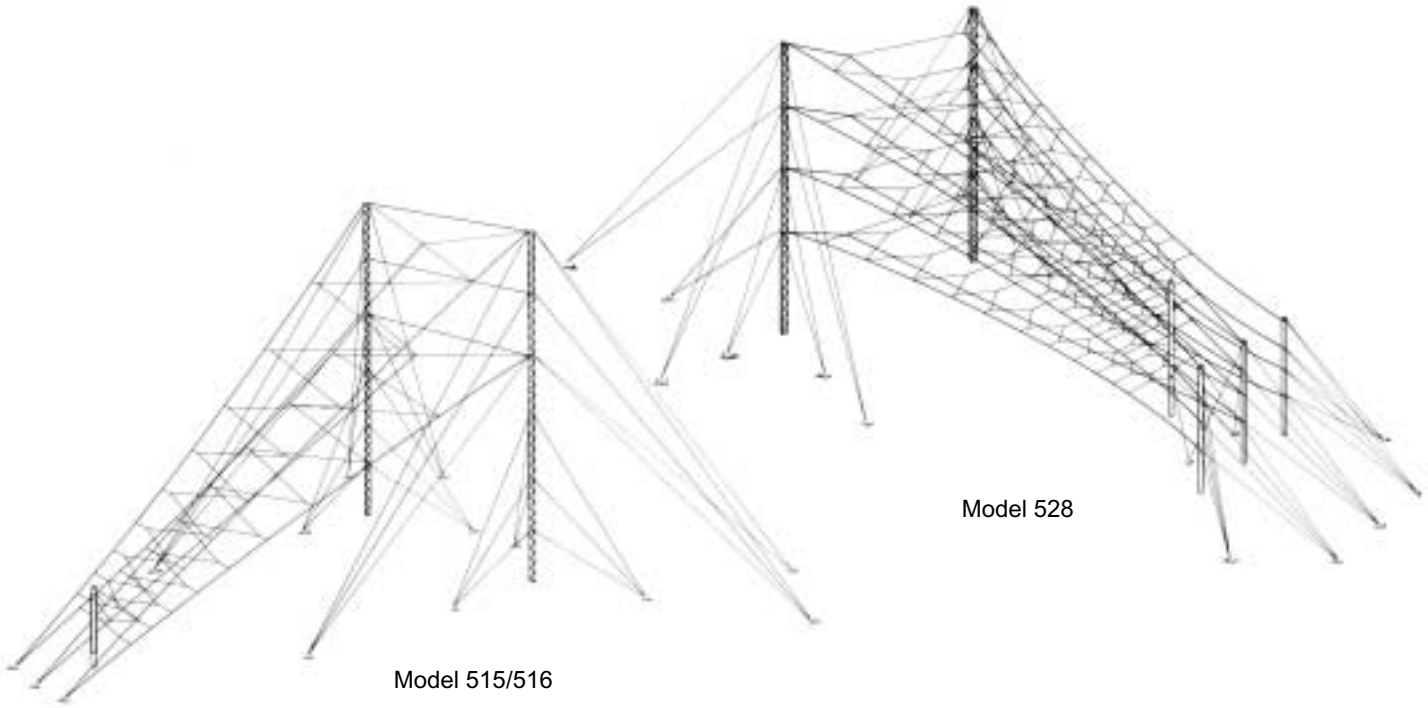
MODELS

515,516&528

Short Wave Broadcast High Power Log-Periodic Antennas



Model 528

Model 515/516

Because of seasonal and diurnal variations of the ionosphere, shortwave broadcasters have found it necessary to change frequencies at regular intervals. Frequency changes can be simplified with the use of wideband frequency-independent antennas. For this application TCI offers the Models 515, 516, and 528 high power log-periodic antennas.

Log-periodic antennas have long been desired for their wide band characteristics, efficient land use, and modest price. Heretofore, however, high power log-periodic antennas have not been possible due to the extremely high voltage stresses on individual elements nor have they provided the gain of more conventional approaches. These problems have been overcome with the unique radiator and array configuration developed at TCI.

The radiator designs employed are the equivalent of "fattened" radiators with lowered Q and reduced voltage stress. These radiators bring the further benefit of increasing the effective "active region" radiating length in each curtain resulting in greater radiation efficiency and higher power gain. TCI analytical techniques have been employed to provide large volumetrical apertures and resultant high power gain while maintaining log-periodic performance.

