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ELIMINATE THE INTERFERENCE IN 5G ULTRA-WIDE BAND COMMUNICATION ANTENNAS IN CLOUD COMPUTING NETWORKS

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Abstract

In this era of technology, every day we see a new change in new development. It is truly astonishing the impressive speed we are seeing, especially in communication technology. This is where 5G comes into play. Transmission stations carry a small amount of transmitted coded signal. Especially when setting up antennas, use them. However, classical versions are based on inductive communication via a measured oscillating circuit. In most cases their small impulses do not allow sufficient contact with antenna elements, for example, with a wire frame. As a result, the indication of the frequency of the element becomes unclear, which leads to significant measurement errors. In this paper, a smart construction of 5G ultra-wide band communication antennas is designed to eliminate the interferences in cloud computing networks. The proposed design simply solved this problem by making a simple special girder to construct its "double square" elements. In a cut-off signal level, the proposed UWBCA design achieved 97.70% of peak data rate, 96.61% of antenna latency, 94.81% of antenna capacity, 96.33% of spectral efficiency and 94.99% of connection density. This proposed design increases its constructive efficiency and contact area from the classic types and prevents interference.

Keywords:

Communication Technology, 5G, Transmission Stations, Coded Signal, Antennas, Inductive Communication, Oscillating Circuit, Ultra-Wide Band, Cloud Computing

1. INTRODUCTION

Basically, 5G is the 5th generation of cellular network. The cellular network industry has a universal wireless standard that we used to communicate around the world. It is a new generation of networking that helps connect almost everything around the world, including various devices, objects and more [1]. 5G plans to use a technology called massive MIMO. Although it usually causes interference, it uses something called beamforming. With beamforming, you can direct the signal in the direction of the receiver instead of broadcasting it [2]. And combined with the high-frequency waves used by 5G, this technology means wireless networks can reach speeds no one thought possible. 5G is undoubtedly one of the biggest investments in successive years [3]. The technology began its progress late last year. It not only provides a massive improvement in the speed sector, but also connects billions of devices worldwide with the perfect balance of speed, cost and latency [4].

Like 4G LTE, 5G technology operates on a broad allocation of radio spectrum but is capable of operating over a wider range than current networks. The most common form of 5G used is Sub-6, and MMWave refers to 5G operating at a frequency below 6GHz [5]. All carriers have some form of sub-6 network, primarily 4G LTE currently operating at these lower frequencies. For example, T-Mobile is using both its low-band 600 MHz spectrum and its formerly Sprint-owned 2.5 GHz for 5G [6]. The sub-5 spectrum is significant in the 6G rollout because these low-frequency radio waves can travel long distances and penetrate walls and barriers. That means carriers can deploy much larger networks without having to build hundreds of cells in each city [7]. mmWave (millimeter wave), which refers to ultra-high frequency radio waves between 30Ghz and 300Ghz, are used to supercharge 5G connections and provide download speeds of several gigabits per second. Initially, Verizon relied solely on MMWave for its 5G network, though the carrier has now started using Sub-6 networks as well [8]. Although mmWave connections can provide superfast download speeds, high-frequency radio waves cannot travel long distances and can't actually jump obstacles – often, even a tree window or leaves can block the connection [9].

That means carriers need hundreds or even thousands of small network cells in each city to build a robust mmWave network. Essentially, mmWave network deployment often requires the creation of smaller networks at each corner of a building [10]. MMWave can handle an incredible amount of data and an incredible number of users simultaneously. It is ideal for densely populated cities and places like stadiums and arenas [11]. All major carriers use MMWave networks, but to date, those superfast connections are limited to a few urban areas in major cities. MMWave networks are expected to be more robust, but only time will tell how long that actually takes [12]. By using the tuner only at the output of the transmitter, full compensation cannot be ensured, and loss of gain will occur due to misalignment with the antenna [13]. In this case, you need another tuner, which should be connected between the feeder and the antenna, and then it corrects the position and compensates for the reaction. In this example, the feeder performs an agreed-upon line of exchange of arbitrary length [14]. A structural antenna with an active input impedance of about 110 ohms must be integrated into a 50-ohm transmission line [15]. Transmitter output is 50 ohms. Here you have a matching device installed at the feed connection point to the antenna. In general, many lovers use HF transformers of various types with ferrite cores, but a 75-ohm cable is more convenient to make a quarter-wave coaxial transformer [16]. A half-wave or multiple half-waves usually wave resistance (also taking into account the attenuation coefficient) usually through a coaxial cable multiple half-wave. It switches between the antenna and the tuner located near the transmitter. The antenna input resistance of about 110 ohms is changed at the lower end of the cable and converted to a resistance of 50 ohms using the tuner. In this case, a transmitter has a complete approval of an antenna, and the feeder performs the return function.

