

DAB-IBOC-DRM

a comparison of three Terrestrial Digital Radio systems

Le Radio
Paris – February 3, 2004
Alain Untersee

New Models for Radio

- Base Radio: Audio Only
- Mid-level Radio: Audio and basic data Capability (Text)
- Up-level Radio: Audio and medium Data Capability (Text, Still Pictures, EPG,...)
- Premium-level Radio: Audio, unlimited data capabilities (Text, Still Pictures, EPG, Moving Pictures,...)



Digital Radio

- Radically Upgraded Radio
 - High Quality Mono & Stereo
 - Eliminates interference
- Valuable New Data Services
 - Content Applications
 - Local Traffic/Weather Conditions
 - Financial/Sports Information
 - Digital Storage
 - Store Replay, Time Shift
 - Advertising Applications
 - Location-based Advertising
 - Other Applications
 - eNewspapers, eBooks, Games Downloads

Automotive Devices



PDA's



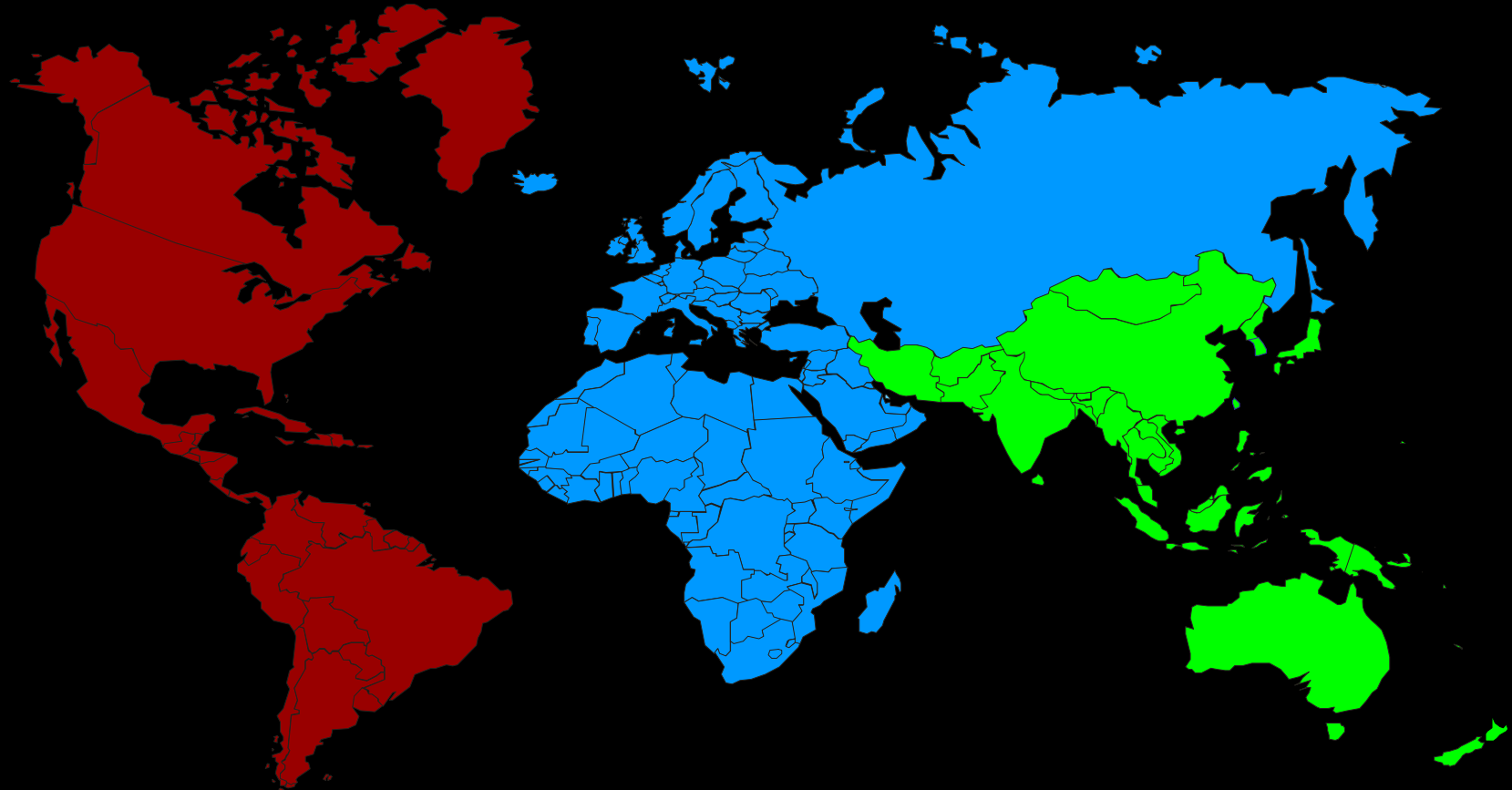
eTablets



Smart Phones



ITU Standards Regions / AM



Region 2

Region 1

Region 3

Channel spacing

10 kHz

9 kHz

9 kHz

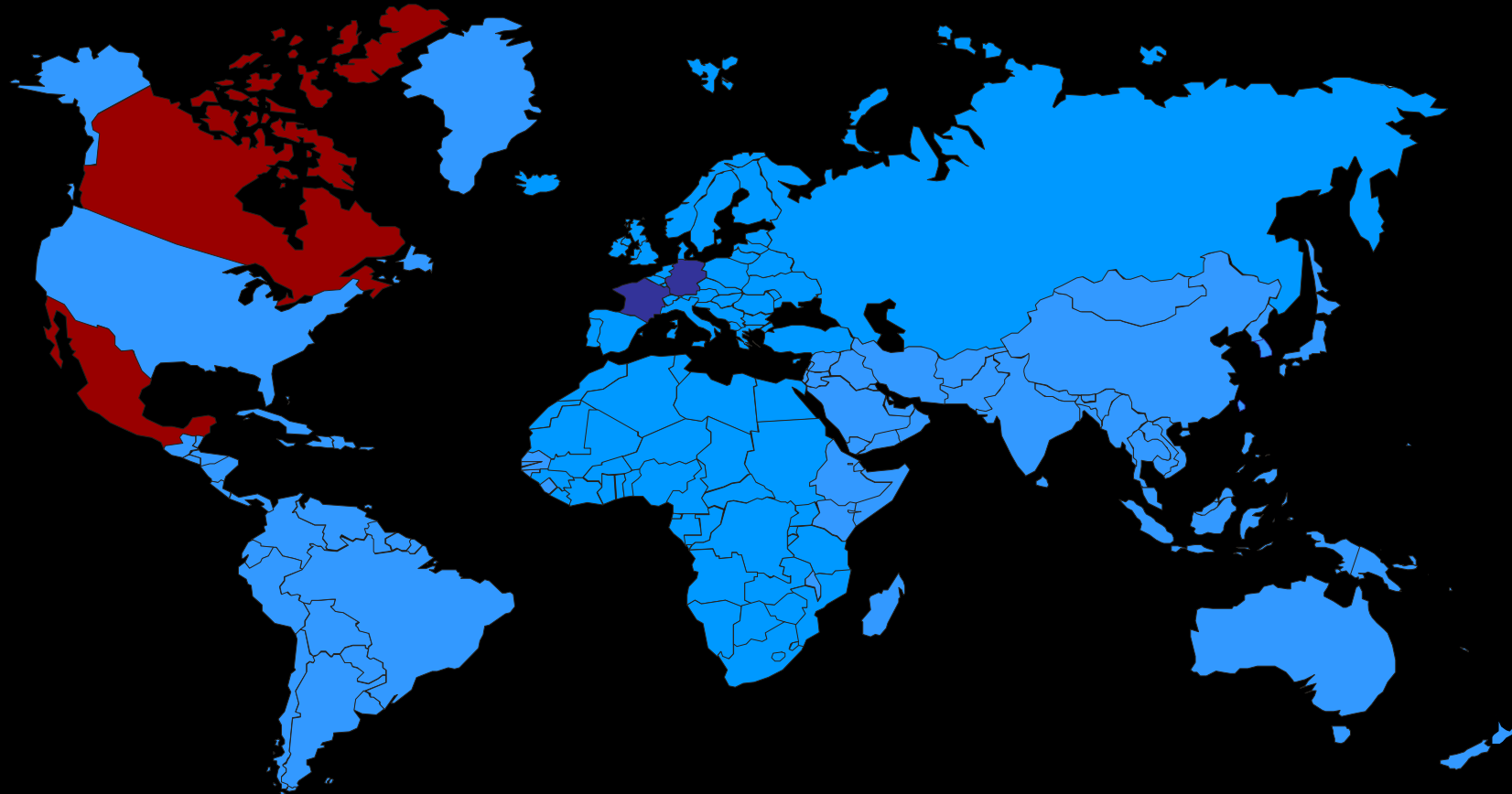
Bandwidth used

30 kHz

9 kHz

18 kHz

New frequencies for DAB



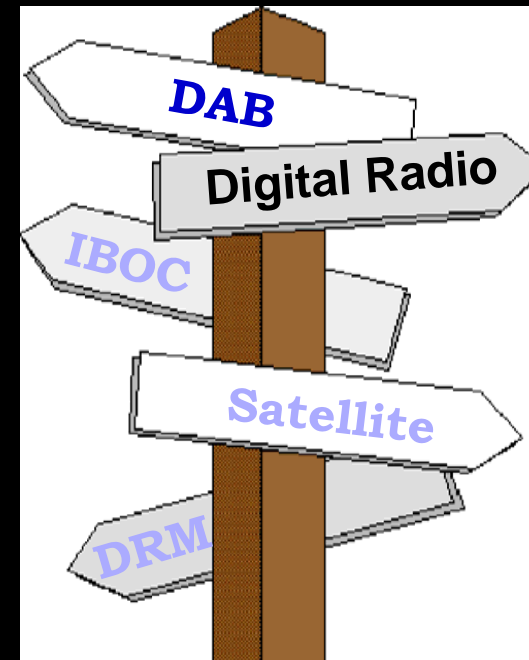
Band III

L-Band

Band III + L-Band

