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MALAYSIAN COMMUNICATIONS AND MULTIMEDIA COMMISSION

DISCUSSION PAPER

CONCEPTS FOR THE INTRODUCTION OF DIGITAL SOUND BROADCAST IN MALAYSIA

NOVEMBER 2004

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INTRODUCTION

The MCMC since its inception has always worked on the principle of transparency and participative with the industry. Many interactions and public discussions with the industry have been conducted by the MCMC to uphold this principle. One of the documents which was developed through this process and have been the reference document by the industry is the Framework for Industry Development 2002- 2006.

One of the deliverables in the Framework for Industry Development is the promotion of a fully digital national network system in which the implementation of Digital Sound Broadcasting by year 2007 is one of the performance indicators to complete the digital evolution of our national network system.

The introduction of DSB together with all other digitalization initiatives such as IMT 2000, Digital Terrestrial Television Broadcasting, National Broadband Plan and Wireless Hot Spots would assist Malaysia in achieving its goal of becoming a global hub as outlined in the National Policy Objectives in section 3 of the CMA (please refer to ***Attachment A***).

The introduction of Digital Sound Broadcasting (DSB) in Malaysia poses a number of challenges to the country, the industry, as well as the general Malaysian public. This, no doubt has to be balanced in order to achieve the aspirations of the country, promote the development of the industry, as well as to create a mature and well-informed society.

The Communications and Multimedia Act 1998 (CMA) provides for a robust and converged approach to the provision of facilities and services in the digital era, which promotes for an efficient management of resources while allowing it to adapt to the ever changing business models arising from digitalization. Nonetheless, MCMC as the regulator will have to balance the needs of the industry to the needs of the consumers in general in order to ensure that the migration to the digital sound benefits all the parties concerned.

In formulating policy direction and principles toward successful implementation of DSB, Malaysian Communications and Multimedia Commission (MCMC) views the following general approach as relevant challenges:

1. Providing coverage
2. Providing service
3. Planning for migration and adoption of digital sound

This Discussion Paper seeks to invite submission from interested parties on the issues raised in this Discussion Paper or any other matters relevant to the subject. Written submissions, be it in hard copy or electronic copy, be received by MCMC not later than 12.00 noon on January 13, 2005. Submissions should be addressed to:

Malaysian Communications and Multimedia Commission
63000 Cyberjaya
Selangor Darul Ehsan

Attention	:	Technical Division
Tel.	:	+6 03 8688 8000
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Email	:	dsb@cmc.gov.my

In the interest of providing an informed and robust consultative process, MCMC may publish the feedbacks received. Any commercially sensitive information should be provided under a separate cover clearly marked, "**CONFIDENTIAL**".

MCMC extends its appreciation to interested parties for their participation and for providing written submissions in this process.

BACKGROUND

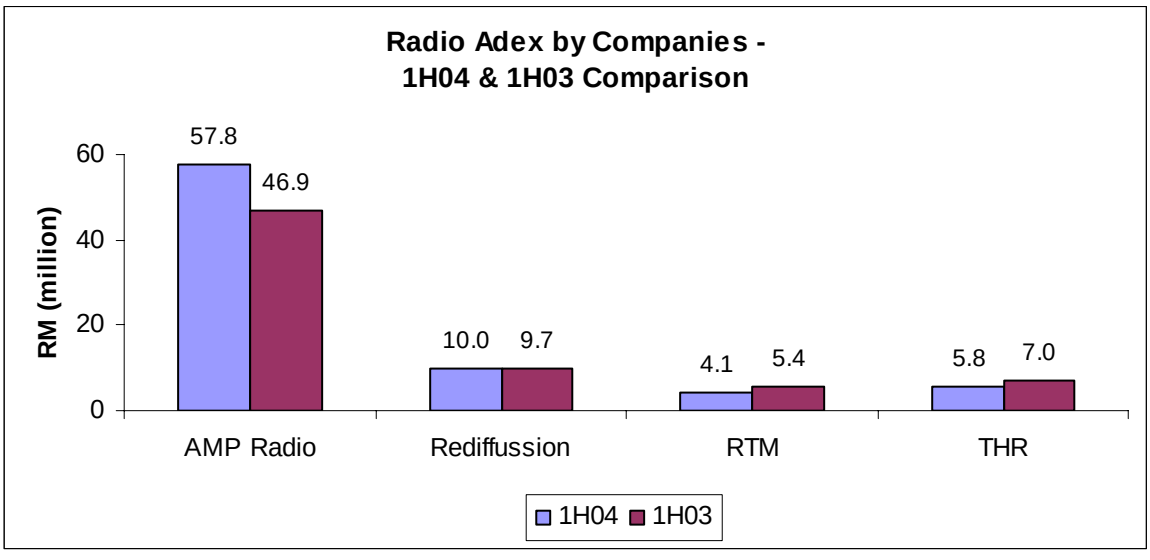
RADIO BROADCASTING IN MALAYSIA

1 During the many years of existence in Malaysia, radio broadcasting has evolved to numerous radio stations to cater to the different niche markets. It has since grown to reach almost every Malaysian household. From only one government-owned RTM radio stations catering to different language speaking groups to various radio stations catering to variety of niche markets currently, the Malaysian listeners are able to choose their respective stations for a variety of music and information.

2 Currently, there are 13 licensees providing terrestrial FM radio broadcasting. There are 10 active players while 3 of the licensees are not in operation. The 3 non-operational radio stations are Radio Wanita Berhad, Malaysia Airports (Sepang) Sdn. Bhd., and Rimakmur Sdn. Bhd. (*refer to* ***Attachment B***). Radio Television Malaysia (RTM), on the other hand is providing FM & HF broadcasting service.

3 The main players in the Malaysian radio market are five highly targeted radio station managed by Airtime Management and Programming Sdn Bhd (AMP) who operates Era, MIX fm, MY fm, HITZ fm, Sinar FM and Light & Easy. According to the Nielsen Media Research for the Radio Listenership Survey 2, 2003, 8.74 million Malaysians listen to AMP radios, this represents an average listener share of 45 per cent amongst all radio stations in Peninsular Malaysia.

Advertising Revenue and expenditure (ADEX) for Radio Stations

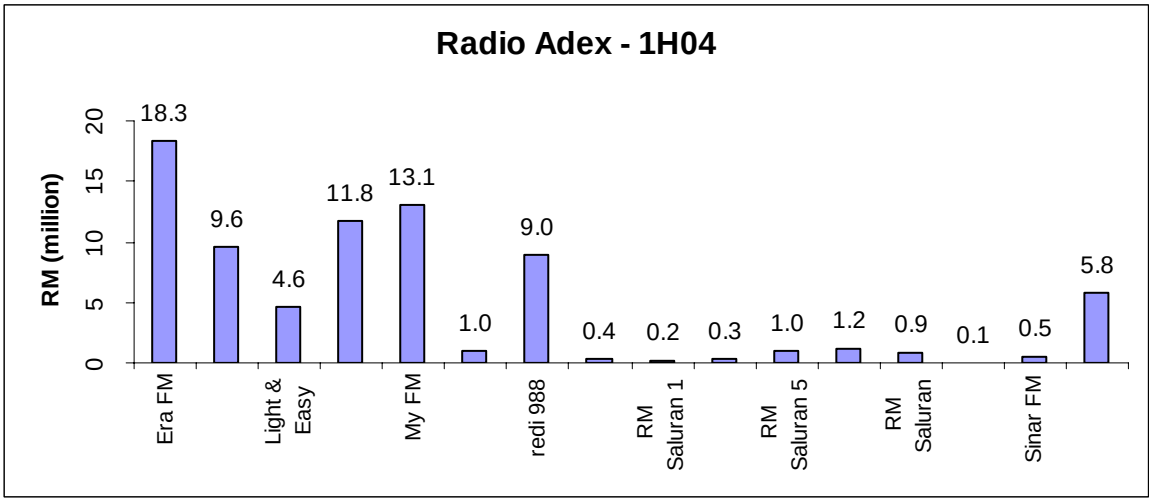


(Source: Nielsen Media Research for the Radio Listenership Survey 2, 2003)

