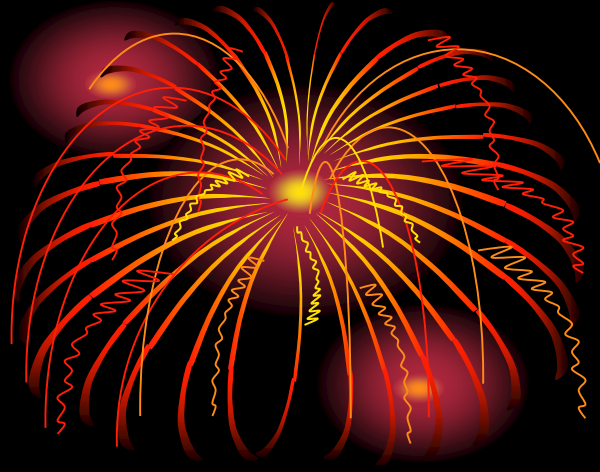
The DTMB Deployment Status in China and the Work for Future

Jian Song
jsong@tsinghua.edu.cn

06/17/2015



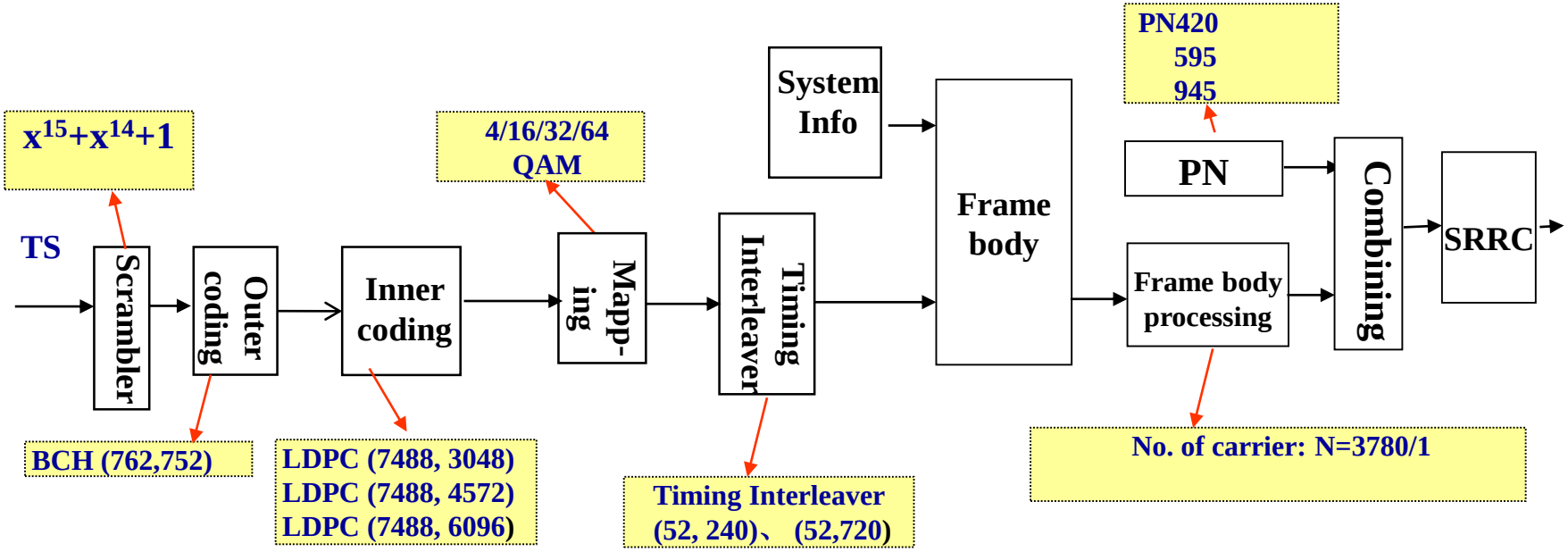
Outlines

- Brief review of DTMB standard
- Current status of DTMB deployment
- The work for future

Framing Structure, Channel Coding and Modulation for Digital Television Terrestrial Broadcasting System

Digital Television Terrestrial Multimedia Broadcasting (DTMB), GB20600-2006

- **Announced: Ratified on Aug. 18, 2006,**
- **Become mandatory since Aug. 1, 2007**



