**Project Based Learning (PBL) – 2020-21**

**Antennas and Wave Propagation:**

PBL is conducted under group-1 ie, fields and wave group faculty of department ECE .Five projects were submitted by III year students under the guidance of Prof. B.Hari Kumar and Dr.B.L.Prakash, Associated faculty members :Mr.Ch.Suresh kumar, Mr.k.Satish babu.

 Project titled “**Design of Monopole Antenna for P-Band Operation”**

 Project titled “**Design of Dipole Antenna for P-Band Operation”**

 Project titled “**Design of Microstrip Filters for X-Band Operation”**

 Project titled “**Design of transmission Lines for X-Band Operation”**

 Project titled “**Design of Microstrip Antenna for X-Band Operation”**

The project based learning is successfully implemented in the course of Antennas and Wave Propagation by way of training the III ECE students in the HFSS software for the design and implementation of (i)Mono-Pole Antenna (ii) Dipole Antenna (iii)MicroStrip feed Insert Antenna (iv)Impedance matched Edge feed Micro strip antenna (v)Micro-strip patch With coaxial feed antenna for X-band and (vi) Stepped impedance Low Pass Microwave filters (vii) Transmission line . All Students are given training in (a)HFSS software (b) Designing the antenna Based On Mathematical Calculations and (c) Simulating the designed antenna using HFSS software (d) obtaining the results of Radiation Pattern, gain Plot, Return loss.

After Training, students have implemented above designs using HFSS software in groups for different operating frequencies.

The scanned copies of assigned batches and the projects that they have successfully implemented are given below. The summary of the role of the students and faculty is given below:

|  |  |  |  |
| --- | --- | --- | --- |
| *Project Name* | Scope/Work involved | Outcome | Status and No of Students involved |
| *1.Design of Monopole Antenna for P-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the monopole antenna mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 9  III ECE – B: 9  III ECE – C: 9  III ECE – D: 6  III ECE – E: 9  Note: Each batch contains 3 students |
| *2.Design of Dipole Antenna for P-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the dipole antenna mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 9  III ECE – B: 9  III ECE – C: 9  III ECE – D: 4  III ECE – E: 9  Note: Each batch contains 3 students |
| *3.Design of Transmission line for X-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the Transmission line mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 6  III ECE – B: 9  III ECE – C: 9  III ECE – D: 4  III ECE – E: 9  Note: Each batch contains 3 students |
| *4.Design of Coaxial Feed Micosrtrip Antenna for X-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the Transmission line mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 6  III ECE – B: 3  III ECE – C: 9  III ECE – D: 3  III ECE – E:9  Note: Each batch contains 3 students |
| *5.Design of Edge feed microstrip Antenna for X-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the dipole antenna mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 6  III ECE – B: 3  III ECE – C: 6  III ECE – D: 3  III ECE – E: 6  Note: Each batch contains 3 students |
| *6.Design of Insert feed microstrip Antenna for X-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the dipole antenna mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 3  III ECE – B: 6  III ECE – C: 6  III ECE – E: 6  Note: Each batch contains 3 students |
| *7.Design of Stepped Impedance filter for X-Band Operation*  *Guide:*  III ECE-  A: Prof. B. Hari Kumar  B: Mr .Ch suresh Kumar  C: Mr.B Satish Babu  D: Dr.B.Leela Prakash  E: Mr .Ch suresh Kumar | The students will design the dipole antenna mathematically for selected frequency, then will test the parameter by drawing and simulating using HFSS software. Later student will analyze the concepts learned theoretically and compare with the obtained results | i) Understand mathematical analysis  ii) Understand how to design using HFSS software  iii) Compare theoretical and practical results | • Status: Explained the process to students and they are practicing individually  • No of Batches:  III ECE – A: 3  III ECE – B: 6  III ECE – C: 6  III ECE – E: 3  Note: Each batch contains 3 students |

**Students details involved in PBL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No | Name | Roll No | Sec | Project Name |
| 1 | Sreevani | 19R11A0402 | A | Design of Monopole Antenna for P-Band Operation |
| 2 | Sri Vathsa | 19R11A0408 | A | Design of Monopole Antenna for P-Band Operation |
| 3 | suryaamshu | 19R11A0410 | A | Design of Monopole Antenna for P-Band Operation |
| 4 | sowjanya | 19R11A0414 | A | Design of Dipole Antenna for P-Band Operation |
| 5 | Sravan | 19R11A0415 | A | Design of Dipole Antenna for P-Band Operation |
| 6 | Rakesh | 19R11A0416 | A | Design of Dipole Antenna for P-Band Operation |
| 7 | Salman | 19R11A0417 | A | Design of Microstrip Filters for X-Band Operation |
| 8 | Pavan | 19R11A0418 | A | Design of Microstrip Filters for X-Band Operation |
| 9 | Maheswar | 19R11A0421 | A | Design of Microstrip Filters for X-Band Operation |
| 10 | Bhargav | 19R11A0423 | A | Design of transmission Lines for X-Band Operation |
| 11 | Jyothi | 19R11A0425 | A | Design of transmission Lines for X-Band Operation |
| 12 | Harsha | 19R11A0426 | A | Design of transmission Lines for X-Band Operation |
| 13 | Varun | 19R11A0428 | A | Design of Microstrip Antenna for X-Band Operation |
| 14 | Abhinav | 19R11A0431 | A | Design of Microstrip Antenna for X-Band Operation |
| 15 | Bhairava Swamy | 19R11A0432 | A | Dipole Antenna for P-Band Operation |
| 16 | P. Vaishnavi | 19R11A0433 | A | Dipole Antenna for P-Band Operation |
| 17 | P. Bhavya Sai | 19R11A0434 | A | Dipole Antenna for P-Band Operation |
| 18 | Sai Teja | 19R11A0436 | A | Design of Monopole Antenna for P-Band Operation |
| 19 | Sujit | 19R11A0438 | A | Design of Monopole Antenna for P-Band Operation |
| 20 | Rohith | 19R11A0441 | A | Design of Monopole Antenna for P-Band Operation |
| 21 | S. Vaishnavi | 19R11A0442 | A | Design of Microstrip Filters for X-Band Operation |
| 22 | T. Rohith | 19R11A0445 | A | Design of Microstrip Filters for X-Band Operation |
| 23 | Sravya | 19R11A0448 | A | Design of Microstrip Filters for X-Band Operation |
| 24 | B.Sai Chandra lekha | 19R11A0452 | B | Design of Microstrip Filters for X-Band Operation |
| 25 | B.Rachana | 19R11A0453 | B | Design of Microstrip Filters for X-Band Operation |
| 26 | C.Hemalatha | 19R11A0456 | B | Design of Microstrip Filters for X-Band Operation |
| 27 | Chepuri Lavanya | 19R11A0458 | B | Design of transmission Lines for X-Band Operation |
| 28 | CherlaVineela | 19R11A0459 | B | Design of transmission Lines for X-Band Operation |
| 29 | G. Gayathri | 19R11A0462 | B | Design of transmission Lines for X-Band Operation |
| 30 | G.Srividya | 19R11A0463 | B | Design of transmission Lines for X-Band Operation |

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| --- | --- | --- | --- | --- |
| 31` | G. Kusuma clayton | 19R11A0465 | B | Design of Microstrip Antenna for X-Band Operation |
| 32 | G. Harini | 19R11A0466 | B | Design of Microstrip Antenna for X-Band Operation |
| 33 | K.Akash | 19R11A0469 | B | Design of Microstrip Antenna for X-Band Operation |
| 34 | K.PavanPrathiek | 19R11A0471 | B | Design of Microstrip Filters for X-Band Operation |
| 35 | K.NaithikaSree | 19R11A0473 | B | Design of Microstrip Filters for X-Band Operation |
| 36 | Mallela Akhila | 19R11A0477 | B | Design of Microstrip Filters for X-Band Operation |
| 37 | M.SaiSruthi | 19R11A0480 | B | Design of Microstrip Filters for X-Band Operation |
| 38 | N.Salman vali | 19R11A0482 | B | Design of transmission Lines for X-Band Operation |
| 39 | Paila Akshaya | 19R11A0483 | B | Design of transmission Lines for X-Band Operation |
| 40 | S.G.Surupa | 19R11A0489 | B | Design of transmission Lines for X-Band Operation |
| 41 | Sangolu Sriram Chary | 19R11A0492 | B | Design of transmission Lines for X-Band Operation |
| 42 | Thota Sai Tanush | 19R11A0493 | B | Design of Microstrip Antenna for X-Band Operation |
| 43 | V.Sumanthkumarreddy | 19R11A0494 | B | Design of Microstrip Antenna for X-Band Operation |
| 44 | V.KaushikRamkoteswar | 19R11A0495 | B | Design of Microstrip Antenna for X-Band Operation |
| 45 | Vurenuka Anusha | 19R11A0496 | B | Design of Microstrip Antenna for X-Band Operation |
| 46 | A.Prathyusha | 19R11A0497 | C | Design of Microstrip Antenna for X-Band Operation |
| 47 | A.Karthikeya | 19R11A0498 | C | Design of Dipole Antenna for P-Band Operation |
| 48 | A.Supreeth | 19R11A0499 | C | Design of Dipole Antenna for P-Band Operation |
| 49 | B.Niharika | 19R11A04A2 | C | Design of Dipole Antenna for P-Band Operation |
| 50 | B.Sharmila | 19R11A04A3 | C | Design of transmission Lines for X-Band Operation |
| 51 | G.Chandana | 19R11A04A9 | C | Design of transmission Lines for X-Band Operation |
| 52 | K.Udayasree | 19R11A04C0 | C | Design of transmission Lines for X-Band Operation |
| 53 | M.Sarathchandra | 19R11A04C1 | C | Design of Monopole Antenna for P-Band Operation |
| 54 | M.Aditya | 19R11A04C2 | C | Design of Monopole Antenna for P-Band Operation |
| 55 | M.Satwik Sai | 19R11A04C3 | C | Design of Monopole Antenna for P-Band Operation |
| 56 | MSV. Sampath | 19R11A04C4 | C | Design of Microstrip Filters for X-Band Operation |
| 57 | Taha Raheel | 19R11A04C7 | C | Design of Microstrip Filters for X-Band Operation |
| 58 | P.Nishanth | 19R11A04D0 | C | Design of Microstrip Filters for X-Band Operation |
| 59 | Shashi Vigneesh | 19R11A04D1 | C | Design of transmission Lines for X-Band Operation |
| 60 | S.Dheeraj | 19R11A04D6 | C | Design of transmission Lines for X-Band Operation |
| 61 | K.Tejaswi | 19R11A04D7 | C | Design of transmission Lines for X-Band Operation |
| 62 | Shruthi Singh | 19R11A04D8 | C | Design of Monopole Antenna for P-Band Operation |
| 63 | Siddanath Chandra | 19R11A04D9 | C | Design of Monopole Antenna for P-Band Operation |
| 64 | Tarang Harsha | 19R11A04E0 | C | Design of Monopole Antenna for P-Band Operation |
| 65 | T.Sahaja | 19R11A04E1 | C | Design of Monopole Antenna for P-Band Operation |
| 66 | V.Jayasree | 19R11A04E2 | C | Design of Monopole Antenna for P-Band Operation |
| 67 | Y.Sandhya | 19R11A04E4 | C | Design of Monopole Antenna for P-Band Operation |
| 68 | B R Madhavi | 19R11A04E5 | D | Design of Dipole Antenna for P-Band Operation |
| 69 | Akshitha | 19R11A04F0 | D | Design of Dipole Antenna for P-Band Operation |
| 70 | Ashritha | 19R11A04G3 | D | Design of Dipole Antenna for P-Band Operation |
| 71 | Y.Praneetha | 19R11A04K2 | D | Design of Dipole Antenna for P-Band Operation |
| 72 | Anugu Sai Keerthana | 19R11A04K4 | E | Design of transmission Lines for X-Band Operation |
| 73 | AnumoluSathvika | 19R11A04K5 | E | Design of transmission Lines for X-Band Operation |
| 74 | B.N.Chandrika | 19R11A04K8 | E | Design of transmission Lines for X-Band Operation |
| 75 | Ch.Tulasi | 19R11A04L2 | E | Design of transmission Lines for X-Band Operation |
| 76 | G.Abhinav | 19R11A04M0 | E | Design of transmission Lines for X-Band Operation |
| 77 | G.AnuSree | 19R11A04M1 | E | Design of Microstrip Antenna for X-Band Operation |
| 78 | P. Harika | 19R11A04M3 | E | Design of Microstrip Antenna for X-Band Operation |
| 79 | K.Anju | 19R11A04M4 | E | Design of Microstrip Antenna for X-Band Operation |
| 80 | KVN Saikrishna Nikhil | 19R11A04M5 | E | Design of Monopole Antenna for P-Band Operation |
| 81 | Kanakari Akash | 19R11A04M6 | E | Design of Monopole Antenna for P-Band Operation |
| 82 | K.R.Priyanka | 19R11A04M7 | E | Design of Monopole Antenna for P-Band Operation |
| 83 | KVK Sai Sriharsha | 19R11A04M9 | E | Design of Microstrip Filters for X-Band Operation |
| 84 | M.K.Ramanuja Swami | 19R11A04N1 | E | Design of Microstrip Filters for X-Band Operation |
| 85 | Medikonda Rupa | 19R11A04N3 | E | Design of Microstrip Filters for X-Band Operation |
| 86 | R.Shyalaja | 19R11A04N8 | E | Design of Dipole Antenna for P-Band Operation |
| 87 | S.Likhitha | 19R11A04P0 | E | Design of Dipole Antenna for P-Band Operation |
| 88 | S.Anusha | 19R11A04P1 | E | Design of Dipole Antenna for P-Band Operation |
| 89 | V.Samhitha | 19R11A04P2 | E | Design of Microstrip Antenna for X-Band Operation |
| 90 | V.Sree Harsha | 19R11A04P7 | E | Design of Microstrip Antenna for X-Band Operation |
| 91 | V.Shravani Reddy | 19R11A04P9 | E | Design of Microstrip Antenna for X-Band Operation |
| 92 | Sandhya | 20R11A0403 | A | Design of Microstrip Antenna for X-Band Operation |

