Shielding Effectiveness

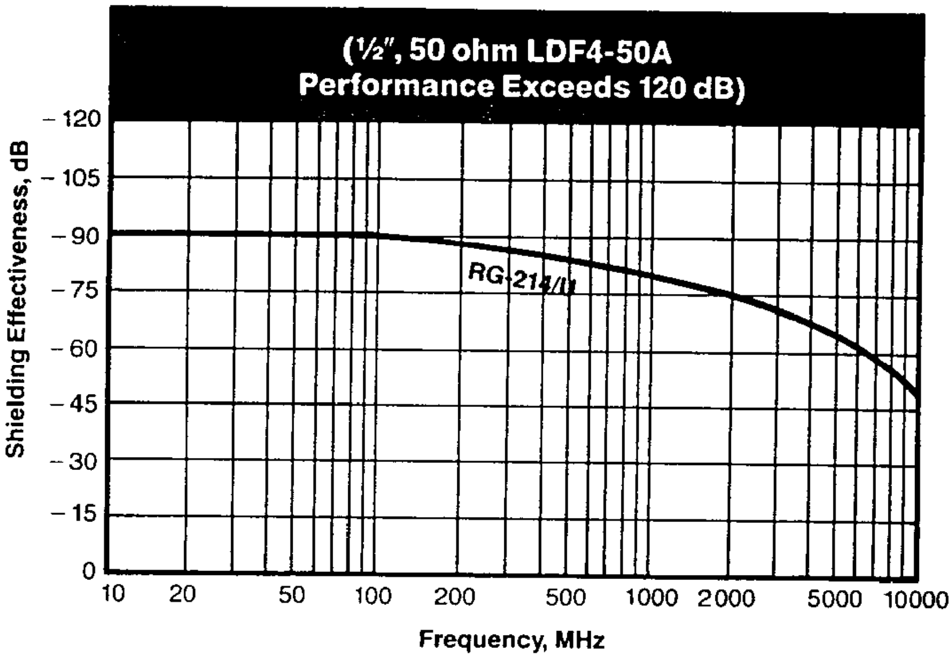
There are many coaxial cable applications where proper shielding is of special concern -- in equipment racks, transmit combiners or wherever there are several cables or connectors in close proximity. But, in *military* systems, signal leakage into or out of a cable can be fatal to the system. How well individual components are shielded can determine whether or not the system will provide consistent quality performance.

Poor cable shielding can result in unwanted signals entering the system, causing noise or, in the case of EMP, damage to the system. Signals leaking out of the cable can cause interference with other components and allow interception and detection of the spurious emissions.

The following pages explain transfer impedance and shielding effectiveness and provide data for HELIAX® cables and cable assemblies.

HELIAX coaxial cables and coaxial cable assemblies have excellent shielding characteristics. HELIAX cables have very low transfer impedances making them the choice where RFI and EMI shielding is needed. HELIAX connectors complement HELIAX cables by providing excellent shielding effectiveness at the critical connector-to-cable and connector-to-connector interfaces.

Shown below is a comparison of RG214 to Andrew Type LDF4-50A HELIAX® coaxial cable demonstrating the significant difference between HELIAX coaxial cable and the common RG braided type coaxial cables.



Transfer Impedance

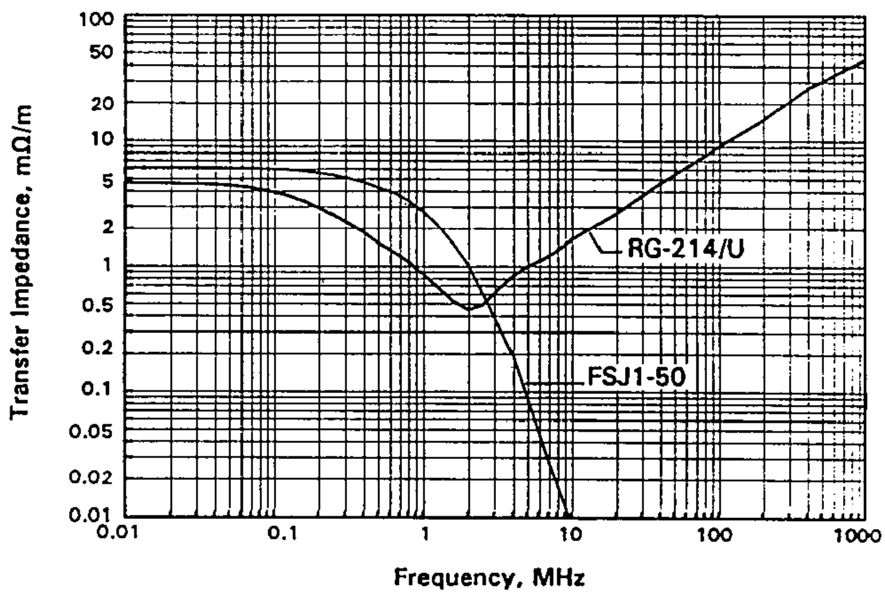
Transfer impedance, sometimes called surface transfer impedance, is the most consistent way of measuring and comparing shielding effectiveness. Transfer impedance is defined by the following equation:

