

# *The Perspective of DAB Data Broadcasting Technology and Services*

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# I. General Data Broadcasting Charateristics for DAB

## **Data Service using Broadcasting System**

- Merits
  - High Transmission Power (\*\*W ~ \*Kw)
  - Excellent Transmission Site (highest mountain or special tower)
  - No battle-neck and less delay for the transmission
  - No limit for the number of recipients who receive the data simultaneously
- Demerit
  - One way transmission

## The Data Service for DAB

- Multimedia Broadcasting (DMB)
- Traffic Information (ITS, TPEG)
- Broadcasting files and streams
- Stock and shares information
- Band and artist information
- The title of the track
- Programme information
- News, Sports headlines (+ scores)
- Contact telephone numbers

## The Characteristics of Data Broadcasting for Eureka-147

- provides reliable reception with fixed, portable and mobile receivers
- operates at any frequencies – up to 3GHz for mobile reception  
on terrestrial, satellite, hybrid and cable network
- Within 1.5MHz frequency block, **1.824 Mbps** available  
depending on level of protection
- Using SFN the transmission of programs or data over several  
transmitters, nation wide

## The Characteristics of Data Broadcasting for Eureka-147

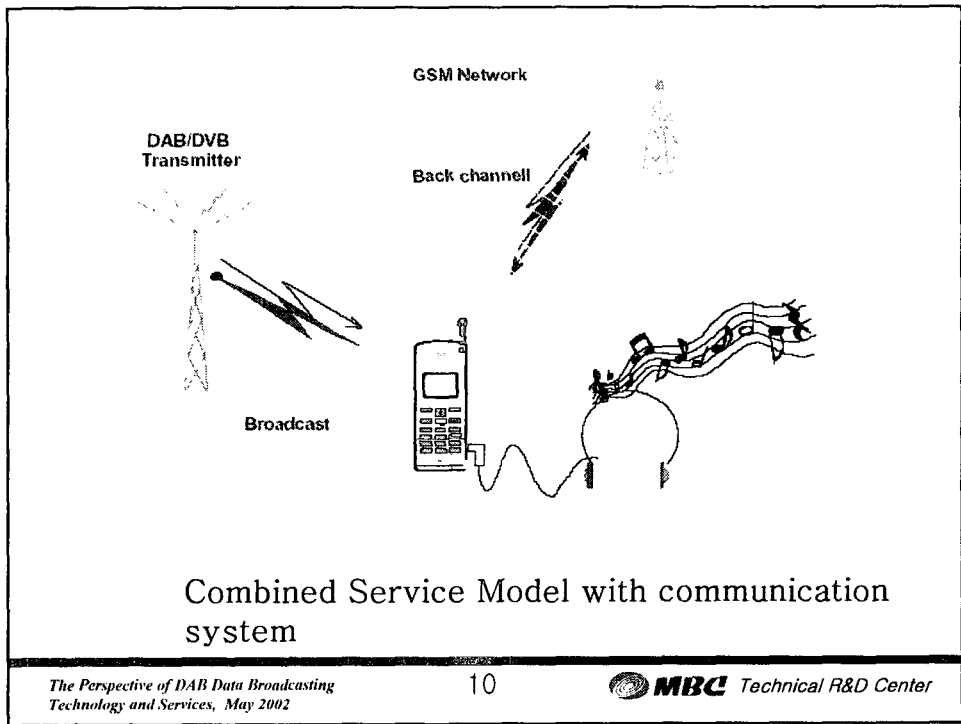
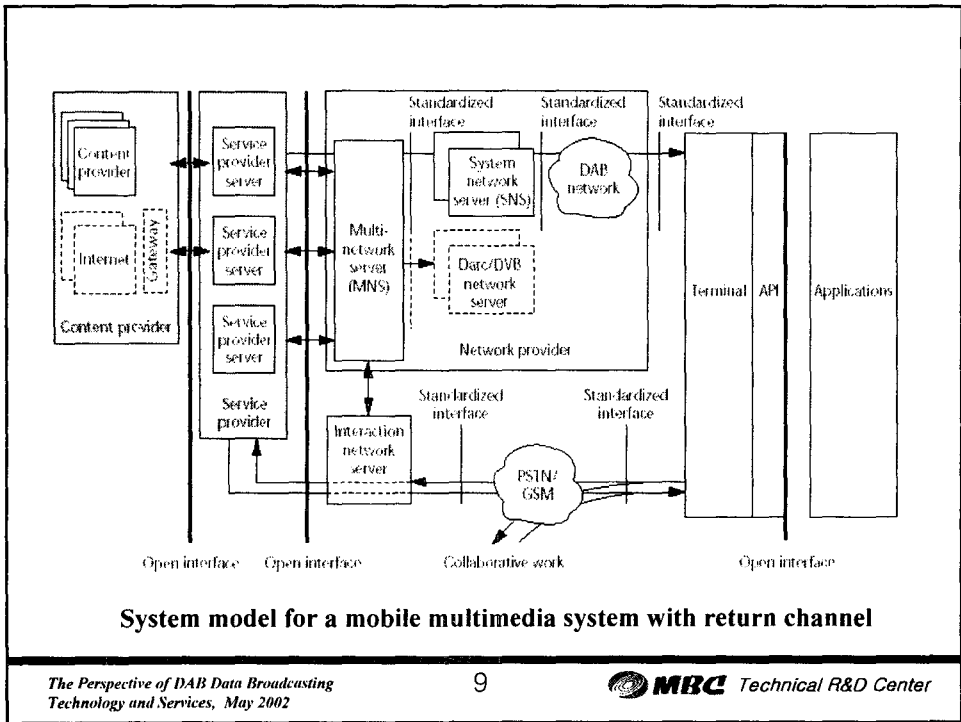
- a wide range of sources, channel coding options, and data services
- incorporates Conditional Access  
(encryption and assressing, enabling transmission to secluded groups)
- MOT for multimedia objects in DAB

