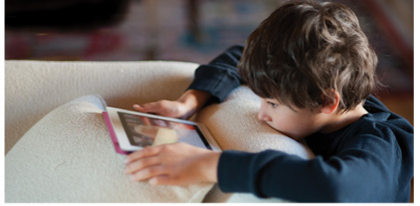


Harris Broadcast

PREPARING FOR SPECTRUM REPACK

Jay Adrick, Technology Advisor

Harris Broadcast
DELIVERING THE MOMENT

BACKGROUND ON SPECTRUM BATTLE

A Broadcast Perspective











NATIONAL BROADBAND PLAN

- The National Broadband Plan released in March 2010
  - Authorized and funded by American Recovery and Reinvestment Act of 2009 (ARRA)
  - Assembled by FCC under the direction of then Chairman Julius Genachowski
- The NBP calls for harvesting 500 MHz of spectrum between 225 MHz and 3.7 GHz.
  - Spectrum would come from both FCC and NTIA allocations
  - NBP targets 120 MHz from current UHF Television allocation
- The NBP proposes a spectrum auction process
  - Auction proceeds to go to U.S. Treasury
- The ARRA did not give the FCC specific jurisdiction to carry out the plan

FCC REPORTS TO CONGRESS

- The FCC is an independent agency
  - The Chairman and Commissioners are nominated by the President
  - Nominees must be approved by the Senate
- FCC oversight conducted by Congress
  - Senate Committee on Commerce, Science & Transportation
    - Senate Subcommittee on Communications, Technology and Internet
  - House Energy and Commerce Committee
    - House Subcommittee on Communications and Technology
- Regulatory activities of the FCC fall under two acts of Congress
  - Communications Act of 1934
  - Telecommunications Act of 1996

INDUSTRY LOBBYING EFFORT

- NAB, MSTV, OMVC, APTS, individual stations and a few manufacturers including Harris Broadcast provided input to the FCC, members of Congress and the FCC over sight committees in Congress
- The messages were centered on:
  - The value of local broadcasting
  - Technology innovation by broadcasters
  - Reliable and sound infrastructure of broadcasting during times of disaster or emergency
  - The growing use of “Over the Air” television

HARRIS BROADCAST SUPPORTS LOBBYING EFFORT

- Harris Broadcast, represented by Jay Adrick, participated in 4 trips to the Hill, visiting members of the Senate Subcommittee on Communications, Technology and Internet and the House Subcommittee on Communications and Technology.
  - Meetings were held in concert with the OMVC and the ATSC
- Harris Broadcast also conducted several visits to FCC Commissioners, Media Bureau personnel and Office of Engineering and Technology personnel.

CONGRESSIONAL AUTHORIZATION FOR NBP - 2012

- Authorization to proceed with the National Broadband Plan and spectrum auctions is buried in a Congressional Act known as Middle Class Tax Relief and Job Creation Act of 2012 also known as The Spectrum Act of 2012.
- While the act authorizes the FCC to move ahead with a plan to recoup spectrum from various sources including television broadcast, it also puts in place safe guards for the television broadcasters.

CONGRESSIONAL SAFEGUARDS

- Participation in the spectrum auction process is voluntary.
- Stations may elect to share a channel and retain full “must carry”.
- No station will be forced to move from a UHF to a VHF channel assignment or from a high band VHF to a low band VHF channel assignment.
- Stations forced to move to a new channel assignment will be reasonably compensated for costs incurred from a $1.75 Billion fund.
- The FCC shall make all reasonable efforts to preserve the coverage area and population served of each licensee.

CONGRESSIONAL SAFEGUARDS

- The Commission may conduct only one auction.
- The FCC must enter into international negotiations with Canada and Mexico before making channel assignments.
- The reverse auction process must be completed by 2022.

DOCKET 12-268 NPRM

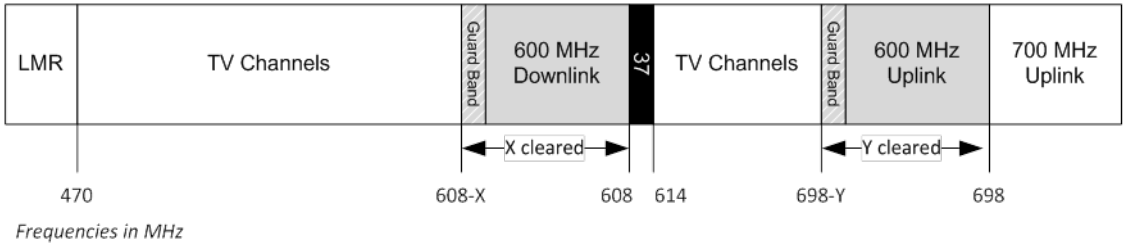
- Titled: Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions
  - Issued October 2, 2012 with comments due December 21, 2012 but extended to January 25, 2013
- NPRM proposes a reverse auction followed by TV band repacking to be held before forward auction.
  - Defines auction eligibility and bid options for reverse auction
  - Proposes compensation for relocation but asks questions regarding how to structure a plan the equitable.
  - Proposes general auction rules
  - Proposes a repack time line that is only 18 months vs the proposal from Congress of 36 months

DOCKET 12-268 NPRM

- The NPRM specifically limits the compensation for relocation of channel assignment to Full Power and Class A television licenses.
  - No protection is offered for low power or translator licenses in the spectrum repack.
  - Low power and translator channel assignments will likely continue to exist on a “spectrum available” basis. If these stations are required to relocate, the expenses will be born by the licensee.