$$Z_t = \left(\frac{1}{I}\right) \cdot \left(\frac{dV_t}{dz}\right)$$

Where Z_t is the surface transfer impedance; I is the interference current in the shield; and dV_t is the voltage generated by the current I on the dz length of the shield, and measured on the opposite side of the shield from the current I return path.

The chart compares the measured surface transfer impedance of Andrew Type FSJ1-50 with that of RG-214/U.

Surface Transfer Impedance



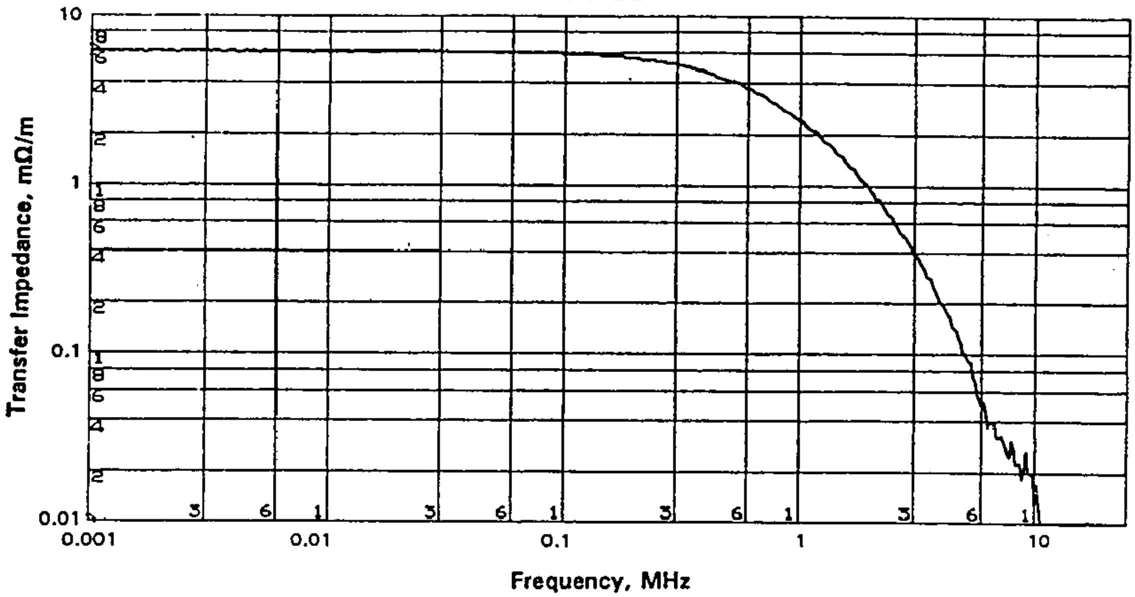
Because RG-214/U has a lower dc resistance than FSJ1-50, it has a slightly lower surface transfer impedance at the lower frequencies. However, as frequency increases above 2 MHz, the transfer impedance of FSJ1-50 dramatically decreases below measurement sensitivity while RG-214/U increases to well beyond its initial value. This is because of the holes between the braid wires in the RG-214/U shield.

It is desirable to have the lowest possible surface transfer impedance so that the potential for coupling or introducing unwanted signals into the cable is minimized.

