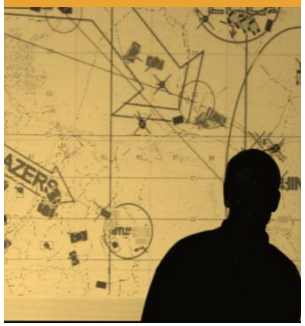
SRI International



CubeSat Communications Update

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SRI International
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CubeSat Summer Workshop
Utah State University, Logan, Utah
2 August 2014

ISILaunch-07

- 19 June 2014, Dnepr from Yasny
- UniSat-6 NanoSat
  - 2 CalPoly PPODs integrated by Tyvak (TLS-01)
  - 1 GAUSS PEPPOD
- 5 ISIS QuadPacks
  - 58U deployed, one 2U mass model wired in

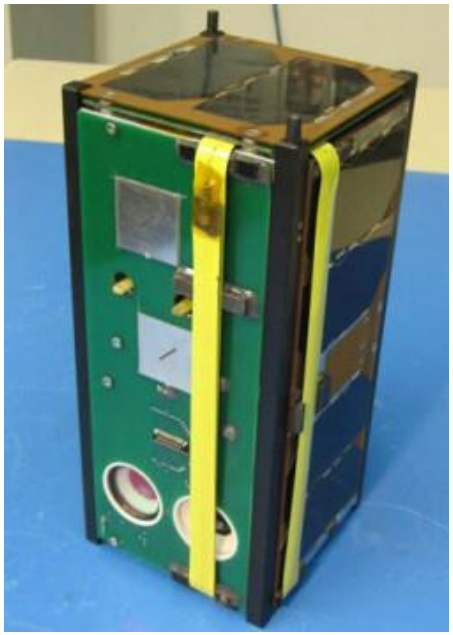
UniSat-6

Dnepr Space Head Module

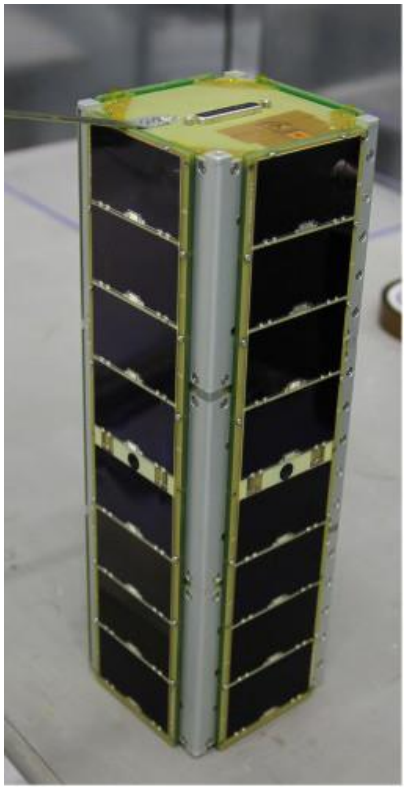
Photos from GAUSS/ISIS Launch Blog

ISILaunch-07: UniSat-6 CubeSats

- AntelSat (2U)
  - First Uruguayan satellite
  - 100 mW CW: 437.280 MHz
  - 1200 baud FSK: 437.575 MHz
  - 1 Mbps GFSK: 2.403 GHz
  - Amateur license
- AeroCube-6 (2x 0.5U)
  - CC1101: 915 MHz
  - Experimental license
- LEMUR-1 (3U)
  - AstroDev Lithium: 402 MHz
  - AstroDev Beryllium: 2.4 GHz
  - Experimental license
- TigriSat (3U)
  - Built by Iraqi students at GAUSS



