WBS 3.3
High Beta Accel.

$\beta = 0.48$

	ASSUMPTIONS:		Number of drawings comparable to current design											
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost of Current Design			CEBAF escalated to today's prices						
RIA4M.xls	Prototype +30%		1840 Mhrs/yr					cost of engineering $ X k/year =		150000				
	Frequency (MHz) =		1497	Gradient (MV/m) =		5		Cost			# of CM's	MeV	meters	
	Cryomodules cost approximately =					$1,390,891		$26,426,933	Fabrication		19	845	169	
	Active meters per cryomodule =					4		$1,402,826	Design/Engr		k$/MV =	$31.27		
	Cost is about per active meter currently =					$347,723		$27,829,759	Total					
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	# Req'd	Fab Cost	Prot Cost	# Req'd	Prod Cost		
							Prodt'n	CU	Proto	CU	CM	CM		
CAVITY														
Cavities	100	2000	800	$163,043	$65,217	$228,261	$30,000	2	$41,057	$82,114	8	$328,457	Cavities	
Nobium							$6,000	2	$8,211	$16,423	8	$65,691	Nobium	
HOM	5	100	40	$8,152	$3,261	$11,413	$800	4	$1,095	$4,379	16	$17,518	HOM	
Window	5	100	40	$8,152	$3,261	$11,413	$2,500	2	$3,421	$6,843	8	$27,371	Window	
Pair Parts	10	200	80	$16,304	$6,522	$22,826	$7,000	2	$9,580	$19,160	8	$76,640	Pair Parts	
													$9,797,860	
CRYOUNIT														
Tuners	50	1000	400	$81,522	$32,609	$114,130	$2,700	2	$3,695	$7,390	8	$29,561	Tuners	
Rotary Fdthru	2	40	16	$3,261	$1,304	$4,565	$625	4	$855	$3,421	16	$13,686	Rotary Fdthru	
He Vessel	33	660	264	$53,804	$21,522	$75,326	$8,000	1	$10,949	$10,949	4	$43,794	He Vessel	
Vacuum Tk	56	1120	448	$91,304	$36,522	$127,826	$15,500	1	$21,213	$21,213	4	$84,851	Vacuum Tk	
Magntic Shd	10	200	80	$16,304	$6,522	$22,826	$2,000	1	$2,737	$2,737	4	$10,949	Magntic Shd	
Wiring	10	200	80	$16,304	$6,522	$22,826	$2,000	2	$2,737	$5,474	8	$21,897	Wiring	
Fd Thrus	5	100	40	$8,152	$3,261	$11,413	$300	4	$411	$1,642	16	$6,569	Fd Thrus	
Indium Seals	10	200	80	$16,304	$6,522	$22,826	$400	1	$547	$547	4	$2,190	Indium Seals	
Top Hats	45	900	360	$73,370	$29,348	$102,717	$6,400	1	$8,759	$8,759	4	$35,035	Top Hats	
Waveguides	15	300	120	$24,457	$9,783	$34,239	$1,600	2	$2,190	$4,379	8	$17,518	Waveguides	
													$5,054,947	
CRYOMODULE														
End Cans	100	2000	800	$97,826	$65,217	$163,043	$55,000	1	$75,271	$75,271	1	$75,271	End Cans	
Bridging	35	700	280	$34,239	$22,826	$57,065	$14,000	1	$19,160	$19,160	1	$19,160	Bridging	
Stands	40	800	320	$39,130	$26,087	$65,217	$4,800	2	$6,569	$13,138	1	$6,569	Stands	
													$1,919,008	
VACUUM														
Pumpdrops	5	100	40	$4,891	$3,261	$8,152	$1,200	2	$1,642	$3,285	2	$3,285	Pumpdrops	
Connections	5	100	40	$4,891	$3,261	$8,152	$900	2	$1,232	$2,463	4	$4,927	Connections	
Girders	12	240	96	$11,739	$7,826	$19,565	$1,000	1	$1,369	$1,369	1	$1,369	Girders	
Fast Valve	27	540	216	$26,413	$17,609	$44,022	$3,000	1	$4,106	$4,106	1	$4,106	Fast Valve	
Slow Valves	2	40	16	$1,957	$1,304	$3,261	$1,000	2	$1,369	$2,737	2	$2,737	Slow Valves	
20 l/s Pumps	2	40	16	$1,957	$1,304	$3,261	$700	1	$958	$958	4	$3,832	20 l/s Pumps	
30 l/s Pumps	2	40	16	$1,957	$1,304	$3,261	$900	1	$1,232	$1,232	2	$2,463	30 l/s Pumps	
4" Vac Valves	2	40	16	$1,957	$1,304	$3,261	$900	1	$1,232	$1,232	1	$1,232	4" Vac Valves	
													$455,049	
INTERFACE														
Assembly	20	400	160	$19,565	$13,043	$32,609	$112,500	1	$112,500	$112,500	4	$450,000	Assembly	
													$8,550,000	
ELECTRICAL														
Interlocks	100	2000	800	$97,826	$65,217	$163,043	$20,000	1	$27,371	$27,371	1	$27,371	Interlocks	
Instrumentation	10	200	80	$9,783	$6,522	$16,304	$5,000	1	$6,843	$6,843	1	$6,843	Instrumentation	
													$650,070	
LABOR # / MHRS		8	4											
TOTALS	718	14360	7241	$934,565	$468,261	$1,402,826	$306,725	1	$378,310	$617,096	1	$1,390,891	TOTALS	
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	Number	Fab Cost	Tot Cost	Number	Cost	$26,426,933	
							Prod CU	Req'd	Proto	per CU	Req'd	per CM		

	ASSUMPTIONS:		Number of drawings comparable to current design							MEDIUM BETA PRODUCTION				
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost of Current Design based upon CEBAF and DESY					cost of engineering $ X k/year =		150000		
RIA4M.XLS	Prototype +30%		1840 Mhrs/yr		Beta =	0.49		Cost			#/CM's	MeV	meters	WBS
	Frequency (MHz) =		805	Gradient (MV/m) =		8.28		$21,810,860	Fabrication		19	298.68	40.28	
	Cryomodules cost approximately =					$1,147,940		$964,402	Design/Engr					
	Active meters per cryomodule =					2.12		$22,775,262	Total		k$/MV =	73.02		
	Cost is about per active meter currently =					$541,481								
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	# Req'd	Fab Cost	Tot Cost	# Req'd	Prod Cost		
							Prodt'n	section	Production	Production	per CM	per CM		
CAVITY													CAVITY	
Cavity Assy	50	1000	400	$81,522	$32,609	$114,130	$45,000	1	$45,000	$45,000	4	$180,000	Cavities	1.11.1.1.1.1
Niobium Mat'l							$18,860	1	$18,860	$18,860	4	$75,440	Niobium	1.11.1.1.1.2

Coupler Assy	7.5	150	60	$12,228	$4,891	$17,120	$17,000	1	$17,000	$17,000	4	$68,000	Coupler Assy	1.11.1.1.1.3
Misc Cavity Parts	5	100	40	$8,152	$3,261	$11,413	$2,000	1	$2,000	$2,000	4	$8,000	Misc Cavity Pts	1.11.1.1.1.4
HOM Assy	2.5	50	20	$4,076	$1,630	$5,707	$7,000	2	$7,000	$14,000	4	$56,000	HOM Assy	1.11.1.1.1.5
													$7,361,360	1.11.1.1.1.