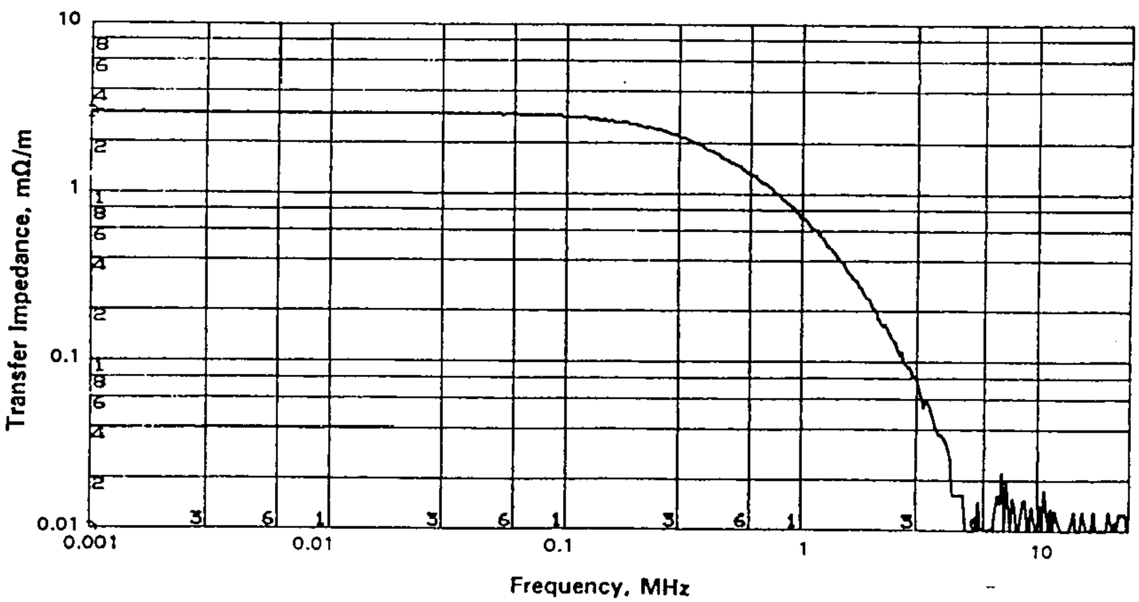
The following three pages show the measured surface transfer impedance of several Andrew HELIAX® foam-dielectric cables.

