# Examination of transformer type matching box

## 1. Review of half-wave dipole (DP) antenna

・ Frequency f [Hz],

Wavelength λ = c / f [m] c: Speed of light (3 × 108 m / s)

・ Example

When the frequency is 7.1MHz = 7.1 × 106 [1 / s]

Wavelength λ = 3 × 108 [m / s] / 7.1 × 106 [1 / s]

= 42.25 [m]

The condition for the length of the standing wave in the wire antenna is p = nλ / 2, n: natural number

p = λ / 2 = 21.13 [m] (n = 1)

In the case of center power supply, the impedance is

Z = 73 + j 43 [Ω]

Slightly shortened (4-5%) to cancel the inductive reactance (j43Ω)

P = λ / 2 = 21.13 × 0.95 = 20.07 ≒ 20 [m]

It is known that the impedance rises when the feeding point is moved from the center to one end. one end What is the impedance value when it comes to? What is the resistance component? Reactance component is 0

## 2. Questions about one-sided feeding antenna

・ What is the impedance when power is supplied from one end of the antenna wire?

・ What is the shortening rate? (What is the shortening rate for jX = 0)

・ What is the change in Z depending on the installation conditions?

Vertical to the ground / parallel to the ground (height at that time) / when bent

・ What is the change in Z due to standing wave conditions p = nλ/2, n=1,2,3, n?

・ What is the change in Z when a loading coil is inserted?

## 3. Examination of how to solve questions

・ What is the solution method analytically or by computer simulation?

⇒ × Impossible! (Even if it can be done in the first place, it cannot be verified whether it is correct)

・ Prototype actual machine and experimentally verify

⇒ Create a prototype with a wide range of parameters

⇒ Test under various conditions and maintain a database (← divide by everyone)

⇒Practical logic is prepared by comparing with analysis / simulation results, etc.

⇒ ○ This is a realistic elucidation (solution) method!

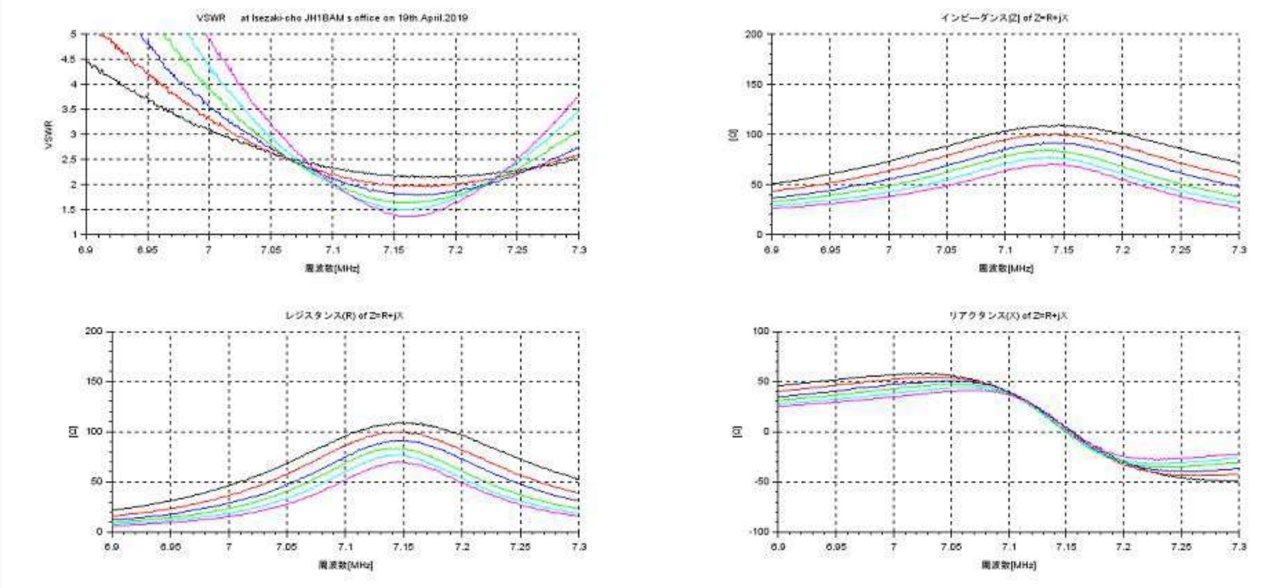
## 4. Prototype matching box (MB)

・When the number of turns on the primary side (transmitter side) is n1 and the number of turns on the secondary side (antenna side) is n2, the impedance Z2 on the secondary side is Z1 = (n1 / n2) when viewed from the primary side. Can be converted to 2 × Z2.

・When power is supplied from one end of the antenna wire, the impedance value is unknown, so prepare a large number of MBs with a turns ratio and consider selecting the optimum one.

| model | | MB0214 | MB0216 | MB0218 | MB0220 | MB0222 | MB0224 | MB0226 |
|---|---|---|---|---|---|---|---|---|
| Troidal core | | FT-140#43 | | | | | | |
| Number of primary windings | n1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of secondary windings | n2 | 14 | 16 | 18 | 20 | 22 | 24 | 26 |
| n2/n1 | - | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Reactance (Primary) | L1 | 3.86 | 3.90 | 3.92 | 3.88 | 3.96 | 3.98 | 3.77 |
| Reactance (Secondary) | L2 | 178.0 | 234.7 | 301.1 | 365.5 | 450.5 | 539.6 | 594.6 |
| L2/L1 | - | 46.1 | 60.2 | 76.8 | 94.2 | 113.8 | 135.6 | 157.7 |
| SQRT(L1/L2) | - | 6.79 | 7.76 | 8.76 | 9.71 | 10.67 | 11.64 | 12.56 |
| Impedance (Secondary) | ohm | 2306 | 3009 | 3841 | 4710 | 5688 | 6779 | 7886 |
| Impedance (Secondary) | k-ohm | 2.31 | 3.01 | 3.84 | 4.71 | 5.69 | 6.78 | 7.98 |
| Capacitance | pF | 100 | 150 | 150 | 150 | 150 | 150 | 150 |

## 5. Data example using matching box




・The above graph is the result of measuring with RigExpert AA-30 by connecting MB0216 to MB0226 to a 5m long (3m + 42uH + 2m) antenna wire (white wire01). (MB0216: Black, MB0218: Red, MB0220: Blue, MB0222: Green, MB0224: Cyan, MB0226: Magenta)

・Since the characteristics of MB shown in item 4 and the data (above) acquired by connecting the MB to one end of the actual antenna wire do not match, the cause and principle are under consideration. (The impedance ratio is lower than the winding ratio!)