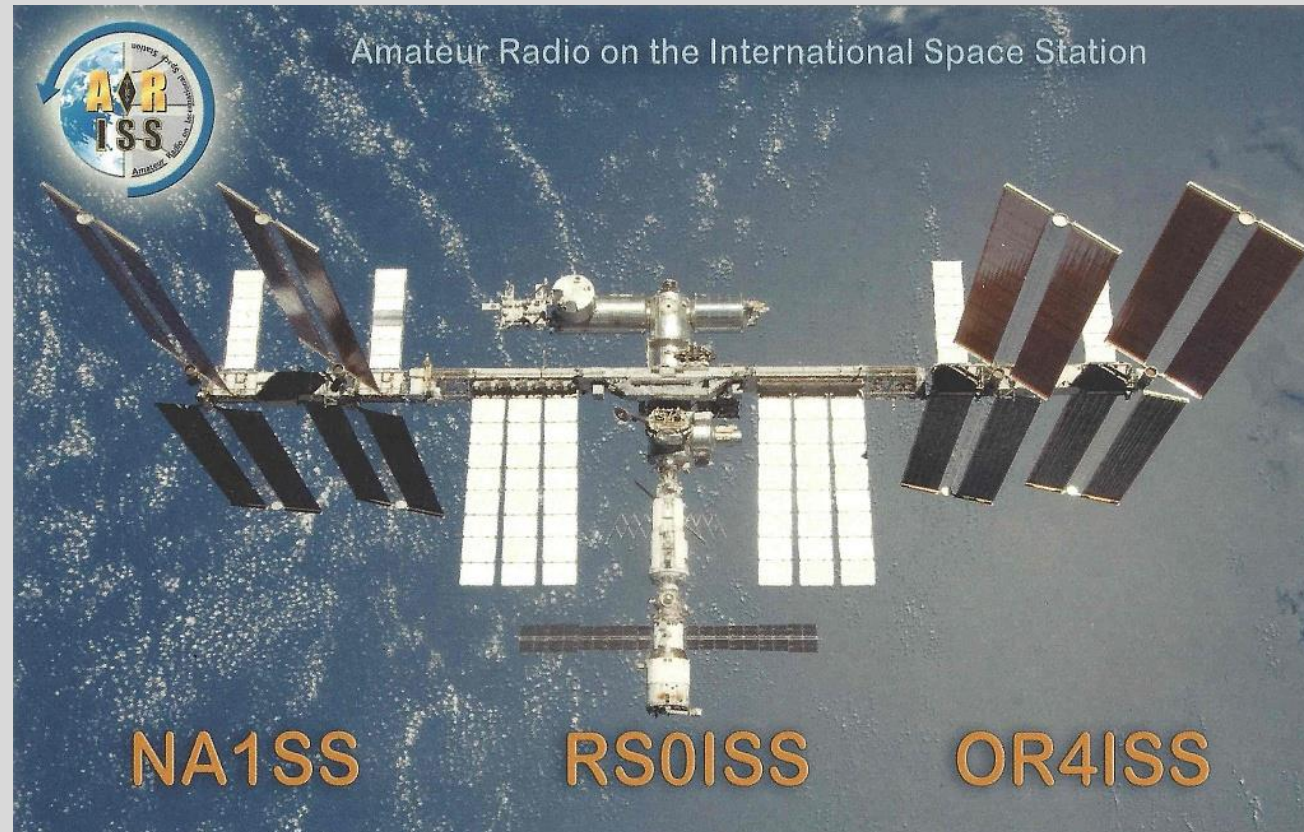


ARISS contact with German Astronaut Matthias Maurer



Matthias Bopp DD1US
June 10th 2022
VII Microwave & EME Symposium
Radkow / Poland



Agenda

- **Amateur Radio on the ISS**
- ARISS contacts
- School contact from Denzlingen / Germany

Amateur Radio on Space Stations



Bill McArthur
KC5ACR



Ernst Messerschmid
DG2KM



Reinhard Furrer †
DD6CF



Ulf Merbold
DB1KM



Thomas Reiter
DF4TR



Reinhold Ewald
DL2MIR



Alexander Gerst
KF5ONO



Matthias Maurer
KI5KFH

- Many astronauts have an amateur radio licence.
- There were already many amateur radio contacts during earlier missions such as Spacelab and MIR.
- There are regular radio contacts with school stations from the ISS.
- The students can talk live to the astronauts for about 12 minutes.
- Contacts with radio amateurs without prior appointment are possible depending on the interest and available free time of the astronauts.



The International Space Station ISS

Launch Zarya module: 1998
Length : 94 m
Width : 67 m
Height : 73 m
Weight : 420 t
Apogee : 360 km
Perigee : 347 km
Inclination : 51.6 degree
Period : 91.5 minutes
Speed : $7706 \text{ m/s} = 27743 \text{ km/h}$
Solar power: 75 ... 90 kW



Satellite Orbit – ISS (LEO)



ISS in a LEO (Low Earth Orbit): low altitude, limited visibility range,
only low radiated power required (small antenna and/or low transmit power)

Agenda

- Amateur Radio on the ISS
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Who is ARISS ?



The **ARISS** project (**A**mateur **R**adio on the **I**nternational **S**pace **S**tation) enables schoolchildren to make radio contact with astronauts in the ISS space station through the amateur radio service via satellites.

Volunteer radio amateurs establish connections between schools and the space station, as we did recently in Denzlingen.

Some of the ARISS equipment in the ISS was developed and built by radio amateurs.

Voice communication with the ISS

Amateur radio operations can be carried out in the ISS from two different modules. In each case, dedicated antennas are used that are attached to the outside of the modules.

In the Russian segment Zvezda (service module) there is a Kenwood FM mobile radio with max. 50W output power.



Recently, such a radio has also been available in the European Columbus module. Matthias Maurer used it during our contact.

Slow Scan Television (SSTV) from the ISS

Some amateur radio satellites and also the ISS regularly transmit SSTV images.



Digital Amateur Radio TV (DATV) from the ISS

The regular radio contacts between the astronauts on the ISS and schoolchildren on Earth are supplemented by uni-directional video transmissions (DVB-S on 2.395 GHz).

The European Columbus module of the ISS has several amateur radio antennas for this purpose. The digital television transmitter (DATV) was brought to the ISS on August 3rd 2013.

Unfortunately, the DATV transmitter on the ISS has been defective since April 2018 and is still being repaired in Italy.



ARISS-DATV ground stations in Europe



EI9FHB

G8GTZ

PA3WEG

SP3QFE

GOONHILLY

MODNY
M0EYT

OK2UUJ

DD1US

F6DZP

IK1SLD

F4HHV



Digital Amateur Radio TV (DATV) from the ISS



Received by DD1US

School Contact from Heilbronn



Robert-Mayer-
Gymnasium

Heilbronn

5.12.2018

Christian Weidemann

Janik Herzog

Mert Tektas

Sebastian Weiser

Sara Roth

Niklas Jedele

Jan Heuer

Lukas Zehnder

Samuel Ulrich

Sarah Roßnagel

Steffen Utech



DP0ISS
Alexander Gerst KF5ONO



Jürgen Wetzel DL8SDQ

Wolfgang Haug DK2ZO

Michael Hayler DC1SHM

Ulrich Hammes DG7SCB

Matthias Bopp DD1US

Harald Gerlach DL2SAX

Achim Wassener DK2MY

Joachim Sack DL8SCD

Jürgen Reinhard DL1SAX

Reinhold Stadtmüller DL9SCM

Steffen Peikert DH9SP

Alfred Dimter DK9SV

Rudi Rapp DL5TQ



School Contact from Künzelsau



Künzelsau
16.10.2018

Elke Sturm
Edwin Straßer
Dr. Thomas Lonkai
Florian Frank
Bernd Paukner
Nala Lucy
Xenia Chris
Julian Sara
Lorena Kristina
Nikola Lara
Sebastian Max
Pauline Kim-Luca
Amelie Mika
Mark Theo
Georg Henrik
Jennifer Svea
Emma Marie
Timo Anna-Lena