Seven modes are recommended

Mode	No. of Carriers	FEC Code rate	Modulation	Frame header choice	Interleaver length	Throughput (Mbps)
1	3780	0.4	16QAM	PN945	720	**9.626**
2	1	0.8	4QAM	PN595	720	**10.396**
3	3780	0.6	16QAM	PN945	720	**14.438**
4	1	0.8	16QAM	PN595	720	**20.791**
5	3780	0.8	16QAM	PN420	720	**21.658**
6	3780	0.6	64QAM	PN420	720	**24.365**
7	1	0.8	32QAM	PN595	720	**25.989**

Standardization

ICS 33.160
M 63

中华人民共和国国家标准

GB/T 26666—2011

ICS 33.160
M 63

中华人民共和国国家标准

GB/T 26252—2010

ICS 33.160.25
M 74

中华人民共和国国家标准

地面数字电视广播

GB/T 26683—2011

地面数字电视接收器通用规范

General specification for digital terrestrial set-top box

Implementation guideli
digital terrestrial
broadcasting in the

workgroup
including t
equipment
measuring
quality afte

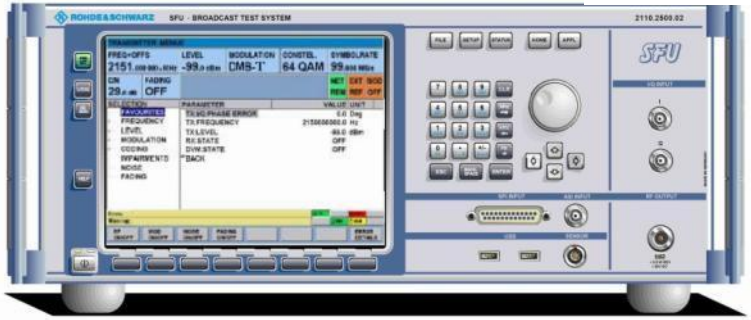
re,
deo

DTMB Transmitter/Exciter

DTMB Terminals

- Companies such as Haier, Changhong, Tongfang, Hisense, Skyworth, TCL, Samsung, LG, and Toshiba now provide over hundreds of receiver models.

