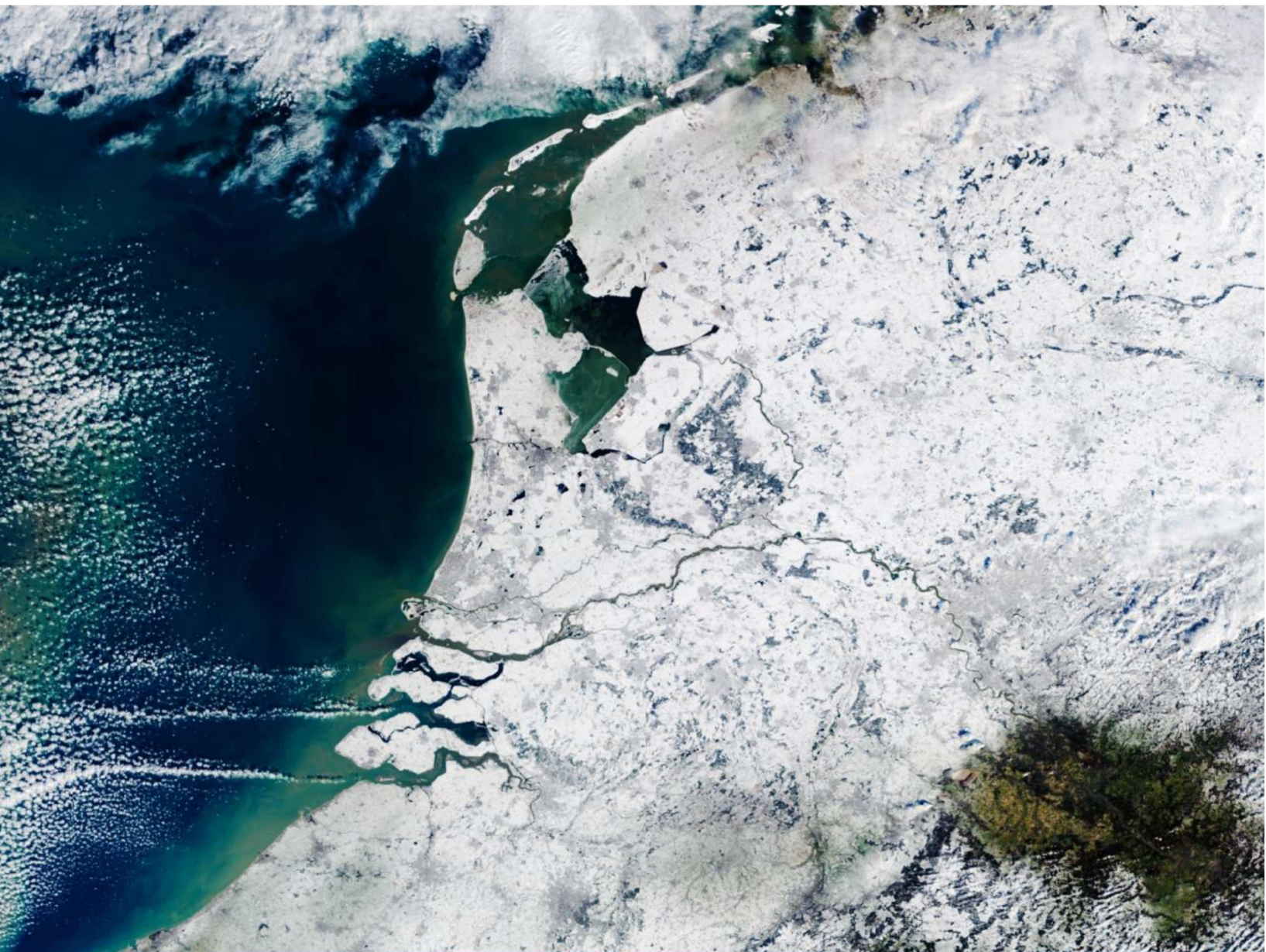




DE KUNSTMAAN

Maart 2021 – 48e jaargang nr. 1

Uitgave van de Werkgroep Kunstmanen



In dit nummer o.a.
Arduino voor rotor aansturing
Printplaat etsen deel 2
Een belichtingsklok
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, e.g. 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 2019, 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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Photo front page:

Copernicus Sentinel data (2021), processed by ESA

Preface

Sadly, news reached us that Francis Bell, founder and president of the GEO, passed away on January 14. In this Kunstmaan you will find the In Memoriam .

Meetings

Unfortunately no New Year's gathering with drinks this year. Hopefully we can organize an after-corona drink after the summer . I think everyone is ready for this. On January 9 this year. We have the meeting held in English because our American e member Ed participated, despite much that he could be present for his lateness. During the survey , the specifications of the various SDR receivers were asked . Arne has found an overview:

Comparison Table

	HackRF One	Ettus B200	Ettus B210	BladeRF x40	RTL-SDR	LimeSDR	LimeSDR Mini
Frequency Range	1 MHz - 6 GHz	70 MHz - 6 GHz	70 MHz - 6 GHz	300 MHz - 3.8 GHz	22 MHz - 2.2 GHz	100 kHz - 3.8 GHz	10 MHz - 3.5 GHz
RF Bandwidth	20 MHz	61.44 MHz	61.44 MHz	40 MHz	3.2 MHz	61.44 MHz	30.72 MHz
Sample Depth	8 bit	12 bit	12 bit	12 bit	8 bit	12 bit	12 bit
Sample Rate	20 MSPS	61.44 MSPS	61.44 MSPS	40 MSPS	3.2 MSPS	61.44 MSPS	30.72MSPS
TX Channels	1	1	2	1	0	2	1
RX Channels	1	1	2	1	1	2	1
Duplex	Half	Full	Full	Full	N/A	Full	Full
Interface	USB 2.0	USB 3.0	USB 3.0	USB 3.0	USB 2.0	USB 3.0	USB 3.0
Programmable Logic Gates	64 macrocell CPLD	75k	100k	40k (115k avail)	N/A	40k	16K
Chipset	MAX5864, MAX2837, RF6C5072	AD9364	AD9361	LMS6002M	RTL2832U	LMS7002M	LMS7002M
Open Source	Full	Schematic, Firmware	Schematic, Firmware	Schematic, Firmware	No	Full	Full
Oscillator Precision	+/- 20 ppm	+/- 2 ppm	+/- 2 ppm	+/- 1 ppm	?	+/- 1 ppm initial, +/- 4 ppm stable	+/- 1 ppm initial, +/- 4 ppm stable
Transmit Power	-10 dBm+ (15 dBm @ 2.4 GHz)	10 dBm+	10 dBm+	6 dBm	N/A	max 10 dBm (depending on freq.)	max 10 dBm (depending on freq.)

Overview of different SDR receivers

Last Saturday, Job gave a very educational lecture about 8 GHz feed horns . A necessary and important part for the reception of the 8 GHz band. It seems that as the frequency increases, your skills as a metalworker become more and more important.

Weather

We actually had frost for a few days! At one point even talked about the Elfstedentocht . Should the top athletes go skating in a bubble or not ? Fortunately for the government, the thaw set in and this saved difficult discussions about the public, recreational skaters, etc. Next year another chance. The question then arose what you should do to keep your saucer free of snow. When the saucer is in storm position (the saucer is facing the zenith) , a pack of snow can add quite a weight that the construction may not be able to handle. It has been suggested to use heating cord / foil to keep the dish free of snow. Whether the dish vertically can be put to the snow mode, so no snow can fall. Teflon spray is also said to help with the sticking of snow.

You can see that the snow can produce beautiful pictures on the front page of this Kunstmaan. Thanks to Harrie.



Metop on January 11, 2021

Orders

For the members who regularly order in China. From 1 July 2021 there will be VAT levied on goods from China (abroad are generally are) imported . The exemption of 22 Euro will be cancelled. How this will take shape is unclear. Maybe an extra bill of 15 Euro for administration costs? Or you will pay VAT to eBay . The Chinese will come up with something otherwise it will cost them too much money. Or we are driven into Amazon 's arms .

The Kunstmaan

This is the first Kunstmaan to be published both digitally (pdf) and in paper form. About half of the members wish to receive the Kunstmaan in digital form. De

pdf would still print. If you print this double-sided in book form, you will get the Kunstmaan in the old A5 format! It reduces a lot of paper and postage costs .

In this Kunstmaan many mandatory topics such as the financial annual report and the very short annual overview 2020. Furthermore, two reports of the virtual meetings this year.

Rob has two stories written about the accuracy that can be achieved with the Arduino in a rotor control system and a follow-up his account of Meteosat sin r antenna.

Paul has the last UKW Berichte 2020 by digging and its reflections in the " The librarian ' read.

The last page is dedicated to satellite status. If this information is incorrect, please let us know. The satellite status is a useful reference work that is often consulted.

I myself go a bit further in on the self-etching and building print. I have a simple exposing time clock , who is useful in exposing and etching print. It takes a lot of time to look at your cell phone to keep an eye on the time.

Zoom

Unfortunately, we have already had five virtual meetings. As it looks now, we are also not rid of it. In any case, the May meeting will still be digital. But even if we are allowed to meet again, we will still continue to offer the meeting digitally .



Presentation of Job on March 13th on 8 GHz feedhorns

I sense some members' reluctance to participate in such a digital meeting. Hopefully I can resolve some of the concerns:

No special computer required

If you just want to listen then you need a computer with a speaker. If you want to say something, a microphone is necessary. In any case, everyone can participate passively! Zoom is suitable from Windows 7, Linux, Mac . You don't need a special PC, so you don't need a camera. The most stable is when the network connection is not via wifi but via a network cable runs .

It's safe

In the beginning, there were stories that digital meetings are unsafe. We only send the login information to the members who have registered. Not like other gatherings where everyone gets them. You also have to be admitted to the meeting , so not everyone just comes into the meeting.

Sound and picture is much better

The sound and image is much better than in the canteen of the Nimeto . We do not suffer from painters who are noisy eating, or the statue d walk. No problems with the blind that does not work properly. You can turn the sound as loud as you want, nobody will be bothered by this. If you want to show something, this can be visualized very well for everyone with a built-in camera .

No travel time

For many of us, a trip to Utrecht is an undertaking. Sometimes two hours there and two hours back. Parking fees or worse, fines. For a virtual meeting you log in at 11:00 am and it will be ready around 1:00 pm. J e all day have yet to craft !