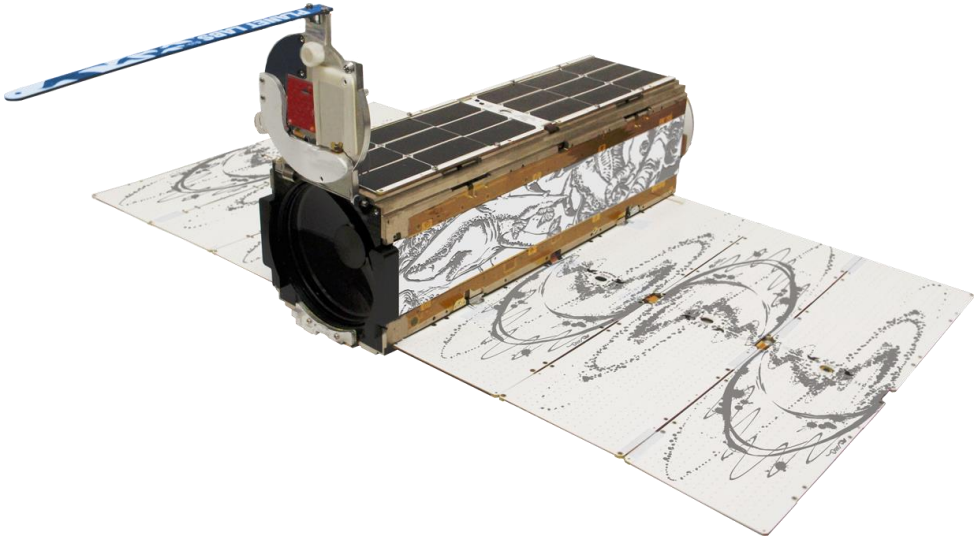
AntelSat



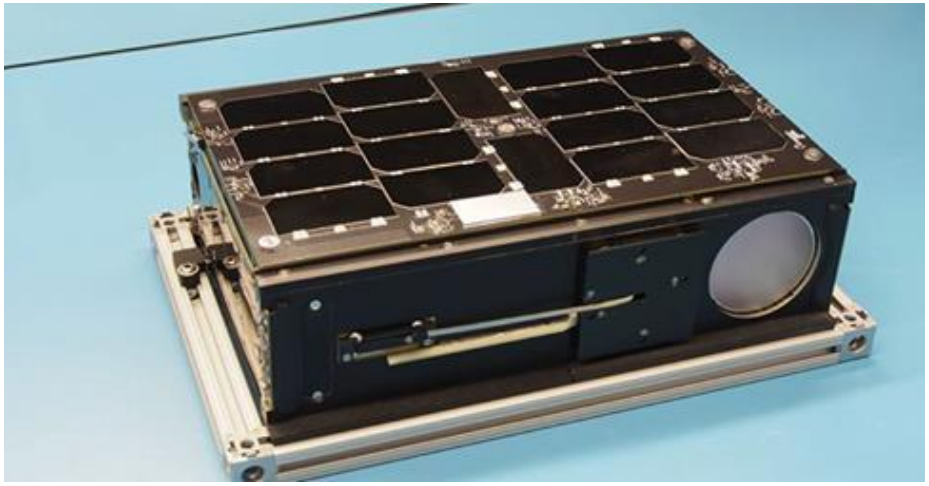
TigriSat

Photos from GAUSS

ISILaunch-07: Commercial Satellites



- Flock 1 (11x 3U)
  - TT&C: 402 MHz
  - Image downlink: 8.2 GHz
  - Full commercial license
- Perseus-M (2x 6U)
  - TT&C: 402 MHz
  - AIS downlink: 26.8 GHz
  - Experimental license



Perseus-M

ISILaunch-07: QB50 Precursor Missions

- QB50P1 (2U)
  - Built by ISIS
  - FUNcube-3 linear transponder
  - 9600 bps BPSK: 145.815 MHz
- QB50P2 (2U)
  - Built by ISIS
  - FM transponder UHF up/VHF down
  - 9600 bps BPSK: 145.880 MHz

