NPL Polarized Source Group
Technical Note # 90-9

Charging the Cesiator on the Illinois/CEBAF Polarized Electron Source

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In this note we outline the steps necessary to charge the cesiator of the Illinois/CEBAF polarized electron source. The procedure to be followed is the same whether the cesiator is a fresh one being charged for the first time or an old one being re-charged. However, the initial operation of the cesiator will differ depending on whether it has been used previously or not.

Materials:

1. Clean J-tube assembly (2709-47)
2. Cesium Capsule
3. Pinch-off tool

Procedure

1. Take the new J-tube assembly and put a partial crimp (a "dent") in the straight section using the pinch-off tool. See drawing 2709-47 and the attached figure for the location of the crimp; be sure to leave enough room for the cesium ampule and a pinch off above it.
2. Place a clean copper mesh cup (2709-52) on the end of a cleaned 1/4" diameter stainless steel rod; use the rod to push the cup into the J-tube until it rests on the crimp.
3. Clean the cesium ampule carefully by wiping it with methanol using a piece of lint-free paper. Then slide the ampule into the top of the J- tube; it should come to rest in the mesh cup just above the crimp. Then pinch-off the top of the tube using the pinch-off tool, and cover the sharp edge resulting from the crimp with RTV sealant.
4. If the gun is not already up to atmospheric pressure, vent it by backfilling with dry nitrogen, and leave it with a modest ($\sim$1 psi) positive pressure of nitrogen flowing.
5. Install the J-tube on the cesiator and open the cesiator valve.
6. Evacuate and bakeout the gun using the standard procedure (#90-7); during the leak testing pay particular attention to the cesiator.
7. After the bakeout has been completed, close the cesiator valve. Clean the J-tube using Scotchbrite, and then, using the pinch-off tool *very* carefully, crack the glass ampule by squeezing on the copper tube in 10-12 locations in the region where the ampule is located (just above the crimp in the tube made in the first step of this procedure).

8. Place the elbow of the J-tube in a tub of cool water, then heat the J-tube in the region of the ampule as hot as you can get it using a hot air gun for a period of 30-60 minutes. Tap the tube gently during this heating in the region *above* the crimp with a screwdriver; be careful to not tap the tube below the crimp. (Replace the water as needed during this step to keep the elbow of the J-tube cool.)

9. After it has cooled, clean the area below the crimp with Scotchbrite. Check that the jaws of the pinch-off tool are clean. Have an assistant hold the top of the J-tube steady, center the pinch-off tool on the tube just about level with the cesiator valve, and pinch it off.

10. Now you are ready to open the cesiator valve. Since the cesium in the ampule was packed under an argon atmosphere this operation must be done carefully. Open the cesiator valve *very* slowly, keeping the ion pump current under 100 mA. This may take several tries and as long as an hour. If you open the valve too rapidly the pump will shut off. If the pinch-off was not made correctly the pressure will rise each time you open the valve. If the pinch-off was successful, each successive "cracking" of the valve will result in a somewhat lower pressure rise.

11. Install the thermocouples on the cesiator, wrap it with Fibrefrax, and connect it to the nitrogen heater. Bring the cesiator to its normal operating temperatures and check for correct operation by looking for an increase in the white light photocurrent when the cesiator is inserted (see NPL source notes #90-7 and #90-5 for details).