This is not a trumpet for stopping the physical gatherings, on the contrary , but we have nothing else for now. I hope many of the virtual meeting on May 8 axis meet.

Happy reading with this Kunstmaan.

Ben Schellekens

Chairman Werkgroep Kunstmanen

Suitability Arduino for controlling rotors

To accurately control rotors, it is of course necessary that the controller is fast enough to process the current position and control the motors.

The controller realized in an Arduino does the following:

- Capture and process feedback pulses (current position)
- Capture and process command (desired rotor position)
- Control motors using desired and current position

The first point is realized via an interrupt, the other points are handled in an endless loop:

```
void loop ( )
{
    ...
    if (Serial.available ( )) // new command
    {
        readCommand ( )      // read command
    }
    rotor_goto ( )           // send rotor AX
    rotor_goto ( )           // send rotor EY
    ...
}
```

Here AX and EY are the rotors for Azimut or X respectively Elevation or Y.

Of course, the speed of processing depends on the code. I measured the speed by repeatedly inverting an output of the Arduino using a function inserted in the loop; with a scope it is then easy to see how quickly the program runs and how this lead time is disrupted.

There are two disturbances:

- Processing messages that come from PC/tracker program and extraction of the desired position
- Interrupt when a pulse comes in (feedback from rotor, there are several pulses per degree rotation)

The loop is completed in approx. 500 μ s without the mentioned disturbances; the adjustment of the motor speed is therefore 2000x per second.

Handling commands seems to have a negligible influence, even if they come in 10x per second.

The interrupts which occur at each pulse, give a significant influence to the processing time, especially if the motors rotate rapidly causing a lot of pulses per second. The interrupt servicerroutine looks like this:


```

static void pos_handler (ROTOR * rot)
{
    if (rot->dir)
    {
        rot->pulse_count ++;
    }
    else
    {
        rot->pulse_count--;
    }
}

```

The routine itself is not much of a problem; even with 7000 pulses / sec from both rotors, this is still maintained good. With fast rotating rotors and therefore many recurring pulses, the main program is disrupted in such a way that not every incoming pulse is immediately processed. In itself that is not such a problem because counting the pulses, and thus keeping track of the momentary position of the rotors, is going well. However, it can result in a rotor overshoot if the position (pulse_count) is passed to the main program too late. This will be corrected, but may still lead to unwanted “flipping” of the rotor / dish.

Because the speed of the rotor is reduced when approaching the end position, which also reduces the pulse frequency, it is all OK, except when one rotor reaches its end position and the other rotor is still spinning at full speed.

Whether this is in practice really a problem is the question but it is good to realize that one rotor can influence the accuracy of the other. Especially important to realize with a elevation / azimuth rotor system; the azimuth rotor should run quickly at high elevation while the elevation rotor moves very slowly. For X / Y rotor systems it is not expected that this will give problems.

In the current controller I have measured the following for the maximum pulse frequency, wherein each pulse is included immediately in the control:

- pulses from 1 rotor: 80 Hz = 12.5 ms
- pulses from both rotors: 40 Hz = 25.0 ms

By way of comparison: the rotors from P eter Smits emit a pulse frequency of max. 60 Hz.

Conclusion : The Arduino seems suitable (fast enough) for accurately controlling two rotors. A faster processor, for example an STM32 (see [1], [2]) does not seem necessary for the time being.

References

- [1] Constellation viewer, de Kunstmaan 2018 no. 1 pag. 7
- [2] Constellation viewer, de Kunstmaan 2018 no. 2 page 13

Family expansion

Peter Smits has obtained a 120 cm offset dish to expand his current collection of satellite dishes. This dish was used for the reception of television satellites on a campsite and had become redundant due to the installation of cable TV .

With 10 kg it is a heavy polyester dish. The extra ribs on the back make this dish shape-retaining.

The dish is mounted with a mounting plate on its stainless steel XY rotor . The angle of the dish can be adjusted by means of hinges and adjusting bolts. As can be seen in the photo , the dish is now mounted too far to the left. The center of gravity is now off-center.

Balancing is necessary with its 10 kg. A counterweight can be mounted on the lower shaft of the rotor. This is not possible for the top axle.

The illuminator that is mounted is for illustration, it should probably only have to be moved to the back.

Hopefully it will be possible to receive 8GHz satellites with this dish. Congratulations Peter!



Etching circuit board and further construction - part 2

Summary

This is the second part of the article started in the September 2020 Kunstmaan where I describe d how to produce your own PCB. This article focuses on drilling and soldering.

preface

In the Kunstmaan of June last year I described the construction of an amplifier with the Gali-2. I had etched the print (material IS680 from Isola) myself and the result was much better than the build-up with a simple test print. But the gain from 8.4 to 10.1 dB was still a bit low and hopefully could be improved.

I have made some improvements:

- In the old print design, the 50-Ohm print path was a so-called coplanar waveguide. Here are ground planes next to the print path. The disadvantage is that this ground planes through vias (not through by metallization but with wires) to the other side to connect the pcb and the narrower trace is more difficult to etch.
- SMA connectors for better quality.
- Use much less solder t so that the print web is not covered by the solder .

Etching

In the article about etching prints in the Kunstmaan of September 2020, I used hydrochloric acid mixed with hydrogen peroxide as an etching fluid. I was not very satisfied with that. First, it is difficult to get hydrochloric acid unless you want 25 liters. The hydrochloric acid I kept in a dark glass bottle but o p somehow the acid was on the outside of the bottle . W aterstofperoxide you can at the Grocery d vessel purchase but has a limited shelf life. Also, I did not feel in the corona time they go shopping.

So I looked for a different etchant and started working with sodium persulphate . This is easily available online at Reichelt, for example, in various packaging units. What I don't know yet is whether it is hygroscopic or not. One source says yes and the other doesn't. Otherwise I have to divide it over several bags that I vacuum .



The description of the sodium persulfate states that you have to prepare three liters of etching fluid in one go, then you can work in an etching tank. I didn't really feel like it because I prefer to use etchant only once to keep the quality constant.

I now simply illuminate the print with a light bulb to illuminate the workspace and no longer in the dark, so that I can see what I am doing. I did a test of half an hour of exposure to that light bulb and this does not illuminate the foil. Incidentally, I do this without daylight (this contains UV radiation).

Then you have to run the film with the print layout tightly on the print . I do this with a (kitchen) vacuum more device , this works very well! Press the vacuum bag flat during the vacuuming so that there is no pleat.

Then the etching. For every cm² of printed circuit board I use about 1.5 ml etching fluid. So for my 8x8cm double-sided print I used 100 ml. The amount of sodium persulfate is 20 % by weight of the amount of water.

Dissolution and etching should take place at approximately 50 °C . I get the water from a kettle and with a 500 Watt construction lamp I keep the etching tray at the right temperature. In my garage where it was 5 °C this went well. The print is ready after about 10 to 12 minutes of etching.

PCB drilling

Drilling the holes is very difficult, especially if the tiny holes should be . For example, with the BFP840FESD, due to emitter degeneration , the vias must have a diameter of 0.3 mm. These little vias are not necessary for the Gali-2 .

You have to do the drilling under magnification anyway. Only then you can no longer see the depth very well. You are always guessing where the print drill will hit the print, often wrong. A center hole that guides the drill to the right place will not work. The drill is made of carbide and does not bend and is very fragile.



Drill with video camera

I mounted a digital microscope on the drill.

In order

to land the drill in the right place via the monitor, which shows the image from the microscope, the matter must first be calibrated.

Make sure that the set-up of the drilling machine, drilling platform and microscope is absolutely stable.

Take a piece of residual printed circuit board of the same type that will be used later, fix it on the drilling platform and drill a hole.

Now look on the monitor where the hole is and mark it. To avoid drawing on the monitor itself, you can attach a piece of transparent foil to the monitor with adhesive tape and make the mark on it.

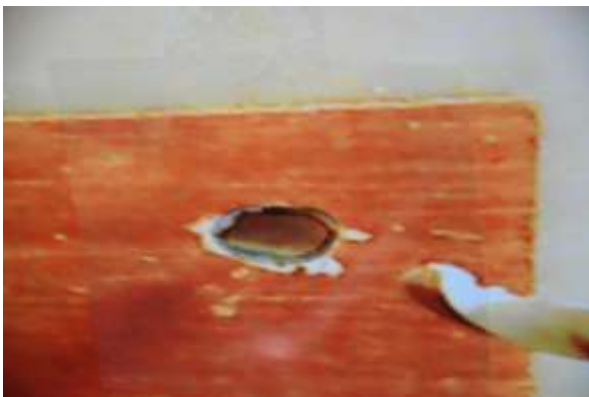


Photo of the monitor with the outline of the hole drawn on foil . This serves to accurately position the print for new drillings

After this, the holes in the 'real' print can be made by moving the print in such a way that the place where a hole should be placed on the monitor coincides with the drawn

drill hole on the foil.

Because the "camera - drill - foil" is a fixed setup, you will always drill in the right place.

Please note that, as the camera, drill and / or a film with respect to each freshly chosen than the above-mentioned need calibration procedure be carried out again.

Soldering

Soldering is a different story. First I did this by applying a little bit of solder to the print track with a thin soldering tip. Solder part and then the rest of the legs. This nevertheless resulted in large solder areas on the print track. So I started looking for something else.

On the Internet I have a solder paste - found dispenser [3]. If you find you believe it is using very simple.

A few points to note:

- You cannot use solder paste that they also use for solder paste stencils. ChipQuik pasta seems to work best. The type T5 must have (this gives the growth of the solder bumps in the flux). I had T4 and this also worked, I don't know if T5 is going better.
- Placing the syringe in the holder is difficult. On the internet there is a simple aid of a piece of printed circuit board to place the syringe in the holder [4]. I still have to make this.
- The shelf life of the solder paste is not long, maybe a few months? I'll let you know when I find out.



