Presentation 6

ISDB-T / One-Seg Receivers

13th -14th June, 2007

Bangkok, Thailand

DiBEG JAPAN

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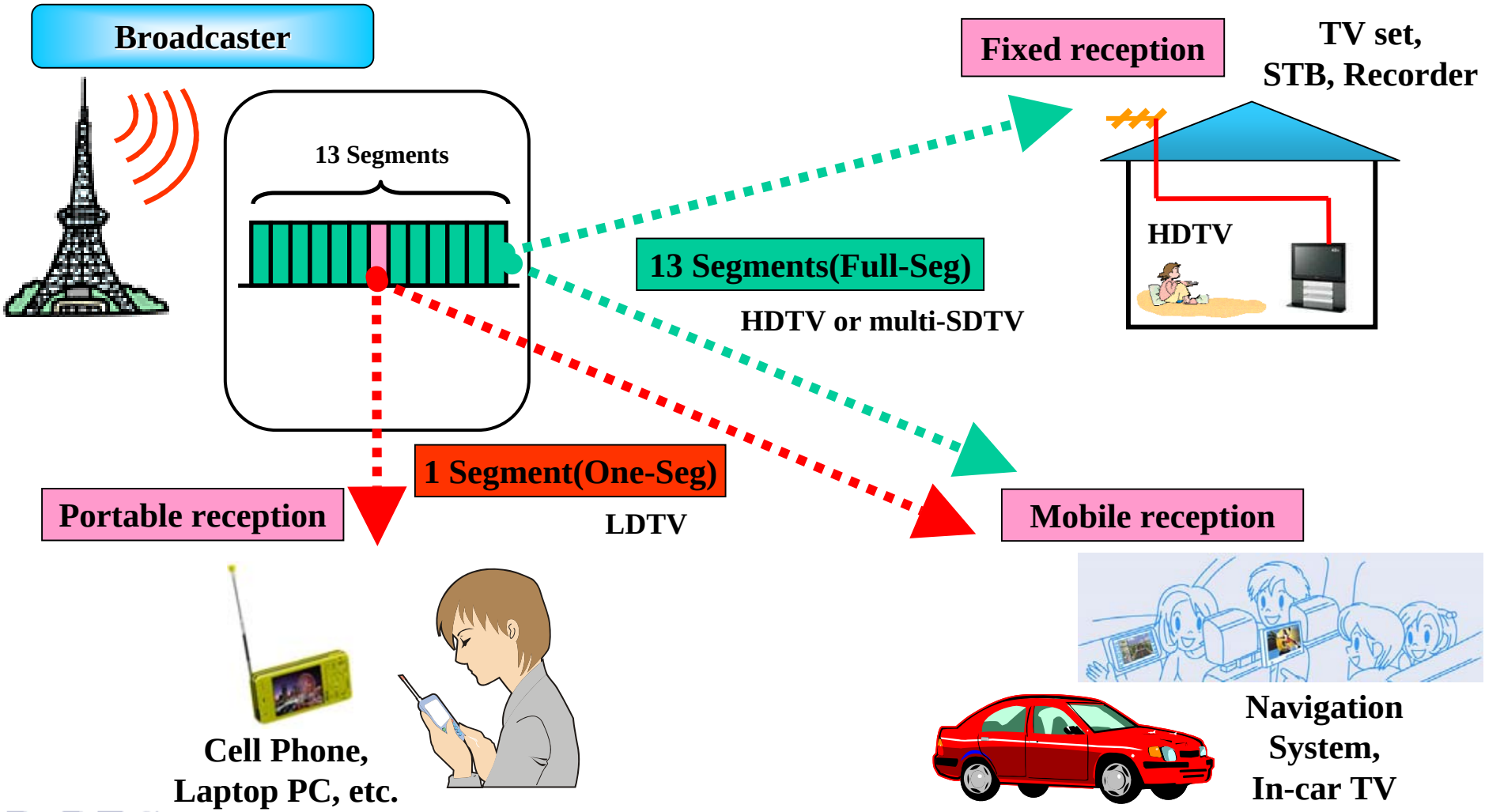
Contents

- Reception types of ISDB-T
- Introduction of some Japanese ISDB-T receivers
  - Fixed receivers
  - In-car receivers
  - Portable receivers
- Shipments and diffusion prediction of ISDB-T receivers
- Merits of One-Seg
- Configuration of a basic receiver
- Improvement of reception performance
  - Introduction of diversity system
  - Experiments of One-Seg diversity reception

Reception Types of ISDB-T in Japan

One channel of ISDB-T is divided into 13 segments.
One segment of them is used for mobile and handheld TVs.



■Fixed Receivers

PDP TV

VIERA TH-42PZ700SK
Panasonic

Wooo P42-HR01
HITACHI

PDP-A427HX
Pioneer

LCD TV

REGZA 42H3000
TOSHIBA

AQUOS LC-42RX1W
SHARP

VIERA TH-20LX70
Panasonic

BRAVIA KDL-40V2500
SONY

LCD-32HR100
SANYO

AQUOS LC-16E1
SHARP

SDTV

VIERA TH-15LD70
Panasonic

AQUOS LC-13SX7
SHARP

■Fixed Receivers(Cont.)

HDD/DVD Recorder

RDZ-D800
SONY

DIGA DMR-XW51
Panasonic

VARDIA RD-S600
TOSHIBA

DVR-DV635
MITSUBISHI

Blu-ray

BDZ-V9
SONY

DIGA DMR-BW200
Panasonic

STB

TU-MHD600
Panasonic

DT400
MASPRO

Cable STB

TZ-DCH1800
Panasonic

■Fixed Receivers(Cont.)

Desktop PC

20 inch
(1680x1050)

VALUESTAR S VS770/JG

NEC

20.1 inch
(1680x1050)

FMV-DESKPOWER LX70W/D

FUJITSU

20.1 inch
(1680x1050)

Prius One type W AW37W5U

HITACHI

Notebook PC (medium-large size)

15.4 inch
(1280x800)

LaVie L LL970/HG

NEC

17 inch
(1440x900)

FMV-BIBLO NX95W/D

FUJITSU

17 inch
(1920x1200)

Qosmio G40/95C

TOSHIBA

■In-car Receivers

Navigation System
Full-Seg/One-Seg

Strada CN-HDS965TD

Panasonic

Tuner separated model

AVIC-VH099G

Pioneer

All-in-one model

HS706D-A

NISSAN/SANYO

One-Seg Only

※Full-Seg is Optional

GORILLA NV-HD830DT

SANYO

Portable Navigation Device
One-Seg Only

Mini GORILLA
NV-SD10DT

SANYO

In-Car TV
One-Seg Only

CAV-TD85D1

SANYO

■Portable Receivers

Cell Phone One-Seg Only

W51SA

P903iTV

911SH

W52T

D903iTV

911T

au

14 models are available
at the end of May, 2007

NTT DoCoMo

4 models are available
at the end of May, 2007

Softbank

3 models are available
at the end of May, 2007

■Portable Receivers(Cont.)

One-Seg Only

DVD Player

DVD-LX87

Panasonic

DVD-HP700ND

SANYO

Laptop

VAIO type T

SONY

Adapters(USB, etc.)

