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Implementation of Emergency Warning Broadcasting System in the Asia Pacific Region

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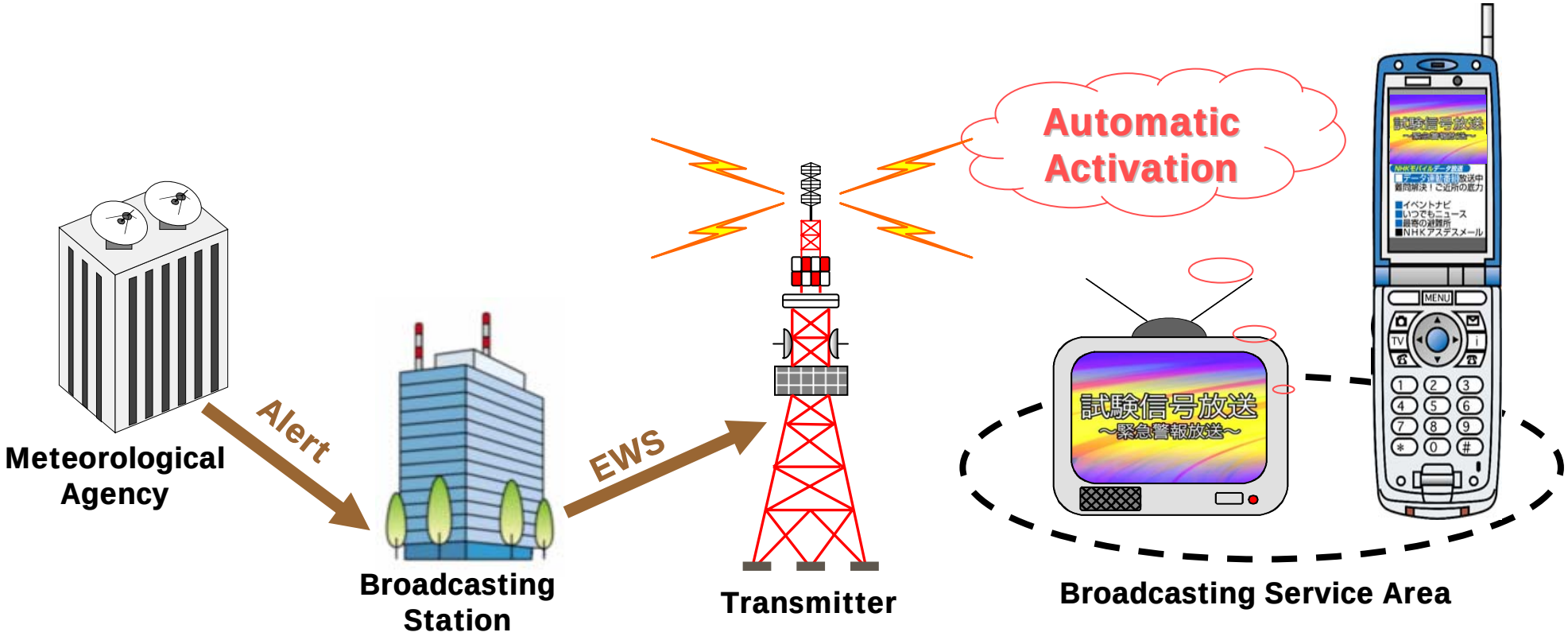
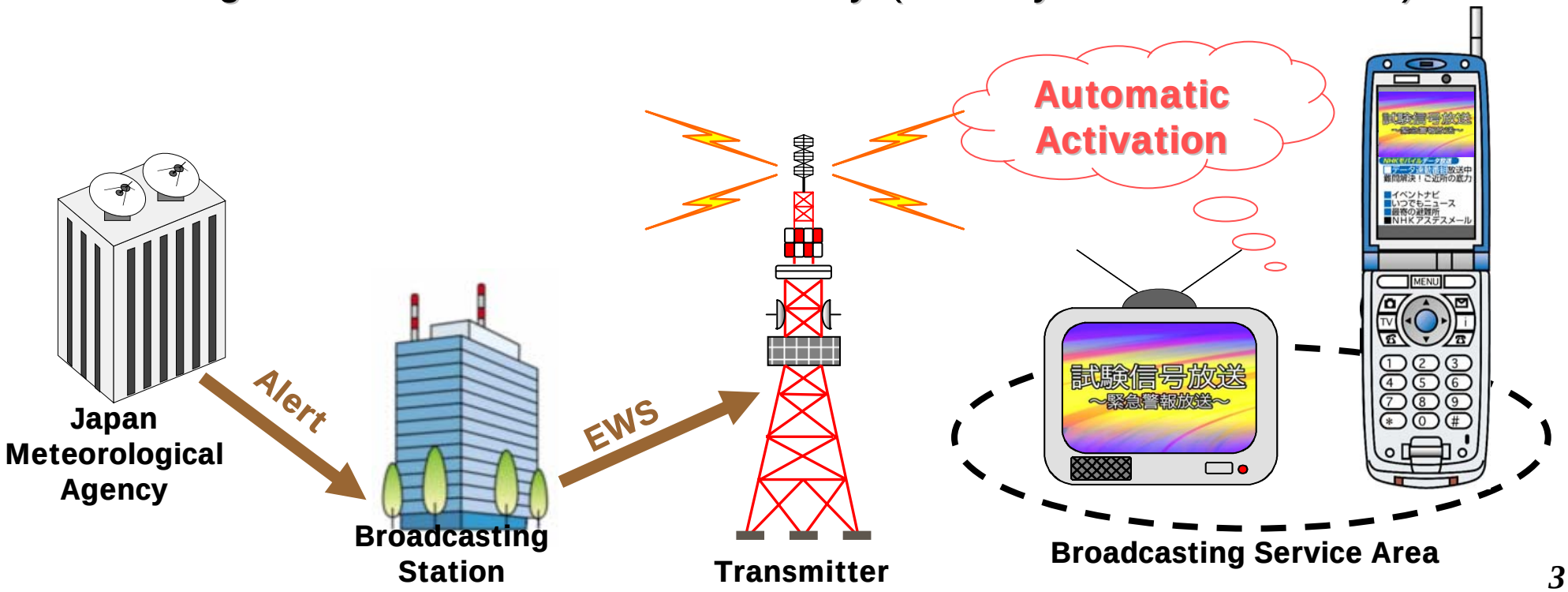
Emergency Warning Broadcasting System

- Remote activation of Radio & TV receivers ready for EWBS
- EWBS has been operated since September 1985



Emergency Warning Broadcasting System

- AM, FM Radio & TV
  - Control and Alert Sound
- ISDB-T (including One-Seg service for mobile reception)
  - Emergency Warning bit on TMCC (Transmission and Multiplexing Configuration Control) Signal
- Test signals are broadcast monthly (1st day of each month)



Emergency Warning Broadcasting System (EWBS)

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- 1. Functions of broadcasting in disaster relief and mitigation
- 2. EWBS - History
- 3. Implementation of EWBS in the ABU region
- 4. Techniques employed for Audible EWBS
- 5. Receivers for EWBS
- 6. EWBS for digital broadcasting

