

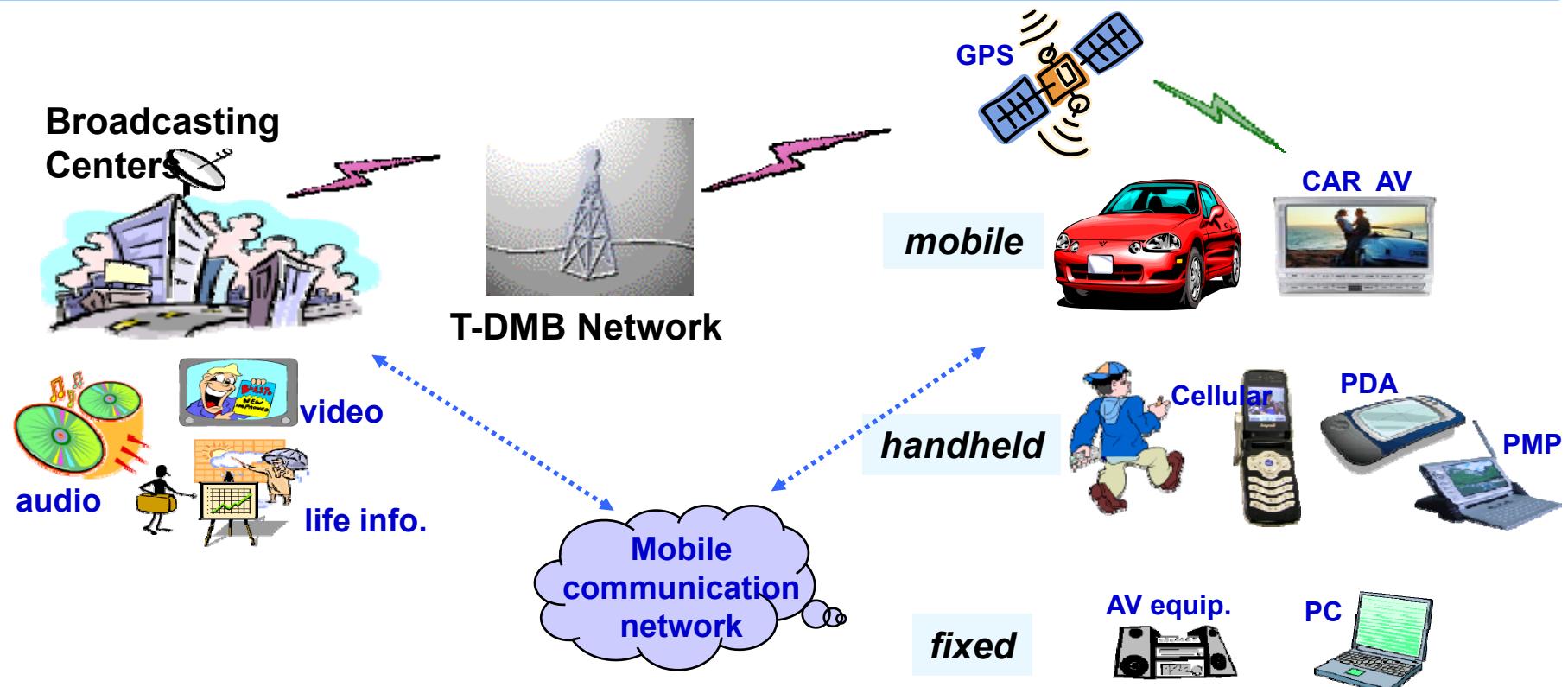
I

## Overview of T-DMB

# What is T-DMB?

***Video standard extension of Digital Audio Broadcasting (DAB)***

- Fully compatible with Eureka-147
- Provides video and data services as well as CD-quality audio service



# T-DMB Features



**Mobile**

**Mobile multimedia broadcasting services**

- *anytime, anywhere with any devices*



**Personal**

**Personalized services by handheld receivers**

- *Mobile phone, PDA, Notebook PC, PMP, etc.*



**Interactive**

**Bi-directional interactive services linked with mobile communication networks**

- *TTI, PPV, on-line shopping, internet access, etc.*

**Personal Mobile Interactive Multimedia Broadcasting Services**

TTI : Traffic and Travel Information,    PPV: Pay Per View

# Design Concept of T-DMB(1)

- Design Concept of Eureka-147 DAB system
  - ◆ Mobile, portable and fixed reception
  - ◆ Power efficient transmission network planning
  - ◆ SFN network
  - 👉 *Adoption of DAB system*
  
