



Federal
Communications
Commission

Digital Dividend

Americas Regional Radiocommunication Seminar 2013 Asunción, Paraguay

Alison Greenwald Neplokh
Chief Engineer
FCC Media Bureau



Agenda

- DTV Transition

- 700 MHz Band

- 600 Mhz and Beyond
 - Incentive Auctions



Timeline of US DTV Transition

- 1987 – FCC began “advanced television” proceeding
- 1996 – “Grand Alliance” adopts Advanced Television Systems Committee (ATSC) as standard for DTV
- 1997 – FCC adopted service rules and created Table of Allotments for additional channels
- 1998 – First DTV station on air
- 2006 – Congress establishes “hard deadline” for transition on February 17, 2009 and creates subsidy program for DTV converter boxes
- 2004-07 – Tuner mandate effective
- 2008 – NTIA begins distributing subsidy coupons for DTV converter boxes, Commission requires broadcasters, cable and satellite providers, manufacturers and others to provide DTV consumer education
- 2008-09 – Focus on consumer outreach activities by Commission staff, partners and contractors
- 2009 – Congress changes transition deadline to June 12, 2009
- 2015 – Digital conversion deadline for low-power, class-A, translator stations



US Regulatory Regime for Broadcasters

- **Second 6 MHz channel loaned to all incumbent broadcasters to build their transitional digital transmission facility.**
 - TV broadcasters would transmit in analog on one channel and in digital on the other channel during the transition.
 - The second channel would be returned at the end of the transition.
- **Flexible TV Broadcast Service Rules**
 - Each TV station is licensed for a 6 MHz channel that provides 19.4 Mbps.
 - One standard-definition broadcast video stream is required.
 - In addition, high-definition (HD), multicasting (multiple simultaneous streams), datacasting, mobile DTV, and other uses are permitted.
 - If a station uses part of its licensed channel for a subscription service, it must pay the government 5% of its gross revenues from the service.



Equipment / Consumer Programs

- **DTV receivers required to be built into TV sets**
 - phased-in basis, beginning with sets 36” and above, starting July 2004 and finishing with all sets and TV devices in July 2007.
 - Labeling required for sets and devices without a DTV tuner
- **Subsidy Program for DTV converter boxes**
 - Administered by NTIA
 - Two \$40 coupons made available to any household to use toward the purchase of two converter boxes
 - Eligible boxes had to meet performance and feature standards set by NTIA and tested by FCC
- **Massive Consumer Outreach Program**
 - Government focused on the consumers likely to need the most attention.
 - TV stations required to air PSAs and educational programming



Scale of US Transition (Broadcasters)

- 1,800 full power television stations broadcasting in analog that had to transition to digital.
 - Includes nearly 400 that are non-commercial stations.
 - Approximately 1,700 had both analog and digital channels (about 100 had no digital channel before the transition and 20 were digital only).
 - Almost 800 terminated analog service before June 12, 2009 (many on February 17, 2009).
 - Approximately 1,000 transitioned on June 12, 2009.
 - Fewer than 10 stations did not transition and ceased broadcasting.



Scale of Transition (Consumers)

- Nearly 115 million households have one or more televisions in the US.
 - 98.9% of total 116,170,000 million households, over 300 million people overall.
- 11%, or 12.5 million households, rely exclusively on over-the-air (free) broadcasting for their access to television; that is, they do not subscribe to cable, satellite or any other pay service.
- Estimate that 40 million households have at least one TV set that relies on over-the-air (free) broadcasting, even though they have other TV sets in the household that are connected to a subscription service.
- By June 12, 2009, 97.8% of households were ready for the transition because they had a DTV set, a converter box, or subscribed to cable, satellite or another pay service.



Consumer Outreach

- Outreach efforts began in 2007.
- Focused on the consumers likely to need the most attention.
 - Targeted all TV viewers, in particular those who rely on over-the-air (terrestrial) broadcasting and do not subscribe to a pay service.
 - Also concentrated on reaching and helping senior citizens, minorities, non-English speakers, those with disabilities, low income consumers, and those living in rural areas or on tribal lands.
- Used FCC's existing toll-free call center, 1-888-CALL-FCC.
- Created a DTV website, www.dtv.gov, containing publications, frequently asked questions, explanatory charts for installing converter boxes, troubleshooting guides, antenna information and mapping tools.
 - All publications were available in English and Spanish.
 - Key publications were translated into 29 languages.



Consumer Outreach

- Trained a team of 200 Commission staff who traveled throughout the country providing direct outreach to consumers and developing partnerships with local governmental agencies and non-governmental organizations.
- Established national partnerships with government agencies, such as the National Telecommunications and Information Administration, and industry groups representing broadcasters, television manufacturers, cable television, and retailers; as well as national consumer groups.
- Developed and implemented government-financed contracts with businesses for in-home installation services and walk-in help centers throughout the nation.



