

HLRF Meeting 6/8/06

M.Neubauer

WBS worksheet update for RF
Distribution Costs

Engineering Estimates from worksheets

Industry Quotes

Per Station rolled up estimates

DRAFT 042606 rsl		Engine	Engrg. Est.	Learning Curve Parameters & Results							Estimate	
HIGH LEVEL RF WBS ITEM		Total Quantity	D & a & S-b I- K o h \$ r.	1st Mfg Unit Cost (50%) (\$)	Materials Alpha	Labor Alpha	Batch Size/ No. Vendors	Mfg ED&I %	Mfg Profit %	Avg. Mfg Cost Unit 1	Total Acq. Cost (\$K) N Units	
				\$ 610,932	per station							290,943.99
1.5.1.1.3.1	WR650 WG	41580		\$ 537			MEGA			\$ 249	10,348,453.07	
1.5.1.1.3.2	Directional Coupler	3150		\$ 910						690	2,173,500.00	
1.5.1.1.3.3	Circulator	15120		\$ 8,000			AFT			4000	60,480,000.00	
		15120		\$ 7,634	\$ 115,422,352	-0.074	-0.152	in-house	15%	30%	\$ 3,308	50,016,182.98
1.5.1.1.3.4	H-plane Bend	17010		\$ 1,230	\$ 20,922,300		MEGA			448	7,620,480.00	
		17010		\$ 727	\$ 12,364,628	-0.074	-0.074	in-house	5%	30%	\$ 354	6,013,211.30
1.5.1.1.3.5	E-plane Bend	10710		\$ 1,138	\$ 12,187,980		MEGA			433.8	4,645,998.00	
		10710		\$ 727	\$ 7,785,136	-0.074	-0.074	in-house	5%	30%	\$ 354	3,786,096.00
1.5.1.1.3.6	Tee	1260		\$ 1,862	\$ 2,346,120		MEGA			1345	1,694,700.00	
		1260		\$ 1,783		-0.074	-0.074	in-house	10%	30%	\$ 867	1,092,281.90
1.5.1.1.3.7	180 degree bend	31500		\$ 1,525	\$ 48,034,980					500	15,750,000.00	
		31500		\$ 727	\$ 7,785,136	-0.074	-0.074	in-house	5%	30%	\$ 354	11,135,576.47
1.5.1.1.3.8	Flex Waveguide	16380		\$ 571	\$ 9,352,980		MEGA			470	7,698,600.00	
1.5.1.1.3.9	Slot Hybrids	13860		\$ 2,416	\$ 33,485,760		MEGA			1000	13,860,000.00	
		13860		\$ 2,091	\$ 28,978,521	-0.074	-0.074	in-house	15%	30%	\$ 1,032	14,308,144.67
1.5.1.1.3.10	Hybrid Loads	13860		\$ 2,000	\$ 27,720,000		MEGA			1150	15,939,000.00	
		13860		\$ 2,568	\$ 35,592,019	-0.074	-0.152	in-house	10%	30%	\$ 1,143	15,846,493.28
1.5.1.1.3.11	Circulator Load	15120		\$ 3,000	\$ 45,360,000		SPA			1500	22,680,000.00	
		15120		\$ 3,051	\$ 46,135,758	-0.074	-0.152	in-house	10%	30%	\$ 1,358	20,537,075.45
1.5.1.1.3.12	3-stub tuner	15120		\$ 2,600	\$ 39,312,000		MEGA			1350	20,412,000.00	
		15120		\$ 4,408	\$ 66,645,118	-0.074	-0.152	in-house	15%	30%	\$ 1,973	29,835,865.75
1.5.1.1.3.13	Pressure Adapter			\$ 560							-	
1.5.1.1.3.14	Gaskets			\$ 25							-	
1.5.1.1.3.15	Flange Pair			\$ 177						\$29.50	-	

