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Reduction of Interference Between 5G cellular networks and Fixed Services using Different Deployment Method: A survey

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Abstract:- *The increasing demand for higher data rates has immediately research on Fifth generation of mobile cellular networks and also satellite communication. One of the key factors of 5G is the use of a huge bandwidth allocated in the millimeter wave (mm Wave) frequency spectrum. The spectrum wrong in the 17-30 GHz range is a promising candidate as it provides a good compromise between spectrum availability and radio propagation. Unfortunately, this frequency band has already been allocated to various systems such as Fixed Services (FS). Hence, solutions for reducing the interference from one system to another are needed.*

The objective of this work is to reduce the interference and access the maximum working time for which the interference power (in dBm) is under a certain threshold. This can be achieved by adjusting the different parameter: Changing 5G BSs density, coordinated deployment of 5G BSs location, Varying Fixed Service receiver antenna height and user's association to BS.

Key Words:- **5G, Fixed services, co-existence, interference, beam forming, Various Deployment Method.**

1. INTRODUCTION

5G networks are develop not only for advanced communication services, but also develop to the infrastructure supporting socio economic development and driving industrial digital conversion. Spectrum and management play a important role of 5G make success, assure time available of the spectrum under appropriate conditions to fallow the wireless market to respond the consumer and industrial demand for services [2].

forecast makes plain that an incremental approach will not come close to meeting the demands that networks will face by 2020[1]. Many research anticipated that the 5G network would be a efficient and super-fast mobile Communication comprising of compactly clustered advanced small cells to give an uninterrupted coverage while deliver a superior performance for lower establishment cost at the same time.

5G network would need to additional amount of bandwidth demand, which is fairly challenged to within the traditional radio spectrum range. A solution to have access to the already allocated spectrum is to co-exist with the existing services. Show in fig.2 According to a mobile communications association of mobile operators, vendors, manufacturers and research institutes, the Fifth Generation of Mobile Networks (NGMN) Alliance, deployment of 5G network should be done by 2020 to satisfy the commercial and user demands[6].

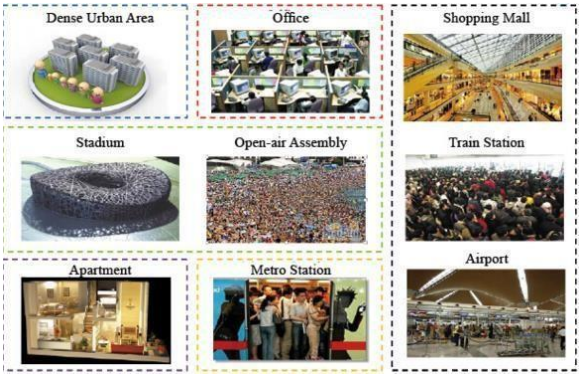

Fig-1: Typical 5G Network Scenarios

5G needs access to "high" "medium" and "low" frequencies[3].

Fig-2: Multi-layer frequencies approach for 5G usage scenarios[3]

1.1 Fixed Services

"Fixed links" in the context of this study are point to point radio links used to convey voice or data traffic between two specified geographic locations[7] Fixed service (FS) are use for two site connected using a wireless link. It is a form of point to point communication, where a fixed link is used to enable data communications between the two sites.

The main advantage of FS is the capability to connect users in isolated areas without the need for setting up new cables. Fixed Services is difficult to implement broadband communication. That's why FS popular for short distance communication over fiber or cable connection. To avoid interference with other cellular services, most of the FS are operated in higher frequency range above 6 GHz.

From a technical point of view sharing with fixed link can be coordinated. For some applications, the positions of the fixed transmitter and receiver are known by regulators and some parameters (i.e. transmit power) are regulated[2].

