Phase 2 Hardware Development

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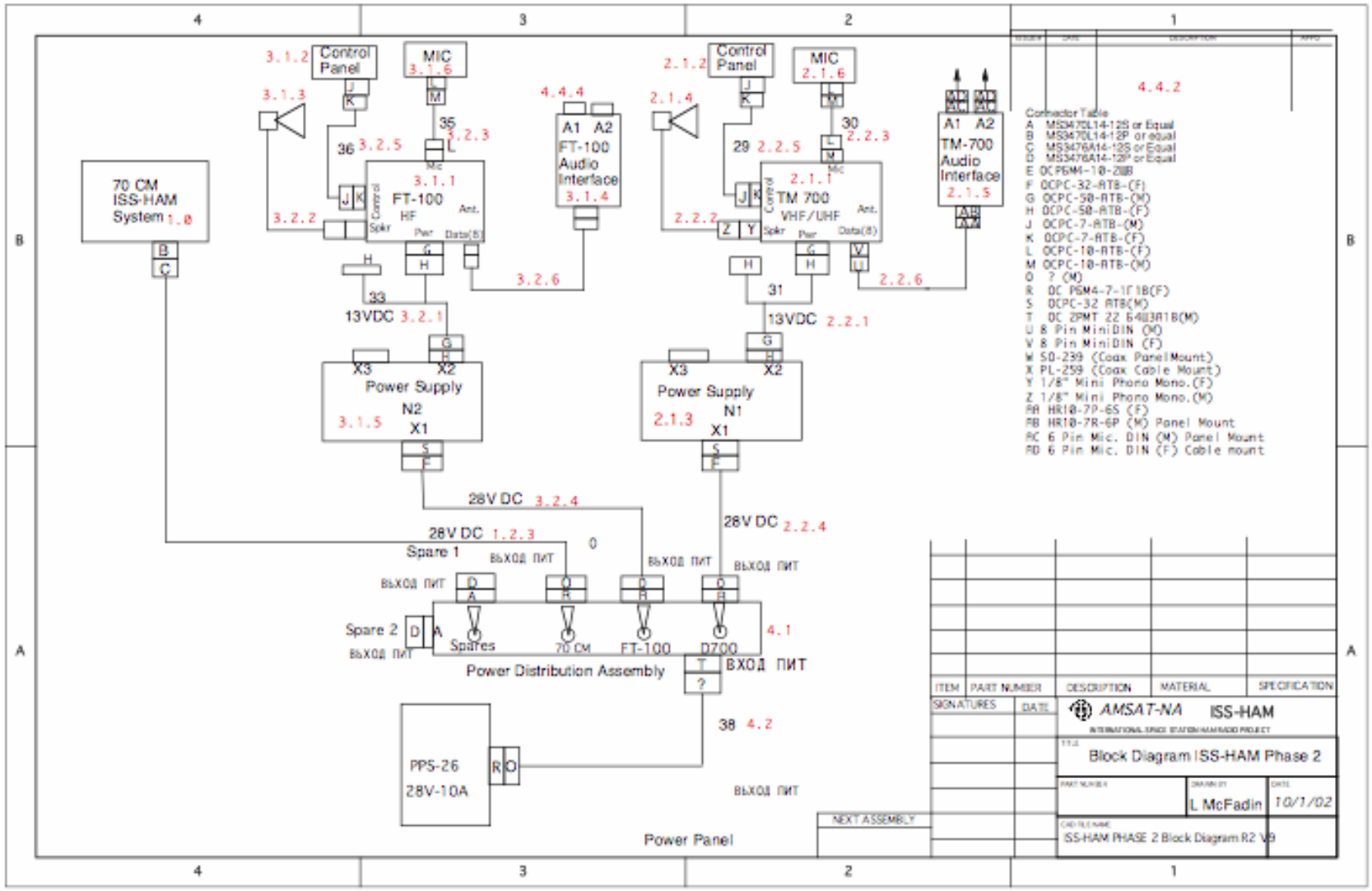
Phase 2 System Description

- Installed in Service Module
- Uses new ARISS antenna systems
- Phase 2 system consists of:
  - SAREX Phase 1 70 cm radio hardware (Packet Module, Ericsson 70 cm Radio, adapter module, headset, cables)
  - Kenwood TM-D700 VHF/UHF radio system
  - Yaesu FT-100D HF radio system
  - Specially built Energia Power Supplies
  - Foldable Mounting Device

