

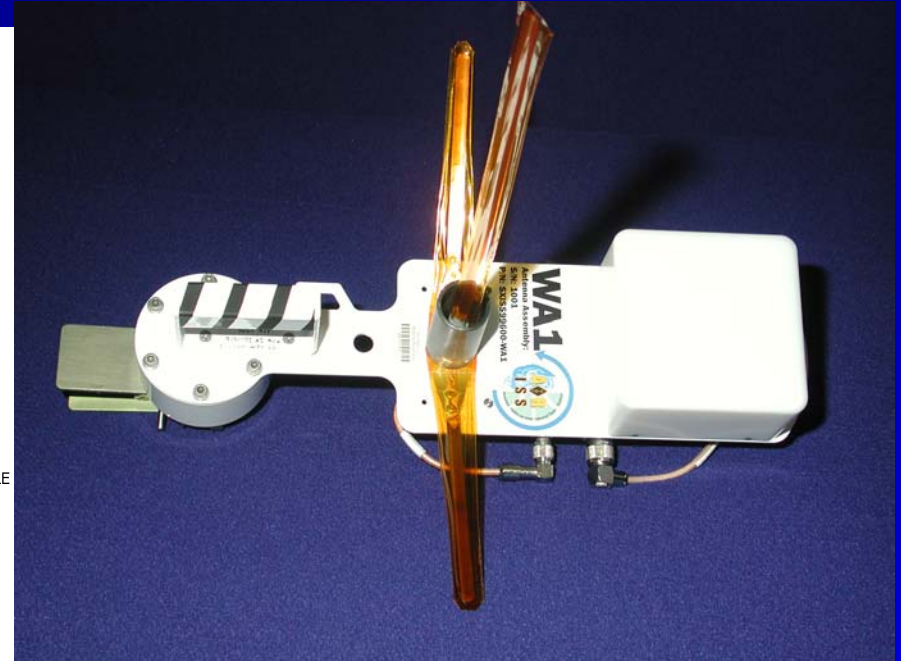
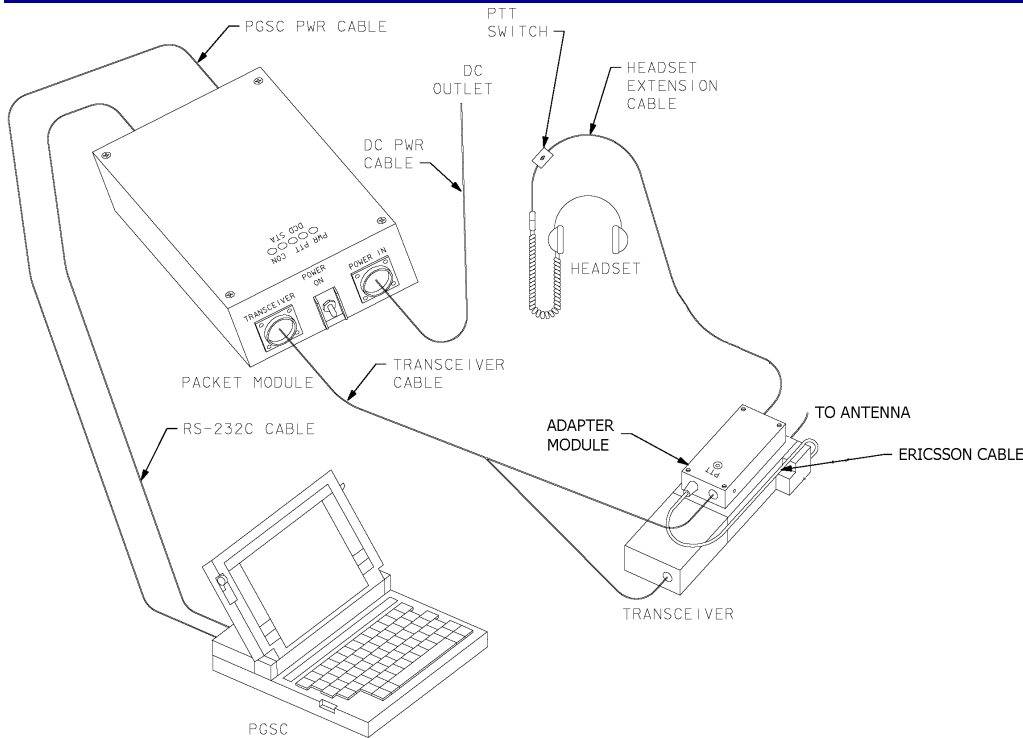
Antenna Systems and Antenna EVA Status



*ARISS Meeting at CSA
April 4, 2002*

**Frank H. Bauer, KA3HDO
Sergej Samburov, RV3DR**

ISS HAM Configuration



**Radio Equipment
in Service Module**

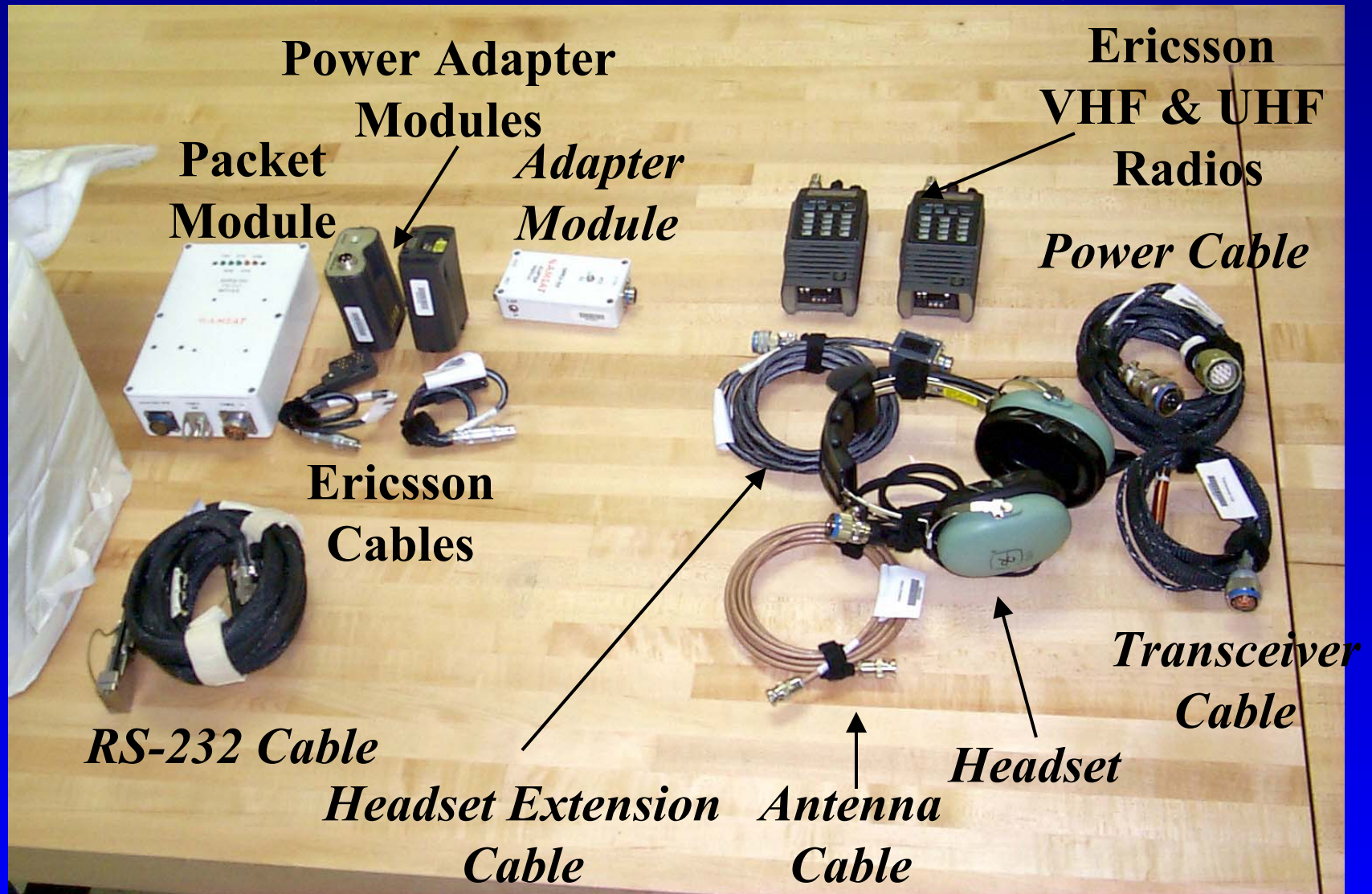
**1 of 4 Antenna Systems
Mounted Around
Perimeter of Service
Module**

Near Term Schedule

- STS-105 (7.a.1) August 10, 2001
 - Delivered new packet module on orbit
 - Supports simultaneous 2 radio ops in FGB & Service Module
- STS-108 (UF-1) December 5, 2001
 - Delivered 4 antenna systems to ISS
 - Delivered adapter module & add'l cables to support 2 radio ops to ISS
- Expedition 4 crew
 - installed antennas during 2 Extra Vehicular Activities (EVAs) (January 14 & January 25, 2002)
- Other antennas will be installed on subsequent Expeditions

