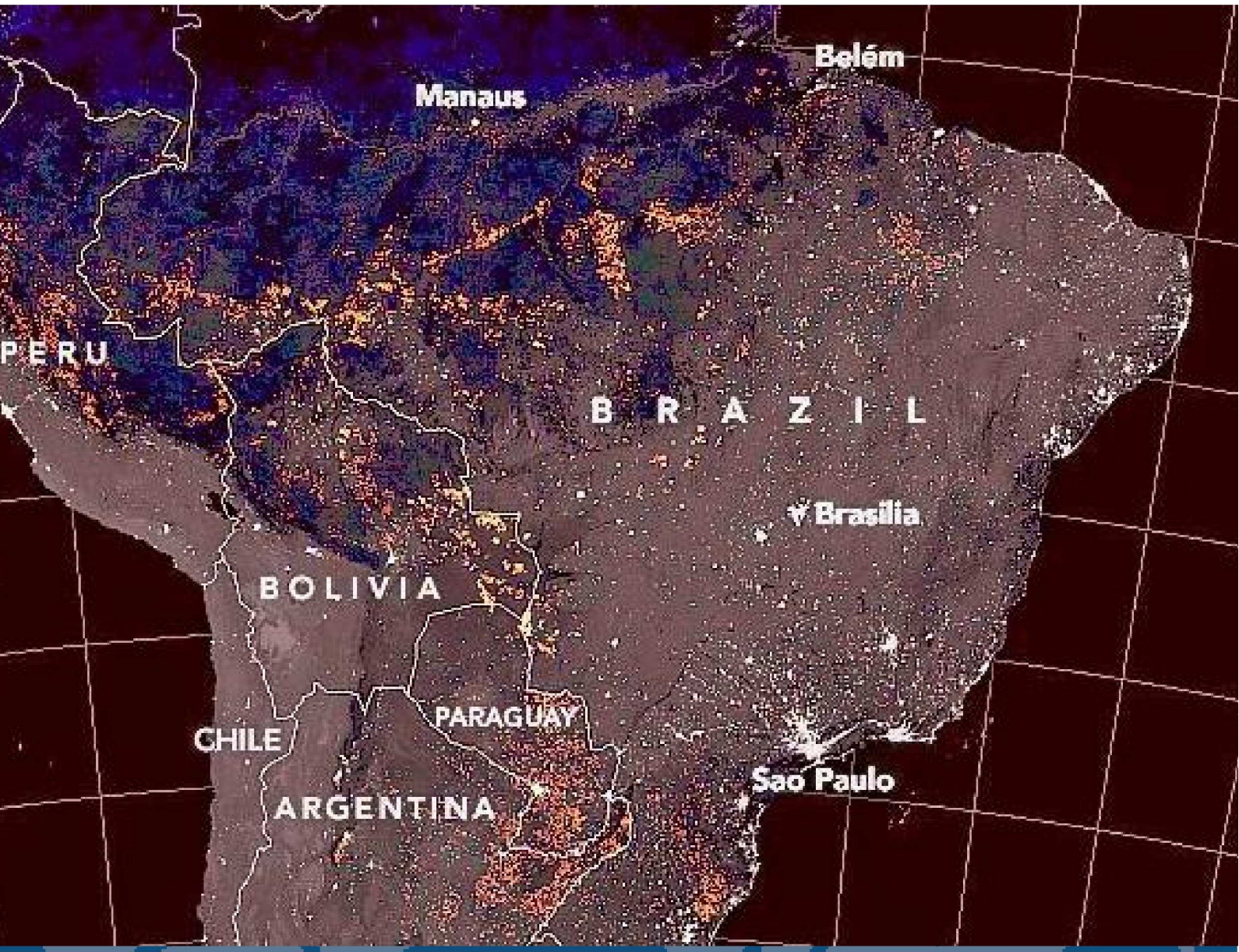
DE KUNSTMAAN

September 2019 – 46e jaargang nr. 3

Uitgave van de Werkgroep Kunstmanen



In dit nummer o.a.

- FT232H alternatief voor FT245
- Een nieuwe 1000-deler
- Geodetische paraboolantenne
- 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
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Content

Photo front page:
Fire in the Amazone area (NASA)

Preface

The summer has of course passed too quickly. Fortunately not as dry as last year, but we did have hot moments. On the front plate a NASA recording of the rainforest in the Amazon that is on fire. Satellites have proved to be indispensable to refute claims such as "it is not too bad with those fires".

The nice weather invites you to work with the antennas. On Friday, August 16, we did some antenna measurements in the open field. Peter Smits wanted to make recordings in the field of events that last as long as possible. This was combined with antenna measurements. Peter Cooper managed to snare a farmer to his pasture may be. Gentlemen thanks for the organization ! The patch and the helical antenna were measured. Now it is difficult to choose a "winner" but the helical antenna seems to do better than the patch antenna . The question is how this is possible because the antenna is not constructed according to the booklets. It can of course also be due to the measurement setup. It seems to be a difficult story with many variables . The following Kunstmaan comes a report .

Measuring a satellite dish is a serious matter! Job and Rob behind the table. Arne watches. In the background the farmer who let us use his pasture.

I myself have built a so-called geodesic antenna. This antenna consists of loose strips of aluminium that are bolted together. The construction was relatively quick and easy. The antenna has not been on my rotor yet, so I cannot share practical experiences. More about this in this Kunstmaan.

Recently I have also been diving in Scilab. This is an open source alternative to Matlab. In this Kunstmaan a story about the control of a spectrum analyzer . In the following Kunstmanen there will be more articles about applications of Scilab in our beautiful hobby.

Even more software news : KiCad has been released with version 5.1.4, unfortunately not yet a 6.0 version. The open source print design program is gaining popularity: they have actually held a conference in Chicago. Search YouTube for " KiCon 2019". Here you can also find a presentation about the use of KiCad for printed circuit boards in the microwave range.

And after more than a year of radio silence, GNU Radio comes with version 3.8.0. There are so many improvements in this version that can not be picked sum d. I haven't had time to test yet.

Rob describes FT232H USB chip needed is for the higher data rates . Fortunately adapter adapters (from Adafuit) are for sale so that you do not have to solder this chip yourself. Along with this expansion, Harry has also launched a new decoder print.

And Fred has 33 ᵉcontribution from Vietnam. Still a small gradient in his receiver. This is something we are going to investigate further. It should not be necessary to turn trimmers or reels during this time.

Meeting

With 18 people present it was quiet at the meeting of 14 September. Timo has given an interesting lecture about the use of a Vector Network Analyzer . This is designed by professor Thomas Baier and runs up to 1.3 G Hz . We also have a test of the VNA in combination with the band converter so that we could look in the range of 1500 to 2000 MHz. In addition, the explanation about Smith charts was very enlightening. With simulation software, creating an adaptation network is a piece of cake.

Air Force Days

We were also invited to the air force days in Volkel . We had a market stall of 4 meters and had a lot of visitors with our direct reception. There I spoke with a lieutenant from the Air & Space Warfare department , he called it Russian !! program Heavensat [4] with which they visualize satellites that are visible in the sky. He also said that photographing geostationary satellites seems to be relatively easy. You make a time recording where the stars become stripes and the satellites remain dots. This is something to try out in the winter months.

Mobile dish antenna on the Air Force Days

Have fun with this Kunstmaan and hope to see you soon at our next meeting on 9 November.

Links

GNU Radio

https://www.gnuradio.org/news/2019-08-10-gnu-radio-v3-8-0-0-release/

Kicad

http://kicad-pcb.org/download/

Heavensat

http://www.sat.belastro.net/heavensat.ru/english/index.html

Weather satellites in Vietnam (33) **Fred van den Bosch**

Summary
My experiences with weather satellites etc. in Vietnam.

After the extra long version of the last time, this time an (extra) short one. By the way, did anyone with my article have anything to do with the automation of his system? Any additions / ideas / wishes?

APT
This runs as usual: smoothly and automatically. At least, as long as the electricity doesn't go out, because that was bad again lately. The resulting composition photo was shown in the previous KM. This too is constantly updated.

HRPT / QPSK
Meteor M N2
In the beginning it took quite a bit of effort to receive this new satellite. In the end a slightly misadjusted coil on the demodulator board of the receiver turned out to be the cause of the non-receiving. &% (& ^ $ (* & ^% $

Hereby one of the recordings. The first shot that worked was a very low pass of 7 g. and I used that to adjust the coil.

*** Photo

This recording is from 10/8 13:56. At the top you can see the super typhoon Lekima, now weakened to a Severe tropical storm, on this photo. Elsewhere in this Kunstmaan an APT photo is shown when the typhoon was much more powerful.

I have regular passes that start and end at around 3-4 gr. above the horizon. Not bad with mountains all around up to 6-7 gr. high

Automation
Refinements are still regularly made.

Miscellaneous
A free-to-use radio telescope
On the Astro forum I found a link [1] to the website.

Apollo 11
For those who have not yet seen the documentary [2]: an absolute must!

Do-it-yourself Apollo elf
And replay is also possible: [3]

References, see website

[1] Free-to-use radio telescope
[2] Apollo 11
[3] Do-it-yourself Apollo elf

FT232H: the better alternative to the FT245

In the (A)HRPT decoder, a USB interface based on the FT245 is used for connection to the PC. Sparkfun had a "break-out board" based on this chip, and it works great for lower speeds. For higher speeds, needed for the QPSK satellites such as Metop and Fengyun, the speed of the FT245 is very tight; to pass on all data + some status information (such as in-sync state of the decoder) "dirty" tricks had to be implemented.
For X-band satellites, such as NOAA-20 and Fengyun-3D, the speed of the FT245 is much too low.

Fortunately there is a much faster USB interface on the market; Adafruit has issued it as a 'breakout board' based on the FT232H. Unfortunately, the board is not pin-compatible with the Sparkfun, so an adapter or other decoder print is required. The control is the same, so no other FPGA load is needed.
This break-out board has already been discussed in “de Kunstmaan” 2017, no. 3, page 7 [1].

The table below provides an overview of the satellites to be received and the usable USB chips. The gross bit rate refers to the bits that are received, the net bit rate to the data bits that are sent to the PC.

satellite	Gross Bit Rate (Mb / s)	Net bit rate (Mb / s)	USB bit rate (Mb / s) via FT245 (1)	USB bit rate (Mb / s) via FT232H (2)
NOAA-19	1,3308	0.6654	1.06464	1.06464
METOP	4.66	3.5	4.66	7.0
FY3AB	5.6	4.2	5.6	8.4
FY3C	5.2	3.9	5.2	7.8
NOAA-20	30	15	-	30
FY3D	60	45	-	90

1) FT245: bitrate max. 8 Mbit / s; transfer via USB: 4 bytes per 3 data bytes
2) FT232H: bitrate max. 64 Mbit / s; transfer via USB: 2 bytes per data byte

In addition to the data bits, some additional decoder status must also be transferred, at least the sync state of the decoder. With HRPT ("old" NOAAs: 19 and older) the data words are made up of 10 bits. By transferring 2 bytes per word, extra bits are available to add the decoder status.
In QPSK satellites like Metop and Fengyun data to transfer is byte oriented, so a full extra byte has to be transferred to add the decoder status. The bit rate over USB is then double to what is in the "Net bit rate" column. Those values are close to or over the maximum bit rate of what an FT245 can handle. That is why a different method had to be devised here. Here 3 data bytes are sent using 4 bytes to be able to add the extra information, hence the required bit rate via USB is not 2x as high but 4 / 3x as high.

For the X-band satellites NOAA20 and FY3D this trick no longer applies and the FT245 is unusable. For the FT232H it is no problem and you can even simply apply a byte doubling. This has already been proven for NOAA-20 (albeit with a generator, not yet with “real” NOAA-20 data); the decoding of FY3D has yet to be made.

The choice between "4 bytes per 3 data bytes" and "2 bytes per 1 data byte" is determined in Preferences of the program 'wsat'; this sets the GODIL (decoder) in the correct mode. The FT232H can also work in the "4 bytes per 3 data bytes" mode, but that is not necessary (except perhaps for the FY3D).

Set up.

The FT232H is a universal communication chip that can also handle UART, I2C, etc. By default it is set for serial communication; that should be byte communication, as the FT245 does. For this the chip must be reprogrammed; this is very easy to do with an extra tool: FT_PROG.exe (see [2])

This goes as follows:

- Connect the Adafruit board (with the FT232H) to the PC via the USB plug. There is a micro USB plug on the board. Please note: there are adapter cables that only transmit the power; they are therefore unusable!
- Start FT_PROG.EXE and click on the magnifying glass. Result: see fig. 1.

