Laboratorij za Sevanje in Optiko

Fakulteta za Elektrotehniko

Univerza v Ljubljani

Kratka zgodovina naših poskusov z umetnimi sateliti

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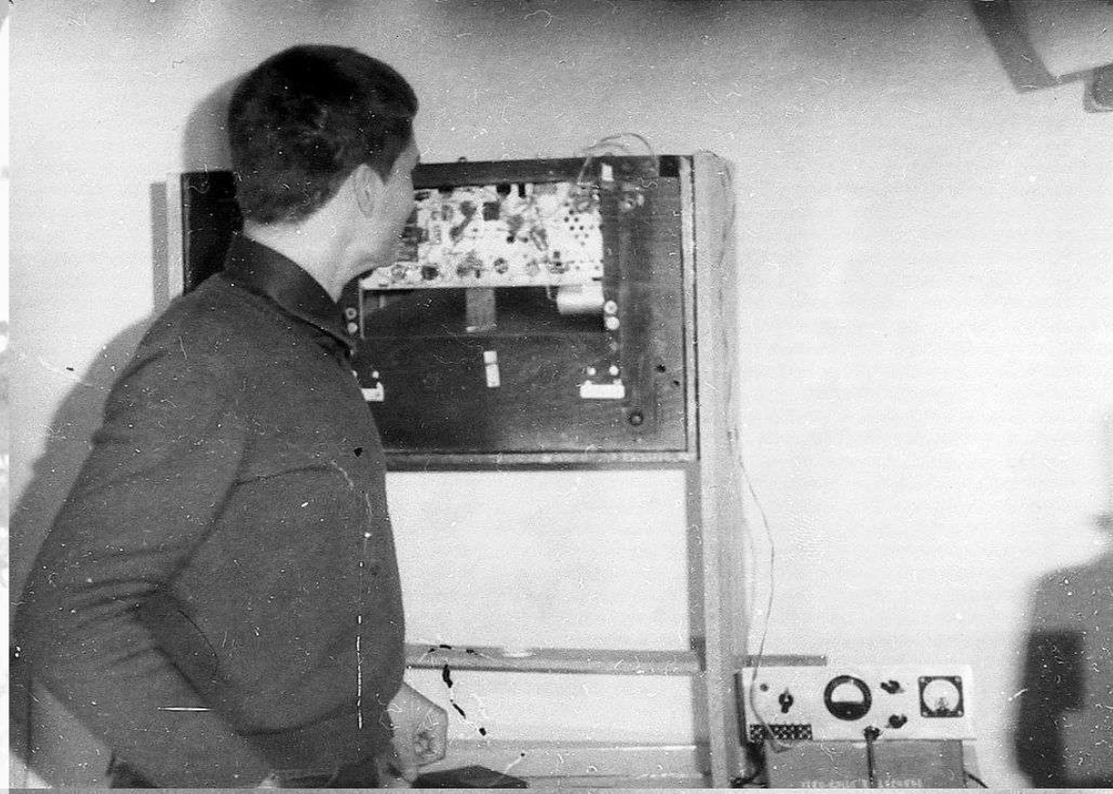
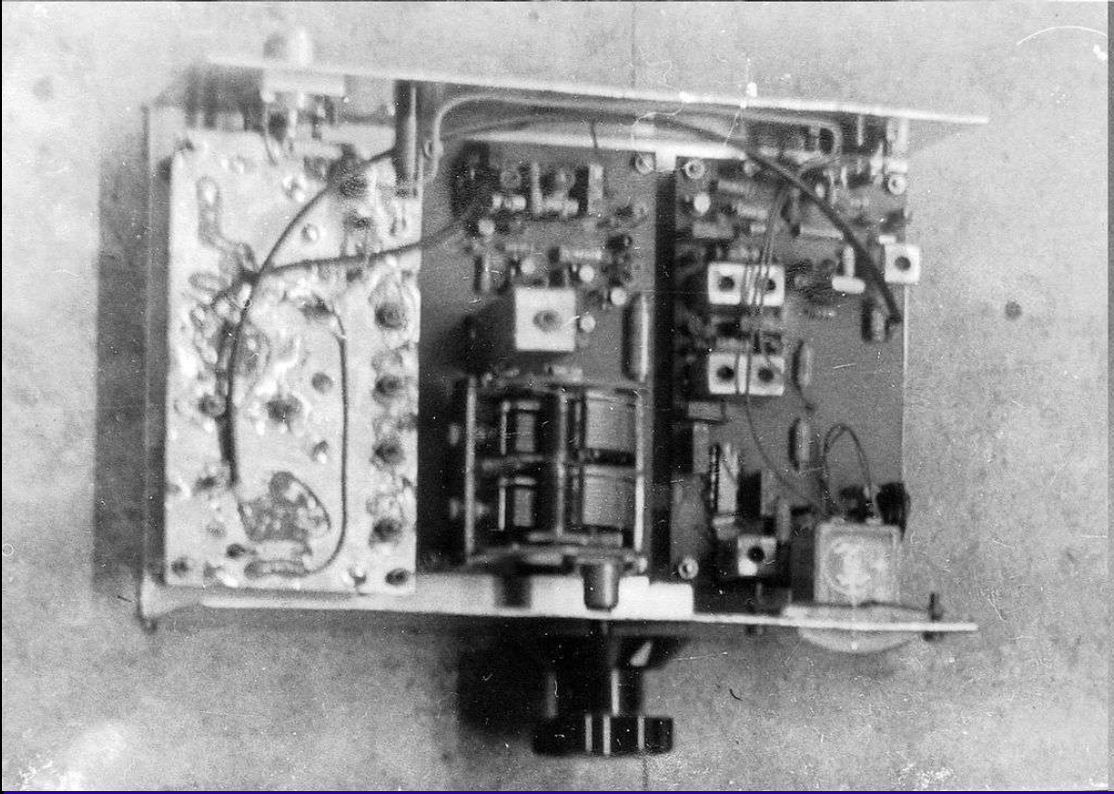
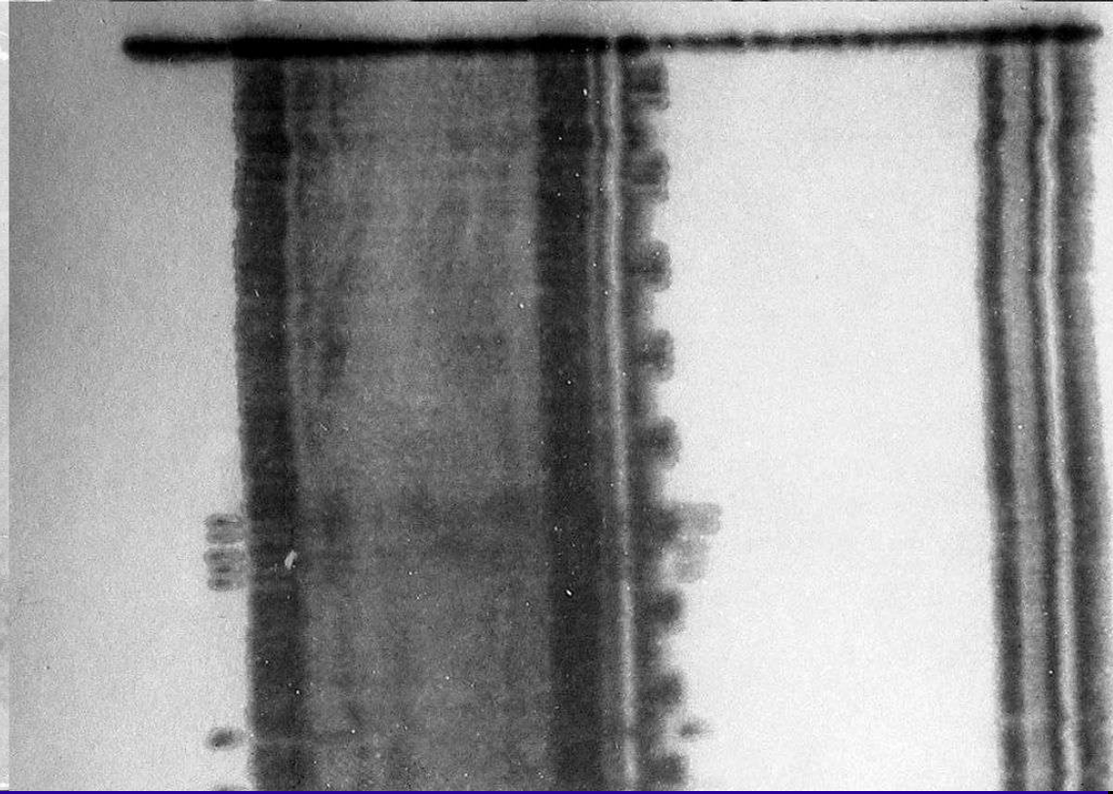
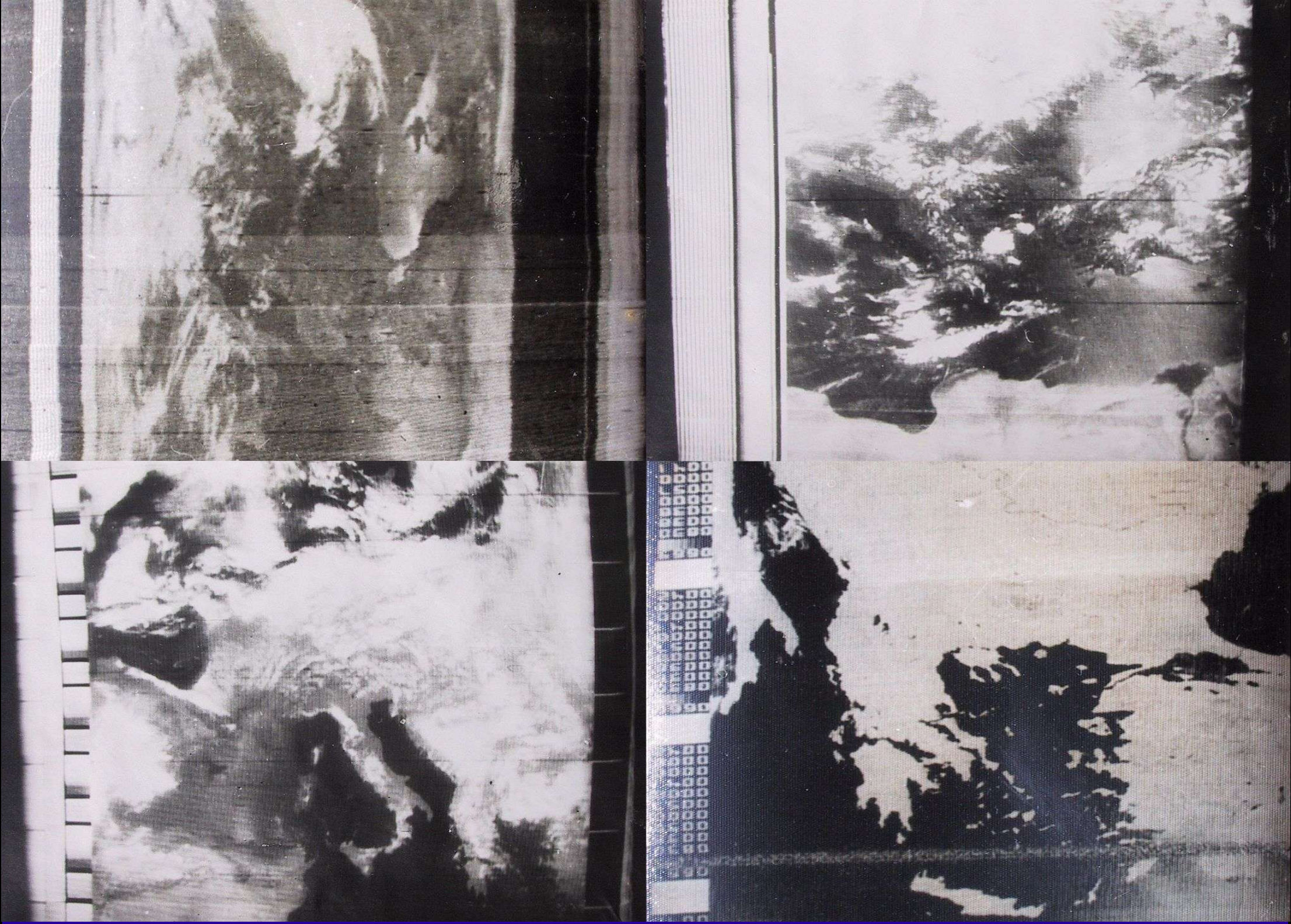
http://www.s5tech.net/s53mv/



