

10GHz Amateur Satellites



A Backgrounder for
Stakeholders by:-



Introduction to Amateur Space Ops

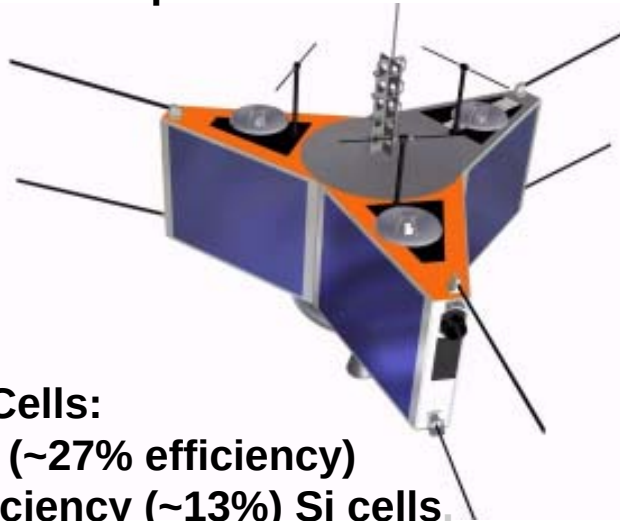
- [Phase-3E](#) - Elliptical Earth Orbit - Launch due 2007
 - A Successor to the popular Oscar-40, using the Oscar 10/13 chassis
 - A Technology Testbed for P5A which uses S-Band Up, X-Band Down
- [Phase-5A - Mars Orbiter and Balloon Lander](#) - Launch due 2009
 - A joint Amateur, Mars Society and ESA/DLR Science Mission
- [Oscar-40](#) (aka P3D) is in orbit and has 10GHz Capability (same chassis as P5A) but currently non-operational
- Construction is by Amsat-DL in Germany supported by US, UK and other Amateurs, plus Academic & Industrial Sponsors
- Newly Refurbished [Bochum 20m Groundstation](#) for Deep Space Ops
- Arianespace MoU in place for launches
- Current 10GHz use is for S-E, though allocation does permit E-S



Phase 3E Summary

Basic data

Mass at lift-off: 150 kg
Mass in orbit: 90 kg
Dimensions: Height 50cm / Span 1.30m
Spin stabilized: 20 – 40 rpm
Orbit:
Elliptical HEO,
2000km perigee,
44000km apogee,
50° Inclination.



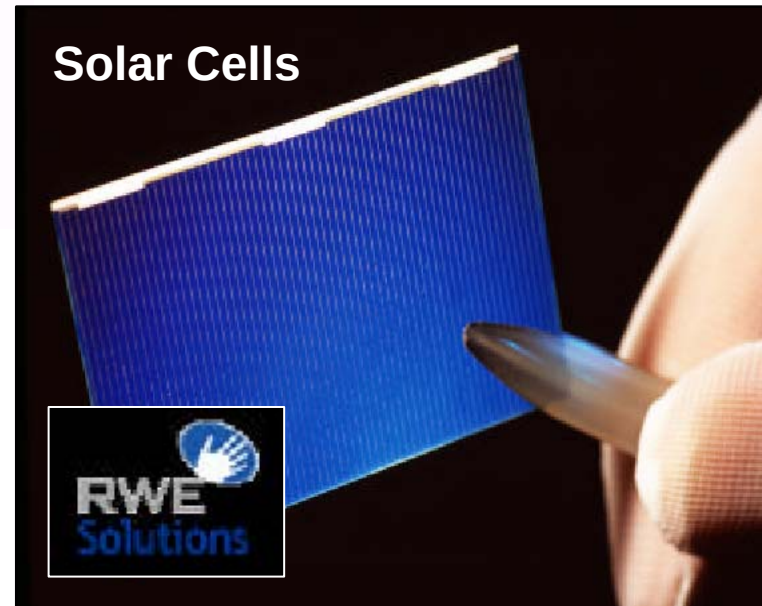
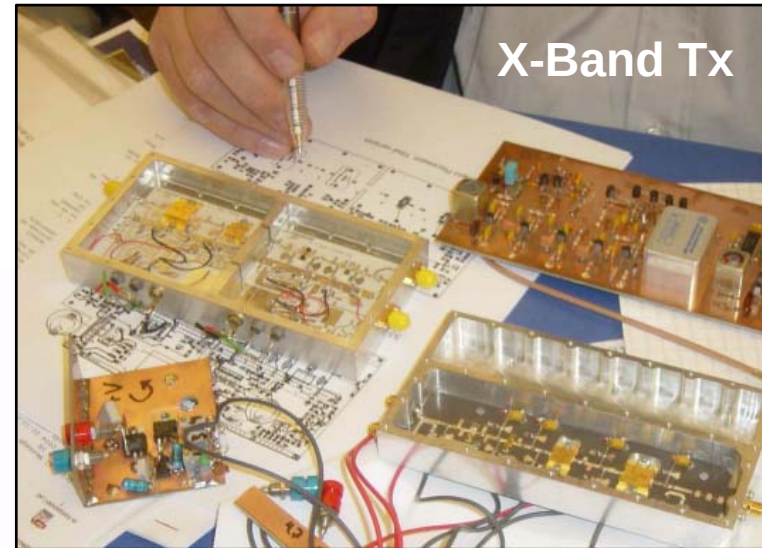
DC Power

