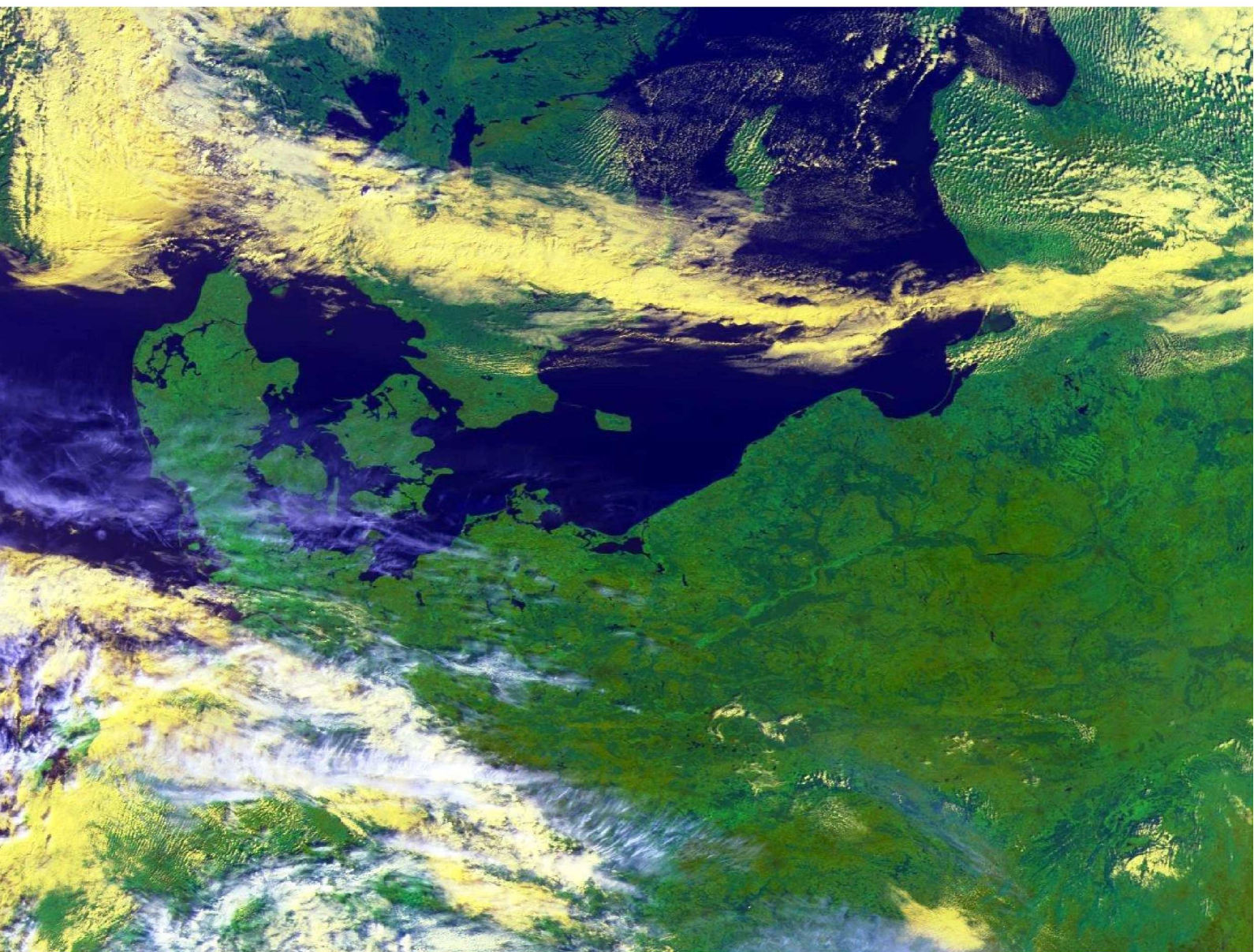


DE KUNSTMAAN

September 2016 - 43^e jaargang nr. 3

Uitgave van de Werkgroep Kunstmanen



In dit nummer o.a.
First Image: MetopB
Interdigital filter voor 1700 MHz
Eumetcast: The Movie
en nog veel meer



Dear member,

This pdf contains some translated articles of our Dutch magazine “De Kunstmaan”.

Google Translate is used; none or very few corrections are done afterwards. Results may be sometimes incorrect or hard to understand, but mostly I think it is usable.

Figures and pictures are partly left out. Please use the “paper” (Dutch) magazine together with these translations.

I hope these translations will help you to understand the Dutch articles.

Please check also our web-site, which has now a translated version:

www.kunstmanen.net

(middle of home page, “English version”).

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Preface

At the very end of last meeting and this Kunstmaan I am very proud that we have received the first MetOp image with the new QPSK demodulator! Harrie managed to come up with a perfect design that represents the future of direct satellite with affordable equipment safely. In this Kunstmaan was a description of how the bumpy road to this recipient.

To see if I can get some more recognition for our working group, I posted a message on Twitter. The working group has for some time a Twitter account, but unfortunately there doesn't happen as much.

A Twitter message is only 140 characters long. The official language is English because we want to reach the whole world.

Figure 1 The issued message on Twitter

The message above, with image, was published and received by 5019 people on their timeline. This means that 5019 people have seen the message. Eleven people found it so interesting that they have forwarded the message. The number of followers of 50 went to 73. 400 people have visited the Workgroup page.

Figure 2 shows the range. 5019 persons have received the message on their timeline

This is a very good result. When you only mention this on your website then you never reach so many people.

Go follow the Working Group on Twitter and send by who knows who we reach the messages.

Antenna rotor

Always a rewarding subject to think about. Similarly, at the meeting where Harrie broke a lance for the Jaeger rotors that are still available in England. After more than 16 years they are still working satisfactorily.

Some of us know the Russian Oleg amateur who has realized several projects for the reception of weather satellites (including receipt of MetOp and Fengyun). Recently he has been working on replacing its DiSeq-XY rotor control for heavier version. Soon there will be more information on his website. I wonder how he has constructed this rotor. It certainly looks well built.

Figure 3 DIY Rotor Oleg. Heavier than his first rotor

Survey

About 20 members completed the survey. Some have given a comprehensive response how things can be better / different. Thank you in advance for this. In the last Kunstmaan of this year we will present the results. About the frequency of meetings: the people that always come don't want a lower frequency. You can see that there is a small group of people who always come, as well last week.