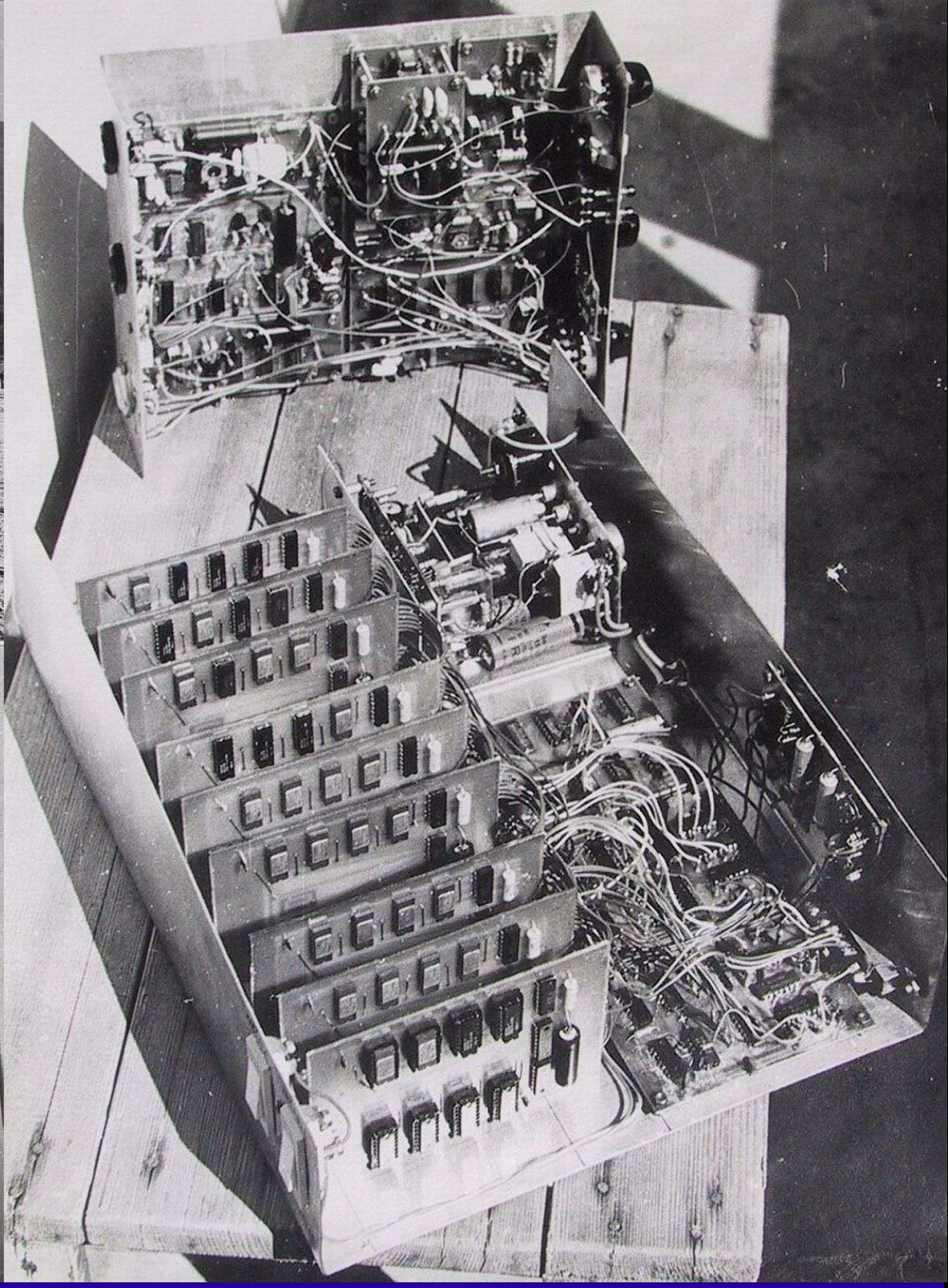




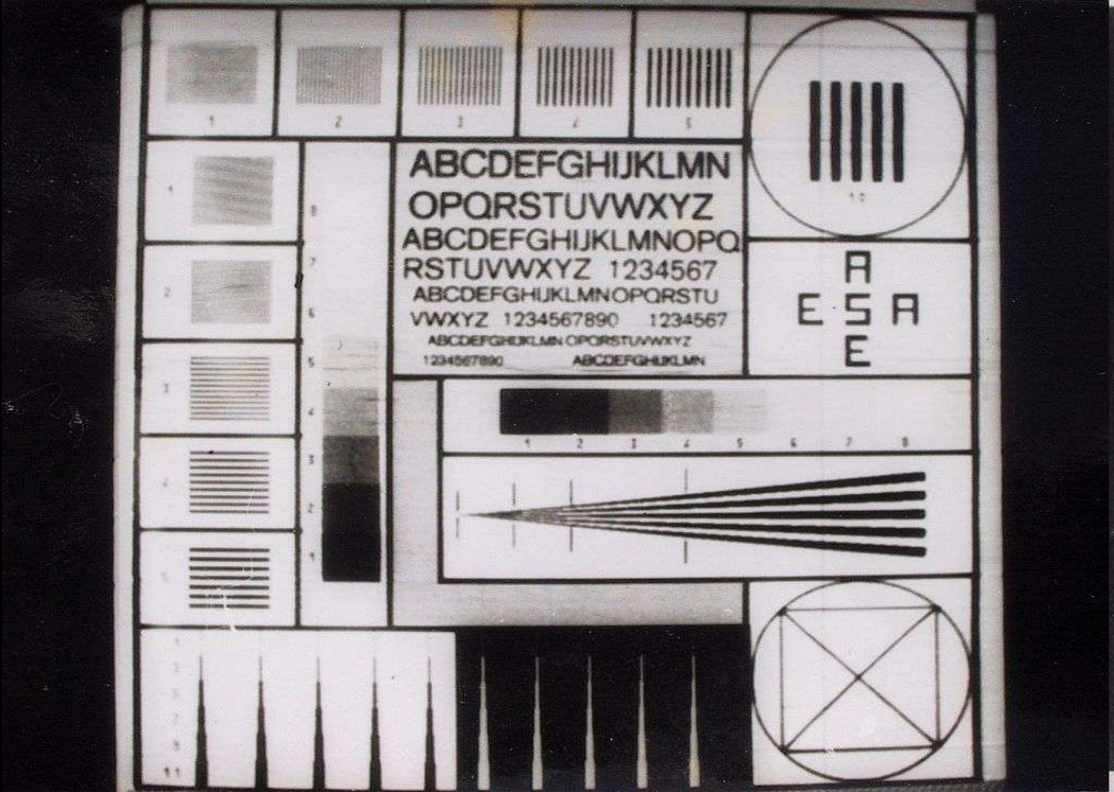
1976: prvi sprejem vremenskih satelitov ITOS na 137MHz