In more complex cases, where the input resistance of the antenna does not correspond to the waveform resistance, and the feeder resistance does not correspond to the transmitter output resistance, two matching devices are required. One top to match the antenna with the feeder and the other to the transmitter. Only one antenna feeder is needed to integrate the whole chain: antenna - feeder - transmitter is not possible [17]. Having rehab complicates the situation. An antenna tuner in this case should significantly improve the integration of the transmitter with the fader, thus simplifying the work of the terminal layer, but nothing more. As the feed does not match the antenna, loss will occur and the antenna's performance will be reduced. The CWW meter between the transmitter and the tuner will adjust KSW 1, and there will be no one between the tuner and the handicap due to the disagreement of the handicap with the antenna [18]. This suggests a reasonable conclusion: the tuner supports the normal mode of the transmitter when working with an abnormal load, but it is not capable of improving the performance of the antenna.

Feeder It is very useful when antennas (frames, diloles) work during a half-wave recovery. In this case, the input resistance of the antenna is different on different bands, but easily changes with the transmitter using a matching device. The proposed tuner can operate in the frequency band from 1.5 to 30 MHz with a transmitter power of 1.5 kW [19]. Tuner main components - RF Autotransformer on ferrite ring from unt-35 tv and 17 positions switch on ferrite ring. It is possible to use cone rings on CNT-47/59 TVs or from others. The winding has 12 turns wound on two wires. The beginning of one winding is connected to the end of another [20]. The wire itself is encased in fluoroplastic insulation. Wire diameter is 2.5 mm in isolation. Pipes in each turn are made starting from the eighth of the landed ends.

2. LITERATURE REVIEW

Needless to say, 5G ecology is far superior to 4G in various aspects. After the transition from 3G to 4G, we saw a massive change in speed across various mobile broadband services. 4G's main goal was twofold focus on speed. But 5G investment is about more than that [1]. The ultimate goal of 5G is to create a more integrated system and efficient platform. As a result, we can enjoy a mobile broadband service far superior to the previous generation. It will also ensure that important communication and massive IoT designs are in place. This technology introduces a wide range of models and some new ways we can use them to connect to each other [2].

An attempt to compensate for the reactance in the gap (in the transmitter) of the feeder (in the transmitter) is unsuccessful, because it is limited by the parameters of the handicap. Amateur ranges [3] The frequency adjustment of the transmitter in short sections does not lead to the appearance of a significant reactive component, so in most cases there is no need to compensate for the reaction. Even properly designed multi-element antennas do not have a large reactive component of the input resistance, and its compensation is not necessary [4]. There is often controversy over the role and designation of an antenna matching device (antenna tuner) when authenticating a transmitter with an antenna. Some have great faith in him, while others consider him an unnecessary toy [5]. A split resonator (dipole), connected to a transmitter with an active input impedance of about 70 ohms and a resonant frequency of about 70 ohms, has an output resistance of 50 ohms [6]. The tuner is set at the output of the transmitter, and in this case, it plays the role of a matching node between the feeder and the transmitter, in which copies is easy [7]. If the transmitter frequency is retuned to a frequency different from the antenna frequency, this characteristic will occur in the antenna input impedance. It immediately appears at the low-nutrition end. The tuner is capable of compensating, and the transmitter will be acknowledged once the antenna is disabled again [8].

3. PROPOSED MODEL

A heather pain indicator circuit solution of dissatisfaction may exist. Vibration indication is carried out by changing the source of the transistor, so that these changes are more pronounced, and the displacement voltage is supplied to the measuring device. It can be adjusted variable resistance, before installing before measuring, to bring the arrow of the device closer to the final goal of its scale. The frequency is recorded by a digital frequency meter. The proposed antenna design includes the following objectives shown in Fig.1.

