

SpaceWire Development and Test Equipment

International SpaceWire Seminar 2003

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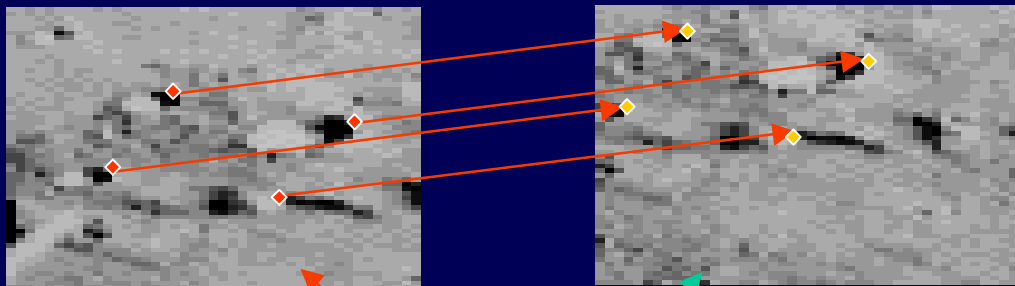
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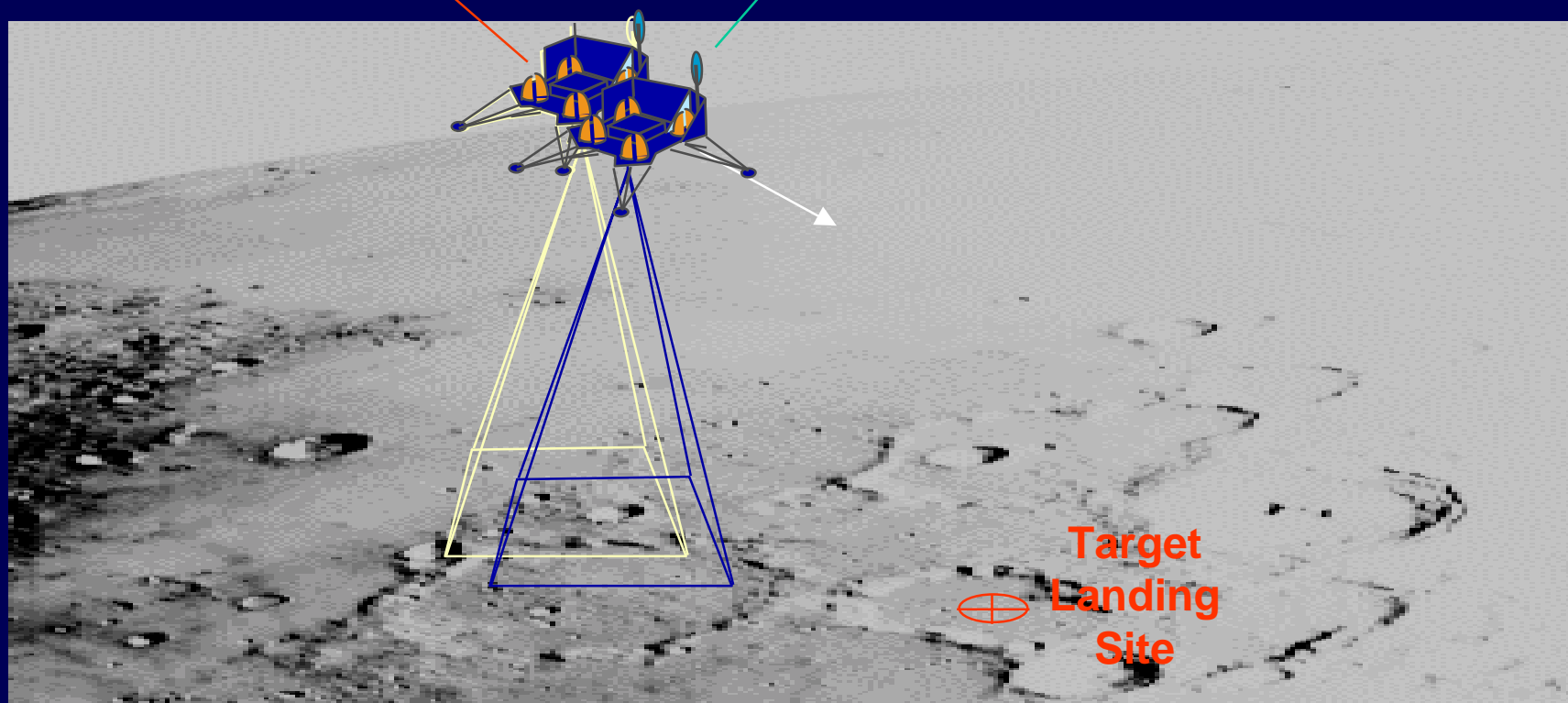
SpaceWire IP

- SpaceWire CODEC
 - Configurable VHDL core
 - Suitable for ASIC and FPGA implementation
 - IP licence available from ESA
- SpaceWire Router
 - Configurable VHDL Router
 - Generics for
 - Number of SpaceWire Ports
 - Number of External Ports
 - IP licence from University of Dundee

