



101 Regency Parkway  
Mansfield, Texas 76063  
800 765 6518 toll free  
817 842 8000 office  
817 842 8100 fax

Master Meter Inc.  
March 2022

## **Coachella, CA Allegro Equipment Installation Specifications**

This document is intended to detail the information needed to for the installation of Master Meter's Allegro infrastructure. Master Meter's Allegro AMI system is a RF communication network that interfaces between a water utility and their customers. The system operates in the licensed 450MHz to 470 MHz frequency band.

The base station gathers the data from the meters at the water utility's customers and forwards the data to the Harmony server typically via a cellular network. Depending on the system design, a single Omni directional antenna or multiple directional antennas are added to the water utility's water towers or other structures which have a minimum height of 70 feet.

## Installation of Antennas on Existing Infrastructure

### City Hall Tower 90' (Base Station) 809 Orchard St

|            |   |
|------------|---|
| Latitude:  | <input type="text" value="33.679446°"/>   |
| Longitude: | <input type="text" value="-116.176705°"/> |

- Contractor will be responsible for installing new equipment supplied by Master Meter on specific tower designated and agreed upon by the municipality and Master Meter. (Figure 1)
- The working height ranges can be from approximately 90-100' above ground (varies upon infrastructure used). Antenna height will be agreed upon with Master Meter prior to installation.
- Contractor will be responsible for supplying all necessary brackets (material will vary on infrastructure being used. and installing antennas (supplied by Master Meter). For Master Meter contractors, mounting method to be pre-approved before installation.
- 1 Omni antenna (Appendix A) will be mounted on top of the water tank (mount type will vary on infrastructure used) with mast. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of the tower. (see Figure 2)
- Coax cable preferred is a Helix 7/8" AVA5-50 (Appendix B). Preferred cable for (2) 1/2" jumpers is LMR 400 (Appendix C).
- All 7/8" coax will be used for the long runs from jumper at top (connected to antenna) and jumper located at the base station (connect from drawer inside enclosure). All cables will be strapped, neatly run along the pole, and properly bonded at all termination points. Contractor will also provide support with strain relief for all cables at top of. (see Figure 3)
- Contractor will mount enclosure (supplied by Master Meter) inside building owned by utility. Contractor will be responsible for material for mounting enclosure for UPS (material varies per location). Typical material is UniStrut Channel (W 3-1/4, D 1-5/8). Location of enclosures will be determined by Master Meter technician on site. (see Figure 4)
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.

### **1.5 MG Reservoir Tank 50' (Base Station)**

Polk St

|            |   |
|------------|---|
| Latitude:  | <input type="text" value="33.714365°"/>   |
| Longitude: | <input type="text" value="-116.147803°"/> |

- Contractor will be responsible for installing new equipment supplied by Master Meter on specific tower designated and agreed upon by the municipality and Master Meter. (Figure 5)
- The working height ranges can be from approximately 50'-60' above ground (varies upon infrastructure used). Antenna height will be agreed upon with Master Meter prior to installation.
- Contractor will be responsible for supplying all necessary brackets (material will vary on infrastructure being used. and installing antennas (supplied by Master Meter). For Master Meter contractors, mounting method to be pre-approved before installation.
- 1 Omni antenna (Appendix A) will be mounted on top of the water tank (mount type will vary on infrastructure used) with mast. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of the tower. (see Figure 2)
- Coax cable preferred is a Heliac 7/8" AVA5-50 (Appendix B). Preferred cable for (2) 1/2" jumpers is LMR 400 (Appendix C).
- All 7/8" coax will be used for the long runs from jumper at top (connected to antenna) and jumper located at the base station (connect from drawer inside enclosure). All cables will be strapped, neatly run along the pole, and properly bonded at all termination points. Contractor will also provide support with strain relief for all cables at top of. (see Figure 3)
- Contractor will mount enclosure (supplied by Master Meter) inside building owned by utility. Contractor will be responsible for material for mounting enclosure for UPS (material varies per location). Typical material is UniStrut Channel (W 3-1/4, D 1-5/8). Location of enclosures will be determined by Master Meter technician on site. (see Figure 4)
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.



