

PRESENT AND FUTURE OF MOBILE COMMUNICATIONS IN JAPAN (Invited Paper)

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ABSTRACT

In Japan, mobile communication subscribers have been increasing rapidly, in specially cellular telephone, radio paging, trunked system (called MCA) and cordless phone.

The digital cellular service is going into operation in the spring of 1993.

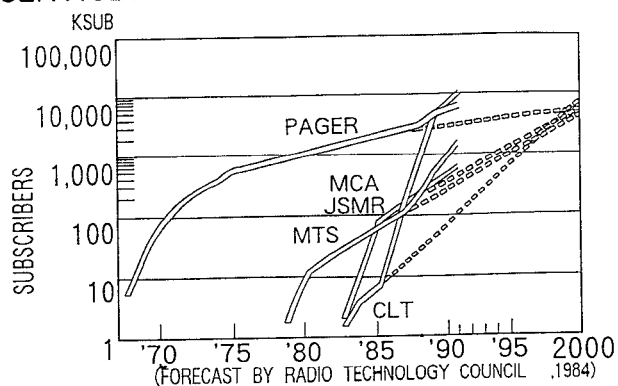
The digital cordless telephone, digital trunked system and future public land mobile telecommunication system (FPLMTS) are now been considered.

This paper describes the following items;

- 1) Mobile Communication Services in Japan
- 2) Personal Mobile Communications
- 3) Future Mobile Communication Terminals

1. MOBILE COMMUNICATION SERVICES IN JAPAN [1]

TRENDS IN MOBILE COMMUNICATION SERVICES IN JAPAN

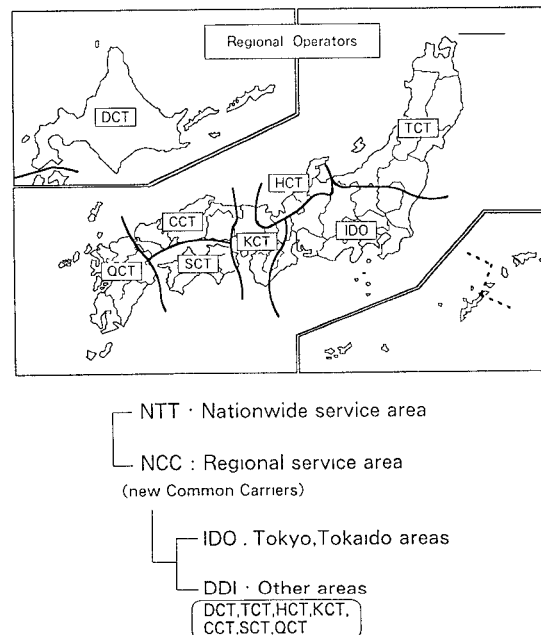


NUMBER OF SUBSCRIBERS FOR LAND MOBILE COMMUNICATION SERVICES

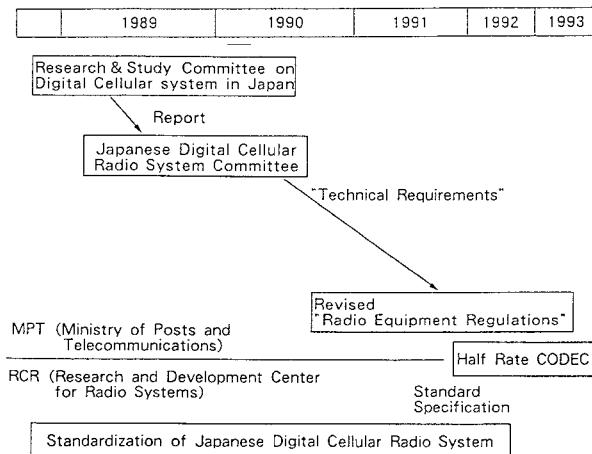
Service		Number of Subscribers (Unit : 1000)					
		1987.3	1988.3	1989.3	1990.3	1991.3	1992.1
Cellular Telephone	Car Telephone	95	151	243	328	412	342
	Portable Telephone	—	—	—	162	456	1258
RADIO PAGING		2488	2953	3520	4247	5083	6445
Teleterminal		—	—	—	0.1	0.7	1.5
Cordless Telephone (presumed)		—	119	799	3229	7500	10000
MCA System	—	103	147	209	289	367	508
	JSMR	—	1	9	25	60	126

