CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

S-E-C-R-E-T

COUNTRY **East Germany**

SUBJECT **VEB Funkwerk Koepenick: Theoretical Antenna Research**

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REFERENCES

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This is UNEVALUATED Information

THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

1. In 1953, the East German Ministry for Post and Telecommunications ordered Department TEA (Technical Development of Antennae) of VEB Funkwerk Koepenick to carry out certain research concerning a number of medium wave transmitters located in East Germany. This research involved numerical results which had to be obtained by measurements of these transmitters. The research, which lasted until January 1955, was carried out by Eng. Rolf Gruss of the department mentioned The research was first supervised by Dr. Erich Schuattloeffel head of the department and then by his successor Eng. Horst Geschwinde. The research was first carried out with medium wave transmitters and later also with short wave transmitters.

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2. Antennae of medium wave transmitters

a. The following transmitters were investigated:

Berlin, about 400 kw with reflector

Burg, about 400 kw with reflector (under construction)

Ludwigslust, about 150 kw with reflector (under construction)

Leipzig, about 100 kw.

Dresden, about 100 kw.

Each of the transmitters mentioned has a main antenna and an auxiliary antenna of the Dreiecksflaechenantenne type. The main antenna is a steel tube radiator, a quarter of lambda to a half lambda in size, with Fusspunkteinspeisung. Some of the antennae are provided with reflectors (figure 1 of annex 1 represents a schematic diagram of the main antenna and figure 2 of annex 2 represents a Dreiecksflaechenantenne).

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b. Measurements were carried out in order to determine the values of the capacity and the inductivity which the tuning circuits must have for a good match of transmitter and antenna. In addition, the measurement values were to furnish the numerical basis for a comparison of the theoretical and actual values of the Fusspunkt resistance (input impedance).

c. The measurements were carried out during night-time only, since the other East German transmitters were not operating then. Nevertheless rather large extraneous voltages (Stoerspannungen) up to 5 volt were measured; these came from atmospheric disturbances and probably from West German transmitters. A powerful impedance measurement unit therfore had to be used.

d. The computing was carried out according to the so-called "extended transmission line theory" (Erweiterte Leitungstheorie), i.e. on the basis of line equations[1]. The radiation resistance occurring in the attenuation term of the equation was computed with the aid of Maxwell's field theory[2].

e. The computations showed deviations from the actual measurements. Attempts to eliminate the discrepancies mainly involved the following steps:

1) The computations were first made under the supposition of the earth having perfect conductivity (unendlich gutleitende Erde). Adjustments were made for an earth with imperfect conductivity. Further corrections were made under consideration of the Dachkapazitaet. (See figure 1 of annex 1).

2) With the aid of the corrections mentioned the practical experiments still did not agree with the theoretical results. Therefore the approximation method based on the extended transmission line theory was discarded and the strict integral equation method of Hallen was used[3].

3) Although the complicated numerical evaluation based on the Hallen method was carried out repeatedly, no results better than those obtained through the approximation method were obtained. For this reason the approximation method was finally used again and the discrepancies were roughly eliminated by qualitative evaluation of the errors(capacities and inductivities of the antenna switch).

4) The deviations from the experiment were even greater with respect to the auxiliary antennae. A good agreement with the results obtained through use of the approximation method could only be reached though consideration of the radiation coupling (Strahlungskopplung) between the wires.

3. Similar research was carried out concerning the antennae of short wave transmitters. The investigations served the purpose of studying the qualities of the Fusspunkt resistance of short wave antennae. The following antennae were investigated:

a. The antenna of the KN3 transmitter (3 frequency ranges from 3 to 18 mcs; 5 kw - see figure 3 in annex 2).

b. The Reusen antenna (see figure 4 of annex 2). A laboratory model of this antenna was developed on the basis of a proposition made by department head Dr. Erich Schaetzloeffel. In view of its wide shape, its main

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purpose was to make unnecessary the tuning circuits for the matching of transmitter and antenna.

c. Various wire antennae. These antennae were only used for laboratory work by other departments, for instance Department TEF. 4/

1. [redacted] Comment. Line equations are relations obtained from the well-known telegraphic equation under consideration of the attenuation. 25X1

2. Comment. The following literature was mainly used: Brueckmann, Theorie der Wellenausbreitung; Zuart, Elektromagnetische Strahlungsfelder.

3. Comment. This method makes it possible to compute with a high degree of accuracy the current distribution upon the antenna. The current distribution is the unknown value in the integral equation.

4. [redacted] Comment: [redacted] 25X1 25X1

department TFA is to be dissolved in 1955 and its technicians transferred to other departments.

