The Review of ITU Registration for Koreasat

Yeong-Mo Kwon*

〈Contents〉

1. Introduction

When a nation or a company intends to establish a satellite network, it must consider the availability of orbital slot and frequency.

The space resources. i.e., orbit and frequency, had been occupied only by a few well developed countries until the mid of 1970's. Other countries had insisted on the equal utilization of the limited space resources. As a result of the constant demand, FSS and BSS frequencies were allotted

* Satellite Coordination Manager, Korea Telecom, Satellite Business Group

to each member of ITU depending on its size of nation and population and so on. BSS downlink was allotted at WARC-77, and BSS feederlink and FSS was at WARC-88.

However, allotted frequency has some difficulty in being utilized since the frequency band is not commonly or commercially used.

ITU allotted a common frequency band to any country who wants to establish a satellite network on the basis of "First-Come, First-Served", but subject to registration to ITU. As entering into 1980's, the global economy has grown so rapidly that service planner started to focus on the satellite network to meet a new high-tech communications services demand. The satellite network has advantage of high-tech communications services demand. The satellite network has advantage of no limitation of place, speedy re-configuration of network, wide service coverage, anti-natural disaster, etc. This phenomena resulted in incredible increase of spectrum demand and conflict for coordination. Conflict in commonly allotted frequency band has helped satellite network planners pay more attention to cooperation with other entrepreneurs becuase of difficulty in finding a spectrum.

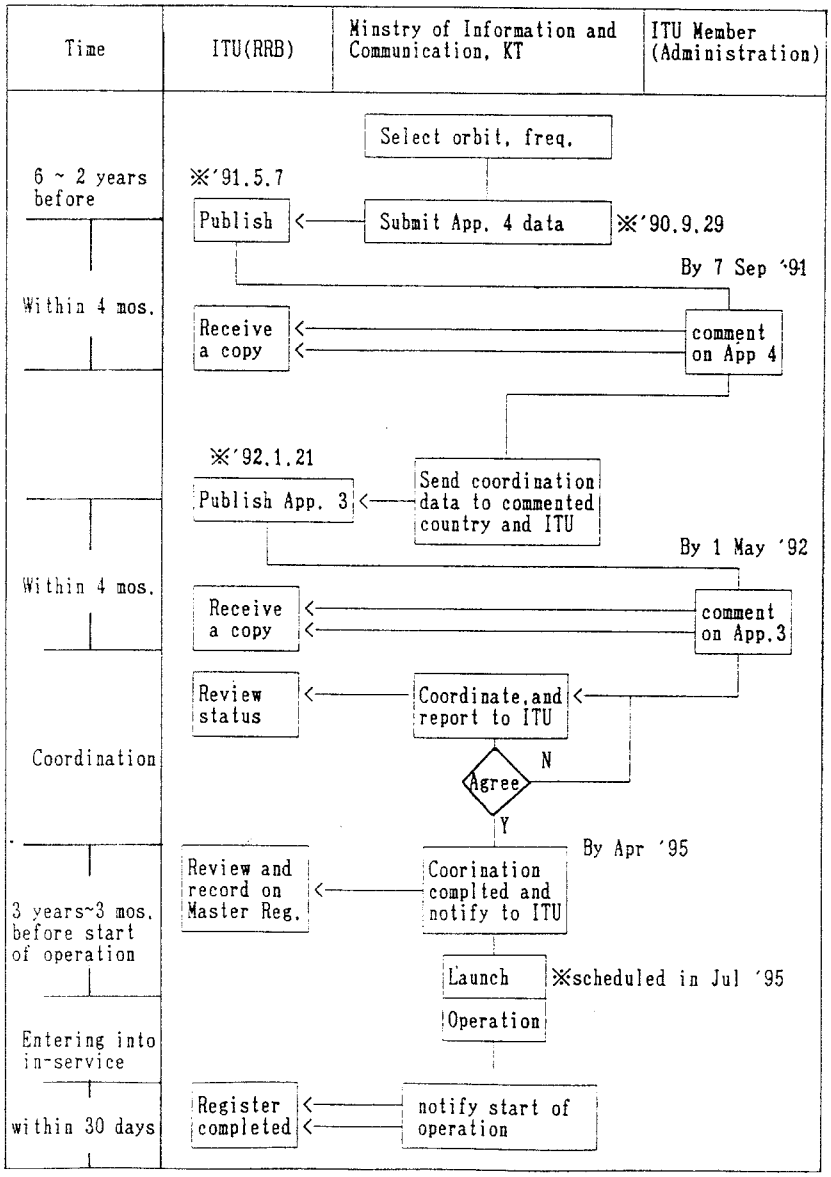
This paper review the ITU registration for Koreasat from the start of Advance Publication to the registration notification to ITU. The review includes procudure and its obligation of the RR(Radio Regulations), frequency plan and technical characteristics of Koreasat, coordination with coordination requested countries, agreement, outstanding points to be improved in the RR procedure and so on.