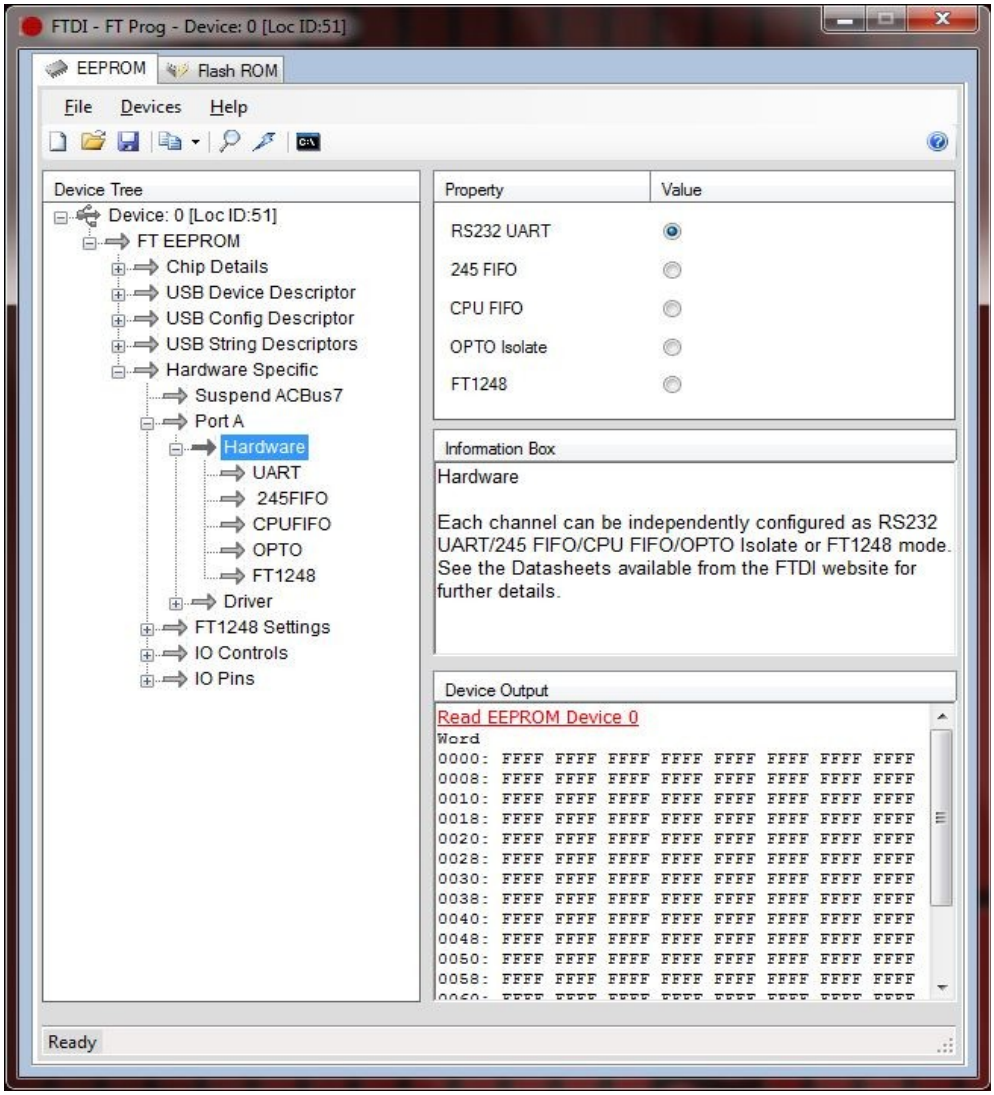


FIG. 1. FT232H still set as RS232 UART.

Now choose top right 245 FIFO.

Then click on the "magic stick" (to the right of the magnifying glass). This gives fig. 2:

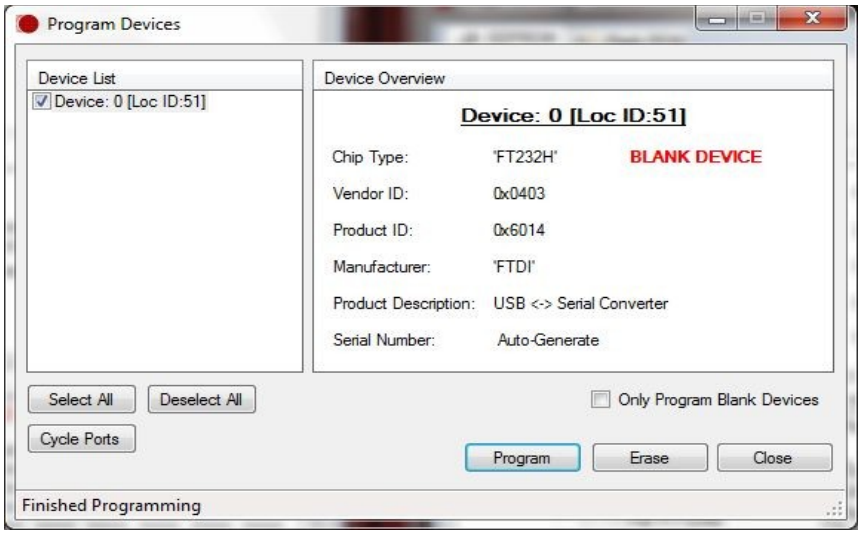


FIG. 2. Programming.

Click on Program. The main window now indicates:

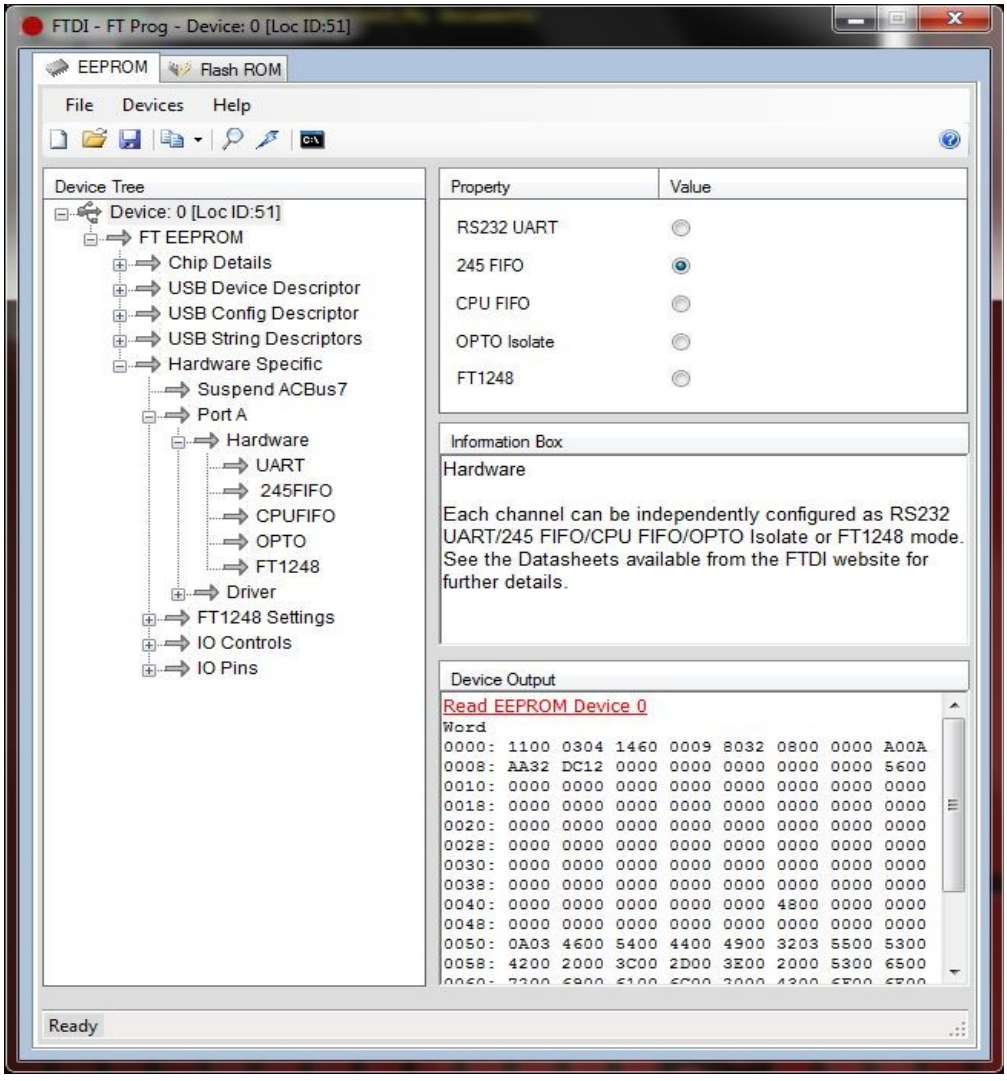


FIG. 3. FT232H programmed as 245 FIFO.

(Note that the field "Device output" now does not just contain "F".

Even if the USB connection is broken and then restored, this will be the result. The FT232H is now programmed as 245 FIFO and can be used as decoder interface.
FIG. 4 indicates how the board must be connected; apart from the voltage divider, it is identical with the connections of the old Sparkfun.

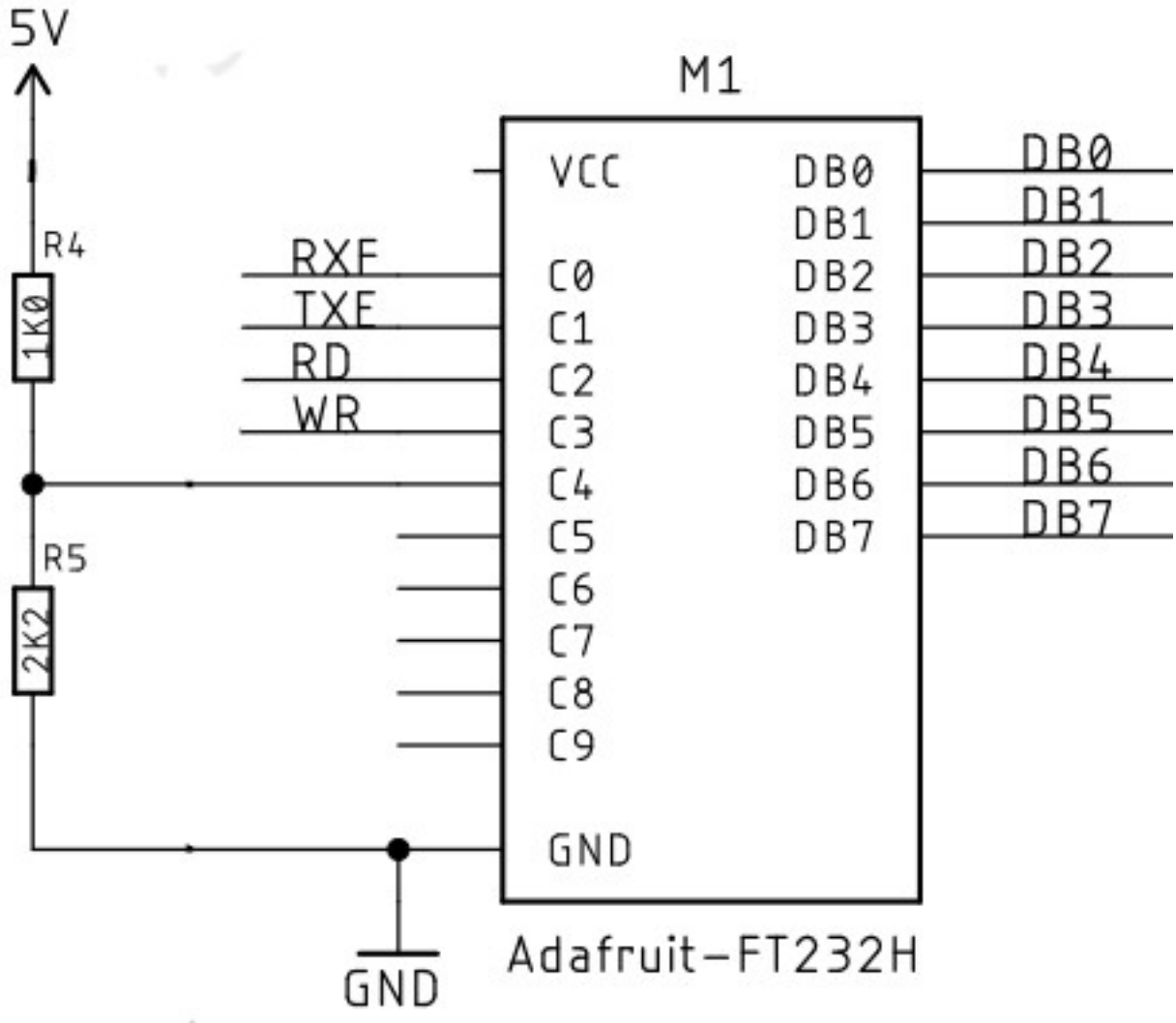


FIG. 4. The FT232H as a USB interface.

