

The Millimeter/Submillimeter Wave Lab

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I. Summary

- **YEAR OF FOUNDATION:** 2008.
- **SENIOR RESEARCHER:** F. P. Mena, L. Bronfman, R. Finger & N. Reyes.
- **PEOPLE:** 5 engineers, 1 postdoc, 1 mechanical technician, 2 PhD students, 4 MSc students, 2 undergrad students.
- **STUDENTS GRADUATED:** 4 PhD's, 1 MSc, 10 engineers.
- **AREAS OF EXPERTISE:**
 - Design/construction/testing of heterodyne receivers.
 - Design/construction/testing of active/passive microwave components.
 - Digital tools for Astronomy.
- **OTHER RELATED LABS AT UCHILE:** THz and Astro Photonics Lab & Space and Planetary Exploration Lab.

II. Main Lab Facilities

- **SIMULATION:** HFSS, AWR, WaspNet, μ -wave Mician.
- **FABRICATION:** High-precision CNC lathe & mill, laser prototyper, bonding machine.
- **TESTING:** VNA up to 50 GHz, SNA up to 115 GHz, anechoic chamber, probe station.
- **CRYOGENICS:** Test cryostats for components & ALMA receivers.



Fig. 1. High-precision ($\sim 1 \mu\text{m}$) CNC milling machine and lathe.

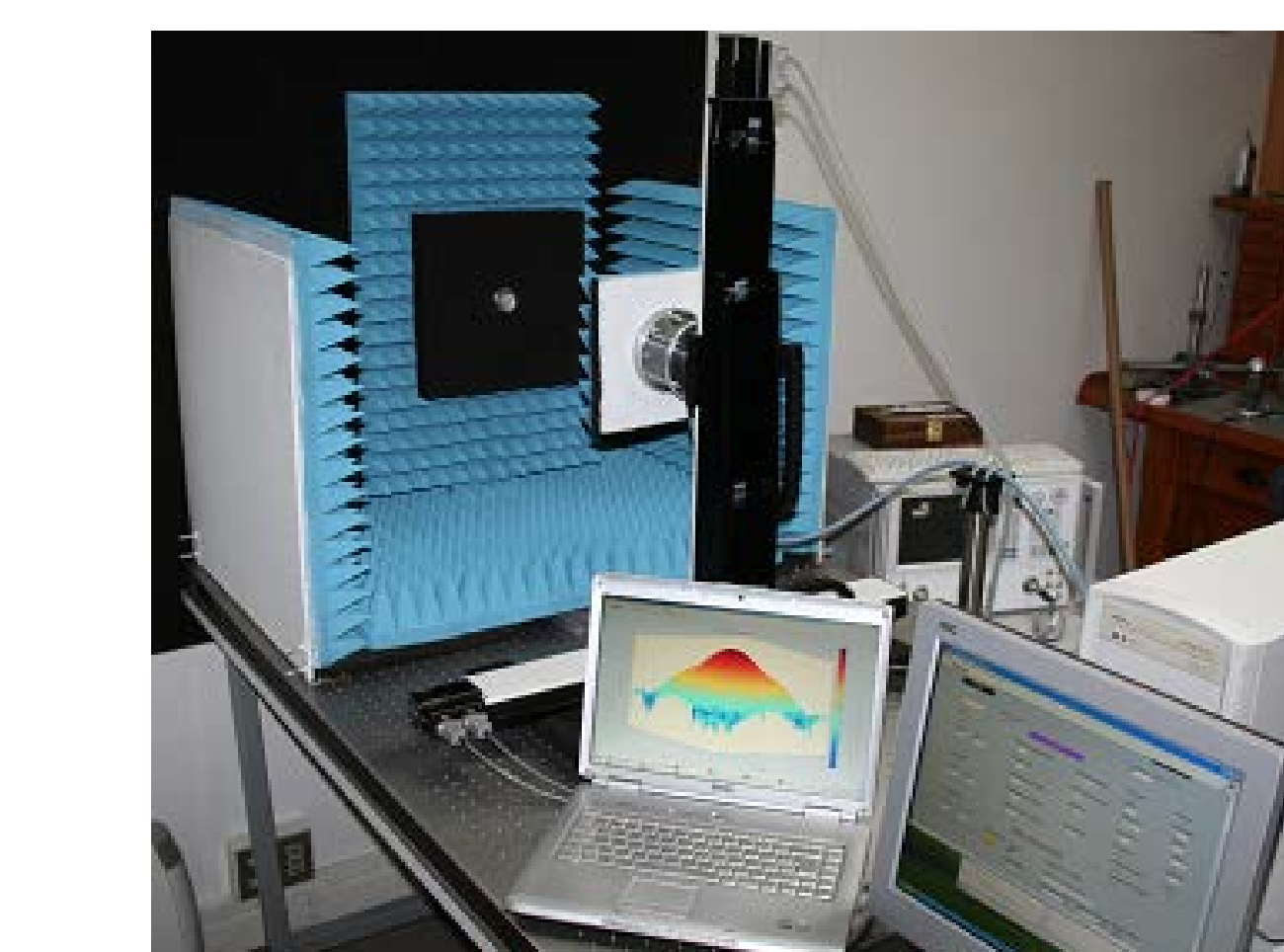


Fig. 2. Anechoic chamber for bands Q, V & W.



Fig. 3. Band-W receiver in test cryostat.



Fig. 4. ALMA test cryostat.

