A note on Hardy spaces on quadratic CR manifolds

M. Calzi

Abstract. Given a quadratic CR manifold $M$ embedded in a complex space, and a holomorphic function $f$ on a tubular neighbourhood of $M$, we show that the $L^p$-norms of the restrictions of $f$ to the translates of $M$ is decreasing for the ordering induced by the closed convex envelope of the image of the Levi form of $M$.

CONTENTS

1. Introduction 1498
2. Preliminaries 1499
3. A property of Hardy spaces 1500
4. Examples 1502
References 1504

1. Introduction

Let $f$ be a holomorphic function on the upper half-plane $C_+ = \mathbb{R} + i\mathbb{R}_+^*$. If $f$ belongs to the Hardy space $H^p(C_+)$, that is, if $\sup_{y>0} \|f_y\|_{L^p(\mathbb{R})}$ is finite, where $f_y : x \mapsto f(x + iy)$, then it is well known that the function $y \mapsto \|f_y\|_{L^p(\mathbb{R})}$ is decreasing on $\mathbb{R}_+^*$, for every $p \in [0, \infty]$. Nonetheless, if $f$ is simply holomorphic, then the lower semicontinuous function $y \mapsto \|f_y\|_{L^p(\mathbb{R})}$ need not be decreasing. Actually, the set where it is finite may be any interval in $\mathbb{R}_+^*$, or even a disconnected set.

Now, replace the upper half-plane $C_+$ with a Siegel upper half-space $D := \{(\zeta, z) \in \mathbb{C}^n \times \mathbb{C} : \text{Im} z - |\zeta|^2 > 0\}$, and define $f_h : \mathbb{C}^n \times \mathbb{R} \ni (\zeta, x) \mapsto f(\zeta, x + i|\zeta|^2 + h)$.
for every \( h > 0 \) and for every function \( f \) on \( D \). This definition is motivated by the fact that

\[
bD := \{ (\zeta, x + i|\zeta|^2) : (\zeta, x) \in \mathbb{C}^n \times \mathbb{R} \}
\]

is the boundary of \( D \), and the sets \( bD + (0, ih) \), for \( h > 0 \), foliate \( D \) as the sets \( \mathbb{R} + iy \), for \( y > 0 \), foliate \( \mathbb{C} \). If \( f \) is holomorphic on \( D \), then the mapping \( h \mapsto \|f_h\|_{L_p(\mathbb{C}^n \times \mathbb{R})} \) is always decreasing (though not necessarily finite), in contrast to the preceding case (cf. Theorem 3.1). This fact is closely related with the fact that every holomorphic function defined in a neighbourhood of \( bD \) automatically extends to \( D \). More precisely, if one observes that \( bD \) has the structure of a CR submanifold of \( \mathbb{C}^n \times \mathbb{C} \), one may actually prove that every CR function (of class \( C^1 \)) is the boundary values of a unique holomorphic function on \( D \) (cf. [2, Theorem 1 of Section 15.3]).

In this note, we show that an analogous property holds when \( bD \) is replaced by a general quadratic, or quadric, CR submanifold of a complex space, and then discuss some examples of Šilov boundaries of (homogeneous) Siegel domains.

### 2. Preliminaries

We fix a complex hilbertian space \( E \) of dimension \( n \), a real hilbertian space \( F \) of dimension \( m \), and a hermitian map \( \Phi : E \times E \to F_C \). Define

\[
\mathcal{M} := \{ (\zeta, x + i\Phi(\zeta)) : \zeta \in E, x \in F \} = \{ (\zeta, z) \in E \times F_C : \Im z - \Phi(\zeta) = 0 \}
\]

where \( F_C \) denotes the complexification of \( F \), while \( \Phi(\zeta) := \Phi(\zeta, \cdot) \) for every \( \zeta \in E \). We define

\[
\rho : E \times F_C \ni (\zeta, z) \mapsto \Im z - \Phi(\zeta) \in F.
\]