HV ASS'Y													HV ASS'Y	
He Vessel	16.5	330	132	$26,902	$10,761	$37,663	$7,000	1	$7,000	$7,000	4	$28,000	He Vessel	1.11.1.1.2.1
Wiring	5	100	40	$8,152	$3,261	$11,413	$2,500	1	$2,500	$2,500	4	$10,000	Wiring	1.11.1.1.2.4
Fd Thrus	2.5	50	20	$4,076	$1,630	$5,707	$400	4	$400	$1,600	4	$6,400	Fd Thrus	1.11.1.1.2.5
													$843,600	1.11.1.1.2
SPACE FRAME													SPACE FRAME	
Tuners	25	500	200	$40,761	$16,304	$57,065	$7,000	1	$7,000	$7,000	4	$28,000	Tuners	1.11.1.2.1
Headers S&R	2.5	50	20	$4,076	$1,630	$5,707	$3,200	1	$3,200	$3,200	4	$12,800	Headers S&R	1.11.1.2.2
Magntic Shd	5	100	40	$8,152	$3,261	$11,413	$2,500	1	$2,500	$2,500	4	$10,000	Magntic Shd	1.11.1.2.4
Thermal Shield	22.5	450	180	$36,685	$14,674	$51,359	$8,400	1	$8,400	$8,400	4	$33,600	Thermal Shield	1.11.1.2.6
Seals/Misc Hardw	5	100	40	$8,152	$3,261	$11,413	$1,000	1	$1,000	$1,000	4	$4,000	Seals/Misc Hdw	1.11.1.2.7
Space Frame	28	560	224	$45,652	$18,261	$63,913	$10,000	1	$10,000	$10,000	4	$40,000	Space Frame	1.11.1.2.8
													$2,439,600	1.11.1.2
CRYOMODULE													CRYOMODULE	
Vacuum Tk	28	560	224	$45,652	$18,261	$63,913	$10,000	1	$10,000	$10,000	4	$40,000	Vacuum Tk	1.11.1.3.2
End Cans	100	2000	800	$163,043	$65,217	$228,261	$90,000	1	$90,000	$90,000	1	$90,000	End Cans	1.11.1.3.3
heat exchanger	17.5	350	140	$28,533	$11,413	$39,946	$10,000	1	$10,000	$10,000	1	$10,000	Heat Exchanger	1.11.1.3.2
Stands	20	400	160	$32,609	$13,043	$45,652	$6,000	2	$6,000	$12,000	1	$12,000	Stands	1.11.1.3.5
													$2,888,000	1.11.1.3.
VACUUM													VACUUM	
Pumpdrops	2.5	50	20	$4,076	$1,630	$5,707	$1,500	2	$1,500	$3,000	1	$3,000	Pumpdrops	1.11.1.3.1
Connections	2.5	50	20	$4,076	$1,630	$5,707	$1,200	2	$1,200	$2,400	1	$2,400	Connections	1.11.1.3.4
Girders	6	120	48	$9,783	$3,913	$13,696	$1,300	1	$1,300	$1,300	1	$1,300	Girders	
Slow Valves	1	20	8	$1,630	$652	$2,283	$2,300	2	$2,300	$4,600	1	$4,600	Slow Valves	1.11.1.3.2
Coupler Inst	1	20	8	$1,630	$652	$2,283	$2,500	3	$2,500	$7,500	1	$7,500	Coupler Inst	1.11.1.3.5
40 l/s Pumps	1	20	8	$1,630	$652	$2,283	$3,000	2	$3,000	$6,000	1	$6,000	40 l/s Pumps	1.11.1.3.3
4" Vac Valves	1	20	8	$1,630	$652	$2,283	$2,200	2	$2,200	$4,400	1	$4,400	4" Vac Valves	1.11.1.3.2
													$554,800	1.11.1.3
INTERFACE													INTERFACE	
Assembly	10	200	80	$16,304	$6,522	$22,826	$90,000	1	$90,000	$90,000	4	$360,000	Assembly	1.11.1.4
test,install							$15,000	1	$15,000	$15,000	1	$15,000	Installation	1.11.1.6.1
													$7,125,000	1.11.1.6
ELECTRICAL													ELECTRICAL	
Interlocks	50	1000	400	$81,522	$32,609	$114,130	$25,000	1	$25,000	$25,000	1	$25,000	Interlocks	1.11.1.7.2.2
Instrumentation	5	100	40	$8,152	$3,261	$11,413	$6,500	1	$6,500	$6,500	1	$6,500	Instrumentation	1.11.1.7.2.2
													$598,500	1.11.1.7.
TOTALS		5	2										TOTAL	
LABOR # / MHRS	423	8450	3380	$688,859	$275,543	$964,402	$398,360	1	$398,360	$427,760	1	$1,147,940	$21,810,860	1.11.1

ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Production	Number Req'd	Fab Cost Production	Tot Cost per CU	Number Req'd	Cost per CM	TOTALS	
	ASSUMPTIONS:		Number of drawings comparable to current design											
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost factor of 1.3 added					MEDIUM BETA PROTOTYPE				
RIA4MR&D.XLS	Prototype +30%		1840 Mhrs/yr		Beta =	0.49				cost of engineering $ X k/year =		150000		
	Frequency (MHz) =		805	Gradient (MV/m) =		8.28		Cost			# of CM's	MeV	meters	
	Cryomodules cost approximately =					$1,492,322		$1,492,322	Fabrication		1	15.72	2.12	
	Active meters per cryomodule =					2.12		$1,928,804	Design/Engr		k$/MV =	94.93		
	Cost is about per active meter currently =					$703,925		$3,421,126	Total					
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Prodt'n	# Req'd section	Fab Cost Prototype	Tot Cost Prototype	# Req'd per CM	Prot Cost per CM		
CAVITY													CAVITY	
Cavity Assy	100	2000	800	$163,043	$65,217	$228,261	$45,000	1	$58,500	$58,500	4	$234,000	Cavities	1.11.1.1.1.1
Niobium Mat'l							$18,860	1	$24,518	$24,518	4	$98,072	Niobium	1.11.1.1.1.2
Coupler Assy	15	300	120	$24,457	$9,783	$34,239	$17,000	1	$22,100	$22,100	4	$88,400	Coupler Assy	1.11.1.1.1.3
Misc Cavity Parts	10	200	80	$16,304	$6,522	$22,826	$2,000	1	$2,600	$2,600	4	$10,400	Misc Cavity Pts	1.11.1.1.1.4
HOM Assy	5	100	40	$8,152	$3,261	$11,413	$7,000	2	$9,100	$18,200	4	$72,800	HOM Assy	1.11.1.1.1.5
													$503,672	1.11.1.1.1.
