

CONSULTATION PAPER ON FREQUENCY LAYOUT PLAN OF IN-BUILDING COAXIAL CABLE DISTRIBUTION SYSTEMS

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INTRODUCTION

As a result of the 1998 Review of Television Policy, the Secretary for Information Technology and Broadcasting announced Government's decision in December 1998 to further open up the television broadcasting market in Hong Kong. The review has also identified that one of the hurdles in further opening up of the market is the limited capacity of the in-building distribution systems in highrise residential buildings. To address this problem, the Government undertook to formulate an optimal frequency layout plan and draw up technical specifications on the standards of distribution for consultation with the industry. Having conducted an internal study on a frequency rationalization plan for in-building cable distribution systems and the technical standards for the distribution system and associated set-top boxes, this consultation paper seeks views and comments from the industry before the Telecommunications Authority (TA) finalizes these technical standards to facilitate the introduction of new television services.

2. The TA welcomes views and comments on any issues raised in this Consultation Paper and in particular the points listed in paragraph 58 below. All views and comments should be sent to the Office of the Telecommunications Authority by 30 April 1999 via:

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Wu Chung House,
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3. The TA reserves the right to make public all, or parts, of any submissions made in response to this Consultation Paper.

CURRENT SITUATION

4. At present, Television Broadcasts Limited (TVB) and Asia Television Limited (ATV) provide four terrestrial television programme channels. Hong Kong Cable Television Limited (HKCTV) uses 36 frequency channels for providing cable television (CTV) services, five of which are assigned for temporary use until 24 April 1999. Hong Kong Telecom VOD Limited (HKTVOOD) provides video-on-demand (VOD)

programme services through the Fixed Telecommunications Network operated by Hong Kong Telecommunications Limited. There are also a number of free satellite television signals which are relayed to the viewers by Satellite Master Antenna Television (SMATV) systems. In addition, there are security video signals conveyed to the viewers through closed circuit television (CCTV) systems. Except for the VOD service which is distributed by twisted copper wires, all other television services and signals are distributed by coaxial cable systems in residential premises. These may include communal aerial broadcast distribution (CABD) systems, SMATV systems, CCTV systems, CTV system or any combination of these systems. Such coaxial cable systems are commonly referred to as "In-building Coaxial Cable Distribution System (IBCCDS)". A typical configuration of an IBCCDS is given in Annex 1.

Communal Aerial Broadcast Distribution (CABD) System

5. At present, the four terrestrial television channels are transmitted in the frequency band of 470 - 790 MHz. To avoid signal interference, different terrestrial television transposers use different groups of transmitting frequencies. The frequencies employed for transmitting the four terrestrial channels are detailed in Annex 2. Within a CABD system, it is common to distribute terrestrial television programmes at the same frequencies as they are received off-air. However, if the CABD system operates in close proximity to a transposer, off-air signal levels will be high (say, over 90 dB μ V/m) and interference may be experienced due to direct pick-up of this strong off-air signal by the CABD system and

receivers. Under this condition, the reception frequencies are normally translated to different distribution frequencies to avoid interference. Therefore at present a common territory-wide frequency plan for distribution of terrestrial television programmes in the CABD does not exist. Under section 8(4)(e) of the Telecommunication Ordinance (Chapter 106), CABD systems are exempt from licensing. As there is no statutory requirement for CABD operators to report information about the CABD systems to the TA, the TA does not have a central record of the frequency channels used by the CABD systems. It is estimated that there are about 5,000 CABD systems in Hong Kong.

Closed Circuit Television (CCTV) System

6. CCTV system is used for internal information and security communication purposes. Usually, a CCTV system is combined with the CABD system in the same building and occupies one channel within the frequency range of 470 - 750 MHz. Under section 8(4)(f) of the Telecommunication Ordinance (Chapter 106), CCTV systems are exempt from licensing. Again there is no central record of the frequency channels that are used by CCTV systems. It is estimated that there are over 5,000 CCTV systems in Hong Kong.

Satellite Master Antenna Television (SMATV) System

7. SMATV systems are subject to licensing under the Telecommunication Ordinance (Chapter 106). Most SMATV systems distribute 4 - 5 satellite television channels but some may distribute more than 15 channels. Some statistics of the number of satellite television channels carried by SMATV systems are provided at **Annex 3**. The distribution frequencies of SMATV systems are within 470 - 750 MHz. SMATV operators are required to submit frequency transmission plans of their SMATV systems to the TA for approval. Usually, a SMATV system is combined with the CABD system and the CCTV system in the same building for distribution of satellite television, terrestrial television and CCTV signals. The formats of satellite television signals may be PAL or NTSC which occupy a bandwidth of 8 MHz and 6 MHz respectively. In the IBCCDS, both 8 MHz channel plan and mixed 8 MHz and 6 MHz channel plan are used to distribute the signals. For SMATV systems which carry only a few free satellite television programmes, alternate channels in the 470 - 750 MHz band are used to avoid adjacent channel interference. For SMATV systems which carry a large number of satellite television programmes, sharp filters are installed so that adjacent channels can be used. As at February 1999, there were 1,644 SMATV systems connecting to 548,557 households in Hong Kong.

Cable Television (CTV) System

8. At present, there is only one cable TV operator in Hong Kong, namely Hong Kong Cable Television Limited (HKCTV) (formerly known as Wharf Cable Limited). HKCTV has built a hybrid fibre-coaxial cable (HFC) network and a microwave multi-point distribution system (MMDS). Both networks use coaxial cable for in-building distribution. The operating frequency range of the coaxial cable is up to 750 MHz. Currently HKCTV uses 36 frequency channels, five of which are assigned for temporary use until 24 April 1999, over the HFC network and 20 frequency channels over the MMDS-coaxial cable network. Subscribers connected to the HFC network can receive up to 36 channels (5 channels are temporary) whereas those connected to the MMDS can receive only 20 channels. The MMDS frequencies currently assigned to HKCTV are for temporary use only and they have to be surrendered by 31 May 2001. As at the end of January 1999, HKCTV's HFC network and MMDS passed about 640,000 and 968,000 homes respectively. The frequency ranges of the upstream data channel, downstream data channel and programme channels of the CTV system are in the frequency bands 8.3 - 10.4 MHz, 53.275 - 53.425 MHz and 54 - 462 MHz respectively. Under section 18(4)(aa) of the Television Ordinance (Chapter 52), the transmission plan of CTV system is subject to TA's approval.

9. CTV system is usually interconnected with the SMATV/CABD systems in the same building to enable the subscribers to receive CTV, SMATV, terrestrial television and CCTV signals via the existing single drop cable. The channel numbers 1, 2, 3 and 4 as

displayed on the CTV set-top boxes are reserved for the four terrestrial television channels while the channel numbers 5 - 24 and 76 - 95 are assigned to CTV channels.

Cable Telephony

10. The frequency ranges of 21 - 25 MHz and 462 - 466 MHz have been assigned to New T & T Hong Kong Limited (New T&T) for the upstream and downstream signals respectively for its telephony service.

RF Outputs of VCRs and Set-Top Boxes

11. Currently, three channels in 766 - 790 MHz are assigned for the radio frequency (RF) outputs of CTV set-top boxes. Only one channel is required and most CTV set-top boxes are set to channel E 59 (774 - 782 MHz) with the remaining set to channel E 58 (766 - 774 MHz) or channel E 60 (782 - 790 MHz). Two channels in 470 - 750 MHz are assigned for RF outputs of video cassette recorders (VCRs) and set-top boxes for VOD service. The preset RF output channels of VCRs are usually in E 35 (582 - 590 MHz) to E 38 (606 - 614 MHz). The RF output channel of set-top boxes for VOD service is not fixed.

Prohibited Frequency Ranges

..... 12. There are 10 frequency channels (**Annex 4A**) in the 54 - 470 MHz band which overlap with some essential services (e.g. aeronautical radio-navigation for air traffic control, emergency position indicating radio beacon for search and rescue purpose in case of distress). The use of these 10 frequency channels will generate unacceptable interference which may affect the normal operation of the essential services and therefore are prohibited for use.

Existing Frequency Allocation Plan and Spare Channels

..... 13. The existing frequency allocation plan for IBCCDSs is given in **Annexes 4A and 4B**. Some typical examples of the frequency plans used in SMATV/CABD systems operating in 470 - 750 MHz are given in **Annexes 5A, 5B and 5C**. Most systems employ a channel width of 8 MHz. However, some SMATV systems (about 150 systems) employ a mixture of 6 MHz and 8 MHz channel widths for distribution of satellite television programmes. This is because certain satellite television programmes which are broadcast in 6 MHz channels are relayed directly to the distribution network without any conversion. An example of these systems is given in **Annex 6**.

14. To avoid adjacent channel interference, most of the IBCCDSs adopt an alternate channel plan in the UHF band. Only a few SMATV systems use an adjacent channel plan and have installed filters at the

headend to reduce the interference. In the VHF band, the main user is HKCTV and it uses adjacent channel plan with filters at the headend as well as the receiving end (Set-top Box).

Spare Channels in the VHF (54 - 470 MHz) Band

15. There are 52 channels with 8MHz bandwidth available in the VHF band. 31 channels have been allocated to HKCTV with another 5 channels for temporary use. 10 channels are reserved to protect essential services (Annex 4A). One channel has been assigned for telecommunications services and a block of 4 MHz of the channel has been allocated to New T&T for telephone services. There are only 5 channels left. Two of the 5 channels (166-174MHz and 278-286MHz) fall in the paging services frequency blocks. Interference is high and these two channels are therefore not usable for other purposes. One of the 5 channel (78-86MHz) suffers strong signals from mobile radio systems and is also not usable. The number of channels available in the VHF band to meet new demand is therefore 7 (5 temporary channels and 2 spare channels).

Spare Channels in the UHF (470 - 790 MHz or 862 MHz) Band

16. There are 35 and 49 channels of 8 MHz bandwidth in the 470 - 750MHz and 470-862MHz bands respectively. In general 4 channels are required for terrestrial television services, one channel for CCTV, one channel for radio frequency (RF) output of VCR, one channel for RF

output of set-top box of HKCTV and about 10 channels (95.75% of the SMATV systems install 10 channels or less) for SMATV services. If adjacent channels are not used, there is only one spare channel available in 470 - 750 MHz systems and a maximum of only 7 spare channels in 470 - 862 MHz systems. If adjacent channels are used, a maximum of 19 and 32 spare channels are available in 470 - 750 MHz systems and 470 - 862 MHz systems respectively.

NEW SERVICES

17. On completion of the 1998 Television Policy Review, the Government has announced its policy decision, inter alia, to open up the television market for free competition. Companies which are interested in establishing new television services, whether on a free or subscription basis, can apply for relevant licences under the liberalized regulatory regime subject to the physical constraints of available spectrum.

Broadcasting-Satellite Services (BSS)

18. In November 1997, the International Telecommunication Union (ITU) allocated to Hong Kong 4 Ku-band channels for the provision of BSS. Preparatory work for the licensing of BSS is underway and the Government intends to invite applications for the use of these four channels in late 1999.

