7 euros.

Fig. 4. Programmer for the STM32.

Glockenspiel.

The STM32 has an extensive possibility of internal clocks, to control the various components. An 8 MHz crystal is placed on the Blue Pill. The STM32 has a PLL on board with which the clock frequency can be boosted to a maximum of 72 MHz. There is also an internal 8 MHz RC oscillator and connections for a 32.768 kHz crystal for clock-related cases. We do not use this further.

With various dividers the different parts can be provided with the correct clock frequency. The OLED can handle a maximum of 4.5 Mb / s, so the SPI clock must have that value. That can easily be done by dividing 72 MHz by 16.

The ADC can handle a maximum of 14 MHz; this can not be achieved by dividing 72 MHz. Divide by 6 gives 12 MHz.

Not all settings can be changed “on the fly”. The PLL can only be programmed before it is switched on. In my environment (Arduino_STM32), PLL and partial factor of the ADC are fixed to the above values, but that could be changed if desired..

ADC

In the Arduino STM32 library, sample programs have been given for various parts. Unfortunately, there was no example for the use of the 2 ADCs in parallel, so for that I had to dive into the documentation of the STM32. [4] With 1134 pages not something to print out. Fortunately, you don't have to read everything ...

As mentioned, the STM32 has 2 ADCs on board. Both can be connected to one of the inputs via multiplexers.
The important features of these ADCs are:

- 12 bit resolution
- minimum conversion time: 1 us (14 periods of the ADC_CLK = 14 MHz)
  - S & H: approx. 0.1 us (1.5 periods of 14 MHz)
  - ADC: approx. 0.9 us (12.5 periods of 14 MHz)

With a clock of 12 MHz, the ADC is slightly slower:

- minimum conversion time: 1 us (14 periods of the ADC_CLK = 14 MHz)
  - S & H: approx. 0.125 us (1.5 periods of 12 MHz)
  - ADC: approx. 1.04 us (12.5 periods of 12 MHz)

The Sample time of 0.125 µs is fast enough to “undersample” a 3 Mb / s signal.

There are not many settings needed to get the dual ADC talking:

```
(* ADC1_CR1)  | = 0x060000; // dualmode
(* ADC1_CR2)  | = 0x000001; // ADON: enable ADC1
(* ADC2_CR2)  | = 0x000001; // ADON: enable ADC2
(* ADC1_SQR3) | = 0x00;     // channel 0, pin IN0 = PA0
(* ADC2_SQR3) | = 0x01;     // channel 1, pin IN1 = PA1

(* ADC1_CR2)  | = 0x0e0000; // set trigger to SWSTART
(* ADC2_CR2)  | = 0x0e0000;
```

For those who are not familiar with C:
On the left are the addresses that are set, eg ADC1_CR1 which has the address value 0x40012404. With:

(ADC1_CR1) | = 0x060000;*

the bits 17 and 18 at this address are set to '1' (and the remaining bits are left untouched); this is described in the documentation as:

Regular simultaneous mode only ([4], p. 238)

This sets the dual mode, ie the 2 ADCs work in parallel.
The last setting, indicated as:

set trigger to SWSTART

ensures that the ADCs are triggered together using bit 22 in register ADC1_CR2. (see [4], p. 240)

A double-sample can now be made with the following code:

```
(* ADC1_CR2) | = SWSTART_BIT;    // take new samples
while (! (* ADC1_SR) & EOC_BIT); // wait until ADC ready

x = * ADC1_DR;                   // read ADC1
y = * ADC2_DR;                   // read ADC2
```

With this we have taken the I and Q values of the receiver; the pixel must be set to the corresponding (x, y) position.
But first the I and Q values have to be scaled in the right way so that they fit nicely within the OLED range (0 ... 127.0 ... 127).

SPI

This part can also be easily initialized. For this, the settings can simply be used via the Arduino_STM32 library. This concerns the settings:

- bit-order: MSB first
- data mode: SPI_MODE0, this has to do with the position of the data with respect to the clock
- divisor for the SPI clock: parts of 72 MHz by 16 gives 4.5 MHz

Furthermore, a number of pins have to be defined. Some have already been done:

- SCK1 on pin A5 (the SPI clock)
- MOSI1 on pin PA7 (data)

The following pins are further needed:

- NSS1 on pin PA4 (this is the CS pin on the OLED display)
- DC_PIN to PB1 (the extra data / control bit, see chapter "Display")
- RESET_PIN on PB0

In chapter Display it is already explained how a pixel should be controlled.

Conversion (I, Q) to (X, Y)

The previous parts are straightforward: how do you read the I and Q values from the ADC, and how to control a pixel by position (x, y) in the display. What remains is the conversion of (I, Q) to (x, y). The simplest method would be:

- analogue in: range (I, Q) runs from 1.5 to 3.5V
- The output of the 12-bit ADC results in values between about 25 ... 2000
- Do scaling so that number range (25...2000) is converted to (0 ... 127):
  - x = (I - 25) / 16
  - y = (Q - 25) / 16
- Place pixel on this (x, y) on white
- Move previous pixel to black (so the (x, y) must be saved for 1 stroke)

As already noted, controlling a single pixel gives a lot of overhead (at least 6 bytes per pixel required). Doing it this way results in not much more than some shieking of dots.

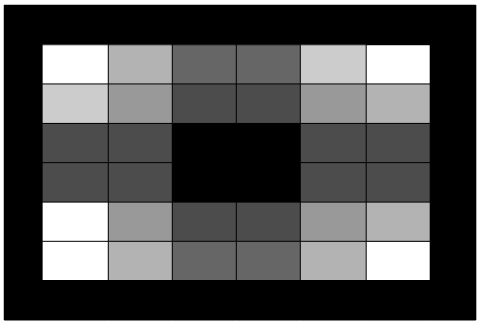
A further attempt was not to immediately put a point back on black but to slow it down. This requires an array to store the position of pixels that have been set so that they can be blacked out later. This gave slightly better results, but not yet good enough; a constellation diagram could only be recognized with difficulty.