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### **Ave 52 Tower 100' (Base Station)**

Ave 52

|            |   |
|------------|---|
| Latitude:  | <input type="text" value="33.670663°"/>   |
| Longitude: | <input type="text" value="-116.157401°"/> |

- Contractor will be responsible for installing new equipment supplied by Master Meter on specific tower designated and agreed upon by the municipality and Master Meter. (Figure 6)
- The working height ranges can be from approximately 90-100' above ground (varies upon infrastructure used). Antenna height will be agreed upon with Master Meter prior to installation.
- Contractor will be responsible for supplying all necessary brackets (material will vary on infrastructure being used. and installing antennas (supplied by Master Meter). For Master Meter contractors, mounting method to be pre-approved before installation.
- 1 Omni antenna (Appendix A) will be mounted on top of the water tank (mount type will vary on infrastructure used) with mast. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of the tower. (see Figure 2)
- Coax cable preferred is a Helix 7/8" AVA5-50 (Appendix B). Preferred cable for (2) 1/2" jumpers is LMR 400 (Appendix C).
- All 7/8" coax will be used for the long runs from jumper at top (connected to antenna) and jumper located at the base station (connect from drawer inside enclosure). All cables will be strapped, neatly run along the pole, and properly bonded at all termination points. Contractor will also provide support with strain relief for all cables at top of. (see Figure 3)
- Contractor will mount enclosure (supplied by Master Meter) inside building owned by utility. Contractor will be responsible for material for mounting enclosure for UPS (material varies per location). Typical material is UniStrut Channel (W 3-1/4, D 1-5/8). Location of enclosures will be determined by Master Meter technician on site. (see Figure 4)
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.

**Rancho Las Flores Park Lights 80' (Repeater)**  
**48424 Van Buren St**

|            |              |
|------------|--------------|
| Latitude:  | 33.696382°   |
| Longitude: | -116.197154° |

- Contractor will be responsible for installing new equipment (1 Omni antenna (**Appendix B**) and 1 repeater (**Appendix E**)) supplied by Master Meter on field lights (**Figure 7**).
- The field light working height ranges from approximately from **80'** above ground. Contractor is responsible for all fall protection of its personnel.
- 1 Omni antenna (**Appendix B**) will be mounted on side or top with standoff bracket. Location will be determined by Master Meter technician on site. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of tank.
- Contractor will connect coax jumper w/connectors, approx. 90' (supplied by contractor) to repeater and mount at bottom of tank.
- Contractor will hard wire repeater to supplied power provided by city.
- Contractor will analyze installation and determine if modifications are to be made to optimize system.
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.

**Bagdouma Park 80' (Repeater)**  
**51782 Douma St**

|            |   |
|------------|---|
| Latitude:  | <input type="text" value="33.675238°"/>   |
| Longitude: | <input type="text" value="-116.189350°"/> |

- Contractor will be responsible for installing new equipment (1 Omni antenna (**Appendix B**) and 1 repeater (**Appendix E**)) supplied by Master Meter on field lights (**Figure 8**).
- The field light working height ranges from approximately from **80'** above ground. Contractor is responsible for all fall protection of its personnel.
- 1 Omni antenna (**Appendix B**) will be mounted on side or top with standoff bracket. Location will be determined by Master Meter technician on site. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of pole.
- Contractor will connect coax jumper w/connectors, approx. 90' (supplied by contractor) to repeater and mount at bottom of pole.
- Contractor will hard wire repeater to supplied power provided by city.
- Contractor will analyze installation and determine if modifications are to be made to optimize system.
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.



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### **Calhoun and Ave 50 50' (Repeater)**

Latitude:

Longitude:

- Contractor will be responsible for installing new equipment (1 Omni antenna (**Appendix B**) and 1 repeater (**Appendix E**)) supplied by Master Meter on field lights (**Figure 9**).
- The field light working height ranges from approximately from 40' -**50'** above ground. Contractor is responsible for all fall protection of its personnel.
- 1 Omni antenna (**Appendix B**) will be mounted on side or top with standoff bracket. Location will be determined by Master Meter technician on site. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of tower.
- Contractor will connect coax jumper w/connectors, approx. 60' (supplied by contractor) to repeater and mount at bottom of tower.
- Contractor will hard wire repeater to supplied power provided by city.
- Contractor will analyze installation and determine if modifications are to be made to optimize system.
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.



