

- Luvata was winning bidder:
 - \$1.973/m if max # pieces per 87 km (one winding) is 6
 - \$1.777/m if max # pieces per 87 km (one winding) is 9
- We decided to go with the lower cost option
 - So for 3 windings worth (261 km) - **\$466,372.00**
 - \$291,000.00 carry-over from FY10 (+ 175,372.00)
 - About \$51k savings with > piece count
 - Will require careful “vetting” of winding/spice process at Qi Huan

Luvata SC specification



- The only exception to the spec. that Luvata took was the # of pieces.

Product Characteristics:

	Unit	
Insulated Width W	mm	1.625
Insulated Thickness T	mm	1.00
Tolerance on W or T	mm	+/- .025
Corner Radius	mm	0.2 - 0.475
Insulation		Formvar
SC Alloy Grade		Standard
Cu/Sc Ratio		4.0 +/-0.5
No. of Filaments		222
Filament Diameter	μm	41
Filament Twist Pitch	mm	19 +/- 6
Guaranteed $I_c(5T)$	A	760
Expected $I_c(5T)$	A	830
Minimum "n" value		35
RRR		≥ 70
Minimum piece Length	m	4000
Total Length	m	174,000
Total Length: Alternate 1	m	87,000

CC wind characteristics



		(mm)				
	Inner Radius	750.5	750.7			Pi 3.14159265
	Outer Radius	856.5	855.5			
	Coil Height	106	104.8			
	Coil Width	285				
	Layer Height	1.10				
	Number of Layers	96	Layer Height	1.104		
	Number Turns/Layer	166				
	Number Layers/Group	12	<i>8 groups for quench protection; 12 layers per group</i>			
	Cable Thickness	1.000				
	Cable Width	1.625		269.75		
	Insulation Thickness	0.000				
	Inter-layer thickness	0.000				

Wind Table from John Tompkins



<i>Group Number</i>	<i>Layer Number</i>	Radius (mm)	Turn Length (m)	Total Length(m)	Layer Length (m)
<i>1</i>	<i>1</i>	751.05	783.4	783.4	
	<i>2</i>	752.16	784.5	1567.9	
	<i>3</i>	753.26	785.7	2353.5	
	<i>4</i>	754.36	786.8	3140.3	
	<i>5</i>	755.47	788.0	3928.3	
	<i>6</i>	756.57	789.1	4717.4	
	<i>7</i>	757.68	790.3	5507.7	
	<i>8</i>	758.78	791.4	6299.1	
	<i>9</i>	759.89	792.6	7091.6	
	<i>10</i>	760.99	793.7	7885.4	
	<i>11</i>	762.09	794.9	8680.2	
	<i>12</i>	763.20	796.0	9476.3	9476

2	<i>1</i>	764.30	797.2	10273.4	
	<i>2</i>	765.41	798.3	11071.8	
	<i>3</i>	766.51	799.5	11871.2	
	<i>4</i>	767.61	800.6	12671.9	
	<i>5</i>	768.72	801.8	13473.6	
	<i>6</i>	769.82	802.9	14276.6	
	<i>7</i>	770.93	804.1	15080.7	
	<i>8</i>	772.03	805.2	15885.9	
	<i>9</i>	773.14	806.4	16692.3	
	<i>10</i>	774.24	807.5	17499.8	
	<i>11</i>	775.34	808.7	18308.5	
	<i>12</i>	776.45	809.8	19118.4	9642

3	<i>1</i>	777.55	811.0	19929.3	
	<i>2</i>	778.66	812.1	20741.5	
	<i>3</i>	779.76	813.3	21554.8	
	<i>4</i>	780.86	814.4	22369.2	
	<i>5</i>	781.97	815.6	23184.8	
	<i>6</i>	783.07	816.8	24001.6	
	<i>7</i>	784.18	817.9	24819.5	
	<i>8</i>	785.28	819.1	25638.5	
	<i>9</i>	786.39	820.2	26458.8	
	<i>10</i>	787.49	821.4	27280.1	
	<i>11</i>	788.59	822.5	28102.6	
	<i>12</i>	789.70	823.7	28926.3	9808