HV ASS'Y													HV ASS'Y	
He Vessel	33	660	264	$53,804	$21,522	$75,326	$7,000	1	$9,100	$9,100	4	$36,400	He Vessel	1.11.1.1.2.1
Wiring	10	200	80	$16,304	$6,522	$22,826	$2,500	1	$3,250	$3,250	4	$13,000	Wiring	1.11.1.1.2.4
Fd Thrus	5	100	40	$8,152	$3,261	$11,413	$400	4	$520	$2,080	4	$8,320	Fd Thrus	1.11.1.1.2.5
													$57,720	1.11.1.1.2
SPACE FRAME													SPACE FRAME	
Tuners	50	1000	400	$81,522	$32,609	$114,130	$7,000	1	$9,100	$9,100	4	$36,400	Tuners	1.11.1.2.1

Headers S&R	5	100	40	$8,152	$3,261	$11,413	$3,200	1	$4,160	$4,160	4	$16,640	Headers S&R	1.11.1.2.2
Magntic Shd	10	200	80	$16,304	$6,522	$22,826	$2,500	1	$3,250	$3,250	4	$13,000	Magntic Shd	1.11.1.2.4
Thermal Shield	45	900	360	$73,370	$29,348	$102,717	$8,400	1	$10,920	$10,920	4	$43,680	Thermal Shield	1.11.1.2.6
Seals/Misc Hardwa	10	200	80	$16,304	$6,522	$22,826	$1,000	1	$1,300	$1,300	4	$5,200	Seals/Misc Hdw	1.11.1.2.7
Space Frame	56	1120	448	$91,304	$36,522	$127,826	$10,000	1	$13,000	$13,000	4	$52,000	Space Frame	1.11.1.2.8
													$166,920	1.11.1.2
CRYOMODULE													CRYOMODULE	
Vacuum Tk	56	1120	448	$91,304	$36,522	$127,826	$10,000	1	$13,000	$13,000	4	$52,000	Vacuum Tk	1.11.1.3.2
End Cans	200	4000	1600	$326,087	$130,435	$456,522	$90,000	1	$117,000	$117,000	1	$117,000	End Cans	1.11.1.3.3
heat exchanger	35	700	280	$57,065	$22,826	$79,891	$10,000	1	$13,000	$13,000	1	$13,000	heat exchanger	1.11.1.3.2
Stands	40	800	320	$65,217	$26,087	$91,304	$6,000	2	$7,800	$15,600	1	$15,600	Stands	1.11.1.3.5
													$197,600	1.11.1.3.
VACUUM													VACUUM	
Pumpdrops	5	100	40	$8,152	$3,261	$11,413	$1,500	2	$1,950	$3,900	1	$3,900	Pumpdrops	1.11.1.3.1
Connections	5	100	40	$8,152	$3,261	$11,413	$1,200	2	$1,560	$3,120	1	$3,120	Connections	1.11.1.3.4
Girders	12	240	96	$19,565	$7,826	$27,391	$1,300	1	$1,690	$1,690	1	$1,690	Girders	
Slow Valves	2	40	16	$3,261	$1,304	$4,565	$2,300	2	$2,990	$5,980	1	$5,980	Slow Valves	1.11.1.3.2
Coupler Inst	2	40	16	$3,261	$1,304	$4,565	$2,500	3	$3,250	$9,750	1	$9,750	Coupler Inst	1.11.1.3.5
40 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$3,000	2	$3,900	$7,800	1	$7,800	40 l/s Pumps	1.11.1.3.3
4" Vac Valves	2	40	16	$3,261	$1,304	$4,565	$2,200	2	$2,860	$5,720	1	$5,720	4" Vac Valves	1.11.1.3.2
													$37,960	1.11.1.3
INTERFACE													INTERFACE	
Assembly	20	400	160	$32,609	$13,043	$45,652	$90,000	1	$117,000	$117,000	4	$468,000	Assembly	1.11.1.4
test,install							$15,000	1	$19,500	$19,500	1	$19,500	Installation	1.11.1.6.1
													$487,500	1.11.1.6
ELECTRICAL													ELECTRICAL	
Interlocks	100	2000	800	$163,043	$65,217	$228,261	$25,000	1	$32,500	$32,500	1	$32,500	Interlocks	1.11.1.7.2.2
Instrumentation	10	200	80	$16,304	$6,522	$22,826	$6,500	1	$8,450	$8,450	1	$8,450	Instrumentation	1.11.1.7.2.2
													$40,950	1.11.1.7.
TOTALS		9	4										TOTAL	
LABOR # / MHRS	845	16900	6760	$1,377,717	$551,087	$1,928,804	$398,360	1	$517,868	$556,088	1	$1,492,322	$1,492,322	1.11.1
							Production	Req'd	Prototype	proto sect	Req'd	per CM		

$\beta = 0.61$

	ASSUMPTIONS:		Number of drawings comparable to current design											
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost of Current Design			CEBAF escalated to today's prices						
RIASM.xls	Prototype +30%		1840 Mhrs/yr					cost of engineering $ X k/year		150000				
	Frequency (MHz) =		1497	Gradient (MV/m) =		5		Cost			# of CM's	MeV	meters	
	Cryomodules cost approximately =					$1,390,891		$29,208,716	Fabrication		21	845	169	
	Active meters per cryomodule =					4		$1,638,913	Design/Engr					
	Cost is about per active meter currently =					$347,723		$30,847,629	Total		KS/MV =	34.57		
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Prod'n	# Req'd CU	Fab Cost Proto	Prot Cost CU	# Req'd CM	Prod Cost CM		
CAVITY														
Cavities	100	2000	800	$163,043	$65,217	$228,261	$30,000	2	$41,057	$82,114	8	$328,457	Cavities	
Nobium							$5,000	2	$8,211	$16,423	8	$65,691	Nobium	
HOM	5	100	40	$8,152	$3,261	$11,413	$800	4	$1,095	$4,379	16	$17,518	HOM	
Window	5	100	40	$8,152	$3,261	$11,413	$2,500	2	$3,421	$6,843	8	$27,371	Window	
Pair Parts	10	200	80	$16,304	$6,522	$22,826	$7,000	2	$9,580	$19,160	8	$76,640	Pair Parts	
													$10,829,213	
CRYOUNIT														
Tuners	50	1000	400	$81,522	$32,609	$114,130	$2,700	2	$3,695	$7,390	8	$29,561	Tuners	
Rotary Fdthru	2	40	16	$3,261	$1,304	$4,565	$625	4	$855	$3,421	16	$13,686	Rotary Fdthru	
He Vessel	33	660	264	$53,804	$21,522	$75,326	$8,000	1	$10,949	$10,949	4	$43,794	He Vessel	
Vacuum Tk	56	1120	448	$91,304	$36,522	$127,826	$15,500	1	$21,213	$21,213	4	$84,851	Vacuum Tk	
Magntic Shd	10	200	80	$16,304	$6,522	$22,826	$2,000	1	$2,737	$2,737	4	$10,949	Magntic Shd	
Wiring	10	200	80	$16,304	$6,522	$22,826	$2,000	2	$2,737	$5,474	8	$21,897	Wiring	
Fd Thrus	5	100	40	$8,152	$3,261	$11,413	$300	4	$411	$1,642	16	$6,569	Fd Thrus	
