

RF System

Antenna, Line & Tower

Exciter Technology

Repack - Key Transmitter Plant Considerations

Repack & ATSC 3.0 - Key RF System Considerations

Determine if You are Changing Frequency Bands from UHF to VHF

- If Yes → Entire RF system replacement required.
- If No → Still likely that a replacement system is needed.
- In either case- check with manufacturer, some components may be re-used, or re-tuned on a new channel depending on extent of frequency shift.

Mask Filter (in same band)

- ✓ Check if your mask filter is re-tunable (most are not).
- ✓ Compare cost to replace versus re-tune filter on site.
- ✓ Physical size and installation considerations.
- ✓ Availability and lead time-potential implementation issue.

Magic Tee RF Combining Systems

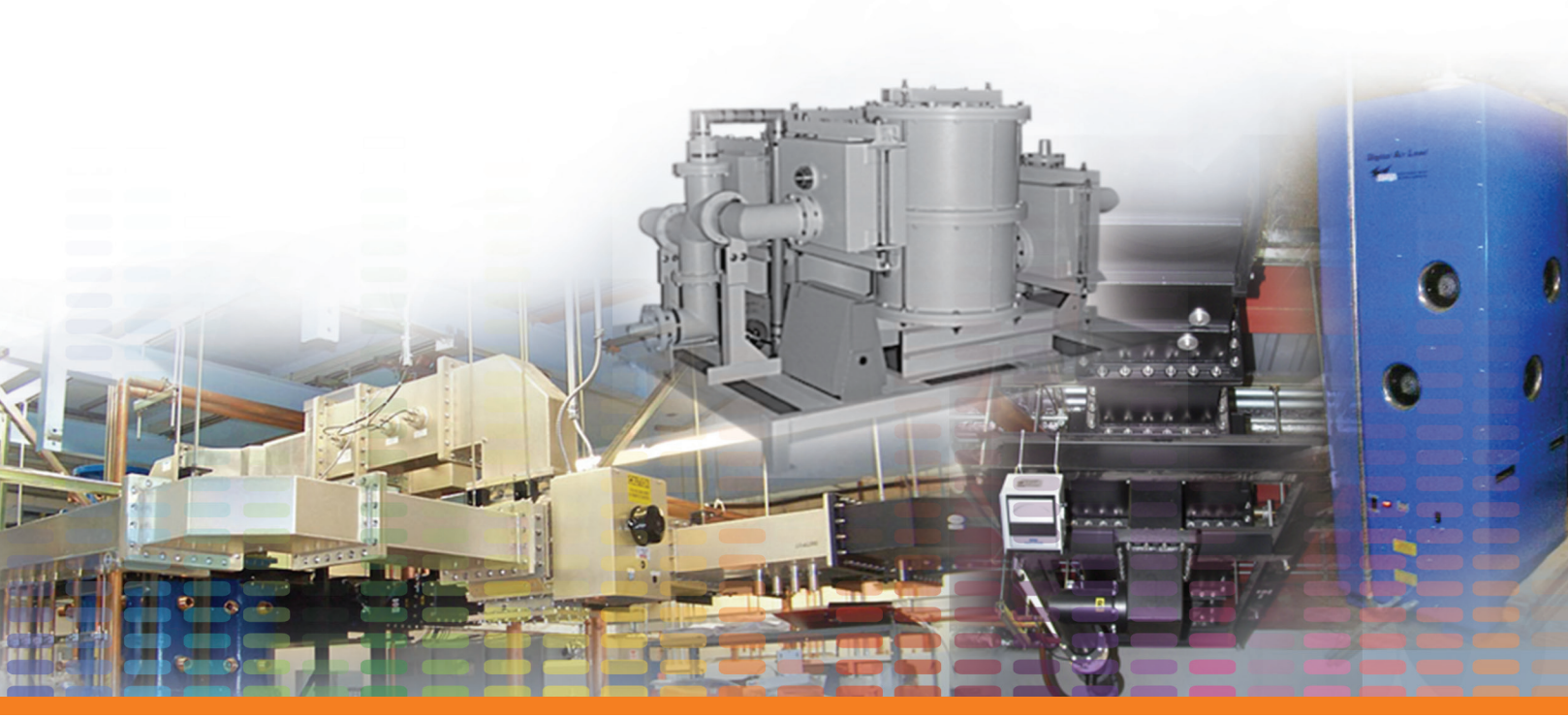
- ✓ Magic Tee will not be tunable to a new channel.
- Question: Do I still need a Magic Tee combiner?
 - A new solid state transmitter with multi-power blocks will have excellent redundancy.
 - Replacement Magic Tee RF system can cost well over \$100k.