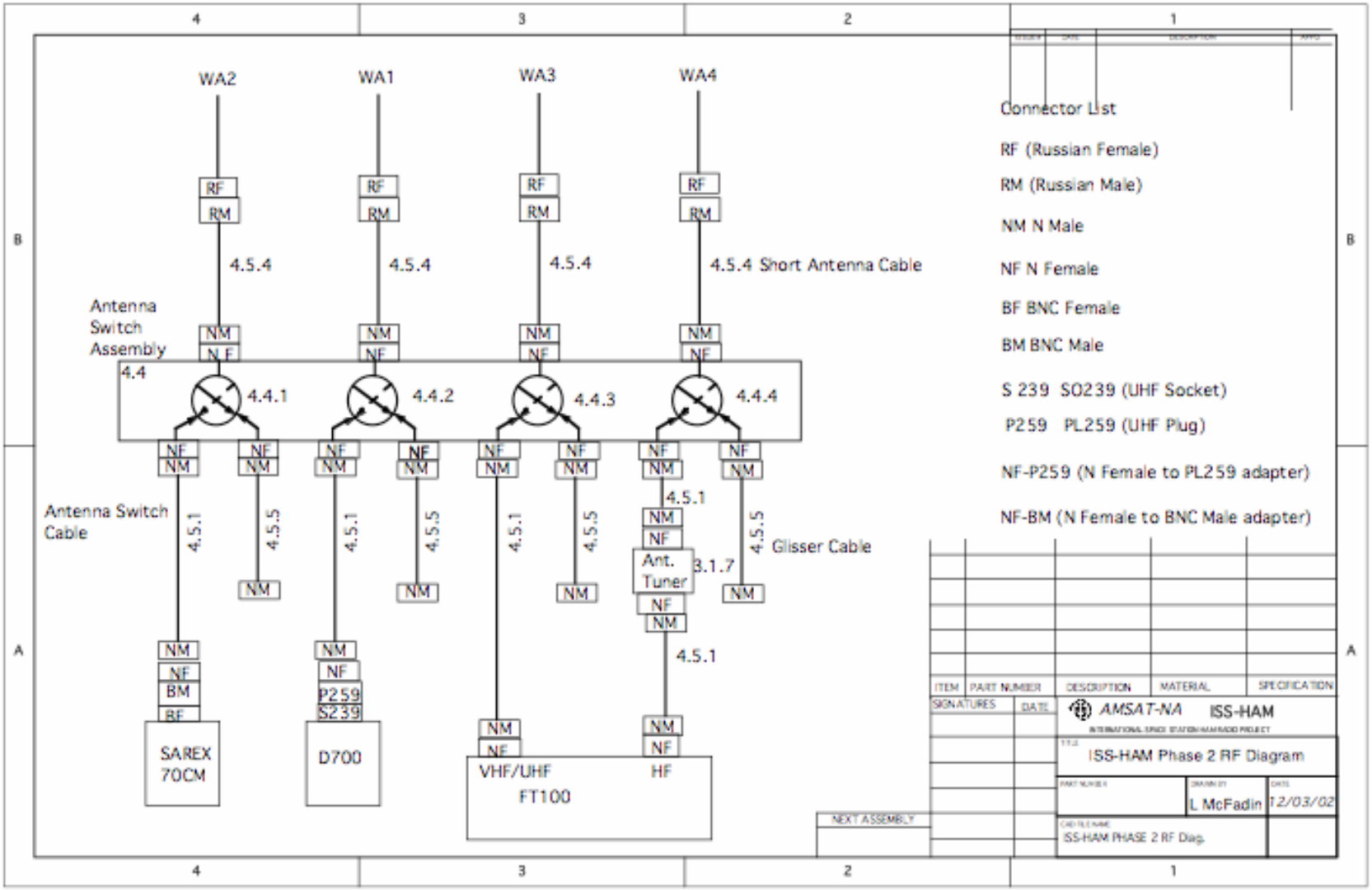
Phase 2 System Capabilities

- Transmit and Receive on Two Meters
- 70 CM and HF
- Include 70CM system identical to existing 2M system in FGB
- Allows simultaneous operation on multiple bands
- Include additional packet TNC (in D700).
- Has provisions for adding SSTV.
- Has provisions for further expansion
- Has higher power thereby improving communication links.

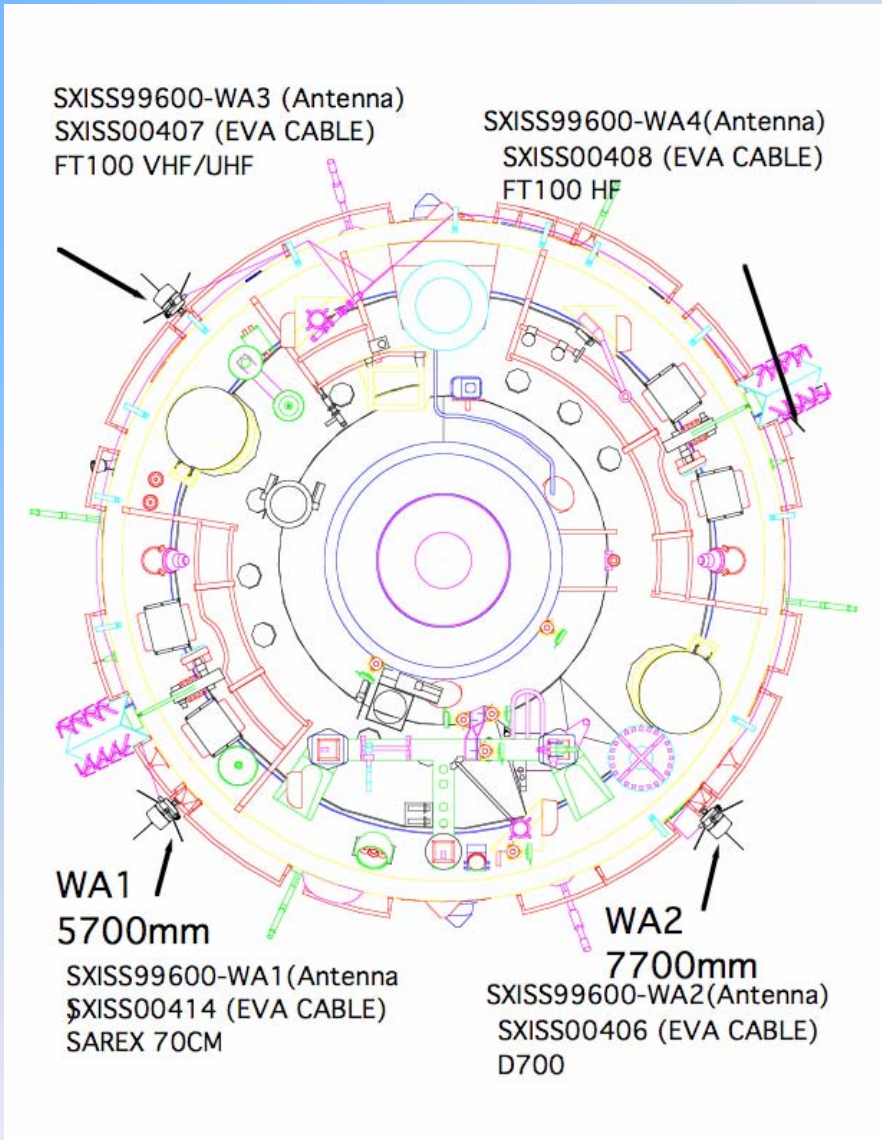
Phase 2 System Diagram



Phase 2 RF System Diagram



Antenna Placement



List of Equipment
SAREX 70CM

- Section one SAREX 70 CM system consisting of the following.
- 1.1Modules
- 1.1.1 Packet Module
- 1.1.2 Ericsson 70CM transceiver
- 1.1.3 Adapter Module
- 1.1.4 Power Module
- 1.1.5 Headset
- 1.2 Cables
- 1.2.1 Ericsson Cable
- 1.2.2 Transceiver Cable
- 1.2.3 28VDC 10 A Power cable NO. 40
- 1.2.4 RS232 Cable
- 1.2.5 Headset Extension Cable
- 1.2.6 Speaker Cable
- 1.2.7 Antenna cable