III. Main Projects

1. RECEIVERS FOR ALMA BANDS 1 AND 2+3.

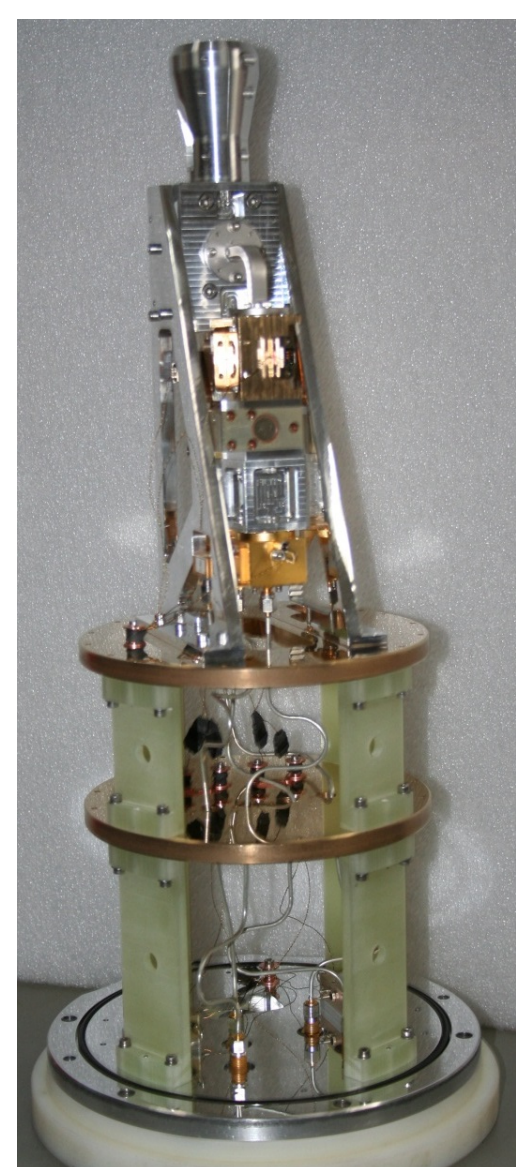


Fig. 5. Prototype receiver for ALMA B1.

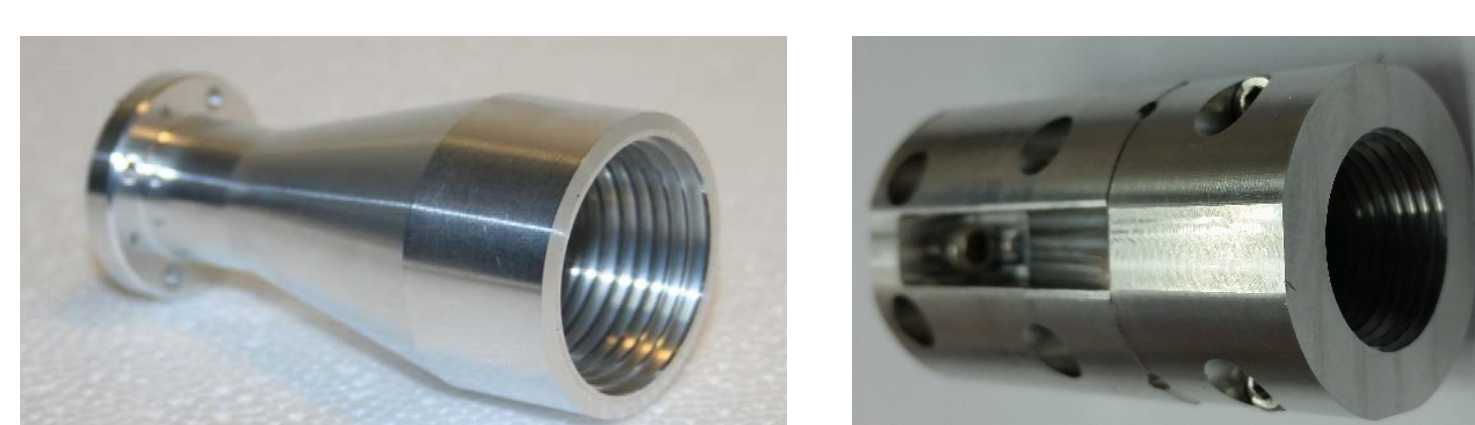


Fig. 6. Horns for Bands 1 (single block) and 2+3 (split block).

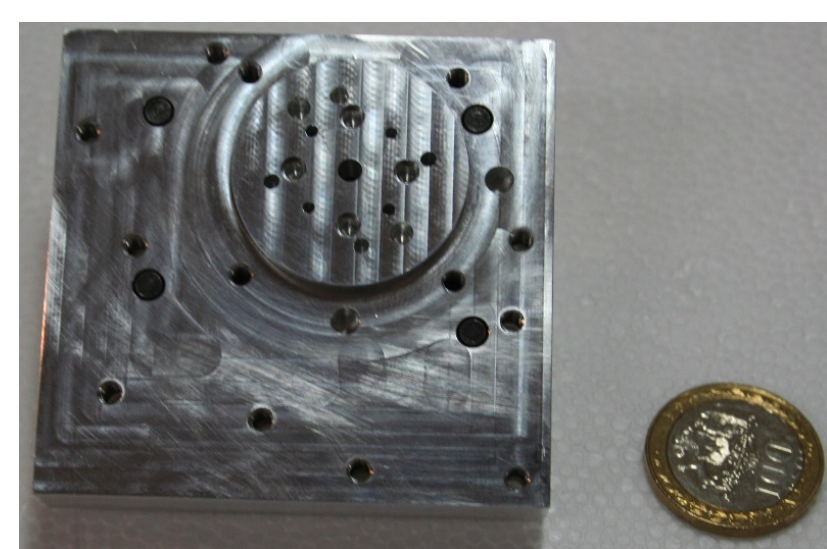


Fig. 7. OMT for Band 2+3.