As with all TCI antennas, this line of shortwave broadcast antennas utilizes high quality, rugged, exhaustively tested components and materials. No fiberglass assemblies are used throughout the antenna. Alumoweld wire, segmented where necessary with high quality ceramic fail-safe insulators, is used to provide long trouble-free service life. Carefully tested corona protection details are employed where necessary in the curtain. No dissimilar contacts, which have historically been the major cause of corrosion, exist anywhere in the tower structure or antenna curtains.

- **High Power – Able to handle 2 megawatt peak power (500 kw carrier power)**
- **High Power Gain – (over 20 dBi) provides high receive signal levels for good listening**
- **Slewable over ±23°**
- **Wide Frequency Bandwidth – 3–27 MHz**
- **Low VSWR – 1.5:1 max.**
- **Rugged Construction**
- **Easily and Quickly Installed**

Long Range Broadcast 528

Longer broadcast circuits (in excess of 1000 km) require high power and low take-off angles. The 528 has a frequency bandwidth of 6–27 MHz, is able to handle 250 kW of AM carrier power with 100% modulation, and provides a low take-off angle.

The 528 gives 20.7 dBi power gain which results in an effective radiated carrier power (ERP) of 29 million watts when used with a 250 kW transmitter. Extremely high signal levels occur at the receiving locations assuring high quality reception and listener satisfaction. Figure 1 shows received signal level contours resulting from a 528 and a 250 kW transmitter located in San Francisco. It can be seen that the 528 achieves a signal level of 0.56 mV/m, which is the CCIR minimum acceptable signal level, all the way to Recife, Brazil, a 10,300 km path.

The high true power gain of the 528 provides real economic value. This antenna provides 9 dBi gain more than most standard log-periodic antennas, allowing a reduction in required transmitter power for a given ERP with the attendant savings in acquisition cost and electricity charges. Increasing antenna gain by 9 dBi is equivalent to increasing the power of a 50 kW transmitter to 400 kW. The gain of the 528 is equivalent to that of a giant rhombic occupying twice as much land area.

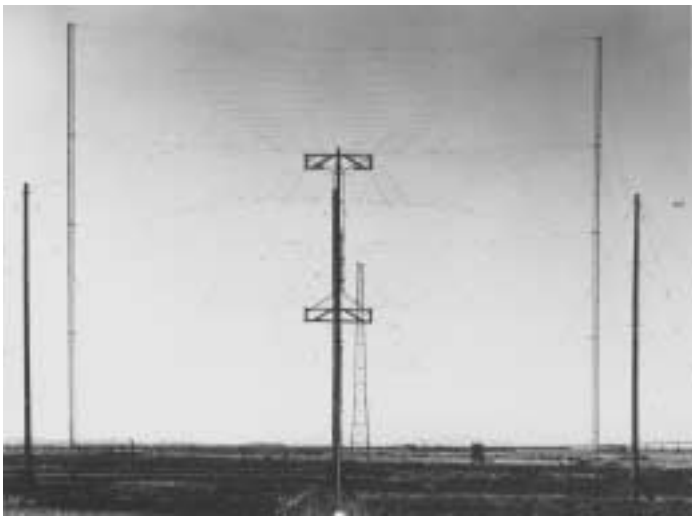
528S

The 528S is a higher powered slewable version of the 528. It can handle 300 kW carrier power at 100% modulation and can slew ±23°. It provides a gain of up to 22.2 dBi which results in an ERP of 50 million watts. One 528S can perform the function of three standard HRS 4/4/0.5 dipole curtain arrays. Receiving signal levels are shown in parentheses in Figure 1.

Medium Range Broadcast

For medium range broadcasting (700 km to 3000 km) moderate transmitter power and high take-off angles are required. Optimum for this application are the TCI Models 515 and 516 log-periodic antennas which can handle 100 kW carrier power with 100% modulation.

The 515 provides take-off angles of 30 to 45 degrees, and the 516 provides a take-off angle of 21 degrees for slightly longer paths. Both antennas have negligible side and back lobes, and low VSWR. These antennas are extremely efficient resulting in high ERP and received signal level.