Phase 1 System

List of Equipment Kenwood D700

- Kenwood TM 700 system consisting of the following:
- 2.1 Modules
- 2.1.1 TM 700 Transceiver A4
- 2.1.2 TM 700 Control panel A2
- 2.1.3 Russian power supply A5
- 2.1.4 Speaker A14
- 2.1.5 TM 700 Audio Interface Module
- 2.1.6 TM 700 Microphone A3
- 2.2 Cables
- 2.2.1 13 VDC Power Cable No.31
- 2.2.2 Speaker Cable NO. 38
- 2.2.3 Microphone Cable NO. 30
- 2.2.4 28VDC Power Cable NO.32
- 2.2.5 Control Panel Cable NO. 29
- 2.2.6 Audio Interface Cable NO. 38
- 2.2.7RF Cable NO. TBD

Kenwood D700

List of Equipment
Yaesu FT100

- FT100 system consisting of the following
- 3.1 Modules
- 3.1.1 FT 100 Transceiver A8
- 3.1.2 FT100 Control Panel A11
- 3.1.3 FT 100 Speaker A15
- 3.1.4 FT 100 Audio Interface Module
- 3.1.5 Russian Power Supply A9
- 3.1.6 FT 100 Microphone Cable
- 3.1.7 TBD Antenna Tuner
-
- 3.2 Cables
- 3.2.1 13 VDC Power Cable No.33
- 3.2.2 Speaker Cable NO. 39
- 3.2.3 Microphone Cable NO. 35
- 3.2.4 28VDC Power Cable NO.34
- 3.2.5 Control Panel Cable NO. 36
- 3.2.6 Audio Interface Cable NO. 39
- 3.2.7 RF Cable NO. TBD

FT 100


YAESU
MH-36B
V-A
MG6
300
CH
DBP
VFO
21.295.00
10 USB
A/B A=B SPL QMB
MODE
UP
DWN
VFO/MR
STEP
HOME
LOCK
CLAR
SELECT
A
B
C
D
DSP

FC-20

List Of Equipment Supporting

- 4.0 Support System Consisting of the following:
- 4.1 Power Switching Assembly A16
- 4.2 28VDC 10 A Power Cable NO. 38
- 4.3 Mounting frame
- 4.4 Antenna Switch Assembly
- 4.4.1 Antenna Switch 1 A12
- 4.4.2 Antenna Switch 2 A13
- 4.4.3 Antenna Switch 3 A6
- 4.4.4 Antenna Switch 4 A7

List of Supporting Equipment Cont.

- 4.5
  - 4.5.1Antenna Switch Cable(4 each)
  - 4.5.2 70CM Station adapter (N Female to BNC Male)(one each)
  - 4.5.3 D700-FT100 Station adapter (N Female to SO239)(3 each).
  - 4.5.4 Short Antenna Cable
    - (Russian male to N Male ~12 inches long)
  - 4.5.5 Glisser Cable (five each)
    - N male on each end ~12 inches long

List of Equipment
Future Systems to be added

- 5.1 SSTV System
- 5.1.1 SSTV/Vox Module
- 5.1.1.1 SSTV Audio Cable
- 5.1.1.2 SSTV Adapter Cable
- 5.1.2 SSTV Software

List of Equipment Future Computer and Modem

- 5.2 Computer
- 5.2.1. Computer
- 5.2.2 Computer Power Cable
- 5.2.3 Serial Cable
- 5.3 9600 Baud Modem
- 5.3.1 9600 Baud Modem
- 5.3.2 Modem Data Cable
- 5.3.3 Modem Power Cable

Phase 2 Equipment Requested from Manufacturers

Red = In Russia (RSC "E")	Blue = in U.S.	TM-D700	TH-D7E	TS-50S	FT-100 & Tuner	VX-5R	FT-50R	Totals
Flight	**RSC'E' Flight**	**1**			**1**			**2**
Flight	**RSC "E Flight BU**	**1**			**1**			**2**
Flight	RSC"E" Test and Cert	1			1			2
Flight RSC ""E"	Flight KIS (Complex Stand)	1			1			2
HI FI Training (RSC""E")	**Flight support &Training Stand**	**1**	**2**		**1**			**4**
HI FI Training (RSC "E")	Cosmonaut Training & Family	1	2	1	1			5
Crew Ham Familiarization	RSC "E" Crew Loaner Prime 1(2 member x1=)	2			2			4
Crew Ham Familiarization	RSC "E" Crew Loaner Prime 2(1 member x1=)	1			1			2
Crew Ham Familiarization	RSC "E" Crew Loaner Backup 1(2 member x1=)		2	2				4
Crew Ham Familiarization	RSC "E" Crew Loaner Backup 2(1 member x1=)		1	1				2
Totals (Russian)		9	7	4	9	0	0	
Crew Ham Familiarization	JSC Crew Loaner Prime		1					1
Crew Ham Familiarization	JSC Crew Loaner Backup		1					1
Crew Ham Familiarization	JSC Procedure dev. and Verify	1	1		1			3
HI FI Training	**JSC Training B5**	**1**			**1**			**2**
	JSC Training B4 S	**1**			**1**			**2**
	GSFC Procedure Dev. Verify	1			1			2
Flight	**GSFC Test and Cert**	**1**	**1**		**1**			**3**
Flight	**AMSAT LAB Test and Cert**	**1**	**1**	**1**	**1**			**4**
Totals (U.S.)		6	5	1	6	0	0	