2. ACTIVE COMPONENTS FOR BANDS Q AND W.

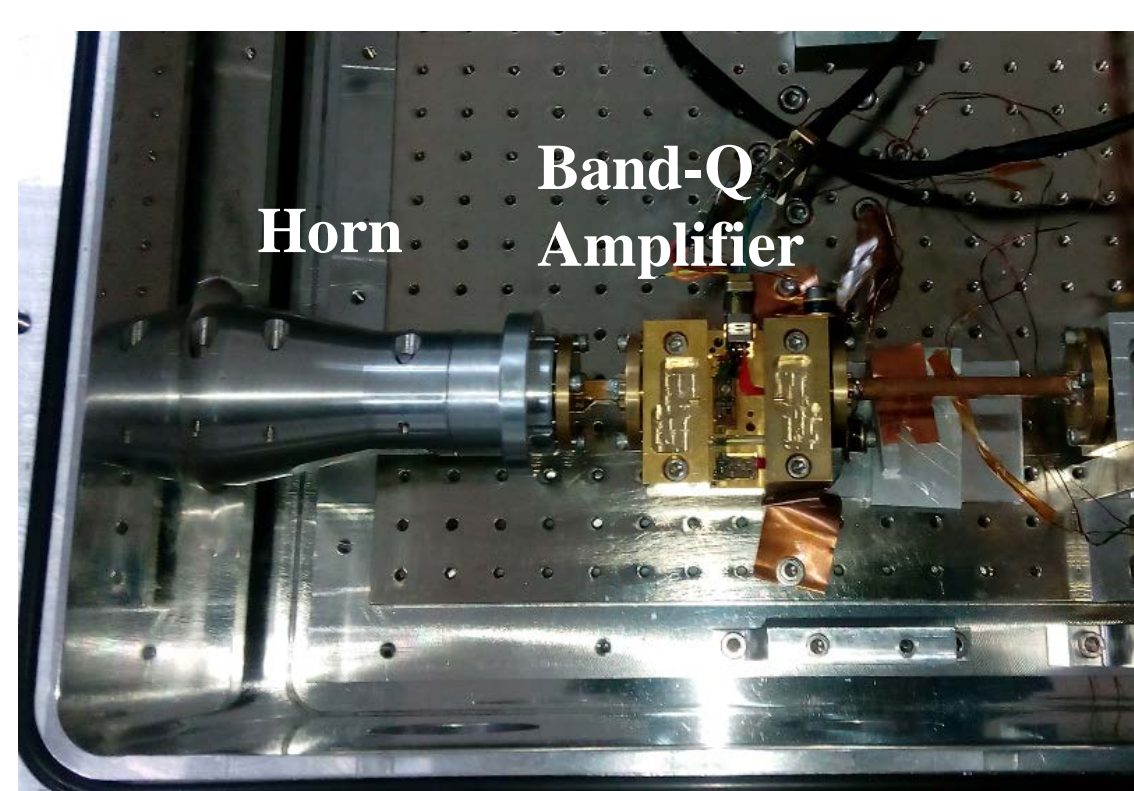


Fig. 8. Amplifier for Band Q.

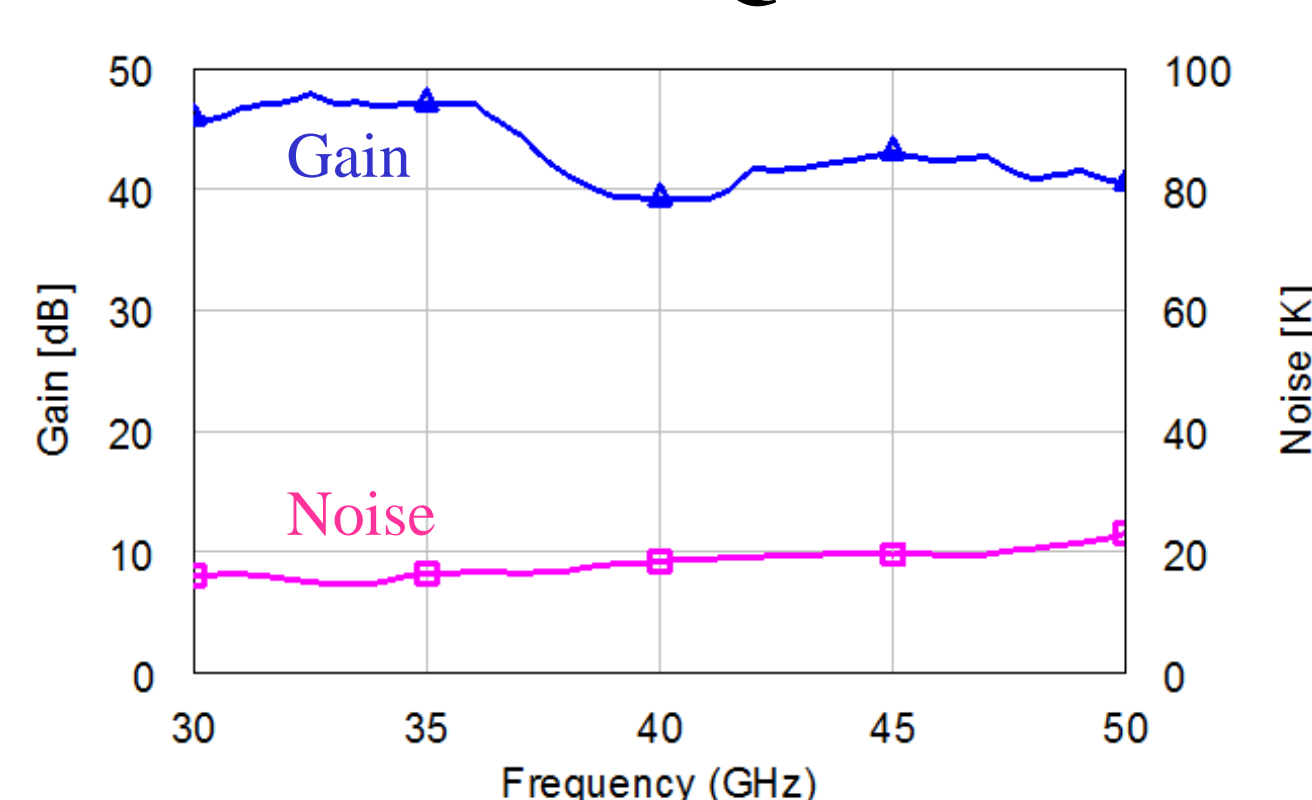


Fig. 9. Cryo 3 + commercial MMIC.