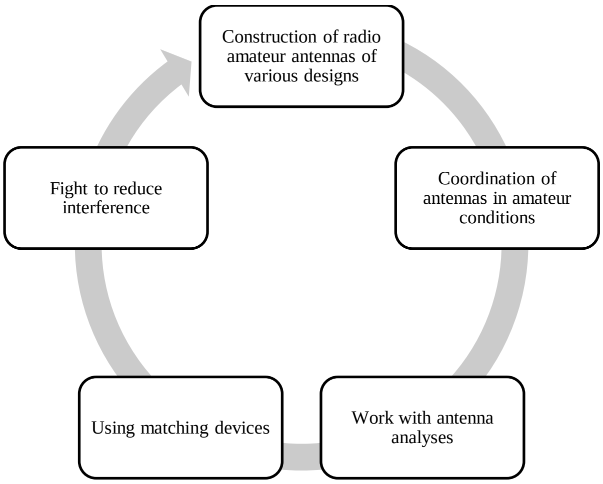

Fig.1. Objectives of proposed antenna design

- Construction of radio amateur antennas of various designs
- Coordination of antennas in amateur conditions
- Work with antenna analyses
- Using matching devices
- Fight to reduce interference

A constructive difference from traditional versions is the use of a large-sized coil, which is possible to provide a significant connection to an antenna element. It is a dielectric plate 150 wide and 15 mm thick base. Its length is not critical - it depends on the size of the box in which the tuning elements are placed, and on the size of the frequency meter used in the factory. In the upper part of this plate, a coil is wound, which consists of five turns of wire with a diameter of 7mm isolated. Its excitation turned out to be about 3μg, which, by changing the number of turns, can obtain the other necessary to construct a particular antenna with a frequency. In the upper part of the plate there are two dielectric hooks (from those used to fasten the wiring), which suspends the device antenna wire element. This allows adjusting the relative position of the Kir coil and this element, which increases the measurement accuracy. The wire element of the antenna consists of rectangular coil turns with long sides parallel to each other. As this experiment showed, an antenna element and its frequency provide a sufficiently strong connection to a Gir coil for reliable recording of the frequency. Therefore, when working with the "double square" structure, the change in the testimony of the measuring device during dissatisfaction is about 40% of the total. The frequency range of the RF generator is divided into 6 sub-ranges components shown in Fig.2.

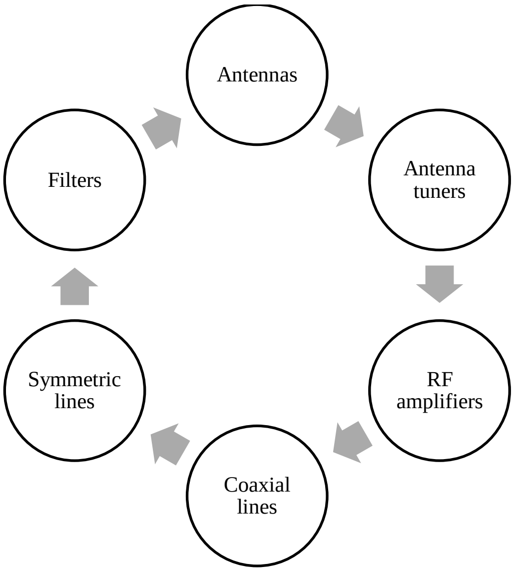

Fig.2. Sub-range components of proposed antenna design

- Antennas
- Antenna tuners
- Radio frequency amplifiers
- Coaxial lines
- Symmetric lines
- Filters

Before, installing the antenna in the structure of the fasting of the loops is the installation of temporary devices for the remote adjustment of the loops. Establish and secure an asymmetrical bridge. Let us fix the antenna of 20 range, center frequency of 14,150 MHz. 5 m equal to 10 is the length of the prize asymmetric bridge. After that, for measurements of antenna parameters, you need to prepare a cable segment equal to or several lambdas equal to 2, half-wave recovery, taking into account the length of the cable in the balanced device. If a cable with a polyethylene filling is used, with an attenuation coefficient, the length of the half-wave reset is 6.975m. The minimum height of installation of an antenna from the ground is 10 meters. The measuring instruments are located at the base of the mast, which means that a cable length of 1.5 lambdas is chosen. This is equal to 20m.925mm. To be immediately explained, the antenna power is carried out by a non-resonant method and the total length of the cable from the transceiver from the antenna can be arbitrary. By cutting a cable equal to 1.5 Lambda we need only for measurements and antenna systems, and then it is filled with a reduction cable to the required length. In addition, you can check the cable length of 1.5 Lambda with a high-frequency bridge, but, as the practice shows the square limit. The estimated error is so small that it can be neglected. 5G is a new generation of network standards that must follow certain requirements.