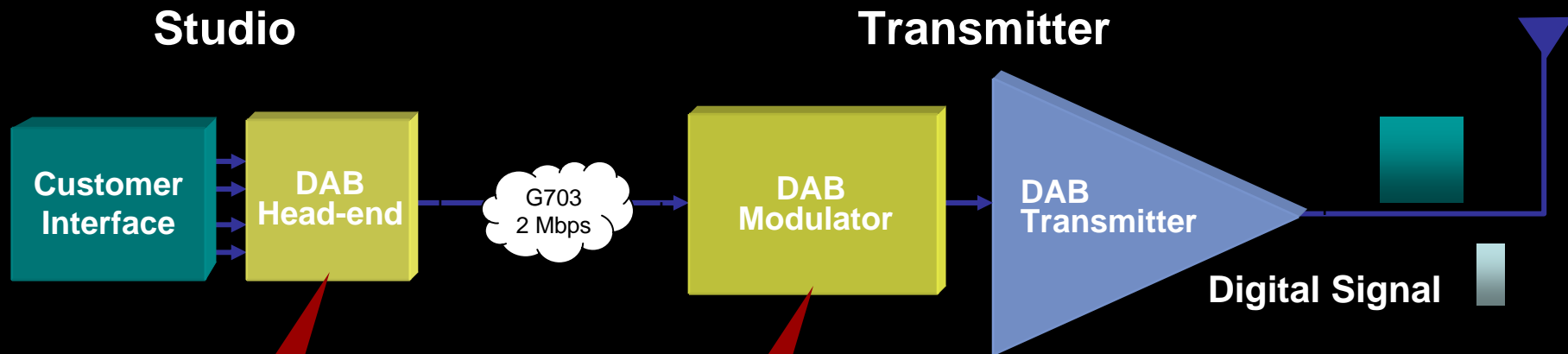
DAB – Eureka 147

- New services in new bands
- High quality, high bandwidth, multiplexed broadcasting of sound, data, & video
- Proven technology, started in Europe and Asia, more than 1500 transmitters on air
- Accepted as the standard in many countries worldwide
 - High success in UK
 - Receiver availability and new content programming were crucial issues



DAB
Digital Audio Broadcasting

DAB Eureka 147 system



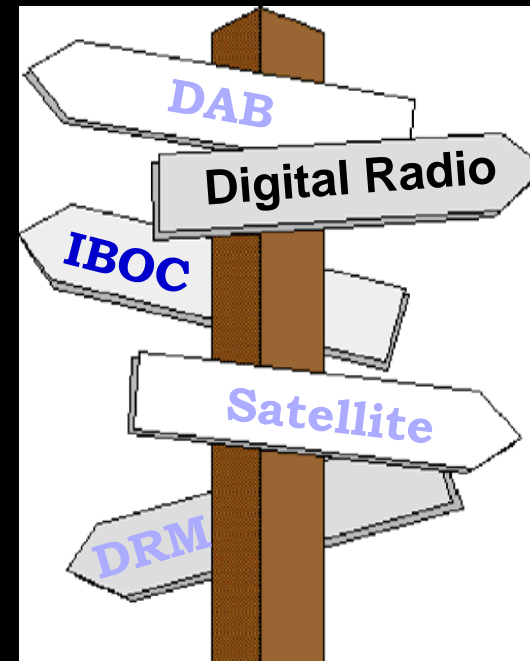
Audio encoding
 Data formatting & insertion
 Service Multiplexing
 Signalling generation

