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# EVLA Front-End CDR

## EVLA Front-End Budget



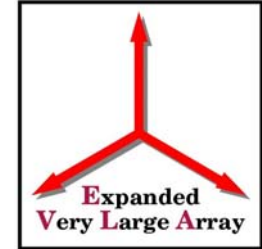
# EVLA Front-End Budget Overview



- 1) Budget Overview
- 2) Annual M&S Cost Estimates
- 3) Annual Manpower Cost Estimates
- 4) Annual Machining Estimates
- 5) Total FE Costs



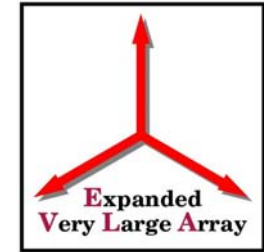
# Budget Overview



- WBS broken down by Receiver Band, Monitor & Control and Cryogenics
- FE Estimates include M&S, FE/Cryo Group manpower loading & Machining effort
- Management / System Engineering – Catch-All Budget
  - **HFSS (\$45K) & Miscellaneous (\$70K)**
  - **Software, Lab PC's and Laptops for Site Maintenance (\$68K)**
  - **Test Equipment, including Rx Test Racks & Repair/Calibration (\$115K)**
  - **Caltech QPAM & KaDCM Design & Prototype Contract (\$120K)**
  - **Wafers - Raytheon MMIC Amps (\$55K) & NG Cryo-3 (\$70K)**
  - **Feed Heater & Moisture Control (\$178K)**
  - **Student Salaries (\$85K)**
  - **Conference, Training & Business Travel**
  - **LNA staff effort at CDL (4.8 FTE)**
  - **EVLA Staff effort not directed towards any specific Receiver task**
- Additional LNA costs included in Receiver Band M&S estimates
- Feeds have their own budget
- Manpower loading estimates includes:
  - **EVLA funded positions**
  - **Contributed Effort (NRAO Operations Budget)**



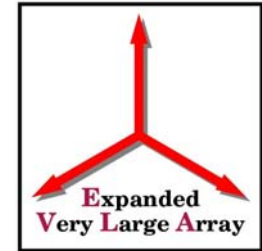
# Annual FE **M&S** Budget Estimates by Rx Band (\$K)



Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
L	3.0	10.7	3.4	9.6	318.7	186.5	153.3	57.7	42.7	44.7	0	830.3
S	0	2.2	1.4	1.4	0	53.1	213.5	184.7	42.7	42.7	0	541.7
C	0	10.8	76.3	150.2	172.8	111.4	31.1	23.3	15.5	11.6	0	603.0
X	0	0	0.4	0	0	0	50.9	201.6	329.8	13.0	0	595.7
Ku	0	1.8	10.8	0	0	39.0	0	236.1	306.7	0	0	594.5
K	0	20.7	143.2	125.2	53.2	17.5	62.5	9.5	13.0	0	0	445.4
Ka	0	164.1	26.1	6.7	299.1	211.7	118.8	46.6	33.2	17.5	0	923.3
Q	3.8	12.5	52.6	37.2	74.1	31.8	19.6	15.0	8.0	0	0	254.7
<b>Total</b>	<b>6.8</b>	<b>222.8</b>	<b>314.2</b>	<b>330.3</b>	<b>917.9</b>	<b>651.0</b>	<b>649.7</b>	<b>774.5</b>	<b>791.6</b>	<b>129.5</b>	<b>0</b>	<b>4788.6</b>



# Annual FE **M&S** Budget Cryogenic Estimates (\$K)

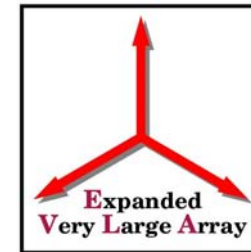


Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Vacuun Sys	3.4	23.5	46.8	21.0	36.2	0	15.2	0	0	0	0	146.1
Com-pressors	6.5	34.8	122.0	44.5	14.2	8.0	5.5	26.8	20.0	0	0	282.3
CTI 350's	47.0	54.3	566.8	14.0	14.0	7.0	0	0	0	0	0	703.1
Cryo Total	56.9	112.6	735.6	79.5	64.4	15.0	20.7	26.8	20.0	0	0	1131.5



