(SSE-21/12/256/2)- DESIGN AND ANALYSIS OF SURFACE CURRENT DISTRIBUTION AT 2.4 GHz and COMPARE WITH and WITHOUT SLOT

PICO:

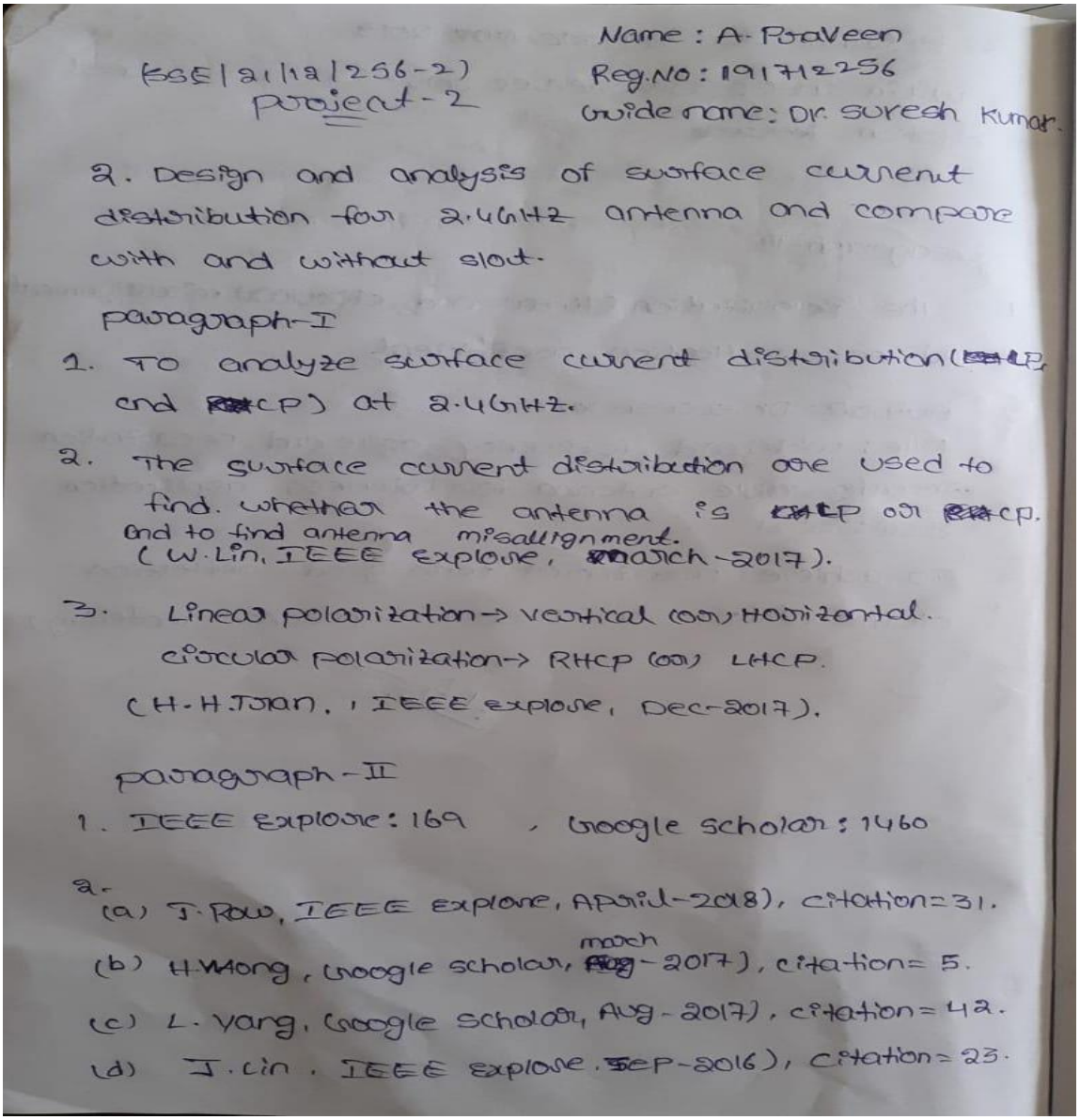
Problem: Current orientation is difficult

Intervention: slot creation method

Comparison: Current distribution of with and without slot

Outcome: Frequency vs Current distribution (with and without slot)

INTRODUCTION:



Name : A. PraVeen
Reg.NO : 191712256
Guide name: Dr. Suresh Kumar.