Time to take a good look at the constellation diagram on a scoop; see fig. 1. What we see here is that the corner points are clear and the connecting lines weak. If the received signal is very strong, there are almost no connecting lines to be seen anymore. With weaker signals, where the connecting lines become thicker, the whole is still clearly recognizable because of the differences in brightness. So we have to mimick this some way.

The solution is to first build up an image in the CPU register and then transfer it to the display in one stroke. That building is as follows: A piece of memory is reserved as a matrix; The contents of all boxes is 0. A (x, y) -coordinate from the ADCs points so to say to one memory location. The number at that location is incremented. After a number of iterations you end up with something like:

0	0	0	0	0	0	0	0
0	9	6	3	3	7	9	0
0	7	4	1	1	4	7	0
0	1	1	0	0	1	1	0
0	1	1	0	0	1	1	0
0	7	4	1	1	4	7	0
0	9	6	3	3	7	9	0
0	0	0	0	0	0	0	0

By sending the numbers in this matrix as brightness to the display you get:



This is, of course, very crude, but with a resolution of 64x64 an entirely acceptable picture

is created. The STM32 appears to have just too little memory to contain all 128x128 pixels, so 2x2 points are merged.

In the program 8192 (x, y) pairs are now treated in this way before the result is sent to the display. The matrix is reset to 0 and then again 8192 pairs are treated.

In black-and-white the luminance lies between 0 and 31 (green has 5 bits). For red and blue, with only 4 bits available, these are only 16 values, so the points are not always pure gray. You hardly see that in practice. Incidentally, you can also choose to display the constellation diagram in a color, eg green. It is just a matter of how the luminance from the array is translated to RGB.

The repeat frequency is, due to the long integration time, approx. 6 Hz, so 6x per second the display is refreshed. In practice, that is not annoyingly low. But it is possible to speed up; for example, with twice as large steps integrate half of the time.

In the extreme case you "integrate" in 1 step to the maximum value so that you only get black and white, without shades of gray. That does not look good, but shows that the chosen method, with shades of gray, works well.

Now there is another point: scaling of the numbers coming from the ADC to the OLED range. This can be done with formulas as given at the beginning of this chapter, but it can also be done automatically. To this end, the minimum and maximum values are determined for a number of (x, y) values. From this the parameters can be calculated with which the constellation diagram can be optimally recorded in the screen:

- offset = xymin
- slope = 127 / (xymax-xymin)

With which the final values will be:

- x2 = (x1 - offset) * slope
- y2 = (y1 - offset) * slope

The minimum and maximum values of x and y are taken together so that also in the case of HRPT, where the y-values have a smaller range than the x-values, not a y-directionally stretched whole is obtained.

The disadvantage of this automatic scaling is that the whole can "wobble" a bit. In practice this is not so bad. Note that scaling is possible because we have 12 bits available while only 5 are needed. As a result, the number of gray gradations does not decrease.

Scheme.

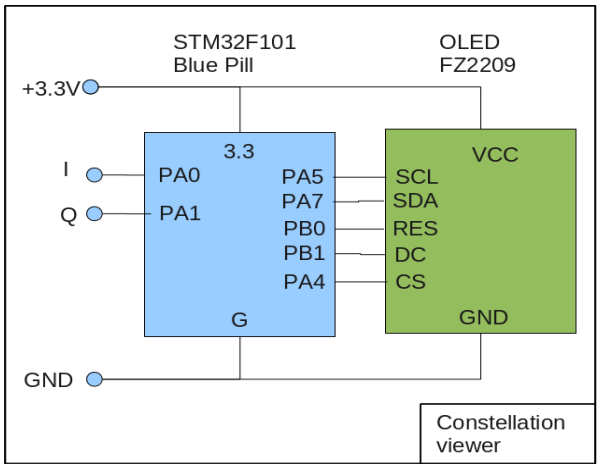


Fig. 5. Schematic.

The schematic is very simple; see fig. 5. Thanks to automatic scaling, no potmeters in the I and Q lines are required to adjust offset and attenuation.

Fig. 6, on the front page, shows an experimental setup. At the bottom the USB interface for programming is seen; can also to be used as a (temporary) power-feed. The wires at the top can be connected directly to the P2 connector of the receiver ("XY-scope").

During experimentation, the whole can be fed from the ST-Link programmer; no extra power is then required. The programmer must be connected to the 4 lower pins (see fig. 3). See also fig. 7. The OLED may also remain connected to the Blue Pill during programming.

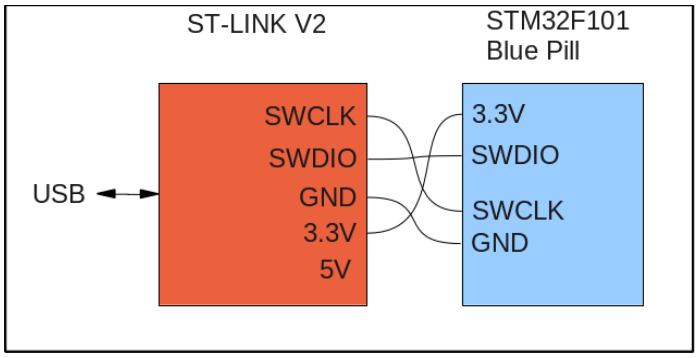


Fig. 7. Programming the Blue Pill.

