COLLABORATIVE RESEARCH PROJECT AGREEMENT
UNDER
MEMORANDUM OF UNDERSTANDING DATED 17TH JULY 2015 ("Master Agreement")
BY AND AMONGST
INDIAN INSTITUTE OF SCIENCE ("IISc")
SOCIETY FOR INNOVATION AND DEVELOPMENT ("SID")
(collectively the "Institute")
AND
TATA CONSULTANCY SERVICES LIMITED ("TCS")

This Collaborative Research Project Agreement ("Project Agreement") is made on the date of last signature below and shall be effective from 1st August 2022 ("Effective Date")

Upon execution by the Parties below, the Project specified herein shall be awarded and performed in accordance with the Master Agreement. The terms of the Master Agreement will prevail over this Project Agreement except to the limited extent specified herein. The applicable terms of the Master Agreement are incorporated herein by reference and will apply mutatis mutandis to this Project Agreement between the Parties.

The Project Agreement includes the following information:

1. Research Project Title: Flexible MetaSurface Antennas for Mobile VSAT Applications

2. Type of Project: Collaborative Research Project

3. Statement of Work: See attached Project Proposal Document

4. Principal Investigator(s) for Project and Party Name:

Party Name	Principal Investigator
Institute	S Venugopal, Department of Chemical Engineering, IISc
TCS	Tapas Chakravarty, Principal Scientist, TCS Research

5. Term/Period of Performance: ONE (1) YEAR (Start Date: Effective Date mentioned above)

6. Amount of Support: ₹ 10,35,000/- (Rupees Ten Lakhs Thirty-five Thousand only) (excluding Taxes)
Itemized Budget: See attached Project Proposal Document

JPC Meeting Date Approving the Project: 29th November, 2021

Payment Milestones and Provisions:
The invoices will be tentatively raised as per the following schedule subject to review of the Project progress as per the Milestones and furnishing of the Fund Utilization Certificate for the previous payment. If there is any change/modification in the invoicing schedule or payment milestone(s) or budget, Parties will formalize such change/modification by way of a written and signed amendment to this Project Agreement.

Invoicing Schedule		Milestones		Budget (₹)
1st Invoice	*First invoice will be raised upon execution of this Agreement.*	Milestone 1	Execution of Agreement	10,35,000/-

Fees shall be exclusive of all Taxes. Taxes will be charged separately by Institute. Such fees or other compensation is the exclusive and conclusive compensation for services under this Project Agreement, and there shall not be any other reimbursement of expenses or any other additional consideration for services. The invoice raised by the Institute according to agreed milestones would be paid for by TCS within sixty (60) days from the date of receipt of correct and

valid invoice and documents/information from Institute. Institute shall provide relevant supporting documents during reconciliation at the end of financial year or on TCS' request, whichever is earlier.
Parties agree that payments will be subject to withholding taxes as per the provisions of the Indian Income Tax Act, 1961 and also as per the provisions of GST Legislation, as amended from time to time. TCS will provide withholding tax certificates to Institute as per the provisions of the Income Tax Act, 1961 and GST Legislation as the case may be. In case any GST credit, refund or other benefit is denied or delayed to TCS due to any non-compliance by Institute, including but not limited to, failure to upload details of supply on GSTN portal, or failure to pay Tax to the Government, or non-furnishing or furnishing of incorrect or incomplete returns/documents/details/ information; TCS shall deduct the appropriate amount of loss incurred by TCS (including but not limited to, tax loss, interest and penalty) from any payments due to Institute. In a situation where there is no payment due by TCS to Institute, Institute shall reimburse TCS any loss incurred by TCS.