RWE / EADS Solar Cells:
2 Panels of GaAs (~27% efficiency)
5 Panels high efficiency (~13%) Si cells
Solar Power output 92W , 2.7A (200W+ Peak)

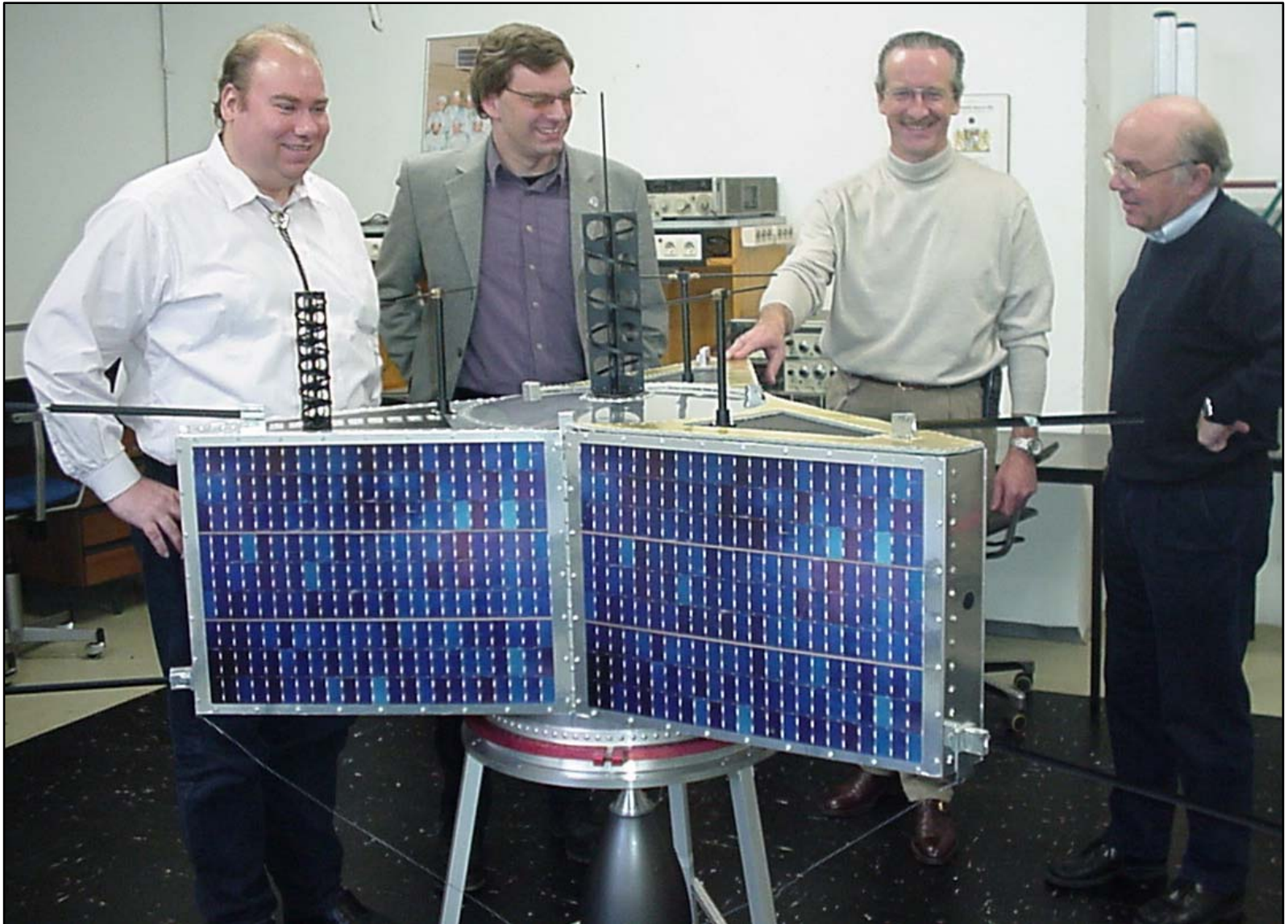
X-Band Downlink

Antenna: 15cm Dia
Tx Power: ~20W (tbc)