Lessons Learned

- Setting a hard date for switch-off is important (but OK to change it if necessary)
- Consistent Message is Important
- Early transition for a few markets
- “Soft tests”
 - Coordinate across all stations in a market
 - Combine with a local “call-in” center
- Pay attention to receiving antennas
- Low VHF (channels 2-6) subject to reception problems (more than anticipated)
- “Night light” service after switch-off date



Agenda

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- 600 Mhz and Beyond
- Incentive Auctions



The US “Digital Dividend”

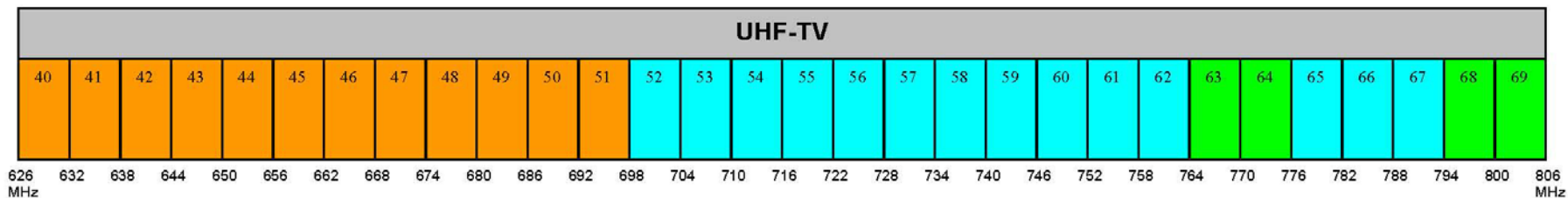
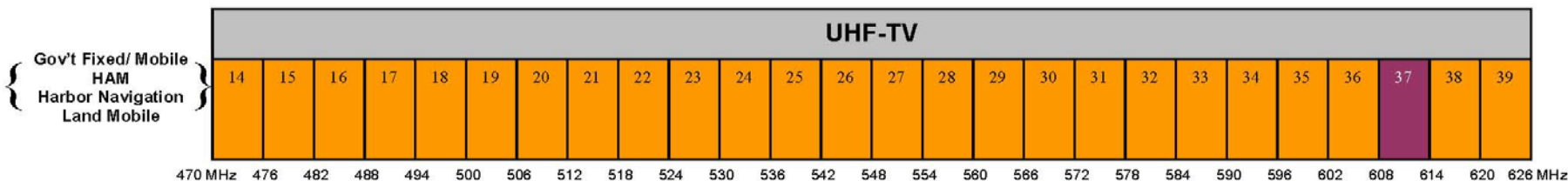
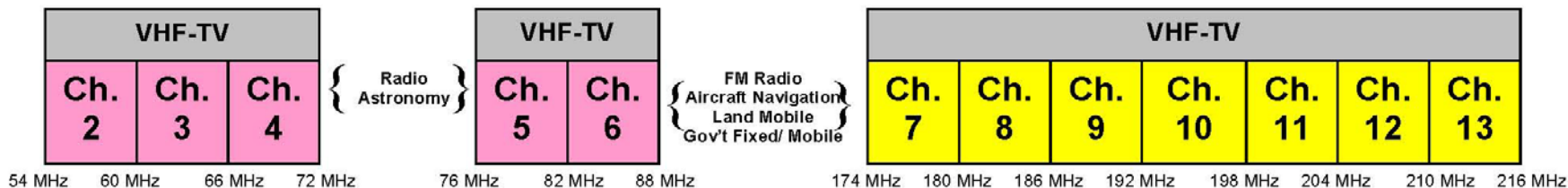
- 108 MHz of UHF spectrum reclaimed in the 700 MHz band
- 74 MHz commercial use (assigned by auction) 34 MHz public safety (no auction)
 - 24 MHz pursuant to 1997 Congressional legislation
 - 10 MHz to be assigned pursuant to February 2012 Congressional legislation
- Additional value likely resides in “white space” within the remaining spectrum assigned for television service

TV SPECTRUM ALLOCATION

Before Transition: Analog and Digital TV stations allocated to Ch. 2 – 69 (each channel is 6 MHz)

After Transition: Digital TV stations allocated to Ch. 2 – 51 (i.e. “core” DTV spectrum)

- Ch. 52 – 69 – Reclaimed for advanced wireless uses
- Ch. 63, 64, 68 and 69 – Reallocated for public safety



Key:

- = “In core”/ “Low VHF” channel
- = “In core”/ “High VHF” channel
- = “In core” UHF channel
- = “Out of core” channel (also referred to as “700 MHz Band”)
- = Spectrum allocated for Public Safety
- = Channel allocated to Radio Astronomy and Medical Telemetry





US Auction Results for 700 MHz Band

- Revenue
 - Net auction proceeds \$19.6 billion
 - 2008 700 MHz auction (Auction 73) yielded \$1.287/MHz-pop
- Timing: Auction completed prior to June, 2009 analog switch-off date
- Auction winners include
 - Major telephone companies (Verizon, ATT); wireless broadband use
 - ATT, via a secondary market transaction, acquired spectrum purchased at auction by Qualcomm
 - Qualcomm's mobile video service (separate from ATSC DTV) operated for several years but ultimately was not profitable
 - Other



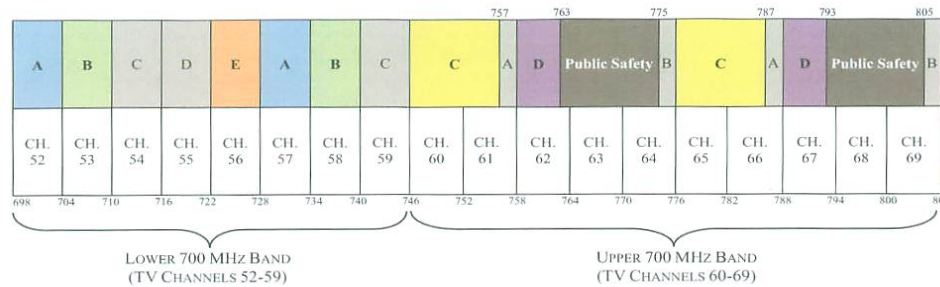
Spectrum Reallocated From Television Broadcast to Commercial Wireless and Public Safety Use

