Signal Feedthrough Progress Report

ATLAS LAr Week 9th July 98

- General Status
- FEA Update
- Project Schedule
- Low Voltage Cables
 - Cable development update
 - FEA update



Presented by Terry Hodges TRIUMF and University of Victoria British Columbia, Canada

Pin Carrier Order for Prototypes

- BNL and Victoria plan to produce 2 feedthrough units each
- Total Order:
 - Glasseal
 - Start of reception expected mid July 98
 - 20 pin carriers BNL
 - 20 pin carriers Victoria
 - These will be gold-plated
 - Pacific Coast Technologies
 - Start of reception expected late July 98
 - 10 pin carriers BNL
 - 10 pin carriers Victoria
 - These will NOT be gold-plated
- Costs
 - Glasseal
 - 448 pins: US\$ 1455 each for 20 + US\$ 40 for Au
 - 512 pins: US\$ 1621 each for 20 + US\$ 47 for Au
 - 448 pins: US\$ 593 each for 500
 - 512 pins: US\$ 659 each for 500
 - PCT
 - 448 pins: US\$ 3872 each for 10 + US\$ 1400 for Au
 - 512 pins: US\$ 3961 each for 10 + US\$ 1400 for Au
 - 448 pins: US\$ 1997 each for 500 + US\$ 200 for Au
 - 512 pins: US\$ 2027 each for 500 + US\$ 200 for Au



- Leak detection using He leak detector supported by an RGA
- Leak detector services warm and cold test stations
- Cooling by cryo-cooler or LN₂
- All assembled, commissioning started







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Controlled Temperature Cycling Refrigerator for pin carriers

All assembled

Capacity of 12 pin carriers

Cooled by Cryocooler or LN₂



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Assembly Jig in Victoria



- Rotation about horizontal and vertical axis possible
- Various assembly scenarios under study
- Being assembled

Endcap Signal Feedthrough Project Canadian Responsibilities

- Design
- Fabrication
 - Signal Pigtails purchased from Orsay
 - Low Voltage Pigtails purchased from MPI
- Commissioning
- Transport
- Assistance during installation:
 - Considering to cover the cost of an orbital cutter
 - Assistance during welding on the cryostat
 - Assistance for leak testing during installation
 - DC Electrical tests during the installation
- Grey areas which require more discussion:
 - Heater power distribution
 - Flange temperature monitoring
 - Connection to vacuum manifolds

Endcap Signal Feedthrough Team

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Paul Birney	Senior Technician, TRIUMF Leak test station Assembly tooling
Margret Fincke	Research Associate, Victoria Electric test station Vacuum cable development
Terry Hodges	Chief Engineer, TRIUMF Feedthrough unit design Finite element analysis
Alisa Dowling	Junior Technician, Victoria Temperature Cycling Unit
Richard Keeler	Faculty, Victoria Test stations Vacuum cable development
Roy Langstaff	Senior Draftsman, TRIUMF Feedthrough unit design Procurement issues
Michel Lefebvre	Faculty, Victoria Project leader
Mark Lenckowski	Draftsman, TRIUMF
Ernie Neuheimer	Research Scientist, CRPP Carleton Vacuum cable development
On a consultant basis:	
Paul Poffenberger	Research Associate, Victoria Leak test station Vacuum system
Randy Sobie	Faculty, Victoria DAQ