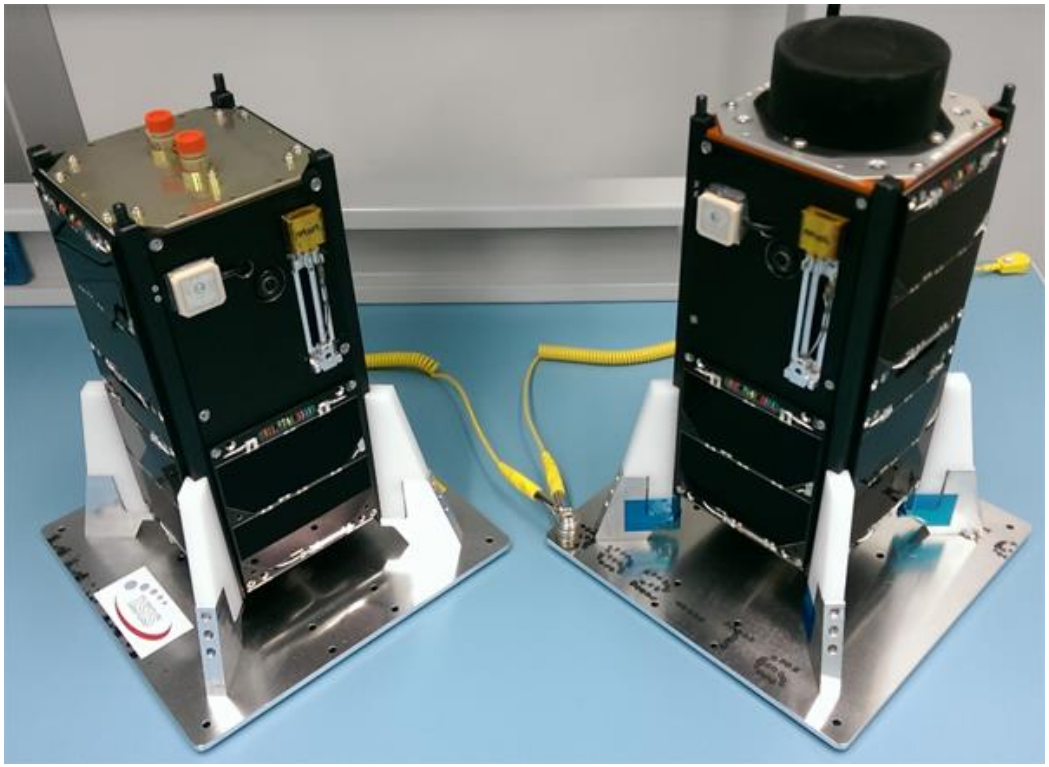
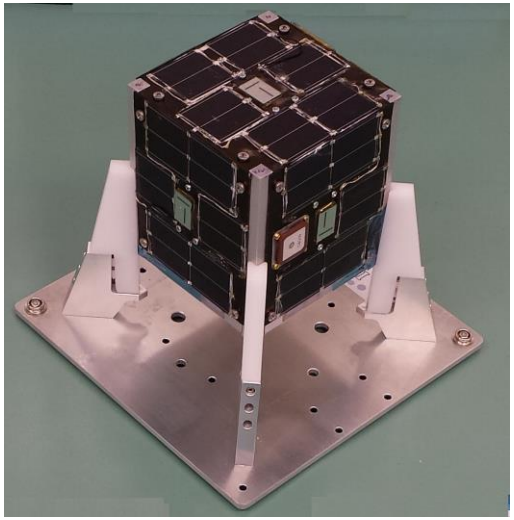


Photo from ISIS Launch Blog

ISILaunch-07: Educational CubeSats

- DTUSat-2 (1U)
  - Built by Technical University of Denmark
  - CW and FSK data on 2.401 GHz, 220 mW
  - Tracking migrating birds across Europe and Africa
  - Amateur licensed
- PolyITAN-1 (1U)
  - National Technical University of Ukraine
  - First CubeSat from Ukraine
  - Demonstration mission
  - 1200 baud AFSK at 437.675 MHz , 600 mW
  - Amateur licensed

