

BEESAT EOL campaigns

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→ THE EUROPEAN SPACE AGENCY

- 1U Technology demonstration CubeSat's
- primary mission long complete
- No more funding for ongoing operations
- Operations taken over by Student group
- Sequential re-entries → Applying lessons learned from previous re-entries to subsequent re-entries
- EOL Campaign goals:
 - Maintain contact as long and low as possible
 - Gather data on S/C behaviour until the latest possible moment and lowest possible altitude
 - Evaluate EoL status of the S/C and possible degradation of performance

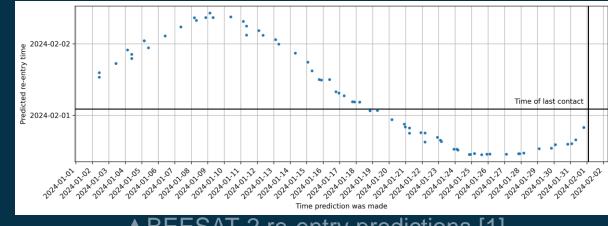








- Continues prediction of all re-entries
- Conduct final experiments
- Reducing onboard telemetry backlog as re-entry approaches

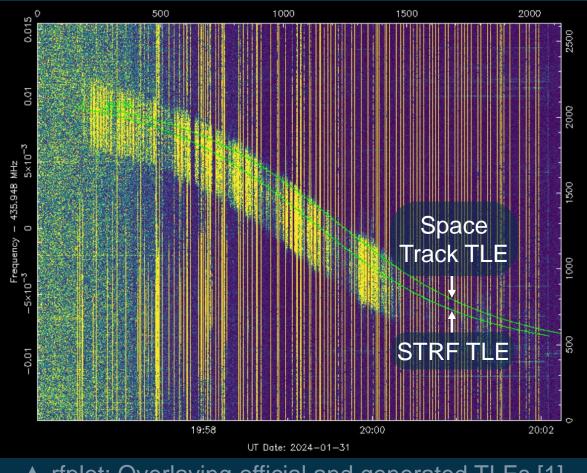


▲ BEESAT-2 re-entry predictions [1]

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- Continues prediction of all re-entries
- Conduct final experiments
- Reducing onboard telemetry backlog as re-entry approaches
- Monitor TLE accuracy through Radio frequency tracking

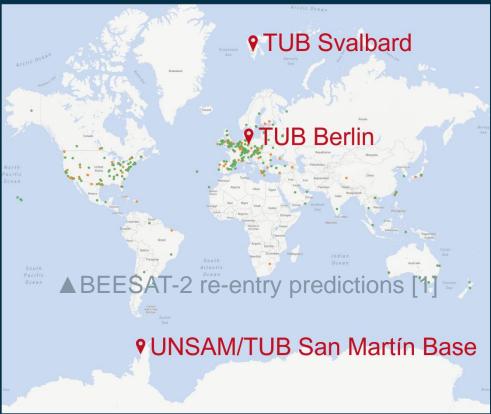


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- Continues prediction of all re-entries
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- Monitor TLE accuracy through Radio frequency tracking
- Utilizing SatNOGS and Involving HAM community
 - Transmitting Telemetry beacons over SatNOGS stations

SatN©GS NETWORK



▲ SatNOGS & TUB ground stations

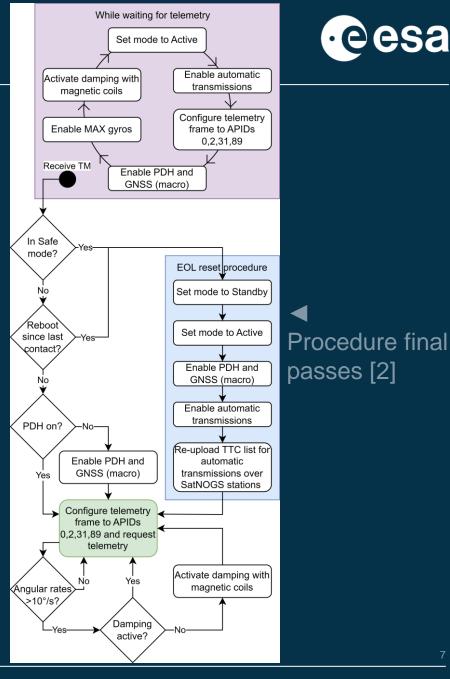
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- Prepare S/C for EoL
 - Enter predefined EoL State
 - Close monitoring of all space and ground systems