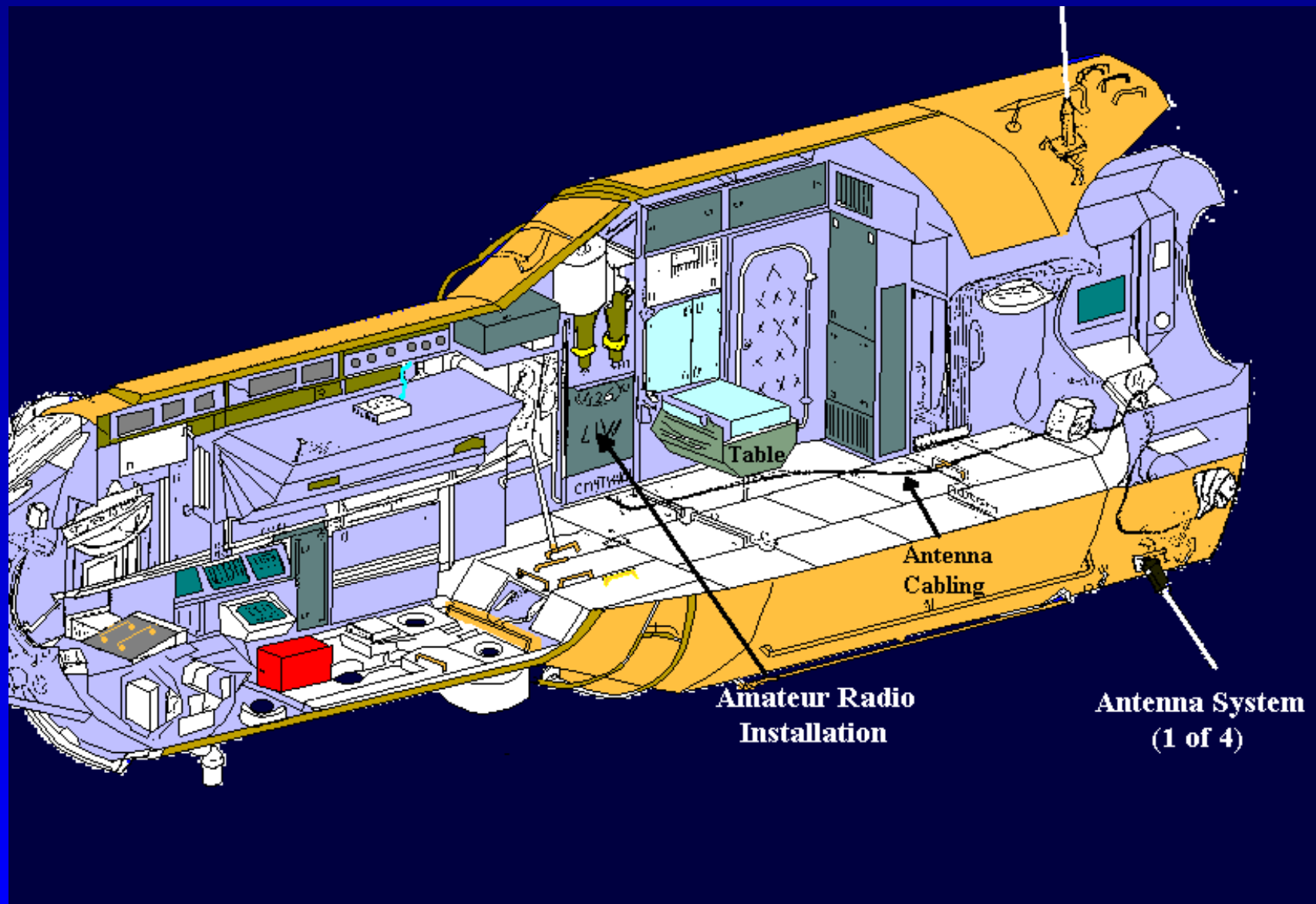
Internal Hardware

(*STS-108 series hardware in italics*)



ARISS / ISS HAM

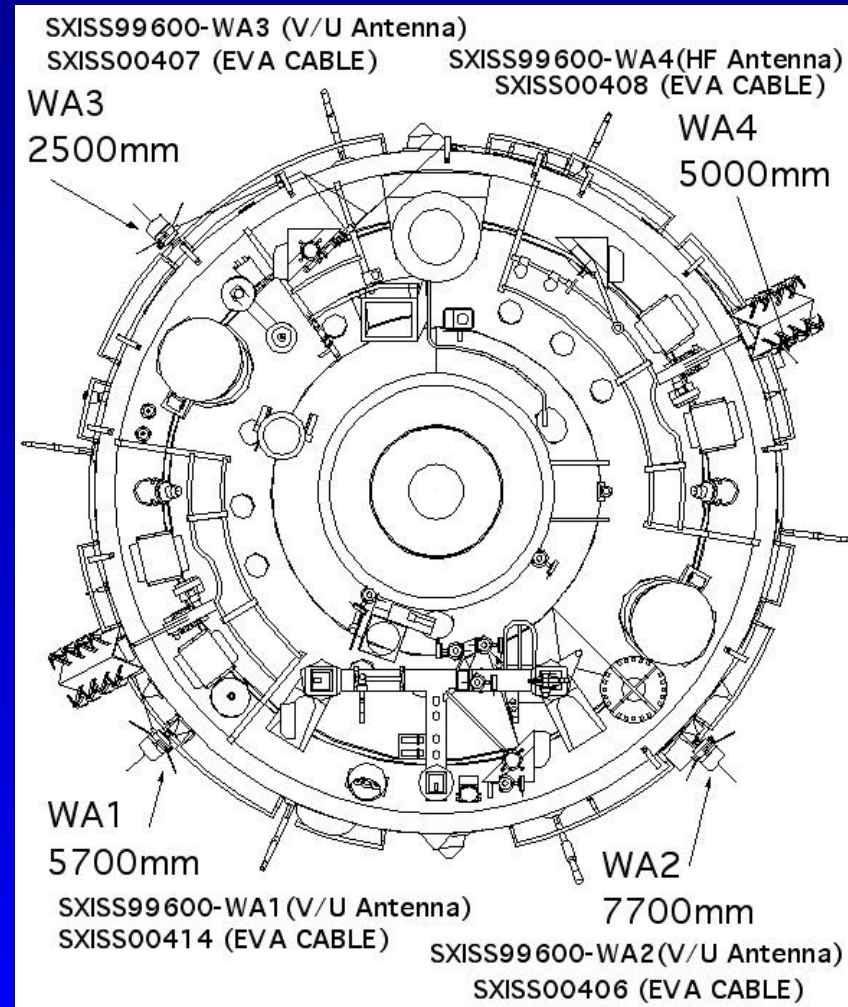
Location in and on the Service Module



Service Module and FGB



Antenna System Installation on Service Module



Service Module Closeout Photos

Radio Station Location



Internal Hardware

(New Item Introduced per Energia's Request)



ISS Ham RF Interface Cable

Antenna System w/ VHF/UHF Antenna Installed (1 of 4)

Internationally Developed

Italian Contribution:

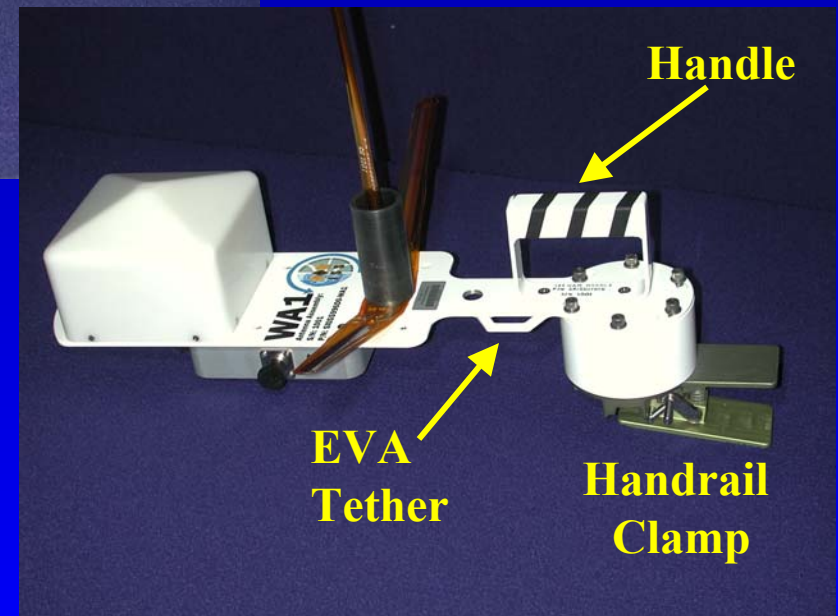
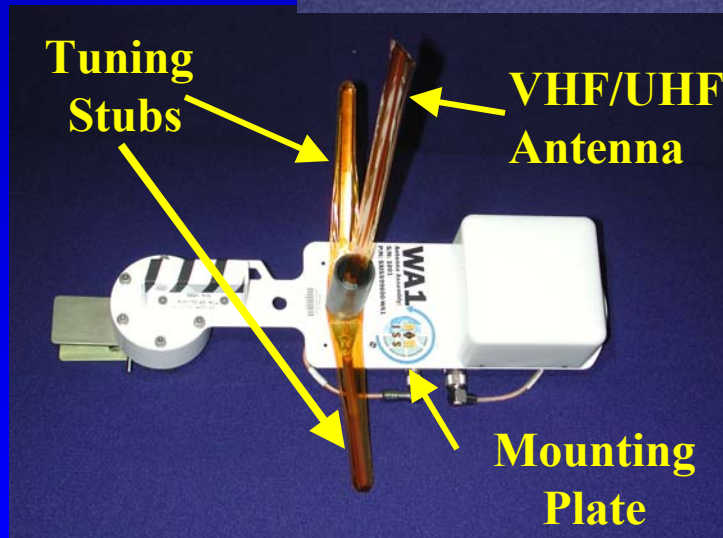
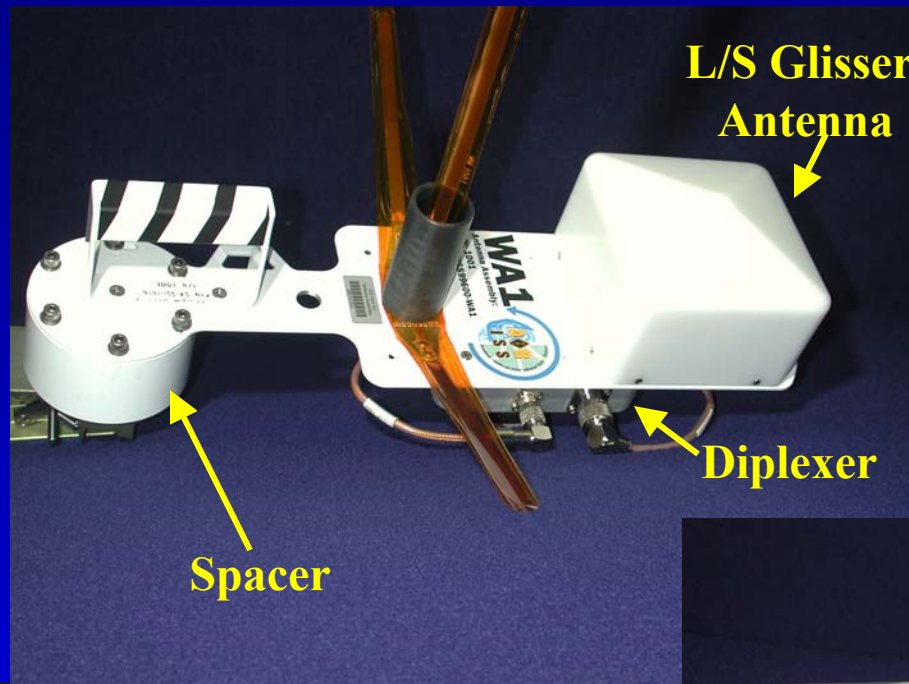
Microwave Antennas
Diplexer