- The 698-806 MHz band (“700 MHz Band”) had been occupied by television broadcasters using TV channels 52 through 69.
 - Excellent propagation characteristics for mobile use
 - Signals penetrate buildings and walls
 - Cover large geographic areas with less infrastructure than higher bands
- As a result of the DTV transition, the 700 MHz band has been made available for new commercial and public safety services.
 - 24 MHz for public safety uses
 - Remainder for commercial uses
 - In 2008, the Commission offered at auction ten megahertz of the commercial spectrum (the “D Block”) with conditions designed to facilitate deployment of a nationwide, interoperable broadband public safety communications network on the adjacent public safety spectrum. Because the highest bid did not meet the reserve price, the D Block was not sold and remains with the FCC.
 - The Public Safety chapter of the National Broadband Plan describes an alternative proposal for moving forward on a public safety broadband network.



US 700 MHz Band Plan

Revised 700 MHz Band Plan for Commercial Services



Block	Frequencies (MHz)	Bandwidth	Pairing	Area Type	Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	EA	176
B	704-710, 734-740	12 MHz	2 x 6 MHz	CMA	734
C	710-716, 740-746	12 MHz	2 x 6 MHz	CMA	734
D	716-722	6 MHz	unpaired	EAG	6
E	722-728	6 MHz	unpaired	EA	176
C	746-757, 776-787	22 MHz	2 x 11 MHz	REAG	12
A	757-758, 787-788	2 MHz	2 x 1 MHz	MEA	52
D	758-763, 788-793	10 MHz	2 x 5 MHz	Nationwide	1 *
B	775-776, 805-806	2 MHz	2 x 1 MHz	MEA	52

* Subject to conditions respecting a public/private partnership.

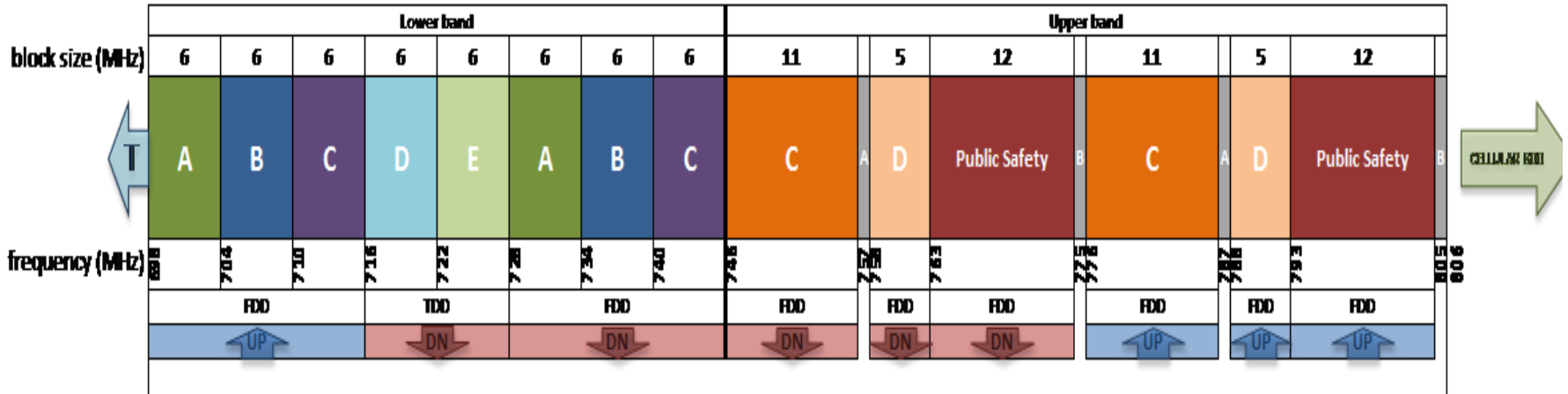
The blocks shaded above in gray (Lower 700 MHz Band C and D Blocks and Upper 700 MHz Band A and B Blocks) were auctioned prior to Auction 73.

Last reviewed/updated 9/5/2007.