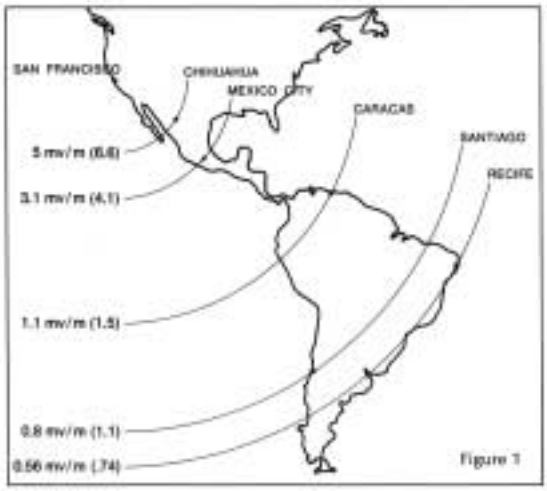


528 Antenna located in Belmont, Ca.,operating at 250kW with 100% modulation

Figure 2 shows the received signal level contours for a 516 antenna with a 100 kW transmitter located in San Francisco. With the 516, excellent reception (1 mV/m) occurs all the way to Mexico City.

Application Engineering

TCI has developed and demonstrated expertise in high power shortwave broadcast antennas. The 515, 516, and 528 have wide application for shortwave broadcasting and can be used in most projects. In those instances where the particular application requires a special solution, TCI can offer related antennas such as our curtain arrays or linear arrays and accessories such as compensated high power open wire transmission line assemblies.



Field strength contour (millivolts/meter) resulting from 528 antenna and 250 kW AM transmitter located in San Francisco. Data generated by ITS propagation analysis computer program. CCIR minimum acceptable signal level 0.56 mV/m. The values for the 528S with a 300 kW transmitter are shown in parentheses.

Field strength contour (millivolts/meter) resulting from 516 antenna and 100 kW transmitter located in San Francisco. Data generated by ITS propagation analysis computer program.

Specifications

MODEL 528

Polarization ..... Horizontal
VSWR..... 1.5:1 Maximum
Input Impedance..... 300 ohms Balanced
Power..... 250 kW AM Carrier (375 kW avg., 1000 kW Peak)
Side Lobe Level ..... Less than –14 dB
Front-to-Back Ratio .... 14 dB Minimum
Environmental Performance..... Designed in accordance with EIA Specification RS-222C for loading of 160 km/h (100 mi/h) wind (Higher environmental capability available upon request)

Size

Model Number	Frequency	Height ft.	Height mtr.	Length* ft.	Length* mtr.	Width* ft.	Width* mtr.
528-1	6–27MHz	245	79.4	600	183	650	198
528-2	9–27 MHz	183	55.6	430	131	500	152.4

Gain and Pattern Data

Freq.	Lower HPP	Take-Off Angle	Upper HPP	Azimuth Beamwidth	Gain
6 MHz	6.5°	13°	21°	33°	18.7 dBi
9 MHz	6°	12.5°	20°	33°	18.7 dBi
11 MHz	5.5°	12°	18.5°	32°	18.7 dBi
15 MHz	5°	11°	16.5°	32°	19.2 dBi
17 MHz	4.7°	10.5°	16°	31°	19.7 dBi
27 MHz	3°	7°	11°	31°	20.7 dBi

MODEL 528S

Polarization ..... Horizontal
VSWR..... 1.5:1 Maximum
Slew ..... ±23°
Input Impedance..... 300 ohms Balanced
Power..... 300 kW AM Carrier (450 kW avg., 1200 kW Peak)
Side Lobe Level ..... Less than –14 dB
Front-to-Back Ratio .... 14 dB Minimum
Environmental Performance..... Designed in accordance with EIA Specification RS-222C for loading of 160 km/h (100 mi/h) wind (Higher environmental capability available upon request)

Size

Model Number	Frequency	Height ft.	Height mtr.	Length* ft.	Length* mtr.	Width* ft.	Width* mtr.
528S-1	5.95-26 MHz	322	98	656	200	1050	320
528S-2	9–26 MHz	183	55.6	430	131	580	176
528S-3	6.8-26.1 MHz	268	82	527	161	893	273

Gain and Pattern Data

Freq.	Lower HPP	Take-Off Angle	Upper HPP	Azimuth Beamwidth	Gain
6 MHz	6.5°	13°	21°	24°	20.5 dBi
9 MHz	6°	12.5°	20°	24°	20.7 dBi
11 MHz	5.5°	12°	18.5°	24°	20.8 dBi
15 MHz	5°	11°	16.5°	24°	21.5 dBi
17 MHz	4.7°	10.5°	16°	24°	21.7 dBi
26 MHz	3°	7°	11°	24°	22.2 dBi