US Contribution:

Mounting Plate
VHF/UHF Antenna

Russian Contribution:

Handrail Clamp
Interconnecting Cables

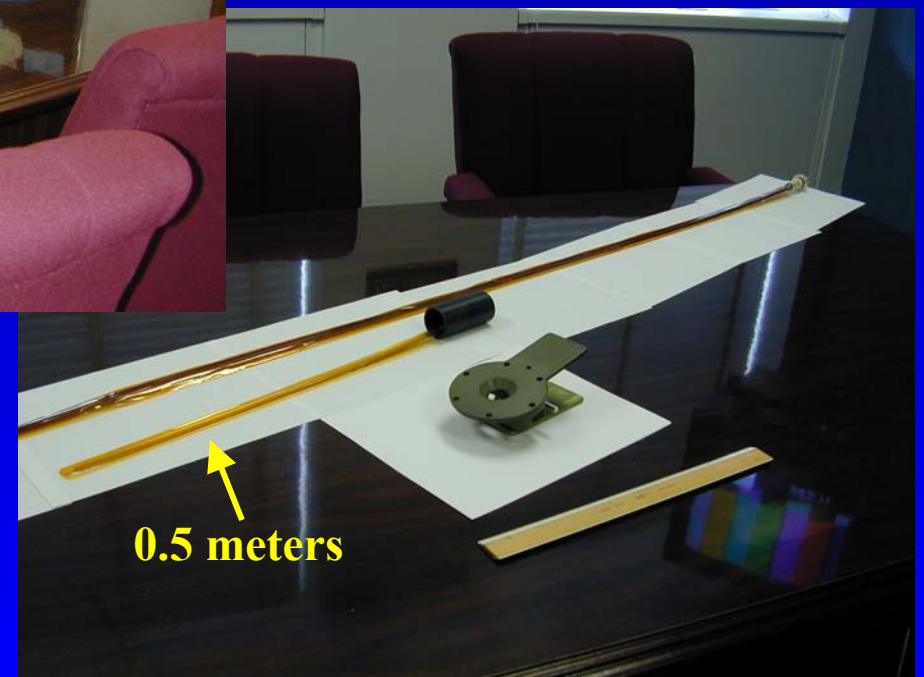
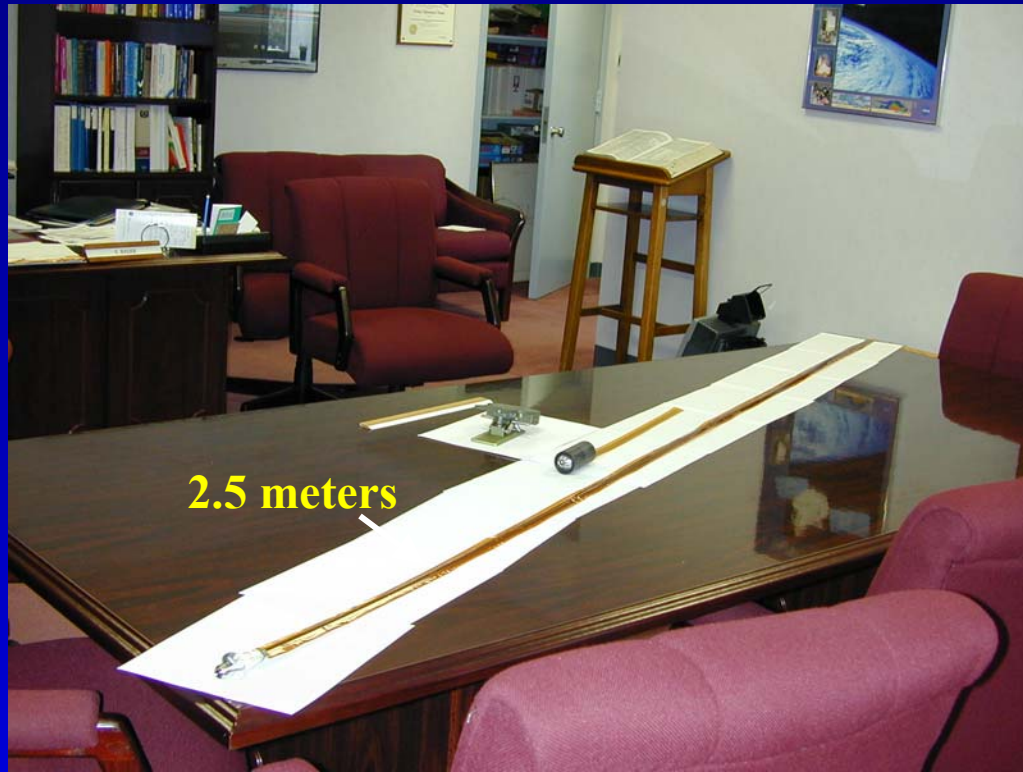


VHF/UHF/HF Antenna

- Flexible metal tape antenna
- Kapton coated
- Delrin mounting collar protects against breakage
- Meets 125 lb kick loads