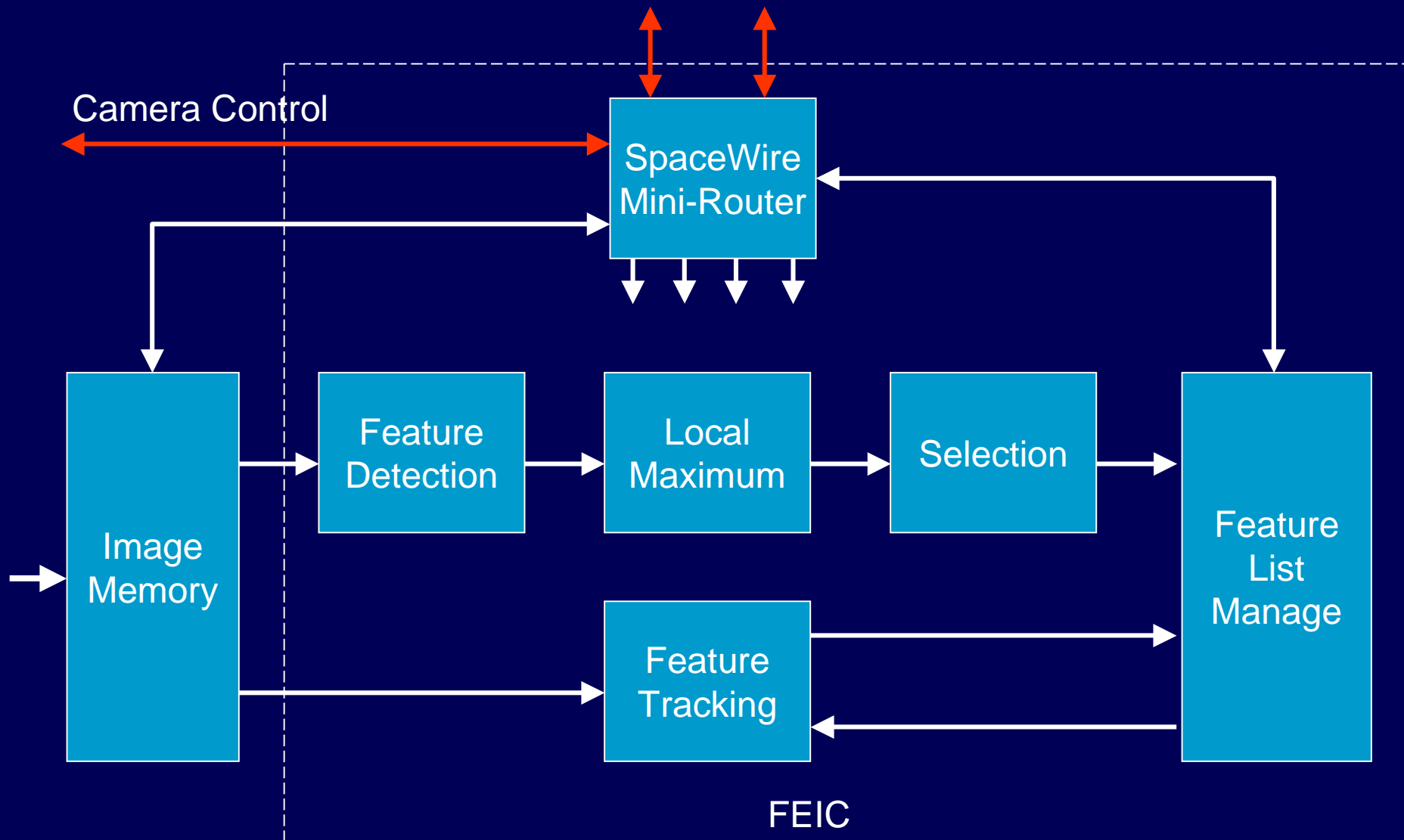
Feature Tracking



“Landmark”
Tracking



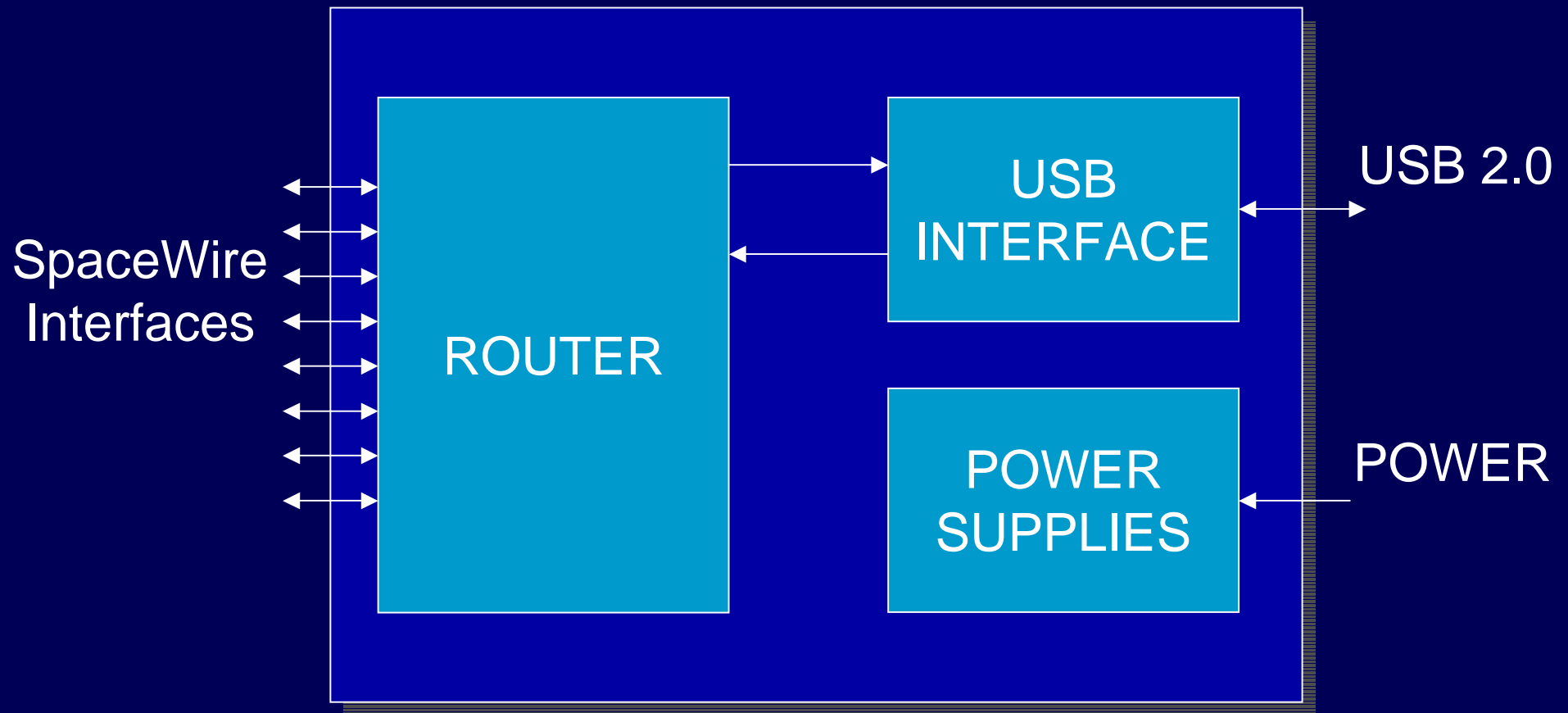
Feature Extraction IC

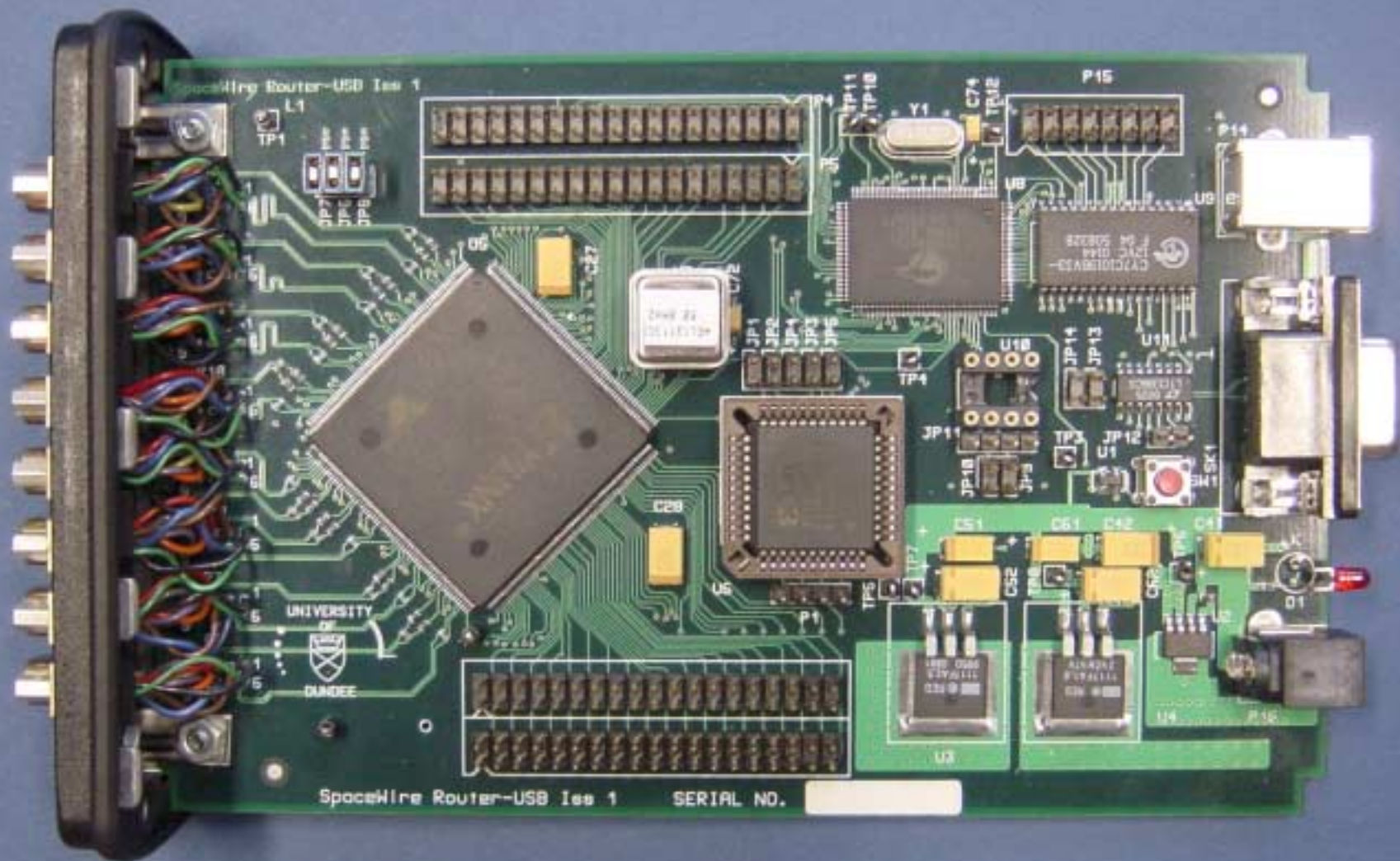


SpaceWire Router-USB

- Eight port SpaceWire router
- FPGA prototype for SpaceWire Router ASIC
- Operates at 200 Mbps
- External port connected to USB 2.0 interface
- Unit operates from single +5V power supply

