Getting Ready for the Repack –

- Antennas
- Transmission Line
- RF Systems

Re-use or Replace ?

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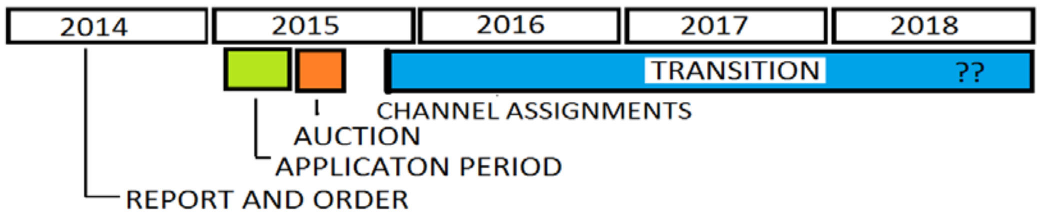
Sr. RF Engineer

Repack / Transition Timeline

Dielectric



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3	48	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	7	A	B	C	11	A	B	C					700 MHz UL
4	60	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	9	A	B	C	D	11	A	B	C	D					700 MHz UL
5	72	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	11	A	B	C	D	E	11	A	B	C	D	E					700 MHz UL
6	78	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	7	A	B	C	D	E	F	11	A	B	C	D	E	F				700 MHz UL
7	84	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	3	A	B	C	D	E	F	G	11	A	B	C	D	E	F	G			700 MHz UL
8	108	21	22	23	24	25	26	27	28	29	30	31	32	11	A	B	3	37	3	C	D	F	F	G	H	11	A	B	C	D	E	F	G	H			700 MHz UL
9	114	21	22	23	24	25	26	27	28	29	30	31	7	A	B	C	D	3	37	3	E	F	G	H	I	11	A	B	C	D	E	F	G	H	I		700 MHz UL
10	126	21	22	23	24	25	26	27	28	29	9	A	B	C	D	E	F	3	37	3	G	H	I	J	11	A	B	C	D	E	F	G	H	I	J		700 MHz UL
11	138	21	22	23	24	25	26	27	11	A	B	C	D	E	F	G	H	3	37	3	I	J	K	11	A	B	C	D	E	F	G	H	I	J	K		700 MHz UL
12	144	21	22	23	24	25	26		A	B	C	D	E	F	G	H	I	J	3	37	3	K	L	11	A	B	C	D	E	F	G	H	I	J	K	L	700 MHz UL

Figure 23. Band Plan Scenarios

Overview

- **Towers**
- **Antenna’s**
- **Transmission Line**
- **RF Systems**
- **Transition Scenario's**

