SIMULATION OF TRANSMITTING AUDIO/VIDEO OVER 5G IN ROBOTIC TELESURGERY SYSTEM

A Mini Project Report Submitted in Partial Fulfillment of the Requirement of the Degree

of

BACHELOR OF TECHNOLOGY

in

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY ,MAJITAR, EAST SIKKIM-737136, JANUARY 2020

Certificate

This is to certify that the project report entitled "Simulation of transmitting audio andvideo over 5G" submitted by E.HARI KIRAN BABU (201800240) & P. PAVAN KALYAN (201800265) to Sikkim Manipal Institute of Technology, Sikkim partial fulfillment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering , is a bonafide record of the project work carried out by them under my guidance and supervision during the academic session January – May 2021.

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PROFESSOR
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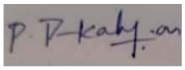
Abstract

Telesurgery" is an innovative trend of surgery which promises to replace or help supportively the conventional method of surgery operation. Telesurgerymakes use of wireless technologies and robotic systems so as to allow surgeons to operate on patients from distance . New emerging technologies, such as Internet of Things (IoT), Wireless Sensor Networks (WSN), 5G Networks, Tactile Robotics, Artificial Intelligence (AI) and novel Video Compressing techniques for a better quality of visualization and lower latency, can be evaluated for successful telesurgery operation .HDVideo and Audio over 5G network i.e , Remote Surgeons will be able to see the distant patient and also the Robotic Hands .

Acknowledgement

We would like to express our sincere gratitude and appreciation to the Electronics and Com- munication Department, SMIT for providing the opportunity of major project and to our HOD Dr. Sourav dhar for his support. Special thanks to my project guide (Mr. Rabindranath bera) for his meaningful contribution for the works related to this project and its successful completion.

We would like to thank all the teaching and non-teaching staffs of ECE Department, Sikkim Manipal Institute of Technology, for providing enormous support to carry out my research works. We would also like to thank all our colleagues of Sikkim Manipal Institute of Tech-nology, for providing their support in various manners during our research works.



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(201800240)

Dept. Of Electronics and Communication, SMIT

A. INTRODUCTION :

The next generation of mobile broadband infrastructure or International Mobile Telecommunications (IMT) for 2020 and beyond (5G) will expand and support diverse usage scenarios and applications with respect to previous network generations, purposed primarily for the support of improved voice, mobile Internet and video experience. The main categories of usage scenarios for 5G are enhanced Mobile Broadband (eMBB), addressing human-centric use cases for access to multimedia content, services and data; Ultra-Reliable Low-Latency Communications (URLLC), with strict requirements, especially in terms of end-to-end latency and reliability; and massive Machine-Type Communications (Mmtc), for a huge number of connected devices, typically transmitting a relatively low volume of non-delay-sensitive information.

B. MOTIVATION:

The 5G network architecture enabling the verticals was described. This section presents the architecture, technology and security aspects of 5G that would cater for the Tele-healthcare use cases and applications presented in Section The reader may find more information about 5G network domains, architectures and slicing in and, respectively.

Robotic surgery reduces hospitalisation time, pain and discomfort and recovery time; it infers smaller incisions, reduced risk of infection reduced blood loss and transfusions, minimal scaring.

C. LITERATURE SURVEY:

Sl. No.	Author	Title	Year	Findings	Relevance to the project
1.	YUSUF ABDUL REHAMAN SAMBO,MOHAMMAD ALI IMRAN,QAMMAER H.ABBASI	ENABLING 5G COMMUNICATIO N SYSTEM TO SUPPORT 5G	2019	With 5G , a specialist could examine operate on a patient at a different geographic location and the system could potentially remove barriers to healthcare provisions in developing countries.	Telesurgery enables 1) visual guidance during surgeries, 2) augmented reality (AR), helpful for the surgery team, and 3) the assistance of robots that greatly reduce surgery invasiveness, thus making patient recovery faster. Data rates higher
2.	D.SOLADANI	5G MOBILE SYSTEMS FOR HEALTHCARE	2017	fifth generation (5G) mobile communication for ultra-reliable lowlatency communications. With the expected superior performance to the current generation of mobile networks	5G communication system are used to support new and diverse scenarios like 5G communication system used in wire less telesurgery
3.	M.Deborah and C.Soniya Prathap	Detection of Fake currency using Image Processing	2014	This paper presents the design and implementation of Indian paper currency authentication system based on feature extraction by edge based segmentation using sobel operator.	This helped in understanding the pre-processing of the image which was cropped, adjusted and smoothed then conversion the edges are detected where edge detection used the sobel operator

D. OBJECTIVE:

Technology that enables telepresence has facilitated complex surgical procedures to be carried out in regions that lack expert surgeons, such as in small hospitals, developing countries, and also for militaries in combat. At the same time, robotics provide invaluable assistance, allowing procedures to be performed less invasively, thus reducing complications and delivery times. An aspect that will advance telesurgery even further is the attainment of a fast enough internet connection that will permit telepresence in real time. This is what our team in Barcelona is moving towards. Mobile World Capital Barcelona, Hospital Clínic de Barcelona and Advances in Surgery (AIS) Channel, a company I founded to improve training and performance, have implemented a pilot project that will use 5G technology to enable remote assistance for surgical procedures in real time

E. PROBLEM DEFINITION AND PROPOSED SOLUTION PLANNING:

Model Development Phase:
STEP 1: 5G Transmitter to be modeled in Systemvue with
i) OFDM as waveform ii) Smart antenna
STEP 2: 5G Channel to be modeled having flexibility in varying the distance between transmitter and receiver
STEP 3: 5G Receiver to be designed with Smart antenna
STEP 4: AUDIO and VIDEO sources to be interfaced at the transmitter
STEP 5: AUDIO/VIDEO sink to be added as CRO channel 1 and channel 2 for the display
Performance TESTING PHASE :-
STEP 1: Waveform to be visualized at different stages of the Model using CRO and Spectrum Analyzer
STEP 2: SMART antenna operation to be tested
Step 3: BER and Throughput to be measured
Final Outcome testing
Step 1: 5G Communication system to be tested for 1 KHZ audio tone,
Step 2: Short duration voice reception can be tested in OFF LINE mode
Step 3: 5G Communication system to be tested for VIDEO PATTERN for it faithful reception

METHODOLOGY:

PLANNING AND METHADOLOGY:

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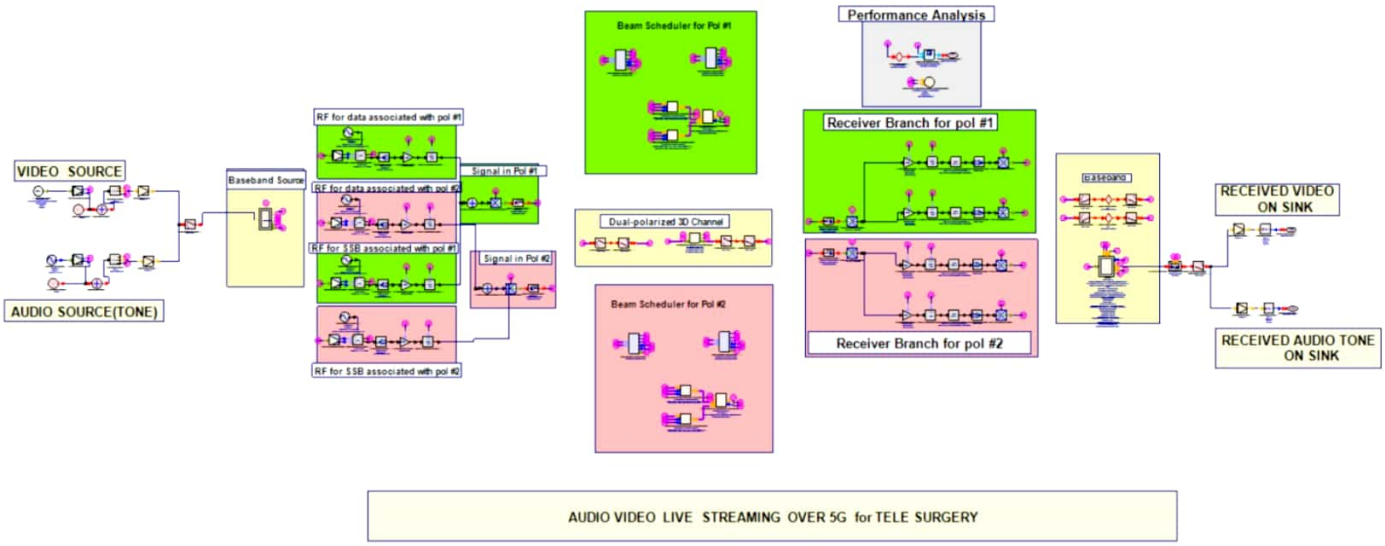
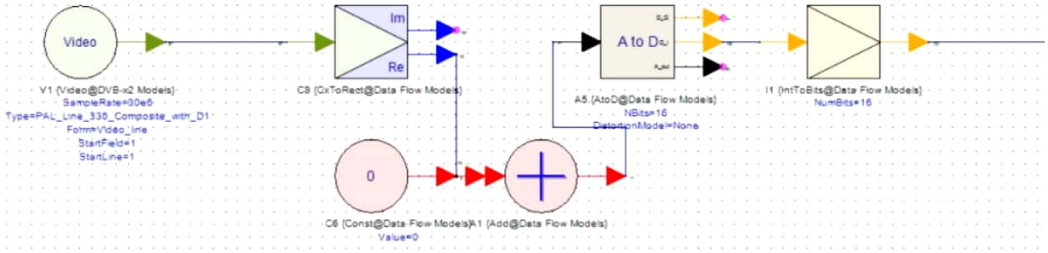
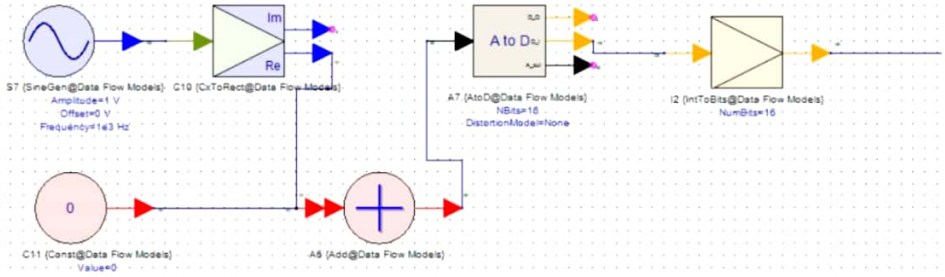
CIRCUIT:

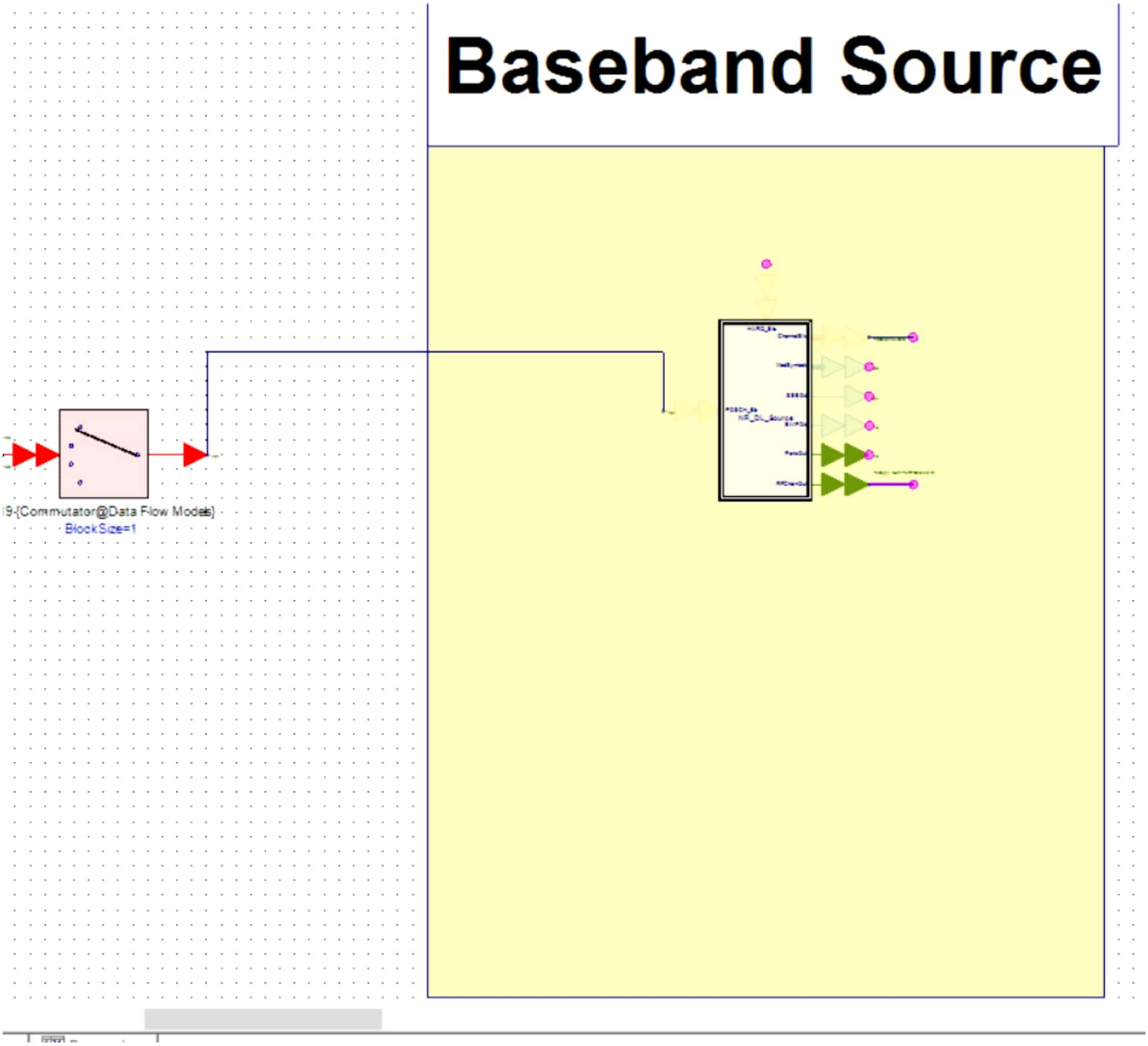


VIDEO SOURCE

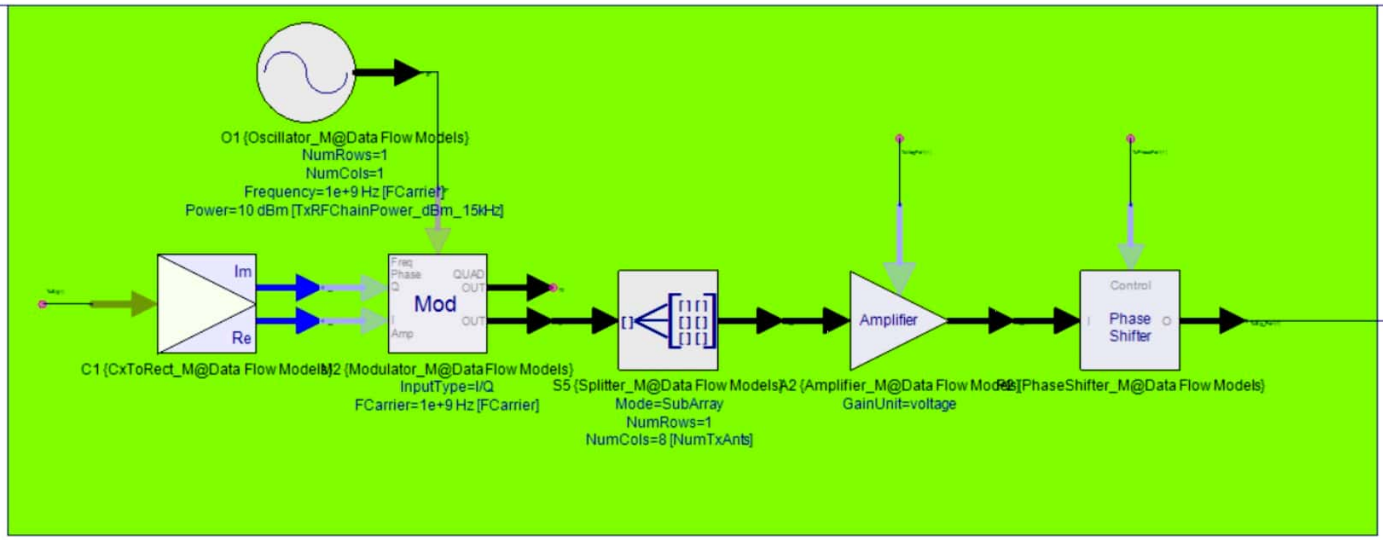




AUDIO SOURCE(TONE)



