DE KUNSTMAAN

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Uitgave van de Werkgroep Kunstmanen

In dit nummer o.a.

8GHz: Stand van zaken
Een wals voor het maken van kegels
Weersatellieten met SatPy
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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Content

Photo front page:
Finger roller for making conical parts. Made by Peter Smits

Preface

On March 12 we got together again in the Nimeto! Twelve of us attended and five participated via zoom. Because it was the first meeting of the new year, there was a snack and a drink that was eagerly used.

Snack and a drink offered by the chairman

It remains a challenge to get the technology working. The Nimeto's wifi is not stable. We resorted to my phone's mobile hotspot. The survey have now been done with zoom on a mobile phone. Hopefully the sound quality and picture will be better for the remote participants.

Job gave a nice presentation about the opening ratio of an offset dish . An important subject if you want to get the most out of your dish. The presentation will be posted on our website.

Presentation of Job

Job offer

From this place I would like to appeal to the members if anyone would like to become a librarian and webmaster. An important function of the working group is to disseminate knowledge regarding the reception of (weather) satellites. Because more

and more information can be found online, it will also be a combined function. Interested parties can contact me.

Software

Kicad released the long-awaited version 6.0 at the end of December. After the release of 5.0 in July 2018, this is a major release. Version 6.0.4 was released in mid - March with a number of bug fixes . Much attention has been paid to the user interface . Despite these improvements, it is a very comprehensive package with a learning curve. It's nice that this open source software is in development like this.

You can't say that Scilab I've written about in the past. Neither the software nor the toolboxes are really updated. That is why I decided to purchase Matlab. For only 135 Euro you have a home license that you can use on two computers. For many people, paying for hardware is not a problem, but the software should be free...

De Kunstmaan

In this Kunstmaan an article by Peter Smits about a roller he built with which you can make the cones for an 8GHz feed. See also the beautiful front plate.

Furthermore, a fairly literal representation of the joint session we had at the zoom meeting of January 15 about the state of affairs on the 8 GHz. For a long time I debated whether I should just put the recording on YouTube and that interested parties could listen to it. Apart from the privacy issue (you must have permission from the participants), I decided to work it out anyway. Reading something is more pleasant than listening to a video of an hour and a half.

If there is interest in listening to presentations on YouTube , let us know and we can organize this.

I myself have done some measurements on 8GHz filters and an LNA.

Rob started working with the Python. With Satpy you can easily extract weather images from EumetCast data with a few lines of Python .

Job has written the follow up to his article on the ESP32.

Have fun reading this Kunstmaan and I hope to see everyone at Nimeto in May.

8 GHz the current status

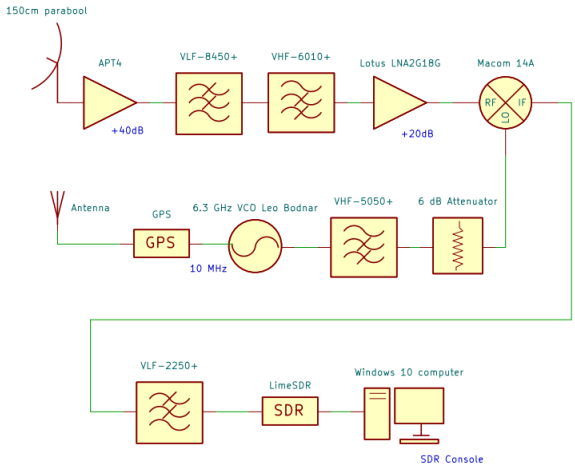
Introduction

At the Zoom meeting on January 15, after the general part, we had a joint session in which we shared the experiences on the 8 GHz with each other.

The following members took part in the discussion: AvB : Arne van Belle, BS: Ben Schellekens, FJ: Fred Jansen, JdH : Job de Haas, PS: Peter Smits, HvD : Harrie van Deursen , PK: Peter Kooistra (via email) , RA: Rob Alblas

Receiver installation

Below is a short schematic overview of the reception installations that members of our working group have for the reception of 8 GHz.



Fred Jansen's first setup with a 150 cm dish.

Dish and the feed

FJ: Has a 150cm diameter dish with fine mesh from RF Hamdesign. The mesh is not rust-free in all places, but in general it should be.

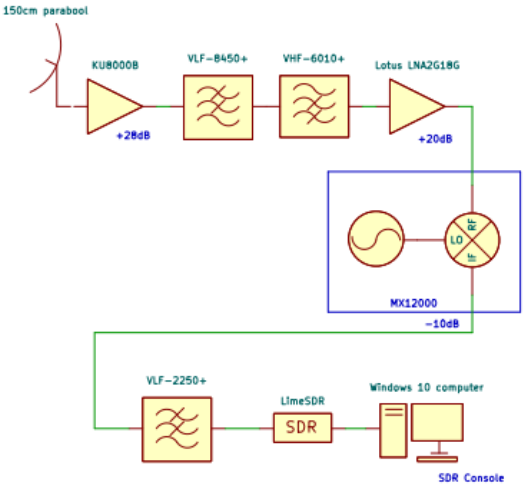
BS: Were you able to make a comparison with dishes of a different design because a dish with radians by definition also has straight parts and can not be accurate enough.

FJ: It's really hard to compare. An example is solar noise. With my best setup, feed, all the best I got 6.2dB with my 150cm dish. Michael Magaras in Greece has the same feed and dish diameter and has 9.5dB solar noise. Paul in England has a 3 meter dish and has 12dB of solar noise. Paul holds the gold standard of X-band

reception. If you have a 1.5 meter dish, you are a factor of 4 lower and you can never have more than 6dB of solar noise. So how Michael gets his 9dB is how you measure. It is very difficult to compare. What I can tell you is that on average my results are very close to Arved and it has a 2.4 meter dish. This is about right, because there should be about 3dB between mine and his setup.

My feeling is that spoke dish is pretty well shaped. I've checked it once by measuring the depth and it looks pretty good.

But assembling the dish from RF Hamdesign is a hobby in itself. You need to install more than 150 pop rivets.



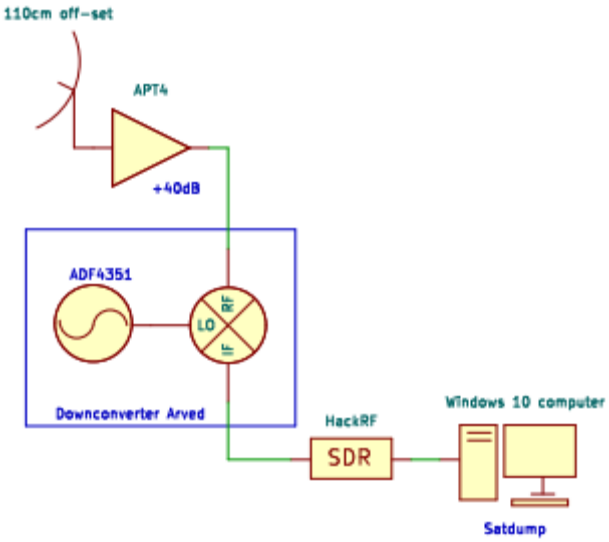
Fred's installation after optimization

AvB : There are two routes. Or you take a manufactured offset dish that has been proven. An offset dish has advantages. Or you go the DIY route and make a prime focus mesh dish. This has the advantage that a little more wind passes through it and you could put it on the roof with a rotor arrangement. Whether you can put the offset dish on the roof is the question.

FJ: My dish has been on the roof for two years and has withstood all the storms.

AvB : You can now buy a 120cm offset dish. You will have to turn with the wind or put it in a sheltered place. But that is of later concern. First follow by hand, optimize and see if you can get the diameter down. In the beginning they also said that you needed 3 meters for Meteosat and that has now been reduced to 80cm. On the 12 GHz you see the same thing: the signals do not get better, but the dishes are smaller. This has the advantage that you have to follow less accurately, but because of the large opening angle you are more bothered by noise from the earth at a low elevation

of the dish. But most people will not be able to reach such a low elevation because of buildings, so that noise does not have to be a real problem.



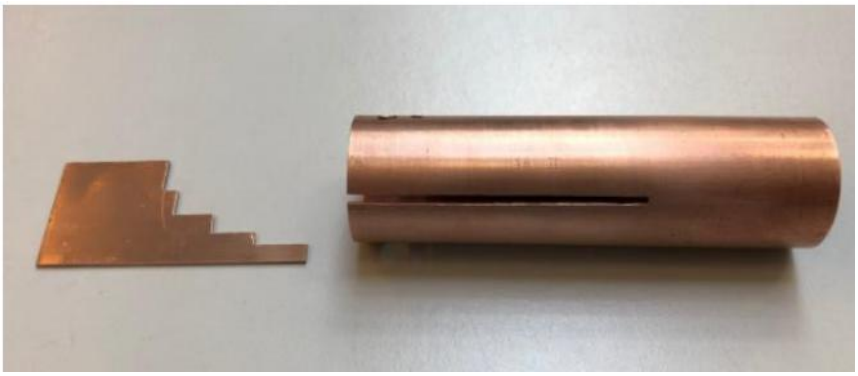
Installation by Peter Kooistra

BS: If you have an 80cm dish, like Jean Claude, which satellites can you receive? FY-3D?

FJ: FY-3B, FY-3D, Aqua, Terra, Suomi, NOAA-20. But this works with Jean Claude, because everything he has is optimal. I started with 1.5m and this shouldn't work and I now have 6dB margin on some satellites. Your surface also helps you create margin in your system.

AvB : I personally wouldn't go for 80cm but for 1 meter or 1.2 because it makes so little difference in windage or handling, but you do have more gain and selectivity. The problem with a smaller dish is that if a satellite flies next to it, you can no longer separate it, there is more chance of interference. But for a mobile setup or test, it would be very nice. The advantage of an offset dish is that the f/D ratio is all the same: 0.6. Very old or special dishes have an f/D of 0.7. Professional dishes have an f/D of 0.8.

BS: Your feed should also be adjusted for this. What kind of feed can you use for the best possible result ? Then you also have to deal with polarization and what solutions are there for that?



September feed

FJ: From my experience I see that feeds with a wider tube width (with a septum) from Michael really work better than the 28mm tube. My experience with a 28mm septum has been poor, as the response lateral to the septal shot has a strong dip, close to the center. If you are a little off in your tracking, then you will suffer a lot from that and I did not see that with Michael's feed. Whether this is because he has a better septal baffle or a wider tube, I don't know. The tube diameter really makes a difference in my opinion.

AvB : I compared a lot and had contact with Jean Claude. The bottom line is that the septum is very critical. Fons took a calculation for a square waveguide and adapted it to a round tube. I think that's not optimal. Jean Claude has scaled up publication from 1296 MHz. I have found a publication in India. If the diameter of the tube deviates slightly, the septum must be recalculated. Then you have to have special simulation software or formulas and they are all for a square tube. I want to deviate as little as possible from the known value, but I cannot simulate or calculate, so I stick to what has been tested in practice.

BS: What do we use the septum for?

AvB : The conversion from circular to horizontal, the probe. In this case twice. Left hangs on one side of the stiffener and right on the other side. You have to see it as a corkscrew that flies in. The partition determines how well you convert it circularly to the probe. You can have a partition, which is very bad. Then you think you are receiving some, but you have a 3dB loss in your conversion and you can also get a lot of fading. You have to be able to rotate a circular bus around its axis and then you should not see any loss, which is very difficult in practice. They call it the axial ratio. Horizontally and vertically should be completely symmetrical all around.

BS: How is the comparison between a septum and a dielectric baffle?

AvB : I've never been able to find that.

FJ: I have a septum feed and a feed with a partition and I can barely distinguish between the two. The septum feed is slightly better than the septal feed. But this one has the big disadvantage that if you want a different polarization, you have to turn the stiffener a quarter of a turn.

JdH : You could also mount two SMA connectors with the partition. You are then in the other quadrant and then it is as if you have turned it. Same as with the septum, they have them perpendicular to each other and with the stiffener you get two at 90 degrees.