Solder paste dispenser and the solder paste

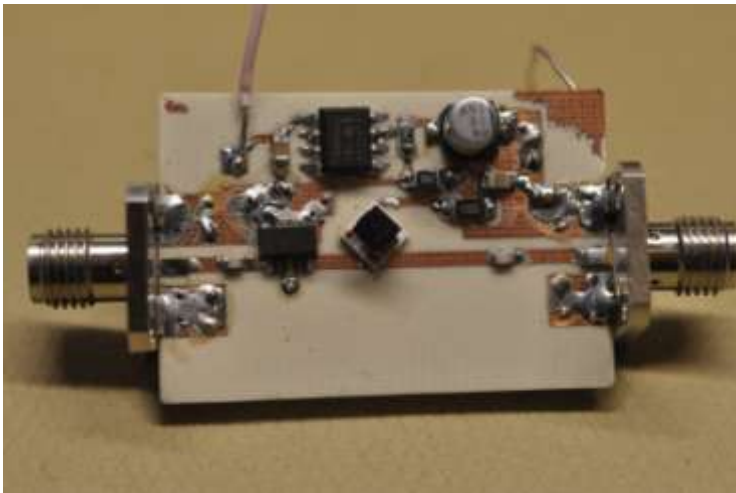
If you have applied the solder drops, you can place the parts with a pin c et. With me the printed circuit board goes on the preheater, which is set at 120 ° C and I solder the parts with a hot air soldering iron.

Incidentally, I only solder the parts in the 50-ohm circuit in this way. The rest just goes the old way.

SMA connectors

I bought SMA connectors from RF-Microwave. This got me stuck to the PCB solder, while mean d have to fasten screws. You should n't do any soldering ! The print is not strong enough for this at all. This bends and print paths come loose.

My next step is to see if I print on a 10mm thick can assemble piece of aluminium and then investigate the impact of the housing. However, it i s also again a verh material. You have to drill very precise and 2.5mm thread taps for the connectors . If anyone have any good ideas have , how you SMA connectors to a 0.5mm - can mount print , then I hear this happy.



SMA connectors soldered to the PCB

Mark on the print during the print design where the drill holes will be for confirmation! You print and connectors have been in the case can confirm and , before you solder the components. Once the parts are in place , there is not much you can do mechanically , because it is all so small and fragile.

Result

Below is the table that was in the June Kunstmaan, expanded with the measurements of the new print. You can see that a lot of extra dB 's have come. I cannot judge the quality of the signal. Maybe something is oscillating.

Frequency	Level after the filter	Level after the Gali-2 old print	Reinforcement of old print	Level after the Gali-2 new print	Reinforcement of new print	Difference with old print
7812 MHz	-28.8 dBm	-20.4 dBm	8.4 dBm	-15.9 dBm	12.9 dBm	4.5 dBm
8000 MHz	-26.2 dBm	-17.9 dBm	8.3 dBm	-12.8 dBm	13.4 dBm	5.3 dBm
8212 MHz	-22.5 dBm	-12.6 dBm	9.9 dBm	-10.1 dBm	12.4 dBm	2.5 dBm

Conclusion

At a frequency of 8 GHz, the actual construction of the print is decisive for the quality. What I have learned too , that if you have the print etched , you should check the same or you can mount it in a casing .

Solder paste dispenser

[3] <https://www.avdweb.nl/tech-tips/pcb/solder-paste-dispenser>

Relevant soldering tips

[4] <https://forum.arduino.cc/index.php?topic=445951.msg4515977#msg4515977>

Exposure clock

Preface

In this article a timer for an UV LED lamp is presented . It uses an ATmega328 microcontroller and has a buzzer.

Preface

Now that I have started etching again, an exposure clock is useful that controls the UV lamp and can also serve as a timer.

First I measure the duration with my mobile phone, this is not really useful because it constantly jumped into the screen saver or into sleep mode. Then you had to enter your password again, etc. etc.

Because you're dealing with multiple times: exposure, development time and second exposure, you may want to set it quickly.

The lighting clock that I designed consists only of wired parts, no SMD, so very easy to build / solder.

An ATmega328 / Arduino is the microcontroller. I chose a rotary encoder to set the time . When the time has elapsed, a buzzer will sound. There is a switched 12V output to switch the UV lighting . The (elapsed) time is shown on an OLED display and is also clearly visible in the dark.



Fig 1 The exposure clock in action

Rotary encoder

A rotary encoder is used to set the time. This supplies a so-called quadrature signal. You can recognize the direction of rotation from this signal. In addition, the amendments will you also pulses to count.

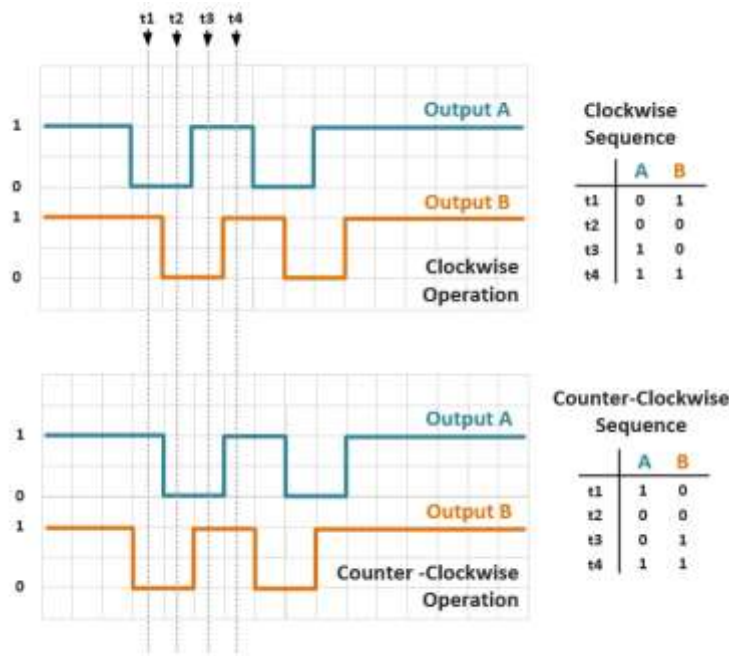


Fig 2 By measuring the level of signal B during the rising edge of signal A, you can determine the direction of rotation

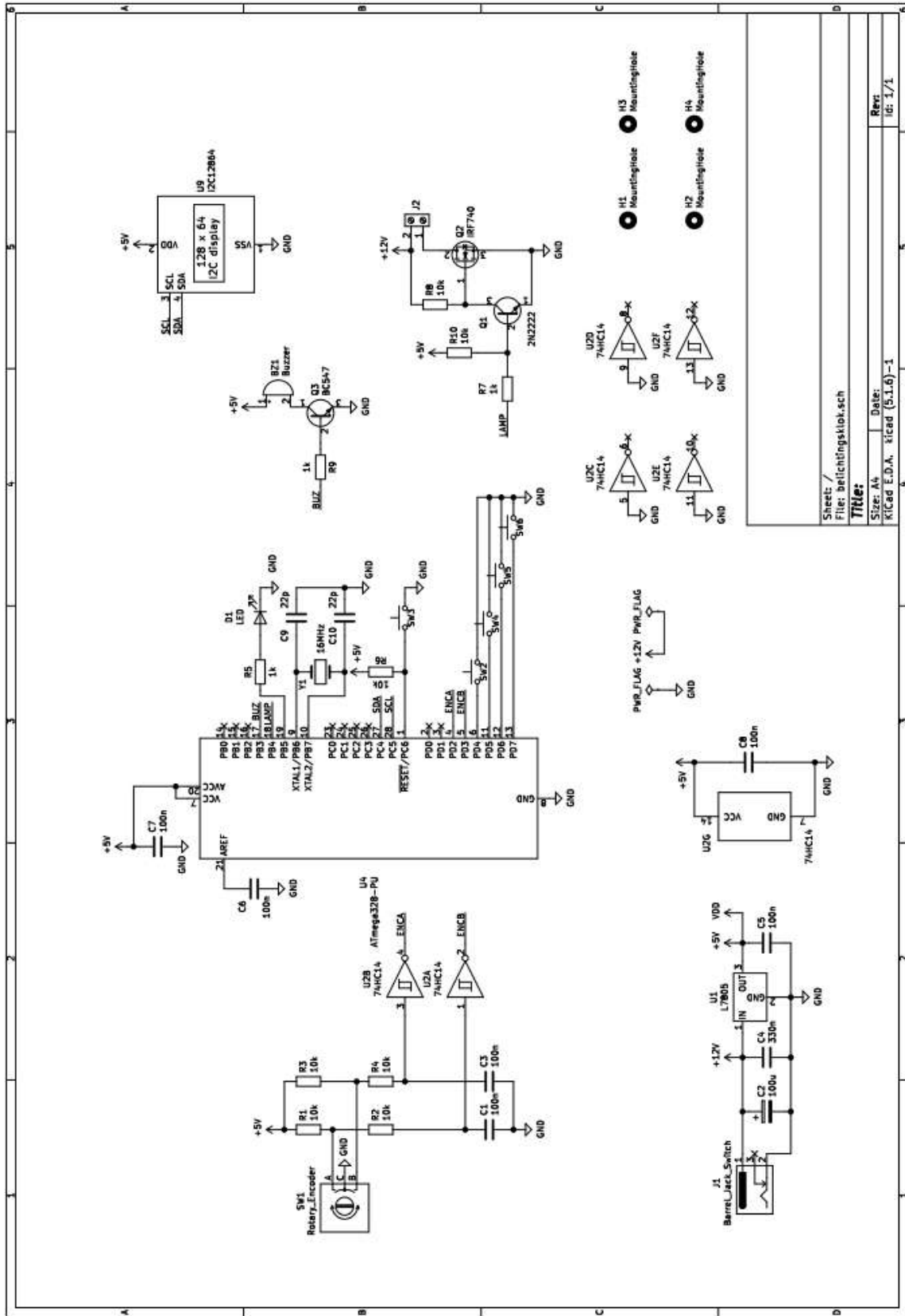
The problem with all mechanical switches is contact bounce that can occur. When opening or closing a switch, it thunders and opens and closes many times. The microcontroller is fast enough to recognize this and will see false pulses.

There are two ways to overcome this problem: in software or in hardware. Since I am not very good with software, I decided to solve it in hardware.

The solution is a high-pass and low-pass filter in combination with a Schmitt trigger. A Schmitt-trigger has two voltage thresholds: the signal rises above the upper level than is the on-state corridor high, and the signal falls below the lowest level, the output goes low.

If you place a low-pass filter for this, you have lost the contact bounce. The low pass filter consists of $R2 / C1$ and $R4 / C3$. See the schedule in this article.

An additional advantage is that the resistors $R2$ and $R4$ limit the discharge current from $C1$ and $C3$. Failure to do this can cause excessive wear on the rotary encoder contacts.