Digital Terrestrial Television (DTT)

19. The technical trials on DTT will be conducted with the two terrestrial television broadcasters in 1999. On successful completion of the trials, simulcast of analogue and digital terrestrial television could commence in 2001.

Telecommunications Services

20. In an emerging multi-media and technologically convergent environment, there will be increasing demand for delivering telecommunications services such as fast Internet and cable modem services to consumers through IBCCDSs.

PROBLEMS

21. There is a growing demand for frequency spectrum in IBCCDS to meet the need of conveying new television and telecommunications services as mentioned above as well as the increasing number of channels of the existing CTV service and SMATV service.

22. However, the frequency channel capacity inside the IBCCDS is limited. The last horizontal drop cable which is the only coaxial cable access point to individual residential premises will remain a bottleneck for the introduction of new services. The installation of a second horizontal

drop cable is difficult in practice in most existing buildings in Hong Kong. The TA considers that the frequency spectrum within IBCCDS is a limited resource and is a public property. There is therefore a need to properly regulate and allocate the frequency channels in IBCCDS to enable maximum efficiency in the use of these systems.

23. Although vacant channels are currently available in the existing IBCCDS, the number and frequency ranges of these channels vary for different IBCCDS as these depend on the reception frequencies of terrestrial television channels as well as the distribution frequencies of satellite television programmes and CCTV signals. Service providers will find it difficult to plan their new services if there is no central record of the frequency channels used in the IBCCDS in Hong Kong.

PROPOSALS

24. If there is no requirement for new television services in an existing building, congestion in the IBCCDS will not happen. Therefore it is proposed that the following requirements need not apply to those buildings where the residents do not wish to have new television services to be carried in their IBCCDSs. However residents wishing to increase the capacity or use the spare capacity of their IBCCDS to receive the new television or telecommunications services should follow the arrangements as described in the following paragraphs: -

Channel Plan

25. To facilitate the allocation of frequency spectrum in the IBCCDSs, it is proposed that a channel plan specifying the channel numbers and the frequency ranges of each channel should be formulated. The following approach is recommended.

(a) VHF (54 - 470 MHz)

.....
The current channel numbering and frequency ranges as given in Annex 4A are compatible with the design of set-top boxes. It is proposed that no change should be made. The proposed channel plan for the VHF band is given in Annex 7A. It is also proposed that the 7 spare channels mentioned in paragraph 15 should be made available for allocation by the TA to services employing digital or other advanced spectrum efficient technology.
.....

(b) UHF (470 - 862 MHz)

There are two options for the channel plans for the UHF spectrum. Option 1 is to designate a fixed bandwidth of 8 MHz to all the channels. The lower and upper frequency ranges of each channel will then be fixed. Existing signals distributed in the 6 MHz NTSC format will be required to stay within the 8 MHz slot and their vision carriers will be aligned with those of the 8 MHz plan. This option enables the use of a common channel plan for all IBCCDSs in Hong Kong. The harmonics generated will also spread evenly over the

UHF band. However, some of the SMATV systems now using a mixture of 6 MHz and 8 MHz channel plans may be required to rearrange their channels. The cost involved should be under HK\$10,000 per channel per system. Option 2 is to allow the co-existence of a mixture of 6 MHz and 8 MHz channel widths. This means existing SMATV systems using a mixture of 6 MHz and 8 MHz channel widths will not be required to rearrange their channels. However, a main drawback of this option is that common channel plan for all IBCCDSs is not possible and the harmonics will fall unevenly across the UHF band causing interference. The consequence is fewer channels will eventually be available. Therefore it is proposed that Option 1 should be adopted. The proposed channel plan is set out in **Annex 7B**. Similarly, it is proposed that the spare channels should be allocated by the TA to licensed service providers employing spectrum efficient technologies.

Digital Environment

26. The above channel plan employing a bandwidth of 8MHz is compatible with the digital channeling requirements. Each 8MHz block will be further sub-divided into 6 or more digital channels depending on usage and compression ratio. Digital channels will be allocated to licensed service operators in whole or part of the 8MHz block. This plan

may be reviewed as necessary, particularly when digital terrestrial television has been introduced.

Fixed Channel Plan Employing Adjacent Channels

27. In order to facilitate the easy planning of introducing new services, it will be useful if the same frequency channel is used in each IBCCDS to distribute the same television programme in the whole territory (i.e. a frequency channel is used to distribute a particular television programme in individual IBCCDS). Two options exist to achieve this. Option 1 is to use Channels E21, E23, E25 and E27 for TVB and ATV (Annex 12C). This avoids excessive translation of frequencies; but for those buildings served by Temple Hill transmitter with strong off-air signals, alternative channels will be required. Option 2 is to translate all existing off-air channels to a uniform pattern, for example E31, E32, E33 and E34 (Annex 12D). The exact channel plan will be specified by the TA having consulted the industry. In addition, in order to have the maximum numbers of channels available in an IBCCDS, it is proposed that all the adjacent channels should be used. IBCCDS not conforming to this plan will have to be modified. Some old television receivers may suffer from adjacent channel interference. Set-top should be employed to overcome this problem.

Channel Numbers as Displayed on Set-Top Boxes

28. In most set-top boxes it is possible to set a channel number to a programme service which is independent of the frequency channel the service is being transmitted on. It would be more user friendly if the channel numbers as displayed on set-top boxes could also be made uniform everywhere in Hong Kong. Accordingly, views and comments are sought on whether this is necessary. Viewers normally set their terrestrial television channels to channels 1 to 4 on their television sets. To make it easier for the viewers, it is also proposed that the present arrangement of reserving channel numbers 1 to 4 on set-top boxes for the terrestrial television channels should continue.

Proposed Principles for Frequency Allocation

29. In order to achieve efficient use of frequency spectrum, digital technique and other advanced technologies which can increase the channel capacity of the IBCCDS must be adopted for any new services.

Priority

30. Given the congestion in the drop cable it is proposed that the frequency spectrum in the IBCCDS should be assigned according to a priority system, as proposed below:-

(a) Safeguarding existing services

All existing services shall be safeguarded and shall continue to be distributed by IBCCDS.

(b) Domestic Services over non-Domestic Services

Domestic Services not only provide entertainment, they also offer means of communicating essential public information such as typhoons and rainstorms.

(c) Territory-Wide Services over Localized Services

Territory-wide services which serve the wider community and a greater number of viewers should have priority over localized services.

Fair Competition

31. To ensure fair competition, a minimum set of channels should be allocated to each licensed service operator as far as practicable. Additional channels will be allocated on the basis of proven demand.

Proposed Priorities for Distribution in IBCCDS

32. In accordance with the principles set out in paragraph 30, it is proposed that the following arrangements should be adopted: -

- (a) all existing services including the four terrestrial channels, 31 CTV channels, one CCTV channel, one VCR RF output channel, one VOD RF output channel, one set-top box RF output channel should continue to be distributed;
- (b) all licensed satellite television channels which are already in service (at present four channels of STAR TV) should continue to be distributed;
- (c) up to 10 channels in the 470 - 862 MHz band should be reserved for services as decided by the residents of a building, such as for distributing free television programmes of their choice including terrestrial and satellite services, or other localized services; and
- (d) the rest of the spare channels mentioned in paragraphs 15 and 16 to be allocated to licensed services employing digital or other spectrally efficient technology.

Database for In-Building Coaxial Cable Distribution Systems

33. It is proposed that all licensed service operators should submit the channel plans of their IBCCDSs for TA's approval. Service operators should also seek the TA's approval for any subsequent changes to their channel plans. With the availability of this information, OFTA will be able to compile a database for all IBCCDSs. It is proposed that this database should be published for public access in order to facilitate system planning by service providers. An example of the data to be published is given in **Annex 8**. The TA will also encourage the owners of the CABD and CCTV systems to provide OFTA with their channel plans and any subsequent changes.

To Increase Channel Capacity

34. There are several methods to increase the channel capacity of IBCCDSs. These are explained in the following paragraphs:-

Frequencies Prohibited for Use

35. As explained in paragraph 12 above there are 10 channels falling in the frequency blocks which are prohibited for use. OFTA will carry out further studies to find out whether some of these restrictions may be relaxed.

Digital Compression Technology

36. By employing digital compression technology, one analogue television channel can be used to deliver several digital television programme services. The technology is already available in the market. To promote the efficient use of the limited frequency spectrum, it is proposed that service operators should be required to adopt this technology for introducing any new services. It is also proposed that a compression ratio of 6 or more should be employed .

Extend the Upper Operating Frequency

37. Most of the existing IBCCDSs are designed to operate up to 750 MHz. Accordingly, the maximum number of 8 MHz channels available in 54 - 750 MHz is limited to 87. By extending the upper operating frequency of the systems to 862 MHz or 1 GHz, the numbers of channels of the IBCCDSs could be increased to 101 and 118 respectively. The following considerations should be taken into account in deciding whether IBCCDSs should be upgraded to 862 MHz or 1 GHz: -

- (a) to avoid interference to the aeronautical radio-navigation service operating in 960 - 1215 MHz, the upper operating frequency should not exceed 960 MHz;
- (b) there are 26 channels in 750 - 960 MHz of which 11 channels overlap with the transmitting frequency ranges of the base

stations of the Trunked Mobile Radio System, Public Paging Services and Public Mobile Radiotelephone Service (Annex 9). These 11 channels might suffer interference, especially when the IBCCDSs are close to the base transmitter stations. Better shielding is required for these systems. Similarly there are 14 channels in 750 - 862 MHz where 2 channels overlap with other licensed transmitting frequencies. Again extra shielding will be required if these 2 channels are to be used;

- (c) set-top boxes are required to receive the channels in 862 - 960 MHz as most television sets are equipped with tuners operating up to 862 MHz only; and
- (d) for a typical 30-metre drop cable, the cable losses at 600 MHz, 800 MHz and 1 GHz are about 4.6 dB, 5.4 dB and 6.0 dB respectively. The cable loss at 1 GHz is not significantly greater than that at 600 MHz and such loss should not significantly degrade the quality of signals. However, very old drop cables may cause high attenuation to signals above 750 MHz and the quality of signals may be significantly degraded. These drop cables may need to be replaced if the IBCCDSs are upgraded to operate beyond 750 MHz.

38. In the light of the foregoing considerations, it is considered that there is not a lot of benefits to be gained by upgrading IBCCDSs to 1 GHz. On the other hand, upgrading to 862 MHz is possible and relatively

easy to implement. The proposed central allocation plan therefore has an upper limit at 862 MHz for the time being.

39. Licensed operators willing to upgrade the IBCCDSs to operate beyond 862 MHz are encouraged to do so. The additional frequency channels above 862MHz will be allocated by the TA only to licensed services employing digital or spectrally efficient technology.

Intermediate Frequency (IF) Distribution Method for Satellite Signals

40. In existing SMATV systems, satellite signals are normally demodulated to the base band at the rooftops and then re-modulated again for distribution in 470 - 750 MHz. Television sets tune into the satellite signals in the same way as they tune into terrestrial television signals. In an IF distribution system, satellite signals are translated to intermediate frequency in 950 - 2150 MHz with a typical bandwidth of 40 MHz. These signals are then distributed by the IBCCDS to outlet points. Each user has to install an integrated receiver decoder (IRD) (or commonly known as satellite receiver) in their premises to receive the satellite television signals. The output signals of the IRD can be connected to the video or RF input of a television receiver. IF distribution method has been used elsewhere for several years and comprehensive products for IF distribution are available in the market, though they are mostly designed for small distribution systems covering short distance. More sophisticated design with good installation and maintenance are required for large scale distribution

systems.

