

Interview

Satellite Communications and I (17)

Ms. Naoko Yoshimura, senior researcher of the Communications Research Laboratory, who has been engaged in the satellite communications system research, told her motivation and passion. (YS)

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I think my interest to the space began when I got to know NASA's Voyager Project in my elementary school days. I remember that I was much impressed by the facts that we could observe astronomical objects existing far away very clearly even from the Earth. My interest in space and astronomy became bigger and bigger with those impressions, and I hoped to be along with something related to the space. Even if I could not see the aspects of universe by my own eyes from the space, I hoped to receive the observation data from the space to look at them by myself at the earliest. From these thoughts, I aspired to do jobs related to space communications. . And then, I can work in wireless communication division in CRL now, realizing my ambition.



Even though I have such hope, to tell the truth, I didn't have any experience regarding space communications before I entered the CRL because I studied an antenna unit technology for a research and experiments on the remote sensing in my university days. In the nature of things, I was quite an amateur about satellite communications technology. When I entered the CRL, I studied to obtain new knowledge about communications as much as I can as the

first step. On the other hand, I actually thought sometimes that it had been better to continue to be in the field of remote sensing.

I started my job in CRL at Kashima Space Research Center (KSRC). In those days, an experimental earth station for the Engineering Test Satellite V (ETS-V), was facilitated at the KSRC. When I took part in this ETS-V project, the main mission of ETS-V had been almost finished and the project team was carrying out PARTNERS experiment as the additional experiment in the residual satellite life. As the KSRC worked as the HUB station in the PARTNERS experimental network, we had to operate the station to connect Earth stations of PARTNERS participants each other, to keep watching the status of satellite transponder, antenna pointing and so on. Though I was quite amateur about satellite communication, I think I built up many precious experiences needed to carry out satellite communication experiments through this experiment.

On the other hand, the project plans for the Engineering Test Satellite VI "ETS-VI" and the Communications and broadcasting Engineering Test Satellite "COMETS" were concurrently going on as the next engineering test satellite project. Then I could participate in characteristics measurement of the earth station for these projects.

However, ETS-VI launched in the next year could not be put in the planned geostationary orbit unfortunately and we had to decide to put it in a highly elliptical orbit urgently for maintaining an opportunity to carry out available experiments. We had a very hard task from this decision. Because the ground segment was basically designed for a geostationary satellite, it was very difficult for this ground equipment to use for the experiment with a satellite in highly elliptical orbit. These earth stations had very limited antenna driving range, or no tracking function, we had to improve them to have wide range satellite tracking function. The satellite tracking function was the most important function because we could not carry out any experiments using ETS-VI without it. Therefore, the solution of this issue is the highest priority matter. Luckily, as the feeder-link earth station which was the most important in this experiment had an antenna driving gear though its driving range was limited, we added the programmable tracking function controlled by an external equipment. Furthermore, we improved local oscillators of frequency converters to be controllable to compensate the Doppler shift automatically. The improvement of other earth stations could not be done until the beginning of experiment. Then, we directed antenna manually toward the satellite position estimated from orbital information about every half an hour in case of small earth station with wide beam width, or even every a few minutes for earth stations with narrower beam width during experiment periods. . The season we began the ETS-VI experiment was mid-winter and the time to start the experiment was mid-night. It was the memories dear to me that I shivered with cold sea breeze during the experiment. When we could not receive any signal from the satellite, I checked every measurable point and finally I had almost broken up the antenna unit. In this time, my knowledge about antenna engineering was helpful, so I was happy that the knowledge of my school years didn't come to nothing. All these things still come to my mind.

Many planned experimental items could not be carried out because the satellite was in non-geostationary orbit. It was regrettable fact for me but I think I got a precious experience for myself from a great variety point of view to be engaged in satellite communication system from now on.

Next, I participated COMETS project, but unfortunately COMETS also could not be put in

a planned geostationary orbit. Then COMETS also became a non-geostationary satellite. By a curious coincidence, AIAA ICSSC was in session at Yokohama International Convention Hall on the day of COMETS' launch. I remember that I heard this regrettable news at the conference venue of ICSSC.

I also took part in Japan-U.S. international high data rate satellite communication experiment (a.k.a. The Trans-Pacific HDR Satcom Exp.) In the phase 1 of this experiment, we achieved DS-3 rate international ATM connection utilizing 2 satellite links with INTELSAT and NASA's ACTS as well as 3 terrestrial networks. We performed the remote high-definition-video (HDV) post-production demonstration successfully over this experimental link in 1997. In this demonstration, we transmitted HDV filmed in the U.S. to Japan and edited the video in Japan, then transmitted it back to the U.S.. Following this demonstration we carried out the phase 2 experiment last year. In this phase, we used N-STAR for domestic connection, INTELSAT for Japan-Canada international connection, the terrestrial networks for Canada-U.S. connection. We demonstrated the remote astronomical observation and large capacity digital data transmission between the U.S. and Japan. In this experiments, we spent long time to establish connection between satellite links and terrestrial networks. But, I was much expanded my horizons through these experiments because I could know many things that I don't think about if I took part in only satellite part in the experiment. Furthermore, I really felt necessity of "human network". I understood that every thing relating to carry out the project such as coping with troubles, preparing the experiments and so on was lead by a relationship of mutual trust among partners joined the experiments. I wish I had a human network like as this.

Currently I am involved in the development of very high data rate experimental satellite tentatively named 'Gigabit Internet Test Satellite'. We are very keen to develop a new high throughput on-board switch, high data rate on-board demodulator and modulator, advanced antenna technology and other challenging equipment. I wish to make those technologies real and to operate such very advanced satellite communications system. I'm looking forward to the date of the launch of this satellite from now.

Recently, I visited JPL on business and found a mockup model of the Voyager space craft in the exhibition room there. I just stood there remembering many things such that I was very excited by watching TV program introducing Voyager project in my childhood, I was impressed by clear pictures transmitted from Voyager, and I wished to see these space spectacles by my own eyes. I still wish to watch precious data send from deep space by my own eyes someday.