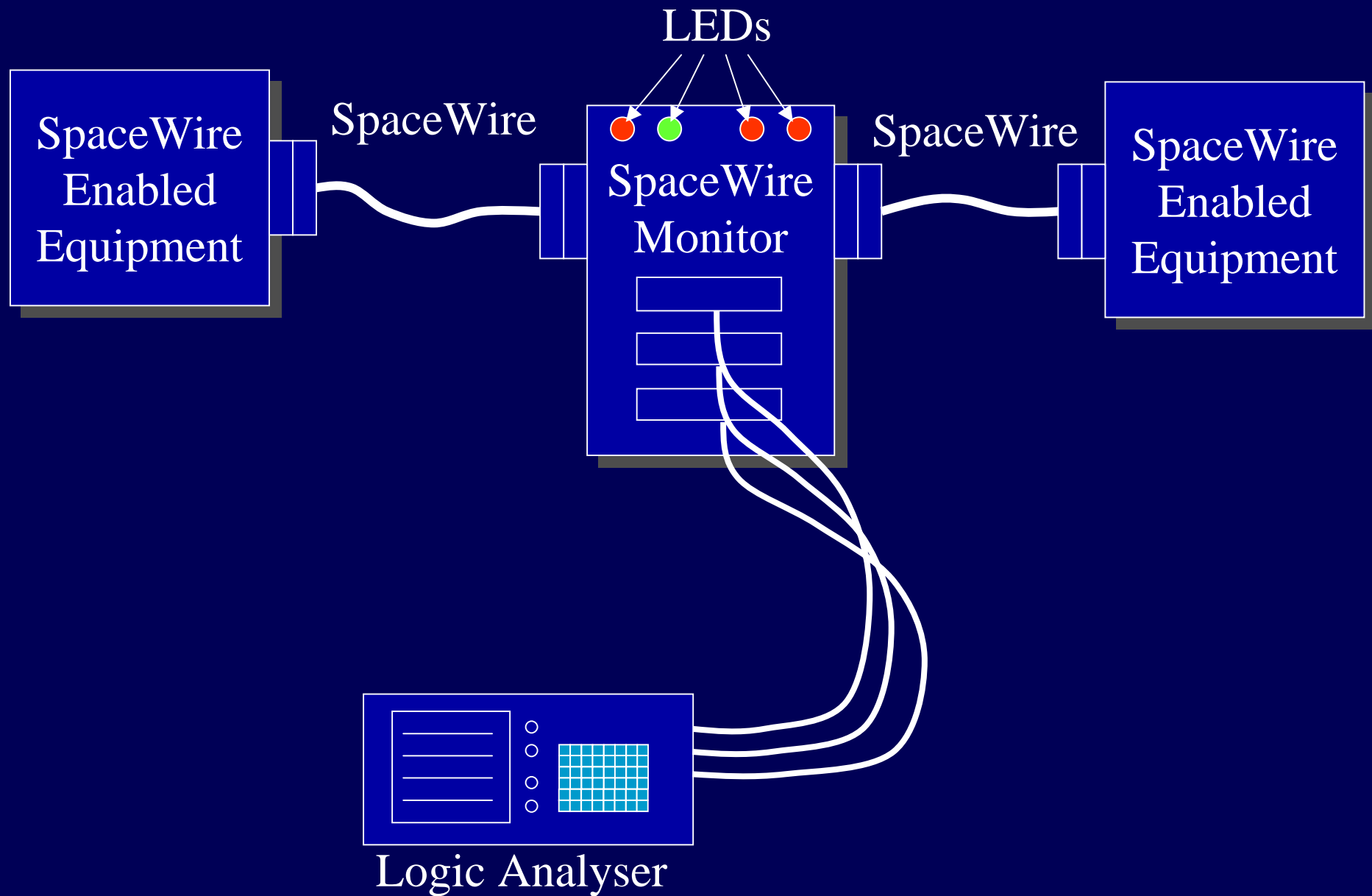
SpaceWire Router-USB







SpaceWire Monitor



SpaceWire Monitor

- Monitors traffic on a SpaceWire link
- Two banks of LEDs show
 - connection state
 - Data flow
 - EOPs/EEP
 - NULLs
 - FCTs
 - Errors

SpaceWire Monitor

- Logic analyser connections
 - Break-out decoded SpaceWire signals
 - For analysis of what is happening on the link
- Both directions monitored simultaneously

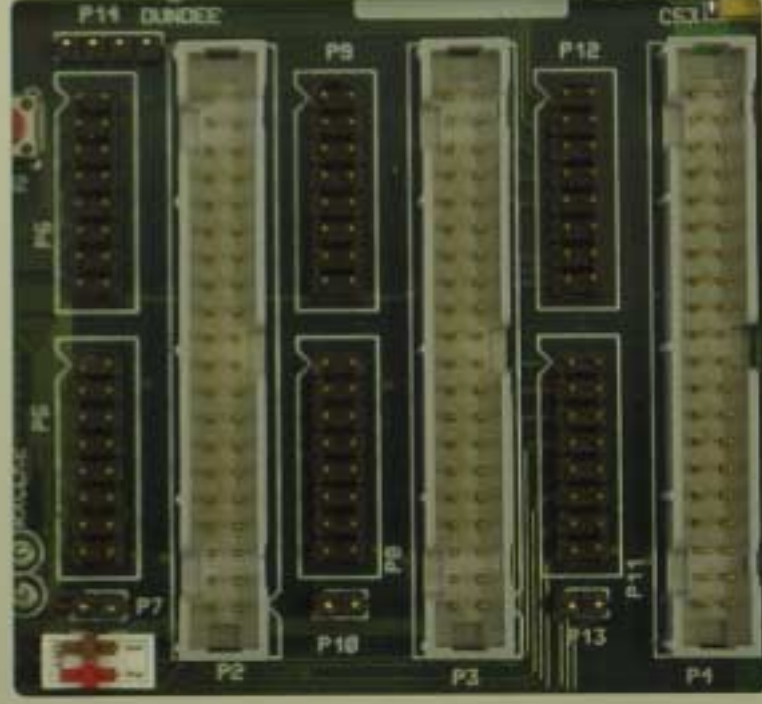
A
UNBUFFERED

B
BUFFERED

SpaceWire Monitor

A to B

B to A





A
UNBUFFERED

B

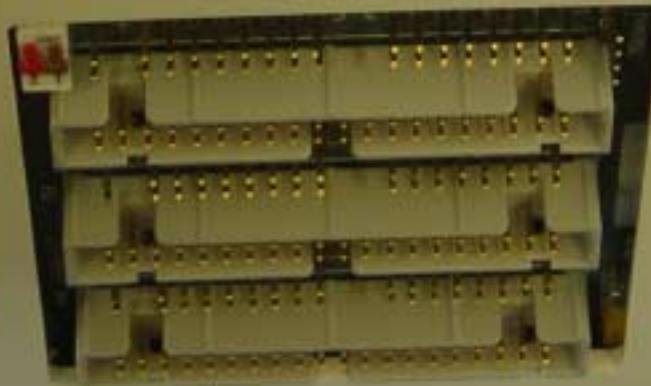
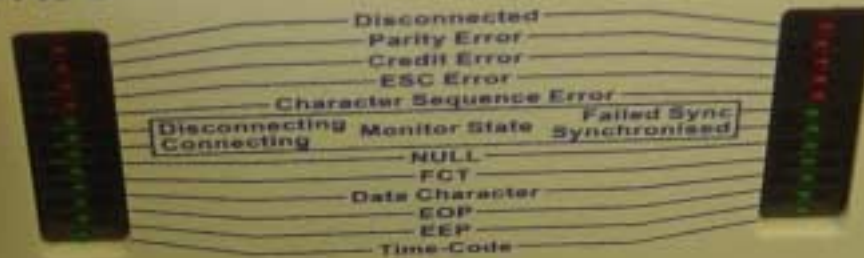
A
BUFFERED

B

SpaceWire Monitor

A to B

B to A



STAR-Dundee

SpaceWire Monitor LEDs

	----- Disconnected -----	
	----- Parity Error -----	
	----- Credit Error -----	
	----- ESC Error -----	
	----- Character Sequence Error-----	
	Disconnected	Failed Sync
	Connecting	Synchronised
	----- Null -----	
	----- FCT -----	
	----- Data Character -----	
	----- EOP -----	
	----- EEP -----	
	----- Time-Code -----	

Analyzer


Listing RECEIVER1

Cancel

Run

Markers
Off

Acquisition Time
07 Nov 2002 13:08:56


Label>
Base>

RXCHA1

RXCHA2

NCHAR1

NCHAR2

Time

Symbol

Symbol

Hex

Hex

Relative

0

ESCAPE

000

000

1

NULL

000

000

336

2

ESCAPE

000

000

344

3

NULL

000

000

336

4

ESCAPE

000

000

344

5

ESCAPE

000

000

176

6

NULL

000

000

160

7

NULL

000

000

184

8

ESCAPE

000

000

160

9

FCT

000

000

176

10

NULL

000

000

160

11

FCT

ESCAPE

000

000

184

12

NULL

000

000

16

13

FCT

000

000

24

14

FCT

000

000

16

15

FCT

000

000

24

Analyzer


Listing RECEIVER1

Cancel

Run

Markers
Off

Acquisition Time
07 Nov 2002 13:08:56


Label>
Base>

RXCHA1

RXCHA2

NCHAR1

NCHAR2

Time

Symbol

Symbol

Hex

Hex

Relative

30	NULL		000	015	24
31	ESCAPE	NCHAR	000	016	16
32	NULL		000	016	24
33	ESCAPE		000	017	16
34		NCHAR	000	017	8
35	NULL		000	017	16
36	ESCAPE		000	017	16
37	NULL	NCHAR	000	018	24
38	ESCAPE		000	018	16
39	NULL		000	019	24
40		NCHAR	000	019	8
41	ESCAPE		000	019	8
42	NULL	EOP	000	100	24
43		ESCAPE	000	100	8
44	ESCAPE		000	100	8
45		NULL	000	100	16