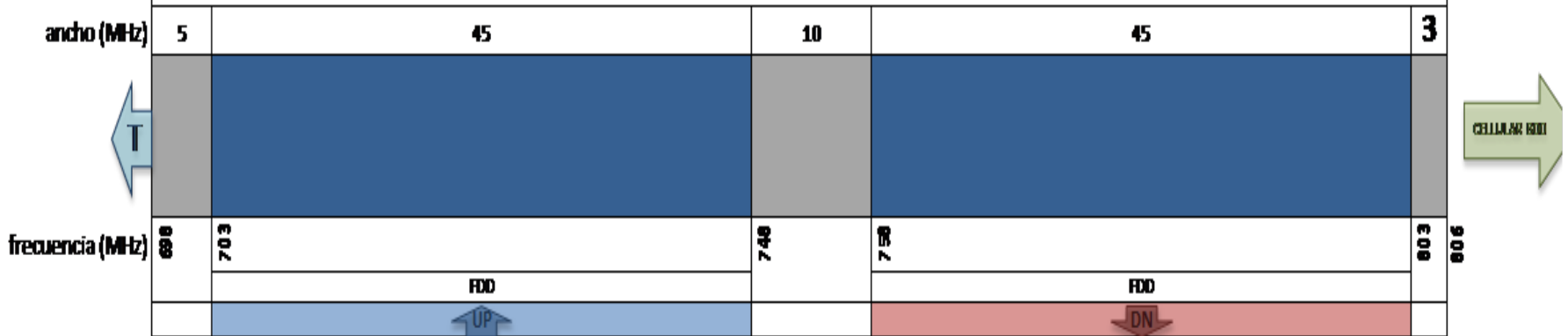


US & APT Plans

US band plan

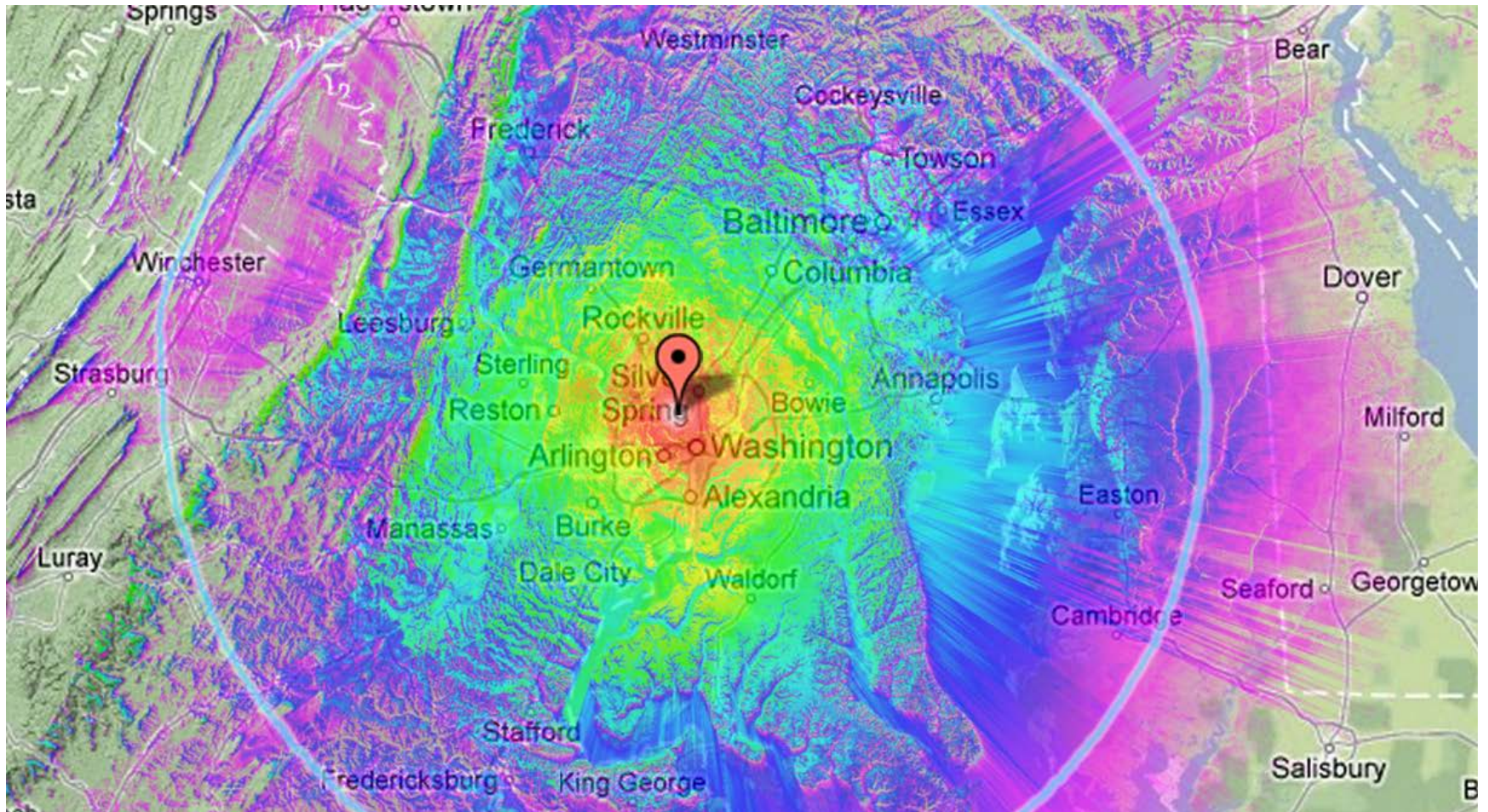


APT FDD band plan



Source: Wikimedia Commons

FC RF Propagation



Signals do not stop where they are supposed to



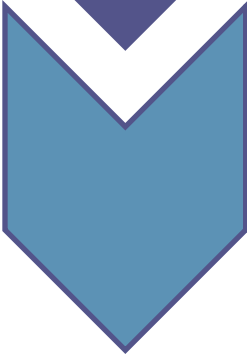
Agenda

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- DTV Transition

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- 700 MHz Band

