RADIO TELESCOPES FOR MILLIMETER WAVELENGTH

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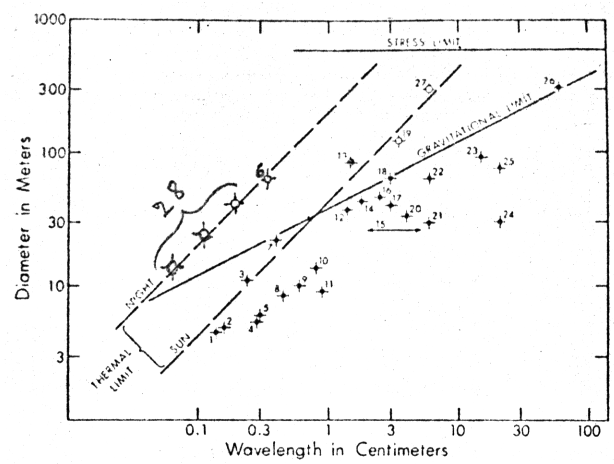
Summary

General rules are discussed for selecting the shortest observational wavelength, and for finding the largest technically possible diameter, for the design of steerable radio telescopes. The shortest wavelength should be selected in one of the four atmospheric "windows" of good transparency, and it depends also on the telescope site; the largest diameter then is defined for this wavelength by thermal deformations, if gravitational deformations are omitted by a homologously deforming design.

The NRAO design of 65-m telescope for 3.5 mm wavelength is briefly described. This design then is scaled down to smaller diameters, for cost reduction as well as for reaching still shorter wavelengths. Cost and performance (without radome) are calculated as functions of the diameter, and results are presented in the following table for all four atmospheric windows.

Enclosure in a radome is not essential for this type of design, as a detailed estimate shows. But the radome eases operation and scheduling considerably, by bringing shortest wavelength and pointing error during sunshine down to the same low value as at night.

Diameter (meter)	Diameter (feet)	Shortest wavelength (millimeter) night	Shortest wavelength (millimeter) sunshine	Cost (million dollars, 1974)	Beamwidth (arcsec) night	Beamwidth (arcsec) sunshine	Pointing error (arcsec) night	Pointing error (arcsec) sunshine
65	213	3.5	8.5	10.7	13.3	32	4.0	8.0
40	131	2.0	4.9	6.3	12.4	30	2.5	4.5
25	82	1.2	3.0	4.0	13.5	34	2.2	3.8
14	46	.8	2.0	3.2	14.1	35	2.1	3.6



<u>**KEY**</u>

1. AEROSPACE CORPORATION
2. UNIVERSITY OF TEXAS
3. KITT PEAK, NRAO
4. JPL, GOLDSTONE
5. HAT CREEK
6. 65-M TELESCOPE DESIGN
7. RT-22, CRIMEA, RUSSIA
8. MIT, LINCOLN LABORATORY
9. BONN, GERMANY
10. ITAPETINGA, BRAZIL
11. NRC, CANADA
12. HAYSTACK, NEROC
13. BONN, GERMANY, 100 M
14. 140-FOOT, NRAO
15. VARIOUS 85-FOOT TELESCOPES
16. ALGONQUIN, CANADA
17. OWENS VALLEY
18. GOLDSTONE
19. NEROC DESIGN
20. WERTHOVEN, GERMANY
21. MARK II, JODRELL BANK
22. PARKES, AUSTRALIA
23. 300-FOOT, NRAO
24. MARK III, JODRELL BANK
25. MARK I, JODRELL BANK
26. ARECIBO
27. ARECIBO WHEN RESURFACED
28. <u>PRESENT SUGGESTIONS</u>

Natural limits for steerable radio telescopes. Telescopes plotted with open circles are either not yet completed or have not yet demonstrated the performance indicated.