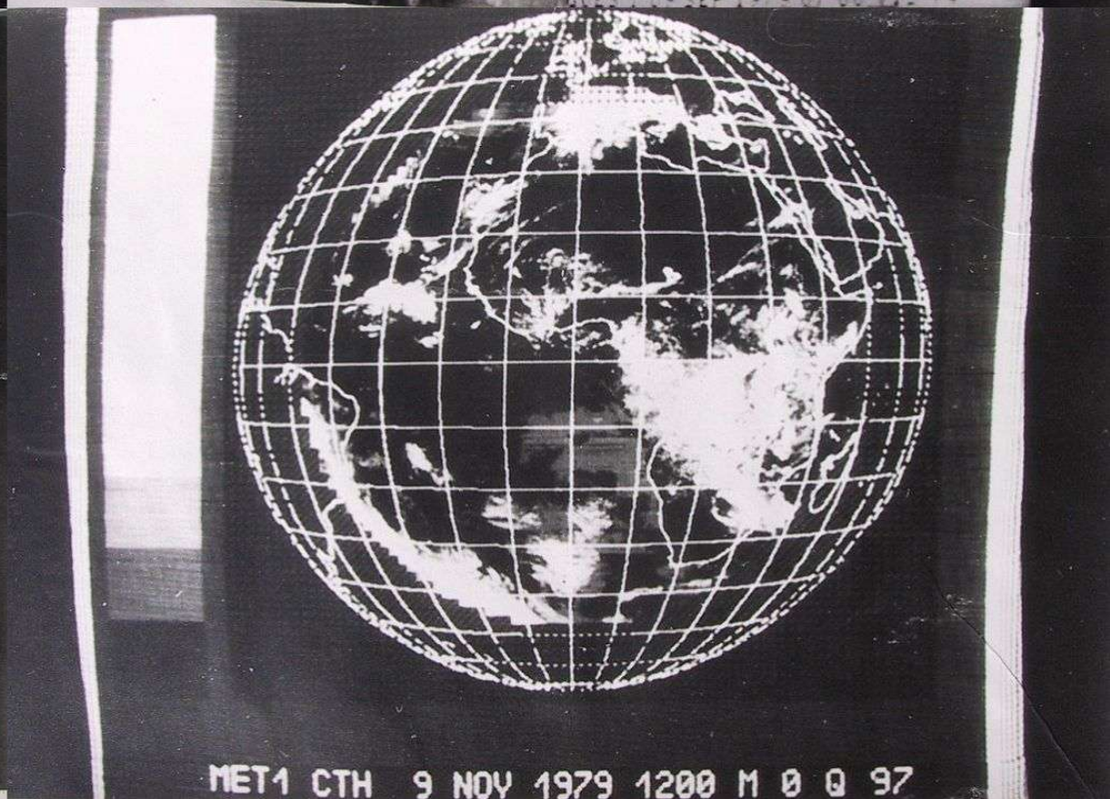


1978: APT slike satelitov ITOS, TIROS-N in METEOR 1 in 2

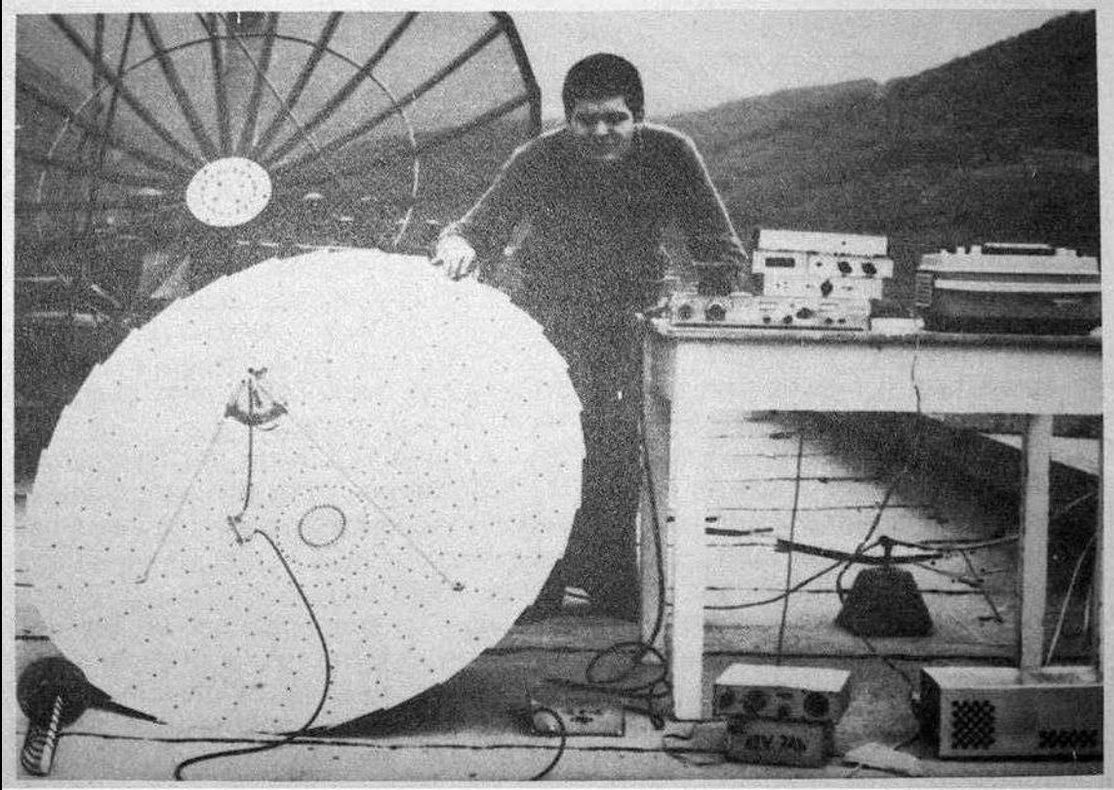


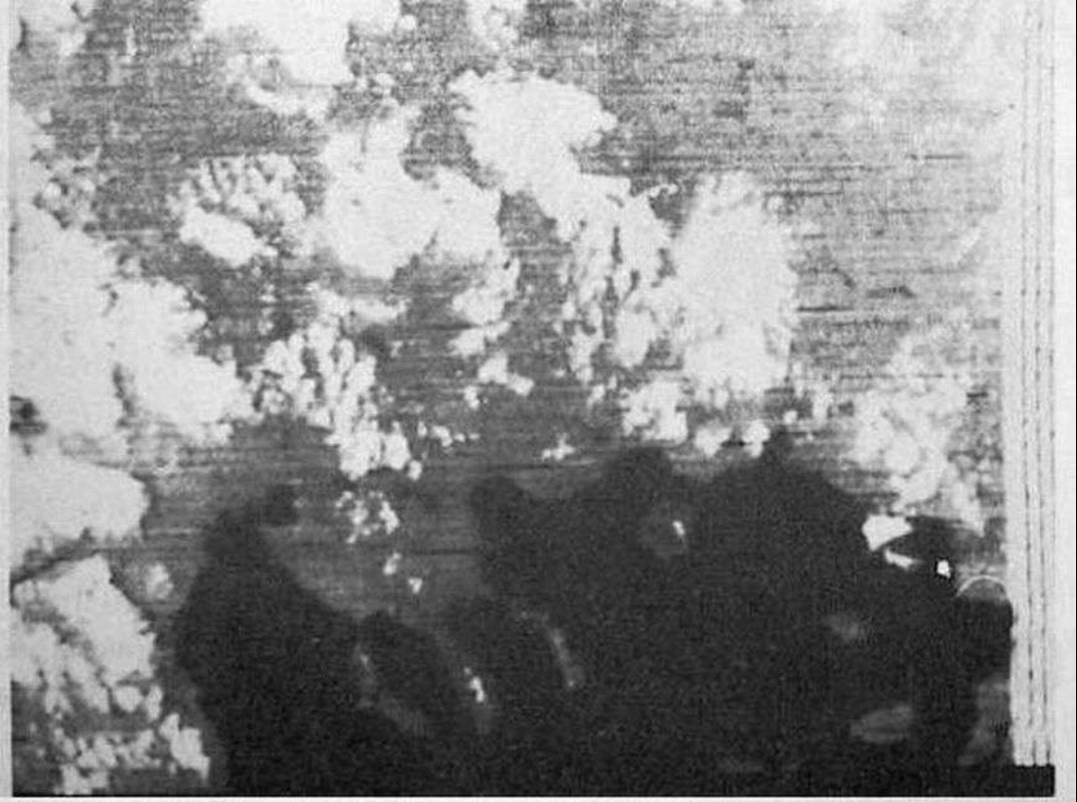
1979: sprejemnik za satelit Meteosat-1 na 1.7GHz