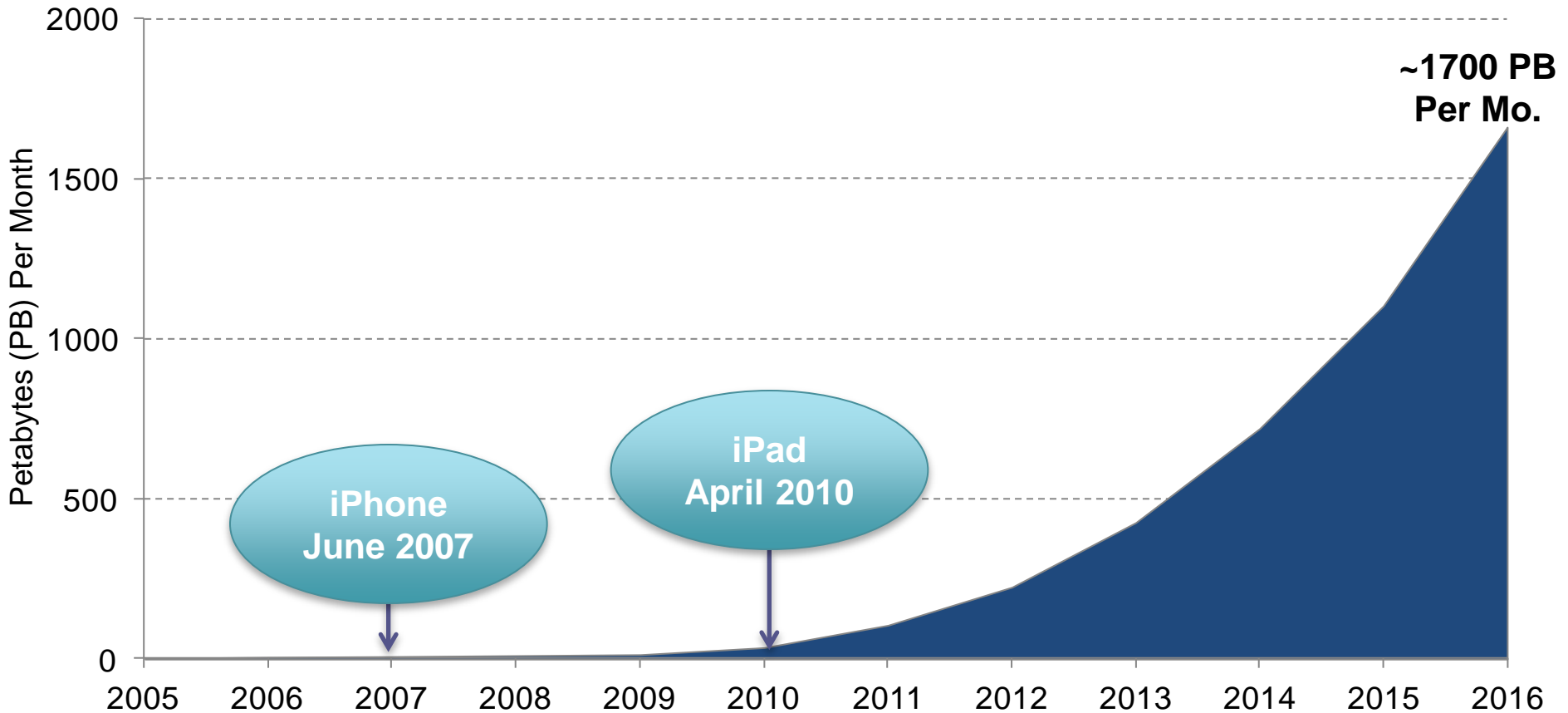
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- 600 MHz and Beyond
Incentive Auctions



Exponential Mobile Data Growth...







U.S. Mobile Data Traffic Growth Forecast



1 Petabyte (PB) = Approx. 1 Million Gigabytes = 10^{15} bytes

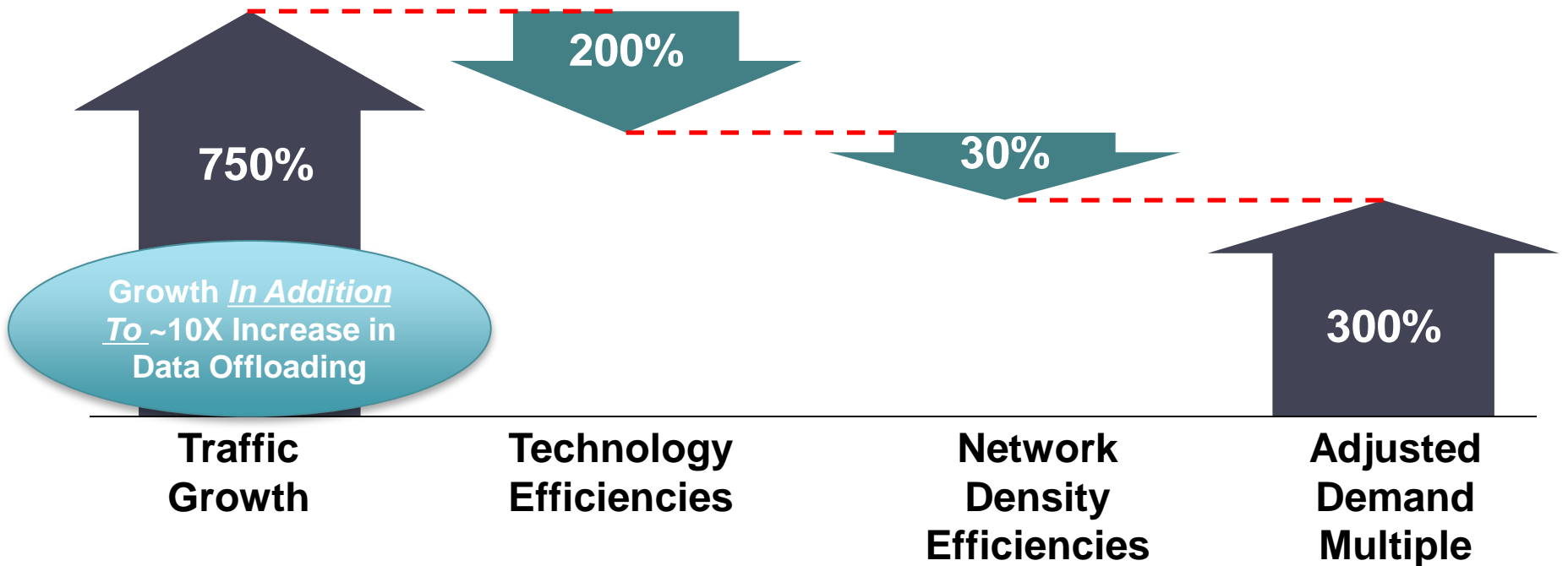


...Driven by New Technologies and Consumption Patterns...