Phase shift with screws

It's the same as in the top photo. The screws do the same as the baffle, they delay the phase of the signal in one direction, horizontal or vertical, relative to the other and thereby transform the circular in one direction. Jean Luc also uses a Teflon baffle, 3mm thick. The advantage of the Teflon partition is that you can tune a lot (determine length) to the partition until you have the axial ratio right. The disadvantage of the stiffener is that it is full in your path and weakens more. a squeezed feedhorn has less loss because you have less material in the middle part. Tuning a screw feed is more complicated. It was an article from a MUD conference. The disadvantage of a septum is that you cannot tune it; you have to make a new one. Arne 's idea for clamping is interesting, but it's never as good as a fixed connection.

If you're starting, I'd start with a Teflon shot. The sizes are known for a number of diameters and you can measure them yourself.

BS: can you also work without a conversion from circular to horizontal or vertical?

JdH : You have 3 dB less. Just pull the partition out. I had 2 dB less. Jean Luc sometimes had more than 3dB difference, this would not be possible.

BS: When you're starting out, a shot is worth a first try.

FJ: Making a septum shot is quite a job. I would never have succeeded.

JdH : And if you're not sure about the sizes, it's all a drama.

FJ: Then you also have the black magic of how long and how thick the pin should be.

JdH : And that also changes if you have a septum.

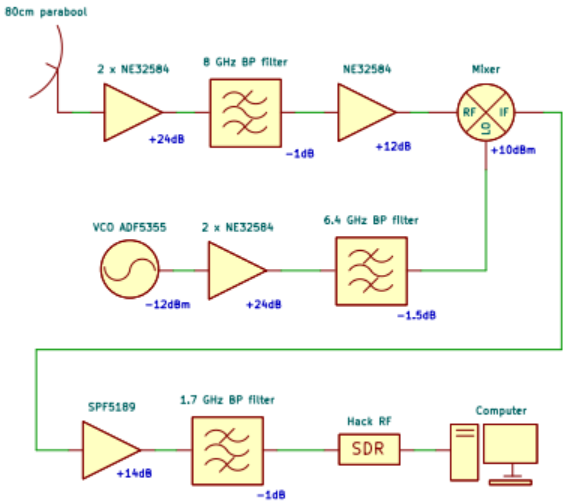
FJ: In my opinion if you want to start is to recreate Jean Luc's feed. If this works, see if you can reproduce this with a 28mm tube. When you start making a septum feed yourself, there are so many variables and too much can go wrong.

BS: Can a tube get too thick too? Is 35mm too thick?

AvB : You are not easily out of range, but it is not optimal. This is optimal at 6.8GHz, but falls off more towards the top.

JdH : According to the theory of the tubes, it is a high-pass filter. As long as you're on the low end it should be OK. If you make it too wide, you will also get low frequencies.

FJ: In my case when measuring the solar noise, Michael's feed gives 6.2 dB and the 28mm tube 4.7 dB.



The installation of Jean Claude. Also described in the previous Kunstmaan

AvB : I think there is more than the diameter of tube. The septum feed is very critical, a Teflon baffle is a matter of tailoring. You can adjust the probe with a standing wave. It's easier, but I think you're less likely to get it right. I don't think you get a 3dB gain from circular to horizontal or vertical with the partition.

JdH : I have formulas / papers for calculating the stiffener. It's all things from the 60s. First it was done experimentally and then the formulas were outdated. In a dielectric you have a different transmission rate, so you get a phase shift and it has to be

exactly 90. You may have a half dB loss through the stiffener, which you could gain by using a different technique.

BS: You will have to experiment a lot. I think the only way this can be done is on an existing satellite.

JdH : There are plenty of geostationary X-band satellites

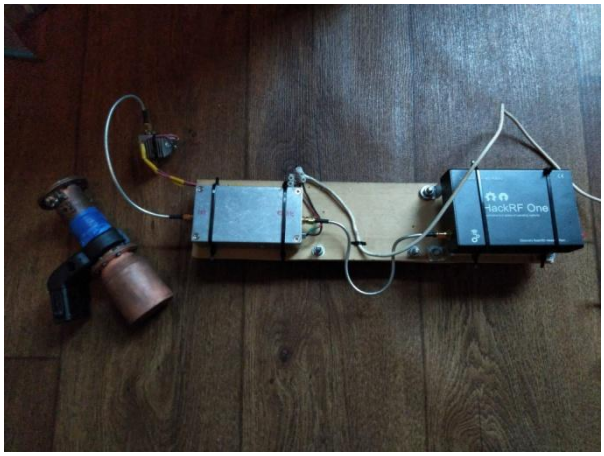
FJ: A lot of geostationary satellites are LHCP. The charming thing about the stiffener is that you can rotate it 90 degrees and you're in business.

PS: What about tracking with an XY or an azimuth elevation and the polarization?

AvB : It doesn't matter. It's about the 45 degree rotation relative to the probe in the back.

JdH : The underlying reason for circular signals is that it does not matter what the position of the satellite is in relation to your dish.

AvB : You can receive a circular signal with a horizontal probe in all directions, only with a 3dB loss. A reflected wave changes polarization and no longer causes interference if you receive circularly.



Setup Peter Kooistra : 3D-printed septum feed (design margaras)

Jean Claude built his septum feed and the cone completely separate from others. The septum feed is from a very old QEX publication, scaled from 1296MHz. I think that's pretty big. He determined the dimensions of the cone experimentally, he started with 70, then 50 mm. Until he thought, now I have the maximum. He will have optimal signal, but it is not calculated or with a mathematical background.

Then there is a publication from India and I combined this with a dual mode feed from a Japanese.

BS: We can test this on the Syracuse then.

AvB : Or on the noise of the sun. It is about how much signal you have on the sun and how much you have on the cold air and with what kind of dish diameter.

FJ: The advantage of the Syracuse is that it stands still. With the sun you are off by a minute or two. You are optimizing and you want repeatability and Syracuse is standing still. That is not quite the case with solar noise. Some days you have more sun noise than others.

low noise Amplifier

BS: Are you going to do it yourself or buy it? Mini-Circuits also has LNA's but the noise figure is worse. Preferably you have something that you can buy in the store for 50 Euros.

AvB : Make it ten times as high.

LNA from Kuhne Electronic

FJ: The Kuhne costs 360 Euros. I started with the APT-4, bought two from a friend and they were broken, the third one worked. In total I lost 550 Euros on this exercise. Cheap can be very expensive. The Kuhne is a top thing. It has been measured, you get a noise figure and it is much more broadband than the packaging says. This is important because a good number of satellites are between 7500 and 8000 MHz. My experience is that this LNA is robust and very well built. Joe in California uses such a Swedish thing that is immediately built on a downconverter and it is 2800 Euros. Kuhne also has a wave guide-based LNA, which is very good but also costs about 2600 Euro, it's called 0850WG or something like that.

BS: This is the only thing that is ready made.

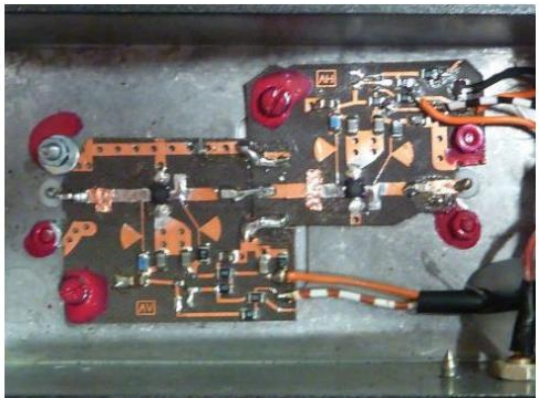
LNA from AmpliTech

FJ: About AmpliTech , you rely heavily on what's being offered on eBay. I haven't seen Amplitex on eBay in about 13 months . They are types that are not intended as LNA, but you can abuse them for that. Job has one such thing, an AFS03-850 or something. They are scrapped from military equipment and a company from Israel sells them. The company from Israel is the company in this field. You also get your money back here if something is broken.

AvB : A fourth option is the LNB I'm working on. A 12 GHz LNB from Italy. The advantage compared to Franco Rota PCBs is that there are 50 Ohm inputs, only SMA connectors have to be put on them. There is plenty of room to optimize with pennants. Can we get below 1dB noise? It also contains a mixer and a dielectric stabilized oscillator. For four Euros each I couldn't pass this up. The disadvantage is that you cannot work with fixed filters. The question is: do you get sufficient signal strength and can you work without the filters. An F connector comes out and you can switch the inputs with 14V. If this works then this is a good starter and you can delete a large part of the required hardware. But this has to be tested with the Syracuse or on a noise measuring bridge.

JdH : I make my own design. I made a one-step print. It works, but is not yet optimal: 1 dB noise and 14 dB gain. I try to make simulations with Qucs and I can predict what will happen if you set it optimally.

BS: That's good isn't it?



LNA by Jean Claude made from prints by Franco Rota

JdH : It should be better. I should be able to get 0.7dB noise figure. But then you must have an entrance, as you will actually use it. When you create a test set-up, you optimize the test set-up. As soon as you change something at the entrance, it is no longer optimal. The idea that you design something and fully calculate and build it does not really hold true. I was playing with it in the spring. The ultimate goal is to make a two-stage version. It should also be built into a cabinet that can be easily hung from the feed. The design is driven by the size of the cabinet. RF behavior and physical size are all related. You have to make something in the physical form factor as you want to use it and then start tuning and improving it. You should be able to have something for 50 Euro.

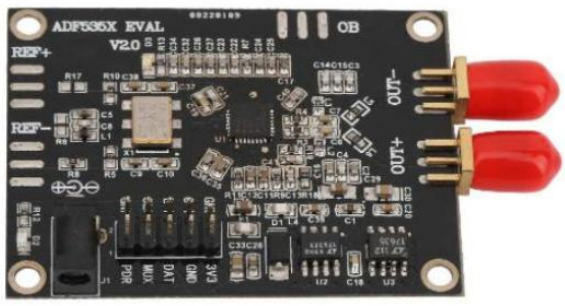
BS: If you don't want to tinker then the Kuhne is a good option or build yourself and experiment a lot. This is not yet a route.

VCO

BS: You need the VCO to power the mixer. I only have things from Analog Devices found. Arne has an LNB.

AvB : The disadvantage of the DRO is that it sits outside and drifts a bit. You don't have a megahertz accurate reading. With satellite TV this is not necessary, because it falls within the AFC of the receiver. It's a fixed DRO, your downconverter has a variable output. Now it is usually assumed a VCO at exactly the right frequency to pass through the bandpass filter. Maybe my setup in a heavily polluted environment (cell phone masts) won't work. The fail safe option: low- and high-pass filter, mixing to a fixed mid-frequency and a filter there too. But I hope that the feedhorn will catch this as much as possible.

BS: Do we have any experience with the ADF5355 boards yet?



ADF5355 board from eBay

AvB : I think Jean Claude still uses the forerunner with tripling, just like Harm. It has a 6.4 GHz filter behind it to extract and amplify the triple harmonic. Jan Claude has switched to a converted LNB and only uses the mixer.

BS: The power supply makes a big difference to the phase noise. Does this have a lot of influence on reception behaviour?

AvB : There are people who place capacitors in various places and then the noise is a lot less. But I doubt whether that is so critical for a broadband signal.

JdH : The question is whether you want a fixed LO or whether you can vary it? Do you want a fixed mid-frequency? Most use SDR and then you have enough bandwidth. With a hardware receiver you will have to switch your LO frequency. If you don't want to vary so much in your LO, you could also purchase a more dedicated PLL. RF Hamdesign also has this one from a Czech.

AvB : It is about knowing or accurately stabilizing the deviation of your VCO. Not that you're waiting for a signal 10 MHz away that you don't see. Doppler falls within the window of the SDR.

JdH : You should then be able to set your VCO remotely. The stability via GPS or an OXO is for the 10 MHz reference, this is a loose point actually.