DP0ISS
Alexander Gerst KF5ONO



Reinhold Stadtmüller DL9SCM
Matthias Bopp DD1US
Jürgen Wetzel DL8SDQ
Wolfgang Haug DK2ZO
Michael Hayler DC1SHM
Ulrich Hammes DG7SCB
Steffen Peikert DH9SP
Alfred Dimter DK9SV
Rudi Rapp DL5TQ
Gernot Sattelmayer DH1SG
Markus Greiser DC1GN
Michael Ehrler DL7MD
Peter Egner DL2SCI
Helmut Burkhardt DG5SAH
Andreas Alferink DG3AAA
Hans Bullinger DL5SEA



DN6SP

School Contact from Rust



Carsten Münchenbach
Thomas Riedel
Matthias Wölfel
Kerstin Kopf
Klara Pfister
Fabian Mutschler
Kim Leucht
Lukas Weber
Janina Feger
Nils Köllermann
Lea Mlyneck
Willi Rautenberg
Marius Müller
Berna Mahmutovic
Svenja Wendler
Felix Vierthaler
Jakob Karmann
Lara Bartsch
Daniel Burgardt



Europapark Rust
17. Oktober 2019



Matthias Bopp DD1US
Jürgen Wetzel DL8SDQ
Michael Hayler DC1SHM
Kay Zipperle DK4KAY
Markus Wallschlag DH5WM
Heinrich Lamprecht DK8GL
Marianne Lamprecht DL1GAM
Gerold Bey DL8BBP
Erich Schneider DL1GQE
Alex Gehri DB8TA
Irene Haug DL8GBI
Mattias Golla DO4MAG
Sören Alrutz DO4DKW
Kevin Pfister DO8PK
Klaus Kuhnt DF3GU

IROISS

Luca Parmitano KF5KDP

Lea Errerd
Lukas Rosenfeld
Sam Al Hilli
Pascal Reich
Saskia Hellinger



DN1EME

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- Amateur Radio on the ISS
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Our ARISS astronaut



Our contact was with the German ESA astronaut Matthias Maurer.

He studied materials science and did his doctorate in this subject area.

He has been working at ESA since 2010.

He was in the ISS from 11.11.2021 to 5.5.2022 for his first mission "Cosmic Kiss" as on-board engineer.



He has an amateur radio licence (individual callsign KI5KFH).

During our contact he used the callsign of the ISS DP0ISS.



Matthias Maurer

School Contact from Denzlingen



After it became known that the German astronaut Matthias Maurer would travel to the ISS in 2021, we decided to participate again. For the "core team", this would be already the 5th school contact with the ISS.

We were able to interest the ERASMUS Gymnasium in Denzlingen and the Goethe Gymnasium in Freiburg to participate in the contact.

Thus, in summer 2020, we jointly submitted the corresponding applications for two separate ARISS school contacts for the 2nd half of 2021.

Both applications were approved at the beginning of 2021.

As we did not know whether the two contacts would possibly be shortly after each other, we started to develop a second redundant radio system in the club in Freiburg (DOK A05).

We carried out inspections in both schools and planned possible antenna locations.

School Contact from Denzlingen



Heinrich DK8GL and I gave lectures and practiced radio communication in both schools.

The highlight was an SSB contact with the Neumayer-Station III in Antarctica via QO-100.



School Contact from Freiburg



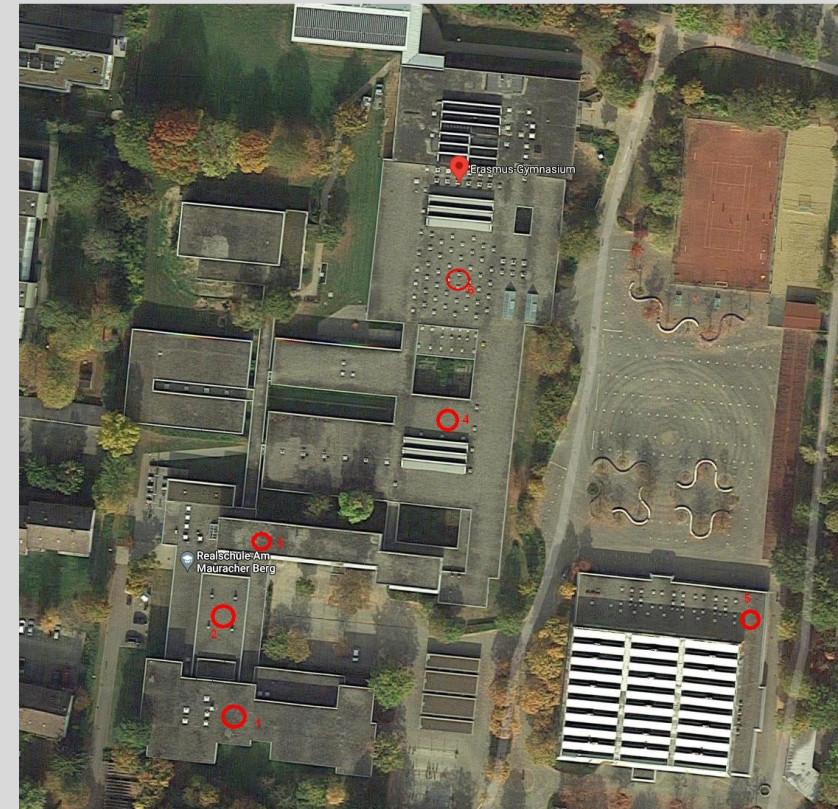
School Contact from Denzlingen



In the summer of 2021, at the request of the ARISS organization, we changed the two contacts in Denzlingen and Freiburg into one joint contact and decided to hold this contact in Denzlingen.

From then on, we concentrated on a single redundant system based on the already proven setup from Heilbronn built by Jürgen DL8SDQ and Michael DC1SHM.

The question of where to place the antennas on the roofs of the school in Denzlingen proved difficult.



School Contact from Denzlingen



Suddenly the idea was born, to ask the Becker company with their headquarters in Denzlingen for cherry pickers and to use them as mobile antenna supports.

Heinrich DK8GL was able to convince the Becker company to provide us with two cherry pickers free of charge. During a joint visit to the Becker company, Heinrich, Gerold and I were able to choose suitable models.



School Contact from Denzlingen



Due to Corona, many additional measures had to be planned and arranged for the contact.

Since we wanted to broadcast the event in the classrooms of both schools as well as on the internet, it was necessary to set up an appropriate infrastructure.

Unfortunately, the Erasmus-Gymnasium could not provide us with sound or video equipment. Even streaming to the internet was not possible via the school network.

So we were glad that the team around Markus DK5WM and Soeren DO4DKW developed and provided the appropriate technology.

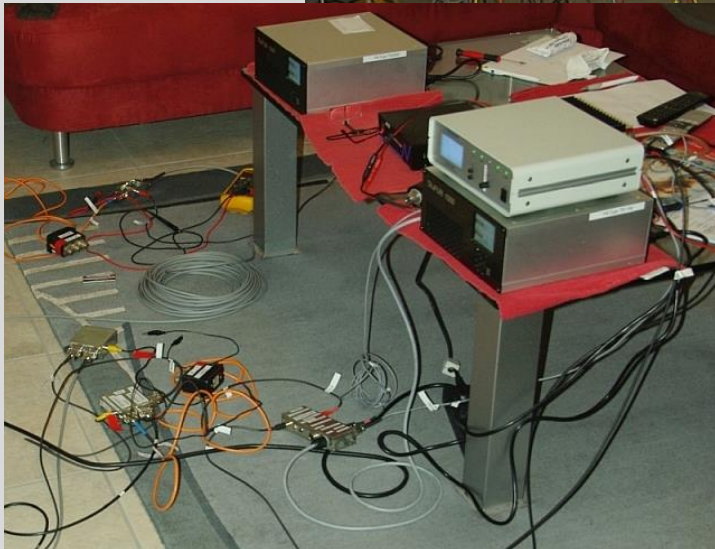
Finally, the date was fixed:
it was to be Tuesday, 22.02.2022.