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1. Functions of Broadcasting in Disaster Relief and Mitigation

- Gathering/receiving disaster information from administrative organizations
- Filtering information
- Delivering disaster information to the general public

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1. Functions of Broadcasting in Disaster Relief and Mitigation

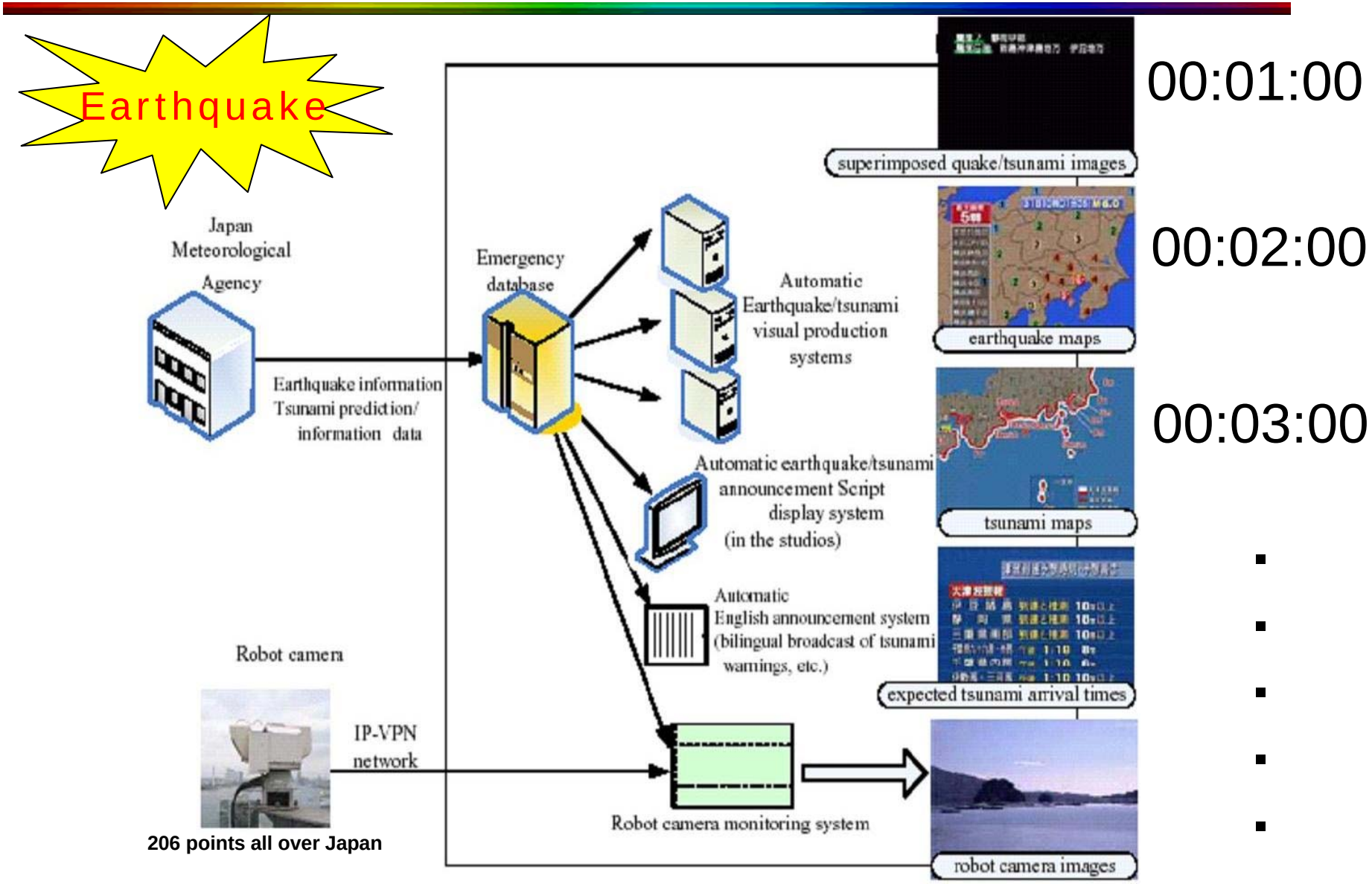
- **Broadcasting offers reliable information**
  There are no “spam” information in broadcasting

- **Always connected to everybody**
  There are no congestions like in communication

- **Always active : 24 hour operation**

Broadcasting is a ideal media to deliver disaster information

1. Functions of Broadcasting in Disaster Relief and Mitigation



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1. Functions of Broadcasting in Disaster Relief and Mitigation

Emergency Console in NHK Studio

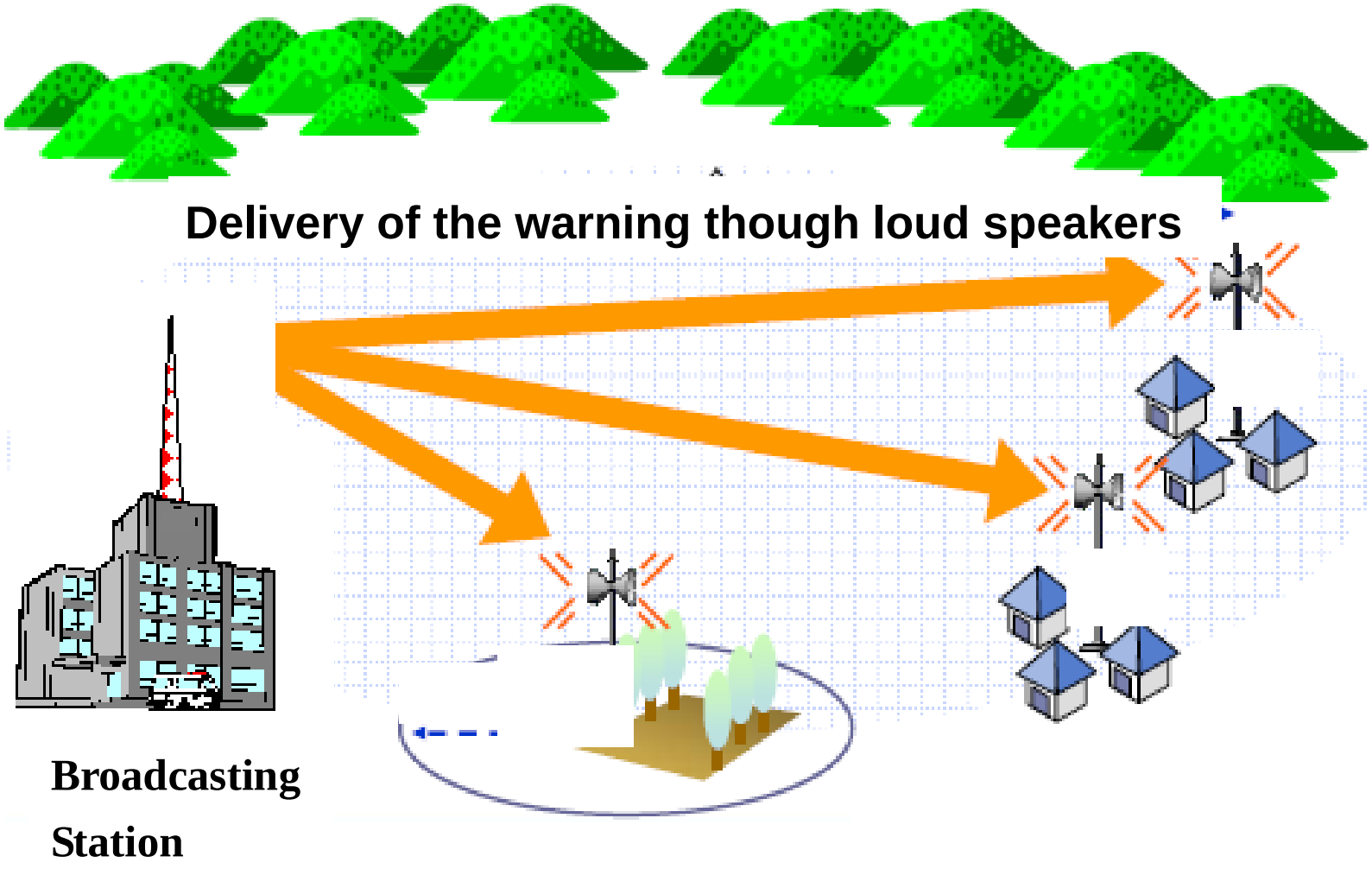
2. Emergency Warning Broadcasting System (EWBS) in Japan - History