FJ: I found more and more that in the SDRs there are spurs on all kinds of frequencies. It's hard to find a piece that's really clean and that the software doesn't mess up with a fake spike (spur) hidden under your signal. That is why I opted for a fixed mid-frequency of 1860 MHz and bought an integrated solution. My goal was to take the SDR out of the equation when testing the X-band stuff. The spurs come from a combination of the SDR and software behind it and that is also reflected in your recording.

BS: Have you chosen the mid-frequency of 1860MHz so that the combination of SDR and software won't cause any problems?

FJ: I optimized my whole system on Aqua in the beginning: 6300MHz LO + 1860MHz mid-frequency is Aqua. I should never have done this because it is a terribly difficult satellite.

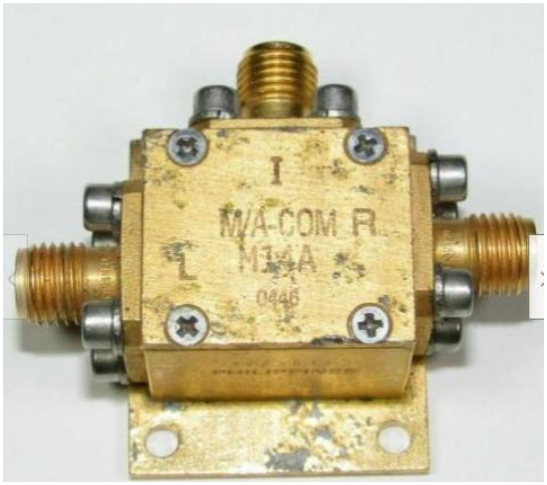
JdH : The reason for spurs in SDR is that you also mix there with a variable LO. The variable LO also has spurs itself. An ADF board also gives spurs. When tuning, you walk through areas with more or less spurs all the time. Such an ADF board can give quite a few spurs, depending on how you set it up. Setting the fractional dividers can differ per software and with this also the spurs.

FJ: I have a downconverter from (designed and built by) Arved . That seems to be a good thing. I haven't tested it myself yet. You can choose two or three values so that you have as few spurs as possible.

mixer

BS: You have different levels of LO signal. Other than that, there aren't that many differences?

FJ: The M/A-COM is easy to get. It breaks quite easily, I've never figured out why. That's why I switched to another solution. I get a lot of signal variation on Syracuse 3B. With a new mixer this was gone. They have always worked for three to six months. They are diode mixers and therefore vulnerable things.



Used mixer from M/A-COM

AvB : It's second-hand stuff. I have such a mixer from Israel. It is thrown so hard that the SMA connectors were bent.

FJ: I've been using these mixers because others use them too.

JdH : This mixer has max 20dBm input. If you have 60dB amplification in front of it, it can become too much. It depends on your last amplification stage, whether it can provide this.

AvB : Problem can be caused by oscillations. Before disconnecting anything, you must first remove the tension from the entire chain. Static electricity is usually not a problem with diode mixers. The biggest disadvantage is that they need a lot of signal.

BS: Ideally, the RF level should be 20dB below the LO?

FJ: This doesn't matter. I have experimented a lot with different RF levels. The mixer always gave a workable result. The LO is set at 6dBm.

JdH : Your LO determines the conversion loss but the mixer mixes all the signals it receives.

Recipient

BS: So far we've only heard about SDR receivers.

FJ: I'm using a LimeSDR and a BladeRF . In practice I use the LimeSDR every day. At 80MHz sample rate you can fry an egg on it. I have a case with a fan.

BS: There is an upper limit to the sample rate . Oleg has once reached 300MHz. How does he do that then?

FJ: He never says it, but he has professional equipment. If you receive signals with a bandwidth of 300MHz then you have expensive stuff.

BS: Don't you also need a heavy PC at the back to be able to process this data stream?

FJ: That's not too bad. It's about the throughput . You have to record it at 16 bits with I and Q. At 80MHz bandwidth you write 320MB per second. I have a special NVMe hard drive that is only used for the SDR. You can't do it on your SSD whatever your Windows is on. You do need good hardware, but it doesn't have to be a super PC. When writing at 320MB per second, you run into system limitations.

You should not hang the LimeSDR on a hub. It must be connected directly to the USB port on your motherboard on the bus. Otherwise you won't succeed. You also have to make sure that the bus is not shared by another device that needs attention. You should choose the USB port you use with care.

The LimeSDR

BS: And recording in 8 bit?

FJ: HDSDR records wav files in 8 bit. There is little software that supports 16 bit recording with LimeSDR. Satdump and Joe in California has it. With a 16-bit signal I

get a lock more easily at low elevation . If the satellite is above you and has a 15dB signal-to-noise ratio, you will have no problem with 8-bit.

Receiver in hardware

BS: With the QPSK receiver, we have that. You have much less data because you decode with hardware. To what extent can we also get the QPSK receiver working on these higher data rates ?

FJ: You also have to look at the economics of the situation. If you are going to use a hardware receiver, you choose a modulation scheme. There are quite a few different modulation schemes: QPSK, OQPSK. If you want to support this in hardware, it will very quickly become as expensive as a LimeSDR.

HvD : If you have different types of QPSK, this can indeed get complicated.

FJ: The advantage of demodulating in software is that the costas loop and the frequency stability are not so important. I don't have a GPS LO. The costas loop in software finds the center in the signal itself.

BS: Is there an overview of the modulation schemes that the satellites are broadcasting?

FJ: I knew you were going to ask this. I'm going to add it to my table.

JdH : In Satdump it's in the source code.

FJ: I'm going to ask Allen if he can provide a table, including the error corrections.

HvD : Switching the bandwidth in reception is not easy in hardware.

FJ: Converting the bandwidth in SDR is very flexible.

AvB : Your sample rate must be higher than the bandwidth. With the LimeSDR this is 60, some say 80MHz. You get huge intermediate files.

BS: Are there any hardware receivers?

FJ: I don't know amateur hardware receivers, but I do know the professional stuff. These cost half a million.

JdH : At the Portsdown receivers they use chips that use in DVB-S receivers. Then you design it around a television demodulator. But you have variants where you can do more with the output, the advantage is that you then have many more demodulation schemes . Then you also have 8-QPSK.

FJ: I could do an experiment where my mixer can up-convert to DVB bandwidth and then choose the modulation scheme with my DVB receiver.

AvB : You can no longer get I and Q out of it. It's so integrated, video comes out right away.

JdH : With Portsdown they have 10 GHz ATV. They have made a self-built transmitter and receiver and they use DVB-S chips to solve the modulation. There is Linux software that lets you see low level things: Crazyscan . Sometimes the source is also available. They get data from registers and you can also get constellation plots. Portsdown has now also switched to the LimeSDR.

The hardware is available, but it takes a lot of time to figure it out and if it's suitable for weather satellites I don't know, I think so. They do all FECs (forward error correction) that you can have. It is true that it is becoming more integrated and perhaps more difficult to obtain.

They use NIM, network interface module, a tuner module that you plug into a setup box .

AvB : Despite having all the equipment, Oleg also uses SDR. If you also want to see the spectrum, which says a lot, then you are stuck with SDR.

BS: The charm of a hardware receiver is that you immediately see the picture. I think that's super cool.

FJ: With Allen's software you can just decode L-band live. I understand that it is difficult for you to sell your soul to the devil. My experience with SDR is that it is difficult to find a good one. Job and I have had good experiences with LimeSDR. Those Ettus things are good and have high performance solutions too. If you want to use 80MHz bandwidth here, you are looking at six to seven thousand Euros. The LimeSDR is not available at the moment. You can buy nice things at Ali, but if you want to be sure that you don't buy a clone that already gives up the ghost at 30MHz, then you shouldn't do this. Justin Peng makes it a hobby to recreate all that junk. Those guys from Airspy are furious. He is also from the nano vna .

AvB : Warning: the LimeSDR is available in two versions. The mini achieves half the bandwidth, namely 30 MHz. The LimeSDR I know is a kit. If you use the print without cooling, it will break.

JdH : Doesn't have these experiences. I've never refrigerated it and it works fine.

BS: In summary: if you want to get started quickly, you can get started for under a thousand Euros. Preamp from Kuhne, LimeSDR and the downconverter from Arvid . It's doable and that's great fun.

AvB : You also have the HackRF . Jean Claude works with it.

PK: Due to the limitations of the HackRF , I can only decode Aqua, Aura, NOAA-20 and Suomi at the moment . Aqua / Aura go perfectly on 12 MSPS, NOAA and Suomi I do with 20 MSPS.

FJ: The bandwidth limitations are very real and the satellites you can receive are twenty years old. All the new stuff that's coming out is all heading towards the 50 and 60 MHz.

The BladeRF should be able to do it too but someone on Twitter described the noise floor as a smiling face. In the middle it is low and on the sides it goes up hard. It is very difficult to work with.

RA: I don't think we're going to do the hardware side or are there plans to do something along those lines? We cannot do all satellites, because there is too much spread, but some should be possible.

BS: I'm definitely in favor of still exploring the hardware direction. We've been doing this since the inception of our working group and we will continue to do so.

DE ESP32 ROTOR-CONTROLLER

Job de Haas

This story is a sequel to the one from Kunstmaan 2021-4 about using an ESP32 microcontroller in my rotor controller. One of the features that I use is the possibility to control the controller wirelessly over WIFI.

My rotor controller consists of the following parts:

- 2x BTS7960 motor driver
- 2x AS5601 encoder
- ESP32
- DC-DC converter
- 24 volt power supply

I can be brief about the choice of the BTS7960: don't do it. It can handle a lot of power, but it needs a separate PWM for left and right. Unnecessarily complicated, there are better alternatives for that.

I have described the encoders that I use in Kunstmaan 2021-2. They use quadrature pulses to transmit position and direction.

Everything schematically linked together looks as shown in figure 1. The connections are not exact as in the figure but it gives an idea.

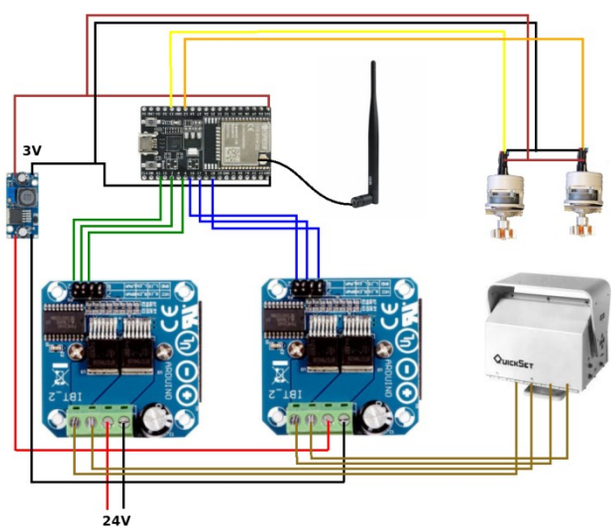


Fig.1 Schematic of the rotor controller

As a basis for the rotor-controller software I use the Arduino software from Rob Alblas: *rotorctrl* [1]

The purpose of using the ESP32 is, among other things, that it becomes possible to control the rotor with the built-in WIFI. As a solution I came up with the following: A connection is made with the TCP/IP protocol such that an equivalent connection is created to a serial full-duplex connection. The advantage for me is that I can manually test whether the rotor works by connecting using a "telnet" program. The same commands can then be given via this network connection as via the serial connection (for example via the USB cable). To implement this I use a library AsyncTCP [2]

To get a connection via a WIFI network, you can include the network name and password in the code. It always tries to connect with that. The disadvantage is that if this fails, or if the password is changed, it will no longer be possible to connect. And if you can't connect, you can't set a new password either. The only way to change the setting or the software is to connect the ESP32 to the computer with a USB cable. For me that is a hassle because the controllers are on the mast near the dish.