Towers

- **TIA-222 Rev G**

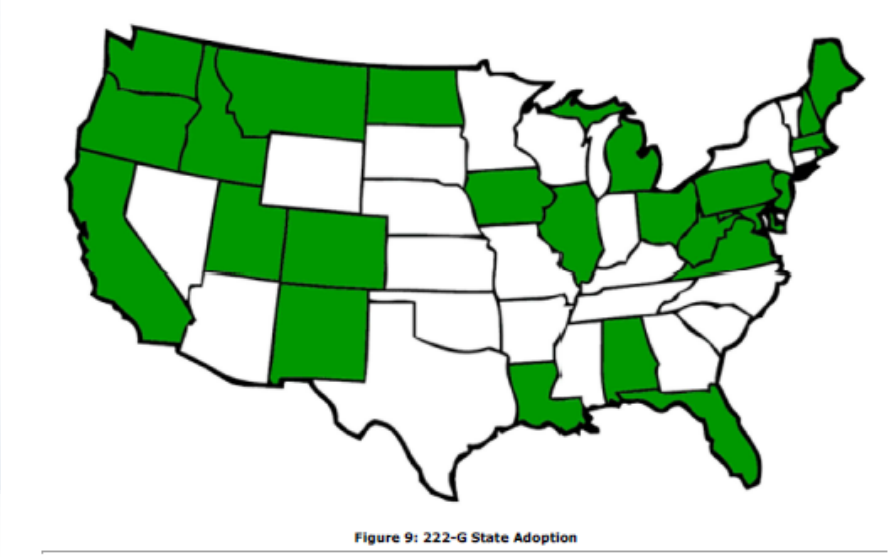


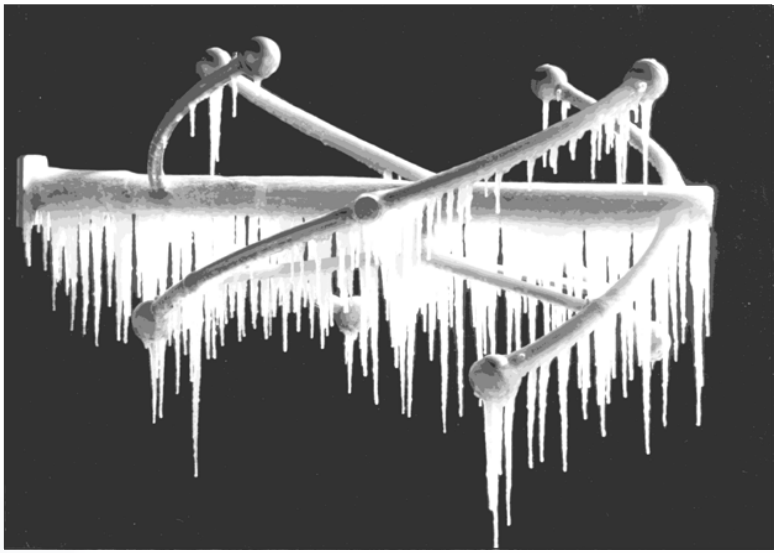
Figure 9: 222-G State Adoption

Towers

- **TIA-222 Rev G**

Ice
Antenna Areas
Wind Speed
Topography

Get structural analysis
Need detailed site information

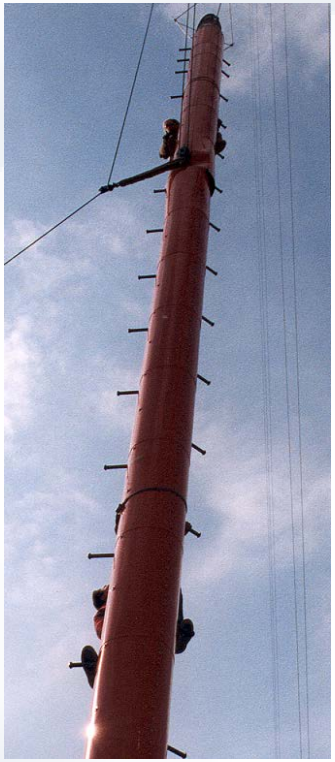


Antennas

- **Pylon**

- Narrowband
- Moving down in channel = larger antenna

- Some may allow adjacent channel operation
- Center-fed only for use on multi-channel



"dipole factor"

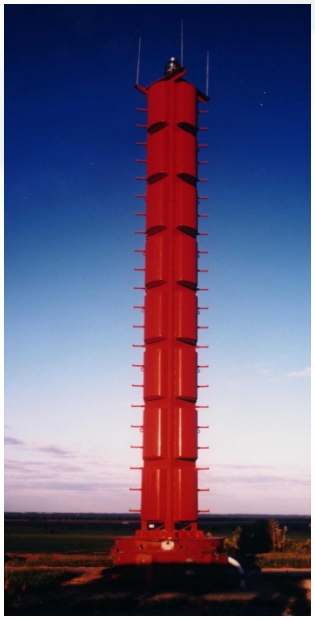
- Less ERP required at lower channels to replicate coverage
- Antenna not necessarily longer

Replace

Antennas

- **Panel**

- Broadband
- All stations have common pattern
- Number of channels can be limited by Power