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### **Shady Lane and Ave 53 50' (Repeater)**

Latitude:

Longitude:

- Contractor will be responsible for installing new equipment (1 Omni antenna (**Appendix B**) and 1 repeater (**Appendix E**)) supplied by Master Meter on field lights (**Figure 10**).
- The field light working height ranges from approximately from **40'-50'** above ground. Contractor is responsible for all fall protection of its personnel.
- 1 Omni antenna (**Appendix B**) will be mounted on side or top with standoff bracket. Location will be determined by Master Meter technician on site. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of tower.
- Contractor will connect coax jumper w/connectors, approx. 60' (supplied by contractor) to repeater and mount at bottom of tower.
- Contractor will hard wire repeater to supplied power provided by city.
- Contractor will analyze installation and determine if modifications are to be made to optimize system.
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.





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### **Tot Lot Park 50' (Repeater)**

84739 Ave 53

|            |              |
|------------|--------------|
| Latitude:  | 33.663654°   |
| Longitude: | -116.186052° |

- Contractor will be responsible for installing new equipment (1 Omni antenna (**Appendix B**) and 1 repeater (**Appendix E**)) supplied by Master Meter on field lights (**Figure 11**).
- The field light working height ranges from approximately from **40-50'** above ground. Contractor is responsible for all fall protection of its personnel.
- 1 Omni antenna (**Appendix B**) will be mounted on side or top with standoff bracket. Location will be determined by Master Meter technician on site. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of tower.
- Contractor will connect coax jumper w/connectors, approx. 60' (supplied by contractor) to repeater and mount at bottom of tower.
- Contractor will hard wire repeater to supplied power provided by city.
- Contractor will analyze installation and determine if modifications are to be made to optimize system.
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.



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### **Well 19 50' (Repeater)**

83043 El Greco Ave

|            |   |
|------------|---|
| Latitude:  | <input type="text" value="33.698082°"/>   |
| Longitude: | <input type="text" value="-116.215948°"/> |

- Contractor will be responsible for installing new equipment (1 Omni antenna (**Appendix B**) and 1 repeater (**Appendix E**)) supplied by Master Meter on field lights (**Figure 12**).
- The field light working height ranges from approximately from **40-50'** above ground. Contractor is responsible for all fall protection of its personnel.
- 1 Omni antenna (**Appendix B**) will be mounted on side or top with standoff bracket. Location will be determined by Master Meter technician on site. Maximum height will vary depending on accessibility. This antenna is utilized to receive all meters directly within range of tower.
- Contractor will connect coax jumper w/connectors, approx. 60' (supplied by contractor) to repeater and mount at bottom of tower.
- Contractor will hard wire repeater to supplied power provided by city.
- Contractor will analyze installation and determine if modifications are to be made to optimize system.
- Contractor will be responsible for meeting all safety and construction requirements for the installation, including all grounding and weather proofing of coax at connection points.
- Contractor will perform sweep test once new antenna is installed and connected.
- Contractor will supply closeout photos of project.



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### **Calhoun and San Ignacio 35' (Repeater)**

49330 Calhoun St

Latitude: 33.695228°

Longitude: -116.207734°

- Utility will be responsible for installing new equipment (1 Photocell Repeater) (**Appendix C**) supplied by Master Meter on streetlights (**Figure 13**).
- The streetlight working height ranges from approximately from **40-50'** above ground. Utility is responsible for all fall protection of its personnel.
- Utility will remove the existing photocell by twisting counterclockwise, unlocking the plug from the receptacle.
- Align the tallest and widest prong (neutral) at the center of the Allegro photocell repeater plug with the widest socket in the receptacle. Firmly insert the plug into the receptacle
- Twist the Allegro photocell repeater clockwise, until the Allegro photocell repeater stops moving and is securely locked and the bottom of the NEMA is even with the top of the receptacle
- This antenna is utilized to receive all meters directly within range of tower.
- Utility will be responsible for meeting all safety and construction requirements for the installation.
- Once power is supplied, tech will program and sync to base station
- Tech will perform sweep test once new antenna is installed and connected.
- Tech will supply closeout of project photos.