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| --- | --- | --- | --- | --- |
| 93 | M.Nanda Kishore | 20R15A0412 | C | **Design of transmission Lines for X-Band Operation** |
| 94 | P.Chaitanya | 20R15A0413 | C | **Design of transmission Lines for X-Band Operation** |
| 95 | R.Sumanth | 20R15A0414 | C | **Design of transmission Lines for X-Band Operation** |
| 96 | V.Vinay Kumar | 20R15A0415 | C | **Design of transmission Lines for X-Band Operation** |
| 97 | A.Shravani | 20R15A0421 | E | **Design of transmission Lines for X-Band Operation** |
| 98 | D.Preethi | 20R15A0422 | E | **Design of transmission Lines for X-Band Operation** |
| 99 | Y.Nikhitha | 20R15A0423 | E | **Design of transmission Lines for X-Band Operation** |

1. Design of monopole Antenna

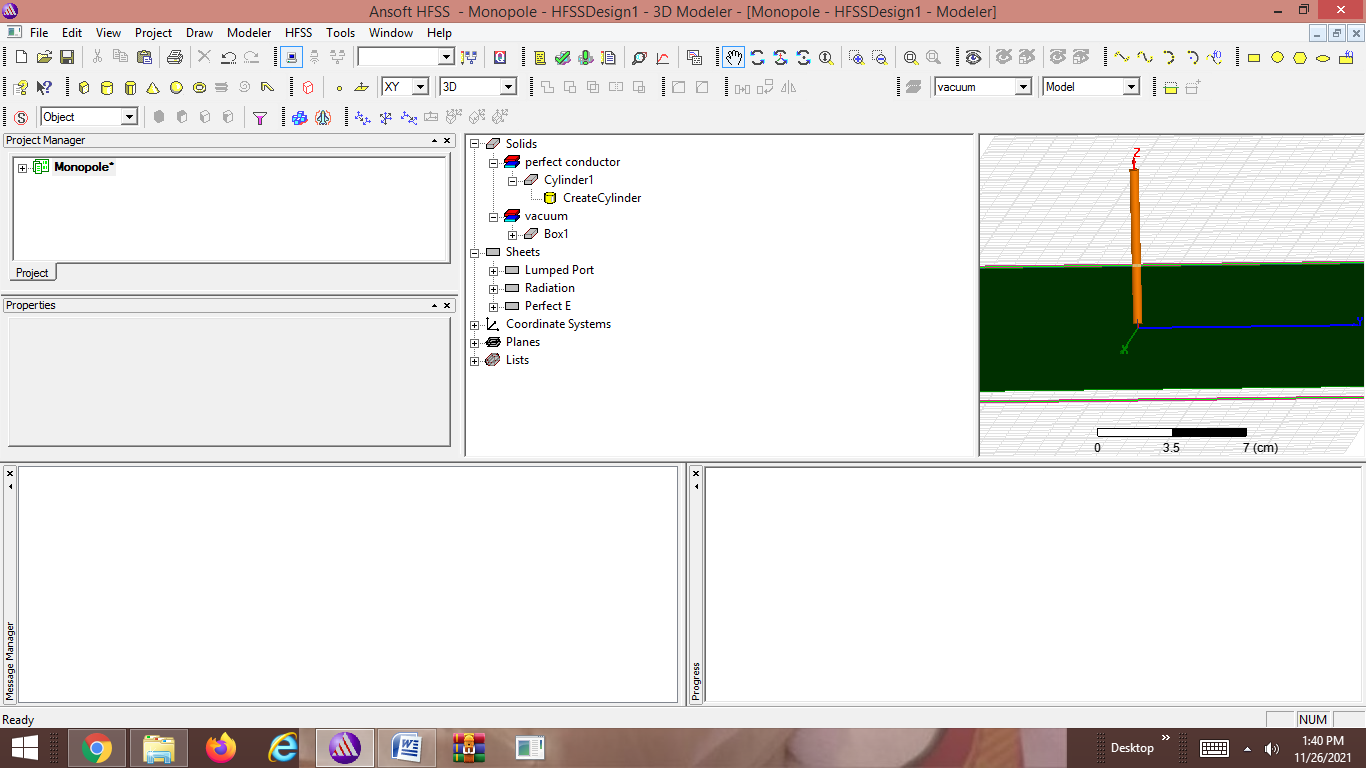


Fig.1(a) Monopole Antenna

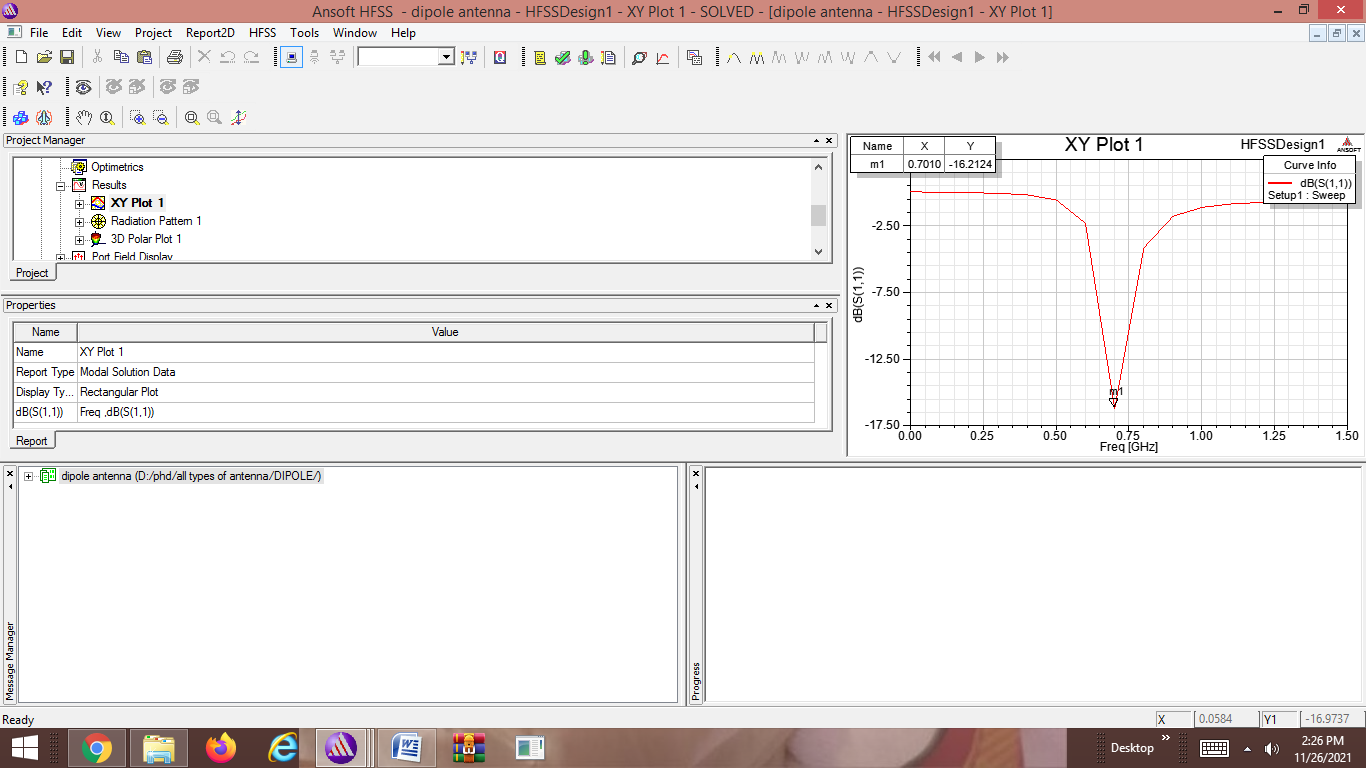


Fig.1(b) Return Loss Vs Frequency.