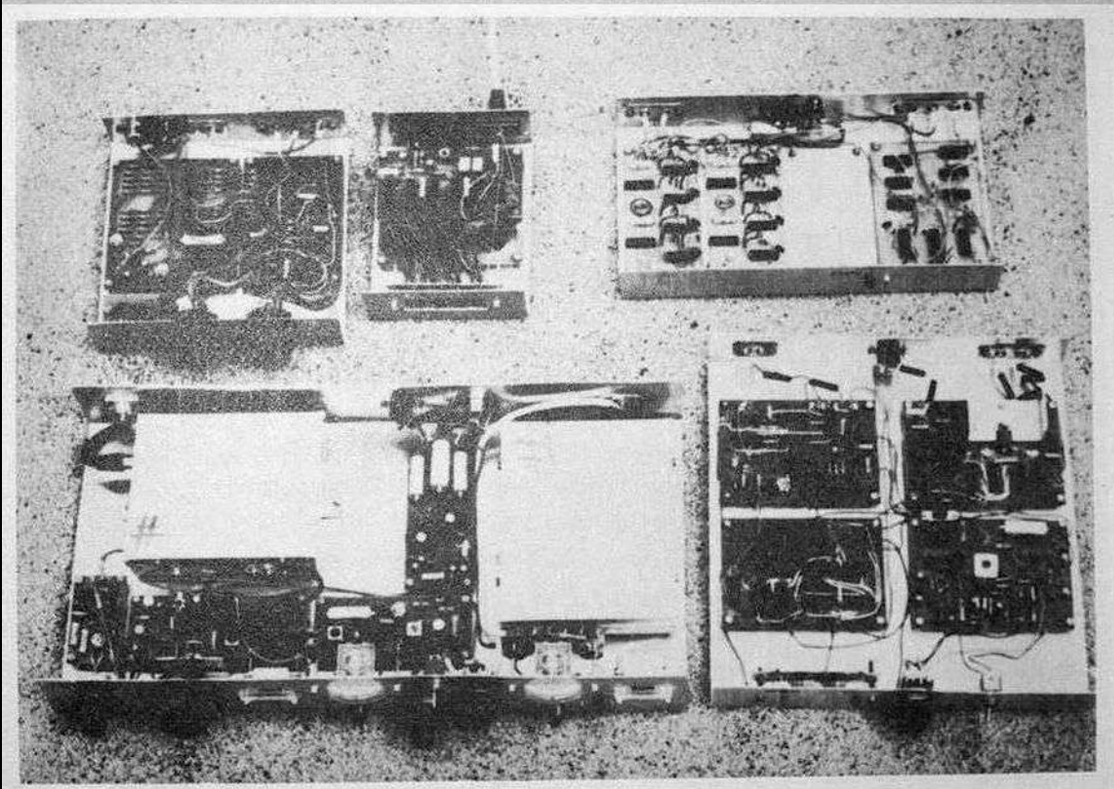




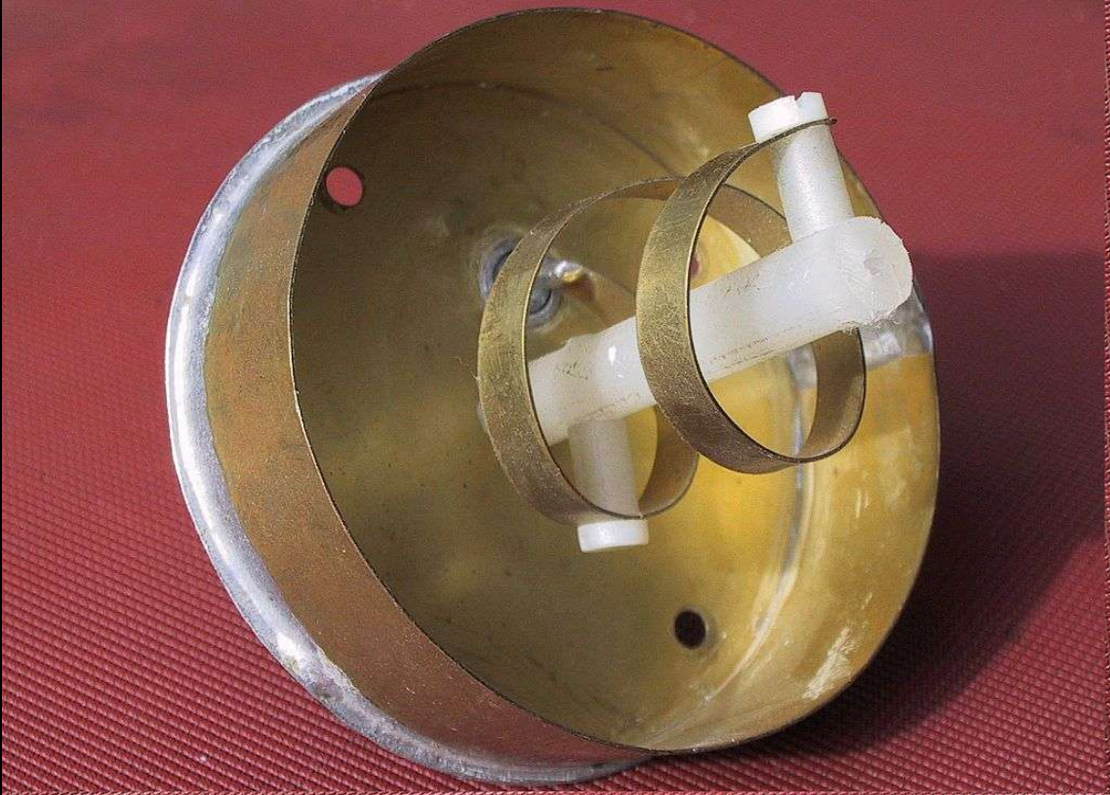
1979: APT/WEFAX slike s satelita Meteosat-1