Title:

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Id: 1/1

Software

In the Arduino you also have to make some arrangements to count the pulses. We do this with interrupts. When an interrupt comes in, normal program execution is immediately interrupted and an interrupt routine is called . This interrupt routine should be as small as possible and contain only the most necessary code. Otherwise, you run the risk of receiving another interrupt while the microcontroller is still handling the first interrupt.

```
// Defining the IO pins used
#define ENCA 2 // Rotary encoder clockwise on pin 2
#define ENCB 3 // Rotary encoder counterclockwise on pin 3

// Interrupt number 0 is associated with the subroutine doEncode
// when it gets a rising signal on pin number 2:
attachInterrupt (0, doEncoder , RISING);

// Then the following subroutine is executed:
void doEncoder () {
    if ( digitalRead (ENCB) == LOW)
    {
        secondsset_org -;
    }
    else
    {
        secondsset_org ++;
    }
}
```

So when there is a rising pulse on ENCA, you are reading ENCB. If this is low, lower the seconds counter and otherwise increase it.

The buzzer

There are different types of buzzers with different power consumption on the market . A digital I / O pin of the ATmega328 can supply a maximum of 20 mA and some buzzers are above. To be safe I have added a switch transistor.

Switched output

The lighting clock is supplied with a minimum of 8V. This voltage is also switched o p connector J2 available. Switching is done with an N-channel MOSFET, the type is not critical. The IRF540 chosen here can switch 23A, at 100V .

To fully open a MOSFET , the 5V (or sometimes 3V3) that the Arduino can supply is often insufficient . An N-channel MOSFET prefers to see 7V or higher . Hence the

extra switching FET Q1 that switches the gate , either to the 12V , or to the GND. Q1 invert t the signal from the ATmega328, a low signal will turn on the lamp.

If you don't want to use the extra switching FET , you have to use a so-called " logic level MOSFET".

You can directly connect the UV LEDs to this switched output . Of course the power supply must be able to supply the voltage and current. In my case these are 48 UV LEDs that are supplied with 12V (design by Elmar).

Switches

There are five switches that do the following , from left to right :

- SW3 The reset button
- SW2 The start button . If you press this, the lamp switches on for the set time
- SW4 The stop button . Immediately turn off and turn on the buzzer for a moment
- SW5 Set the duration to 120 seconds, this is for developing the print
- SW6 Set the duration to 300 seconds, this can be hardened extra for the post-exposure on the foil.

With the switches SW5 and SW6, the time can be quickly set, which can then be adjusted with the rotary encoder.

The last used exposure time is stored in the EEPROM of the ATmega328. If you want a different time behind SW5 or SW6, you have to adjust the Arduino sketch .

PCB

Building the PCB will not cause any problems because no SMD parts have been used. I still have a few prints for the enthusiasts.

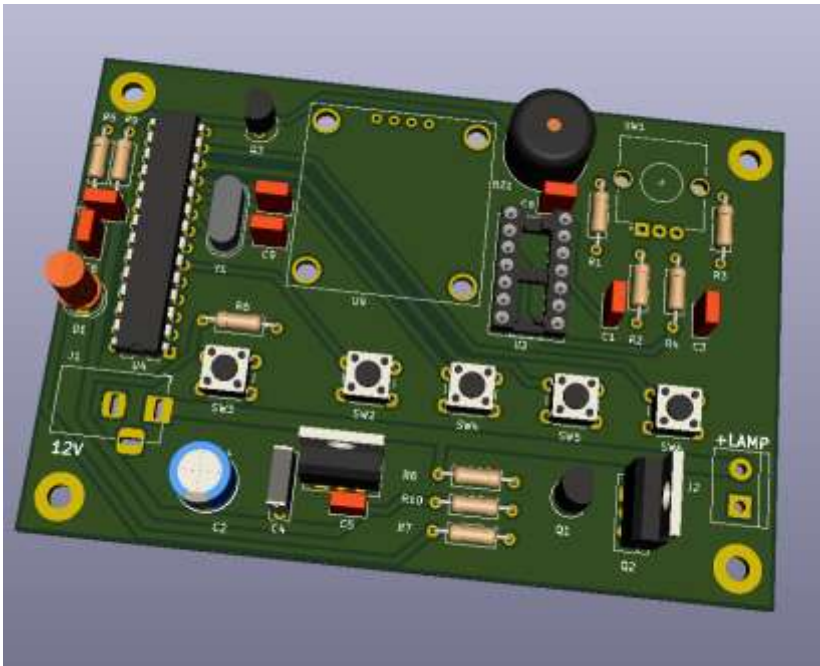


Fig 4 3D animation of the double-sided print

Concluding remarks

The exposure clock does what it is supposed to do and it saves a lot of action compared to a mobile phone with a timer. The Arduino sketch can be found on the Werkgroep github .

Meteosat without antenna (continued)

In the previous Kunstmaan [1] I described how you can get satellite data from Eumetsat from the Internet with a few Python scripts. I have adapted these scripts so that they are simpler and more widely applicable. I have now also tested a few things on a Raspberry Pi 4.

I called the script set *eds* : Eumetsat Data Store ¹⁾. These scripts are an alternative to receive the same data via DVB / satellite; near-real-time data is available in this way. But older data is also available the same way.

Naturally, the scripts can be adapted if desired.

Note: Currently, these scripts are only suitable for files in zip format.

Functions

I will give here a list of the files and the functions herein defined. Two examples are also discussed.

eds_defs.py

A number of fixed items are defined here, such as:

- the URL of Eumetsat where the data is available
- verbose level: level of errors (nothing, only errors, only warnings, everything)
- the files containing the key (eds.key) and a list of products (eds.prd)
- locations where files should be dropped and where the unzipped files should end

eds_funcs.py

This contains a number of functions that can be used by several programs:

- `message()`: for errors, warnings, etc., depending on setting of 'verbose level'
- `get_product()`: gets the desired product from file eds.prd
- `list_datasets()`: show all products in a list
- `create_list()`: creates a list of start and end time
 - `get_datasets ()`: creates a new list based on a product and a start and end time
- `remove_not_in_dataset ()` removes all zip files (no longer) in the list of items to download. The zip files are considered to be already unzipped.
- `download_dataset`
 - `get_token()`: token is created from the key
 - `download_zipped_product()`: checks if file is already downloaded, otherwise:
 - `download()`: does the actual download

1) In part 1 I had named the scrip set *eci* : EumetCastInternet. But although (part of) the same type of data is available in this way as via Eumetcast, this is somewhat different. Hence the name change in *eds* .

eds_process.py

The content may be adapted to your needs. What's in it now:

- process_file(path_unzipped, fn): path and filename to process, e.g. with xrit2pic_cmd; the example shows how a movie can be created and expanded.

Executable programs

There are three example programs available using the above functions.

eds_select.py

This is a simple graphical program with which a product can be selected and stored in eds.prd, so that other programs can refer to it at will.

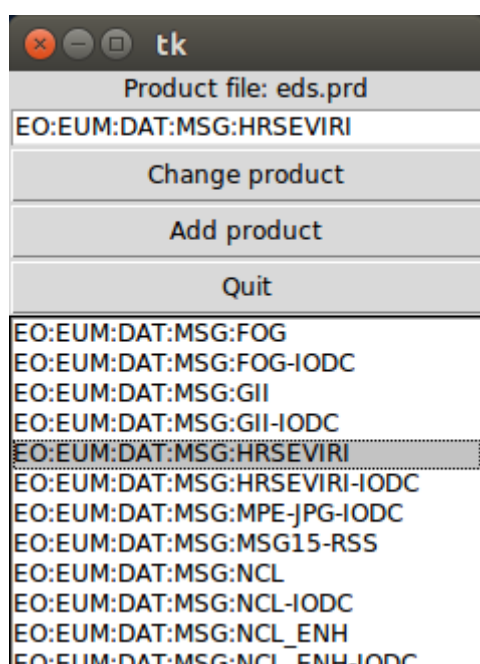


Fig. 1. The product selector.

After selecting a product and clicking on 'Change product', this product will be placed in eds.prd (old content will then be replaced) . With 'Add product' the selected product is added to the list.

eds_get_in_period.py

With this program, a selected set of files can be downloaded. In the example, a year, start month/day and end month/day can be entered; after this, all files in this period from 16:00 UTC will be retrieved. I used this to make a film of the ice floe A68-a that drifted near the South Pole. In this case, that film consists of one frame per day (namely the one at 4:00 PM). The same applies here: adjust yourself to what you need.

Note that this script only downloads files and unzips them. A movie can then be made with (e.g.) xrit2pic .

eds_make_movie.py

This makes a growing movie. For this, the previously mentioned eds_process.py is used, in which xrit2pic is used to create the movie, if desired with a maximum length. This only works for files in native format (included in the zip file to be downloaded).

- The current day is set and a list is created. That list will contain the 10 newest files.
- Zip files that are still in the 'download' location but that are not (anymore) in the list will be removed.
- A token is requested; this, as it were, grants permission to retrieve the files. (See [1])
- The list is processed:
 - if a zip file already exists, it will be skipped. This is why zip files are only discarded when they are no longer in the list of 10 newest files, otherwise they would be retrieved and edited over and over again.
 - Other:
 - Download zip file
 - Unzip, the result is a native (.nat) file
 - The process_file() function is called, which uses the .nat file to extend the movie by a single frame
 - the .nat file is deleted

This program should be run regularly, eg every 5 minutes. The RSS product MSG gives every five minutes a new file. For “full globe” a new file is available every 15 minutes, then this script only needs to be run once every 15 minutes.

The film is also refreshed fully automatically; files that are no longer needed are deleted so that the system does not fill-up with already used files.

Running it repeatedly can be done in a number of ways. A not so nice method is to make an endless loop, with a waiting time of eg 5 min. The original file ends with:

```
run_make_movie(selected_item)
```

You can change this into:

```
while (True):  
    run_make_movie(selected_item)  
    delay(300)                // delay in seconds
```

However, there is a much better method:

- Linux: cron
- Windows: there are several options: Task Scheduler, Z-Cron, AT. I have not tested these options.

For Linux, with cron, this goes as follows:

In a command window give command:

```
crontab -e
```

An editor will now open.