*Figure 1*



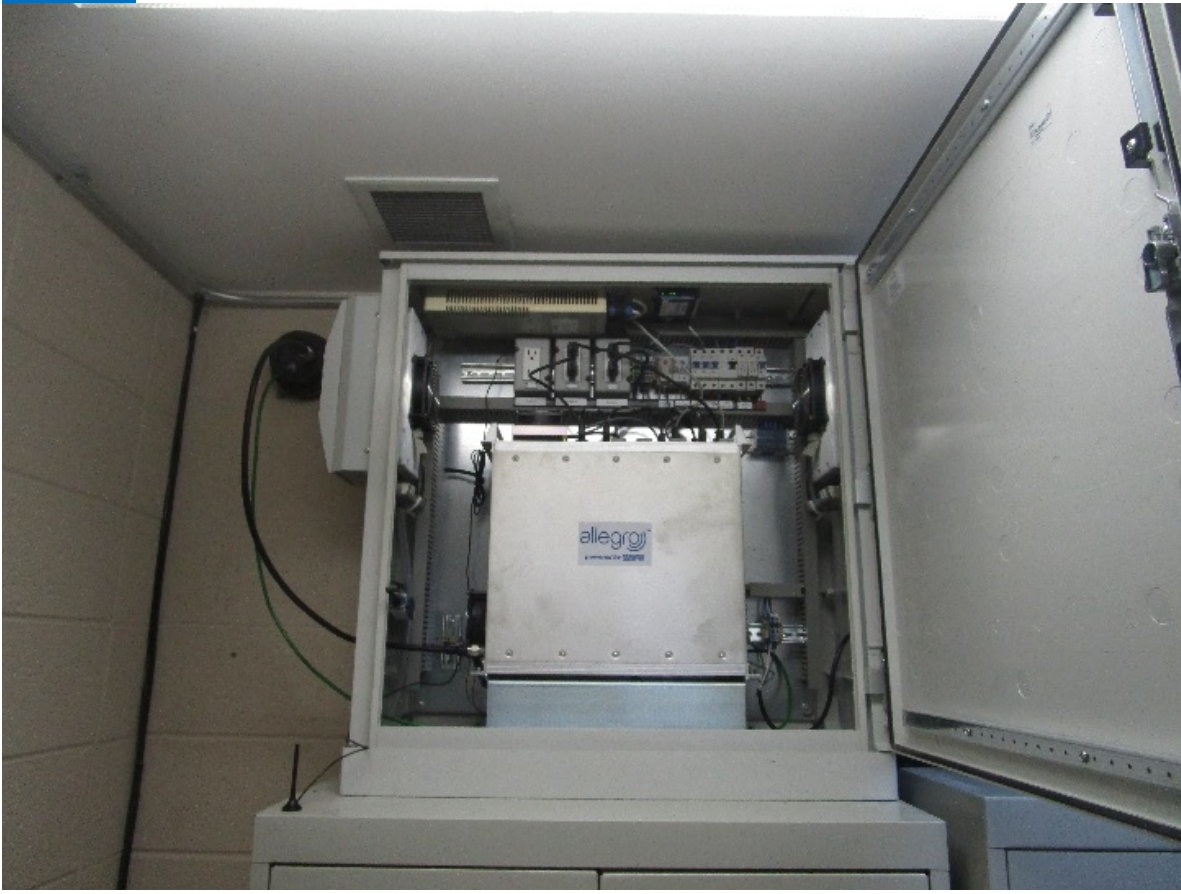
*Figure 2*



*Figure 3*



*Figure 4*



*Figure 5*





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*Figure 6*



Figure 7



*Figure 8*



***Figure 9***



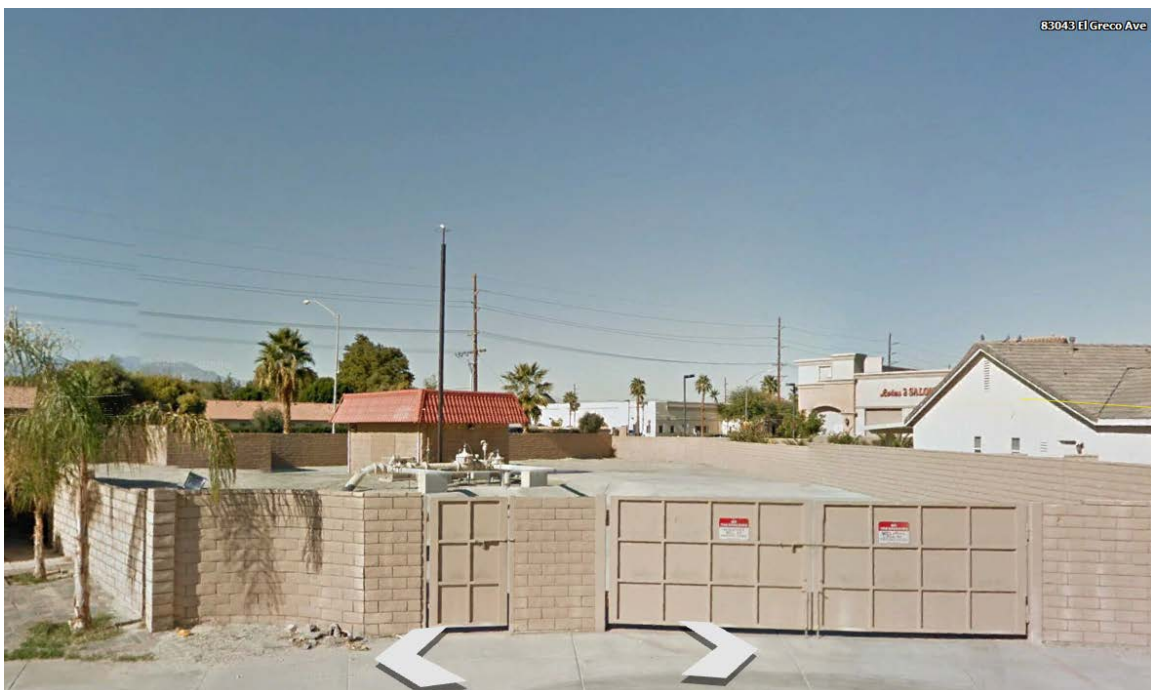
***Figure 10***



***Figure 11***



***Figure 12***



*Figure 13*



# Appendix A

4220.09-445-Txx



## 9 dBd HD omni antenna 420-470MHz, low PIM

### DESCRIPTION

The 4220 Series omni antenna is designed for demanding applications where a durable and high performance colinear is required. The centre fed dipole design and feed network gives a stable radiation pattern across a wide bandwidth, and allows tilted beam designs to be effectively employed without large pattern distortions. High quality materials and manufacturing techniques are employed to ensure that the antenna has excellent intermodulation performance & wide bandwidth characteristics for multi-channel trunked radio communication systems. The antenna has been designed to withstand lightning strike.  
 \* Former Skymast brand product.

### SPECIFICATIONS

| Electrical                     |  |
|--------------------------------|--|
| Frequency                      | 420 - 470 MHz  |
| Omni Deviation                 | < ± 1 dB   |
| 3 dB Beamwidth, H-Plane        | Omnidirectional  |
| Polarisation                   | Vertical   |
