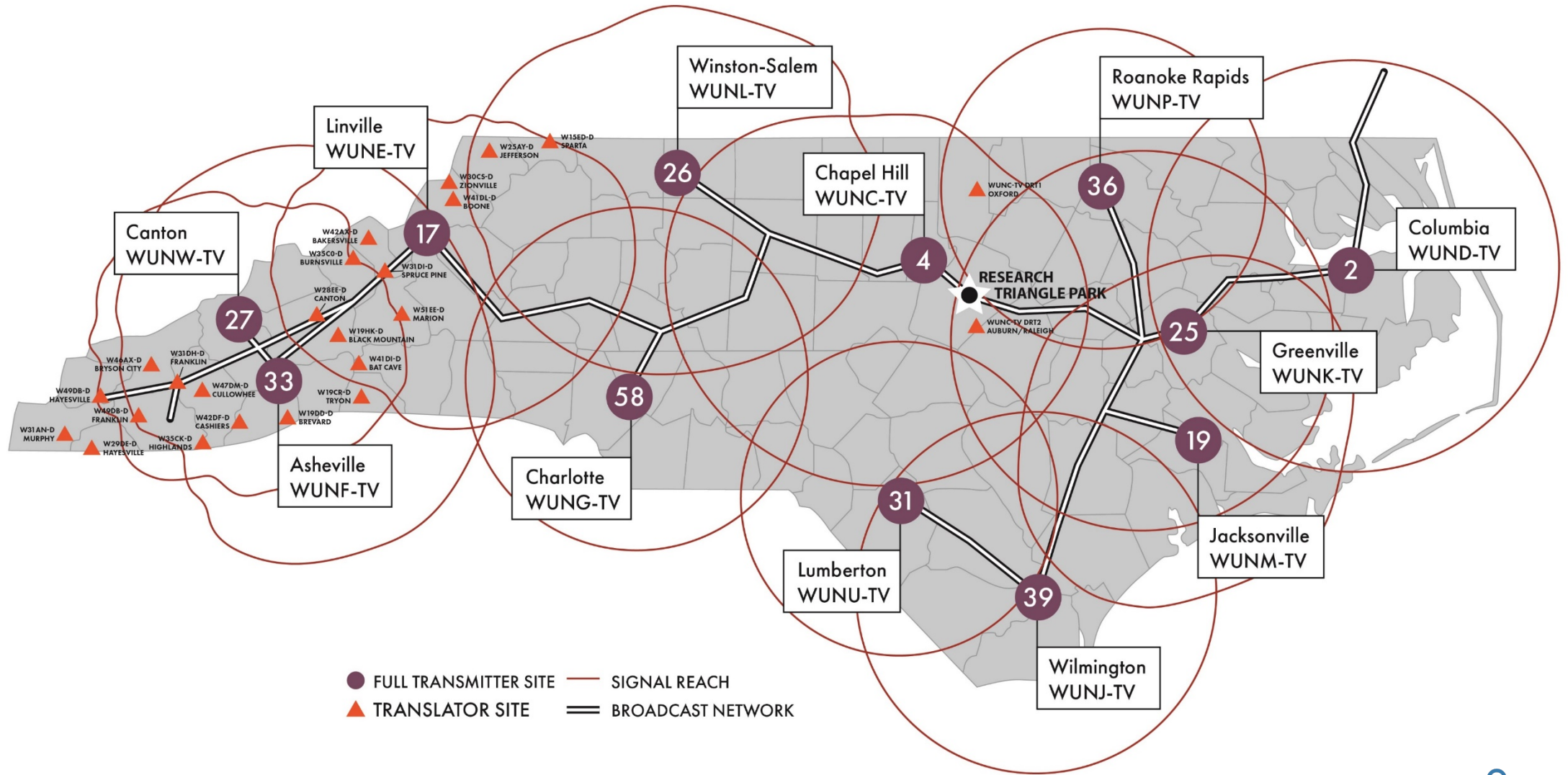# Digital Paging over Public Television

Fred Engel, Chief Technology Office, PBS North Carolina

Red Grasso, Director, First Responder Emerging
Technologies (FirstTech) Program
N.C. Department of Information Technology

Public Media Perception

Public Media Perception

Public media organizations have always been focused on <u>enriching</u> lives.