# Annual FE **M&S** Budget

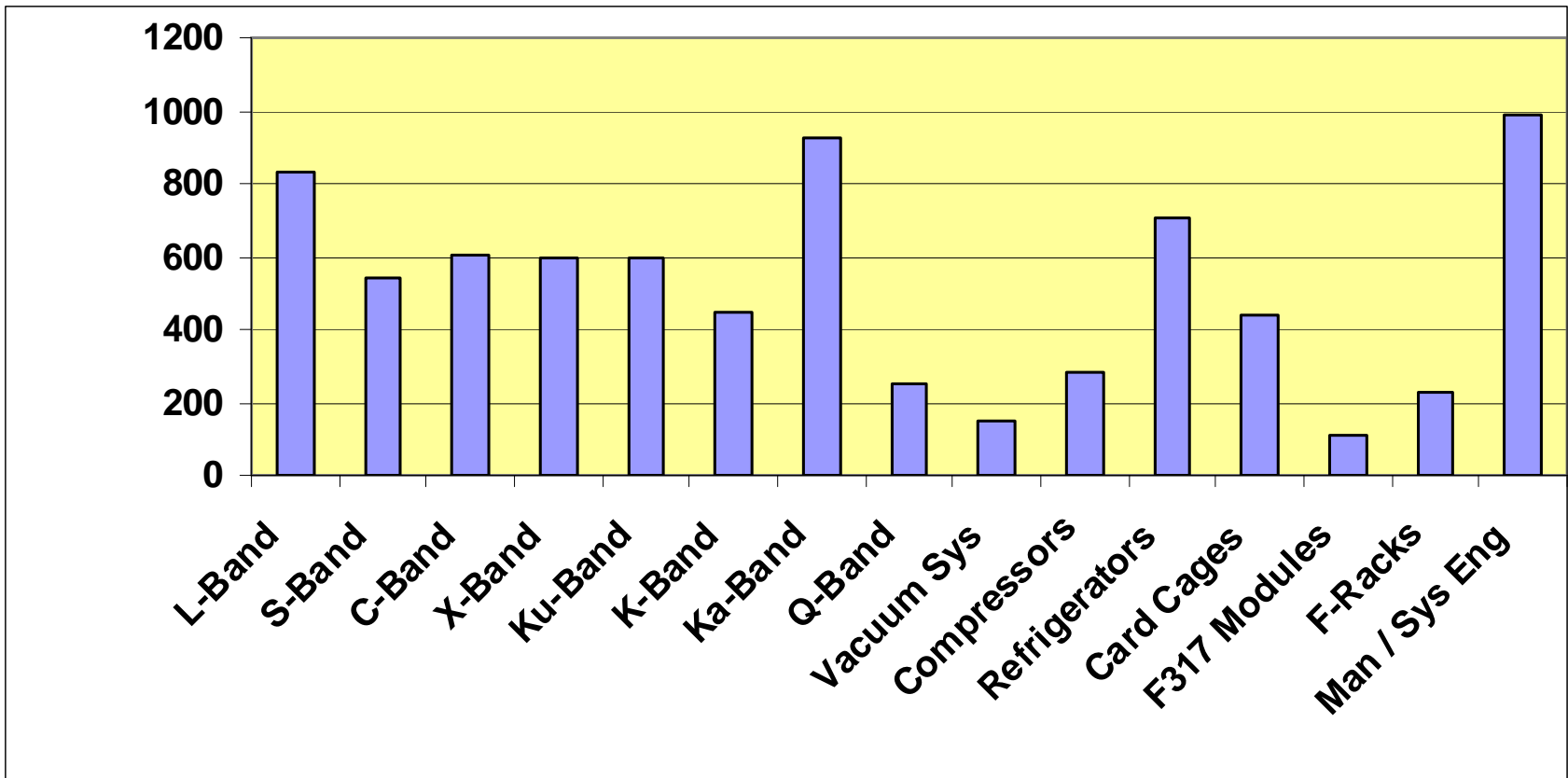
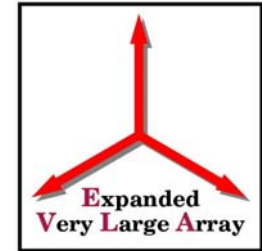
## Miscellaneous Estimates (\$K)



Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Man / Sys Eng	50.3	167.0	126.8	180.7	138.8	85.8	115.0	76.0	46.5	4.0	0	990.9
Card Cage	2.0	11.2	20.1	69.2	176.9	40.1	78.3	40.1	0	0	0	437.9
F317 Mod	0	0	5.6	19.0	31.0	21.7	21.7	10.9	0	0	0	109.9
F- Rack	0	0	19.0	74.4	44.1	44.1	45.1	0	0	0	0	226.7
M&C Total	2.0	11.2	44.7	162.6	252.0	105.9	145.1	51.0	0	0	0	774.5