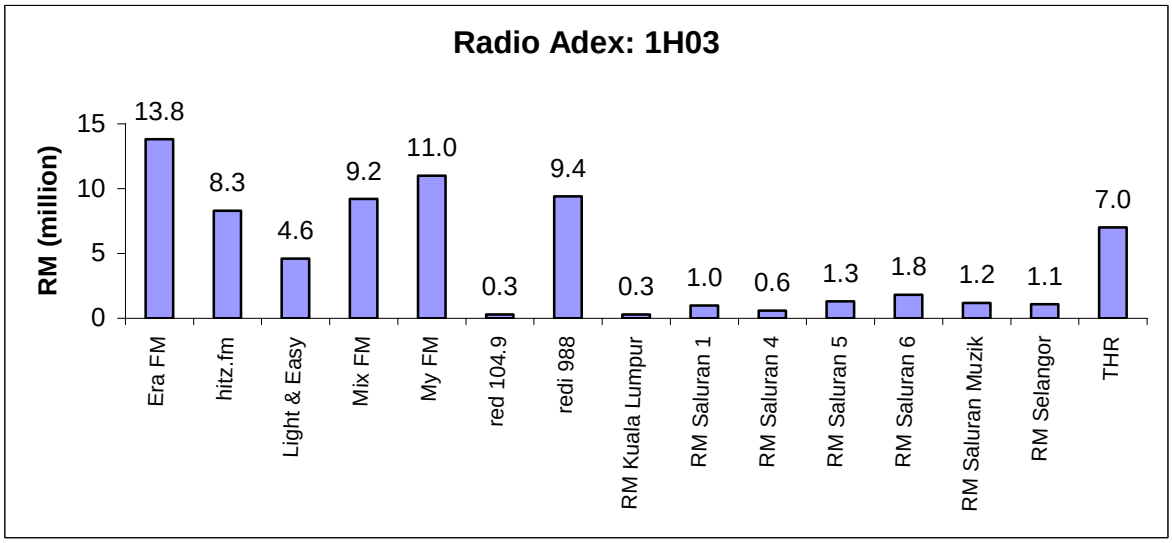
4 AMP radio stations hold 75% of the market share for radio adex for 1H04. This is a continued trend for the past few years.

5 Second largest market share holder, Radio Rediffussion stations recorded a RM10.0 million in adex revenue for the same period - only a slight increase of 3% from RM9.7 million for 1H03. In terms of market share, Rediffussion radio stations took only 13% market share despite its growing listenership for their English radio station.

6 Both RTM radio stations and THR radio station recorded lower radio adex revenue for the same period. RTM recorded only RM4.1 million, a drop of about 24% from RM5.4 million of last year. THR recorded RM5.8 million which is a 17% decrease from RM7.0 million of the previous half year. In terms of market share, RTM and THR radio stations commanded 5% and 7% respectively.



(Source: Nielsen Media Research for the Radio Listenership Survey 2, 2003)



(Source: Nielsen Media Research for the Radio Listenership Survey 2, 2003)

7 A predominantly Malay radio station, Era FM, remained the favourite radio station. Era FM captured advertisements worth RM18.3 million for 1H04, an increase of 33%. This is followed by My FM at RM13.1 million and Mix FM at RM11.8 million. Rediffussion radio station, red1049 recorded a healthy growth of 23% adex share from RM0.3 million in 1H03 to RM1.0 million for the period of first half of 2004. The radio industry looks well positioned in terms of success of formatted radios to gear ahead into a highly competitive DSB.

8 The current study of Wave VI of the consumer satisfaction study commissioned by MCMC on the other hand, shows that with the exception of Hitz Fm and My Fm, all other radio stations experienced a decline in Consumer Satisfaction Index (CSI) score. However, public radio stations secured the highest CSI score. The table below shows the decline of the CSI score from Wave V survey to Wave VI: (Note: The maximum score is 5).

Stations	Wave V	Wave VI	Difference
Radio 3	3.94	3.85	-0.09
Radio 5	3.83	3.84	+0.01
Hitz Fm	3.79	3.83	+0.04
My Fm	3.79	3.83	+0.04
Radio 6	3.87	3.82	-0.05
Radio Muzik	3.90	3.82	-0.08
THR	3.87	3.81	-0.06
Era	3.81	3.77	-0.04
Radio 1	3.74	3.72	-0.02
Mix Fm	3.72	3.69	-0.03

(Source: Consumer Satisfaction Study, Wave VI, MCMC)

9 Thereby in order to increase consumer satisfaction, Digital radio may provide the industry the opportunity to attract listeners through improved reception, better audio quality and a broader range of services. The introduction of DSB may see the rise in the consumer satisfaction index in future studies. The introduction of digital radio shall offer the commercial industry the opportunity to develop new revenue streams. These new revenue streams may include better advertising and sponsorship opportunities through program associated text and images, additional data services and the offer of subscription services.

10 The success of these radio stations have been largely been attributed to its programming format which caters to specific audiences. With Digital Sound Broadcasting, players will be best able to cater to such niche markets and licensee as players will no longer restrained/constrained by frequency limitations.

The radio industry looks well positioned in terms of success of the formatted radios to gear ahead into a highly competitive DSB services.

11 Having looked into the Malaysian radio broadcasting scenario, its adex and consumer satisfaction which shows growth from the year 2003 to first half of 2004 and decline is consumer satisfaction, the success of DSB is something that can be dream about. Consequently, in ensuring the success of the implementation of DSB in Malaysia, there should be greater co-operation between the industry players and viewers. As the initiative involves a significant number of the population, it is necessary that this transition is managed efficiently.

SOUND BROADCASTING UNDER CMA

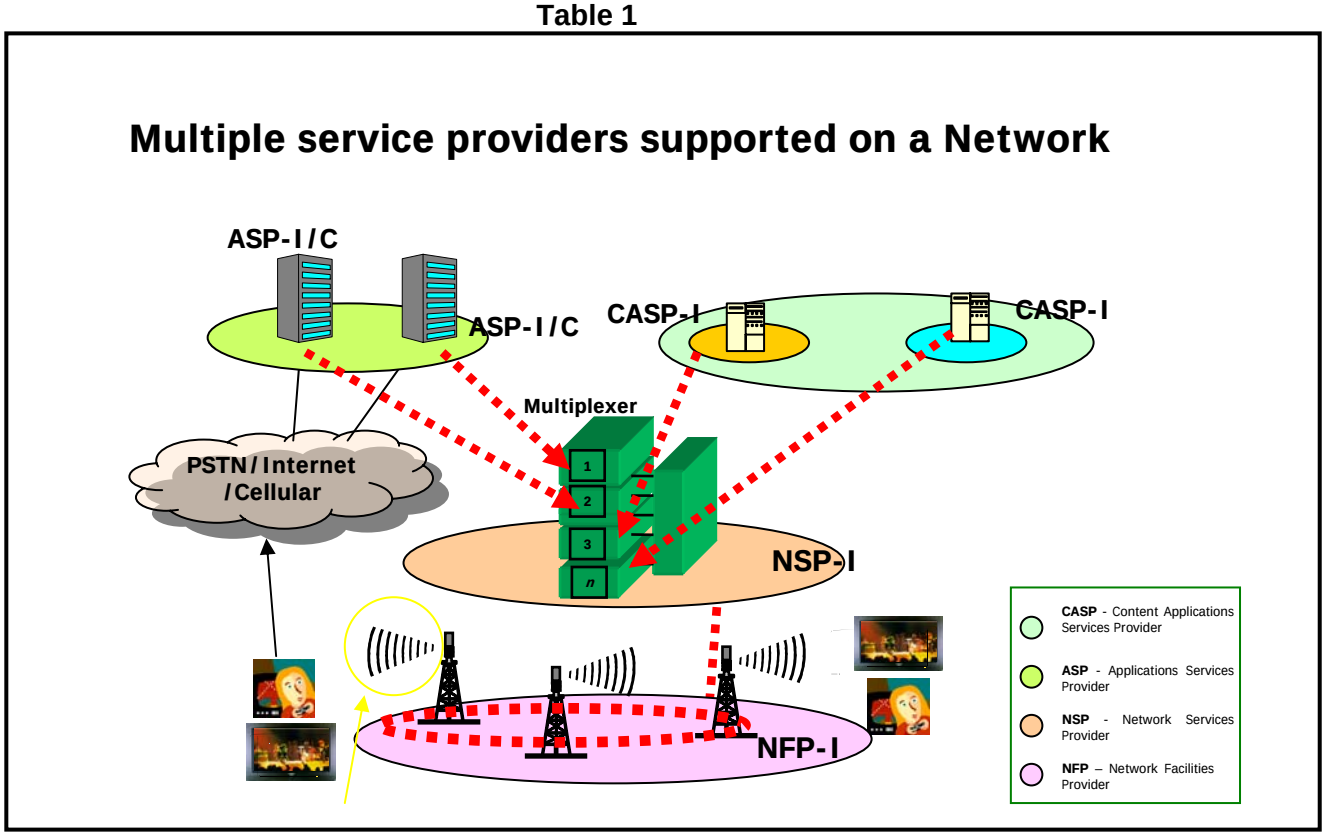
12 In Malaysia, sound broadcasters are individually licensed as Content Applications Service Provider (CASP(I)), whereby the activities require a higher level of control in terms of market entry and requires close regulatory supervision due to its pervasiveness and impact to the society.