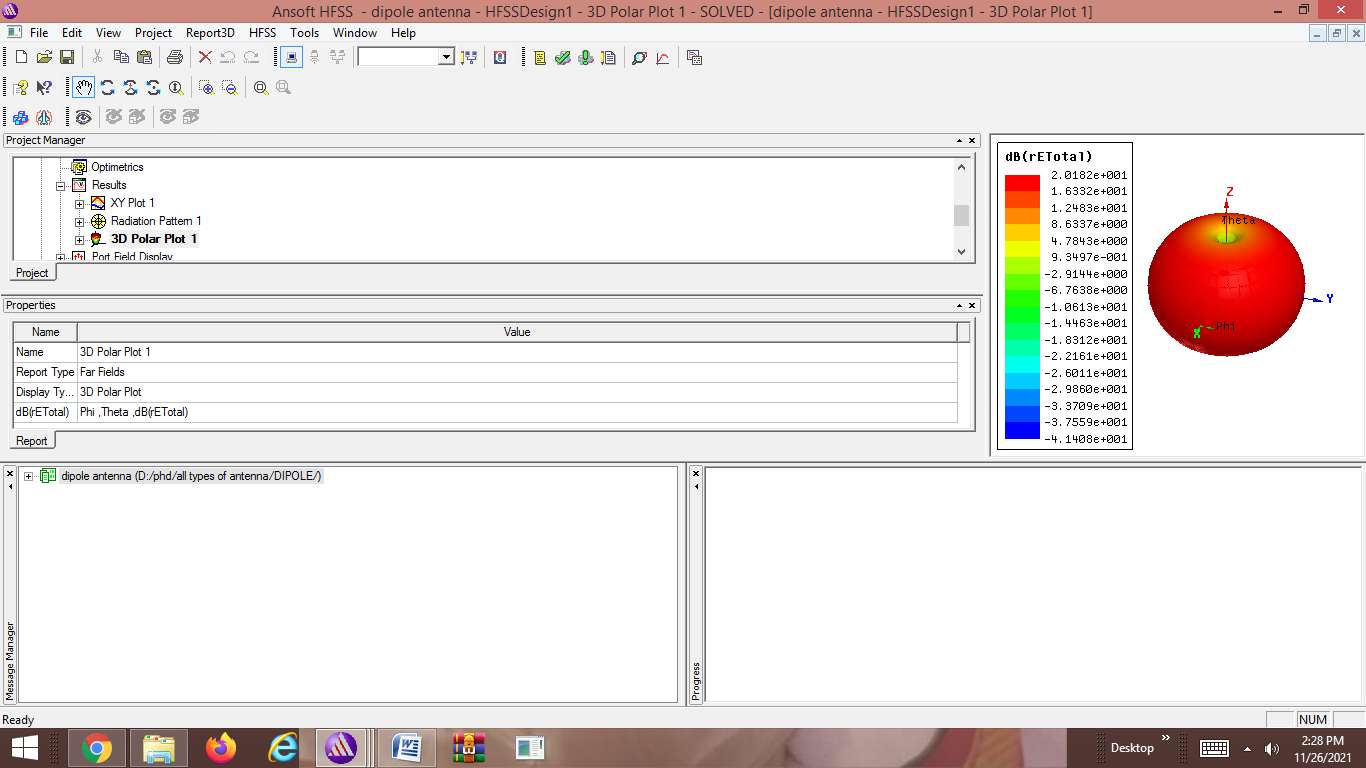


Fig.1(c) Gain in 3D plot

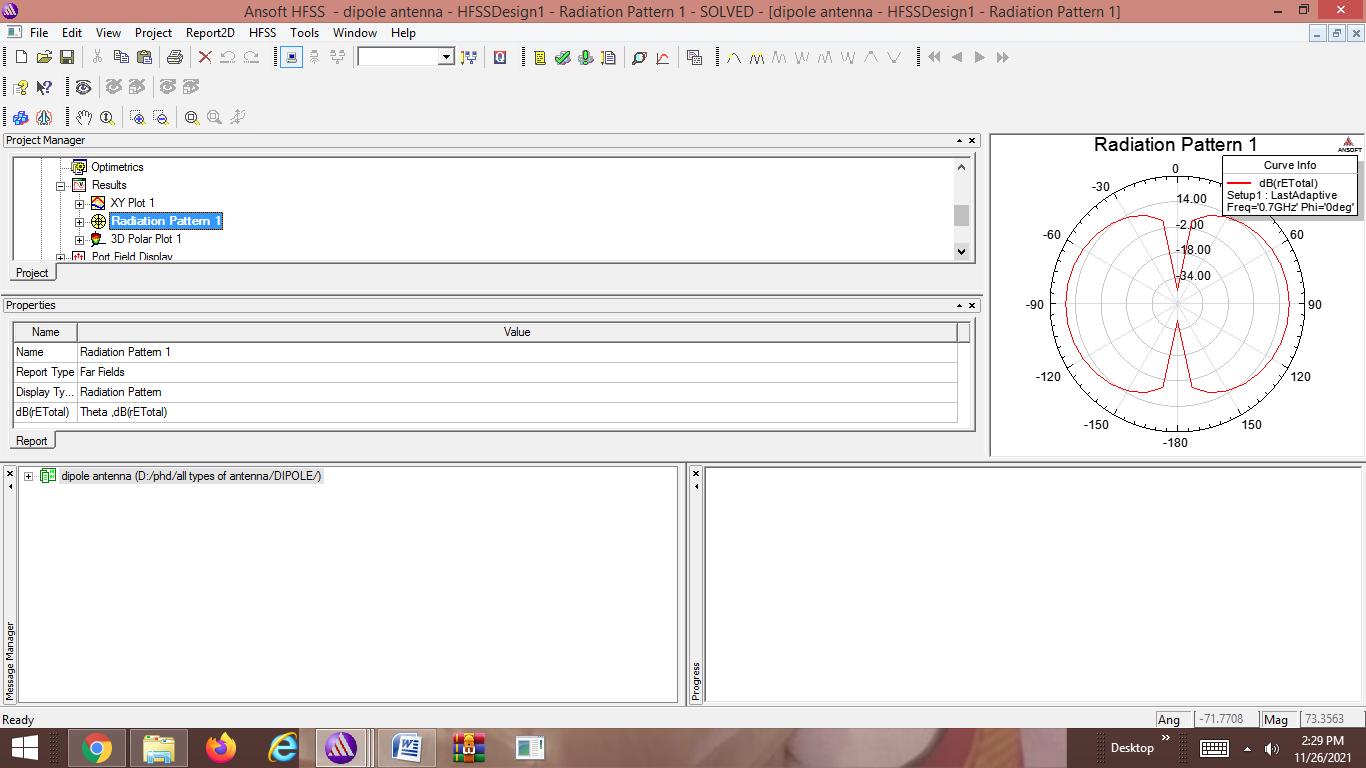


Fig.1(d) Radiation Pattern .

Conclusion: The Monopole antenna is designed in P-band and it is operating at 0.75GHz and obtained a gain of 2dB and radiation pattern as shown.

2.Design of dipole Antenna

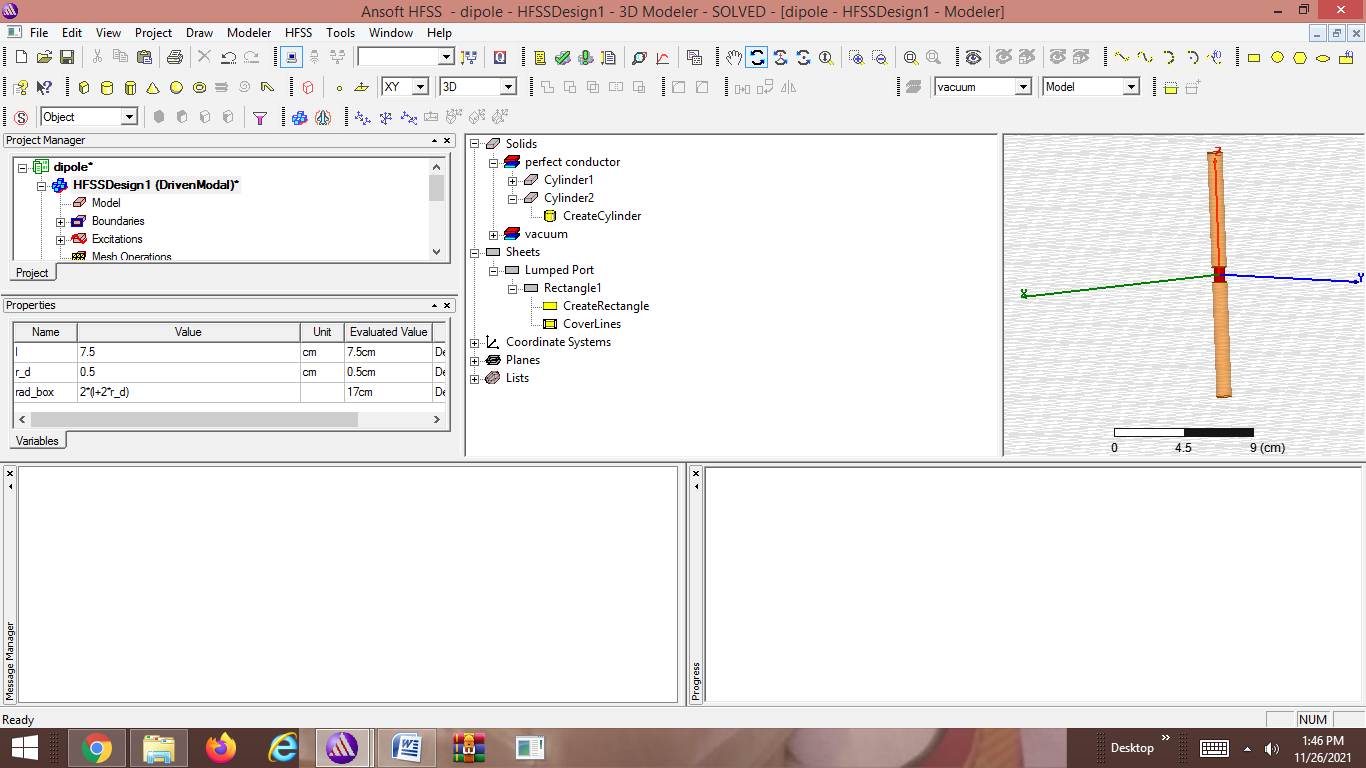


Fig.2(a) Dipole Antenna

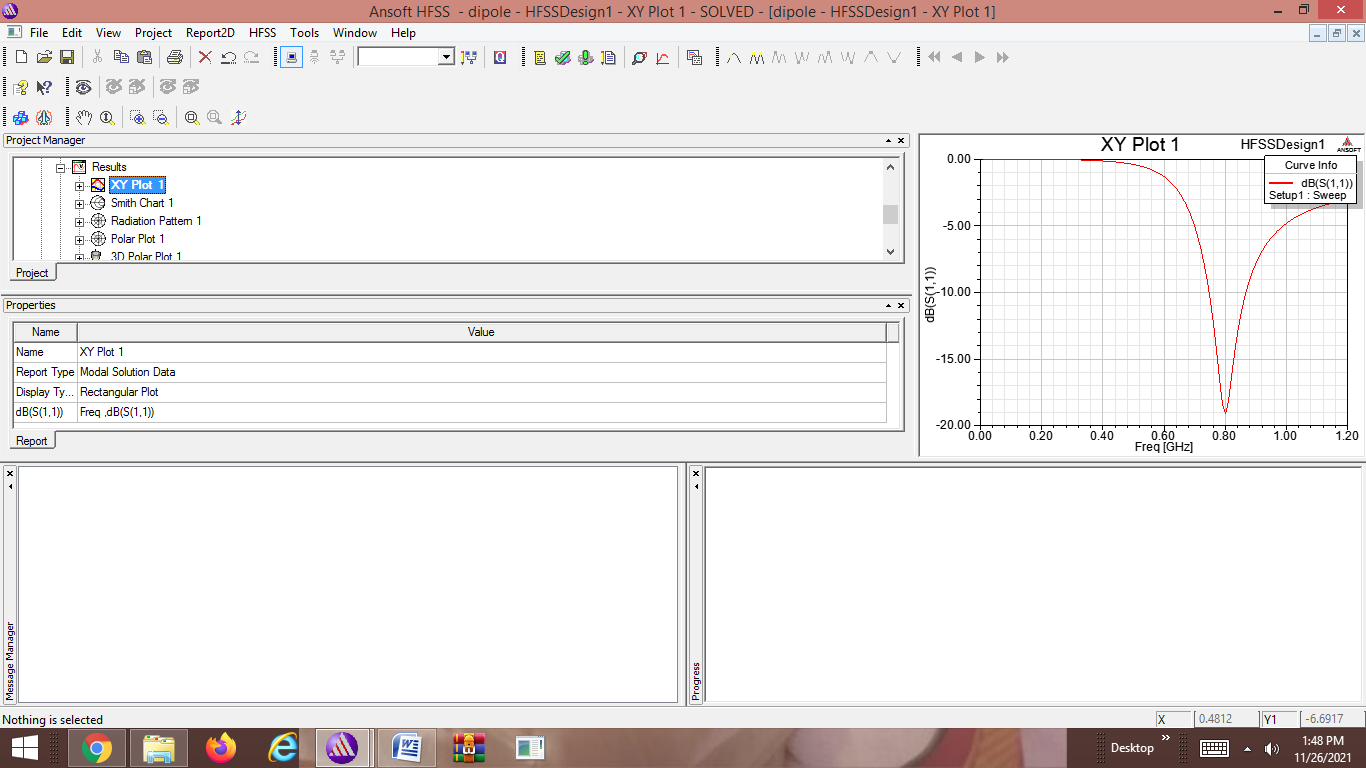


Fig.2(b)Return Loss Vs Frequency.