Many products are on sale.

BUFFALO, I・O DATA, etc.

Audio Player

gigabeat V30E

TOSHIBA

Dictionary

Papyrus PW-TC900

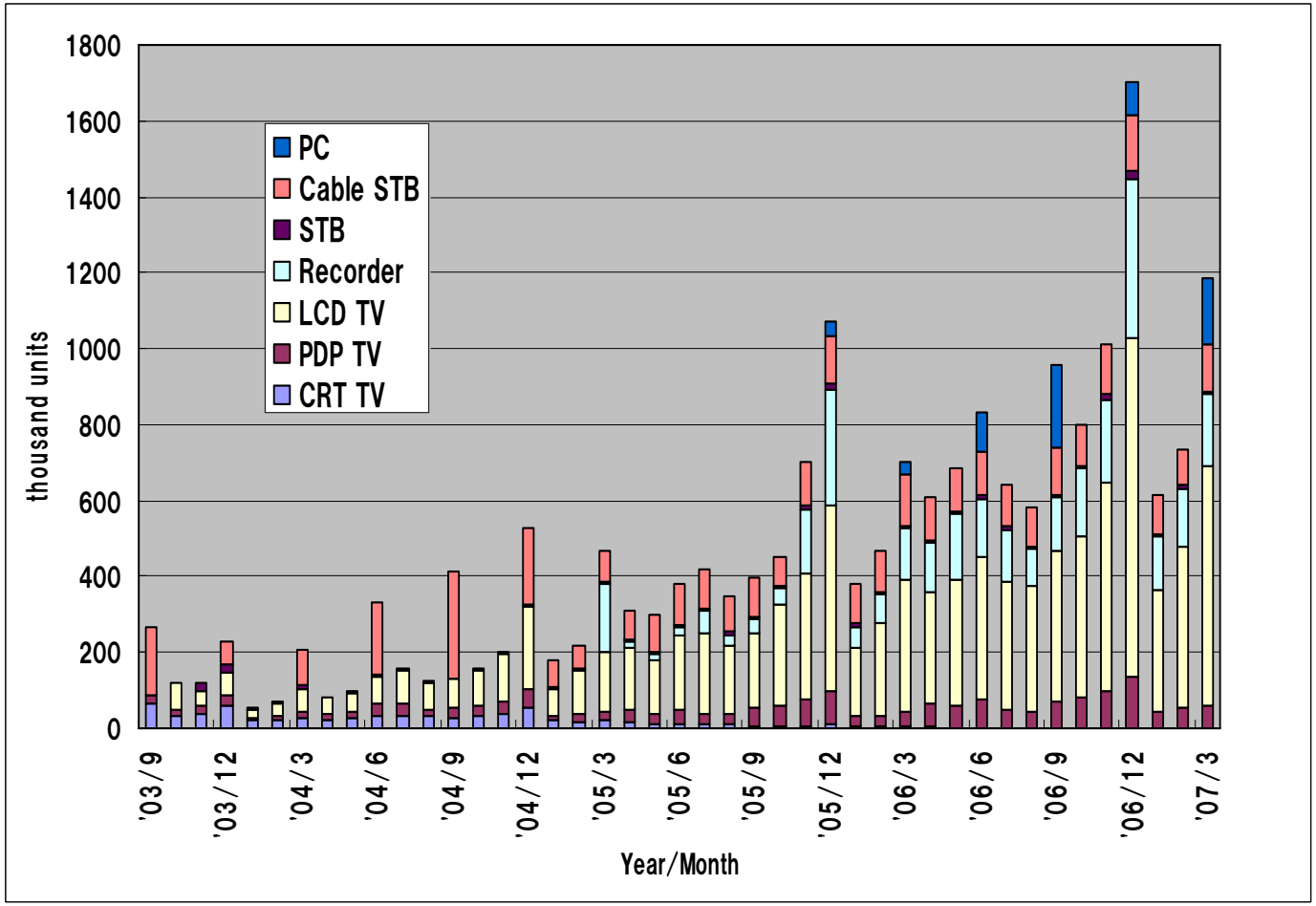
SHARP

Portable TV

XDV-100

SONY

Shipment Volume of ISDB-T Receivers



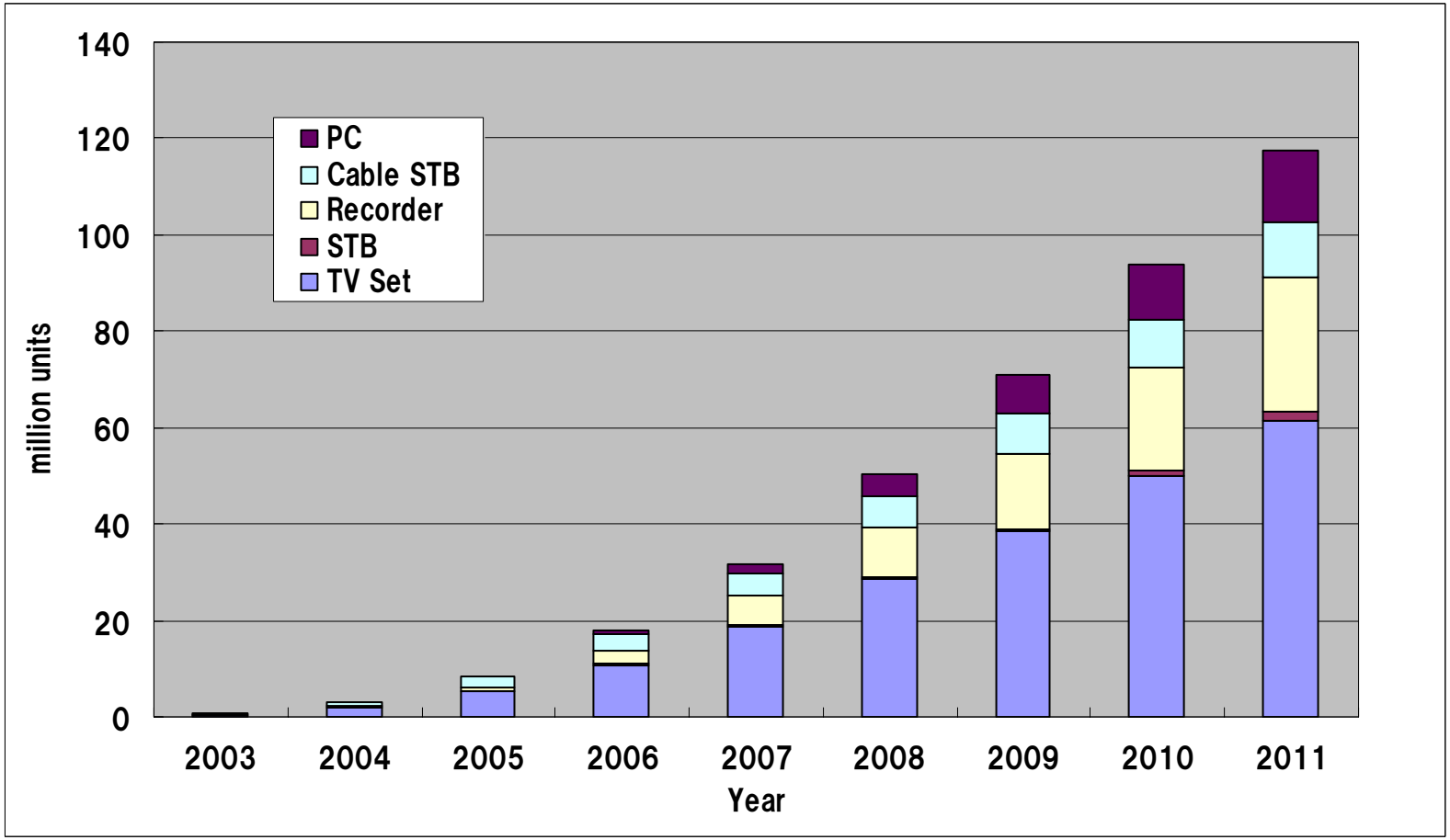
Total until April, 2007 21,287 (thousand units)	
PC	701
Cable STB	3,926
STB	326
Recorder	3,528
LCD TV	10,230
PDP TV	1,854
CRT TV	722