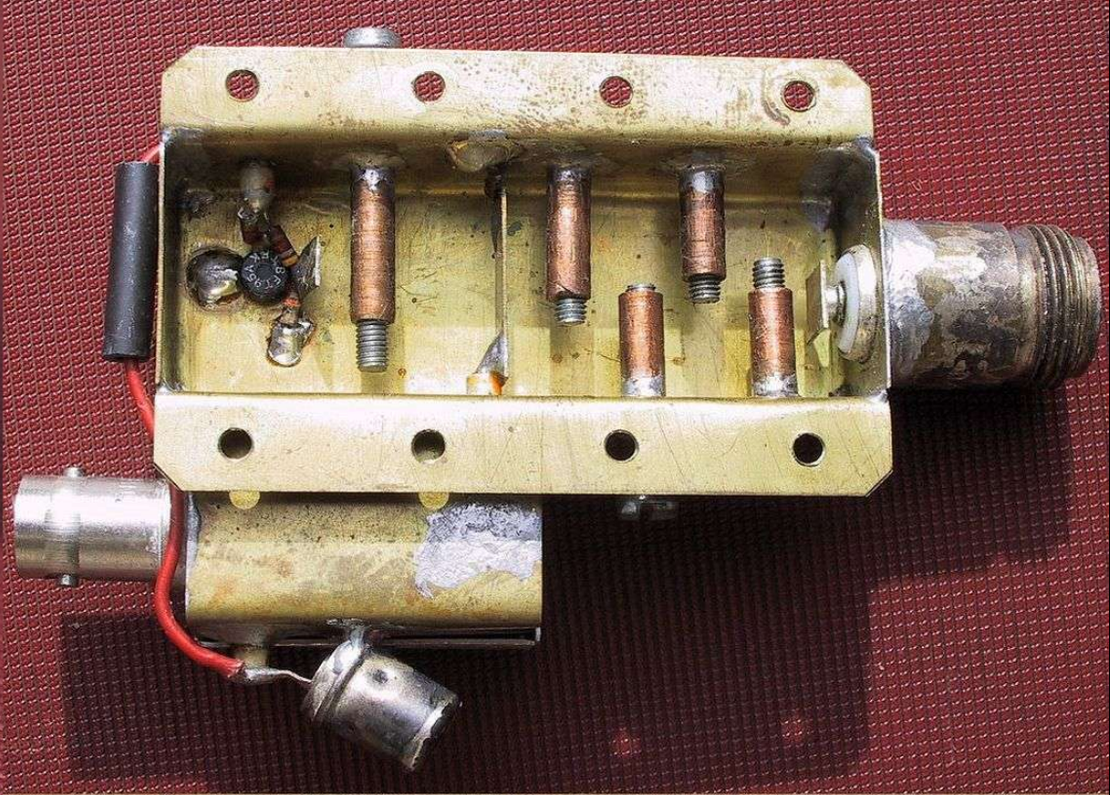


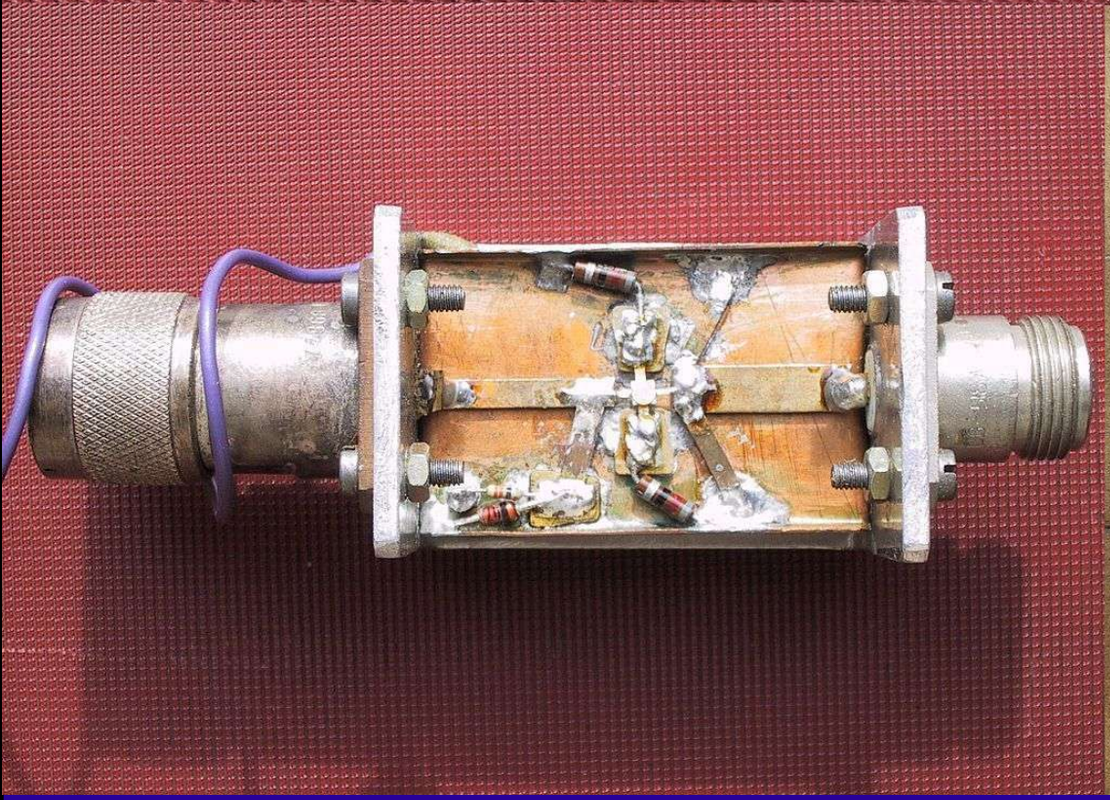


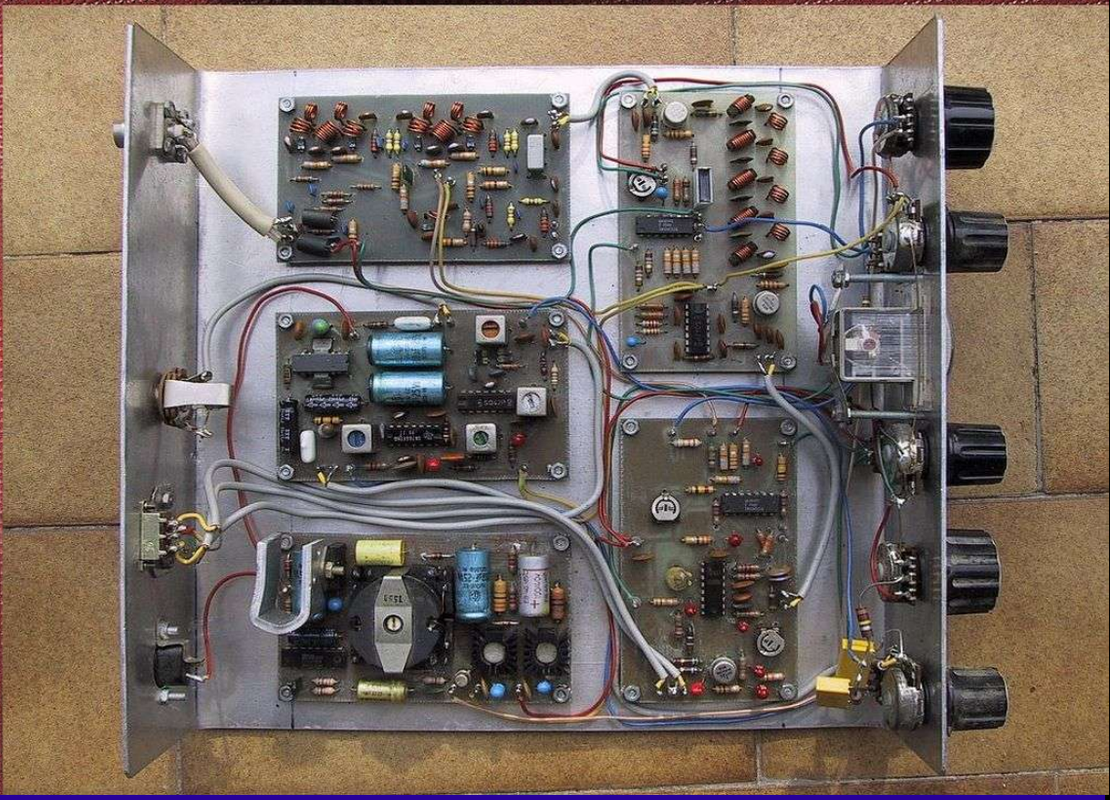


1981: sprejem HRPT slik satelitov TIROS-N na 1.7GHz

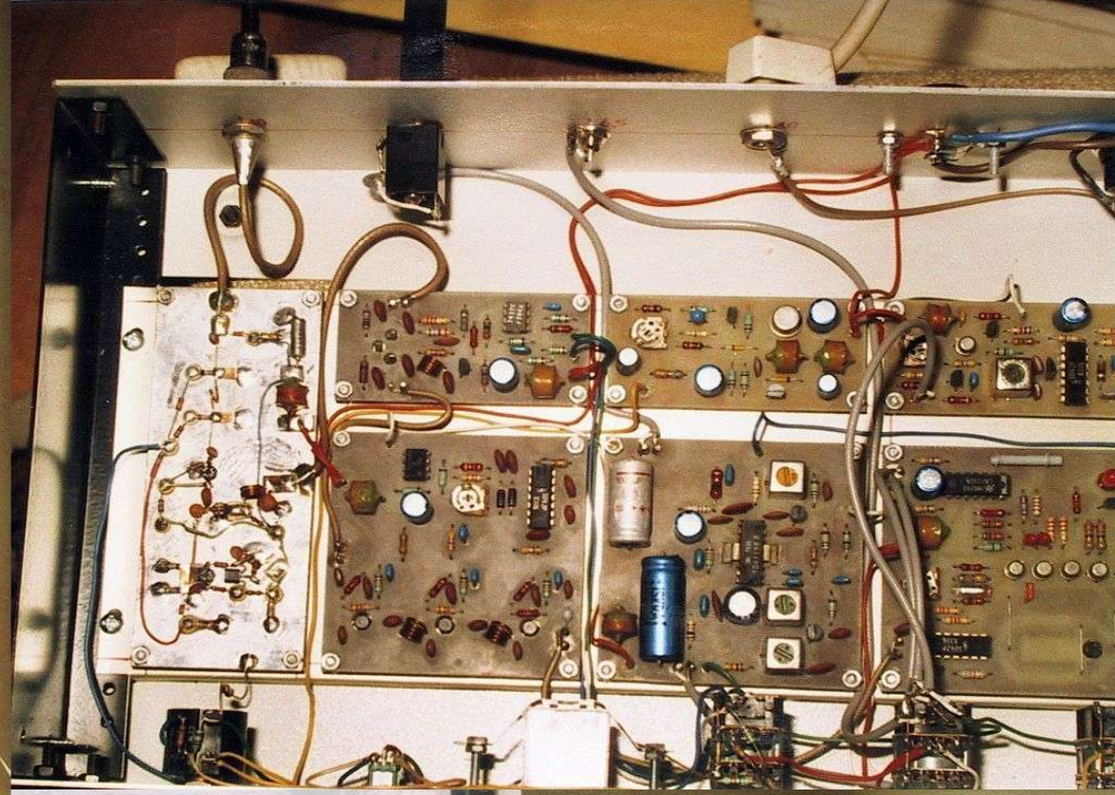


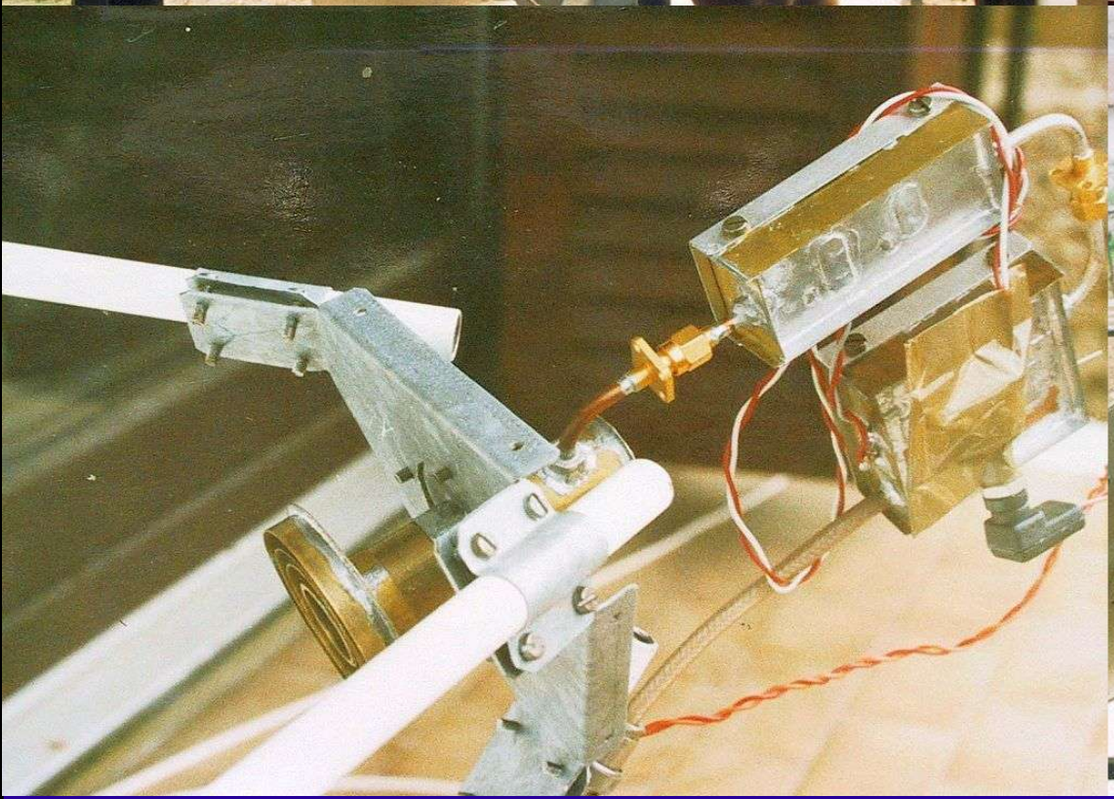


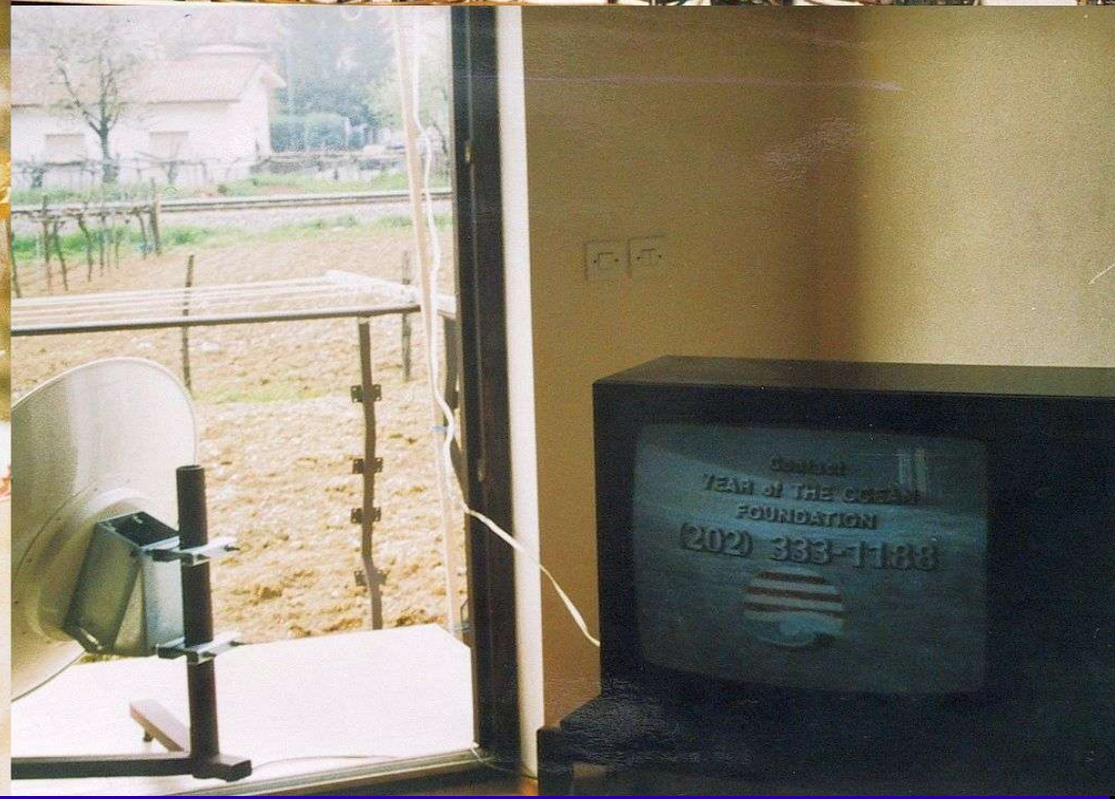




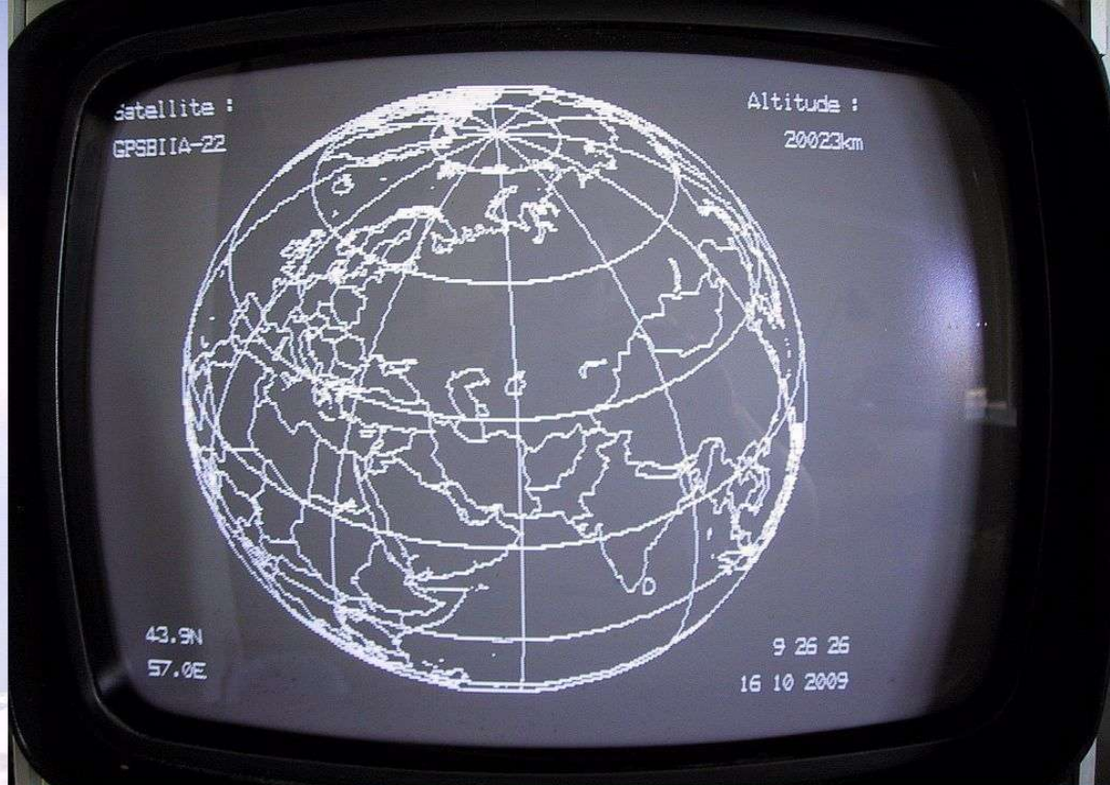