- Based on Eureka-147 DAB System
  - ◆ Upgrade Eureka-147 DAB to provide video service as well as audio service

# Design Concept of T-DMB(2)

- Stable service in mobile, portable and fixed reception
  - ◆ Adoption of transmission mode I of Eureka-147
  - ◆ Video : CIF resolution(352x288)
  - ◆ Audio : CD quality
- Cheap service charges
  - ◆ Less transmitters for T-DMB service and SFN installation
  - ◆ Service price becomes low !
- Cheap receiver price
  - ◆ T-DMB receiver structure is simple
  - ◆ Receiver price becomes low !

# Eureka-147 DAB Parameters

Signal		<b>COFDM</b>			
Modulation		DQPSK			
Channel Coding		Convolutional : variable rate, constraint length = 7			
Time Interleaving	ms	Depth = 384			
Frequency Interleaving	MHz	Width = 1.536			
Effective Data Rate	Mbps	<b>0.8 ~ 1.7 Mbps</b>			
System Bandwidth	MHz	<b>1.536 MHz</b>			
Transmission Mode		I	II	III	IV
Application		<b>Terrestrial (SFN)</b>	Terrestrial /Satellite	Terrestrial /Satellite	Terrestrial /Satellite
Frequency Band	GHz	< 0.375	< 1.5	< 3	< 1.5
Sub carriers		1,536	384	192	768
Sub carrier interval	KHz	1	4	8	2
Guard interval	μs	246	62	31	123
Symbol length	μs	1,000	250	125	500
Frame length	ms	96	24	24	48

# T-DMB Frequency Allocation

## T-DMB Frequency Band in Korea

Band	VHF			UHF	
Allocation	TV (ch. 2~4)	TV (ch. 5~6)	FM Radio	TV / T-DMB (ch. 7~13)	TV (ch. 14~60)
Frequency (MHz)	54~72	76~88	88~108	174~216	470~752

Seoul  
Metropolitan

Allocation of 12MHz (ch.8 & ch.12)

→ 6 broadcasters (Dec. 2005)

Local Province

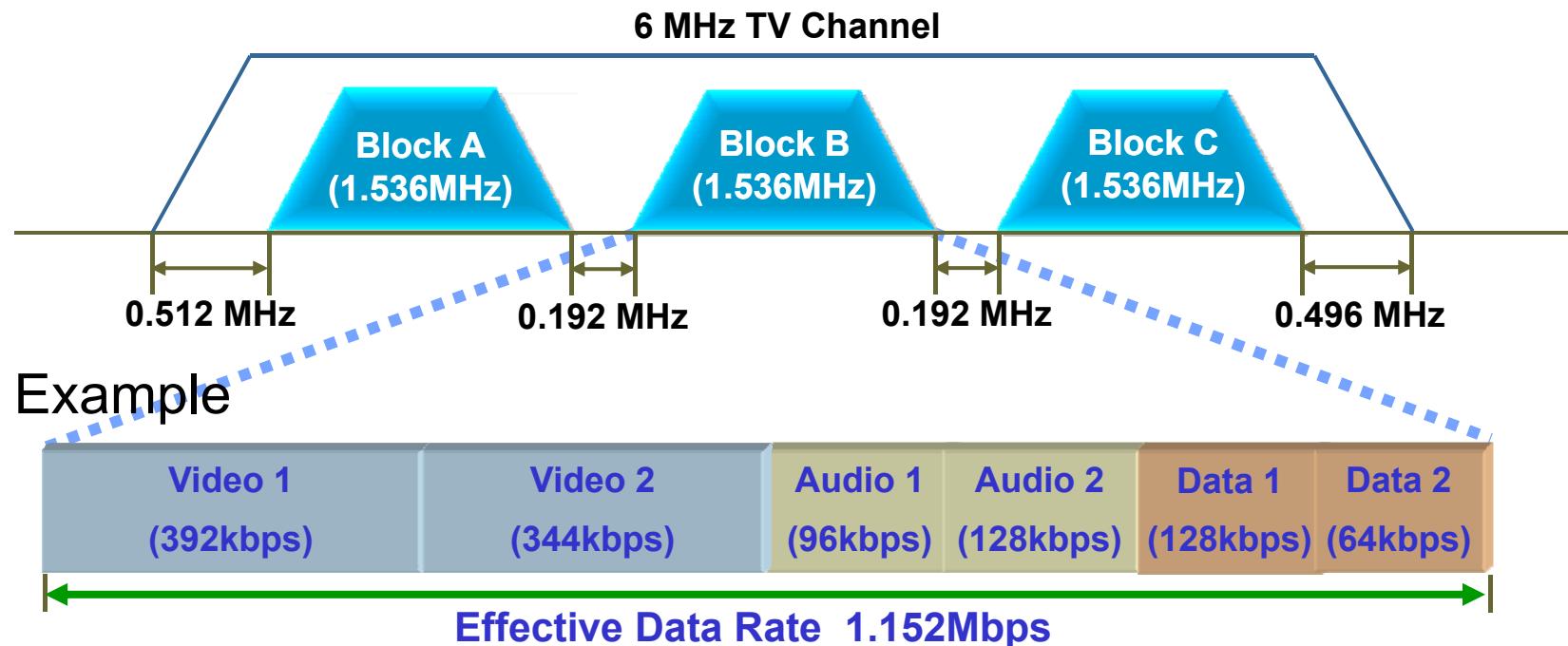
Allocation of 6MHz per region (1 VHF Channel)

