Hello YouTubers, here is the guy with the Swiss accent. LoRa is the abbreviation for “Long Range”. Today, I want to see if this is an earned name. I will attempt to break at least two world records:

1. Longest connection to a TTN gateway.
2. Longest LPWAN ground to ground connection with LoRa on 868 MHz

Maybe you want to accompany me in this attempt.

As in every sport, I have to do some training. For example, find the right antenna and extend my knowledge about propagation of these LoRa waves in air.

In video #118 I already started with the training and the understanding of propagation. In addition, I had to set some goals for the attempt. As far as I know, the longest distances measured with LoRa gateways in Switzerland is 62 km. And some crazy technicians from TI were able to get 100 km in South Africa, but with a slightly different technology. So, the goal is for sure more than 100km. But, as you know, we Swiss are ambitious…

This project became possible when I discovered in my last video about Lora, that there is a new Gateway on a hill in the middle of Switzerland, called “Weissenstein”.

But let’s start with the training first: Last Saturday I drove around 300 km with my car, and my LoRa node. The initial plan was, to go to the highest hill in our area, the “Grand Ballon” in France. There are websites available to map the profile between two points on the map. And here, you see, that I should have a line of sight. And that the distance is about 80 km. Which would be already goal one achieved. But unfortunately, it is still winter here and the road to the Grand Ballon is still closed. So, I had to change my plan and I just searched hills in the surrounding to get a connection. Without big success. The first connection I got was only about 25 km, which definitively was disappointing. Here, you see, that I had a line of sight from this place to the gateway.

But I was able to do some training. The first new thing was, that I discovered a very promising project: The TTNmapper. This is a webpage and an app for IOS and Android. And they work together in a very innovative way.

You have to have your smartphone and your Lora node with you. Then, the app on your smartphone connects to the MQTT server on the things network. As soon as your Node sends a message and it it arrives at one or more gateways, the TTN network sends a MQTT message to your smartphone. Because it knows the exact place of your node, it sends this position information, together with the information about the connection, the webpage and there, the connection is mapped. Very cool. And extremely simple. You just have to keep this app running during your tests. And your smartphone needs to have an internet connection, which is not always easy, as we will see later.

The other thing is, that I was able to test the different antennas.

now we are here at a

nice place at the border between

Switzerland and Germany and France and

in this direction is the Bison Stein

LoRa gateway I try now with my biggest

antenna whether I can reach it on SF12

and this is my biggest antenna here

12 meter long and I try now to reach

the Gateway and here we see one minute

ago I reach the Gateway one on SF 12 now

I try with a smaller antenna now this is

the smallest antenna here a very very

short antenna but it's also for 868 it

is optimal for a small sensor node you

can hide it it ideally but now I check

if I get also to the Gateway and I did

not get to the Gateway you see four

minutes ago this was my last try with the

big antenna and now I try with the

normal antenna I used also in my former

test

and with this antenna I got it so it's a

big difference between the smaller one

and the big one so this antenna is

already okay and the big one is also ok

but of course I have more antennas this

is one which can be sticked to a surface

somewhere and it seems to be a dipole

and it's called super antenna Niles

let's check one disadvantage is it 33

meters of very thin God wire which takes

already a lot of energy away but i'll

try this also didn't make it so also

this small antenna did not make it but I

have more antennas here is the next one

also a dipole it's called a horn antenna

let's check this one this one also is ok

this is anyway one of the better

antennas I had also good results in

other situation with this antenna but I

still have one more this is an

interesting antenna it's completely

around and can be mounted somewhere on

on top of a roof or something it's quite

small so let's try and this also came

through so also this small antenna here

was also capable and now the last one

which is longer than the average one I

used for all the other tests this is

about 30 centimeters long and also this

one made it now I try this one again but

without the violent coax cable now I

have it free hanging and it worked also

so also this super antenna works not

just the smallest one did not work and I

check it again just to make sure

and when I placed it on my roof of the

car then it came through so with the

grand clean this helps a lot so now all

antennas came through also a year we see

1544 and 43 this was the smallest one

quite interesting

Summarized, the antenna is less important than many people might think. The reason for that fact is, that LoRa has a very high link budget, as showed in video #112. And an antenna, even if it has a lot of gain, adds only 6 to maximum 10 db to this budget. This is, why I was able to connect also with the smallest antenna to the gateway without problems. But only, with line of sight. And without line of sight, there was no connection, also very close to a gateway.

So, I had to plan a new drive. The plan was to try the first connection at 50 km. So, the first stop was at Habsheim.