We endow \( E \times F_C \) with the product

\[
(\zeta, z)(\zeta', z') := (\zeta + \zeta', z + z' + 2i\Phi(\zeta', \zeta))
\]

for every \((\zeta, z), (\zeta', z') \in E \times F_C\), so that \( E \times F_C \) becomes a 2-step nilpotent Lie group, and \( \mathcal{M} \) a closed subgroup of \( E \times F_C \). In particular, the identity of \( E \times F_C \) is \((0, 0)\) and \((\zeta, z)^{-1} = (-\zeta, -z + 2i\Phi(\zeta)) \) for every \((\zeta, z) \in E \times F_C \). It will be convenient to identify \( \mathcal{M} \) with the 2-step nilpotent Lie group \( \mathcal{N} := E \times F \), endowed with the product

\[
(\zeta, x)(\zeta', x') := (\zeta + \zeta', x + x' + 2\Im \Phi(\zeta, \zeta'))
\]

for every \((\zeta, x), (\zeta', x') \in \mathcal{N}\), by means of the isomorphism

\[
t : \mathcal{N} \ni (\zeta, x) \mapsto (\zeta, x + i\Phi(\zeta)) \in E \times F_C.
\]

In particular, the identity of \( \mathcal{N} \) is \((0, 0)\) and \((\zeta, x)^{-1} = (-\zeta, -x) \) for every \((\zeta, x) \in \mathcal{N} \). Notice that, in this way, \( \mathcal{N} \) acts holomorphically (on the left) on \( E \times F_C \). Given a function \( f \) on \( E \times F_C \), we shall define

\[
f_h : \mathcal{N} \ni (\zeta, x) \mapsto f(\zeta, x + i\Phi(\zeta) + ih) \in C
\]

for every \( h \in F \).
Observe that the preceding group structures show that, if we define the complex tangent space of $\mathcal{M}$ at $(\zeta, z)$ as

$$H_{(\zeta, z)} \mathcal{M} := T_{(\zeta, z)} \mathcal{M} \cap (iT_{(\zeta, z)} \mathcal{M})$$

for every $(\zeta, z) \in \mathcal{M}$, where $T_{(\zeta, z)} \mathcal{M}$ denotes the real tangent space to $\mathcal{M}$ at $(\zeta, z)$, identified with a subspace of $E \times F_{\mathbb{C}}$, then

$$H_{(\zeta, z)} = dL_{(\zeta, z)} H_{(0, 0)} \mathcal{M},$$

where $L_{(\zeta, z)}$ denotes the left translation by $(\zeta, z)$ (in $E \times F_{\mathbb{C}}$), and $dL_{(\zeta, z)}$ its differential at $(0, 0)$. Therefore, $\dim_C H_{(\zeta, z)} = n$ for every $(\zeta, z) \in \mathcal{M}$, so that $\mathcal{M}$ is a CR submanifold of $E \times F_{\mathbb{C}}$ (cf. [2, Chapter 7]), called a quadratic or quadric CR manifold (cf. [2, Section 7.3] and [10, 11]).

We observe explicitly that $\mathcal{M}$ is generic (that is, $\dim_R \mathcal{M} - \dim_R H_{(0, 0)} \mathcal{M} = \dim_R E \times F_{\mathbb{C}} - \dim_R \mathcal{M}$, cf. [2, Definition 5 and Lemma 4 of Section 7.1]) and that its Levi form may be canonically identified with $\Phi$ (cf. [2, Chapter 10] and [11]).

3. A property of Hardy spaces

We denote by $C$ the convex envelope of $\Phi(E)$.

**Theorem 3.1.** Let $\Omega$ be an open subset of $F$ such that $\Omega = \Omega + \overline{C}$, and set $D := \rho^{-1}(\Omega)$. Then, for every $f \in \text{Hol}(D)$, for every $p \in [0, \infty)$, for every $h \in \Omega$ and for every $h' \in \overline{C}$,

$$\|f_{h + h'}\|_{L^p(\Omega)} \leq \|f_h\|_{L^p(\Omega)}.$$ 

The proof is based on the ‘analytic disc technique’ presented in [2, Section 15.3].

Observe that the assumption that $\Omega = \Omega + \overline{C}$ is not restrictive. Indeed, if $\Omega$ is connected and $C$ has a non-empty interior $\text{Int} C$, then every function which is holomorphic on $\rho^{-1}(\Omega)$ extends (uniquely) to a holomorphic function on $\rho^{-1}(\Omega + \text{Int} C \cup \{0\})$ by [2, Theorem 1 of Section 15.3], and $\Omega + \text{Int} C \cup \{0\} = \Omega + \overline{C}$ since $\Omega$ is open and $\overline{C} = \text{Int} C$ by convexity. The case in which $\text{Int} C = \emptyset$ may be treated directly using similar techniques.