Note: VCC of the Adafruit must **not** be connected! It contains 5V from the PC, but the decoder has its own power supply.

Print
Harry Arends has designed a new print on which this USB interface can be placed directly. The print is also intended to work with a VCXO instead of a VCO (see also [4]).
FIG. 5 shows the schematic. All connections with the “Angry Outside World” (including DiSEqC outputs, UART, etc.) contain buffers, which more or less shield the GODIL from the outside world.

FIG. 6 shows the PCB and used modules..

Building the decoder print will not cause many problems. Only the VCXO is in SMD version, but it is easy to solder.
A point of attention is IC3 (3.3V stabilizer for the VCXO). The print provides two footprints, so depending on the type you have choose IC3 or IC3a.
The part around IC2 and L1 can be adjusted to the needs:

- Diode D1 is only for protection against incorrect polarity
- If 5V is available immediately, IC2 is not necessary, but D1 must also be omitted.
- If a higher voltage is available that is not used directly for other circuits, then L1, C2 and C3 are not required.
- If the higher voltage is used directly (eg 12V that is also used for the receiver) then L1 / C2 / C3 is required in addition to IC2. This is because IC2 (switched stabilizer) produces a very high interference noise on the input voltage (see [5]).
- When using a normal 7805 for IC2, L1, C2 and C3 are not necessary, but bear in mind that the 7805 must then be properly cooled (0.3A at 7V gives more than 2 W of dissipation).

The print can be connected to a power supply in two ways:

- Connector K6 is a plug for an external power supply
- K6A is a terminal connection for a power cable.

On the photo the decoder is built without the TSR-1-2450 (this is a 5V regulator) because the decoder is supplied from an external 5V supply. Here, diode D1 and IC2 are bypassed using a wire bridge.

For [1], [2], [3]: see http://www.kunstmanen.net, menu 'weblinks', 'KM links 2019

[1] I2C with the ft232h of adafruit
[2] Program to set the ft232h to 245 fifo mode.
[3] The chip used on an Adafruit break-out board.
[4] The VCO of the decoder. de Kunstmaan, 2018 no. 3, p. 9
[5] Power supply of the HRPT / QPSK receiver / decoder. de Kunstmaan, 2018 no. 4, p. 6

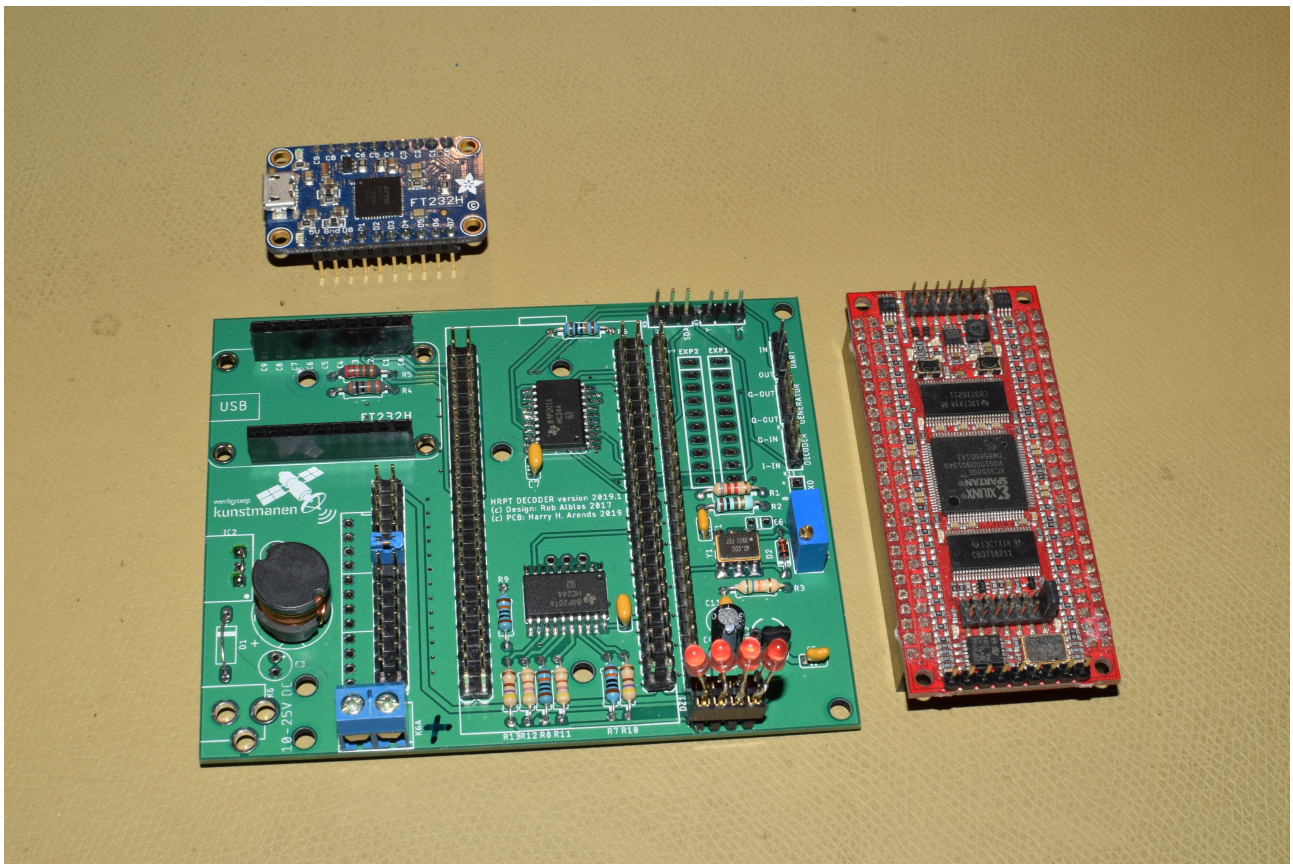
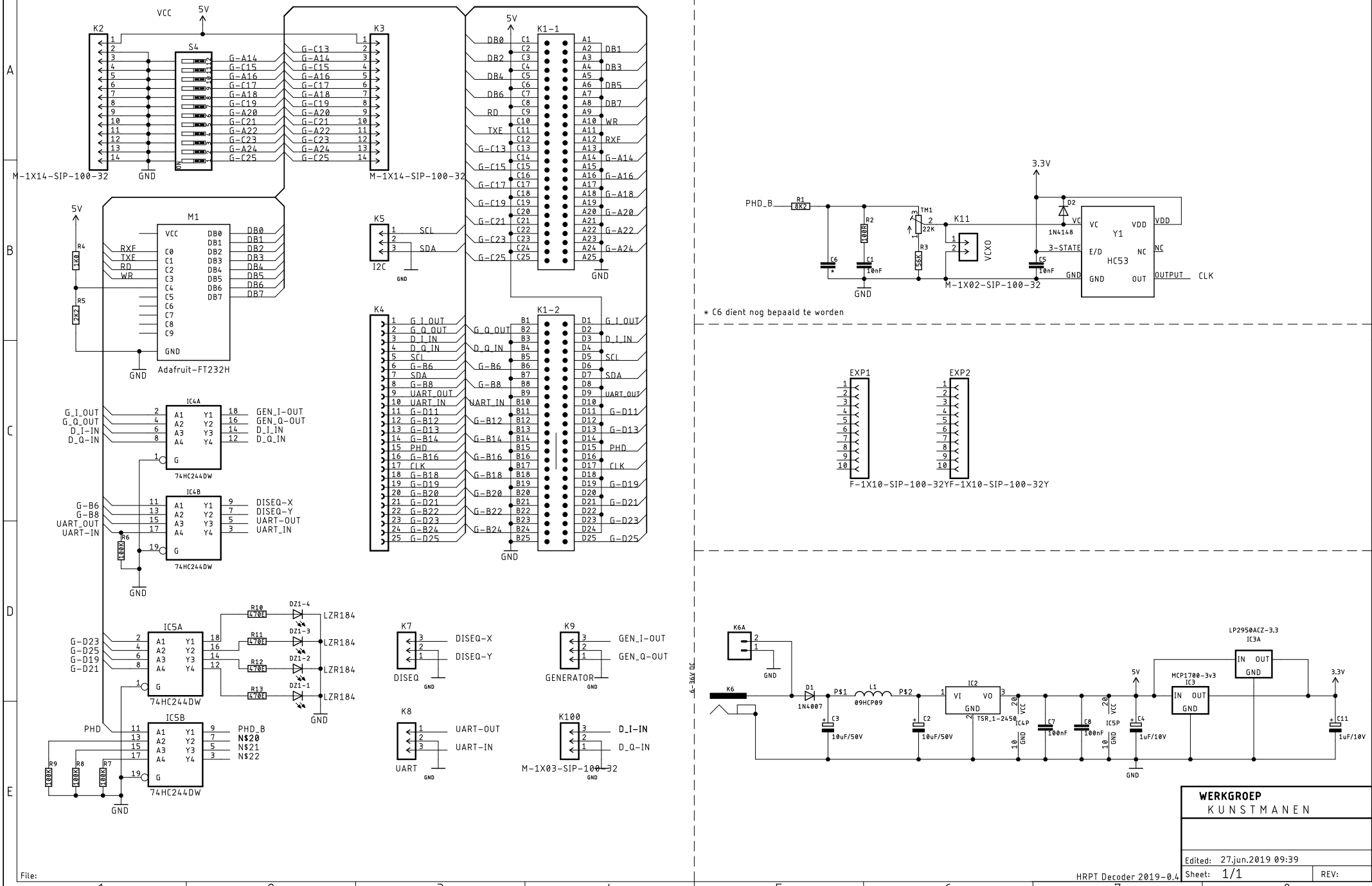


Fig. 5. Decoder pcb; rright the GODIL module, at top the Adafrruit break-out board.

Fig. 6: Schematic. (See next page.)


K2
K3
S4
M-1X14-SIP-100-32
M-1X14-SIP-100-32
GND
VCC
5V
K1-1
K1-2
M1
Adafruit-FT232H
K4
K5
I2C
SCL
SDA
RXF
TXE
RD
WR
IC4A
IC4B
74HC244DW
GEN_I-OUT
GEN_Q-OUT
DISEQ-X
DISEQ-Y
UART-OUT
UART_IN
IC5A
IC5B
LZR184
PHD_B
K7
DISEQ
K8
UART
K9
GENERATOR
K100
M-1X03-SIP-100-32
PHD_B
R1
8K2
R2
100R
R3
56K
TM1
22K
K11
VCXO
D2
1N4148
Y1
HC53
3-STATE
OUTPUT
CLK
M-1X02-SIP-100-32
* C6 dient nog bepaald te worden
EXP1
EXP2
F-1X10-SIP-100-32Y
K6A
K6
6-36V DC
1N4007
09HCP09
TSR_1-2450
LP2950ACZ-3.3
MCP1700-3v3
3.3V
5V
WERKGROEP
KUNSTMANEN
Edited: 27.jun.2019 09:39
Sheet: 1/1
REV:
HRPT Decoder 2019-0.4
File:

A new 1000 divider

Summary

This article describes a 1000 divider which can be used in the front or a frequency counter. Special in this design is that you can choose between an ADF4107 and the ADF41020, depending on the desired frequency range, money or soldering skills.

Preface

In the past I have written about 1000 sharers before. The first article from December 2013's Kunstmaan was based on a 128 divider, the uPB1507gv, combined with a CLPLD to be able to do the 7.125 division. This is not really a common solution anymore. The second article from October 2014 had the ADF4107 which was configured as a 1000 divider. The control was with a PIC 12F675.

The major limitation of the ADF4107 is the maximum limit of 7 GHz . The ADF41020 has a minimum input frequency of 4 GHz and a maximum of 18 GHz according to the datasheet . So it's time for an update.