The event poster is a blue rectangular graphic. In the top left, it says 'Goethe-Gymnasium Freiburg' with a small building icon and the tagline 'MITTEN IN DER STADT & NAH AM MENSCHEN'. In the top right, it says 'ISS-Funkkontakt' and 'Live am 22.02.2022 ab 9:15 Uhr MEZ'. The center features the 'AR ISS' logo on the left and the 'DARC' logo (Deutscher Amateur-Radio-Club e.V.) on the right. In the bottom right corner, there is a logo for 'ERASMUS GYMNASIUM Denzlingen' which includes a white silhouette of a head, and a small circular logo with the text 'cosmic iss' and a satellite icon.

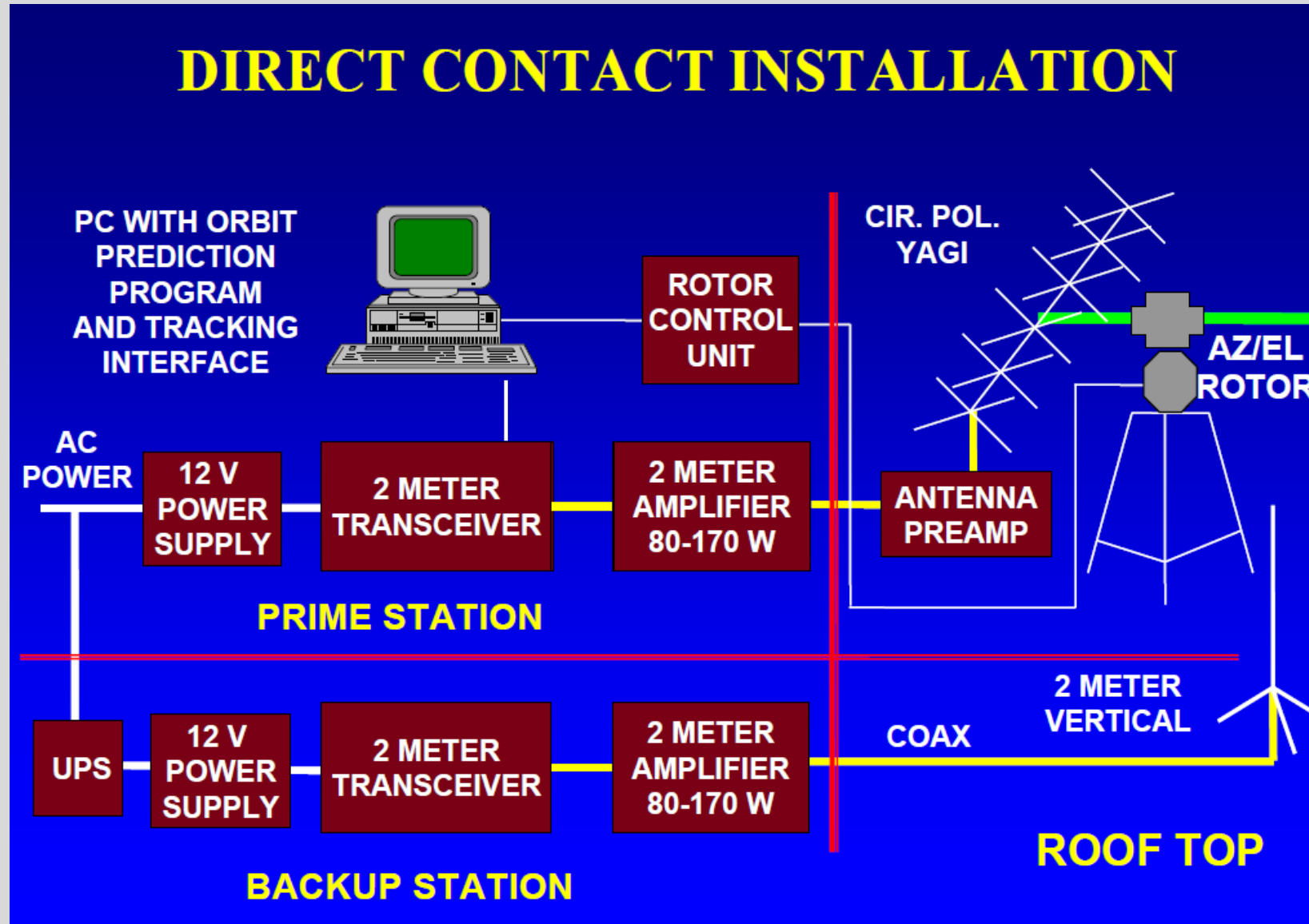
School Contact from Denzlingen



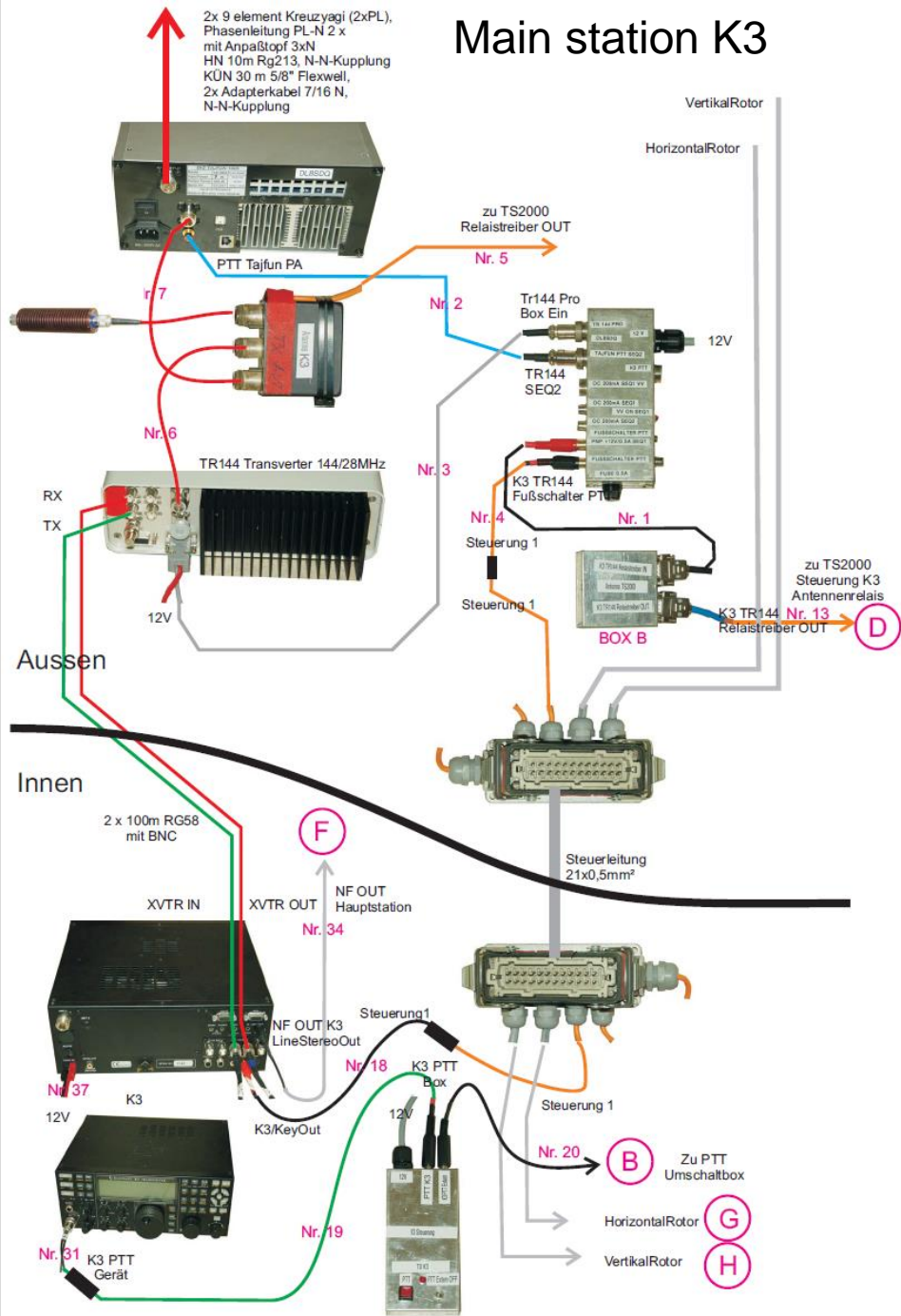
Jürgen and Michael as well as Markus and Soeren carried out extensive tests of their equipment.