Mr Temme created a small computer from a Raspberry Pi and a portable VGA display that runs on Xtrack. You can hang it on the wall!

Figure 4 Xtrack on the Raspberry Pi

Further in this Kunstmaan lot of articles worth reading. Rob wrote how to make a movie with xrit2pic by pasting pictures in succession. Very special is that satellite images of Japan Himawari the moon is visible. Fred writes has its usual report from Vietnam. Furthermore, from his hand an article on how to create 3D images. The bas-relief program, this very simple. Arne describes how to align a satellite dish for EUMETCast reception. Again, Google has an answer! Hendrik stood hours behind the milling machine to create an interdigital filter, the results are there!

Have fun reading this Kunstmaan and see you at the next meeting on 12 November. Unfortunately, our Harry was not able to compile this Kunstmaan, from this place a thank you to Fred who did this.

PS. We are also on the DIY exhibition Day for the radio amateur on November 5 in Apeldoorn.

Weather Satellites in Vietnam (21) Fred van den Bosch

summary

My experiences with weather satellites, etc. in Vietnam.

general

In mid-July, I had the provisional final check of my eye. The retina is still good. Totally OK it's not: i.p.v. a straight line, I see the occasional wave. The ophthalmologist will provisionally regard. If not worse return for control over 5 months. I also have another left contact lens and that has improved visibility. So I'm careful again with anything and everything started. Of those waves I did not suffer as much. Only if I make a sketch of my new rotor is sometimes annoying.

APT

This station is still automatic, as long as at least the electricity is not interrupted. UPS, where the PC is joined, unfortunately, does not turn on automatically. So if I'm not home can happen, nothing happens. Then it just turned out the job for more than 5 minutes.

Even if there is thunder, I get nothing. The antenna is then very quickly from the receiver: the PADAT is still the highest point on the roof.

HRPT

Rotor

Through Hai, my welder, I've got some pieces of steel for the new rotor. But they turn out to be very heavy. By coincidence Hai recently found out the address of a business in Nha Trang, where they appear to sell aluminum. Minh went searching and found the thing after a lot of questions. This case Another case, which was referred to Minh (and of course family) show or to sell smaller pieces of aluminum and is therefore immediately 2 times more expensive unfortunately only sells plates of 2 x 1 m.. Well, if it works here, it should come from the length or width. According to Minh, they can also convert documents right angles, so I have to look twice myself. I do once I got around the design (and I can persuade Minh to go to interpreters).

I hope I can report the next time some progress and even more preferably a working system. Can the thing finally to the roof and my terrace free.

Again

weather

The storm season is here also erupted again and I can test my new station. You see a series of illuminated cubes how far the storm is gone. It seems to fit pretty nice one comment: (. 0-5 km) I have the upper block never see light. I pass that on to the supplier, but which had no comment about it yet. In itself it is not so bad. If the block of 5 km. lights, I have long been disconnected from all antennas, TV and Internet. Security for all.

Worst storm in 33 years in Hong Kong

"Public life in Hong Kong has partially come to a halt by Typhoon Nida who reached the city Tuesday. The storm, with wind speeds up to 150 kilometers an hour, accompanied by heavy rains. According to authorities, it is the worst storm in 33 years. "

The photo is automatically received APT shot on that Tuesday. I was not at home for a HRPT.

Everything

Beautiful view of the final phase of the LM descent to the lunar surface (Apollo 15) PDI (powered descent initiation) from the camera switches about 11 minutes in. [1]

An overview what all fly to satellites and is available at any time [2]

Tools Site with a wink. [3]

For those who also want a smartwatch, but do not want to spend too much, in [4] reviewing a copy for a tenner.

Ben told in previous issues of the Kunstmaan about his experience with Python. In [5] contains very detailed information on Python for astronomy.

To [6] can watch a time lapse of 10 Meteosat.

References

[1] Apollo 15, see website

[2] Overview of satellites, see website

[3] tools with a wink, see website

[4] SmartWatch for a tenner, see website

[5] Python for astronomy, see website

[6] Timelapse Meteosat 10, see website

EUMETCast: The movie

Rob Alblas

Summary.

A description how to generate and continuously show a movie from EUMETCast data using xrit2pic.

The EUMETCast data provides a wealth of information, not at least the images, which can be manipulated in many ways. Showing pictures etc. manually each day is not very attractive, and it may happen that you miss sometimes unexpected and spectacular weather phenomena.

Our former secretary Hans Scherhorn had some equipment in his living room, showing APT images in an automatic way. It was always running; when you entered the room you actually could not ignore it.

With EUMETCast reception this is easy to do using my programs xrit2pic.

One aspect missing here though, are the movements and formations of clouds. This now gives sometimes spectacular and unexpected results, if played back accelerated.

In the previous KM (June 2016) I did show a sudden very rapid large cloud development, seemingly out of nowhere.

With xrit2pic it was already possible to make movies but that was rather cumbersome, i.e., you have to select the period in which you want to make the movie and then the PC needs to process some time to create the movie. Not very nice to do each day.

Creation of a movie in an automatic way has been long on my wish list but up to now I didn't find the time to add this to my program. This is now finally done, and the results are truly stunning. Especially with the RSS (Rapid Scan service, every five minutes a new image) very nice shock-free movies are created in an automatic way.

This runs now continuously for several months. No attention is needed, but of course now and then you need to have a look to the movie as it develops...

Necessities.

Obviously you need a EUMETCast reception system; several articles have been written about it in the past. Due to the transition to the DVB-S2 system, which requires a different receiver, you may have stopped these activities. This is a good occasion to resume EUMETCast reception again.

What is needed:

- Tellique software
- ECU
- dish / LNB
- receiver, eg. the inexpensive USB receiver that Arne discussed in the June issue of the KM
- PC / laptop (Windows or Linux)

In order to limit the power cost a (not too) old laptop may be very suitable.

Additional software required:

- xrit2pic a recent version (2016.5 or later)
- mplayer: This is a movieplayer which can easily be activated by xrit2pic.