That is why I opted for a solution in which a temporary WIFI network is created to carry out the configuration. Again there is a library for this: Wifimanager [3]. The disadvantage of some libraries is the multitude of possibilities and options that all have to be set. Unfortunately, this also applies to Wifimanager. In the end I chose to use the solution that creates a temporary WIFI network for the first few minutes and then switches to the set WIFI network. If there is no network set up yet, it will wait using the temporary network. Configuring then proceeds by connecting to this temporary network. The name is something like ESP_XXXXX with a password that you can set yourself (in the code). If you are successful in connecting to this network, a configuration page can be found with a web browser at the address http://192.168.4.1.

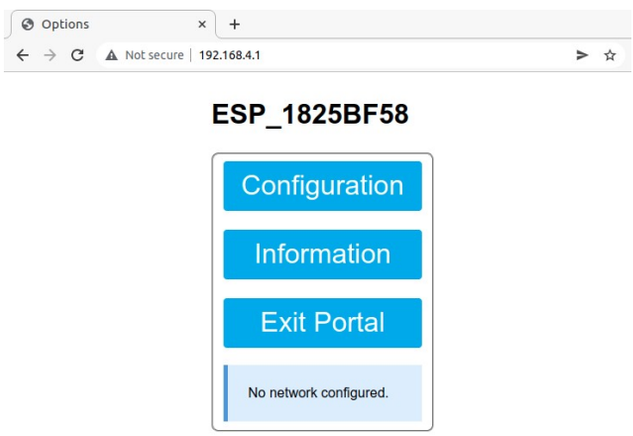


Fig 2. The home screen of Wifimanager

Then the ESP32 can itself scan for existing networks that you can select and for which you have to enter the password. You can also choose a second network as a backup. The data is stored in the ESP32 and can therefore be used again after a power failure or reset.

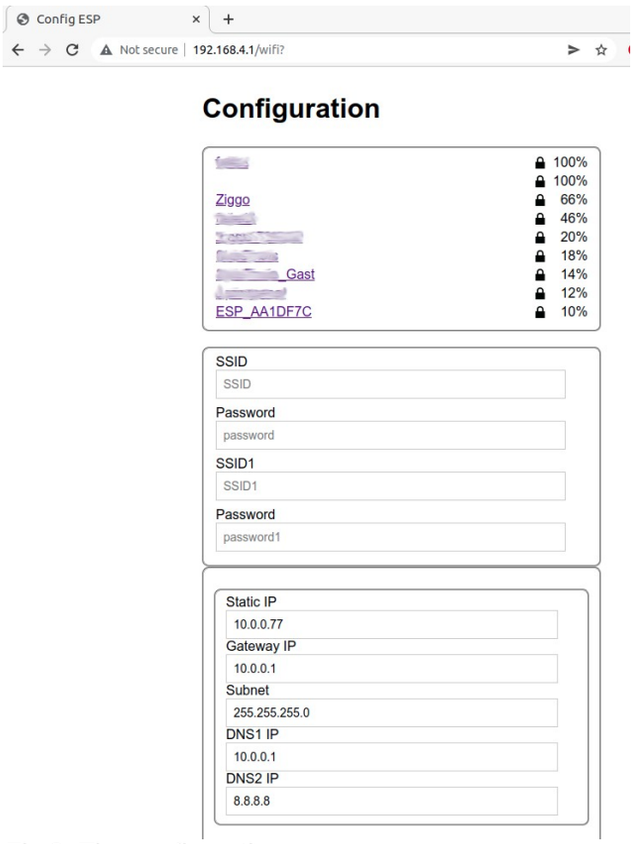


Fig 3. The configuration screen

It is useful to use a so-called static IP address because otherwise it will be difficult to find the rotor controller. Via DHCP, the address can just change the next time the controller starts up. You have to enter this IP address in xtrack later.

Credentials Saved
Try connecting ESP to the failed/failed network. Wait around 10 seconds then check if it's OK.

The ESP_1825BF58 AP will run on the same WiFi channel of the failed/failed AP. You may have to manually reconnect to the ESP_1825BF58 AP.

In addition to operating the rotor, I also wanted to be able to adjust the software remotely. The rotor controller is now outside, mounted close to my rotor. The advantage is that the connections to the motors and encoders are short. This leads to less interference. However, updating the software via a USB cable has now become a lot more difficult. Fortunately, there is also a library to update the software via WIFI. That's called "Over The Air" or OTA. I have used the library AsyncElegantOTA [4]. To use this, go to “Export Compiled Binary File” under the “Sketch” menu in the Arduino software. You can then upload the exported file.

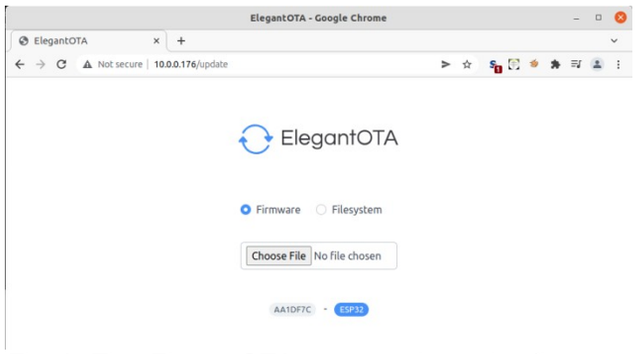


Fig 4. The ElegantOTA screen where the firmware can be loaded.

The last step is of course that a driver on the PC can control the rotor. Neither xtrack nor wsat are capable of that yet. Fortunately, Rob has already made a beta version of xtrack on Linux that can do it.

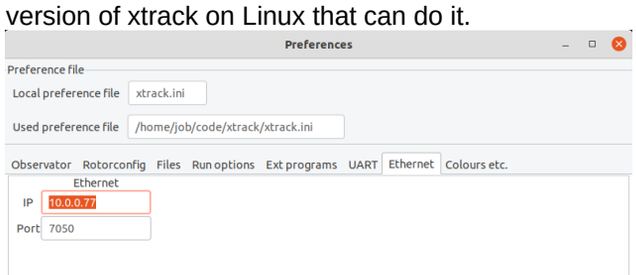


Fig 5. Configuration of TCP/Ethernet in xtrack

Because I actually copy the serial connection with the TCP connection, it is also possible to use programs that support serial-over-TCP. For example, I can use socat [5] on Linux. This makes it possible to create a virtual serial port and choose it in xtrack. I used the following command:

```
socat
pty.link=/dev/ttyUSB2,raw,echo=0,waitslave,group-
late=dialout,mode=660 tcp:10.0.0.77:7050
```

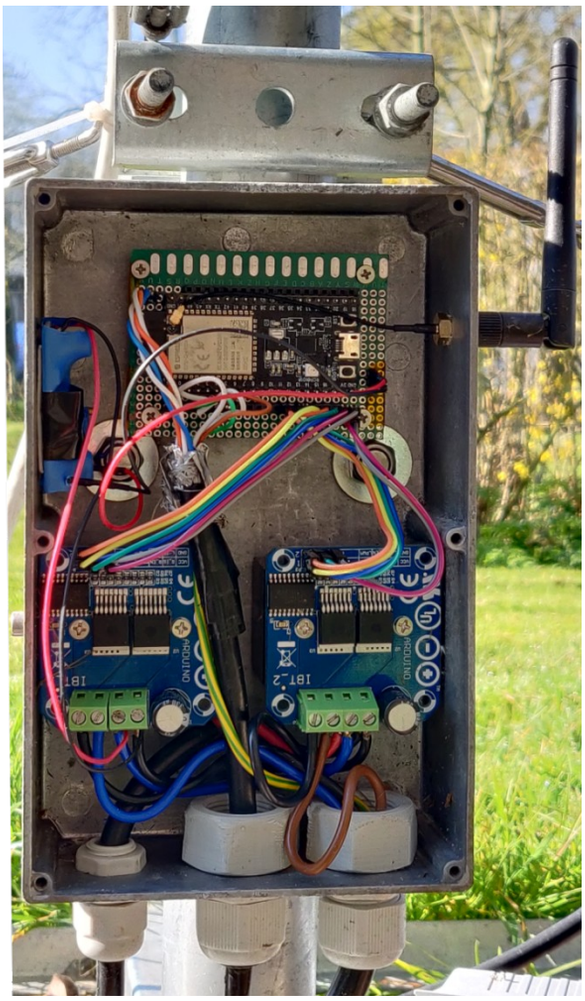
I have not tested this under Windows, but there are comparable programs that do that [6].

Conclusion

In the end I was able to make a reliable and accurate rotor controller using an ESP32. I can control and update it via WIFI. Finally, the ESP32 has enough processing power to carry out the entire path planning based on TLEs. Maybe that's the next step in the development that I'm going to do. I have not yet published the source code of my adjustments, but can always be requested from me.

Links

[1] GitHub rotorctrl
[2] AsyncTCP bibliotheek
[3] ESPAsync_WiFiManager bibliotheek
[4] AsyncElegantOTA bibliotheek
[5] socat
[6] hw vsp3 virtual serial port




The rotor controller: Mounted on the left in the housing and on the right as mounted on the dish mast

GREETINGS FROM CURAÇAO

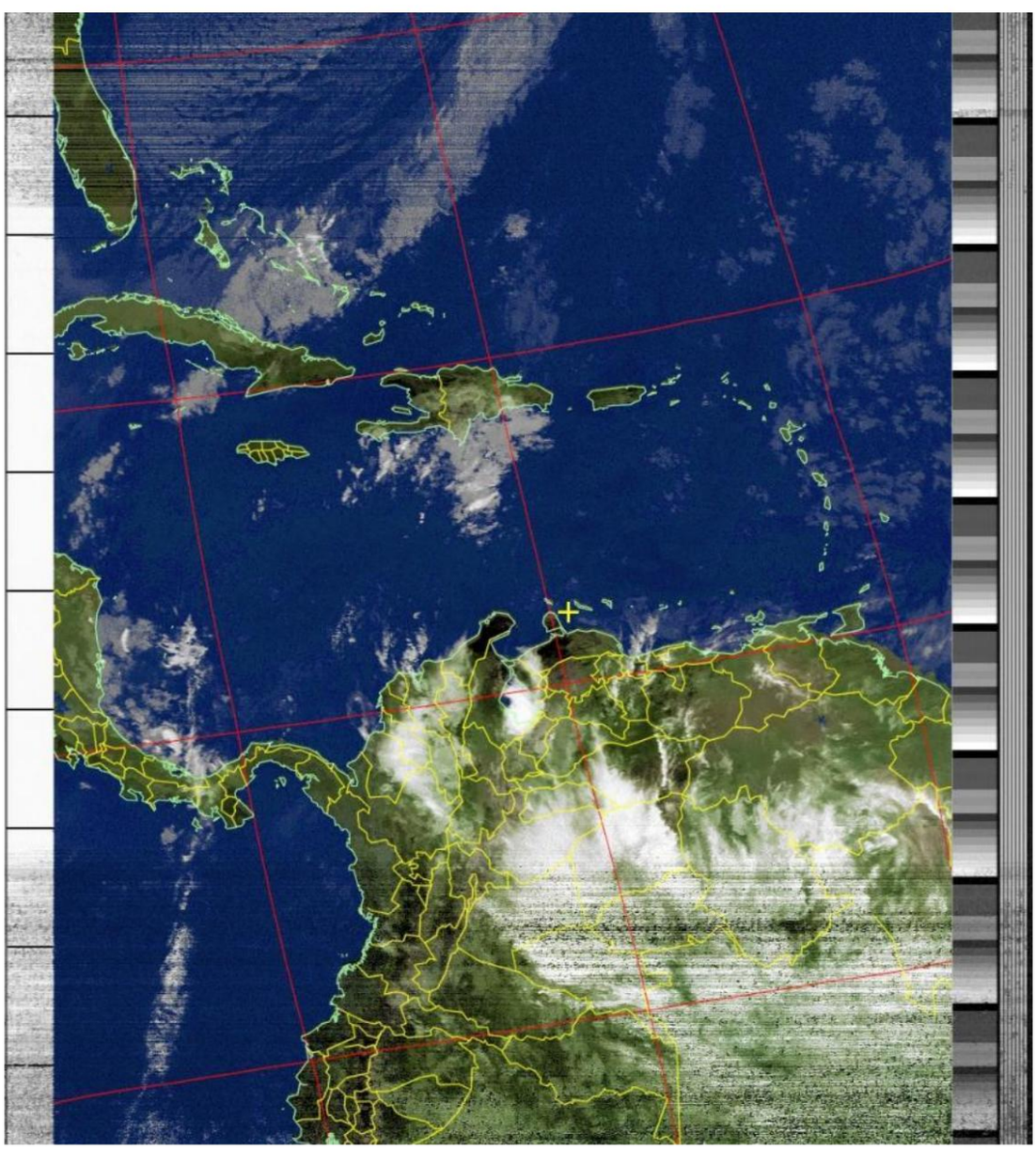
Peter Kuiper

Because I wanted to get some weather maps anyway, I spent two and a half days to build a Quadrifilar Helix Antenna for 137 MHz.