The ADF41020

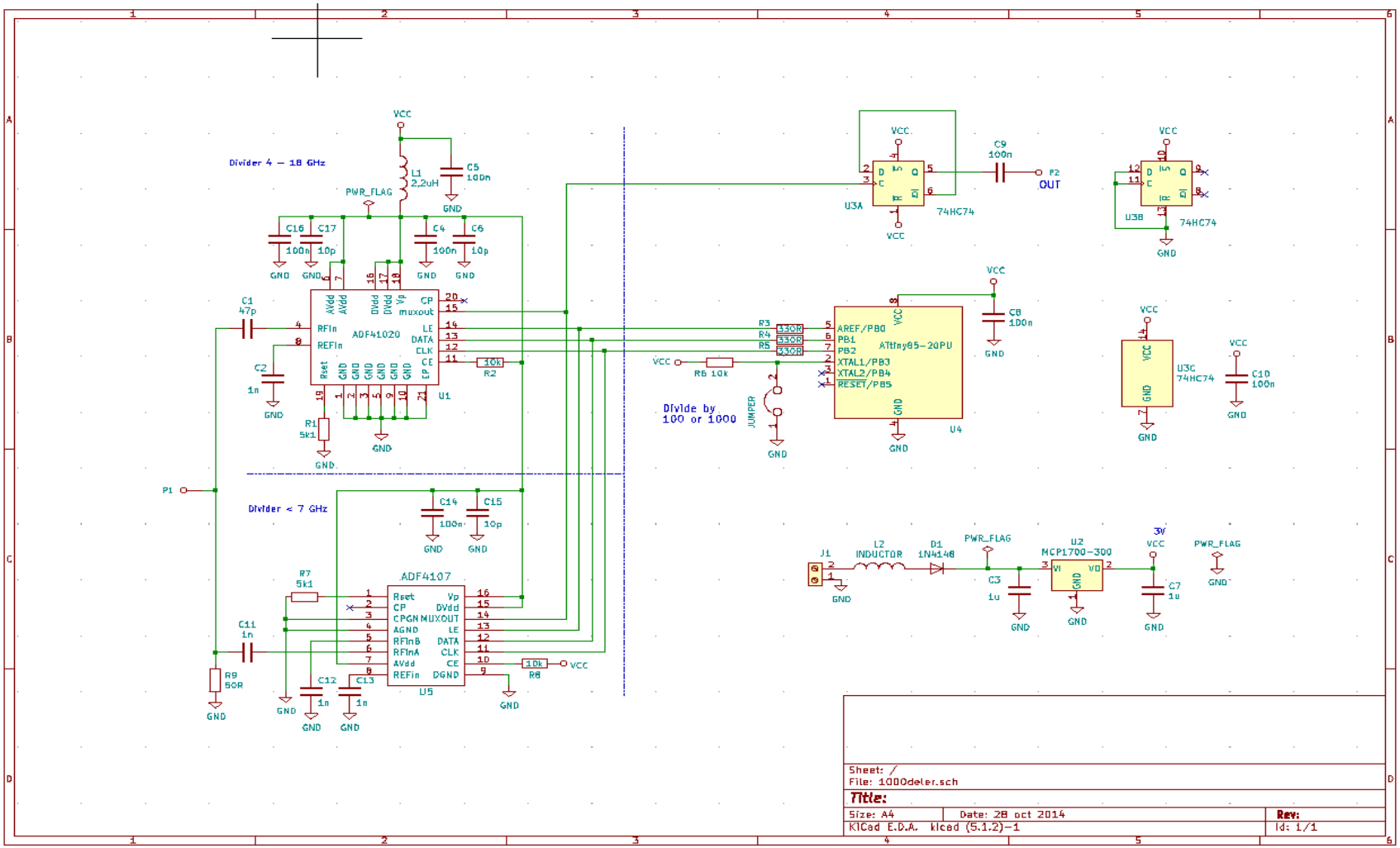
The concept of using the N divider from the PLL chip is attractive in itself because the design becomes very simple. Unfortunately, the number of alternatives to PLL chips from the Analog Devices series is not very large. If you look at the integer-N PLLs, then Analog Devices also has the ADF4108 that only goes up to 8 GHz and the ADF41020. The latter goes up to 18 GHz and is software compatible with the ADF4107, so it saves a lot of
research. Thomas Baier and Andreas Zimmermann also published a draft of this in the Funk Amateur of December 2015 , so it must be working.

Features of the ADF41020

- Goes up to 18 GHz

- Housing is LFCSP, 20 pins in a 4 x 4 mm housing, with a central GND pad . Without soldering an SMD rework station (or a grill plate for the brave among us).

- With a small 20 Euro this is an expensive chip


Divider 4 – 18 GHz
Divider < 7 GHz
Divide by
100 or 1000
ADF41020
ADF4107
ATtiny85-20PU
74HC74
MCP1700-300
INDUCTOR
1N4148
JUMPER
VCC
GND
PWR_FLAG
OUT
3V
L1 2,2uH
C5 100n
C16 100n
C17 10p
C4 100n
C6 10p
C1 47p
C2 1n
R1 5k1
R2 10k
C14 100n
C15 10p
R7 5k1
C11 1n
R9 50R
C12 1n
C13 1n
R8 10k
R3 330R
R4 330R
R5 330R
R6 10k
C9 100n
C8 100n
C10 100n
C3 1u
C7 1u
P1
P2
J1
L2
D1
U1
U2
U3A
U3B
U3C
U4
U5
Sheet: /
File: 1000deler.sch
Title:
Size: A4
Date: 28 oct 2014
KiCad E.D.A. kicad (5.1.2)-1
Rev:
Id: 1/1

Features of the ADF4107

- Goes up to 7 GHz

- Housing is 16 pin TSSOP, this can be soldered by hand and a normal soldering iron. With a pin distance of 0.65 mm, this is not easy

- With 6.5 Euro a lot cheaper

Scheme

For clarity: you mount the ADF4107 or ADF41020 depending on the maximum frequency to be measured.

My first idea was to design a print for the ADF4107 with an ATtiny85 (with Arduino software) for control. If this worked to make a new print for the ADF41020. When I was working on the print design I realized that there was enough space on the print for both chips. Depending on the version you wish to have, you choose the relevant chip.

The whole works on 3V that is made with an MCP1700 regulator. You can supply the circuit with a USB power supply . With the Action you can buy a colorful USB cable for one Euro . The voltage drop that occurs in this "lesser quality" USB cable is not great because the circuit draws little current.

A 7474 flip-flop is also included in the diagram. This is necessary to convert the needle-shaped pulses from the ADF4107 / ADF41020 to a square wave. Some counters may have problems counting needle-shaped pulses. The use of a flip-flop means an additional two-part. The ADF4107 / ADF41020 must therefore be divided by 500.

The 7 GHz variant

There is a 5 0 Ohm resistor at the input that must be mounted because the ADF4107 is not internally terminated with 50 Ohm. Mount capacitor C1. This is of the type 0402, very small. I chose this type because they are the most suitable for very high frequencies.

Furthermore, all decoupling Cs must be mounted around the ADF4107.

The 18 GHz variant

The 50 Ohm resistor is not necessary because it is already in the ADF41020 and mount capacitor C1 1 . Install all decoupling Cs and two resistors.

We want e e n 500-divider to make this is one thing. The ADF41020 cannot divide up to 18 GHz by 500. This is because the internal A and B counters can't measure above 350 MHz.

The ADF41020 has a fixed quad divider, followed by a prescaler (P) that can be set to 8/16 or 32.

Another precondition is that 4 x (P x P - P) is the minimum N division . For the different prescaler values you get:

P = 8 N at least 224

P = 16 N at least 960

P = 32 N at least 3968

For a 500 divider, with the ADF41020, you then come to a prescaler of 8. The maximum frequency is then 8 x 4 x 350 MHz = 11.2 GHz .

This creates the following variants for the frequency divider :

- A 1000 divider that can measure up to 11.2 GHz

- A 2000 divider, which can measure up to 18 GHz , with a square wave because the 7474 flip-flop is used

- A 1000 divider, which can measure up to 18 GHz , with short pulses on the output because the 7474 flipflop is not used

- A 100-divider as with the 7 GHz is not possible here

Software

To determine the bits to be sent to the PLLs , I used the software from Analog Devices . Both for the ADF4107 and ADF41020 [1].