Channel coding
 Digital modulation

Band III (VHF)
 L-Band

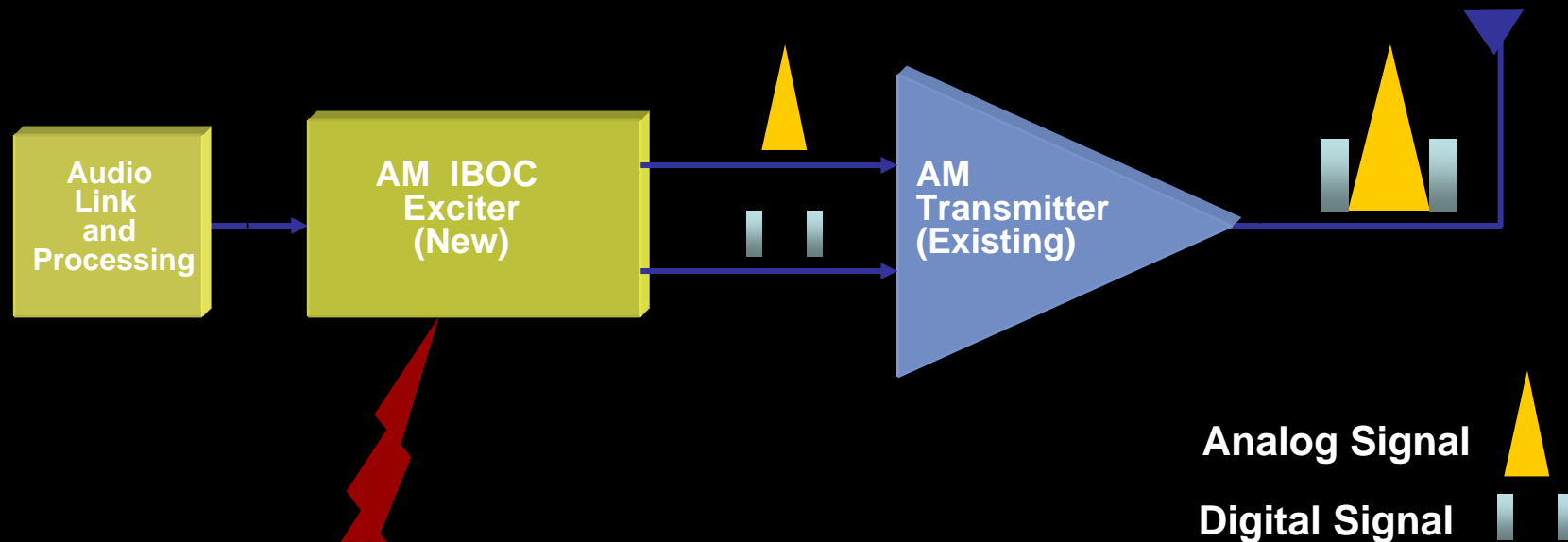
IBOC (In Band On Channel Digital Radio)

- Digital broadcasting using existing AM & FM bands for existing services
- Will start in the USA, as a hybrid service to retain the existing broadcast infrastructure while moving to digital radio
- Introduction of IBOC receivers in December, 2003