1982: sprejemnik za TV satelit Gorizont na 3.675GHz



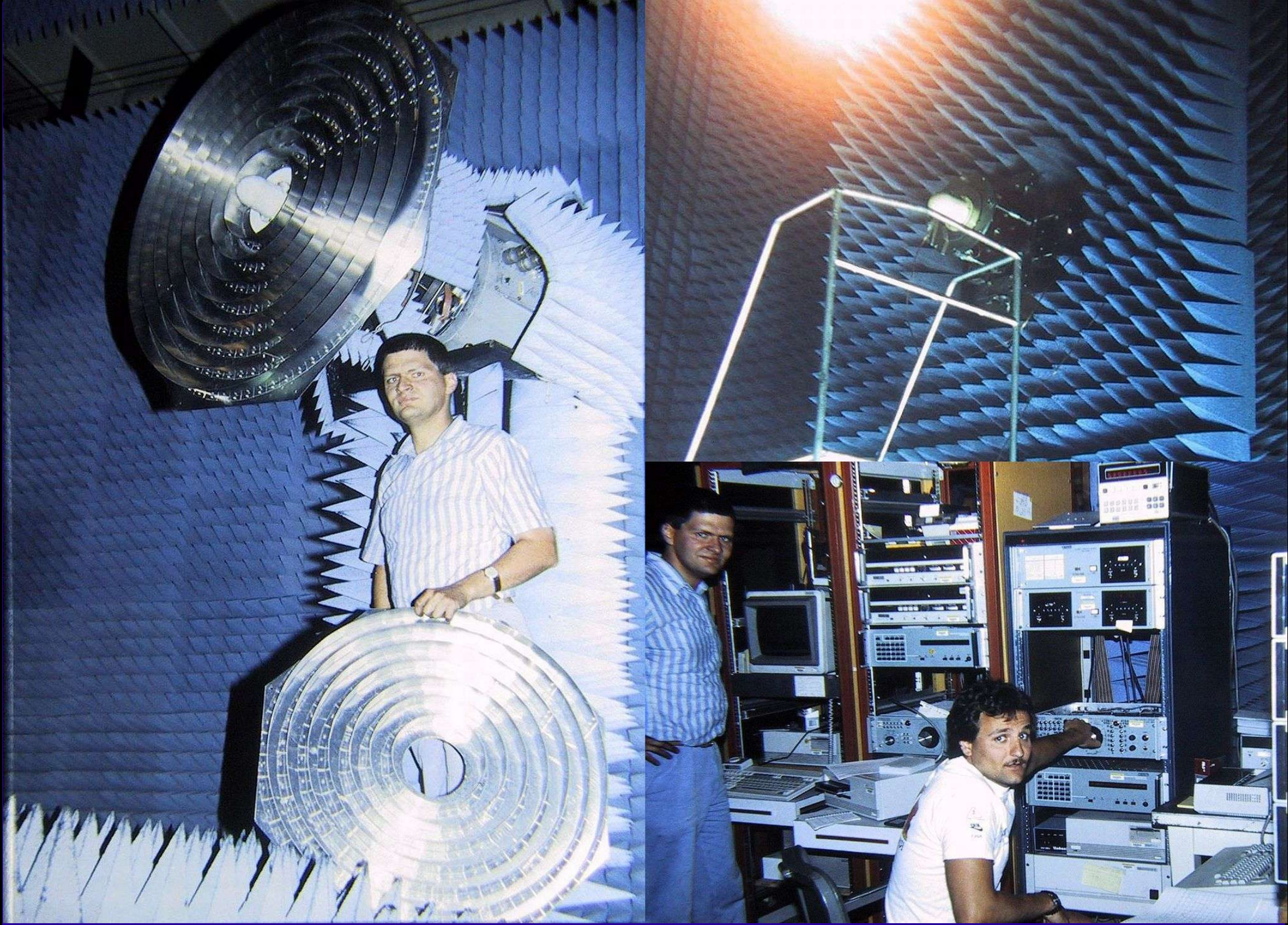




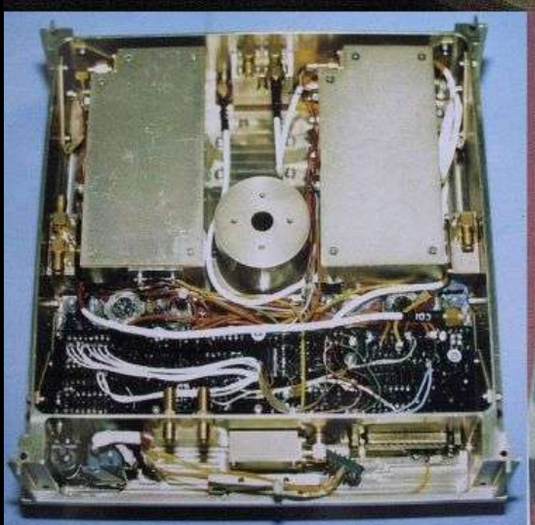
1985: TV sprejemnik za satelit ECS-1 na 11GHz

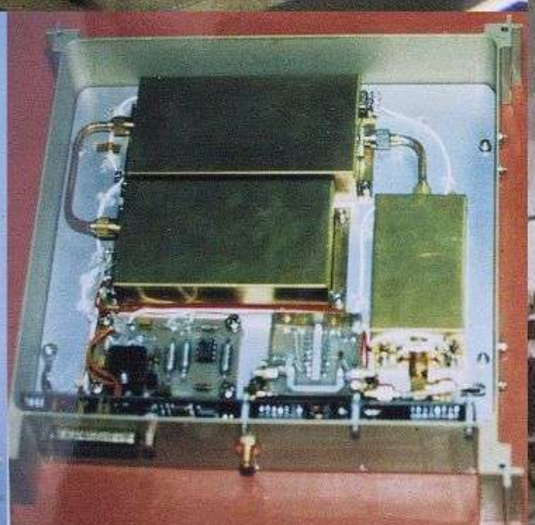


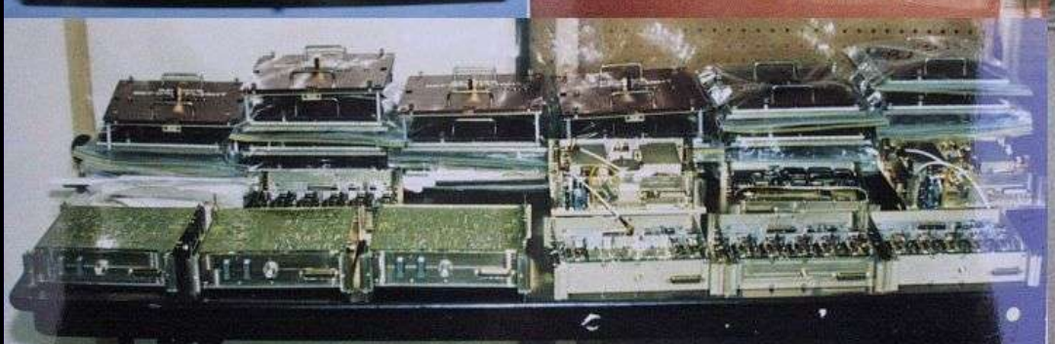
1988: izračun tirnice satelita in vodenje anten



1989: GPS prenos časa (NIST, Boulder, Colorado, ZDA)