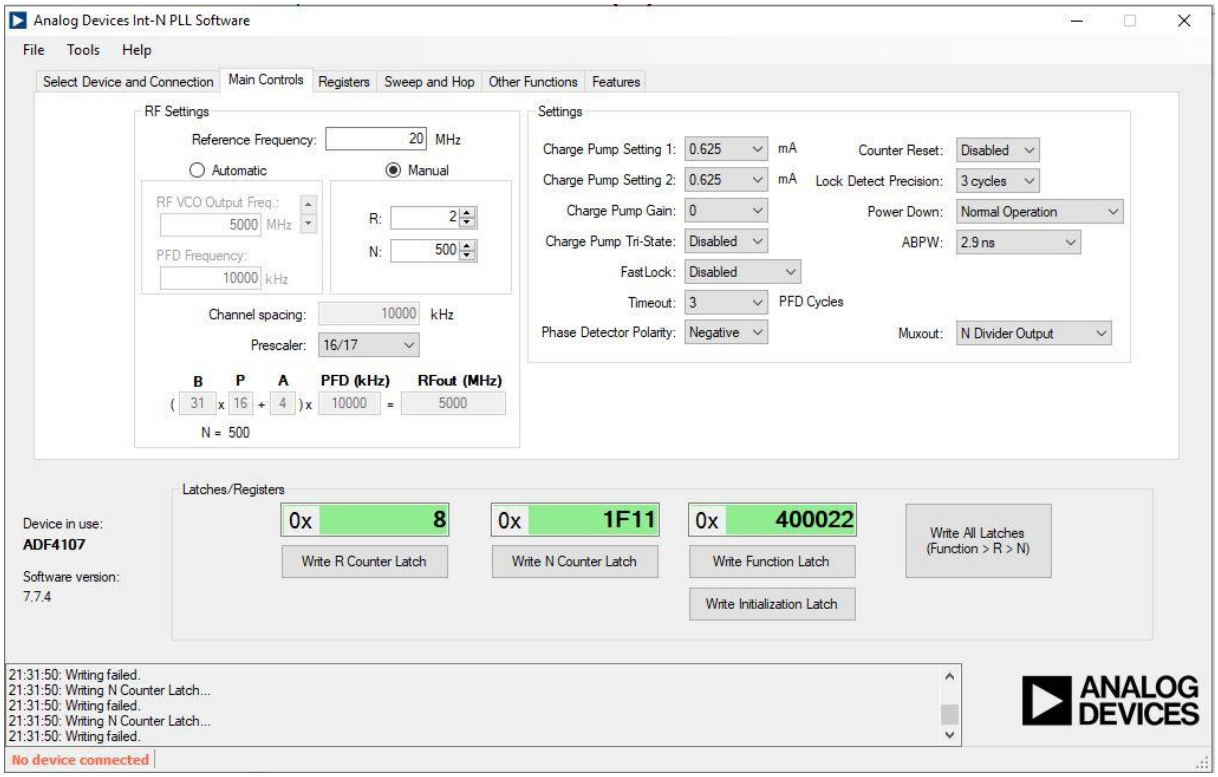


Fig 1 The settings for the ADF4107

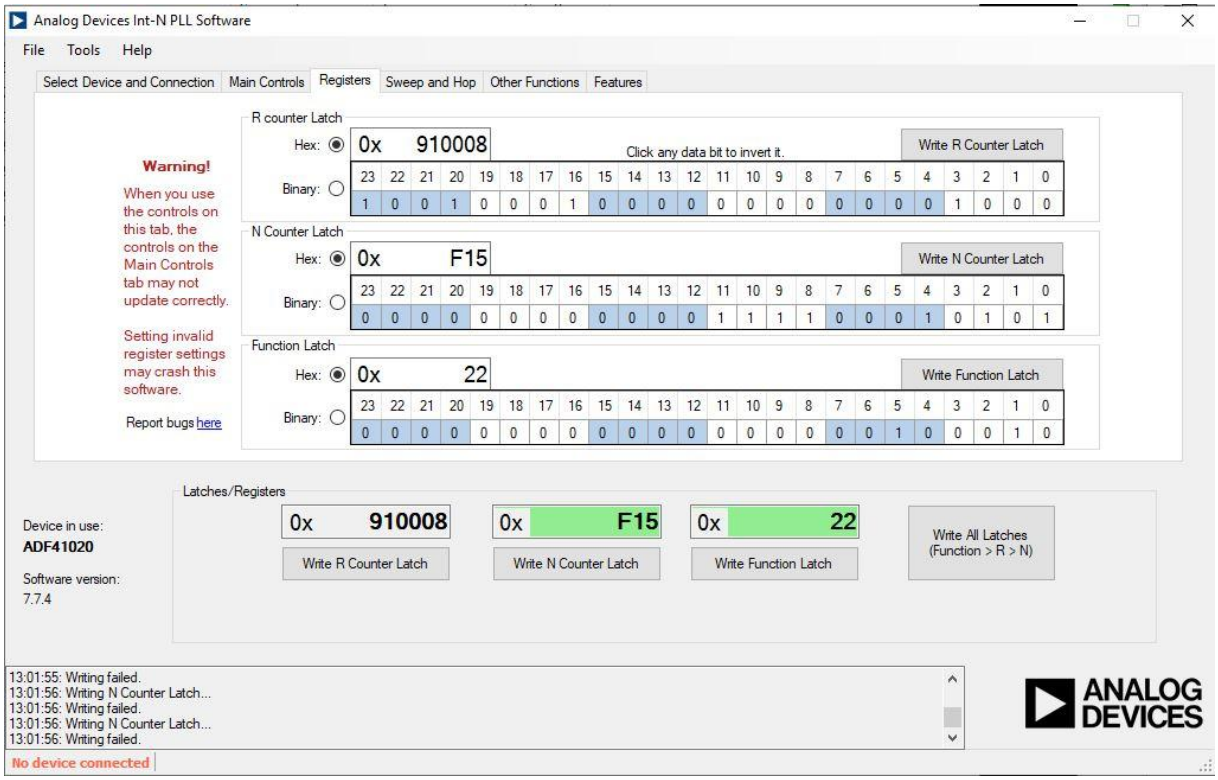


Fig 2 The settings for the ADF41020 but then with the register content

I use the ATtiny85 for controlling the PLLs , which can be programmed with an Arduino .

At the beginning of the program you indicate which connections are used for the slave selection , data and clock .

I do not use SPI libraries but my own function sendCommand () with which I bring out the bits one by one.

The PLL is initialized in the setup () routine . Nothing happens in the infinite loop.

```
// Set ADF41020 N-divider at 500
// According datasheet page 14, function latch method

int nrbits = 23; //Always one lower: 24 bits -> 23

// Arduino ATtiny85 -- select one
const int slaveSelect = 0;
const int dat = 1;
const int clck = 2;

boolean aanuit = true;

void sendCommand(long value)
{
  digitalWrite(slaveSelect,LOW); //chip select is active low
  delay(2);

    for (int i = nrbits; i >= 0; i--)
    {
        aanuit = bitRead(value, i);

        digitalWrite(dat,aanuit);
        //delay(1);
        digitalWrite(clck,HIGH);
        //delay(1);
        digitalWrite(clck,LOW);
    }
```

```
    digitalWrite(slaveSelect,HIGH); //release chip, signal end
transfer
}

void setup()
{
    pinMode(slaveSelect, OUTPUT);
    pinMode(dat, OUTPUT);
    pinMode(clck, OUTPUT);

    digitalWrite(slaveSelect,HIGH); //deselect slave
    delay(1000);
    // 1. Apply Vdd

    // 2. Program function latch (10 in 2 LSBs).
    sendCommand(0x000022);

    // 3. Program R counter latch (00 in 2 LSBs).
    sendCommand(0x910008);

    // 4. Program N(A, B) counter latch (01 in 2 LSBs).
    sendCommand(0x000F15);
}

void loop()
{
}
```

PCB

The print has not become that exciting. It is a double-sided print made of FR4 to keep costs down. Due to the high frequencies, Duroid would have been better because it has less attenuation. The problem is that the average Chinese cannot deliver this.

The print only t in a standard tin can of 37 x 74 mm and can be on the edges soldered .

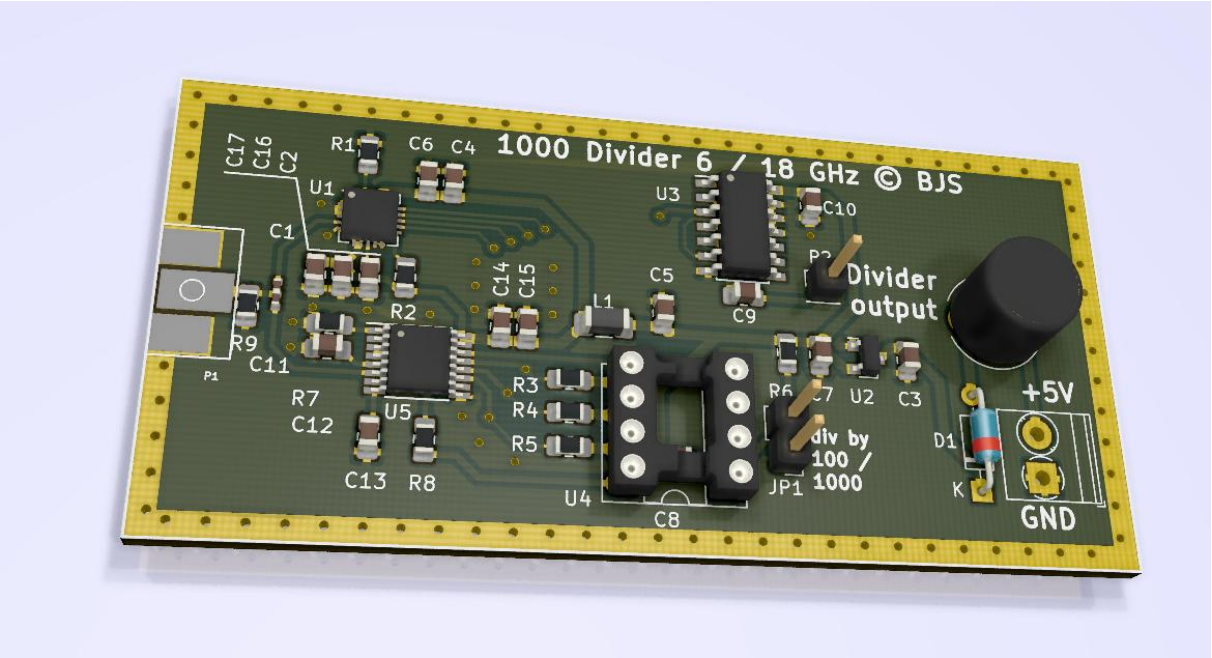


Fig 3 A 3D animation from Kicad , with the ray-tracing option turned on.

There is a catch

The ADF4107 may be able to measure up to 7 GHz and the ADF41020 up to 18 GHz , but the divider can get a problem with the pulses being offered. The pulse duration is namely frequency dependent . See the status below.

Sensitivity / pulse duration	ADF4107	ADF41020
500 MHz	-20 dBm / 30 ns	1 dBm / 60 ns
1 GHz	-25 dBm / 15 ns	- 7 dBm / 30 ns
2 GHz	-25 dBm / 5 ns	-15 dBm / 15 ns

According to the datasheet of the 74HC74 (symbol t_w) , the minimal at 4.5V pulse width 20 ns are , but the typical value is 7 n s . With the 74VHC74 this value is 5 n at 5 n s at 5V . With this the maximum frequency to be measured is defined. With the ADF4107 you come to the 2GHz and you want to go to the 5 GHz then you can use the ADF41020 . Nexperia (former NXP) has the 74ALVC74 wherein the t_w at least 2.5 ns is 1.3, and typically ns .

You can also choose not to use the split divider. The point you get is that at high frequencies the long cables through which the short pulses have to play and a disturbing role. Furthermore, the frequency counter also has a minimum pulse width. So this in my HP53181A least 50 ns.

What you have to do is the factor of the prescaler increase. This makes the pulse duration proportionally longer. If you set the prescaler to 16 then you make a 2000 dealer. You can also divide the ADF 41020 by 500,000, you get a 1 million dealer.

Concluding remarks

The problem with the pulse duration is nevertheless a disappointment. The article in the Funk Amateur does not really address this problem either.

It's nice that you can measure such high frequencies with relatively few resources. Sat high for the time being. Now ensure that my frequency counter is on a 10 MHz GPS standard .

Links

[1] Software for the ADF4107 and the ADF41020

https://www.analog.com/media/en/evaluation-boards-kits/evaluation-software/ADI_Int-N.zip

Geodesic parabolic antenna

Summary

In this article my experiences with building a so called geodetic antenn a . This antenn a is derived from a stressed dish, but with a geometrical structure.

I've build a n 150 cm antenn a ,-which is very light. But it needs some modification to make it more rigid.

preface

Some time ago Hendrik sent me the "Hyper Revue" magazine published by a group of French radio amateurs [1]. Incidentally, this is a very nice magazine with all publications on the internet, but in French. A so-called geodesic antenna was described herein. Something very different from what we are used to.

What is a geodesic antenna

The design is not from the Frenchman but from the Japanese JA6XKQ [2] . He has done a lot of research on this antenna and also made an Excel sheet [3] for the calculations.

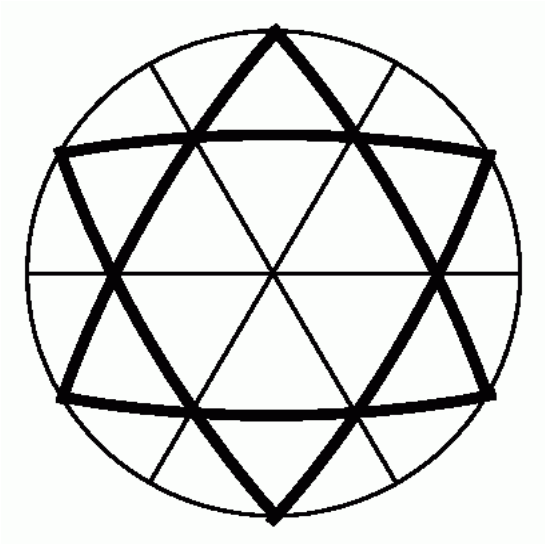


FIG . 1 geodesic dish. The dish is divided into planes

The geodesic antenna is given its shape by metal strips that have a certain length and are connected to each other. A geometric structure is created that is very strong. An example of a geodesic antenna is the antenna in Dwingeloo .

Fig 2. The radio telescope in Dwingeloo

A "normal" satellite dish that we build ourselves has radians that go out from the center, it looks like a star shape.

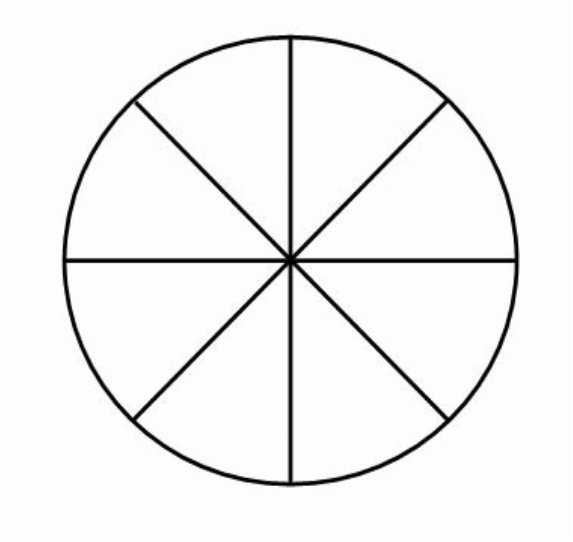


Fig 3. Normal satellite dish , which has a star shape . You can imagine that in the middle between the radians and the edges, the inaccuracy is greatest.

Advantages and disadvantages at a glance

Geodesic antenna

Parts for the construction

These are 2 mm thick aluminum strips. These can easily be cut / cut to size and drilled.

Assembly of these parts

No problem. Bolt the strips together and the parabolic shape is created automatically.

Surface accuracy

Depending on the construction. The surface accuracy is everywhere o far , the same dish ons divided. The advice is to make the strips / drill holes accurate to 0.5 mm .

Firmness

Reasonably good.

Weight

A very low weight because you do not you profile and need.

Assembly of the mesh

Very easy. You can fold it around the strips and pull it tight. With garden wire z e t get it fixed. Do not pierce or po p nailing. You also do not want this because the strips will become weaker.