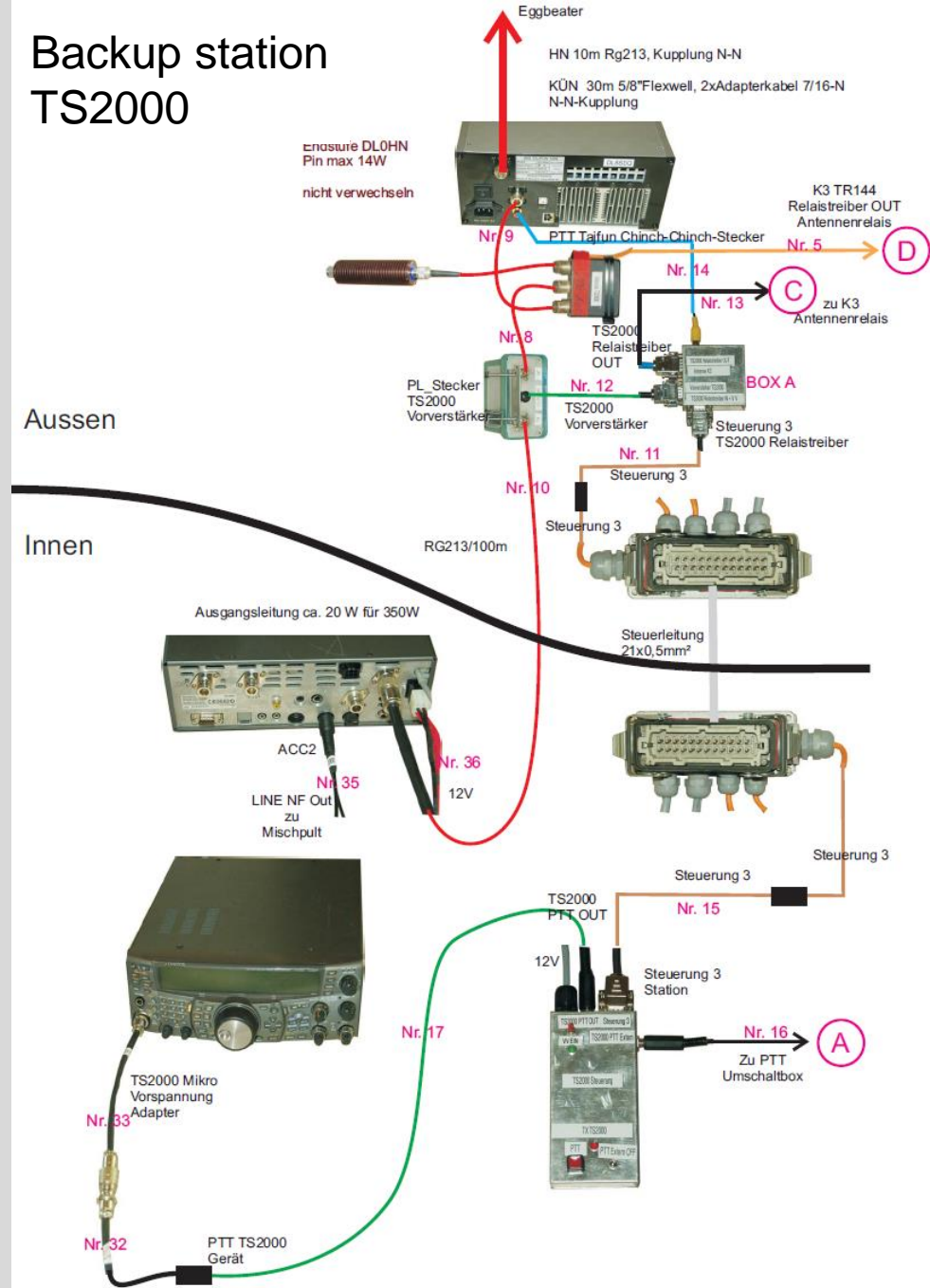
Recommended setup for ARISS contacts



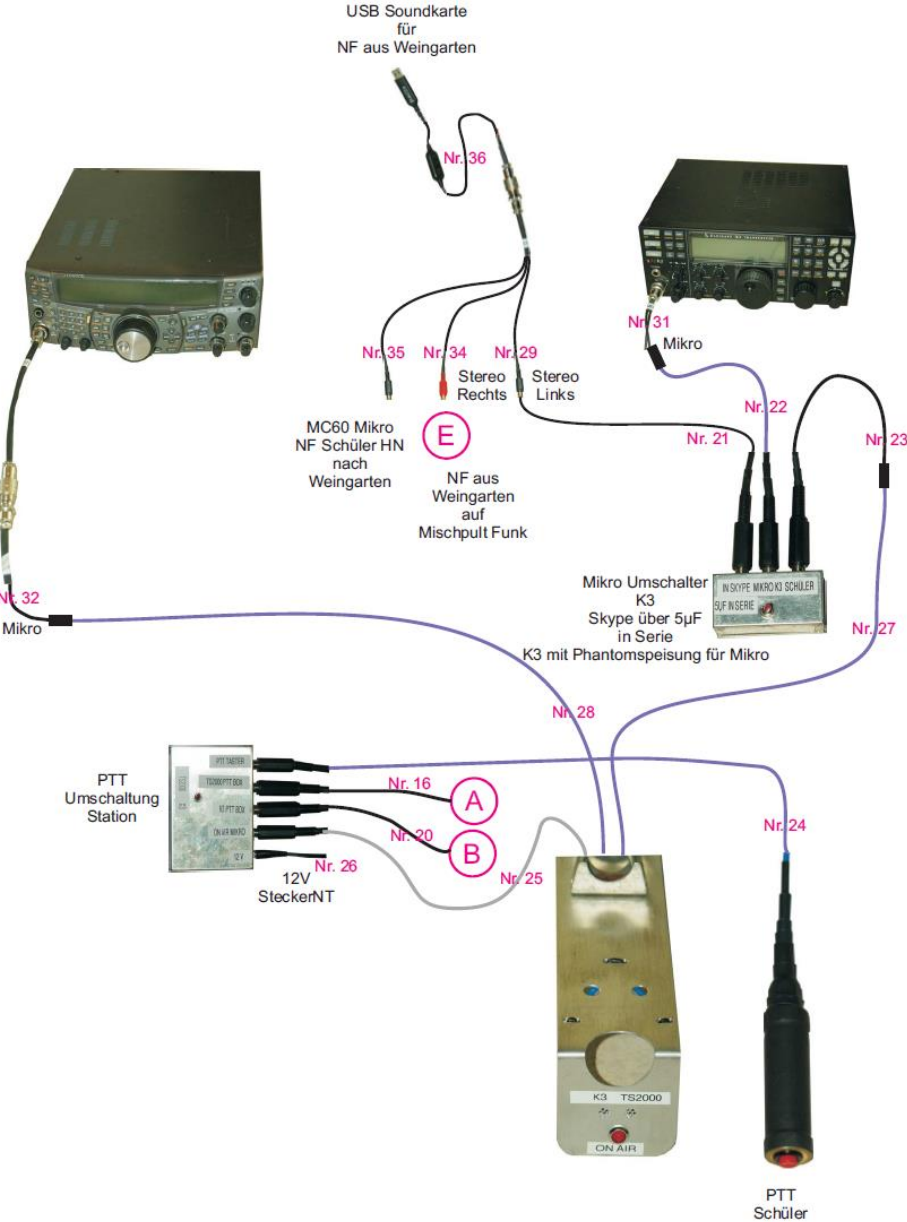
Main station K3



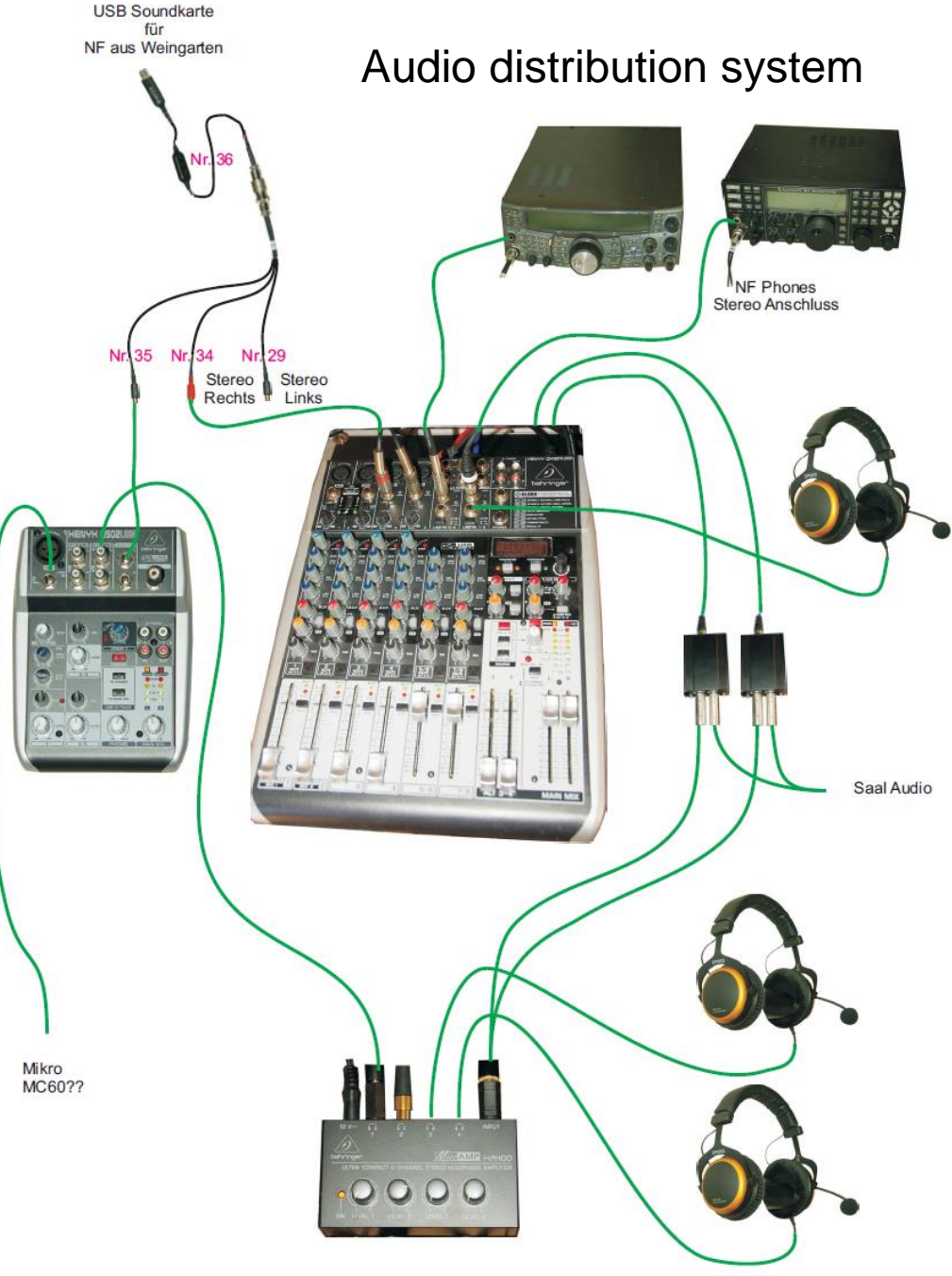
Backup station TS2000



Microphone and PTT switching between main and backup station