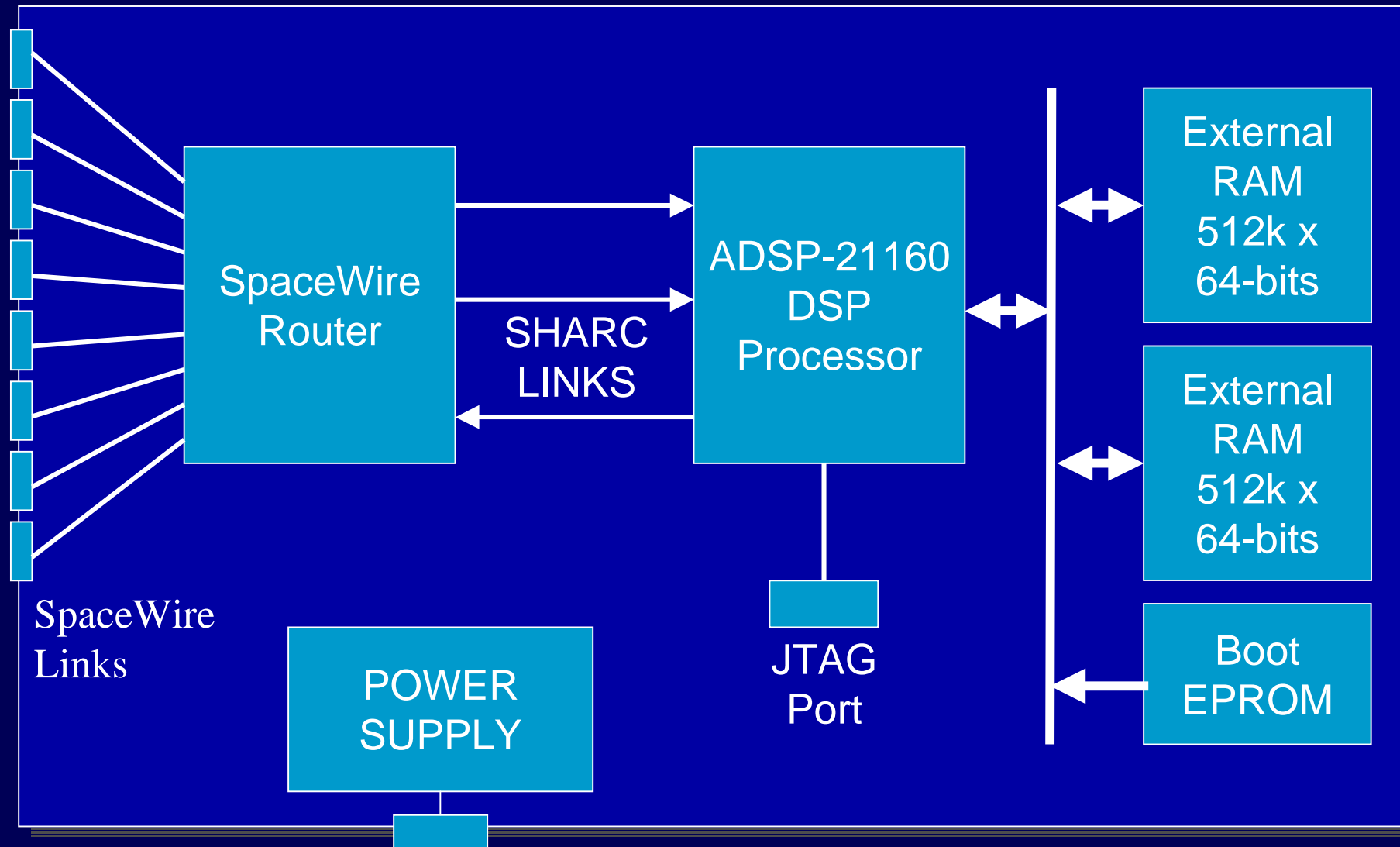
SpaceWire Monitor Summary

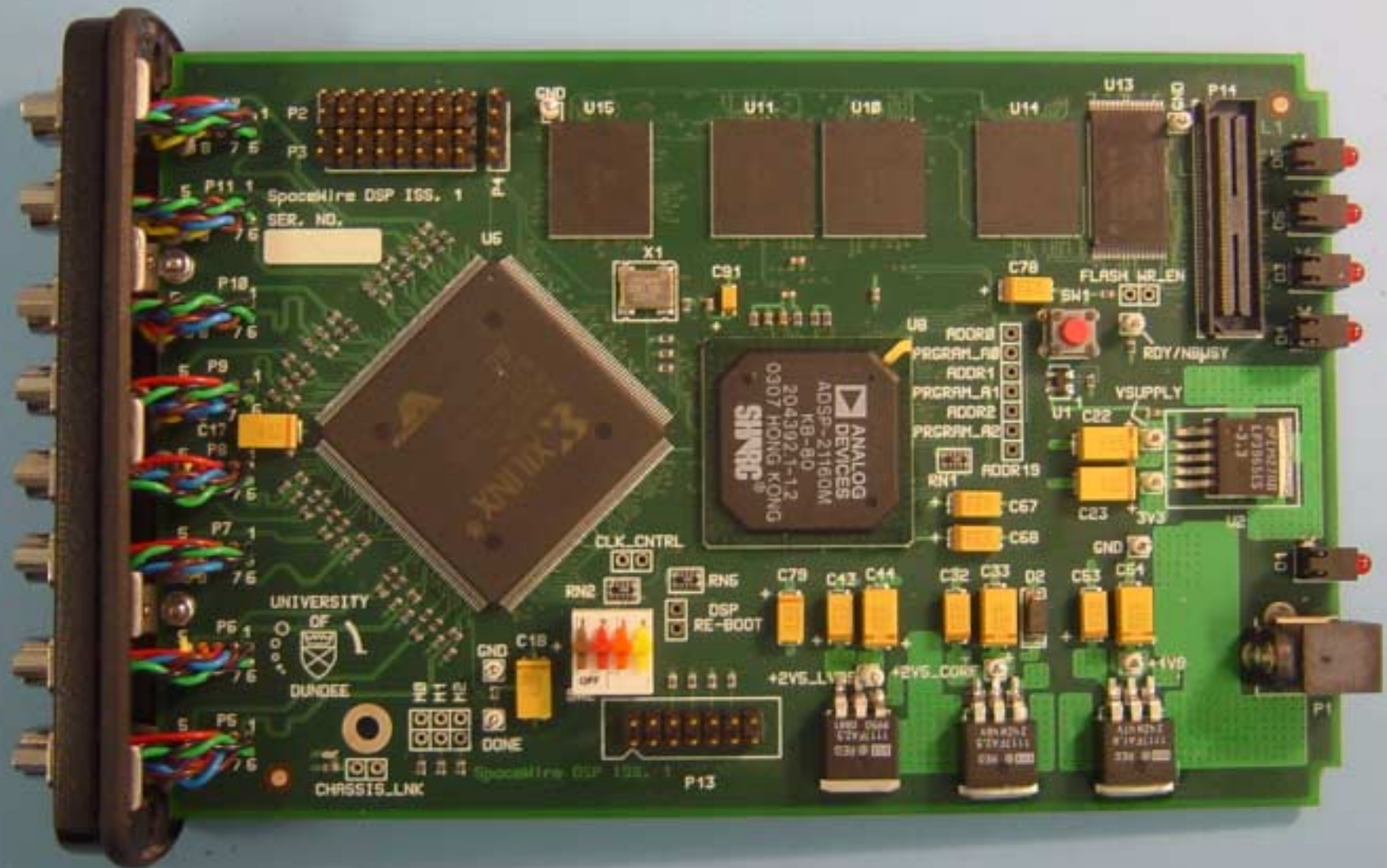
- SpaceWire Monitor provides:
 - Convenient means of monitor SpaceWire
 - Two methods of monitoring
 - LEDs
 - Logic Analyser