Normal satellite dish

Parts for the construction

The self-assembly dish often uses u-profile radials , which must be shaped with a roller. You also need a center plate with accurately drilled holes and spacers.

Assembly of these parts

It is difficult to do this well and to get the right parabola shape. You should first have the outer edge and then mount the radians on it. Drill holes at the correct distance. All of them awkward.

Surface accuracy

The accuracy of the parabola shape depends on the distance between these radians. The radians, the outer edge and the center are in the parabola. The areas in between, the mesh, to a greater or lesser extent not. If you want a higher accuracy, more radians must come. This makes everything heavier.

Firmness

Very sturdy. The geodesic antenna "flutters" faster. This is probably because my dish is relatively flat with an opening ratio of 0.6 .

Weight

Relatively high, because the profiles are heavier.

Assembly of the mesh

Very hard. Often, additional strips ge - doll nageld to thereby clamp the wire mesh.

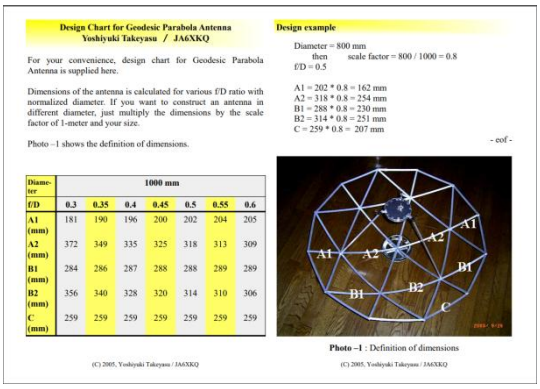
Construction time

Multiple days.

The construction of a 150 cm dish

Yoshiyuki Takeyasu has a very useful e Excel spreadsheet [3] designed for the calculation of the length of the strips .

He also has a design-chart [4] made for different opening ratios , where the lengths of the strips have been normalized for a dish of 100cm.



Design Chart for Geodesic Parabola Antenna
Yoshiyuki Takeyasu / JA6XKQ

For your convenience, design chart for Geodesic Parabola Antenna is supplied here.

Dimensions of the antenna is calculated for various f/D ratio with normalized diameter. If you want to construct an antenna in different diameter, just multiply the dimensions by the scale factor of 1-meter and your size.

Photo –1 shows the definition of dimensions.

Diame-ter	1000 mm						
f/D	0.3	0.35	0.4	0.45	0.5	0.55	0.6
A1 (mm)	181	190	196	200	202	204	205
A2 (mm)	372	349	335	325	318	313	309
B1 (mm)	284	286	287	288	288	289	289
B2 (mm)	356	340	328	320	314	310	306
C (mm)	259	259	259	259	259	259	259

(C) 2005, Yoshiyuki Takeyasu / JA6XKQ

Design example

Diameter = 800 mm
then scale factor = 800 / 1000 = 0.8
f/D = 0.5

A1 = 202 * 0.8 = 162 mm
A2 = 318 * 0.8 = 254 mm
B1 = 288 * 0.8 = 230 mm
B2 = 314 * 0.8 = 251 mm
C = 259 * 0.8 = 207 mm

- eof -

Photo –1 : Definition of dimensions

(C) 2005, Yoshiyuki Takeyasu / JA6XKQ

Figure 4. The design - chart for different opening ratios

If you want to work with different opening ratios, you can check with the design chart whether the spreadsheet returns the correct values.

Diameter D(mm)	**1000**
f/D	**0,6**
Depth d(mm)	104,1666667
Focal length f(mm)	600
Number of segment	12
Length of chord (mm)	258,8190451
Total length of Rib-A (mm)	1038,224796
Total length of Rib-B (mm)	893,6332874
Total length of RIB-C (mm)	268,8190451
A1(mm)	**205,4219782**
A2(mm	**308,69042**
B1(mm)	**288,7152423**
B2(mm)	**306,2028027**
C(mm)	**258,8190451**

Above is the length of the strip which passes through the center ge-highlight . This includes an extra 10mm which there on the edge is because otherwise no holes k you n t drilling.

When you start working with the Excel sheet , make sure that you enable the execution of macros, since this is off by default. What I also found out is that if you want extra strips because of a larger diameter, you use the second tab "Inner-1".

Inner Diameter (mm)	533,12491
Inner f/D	1,1254398

The diameter and f / D of this "inner" dish were copied to the "Inner-1" tab, but not calculated. When I entered the value manually it went well.

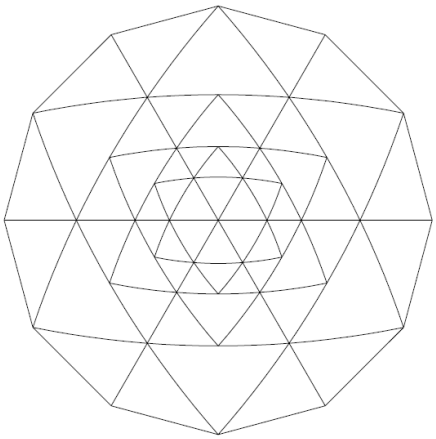


Fig 5 . Multiple geodetic structures superimposed. I did this for my 150 cm dish.

Construction

The strips that I used are 15 mm wide and 2 mm thick. I bought this at aluminumopmaat.nl in lengths of 6 meters. There on the spot I cut it into pieces of about 3 meters so that it fits in my car.

I cut the A, B and C strips 2 mm longer with a hand plate scissors . Then I milled several strips to the exact length. A milling machine is not a requirement but it is handy.

It is also very easy to drill. You drill through multiple strips at once. The advice is to maintain an accuracy of 0.5 mm for the length of the strips and the drilling distances.

The different strips are connected with 4mm bolts / nuts. Due to the specific lengths and drilling distances of the strips, they bend into a parabola shape. The 4mm stainless bolds and nuts I at the rvspaleis.nl purchased.

Attach the mesh

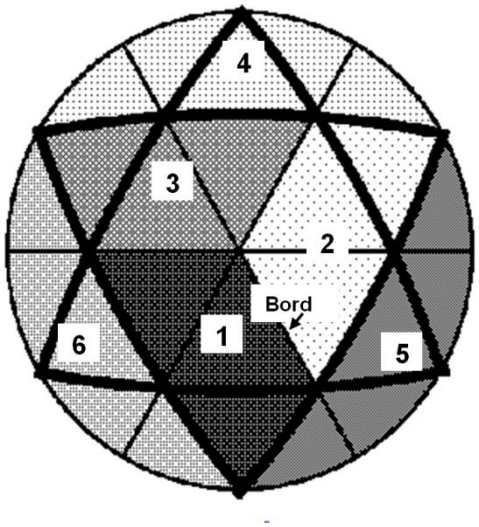


Fig 6 . Six pieces of mesh are needed in total. First make a mall out of cardboard

The mesh comes from the local Hubo and has a mesh size of 1.8 x 1.6mm. It is easy to fold around the aluminium strips . Where this is not possible I have secured the mesh with garden wire. After everything was assembled, I applied Polymax kit over the strips and the mesh for reinforcement.

Fig 7. The edge where four strips meet.

For the mounting of the antenna on the rotor , use a stainless steel trough for dogs that pierces your eye. Of course, also drill the holes in the aluminum strips, as they are not in the spreadsheet, see figure 8 below.

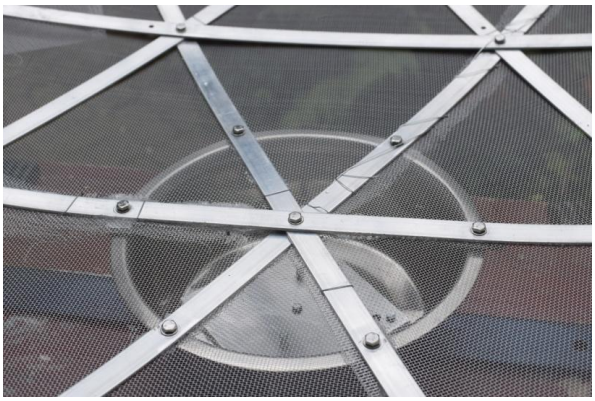


Fig 8 . The 20 cm dog food bowl. There are additional strips at four of the six mounting points to prevent the strips from bending when mounted on the manger.

Construction time

For a 150 cm dish, I spent a day drilling and assembling the aluminium strips. And another day for assembling the mesh. I think that for a dish with a diameter of a meter you might be busy for a small day.

With a larger dish diameter extra strips are included in the middle for reinforcement. You actually get a dish in a dish.

Adjust

Now that the MSG no longer broadcasts on the 1700 MHz, I have made a test setup myself. From my balcony (at a height of 9 meters) I have directed a slat with a helical downwards. The helical is connected to my measuring station at 1700 MHz broadcast t . In the garden is the satellite dish, facing the zenith . The alignment is very easy to do with a piece of string and weight.

Fig 9. The transmitting antenna on a stick from the balcony

Fig 10. The geodesic antenna is fixed on a workbench with a corner profile. In the background the spectrum analyzer for adjustment at the focal point.

My first findings

I think the antenna is still too weak. I want to try the following improvements:

- strips with a width of 20 mm

- a long strip around the outside edge

- a feeding bowl with a larger diameter. You have them 30 cm in diameter and shallower.

- a smaller opening ratio (0.5 f / D)

If this is insufficient then extra radians for support .

Concluding remarks

Due to time constraints, I have not yet used the antenna to receive a satellite.

The lesser firmness is a point for attention, maybe this is because I immediately made a dish of 150 cm. I will have to mount extra support for the dish .

The accuracy and thus the efficiency is not easy to determine. You will have to take comparative measurements with the same transmitting antenna and illuminator. This is a story apart. Very deep in the back of my mind I hope that this antenna is interesting for the 7.8 GHz. This antenna will not work, it is too weak.

What appeals to me in this antenna is that it is a completely different concept and that the construction is relatively simple and that you do not need any special tools. To be continued.

Left

[1] Website of Hyper Revue

www.revue-hyper.fr/

[2] Website of the designer

http://www.terra.dti.ne.jp/~takeyasu/

[3] Excel sheet with the calculations

http://www.terra.dti.ne.jp/~takeyasu/geodesic_camellia.xls

[4] Design chart

http://www.terra.dti.ne.jp/~takeyasu/GeoParaAnt_9.pdf

Air Force Days 2019

Summary

We were present with a booth at the bi a n Nual airshow in Volkel

After six years we were back at the Air Force Days in Volkel . We have skipped the Air Force Days for a number of years because it involved stand costs or because it was too far away (Leeuwarden). We were so well when we plated the airbase Volkel approached o f we again stand wanted man.

Hendrik had already stopped by on Thursday to make fifteen minutes. We had received a market stall in a large "tent" from the organization. And with a long cable we were able to connect the satellite dish, which was installed outside on the side of the tent, with our installed receivers.

Our stand at the Air Force Days in Volkel

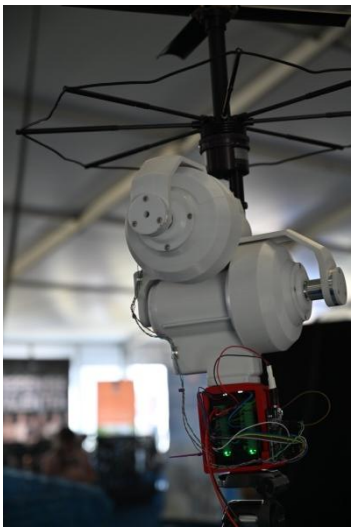
It got up early on Friday. The alarm went off at 4:30 am, after which I picked up Wim at the carpool on the A15. We had to be on site before 7:00 am because access roads were closed after that time . To make matters worse, the A2 was closed off due to a truck accident and we had to go inside. O ecause they were so accommodating , we could g elukkig still inside. It was a beautiful sunny day. Job had brought his dish with a 3D-printed rotor that attracted a lot of attention. Rob also stopped by during the morning.