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9 July 1998 LAr Week

Endcap Signal Feedthrough Project Top PBS Levels

PBS	Task	WBS	Description
4		1	Endcap Signal Feedthroughs
4.1		2	Project Setup
4.1.1		3	Leak Test Setup
4.1.2		3	Electric Test Setup
4.1.3		3	Data Acquisition System
4.1.4		3	FT Assembly Tools
4.1.5		3	FT Prototypes
4.1.6		3	Management Tools
4.2		2	FT Series Assemblies
4.2	D	3	Design
4.2	AO	3	Assembly for ECC
4.2	Т	3	Testing and Commissioning for ECC
4.2	А	3	Installation on ECC
4.2	AO	3	Assembly for ECA
4.2	Т	3	Testing and Commissioning for ECA
4.2	А	3	Installation on ECA
4.2	RE	3	Repairs
4.2.1		3	Mechanical Components
4.2.1.1		4	Pin Carriers
4.2.1.2		4	Warm Flanges
4.2.1.3		4	Cold Flanges
4.2.1.4		4	Bellow Assemblies
4.2.1.5		4	Bolt Flanges
4.2.1.6		4	Funnel Assemblies
4.2.1.7		4	Pipe Fittings
4.2.2		3	Electrical Components
4.2.2.1		4	Pig Tail Cables
4.2.2.2		4	Vacuum Cables
4.2.2.3		4	Low Voltage Pigtail Cables
4.2.2.4		4	Low Voltage Vacuum Cables
4.2.2.5		4	Heaters
4.2.3	ŀ	3	Shipping Crates

4.n for ATLAS Canada corresponds to4.2.2.1.n in the TDR

Endcap Signal Feedthrough Project Installation

PBS	Task	WBS	Description	1996	1997	199	98	1999	2000	2001	2002	2003
4		1	Endcap Signal Feedthroughs									
4.1		2	Project Setup					-				
4.2		2	FT Series Assemblies	-				_				
4.2	D	3	Design									
4.2	AO	3	Assembly for ECC									
4.2	Т	3	Testing and Commissioning for ECC									
4.2	Α	3	Installation on ECC						4			
4.2	AO	3	Assembly for ECA									
4.2	т	3	Testing and Commissioning for ECA	_								
4.2	Α	3	Installation on ECA								1	
4.2	RE	3	Repairs									
4.2.1		3	Mechanical Components				ŀ					
4.2.2		3	Electrical Components				⊢					
4.2.3		3	Shipping Crates									

Dates Assumed (CB of 11/06/98)

24/11/00 for 90 days Installation on ECC 22/02/02 for 90 days Installation on ECA

Endcap Signal Feedthrough Project Schedule: Mechanical Components

41Endap Signal Feedthroughs4.1I.2Project Stup4.2I.2Project Stup4.2J.3Obasign4.2J.3Assemblies4.2A3Assembly for ECC4.2A3Installation on ECC4.2A3Installation on ECC4.2A3Installation on ECC4.2A3Installation on ECC4.2A3Installation on ECA4.2R3Installation on ECA4.2R3Installation on ECA4.2.1C5Ordering4.2.1.1CR5Installation on ECA4.2.1.1CR5Ordering4.2.1.1CR5Installation or ECA4.2.1.1CR5Ordering4.2.1.1CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.2CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.2CR5Installation or ECA4.2.1.1CR5Installation or ECA4.2.1.2CR5Installation or ECA <th>PBS</th> <th>Task</th> <th>WBS</th> <th>Description</th> <th>1996</th> <th>1997</th> <th>1998</th> <th>1999</th> <th>2000</th> <th>2001</th> <th>2002</th> <th>2003</th>	PBS	Task	WBS	Description	1996	1997	1998	1999	2000	2001	2002	2003
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4.2.1.2CO5Ordering4.2.1.2CR5Reception for ECC4.2.1.2CR5Reception for ECA4.2.1.3CR4Cold Flanges4.2.1.4ABellow Assemblies4.2.1.5ABolt Flanges4.2.1.6AFunnel Assemblies4.2.1.7APipe Fittings4.2.1.7SS4.2.1.7SS5Shipping Crates	4.2.1.2	СТ	5	Tendering Process				K				
4.2.1.2CR5Reception for ECC4.2.1.2CR5Reception for ECA4.2.1.3CR4Cold Flanges4.2.1.44Bellow Assemblies4.2.1.54Bolt Flanges4.2.1.64Funnel Assemblies4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.2	со	5	Ordering				2/12	—			
4.2.1.2CR5Reception for ECA4.2.1.34Cold Flanges4.2.1.44Bellow Assemblies4.2.1.54Bolt Flanges4.2.1.64Funnel Assemblies4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.2	CR	5	Reception for ECC				4/1	3			
4.2.1.34Cold Flanges4.2.1.44Bellow Assemblies4.2.1.54Bolt Flanges4.2.1.64Funnel Assemblies4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.2	CR	5	Reception for ECA					* • •	8/5		
4.2.1.44Bellow Assemblies4.2.1.54Bolt Flanges4.2.1.64Funnel Assemblies4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.3		4	Cold Flanges				ŀ				
4.2.1.54Bolt Flanges4.2.1.64Funnel Assemblies4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.4		4	Bellow Assemblies				- 				
4.2.1.64Funnel Assemblies4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.5		4	Bolt Flanges				- 				
4.2.1.74Pipe Fittings4.2.23Electrical Components4.2.33Shipping Crates	4.2.1.6		4	Funnel Assemblies				- 				
4.2.2 3 Electrical Components 4.2.3 3 Shipping Crates	4.2.1.7		4	Pipe Fittings					_			
4.2.3 3 Shipping Crates	4.2.2		3	Electrical Components			ŀ	-				
	4.2.3		3	Shipping Crates				I			-1	