13 Additionally, broadcasting ***distribution*** services are individually licensed as Network Service Provider (NSP(I))[1]. As an NSP(I) license holder, a company is allowed to provide ***carriage*** of broadcast signals. The physical infrastructure required for the **transmission** of broadcast signals are individually licensed as Network Facilities Provider (NFP(I)).

14 As the licensing framework under the CMA is technology-neutral, the transmission of digital channels will be the responsibility of the assignee of the spectrum and the broadcasters are responsible for the provision of broadcasting services or "audio programs". This arrangement has in fact been partly undertaken currently, whereby existing broadcasters use the facilities of a third party to transmit their programs. Table 1 below illustrates broadcasting activities' relevance in a converged environment :

[1] Please refer to Communications and Multimedia (Licensing) Regulations 2000.

Table 1



15 Analogue sound transmission is inefficient since it requires heavy use of scarce resources, i.e. spectrum. As such, it is pertinent for the MCMC to provide and manage the demand and challenges arising from the changing business environment. This, in part, prompts the MCMC to facilitate the transition from analogue to digital transmission.

16 In carrying out its role to facilitate a smooth transition from analogue to digital transmission, the Malaysian Communications and Multimedia Commission (MCMC) is guided by the Ten National Policy Objectives as set out in the CMA (please refer to ***Attachment A***). In particular, the following objectives are what the MCMC considers to be the relevant main drivers in implementing Digital Sound Broadcast in Malaysia:

(a) Upgrading network capabilities;

(b) Improving service quality and choice of services;

(c) Building capacity; and

(d) Managing resources efficiently.

DIGITAL SOUND BROADCASTING

What is Digital Sound Broadcasting?

17 Digital Sound Broadcasting (DSB), in the context of this Discussion Paper, refers to the transmission technology used to broadcast radio signals to the listeners. DSB brings significant improvements to listeners. Increasingly, systems that distribute data in digital form are capable of competing with or substituting for analogue radio in the provision of audio entertainment and information. Digital systems hold the promise of further improving the quality and ubiquity of radio, adding enhancements and expanding the range of services available.

18 Digital sound broadcasting provides the following significant quality to the listeners:

- **CD-like sound quality**
  With no more than a simple whip antenna, DSB users can enjoy pure undistorted sound quality.

- **Easy program selection**
  Rather than searching wavebands as present, users can select all available stations or preferred formats from a simple text menu.

- **Perfect reception**
  DSB eliminates interference and the problem of multi-path while in a car. It "blankets" wide geographical areas with an even, uninterrupted signal. Once full services are up and running, a driver will be able to cross an entire country staying tuned to the same station with no signal fade, without altering frequency.

- **One receiver does it all!**
  DSB is quite unique in that both music and data services will be received using the same receivers

- **Program-associated data**
  DSB broadcasts can display text information in far greater details than the RDS system, such as program background facts a menu of future broadcasts and complementary advertising information. Receivers attached to a small screen will display visual information as diverse as weather maps and CD cover images.

19 Other benefits of Digital Sound Broadcasting are due to digitalization. With DSB, information services from sources other than the broadcasting station are included within the same channel for the user to access at will. These include news headlines, detailed weather information or even the latest stock prices. Besides that, digital technology allows a massive amount of different information, thereby specific information user groups can be targeted with great accuracy because each receiver can be addressable.

20 It is also possible to access DSB services on a wide range of receiving equipment including fixed, mobile and portable radio receivers with displays or screens and even personal computers. Further more, DSB services will be available on terrestrial and satellite networks and the same receiver could be used to provide radio programmes and/or data services for national, regional, local and international coverage. DSB also allows broadcasters to provide a wide range of material simultaneously on the same frequency. This not only makes room for a vastly increased number of programs to increase user choice, but also has important broadcast cost-cutting implications.

Transmission

21 Unlike analogue Radio FM, which is transmitted in a form of continuous wave, digital sound (terrestrial) is transmitted in the form of bits of information. As such, digital sound (terrestrial) is considered superior to that of analogue transmission as it provides better sound quality, allows flexibility in programs, as well as maximizing the use of spectrum.

Reception

22 A listener will be able to receive Digital Sound programs via a fully integrated Digital Sound Receiver. Depending on the location and other physical factors, the listener can instantly receive DSB signals, much like the reception of existing analogue transmission.

DSB Standards

23 There are four (4) competing transmission standards being promoted worldwide for DSB services:

(a) Digital Audio Broadcast(DAB) or Eureka 147 – developed in Europe

(b) Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) – developed in Japan

(c) Digital Radio Mondial (DRM) – developed in Europe

(d) In-Band On Channel (IBOC) – developed in North America,

The information for the above standards is summarised in ***Attachment C.***

24 It is also worth noting that though the standards are different, they do not completely compete with each other as they operate at a different band as Table 2. Thus, it is possible for Malaysia to adopt more than one standard, but it is not advisable to adopt too many standards to avoid redundancy of resources.

Band / Standard	LF,MF,HF	VHF(FM)	VHF	UHF	UHF
DAB			X(Band III)		X (L Band)
ISDB-T			X(Band III)	X(Band IV & V)	
DRM	X				
IBOC	X	X(Band II)			

Table 2: Standards and their operating bands

Datacasting – Data Services over Digital Sound Broadcasting (DSB)

25 Apart from Audio services, DSB may be used to provide data casting services. A data casting service delivers content in the form of text, data, speech, music or other sounds or visual images (animated or otherwise), or in any combination of forms to persons having equipment to receive that service. Digital Radio Data casting allows data services to be transmitted in the available audio streams within the channels.

26 One of the most exciting aspects of digital radio is the opportunity to produce multimedia radio programs. It can deliver a range of new data services on a radio screen from identifying song titles and artists to scrolling local traffic, weather and news.

27 The data services can be categorized into two, **program associated data (PAD) and non-program associated data (N-PAD).**

28 **PAD** is data directly associated with the program. It may be data, which provides enhanced tuning facilities at the receiver or data that enhances the program in terms of additional background text or graphics related directly to the program

content. Examples of PAD are titles or lyrics of songs, names of stations or presenters, are transmitted together with the audio signals.

29 **N-PAD** is data that is not directly associated with the program itself, but conforms to a format set out in the transmission specification. Any suitably equipped receiver can use this data. The process could involve the transmission of text, graphics or other data.

30 It is N-PAD that there is the greatest scope of additional revenue streams, in providing added value for radio listeners as well as data transmission. Examples of Independent data services are traffic messages, paging, electronic newspapers are transmitted as separate services.

Multicasting

31 The DSB system permits a radio station to broadcast multiple audio programming services within its assigned channel.

32 Digital Radio is capable to air not only more music programming, but also public safety services (e.g., national security announcements), assisted living services (e.g., radio reading services), non-English language programming, and news services to underserved populations.

CONSIDERATIONS

PROVIDING COVERAGE

Spectrum Plan and Spectrum Use

33 The Malaysian Spectrum Plan[2] currently allocates the following bands for DSB (terrestrial) transmission:

(a) VHF Band III (174 – 230 MHz):

(b) UHF L-Band (1452 – 1492 MHz):

(c) LF,MF and HF Band (below 30 MHz):

(d) VHF Band II/Radio FM (87.5 – 108 MHz)

An extract of Frequency Allocation in 174.00MHz – 230.00MHz available in ***Attachment D*** and 1452 MHz – 1492 MHz is available in ***Attachment E***.

VHF Band III & UHF L-Band

34 Currently, analogue sound signals i.e. VHF Band II (Radio FM) is transmitted in band 87.5 MHz – 108.0 MHz, where the channels being heavily used throughout Malaysia. By nature, spectrum-intensive analogue terrestrial transmission requires high power to cover the widest possible coverage, which at times requires border coordination and heavy spectrum planning in order to reduce interference.