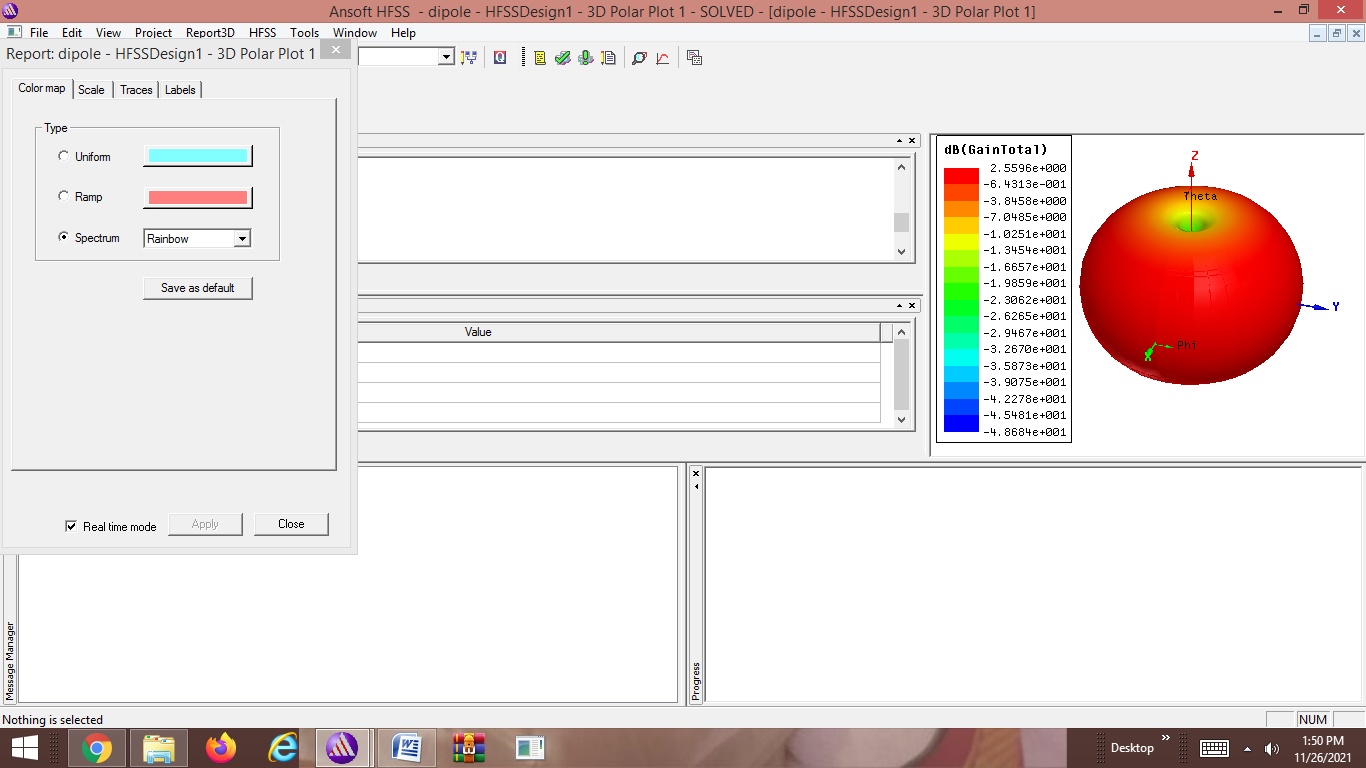


Fig.2(c) Gain in 3D plot

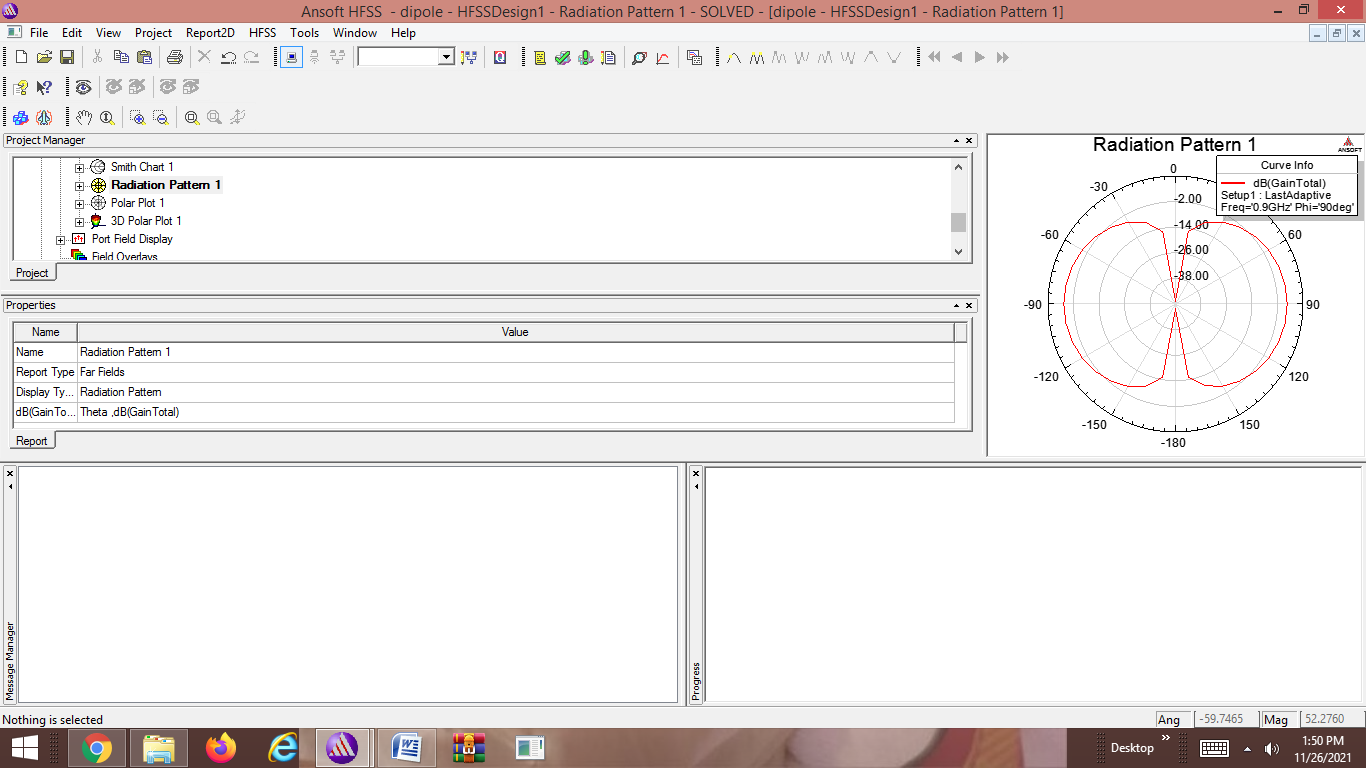


Fig.2(d) Radiation Pattern .

Conclusion: The dipole antenna is designed in P-band and it is operating at 0.8GHz and obtained a gain of 2.5dB and radiation pattern as shown.

3. Design of Transmission Line

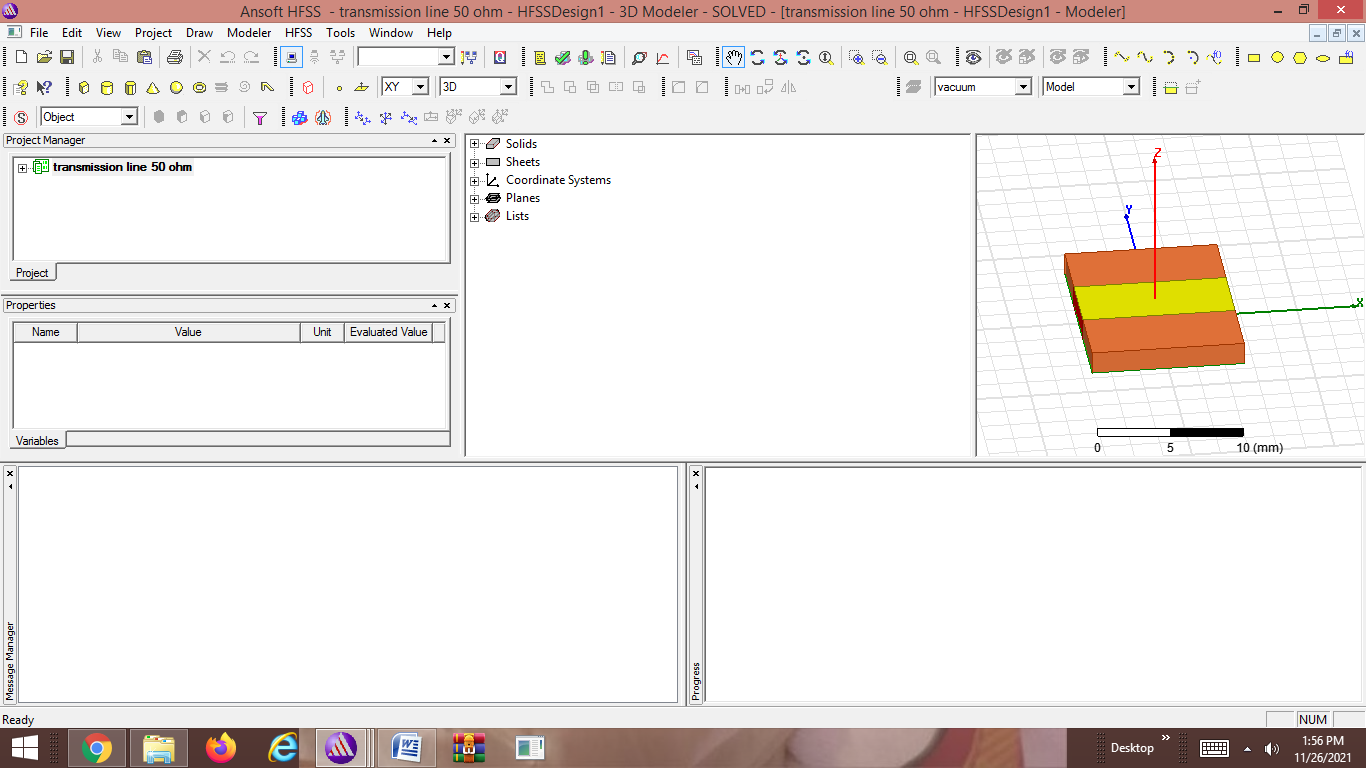


Fig.3(a) Transmission Line

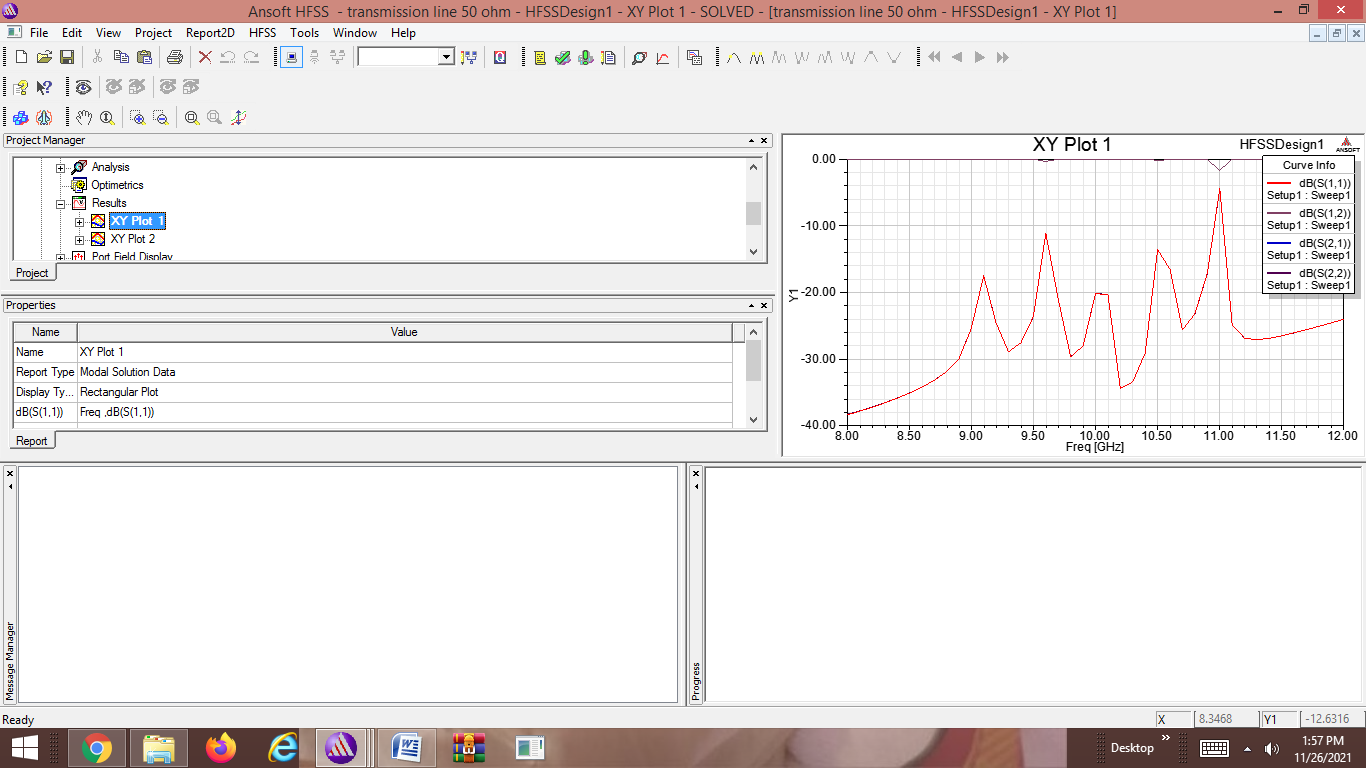


Fig.3(b) Return Loss Vs Frequency.