We also mention that, if $p < \infty$ and either $\Phi$ is degenerate or the polar of $\Phi(E)$ has an empty interior (that is, the closed convex envelope of $\Phi(E)$ contains a non-trivial vector subspace), then either $f_h = 0$ or $f_h \not\in L^p(\mathcal{N})$ (at least for $p \geq 1$ when $\Phi$ is non-degenerate). Cf. [6] for more details in a similar case.

**Proof.** For every $v = (v_j) \in E^m$, consider

$$A_v : C \ni w \mapsto \left( \sum_{j=1}^m v_j w^j, i \sum_{j=1}^m \Phi(v_j) + 2i \sum_{k<j} \Phi(v_j, v_k) w^{j-k} \right) \in E \times F_{\mathbb{C}},$$

and

$$\Psi(v) := \sum_{j=1}^m \Phi(v_j) \in C,$$
and observe that the following hold:

- \( A_v(0) = (0, i\Psi(v)) \);
- \( \Psi(E^m) \) is the convex envelope \( C \) of \( \Phi(E) \), thanks to \[12, \text{Corollary 17.1.2}]\;
- \( \rho(A_v(w)) = 0 \) for every \( w \in T \);
- the mapping \( A : E^m \ni v \mapsto A_v \in \text{Hol}(C; E \times F_C) \) is continuous (actually, polynomial).

Now, take \( h \in \Omega \). By continuity, there is \( \varepsilon > 0 \) such that \( A_v([0,0]) + ih \subseteq D \) for every \( v \in B_{E^m}(0, \varepsilon) \), where \( U \) denotes the unit disc in \( C \), and \( \overline{U} \) its closure. Then, \( A_v([0,0]) + ih' \subseteq D \) for every \( v \in B_{E^m}(0, \varepsilon) \) and for every \( h' \in h + \overline{C} \). For every \( h' \in \Psi(B_{E^m}(0, \varepsilon)) \), denote by \( \nu_{h'} \) the image of the normalized Haar measure on \( T \) under the mapping \( \pi \circ A_v \), for some \( v \in B_{E^m}(0, \varepsilon) \cap \Psi^{-1}(h') \), where \( \pi : E \times F_C \ni (\zeta, z) \mapsto (\zeta, \Re z) \in N \). Observe that, for every \( (\zeta, \chi, \zeta, \chi') \in N \) and for every \( h'' \in h + \overline{C} \), the mapping

\[
\overline{U} \ni w \mapsto f((\zeta + i\Phi(\overline{\zeta})), [A_v(w) + (0, i\overline{h''})]) \in C
\]

is continuous and holomorphic on \( U \), so that, by subharmonicity (cf., e.g., \[13, \text{Theorem 15.19}],

\[
|f(\zeta, x + i\Phi(\xi) + i(h' + h''))|^{1\min(1, p)} \leq \int_T |f((\zeta, x + i\Phi(\xi)) \cdot [A_v(w) + (0, i\overline{h''})])|^{1\min(1, p)} \, dw
\]

\[
= \int_N |f_{h''}(\zeta, x)(\xi, \chi')|^{1\min(1, p)} \, d\nu_{h'}(\zeta', \chi')
\]

\[
= (|f_{h''}|^{1\min(1, p)} \ast \tilde{\nu}_{h'})(\zeta, \chi),
\]

where \( \tilde{\nu}_{h'} \) denotes the reflection of \( \nu_{h'} \), while \( v \) is a suitable element of \( B_{E^m}(0, \varepsilon) \cap \Psi^{-1}(h') \). Since \( \nu_{h'} \) is a probability measure, by Young’s inequality (cf., e.g., \[4, \text{Chapter III, \S 4, No. 4}]\) we then infer that

\[
\|f_{h' + h''}\|_{L^p(N)} = \|f_{h' + h''}|^{1\min(1, p)}\|_{L^{\max(1, p)}}^{1/\min(1, p)}
\]

\[
\leq \|f_{h''}|^{1\min(1, p)}\|_{L^{\max(1, p)}(N)}^{1/\min(1, p)} = \|f_{h''}\|_{L^p(N)}
\]

for every \( h' \in \Psi(B_{E^m}(0, \varepsilon)) \) and for every \( h'' \in h + \overline{C} \). Since every element of \( C \) may we written as a finite sum of elements of \( \Psi(B_{E^m}(0, \varepsilon)) \), the arbitrariness of \( h'' \) shows that

\[
\|f_{h + h'}\|_{L^p(N)} \leq \|f_h\|_{L^p(N)}
\]

for every \( h' \in C \), hence for every \( h' \in \overline{C} \) by lower semi-continuity. The proof is complete. \( \square \)