2. Regulations of ITU registration procedure

2.1 Necessity of ITU registration

According to the ITU Radio Regulations, when an administration wants to assign frequency to ground based station or space station, earth station

for the purpose of providing special radiocommunication services such as fixed, land broadcasting, radionavigation land, radiolocation land, standard



〈Fig. 1 ITU registration procedure as a example of Koreasat〉

station/time signal station and terrestrial observation, it should register its frequencies for the following cases.

① if the use of the frequency concerned is capable of causing harmful interference to any service of another administration ;
② if the frequency is to be used for international radiocommunication ;
③ if it is desired to obtain international recognition of the use of the frequency.

2.2 The procedure of ITU registraiton

The procedure of registration mainly consists of three phases as shown in the Figure 1.

The 1st Phase

○An administration who intends to establish a satellite network must send ITU RRB, not earlier than six years or not later than two years before the date of bring the network into service, the information listed in AP4 of the Radio Regulations.(RR No. 1042)

○ITU RRB review and publishes this information in its Weekly Circular including the name of other administrations that may be affected by intended network(RR No. 1044)

○If any administration is of the opinion that interference that may be unacceptable could be caused to its existing or planned space radiocommunication service, it should send its comments to the administration concerned and with a copy to RRB within four months after the date the Weekly Circular published.(RR No. 1047)

The 2nd Phase

○The coordination information listed in AP3 of the Radio Regulations

should be sent to the other administrations concerned, with a copy to RRB. Then RRB publishes this information in its Weekly Circular.(RR No. 1060)

○ The coordination information is considered as having been received by RRB not earlier than six months after the date of receipt of information for Advance Publication AP3.(RR No. 1058E)

– The priority is given in accordance with the receipt date of coordination information by RRB. However, the network that operated prior to publishing the information dose not be afforded any priority.(RR No. 1060B)

○ After examining the coordination information with respect to conformity with the RR, RRB publishes this information in the Weekly Circular within three months after the date of receipt.(RR No. 1078)

○ If any administration is of the opinion that interference that may be unacceptable could be caused to its existing or planned network, it should send its comments to the administration concerned and with a copy to RRB between three years and three months before a frequency assignment to be brought into use.(RR No. 1496)

The 3rd Phase

○ After completing the coordination, the administration should notify to RRB between three years and three months before a frequency assignnment to be brought into use.(RR No. 1496)

○ After examining the completion of coordination and the information's conformity with the Radio Regulations, RRB records the Frequency assignment in the Master International Frequency Resiter.

2.3 Cases not required for coordination

The cases which are not required for coordination are as following.

① when an administration proposes to notify or bring into use, within the service area of a satellite network, a typical earth station or an earth station which would not cause or suffer interference of a level greater than the typical earth station ;

② when the use of a new frequency assignment will cause, to any service of another administration, an increase in the noise temperature of any space station receiver or earth station reciver, or an increase in the equivalent satellite link noise temperature, as appropriate, calculated in accordance with the method given in RR App.29, which does not exceed the threshold value defined therein ;

③ when the interference resulting from a modification to a frequency assignment which has previously been coordinated will not exceed that value agreed during coordination ;

④ when an administation proposes to notify or bring into use a new earth station which would not cause or suffer interference of a level greater than that which would not be caused by an earth station belonging to the same satellite network and whose characteristics have been published in accordance with RR No. 1078(coordination data publication), or notified to the RR without coordination in those cases where coordination was not required ;

⑤ when, for a new frequency assignment to a receiving station, the notifying administration states that it accepts the interference resulting from the frequency assignments ;

⑥ between earth station using frequency assignments in the same direction (either Earth-to-space or space-to-Earth).