- Simple and powerful debugging aid

SpaceWire DSP

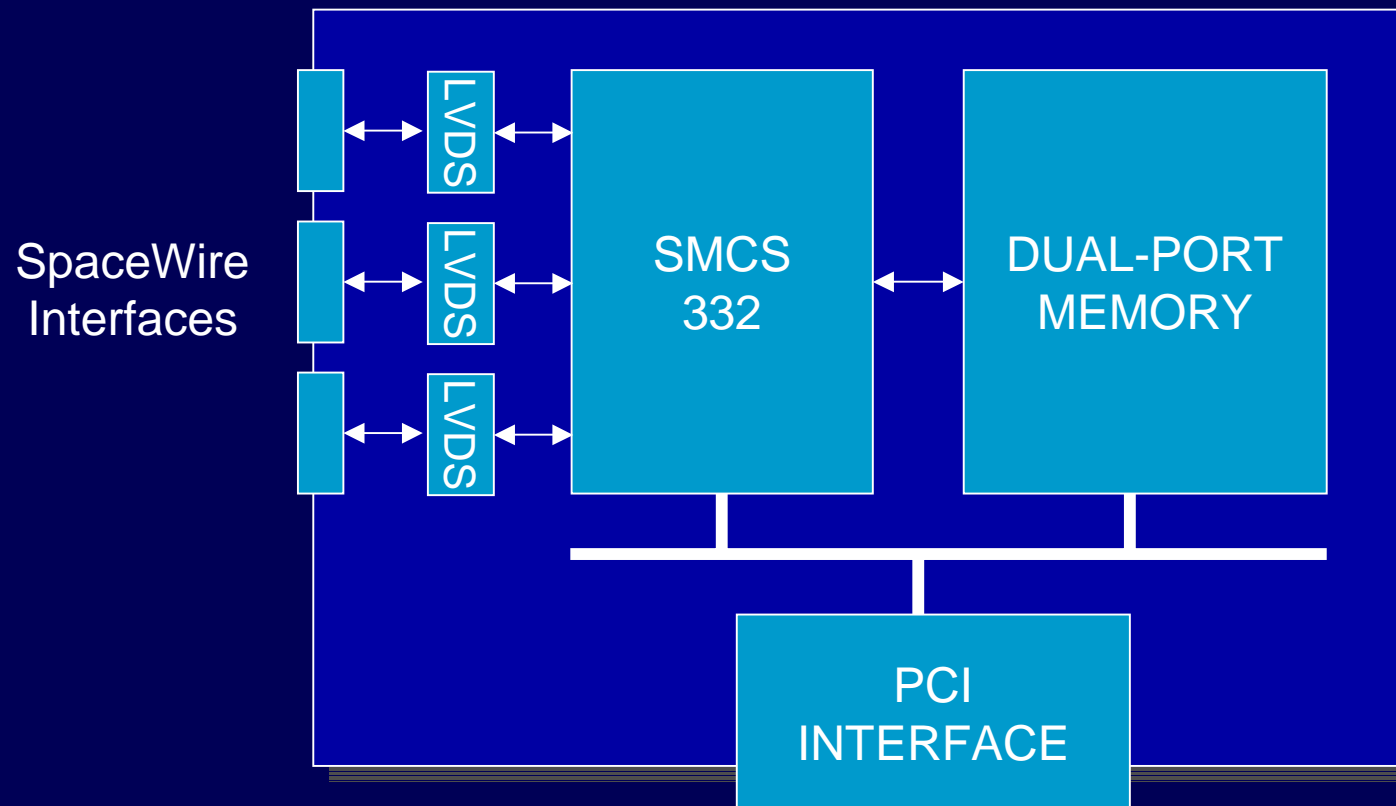
- Developed under BNSC funding
- Sub-contractor to SciSys
- 8-port router
- Powerful DSP
- For research use
- Micro ORB running over SpaceWire

