Fluorescence EXAFS data were collected at GILDA beamline at the Ga-K edge on different Ga films deposited onto sapphire substrates and covered with a thin layer of SiO_x to prevent Ga oxidation. Three films were investigated, differing in their thickness. In particular the measurements were carried out on a 3 nm, 10 nm and 100 nm films. Previous AFM investigations showed that in the two thinnest films the Ga layer consists nearly hemispherical small droplets, while the thickest film is continuous. The measurements were performed as a function of temperature in the range 90 – 345 K.

From a qualitative point of view, Figure 1 shows the evolution of the EXAFS Fourier transforms of the 10 nm film as a function of *T*. This graph is in large measure representative of the behaviour of the other films, but there are fine details that change in dependence of the film thickness and that probably depend on the different surface energy contribution. As the data analysis is still in progress, we will focus on the qualitative result that can be drawn from Fig. 1.

1) First, there is a clear discontinuity in the shape of the EXAFS Fourier transforms when the temperature rises above 285 K to 304 K. It is useful to remember that the Gallium melting point is 303 K. At this temperature the electrical capacitance of the film has an anomaly (see Fig. 2).
2) A further increase in *T* in the interval 307-325 K causes a regular decrease in amplitude of the second peak in the EXAFS FT.
3) When *T* is further increased to 345 K, the first peak in the EXAFS FT starts to decrease in amplitude.

All the above evidences can be rationalised by taking into account the fact that in the solid state the films have the α-Ga structure. A peculiar feature of the *Cmca* structure of the α-Ga phase is that is made of dimers with a bond length of 2.44 Å. The second, third and fourth shells each contain two atoms and are at 0.27, 0.30 and 0.39 Å further apart. It is worth noticing that without the introduction of four shells it is impossible to reasonably fit the spectra, even at 90 K where a single peak is apparent in the EXAFS FT. Now, it is possible to deduce from the above reported experimental findings that the dimers persist in the liquid phase. In addition, the liquid structure near the melting point can be interpreted in terms of a solid-like structure similar to that of the α phase. When the temperature is increased above the melting point there is a progressive loss in correlation for the higher distance shells. The dimers start to loss their correlation only between 325 and 345 K, that is well above the melting point.

With this model it is also possible to rationalise the anomalies found in the capacitance vs. *T* curve which is reported in Fig. 2. The plateau in this figure corresponds to the temperature interval in which the liquid orders in a solid like α phase structure. Above 307 K, this ordering is increasingly destroyed by increasing *T*, although the dimers still persist in the liquid phase at least until 345 K.