※Receivers only for One-Seg and in-car receivers are not included.

Source: Japan Electronics and Information Technology Association (JEITA)

Diffusion Prediction of ISDB-T Receivers

The cumulative total of sales until 2011 will be 117 million units.

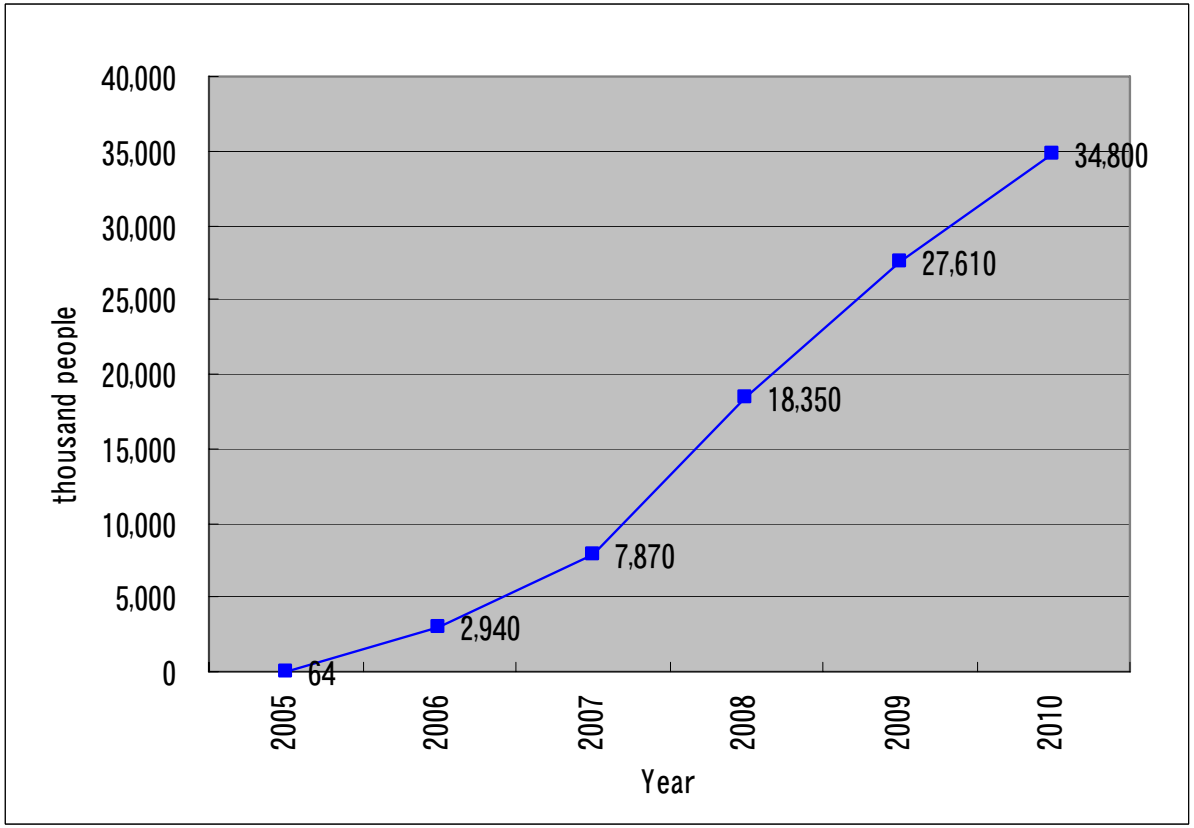


※Receivers only for One-Seg and in-car receivers are not included.

Source: Japan Electronics and Information Technology Association (JEITA)

Diffusion Prediction of One-Seg Cell Phones

A certain research institute has reported diffusion prediction of One-Seg cell phones. About 30% of cell phone users will have One-Seg cell phones in 2010.



Source: Yano Research Institute Ltd., Japan

■Merits of One-Seg

■ High quality video & audio in a mobile environment

●Robustness to noise and multipath

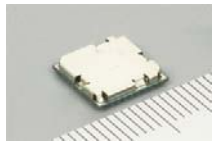
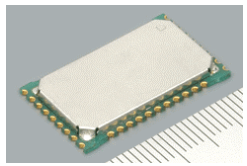
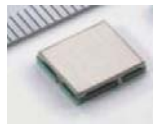
Stable reception in a mobile environment

■ Easy to put the function on portable terminals

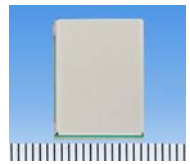
●One-seg receivers need lower cost, smaller devices, lower power consumption, and lower CPU power than Full-seg receivers.

Various portable terminals get possible to have TV function.

