CERTIFICATE OF ANALYSIS

International Temperature Scale of 1990

Silver Freezing-Point Cell
Pond Engineering Model K23C
Serial Number Ag 98358

Tested for
Instituto Nacional de Tecnica Aerospacial
Madrid, Spain

6 December 1999

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Instituto Nacional de Tecnica Aerospacial
Attn.: Dr. Robert Benyon
Temperature and Humidity Laboratory
CTRA Ajalvir
22850 Torrejón de Ardoz
Madrid, Spain

Subject: Quality evaluation of Ag FP cell (s/n Al 98358)
Purchase Order No.: 7230-127/1.998
Test No.: 836/261097-99

Dear Dr. Benyon:

A direct comparison of your silver freezing-point cell (Pond Engineering Model K23C, s/n Ag 98358) was made against our laboratory standard silver freezing-point cell (Ag 92-1). The measurement system included an ASL Model F18 operating at a frequency of 30 Hz with a 100 Ω Tinsley Model 5685 reference resistor, temperature controlled to within ± 8 mK, and a 0.25 Ω HTSPRT. The depth from the mid-point of the SPRT sensor to the liquid surface of your fixed-point cell is stated to be 16.5 cm; the depth of our cell is 18 cm. The pressure in your fixed-point cell and our cell was set to 101.3 kPa. Corrections were made to account for the difference in immersion depth. As shown in figure 1, the freezing-point temperature of your cell is 0.9_8 mK lower than that of the NIST reference cell Ag 92-1 cell. We assign an expanded uncertainty (k=2) of 1.0 mK on the realized value of our cell to account for impurities and measurement errors.

Figures 2 and 3 give an example of a freezing and melting curve for your cell, respectively. Figure 4 gives an example of the immersion characteristics of a Hart 5684 HTSPRT in your cell relative to the ITS-90 assigned hydrostatic-head effect for silver. A thermometer must track the hydrostatic-head effect over the bottommost 3 cm of the reentrant well to exhibit proper immersion in a fixed-point cell.

Sincerely,

Dr. B. W. Mangum
Leader, Thermometry Group
Process Measurements Division

Figure 1: Direct comparison of the INTA Ag cell (s/n Ag 98358) with the NIST reference Ag cell (Ag 92-1), ASL F18, 30 Hz, 0 mA