41. Additional expenditure will be required for this option. For example, the cost of installing a new IF distribution system (excluding the satellite dish and receiving equipment) for a building with 30 storeys with 8 flats per storey is about HK\$100,000. The cost per flat is about HK\$420. In addition, each subscriber will need an IRD which costs around HK\$2,000 plus depending on functionality and features.

42. If IF distribution method is used, there is a need to prevent interference caused to essential services. The concerned frequency ranges of 960 -1215 MHz (aeronautical radio-navigation), 1300 -1350 MHz (aeronautical radio-navigation) and 1400 - 1427 MHz (earth exploration-satellite, radio astronomy and space research) which overlap with the intermediate frequency range need to be protected. In addition, the frequency range of 1452 - 1492 MHz should be reserved for distributing digital audio broadcast signals. The remaining spectrum in the range of 1215 - 2150 MHz can provide about 20 channels with 40 MHz channel bandwidth. With digital transmission, more than 100 channels of standard television quality could be distributed. This will greatly increase the available channels for new services.

43. Service providers or SMATV operators willing to install IF distribution systems are encouraged to do so. They should bear all the cost for upgrading the cable distribution network and the following conditions should apply: -

- (a) the IF distribution method should be used for distributing satellite television or radio signals only;
- (b) the use of IF distribution method should not affect the transmission and access of signals below 862 MHz including the upstream signals; and
- (c) the satellite receiver for decoding the television signals should satisfy the requirements as stated in paragraphs 52 to 56.

Parallel Distribution Network

44. The capacity of an IBCCDS can be increased by installing multiple vertical coaxial cables in parallel with existing ones. A remote controlled switch will be required to enable individual user to select which vertical cable the final drop cable is connected to. A typical configuration of a parallel distribution network (PDN) is shown in **Annex 10**. This is a complicated option and the following constraints exist: -

- (a) there are practical and technical constraints, such as space for the installation of remote controlled switch, power supply for the switch, distribution amplifiers, ownership, maintenance responsibility, which have to be overcome ;
- (b) there are limited equipment suppliers for the remote

controlled switches and consumers need to install individual remote controllers;

- (c) the switches available in the market are normally directional and do not support upstream signaling;
- (d) simultaneous reception and recording of services distributed by different vertical cables are not possible; and
- (e) the cost of installation is quite high. A typical installation for a 30-storey building with 8 flats per storey costs HK\$240,000. Cost per flat will be around HK\$1,000.

45. Despite the above constraints, licensed operators willing to adopt this method to increase channel capacity should be encouraged to do so. This method can also be adopted if some residents of a building wish to receive new services while others wish to remain on the old system only. The following conditions should apply: -

- (a) after the installation of a new parallel distribution cable network a viewer should still have access to all the television signals of the original network;
- (b) some basic channels, such as the four existing terrestrial television channels and possibly other future channels designated as basic channels by the Government, must be

carried in all the vertical cable networks to enable recording and separate viewing of these channels ; and

- (c) operators should provide a technical means to ensure that all types of upstream signals will not be affected regardless of which vertical cable network a viewer selects.

Frequency Spectrum for Upstream Signals

46. At present, a total bandwidth of 6.1 MHz in 5 - 50 MHz is used by cable television and cable telephony services (**Annex 4A**). It is proposed that the whole frequency spectrum in this band i.e. 5 - 50 MHz should be allocated by the TA for upstream signals of pay television and telecommunications services on a need basis. A licensed operator will be allocated a minimum but sufficient block of spectrum to meet the need of the service initially. Additional allocation to the operator will be made based on proven demand.

Frequency Spectrum for Downstream Signals of Telecommunications Services

47. In addition to the possible allocation of some of the 8MHz channels for telecommunication services, to fully utilize the frequency spectrum of the IBCCDSs, it is proposed that some of the vacant frequency

bands with bandwidths less than 8 MHz in 54 - 470 MHz should be allocated for downstream signals of telecommunications services as shown in **Annex 11**. A licensed operator will be allocated a minimum but sufficient block of spectrum to meet the need of the service initially. Additional allocation to the operator will be made based on proven demand.

Proposed Frequency Allocation Plan

48. As described in paragraph 27, the proposed fixed channel plan with the use of adjacent channels for television programmes and telecommunications services to be distributed in the IBCCDSs is specified in **Annexes 12A, 12B, 12C and 12D**. In order to leave more channels for carriage of telecommunications services and television programmes, it is proposed that the current plan (see paragraph 11) of using 3 channels for RF outputs of set-top boxes should remain unchanged.

49. In order to minimize uneven harmonic signals caused by the distribution of mixed 6 MHz and 8 MHz television signals in the IBCCDSs, it is proposed that the vision carrier frequencies of all 6 MHz television signals should be aligned with those of the 8 MHz channel plan.

SUMMARY OF PROPOSALS FOR IBCCDSs

50. The following is a summary of the proposals:

- (a) to adopt a 8MHz channel plan with the use of all the adjacent channels (**Annex 7**) ;
- (b) to adopt a fixed channel plan as specified by the TA for distributing different television programmes and telecommunications services (**Annexes 12A, 12B, 12C and 12D**);
- (c) a compression ratio of 6 or more should be used in digital transmission;
- (d) 862 MHz to be adopted as the minimum upper operating frequency of IBCCDS for new systems or systems to be upgraded;
- (e) the use of all the channels of an IBCCDS for new services is to be specified by the TA;
- (f) subject to the requirements set out in paragraph 43, IF distribution may be used for carrying satellite television programmes; and
- (g) subject to the requirements set out in paragraph 45, parallel distribution cable network may be used.

IMPLEMENTATION

51. The following implementation approach is proposed:-

- (a) For buildings where the residents do not wish to have new television programmes or telecommunications services to be distributed by the IBCCDS, the IBCCDS may remain unchanged and upgrading work is unnecessary.

- (b) For buildings where owners want to receive new television programmes by using the IBCCDS, upgrading would only be necessary when the capacity of the IBCCDS is full. This avoids excessive expenditure at the initial stage. However, when upgrading of the IBCCDS is necessary, the requirements set out in paragraph 50 should be followed. Alternatively, a new vertical cable may be installed to carry the new services to serve those owners who wish to have new services and the conditions set out in paragraph 45 apply. As regards the cost for the upgrading work, subject to commercial agreement, it may be paid wholly by or shared among the Owners Incorporations, the licensed television service providers, the licensed telecommunications service providers and the parties concerned who wish to distribute the services to the building.

BASIC REQUIREMENTS FOR SET-TOP BOXES

52. The TA considers that it would be desirable to have a universal standard for set top boxes so that a single set-top box could be used to distribute all the television and telecommunications services.

However, this is not entirely possible at this stage for the following reasons : -

- (a) the digital transmission and compression ratios used by different operators may be different;
- (b) the service offerings of each operator may not be the same;
and
- (c) the conditional access systems used by each operator may be different.

53. Despite the above constraints, the TA considers that it is desirable to introduce the following basic requirements on set-top boxes to ensure fair competition and free access of services as well as to facilitate interconnection of set-top boxes and other equipment of the consumers: -

- (a) set-top boxes should not distort, restrict or prevent competition in broadcasting or telecommunications services. The set-top boxes should not lead to consumer choice being unreasonably constrained, whether in relation to consumer equipment, the range of services available via that equipment or the packaging of those services;
- (b) set-top boxes should be equipped with by-pass outputs so that signals within the frequency range 50 - 862 MHz can by-pass the set-top boxes with minimum attenuation. The noise introduced by the set-top boxes should be as low as possible and should be less than 5 dB;

- (c) set-top boxes should be capable of operating on adjacent channels so that they will be compatible with the channel plan as proposed in paragraph 27;
- (d) set-top boxes should be tunable in the range of 54 -862 MHz;
- (e) set-top boxes should be equipped with audio/video (A/V) outputs to simplify the connection with the television set and other audiovisual equipment;
- (f) the above requirements should apply to all new set-top boxes except:
 - (i) the set-top boxes for digital terrestrial television services (additional requirements may be determined later); and
 - (ii) the set-top boxes that are in use by existing licensees.

Supply of Set-top Boxes

54. A set-top box normally provides two main kinds of functions namely security functions and non-security functions. Security functions refer to the encryption of signals and conditional access to the services and are for the purpose of controlling the access of the services by valid subscribers only. There is currently no common standard for the

security functions but it is likely that some common standards may emerge in the near future. Non-security functions refer to functions for the normal reception of television programmes such as tuning capability, channel setting, audio and video outputs, etc. The existing set-top boxes used by the HKCTV mixed the security functions with the non-security functions hence it is not possible for other manufacturers to produce the set-top boxes due to the proprietary nature of the security functions. When a licensed pay television service operator adopts this kind of set-top boxes, the users will have no choice of set-top boxes when they subscribe to the pay television service. The licensed pay television service operator will be the only supply source of set-top boxes. If the two kinds of functions can be separated, it will permit various manufacturers to produce competitive set-top boxes with the non-security functions to meet the market need. The set-top box may have a plug-in slot for the security functions. The security functions can be built in the form of plug-in cards or smart cards so that it can be inserted into a set-top box. This approach will benefit the users as they can have a choice of set-top boxes. This will also allow different service suppliers to use the same set-top box but simply giving users different smart cards as plug-in. In order to facilitate the emergence of a competitive marketplace for set-top boxes, it is proposed that:-

- (a) service providers should separate security functions from non-security functions;
- (b) service providers should provide, upon request, technical information concerning interface parameters that are needed to

permit set-top boxes to operate with their systems and that consumers should have the right to attach any compatible set-top box to a service provider's system;

- (c) service providers are prohibited from taking actions which would prevent competitive supply of set-top boxes; and
- (d) service providers may not offer set-top boxes that have security and non-security functions integrated.

55. In order to give suppliers sufficient time to meet the requirements in paragraph 54 for set-top boxes, it is proposed that the effective dates for the application of requirements (a), (b) and (c) should be set at 1 July 2000 and for criterion (d) 1 January 2005.

56. To minimize the number of set-top boxes and simplify the connection required at the consumers' end, service providers are encouraged to share a common set-top box for multiple services. This is a type of interconnection covered by sections 36A, 36B and 36C of the Telecommunication Ordinance. The TA will encourage commercial arrangements to be agreed between operators. If service operators cannot reach an agreement, the TA may be requested to make a determination. The TA will publish additional guidelines at a later stage about this determination.