# Total FE **M&S** Budget Estimates by Task (\$K)

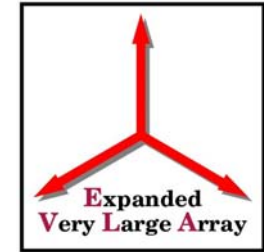




# Annual FE Manpower

## Estimates By Task

### (Man-Months)

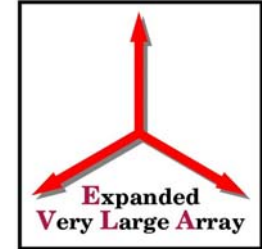


Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
L	4.7	6.4	7.4	12.9	19.2	15.5	15.5	15.5	15.4	6	0	118.5
S	0	0	0.3	8.0	11.2	9.1	13.1	13.1	13.0	13.0	0	80.8
C	3.6	11.4	14.5	10.4	14.8	13.4	12.9	12.9	12.8	0	0	106.7
X	1.8	0.7	0.4	4.8	5.7	0.1	0.1	0.1	0.1	32.0	32.0	77.8
Ku	0	1.4	5.3	2.2	7.7	13.2	15.1	15.5	16.3	12.5	0	89.0
K	0	5.9	5.1	5.2	7.6	7.6	7.5	7.5	7.4	0	0	53.4
Ka	4.5	13.6	21.9	10.8	19.2	16.1	16.1	16.1	16.1	0	0	134.1
Q	1.4	6.8	5.4	4.4	5.9	4.8	4.8	4.8	4.8	0	0	43.0
Cryo	7.2	11.4	14.6	28.8	30.0	28.0	28.0	5.5	0	0	0	155.5
M&C	0	11.8	20.4	21.1	13.2	12.9	10.7	6.5	6.5	0	0	103.1
M/SE	11.0	9.4	24.5	37.8	23.8	17.9	17.0	19.3	14.2	7.0	6.9	188.8
<b>Total</b>	<b>34.2</b>	<b>78.8</b>	<b>119.8</b>	<b>146.4</b>	<b>158.3</b>	<b>138.6</b>	<b>140.8</b>	<b>116.8</b>	<b>106.6</b>	<b>70.5</b>	<b>38.9</b>	<b>1150.7</b>





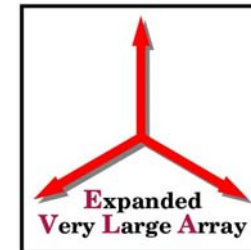
# Front-End **Manpower** Estimates By Staff Effort (Man-Months)



Task	Engineering	Technical	Cryogenic	Total
L-Band	44.5	74.0	0	118.5
S-Band	32.6	48.2	0	80.8
C-Band	42.1	64.6	0	106.7
X-Band	28.7	49.1	0	77.8
Ku-Band	36.2	52.8	0	89.0
K-Band	17.5	35.9	0	53.4
Ka-Band	46.8	87.3	0	134.1
Q-Band	23.2	19.8	0	43.0
Cryogenics	0	0	155.5	155.5
Miscellaneous	20.3	82.8	0	103.1
Man / Sys Eng	100.0	88.9	0	188.8
<b>Total</b>	<b>391.9</b>	<b>603.4</b>	<b>155.5</b>	<b>1150.7</b>



