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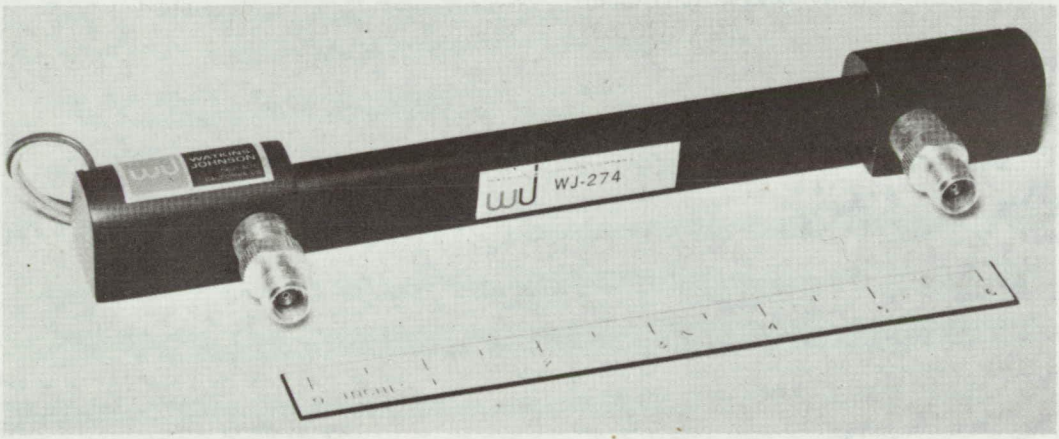
NASA TECH BRIEF

A Positive Taper Traveling-Wave Tube



The problem:

In a traveling-wave tube used in space communication systems having a uniform slow-wave circuit throughout its length, the phase velocity of the fundamental component of rf beam current at the output increases relative to the phase velocity of the wave carried by the slow-wave circuit. Consequently, there is a loss of synchronism between the circuit electromagnetic wave and the rf beam current wave. This results in a loss of linearity and reduction of beam conversion efficiency.

The solution:

Synchronism can be maintained between the rf beam current and the circuit electromagnetic waves over substantially the entire length of the tube by increasing the pitch of the last portion of the helical wave structure.

How it's done:

A space-type S-band traveling-wave tube (the WJ-274) was constructed with a helical wave structure 7.03 inches long. The downstream end of the helical wave structure was 4.27 inches long with a pitch of 61.3 turns per inch; the last 0.61 inch had an increased pitch with 56 turns per inch.

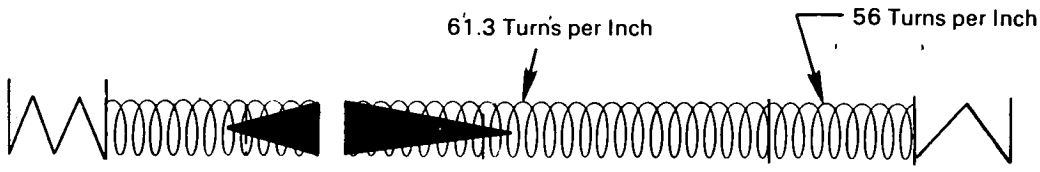
For this tube configuration, the difference in small signal gain and saturation gain was only 3 dB. Saturation gains of 30 to 35 dB were obtainable with minimum degradation of tube efficiency. The overall efficiency of the tube was 42 percent at an output power level of 25 watts.

Note:

Documentation is available from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Price $3.00
Reference: TSP69-10407

(continued overleaf)



Positive Taper Helix

Patent status:

No patent action is contemplated by NASA.

Source: Ralph W. Grechberg
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under contract to
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