RF for data associated with pol #1



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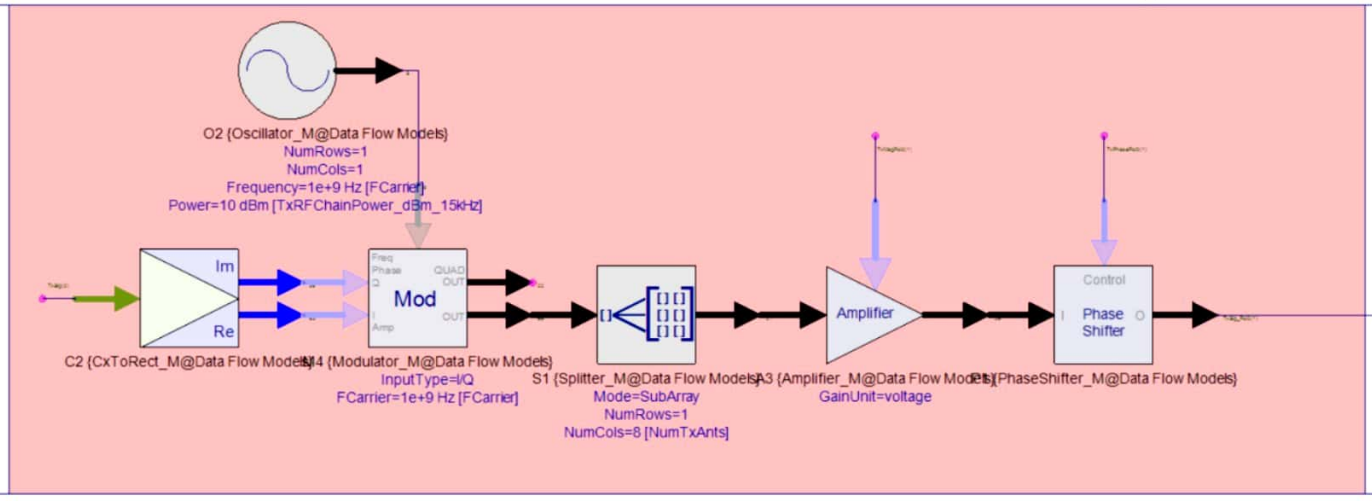
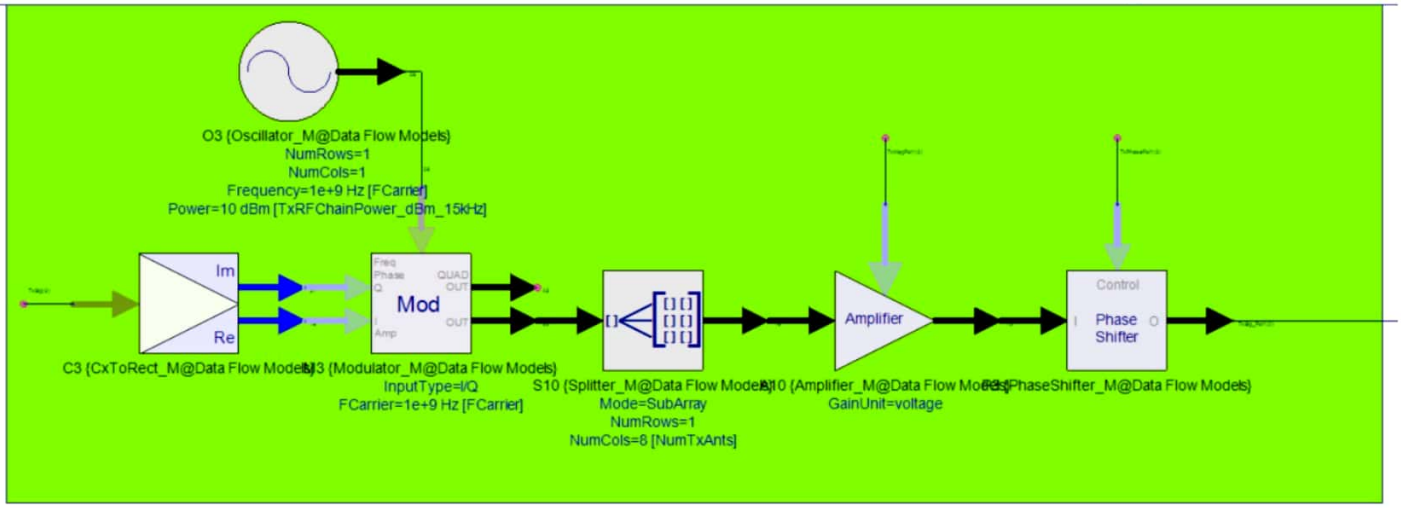
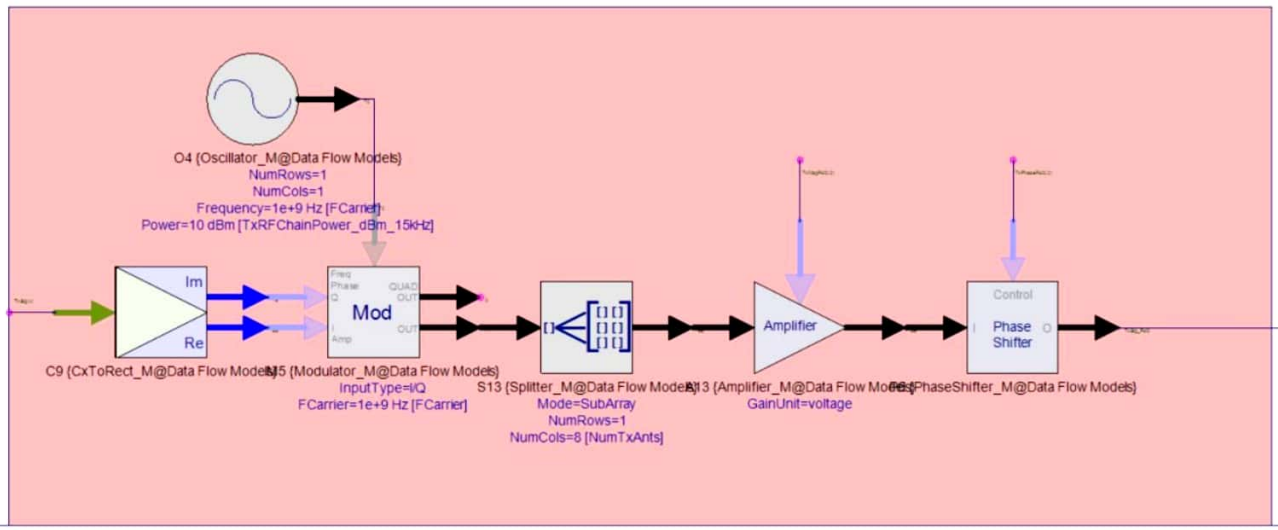
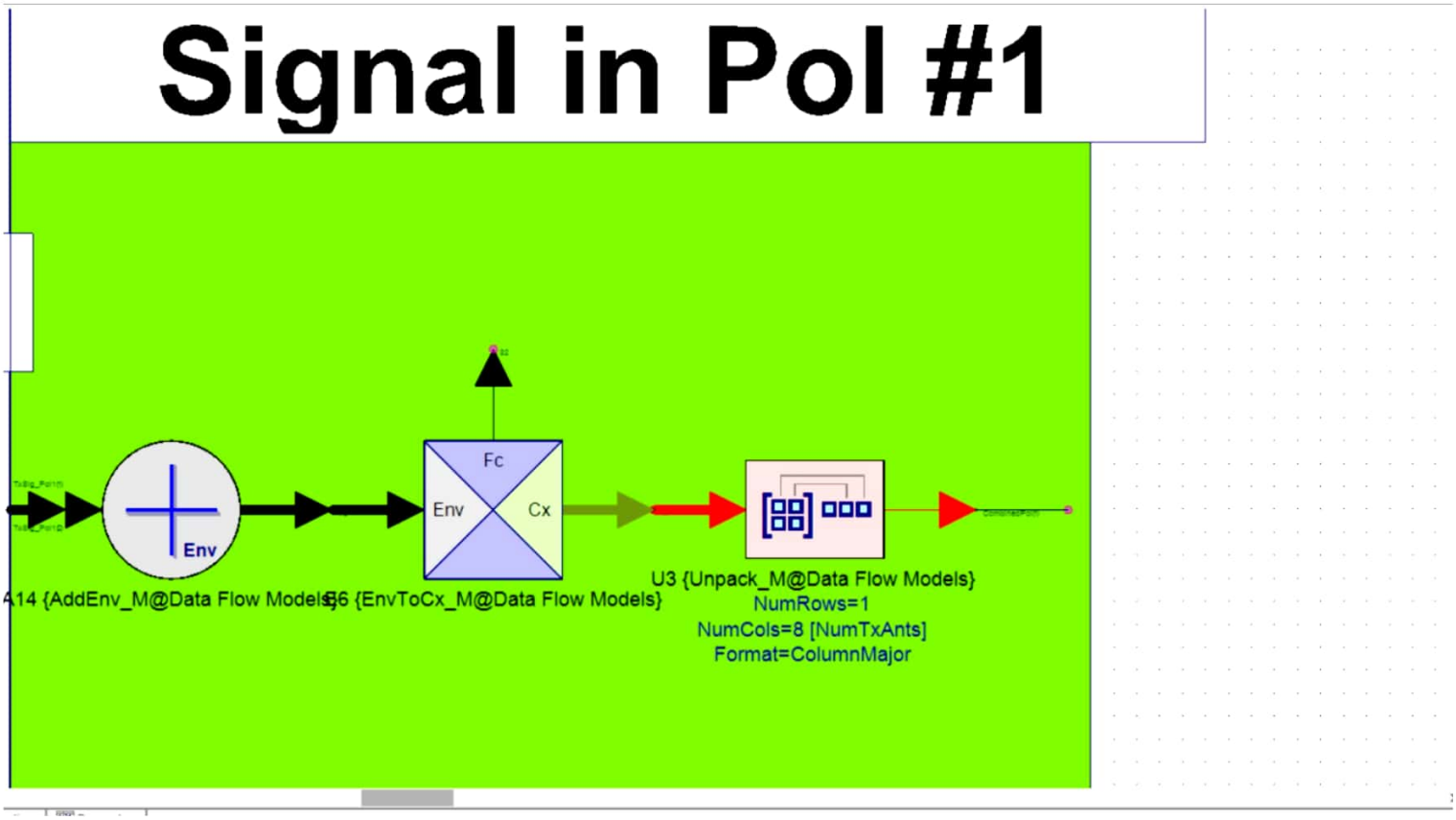