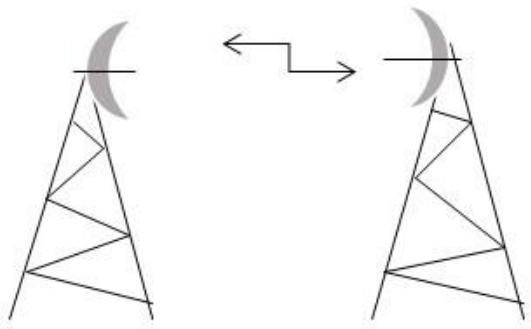

Fig-3: Fixed Service (FS)

As already discussed in the previous sections, in order to utilize the 5G network completely to fulfill the exploding traffic demand, it would need substantial extent of bandwidth. Assigning this large bandwidth within the traditional radio spectrum range is a fairly difficult task and as a consequence, we are studying the possibility of utilizing the higher frequency band range (10-20 GHz) for the 5G network. In order to do that, one major obstacle is the presence of FS which also operate in higher frequency range, generally above 6 GHz to avoid interference with the existing cellular communication.

A previous study has demonstrated that the interference coming from FS to 5G networks do not disturb the 5G networks QoS and, therefore, only the interference coming from 5G networks to FS is considered in this study.

2. BEAMFORMING

Beamforming means "pointing" an antenna array and shaping the beam. In short- give to every antenna right delay and information, and then adding the signals. Advanced antennas would play an important role in 5G radio access. Antenna patterns are the same when transmitting or receiving.

3. VARIOUS DEPLOYMENT METHOD

Four parameters are chosen for our deployment. They can basically be divided into two parts:

- ❖ Deployment
  - ✓ BS Position
  - ✓ BS density
  - ✓ Fixed Service height
- ❖ Network Controller
  - ✓ Users connection to BS

Four way are deployment to show the impact of the parameter on the interference coming from 5G networks to Fixed Services (FS).

- ❖ Deployment

3.1 Apply a Coequal deployment of 5G BS.

We are apply coequal deployment for BS issue in our region of interest. In some cases, the different deployment is applied for Base Station issue. Different deployment means that deploy the base station with considering the position of fixed service (FS). When we are deploy the base station, than we can also consider the position of fixed service. In our coequal deployment, we take interference scenario. We are try to deploy the cells surrounding the FS.

Handover of the user within the Security Region.

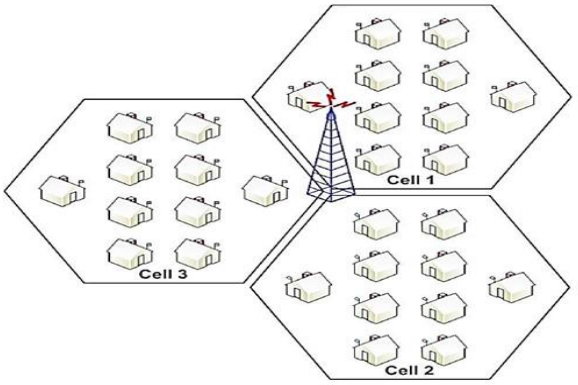

Fig-4: Coequal deployments of BS

In this method, the FS is the centre of the cell we can make minimum distance between FS and BS equals to the radius of the cell. More, it is increase the path loss from BS to FS.

This coequal deployment may help to reduce the interferences for the surrounding cells around the FS.

3.2 Increase the BS consistence by changing the cell area.

We will increase the BS consistence by decrease the area of our cell. That menace many Base Station are same cell area. That's way interference occurring 5G to fixed services. We will find what is impact are occurring to the interference.

3.3 Increase the Elevation angle of Fixed Services antenna

Now, we would try to increase the Elevation angle of FS to increase the path loss from BS to FS as well as the elevation angle. With the increase of the elevation angles, the sending and receiving gain are decrease, and eventually it would cause the interference from the BS to be weaker. Moreover, the increased path loss would also help to reduce the interference further.