- The first requirement of 5G is to provide data rates of up to 10 gigabits per second. This ensures around 10 to 100 times improvement in speed over the previous generation of cellular network.
- 5th generation of network should have 1 millisecond delay.
- 1000 times bandwidth per unit area.
- 5G availability should be more than 99.99%.
- Ensure 100% security user.
- Energy usage for balancing the network should be reduced by 90% from previous generation networks.
- Ensure up to 10-year battery life for various low-powers IoT devices.

Prepare an antenna and cable and raise and install an antenna at its continuous operating height. The mast is swallowed with sages, if the rigging of many layers, all the layers of degros are immediately installed. The mast is attached to a temporary technical bracket, which has a girder. Gir frame should be close to the ring of active elements, and can be teleported. To do this, Gira plans to put a varicap in parallel with the capacitor changing capacity. In the ideal case, one element of the double square can be moved to adjust the distance between the frames. If there is no invalid relay, the switch must be done manually and the cables must be replaced according to the scheme. On one side of the first relay, a high-frequency bridge is connected to measure the active resistance of the antenna. If a change in length affects a change in the value of KSV, one or more of the following factors come into play major role shown in Fig.3:

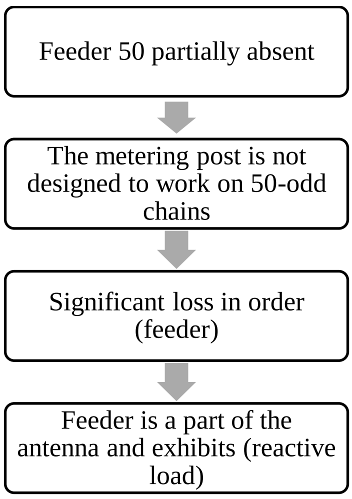

Fig.3. Design factors come into construct major role

- Feeder 50 partially absent
- The metering post is not designed to work on 50-odd chains
- Significant loss in order (feeder)
- Feeder is a part of the antenna and exhibits (reactive load)

It is desirable that the bridge is without a cable, the relay is screwed directly on the relay, otherwise you have to take into account this cable (from the relay to the rf bridge) and 1.5 lambda in the same section from the recovery. On the other hand, the first relay is connected by a cable of arbitrary length to a second Repex connecting the second Repex RF Bridge and a descending cable to the transceiver. A cable connecting the second relay and the RF

Bridge is an arbitrary length. A low-power installation of the transceiver, i.e., the RF Bridge, is necessary for operation. Place the HF generator in the active element of the frame in the direction of receiving the antenna at a distance of at least 1 Lambda, mounted on a small dipole horizontal polarizer, the dipole shoulders size is approximately 0.5m. The antenna of this generator should be at the same height as the measured antenna. Antenna setup is carried out by two measurement conditions.

- Located next to an antenna is the transceiver
- If there is an opportunity, the transceiver is set up near the antenna

Otherwise, you have to install a telephone connection or use small radio stations. It is in the transceiver. It must tune to the gram signal and communicate the frequency. The operator should press the power button located on the control panel, confirm that the settings are correct, and turn off the control panel. After all, some powerful radio station can be mistaken for a cab. By defining the frequency of the efficiency law, we see in which direction the frequency must be shifted to satisfy the law. Antennas with various swimming coils, antennas fed on a coaxial cable 50 ohms without impedances, impedances, capacitive loads, etc.

- Connect the antenna bead to the antenna beam
- ConFig.the generator to reduce the KSW meter reading
- Read and write frequency to frequency meter display
- Divide the desired result by frequency
- Multiply the existing antenna length by the result obtained. it will be a new desired antenna length.

