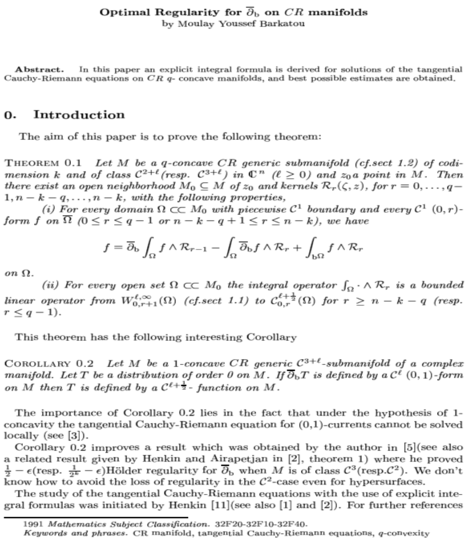
Homotopy Formulas In The Tangential Cauchy-Riemann Complex



Optimal Regularity for $\overline{\partial}_b$ on CR manifolds
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Abstract. In this paper an explicit integral formula is derived for solutions of the tangential Cauchy-Riemann equations on CR q- concave manifolds, and best possible estimates are obtained.

0. Introduction

The aim of this paper is to prove the following theorem:

THEOREM 0.1 *Let M be a q-concave CR generic submanifold (cf.sect 1.2) of codimension k and of class $\mathcal{C}^{2+\ell}$(resp. $\mathcal{C}^{3+\ell}$) in $\mathbb{C}^n$ ($\ell \geq 0$) and z_0 a point in M. Then there exist an open neighborhood $M_0 \subseteq M$ of z_0 and kernels $\mathcal{R}_r(\zeta, z)$, for $r = 0, \ldots, q-1, n-k-q, \ldots, n-k$, with the following properties,*

(i) For every domain $\Omega \subset\subset M_0$ with piecewise $\mathcal{C}^1$ boundary and every $\mathcal{C}^1$ $(0,r)$-form f on $\overline{\Omega}$ ($0 \leq r \leq q-1$ or $n-k-q+1 \leq r \leq n-k$), we have

$$f = \overline{\partial}_b \int_\Omega f \wedge \mathcal{R}_{r-1} - \int_\Omega \overline{\partial}_b f \wedge \mathcal{R}_r + \int_{b\Omega} f \wedge \mathcal{R}_r$$

on Ω.

(ii) For every open set $\Omega \subset\subset M_0$ the integral operator $\int_\Omega \cdot \wedge \mathcal{R}_r$ is a bounded linear operator from $W^{\ell,\infty}_{0,r+1}(\Omega)$ (cf.sect 1.1) to $\mathcal{C}^{\ell+\frac{1}{2}}_{0,r}(\Omega)$ for $r \geq n-k-q$ (resp. $r \leq q-1$).

This theorem has the following interesting Corollary

COROLLARY 0.2 *Let M be a 1-concave CR generic $\mathcal{C}^{3+\ell}$-submanifold of a complex manifold. Let T be a distribution of order 0 on M. If $\overline{\partial}_b T$ is defined by a $\mathcal{C}^\ell$ $(0,1)$-form on M then T is defined by a $\mathcal{C}^{\ell+\frac{1}{2}}$- function on M.*

The importance of Corollary 0.2 lies in the fact that under the hypothesis of 1-concavity the tangential Cauchy-Riemann equation for (0,1)-currents cannot be solved locally (see [3]).

Corollary 0.2 improves a result which was obtained by the author in [5](see also a related result given by Henkin and Airapetjan in [2], theorem 1) where he proved $\frac{1}{2} - \epsilon$(resp. $\frac{1}{2^k} - \epsilon$)Hölder regularity for $\overline{\partial}_b$ when M is of class $\mathcal{C}^3$(resp.$\mathcal{C}^2$). We don't know how to avoid the loss of regularity in the $\mathcal{C}^2$-case even for hypersurfaces.

The study of the tangential Cauchy-Riemann equations with the use of explicit integral formulas was initiated by Henkin [11](see also [1] and [2]). For further references

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