DTMB Test Instruments

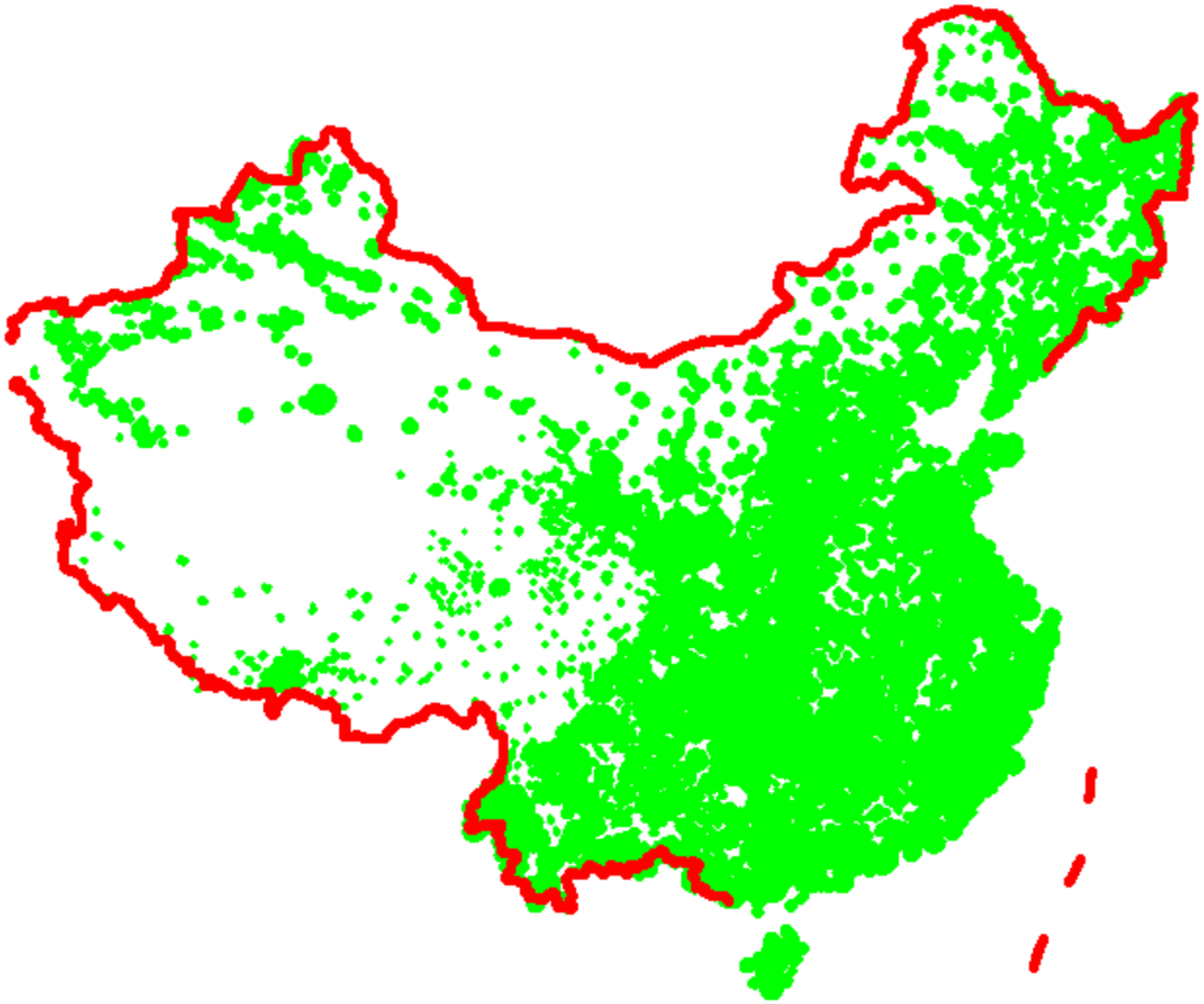


DTMB Deployment in China

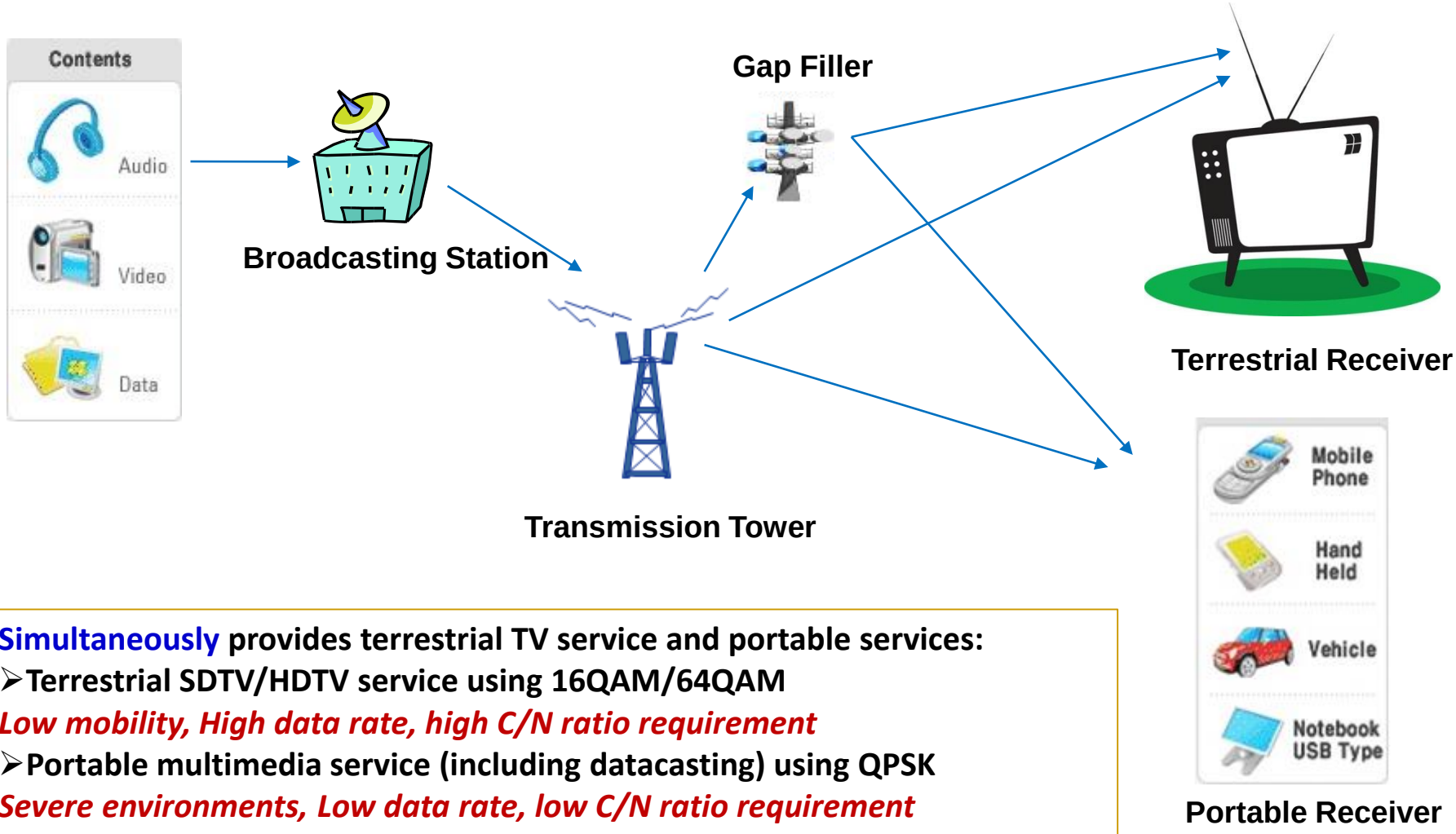
- 2103 Stations use DTMB for fixed reception
- 57 Stations use DTMB for fixed/mobile reception
- The overall coverage is over 50% population