Invoices need to be sent on the address mentioned below –
Tata Consultancy Services Limited
Phase - 2, Block A, Second Floor,
IIT-Madras Research Park,
Kanagam Road, Taramani,
Chennai - 600113,
Tamil Nadu, India
TCS GST - 33AAACR4849R2ZR
Kind Attention: Mr K Ananth Krishnan

Soft copy of the invoice can reach *cto.fincoin@tcs.com*

Mode of Payment- by Bank Transfer, the bank account details for wire transfer are:

Bank Name	Canara Bank
Branch	IISc Campus, IISc, Bangalore - 560012
IFSC Code	CNRB0000683
MICR Code	560015023
Account Name	Society for Innovation and Development
Account Number	0683101018843
CGST / SGST No.	29AAATS5333E1ZJ
GST Registration Name	Society for Innovation and Development

7. Specified Deliverable / Outcomes of the Project and Intellectual Property Ownership:

		Outcome / Deliverable**	Whether the Outcome or Deliverable is based on or derived from Background IP of any Party[$]				
			Yes/ No	If Yes, Name of the Party (TCS/Institute/ Joint (TCS & Institute)/3rd Party)	If Yes, Name of the Background IP	If NO, Name of the Party owning Foreground IP (Sole TCS IP / Sole Institute IP /Joint IP)[∞]	Dependencies (if any) on (Institute/TCS)
Sub-Project 1 / Work Package 1	Year 1	D1. Design and simulation of Flat antennas in X-band & Ku Band	Yes	TCS	"Computer Controlled Electromechanical MMW Frequency Antenna Scanning System And Beam Steering Thereof", CS 202121023515, India, 27-MAY-2021 (IDF-224009-046)		IISC to define material type, electrical properties and thickness of film. IISc to define estimated fabrication tolerances

		D2. Printing of the antennas design (as per D1) on Kapton films using the Print-Expose-Develop technique developed at IISc. The method uses a standard desktop inkjet printer to define the metallic patterns with mm-scale features on flexible substrates	No			Sole Institute IP	TCS design as per D1 conforming to the material type and tolerances
		D3. Print quality and material characterization	No			Sole Institute IP	TCS to provide at-least two different designs to compare print quality
		D4. Antenna measurement and performance metrics	No			Sole TCS IP	Subject to D2 and D3
Mention Name of the Overall Solution and Name of the Party who will own the Overall Solution		Name of the Overall Solution***: Flat & Flexible MetaSurface Antennas for Mobile VSAT Applications in X/ Ku band Description of Overall Solution: The Overall Solution has three components namely, 1. TCS will design flat antennas in X or Ku Band (one or more design iterations will be required) 2. IISc will print these antennas on the flexible material (limited to the choice of any one or two materials and different available thicknesses) and establish quality metric as per print quality 3. TCS will conduct the Antenna testing Keeping these in mind, the Overall Solution is described as Flat antennas printed on suitable flexible materials and limited to the extent of antenna designs provided by TCS as well as the associated technique (knowledgebase) established for printing of these antenna designs along with print quality evaluation vis-à-vis antenna's functional performance. Another way of describing the above is: 1. Solution - X/Ku Band Flat antenna (for VSAT mobile terminal-as per TCS design) Owner-TCS 2. Antenna design, testing by TCS 3. Antenna printing uses IISc technology - Owner IISc. Item 3 is not part of solution, but an enabler to build the solution. Name of the Party who will own the Overall Solution: TCS *** *the Overall Solution herein shall mean the product/ solution or overall outcome conceived, created, invented, discovered or developed, using the Background IP of the parties as identified above and Foreground IP generated by the parties under this Project Agreement. To the extent Institute Background IP or Institute Sole Foreground IP or Joint Foreground IP is incorporated or required for exploitation of Overall Solution, TCS will take appropriate licenses for commercialization of the same, where required, as per the terms of the Master Agreement*					

** *This column should mention complete list of outcomes or deliverables of the Project including New/Foreground IP and any Modifications, Enhancements or Other Derivative Works of or Add-Ons to Background IP of any Party.*

$ Please ensure that the Background IP mentioned here is also listed in the Background IP table in the proposal. Background IP should include only patents, patent applications, designs and any tangible or code based assets. Research Publications not protected by patents, designs or code-based assets should be mentioned as prior art. Background IP may be used with an Outcome / Deliverable but it is not necessary that Outcome / Deliverable is derived out of such Background IP; in which case such Outcome / Deliverable should be treated as Foreground IP and not based on Background IP. However, such Background IP should be listed in the Background IP table in the proposal.

IP generated out of Modifications, Enhancements or Other Derivative Works would always vest with the Party contributing the Background IP and/or its licensors.