The receiver is an RTL SDR single.

The antenna protrudes slightly above the roof.

This is what the sky looked like this morning in Curaçao.



Measurements on 8 GHz filters and LNA

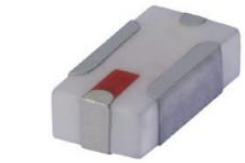
Introduction

I am trying to design my own down converter for the 8 GHz. Fun and educational. As I now see the down converter in front of me, there is a bandpass filter at the input followed by an amplifier to compensate for the mixer's losses. This is followed by the mixer and a PGA-103 for extra amplification. As an oscillator I want to use an ADF5355.

In this article I want to show the results of the Mini-Circuits bandpass filter BFCN-8000+

BFCN-8000

The BFCN-8000 comes in a 1206 housing. This is 3.2 x 1.6mm and is easy to solder by hand.



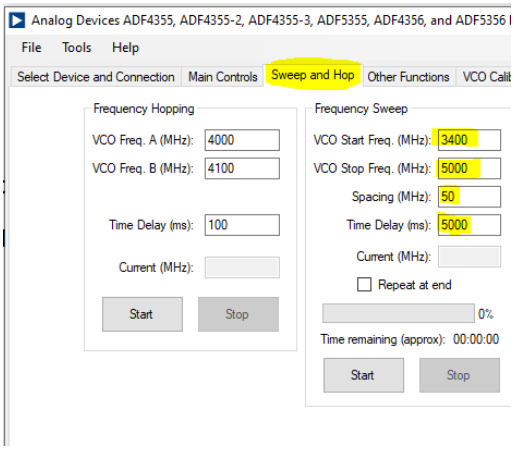
The 1206 housing. The red line marks the entrance.

According to the datasheet the attenuation at 7600 MHz is 2.24dB and at 8100 MHz it is 1.86dB.

I want to see if I can get this bandpass filter working properly with my self-etched PCB and housing.

Measurement setup

The signal generator is the experiment board from Analog Devices ADF5356. This is done with the Analog . software Devices controlled. You can easily set up a sweep in this software .



It's easy to set up a sweep function . We are using the RFoutB and it is twice the VCO frequency . An interval of 5 seconds is sufficient to note the values.

The VCO of the ADF5356 runs from 3400 to 6800 MHz. Via a doubler, 13.6GHz on the output is RFoutB available. An Astrolab Minibend R-5 cable goes to the DUT.

I measure the signal strength with the power meter NRP-Z11 from Rohde & Schwartz. Officially, this meter is specified up to 8 GHz.

Measurements

I have made several measurements:

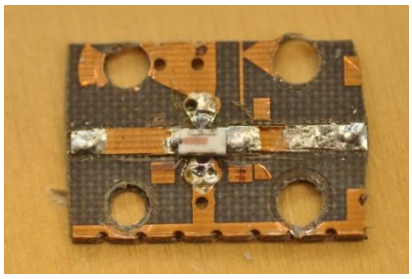
Enclosure with print

This is a PCB with only a 1.1mm copper track, this should be 50 Ohms. The dimensions are the same as the PCB for the BFCN-8000. This excludes the cable, connectors and the PCB in the measurements.

You see losses between 1 and 2 dB for just the housing with connectors.

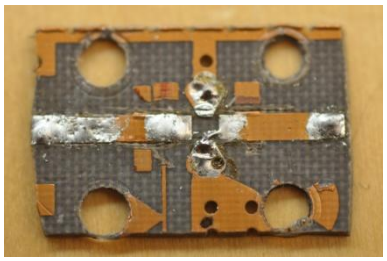
Print by Franco Rota

I thought I was smart by soldering the BFCN-8000+ to Franco Rota 's LNA PCB where the FET is located. This fit very nicely.



The BFCN-8000+ is on a piece of teflon print.

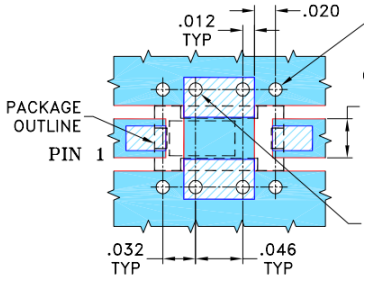
But the result didn't look like anything. The problem is in the print layout . The ground plane does not extend below the BFCN-8000+.

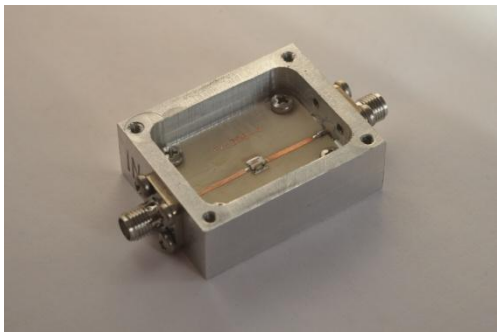


The ground plane does not pass under the filter.

Layout according to the datasheet

The BFCN-8000+ that was mounted on the Franco Rota print, I have now mounted on a print layout according to the datasheet. There are metalizations on both sides of the filter . I made this by drilling 0.3mm holes and soldering them to the underside of the PCB with wires. I sanded everything flat with sandpaper .





The same filter but in a milled housing and mounted on an Isola print .

Datasheet

The Mini-Circuits site also lists values for different frequencies. I also put this in the chart.

What is striking is that, according to the datasheet, the filter is narrower . At the bottom of the pass, the DUT follows the values from the datasheet, but at the top the pass of the DUT is 500 MHz higher. No idea how this happened.

Matlab script

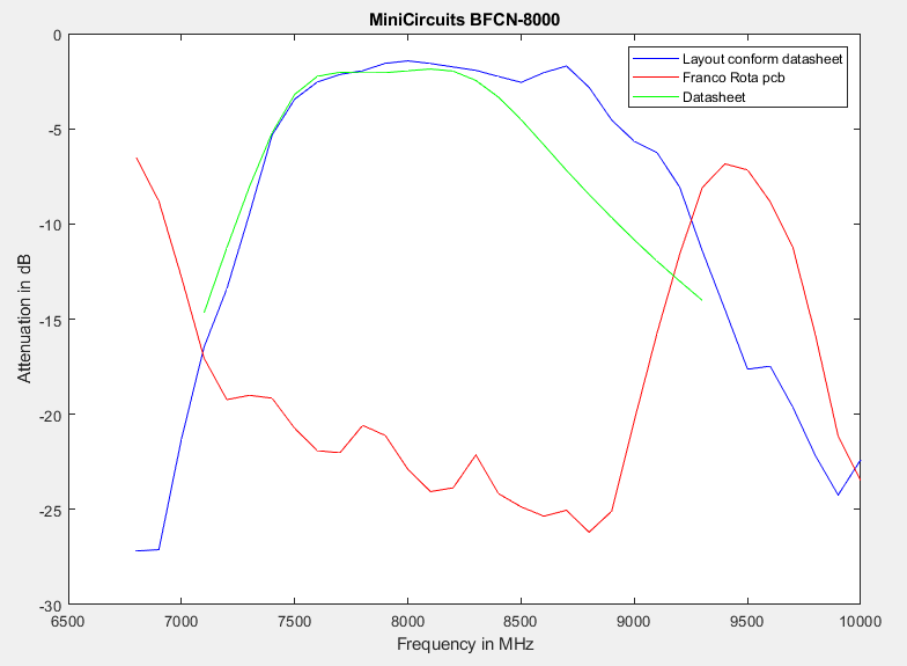
The measured values are stored from Excel in a csv file.

On line 3, the entire file is read into matrix A. On line 4, the x-axis, the frequency, is extracted from the matrix. The ":" means all rows and the "1" is the first column.

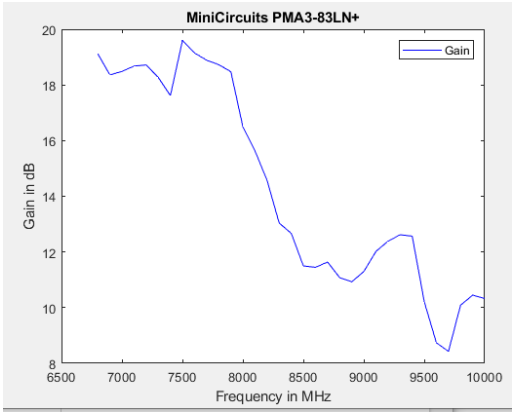
On lines 6, 7 and 8, three different y-values are determined. And on line 9, they are plotted on a graph. The sequence in the plot command is: x-value, y-value followed by color. Then you indicate a title and labels.

```
% Read csv file and plot
filename = 'sweep.csv' ;
A = readmatrix ( filename, 'FileType' , 'text' , 'NumHeaderLines ' ,
1, 'Delimiter' , ';' , 'DecimalSeparator' , ',' );
x = A(:,1);
correction = A(:,3);
y1 = A(:,6) - correction ;
y2 = A(:,4) - correction ;
y3 = A(:,7);
plot(x,y1, 'b' ,x, y2, 'r' ,x,y3, 'g' )
title( ' MiniCircuits BFCN-8000' )
xlabel ( 'Frequency in MHz' )
ylabel ( 'Attenuation in dB' )
legend( 'Layout according to datasheet' , 'Franco Rota pcb ' , 'Datasheet' )
```

Result



I also did measurements on the PMA3-83LN+. According to the datasheet, this low noise amplifier is suitable up to 8 GHz. Now I hoped that the gain would continue to 8100MHz. A glance at the graph shows that this is not the case. It is not suitable as an amplifier for the mixer, but it is suitable as an amplifier for the oscillator, which is around 6800 MHz.



The gain drops very quickly around 8 GHz. According to the datasheet, it shouldn't decline that much.

MAKING A CONE FOR A FEEDHORN

Peter Smits

Pastime in the winter months: thinking how we can make a feedhorn for 8 GHz according to calculations and models that are in circulation among various amateurs at home and abroad.

Last meeting of March 12, 2022, we discussed how we can calculate a feedhorn.
There are many models for doing this and they sometimes contradict each other. But many variants have a conical part.

In conversation with Peter Kuiper we came up with the question of how we can make the conical part of a feedhorn. He then said: let's take a look on YouTube. Found some what looked big and expensive but not for our wallet see the red example (Fig .1)

Fig 1. Professional roller

But do you need something like that? No, you can also do it by hand and a plastic hammer. But is it beautiful and pure in form and useful?

Accepted the challenge and started to make a waltz, because this way a cone can be made much nicer and smoother in shape. Found the necessary things in the junk box that we had to do it with and see the result.

I've been working on making a finger roller with which we can produce a cone for an 8 GHz feedhorn. But once looked on the internet how something like this works, and here a trifle of 3 days sawing, milling and turning (Fig 2).

Whether it will work is another question. This one (Fig. 2) has not yet been tried and is still in its infancy. Much remains to be done.