**Corollary 3.2.** Assume that \( C \) has a non-empty interior \( \Omega \), and set \( D := \rho^{-1}(\Omega) \). Then, for every \( p \in [0, \infty) \) and \( f \in \text{Hol}(D) \),

\[
\sup_{h \in \Omega} \|f_h\|_{L^p(N)} = \lim \inf_{\eta \to 0, h \in \Omega} \|f_h\|_{L^p(N)}.
\]
In particular, if we define the Hardy space $H^p(D)$ as the set of $f \in \text{Hol}(D)$ such that $\sup_{h \in \Omega} \|f_h\|_{H^p(D)}$ is finite, the preceding result states that $H^p(D)$ may be equivalently defined as the set of $f \in \text{Hol}(D)$ such that $\liminf_{h \to 0, h \in \Omega} \|f_h\|_{L^p(\Omega)}$ is finite. This result should be compared with [3], where the boundary values of the elements of $H^p(D)$ are characterized as the CR elements of $L^p(\Omega)$, for $p \in [1, \infty]$. In particular, Corollary 3.2 could be deduced from the results of [3], when $p \in [1, \infty]$, though at the expense of some further technicalities.

This result extends [7, Corollary 1.43].

4. Examples

We shall now present some examples of homogeneous Siegel domains $D = \rho^{-1}(\Omega)$ for which $\bar{\Omega}$ is the closed convex envelope of $\Phi(E)$, so that Corollary 3.2 applies.

We recall that $D$ is said to be a Siegel domain if $\Omega$ is an open convex cone not containing affine lines, $\Phi$ is non-degenerate, and $\Phi(E) \subseteq \bar{\Omega}$. In addition, $D$ is said to be homogeneous if the group of its biholomorphisms acts transitively on $\Delta$.

It is known (cf., e.g., [5, Proposition 1]) that $D$ is homogeneous if and only if there is a triangular Lie subgroup $T_+$ of $GL(F)$ which acts simply transitively on $\Omega$, and for every $t \in T_+$ there is $g \in GL(E)$ such that $t\Phi = \Phi(g \times g)$.

If $T'_+$ is another Lie subgroup of $GL(F)$ with the same properties as $T_+$, then $T_+$ and $T'_+$ are conjugated by an automorphism of $F$ preserving $\Omega$. Thanks to this fact, we may use the results of [7] even if a different $T_+$ is chosen. In particular, there is a surjective (open and) continuous homomorphism of Lie groups

$$\Delta : T_+ \rightarrow (\mathbb{R}_+^r)'$$

for some $r \in \mathbb{N}$, called the rank of $\Omega$, so that

$$\Delta^s = \Delta_1^{s_1} \cdots \Delta_r^{s_r},$$

$s \in \mathbb{C}^r$, are the characters of $T_+$. Once a base point $e_\Omega \in \Omega$ has been fixed, $\Delta^s$ induces a function $\Delta^s_\Omega$ on $\Omega$, setting $\Delta^s_\Omega(t(e_\Omega)) = \Delta^s(t)$ for every $t \in T_+$.

Up to modifying $\Delta$, we may then assume that the functions $\Delta^s_\Omega$ are bounded on the bounded subsets of $\Omega$ if and only if $\text{Re} \ s \in \mathbb{R}_+$ (cf. [7, Lemma 2.34]). In particular, there is $b \in \mathbb{R}_+$ such that $\Delta^{-b}(t) = |\det_{C,E} g|^2$ for every $t \in T_+$ and for every $g \in GL(E)$ such that $t\Phi = \Phi(g \times g)$ (cf. [7, Lemma 2.9]), and one may prove that $b \in (\mathbb{R}_+)^r$ if and only if $\Phi(E)$ generates $F$ as a vector space, in which case $\Omega$ is the interior of the convex envelope of $\Phi(E)$ (cf. [7, Proposition 2.57 and its proof, and Corollary 2.58]). Therefore, we are interested in finding examples of homogeneous Siegel domains for which $b \in (\mathbb{R}_+)^r$.

Notice, in addition, that if $b \notin (\mathbb{R}_+)^r$, then $\Phi(E)$ is contained in a hyperplane, so that the interior of its convex envelope is empty.