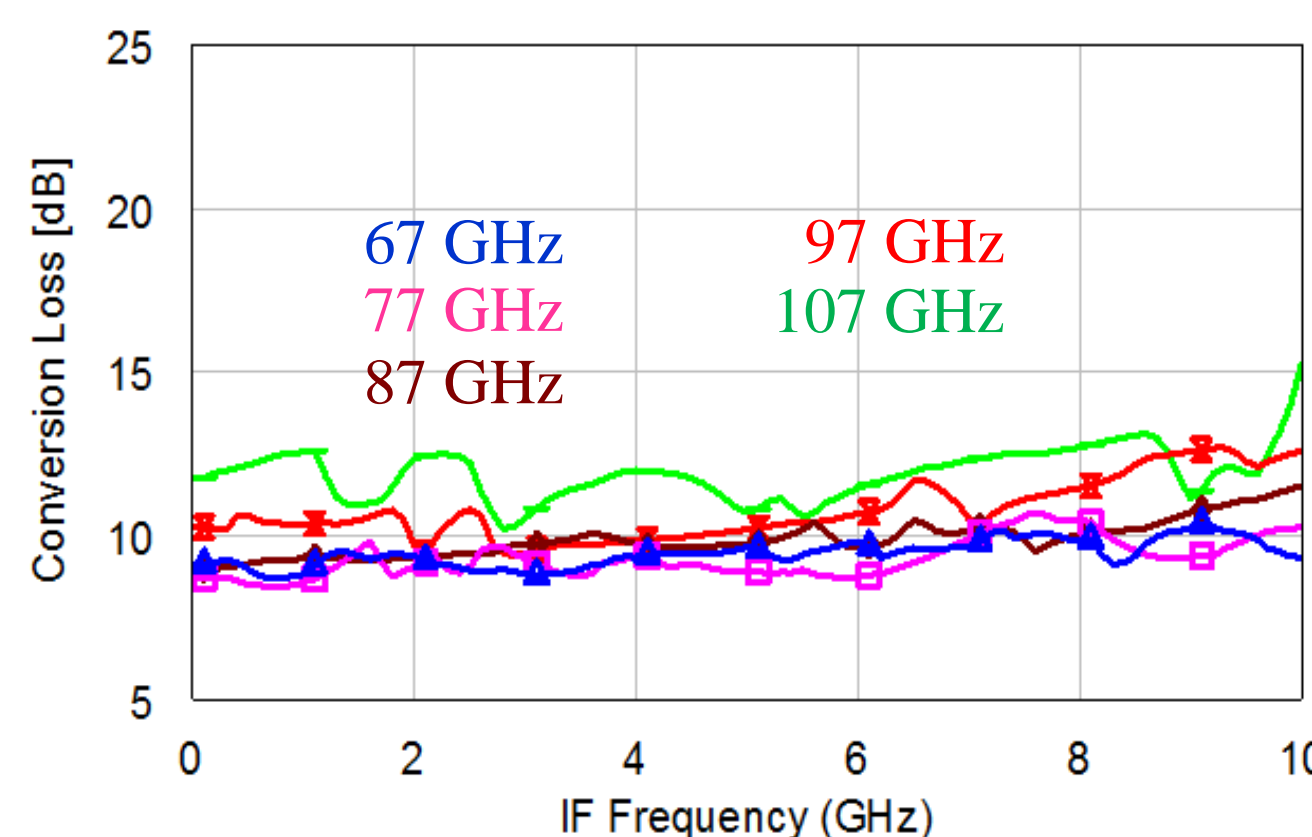


Fig. 11. Subharmonic Mixer for Band V+W.