*MOT : Multimedia Object Transfer Protocol*

## MOT (Multimedia Object Transfer Protocol)

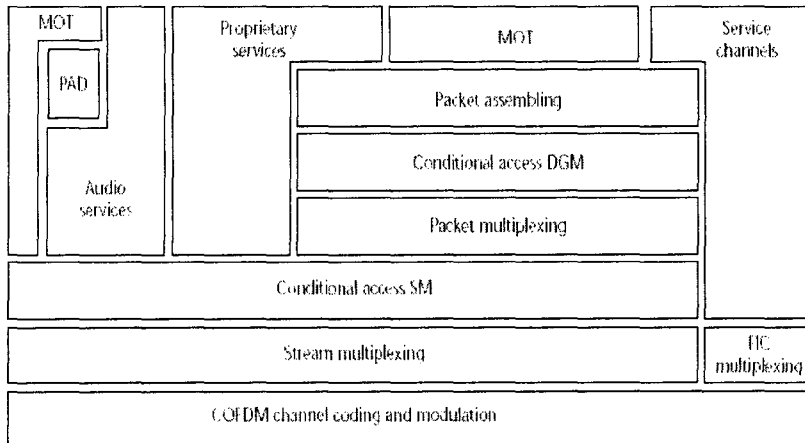
- supports transporting objects and files
- segments the objects, interleaving on different levels
- links objects in different data streams
- lets the terminal identify different types of objects as JPEG, MPEG or ASCII
- includes optional parameters to support applications

*: time stamps, creating file name, providing alternative display mode*



## The Protocol Stack for the Eureka-147

- A stream multiplex and *Fast Information Channel (FIC)* build the DAB stream
- FIC handles multiplex configuration information
- such as the number of available audio or data channels ,the labels indentifying the channels
- descriptions of whether certain channels should link together in the receiver to creat a full service
- also carries service information describing each service



The Protocol Stack for the Eureka-147

## Interactive Channel

- *Open loop, Closed loop*
- Two Subgroups in Closed loop
- One uses interactive channel for transmission purpose  
*ex : Acknodgement or request for resending the information for error*
- The other uses the channel for application purposes  
*ex : End users order information to download from the service provider*
- Quality of service, number of recipients, system load, security determines whether broadband broadcasting or narrow point-to-point broadcasting
- The interactive channel may have a smaller capacity and be more expensive

## Other Considerations for Data Broadcasting

- A Specific Capacity
- A Specific coverage area and transmission over a selected area
- A probability of reception  
*- the level of protection, segmentation, repetition ration*
- Different transmission channels  
*- stream mode, packet mode, FIC, PAD, AIC*
- Validity time for the information
- Triggering and activation of the service
- Identification of the content format of the object