	2011	2016	CAGR ⁽¹⁾
	MBs per Month	MBs per Month	
Non-Smartphone 	4	108	91%
M2M 	71	266	30%
Smartphone 	150	2,576	77%
E-Book Reader 	750	2,880	31%
Tablet 	517	4,223	52%
Laptop 	2,131	6,942	27%

FC ...Has Outpaced Network Efficiency Gains...

Spectrum Demand Drivers (2012-2016)



Growth *In Addition*
To ~10X Increase in
Data Offloading

**Traffic
Growth**

**Technology
Efficiencies**

**Network
Density
Efficiencies**

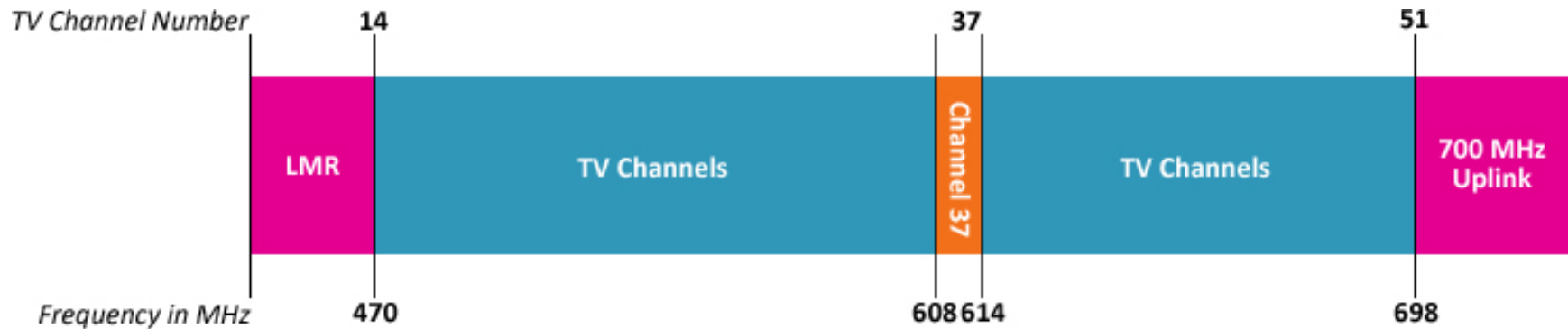
**Adjusted
Demand
Multiple**

**Traffic growth outpacing
efficiency gains by 2.5X**



Broadcast TV Allocation

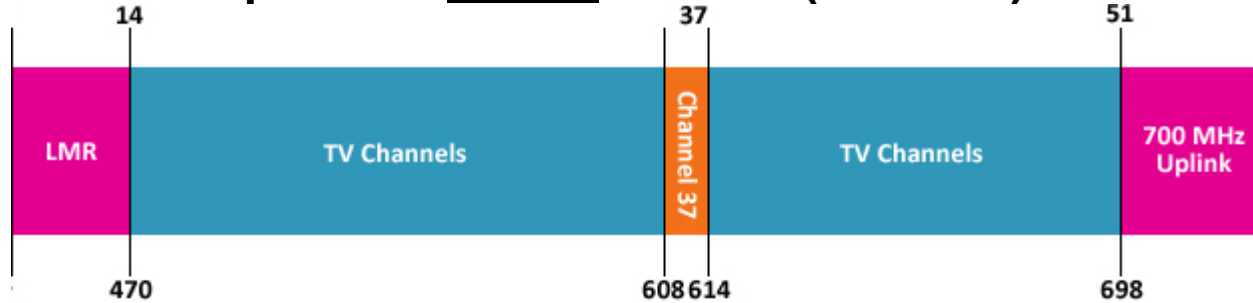
TV Band Spectrum Post DTV Transition: 294 MHz





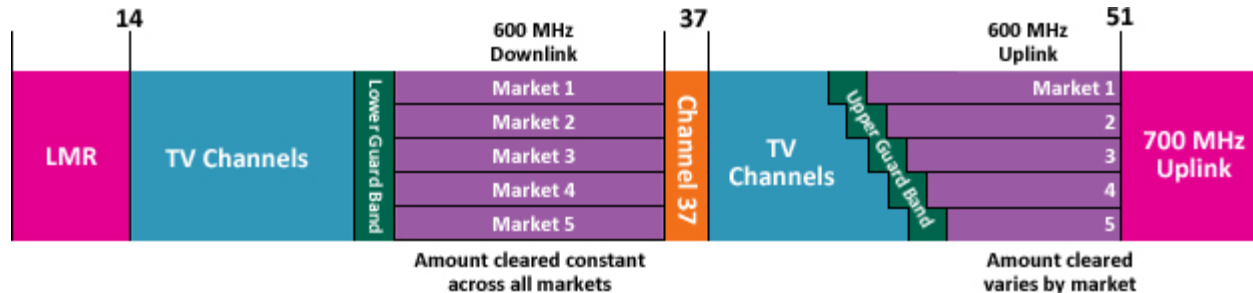
Efficient Reallocation of Spectrum Using Innovative Band Plans