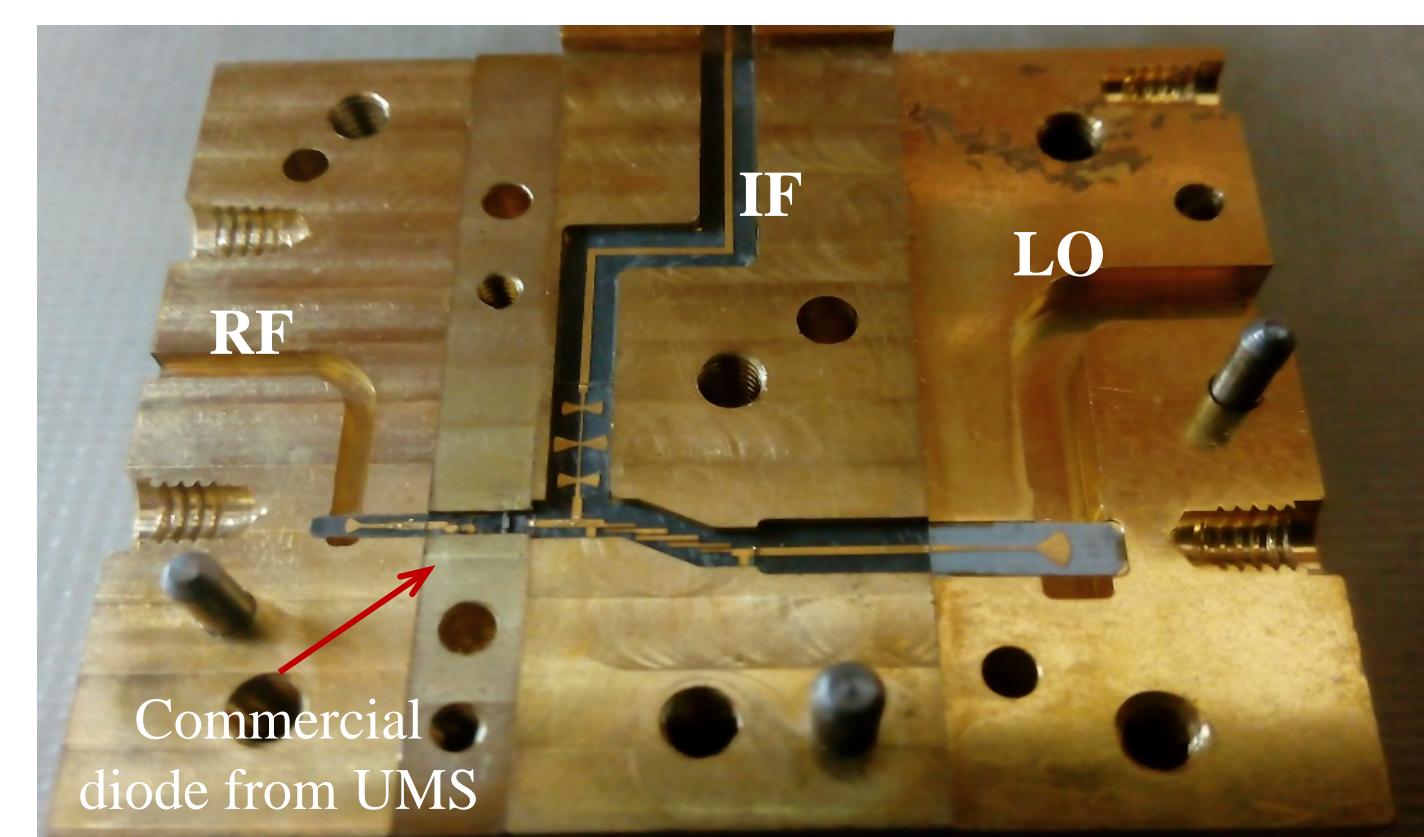


Fig. 10. Subharmonic Mixer for Band W.

3. RECEIVERS ABOVE 600 GHz (WITH SRON).

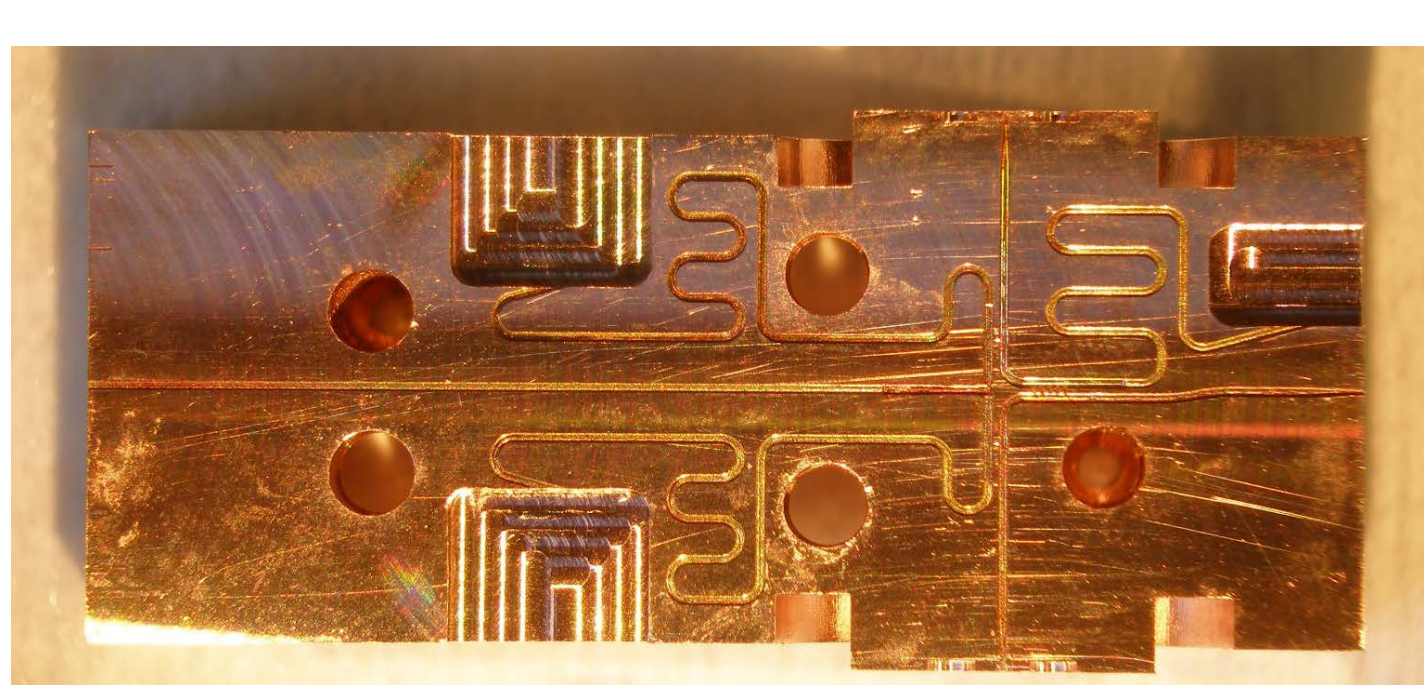


Fig. 12. Waveguide block for 650 GHz.