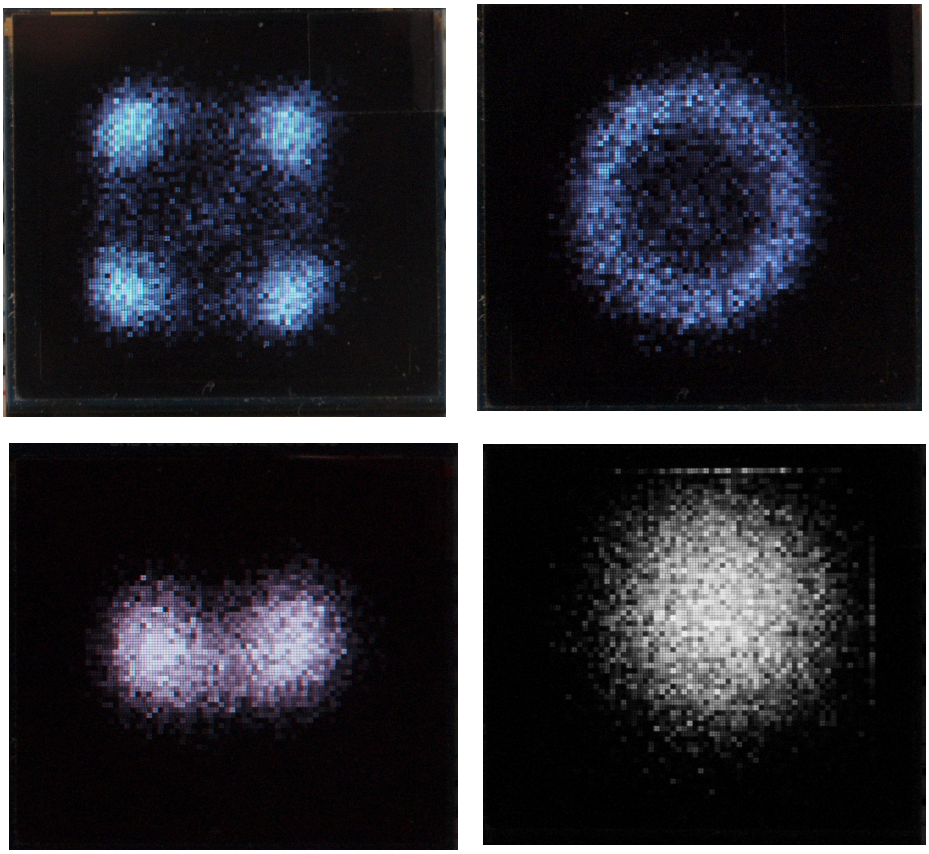


Fig. 8a, b, c, d. Constellations on the OLED screen.

Above a strong METOP; same but with the demodulator out of sync.

Below a not too strong Meteor (PSK) and just "noise".

The programming environment.

There are a number of possibilities to create and load programs for the STM32:

- Arduino environment
- STM32 workbench, works with Eclipse

The Arduino environment is easiest to get to work, especially if you've already Arduino installed. It is just a matter of installing the extra STM32libs need to be installed.

Instructions can be found on the internet; see [5]

Only 2 actions are needed:

- In Arduino:
  - menu Tools -> Boards -> Boards Manager
  - Install the "Arduino SAM Boards" package
- Download a zip file containing the Arduino STM32 files from here .: ([6])

The zip-file must now be extracted on position: (Windows)

- C: \ Users \ <user> \ Documents \ Arduino \ hardware

Result:

- C: \ Users \ <user> \ Documents \ Arduino \ hardware \ Arduino_STM32 master \ drivers etc.

Now close Arduino and restart. Go to menu: Tools-> Board

If all went well, this menu has now been expanded with a number of new items. Select:

- Generic STM32F103C series

Then, in Tools-> Upload method:

- STLink

Now you can create, compile and upload programs in the usual way.

Note: With Arduino it is also possible to load a bootloader, as usual with ATmega processors. The STLink may not be necessary and the Blue Pill can be programmed via USB. I have not tested this further.

Note: Installation on Linux is just as easy.

Code

The software can be downloaded from my github account; see [7]. The code is divided in pieces in such a way that another display type could easily be added.

References

See www.kunstmanen.net , menu Weblinks.

[1] My first picture. De Kunstmaan nr. 2, 2018
[2] constellation viewer Oleg
[3] documentation SSD1351
[4] STM32 documentation
[5] Installation procedure STM32 with Arduino
[6] zip-file with STM32 libraries
[7] Software

Patch antenna vs helical for the 1700 MHz

Summary

In this article we describe a field test between the patch antenna and the helical.

preface

Several members have already recreated the patch antenna from Oleg [1]. It was time to see if we could measure this. The patch antenna was built by Peter Smits and has already proven itself in the reception of weather satellites.

Measurement setup

The transmitter is a synthesizer of Mini Circuits at 1698 MHz with an output power of 2dBm . A Meteosat can- antenna is used that unipolar broadcast and is rotatable. The idea is to measure the maximum and minimum level while turning in order to measure the circularity of the antennas to be tested.

The transmitting antenna with the 2dBm synthesizer

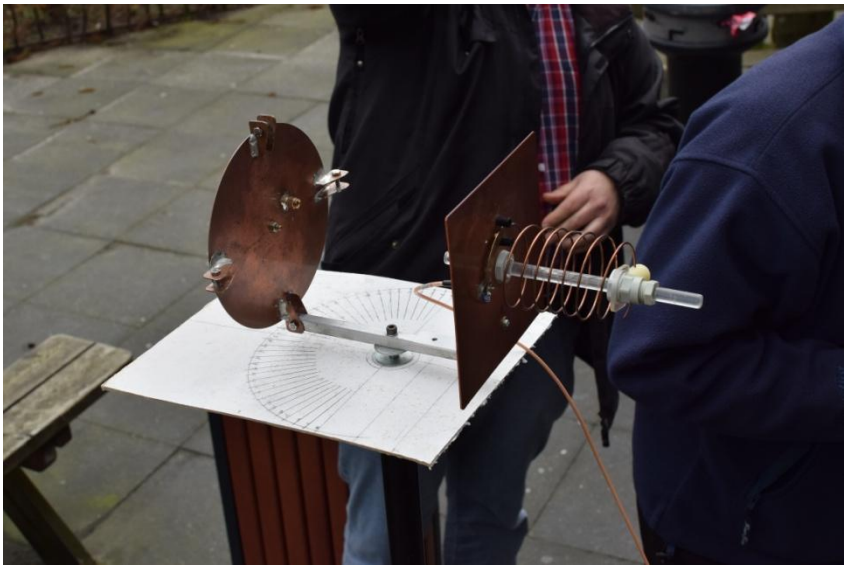
The receiver is the Siglent spectrum analyzer. To be sure, we had brought an interdigital filter to suppress interference, but this was not necessary.