2. CELLULAR RADIO IN JAPAN [1] [2]

CELLULAR MARKET IN JAPAN



RESEARCH & STUDY PROCESS



TECHNICAL FEATURES

Core parameters

Feature	Japan	North America	GSM
Transmit frequency bands — base stations — mobile stations (MHz)	810- 826 1429-1453 940- 956 1477-1501	824 - 849 869 - 894	935 - 960 890 - 915
Duplex Separation (MHz)	130 48 (1.5GHz)	45	45
RF Carrier Spacing (kHz)	25 interleaved 50	30	200
Cell radius (km)	0.5 - 20km	0.5 - 20km	0.5 - 35km
Access method	TDMA	TDMA	TDMA
Traffic channels /RF carrier	3	3	8
Transmission rate (kbit/s)	42	48.6	270.833
Modulation	$\pi/4$ shifted QPSK	$\pi/4$ shifted QPSK	GMSK
Coding algorithm (Traffic channels)	VSELP 11.2kbps	VSELP 13 kbps	RPE - LTP 23 kbps
Delay spread equalization capability (μ s)	option	60	20

3. DIGITAL CORDLESS TELEPHONE(PHP) IN JAPAN

PHP SERVICE IMAGE

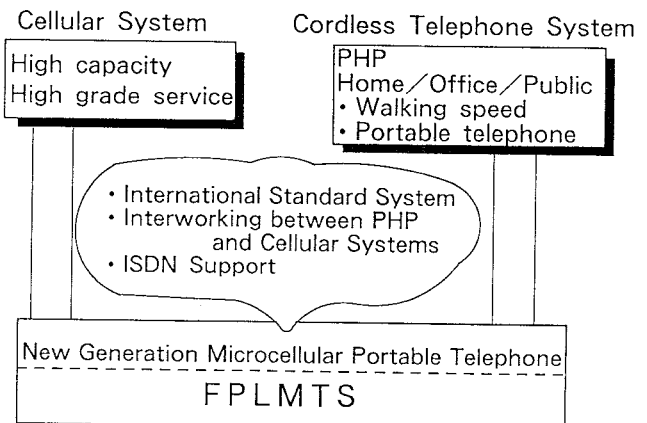


MAIN FEATURES OF PHP

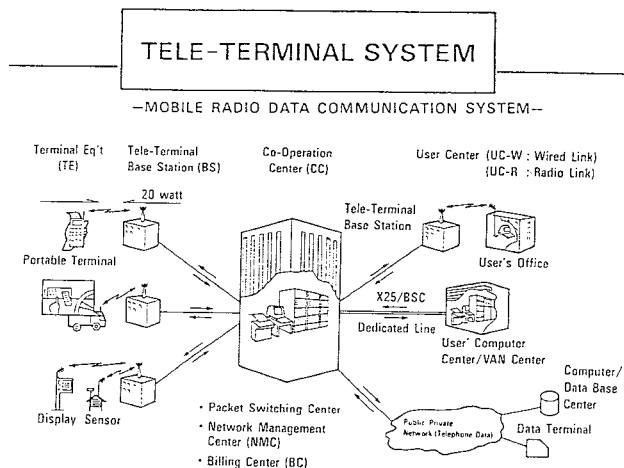
Frequency Band	1.9 GHz
Access Method	TDMA/TDD
Traffic Channels/RF Carrier	4
Modulation	$\pi/4$ - QPSK
Voice Codec	32 kbit/s ADPCM
Output Power (PS)	10mW
Radio Transmission Rate	384 kbit/s
Carrier Spacing	300 KHz