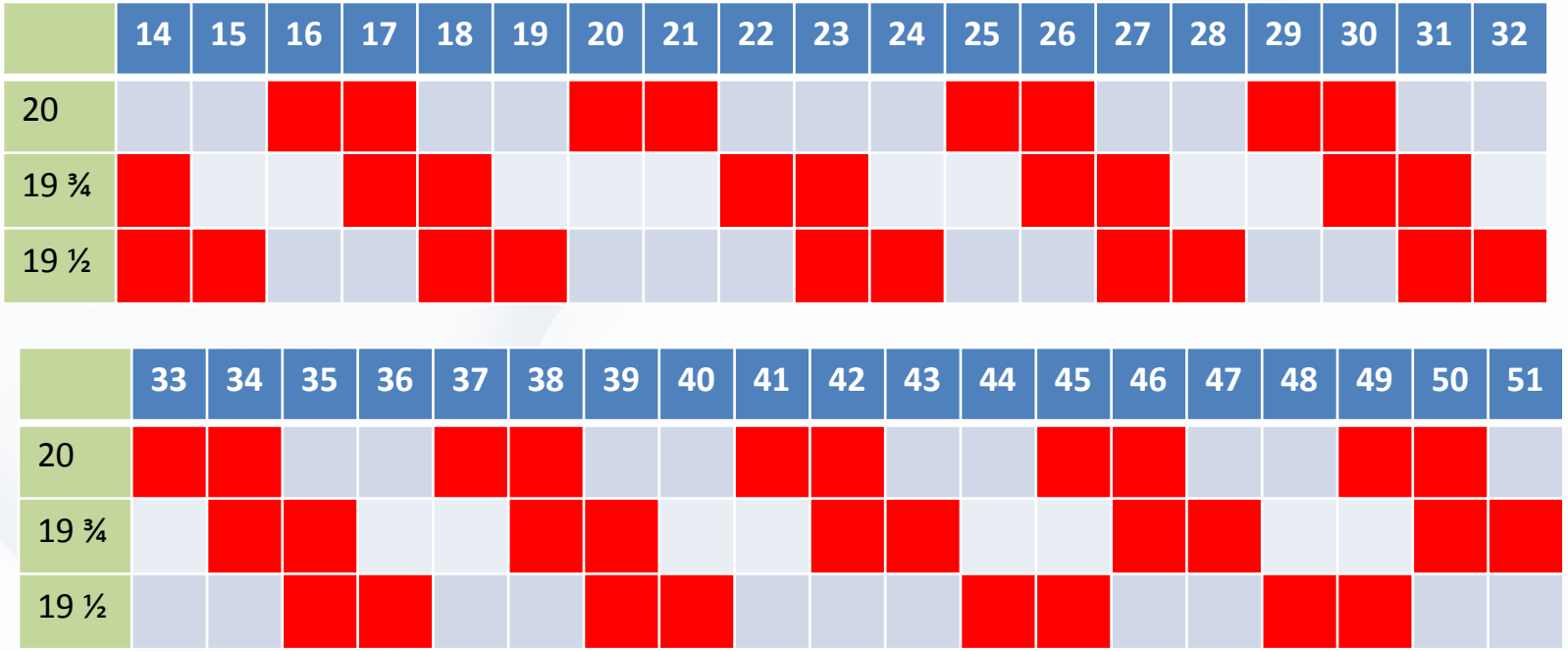
- **Joining a Panel**

- Owned by “vertical real-estate” companies
- Broadcaster going dark may open up space on panel

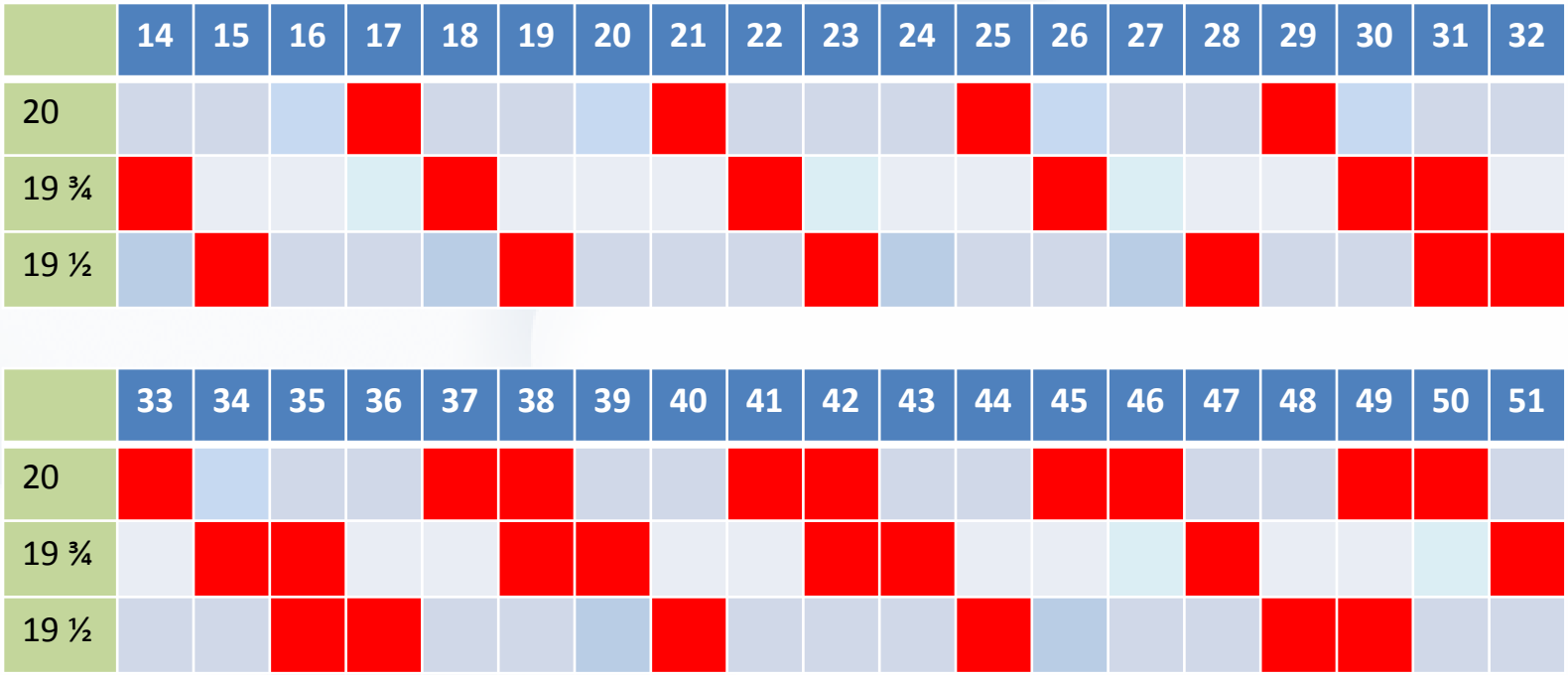
Re-use

- FCC is not considering moving Tx location during “re-pack” phase of the auction
- Application to move to a new Tx site will be done post auction