| Peak Instantaneous Power (PIP) | 25 kW  |
| 3 dB Beamwidth, E-Plane        | 8° ± 1°  |
| Impedance                      | 50 Ω   |
| Gain                           | 8.7 dBd (10.9 dBi)   |
| SWR                            | < 1.5:1  |
| Maximum Input Power            | 300 W  |
| Passive Intermodulation        | -15dBc (3rd Order, 2 x Tx @ 43dBm)   |
| Lightning Protection           | Lightning current handling capability: 200 kA According to EN 62305-1 (Test pulse 10/350 µs) |
| Antistatic Protection          | All metal parts DC-grounded (Connector shows a DC-short)                                     |

| Mechanical       |   |
|------------------|---|
| Connection(s)    | 7/16(f)   |
| Materials        | Antenna Base: Aluminium<br>Shroud: GFR tube 53mm dia. |
| Mounting Section | Al. tube 63.5mm dia. x 350mm long                     |
| Dimensions       | 5360mm (l) x 53mm (dia.)                              |
| Wind Load        | 417 N (160km/h)                                       |
| Weight           | 13 kg / 28.66 lb                                      |
| Mounting Bracket | 2141.01.00.00 (up to ø120mm)<br>(Ordered Separately)  |
|                  | ETC-250 (ø50 to ø76mm)<br>(Ordered Separately)        |

| Environmental       |          |
|---------------------|----------|
| Survival Wind Speed | 300 km/h |
| Ingress Protection  | IP56     |