As a rule of thumb, the standard output impedance with almost all modern broadband transmitters is 50 ohms. Most coaxial cables used as a payload have a standard 50- or 75-ohm ripple resistance rating. Antennas, depending on the type and design, can have input resistances in a wide range of values: from several ohms to hundreds and even more. An element at an unusual frequency is known to be active in the input impedance of antennas. The frequency of the transmitter differs from the frequency of the antenna frequency in one direction or another, and the input impedance of the antenna appears as a reactive component of a capacitive or inductive nature. In multi-element antennas, the input impedance over frequency is complex in nature because the passive components contribute to the generation of reactive components.

In the case when the input resistance of the antenna is purely active, it is easier to adopt the feeder resistance in suitable switching devices. At the same time, the losses are very insignificant. But, once the jet component builds up in the input resistance, integration becomes complicated, and a complex matching device is required to compensate for the unwanted performance. This device must have an antenna power point. No compensated function worsens CWs in disabled individuals and increases loss.

4. RESULTS AND DISCUSSION

The Proposed ultra-wide band communication antennas (UWBCA) design was compared with the existing Ultra-Wideband Fabric MIMO Antenna (UWFMA), miniaturized T-shape ultra-wideband antenna (MTSUWA), Compact Ultra-Wideband Chip Antenna (CUWCA) and multi-dimensional antenna (MDA) designs.

4.1 PEAK DATA RATE

5G will provide absolutely fast data speed. Peak data rates hit 20 Gbps downlink and 10 Gbps uplink for a versatile base station. Mind you, it's not the speed you're getting insight into with 5G (unless you have a solid connection) - it's the speed shared by all customers in the cell, and surprisingly at that point, it's higher. While the peak data rates are quite impressive, the actual speeds may not be very similar. The spec calls for 100Mbps client download speeds and 50Mbps transfer speeds. The comparison of peak data rate was demonstrated in the following table 1,

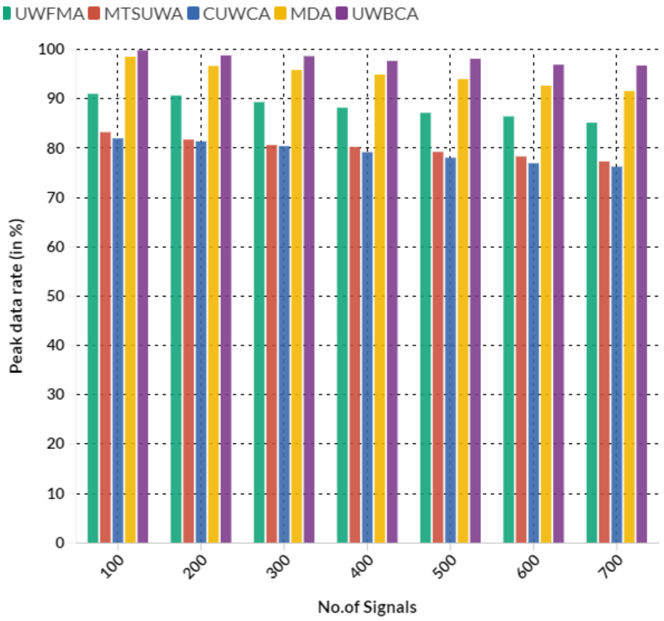

Fig.4. Comparison of Peak data rate

From Fig.4, in a cut-off signal level the proposed UWBCA design achieved 97.70% of peak data rate. In the same signal level, the existing UWFMA reached 88.21%, MTSUWA reached 80.26%, CUWCA obtained 79.20% and MDA achieved 94.93% of peak data rate. While compared with the other designs, the proposed design reached the better results.

4.2 ANTENNA LATENCY

Latency, the time it takes for data to travel from one point to the next, should be 4ms under ideal conditions and 1 millisecond for use cases that demand very high speeds.

From Fig.5, in a cut-off signal level the proposed UWBCA design achieved 96.61% of antenna latency. In the same signal level, the existing UWFMA reached 90.51%, MTSUWA reached 82.56%, CUWCA obtained 75.80% and MDA achieved 92.19% of antenna latency. While compared with the other designs, the proposed design reached the better results.