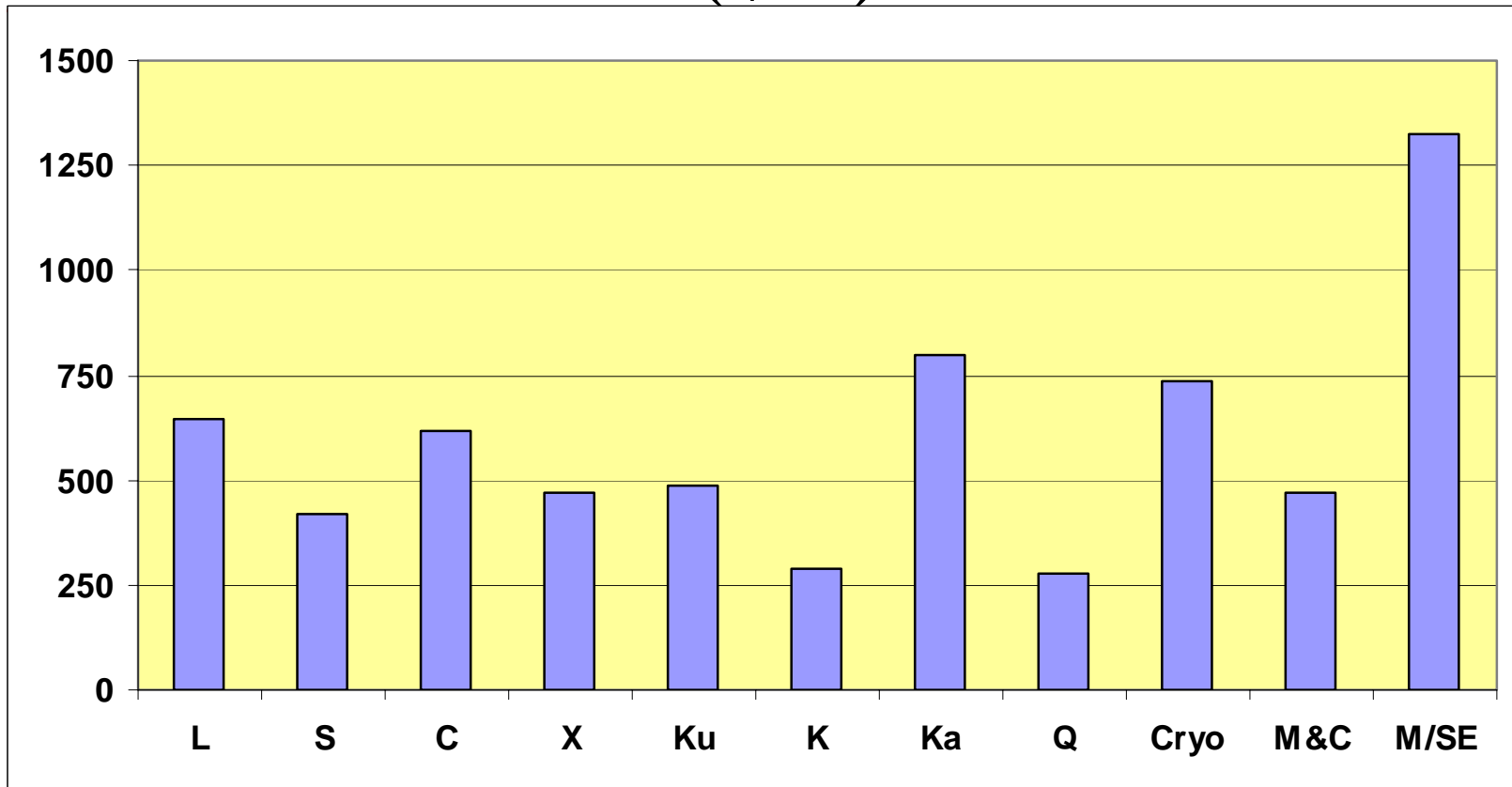
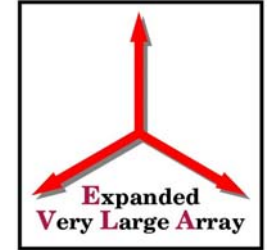
# Annual FE **Manpower** Budget Estimates (\$K)



Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
L	36.0	59.9	59.4	77.5	130.4	71.2	71.2	71.2	70.5	0	0	647.2
S	0	0	1.8	50.3	59.0	46.2	61.7	61.7	61.7	77.4	0	419.2
C	27.4	72.1	80.8	67.2	75.3	76.1	73.1	73.1	72.5	0	0	617.6
X	0	10.6	4.1	3.4	39.7	45.2	0.6	0.6	0.6	183.2	183.2	471.3
Ku	0	10.6	34.3	16.1	34.8	66.1	82.6	89.3	94.5	59.6	0	488.4
K	0	34.3	27.6	30.2	39.6	39.6	38.6	38.6	38.0	0	0	286.5
Ka	28.3	88.7	124.5	73.1	116.3	91.3	91.3	91.3	91.3	0	0	795.9
Q	8.2	42.6	34.1	30.4	39.7	29.9	29.9	29.9	29.9	0	0	274.7
Cryo	48.8	59.9	72.9	133.2	140.5	128.3	128.3	25.5	0	0	0	737.3
M&C	0	67.8	101.7	90.2	56.4	54.6	45.6	26.5	26.5	0	0	469.2
M/SE	76.6	66.8	135.8	228.4	179.7	146.7	145.7	157.3	101.3	44.3	44.0	1326.5
<b>Total</b>	<b>148.7</b>	<b>446.5</b>	<b>541.2</b>	<b>571.6</b>	<b>731.7</b>	<b>648.5</b>	<b>622.9</b>	<b>507.7</b>	<b>485.5</b>	<b>320.2</b>	<b>183.2</b>	<b>5207.3</b>