35 It is proposed that the DSB proceeds on the Band III initially due to four reason factors, namely:

a) Better propagation characteristics with improvements in penetration through buildings, at Band III compared to L-Band;

b) Larger coverage area achieved at Band III compared to L-Band;

c) Currently limited Band III spectrum is available, therefore it is important to allocate current available channels for DSB usage; and

d) With the larger service area achieved at band III, the network infrastructure cost are significantly reduced compared to projected network cost at L-Band;

[2] Table of Frequency Allocation, Malaysian Spectrum Plan, 2002 available from www.cmc.gov.my

36 Band III is currently allotted for analogue television transmission, including the transmission of NICAM stereo sound accompanying the Television picture. The DSB plan has been undertaken to ensure it will co-exist with the current analogue current assigned. One DSB channel consists of 1.536 MHz bandwidth. It is expected that some five to six audio services be multiplexed into the one DSB channel.

37 The proposed network can be best seen when viewed as a nationwide network covering the whole country. Each area has been divided up into transmission sections where DSB channels can be used to form a national network. This requires extensive use of single frequency reuse to maximize the use of the spectrum and make it possible to accommodate the new technology together with the existing television and radio services. In this type of network the same programme content has to be maintained throughout, otherwise the Single Frequency Network (SFN) network will not work and the listener will suffer interference.

38 At the same time certain blocks of DSB channel has been identified to be used as a Regional Network. This allows the customizing of the programmes for local content and different programming within an area. Because of the congested and sharing of spectrum there is still a need to utilize SFN within each area but between regions as interleaving spectrum allocation is sought.

Question A. Should MCMC make available a portion of the Band III "available" 32 channels immediately, or engage in "cleaning up" the Band and make them available in the immediate future? The respondents should take into considerations of the costs associated with "cleaning up" these channels.

Question B. What are the other factors that should be taken into consideration when deciding which channels are suitable for DSB services?

39 The detailed ***band plan*** for the proposed service is included in ***Attachment D*****.**

LF,MF and HF Band

40 In IEC Standards 62272 -1 describes as follows the frequency band used for broadcasting below 30 MHz:[3]

- Low frequency (LF) band - from 148.5 kHz to 283.5 kHz, in ITU Region 1 only;

[3] Malaysia is located in Region 3

- Medium frequency (MF) band - from 526.5 kHz to 1 606.5 kHz, in ITU Regions 1 and 3 and from 525 kHz to 1 705 kHz in ITU Region 2;
- High frequency (HF) bands - a set of individual broadcasting bands in the frequency range 2.3 MHz to 27 MHz, generally available on a worldwide basis.

41 Unlike the analogue VHF Band II (Radio FM), the MF and HF bands is less utilize by analogue broadcastings. There are still many available channels in these bands. Thus other than Band III and L-Band, these band stands to be other suitable bandwidth to introduce DSB.

42 In addition to the less utilize of the 3 bands, with proper considerations of digital power levels, analogue and digital signals can also "co-exist" in the same band.

VHF Band II (Radio FM)

43 The VHF Band II (Radio FM) is currently, being heavily used throughout Malaysia for analogue broadcasting. As stated above in the Background section, there are 13 licensees utilizing the VHF Band II.

44 Though heavily utilize for analogue sound broadcastings, VHF Band II can still be used for digital broadcastings. This is due to the capability of digital sound broadcasting technology that allows analogue and digital signals to "co-exist" in the same band.

> ***Question C.*** Should VHF Band II be left alone for analogue sound broadcasting or also be available for digital sound broadcastings?

Analogue Sound Transmission

Frequency Planning

45 The approach to frequency planning in terrestrial sound transmission (digital or analogue) is remarkably different from the methodology employed in mobile communications. Frequency planning for the allocation of channels to terrestrial sound transmission has been constrained by site locations and border co-ordinations and the available channels are few and limited in numbers. The planning has also been guided by the "widest possible coverage" principle, whereby a high power transmitter (kilowatts) will be located at high altitudes to cover the widest possible coverage.

46 Due to this, the coverage of a sound transmission may extend up to 80 km from the transmitter and the coverage could extend further, depending on the terrains

and varying environmental conditions. Consequently, there are problems of overspill signals across national boundaries. For example, coverage of a 5 kW VHF FM Radio transmitter located on top of Gunung Jerai in Kedah could extend up to Songkhla in Southern Thailand. Similarly, listeners in Penang could receive FM Radio signals from Southern Thailand. Thus, frequency planning and utilisation near border areas are coordinated with neighbouring countries to avoid interference.

Frequency Network

47 Due to the factors explained in the preceding paragraphs, the frequency network of an analogue broadcasting system has evolved to become Multiple Frequency Network (MFN), whereby a radio station operating in Kuala Lumpur will transmit its programs using various channels available to them nationwide. Significant planning is involved in Multiple Frequency Network whereby the transmission has to be planned to avoid signal interference with other broadcasters, as well as with neighbouring broadcasters. This has largely led to a collection of unusable channels in a certain area.

48 Depending on transmission standards, digital transmission allows the use of similar or same frequency channel (Single Frequency Network, or SFN) to transmit sound broadcast throughout a wide coverage area, or even nationwide. Careful planning would allow low power transmitters be installed using the same channel to provide coverage in dense and stratified housing areas – where it is currently a challenge in major cities like Kuala Lumpur.

49 Unlike analogue transmission where adjacent channels are often wasted in the same area of coverage, digital transmission also allows the use of these adjacent channels, thus maximizing the use of spectrum. Digital transmission also requires less distance between co-channel services than that of analogue services with the same coverage.

50 Theoretically, almost all the available channels in VHF Band III can be used for DSB. However, planning has to take into considerations of the following:

(a) Relocation of existing transmissions;

(b) Simulcasting of existing analogue broadcasts;

51 In addition to the above, ***strategic*** planning of the spectrum would have to consider the following:

(a) Maximizing spectrum use;

(b) Planning for future use of other channels in the bands; and

(c) Providing for stable use of services in the allocated channels.

Question D.

1. How would the proposed services (DSB and datacasting) be best served in the planning of broadcast network in Malaysia? Among the factors that will have to be considered by respondents are:

2. Would a nationwide SFN or MFN provide broadcasters the opportunity to improve its services, as well as new and innovative services such as datacasting?

3. How would a nationwide SFN or MFN assist the nation in migrating to DSB? This decision will, in a way, affect the planning and release of spectrum, and eventually the switch-off date for analogue radio.

4. Would a combination of nationwide SFN and regional MFN promote the development of nation-building, local content, regional innovation, and niche services? How would the listeners be best served eventually?

Transmission – Multiplex Operator

52 Unlike the analogue radio business model, whereby the broadcaster is involved from production, to programming and transmission, the business models in DSB allows for multiplex operator(s) to "assemble" the different audio channels and transmit it over the air.

53 In this scenario, CASPs will make the necessary arrangements with multiplex operator or operators. Multiplex operator's role itself is very important whereby it performs the function of a 'gatekeeper' allowing transmission of audio programs.

54 As indicated earlier, the converged licensing framework provided under the CMA is robust enough to cater for the above arrangements. In a DSB environment, a CASP will have the opportunity to leverage its production and programming expertise to provide the best service to the viewer, while the matters of transmission and coverage will be best taken by a NSP.

Question E. What are the factors that should be considered in promoting access to multiplexers? What are the criteria that should be taken into consideration in assessing the suitability of applicants?

Spectrum Assignment

55 The Communications and Multimedia (Spectrum) Regulations 2000 ("Spectrum Regulations") introduced Spectrum Assignment as a method of spectrum management. Under this concept, spectrum, which was previously managed wholly by the regulator, will be assigned to another party. The assigned party will then be responsible to maximize the use of the spectrum, either by employing all the services allocated under the spectrum, or to maximize the number of users in the specific services allocated in the most efficient way.

56 The Spectrum Regulations also provides the tools for which these spectrums could be assigned, which include assignment by way of tender, auction or fixed price[4].

57 On the other hand, Apparatus Assignment can also be used to allow use of transmission equipment to transmit broadcast signals. In an Apparatus Assignment environment, the MCMC will plan the use of the spectrum, which is later to be applied by operators on a yearly basis. Apparatus Assignment, then, allows for the MCMC as the regulator to determine the best possible coverage for transmission. However, this will require extensive planning and management on the part of the regulator, which might, or might not be able to respond to the demand from the industry.

Question F. What are the best methods in assigning this spectrum taking into consideration that the broadcasting industry has the responsibility to provide coverage and service to the Malaysian, without unduly increasing the cost or subsequently translating the cost to the consumer?

PROVIDING SERVICE

Business Model

58 There are two business models where Sound Broadcasters can provide services to listeners. They are free-to-air or by subscription.

[4] Please refer to Spectrum Regulations 2000.

