RadioWorld

Category of the Month

Buyers Guide

Antennas Towers & Cables

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Guy Insulator Arcing Solution

by Hal Proppe/VP Mktg
Lightning Elimination Assoc

Santa Fe Springs CA . . . Within the broadcast industry and where isolated towers are required, there is a phenomenon known as "guy snapping." The primary manifestation of this phenomenon is both audible and visual; there is a pronounced arcing across the guy insulators. It may start from the top and jump each insulator in succession to the bottom, or it may start from the lower insulators and move to the top.

This arcing produces several secondary effects. The most immediate is on the effective antenna impedance; it will change each time the arc occurs. The arc, together with the adjacent guy wires on either side of the insulator, appears as a single wire. This in turn will act as a re-radiator closely coupled to the antenna inducing, by the mutual coupling, a reflected wave into the primary antenna.

This results in a change in the VSWR at the transmitter, resulting in a temporary overload, a cycling on and off, or even transmitter failure. Some customers report that this phenomenon creates a sound like a machine gun superimposed on the broadcast signal.

A more long-term effect of this arcing phenomenon is the impact on the insulator. Continual arcing across the insulator will cause "tracking," which leads to a breakdown of the glazing, deterioration of the insulator and finally, its destruction.

The guy snapping phenomenon seems to be isolated to certain geographic areas and is most predominate under special situations, specifically, dry areas, prior to or during electrical storms, but before the rain starts. Blowing dust or dry snow will also produce spectacular displays. In each case it seems that the phenomenon disappears as soon as the rain starts in the transmitter area and the insulators get wet.

The cause

A thorough analysis of case histories and a correlation of the phenomenon with local conditions reveals two seemingly unrelated physical situations that exist while guy snapping is observed.

Either there is dry air, high wind velocities, with or without dust or snow. Or, it happens during the early phases of a thunderstorm prior to the downpour, during what is termed the build-up stage of the storm and/or under fast moving dark clouds.

These situations create the guy snapping phenomenon, but do so in entirely different and unrelated ways. Both involve he charging of the isolated guys to the point where the difference in potential across any given breakup insulator exceeds the flashover point. Once one flashover occurs, the phenomenon tends to cascade in a domino effect, usually working from top to bottom, but sometimes in reverse.

To protect against this phenomenon the protector must prevent the charge build up or it must take some form of remedial action. Both have been tried in the past with varying degrees of success, although none have been considered the panacea.

It is obvious that to prevent the phenomenon there must be a way of preventing the charge buildup, or a way of draining it off fast enough to keep the difference of potential across any given insulator below the arc-over potential. LEA has developed a system that will accomplish both. It includes use of a special type of choke developed specifically for this function and proven in the field under all of the potential problems identified.

The Guy Charge Dissipation Choke (GCDC) concept takes advantage of the fact that there is a significant separation between the AM broadcast frequency spectrum and the charging frequency related to the causes of the bound charge on the guy section. Where the lowest frequency in the AM band is 550 kHz, the fastest field recovery rate related to atmospheric electricity is in the order of 10-100 Hz. Blowing snow and dust are much slower.

Since we know that the arcing phenomenon is not prevalent with solid guyed

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Antennas by Tennaplex

by Marvin B. Crouch/Pres
Tennaplex Systems

Ottawa Ont . . . Tennaplex has been supplying broadband dipole array antennas to the North American market for about 10 years. In TV and FM there are over 100 now operating.

Our FM-CP panels differ from most in that they have 4 radiators per panel, 2 vertical and 2 horizontal. The half lambda spacing of the pairs of radiators gives 30 dB of decoupling between adjacent pairs and allows independent phasing and powering of individual panels. An infinite number of patterns of choice are possible both horizontally and vertically.

In addition, double phase compensation can be employed so that ice and snow have no VSWR effects without the need for large radomes or de-icers. These antennas work well even in solid ice maintaining match and pattern.

All the hardware is hot dipped galvanized steel or stainless. The general open construction keeps the windload minimal and thin wall galvanized tubing keeps the panels light but strong.

The broadband nature of the dipole panel covering 88-108 MHz permits multiplexing several FM signals into one antenna. The higher quality of this antenna becomes more economically competitive as the number of signals using it go up.

In mountainous areas where multipath creates problems, the ability to tailor the pattern to the terrain is very useful. Independent drive to the vertical and horizontal elements also helps because of the phenomena of vertical polarization reflecting 3 times better than horizontal.

The panel antenna has no tower mounting effects because of its reflecting screens. Patterns as predicted by computer are realizable on the test range. Circular polarization has the same sense of rotation in all azimuths in contrast to the bent ring antennas.

The 30 dB decoupling vertically between panels cancels radiation up and down the tower, concentrating the power on the horizon. The efficiency of the 4 dipole panel array is therefore very high, and with directivity in the HRP to avoid multipath stimulus or to cover specific azimuth patterns, these antennas occupy less aperture than any other type for the same gain.

