ELECTROFORMING BUDGET JUSTIFICATION
(J. Reeves & Sons, LLC. Jan 21, 2006)

BUILD CUSTOM BATH FOR LARGE PARTS (6 weeks to complete)

Materials required
Copper for anodes $2000. (assuming OFHC rods plus 3/8” x ½” pellets).
If performed at Soudan, could use the leftover copper for other works $1,000.
Plastic vessel to contain bath $500.
Parts to enclose plating bath to reduce radon daughters $200.
Pump for recirculating bath $1000.
Filter $200
Tubing, connectors, etc. $300.
Purified acid for bath $500.
Purified copper sulfate for bath $500.
Purified water $100. (including final cleaning and rinsing)
Heater/cooler and control circuity $200.
Construction, cleaning, loading bath $1,000.

TOTAL = $5500.00

ELECTROFORMING CRYOSTAT (6 months, incl. ordering parts, etc)
A degree of cleanliness never before attained must be maintained in order to produce finished components with the necessary radiopurity.

A stainless steel mandrel for each piece must be purchased, machined to the proper diameter, polished, and cleaned.
$1,000.00 for parts and another $4,000.00 for labor = $5,000.00 total for mandrels.

A method for removing each part from the mandrell must be developed and tested (usually, rolling between two round pieces of stainless steel works well for right circular cylinders). Labor $1000.00
Cross arm:
  Labor for electroforming $500.00
  Labor for Machining, including machining between layers if necessary) $1,000.00
  (includes keeping the parts in radon reduced atmosphere all of the time)
  Labor for removing from mandrel $400.00
Electrowelding the flange to the cross arm $1,000.00
Labor for cleaning, etching, and vacuum baking $1000.00
(this is a very long piece and will require a special chamber and technique)

Cup (the piece that connects the cross arm to the end cap)
  [this part may be simply a flange or can have some depth]
    Labor for electroforming $500.00
Labor for Machining $500.00
Labor for removing from Mandrel $200.00
Labor for electrowelding the cup to the cross arm $2,000.00.
Labor for cleaning, etching, and vacuum baking $500.00

End Cap (the vacuum vessel that contains the detector itself)
Labor for electroforming $500.00
Labor for machining $500.00
Labor for removing from Mandrel $200.00
Labor for cleaning, etching, and vacuum baking $500.00

Cold Plate (connects the cold finger to the IR shield and cools the detector).
Labor for electroforming $1,000.00
Labor for machining $500.00
Labor for removing from Mandrel $200.00
Labor for cleaning, etching, and vacuum baking $500.00

Cold Finger (transfers heat from the detector to a liquid nitrogen dewar).
Labor for electroforming, incl. several machinings to allow thick parts $2,000.00.
Labor for final machining $500.00
Labor for removing from Mandrel $200.00
Labor for cleaning, etching, and vacuum baking $500.00

Infrared (IR) Shield
Labor for electroforming $500.00
Labor for machining $500.00
Labor for removing from Mandrel $200.00
Labor for cleaning, etching, and vacuum baking $500.00

Miscellaneous electroformed parts such as screws, pins, mounts, etc. $2,000.00
Assemble, vacuum testing, and testing cooling capacity $2,000.00
Miscellaneous parts such as plastic bags, etc. $100.00

**TOTAL = $26,500 + ($5,500 for bath) = $32,000.**