- 1980 — Start of EWBS study
- Sep. 1,1985† — Start of EWBS in Japan
- Mar.18,1987 — First EWBS operation for tsunami warning
- Nov.15,2006 — Latest EWBS operation for tsunami warning
- Up to now †† — 14 times EWBS operation during 20 years

† On Sep. 1, 1923, a big earthquake attacked Tokyo area and more than 100 thousand people died. It became a trigger to start radio broadcasting in Japan. Sep. 1st is the day of disaster prevention in Japan.

†† 1987.3.18 Miyazaki-Pref., 1989.11.2 Sanriku-oki, 1993.7.12 Hokkaido South-East, 1994.10.4 Hokkaido East, 1994.12.28 Sanriku, 1995.10.19 Amami-Ohshima, 1996.2.17 New Guinea, 1996.10.19 Hyuga-Oki, 1998.5.4 Okinawa Ishigaki-Jima, 2000.3.26 Okinawa Ishigaki-Jima, 2000.3.31 Taiwan, 2001.9.26 Hokkaido Kushiro, 2004.9.5 Tokaido-Oki, 2006.11.15 Chishima-Retto
(All the Emergency Warning Broadcasting is Tsunami warning.)

3. Implementation of EWBS in the ABU region



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3. Implementation of EWBS in the ABU region
Media suitable for EWBS

- Two possibilities to implement the EWBS in the ABU region. The control signal (warning code) of EWBS is transmitted by
  - the existing broadcasting stations (AM/FM/TV sound).
  - a newly constructed transmitting station, for example in the Indian Ocean area.
- The SW(HF) has some difficulties to be overcome, for example multiple frequency bands are needed for stable reception.
- Existing AM(MF) and FM(VHF) transmitting stations seem suitable for the EWBS in the ABU region

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3. Implementation of EWBS in the ABU region
Coping with jamming and abuse of EWBS

- To reduce the occasion for abuse of EWBS, time codes are provided in EWBS
- Listeners can judge the emergency broadcast to be true or pretended, because they are familiar with the voice of the ordinary announcer
- Abuse of EWS needs very high power transmitter to overcome broadcasting during on air, so 24 hours broadcasting can defend from the attack

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3. Implementation of EWBS in the ABU region
Set up of a new study project

(1) Set up of Project Group in ABU Technical Comittee : May 2005

(2) The tasks of T/ EWBS in ABU Technical Committee

- Implementation of EWBS in the ABU region
- Techniques employed for EWBS
- Media suitable for EWBS (SW, MW, FM, etc).
- Connection of broadcasting stations to governmental or international organizations which issue the disaster forecast.
- Emergency warning codes (Fixed code, Area code, Time code, etc.).
- Receivers for EWBS including digital broadcasting.

(3) The deliverables of T/ EWBS are expected as follows;

- Guidelines for implementation of EWBS in the ABU region.
- A set of rules that may be observed in establishing EWBS in the ABU region.

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3. Implementation of EWBS in the ABU region
Requirements for the implementation of EWBS

Requirements for the implementation of EWBS in the ABU region may be as follows;

(1) The equipment for issuing the control signal installed in broadcasting stations should be simple and low cost.

(2) The warning receivers should be low cost.

(3) The language for emergency broadcasting should be local so that people can understand the warning and the following information.

(4) In addition to the direct reception of EWBS with individual receivers, it may be effective to warn people through loud speakers with the warning receivers (See Fig. 1).

(5) The government in the ABU region should put up the necessary regulation and make the support for EWBS mandatory for all broadcasters or else it would not be effective.

(6) Funding of the EWBS will need to be discussed.

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3. Implementation of EWBS in the ABU region
ABU Recommendation and Declaration

(1) ABU RECOMMENDATION 1/2006
(REVISION OF RECOMMENDATION 1/2005)