Frequency: 10490.118 – 10490.168MHz



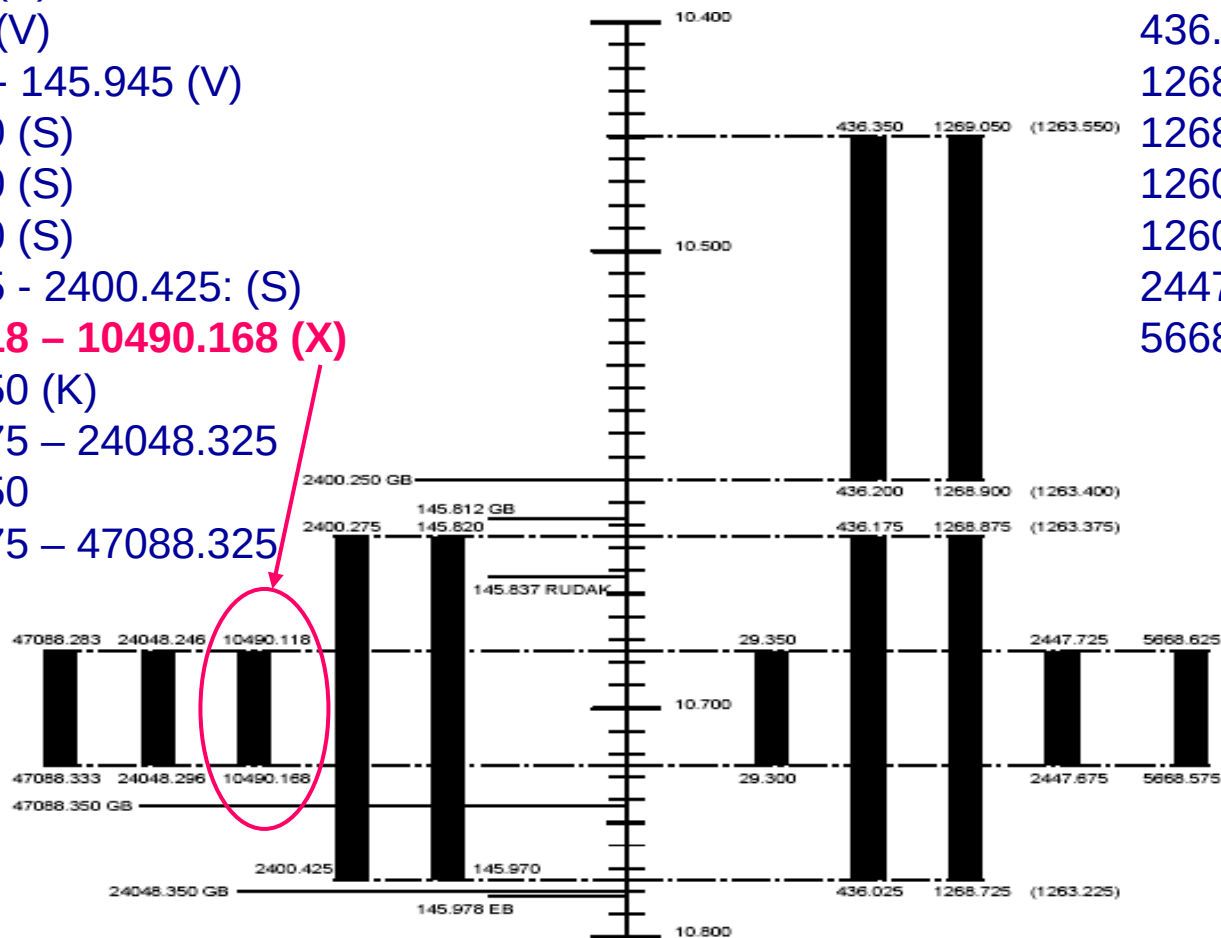
Phase-3E Satellite



Phase-3E Frequency Information

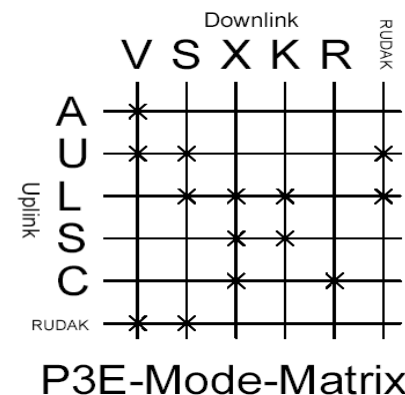
Downlinks, MHz

145.812 (V)
 145.957 (V)
 145.837 (V)
 145.845 - 145.945 (V)
 2400.250 (S)
 2400.500 (S)
 2400.600 (S)
 2400.275 - 2400.425: (S)
10490.118 – 10490.168 (X)
 24048.350 (K)
 24048.275 – 24048.325
 47088.350
 47088.275 – 47088.325



Uplinks, MHz

29.500 (A)
 436.200 - 436.350 (U)
 436.050 - 436.150 (U)
 1268.775 - 1268.925 (L1)
 1268.600 - 1268.750 (L1)
 1260.275 - 1260.425 (L2)
 1260.100 - 1260.225 (L2)
 2447.675 - 2447.725 (S)
 5668.575 - 5668.625 (C)