+

Now, they will also help <u>save</u> them.
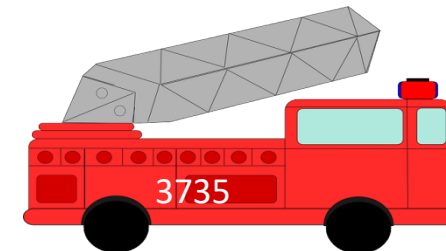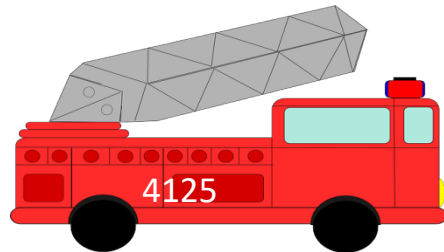
Kitchen Fire Dispatch: Current

- 5 tones to 9 units – 26 secs
- Voice announcement <u>only after</u> all pager tones
- 11 secs to read unit numbers
- Location announced 42 secs after alert initiated
- Full alert = ~67 secs

Tone alerting and todays analog pagers

- Technology from 50+ years ago
- 70% of firefights are volunteers
- Volunteers might not be located at the fire station
- Tone & Voice Pager
- Extremely reliable & durable
- Most have no display, voice only
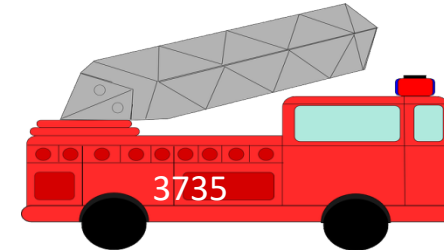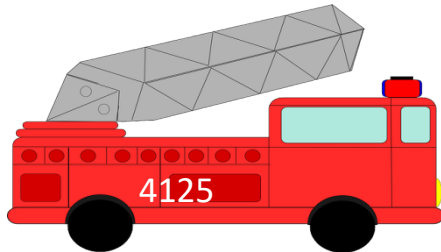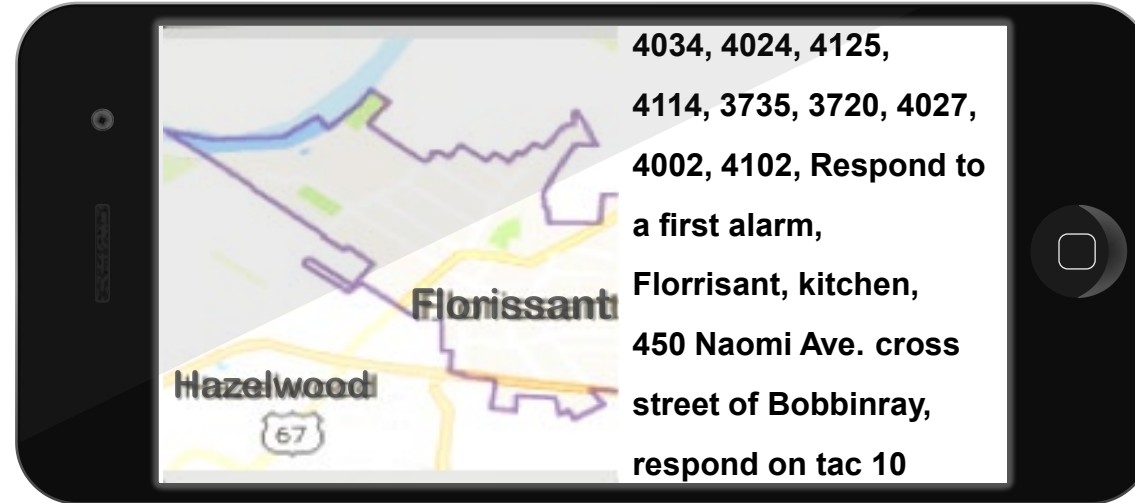- Listen to on-scene radio traffic

Kitchen Fire Dispatch: NextGenTV

Full alert ≈ 1 second

4034, 4024, 4125, 4114, 3735, 3720, 4027, 4002, 4102, Respond to a first alarm, Florrisant, kitchen, 450 Naomi Ave. cross street of Bobbinray, respond on tac 10

INTRODUCTION

Fire and EMS services across the United States still rely on paging technology to communicate emergency incident information. The infrastructure for these paging systems is typically owned, operated, and maintained by the local government or agency to ensure coverage includes as close to 100% of the jurisdiction as possible. This paper proposes the use of datacasting technology to serve the paging needs of public safety and uses North Carolina as a test case. This concept could lead to cost-sharing, greater collaboration across jurisdictions, and reduced response times for mutual aid requests. The public deserve the best possible response from the public safety sector and therefore, public safety deserves the best technology available in order to achieve their mission. Note that certain topics, such as automated voice systems, smartphone apps, alphanumeric pagers, fire station alerting, and CAD-to-CAD interfaces are not discussed here for the sake of focus and clarity.

THE STATE OF PUBLIC SAFETY PAGING

Currently, paging is still widely used in the Fire and EMS disciplines for emergency call alerting. This can be true for both volunteer and staffed/career agencies. In these instances, paging is generally only a one-way page sent from fixed infrastructure to a device worn by a member of that agency. Call alerting can occur for agency members while they are at a station, at home, or even as they go about their daily jobs. A Public Safety Answering Point (PSAP), or 911 center, send the page to a voice pager with information about the location and type of emergency. This type of pager allows the responder to hear the dispatch. These devices are also known as a Tone & Voice Pager, Fire Pager, Voice Pager, and/or by the common vendor models such as the Motorola Minitor Pager, Unication G4/G5 Voice Pager, SwissPhone Voice Pager, or Apollo Voice Pager, just to name a few.

