# Modeling of air plasma emission in the VUV/UV spectral region

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We present new measurements of high temperature air emission in the vacuum ultraviolet spectral region. Correctly modeling high temperature air emission is relevant for several applications. In the field of atmospheric reentry, such modeling is necessary to correctly predict the large heat flux that arrives at the surface of the reentering capsule. Understanding and accurately modeling the various molecular and atomic sources of emission is also important for optical diagnostics such as Optical Emission Spectroscopy that rely on the analysis of measured emission to determine plasma temperature and chemical composition.

The figure below shows our measured air emission spectrum in blue. The high temperature air responsible for the emission is in equilibrium and at a temperature of approximately 6700 K. At this temperature, the air is a weakly ionized plasma and electrons/ions are present in mole fractions on the order of $O(10^{-4} - 10^{-3})$. The structure of the observed spectrum is dominated by nitric oxide emission bands ($\gamma, \beta, \delta$ and $\varepsilon$ systems of nitric oxide). Accurate prediction of the observed molecular nitric oxide emission is very difficult. Several emission bands overlap each other, making it difficult to individually validate the various bands responsible for the emission. Perturbations amongst the various electronic *NO* states responsible for the emission occur.[1] These perturbations must be accounted for. We use the SPECAIR radiation code to model the measured emission.[2] The figure below shows the agreement that results (SPECAIR prediction is in red). Good agreement is obtained at longer wavelengths whereas a discrepancy is observed at lower wavelengths. We will discuss the current radiation model as well as potential sources for the discrepancy that is observed.

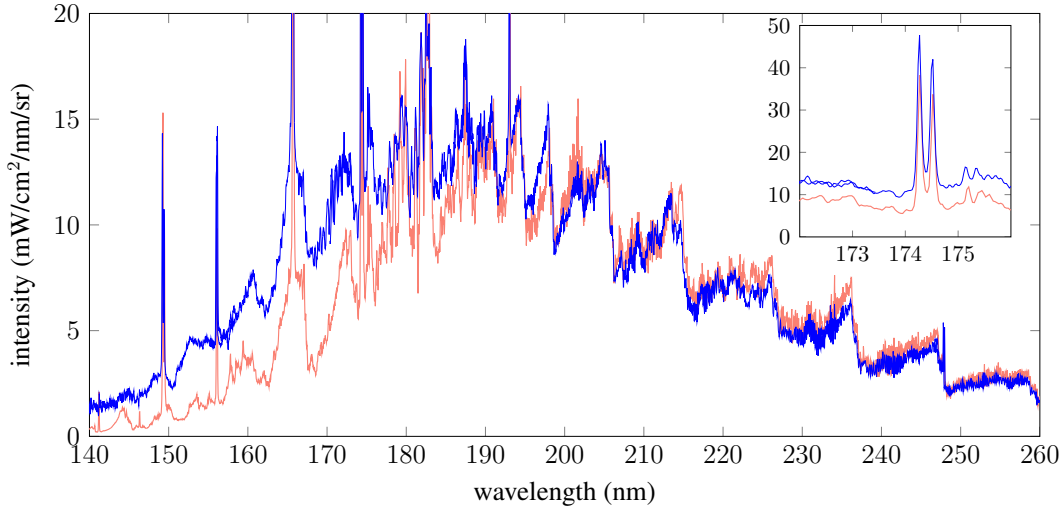


**Figure 1 :** *Measured (blue) and calculated (red) high temperature air emission spectrum. The inset is a zoom on a strong atomic nitrogen feature.*

**Références**

[1] R. Gallusser and K. Dressler, Journal of Chemical Physics, vol. 76, no. 9, pp. 4311-4327.
[2] C. Laux, "Optical Diagnostics and Radiative Emission of Air Plasmas," Stanford University, 1993.

**Statut : permanent**