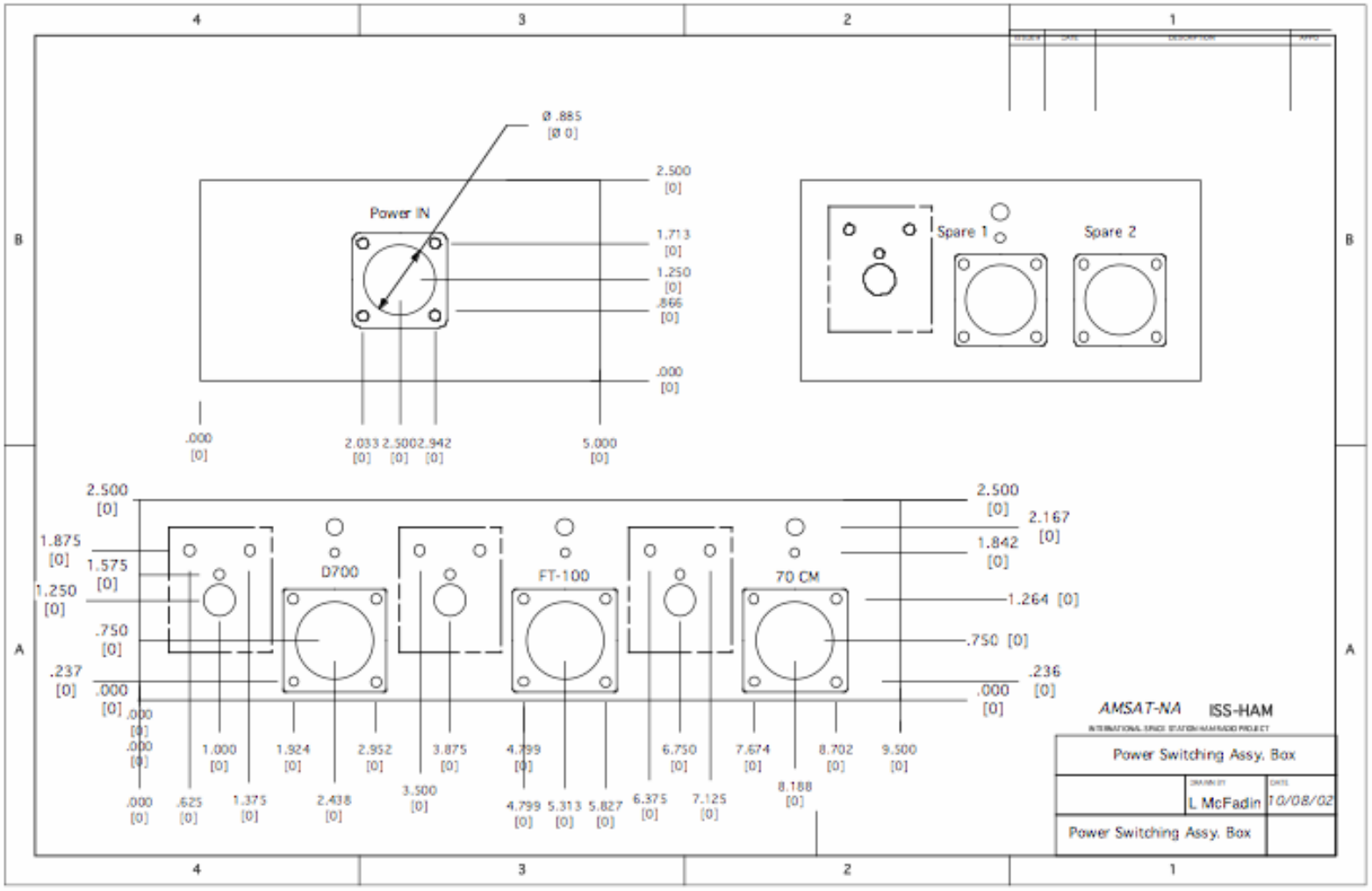
Bold means Modified per flight requirements

The ITU Amateur Satellite Service Bands are:

7.0 - 7.100 MHz

- 14.0 - 14.250 MHz (That's right 250 not 350)
- 18.068 - 18.168 MHz
- 21.0 - 21.450 MHz
- 24.890 - 24.990 MHz
- 28.0 -29.70 MHz
- 144.0 - 146.0 MHz
- 435.0 - 438.0 MHz
- 1260 - 1270 MHz Uplink only
- 2400 - 2450 MHz
- 3400 - 3410 MHz Regions 2 & 3 only, Downlink only
- 5650 - 5670 MHz Uplink only *
- 10.45 - 10.50 GHz
- 24.00 - 24.05 GHz
- 47.0 - 47.2 GHz
- 76.0 - 81 GHz
- 134 - 141 GHZ
- 341 - 250 GHZ

