

第V部 将来への展望

(I) 超高精度 VLBI を目指して

V. VIEW TO THE FUTURE VLBI

(I) DIRECTING ATTENTION TO MORE PRECISE VLBI

We are now aiming at more accurate VLBI system, in order to expand the fields of VLBI applications. At present, the items in the following chapters should be considered to improve VLBI measurements.

In chapter V-1., general description on the frequency stability of local oscillator is given with formulas in the first half. In the latter half, some hopeful frequency standards, such as H-maser, SCO(=Super Conducting cavity stabilized Oscillator) are compared with the conventional atomic standards of Cs and Rb.

In chapter V-2., the following articles are introduced. In stability and reliability, digital VLBI system has been superior to analogue one. However, situation has been developing in favor of analogue. For example, charge coupled or bucket brigade devices are able to shift-register analogue video signals. These enable us to make continuous correlation, which has been impossible by the digital discrete correlator. In future, unified hybrid technique may bring about a dialectical development of VLBI system.

High resolution VLBI systems using bandwidth synthesis method are now being planned. In this method, selection of channel frequency and delay resolution function are important factors. In chapter V-3., it is shown that the optimum channel frequency set is obtained by the application of Minimum Redundancy Array theory. It also contains practical estimation of the effect caused by wide band frequency characteristics of the first parametric pre-amplifiers.

The recording and reproducing system in our previous VLBI experiment had several disadvantages, such as limit of recording bandwidth, "drop out" of VLBI signals. In chapter V-4., the new plan using a microlink for connecting the data from two antennas, and carrying out real time fringe-stopping and/or other data handling with real time correlating system, are introduced, in which the magnetic tape recorder come to be unnecessary.

Total instrumental delay is one of the most important factors in VLBI. In chapter V-5., high accuracy measurement of that delay with a simple reference receiving station, is discussed. Further,

the time variation of the delay is also to be remarked.

In chapter V-6., correction for the effect of the troposphere and the ionosphere are discussed. The former may be reduced by observing the H₂O line of 22.35 GHz and O₂ line of 60 GHz. As to the latter, the ionospheric effect can be taken out by observing at two frequencies, such as 2.3 /8.3 GHz. The effect of the earth crustal tide is also discussed.