

# Wire Procurement and Quality Control for the BABAR Drift Chamber

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## Wire Types

The drift chamber is  $2.76 \text{ m} = 9.2 \text{ ft}$  long.

Order twice nominal length to allow for loss during stringing.

1. 7104 sense wires,  $20\text{-}\mu\text{m}$  gold-plated tungsten; as stiff as possible for ease of insertion into crimp pins.

Order 150,000 ft.

Vendor: Thermionic Products.

2. 14,208 field wires,  $120\text{-}\mu\text{m}$  gold-plated aluminum.

Order 300,000 ft (change diamond dies every 10,000 ft).

Vendor: California Fine Wire.

3. 7,456 clearing wires,  $80\text{-}\mu\text{m}$  gold-plated aluminum.

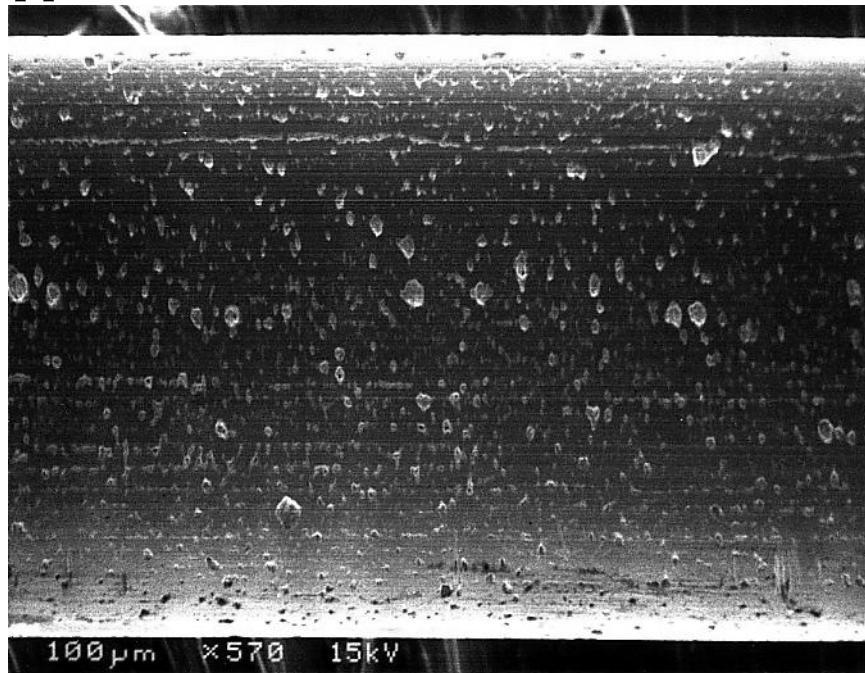
Order 150,000 ft.

Vendor: California Fine Wire.