Audio distribution system

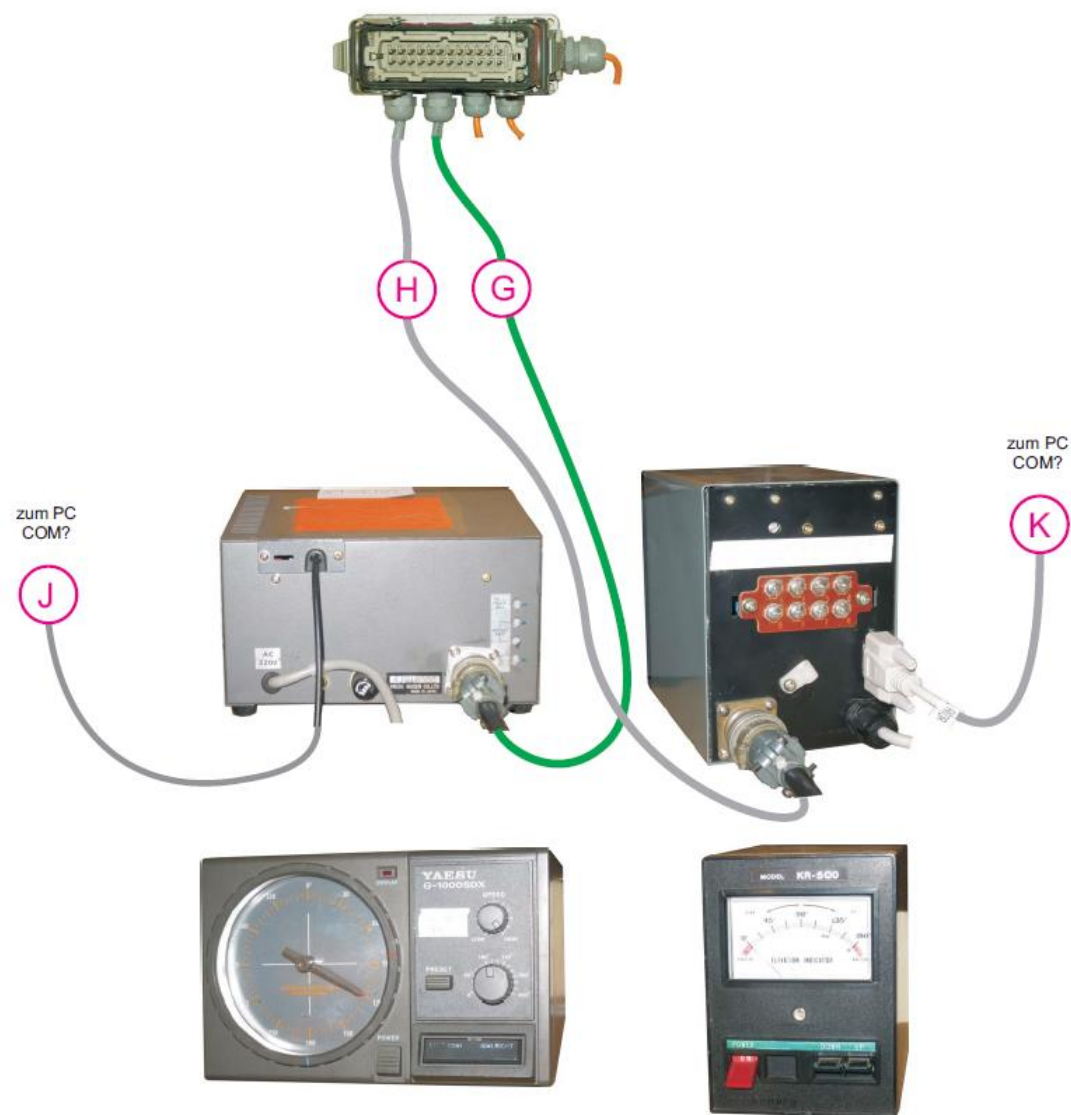


N-Stecker
ca. 5 m
Aircom

Alu Schiebemast ca. 8 m

Bei dem Test Kreuzyagi direkt auf Eggbeather ausgerichtet. Abstand ca.7 m Koppeldämpfung ca.30 dB.

