

**$\Gamma$ -GAMMA-SEMI NORMAL SUB NEAR-FIELD SPACES  
OF A  $\Gamma$ -NEAR-FIELD SPACE OVER NEAR-FIELD PART II**

**Smt. THURUMELLA MADHAVI LATHA<sup>1</sup>**

Research Scholar,  
Junior Lecturer, Department of Mathematics, APSWREIS  
Tadepalli, Guntur District, Amaravathi, Andhra Pradesh. INDIA.

**Dr T V PRADEEP KUMAR<sup>2</sup>**

Assistant Professor of Mathematics,  
A N U College of Engineering & Technology  
Department of Mathematics, Acharya Nagarjuna University  
Nambur, Nagarjuna Nagar 522 510. Guntur District. Andhra Pradesh. INDIA.

**Dr N V NAGENDRAM<sup>\*3</sup>**

Professor of Mathematics,  
Kakinada Institute of Technology & Science (K.I.T.S.)  
Department of Humanities & Science (Mathematics)  
Tirupathi (Vill.) Peddapuram (M), Divili 533 433  
East Godavari District. Andhra Pradesh. INDIA.

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**ABSTRACT**

*In this paper we introduce the Gamma-semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field PART II, and we three Smt. Thurumella Madhavi Latha, Dr. T V Pradeep Kumar and Dr. N V Nagendram together investigate the related properties of generalization of a Gamma-semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field.*

**Keywords:**  $\Gamma$ -near-field space;  $\Gamma$ -Semi normal sub near-field space of  $\Gamma$ -near-field space; Semi near-field space of  $\Gamma$ -near-field space.

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**SECTION-1: INTRODUCTION**

In this paper, Part II consisting two important sections we introduce the  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field, and we three Smt. Thurumella Madhavi Latha, Dr. T V Pradeep Kumar and Dr. N V Nagendram together investigate the related properties of generalization of a  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field.

As a generalization of a  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field, introduced the notion of  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field, extended many classical notions of  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field. In this chapter we develop the algebraic theory of  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field.

The notion of a  $\Gamma$ - semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field is introduced and some examples are given. Further the terms; commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, quasi commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, normal  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, left pseudo commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, right pseudo commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space are introduced. It is proved that (1) if  $S$  is a commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space then  $S$  is a quasi commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, (2) if  $S$  is a quasi commutative  $\Gamma$ -semi normal sub near-field spaces in

$\Gamma$ -near-field space then  $S$  is a normal Gamma-semi normal sub near-field spaces in  $\Gamma$ -near-field space, (3) if  $S$  is a commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, then  $S$  is both a left pseudo commutative and a right pseudo commutative  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field. Further the terms; left identity, right identity, identity, left zero, right zero, zero of a Gamma-semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field are introduced. It is proved that if  $a$  is a left identity and  $b$  is a right identity of a  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, then  $a = b$ . It is also proved that any  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space has at most one identity. It is proved that if  $a$  is a left zero and  $b$  is a right zero of a  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space, then  $a = b$  and also it is proved that any  $\Gamma$ -semi normal sub near-field spaces in  $\Gamma$ -near-field space over a near-field has at most one zero element