Basically above cases imply that a new frequency assignment to a station

does not require coordination if it does not cause interference into all existing of planned networks or the intended station allows any interference from other networks. This will operate as an unfavorable point for late frequency assignment.

2.4 The ITU regulations on the satellite network launched without completing coordination

According to the ITU Radio Regulations, a satellite network should be brought into service after completion of coordination and registration. However, the coordination with a satellite network that has not actual operation plan, called "paper satellite", will take a long time to be agreed mainly because the paper satellite side will not be in faith in coordination.

To avoid this problem, ITU regulates that if the coordination has not been successfully effected between networks A(Earlier date of filing of AP3 than network B) and B, the RRB will proceed in application of the record in the Master International Frequency Register on the condition that network B can be registered in the case where the earlier filing date network A is not yet put into operation(RR Nos. 1544/15560). Once network A is brought into operation, both networks will be checked for four months whether any harmful interference is reported. If any harmful interference is reported, network A can request network B to eliminate the interference that means turning the power off(ITU Rule H.40 Rev. 1, RR No. 1559).

This implies that network B can be registered in the Master International Frequency Register(MIFR) and protected against the latter planned networks before network A is put into operation. If network B does not have a concrete plan to be brought into use, it will lose its priority after specified period, 9 years including 3 year extension after its Advance Publication.

3. Koreasat frequency, slot and its service plan

3.1 Koreasat project

In early 1980's, the Korean Government made a feasibility study on a possible domestic satellite network. With further study by Electronics Telecommunications Research Institute(ETRI), it decided to implement Koreasat project as a national project and gave license to Korea Telecom as a satellite operator, a prosperous and biggest common carrier in Korea. Inside Korea Telecom, a draft master plan for the Koreasat Project was under preparation in 1989. By the direction from the government, Satellite Business Group was organized at Korea Telecom in July 1990. From thereafter, a master plan was prepared. The Satellite Business Group(SBG) of Korea Telecom is responsible for the program management and monitoring and testing of the Koreasat, which will be the first geostaionary satellite in Korea. One of the important missions of SBG is ITU registration of the satellite network.

According to the master plan, three major stages were established. At the first stage, introduction of the leased domestic satellite network using Intelsat satellite starting from late 1991. At the second stage, procurement of foreign satellite and accumulation of technical know-how through the first Koreasat program. Actually, we dispatched 30 engineers or researchers from various Korean industries, research institutes and Korea Telecom to Koreasat manufacturing company from the early stage of design to the final stage of launching the Koreasat. At the third stage, design to manufacture of the second generation Koreasat satellite will be accomplished by Korean industries.

The progress status of Koreasat project is now in the final system test phase for the spacecraft. Two Koreasat satellites will be launched in 1995 and collocated on the geostationary orbit at 116°E.

3.2 Korean industry participation and technology transfer

Throughout Koreasat project, several Korean industries and research institutes have participated in the Koreasat Program.

Goldstar Information and Communications Company participates under a subcontract with MM Astro in ① CR&T module, ② static spacecraft simulator H/W and S/W, ③ TC&R subsystem and with MMS ① in CSM/IOT ② secondary TT&C baseband subsystem, control and monitor subsystem ③ FSS channel amplifier with ALC, FSS channel amplifier with fixed gain and DBS channel amplifier.

Korean Air Aerospace Company fabricated, tested and delivered under a subcontract with MM Astro ① series 3000 rectangular box, ② six solar array panel substrates ③ secondary structure items.

Hanlla Havy Industry under a subcontract with MD manufactures four sets of the solid rocket motor nose cones for nine boost augmentation graphite epoxy motors, four sets of nine solid rocket nose cone adapters and two sets of the third stage Payload Attach Fitting(PAF).

For the low speed data transfer, facsimile and digital voice services, a team of Korean industries and MPR Teltech in Canada developed the VSAT system.

Also other Korean industries along with Alenia Spazio in Italy developed the DAMA/SCPC system which will be used for voice and data circuits.

Throughout this OJT program, Korean engineers will acquire a good knowledge and technical know-how in the field of satellite communications and manuafacture.