On Saturday we were three : Hendrik, Wim and the undersigned. The day started with a lot of rain so they had to start the day program a little later. But the weather cleared up and eventually the sun even started to shine and it became a beautiful

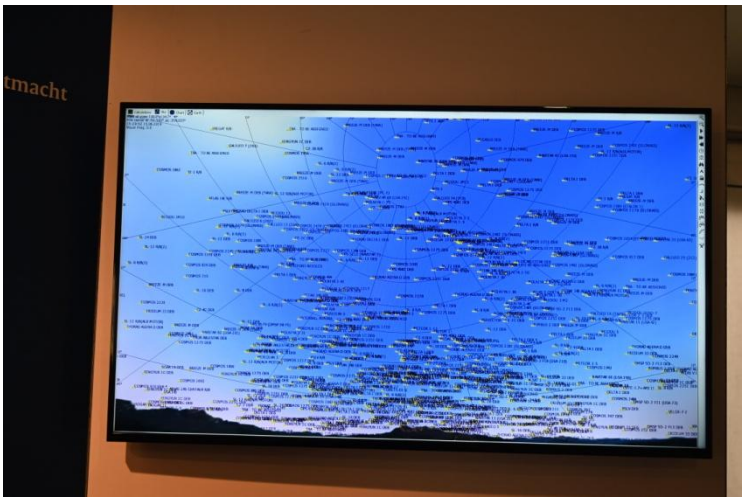
day. This was really a family day. Our booth attracted a lot of attention because we showed live weather scenes and animations .

A lot of interest from the youth

Furthermore, we also visited the other stands and gained ideas for the reception of weather satellites. The antennas of Swe-Dish , the so-called "Military Grade VSAT for quick deployment and satellite auto-acquisition in minutes", were very nice. Also very nice was a 3D-printed XY-rotor with a spring mechanism.



An XY rotor with a built-in spring to replace a counterweight. This antenna has been developed by an innovation team from Defense.



Defense used the program Heavensat o m to monitor the satellites.

There was also ample opportunity to see the shows, with earplugs in! All in all, the days were very successful and hopefully we can be present again next time.

Remote control Spectrum Analyzer with Scilab

Summary

The open source software Scilab (as an alternative to Matlab) is used to capture data from a Rigol DSA815 spectrum analyzer and present it as a graph on the PC.

preface

Our hobby cannot do without software. We use it for, among other things, calculating satellite orbits, receiving the data from the decoder via the USB interface and showing the image. But also in the receiver there is software for controlling the tuner, displaying information on the display etc. Too many to mention.

For me a lot of that software is a "black box", you put something in it and (very often) something good comes out of it. Because software is so important, I wanted to know the background of how something works.

So I started looking for software with which you can "play" in a simple way and hopefully get a quick result.

Because there are a few programmers at work, I consulted them. Programming languages such as C and C # are "difficult". Setting up libraries with functions is difficult if you don't know what you want. Furthermore, you have to describe everything extensively in these languages, which takes a lot of (debug) time. On the other hand you scripting languages , including Python, the best known is (including the Raspberry Pi which in the original idea was that there only Python could run on [1]).

I started with Python and I was very disappointed. You have multiple versions. A particular feature works well in one version but not in the other. It is unclear whether a library is outdated or not. Installation is anything but simple. At least on Windows there are many (country) roads that suffer to Rome. What appealed to me was that there is a module for matrix calculation (NumPy). There is also a nice matplotlib module for creating graphs.

The program that you actually want is MATLAB (originally MATrix LABoratory) . Minimum price two thousand euros and for each toolbox an amount around one to two thousand euros. You can do everything with this software and this is the industry standard for mathematical functions, matrix operations, statistics, graphs . Vo or individuals are cheap licenses, but it also runs quickly in the hundreds of euros.

Until I read about Scilab in Robert Lacoste 's book . He described many programs that you could do with the open source software Scilab. It is not as extensive as MATLAB, but it is free. The syntax is broadly the same as MATLAB to make the switch as simple as possible.

What is Scilab?

It is very difficult to make a short description of what the program is and can do. As a starting point you can think that everything is a "matrix" (there are also variables, lists and structures) . In high school I got this in the course Mathematics II, linear algebra. Matrix calculations can be done very quickly by a computer because MATLAB / Scilab are optimized for this. The programs can then be shorter and easier to understand .

Scilab is released by the French company ESI Group under an open source license. They have many partners, including the national French space organization CNES, which has released its own Scilab module .

Fig 1 Homepage of Scilab

Very short introduction to Scilab

Below is a simple matrix, which has three rows and three columns:

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

A well-known matrix is the magic square of Dürer :

$$\begin{bmatrix} 16 & 3 & 2 & 13 \\ 5 & 10 & 11 & 8 \\ 9 & 6 & 7 & 12 \\ 4 & 15 & 14 & 1 \end{bmatrix}$$

All rows, columns, diagonals, quadrants count to 34! Nice as an exercise to master Scilab. For more information see [2] .

You can have a matrix with one row, it 's called a vector:

$$[10 \quad 11 \quad 12 \quad 13 \quad 14 \quad 15]$$

Or with one column, this is also a vector:

$$\begin{bmatrix} 20 \\ 10 \\ 5 \end{bmatrix}$$

You can imagine that if you want to do something with time, this will be in a row vector . A black and white image would fit into a matrix.

For more information about Scilab you can buy two very cheap books on Amazon [4] :

- Scilab, from theory to practice, Philippe Roux, 5 Euro

- Introduction to Scilab, Rachna Verma and Arvind Verma , 8 Euro

Remote control of a Spectrum Analyzer

You can use a USB stick to make a screen print of a spectrum analyzer (SA) . I find this awkward because it sometimes fails, stick broken etc. Peter Dreisiebner, for example, has written a program with which you can easily make a print screen via the LAN (network) . This program is recommended. [5]

But with this you only grab a picture and I want data so that I can edit it. Ultimately, I want to compare the signal-to-noise distance against the track data (elevation and distance) and see if anything out of the ordinary comes out here.

With Scilab it is possible to request the sampling data from the SA. Then we can make a picture of this in Scilab. The advantage of this method is that we have the ability to automate data encoding , for example during the arrival of a satellite.

Installation

Installation is very simple: go to the website [3], choose downloads and the operating system and you install the software. Installation files are for Windows, Linux and Mac . available.

In addition to the software, there are additional modules that you can install from Scilab: such as Image Processing, CelestLab (space travel), Instruments Control (Visa and Arduino).

For remote control of the SA we have to install drivers from National Instruments [6] and via a ATOS (in Scilab) the module "Visa Integration Toolbox" .

The SA must be included in the network with a network cable. I myself have an 8-port router in my c m e r are where all the measuring equipment and computers are connected to.

As a test to see if the network connection works you can open a so-called telnet session with the program PuTTY [7] to the DSA815 (my Rigol spectrum analyzer) and enter commands. What you need to know is the IP address of the DSA815. You can see this via the "System -> Lan-settings " button on the SA .

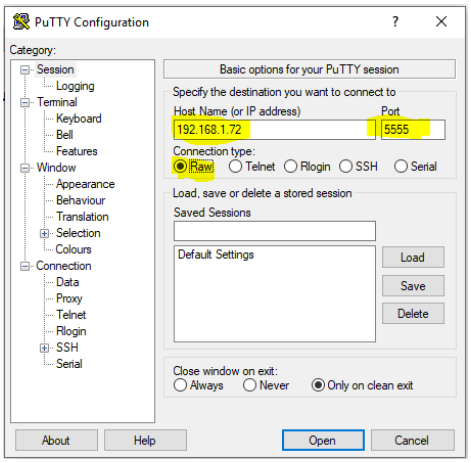


Fig 2 Session settings for PuTTY

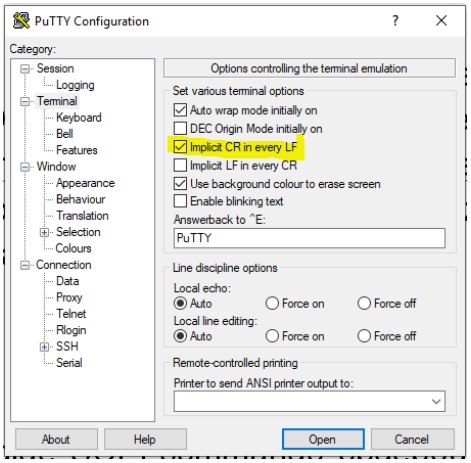


Fig 3 Terminal settings for PuTTY

After you launch PuTTY you will see a blank black screen. Do you give *** IDN?** i n , then ask you to DSA815 for his return ID. In addition to the * IDN command ? there are many more so-called SCPI
commands (Standard Commands for Programmable Instruments) that are described in the Programmers Guide . Which commands to use is an incredible puzzle, but it seems that you can operate the DSA815 completely remotely .

SCPI command ' s have a hierarchical tree structure. In the Scilab script I use:

SENSe : FREQuency : CENTer 700000000

Then "SENS" is the highest level and FREQ the second and CENT the third level. The lowercase letters are not required to pass on to the instrument, it makes the code easier to read.

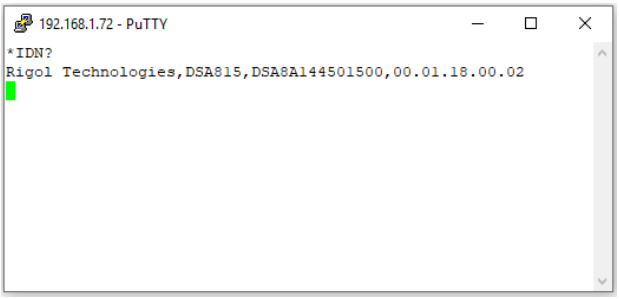


Fig 4. The ID of the SA

You can enter all SCPI commands in PuTTY but that doesn't work very well if you want to automate it.

The Scilab script

On the next page you will find the full Scilab script for remote control of the spectrum analyzer . It is a print screen from the Scilab editor SciNotes .

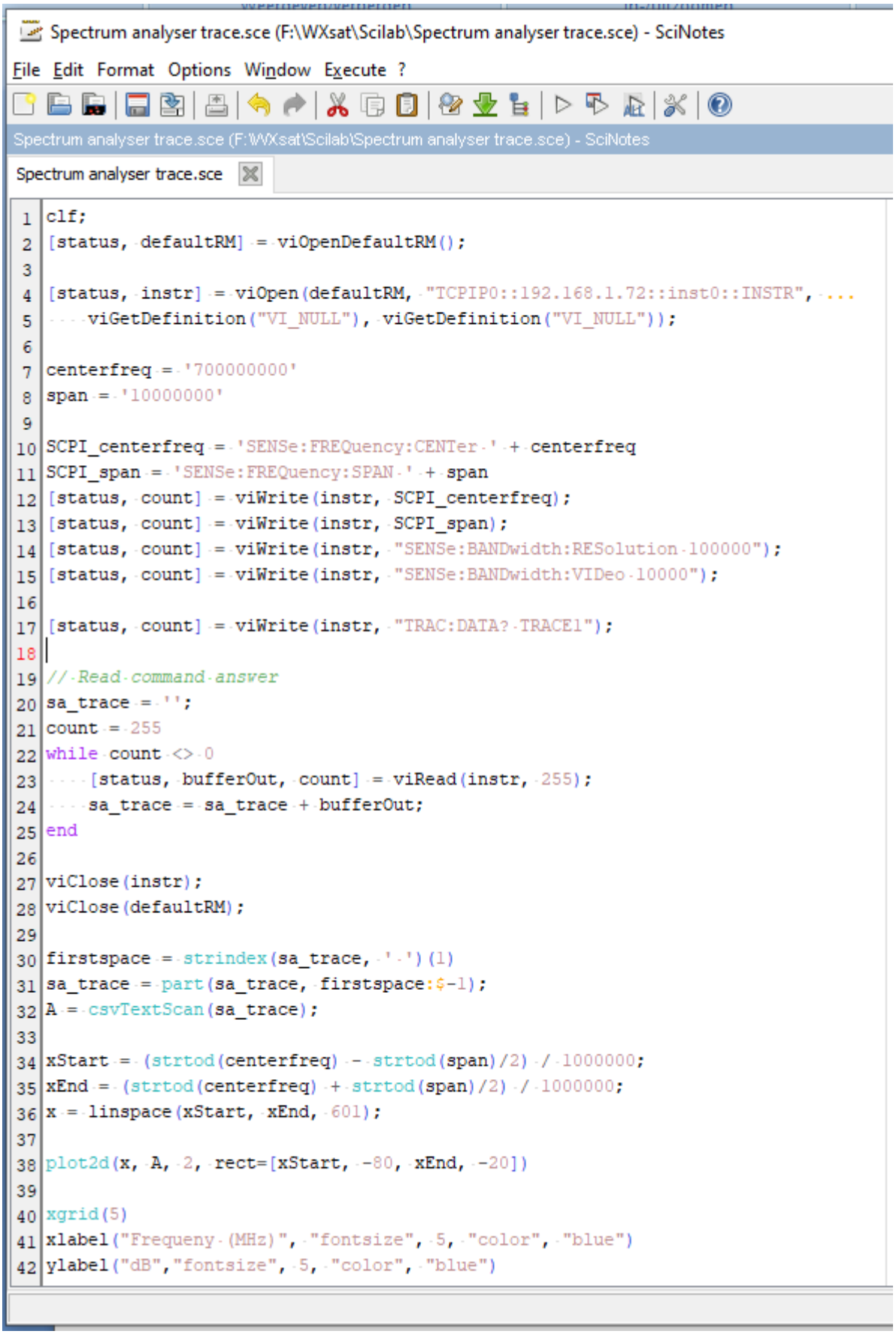


Fig 5 The full Scilab script to read the data

On line 7 and 8 gee f i the center frequency and span as text (not numbers) on. In lines 10 and 1 1 word , and here the full SCPI commands ' s established. By the way, you could also enter this literally in the telnet session . Lines s 14 and 15 send the resolution and video bandwidth to the SA.