Example: Circulator Estimate with directional coupler

		QTY	Unit	\$ per		Source	Dimensions		
Ferrites	ferrites unplated	1.4884	in ²	\$ 4.94		requisition	max dia	6.5	in
	ferrites plated	1.4884	in ²	\$ 5.37		requisition	area	33.2	in ²
	ferrites brazed to plate	0.5	hr	\$ 76.00		eng. Est.			
	Light machining	1	hr	\$ 76.00					
	ferrites x area plates	1	plate		\$ 456				
					Cost of 1st item		Cum avg cost of N items		
Material						N=	15120	LC	alpha
	three plates of ferrites	3		\$ 456	\$ 1,369				
	two plates of magnet material				\$ 1,825	2x ferrite			
	iron yoke	1	ea	\$ 50	\$ 50	eng. Est.			
	waveguide flanges	3	flanges	\$ 90	\$ 270	requisition			
	waveguide spool piece	45	in	\$ 10	\$ 450	requisition			
	Type N connector	2	ea	\$ 7	\$ 14	requisition			
					Material Sub-total		1,951.31	95%	-0.074
Labor				MFD rates					
	Production Planning	0.5	hrs	\$ 90	\$ 45	eng. Est.			
	Plating/Painting	1	hrs	\$ 141	\$ 141	eng. Est.			
	Welding/Brazing	2	hrs	\$ 76	\$ 152	eng. Est.			
	Mechanical Assembly	4	hrs	\$ 76	\$ 304	eng. Est.			
	Microwave Testing	4	hrs	\$ 76	\$ 304	eng. Est.			
	QC	2	hrs	\$ 76	\$ 152	eng. Est.			
	Final Finishing	1	hrs	\$ 76	\$ 76	eng. Est.			
					Labor sub-total		261.37	90%	-0.152
					Total Cost of Circulator		\$ 2,213		
					with ED&I	15%	\$ 2,545		
					with Mfg profit	30%	\$ 3,308		

Example: Circulator Loads

Circulator Load									
		QTY	Unit	\$ per		Source		Dimensions	
	ferrites unplated	1.4884	in ²	\$ 4.94		requisition		length	6.5 in
	ferrites plated	1.4884	in ²	\$ 5.37		requisition		width	6.5
	ferrites brazed to plate	0.5	hr	\$ 76.00		eng. Est.		area	42.25 in ²
	Light machining	1	hr	\$ 76.00					
	ferrites x area plates	1	plate		\$ 550				
					Cost of 1st item		Cumulative average cost of Nth item		
Material						N=	15120	LC	alpha
	two plates of ferrites	2	plates		\$ 1,099				
	waveguide flanges	1	flanges	90	\$ 90	requisition			
	waveguide spool piece	7	in	10	\$ 70	requisition			
	cast air waveguide fins			200					
	water cooling plates			500	\$ 500				
		Material Sub-total			\$ 1,759		863.16	95%	-0.074
Labor				MFD rates					
	Production Planning	0.1	hrs	\$ 89.60	\$ 9	eng. Est.			
	Plating/Painting	0.5	hrs	\$ 140.65	\$ 70	eng. Est.			
	Welding/Brazing	1	hrs	\$ 76.00	\$ 76	eng. Est.			
	Mechanical Assembly	0.5	hrs	\$ 76.00	\$ 38	eng. Est.			
	Microwave Testing	1	hrs	\$ 76.00	\$ 76	eng. Est.			
	QC	1	hrs	\$ 76.00	\$ 76	eng. Est.			
	Final Finishing	0.5	hrs	\$ 76.00	\$ 38	eng. Est.			
		Labor sub-total			\$ 374		86.69	90%	-0.152
		Total Cost of Circulator			\$ 2,134		\$ 950		
		with ED&I			10%	\$ 2,347	\$ 1,045		
		with Mfg profit			30%	\$ 3,051	\$ 1,358		

CW Stations based on B-factory

DRAFT 042606 rsl		Engineering Estimate				Engrg. Est.	Learning Curve Parameters & Results					
HIGH LEVEL RF WBS ITEM		Total Quantity N	ED&I- hrs	M&S- K\$	Labor hrs	1st Mfg Unit Cost (50%) (\$)	Materials Alpha	Labor Alpha	Batch Size/ No. Vendors	Mfg ED&I %	Mfg Profit %	Avg. Mfg Cost Unit 1
1.5.1.3.1.1	CW RF Stations					\$ 2,222	Total per Station					
	1.5.1.3.1.1.1	Klystron	750	640		\$ 700				9%		
	1.5.1.3.1.1.2	Waveguide	0	255	100	\$ 260				0		
	1.5.1.3.1.1.3	LLRF	750	260	1300	\$ 385				16%		
	1.5.1.3.1.1.4	HVPS	1250	630	1500	\$ 805				12%		
	1.5.1.3.1.1.5	Cooling	125	20	0	\$ 30				33%		
	1.5.1.3.1.1.6	Cabling	125	32	0	\$ 42				24%		