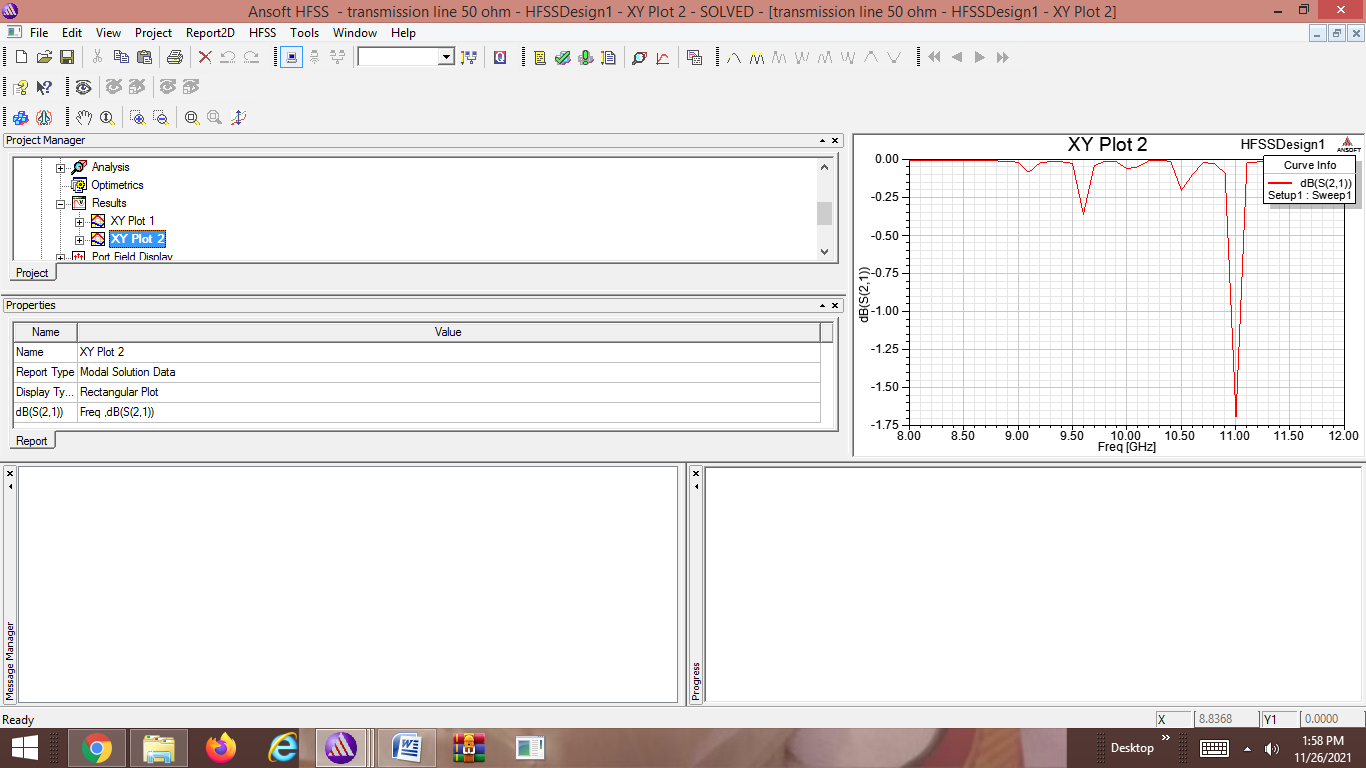


Fig.3(c) Transission Vs Frequency.

Conclusion:11 GHz frequency Micro strip transmission line is designed

4.Coaxial Feed Microstrip Patch antenna

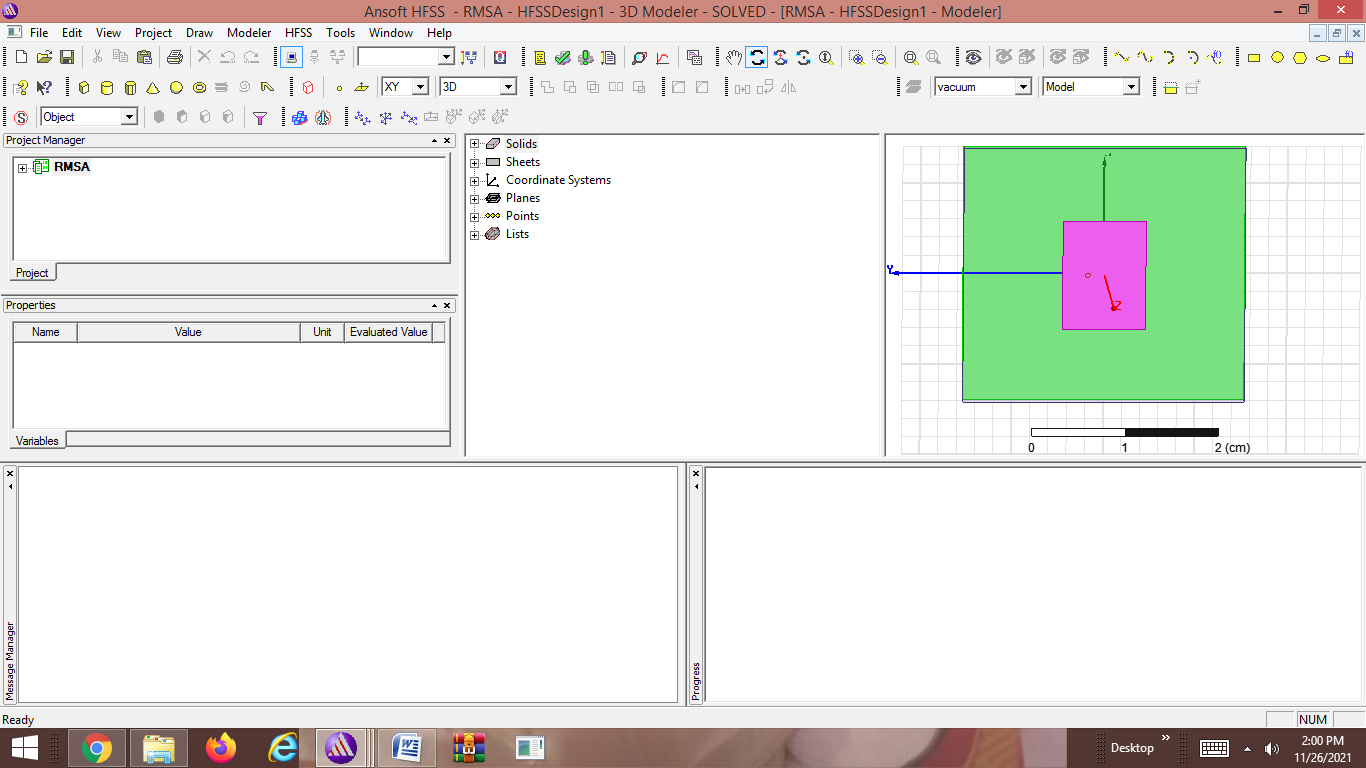


Fig.4(a) Microstrip patch with coaxial feed

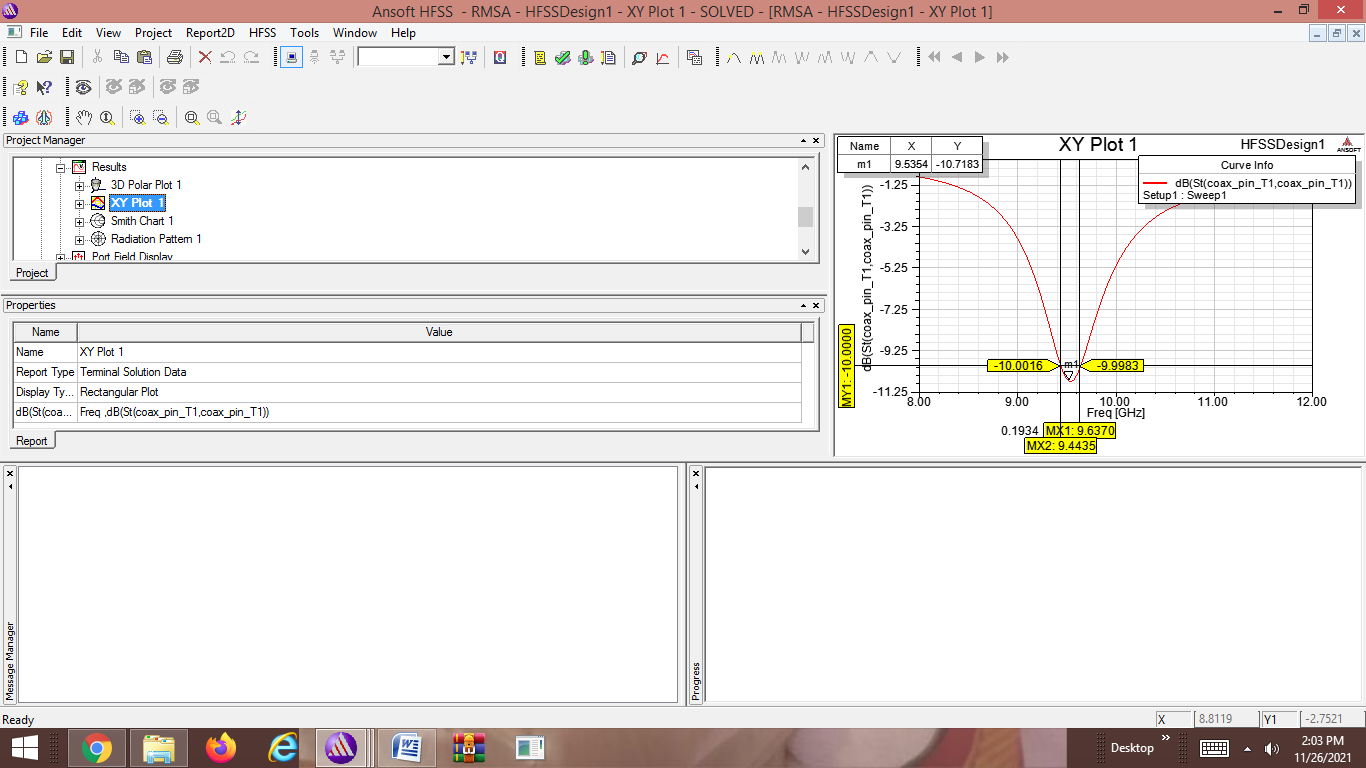


Fig.4(b) Return Loss Vs Frequency.