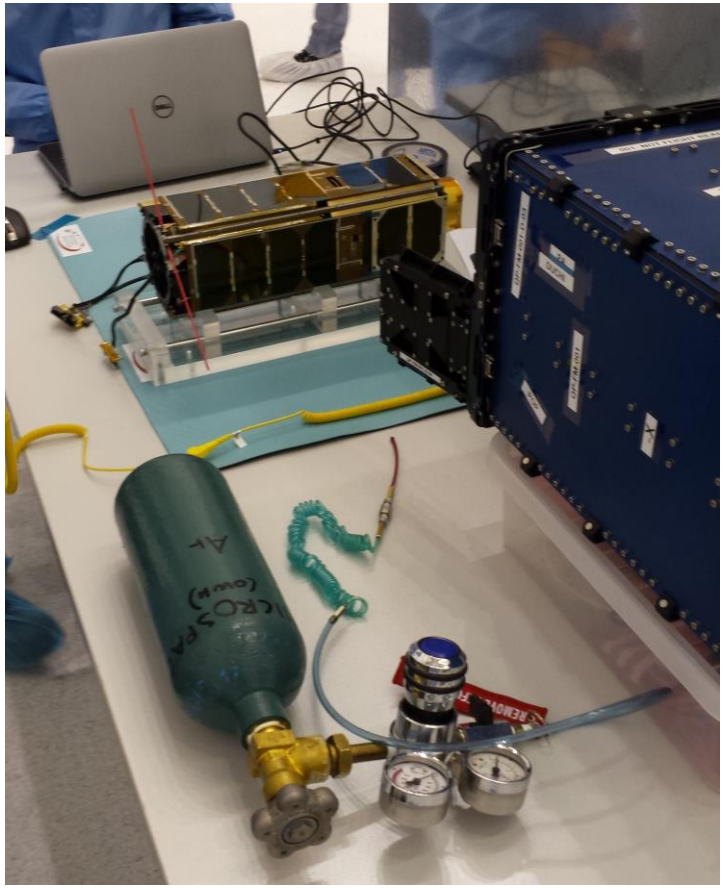


PolyITAN-1

Photo from ISIS Launch Blog

ISILaunch-07

- Duchifat-1 (1U)
  - Herzliya Science Centre, Israel
  - APRS digipeater on 145.825 MHz
  - ISIS TRXUV transceiver
- NanoSatC-Br 1 (1U)
  - 145.865 MHz
  - Amateur license
- PACE (2U)
  - National Cheng Kung University, Taiwan
  - Attitude experiments
- POPSAT-HIP-1 (3U)
  - Singapore
  - 437.405 MHz
  - Argon cold-gas propulsion
  - Amateur license



POPSAT-HIP-1 Integration

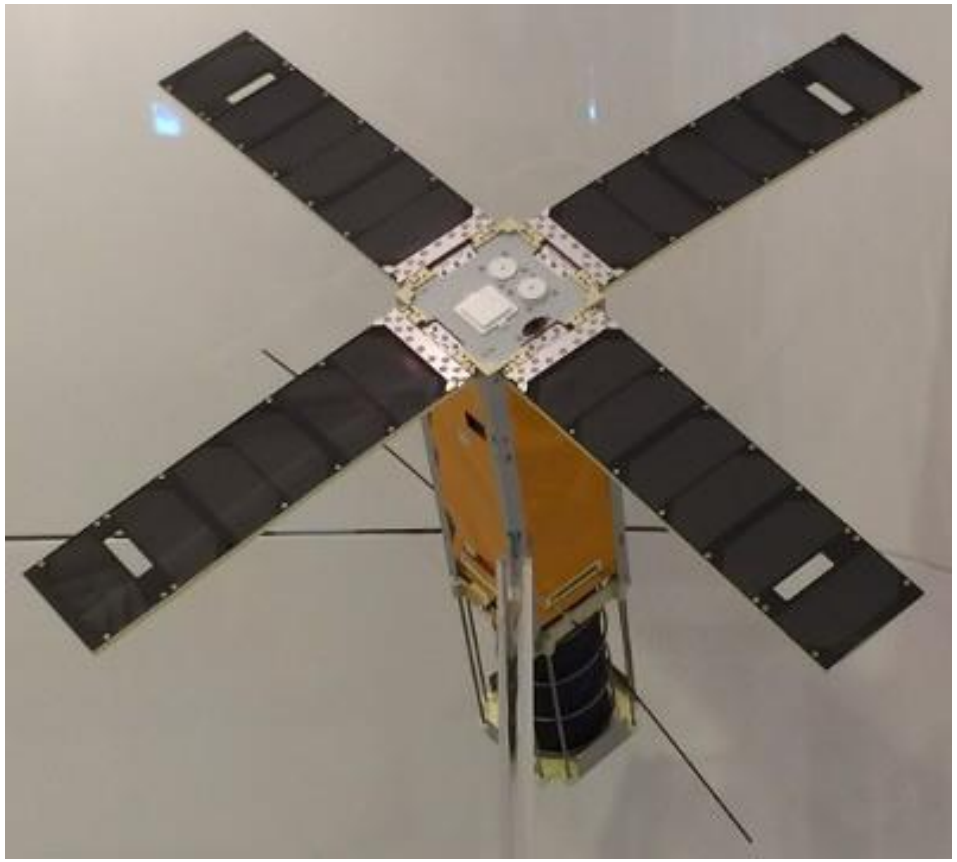
Photo from ISIS Launch Blog

PSLV-C23

- 30 June 2014
- Satish Dhawan Space Center, Sriharikota, India
- SPOT-7 primary

- VELOX-1 (3U)
  - Nanyang Technological University, Singapore
  - 145.980 MHz CW
  - ISIS TRXUV transceiver
  - Amateur licensed

- VELOX-1 PIII PicoSatellite
  - 250 grams, 6 x 7 x 3 cm



Photos from Channel News Asia

Summary

- European CubeSats (QB50) are using 145 MHz for downlink
  - IARU not coordinating non-Amateur (US) CubeSats in this band
  - Spectrum already crowded, not much bandwidth
- High data downlink CubeSats have found alternate frequencies
  - Higher bands have a lot more bandwidth available
  - Relieved pressure on the 437 MHz Amateur band
  - Most educational CubeSats still using 437 MHz Amateur band
- Updates? Please contact me
- Questions?

Thank You

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