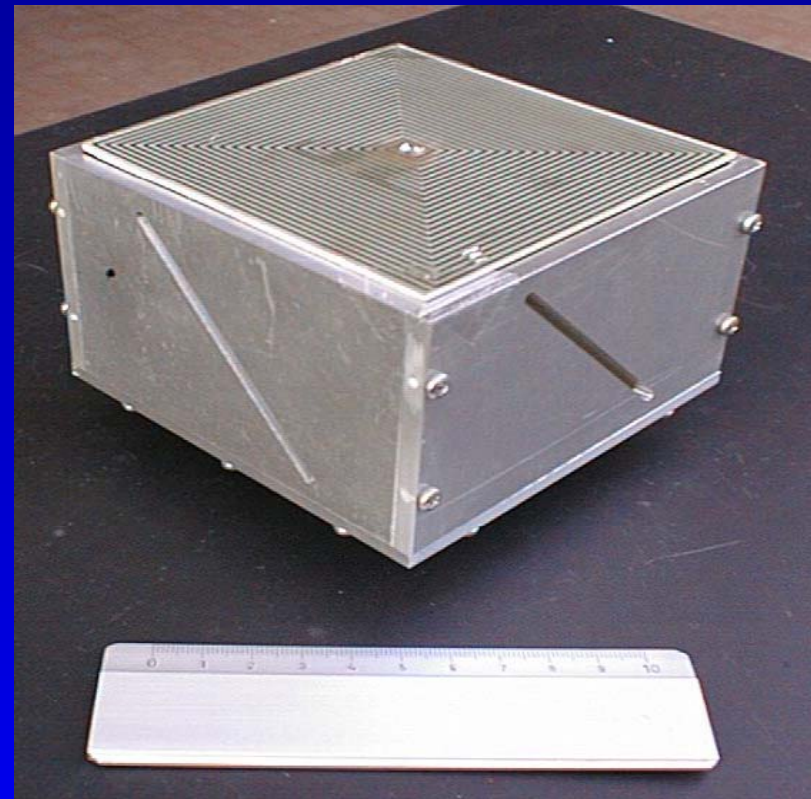


VHF/UHF & HF Antenna Systems

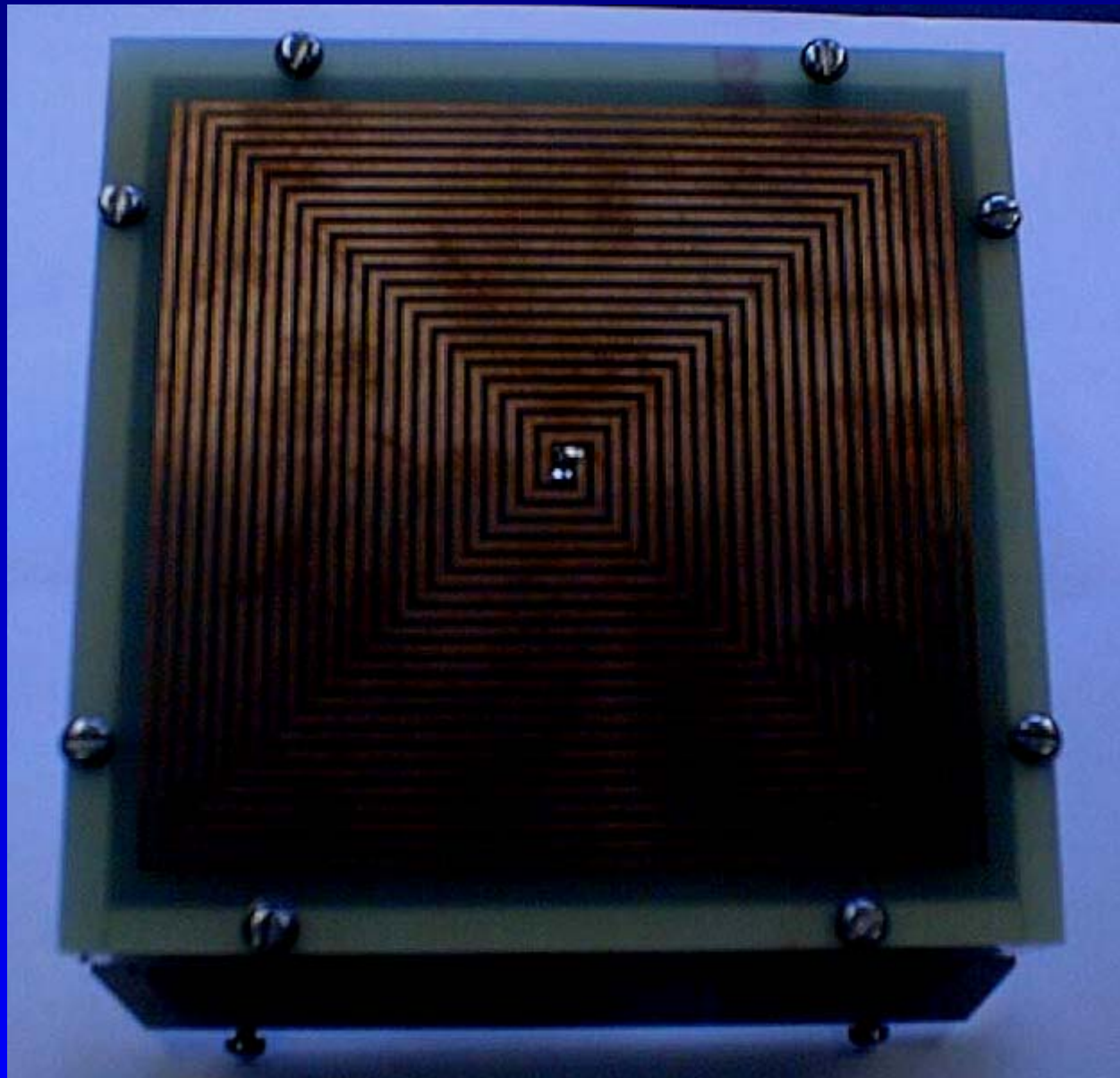


L/S/Glisser Antenna

- Flat spiral antenna
- 250mmX250mmX150mm
- Delrin cover
- Supports EVA activity proximity video (Glisser)
 - Receive only
 - 1.99 GHz
- Supports Amateur Radio L and S bands
 - Transmit & Receive
- Meets 125 lb kick load



L/S Band Antenna Prototype



Russian Sub-components

Handrail Clamp



**Power Connector
(Internal)**

**ISS Ham EVA Cable
(w/ EVA RF Interface
Connector Attached)**



EVA Connector

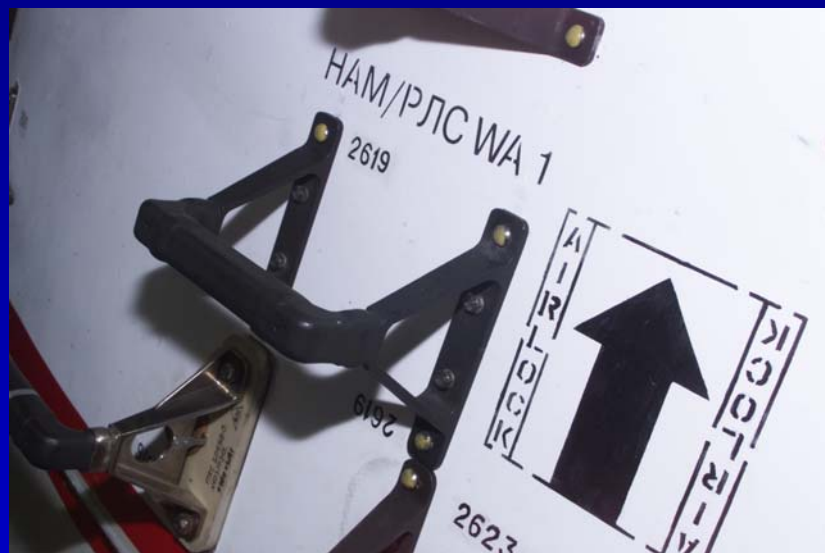


Service Module Closeout Photos

EVA Connectors



Antenna Handrail Closeout Photos



ISS Ham Antenna Frame

- Considered an EVA tool
- Certification and Acceptance Requirements Document (CARD)



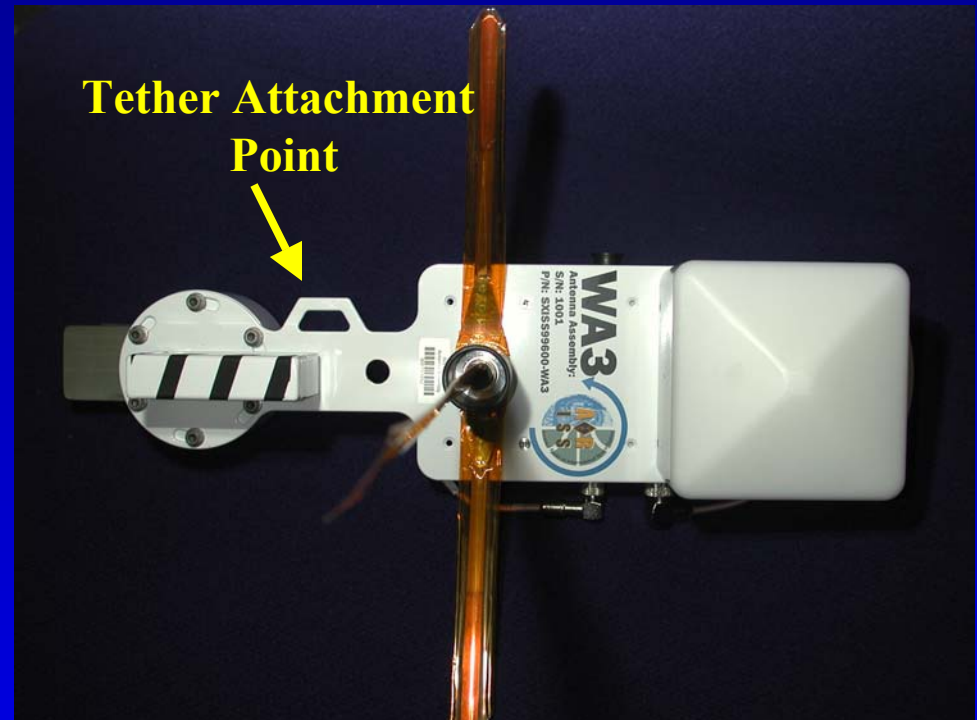
Flight Frame



**Frame Mockup for
Hydrolab Training**

Tether Attachment Point

- Test successfully performed on 3/14/01 to validate that Russian & U.S. tether hooks attach to plate tether attachment point
- Test performed by Ed Svrcek/XA & Gary Wright SR&QA of JSC