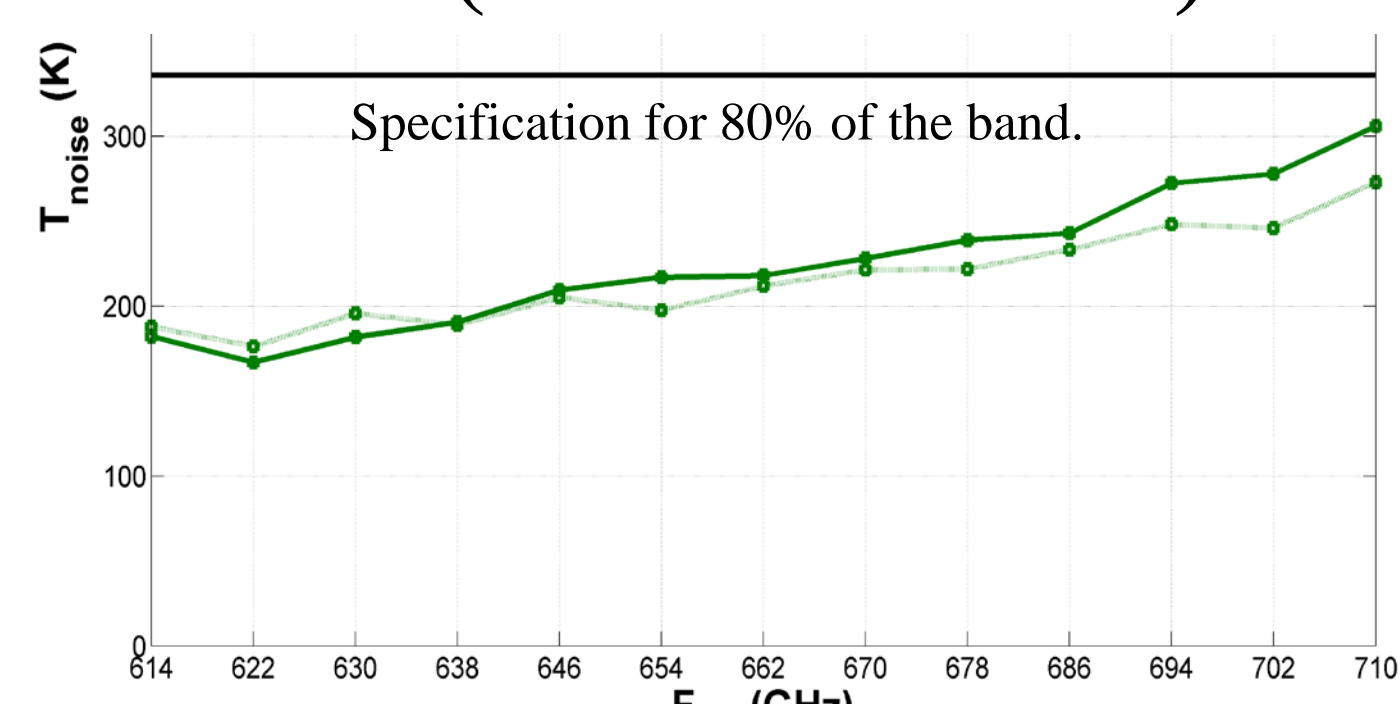


Fig. 13. Measured noise temperature.

4. DIGITAL TOOLS FOR RADIO ASTRONOMY.

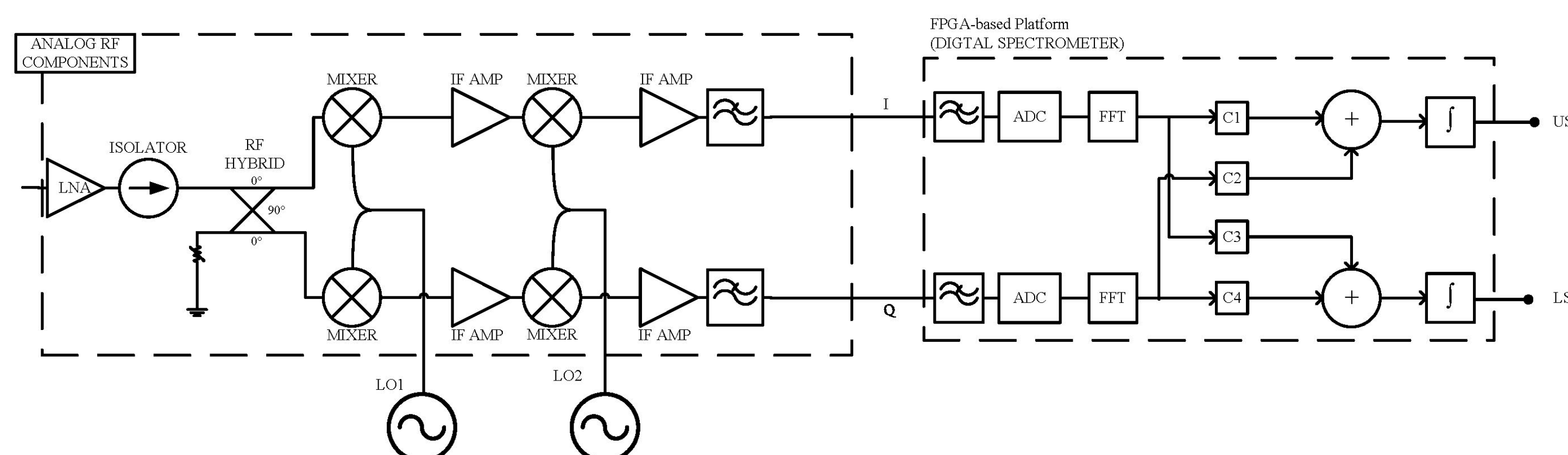


Fig. 14. Schematics of a 2SB analogue receiver with a digital IF hybrid.