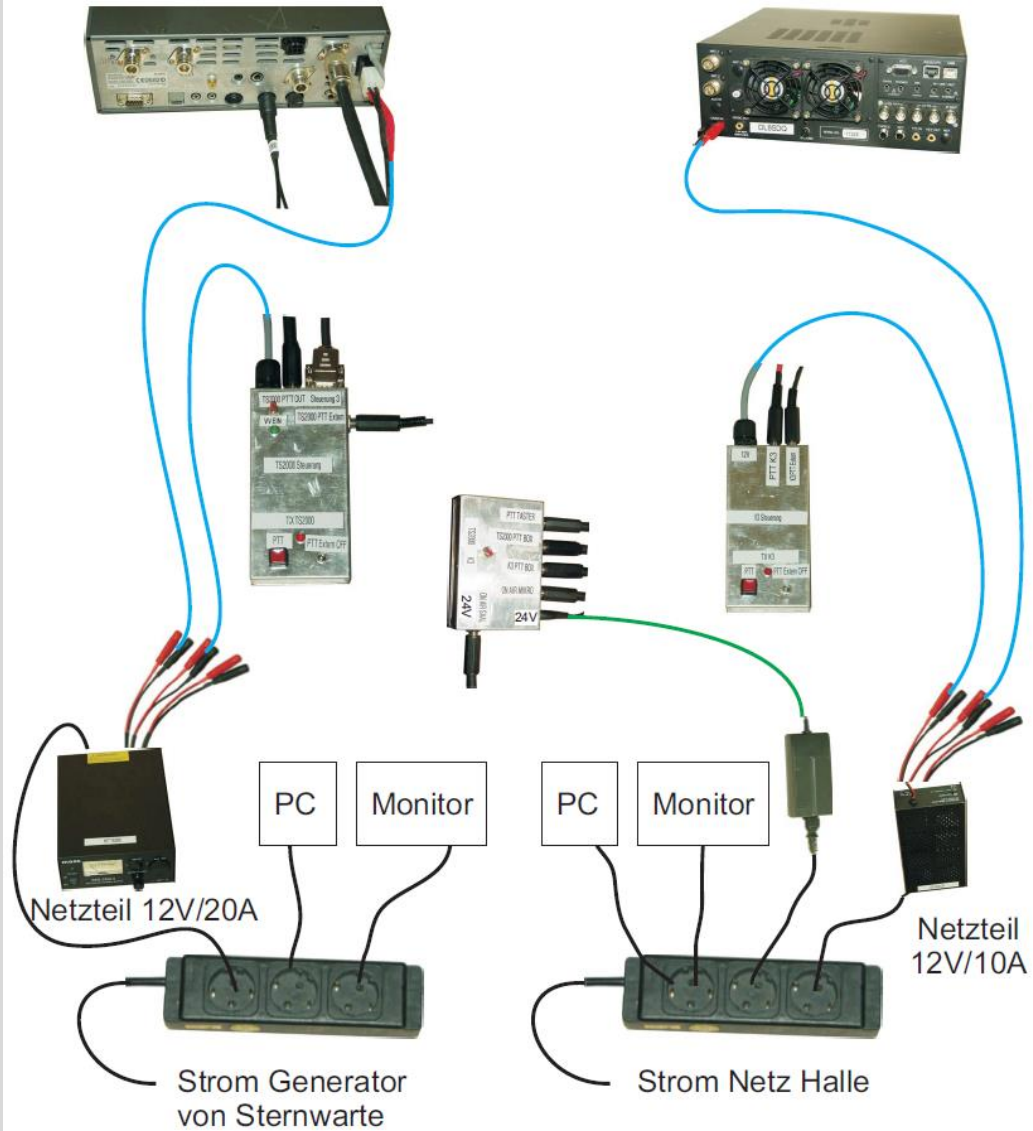
Rotator control system for main station



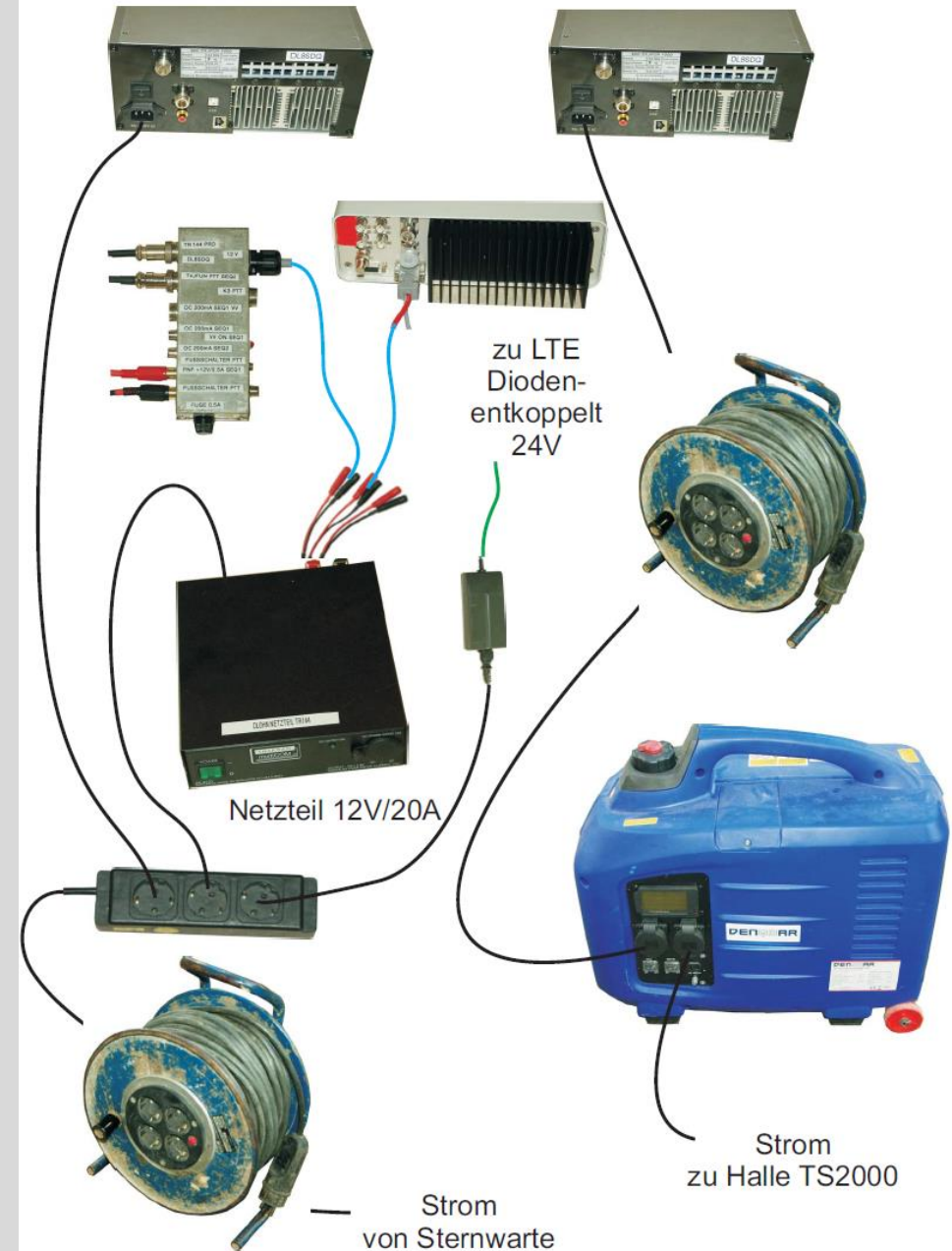
PC control for rotators and transceivers



Power supply for main station



Power supply for backup station



Assembly of both antenna systems



BECKER

The Becker company provided us with two 26m high cherry pickers free of charge from Saturday morning to Tuesday evening.