Fig 2. Result of 3 days of tinkering.

As a model it looks nice. It has a bottom and a top roller, with left and right adjusting rollers to make a model. It has become a roller with four rolls.

The side rollers can be moved left and right so that they are skewed, so that the material to be fed through automatically becomes a cone. You can of course also buy a roller, but they are not suitable for us to make a cone: the rollers are too thick. The roller I made has 20 mm rolls. Why? Because the cone has a hole of 26 mm. The lower and upper rollers are connected with gears to allow material to be fed through.

Now that the roller has taken shape, let's try and see if we can make something. First make a result of a model, we can do this with the program **templatemaker** [1]. When the result is made, we can roll it into a cone.

Type your text

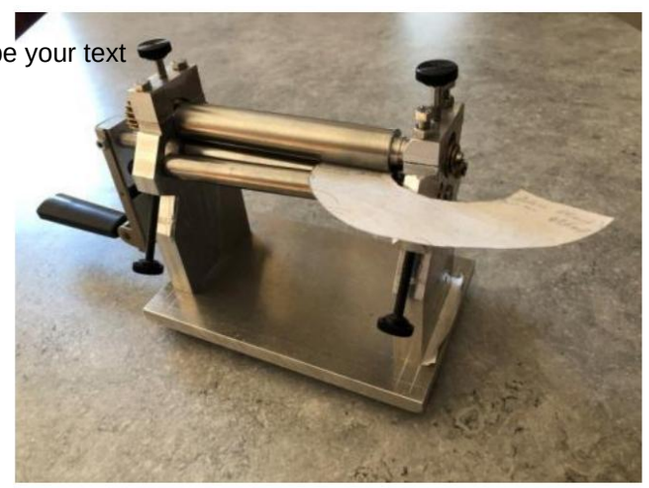


Fig 3. Roll with a paper template to see if there is enough room to mold.

I have to say it's not going smoothly.
It takes quite a bit of effort. The material is jammed so I modified the roller with a bearing between the top and bottom rollers so that the cone spins around it. After some practice it is still possible to make a cone, see the models (Fig 4 and 5).

Fig 4. Turning a cone.

The thickness that we can handle with this roller is 1 mm aluminum, copper and brass, brass is a bit harder than copper, so whether that will work??

[1] https://www.templatemaker.nl/nl/cone

Fig 5. Two examples of a feedhorn with a cone turned on the roller.

Weather satellites with SatPy

A number of programs are available for making pictures from weather satellite data, especially from EumetCast:

- Toolset by David Taylor
- EUMETCastView by Hugo van Ruyskensvelde
- xrit2pic (from me)

A new platform has recently been added: PyTROLL/SatPy, based on the Python language. An important difference from the former programs is that it is maintained by a group (the PyTROLL group), not by a single person. This benefits continuity.

SatPy has been around (as far as I know) since 2018. It is a superset on top of the Pytroll packages that allows you to create weather images from eg EumetCast data with just a few lines of Python.

One drawback for many people is that it is not a ready-made solution that you can install and then use; scripts have to be created that do the work. There is therefore no graphical interface.

Ernst Lobsiger, a Swiss person who is very active on the MSG mailing list, has made a package and manual with which you can install the satpy environment with little effort (for both Linux and Windows). This package also includes a number of almost ready-made scripts that you can use immediately. This makes Satpy a lot more accessible.
I have further developed these scripts so that they are even easier to use.

Installation

I've created a web page that lists the main links, including links to the start kits for both Linux and Windows. This has all been discussed on the MSG-1 mailing list but the kits are not that easy to find. Hence this webpage: [1]
Basically, you pick up one of the starter kits (Linux or Windows) and unpack it. The result is a subdirectory containing a number of tar/zip files. After unpacking, an extensive manual can be found under EMCtools/documents:
SatPy_for_EUMETCast_HOWTO_V30.txt (Windows: Satpy_HOWTO_v30.txt)
This describes a number of ways to complete the installation. I chose the miniconda method myself. This is a program that makes it easy to do an installation that is kept completely separate from other installations. This can be done in your own “user” environment so that no root/administration privilege is required.
When installing SatPy, don't be afraid to type in commands; also for Windows installation is not a matter of running a setup! But if you follow the manual carefully, it is certainly doable.
On my website I have provided an overview of the installation as I did it ([2]). An installation under Windows is almost identical to that for Linux.

The scripts

Scripts are available for both geostationary satellites (MSG, GOES, Himawari) and polar satellites (METOP, NOAA20, FY3D, Aqua/Terra, Sentinel). The original scripts as they are in the package still need to be modified:

- the location where SatPy is installed (this also contains utilities and data that the scripts need)
- the location where the data files are located

- possibly adjust 'area' (which part you want to see) and 'composite' (way in which channels are combined into an RGB image)

Then it's a matter of running the script in question with a single argument:
- the date/time (for geostationary satellites: YYYYmmDDHHMM), e.g.:
  - python MSG4.py 202201201045
- only the date (for polar satellites: YYYYmmDD), e.g.:
  - python Metop-A_DAY.py 20220120

The result can be either the original “flat” image or projected onto the globe in a particular way. For example, you can make an image of, for example, only Europe for both geostationary and polar satellites, with the viewpoint above, for example, central Europe. Furthermore, various RGB composites can be made.

Adapted scripts

A disadvantage of the original scripts is that for a different area ('area') or different channel composition ('composite'), the scripts have to be adapted. This is also necessary if the data to be used is located at a different location. Think, for example, of recent data on the one hand and an archive where you keep interesting old data on the other. There are also separate scripts for MSG1 to 4; when changing satellites (eg MSG3 which takes over MSG4 if MSG4 is taken out of service for a while) one has to think about changing the script.
I have adapted the original scripts so that you can specify which area, composition or satellite to use with options; see [3].
For MSG1 to 4 that is a single script: MSGx.py
Mandatory option is the time, other options only need to be specified if you want to deviate from built-in 'defaults'. Some examples:

python MSGx.py -t 202201201045 -sat RSS -area eurol -composite natural_color

This will automatically use the data from the MSG satellite that is currently feeding RSS.

python MSGx.py -t 202201201045 -sat IODC

Selects the satellite that outputs IODC. That is/was MSG1, but will be/is now MSG2.

If desired, the satellite can also be explicitly selected, e.g. MSG4:

python MSGx.py -t 202201201045 -sat 4

Note that you have to use the -t option here with the time, unlike the original scripts where you specify the time without '-t'. With the -src option you can indicate where the raw files can be found, with -dst where the result should be. If this is not specified, the defaults as defined in the scripts are used, which must then be adjusted if desired.
In the custom scripts, only one customization is really required: the location where satpy is installed. That can be adjusted almost at the top of the scripts at:

satpyloc

There are currently custom scripts for:
- MSG: MSGx.py
- Himawari: HIMAx.py
- GOES: GOESx.py
- Metop: Metox.py

- NOAA and Suomi: NOAAx.py

Polar satellites

With these satellites there is an extra level of difficulty; the correct files must be found to create an image of the desired area. The original scripts require a TLE (Kepler data) file to determine the times when the satellite was over the desired area. That is not such a problem if you always work with recent data, but with older data it can be a problem. The current position can be obtained from the files themselves, but they must first be unzipped and opened before you can see whether the file in question is needed or not, which can make processing unnecessarily long.
At Metop there is another option; these files already contain the TLE parameters themselves. It is then sufficient to open a single file and extract the TLE from it with which the position of the other files can be determined without opening them first. I haven't built this capability into my scripts yet; unfortunately only Metop seems to have this data and not the NOAAs etc. It is therefore not a generally applicable method.
Another point is that polar satellites pass over a certain area twice a day; eg during the day and at night. That's why there are separate scripts for day-overs and night-times. In my custom scripts, that can be specified as an option:

python Metopx -t 20220112 -sat BD
Here a day transfer from Metop-B is used

python Metopx -t 20220112 -sat CN
A Metop-C night transfer is used here

Furthermore, it is also possible with these scripts to make a so-called 'stacked' image; multiple passes are then used, with the most central pass being given priority. This replaces the original 6 METEO scripts (A,B,C and DAY/NIG) with only 1 script, which also allows a multi-pass (the current script set does not have that for Metop). The 3 original NOAA20 scripts are also replaced by one script.
Meanwhile, I am busy with dividing the contents of polar scripts into general purpose part and satellite specific scripts. Much of the code is the same. The advantage is that this is easier to expand and that you immediately have all the options for all satellites. For example, it is not necessary to create separate scripts using a single pass or multiple passes. Particularly with polar satellites, the functionality to select files belonging to certain orbits is always the same.
So there are now 3 sets:

- Original set by Ernst Lobsiger (8x GEO, 17x LEO)
- Combined set (3x GEO, 2x LEO, not complete), still very similar to the original scripts
- Latest set for LEO (4x)

Note that per LEO satellite (apart from 'area' and 'composite') there are 4 possibilities: day/night and single pass/multi-pass (stacked). If you would put that in separate files, you would come to 28 files for 7 satellites. With the new set there are only 5 (NOAA and Suomi are combined, as well as Aqua and Terra).

Overview scripts:

Original	combined	Features in satpy_ecast_rts.py
MSG1,MSG2,MSG3,MSG4.py	MSGx.py	
Hima8.py	himax.py	
GOES16, GOES17.py	GOESx.py	
Metop-A/B/C_Day/NIG.py (6x)	Metopx.py	Metop.py
NOAA-20_DAY/NIG.py NOAA-20_DAY_stack.py Suomi-NPP_DAY/NIG.py Suomi-NPP_DAY_stack.py	NOAAx.py	NOAA.py
FY-3D_DAY/NIG.py FY-3D_DAY_stack.py	-	FY3D.py
EOS-Aqua_DAY.py EOS-Terra_DAY.py	-	AquaTerra.py
Sentinel-3A_DAY.py Sentinel-3B_DAY.py Sentinel-3X_DAY_stack.py	-	Sentinel3.py

The middle column is not complete; for polar satellites this is actually already obsolete by the sripts in the right-hand column. For now, I don't plan to complete the set in the middle column.

xrit2pic as “manager”

To simplify the use of the scripts even further, I made xrit2pic suitable to control the Python scripts for satellites. Xrit2pic then only works as a kind of 'data manager' and does nothing else with the data itself. In 'SatPy mode', when clicking on a satellite, the correct script is automatically selected, the available areas ('area') and compositions ('composite') are extracted from that script, after which the menus for this in xrit2pic are automatically adjusted. Then it is a matter of choosing 'area' and 'composite' in xrit2pic and the correct script is controlled at 'Export' or 'Preview'.
Actually it would be better to make a Python-based gui, but xrit2pic already contains the whole setup to rake data together and make it displayable; only a few minor extensions were needed to make xrit2pic suitable for this work.
For automation it is better to use the Python scripts (original or modified) directly.

Customize/create Python scripts yourself

The Python scripts may look complicated at first glance, but most of the code is for collecting the correct files and such. The most complex part is executed “underwater” via just a few Python lines. To gain a little more insight, here are some example scripts that have been stripped down as much as possible, but are functionally complete. To make it as simple as possible, these sample scripts have been put together with all necessary satellite files in a single location.

The script for geostationary satellites:

```
# required components
import os
from satpy import Scene
from glob import glob

# select files at a specific time, by file name
files = glob('H-000-MSG4*202201041200*')

composite = 'natural_color'
scene = Scene(filenames = files, reader = 'seviri_l1b_hrit')
scene.load([composite])
scene.save_dataset(composite, 'MSG.png')
```

And that's all! The images of MSG are "upside down", and the generated .png inherits a mostly unwanted effect outside the globe (block grid or white, because there are no pixels for these parts). Both problems can be overcome by replacing the last line with:

```
new_scene = scene.resample('seviri_0deg', radius_of_influence = 20000)
new_scene.save_dataset(composite, 'MSG.png')
os.system("magick 'MSG.png' 'MSG.jpg'")
```

The result is a jpeg file. So in total only 10 lines of Python are needed.