The measurement setup was not automated. In the past an automated setup was made with a BBC computer .

We have taken the measurement outside. The transmitter beamed towards the building, the receiving antenna looked from the building, in order to avoid as many reflections as possible. The measuring distance was 3 meters.

Measurements

The opening angle could be determined by simply rotating the receiving antenna. The transmitting antenna was also rotatable and, if we were able to determine variations in cicularity.



Two antennas on one arm , left the patch antenna , right the helical

We measured the -3dB, -6dB and the -10 dB point. The latter is often taken as the starting point for the opening angle of the satellite dish. The illuminator for a dish antenna is a compromise between one that only looks at a part, the center, of a dish and an illuminator that also looks over the edge of the dish and thus absorbs noise from the earth. The -10dB point is apparently the optimum angle.

	Helical	**Patch antenna**	**Specification patch antenna**
Level maximum	-28.8 dBm	-28.0 dBm	
-3 dB	50 degrees	70 degrees	85 degrees
-6 dB	75 degrees	85 degrees	
-10 dB	95 degrees	105 degrees	120 degrees
Circularity	4.2 dBm	1 1 , 6 dBm	
Sensitivity to circular signal	-30.9 dBm	-33.8 dBm	

Determining the opening angle is simply done by hand.

Conclusion

It is very hard to draw a conclusion. The sensitivity of the patch antenna is 0.8dB higher, this is not very much. It does, however, add directly to the noise figure of the receiving system. What we have not measured is sensitivity over a larger frequency range: from 1698 to 1707 MHz.

Because the antennas are not perfectly circular , we can probably assume the average measured value between maximum and minimum when the transmitting antenna is running for a circular transmission signal. The helical then does 2.9 dB better.

The measured opening angle of Peter's antenna is much smaller than that according to Oleg 's specifications , despite the fact that it has a raised edge around his patch antenna .

[1] Patch antenna Oleg

http://www.sat.cc.ua/page3.html

From the Library

Dear people,

What a great Workgroup we have! And this time I mean what I say. I see the Workgroup as a precious little receiver disk, which we all hold upwards. But that does not happen by itself. The little receiver disk could fall down and then it is bent. Just look at another club, there they have dropped the little disk and now they are in the chaos on the ultrashort waves. Let us tell each other, with which we keep that little dish up, more often that we greatly appreciate ourselves! (mocking the dutch prime minister here, when peptalking in view of coming elections. Can't translate that well, sorry)

That passage of the New Horizons probe along Ultima Thule has become a bit of a disappointment. It was a gray peanut rock, just like that comet a few years back. And no spectacular colors or steam plumes, and then it does not appeal to the imagination; that is how things work in publicity. Technically, I think it's a real treat to enjoy, and NASA is already looking for a next visit address as well. The data from the peanut rock will need another 18 months before everything is transmitted. I would like to know what the residual power and the speed and so on are, but I have not been able to find much. I also want to know how much weaker the signal from the distance is compared to what we get on our dishes. Not that I can do anything with it, it's just for the idea.

Earlier I wanted to say something about the USB microscopes which you can find with Elektor. On visiting a dissident VERON department, I saw a very small microscope for mounting small print components. It is standalone, 2 decimetres high, with its own screen of 4.5 inches and it costs 50 euro ex customs costs. Well photographed, he looks impressive too. Maybe nice for the miniature solderers among us. I spoke to the owner about the fragile triangle of Alibubbles - reliability - quality and he said very realistically that you can not avoid it in the hobby. That's true. The USB microscope at Elektor is also very affordable at 90 euros and it is difficult to choose. I have not yet been able to find an independent comparative test.

OLED displays are beautiful and affordable, but small. On Elektor

found: a tri-color screen of 2.9 inches for 25 euros. It talks via SPI. I already saw the employability on the WRX in front of me with blush on my cheeks, with relevant numbers and the constellation diagram of Rob Alblas, until I saw a parameter refresh rate of 15 seconds. It is therefore intended as an e-paper. It is not a big OLED like I first thought. Missed target. Too bad, but our chance will come. OLED for our use will in time get bigger and more affordable.

You will receive a newsletter from our club shortly before the bi-monthly meeting. Some people have noticed that they suddenly no longer received them, including me. Please see if you received it shortly before the March meeting. If not, just let us know. With me, it almost escaped attention and memory may miss know and then.

Speaking of memory. If you collect beautiful satellite photos, you need a lot of storage space. This can be done on a hard disk, but also large semiconductor storage comes slowly within reach of our ordinary people. Almost. There is now a 1TB SD card from Lexar. With that, you can save a small million photos, so I estimate. If you read how much it costs, you will jump to the next paragraph: $ 500.

A large modern TV has finally appeared here at home by command from mrs. Librarian in Chief. I must admit, the old one with a CRT did indeed have some flaws, such as the changing focus. That new TV is much sharper. A big improvement! Now you also see much sharper that those programs are not worth the effort of watching. The average weather picture is much more engaging, much more inspiring. So I effortlessly flee the couch and dive behind the laptop to give my forces to the Working Group. These days there is supreme motivation and concentration with

your librarian

METERK

UKW-Berichte

Ben Schellekens

Summary

In this article a small review of articles published in the 4 th edition of 2018 of the German magazine UKW- Berichte. We have a subscription on this magazine.

At the last moment of the new year, the fourth edition of UKW-reports came up. To relieve our librarian from writing a summary, I have taken on this beautiful task. Please let us know if you like the subscription!

The fourth edition of 2018

The first article is by Wolfgang Schneider about a low-pass filter to suppress the harmonics of a signal from a GPSDO (GPS disciplined oscillator).

The signal from a GPSDO is often a square wave. As is known, a square wave consists of an infinite series of sinuses with different amplitudes. The purpose of the filter is to suppress all these harmonics .