SARFT	Phase	Time	Deployment plan
	I	2008-2012	37 major cities (156+ Transmitters) , Simulcast, gradually extend to big cities and counties
	II	2015-2016	4.8 Billion RMB has been allocated to 6293 transmitters for the country wide coverage with the Simulcast
MIIT	Phase	Time	Terminals
	I	2014.1	Built-in DTMB chip for terminals over 40 inches
	II	2015.1	All new TVs should have built-in DTMB chip

DTMB Coverage Plan by 2016



Multiple Services over DTMB



Simultaneously provides terrestrial TV service and portable services:

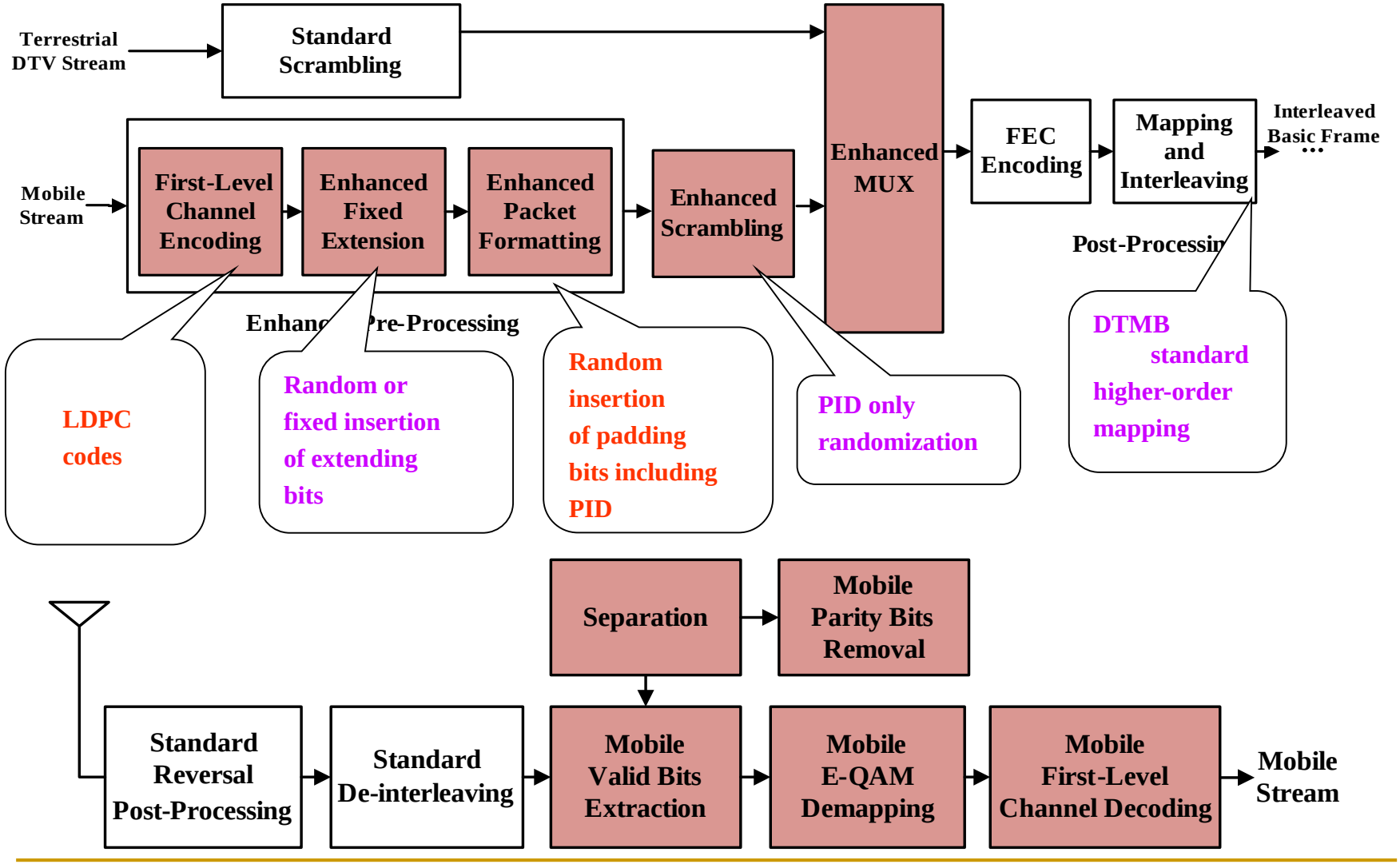
- Terrestrial SDTV/HDTV service using 16QAM/64QAM