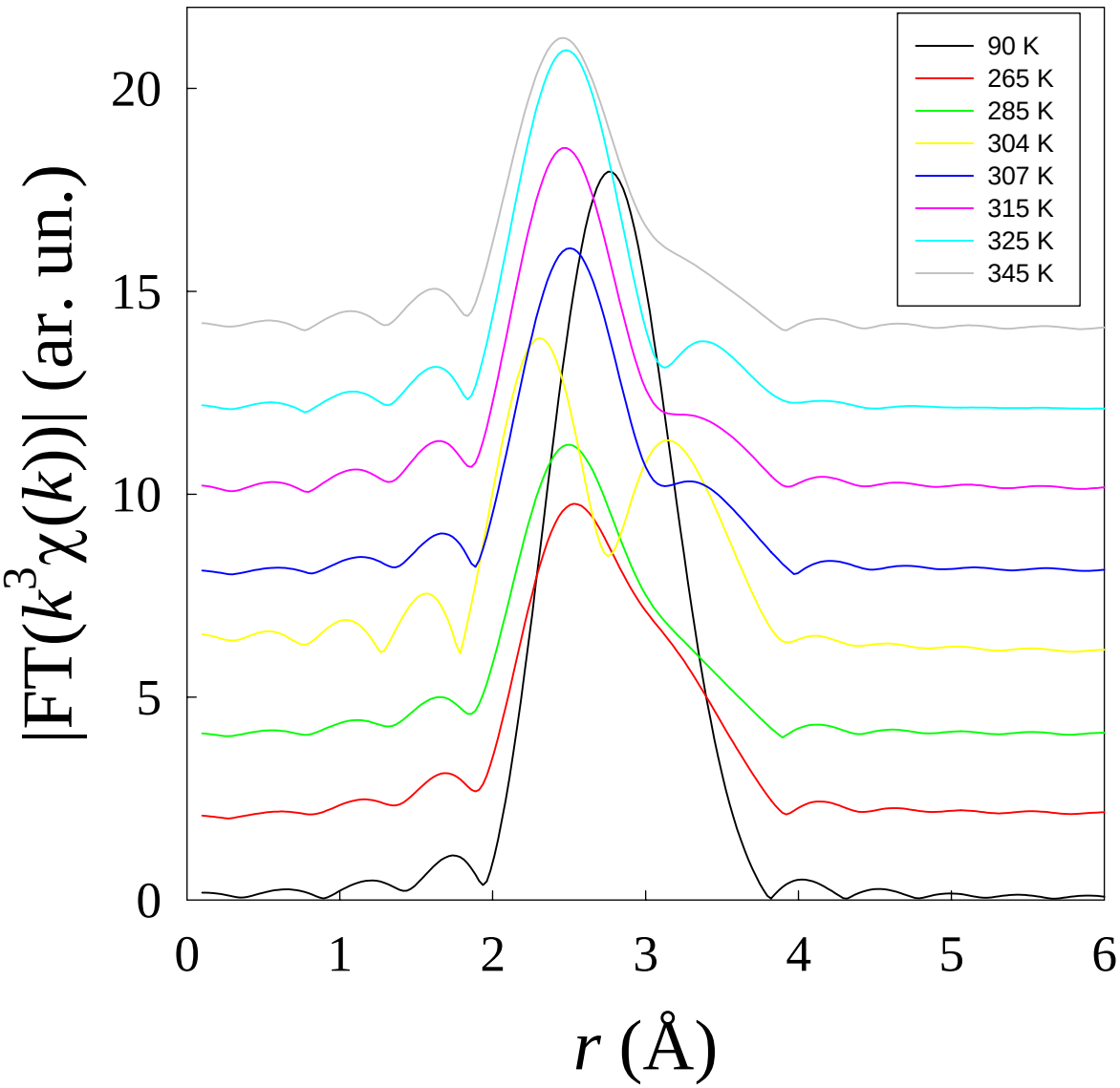

Figure 1.- FT transforms of the Ga-K edge EXAFS spectra of the 10 nm film investigated in this work at different temperatures, after Fourier filtering in the region 2-4 Å

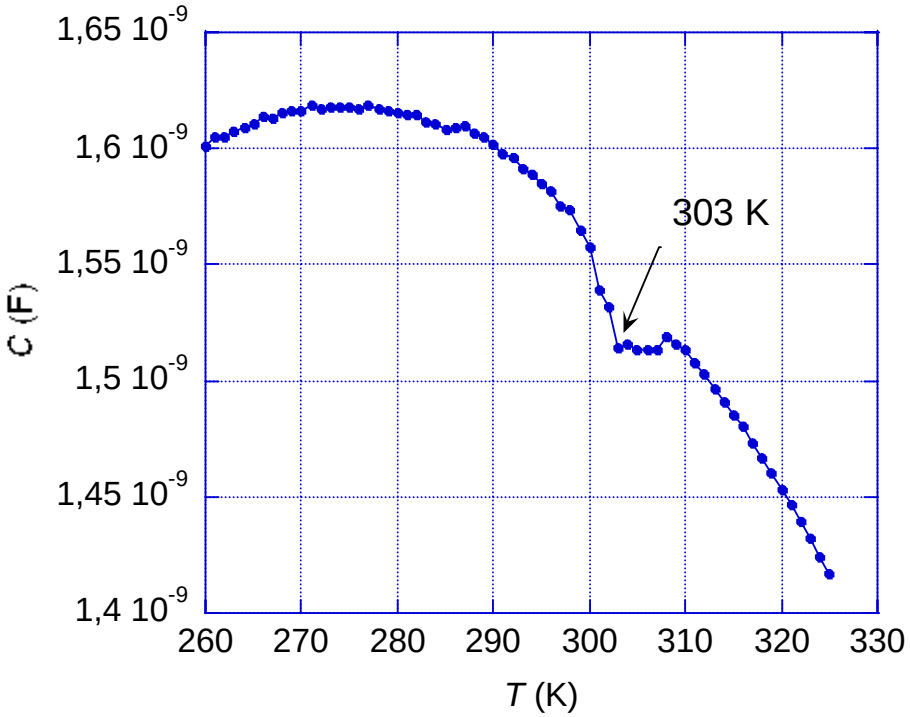

Figure 2. - Electrical capacitance of the Ga film .