4	<i>1</i>	790.80	824.8	29751.1	
	<i>2</i>	791.91	826.0	30577.1	
	<i>3</i>	793.01	827.1	31404.2	
	<i>4</i>	794.11	828.3	32232.4	
	<i>5</i>	795.22	829.4	33061.9	
	<i>6</i>	796.32	830.6	33892.4	
	<i>7</i>	797.43	831.7	34724.2	
	<i>8</i>	798.53	832.9	35557.0	
	<i>9</i>	799.64	834.0	36391.1	
	<i>10</i>	800.74	835.2	37226.2	
	<i>11</i>	801.84	836.3	38062.6	
	<i>12</i>	802.95	837.5	38900.1	9974

5	<i>1</i>	804.05	838.6	39738.7	
	<i>2</i>	805.16	839.8	40578.5	
	<i>3</i>	806.26	840.9	41419.4	
	<i>4</i>	807.36	842.1	42261.5	
	<i>5</i>	808.47	843.2	43104.7	
	<i>6</i>	809.57	844.4	43949.1	
	<i>7</i>	810.68	845.5	44794.7	
	<i>8</i>	811.78	846.7	45641.4	
	<i>9</i>	812.89	847.8	46489.2	
	<i>10</i>	813.99	849.0	47338.2	
	<i>11</i>	815.09	850.1	48188.4	
	<i>12</i>	816.20	851.3	49039.7	<i>10140</i>

6	<i>1</i>	817.30	852.5	49892.1	
	<i>2</i>	818.41	853.6	50745.7	
	<i>3</i>	819.51	854.8	51600.5	
	<i>4</i>	820.61	855.9	52456.4	
	<i>5</i>	821.72	857.1	53313.4	
	<i>6</i>	822.82	858.2	54171.7	
	<i>7</i>	823.93	859.4	55031.0	
	<i>8</i>	825.03	860.5	55891.5	
	<i>9</i>	826.14	861.7	56753.2	
	<i>10</i>	827.24	862.8	57616.0	
	<i>11</i>	828.34	864.0	58480.0	
	<i>12</i>	829.45	865.1	59345.1	10305

<i>7</i>	<i>1</i>	830.55	866.3	60211.4	
	<i>2</i>	831.66	867.4	61078.8	
	<i>3</i>	832.76	868.6	61947.4	
	<i>4</i>	833.86	869.7	62817.1	
	<i>5</i>	834.97	870.9	63688.0	
	<i>6</i>	836.07	872.0	64560.0	
	<i>7</i>	837.18	873.2	65433.2	
	<i>8</i>	838.28	874.3	66307.5	
	<i>9</i>	839.39	875.5	67183.0	
	<i>10</i>	840.49	876.6	68059.7	
	<i>11</i>	841.59	877.8	68937.5	
	<i>12</i>	842.70	878.9	69816.4	<i>10471</i>

8	<i>1</i>	843.80	880.1	70696.5	
	<i>2</i>	844.91	881.2	71577.7	
	<i>3</i>	846.01	882.4	72460.1	
	<i>4</i>	847.11	883.5	73343.7	
	<i>5</i>	848.22	884.7	74228.4	
	<i>6</i>	849.32	885.9	75114.2	
	<i>7</i>	850.43	887.0	76001.2	
	<i>8</i>	851.53	888.2	76889.4	
	<i>9</i>	852.64	889.3	77778.7	
	<i>10</i>	853.74	890.5	78669.2	
	<i>11</i>	854.84	891.6	79560.8	
	<i>12</i>	855.95	892.8	80453.5	<i>10637</i>

- So, would be best to splice between groups (8), but $L \approx 9500-10,600\text{m}$ & with 9 pieces/87 km = 9600m on average. Close, but....
- Luvata seems to be willing to work with us:
 - “Hi Tom,
We are quite used to working with magnet designers who have similar situations. We very well understand the issues from both sides. With the winding map as a guide we can better assist you to minimize joints.
With best regards,
Hem
Dr. Hem Kanithi
VP - Technology
Luvata Waterbury, Inc.