AM IBOC System

AM Digital Transmitter



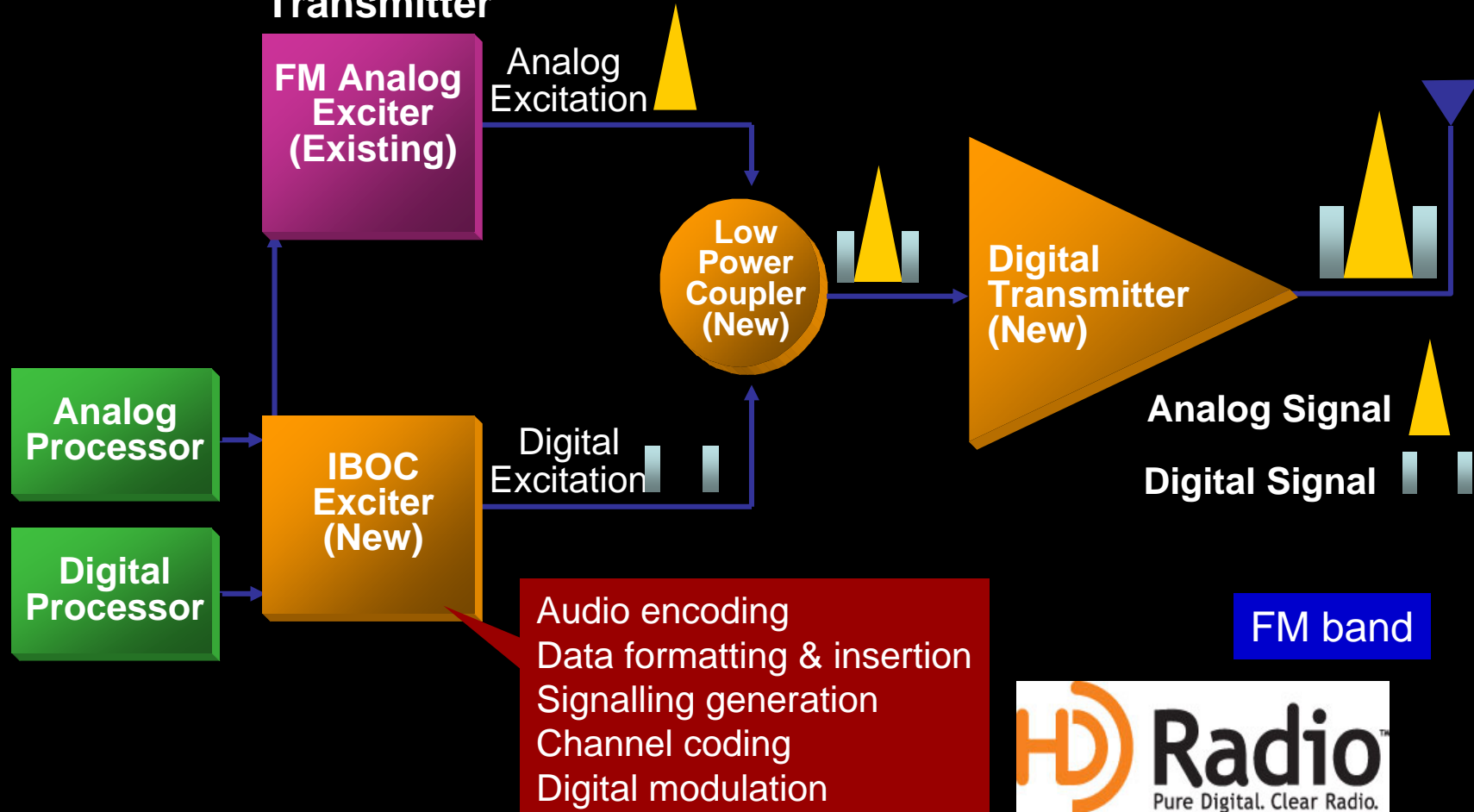
Audio encoding
 Data formatting & insertion
 Signalling generation
 Channel coding
 Digital modulation