UPSTREAM SIGNALS

57. Usually the by-pass circuitry of a set-top box contains an amplifier. If two or more set-top boxes are connected in series as shown in Annex 13, upstream signal from the second or subsequent set-top boxes might be blocked by the first or preceding set-top boxes. There are two options to resolve this problem and they are given in Annex 14. In option 1, a RF switch is added to select the set-top box to be used. Each time only one set-top box will be selected. Therefore, separate reception and recording of all the services is not possible. However, the loss introduced by the RF switch is low and the quality of the signals would not be significantly degraded by the RF switch. In option 2, a splitter is used to split the original signal path into several parallel paths (in this example, the original signal path is split into three parallel paths and a 5.5 dB loss will be experienced) for connection of the set-top boxes. Separate reception and recording of all the services would be possible but the loss introduced by the splitter have to be tolerated by all the services. It is proposed that either option may be adopted by the operators.

COMMENTS AND PROPOSALS

58. The TA welcomes comments on this paper for the future arrangement of the IBCCDS in Hong Kong, especially on the following:-

- (a) whether 8 MHz per channel plan should be adopted (c.f. paragraph 25(b));
- (b) the proposal for the TA to allocate the spare channels to licensed service providers employing spectrum efficient technologies (c.f. paragraph 25(a) and (b));
- (c) whether a fixed channel plan employing adjacent channels should be adopted and the preferred option (c.f. paragraph 27);
- (d) whether it is acceptable to fix the channel numbers for the television programmes and reserve channel numbers 1 to 4 on set-top boxes for the four terrestrial television programmes (c.f. paragraph 28);
- (e) whether the proposed priorities for distribution in IBCCDS are acceptable (c.f. paragraph 32);
- (f) whether it is acceptable for the TA to publish the database of IBCCDS (c.f. paragraph 33);
- (g) whether it is acceptable to use a compression ratio of 6 or more for digital transmission (c.f. paragraph 36);
- (h) whether the proposed criteria for installing IF distribution system are acceptable (c.f. paragraph 43);

- (i) whether the proposed criteria for installing parallel distribution network are acceptable (c.f. paragraph 45);
- (j) whether it is acceptable to allocate the frequency band of 5-50MHz for upstream signal purpose (c.f. paragraph 46);
- (k) whether it is acceptable to allocate the vacant frequency bands with bandwidths less than 8 MHz in 54-470 MHz for downstream signals of telecommunications services (c.f. paragraph 47);
- (l) whether the proposed frequency allocation plan is acceptable (c.f. paragraphs 48 and 49);
- (m) whether the proposals for upgrading IBCCDS are acceptable (c.f. paragraph 50);
- (n) whether the proposed implementation arrangement is acceptable (c.f. paragraph 51);
- (o) whether the proposed policy and requirements for set-top boxes are acceptable (c.f. paragraphs 52-56); and
- (p) whether the proposed options for upstream signal are acceptable (c.f. paragraph 57)

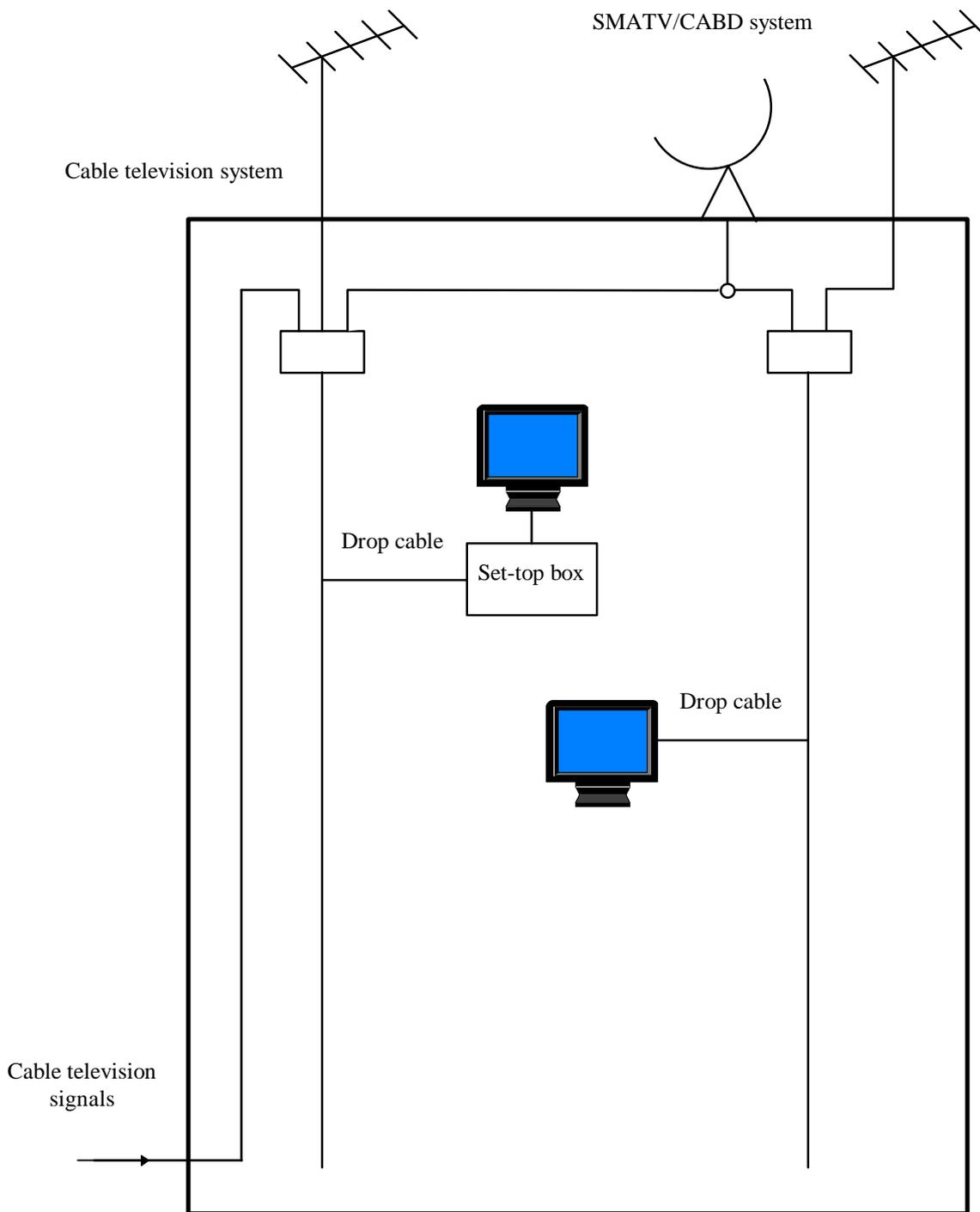
59. Alternative proposals which will achieve the same purposes are also welcomed. All submission should be sent to the Office of the Telecommunications Authority by 30 April 1999 to the address as shown in paragraph 2. For clarification and enquiry on the paper, please contact Mr. Y. C. Leung, Senior Telecommunications Engineer, by phone on (852) 2961 6639 or by fax to (852) 2904 7141.

Office of the Telecommunications Authority
31 March 1999

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Typical Configuration of the In-Building Coaxial Cable Distribution System



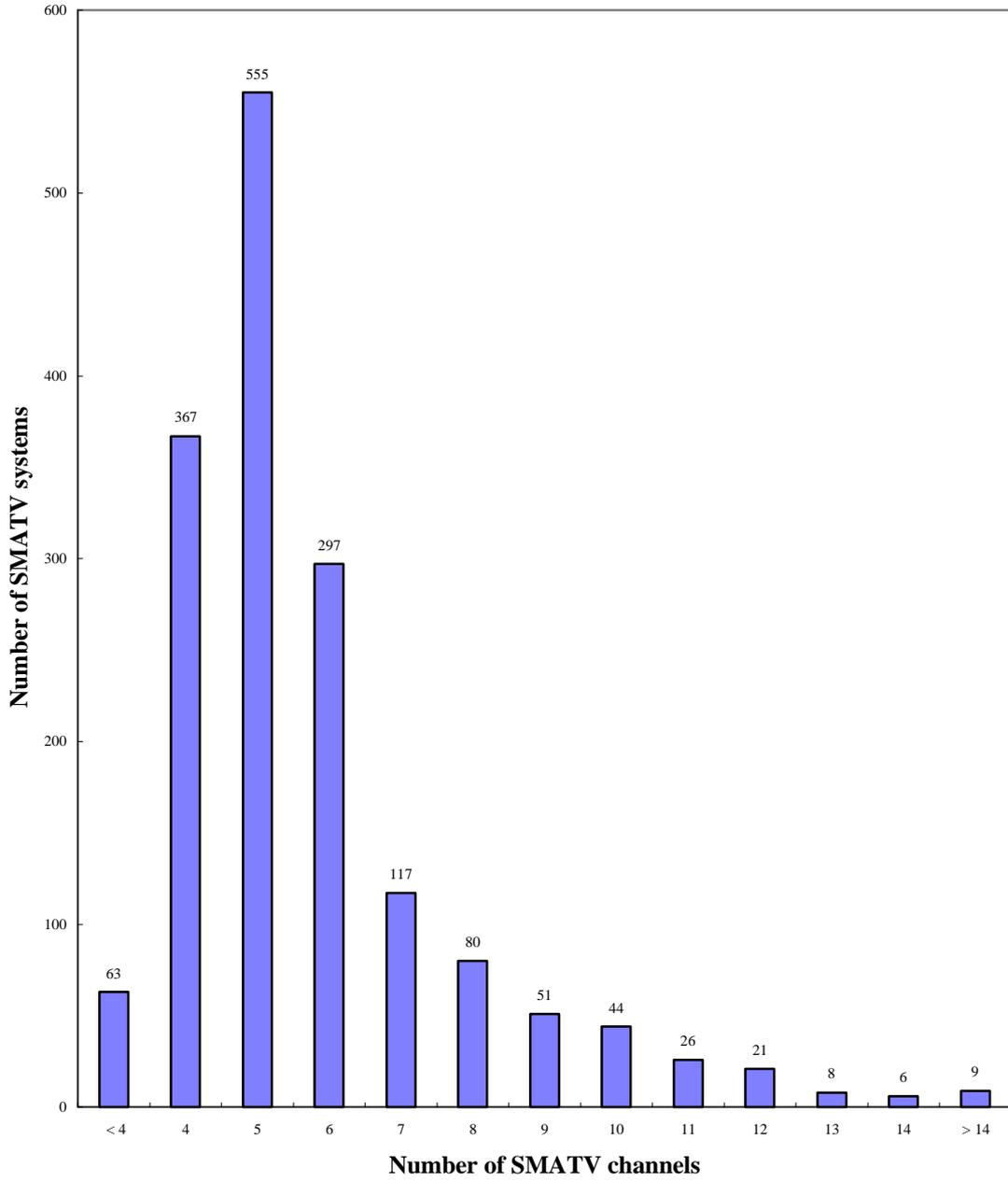
Television Broadcasting Network of Hong Kong