This voice pager has a speaker listening to a specific radio channel with a 'selective' call setting that will keep the speaker silent until a trigger (such as a specific set of tones) is heard on that channel. When a trigger is heard, the pager will then alert the user, either with a special beep and/or vibration, and unmute the speaker so that the dispatcher can be heard. There are a number of manufacturers of these voice pagers, each with a number of different features such as audio recording (stored voice), a display screen, customized audio alerts, etc.

Analog Paging, Time for a Change? ATSC 3.0 as a Use Case for Public Safety Communications

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THE STATE OF PUBLIC SAFETY PAGING

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The selective call feature allows responders to be alerted only for emergency incidents or for other 911 Center information that is targeted for a specific group. The group

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News Release: DHS Awards $981K to N. Carolina Small Business for Digital Paging Technology

Release Date: August 17, 2021

FOR IMMEDIATE RELEASE
S&T Public Affairs, 202-254-2385

WASHINGTON – The Department of Homeland Security (DHS) [Small Business Innovation Research](#) (SBIR) Program recently awarded $981,657.52 to Hillsborough, North Carolina-based Device Solutions, Inc. to develop a secure, standards-based, public safety one-way digital paging system. Currently, many emergency medical services (EMS) agencies rely on analog voice pager infrastructure to communicate during emergency incidents. The new capabilities will use the Advanced Television Systems Committee 3.0 (ATSC 3.0) standard, providing responders with improved pager coverage capacity, quicker dispatching, and overall improved situational awareness.

"It is vital that we develop and implement the most advanced interoperable communications technologies so our emergency responders can to do their jobs effectively, protect the public, and remain safe themselves," said Kathryn Coulter Mitchell, DHS Senior Official Performing the Duties of the Under Secretary for Science and Technology. "We must continue to leverage technology advancements, and by using the ATSC 3.0 standard to develop a more robust digital paging system, we can address the substantial challenges of slow speed, limited coverage, and capacity found with existing analog voice paging systems."

Definitions/Acronyms

- PSAP – Public Safety Answering Point, a 911 dispatch center

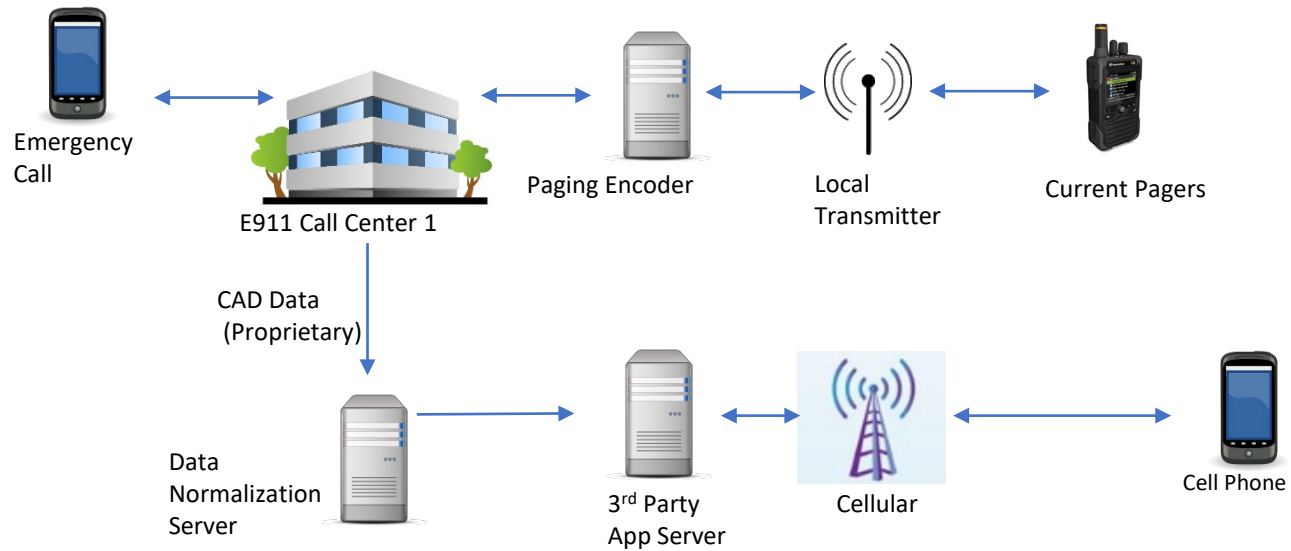- CAD – Computer Aided Dispatch software

eDPPT Phase II Project

- *DHS SBIR Phase II Contract awarded April 2021!*

- Goals:
  - Develop a prototype ATSC 3.0 paging receiver which displays / forwards the CAD information sent from the normalization server to the ATSC 3.0 transmitter
  - Optimize ATSC 3.0 delivery chain for delivery of emergency pages
  - Deliver results from performance modeling and testing of ATSC 3.0 receptibility in a controlled environment for anticipated paging receiver design (for example, body worn small device on a belt)
  - *Prototype two different paging receiver designs, one based on a stand-alone model and the other based on a smartphone integration with the ATSC 3.0 information passed along to a smartphone application*
  - Provide a practical demonstration of the capability with at least 10 receivers located with different first responder organizations from different jurisdictions within a state. The organizations should represent different types of jurisdictions from urban to rural, career to volunteer, mountainous to coastal