MF band



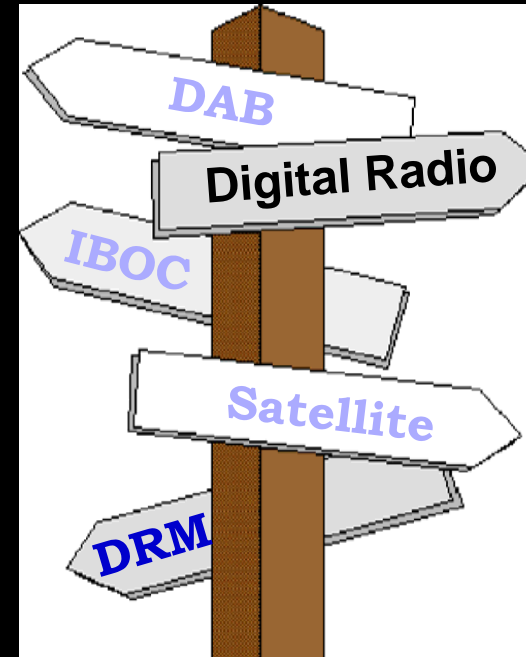
IBOC FM - Common Amplification

Digital FM Common Amplification Transmitter



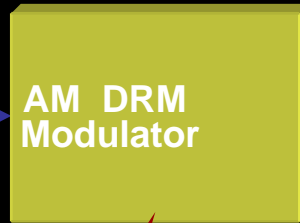
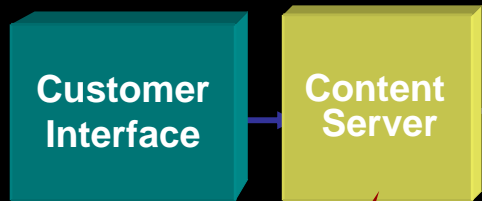
DRM (Digital Radio Mondiale)

- For digitalization of existing services in Long wave, Medium wave, and Short wave
- Narrow band, digital only and hybrid (Simulcast)
- International broadcasting underway with receivers available in late 2004
- Worldwide standard
- High spectrum efficiency

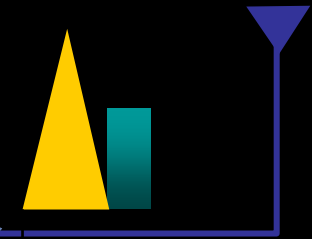
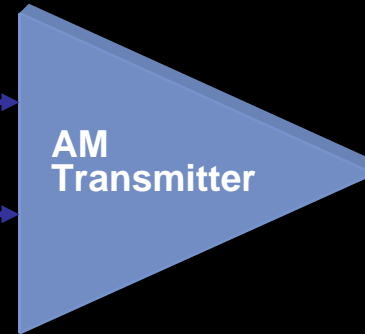


AM DRM System

Studio



Transmitter



Audio encoding
 Data formatting & insertion
 Service Multiplexing
 Signalling generation

Channel coding
 Digital modulation

Analog Signal 

Digital Signal 

LF band
 MF band
 HF band



Comparaison – technical

	DAB	IBOC-AM	IBOC-FM	DRM
System	Eureka 147	HD Radio / Ibiquity	HD Radio / Ibiquity	Digital Radio Mondiale
Frequency Band	Band III, L-Band	MF	Band II	LF, MF, HF
Hybrid mode capability (analog & digital)	No	Yes	Yes	Yes
Digital only mode capability	Yes	Yes	Yes	Yes
Audio coding	MPEG 1 Layer II & MPEG 2 Layer II half sampling rate 8 – 384 kbps	Proprietary 36 – 48 kbps	Proprietary 96 – 150 kbps	MPEG4 (AAC+) 8 – 48 kbps CELP (speech) HVXC (speech) 2 – 8 kbps
Modulation	COFDM	COFDM	COFDM	COFDM
SFN capability	Yes	No	Yes	Yes

Comparaison - technical

Hybrid mode	DAB	IBOC-AM	IBOC-FM	DRM
Channel width	-	30 kHz	400 kHz	9, 10, 18, 20 27, 30 kHz
Modulation	-	COFDM	COFDM 1068 carriers	COFDM 100 - 400 carriers
Useful digital rate	-	audio: 36kbps data: 4 kbps	audio: 96 kbps data: 4 kbps	4.8 – 72 kbps
Efficiency	-	up to 0,75 bps / Hz	up to 0,25 bps / Hz	0,5 – 1,6 bps / Hz
Multi service	-	up to 2 one audio, one data	up to 4 audio, data adjustable rates	up to 4 audio, data adjustable rates
Audio quality (analog)	-	4,5 kHz mono	FM stereo	4,5 kHz mono
Audio quality (digital)	-	FM quality mono	CD quality mono - stereo	FM quality mono – stereo
Data services (analog)	-	No	RDS	No
Data services (digital)	-	PAD	PAD, N-PAD	PAD, N-PAD