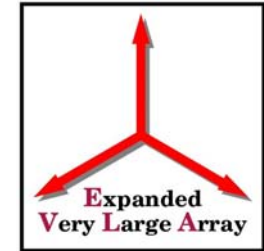


# Total FE **Manpower** Budget Estimates by Task (\$K)





# Annual **Machining** Manpower Estimates by Task (Man-Months)

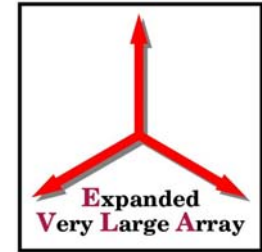


Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
L	0	2.0	6.3	6.3	6.3	6.3	0.2	0.2	0.2	0	0	27.8
S	0	0	0	0	3.1	10.0	10.0	10.0	10.0	0.2	0.2	43.6
C	0	3.1	12.4	12.4	12.4	12.4	0.2	0.2	0.2	0	0	53.3
X	0	0	0	0	0	1.7	0	0	15.0	15.0	15.0	46.7
Ku	0	0	0.2	2.4	0	14.4	14.4	14.4	14.4	0	0	60.3
K	0	0.4	1.0	1.0	1.0	1.0	0	0	0	0	0	4.6
Ka	0	1.4	13.4	3.0	14.0	14.0	14.0	14.0	6.0	0	0	79.8
Q	0	0.4	1.4	1.4	6.0	6.0	6.0	6.0	6.0	0	0	33.3
Cryo	0	0	0	0	0	0	0	0	0	0	0	0
M&C	0	0.7	1.3	1.9	1.9	1.9	1.9	0	0	0	0	9.6
<b>Total</b>	<b>0</b>	<b>8.0</b>	<b>36.0</b>	<b>28.4</b>	<b>44.7</b>	<b>67.7</b>	<b>46.7</b>	<b>44.8</b>	<b>51.8</b>	<b>15.2</b>	<b>15.2</b>	<b>359.0</b>



# Annual **Machining** Budget

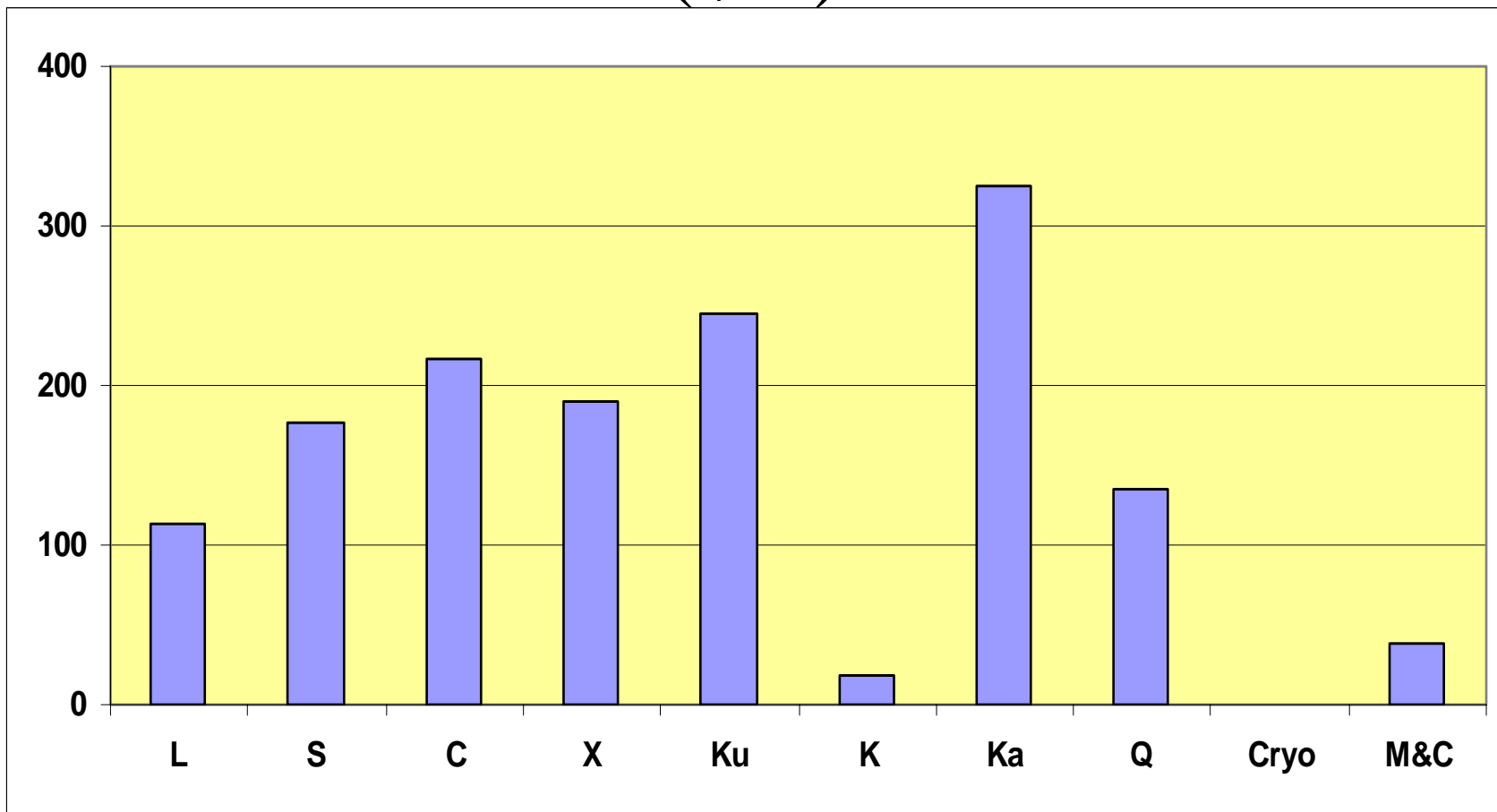
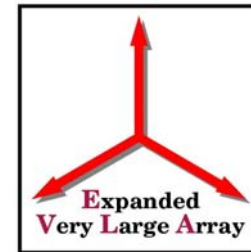
## Estimates by Task (\$K)