The Siegel domain $D$ is said to be symmetric if it is homogeneous and admits an involutive biholomorphism with a unique fixed point (equivalently, if for every $(\zeta, z) \in D$ there is an involutive biholomorphism of $D$ for which $(\zeta, z)$ is
an isolated (or the unique) fixed point). The domain $D$ is said to be irreducible if it is not biholomorphic to the product of two non-trivial Siegel domains.

It is well known that every symmetric Siegel domain is biholomorphic to a product of irreducible ones, and that the irreducible symmetric Siegel domains can be classified in four infinite families plus two exceptional domains (cf., e.g., [1, §§ 1, 2]). In particular, for an irreducible symmetric Siegel domain, either $b = 0$ (that is, $E = \{0\}$, in which case $D$ is ‘of tube type’), or $b \in (\mathbb{R}^n)'$ (cf., e.g., [7, Example 2.11]). Hence, when $D$ is a symmetric Siegel domain, $\Omega$ is the closed convex envelope of $\Phi(E)$ if and only if none of the irreducible components of $D$ is of tube type. Note that these domains can be also characterized as those which do not admit any non-constant rational inner functions, thanks to [8].

We now present some examples of (homogeneous) Siegel domains.

**Example 4.1.** Let $\mathbb{K}$ be either $\mathbb{C}$ or the division ring of the quaternions. In addition, fix $r, k, p \in \mathbb{N}$ with $p \leq r$, and define

- $E$ as the space of $k \times r$ matrices over $\mathbb{K}$ whose $j$-th columns have zero entries for $j = p + 1, \ldots, r$;
- $F$ as the space of self-adjoint $r \times r$ matrices over $\mathbb{K}$;
- $\Omega$ as the cone of non-degenerate positive self-adjoint $r \times r$ matrices over $\mathbb{K}$;
- $\Phi : E \times E \ni (\zeta, \zeta') \mapsto \frac{1}{2}[(\zeta^* \zeta' + \zeta' \zeta^*) + i(\zeta^* i \zeta' - \zeta' i \zeta)] \in F_\mathbb{C}$;
- $T_+^\cdot$ as the group of upper triangular $r \times r$-matrices over $\mathbb{K}$ with strictly positive diagonal entries, acting on $\Omega$ (and $F$) by the formula $t \cdot h := \det t^*$;
- $\Delta : T_+ \ni t \mapsto (t_{1,1}, \ldots, t_{r,r}) \in (\mathbb{R}^r_+)'$.

Then, $\Omega$ is an irreducible symmetric cone\(^1\) of rank $r$ on which $T_+^\cdot$ acts simply transitively by [7, Example 2.6]. In addition, $\Phi$ is well defined, since $\zeta^* \zeta + \zeta^* \zeta' + \zeta^* i \zeta' - \zeta' i \zeta \in F$ for every $\zeta, \zeta' \in E$, and clearly $\Phi(\zeta) \in \Omega$ and $t \cdot \Phi(\zeta) = t \cdot (\zeta^* \zeta) = (\zeta t^*)^\cdot(\zeta t^*) = \Phi(\zeta t^*)$ for every $t \in T_+$ and for every $\zeta \in E$ (with $\zeta t^* \in E$), so that $D$ is homogeneous. Then, $b = (b_j)$, with $b_j = -k \dim C \mathbb{K}$ for $j = 1, \ldots, p$ and $b_j = 0$ for $j = p + 1, \ldots, r$. Consequently, $\Omega$ is the closed convex envelope of $\Phi(E)$ if and only if $p = r$ and $k > 0$.

Notice that $D$ is irreducible since $\Omega$ is irreducible (cf. [9, Corollary 4.8]), and that $D$ is symmetric if $kp = 0$ or if $p = r$ and $\mathbb{K} = \mathbb{C}$ (cf. [7, Examples 2.14 and 2.15]). If $kp(r - p) > 0$, or if $\mathbb{K} \neq \mathbb{C}$, $r \geq 3$, and $k \geq 2$, then $D$ cannot be symmetric.