We are designing an affordable, long battery life, receiver reference design to improve situational awareness. By utilizing Digital TV ATSC3 technology deployed by TV broadcasters, we can help firefighters, first responders, and EMTs with increased coverage area and penetration, reduce latency, and provide a secure, reliable, means for transmitting emergency pages.

Existing Emergency Paging Eco-System

Emergency Call

E911 Call Center 1

Paging Encoder

Local Transmitter

Current Pagers

CAD Data (Proprietary)

Data Normalization Server

3rd Party App Server

Cellular

Cell Phone

End Users:
- **EMT**
- **First Responders**
- **Firefighters**

DS DeviceSolutions®
Imagination. Realized.

wireless research center

ATSC 3.0 Standalone Paging Eco-System

Emergency Call

E911 Call Center 1

Paging Encoder

Local Transmitter

Current Pagers

CAD Data (Proprietary)

Data Normalization Server

3rd Party App Server

Cellular

Cell Phone

Meta Data Builder

TV Broadcast

PBS NC
POWERED BY THE UNC SYSTEM

ATSC 3.0 Pager

DS DeviceSolutions
Imagination. Realized.

End Users:
- **EMT**
- **First Responders**
- **Firefighters**

DS DeviceSolutions®
Imagination. Realized.

wireless research center
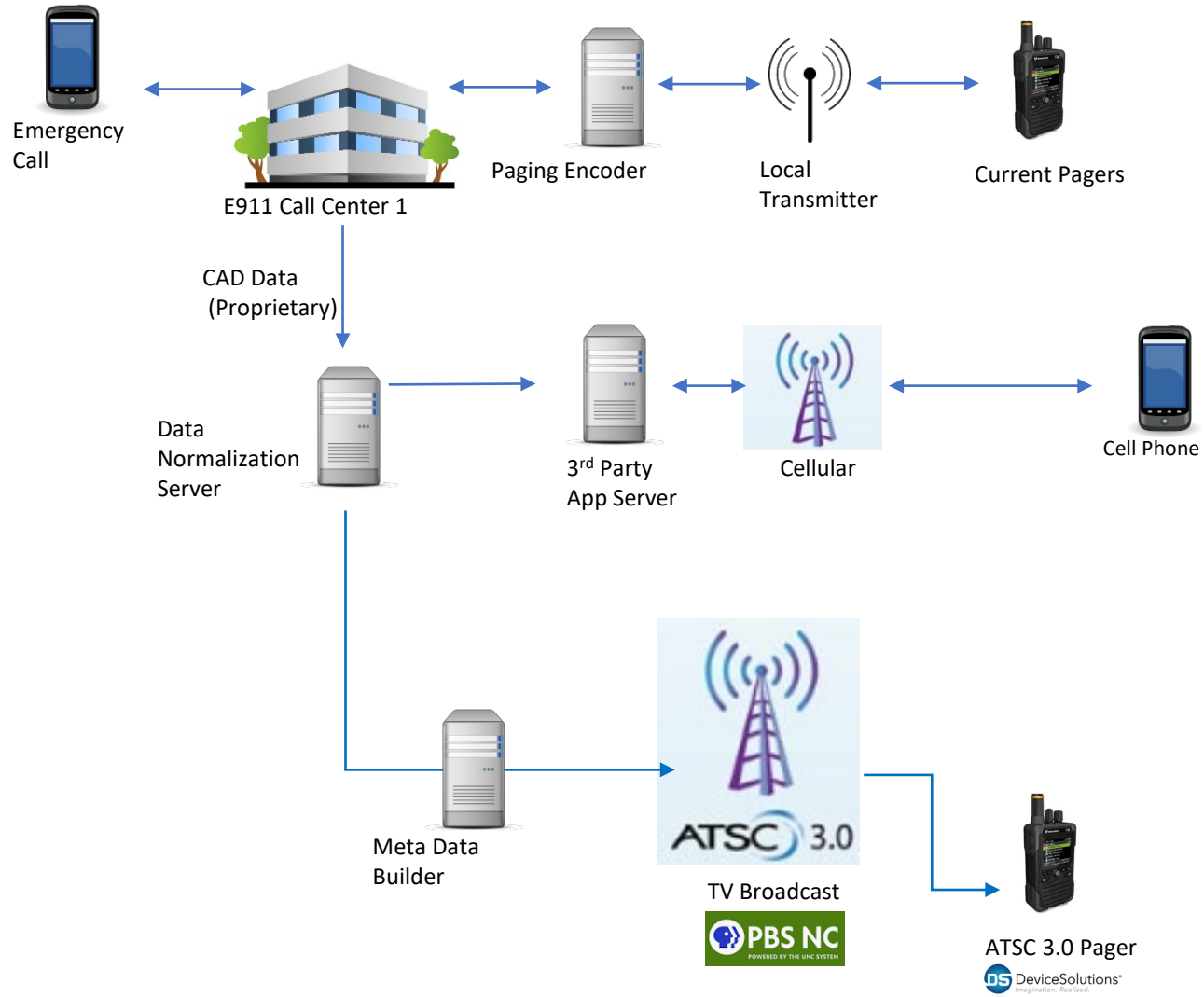
ATSC 3.0 Companion Device Paging Eco-System