Assembly of both antenna systems



Assembly of both antenna systems



School Contact from Denzlingen



Assembly and testing of the station



Program of the day



09:15 Start of the livestream

09:15 Musical contribution "Starwars" (school orchestra Erasmus-Gymnasium Denzlingen)

09:20 Welcome and presentation of the program and schedule (Mr. Schmid, Cosmic Kiss mission manager from the German Space Agency at DLR)

09:25 Greeting by the headmistress of the Erasmus-Gymnasium (Mrs. Bohlen)

09:30 Greeting by the mayor of Denzlingen (Mr. Hollemann)

09:35 Presentation on Cosmic Kiss (Mr. Schmid)

10:00 Break

10:15 Presentation on ARISS radio contact (Mr. Bopp)

10:40 Video contribution on various class projects about space travel (Erasmus-Gymnasium Denzlingen)

10:50 Musical contribution "Major-Tom" (school choir Goethe-Gymnasium Freiburg)

10:55 Introduction to the radio contact (Mr. Schmid, Mr. Bopp)

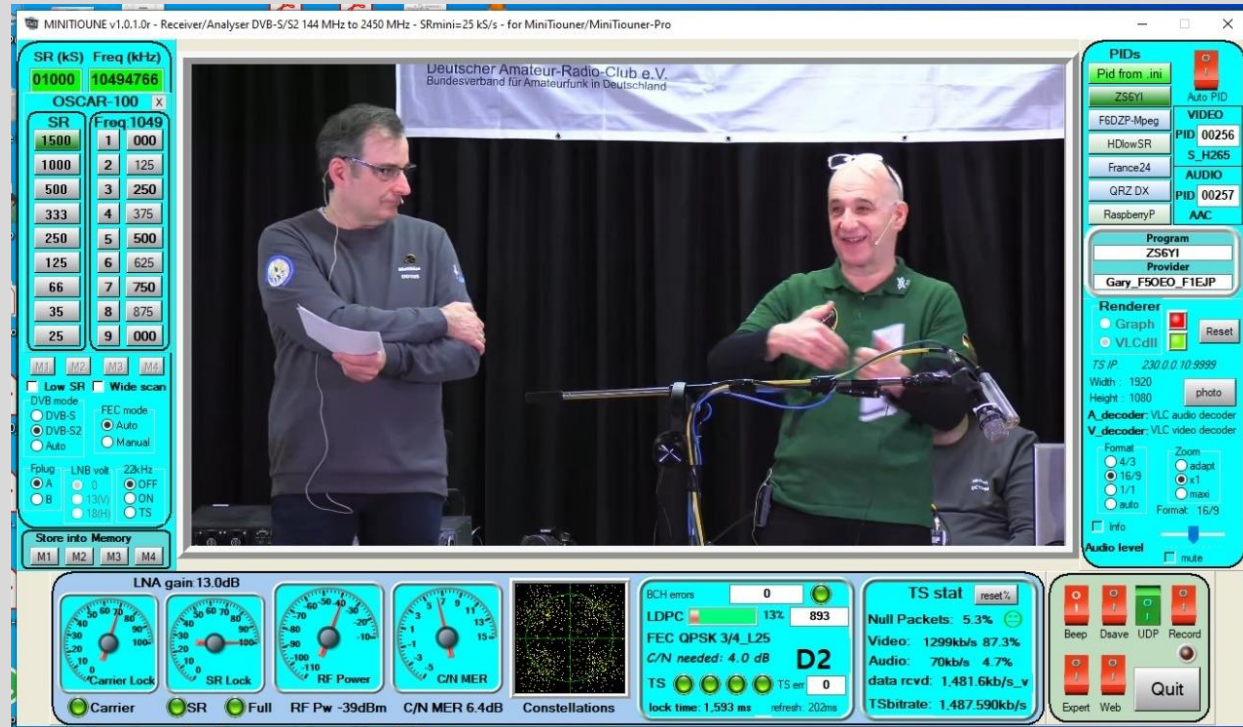
11:04 Radio contact (Mr. Bopp)

11:20 Interviews with teachers, students and radio amateurs (Mr. Schmid)

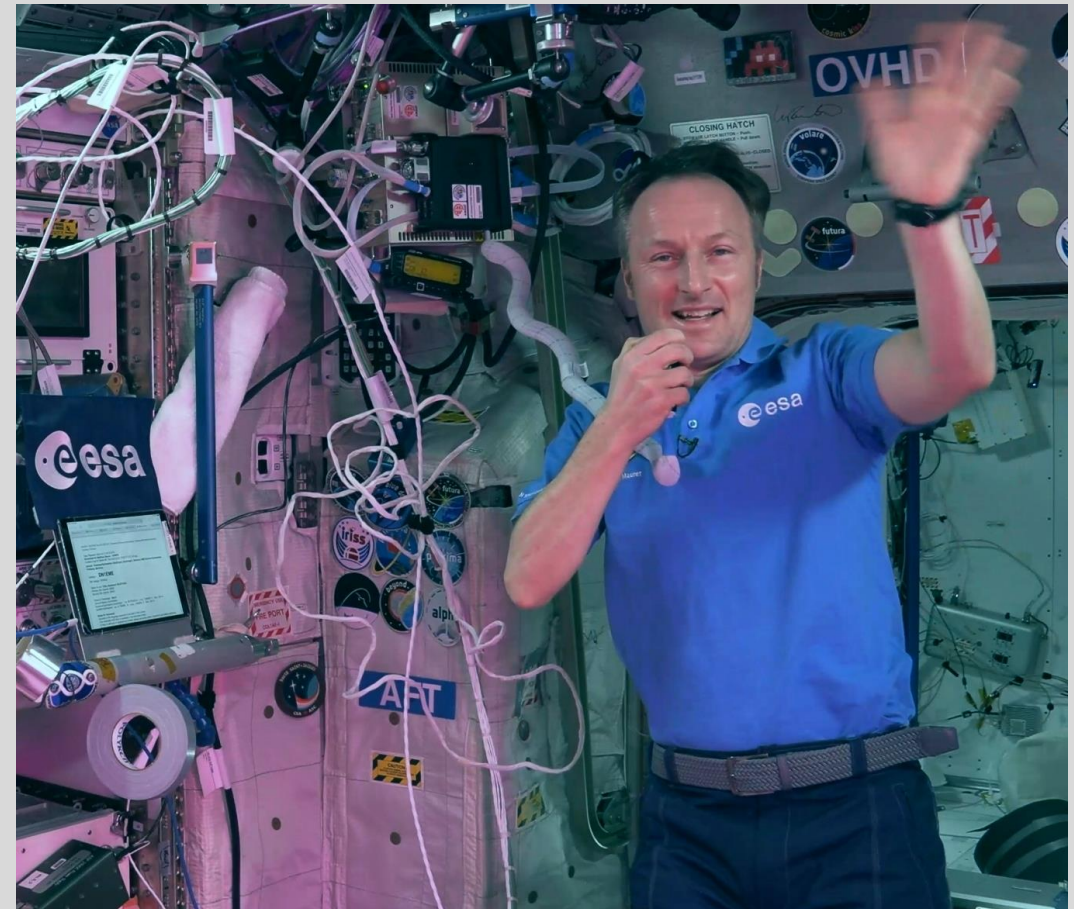
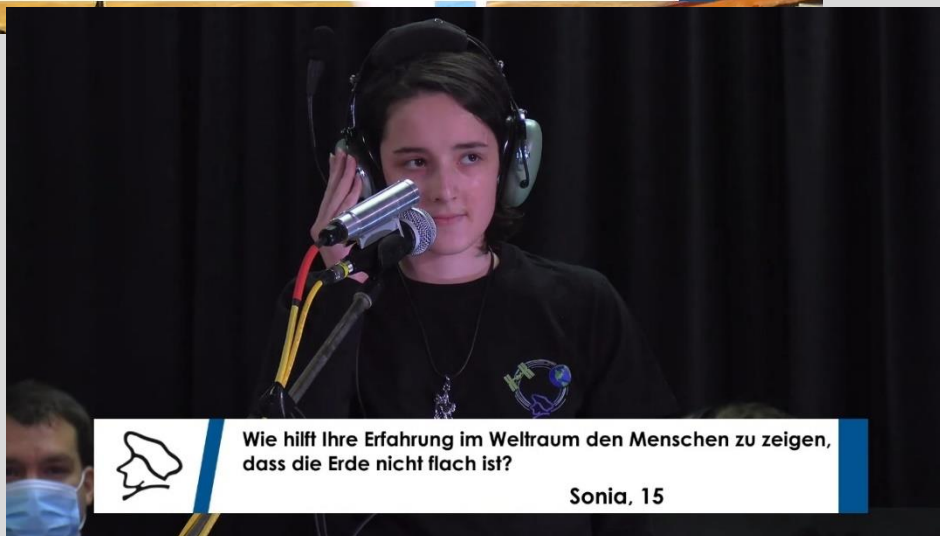
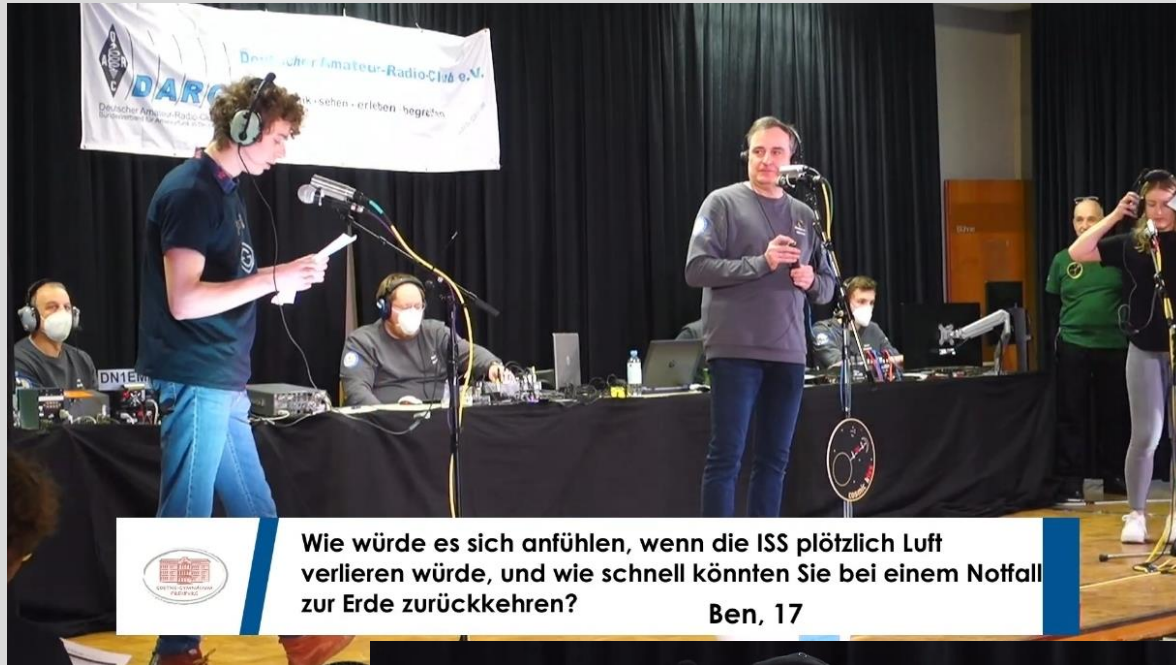
11:40 Farewell (Mr. Schmid)