## Other Considerations for Data Broadcasting

- Alternative display mode
- Defining other parameters for the future
  - *priority for memory handling or capacity allocation in a receiver*
- Time of transmission
- Priority of transmission
- Encryption
- Conditional Access
- Cyclic Transmission and repetition of data objects

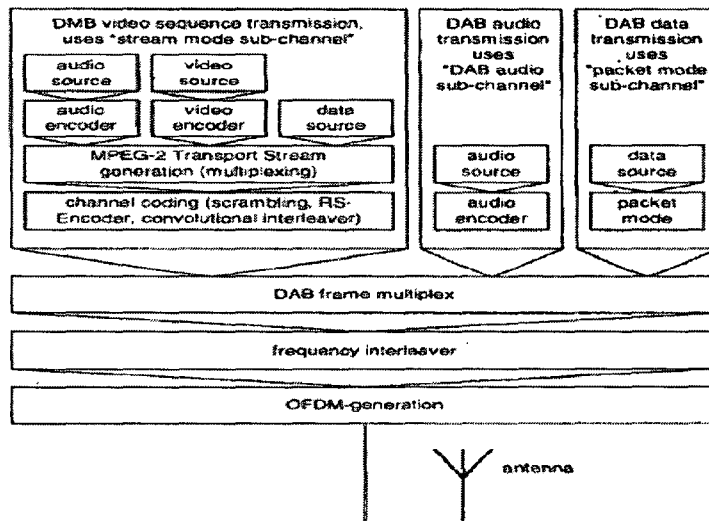
## II. MPEG-4 based DMB

(Digital Multimedia Broadcasting)



## MPEG-4 based DMB (Digital Multimedia Broadcasting)

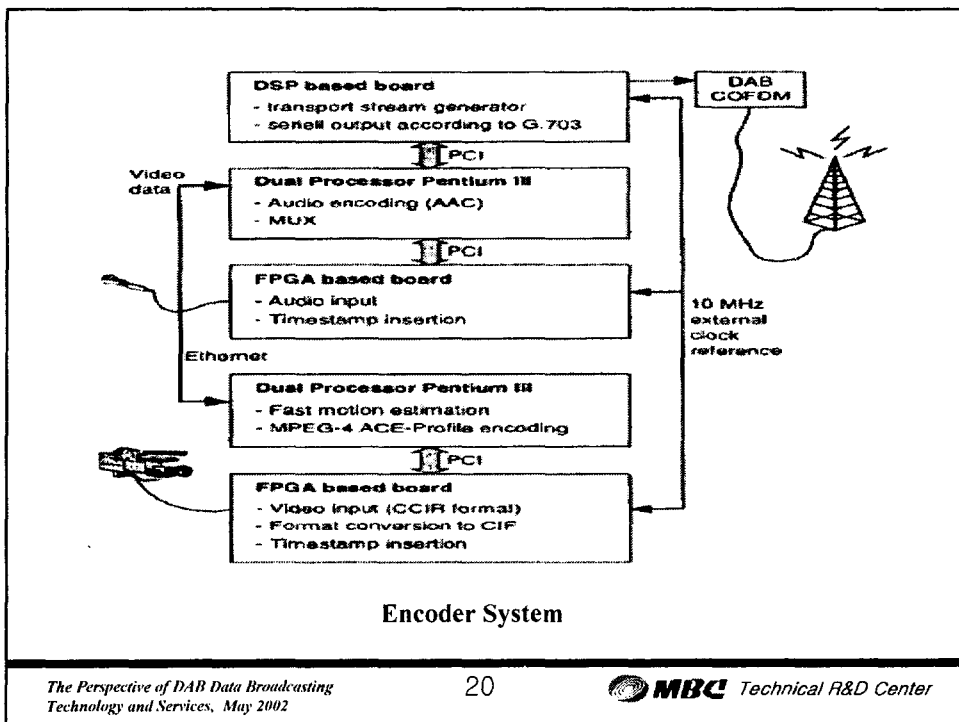
- Studied and developed by Robert Bosch GmbH
- The elementary streams resulting MPEG-4 are wrapped into an MPEG-2 TS
- Main work items are MPEG-4 audio, video codec
- which are highly optimised to achieve real-time performance
- Good coding efficiency was essential for the limited bandwidth
- DMB improves the error protection with the additional blocks : scrambling, RS encoder and convolutional interleaver