TV Band Spectrum Before Auction (294 MHz)



Incentive Auction / Repacking

TV Band Spectrum After Auction (fewer MHz, market-determined)

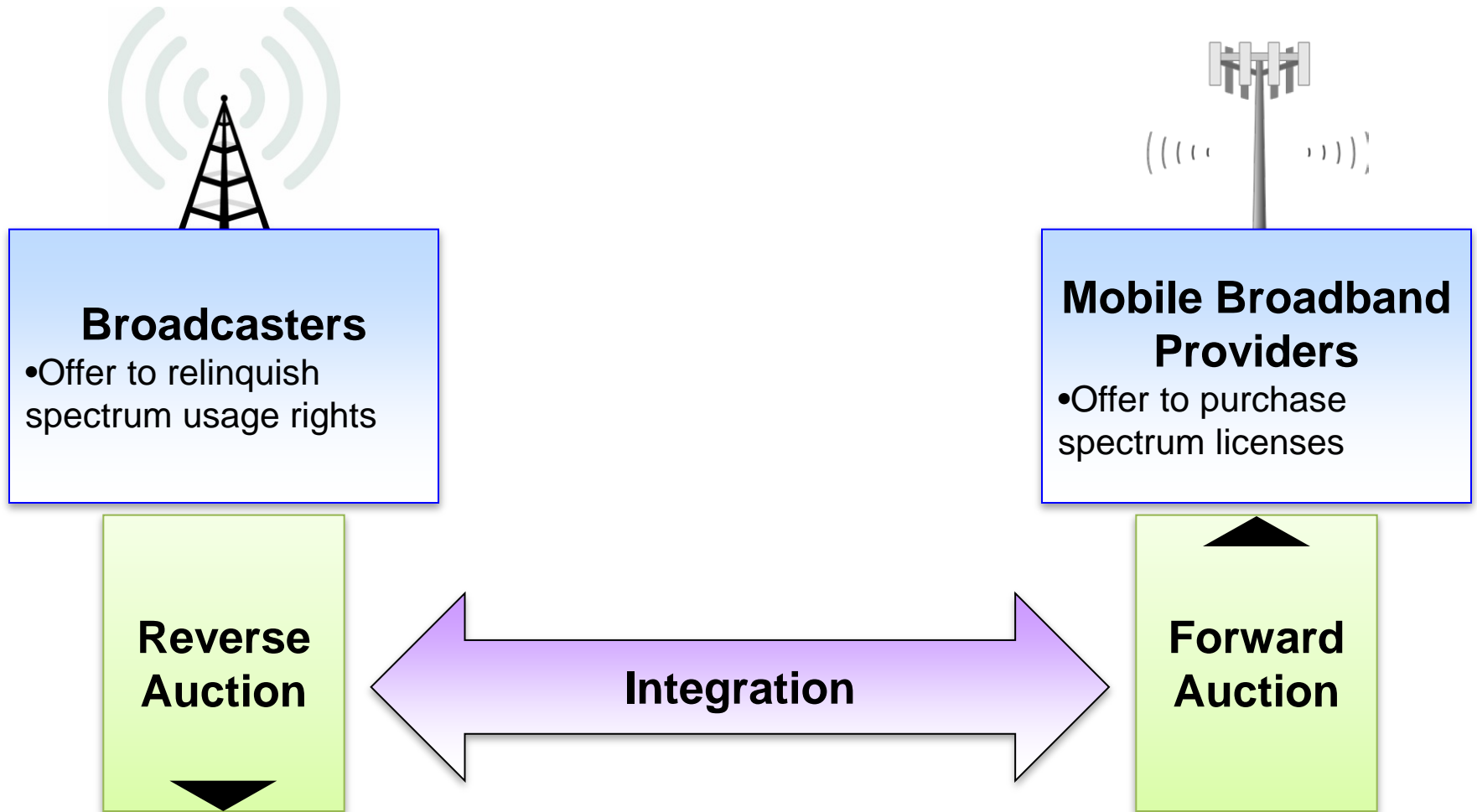


Key Post-Auction Band Plan Innovations

- Flexible band plans to accommodate varying amounts of cleared spectrum
- Consistent downlink nationwide, varying uplink
- “Generic” 5 MHz spectrum blocks

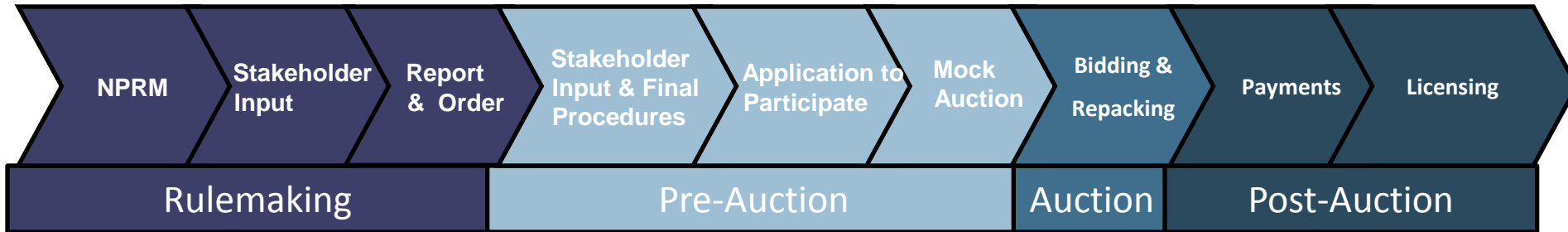


Incentive Auction Key Components





Incentive Auction Process Timeline



- NPRM issued October 2012
- Report & Order expected later this year
- Target Auction in 2014