IP generated out of Add-ons to Background IP can be listed as Sole or Joint Foreground IP of other Party only if rights are given by the Party contributing Background IP to other Party to develop the Add-ons solely or jointly with the party

contributing Background IP. However, if Add-ons are created by the party contributing the Background IP, such Add-ons will continue to vest with the party contributing the Background IP.

The novelty and competitiveness of the outcomes / methods employed will be demonstrated through the following:

a. Patents (to be treated in a manner set out in the Master Agreement)
b. Publications in Journals & Conferences (in a manner set out in the Master Agreement)
c. Live demonstrations.

Ownership of IP generated during the course of the Project: Parties should take care that any Outcome / Deliverable which is an Enhancement, Modification or Other Derivative Work of a Party's Background IP is not considered Foreground IP.
The governance and ownership of the IP produced by this research project will be as per the Master Agreement. Among the IP models covered by the Master Agreement, it is proposed that the IP ownership model applicable to Collaborative Research Projects be considered for the work products and outcomes of this Project.

∞If there is any change in the ownership status of any outcome or deliverable as approved by the MC in its review meetings, the same will be recorded by the parties in writing in the review minutes of meetings and at the end of the Project by signing a memorandum as an addendum to this Project Agreement mentioning the final status of the IP ownership of the outcomes / deliverables resulting from this Project.

8. Background IPR:
(a) Background IPR of Parties: For details refer the Project Proposal.

(b) Background IPR of Third Party/Parties: For details refer the Project Proposal.

(*Subsequently, as and when a Party may utilize or bring in its Background IP, it will without undue delay bring the same to the notice of the other Party in writing which should be approved in the MC review meetings and recorded by the Parties in writing in the review minutes of meetings and at the end of the Project by signing a memorandum as an addendum to this Project Agreement)*

9. TCS Equipment Loans or Gifts (if any): Not Applicable

In case of funding for purchase of hardware which is to be done by Institute, TCS will require a Tax Invoice from Institute with confirmation of hardware installation and a TCS pre Approval for Specification and Cost. It should be also supported by Original Vendor Invoice from where purchase is made. TCS will also require a Delivery Challan Copy and Vendor Installation Report of the said Hardware.

In case of funding for purchase of hardware which is to be done by Institute via online procurement, TCS may release Advance Payment to Institute based on Payment Release Letter supported by Procurement Item listing with Online Price and Quantity along with TCS Pre Approval for Specification with Cost. Post online procurement within 7 Days Institute to submit a Tax Invoice supported by hardware installation report, Online Payment Invoice and Receipt for settlement of Advance.

10. Final Project Report: Within thirty (30) days after the end of the Project period, Institute shall cause the Principal Investigator(s) to provide TCS with a detailed written report summarizing the Outcomes/Deliverables obtained during the Project period and the Principal Investigator hereby undertakes to abide by the aforementioned timeline provided for submission of the Final Project Report. Such Report shall among other things also identify the Background IPs, and Sole IPs of the parties and Joint IPs which gets incorporated into or otherwise required for the exploitation of the overall final solution(s)/outcome(s) mentioned in the deliverables table section 7 above.

Research Project Authorization:

TATA CONSULTANCY SERVICES LIMITED

..... Date:
Name: K Ananth Krishnan
Title: Executive Vice President & CTO

INDIAN INSTITUTE OF SCIENCE

..... Date:
Name:
Title:

SOCIETY FOR INNOVATION AND DEVELOPMENT ("SID")

..... Date:
Name:
Title:

PRINCIPAL INVESTIGATOR'S ACKNOWLEDGEMENT

I confirm that I've read and understand the terms and conditions of the Master Agreement signed between Institute and TCS under which this Project Agreement is executed and agree to comply with the terms of that Master Agreement as they relate to my activities under this Project.