\(^1\)A cone is said to be homogeneous if the group of its linear automorphisms acts transitively on it. It is said to be symmetric if, in addition, it is self-dual for some scalar product. A convex cone is said to be irreducible if it is not isomorphic to a product of non-trivial convex cones.
Example 4.2. Take \( k, p, q \in \mathbb{N}, p \leq 2 \). Define:

- \( E \) as the space of formal \( k \times 2 \) matrices whose entries of the first column belong to \( \mathbb{C} \) (and are 0 if \( p = 0 \)), and whose entries of the second column belong to \( \mathbb{C}^q \) (and are 0 if \( p \leq 1 \));
- \( F \) as the space of formally self-adjoint \( 2 \times 2 \) matrices whose diagonal entries belong to \( \mathbb{R} \), and whose non-diagonal entries belong to \( \mathbb{C}^q \);
- \( \Omega \) as the cone of \( \begin{pmatrix} a & b \\ b & c \end{pmatrix} \in F \) with \( a, c > 0, b \in \mathbb{C}^q \), and \( ac - |b|^2 > 0 \);
- \( \Phi \) so that

\[
\Phi \left( \begin{array}{c} \alpha_1 \\ \vdots \\ \alpha_k \\ b_k \\ \vdots \\ b_1 \end{array} \right) = \left( \begin{array}{c} \sum_j |\alpha_j|^2 \\ \sum_j \overline{\alpha_j} b_j \\ \sum_j |b_j|^2 \end{array} \right)
\]

for every \( \left( \begin{array}{c} \alpha_1 \\ \vdots \\ \alpha_k \\ b_k \\ \vdots \\ b_1 \end{array} \right) \in E \);
- \( T_+ \) as the group of formal \( 2 \times 2 \) upper triangular matrices with diagonal entries in \( \mathbb{R}^+ \) and non-diagonal entries in \( \mathbb{C}^q \), with the action\(^2\)

\[
\begin{pmatrix} a & b \\ 0 & c \end{pmatrix} \cdot \begin{pmatrix} a' & b' \\ 0 & c' \end{pmatrix} := \begin{pmatrix} a' a^2 + c'|b|^2 + 2a \text{Re} \langle b, b' \rangle \\ acb' + cc' b \\ c^2 c' \end{pmatrix}.
\]

- \( \Delta : T_+ \ni t \mapsto (t_{1,1}, t_{2,2}) \).

Then, \( \Omega \) is an irreducible symmetric cone of rank 2 on which \( T_+ \) acts simply transitively (cf. [7, Example 2.7]). In addition, \( \Phi(\xi) \in \overline{\Omega} \) for every \( \xi \in E \), and

\[
t \cdot \Phi(\xi) = \Phi(\xi t^*)
\]

for every \( t \in T_+ \) and \( \xi \in E \) (with \( \xi t^* \in E \)), provided that \( p \leq 1 \). Then, \( D \) is an irreducible Siegel domain, and it is homogeneous if \( p \leq 1 \) (it is symmetric if \( p = 0 \)). In addition, \( b = 0 \) if \( p = 0 \), while \( b = (k, 0) \) if \( p = 1 \). Further, if \( p = 2 \), then \( \Phi(E) \) contains the boundary of \( \Omega \), since \( \begin{pmatrix} b \\ c \end{pmatrix} \in C^q \) belongs to

\[
\Phi \left( \begin{array}{c} a^{1/2} \\ 0 \\ 0 \\ 0 \end{array} \right) = \Phi \left( \begin{array}{c} a^{1/2} \\ 0 \\ 0 \\ 0 \end{array} \right)
\]

for every \( a > 0 \), for every \( c \geq 0 \) and for every \( b \in \mathbb{C}^q \) such that \( |b|^2 = ac \) (the case \( a = 0, b = 0, c \geq 0 \) is treated similarly). Then, \( \overline{\Omega} \) is the closed convex envelope of \( \Phi(E) \) if and only if \( p = 2 \).

References


\(^2\)Formally, \( \left( \begin{array}{c} a & b \\ 0 & c \end{array} \right) \cdot \left( \begin{array}{c} a' & b' \\ 0 & c' \end{array} \right) = \left( \begin{array}{c} a & b \\ 0 & c \end{array} \right) \left( \begin{array}{c} a' & b' \\ 0 & c' \end{array} \right)^* \).
A NOTE ON HARDY SPACES ON QUADRATIC CR MANIFOLDS


(M. Calzi) Dipartimento di Matematica, Università degli Studi di Milano, Via C. Saldini 50, 20133 Milano, Italy
mattia.calzi@unimi.it

This paper is available via http://nyjm.albany.edu/j/2022/28-64.html.