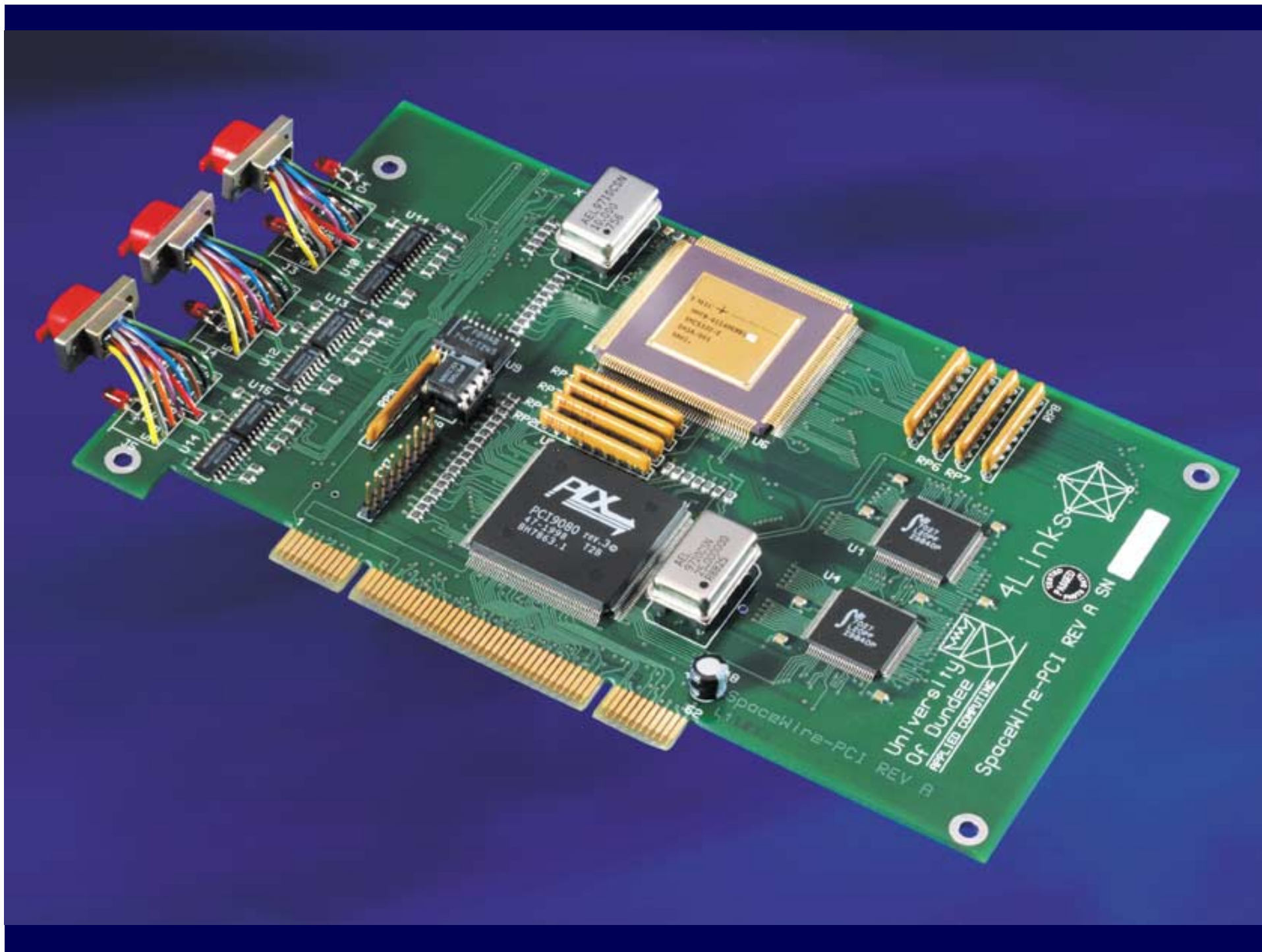
SpaceWire-DSP

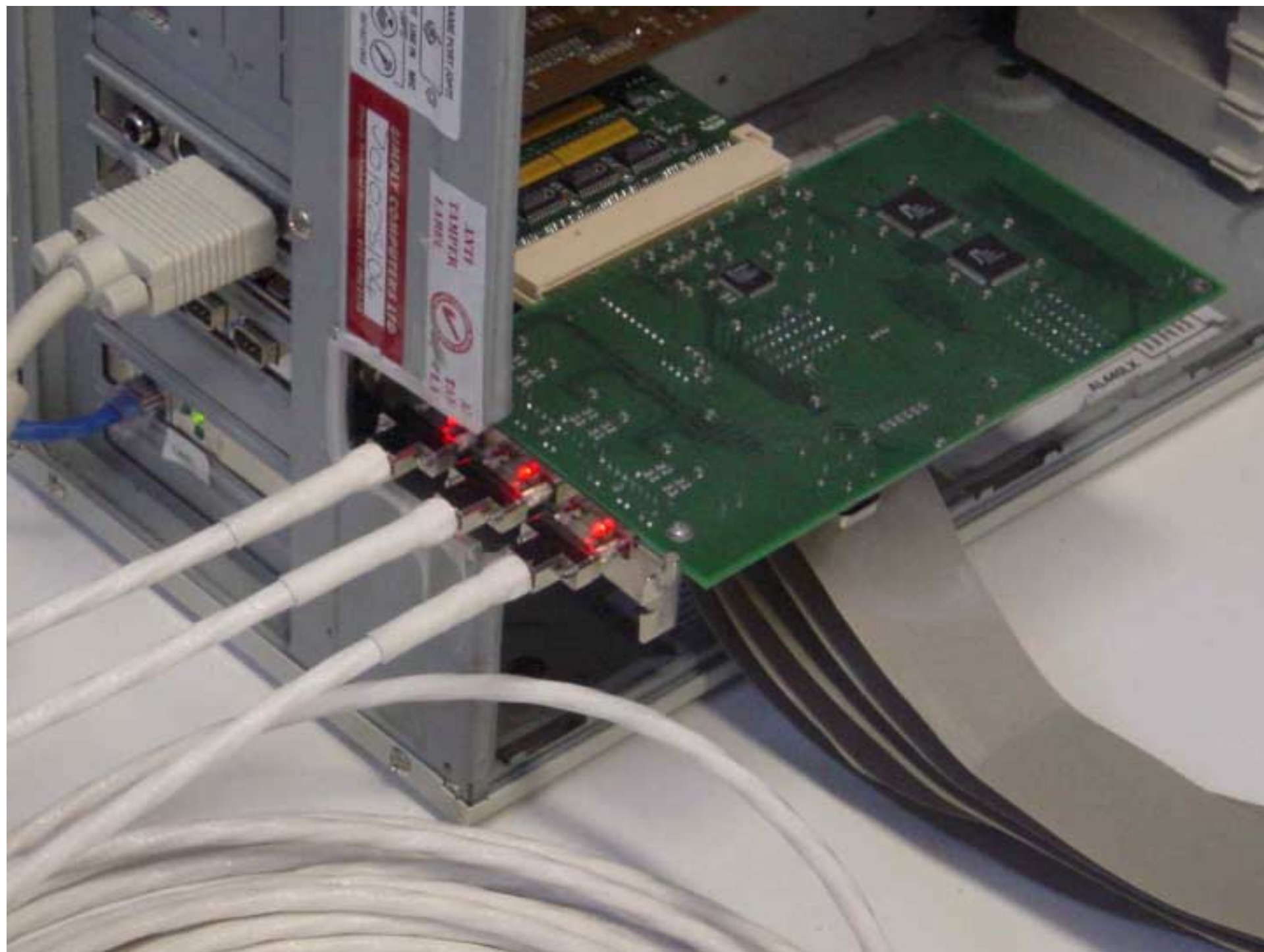




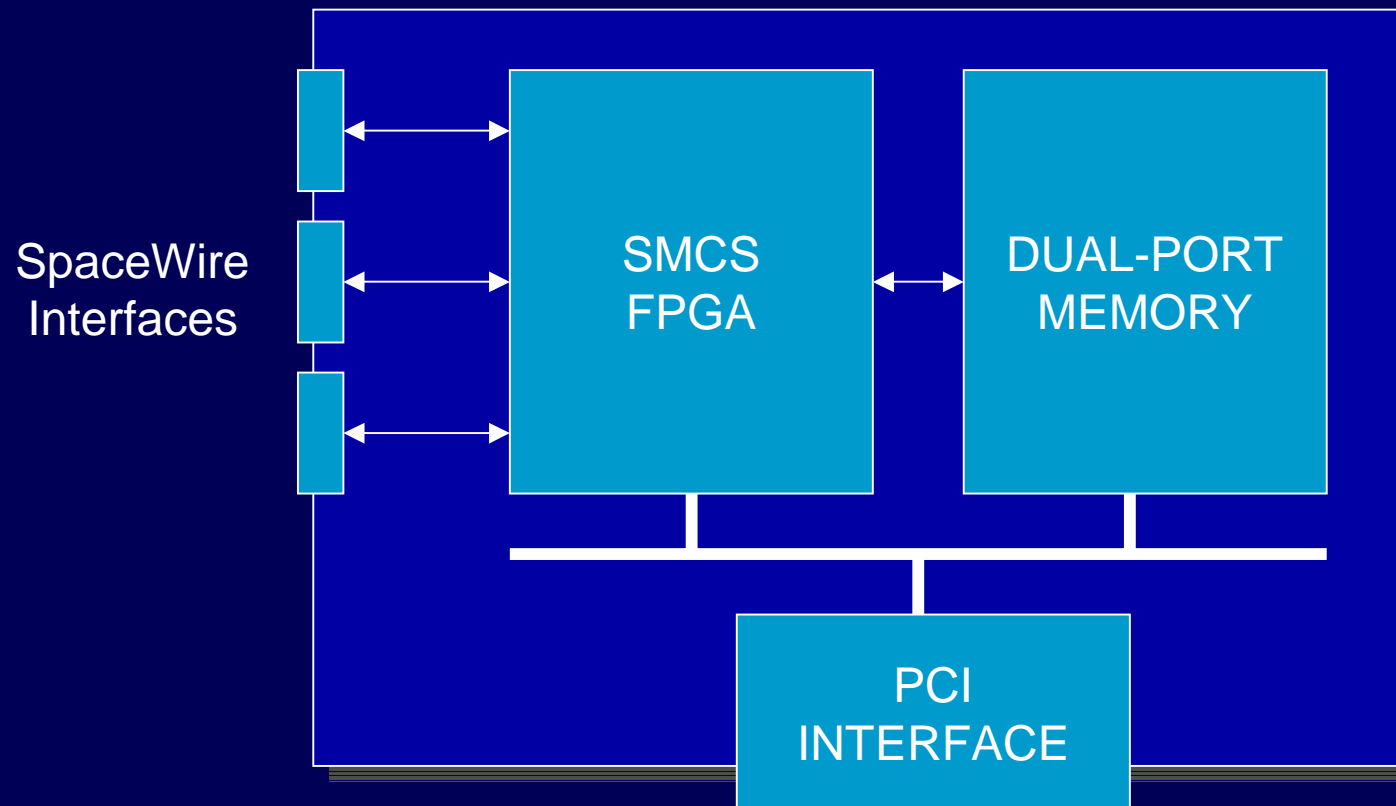
SpaceWire-PCI







SpaceWire-PCI-2



SpaceWire PCI-2

- Fully SpaceWire compliant
- SMCS FPGA being developed by Astrium GmbH
- Board currently being designed
- Funded by ESA
- Sub-contractor to Astrium GmbH

SpaceWire Drivers

- SpaceWire PCI (and PCI-2)
 - Windows (98, 2000, XP)
 - Linux
 - VxWorks
 - TCP/IP network driver for Linux
- SpaceWire Router-USB
 - Linux
 - TCP/IP network driver for Linux
 - Windows driver under development

Other SpaceWire Developments

- SpaceWire Conformance Tester
 - Unit to test conformance of other equipment to SpaceWire standard
 - Level that can be tested will depend upon accessibility to equipment under test
 - Funded by ESA
 - Sub-contractor to Austrian Aerospace

SpaceWire-USB Stick

- SpaceWire to USB 2.0 interface
- 160 Mbits/s real data rate to/from PC main memory
- 124 Mbits/s bi-directional
- Powered from USB



SpaceWire-USB Brick

- SpaceWire to USB 2.0 interface
- Two SpaceWire ports
- Configurable as three port router
- Or two port interface
- 160 Mbits/s real data rate to/from PC main memory
- 124 Mbits/s bi-directional
- Powered from USB



SpaceWire Link Analyser

- Displays link state on host PC
- Captures link packet transfers
- Funded by SMART award from Scottish Executive
- Can also act as two port SpaceWire interface



SpaceWire Research

- IP is available from University of Dundee
 - Router encrypted VHDL
 - Router VHDL source code
 - Software source code



- Support for users of SpaceWire
 - IP support
 - ASIC support
 - Development support
 - Software drivers
 - Test equipment



- Products available now
 - Router-USB driver
 - Full CE/FCC certification
 - SpaceWire PCI drivers
- Products available soon
 - SpaceWire Monitor
 - SpaceWire Link Analyser
 - SpaceWire USB Stick
 - SpaceWire USB Brick
 - SpaceWire Conformance Tester