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On the Field Intensity of Radio Wave at Otaru

By

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The broadcasting station, JOIK, was established at Tukisappu, near Sapporo, in June of 1928 and broadcasting was commenced from the 6th day of June. The people who dwell in Hokkaidô have received the benefits of radio entertainment. Especially the townspeople at Sapporo could receive it by simple crystal set. Also the townspeople at Otaru had expected to be able to receive the benefit of radio. In spite of this expectation however, the audibility by radio set at Otaru was reported to be poor.

To confirm this fact, the author stayed there and using a crystal set made a numerical measurement of the field intensity produced by electric waves at that place. The observations were made in the daytime of 15 and 16th July in the same year.

Audibility at Iwamizawa, which is the same distance as Otaru from the broadcasting station but to the opposite direction, has been shown to be 7 times greater than that at Otaru by the author's measurement.

The audibilities in the daytime at Otaru and Iwamizawa by simple crystal set were measured respectively as 21 and 150. This measurement was carried out by simple crystal set and inverted *L* type antenna whose horizontal length is 14 m and vertical one is 7 m. The relation between audibility and microamperage has been studied by Mr. N. MARUMO. According to his result, when the maximum modulation of carrier wave is given as 30 percent, the magnitude of detected current is approximately proportional to the audibility under the same condition.

Therefore the ratio of audibilities at two stations is approximately considered to be the ratio of their field intensities. From my observation obtained by audibility meter it is supposed that radio wave is remarkably absorbed in the region between the broadcasting station and Otaru.

Table 1.

Notation of Obser- vation Station	Size of Antenna			H+L-h	Direc- tion of Antenna	Type of Antenna	I	$I/\frac{H+L-h}{100}$	Earth	Observed position
	H	L	h							
A	50	60	10	110	0°	inverted L-Type	17.5	15.9	water pipe	13-Banti, Toyokawa-Chô.
B	58	46		104	0°	„	3.0	2.8	„	14 Banti, 3-Chôme, Temiya Chô.
C	45	60		105	60°	„	8.0	7.6	„	Higasi-3-Chôme, Inaho-Chô.
D	60	50		100	60°	„	3.8	3.8	„	10-Banti, 3-Chôme, Ironai-Chô.
E	80	60		140	0°	„	3.5	2.5	„	Higasi 5-Chôme, Inaho-Chô.
F	65	70		135	60°	„	7.0	5.2	„	19-Banti, Higasi-6-Chôme, Inaho-Chô.
G	45	50		95	0°	„	1.0	1.0	„	53-Banti, 1-Chôme, Tomioka-Chô.
H	55	50	30	105	30°	„	2.0	1.9	copper plate	6-Banti, Sintomi-Chô.
I	45	50		95	0°	„	0.3	0.3	„	8-Banti, 4-Chôme, Midori-Chô.
J	60	60		120	35°	T-Type	2.5	2.0	water pipe	12-Banti, 5-Chôme, Irihune-Chô.
K	47	53		100	30°	inverted L-Type	1.2	1.2	„	2-Chôme, Okuzawa-Chô.
L	50	50		70	0°	„	1.0	1.4	heater pipe	Higasi-8-Chôme, Inaho-Chô.
M	40	36		76	90°	„	0.3	0.39	water pipe	9-Banti, Higasi-2-Chôme, Hanazono-Chô.
N	60	100		160	90°	„	4.2	2.6	„	52-Banti, 8-Chôme, Ironai-Chô.
O	80	60	25	115	90°	„	6.0	5.2	„	16-Banti, Minato-Chô.
P	50	55		105	0°	„	1.0	0.95	„	7-Banti, 4-Chôme, Irihune-Chô.
Q	45	60		105	30°	„	5.2	4.95	„	1-Chôme, Aioi-Chô.
R	55	60		115	0°	„	1.2	1.04	„	19-Banti, Nisi-3-Chôme, Hanazono-Chô.