The DAB/DMB Transmission System

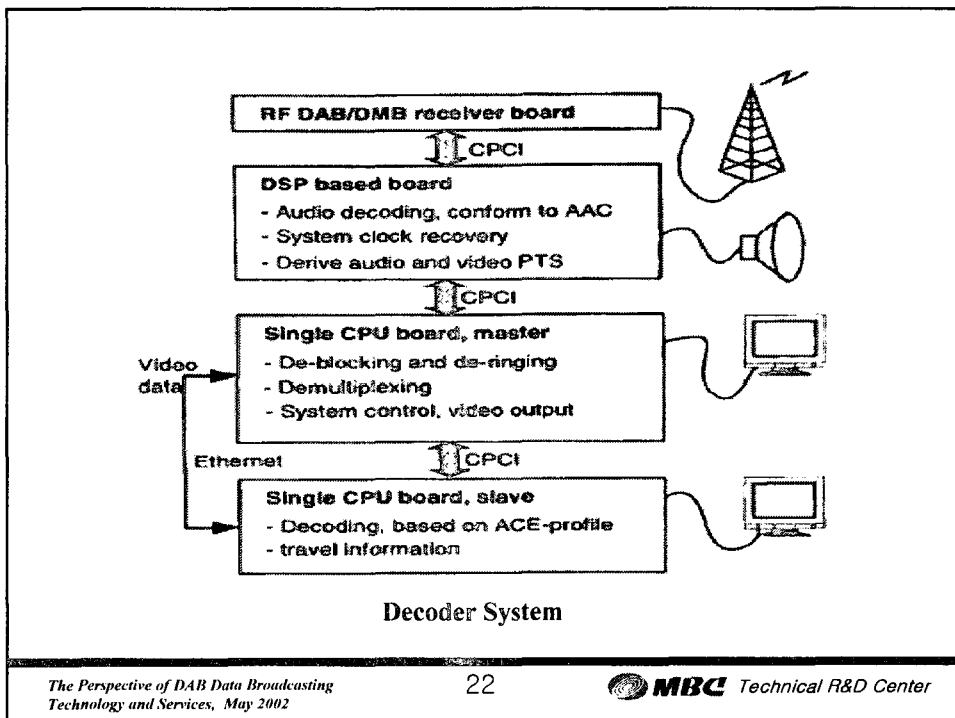
## MPEG-4 based DMB Encoder

- Modularity and expandability
- The processing of audio and video signals is done in two different subsystems
- Ethernet for dual PIII systems
- Universal interface board for the connection of external sources
- Both audio and video signals are synchronized by timestamps based on 10MHz external clock reference
- To cope with the real-time processing demands, the OS on both subsystems is SMP-Linux with a real time extension



## MPEG-4 based DMB Decoder

- consists of two separate CPUs, connected by ethernet
- The OS is Windos NT for both CPU
- The master CPU reads the transport stream from the RF-module and de-multiplexes the audio and video elementary stream
- The audio stream is decoded in DSP-based decoder board
- The audio stream is transferred to the slave CPU, which decodes video data according to the ACE-profile (pre-processing)
- Master CPU finally presents the decoded video signal
- additional task of slave CPU is to present of information data



### III. ITS Services and DAB

#### *Needs for TTI (Traffic and Travel Information)*

- *Where am I ?*
- *How do I get to where I want to go ?*
- *How can I go without getting caught traffic jamming ?*