The described five-pole filter is of the Tschebyscheff type . Characteristic of this type of filter is the steep damping. Values from the E12 series for capacitors and coils are given for three different frequencies . The structure of the filter is made of SMD 1206 components and no adjustment is required.

Ansoft Designer SV and Elsie from Tonne software were used to simulate the filter .

Sigmund Werner writes about frequency multipliers for the 76! GHz with output capacities up to 525 mW . The housings are milled from brass. The parts are on Al2O3 printed circuit board, connected with gold wires. Nice this frequency range, but unreachable for the amateur. Well nice to see that the technology is no different than at lower frequencies, just everything is very much smaller.

The "permanent" author Gunthard Kraus writes about a low-noise and economical amplifier stage for the 70 cm. The BFP420 from Infineon is used as a chip . Here too Ansoft Designer SV is used for the simulation .

The well-known tin cans are used for the housing . The starting point is that the print must be removable. For example, he placed the print on spacers for the first prototype. The problem is that the spacers start to act as a coil to ground, 3 nH per spacer. For the second prototype he has soldered a 10mm thick brass block in the tin can! The print can be screwed on here. Well, it may weigh a little and cost.

Heiko Leutbecher writes about MMICs and LNA for the 70 cm band. To achieve a higher output power are discussed both parallel and opposite phase variants. As a semiconductor, the PGA-103 and the ATF-54143 are tested.

Perhaps unnecessarily: UKW-Berichte is a German-language publication, without an English translation (as with the Dubus magazine). You don't have to leave it for the money either: the magazine, including shipping from Germany, costs 32 Euro per year.

Annual report for 2018

The first meeting in the new year was on January 6 , the first Saturday of the month. The Nimeto has opened especially for us. Fred was back from Vietnam. Compared to last year, the weather was good, no snow or sleet. There were 22 members present, two had also brought their wives for the occasion, nice!

Your chairman told us during the New Year's speech that we should go to 7.8 GHz . It has to be possible. We will have to redesign many things, but this is a fun challenge.

It was also the time to thank Harry Arends for his 12-year editorial role! Due to health reasons, he is unfortunately no longer able to make up the Kunstmaan. He will focus on the HRPT decoder print and the rotor control from SatNOGS .

During the survey, Arne again showed various things from China. Wim told about his experiences on the 8 GHz . Job had taken his entire receiving installation with him.

The drink was offered by the board . The pleasant meeting lasted until 3:30 PM.

The second meeting on 3 March, a week earlier than usual due to the open house on 10 March. No happy date due to spring vacations. After a cold week, snow had fallen in the south. Several members had cancelled due to illness. The turnout with 14 members was therefore low.

The lecture "To the 7.8 GHz " was given by the chairman and was a compilation about what is known and the problem for receiving the weather satellites in the 7.8 GHz band.

Peter Smits had brought his interdigital filter, made of copper plate. This was measured with the new SA from Arne . Many members were infected by the SA virus .

The General Members' Meeting was on 19 May. With 21 attendees, it was a busy meeting. The canteen of the Nimeto , our host, was renovated. Along the sides were couches made of wood scaffold placed t. Various members made use of this.

Your chairperson has cleaned up his attic and offered the things that will no longer be used to the club. There were four categories : free, one Euro, two Euro and five Euro. The first category was of course the fastest.

It was the meeting themed "experiments on the 7,8GHz". The presentations were from your chairman, Job, Peter and Wim. Ben showed a signal generator and a down converter for the spectrum analyzer. Job showed a tape converter, mixer and various

horns (made by Peter). Wim told about his 7.8 GHz installation. At the campsite he was unfortunately unable to receive the NOAA20 with a 60 cm dish .

We interrupted the ALV for the live reception of a FengYun satellite. Job had taken along and set up his entire installation. A unique, live reception from AHRPT at a meeting!

Live reception at the May meeting

After a long, hot and dry summer, there was another regular meeting on 8 September. In total we were 15 people, not as much as usual. On this day we also have to compete with the UKW tagung in Weinheim .

It seems that another meeting is being organized by the GEO in Darmstadt in 2019 .

During the lively survey, Paul told that there were also acid-free! S-39. Furthermore, the tip of Fons to adjust the illuminator at the focal point, also GLONASS satellites can be used. These satellites move up slowly across the sky , so you have enough time to adjust . On the 7.8 GHz a German amateur is busy designing / building a downconverter. Furthermore, there are not many progress in this area.

Rob gave a very interesting lecture about the use of a VCXO in the HRPT / QPSK decoder . The difficult adjustment has been eliminated. Harry Arends is busy designing a print where the VCXO is included.

The last meeting of this year was on 10 November. The theme was measuring is knowing, or guessing is missing, or gambling is docking. Your chairman gave a short

lecture about a reflectometer on the 8 GHz and a spectrum analyzer for the 1090 MHz (ADS-B antenna).

It was pleasantly busy with 21 attendees. Also at this meeting many things that were donated to our Working Group, among others from the legacy of Jan Mahieu.

Arne has measured various patch antennas , designed by Oleg . The impedance curve looked very good. Unfortunately no practical measurements yet. Questions to be answered are: how large is the opening angle and how sensitive is this antenna to GSM signals .

Trade shows , meetings and presentations

We were back in Rosmalen on 17 March. It was cold outside and there was an icy east wind . This did not stop many people from visiting the fair. The stand crew consisted of Arne , Ben, Hendrik, Herman, Rob and Timo. Job came as an ordinary visitor. It was a nice fair and we met a lot of old acquaintances. Hendrik and Arne provided live reception of the MSG. Due to the strong wind, the dish was blown over several times.

We were on the open day of Estec

On October 7, 2 018 was the open day of ESTEC, here we were represented! Because we as a Working Group are members of the Dutch Association for Space Travel, we had the opportunity to act as a stand crew. We did not let this be said a second time. With the QPSK receiver , rollup banner and leaflets we were

able to stand there in the Sunday morning. The NVR stand was in the NL-Space 'tent'. When André Kuipers spoke to the children, the place was completely filled.