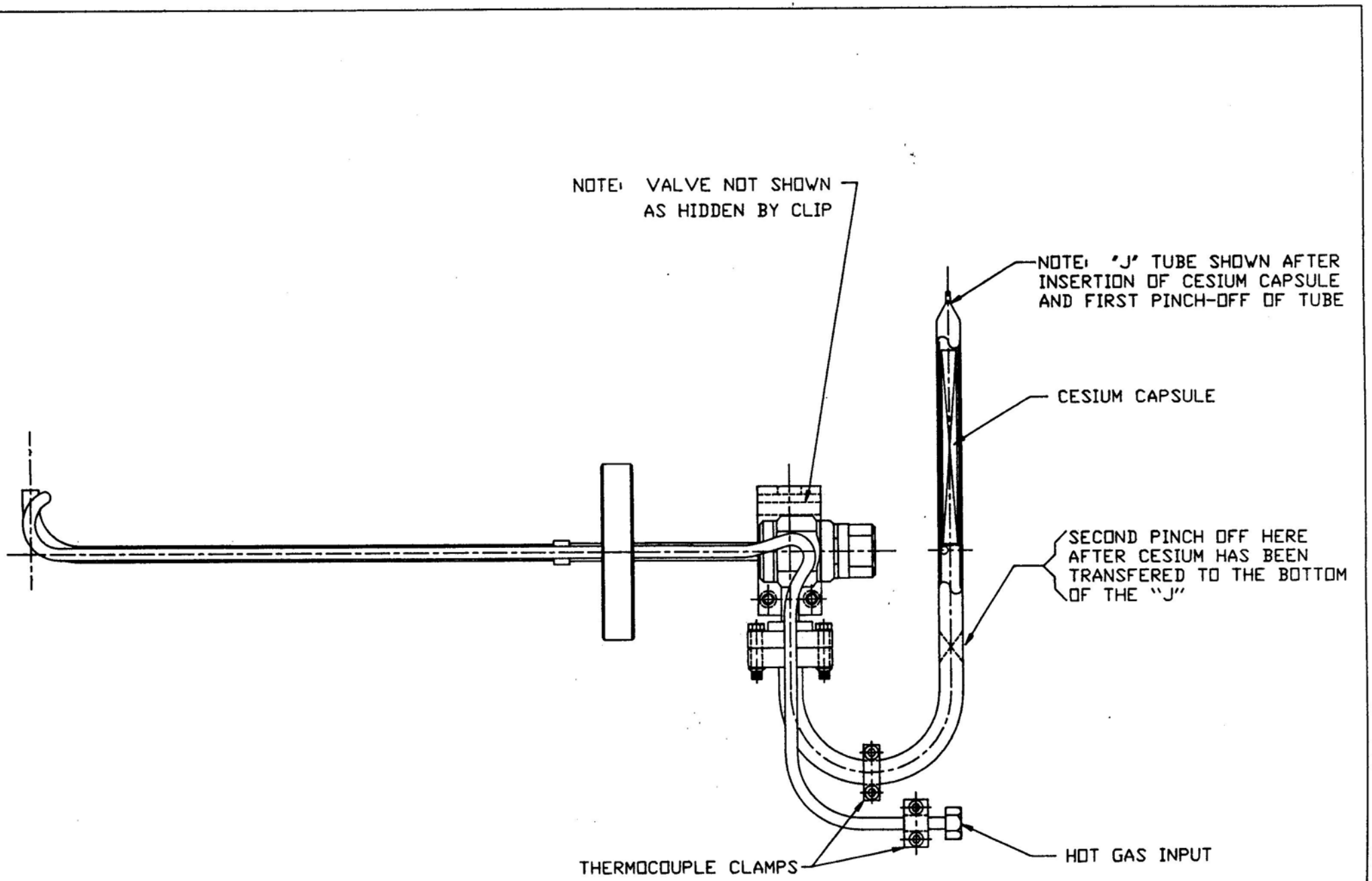
Notes:

1. The cesium capsules were purchased from Callery Chemical Co., P. O. Box 429, Pittsburg, PA 15230 (412)-538-3510. Order 1-gram ampules of cesium metal packaged in a standard 6 mm. diameter glass tube.

2. The pinch-off tool used for the cesiator charging is part number POD- 375 obtained from CHA Industries. 415-683-8554

3. When charging a completely new cesiator the details of the initial operation will differ slightly – see NPL source notes #90-4 and #90-5 for details.

(4) Copper tube brazed to mini CF copper gasket.