3.3 Background of frequency and orbital location selection for Koreasat

As a foundation to utilize minimum spectrum by ITU member assigned

at WARC-77, WARC-88 for FEE and BSS services was constructed, 17/12 GHz for BSS and 13/10GHz band for FSS were assigned to Korea shown in the table 1. However, the frequency band is not common and commercial one. We have to consider carefully about equipment reliability, technical difficulty in manufacturing and no technology transfer by doing Koreasat project for the Korean industries if we use uncommon frequency band.

classification		FSS service	BSS service
Orbital location		116.2± 10°E	110°E
Frequency	Uplink	12.75~13.25GHz	17.30~18.10GHz
	Downlink	10.70~11.45GHz	11.70~12.20GHz

〈Table 1. The Plan allotted to Korea for FSS and BSS〉

In this regard, we decided to use a common, commercial band that is 14/12GHz for FSS and 14/11 GHz for BSS as shown in the table 2.

Classification		FSS service	BSS service
Orbital location		116°E & 113°E	
Frequency	Uplink	14.00~14.50GHz	14.50~14.80GHz
	Downlink	12.25~12.75GHz	11.70~12.20GHz

〈Table 2. Revised Koreasat frequency plan〉

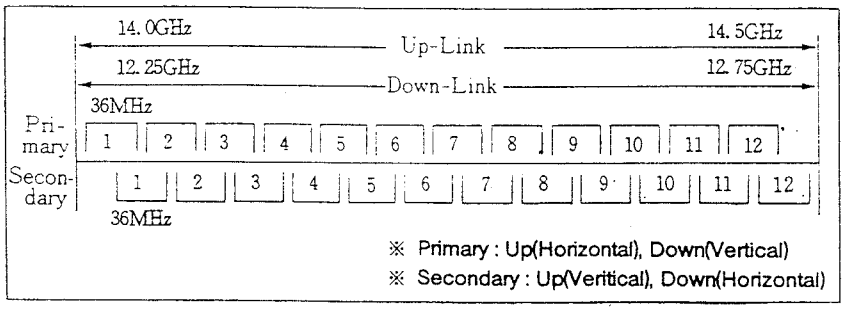
Since Koreasat, hybrid of FSS and BSS, should be put at one orbital location, at first we had filed AP4(Advance Publication) to ITU at 116°E. After publication of AP3, followed by AP4, we noticed that Koreasat was put under conflict with AsiaSat which filed the same slot at 116°E earlier than Koreasat. For future satellite slot, we had filed to ITU for another orbital location at 113°E.

3.4 Frequency plan and technical characteristics of Koreasat

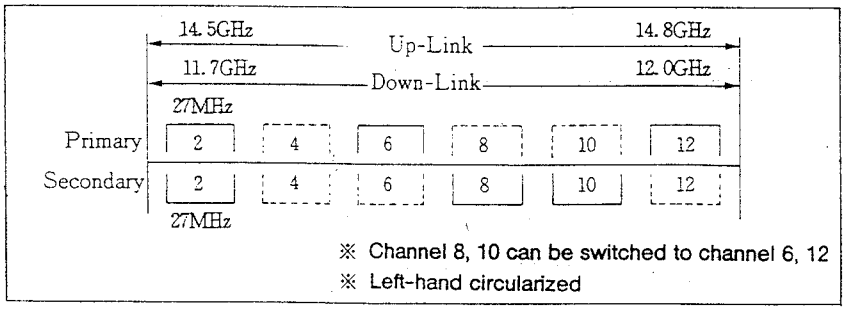
To minimize any harmful interference into existing and planned satellite

networks, we planned a middle level domestic satellite which covers only over Korean peninsula. Two satellites, one for primary, the other for back-up, with twelve 36

Transponder for FSS



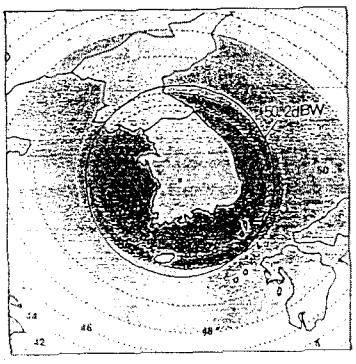
Transponder for DBS



〈Fig.2 Transponder Frequency plan of Koreasat〉

Koreasat can produce a maximum of 52.3 dBW EIRP for FSS using 14 Watt TWT and 62.4 dBW EIRP for BSS using 120 Watt TWT respectively. One Gregorian antenna for both FSS and BSS was designed. Its beam contour or beam coverage is shown in the figure 3.