(SSE/21/12/256-2)
Project-2

2. Design and analysis of surface current distribution for 2.4GHz antenna and compare with and without slot.

paragraph-I

1. To analyze surface current distribution (LHCP and RHCP) at 2.4GHz.

2. The surface current distribution are used to find. whether the antenna is LHCP or RHCP. and to find antenna misalignment. (W.Lin, IEEE Explore, March-2017).

3. Linear polarization → Vertical (or) Horizontal.
circular polarization → RHCP (or) LHCP.
(H.H.Tran, IEEE explore, Dec-2017).

paragraph-II

1. IEEE Explore: 169 , Google Scholar: 1460

2.
(a) T. Row, IEEE explore, April-2018), citation=31.
(b) H.Wang, Google scholar, March-2017), citation= 5.
(c) L. Yang, Google Scholar, Aug-2017), citation=42.
(d) J. Lin, IEEE explore, Sep-2016), citation=23.

3. L. Yang, Google scholar, Aug-2017. It is the best citation.

paragraph-III

1. low surface current distribution in polarization reconfigurable antenna inspired me to do this research.

2. Author: K.W. Leung.

   Title: frequency-tunable designs of the linearly and circularly polarized dielectric resonator antennas using a parasitic slot.

   year: 2015.

3. To achieve low surface current distribution for linear and circular polarization at 2.4GHz.

MATERIALS AND METHODS

Name: A. Praveen
Reg.NO: 191712256
Guide: Dr. Suresh Kumar M

materials and methods-2
(SSE/21/12/256-2)

Title 2: Design and analysis of surface current distribution at 2.4 GHz and compare with and without slot.

para-1:

Study setting: Saveetha school of Engineering.

No. of groups: 2

Sample size: 16

Total sample size: 32

pre-test power: 80%

para-2

Sample preparation group-1:

Designing a circular patch with slot antenna using at 2.4 GHz

procedure:

1. Design a circular patch with slot antenna by calculating the current distribution.
2. Give the feed between two patches.
3. Give radiation and boundary
4. analysis and frequency sweep
5. save and validate it.

para-3:

sample preparation group-2:

Designing a circular patch without slot antenna using HFSS at 2.4GHz.

procedure:

1. Design a circular patch without slot antenna by calculating the current distribution.
2. Give ground (perfect 3).
3. Give source to antenna.
4. Give frequency sweep and validated the design.

para-4

* Ansoft HFSS is a 3D electromagnetic simulation software for designing high frequency electronic product such as antennas, antenna arrays, RF and high-speed interconnect, filters and connectors.

* circular patch antenna, length, ~~height~~ width, radius and dielectric substrate were set.

Testing procedure:

* Assign dielectric material and frequency
* calculating the length and width of patch using microstrip test line calculator.
* Assign boundary conditions
* Assign excitation
* Assign analysis setup
* validating design
* Result analysis

para-5

Data collection: ~~Data entered in excel sheet.~~ there is no data for comparing the current distribution.

para-6

Statistical software used:

* HFSS software used for simulation and verification.
* ORIGIN Vs0 software.
* SPSS.

Independent variable:

* frequency (GHz)
* ~~RT-duroid~~ ~~Dielectric~~ constant
* ~~RT-duroid~~ ~~Dielectric~~ Height

dependent variable:

* current distribution.

analysis done:

comparing current distribution of circular patch. without slot only circular polarized is achieved and with slot right hand circular polarized is achieved.