Task	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
L	0	8.1	25.6	25.6	25.6	25.6	0.8	0.8	0.8	0	0	113.2
S	0	0	0	0	12.6	40.7	40.7	40.7	40.7	0.8	0.8	177.5
C	0	12.6	50.5	50.5	50.5	50.5	0.8	0.8	0.8	0	0	217.0
X	0	0	0	0	0	6.9	0	0	61.1	61.1	61.1	190.2
Ku	0	0	0.8	9.8	0	58.6	58.6	58.6	58.6	0	0	245.5
K	0	1.6	4.1	4.0	4.0	4.0	0	0	0	0	0	18.7
Ka	0	5.7	54.6	12.2	57.0	57.0	57.0	57.0	24.4	0	0	324.9
Q	0	1.6	5.7	5.7	24.4	24.4	24.4	24.4	24.4	0	0	135.6
Cryo	0	0	0	0	0	0	0	0	0	0	0	0
M&C	0	2.8	5.3	7.7	7.7	7.7	7.7	0	0	0	0	39.1
<b>Total</b>	<b>0</b>	<b>32.6</b>	<b>146.6</b>	<b>115.6</b>	<b>182.0</b>	<b>275.7</b>	<b>190.2</b>	<b>182.4</b>	<b>210.9</b>	<b>61.9</b>	<b>61.9</b>	<b>1461.9</b>

