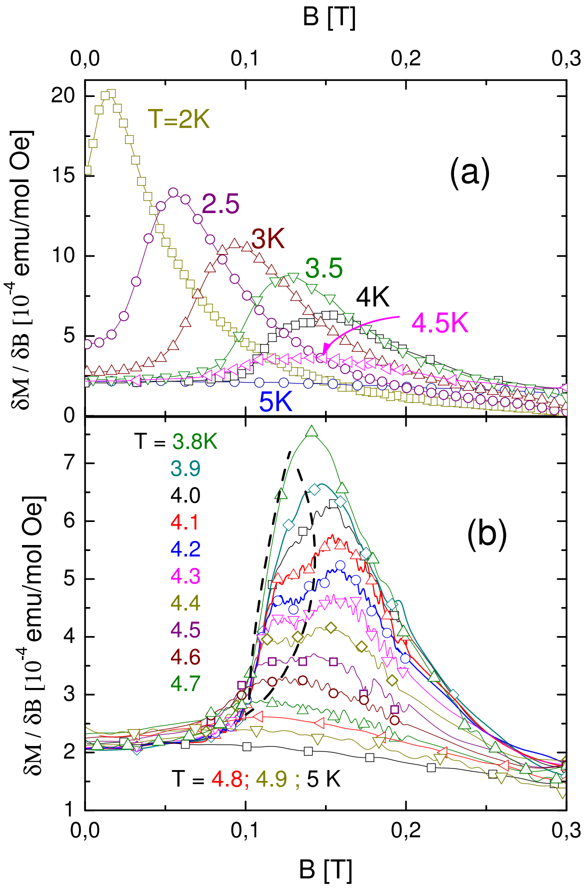

FIG. 5: (Color online) (a) Isothermal field derivative of the magnetization between 2 and 5 K and (b) detail between $3.8 \leq T \leq 5$ K showing an incipient structure in the maximum of the derivative around the critical point. Dashed curves mark the maximum slope of those derivatives

$B = 0.15$ T at $T = 4.2$ K, see dashed curves in Fig.5b. Above that temperature the satellite maximum progressively vanishes, disappearing at $T \approx 4.7$ K. Such a split of the $\partial M/\partial B\mid_T$ derivative might be due to the formation of a field induced phase when the point is approached. This feature my be related to one of the predictions for the ShSu lattice, that is the appearance of a plateaux in the magnetization at 1/4, 1/8 and 1/10 of the full saturated moment, as different ordered states emerge from the initially frustrated spin liquid through the application of magnetic field [4].

The obtained magnetic phase diagram is presented in Fig.6. There, the field driven transition between intermediate and FM phases is drawn according to the temperature of the maximum slope $\partial M/\partial T\mid_{max}$, which is in agreement with $C_m(T)$ measurements. Since T_M is practically not affected by field, both phase boundaries join at a critical point, at $T_{cr} = (4.2 \pm 0.3)$K for $B_{cr} = (0.12 \pm 0.02)$T.

In the inset of Fig. 6 we show a detail of the critical region extracted from the maximum slopes of the $M/\partial B\mid_T (B)$ derivatives depicted in Fig.5b. As mentioned before, the structure observed in the

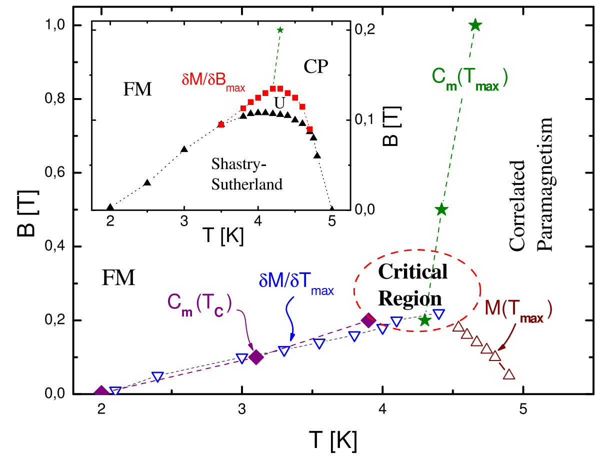

FIG. 6: (Color online) Field vs temperature phase diagram determined by the temperature of the maximum $\partial M/\partial T < 0$ slope and the $C_m(T_C)$ jump and the cusp of $M(T_M)$. Inset: detailed of the critical region using the criterion of the maximum slope of $\partial M/\partial B\mid_{max}$, showing the site 'U' of the observed structure (see the text). Error bar for the U-region boundary determination is ± 7 mT

$\partial M/\partial B\mid_T$ as a function of field may correspond to one of the steps predicted in the $M(B)$ dependence, which in this case corresponds to $\approx 1/8$ of the saturated moment M_S. The weakness of this effect can be attributed to the poly-crystalline character of the samples.

As proposed in Ref.[8] for $B = 0$, Ce nearest-neighbors form FM pairs with effective spin $S_{eff} = 1$ which define a simple square lattice lying parallel to the basal plane. A ShSu phase builds up from those dimers at $T = T_M$, which interact antiferromagnetically among them. From the present results we observe that dimers keep forming under moderate external field. However, the fact that the $C_m(T_C)$ jump and the height of the $\partial M/\partial B\mid_T$ maxima decrease as $T_C(B) \rightarrow T_M$ indicates that the degrees of freedom involved in the formation of the intermediate phase are progressively reduced by increasing magnetic field.

IV. CONCLUSIONS

The field dependent magnetic phase diagram was established for Ce_2Pd_2Sn. The application of magnetic field confirms that the transition at $T = T_M$ cannot be regarded as a canonical AF transition since T_M is practically not affected by fields of moderate intensity. On the contrary, the low temperature FM phase is favored by field since the AF interaction among dimers in the intermediate phase is progressively suppressed.

The instability of the intermediate Shasry-Sutherland phase in this compound is confirmed by the low value of applied field $B_{cr} \approx 0.12$ T required for its suppression. Around the critical region, a weak