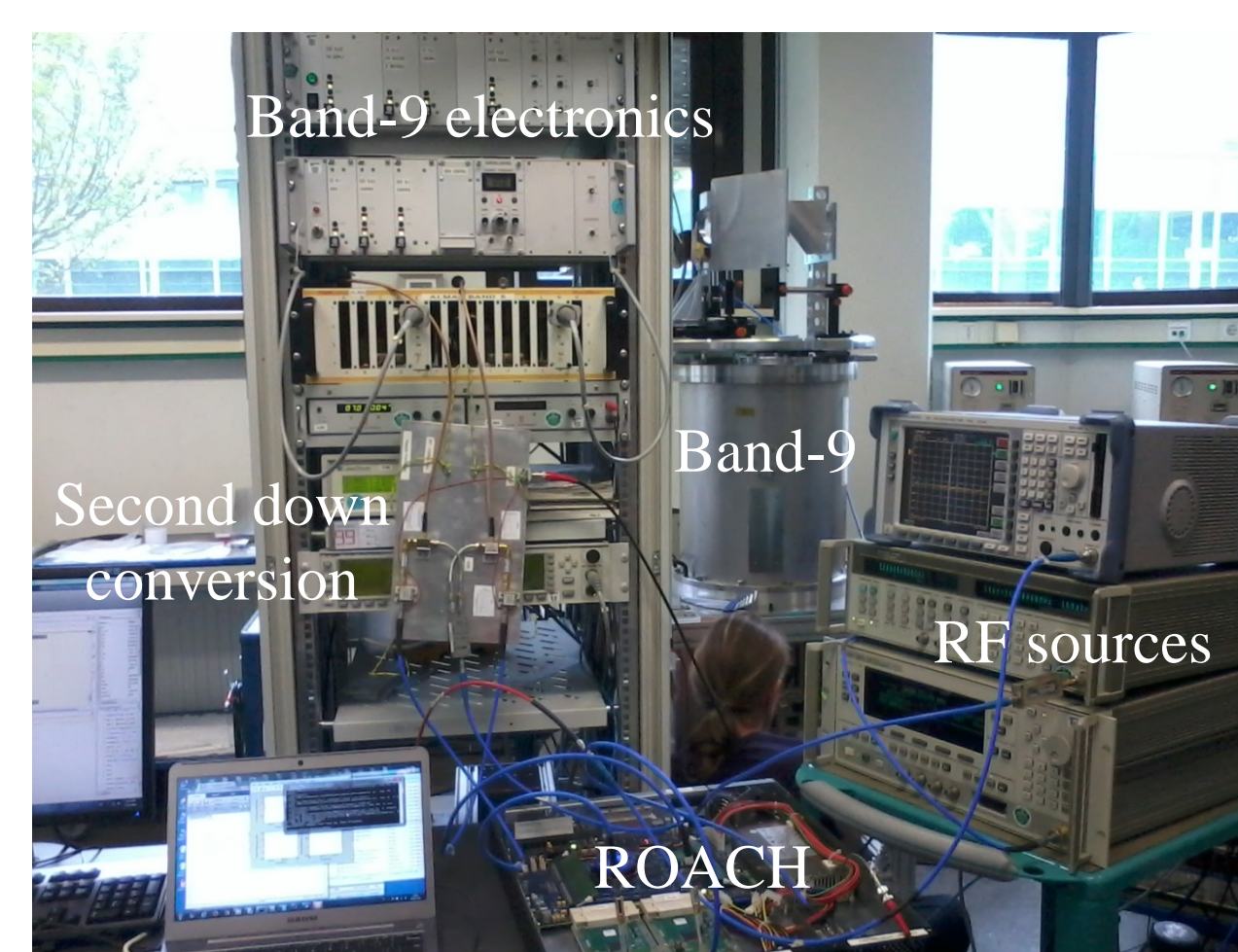


Fig. 15. Band-9 2SB receiver integrated with digital spectrometer.