Rounding out our antenna line, Tennaplex offers combiners for multiplexing FM signals. We offer starpoints, bandpass hybrids and stretch line types. All are convection cooled and required no fans or blowers.

The bandpass hybrid type combiner is expandable. Future additions can be added at any time without shutdown if the antenna is harnessed for the extra power. Further features are that the filters can be field tuned to a new channel if needed and a standby broadband port is provided for emergency use.

Upgrading High Power Coax

by Jack Kruger/Pres
SWR Inc

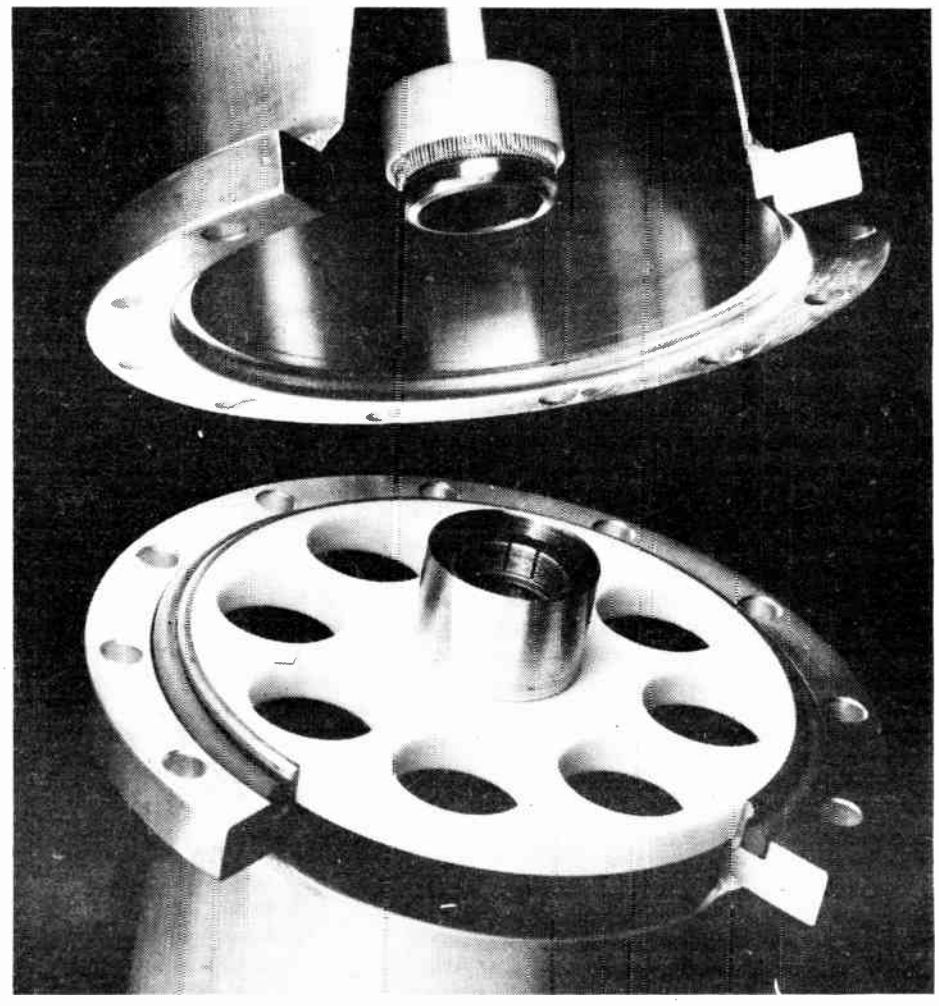
Goffstown NH . . . With the advent of circular polarized antennas, more and more FM broadcasters are doubling their power output. Unfortunately, most of the 3-1/8" transmission line that is available on the market today is inadequate to match these new power demands.

The weakness lies in the design of the standard connector, which permits contamination due to galling, and has poor heat flow characteristics. Clearly the FM industry is on the lookout for a new standard in transmission line that has heretofore been unavailable.

A few years ago, SWR responded to a similar need in the UHF market. We designed a new connector of all-copper construction, with a watchband spring that makes for total peripheral contact. Its unique design does not permit any wear dust to contaminate the teflon insulator. Any such wear dust is captured in the connector's mating female cup.

Also, this new connector has only one contact joint per 20 foot section of line, where all other manufacturers have two contact joints. This makes for improved electrical conductivity.

At high power, however, there is another



problem, namely heat transfer. The standard bullets available today are of silver-plated brass constuction. But the galling caused by daily differential expansion of the line wears the silver plating down, exposing the brass.

In terms of heat transfer, brass is less than 30% as efficient as copper. Hence, we designed an all-copper connector, with a unique thermocouple that aids in the distribution of heat. This all-copper connector is an integral part of our inner conductor.

Moreover, the inner conductor is constructed of heavy-wall copper, while some in the industry use thin-wall copper for their inners. All these factors result in maximum heat transfer. When this high caloric conductivity is united to our improved electrical conductivity, the end result is optimal and reliable performance.