■Tuner Modules for One-Seg





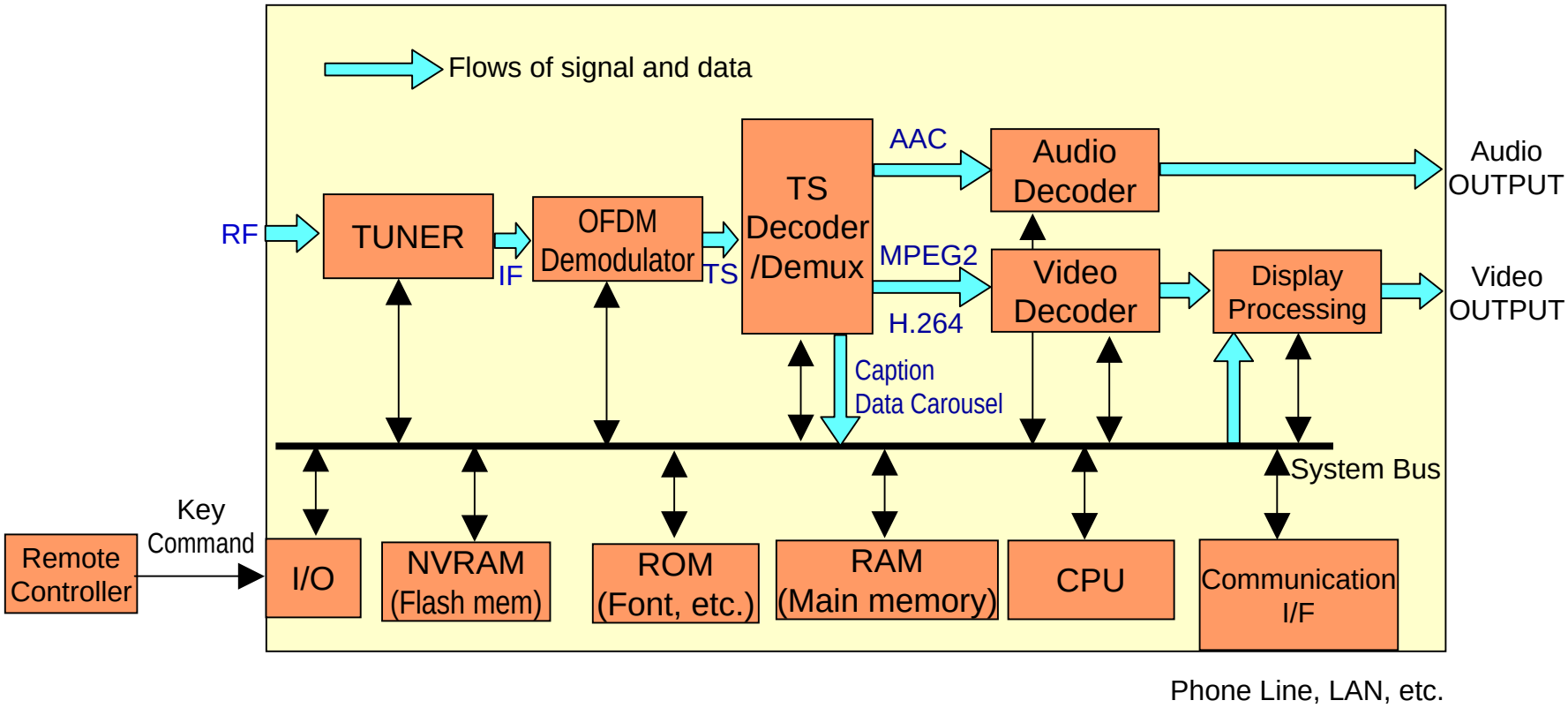
Maker	ALPS	ALPS	MURATA	SHARP	MITSUMI	Panasonic
Model/Type	TDPJ	TSL	SUMUDDJ-LS101	VA35JZ9910	DVT7-J11D	CTMW02
Announcement date	Mar. 2006	Nov. 2006	Sep. 2006	Jan. 2007	Feb. 2007	Mar. 2007
Feature	Small size	High durability for automobile environments	Small size	Low power consumption	Small size	Diversity reception
Size(mm)	9.5x9.5x1.7	25.0x15.2x2.1	8.7x9.6x1.55	9.0x9.0x1.5	8.9x8.9x1.5	12.5x16.5x1.95
Power consumption (mW)	180	-	-	95	140	100(low power mode) /115(normal mode) ※single mode
Minimum input sensitivity (dBm,1segment bandwidth, QPSK1/2)	-109	-107.5	-110	-109	-109	-109(single mode) /-112(diversity mode)

■Improvement of One-Seg Cell Phones

Model	W33SA (The first One-Seg receiver)	W43SA	W51SA
Released date	Dec. 2005	Oct. 2006	Jan. 2007
Size(mm) (when closed)	105x50x27	102x50x22	105x51x21
Weight(g) (with battery)	150	133	146
Display	2.4inch QVGA (240x320)	2.4inch QVGA (240x320)	2.6inch QVGA (240x320)
Battery capacity(mAh)	830	840	840
Continuous watch time for “One-Seg”	2 h 45 m <	4 h 40 m <	5 h 5 m

Duration time has become longer mainly thanks to lower power consumption of a tuner and a chipset.

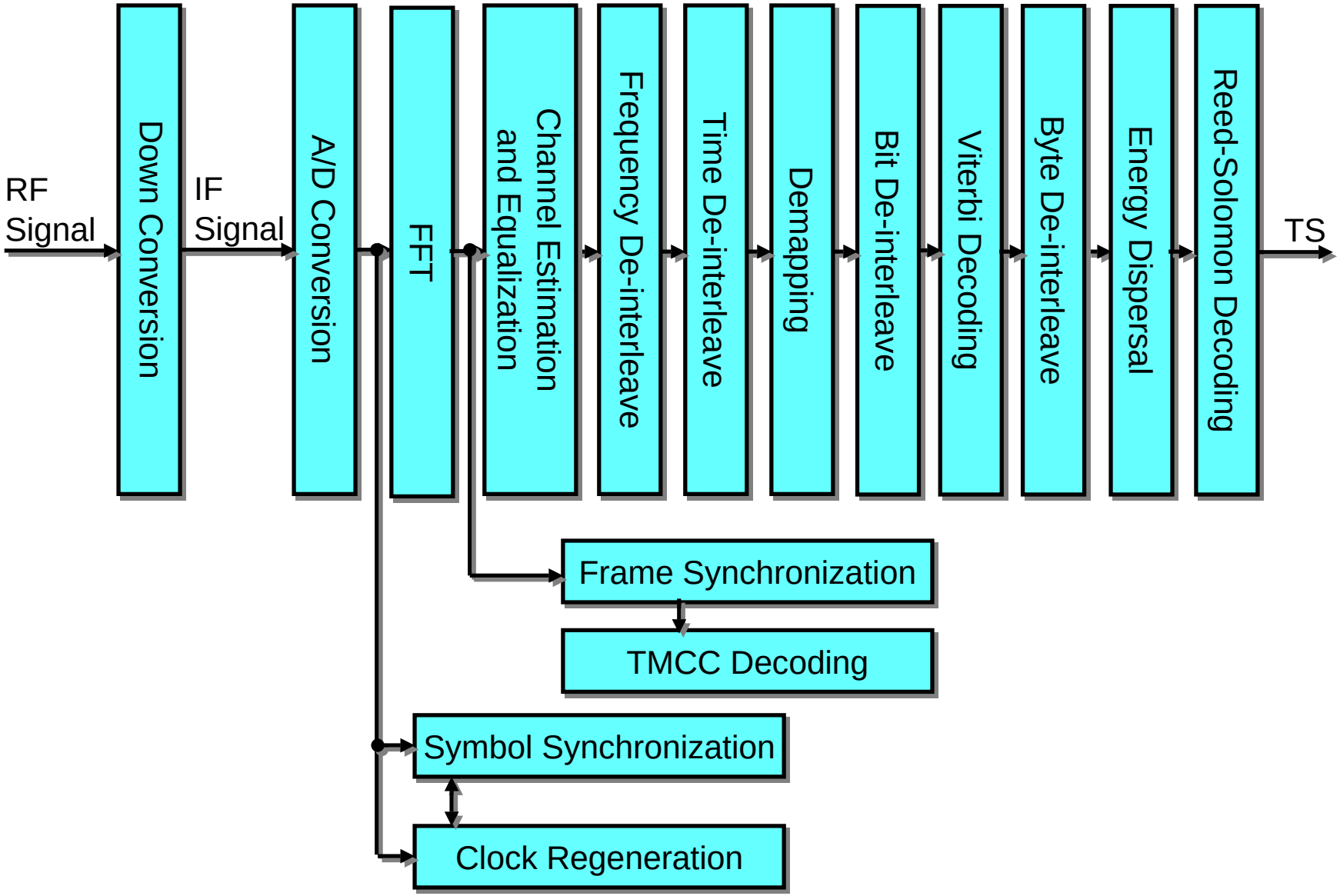
Hardware Components of a Basic Receiver



Between a Full-Seg receiver and a One-Seg receiver, the basic configurations are about the same, though there are some differences such as a tuner, video decoder, resolution of display and so on.