→ 3 broadcasters per region (Aug. 2007)

# T-DMB Spectrum Plan

## ● Channel Allocation

- ◆ 3 blocks in 6MHz (BW=1.536 MHz)
- ◆ Effective data rate is 1.152 Mbps in 1.536 MHz
  - 2 Video Services are possible per 1.5 MHz block (6 per 6MHz)
  - Typical Service : 2 Video + 2 Audio + 2 Data



# T-DMB Services

## *Audio only service*

- **Stereo (CD-like)**



Traffic Information  
TPEG/ DGPS



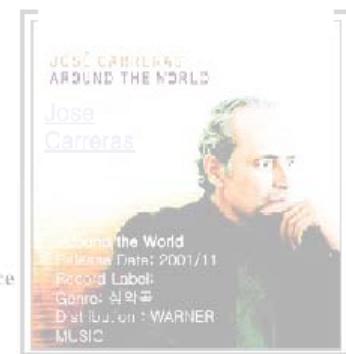
## *Video service*

- **Video : VCD quality (7" LCD)**
- **Audio : Stereo (CD-like )**
- **Program related Data**



CD Like High Quality Audio  
Additional Data Service

R-Commerce  
Purchase  
CD/Ticket



## *Data service*

- **Electronic Program Guide**
- **Headline news, Weather**
- **Traffic, Navigation**
- **Slide show, Broadcasting Web Service, etc.**

# T-DMB Data Services

**BWS**



New education minister Kim Jin-pyo on Friday pledged to enhance the competitiveness of higher learning institutions to better cultivate human resources to meet the demands of industry

◆ New Minister Vows to Provide Quality Education ◆



**HTML**

**EPG**



**Ensemble & service label**

**Program information**

**More Information with text & graphic**

**User interactions**

**Binary encoded XML**

BWS : Broadcast Web Site,  
EPG : Electronic Program Guide,

TTI : Traffic and Travel Information  
BIFS : Binary Format for Scenes

**Road Traffic Message**

**Public Transport Info**

**Congestion Information**

**Parking Info**

**Traffic & travel information**

**TTI**

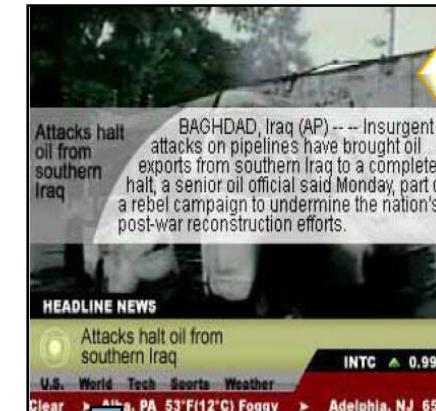


**Navigation System**

**BIFS**



**Interactive multimedia data service**



# Programs of T-DMB

KBS

- TV : UKBS STAR (GP)  
UKBS HEART (GP)
- Radio : UKBS MUSIC
- Data : KBS TPEG  
BWS

MBC

- TV : myMBC TV (GP)
- Radio : myMBC Radio (GP)  
MBN (business & economics)
- Arirang (English Channel)
- Data : MBC TPEG  
BWS