We had designed this new connector with the needs of UHF stations in mind. Yet, some 3 years ago, Tim Sawyer, CE at KCEZ-FM in Kansas City, approached us for a solution to his transmission line problems.

In the previous year, his new 3-1/8" universal-type line had burned out on two occasions while applying a forward power of slightly over 38 kW. He had heard of our new thermocouple connector and its good results in UHF installations. After a brief consultation, we agreed to rebuild his existing line by cleaning his outer conductors and replacing his inner conductors.

After we completed the installation, he found that looking into the same antenna system, our line more than adequately handled his power output, and has done so for 3 years without incident. In fact, even when half his antenna system failed, our line continued to perform reliably under the increased load. Such examples could be multiplied, but what is significant here is that a connector that was originally designed for high power UHF service is now being effectively utilized as a solution to the increased power requirements in the FM industry.

If customer feedback is any indicator of reliable performance, then this new connector seems to be a proven product. In every FM station in which we have installed our new connectors, we have seen a noticeable upgrading of performance.

The FM broadcasters seem to appreciate the confidence we have in this product, because we underwrite it with a warranty of 2 years, which is unheard of in the industry. We think that this confidence is well-placed, since we have never had to honor one of our warranties!

For those FM broadcasters who are contemplating an upgrading of their systems and going to higher power, there are some practical considerations that could result in substantial savings. In the first place, there is no need to move from 3-1/8" line to 4-1/16" coax, the next largest size.

It is understandable that there be an adequate safety factor at higher powers.

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Discussion of Spurious Signals

Calculated Output Spectra of Transmitters and Combiner

Channel No.	Carrier Freq. MHz	Lower Adj f MHz	Upper Adj f MHz	Level of Adj Freq fr Combr to Xmttr	Spur Freq MHz	Spur Level Xmttr Output db	Spur Level Combr Output db
1	92.3		94.7	−51	87.5	−62	−95
					89.9	−61	−83
					97.1	−62	−95
2	94.7	92.3		−58	89.9	−69	−109
					97.1	−68	−96
					99.5	−69	−109
			96.3	−51	91.5	−62	−95
					93.1	−61	−82
					97.9	−62	−95
3	96.3	94.7		−60	93.1	−62	−104
					97.9	−70	−100
					99.5	−62	−104
			97.1	−54	94.7	−63	−97
					95.5	−64	−82
					97.9	−63	−97
4	97.1	96.3		−51	95.5	−62	−95
					97.9	−61	−82
					98.7	−62	−95
	97.1		99.7	−72	91.9	−83	−137
					94.5	−82	−124
					102.3	−83	−137
5	99.7	97.1		−53	94.5	−64	−99
					102.3	−63	−86
					104.9	−64	−99

Note that spur levels are significant on transmitter side, but insignificant on output side of multiplexer.

by Ed Shively
Shively Labs

Bridgton ME . . . When a low level leakage signal from a neighboring transmitter passes through the multiplexer and enters the final amplifier of a given transmitter, spurious signals are generated at the sum and difference frequencies, and multiples thereof. The sums are ordinarily rejected by the transmitter's harmonic filter, but the difference frequencies modulate the main carrier, producing spurs separated from the main carrier by multiples of the difference frequency.

Thus when two transmitters at f_1 and f_2 are diplexed, the output spectrum of T_1 will contain f_1, f_2, $f_1 +/- \Delta$, $f_1 +/- 2\Delta$, $f_1 +/- 3\Delta$, etc, where $\Delta = f_2 - f_1$, with the level of the spurs decreasing with separation from the carrier. The same is true of the output spectrum of T_2.

Spurs go through

If the diplexer contains only notch filtering at f_1 and f_2, these spurs will go right through it and become on-air spurs. Of course, some of the spurs are completely obliterated by the presence of the other carrier, so the measurable on-air spectrum will consist of f_1, f_2, $f_1 - \Delta$, $f_2 + \Delta$, $f_1 - 2\Delta$, $f_2 + 2\Delta$, etc.

A commonly accepted level for generation of the dominant spurs, at $f_1 +/- \Delta$ and $f_2 +/- \Delta$ is 10 dB below the level of the leakage carrier signal so that in the case of multiplexers with low isolations, such as 30 dB, spurs will go back at the multiplexer only 40 dB below the carrier, and if notch filtering is employed, most of these spurs will be radiated.

Therefore, a high degree of bandpass filtering must be employed, and that is why a minimum of 50 dB isolation between inputs should be used. At that level, with a −10 dB conversion level for the dominant spurs, only 20 dB of bandpass filtering is required to meet the −80 requirement for out-of-channel transmission, and the level of spurs is always below this.

Moreover, at this level of isolation, the leakage carrier signal from T_2 cannot be seen on the T_1 reflectometer, so a true reading results. The same comments on spur generation and bandpass filtering apply to those situations in which strong local signals are received on the transmitting antenna of a station in close proximity to others, such as in antenna farms, on mountain top locations, and the like.