Indium Seals	10	200	80	$16,304	$6,522	$22,826	$400	1	$547	$547	4	$2,190	Indium Seals	
Top Hats	45	900	360	$73,370	$29,348	$102,717	$6,400	1	$8,759	$8,759	4	$35,035	Top Hats	
Waveguides	15	300	120	$24,457	$9,783	$34,239	$1,600	2	$2,190	$4,379	8	$17,518	Waveguides	
													$5,587,046	
CRYOMODULE														
End Cans	100	2000	800	$163,043	$65,217	$228,261	$55,000	1	$75,271	$75,271	1	$75,271	End Cans	
Bridging	35	700	280	$57,065	$22,826	$79,891	$14,000	1	$19,160	$19,160	1	$19,160	Bridging	
Stands	40	800	320	$65,217	$26,087	$91,304	$4,800	2	$6,569	$13,138	1	$6,569	Stands	
													$2,121,008	
VACUUM														
Pumpdrops	5	100	40	$8,152	$3,261	$11,413	$1,200	2	$1,642	$3,285	2	$3,285	Pumpdrops	
Connections	5	100	40	$8,152	$3,261	$11,413	$900	2	$1,232	$2,463	4	$4,927	Connections	
Girders	12	240	96	$19,565	$7,826	$27,391	$1,000	1	$1,369	$1,369	1	$1,369	Girders	
Fast Valve	27	540	216	$44,022	$17,609	$61,630	$3,000	1	$4,106	$4,106	1	$4,106	Fast Valve	
Slow Valves	2	40	16	$3,261	$1,304	$4,565	$1,000	2	$1,369	$2,737	2	$2,737	Slow Valves	
20 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$700	1	$958	$958	4	$3,832	20 l/s Pumps	
30 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$900	1	$1,232	$1,232	2	$2,463	30 l/s Pumps	
4" Vac Valves	2	40	16	$3,261	$1,304	$4,565	$900	1	$1,232	$1,232	1	$1,232	4" Vac Valves	
													$502,949	
INTERFACE														
Assembly	20	400	160	$32,609	$13,043	$45,652	$112,500	1	$112,500	$112,500	4	$450,000	Assembly	
													$9,450,000	
ELECTRICAL														
Interlocks	100	2000	800	$163,043	$65,217	$228,261	$20,000	1	$27,371	$27,371	1	$27,371	Interlocks	
Instrumentation	10	200	80	$16,304	$6,522	$22,826	$5,000	1	$6,843	$6,843	1	$6,843	Instrumentation	
													$718,499	
LABOR # / MHRS		8	4											
TOTALS	718	14360	7241	$1,170,652	$468,261	$1,638,913	$306,725	1	$378,310	$617,096	1	$1,390,891	TOTALS	
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Prod CU	Number Req'd	Fab Cost Proto	Tot Cost per CU	Number Req'd	Cost per CM	$29,208,716	
	ASSUMPTIONS:		Number of drawings comparable to current design							MEDIUM BETA PRODUCTION				
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost of Current Design based upon CEBAF and DESY					Engineering cost $ X k/year		150000		
RIASM.XLS	Prototype +30%		1840 Mhrs/yr		Beta =	0.61		Cost			#/CM's	MeV	meters	WBS
	Frequency (MHz) =		805	Gradient (MV/m) =		10.22		$24,664,080	Fabrication		21	507.36	57.288	
	Cryomodules cost approximately =					$1,174,480		$964,402	Design/Engr					
	Active meters per cryomodule =					2.728		$25,628,482	Total			KS/MV =	48.61	
	Cost is about per active meter currently =					$430,528								
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Prod'n	# Req'd section	Fab Cost Production	Tot Cost Production	# Req'd per CM	Prod Cost per CM		
CAVITY													CAVITY	
Cavity Assy	50	1000	400	$81,522	$32,609	$114,130	$45,000	1	$45,000	$45,000	4	$180,000	Cavities	1.11.1.1.1.1
Niobium Mat'l							$24,395	1	$24,395	$24,395	4	$97,580	Niobium	1.11.1.1.1.2

Coupler Assy	7.5	150	60	$12,228	$4,891	$17,120	$17,000	1	$17,000	$17,000	4	$68,000	Coupler Assy	1.11.1.1.1.3
Misc Cavity Parts	5	100	40	$8,152	$3,261	$11,413	$2,000	1	$2,000	$2,000	4	$8,000	Misc Cavity Pts	1.11.1.1.1.4
HOM Assy	2.5	50	20	$4,076	$1,630	$5,707	$7,000	2	$7,000	$14,000	4	$56,000	HOM Assy	1.11.1.1.1.5
													$8,601,180	1.11.1.1.1.
HV ASS'Y													HV ASS'Y	
He Vessel	16.5	330	132	$26,902	$10,761	$37,663	$8,000	1	$8,000	$8,000	4	$32,000	He Vessel	1.11.1.1.2.1
Wiring	5	100	40	$8,152	$3,261	$11,413	$2,500	1	$2,500	$2,500	4	$10,000	Wiring	1.11.1.1.2.4
Fd Thrus	2.5	50	20	$4,076	$1,630	$5,707	$400	4	$400	$1,600	4	$6,400	Fd Thrus	1.11.1.1.2.5
													$1,016,400	1.11.1.1.2
SPACE FRAME													SPACE FRAME	
Tuners	25	500	200	$40,761	$16,304	$57,065	$7,000	1	$7,000	$7,000	4	$28,000	Tuners	1.11.1.2.1
Headers S&R	2.5	50	20	$4,076	$1,630	$5,707	$3,200	1	$3,200	$3,200	4	$12,800	Headers S&R	1.11.1.2.2
Magntic Shd	5	100	40	$8,152	$3,261	$11,413	$2,500	1	$2,500	$2,500	4	$10,000	Magntic Shd	1.11.1.2.4
Thermal Shield	22.5	450	180	$36,685	$14,674	$51,359	$8,400	1	$8,400	$8,400	4	$33,600	Thermal Shield	1.11.1.2.6
Seals/Misc Hardwa	5	100	40	$8,152	$3,261	$11,413	$1,000	1	$1,000	$1,000	4	$4,000	Seals/Misc Hdw	1.11.1.2.7
Space Frame	28	560	224	$45,652	$18,261	$63,913	$10,000	1	$10,000	$10,000	4	$40,000	Space Frame	1.11.1.2.8
													$2,696,400	1.11.1.2
CRYOMODULE													CRYOMODULE	
Vacuum Tk	28	560	224	$45,652	$18,261	$63,913	$10,000	1	$10,000	$10,000	4	$40,000	Vacuum Tk	1.11.1.3.2
End Cans	100	2000	800	$163,043	$65,217	$228,261	$90,000	1	$90,000	$90,000	1	$90,000	End Cans	1.11.1.3.3
heat exchanger	17.5	350	140	$28,533	$11,413	$39,946	$10,000	1	$10,000	$10,000	1	$10,000	Heat Exchanger	1.11.1.3.2
Stands	20	400	160	$32,609	$13,043	$45,652	$6,000	2	$6,000	$12,000	1	$12,000	Stands	1.11.1.3.5
													$3,192,000	1.11.1.3.