4. MICROCELLULAR MOBILE TELECOMMUNICATION [1]

TECHNICAL TREND OF MOBILE TELECOMMUNICATION EVOLUTION IN JAPAN

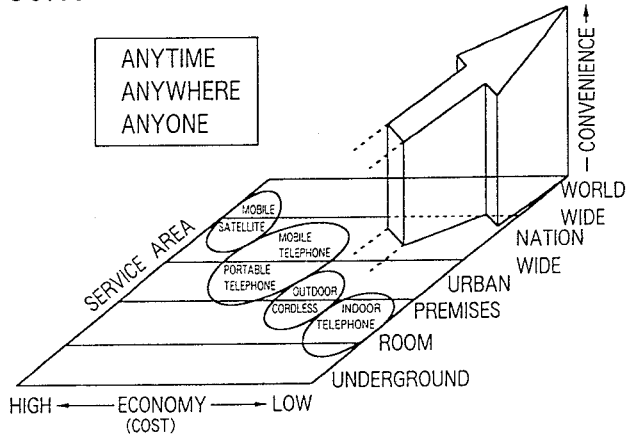


5. TELE-TERMINAL SYSTEM (DATA COMMUNICATION)



6. PERSONAL MOBILE COMMUNICATIONS [3] [4]

CONCEPT OF MOBILE COMMUNICATIONS



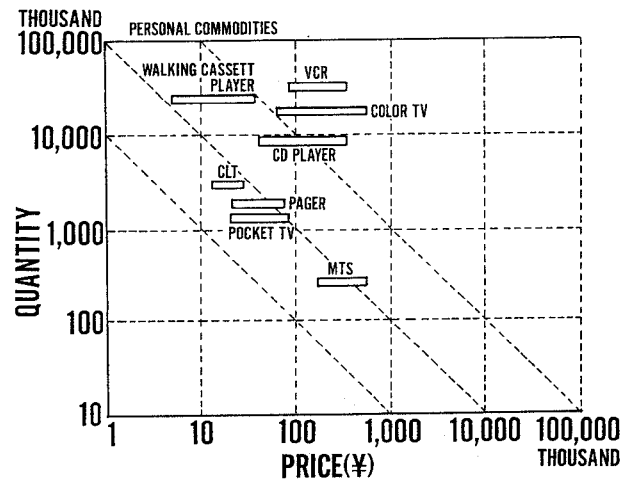
RESTRICTING FACTORS IN PERSONAL COMMUNICATIONS

- FREQUENCY RESOURCES
- COST
- PRIVACY

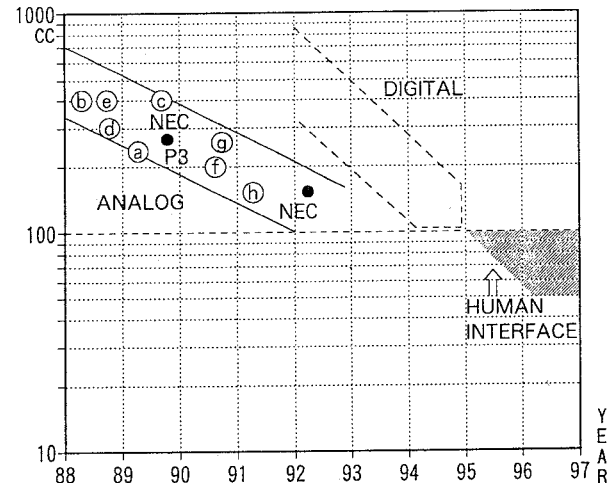
TRENDS IN CELLULAR MOBILE TELEPHONE SYSTEMS

YEAR	1980 s	1990 s
ITEM	MEDIUM CELL	SMALL CELL MICRO CELL
CELL CONFIGURATION		
TYPE OF MOBILE SUBSCRIBER STATION	CAR-MOUNT → TRANSPORTABLE	HAND-HELD PORTABLE → PERSONAL POCKETPHONE
	ANALOG	DIGITAL