Low mobility, High data rate, high C/N ratio requirement

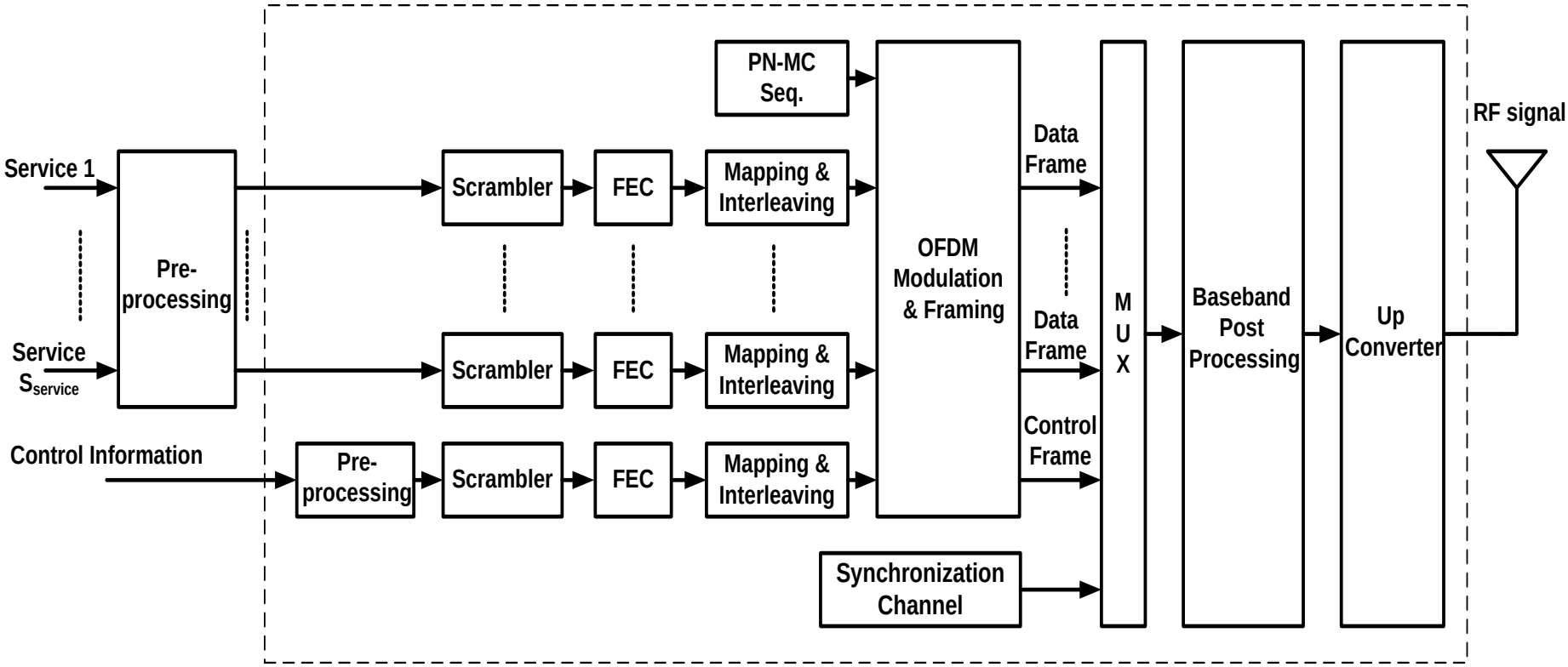
- Portable multimedia service (including datacasting) using QPSK