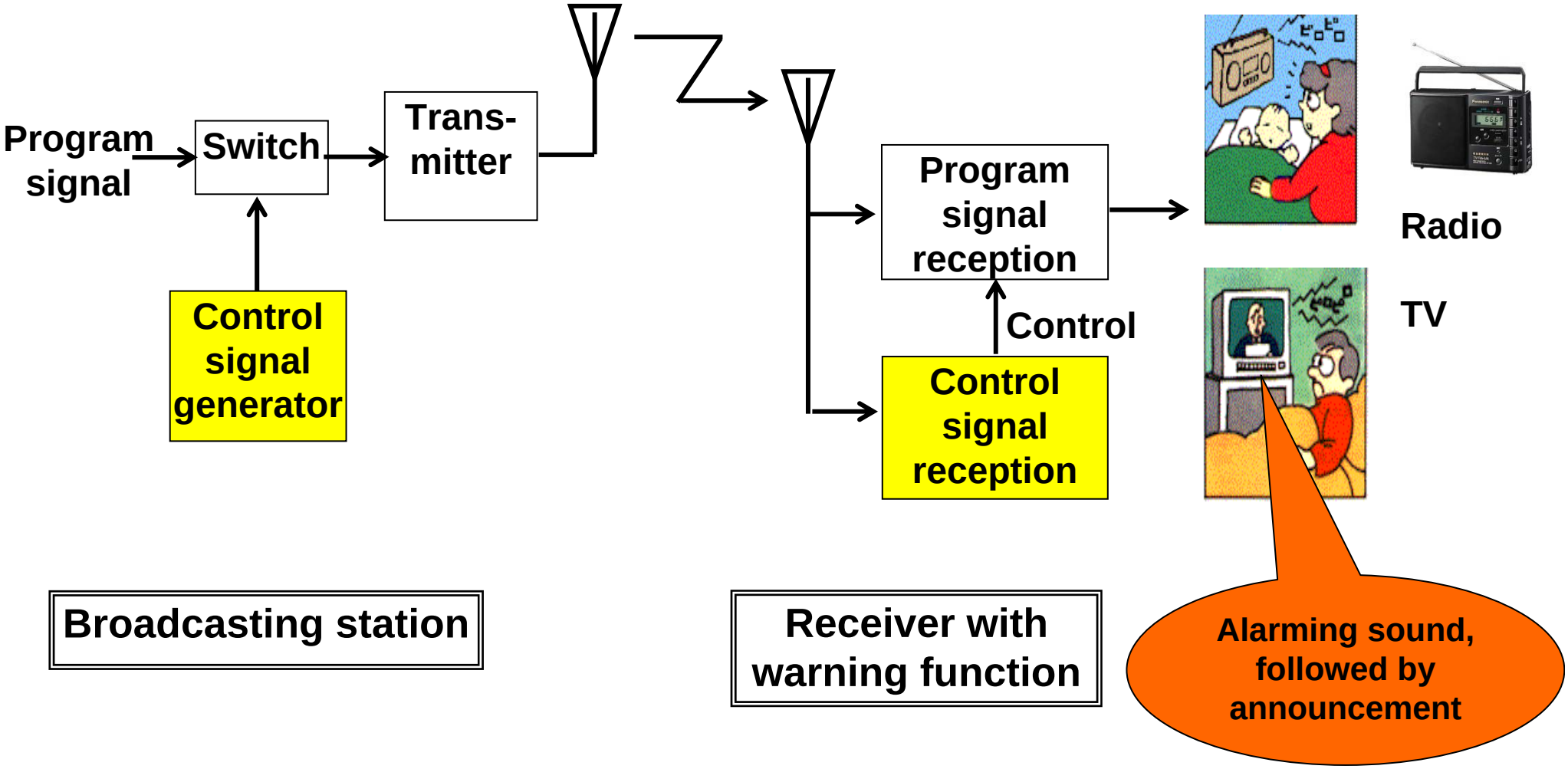
IMPLEMENTATION OF EMERGENCY WARNING BROADCASTING SYSTEM IN THE ASIA-PACIFIC REGION

(2) ABU DECLARATION (November 2006)

IMPLEMENTATION OF EMERGENCY WARNING BROADCASTING SYSTEMS IN THE ASIA-PACIFIC REGION

- **that in order to minimise the damage and impact of disasters, ABU members support the development of EWBS systems for the Asia-Pacific region;**
- **that, as a matter of urgency, ABU members consider the introduction of such EWBS systems which link with national or international organisations identified for issuing disaster forecasts;**
- **that ABU members urge their national regulators to enact provisions to implement EWBS systems in the Asia-Pacific region;**
- **that ABU members encourage manufacturers to produce receivers with the EWBS feature.**

4. Techniques employed for EWBS Transmission and reception



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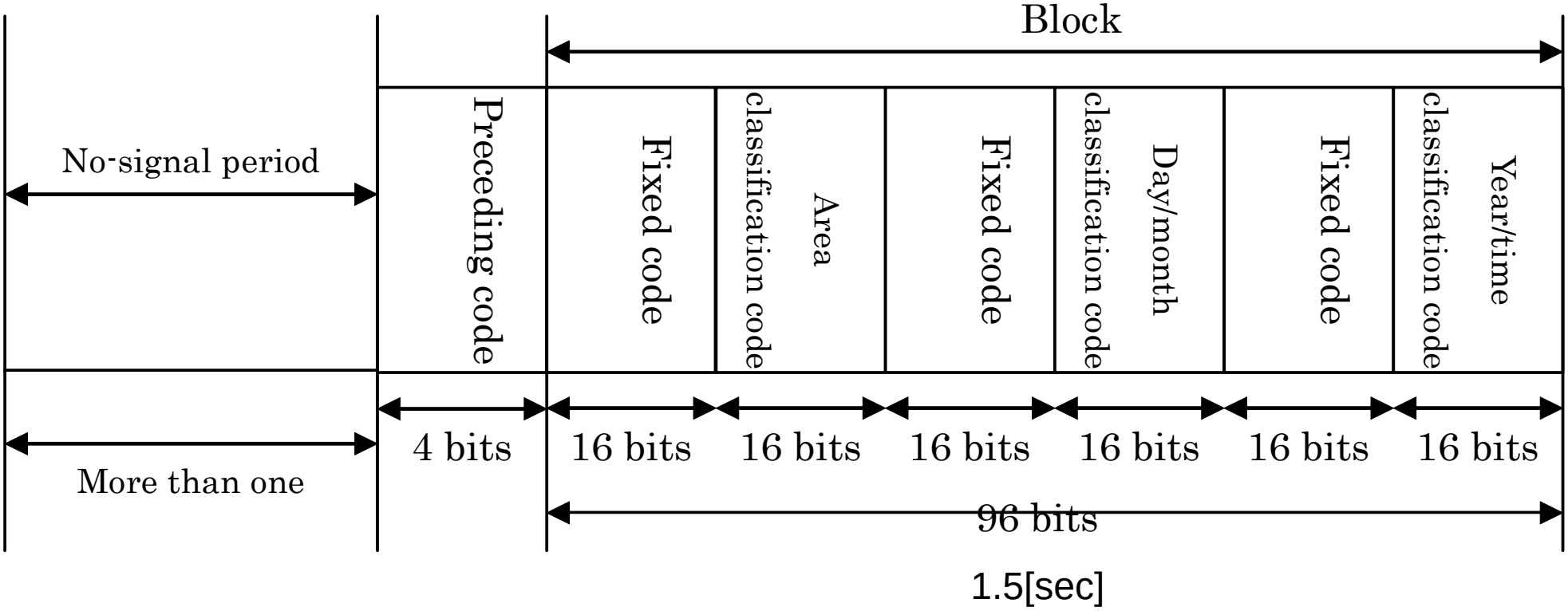
4. Techniques employed for EWBS Operational restrictions in Japan