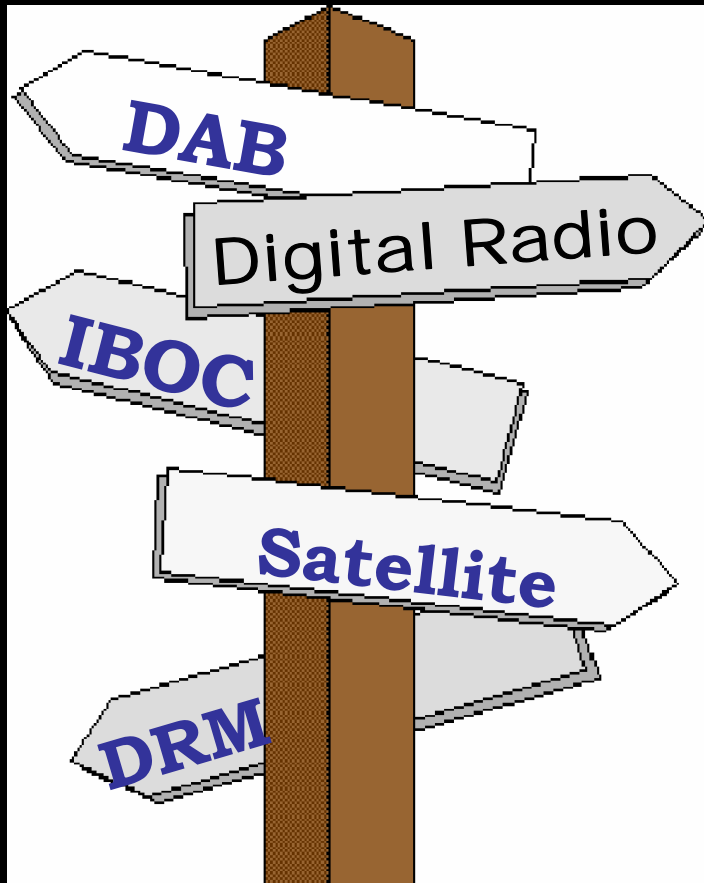
Comparaison - technical

Digital mode	DAB	IBOC-AM	IBOC-FM	DRM
Channel width	1,5 MHz	20 kHz	400 kHz	4.5, 5, 9, 10, 18, 20 kHz
Modulation	COFDM 192 – 1 536 carriers	COFDM	COFDM 1 068 carriers	COFDM 100 - 400 carriers
Useful digital rate	0,8 – 1,7 Mbps	up to 60 kbps	up to 300 kbps	4.8 – 72 kbps
Efficiency	0.5 – 1.2 bps / Hz	up to 3 bps / Hz	up to 0,75 bps / Hz	1 - 3 bps / Hz
Multi service	up to 64 services adjustable bitrates by 8 kbps steps	up to 2 one audio, one data	up to 4 audio, data adjustable rates	up to 4 audio, data adjustable rates
Audio services	CD quality mono - stereo	FM quality mono - stereo	CD quality mono - stereo	FM quality mono - stereo
Data services	PAD, N-PAD	PAD	PAD, N-PAD	PAD, N-PAD

Comparaison - markets

	DAB	IBOC-AM	IBOC-FM	DRM
Standard	Open	Proprietary	Proprietary	Open
Hybrid capability for transition	No	Yes	Yes	Yes
Frequency bands	New	Existing MF	Existing Band II	Existing LF, MF, and HF
Standard finalised	end 1994	2001	2001	end 2001
Consumer receiver availability	Yes	Dec 2003	Dec 2003	End 2004
Target audience	New	Existing	Existing	Existing & New
Target coverage	Small to medium	Medium	Medium	Medium to high and very high

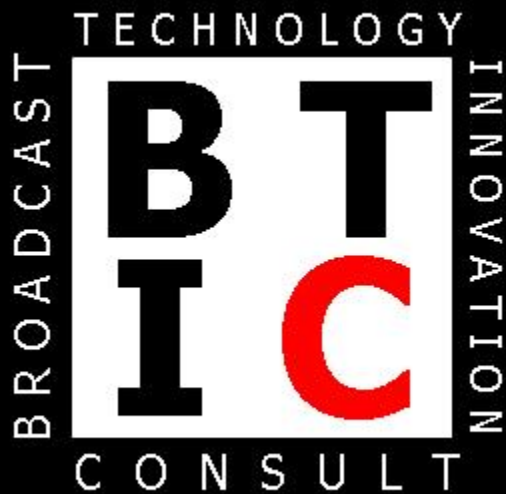
The Digital Radio Future



Digital Radio –

As an enhancement to existing services with **IBOC** & **DRM**

For new services in new frequency bands with **DAB**



Thanks for your attention

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