Very broadly, the process is as follows:

- In the "received" folder the data comes in, as usual.
- xrit2pic detects new data, and displays it immediately as an image. (This was already the case.)
- Once all the data has been received for a new piece of film a JPEG image is generated.
- If this is the first time the movie is generated then the JPEG image is converted to movie format (now still "standing": just one image).
- If there is already a movie then the new picture is added to the end of the film.
- It can be set so that the movie will get a certain maximum length, eg. 2 days. If the film becomes larger after the addition of a new frame then an image at the beginning is removed. The film thus grows to the specified maximum length, and then remains at that length, but slides in its entirety as it were, in terms of time.
- The used JPEG image is now removed; it's already in the film.
- Mplayer, continuously showing the movie, stops briefly by xrit2pic and restarts again in order to show the adapted movie.
- Optionally at midnight raw data older than eg. two days, will be removed.

The result is a system where you do not have to worry about anymore. The disc remains clean; old data is removed regularly, and a movie of (eg.) the last two days will be shown continuously.

If at some time you have a nice movie you want to keep, you can simply copy the movie file (.avi). That is much easier than having to regenerate the film.

What the movie has to offer is completely adjustable: a single channel, RGB colour film, zoomed in or not, land contours added or not, it's all possible. Using the visual channels for RGB gives problems at night; I added an extra mapping where at daytime colour is displayed and at night the clouds remain visible by adding an IR channel. The result can be seen in the images range in the June issue (p. 15).

Adjustments xrit2pic

Especially in the 'record' part of xrit2pic much has been changed. A number of settings are now double for Record and 'Main' (manual operation). To save settings separately both tabs have their own 'Save' button.

Just do all settings in eg. the 'record' tab as you want it at start of xrit2pic, click 'Save' and the next time you start xrit2pic all the settings of this tab are restored. This means you can set the whole such that when starting the program, automatically the incoming data is analyzed, a film is generated and also shown, while old data is automatically discarded. If you set Windows / Linux such that xrit2pic starts immediately after 'boot' it is just a matter of: Power on and watch. We can not make it easier...

MSG: What?

At present there are three MSG satellites active:

- MSG1: who will soon move to the Far East (now done)
- MSG2: usually for the RSS service (Rapid Scan, 5 min interval, Europe.)
- MSG3: the 'normal' 15-min. service (Euro-Africa)

MSG4 is in the (vacuum) mothballed and is not yet active.

Sometimes there will be a switch between the MSG's, e.g. MSG2 used for "normal" service instead of MSG3, and until recently MSG1 was then used for RSS. Later, when MSG4 is active, other switches between satellites may occur.

To avoid problems with making movies, I added a choice of the MSG where the exact number is not important:

- MSG?
- MSG? _RSS

By eg. selecting MSG? _RSS it does not matter if the service switches between satellites. If you would select MSG2 for RSS then no pictures/movie extension would be generated if the service switches to another satellite.

Normally you always receive not more than one normal Euro-Africa image and up to 1 RSS Europe picture. I have seen several switches between MSG1-RSS and MSG2-RSS and the making of the movie just goes on. Nice to see that cutting off the northern and southern part is different between MSG1 and MSG2; That is because they are at different locations, and images are corrected in Darmstadt to one position. This is the only thing you can see that the film midway switches to another satellite.

The new xrit2pic tabs

Fig. 1 shows the part where the satellite to display is chosen. At the left you can choose additions like land borders, longitude / latitude lines, marker, cities, time and additional text. Here you can also define if a composite image (RGB), or a single channel has to be used.

Fig. 2, sub-tab 'Generate', shows the settings for what needs to be generated: single files or a movie. You can also choose here if jpeg files, used for the film, must be removed after they have been added to the movie.

Furthermore, here you can set the maximum length, and if the last image should pause for a moment before the film starts over again. This is done by repeating the last image several times.

At the bottom part settings for the movie player can be defined. An external program 'mplayer' is used because it can be easily be controlled using commands. At the end of the movie, it will automatically restart again. That transition is very smoothly, as if the film just continues. The speed can be set; that can be done in time units because xrit2pic "knows" how many images per hour come in. A speed of 5 min / sec means that there is a 5-minute per second 'real time' play back. For RSS (every 5 min. a new image) this results in one frame per second.

In Fig. 3, tab "Aging" you can define to remove old data. That always happens at 0:00 UTC.

The just discussed tabs have a common part at the top: the button to start the process, and also some indicators that show what is set in other sub-tabs. That way you can see at a glance the most important settings without switching between subtabs.

To the far right the 'Save' button is situated, which allows to save the state of all buttons in the 'Record' part.

mplayer

The movie player I use here is perhaps not very well known. The bare mplayer has no "gui"; it is activated via a command and has many options, including speed, full-screen etc. It works also excellent for playing "normal" movies (of course, for that it is written). There are several GUI-peels for mplayer, but these are not needed for this application; xrit2pic takes care of everything.

Honesty compels me to say that for Windows I didn't test the xrit2pic combination with mplayer very extensively. Linux runs flawlessly for months now; under Windows I have tested the main functionality (start / stop mplayer) but I didn't run it in conjunction with reception for days. I must still do it, but if someone faces problems please let me know.

It is possible to use another player. The film is generated in avi format and any reproducer can be used to play. There might be a problem arise after the .avi file is regenerated. Then it depends on the player what's going to happen: the old version of the movie is shown, the player stops with an error message or crashes, or the player automatically shows the new version. The latter would be ideal; mplayer can not and will do strange things when the AVI file is changed. Hence mplayer is stopped after adjusting the AVI file by xrit2pic and then restarted.

mplayer can be downloaded from:

<https://github.com/lordmulder/mplayer-setup-win32/releases/tag/2016-05-04>

Download and install:

MPUI.2016-05-04.exe

The program is normally (but not necessarily) installed at:

C: \ Program Files \ MPlayer for Windows

In order to start the command line version, as done by xrit2pic, a search path must be set to the location of mplayer.exe. This goes as follows:

Under XP:

- right-click on My Computer, select Properties
- Click the Advanced tab.
- Click on "Environment Variables"

At the bottom something like "Systemvariable" should be visible. Somewhere in the list you can find a variable named "Path". Click on the entry and then click Edit.

You will now see a rule value of the variable. This rule contains multiple search paths, separated by ';'.

Now add a new search path. Note: Before you start typing, make sure the cursor is at the

back of the line, and that line is not selected as a whole!

Add: the location of mplayer.exe, e.g.:

C:\Program Files\MPlayer for Windows

then:

OK

Now "OK" away all windows.