DOCKET 12-268 NPRM

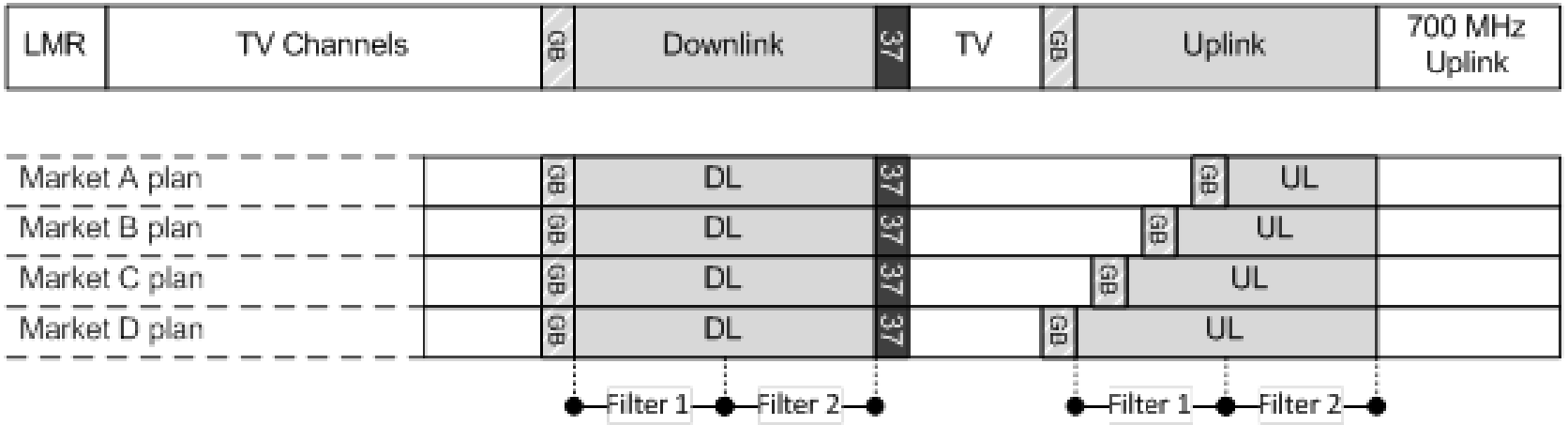
- NPRM proposes a 600 MHz band plan
  - Plan proposes split segments for wireless services, guard bands between broadcast and wireless, 5 MHz channel blocks for wireless
  - Power limitations proposed for new users lower than 700Mhz plan



  - White Space and unlicensed devices are part of the plan
  - Wireless microphone allocations are also supported

FCC PROPOSED 600MHZ BAND PLAN

- A flexible band plan is proposed to accommodate market variations



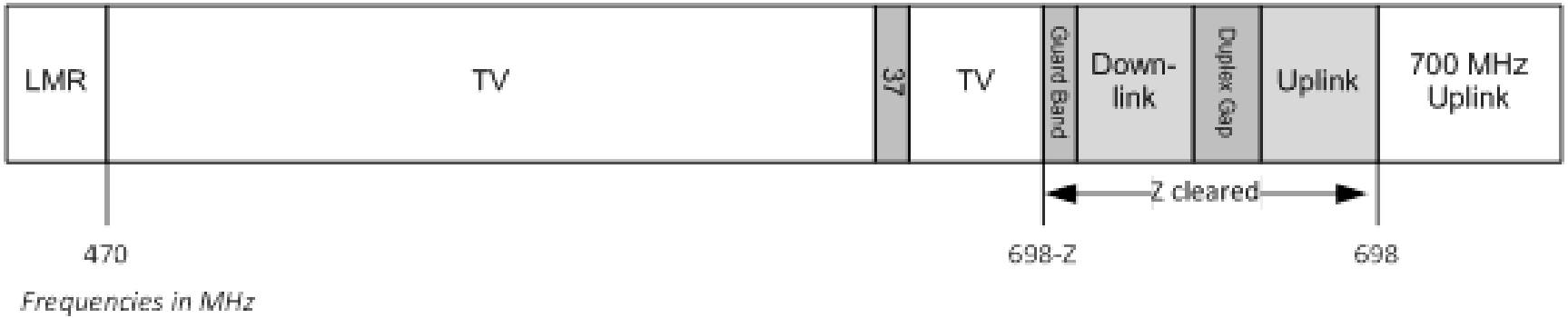
- The downlink segment is fixed and the uplink segment is variable
- TV allocations are proposed in the duplex gap for wireless

INDUSTRY RESPONSES TO DOCKET 12-268 NPRM

- Both broadcast and wireless respondents object to a split band plan citing that it serves no useful purpose
- Both are opposed to broadcast assignments in the duplex gap
- Broadcasters want a uniform band plan to avoid co-channel interference
- Broadcasters want a fair and equitable compensation plan if forced to relocate channels
- Broadcasters stressed that adequate time be given to those who must relocate…18 months is not enough…many believe that 3 years is also insufficient.