**TPEG - A public service business model**

**78% of people questioned in the UK expect the BBC to provide a traffic and travel information service**

Travel News from the  
**BBC**

**The need for Traffic information Service using broadcasting : UK**

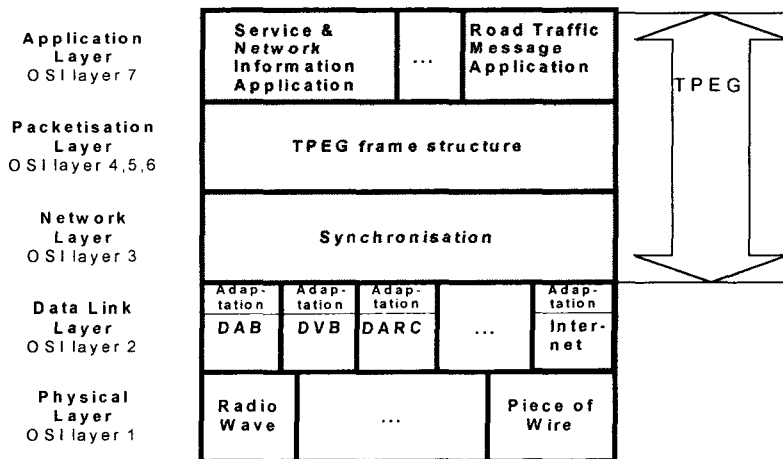
## Development of TPEG

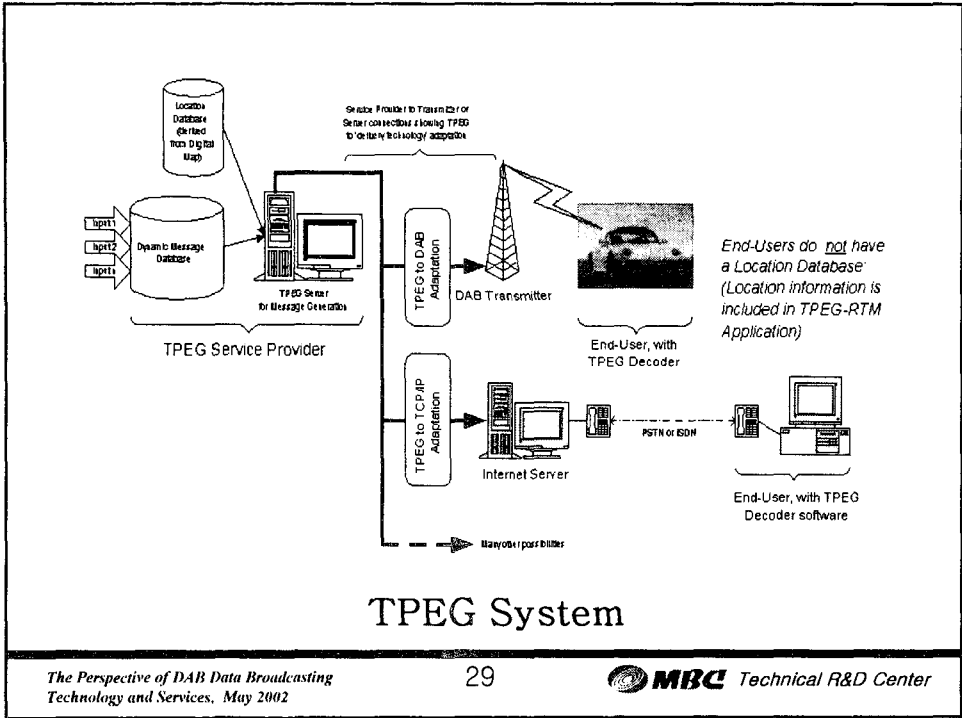
- 1997, B/TPEG Project Group in EBU (supported by EC)
- One Message Generation Process – Various Delivery Technologies
  - FM (RDS–TMC, DARC), Mobile Comm. System (GSM, CDMA, IMT 2000), Internet, DAB, DVB–T*
- Wide Range of Receiver could be used for TPEG protocol
- Includes : *Broadcasters, Electronics manufacturers, Digital Mapping Companies, Service Providers, Transmission Operators*

## The 4 design goal for TPEG

- *to be bearer independent broadcast protocol*
- *to be appropriate to low to high bit rate systems*
- *to provide a rich and flexible description of information*  
*to support ITS*
- *to be openly specified and appropriate to both commercial*  
*and public service models of operation*

## TPEG Layer Model





## IV. DGPS Service

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## Required Accuracy level for DGPS

- Navigation : 1-5 m  
5-10 m
- Construction, : cm
- Accurate Survey : mm
- Personal Mobile Terminal : m