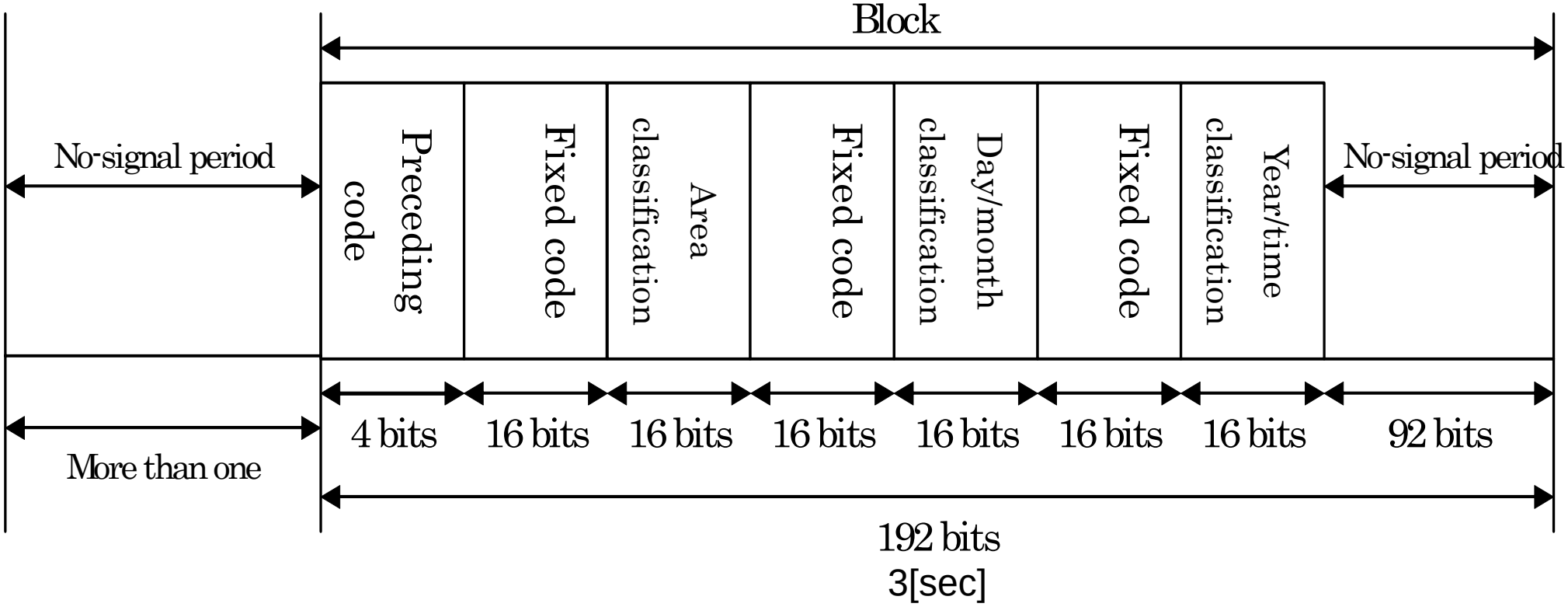
	Case	Category	Area code
(1)	Large-scale earthquake warning statement is declared by Meteorological Agency	I	Nation wide
(2)	Including broadcasting of evacuation order is requested by governor of prefecture	I	Prefecture or wide area
(3)	Tsunami warning is declared by Meteorological Agency	II	Nation wide, Prefecture or wide area

4. Techniques employed for EWBS
Configuration of Start Signal



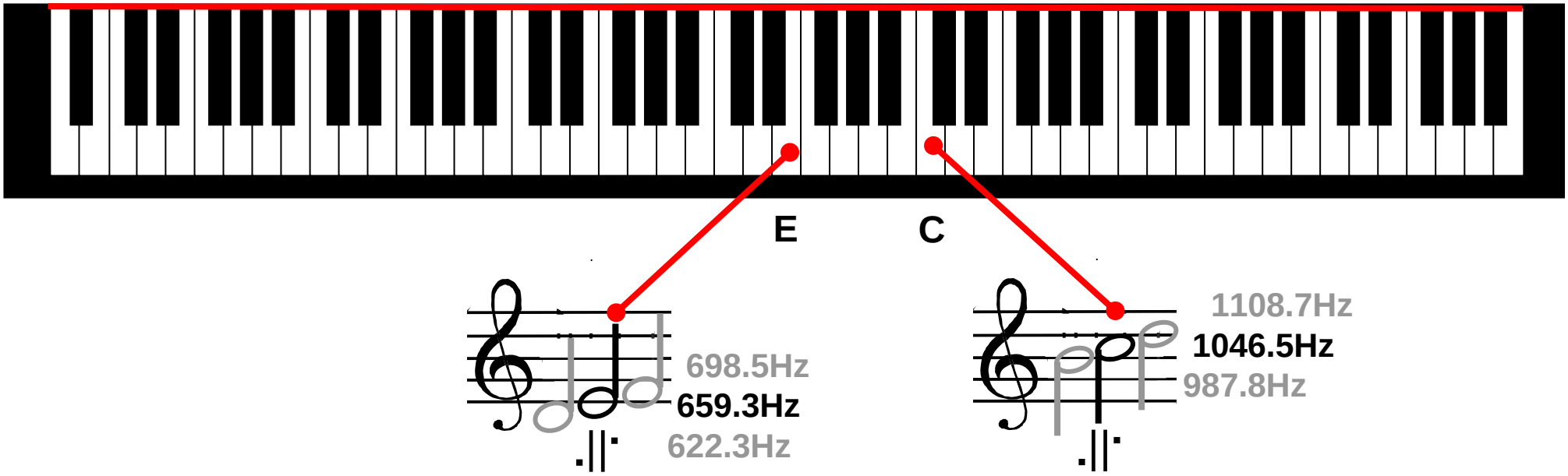
For reliable reception, blocks are repeated 4 to 10 times and it takes 6 to 15[sec].

4. Techniques employed for EWBS
Configuration of End Signal



For reliable reception, blocks are repeated 2 to 4 times and it takes 6 to 12[sec].

4. Techniques employed for EWBS
64 bit/s FSK Tones



640Hz 10 cycles
“Space”=0

1024Hz 16 cycles
“Mark”=1

- Can be delivered through audio storage media or telephone line (300-3400Hz)
- Highly reliable codes are used

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4. Techniques employed for EWBS
Codes for EWBS

Code type	Type of EWS	Configuration of signal
Preceding code (4 bits)	I,II start	1100
	I,II end	0011
Fixed code (16 bits)	I start / I,II end	0000 1110 0110 1101 (e.g. Japan)
	II start	1111 0001 1001 0010 (e.g. Japan)
Area code (16bits)	I,II start	10 [Area code (12 bits)] 00
	I,II end	01[Area code (12 bits)] 11
Day/month code (16 bits)	I,II start	010[Date(5 bits)†]0[Month(4 bits)†]100
	I,II end	100[Date(5 bits)†]0[Month(4 bits)†]111
Time/year code (16 bits)	I,II start	011[Time(5 bits)]0[Year(4 bits)]100
	I,II end	101[Time(5 bits)]0[Year(4 bits)]111

† LSB first

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5. Receivers for EWBS (Conventional)

Receiver with a Clock

Portable AM/FM Receiver

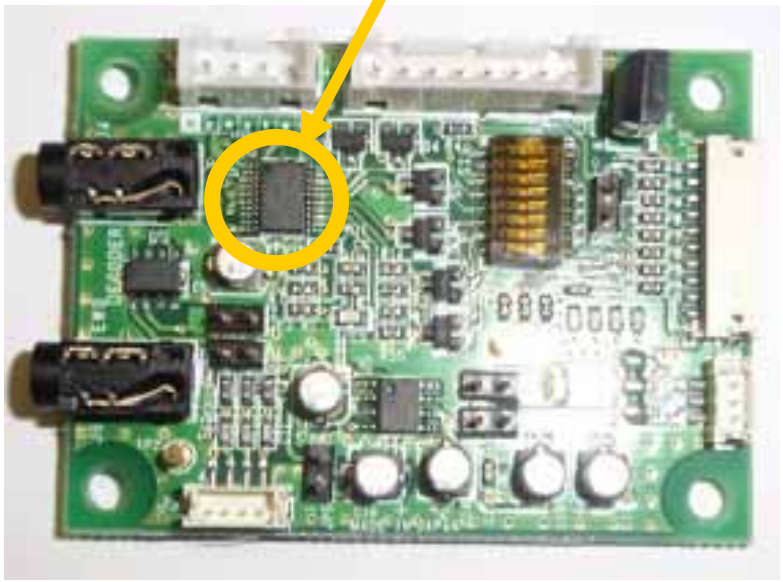
Receiver with Power on switch

・・・・・were too expensive ($60 - $130)