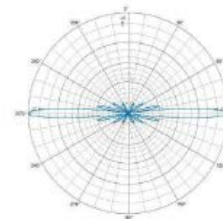
### ORDERING

| Type  | Product No.    | Description        | Frequency     |
|---|----------------|--------------------|---------------|
| 9 dBd HD omni antenna 420-470MHz, low PIM         | 4220.09-445-T0 | 0° Electrical Tilt | 420 - 470 MHz |
| 9 dBd HD omni antenna 420-470MHz, low PIM         | 4220.09-445-T6 | 6° Electrical Tilt | 420 - 470 MHz |
| Galvanised steel parallel bracket 38-120mm (PAIR) | 2141.01.00.00  |                    |               |
| Extruded Parallel Tube Clamp, 50 - 76mm           | ETC-250        |                    |               |



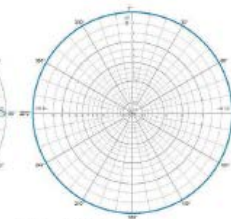
### DIAGRAM

#### RADIATION PATTERNS



E-Plane | 445 MHz

#### RADIATION PATTERNS



H-Plane | 445 MHz

## Appendix B

S.C3B-460 

### Broadband 3db glassfibre colinear 450-470MHz

#### DESCRIPTION

A rugged and durable UHF colinear antenna designed for Telemetry, Paging and PMRF Trunked Radio applications. Housed inside a high-strength glass fibre shroud, the antenna includes an integrated mounting clamp allowing easy installation on poles or horizontal rails. The robust antenna design ensures reliable operation in harsh environmental conditions.  
 • Former Skymasts brand product.

#### SPECIFICATIONS

| Electrical              |  |
|-------------------------|--|
| Frequency               | 450 - 470 MHz  |
| Max. Input Power        | 100 W  |
| Omni Deviation          | < ± 0.5 dB   |
| Polarisation            | Vertical   |
| 3 dB Beamwidth, E-Plane | 33 °   |
| 3 dB Beamwidth, H-Plane | Omnidirectional  |
| Impedance               | 50 Ω   |
| Gain                    | 3 dBd (5.2 dBi)  |
| VSWR                    | < 1.5:1  |
| Antistatic Protection   | All metal parts DC-grounded (Connector shows a DC-short) |

| Mechanical               |  |
|--------------------------|--|
| Radiating Element(s)     | 11 mm dia brass tube   |
| Connection(s)            | N(f) on 500mm RG213/U cable  |
| Radiator Feed            | PTFE dielectric coaxial cable  |
| Radome Material / Colour | GRP tube grey, 26mm dia.   |
| Length                   | 1300 mm / 51.18 in.  |
| Wind Load                | 90 N (160km/h)   |
| Corrosion Protection     | Black anodise  |
| Weight                   | 0.7 kg / 1.54 lb   |
| Mounting                 | Integral mounting clamp to fit 38 - 50 mm dia. pipe or horizontal rail |

#### ORDERING

| Model  | Product No. | Frequency     |
|--|-------------|---------------|
| Broadband 3db glassfibre colinear 450-470MHz | S.C3B-460   | 450 - 470 MHz |



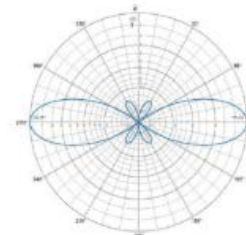
#### DIAGRAM

##### MOUNTING & DIAGRAMS



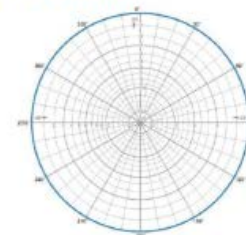
Antenna Mounting

##### RADIATION PATTERNS



E-Plane | 460 MHz

##### RADIATION PATTERNS



H-Plane | 460 MHz



## Appendix C

### Product Specifications

COMMScope®

POWERED BY 



**AVA5-50FX**  
 AVA5-50FX, HELIAX® Andrew Virtual Air™ Coaxial Cable, corrugated copper, 7/8 in, black PE jacket

#### Construction Materials

|                          |                   |
|--------------------------|-------------------|
| Jacket Material          | PE                |
| Outer Conductor Material | Corrugated copper |
| Dielectric Material      | Foam PE           |
| Flexibility              | Standard          |
| Inner Conductor Material | Copper            |
| Jacket Color             | Black             |