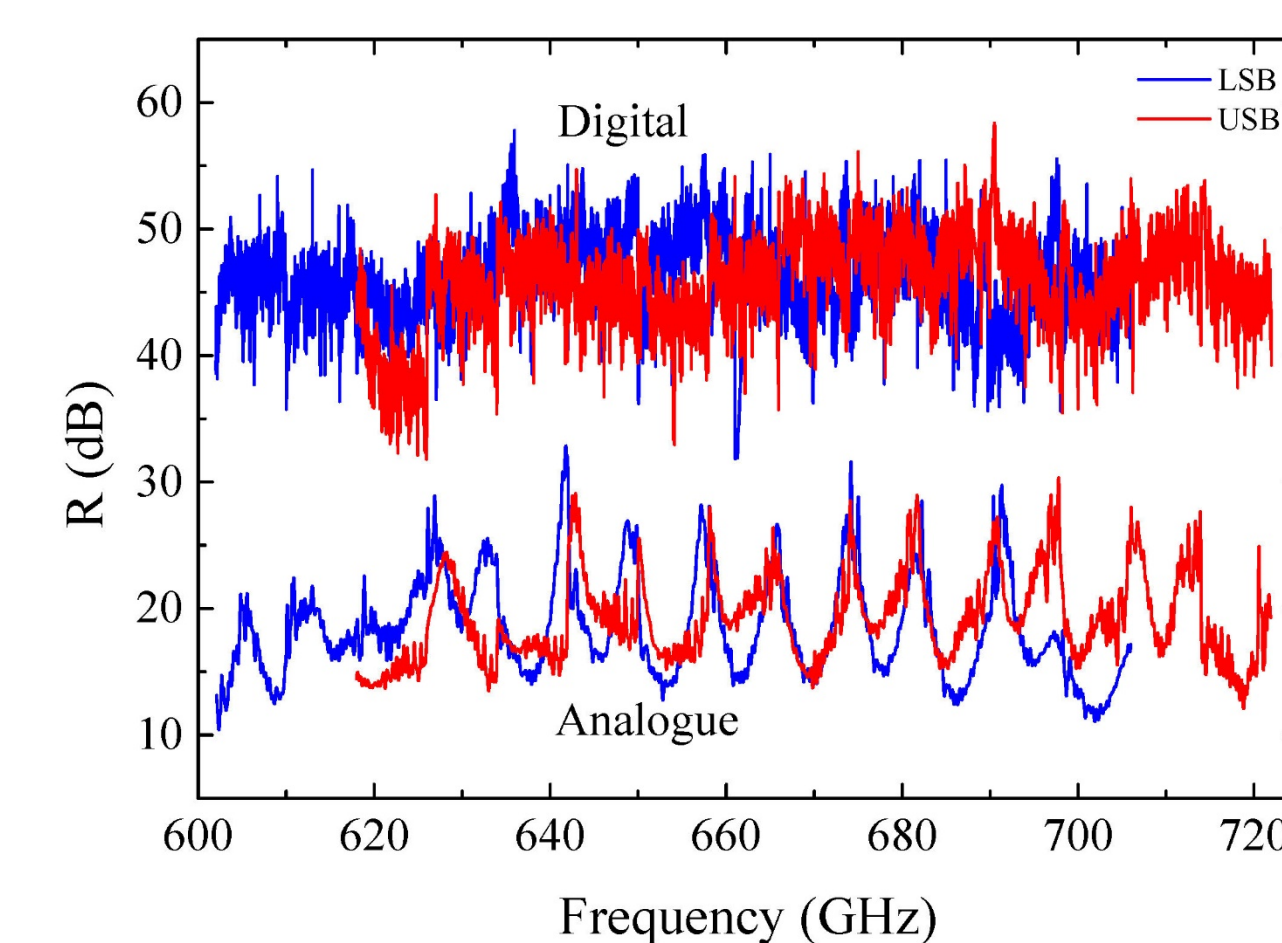


Fig. 16. Sideband rejection ratio with analogue and digital IF hybrid for Band-9 receiver.

5. UPGRADING/OPERATION OF OWN TELESCOPE.



Fig. 17. Band-W (80-115 GHz) telescope being installed.

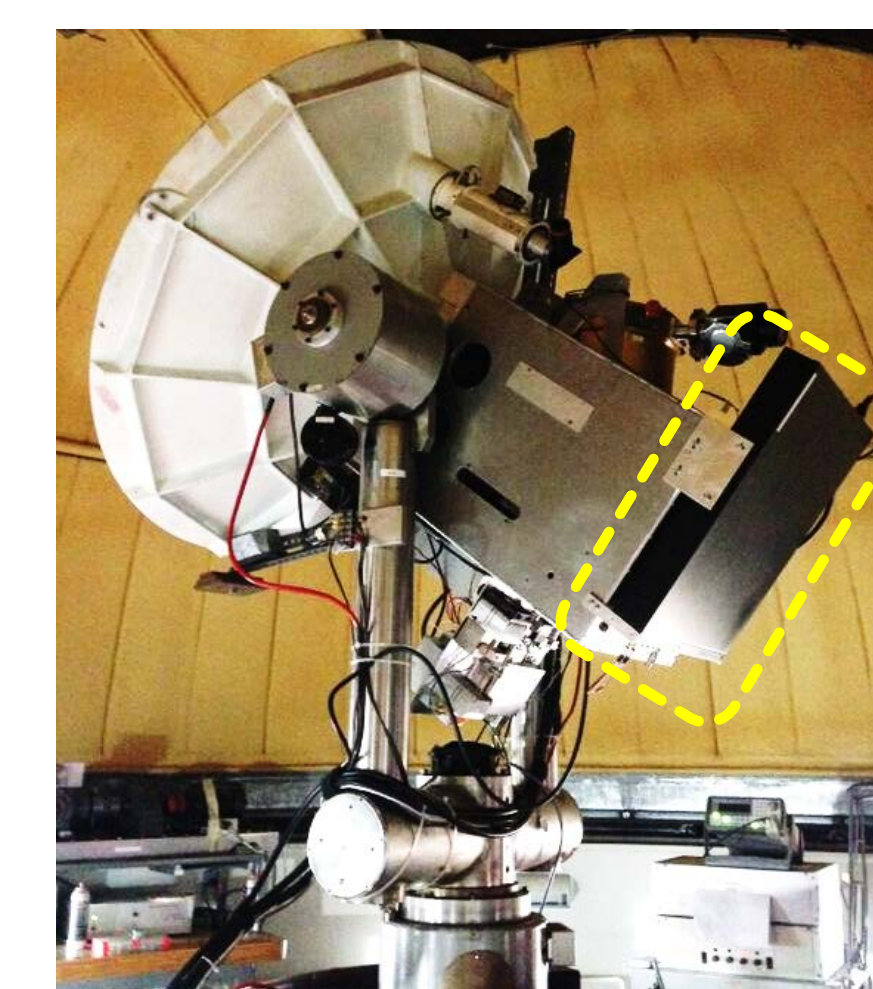


Fig. 18. New HEMT-based 2SB receiver with digital spectrometer.

6. STARTING PROJECTS.

- Receivers for LLAMA (argentinian-brazilian telescope).
- Heterodyne arrays for CCAT pathfinder (with UCologne).
- Technology transfer.

More Info?

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