Add at the very bottom of the opened file the following line: (in this example:

`eds_make_movie.py` exists in folder `eds`)

```
* /5 * * * * eds/eds_make_movie.py >> eds.log
```

Save and close.

To check:

```
crontab -l
```

The newly entered line should now appear.

What does this do:

The first 5 positions indicate the minute, hour, day, month and week when the program is to be run. A number indicates: execute at this time, e.g. if position 'hour' says 12 :

```
0 12 * * *
```

then the program is always executed 1x at 12 o'clock. A '*' means ignore, so in this example day, month and week are ignored.

To run the program every 5 minutes insert in the 'minutes' location: `*/5`.

In this example, the program `eds/eds_make_movie.py` will be executed every 5 minutes, independently of the hour, day, etc. . Text such as error messages etc. ends up in `eds.log`.

Now, as soon as the PC is turned on with this setting, the program will run once every 5 minutes.

By putting a '#' in front of the line with `crontab`, this action can be stopped.

Raspberry Pi

The above mentioned programs are particularly suitable for a Raspberry Pi. In my previous story I used a first-generation Pi, but this is not powerful enough to make a composite using multiple channels with `xrit2pic` (there is just 500 Mbytes of RAM) . The newest Pi's are suitable. The Pi 2^e and 3^e generation are less suitable because they have only max 1 GByte RAM; then you still run into problems making a composite. The Pi 4^e -generation is suitable; it has 2, 4 or even 8 G Byte RAM. I would recommend at least a Pi with 4 GByte RAM, but for a few tens of euro's extra you have 8 GByte .

This Pi has a 64-bit ARM processor. You can use an operating system to your choice. Linux is common, but Windows also seems to be possible. Because the OS is on an SD card, you can easily switch OS by simply changing the SD card. Raspberry's OS itself are all 32-bit Linux versions ; Ubuntu has 64-bit versions you can use. I don't think it will make

much of a difference in this case. Keep in mind that a 64-bit processor with 32-bit OS means that maybe only half of the available RAM is accessible, so do not be stingy with your choice of RAM size!

There are many housings available for the Pi, with and without fan(s); the processor can become very hot. I opted for a metal housing where the housing itself also serves as (passive) cooling. Because the processor only has to do something from time to time, the average power consumption is low; the RPi only gets a little warm.



Fig. 2. PI in cooling metal housing.

What is needed:

- RPi-4 model B, with 4 or 8 GByte RAM
- Some form of cooling, passive by means of the housing is sufficient
- Power supply 5V / 3A with USB-C connector
- Ethernet connection
- Possibly micro-HDMI to HDMI adapter (you can also do everything on another PC via the ethernet connection)
- Keys of Eumetsat, see [1]

References (see <http://www.kunstmanen.net>, menu Weblinks)

[1] Meteosat without antenna (continued) de Kunstmaan 2020, no. 4, page 15

[2] Operating systems RPi

In Memoriam: Francis Bell

Francis Bell passed away at the beginning of January . He was the founder and chairman of the Group for Earth Observation . In 2003, the GEO was founded and in March 2004 the first GEO Quarterly was released.

Around this time was also the launch of the MSG 1 where a broken amplifier caused Eumetsat to find a different way of distributing the data. Commercial television satellites started to broadcast the data : Eumetcast was born. At Eumetsat, Francis Bell has always been committed to the free reception by amateurs of weather satellite recordings.

He maintained good contacts with Eumetsat. This made it possible to visit Eumetsat in Darmstadt three times during which interesting lectures were given and we were also allowed to look behind the scenes.

The first visit to Eumetsat was in 2007. On the first day we received presentations and on the second day we went to the ground station in Usingen . This visit was such a success that it was repeated in 2011 and 2015 . In 2012 he organized a visit to Surrey Satellite Technology Limited (SSTL) where Arne was also present from our Working Group.



Visit SSTL

In 2009, among other things, he organized a GEO Symposium. In the evening we had a nice barbecue at his house.



Geo Symposium 2011

He always called our Working Group "our Dutch friends". He was a great advocate for the reception of weather satellites and his warm personality will be missed by all.

Annual report 2020

Summary

A brief overview of the activities of the Werkgroep Kunstmanen in 2020

Unfortunately, this is a very short annual report. The cause is of course that many activities could not take place due to corona.

Every year we have two fairs, in Rosmalen and Zwolle, which of course have been canceled. We also once attended the Estec open day . One of the highlights should have been the visit to Eumetsat in Darmstadt .

What have we done? Like so many organizations, we had to go online. We have discussed and thought about this in previous years . How we could do this to involve members who do not have the opportunity to attend the meetings.

Meetings



Tables and members 1.5 meters away at our last meeting at the Nimeto, a year ago .

March meeting

The second meeting of 2020 was on 14 March . I remember very well that on Thursday 12 March I was sent home from a visit in Maastricht by my employer following the press conference in which it was announced that the country was locked up. The question immediately arose whether we should continue the meeting on Saturday. Important considerations were that our members can judge for

themselves whether it was wise to come and whether it was allowed to continue the meeting.

The turnout was of course lower than normal and we had to keep a distance of one and a half meters. The whole canteen was empty, all desks were to the side. We had to put the desks remotely and then put them back again afterwards.

The theme of the meeting was rotors. Everyone took part in the group discussion. Harrie v D , who was not present, and Harry A had submitted their contribution by e-mail. This discussion resulted in the article of the June Kunstmaan.



The theme was rotors. Here an experimental setup by Harm

May meeting

On Wednesday May 6, in the run-up to our Zoom meeting, Peter K (from Curacao), Peter S, Wim, Elmar and Fred vd B (from Vietnam) participated in a Zoom test session. Bra lve us no picture of Peter had , was the session well.

We had not expected that our AGM in May by k in Nimeto o go n. That is why we decided to move it to September in the hope that we could get together. The virtual meeting was held on 9 May with thirteen participants. There was no special nomination.

September meeting

On September 12, we had our ALV, also virtually. At the board w e granted rd discharge for the financial and implemented policy. Fred J gave a very nice presentation about his 8 GHz reception system. In December Kunstmaan vari over an article about.

November meeting

Again a virtual meeting with 14 participants. Rob g finished a presentation on a rotor control with the Arduino. Your president show the one rotor driver that is under development.

The Kunstmaan

Despite all the corona perils, the Kunstmaan was released four times. The first three copies had 28 pages and the last 24. This last Kunstmaan also contained a list of members with email addresses so that members could contact each other.

The satellite status, a permanent feature in the Kunstmaan, went to one page in the December Kunstmaan because a lot of information does not change.

Paul provided summaries of the UKW reports and wrote ' Uit de Bibliotheek ' .

Reports of the meetings were written by Rob.

In the March Kunstmaan articles I wrote about the NanoVNA, a very affordable VNA. Also an article about the satellite orbit calculation with Scilab. There was a sequel in June Kunstmaan with an article by Rob and an update Xtrack . Rob improved the QPSK receiver to suppress lock issues and an article on PWM for Arduino.

In June Kunstmaan Fred vd B wrote his last column from Vietnam. Unfortunately, but thanks for all your nice contributions. Fred Jansen described how geo-references can use to compare and with maps, coastlines and allow combining recordings. I myself have tried to an amplifier with Gali 2 to 7 GHz to make and.

In September Kunstmaan Rob described the hdf5 format. This is a data format used by newer satellites (eg GOES16 and MTG) and is now also supported by Xrit2pic. Ger Smit started using the Raspberry Pi to download Eumetcast data via the internet.

I myself started etching printed circuit boards again. With a 35mm camera I make the film with which the print is exposed. I also wrote a story about wireless control of an ESP8266 microcontroller and an AD F 5355. With a power detector, the signal strength is measured. Scilab you get an impression of the door late curve.

In the December Kunstmaan an article by Fred Jansen about the reception of satellites on the 8 GHz. His test setup can be found on the front page of the September Kunstmaan . Rob has a method development d to measure the tracking accuracy of polar satellites. Also from Rob a follow-up to the download of Eumetcast data , but now the HRIT data. I myself wrote a small article about a dual 5V power supply.

De Digital Kunstmaan

In addition to the Christmas wish, it was sent as a pre-announcement for the meetings. Leave a Anyone who some fun knows this send so that we in the Digital Kunstmaan recording.

Website

A first design of a new website has been made. This needs to be further assessed.

Satellites

The GOES-13 renamed to the EWS G1 and now stands at 61 degrees East (Indian Ocean). The oldies are still doing well. For example, the NOAA-18 is 15 years old and the NOAA-19 is 12 years old.



The launch of the GOES-13 now almost 15 years ago!

Looking back on this year there are things which remain n are. We know, we simply remote members to the meetings can participate. But there are also members who do not participate in the digital meeting and that is very unfortunate.

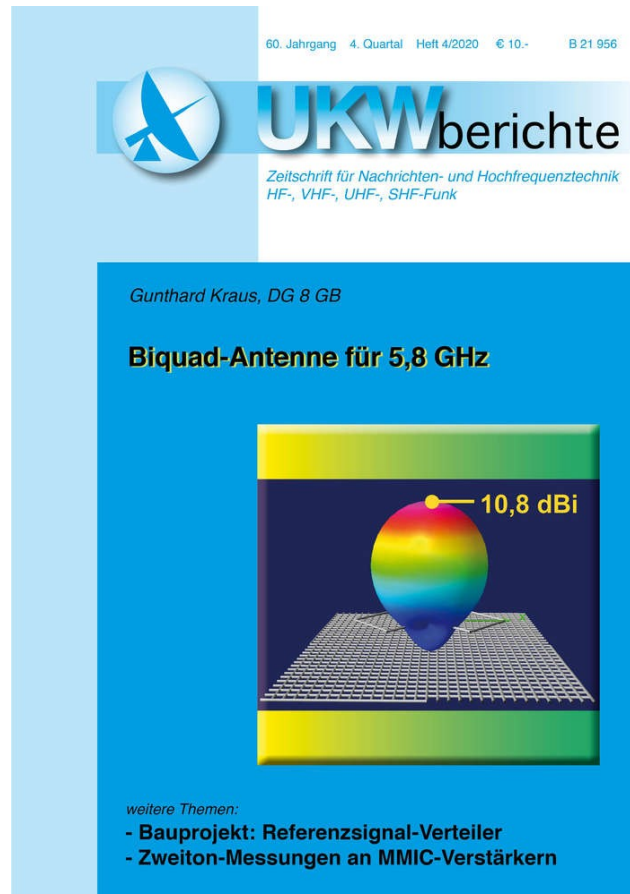
Let me first state that digital meetings are not the new normal for our Working Group. When possible we will get back together and hopefully this will be in this year. It is not normal for people to only meet via a screen.