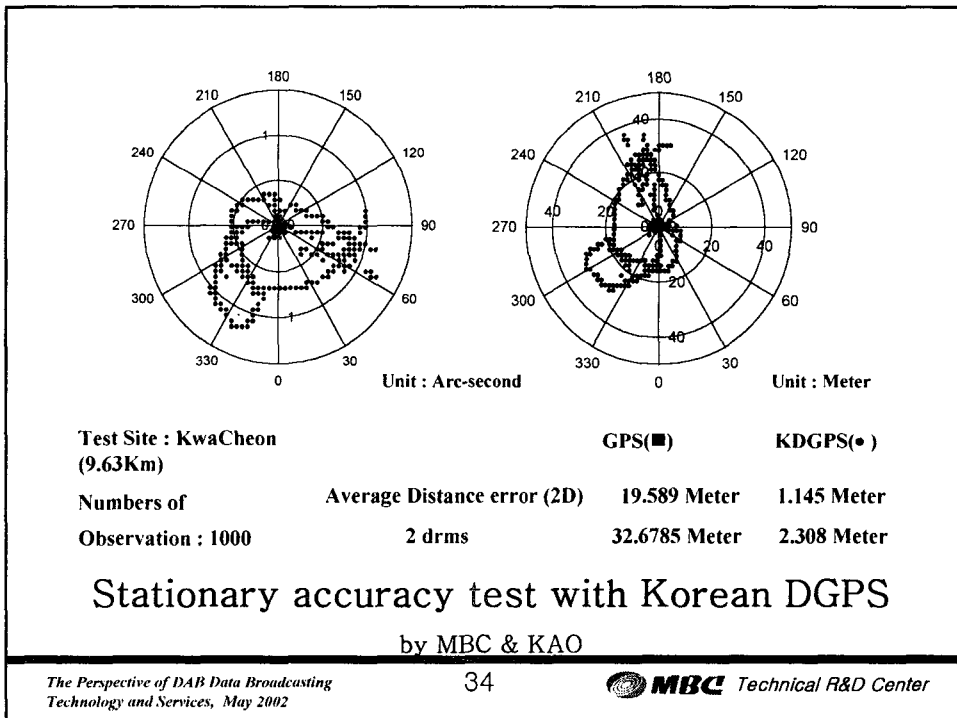
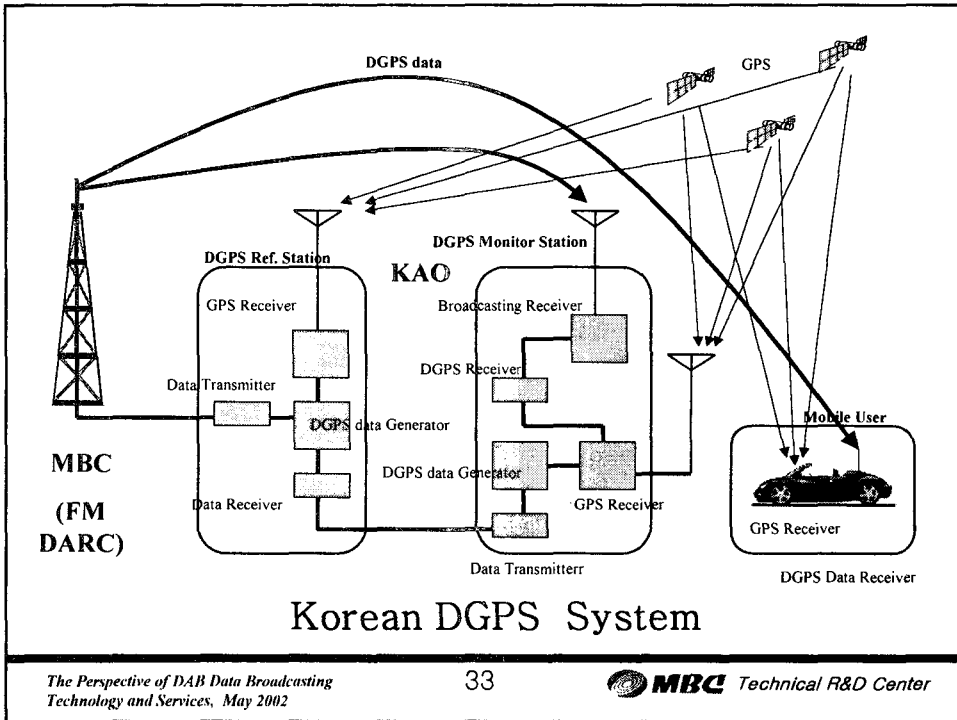
## Accuracy of GPS

- Usually under 30 m with fluctuation  
(after exclusion of SA error)

## Operation of DGPS System

- DGPS referation system
  - *receives GPS signal and calculates the errors compared with accurated surveyed points values*
  - *transports the calculated DGPS data to broadcasting station*
- Broadcasting station
  - *broadcasts received DGPS data with minimum time delay*
- Mobile station (User)
  - *receives GPS signal and broadcasted DGPS data simultaneously and calculates the compensated points values*