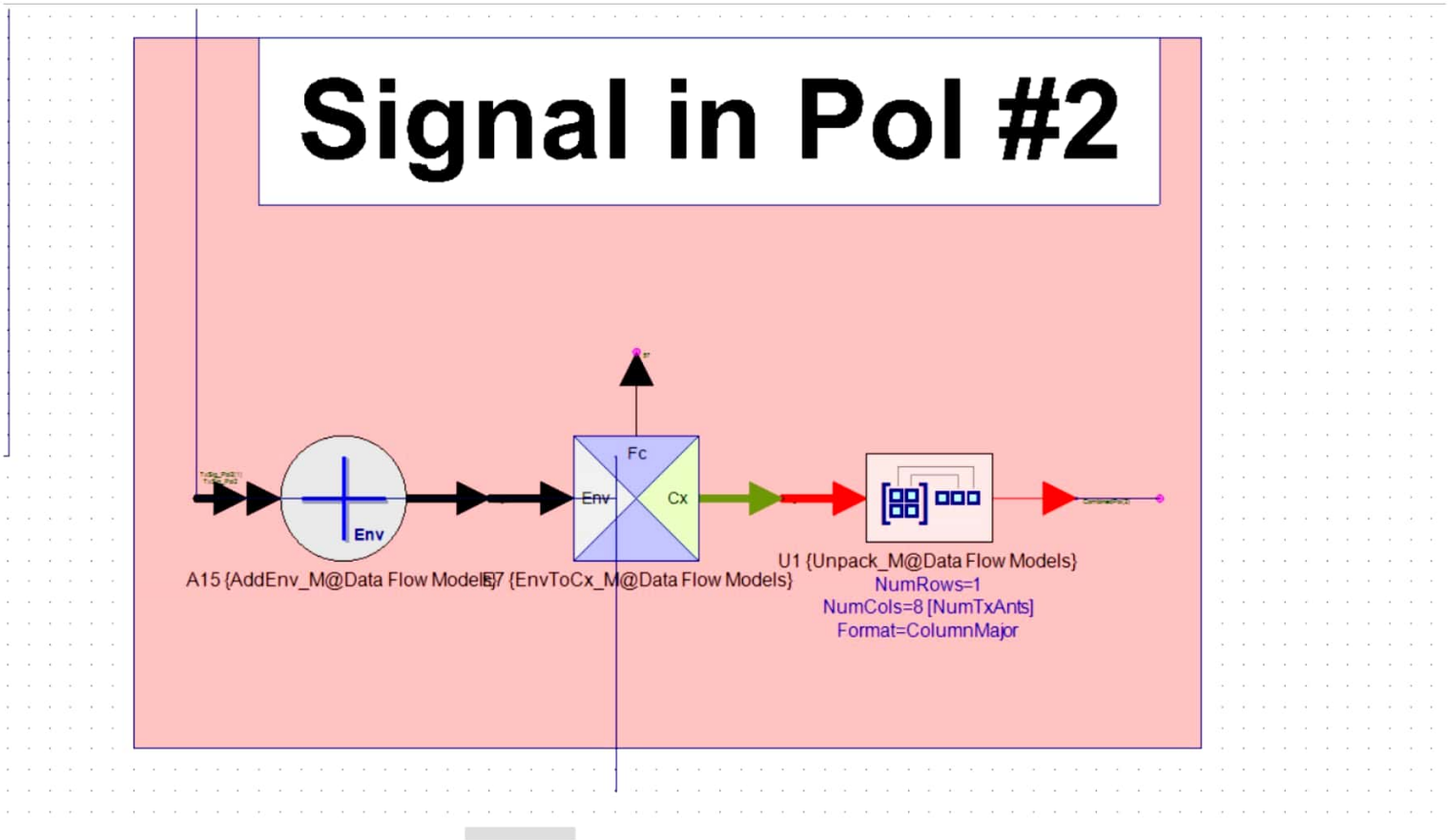
RF for SSB associated with pol #1



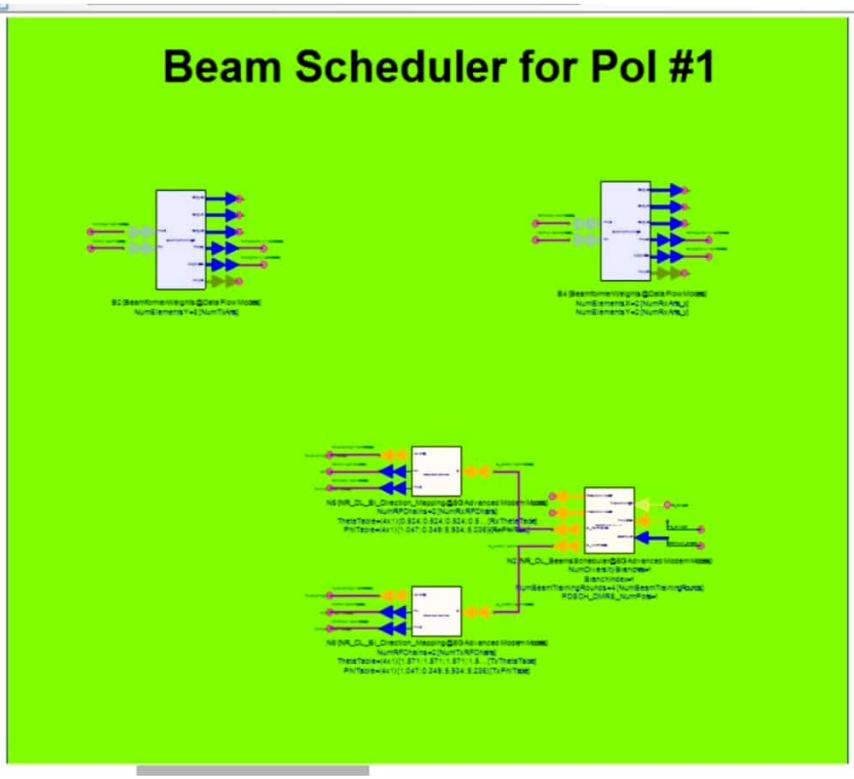


RF for SSB associated with pol #2

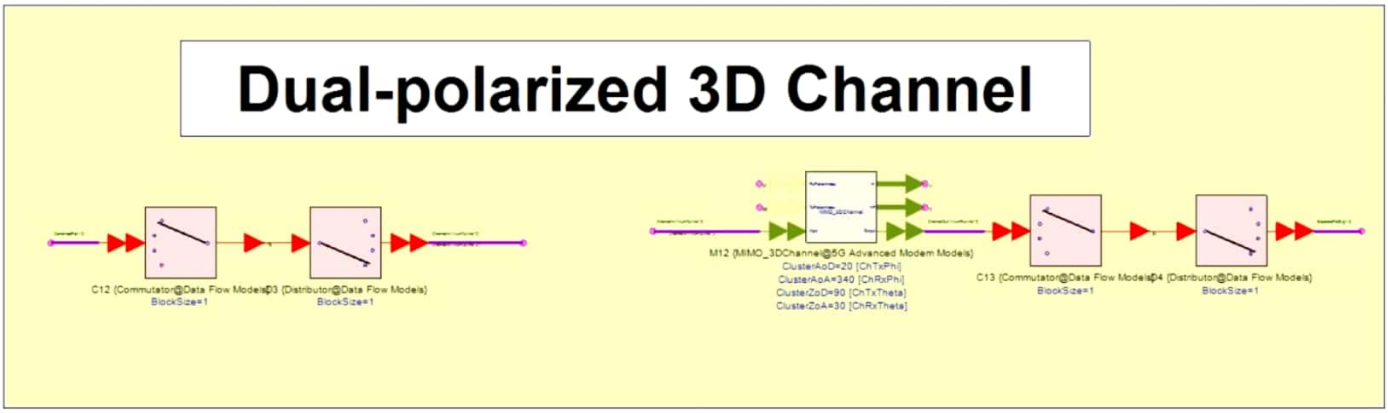




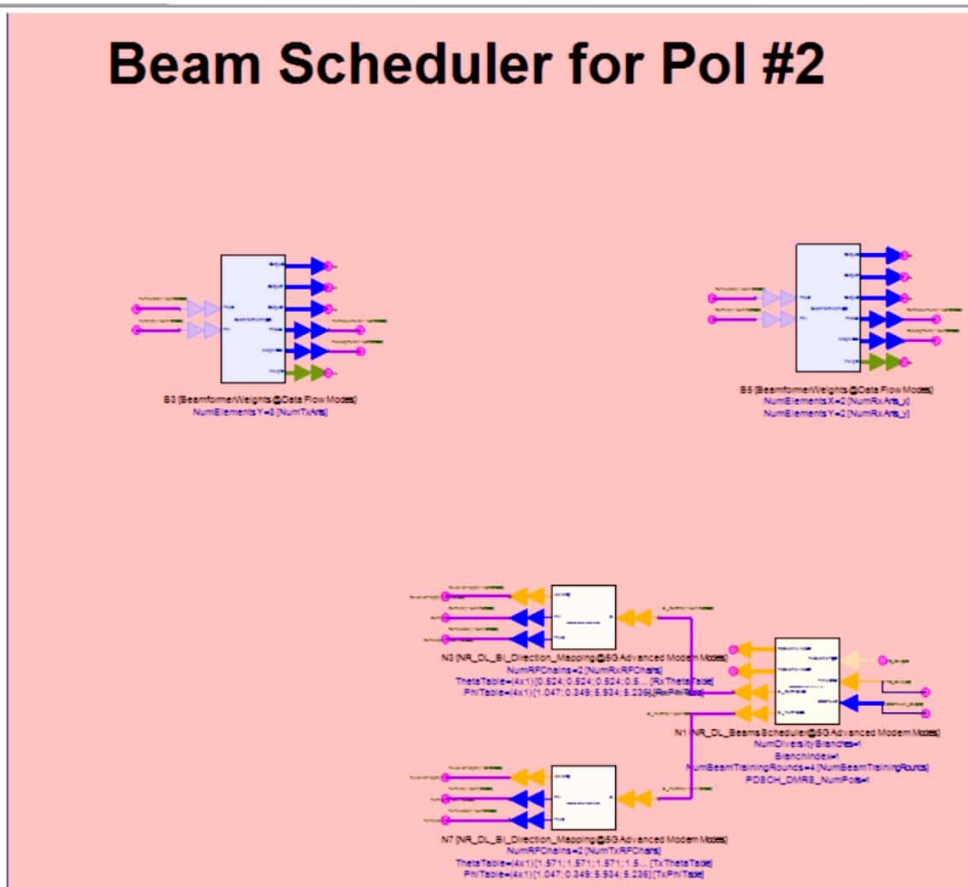
Beam Scheduler for Pol #1



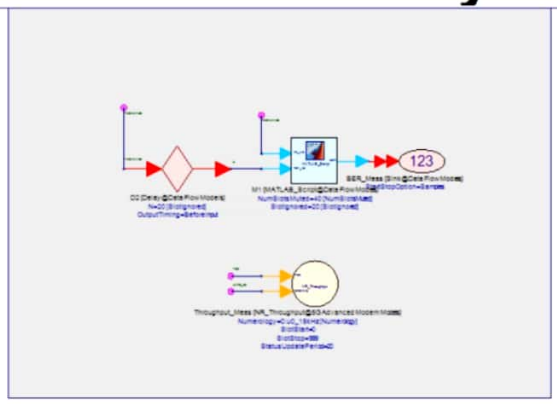
Dual-polarized 3D Channel