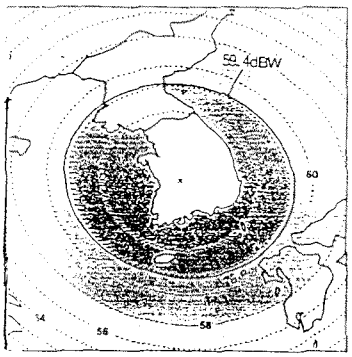
● **FSS**



EIRP : 50.2dBW(EOC)
Center of Beam : 127°30′E, 36°00′N
Shape of Beam : Circular(0.86°×0.86°)
※ EIRP(Equivalent Isostropic Radiated Power)[dBW]
Determined by multiplying the
transmitting antenna's gain by it's power.

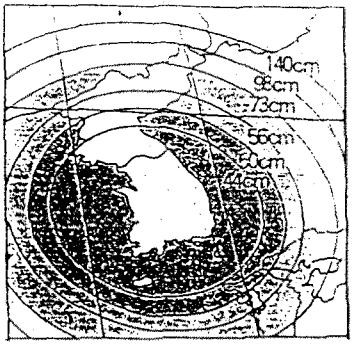
※ EOC(End of Coverage)

● **DBS**



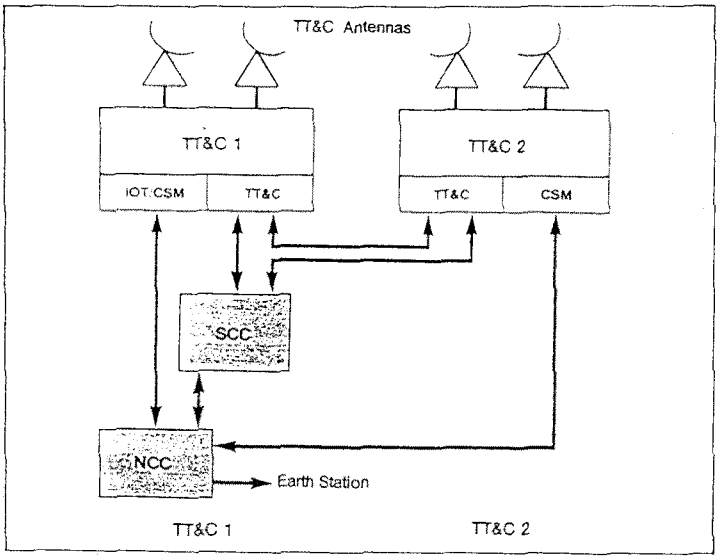
EIRP : 59.4dBW(EOC)
Center of Beam : 127°30′E, 36°00′N
Shape of Beam : Elliptical(1.06°×0.86°)

● **Diameter of Receiving Antenna for DBS**



〈Fig. 3 EIRP contour or beam coverage〉

TT&C facilities were installed in Yongin, 60 Km south of Seoul, for the primary site and in Taejeon, 180 Km south of Seoul, for the secondary site. Their layouts are shown in the figure 4. The primary TT&C earth station will exclusively support IOT/CSM and NCC functions and together with secondary TT&C earth station will support Satellite Control Center (SCC) and Communications System Monitoring(CSM).



〈Fig.4 Layouts of Koreasat Ground segment〉

3.5 Service plan of Koreasat

BSS transponders will provide DBS service and HDTV test broadcasting. FSS transponders will provide video, digital compressed CATV, main transmission line for data telephone, high speed data transmission, VSAT, DAMA-SCPC, PCM music broadcast, video conference or other new media services. A mobile telecommunications company considers to implement a national paging signal distribution network using Koreasat.

4. Proceedings of ITU registration for Koreasat and comments from other networks

For the ITU registration of the Koreasat satellite networks, we consulted with a foreign consulting company for preparation of the publication information and coordination. On 7 May 1991, Advance Publication for Koreasat FSS was made and On December 1991, Koreasat BSS publication was made.

The coordination data for FSS was published on 11 February 1992. From

thereafter, we recevied comments from five countries, more than 15 networks as shown in the table 4. It includes Japan, Hong Kong(Under name of the United Kingdom administration), the Kingdom of Tonga, Intelsat and Papua New Guinea.