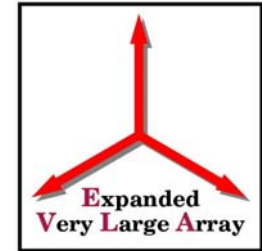


# Total **Machining** Budget Estimates by Task (\$K)





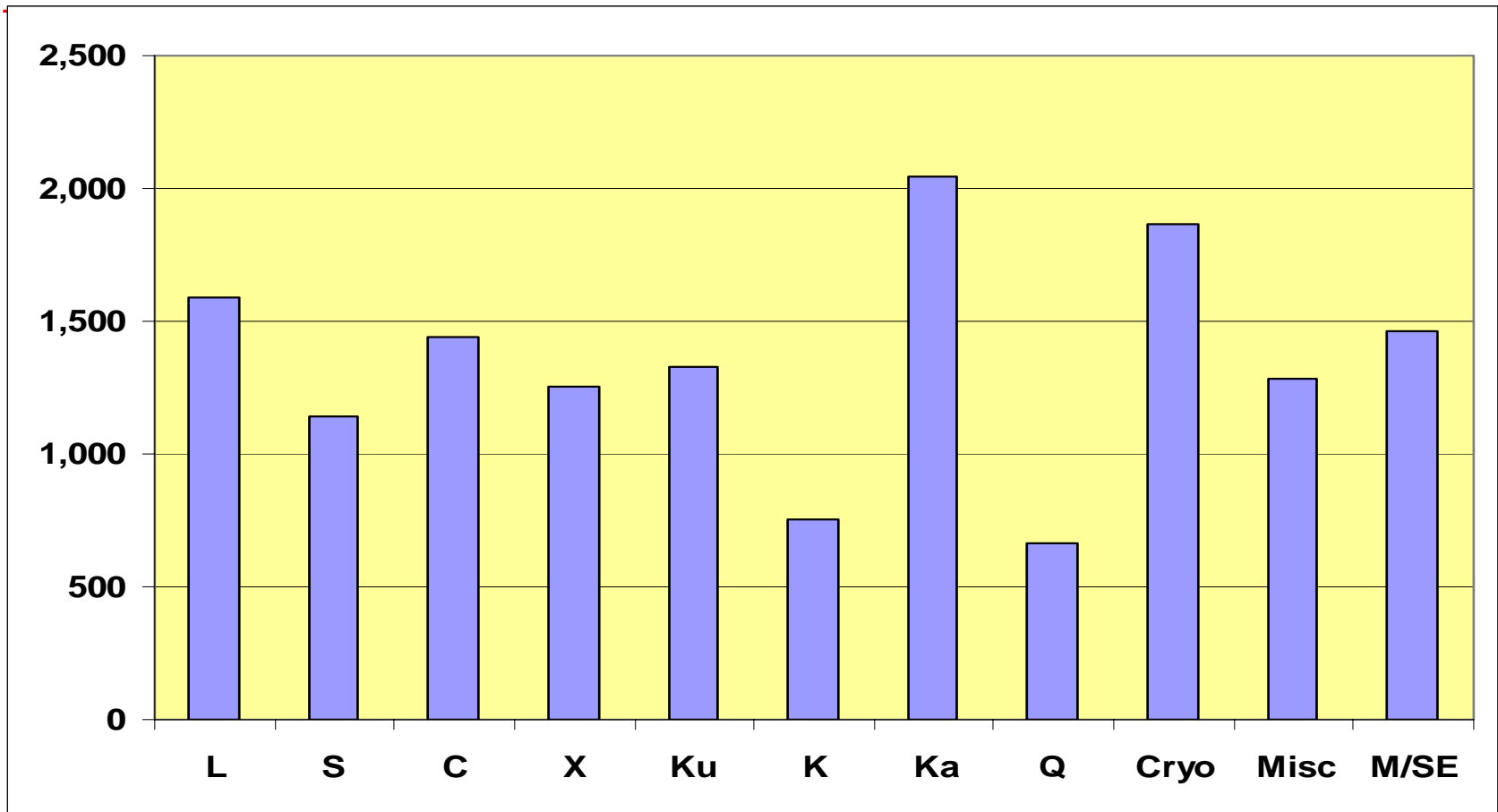
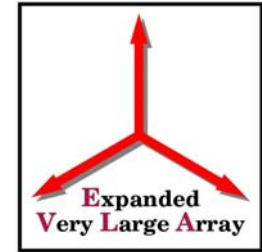
# Total Front-End Budget Estimates by Task (\$K)



Task	M&S	Manpower	Machining	Total
L-Band	830.3	647.2	113.2	1,590.7
S-Band	541.7	419.2	177.5	1,138.4
C-Band	603.0	617.6	217.0	1,437.6
X-Band	595.7	471.3	190.2	1,257.2
Ku-Band	594.5	488.4	245.5	1,328.4
K-Band	445.4	286.5	18.7	750.6
Ka-Band	923.3	795.9	324.9	2,044.1
Q-Band	254.7	274.7	135.6	665.0
Cryogenics	1,131.5	737.3	0	1,868.8
Miscellaneous	774.5	469.2	39.1	1,282.8
Man / Sys Eng	990.9	1326.5	0	1,466.4
<b>Total</b>	<b>7,685.5</b>	<b>6,533.8</b>	<b>1,461.7</b>	<b>15,681.0</b>



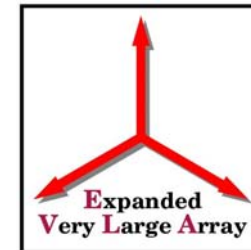
# Total Front-End Budget Estimates by Task (\$K)