Arcing

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towers, it is evident that if this can be duplicated in effect the problem with isolated guy wires can be eliminated. Therefore, because of the wide separation in frequencies of concern, LEA has found that the guy charge dissipation chokes can be designed to make the guy wire appear electrically as a solid conductor to the charging mechanism and an open circuit to the broadcast frequencies.

This is impossible theoretically, but possible practically, with very little compromise in the objecives. Restated, the objective is to nearly equalize the static voltage along the wire so that the difference of potential between any given adjacent guy segments is well below the insulator flashover potential. And, to assure a high enough impedance to broadcast frequency to virtually eliminate any leakage and resulting loading effect at the broadcast frequencies.

Modeling studies have been conducted and several choke types tried. A choke wound on a 2 inch fiberglass rod, and providing an impedance of 5,000 ohms at 550 Hz was chosen. Subsequent tests on several stations proved the choice to be correct for all frequencies in the AM range.

The resonant frequency is well above the AM band. The final assembly of the choke is coated with an epoxy that is not sensitive to ultraviolet rays that normally deteriorate epoxy.

The impact of the multiple chokes in series may be understood from an example. If a typical installation has a mini-

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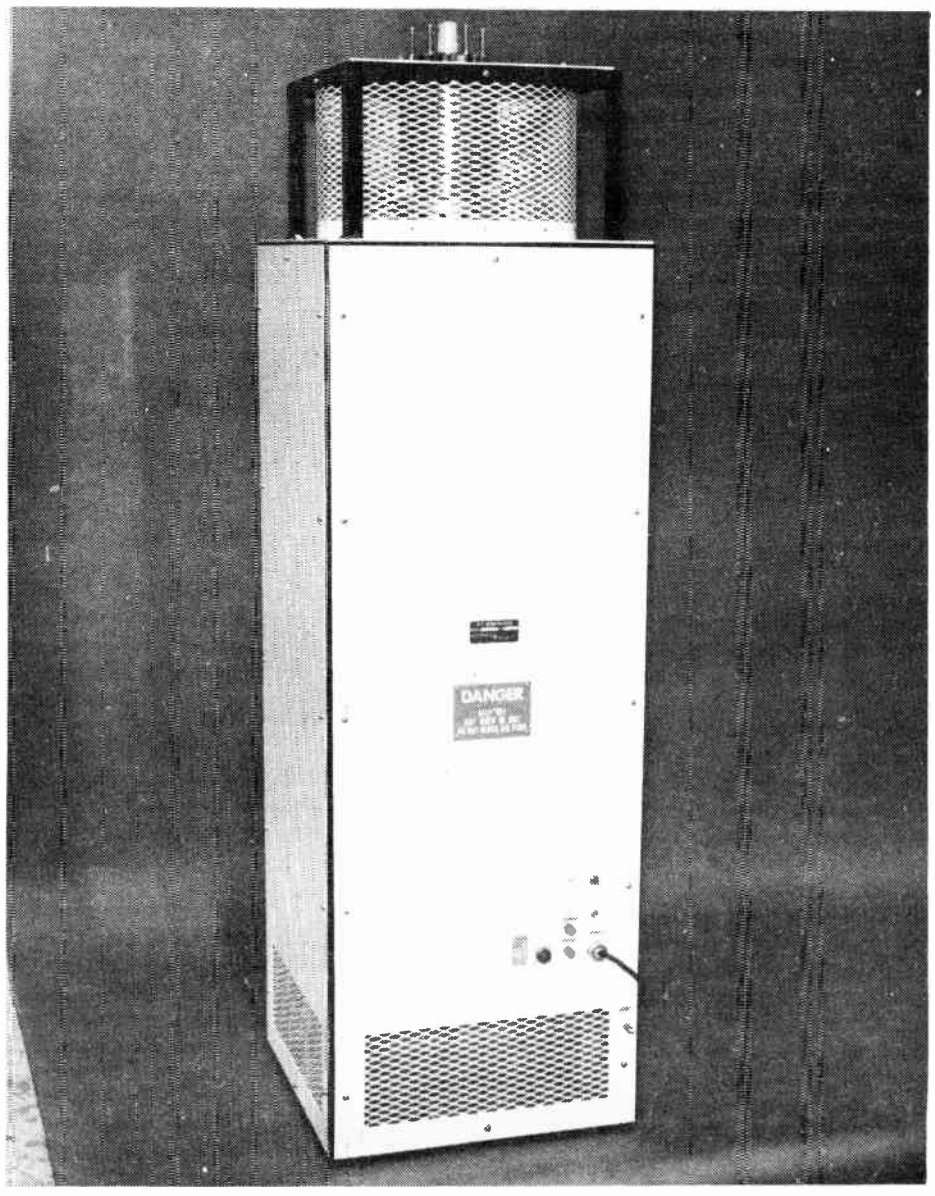
Choosing Proper Dummy Loads

by Mark Rubin/Pres
Electro Impulse, Inc



Red Bank NJ . . . Electro Impulse Laboratory has one of the most comprehensive lines of RF dummy loads in the industry. We offer loads from 500 up to 1,500,000 watts average power; loads cooled by air, water and other coolants; loads designed for calorimetry for high accuracy power measurement; ultra low IM distortion loads for special applications, and many more.