MODEL 515/516

Polarization ..... Horizontal
VSWR..... 2.0:1 Maximum
Input Impedance..... 300 ohms Balanced
Power..... –50 kW AM Carrier Power (75 kW avg., 200 kW Peak) or –100 kW AM Carrier Power (150 kW avg., 400 kW Peak) –250 kW AM Carrier Power (516 – 3A only)
Side Lobe Level ..... Less than –13 dB
Front-to-Back Ratio .... 14 dB Minimum
Environmental Performance..... Designed in accordance with EIA Specification RS-222C for loading of 160 km/h (100 mi/h) wind (Higher environmental capability available upon request)

Size

Model Number	Frequency	Height ft.	Height mtr.	Length* ft.	Length* mtr.	Width* ft.	Width* mtr.
515-2	4-9 MHz	165	50	432	132	410	125
515-3	3.9-18 MHz	121	36.9	333	102	362	110.5
515-4	3-20 MHz	141	43	378	115	502.5	153
516-2	3.9-17.9 MHz	225	68.6	476	145	497	151
516-3	5.95-17.9 MHz	145	44.2	352	107	381	116
516-4A	5.95-26.1 MHz	145	44.2	352	107	381	116

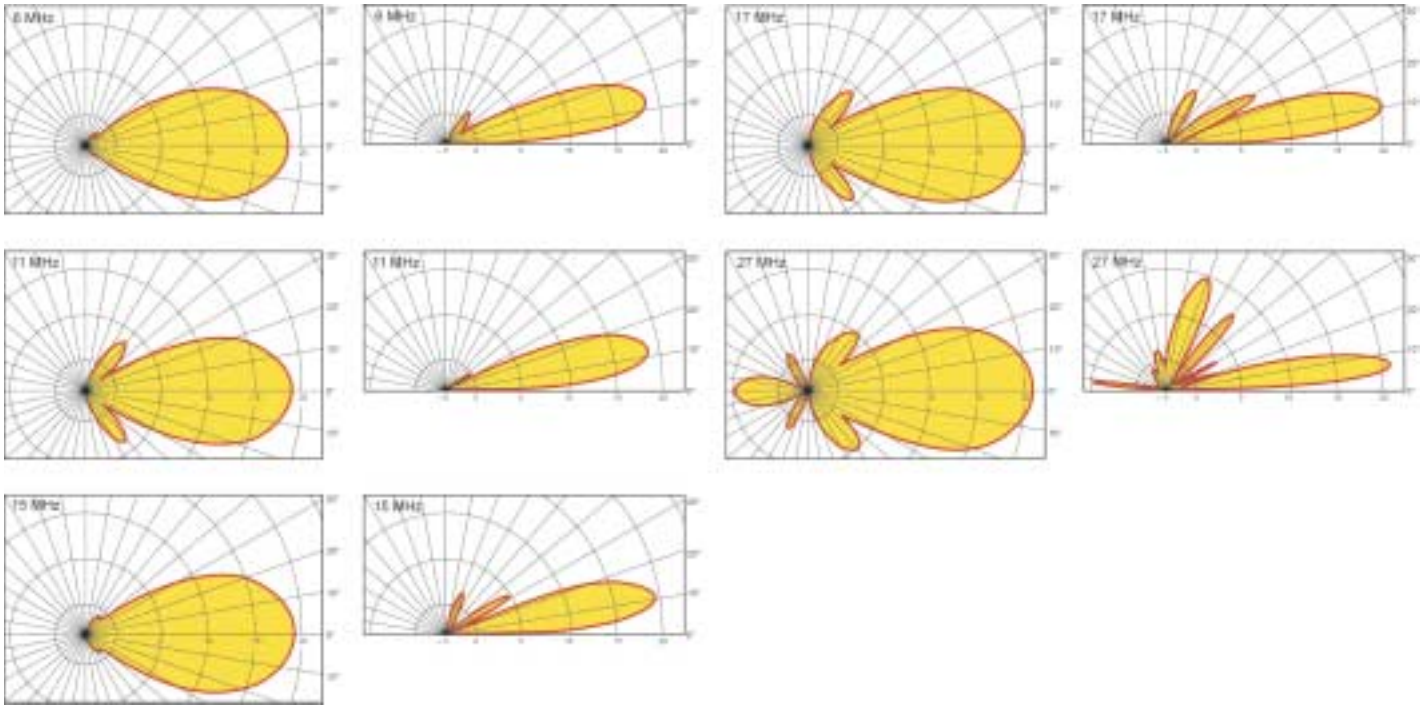
Gain and Pattern Data

Model	Lower HPP	Take-Off Angle	Upper HPP	Azimuth Beamwidth	Gain
515-2	15°	30°	42°	68°	12.5 dBi
515-3,4	20°	45°	74°	86°	12 dBi
516-2,3,3A	10°	21°	33°	68°	14.5 dBi