Power Switching Assembly



Power Switching Assembly

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Phase 2 System Layout

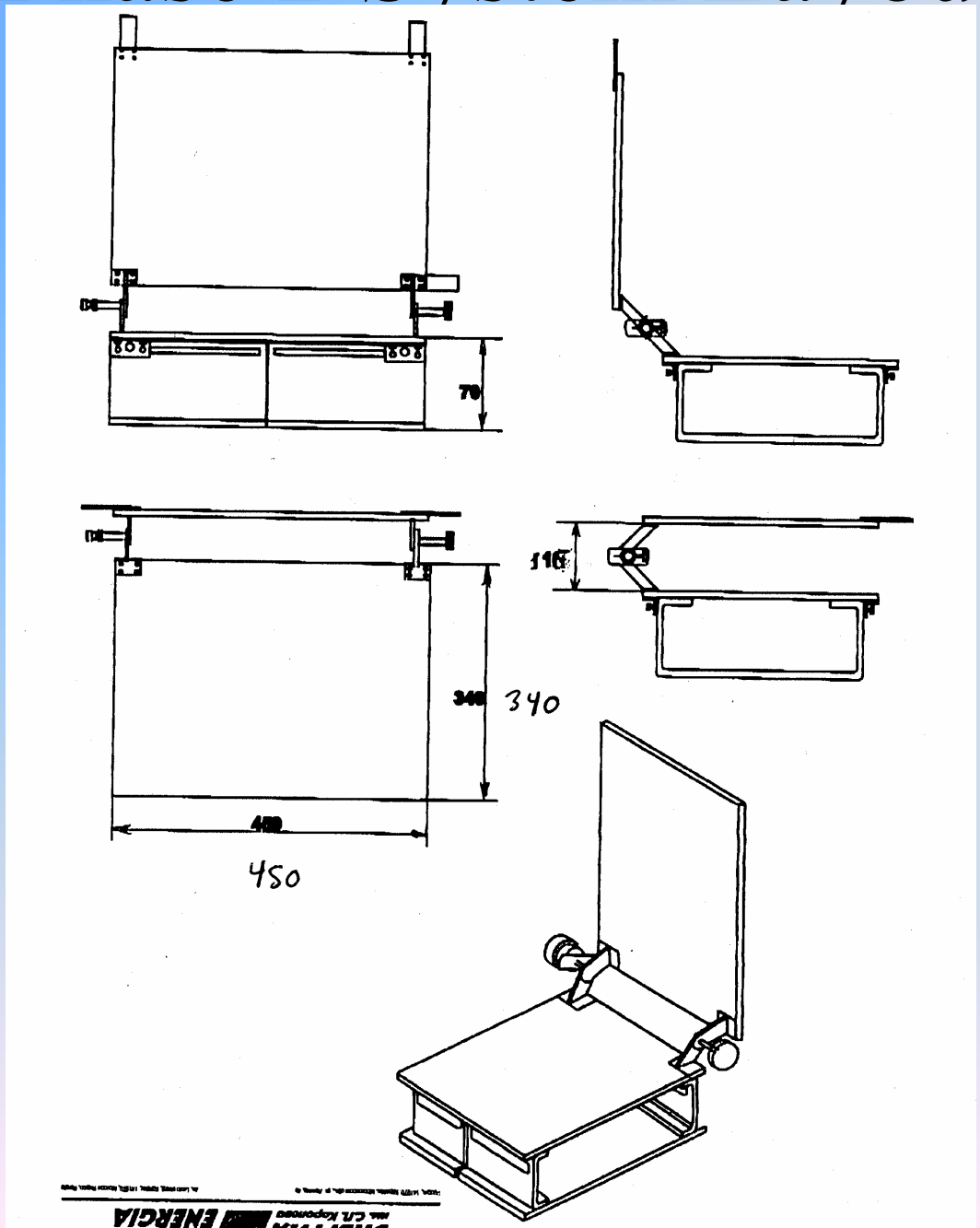


Table Left Side View Open

Table Closed

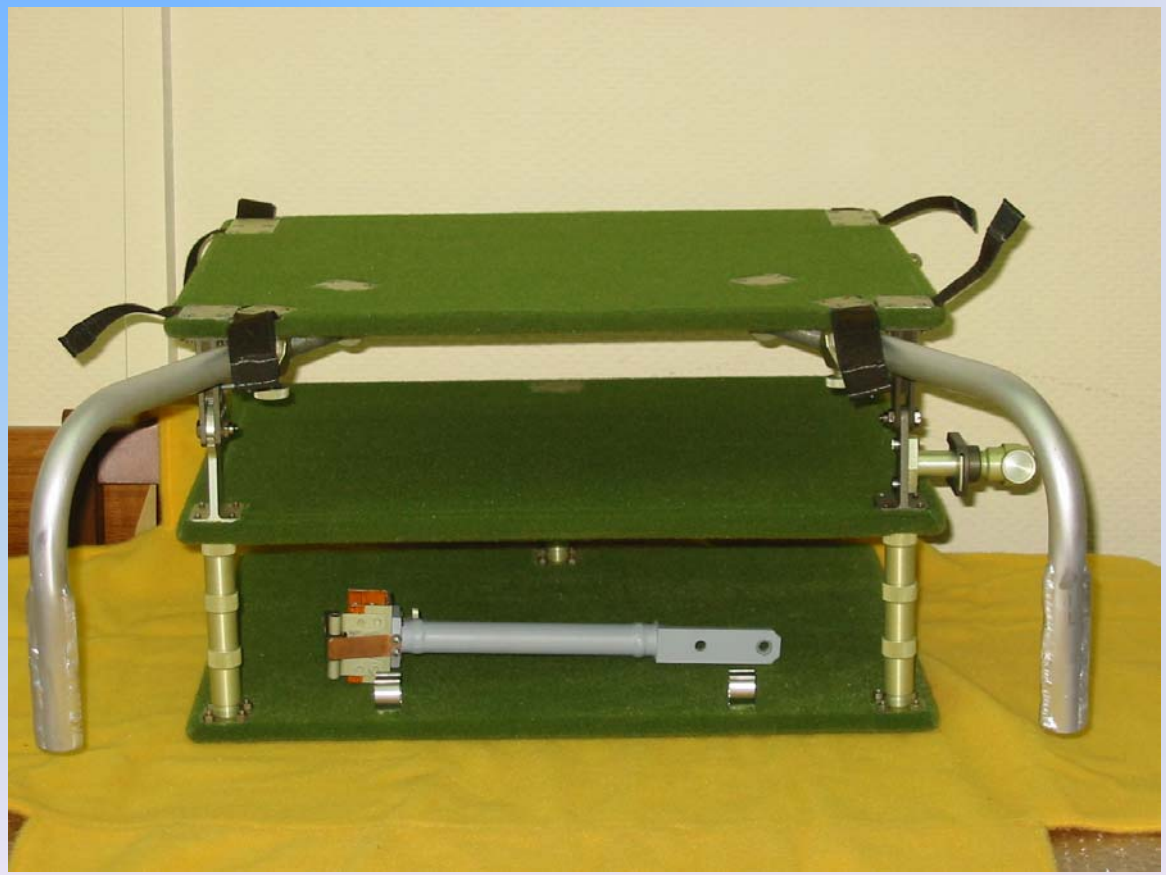
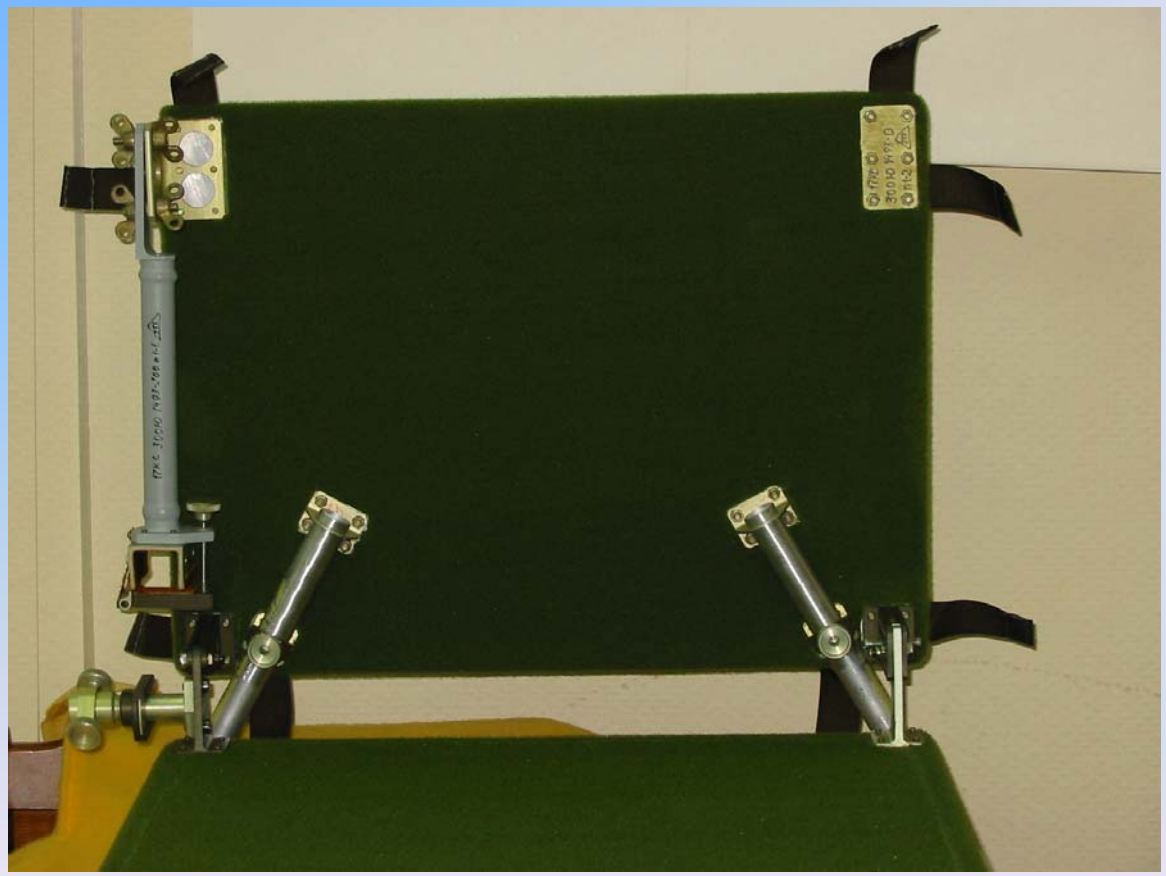