Emergency Call

E911 Call Center 1

Paging Encoder

Local Transmitter

Current Pagers

CAD Data (Proprietary)

Data Normalization Server

3rd Party App Server

Cellular

Cell Phone

Local Link (Bluetooth)

Companion Paging Receiver

DeviceSolutions
Imagination. Realized.

Meta Data Builder

ATSC 3.0

TV Broadcast

PBS NC
POWERED BY THE UNC SYSTEM

ATSC 3.0 Pager

DeviceSolutions
Imagination. Realized.

End Users:
- **EMT**
- **First Responders**
- **Firefighters**

DS DeviceSolutions®
Imagination. Realized.

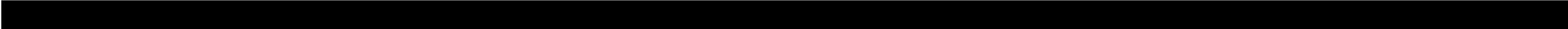wireless research center

Digital Paging over Public Television Benefits

- High Tower & High Power
- Infrastructure already exists
- Instantaneous
- Encrypted
- Scalable bandwidth
- Simultaneous dispatches
- Maps, preplans, ICS forms, audio, video

PBS NC ATSC 3.0 NextGen TV Facilities
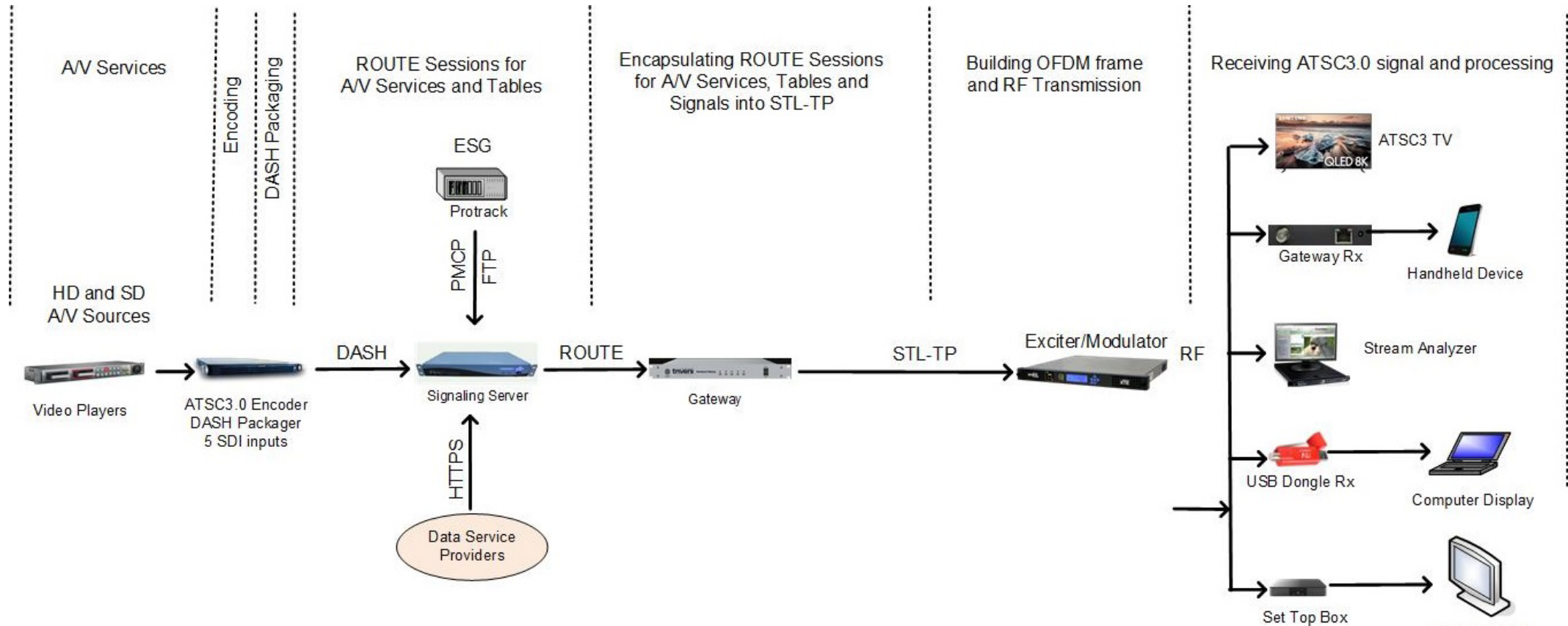

WUNC-TV Chapel Hill NC

Hosted by Capitol Broadcasting Company

NextGen TV Research Lab

WUNK-TV Greenville NC

PBS NC NextGen TV Research Lab

WUNK-TV Transmission Facility

Encoding

Encapsulating ROUTE Sessions for A/V Services, Tables and Signals into STL-TP

Transmission / RF Facility

DASDEC AEA Server

ESG
Protrack

FTP

PMCP
FTP

ATSC3.0 Encoder
DASH Packager
5 SDI inputs

Signaling Server

ROUTE

Gateway

STL-TP (IP)

STL System

Transmitter

RF

Mask Filter

Transmission Line & Antenna

Data Service Providers
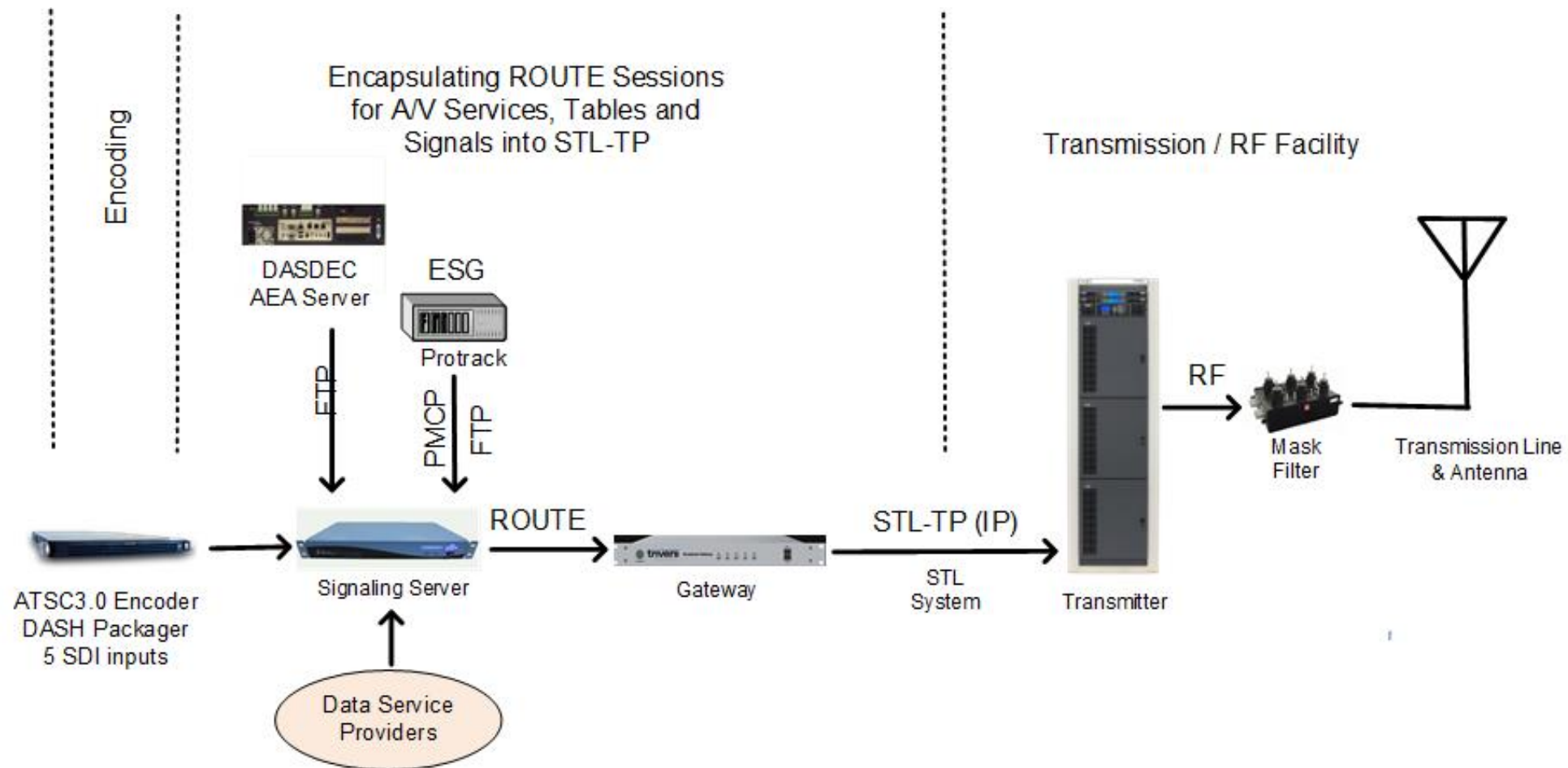
ATSC 3.0 Considerations & Challenges