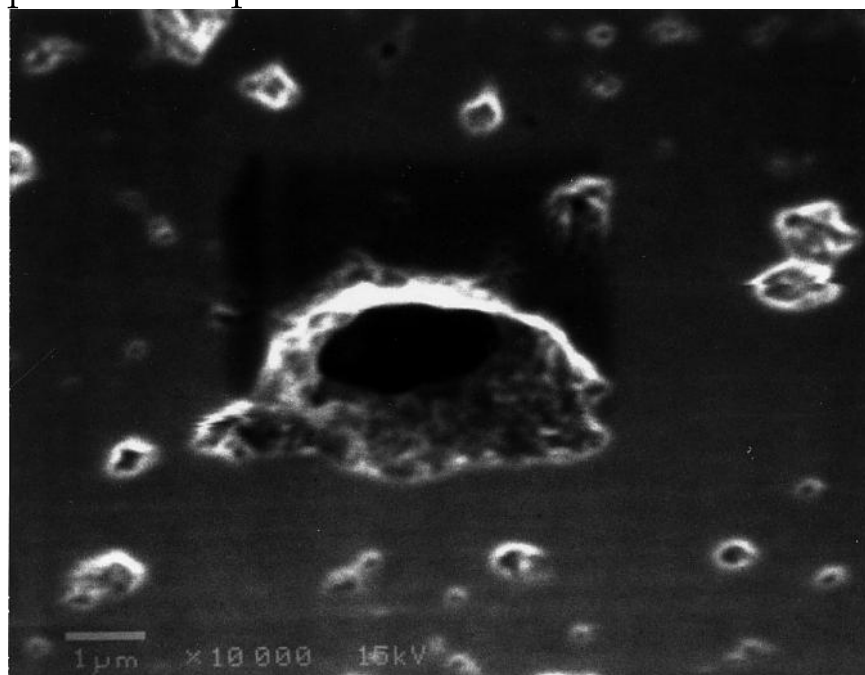
## Quality of Aluminum Plating

The gold-plated aluminum wire is pitted.

CLEO wire appears the same.

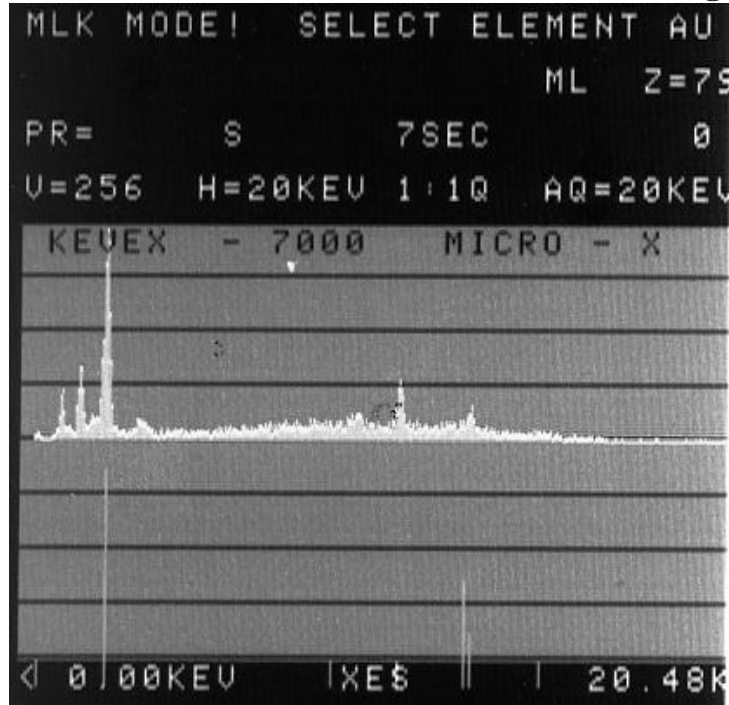


Some pits appear to expose bare aluminum.

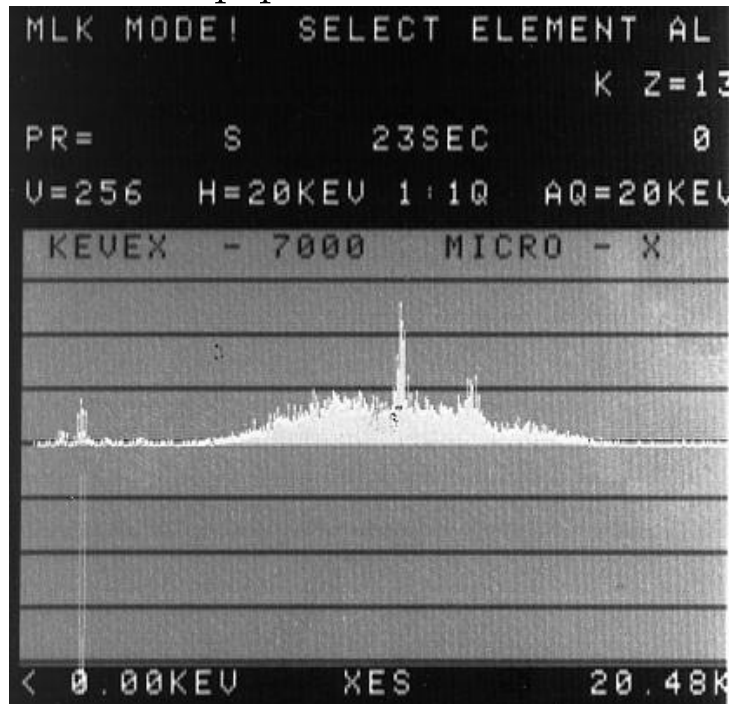


# X-Ray Analysis

Both gold and aluminum detected in smooth regions.