To check whether it went well: Open a command shell and type:

mplayer

If it is good a help text showing several options is shown.

If the program is not recognized:

Type:

path

and make sure the added path is right.

You will get a text like this:

```
PATH = C:\Windows\system32;C:\Windows..(etc.);C:\Program Files\  
MPlayer for Windows
```

Windows-7,8,10 goes about the same way, only the actions to get the window may vary slightly. For detailed instructions, see:

<http://www.computerhope.com/issues/ch000549.htm>

See the moon shining

Summary: The moon, seen from Himawari.

Sometimes weather satellites show unexpected images. In my article "EUMETCast, the Movie" I described how you can continuously create and show a film. This works for any geostationary satellite, for example also with the Japanese Himawari. This movies is not as nice as those of MSG because there are only two frames per hour but I wanted that this should work too.

During testing, now and then I have a look at the film as it proceeds. On July 24, I saw a short "flash" on the left, just beyond the Earth. On closer analysis, it turned out to be the moon, which happened to be visible for a single frame. It is then easy to re-generate this frame, zoomed in, resulting in the accompanying figures.

Items beyond Earth are normally filtered away so non-earth item are never seen on weather satellite plates. Apparently this is not done at Himawari.

On July 26 the moon was visible again, now to the right of the earth.

A fun challenge for the mathematicians among us: Work out when the moon should be visible in images of a geostationary satellite.

WXtoImg PRO FREE

Fred van den Bosch

summary

WXtoImg Pro now freeware

It would appear that Craig Anderson stopped servicing WXtoImg, probably the most widely used program for APT. On the website <http://www.wxtoimg.com/> are free upgrade keys for both the Standard and Professional versions. So for those who receive APT and not the Professional version is definitely worth it.

Standard Edition Upgrade Key

Install Help -> Enter Upgrade Key (use upper / lower case exactly as below):

Full Name: WXtoImg Standard

Email Address: your email address

Upgrade Key: EDG9-T4PH-QFPT-G86U-FB2X

Professional Edition Upgrade Key

Full Name: Professional WXtoImg

Email Address: your email address

Upgrade Key: ZC7W-KRKY-QLWT-4ZCT-AEB2

The Handbook is a comprehensive section on WXtoImg.

Below, the result of one of the very many options of WXtoImg: a composite shot. This is made by a large number of days to overlay the captured images on each other. This is set once after the borders have fully automatically controlled by the program.

basrelief

Introduction

The atmosphere is colder with increasing altitude. This is particularly seen in the IR recordings: the brighter the image, the colder and therefore higher. these temperature Fig. 1

information can be used to create 3D images. The temperature is then used to determine the altitude of the clouds.

WXtolmg, the program I use for APT images, knows in the registered version the ability to create 3D images (Anaglyphs). These are viewed through glasses with one red glass left and right green / blue glass. Because both the APT as MSG images "flat" images are the MFI should be possible to also make a MSG recording an anaglyph. This proved to be a disappointment. Internet search yielded a large quantity of procedures for photo programs like Photoshop and Paint Shop Pro, but performing these procedures was mostly extremely difficult and the results did not. For those who want to know more, I have the forum SatSignal these experiences summarized in "How to make Anaglyphs". After this depressing experiences I started looking for programs that make it possible to make an anaglyph directly from a recording.

Theory

First, a very small piece of theory. A classic way to present two different stereo recordings of an object is to convert it to a (color) anaglyph. An anaglyph, the information of the left image in the red channel and that of the right image in the green and blue channels of the color image. See Fig. 1. The image is viewed through glasses with colored lenses. The red filter for the left eye only gives the information of the left image and the green or red filter for the right eye displays the information of the right image. By now see one image with depth.

Bas Relief

Bas Relief is a very comprehensive program to create all kinds of 3D pictures. There is a demo version available with a fully functional feature: Anaglyphs!

This can be downloaded from

<http://www.3dphotopro.com/software.html>.

Operation.

The operation is as follows. The program assumes that all light-colored parts of the picture are close and all dark areas far away. This information is used to make a so-called.

Depthmap (depth map). Using the original recording + the depthmap then creates the anaglyph.

Fig. 2

Procedure.

Creating a 3D image is actually very simple. Start the program. You will see a screen like Fig. 2. Open both image and at the same depthmap MSG intake. Now click <Smooth>. This will open a popup window (see Fig. 3). First, click on <Create outline image>. Once this has appeared click <Close>. Then we choose <Smooth depth map>. This option ensures that everything is "blurred". If the folder was created, we again click <Close>. Finally, we open the created folder with depth <Open depth map> and closed with <Close> screen of Fig. 3 off. On the main screen (Fig. 2), we test at <Parallax between views> 20, select <Color Red-Cyan> and click on <Anaglyph image> is the 3D image generated (see Fig. 4).

Fig. 3

By chance I found out later that this is even faster. The step "smooth" can be beaten. After opening MSG recordings of image and depth map can be prosecuted immediately generate

a 3D image by clicking <Anaglyph image>. There appear to be no (visible) differences between recordings with and without generated depth map. It seems indeed that smoothing automatically occurs during the generation of the recording, such as to see "progress". Further, there can still be experimented with the use of IR images in the depth map. Indeed, the lighter the cloud, the higher it is. Information teaches at KNMI, the channels 9 (10.8), and 10 (12.0) above are most suitable because its brightness (= height) of the clouds is best reflected. Thus, combinations of channel 1 with channel 9 or 10 for depth map indicate the most faithful reproduction.

disadvantages

Although a very simple procedure is free of the still relatively a lot of work to create 3D images with this program. Who looks capabilities to automate this process?

A second drawback is related to the principle: the light areas come to the fore. A lighter in color as part eg. The Sahara will also come forward. But as long as Europe is chosen as the area is not so bad this disadvantage.

alternatives

These are actually not found. All other processes give much more work than Basrelief. It would be best if there is a separate program, a simple combination of a visual and an IR channel reads and mandate makes an anaglyph automatic. Xrit2pic about gens also offers the possibility of making Anaglyphs.

EUMETCast dish alignment using a compass

The EUMETCast service has now moved several times to another satellite and more recently changes of modulation.

Unfortunately, this also means that it is "finding" the correct transponder, read the alignment of the satellite dish, a piece has become more difficult.