System Power Limits

- ✓ Is a power level increase required?
 - Check ratings of low pass filters, dummy loads, line sizes, test loads, etc.

System Efficiency

- ✓ Recent changes in filter design may offer lower insertion loss which will improve system efficiency and lower operating costs.



Repack & ATSC 3.0 - Key RF System Considerations

Determine if You are Changing Frequency Bands from UHF to VHF

- If Yes → Antenna replacement required depending on frequency shift.
- If No → Check antenna (broadband vs. single channel) order new if needed.

System Power Limits

- ✓ Am I increasing RF power?
 - Consult line manufacturer
- ✓ If Broadband antenna- check antenna power rating

Transmission Line/Waveguide

- ✓ Check if existing line will work on new channel
- ✓ Evaluate bandwidth and VSWR performance prior to antenna change
- ✓ If line replacement is needed, establish budget early
- ✓ Availability of skilled riggers/tower crews
- ✓ Timing and unforeseen weather delays

If Needing a New Antenna

- ✓ Cost and delivery
- ✓ Installation and logistics
- ✓ Consider incorporating Vpol to help in 3.0 mobile reception

Tower Structure

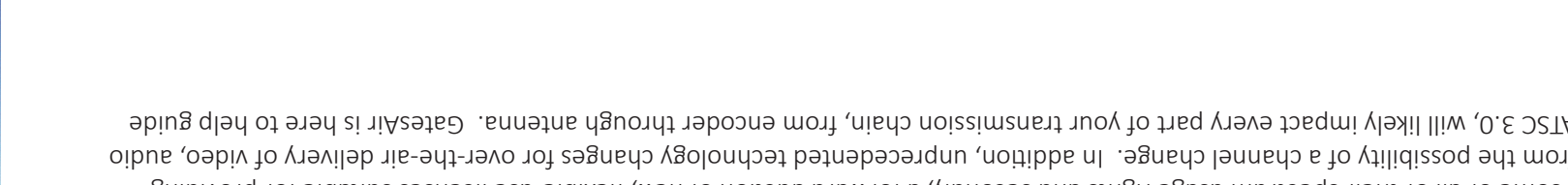
- ✓ Tower analysis – does it meet TIA-222 Rev G specifications (Standard for antenna supporting structures and antennas)?
- ✓ Will it support weight and wind load of new antenna?
- ✓ Availability of qualified tower crews
- ✓ Auxiliary antenna or back up site while main work is being done



ATSC 3.0 - Key Transmitter Plant Considerations

- **Exciter Technology**
 - ✓ Can my exciter be upgraded for ATSC 3.0 when it becomes available?
 - ✓ GatesAir can provide a new exciter, specifically designed to maximize ATSC 3.0 capabilities and features
 - ✓ Can the exciter in my existing transmitter be replaced with an ATSC 3.0 capable unit?
 - Contact GatesAir for details
- **Transmitter – A few things to consider**
 - ✓ ATSC 3.0 and ATSC 1.0 have different Peak-to-average Power Ratios (PAR)
 - ✓ ATSC 1.0 is 6dB (measured, not exceeded 99.9% of the time)
 - ✓ ATSC 3.0 is 8dB (to be verified)
 - ✓ This represents a power ratio of 2dB or 1.585
 - ✓ All transmitters are peak power limited
 - ✓ Therefore an ATSC 1.0 transmitter rated for 10kW average power will run at 10/1.585 = 6.3kW with ATSC 3.0
 - ✓ Do I need a larger transmitter in order to maximize (with peak power remaining the same)
- **Total Cost of Ownership (TCO) Analysis**
 - ✓ Can I upgrade my transmitter for higher power operation?
 - ✓ EFP & coverage?
 - ✓ Are all parts readily available and for how long?
 - ✓ Availability of knowledgeable maintenance staff
 - ✓ Frequency of site visits for repair versus reliable new equipment
- **Service & Support**
 - ✓ Is your transmitter manufacturer still in business?
 - ✓ Is the transmitter a current model and if so, when will it be discontinued?
 - ✓ Availability of RF devices used in the transmitter
 - ✓ Are all parts readily available and for how long?
- **Obsolescence**
 - ✓ Unknown tube availability in the near future
 - ✓ Tube versus solid-state considerations (safety-high voltage)
- **Frequency agility**
 - ✓ Is your transmitter fully broadband?
 - ✓ If not broadband, can it be re-channelled cost effectively?
 - ✓ What would be the cost and how long will it take to re-channel the transmitter?
 - ✓ How energy efficient is your transmitter system?
 - ✓ Can you save money by replacing the transmitter?
 - ✓ Is your transmitter manufacturer still in business?
 - ✓ Is the transmitter a current model and if so, when will it be discontinued?