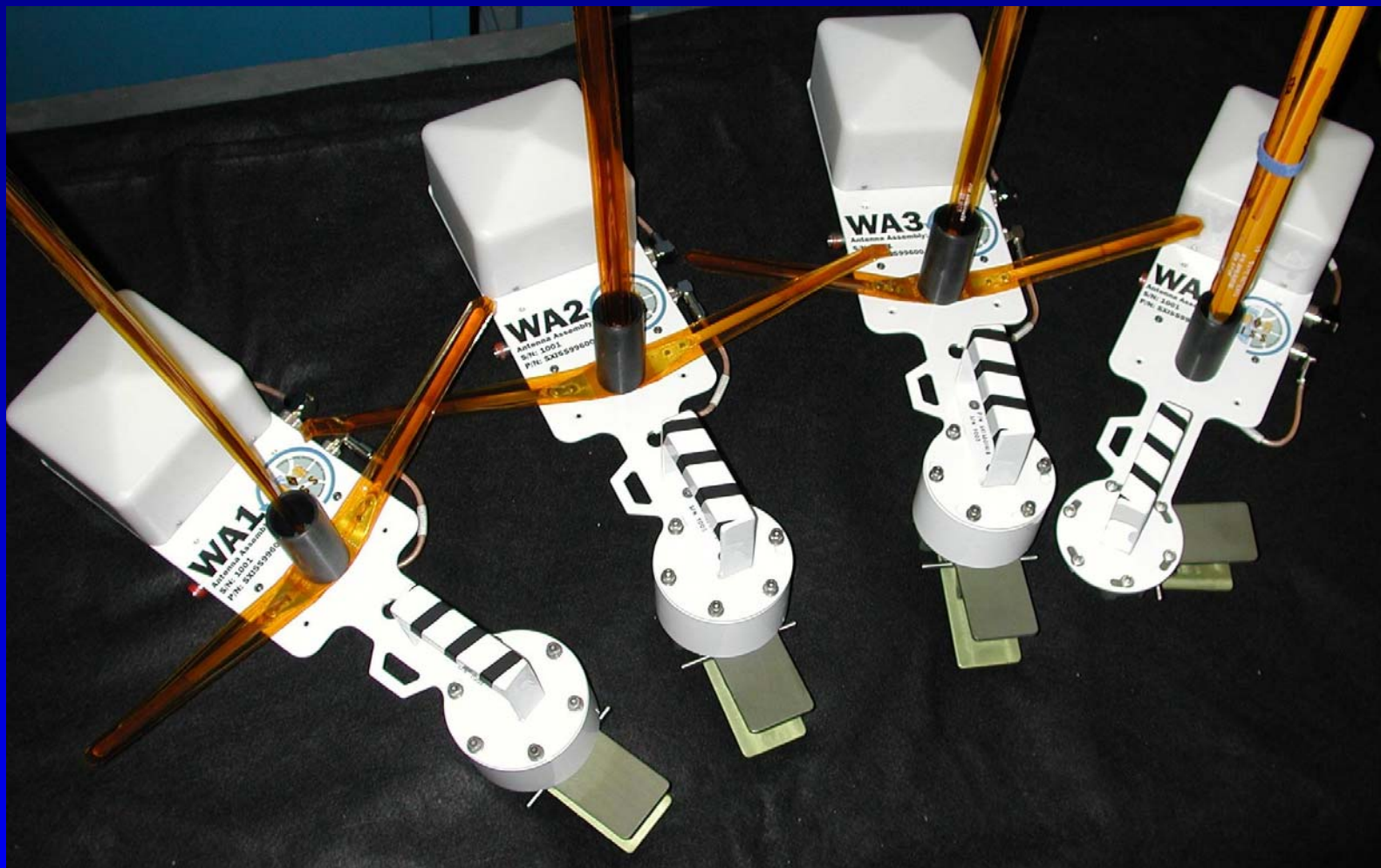


Antenna Assemblies

Provider	Quantity	Part Number	Description
ISSHAM	1	SXISS99600-WA1	ISS HAM VU ANTENNA ASSEMBLY
ISSHAM	1	SXISS00606	VU TAPE ANTENNA
ISSHAM	1	SXISS00611	ANTENNA COLLAR
ISSHAM	1	SXISS00612	ANTENNA NUT
ISSHAM	1	SXISS00607	L/S BAND ANTENNA
ISSHAM	1	SXISS00602	DIPLEXER
ISSHAM	1	SXISS00603-1	ANTENNA PLATE
Energia	1	SXISS00604	HANDRAIL CLAMP
ISSHAM	1	SXISS00414	ISS HAM EVA CABLE (WA1)
ISSHAM	1	SXISS00412	L/S DIPLEXER CABLE
ISSHAM	1	SXISS00413	U/V/H DIPLEXER CABLE
ISSHAM	1	SXISS00610	ANTENNA RADIAL
ISSHAM	1	SXISS01617	ANTENNA SPACER
ISSHAM	1	SXISS01616	ISS HAM HANDLE
ISSHAM	1	SXISS99600-WA2	ISS HAM VU ANTENNA ASSEMBLY
ISSHAM	1	SXISS00606	VU TAPE ANTENNA
ISSHAM	1	SXISS00611	ANTENNA COLLAR
ISSHAM	1	SXISS00612	ANTENNA NUT
ISSHAM	1	SXISS00607	L/S BAND ANTENNA
ISSHAM	1	SXISS00602	DIPLEXER
ISSHAM	1	SXISS00603-1	ANTENNA PLATE
Energia	1	SXISS00604	HANDRAIL CLAMP
ISSHAM	1	SXISS00406	ISS HAM EVA CABLE (WA2)
ISSHAM	1	SXISS00412	L/S DIPLEXER CABLE
ISSHAM	1	SXISS00413	U/V/H DIPLEXER CABLE
ISSHAM	1	SXISS00610	ANTENNA RADIAL
ISSHAM	1	SXISS01617	ANTENNA SPACER
ISSHAM	1	SXISS01616	ISS HAM HANDLE

Provider	Quantity	Part Number	Description
ISSHAM	1	SXISS99600-WA3	ISS HAM VU ANTENNA ASSEMBLY
ISSHAM	1	SXISS00606	VU TAPE ANTENNA
ISSHAM	1	SXISS00611	ANTENNA COLLAR
ISSHAM	1	SXISS00612	ANTENNA NUT
ISSHAM	1	SXISS00607	L/S BAND ANTENNA
ISSHAM	1	SXISS00602	DIPLEXER
ISSHAM	1	SXISS00603-1	ANTENNA PLATE
Energia	1	SXISS00604	HANDRAIL CLAMP
ISSHAM	1	SXISS00407	ISS HAM EVA CABLE (WA3)
ISSHAM	1	SXISS00412	L/S DIPLEXER CABLE
ISSHAM	1	SXISS00413	U/V/H DIPLEXER CABLE
ISSHAM	1	SXISS00610	ANTENNA RADIAL
ISSHAM	1	SXISS01617	ANTENNA SPACER
ISSHAM	1	SXISS01616	ISS HAM HANDLE
ISSHAM	1	SXISS99600-WA4	ISS HAM HF ANTENNA ASSEMBLY
ISSHAM	1	SXISS00609	HF TAPE ANTENNA
ISSHAM	1	SXISS00611	ANTENNA COLLAR
ISSHAM	1	SXISS00612	ANTENNA NUT
ISSHAM	1	SXISS00607	L/S BAND ANTENNA
ISSHAM	1	SXISS00602	DIPLEXER
ISSHAM	1	SXISS00603-1	ANTENNA PLATE
Energia	1	SXISS00604	HANDRAIL CLAMP
ISSHAM	1	SXISS00408	ISS HAM EVA CABLE (WA4)
ISSHAM	1	SXISS00412	L/S DIPLEXER CABLE
ISSHAM	1	SXISS00413	U/V/H DIPLEXER CABLE
ISSHAM	1	SXISS01616	ISS HAM HANDLE

Antenna Systems WA1-WA4



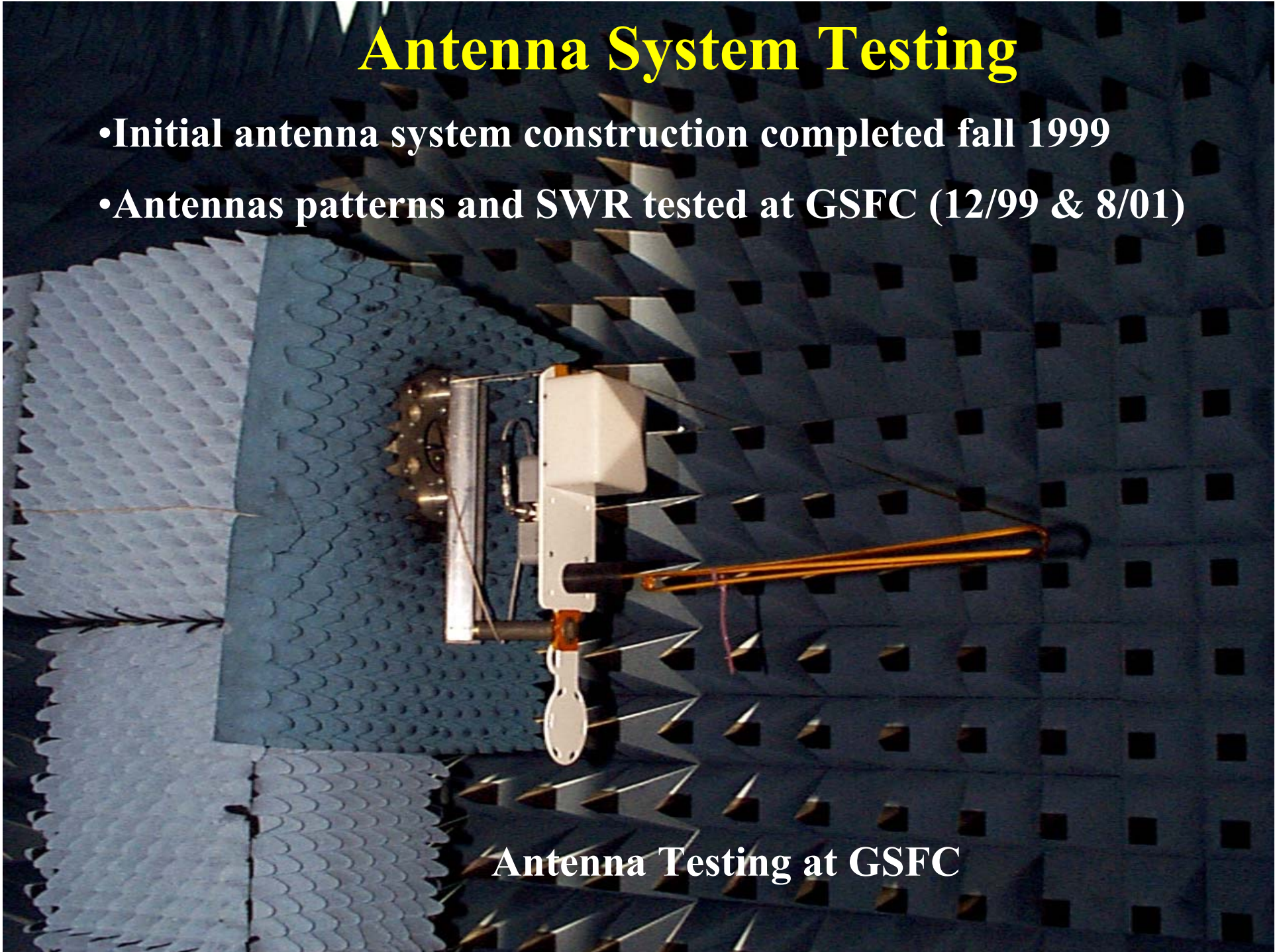
Performance and Safety Validation Tests

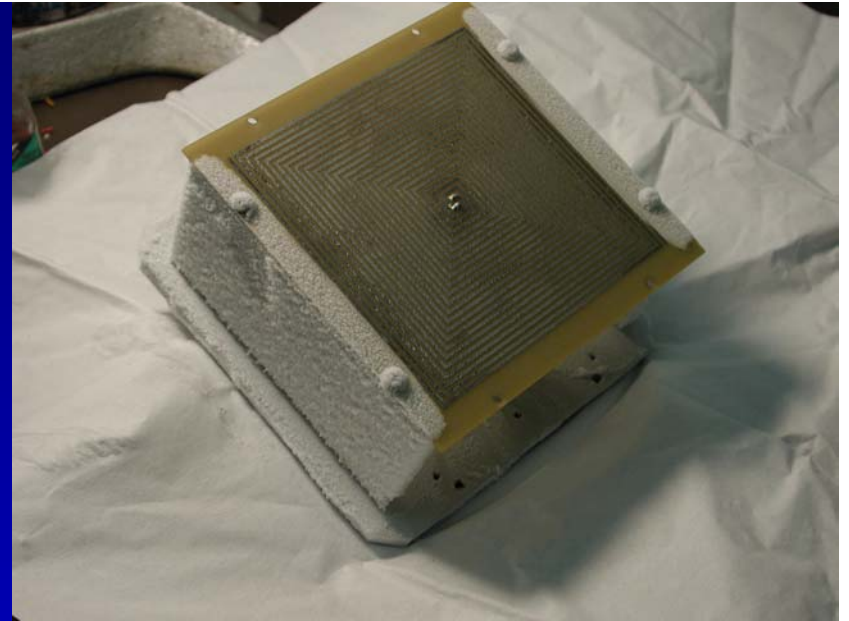
- Parts & Materials validation
- Standing Wave Ratio
- Antenna Gain and Pattern Measurement (primarily microwave)
- Swatch sharp edge inspection
- Offgassing test of protoflight hardware