UKW-BERICHTE

Paul Baak

Summary

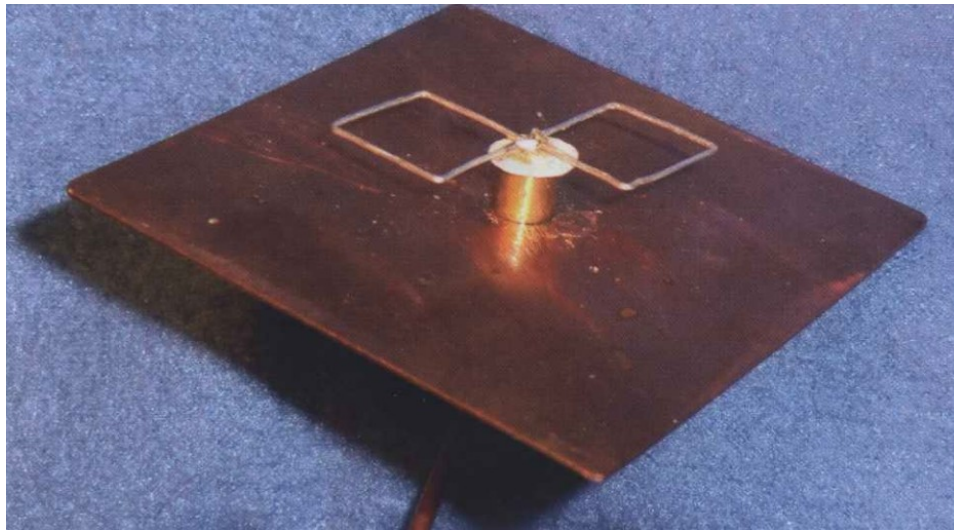
In this article a concise review of articles published in the 4th edition of 2020 of the German magazine UKW-Berichte. We have a subscription to this magazine.



Here is an overview of UKW berichte 2020 Heft 4. There we find 4 main articles, and two small overviews of useful links resp. messages. Our club has a subscription to this magazine. Please indicate if you would like to subscribe. The latest issues are available on the library table at meetings; now that this is not feasible for the time being, please contact the librarian.

Wolfgang Schneider builds a four-way splitter for 10 and 25 MHz. The knack of such a design is in the separation between the channels. It is also suitable for other frequencies because of its wideband design, which is based on the 4 pieces of MAX4012 ICs (about 4 usd each). The -3 dB point is expected to be near 100 MHz. It relies entirely on SMD components.

Gunthard Kraus is following up on an earlier design for an antenna for 2300 MHz [1]. As an aside, many of the articles he previously wrote for UKW berichte can be found on that Gunthard Kraus site. He is now building a biquad antenna for 5800 MHz. The approach is to use a program for calculation [2] and then simulation with 4NEC2 [3]. This promises an antenna gain of over 10dBi. The construction is described as a real challenge, as many mechanical adjustments, here: bending, are needed to achieve a good result for the S11 value.



Heiko Leutbecher performs intermodulation measurements (IP3) on MMIC amplifiers in the vicinity of 430 MHz. Two oscillators with nearby frequencies (the construction is a subject in itself) come together in a directional coupler and the result goes via an attenuator to an SA. First test object is the PGA103+, well known from previous measurements. A second test object was a CGY120, an MMIC with adjustable gain. A clear relationship between power supply and IP value could not be established. In general, it is not possible to verify the manufacturer's specifications.

Henning Weddig takes a close look at logarithmic HF power detectors with the AD 8318. The range applied is 1 MHz to 8 GHz. The reasoning is that the price of these modules coming from Asia is so low that homebrew is no longer worthwhile. However, the objective of building a reliable and accurate power meter with cheap (<10 euro) modules (and an Arduino and an LCD shield) is not achieved. One expects more from (a module with) the AD8317 or the HMC602. They apparently want to continue working on that later.

Gunthard Kraus brings us, as always, a series of links in Fundstelle Internet. I limit myself to the links relevant to us: receiver tests, articles on microcontrollers, quartz crystal testing with a VNA and two links for homebrew antennas.

The section Ultrakurz shows some available materials and a guide to them and the dates of the proposed HAM Radio 2021 Friedrichshaven on June 25 to 27. Of course with the in these days understandable caveats.

UKW-Berichte [4] is a German publication, now without an English version that used to exist under the name VHF communications. The magazine will cost 34 Euro per year from 2021 including shipping from Germany to the Netherlands. Single copies and annual volumes (DVD) are also available.

links:

[1] self-built Bi-quad antenna

[2] calculation of Bi-quad

[3] simulation of Bi-quad

[4] Berichte/ABO-UKW-Berichte

FROM THE LIBRARY

Paul Baak

Dear people,

Perspective! Perspective! Every high placed gentleman or lady in this country is talking about it. For the time being, it's not going very fast. We just can't get the jars of anti-bat oil across the country. I can't stand it any longer and I'm intervening. I am vaccinating you unsolicited and unanesthetized with the following mixture of approved messages. More than 90% effective and completely safe!

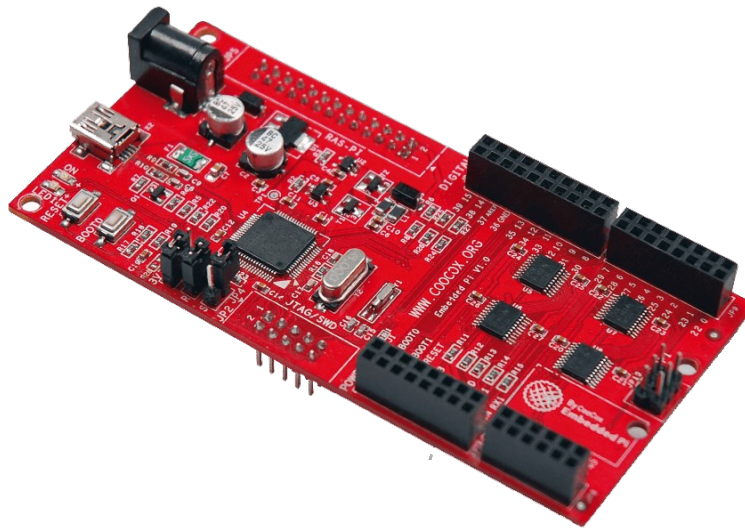
Japanese billionaire Maezawa wants to circle round the moon in 2023 and is urgently looking for eight fellow passengers. I must advise against it. There are certainly no catering terraces open on the moon. Moreover, the intended means of transport has to date consistently exploded on landing and our club does not have that many members. Perhaps however this trip will be another nice object to point our antennas at. For as long as it will last then. I do not yet know the reception frequency. With a bit of luck it will be in the neighborhood of 2200 MHz, like in the time of the moon landings. The problem is that it will be encrypted for all sorts of obvious reasons.

VERON is releasing the 2020 Electrons. You can pick it up yourself at [1], buy it there and apply the discount code. They do that once every few years, apparently as a promotion. For our association, a nationwide pdf membership is now available and I participate. Years ago I called a large colorful KunstMaan a joy to read under the screen lamp; the raison d'être of a librarian, something that makes life worth living after all. That is still true, but we live in a society with a lot of information and it is no longer traceable or searchable in this way. Sometimes one of the members asks for some information from our library. Then I have to drive 120 kilometers, search through the cupboards in a basement with a flashlight to find it. I will gladly do that for you, but paper information is actually getting out of reach. We need to change our lifestyle. Is your house actually paper-neutral yet?

The GEO 69 has been published. You can pick it up along with all its predecessors at [2] and [3]. The death of Francis Bell is of course remembered. Also two articles about iceberg A68 which will not damage South Georgia after all. The picture of The Netherlands in its snowy week made by NOAA-20 is a nice one. A nice quiet week it was: nobody whining about global warming. Meanwhile, another piece of ice called A74 has moved off the South Pole, and Scientias.nl has said something about that again with a moving gif[4].

There is a new Raspberry out, number 4. Again more powerful and 8 GB ram (maximum) is a lot. I do not see any real functional added value. Just keep in mind that the cooling here needs serious attention. The price is only about 80 euros. Where new hardware comes on the market, there is also a new book like [5] (several, free) and [6] and [7]. I have not read everything myself, that only makes sense when I work with it. Those who want an overview of the quite expanding raspberry garden

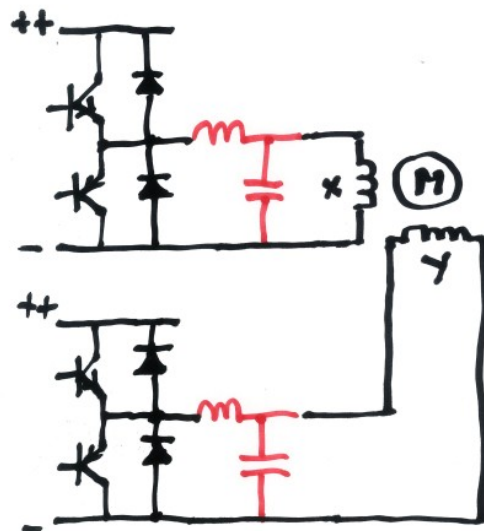
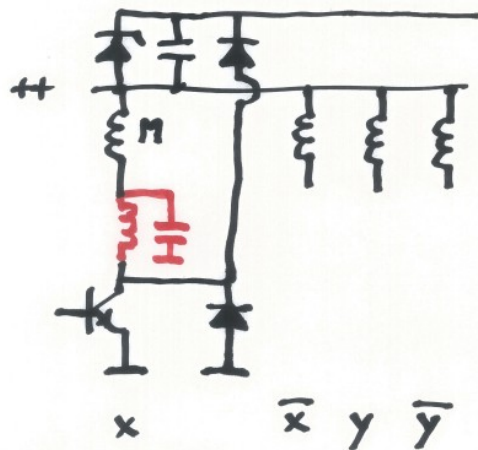
may look at [8] Our big question is of course: what is the application (it used to be called a "killer app") that makes migration from Arduino to Raspberry meaningful? Integration with smartphones could be one, but for now we have our hands full with the challenge of 7.8 GHz I think. Maybe the link between Arduino and Raspberry environment will come into play after all. Elektor has a handy board for it from Farnell [9].