Peak-to-Average Comparison



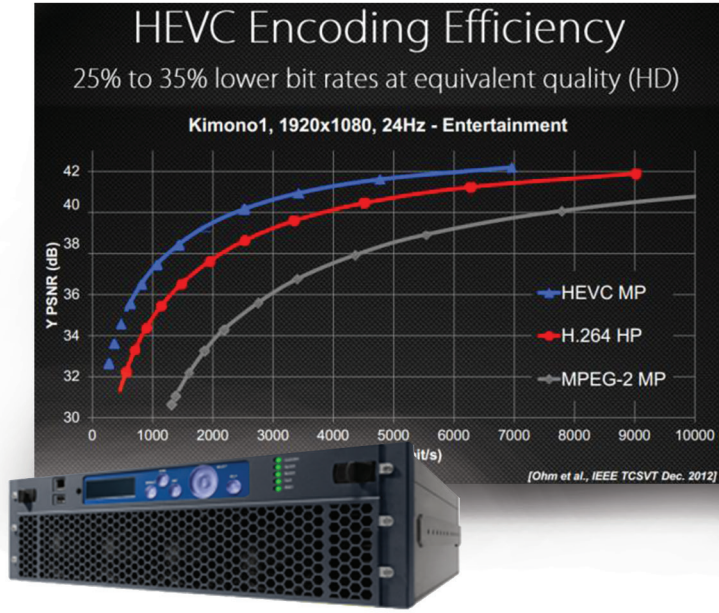
To help fulfill the increasing demand for wireless broadband access, the FCC plans to reallocate a portion of broadcast spectrum used by television stations and make it available for use by wireless carriers. To facilitate this process, an incentive auction is being planned. There are two parts to this – First, a reverse auction in which broadcasters will offer to voluntarily relinquish some or all of their spectrum usage rights and secondly, a forward auction of new, flexible-use licenses suitable for providing mobile broadband services. Regardless of the current RF channel, power level and geographic location, no station is exempt from the possibility of a channel change. In addition, unprecedented technology changes for over-the-air delivery of video, audio and many other services are being planned for the near future. The implementation of an advanced transmission standard, ATSC 3.0, will likely impact every part of your transmission chain, from encoder through antenna. GatesAir is here to help guide you through this challenging period.

Are You Ready for Spectrum Repack and ATSC 3.0?