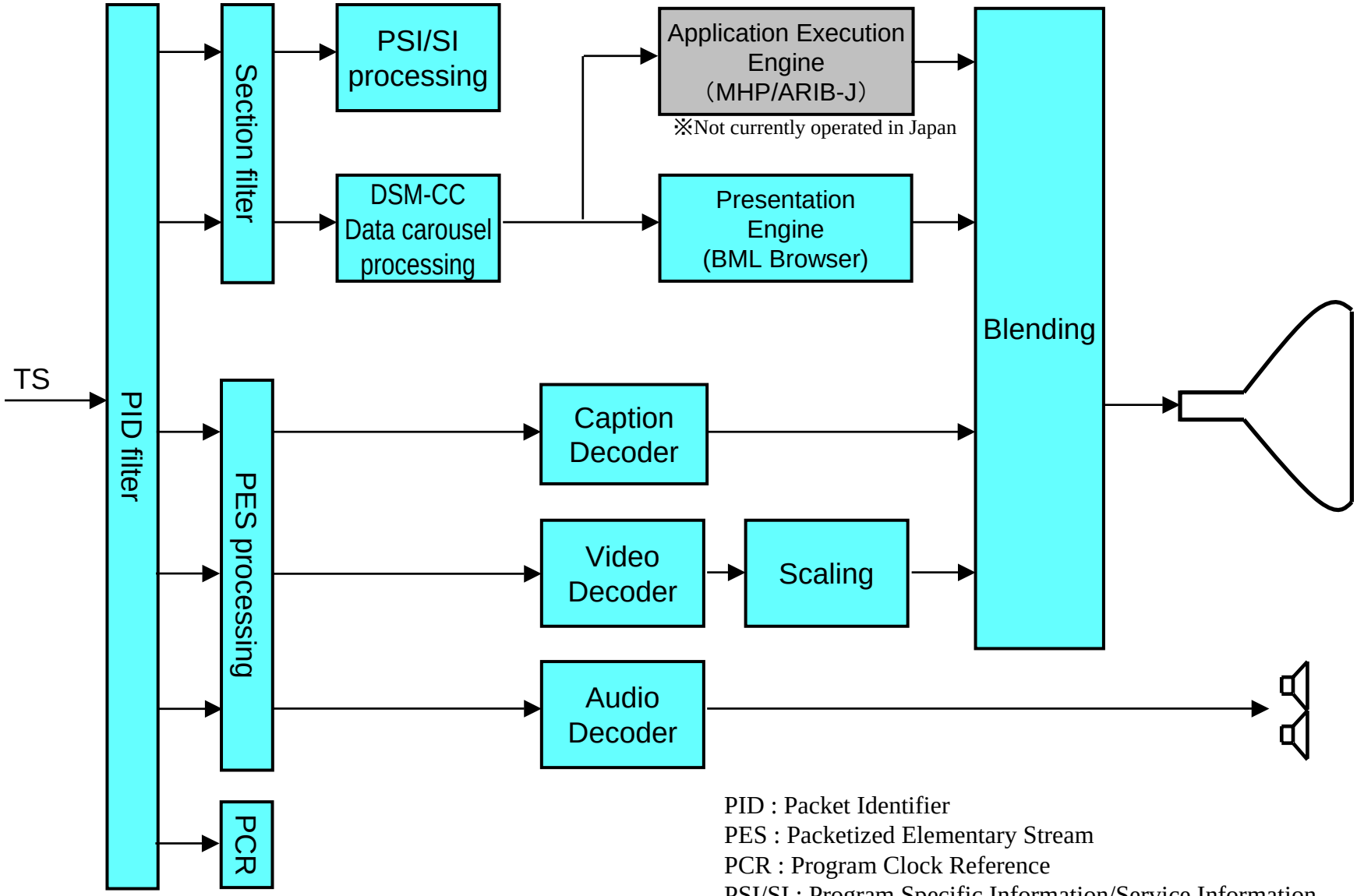
RF : Radio Frequency
IF : Intermediate Frequency
TS : Transport Stream
Demux : Demultiplexer
NVRAM : Non-volatile RAM

Functional Block Diagram of the Front-end



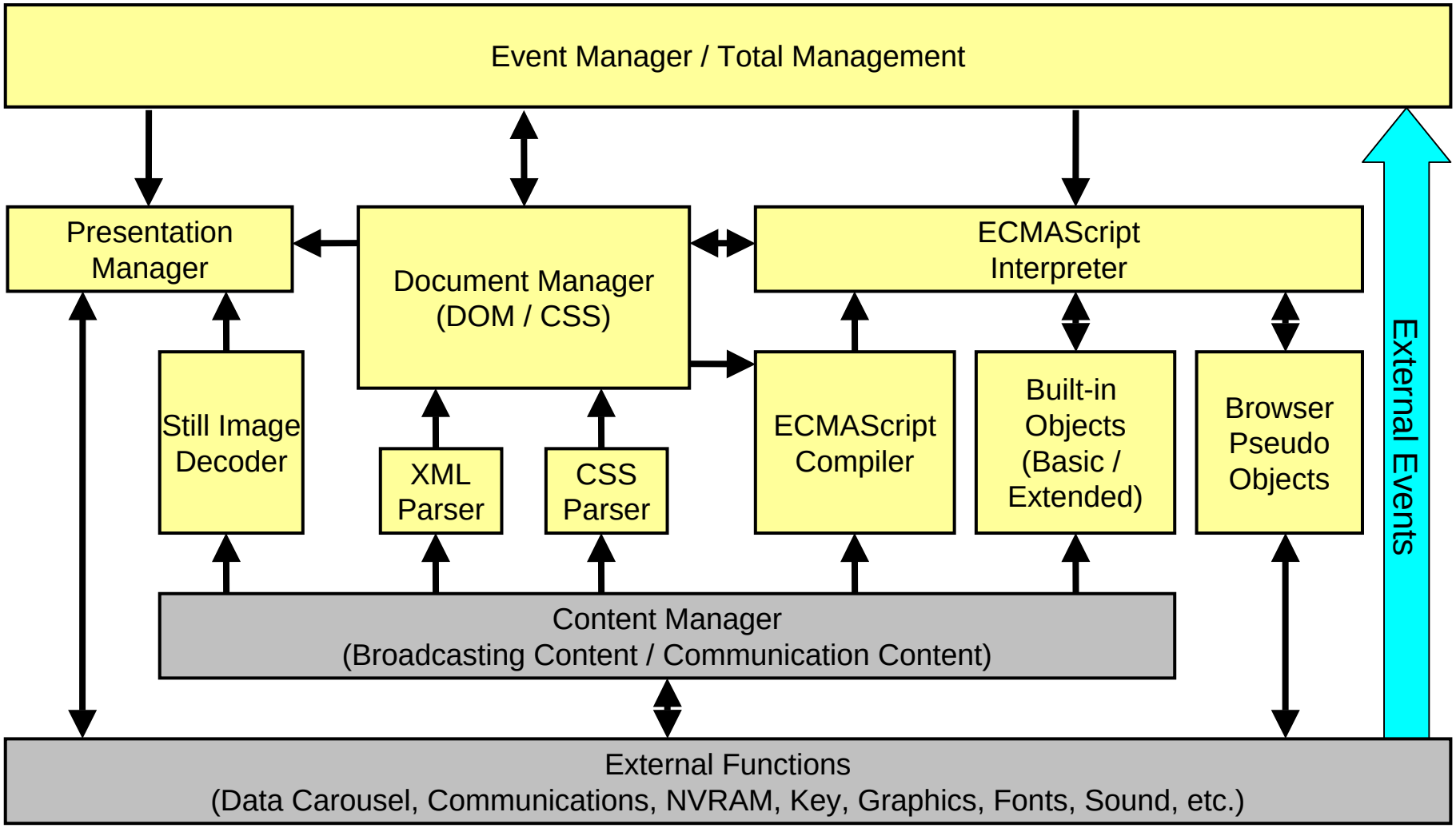
FFT : Fast Fourier Transform
TMCC : Transmission and Multiplexing Configuration Control