5. Receivers for EWBS
(Newly Developed)

(1) RZ-AM software receiver

(2) One Chip ($1) EWBS decoder for conventional receiver



・・・・・low cost
(expected to be less than $10)

5. Receivers for EWBS

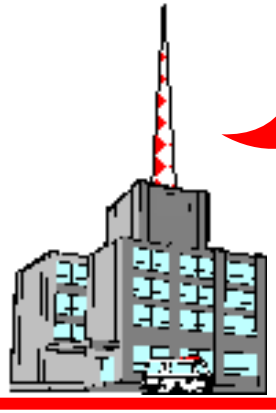
Low cost and high performance EWBS reception

- **A new and simple algorithm for EWBS has been developed**
- **A general use 16-bit microcontroller chip is employed**

TI MSP430F2121

- 16-bit RISC CPU, 16-bit registers, 16 MHz
- 4KB+256B Flash Memory, 256B RAM
- 5mm x 4mm x 1mm Micro Lead Frame Package

5. Receivers for EWBS
Low cost EWBS implements



Compact Disc in which EWBS signals are recorded

Enough for sending EWBS

Conventional Receiver ($2)

Speaker

EWBS Adaptor IC* parts: ($1)

*TI MSP430

Enough for receiving EWBS

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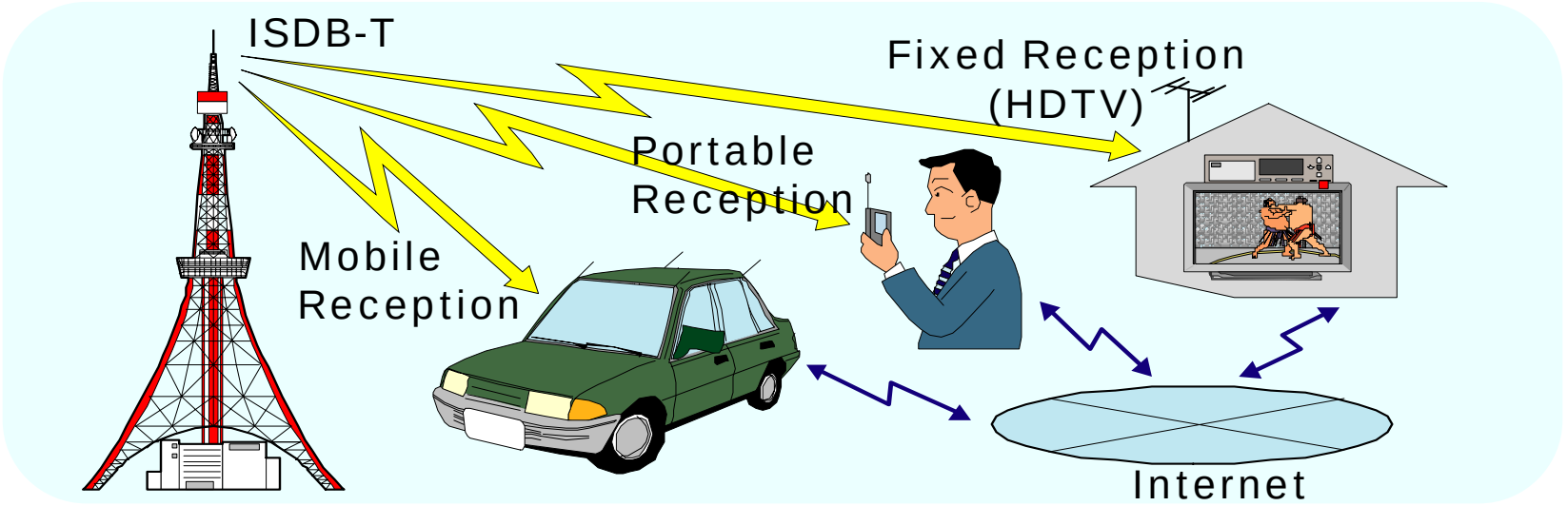
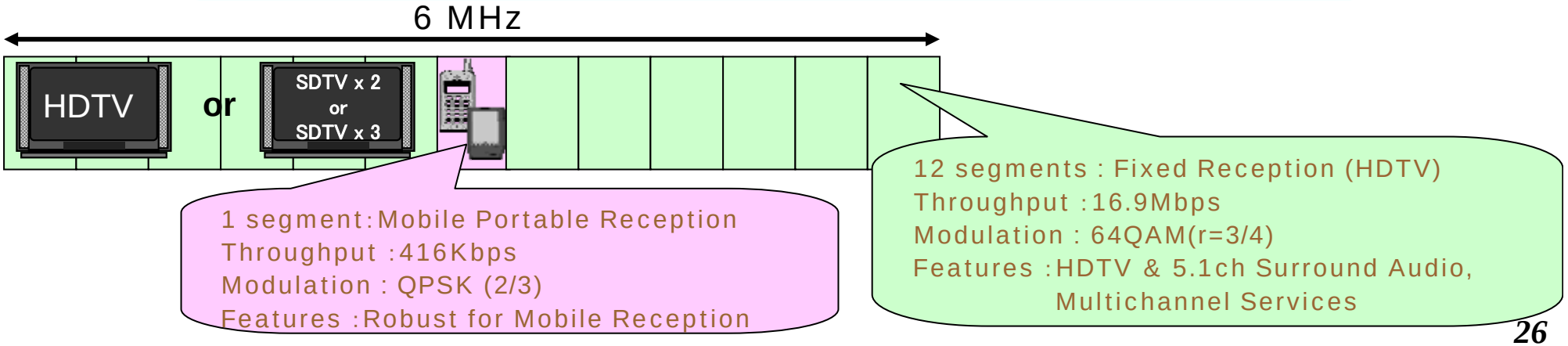
6. EWBS for Digital Broadcasting
ISDB-T One-Seg Services

- A channel slot divided into 13 segments
- 12 segments for HDTV services
- 1 segment for mobile / portable services
- Both services are simulcast now.





