

January 28, 2007

Version 1.3

Deliverable D

Manufacturing Report

System: MIT Space Elevator Team Beamed Ribbon Climber

Component or Subsystem: Microwave Beaming System

Team Name: The Rather-Naïve-About-Optics Team

Team Member 1: Ethan Huwe

Team Member 2: Arka P. Dhar

Team Member 3: Chris Mandy

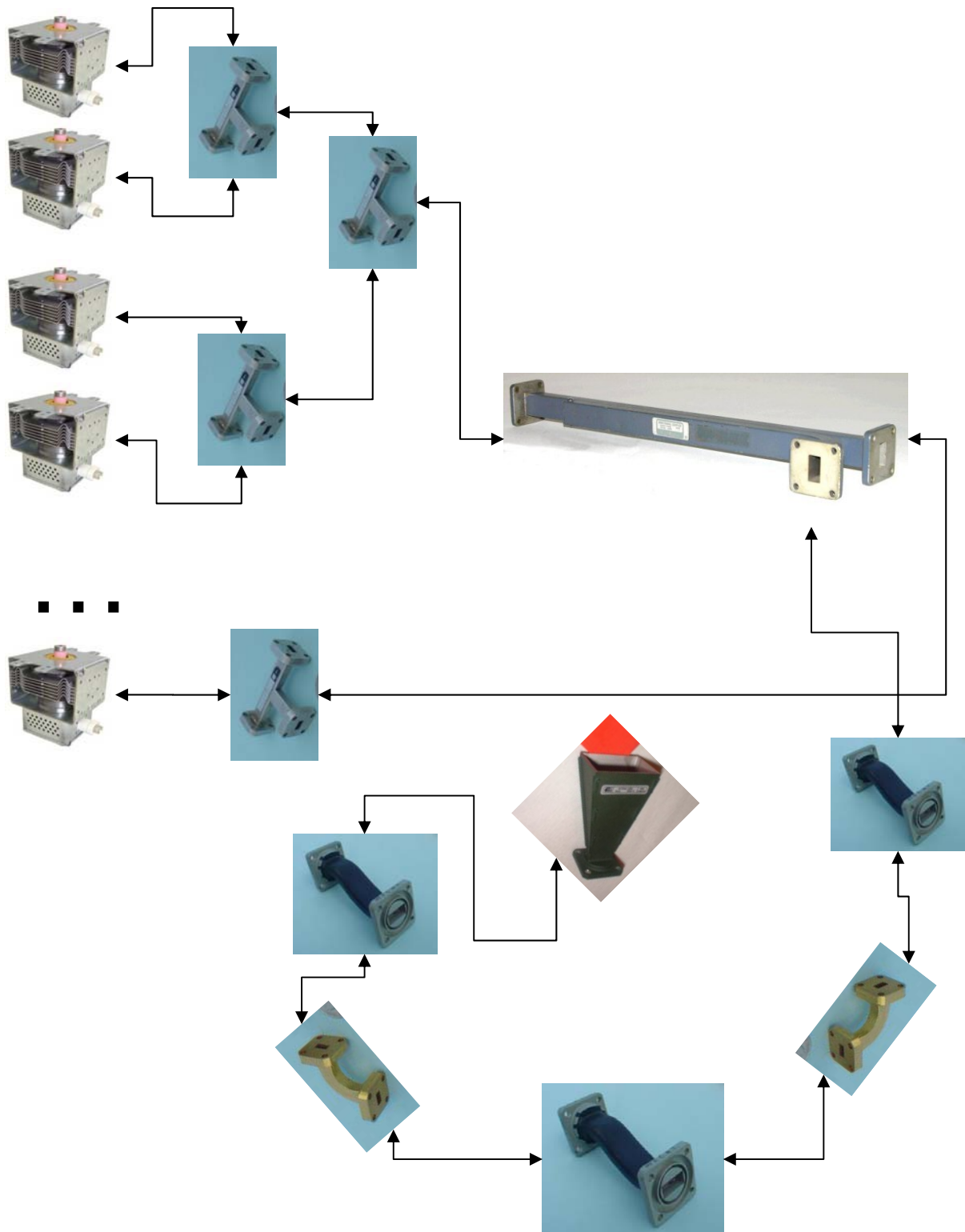
1. Microwave Circuitry

Nearly all components of the waveguide circuitry will be purchased, so that manufacturing and assembly is rather limited. Waveguide components come equipped with 6 holes for 2.4mm diameter screws. Screws of 4cm length are long enough to protrude on both sides of the thick brass plate around the waveguide protrusions. All that is needed is to assemble the 12 Magnetrons 2-by-2 to beam combiners, combining four of these 6 pairings into two more pairings, and combining these new pairings with another pair, so that the magnetrons are grouped in two groups of 6. Combining these two groups with the quadrature coupler yields a single beam source of appropriately polarized light.

This source should now be connected to the 41cm waveguide, then attached to the first H-bend, second waveguide (61cm) and second H-bend (the radiation exiting from the second H-bend should be parallel to that of the first, directed in the opposite sense).

The next item to be manufactured is the horn. A design template was generated from Paul Wade's hdl_3b4 program, which can be copied onto the copper sheet with any punch. Cutting the copper sheet can be simply done by saw, followed by punching 12 holes in the indicated areas, finally folding along the necessary lines, and bolting the horn in its final shape. Connecting this horn to the third (14cm) waveguide occurs in the same manner as the previous two cases. This final microwave circuitry section should only be connected to the rest once the circuit is supported by the horn support.