- US Proposal to JTG on Agenda Item 1.1
- Recognizing the growing need for mobile spectrum 470-806/862 MHz frequency range and different national priorities among the member states for the UHF broadcasting, it is necessary for WRC-15 to adopt a regulatory solution that would:
 - a) Enable administrations to preserve broadcasting and other services in the UHF range and,
 - b) Allow administrations flexibility to address the mobile spectrum shortage consistent with their domestic requirements.
- Match Region III allocation

Thank you



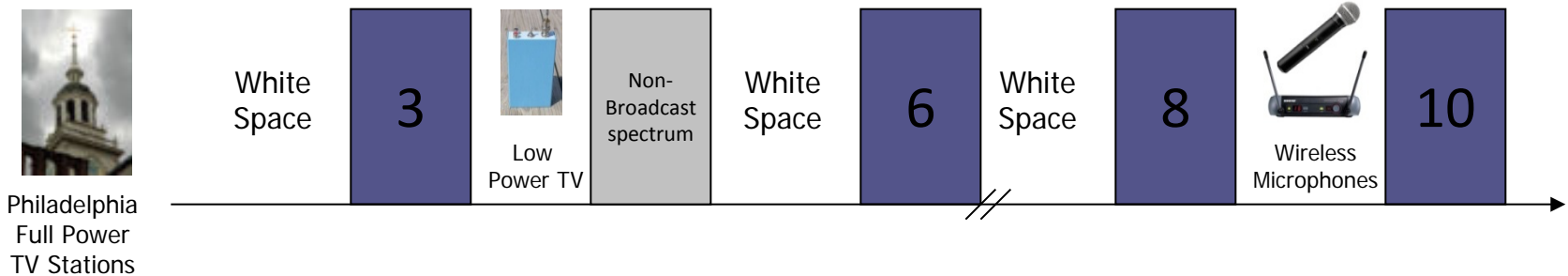
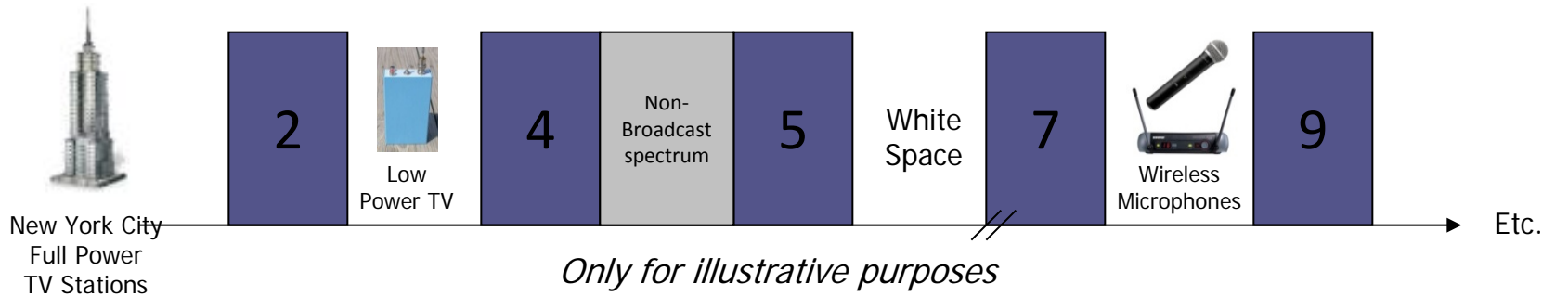


WHITE SPACES



TV White Spaces

- TV channels are “allotted” to cities to serve the local area
- Other licensed and unlicensed services are also in TV bands
- “White Spaces” are the channels that are “unused” at any given location by licensed devices





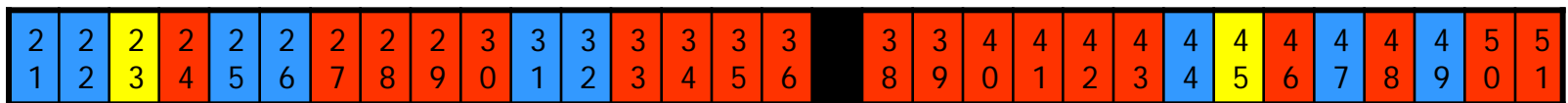
TVWS Spectrum Availability

- Available spectrum varies by location
- In rural areas many channels are available
- In big cities only a few channels may be available
- Examples of availability in UHF channels 21 – 51 (Illustrative):

New York



Washington, DC



Full Service DTV Station



Low Power TV Station



Channel Open/ Adjacent to TV



Channel Open/ Not Adjacent to TV

In less dense areas many channels are available.
For example: Wilmington, NC: 25 channels = 150 MHz



Overview of TV White Space Rules

- Both fixed and personal/portable devices may operate in the TV white spaces on an unlicensed basis
- Devices must:
 - 1) include a geolocation capability and
 - 2) access a database of protected radio services at that location to obtain a list of available channels
- Database(s) established & administered by third parties