Encoding & Headend

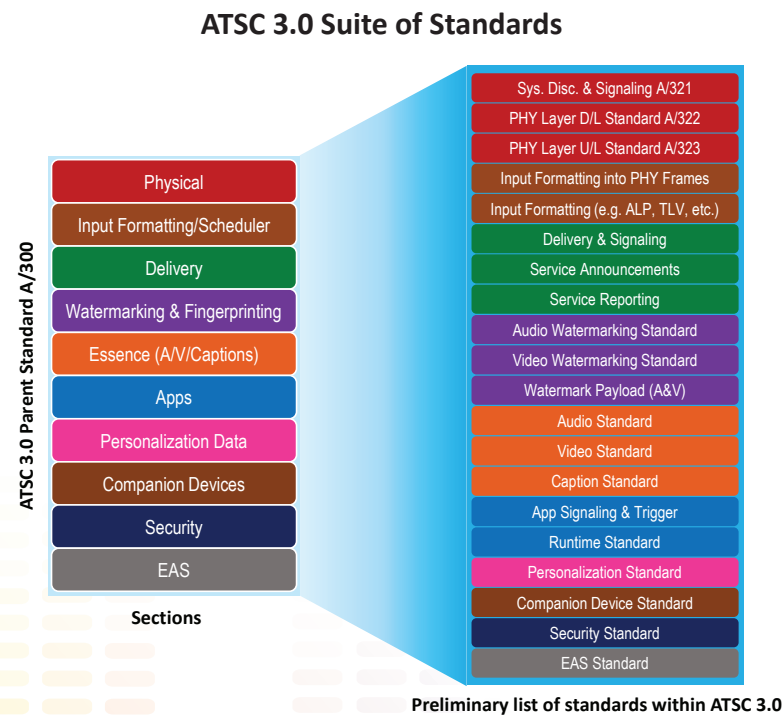
Repack & ATSC 3.0 - Key Considerations

- Potential updates if channel sharing after Repack
 - ✓ Advances in MPEG-2 coding efficiency and next generation statistical multiplexing enables up to 2 1080i HD and four 480i SD streams on air in a single 6 MHz DTV channel
- For ATSC 3.0- new equipment will be required:
 - ✓ New HEVC Compression, Encoders, Mux
 - High Efficiency Video Coding allows Ultra HD (4k) and exceptions in mobile HD capability at efficient data rates
 - ✓ IP Transport versus ASI or SMPTE-310
 - ✓ Multiple Encoders, as required for multiple services
 - ✓ Multiplexing and encoding separate and new equivalent to DVB-T2 Gateway. Provisionally named the "ATSC 3.0 Scheduler/Framer"
 - ✓ New PSIP requirements, and advanced EAS support
- **GatesAir will introduce an ATSC 3.0 Scheduler/Framer product in the near future – stayed tuned for details!**
- IP Transport allows use of cutting edge error mitigation and redundancy techniques, while lowering transport costs.



What is ATSC 3.0?

- ATSC 3.0 is a next-generation transmission platform in development, using new technologies and advanced error correction for the physical layer featuring OFDM modulation to create a wireless data agnostic IP delivery system.
- It accommodates and extends the existing high-power/tall-tower broadcast infrastructure, while supporting delivery of robust mobile and pedestrian mobile television and other data services to portable devices.
- It is not backwards compatible with ATSC 1.0 receiving devices (new receivers or STB's needed).
- ATSC 3.0 is a "scalable," "interoperable" and "adaptable" platform.
- It provides enhanced viewing and listening experiences:
 - Ultra HD video up to 3,840 x 2,160 (8.2 Megapixels) at 60 fps.
 - Delivers a unique immersive audio experience.
- Uses IP Transport Stream versus ASI or SMPTE-310.
- Higher data rates and capability for multiple programs, each optimized for different reception criteria (e.g. combinations of UHD indoor/HD tablet/SD mobile). Max data rate up to \approx 60 Mb/s, however 32 to 36dB C/N required.
- Allows broadcasters to extend coverage using a Single Frequency Network (SFN).
- An addressable feature of the transmission coding will allow "zoning" of programming, advertising and data services – supporting expansion of broadcasters services such as geo-localation targeted content and advertising.
- Includes a new Advanced Warning and Response Network (AWARN). Designed to leverage the higher data throughput, more robust transmission and improved indoor reception.



GatesAir – Your Partner for Spectrum Repack and Future ATSC 3.0 Solutions and Services

With nearly 100 years of experience in broadcast equipment manufacturing, servicing and support, GatesAir stands ready to provide guidance to assist you in these times of change. With the imminent prospect of a USA TV spectrum repack, many broadcasters may face unforeseen and complex challenges, including:

- Transmitter channel changes, and/or new equipment requirements
- RF plant upgrades
- Antenna/line and tower implications
- Planning a cost-effective and seamless transition to a new channel
- Factoring ATSC 3.0 into long-term planning & transmission strategies

GatesAir is ready to help you. With a strong leadership position in TV broadcast equipment manufacturing, our portfolio includes the most comprehensive array of products, services and support available. Our dedicated and experienced staff will apply their knowledge to help you understand the best strategy for your station or network. Our new broadband high-efficiency transmitter solutions represent the most cost-effective and well engineered products available, along with several innovative features that ensure the utmost in efficiency, bandwidth and reliability.