_____Date: _____
Institute Principal Investigator
Prof. S. Venugopal Dept of Chemical Engineering, IISc

_____Date: _____
TCS Principal Investigator
Dr Tapas Chakravarty TCS Research, Kolkata

Statement of Work: PROJECT PROPOSAL

Collaborative Project Proposal On Flexible MetaSurface Antennas for Mobile VSAT Applications

1. Abstract

VSAT systems are essential components of modern communications systems, especially in remote/mobile/emergency/disaster management settings. A flexible lightweight antenna, preferably tunable, is highly desirable in such applications. Metasurfaces, thin film versions of metamaterials, are ideally suited for such applications. Metasurface antennas, comprising of periodically patterned metallic inclusions on a dielectric thin film, are versatile low profile radiators. They harness the interaction between a surface wave and a modulated impedance surface (metasurface) to create radiation patterns with designed shape and polarizations. The fabrication process for such metallic patterns is based on the subtractive manufacturing paradigm used in PCB industry. The lithographic processing has high environmental consequences as well as large energy requirements. Recently, several additive processes based on nanoparticulate inks have emerged as alternatives for printing metallic structures used in metasurfaces. At IISc, we have developed a simple "print-expose-develop" technique, which is based on salt printing technique used in 1800s for photography. This process is scalable and designed for manufacturing on a wide variety of flexible substrates. In this proposal, we propose to conduct research and development to overcome issues such as material property degradation by silver tarnishing, and identify resolution limits for fabricating metallic patterns. The specific objective is a proof-of-concept demonstration of the ability to rapidly prototype suitable metasurface antenna designs developed by TCS.

2. Research Problem

a. Purpose

Parabolic dish antennas, presently used in mobile VSAT applications, are unwieldy and their manufacturing process is not easily adaptable for complex configurations. MetaSurface (Reflectarray) antenna designs based on modular patterns of metallic thin films ("Flat antennas") are lightweight and can conform to surfaces. The objective is to establish a low-cost, modular and rapid prototyping technique for fabricating novel MetaSurface ("Flat") antennas designed for mobile VSAT applications

b. Methodology

A brief discussion of each of the above subprojects / work packages emphasising the various research components envisaged is given below.

Sub-project 1 / Work Package 1.

1. Design and simulation of Flat antennas in X-band & Ku Band

The current paradigm in VSAT earth station antennas consist of parabolic dish antennas of diameters in the range between 0.8m to 1.5m. Here, we will research on designing flat antennas which can be mounted on the roof of vehicles. However, in order to obtain highly collimated beam research is needed to design such using the emerging metasurface concepts where the concerned design consists of small sized metallic patches in a periodic arrangement on a dielectric substrate. Since each patch is sub-Wavelength size, there are concerns with respect to printing quality and tolerances associated with inkjet printing.

2. Printing of the antennas design

Here, the design as per step 1 will be printed on Kapton films using the Print-Expose-Develop technique developed at IISc. The method uses a standard desktop inkjet printer to define the metallic patterns with mm-scale features on flexible substrates. Thus, the process for rapid prototyping of novel MetaSurface antenna designs developed by TCS for mobile VSAT applications will be demonstrated.

3. Print quality and material adhesion analysis

In this step, Geometric fidelity of fabricated structures will be evaluated. The outcome will be the establishment of the process of rapid prototyping of metallic patches on flexible substrates like Kapton. Thus the developed process will not only permit new antennas to be built but also be a step in the direction for creating new electronic devices, as per flexible electronics paradigm.

4. Antenna measurement and performance metrics

The fabricated antennas will be tested for antenna performance like return loss, impedance bandwidth, gain in orthogonal elevation planes and axial ratio (if applicable). It is envisaged that the antenna design, fabrication and evaluation stages will go through few iterations.

c. Scope

1. Design of Metasurface based flat antenna design at X & Ku-band
2. Printing of the above antenna designs on Kapton, a thin and flexible substrate
3. Establishing the process of such rapid prototyping
4. Evaluation of antenna performance through measurements on fabricated antennas

d. Research Novelty

The use of additive printing techniques, as opposed to the subtractive PCB manufacturing process, to define metasurfaces (metallic patterns at sub-wavelength scale) for VSAT applications. Environment and energy-efficient process designed for manufacturing (DFM)

e. Relevance to TCS

Rapidly deployable, flexible, lightweight, VSAT antennas.