Coaxial line “stick” length, 3 MHz Guard Band



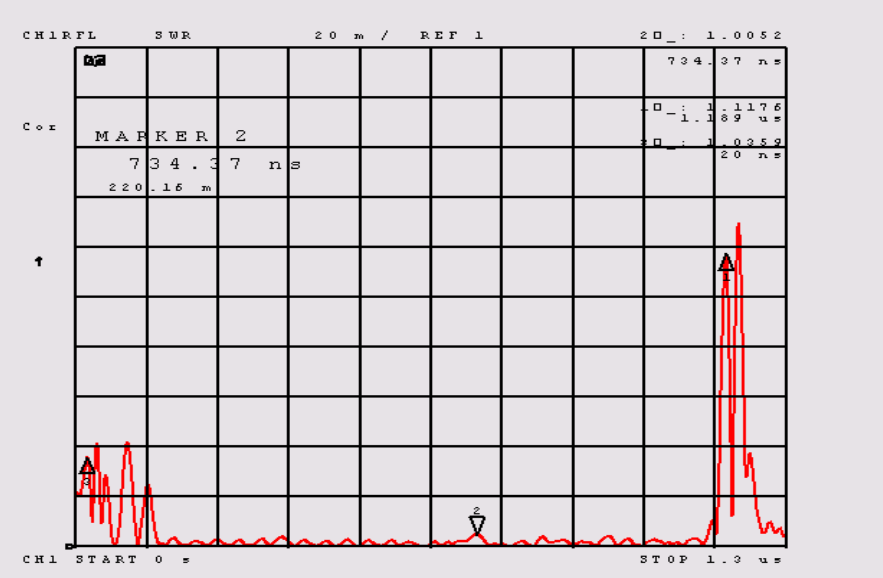
Coaxial line “stick” length, 1.5 MHz Guard Band



Transmission line

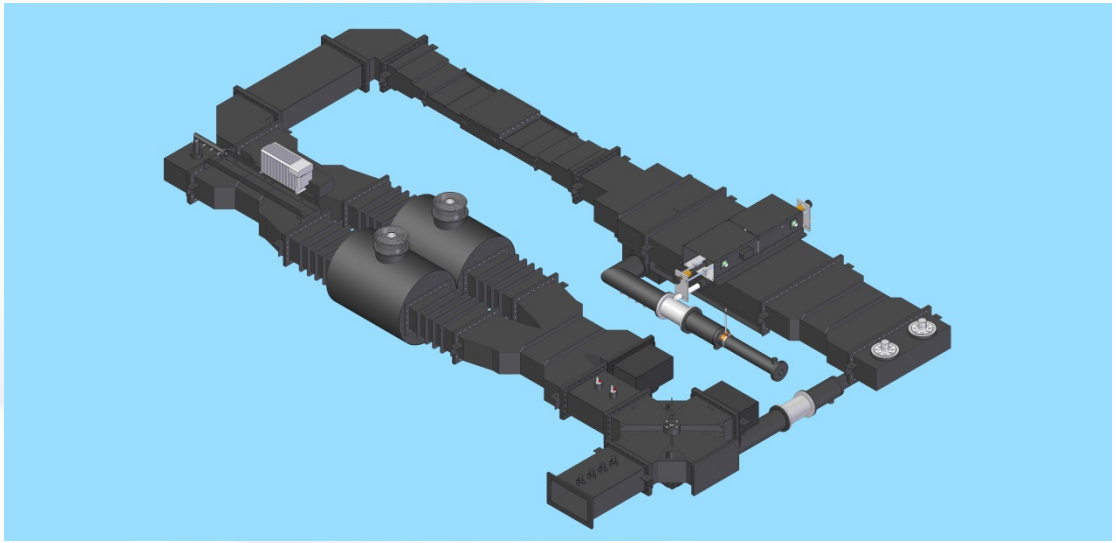
- **Get a line sweep**
- **Do it now !!**