INDUSTRY RESPONSES TO DOCKET 12-268 NPRM

- Alternative Band Plans Suggested by broadcasters and wireless industry



- FCC Band Plan meeting in early May reinforced the industry position on a “Down from 51” solution…FCC issued an NOI asking input on the band plan

HARRIS BROADCAST RESPONSES TO NPRM

- THE COMMISSION SHOULD IMPLEMENT POST-AUCTION PROCEDURES THAT MINIMIZE THE DISRUPTION TO BROADCASTERS AND VIEWERS
  - The FCC's repacking model should ensure that broadcasters will continue to serve the same coverage area and population.
  - The Commission must establish realistic deadlines for broadcasters to transition to their post-auction facilities.
    - The Commission should adopt a phased post-auction transition schedule.
    - The Commission must provide a realistic amount of time for stations to modify their facilities.

HARRIS BROADCAST RESPONSES TO NPRM

- THE PROCESS FOR PAYMENT OF RELOCATION COSTS SHOULD BE TRANSPARENT AND ENSURE A MAXIMUM AND FAIR DISTRIBUTION OF FUNDS
  - The FCC should ensure that total broadcaster relocation costs Do Not Exceed the $1.75 Billion allocated by Congress.
  - The FCC should establish a procedure for fair and equal reimbursement based on actual costs.
  - The Commission should adopt a detailed list of what expenses are “Reasonably Incurred”.
  - The Statutory completion date should be construed to provide sufficient time for broadcasters to complete their relocation.

HARRIS BROADCAST RESPONSES TO NPRM

- ANY ADDITIONAL INTERFERENCE TO EXISTING BROADCASTERS MUST BE VOLUNTARY
  - Stations should have the option to voluntarily accept additional interference in exchange for a share of the auction proceeds.
  - Full Power and Class A Stations should not have the option of relocating to the Low VHF Band.

HARRIS BROADCAST RESPONSES TO NPRM

- THE FCC SHOULD PROVIDE THE MOST EFFICIENT ALLOCATION OF SPECTRUM IN THE EXISTING TV BANDS
  - The Commission should restructure the 600 MHz Band Plan to maximize efficiency while minimizing interference.
  - The 600 MHz Wireless Band should be continuous and uniform.
  - The 600 MHz Guard Bands should not come from additional broadcast allocation.
  - The Commission should seize this opportunity to solve the problem of Low Band VHF

HARRIS PARTICIPATION IN REPACK WORKSHOP

- The FCC held the first in a series of Repack Workshops on October 26, 2012. The workshop was focused on:
  - Station compensation for channel relocation
  - Time allocation for repacking
  - Industry resources to support repacking
- Harris representative Jay Adrick was invited to make an opening presentation to set the stage for the event while proposing:
  - Initial list of equipment and services that should be covered by the compensation fund
  - Warning on the limitations of tower/antenna crews and transmitter install crews available during the 36 month window

COMPENSATION FOR REPACKING

- The 20-268 NPRM asked for compensation proposals
- Harris proposed a plan also supported by NAB:
  - Each station must submit an estimate based on actual quotes from their selected vendors
  - Compensation fund would pay each station 80% before construction
  - The station would submit actual invoices at the close of the project and compensation is then trued up to the actual final amount.
- What if the compensation fund is insufficient to fund every station?
  - Partial payment of equal percentage for each station
  - Lobby Congress for additional funding to make up difference

REIMBURSEMENT ITEMS PROPOSED BY HARRIS & NAB

- Engineering study
- Transmitter(s)
- Transmitter installation
- Channel filter
- Antenna
- Tower rigging
- Permits
- Building modifications
- Electrical service modifications
- Leasing temporary antenna and transmission line
- Tower loading study
- Proof of performance testing
- Coverage verification
- Transmission line
- Channel combiners at common sites
- Constructing a new tower if needed
- Legal services for filing
- Clean up and removal of old equipment

FCC WORKSHOP ON 600MHZ BAND PLAN

- After the NPRM responses rejected the proposals put forth on the 600 Mhz band plan as proposed by the FCC Wireless Bureau engineers, the FCC hosted a band plan workshop on May 3, 2013.
  - The workshop format consisted of a panel representing the wireless and broadcast industries in front of a group of engineers from the FCC Wireless Bureau.
  - There were 27 attendees representing most wireless carriers, cellular receiver manufacturers, base station providers and associated equipment manufacturers
  - Broadcast was represented by three attendees, Victor Tawil – NAB, Jay Adrick – Harris Broadcast and Preston Padden representing 70 stations who plan to put their properties into the auction

FCC WORKSHOP ON 600MHZ BAND PLAN

- Both the wireless and the broadcast attendees again rejected the split band plan with TV assignments in the split. All attendees cited the problems of inter-mod and receiver overload due to the high power TV signals in the split. It was also recognized that wireless devices could more easily interfere with TV reception if a spit band were employed
- Co- Channel spacing between wireless and broadcast was also an issue. The FCC was pushing for a 200KM spacing between assignments

NOTICE OF INQUIRY ON 600 MHZ BAND PLAN

- After the NPRM responses and the Band Plan Workshop attendees rejected the proposals put forth on the 600 Mhz band plan by the FCC Wireless Bureau engineers, the Wireless Bureau did a slight revision of their plan.
  - Revision was centered around reversing the uplink and downlink allocations
- The Wireless Bureau issued a Notice of Inquiry (NOI) on May 17, 2013 to gather more information and try once again to sell their plan

INDUSTRY RESPONSES TO NOI ON 600 MHZ PLAN

- Both the NAB and Harris Broadcast responded to the NOI on behalf of the broadcast industry
- The *Notice* recognizes that the majority of commenters in the record and attendees at the band plan workshop on May 3 oppose the *NPRM*'s "split" band plan and overwhelmingly favor its alternative "down from 51" approach. The Wireless Bureau does not take issue with the engineering conclusions reached by these commenters, but does not adopt the near-consensus approach that has emerged.