Broadcasters favor our dry, forced air cooled loads for AM, SW, FM and low TV. These loads exhibit a very low VSWR up through 110 MHz, and can handle tremendous overloads.

For example, our DPTC-25KFM model, rated 25 kW average through FM, can actually dissipate full power for a short time without being turned on (not recommended)! To protect against this, all high power loads are interlocked, normally with low air flow and high temperature sensors with external relay contacts provided.

Air cooled loads require special consideration when planning their installation. All of the power dissipated by such loads (plus the heat from the fan motor) will heat the space they are in. Normally in a large transmitter installation there is enough ventilation to prevent excess temperatures, but in a small air conditioned room, a dry load could quickly raise room temperatures above tolerable limits.

Select proper load

First determine the average power rating, frequency/VSWR, and input connector for the application. Remember that for AM transmitters, total average power must include 100% modulation; so a 10 kW AM station would need a 15 kW rated load.

In an FM application with 2 transmitters and a combiner/reject load, the load is often selected for the reject use and as a full power load for one of the transmitters without the combiner. Our dry, forced air cooled FM loads can be fitted with a "reject load option" which thermostatically controls the fan motor so it runs only when there is heat being dissipated.

In TV applications, the total average power is derived from dividing peak power by 1.68 (includes modulation and sync pulses) and very low VSWR, such as that of a coaxial water load, is required.

Next, consider the desired cooling method, remembering that all dissipated RF power must somehow be dealt with in terms of heat removal. The amount of heat to be considered is the average power in watts (or for BTU/hr multiply watts by 3.412) that the load absorbs.

In most applications, this heat is usually exhausted into the room ambient by dry or heat exchanger loads, and into the waste line by tap water cooled loads. Ducting of air from dry loads can be accomplished, but only if the load is specially designed for ducting, since the higher air flow back pressure will reduce air flow and could result in load failure. Choosing the correct load can be complex. Make sure you have considered all the alternatives and factors.

Guy Insulator Arcing

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mum of 5 chokes per guy wire and the guy is 150 meters long, the total series impedance would be in excess of 26k ohms at 1 MHz. Even at 50 kV, the total RF leakage current would be on the order of 1 ma for the worst case antenna.

The GCD chokes would only be required for the upper guy insulators because of the effect they create on the inducing fields. Since the upper guy with a full set of chokes appears as a solid wire to the charging field, it will in effect act as a shield wire for the lower guys. This prevents the lower guy segments from being exposed to the charging fields created by a storm.

As a result they should not pick up a measurable charge from the electrical storm. However, there may be a charging effect from wind, dust or blowing snow. Experience to date has indicated that this is not a serious problem. However, in areas where this is the primary cause of arcing, it may be necessary to deal with some of the other insulators.

The guy charge dissipation chokes are available in 2 types: the insulator bypass choke, and the strain insulator choke. The insulator bypass choke is designed to clamp on to the guy wire on either end of the insulator. The clamp makes electrical contact to the guy wire and the choke.

Where a long chain of insulators is used for the top insulated section, they are spanned by a choke, connected from the base of the lower-most insulator directly to the tower at the closest point. These chokes may be installed by dropping the guy wire or from a boatswain's chair.

The strain insulator choke is installed in place of the usual strain insulators and must, therefore, be designed to carry the tension load as well as perform the choke function. In this situation, the customer must specify the insulator requirement, however, the user is limited to the fiberglass rod type of insulators.

Leasing is Only Third Best

by David Green
Bdct Finance Corp

Leesburg VA . . . When it gets to big money you need to consider the fact you are making two purchases at the same time. One is the equipment, but the other is the paper, that is, the financing.

Transmitter related packages of equipment with antennas and all that goes to build today's FM station amount to a serious amount of capital. Even doing a production room can get over $5000 quickly.

You would think the president of a broadcast leasing company would tell you his option is the best way to finance such a purchase. It isn't. The least expensive way is always the best. Having the luxury of all the cash in your bank account is the most inexpensive way to buy any equipment.

The second best way is your friendly local banker. He should be your most important relationship anyway. You can work for years on the development of a solid friendship with your banker. His interest rate and terms are going to be the best if he has the money to lend.

Times have changed

Leasing is only the third best way to finance a major purchase in our industry. Many of our clients find their local banker will be more than willing to finance an automobile because if the client defaults, the banker has many other depositors willing to take the automobile on favorable repossessed terms.

But broadcast equipment is foreign to their thinking. How would a banker get rid of the equipment should the borrower be placed in the painful position of default?

Bankers don't know a lot of broadcasters that would have the same needs as the borrowing station. We built a company around the same needs of an industry that is nationwide, and leasing the major purchases became a natural way to extend our ability to serve our market.