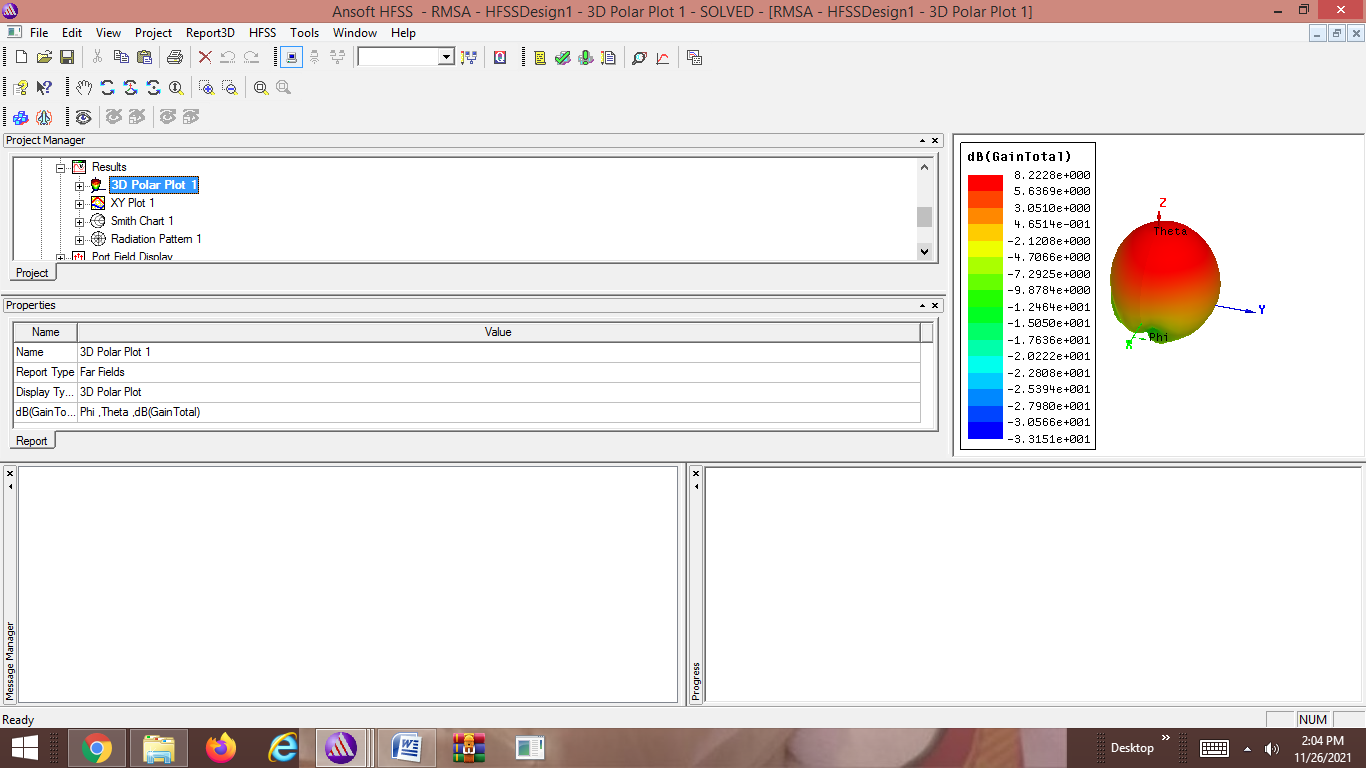


Fig.4(c) Gain in 3D plot

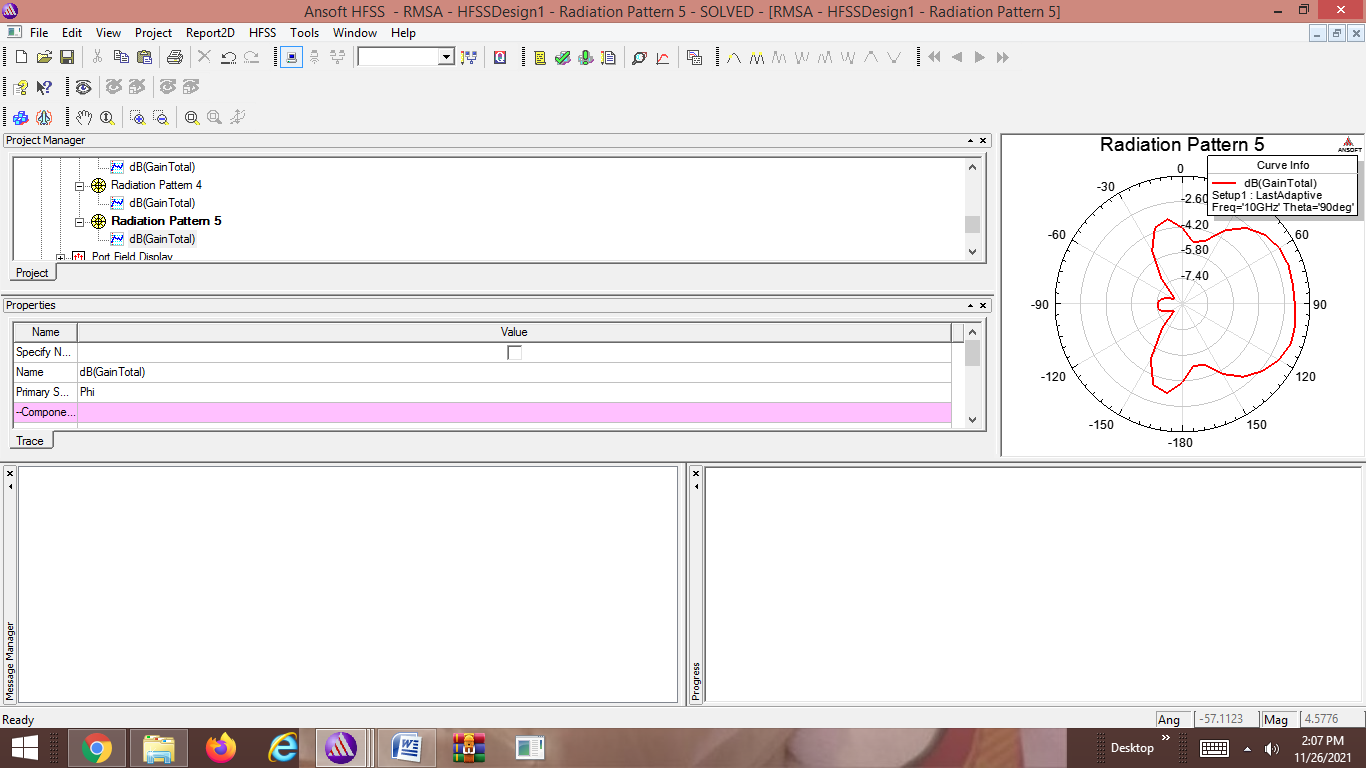


Fig.4(d) Radiation Pattern

Conclusion : Microstrip patch antenna with coaxial feed is designed to obtain the operating frequency 9.5Ghz with gain 8.22 dB which can be used for X-Band applications.

5.Design of Edge feed Microstrip Antenna

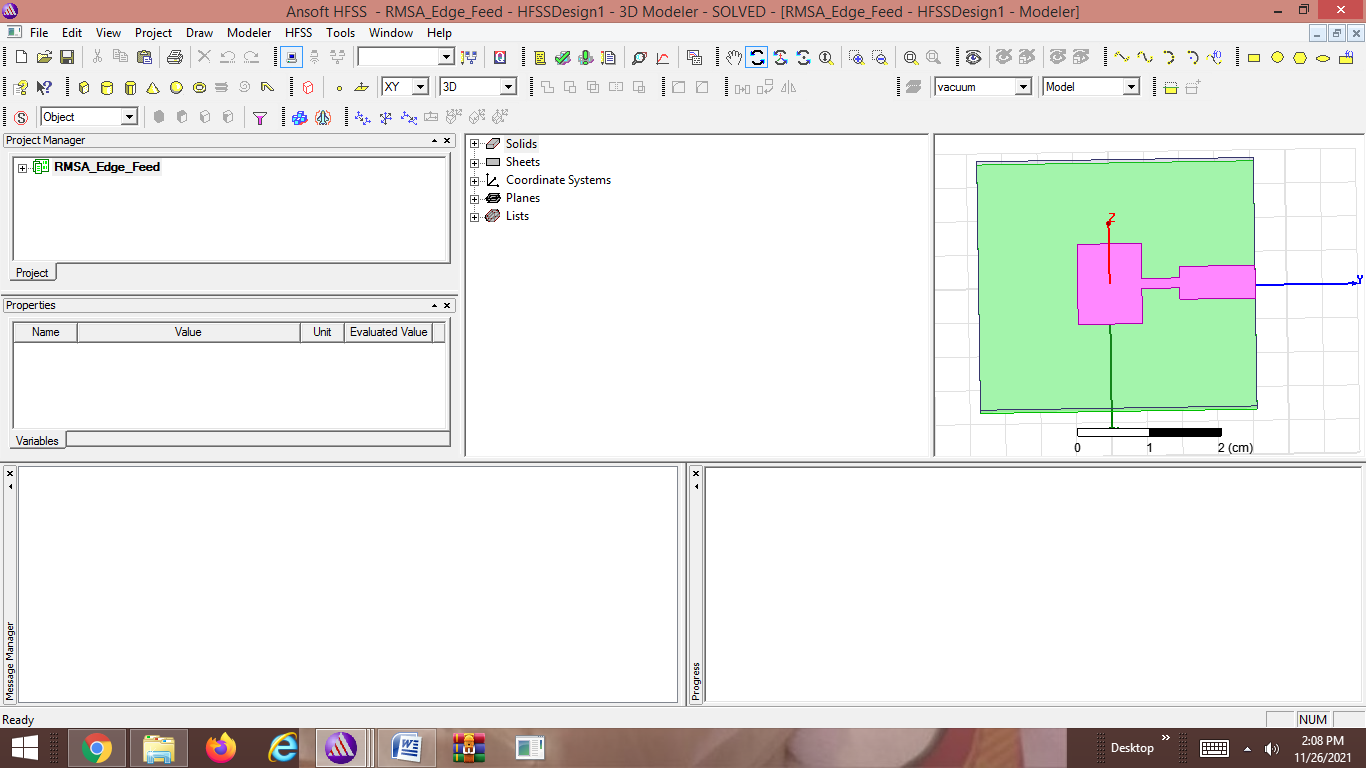


Fig.5(a) Edge feed Microstrip Antenna with Edge feed

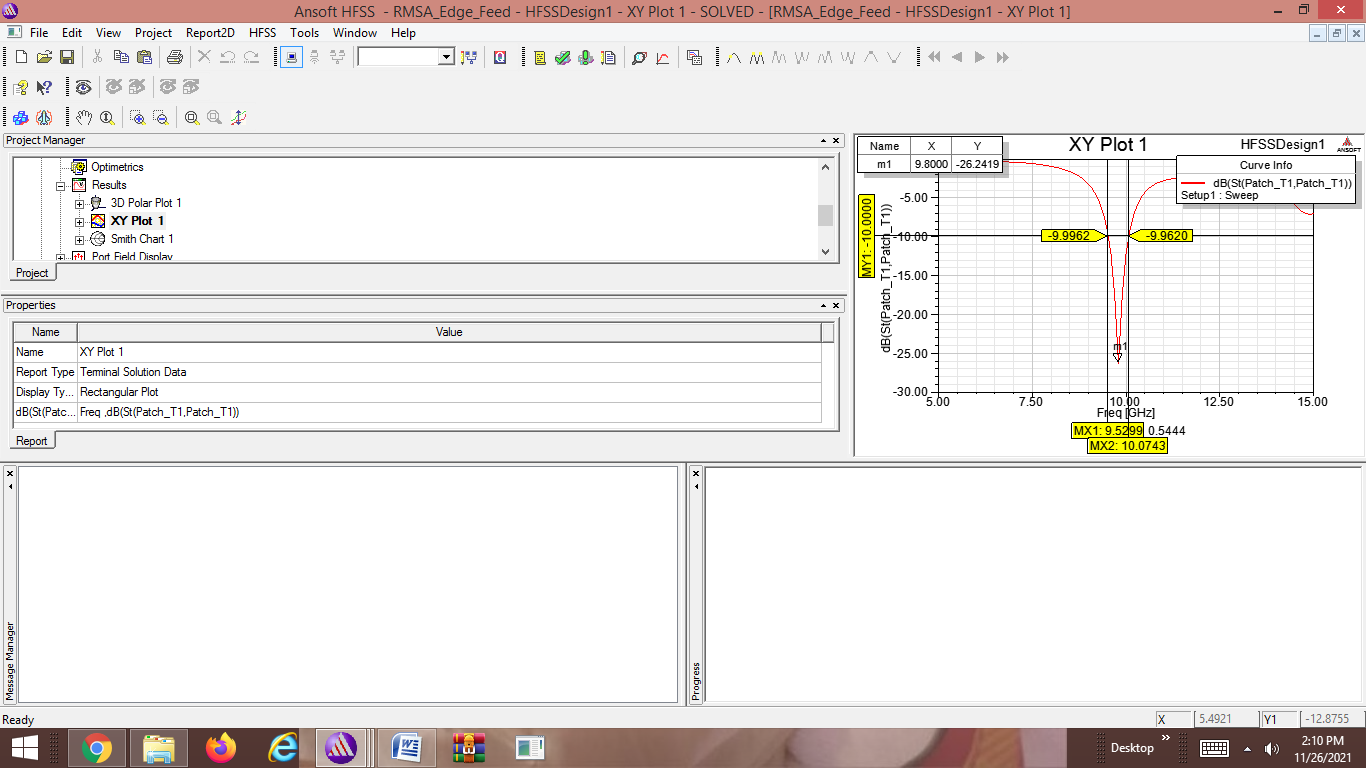


Fig.5(b) Return Loss Vs Frequency.

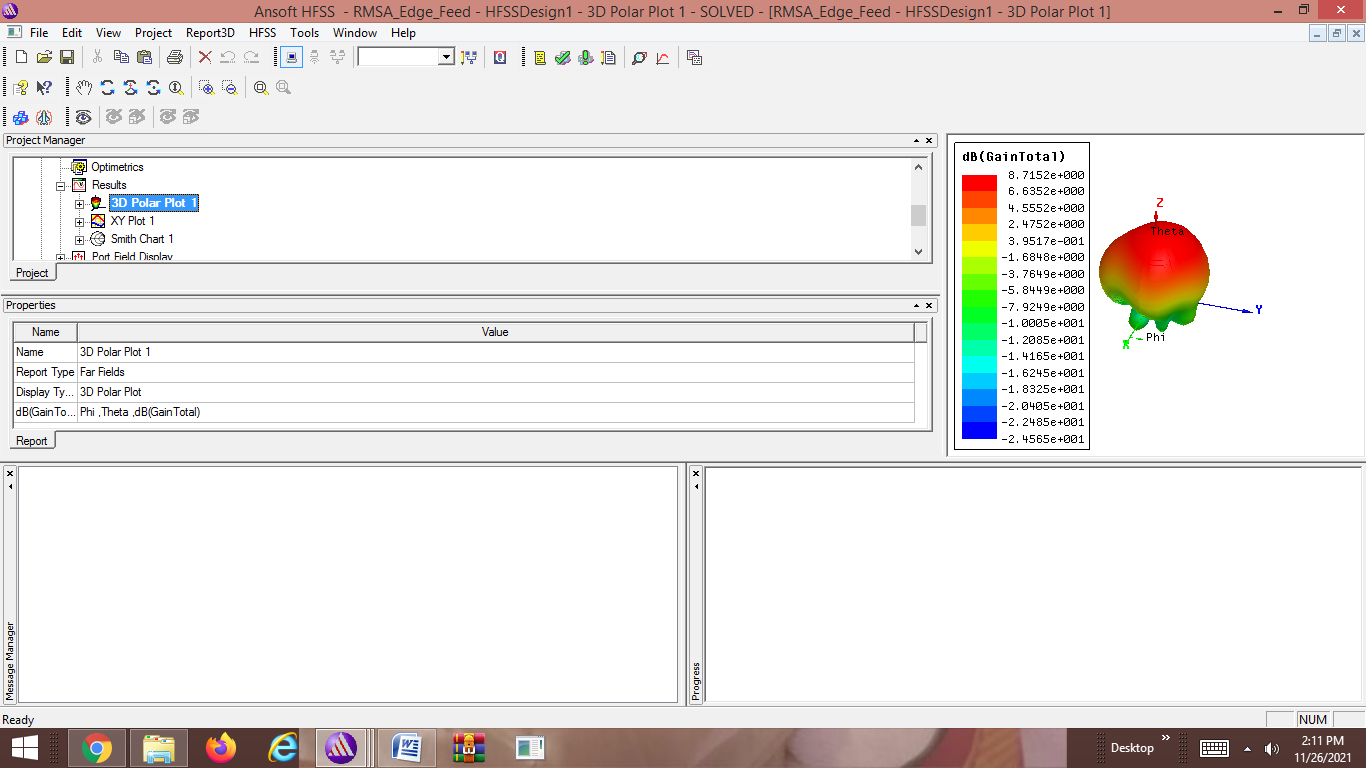


Fig.5(c) Gain in 3D plot

Conclusion : Microstrip patch antenna with edge feed is designed and used a quarter wave transformer to obtain impedance matching between microstrip and patch and operating frequency 9.8Ghz with gain 4.52 dB which can be used for X-Band applications.