INDUSTRY RESPONSES TO NOI ON 600 MHZ PLAN

- The *NPRM* in this proceeding and the *Public Notice* scarcely acknowledge that separation distances – indeed, quite large ones – will be needed to mitigate inherent interference between broadcasters and wireless carriers operating on the same or adjacent channels. The *Notice*'s only fleeting recognition of this separation distance issue demonstrates a failure to grasp its implications or to study it with any rigor.
- NAB and others who support the down from 51 approach in the record are not consumed with mere technical "operational certainty," but rather favor consumers having meaningful experiences on their wireless devices and watching broadcast television without interference.

INDUSTRY RESPONSES TO NOI ON 600 MHZ PLAN

- The *Notice* recognizes that nearly all commenters have significant concerns about allowing high power services to operate in the duplex gap.It queries, however, whether such concerns are dissipated if TV broadcast services are permitted only in those markets where less spectrum is available. The simple answer is no. The record makes crystal clear that high power TV operation in the duplex gap is problematic for television viewers and wireless operations. Such operation has the potential to cause harmonic and intermodulation interference to both services, and there is no technical justification for suggesting that limiting such operation to only certain markets will eliminate or lessen the interference situation.

FCC'S "OH BY THE WAY" – BUT NOT PART OF THE CURRENT SPECTRUM ACTIVITY

- T-Band (Channels 14 through 20)
  - Certain channels allocated in major markets
    - For example: Boston, Los Angeles, New York, Chicago, Philadelphia, Dallas, Houston, Miami, Pittsburgh, San Francisco, Washington, DC
  - To be migrated out of T-Band by 2021
  - Vacant channels to be auctioned in a separate FCC action

Spectrum repacking

The industry responds to the FCC's plan.

BY JAY C. ADRICK

In the December 2012 issue of *Broadcast Engineering*, I presented an article focused on the eventual television band repack, and how stations should prepare for this event. At the time the article was written, the FCC had just released its Notice of Proposed Rule Making (NPRM) (Docket No. 12-268). No industry responses had been filed, and many were just beginning to think about the impact of the auctions and transmission line and channel mask filters announced that it would close its doors in June. It has been a busy six months.

If this wasn't enough, the FCC also announced that it is beginning proceedings on the T-band segment (TV Channels 14–20), where the television service has shared, in some markets, this spectrum with public safety users.

manufacturers and users. The medical instrumentation and scientific communities also filed comments as they currently use Channel 37 for wireless interconnection of medical instruments in hospitals and for radio astronomy.

Both the broadcast and wireless communities were aligned on one major point: no one liked the FCC's proposal for a split-band plan. (See Figure 1.) Most support the idea that

Television spectrum repacking

BY JAY C. ADRICK

One of the most significant impacts on U.S. television broadcasters by the National Broadband Plan (NBP) will be the repacking of the UHF television spectrum. There are still many details to be settled, but one can assume that many television broadcasters will be forced to relocate to another channel even though they are not participating in the reverse spectrum auction process.

What we do not know far outweighs that which we know about the process. The rules for the auction and repacking process are under development. The preliminary details, subject to revision, were presented by the FCC as part of the Sept. 28, 2012, Notice of Proposed Rule Making (NPRM) (Docket No. 12-268).

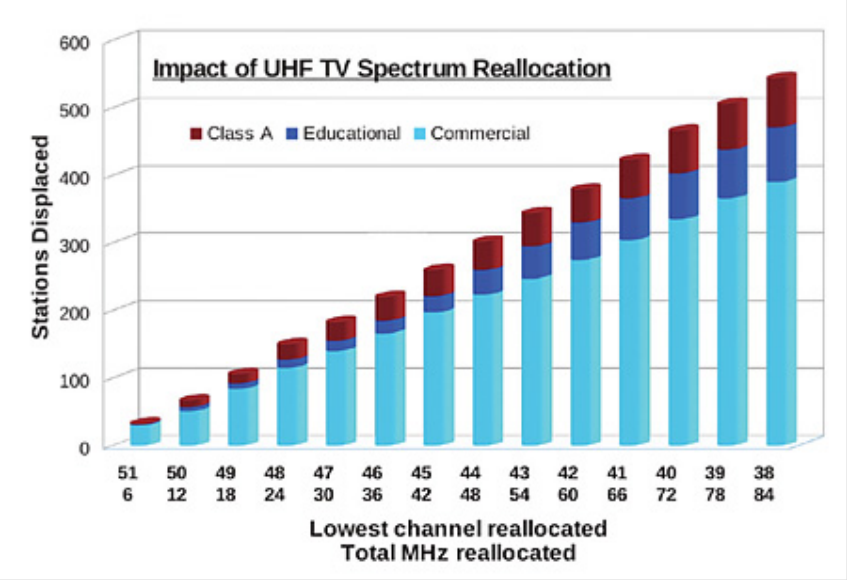
The debate over the spectrum has been a hot topic well before the release of this NPRM. Through the efforts of the NAB and many state broadcast associations, Congress

REPACK'S LONG LIST OF UNKNOWNS

- How much spectrum is the FCC actually expecting to reclaim?
  - National Broad Band Plan called for 120 Mhz (20 TV Channels).
    - Most believe that 120 MHz is only a "dream".
  - Some wireless industry people talk about 84 Mhz (14 TV Channels) as being a great goal.
  - Many industry experts believe that unless more stations "go on the block", the auction and repack is likely to only eliminate 36MHz (6 TV Channels).