Leasing nationwide

There are three types of companies that market a leasing program in our industry. One is the big city banks who get around the interstate banking stumbling block with the ability to sell a lease in states other than their home base. These factoring houses usually want the highest quality of credit risk they can get. Their rates are slightly inflated sometimes to pay a commission to those brokers or dealers who place their leases or bring them the customers.

The most common type of leasing firm is a regional one that has carved out a good geographical area in which they want to specialize, or perhaps an industry such as computers in which they want to center their attention. These firms are normally an offshoot or even division of a regional banking center. Their employees are former bankers from the large bank who coincidentally refer customers of the bank to the leasing company.

One of our competitors, Park Leasing of Des Moines, is run by Bob Arnold who is a respected old hand in this business. His, like ours, is the third kind of firm, one that specializes in the broadcast business and even has broadcasters on its board of directors. The basis of capital for this kind of a lessor comes from a financial fund created for the purpose of placing capital in a wide range of stable industries.

Your banker will probably want you to put about 25% down on what you want to own. A lease can require less than that in advance and in some cases, just a token payment in advance.

The monthly payments on a bank loan versus a lease are probably smaller on a lease but the term of payment is longer. If you figure you are buying 1982 dollars down but paying the lease off in inflated, less expensive dollars down the line, then the term of the lease becomes an advantage.

The tax advantage of leasing can benefit any broadcaster, but since it is so complicated it is also subject to negotiation. The best situation is to tailor a lease to your exact cash flow and tax status.

In our lease plan we have an interchange feature that will allow you to select state-of-the-art equipment each year if you want to carry it to that extent. You then just trade for what you need that is on the leading edge of technology, and begin your lease all over again.

In addition, all equipment we sell is backed by a guarantee in excess of the manufacturers, not just one year. This means if you have a problem with it down the line, it can be replaced with brand new equipment before you complete the lease. With a bank loan, the banker would just look at you with a blank stare if you said you wanted to replace it.

When we quote a lease, we are quoting a conditional sale with a buy out. In other words, we are allowing the station another method of a purchase. The technical term for the buy out at the end of the lease is residual.

In most cases it is 10% of the face value of the lease. You can negotiate three different items in a lease, the down payment, the monthly amount and the residual. If you want to increase or decrease one of the three, the other two must change so the lender's yield is the same factor.

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CP Antennas

by Fadi S. Walieddine/DE
Cetec Antennas

Sacramento CA . . . Over the past 2 decades circular polarization has proven to broadcasters that it is superior to either vertical or horizontal polarization due to the quality of the received signal. Horizontal receiving antennas in most household systems together with vertical antennas on automobiles receive the corresponding signals from a circularly polarized broadcasting station with good quality.

A circularly polarized wave is defined as a transverse electromagnetic wave for which the extremity of the electric vector describes a circle in a plane perpendicular to the direction of propagation, completing a full revolution during one period of the wave. Mentally it can be pictured as two waves, one vertically polarized and the other horizontally polarized, each having the same strength and with a 90% phase difference.

The coexistence of these two waves results in a rotating electric field that has a counter clockwise rotation like a corkscrew effect in the direction of propagation. As standardized by the IRE, for an observer looking in the direction of propagation, the rotation of the electric field vector in a transverse plane is clockwise for right-hand polarization and counter-clockwise for left-hand polarization.

The proscribed curve in the transverse plane is not a perfect circle, it's more like an ellipse. The ratio of minor and major axis is defined as the axial ratio and it's usually specified in decibels, with the omission of the negative sign.

A receiving antenna gets the maximum energy from a radio wave if its polarization is identical to that of the wave (assuming that the transmission path does not have an adverse effect on the polarization). Thus, if a signal is launched from a vertically polarized antenna, the best reception is obtained using a vertically polarized receiving antenna.

Vertically polarized waves are not affected after reflection off smooth surfaces, while on the other hand, when a horizontally polarized wave is reflected it undergoes a 180% phase change. Therefore, when this occurs for a CP wave there is a reversal of the sense of the wave (eg: right-hand circular to left-hand circular). Thus the right hand circular receiving antenna will be immune to effects of reflections coming at a different phase and distorting the signal.

PRESS RELEASES

UNR-Rohn

The Rohn B1-300 MM code beacon is designed as a warning light for hazards to air navigation. Designated for use on TV, radio, microwave and transmission line towers, and other lofty structures presenting hazards as specified by the FCC or FAA. It meets all FCC and FAA beacon specifications and requirements

The beacons are furnished with red filters and clear heat-resistant lenses and 5 feet of SO neoprene covered cable secured to the base with a water tight connector. Conduit may be used, if desired. A terminal block in the base permits each lamp to be independently fed and monitored. Internal wiring is of heavily insulated flexible cable.

Magnum Towers

Magnum Towers manufacturers self-supporting and guyed towers for service as broadcast antennas and supporting structures in AM, FM, VHF-TV, UHF-TV, and microwave installations. Each tower meets the most exacting standards and specifications in any service. All Magnum designs are by licensed independent structural engineers.