Antenna System Testing

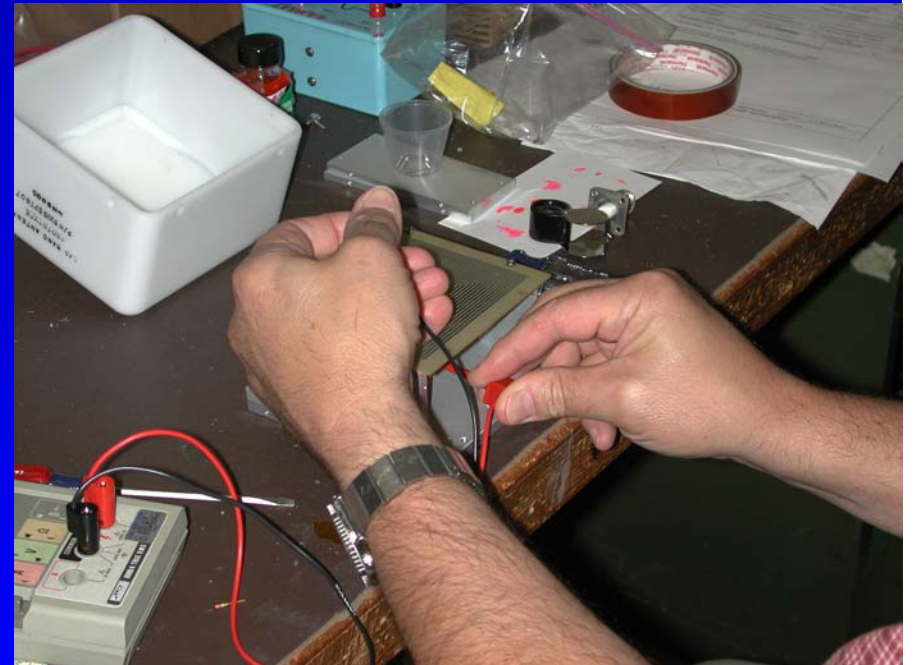
- Initial antenna system construction completed fall 1999
- Antennas patterns and SWR tested at GSFC (12/99 & 8/01)

Antenna Testing at GSFC





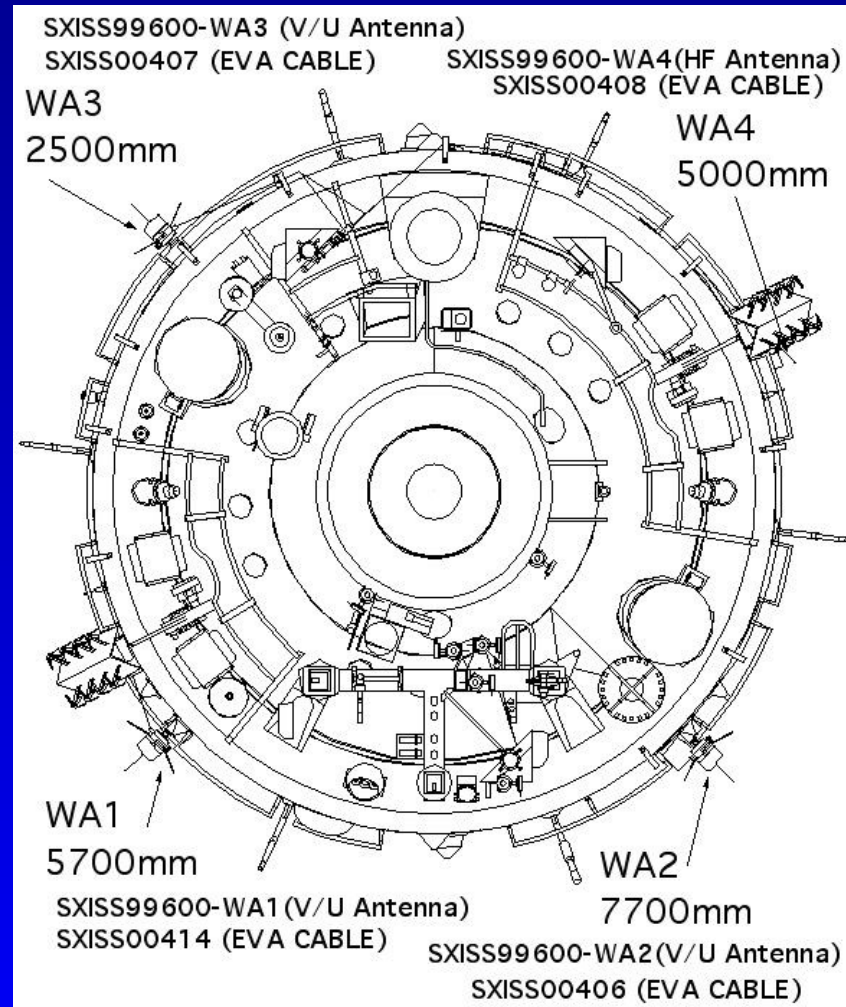
Antenna System Thermal Testing

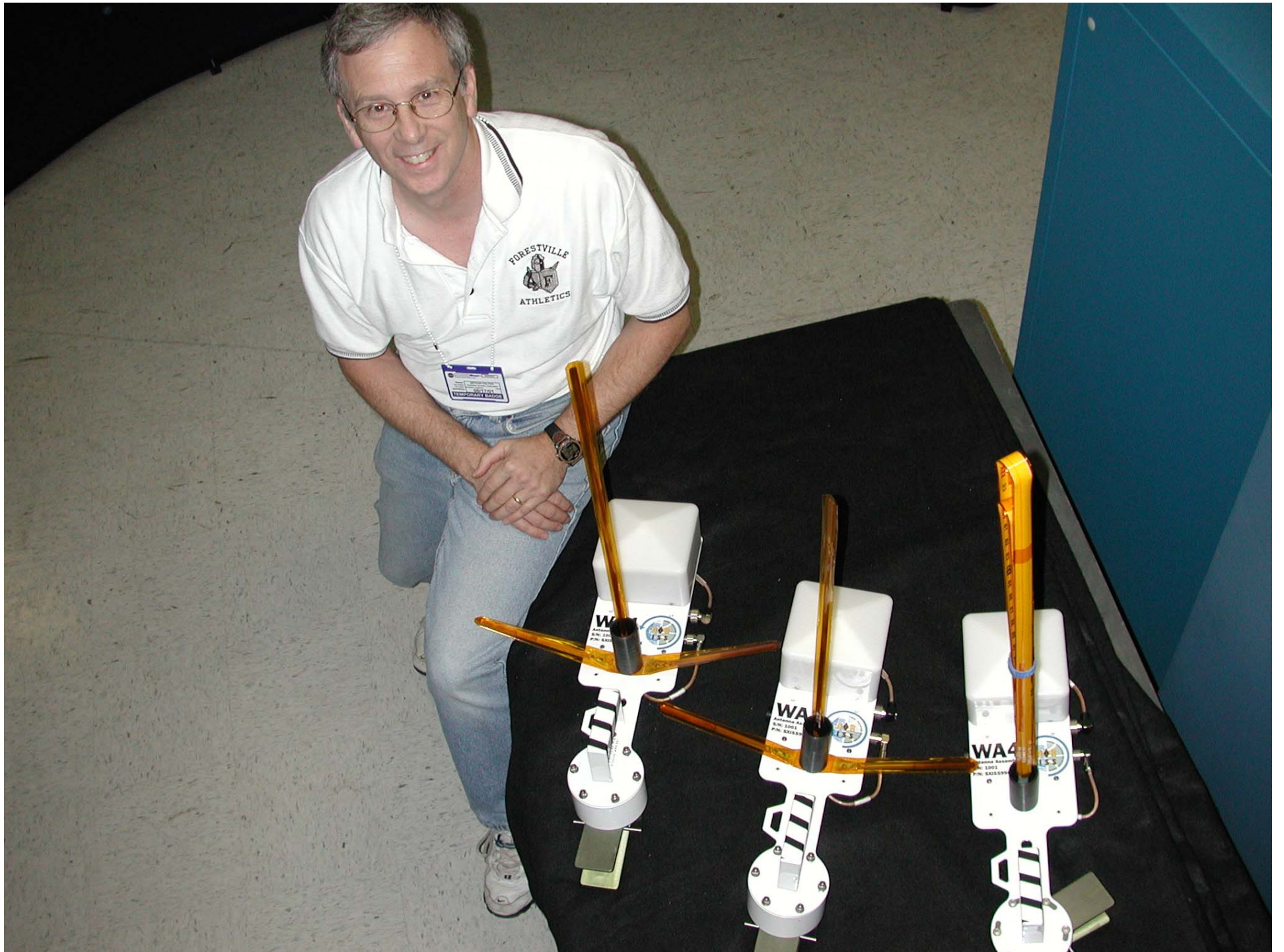


Antenna System Status & EVA Installation Plans

- U.S. team delivered 4 flight validated antenna systems and EVA frame to NASA on September 6, 2001
- Above flown on STS-108 UF-1 flight in December 2001
- Russian team to delivered cable attachment clips & EVA velcro straps by Progress
- Expedition 4 crew installed WA3 antenna on January 14 & WA4 antenna (HF) on January 25
- Two remaining antennas to be installed by either Expedition 5 crew (June-September 2002) or Expedition 6 crew (September 2002-January 2003)
- End-to-end testing of antenna systems and radio systems in Russian Service Module electrical simulator (KIS) planned for fall 2002