REPACK'S LONG LIST OF UNKNOWNS

- How many stations will have to relocate based on spectrum reclaimed?



- The above chart only illustrates the direct displacement of stations and does not take into account the impact on other stations as a result of moving the above stations

REPACK'S LONG LIST OF UNKNOWNS

- What will be the impact of the move for each individual station based on their unique equipment and needs?
- Over what period of time will the channel change process occur?
  - Start date
  - End date
  - Transition period….FCC wants 18 months Congress allocates 3 years
  - Will the channel change process take place across a region, by DMA or by auction market?
- Is the compensation fund adequate to fund all expenses or all impacted stations?

REPACK’S LONG LIST OF UNKNOWNS

- Will the revised OET-69 software preserve the stations current coverage area?

WILL STATIONS VOLUNTEER FOR AUCTION?

- Recent news articles indicate that more than $370Million has been spent for Class A and full power stations by those who hope to profit from the auction process.
  - Are these stations in the markets that will make meaningful contribution to the need for spectrum?
- Preston Padden (former Disney lobbyist) represents a coalition of station owners who plan to put their property up for auction
  - Padden indicates that his group represents about 70 stations and they are about an equal split between Class A and Full Power stations
  - No locations of these stations has been disclosed

ONE VIEW OF STATION PARTICIPATION

$370 Million In TV Deals Done for Spectrum Auction Tender
Up to $8 billion in station assets could move
NEW YORK — Around $370 million worth of TV stations have traded hands with the express purpose of offering them up in the incentive auction, Wells Fargo analysts report. In round numbers, at least 70 TV stations are going on the block through the group led by former Disney lobbyist Preston Padden, who described them as “heavily weighted toward the largest markets.”

Both Padden and the Wells Fargo team, led by Marci Ryvicker, attended the SNL Kagan Broadcast Summit in New York on Thursday.

Padden said his group “remains bullish about the prospects for a successful auction by the end of 2014.” Broadcasters at the summit pegged 2015-16 as a more realistic timeframe, Ryvicker said.

WILL STATIONS VOLUNTEER FOR AUCTION?

- The FCC auction model proposes to look at a station's valuation by factors including measured viewership, network affiliation, market size and revenue generated.
- Another major factor will be the ability to use the station to contribute spectrum in the repack to those markets that need additional spectrum…top 25 to 30 markets or adjacent markets
- Owners of Class A stations and smaller market stations have proposed that "spectrum is spectrum" and the valuation within a market should not vary based on any other factors.
  - Their 6 MHz is worth the same as any other stations spectrum

WILL STATIONS VOLUNTEER FOR AUCTION?

Network affiliates not interested in FCC auction, TV exec says

By Brendan Sasso - 08/20/13 02:02 PM ET

ASPEN, Colo. — Television stations affiliated with the major networks have no interest in selling their broadcast licenses back to the Federal Communications Commission, according to Preston Padden, the director of a coalition of broadcasters who want to sell their licenses.

"To the best of my knowledge, the commission is extremely unlikely to attract affiliates of ABC, CBS, NBC and Fox to this auction," Padden said during a panel discussion at a Technology Policy Institute conference. "I am not personally aware of any affiliate of a major network who is planning to participate in the auction."

Padden explained that his group, the Expanding Opportunities for Broadcasters Coalition, is made up entirely of independent stations.

He argued that the FCC's system for scoring the value of broadcasters is discouraging stations from participating.

The FCC plans to buyback the licenses of interested TV stations and to then sell them to cell phone carriers, which have been struggling in recent years to accumulate enough airwaves to meet their customers' skyrocketing demand for mobile data.

The auction is expected to generate billions of dollars in revenue, which the government plans to use to pay for a nationwide wireless network for emergency responders and to pay down the national debt.

But the auction will only succeed if enough broadcasters agree to sell their licenses and go out of business.

CURRENT STATUS OF RULEMAKING

- Bits and Pieces are emerging from the Commission every month
  - Revised OET-69 software in July
  - Task Force update August 9th
  - Webinar on repacking data August 22nd
- Some FCC insiders believe that a rule making document will be released before the end of October.

Harris Broadcast
DELIVERING THE MOMENT

REPACK ISSUES – THE BROADCAST INDUSTRY VIEW

Many Factors to Coordinate












REPACK ISSUES - STATION

- How to remain “On Air” during a channel change?
  - Typical effort to change channel on transmitter in most cases will require multiple days of down time
    - Either a temporary transmitter or a new replacement transmitter will be required – most probably a new transmitter will be required
    - Some stations may have a second transmitter
  - Tower structures must be able to support the addition of temporary antennas and feed lines during the transition
    - Revised EIA specs show that many towers will be overloaded
  - Is building space and power available for a second transmitter during transition?

REPACK ISSUES - STATION

- Addressing local zoning law and regulations related to facilities modification and antenna/tower changes.
  - Issues are both timing and cost
- Engineering considerations related to building modifications, site surveys, tower loading evaluation, etc.
  - Issues are both timing and cost
- Will reimbursement cover a station with 2 transmitters…1 main and 1 alternate or multiple sites?