3. Research Approach

a. Proof of Concept

The definition of metallic patterns using an inkjet printer is based on "prior art" developed at IISc. It is inspired by "salt printing" technique, first pioneered in 1867 by Henry Talbot (precursor of Silver-Halide Photography). We are presently using a simple office desktop printer to carry out this process at cm scale resolutions on flexible paper/plastic substrates. The metasurfaces for VSAT antenna systems will require process optimization and development for fabricating mm-scale features. The technique can be easily scaled up for manufacturibility using any of the high-speed printing processes such as gravure/flexure/textile printing (used to print newspapers). These techniques also have sub-mm resolution capability. The aim in this project is to optimise/develop processes to ensure, using realistic designs, that the printed silver nanostructures act as metasurface antennas.

b. Efforts and Timelines

Time line: ONE (1) year from the Effective Date

Work (lead team) \Time (Months)	0-3	3-6	6-9	9-12
D1 (TCS)				
D2 (IISc)				
D3 (IISc)				
D4 (TCS)				

c. Team

Institute

Prof. S. Venugopal, Associate Professor, Department of Chemical Engineering, (Relevant Research Area: Metallic Nanostructures)

TCS:

Dr. Tapas Chakravarty, Principal Scientist, TCS Innovation Labs, Kolkota

Dr. Achanna Anil Kumar, Senior Scientist, TCS Innovation Labs, Bangalore

In terms of FTE, it is proposed that TCS will budget for 1 FTEs per year for this project.

Please note that the development effort will be towards a proof of concept only, and the efforts required for the commercialization aspects are out of scope of this proposal.

Before involving any team member(s) for execution of the Project, Institute PI shall ensure that each individual team member signs declaration form(s) ("Declaration Form") in the manner prescribed in Exhibit A to this Project Proposal and shall also provide a copy of the duly executed Declaration Form(s) to TCS within five (5) days from the date of such execution.

d. Potential TCS OUs / BU's for Interaction

The _B&TS-IoT ISU are the potential OUs/BUs identified for this research project.

4. Project Governance

a. Technical Review Committee

A review committee comprising personnel from both Institute [e.g. Head of the relevant department(s)] and TCS (e.g. Research Area heads, representatives from the relevant business units) will be constituted to monitor and review the progress of the project.

b. Review Schedule: Once in SIX months

c. Risk Planning and Mitigation

Risk	Mitigation Plan
Silver Tarnishing	Electroplating with a thin layer of sacrificial/protective metal film (Zinc, Gold etc)
Ku band (2.5 – 1.67 cm wavelength) metasurface designs may require 100 micron resolution	If possible, Dimatix material printer from CeNSE can be utilised. Otherwise, for proof of concept, we may focus on C-band or even L-band designs

5. Expected Outcomes / Deliverables and Intellectual Property Ownership

Note: This table should be identical to the one in the main CR Project Agreement.

		Outcome / Deliverable**	Whether the Outcome or Deliverable is based on or derived from Background IP of any Party$				
			Yes/ No	If Yes, Name of the Party (TCS/Institute/ Joint (TCS & Institute)/3rd Party)	If Yes, Name of the Background IP	If NO, Name of the Party owning Foreground IP (Sole TCS IP / Sole Institute IP /Joint IP) ∞	Dependencies (if any) on (Institute/TCS)
Sub-Project 1 / Work Package 1	Year 1	D1. Design and simulation of Flat antennas in X-band & Ku Band	Yes	TCS	"Computer Controlled Electromechanical MMW Frequency Antenna Scanning System And Beam Steering Thereof", CS 202121023515, India, 27-MAY-2021 (IDF-224009-046)		IISC to define material type, electrical properties and thickness of film. IISc to define estimated fabrication tolerances
		D2. Printing of the antennas design (as per D1) on Kapton films using the Print-Expose-Develop technique developed at IISc. The method uses a standard desktop inkjet printer to define the metallic patterns with mm-scale features on flexible substrates	No			Sole Institute IP	TCS design as per D1 conforming to the material type and tolerances
		D3. Print quality and material characterization	No			Sole Institute IP	TCS to provide at-least two different designs to compare print quality