# Front-End **Unit Cost** Estimates (\$K)

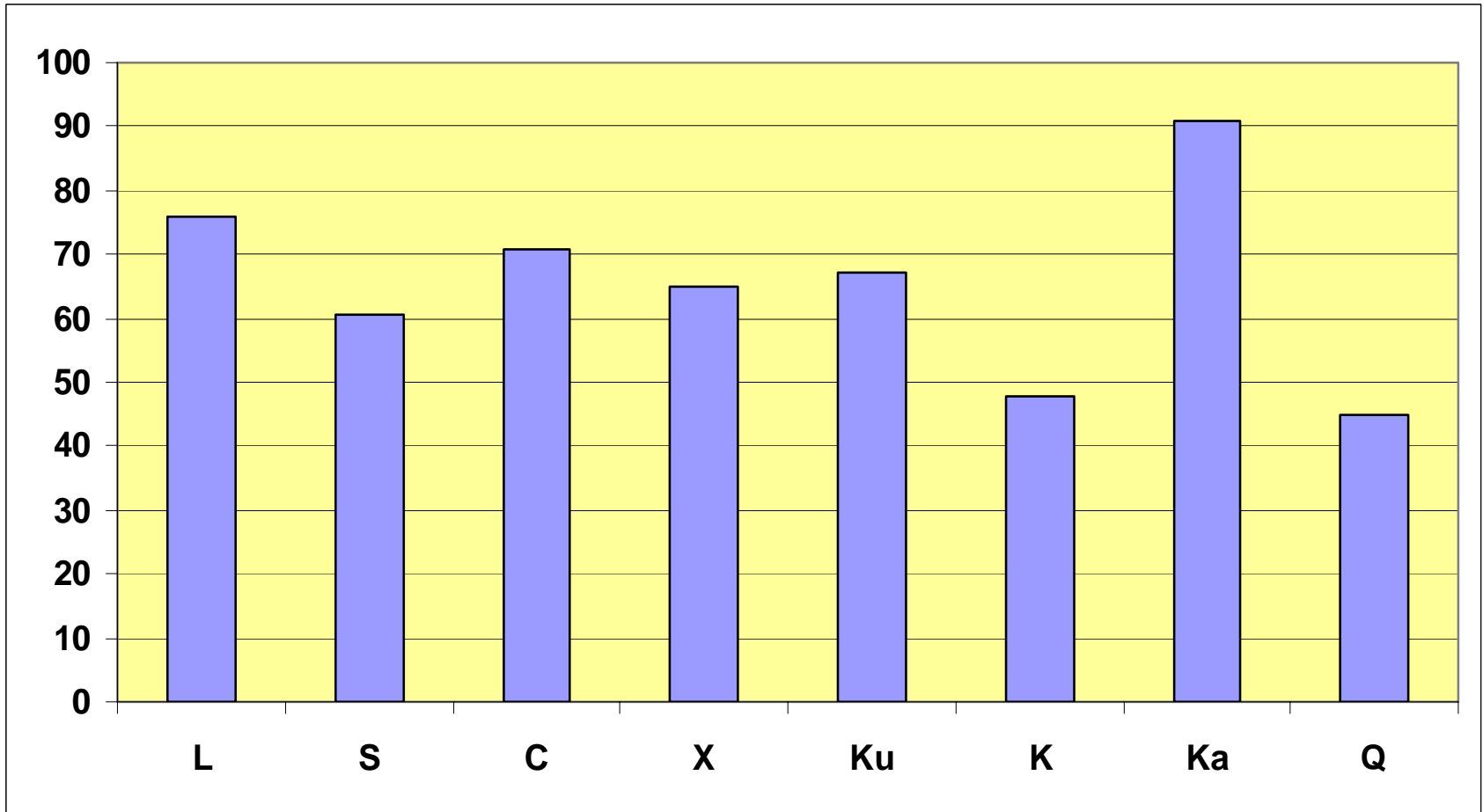
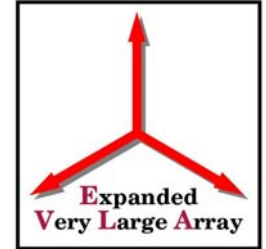


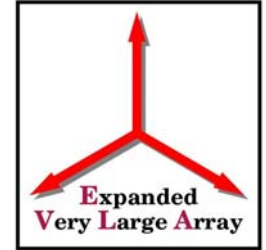
Including (Cryo, Misc & S.E. Costs) / 240

Task	M&S	Manpower	Machining	Total
L-Band	39.8	32.1	3.9	75.8
S-Band	30.1	24.5	6.1	60.7
C-Band	32.2	31.1	7.4	70.7
X-Band	32.0	26.3	6.5	64.8
Ku-Band	31.9	26.8	8.4	67.1
K-Band	26.9	20.1	0.8	47.8
Ka-Band	42.9	37.1	11.0	91.0
Q-Band	20.6	19.7	4.7	45.0
Per Antenna	256.4	217.8	48.7	522.9



# Unit Cost Per Receiver (\$K)





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# Questions ?