The script for polar satellites, Metop:

```
# required components
import os
from pyorbital.orbital import Orbital
from satpy.scene import Scene
from glob import glob

# select files on a specific date, by file name
flist = glob('AVHR_xxx_1B_M02_20150617*')

composite='natural_with_night_fog'
scn = Scene(filenames = flist, reader = 'avhrr_l1b_eps')
scn.load([composite])
scn.save_dataset(composite,'METOP-A.png')
```

This results in a so-called 'swath', scan lines under each other, as you are used to with the direct reception of polar satellites.
An image on the globe can be created by simply replacing the last line with:

```
new_scn = scn.resample('euron1', radius_of_influence = 4000)
new_scn.save_dataset(composite,'METOP-A.png')
os.system("magick 'METOP-A.png' 'METOP-A.jpg'")
```

The last line again ensures that the parts for which there are no scan lines are black. Only 11 lines of Python!
With this script, even parts of different orbits are automatically merged, see fig. 1. Also note the line:

flist = glob('AVHR_xxx_1B_M02_20150617*')

where only the date is set so that multiple orbits on the same day (but different times) are selected. In this case there are 3 different orbits.

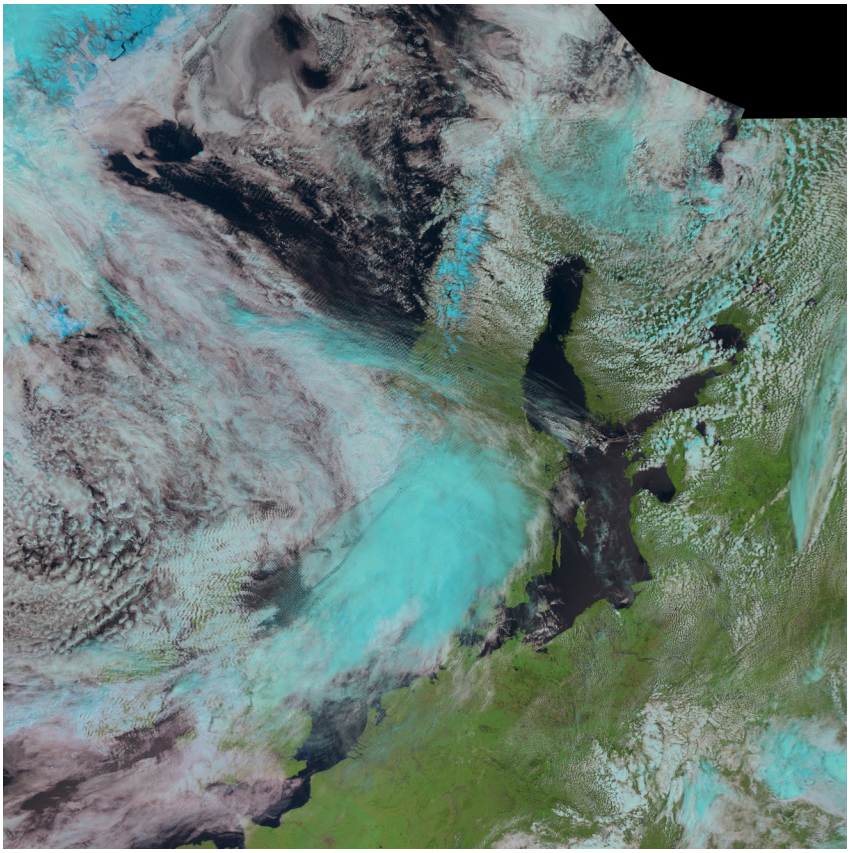


fig. 1. Metop, consisting of several (3) combined orbits.

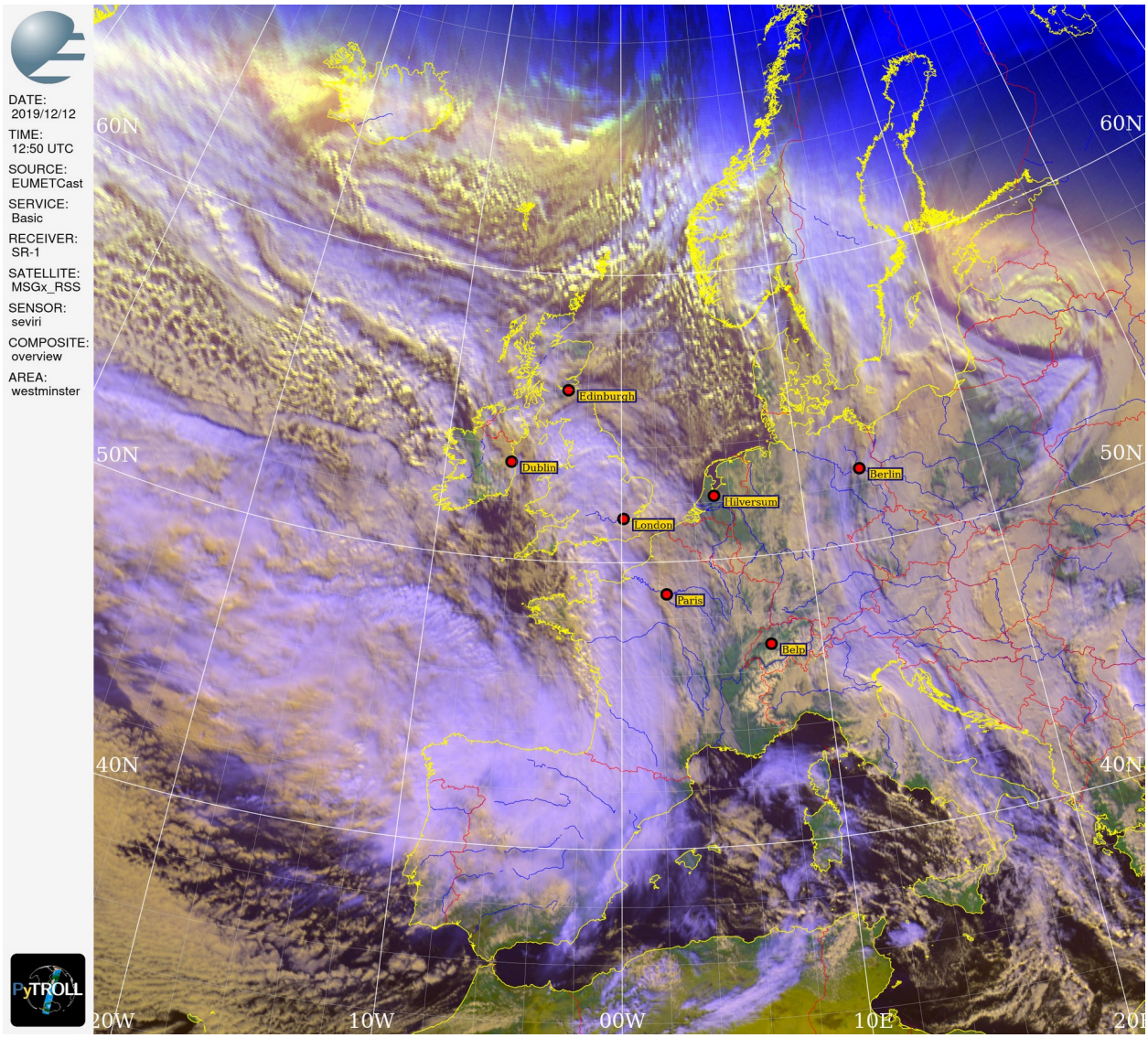
The above scripts are just to illustrate how results can be obtained with just a few lines of Python. Selecting the right data is then still the most work; as said, in the above scripts this is done by simply adding the necessary files to the scripts so that further selection is no longer necessary. Furthermore, Metop must take into account switching channel 3 between 3A and 3B, if that channel is used.

Data formats

SatPy can handle many data formats; primarily as available through EumetCast. But in principle a 'reader' can be written for any format; so this should also be possible for self-received polar satellites (eg NOAA19, Metop, Fenyung).

Overlays

Borders, rivers and places can also be easily added. See Fig. 2 as an example; MSG3 RSS. A legend is also included here on the left.



Conclusion

With SatPy you have access to a very flexible and extensive tool for displaying satellite data.

References

[1] http://www.alblas.demon.nl/SatPy
[2] http://www.alblas.demon.nl/wsat/software/satpy_install.html
[3] http://www.alblas.demon.nl/wsat/software/satpy.html

UKW Berichte

Four main articles were published in the last UKW report of last year.

You also have the "Fundstelle Internet" section where interesting websites are discussed. Interesting for us is a website where the phase noise of ADF5355 can be reduced. [1]

You can quickly navigate to it with the QR code. Point the camera of your smartphone at the code and you're on the website where you need to go.

Our association has a subscription to the UKW messages. Please indicate whether you would like this subscription. The latest publications are available for inspection at meetings.

The first article is by Heiko Leutbecher comparing two- stage MMIC amplifiers with a 3-dB bandwidth from 100MHz to over 3.5GHz. He uses experimental prints from Koeditz.org.

He compares the NBB-310, HMC311SC70, SNA-186, SKY65013-70LF, PHA-101+ and PHA-102+, among others.

Up to 3.5GHz, the gain of the NBB-310 and the SNA-186 is even (between 22 and 25dB).

He has also made measurements up to 8.5GHz. The way of powering the MMIC amps matters a lot . The use of parallel resistors and ferrite produced a flatter amplifier pattern and became more broadband.

The second article by Wolfgang Schneider is about a modular transverter concept for the 23/13 cm band. An ADE-5 is used as a mixer. The transverter connects to a 2-meter transceiver. As an oscillator, a Dieter . module is Leupold DF9NP used. By changing a few components, this transverter can be adapted for the 2400 MHz.

Bernd Kaa describes a low-noise preamp from Analog Devices the ADL9005 which runs up to 26.5 GHz. Application is, for example, as a preamplifier in spectrum analyzers . The amplifier has a noise figure of 2.5dB. The inputs are adjusted for 50 Ohms.

As a voltage regulator he uses an ADP7112. What is special about this is that this is a chip with six solder droplets (BGA) on the bottom. This seems to be very easy to solder. With some flux and heating of the circuit board, the chip will center and solder perfectly.

Despite the high frequency, it uses 4-layer FR4 circuit board. The loss is 0.9dB per centimeter at 20 GHz. With this PCB the 50 Ohm lanes are 0.3mm wide and adapt so well to the ADL9005.

Evaluation board of the ADL9005 developed by Analog Devices . Bernd Kaa has designed her own print.

Particular attention to the connection of the SMA connector . Ideally, the side of the PCB should be metallized to connect the ground planes of the top and bottom. He had a through-metallised slot made in the print. He then uses a file to open this slot and thus has a metallized side to which the SMA connector can be soldered.

Before you run to the store, the ADL9005 costs 200 Euro each at Mouser !

The last article is by Jochen jirmann . It is the second part of a low pass filter for the output stage of a transmitter. The filters are in the range of 2 to 30 MHz.

As mentioned: the UKW messages are available for inspection at the meetings.

Left

[1] https://gm8bjf.joomla.com/past-talks/15-reducing-phase-noise-pn-on-chinese-adf5355-boards

Report members meeting January 8, 2022

Rob Alblas

1 Opening.
The chairman asks if there is any objection to him recording the last part of the zoom session. This in connection with taking minutes of the 8 GHz topic that we will discuss later and on which he will write an article. There are no objections.

Insofar as this is still allowed, best wishes for 2022 to all members. Thanks also to the fellow board members for their work.
Not everyone wants to join a zoom session; hopefully we can organize another real meeting in March. Today we might have had a real meeting, but then the Nimeto would have to open especially for us.