		D4. Antenna measurement and performance metrics	No			Sole TCS IP	Subject to D2 and D3
Mention Name of the Overall Solution and Name of the Party who will own the Overall Solution		Name of the Overall Solution***: Flat & Flexible MetaSurface Antennas for Mobile VSAT Applications in X/ Ku band Description of Overall Solution: The Overall Solution has three components namely, 4. TCS will design flat antennas in X or Ku Band (one or more design iterations will be required) 5. IISc will print these antennas on the flexible material (limited to the choice of any one or two materials and different available thicknesses) and establish quality metric as per print quality 6. TCS will conduct the Antenna testing Keeping these in mind, the Overall Solution is described as Flat antennas printed on suitable flexible materials and limited to the extent of antenna designs provided by TCS as well as the associated technique (knowledgebase) established for printing of these antenna designs along with print quality evaluation vis-à-vis antenna's functional performance. Another way of describing the above is: 4. Solution - X/Ku Band Flat antenna (for VSAT mobile terminal-as per TCS design) Owner-TCS 5. Antenna design, testing by TCS 6. Antenna printing uses IISc technology - Owner IISc. Item 3 is not part of solution, but an enabler to build the solution. Name of the Party who will own the Overall Solution: TCS *** *the Overall Solution herein shall mean the product/ solution or overall outcome conceived, created, invented, discovered or developed, using the Background IP of the parties as identified above and Foreground IP generated by the parties under this Project Agreement. To the extent Institute Background IP or Institute Sole Foreground IP or Joint Foreground IP is incorporated or required for exploitation of Overall Solution, TCS will take appropriate licenses for commercialization of the same, where required, as per the terms of the Master Agreement*					

6. State of the Art (Prior Art)

6.1 Background IPR

a. Background IP of the Parties

The Background IP of the Parties (assets, patents) which is currently considered relevant and likely to be used for the Project are given below:

Mark 'X' in the relevant column which is not applicable

Institute Background Intellectual Property (IP)					
Patent/ Design	S. No.	Patent/Design Title	Patent/Design No. /Application No.	Country	Status
	1.	X	X	X	X
Asset (E.g. Code and non-code based assets including documents)	S. No.	Asset Name	Purpose of Use	Remarks	
	1.	*E.g. Code based asset*	X	X	
	2.	*Non-code based asset E.g. Framework, Model, Architecture, etc.*	X	X	

TCS Background Intellectual Property (IP)					
Patent/Design	S. No.	Patent/Design Title	Patent/Design Number/Application Number	Country	Status

	1.	"Computer Controlled Electromechanical MMW Frequency Antenna Scanning System And Beam Steering Thereof",	CS 202121023515	India	CS filed, 27-May-2021
Asset (E.g. Code and non-code based assets including documents)	S. No.	Asset Name	Purpose of Use	Remarks	
	1.	*E.g. Code based asset*	X	X	
	2.	*Non-code based asset E.g. Framework, Model, Architecture, etc.*	X	X	

Joint Background Intellectual Property (IP)					
Patent/ Design	S. No.	Patent/ Design Title	Patent/ Design Number/Application Number	Country	Status
	1.	X	X	X	X
Asset (E.g. Code and non-code based assets including documents)	S. No.	Asset Name	Purpose of Use		Remarks
	1.	*E.g. Code based asset*	X		X
	2.	*Non-code based asset E.g. Framework, Model, Architecture, etc.*	X		X

b. Background IP of Third (3rd) Parties

The Background IP of the Third Parties (assets, patents) which is currently considered relevant for the Project are given below:

Third Party Background Intellectual Property (IP)***						
Patent/ Design	S. No.	Patent/Design Title	Patent/Design Number/Application Number	Country	Status	To be Used in Project (Yes/No)
	1.	X	X	X	X	X
Asset (E.g. Code and non-code based assets including documents)	S. No.	Asset Name	Purpose of Use	Remarks		To be Used in Project (Yes/No)
	1.	*E.g. Code based asset*	X	X		X
	2.	*Non-code based asset E.g. Framework, Model, Architecture, etc.*	X	X		X

****In the event that Background IP of any third party is intended to be incorporated into the Sole Foreground IP, the Party incorporating, covenants that it shall use its best efforts to procure such rights in and to the third party Background IP to be incorporated. If any third party Background IP is considered necessary, the Parties shall mutually agree to incorporate or embed any third party Background IP and shall negotiate in good faith and set forth the applicable terms and conditions in a separate license agreement before it is so incorporated or used.*

6.2 Publications Landscape

A search for Publications in related areas was carried out and some of the relevant results are shown below clearly showing how they are different from the proposed work.