Commented Country	Name of satellite network
Japan	BS, SCS, N-STAR, SJC, N-SAT
U.K(Hong Kong)	Asiasat-AK, BK, CK, D, E
Tonga	Tongasat-C/Ku-1
Intelsat	All Intelsat satellite series
Papua New Guinea	Pacstar-1, Pacstar-2

〈Table 4. List of countries and networks commented on Koreasat〉

In case of BSS, Koreasat BSS downlink frequency uses the Plan allotted to Korea and is planned to be operated under the scope of the technical parameters of it so that we did not receive any comments from existing network or the allotted BSS Plan. It is largely because of different polarization, frequency assignment and orbital location separation. So, no possible interference occurs among them. However, we effected coordination for North Korea through ITU.

The only adminsitration sent comment on Koreasat BSS downlink is the Russia who expressed concern about possible interference with its terrestrial micro wave network using same frequency band. We analyzed interference status with it and found no possiblility of interference between Koreasast BSS network and the Russian terrestrial network considering off-axis angle separation because of the high Koreasat earth station elevation angle. By exchanging several correspondences, we are soon to come to agreement.

Feederlink frequency band of Koreasat BSS is a new assignment and there is no network near Koreasat. Surely we did not receive any comments from other administration.

In late 1993, the Korean Government decided to convert analogue BSS to digital BSS plan. It wanted to diversify quantity of progam with more

channels through Koreasat BSS transponders. With one 27 MHz transponder, only one standard analogue TV program can be transmitted. By converting into digital BSS transmission, we could increase upto 4 channels with one transponder totaling 12 channels through one Koreasat.

However, in a view to ITU registration for digital BSS network, there is no available method in analyzing interference between traditional analogue BSS and a new digital BSS carriers at ITU. Even though we submitted digital BSS transmission file to ITU in late 1993, no publication has yet been made until today. At ITU-R WP 10/11S, a method has been prepared. It is currently under final review at ITU and soon to be adopted as the standard method. We expect that Koreasat digital BSS network be published in late April or early May 1995. The coordination for Koreasat digital BSS network will be proceeded after launching.

5. Development of coordination with commented administrations

The coordination with Japan, the Kingdom of Tonga, Papua New Guinea, Intelsat could be successfully completed in a mutual understanding and truthful manner either by having alternatively exchanging meetings, or by correspondence by the time of April 1994. However, there has been a bitter dispute with AsiaSat over 116°E at which Koreasat and AsiaSat had filed to ITU with the same frequency and slot.

In the early stage of the our project, the conflict was raised. Priority was accordingly afforded to AsiaSat since AsiaSat had earlier filing date than Koreasat only for the uplink 14 GHz. Coorination has been continued for more than 5 years and finally an agreement was made in February 1995.

In our experience with AsiaSat, we have learned that ITU RR No. 339, in which it says that an administration should minimize its use of spectrum just to fit its services as appropriate, did not work at all. Furthermore, RR No. 1085A, in which coordination involved sides should do their best

and in faith to compromise into agreement, is meaningless. Only priority as protected by ITU Rule H. 40 Rev. 1 could exist between both sides.

By looking at the space network list issued by ITU, we easily can find over requested spectrum list filed by one nation with same technical characteristics, only difference is orbital location. For instance, the Kingdom of Tonga located in a small southern pacific island, filed 36 locations to ITU even though they look technically different each other. After publication, they received heavy pressure from ITU members and they relinquished most of them.

Anyway they successfully completed notification for 6 slots and have been starting slot lease business in public. Even though the United States consider to put a restriction on the US based earth station's uplinking toward Tongasat, most companies who are looking for a slot still envy Tongasat. I dare say that this slot trafficking should stop to give equal chance to whoever wants to access limited space resources.

5.1 Additional coordination requirement with Intelsat as its signatory

Intelsat, an international, non-commercial organizaiton, was set up in early 1960's to provide an exclusive and efficient global satellite network under the Operations Agreement signed by all signatories who were shareholders.

Each signatory should consult with Intelast and receive an approval from the Board of Governors as specified under article 14 of the Agreement when it intends to establish a separate satellite network which may do economic harm to Intelsat revenue.

This condition was drawn with a view to limit any establishment of regional or international satellite network separate from Intelsat hoping for keeping its status as a permanent global satellite network provider. By contrast, it has allowed non-signatory to easily set up a regional or an international satellite network of which Intelsat could not fulfill various demands from the users, like regional DTH TV distribution service. Surely non-signatiory's

separate satellite network is well prepared to compete with Intelsat in some ways.