To learn more about how we can help you with your needs for spectrum repack or ATSC 3.0, contact our Sales team at +1 513 459 3400, or email us at Americas@gatesair.com.



GatesAir Service & Support

- As you plan out your stations strategy for Spectrum Repack, and later transitioning to ATSC 3.0, you can be assured that GatesAir will be there to help.
- Our dedicated and knowledgeable TV Service group will provide expert support along the way. We can provide training, installation services, on-site commissioning, program management, planning and all other aspects of your transition.
- Transitioning to a new channel while remaining on the air is often the biggest challenge. We can provide guidance and on-site support to avoid costly off-air time during this period.
- Ongoing service plans available features planned maintenance visits, remote monitoring and expert repairs.

AMERICAS
 Americas Support
 Europe, Middle East
 Asia and Africa

+1 513 459 3400
 Americas@gatesair.com
 +1 217 222 8200

+33 1 47 92 44 20
 EMEA-APAC@gatesair.com

For more information, please visit gatesair.com

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STL & Transport

Repack & ATSC 3.0 - Key Considerations

- Exiting microwave system may be viable for Spectrum Repack, unless additional capacity is required due to channel sharing.
- Systems designed initially for ATSC 1.0 and a constant data rate of 19.39Mb/s and with a SMPTE-310M, or ASI Transport Stream.
 - For ATSC 3.0, higher data rates up to \approx 60 Mb/s may mean that the original STL may not be suitable.
- ATSC 3.0 uses IP Transport Streams versus ASI or SMPTE-310.
- IP transport opens the door to alternative STL methods including IP microwave, fiber, IP via private network and satellite. Early evaluation of access options at the transmitter site provides for flexibility.
- New IP transport methods provide the means to add significantly improved error mitigation and redundancy.



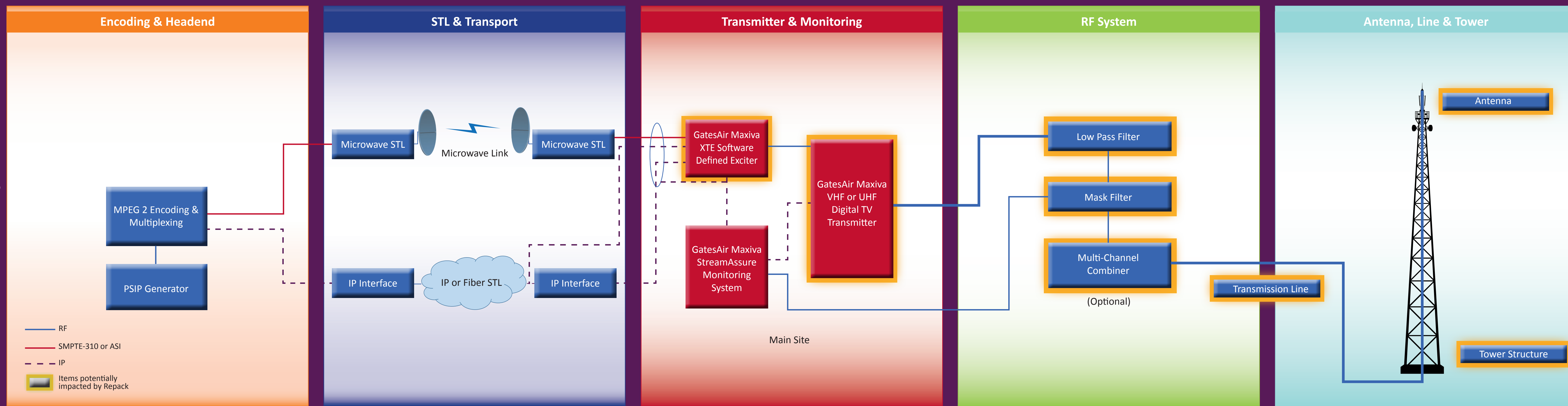
GATESAIR

The Future of Television
is About to Unfold...

CONNECTING WHAT'S NEXT
 5300 Kings Island Drive, Suite 101
 Mason, OH USA 45040
 Tel: +1 513 459 3400
 GatesAir.com

Spectrum Repack and ATSC 3.0 Roadmap - Let GATESAIR Show You The Way

ATSC Repack



ATSC 3.0