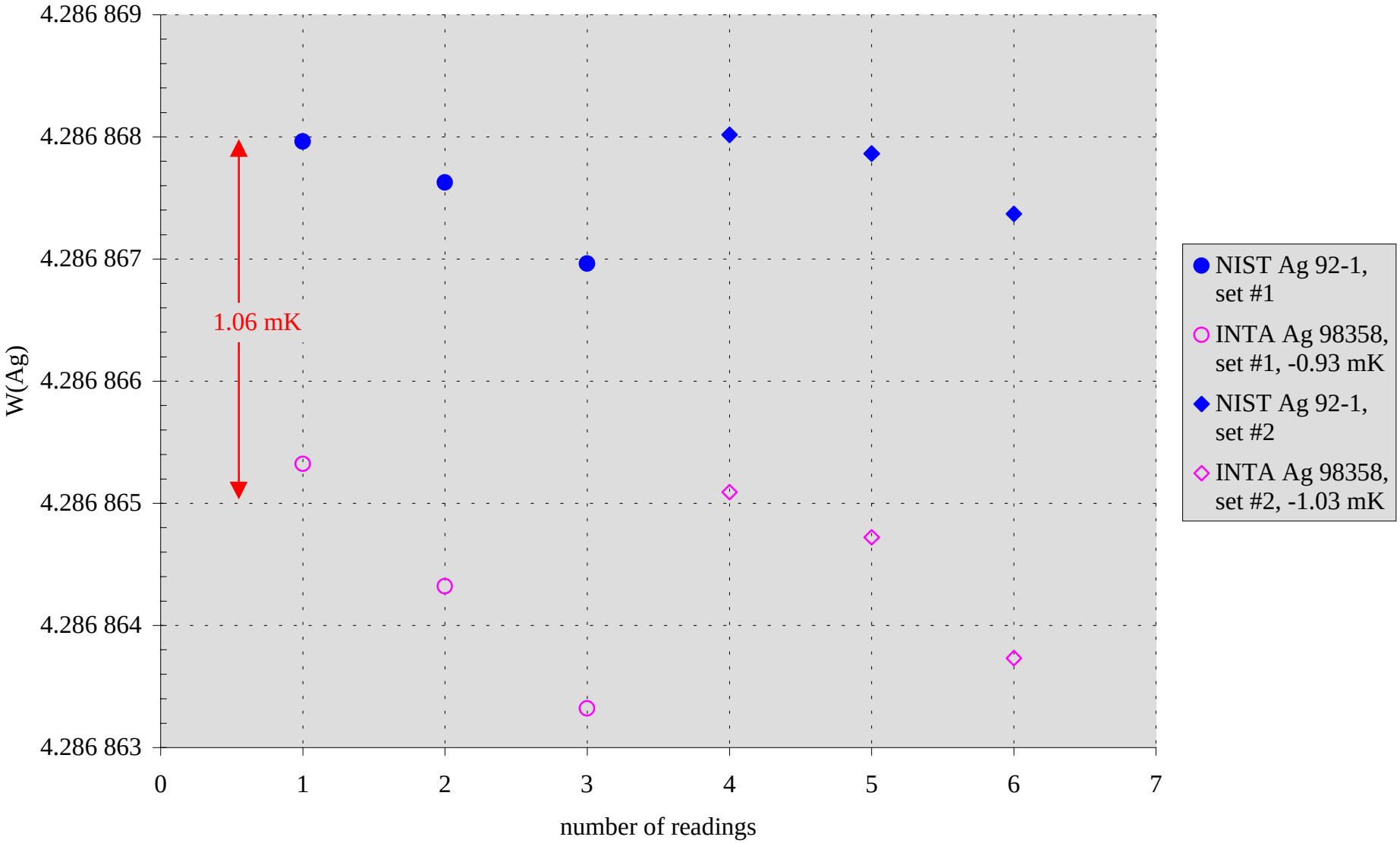

Figure 2: Freezing curve of the INTA Ag fixed-point cell (s/n Ag 98358)
ASL F18, 30 Hz, 14.14 mA