SBS

- TV : SBS<sup>①</sup> (GP)  
SBS CNBC
- Radio : SBS<sup>①-V</sup> (GP)  
tbs DMB
- Data : SBS TPEG  
BWS

YTN  
DMB

- TV : mytn (GP)  
Korea Economy WOW
- Radio : TBN (Traffic Information)
- Data : 4DRIVE TPEG  
BWS  
EPG  
SK Broadband

U1  
MEDIA

- TV : U1 (GP)  
MBN(business & economics)
- MTN(business & economics)
- Data : BWS

Korea  
DMB

- TV : QBS (GP)  
TVN  
TBS TV
  - Data: BWS
- GP (General Programming)

# Types of T-DMB Devices in Korea

## Phone



T-DMB in GSM / CDMA / WCDMA Phones available

## In-Car/PMP



## Digital Camera



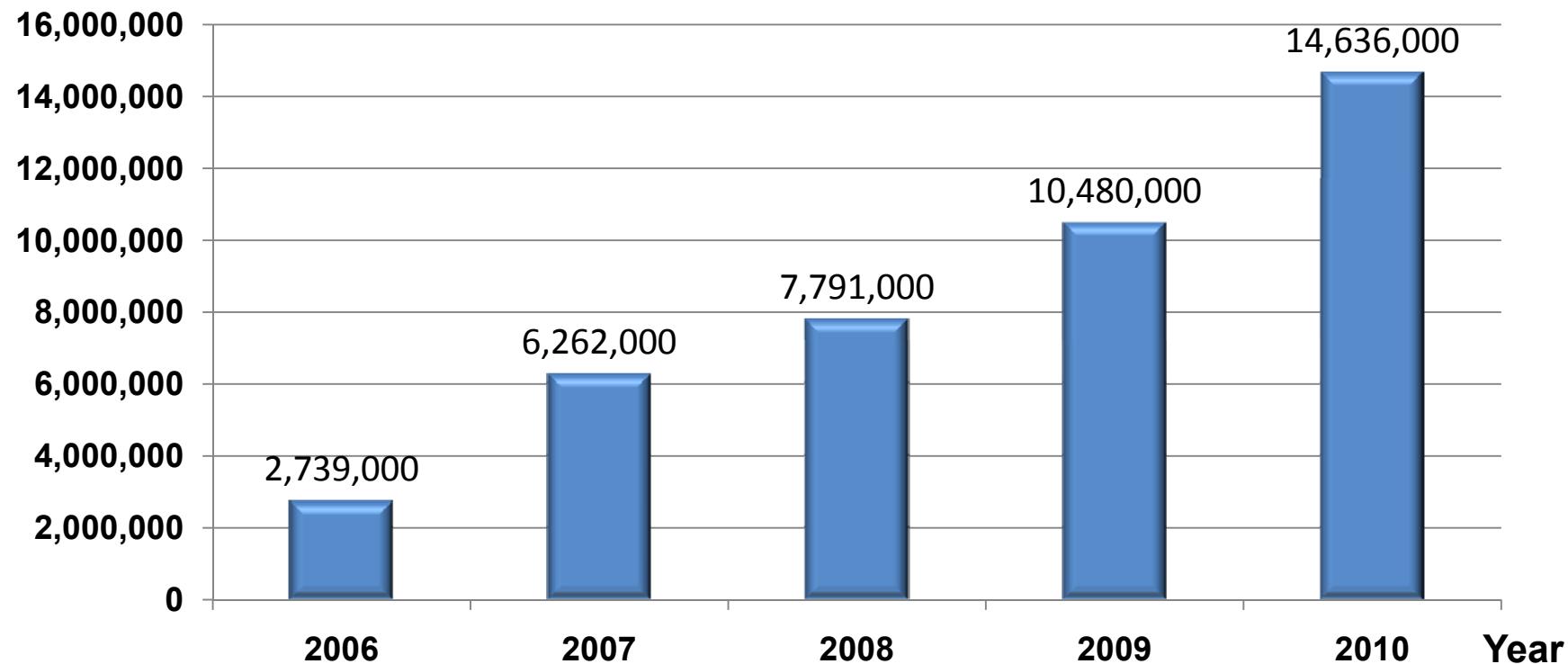
## Laptop & USB



# Annual Sales Volume of T-DMB

- The cumulative number of sales from 2006 to 2010 : 42 million

Sales quantity



Source : Korea Radio Promotion Association

# Countries with T-DMB Services



## *Countries with regular services (4 countries)*

- Korea
- Norway
- China
- Ghana



## *Countries with trials (14 countries)*

- Vietnam
- France
- Sweden
- Cambodia
- Poland
- Italy (Vatican City)
- Netherlands
- Indonesia
- South Africa
- Singapore
- Mongolia
- Mexico
- Malaysia
- Egypt

