# DETERMINATION OF THE MERCURY BOILING POINT USING A HEAT-PIPE

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The mercury liquid-vapour equilibrium is realised at IMGC by means of a gas-controlled heat-pipe operating from 200 °C to 450 °C. The helium pressure in the heat pipe is controlled between 10 kPa and 400 kPa by means of a very accurate computer-driven system having a sensitivity of a few parts per million in pressure.
A standard interferometric manobarometer and a standard platinum resistance thermometer calibrated at the ITS-90 fixed points, were used to measure the vapour pressure of mercury around its boiling point. The basic features of gas-controlled heat-pipes allow the direct measurement of temperature and pressure of the liquid-vapour interface. The metrological level of the measurements allows an accurate re-determination of the mercury vapour pressure curve, still in progress.
A preliminary determination of the mercury vapour pressure using a heat-pipe has been presented at Tempmeko 2001 [1]. The relationship between vapour pressure and temperature of mercury was established between 10 kPa and 101,33 kPa with an accuracy at the 99% confidence level within 0,10% of pressure, a level much better than all previous determinations.
Among the experimental data, the mercury liquid-vapour interface temperature has also been measured close to normal pressure. Values and uncertainties are reported in the following table:

| **Pressure** (Pa) | | **Temperature** (K) | | Pressure equivalent of temperature uncertainty (Pa) |
|---|---|---|---|---|
| Value | Uncertainty (k=2) | Value | Uncertainty (k=2) | |
| **101330,2** | 0,54 | **629,764** | 0,007 | 11,9 |

The temperature value can be compared with the recommended value as given by Working Group 2 of the Comité Consultatif de Thermométrie [2]. The recommended value for a pressure of 101330,2 Pa is calculated as 629,772 K with a standard uncertainty of ±10 mK. This compares favourably with our value of 629,764 K ± 3,3 mK (k=1), well within the combined uncertainty of the two values.

**References**:

[1] *Preliminary Determination of the Mercury Vapour P-T relation using a Heat-pipe*, A. Merlone, P. Marcarino, P.P.M. Steur, R. Dematteis, **Proc. TEMPMEKO 2001** in press.
[2] Bedford R.E., Bonnier G., Maas H. and Pavese F., Metrologia, 1996, **33**, 133-154.