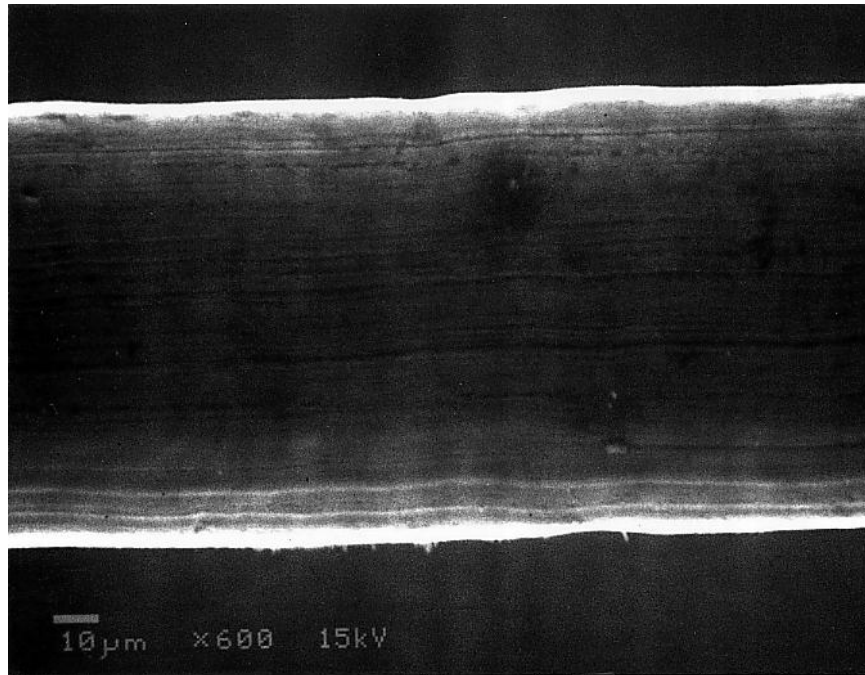


No gold detected in a deep pit.