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▲ Live RF spectrum monitoring during final passes

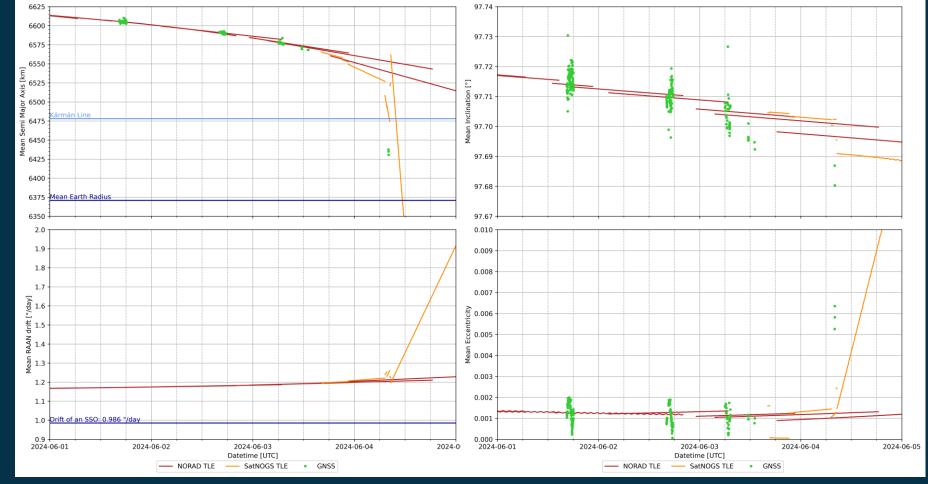
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- Prepare S/C for EoL
 - Enter predefined EoL State
 - Close monitoring of all space and ground systems
- Prepare a complete decision tree for the final passes



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▲ mean orbital elements BEESAT-9, TLE and GNSS [2]



• GNSS Data (BEESAT-9)

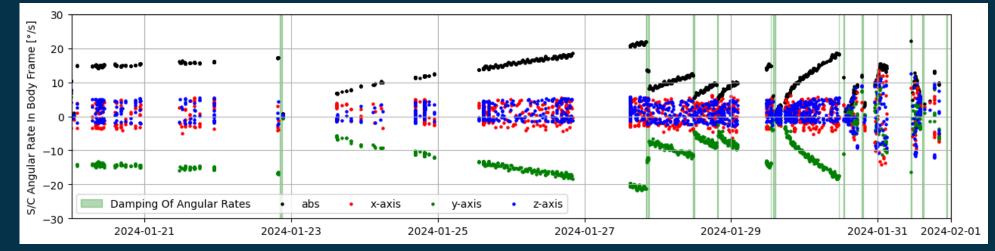
Available Data



Available Data



- GNSS Data (BEESAT-9)
- AOCS Data (BEESAT-2,4 and 9)



▲ Angular rates BEESAT-2 [1]

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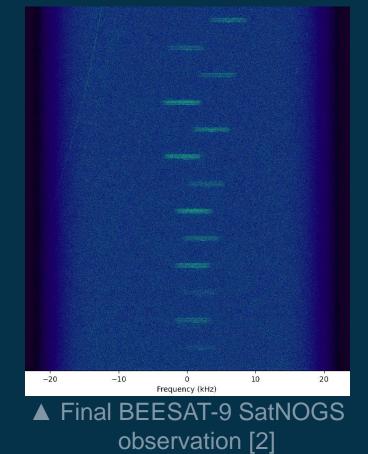
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Available Data