Magnum has available to its customers complete systems including towers, installations, building and maintenance. All installations are accomplished by experienced erection crews with safe and modern rigging equipment. Towers can be transported to the site from Magnum to eliminate down time and to insure all necessary equipment is available.

All welded sections are fabricated using individual pieces for each horizontal and diagonal member. Our design allows for full 360 degree welds around each member end. This application eliminates excessive radius bending of members in the area of contact to legs and avoids pin holes and gaps occuring between web members and legs.

The geometrical design center of the tower becomes more exact with the horizontal and vertical components directed into the center of the tower legs. All guy attachment points are welded directly to tower sections at a horizontal member.

All welding is done in heavy, specially designed jigs to insure uniformity and straightness of each section. All welding is performed by experienced certified craftsmen and is in accord with the specifications of the American Welding Society for all structures. Our end to end jig tolerance for 12M to 36M series sections do not vary more than 0.006 inches in 20 feet.

Upgrading High Power Coax Lines

(continued from page 2)

However, it should be noted that 3-1/8", 50 ohm rigid coax is rated to handle up to 55 kW at 100 MHz. This, of course, is only a theoretical figure, and the actual handling capability would be considerably less with conventional connectors.

Our improved, all-copper connector permits smooth, reliable performance at 40 kW, even with derating factors such as ice build-up on the antenna. In fact, wherever wind-loading is a problem for a tower, the smaller diameter line would be better, provided that it takes the power reliably. Our connectors make this possible for any existing 3-1/8" line. We have rebuilt the coax of virtually every manufacturer in the country for about one-half the cost of purchasing new line.

Another practical consideration is the choice that must be made between rigid and flexible coax line. Here, although flexible line may seem less costly to install, the insertion loss is higher. In the long run, operating costs are higher, in terms of increased power bills.

Usually 3" flexible line has an insertion loss of 0.150 dB per 100 feet of line at 37 kW (at a frequency of 100 MHz). This means that flexible line has 30% more attenuation per 100 feet than rigid coax.

Clearly, the operating costs are significantly less for rigid line. There is also an additional consideration. Damaged sections of rigid line can be replaced, but the entire run of flexible coax would have to be replaced in the event of any damage to the line.

In short, FM stations now have the option of turning to a product originally designed for UHF for their increased power needs. SWR's inner conductors and connectors can be purchased at about one-half the cost of new line. It is a dictum in the industry that "the outer conductors don't wear out, but the inners do."

It makes sense to utilize an inner conductor that doesn't wear out as well. Furthermore, SWR has specially designed cleaning machines that bring existing outer conductors back to original condition.

With the budgetary restraints on many FM stations today, long-term operating costs are an important consideration. It should be remembered that it is not what transmission line originally costs when it is purchased or rebuilt that matters most, but rather what it costs to operate in the long run!

Buyers Guide: Category of the Month

Each month Radio World's Buyers Guide section will highlight one area of radio broadcast equipment.

JANUARY	FEBRUARY	MARCH	APRIL
Test & Monitoring Equipment	Automation Equipment	Microphones & Turntables	Transmitters & Exciters
MAY	**JUNE**	**JULY**	**AUGUST**
Antennas Towers & Cables	Program Audio Processing	Studio Audio Equipment	Consoles
SEPTEMBER	**OCTOBER**	**NOVEMBER**	**DECEMBER**
Reel-Reel Recorders	STL, Remote, & Telco Equipment	Computer Systems	Cart Machines

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JH-110B High Profile Cabinet

JH-110BX Variable Profile Cabinet

It's a quality combination possible only after decades of designing, refining and debugging. And it's yours today only in the JH-110B and the JH-110BX from MCI...sound so clean that no competitive manufacturer has dared challenge our performance graphs. The rugged reliability and built-in serviceability of MCI's JH-110B Series make downtime almost a thing of the past. And an array of standard features helps you cut production time and makes your job easier. Two cabinet choices suit any operator's preference, including MCI's exclusive variable profile design -- user adjustable to take the ache out of long editing sessions. Before you buy, compare the JH-110B -- or when cue and three speed capabilities aren't critical -- the economically priced JH-110BX. You'll discover why MCI is the recognized leader in the pro recording industry. And why today's quality conscious broadcasters demand it.

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PRESS RELEASES

Utility Tower

Utility Tower installation crews know their job. Our installation supervisors average 8 years experience. Their assistants average 5. These men know how to do the job correctly, economically and on time. They handle all the details of a package installation including lighting and ground systems.

Insulated vertical radiators are equipped with the latest Utility 3401 or Utility 2201 pivot base insulators for positive insulation between base and ground. Utility base insulators have much higher compression ratings than hollow insulators of similar size. Resilient and shatter-proof, each insulator is proof tested for a load approximately 8 times greater than ever carried in normal broadcast service.

You save money on initial engineering costs because Utility Towers are easier to tune. One reason for this is the fact they are built to your exact requirements and each bolted connection is tack welded after erection.