## **SECTION-2: $\Gamma$ -SEMI NORMAL SUB NEAR-FIELD SPACES OF $\Gamma$ -NEAR-FIELD SPACE OVER NEAR-FIELD SPACE**

$\Gamma$ -semi normal sub near-field spaces has greater importance in the theory of semi normal sub near-field spaces of  $\Gamma$ -near-field space over near-field space. In this section, the terms left  $\Gamma$ -semi normal sub near-field space, right  $\Gamma$ -semi normal sub near-field space,  $\Gamma$ -semi normal sub near-field space, proper  $\Gamma$ -semi normal sub near-field space, trivial  $\Gamma$ -semi normal sub near-field space, maximal left  $\Gamma$ -semi normal sub near-field space, maximal right  $\Gamma$ -semi normal sub near-field space, maximal  $\Gamma$ -semi normal sub near-field space, left  $\Gamma$ -semi normal sub near-field space generated by a subset, right  $\Gamma$ -semi normal sub near-field space generated by a sub near-field space,  $\Gamma$ -semi normal sub near-field space generated by a sub near-field space, principal left  $\Gamma$ -semi normal sub near-field space, principal right  $\Gamma$ -semi normal sub near-field space, principal  $\Gamma$ -semi normal sub near-field space of a  $\Gamma$ -semi normal sub near-field space are introduced. Also left duo  $\Gamma$ -semi normal sub near-field space, right duo  $\Gamma$ -semi normal sub near-field space, duo  $\Gamma$ -semi normal sub near-field space, left simple  $\Gamma$ -semi normal sub near-field space, right simple  $\Gamma$ -semi normal sub near-field space, simple  $\Gamma$ -semi normal sub near-field space are introduced. It is proved that (1) the nonempty intersection of any two left  $\Gamma$ -semi normal sub near-field space  $s$  of a  $\Gamma$ -semi sub near-field space  $S$  is a left  $\Gamma$ -semi normal sub near-field space of  $S$ , (2) the nonempty intersection of any family of left  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a left  $\Gamma$ -semi normal sub near-field space of  $S$ , (3) the union of any two left  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a left  $\Gamma$ -semi normal sub near-field space of  $S$  and (4) the union of any family of left  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a left  $\Gamma$ -semi normal sub near-field space of  $S$ .

It is also proved that (1) the nonempty intersection of any two right  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a right  $\Gamma$ -semi normal sub near-field space of  $S$ , (2) the nonempty intersection of any family of right  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a right  $\Gamma$ -semi normal sub near-field space of  $S$ , (3) the union of any two right  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a right  $\Gamma$ -semi normal sub near-field space of  $S$  and (4) the union of any family of right  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a right  $\Gamma$ -semi normal sub near-field space of  $S$ . Further it is proved that (1) the nonempty intersection of any two  $\Gamma$ -ideals of a  $\Gamma$ -semi sub near-field space  $S$  is a  $\Gamma$ -ideal of  $S$ , (2) the nonempty intersection of any family of  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a  $\Gamma$ -semi normal sub near-field space of  $S$ , (3) the union of any two  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a  $\Gamma$ -semi normal sub near-field space of  $S$  and (4) the union of any family of  $\Gamma$ -semi normal sub near-field spaces of a  $\Gamma$ -semi sub near-field space  $S$  is a  $\Gamma$ -semi normal sub near-field space of  $S$ .

It is proved that if  $S$  is a  $\Gamma$ -semi normal sub near-field space and  $a \in S$  then (i)  $L(a) = a \cup S \Gamma a$ , (ii)  $R(a) = a \cup a \Gamma S$ , (iii)  $J(a) = a \cup a \Gamma S \cup S \Gamma a \cup S \Gamma a \Gamma S$ . It is proved that a  $\Gamma$ -semi normal sub near-field space  $S$  is a duo  $\Gamma$ -semi normal sub near-field space if and only if  $x \Gamma S^1 = S^1 \Gamma x$  for all  $x \in S$ . Further it is also proved that every normal  $\Gamma$ -semi sub near-field space is a duo  $\Gamma$ -semi normal sub near-field space. It is proved that (1) a  $\Gamma$ -semi normal sub near-field space  $S$  is a left simple  $\Gamma$ -semi normal sub near-field space if and only if  $S \Gamma a = S$  for all  $a \in S$ , (2) a  $\Gamma$ -semi normal sub near-field space  $S$  is right a simple  $\Gamma$ -semi normal sub near-field space if and only if  $a \Gamma S = S$  for all  $a \in S$ , (3) a  $\Gamma$ -semi normal sub near-field space  $S$  is a simple  $\Gamma$ -semi normal sub near-field space if and only if  $S \Gamma a \Gamma S = S$  for all  $a \in S$ .

We now introduce the term of a left  $\Gamma$ - semi normal sub near-field space in a  $\Gamma$ -semi sub near-field space over near-field.

**Definition 2.1:** A non-empty  $\Gamma$ -semi sub near-field space  $A$  of a  $\Gamma$ -semi normal sub near-field space  $S$  is said to be a left  $\Gamma$ - semi normal sub near-field space of  $S$  if  $s \in S, a \in A, \alpha \in \Gamma \Rightarrow s \alpha a \in A$ .

**Note 2.2:** A nonempty  $\Gamma$ -semi sub near-field space  $A$  of a  $\Gamma$ -semi normal sub near-field space  $S$  is a left  $\Gamma$ - semi normal sub near-field space of  $S$  iff  $S \Gamma A \subseteq A$ .