Television Transmitter Location	Television Services / Tx. Frequencies (MHz)												E.R.P.	Pol.	Offset
	Jade			Pearl			Home			World					
	TV CH	Vision Freq	Sound Freq	TV CH	Vision Freq	Sound Freq	TV CH	Vision Freq	Sound Freq	TV CH	Vision Freq	Sound Freq			
Temple Hill	21	471.25	477.25	25	503.25	509.25	23	487.25	493.25	27	519.25	525.25	10,000	H	0 fl NP
Castle Peak	34	575.25	581.25	38	607.25	613.25	42	639.25	645.25	44	655.25	661.25	1,000	H	+5/3 fl NP
Kowloon Peak	34	575.25	581.25	38	607.25	613.25	42	639.25	645.25	44	655.25	661.25	1,000	H	-5/3 fl NP
Golden Hill	33	567.25	573.25	39	615.25	621.25	43	647.25	653.25	45	663.25	669.25	1,000	H	0 fl NP
Cloudy Hill	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	1,000	H	0 fl NP
Lamma Island	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	1,500	V	-5/3 fl NP
Stanley	34	575.25	581.25	38	607.25	613.25	42	639.25	645.25	44	655.25	661.25	100	H	0 fl NP
Brick Hill	33	567.25	573.25	39	615.25	621.25	43	647.25	653.25	45	663.25	669.25	100	H	+5/3 fl NP
Pottinger Peak	33	567.25	573.25	39	615.25	621.25	43	647.25	653.25	45	663.25	669.25	100	H	+5/3 fl NP
Chai Wan	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	100	H	+5/3 fl NP
Mt. Nicholson	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	100	V	-5/3 fl NP
Caldecott Road	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	100	H	+5/3 fl NP
Chiu Keng Wan Shan	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	0.5	H	0 fl NP
Robin's Nest	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	100	V	0 fl NP
Beacon Hill	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	2	H	0 fl NP
Hill 275	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	10	H	0 fl NP
Shek Pik	34	575.25	581.25	38	607.25	613.25	42	639.25	645.25	44	655.25	661.25	1	V	
Wang Chau	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	0.1	H	
Hong Lok Yuen	33	567.25	573.25	39	615.25	621.25	43	647.25	653.25	45	663.25	669.25	0.1	H	
Shek Kong	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	2	V	-5/3 fl NP
Sheung Yeung Shan	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	6	V	+1/12 fl NP
On Lok Road Yuen Long	34	575.25	581.25	38	607.25	613.25	42	639.25	645.25	44	655.25	661.25	0.3	V	
Hill 297 Yuen Long	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	2	H	-5/3 fl NP

Television Transmitter Location	Television Services / Tx. Frequencies (MHz)												E.R.P.	Pol.	Offset
	Jade			Pearl			Home			World					
	TV CH	Vision Freq	Sound Freq	TV CH	Vision Freq	Sound Freq	TV CH	Vision Freq	Sound Freq	TV CH	Vision Freq	Sound Freq			
Hill 141 Tai Lam Chung	48	687.25	693.25	50	703.25	709.25	52	719.25	725.25	54	735.25	741.25	2	V	+5/3 fl NP
Tai Po Tsai	49	695.25	701.25	51	711.25	717.25	53	727.25	733.25	55	743.25	749.25	0.5	V	-5/3 fl NP
Tsuen Wan	26	511.25	517.25				41	631.25	637.25				1	V	0 fl NP
Ma Wan	58	767.25	773.25	26	511.25	517.25	60	783.25	789.25	41	631.25	637.25	0.5	H	
Tai O	33	567.25	573.25	49	695.25	701.25	39	615.25	621.25	55	743.25	749.25	7	V	-5/3 fl NP
Royal Ascot Shatin	33	567.25	573.25	39	615.25	621.25	43	647.25	653.25	45	663.25	669.25	1	V	
Pokfulam	33	567.25	573.25				39	615.25	621.25				0.25	V	-5/3 fl NP
Tui Min Hoi Sai Kung	24	495.25	501.25	30	543.25	549.25	26	511.25	517.25	57	759.25	765.25	2	V	0 fl NP
Sham Tseng	57	759.25	765.25				47	679.25	685.25				0.5	V	0 fl NP
Tuen Mun	33	567.25	573.25				41	631.25	637.25				0.3	V	
Lam Tei	32	559.25	565.25				43	647.25	653.25				0.1	V	-5/3 fl NP
Ying Pun #	41	631.25	637.25				33	567.25	573.25				4	V	-6/12 fl NP
Tsing Yi #	57	759.25	765.25				60	783.25	789.25				1	V	0 fl NP
Sun Yuen Long Centre	33	567.25	573.25				41	631.25	637.25				0.3	V	0 fl NP
Yuen Long town centre #	43	647.25	653.25				45	663.25	669.25				3	V	0 fl NP
Tseung Kwan O Village #	22	479.25	485.25	32	559.25	565.25	30	543.25	549.25	40	623.25	629.25	0.3	V	0 fl NP

Keys : fl Line frequency H Horizontal
 Pol Polarization V Vertical
 ERP Effective Radiated Power NP Non-precision
 # The station is under planning. The technical parameters may be changed.

Number of SMATV Channels as of February 1999



1. Existing Frequency Allocation Plan (5-54 MHz)

Frequency Range	Existing Allocation
5-8.3 MHz	to be planned
8.3-10.4 MHz	cable television (upstream signals)
10.4-21 MHz	to be planned
21-25 MHz	allocated to New T & T for cable telephony (upstream signals)
25-53.275 MHz	to be planned
53.275-53.425 MHz	cable television (downstream data)
53.425-54 MHz	to be planned

2. Existing Frequency Allocation Plan (54-470 MHz)

Channel Number	Frequency Range	Existing Allocation	Remark
C 1	54-62 MHz	cable television	
C 2	62-70 MHz	cable television	
C 3 *	70-78 MHz	to be planned	74.8-75.2 MHz (prohibited for use)
C 4	78-86 MHz	to be planned	
C 5 *	86-94 MHz	86-87 MHz (to be planned) 87-108 MHz (FM radio)	108-110 MHz (prohibited for use)
C 6 *	94-102 MHz		
C 7 *	102-110 MHz		
C 8 *	110-118 MHz	to be planned	110-117.975 MHz (prohibited for use)
C 9 *	118-126 MHz	to be planned	121.3-121.7 MHz (prohibited for use)
C 10	126-134 MHz	cable television	
C 11	134-142 MHz	cable television	
C 12	142-150 MHz	cable television	
C 13 *	150-158 MHz	to be planned	156.6-157 MHz (prohibited for use)
C 14	158-166 MHz	cable television	
C 15	166-174 MHz	to be planned	
C 16	174-182 MHz	cable television	
C 17	182-190 MHz	cable television	
C 18	190-198 MHz	cable television	
C 19	198-206 MHz	cable television	
C 20	206-214 MHz	cable television	
C 21	214-222 MHz	cable television	for temporary use
C 22	222-230 MHz	cable television	
C 23	230-238 MHz	cable television	for temporary use
C 24 *	238-246 MHz	to be planned	242.8-243.2 MHz (prohibited for use)
C 25	246-254 MHz	cable television	
C 26	254-262 MHz	cable television	for temporary use
C 27	262-270 MHz	cable television	
C 28	270-278 MHz	cable television	
C 29	278-286 MHz	to be planned	
C 30	286-294 MHz	cable television	
C 31	294-302 MHz	cable television	for temporary use
C 32	302-310 MHz	cable television	
C 33	310-318 MHz	cable television	
C 34	318-326 MHz	cable television	
C 35 *	326-334 MHz	to be planned	328.6-335.4 MHz (prohibited for use)
C 36 *	334-342 MHz		
C 37	342-350 MHz	cable television	
C 38	350-358 MHz	cable television	
C 39	358-366 MHz	cable television	
C 40	366-374 MHz	cable television	
C 41	374-382 MHz	cable television	
C 42	382-390 MHz	cable television	
C 43	390-398 MHz	cable television	
C 44 **	398-406 MHz	cable television	405.85-406.25 MHz (prohibited for use)
C 45 **	406-414 MHz	cable television	
C 46	414-422 MHz	cable television	for temporary use
C 47	422-430 MHz	cable television	
C 48	430-438 MHz	cable television	
C 49	438-446 MHz	to be planned	
C 50	446-454 MHz	to be planned	
C 51	454-462 MHz	cable television	
C 52	462-470 MHz	462-466 MHz (cable telephony - downstream signals) 466-470 MHz (to be planned)	the frequency range 462-466 MHz was allocated to New T & T

* A total of 10 channels overlap with the essential services including FM broadcast, aeronautical radio-navigation for air traffic control and emergency position indicating radio beacons (EPIRB) and cannot be used.

** Existing analogue television services on these two channels do not affect the essential service in 405.85-406.25 MHz.

3. Existing Frequency Allocation Plan (470-790 MHz)

Channel Number	Frequency Range	Existing Allocation	Remark
E 21	470-478 MHz	terrestrial television, SMATV, VCR, CCTV and VOD	
E 22	478-486 MHz		
E 23	486-494 MHz		
E 24	494-502 MHz		
E 25	502-510 MHz		
E 26	510-518 MHz		
E 27	518-526 MHz		
E 28	526-534 MHz		
E 29	534-542 MHz		
E 30	542-550 MHz		
E 31	550-558 MHz		
E 32	558-566 MHz		
E 33	566-574 MHz		
E 34	574-582 MHz		
E 35	582-590 MHz		
E 36	590-598 MHz		
E 37	598-606 MHz		
E 38	606-614 MHz		
E 39	614-622 MHz		
E 40	622-630 MHz		
E 41	630-638 MHz		
E 42	638-646 MHz		
E 43	646-654 MHz		
E 44	654-662 MHz		
E 45	662-670 MHz		
E 46	670-678 MHz		
E 47	678-686 MHz		
E 48	686-694 MHz		
E 49	694-702 MHz		
E 50	702-710 MHz		
E 51	710-718 MHz		
E 52	718-726 MHz		
E 53	726-734 MHz		
E 54	734-742 MHz		
E 55	742-750 MHz		
E 56	750-758 MHz	terrestrial television	
E 57	758-766 MHz		
E 58	766-774 MHz	terrestrial television and RF outputs of set-top boxes	
E 59	774-782 MHz		
E 60	782-790 MHz		

**A. Example of 8 MHz Frequency Plan for SMATV/CABD System Operating in 470-750 MHz
(5 Satellite Television Channels)**

Channel Number	Frequency Range	Existing Utilisation
E 21	470-478 MHz	TVB Jade
E 22	478-486 MHz	
E 23	486-494 MHz	ATV Home
E 24	494-502 MHz	
E 25	502-510 MHz	TVB Pearl
E 26	510-518 MHz	
E 27	518-526 MHz	ATV World
E 28	526-534 MHz	
E 29	534-542 MHz	
E 30	542-550 MHz	
E 31	550-558 MHz	CCTV
E 32	558-566 MHz	
E 33	566-574 MHz	
E 34	574-582 MHz	satellite television
E 35	582-590 MHz	
E 36	590-598 MHz	
E 37	598-606 MHz	
E 38	606-614 MHz	satellite television
E 39	614-622 MHz	
E 40	622-630 MHz	satellite television
E 41	630-638 MHz	
E 42	638-646 MHz	satellite television
E 43	646-654 MHz	
E 44	654-662 MHz	satellite television
E 45	662-670 MHz	
E 46	670-678 MHz	
E 47	678-686 MHz	
E 48	686-694 MHz	
E 49	694-702 MHz	
E 50	702-710 MHz	
E 51	710-718 MHz	
E 52	718-726 MHz	
E 53	726-734 MHz	
E 54	734-742 MHz	
E 55	742-750 MHz	