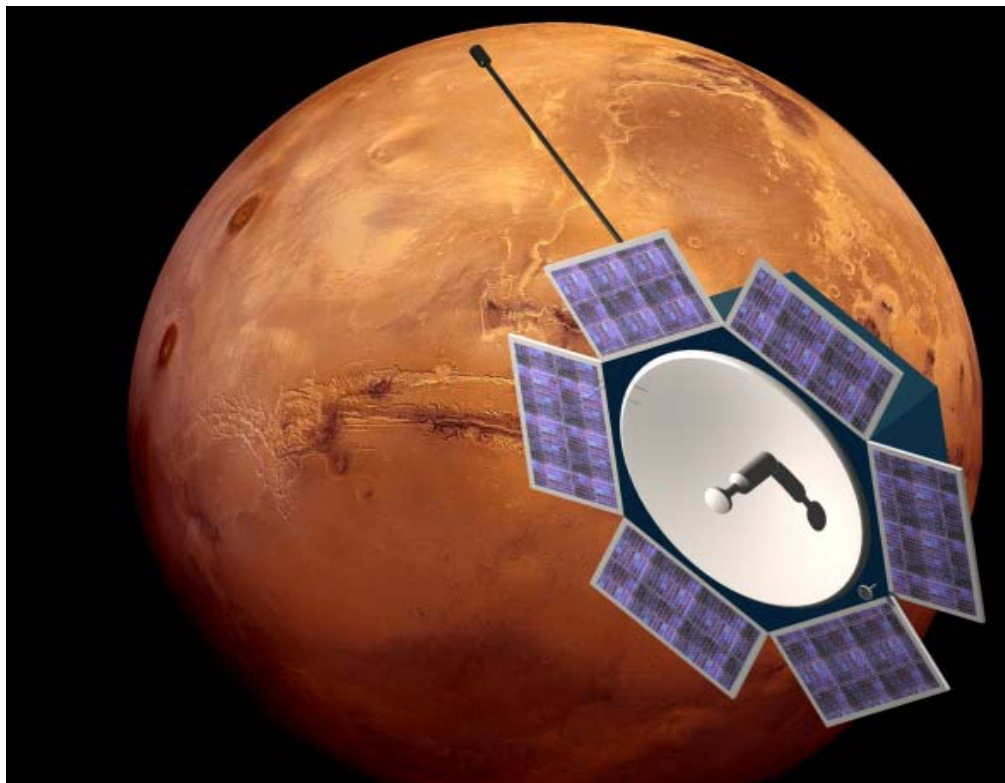
P5A Mars Orbiter & Lander



P5A Engineering Model

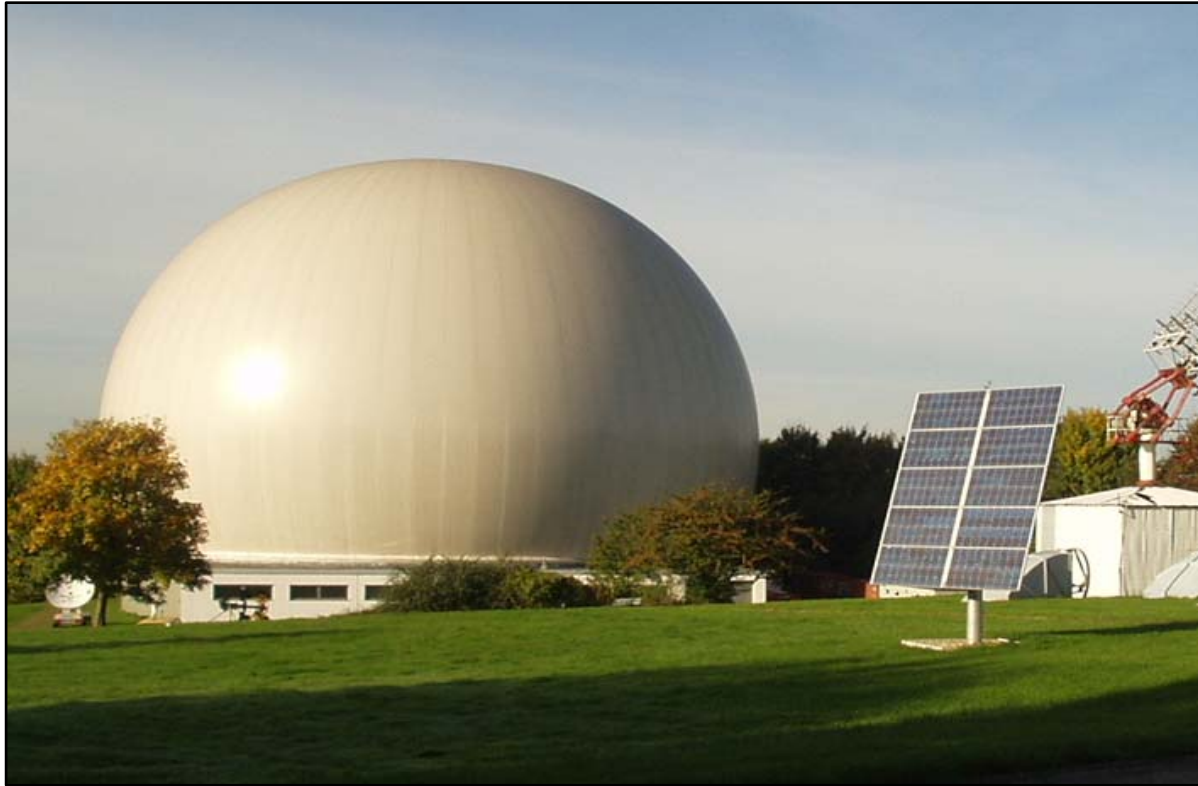


Oscar-40 - Now In Earth Orbit



- Probable Launch 2009
- Based on Oscar-40 Chassis
- 2m High Gain Antenna, 50W+ X-Band Tx
- Receivable by ordinary enthusiasts
- Carries Mars Balloon Lander

20 Metre Bochum Groundstation



- Newly Refurbished Amsat-DL Ops Centre
- Underpins Mission Assurance and Compliance with RadioReg-25.11

P5A Archimedes Balloon on Mars

- Subsidiary payload on P5A provided by the German Mars Society
- Sponsors include ESA, DLR, IABG, Finnish Met Institute etc
- Instruments:
 - Aerial Imager
 - Magnetometer
 - Accelerometers
 - Atmospheric Sensors
- Uses P5A Orbiter as relay and 10GHz Earth Return Link



ARCHIMEDES:

Aerial Robot Carrying HI-Res Imaging Magnetometer Experiment and Direct Environment Sensors

Reference: <http://www.archimedes-balloon.de/>

Deploying Balloon in Zero-G Environment



June-2005: Simulated Zero-G Deployment during Parabolic Airbus Flights

Summary

- **Amateur 10GHz Satellite Band at 10.450-10.500 is in use**
- **Principally for Weak Signal Flux S-E Downlinks**
- **Additional Detail & Submissions will be made available**
- **Amateur Satellite Community is keen to promote and protect Innovation and Scientific Endeavour**
- **Terrestrial Footnote:**
On Saturday 15-July-2006: A new **UK 10GHz Distance Record of 1347km** was worked **using just 2Watts** by Ian Lamb G8KQW near Farnham contacting Lars-Bertil SM4DHN in Sweden on 10.368GHz. This shows that 10GHz can be long range and needs full coordination
- **Main Source: Amsat-DL, Germany** <http://www.amsat-dl.org/>