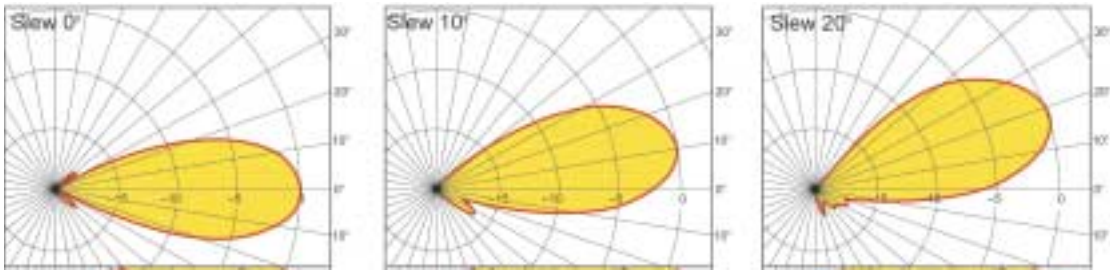
* Measured from extreme guy points.

Elevation and Azimuth Patterns (Azimuth pattern at elevation angle of beam maximum) gain in dBi

Model 528

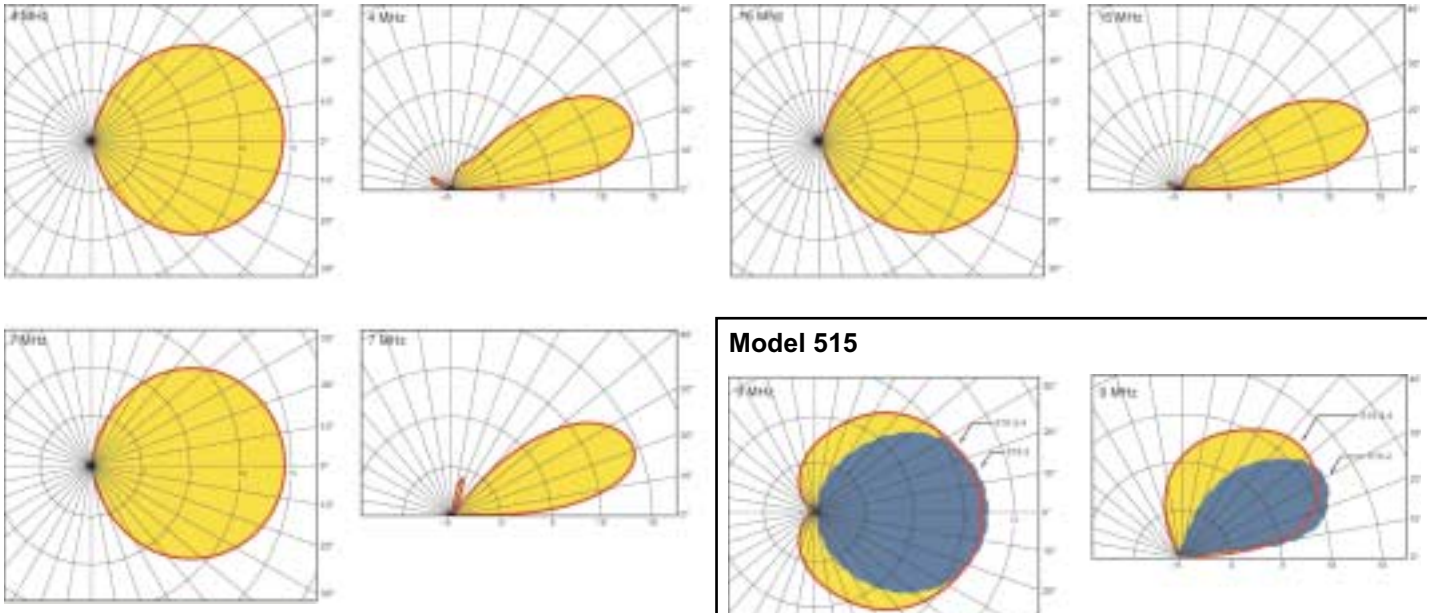


Model 528S



528S elevation patterns are indentical in shape to the patterns of the 528. The azimuth patterns at slew angles of 0°, 10°, and 20° are shown.

Model 516



Model 515

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