# T-DMB Standardization Status



## *Domestic Standardization*

- Jan. 2003 : started DMB standardization
- Aug. 2004 : released DMB standard



## *ETSI Standardization*

- Aug. 2004 : submitted DMB standard document to the WorldDAB forum
- Dec. 2004 : approved of DMB standard document
- July 2005 : released ETSI standard



## *ITU Standardization*

- Nov. 2004 : approved ITU-R report on DMB standard
- Dec. 2007 : released ITU-R recommendation

# T-DMB in Korea

- Fully backward compatible with Eureka-147 DAB
- Public Broadcasting for free
- Commercial service was launched in December, 2005
- Nationwide service from Aug. 2007
- More than 42,000,000 terminals have been sold since 2005

II

## Overview of Advanced T-DMB

# Background of Developing

## ● Advantages of T-DMB

- ◆ Good mobile reception performance
- ◆ Power efficient transmission
- ◆ Low cost of network investment
- ◆ Low power dissipating receiver etc.

☞ T-DMB : **Cost effective** mobile broadcasting technology.

## ● T-DMB provides less number of services than other system

- ◆ More channel capacity is required for variety multimedia and data services.

# Developing Requirements

- Guarantee of backward compatibility with the T-DMB service
  - ◆ T-DMB receiver can receive
    - only all the existing T-DMB programs
  - ◆ AT-DMB receiver can receive
    - all the existing T-DMB programs
    - plus new programs of AT-DMB
- Increase of data rate up to twice the data rate of T-DMB
- ☞ Adoption of *hierarchical modulation* scheme

# Applied Technologies

## ● Hierarchical Modulation

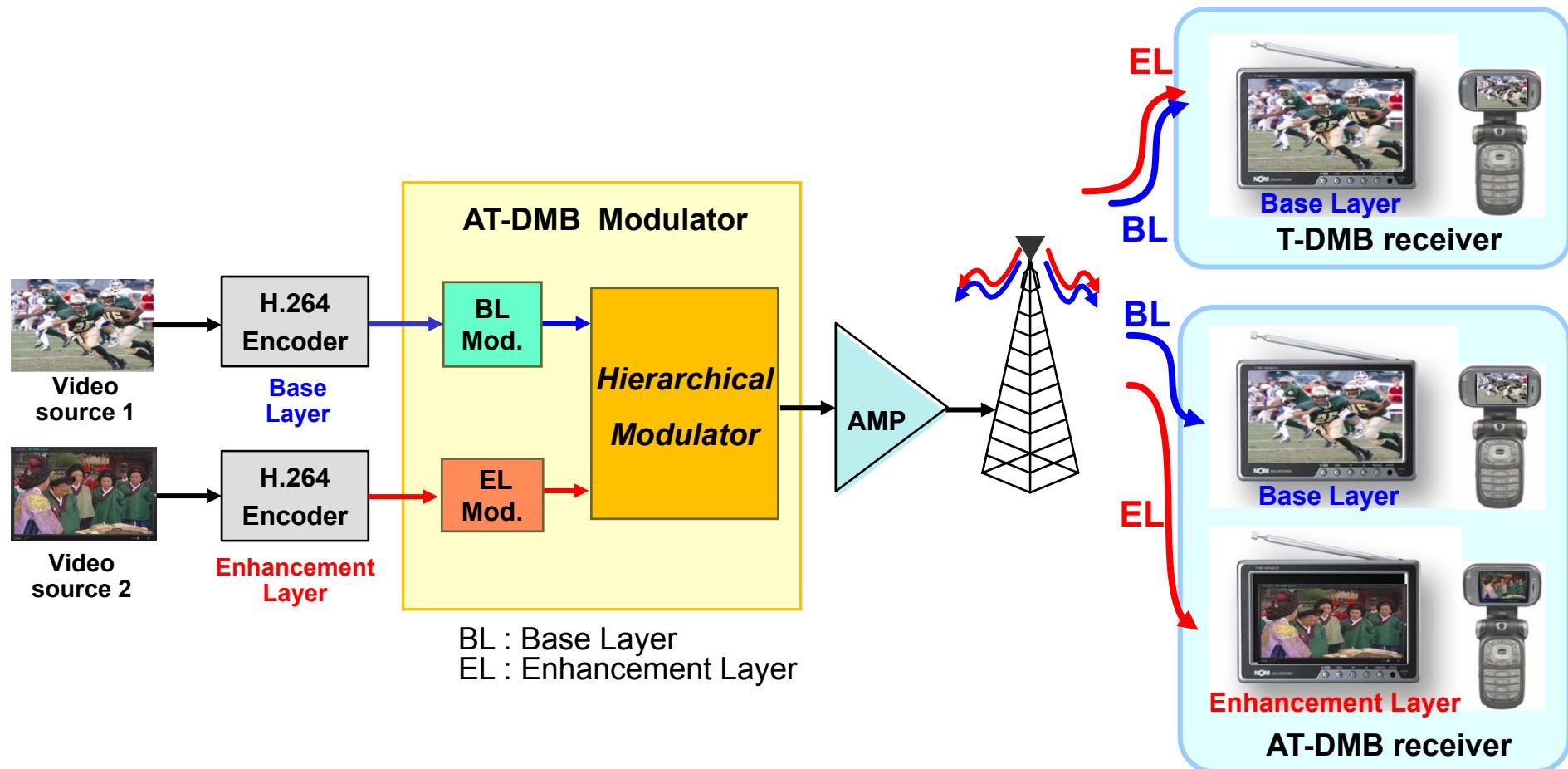
- ◆ AT-DMB service is composed of base layer and enhancement layer
  - Base layer : T-DMB service
  - Enhancement layer : additional video service and data service