**B. Example of 8 MHz Frequency Plan for SMATV/CABD System Operating in 470-750 MHz
(11 Satellite Television Channels)**

Channel Number	Frequency Range	Existing Utilisation
E 21	470-478 MHz	TVB Jade
E 22	478-486 MHz	
E 23	486-494 MHz	ATV Home
E 24	494-502 MHz	
E 25	502-510 MHz	TVB Pearl
E 26	510-518 MHz	
E 27	518-526 MHz	ATV World
E 28	526-534 MHz	
E 29	534-542 MHz	
E 30	542-550 MHz	CCTV
E 31	550-558 MHz	
E 32	558-566 MHz	satellite television
E 33	566-574 MHz	
E 34	574-582 MHz	satellite television
E 35	582-590 MHz	
E 36	590-598 MHz	
E 37	598-606 MHz	
E 38	606-614 MHz	satellite television
E 39	614-622 MHz	
E 40	622-630 MHz	satellite television
E 41	630-638 MHz	
E 42	638-646 MHz	satellite television
E 43	646-654 MHz	
E 44	654-662 MHz	satellite television
E 45	662-670 MHz	
E 46	670-678 MHz	satellite television
E 47	678-686 MHz	
E 48	686-694 MHz	satellite television
E 49	694-702 MHz	
E 50	702-710 MHz	
E 51	710-718 MHz	satellite television
E 52	718-726 MHz	
E 53	726-734 MHz	satellite television
E 54	734-742 MHz	
E 55	742-750 MHz	satellite television

**C. Example of 8 MHz Frequency Plan for SMATV/CABD System Operating in 470-750 MHz
(21 Satellite Television Channels)**

Channel Number	Frequency Range	Existing Utilisation
E 21	470-478 MHz	TVB Jade
E 22	478-486 MHz	
E 23	486-494 MHz	ATV Home
E 24	494-502 MHz	
E 25	502-510 MHz	satellite television
E 26	510-518 MHz	satellite television
E 27	518-526 MHz	satellite television
E 28	526-534 MHz	satellite television
E 29	534-542 MHz	satellite television
E 30	542-550 MHz	satellite television
E 31	550-558 MHz	satellite television
E 32	558-566 MHz	satellite television
E 33	566-574 MHz	satellite television
E 34	574-582 MHz	
E 35	582-590 MHz	
E 36	590-598 MHz	
E 37	598-606 MHz	satellite television
E 38	606-614 MHz	satellite television
E 39	614-622 MHz	satellite television
E 40	622-630 MHz	satellite television
E 41	630-638 MHz	satellite television
E 42	638-646 MHz	satellite television
E 43	646-654 MHz	satellite television
E 44	654-662 MHz	satellite television
E 45	662-670 MHz	satellite television
E 46	670-678 MHz	satellite television
E 47	678-686 MHz	satellite television
E 48	686-694 MHz	satellite television
E 49	694-702 MHz	CCTV
E 50	702-710 MHz	CCTV
E 51	710-718 MHz	
E 52	718-726 MHz	
E 53	726-734 MHz	ATV World
E 54	734-742 MHz	
E 55	742-750 MHz	TVB Pearl

**Example of Mixed 8 MHz and 6 MHz Frequency Plan for
SMATV/CABD System Operating in 470-750 MHz
(20 Satellite Television Channels)**

Channel Number	Frequency Range	Existing Utilisation
E 21	470-478 MHz	TVB Jade
E 22	478-486 MHz	
E 23	486-494 MHz	ATV Home
E 24	494-502 MHz	
E 25	502-510 MHz	TVB Pearl
E 26	510-518 MHz	
E 27	518-526 MHz	ATV World
A 24	530-536 MHz	satellite television (6 MHz)
A 25	536-542 MHz	satellite television (6 MHz)
A 26	542-548 MHz	satellite television (6 MHz)
A 27	548-554 MHz	satellite television (6 MHz)
A 28	554-560 MHz	satellite television (6 MHz)
A 29	560-566 MHz	satellite television (6 MHz)
A 30	566-572 MHz	satellite television (6 MHz)
E 34	574-582 MHz	
E 35	582-590 MHz	
E 36	590-598 MHz	
A 36	602-608 MHz	satellite television (6 MHz)
A 37	608-614 MHz	
E 39	614-622 MHz	
E 40	622-630 MHz	
E 41	630-638 MHz	satellite television
E 42	638-646 MHz	satellite television
E 43	646-654 MHz	
E 44	654-662 MHz	satellite television
E 45	662-670 MHz	
E 46	670-678 MHz	satellite television
E 47	678-686 MHz	satellite television
E 48	686-694 MHz	satellite television
E 49	694-702 MHz	satellite television
E 50	702-710 MHz	satellite television
E 51	710-718 MHz	satellite television
E 52	718-726 MHz	satellite television
E 53	726-734 MHz	satellite television
E 54	734-742 MHz	satellite television
E 55	742-750 MHz	

A. Proposed Channel Plan (54-470 MHz, Channel Width = 8 MHz)

Frequency Range	Channel Number
54-62 MHz	C 1
62-70 MHz	C 2
70-78 MHz	C 3
78-86 MHz	C 4
86-94 MHz	C 5
94-102 MHz	C 6
102-110 MHz	C 7
110-118 MHz	C 8
118-126 MHz	C 9
126-134 MHz	C 10
134-142 MHz	C 11
142-150 MHz	C 12
150-158 MHz	C 13
158-166 MHz	C 14
166-174 MHz	C 15
174-182 MHz	C 16
182-190 MHz	C 17
190-198 MHz	C 18
198-206 MHz	C 19
206-214 MHz	C 20
214-222 MHz	C 21
222-230 MHz	C 22
230-238 MHz	C 23
238-246 MHz	C 24
246-254 MHz	C 25
254-262 MHz	C 26
262-270 MHz	C 27
270-278 MHz	C 28
278-286 MHz	C 29
286-294 MHz	C 30
294-302 MHz	C 31
302-310 MHz	C 32
310-318 MHz	C 33
318-326 MHz	C 34
326-334 MHz	C 35
334-342 MHz	C 36
342-350 MHz	C 37
350-358 MHz	C 38
358-366 MHz	C 39
366-374 MHz	C 40
374-382 MHz	C 41
382-390 MHz	C 42
390-398 MHz	C 43
398-406 MHz	C 44
406-414 MHz	C 45
414-422 MHz	C 46
422-430 MHz	C 47
430-438 MHz	C 48
438-446 MHz	C 49
446-454 MHz	C 50
454-462 MHz	C 51
462-470 MHz	C 52

B. Proposed Channel Plan (470-862 MHz, Channel Width = 8 MHz)

Frequency Range	Channel Number
470-478 MHz	E 21
478-486 MHz	E 22
486-494 MHz	E 23
494-502 MHz	E 24
502-510 MHz	E 25
510-518 MHz	E 26
518-526 MHz	E 27
526-534 MHz	E 28
534-542 MHz	E 29
542-550 MHz	E 30
550-558 MHz	E 31
558-566 MHz	E 32
566-574 MHz	E 33
574-582 MHz	E 34
582-590 MHz	E 35
590-598 MHz	E 36
598-606 MHz	E 37
606-614 MHz	E 38
614-622 MHz	E 39
622-630 MHz	E 40
630-638 MHz	E 41
638-646 MHz	E 42
646-654 MHz	E 43
654-662 MHz	E 44
662-670 MHz	E 45
670-678 MHz	E 46
678-686 MHz	E 47
686-694 MHz	E 48
694-702 MHz	E 49
702-710 MHz	E 50
710-718 MHz	E 51
718-726 MHz	E 52
726-734 MHz	E 53
734-742 MHz	E 54
742-750 MHz	E 55
750-758 MHz	E 56
758-766 MHz	E 57
766-774 MHz	E 58
774-782 MHz	E 59
782-790 MHz	E 60
790-798 MHz	E 61
798-806 MHz	E 62
806-814 MHz	E 63
814-822 MHz	E 64
822-830 MHz	E 65
830-838 MHz	E 66
838-846 MHz	E 67
846-854 MHz	E 68
854-862 MHz	E 69

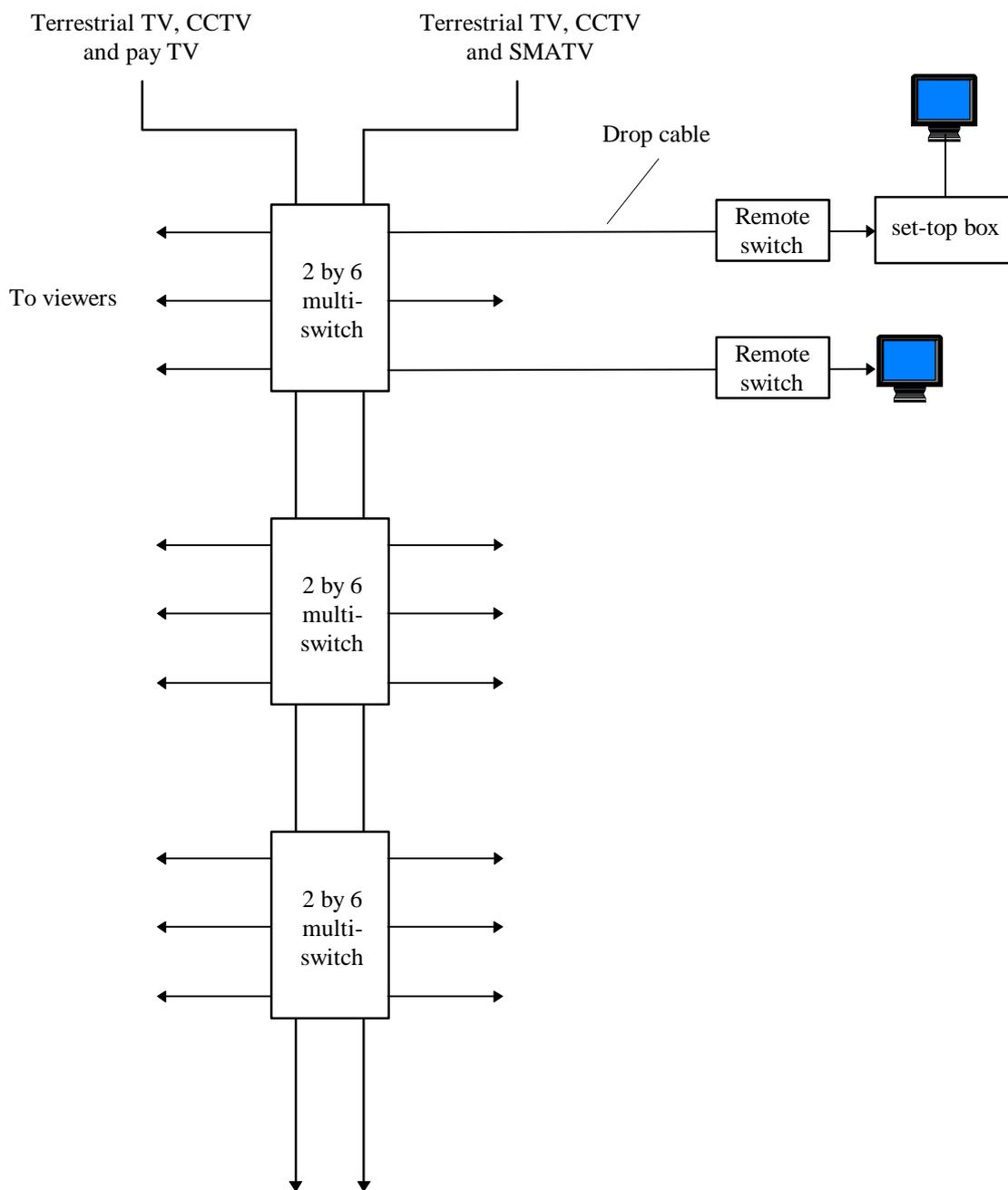
An Example of the Data of the In-Building Coaxial Cable Distribution System