Because EUMETCast is now on a less used satellite at 10 degrees and is surrounded by more powerful satellites on 9 and 13 degrees.

The alignment with the aid of a satfinder (a device that the sum of all the transponders display on a satellite) which have made it virtually impossible at 10 degrees East.

In addition, using EUMETCast now DVBS2 with VCM, there is alternated between Basic service and High Volume service the bandwidth becomes greater but the signal bearing will show you.

However, from testing it has been found in practice, with different dishes at several locations that it is possible to use a compass to accurately set the dish in advance in the proper direction so that there will be directly received the correct signal. Once you are "locked" on the right transponder than is necessary only a fine adjustment for maximum signal / noise ratio.

In preparation you should first go <http://www.dishpointer.com/> enter and the destination. Here you can "street name, city, country" or enter zip code or latitude and longitude from a GPS or enter a card.

Remember to select the right satellite: EUTELSAT 10A to 10E EUMETCast.

Now you see an aerial view of Google EARTH your location with the line of sight to the satellite. Please any further and drag the green pointer to the location where the dish is prepared. DishPointer now calculated as follows:

Dish Setup Data

Elevation: 30.5 °

Azimuth (true): 173.1 °

Azimuth (magn.): 172.4 °

LNB Skew: -4.2 ° (Turn counter-clockwise standing behind the dish)

Using the "show obstacle" (line of sight checker) you can even determine if the line of sight is clear of trees or neighboring buildings. Keep in mind that Google EARTH sometimes used aerial photos from years ago, trees can now be a lot bigger!

Because we use a magnetic compass, we should "Azimuth (magn.)" Value record and not the "true" value. See https://en.wikipedia.org/wiki/Magnetic_declination for further explanation. Also note the "Elevation" and "LNB Skew" values.

At the frequencies (11-12 GHz) and disk diameter (less than 2 meters), we need to align the plate with an accuracy of about 2 degrees. So you need a compass whose scale rises by 2 degrees or less line.

I have been using for years a Recta DS40 map compass (made in Switzerland) but also other card compasses brands like Suunto or Silva are useful and available for 30 to 50 euros.

Map compass, you can rotate the bottom plate with a ring to the desired position (put the reading at 172.4 °, which is about 1 bar over 170 ° or four dashes to 180 °).

Then you turn the compass so that the compass needle exactly parallel to the North-South lines on the bottom plate.

For non-adjustable compass takes the 360 degree scale along with the compass needle. Here you must continue the 172-degree position on the rotating scale search and align with the center line. This is a lot harder!

Magnetic metals, magnets and electrical devices can affect a compass!

For precise alignment, the compass must remove at least 30cm remain magnetic metals such as the dish, your watch, cell phone or belt clip!

Hold the compass card remains horizontal and the needle parallel to the North-South lines on the bottom plate while the compass right positions over the LNB arm.

We assume that the LNB arm is mounted exactly perpendicular to the platter and thus points in the direction of the satellite. If you have a tapering arm then you should put a center line on it with marker.

Rotate the dish now over so that the LNB arm is parallel to the azimuth axis (vertical axis) along the long edge of the compass card.

Check here regularly for the compass needle still runs parallel to the North-South lines on the bottom plate.

With some patience and multiple control steps so you can put the dish in the right direction.

Next step is to set the proper elevation. We usually use an Offset dish, most dishes have an offset angle of 26 degrees.

Thus, for an elevation 30.5 of the front side of the dish should $30.5 - 26 = 4.5$ degrees inclined backwards (relative to the vertical axis).

Using a spirit level corner you can see the inclination of reading. When dishes with flat front you can measure the best angle at mid-height on the outer edge.

If you have an Android smartphone, you can make good use of the small program "inclinometer"!

Please note that the smartphone is near the edge of the dish because in some smartphones, the buttons may prevent this.

Triax sits at an elevation scale on the mast mounting, it is also useful if the pole exactly vertical.

As a final step you need to properly set the rotation of the LNB (LNB skew) DishPointer indicates that the LNB 4.2 degrees counterclockwise to be twisted (seen from behind the dish). This is also to do with a level angle or the "inclinometer" program.

Now azimuth and elevation and LNB skew well put must enter signal from Eutelsat 10A.

The receiver must lock onto the correct frequency and Tellicast would already be working (Pink T).

If this is not the case then a small azimuth correction should be sufficient. With small correction, I mean the edge of the dish only 1 cm forward or turning back.

If the recipient lockt and Tellicast work then you need to fine tune the azimuth and elevation, using only refer to the "Signal Quality" or SNR indication of the recipient.

You can also try to improve the LNB skew but in general you will see no improvement here and you better keep setting DishPointer (4.2 degrees counterclockwise seen from behind the dish).

You can use the compass in your smartphone?

There are several apps for the smartphone to align your dish.

Often these are not free and unfortunately showed that the electronic compass deviates too much. Each electronic compass must be calibrated, usually even each time after Booting from the program because calibration is not saved!

See <https://www.youtube.com/watch?v=k1EPbAapael> for the appropriate method.

After testing, I found three useful apps for Android

Satellite Director (Android freeware) of www.zekitez.com

Program uses GPS, camera, compass and inclination meters! Unfortunately I got after alignment allows no reception. It turned out that my electronic compass despite many calibrate it 7.9 degrees off target! Also on another android smartphone week too heavily on the compass.

Only after checking with compass and entering a compass offset of 7.9 degrees this app now an excellent replacement of the compass. Click "Settings" when you're in the 3rd screen for inputting an offset.

But the option to set the correct angle has not much use for it sits on your platter nothing that is on 30.5 degrees elevation.

How do you decide on the location of the signal just passes by trees or other obstacles:

To find a free line of sight is the Android app **EutelsatFinder** recommended. You are set with the LNB skew. You can however not enter compass offset and me is unclear whether the app keep account of the difference between magnetic and true azimuth.

Want more free sightlines determine it is advisable paid (\$ 20) DishPointer app. Here you to deviate significantly off the compass and use a different visual point as a reference.

Interdigital Filter 1700 MHz

Summary

This article describes an interdigital filter for the 1700 MHz. It's a three pole filter, saving weight and small size.