Table Side View Open

Table vertical panel open



Phase 2 HW Dev.

Table panel separator(adjustable)

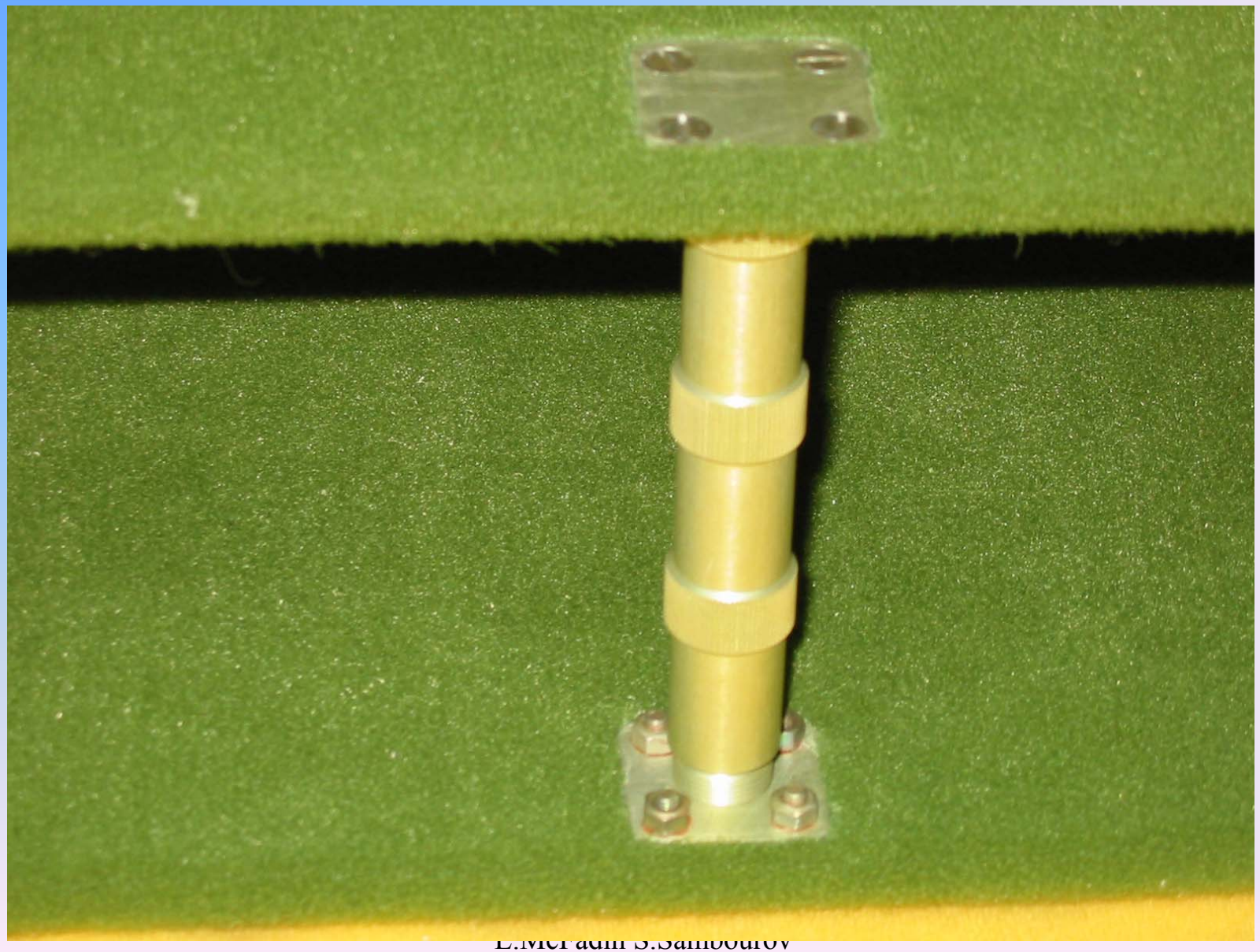