On November 3 we were on the Day for the Radio Amateur . Due to the demolition of the America Hall in Apeldoorn i s stock market from this year's IJsselhallen in Zwolle. We had a lot of attention, probably because our stand was downstairs. Our stand was very spacious, next time we will make our own seat! We stood next to the measurement club and Camras . Despite a greater trip distance it was a successful day.

Participants were Rob, Hendrik, Job, Wim and the undersigned, unfortunately Arne could not be present. Job had again brought his 3D-printed rotor with saucer, which attracted a lot of attention. Hendrik took care of the decoration of the stand and, not unimportantly, he made sure that we had immediate reception from Eumetcast . With a cable of 75 meters we managed to arrange the dish so that it looked past the building. The laptops for the screen shows did not have to come this year because we had taken over with a number of Raspberry Pi's.

Stand of the working group at the fair in Zwolle. The slideshows on the monitors are played by Raspberry Pi's.

The Kunstmaan

The Kunstmaan was published four times in full color in 2018. A total of 112 editorial pages were published, in 2017 there were 104.

All four Kunstmanen were compiled and made up by Fred. Fred has temporarily taken over Harry's work, awaiting a final editor. The preparation of the Kunstmaan is a kind of continuous process . When an article is delivered as a draft, it will be drawn

up as a draft. In this way you get a good picture of how the new Kunstmaan looks over time. For example, the last few steps weigh less and there is less time pressure when approaching the deadline. We are very happy that all these years we have managed to lay down a neat Kunstmaan for the members every time.

The Satellite Status of Arne was a regular section. Another permanent part of the Kunstmaan is the report of the meetings recorded by our treasurer / secretary ai Rob Alblas .

Fred van den Bosch placed an article in every Kunstmaan entitled "Weather satellites in Vietnam". In it Fred described his experiences with the reception of weather satellites in Vietnam (now also with QPSK reception) and what he encountered while practicing the hobby. Our librarian Paul has provided nice contributions from the library. In the latter he expresses his concern about the four full cupboards that we have below at Nimeto . The plan for 2019 is to do something with this.

The March issue contained a list of members as a separate attachment. The front plate was adorned with Mr. Still 's receiver , who built the QPSK receiver from separate parts . His satellite dish is on page 25 , with three messages ! In this issue also the financial overview for 2017, the annual report 2017 and two reports of the January and March meetings , all of this by Rob. There was also room for technology. Rob describes a channel selector for Eumetcast . Due to a new version of Tellicast , it was necessary to deal with the channel selector . Fred describes how to align an XY dish . The tuner print of the QPSK receiver also had to be adjusted because the UV916 is no longer available and the UV1316 is (I still have enough). Also a story about the control of a Weinschel attenuator from the dump. We are also dealing with the AVG and Paul has written a short story about this in this Kunstmaan.

The June issue again had a First-image article. Fred receives QPSK satellites ! Although he had brought a working recipient, he had to be adjusted again in Vietnam . With the help of several members, this was achieved remotely. And Rob also had to believe: he can now also do QPSK with a 65 cm dish. Rob besc h also made the adjustments in wsat , now that he has also become an experience expert . From my hand the description of a band converter for the Rigol DSA815 spectrum analyzer . It is Harrie's design, but with a small print . I started with the first experiments on the 7.8 GHz : a signal generator with the ADF4351. I also measured the Neosid 1690. A filter that you do not need to adjust. The attenuation in the passage area is 2.5dB.

The front page of the September Kunstmaan showed various constructions that the members had made. One of these is the band converter for the Advantest R33361A spectrum analyzerthat Job has designed for the 8 GHz . The VCO of the decoder must be adjusted for the different bit rates that come in. Rob describes a fractional

divisor in the FPGA in combination with a VCXO. From my hand a short story about testing the VCXOs . Rob describes the expansion of wsat to "obscure" interference lines.

On the front page of the last Kunstmaan of 2018, the patch antenna for the 1700 MHz that Peter Smits made was displayed. Rob describes the power supply issues for the QPSK1700 receiver and the HRPT decoder . He has also expanded the decoder with a number of measuring points and a better generator. From my hand a description of an ADSB receiver for receiving flight data from aircraft with a Raspberry Pi and Power over Ethernet. Also in this Kunstmaan something about measuring equipment: the DE-5000 LCR meter and Job has HP measuring equipment up to 26 GHz .

The Digital Kunstmaan

In addition to the Christmas wish is the Digital Kunstmaan four times released in 201 8. As far as can be ascertained, the Digital Art Moon is well read. The opening percentage is around 80 percent, this is very high. 23 percent view the mailing from a mobile and the rest from a desktop.
The mailing is sent about two weeks before the meeting.
Let everyone who has a nice news for the digital Kunstmaan pass this on to redactie@kunstmanen.net.

Website

Despite all the good intentions, not much concrete has happened yet with regard to a new website.

Satellites

The MetOp-C was launched with a Soyuz rocket from Kourou on 7 November . This is the last satellite from the MetOp series . The first was launched in 2006 and the second in 2012. The satellites run in the same orbit with an equal distance of 120 degrees.

Financial overview 2018; budget 2019

This is an overview of income / expenditure for the calendar year 2018. The actual income / expenses can be (partly) made in another year.

The 2019 budget is also included here. The loss in 2018 has decreased slightly. For the time being we can bear this loss, but in the long term we will have to look at measures. We keep an eye on it.

From 2019 a PDF subscription has been introduced for non-Dutch speakers. The income from membership fees will decrease, but the printing / shipping costs will also be less.