Introduction

Interference to reception only seems to be increasing. Filtering the signal is therefore inevitable. In some cases it is sufficient to take a filter after the pre-amplifier (Low Noise Amplifier, LNA). But sometimes, as in my case, the filter should be before the LNA.

Interdigital Filter

Arne wrote already about how such a filter in the Feb. Kunstmaan 2002. He described a filter with five rods. Each rod has a resonant circuit that is put with a set screw on the right frequency. The filter design is symmetrical: it does not matter which port you choose as input or output.

It is not necessary to equip the filter with five rods. It may also be less, than the filter is smaller and making adjustments is easier.

Especially when the filter needs at the top of the dish, you want to be as light as possible. So I got the idea to see what would filter with three posts. Because I lack the experience of working with a milling mass, I asked Hendrik to make this filter.

Figure 1 The interdigital filter machined from a single piece of aluminum

Calculations

Refers to a GWBASIC program in the article by Arne. Nowadays, you can make the math easy on the Internet. As a starting point I took over Arne values for three posts.

As an example of how the filter may be constructed of the filter I had the filter from Rob Hollander.

Figure 2 The values such as these should be implemented on the site of Ajarn Changpuak

Figure 3 shows the dimensions calculated

On the website I used to see what the differences are in different numbers of bars. The starting point is a desired bandwidth, in our case is 30 MHz. It appears that more rods the curve steepens. Outside

the band is more damping at 1750 MHz: 3 sticks 32dB, 47dB 5 bars and 7 bars 75dB attenuation. This is at the expense of attenuation at the band, this is by 0.73dB, 1.18dB 1.6dB.

Result

Past week Hendrik was busy machining and the results are impressive. At the last meeting the filter with the band converter was measured by Harrie with the spectrum analyzer.

After tuning the loss is 0.2dB. The modified filter to 1700 MHz from Dolf (Dolf van Delft sells bandpass filters for e.g. 23 cm, on www.tweedehands.nl) has a loss of 0.5dB. To measure the total loss real good you should use the MSG LRIT signal.

What we have not yet been measured in the impedance, it should be 50 ohms.

Figure 4 A damping by 0.17 dB, a very good result.

Fig 5 The passage curve. At 1800 MHz, an attenuation of more than 33 dB.

Future

Hendrik is enthusiastic about the results and he will make a new filter. Now, however, with a male N connector so it can be mounted directly on the N connector of the helical.

References

(1) Interdigital filter for the 1700 MHz band WXSAT

The Kunstmaan February 2002

(2) Interdigital Bandpass Filter Designer

http://www.changpuak.ch/electronics/interdigital_bandpass_filter_designer.php

First Image: MetOp with the new QPSK receiver

Figure 1 First Image of the MetOp who came on September 10

Summary

This article describes the issues we had to solve while getting to the first image with the new QPSK demodulator developed by Harrie. The FPGA in the HRPT decoder is used to capture the binary stream and store this on the PC. The data is processed in further GNU Radio software from Oleg and David Taylor.

Introduction

At last the time has come that we can receive the MetOp satellites with a receiver designed by ourselves. Harrie has spent the last few years a lot of time in perfecting a QPSK receiver. By law, we can speak of a very big step in the developments that the Working Group has made in recent decades. In this article I reflect on where we are now and where we hope to go.

Existing solutions

Without trying to be exhaustive, the following host systems MetOp (some) radio amateurs worldwide:

gnuradio

In June 2015 I wrote Kunstmaan about my experiments with the receipt of MetOp using Ettus B200 receiver. The receiver is expensive and you need a heavy PC to handle the flow of data. The design of the receiver gnuradio is the work of Martin Blaho.

SLM-7650

This is a professional satellite modem of the manufacturer Comtech. These modems you do not come much against the second hand market. Do not be shocked by the prices you have to pay, it can quickly run into thousands of euros. You should also be able to serve such a modem. Want to try your luck? Look for a modem which complies with "MIL-STD-188-165." A Russian amateur Oleg thus receives the MetOp.

IQ receiver AOR

An American radio amateur has to receive the MetOp with this receiver and self-written software. The receiver costs more than 3000 dollars.

Probably there are more recipients but are not known to me.

Above receivers have a number of disadvantages:

- The price
- Not real-time display of the image. The processing of the data stream in software simply takes a lot of time.

WRX-QPSK receiver

Where the new receiver consist of? As a starting point we took the WRX1700. In particular, the UV916 receiver, SAW filter and power were handy. But, everything behind the SAW filter is different.

In order to be more flexible in the development of the receiver and to reduce the cost, we decided to carry out the receiver on two pcb's. One pcb houses the UV916 and power supply, other pcb demodulator. Strangely enough, the making of two printing 10 x 10 cm much cheaper than a Eurocard 16 x 10 cm.

Because there are not many etching their own PCB's and metallization is not possible we decided to carry out the print double-sided. Use is made of both "through hole" - as well as SMD components. The latter is unfortunately inevitable. Many parts are only available only as SMD.

Figure 2 Left the UV916 receiver pcb, in addition to the demodulator. One ribbon cable connects the whole of the display board (with LCD display)

History

On the front page of the September 2013 Kunstmaan a prototype receiver was shown. Viterbi decoding must take place in the FPGA in real time so as to write an image. Furthermore, elected to first deal with the Fengyun started because the signal is stronger and there are more satellites.

Realizing the Viterbi decoder with depuncturing did not go smoothly. The license of Xilinx did not get to work. At that time (summer 2014) we met with Martin Blaho contact which MetOp-receipt had been working in gnuradio and the idea arose to create a datadumper with the FPGA.

Datadumper

The datadumper, designed by Rob proved to be a golden opportunity. The datadumper bits can be captured from the WRX-QPSK receiver and stored on the PC in a file. You can then analyze the data using software and see how it should be decoded. With software you can figure things much easier than in hardware (FPGA).

The beauty of the datadumper is that it is configurable in terms of frequency: suitable for LRPT (Meteor) and MetOp and Fengyun.

In May 2015 the first tests were done with the datadumper. Initially this was done with my t installation ontvangs because I have a dish of 130 cm. It turned out to perform this worse than a 80 cm dish. The data dump files, then so also came close.

Low noise in the receiving system was found to be crucial. Harrie has also started working at this time to further optimize the helical, see the article in the December 2015 Kunstmaan.