Table horizontal panels

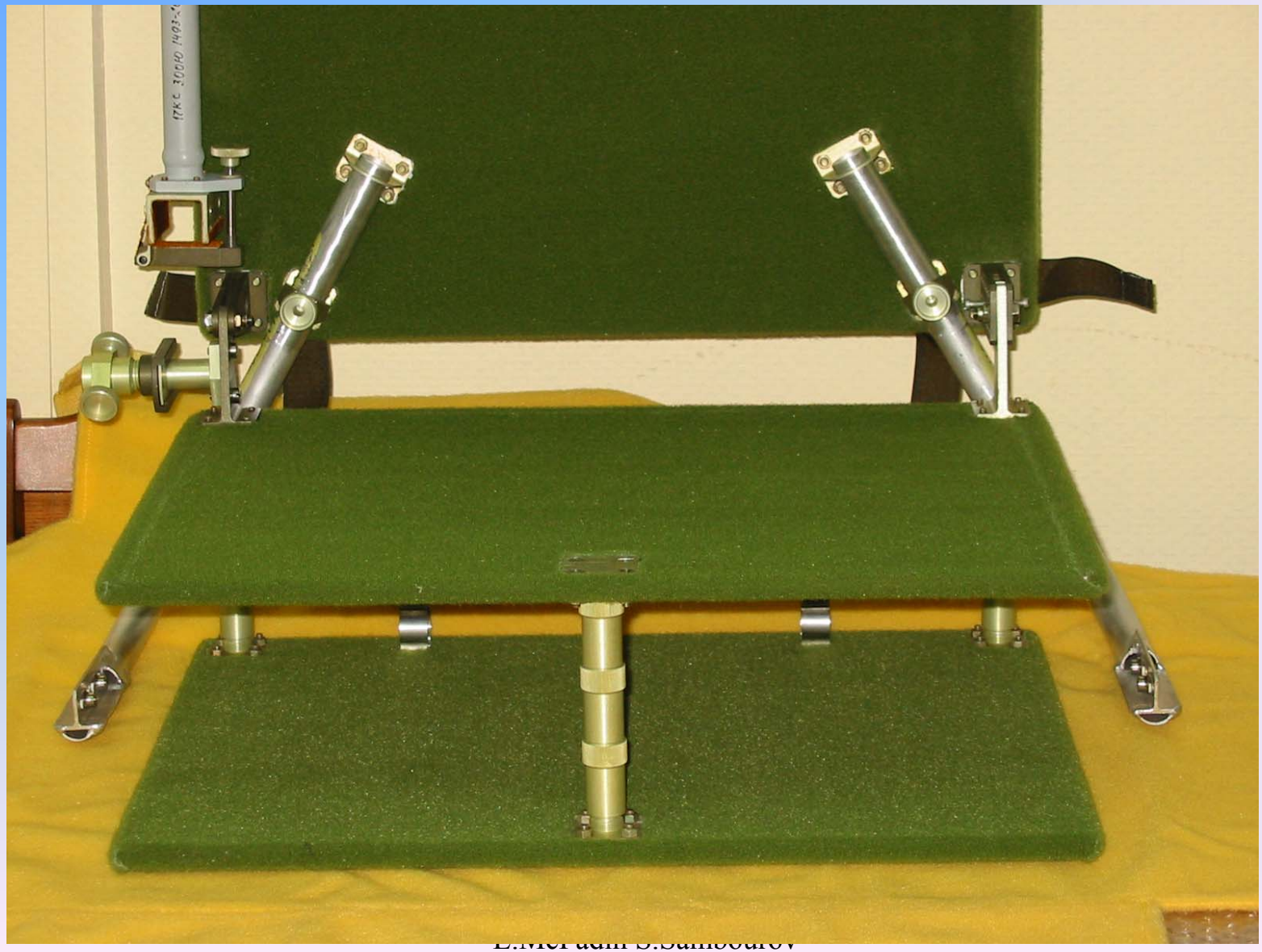
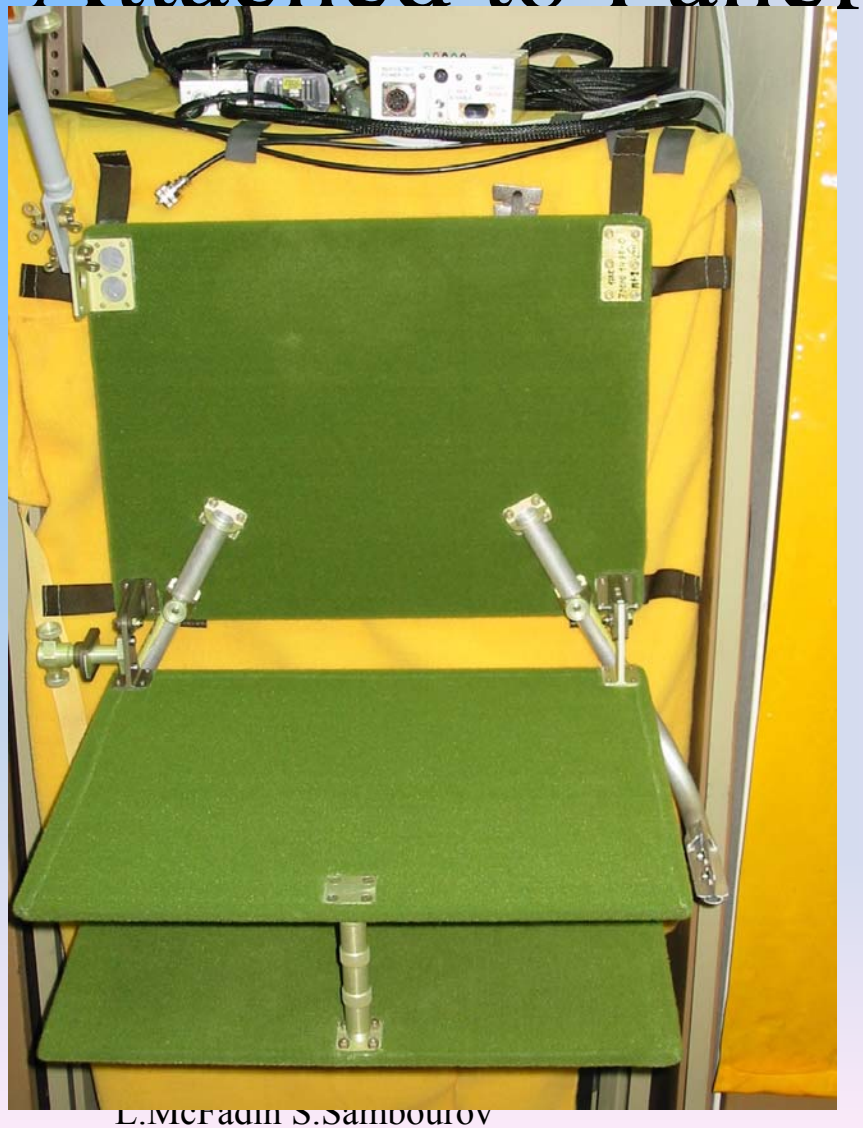