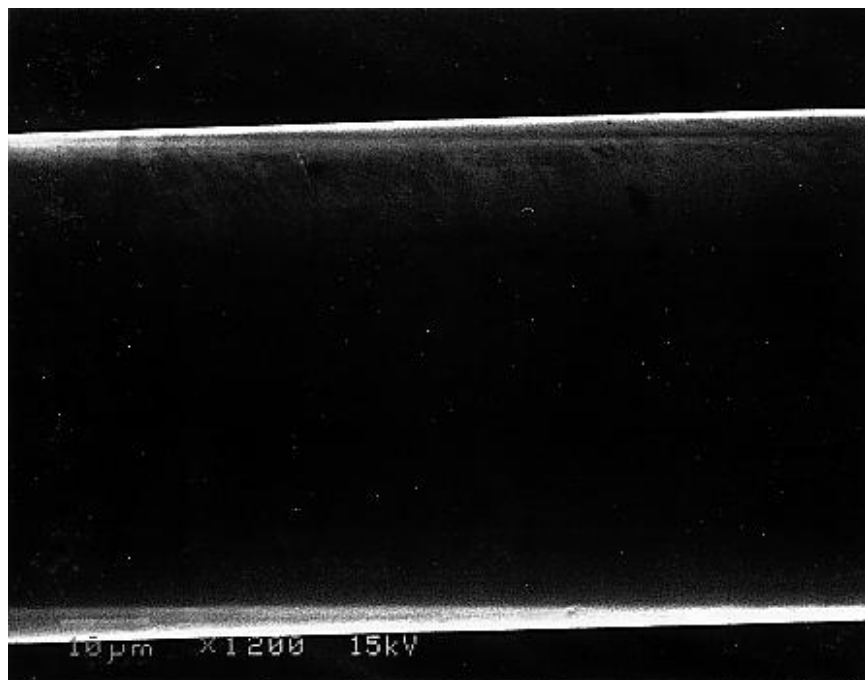


## Other Samples from California Fine Wire

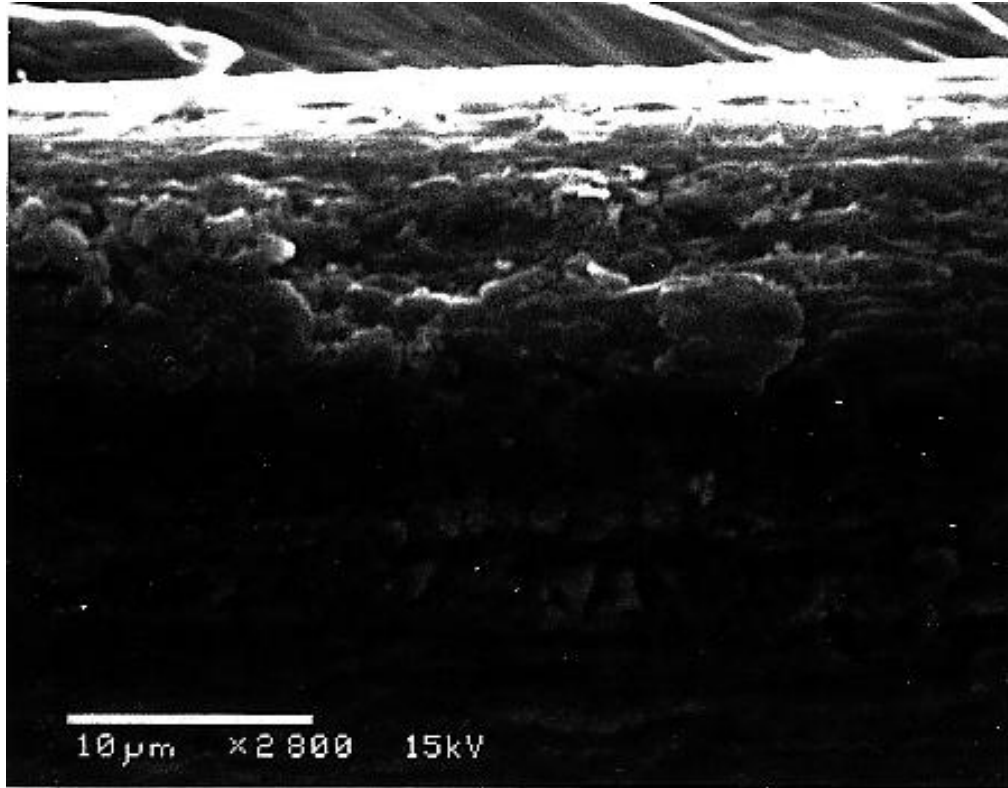
Bare wire, manufactured in 1990.



Silver-plated Al wire manufactured for KLOE in 1994.



Bare Al wire, with 'Alodine' chromate surface treatment.



## Is the Gold Plating OK?

Plating on Al cathode wires is to avoid high surface resistivity, which might lead to positive-charge buildup and eventual breakdown with emission of electrons and/or photons (Malter effect).

The pitting in the surface of the California Fine Wire is a minor effect.

CLEO is currently building drift chamber DR3 with the same wire, with no sign of trouble in tests.