If there are questions about this overview, I would like to hear that before the annual meeting (May 2019) so that I can explain on that day.

expenses	2017	2018	2019			income	2017	2018	2019
	Realisatie	Realisatie	budget				Realisatie	Realisatie	budget
Print+postal costs KM	€ 2.370,00	€ 2.450,00	€ 2.300,00			membership	€ 2.585,00	€ 2.765,00	€ 2.750,00
rental Nimeto	€ 319,00	€ 319,00	€ 320,00						
beheerder Nimeto	€ 400,00	€ 400,00	€ 400,00						
Beurzen inschrijving	€ 116,00	€ 126,00	€ 130,00			Rent Zki bank savings	€ 8,62	€ 2,32	€ 0,00
expenses projects	€ 1.168,70	€ 220,26	€ 50,00			sell given app.	€ 0,00	€ 229,00	
memberships.	€ 84,00	€ 84,00	€ 90,00			gifts	€ 200,00	€ 0,00	€ 0,00
Internet fee	€ 57,20	€ 57,20	€ 60,00			sell. Components projects	€ 1.905,00	€ 285,00	€ 0,00
bank costs	€ 138,00	€ 144,93	€ 150,00						
paypal costs contr.	€ 16,86	€ 18,24	€ 20,00						
Stamps etc.	€ 30,70	€ 21,00	€ 30,00						
						loss	€ 626,84	€ 564,31	€ 800,00
refund membership	€ 25,00	€ 5,00							
refund Projects	€ 600,00	€ 0,00							
Result expenses	€ 5.325,46	€ 3.845,63	€ 3.550,00			Result income	€ 5.325,46	€ 3.845,63	€ 3.550,00

Balance 31-12-2018

Activa	2017	2018		Passiva	2017	2018
ZKI avings account	€ 8.634,22	€ 7.936,54		Eigen vermogen	€ 8.186,60	€ 7.622,29
Bank	€ 707,38	€ 1.108,67		membership next year	€ 1.155,00	€ 1.422,92
Total	€ 9.341,60	€ 9.045,21		Total	€ 9.341,60	€ 9.045,21

Overview end-of-year accounts.

	2013	2014	2015	2016	2017	2018
Savings accounts	€ 10.220,41	€ 9.905,62	€ 9.354,50	€ 8.625,60	€ 8.634,22	€ 7.936,54
Pay accounts	€ 1.675,72	€ 1.628,19	€ 1.409,25	€ 1.045,26	€ 707,38	€ 1.108,67
cash	€ 1,82	€ 1,82	€ 0,00	€ 0,00	€ 0,00	€ 0,00
Total	€ 11.897,95	€ 11.535,63	€ 10.763,75	€ 9.670,86	€ 9.341,60	€ 9.045,21

These are the amounts on the various accounts at the end of a calendar year.

Overview of memberships and income.

	Realisatie 2017		Begroting 2018		Realisatie 2018		Begroting 2019	
	aantal	inkomsten	aantal	inkomsten	aantal	inkomsten	aantal	inkomsten
Netherlands	74	€ 1.850,00	73	€ 1.825,00	77	€ 1.925,00	84	€ 2.100,00
Foreign	24	€ 720,00	28	€ 840,00	28	€ 840,00	19	€ 570,00
PDF							8	€ 80,00
Special member	9	€ 0,00	9	€ 0,00	9	€ 0,00	2	€ 0,00
Total	107	€ 2.570,00	110	€ 2.665,00	114	€ 2.765,00	113	€ 2.750,00

The number of members has decreased slightly in 2019. The number of "special members" (exempt from membership fees) has decreased drastically; members of the board now also pay. Hence the increase in members of the Netherlands in the above table. The table below shows the membership progress in the past 5 years.

jaar	af	bij (tot nu toe)	aantal leden
2019	-4	1	111
2018	-4	9	114
2017	-9	11	109
2016	-6	1	107
2015	-8	2	112

Rob Alblas

treasurer

Report members meeting January 5, 2019.

Opening by the chairman.
The chair wishes everyone a good 2019.
Fred vd Bosch is particularly thanked for his dedication as an editor. We are looking for someone who can take over his job.
Also thanks to other people who in one way or another have worked for the working group.
The member base is currently stable; a few cancellations and about as many new members.
In July there is an excursion to Darmstadt. We want to try to profile ourselves in one way or another.

Last year we had 5 meetings. At one of them we had live reception of HRPT thanks to Job with his rotor system.
For lectures in 2019, we are thinking of a new network analyzer, noise measurements, and perhaps something about reception of weather balloons. People are invited to think about these or other topics.

We have received an invitation to participate in the air force days in Volkel; we are still looking for stand crew. They are 2 days; 14 and 15 June. You have to be present at 6:30 in order to be able to enter the grounds by car.

Furthermore, we are thinking of more “new techniques” for satellite reception; Raspberry Pi, something with smartphones?

The newsletter is not received by everyone. This is always sent a few days before a meeting. Check the spam box. The offering via Mailchimp also sometimes causes problems; sometimes even an old newsletter is sent. The latter is then for the board to check and resolve.

Report meeting
No comments.

Setting the agenda
No comments.

Administrative affairs, editorship
We are looking for a replacement / backup for the editor.

Satellite status
Given by Arne, see elsewhere in this Kunstmaan.

Any other business
Harrie v. Deursen has 3 Jaeger rotors on offer, 55 euros each.

Wim Bravenboer has ordered an 8.4 GHz LNA. Connection is via waveguide and N-connector. To be used for our 8 GHz project.
He also wants to mount 2 dishes on a single rotor system; that should be possible.

Job de Haas has been busy with measurements more than with reception. Among other things, he uses GPS to check measuring equipment in terms of frequencies.
He is also working with a noise source up to 10 GHz

Elmar experiments with making / exposing printed circuit boards using blue power LEDs placed in an array.

Ben Schellekens is working on a print for a 1000-divider that works up to 13 GHz.

Arne: has some plastic canisters (from Jewish cakes) to use to protect an LNA for weather influences. These are transparent to RF. After a while these buses will disintegrate, though.

He also has a measuring bridge (directional coupler); the terminating resistors must be checked.

Rob: Is busy setting the tuner frequency automatically, depending on which satellite is being received. The FPGA in the decoder has already been adapted for this.

Ben reports that there is a measurement day on 19 January in Heelweg.

Closing

After the traditional new-year drinks, 2 lectures will be given.