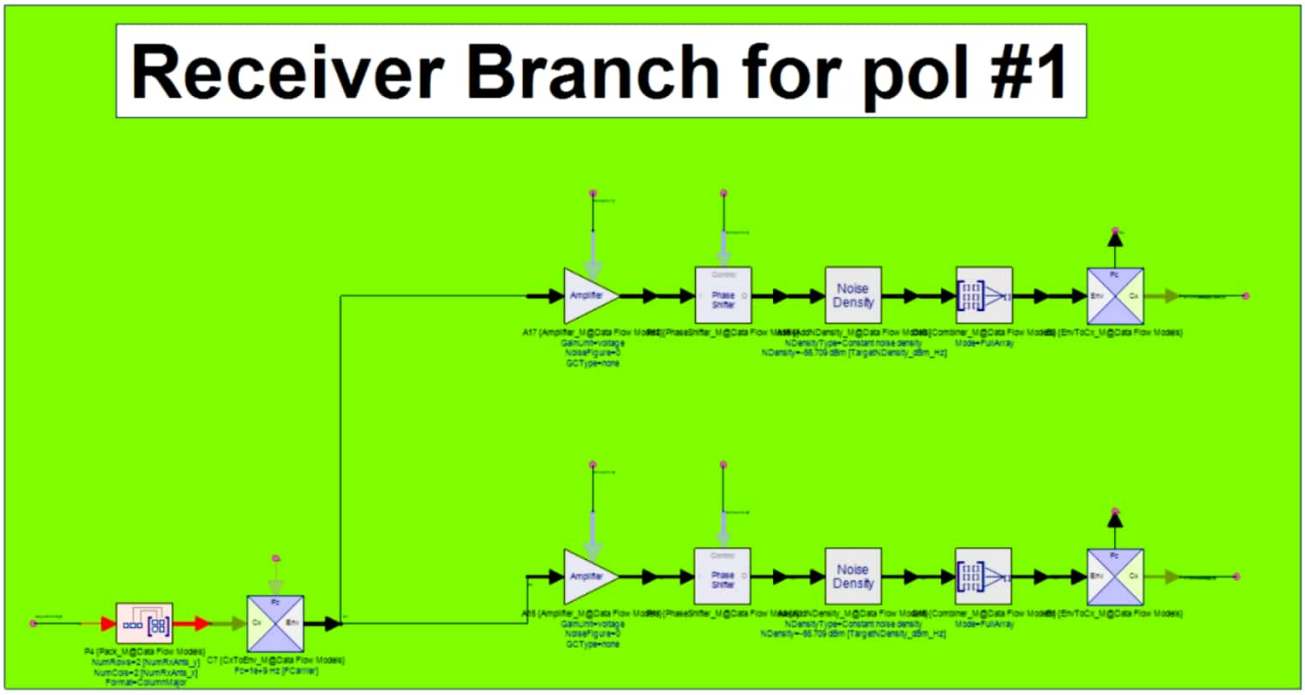
Beam Scheduler for Pol #2

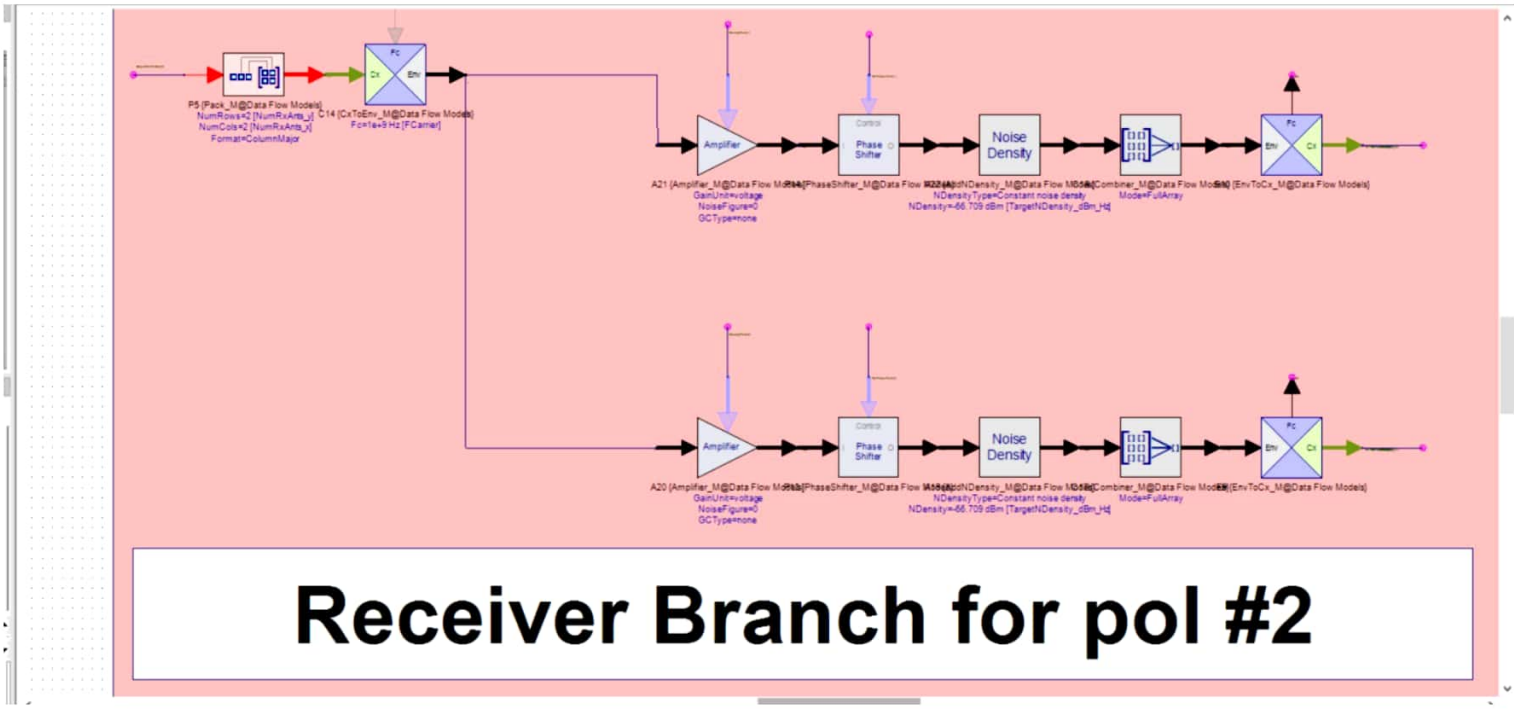


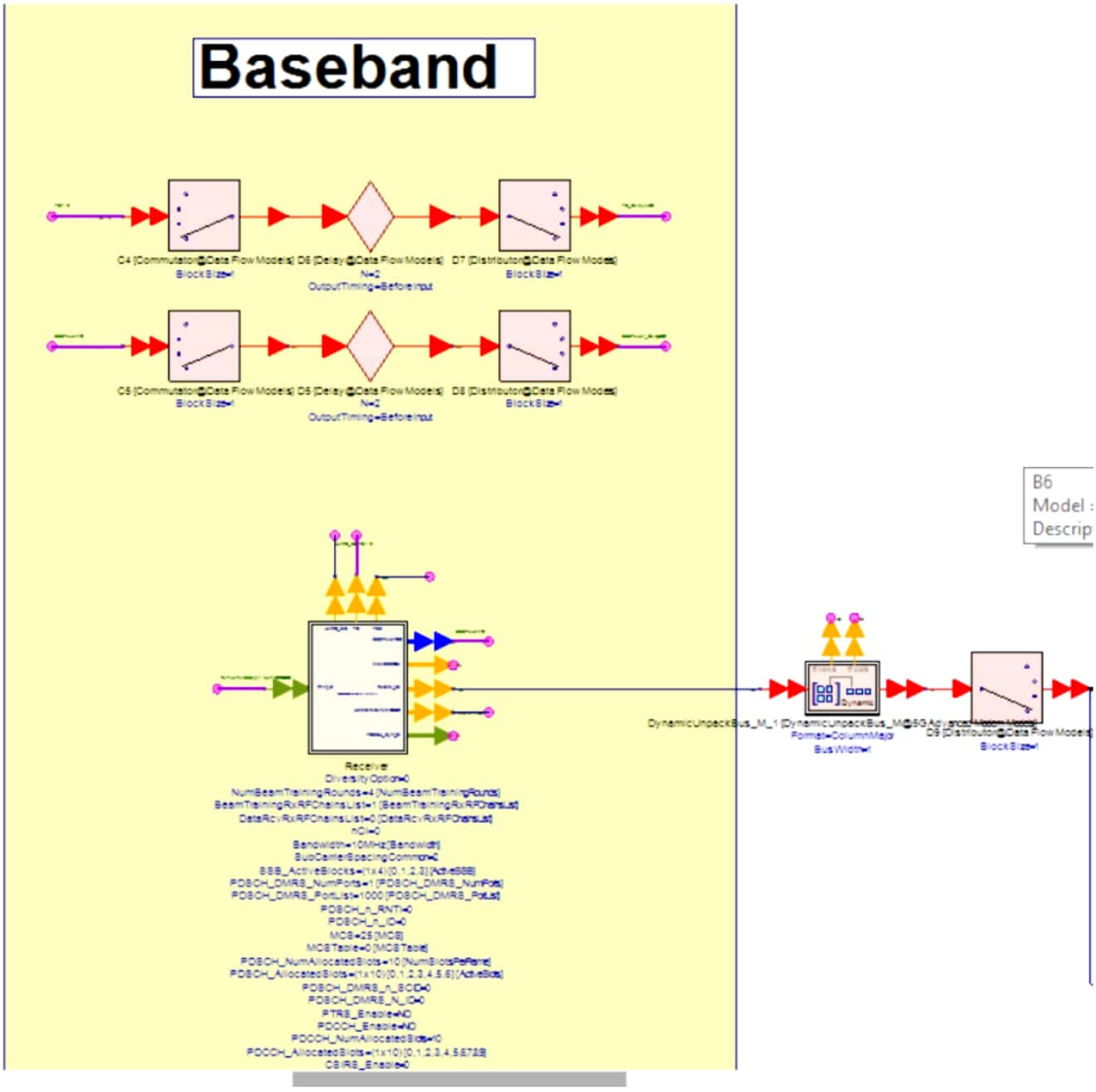
Performance Analysis

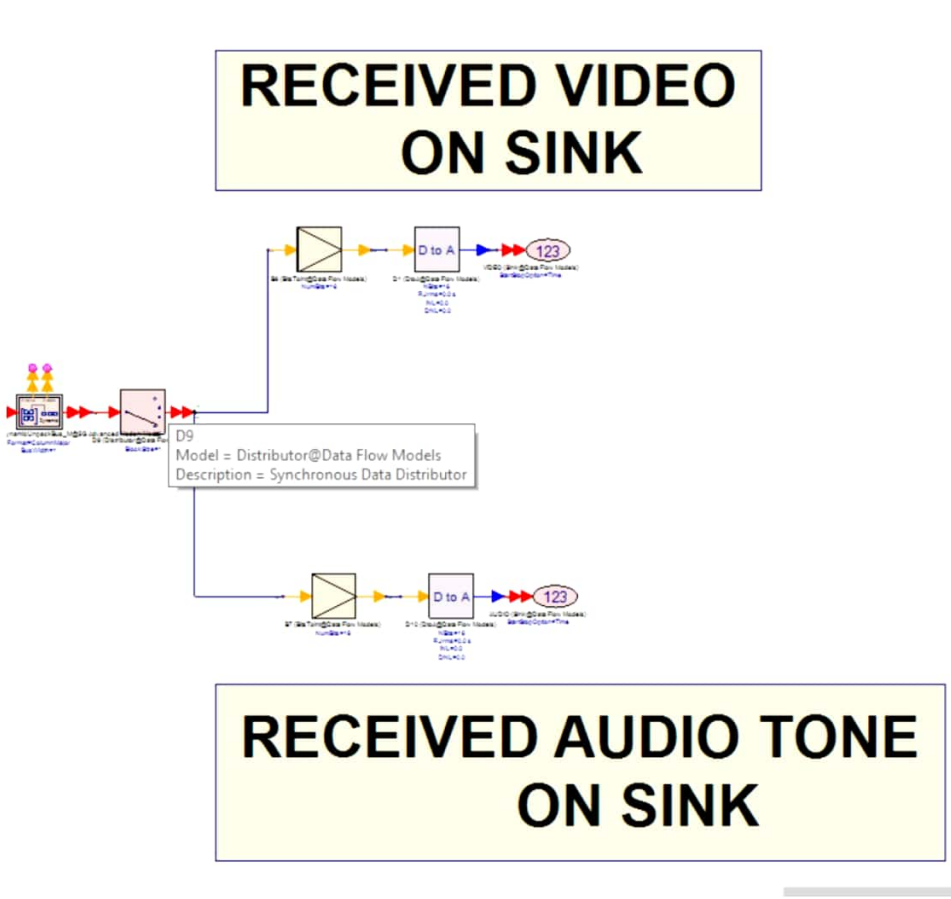


Receiver Branch for pol #1









FINAL RESULT:

- We have designed the circuit for audio video live streaming over 5G for telesurgery .