Schematical view:



2. Dish Support

The process is again quite simple, detailed here:

- Cut steel tubing to desired length and angle with chop saw
- Cut steel plates with band saw
- Drill ½” holes in the plates
- Weld plates to single end of tubing
- Drill hole into frame of dish
- Bolt legs onto the dish through these holes

3. Horn and Waveguide Support

It will not be much challenging to craft the horn support.

- Cut 4 40.3” and 63” tubing and angle with chop saw.
- Bolt the main join together holding the longer side perpendicular to the 40.3” part.
- Take the wigi-wigi tube and as designed attach them with the structure, so as to increase stability.
- Put the waveguides through the tube cavity, and bolt the horn with the extended plate of the longer hand.
- Bolt the leg with a 10” X 10” metal/polycarbonate base.

Deliverable D: Cost Estimate*M1 Team* *Naïve About Optics Team*

Ethan Huwe

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Item	Price	Unit	Quantity	Cost
<i>Raw Materials</i>				
<i>Dish Support</i>				
Steel Tubing 1" square	5	\$/yard	12	60
Steel Plates	4.73	\$/sq. foot	2	9.46
Bolts	2	\$/25	1	2
Screws	6	\$/25	1	6
Fasteners	4.2	\$/100	1	4.2
<i>Horn Support</i>				
Tubing	5	\$/yard	13	65
Bolts	2.5	\$/25	8	20
Nuts	2	\$/25	8	16
Wigi-wigi wire	3	\$/yard	30	90
<i>Microwave Circuit</i>				
Magnetrons	1170	\$/unit	11	12870
Waveguide 41.41cm	131.44	\$/unit	1	131.44
Waveguide 62.74cm	172.65	\$/unit	1	172.65
Waveguide 14.22cm	41.23	\$/unit	1	41.23
H-Bend	210.2	\$/unit	2	420.4
Horn Copper	2.2	\$/sq. foot	1	2.2
Bolts	2	\$/25	2	4
Screws	6	\$/25	2	12
Horn Backplate	0	Scrap	1	0
Beam Combiner	301.5	\$/unit	10	3015
Quadrature Coupler	440	\$/unit	1	440
<i>Manufacturing</i>				
Welding	75	\$/hour	2	150
Cutting and Drilling	75	\$/hour	1	75
<i>Assembly</i>				
Assembly	75	\$/hour	4	300
<i>Testing</i>				
Not quite yet...				
Total				17906.58