By the way, non-signatory is not required to do so as signatory does. Some times, this additional requirement will badly impact on signatory business if the important information is unveiled to its competitor.

For example, AsiaSat, a regional satellite network operator has succeeded in its business by providing Asian regional and domestic TV program transmission. It includes STAR-TV, Mongolian, Burmese, Chinese national TV. This was resulted mainly from incapability of Intelsat to suffice the capacity demand in the region at right time when they wanted.

The threshold of separate network allowed by signatory was one hunded 64KBPS equivalent telephone circuits and it has grown to 1,250 in December 1992, finally to 8,000 in March 1995. From a point of this view, not only to cope with this dynamically changing trend, but also to compete with expanding cable, it shows that Intelsat is now changing from a non-commercial, non-privatized international organization into a commercial, profit making company.

5.2 Coordination with the operating satellite before the publication of AP3

The communication infrastructure in China was not well developed to accommodate a crazy increase of communications network demand from current exploding expansion of economic growth. To meet such a demand, especially telephone circuits, the Chinese government decided to purchase an in-orbit US spacecraft owned by GTE, GTE spacenet-1 having C and Ku-band capacity in December 1992.

The Chinese government took a good advantage of one of salient features of satellite network ; speedy configuration of network and started to operate it from the mid of July 1993 in C-band. At that time, the Chinese administration had filed to ITU for 115.5°E as DFH-3-OD only for C-band and DFH-3-OD was at the status of Advance Publication. This satellite is located only 0.5° apart from Koreasat to be located at 116°E. Surely harmful interfe-

rence was expected between Koreasat and DFH-3-OD since not only both satellite was planned to use same Ku-band frequency band, but also both countries are geographically close each other.

Both sides held two round meetings to find a mutual agreeable solution. Before the meetings, the Korean administration sent letters several times to the Chinese administration and ITU expressing our concern about severe interference possibility and reminding the Radio Regulations to be abided by.

At the meetings, the Chinese administration proposed to share frequency band half by half by each side until DFH-3-OF goes out of life expected in late 1997. As for our side, that proposal was quite a difficult to accept considering our operation plan for both primary and secondary satellites. Instead of sharing planned band, we suggested technical methods, by explaining priority stated in ITU Rule of procedure H.40 Rev.1, such as the use of larger antenna in order to reduce off-axis EIRP toward Koreasat network, putting carriers in between Koreasat's unused band.

China refused our suggestion. They asserted that any country should not say priority while coordination process. That was right, however, they overlooked the RR No. 1060B in which any right will not be given to a satellite network if it was entered into operation before AP3 publication.

This matter was set aside for the time being after two round meetings, the last one was took place in April 1993 by considering many other networks to be coordinated with Koreasat before launching. We think that DFH-3-OD will not be an obstacle in registraion of Koreasat and that eventually Koreasat will be protected against it as well specified in the relevant Radio Regulations.

5.3 Limitation of technical coordination by the way of the Radio Regulations

Although each party, coordination requested or coordination requesting side, should do its best effort to compromise to agreement as specified

in the RR, a country having priority normally does not show enthusiastic attitude to concession if the agreement contains unsatisfactory contents in operating its satellite network.

Since coordination always lies in a conflict of interests, one side will take some if the other side gives some. That's why the country having priority intentionally be in a position of reluctance to yield some to the country not having priority. Here is some examples followed in the Asian region.

① Before and after launching APSTAR-1 into 131°E, the Japanese administration severely condemns the Chinese administration for putting satellite near Japanese CS-3a operating at 132°E through the press or ITU worrying possible cause of harmful interference between two networks. Nevertheless APSTAR-1 was launched into its slot at 131°E. Pressure from the Japanese side kept increasing day after day. Finally, the Chinese administration contacted Tongasat to negotiate with them to buy an orbital location that is 135°E and moved its satellite to Tongasat registered orbital location.

② AsiaSat in Hong Kong under the name of the United Kingdonm administration has filed four orbital locations at 77.5°E, 100.5°E, 116°E, 122°E and the Thailand administration at 78.5°E, 101°E, 120°E, as AsiaSat has the prior App. 3 filing date in each case of conflicted locations, 77.5−78.5°E, 100.5-101°E, 122-120°E.