59 Free-to-air model is listeners are free to listen to audio channels using digital sound receiver. Listeners just need to tune to the required frequency. Digital Sound Broadcasters will profit from advertisements placed by third parties. In digital broadcasting, advertisements could be in the form of audio and datacasting.

60 Subscription model is listeners are required to subscribe to the services by Digital Sound Broadcasters. Services could be in the form of audio and datacasting. Advertisement by third parties is none or limited.

> ***Question G.*** Should Sound Broadcasters Business Model be limited to Free-To-Air, subscription or both?

Cost Implications

61 The investment cost to implement DSB, in particular the provision of transmission systems will be similar to the analogue system. New system and equipment for DSB can largely be considered as replacement or upgrading cost. The additional cost that will be incurred by the service providers is on the multiplexers.

62 Physical rollout is expected to be minimal since existing transmitter locations can still be used. Additional sites may be required for pocket fillings as well as for extending the coverage areas throughout the nation.

63 Assuming that there are about 60 analogue transmitters, and the cost of each replacement is RM500,000, the cost to the industry in enabling digital transmission will be around RM30million, at the minimum.

> ***Question H.*** Will the investment (replacement and other upgrading equipment) cost affect the adoption of DSB?

Consumer Drivers

64 Most digital radio systems are promoted as providing improved reception, better audio quality, and a broader range of services including through program associated text and images, additional data services and the offer of subscription services. Different digital radio system have the potential to compete effectively in most or all of the key areas of consumer value, however, no digital system has yet

met all of these criteria. A number of key drivers receiving attention in major digital radio markets around the world. They are:

a) Unique-to-digital services

65 A number of European studies conducted in recent years have found at least a limited number of new and exclusive digital radio channels would be essential for a successful rollout of digital radio

66 In 2003, one European Commission report recommended the subsidization of digital-only channel as a means to improve the relative benefit to consumers from paying the premium for a digital receiver.

67 This view is supported by a recent survey conducted by the Digital Radio Development Bureau in the UK, which found that 80 percent of consumers who purchased digital radios did so listen to the new digital-only services launched by both the BBC and commercial sector.

68 In the UK, a listener has access to around 12-15 analogue services or on average, around 35-40 digital radio services. Many of these are unique-to-digital services which appear to target niche audiences, such as the Oneword station, broadcasting books, plays and comedy programs; PrimeTime, targeting an older generation of listeners; and Purple Radio which is aimed at the gay and lesbian community.

69 In the US, consumer take up of subscription satellite digital radio has been reasonably strong, probably in part due to the availability of a large number of niche and themes services.

Question I. *Should audio content for DSB be limited to new digital- only services or an 'enhancement' of existing analogue services?*

Question J. *What sort of policy and regulatory incentives that Government should provide to encourage provision of new digital -only services?*

b) Price of digital radio receivers

70 The price of digital radio receivers is the key challenge for the rapid consumers take up of digital radio. A European survey of the market potential for digital radio receivers found that, even among the most interested consumers, the most they were willing to pay for a digital radio receiver was a 55 per cent premium on the

price of an analogue radio. The more sophisticated the features and functions of the receiver, the more consumers were prepared to pay. With the most basic and least expensive digital radio receivers on the European market still many times the price of a low-cost analogue receiver, it would appear there remains a considerable mismatch between the price of receivers and consumers willingness to pay.

71 On the other hand, the introduction of a 'low-cost' 99 franc digital radio receiver in December 2002 almost doubled the numbers of digital radio receivers in the UK. The receiver in question, the Pure Evoke-1, was a very basic Eureka 147 receiver. Even at this price, the receiver still cost many times the price of a basic analogue.

Question K. *Who are the potential suppliers of receivers currently in the country (are they any)?* What incentives should be considered in facilitating the production of digital radio receivers locally?

Question L. What is the estimated price in Malaysia? What is the ideal price for consumers?

72 Alliances with the automobile manufacturers to install digital radio receivers in new vehicles have been another strategy employed to address the issues of receiver price. For consumers, the psychological threshold for buying a relatively expensive digital radio receiver is much lower if the price is built into the cost of a new car.

c) Data Services

73 Consumers have expressed strong demand for data services, particularly in the form of local information, including news, weather and traffic condition updates. However, a number of governments (in countries that have adopted the Eureka system) have imposed limits of the amount of multiplex capacity that can be allotted to data services. For e.g., in the UK, multiplexes are limited to utilizing 10 percent of multiplex capacity to provide program related data services, while an additional 10 per cent is allowed for the delivery of non-program related ancillary data services.

74 The substantial variation in laws regulating the delivery of data services across EU could create problems for broadcasters and manufacturers in terms of coordination of content and hardware and in the variation in data capability of receivers across markets.

Question M. Can non-broadcasters offer data casting services? We seek comment if spectrum space can be allocated to non-broadcasters who will be allowed to deliver data casting but no commercial quality broadcasting content.

Question N. Should there be limits on the percentage of capacity or bandwidth to be utilized for data services? If so, what should be the percentage be?

d) Consumer awareness

75 Of critical importance to the rapid take up of digital radio is the issue of consumer awareness and consumer confidence. Recognizing the importance of this, a number of jurisdictions impose requirements on multiplex operators to promote the take up of digital radio to consumers. These requirements take the form of license conditions in Germany, the UK, and Spain.

76 Further to these regulatory requirements, it is clearly in the industry's interest to facilitate rapid take up of digital radio by promoting the benefits to consumers and broadcasters alike. Consequently, organizations focused on promoting the technology have been established in most countries that have implemented digital radio. For example, the German consumer electronics manufacturers' association established the 'Initiative Marketing Digital Radio' (IMDR) in 2001. IMDR aims to improve receiver penetration through co-operation with broadcasters and the automobile industry. It is funded for 3 years by the network operators and a number of major receiver manufacturers.

77 Digital Radio Roll-Out Inc. (DRRI) with the support of the Canadian Government manages the marketing of digital radio in Canada. DRRI is a non-profit joint initiative of major private broadcasters (CBC and Canada). It was established by government funding of $CDN 1 million which was subsequently matched by the industry. The DRDB aims to promote and encourage take up of digital radio in the UK. It is funded by both the BBC and the commercial multiplex operators. The DRDB provides consistent marketing message to broadcasters, support for retailers and coordinates 'hands on' demonstrations of digital radio for consumers.

Question O. Should players be subject to certain duties or obligations to educate or create awareness of DSB? What role should the Government play in this regard?

e) Audio quality

78 The particular audio compression standard employed and the bit rate allocated to a particular service largely determine the perceived audio quality. Generally speaking, a higher bit rate provides better audio quality but a lower bit rate allows for more services to be accommodated in a given amount of spectrum. A number of countries have regulated minimum bit rates for music and speech services respectively. For example, in the UK, the Radio Authority has mandated minimum bit rates for services; at *128kbits/s for music stations and 64 kits/s for speech stations.* The Radio Authority expects that these minimum rates will be lowered over time due to anticipated improvements in audio coding technology.

Question P. Apart from the factors identified above, what are the other key drivers that will influence the take-up rate of DSB in Malaysia?

Question Q. What incentives should the government provide to foster and promote this growth?

Question R. Should the government mandate QoS with respect to the provision of DSB or should this be left to market forces?

MANAGING DIGITAL TRANSITION

Standards Development -Transmission

79 As early as 1999, MCMC has tasked various Working Groups to ensure development of standards and other technical matters pertinent to the industry and the consumer. Members of the Working Groups comprise the players in the industry, as well as academicians and those who represent the consumer.

80 In this regard, Working Group 8 (WG8) was formed to initiate a trial and to recommend a Digital Sound Broadcast standard to be adopted in Malaysia. The WG8, has proposed Eureka 147 DAB standard as the DSB standard in Malaysia.

81 The DAB is planned for digital migration of the analogue VHF Band II/Radio FM. The digital migration for the AM bands was not discussed by the WG8 though there are ample spectrum resources in AM bands. Thus, Digital Radio Mondial (DRM) was mentioned in the MCMC's Strategies Issues on Spectrum Usage 2002, for the digital migration of the AM bands.

82 However, it is not within the scope of this Discussion Paper to elaborate the advantages and disadvantages of a specific standard for Digital Terrestrial Sound Broadcast.

Standards Development – Consumers Equipment

83 In addition to determine a uniform transmission standards, it is also viewed that it is necessary to determine a uniform digital receiver standards to promote early take-up and minimize costs

84 Further, it is imperative that listeners are not unnecessarily burdened with the complexities of installing the digital receivers. Solutions should include 'plug-and-play' receivers inclusive of relevant aerial types.