## ● Enhancement layer requires high performance channel code

- ☞ Adoption of Turbo code (code rate : 1/2, 2/5, 1/3, 1/4)

# Service Concept of AT-DMB

- T-DMB receiver can receive only BL(base layer) service
- AT-DMB receiver can receive both BL and EL(enchantment layer) service



# Key Features of AT-DMB

• Guarantees backward compatibility with T-DMB

• Provides maximum twice the T-DMB data rate

• Easy to migrate from T-DMB to AT-DMB with low cost

- T-DMB exciter → AT-DMB exciter
- T-DMB multiplexer → AT-DMB multiplexer
- Add service encoders for the enhancement layer

• Has simple layered structure to apply for profitable model

III

## Overview of ATSC

# Digital TV Technology

## ➊ Main Features of Digital TV Broadcasting Technology

Technology	Main Features
ATSC	<ul style="list-style-type: none"><li>▪ A 8-VSB Transmission technology developed by ATSC</li><li>▪ Suitable for HDTV</li></ul>
DVB-T	<ul style="list-style-type: none"><li>▪ COFDM transmission technology developed by Europe's DVB Group</li><li>▪ Advantageous in mobility</li></ul>
ISDB-T	<ul style="list-style-type: none"><li>▪ BST OFDM(Band-segmented Transmission OFDM) transmission technology</li><li>▪ Developed by Japan</li></ul>