VACUUM													VACUUM	
Pumpdrops	2.5	50	20	$4,076	$1,630	$5,707	$1,500	2	$1,500	$3,000	1	$3,000	Pumpdrops	1.11.1.3.1
Connections	2.5	50	20	$4,076	$1,630	$5,707	$1,200	2	$1,200	$2,400	1	$2,400	Connections	1.11.1.3.4
Girders	6	120	48	$9,783	$3,913	$13,696	$1,300	1	$1,300	$1,300	1	$1,300	Girders	
Slow Valves	1	20	8	$1,630	$652	$2,283	$2,500	2	$2,500	$5,000	1	$5,000	Slow Valves	1.11.1.3.2
coupler instr	1	20	8	$1,630	$652	$2,283	$2,500	3	$2,500	$7,500	1	$7,500	coupler instr	1.11.1.3.5
40 l/s Pumps	1	20	8	$1,630	$652	$2,283	$3,000	2	$3,000	$6,000	1	$6,000	40 l/s Pumps	1.11.1.3.3
4" Vac Valves	1	20	8	$1,630	$652	$2,283	$2,200	2	$2,200	$4,400	1	$4,400	4" Vac Valves	1.11.1.3.2
													$621,600	1.11.1.3
INTERFACE													INTERFACE	
Assembly	10	200	80	$16,304	$6,522	$22,826	$90,000	1	$90,000	$90,000	4	$360,000	Assembly	1.11.1.4
test,install							$15,000	1	$15,000	$15,000	1	$15,000	Installation	1.11.1.6.1
													$7,875,000	1.11.1.6
ELECTRICAL													ELECTRICAL	
Interlocks	50	1000	400	$81,522	$32,609	$114,130	$25,000	1	$25,000	$25,000	1	$25,000	Interlocks	1.11.1.7.2.2
Instrumentation	5	100	40	$8,152	$3,261	$11,413	$6,500	1	$6,500	$6,500	1	$6,500	Instrumentation	1.11.1.7.2.2
													$661,500	1.11.1.7.
TOTALS		5	2										TOTAL	
LABOR # / MHRS	423	8450	3380	$688,859	$275,543	$964,402	$405,095	1	$405,095	$434,695	1	$1,174,480	$24,664,080	1.11.1
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Production	Number Req'd	Fab Cost Production	Tot Cost per CU	Number Req'd	Cost per CM	TOTALS	
	ASSUMPTIONS:		Number of drawings comparable to current design											
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost factor of 1.3 added					MEDIUM BETA PROTOTYPE				
RIASMR&D.XLS	Prototype +30%		1840 Mhrs/yr		Beta =	0.61				Engineering cost $ X k/year		150000		
	Frequency (MHz) =		805	Gradient (MV/m) =		10.22		Cost			# of CM's	MeV	meters	
	Cryomodules cost approximately =					$1,526,304		$1,526,304	Fabrication		1	24.16	2.728	
	Active meters per cryomodule =					2.728		$1,928,804	Design/Engr			K$/MV =	63.17	
	Cost is about per active meter currently =					$559,496		$3,455,108	Total					
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost Prodt'n	# Req'd section	Fab Cost Prototype	Tot Cost Prototype	# Req'd per CM	Prot Cost per CM		
CAVITY													CAVITY	
Cavity Assy	100	2000	800	$163,043	$65,217	$228,261	$45,000	1	$58,500	$58,500	4	$234,000	Cavities	1.11.1.1.1.1
Niobium Mat'l							$24,395	1	$31,714	$31,714	4	$126,854	Niobium	1.11.1.1.1.2
Coupler Assy	15	300	120	$24,457	$9,783	$34,239	$17,000	1	$22,100	$22,100	4	$88,400	Coupler Assy	1.11.1.1.1.3
Misc Cavity Parts	10	200	80	$16,304	$6,522	$22,826	$2,000	1	$2,600	$2,600	4	$10,400	Misc Cavity Pts	1.11.1.1.1.4
HOM Assy	5	100	40	$8,152	$3,261	$11,413	$7,000	2	$9,100	$18,200	4	$72,800	HOM Assy	1.11.1.1.1.5
													$532,454	1.11.1.1.1.
HV ASS'Y													HV ASS'Y	
He Vessel	33	660	264	$53,804	$21,522	$75,326	$8,000	1	$10,400	$10,400	4	$41,600	He Vessel	1.11.1.1.2.1
Wiring	10	200	80	$16,304	$6,522	$22,826	$2,500	1	$3,250	$3,250	4	$13,000	Wiring	1.11.1.1.2.4
Fd Thrus	5	100	40	$8,152	$3,261	$11,413	$400	4	$520	$2,080	4	$8,320	Fd Thrus	1.11.1.1.2.5
													$62,920	1.11.1.1.2
SPACE FRAME													SPACE FRAME	
Tuners	50	1000	400	$81,522	$32,609	$114,130	$7,000	1	$9,100	$9,100	4	$36,400	Tuners	1.11.1.2.1

Headers S&R	5	100	40	$8,152	$3,261	$11,413	$3,200	1	$4,160	$4,160	4	$16,640	Headers S&R	1.11.1.2.2
Magntic Shd	10	200	80	$16,304	$6,522	$22,826	$2,500	1	$3,250	$3,250	4	$13,000	Magntic Shd	1.11.1.2.4
Thermal Shield	45	900	360	$73,370	$29,348	$102,717	$8,400	1	$10,920	$10,920	4	$43,680	Thermal Shield	1.11.1.2.6
Seals/Misc Hardwa	10	200	80	$16,304	$6,522	$22,826	$1,000	1	$1,300	$1,300	4	$5,200	Seals/Misc Hdw	1.11.1.2.7
Space Frame	56	1120	448	$91,304	$36,522	$127,826	$10,000	1	$13,000	$13,000	4	$52,000	Space Frame	1.11.1.2.8
													$166,920	1.11.1.2
CRYOMODULE													CRYOMODULE	
Vacuum Tk	56	1120	448	$91,304	$36,522	$127,826	$10,000	1	$13,000	$13,000	4	$52,000	Vacuum Tk	1.11.1.3.2
End Cans	200	4000	1600	$326,087	$130,435	$456,522	$90,000	1	$117,000	$117,000	1	$117,000	End Cans	1.11.1.3.3
heat exchanger	35	700	280	$57,065	$22,826	$79,891	$10,000	1	$13,000	$13,000	1	$13,000	heat exchanger	1.11.1.3.2
Stands	40	800	320	$65,217	$26,087	$91,304	$6,000	2	$7,800	$15,600	1	$15,600	Stands	1.11.1.3.5
													$197,600	1.11.1.3.