NOTE: VALVE NOT SHOWN AS HIDDEN BY CLIP
NOTE: "J" TUBE SHOWN AFTER INSERTION OF CESIUM CAPSULE AND FIRST PINCH-OFF OF TUBE
CESIUM CAPSULE
SECOND PINCH OFF HERE AFTER CESIUM HAS BEEN TRANSFERED TO THE BOTTOM OF THE "J"
THERMOCOUPLE CLAMPS
HOT GAS INPUT

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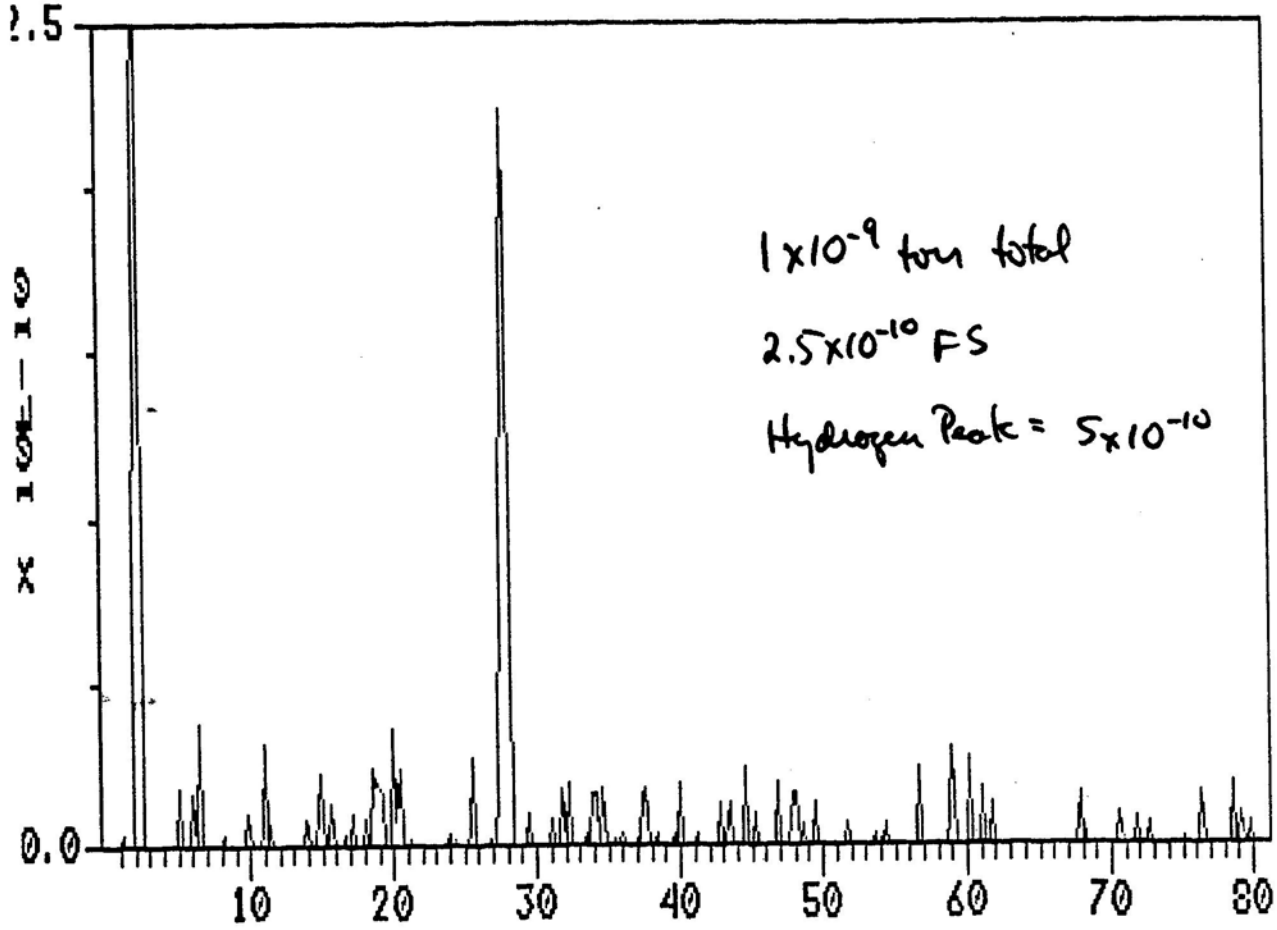
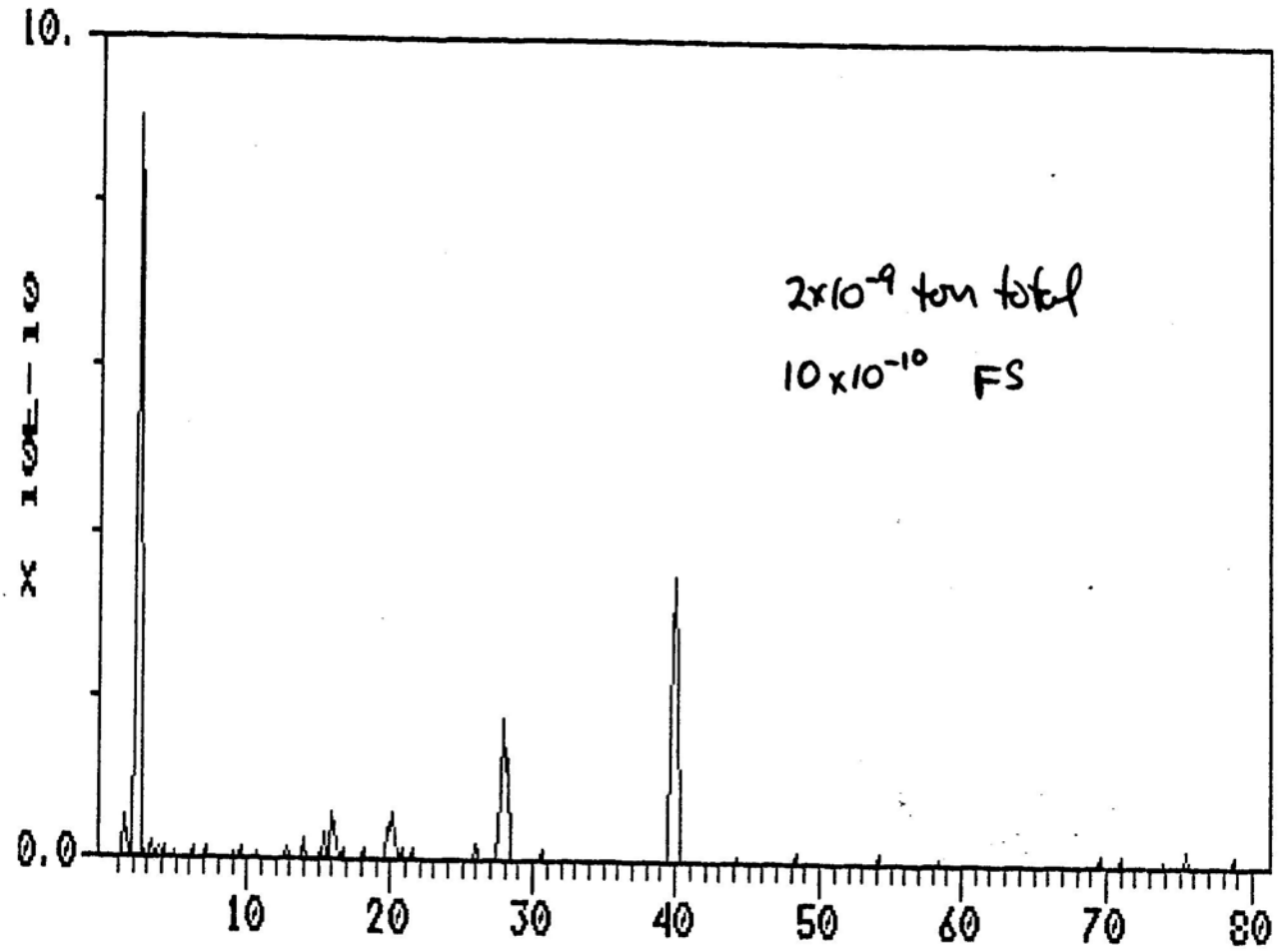
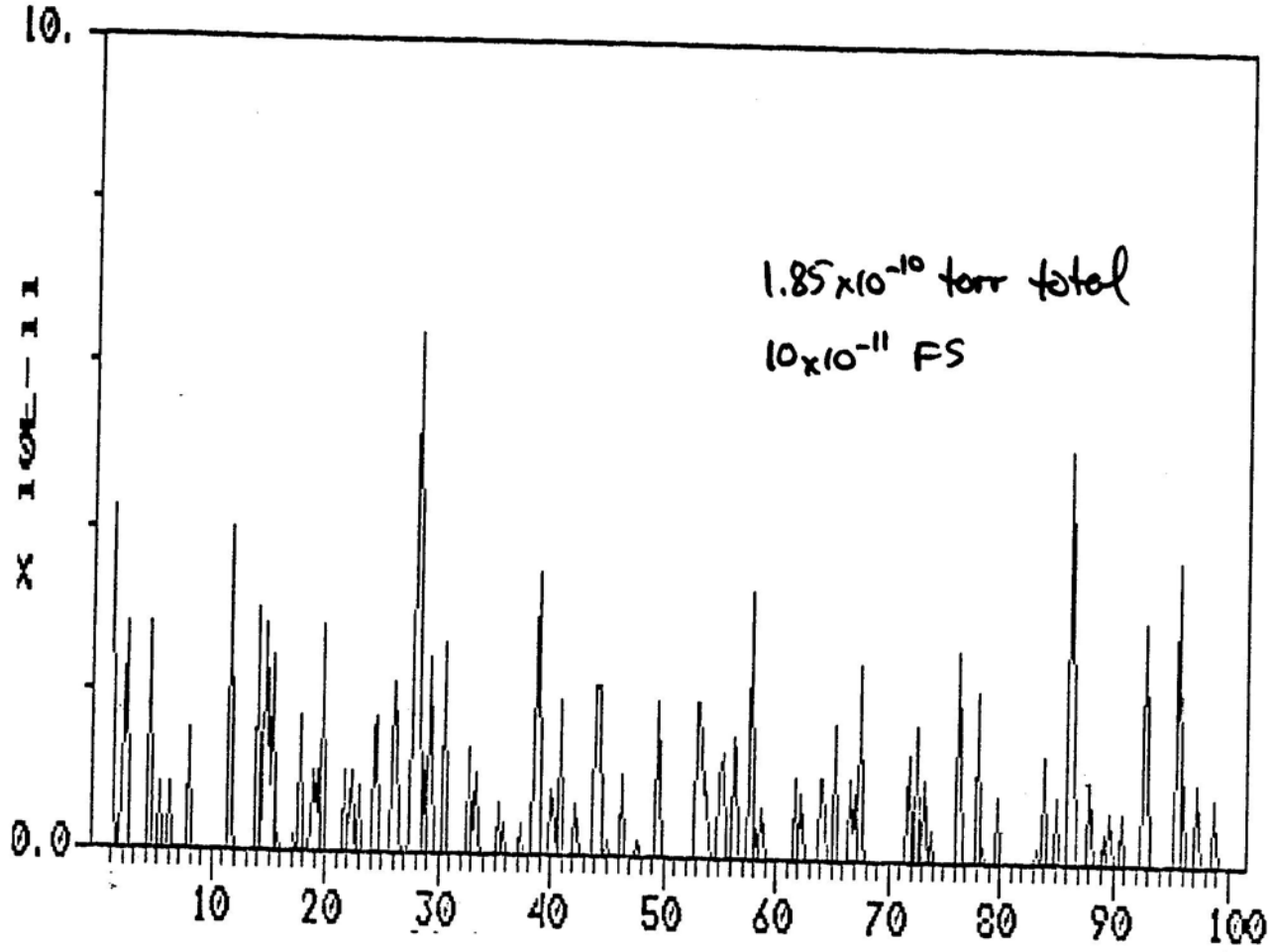


Spectrum After Bakeout, before breaking Cs capsule



Spectrum after pump has recovered from the "Argon blast" that results from breaking the Cs capsule.



Spectrum taken after opening Cs valve after pinchoff