Round members and welded construction provide smooth surfaces for easy painting and servicing. Steps are built into the bracing to eliminate the need for scaffolding and to make the entire height of the tower easy for maintenance men to each.

World Tower

The name World Tower may be new but the company is old in the tower business. Their personnel have a vast knowledge of tower fabrication and erection. Their experience was gained through the guidance of an established tower company of which they were a part for many years.

The physical location and experienced personnel remained the same. Formerly the business was primarily concentated in the Eastern portion of the US. World does, however, look forward to expanding their operations to "cover the world."

Fred A. Nudd Corp

Nudd is a manufacturer of standard guyed towers, self-supporting towers, and monopoles as well as custom designed and fabricated communications towers, all made to EIA specifications, including tower hardware and accessories. All components are hot-dipped galvanized after fabrication to guarantee longevity of the tower.

Nudd installs all kinds of towers, monopoles, ground systems, antennas and tower related equipment and hardware. All work is done to meet or exceed applicable building codes or EIA specifications anywhere in the US and overseas.

Andrew Corp

Andrew recently introduced the new LDF series of improved foam-dielectric Heliax cables. ½". 7/8", and 1-5/8" sizes are now available. The new cables have the same flexibility, RF shielding, and long-term reliability as previous foam Heliax cables, but with improved environmental and electrical performance features.

The new low-loss foam dielectric offers attenuation performance approaching that of air-dielectric cables of similar size. Connector "O" ring seals, in conjunction with the new annular corrugations of the cable, provide a longitudinal moisture block. To eliminate differential expansion the dielectric is mechanically locked to the outer conductor and bonded to the inner conductor.

Comark Industries

The Comark FM series of circularly polarized antennas are basically 1½ turn helixes separated one wavelength apart. The radiation centers of both the vertical and horizontal components are identical, thus the FM antennas are one of the few antennas with phase coincidence so essential for true circular polarization.

The basic element with a minimum of retuning can serve as a radiator at any frequency in the standard FM broadcast band. The free space circularity pattern of the FM antenna are within ²1 dB of optimum circularity. However, when side mounted on a wide tower, the antenna patterns will degrade with some scalloping and loss of circularity. In practice the antenna will provide the urban area with considerably better coverage than a horizontal only radiating system.

The antenna is supplied with a triple stub tuner which provides adjustable capacitors at discrete positions in the feed line. These adjustments are such that they compensate for impedance changes due to mounting environment and still achieve a matched condition.

The deicers of the FM series antennas require approximately 400 watts of power consumption per bay. They are capable of achieving ice-free operation at ambient temperatures of 0% C. and 50 mph winds. They require 230 volts, single phase AC

Delta Electronics

The Delta Model OIB-1 operating impedance bridge is an instrument for impedance measurement and has two main characteristics that make it unique. These characteristics are its ability to handle a large through power (up to 5 kW with modulation, 10 kW unmodulated), and, its very low insertion effect in the circuit being measured.

It is a characteristic of directional antenna systems that the impedance at each point throughout the antenna system varies according to the tuning of the antenna system. When an ordinary bridge is inserted in such a system, the impedance measured with that bridge is not the actual operating impedance since the insertion of the bridge greatly detunes the system. The OIB-1. on the other hand, can be inserted at any point throughout a directional antenna system. The insertion effect is so low (equal to 9" of 150 ohm line) that the antenna continues to function without significant detuning.

Phelps Dodge

In areas where icing is encountered, radomes are available for all CPFM antennas. The radome covered elements in the HP and LP antennas are of a higher Q design than the heated or unheated elements and therefore are not capable of handling the same input power as these units.

In heavy icing areas heated elements are recommended. In light icing areas the radomed units will perform satisfactorily at input powers not exceeding 2,500 watts per bay.

CP-1000 and ECFM antennas are also available with radomes. The power rating of these antennas remain unchanged. No heaters are available for these antennas and in icing areas the radomes are recommended.

Leasing Third Best

(continued from page 5)

To put it simply, it is up for negotiation. But, the more you put down, the less the monthly payment you will have to make. And, vice-versa, the lower the down payment the higher the monthly payment.

References

A simple credit check to show a history of positive bank dealings is not hard to find on most radio stations. Like a bank, we require a personal guaranty from the majority stockholder. A loss payee is required from the station's insurance agent showing that the interests of the lender are protected.

UCC filings are routine in the local county court and state corporation commission. In short, what we look for is someone that will give us repeat business. To do that, we want to be reasonably certain of the station's ability to pay back what we lend. We've found that most broadcasters are excellent partners.

(Ed Note: David Green is President of two companies that are familiar to most station owners and engineers. Broadcast Consultants Corporation sells equipment. supplies and broadcast consulting services to over 3000 clients who participate in a unique buying system called, "The Loyalty Discount Plan." the other company is the Broadcast Finance Corporation which provides a rental plan for the short term use of proof-of-performance field strength meters and operating bridges. BFC is also one of the largest leasing specialists for packages of broadcast equipment.)

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