Reading: 8 GHz downconverter
Ben has compiled some diagrams for an 8 GHz downconverter. Modular construction so that the different components can be tested separately:

- LNA (from loetlabor-jena.de, a 8.4 GHz LNA) [1]
- Oscillator with ADF4351, 2200 MHz
- 3x Multiplier to make 6600 MHz [2]
- Mixer, with which 7800 MHz is converted to 1200 MHz; see [3].

Using this information, the 8 GHz project was discussed.

Lecture: Constellation viewer
This viewer is made with an ATmega processor and OLED display with 128x128 pixels. Rob shows how far he has come with this. The Amega now used is actually too slow and too small; there will be further testing with a STM32. (See elsewhere in this Kunstmaan.)

Rob Alblas
(secretary AI)

References: (see web-site)
[1] LNA from loetlabor-jena.de
[2] multiplier:
[3] Mixer: story Paul Wade, with MCA1-12G + from Minicircuits

Report members meeting 9 March 2019.

Opening by the chairman.
A greeting from Peter Kuipers from Curaçao.
A visit to Darmstadt would take place on 4 July. We hear, however, that this visit may be canceled due to lack of interest.
Of the attendees there were in principle 8 interested parties, but only 3 have registered so far. You will be called to sign up.

There is a new decoder print, which has to be tested. Ben has the schematics.

Ben is going to make a so-called geodetic antenna for 1700 MHz. This would go to about 6 GHz, so not suitable for the X-band.
From Eumetsat comes the message that now all data on the whole hour as "essential" can be received free of charge. The question is whether an EKU is needed. According to Rob, that EKU is now free. (Incidentally, the Tellique software is now also free of charge.)

Ben asks if everyone has paid his membership. Rob reports that 3 members have not paid (not even after 2 reminders) but they are not present now.

Ben took again some things from his "attic"; the proceeds are for the workgroup.

Report meeting
No comments.

Setting the agenda
No comments.

Administrative affairs, editorship
Job will take over Fred's editorial office in due time.

Satellite status
See elsewhere in this artificial moon.

Any other business
Harrie: will do comparative measurements on a patch versus helical antenna. We also look at the selectivity with respect to interference signals.

Rob Hollander: tried the programming environment 'Eclipse' for the STM32 processor, but he can't get it to work. Job did get this environment to work but it's not that easy.
Rob reports that you can also program the STM32 via the Arduino environment, and that this is much easier to get started.

Harm shows a self-made patch antenna for GPS; this appears to work well.

Job: is working on a noise source.

Peter Smits shows an arrangement of a transmitter-in-bus and patch antenna, which will soon be tested.

Elmar: shows an exposure box with UV-LEDs to create printing circuit boards.

Timo: shows some wave pipes for X-band experiments. They are types WG14 or WR137, with internal dimensions of 35x16 mm.

Ben shows an arrangement with a variable attenuator up to 18 GHz, complete with control of that attenuator. Must still be tested.
He also recommends two books:

- The darker side (Robert Lacoste): The book treats "airy" a wide range of subjects that are considered by many to be difficult, such as: impedance matching, microstrip techniques, signal processing (FFT), PLLs and digital communication techniques (FSK, QPSK) .
- Kicad like a Pro: for people who want to start with the Kicad print design package.

Together with Hendrik, Arne is working on equipment for spot welding.
He also reports that Texas Instruments now has a chip with 4 AD-converters / DA converters, which can work up to more than 4 GHz. This would enable an SDR system to be made for high frequencies, eg 1700 MHz, where the input signal does not first have to be converted to a lower intermediate frequency. The type number is AFE7444.

Rob has been able to convert the (A) HRPT decoder for frequencies up to 20 MHz, so that NOAA20 could also be decoded.

Closing

After this, measurements are done on patch antennas versus helical, until the rain comes out of the sky with bins ...

Rob Alblas
(secretary AI)

satellietstatus

Arne van Belle, March 13 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 June 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)	1691 LRIT	1695.15 HRIT	0 , operationeel
MET-10	1691 LRIT	1695.15 HRIT	9.5 degree O, RSS
MET-9	1691 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 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.

Check the cap of your LNB because last week the sun was right behind 10 degrees east, if the cap is cracked then repair with plexiglass and silicone kit before water runs into the LNB!

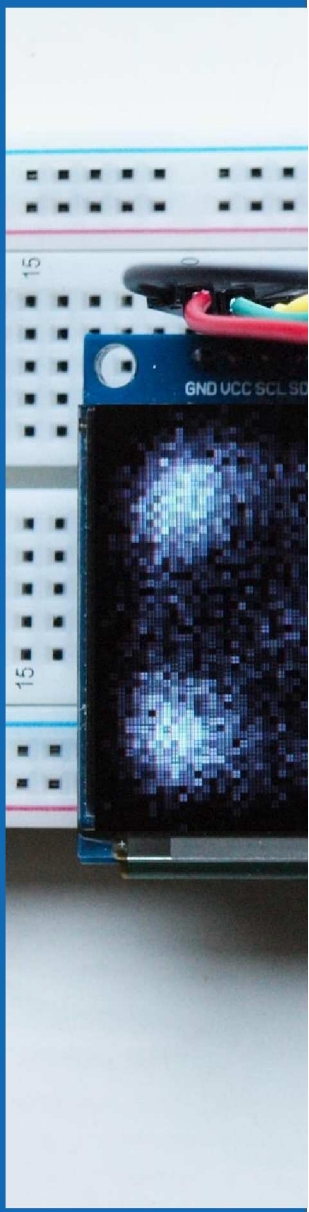
Eumetsat has released an update from Tellicast, TC 2.14.5. In addition to improvements, the license can handle up to 500 Mbit/s instead of 200. The channel files are also completely revised. Make a backup of your old ini and channels file in advance! The software update arrives 2x every day on Eumetcast 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.



werkgroep kunstmanen

De werkgroep is opgericht in 1973 en stelt zich tot doel:
Het bevorderen van het waarnemen van kunstmanen
m.b.v. visuele, radiofrequente en andere middelen

www.kunstmanen.net