Triple-Play platform interface

Just coming back to the import of our materials, from abroad and mostly China. Elmar also mentioned it in one of our video meetings. The VAT threshold of 22 Euros is going to disappear and there will also be customs clearance costs. This is called de-regulation these days. Because of covid (they say) will now be in the middle of this year. I have spent an afternoon clicking on the internet to find out how this will work out in practice for us as customers and the how is still unclear or unregulated. Our criminal friends are making a living out of this expanding bureaucracy: I already received the first request to generously send money to Asia for VAT on a non-existent package. At first glance, it even looked credible.

Also returning to an earlier theme of noisy motors: Jacques Verveer, emeritus electronic engineer at ESA and a computer acquaintance of mine who had a solution for his screeching telescope setup, based it on LC filters between motor control and motors. That takes the edge off the control current. The image shows the approach simplified.



Stepper motor filtering

Every country that has some tension at home, with protesters or something, sends a trolley to Mars these days. That distracts the attention. That Perseverance cart from the Americans is nice, because of the good marketing. Read: the razor sharp and telling pictures and the timing of release of pictures. Reception should not be impossible for us with an equatorial motor control: Canadian Scott Tilley [10] picked up the signal from the Chinese probe Tianwen-1 ("Heaven's Questions"), somewhere in the X-band. He has also picked up signals from NASA's Mars Reconnaissance Orbiter and the United Arab Emirates' Hope probe, both on or around Mars with his homebuilt 60-centimeter dish and SDR. Surely that offers opportunities.

For Voyager-2 (1977; victory tour past Jupiter, Saturn, Uranus, Neptune), it's all a bit trickier; it's now 90 AU away, but NASA was still in contact with it. Until an antenna in Australia broke down. NASA sent a repair team there that was too small. Of all the illogical corona measures (and there are quite a few by now), I do think this is the

most senseless, to stay in communication terms. The antenna has been repaired, albeit slowly of course, and NASA is back in touch.

In a Zoom meeting, the concept of right time came up. Coincidentally, a few weeks earlier I had realized that for reception of 7.8 GHz, the correct time at a crossing is more pressing. I compared the times from Teletext and Microsoft and they differed by almost 30 seconds(!). Surprise. Today it's 7 seconds. Time.gov vindicates Microsoft. So Teletext's cuckoo clock must be broken. It raises the philosophical question of who owns the correct time. The correct time in relation to the Kepler tables is of course more important. In this March's Electron there is a small design for an ntp clock with ESP32.

In that Electron also an explanation of antennas, radiation and far fields. I wanted to devote a story here to books on Maxwell's equations before, but it didn't make it yet. Maybe this will give me a push for next time.

The UK Microwave group has released all the 2019 issues [11] and I am happy to pass on this tip from editor Job. One of the articles there is about transmission at 122 GHz. At that time I felt a kind of indirect fear of heights, but that too will disappear at some point with

your Librarian

- 1] Veron webshop
- 2] GEO newsletter
- 3] GEO newsletter, previous issues
- 4] Iceberg breaks off
- 5] Raspberry books for beginners, free
- 6] Raspberry Pi 4 beginners guide
- 7] Raspberry Pi 4 For Beginners And Intermediates
- 8] Raspberry overview
- [9] Farnell platform link
- [10] Mars expeditions
- [11] Scatterpoint

Report of the members meeting January 9, 2021.

Opening by the chairman.

Ed Murashi is also “present”, which is why this zoom session is done in English. This is no problem for the other “attendees”.

About the contribution for 2021; as known there are now two membership types: paper or pdf.

In 2020, a large number of planned events were canceled for the well-known reason: the visit to Darmstadt, two fairs and three meetings; those have been replaced by Zoom sessions.

The last 'real' meeting was in March, just after the lockdown (but within the rules), with only a few attendees.

There were some problems with sending of the magazine "de Kunstmaan" (wet KM's); it has our attention.

No new construction kits were sold for the receiver in 2020. The availability of parts remains a problem.

The meeting in March will also be a zoom session; maybe we can have a 'real' meeting in September. The visit to Darmstadt is expected to be postponed for another year.

One of the problems we are working on is antenna control; that is still a problem with 8 GHz, because of the accuracy. Hopefully we get this year a little further with the 8 GHz projects.

Setting the agenda

Extra point: appointment of Cash Control Committee. Wim Bravenboer takes over from Herman ten Grotenhuis and, together with Rob Hollander, is doing the check for 2020.

Satellite status

With regard to the usual weather satellites, there are few changes; see elsewhere in this magazine.

Fred Jansen reports that Aqua (polar satellite) is to the end of its life time (the fuel is running low), it is expected that the satellite will be set out-of-service beyond this year, and the last bit of fuel will be used to push it into an orbit where it can not do any harm. It's a pity; Aqua gives a very strong signal at 8 GHz and is therefore suitable for testing receiving equipment. Chinese FY-3B has also a strong signal at 8 GHz, so this can then be used as a "test signal". But this signal is occasionally turned off by the Chinese. The bit rate is 30 Mb/s. Fred will make a list of 8 GHz satellites that we can use.

He maintains, moreover, a log of the receipt of 8 GHz satellites, this logbook has already a volume of 150 pages.

Presentation

Ben summarizes 8 GHz related issues. An overview, with comments from other members:

Time determination with DCF77 gives a deviation of 1 sec. compared to GPS. It is not clear which of these two indicates the correct time.

For the testing of 8 GHz the geostationary Syracuse 3B will be used; it has a very strong signal. Polarization is circular, but reversed compared to weather satellites.

The question is whether Xtrack can be adjusted so that position calibration can be done on the basis of this satellite. Rob will have a look at it.

Regarding the required dimensions of the dish: Fred Jansen can receive the Aqua with a 1 meter dish; an LNB with a very good noise figure is required.

Arne reports that the efficiency of primary focus antenna may be only 60%; with offset dishes this can be 80%. One of the reasons for the poorer efficiency of a primary focus antenna is that the "head" shields off partly the received beam.

Furthermore, for self-made dishes, it is difficult to get the correct parabolic shape and get comparable results as with a purchased TV dish.

The best thing is to start from an offset dish, and make a feedhorn for it.

LNA: best is to buy one, it is difficult to make a good one yourself. You can buy via ebay, but then you have to be lucky to find a good one; eventually you may be cheaper out if you buy a new one.

A Pickett-Potter horn may be a good alternative to a self-made feedhorn .

As far as the rotor is concerned, an X / Y system is preferred; an elevation/azimut system can cause speed problems at high crossings (especially the azimuth rotor).

Regarding the receiver, the UV1316 may be useful if filters are removed to increase bandwidth. Question is whether the existing QPSK demodulator (now used for METOP) can handle the data rate; Rob has his doubts.

Fred has recorded IQ signals, which in combination with an Ettus SDR could be used to create a signal to test a few things.

Fons has compared some SDRs :

- PLUTO: is too slow (USB2 output).
- The B200 from Ettus is good but expensive
- LimeSDR a good alternative; gives a little more noise, but is much cheaper

Any other business

Elmar : asks if invitations for this meeting are sent to GEO members. That is not the case; the invitation was only sent to members of the "Kunstmanen" group .

With regard to orders abroad: the announced VAT adjustments have been postponed until June, possibly even later. This because of the Corona troubles.

Ed Murashi : For him, 2020 was a “good” year; the Corona conditions have also brought something positive in the form of many online seminars etc. This allowed him to attend many of these “meetings” without traveling.

One of the clubs where he finds a lot of information is the San Bernardino Microwave Society ([1], [2]). For him our Kunstmanen-group is especially interesting for the software.

Arne: shows a number of available modules for 8 GHz amplifiers / mixers. Job reports that a problem with some of these modules is to get a stable and at the same time good noise figure.

Job de Haas: is trying to make an LNA for 8 GHz.

Wim Bravenboer: asks whether a “Lime SDR Mini” is suitable for the 8 GHz band. This has a bandwidth of approx. 30 MHz, max. sample rate approx. 30 Msamples / sec. That's half of what a regular LimeSDR can do. Whether this SDR is suitable could not be answered with certainty.

Another question: does it make sense to cool the LNA with Peltier elements to get a lower noise figure? That effect is negligible; cooling with, for example, 20 degrees seems like a lot, but you have to look at this in relation to the absolute temperature, so then the cooling will go from, for example, 293 Kelvin (+20 degrees) to 273 Kelvin (0 degrees). That is not so much. Cooling only makes sense if you do it with liquid nitrogen (-75 degrees), not something for amateurs .

Arne: Look for offset dishes of 1.2 or 1.5 meters. These may be well suited for 8 GHz reception, but they are rare because satellite TV transmitters are becoming stronger (and conventional antennas thus smaller). Polyester dishes are dimensionally stable even after 20 years and do not rust and are preferable to steel or aluminum pressed dishes.

Fred Jansen finally shows a nice picture of Europe, which he himself received from the Chinese FY3-D (X-band).

13:15: End of this zoom meeting. There were 14 members " present."

Rob Alblas

(secretary AI)

References

[1] New San Bernardino Microwave Society webpage

[2] Old San Bernardino Microwave Society webpage

Report of the members meeting 13 March 2021.

Opening by the chairman.

Fred Jansen and Fons Buitelaar cannot attend this meeting.
Fred Jansen did report that he can receive Terra at 8 GHz.

Francis Bell, founder of GEO, has passed away. We had good contacts with him; He also visited Fred vd Bosch in Vietnam. For an In Memoriam see elsewhere in this magazine.

March last year was the last 'real' meeting. The meeting on May 8 will also go via zoom; hopefully we can have a 'real' meeting in Utrecht in September

Setting the agenda

No comments / adjustments reported.

Administrative affairs

No changes. We now have 102 members, of which 54 want to receive a paper magazine the other 48 will receive only a PDF version.

Satellite status

Some adjustments have already been made in the last KM of 2020; this will be further updated. The fixed information that was always with the satellite status will be put on the website.

Arne reports that little has changed in the status. Meteor MN 2-3 will be launched somewhere this year, it is unknown when. Hopefully we will then have a full-working Meteor again. Meteor MN 2-2 suffered by probably a meteorite; no LRPT is emitted, and AHRPT only works when sunlight falls on the solar cells.