**Theorem 2.3:** The nonempty intersection of any two left  $\Gamma$ -semi sub near-field spaces of a  $\Gamma$ - semi normal sub near-field space  $S$  is a left  $\Gamma$ -semi sub near-field space of  $S$ .

**Proof:** Let  $A, B$  be two left  $\Gamma$ -semi sub near-field spaces of  $S$ . Let  $a \in A \cap B$  and  $s \in S, \gamma \in \Gamma$ .

$a \in A \cap B \Rightarrow a \in A$  and  $a \in B$ .

$a \in A, s \in S, \gamma \in \Gamma, A$  is a left  $\Gamma$ -semi sub near-field space of  $S \Rightarrow s \gamma a \in A$ .

$a \in B, s \in S, \gamma \in \Gamma, B$  is a left  $\Gamma$ -semi sub near-field space of  $S \Rightarrow s \gamma a \in B$ .

$s \gamma a \in A, s \gamma a \in B \Rightarrow s \gamma a \in A \cap B$ . Therefore  $A \cap B$  is a left  $\Gamma$ -semi sub near-field space of  $S$ .

**Theorem 2.4:** The nonempty intersection of any family of left  $\Gamma$ -semi sub near-field spaces of a  $\Gamma$ - semi normal sub near-field space  $S$  is a left  $\Gamma$ -semi sub near-field space of  $S$ .

**Proof:** Let  $\{A_\alpha\}_{\alpha \in \Delta}$  be a family of left  $\Gamma$ -semi sub near-field spaces of  $S$  and let  $A = \bigcap_{\alpha \in \Delta} A_\alpha$ .

Let  $a \in A, s \in S, \gamma \in \Gamma$ .

$a \in A \Rightarrow a \in \bigcap_{\alpha \in \Delta} A_\alpha \Rightarrow a \in A_\alpha$  for each  $\alpha \in \Delta$ .

$a \in A_\alpha, s \in S, \gamma \in \Gamma, A_\alpha$  is a left  $\Gamma$ -semi sub near-field space of  $S \Rightarrow s \gamma a \in A_\alpha$ .

$s \gamma a \in A_\alpha$  for all  $\alpha \in \Delta \Rightarrow s \gamma a \in A_\alpha$ .

$s \gamma a \in A_\alpha$  for each  $\alpha \in \Delta \Rightarrow s \gamma a \in \bigcap_{\alpha \in \Delta} A_\alpha \Rightarrow s \gamma a \in A$ . Therefore  $A$  is a left  $\Gamma$ -semi sub near-field space of  $S$ . This

completes the proof of the theorem.

**Theorem 2.5:** The union of any two left  $\Gamma$ -semi sub near-field spaces of a  $\Gamma$ - semi normal sub near-field space  $S$  is a left  $\Gamma$ -semi sub near-field space of  $S$ .

**Proof:** Let  $A_1, A_2$  be two left  $\Gamma$ -semi sub near-field spaces of a  $\Gamma$ - semi normal sub near-field space  $S$ . Let  $A = A_1 \cup A_2$ .

Clearly  $A$  is a nonempty subset of  $S$ . Let  $a \in A, s \in S$  and  $\gamma \in \Gamma$ .

$a \in A \Rightarrow a \in A_1 \cup A_2 \Rightarrow a \in A_1$  or  $a \in A_2$ .

If  $a \in A_1$  then  $a \in A_1, s \in S, \gamma \in \Gamma, A_1$  is a left  $\Gamma$ -semi sub near-field space of  $S \Rightarrow s \gamma a \in A_1 \subseteq A_1 \cup A_2 = A$

$\Rightarrow s \gamma a \in A$ .

Therefore  $a \in A, s \in S, \gamma \in \Gamma \Rightarrow s \gamma a \in A$  and hence  $A$  is a left  $\Gamma$ -semi sub near-field space of  $S$ . This completes the proof of the theorem.

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**Corresponding Author(s): Smt. T. Madhavi Latha<sup>1</sup>, Dr. T V Pradeep Kumar<sup>2</sup> and Dr. N. V. Nagendram<sup>3</sup>  
 Professor of Mathematics, Kakinada Institute of Technology & Science, Tirupathi (v),  
 Peddapuram(M), Divili 533 433, East Godavari District, Andhra Pradesh. India.**

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