- Encoding and Signaling Systems

- Studio to Transmitter Link

- Transmitter
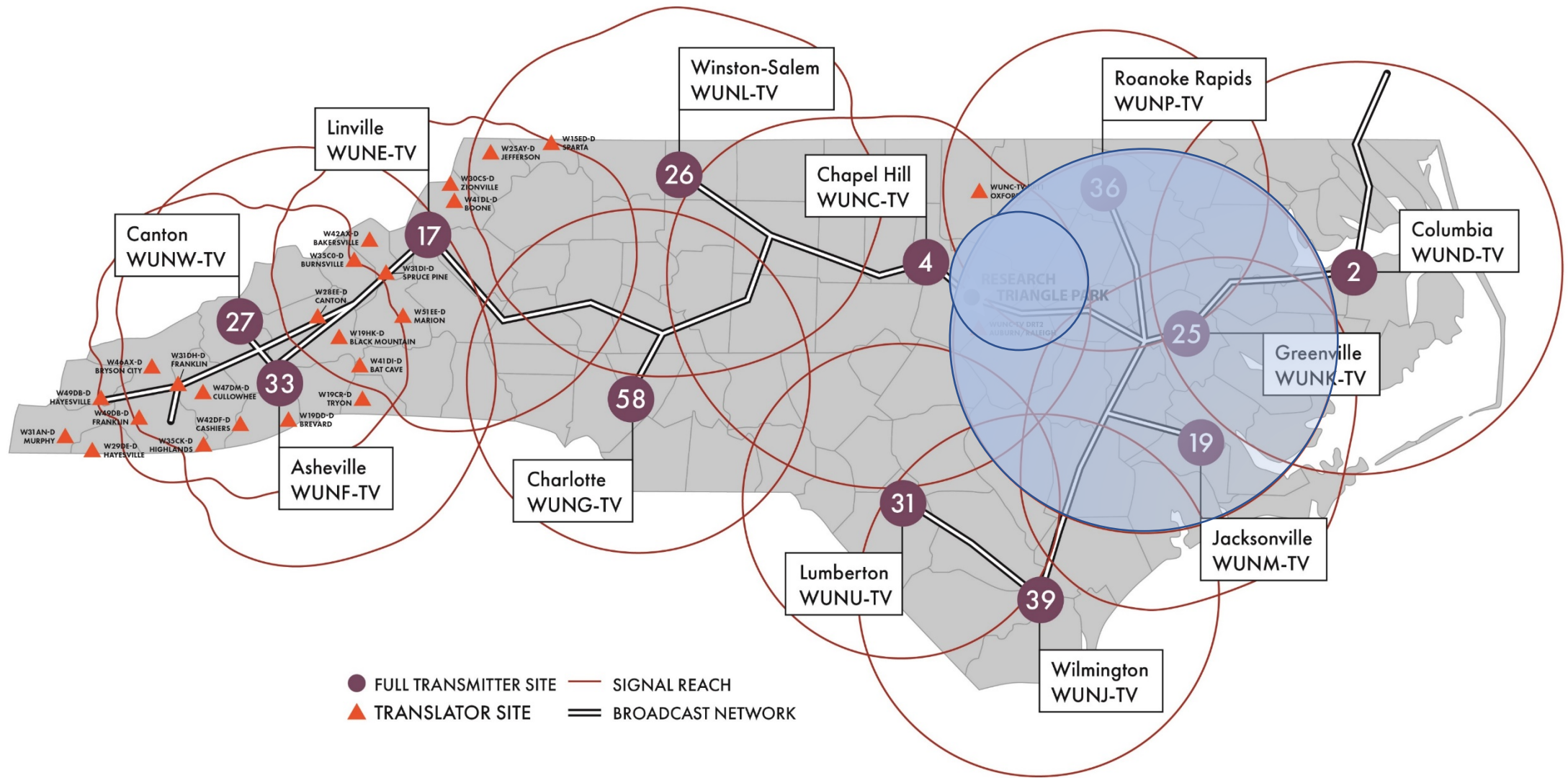 - Exciter(s)
  - Power Amplifiers
  - Mask Filter

- Antenna System
  - Power handling
  - Vertical Polarization

WUNC-TV/Chapel Hill NC

Host:
    WARZ-CD, Channel 23

Guest:
    WRAL-TV (NBC)
    WRAZ (Fox)
    WUNC-TV (PBS)

Transmit Power:
    15 KW ERP Directional

Antenna Polarization:
    Circular

Antenna Height:
    317 M (1040 ft)