Fred vd Bosch still receives APT from NOAA18 / 19, NOAA15 is very weak.

Job reports that a new satellite Arktika has recently been launched; it transmits in the 1700 MHz band. It is in a highly elliptical orbit and is primarily intended for polar observation. It is not clear whether we can do anything with this. For the moment we add this one to the satellite status.

Any other business

Rob has expanded xtrack with a possibility to send the antenna a little forward. This may be necessary if a satellite has to be tracked very precisely (8 GHz, large dish). The antenna is then moved forward by a maximum of half the opening angle. He is also trying to build in a possibility to calibrate on an 8 GHz geostationary satellite (Siracuse) of which

the position is accurately known.

Herman ten Grotenhuis reports: Scatterpoint of the UK Microwave Group, mentioned in the newsletter; in addition to the 2019 year mentioned, you can also view older volumes. There are increasingly more magazines that you can download for free via the internet. Herman will send a list to the board so that we can put it on the website.

Wim Bravenboer has material for aluminium soldering, he will experiment with it.

Peter Kuiper is asking for information about a new to build receiver for 8 GHz; what do we need? What type of feed is needed, is it also possible with a helical? He asks for an overview.

Job: you need a horn feed and the receiver needs more bandwidth. A first solution could be to realize reception with an SDR; this is already being done here and there. Then you could see how the receiver can be realized in hardware. The advantage of hardware is that you have an immediate image; with an SDR you receive a lot of Giga-bytes which you then have to decode.

Ben adds: the QPSK receiver we have now: the bandwidth of the tuner is too narrow, the QPSK demodulator is maybe suitable.

Ben is working on printed circuit boards for 8 GHz, especially for a mixer up to 430 MHz. Furthermore, he shows a movie showing how to create a round (3D) metal form using a lathe. This is done by pushing a turning disc over a shape, as it were. The question is whether this is practically feasible for us.

Lecture on 8 GHz feeds by Job

Job talks about waveguides and the dimensions related to frequency.

Some keywords: converting circular to linear polarization using septum or Teflon plate, adaptation of the feed to the dish, the probe with which the signal in the waveguide is picked up. These matters will be described in a subsequent KM.

Finally Ben shows a utility 'HDL_ANT32' which can be used to calculate needed sizes of e.g. a feed.

Rob Alblas

(secretary AI)

Financial annual overview in 2020; budget 2021

This is an overview of income / expenditure for the calendar year 2020. The actual income / expenditure may (partially) have been made in another year.

The budget for 2021 is also included here. Due to the cancellation of meetings and fairs, less expenditure was incurred. Normally, the loss would have been about 300 euros higher. Because a PDF subscription has now been introduced, the income and expenses are different from previous years.

If there are any questions about this overview, please let me know before the annual meeting (May 2021) so that I can explain things on that day.

Expenses	2019	2020	2021		Income	2019	2020	2021
	Realisation	Realisation	Budget			Realisation	Realisation	Budget
printing costs KM	€ 2.249,86	€ 908,05	€ 560,00		subscriptions	€ 2.625,00	€ 2.615,00	€ 2.083,00
shipping KM		€ 1.190,52	€ 730,00					
rent Nimeto	€ 319,00	€ 138,00	€ 320,00					
Beheerder Nimeto	€ 320,00							
Fairs	€ 126,00	€ 0,00	€ 130,00		onterest saving account	€ 0,00	€ 0,00	€ 0,00
Work projects	€ 0,00	€ 14,90	€ 50,00		selling equipment	€ 45,00	€ 0,00	€ 0,00
subscriptions library	€ 84,00	€ 117,80	€ 90,00		selling KM	€ 5,00	€ 9,00	€ 0,00
Internet subscriptions	€ 67,20	€ 69,90	€ 70,00		selling components proj.	€ 0,00	€ 14,90	€ 0,00
Bankcosts	€ 166,74	€ 154,63	€ 170,00		Gifts		€ 10,00	
Paypal costs contr.	€ 13,08	€ 12,59	€ 15,00					
office supplies	€ 87,21	€ 66,00	€ 30,00					
					Losses	€ 758,09	€ 23,49	€ 82,00
Result expenses	€ 3.433,09	€ 2.672,39	€ 2.165,00		Result income	€ 3.433,09	€ 2.672,39	€ 2.165,00

Note: subscription UKW messages (33.80) is now also taxed, in contrast to previous years (used to be paid privately).

Balance 31-12-2020

Activa	2019	2020	Passiva	2019	2020
ZKI savings account	€ 6.936,54	€ 6.336,54	Eigen vermogen	€ 6.864,20	€ 6.850,71
Bank	€ 1.225,26	€ 691,09	membership next year	€ 1.140,00	€ 608,00
stamps		€ 540,98	Rest. membership (last year)	€ 30,00	€ 40,00
			Nimeto 2019	€ 127,60	
			Internet abonnement		€ 69,90
Total	€ 8.161,80	€ 7.568,61	Total	€ 8.161,80	€ 7.568,61

Overview of year-end accounts.

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

	2015	2016	2017	2018	2019	2020
saving account	€ 9.354,50	€ 8.625,60	€ 8.634,22	€ 7.936,54	€ 6.936,54	€ 6.336,54
bank account	€ 1.409,25	€ 1.045,26	€ 707,38	€ 1.108,67	€ 1.225,26	€ 691,09
Total	€ 10.763,75	€ 9.670,86	€ 9.341,60	€ 9.045,21	€ 8.161,80	€ 7.027,63

Overview of membership and income.

	Realisation 2018		Realisation 2019		Realisation 2020		Begroting 2021	
	amount	income	amount	income	amount	income	amount	income
Netherlands	77	€ 1.925,00	81	€ 2.025,00	81	€ 2.025,00	47	€ 1.316,00
Netherlands PDF	0		0		0		34	€ 340,00
Abroad	28	€ 840,00	17	€ 510,00	17	€ 510,00	9	€ 297,00
Abroad PDF			9	€ 90,00	8	€ 80,00	13	€ 130,00
Special members	9	€ 0,00	2	€ 0,00	2	€ 0,00	2	€ 0,00
Totaal	114	€ 2.765,00	109	€ 2.625,00	108	€ 2.615,00	105	€ 2.083,00

Note: As of 2021, there is now also a subscription PDF for Dutch speaking members.

The table below shows the membership turnover in the past 4 years.

year	lost	new (up to now)	amount members
2021	-5	2	105
2020	-5	4	108
2019	-9	4	109
2018	-2	9	114
2017	-9	11	107

Rob Alblas

treasurer

Arne van Belle, per 25 march 2021

POLAIR	APT (MHz)	HRPT (MHz)	Pass
NOAA 15	137.620	1702.5	morning/evening, weak and sync problems
NOAA 18	137.9125	1707.0	early morning/ late noon
NOAA 19	137.100	1698.0	morning/evening
FengYun 3A	no	1704.5	AHRPT 2.80 Msym/s
FengYun 3B	no	1704.5 X-band	AHRPT 2.80 Msym/s
FengYun 3C	no	1701.3	AHRPT 2.60 Msym/s
FengYun 3D	no	7820.0 X-band	noon MPT 30 Msym/s
Metop-A	off(137.100 LRPT)	1701.3	LRPT/AHRPT 2.33 Msym/s
Metop-B	no	1701.3	Only AHRPT 2.33 Msym/s
Metop-C	no	1701.3	Only AHRPT 2.33 Msym/s
METEOR M N2	137.100 LRPT	1700.0	LRPT/MHRPT
METEOR M N2-2	off(137.100 LRPT)	1700.0	LRPT/MHRPT damaged by meteorite ?
NPP	no	7812.0 X-band	HRD 15 Mbps
JPSS-1/NOAA 20	no	7812.0 X-band	HRD 15 Mbps
Arktika M1	no	1697 and 7865 X-band	BPSK 30.72 MS/s, telemetry on 1703 MHz

GEOSTATIONAIR	APT (MHz)	(SDUS)/PDUS (MHz)	Orbital position
MET-11 (MSG-4)	no LRIT	1695.15 HRIT	0 degrees, operational
MET-10	no LRIT	1695.15 HRIT	9.5 degrees O, RSS
MET-9	no LRIT	1695.15 HRIT	3.5 degrees O, standby
MET-8	no LRIT	1695.15 HRIT	41.5° degrees O, IODC
GOES-E (no. 16)	1686.6 GRB	1694.1 HRIT	75.2 degrees W via Eumetcast
GOES-W (no. 17)	1686.6 GRB	1694.1 HRIT	137.2 degrees W via Eumetcast
GOES 14	1691 LRIT	1685,7 GVAR	105 degrees W, Backup
GOES 13 / EWS-G1	1676 SD	1685,7 GVAR	61.5 degrees O, Now Space Force
GOES 15	1691 LRIT	1685,7 GVAR	128 degrees W parallel with GOES 17
Elektro-L2	1691 LRIT	1693 HRIT	14.5 Degrees W, via Eumetcast
Elektro-L3	LRIT	HRIT	76 Degrees O, Operational
MTSAT-1R	1691 LRIT	1687.1 HRIT	140 degrees O, Backup for MTSAT2
MTSAT-2	1691 LRIT	1687.1 HRIT	145 degrees O, via Eumetcast
Himawari-8	no LRIT	no HRIT	140.7 degrees O, via HimawariCast
Himawari-9	no LRIT	no HRIT	140.7 degrees O, Backup for 8
Feng Yun 2E	-	-	86.5 degrees O, Backup
Feng Yun 2F	-	-	112.5 degrees O, Backup
Feng Yun 2G	-	-	99.5 degrees O
Feng Yun 2H	-	-	79 degrees O
Feng Yun 4A	1697 LRIT	1681HRIT	99.5 degrees O, Operational

GOES-13 has been moved and handed over to Space Force and renamed to EWS-G1. The GVAR mode can be received and decoded using SDR using a dish minimum 180cm (search for @ZSztanga on the web).

Meteor M N2-3 launch has been delayed to next year.

Arktika-M1 has been launched successfully and uses a Molnya orbit. Signals have been received on 1697, 1703 and 7865 MHz.

GOES-T launch (GOES 18 once in orbit) is expected 7 December 2021.



De werkgroep is opgericht in 1973 en stelt zich tot doel:
*Het bevorderen van het waarnemen van kunstmanen
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