Maybe Re-use



RF Systems

- **High Power RF System Components (25kW-80 kW)**



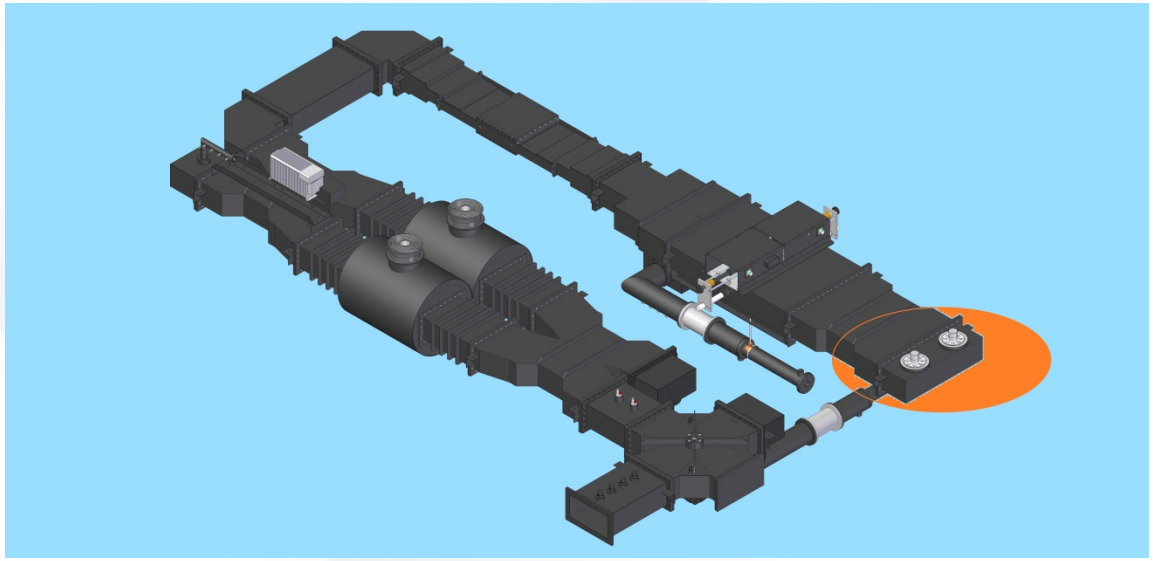
WR1150
Ch44-69

WR1500
Ch18-48

WR1800
Ch14-17

RF Systems

- **High Power RF System Components**



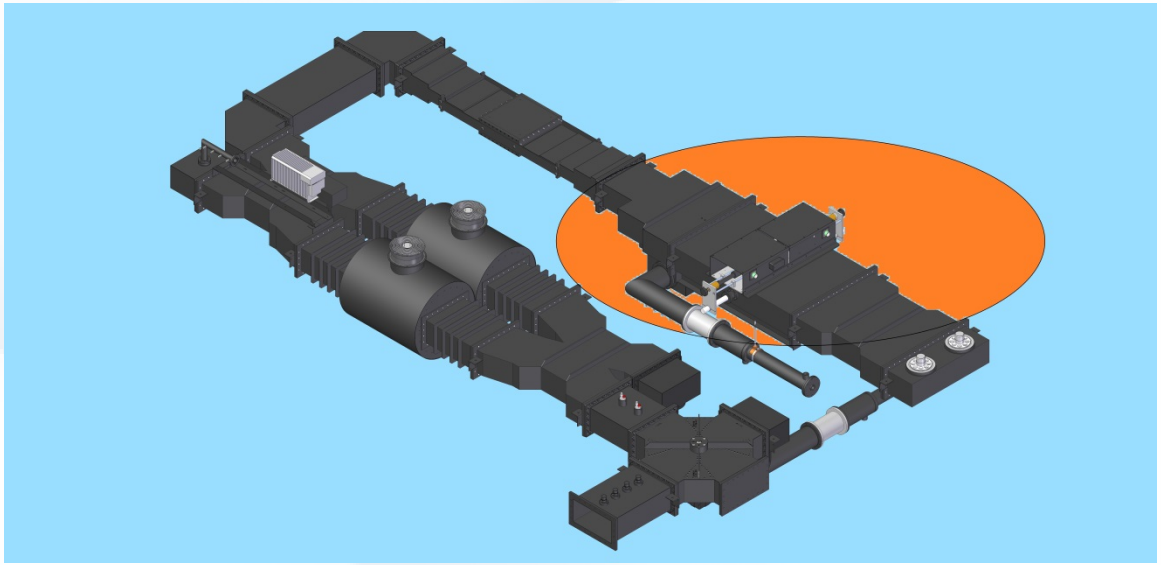
Coax to Waveguide Transitions

Narrowband

Replace

RF Systems

- **High Power RF System Components**



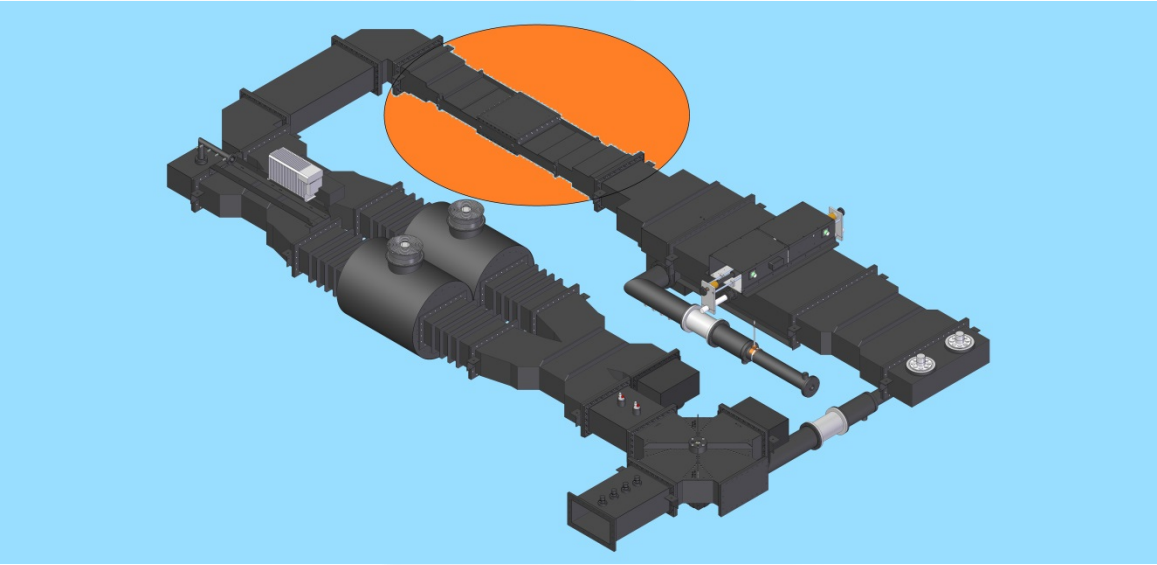
Waveguide
Magic Tee
Combiner

New Slabs
Required

Re-tune

RF Systems

- **High Power RF System Components**

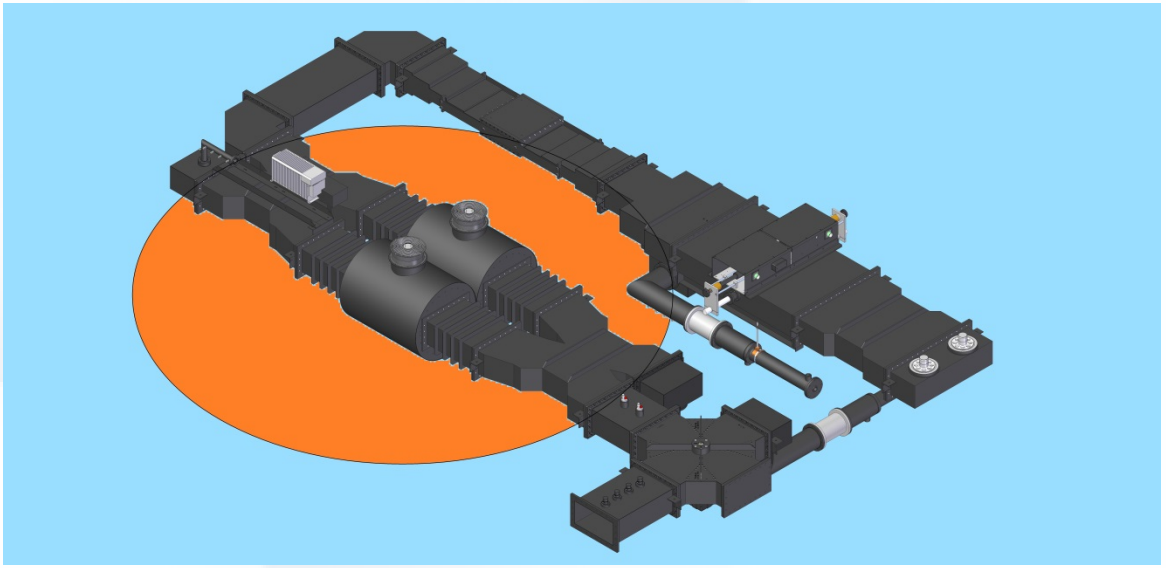


Waffle Iron
Low Pass
Filter

Re-tune

RF Systems