11:45 End of the livestream

Live Streaming via QO-100



The contact



Group photo after the contact





ARRISS
Amateur Radio on the International Space Station

ISS-Funkkontakt 22.2.2022 Denzlingen




Goethe-Gymnasium Freiburg
MITTEN IN DER STADT & NAH AM MENSCHEN



Dr. Marcel Lorenz

Anuk Oltersdorf
Kemi Fischer
Ben Sandeck
Robin Stadler
Adriana Koch
Iva Rießler
Maren Dittmaier
Jonas Schmidtmayer
Diana Döhler
Jannis Merz
Vinh Bornschein
Linda Hahnemann
Nele Wagner
Matteo Meyer zu Brickwedde

Christel Bohlen
Michael Bauer
Caroline Ernst

Katharina Sackers
Katja Hohe
Sonia Roller
Anna Erler
Jannik Russ
Bela Mari
Louisa Scherberger
Noah Wurch
Esra Yaman
Peter Hornstein
Philipp Kappler
David Naumann
Aron Kulik



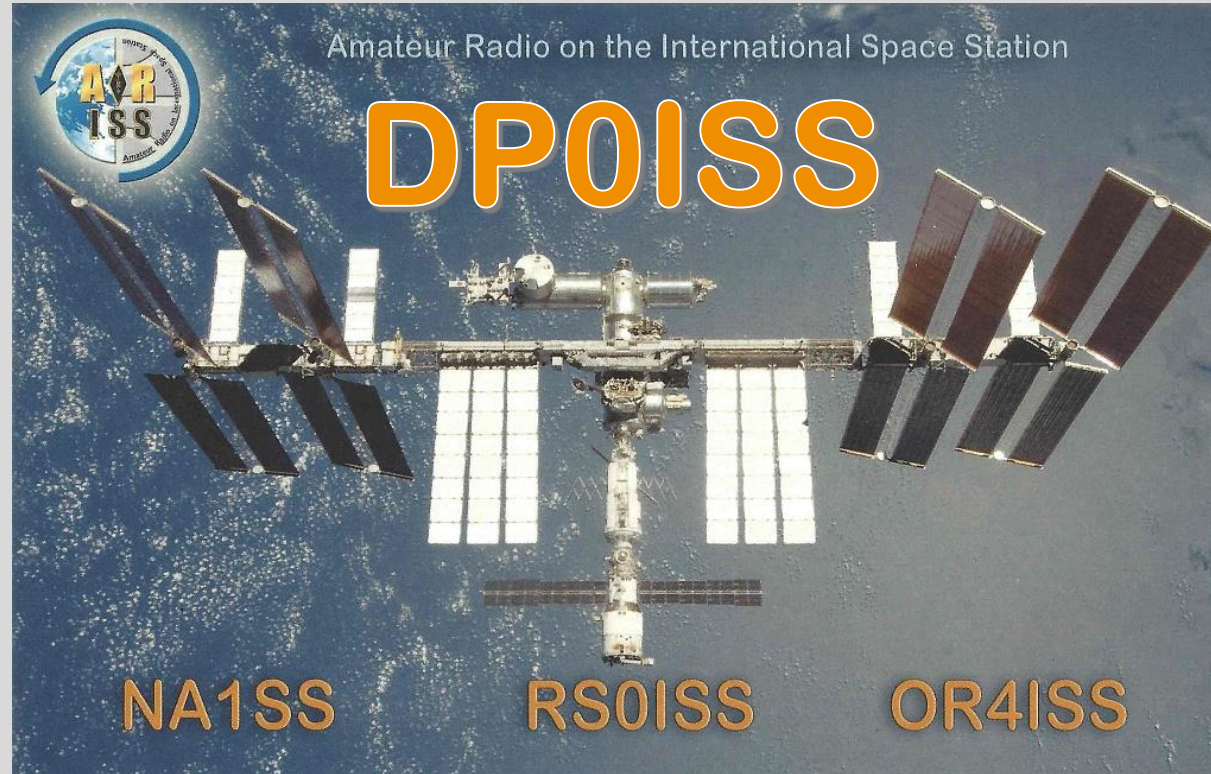
Picture: NASA



DN1EME

Matthias Bopp DD1US, Jürgen Wetzel DL8SDQ,
Michael Hayler DC1SHM, Sören Alrutz DO4DKW,
Markus Wallschlag DH5WM,
Sascha Zimmermann DD6AU,
Heinrich Lamprecht DK8GL, Gerold Bey DL8BBP,
Erich Schneider DL1GQE, Alexander Gehri DB8TA,
Mattias Golla DO4MAG,
Timi Jay (the guy with the cam)
Volker Schmid (DLR)

Thank you very much to all sponsors for their kind support!



ERASMUS-GYMNASIUM
DENZLINGEN