Functional Block Diagram of the Back-end



PID : Packet Identifier
PES : Packetized Elementary Stream
PCR : Program Clock Reference
PSI/SI : Program Specific Information/Service Information
DSM-CC : Digital Storage Media - Command and Control
BML : Broadcast Markup Language

Functional Block Diagram of BML Browser



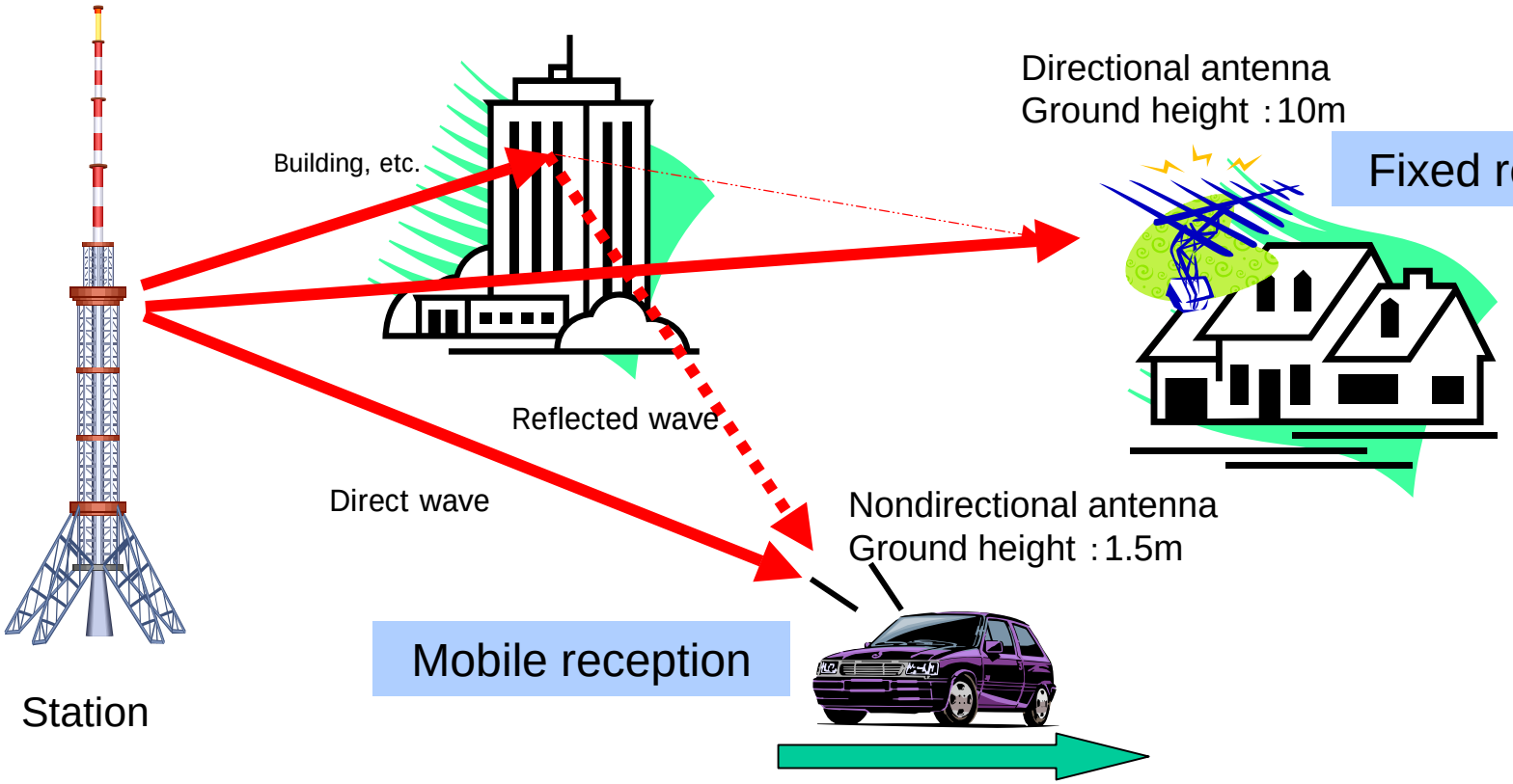
Basic Applications on ISDB-T Receivers

- Frequency scanning / Channel list
- Channel selecting
- Audio/Video playing back
- EPG (Electronic Program Guide)
- Closed Caption / Subtitle
- Data Broadcasting (BML)
- Interactive service

etc.

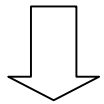
Mobile Reception Environment

1. Lower electric field strength because of low antenna height (Approx. 10dB down)
2. Smaller antenna gain because of a nondirectional antenna (Approx. 10dB down)
3. Greatly affected by multipath fading because of mobile reception
4. Doppler shift because of high-speed movement