REPACK ISSUES - INDUSTRY

- Limited number of qualified tower crews to change out antennas and feed lines
  - See next slide for more details
- Limited number of technical crews to retune existing or install new transmitters
- Manufacturing capacity for replacement antennas, channel filters, RF line systems and transmitters
- How to deal with and compensate stations when a common antenna facility is involved
- How to deal with and compensate stations located at a common antenna site that do not change channel but are impacted by adding a first adjacent channel station to the common site

REPACK ISSUES - INDUSTRY

- There is a total of 14 tower crews in the US that have the skills, training, equipment and insurability to remove and replace heavy television transmitting antennas on tall towers
- The typical broadcast TV antenna replacement job including a temporary antenna will take from 3 to 6 weeks to complete
  - Average 5 weeks including travel
  - Working 52 weeks per year for 3 years, the 14 crews could do a maximum of 434 stations

REPACK ISSUES - TECHNOLOGY

- Moving to lower frequency channel assignments will mean larger antennas for equal gain or lower gain for equal sized antennas
  - Tower loading limitations may impact the size of antenna or drive additional cost to reinforce the tower structure
  - Tower specifications have recently been upgraded under TIA/EIA – 222-G
    - This may limit increased loading on current structures
  - Lower gain antennas will require higher transmitter power to provide equal coverage

REPACK ISSUES - REGULATORY

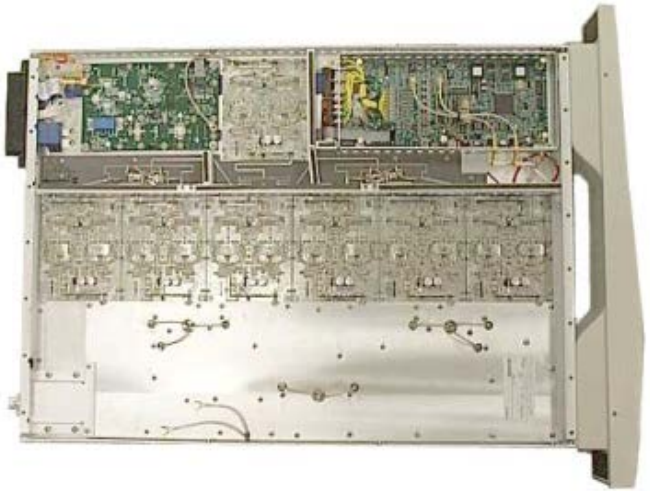
- Congressional mandate that compensation must be made within 3 years from completion of the forward auction
- International treaties with Canada and Mexico must be resolved
- FCC’s unwillingness to wait for new technology (ATSC 3.0)

TRANSMITTER REPLACEMENT IS LIKELY

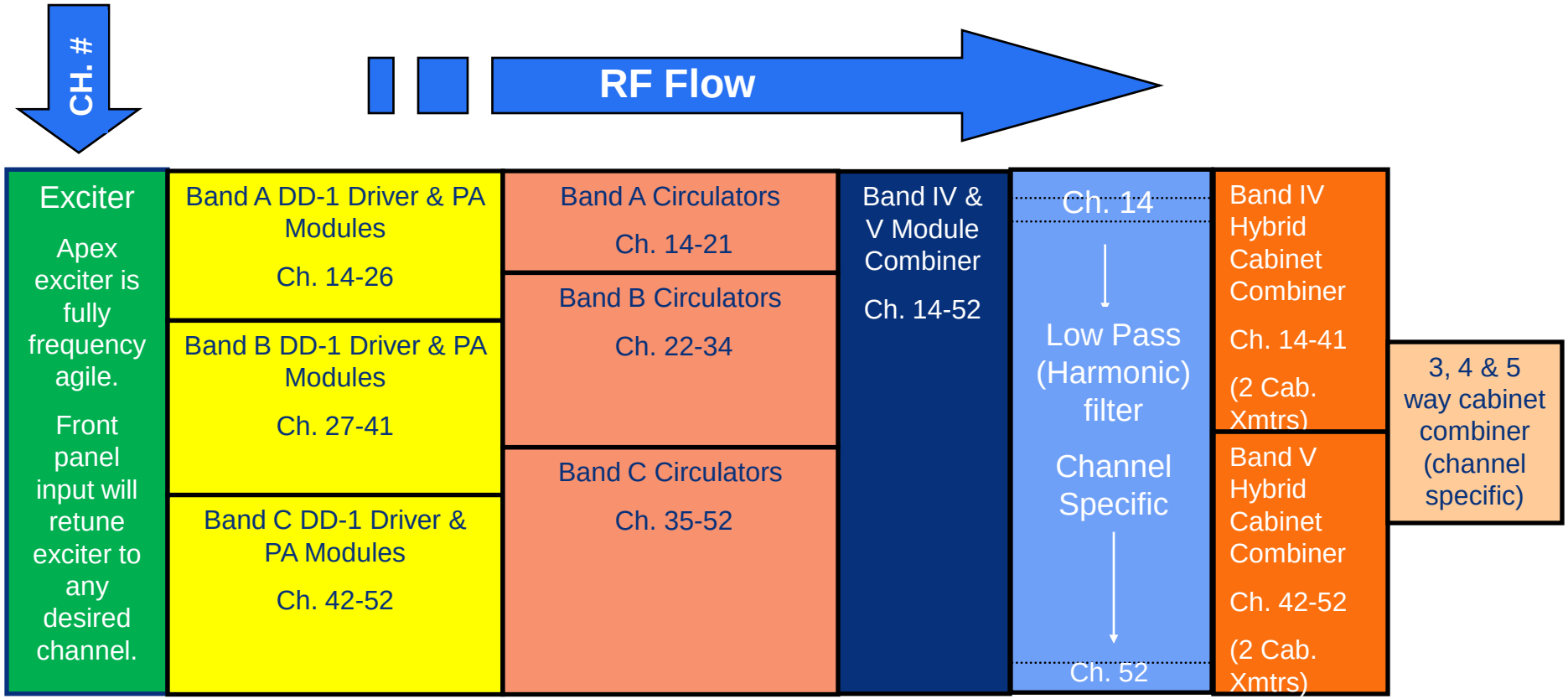
- By the time repack begins, most transmitters will be between 8 and 20 years old
  - Solid state device technology has advanced with older device types going out of production
  - Newer transmitter designs are significantly more power efficient.