VACUUM													VACUUM	
Pumpdrops	5	100	40	$8,152	$3,261	$11,413	$1,500	2	$1,950	$3,900	1	$3,900	Pumpdrops	1.11.1.3.1
Connections	5	100	40	$8,152	$3,261	$11,413	$1,200	2	$1,560	$3,120	1	$3,120	Connections	1.11.1.3.4
Girders	12	240	96	$19,565	$7,826	$27,391	$1,300	1	$1,690	$1,690	1	$1,690	Girders	
Slow Valves	2	40	16	$3,261	$1,304	$4,565	$2,300	2	$2,990	$5,980	1	$5,980	Slow Valves	1.11.1.3.2
coupler instr	2	40	16	$3,261	$1,304	$4,565	$2,500	3	$3,250	$9,750	1	$9,750	coupler instr	1.11.1.3.5
40 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$3,000	2	$3,900	$7,800	1	$7,800	40 l/s Pumps	1.11.1.3.3
4" Vac Valves	2	40	16	$3,261	$1,304	$4,565	$2,200	2	$2,860	$5,720	1	$5,720	4" Vac Valves	1.11.1.3.2
													$37,960	1.11.1.3
INTERFACE													INTERFACE	
Assembly	20	400	160	$32,609	$13,043	$45,652	$90,000	1	$117,000	$117,000	4	$468,000	Assembly	1.11.1.4
test,install							$15,000	1	$19,500	$19,500	1	$19,500	Installation	1.11.1.6.1
													$487,500	1.11.1.6
ELECTRICAL													ELECTRICAL	
Interlocks	100	2000	800	$163,043	$65,217	$228,261	$25,000	1	$32,500	$32,500	1	$32,500	Interlocks	1.11.1.7.2.2
Instrumentation	10	200	80	$16,304	$6,522	$22,826	$6,500	1	$8,450	$8,450	1	$8,450	Instrumentation	1.11.1.7.2.2
													$40,950	1.11.1.7.
TOTALS		9	4										TOTAL	
LABOR # / MHRS	845	16900	6760	$1,377,717	$551,087	$1,928,804	$404,895	1	$526,364	$564,584	1	$1,526,304	$1,526,304	1.11.1
							Production	Req'd	Prototype	proto sect	Req'd	per CM		

$\beta = 0.81$

	ASSUMPTIONS:		Number of drawings comparable to current design											
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost of Current Design			CEBAF escalated to today's prices						
RIA06M.xls	Prototype +30%		1840 Mhrs/yr					cost of engineering $ X k/year		150000				
	Frequency (MHz) =		1497	Gradient (MV/m) =		5		Cost			# of CM's	MeV	meters	
	Cryomodules cost approximately =					$1,390,891		$9,736,239	Fabrication		7	845	169	
	Active meters per cryomodule =					4		$1,638,913	Design/Engr		K$/MV =	$11.52		
	Cost is about per active meter currently =					$347,723		$11,375,152	Total					
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	# Req'd	Fab Cost	Prot Cost	# Req'd	Prod Cost		
							Prodt'n	CU	Proto	CU	CM	CM		
CAVITY														
Cavities	100	2000	800	$163,043	$65,217	$228,261	$30,000	2	$41,057	$82,114	8	$328,457	Cavities	
Niobium							$6,000	2	$8,211	$16,423	8	$65,691	Niobium	
HOM	5	100	40	$8,152	$3,261	$11,413	$800	4	$1,095	$4,379	16	$17,518	HOM	
Window	5	100	40	$8,152	$3,261	$11,413	$2,500	2	$3,421	$6,843	8	$27,371	Window	
Pair Parts	10	200	80	$16,304	$6,522	$22,826	$7,000	2	$9,580	$19,160	8	$76,640	Pair Parts	
													$3,609,738	
CRYOUNIT														
Tuners	50	1000	400	$81,522	$32,609	$114,130	$2,700	2	$3,695	$7,390	8	$29,561	Tuners	
Rotary Fdthru	2	40	16	$3,261	$1,304	$4,565	$625	4	$855	$3,421	16	$13,686	Rotary Fdthru	
He Vessel	33	660	264	$53,804	$21,522	$75,326	$8,000	1	$10,949	$10,949	4	$43,794	He Vessel	
Vacuum Tk	56	1120	448	$91,304	$36,522	$127,826	$15,500	1	$21,213	$21,213	4	$84,851	Vacuum Tk	
Magntic Shd	10	200	80	$16,304	$6,522	$22,826	$2,000	1	$2,737	$2,737	4	$10,949	Magntic Shd	
Wiring	10	200	80	$16,304	$6,522	$22,826	$2,000	2	$2,737	$5,474	8	$21,897	Wiring	
Fd Thrus	5	100	40	$8,152	$3,261	$11,413	$300	4	$411	$1,642	16	$6,569	Fd Thrus	
Indium Seals	10	200	80	$16,304	$6,522	$22,826	$400	1	$547	$547	4	$2,190	Indium Seals	
Top Hats	45	900	360	$73,370	$29,348	$102,717	$6,400	1	$8,759	$8,759	4	$35,035	Top Hats	
Waveguides	15	300	120	$24,457	$9,783	$34,239	$1,600	2	$2,190	$4,379	8	$17,518	Waveguides	
													$1,862,349	
CRYOMODULE														
End Cans	100	2000	800	$163,043	$65,217	$228,261	$55,000	1	$75,271	$75,271	1	$75,271	End Cans	
Bridging	35	700	280	$57,065	$22,826	$79,891	$14,000	1	$19,160	$19,160	1	$19,160	Bridging	
Stands	40	800	320	$65,217	$26,087	$91,304	$4,800	2	$6,569	$13,138	1	$6,569	Stands	
													$707,003	
VACUUM														
Pumpdrops	5	100	40	$8,152	$3,261	$11,413	$1,200	2	$1,642	$3,285	2	$3,285	Pumpdrops	
Connections	5	100	40	$8,152	$3,261	$11,413	$900	2	$1,232	$2,463	4	$4,927	Connections	
Girders	12	240	96	$19,565	$7,826	$27,391	$1,000	1	$1,369	$1,369	1	$1,369	Girders	
Fast Valve	27	540	216	$44,022	$17,609	$61,630	$3,000	1	$4,106	$4,106	1	$4,106	Fast Valve	
Slow Valves	2	40	16	$3,261	$1,304	$4,565	$1,000	2	$1,369	$2,737	2	$2,737	Slow Valves	
20 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$700	1	$958	$958	4	$3,832	20 l/s Pumps	
30 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$900	1	$1,232	$1,232	2	$2,463	30 l/s Pumps	
4" Vac Valves	2	40	16	$3,261	$1,304	$4,565	$900	1	$1,232	$1,232	1	$1,232	4" Vac Valves	
													$167,650	
INTERFACE														