DESIGN AND ANALYSIS OF SURFACE CURRENT DISTRIBUTION AT 2.4 GHz and COMPARE WITH and WITHOUT SLOT

DATA COLLECTION: WITH AND WITHOUT SLOT

S.NO	GROUP1	FREQUENCY	CURRENT DISTRIBUTION	GROUP2	FREQUENCY	CURRENT DISTRIBUTION
1	1	2.25	-.1320	2	2.25	-.2210
2	1	2.30	-.1420	2	2.30	-.3710
3	1	2.35	-.4280	2	2.35	-.7140
4	1	2.40	-.1420	2	2.40	-.5640
5	1	2.45	-.8510	2	2.45	-.4280
6	1	2.50	-.5710	2	2.50	-.7850
7	1	2.55	-.2850	2	2.55	-.1420
8	1	2.60	-.2430	2	2.60	-.5000
9	1	2.65	-.7140	2	2.65	-.8570
10	1	2.70	-.4280	2	2.70	-.2410
11	1	2.75	-.1420	2	2.75	-.5710
12	1	2.80	-.8570	2	2.80	-.2860
13	1	2.85	-.5710	2	2.85	-.2850
14	1	2.90	-.2850	2	2.90	-.6420
15	1	2.95	-.4330	2	2.95	-.1560
16	1	3.00	-.3220	2	3.00	-.3340

Group Statistics:

	group	N	Mean	Std. Deviation	Std. Error Mean
frequency	withslot	16	2.6250	.23805	.05951
	withoutslot	16	2.6250	.23805	.05951
Current distribution	withslot	16	-.409125	.2448607	.0612152
	withoutslot	16	-.443562	.2259251	.0564813

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
frequency	Equal variances assumed	.000	0.453	.000	30
	Equal variances not assumed			.000	30.000
Current distribution	Equal variances assumed	.022	0.434	.413	30
	Equal variances not assumed			.413	29.808

Comparison of current distribution of with and without slot by varying the frequency ranging from 1GHz to 3GHz.there is statistically significant difference in current distribution of with and without slot. The current distribution of without slot is higher when compare to with slot.

BAR CHART:

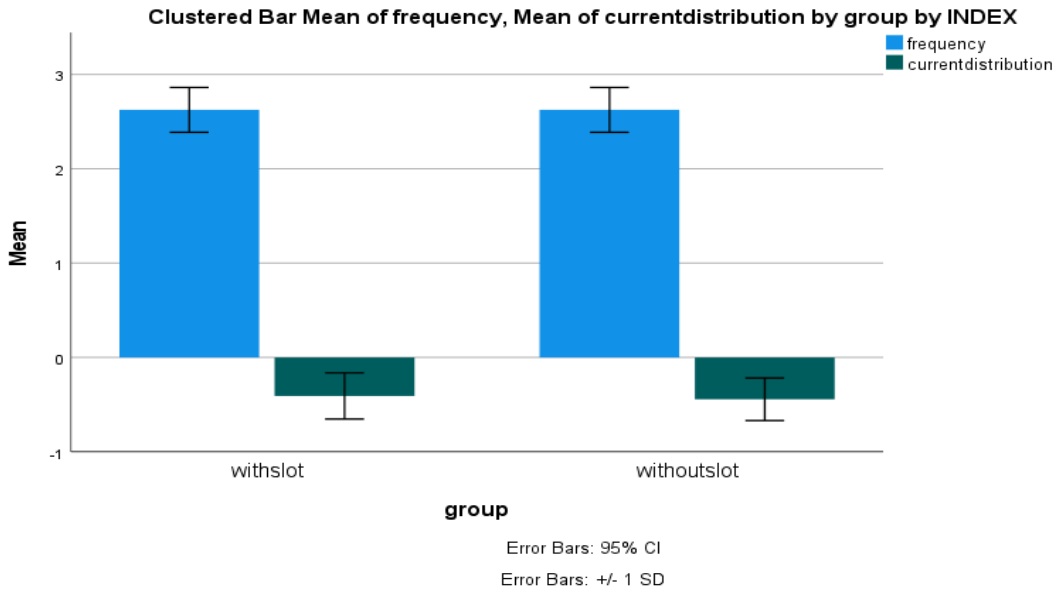
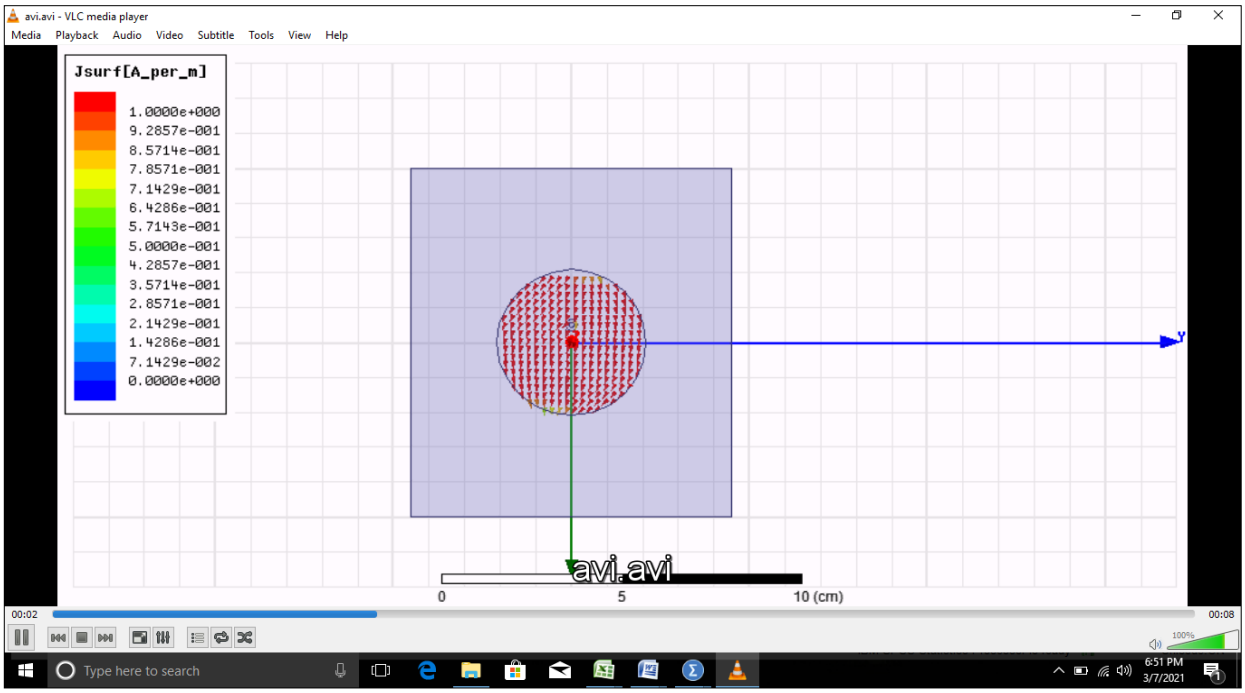


Fig. Bar chart comparing the mean current distribution of with and without slot by varying the frequency. There is no significance difference between the two groups p>0.05(Independent sample t test).