- We have used the systemvue software for designing the circuit and simulation process.
- In previous progress we have completed the video part in this circuit, now we have introduced the commutator and distributor for making audio part and multiplexing the audio sink and video sink.
- The final outcome will be graph of showing the outcomes of live audio tone over 5G and live video tone over 5G . This is the completion of our mini project.

FINAL RESULT:

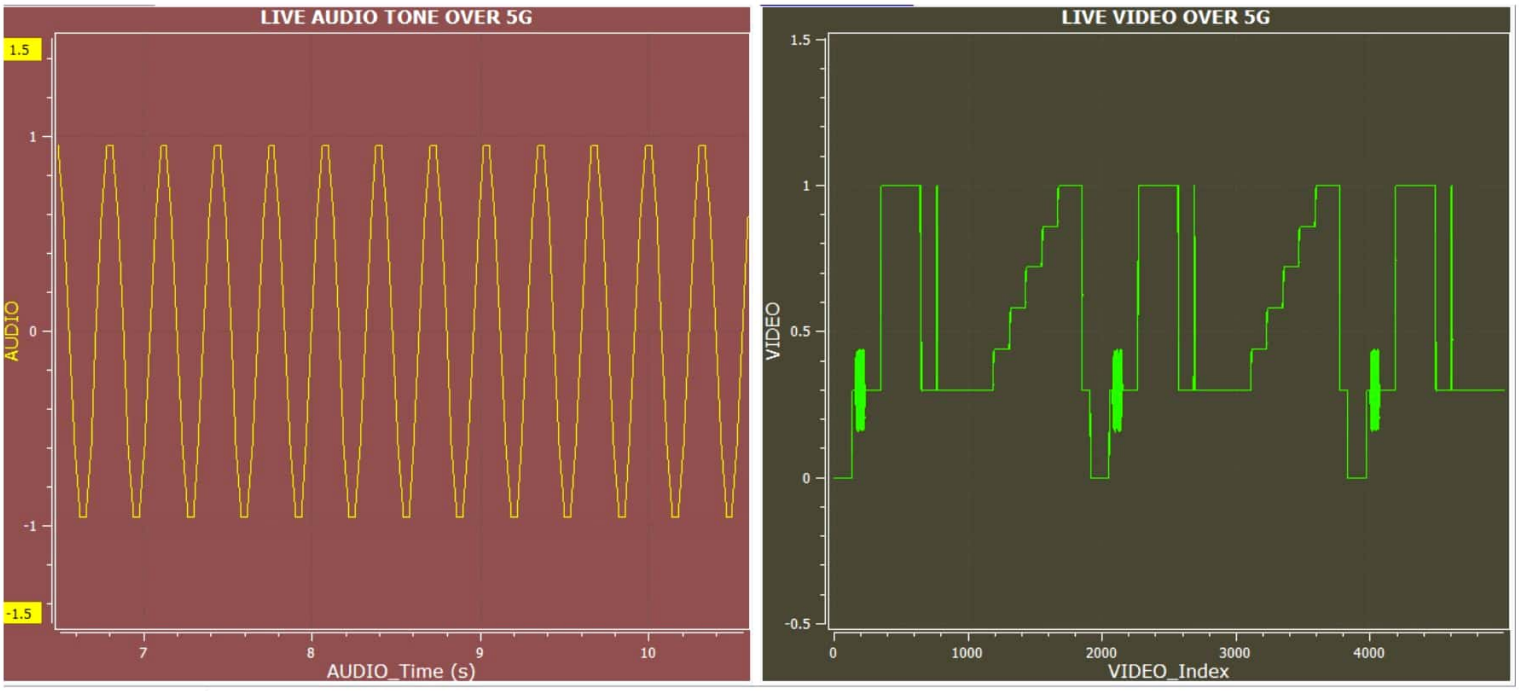


Fig : LIVE AUDIO &VIDEO received at the output of 5G receiver

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