Assembly	20	400	160	$32,609	$13,043	$45,652	$112,500	1	$112,500	$112,500	4	$450,000	Assembly	
													$3,150,000	
ELECTRICAL														
Interlocks	100	2000	800	$163,043	$65,217	$228,261	$20,000	1	$27,371	$27,371	1	$27,371	Interlocks	
Instrumentation	10	200	80	$16,304	$6,522	$22,826	$5,000	1	$6,843	$6,843	1	$6,843	Instrumentation	
													$239,500	
LABOR # / MHRS		8	4											
TOTALS	718	14360	7241	$1,170,652	$468,261	$1,638,913	$306,725	1	$378,310	$617,096	1	$1,390,891	TOTALS	
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	Number	Fab Cost	Tot Cost	Number	Cost	$9,736,239	
							Prod CU	Req'd	Proto	per CU	Req'd	per CM		
										HIGH BETA PRODUCTION				
	ASSUMPTIONS:		Number of drawings comparable to current design											
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost of Current Design based upon CEBAF and DESY					Engineering cost $ X k/year		150000		
RIA06M.XLS	Prototype +30%		1840 Mhrs/yr		Beta =	0.81		Cost			#CM's	MeV	meters	WBS
	Frequency (MHz) =		805	Gradient (MV/m) =		12.56		$8,436,960	Fabrication		7	275.8	23.772	
	Cryomodules cost approximately =					$1,205,280		$964,402	Design/Engr					
	Active meters per cryomodule =					3.396		$9,401,362	Total			K$/MV =	$30.59	
	Cost is about per active meter currently =					$354,912								
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	# Req'd	Fab Cost	Tot Cost	# Req'd	Prod Cost		
							Prodt'n	section	Production	Production	per CM	per CM		
CAVITY													CAVITY	
Cavity Assy	50	1000	400	$81,522	$32,609	$114,130	$45,000	1	$45,000	$45,000	4	$180,000	Cavities	1.11.1.1.1.1
Niobium Mat'l							$29,520	1	$29,520	$29,520	4	$118,080	Niobium	1.11.1.1.1.2

Coupler Assy	7.5	150	60	$12,228	$4,891	$17,120	$17,000	1	$17,000	$17,000	4	$68,000	Coupler Assy	1.11.1.1.1.3
Misc Cavity Parts	5	100	40	$8,152	$3,261	$11,413	$2,000	1	$2,000	$2,000	4	$8,000	Misc Cavity Pts	1.11.1.1.1.4
HOM Assy	2.5	50	20	$4,076	$1,630	$5,707	$7,000	2	$7,000	$14,000	4	$56,000	HOM Assy	1.11.1.1.1.5
													$3,010,560	1.11.1.1.1.
HV ASS'Y													HV ASS'Y	
He Vessel	16.5	330	132	$26,902	$10,761	$37,663	$9,000	1	$9,000	$9,000	4	$36,000	He Vessel	1.11.1.1.2.1
Wiring	5	100	40	$8,152	$3,261	$11,413	$2,500	1	$2,500	$2,500	4	$10,000	Wiring	1.11.1.1.2.4
Fd Thrus	2.5	50	20	$4,076	$1,630	$5,707	$400	4	$400	$1,600	8	$12,800	Fd Thrus	1.11.1.1.2.5
													$411,600	1.11.1.1.2
SPACE FRAME													SPACE FRAME	
Tuners	25	500	200	$40,761	$16,304	$57,065	$7,000	1	$7,000	$7,000	4	$28,000	Tuners	1.11.1.2.1
Headers S&R	2.5	50	20	$4,076	$1,630	$5,707	$3,200	1	$3,200	$3,200	4	$12,800	Headers S&R	1.11.1.2.2
Magntic Shd	5	100	40	$8,152	$3,261	$11,413	$2,500	1	$2,500	$2,500	4	$10,000	Magntic Shd	1.11.1.2.4
Thermal Shield	22.5	450	180	$36,685	$14,674	$51,359	$8,400	1	$8,400	$8,400	4	$33,600	Thermal Shield	1.11.1.2.6
Seals/Misc Hardw	5	100	40	$8,152	$3,261	$11,413	$1,000	1	$1,000	$1,000	4	$4,000	Seals/Misc Hdw	1.11.1.2.7
Space Frame	28	560	224	$45,652	$18,261	$63,913	$10,000	1	$10,000	$10,000	4	$40,000	Space Frame	1.11.1.2.8
													$898,800	1.11.1.2
CRYOMODULE													CRYOMODULE	
Vacuum Tk	28	560	224	$45,652	$18,261	$63,913	$10,000	1	$10,000	$10,000	4	$40,000	Vacuum Tk	1.11.1.3.2
End Cans	100	2000	800	$163,043	$65,217	$228,261	$90,000	1	$90,000	$90,000	1	$90,000	End Cans	1.11.1.3.3
heat exchanger	17.5	350	140	$28,533	$11,413	$39,946	$10,000	1	$10,000	$10,000	1	$10,000	heat exchanger	1.11.1.3.2
Stands	20	400	160	$32,609	$13,043	$45,652	$6,000	2	$6,000	$12,000	1	$12,000	Stands	1.11.1.3.5
													$1,064,000	1.11.1.3.
VACUUM													VACUUM	
Pumpdrops	2.5	50	20	$4,076	$1,630	$5,707	$1,500	2	$1,500	$3,000	1	$3,000	Pumpdrops	1.11.1.3.1
Connections	2.5	50	20	$4,076	$1,630	$5,707	$1,200	2	$1,200	$2,400	1	$2,400	Connections	1.11.1.3.4
Girders	6	120	48	$9,783	$3,913	$13,696	$1,300	1	$1,300	$1,300	1	$1,300	Girders	
Slow Valves	1	20	8	$1,630	$652	$2,283	$2,300	2	$2,300	$4,600	1	$4,600	Slow Valves	1.11.1.3.2
coupler instr	1	20	8	$1,630	$652	$2,283	$2,500	4	$2,500	$10,000	1	$10,000	coupler instr	1.11.1.3.5
40 l/s Pumps	1	20	8	$1,630	$652	$2,283	$3,000	2	$3,000	$6,000	1	$6,000	40 l/s Pumps	1.11.1.3.3
4" Vac Valves	1	20	8	$1,630	$652	$2,283	$2,200	1	$2,200	$2,200	1	$2,200	4" Vac Valves	1.11.1.3.2
													$206,500	1.11.1.3
INTERFACE													INTERFACE	
Assembly	10	200	80	$16,304	$6,522	$22,826	$90,000	1	$90,000	$90,000	4	$360,000	Assembly	1.11.1.4
test,install							$15,000	1	$15,000	$15,000	1	$15,000	Installation	1.11.1.6.1
													$2,625,000	1.11.1.6
ELECTRICAL													ELECTRICAL	
Interlocks	50	1000	400	$81,522	$32,609	$114,130	$25,000	1	$25,000	$25,000	1	$25,000	Interlocks	1.11.1.7.2.2
Instrumentation	5	100	40	$8,152	$3,261	$11,413	$6,500	1	$6,500	$6,500	1	$6,500	Instrumentation	1.11.1.7.2.2
													$220,500	1.11.1.7.