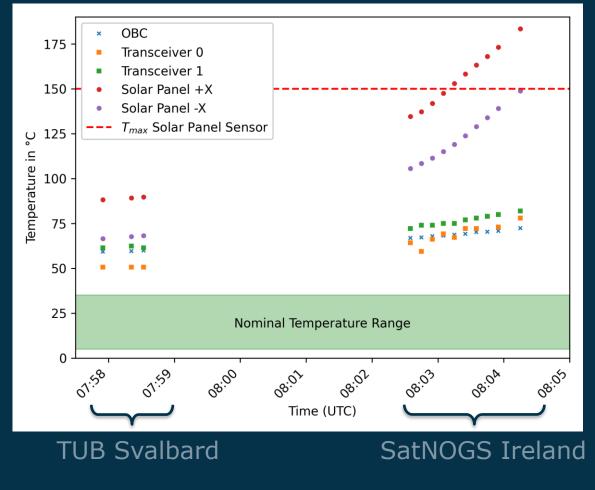


- GNSS Data (BEESAT-9)
- AOCS Data (BEESAT-2,4 and 9)
- Thermal Data (BESAT-2,4 and 9)



Temperatures of selected BEESAT-9 sensors

▼ shortly before re-entry [2]



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Associated Publications and links



LESSONS LEARNED FROM OPERATING THREE CUBESATS UNTIL THEIR CONSECUTIVE RE-ENTRIES

. Julian Harbeck¹, Antan Jahann Große Sitstrup¹, Victoria Koñack¹, Oisín Smith¹, Linus Streibert¹, Tony Erdmann¹, Sascha Kapitola¹, Sebastian Grau¹, Emrico Stoll¹

¹Testinitadia Universitat Berlin, Chair of Ignau Technology, Mercinist. 12-14, 22-1038: Berlin, 149-314-21623, kerheckigin-berlin de Mar 29, 2014

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1 INTRODUCTION

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DIC-29-DRUB/S7, (RSNS)

BEESAT'9 Re-Entry: Applying Lessons Learned from Operating Provinus BEESAT Re-Entries

Jalim Harbech[®], Anton Greile Siestung[®], Alfredor-Panagiotis Bandadis⁹, Victoria Kobach[®], Okin Smith[®], Linn Streillert[®], Tany Releann[®], Sacha Kopitalis[®], Salanian Gran[®], Turier Staff[®] "Releaseds Advances Review Color Streve Streidener Formit Instruction Victoriana".

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[2] BEESAT-9 Re-Entry: Applying Lessons Learned from Operating Previous BEESAT Re-Entries, IAC 2024 Available on ResearchGate

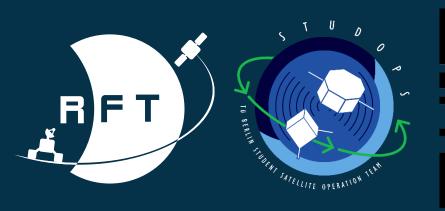
Available Data



Last 6 months of telemetry from BEESAT-2,4 and 9 are available for download in .csv format on the TU-Berlin Website

BEESAT-9

- Standard housekeeping data
- GNSS Data
- TM from Electrical and Thermal subsystems
- AOCS TM



BEESAT-4

- Standard housekeeping data
- TM from Electrical and Thermal subsystems
- AOCS TM
- Extended AOCS TM

BEESAT-2

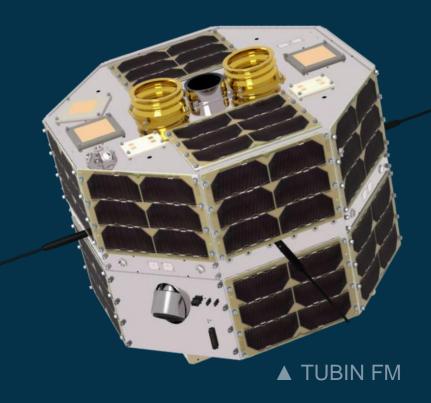
- Standard housekeeping data
- TM from Electrical subsystem
- TM from Thermal subsystem
- AOCS TM
- Extended AOCS TM

https://www.tu.berlin/en/raumfahrttechnik/teaching/studentinitiatives/studops/experiments#c2358487

Outlook TUBIN Re-Entery Q3 2025



- 22.5 kg earth observation spacecraft
- S and X Band Downlink
- Continuous GNSS observations
- Drag reduction campaign





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