- Pin Carriers ordered shortly after PRR
- Contract preparation to start in 1998

M. Lefebvre

Endcap Signal Feedthrough Project Schedule: Electrical Components

PBS	Task	WBS	Description	1996	1997	1998	1999	2000	2001	2002	2003
4		1	Endcap Signal Feedthroughs								
4.1		2	Project Setup				-1				
4.2		2	FT Series Assemblies	_			-				
4.2	D	3	Design								
4.2	AO	3	Assembly for ECC								
4.2	т	3	Testing and Commissioning for ECC					<mark> </mark> 7			
4.2	Α	3	Installation on ECC								
4.2	AO	3	Assembly for ECA								
4.2	т	3	Testing and Commissioning for ECA								
4.2	Α	3	Installation on ECA								
4.2	RE	3	Repairs						*		
4.2.1		3	Mechanical Components								
4.2.2		3	Electrical Components								
4.2.2.1		4	Pig Tail Cables								
4.2.2.1	со	5	Ordering				9/1				
4.2.2.1	м	5	Start of Fabrication				-11/1				
4.2.2.1	CR	5	First Delivery for ECC				↓ 5/1				
4.2.2.1	CR	5	Last Delivery for ECC						3/1		
4.2.2.1	CR	5	First Delivery for ECA					→	9/1		
4.2.2.1	CR	5	Last Delivery for ECA							12/1	
4.2.2.2		4	Vacuum Cables				I				
4.2.2.2	со	5	Ordering				∳ _3/1				
4.2.2.2	CR	5	Delivery for ECC				5/1				
4.2.2.2	CR	5	Delivery for ECA						11/1		
4.2.2.3		4	Low Voltage Pigtail Cables				Н				
4.2.2.4		4	Low Voltage Vacuum Cables				H				
4.2.2.5		4	Heaters				I				
4.2.3		3	Shipping Crates								

- Critical dates: Pigtails last delivery dates for EEC and ECA
- Currently, no contingency...