Prior Art Publications

S. No.	Publication Title	Publication Journal/ Conference	Date of Publication	Remarks
1.	High-Throughput Satellite Connectivity for the Constant Contact Vehicle	Proceedings of the 48th European Microwave Conference	25–27 Sept 2018,	employs high-birefringence, nematic liquid crystals as tunable dielectric to control the capacitance of themetasurface scattering elements
2.	Ultra-flat high gain x-band antenna based on modulated metasurfaces	ESTEC,	22-23 February 2016	Uses subtractive PCB technique for fabricating Metasurfaces
3.	Design, realization and experimental characterization of a 40dB gain metasurface antenna	2019 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting	7-12 July 2019	
4.	Using an Office Inkjet Printer to Define the Formation of Copper Films on Paper	IEEE Transactions on Nanotechnology	2013	Prior Art (IISc). Uses a inkjet printed seed layer for copper electrodeposition to form UWB antenna structures

7. Funding Requirement (1 year)
Year 1

Head	Sub-Project 1 / Work Package 1 (Lacs ₹)
Equipment – Backup/Maintenance	-
Computers	-
Communication	-
Manpower – Faculty, Students and Field and Technical Project Staff	4.08 (One Project Assistant)
Consumables	3.00 (Consumables/ Materials Characterization)
Travel	-
Contingencies	1.2
Overhead (@ 25%)	2.7
Taxes	As applicable
Total	10.35

Exhibit A
DECLARATION FORM

PROJECT TITLE: Flexible MetaSurface Antennas for Mobile VSAT Applications

INSTITUTE PROJECT PI: S. Venugopal

TCS PROJECT PI: Tapas Chakravarty

INSTITUTE TEAM MEMBER REPRESENTATIONS:

I, the undersigned, a member of the Institute Project Team, represent that:

1. I will not, in the performance of the Project, knowingly infringe upon or misappropriate any third party intellectual property rights, confidential information or trade secrets.

2. I agree that I will execute all the necessary documents required by law including but not limited to assignments deeds and forms in order to vest the intellectual property rights and/or other ownership rights or title with respect to any and all Intellectual Property conceived, invented, generated, developed or created in the course of, or as a result of, the Project undertaken under this Project Agreement in favour of Institute and/or TCS (as the case may be) as may be required by TCS.

3. I will not publish or act or omit to act in any manner so as to cause any loss or damage to the Intellectual Property so generated or disclosure of Confidential Information received from or relating to TCS and Project (including Deliverables/Outcomes generated in the course of the Project) without prior written permission of Institute PI and TCS PI.

4. My engagement in research with third parties during the Project period does not have any conflict of interest with my obligations under this Project Agreement and do not have any adverse or detrimental effect on the Project undertaken hereunder.

5. I will adhere to highest fiduciary standards, ethical practices and standards of care and competence while performing my obligations under this Project Agreement.

6. Under no circumstances shall my engagement/participation in this Project be construed as an employment with TCS.

7. I voluntarily assume and understand any and all risks associated with my engagement/participation in the Project and I hereby, agree that TCS shall not be held liable for any losses that I may sustain due to my engagement/participation in the Project. Accordingly, I hereby waive any and all right or claim for losses.

8. If I'm issued a TCS ID or Email ID, I agree to abide by and be bound by any and all policies, documents, guidelines and processes including IP, Security and Confidentiality of TCS in force from time to time whether expressly endorsed or not and shall keep any such credentials confidential, not share the same with anyone else and use the same only for the purpose of the Project. I acknowledge and agree that issuance of such TCS ID or Email ID does not imply or create a relationship of employer and employee between TCS and me and shall not make any such claim against TCS and/or for any benefits available to an employee.

Sincerely,

Name: _____ ID no. _____ Signature: _____ Project Joining Date: _____

Name: _____ ID no. _____ Signature: _____ Project Joining Date: _____

- End of Document -