The Thailand administration has claimed on the basis that it circulated its preliminary plans for the slot to ITU members ahead of AsiaSat and insisted to launch its satellite without completion of coordination before AsiaSat's launching. AsiaSat surely be afforded priority for protection according to the relevant Radio Regulations under the rule of the road in which priority goes to whoever first files successfully, this appears not to account. However, both sides have embroiled in a bitter dispute over the use of their favorite slots at 77.5-78.5°E respectively.

Thaicom was launched at 78.5°E in December 1994 and AsiaSat will launch its second satellite in late 1994 at 100.5°E. As we can see in this case, technical solution cannot be expected at all.

③ Other scrambles of a bitter dispute for orbital location are Indonesia's Palapa-Cl-the Kingdom of Tonga's Tongasat-C/Ku-2 at same slot of 134°E, China's DFH2 at 96°-India's Insat-1C at 93.5°E, Korea's Koreasat-AsiaSat at the same slot of 116°E. In case of Palapa-Tongasat, Indonesia put its satellite into orbit before Tongasat and Tonga didn't show any consession to Indonesia. Once Tonga announced that they struck a deal with the Russian authority to lease aging, in-orbit Russian satellite, Gorizont, and move it to conflicted slot, the war of words between two sides escalated rapidly from that point. Indonesia vowed to keep its satellite in place and Tonga threatened to intentionally turn its satellite's transponder on to drown out the old Palapa because Tongasat was filed earlier than Palapa.

However, in case of Koreasat-AsiaSat, we reasonably came to compromise and successfully completed the coordination in February 1995.

As we can see in the above cases, it is quite difficult process in coordinating through technical methods.

6. The coordination result of Koreasat

We successfully completed the coordination for communication network with coordination requested networks by the time of February 1995, we are preparing for notification document to be submitted to ITU by the end of April 1995.

However, for Koreasat's BSS network, conversion from analogue to digital BSS service in late 1993 and no defined interference analysis method between conventional analogue and digital networks at ITU caused publication of Koreasat digital BSS network delayed.

We have been infromed that the Koreasat BSS network will be published in late April this year. Considering Koreasat launching in July this year, we need to finish registration by April, at least three months before launching as specified by the Radio Regulations. Otherwise we need to countinue the coordination after putting the satellite on its orbital location at 166E.

In addition, we have chosen 20 locations around Korea for ITU registra-

tion as specific earth station sites to coordinate with neighboring countries' terrestrial micro wave networks and completed the coordination. We are soon to submit notification by this month. By doing this, without any coordination process but just sending notification to ITU, we can easily enter into operation fo any earth station within in Korea in the future.

7. Next generation of Koreasat

With relatively small size of land and a well developed terrestrial infrastructure of communication networks in Korea, we are under consideration of joint regional satellite business for further development by a consortium with neighboring countries.

The problem we are confronted with may be how we acquire the orbit and frequency without difficulty of coordination. We can resolve this problem by joint business with interested countries neighbored.

8. Conclusion and Recommendation

Successful coordination among satellite networks is becoming more difficult. Therefore, early coordination plan is desired.

Also it is important to utilize limited space resources equally among ITU members. Even though it look ideal that spectrum could be assigned to the countries proportionally to their economic capacity, population, land size and so on we cannot underestimate the principle, "First-come, First-served", which was agreed by all ITU members.

This principle makes sense when we have a concrete plan and minimize the use of spectrum just to fit its service requirement as stated in the RR No. 339, but the current increase of false demand for spectrum by some countries is quite more than what they needed and resulted in a huge inflow of application for orbit requests into ITU.

This kind of trend has encouraged ITU members not to observe the specification of the RR without any feeling of shamefulness or guilt and

urged them to submit a bunch of document to ITU consequently producing more paper satellites.

For these false satellite networks, more longer time and valueless effort are required for coordination. They are quite burdensome to a member who plans to establish a real satellite network. This king of problem will cause early occupation of slots by real or false satellite networks and eventually will exhaust space resources rapidly.

For a possible solution to prevent the advent of paper satellites, we have to consider seriously putting penalty on whoever does not launch planned satellite within four to five years after Advance Publication. If failed to do so, we can restrict it from applying for spectrum for some specific period. However, any country who cannot enter into in-service with an unavoidable situation could be excused two or three times only by an investigation commission but subject to penalty after that.

For another possible solution, I would like to propose to put penalty on any country who does not utilize their registered slots for their own networks as intended.