TRANSMITTER REPLACEMENT IS LIKELY

- Most UHF transmitters currently deployed are designed around segmented bands…usually three band segments
  - Moving across segments would require new amplifier pallets and combiners if solid state TX or new driver modules if IOT type TX.
  - Device availability is unlikely



EXAMPLE: DIAMONDCD® TX BAND SPLITS



CHANNEL CHANGE SCENARIOS

- Channel change within the technical limits of the existing transmitter and antenna
  - Transmitter employs currently supported technology
  - Estimated that <5% of stations in this category
- Channel change beyond the technical limits of the existing supported transmitter and antenna
  - Transmitter employs currently supported technology
  - Estimated about 40% stations in this category
- Channel change beyond the technical limits of the existing un-supported transmitter and antenna
  - Transmitter is no longer supported due to technology obsolescence
  - Estimated about 55% stations in this category

LEAST IMPACT (<5%)

- Retune transmitter to new channel
- Replace Output Mask Filter
- Conduct Proof of Performance testing
- Begin operation on new channel

MODERATE IMPACT (15%-25%)

- Install temporary antenna and transmission line
- Retune existing transmitter to new channel
- Replace Output Mask Filter
- Conduct Proof of Performance testing
- Cut over to new channel
- Remove original antenna
- Install new antenna
- Cut over to new antenna
- Remove temporary antenna and transmission line

LIKELY IMPACT (45%-55%)

- Install temporary antenna and transmission line
- Modify building and electrical for additional transmitter
- Install new transmitter
- Install new channel mask filter
- Remove original antenna
- Install new antenna
- Conduct system proof tests
- Cut over to new channel
- Remove temporary antenna and transmission line
- Remove original transmitter or convert to new channel as back up transmitter

ALMOST WORST CASE IMPACT (20%-25%)

- Install temporary antenna and transmission line
- Modify building and electrical for additional transmitter
- Install new transmitter
- Install new channel mask filter
- Remove original antenna
- Remove original transmission line
- Install new transmission line
- Install new antenna
- Conduct system proof tests
- Cut over to new channel
- Remove temporary antenna and transmission line
- Remove original transmitter or convert to new channel as back up transmitter

WORST CASE IMPACT (10%-15%)

- Acquire new site for tower and transmitter
- Make site improvements
- Build new building for transmitter
- Erect new tower structure
- Install new transmission line
- Install new antenna
- Install new transmitter
- Conduct system proof tests
- Cut over to new channel
- Remove old antenna and transmission line
- Remove old transmitter and associated equipment
- Restore old site

Harris Broadcast
DELIVERING THE MOMENT

THE REPACK PROCESS AS VIEWED BY THE FCC

Current status











REPACKING: THE PROCESS

Repacking - Process of reassigning broadcast TV channels to free up contiguous blocks of spectrum for mobile broadband use

Key Components of the Repacking Process – Two key initial steps in the process are:

- Calculating TV station coverage and interference characteristics (OET-69 and *TVStudy*); and
- Using the OET-69 coverage and interference calculations with other data to analyze repacking constraints (July 22nd Repacking Data Public Notice)

2

REPACKING: NEW SOFTWARE SAME METHODOLOGY

Statutory Obligation

"Commission shall **make all reasonable efforts** to preserve, as of [February 22, 2012], the coverage area and population served of each broadcast television licensee, as determined using the **methodology** described in OET Bulletin 69..."

What is OET-69?

- Longley-Rice methodology for evaluating TV service coverage and interference
- First developed over 16 years ago (1997; updated 2004)

What is *TVStudy*?

- Modern software implementing the OET-69 methodology with improved datasets
- Provides more accurate and efficient modeling and analysis, which is critical for a successful incentive auction

3

REPACKING: UPDATES TO ADHERE TO STATUTE

Preserve "population served"

- Updating census data to 2010
  - Population grew 9.7% (27 million) from 2000 to 2010
  - Over 30% of population moved residences between 2005 & 2010

- More precise geographic coordinates
  - More decimal places = more precise census block locations

Preserve "coverage area"

- More accurate terrain data
  - 3X more granular terrain elevation data

- Actual antenna beam tilt
  - Default angle resulted in inaccurate calculation

- Corrected calculation of depression angle
  - Using proper antenna height parameter