Here you see

that I have a line of sight this morning

it's about fifty seven kilometers from

the Gateway in Switzerland

and here i have my device with the

antenna and i just logged

the first hit 57 kilometers to the

Weissenstein on SF12 I will check if it

works also an SF7 and it works also on

SF7 so nearly 60 kilometers on SF7

and it works also with this smaller antenna

now let's check the RSSI with a big

antenna it's minus 118 and with small

it's 117 the snr is slightly different

so it's not a big difference and it's

SF7 now we continue this is the

direction of the Gateway and I will now

continue to the north to 100 kilometers

so the next position is close to Celeste

at its 110 kilometers and also here we

have a connection 111 kilometers and by

the way it's with a small antenna here

Now here in Schnersheim this is just

about two kilometers away from the place

i really want to go and i tred and it

did not work here now i'm here in

Neugardheim and this is really on a

very nice place and here is direction of

Weissenstein and I got the connection

and now it's 150 kilometers you see I

got a connection to Weissenstein gateway

with the SF12 for the moment now I

check again this is now the

configuration which made 157 kilometers

antenna made 157 kilometers to the

Weissenstein it's really incredible and

the RSSI is minus 117 now I try on SF 7

and it works also on SF 7 but of course

it's not enough we want more in this

direction I have a small secret and it

is well possible that I will be able to

create a world record for LoRa devices

let's check I'm still on my way to this

secret place

or this special place I'm now in

between germany and france but still in

France

Not a lot lot to see here you might

wonder how I found out about the place i

will go

I will tell you this after we tested

whether we will be able to create a

world record now it's finished driving

with the car now I have to walk up the

hill here only birds here and still my

LoRa node so here is the way and

here we get a hint Hohenbourg which

is French and Loewenstein which is German

so here we have the first ancient castle

it was built twelve hundred and

eighty-three but I don't think a lot is

still remaining but you see now what I

was looking for but first a little bit

of work

now you see you still winter here but a

beautiful day SF7 no success still no success

this unfortunately did

not work so the last chance is really

the chateaux Hohenbourg, which means high

castle so probably he works there this

is the way and here is the castle with

the tower and here is the point I want

to go this is the final destination of

today's journey if it works it works is

not bad luck this one was founded 200

years later than Loewenstein and it's

a little bit better in shape but not

really now I'm up

on the tower and you see these guys back

then really had a knack for nice

positions for their houses if you look

around here just nothing just another

castle but nothing this is really the

top of this would be a perfect place for

a Trump tower I think so let's start with

the experiments unfortunately for the

moment I do not have network coverage of

the mobile I have to check if I get it

somewhere because otherwise it's hard to

log where I am and also to check if we

have a connection to the things network

now I got a connection to Weissenstein

incredible now we can start to

experiment 201 kilometers now the

messages start to come in with minus 112

which is a very good signal strength

way with SF7 it does not work so this is

definitely too much for a SF7 but

this is understandable come on now the

small antenna in the meantime I had more

problems with the mobile

network because it connected me to

German network and

unfortunately my mobile phone has on the

French number but now I have everything

place and I got connection with a small

device with small antenna RSSI: 114

quite good SF12 of course so

everything achieved what I wanted today

this is a real nice birthday gift for me

for my 60th birthday I do not know but I

think more than

200 kilometers with this tiny tiny tiny

chip here is really extraordinary and I

think also it is the longest distance

which was measured with these small

devices to a public DTM gateway so far

so now I go home

I promised to show you how I found the two castles, from where the connection was possible.

Fortunately, I found a great software from Roger Coudé, a ham radio operator with 40 years of experience in RF propagation. One of the functions is to simulate the coverage of a sender at a particulat place. I first simulated my own gateway and discovered, that the prediction of the software were very much in line with my experience from “Wardriving”. So, I simulated the Weissenstein gateway. I treated it as a sender, not as a receiver. But physics do not care too much about that. And here is the result: We see, that it covers a nice part of Switzerland. But it covers also a huge area in France and Germany: This is, where I found my points at 50, 100 and 150 km. The maximum was not so easy to find, because most of them are in a forest. And in the middle of a forest, you have a big loss and the chance to get a connection is smaller. But then, I discovered the two castles, in the middle of the forest. And the rest of the story is known to you.

Just a small remark: If you do not believe me that I established the two world records:

1: Here you see, that I really had a direct line of sight. And you see also, that the Earth curvature is clearly visible. This is, why you need a reasonable height for the sender and the receiver.

And you find a link in the comment, wher you see the logged connections.

I hope, this video was useful or at least interesting for you. If true, then like. Bye