Antenna System Installation on Service Module



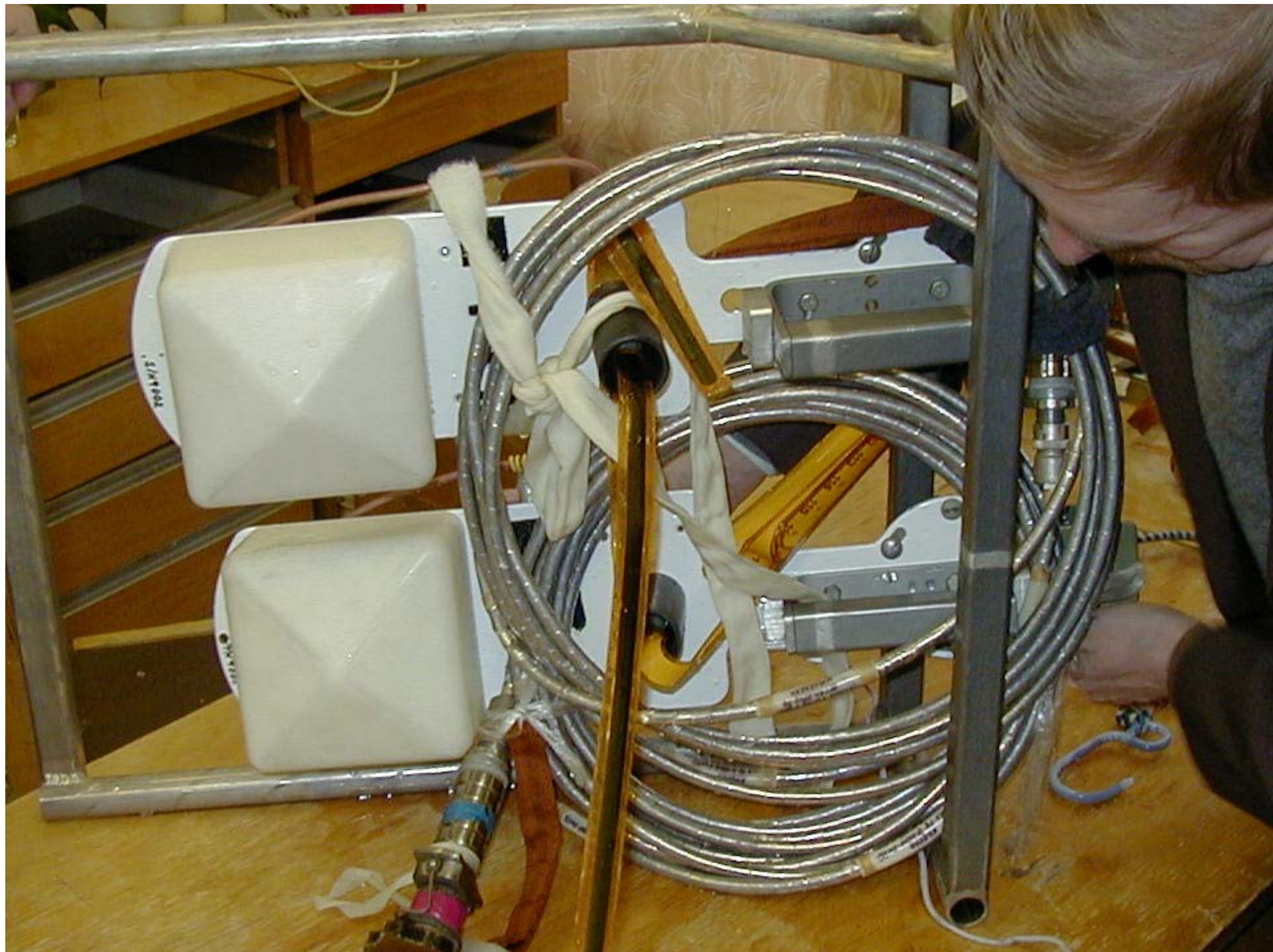


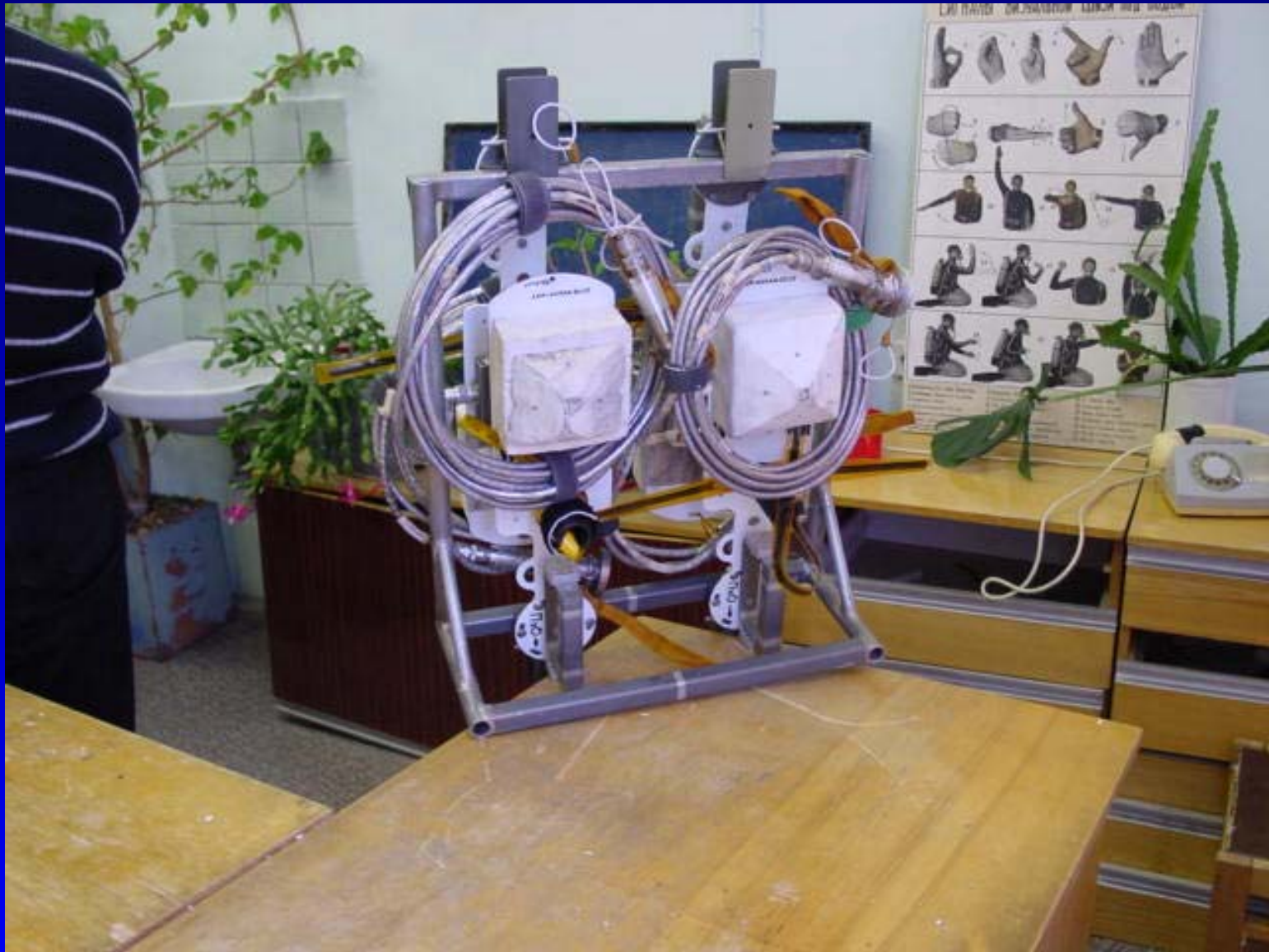


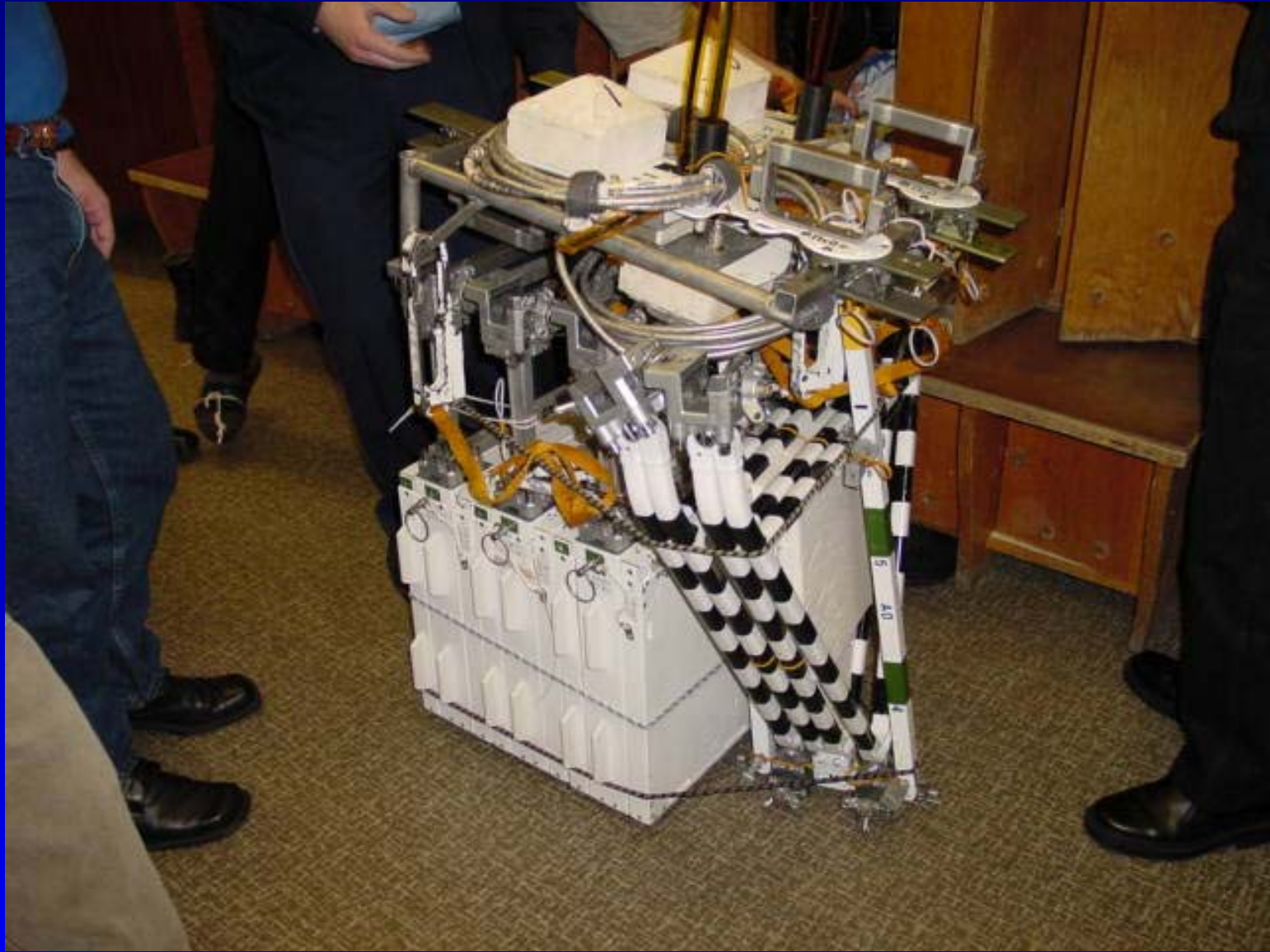
EVA Operations

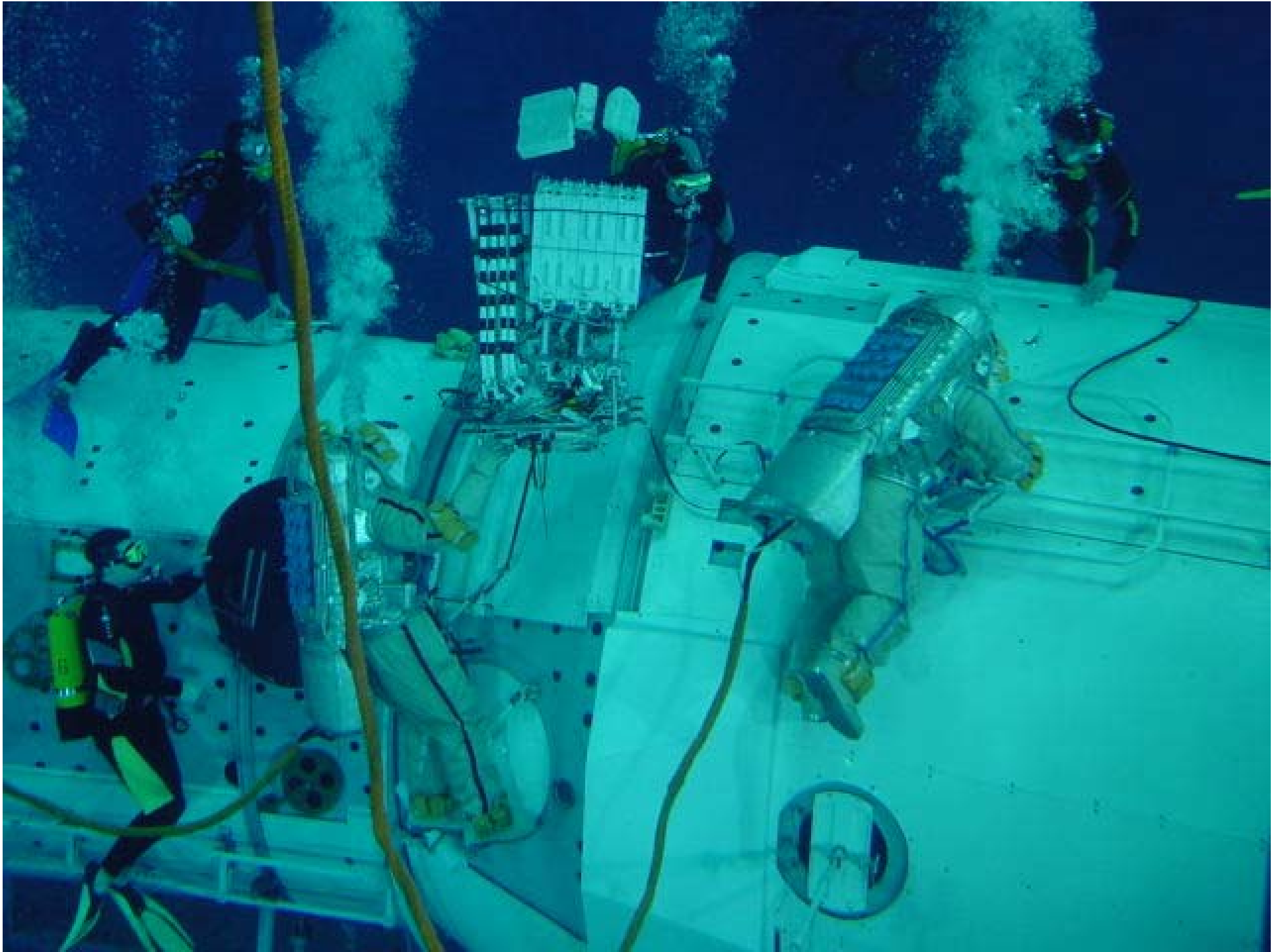
Top-level plan

- Pre-EVA Activities:
 - Use velcro to “segment” each loop of EVA cable
 - Interface EVA Cable to diplexer
 - Using clamp, attach antenna systems to frame or spacesuit