> ***Question S.*** In addition to the above, what are other issues regarding standards and access that should be considered by the MCMC?

Simulcast

85 The approach to DSB will depend largely on the consumer uptake in receiving digital transmission, availability of digital transmission in the area, as well as other industry and consumer factors.

86 In order to prepare for this migration, existing broadcasters are expected to simulcast their programs both in analogue and digital. Simulcasting will commence as soon as digital broadcasting is launched and will continue, depending on the analogue shut-down date. This phasing out period will have to take into consideration the roll-out of digital radio network across the nation and the propensity of listeners to acquire digital radio sets.

87 Taking into consideration that existing broadcasters and the improvement of the quality of their transmission, it will be more economical and less disruptive to the listeners for the simulcast to be done in phases. However, in identified areas where transmission quality is below expectation, the industry could consider transmitting in digital.

Analogue Switch off

88 From spectrum planning perspective, analogue radio transmission will be **phased out starting 2008.** The process of shutting down analogue transmission is expected to be gradual, and will be completed on December 31, 2015, or until at least 90% of the population has switched over to digital radio.

89 In order to facilitate this, the MCMC is of the opinion that no further investment in analogue transmission should be allowed once the spectrum is assigned. This would mean that all new investment for transmission of broadcasting service should be for digital transmission devices.

90 The phasing out of analogue transmission can also be done according to region. It is most likely that analogue transmission will cease its transmission in identified urban areas, for example, Kuala Lumpur and Penang, followed by other areas. This "ripple effect" could make the transition less disruptive to both the industry and the consumer.

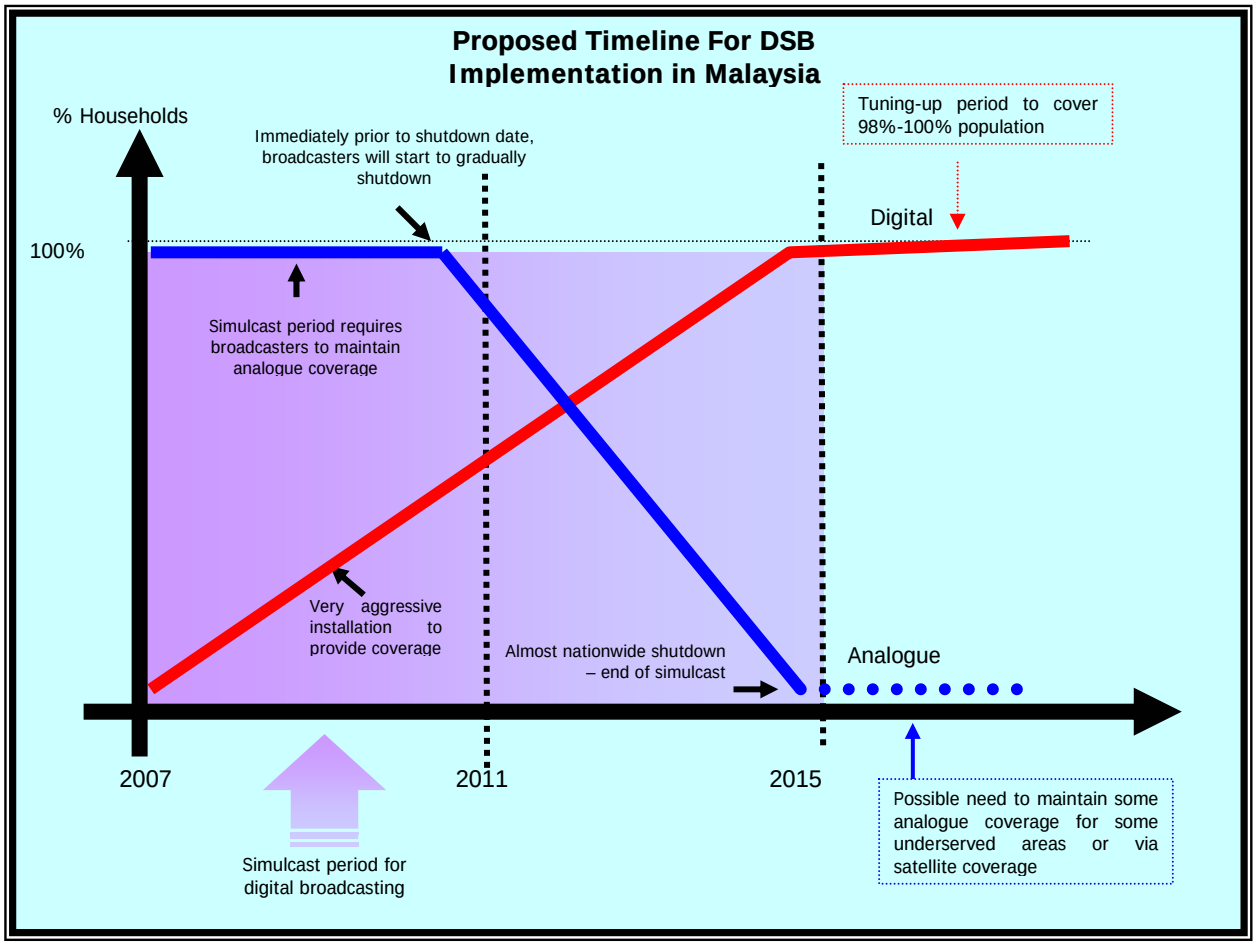
Question T. Do you agree with the statements in Paragraphs 85, 86, and 87 above, and why?

Question U. Will the setting of the date of analogue shut down facilitate, or even accelerate digital radio take up? Should the MCMC take the position that providing digital coverage is more important than setting the analogue switch off? Other than the above, as well as the availability and affordability of digital sound receivers and the success of simulcast, what are other important factors that the MCMC should take into consideration in determining the appropriate measures to ensure a smooth transition and uptake of digital radio?

PROPOSED TIME LINE FOR DSB IMPLEMENTATION

91 This Discussion Paper serves to gauge the level of readiness of the industry and the public, as well as to assess the relevant factors in determining the policy approach and the principles in implementing Digital Sound Broadcast in Malaysia. The following table summarizes the timeline for DSB implementation:

Table 4



92 The above timeline strives to balance the needs to provide a comprehensive digital broadcasting network while allowing for a calculated approach toward reducing analogue coverage. Building an extensive coverage does not necessarily guarantee take-up, however, it allows for the network experiment, as well as relieves the "chicken-and-egg" situation.

93 The MCMC also envisages a period of simulcasting, whereby existing analogue transmission will be required to be simulcasted together with digital transmission. As the MCMC is aware of the costs associated with simulcasting, as well as taking into consideration of the need to encourage take up, it is of the opinion that this requirement should not be necessarily prolonged than envisaged. Thus, it is expected that all analogue transmission will cease on December 31, 2015.

Question V. The MCMC seeks comment on the above-proposed timeline for the implementation of Digital Sound Broadcast in Malaysia.

/end

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

AAC Advanced Audio Coding
ADEX Advertising Expenditure
ASP Application Service Provider license
CASP(I) Content Application Service Provider (Individual) license
CELP Code Excited Linear Prediction
CMA Communications & Multimedia Act 1998
COFDM Coded Orthogonal Frequency Division Multiplex
CSI Consumers Satisfaction Index
DAB Digital Audio Broadcast standard or Eureka 147
DiBEG Digital Broadcasting Experts Group
DRM Digital Radio Mondial standard
DSB Digital Sound Broadcasting
DQPSK Differential Quaternary Phase Shift Keying
ETSI European Telecommunications Standards Institute
EU European Union
FIC Fast information Channel
FM Frequency Modulation
HF High Frequency
HTML HyperText Mark-up Language
HVXC Harmonic Vector eXcitation Coding
IBOC In-Band On Channel standard
IEC International Electrotechnical Commission
ISDB-T Integrated Services Digital Broadcasting – Terrestrial standard
ISO International Organization for Standardization
ITU International Telecommunication Union
ITU-R International Telecommunication Union – Radio
JPEG Joint Photographic Expert Group
LF Low Frequency
LSI Large Scale Integration
MCMC Malaysian Communications & Multimedia Commission
MF Medium Frequency
MFN Multiple Frequency Network
MPEG Moving Picture Experts Group
N-PAD Non- Programming Associated Data
NFP(I) Network Facilities Provider (Individual) license
NICAM Near Instantaneous Companded Audio Multiplex
NSP(I) Network Service Provide (Individual) license
OFDM Orthogonal Frequency Division Multiplex
OSI Open System Interconnection
PAD Programming Associated Data
PS Parametric Stereo
QAM Quadrature Amplitude Modulation
QoS Quality of Service
QPSK Quaternary Phase Shift Keying
RDI Radio Data Interface
RF Radio Frequency
RTM Radio Television Malaysia
SBR Spectral Band Replication
SFN Single Frequency Network
TTC Japanese Telecommunications Technology Council
UHF Ultra High Frequency
UK United Kingdom
VGA Video Graphic Array
VHF Very High Frequency
WG8 Work Group 8