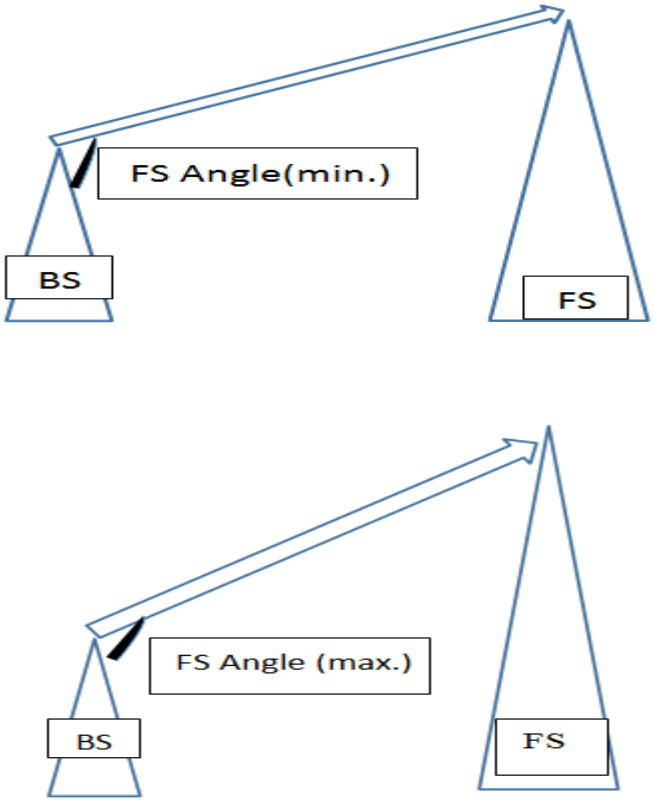

Fig- 5: Elevation Angle of the FS

3.4 Define a new Deployment Method for the users near to the Fixed Services, called as Security Region.

Above deployment method are Base Station are Facing to the Fixed Services and send data to the users near by the Fixed Service with the maximum transmitting power, strongest interference to the FS would be occurring. To reduce the interference, we have defined a new deployment method for the users nearby the FS, called as Security Region.

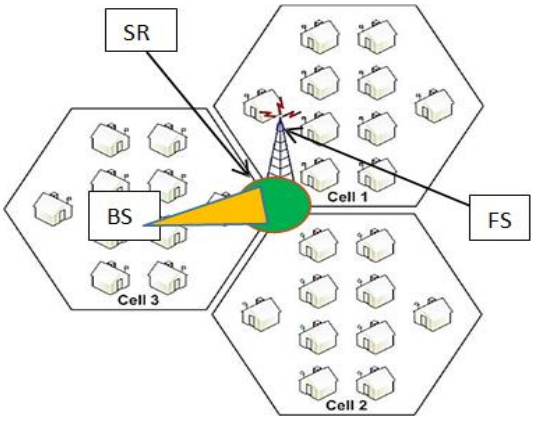

Fig- 6: Security Region

Show in fig. above mentioned security region consist of two areas- one is a circular sector with the BS as the center of the circle its called angle, other is a circular area with the FS as the center of the circle is called security region. We Implement this model, When the user are in security region, that time this user are changed to the BS at the back side of the FS to reduce the interference according to the Below figure 7.

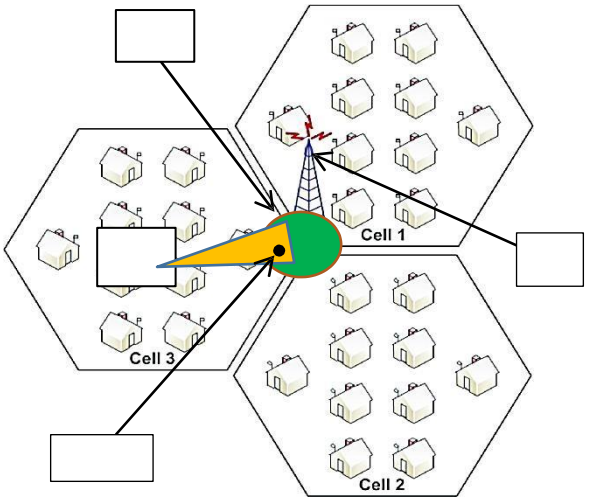

Fig- 7: Handover of the user within the Security Region

In this Method we are using Beamforming antenna for both Base Station and Fixed Services Side.

4. CONCLUSIONS

1. In coequal deployment avoid deploying BSs close the line joined FS transmitter and receiver.
2. In second method we are increase t h e number of Base Station than the distance between the BS and FS is minimum so, interference are increase.
3. Increasing the FS receiver antenna height to the BS, the path of FS is upper to BS path here minimum interference occurring.
4. Our survey, a new Deployment Method for the users near to the Fixed Service, called as Security Region. Security Region is best way to reduce the interference coming from 5G BSs direct around the FS receiver.

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