- **High Power RF System Components**

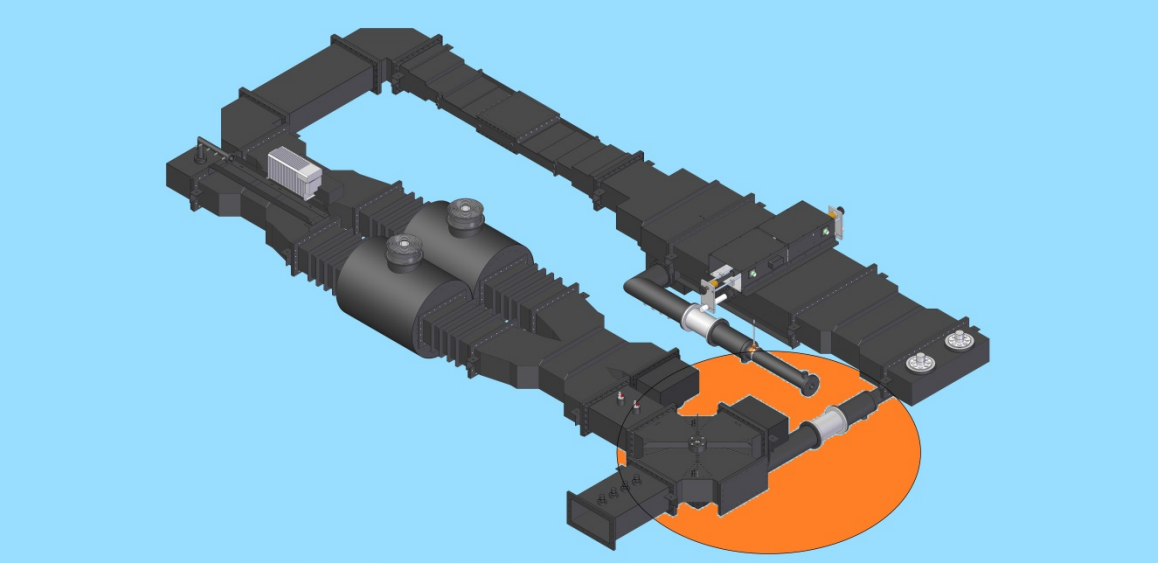


Constant
Impedance
Band-pass
Filter

Replace

RF Systems

- **High Power RF System Components**



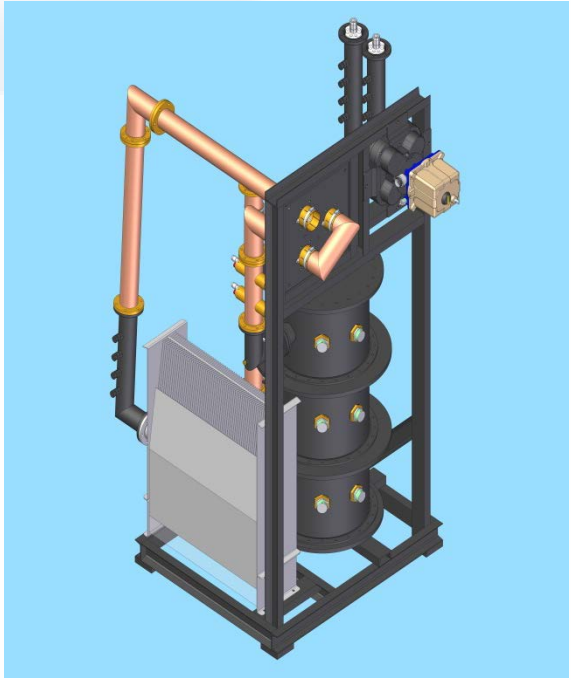
Waveguide
Switch
and Coaxial
Water-load

Re-tune

RF Systems

- **Medium Power RF System Components (10kW-25 kW)**

All components are broadband except waveguide filter



Replace filter

Re-use all else

RF Systems – Practical Considerations

- **Field re-tuning not practical**
  - **Limited qualified talent**
  - **Some parts may need to be replace**
- **If have two tube system**