Transfer Impedance Test Results

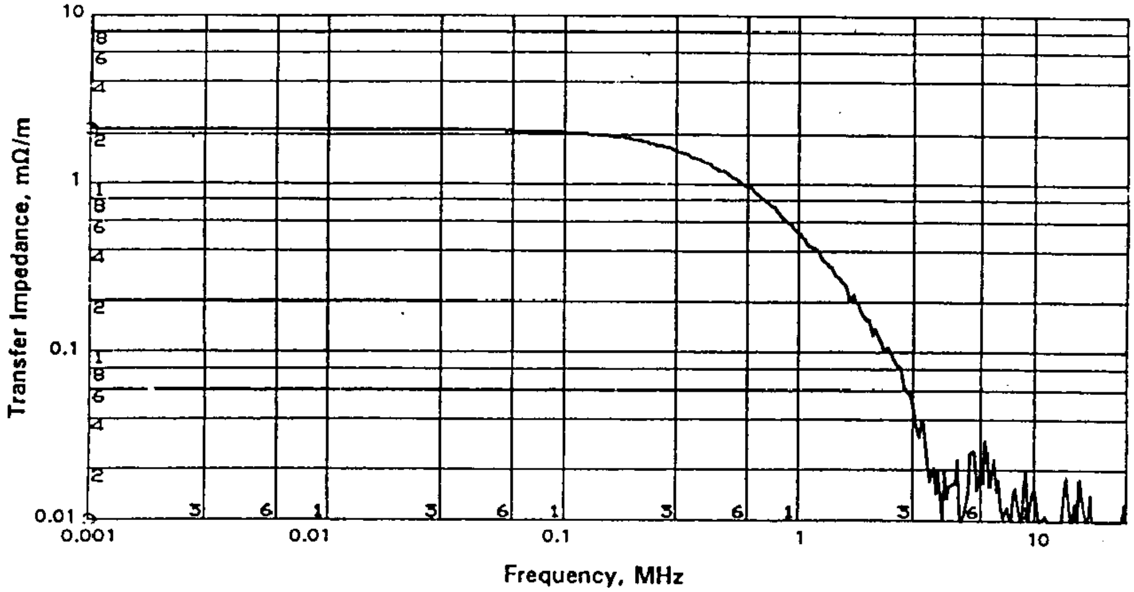
FSJ1-50



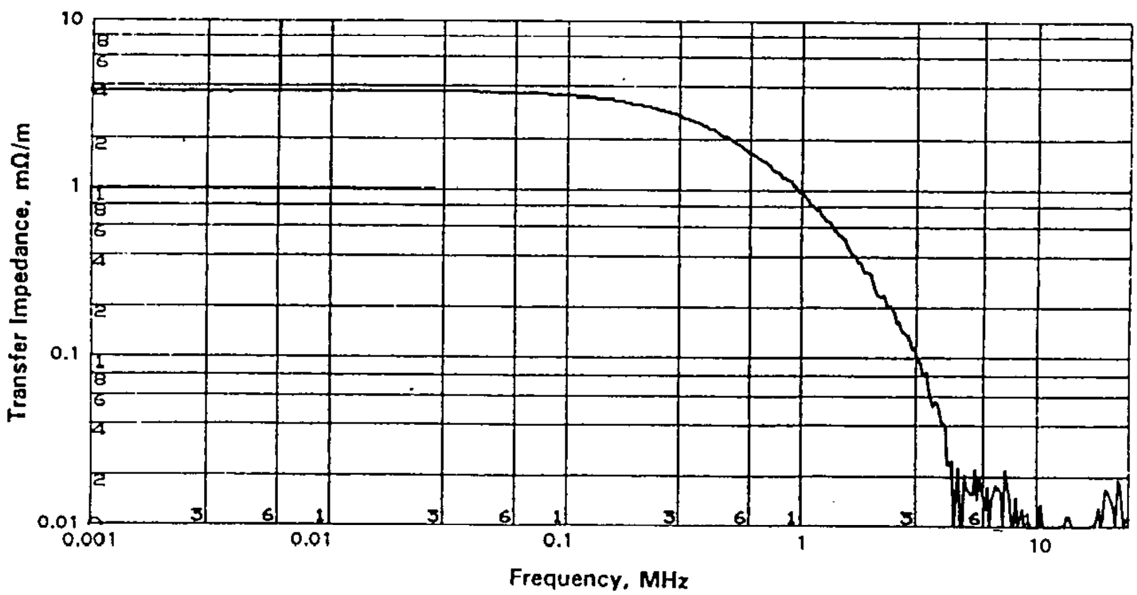
LDF2-50



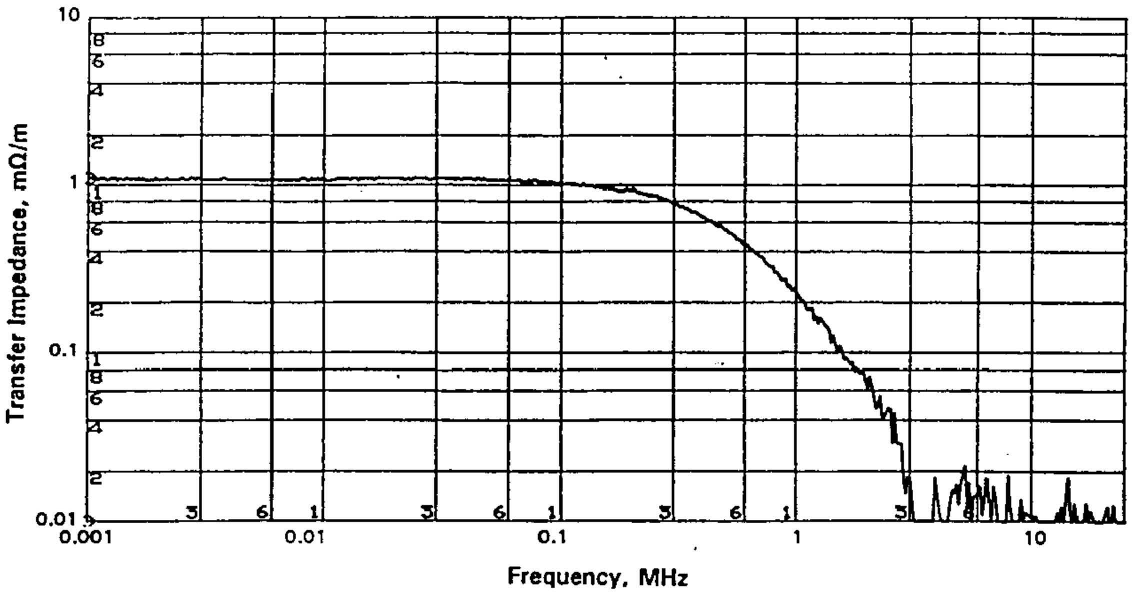
LDF4-50A



FSJ4-50B



LDF5-50A



Connector Shielding Effectiveness

Connector shielding effectiveness (expressed in dB) is the ratio of the RF leakage signal to the RF input signal. Two mated connectors are measured and the shielding effectiveness specified is for the pair.