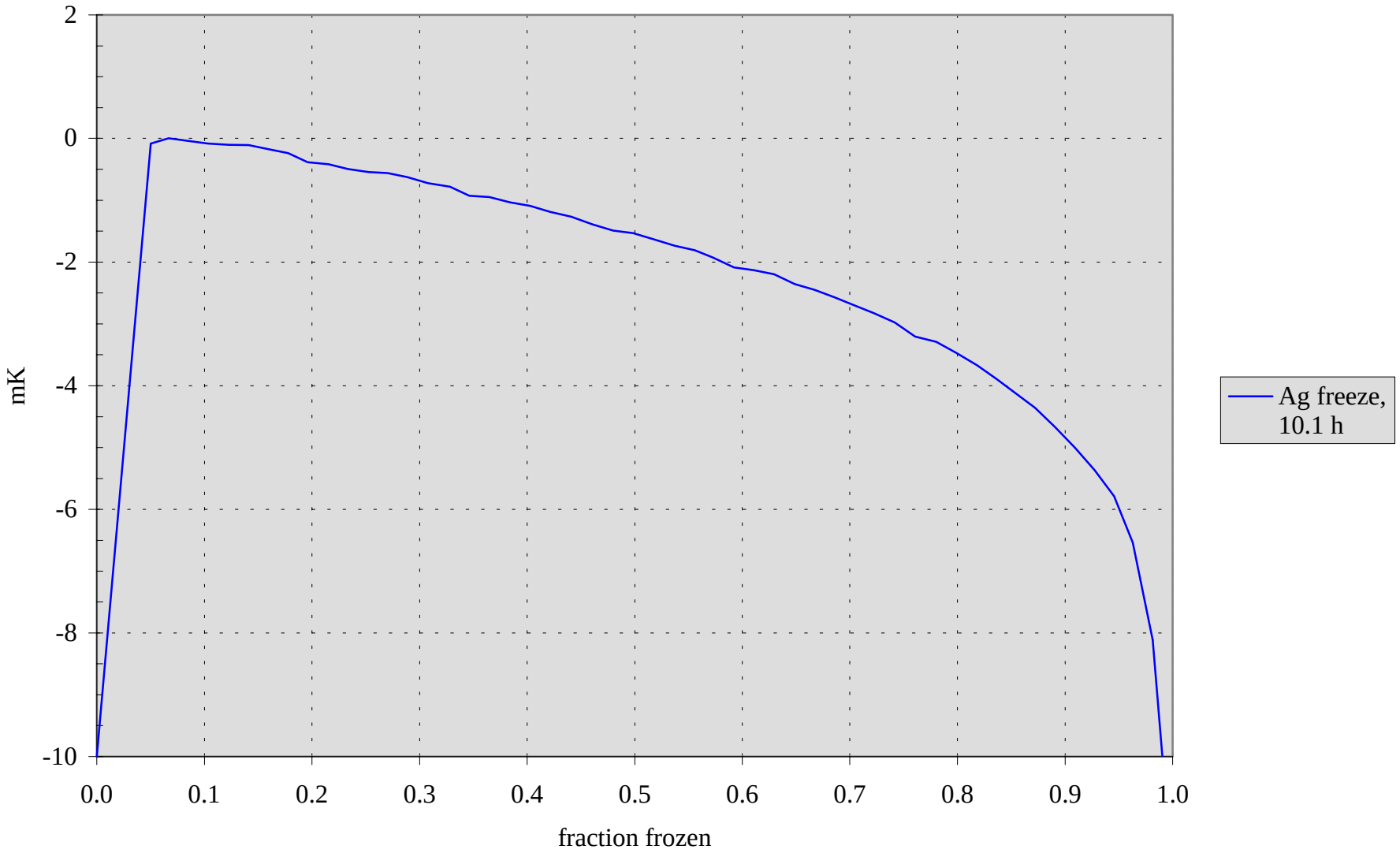

Figure 3: Melting curve of the INTA Ag fixed-point cell (s/n Ag 98358)
ASL F18, 30 Hz, 14.14 mA

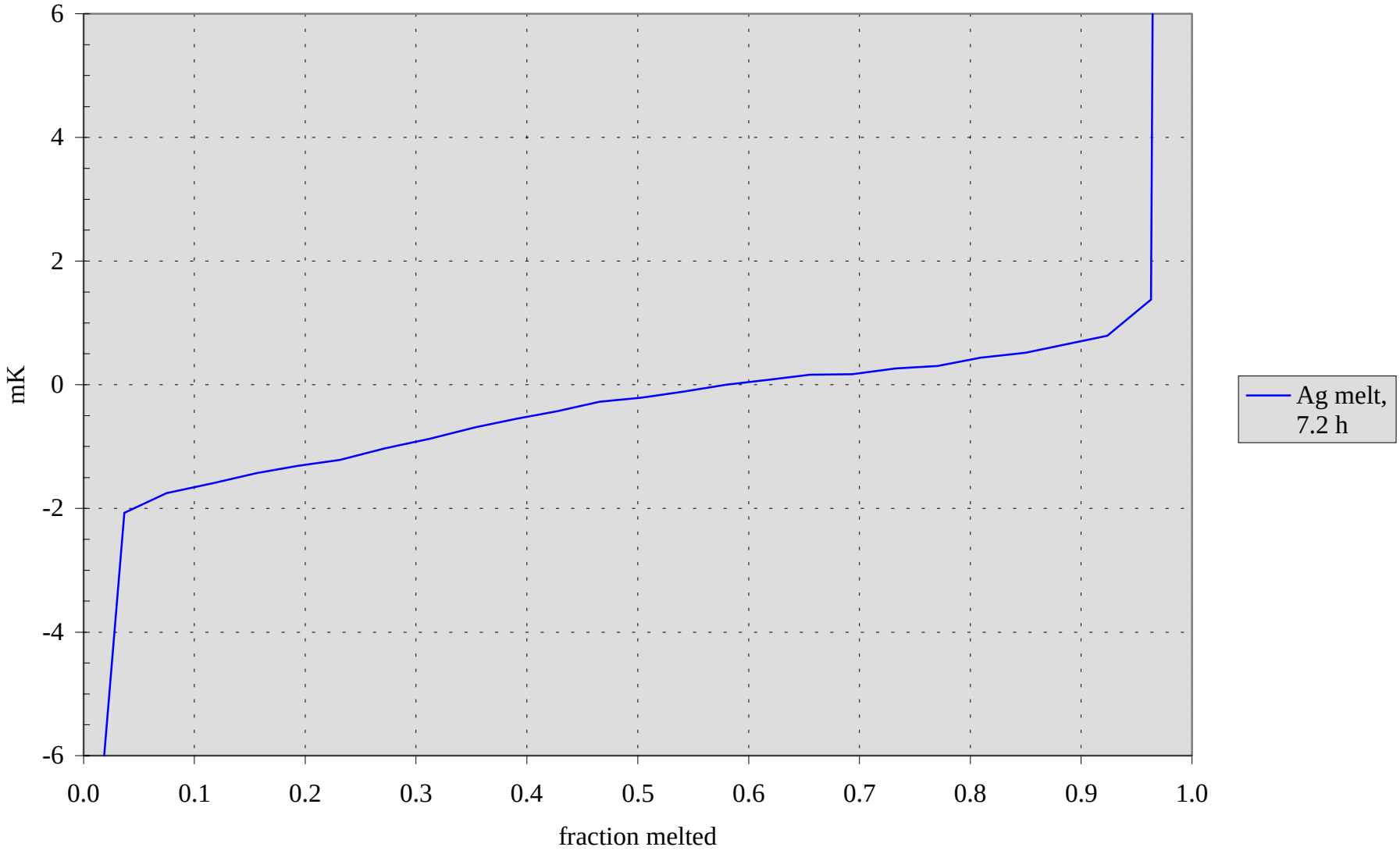

Figure 4: Immersion profile of the INTA Ag fixed-point cell (s/n Ag 98358) during a freezing-point realization using SPRT 0069 (Hart 5684) ASL F18, 30 Hz, 0 mA