In line 1 7 the command o m the trace-data to request. The answer is received in lines 1 9 up to and including 2 5 . For each survey you can request up to 255 characters, so that we just do Zolan g until no more data. All requested data comes in the variable sa_ trace .

The answer has the following format : first a code (# 9000009014) and then the 601 measurement values separated by spaces :

```
# 9000009014 -7.009901e + 01, -6.980703e + 01, -6.968989e + 01, -
6.926057e + 01, -6.921255e + 01, -6.929917th + 01, -6.938

177th + 01, -6,977631th + 01, -7,008842nd + 01, -7,025957th + 01, -
7.056746th + 01, -7.088667th + 01, -7.095662th + 01, -7.108041

e + 01, -7.153751e + 01, -7.183572e + 01, etc.
```

We are only interested in the piece after the first space , so we ignore the code . In line 30 , we find the first space and in line 31, we cut it out. In line 32 the entire data set is converted into a vector .

In rules 3 4 and 3 5 we calculate the start and stop frequency. Because centerfreq and span are defined as text values, they are converted to a number with strtod (STRing TO Decimal).

In line 3 6 the measured frequencies (which you do not get back from the SA!) Are divided into 601 steps d , the DSA815 measuring 601 values.

The final step is to make the graph. In line 3 8 , a plot is made with the plot2d command. As arguments you give the x-axis, measurement values and which part of the graph you want to show. With xgrid (line 40) you place a grid. You give the axes a name with xlabel and ylabel .

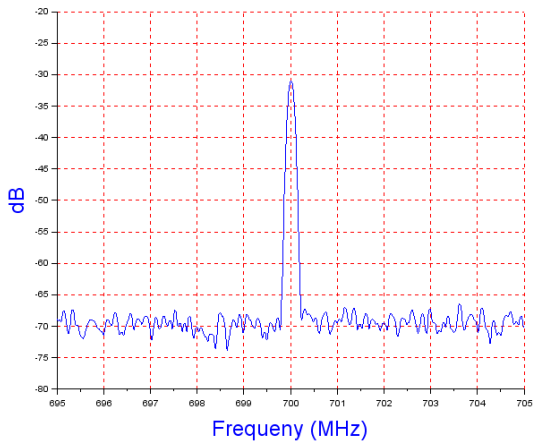


Fig 6 The trace made by Scilab

Concluding remarks

After investing some time in Scilab , I have to say that it has not disappointed me. The development environment is very good. The integrated help (for example with the right mouse button on a command) works very well. For someone like me, who little Arduino scrip t jes makes, you have to learn a different way of thinking. In addition to variables with numbers, in Scilab you have (multi-dimensional) matrices or vectors as a dataset on which you release your operations.

What turned out was very difficult to invent in the way the SCPI command ' s work and in what order they should be called . This, incidentally, has nothing to do with Scilab, but this plays into any programming environment. There are virtually no examples of how to manage things. In the Programming Guide you will find all and how to request the ID.

What I wonder was also about me is that the frequency for each measured value was not returned and you have to calculate this so yourself using the start and stop frequency of 601 samples (wa t also moeiljk finding was) that are taken.

The above story to data from the Spectrum Analyzer off to read I want to continue to keep the signal-to-noise ratio to measure and combine it with the job data WSAT . With this you might be able to determine the radiation characteristic of the antenna in the satellite.

Furthermore ste n have the following items about Scilab on the schedule:

- Converting a dat file from wsat to a picture

- Making an overview with track data of the arrival of a satellite

- A binary data viewer. Allows you to the files of the decoder be see if there are synchronization pulses. I used this in the development of the QPSK receiver , but that was then a Python script

- Plotting the directionality of an antenna, incl. Control of the rotor on which the antenna to be tested is mounted.

Links

[1] Interview with Eben Upton , designer Raspberry Pi

https://www.techspot.com/article/531-eben-upton-interview/

[2] The magic square

http://www.taliscope.com/Durer_en.html

http://www.matrixlab-examples.com/magic-square.html

[3] Scilab books

https://www.amazon.de/dp/1720005702

https://www.amazon.de//dp/2822702934

[4] Download Scilab

https://www.scilab.org/download/6.0.2

[5] Program to a screen-capture to make

http://peter.dreisiebner.at/rigol-dsa815/index.htm

[6] Drivers from National Instruments

http://www.ni.com/en-en/support/downloads/drivers/download.ni-visa.html#305862

[7] PuTTY

https://www.putty.org/

UKW-BERICHTE
Paul Baak

Summary
In this article a small review of articles published in the 2nd edition of 2019 of the German magazine UKW-Berichte. We have a subscription to this magazine.

People at UKW Berichte are lagging a bit. Here an overview of UKW Berichte 2019 Vol 2 (and not Vol 3). Our club has a subscription to this magazine. Please let us know whether you like this subscription! Positive or negative, that doesn't matter, as long as your board hears something.

We find 5 major items. In the first, Gunthard Kraus talks about a low-noise MMIC amplifier with a fmax of 2 GHz. The starting point is a ready-made module of less than 20 euros, found on Ebay. They wanted to examine the PHEMT (type FET) type SPF5189Z separately, could not buy it separately and decided to solder it out and back into the circuit. It is a small SMD component! A lot of attention and tips for the value(s) of often neglected components, coupling and decoupling capacitors. The feed-through capacitor was replaced by an SMB connector (yes!). For those who think using it at 1700 MHz, the results are great.

Alexander Meier describes a small signal generator up to 2500 MHz. It is based on a central PLL / VCO, the HMC830. Surrounded by a series of auxiliary ICs, for the PLL, switching bands, attenuation and a controller. In its construction it is also a complicated device with multiple PCBs. It is not clear to me how one should make his own device, there is no parts list or gerber file etc; just an extensive list of measurement results.

Michael Margraf is concerned about the characteristics of a soldered stripline. It is not about an electrical test, but about theoretical calculations with simulators, getDP and openEMS. How things work out in practice remains an unanswered question here.

Heiko Leutbecher builds forth on an earlier article and combines various FETs, transistors and configurations to develop more power with a low-noise broadband amplifier. It is again not clear from the description what the purpose of this amplifier is in the combination of low noise, broadband and power.

Jochen Jirmann made an active antenna for an FPGA-based digital receiver, the Reuter RDR 51 Pocket. We see a general consideration, calculations and a detailed circuit. For us, it is about (too) low frequencies, namely up to 30 MHz.

The closing item of the magazine is Fundstelle Internet (Finding place Internet), a series of useful internet references with http-links and QR codes. It is a pity that I am not able to transfer this well for you, so you can better take a look yourself. So I just mention a few topics: I / Q for Dummies, the HP346b noise generator, and an explanation about noise measurements and the HP manuals archive.

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

Report of the members' meeting 14 September 2019

Opening by the chairman.
Notice: Across the street from Nimeto is a parking lot where you can park for free. There are also parking options behind the fence on the side (tight because of containers that are there), or behind the barrier at the front.

Harrie van Deursen has announced that he cannot come, he is still busy with moving and vacation. He hopes to be fully operational again in November.

We have held a measurement day, a report of this with results will come in the Kunstmaan in December.

Ben has made a geodesic antenna; see elsewhere in this magazine.

Last summer we were at the Air Force Days in Volkel. Our stand used for these kind of days is again enhanced; nicer and easier to assemble.

The new decoder print is ready and tested and can be ordered. Other special parts required: GODIL, VCXO of 40 MHz (or 20 MHz), FT232H on Adafruit board.

In the 8 GHz area, not much has happened yet; a 1000 divider has already been designed to be able to measure these frequencies; see elsewhere in this magazine.

Setting the agenda
No adjustments.

Administrative Affairs
Job now does the full editing of “de Kunstmaan”; Fred is still watching.

Satellite status

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

Any other business

Harm: has made a QPSK modulator, connected to a 150 MHz measuring transmitter. That seems to work; a constellation diagram can be seen on the receiver, but more research is needed to make it work properly. With this we could make a QPSK measuring transmitter; the digital signals may need to be passed through a net cosine filter for the modulator to work properly. The modulator used is not intended for frequencies higher than 270 kHz, while we need approximately 2.3 MHz.

Peter Kuipers: He is in contact with Harry Arends, who asks if an overview can be made of all items in “de Kunstmaan” that are needed to build the complete receiver + decoder. Job proposes to do that on the website.

Job: Manual aiming the disc to a polar satellite can be done with a telephone on the antenna that shows the location of the satellite 'live'. To what extent is it possible to control the antenna with one rotor, with a fixed axis position?

Elmar: again shows electronics, such as a silent fan to remove the solder odors, for example.

Peter Smits: Are contours in wsat possible? Rob is working on it, also to make the software much faster when zooming in etc.

Closure .

November 2 is the Day for the Radio Amateur (DvdRA); Hendrik, Ben, Rob, Job, Herman and Arne will go.

Lecture: Vector Network Analyzer (VNA): How does it work and what can you do with it? (Timo)

These kind of measurements used to be done with various separate (expensive) measuring devices to measure different aspects of circuits.
With a VNA in combination with software you have a very simple measuring device that can do just about anything. Errors in the measurement set-up (eg connection cables) can also be compensated nicely by doing calibration measurements.
Matters that can be measured: S-parameters from which SWR, transmission, phase etc. can be determined. Furthermore, a number of specific issues can be determined with the software, such as antenna pattern, component test, etc.
With the help of software generating Smith diagrams, these measurements can be made visible, and it is also easy to determine how a cable should be terminated.
The VNA used by Timo has a range of 1 kHz to 1.3 GHz and costs around 570 euros. The software is free.
Compared to a mini VNA this is a much better device; S11 and S21 can be measured directly, among other things.

Conclusion:

- A VNA is very accurate
- With a VNA and simulation programs, matching is a lot easier
- With a VNA much more is possible, which makes the VNA very nice!

Rob Alblas
(secretary ai)

satellietstatus

Arne van Belle, Augustus 25th 2019

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

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

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

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

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

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

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

Launches

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

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

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

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

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

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

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

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

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

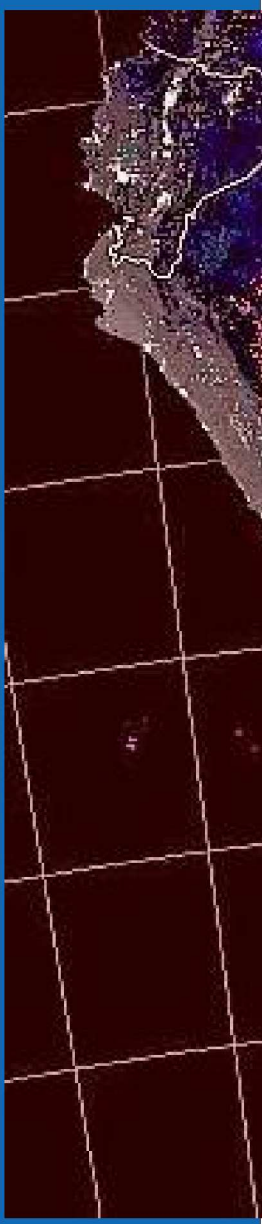
Himawari-8 images are now broadcast every 10 minutes via EUMETCast. Because this concerns all 16 spectral channels with a resolution of 2 km, these are transmitted via HVS-1 under channel E1H-TPG-2. Unfortunately, this stopped the half-hourly Himawari-8 images on the Basic Service on 10 October.

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

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

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

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



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