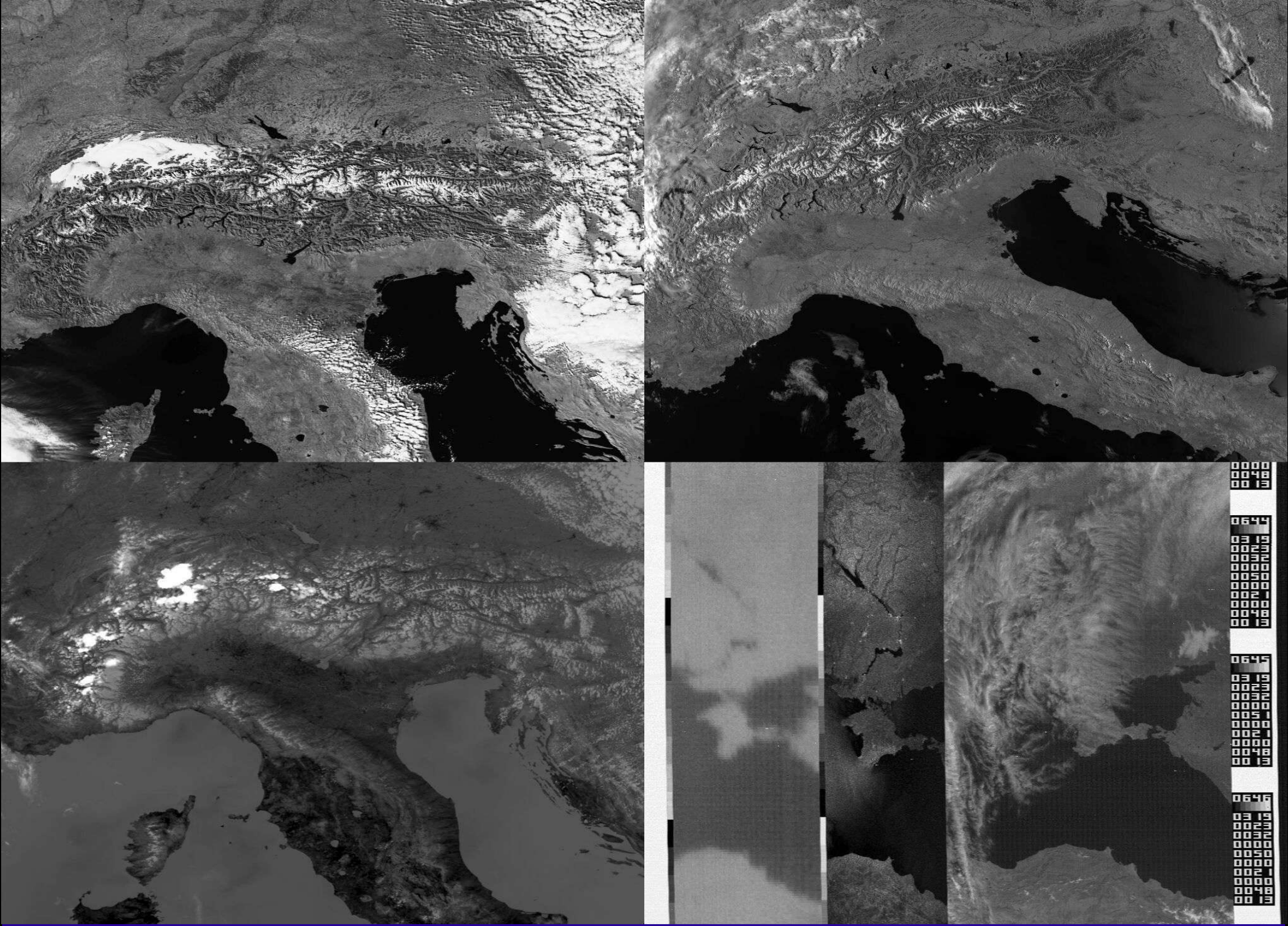






1990: oddajniki satelitov Microsat z visokim izkoristkom

1992: radionavigacijski sprejemniki GPS in GLONASS



1995: satelitske slike NOAA, FENGYUN in OKEAN (RADAR)

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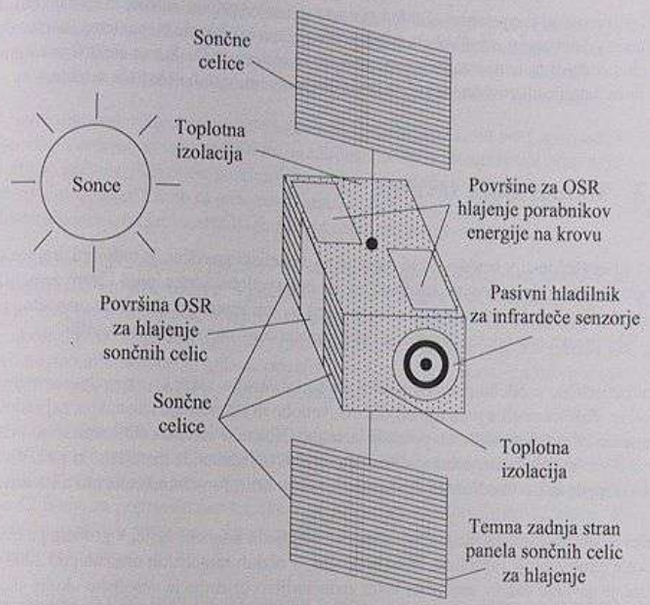
UREDNIK
DRAGO MATKO



Slika 5.4: Primeri uravnavanja toplotnih tokov na satelitu

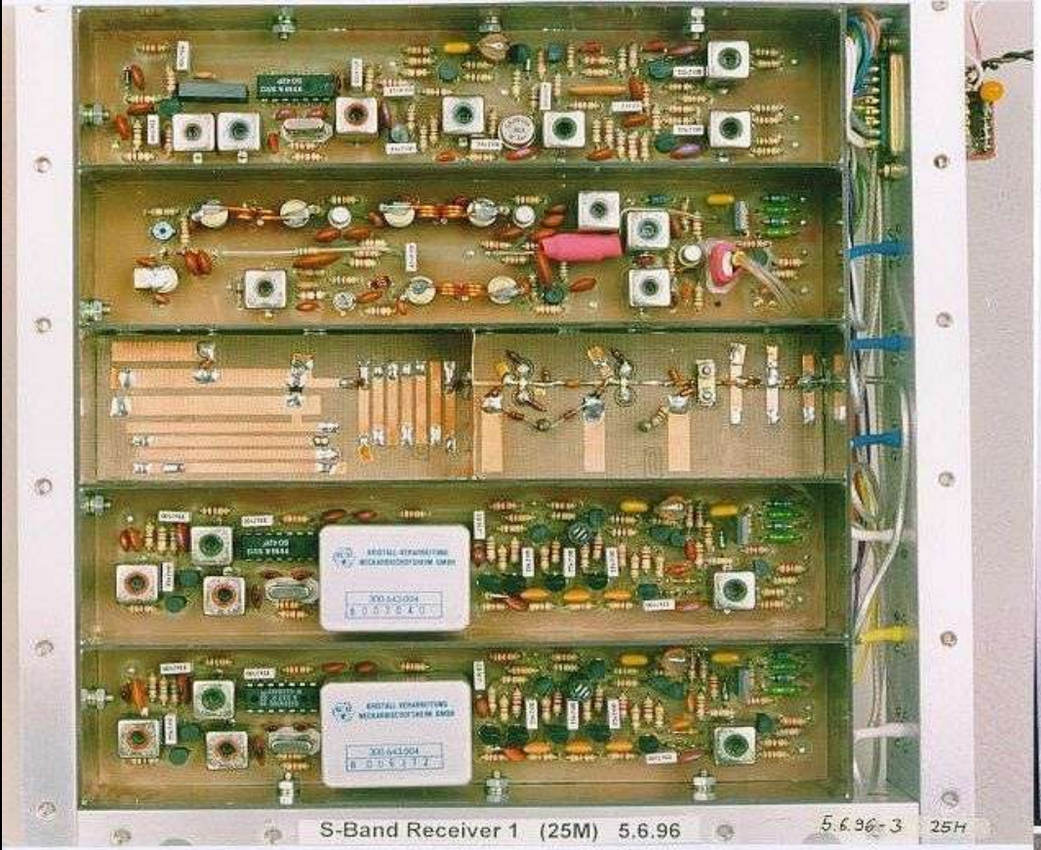
Pri nerodnih konstrukcijah satelitov je treba poskrbeti za uravnavanje temperature tudi v notranjosti samega satelita. Posamezne sestavne dele lahko segrevamo z električnimi upori. Ker upori trošijo dragoceno električno energijo na krovu, jih uporabljamo le v skrajnih slučajih oziroma tam, kjer delujejo le občasno, na primer za segrevanje ventilov z zamrznjenim gorivom za popravek tirnice.

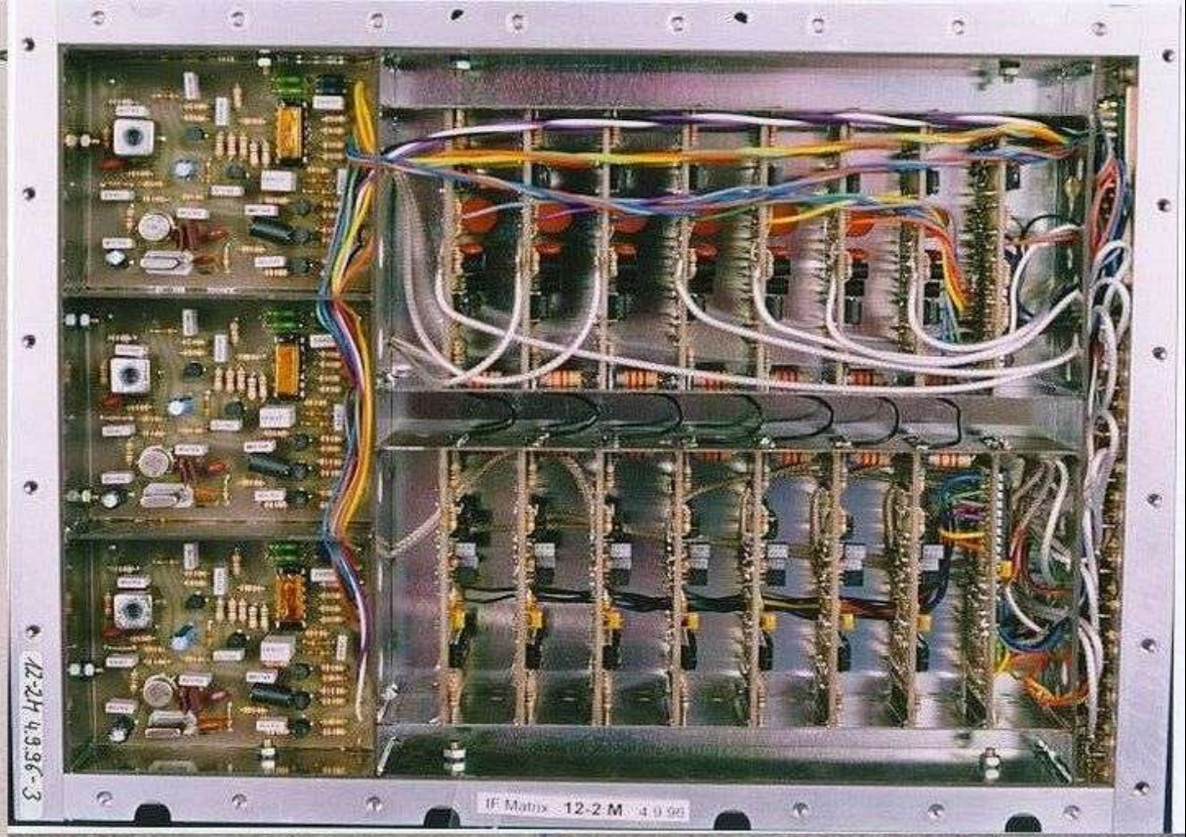
Še bolj nerodno od segrevanja je ohlajanje oziroma odvajanje toplote iz notranjosti satelita. Podoben problem predstavlja tudi prenos toplote iz osvetljene strani satelita na temno stran satelita. Ohišje sodobnih satelitov je v glavnem votlo, torej slab prevodnik toplote. Če bi ga zapolnili s kovino, ki je dober toplotni prevodnik, na primer z bakrom ali aluminijem, bi to prineslo nedopustno povečanje mase satelita.