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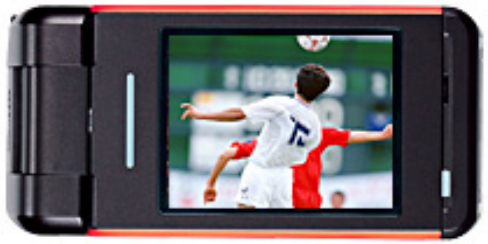
6. EWBS for Digital Broadcasting
ISDB-T One-Seg Services

- EWBS for ISDB systems have already been in operation in Japan as well as analog broadcasting
- Portable EWBS receivers for ISDB-T are now under development
- Portable receivers are expected to enlarge the opportunity to relieve disaster
- Technology for saving power consumption is the key
- EWBS should be prepared by other digital broadcasting systems

6. EWBS for Digital Broadcasting
ISDB-T One-Seg Terminals in the Market

au by KDDI W33SA



CDMA 1X WIN W41H by HITACHI

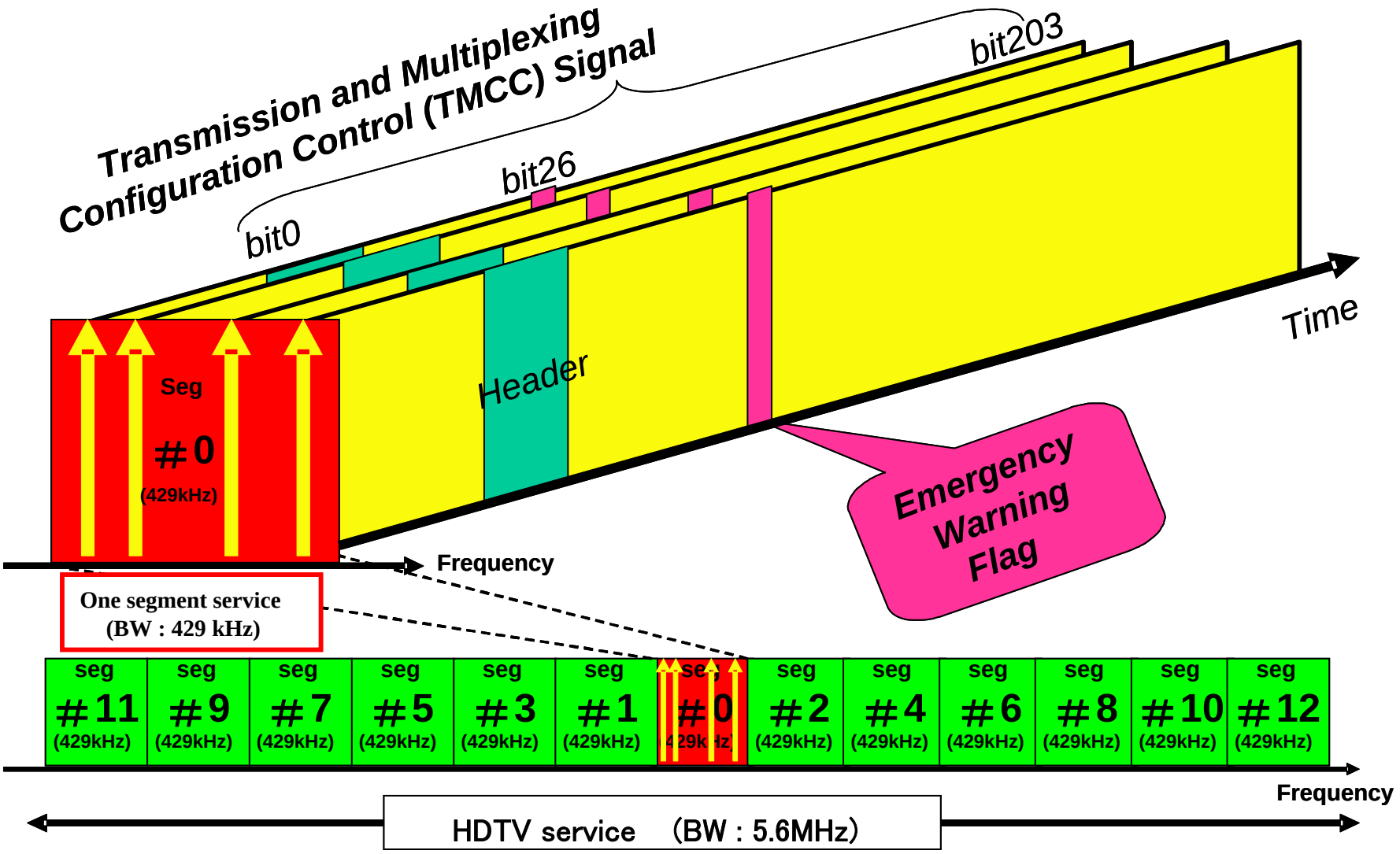
FOMA P901iTV

SoftBank 905SH

Laptop Computer

Portable DVD player

6. EWBS for Digital Broadcasting
EWS signal allocation in ISDB-T



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6. EWBS for Digital Broadcasting
ISDB-T One-Seg Services & EWS

- Remote activation of mobile terminals by EWS is very effective.
- EWS bits in TMCC have to be always watched in mobile terminals.

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The problem is power consumption of mobile terminals

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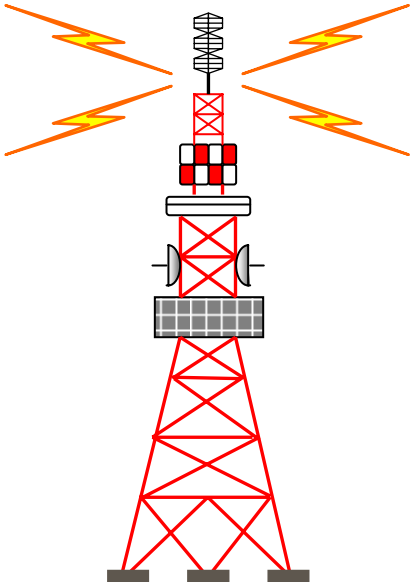
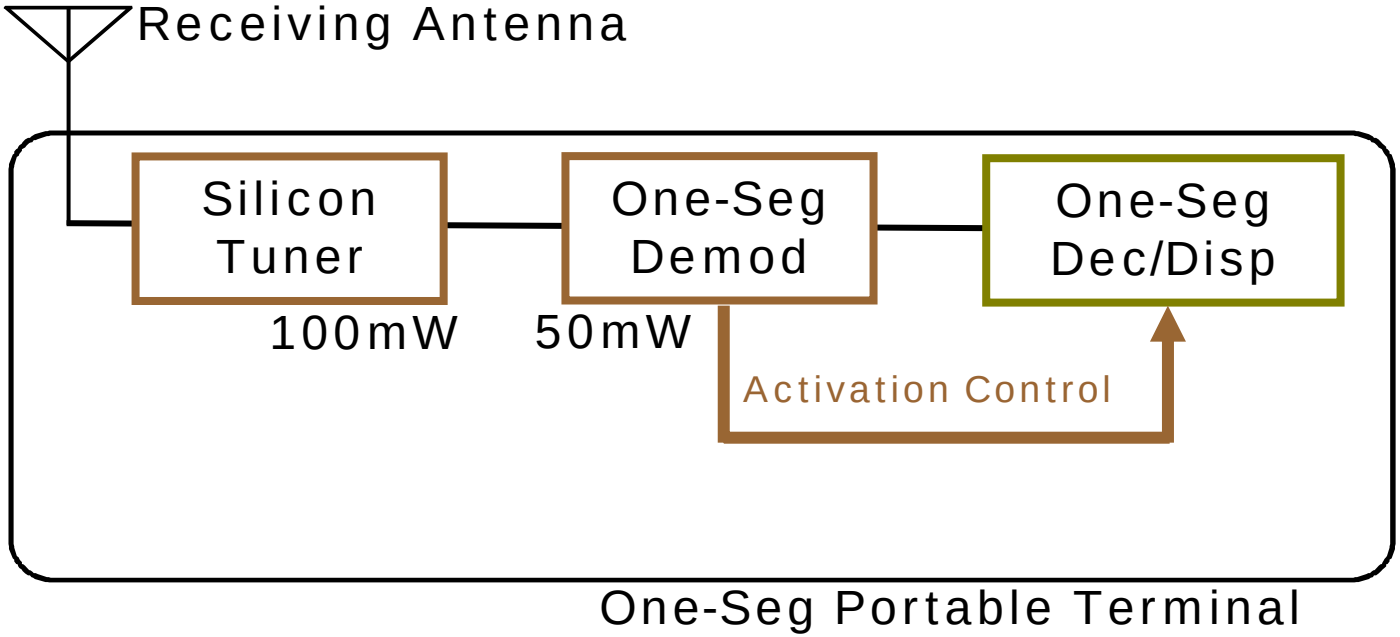
Power consumption saving is required during EWS stand-by mode