  - **Re-tune one tube and operate into new CIF**
  - **Send all other system parts for refurbishment**

Transition Scenario's

Dielectric

FLASH CUT

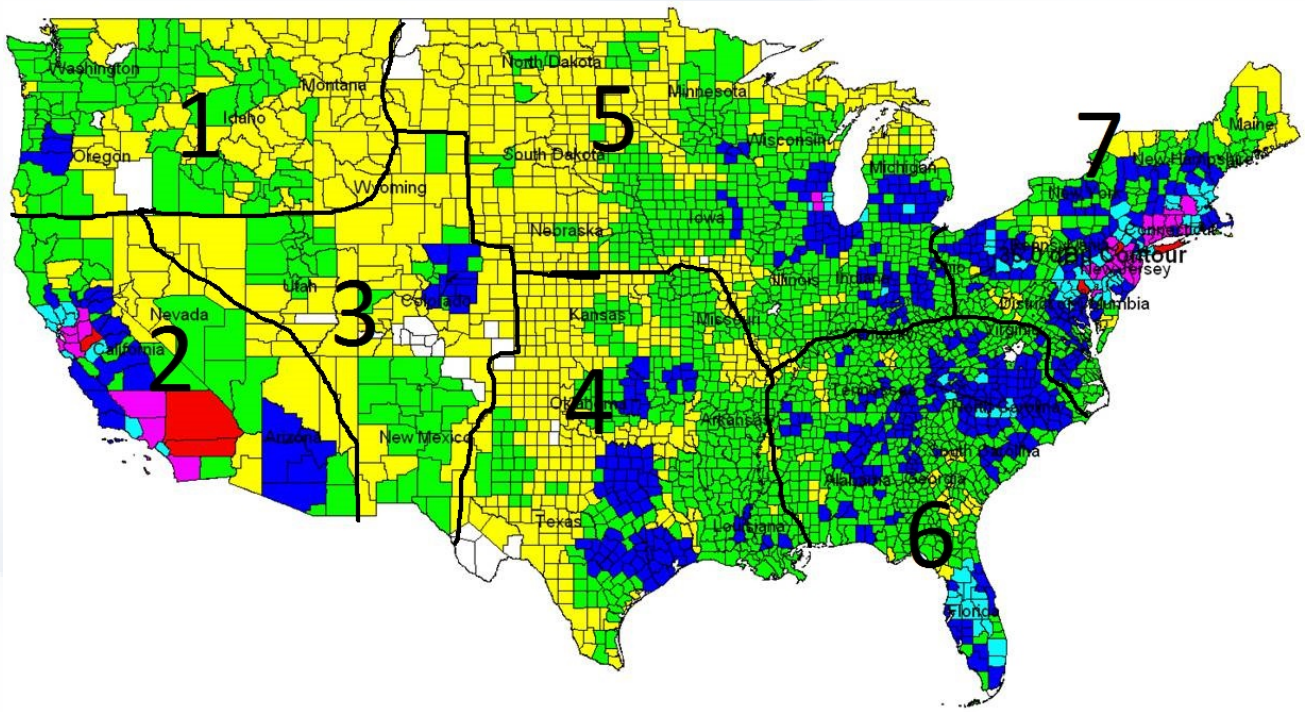
- On air with original channel today
- On air with new channel tomorrow

GOT BACKUP?

STAGED

NEED TEMPORARY TRASMISSION FACILITY

Transition Scenario's - Staged



If you have backup

- Operate off backup site while work is done at main site to get ready for new channel
  - Expect several months of back-up operation
  - Reliable back-up is important

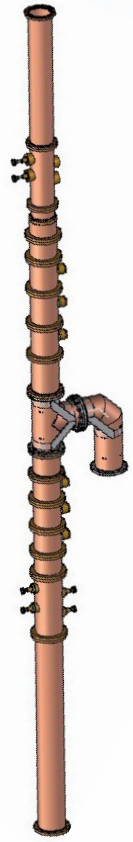
Analog antenna still up?