Endcap Signal Feedthrough Project Project Setup Details

					1996	1997	1998	
ID 1	PBS	Task	WBS	Description	Qtr 1 Qtr 2 Qtr 3 Qtr 4	Qtr 1 Qtr 2 Qtr 3 Qtr 4	Qtr 1 Qtr 2 Qtr 3 Qtr	4 Qtr 1
1	4 1		2	Project Setun				
2	411		3	Leak Test Setun	_			
3	4.1.1	D	4	Design	_			
4	4.1.1		4	Accombly	_			
5	4.1.1		4	Tooting and Commissioning	_			
6	4.1.1	-	4	Fleetrie Teet Setur	_	.		
7	4.1.2		3		_	 		
8	4.1.2	0	4	Design				
9	4.1.2	'	4	Testing and Commissioning				
10	4.1.3		3	Data Acquisition System		 		
11	4.1.3	т	4	Testing and Commissioning				
12	4.1.4		3	FT Assembly Tools		H		
16	4.1.5		3	FT Prototypes				
17	4.1.5	D	4	Design				
18	4.1.5	Α	4	Assembly				
19	4.1.5	т	4	Testing				
20	4.1.5.1		4	Model FT	_	F		
21	4.1.5.1	FM	5	Manufacturing	_			
22	4.1.5.2		4	Weld Test Flanges and Pin Carriers	_	H		
31	4.1.5.3		4	Glass Pin Carriers	-			
32	4.1.5.3	со	5	Ordering	-			
33	4.1.5.3	CR	5	Reception			7/15	
34	4.1.5.4		4	Ceramic Pin Carriers	_			
35	4.1.5.4	со	5	Ordering	_		►	
36	4.1.5.4	CR	5	Reception	_		8/1	
37	4.1.5.5		4	Warm Flanges	_		, in the second	
38	4.1.5.5	со	5	Ordering	_		7/15	
39	4.1.5.5	CR	5	Reception	-		9/15	
40	4.1.5.6		4	Cold Flanges	-			
43	4.1.5.6		4	Bellows Assemblies			BB	
46	4.1.5.7		4	Bolt Flanges				
49	4.1.5.8		4	Funnel Assemblies	_		I I I—I	
52	4.1.5.9		4	Vacuum Cables	_			
53	4.1.5.9	D	5	Design	_			I
54	4.1.5.9.1		5	Strip Assembly Prototypes	_	L		
57	4.1.5.9.2		5	Connector Prototypes	_	ſ		
60	4.1.5.9.3		5	Complete Assembly for Prototypes	_			
64	4.1.5 10		4	Low Voltage Vacuum cables	_			
60	4 1 5 11		-		_			
74	4.1.5.12		-	Dine Eittings	_			1
74	4.1.3.12		4	Fipe Fittings	_		H	
11	4.1.0		3	management roois			H	

Signal Feedthrough Notes

- ATLAS LAr Calorimeter Signal Feedthrough:
 - Design
 - Assembly
 - Vacuum Cables
 - Pigtail Cables
 - Pin Carriers
 - Testing
 - Installation
 - QA and QC
- Work started in Victoria on Assembly/Testing/QA/QC
 - Model finished; assembly and testing procedures can be studied
 - Aim at very first draft for Sept LAr week

Vacuum Cables Low Voltage Cables

Status Report

ATLAS LAr Week 9th July 1998



Margret Fincke-Keeler TRIUMF and University of Victoria British Columbia, Canada

Vacuum Cable Development in Canada Signal Cables

- All-Flex design
 - cables made up of 2 flexible microstrip lines
 - rigid part of the connector are assembled around the two strip lines
- Aim at simpler and cheaper design
- Design work:
 - E. Neuheimer (CRPP Carleton)
 - G. Hoeppel (Strataflex, Toronto)
- Connector design retained:
 - plated-through plastic spacers (Strataflex proposition)
- Prototypes in hand
 - one to BNL and one to Orsay for comments
 - Many thanks to Don Makowiecki for assistance
- Work towards pre-production order ongoing
- Desired schedule:
 - 1/09/98 Get comments from BNL and Orsay
 - 09/98 Workshop on vacuum cables ?
 - 11/98 Place pre-production order
 - 02/98 Test on pre-production cables
 - 03/99 Place production order
 - 05/99 First delivery for ECC (aggressive...)
 - 11/00 First delivery for ECA
- Comments:
 - We anticipate dates of last deliveries to be non critical

Vacuum Cable Development in Canada



Vacuum Cable Development in Canada



Vacuum Cable Development in Canada



HEC Low Voltage Cables

• HEC requires special vacuum cables for the low voltage

• A solution exists (M. Fincke-Keeler, P. Imbert) and is being investigated

• Discussions with MPI concerning low voltage distribution scheme and low voltage cable layout progressing well

- HEC will use special pigtails for the low voltage distribution
 - A solution has been found (H. Oberlack)
 - Pre-production cables will be ordered early Fall 98
 - MOU between Victoria and MPI in the making

• Though these issues clearly require constant efforts, we do not foresee procurement problems at this time