#### Dimensions

|                          |                        |
|--------------------------|------------------------|
| Nominal Size             | 7/8 in                 |
| Cable Weight             | 0.29 lb/ft   0.43 kg/m |
| Diameter Over Dielectric | 24.130 mm   0.950 in   |
| Diameter Over Jacket     | 27.991 mm   1.102 in   |
| Inner Conductor OD       | 9.4488 mm   0.3720 in  |
| Outer Conductor OD       | 25.400 mm   1.000 in   |

#### Electrical Specifications

|                                 |                                |
|---------------------------------|--------------------------------|
| Cable Impedance                 | 50 ohm ±1 ohm                  |
| Capacitance                     | 22.0 pF/ft   73.0 pF/m         |
| dc Resistance, Inner Conductor  | 0.825 ohms/kft   2.888 ohms/km |
| dc Resistance, Outer Conductor  | 0.400 ohms/kft   1.313 ohms/km |
| dc Test Voltage                 | 6000 V                         |
| Inductance                      | 0.184 µH/m   0.056 µH/ft       |
| Insulation Resistance           | 100000 Mohms*km                |
| Jacket Spark Test Voltage (rms) | 8000 V                         |
| Operating Frequency Band        | 1 – 5000 MHz                   |
| Peak Power                      | 91.0 kW                        |
| Velocity                        | 90%                            |

#### Environmental Specifications

|                          |                                      |
|--------------------------|--------------------------------------|
| Installation Temperature | -40 °C to +60 °C (-40 °F to +140 °F) |
| Operating Temperature    | -55 °C to +70 °C (-67 °F to +158 °F) |
| Storage Temperature      | -70 °C to +70 °C (-94 °F to +158 °F) |

# Appendix D

LMR-400

**7 TIMES** MICROWAVE SYSTEMS

**LMR™-400**  
**Flexible Low Loss Communications Coax**

**Ideal for...**

- Drop-in replacement for RG-8/9913 Air-Dielectric type Cable
- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs
- Any application (e.g. WLL, GPS, LMR, WLAN, WISP, WiMax, SCADA, Mobile Antennas) requiring an easily routed, low loss RF cable

• LMR™ standard is a UV Resistant Polyethylene jacketed cable designed for 20-year service outdoor use. The bending and handling characteristics are significantly better than air-dielectric and corrugated hard-line cables.

• LMR™ DB is identical to standard LMR plus has the advantage of being watertight. The addition of waterproofing compound in and around the foil braid insures continuous reliable service should the jacket be inadvertently damaged during installation or in the future.

• LMR™ FR is a non-halogen (non-toxic), low smoke, fire retardant cable designed for in-building runs that can be routed anywhere except air handling plenums. LMR-FR is UL/NEC & CSA rated CMR and FT4 respectively, meets FAA FAR25 requirements and is MSHA-P for mining applications.


• LMR™ FR-PVC is a general-purpose indoor cable and has a UL/NEC & CSA rating of CMR and FT4 respectively. It is less expensive than LMR-FR, however it emits toxic fumes (HCL) and greater smoke density when burned.

• LMR™ PVC is designed for low loss general-purpose applications and is somewhat more flexible than the standard polyethylene jacketed LMR.

• LMR™ PVC-W is a white-jacketed version of LMR-PVC for marine and other applications where color compatibility is desired.

• Flexibility and bendability are hallmarks of the LMR-400 cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.

• Low Loss is another hallmark feature of LMR-400.



**Mechanical Specifications**

| Performance Property       | Units          | US    | US (metric) |
|----------------------------|----------------|-------|-------------|
| Bend Radius - Installation | in. (mm)       | 1.00  | (25.4)      |
| Bend Radius - repeated     | in. (mm)       | 4.0   | (101.6)     |
| Bending Moment             | ft-lb (N-m)    | 0.5   | (0.68)      |
| Weight                     | lb/ft (kg/m)   | 0.069 | (0.10)      |
| Tensile Strength           | lb (kg)        | 160   | (72.6)      |
| Flat Plate Crush           | lb/in. (kg/mm) | 40    | (0.71)      |