- Operate off current digital channel
- Replace analog antenna (top mount)

Currently no Aux Antenna ?

- New side mount on new channel
  - Replace top mount post cut over
  - Side mount becomes backup
- If re-using Tx line tower a top channel splitter can be used to feed side mount
- Side mount can go at separate site and be used as part of SFN or as backup post transition

- Put up side mount on current channel
  - Can do now!!

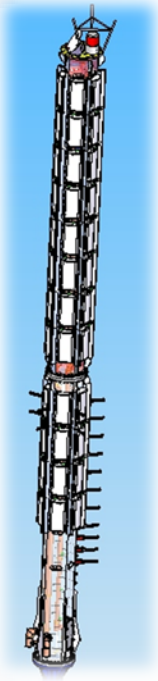


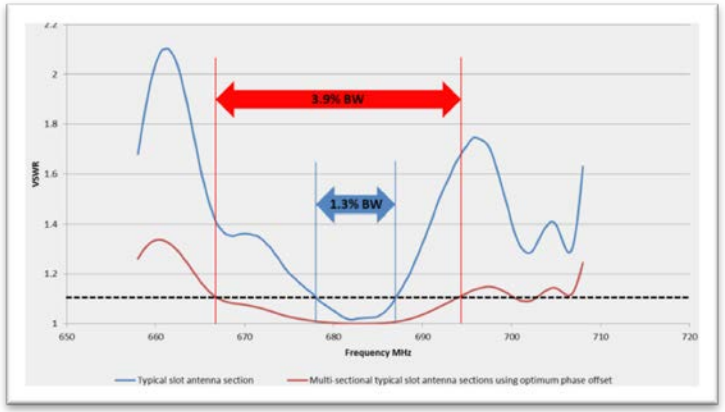
Candelabra ?

- Candelabra – New full power antenna
- New Stacked antenna with another broadcaster
- Space made available by broadcaster going off air ?

Panel or dual channel slot ?

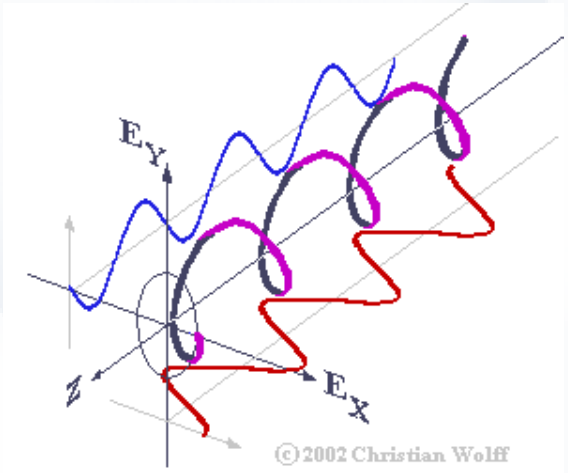
- Join existing or new panel as tenant
- Join existing dual channel pylon as tenant
- Space made available by broadcaster going off air ?

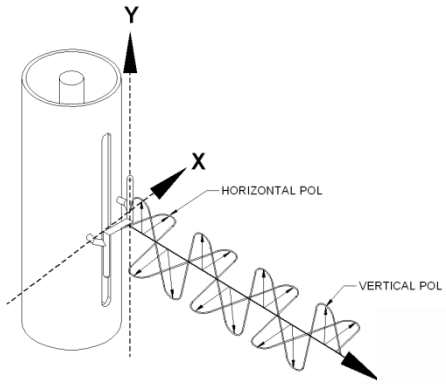




Transition Scenario's

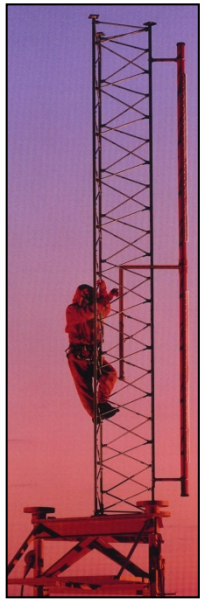
- Add V-Pol to help mobile reception





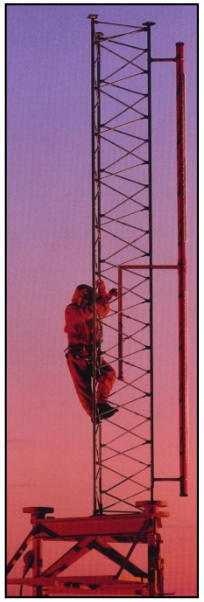
Conclusions

- Tower Crews
  - Work to comply with TIA-222 Rev G
  - Antenna and transmission line replacement
- Capacity in Broadcast Transmission Supply Chain
- Some transmission chain components can be re-used
- Don’t plan on field re-tuning
- Duration of repack TBD years
  - Move to VHF within 18 months
  - Re-imbursement within 3 years
  - Re-imbursement allowed with estimate of construction costs



To Do Now

- FCC – LEARN
  - Participate in comment process
- Transmission line sweep
- Engage structural engineers – collect relevant tower info
- Start Tower work
- Put Aux antenna on existing channel



Questions