Kintronic Labs:
POSSIBLE APPLICATIONS FOR USE OF AM BROADCAST TOWER SPACE

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General Considerations for Co-locating Other Services on AM Base Insulated Towers

- Proposed techniques are applicable to NDA and DA towers
- The peak AM voltage across the base insulator is a critical design parameter in defining the isolation solution
- To minimize the impact of any isolation solution across a tower base insulator, the associated parallel impedance should be a minimum of 10x the magnitude of the tower drive impedance
- When multiple isolation solutions are possible cost will be the deciding factor
- By virtue of the fact that the isolation solution is installed directly across the base insulator, lightning tolerance must enter into the design
GENERAL AM ISOLATION REQUIREMENT

\[ |Z_{IC}| > 10 |Z_D| \]

\[ |Z_D| \parallel |Z_{IC}| = |Z_D| \]
ISOLATION SOLUTION OPTIONS

• RF chokes
• Isolation inductor
• Slotted isolation inductor
• Isocoupler
• Hybrid cable insolation inductor
• Cat 6 cable isolation inductor
BUSINESS MOTIVATIONS

- Telecoms upgrades and next generation buildout
  - Long-Term Evolution (LTE), 4G and 5G
- 5G will require more cell sites
  - Sites closer together
  - Higher data capacity
  - Tower mounted amplifiers fed by fiber optic cable & power cable that requires isolation across the base insulator
- Know what’s available in your local area
  - Do you have a unique site?
  - Zoning restrictions or other land use issues?
  - Ask other landlords – FOIA public agencies
ECONOMIC CONSIDERATIONS

- Will your AM transmitter site offer an economic advantage for the wireless provider?
  - You already have existing land use permits
  - Your site is geographically situated to serve as a gap-filler in existing telecom service
  - Adequate AC power would already be available at the tower site
- Leasing your tower space provides additional monthly revenue streams
  - Share cost of facility upgrade
  - Boost your bottom line
- Maintenance relief for broadcaster
  - Require site maintenance assistance from the service provider
- Opportunity to upgrade facilities in exchange for rent credit
- Use monthly income for facilities maintenance
BENEFITS TO WIRELESS PROVIDERS

• Thousands of available sites, some in desired coverage areas
• Existing towers resulting in minimal community resistance
• Appropriate Zoning/permitting already in place
• Less site work than a newly built site
• Faster time to market for new wireless facilities
CHALLENGES TO WIRELESS PROVIDERS

• Lack of understanding of AM broadcast towers
• Towers and radio stations sometimes under separate ownership
• RF exposure concerns
• Lack of understanding in addressing possible interference issues and the use of proper grounding and shielding practices
ISOLATION SOLUTION EXAMPLES
LIGHTING CHOKES

230 VAC

TO TOWER

REACON
COMMON
SIDE LIGHTS

MODEL
LC-3-8/10/12
MULTIPLE LIGHTING CHOKES PROVIDE RRU DC POWER
24-CONDUCTOR LIGHTING CHOKES
ASSEMBLY
ISOLATION INDUCTOR

- Insertion loss < 1.0 dB
- No concerns with peak voltage handling capacity
- Robust solution in high lightning environment
11 GHZ MICROWAVE SERVICE
ELLIPTICAL WAVEGUIDE ISO-COIL
SLOTTED ISOLATION INDUCTOR

- Isolation of a large number of copper conductors
- Tunable inductor for tower pre-match
- Robust static drain choke
- Tower light circuit isolation
- Sampling line isolation
COMPLEX ISOCOIL

• 3 runs of unjacketed 7/8” coax
• Parallel resonant variable capacitor to yield high Z at AM frequency
• Slotted isocoil with 21 internal copper conductors
LTE 4G MICROWAVE ISOCOUPLER

- Uses coupled microwave horns with air gap
- Requires separate unit for each transmit and receive antenna
- Operate in the 1.9GHz or 2.4GHz bands
FM ISOCCOPLERS

- Utilize magnetically coupled loops
- Insertion loss typically < 0.2 dB
- Yield capacitive reactance in parallel with the AM tower drive Z < 150 pf
- In and out are series tuned LC terminations at the FM frequency
HIGH POWER TV & FM ISOHOILS
FM TRANSLATOR & LPTV ISOCONIOLS

- Not FM frequency specific
- Applicable for combiner FM’s
- Available with resonating caps
- Coax isocoils encapsulated in a non-conducting cylindrical enclosure
  - ISO-130 350W FM power
  - ISO-170 1 kW FM power
  - ISO-100 3 kW FM power
LTE SYSTEM LAYOUT

• Tower mounted transmitters & receivers [Remote Radio Units (RRU)] that require no coax feed

• A typical RRU may be fed with 2 pairs of 48 VDC 6AWG Power Conductors, 4 pairs Fiber Optic cable, and 1 pair 18 AWG alarm

• Hybrid cables include fiber optic, DC power and alarm pairs all combined into one cable with an aluminum corrugated outer jacket. One cable is typically sufficient to support Qty. 3 RRU’s
RFS HYBRIFLEX CABLE
HYBRID CABLE ISOLATION INDUCTOR
HYBRID ISO-COIL INSTALLED AT WLYQ/WVNT DIPLEXED AM SITE
ETHERNET ISO-COIL USING POWER OVER ETHERNET (CAT6 OR CAT7)
QUESTIONS