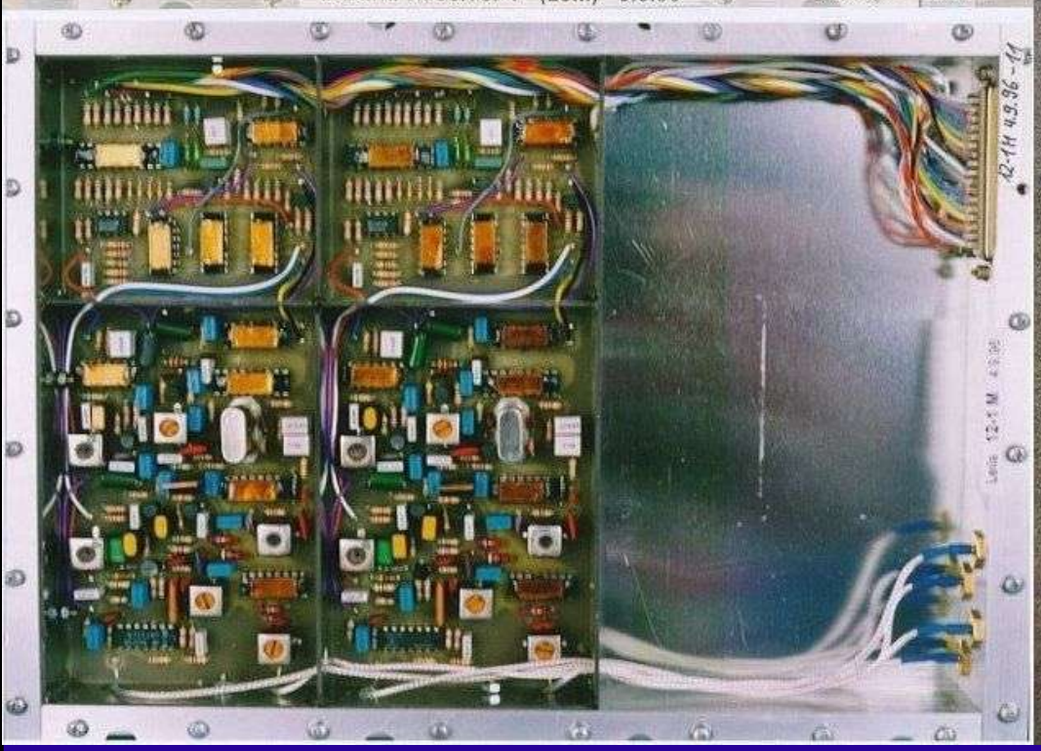
Kot učinkoviti toplotni vodniki se zato uporabljajo cevi ("Heat Pipes"), napolnjene z ustrezno zmesjo primerne tekočine in njene pare. Cevi so na koncih hermetično zavarjene, stene cevi pa so obdelane tako, da površinska napetost tekočine razporedi tekočino po celotni notranji površini cevi. Če takšno cev na enem koncu ogrevamo, se tam tekočina upari. Para potuje po sredini cevi proti hladnemu koncu, tam kondenzira in se kot tekočina spet vrača po stenah cevi na topli konec.

Na vsakem satelitu imamo tudi nekaj izpostavljenih sestavnih delov, na katerih je zelo

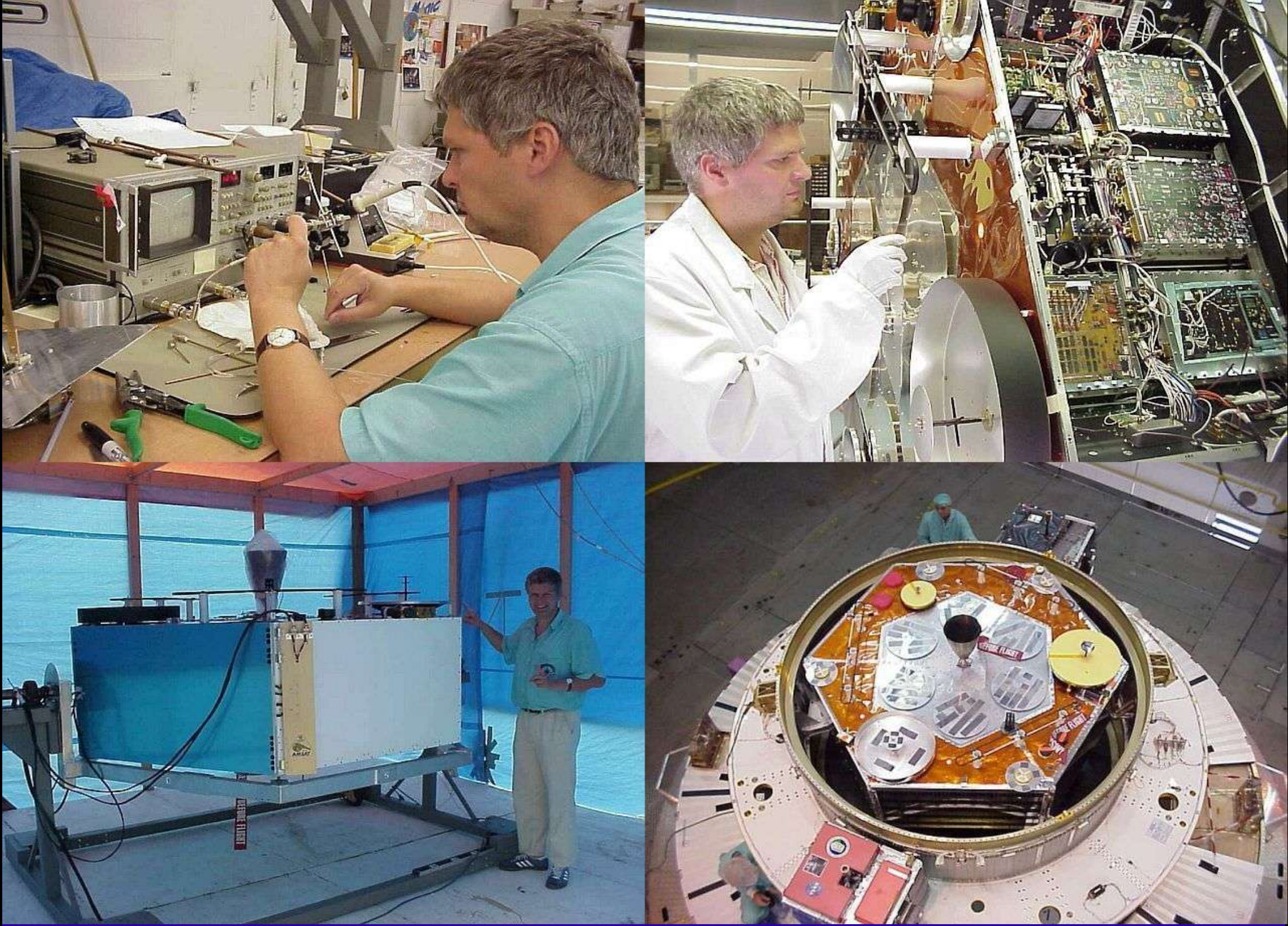
1996: knjiga "Uporaba vesoljskih tehnologij"







1997: gradniki poskusnega satelita AMSAT-P3D



2000: priprava satelita AMSAT-P3D na izstrelitev

2001: laboratorijske vaje za študente smeri UNI-TK

2006: razvoj avionike za mala in velika letala

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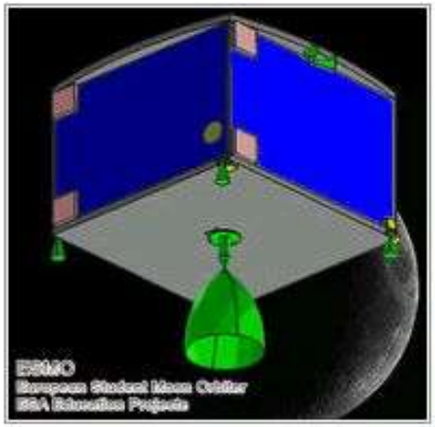

ESMO orbiting the Moon © Uni. Southampton

ESMO mission

The European Student Moon Orbiter (ESMO) is planned to be the first European student mission to the Moon.

ESMO represents a unique and inspirational opportunity for university students, providing them with valuable and challenging hands-on space project experience in order to fully prepare a well qualified workforce for future ESA missions.

In addition, ESMO has a powerful education outreach aspect and strong attraction for younger students studying in high schools across Europe, by lowering the entry-level for lunar exploration to attainable university project activities. ESMO also represents an opportunity for students to contribute to the scientific knowledge and future exploration of the Moon by returning new data and testing new technologies.

Mission objectives

- **To launch the first lunar spacecraft to be designed, built and operated by students across ESA Member States and ESA Cooperating States.**
- **To place and operate the spacecraft in a lunar orbit.**
  - An on-board chemical propulsion system will be used to transfer the spacecraft from its initial Earth orbit to a polar orbit around the Moon via the Sun-Earth L1 Lagrange point over a period of 3 months; this is done to reduce propellant consumption.
- **To acquire images of the Moon from a stable lunar orbit and transmit them back to Earth for education outreach purposes.**
  - A 2.5 kg narrow angle camera will be used for providing medium-resolution images of the lunar surface at specific locations upon request from schools.
- **To perform new measurements relevant to advanced technology demonstration, lunar science and exploration.**

More information
- European Student Moon Orbiter
- European Student Earth Orbiter

Documents
- ESMO fact sheet
- ESMO university teams

Related news
- Invitation to Tender for Student Moon Orbiter
- ESMO call for proposals for new student teams
- Student teams needed for moon mission
- Call for interest for ESEO and ESMO projects

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2009: študentsko raziskovalno plovilo Lune ESMO