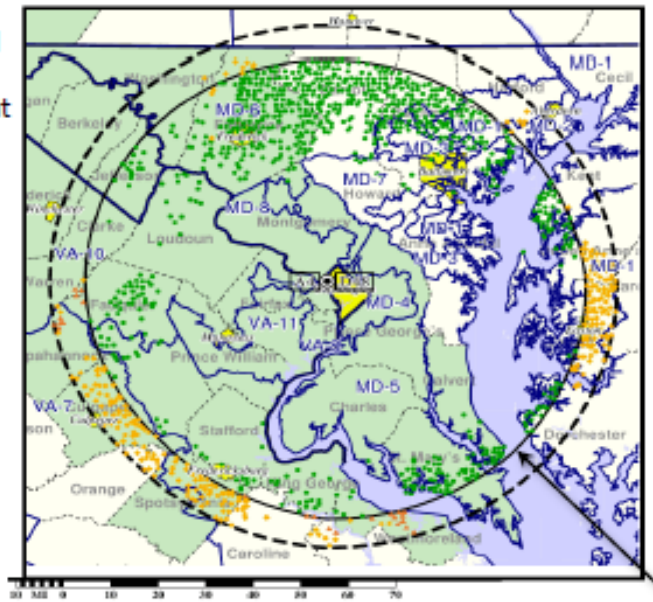
- Universal cell/grid
  - ***Necessary for repacking -- Allows station-to-station, "pairwise," interference calculation***

REPACKING: DIFFERENT FROM DTV TRANSITION

DTV Gain/Loss Map

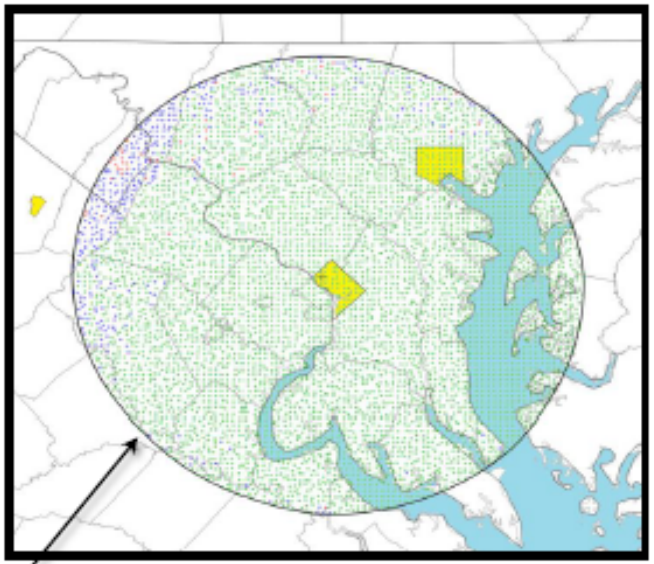
Digital License (solid) vs. Analog (dashed)

- Coverage gained
- Coverage lost but still served by same network
- Coverage lost & no services



Analog service	6,570,779 persons
Digital service	7,030,592
Analog loss	87,256
Digital gain	547,069
Net gain	459,813

TVStudy Interference Map



- Service
- No Service
- Interference

Notice matching contour maps

5

REPACKING: DATA PUBLIC NOTICE

The public notice released on July 22, 2013 was the first of several public notices on the repacking process. The public notice includes:

1. Updated *TVStudy* software
2. Data about Canadian and Mexican television allotments, domestic TV stations, and other incumbents in the band
3. Descriptions of how stations **could** be assigned or reassigned to particular channels

The preliminary data released with the public notice are for **illustrative purposes only**. Many of the assumptions relate to issues that will be decided by the Commission.

REPACKING: DOMAIN FILE

For each U.S. TV station, the *Domain file* provides a list of channels that the station may be assigned to in the incentive auction repacking process.

In the following sample, Station #10001 may **only be placed** on channels 2, 3, 4, 5, 6, 19, 20, 21, 48, 49, 50, 51. A channel assignment algorithm could not place Station #10001 on any other channel.

```
DOMAIN, 10001, 2, 3, 4, 5, 6, 19, 20, 21, 48, 49, 50, 51
```

Sample does not reflect real station data.

REPACKING: INTERFERENCE_PAIRED FILE

For each U.S. TV station, the *Interference_Paired file* provides a list of other stations that cannot be assigned the same channel or an adjacent channel if the station were placed in one of the three television bands.

If after repacking Station 1362 is placed in the UHF band (channels 14-51) then:
Stations 1116, 1301, 285, 1356, 390, 588, 1981 and 383 cannot be placed on the same channel (co-channel);
Stations 1116, 1301, 285, 1356, 1981 and 383 cannot be placed on the first adjacent channel above station 1362;
Stations 1116, 1301, 285, 1356, 1981 and 383 cannot be placed on the first adjacent channel below station 1362.

CO, 14, 51, 1362, 1116, 1301, 285, 1356, 390, 588, 1981, 383
ADJ+1, 14, 51, 1362, 1116, 1301, 285, 1356, 1981, 383
ADJ-1, 14, 51, 1362, 1116, 1301, 285, 1356, 1981, 383

Sample – does not reflect real station data.

REPACKING: NEXT STEPS

- Host webinar on technical details of publicly released repacking resources
- Release additional repacking information to the public

TRANSITION AND REIMBURSEMENT PLANNING

- Working directly with broadcast and cable industries on transition planning and reimbursement issues
- Reviewing preliminary findings on cost models, timing, and logistics of transition planning
- Beginning long term planning for a Fund Administrator

NEXT STEPS: TRANSITION AND REIMBURSEMENT

- Release preliminary reimbursement cost guidelines for public comment
- Host workshop in September on broadcaster transition and reimbursement processes

Harris Broadcast
DELIVERING THE MOMENT

QUESTIONS?