ATTACHMENT A

SECTION 3 OF THE COMMUNICATIONS AND MULTIMEDIA ACT 1998

NATIONAL POLICY OBJECTIVES FOR THE COMMUNICATIONS AND MULTIMEDIA INDUSTRY

1. to establish Malaysia as a major global centre and hub for communications and multimedia information and content services;

2. to promote a civil society where information-based services will provide the basis of continuing enhancements to quality of work and life;

3. to grow and nurture local information resources and cultural representation that facilitates the national identity and global diversity;

4. to regulate for the long-term benefit of the end user;

5. to promote a high level of consumer confidence in service delivery from the industry;

6. to ensure an equitable provision of affordable services over ubiquitous national infrastructure;

7. to create a robust applications environment for end users;

8. to facilitate the efficient allocation of resources such as skilled labour, capital, knowledge and national assets;

9. to promote the development of capabilities and skills within Malaysia's convergence industries; and

10. to ensure information security and network reliability and integrity.

ATTACHMENT B

Licensees & Radio Stations

No.	Licensee	Radio Station
1.	Maestra Broadcast Sdn. Bhd.	Era Radio – services in BM MIX FM – services in English XFresh- services in BM and English
2.	Measat Radio Communication Sdn. Bhd.	HITZ FM- services in English MY FM- services in Mandarin and Cantonese Light & Easy-services in English
3.	Perfect Excellence Waves Sdn. Bhd.	Sinar FM-services in BM
4.	Radio Lebuhraya Sdn. Bhd.	THR.FM-services in BM
5.	Husa Network Sdn. Bhd.	Manis.fm- services 60% in BM & 40% other languages. (Transmission in Kelantan, Terengganu and Pahang)
6.	Kristal Harta Sdn. Bhd.	CATZ Radio-services 60% BM (including dialects) & 40% other languages (Transmission in Sarawak)
7.	Suara Johor Sdn. Bhd	Best 10.4- services 60% in BM (including dialects) & 40% other languages
8.	Star RFM Sdn Bhd	Red 98.8- services in Chinese language Red 104.9- services in English
9.	Synchrosound Studios Sdn. Bhd.	WA.FM 976- services in Chinese language
10.	Institut Kefahaman Islam Malaysia	IKIM. FM-services in BM

ATTACHMENT C

Information on the Four Standards for Digital Sound Broadcasts (DSB)

	Eureka 147 DAB	ISDB-T	DRM	IBOC
Operating Frequency	VHF Band III, UHF L Band	VHF Band III, UHF Band IV & V	Broadcastings band below 30Mhz	Broadcastings band below 30Mhz and VHF Band II (Radio FM)
Bandwidth per channel	1.536 MHz	500kHz or 1.5 MHz	4.5, 5,9,10,18,20 kHz	20kHz
Range of audio quality and types of reception	Range is from 8 to 384 kbit/s per audio channel in increments of 8 kbit/s. MPEG-2 Layer II audio decoder typically operating at 192 kbit/s is implemented in receivers. The system is intended for vehicular, portable and fixed reception	Range is from phone quality to CD quality. It is also capable of 5.1 multi-channel audio. MPEG-2 advanced audio coding (AAC) decoder typically operates at 144 kbit/s for stereo. The system is intended for vehicular, portable and fixed reception	Range from 8 kbit/s (half channels) to 20 kbit/s (standard channels) to up to 72 kbit/s (double channels). MPEG4 AAC, MPEG4 CELP, HVXC, Spectral Band Replication (SBR) and Parametric Stereo (PS), The system is intended for vehicular, portable and fixed reception	Range is from 48 kbit/s to 96 kbit/s using the MPEG-2 AAC decoder. The system is intended for vehicular(1), portable and fixed reception
Carrier modulation	Differential quaternary phase shift keying (DQPSK) OFDM	DQPSK, QPSK, 16-QAM, 64-QAM, coding rate: 1/2, 2/3, 3/4, 5/6, 7/8	4-QAM, 16-QAM, 64-QAM	DQPSK, QPSK, 16-QAM, 64-QAM
Performance in multipath and shadowing environments	System is especially designed for multipath operation. It works on the basis of a power summation of echoes falling within a given time interval. This feature allows use of on-channel repeaters to cover terrain shadowed areas	System is especially designed for multipath environment. It works on the basis of a power summation of echoes falling within a given time interval. This feature allows the use of on-channel repeaters to cover terrain shadowed areas	System is especially designed for multipath operation. It is COFDM modulated thereby achieving a high degree of performance in multipath. This feature allows the use of on-channel repeaters to cover terrain shadowed areas	System is especially designed for multipath operation. It is OFDM modulated thereby achieving a high degree of performance in multipath. This feature allows the use of on-channel repeaters to cover terrain shadowed areas

ATTACHMENT C (*CONTINUED)*

	Eureka 147 DAB	**ISDB-T**	**DRM**	**IBOC**
Service coverage	Allows local, subnational and national terrestrial services with the same modulation with single transmitter or multiple transmitters operating in a single frequency network to take advantage of a common receiver.	Allows local, subnational and national terrestrial services with the same modulation with a single transmitter or multiple transmitters operating in a single frequency network to take advantage of a common receiver.	Allows local, subnational and national terrestrial services with the same modulation with a single transmitter or multiple transmitters operating in a single frequency network to take advantage of a common receiver.	System uses common antenna and front end that is compatible with existing analogue FM broadcast services for Radio FM band. Allows for local service as well as subnational and national terrestrial services with a single transmitter or multiple transmitters operating in a single frequency network in the case of the digital portion of the hybrid mode or the all digital mode. Allows for common delivery of FM programming that makes a seamless transition from digital to analogue and back.
Flexible assignment of services	The multiplex can be dynamically re-configured in a fashion transparent to the user	The multiplex can be dynamically re-configured in a fashion transparent to the user	The multiplex can be dynamically re-configured in a fashion transparent to the user	The system automatically reconfigures between audio and data in a fashion transparent to user
Compatibility of multiplex structure with open system interconnection (OSI)	The system multiplex structure is compliant with the OSI layered model, especially for the data channels, except for the unequal error protection features of the MPEG-2 Layer II audio channel	The system multiplex structure is fully compliant with MPEG-2 systems architecture	The system multiplex structure is fully compliant with MPEG-4 systems architecture	The system is based on an OSI layered model including both data and audio except for the unique error protection afforded the audio codec

ATTACHMENT C (*CONTINUED)*

	Eureka 147 DAB	**ISDB-T**	**DRM**	**IBOC**
Programme-associated data (PAD) capability	PAD channel from 0.66 kbit/s to 64 kbit/s capacity is available through a reduction of any audio channel by the corresponding amount. Dynamic label for programme and service identification showing only receiver alphanu-meric display is available to all receivers. Basic hypertext mark-up language (HTML) decoding and Joint Photographic Experts Group (JPEG) picture decoding is available on receivers with graphic displays (1/4 video graphic array (VGA)), etc.	PAD multiplexing is based on MPEG-2 systems	PAD multiplexing is based on MPEG-4 systems	PAD is an integral part of the system and can be provided through opportunistic data without any reduction of audio quality or data channels. Dynamic label for programme and service identification showing on any receiver alphanumeric display is available to all receivers
International Recognition	ETSI ETS 300 401 ITU-R Recommendation BS1114-5 ITU-R Recommendation BS1660	Digital Broadcasting Experts Group (DiBEG) developed Standard Japanese Telecommunications Technology Council (TTC) Approved ITU-R Recommendation BS1114-5	IEC 62272-1 ETSI ES 201 980 ETSI TS 101 980 ITU-R Recommendation BS1514-1	FCC Approved ITU-R Recommendation BS1514-1

