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SCIENTIFIC INTELLIGENCE DIGEST

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11 April 1958

CIA/SI/HTA-SID-58-2

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This Digest makes use of [redacted] 25X1

25X1 [redacted] information received in the Office of Scientific Intelligence but does not necessarily represent complete coverage. The comments are based on all sources and reflect the immediate views of the Office of Scientific Intelligence.

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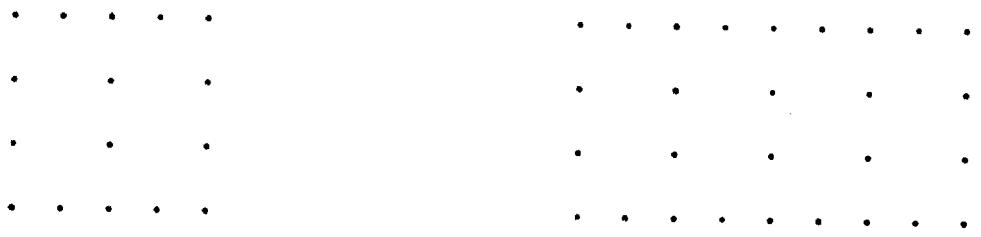
[redacted] 25X2

1. The 5-3-3-5 and 9-5-5-9 Antennas at Komsomolsk, Khabarovsk, Tashkent and Tyura Tam:

25X1D [redacted] 25X1D revealed large communications facilities at Khabarovsk, Tashkent, Tyura Tam and Komsomolsk. These communication installations have antenna farms which include the usual rhombic antennas plus unusual configurations of poles in a rectangular layout. For convenience these rectangular arrangements are called 5-3-3-5 and 9-5-5-9 thus describing the numbers of poles in each row as shown in Fig. 1.



5-3-3-5 9-5-5-9

Fig. 1.

While these antennas evidently are used for high-frequency radio communications, their characteristics were not recognized immediately. A subsequent survey of technical literature of both the USSR and the US has revealed that these pole configurations (5-3-3-5 and 9-5-5-9) are identical with the supporting structure of a form of travelling wave antennas called "fishbone" in technical literature. The advantage of this type of antenna is that it permits efficient, high-frequency operation employing short

poles and requiring a minimum of land without sacrificing antenna gain or band-width. Furthermore, since the antenna system uses short poles the cost of the installation is moderate.

Several references to American work on this antenna were found, the earliest being a paper by Beverage and Peterson in the April 1931 Proceedings of the IRE. A photograph of a two-bay fishbone antenna (5-3-3-5 pattern) at the Riverhead receiving station of RCA is shown in Radio Antenna Engineering by Laport. A photograph of a model of the two-bay fishbone antenna appears in Vestnik Svyazi, December, 1955. Ground

25X1C photography [redacted] of the two-bay antenna system near Leningrad. Although photographs were not found in the open literature of a four-bay "fishbone" antenna, a schematic diagram was found in which the method of connecting the four bays to the transmission line is detailed. The four-bay "fishbone" antenna (9-5-5-9 pattern) is two two-bay antennas operating in parallel as shown in Fig. 2.

25X1D Study of communications facilities revealed [redacted] is continuing and a more comprehensive technical paper dealing with the

25X1A observed antenna systems will be published in the near future. [redacted]

FOUR-BAY FISHBONE ANTENNA

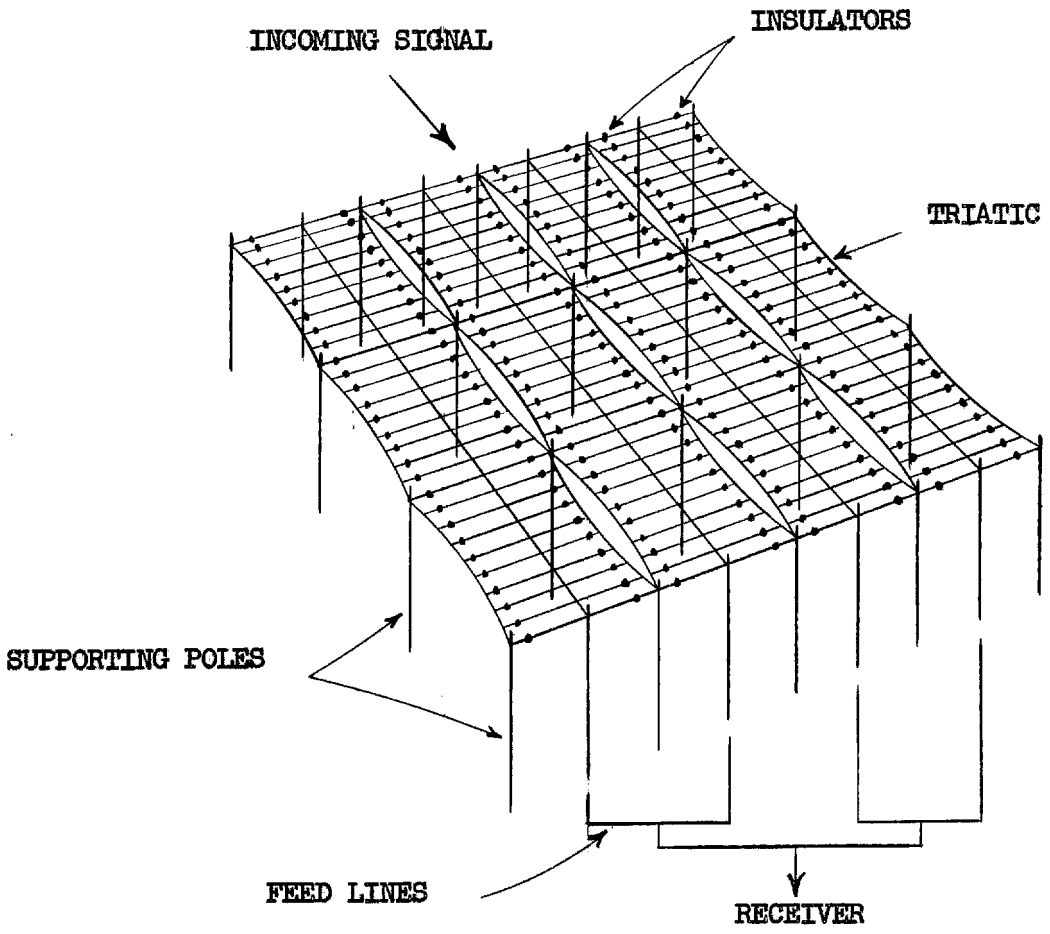


Fig. 2.

The "fishbone" antenna is a high-frequency receiving antenna and is a special form of a travelling wave antenna. It consists of a series of dipoles arranged in collinear pairs, loosely coupled to a transmission line at equal intervals by small capacitances. The transmission line runs horizontally in the direction of the incoming signal. The dipole elements are short enough to be non-resonant within the frequency range of the array and are spaced near enough together to provide a uniforma loading of the transmission line. The dipoles are capacitively coupled to the transmission line to keep the propagation velocity of the line above ninety percent of free space. The end of the transmission line toward the transmitting station is terminated in a non-inductive resistance equal to the characteristic impedance of the line, which is about 400 ohms.

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