6. EWBS for Digital Broadcasting
Conventional EWS stand-by





- Silicon Tuner(100mW) and Demodutator(50mW) are always active
- Life of a Battery(3.7V,800mAh≒3Wh) is only 20h (1 day)

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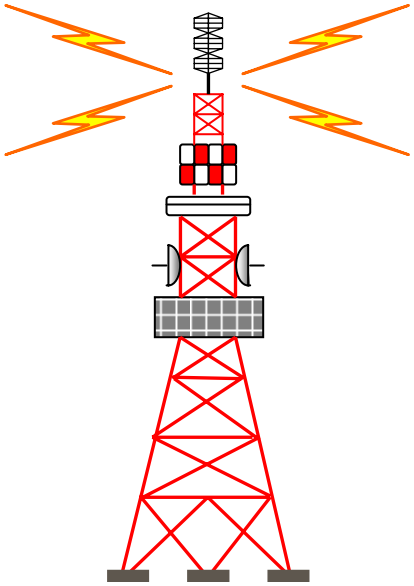
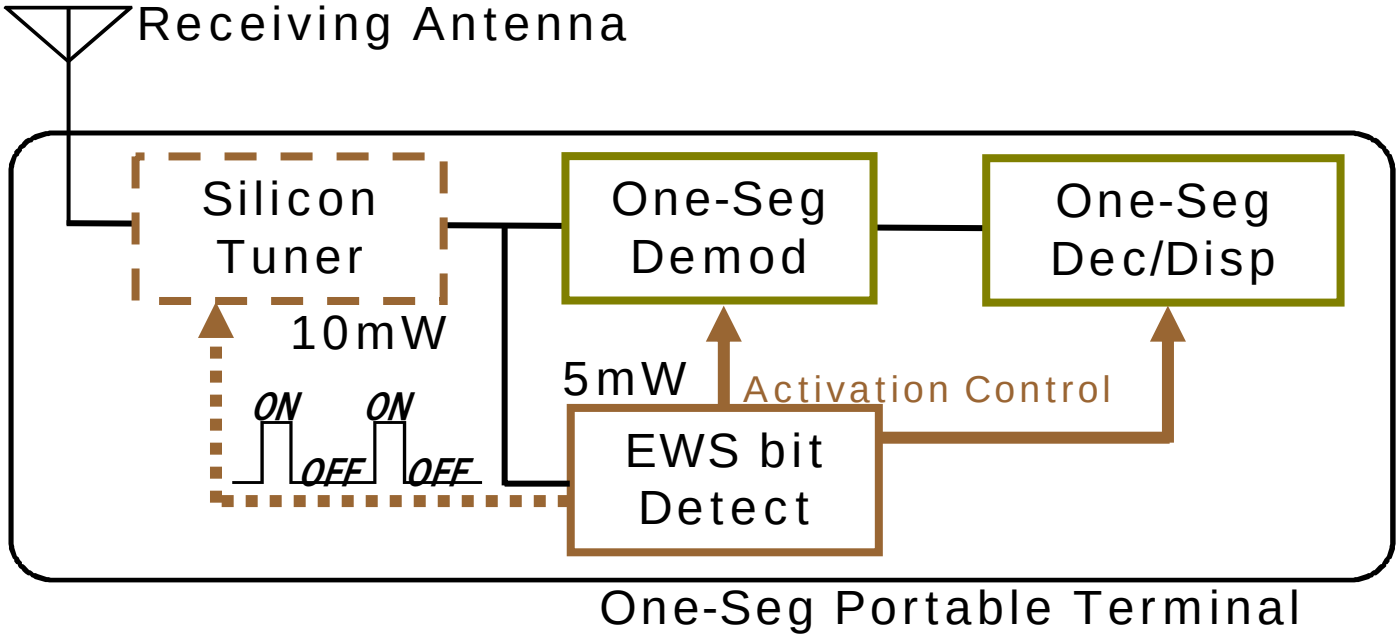
More than 200h (8 days) would be required

6. EWBS for Digital Broadcasting

Saving Power Consumption for EWS stand-by





- Silicon Tuner(10mW) and EWS bit detector(5mW) are active only for necessary duration
- Life of a Battery(3.7V,800mAh≒3Wh) improved to 200h(8 days)

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6. EWBS for Digital Broadcasting

Saving Power Consumption for EWS stand-by

	DTTB Mobile Handheld Receiver	Low-power-consumption EWS stand-by circuit
Front End (Silicon Tuner)	~100 mW	~ 10 mW (at 200 ms intervals)
A/D converter	Clock > 2 MHz	Clock < 1 MHz
Gate Number (in ASIC)	About 100,000	About 30,000
Digital Circuit	~50 mW	~ 5 mW
Total	~150 mW	~15 mW
Life of a Battery (3.7 V,800 mAh)	~20 h (~1 day)	~200 h (~8 days)

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One-Seg Prototype Receiver ready for EWS with very low power consumption

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Usage for EWBS

Not only

- Tsunami forecast and warning

But also

- Earthquake forecast and warning
- Hurricane forecast and warning
- Flood warning
- Eruption warning
- Fire warning
- Riot warning
- Other warning

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Conclusion

- EWBS for analogue AM/FM radio and TV (terrestrial and satellite) has already been in operation in Japan
- Implementation of EWBS is very easy and low cost
  - Broadcasting station : A compact disc or storage media which contains EWBS audio signals (EWBS start code and EWBS end code) is enough for sending EWBS control signals
  - Receiver : Microcomputer chips generally used in consumer electronic products is available for EWBS reception
- Allocation of EWBS control codes in ABU is required
  - Country/area codes
- Encouragement for ABU countries to implement EWBS
- Preparation for EWBS toward digital broadcasting