Over the past year: in terms of all the activities (such as trade shows) that we were unable to do, that corresponds to what we were unable to do in 2020. Among other things, the visit to Eumetsat was canceled again; the question is whether that will be possible this year.
The renovation of the Nimeto should now be approximately complete. We have been in a classroom during this time, rather than the cafeteria. It would be nice if we could also use this space in the future; we then miss the “outdoor event” (the classroom is on the first floor) and getting a sandwich is a bit further. We try to be allowed to use that space, that is discussed with the concierge. If we foresee an outdoor event, we can still use the canteen, is the idea.

The last Kunstmaan was accomplished with some difficulty due to a number of setbacks. There are also very few people who write articles. If you have something, share it, even if you can't write an article yourself. We can always help to make it a good story.

This year we have a PDF and paper edition of the Kunstmaan for the first time. We also had the idea of making a yearbook especially for those who only get PDF, so you still have all the stories on paper. Because it comes out once a year, that also saves on costs. The question is whether there is any interest in this. According to Harrie, a yearbook will be obsolete when it comes out. Furthermore, the idea is that it eventually disappears in the closet and is no longer looked at. We leave the yearbook for what it is.

No more parts packs have been delivered for the QPSK receiver. Time to get to a new receiver, for the X band.

We try to give a lecture or something similar at every meeting. It is not always easy to find someone for this; suggestions or telling something yourself is encouraged.

Regarding fairs: we expect that Rosmalen (in March) will not take place again; perhaps the DvdRA can continue in November.

About the X-band: as far as we know, only Fred Jansen and Peter Kooistra can receive this in our working group. Harm is working on his “artificial satellite” on 8 GHz.

2 Administrative matters
Paul has retired as a librarian. So we are looking for someone who is willing to do this job. The club of members who run the working group is very small; a new librarian is therefore welcome.

3 Satellite status
See satellite status elsewhere.
Fred Jansen gives an overview of the X-band satellites, this overview can also be found in this Kunstmaan.

Fred Jansen has another suggestion to discontinue the Kunstmaan as a magazine, and to put articles on the website instead. A disadvantage is that there is no longer any pressure to deliver something; activities can then “get off”. Herman Grotenhuis has already seen this happen with magazines.

4 Any other business
Rob Alblas reports that Xtrack can now also control a rotor system via Ethernet. This can also be done via WiFi, so that no extra cables need to be connected to the rotor system. This still needs to be extensively tested; Job is working on that. Furthermore, the GODIL decoder has been expanded with NOAA20 and Aqua.

Harry Arends asks to what extent the 8 GHz project is feasible for people who do not have much vision. That is no different than for the 1700 MHz, only you have to aim the dish much more accurately.
Fred Jansen notes that this is not so simple; aiming by hand seems to be easier.
Harry also asks if there is a roadmap for the 8 GHz project. We'll talk about that soon. The cost aspect also will comes to the fore.

closure.

This is followed by a presentation by Ben with discussions about some parts of the 8 GHz project. See elsewhere in this KM.

Report of the members' meeting March 12, 2022

1 Opening.
We have another 'real' meeting at the Nimeto. There is still construction, but the canteen is open again. There are 10 attendees, who have defied the high fuel prices. Furthermore, there are a number of attendees via Zoom.

2 Adoption of agenda.
No changes.

3 Administrative matters.
Our librarian has resigned. It would be nice if someone would take over this role, who can also manage the website.

4 Satellite status
See elsewhere in this KM.
Fred Jansen gives some extra information about the X-band:

- Aqua and Aura are still active, as does Terra.
- FY3B has stopped (both L band and X band); It is expected that it can be received again in the summer.
- FY3D works, FY3E seems to be still in commissioning mode; it sends out a lot of idle patterns.
- NOAA20 and Suomi work, but are difficult to receive due to variable signal strengths.
- Electro-L2: Works but you need a large dish due to proximity to another satellite.

5 Any other business
Herman Vijlbrief asks how you can aim your dish when your PC is remote. You can do that with VNC, also on your phone; with this you can not only see your screen, but also “operate” your PC remotely.

Peter Smits: He made a roller with which conical parts for X-belt parts (mainly 'feeds') can be made.

Harm de Wit is going to try to get NOAA20 speed through his X-band modulator. He now wants to hit “big nails and big heads”.

Wim Bravenboer shows a circular antenna that he wants to try on the X-band.
He also bought a LiteVNA with a range of 50 kHz to 6.3 GHz from AliExpress for a few tens.

Elmar shows an SDR with a range of 10 kHz to 2 GHz, which can be connected to a PC via USB.
The bandwidth is up to 10 MHz, but your PC has to be fast enough to handle that.
Bought for 45 euros from AliExpress. He uses SDRuno as software.

Hendrik Jalving has been busy with rotors again, demonstrating a new construction.

Job de Haas is working on LNAs for X-band.

Rob Alblas has been busy with Satpy/PyTROLL lately. A story about this can be found in this magazine.

Ben Schellekens uses a processor at 3.3V to control an ADF5355. This is difficult with a 'normal' ATmel because it is based on 5V.

He has also been busy milling housings etc. for X-band parts, such as belt filters.

Arne is trying to adapt existing mixers at 10 GHz so that they work at 8 GHz .

8 Closure

Job gives a short presentation about exposure of dishes, and how to deal with F/D and opening angles. See the website for his presentation. [1]
Arne demonstrates with protractor and fishing line how to check the opening angle of an offset dish.

Afterwards, there is still some time to talk as you can only do with a 'real' meeting. While enjoying drinks and snacks: the postponed New Year's drink.

The next meeting will be held on May 14; that's the GV.

Rob Alblas
secretary AI

[1] Presentation Job.

Financial statement 2021; budget 2022

This is an overview of income/expenses for the 2021 calendar year. The actual income/expenses may have been made (partly) in another year.

The budget for 2022 is also included here. Due to the cancellation of (almost) all meetings and fairs, fewer expenses were incurred, hence a profit. Normally there would have been a loss of approx. 100 euros (cost Nimeto + exchanges approx. 337 euros more).

If there are any questions about this overview, please let me know before the annual meeting (May 2022) so that I can explain things on that day.

Uitgaven	2020	2021	2022		Inkomsten, bezit	2020	2021	2022
	Realisatie	Realisatie	Begroting			Realisatie	Realisatie	Begroting
Drukkosten KM	€ 908,05	€ 600,28	€ 600,00		Contributie	€ 2.615,00	€ 2.050,00	€ 1.952,0
Verzendkosten KM	€ 1.190,52	€ 643,08	€ 700,00		Kon Bieb te weinig betaald		€ -3,00	
Huur Nimeto	€ 138,00	€ 138,00	€ 320,00					
Beurzen inschrijving	€ 0,00	€ 0,00	€ 130,00		Rente Zki spaar	€ 0,00	€ 0,00	€ 0,0
Uitgaven werkprojecten	€ 14,90	€ 4,50	€ 50,00		Verkoop geschonken app.	€ 0,00	€ 0,00	€ 0,0
Abonnementen bibl.	€ 117,80	€ 117,80	€ 120,00		Verkoop KM	€ 9,00	€ 0,00	€ 0,0
Internet abonnement	€ 69,90	€ 79,90	€ 80,00		Verk. onderdelen proj.	€ 14,90	€ 10,00	€ 0,0
Bankkosten	€ 154,63	€ 159,14	€ 170,00		Gift	€ 10,00	€ 0,00	
Paypal kosten contr.	€ 12,59	€ 9,03	€ 10,00					
Kantoorbenodigdheden	€ 66,00	€ 37,95	€ 30,00					
extra verzendkosten		€ 34,73						
					Winst	€ -23,49	€ 232,59	€ -258,0
Resultaat uitgaven	€ 2.672,39	€ 1.824,41	€ 2.210,00		Resultaat ontvangsten	€ 2.672,39	€ 1.824,41	€ 2.210,0

Balance 31-12-2021

Activa	2020	2021		Passiva	2020	2021
ZKI spaarrekening	€ 6.336,54	€ 6.336,54		Eigen vermogen	€ 6.979,14	€ 7.211,73
Bank	€ 691,09	€ 1.315,49		Contributie volgend jaar	€ 608,00	€ 330,00
Postzegels	€ 669,41	€ 31,50		Restitutie contr. (vorig jaar)	€ 40,00	€ 22,00
				postzegels niet verrekend		€ 39,90
				Internet abonnement	€ 69,90	€ 79,90
Totaal	€ 7.697,04	€ 7.683,53		Totaal	€ 7.697,04	€ 7.683,53

Nb Difference in equity 2021 and 2020: 7211.73 – 6979.14 = 232.59

Overview of year-end accounts.

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

	2016	2017	2018	2019	2020	2021
Spaarrekeningen	€ 8.625,60	€ 8.634,22	€ 7.936,54	€ 6.936,54	€ 6.336,54	€ 6.3
Betaalrekeningen	€ 1.045,26	€ 707,38	€ 1.108,67	€ 1.225,26	€ 691,09	€ 1.3
Totaal	€ 9.670,86	€ 9.341,60	€ 9.045,21	€ 8.161,80	€ 7.027,63	€ 7.6

Overview of membership and income.

	Realisatie 2019		Realisatie 2020		Realisatie 2021		Begroting 2022	
	aantal	inkomsten	aantal	inkomsten	aantal	inkomsten	aantal	inkomsten
Nederland	81	€ 2.025,00	81	€ 2.025,00	49	€ 1.372,00	48	€ 1.344,00
Nederland PDF	0		0		33	€ 330,00	27	€ 270,00
Buitenland	17	€ 510,00	17	€ 510,00	6	€ 198,00	6	€ 198,00
Buitenland PDF	9	€ 90,00	8	€ 80,00	15	€ 150,00	14	€ 140,00
Speciale leden	2	€ 0,00	2	€ 0,00	2	€ 0,00	2	€ 0,00
Totaal	109	€ 2.625,00	108	€ 2.615,00	105	€ 2.050,00	97	€ 1.952,00

The table below shows the turnover of members over the past 4 years.

jaar	af	bij (tot nu toe)	aantal leden
2022	-9	1	97
2021	-5	2	105
2020	-5	4	108
2019	-9	4	109
2018	-2	9	114

Rob Alblas

treasurer

satellietstatus

Arne van Belle, per 23 maart 2022

POLAIR	APT (MHz)	HRPT (MHz)	Remark
NOAA 15	137.620	1702.5	Morning/evening, weak/sync problems
NOAA 18	137.9125	1707.0	Early morning/afternoon
NOAA 19	137.100	1698.0	Afternoon/night
FengYun 3A	no	1704.5	AHRPT 2.80 Msym/s
FengYun 3B	no	off	-
FengYun 3C	no	1701.3	AHRPT 2.60 Msym/s
FengYun 3D	no	7820.0 X-band	MPT 30 Msym/s
FengYun 3E	no	7820.0 X-band	MPT 30 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	1697.0 X-band	BPSK 30.72 MS/s, telemetry on 1703 and 7865.0

GEOSTATIONAIR	LRIT/GRB (MHz)	(HRIT/GVAR (MHz)	Orbital position/status
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, standby
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 / EWS-G1	1676 SD	1685,7 GVAR	61.5 degree O, Now Space Force
GOES 15	1691 LRIT	1685,7 GVAR	128 degree W parallel with GOES 17
GOES 18	1686.6 GRB	1694.1 HRIT	89.5 Degree W, drift later to 136.8 W
Elektro-L2	1691 LRIT	1693 HRIT	14.5 Degree W, via Eumetcast
Elektro-L3	LRIT	HRIT	76 Degree O, Operational
MTSAT-1R	1691 LRIT	1687.1 HRIT	140 degree O, Backup voor MTSAT2
MTSAT-2	1691 LRIT	1687.1 HRIT	145 degree O, via Eumetcast
Himawari-8	no LRIT	no HRIT	140.7 degree O, via HimawariCast
Himawari-9	no LRIT	no HRIT	140.7 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

FengYun 3B stopped transmitting on both HRPT and X-band. May be back around summer some say.

GOES-T (GOES 18 after launch) has been launched successful on March 1 2022 to 89.5 West and will drift to 136.8 West around august 2022.

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