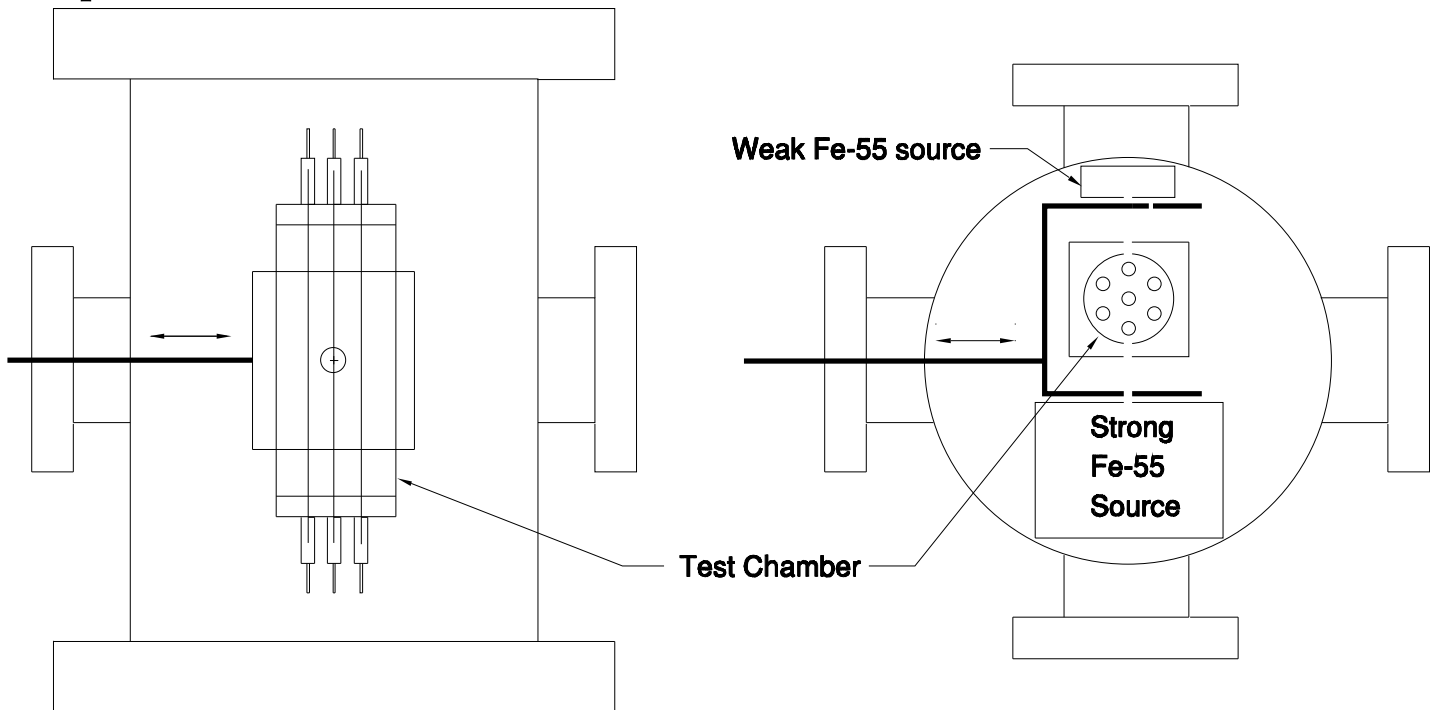
⇒ Reasonably safe to proceed with gold-plated wire from California Fine Wire.

Delivery time  $\approx$  10 weeks, so there is time for R&D.

Change baseline only in event of very striking results.

## R&D on Aluminum Wire

1. The Prototype II drift chamber at SLAC will test performance of baseline wire types.
2. Aging studies in a small chamber are underway at C.S.U.
3. Aging studies in small test chamber with both gold- and silver-plated Al wire from California Fine Wire:

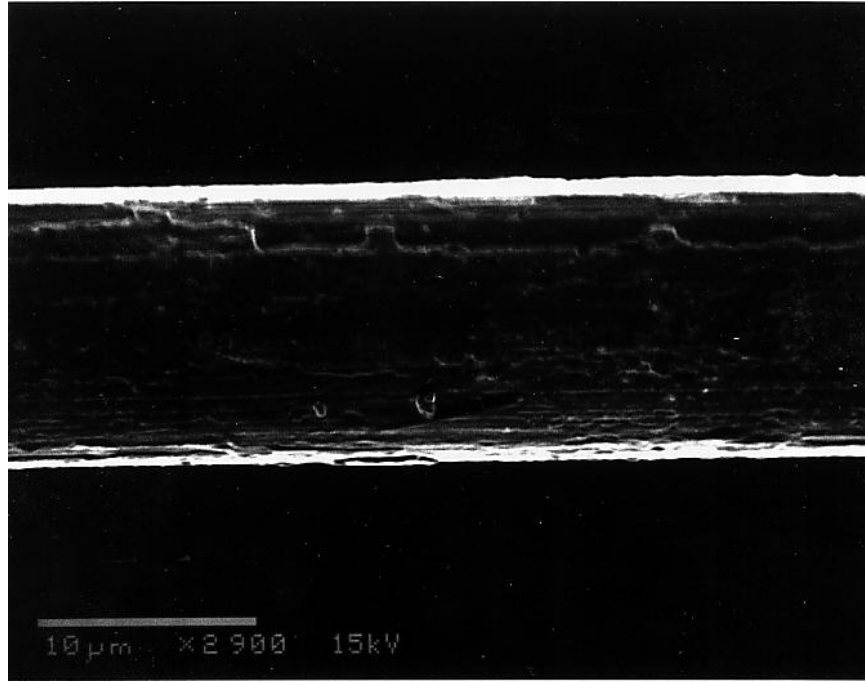


4. Investigate option to have gold plating of bare Al wire from California Fine Wire done in Switzerland by Fluhmann-Galvanolting (recommended by P. Taras).