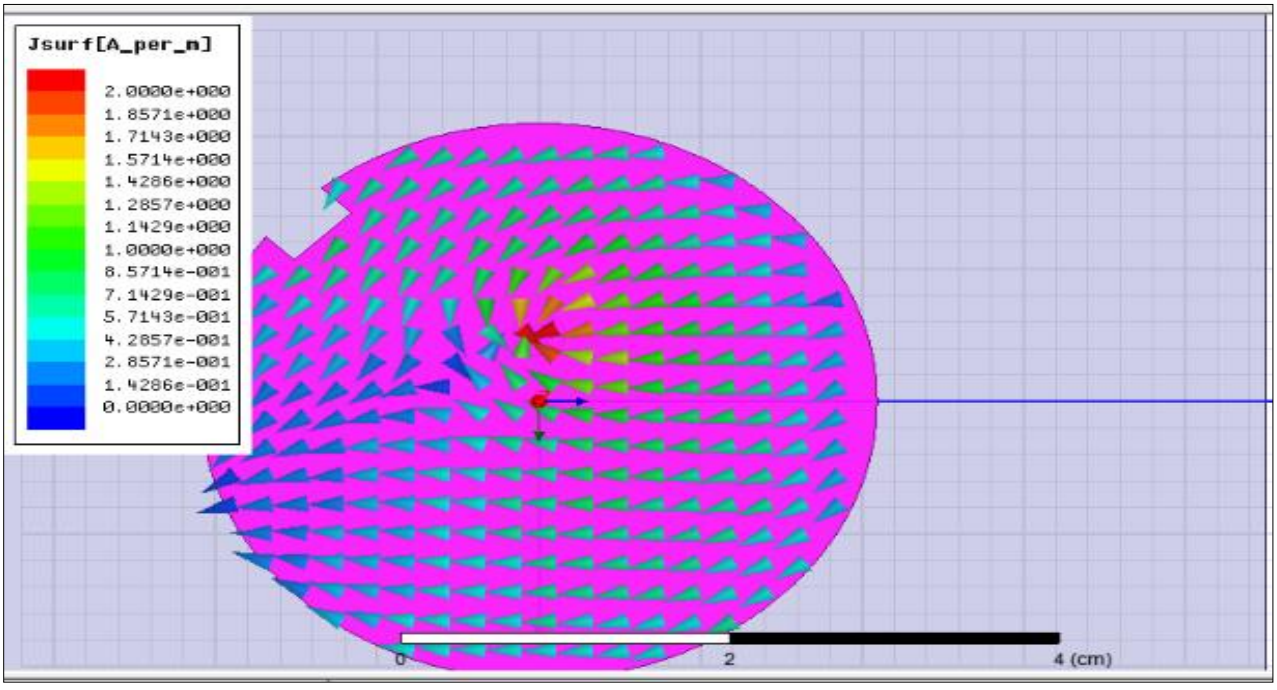
RESULTS AND DISCUSSION:

WITHOUT SLOT CURRENT DISTRIBUTION:



Without slot only circular polarization(CP) is achieved in the current distribution.

WITH SLOT CURRENT DISTRIBUTION:



With slot only right hand circular polarization(RHCP) is achieved in the current distribution.

DISCUSSION HINTS

(SSE/21/13/256-2) Discussion. Hints — A. praveen 191712256

project 2

Design and analysis of surface current distribution at 2.4GHz and compare with and without slot.

para-1

circular patch antenna of surface current distribution is lower in without slot compare to withslot.

para-2

* slot creation affects the circular patch antenna of surface current distribution.
* The slot creation is increases, the surface current distribution is ~~decreases~~. also increases.

para-3

Google scholar citation=80, Google scholar citation=61

* W. Lin march 2015.

wideband circular polarization reconfigurable antenna for surface current distribution.

* oleg Rybin, valerii Shulga, seagey shula. 2019

Investigation the given given surface current distribution model of a rectangle (or) circular patch antenna with substrate.

modification:

slot created with length = 10 cm

and width = 9 cm

Radius of the antenna ~~article~~ = 20.95mm.

future scope:

Increase ~~both~~ surface current distribution and fabricates in future.

Limitations:

only RHCP is achieved for withslot and LHCP is not achieved.

conclusion:

within the limits of this study, the current distribution is higher for both with and without slots. linear polarization and circular polarization is achieved.

Approved,

(guide).