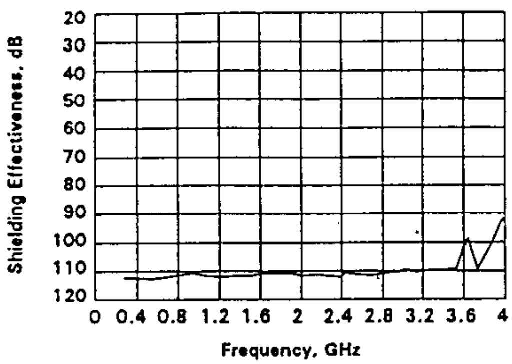
The two main contributors to RF signal leakage are the connector-to-connector interface and the connector-to-cable interface. Since standardized interfaces determine the connector-to-connector leakage, the major variable in shielding effectiveness is the connector-to-cable interface. This is where HELIAX® connectors excel.

The following two pages show the measured shielding effectiveness of a representative sample of mated pairs of Andrew HELIAX connectors.

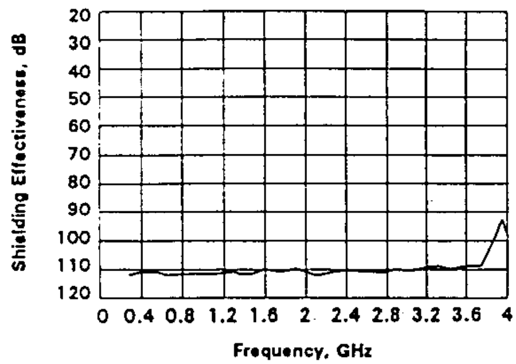
Note: All of the curves show measured results that are in the 110 dB range. 110 dB is the sensitivity limit of the test equipment and actual performance is better.

Connector Shielding Effectiveness Test Results

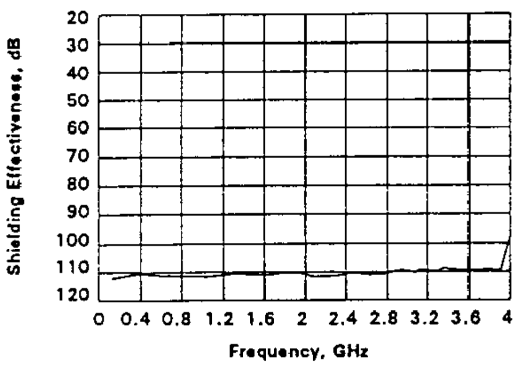
Mated 41ENT and 41EWT, TNC Connectors
FSJ1-50 Cable



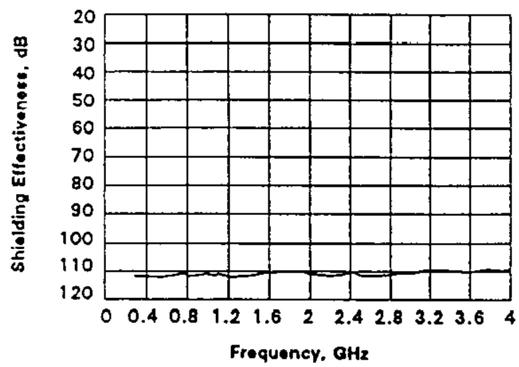
Mated 41N and 41W, Type N Connectors
FSJ1-50 Cable



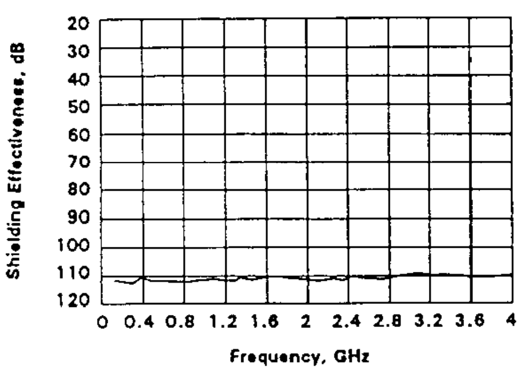
Mated 41P and 41U, UHF Connectors
FSJ1-50 Cable