H : vertical length of receiving antenna in feet.
 L : horizontal length of receiving antenna in feet.
 h : height of crystal set in feet.
 I : Rectified current in micro-amperes.

For the benefit of the measurement, the wave of radio frequency, was sent out from the station at even the time without modulation and thus the measurement continuously progressed. The field intensity was measured by the rectified current in the case when antenna earth circuit through crystal set is tuned as well as possible by varying L and C of crystal set and the capacity of the condenser in series connected to it. The magnitude of the antenna earth current detected by crystal was easily measured by microammeter. Number of the observation stations was 18. The rectified current values are tabulated in Table 1 in which the observation station and type and size of antenna used are together indicated. The values thus measured are plotted on the map of Otaru as shown in Fig. 1.

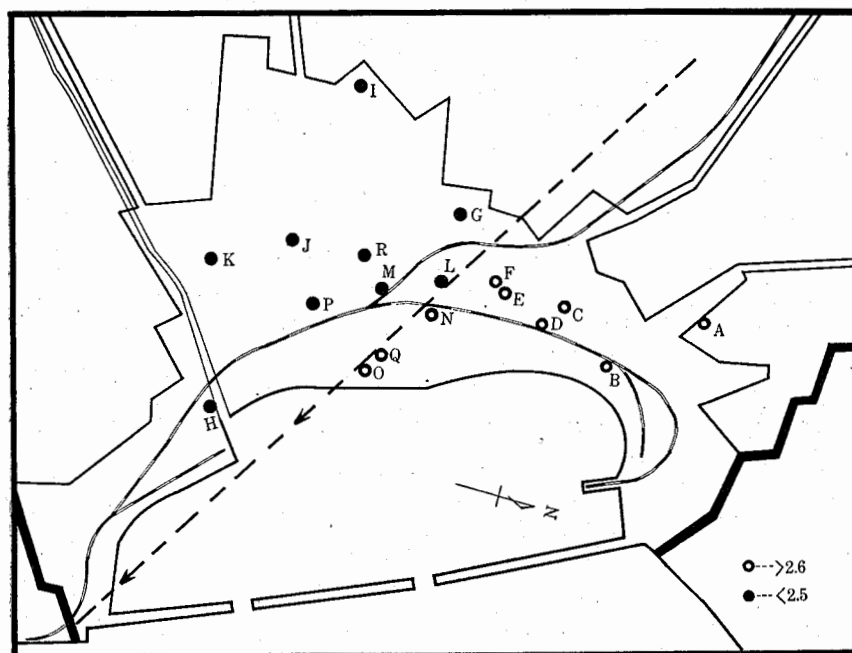


Fig. 1. Map of Otaru.

This result indicates that the distribution of field intensity at this city can be distinctly divided into two domains one of which is remarkably stronger than the other. The boundary of these two domains can be represented by a straight line. If this discontinuous

line is extrapolated in the south-eastern direction, it may be found to take its path through the situation of the broadcasting station as shown in Fig. 2. As the cause of this decrease in field intensity, the absorption by mountains which contain especially metallic materials is considered to be the greatest factor.

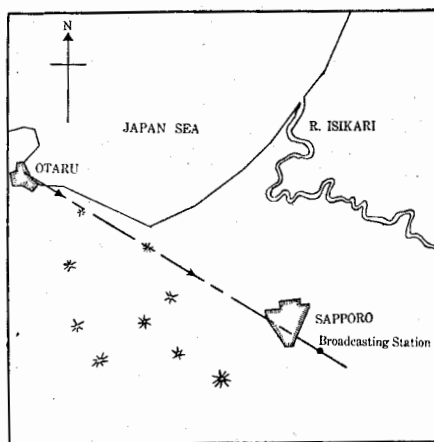


Fig. 2.

After this measurement, in this shadow domain, larger mineral deposits have been actually found and are now being actively worked.

Lastly the author wishes to express his cordial thanks to the late Prof. T. TERADA who has urgently encouraged the author to publish this report.