Table general view

Table Attached to Panel



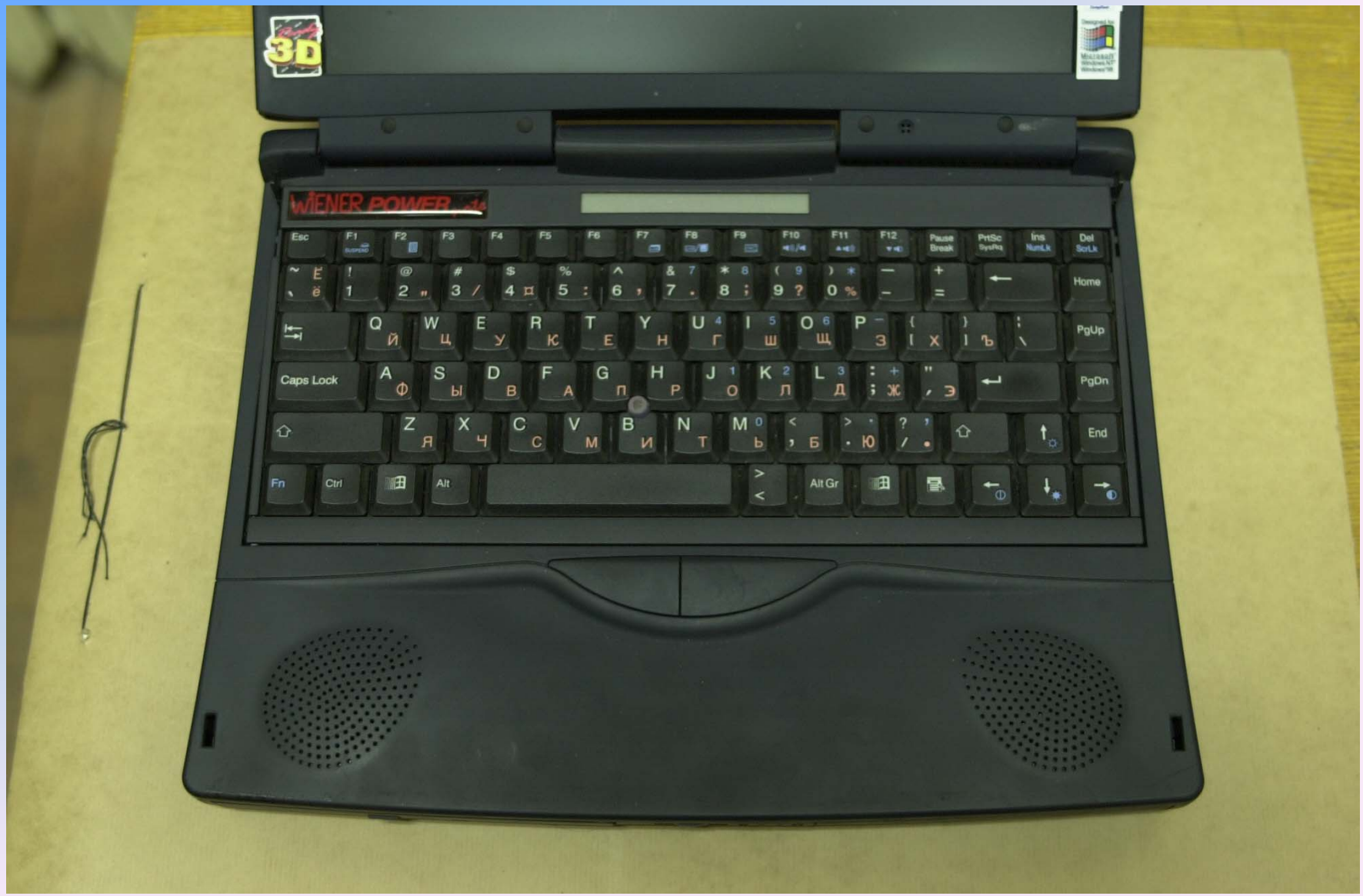
Problems Facing Phase 2 Development

- Open Items (Should be covered in Protocol)
  - Need complete definition of Cables Including Length and technical data on the SM Internal RF cables
  - Need to define Who is building what
  - Need to define testing required
  - Delivery dates need to be defined
- Components needed
  - Russian connectors
  - Radios to be delivered by Manufacturers

Problems Facing Phase 2 Development cont.

- Need to fabricate components needed for Testing in Moscow prior to next Progress flight.
- Need equipment delivered in time for Progress launch.

Computer Keyboard



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Computer rear connector panel

Computer general view