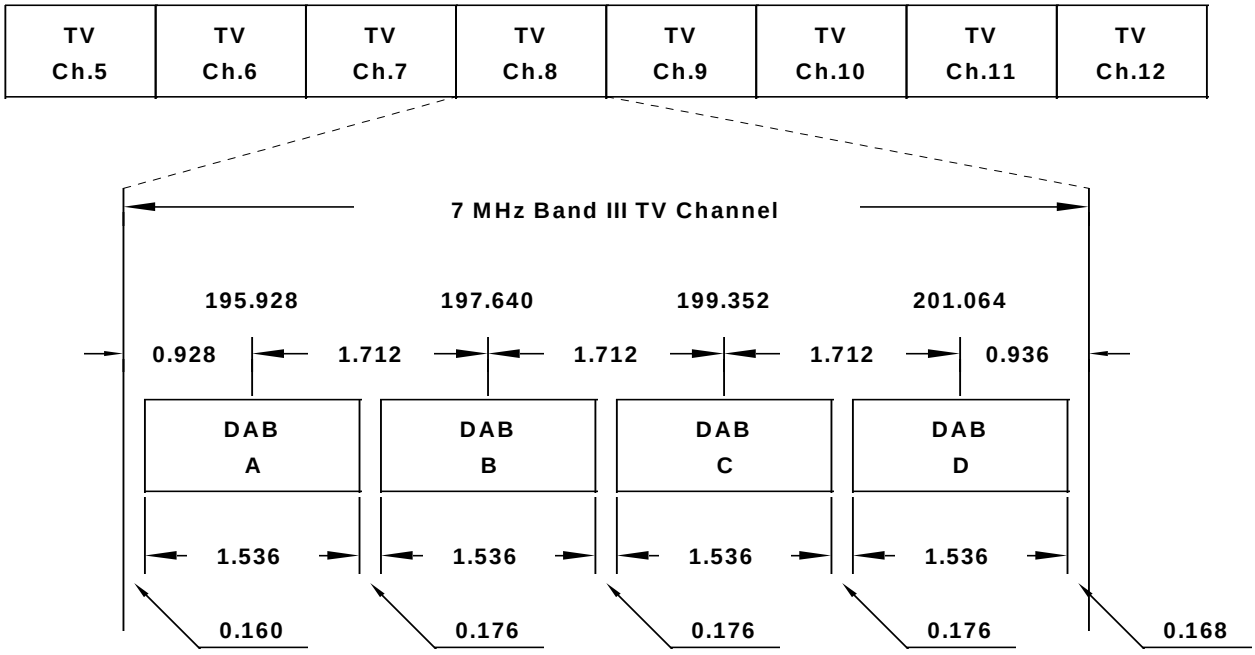
ATTACHMENT C (*END*)

	Eureka 147 DAB	ISDB-T	DRM	IBOC
Value-added data capability	Any sub-channel (out of 64) not used for audio can be used for programme-independent data services. Data packet channels for high priority services available to all receivers tuned to any service of the multi-plex can be carried in the fast information channel (FIC). Total capacity is up to 16 kbit/s. Receivers are equipped with a radio data interface (RDI) for data transfer to a computer	Capacity at any rate up to the full payload capacity can be assigned to independent data for the delivery of business data, paging, still pictures graphics, etc. under conditional access control if desired	Capacity at any rate up to the full payload capacity can be assigned to independent data for the delivery of business data, paging, still pictures graphics, etc. under conditional access control if desired	Capacity at any rate up to the full payload capacity can be assigned to independent data for the delivery of business data, paging still pictures graphics, etc. under conditional access control if desired
Receiver low-cost manufacturing	Allows for mass-production manufacturing and low-cost consumer receivers. Typical receivers have been integrated in two chips. One chip manufacturer has integrated the full receiver circuitry into one chip	The system was specifically optimized to enable an initial low complexity vehicular receiver deployment. Standardization group has been established to achieve low cost receivers based on large scale integration (LSI) mass production techniques	The system requires the software for DRM Decode/ demodulated audio and receiver module to be attach to a PC for reception. Customers in possession of DRM capable equipment need to purchase a licence and download the software from the DRMRX web site.	The system was specifically optimized to enable an initial low complexity vehicular receiver deployment
Available broadcastings	Over 30 countries, throughout the world	Japan	>60 broadcasters	40 Markets(US)

(1)The modes implemented in the in-band on-channel (IBOC) chipset do not support vehicular operation at frequencies above 230 MHz.

ATTACHMENT D

Digital Sound Broadcast (DSB) Channelling Plan
in the VHF Band III (174 - 230 MHz)
Sharing with Television Channels



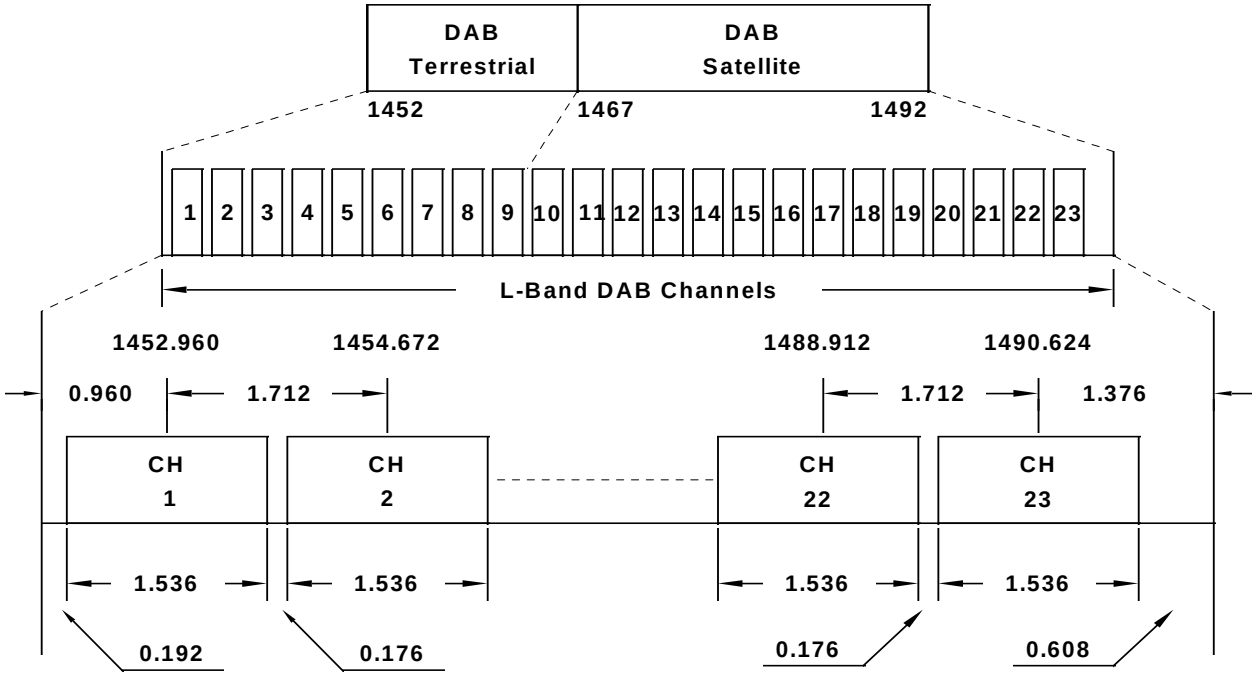
DIGITAL SOUND BROADCAST (DSB)
BAND III CHANNELLING PLAN

DSB Channel bandwidth = 1.536 MHz
Guard band between channels = 0.176 MHz
Lower Guard band of Channel A= 0.160 MHz
Upper Guard band of Channel D= 0.168 MHz

TV Channel No. (Band III)	DAB Channel Centre Frequency			
	A	B	C	D
5 (174-181 MHz)	174.928	176.640	178.352	180.064
6 (181-188 MHz)	181.928	183.640	185.352	187.064
7 (188-195 MHz)	188.928	190.640	192.352	194.064
8 (195-202 MHz)	195.928	197.640	199.352	201.064
9 (202-209 MHz)	202.928	204.640	206.352	208.064
10 (209-216 MHz)	209.928	211.640	213.352	215.064
11 (216-223 MHz)	216.928	218.640	220.352	222.064
12 (223-230 MHz)	223.928	225.640	227.352	229.064

ATTACHMENT E

Digital Audio Broadcast (DAB) Channelling Plan
in the L-Band (1452 - 1492 MHz)



DIGITAL SOUND BROADCAST (DSB) L-BAND CHANNELLING PLAN DSB Channel bandwidth = 1.536 MHz Guard band between channels = 0.176 MHz Lower Guard band = 0.192 MHz Upper Guard band = 0.608 MHz	
DSB - T Channels	
(1452 - 1467 MHz)	
Channel No.	Centre Frequency
1	1452.960
2	1454.672
3	1456.384
4	1458.096
5	1459.808
6	1461.520
7	1463.232
8	1464.944
9	1466.656