## ➋ Korea adopted the ATSC Technology in 1997

# Digital TV Broadcasting

October 2001

- Digital broadcasting commenced in Seoul

July 2004

- Digital broadcasting commenced in metropolitan cities outside of Seoul

December 2005

- Digital broadcasting commenced in provincial locations

June 2006

- Digital broadcasting commenced in counties

December 2012

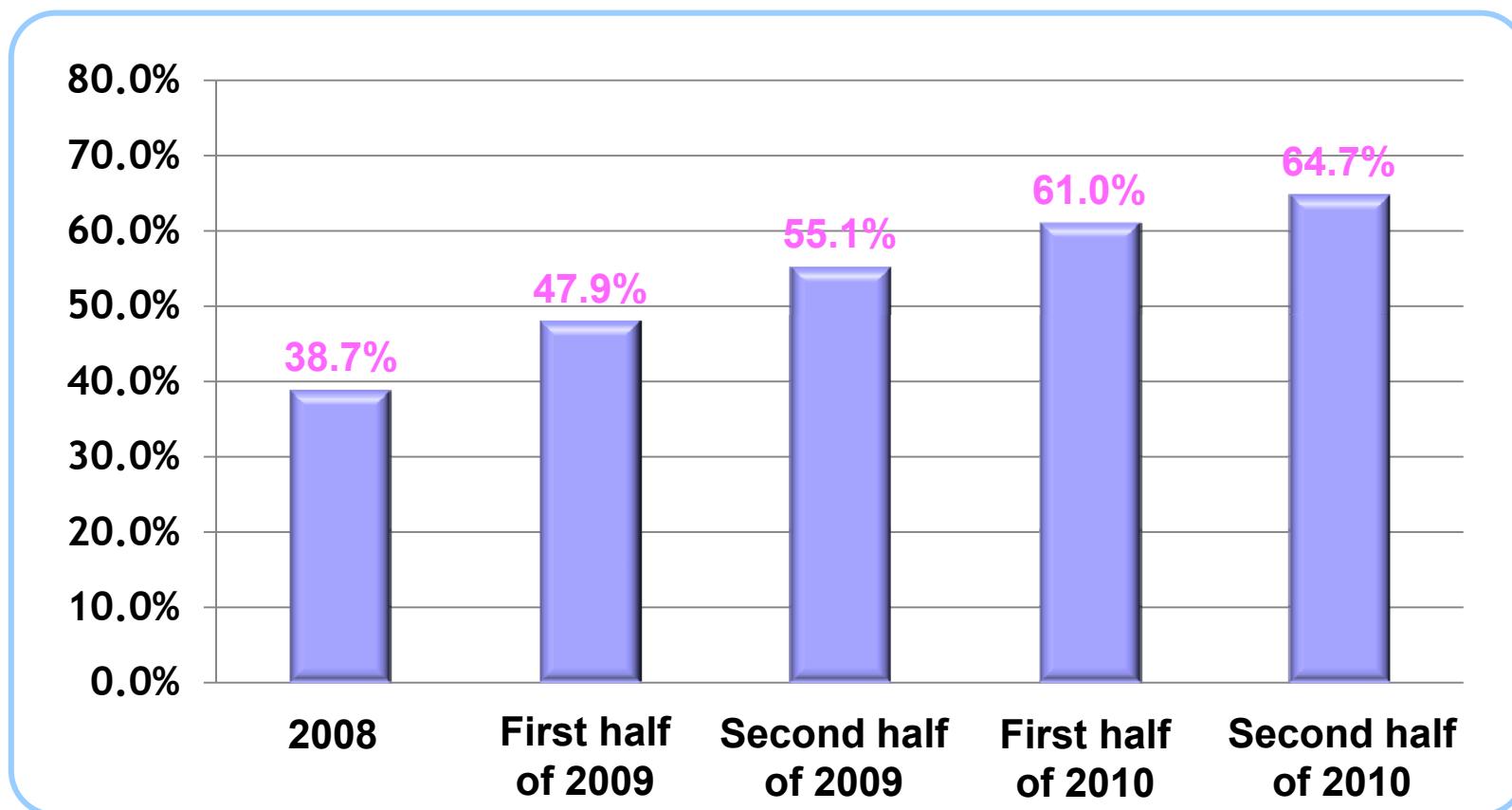
- Analog broadcasting will be terminated

# Korea's DTV Transition Plans

- Conversion plan of digital transmitter
  - ◆ By Dec. 2011, 70% of analog transmitter will be replaced with digital transmitter
  - ◆ By June 2012, 100% of analog transmitter will be replaced with digital transmitter
- Support of low-income citizens
  - ◆ Support of DTV converter box with free of charge
  - ◆ Or, Government subsidy for purchasing DTV set

# National Digital TV Penetration

- National DTV penetration rate in 2010 : 64.7%



Source : DTV Korea

IV

## Summary

# Summary

## ● Many countries are introducing T-DMB services

- Commercial Service : *Korea, China, Norway, Ghana*
- Trial Service : *Vietnam, Indonesia, Netherland, Italy, Poland, ...*

## ● Various rich media services

- TTI (Traffic and Traveler Information)
- BWS (Broadcast Web Site)
- A/V synchronized interactive data with BIFS (Binary Format for Scenes)
- EPG (Electronic Program Guide)

## ● Commercial products are available in the market

- T-DMB receivers
- T-DMB encoders & MUX
- T-DMB chipsets
- T-DMB excitors

***Thank you for your attention !***