This spring I called Harrie and indicated that we cannot continue with the WRX1700. The prototype was the UV916 of the WRX1700 used to feed the IQ-demodulator. My proposal was to create a separate PCB for the UV916 and thus continue. A month later we had finished the prototype and found that the demodulator did much better because there was more signal. The signal from the first prototype from the UV916 was in fact also divided between the APT and HRPT decoder.

The receiving system was much improved and it was time to get started with the datadumper. To test whether this work we received a NOAA19 and analyzed the data, it looked good. MetOp data unfortunately yielded very little.

In the past I wrote a Python script (is sometimes an article about) to visualize data. This script I used to see the files of the datadumper.

Figure 3 Very vaguely see you in the middle that "something is." This should be the synchronization pulses. Far too poor to decode.

Figure 4 shows synchronization pulses of the NOAA19. There's supposed to look like. Still a long way to go.

In the meantime, Rob was busy with its own software Viterbi decoder (which the HW decoder is derived) and get working out GnuRadio. MetOp data from gnuradio now doing well by both Viterbi decoders.

In late August, we completed a prototype of the QPSK demodulator and this seems to work well. Test files from gnuradio do not go well but the datadumper. We doubt if there is a lock problem of the VCO. There still seem to many zeros and e s to be transmitted sequentially. Crosstalk between I and Q, back to the drawing board? The despair: what is wrong and how to fix.

Better news

It was time for better news. In the examination of differences between the I and Q channels, it was found that a buffer amplifier above the 1 MHz is clipping. It also showed that the datadumper VCO was set to double frequency. Fortunately, there appeared to be an improvement, but still not enough to extract an image. There still seems to be a big problem in the lock of the datadumper. Visualization after the Viterbi decoding shows that damn stairs.

Figure 5 The damn stairs. What we try, we continue to see this stairs after the Viterbi decoding. It must be massive columns straight!

Harrie adjusted the VCO during the datadumper with a larger capacitor to make it so slowly. We hoped that the locking'd better go because the VCO loop responds more slowly to the many zeros or e s succession. The scope is the result well, the Viterbi-decoder decoder does not get better.

Figure 6 Despite the randomization of the data you see a lot of zeros and ones in succession. Does this lockingsproblemen?

Meanwhile, Rob was busy building a MetOp-generator and get the decoding problem clearly.

There turned out to be a problem: in the data turns out to be the value 0x00 is written after every 1024 bytes. In the visualization manifests this as a black bar. Could this be a problem? Because these beams far out of sync joists was expected that would not disturb this. The whole story is wall and stuck.

Where we are: visualization shows that there is no locking problem. Synchronization beam look out clean. The eye pattern is quite good. On the receiver side is not improving much more.

Figure 7 is better than this you cannot get it. On the right-hand side, the synchronization pulses. Left a problem related to every 1024th byte, probably Windows / driver.

Then looked at how the bits are offered. In the very sparse information they have about the gray-encoding. How this should be practiced translation d is completely unclear. We must seek it in this corner.

In a QPSK receiver is always phase uncertainty, this translates itself change in I and Q and Q invert, this must be dissolved in the decoder. Does phase uncertainty that too can be changed only I and Q? This does not happen spontaneously, it is fixed and can therefore adopt "wired" to be. Should you do it right, of course! After replacing the I and Q Rob reports that the files from the datadumper are perfect!

Time to also change the I and Q lines in GnuRadio. The Viterbi decoder jumps right in sync. Furthermore, I'm creating a file with CADU frames of up to 7 MB! At first these were always zero bytes. Could it work? Oleg software finds lines. Now HRPTReader yet. Upon opening, I see a black screen until I click on the RGB tab to and I see the picture above, the introduction to this article get. A First Image from the new WRX-QPSK receiver with datadumper, we made history!

Getting to a **picture**

After this long search, we have good datadumper files that we know how they have to process. What steps we go through to arrive at a picture:

- WRX-QPSK1700 and datadumper
- V iterbi decoder from GnuRadio
- Oleg software derandomization and Reed Solomon
- HRPTReader David Taylor to make a picture

Figure 8 A longer shot of MetopB. The quality is fantastic.

Future

The two prints are not finished yet. There are still a few minor modifications but will change nothing essential. Hopefully in the next Kunstmaan a construction description!

Furthermore, I'm thinking to adjust the display print something. The current print is suitable to mount a 2 x 16 LCD display directly on the PCB. Nowadays, you can buy very cheap I2C LCD displays. This makes the structure of the receiver more flexible.

The idea is to do these things in the FPGA:

- Viterbi-decoding
- Derandomization
- Recognition of the sync words

In software WSAT then comes the making of a picture, possibly with the Reed Solomon decoding.

Conclusion

This article hopefully indicates that developing something new has many setbacks. We have sleepless nights had. Sometimes you have to let it lie down in order to gain new insights. Furthermore, we have a working group: in your own it is impossible to realize such a project So come to the meetings, tell what you're doing.. Others may sometimes give a possible solution where you came yourself not up yet.

Report meeting September 24, 2016.

Opening by the Chairman.

Ben has reported on Twitter that we received METOP realized with hardware made by the Working Group. This message is delivered to approximately 4,600 people, and actually read by 400. There have also been a number of positive responses.

Ben shows some images that we received with the receiver and demodulator designed by Harrie van Deursen.

When planning the meetings, we try to take into account other events. Today, there appears to be a radio market "De Lichtmis" in Meppel.

On October 2 is open day at ESTEC.

In Utrecht from October 4 to October 7 there is an exhibition, "World of Technology". If you indicate that you are a member of our group (and thus indicates that you have genuine interest in technology) you will be allowed to enter the exhibition (no fee).

(NB If you are reading this then the above events will have been. Maybe something to put in your diary for next year?)

The next meeting is on 12 November.

Financials 2016: financial control committee

We hope for a notification of someone to repay Herman Grotenhuis as a member of the financial control committee. Otherwise, we will appoint a volunteer on November 12 ...

administration

No changes.

satellite Status

Harry v Deursen reflects the current situation: NOAA18 and 19 are good, Meteor N2 is good but weak, Meteor N1 doesn't show a picture.

Furthermore, there are Fenyung 3a / b / c and METOPa / b, which are transmitting QPSK. Further information can be found elsewhere in this Kunstmaan.