Licence Number/ System Number	Address	District	Channels Occupied by Terrestrial Television Broadcasting Service	Channels Occupied by Other Services
0888/188	Roof Top, Sample Garden, 9 Sample Road	Wan Chai	E 21, E 23, E 25, E 27	E 48, E 50, E 54, E 56

Channels in 790-960 MHz which Overlap with the Transmitting Frequency Ranges of the Base Stations of Conventional or Trunked Mobile Radio Systems, Public Mobile Radiotelephone Services, Mobile Data Systems, One Way Data Message Service and International Paging Service

Channel	Remark
790-798 MHz	
798-806 MHz	
806-814 MHz	
814-822 MHz	
822-830 MHz	
830-838 MHz	
838-846 MHz	
846-854 MHz	<u>851-863 MHz</u> Conventional or Trunked Mobile Radio Systems & Mobile Data Systems (base transmit)
854-862 MHz	
862-870 MHz	<u>863-864.1 MHz</u> Cross border Trunked Radio System (base transmit)
870-878 MHz	<u>872.5-887.5 MHz</u>
878-886 MHz	PMRS (base transmit)
886-894 MHz	
894-902 MHz	
902-910 MHz	
910-918 MHz	
918-926 MHz	<u>922-923 MHz</u> One way data message service
926-934 MHz	<u>923-935 MHz</u> International paging service (931.9375 MHz)
934-942 MHz	<u>935-950 MHz</u>
942-950 MHz	PMRS (base transmit)
950-958 MHz	<u>950.1-951.7 MHz & 952.5-960 MHz</u> PMRS (base transmit)

Typical Configuration of a Parallel Distribution System



Proposed Frequency Allocation Plan for Downstream Signals of Telecommunications Services

Frequency Range	Existing Radio Services	Existing Allocation in IBCCDS	Proposed Allocation in IBCCDS
70-74.8 MHz	<u>70-72.3 MHz</u> 1. Government 2. Model control equipment 3. Open channel frequencies, limited to mobiles/portables only <u>72.3-74.8 MHz</u> 1. Mobile radio systems Two-frequency simplex (base transmit) 2. Demonstration frequency 3. Model control equipment	Nil	Telecommunications services (downstream signals)
75.2-78 MHz	<u>75.2-76.7 MHz</u> Government <u>76.7-78.7 MHz</u> Mobile radio systems Two-frequency simplex (base receive)	Nil	Telecommunications services (downstream signals)
86-87 MHz	<u>86-87 MHz</u> Government	Nil	Telecommunications services (downstream signals)
117.975-121.3 MHz and 121.7-126 MHz	<u>117.975-137 MHz</u> Aeronautical mobile services	Nil	To avoid interference to the aeronautical mobile services, these bands should not be allocated for any services distributed by the IBCCDSs.
150-156.6 MHz	<u>149.9-150.05 MHz</u> Radionavigation satellite <u>150.05-150.75 MHz</u> Government <u>150.75-154.75 MHz</u> Mobile radio systems Two-frequency simplex (base transmit) <u>154.75-156 MHz</u> 1. Mobile radio systems Two-frequency simplex (base transmit) 2. Demonstration frequency	Nil	Telecommunications services (downstream signals)

Frequency Range	Existing Radio Services	Existing Allocation in IBCCDS	Proposed Allocation in IBCCDS
157-158 MHz	<u>156-157.45 MHz</u> Hague Plan <u>157.45-158 MHz</u> Maritime mobile (private channels)	Nil	Telecommunications services (downstream signals)
238-242.8 MHz and 243.2-246 MHz	<u>235-239 MHz</u> Nil <u>239-279 MHz</u> 1. Government 2. Search and rescue (243 MHz) 3. Low power devices	Nil	Telecommunications services (downstream signals)
326-328.6 MHz	<u>322-328.6 MHz</u> Nil	Nil	Telecommunications services (downstream signals)
335.4-342 MHz	<u>335.4-399.9 MHz</u> Government	Nil	Telecommunications services (downstream signals)
466-470 MHz	<u>466-469 MHz</u> 1. Government 2. Mobile radio systems <u>469-470 MHz</u> Mobile radio systems Two-frequency simplex (base transmit)	Nil	Telecommunications services (downstream signals)

**A. Proposed Frequency Allocation Plan for Various Categories of Services
(5-54 MHz)**

Frequency Range	Proposed Allocation
5-50 MHz	upstream signals of pay television and telecommunications services
50-53.275 MHz	to be planned
53.275-53.425 MHz	pay television (downstream data)
53.425-54 MHz	to be planned

**B. Proposed Frequency Allocation Plan for Various Categories of Services
(54-470 MHz, Channel Width = 8 MHz)**

Channel Number	Frequency Range	Proposed Allocation	Remark
C 1	54-62 MHz	pay television	
C 2	62-70 MHz	pay television	
C 3	70-78 MHz	telecommunications services	74.8-75.2 MHz (prohibited for use)
C 4	78-86 MHz	to be planned	strong signals from mobile radio systems
C 5	86-94 MHz	86-87 MHz (telecommunications services)	108-110 MHz (prohibited for use)
C 6	94-102 MHz		
C 7	102-110 MHz	87-108 MHz (FM radio)	
C 8	110-118 MHz	to be planned	110-117.975 MHz (prohibited for use)
C 9	118-126 MHz	to be planned	121.3-121.7 MHz (prohibited for use)
C 10	126-134 MHz	pay television	
C 11	134-142 MHz	pay television	
C 12	142-150 MHz	pay television	
C 13	150-158 MHz	telecommunications services	156.6-157 MHz (prohibited for use)
C 14	158-166 MHz	pay television	
C 15	166-174 MHz	to be planned	strong paging signals
C 16	174-182 MHz	pay television	
C 17	182-190 MHz	pay television	
C 18	190-198 MHz	pay television	
C 19	198-206 MHz	pay television	
C 20	206-214 MHz	pay television	
C 21	214-222 MHz	new television service	
C 22	222-230 MHz	pay television	
C 23	230-238 MHz	new television service	
C 24	238-246 MHz	telecommunications services	242.8-243.2 MHz (prohibited for use)
C 25	246-254 MHz	pay television	
C 26	254-262 MHz	new television service	
C 27	262-270 MHz	pay television	
C 28	270-278 MHz	pay television	
C 29	278-286 MHz	to be planned	strong paging signals
C 30	286-294 MHz	pay television	
C 31	294-302 MHz	new television service	
C 32	302-310 MHz	pay television	
C 33	310-318 MHz	pay television	
C 34	318-326 MHz	pay television	
C 35	326-334 MHz	telecommunications services	328.6-335.4 MHz (prohibited for use)
C 36	334-342 MHz		
C 37	342-350 MHz	pay television	
C 38	350-358 MHz	pay television	
C 39	358-366 MHz	pay television	
C 40	366-374 MHz	pay television	
C 41	374-382 MHz	pay television	
C 42	382-390 MHz	pay television	
C 43	390-398 MHz	pay television	
C 44	398-406 MHz	pay television	405.85-406.25 MHz (prohibited for use)
C 45	406-414 MHz	pay television	
C 46	414-422 MHz	new television service	
C 47	422-430 MHz	pay television	
C 48	430-438 MHz	pay television	
C 49	438-446 MHz	new television service	
C 50	446-454 MHz	new television service	
C 51	454-462 MHz	pay television	
C 52	462-470 MHz	telecommunications services	

**C. Proposed Frequency Allocation Plan for Various Categories of Services (Option 1)
(470-862 MHz, Channel Width = 8 MHz)**