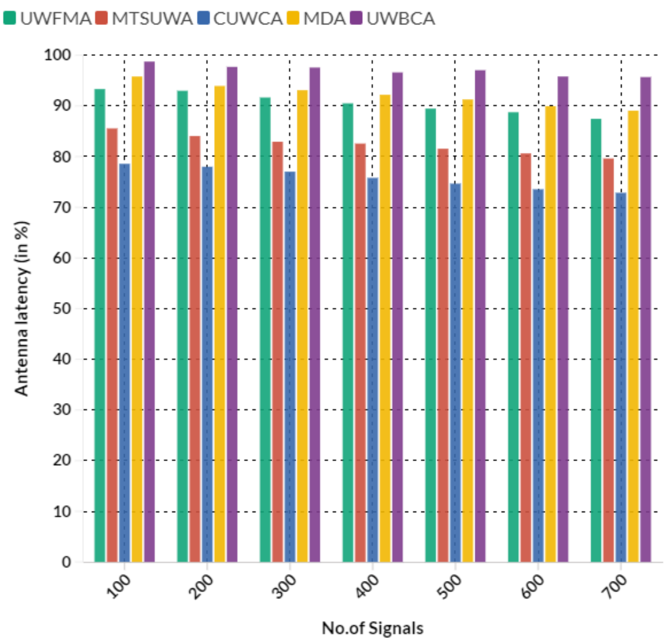

Fig.5. Comparison of antenna latency

4.3 ANTENNA CAPACITY

Radio interfaces should be powered when in use and drop into low power mode when not in use. Preferably, a radio should have the option to switch to a lower power level within 10 ms.

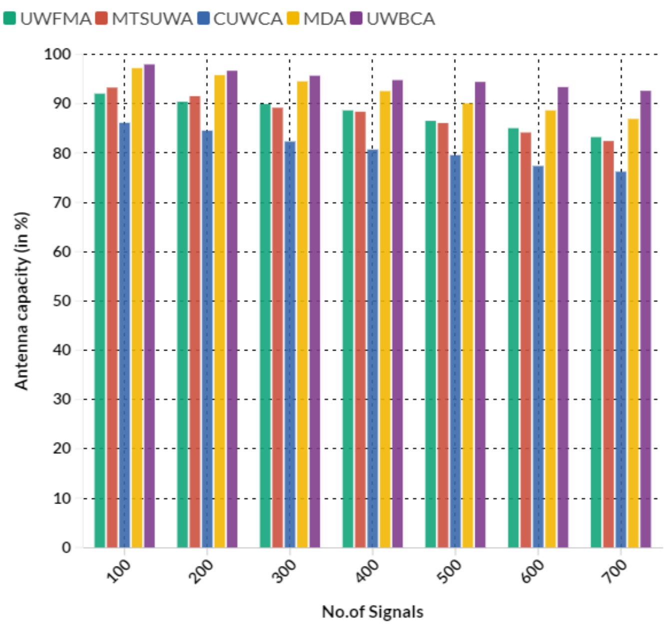

Fig.6. Comparison of antenna capacity

From Fig.6, in a cut-off signal level the proposed UWBCA design achieved 94.81% of antenna capacity. In the same signal level the existing UWFMA reached 88.66%, MTSUWA reached 88.40%, CUWCA obtained 80.73% and MDA achieved 92.57% of antenna capacity. While compared with the other designs, the proposed design reached the better results.

4.4 SPECTRAL EFFICIENCY

Spectral efficiency is the "optimal use of spectrum or bandwidth so that the greatest amount of data can be transmitted with the least possible transmission errors." Naturally, 5G should have slightly better spectral efficiency than LTE, which comes in at 30 bits/Hz downlink and 15 bits/Hz uplink. With 5G, base stations must sustain growth from 0 to 310 mph. This implies that the base station must operate over a range of antenna developments – even on a fast train. While this has been done effectively in LTE companies, such a move could be a trial run in new MMWave companies.