6. Design of Insert Feed Micro strip Antenna

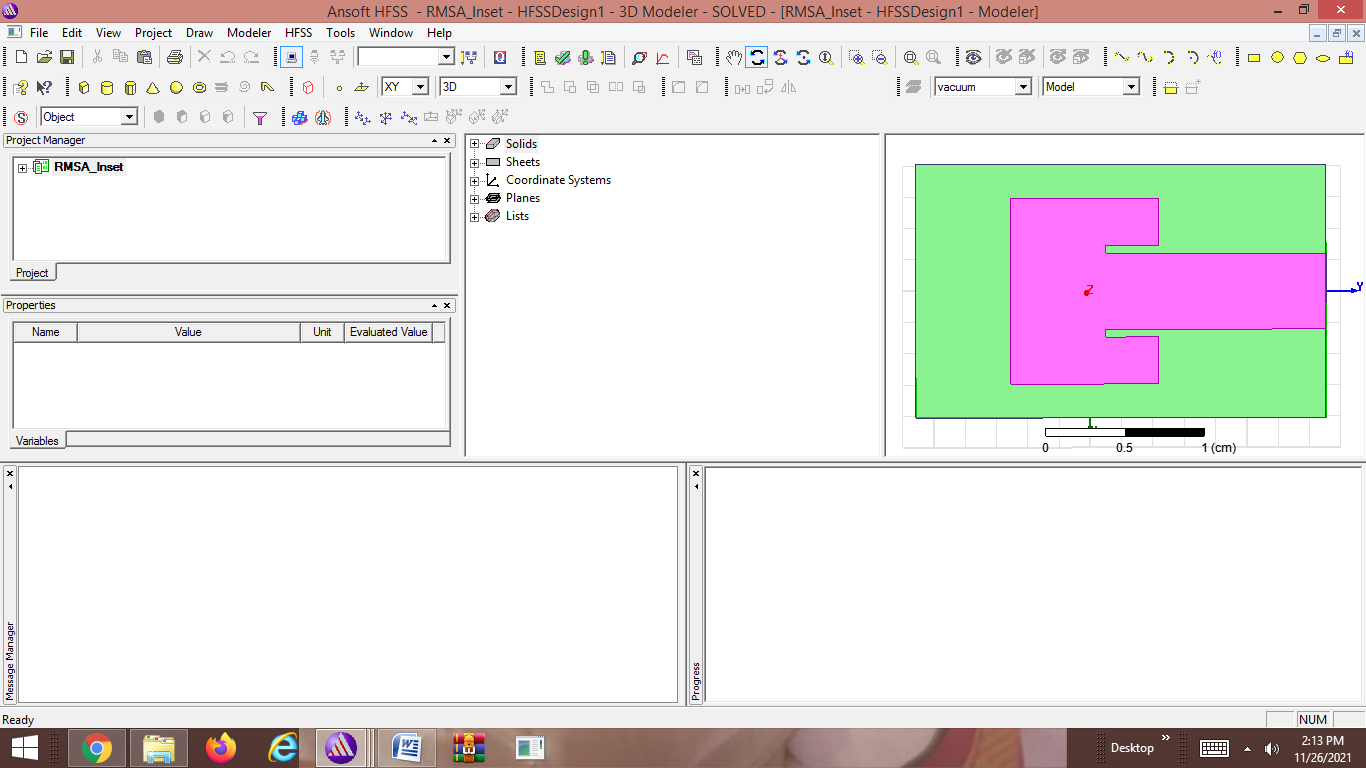


Fig.6(a) Insert feed Microstrip Antenna

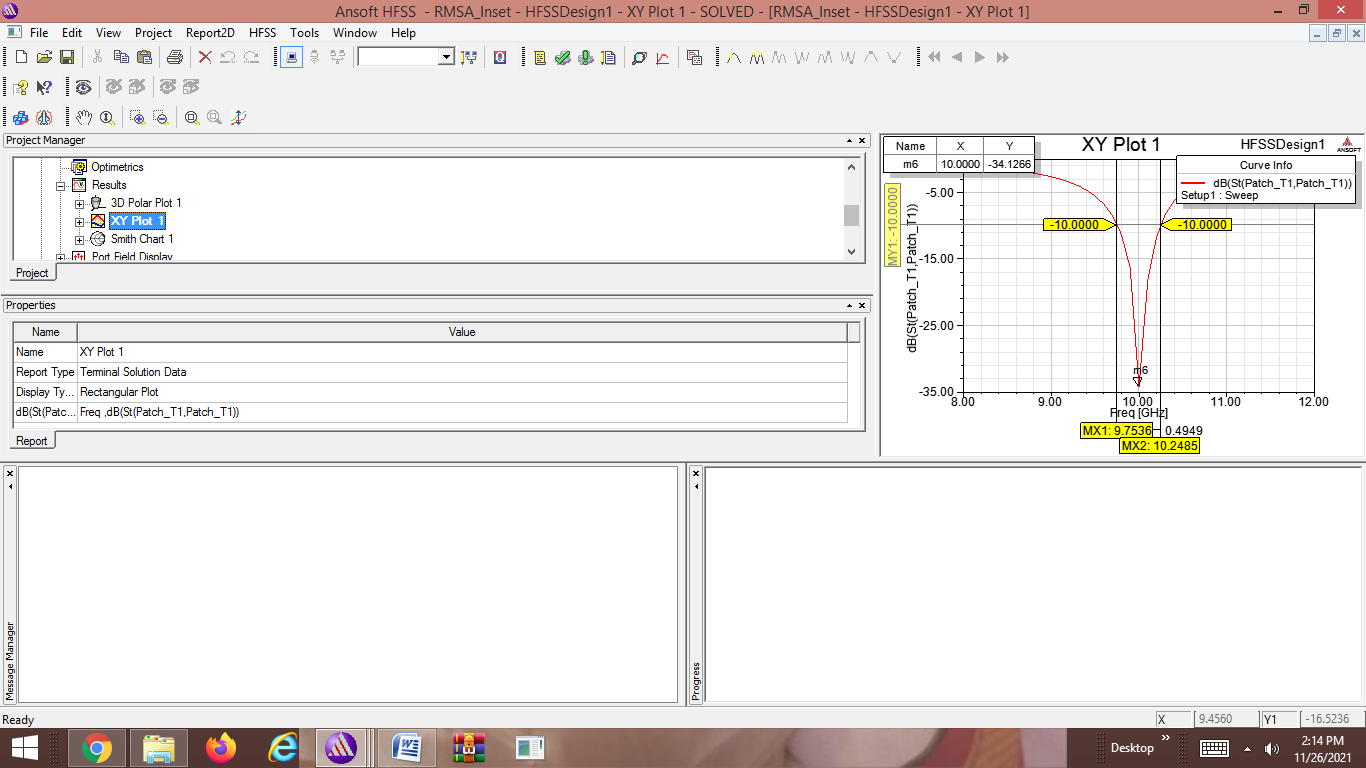


Fig.6(b) Return Loss Vs Frequency.