Severe environments, Low data rate, low C/N ratio requirement

E-DTMB for the Datacasting Service



Block Diagram of DTMB-A

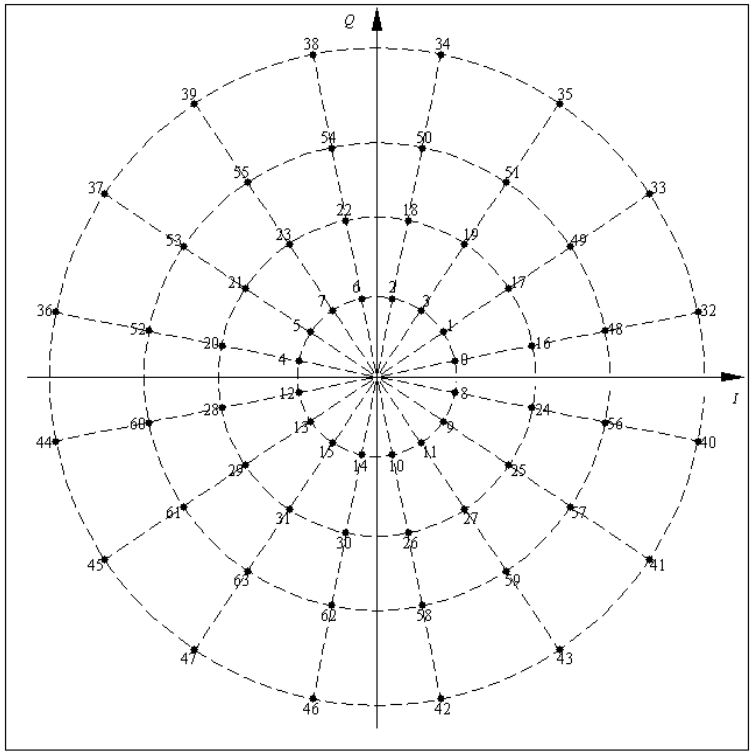


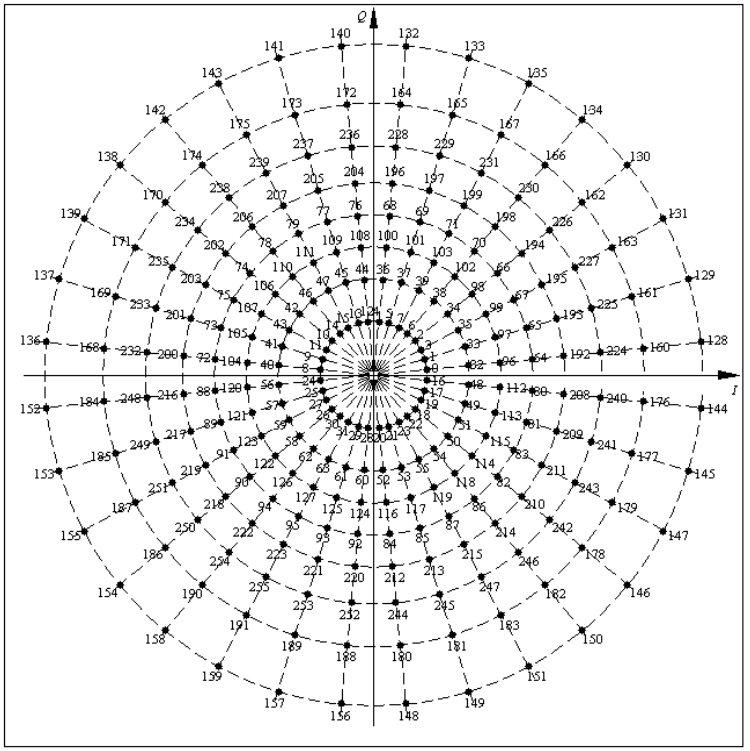
Channel Modulation and Coding

- **APSK to reduce the shaping loss**
  - **Constellation mapping is the key technology**
- **BICM-ID to reduce the demapping loss**
- **Signal space diversity (SSD)**
  - **Working well under various wireless channels is the key technology**
- **Doping to overcome the error floor**

Gray-APSK Modulation

- APSK technology improves the receiving performance remarkably.
- The new polar decomposition based on mutual information greatly reduces the complexity.