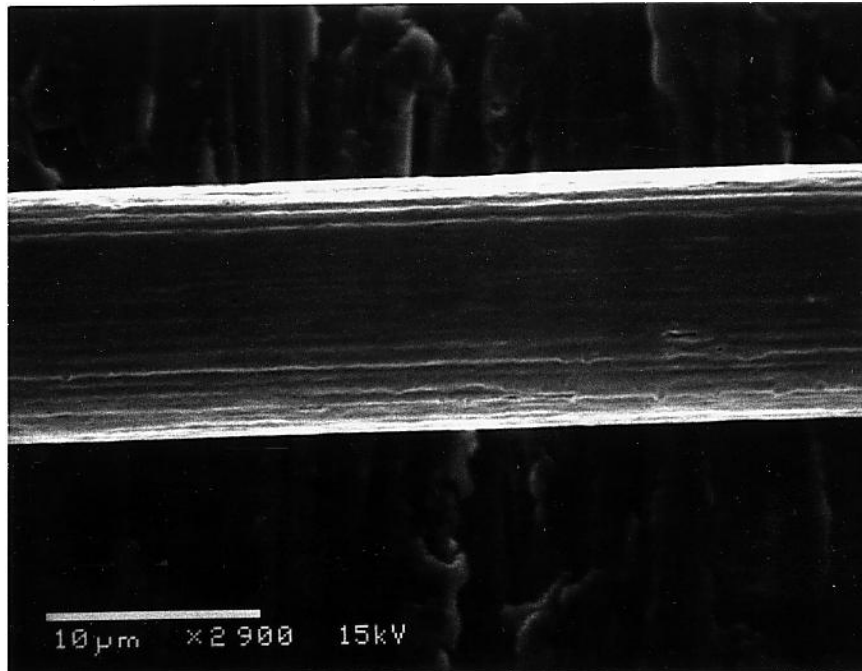


# Gold-Plated Tungsten Wire

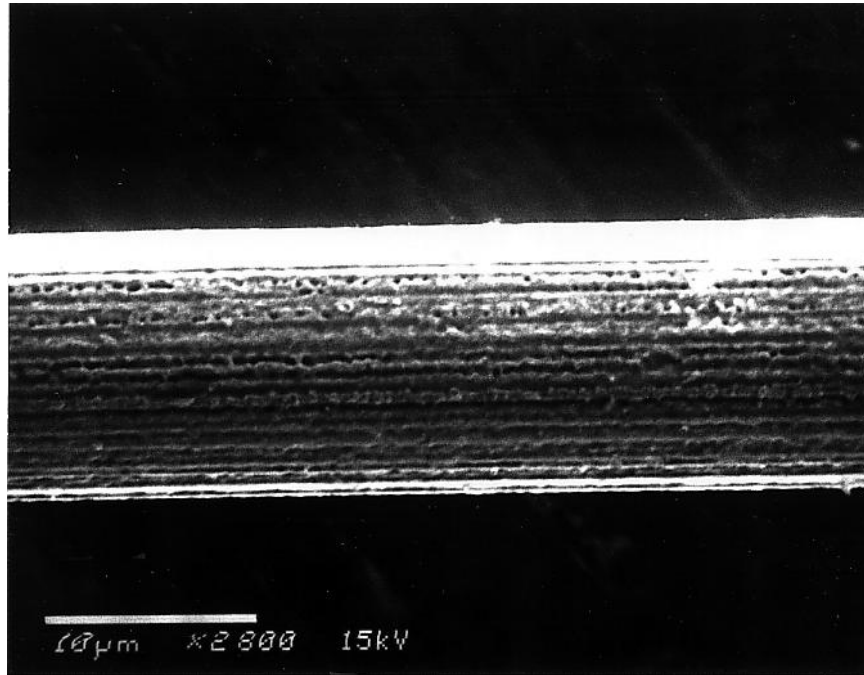
Wire from Thermionics Products; good stiffness.



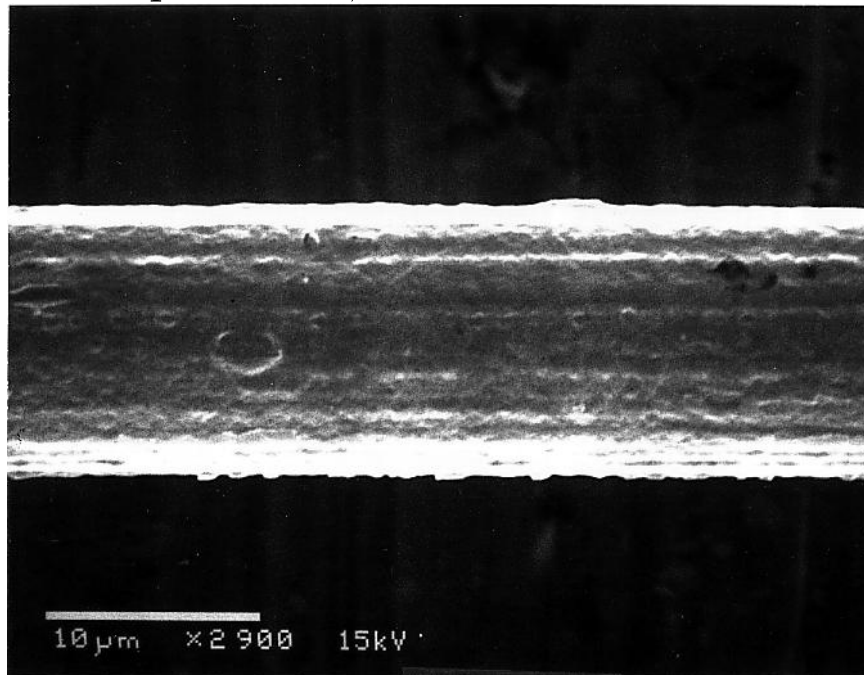
Wire from Luma; better surface but less stiff.



Old wire from GE; considered bad.



Old wire from Philips Elmet; considered bad.



## Proposed Quality Control

At least one sample from every spool will be tested as follows:

1. Wire diameter: weigh a 1-m length on a Mettler AT1005 Mass Comparator (accuracy: 0.02 mg); determine  $\rho r^2$  to 1%.
2. Spring constant and breaking force: measure elongation *vs.* force with a Mitutoyo micrometer and a Denver Instruments balance interfaced to a PC.
3. Surface appearance: use an Amray 1200B scanning electron microscope; option to perform x-ray analysis.
4. High-voltage behavior: test a sample as an anode wire in a short chamber using a CAEN N470 programmable power supply interfaced to a PC.

Use BABAR crimp pins in tests 2 and 4.

Not well characterized: thickness of plating.