- EVA Activities:
 - Traverse along SM to location of EVA RF Connectors
 - Fasten each antenna system to each handrail & lock in place
 - Deploy and tie-down EVA cable as each antenna system is routed to the specifically depicted handrail
 - Attach RF connectors for WA1-WA4



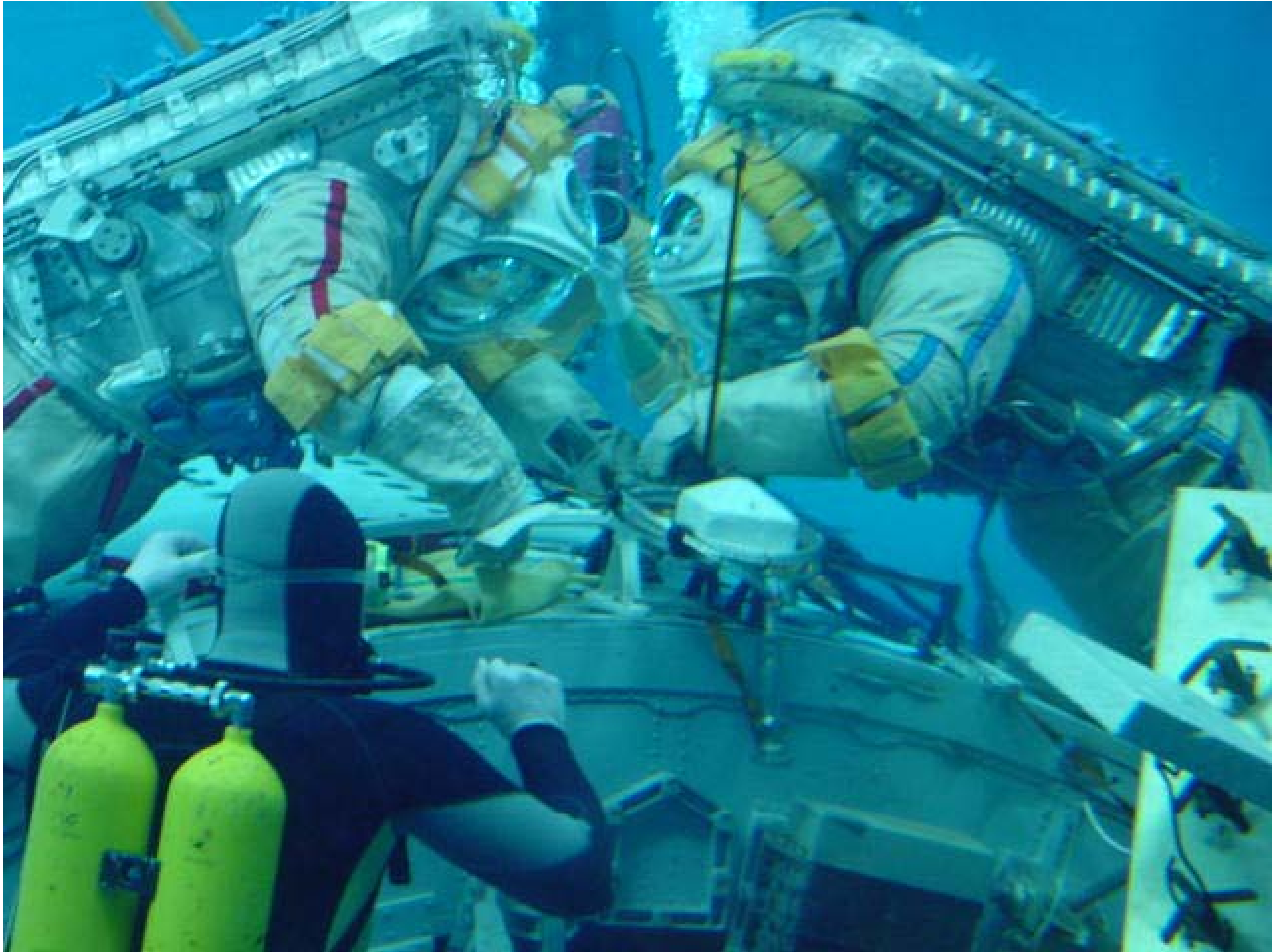












WA4 Antenna Ready for EVA