Improvement of Reception Performance

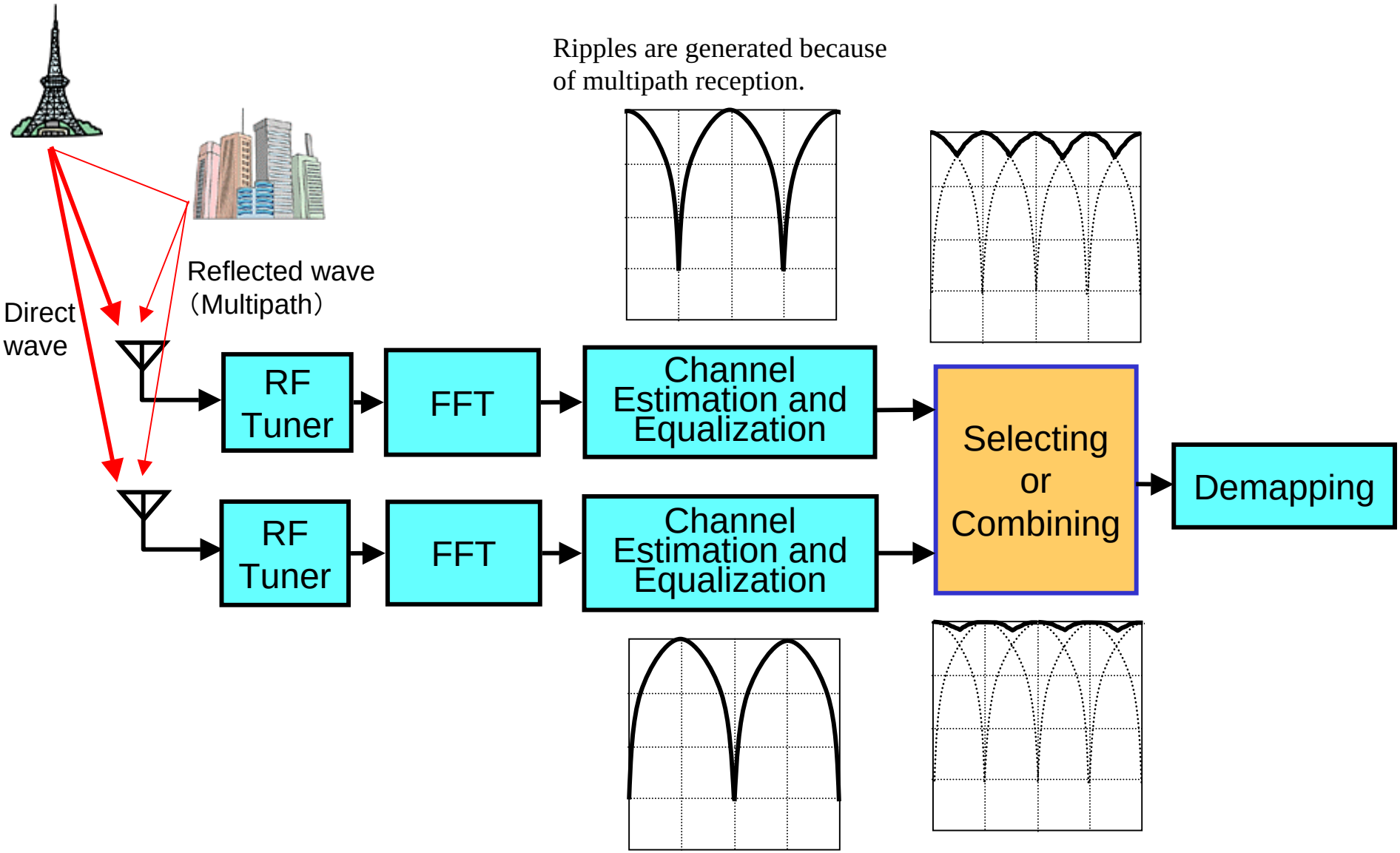
Improvement of a reception sensitivity with a single antenna almost reaches the limit.



Diversity reception techniques are expected to improve total reception sensitivity.

In fixed reception, diversity effect is 3dB at maximum.
But in mobile reception, e.g. in-car TVs or cell phone TVs in a car or train, the effect reaches 6 - 8 dB.

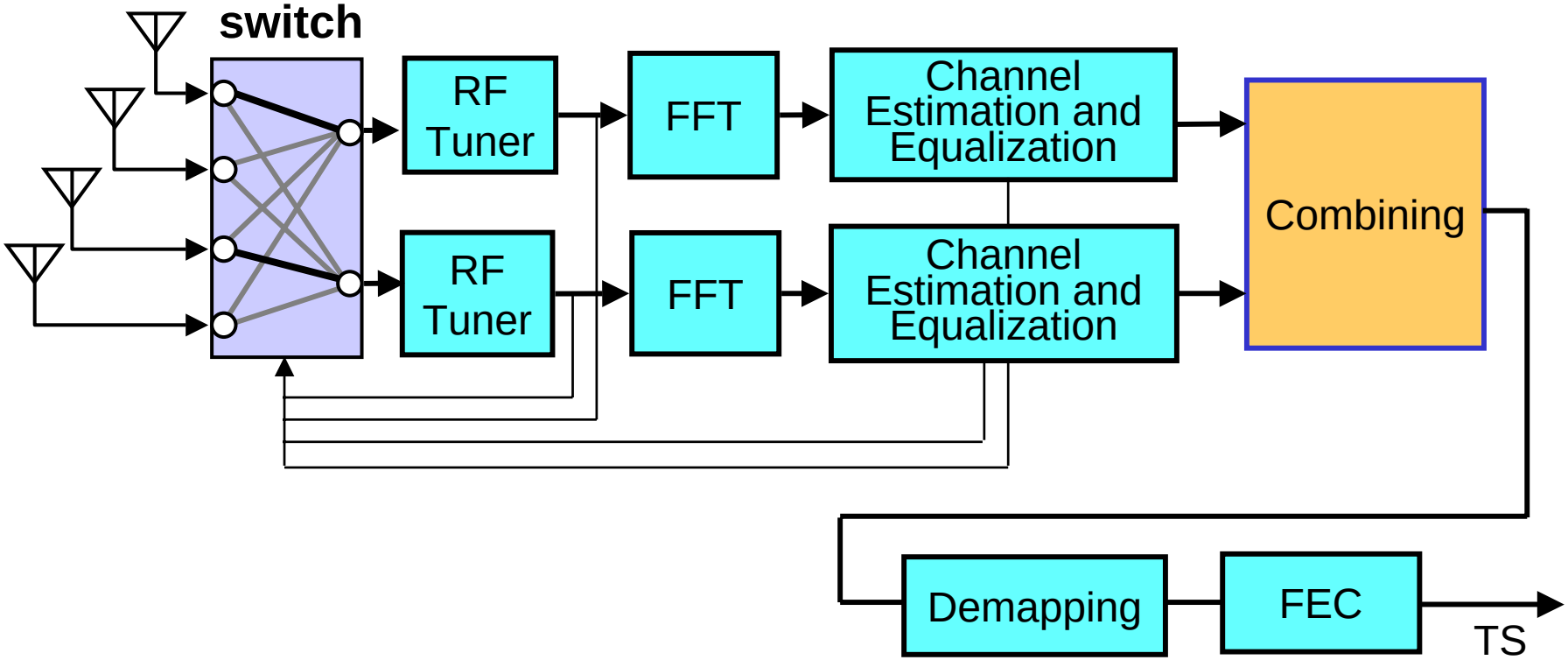
Overview of Diversity System



■2-Diversity System(4 Antennas and 2 Tuners)