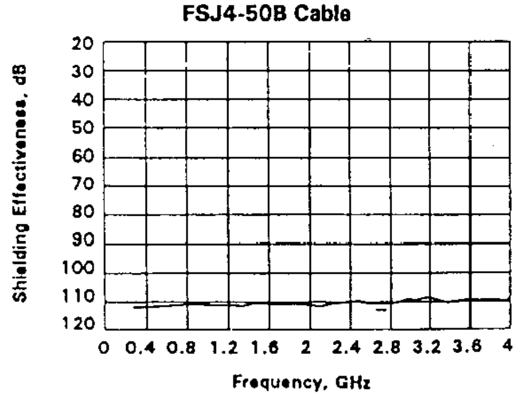
Mated 44ASR and 44ASR, 7/8"EIA Connectors
FSJ4-50B Cable



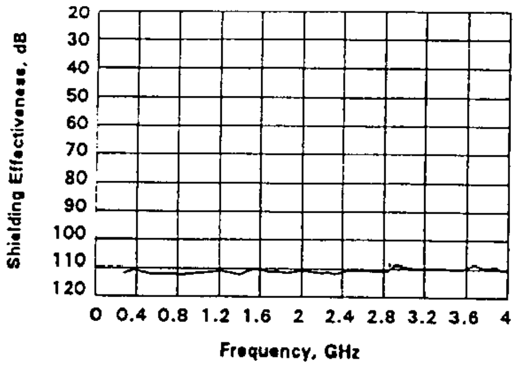
Mated 44ASP and 44ASU UHF Connectors
FSJ4-50B Cable



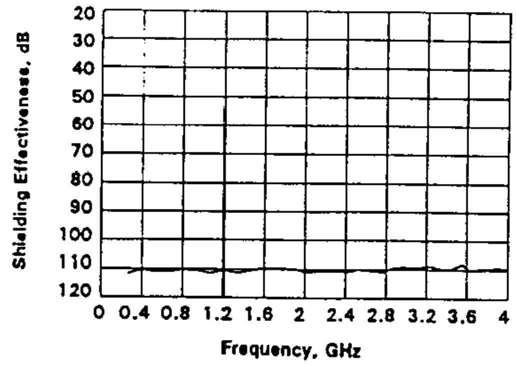
Mated 44ASN and 44ASW, Type N Connectors
FSJ4-50B Cable



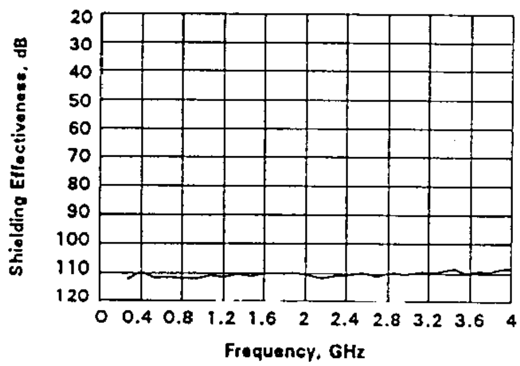
Mated L44R and L44R, 7/8" EIA Connectors
LDF4-50A Cable



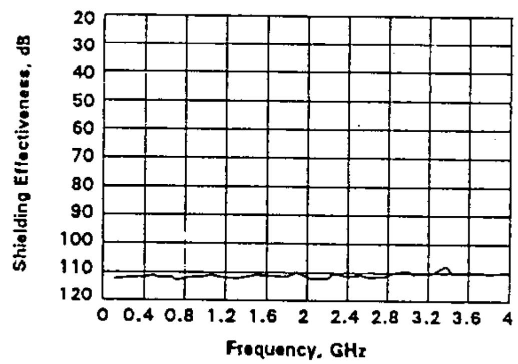
Mated L44P and L44U, UHF Connectors
LDF4-50A Cable



Mated L44W and L44N, Type N Connectors
LDF4-50A Cable



Mated L44DF and L44DM, 7/16 DIN Connectors
LDF4-50A Cable



Mated L45L and L45M, LC Connectors
LDF5-50A Cable