

**PART-I CHARACTERS OF NAGENDRAM Γ -SEMI SUB NEAR-FIELD SPACE
 OF A Γ -NEAR-FIELD SPACE OVER NEAR-FIELD**

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ABSTRACT

In this manuscript we obtain the notion of characters of complex irreducible representations of compact Nagendram Γ -semi sub near-field space of a Γ -near-field space over near-field are linearly independent as elements of $C^\infty(N)$.

Keywords: *characters of Nagendram Γ -semi sub near-field space, Γ -near-field space; Γ -Semi sub near-field space of Γ -near-field space; Semi near-field space of Γ -near-field space, Nagendram Γ -semi sub near-field space, Nagendram Γ -semi near-field space, closed, compact, connected Nagendram Γ -semi sub near-field spaces of a Γ -near-field space over near-field, orthogonality characters of Nagendram Γ -semi sub near-field space.*

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SECTION 1: INTRODUCTION AND PRELIMINARIES.

In this paper author introduced PART I characters of complex irreducible representations of compact Nagendram Γ -semi sub near-field space of a Γ -near-field space over near-field.

We have the notion of the multiplicity $m_{P,Q}$ of an irreducible representation P in a representation Q .

$$Q = \bigoplus_{P \in \text{Irr}(N)} m_{P,Q} P \quad \text{where } nP \text{ is the direct sum of } n \text{ copies of } P.$$

Lemma 1.1: Let N be a compact Nagendram Γ -semi sub near-field space of a Γ -near-field space over near-field. Then the mapping from representations of N to characters of $N : Q \rightarrow \chi_Q$.

Proof: Suppose Q, Q' are two representations of N such that $\chi_Q = \chi_{Q'}$.

$$\text{Write } Q = \bigoplus_{P \in \text{Irr}(N)} m_{P,Q} P ; Q' = \bigoplus_{P \in \text{Irr}(N)} m_{P,Q'} P .$$

$$\text{Then } \chi_Q = \sum_{P \in \text{Irr}(N)} m_{P,Q} \chi_P = \sum_{P \in \text{Irr}(N)} m_{P,Q'} \chi_P$$

Since, $\{ \chi_P : P \in \text{Irr}(N) \}$ is linearly dependent, $m_{P,Q} = m_{P,Q'}$ and hence $Q = Q'$. This completes the proof of the Lemma.

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Example 1.2: Take $N = SU(2)$. Let $T = \left\{ \sum_{k=0}^n a_k z_1^{n-k} z_2^k : a_n \in \mathbb{C} \right\}$ is an irreducible representation of $SU(2)$ and $A \in SU(2)$ acts on $f(z_1, z_2) \in V_n$ by $(A.f)(z_1, z_2) = f((z_1, z_2)A)$.

So $\begin{bmatrix} \lambda & 0 \\ 0 & \lambda^{-1} \end{bmatrix} \cdot z_1^{n-k} z_2^k = (\lambda z_1)^{n-k} (\lambda^{-1} z_2)^k = \lambda^{n-2k} z_1^{n-k} z_2^k$.

Hence, $\chi_n \left(\begin{bmatrix} \lambda & 0 \\ 0 & \lambda^{-1} \end{bmatrix} \right) = \sum_{k=0}^n \lambda^{n-2k}$.

What about $\chi_n(A)$ where A is an arbitrary element of $SU(2)$? Well, any unitary matrix is Diagonalizable, $\chi(BAB^{-1}) = \chi(A)$ and Eigen values of any unitary matrix lie on S^1 . Hence, χ_n is completely determined by its values of T .

Since for any character $\chi : N \rightarrow \mathbb{C}$ of a Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field N , $\chi(aga^{-1}) = \chi(g)$ for all $a, g \in N$, In order to understand characters of N it's important to understand the conjugacy classes of N , i.e., the orbit space N/N where N acts on itself by conjugation. Let's consider an example to see what we should expect.

Example 1.3: Consider the characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field $U(n)$. As mentioned above, every element of $U(n)$ is conjugate to a diagonal matrix whose non-zero entries have norm 1. Note, however, that the set of Eigen values for a particular element of $U(n)$ is an unordered set! So

$U(n) / U(n) \cong \{D \in U(n) : D \text{ is diagonal}\} / \Sigma_n = T^n / \Sigma_n$ where Σ_n is the group of permutations of n letters.

Definition 1.4: A torus is compact, connected abelian characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field. A maximal torus T of a Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field N is a torus Gamma semi sub near-field spaces of a Nagendram Gamma near-field space over a near-field of N such that if T' is any other torus Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field of N and $T \subseteq T'$ then $T = T'$.

Example 1.5: Consider again $N = U(n)$.

The torus $T = \left\{ \begin{bmatrix} \lambda_1 & & & \\ & \lambda_2 & & \\ & & \ddots & \\ & & & \lambda_n \end{bmatrix} \mid |\lambda_j| = 1 \right\} \cong T^n$ is a maximal torus.

Suppose A is a matrix in $U(n)$ that commutes with all elements of T . But every element of T is diagonal, and matrix theory tells us that a matrix that commutes with an arbitrary diagonal matrix is itself diagonal. Hence, $A \in T$.

Note 1.6: (a). Maximal tori exist, (b). If N is compact and T_1, T_2 are two maximal tori, then T_1 and T_2 are conjugate. i.e. there exists $a \in N$ so that $aT_1a^{-1} = T_2$, (c). If N is compact and connected, then for any $g \in N$ there exists a maximal torus T such that $g \in T$. (d). If $T \leq N$ is a maximal torus, N compact and connected, then $N(T) = \{g \in N : gTg^{-1} \subseteq T\}$. The normalizer of T in G satisfies (i) $Q := N(T)/T$ is finite ($N(T)/T$ is called the Weyl Gamma near-field space over a near-field of (T)). (ii) $T/Q \cong N/N$.

SECTION 2: CONNECTED ABELIAN CHARACTERS OF NAGENDRAM GAMMA SEMI SUB NEAR-FIELD SPACES OF A GAMMA NEAR-FIELD SPACE OVER A NEAR-FIELD.

In this section, author present proposition on connected abelian characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field.

Proposition 2.1: Let N be a Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field, $K \subseteq N$ a connected abelian character of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field. Then the closure \overline{K} of K in N is also a connected abelian Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field N .

Proof: Since the closure of a connected space is connected, \overline{K} is connected Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field. We have only to argue that \overline{K} is an abelian Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field. Since, $f : N \times N \rightarrow N, f(a, b) = ab^{-1}$ is continuous and since $f(K \times K) \subseteq K, f(\overline{K} \times \overline{K}) = f(\overline{K \times K}) \subseteq \overline{f(K)} \subseteq \overline{K}$, we see that \overline{K} is a closed Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field N.

It remains to show that \overline{K} is abelian characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field. For any $x, y \in K, xyx^{-1} = y$ which also certainly holds if $y \in \overline{K}$. But then, yx^{-1} holds as well. By the same argument, this relation holds good for all $x, y \in \overline{K}$.

This completes the proof of the proposition.

Corollary 2.2: Any compact abelian characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field N with $\dim N > 0$ has a torus T with $\dim T > 0$.

Proof: For any $X \in g$, then $\{\exp tX : t \in \mathbb{R}\} \subseteq N$ is a connected abelian characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field. Hence its closure connected abelian characters of Nagendram Gamma semi sub near-field spaces of a Gamma near-field space over a near-field N. Since, N is compact, $\{\exp tX : t \in \mathbb{R}\}$ is a torus. This completes the proof of the corollary.

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