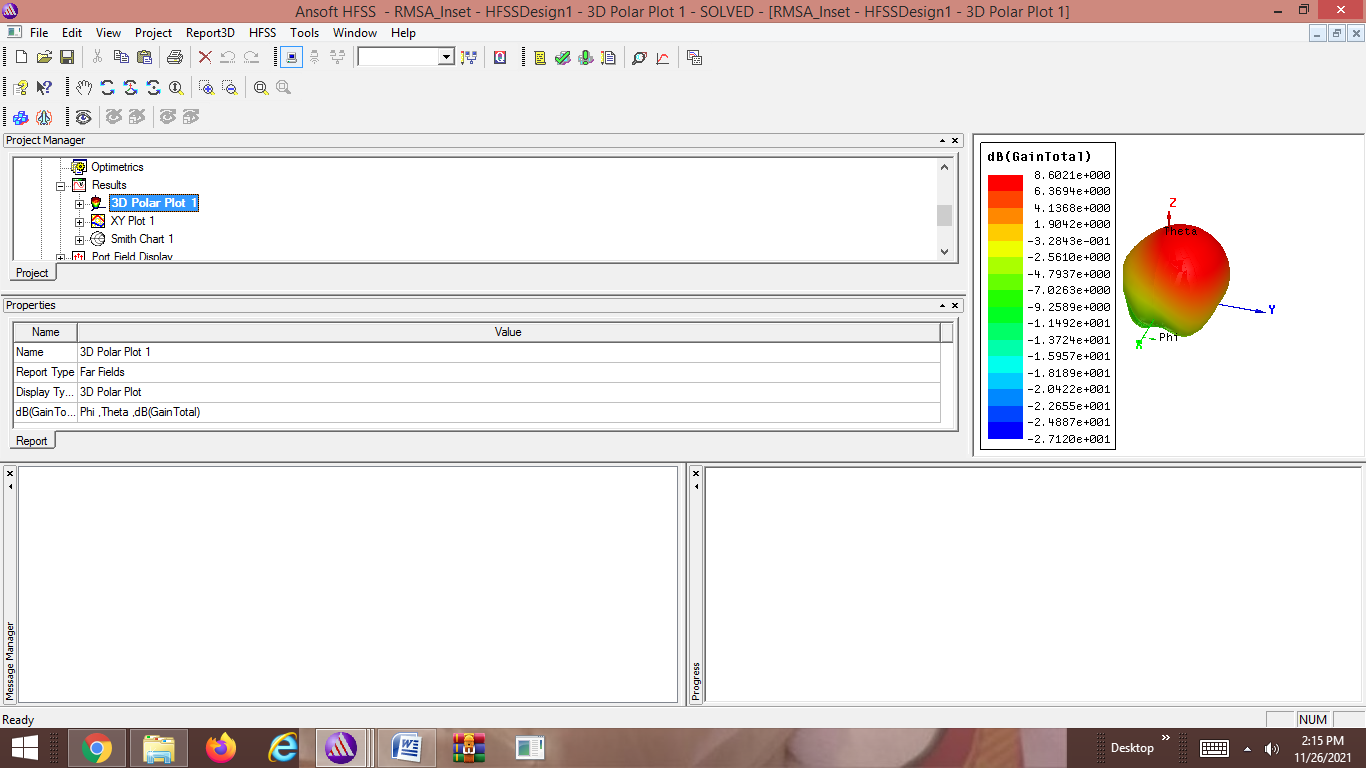


Fig.6(c) Gain in 3D plot

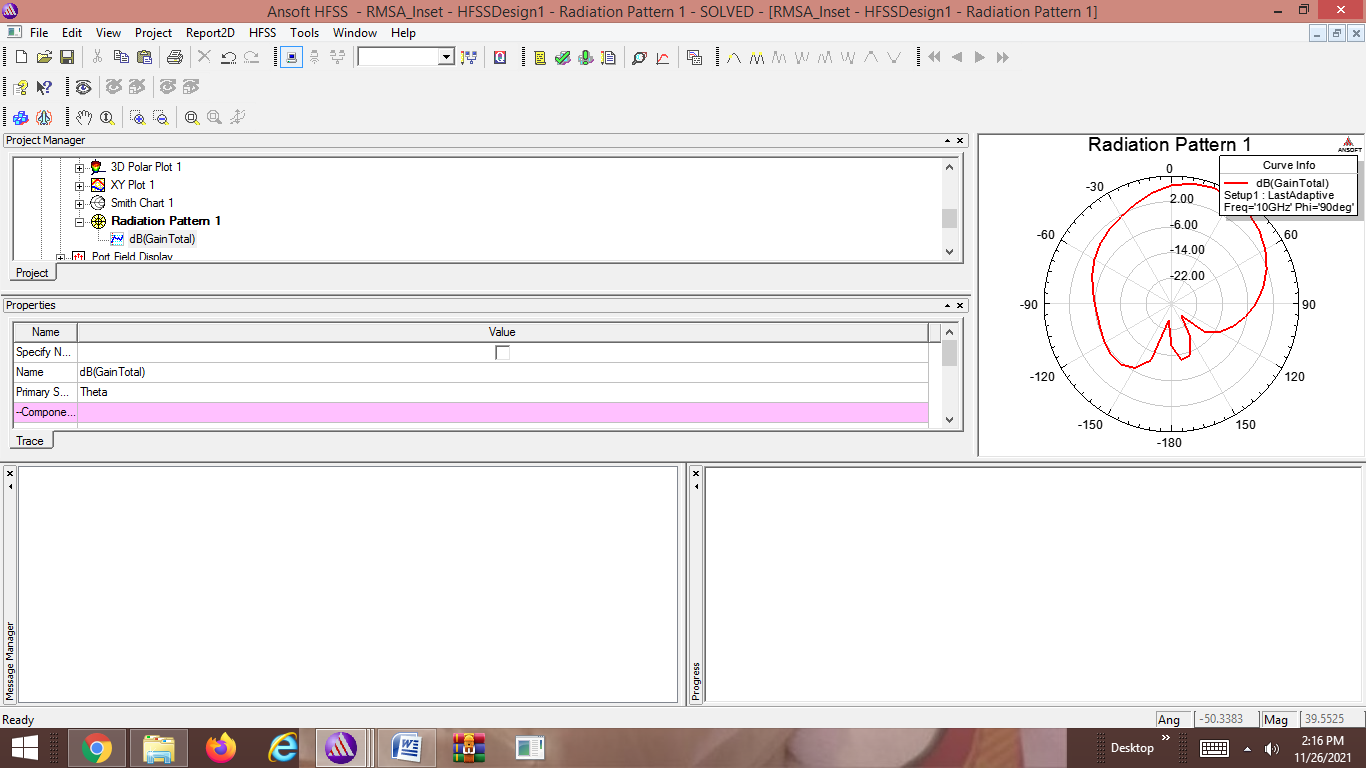


Fig.6(d) Radiation Pattern .

Conclusion : Microstrip patch antenna with Insert feed is designed to obtain operating frequency 9.7Ghz with gain 8.62 dB which can be used for X-Band applications.

7.Stepped Impedance Low Pass Filters

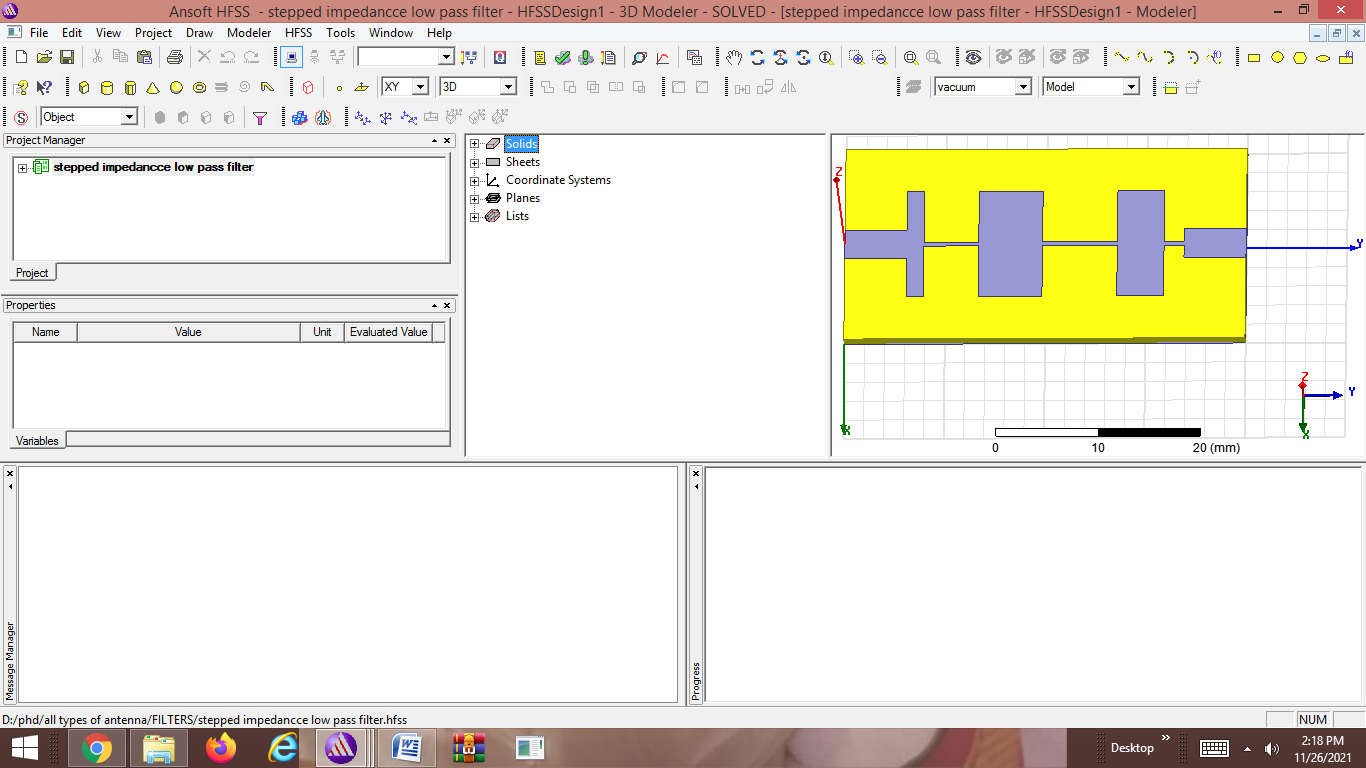


Fig.7(a) Stepped Impedance Low Pass Filters

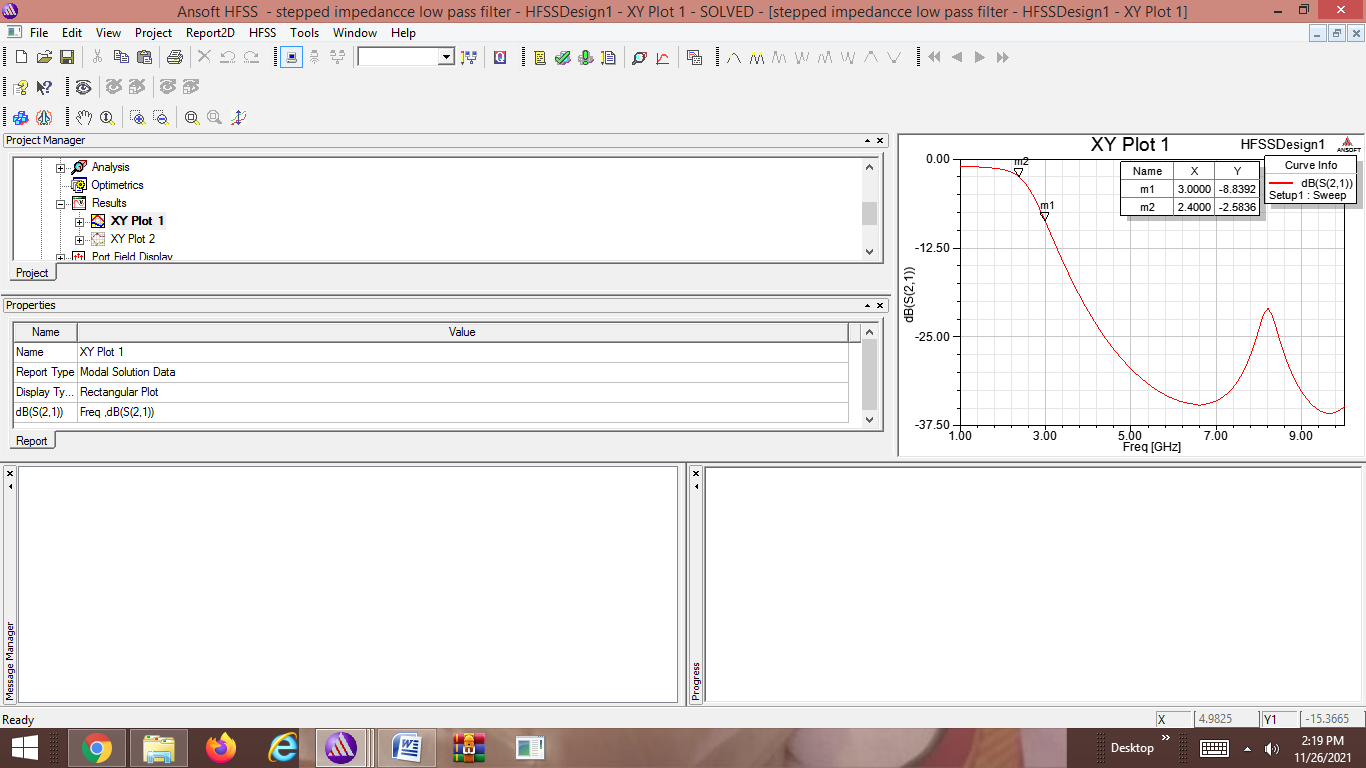


Fig.7(b) S21 Loss Vs Frequency.

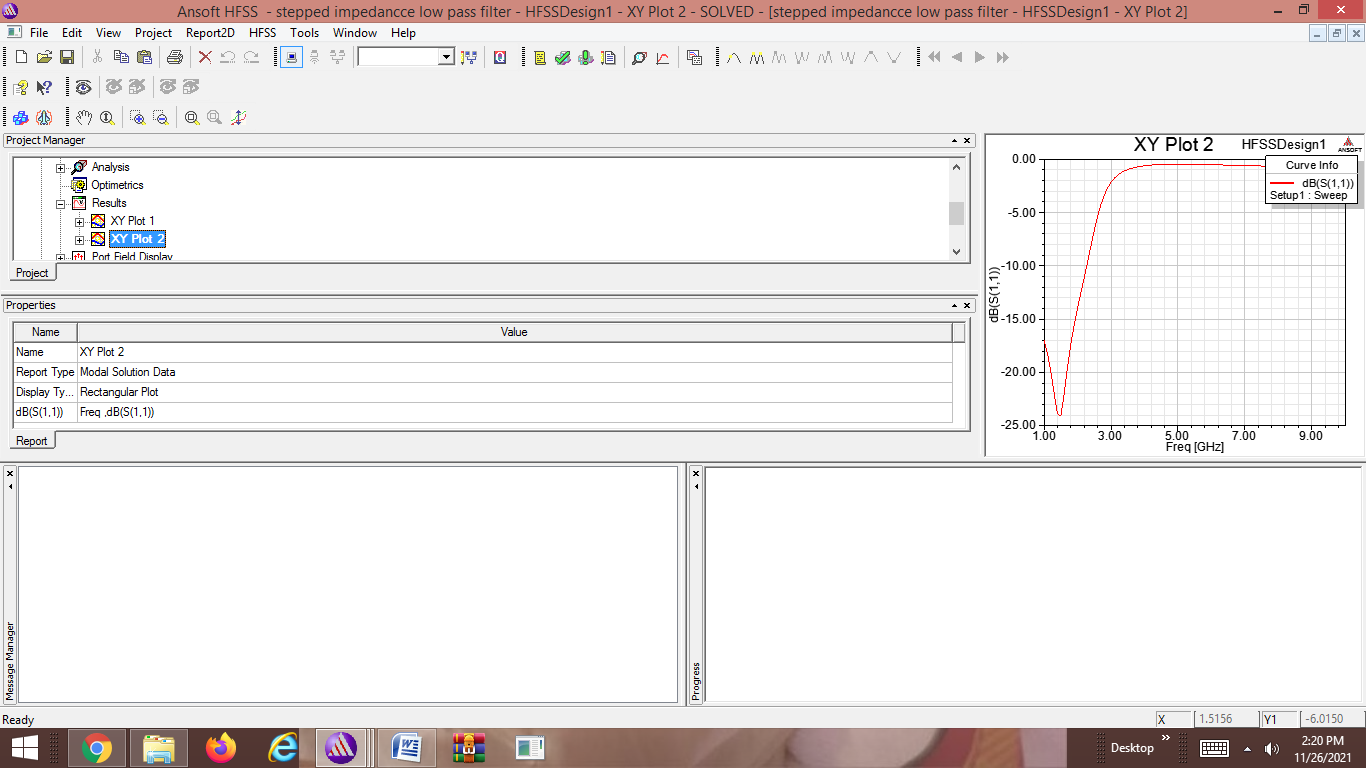


Fig.7(c) Return Loss Vs Frequency.

Conclusion: Stepped impedance low pass filter is designed to allow low frequencies of from 1-2.5GHz.