Payload Data Rate (Typical Mode with Symbol Rate of 7.56Msps)

Mapping	LDPC code rate	N=4096			N=8192			N=32768		
		K=256	K=512	K=1024	K=256	K=512	K=1024	K=256	K=512	K=1024
QPSK	1/2	**6.66**	**5.99**	**5**	**7.05**	**6.66**	**5.99**	**7.38**	**7.26**	**7.05**
	2/3	**8.9**	**8.01**	**6.67**	**9.42**	**8.89**	**8**	**9.85**	**9.7**	**9.41**
	5/6	**11.13**	**10.02**	**8.35**	**11.78**	**11.13**	**10.01**	**12.33**	**12.14**	**11.78**
16APSK	1/2	**13.32**	**11.99**	**9.99**	**14.1**	**13.32**	**11.98**	**14.75**	**14.53**	**14.09**
	2/3	**17.79**	**16.01**	**13.34**	**18.84**	**17.79**	**16.01**	**19.7**	**19.4**	**18.82**
	5/6	**22.26**	**20.04**	**16.7**	**23.57**	**22.26**	**20.03**	**24.65**	**24.28**	**23.55**
64APSK	1/2	**19.98**	**17.98**	**14.99**	**21.15**	**19.98**	**17.98**	**22.13**	**21.79**	**21.14**
	2/3	**26.69**	**24.02**	**20.02**	**28.25**	**26.68**	**24.01**	**29.56**	**29.1**	**28.23**
	5/6	**33.39**	**30.05**	**25.05**	**35.35**	**33.39**	**30.04**	**36.98**	**36.41**	**35.33**
256APSK	1/2	**26.64**	**23.98**	**19.98**	**28.21**	**26.64**	**23.97**	**29.51**	**29.05**	**28.19**
	2/3	**35.58**	**32.03**	**26.69**	**37.67**	**35.58**	**32.01**	**39.41**	**38.8**	**37.64**
	5/6	**44.53**	**40.07**	**33.39**	**47.14**	**44.51**	**40.06**	**49.31**	**48.55**	**47.1**

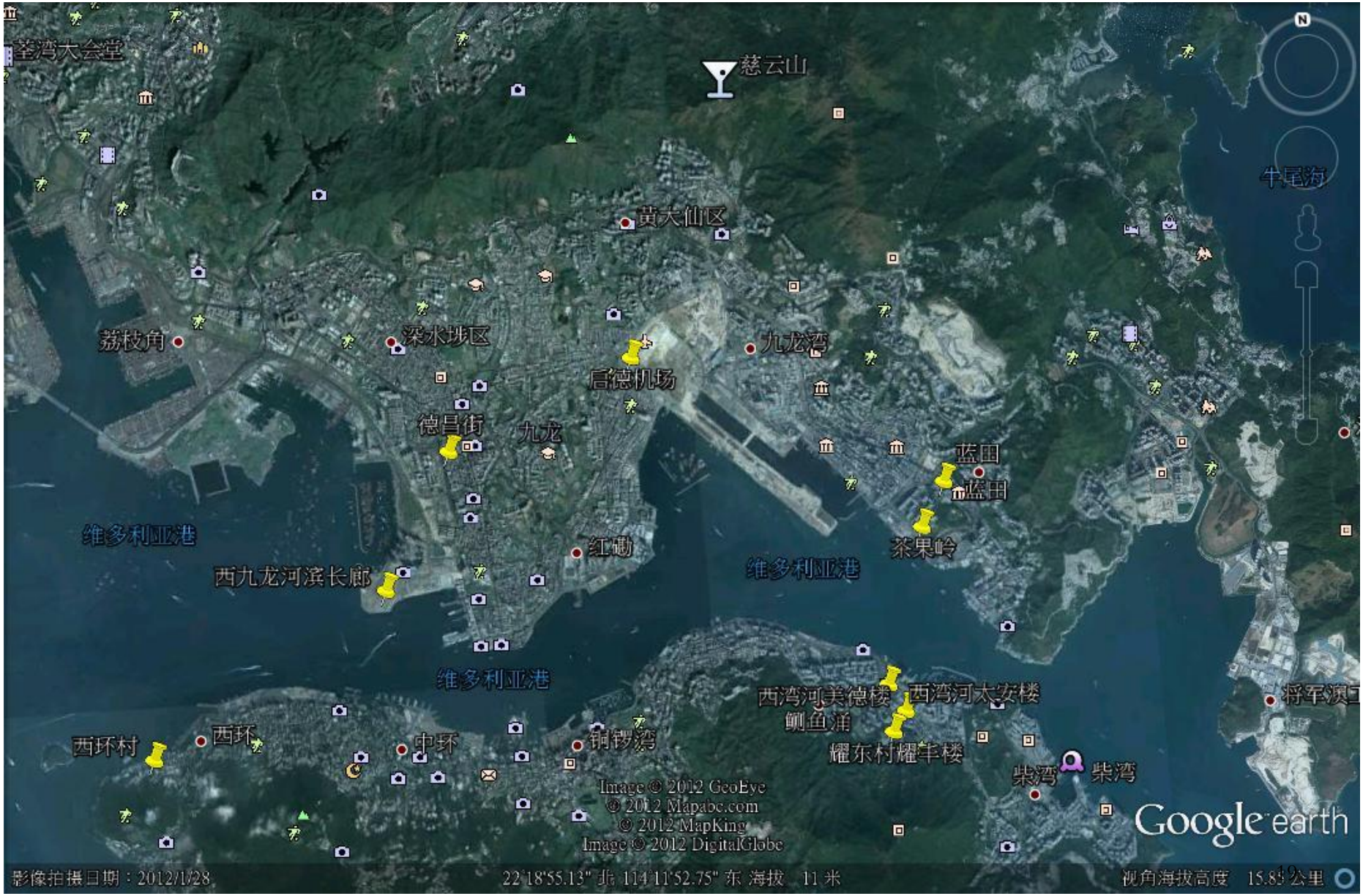
Payload Data Rate (Extended Mode with Symbol Rate of 70/9 Msps)