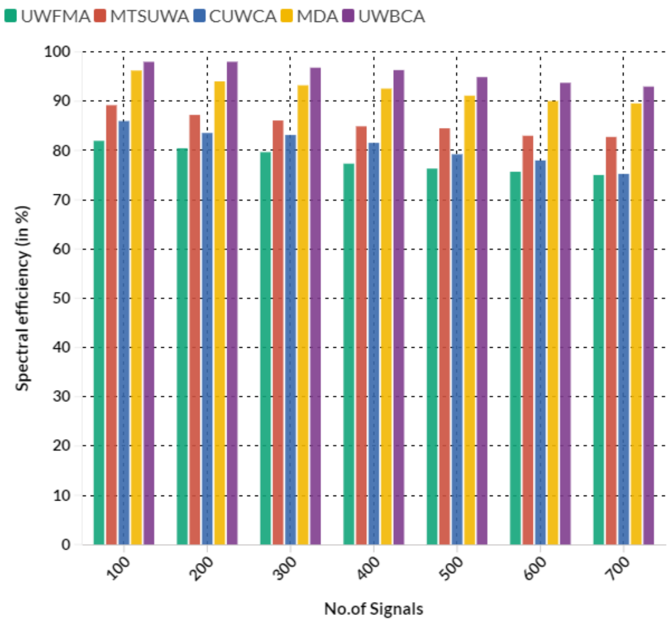

Fig.7. Comparison of spectral efficiency

From Fig.7, in a cut-off signal level the proposed UWBCA design achieved 96.33% of spectral efficiency. In the same signal level the existing UWFMA reached 77.33%, MTSUWA reached 84.90%, CUWCA obtained 81.55% and MDA achieved 92.56% of spectral efficiency. While compared with the other designs, the proposed design reached the better results.

4.5 CONNECTION DENSITY

As far as connection thickness is concerned, 5G should have the option to support more connected devices than 4G LTE. The standard states that every square kilometer should have a 1G option to support 5 million connected devices. This is an enormous number, considering the large number of connected devices that the Internet of Things (IoT) is incorporating into self-discipline.

From Fig.8, in a cut-off signal level the proposed UWBCA design achieved 94.99% of connection density. In the same signal level, the existing UWFMA reached 70.47%, MTSUWA reached 89.09%, CUWCA obtained 84.59% and MDA achieved 91.89% of connection density. While compared with the other designs, the proposed design reached the better results.

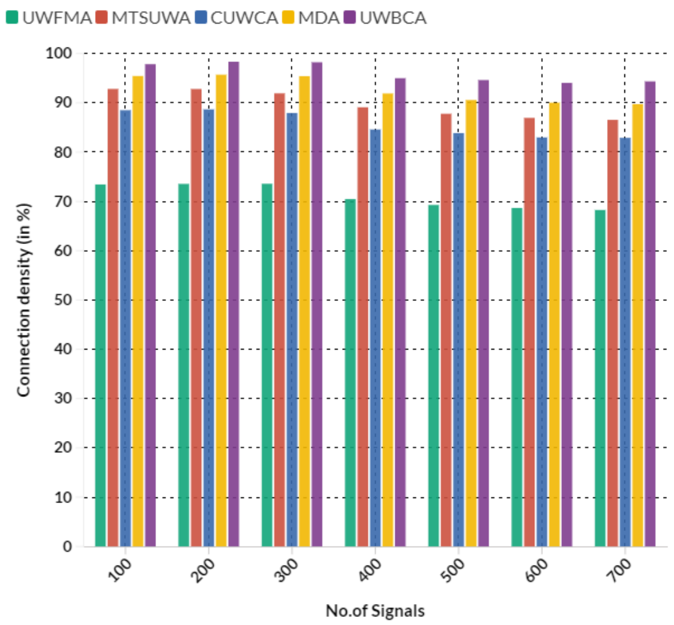

Fig.8. Comparison of Connection Density

5. CONCLUSION

In this practice, Antennas are very rare, it is equal to the input resistance of the feeder wave resistance, and in turn, the output resistance of the transmitter output resistance. Often there is no such approval and special fitting devices must be applied. The proposed UWBCA design was compared with the existing UWFMA, MTSUWA, CUWCA and MDA designs. In a cut-off signal level, the proposed UWBCA design achieved 97.70% of peak data rate, 96.61% of antenna latency, 94.81% of antenna capacity, 96.33% of spectral efficiency and 94.99% of connection density. The proposed antenna design, feeder and transmitter output should be considered as an integrated system in which energy transfer should be conducted without loss.

Implementation of this difficult task requires approval in two places: Feeder with transmitter output and Feeder at connection antenna point. Different types of switching devices are very popular: from synchronous oscillation definitions to coaxial transformers in the form of cable sections of the required length. They have to match all the resistances, which ultimately leads to reducing the losses in the transmission line and most importantly, a decrease in abnormal radiation.

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