**Environmental Specifications**

| Performance Property           | °F          | °C         |
|--------------------------------|-------------|------------|
| Installation Temperature Range | -40 to +115 | -40 to +45 |
| Storage Temperature Range      | -64 to +115 | -75 to +45 |
| Operating Temperature Range    | -40 to +115 | -40 to +45 |

**7 TIMES** MICROWAVE SYSTEMS

**LMR™-400**

**Electrical Specifications**

| Performance Property    | Units            | US    | US (metric) |
|-------------------------|------------------|-------|-------------|
| Velocity of Propagation | %                | 85    |             |
| Dielectric Constant     | N/A              | 1.34  |             |
| Time Delay              | nS/ft (nS/m)     | 1.30  | (3.82)      |
| Impedance               | ohms             | 50    |             |
| Capacitance             | pF/ft (pF/m)     | 23.9  | (78.4)      |
| Inductance              | uH/ft (uH/m)     | 0.060 | (0.20)      |
| Shielding Effectiveness | dB               | -90   |             |
| DC Resistance           |                  |       |             |
| Inner Conductor         | ohms/1000ft (km) | 1.38  | (4.8)       |
| Outer Conductor         | ohms/1000ft (km) | 1.85  | (5.4)       |
| Voltage Withstand       | Volts DC         | 2500  |             |
| Jacket Spark            | Volts RMS        | 8000  |             |
| Peak Power              | kW               | 16    |             |

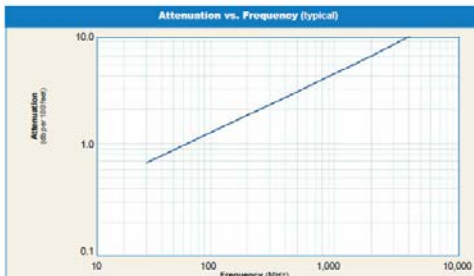
**Part Description**

| Part Number    | Application             | Jacket Color | Code  |
|----------------|-------------------------|--------------|-------|
| LMR-400        | Outdoor                 | PE Black     | 54001 |
| LMR-400-DB     | Outdoor/Watertight      | PE Black     | 54001 |
| LMR-400-FR     | Indoor/Outdoor/Fire CMR | FR/PE Black  | 54030 |
| LMR-400-FR-PVC | Indoor/Outdoor/Fire CMR | FR/PVC Black | 54075 |
| LMR-400-PVC    | General Purpose         | PVC Black    | 54218 |
| LMR-400-PVC-W  | General Purpose         | PVC White    | 54204 |

**Construction Specifications**

| Description     | Material          | in. (mm)      |
|-----------------|-------------------|---------------|
| Inner Conductor | Galv. BCCAl       | 0.108 (2.74)  |
| Dielectric      | Foam PE           | 0.288 (7.34)  |
| Outer Conductor | Aluminum Tape     | 0.281 (7.38)  |
| Overall Braid   | Tinned Copper     | 0.300 (8.13)  |
| Jacket          | (see table above) | 0.405 (10.29) |

**Attenuation vs. Frequency (typical)**



| Frequency (MHz)       | 30   | 50   | 150  | 200  | 400  | 900  | 1500 | 1800 | 2000 | 2500 | 6000 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|
| Attenuation dB/100 ft | 0.7  | 0.9  | 1.5  | 1.9  | 2.7  | 3.9  | 5.1  | 5.7  | 6.0  | 6.6  | 10.8 |
| Attenuation dB/100 m  | 2.2  | 2.9  | 5.0  | 6.1  | 8.0  | 12.8 | 16.6 | 18.6 | 19.6 | 22.2 | 36.5 |
| Avg. Power kW         | 3.33 | 2.57 | 1.47 | 1.20 | 0.83 | 0.58 | 0.44 | 0.40 | 0.37 | 0.33 | 0.21 |

**Calculate Attenuation =**  
 $(0.122260) \cdot \sqrt{F(\text{MHz})} + (0.002293) \cdot F(\text{MHz})$  (interactive calculator available at [http://www.timesmicrowave.com/cable\\_calculator/](http://www.timesmicrowave.com/cable_calculator/))  
 Attenuation:  
 VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading  
 Power:

LMR-400

Visit our Web Site: [www.mastermeter.com](http://www.mastermeter.com)

## Appendix E



**For any further questions, please contact:  
Charlie Montelongo  
AMR Project Coordinator  
Master Meter Inc.  
817.888.0534**