Mapping	LDPC code rate	N=4096			N=8192			N=32768		
		K=256	K=512	K=1024	K=256	K=512	K=1024	K=256	K=512	K=1024
QPSK	1/2	**6.85**	**6.17**	**5.14**	**7.25**	**6.85**	**6.16**	**7.59**	**7.47**	**7.25**
	2/3	**9.15**	**8.24**	**6.86**	**9.69**	**9.15**	**8.23**	**10.14**	**9.98**	**9.68**
	5/6	**11.45**	**10.31**	**8.59**	**12.12**	**11.45**	**10.3**	**12.68**	**12.49**	**12.12**
16APSK	1/2	**13.7**	**12.33**	**10.28**	**14.51**	**13.7**	**12.33**	**15.18**	**14.94**	**14.5**
	2/3	**18.3**	**16.47**	**13.73**	**19.38**	**18.3**	**16.47**	**20.27**	**19.96**	**19.36**
	5/6	**22.9**	**20.61**	**17.18**	**24.25**	**22.9**	**20.6**	**25.36**	**24.98**	**24.23**
64APSK	1/2	**20.56**	**18.5**	**15.42**	**21.76**	**20.55**	**18.49**	**22.77**	**22.42**	**21.75**
	2/3	**27.46**	**24.71**	**20.59**	**29.07**	**27.45**	**24.7**	**30.41**	**29.94**	**29.05**
	5/6	**34.36**	**30.92**	**25.77**	**36.37**	**34.35**	**30.91**	**38.05**	**37.46**	**36.35**
256APSK	1/2	**27.41**	**24.67**	**20.56**	**29.02**	**27.4**	**24.66**	**30.36**	**29.89**	**29**
	2/3	**36.61**	**32.95**	**27.46**	**38.76**	**36.6**	**32.93**	**40.54**	**39.92**	**38.73**
	5/6	**45.81**	**41.23**	**34.36**	**48.5**	**45.8**	**41.21**	**50.73**	**49.95**	**48.46**

Test Program

	TS Play list (1)	TS Play list (3)	TS Play list (4)	TS Play list (5)
Operation mode	DTMB-A Fixed reception	DTMB-A Mobile mode 2	E-DTMB Fixed reception	E-DTMB Mobile mode
Type of programme	2 HD and 2 SD	1 HD and 2 SD	1 HD and 1 SD	1 SD
Maximum total bit rate	37.6Mbps	20.6Mbps	17.6Mbps	660 kbps
Quantity and duration of HD and SD	No special requirement on quantity and duration of the HD and SD test programme.			
Kind of test programmes	Same as RTHK current test programme that is under test transmission since 1st July 2012.			
Form of test programmes	Prefer in file (H.264 TS) with RTHK's logo and output interface is ASI. The files are part of the TS player list and are selected to play in accordance to operation mode during the field trial.			

Testing Sites



Testing Results

- For E-DTMB
  - Performance can be significantly improved
  - Anti-inference performance is good
  - Compatibility with DTMB is also validated
- For DTMB-A
  - System capacity greatly improves
  - The reception performance is satisfactory for both fixed and mobile receptions

Summary and the Future Work

- Massive deployment of DTMB in China has been accelerated
- The next generation of DTTB system with higher data rate and better performance to support both existing services and UHDTV is on the horizon
- Network convergence and the synergy among satellite TV, cable TV and DTTB systems are also gaining the momentum


Thank you very much
for your attention!