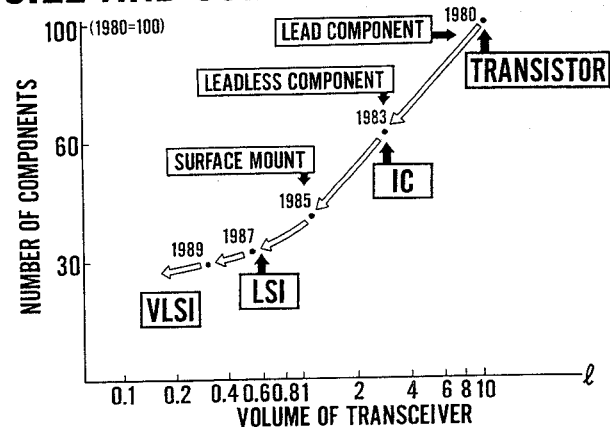
CONSUMER PRODUCT AND MARKET SIZE



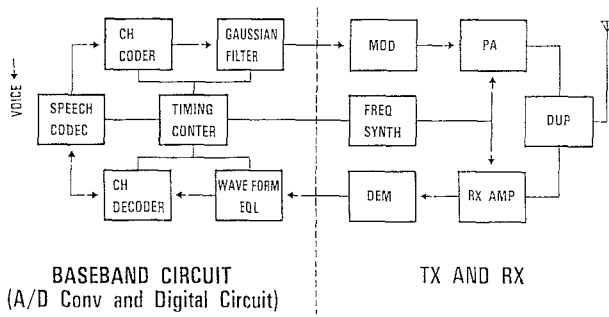
EXPECTED VOLUME OF CELLULAR PHONE



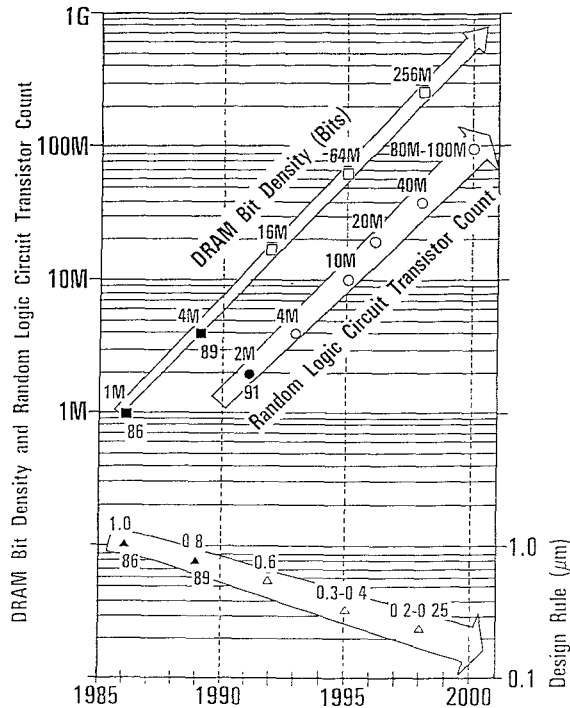
PROGRESS OF MOBILE TELEPHONE SIZE AND COMPONENTS



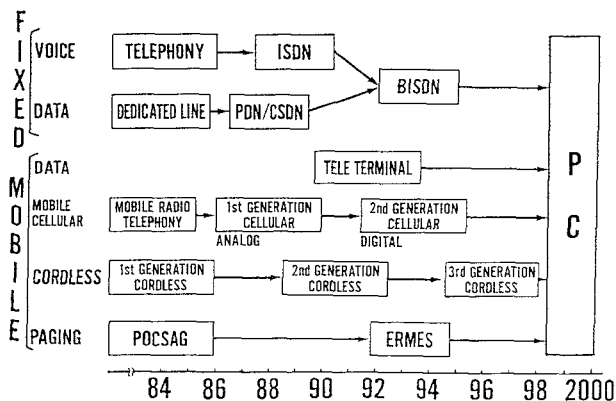
BLOCK DIAGRAM OF PCN TELEPHONE



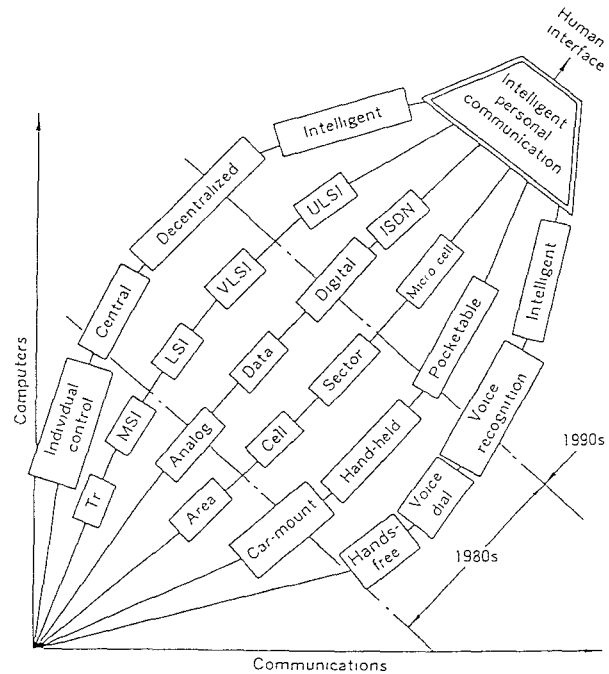
Trends of CMOS Design Rule and Circuit Density



EVOLUTION TOWARDS PERSONAL COMMUNICATIONS



EVOLUTION OF FUNDAMENTAL TECHNOLOGY FOR MOBILE COMMUNICATION



CONCLUSION

Personal mobile communication services are helping to realize the ultimate purpose of telecommunication.

The decisive factor will be the human interfaces and the effective use of technology at a low cost.

VLSI, MMIC (1 ~ 3GHz) need low power consumption, compactness, light weight and low cost.

REFERENCES

- [1] "Report of Mobile Communication Study Meeting '91 in TOKYO," MPT/RCR, 1991.8.
- [2] CCIR Documents:
 - ① RELIMINARY DRAFT NEW RECOMMENDATION DIGITAL CELLULAR LAND MOBILE TELECOMMUNICATION SYSTEMS (DOC.8A/TEMP/69), TOKYO, Jan, 1993
 - ② DRAFT NEW RECOMMENDATION TECHNICAL AND OPERATIONAL CHARACTERISTICS OF CORDLESS TELEPHONES (DOC.8A/TEMP/100), TOKYO, Jan, 1993
- [3] Nakamura, Morishima, "Mobile Communication Technologies in Telecommunication Networks," NEC R&D, pp.208-221, No.96, March 1990
- [4] Sekimoto, "Towards The New Age of Personal Communications," '91 Asia-Pacific Telecommunity, TOKYO