TOTALS		5	2										TOTAL	
LABOR # / MHRS	423	8450	3380	$688,859	$275,543	$964,402	$411,020	1	$411,020	$440,720	1	$1,205,280	$8,436,960	1.11.1
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	Number	Fab Cost	Tot Cost	Number	Cost	TOTALS	
							Production	Req'd	Production	per CU	Req'd	per CM		
	ASSUMPTIONS:		Number of drawings comparable to current design							HIGH BETA PROTOTYPE				
04-Jan-01	20 MHRS/drawing		40% Engineering		Cost factor of 1.3 added									
RIA06MR&D.XLS	Prototype +30%		1840 Mhrs/yr		Beta =	0.81				Engineering cost $ X k/year		150000		
	Frequency (MHz) =		805	Gradient (MV/m) =		12.56		Cost			# of CM's	MeV	meters	
	Cryomodules cost approximately =					$1,552,564		$1,552,564	Fabrication		1	39.4	3.396	
	Active meters per cryomodule =					3.396		$1,928,804	Design/Engr					
	Cost is about per active meter currently =					$457,174		$3,481,368	Total			K$/MV =	$39.41	
ACTIVITY	DRAWINGS	DESMHRS	ENGMHRS	Des Cost	Eng Cost	D/E Cost	Fab Cost	# Req'd	Fab Cost	Tot Cost	# Req'd	Prot Cost		
							Prod'n	section	Prototype	Prototype	per CM	per CM		
CAVITY													CAVITY	
Cavity Assy	100	2000	800	$163,043	$65,217	$228,261	$45,000	1	$58,500	$58,500	4	$234,000	Cavities	1.11.1.1.1.1
Niobium Mat'l							$29,520	1	$38,376	$38,376	4	$153,504	Niobium	1.11.1.1.1.2
Coupler Assy	15	300	120	$24,457	$9,783	$34,239	$17,600	1	$22,100	$22,100	4	$88,400	Coupler Assy	1.11.1.1.1.3
Misc Cavity Parts	10	200	80	$16,304	$6,522	$22,826	$2,000	1	$2,600	$2,600	4	$10,400	Misc Cavity Pts	1.11.1.1.1.4
HOM Assy	5	100	40	$8,152	$3,261	$11,413	$7,000	2	$9,100	$18,200	4	$72,800	HOM Assy	1.11.1.1.1.5
													$559,104	1.11.1.1.1.
HV ASS'Y													HV ASS'Y	
He Vessel	33	660	264	$53,804	$21,522	$75,326	$7,000	1	$9,100	$9,100	4	$36,400	He Vessel	1.11.1.1.2.1
Wiring	10	200	80	$16,304	$6,522	$22,826	$2,500	1	$3,250	$3,250	4	$13,000	Wiring	1.11.1.1.2.4
Fd Thrus	5	100	40	$8,152	$3,261	$11,413	$400	4	$520	$2,080	8	$16,640	Fd Thrus	1.11.1.1.2.5
													$66,040	1.11.1.1.2
SPACE FRAME													SPACE FRAME	
Tuners	50	1000	400	$81,522	$32,609	$114,130	$7,000	1	$9,100	$9,100	4	$36,400	Tuners	1.11.1.2.1

Headers S&R	5	100	40	$8,152	$3,261	$11,413	$3,200	1	$4,160	$4,160	4	$16,640	Headers S&R	1.11.1.2.2
Magntic Shd	10	200	80	$16,304	$6,522	$22,826	$2,500	1	$3,250	$3,250	4	$13,000	Magntic Shd	1.11.1.2.4
Thermal Shield	45	900	360	$73,370	$29,348	$102,717	$8,400	1	$10,920	$10,920	4	$43,680	Thermal Shield	1.11.1.2.6
Seals/Misc Hardw	10	200	80	$16,304	$6,522	$22,826	$1,000	1	$1,300	$1,300	4	$5,200	Seals/Misc Hdw	1.11.1.2.7
Space Frame	56	1120	448	$91,304	$36,522	$127,826	$10,000	1	$13,000	$13,000	4	$52,000	Space Frame	1.11.1.2.8
													$166,920	1.11.1.2
CRYOMODULE													CRYOMODULE	
Vacuum Tk	56	1120	448	$91,304	$36,522	$127,826	$10,000	1	$13,000	$13,000	4	$52,000	Vacuum Tk	1.11.1.3.2
End Cans	200	4000	1600	$326,087	$130,435	$456,522	$90,000	1	$117,000	$117,000	1	$117,000	End Cans	1.11.1.3.3
heat exchanger	35	700	280	$57,065	$22,826	$79,891	$10,000	1	$13,000	$13,000	1	$13,000	heat exchanger	1.11.1.3.2
Stands	40	800	320	$65,217	$26,087	$91,304	$6,000	2	$7,800	$15,600	1	$15,600	Stands	1.11.1.3.5
													$197,600	1.11.1.3.
VACUUM													VACUUM	
Pumpdrops	5	100	40	$8,152	$3,261	$11,413	$1,500	2	$1,950	$3,900	1	$3,900	Pumpdrops	1.11.1.3.1
Connections	5	100	40	$8,152	$3,261	$11,413	$1,200	2	$1,560	$3,120	1	$3,120	Connections	1.11.1.3.4
Girders	12	240	96	$19,565	$7,826	$27,391	$1,300	1	$1,690	$1,690	1	$1,690	Girders	
Slow Valves	2	40	16	$3,261	$1,304	$4,565	$1,300	2	$1,690	$3,380	1	$3,380	Slow Valves	1.11.1.3.2
60 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$2,500	4	$3,250	$13,000	1	$13,000	60 l/s Pumps	1.11.1.3.5
40 l/s Pumps	2	40	16	$3,261	$1,304	$4,565	$3,000	2	$3,900	$7,800	1	$7,800	40 l/s Pumps	1.11.1.3.3
4" Vac Valves	2	40	16	$3,261	$1,304	$4,565	$1,200	1	$1,560	$1,560	1	$1,560	4" Vac Valves	1.11.1.3.2
													$34,450	1.11.1.3
INTERFACE													INTERFACE	
Assembly	20	400	160	$32,609	$13,043	$45,652	$90,000	1	$117,000	$117,000	4	$468,000	Assembly	1.11.1.4
test,install							$15,000	1	$19,500	$19,500	1	$19,500	Installation	1.11.1.6.1
													$487,500	1.11.1.6
ELECTRICAL													ELECTRICAL	
Interlocks	100	2000	800	$163,043	$65,217	$228,261	$25,000	1	$32,500	$32,500	1	$32,500	Interlocks	1.11.1.7.2.2
Instrumentation	10	200	80	$16,304	$6,522	$22,826	$6,500	1	$8,450	$8,450	1	$8,450	Instrumentation	1.11.1.7.2.2
													$40,950	1.11.1.7.
TOTALS		9	4										TOTAL	
LABOR # / MHRS	845	16900	6760	$1,377,717	$551,087	$1,928,804	$407,020	1	$529,126	$568,436	1	$1,552,564	$1,552,564	1.11.1
							Production	Req'd	Prototype	proto sect	Req'd	per CM		