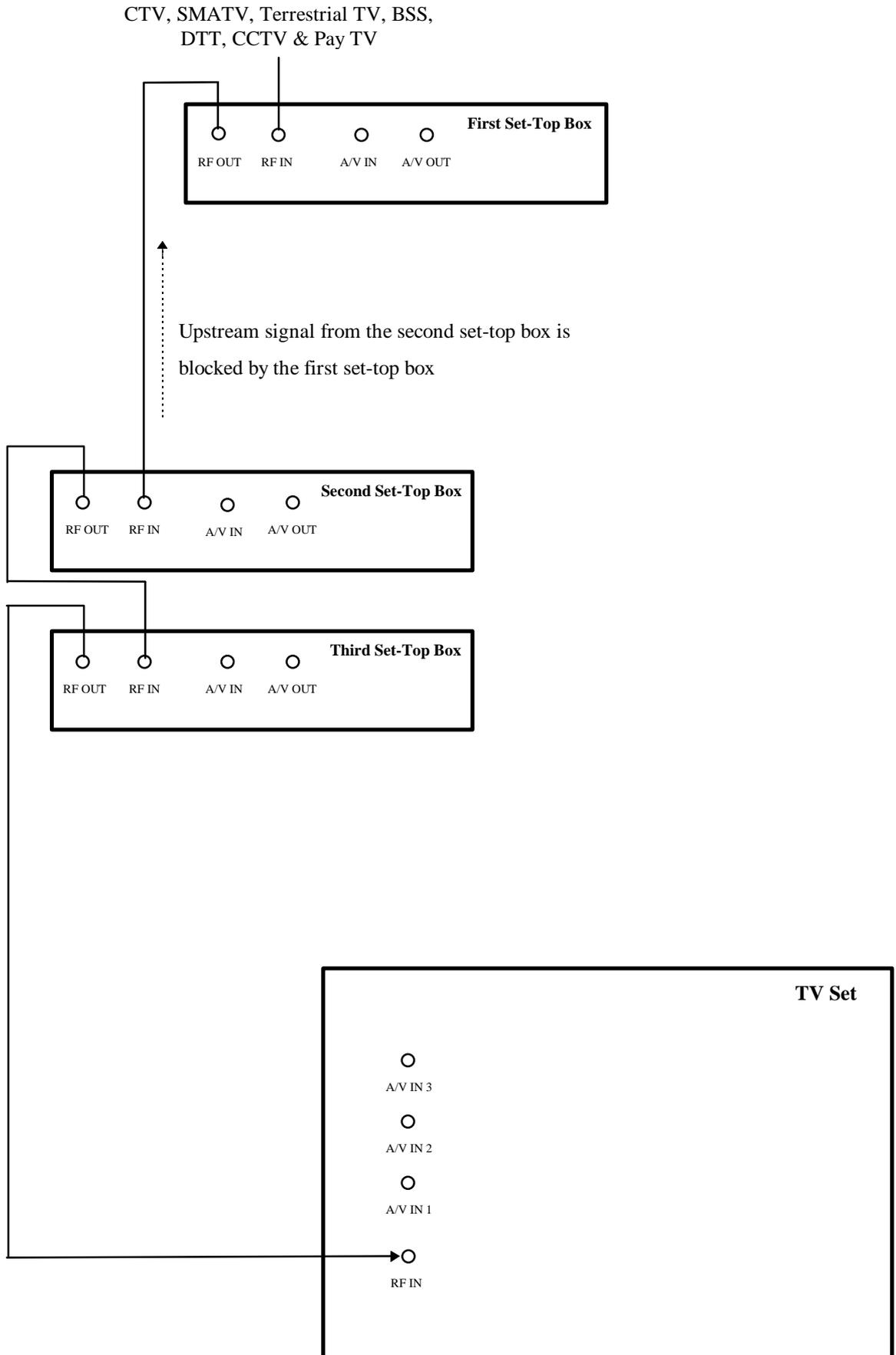
Channel Number	Frequency Range	Proposed Allocation	Remark
E 21	470-478 MHz	TVB Jade	Note
E 22	478-486 MHz	TV or telecommunications services	
E 23	486-494 MHz	ATV Home	Note
E 24	494-502 MHz	TV or telecommunications services	
E 25	502-510 MHz	TVB Pearl	Note
E 26	510-518 MHz	TV or telecommunications services	
E 27	518-526 MHz	ATV World	Note
E 28	526-534 MHz	TV or telecommunications services	
E 29	534-542 MHz	TV or telecommunications services	
E 30	542-550 MHz	TV or telecommunications services	
E 31	550-558 MHz	TV or telecommunications services	
E 32	558-566 MHz	TV or telecommunications services	
E 33	566-574 MHz	TV or telecommunications services	
E 34	574-582 MHz	TV or telecommunications services	
E 35	582-590 MHz	CCTV	
E 36	590-598 MHz	VCR	
E 37	598-606 MHz	TV or telecommunications services	
E 38	606-614 MHz	TV or telecommunications services	
E 39	614-622 MHz	TV or telecommunications services	
E 40	622-630 MHz	TV or telecommunications services	
E 41	630-638 MHz	TV or telecommunications services	
E 42	638-646 MHz	TV or telecommunications services	
E 43	646-654 MHz	TV or telecommunications services	
E 44	654-662 MHz	TV or telecommunications services	
E 45	662-670 MHz	TV or telecommunications services	
E 46	670-678 MHz	TV or telecommunications services	
E 47	678-686 MHz	TV or telecommunications services	
E 48	686-694 MHz	TV or telecommunications services	
E 49	694-702 MHz	TV or telecommunications services	
E 50	702-710 MHz	TV or telecommunications services	
E 51	710-718 MHz	TV or telecommunications services	
E 52	718-726 MHz	TV or telecommunications services	
E 53	726-734 MHz	TV or telecommunications services	
E 54	734-742 MHz	TV or telecommunications services	
E 55	742-750 MHz	TV or telecommunications services	
E 56	750-758 MHz	TV or telecommunications services	
E 57	758-766 MHz	TV or telecommunications services	
E 58	766-774 MHz	RF outputs of set-top boxes	
E 59	774-782 MHz	RF outputs of set-top boxes	
E 60	782-790 MHz	RF outputs of set-top boxes	
E 61	790-798 MHz	TV or telecommunications services	
E 62	798-806 MHz	TV or telecommunications services	
E 63	806-814 MHz	TV or telecommunications services	
E 64	814-822 MHz	TV or telecommunications services	
E 65	822-830 MHz	TV or telecommunications services	
E 66	830-838 MHz	TV or telecommunications services	
E 67	838-846 MHz	TV or telecommunications services	
E 68	846-854 MHz	TV or telecommunications services	
E 69	854-862 MHz	TV or telecommunications services	

Note: For high signal level areas near Temple Hill where direct pick up causes interference these programmes may be distributed by some other channels to be specified by the TA.

**D. Proposed Frequency Allocation Plan for Various Categories of Services (Option 2)
(470-862 MHz, Channel Width = 8 MHz)**

Channel Number	Frequency Range	Proposed Allocation	Remark
E 21	470-478 MHz	TV or telecommunications services	
E 22	478-486 MHz	TV or telecommunications services	
E 23	486-494 MHz	TV or telecommunications services	
E 24	494-502 MHz	TV or telecommunications services	
E 25	502-510 MHz	TV or telecommunications services	
E 26	510-518 MHz	TV or telecommunications services	
E 27	518-526 MHz	TV or telecommunications services	
E 28	526-534 MHz	TV or telecommunications services	
E 29	534-542 MHz	TV or telecommunications services	
E 30	542-550 MHz	TV or telecommunications services	
E 31	550-558 MHz	TVB Jade	
E 32	558-566 MHz	ATV Home	
E 33	566-574 MHz	TVB Pearl	
E 34	574-582 MHz	ATV World	
E 35	582-590 MHz	CCTV	
E 36	590-598 MHz	VCR	
E 37	598-606 MHz	TV or telecommunications services	
E 38	606-614 MHz	TV or telecommunications services	
E 39	614-622 MHz	TV or telecommunications services	
E 40	622-630 MHz	TV or telecommunications services	
E 41	630-638 MHz	TV or telecommunications services	
E 42	638-646 MHz	TV or telecommunications services	
E 43	646-654 MHz	TV or telecommunications services	
E 44	654-662 MHz	TV or telecommunications services	
E 45	662-670 MHz	TV or telecommunications services	
E 46	670-678 MHz	TV or telecommunications services	
E 47	678-686 MHz	TV or telecommunications services	
E 48	686-694 MHz	TV or telecommunications services	
E 49	694-702 MHz	TV or telecommunications services	
E 50	702-710 MHz	TV or telecommunications services	
E 51	710-718 MHz	TV or telecommunications services	
E 52	718-726 MHz	TV or telecommunications services	
E 53	726-734 MHz	TV or telecommunications services	
E 54	734-742 MHz	TV or telecommunications services	
E 55	742-750 MHz	TV or telecommunications services	
E 56	750-758 MHz	TV or telecommunications services	
E 57	758-766 MHz	TV or telecommunications services	
E 58	766-774 MHz	RF outputs of set-top boxes	
E 59	774-782 MHz	RF outputs of set-top boxes	
E 60	782-790 MHz	RF outputs of set-top boxes	
E 61	790-798 MHz	TV or telecommunications services	
E 62	798-806 MHz	TV or telecommunications services	
E 63	806-814 MHz	TV or telecommunications services	
E 64	814-822 MHz	TV or telecommunications services	
E 65	822-830 MHz	TV or telecommunications services	
E 66	830-838 MHz	TV or telecommunications services	
E 67	838-846 MHz	TV or telecommunications services	
E 68	846-854 MHz	TV or telecommunications services	
E 69	854-862 MHz	TV or telecommunications services	

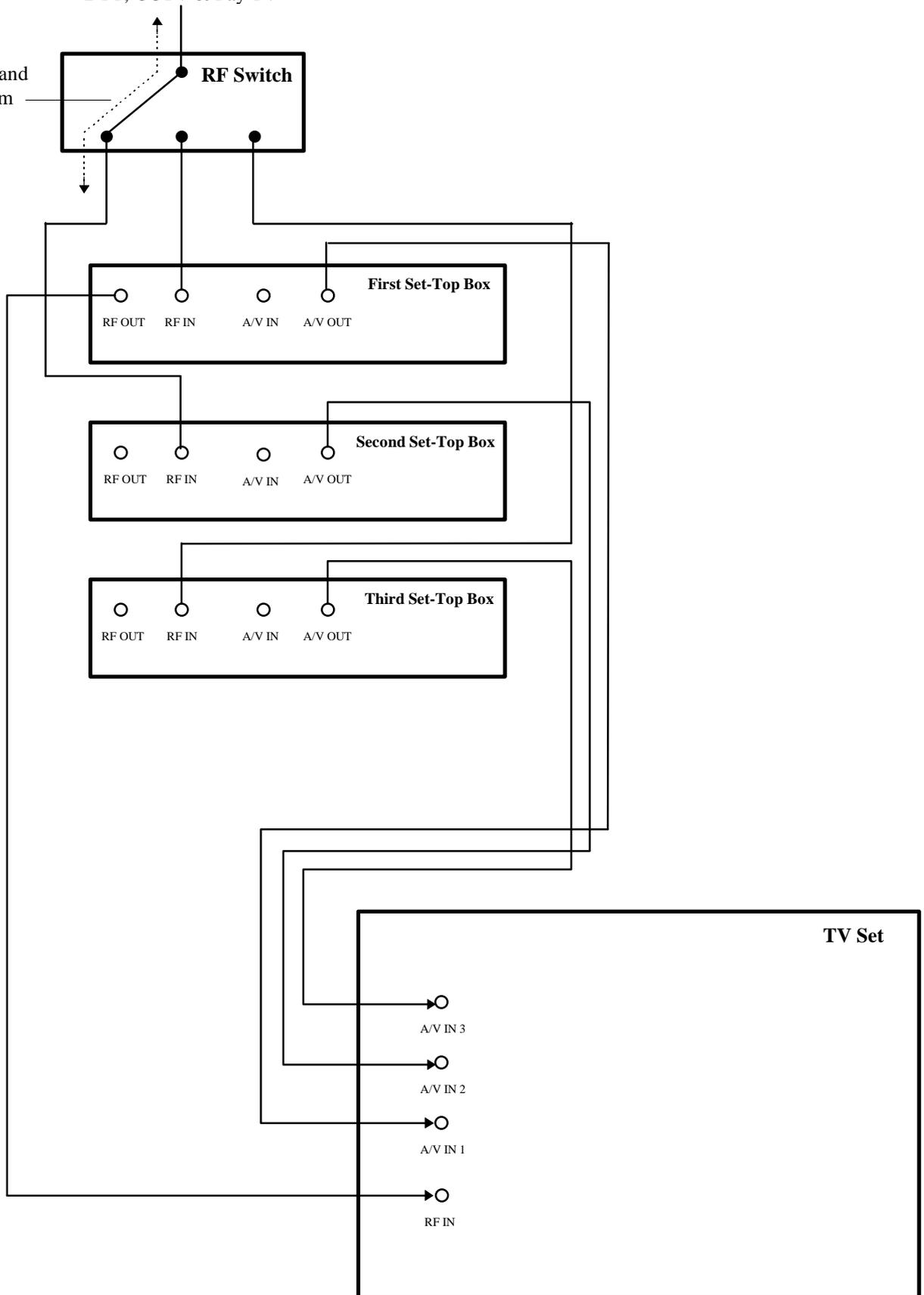
Set-Top Boxes Connected in Series



A. Use RF Switch for Connection of the Set-Top Boxes (Option 1)

CTV, SMATV, Terrestrial TV, BSS,
DTT, CCTV & Pay TV

Upstream and
downstream
signals



B. Use Splitter for Connection of the Set-Top Boxes (Option 2)