WUNK-TV/Greenville NC

Figure 1
UNC-TV Composite Coverage
Post-Auction Facilities
Zoomed to WUNK-TV
With Unique Population

prepared for
University of North Carolina

January, 2020
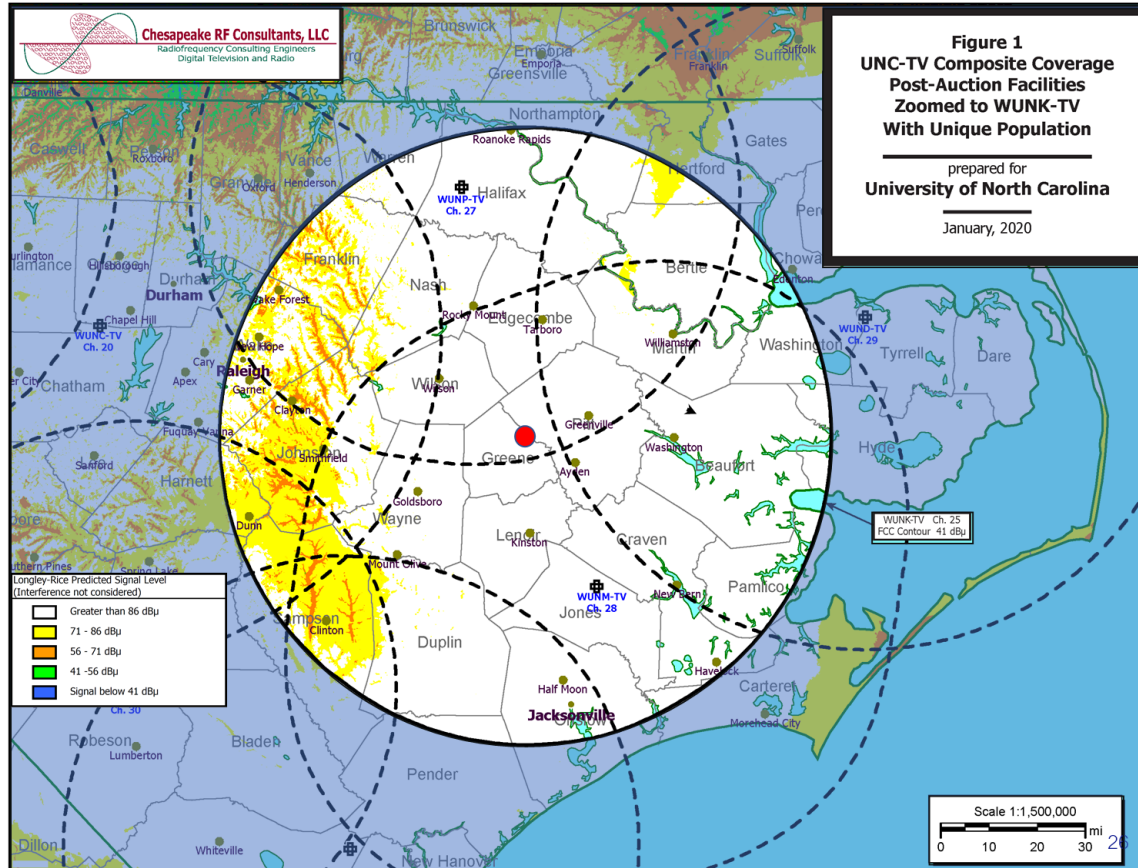
Host:
WUNK-TV, Channel 25

Guest:
none

Transmit Power:
1000 KW ERP

Antenna Polarization:
Elliptical (50%)

Antenna Height:
348 M (1142 ft)

PBS NC Development Timeline

WUNC-TV
signs on air
1955 [Jan 8]

ATSC 3.0
Concept Announced
2013

FCC Approval
of ATSC 3.0
2017 [Nov]

PBS NC's WUNC-TV
ATSC 3.0/NGTV
Transmission starts
2021 (Mar)

PBS NC's WUNK-TV
ATSC 3.0/NGTV
Transmission starts
2021 (Jun)

PBS NC Future
ATSC 3.0/NGTV
Launches
2022 and beyond

Digital TV
Transformation
2003

WRAL-TV
Experimental
3.0 Transmission
2016 (Jun)

PBS NC
Research Lab
Launch
2019 (Nov)

Emergency Services
Testing
DHS SBIR Begins
2020 (May)

Testing begins with
various ATSC 3.0
Receiver
Manufacturers
2021 (Spring)

PBS NC Mobile
Testing Lab on the
Road
2021 (Fall)

Development and
Testing various Projects
and Concepts
**2021 (Fall) and
beyond**

Projects & Concepts to Explore

- Emergency Services
- Educational Opportunities
- Broadcast Applications
  - Advanced Emergency Alerting (AEA)
  - Interactive TV
- Localized Content
- 4K / HDR

- Single Frequency Networks (SFN)
- Station Rebranding (State Nets)
- Wireless Emergency Alerts
- Receiver Testing
- Signal Measurements
- & More...

Q&A / Contact info

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