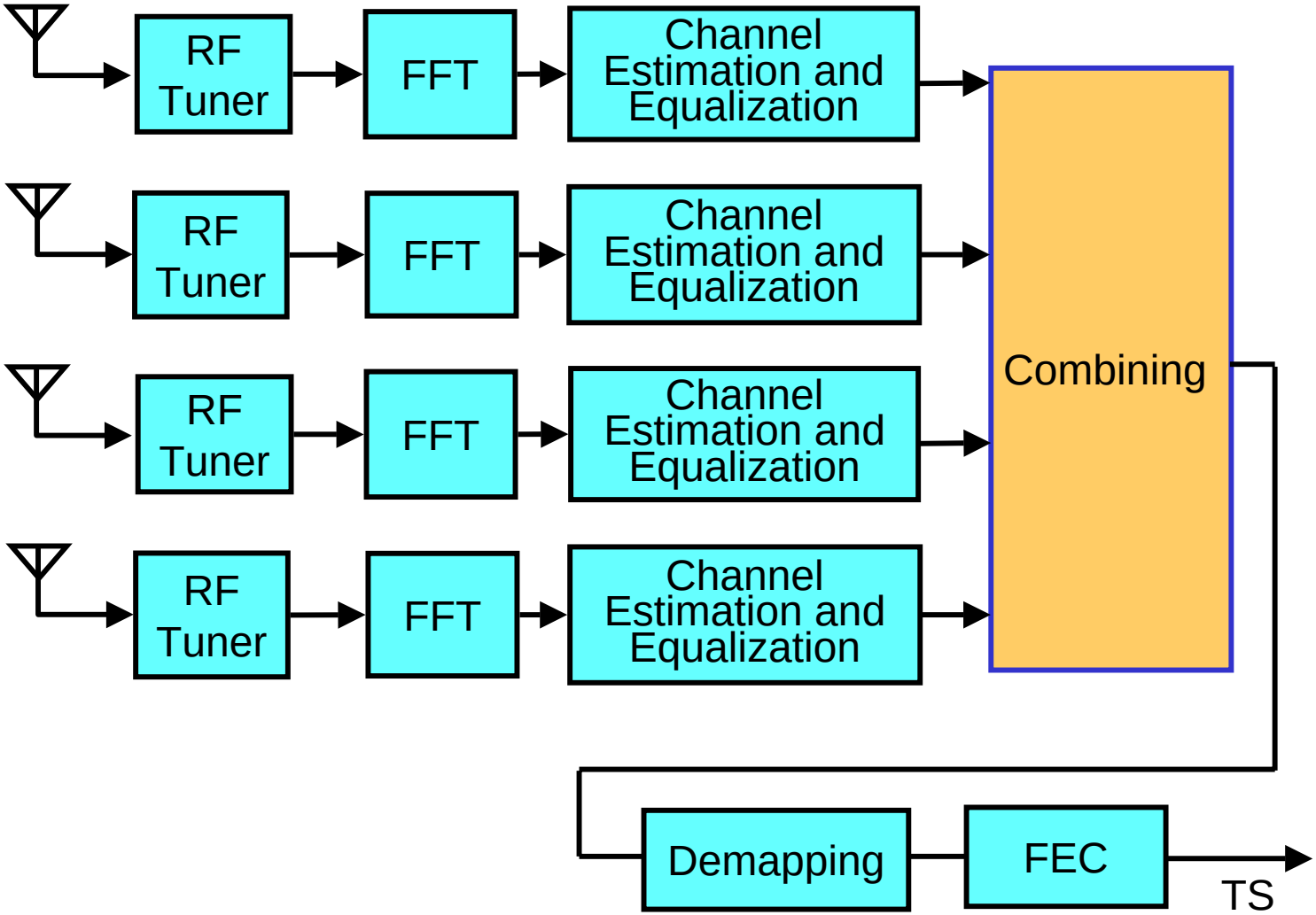
Less complex than 4-tuner diversity system.

Higher-sensitive than conventional 2 antenna-diversity system



4-Diversity System(4 Antennas and 4 Tuners)

4-diversity system improves the reception performance more than conventional 2-diversity system, though the process becomes more complex.



■ Experiments of One-Seg Diversity Reception

Experiment 1 : Field test

A) The upper terminal is using single antenna reception system.

B) The middle terminal is using diversity reception system of SANYO.

C) The lower terminal is using diversity reception system of a certain company.

Experiments of One-Seg Diversity Reception

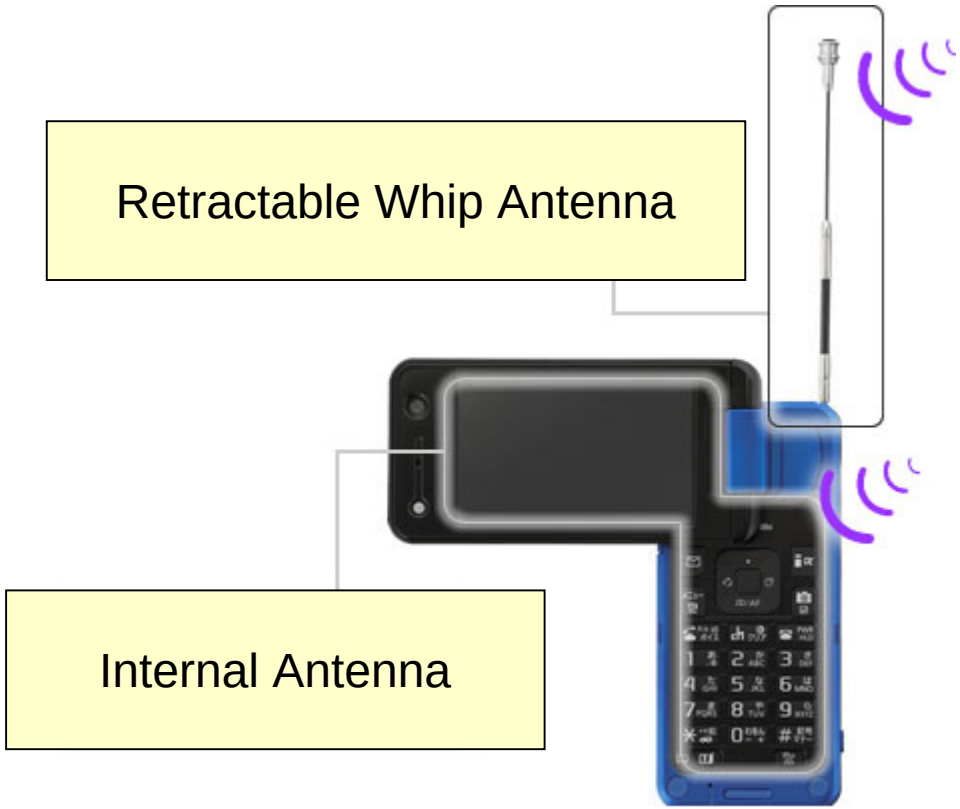
Experiment 2 : Laboratory test

A) The left terminal is using diversity reception system of SANYO.

B) The right terminal is using diversity reception system of a certain company.

■ Diversity Reception System for Cell Phones

Diversity systems are applicable to cell phones as well as in-car receivers.
Now, only one product, P903iTV, is equipped with diversity system.
It has two antennas for One-Seg, a whip antenna and an internal antenna.



Conclusions

✓ Since 2003 various ISDB-T products, fixed, in-car and portable receivers have been launched in Japan.

✓ Consumer adoption of ISDB-T receiver is growing at a rapid pace for 2011 when analogue TV broadcasting will end in Japan.

✓ About 30% of cell phone users will have One-Seg cell phones in 2010 in Japan.

✓ For mobile reception, diversity techniques are very effective to improve the reception performance.

Thank you for your attention.

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