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Annex 1

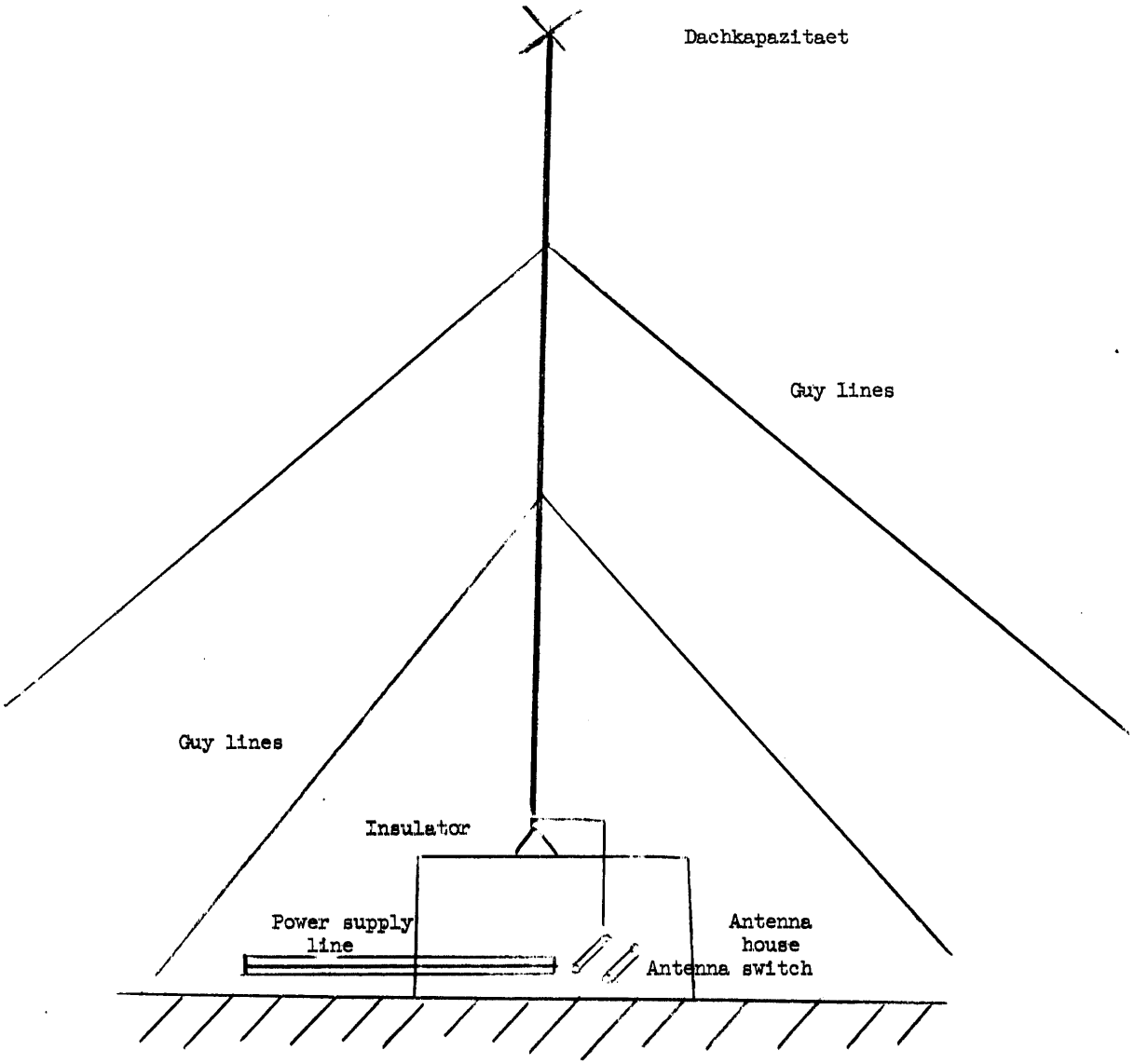

Figure 1: Main antenna

(Height: 100 and 200 meters)

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Annex 2

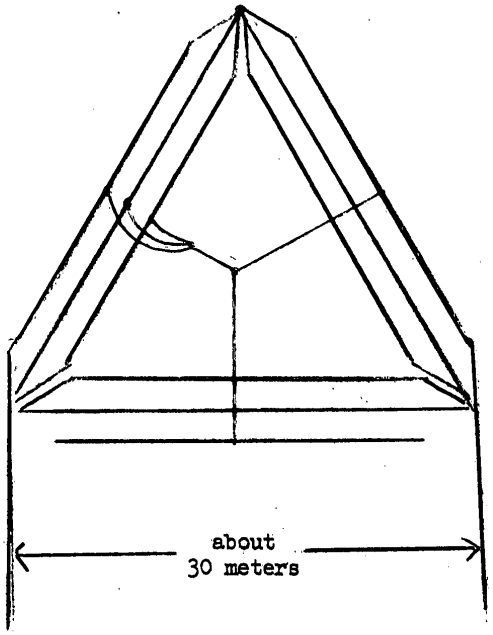

Figure 2: Dreiecksflaechenantenne

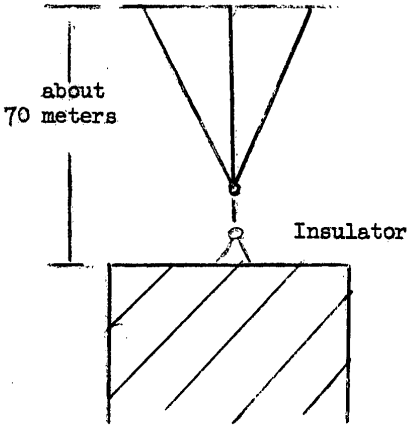

Figure 2: Side view

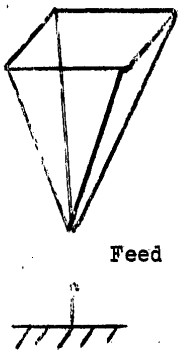

Figure 3: KN3 antenna

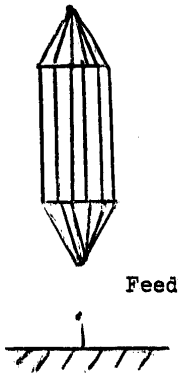

Figure 4: Reusen antenna
(side view)