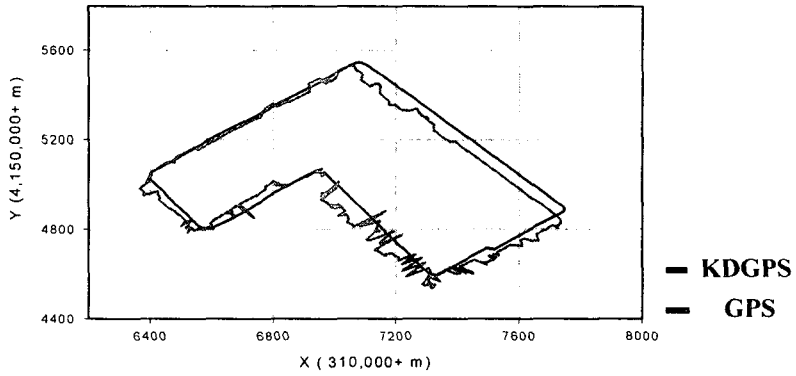
## Activities for the ITS using Broadcasting System

- 1996 : R&D started for traffic information using FM DARC  
includes Traffic Message Set for FM DARC
- 1997 : R&D started for DGPS cooperation with KAO
- 1999 : Carrying out the national R&D Project for **“The development of traffic and DGPS system using FM DARC”** under sponsorship of the MIC
- 1999 : Becomes Vice President Company for ITS Korea
- 1999 : Starts Pilot service for Traffic and DGPS service using FM DARC

*(Operates Traffic, DGPS and others information Center)*

## Activities for the ITS using Broadcasting System

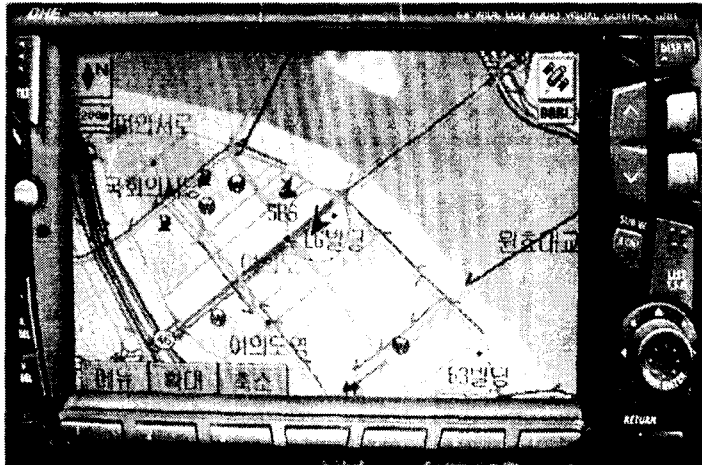
- 2000-2001 : Carrying out the development for **“The Korean national standard for traffic data transmission”** under sponsorship of MOCT
- 2000 : The Korean delegate for the ISO TC-204 (ITS)
- 2002 : will start the Commercial service for Traffic and other data service using FM DARC
- and trying to adopting the services for DAB data system



## Dynamic accuracy test with Korean DGPS

by MBC & KAO

## V. R&D of MBC R&D Center for Data Broadcasting



## Traffic Information Receiver for FM DARC

(with dynamic traffic data)

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## VI. DAB Receivers

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## In Car Receivers



Pioneer DEH-P8100R



VDO DAYTONA MS-4000



Sanyo XT-300 DAB



Kenwood KDC-0020R



Pioneer DEH-PVR 50A



JVC KT-D81500



Clifton 8475R



Grundig Challenge 530

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## HiFi Receivers



Sony ST-D777ES



Aream DT61



Teg McLaren T32R



Cymbol CDAB1



MicroLogic DPA-601ES




Technic ST-GT1000



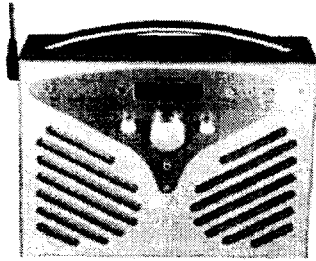
MicroLogic BR1-601ESMLg

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## Portable and PC Type Receivers



videologic KitchenDAB



PS100 Wavefront

## VII. Conclusion

- Various data services will be available with new technology, DAB
- Digital broadcasting systems should not be viewed as competitors to existing mobile communication systems
- Combining the broadcasting channel with mobile communication channel would give a new and efficient mobile service system
- Researches required to find out the service requirements before assigning the broadcasting channel capacity

**Thanks you !!!**

**Any Question ?**