Any other business

Harrie:

The METOP images shown by Ben are received using a 90cm offset dish, down-converter to 137 MHz, a UV916 converter and the newly developed QPSK demodulator, which now has a PCB. The rest is still done with software, Rob is working on this to add more into hardware. Affordable ready-made systems are actually not, but there are options with Software Defined Radio. However, no "live" images are possible because the received data first needs to be processed by a computer. We strive for 'Live' images by realizing a part of the data processing in hardware.

The new demodulator can be used for both BPSK (HRPT) and QPSK. As mentioned, there is already a (pilot) made PCB, a new version is under development.

Hendrik Jalving made a 1700MHz band-pass filter; Harrie shows a measuring arrangement displaying the band curve. The filter works very well.

Elmar: shows a micro Arduino, and some more (very) small stuff.

Ben: shows a type of glasses which you can put your iPhone. Stars will then be projected into your field of vision.

Closure

Hereafter Rob gives a lecture on the techniques used to transmit digital signals. In particular receiving METOP we are faced with a number of new techniques.

There will be an article In the December Kunstmaan about this topic.

Rob Alblas
(Secretary AI)

POLAIR	APT (MHz)	HRPT (MHz)	Track
NOAA 15	137.620	1702.5	morning/evening, on HRPT weak
NOAA 18	137.9125	1707.0	early morning/evening
NOAA 19	137.100	1698.0	afternoon/night
FengYun 3A	none	1704.5	AHRPT new high speed format
FengYun 3B	none	1704.5	AHRPT new high speed format
FengYun 3C	none	1701.3	AHRPT new high speed format
Metop-A	off(137.100)	1701.3	LRPT/AHRPT
Metop-B	none	1701.3	Only AHRPT
METEOR M N1	off(137.100 LRPT)	1700.0	Black image
METEOR M N2	137.100 LRPT	1700.0	LRPT on/MHRPT on
NPP	none	7.75-7.85 GHz X-band with 15Mbits/s	

Fengyun 3A, 3B and 3C transmit only AHRPT out, this is not to receive a standard HRPT receiver and decoder. Unfortunately, this is not entirely AHRPT according to the standard so that even a Metop AHRPT receiver is not suitable for the FY-3 series!

Fengyun 3C has different data rate than 3A and 3B (3.9 Mbps). Harrie van Deursen is receiving and demodulating these satellites.

Unexpected Meteor M N1 was active again after it suddenly failed in September 2014. Unfortunately, there are problems with the stabilization which the images were often unusable and probably is the satellite therefore expelled since March 21.

NPP (NPOESS Preparatory Project) only transmits the X-band with 15 Mbit / s. It is recommended a tracking dish with a diameter of 2.4 meters! The successor JPSS-1 will transmit only on the X-band.

<http://npp.gsfc.nasa.gov/sciencedocs/2015-06/JPSS-1SpacecraftHRDtoDBSRFICDRev-May302012-470-REF-00184.pdf>

Sentinel-3A is successfully launched, this long-awaited successor Envisat will not receive directly but via EUMETCast.

http://www.esa.int/dut/ESA_in_your_country/The_Netherlands/Sentinel-3A_met_succes_gelanceerd

GEOSTATIONAIR	APT (MHz)	(SDUS)/PDUS (MHz)	Track position
MSG-4 (MET-11)	1691 LRIT	1695.15 HRIT	3.4 degrees W, in test phase
MET-10	1691 LRIT	1695.15 HRIT	0 degrees W, operational
MET-9	1691 LRIT	1695.15 HRIT	9.5 degrees O, RSS
MET-8	none LRIT	-	3.5 degrees O, Back-up
MET-7	1691	1691	57.5 degrees O, Wefax only test
GOES-E (no. 13)	1691 LRIT	1685,7 GVAR	75.0 degrees W via Eumetcast
GOES-W (no. 15)	1691 LRIT	1685,7 GVAR	135 degrees W via Eumetcast
GOES 14	1691 LRIT	1685,7 GVAR	105 degrees W, Backup
Elektro-L1	1691 LRIT	1693 HRIT	76 Degrees Oost, via Eumetcast
MTSAT-1R	1691 LRIT	1691 HRIT	140 degrees O, Backup for MTSAT2
MTSAT-2	1691 LRIT	1687.1 HRIT	145 degrees O, via Eumetcast
Himawari-8	none LRIT	none HRIT	Operational, only via HimawariCast
FengYun 2D	-	-	86.5 degrees O
FengYun 2E	-	-	104 degrees O, now via Eumetcast
FengYun 2F	-	-	112.5 degrees O, Backup

MET-10 is now receiving operational satellite and EUMETSAT.

Launching

Himawari-9	november 2016
GOES-R	delayed till November 2016

EUMETCast since Dec 31, 2014 receive only DVB-S2 VCM Eutelsat 10A at 10 degrees East!

To further increase the amount of data sent over EUMETCast in the future to allow for EUMETSAT is transferred in August 2014 from DVB-S to DVB-S2 VCM mode.

The new transponder is on Eutelsat 10A, 11263 MHz H, which stands at 10 degrees East.

The broadcasting standard DVB-S2 8PSK 3/5 VCM (Basic Service) or 16APSK 2/3 (High Volume Service) with a symbol rate of 33 Msps. Unfortunately, DVB-S and the most "DVB-S2 without VCM" recipients no longer usable. With a special driver, some recent DVB-S2 receivers to make more suitable for Basic Service Only. (Only 5980 and TBS Skystar 2 eXpress HD, unfortunately this is not true for the Skystar HD USB box)

The signal at 10 degrees East has a greater bandwidth and is therefore weaker than before.

Recommended dish diameter of 80-90 cm for basic service and at least 120 cm for High Volume Service.

During heavy rains, the signal will disappear sooner and longer.

The reception of EUMETCast data for amateurs free of annual fee, you must, however, register at EUMETSAT. Once you have software (60 Euro) and purchase key (40 Euros).

The EO Portal can EUMETCast users log on and view their personal data and settings and adjust if necessary. Also registering as a new user and extending the license is possible here. You can indicate on-line which products you want to receive your ECU.

We are still working on the new improved Tellicast Client, a trial is over "Info-Channel 1" to receive (version 2.12.1). However, there is no installation version, you have yourself put the files in the appropriate folder. This new client is only required if you wish to receive HVS data.

Thanks to David Taylor and Douglas Deans for the info.