

VLB ARRAY MEMO No. 10

Notes on visit to ASULAB; Neuchatel, Switzerland, June 18, 1980

ASULAB, a subsidiary of ASUAG, has been engaged in a Hydrogen maser development program, with a goal of possible commercial production.

ASULAB is affiliated with Oscilloquartz, a producer of a wide range of frequency standards, including state-of-the-art crystal oscillators. Oscilloquartz is a sister company of FTS in Danvers, Mass.

During my visit to ASULAB on June 18, I spoke with B. Schlueter, Director of Oscilloquartz, and Dr. G. Busca who is in charge of the small group at ASULAB working on the maser project. Two masers have been built and are in operation. The first is an improved version of the infamous old Varian "H-10". The second, developed in collaboration with Harry Peters, is essentially a copy of the unit Peters developed at Goddard, and currently in use at various NASA sites. Because the H-10 is acknowledged to be significantly poorer than the "NASA" maser, and only one "NASA" maser is now operating, performance specifications are not available; although it is claimed that comparisons with crystal and Cs standards reproduce their known stabilities on short (1 sec) and long (100 sec) term comparisons respectively.

Two new "NASA" masers are being built and are expected to be in operation by October, 1980. One of these will be compared with the existing unit to establish performance specifications. The other will be "sold" to the Wettzell satellite tracking station in southern Germany where it will be used to initiate a series of VLBI observations with other European antennas primarily for geodetic applications.

No decision appears to have been reached on whether or not Oscilloquartz will manufacture further units for commercial sales. Schlueter, who apparently initiated the development project, feels that if 20 units per year could be sold for 10 years they could sell them for \$100,000 each. Busca, on the other hand, anticipates a more modest operation which he claims would be commercially viable if a total of 10 units were sold for SF250,000 (~ \$150K). He pointed out that ASULAB is a pure research laboratory, and that future commercial

sales do not necessarily need to directly pay the development costs. Moreover, he recognized the very limited market for Hydrogen masers, and so far they are aware of about 10 potential VLB and satellite tracking customers. Apparently the Swiss are feeling the loss of prestige to Japan in the international watch business, and are anxious to advertise "Swiss clocks" as the "most accurate in the world".

The above price estimates may be compared with the latest SAO estimate of \$315K for one unit and @233K per unit in a production run of 10. In both cases there is a reduction in unit cost of about \$75K if the receiver system is not provided.

Because Oscilloquartz has already written off the current development program as "basic research", I have the impression that their already heavy investment should not necessarily be interpreted as an indication of their marketing plans. Based on the performance parameters established from comparing their two masers later this year, on the experience gained from the "field unit" at Wettzell, and on their assessment of the potential market, a decision will be made in early 1981 on whether to market the masers commercially. If they do so, they would not go into production until late 1981, with the first units being available in late 1982 or early 1983.

ASULAB is also developing a passive Hydrogen maser which although smaller, lighter and simpler to operate, has a stability one to two orders of magnitude poorer than a conventional active maser. At the other extreme is an investigation of cooled Hydrogen masers which use He^3 at 0.3K as coating to obtain a perfect "wall" and an improvement of an order of magnitude in stability.

Oscilloquartz has also developed a new crystal oscillator with a claimed stability $\Delta f/f \sim 10^{-13}$ up to ~ 100 seconds. The "breakthrough" has been in the use of a single rather than double oven to prevent oscillations in oven temperature.

K. I. Kellermann
Green Bank
July 9, 1980